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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 2008

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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 2008, biological and habitat monitoring focused on the Des Plaines River System (DPRS) as well as nine annual Ambient Water Quality Monitoring (AWQM) Program stations located throughout the Chicago and Calumet River Systems. Sediment chemistry and toxicity analyses were also performed on samples from the DPRS. 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 stream water with plant effluents. In the Chicago River System, chlorophyll *a* mean concentrations ranged from 1 µg/L at Foster Avenue on the North Shore Channel (NSC) to18 µg/L at Frontage Road on the Skokie River. The maximum chlorophyll *a* concentration measured in the Chicago River System was 51µg/L at Oakton Street on the NSC.

Mean chlorophyll *a* values in the Calumet River System ranged from 2 µg/L at Ewing Avenue on the Calumet River to 53 µg/L at Burnham Avenue on the Grand Calumet River (GCR). The maximum concentration measured was 201 µg/L at Burnham Avenue on the GCR.

The range of mean chlorophyll *a* concentrations in the DPRS was 2 µg/L at Wille Road, Higgins Creek, to 34 µg/L at Higgins Road, Salt Creek, and Oakton Street, Des Plaines River (DPR). The maximum concentration measured in this system was 124 µg/L at Oakton Street on the DPR.

Habitat

The DPRS consists largely of wadeable waterways with some deeper areas. This system has segments with good pool/riffle/run development, sinuosity, and little-to-no channelization. The DPRS has some positive instream habitat consisting of boulders, brush-debris jams, logs, and aquatic vegetation throughout most of the system. Forested areas are a very common riparian land use in the DPRS. However, all of the waterways in this system have some riparian areas that are dominated by residential or commercial/industrial uses, causing canopy cover to be variable. Sediments, consisting mainly of sand, gravel, and cobble, were common throughout the system with silt in many interstitial spaces.

Fish

Forty-one species of fish, including 16 game fish species, were collected from Chicago area waterways during 2008. The most abundant species in the catch from the deep-draft waterways of the Chicago and Calumet River Systems included gizzard shad, pumpkinseed, and emerald shiner. Green sunfish, bluegill, and bluntnose minnow were the most abundant species in

the DPRS and the wadeable portion of the Chicago River System. In general, all three waterway systems 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 29 AWQM stations during 2008. Total species richness for ponar and Hester Dendy samplers combined was 140 species, while total Ephemeroptera, Plecoptera, and Trichoptera (EPT) richness was 18 species (EPT taxa are considered relatively sensitive to pollution). Comprehensive benthic invertebrate data from 2008 is catalogued in a separate report at mwrd.org (MWRD 2006-2008 Chicago Waterways Benthic Report).

Sediment Chemistry

During 2008, sediment samples were collected from the side and center of the waterway at 20 stations. Sediment samples were analyzed for eight general chemical constituents, 11 trace metals, and a total of 111 organic priority pollutants (OPPs). In addition, a contract laboratory performed acid volatile sulfide/simultaneously extracted metals (AVS/SEM) analysis, particle size determinations, and total organic carbon analysis. Springinsguth Road, on the West Branch DuPage River (WBDR), contained elevated amounts of total Kjeldahl nitrogen (TKN) (5,974 mg/kg), copper (133 mg/kg), and total organic carbon (66,000 mg/kg). Sediment samples from the side and center at Willow Springs Road, DPR, contained the highest values of total phosphorus (TP) (3,253 and 3,473 mg/kg) and iron (24,603 and 23,805 mg/kg). The highest number of OPP detections (17) occurred at Wille Road on Higgins Creek.

Sediment Toxicity

Ten-day *Chironomus tentans* toxicity testing was performed using sediment from side and center locations at 20 stations. Nine of the 38 samples elicited a percent survival rate that was significantly less than the control sites, indicating that the sediment was unsuitable for *Chironomus* survival. None of the locations showed ash-free dried weights that were significantly less than control sites.

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. This report focuses on the biological, habitat, and sediment quality during 2008. 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. The four river systems of interest are the northern portion of the Chicago River System, the southern portion of the Chicago River System, the Calumet River System, and the Des Plaines River System. 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. Of the remaining 44 sampling stations, 12 are on the northern portion of the Chicago River System, 8 are on the southern portion of the Chicago River System, 10 are on the Calumet River System, 13 are on the DPRS, and 1 station is on the Fox River system. During 2008, biological monitoring focused on the DPRS, including the DPR, Salt Creek, Buffalo Creek, Higgins Creek, and WBDR. One station was also monitored on Poplar Creek which flows into the Fox River.

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, nongovernmental 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, Fox, 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 treated municipal wastewater effluent and allowing commercial navigation in the deep-draft portions.

The primary man-made waterways are in the Chicago River System, including the 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 Cal-Sag Channel (CSC), connecting the Little Calumet River (LCR) with the CSSC. The primary natural waterways include the wadeable branches of the NBCR, flowing south from Lake County to the junction with the NSC and continuing as the deep-draft portion of the NBCR, which joins the Chicago River and becomes the South Branch Chicago River; the DPR, 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 CSC. In 2008, Route 19 (station 90) on Poplar Creek was sampled. Poplar Creek flows into the Fox River.

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 in 1998. Secondary criteria for selecting sampling locations included: (1) above and below District WRPs, (2) below Lake Michigan diversion, (3) above the 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 on 14 stations in the DPRS during 2008, including the DPR, Buffalo Creek, Higgins Creek, Salt Creek, and WBDR, and on Poplar Creek in the Fox River System. Table 1 displays the 2008 field monitoring schedule for biological, physical habitat, and sediment quality assessments.

FIGURE 1: AMBIENT WATER QUALITY MONITORING PROGRAM
SAMPLING STATIONS

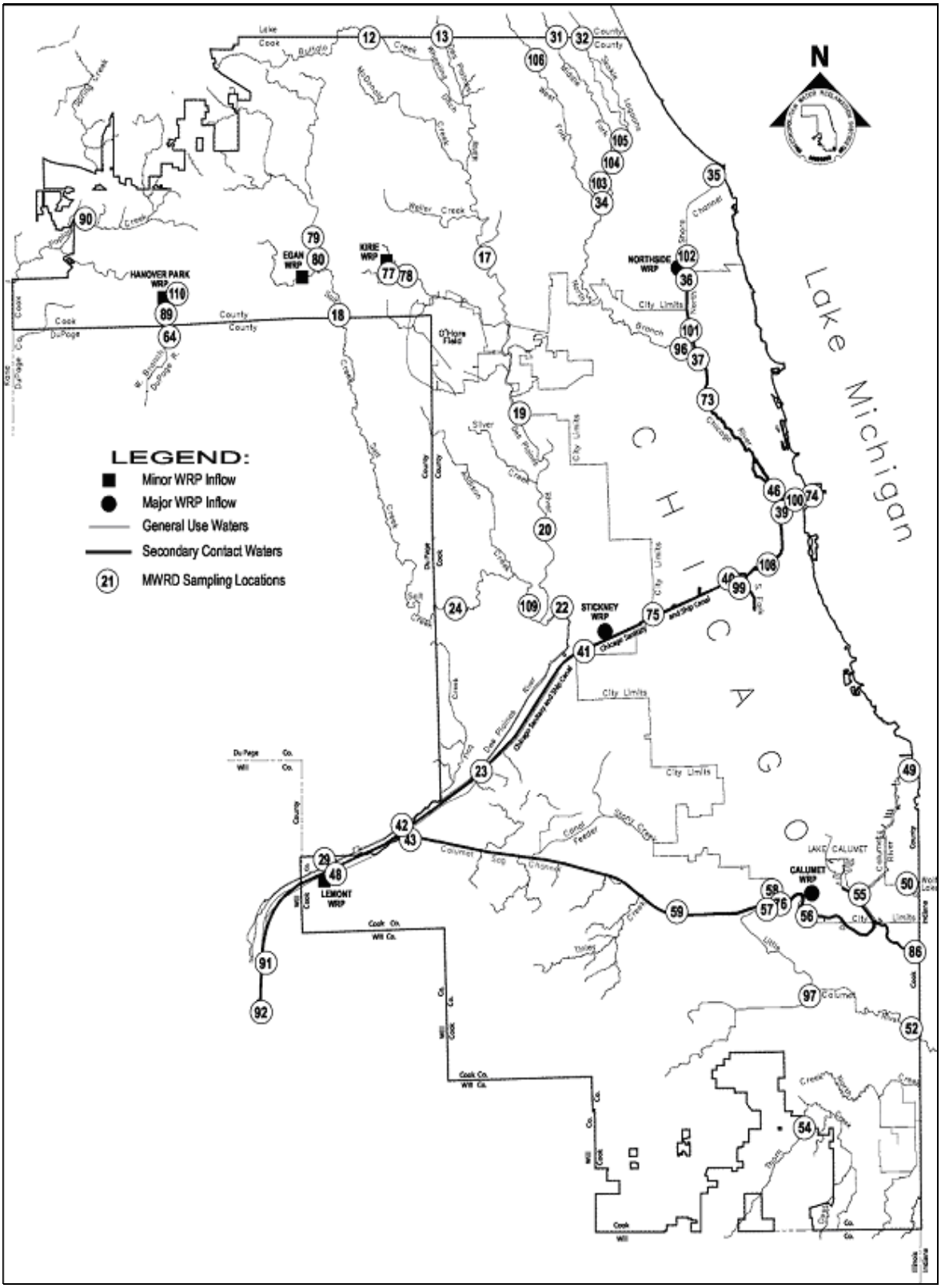


TABLE 1: DATES THAT AMBIENT WATER QUALITY MONITORING PROGRAM STATIONS WERE SAMPLED DURING 2008

Station No.	Sampling Station	Waterway	Date Sampled
		CHICAGO RIVER SYSTEM	
96	Albany Avenue[1]	North Branch Chicago River	8/8/08
36	Touhy Avenue[1]	North Shore Channel	7/29/08[2], 11/06/08[3]
46	Grand Avenue[1]	North Branch Chicago River	7/31/08[2], 11/05/08[3]
75	Cicero Avenue[1]	Chicago Sanitary & Ship Canal	7/31/08[2], 10/29/08[3]
41	Harlem Avenue[1]	Chicago Sanitary & Ship Canal	7/31/08[2], 10/29/08[3]
92	Lockport[1]	Chicago Sanitary & Ship Canal	7/30/08[2], 10/09/08[3]
		CALUMET RIVER SYSTEM	
55	130th Street[1]	Calumet River	8/7/08[2], 10/27/08[3]
76	Halsted Street[1]	Little Calumet River	8/6/08[2], 10/28/08[3]
59	Cicero Avenue[1]	Calumet-Sag Channel	8/6/08[2], 11/17/08[3]
		DES PLAINES RIVER SYSTEM	
12	Lake-Cook Road	Buffalo Creek	7/17/08, 8/28/08[4]
77	Elmhurst Road	Higgins Creek	6/24/08, 8/27/08[4]
78	Wille Road[1]	Higgins Creek	6/24/08, 8/27/08[4]
79	Higgins Road	Salt Creek	7/18/08, 8/25/08[4]
80	Arlington Heights Rd.	Salt Creek	7/01/08, 8/20/08[4]
18	Devon Avenue[1]	Salt Creek	7/14/08, 8/20/08[4]
24	Wolf Road	Salt Creek	8/11/08, 8/15/08[4]
109	Brookfield Avenue	Salt Creek	8/11/08
13	Lake-Cook Road[1]	Des Plaines River	7/17/08[2], 8/28/08
17	Oakton Street	Des Plaines River	7/22/08, 8/25/08[4]
19	Belmont Avenue	Des Plaines River	7/28/08, 8/21/08[4]
20	Roosevelt Road	Des Plaines River	7/23/08, 8/21/08[4]

TABLE 1 (Continued): DATES THAT AMBIENT WATER QUALITY MONITORING PROGRAM STATIONS WERE SAMPLED DURING 2008

Station No.	Sampling Station	Waterway	Date Sampled
		DES PLAINES RIVER SYSTEM(Continued)	
22	Ogden Avenue[1]	Des Plaines River	8/13/08[2], 8/26/08[3] 10/31/08[4]
23	Willow Springs Road	Des Plaines River	8/12/08, 8/19/08[4]
29	Stephen Street	Des Plaines River	8/12/08, 8/19/08[4]
91	Material Service Rd.[1]	Des Plaines River	7/30/08, 8/26/08[4,5]
110	Springinsguth Road	West Branch DuPage River	6/25/08, 8/18/08[4]
89	Walnut Lane	West Branch DuPage River	6/25/08, 8/18/08[4]
64	Lake Street[1]	West Branch DuPage River	6/30/08, 8/22/08[4]
		FOX RIVER SYSTEM	
90	Route 19	Poplar Creek	6/30/08, 8/22/08[4]

[1] Annual sampling station.
[2] Invertebrate sampling only on this date.
[3] Electrofishing and habitat assessment conducted on this date.
[4] Sediment chemistry sampling only on this date.
[5] Fish sampling continued on this date.

