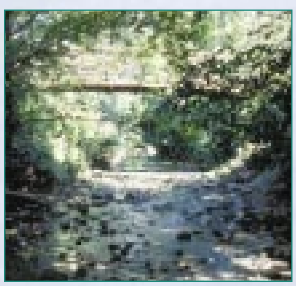
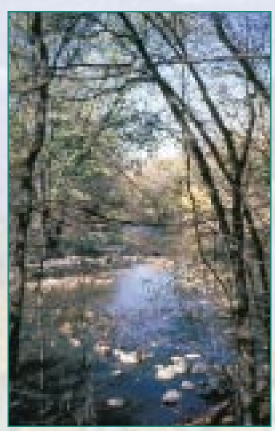
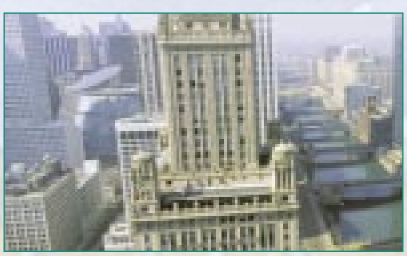
NATURE AND THE RIVER

A Natural Resources Report of the Chicago and Calumet Waterways







Nature and the River

A Natural Resources Report

of the Chicago and Calumet Waterways

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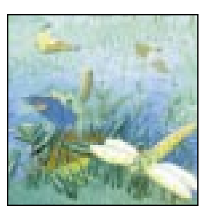

*CHICAGO**Rivers*** **Demonstration Project**

FRONT COVER: As a component of Gompers Park wetland restoration project on the North Branch of the Chicago River, a local art educator assisted by Amundsen High School students created a mural illustrating the biological diversity. Against the background of this mural are images depicting the varied character of Chicago's waterways. Clockwise from upper right, Forest Preserve District of Cook County biologists survey fish in Flatfoot Lake along the Little Calumet River (courtesy of Forest Preserve District of Cook County); a quiet stretch of the West Fork of the Chicago River's North Branch near the suburb of Northbrook (courtesy of Friends of the Chicago River); high-rise architecture and bascule (movable) bridges characteristic of the Chicago River's main stem (photograph by Ron Schramm PHOTO); and a foot bridge spans the upper reaches of the Middle Fork (courtesy of Friends of the Chicago River).

TITLE PAGE: A small portion of the Gompers Park restoration mural depicts a dragon fly hovering above wetland vegetation planted by hundreds of neighborhood volunteers.

This is a publication of the *CHICAGO**Rivers*** Demonstration Project, a national model for the enhancement of urban waterways. It is a collaborative effort directed by the Friends of the Chicago River and the National Park Service, Rivers, Trails, and Conservation Assistance Program.

*CHICAGO**Rivers*** **Demonstration Project** in partnership with:

- Friends of the Chicago River
- Metropolitan Water Reclamation District of Greater Chicago
- National Park Service, Rivers, Trails, and Conservation Assistance Program
- Urban Resources Partnership of Chicago
- U.S. Army Corps of Engineers, Chicago District
- USDA Forest Service, North Central Research Station
- U.S. Fish and Wildlife Service, Chicago Metro Wetlands Office

Friends of the Chicago River is the only non-profit organization dedicated solely to the protection and improvement of the Chicago River. The organization has become the single most influential voice for realizing the potential of the river's many resources. Since its inception in 1979, the Friends of the Chicago River has played a significant role in policy and planning for the promotion of public access and improvements to the river.

The National Park Service, through its Rivers, Trails, and Conservation Assistance Program, is responsible for developing national policies and programs concerning the conservation of the nation's river and trail resources. The Service also helps local communities and organizations create conservation plans for the development and protection of greenways, river corridors, and open space areas outside of the national parks.

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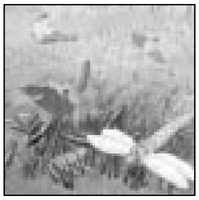
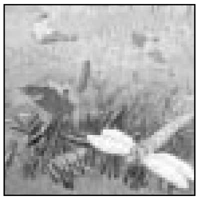
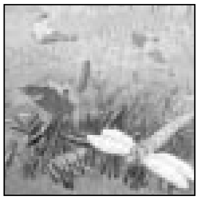


Contents



Tables

TABLES *(Continued)*



Figures and Plates

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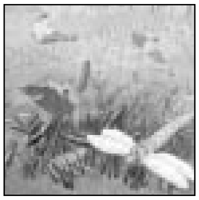
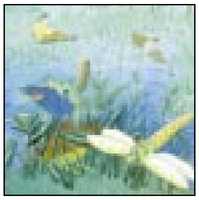


List of Abbreviations

ADID	Advanced Identification
BOD	Biological Oxygen Demand
BSC	Biological Stream Characterization
COE	U.S. Army Corps of Engineers
CSSC	Chicago Sanitary and Ship Canal
CSO	Combined Sewer Overflow
cts	counts
FPDCC	Forest Preserve District of Cook County
FPDDC	Forest Preserve District of DuPage County
GIS	Geographic Information System
IBI	Index of Biotic Integrity
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
I&M	Illinois and Michigan Canal National Heritage Corridor
INAI	Illinois Natural Areas Inventory
INHS	Illinois Natural History Survey
LCFPD	Lake County Forest Preserve District
MBI	Macroinvertebrate Biotic Index
MSDGC	Metropolitan Sanitary District of Greater Chicago
MWRDGC	Metropolitan Water Reclamation District of Greater Chicago
NAWQA	North American Water Quality Assessment Program
NBCR	North Branch of the Chicago River
NIPC	Northeastern Illinois Planning Commission
NSC	North Shore Channel of the Chicago River
NWI	National Wetland Inventory
ppm	parts per million
TARP	Tunnel and Reservoir Project
TDS	Total Dissolved Solids
T&E	Threatened and Endangered
TSS	Total Suspended Solids
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCFPD	Will County Forest Preserve District



Overview of *CHICAGO**Rivers*** Demonstration Project

In 1979, *Chicago* magazine published an article entitled, "Our Friendless River" by Robert Cassidy, who pointedly described the need for individuals or an organization to develop a vision for the Chicago River's future and to care for it. In response to his compelling article, an overwhelming number of concerned citizens cried, "I care! What can I do?" This powerful article gave impetus to individuals forming the Friends of the Chicago River, an organization dedicated to the protection and improvement of the Chicago River system.

During the 1970's and 1980's, substantial improvements to water quality had been accomplished by the Metropolitan Water Reclamation District of Greater Chicago through the implementation of numerous pollution and flood control projects. These innovative projects have revived the ecological health of area waterways.

Improved water quality, the scarcity of suitable open space, and the river's new-found "friends" spurred a renewed awareness of the Chicago River. Area residents began to view the waterways as important resources and community assets, and recognized the need for continued environmental improvements and the opportunity for increased recreation. Responding to this interest, the Friends of the Chicago River organized a series of public forums in 1991 and 1992 called "Voices from the Stream" to emphasize the river's attributes and identify opportunities for future improvements. Building on the results of these forums, a workplan for future river studies was completed by the Friends and the National Park Service.

INITIATION OF *CHICAGO**Rivers*** DEMONSTRATION PROJECT

Local efforts emphasized by the forums drew the attention of Congress, resulting in the initiation of the ChicagoRivers Demonstration Project in 1993. Established as a collaborative effort, project goals emphasize the development of an action plan for river enhancements, initiation of community-based activities and application as a national "model" for revitalizing degraded urban rivers. At its outset, project participants decided that the study area should encompass the North Branch of the Chicago River, North Shore Channel, Chicago River, South Branch of the Chicago River, Chicago Sanitary and Ship Canal, and Calumet-Sag Channel. Comprising 156 miles of natural and constructed waterways, this study area provides the diversity of corridor settings, land uses, population, and issues expected of a national model. In effect, the Chicago and Calumet Waterway Systems became a "classroom" for community organizing and river enhancements.