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 up-stream 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 a preservative, and a 1/2-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, the samples were mixed by rapidly inverting the 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, and the amount of water that was filtered was measured with a graduated cylinder. Following filtration, sample filters were folded and wrapped with aluminum foil for extraction 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 µg/L of chlorophyll *a*. 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.

Habitat

Data Collection. Physical habitat assessment data sheets (Figure A-1) were completed by a staff biologist in the field at each station. 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

Boatable 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, 100 meters of the waterway was sampled. A fourteen-foot (small) electrofishing boat instead of the sixteen-foot (large) electrofishing boat was used for all boatable sites. The large boat was not used in 2008, because the generator had mechanical issues. Besides boat length and width, the main difference between the two boats is the size of the electrofisher. The small electrofishing boat has a 2.5 generator-powered pulsator (GPP) that has a target output range of 5 to 7 amperes, and the large electofishing boat has a 5.0 GPP that has a target output range of 12 to 14 amperes. 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 in order to stun 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.

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 per volume 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 functional organization comparable to that of a natural habitat (Karr et al., 1986). Karr's 1986 IBI was used to analyze fish data from 2008.

The limitations of using this tool, which was meant to apply to wadeable streams for some of the man-made, channelized waterways in the Chicago area, should be recognized.

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.

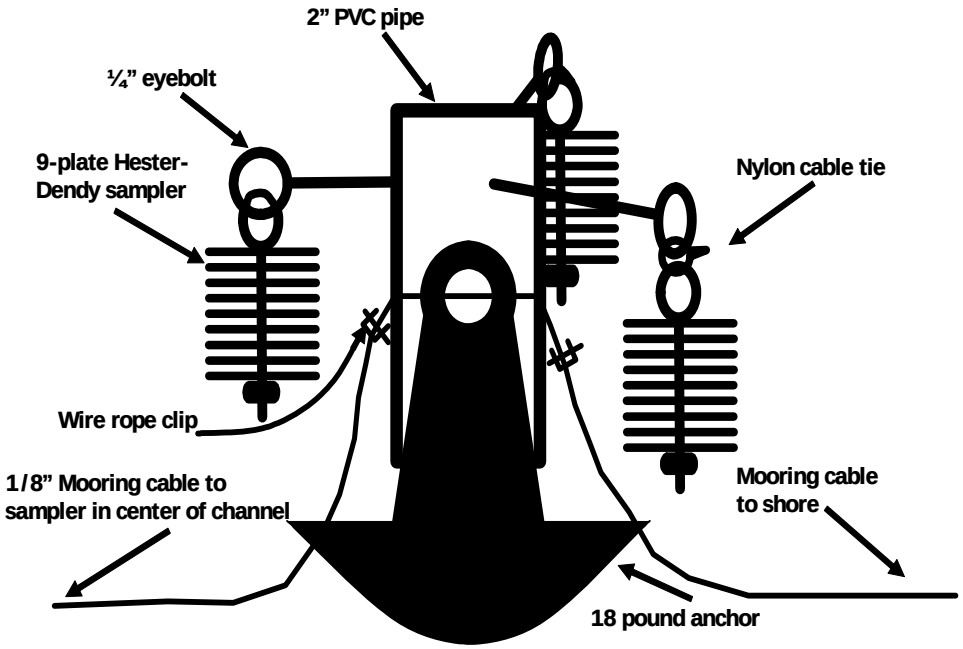
Benthic Invertebrates

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 2008. Figure 2 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 14 weeks and then retrieved concurrent to other biological sampling. 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 at the water surface. 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. These samples are then brought back to the lab and stored at 4°C until processed.

Benthic Invertebrate Processing. Samples were fixed in formalin for thirty days. Next, the ponar sediment samples were gently washed with water and screened through a United States Standard number 60 mesh sieve (250 μm openings) and transferred to a 70 percent ethanol solution. Each Hester Dendy 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. The formalin solution remaining in the Hester Dendy sample container was rinsed into the sieve in order to capture any invertebrates that may have fallen off the Hester Dendy plates. The contents of this sieve were then rinsed back into the bucket with a 70 percent ethanol solution. The ponar and Hester Dendy samples were then stored in a 4°C walk-in cooler until processed. Before processing, the samples were sieved to remove the ethanol solution. The sieved material was then 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.

FIGURE 2: CONFIGURATION OF HESTER DENDY LARVAL PLATE SAMPLER



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 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 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, total volatile solids, ammonia nitrogen (NH_3-N), nitrate plus nitrite nitrogen, TKN, TP, total cyanide, phenols, total metals (including arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc), and 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 (19^{th} 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 2008

Volatile Organic Compounds	Acid Extractables	Base/Neutral Extractables	Pesticides and PCBs
Acrolein	2-Chlorophenol	Acenaphthene	Aldrin
Acrylonitrile	2,4-Dichlorophenol	Acenaphthylene	alpha-BHC
Benzene	2,4-Dimethylphenol	Anthracene	beta-BHC
Bromoform	4,6-Dinitro-o-cresol	Benzidine	gamma-BHC
Carbon tetrachloride	2,4-Dinitrophenol	Benzo(a)anthracene	delta-BHC
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
1,2-Dichlorobenzene	2,4,6-Trichlorophenol	Bis(2-chloroethyl)ether	Endosulfan-I
1,3-Dichlorobenzene		Bis(2-chloroisopropyl)ether	Endosulfan-II
1,4-Dichlorobenzene		Bis(2-ethylhexyl)phthalate	Endosulfan sulfate
Dichlorobromomethane		4-Bromophenyl phenyl ether	Endrin
1,1-Dichloroethane		Butylbenzyl phthalate	Endrin aldehyde
1,2-Dichloroethane		2-Chloronaphthalene	Heptachlor
1,1-Dichloroethylene		4-Chlorophenyl phenyl ether	Heptachlor epoxide
1,2-Dichloropropane		Chrysene	PCB-1242
1,3-Dichloropropene		Dibenzo(a,h)anthracene	PCB-1254
Ethyl benzene		3,3-Dichlorobenzidine	PCB-1221
Methyl bromide		Diethyl phthalate	PCB-1232
Methyl chloride		Dimethyl phthalate	PCB-1248
Methylene chloride		Di-n-butyl phthalate	PCB-1260

TABLE 3 (Continued): LIST OF ORGANIC PRIORITY POLLUTANTS ANALYZED IN SEDIMENT SAMPLES COLLECTED FOR THE AMBIENT WATER QUALITY MONITORING PROGRAM DURING 2008

Volatile Organic Compounds	Acid Extractables	Base/Neutral Extractables	Pesticides and PCBs
1,1,2,2-Tetrachloroethane		2,4-Dinitrotoluene	PCB-1016
Tetrachloroethylene		2,6-Dinitrotoluene	Toxaphene
Toluene		Di-n-octyl phthalate	
1,2-trans-Dichloroethylene		1,2-Diphenylhydrazine	
1,1,1-Trichloroethane		Fluoranthene	
1,1,2-Trichloroethane		Fluorene	
Trichloroethylene		Hexachlorobenzene	
Trichlorofluoromethane		Hexachlorobutadiene	
Vinyl chloride		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. The IEPA is cooperating with other state and local agencies to develop regional water quality criteria for nutrients and possibly chlorophyll. 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 2008 are shown in Table 4.

During 2008, the highest mean chlorophyll *a* value in the Chicago area waterways was at Burnham Avenue on the GCR (53 µg/L). The lowest mean chlorophyll *a* concentration throughout the system was 1 µg/L at Foster Avenue on the NSC.

Habitat

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 display observed and measured characteristics of sampling stations located in the DPRS. The displayed habitat characteristics are a compilation of all the assessments made at each station in 2008.

The DPRS is primarily comprised of shallow and wadeable areas. There are also deeper segments that are considered boatable. The maximum water depth in the boatable portion of the DPRS was 6.8 feet (Higgins Road, Salt Creek) and the wadeable streams had a maximum depth of 3.3 feet (Wolf Road, DPR). Man-made structures, like bridges and riprap, were prevalent throughout the DPRS. Higgins Creek, at Wille Road, is entirely man-made with the banks and streambed consisting of concrete. All of the waterways in this system have some riparian areas that are dominated by residential or commercial/industrial uses, causing canopy cover to be variable. However, the predominant riparian land use in the DPRS is forest. Forested areas that have little-to-no man-made alterations have higher quality channel development and sinuosity. Boulders, brush-debris jams, logs, and aquatic vegetation were the predominant sources of instream habitat in the DPRS. Half of the stations in this system had four or more types of instream habitat, indicating the presence of quality habitat.

Sand was the predominant component in most sediment samples. Stephen Street and Material Services Road on the DPR had the most stable substrate because bedrock was the dominant constituent. Light amounts of oil were observed in sediments from four stations on the DPR, Salt Creek, and WBDR. Belmont Avenue, on the DPR, was the only station where a moderate amount of oil was observed in sediment. The greatest depth of fines measured 3.5 feet at Springinsguth Road on the WBDR, where silt and plant debris were the predominant substrates.

TABLE 4: RANGE AND MEAN CHLOROPHYLL *a* VALUES IN THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2008

Station No.	Station Name	Waterway	N*	Mean µg/L	Minimum µg/L	Maximum µg/L	Standard Deviation µg/L
106	Dundee Road	W Fork N Branch Chicago River[1]	11	14	4	45	11
103	Golf Road	W Fork N Branch Chicago River[1]	10	9	4	18	5
31	Lake-Cook Road	M Fork N Branch Chicago River[2]	10	11	2	23	6
32	Lake-Cook Road	Skokie River	10	8	2	14	4
105	Frontage Road	Skokie River	12	18	5	38	11
104	Glenview Road	North Branch Chicago River	12	11	3	27	7
34	Dempster Street	North Branch Chicago River	11	9	2	20	6
35	Central Street	North Shore Channel	9	6	1	25	8
102	Oakton Street	North Shore Channel	11	13	1	51	17
36	Touhy Avenue	North Shore Channel	12	2	< 1	7	2
101	Foster Avenue	North Shore Channel	12	1	< 1	3	1
37	Wilson Avenue	North Branch Chicago River	12	3	1	6	2
73	Diversey Avenue	North Branch Chicago River	12	4	1	6	2
46	Grand Avenue	North Branch Chicago River	12	4	1	9	3
74	Lake Shore Drive	Chicago River	10	2	1	3	1
100	Wells Street	Chicago River	12	2	1	5	1
39	Madison Street	South Branch Chicago River	12	4	1	12	3
108	Loomis Street	South Branch Chicago River	11	3	1	10	3
99	Archer Avenue	Bubbly Creek	12	11	1	38	12
40	Damen Avenue	Chicago Sanitary and Ship Canal	12	3	1	9	3
75	Cicero Avenue	Chicago Sanitary and Ship Canal	12	4	1	12	3
41	Harlem Avenue	Chicago Sanitary and Ship Canal	12	2	< 1	8	2
42	Route 83	Chicago Sanitary and Ship Canal	12	4	1	12	3

TABLE 4 (Continued): RANGE AND MEAN CHLOROPHYLL *a* VALUES IN THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2008

Station No.	Station Name	Waterway	N*	Mean µg/L	Minimum µg/L	Maximum µg/L	Standard Deviation µg/L
48	Stephen Street	Chicago Sanitary and Ship Canal	12	6	2	16	5
92	Lockport	Chicago Sanitary and Ship Canal	50	5	1	17	4
49	Ewing Avenue	Calumet River	9	2	1	6	2
55	130th Street	Calumet River	8	5	2	8	2
50	Burnham Avenue	Wolf Lake	12	7	3	15	5
86	Burnham Avenue	Grand Calumet River	10	53	2	201	66
56	Indiana Avenue	Little Calumet River	9	21	4	36	11
76	Halsted Street	Little Calumet River	12	8	1	16	5
52	Wentworth Avenue	Little Calumet River	10	6	1	14	4
54	Joe Orr Road	Thorn Creek	9	4	1	8	2
97	170th Street	Thorn Creek	11	8	3	13	4
57	Ashland Avenue	Little Calumet River	10	8	2	14	4
58	Ashland Avenue	Calumet-Sag Channel	12	8	3	17	5
59	Cicero Avenue	Calumet-Sag Channel	11	8	2	23	6
43	Route 83	Calumet-Sag Channel	10	10	1	27	8
90	Route 19	Poplar Creek	11	9	2	18	5
110	Springinsguth Road	West Branch DuPage River	11	14	2	43	13
89	Walnut Lane	West Branch DuPage River	12	7	2	18	5
64	Lake Street	West Branch DuPage River	12	19	5	36	11
79	Higgins Road	Salt Creek	9	34	5	60	18
80	Arlington Heights Road	Salt Creek	12	12	3	40	10
18	Devon Avenue	Salt Creek	12	14	4	44	11
24	Wolf Road	Salt Creek	12	9	1	19	7
109	Brookfield Avenue	Salt Creek	11	6	1	11	4
77	Elmhurst Road	Higgins Creek	5	26	7	92	37

TABLE 4 (Continued): RANGE AND MEAN CHLOROPHYLL *a* VALUES IN THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2008

Station No.	Station Name	Waterway	N*	Mean µg/L	Minimum µg/L	Maximum µg/L	Standard Deviation µg/L
78	Wille Road	Higgins Creek	12	2	1	4	1
12	Lake-Cook Road	Buffalo Creek	11	20	4	46	12
13	Lake-Cook Road	Des Plaines River	12	19	4	74	20
17	Oakton Street	Des Plaines River	12	34	9	124	35
19	Belmont Avenue	Des Plaines River	12	22	2	80	27
20	Roosevelt Road	Des Plaines River	12	23	2	85	30
22	Ogden Avenue	Des Plaines River	11	21	1	83	25
23	Willow Springs Road	Des Plaines River	11	22	1	79	25
29	Stephen Street	Des Plaines River	12	22	2	72	21
91	Material Services Road	Des Plaines River	12	26	4	118	30

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

TABLE 5: SUMMARY OF HABITAT OBSERVATIONS FOR THE LAKE-COOK ROAD STATION ON BUFFALO CREEK DURING 2008

	Buffalo Creek Station No. 12 Lake-Cook Rd.
Depth Range (ft)	0.5-1.6
Man-Made Structure Present	Bridge
Floatable Materials	None
Instream Cover for Fish (Side)	Boulders, Aquatic Vegetation, Brush-Debris Jams, Logs, Submerged Terrestrial Vegetation, Under Cut Bank
Canopy Cover	Partly Shaded
Immediate Shore Cover	Gabions, Grasses, Shrubs, Trees
Riparian Land Use	Golf Course
Sediment Composition (Descending Percentage)	Boulder, Cobble, Gravel, Sand
Amount of Oil in Sediment	None
Depth of Fines Range (ft.)	<0.1

TABLE 6: SUMMARY OF HABITAT OBSERVATIONS FOR STATIONS ON THE DES PLAINES RIVER DURING 2008

	Des Plaines River		
	Station No. 13 Lake-Cook Rd.	Station No. 17 Oakton St.	Station No. 19 Belmont Ave.
Depth Range (ft)	0.7-2.5	1.9-6.25	2.1-5.1
Man-Made Structure Present	Riprap, Bridge	Riprap, Bridge	Bridge
Floatable Materials	Vegetative Material	None	Vegetative Material
Instream Cover for Fish (Side)	Aquatic Vegetation, Boulders, Brush-Debris Jams, Logs	Bridge Pilings, Boulders, Submerged Terrestrial Vegetation	Boulders, Logs
Canopy Cover	Open to Partly Shaded	Open to Partly Shaded	Open to Partly Shaded
Immediate Shore Cover	Trees, Rip Rap, Grasses, Shrubs	Shrubs, Rip Rap, Trees, Grasses	Denuded, Trees, Shrubs
Riparian Land Use	Forest	Urban Residential, Forest	Urban Commercial/Industrial, Forest
Sediment Composition (Descending Percentage)	Sand, Gravel, Silt, Plant Debris, Cobble, Boulder	Gravel, Sand, Silt, Corbicula, Cobble, Boulder, Plant Debris	Sand, Silt, Gravel, Boulder, Concrete, Plant Debris, Mussel Shells
Amount of Oil in Sediment	None	None	None to Moderate
Depth of Fines Range (ft.)	0.3 to 1.2	<0.1 to 2.0	<0.1 to 0.6

TABLE 6 (Continued): SUMMARY OF HABITAT OBSERVATIONS FOR STATIONS ON THE DES PLAINES RIVER DURING 2008

	Des Plaines River		
	Station No. 20 Roosevelt Rd.	Station No. 22 Ogden Ave.	Station No. 23 Willow Springs Rd..
Depth Range (ft)	1.8-2.7	1.2-2.6	1.0-6.5
Man-Made Structure Present	Bridge	Bridge	Bridge
Floatable Materials	Vegetative Material	Vegetative Material	Vegetative Material
Instream Cover for Fish (Side)	Brush-Debris Jams, Logs	Boulders, Brush-Debris Jams, Logs	Boulders, Brush-Debris Jams, Logs, Submerged Terrestrial Vegetation
Canopy Cover	Open to Shaded	Open	Open to Partly Shaded
Immediate Shore Cover	Denuded, Shrubs, Trees	Grasses, Shrubs, Trees	Denuded, Grasses, Shrubs, Trees
Riparian Land Use	Urban Commercial/ Industrial, Forest, Cemetery	Forest	Urban Residential, Urban Commercial/Industrial, Forest
Sediment Composition (Descending Percentage)	Silt, Gravel, Sand, Clay, Asiatic clams	Gravel, Sand, Cobble, Silt, Detritus	Silt, Sand, Plant Debris
Amount of Oil in Sediment	None	None	None to Light
Depth of Fines Range (ft.)	1.5 to 2.8	0.1 to 0.3	0.9 to 3.4

TABLE 6 (Continued): SUMMARY OF HABITAT OBSERVATIONS FOR STATIONS ON THE DES PLAINES RIVER DURING 2008

	Des Plaines River	
	Station No. 29 Stephen St.	Station No. 91 Material Services Rd.
Depth Range (ft)	1.0-2.1	0.6-1.7
Man-Made Structure Present	Bridge	Bridge
Floatable Materials	Vegetative Material	Vegetative Material
Instream Cover for Fish (Side)	Boulders, Brush-Debris Jams, Logs, Submerged Tree Roots, Rock Ledge	Aquatic Vegetation,Boulders, Brush-Debris Jams, Logs, Sub-merged Terrestrial Vegetation, Rock Ledge
Canopy Cover	Open to Partly Shaded	Open
Immediate Shore Cover	Denuded, Grasses, Shrubs, Trees	Grasses, Trees
Riparian Land Use	Urban Commercial/Industrial, Forest	Grassland, Forest
Sediment Composition (Descending Percentage)	Bedrock, Cobble, Boulder, Sand, Silt, Gravel	Bedrock, Boulder
Amount of Oil in Sediment	None to Light	None
Depth of Fines Range (ft.)	<0.1-0.1	<0.1

TABLE 7: SUMMARY OF HABITAT OBSERVATIONS FOR THE ROUTE 19 STATION ON POPLAR CREEK DURING 2008

	Poplar Creek Station No. 90 Route 19
Depth Range (ft)	0.7-1.5
Man-Made Structure Present	Bridge
Floatable Materials	None
Instream Cover for Fish (Side)	Aquatic Vegetation, Boulders, Submerged Terrestrial Vegetation
Canopy Cover	Open
Immediate Shore Cover	Grasses, Trees
Riparian Land Use	Grassland, Urban Residential
Sediment Composition (Descending Percentage)	Gravel, Cobble, Sand, Clay
Amount of Oil in Sediment	None
Depth of Fines Range (ft.)	<0.1–0.2

TABLE 8: SUMMARY OF HABITAT OBSERVATIONS FOR STATIONS ON SALT CREEK DURING 2008

	Salt Creek		
	Station No. 79 Higgins Rd.	Station No. 80 Arlington Heights Rd.	Station No. 18 Devon Ave.
Depth Range (ft)	1.2-6.8	1-4	1-2
Man-Made Structure Present	Bridge	Bridge	Bridge
Floatable Materials	Vegetative Material	Vegetative Material	Vegetative Material
Instream Cover for Fish (Side)	Aquatic Vegetation, Boulders, Brush-Debris Jams, Logs, Submerged Tree Roots, Submerged Terrestrial Vegetation, Under Cut Bank	Aquatic Vegetation, Boulders, Logs, Brush-Debris Jams, Submerged Tree Roots, Under Cut Bank	Aquatic Vegetation, Boulders, Brush-Debris Jams, Logs, Under Cut Bank
Canopy Cover	Open	Open to Partly Shaded	Open to Partly Shaded
Immediate Shore Cover	Grasses, Shrubs, Trees	Grasses, Shrubs, Trees	Grasses, Shrubs, Trees
Riparian Land Use	Wetland, Forest	Forest	Forest
Sediment Composition (Descending Percentage)	Silt, Sand, Clay, Boulder, Cobble, Plant Debris	Gravel, Sand, Silt	Sand, Silt, Gravel, Clay
Amount of Oil in Sediment	None	None	None to Light
Depth of Fines Range (ft.)	<0.1-1.5	0.3 to 0.4	0.2 to 1.8

TABLE 8 (Continued): SUMMARY OF HABITAT OBSERVATIONS FOR STATIONS ON SALT CREEK DURING 2008

	Salt Creek	
	Station No. 24 Wolf Rd.	Station No. 109 Brookfield Ave.
Depth Range (ft)	1.0-3.3	0.4-1.7
Man-Made Structure Present	Bridge	Bridge
Floatable Materials	Vegetative Material	None
Instream Cover for Fish (Side)	Aquatic Vegetation, Boulders, Brush-Debris Jams, Logs, Sub-merged Terrestrial Vegetation	Boulders, Brush-Debris Jams, Logs
Canopy Cover	Open	Open to Partly Shaded
Immediate Shore Cover	Grasses, Shrubs, Trees	Denuded, Grasses, Shrubs, Trees
Riparian Land Use	Forest	Urban Residential, Forest
Sediment Composition (Descending Percentage)	Sand, Plant Debris, Asiatic clams, Silt, Cobble, Boulder	Sand, Cobble, Gravel, Silt, Plant Debris, Asiatic clams
Amount of Oil in Sediment	None	None
Depth of Fines Range (ft.)	<0.1-0.4	<0.1-0.2

TABLE 9: SUMMARY OF HABITAT OBSERVATIONS FOR STATIONS ON HIGGINS CREEK DURING 2008

	Higgins Creek	
	Station No. 77 Elmhurst Rd.	Station No. 78 Wille Rd.
Depth Range (ft)	0.2-0.6	1.4-1.5
Man-Made Structure Present	Rip Rap, Bridge	Bridge
Floatable Materials	Street Litter, Vegetative Matter	None
Instream Cover for Fish (Side)	Aquatic Vegetation, Boulders, Brush-Debris Jams	Aquatic Vegetation, Boulders
Canopy Cover	Open	Open
Immediate Shore Cover	Grasses, Shrubs, Rip Rap	Concrete
Riparian Land Use	Urban Commercial/Industrial	Recreational Park
Sediment Composition (Descending Percentage)	Boulder, Cobble	Concrete, Sand, Gravel
Amount of Oil in Sediment	None	None
Depth of Fines Range (ft.)	<0.1[1]	<0.1[1]

[1]All depth of fines measurements less than 0.1 feet.

TABLE 10: SUMMARY OF HABITAT OBSERVATIONS FOR STATIONS ON THE WEST BRANCH OF THE DUPAGE RIVER DURING 2008

	West Branch DuPage River		
	Station No. 110 Springinsguth Rd.	Station No. 89 Walnut Ln.	Station No. 64 Lake St.
Depth Range (ft)	0.2-0.8	0.5-1.6	1.1-2.0
Man-Made Structure Present	Bridge, Outfall	Bridge	Rip Rap, Bridge
Floatable Materials	Street Litter, Vegetative Material	Street Litter, Vegetative Material	Vegetative Material
Instream Cover for Fish (Side)	Aquatic Vegetation, Boulders	Aquatic Vegetation, Boulders, Brush-Debris Jams	Aquatic Vegetation, Boulders, Brush-Debris Jams, Logs, Under Cut Bank
Canopy Cover	Open to Partly Shaded	Open to Partly Shaded	Open
Immediate Shore Cover	Grasses, Shrubs, Trees	Grasses, Shrubs, Trees	Grasses, Shrubs
Riparian Land Use	Urban Residential	Urban Residential, Row Crops	Grassland
Sediment Composition (Descending Percentage)	Silt, Plant Debris, Sand, Gravel	Sand, Gravel, Silt, Plant Debris	Sand, Silt, Plant Debris, Gravel, Boulder
Amount of Oil in Sediment	Light	None	None
Depth of Fines Range (ft.)	0.4 to 3.5	0.2 to 1.0	0.1 to 1.5

In several reaches where cobble, concrete, or bedrock were present, depth of fines measurements were less than 0.1 foot.

Fish

Table 11 lists the common and scientific names of the fish species collected during 2008 and the 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 2008, 2,191 fish comprised of 41 fish species, including 16 game species, and three hybrids were collected from Chicago area waterways. Numbers of fish collected from each AWQM station are shown in Appendix Tables B-1-B-4. Gizzard shad, emerald shiner, and pumpkinseed sunfish were the most abundant species in the deep-draft waterways. Green sunfish, bluegill, and bluntnose minnows were the most abundant species at the wadeable streams stations.

The 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. The station at Elmhurst Road on Higgins Creek was the only collection rated as poor with respect to the backpack electrofishing collection method, but it was rated fair with respect to the seine collection method. The station at 130th Street on the Calumet River had the highest IBI score of 40.

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 2008 is available at mwrd.org (MWRD 2006-2008 Chicago Waterways Benthic Report). Total species richness for ponar and Hester Dendy samplers combined was 140 species, while total EPT richness was 18 species.