Comprehensive resource assessments encompassing a range of topics have been completed by many agencies participating in the project:

- Metropolitan Water Reclamation District of Greater Chicago provided existing water quality data, information on pollution and flood control activities, and assisted with a related U.S. Bureau of Mines study to assess contaminated river bed sediments and develop model techniques for reclamation.
- U.S. Army Corps of Engineers, Chicago District compiled data on land use, hazardous waste sites and sociocultural characteristics and conducted a telephone survey of recreation use and resident perceptions of the waterways.
- USDA Forest Service, North Central Research Station assessed existing recreational uses and perceptions of the river and identified desired changes expressed by a variety of area residents and organizations.
- U.S. Fish and Wildlife Service, Chicago Metro Wetlands Office conducted an inventory of existing habitat, fisheries and wetland areas and delineated priority areas for the future wetland and habitat improvements.

A parallel effort, conducted by the Friends of the Chicago River, involved community outreach and river constituency development. Using a variety of techniques, the outreach program has increased citizen awareness, strengthened the connection between people and the waterway, articulated "visions" for future river uses and enhancements, and established a grassroots constituency to support implementation.

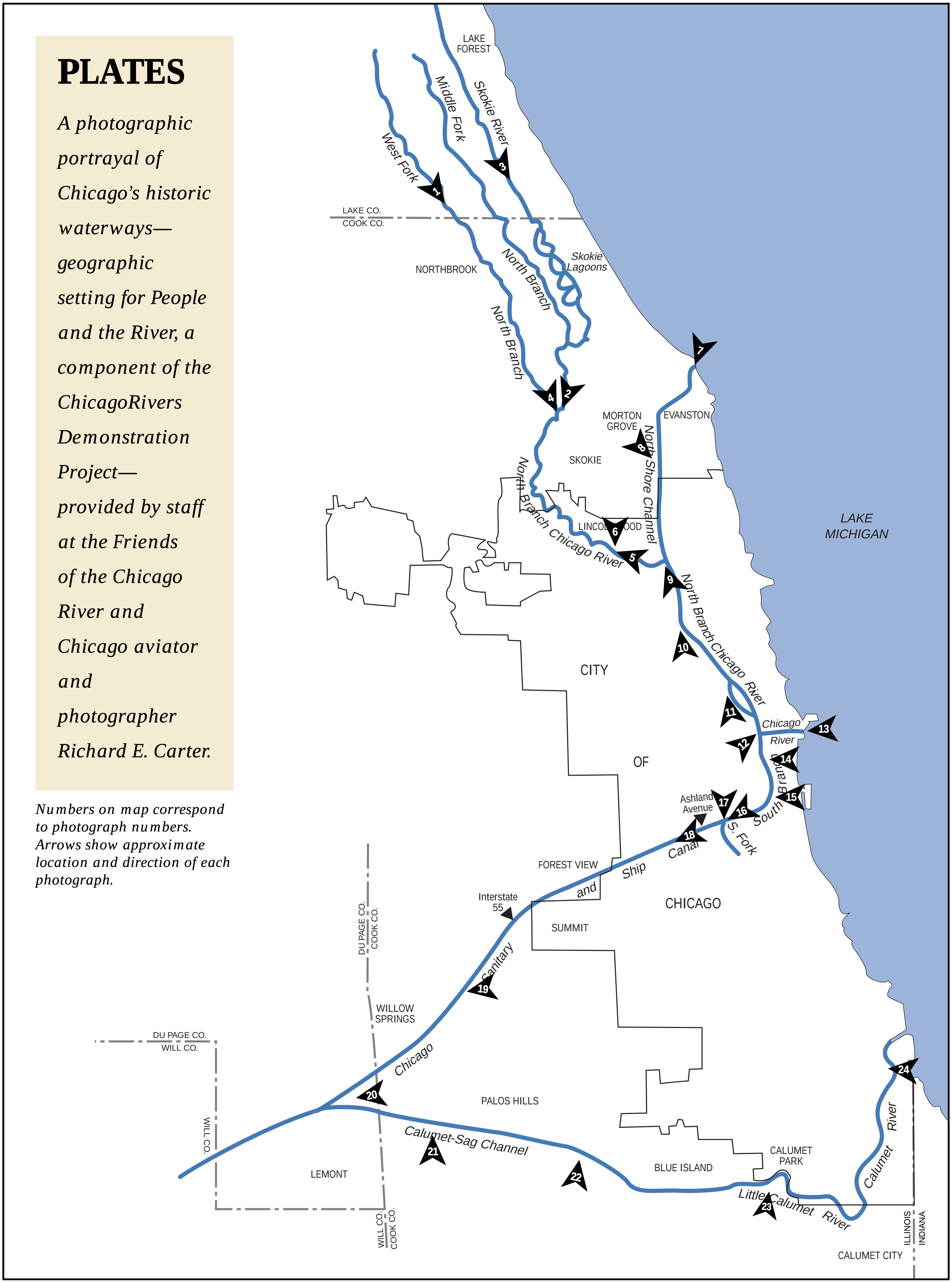
Combining resource capabilities with citizen needs, an action agenda provides direction for developing future recreational uses and implementing specific resource enhancement projects throughout the waterway. Based on community "visions" for both the overall waterway and individual river reaches (sections), the implementation of various projects, policies and programs will provide an effective and comprehensive means of achieving future recreation facilities and resource enhancements.

Project efforts and effective constituency development have already led to specific demonstration activities involving wetland restoration, recreation development and environmental education. These initial actions have been greatly assisted by the Urban Resources Partnership program; local government including the City of Chicago Department of Environment, the Chicago Park District, the Forest Preserve District of Cook County, and the Lake County Forest Preserve District; neighborhood groups such as the North Mayfair Improvement Association and Chicago Youth Centers; and youth organizations such as "Fishin' Buddies!" Youth Fishing Club.

PLATES

A photographic portrayal of Chicago's historic waterways—geographic setting for People and the River, a component of the ChicagoRivers Demonstration Project—provided by staff at the Friends of the Chicago River and Chicago aviator and photographer Richard E. Carter.

Numbers on map correspond to photograph numbers. Arrows show approximate location and direction of each photograph.



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1. West Fork of the North Branch of the Chicago River

This view of the West Fork, taken near Lake Cook Road in Deerfield, illustrates the reason area residents refer to the water course as the “ditch.”

(Courtesy of the Friends of the Chicago River)

2. Middle Fork of the North Branch of the Chicago River

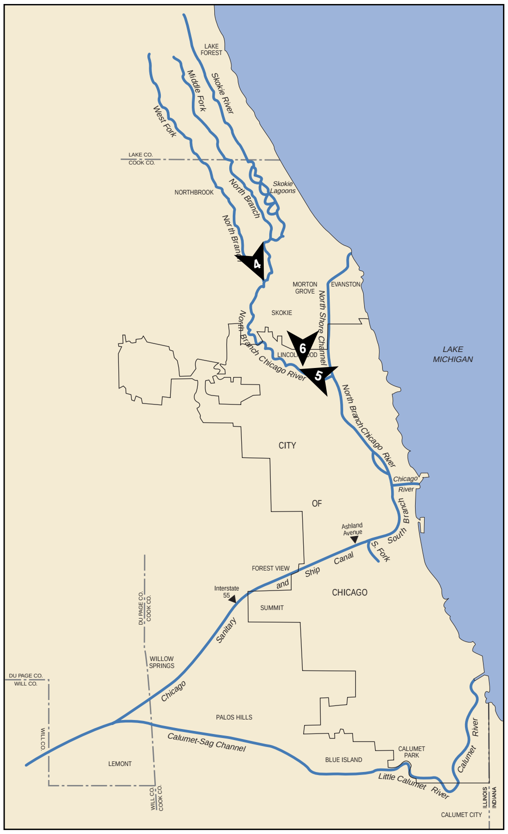
A wooded stretch of the Middle Fork flowing through Harms Woods, a public recreation area located in Glenview and administered by the Forest Preserve District of Cook County.

(Courtesy of the U.S. Fish and Wildlife Service)

3. Skokie River

A peaceful section of the Skokie River or “East Fork” in the vicinity of Centennial Park, a public facility administered by the Park District of Highland Park.

(Courtesy of the Friends of the Chicago River)



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4. Middle Fork of the North Branch of the Chicago River and West Fork of the North Branch of the Chicago River

Confluence of the West Fork (right foreground) and Middle Fork (left foreground) at Chick Evans Golf Course, administered by the Forest Preserve District of Cook County. Below the confluence, the North Branch flows under Beckwith Road (middleground) and Dempster Road (center background).

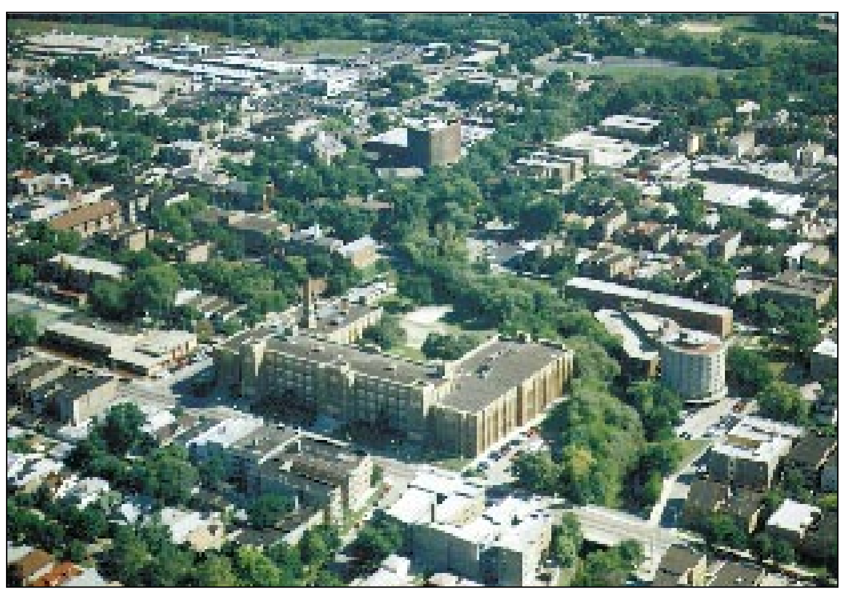
(Photograph by Richard E. Carter, 1996)

5

5. North Branch of the Chicago River

A view of Gompers Park (Chicago Park District) located at the southwest corner of North Pulaski Avenue (foreground) and Foster Avenue. The North Branch, obstructed by dense tree cover, is located in the center of the photograph flowing from upper left to lower right. The Gompers Park wetland restoration project lies along the left riverbank.

(Photograph by Richard E. Carter, 1996)



6

6. North Branch of the Chicago River

A view overlooking North Park College located on Foster Avenue (foreground). The North Branch, identified by the curving line of trees in the center of the photograph, flows from the foreground at Foster Avenue to River Park (Chicago Park District) in the background where the North Shore Channel enters from the left.

(Photograph by Richard E. Carter, 1995)

7

8

9

7. North Shore Channel

A view looking southwest along the Channel as it flows toward the background. The Peter Jans Golf Course adjoins both banks (foreground) and the Evanston Ecology Center is in the right background. The Lincoln Street bridge is in the foreground, while Green Bay Road is in the middleground.

(Photograph by Richard E. Carter, 1994)

8. North Shore Channel

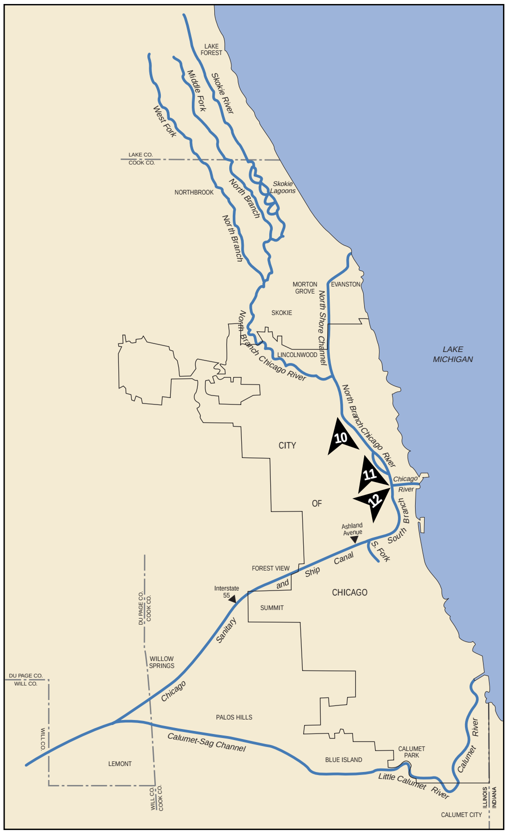
A view of the Channel as it flows (foreground to background) past public recreational facilities administered by the Skokie Park District. The Winston Towers apartments are on the left, while the Lincolntown Mall is to the right.

(Photograph by Richard E. Carter, 1994)

9. North Branch of the Chicago River and North Shore Channel

A view of the North Shore Channel (flowing from right background) and its confluence with the North Branch (center) as it enters from the left. River Park (Chicago Park District) adjoins both banks of the waterway. Argyle Street bridge is in the foreground, while Foster Avenue bridge is in the center.

(Photograph by Richard E. Carter, 1995)



10

11

12

10. North Branch of the Chicago River

A view of the North Branch as it flows through the Ravenswood neighborhood. Horner Park (Chicago Park District) lies along the left bank (west). A local riverbank planting project sponsored by Waters Elementary School has successfully restored portions of the east bank (right) above the Bond Boat Yard (center).

(Photograph by Richard E. Carter, 1996)

11. North Branch of the Chicago River

The North Avenue Turning Basin (center) and the North Branch as it flows on the west (left) side of Goose Island (upper left to lower left). The North Avenue bascule bridge crosses the North Branch immediately above (upstream) the turning basin.

(Photograph by Richard E. Carter, 1995)

12. Chicago River and North Branch of the Chicago River

The North Branch (flowing from left to right) as it joins the Chicago River ("main stem") at Wolf Point (small vegetated site at the river bend). The South Branch of the Chicago River flows behind the large, white building at the right edge (center) of the photograph.

(Photograph by Richard E. Carter, 1995)

13

14

15

13. Chicago River

A view of the Chicago River, North Pier Lock and Lake Michigan (foreground). Water flow between Lake Michigan and the Chicago River system is controlled by the lock. Navy Pier is in the right foreground.