Northern Portion of the 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 and EPT taxa richness among Hester Dendy and ponar samples. The Albany Avenue Hester Dendy sample exhibited 26 total taxa and three EPT taxa. The ponar sample for this station contained 17 total and one EPT taxa. Head capsule deformities in Chironomidae specimens were found in the Hester Dendy and ponar samples at Touhy Avenue (one percent and seven percent of total midges, respectively).

Southern Portion of the Chicago River System. Benthic samples were collected from three stations in the CSSC. Total Hester Dendy taxa richness ranged from 15 at Cicero Avenue and Harlem Avenue to 25 at Lockport. Numbers of EPT taxa for these samples were one, one, and three, respectively. The Harlem Avenue and Lockport ponar samples both had two EPT taxa; Cicero had none. Chironomid head capsule deformities were observed in the Hester Dendy samples at Cicero Avenue and Harlem Avenue (0.7 percent and 2.5 percent of total midges, respectively) and the ponar sample at Lockport (4.3 percent of total midges).

TABLE 11: COMMON AND SCIENTIFIC NAMES OF FISHES COLLECTED FROM THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2008

Common Name	Scientific Name	River System		
		Chicago	Calumet	Des Plaines
HERRING FAMILY	CLUPEIDAE			
Gizzard shad	*Dorosoma cepedianum*	X	X	X
SALMON AND TROUT FAMILY	SALMONIDAE			
Chinook salmon*	*Oncorhynchus tshawytscha*	X	X	
MINNOW FAMILY	CYPRINIDAE			
Goldfish	*Carassius auratus*	X	X	X
Common carp	*Cyprinus carpio*	X	X	X
Carp x Goldfish	*C. carpio x C. auratus*	X		X
Common shiner	*Notropis cornutus*			X
Bigmouth shiner	*Notropis dorsalis*			X
Spotfin shiner	*Cyprinella spiloptera*	X		X
Golden shiner	*Notemigonus crysoleucas*		X	X
Emerald shiner	*Notropis atherinoides*	X	X	
Sand shiner	*Notropis stramineus*			X
Bluntnose minnow	*Pimephales notatus*	X	X	X
Fathead minnow	*Pimephales promelas*	X	X	X
Hornyhead chub	*Nocomis biguttatus*			X
Creek chub	*Semotilus atromaculatus*			X
SUCKER FAMILY	CATOSTOMIDAE			
White sucker	*Catostomus commersonii*	X	X	X
Spotted sucker	*Minytrema melanops*			X
CATFISH FAMILY	ICTALURIDAE			
Yellow bullhead*	*Ameiurus natalis*	X		X
Channel catfish*	*Ictalurus punctatus*	X		
Tadpole madtom	*Noturus gyrinus*			X
PIKES	ESOCIDAE			
Northern pike*	*Esox lucius*		X	X

TABLE 11 (Continued): COMMON AND SCIENTIFIC NAMES OF FISHES COLLECTED FROM THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2008

Common Name	Scientific Name	River System		
		Chicago	Calumet	Des Plaines
KILLIFISH FAMILY	FUNDULIDAE			
Blackstripe topminnow	*Fundulus notatus*	X		X
LIVEBEARER FAMILY	POECILIIDAE			
Western mosquitofish	*Gambusia affinis*	X		X
SILVERSIDE FAMILY	ATHERINIDAE			
Brook silverside	*Labidesthes sicculus*		X	
TEMPERATE BASS FAMILY	MORONIDAE			
White perch*	*Morone Americana*	X		
GOBY FAMILY	GOBIIDAE			
Round goby	*Neogobius melanostomus*			X
SUNFISH FAMILY	*CENTRARCHIDAE*			
Rock bass*	*Ambloplites rupestris*	X	X	X
Green sunfish*	*Lepomis cyanellus*	X	X	X
Pumpkinseed*	*Lepomis gibbosus*	X	X	X
Orangespotted sunfish*	*Lepomis humilis*			X
Bluegill*	*Lepomis macrochirus*	X		X
Green sunfish x Orange-spotted sunfish	*L. cyanellus x L.humilis*			X
Green sunfish x Bluegill	*L. cyanellus x L. macro-chirus*		X	X
Smallmouth bass*	*Micropterus dolomieu*		X	
Largemouth bass*	*Micropterus salmoides*	X	X	X
White crappie*	*Pomoxis annularis*	X		
Black crappie*	*Pomoxis nigromaculatus*	X		X
PERCH FAMILY	*PERCIDAE*			
Johnny darter	*Etheostoma nigrum*			X
Fantail darter	*Etheostoma flabellare*			X
Yellow perch*	*Perca flavescens*		X	
Blackside darter	*Percina maculate*			X
Walleye*	*Stizostedion vitreum*			X

TABLE 11 (Continued): COMMON AND SCIENTIFIC NAMES OF FISHES COLLECTED FROM THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2008

Common Name	Scientific Name	River System		
		Chicago	Calumet	Des Plaines
DRUM FAMILY	SCIAENIDAE			
Freshwater drum	*Aplodinotus grunniens*	X		
LOACH FAMILY	COBITIDAE			
Oriental weatherfish	*Misgurnus anguillicau-datus*			X
Total Number of Fish Species		22	17	32
Total Number of Hybrids		1	1	3

*Game fish species.

TABLE 12: NUMBER, WEIGHT, AND NUMBER OF SPECIES OF FISH COLLECTED FROM THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2008

Station No.	Location	Waterway	Sample Gear	Number of Fish	Weight (grams)	Number of Species		Most Abundant Species
						Total	Game	
36	Touhy Avenue[1]	North Shore Channel	Small EF Boat	68	78,249	14	8	Common carp
96	Albany Avenue[1]	North Branch Chicago River	BP/Seine	52	43	5	1	Fathead minnow
46	Grand Avenue[1]	North Branch Chicago River	Small EF Boat	59	22,981	6	3	Gizzard shad
75	Cicero Avenue[1]	Chicago Sanitary & Ship Canal	Small EF Boat	58	44,151	11	6	Common carp
41	Harlem Avenue[1]	Chicago Sanitary & Ship Canal	Small EF Boat	186	8,819	12	5	Pumpkinseed
92	Lockport[1]	Chicago Sanitary & Ship Canal	Small EF Boat	171	14,870	10	5	Gizzard shad
55	130th Street[1]	Calumet River	Small EF Boat	254	54,785	13	7	Emerald shiner
76	Halsted Street[1]	Little Calumet River	Small EF Boat	45	62,729	12	5	Common carp
59	Cicero Avenue[1]	Calumet-Sag Channel	Small EF Boat	66	28,713	4	2	Gizzard shad
12	Lake-Cook Road	Buffalo Creek	BP/Seine	95	1,693	10	5	Bluegill
13	Lake-Cook Road[1]	Des Plaines River	BP/Seine	214	1,461	11	6	Green sunfish
17	Oakton Street	Des Plaines River	Small EF Boat	21	8,973	8	5	Green sunfish, Northern pike
19	Belmont Avenue	Des Plaines River	Small EF Boat	13	5,318	6	3	Green sunfish
20	Roosevelt Road	Des Plaines River	Small EF Boat	5	5,276	4	1	Common carp
22	Ogden Avenue[1]	Des Plaines River	BP	117	4,046	16	5	Bluntnose minnow
23	Willow Springs Road	Des Plaines River	Small EF Boat	24	10,439	11	8	Gizzard shad
29	Stephen Street	Des Plaines River	BP/Seine	176	343	14	6	Blackstripe topminnow
91	Material Service Road[1]	Des Plaines River	BP/Seine	72	277	13	5	Bluntnose minnow
77	Elmhurst Road	Higgins Creek	BP/Seine	107	575	4	1	Bluntnose minnow
78	Wille Road[1]	Higgins Creek	BP/Seine	20	115	5	2	Fathead minnow

TABLE 12 (Continued): NUMBER, WEIGHT, AND NUMBER OF SPECIES OF FISH COLLECTED FROM THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2008

Station No.	Location	Waterway	Sample Gear	Number of Fish	Weight (grams)	Number of Species		Most Abundant Species
						Total	Game	
79	Higgins Road	Salt Creek	Small EF Boat	83	10,159	9	6	Bluegill
80	Arlington Heights Rd.	Salt Creek	Small EF Boat	52	30,173	7	5	Bluegill
18	Devon Avenue[1]	Salt Creek	BP/Seine	6	152	4	3	Green sunfish
24	Wolf Road	Salt Creek	BP/Seine	23	333	10	3	Bluntnose minnow
109	Brookfield Avenue	Salt Creek	BP/Seine	42	374	10	2	Bigmouth shiner
110	Springinsguth Road	West Branch DuPage River	BP	3	7	1	1	Bluegill
89	Walnut Lane	West Branch DuPage River	BP/Seine	49	347	3	3	Green sunfish
64	Lake Street[1]	West Branch DuPage River	BP/Seine	90	5,244	8	4	Green sunfish
90	Route 19	Poplar Creek	BP/Seine	20	289	9	3	Green sunfish
		TOTAL		2,191	401 kg.	41	16	

[1]Annual sampling station.

TABLE 13: INDEX OF BIOTIC INTEGRITY SCORE AND CATEGORY BY STATION DURING 2008

Station No.	Location	Waterway	Sample Gear	IBI[1] Score	IBI[1] Category
36	Touhy Avenue	North Shore Channel	Small EF Boat	32	Fair
96	Albany Avenue	North Branch Chicago River	BP	22	Fair
96	Albany Avenue	North Branch Chicago River	Seine	24	Fair
46	Grand Avenue	North Branch Chicago River	Small EF Boat	26	Fair
75	Cicero Avenue	Chicago Sanitary and Ship Canal	Small EF Boat	26	Fair
41	Harlem Avenue	Chicago Sanitary and Ship Canal	Small EF Boat	26	Fair
92	Lockport	Chicago Sanitary and Ship Canal	Small EF Boat	24	Fair
55	130th Street	Calumet River	Small EF Boat	40	Fair
76	Halsted Street	Little Calumet River	Small EF Boat	26	Fair
59	Cicero Avenue	Calumet-Sag Channel	Small EF Boat	22	Fair
12	Lake-Cook Road	Buffalo Creek	BP	32	Fair
12	Lake-Cook Road	Buffalo Creek	Seine	24	Fair
13	Lake-Cook Road	Des Plaines River	BP	26	Fair
13	Lake-Cook Road	Des Plaines River	Seine	32	Fair
17	Oakton Street	Des Plaines River	Small EF Boat	26	Fair
19	Belmont Avenue	Des Plaines River	Small EF Boat	28	Fair
20	Roosevelt Road	Des Plaines River	Small EF Boat	26	Fair
22	Ogden Avenue	Des Plaines River	BP	34	Fair
22	Ogden Avenue	Des Plaines River	Seine	ND	ND
23	Willow Springs Road	Des Plaines River	Small EF Boat	34	Fair
29	Stephen Street	Des Plaines River	BP	28	Fair
29	Stephen Street	Des Plaines River	Seine	32	Fair
91	Material Services Road	Des Plaines River	BP	32	Fair
91	Material Services Road	Des Plaines River	Seine	30	Fair
77	Elmhurst Road	Higgins Creek	BP	18	Poor
77	Elmhurst Road	Higgins Creek	Seine	26	Fair
78	Wille Road	Higgins Creek	BP	24	Fair
78	Wille Road	Higgins Creek	Seine	ND	ND

TABLE 13 (Continued): INDEX OF BIOTIC INTEGRITY SCORE AND CATEGORY BY STATION DURING 2008

Station No.	Location	Waterway	Sample Gear	IBI[1] Score	IBI[1] Category
79	Higgins Road	Salt Creek	Small EF Boat	36	Fair
80	Arlington Heights Road	Salt Creek	Small EF Boat	34	Fair
18	Devon Avenue	Salt Creek	BP	26	Fair
18	Devon Avenue	Salt Creek	Seine	ND	ND
24	Wolf Road	Salt Creek	BP	22	Fair
24	Wolf Road	Salt Creek	Seine	32	Fair
109	Brookfield Avenue	Salt Creek	BP	26	Fair
109	Brookfield Avenue	Salt Creek	Seine	30	Fair
89	Walnut Lane	West Branch DuPage River	BP	28	Fair
89	Walnut Lane	West Branch DuPage River	Seine	28	Fair
64	Lake Street	West Branch DuPage River	BP	26	Fair
64	Lake Street	West Branch DuPage River	Seine	26	Fair
90	Route 19	Poplar Creek	BP	34	Fair
90	Route 19	Poplar Creek	Seine	32	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 2008