(Photograph by Richard E. Carter, 1996)

14. South Branch of the Chicago River

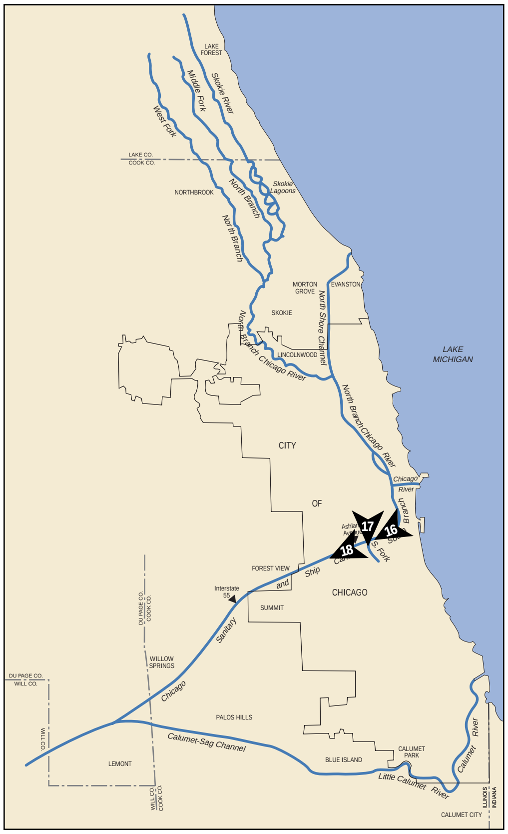
A view of the South Branch of the Chicago River immediately southwest of the Loop. The river flows from right (north) to left (south). Congress Street (Interstate 290, the Eisenhower Expressway) crosses over the South Branch in the center of the photograph, then proceeds through the Chicago Post Office building.

(Photograph by Richard E. Carter, 1995)

15. South Branch of the Chicago River

The South Branch flows from center foreground to left background. Proceeding downstream, bridges include Amtrak Railroad, Canal Street, Cermak Road and the Dan Ryan Expressway (Interstate 90/94).

(Photograph by Richard E. Carter, 1995)



16

16. South Branch of the Chicago River, Sanitary and Ship Canal

The South Branch flows from the right foreground, passing under the Loomis Street bridge, to left background where it joins the Chicago Sanitary and Ship Canal near the Damen Avenue bridge. The South Turning Basin is the large area of open water.

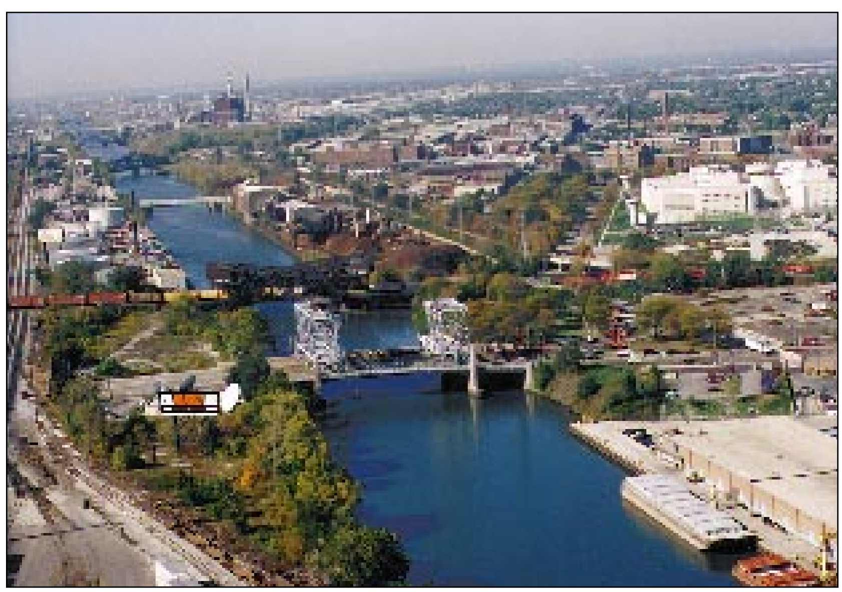
(Photograph by Richard E. Carter, 1995)

17

17. South Fork of the South Branch of the Chicago River

The South Fork flows from left background to center foreground. Ashland Avenue parallels the right bank of the waterway, while the cluster of bridges spanning the South Fork includes the Stevenson Expressway (Interstate 55) and Archer Avenue. The site of the original Illinois and Michigan Canal lock (Lock No. 0), located on the site in the right foreground, will be commemorated by the Chicago Canal Origins Park.

(Photograph by Richard E. Carter, 1996)



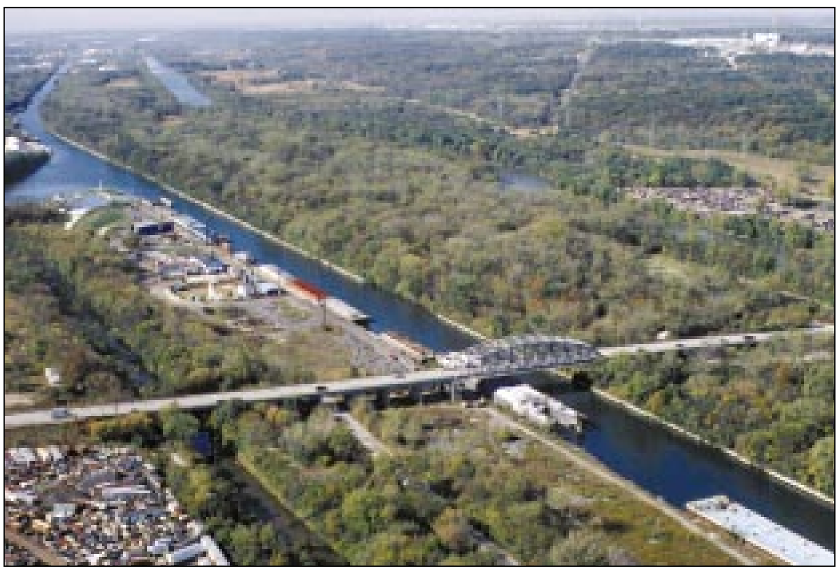
18

18. Chicago Sanitary and Ship Canal

A view looking west along the canal flowing from right foreground to left background. The Commonwealth Edison Crawford Generating Station (striped smokestack) is located to the right of the Canal at the Pulaski Road bridge (background). The waterfront warehouse and loading dock with barges is typical of shipping facilities on navigable portions of the waterway. Bridges include (foreground to middleground) Western Avenue, Baltimore and Ohio Railroad, California Avenue and Illinois Central Gulf Railroad.

(Photograph by Richard E. Carter, 1995)

19



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21

19. Chicago Sanitary and Ship Canal

A view of the Sanitary and Ship Canal and typical barge traffic that frequents the waterway. The Des Plaines River, which parallels the canal south of Summit, is in the upper portion of the photograph and the Illinois and Michigan Canal is hidden by vegetation at the lower left. The area pictured is in the vicinity of Willow Springs south of Interstate 294.

(Photograph by Richard E. Carter, 1995)

20. Chicago Sanitary and Ship Canal and Calumet Sag Channel

A view of the many waterways in the Palos Hills-Lemont area. The historic Illinois and Michigan Canal (lower left) parallels the larger Sanitary and Ship Canal. The bridge in the middle foreground is Illinois Route 83. Paralleling the Sanitary and Ship Canal on the right is the Des Plaines River. The confluence of the Ship Canal and the Calumet Sag Channel is located in the left middle-ground adjacent to the Canal Junction Sidestream Elevated Pool Aeration (SEPA) Station. The Village of Lemont adjoins the left bank of the Ship Canal (left background).

(Photograph by Richard E. Carter, 1995)

21. Calumet Sag Channel

A view of recreational boaters on the Calumet Sag Channel in the Palos Hills Forest Preserve (administered by the Forest Preserve District of Cook County) in the vicinity of Saganashkee Slough.

(Photograph by Richard E. Carter, 1995)

22. Calumet Sag Channel

A view of the channel as it flows through Palos Heights. The water body adjacent to the channel is Lake Katherine and nature center. Harlem Avenue (Illinois Highway 43) crosses the channel in the left middleground and College Drive (Illinois Highway 83) is in the foreground.

(Photograph by Richard E. Carter, 1996)

23. Little Calumet River

A view of the Little Calumet River as it flows (right middleground to left foreground) around the Acme Bend. The Riverdale Plant of Acme Steel Company occupies the peninsula formed by the bend. The Penn Central Railroad crosses the river in the center of the photograph. The wooded area in the foreground is Whistler Woods, administered by the Forest Preserve District of Cook County.

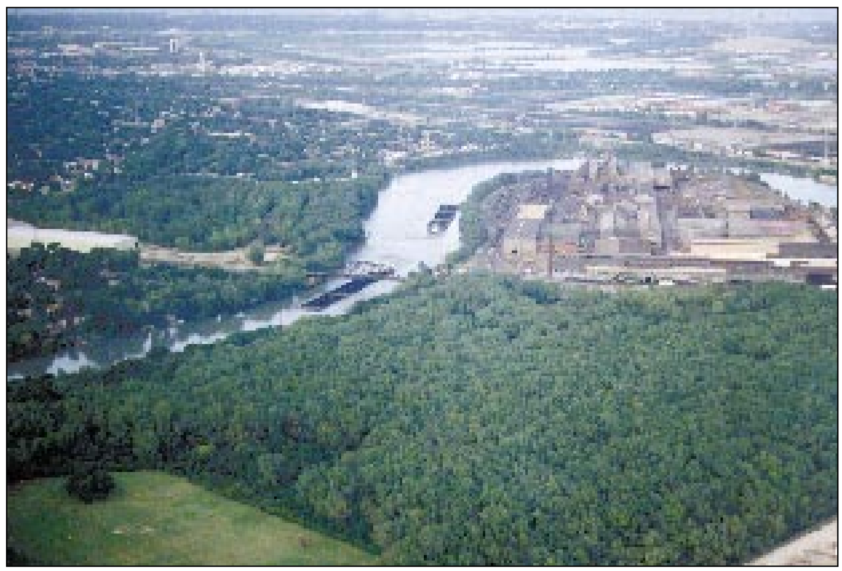
(Photograph by Richard E. Carter, 1996)

24. Calumet River

A view of the Calumet River in the vicinity of Calumet Harbor (out of view to the right) as it flows toward the Little Calumet River (right background to left foreground). The large body of water (right background) is a turning basin. The small bridge just below the basin is 95th Street. The Penn Central Railroad crosses the river in the center of the photograph and the Chicago Skyway (Interstate 190) crosses to the left of center.

(Photograph by Richard E. Carter, 1996)

22



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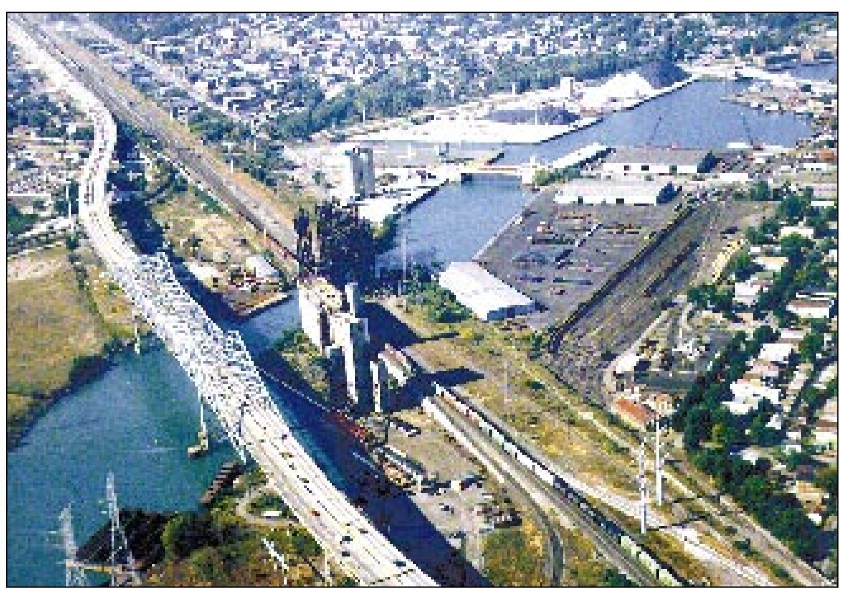

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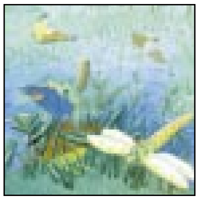


Nature and the River

INTRODUCTION

The Chicago River and the associated waterways that make up the Chicago Waterway System (Chicago Sanitary and Ship Canal, Cal-Sag Channel, Calumet and Little Calumet Rivers, and the North Shore Channel) have significantly changed since the time of European settlement. Perhaps no other system of natural rivers and sloughs has been so completely transformed as has the Chicago Waterway System.

Only 200 years ago, the Chicago River would have been more accurately described as a marshy slough, meandering slowly between low morainic rises, falling imperceptibly as the two principal branches converged from the north and south and crested over the plug of sand at its mouth at Lake Michigan. Water lilies, bulrushes, arrowheads, and other marsh plants grew abundantly within the clear waters of the channel. Wet prairies and marshy meadows extended away from the channel, giving way to oak savannas as the land rose slightly above the water table. Travel along the stream was either by canoe or by foot on Potowattomie trails across the low ridges that separated the forks of the stream. Over time, these trails have been transformed into major highways that link suburban commercial developments to Chicago.

Over time, the Chicago River and its tributaries have been dredged, straightened, and deepened. Upstream reaches were first channelized for agricultural drainage, and are now maintained for urban stormwater drainage. Lower reaches were channelized and armored with seawalls to accommodate commercial navigation. Today, the two forks converge among the concrete and steel canyons of downtown Chicago.

A navigation lock (Chicago River Lock) has replaced the plug of sand at the mouth of the river to Lake Michigan. The low divide between the Chicago River and the Des Plaines River was breached. The flow of the entire river was reversed westward to the Chicago Sanitary and Ship Canal and finally to the Mississippi River. The river was extended southwestward to connect with the Des Plaines River, and eastward through the outlet of the former glacial Lake Chicago. Part of the river was also reconstructed as the Cal-Sag Channel to connect with the Calumet River. Because the river has been engineered so extensively, the network of interconnected waterways is now referred to as the Chicago Waterway System.

In addition to being used for commercial navigation and drainage, the Chicago River was also used to transport the sanitary and industrial wastes away from the area. Indiscriminate discharges from sewers, stockyards, and industry significantly polluted the river system until it became virtually lifeless. More recently, contaminated runoff from impervious surfaces has exceeded the sanitary discharges as the most significant source of pollution. Flooding has increased because of the increased volume of runoff from paved areas, mostly along the northern reaches of the river.

Despite these problems, the Chicago River continues to be a valuable resource. Much of its corridor has been set aside as permanent open space such as parks and county forest preserves. These areas not only serve the recreational needs of an urban population, but contain some of the most diverse native biological resources in the Chicago region. These resources are the focus of some of the premier ecological restoration work conducted by volunteers and professionals in the Chicago area.

The Chicago Waterway System is used extensively for recreational boating and, increasingly, fishing. Water quality in recent years has improved dramatically through the efforts of the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC). All of these factors have created a renewed interest in the Chicago Waterway System. This interest parallels the national focus on urban rivers and the potential of these resources to enrich the lives of people who live in the cities through which they flow.

In 1992, the National Park Service initiated a project to galvanize local interest in the conservation and use of the Chicago Waterway System. The purpose of this project was to promote local stewardship of the waterway system through the integration of economic development, recreation, and environmental conservation. As a result, the ChicagoRivers Demonstration Project was initiated to include government resource agencies and private interests. These entities included the National Park Service, the USDA Forest Service, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, MWRDGC, the Friends of the Chicago River, and many volunteers.