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

TABLE 14 (Continued): BENTHIC INVERTEBRATE TAXA COLLECTED BY PONAR AND HESTER DENDY SAMPLERS DURING 2008

Taxa		Hester Dendy	Petite Ponar
ARACHNOIDEA			
	Hydracarina (Water Mites)	X	X
INSECTA			
	Collembola (Springtails)	X	X
	Ephemeroptera (Mayflies)		
	Baetis intercalaris	X	X
	Leucrocuta	X	
	Maccaffertium integrum	X	
	Maccaffertium terminatum	X	X
	Stenacron	X	X
	Tricorythodes	X	X
	Caenis	X	X
	Anthopotamus myops grp.	X	
	Odonata (Damselflies and Dragonflies)		
	Calopteryx	X	
	Hetaerina	X	X
	Argia	X	X
	Enallagma	X	X
	Lestes	X	
	Aeshna	X	
	Gomphidae[1]		X[1]
	Argiogomphus		X
	Hemiptera (True Bugs)		
	Trepobates	X	
	Rhagovelia	X	
	Corixidae		X
	Megaloptera (Dobsonflies and Alderflies)		
	Chauliodes	X	X
	Sialis	X	
	Trichoptera (Caddisflies)		
	Cyrnellus fraternus	X	X
	Ceratopsyche morosa	X	X

TABLE 14 (Continued): BENTHIC INVERTEBRATE TAXA COLLECTED BY PONAR AND HESTER DENDY SAMPLERS DURING 2008

Taxa	Hester Dendy	Petite Ponar
Trichoptera (Caddisflies) (Continued)		
Cheumatopsyche	X	X
Hydropsyche betteni	X	
Hydropsyche bidens	X	X
Hydropsyche orris	X	X
Hydropsyche simulans	X	X
Hydroptila	X	X
Ceraclea maculate	X	
Oecetis	X	X
Coleoptera (Beetles)		
Dineutus	X	
Peltodytes	X	X
Dubiraphia	X	X
Macronychus glabratus	X	
Stenelmis	X	X
Ectopria		X
Diptera (True Flies)		
Hemerodromia	X	X
Simulium	X	X
Chironimidae (Midges)		
Clinotanypus		X
Coelotanypus		X
Procladius	X	X
Tanypus	X	X
Ablabesmyia janta	X	X
Ablabesmyia mallochi	X	X
Labrundinia	X	X
Nilotanypus	X	
Thienemannimyia grp	X	X
Acricotopus		X
Brillia	X	
Corynoneura lobata	X	
Cricotopus bicinctus grp.	X	X

TABLE 14 (Continued): BENTHIC INVERTEBRATE TAXA COLLECTED BY PONAR AND HESTER DENDY SAMPLERS DURING 2008

Taxa	Hester Dendy	Petite Ponar
Chironimidae (Midges) (Continued)		
Cricotopus sylvestris grp.	X	X
Cricotopus tremulus grp.	X	X
Cricotopus trifascia grp.		X
Nanocladius crassicornus/ rectinervis	X	X
Nanocladius distinctus	X	X
Rheocricotopus robacki	X	
Thienemanniella similis	X	
Thienemanniella xena	X	X
Tvetenia discoloripes grp	X	
Chironomus	X	X
Cladopelma	X	X
Cryptochironomus	X	X
Cryptotendipes	X	X
Dicrotendipes fumidus	X	X
Dicrotendipes lucifer	X	X
Dicrotendipes modestus	X	X
Dicrotendipes neomodestus	X	X
Dicrotendipes nervosus	X	
Dicrotendipes simpsoni	X	X
Endochironomus nigricans	X	X
Glyptotendipes	X	X
Harnischia	X	X
Microchironomus		X
Microtendipes	X	X
Parachironomus	X	X
Paracladopelma		X
Paralauterborniella nigrohalteralis		X
Paratendipes	X	X
Phaenopsectra flavipes	X	X
Phaenopsectra obediens	X	X

TABLE 14 (Continued): BENTHIC INVERTEBRATE TAXA COLLECTED BY PONAR AND HESTER DENDY SAMPLERS DURING 2008

Taxa	Hester Dendy	Petite Ponar
Chironimidae (Midges) (Continued)		
Polypedilum fallax grp.	X	
Polypedilum flavum	X	X
Polypedilum halterale grp.	X	X
Polypedilum illinoense	X	X
Polypedilum scalaenum grp.	X	X
Pseudochironomus	X	X
Saetheria		X
Stenochironomus	X	X
Stictochironomus	X	X
Tribelos jucundum	X	
Cladotanytarsus mancus grp	X	X
Cladotanytarsus vanderwulpi grp.	X	X
Micropsectra	X	
Paratanytarsus	X	X
Rheotanytarsus	X	X
Tanytarsus	X	X
Tanytarsus glabrescens grp.	X	X
Tanytarsus sepp	X	X
GASTROPODA (Snails)		
Ferrissia	X	X
Bithynia tentaculata	X	
Amnicola	X	X
Physa	X	X
Helisoma	X	X
Menetus	X	X
Pleurocera	X	X
Viviparidae[1]	X	X
PELECYPODA (Mussels and Clams)		
Corbicula fluminea	X	X
Dreissena bugensis	X	X
Dreissena polymorpha	X	X

TABLE 14 (Continued): BENTHIC INVERTEBRATE TAXA COLLECTED BY PONAR AND HESTER DENDY SAMPLERS DURING 2008

Taxa	Hester Dendy	Petite Ponar
PELECYPODA (Mussels and Clams) (Continued)		
Eupera cubensis	X	
Sphaerium[1]	X	X
Musculium	X	X
Pisidium	X	X
Elliptio dilatata		X
TOTAL SPECIES RICHNESS BY SAMPLE TYPE	125	106
EPT[2] SPECIES RICHNESS BY SAMPLE TYPE	18	13
TOTAL SPECIES RICHNESS FOR 2008	140	
EPT[2] SPECIES RICHNESS FOR 2008	18	

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

Calumet River System. This watershed includes the Calumet River, LCR, and CSC. Benthic invertebrate samples were collected in each waterway. The Hester-Dendy samples at Cicero Avenue on the CSC and Halsted Street on the LCR both exhibited a total taxa richness of 26 species while Hester Dendy samples at 130th Street on the Calumet River exhibited 11 species. EPT taxa were present in all Hester Dendy samples from this river system. The highest total taxa richness of the ponar samples was observed at 130th Street on the Calumet River (20 species). There were no EPT taxa found in the ponar samples collected in this river system. No Chironomid head capsule deformities were observed at 130th Street. Halsted Street Hester Dendy and ponar samples had a total incidence of Chironomid head capsule deformities within expected reference levels. Cicero Avenue Hester Dendy samples exhibited Chironomid head capsule deformities at a low incidence. However, a significant amount of head capsule deformities were observed for the taxon Procladius in the Cicero Avenue ponar sample.

Des Plaines and Fox River Systems. In 2008, biological sampling focused on the DPRS, including the WBDR, Buffalo Creek, Salt Creek, Higgins Creek, DPR, Poplar Creek and one station from the Fox River basin (Poplar Creek at Route 19). Benthic invertebrate samples were collected at 20 stations therein. Total and EPT taxa richness were relatively high compared to other watersheds sampled in 2008. Route 19 on Poplar Creek exhibited the highest total taxa for Hester Dendy and ponar samples, 48 and 30 taxa, respectively. Lake Cook Road and Oakton Street samples both contained nine EPT taxa, which was the most found in Hester Dendy samples within these systems. There were five stations which exhibited three EPT taxa for ponar samples; Lake Cook Road on Buffalo Creek, Higgins Road on Salt Creek, Arlington Road on Salt Creek, Wolf Road on Salt Creek, and Material Service Road on the DPR. Other stations contained less EPT taxa for ponar samples. Chironomid head capsule deformities were elevated at a few stations but were observed in less than half of the stations sampled.

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 the sediment from 20 sample stations are presented in Table 15. Sediment samples from the side at Oakton Street on the DPR and Springinsguth Road on the WBDR contained the highest concentrations of TKN (5,719 and 5,974 mg/kg respectively). Side and center sediment samples from Willow Springs Road on the DPR both exhibited the highest concentrations of TP (3,253 and 3,473 mg/kg). Sediment taken from the center at Stephen Street on the DPR

TABLE 15: CHEMICAL CHARACTERISTICS OF SEDIMENT COLLECTED FROM THE DES PLAINES AND FOX RIVER SYSTEMS DURING 2008

WATERWAY	SITE NO.	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)
Buffalo Creek	12	Lake Cook Road	Side	78	2	5	2	231	153	0.012	0.034
Buffalo Creek	12	Lake Cook Road	Center	80	3	6	3	357	239	<0.006	0.024
Des Plaines River	13	Lake Cook Road	Side	42	8	42	4	2,280	981	0.076	0.330
Des Plaines River	13	Lake Cook Road	Center	75	1	4	2	196	293	0.023	0.038
Des Plaines River	17	Oakton Street	Side	48	8	40	5	5,719	1,955	0.439	0.212
Des Plaines River	17	Oakton Street	Center	79	2	2	3	172	184	0.019	0.065
Higgins Creek	77	Elmhurst Road	Side	75	3	14	3	658	291	0.013	0.107
Higgins Creek	77	Elmhurst Road	Center	68	5	18	2	1,243	414	0.059	0.233
Higgins Creek	78	Wille Road	Center	73	3	4	4	367	356	0.046	0.030
Des Plaines River	19	Belmont Avenue	Side	51	9	59	12	2,668	1,485	0.133	0.065
Des Plaines River	20	Roosevelt Road	Side	50	10	87	9	544	571	0.121	0.085
Des Plaines River	20	Roosevelt Road	Center	73	3	4	2	318	381	0.047	0.196
Salt Creek	79	Higgins Road	Side	63	5	13	7	947	304	0.046	0.043
Salt Creek	79	Higgins Road	Center	48	8	67	6	4,035	1,099	0.157	0.236
Salt Creek	80	Arlington Hts. Rd.	Side	81	3	20	12	449	310	0.040	0.014
Salt Creek	80	Arlington Hts. Rd.	Center	83	2	4	7	333	228	0.062	0.017
Salt Creek	18	Devon Avenue	Side	70	3	9	8	784	227	0.071	0.045
Salt Creek	18	Devon Avenue	Center	73	2	4	7	249	397	0.059	<0.007
Salt Creek	24	Wolf Road	Side	53	8	52	23	2,721	2,239	0.131	0.073
Salt Creek	24	Wolf Road	Center	78	2	10	3	347	360	0.060	0.046
Salt Creek	109	Brookfield Avenue	Side	73	3	6	4	548	524	0.068	0.079
Salt Creek	109	Brookfield Avenue	Center	76	2	4	4	415	496	0.056	<0.007

TABLE 15 (Continued): CHEMICAL CHARACTERISTICS OF SEDIMENT COLLECTED FROM THE DES PLAINES AND FOX RIVER SYSTEMS DURING 2008

WATERWAY	SITE NO.	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)
Des Plaines River	22	Ogden Avenue	Side	34	16	93	7	2,606	1,849	0.178	0.392
Des Plaines River	22	Ogden Avenue	Center	90	2	2	2	218	329	0.030	0.024
Des Plaines River	23	Willow Springs Rd.	Side	34	11	165	13	4,170	3,253	0.152	0.167
Des Plaines River	23	Willow Springs Rd.	Center	40	9	93	9	3,371	3,473	0.137	0.125
Des Plaines River	29	Stephen Street	Side	70	5	28	4	1,109	764	0.076	0.107
Des Plaines River	29	Stephen Street	Center	27	15	240	17	4,638	2,658	0.191	0.459
Des Plaines River	91	Material Ser. Rd.	Side	79	2	3	1	341	288	0.073	0.016
Des Plaines River	91	Material Ser. Rd.	Center	76	2	4	2	299	322	0.059	0.092
WBDR	110	Springinsguth Rd.	Side	30	17	83	12	5,974	853	0.206	0.213
WBDR	110	Springinsguth Rd.	Center	34	13	35	17	4,345	706	0.206	0.131
WBDR	89	Walnut Lane	Side	78	3	10	4	572	536	0.059	0.068
WBDR	89	Walnut Lane	Center	78	2	5	4	304	342	0.070	0.028
WBDR	64	Lake Street	Side	72	3	16	3	1,011	654	0.036	0.035
WBDR	64	Lake Street	Center	79	2	6	4	583	647	0.024	0.704
Poplar Creek	90	Route 19	Side	72	2	9	3	564	244	0.032	0.074
Poplar Creek	90	Route 19	Center	71	2	9	1	547	257	0.041	0.066

ND= No Data

contained the highest concentration of NH_3-N (240 mg/kg). The side sediment sample at Oakton Street on the DPR contained the highest concentration of total phenols (0.439 mg/kg).

Trace Metals. The 11 trace metal concentrations measured at these same stations are presented in Table 16. The side sample at Springinsguth Road on the WBDR exhibited the highest concentration of copper (133 mg/kg). Willow Springs Road on the DPR side sample contained the highest concentration of iron (24,603 mg/kg). Elevated levels of manganese (2,241 mg/kg) were observed at Lake Cook Road on Buffalo Creek. Significantly high levels of zinc (1,166 mg/kg) were observed for the center sample at Roosevelt Road on the DPR.