STUDY OBJECTIVES

As part of the ChicagoRivers Demonstration Project, the U.S. Fish and Wildlife Service conducted an investigation of the natural resources within a 1-mile-wide corridor along the entire length of the Chicago Waterway System. This report documents the results of the wetland, stream and natural resource surveys conducted along the 156-mile river corridor (Figure 1). The objectives of this study were to:

1) Update the National Wetland Inventory (NWI) maps for the study corridor. The goal was to document the number, character, and acreage of wetlands present along the entire Chicago Waterway System corridor using current aerial photography, NWI mapping, and limited ground-truthing.

STUDY REACHES[1]

Designation Number	Waterway ("common" name)	Length (nautical miles)
1	West Fork of the North Branch of the Chicago River ("West Fork")	14
2A/B	Middle Fork of the North Branch of the Chicago River ("North Branch" or "Middle Fork")	24
3	Skokie River ("East Fork")	17
4	North Shore Channel ("Channel")	17.6
5A/B	North Branch of the Chicago River ("North Branch")	17.2
6	Chicago River ("Main Branch" or "Mainstem")	1.4
7	South Branch of the Chicago River ("South Branch") and South Fork of the South Branch of the Chicago River ("Bubbly Creek")	3.9
8	Chicago Sanitary and Ship Canal ("San-Ship" or "Canal")	8.2
9A/B	Chicago Sanitary and Ship Canal ("San-Ship" or "Canal")	22.5
10A/B/C	Calumet River, Little Calumet River ("Little Calumet") and Calumet-Sag Channel ("Cal-Sag"), collectively known as the Calumet Waterway System	29.8

[1] The waterways included in the ChicagoRivers Demonstration Project were divided into 10 reaches (sections) to facilitate resource assessment and to establish common waterway sections for reporting study findings. For those investigations which required more specific study area delineation, subreaches were established and identified by a letter.

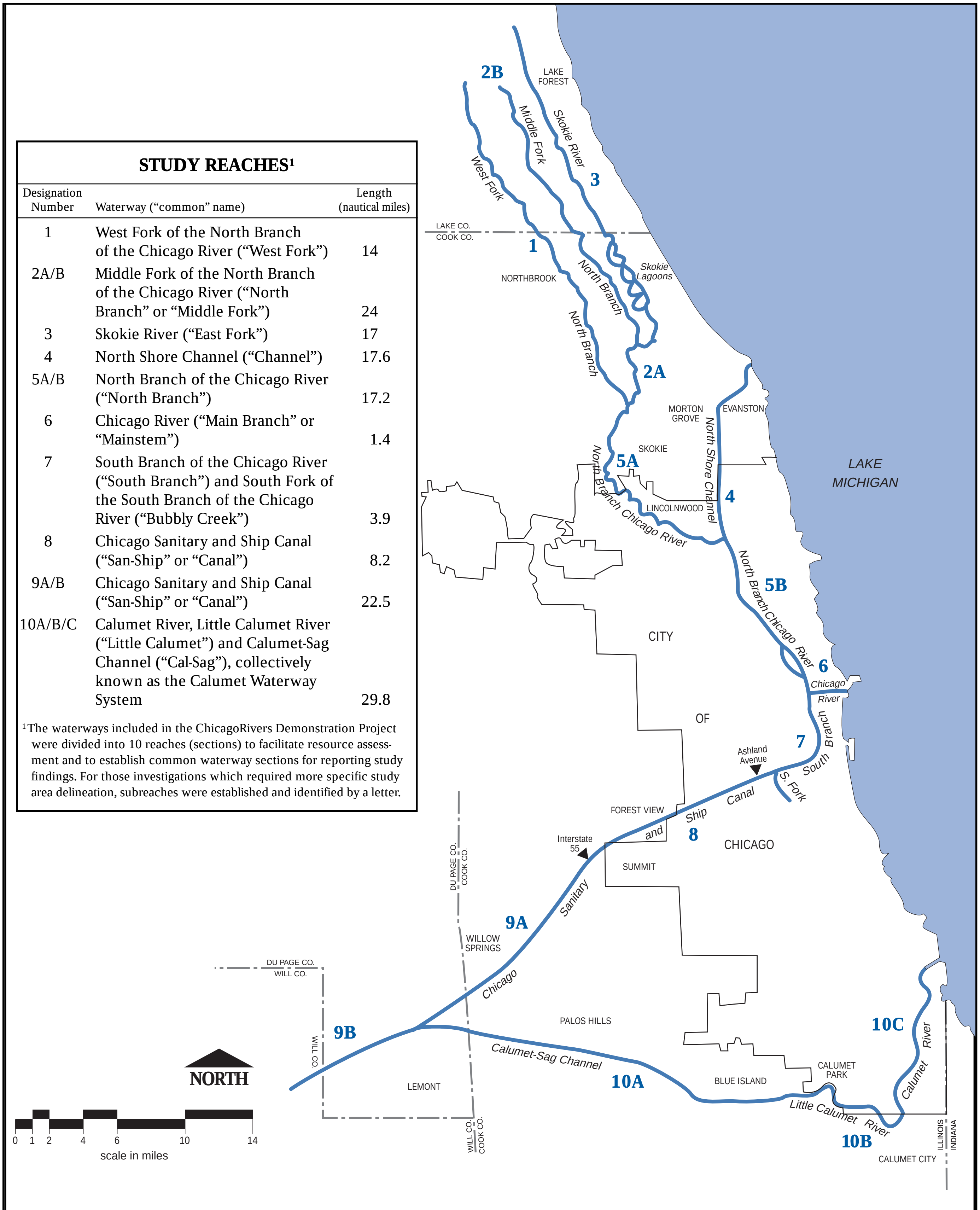


FIGURE 1
Map of Study Reaches

2) Conduct representative fish and benthic invertebrate sampling in the upper tributaries of the system. Previous studies focused on the fish in the southern and more navigable reaches of the study area.

3) Document and describe overall channel and habitat characteristics.

4) Identify and present data on locations of natural areas and open spaces located in the study area. These data include locations of threatened and endangered (T&E) species and other rare flora and fauna.

5) Compile representative literature and reports concerning the natural resources of the Chicago Waterway System.

6) Describe historic and recent water quality trends.

REGIONAL DESCRIPTION

Geology and Geomorphology

Glaciers shaped the Illinois landscape over the course of 100,000 years during the Illinoisan (the earliest established glaciation in the Chicago area) and Wisconsinan Ages of the Pleistocene Epoch (Willman and Frye, 1970). The Wisconsinan Age glaciation formed most of the Chicago area's existing topography. The glaciation period began approximately 70,000 years ago and ended 7,000 years ago. This period was divided into five substages: 1) Altonian; 2) Farmdalian; 3) Woodfordian; 4) Twocreekan; and 5) Valderan.

During the Altonian substage, Winnebago drift was deposited as the glacial ice retreated. Glaciers completely retreated from the Chicago area during the Farmdalian time. Robein silt, an organic peat, accumulated on the Altonian drift. Weathering of the silt and underlying deposits formed the Farmdale Soil, or Farmdalian substage. The silt and soil eroded, but their evidence was found in the subsurface layers. When the ice sheets progressively melted and retreated, till was slowly deposited, eventually forming glacial moraines. The retreating glaciers left behind till and drift and an unsorted mix of rock fragments, which formed the parent material of Chicago's modern soils.

The Woodfordian time was the period of maximum Wisconsinan glaciation. Several moraines were formed and most of the glacial drift was deposited. Subsequently, during the Twocreekan time, the glacial ice withdrew and created a low-water stage of Lake Chicago, which preceded Lake Michigan.

This period was followed by the Valderan substage, during which the Valders glacier had advanced and deposited red till and clay then retreated. The retreat of the Valders glacier signaled the end of Lake Chicago and the beginning of Lake Algonquin.

Five major moraine systems were formed during the Woodfordian time in northern Illinois. The Highland Park, Blodgett, Deerfield, Park Ridge, and Valparaiso moraines occurred east to west away from Lake Michigan in a concentric arc pattern in the northern reaches of the Chicago River. Valparaiso moraines formed a system of large regional moraines that comprised the outermost portion of the system. Moraines appeared as ridges on the landscape paralleling the lakeshore (Willman and Frye, 1970). Topographic low points or sags between the moraines corresponded to natural drainage systems and former marshlands.

Today, the branches of the Chicago River occupy these valleys. The lake border moraines, which were composed of clayey tills, were the major sources of sediments in the waterway system.

The Highland Park moraine extended from the Wisconsin/Illinois State line southward into the northern part of Cook County. A narrow, relatively flat plain separated the Highland Park and Blodgett moraines, and was the plain on which the Skokie River was formed. Prior to European settlement, this area consisted of an extensive network of marshes and other wetlands.

The Blodgett moraine is a narrow feature which for the southern quarter of its length abutted the Deerfield moraine to the west. Most of the plain that separated these two ridges was drained by the Middle Fork of the Chicago River.

A short distance west of the Deerfield moraine was the Park Ridge moraine. This feature extended several miles into Cook County from its origin in west-central Lake County, Illinois. Land between these glacial ridges was level to gently rolling and was drained by the West Fork of the Chicago River (Willman and Frye, 1970).

The Valparaiso moraine was a large system with smaller topographic features. This moraine extended from Wisconsin south by southeast into Indiana. Numerous wetlands were formed in depressions left by ice blocks and from the DuPage and DesPlaines Rivers' drainage system.

Illinois is currently split into 14 natural area divisions based on topography and geology (Schwegman, 1973). The ChicagoRivers Demonstration Project study area is located in the Northeastern Morainal Division. The Northeastern Morainal Division is composed of four sections: 1) the Morainal; 2) the Lake Michigan Dunes; 3) the Chicago Lake Plain; and 4) the Winnebago Drift. Most of the Chicago Waterway System is located in the Morainal and the Chicago Lake Plain sections.

The Northeastern Morainal Division is characterized by deep glacial drifts, rough topography, outwash plains at the fronts of terminal moraines, lake plains, and sand dunes. Soils in this division range from very poorly drained in swales and depressions to well-drained in the uplands.

The Chicago Lake Plain, on which most of the Chicago area is located, is a conspicuous feature. The topography is level because it was an ancient lakebed smoothed by wave action. A defined series of erosional terraces and beaches separated the lake plain from the surrounding morainal topography. Soils high in sand are common on the lake plain, compared with soils on the surrounding moraines which are high in clay.

When the Wisconsinan ice retreated into the current Lake Michigan Basin, an early glacial waterbody named Lake Chicago was formed. This lake drained southwest by way of the Chicago Outlet, a narrow channel cut through the Valparaiso end moraine near the southwest edge of the lake and entrenched itself in Silurian dolomite. Here, a unique combination of till deposits and erosion created a topographic rise known as Mount Forest, which occurred in the southern reaches of the Chicago River. Mount Forest exists today near Lyons, Willow Springs, Palos Hills, Worth, and Lemont. This triangular island formation is known as the Palos and Sag Valley region.

Following glaciation, marshlands and narrow streams occupied valleys both north and south of Mount Forest. These features conveyed water from ancient Lake Chicago toward the south and southwest to the ancient DesPlaines and Illinois River valleys. In 1892, the swale and stream system that formed north of Mount Forest was excavated in 1892 for the Chicago Sanitary and Ship Canal (CSSC). The system located to the south was excavated in 1922 for the Cal-Sag Channel (Angle and Olis, undated).

Soils

Except for a small amount of igneous rock found in southern Illinois, the outcrops of bedrock that occur in the State are sedimentary and range in age from Cambrian to late Pennsylvanian. Beneath the glacial deposits lies bedrock that is mainly Silurian Dolomite. Most of the soil covering the bedrock is derived from loess, a thin wind-deposited silt. This soil is difficult to identify because it is mixed with other materials such as small amounts of clay and fine sand. Loess originated mainly in the bottomlands along streams and valley trails of glacial rivers. Glacial outwash, glacial till, and alluvium are also important soil materials in the area.

In Lake County, there are five mapped soil series bordering the North Branch of the Chicago River (NBCR), the West Fork of the NBCR, and the Skokie River (Paschke and Alexander, 1970). The most predominant soil series is Montgomery silty clay. This soil borders most of the West Fork of the NBCR and sections of the Skokie River, and occurs on low parts of the landscape. The Montgomery series consists of deep, level to depressional, poorly drained to very poorly drained soils that formed in clayey lake-laid or glacial till deposits.

The soil series bordering most of the Skokie River, NBCR, and some of the West Fork of the NBCR is Peotone silty clay loam. The Peotone series consists of deep, level to depressional, very poorly drained soils that formed in thick, silty, and clayey, water-deposited materials. These soils are common in low areas of Lake County.

Pella silty clay loam soil is found along the Skokie River and a few small areas bordering the NBCR. This series consists of deep, level, poorly drained soils that formed in silty and clayey, water-deposited material over calcareous, medium-textured glacial drift. The drift consists of silt loam, loam or sandy loam, is generally stratified, and in some places contains a layer of gravel. These soils are found in low areas throughout Lake County and are subject to ponding.

Ashkum silty clay loam and the Wauconda-Frankfort silt loam soil series are found in small areas bordering the NBCR. The Ashkum series consists of deep, level, poorly drained soils that formed in silty and clayey, water-deposited material of variable thickness and the underlying glacial till. These soils are found in low areas throughout Lake County and are subject to ponding.

The Wauconda series consists of deep, level to gently sloping, somewhat poorly drained soils that formed in 2 to 3 feet of silty material and the underlying calcareous, stratified silt and sand. These soils are found on uplands in all parts of Lake County. The Wauconda-Frankfort silt loams are found mainly in the southeast corner of the county. Some areas contain only Wauconda silt loam and some only Frankfort silt loam, although most areas have some of each. Surface layers are often silt loam and a subsoil of silty clay loam. The topography is nearly level.

Areas within DuPage and Cook Counties have been significantly altered by urban development and little open space remains. Most areas are nearly level to gently sloping because of extensive grading. Hills have been leveled, low areas have been filled and the natural soils disturbed. Soil boundaries have become unrecognizable. Most of the soil types are considered Urban – Markham-Ashkum and Urban – Milford. The designation “Urban” refers to land that has been developed almost completely with buildings and pavement. and smoothing. Urban land is modified by cuts and fills to an extent that identification of the soil is not feasible.

Markham-Ashkum is characterized by built-up areas and deep, gently rolling to nearly level, moderately well-drained and poorly drained soils that have a clayey and silty subsoil formed in glacial till. Milford is similar to Markham-Ashkum except that it is formed in glacial lake sediment (Mapes, 1979).

The predominant soil series found along the Chicago Sanitary and Ship Canal (CSSC) is Romeo silt loam. It is a dark, very shallow soil formed in about 2 to 10 inches of medium textured alluvial sediments on level-bedded dolomitic limestone. A soil association called Faxon-Kankakee-Rockton is also found along the CSSC. This soil is a moderately deep to deep, level to gently sloping, poorly drained to well-drained soil that has a dominant loamy or silty subsoil. It was formed in dolomite bedrock and very coarse glacial outwash on bottom lands and terraces.