Acid Volatile Sulfide, Simultaneously Extracted Metals, Total Organic Carbon, and Particle Size. Table 17 presents the AVS, SEM, TOC, and particle size data for twenty 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 (SEM/AVS<1), it is less likely that metals are available for biological uptake, thus rendering them less toxic to organisms. As a measure of oxidizable organic material, the TOC concentration in sediment affects nonionic organic chemical, as well as metal bioavailability. Five samples exhibited concentrations of TOC above 50,000 mg/kg. These stations were as follows: The center channel sample at Wille Road on Higgins Creek (68,000 mg/kg), side sample at Springinsguth Road on the WBDR (66,000 mg/kg), side sample at Ogden Avenue on the DPR (62,000 mg/kg), and the center and side samples at Stephen Street on the DPR (57,000 and 51,000 mg/kg 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 on the substrate (USEPA, 2001).

Organic Priority Pollutants. There were 111 total OPPs analyzed for each sample collected (listed in Table 3). Tables 18 - 22 present the concentrations of 19 OPPs that were detected in sediment samples during 2008. The sample with the largest number of OPPs detected in 2008 was the center sample collected at Wille Road on Higgins Creek containing 17. The other samples with a slightly less number of OPPs were the side samples collected at Brookfield Avenue on Salt Creek and Ogden Avenue on the DPR (16 and 15, respectively). Wille Road exhibited the highest concentration of most OPP's.

TABLE 16: TRACE METALS IN SEDIMENT COLLECTED FROM THE DES PLAINES AND FOX RIVER SYSTEMS DURING 2008

WATERWAY	SITE NO.	LOCATION		As	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn
				(mg/kg dry weight)										
Buffalo Creek	12	Lake Cook Road	Side	< 20	< 3	20	7	14,819	10	825	<0.250	15	< 1	35
Buffalo Creek	12	Lake Cook Road	Center	< 20	< 3	27	8	21,898	12	2,241	<0.250	22	< 1	33
Des Plaines River	13	Lake Cook Road	Side	< 20	< 3	18	20	13,849	36	464	<0.250	12	< 1	108
Des Plaines River	13	Lake Cook Road	Center	< 20	< 3	10	3	5,798	8	343	<0.250	6	< 1	28
Des Plaines River	17	Oakton Street	Side	< 20	< 3	22	37	13,349	47	613	<0.250	11	< 1	160
Des Plaines River	17	Oakton Street	Center	< 20	< 3	17	5	7,929	20	458	<0.250	10	< 1	41
Higgins Creek	77	Elmhurst Road	Side	< 20	< 3	15	16	16,257	36	336	<0.250	15	< 1	64
Higgins Creek	77	Elmhurst Road	Center	< 20	< 3	18	33	15,293	38	301	<0.250	17	< 1	130
Higgins Creek	78	Wille Road	Center	< 20	< 3	40	15	22,820	21	1,338	<0.250	24	< 1	138
Des Plaines River	19	Belmont Avenue	Side	< 20	4	59	87	23,024	168	623	0.361	27	< 1	322
Des Plaines River	20	Roosevelt Road	Side	< 20	3	63	96	23,554	152	638	0.428	31	< 1	385
Des Plaines River	20	Roosevelt Road	Center	< 20	< 3	57	42	18,908	70	541	<0.250	31	< 1	1,166
Salt Creek	79	Higgins Road	Side	< 20	< 3	17	19	18,144	17	302	<0.250	20	< 1	58
Salt Creek	79	Higgins Road	Center	< 20	< 3	20	27	19,694	24	351	<0.250	21	< 1	104
Salt Creek	80	Arlington Hts. Rd.	Side	< 20	< 3	18	16	16,339	11	415	<0.250	19	< 1	73
Salt Creek	80	Arlington Hts. Rd.	Center	< 20	< 3	11	5	9,064	8	355	<0.250	10	< 1	29
Salt Creek	18	Devon Avenue	Side	< 20	< 3	24	5	6,050	9	144	<0.250	14	< 1	26
Salt Creek	18	Devon Avenue	Center	< 20	< 3	18	6	12,679	11	967	<0.250	13	< 1	38
Salt Creek	24	Wolf Road	Side	< 20	< 3	38	56	22,196	91	555	<0.250	22	< 1	228
Salt Creek	24	Wolf Road	Center	< 20	< 3	14	8	8,003	13	318	<0.250	9	< 1	50
Salt Creek	109	Brookfield Ave.	Side	< 20	< 3	26	18	11,070	24	344	<0.250	15	< 1	83
Salt Creek	109	Brookfield Ave.	Center	< 20	< 3	27	11	8,768	19	329	<0.250	11	< 1	58

TABLE 16 (Continued): TRACE METALS IN SEDIMENT COLLECTED FROM THE DES PLAINES AND FOX RIVER SYSTEMS DURING 2008

WATERWAY	SITE NO.	LOCATION		As	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn
				(mg/kg dry weight)										
Des Plaines River	22	Ogden Avenue	Side	< 20	5	50	72	19,995	93	729	0.301	21	< 1	298
Des Plaines River	22	Ogden Avenue	Center	< 20	< 3	29	7	9,650	52	586	<0.250	16	< 1	73
Des Plaines River	23	Willow Springs Rd.	Side	< 20	< 3	56	85	24,603	84	801	<0.250	26	< 1	357
Des Plaines River	23	Willow Springs Rd.	Center	< 20	< 3	43	63	23,805	68	999	<0.250	23	< 1	278
Des Plaines River	29	Stephen Street	Side	< 20	< 3	59	59	19,779	88	603	<0.250	25	< 1	210
Des Plaines River	29	Stephen Street	Center	< 20	< 3	58	81	24,459	78	879	0.367	29	< 1	340
Des Plaines River	91	Material Ser. Rd.	Side	< 20	< 3	19	< 3	10,411	52	622	<0.250	10	< 1	50
Des Plaines River	91	Material Ser. Rd.	Center	< 20	< 3	17	14	6,666	25	198	<0.250	9	< 1	95
WBDR	110	Springinsguth Rd.	Side	< 20	< 3	38	133	19,681	61	487	<0.250	25	2	398
WBDR	110	Springinsguth Rd.	Center	< 20	< 3	19	24	15,542	27	195	<0.250	17	< 1	121
WBDR	89	Walnut Lane	Side	< 20	< 3	11	12	13,583	12	402	<0.250	11	< 1	62
WBDR	89	Walnut Lane	Center	< 20	< 3	12	8	11,099	10	406	<0.250	8	< 1	51
WBDR	64	Lake Street	Side	< 20	< 3	11	10	9,552	12	243	<0.250	8	< 1	65
WBDR	64	Lake Street	Center	< 20	< 3	25	7	16,858	12	1,575	<0.250	18	< 1	57
Poplar Creek	90	Route 19	Side	< 20	< 3	35	5	13,532	93	531	<0.250	9	< 1	53
Poplar Creek	90	Route 19	Center	< 20	< 3	18	5	13,245	12	911	<0.250	10	< 1	38

ND = No Data

TABLE 17: ACID VOLATILE SULFIDE, SIMULTANEOUSLY EXTRACTED METALS, TOTAL ORGANIC CARBON, AND PARTICLE SIZE DATA IN SEDIMENT COLLECTED FROM THE DES PLAINES AND FOX RIVER SYSTEMS DURING 2008

WATERWAY	SITE NO.	LOCATION		AVS	SEM	SEM/ AVS	TOC	(Particle Size) GRAVEL	SAND	SILT	CLAY
				(umoles/g)			(mg/kg)	(%)	(%)	(%)	(%)
Buffalo Creek	12	Lake Cook Road	Side	7.5	0.5	0.1	23,000	25.3	66.7	5.4	2.7
Buffalo Creek	12	Lake Cook Road	Center	<0.78	0.4	>0.5*	37,000	46.0	48.9	4.5	0.6
Des Plaines River	13	Lake Cook Road	Side	22.0	1.8	0.1	43,000	1.4	50.2	36.4	12.1
Des Plaines River	13	Lake Cook Road	Center	<0.78	0.4	>0.5*	23,000	2.9	94.4	2.7	0.1
Des Plaines River	17	Oakton Street	Side	7.9	2.5	0.3	28,000	3.2	47.4	40.4	9.0
Des Plaines River	17	Oakton Street	Center	<0.78	0.4	>0.5*	13,000	23.2	77.0	0.7	0.0
Higgins Creek	77	Elmhurst Road	Side	2.8	1.0	0.4	16,000	4.1	61.4	18.6	15.8
Higgins Creek	77	Elmhurst Road	Center	18.0	1.6	0.1	33,000	6.0	61.8	20.8	11.4
Higgins Creek	78	Wille Road	Center	<0.78	0.6	>0.8*	68,000	16.6	82.1	1.7	0.0
Des Plaines River	19	Belmont Avenue	Side	17.0	6.2	0.4	30,000	0.4	20.4	52.7	26.5
Des Plaines River	20	Roosevelt Road	Side	20.0	6.9	0.4	3,900	0.0	23.0	54.3	22.7
Des Plaines River	20	Roosevelt Road	Center	<0.78	2.0	>2.6*	36,000	16.1	72.4	8.4	3.1
Salt Creek	79	Higgins Road	Side	2.6	0.9	0.3	13,000	47.4	24.3	11.1	17.2
Salt Creek	79	Higgins Road	Center	13.0	1.7	0.1	23,000	3.0	23.6	37.7	35.7
Salt Creek	80	Arlington Hts. Rd.	Side	<0.78	0.5	>0.6*	10,000	31.3	29.6	12.9	26.3
Salt Creek	80	Arlington Hts. Rd.	Center	<0.78	0.4	>0.5*	15,000	20.1	78.1	1.8	0.0
Salt Creek	18	Devon Avenue	Side	<0.78	0.6	>0.8*	10,000	26.6	62.9	6.1	4.3
Salt Creek	18	Devon Avenue	Center	<0.78	0.4	>0.5*	5,100	10.1	86.4	3.0	0.5
Salt Creek	24	Wolf Road	Side	<0.78	4.3	>5.5*	28,000	1.9	42.7	42.7	12.7
Salt Creek	24	Wolf Road	Center	<0.78	0.6	>0.8*	5,400	21.7	73.4	3.6	1.3
Salt Creek	109	Brookfield Ave.	Side	<0.78	1.3	>1.7*	19,000	6.0	87.0	5.0	2.0
Salt Creek	109	Brookfield Ave.	Center	<0.78	1.0	>1.3*	11,000	0.5	96.5	3.4	0.0

TABLE 17 (Continued): ACID VOLATILE SULFIDE, SIMULTANEOUSLY EXTRACTED METALS, TOTAL ORGANIC CARBON, AND PARTICLE SIZE DATA IN SEDIMENT COLLECTED FROM THE DES PLAINES AND FOX RIVER SYSTEMS DURING 2008

WATERWAY	SITE NO.	LOCATION		AVS	SEM	SEM/ AVS	TOC	(Particle Size) GRAVEL	SAND	SILT	CLAY
				(umoles/g)			(mg/kg)	(%)	(%)	(%)	(%)
Des Plaines River	22	Ogden Avenue	Side	10.0	5.7	0.6	62,000	0.5	32.5	51.1	15.9
Des Plaines River	22	Ogden Avenue	Center	<0.78	0.6	>0.8*	22,000	37.1	61.1	1.8	0.1
Des Plaines River	23	Willow Springs Rd.	Side	10.0	6.0	0.6	47,000	0.0	6.6	65.5	27.8
Des Plaines River	23	Willow Springs Rd.	Center	3.7	4.9	1.3	25,000	1.7	30.2	43.7	24.4
Des Plaines River	29	Stephen Street	Side	11.0	4.8	0.4	51,000	30.3	44.0	14.7	11.1
Des Plaines River	29	Stephen Street	Center	<0.78	5.6	>7.2*	57,000	0.0	15.9	53.9	30.2
Des Plaines River	91	Material Ser. Rd.	Side	<0.78	0.8	>1.0*	30,000	28.0	70.6	1.4	0.1
Des Plaines River	91	Material Ser. Rd.	Center	2.0	1.2	0.6	24,000	7.8	87.1	4.5	0.6
WBDR	110	Springinsguth Rd.	Side	42.0	2.3	0.1	66,000	36.7	34.2	21.1	8.0
WBDR	110	Springinsguth Rd.	Center	23.0	1.8	0.1	36,000	6.2	59.4	20.3	14.1
WBDR	89	Walnut Lane	Side	<0.78	0.8	>1.0*	17,000	22.9	71.8	2.9	2.3
WBDR	89	Walnut Lane	Center	<0.78	0.6	>0.8*	12,000	26.1	70.9	2.9	0.1
WBDR	64	Lake Street	Side	<0.78	0.6	>0.8*	11,000	2.7	81.3	10.0	6.0
WBDR	64	Lake Street	Center	<0.78	0.5	>0.6*	5,000	23.5	66.0	6.4	4.1
Poplar Creek	90	Route 19	Side	1.8	1.1	0.6	9,600	20.5	72.7	4.5	2.3
Poplar Creek	90	Route 19	Center	1.3	0.5	0.4	6,900	32.6	61.3	5.5	0.7

*SEM/AVS calculated using 0.78 as an AVS value.

TABLE 18: ORGANIC PRIORITY POLLUTANTS DETECTED IN SEDIMENT COLLECTED FROM BUFFALO CREEK AND THE DES PLAINES RIVER DURING 2008

Compound[1]	Buffalo Creek		Des Plaines River			
	12 side	12 center	13 side	13 center	17 side	17 center
Acenaphthene	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	ND	ND	1,530	ND	7,100	ND
Benzo(a)pyrene	403	299	1,880	ND	8,610	ND
3,4-Benzofluoranthene	614	522	3,640	ND	16,200	383
Benzo(ghi)perylene	ND	ND	910	ND	5,500	ND
Benzo(k)fluoranthene	ND	ND	1,200	ND	5,800	ND
Butylbenzyl phthalate	ND	ND	ND	ND	ND	ND
Chrysene	437	285	2,310	ND	10,600	282
Dibenzo(a,h)anthracene	ND	ND	ND	ND	1,340	ND
Fluoranthene	1,040	682	5,210	ND	21,000	613
Fluorene	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	255	ND	1,120	ND	6,310	ND
Naphthalene	ND	ND	ND	ND	ND	ND
Phenanthrene	531	288	2,180	ND	9,420	304
Pyrene	765	534	3,880	ND	15,800	470
4,4'-DDT	ND	ND	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND	32.2	ND
4,4'-DDD	ND	ND	ND	ND	49.6	18.1

[1]Concentrations expressed as µg/kg dry weight.
ND = Not Detectable.

TABLE 19: ORGANIC PRIORITY POLLUTANTS DETECTED IN SEDIMENT COLLECTED FROM THE DES PLAINES RIVER DURING 2008

Compound[1]	Des Plaines River				
	19 side	20 side	20 center	22 side	22 center
Acenaphthene	ND	ND	ND	ND	ND
Anthracene	ND	ND	662	1,130	ND
Benzo(a)anthracene	2,520	3,100	2,300	4,910	ND
Benzo(a)pyrene	3,500	4,220	2,330	6,250	365
3,4-Benzofluoranthene	7,320	9,950	4,560	12,800	623
Benzo(ghi)perylene	1,600	2,880	1,110	3,300	ND
Benzo(k)fluoranthene	2,680	3,460	1,350	4,430	ND
Butylbenzyl phthalate	ND	ND	ND	ND	ND
Chrysene	4,630	6,060	3,210	8,990	413
Dibenzo(a,h)anthracene	462	819	331	919	ND
Fluoranthene	7,350	8,110	5,560	14,000	982
Fluorene	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	1,880	3,140	1,200	3,360	ND
Naphthalene	ND	ND	ND	ND	ND
Phenanthrene	3,010	2,780	2,200	6,230	556
Pyrene	6,030	6,090	4,360	11,000	772
4,4'-DDT	18.8	32.4	7.8	43.1	ND
4,4'-DDE	53.2	26.2	ND	83.4	ND
4,4'-DDD	277	85.3	32.7	162.0	9.1

TABLE 19 (Continued): ORGANIC PRIORITY POLLUTANTS DETECTED IN SEDIMENT COLLECTED FROM THE DES PLAINES RIVER DURING 2008

Compound[1]	Des Plaines River					
	23 side	23 center	29 side	29 center	91 side	91 center
Acenaphthene	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	578	ND
Benzo(a)anthracene	2,870	2,400	1,210	2,780	1,760	ND
Benzo(a)pyrene	4,300	3,400	2,080	4,640	1,970	ND
3,4-Benzofluoranthene	10,800	8,570	4,930	10,700	3,020	437
Benzo(ghi)perylene	1,800	1,420	867	2,200	1,120	ND
Benzo(k)fluoranthene	3,600	2,710	1,460	3,280	1,140	ND
Butylbenzyl phthalate	ND	ND	ND	ND	ND	ND
Chrysene	5,820	4,610	2,410	5,860	1,820	254
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
Fluoranthene	8,600	6,940	3,450	7,980	4,410	391
Fluorene	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	2,170	1,650	1,120	2,530	1,200	ND
Naphthalene	ND	ND	ND	ND	ND	ND
Phenanthrene	2,680	2,550	1,040	2,400	1,880	ND
Pyrene	6,740	5,530	2,870	6,500	3,280	330
4,4'-DDT	ND	27.7	ND	25.0	ND	ND
4,4'-DDE	44.2	38.1	29.2	41.8	ND	ND
4,4'-DDD	83.3	81.3	51.5	64.5	ND	ND

[1]Concentrations expressed as μg/kg dry weight.
ND = Not Detectable.

TABLE 20: ORGANIC PRIORITY POLLUTANTS DETECTED IN SEDIMENT COLLECTED FROM HIGGINS CREEK AND POPLAR CREEK DURING 2008

Compound[1]	Higgins Creek			Poplar Creek	
	77 side	77 center	78 center	90 side	90 center
Acenaphthene	ND	ND	4,010	ND	ND
Anthracene	ND	1,300	9,570	1,440	667
Benzo(a)anthracene	1,240	3,470	18,000	5,400	2,340
Benzo(a)pyrene	1,460	3,450	17,100	5,820	2,370
3,4-Benzofluoranthene	2,720	6,870	22,500	9,950	4,100
Benzo(ghi)perylene	718	1,480	8,080	2,990	1,120
Benzo(k)fluoranthene	1,000	2,420	10,300	3,250	1,420
Butylbenzyl phthalate	ND	ND	794	ND	ND
Chrysene	1,970	5,090	19,100	6,780	2,910
Dibenzo(a,h)anthracene	ND	429	2,170	780	310
Fluoranthene	3,970	10,600	59,700	15,200	7,000
Fluorene	ND	ND	4,800	746	ND
Indeno(1,2,3-cd)pyrene	774	1,550	8,170	3,440	1,360
Naphthalene	ND	ND	692	ND	ND
Phenanthrene	2,150	5,280	54,500	9,200	3,940
Pyrene	3,100	8,030	46,300	11,400	5,350
4,4'-DDT	ND	ND	ND	ND	ND
4,4'-DDE	ND	13.9	8.1	ND	ND
4,4'-DDD	7.0	26.2	ND	ND	ND

[1]Concentrations expressed as µg/kg dry weight.
ND = Not Detectable.

TABLE 21: ORGANIC PRIORITY POLLUTANTS DETECTED IN SEDIMENT COLLECTED FROM SALT CREEK DURING 2008

Compound[1]	Salt Creek					
	79 side	79 center	80 side	80 center	18 side	18 center
Acenaphthene	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	ND	1,070	ND	ND	ND	ND
Benzo(a)pyrene	ND	1,660	ND	ND	ND	ND
3,4-Benzofluoranthene	437	4,430	ND	ND	ND	ND
Benzo(ghi)perylene	ND	1,500	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	1,250	ND	ND	ND	ND
Butylbenzyl phthalate	ND	ND	ND	ND	ND	ND
Chrysene	ND	2,400	ND	ND	ND	ND
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
Fluoranthene	496	4,000	ND	ND	ND	440
Fluorene	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	1,580	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	1,100	ND	ND	ND	ND
Pyrene	345	2,800	ND	ND	ND	349
4,4'-DDT	ND	ND	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	13.7	ND	ND	ND	ND

TABLE 21 (Continued): ORGANIC PRIORITY POLLUTANTS DETECTED IN SEDIMENT COLLECTED FROM SALT CREEK DURING 2008

Compound[1]	Salt Creek			
	24 side	24 center	109 side	109 center
Acenaphthene	ND	ND	ND	ND
Anthracene	ND	ND	1,020	ND
Benzo(a)anthracene	1,980	1,070	3,510	ND
Benzo(a)pyrene	2,600	1,110	4,150	ND
3,4-Benzofluoranthene	5,120	1,920	7,870	434
Benzo(ghi)perylene	1,280	424	1,520	ND
Benzo(k)fluoranthene	1,670	550	3,080	ND
Butylbenzyl phthalate	ND	ND	ND	ND
Chrysene	3,270	1,240	6,060	420
Dibenzo(a,h)anthracene	ND	ND	462	ND
Fluoranthene	6,020	2,480	12,900	1,120
Fluorene	ND	ND	612	ND
Indeno(1,2,3-cd)pyrene	1,630	584	1,740	ND
Naphthalene	ND	ND	ND	ND
Phenanthrene	2,060	1,160	9,510	435
Pyrene	4,620	2,040	9,800	1,000
4,4'-DDT	237	ND	32.1	ND
4,4'-DDE	65.1	9.7	56.8	27.8
4,4'-DDD	83.8	14.9	180	159

[1]Concentrations expressed as µg/kg dry weight.
ND = Not Detectable.

TABLE 22: ORGANIC PRIORITY POLLUTANTS DETECTED IN SEDIMENT COLLECTED FROM THE WEST BRANCH DUPAGE RIVER DURING 2008

Compound[1]	West Branch DuPage River					
	110 side	110 center	89 side	89 center	64 side	64 center
Acenaphthene	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	651	ND	ND
Benzo(a)anthracene	975	579	2,270	1,610	587	465
Benzo(a)pyrene	1,330	942	2,700	1,620	622	438
3,4-Benzofluoranthene	3,080	1,920	5,250	3,100	1,160	732
Benzo(ghi)perylene	707	494	962	704	304	ND
Benzo(k)fluoranthene	1,000	645	1,870	1,220	387	314
Butylbenzyl phthalate	ND	ND	1,730	ND	ND	ND
Chrysene	1,680	1,160	3,570	2,100	767	527
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
Fluoranthene	2,920	2,110	6,510	4,390	1,750	1,230
Fluorene	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	905	582	1,220	835	353	ND
Naphthalene	ND	ND	ND	ND	ND	ND
Phenanthrene	1,090	924	2,940	2,900	748	757
Pyrene	2,160	1,560	5,070	3,280	1,240	864
4,4'-DDT	ND	ND	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND	7.9	ND
4,4'-DDD	15.5	8.4	ND	ND	ND	ND

[1]Concentrations expressed as µg/kg dry weight.
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 23. A significant difference in *Chironomus* survival compared to the control sediment indicates that the collected sediment constitutes an unsuitable habitat for *Chironomus* survival. A significantly lower *Chironomus* dried weight and or *Chironomus* ash-free dried weight compared to the control sediment indicates that the collected sediment constitutes an unsuitable habitat for optimal *Chironomus* growth.

Both side and center samples at Springinsguth Road and the center sample at Walnut Lane on the WBDR exhibited a survival rate significantly lower than the control results (21.5, 1.3, and 50.0 percent, respectively). Side samples at Arlington Heights Road, Brookfield Avenue, and Devon Avenue on Salt Creek were shown to have survival rates significantly lower than the control results (11.3, 41.3, and 42.5 percent, respectively). The center sample at Route 19 on Poplar Creek exhibited a significantly lower survival rate than the control results (65 percent). The side sample at Willow Springs Road and the center sample at Stephen Street on the Des Plaines River were shown to have survival rates significantly different than the control results (13.8, and 47.5 percent, respectively). None of the sites had significantly different ash-free dried weight than the West Bearskin Lake control results.

TABLE 23: TOXICITY DATA FROM SEDIMENT COLLECTED FOR THE AMBIENT WATER QUALITY MONITORING PROGRAM DURING 2008

WATERWAY	SITE No.	LOCATION		(*Chironumus tentans* 10-Day Test Data) Survival (%)	Ash-free Dried Weight (mg/org)
Buffalo Creek	12	Lake Cook Road	Side[1]	90.0	0.56
Buffalo Creek	12	Lake Cook Road	Center[1]	83.8	0.58
Des Plaines River	13	Lake Cook Road	Side[1]	81.3	0.48
Des Plaines River	13	Lake Cook Road	Center[1]	90.0	0.44
Des Plaines River	17	Oakton Street	Side[2]	77.5	0.69
Des Plaines River	17	Oakton Street	Center[2]	73.8	0.83
Higgins Creek	77	Elmhurst Road	Side[1]	78.8	0.47
Higgins Creek	77	Elmhurst Road	Center[2]	85.0	0.45
Higgins Creek	78	Wille Road	Center[2]	73.8	0.95
Des Plaines River	19	Belmont Avenue	Side[1]	80.0	0.36
Des Plaines River	20	Roosevelt Road	Side[1]	68.8	0.61
Des Plaines River	20	Roosevelt Road	Center[1]	60.0	0.55
Salt Creek	79	Higgins Road	Side[1]	85.0	0.46
Salt Creek	79	Higgins Road	Center[2]	73.8	0.80
Salt Creek	80	Arlington Hts. Rd.	Side[3]	11.3*	0.48
Salt Creek	80	Arlington Hts. Rd.	Center[3]	68.8	0.85
Salt Creek	18	Devon Avenue	Side[3]	42.5*	1.09
Salt Creek	18	Devon Avenue	Center[3]	68.8	1.04
Salt Creek	24	Wolf Road	Side[3]	61.3	1.14
Salt Creek	24	Wolf Road	Center[3]	80.0	0.76
Salt Creek	109	Brookfield Avenue	Side[3]	41.3*	1.22
Salt Creek	109	Brookfield Avenue	Center[3]	80.0	0.79
Des Plaines River	22	Ogden Avenue	Side[2]	93.8	0.82
Des Plaines River	22	Ogden Avenue	Center[2]	86.3	0.98
Des Plaines River	23	Willow Springs Rd.	Side[3]	13.8*	1.07
Des Plaines River	23	Willow Springs Rd.	Center[3]	58.8	0.79
Des Plaines River	29	Stephen Street	Side[3]	82.2	0.60
Des Plaines River	29	Stephen Street	Center[3]	47.5*	1.05
Des Plaines River	91	Material Ser. Rd.	Side[1]	83.8	0.98
Des Plaines River	91	Material Ser. Rd.	Center[2]	90.0	0.61
WBDR	110	Springinsguth Rd.	Side[3]	21.5*	0.39
WBDR	110	Springinsguth Rd.	Center[3]	1.3*	1.11
WBDR	89	Walnut Lane	Side[3]	70.0	0.96
WBDR	89	Walnut Lane	Center[3]	50.0*	1.38

TABLE 23 (Continued): TOXICITY DATA FROM SEDIMENT COLLECTED FOR THE AMBIENT WATER QUALITY MONITORING PROGRAM DURING 2008

WATERWAY	SITE No.	LOCATION		(*Chironumus tentans* 10-Day Test Data) Survival (%)	Ash-free Dried Weight (mg/org)
WBDR	64	Lake Street	Side[2]	70.0	0.72
WBDR	64	Lake Street	Center[1]	75.0	0.66
Poplar Creek	90	Route 19	Side[2]	82.5	0.53
Poplar Creek	90	Route 19	Center[1]	65.0*	0.53

* Significantly lower than the West Bearskin Lake control results.
[1] Trial 3, West Bearskin Lake Control Survival 85.0%, Ash-free Dried Weight 0.59mg/org.
[2] Trial 2, West Bearskin Lake Control Survival 46.3%, Ash-free Dried Weight 0.47mg/org.
[3] Trial 1, West Bearskin Lake Control Survival 92.5%, Ash-free Dried Weight 0.34mg/org.

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APPENDIX A

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO
PHYSICAL HABITAT ASSESSMENT

FIGURE A-1: 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 **(circle all applicable)**

DAM RIPRAP BRIDGE LEVEE ISLAND
OUTFALL SHEET PILING OTHER _____

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

DENUDED _____ %
GRASSES _____ %
SHRUBS _____ %
TREES _____ %

OTHER (Specify) _____ %

Riparian Land Use

GRASSLAND _____ %
URBAN RESIDENTIAL _____ %
URBAN COMMERCIAL/INDUSTRIAL _____ %
WETLAND _____ %
FOREST _____ %
ROW CROPS _____ %
OTHER (Specify) _____ _____ %

FIGURE A-1 (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

_____

_____

_____

_____

_____

_____

_____

(Complete both sides of page) Page 2

APPENDIX B

NUMBER OF FISH COLLECTED FROM EACH STATION

TABLE B-1: NUMBER OF FISH COLLECTED FROM EACH STATION ON THE NORTH SHORE CHANNEL, THE DEEP-DRAFT PORTION OF THE NORTH BRANCH CHICAGO RIVER, CHICAGO SANITARY AND SHIP CANAL, CALUMET-SAG CHANNEL, LITTLE CALUMET RIVER, AND CALUMET RIVER DURING 2008

Fish Species or Hybrid (x)	North Shore Channel Station No. 36 Touhy Avenue	North Branch Chicago River Station No. 46 Grand Avenue	Chicago Sanitary and Ship Canal Station No. 75 Cicero Avenue	Chicago Sanitary and Ship Canal Station No. 41 Harlem Avenue	Chicago Sanitary and Ship Canal Station No. 92 Lockport (16th Street)	Cal-Sag Channel Station No. 59 Cicero Avenue	Little Calumet River Station No. 76 Halsted Street	Calumet River Station No. 55 130th Street
Gizzard shad	8	37	2	52	118	54	8	91
Chinook salmon	1	0	0	0	0	0	1	0
Northern pike	0	0	0	0	0	0	0	1
Goldfish	0	0	1	2	0	0	1	0
Common carp	13	7	21	1	3	8	16	10
Common carp x goldfish	1	0	0	0	0	0	0	0
Golden shiner	2	0	0	0	0	0	0	2
Emerald shiner	0	0	1	6	25	0	4	110
Spotfin shiner	1	0	0	4	0	0	0	0
Bluntnose minnow	0	2	3	41	14	0	2	3
Fathead minnow	0	0	0	0	0	0	3	0
White sucker	1	0	0	0	0	0	1	0
Channel catfish	1	0	1	0	2	0	0	0
Yellow bullhead	0	0	8	4	1	0	0	0
Mosquitofish	0	0	0	2	0	0	0	0
Brook silverside	0	0	0	0	0	0	0	5
White perch	0	0	0	1	0	0	0	0

TABLE B-1 (Continued): NUMBER OF FISH COLLECTED FROM EACH STATION ON THE NORTH SHORE CHANNEL, THE DEEP-DRAFT PORTION OF THE NORTH BRANCH CHICAGO RIVER, CHICAGO SANITARY AND SHIP CANAL, CALUMET-SAG CHANNEL, LITTLE CALUMET RIVER, AND CALUMET RIVER DURING 2008

Fish Species or Hybrid (x)	North Shore Channel Station No. 36 Touhy Avenue	North Branch Chicago River Station No. 46 Grand Avenue	Chicago Sanitary and Ship Canal Station No. 75 Cicero Avenue	Chicago Sanitary and Ship Canal Station No. 41 Harlem Avenue	Chicago Sanitary and Ship Canal Station No. 92 Lockport (16th Street)	Cal-Sag Channel Station No. 59 Cicero Avenue	Little Calumet River Station No. 76 Halsted Street	Calumet River Station No. 55 130th Street
Rock bass	4	0	0	0	0	0	0	4
Green sunfish	0	0	5	5	0	1	3	1
Pumpkinseed	12	1	10	64	4	0	1	2
Bluegill	9	3	5	4	0	0	0	0
Green sunfish x Bluegill	0	0	0	0	1	0	0	0
Largemouth bass	12	9	1	0	2	3	4	12
Smallmouth bass	0	0	0	0	0	0	0	2
White crappie	1	0	0	0	0	0	0	0
Black crappie	2	0	0	0	0	0	0	0
Yellow perch	0	0	0	0	0	0	1	11
Freshwater drum	0	0	0	0	1	0	0	0
Total Number of Fish	68	59	58	186	171	66	45	254

TABLE B-2: NUMBER OF FISH COLLECTED FROM EACH STATION ON THE DES PLAINES RIVER DURING 2008

Fish Species or Hybrid (x)	Des Plaines River							
	Station No. 13 Lake-Cook Road	Station No. 17 Oakton Street	Station No. 19 Belmont Avenue	Station No. 20 Roosevelt Road	Station No. 22 Ogden Avenue	Station No. 23 Willow Springs Road	Station No. 29 Stephen Street	Station No. 91 Material Service Road
Gizzard shad	0	0	0	0	0	9	0	0
Central mudminnow	0	0	0	0	0	0	0	0
Northern pike	0	5	1	1	0	1	0	1
Common carp	0	2	2	2	1	4	1	0
Common carp x Goldfish	0	0	0	1	0	0	0	0
Hornyhead chub	0	0	0	0	17	0	0	0
Golden shiner	0	0	0	0	0	0	23	0
Spottail shiner	0	0	0	0	0	0	0	0
Spotfin shiner	13	1	0	0	0	2	17	0
Sand shiner	0	0	0	0	7	0	0	0
Bluntnose minnow	2	0	0	0	34	0	30	17
Fathead minnow	0	0	0	0	0	0	2	0
Creek chub	0	0	1	0	5	0	0	0
White sucker	0	0	2	0	1	0	0	0
Spotted sucker	0	2	0	0	0	0	0	0
Oriental weatherfish	0	0	0	0	8	0	2	2
Yellow bullhead	3	1	0	0	0	0	1	6
Tadpole madtom	1	0	0	0	1	0	0	1
Blackstripe topminnow	84	0	0	1	2	0	41	10
Mosquitofish	0	0	0	0	0	0	17	13

TABLE B-2 (Continued): NUMBER OF FISH COLLECTED FROM EACH STATION ON THE DES PLAINES RIVER DURING 2008

Fish Species or Hybrid (x)	Des Plaines River							
	Station No. 13 Lake-Cook Road	Station No. 17 Oakton Street	Station No. 19 Belmont Avenue	Station No. 20 Roosevelt Road	Station No. 22 Ogden Avenue	Station No. 23 Willow Springs Road	Station No. 29 Stephen Street	Station No. 91 Material Service Road
Rock bass	1	0	0	0	0	1	0	0
Green sunfish	86	5	6	0	12	1	10	2
Pumpkinseed	0	0	0	0	2	0	0	0
Orangespotted sunfish	0	0	0	0	2	1	2	0
Bluegill	17	1	0	0	9	1	23	1
Largemouth bass	3	0	1	0	2	2	3	1
Black crappie	1	4	0	0	0	1	4	0
Green sunfish x Bluegill	2	0	0	0	1	0	0	0
Johnny darter	1	0	0	0	5	0	0	4
Blackside darter	0	0	0	0	0	0	0	2
Walleye	0	0	0	0	0	1	0	0
Round goby	0	0	0	0	8	0	0	12
Total Number of Fish	214	21	13	5	117	24	176	72

TABLE B-3: NUMBER OF FISH COLLECTED FROM EACH STATION ON SALT, HIGGINS, AND BUFFALO CREEKS DURING 2008

Fish Species or Hybrid (x)	Salt Creek					Higgins Creek		Buffalo Creek
	Station No. 79 Higgins Road	Station No. 80 Arlington Heights Road	Station No. 18 Devon Avenue	Station No. 24 Wolf Road	Station No. 109 Brookfield Avenue	Station No. 77 Elmhurst Road	Station No. 78 Wille Road	Station No. 12 Lake-Cook Road
Gizzard shad	1	6	0	0	0	0	0	0
Common carp	4	13	0	1	0	0	0	0
Goldfish	0	0	0	0	0	1	0	0
Hornyhead chub	0	0	0	2	2	0	0	0
Golden shiner	1	0	0	0	0	0	0	1
Bigmouth shiner	0	0	0	0	22	0	0	0
Spotfin shiner	0	0	0	2	1	0	0	0
Sand shiner	0	0	0	0	2	0	0	0
Bluntnose minnow	0	0	0	7	5	56	1	0
Fathead minnow	0	0	0	0	2	23	14	8
Creek chub	0	0	0	5	3	0	0	9
White sucker	0	0	0	1	0	0	1	1
Yellow bullhead	0	0	1	1	3	0	2	10
Blackstripe topminnow	0	0	1	2	0	0	0	2
Green sunfish	3	1	3	1	0	27	2	21
Pumpkinseed	13	0	0	0	0	0	0	0
Orangespotted sunfish	1	6	0	0	0	0	0	0
Bluegill	56	18	1	1	1	0	0	38
Largemouth bass	1	0	0	0	0	0	0	4
Black crappie	3	2	0	0	0	0	0	1
Johnny darter	0	0	0	0	1	0	0	0
Walleye	0	6	0	0	0	0	0	0
Total Number of Fish	83	52	6	23	42	107	20	95

TABLE B-4: NUMBER OF FISH COLLECTED FROM EACH STATION ON WADEABLE PORTION OF THE NORTH BRANCH OF THE CHICAGO RIVER AND THE WEST BRANCH OF THE DUPAGE RIVER AND POPLAR CREEK DURING 2008

Fish Species or Hybrid (x)	North Branch Chicago River	West Branch DuPage River			Poplar Creek
	Station No. 96 Albany Avenue	Station No. 110 Springinsguth Road	Station No. 89 Walnut Lane	Station No. 64 Lake Street	Station No. 90 Route 19
Common carp	1	0	0	2	0
Hornyhead chub	0	0	0	0	3
Common shiner	0	0	0	0	2
Spotfin shiner	0	0	0	2	0
Bluntnose minnow	0	0	0	4	1
Fathead minnow	28	0	0	0	0
Creek chub	0	0	0	0	2
White sucker	5	0	0	6	0
Yellow bullhead	0	0	3	3	3
Blackstripe topminnow	3	0	0	0	0
Green sunfish	15	0	42	67	5
Orangespotted sunfish	0	0	0	1	0
Bluegill	0	3	4	4	1
Fantail darter	0	0	0	0	1
Johnny darter	0	0	0	0	2
Green sunfish x Orangespotted sunfish	0	0	0	1	0
Total number of Fish	52	3	49	90	20