Eastward along the Cal-Sag Channel and the Little Calumet River, the soils and soil associations are Faxon-Kankakee-Rockton, Urban – Drummer-Barrington and Urban – Selma-Oakville. Urban – Drummer-Barrington is characterized by built-up areas and deep, nearly level to undulating, poorly drained and well drained soils that have a silty and loamy subsoil formed in glacial outwash. Urban – Selma-Oakville is similar to Urban – Drummer-Barrington, except it was formed in glacial outwash and glacial lake sediment (Wascher et al., 1962).

Regional Climate

The regional climate is predominately continental, characterized by frequent changes in temperature, humidity, cloudiness, and winds. Prolonged warm spells in the summer are infrequent, but long spells of dry weather during the growing season are not unusual. The average length of the growing season is about 155 days.

From late fall through winter, snow squalls are frequent, resulting in a heavy total snowfall. The average annual snowfall is between 35 and 40 inches with at least one inch of snowfall during 32 days a year. During some years, a single prolonged storm can produce more than 2 feet of snow with strong winds creating heavy drifts.

In winter, the average temperature is 25°F. The average daily minimum temperature is 17ºF.

During summer, the average temperature is 71°F, and the average daily maximum temperature is 81°F. Temperatures are cooler in the summer near Lake Michigan due to lake-effect winds. Average precipitation is slightly less than 33 inches a year, occurring mainly between May and September. The average annual relative humidity is about 61 percent; during spring, the humidity is less than 15 percent.

HUMAN SETTLEMENT AND WATERSHED DEVELOPMENT

Native American tribes, such as the Kickapoo, Potawatomi, Miami, and Chippewa, were some of the earliest known settlers in the Chicago River watershed and surrounding area. These people used the eastern end of the drainage basin to gain access between Lake Calumet, Lake Michigan, and the DesPlaines Valley. This passage was later named the Chicago Portage. Between 1673 and 1700, the Chicago Portage was also used by French explorers, missionaries, and fur traders. Land alterations began in the early 1800's, when the first permanent settlers arrived causing large-scale agricultural conversion of the land (Larson, 1979).

The mouth of the Chicago River became a natural meeting place for water-borne travelers and an area worthy of military protection. Fort Dearborn was established in 1804 to prevent the British and their Indian allies from recapturing the vital water transportation route. As the population of the Chicago area grew, so did commercial development and commerce. A permanent harbor suitable for large vessels was essential for the commercial development of the area. In 1833, work was begun on the Chicago Harbor, beginning a long and complex history of use and modification of the land and watershed.

The current Chicago Waterway System is largely an interconnected network of both natural and artificial channels, much of which has been modified. Historically, the system consisted of shallow streams and broad marshes (Larson, 1979; Kirschner, 1983). Early alteration and channelization of these landscape features allowed for agricultural drainage; efficient transportation of people, agricultural products and manufactured goods; and relief from flooding (Kirschner, 1983). Literature on early settlement (Buisseret and Danzer, 1984) and pre-settlement conditions in the 1830's (Hanson, 1981) indicate the presence of marshlands, wet forests and streams along the upper reaches of the forks to the North Branch of the Chicago River.

In pre-settlement times, the region now occupied by the Skokie Lagoons and Skokie River system was mostly marshlands, swamps, and sloughs (Hanson, 1981; Hutchison, 1988; Moran, 1978). Early European settlers tried unsuccessfully to drain the marshlands that paralleled Lake Michigan. By the early 1900's, much artificial drainage had been successfully accomplished. In describing the watershed of the Skokie Marsh, Sherff (1913) mentioned the series of shallow ditches and drainage tiles that traversed the rural part of the "North Shore." These marshlands had been extensively ditched from the stream origin near Waukegan south to the Skokie Marsh.

In 1920, the Forest Preserve District of Cook County (FPDCC) Board passed a resolution to purchase nearly 2,000 acres of the Skokie Marsh region (Mann, 1965). As communities around the marshlands grew, so did flooding and mosquito abatement concerns. Local drainage districts maintained shallow channels and ditches that moved stagnant water away from the marsh areas. Artificial drainage patterns were draining the marsh. By 1920, much of the original character of the Skokie Marsh had been lost (Baker).

Plans to modify the marshlands into a series of ponds or lagoons for flood control were developed in 1929 (Mann, 1965). By 1942, the Civilian Conservation Corps had moved 4 million cubic yards of earth, and had built a seven-lagoon system, a series of related dams, and essential water control structures (FPDCC, 1970).

Between 1892 and 1900, the Chicago Sanitary and Ship Canal (CSSC) was constructed to drain sewage away from Chicago and the city's water source and to accommodate commercial barge traffic. The CSSC paralleled both the Illinois and Michigan (I&M) Canal and the DesPlaines River.

The North Shore Channel is an artificially constructed landscape feature. Constructed between 1908 and 1910, this channel was designed specifically to drain sewage away from Lake Michigan, which was the principal source of drinking water for the region.

Between 1911 and 1922, the Calumet-Sag Channel (Cal-Sag) was constructed by the Metropolitan Sanitary District of Greater Chicago (MWRDGC). The channel extended 15.9 miles from the CSSC to the Little Calumet River. It followed the former outlet of Glacial Lake Chicago, which had become a marshy drainageway. This channel was constructed to reverse the flow of the Calumet River from east to west and to prevent pollution discharges into Lake Michigan. The channel has been widened and deepened since its original construction to accommodate larger vessels.

These waterway projects generally coincided with the late 19th century industrial development in the Calumet region. The Calumet River and Calumet Harbor were dredged and channelized to accommodate larger draft ore boats and ocean-going vessels that supplied raw material to the growing Illinois Steel Works and related facilities. Extensive tracts of marshlands were filled to create areas on which to build these steel mills.

During the 19th century, untreated industrial and municipal wastes were discharged directly into the Calumet River. Water-related health issues occurred in the years following development of the Lake Calumet region. Reversal of the Calumet River was considered essential to limit degradation of Lake Michigan's water quality. On a smaller scale, the Cal-Sag Channel and the O'Brien Lock and Dam facility were constructed to facilitate the reversal of the Calumet River (Larson, 1979).

Water quality problems associated with the Chicago River have existed since the area was first settled in the early 19th century because of disposal of municipal wastes. The poor drainage of the Chicago River has occurred since the area's glacial history. Chicago was built in the shallow margin of post-glacial Lake Michigan. As the lake level dropped, the flat lake bottom became exposed forming the marshland which is now occupied by the city.

Subsequent to glaciation, the Chicago River was left as a shallow, sluggish stream flowing through wetlands and draining into Lake Michigan. In 1869, John Lewis Peyton described the Chicago River as "a sluggish, slimy stream, too lazy to clean itself, and on both sides of its north and south branches, upon a level piece of ground, half dry and half wet, resembling a salt marsh." As was common with cities located on waterways, raw waste was dumped into the river to be washed "away" and cleansed by natural biological means. Unfortunately, the small, slow flowing river emptied waste into Lake Michigan, which served as the city's primary water supply.

The population of Chicago ballooned in the late 19th and early 20th centuries. As a result, the river transported greater waste loads. Because the river flowed into Lake Michigan, sewage and associated pathogens would flush into the lake during storm events and contaminate the city's water supply. In 1854, cholera epidemics in Chicago killed 5.5 percent of the population (3,575 people), and 12 percent (183,000 inhabitants) died from this disease in 1885.

The human denizens of Chicago were not the only source of river pollution. In 1865, union stock yards opened on 325 acres south of a canal off the South Branch. Other stock yards were also located along the river. In the early part of the 20th century, packing and slaughter houses discharged tons of pollution into the river.

Work on the Illinois and Michigan Canal (I&M) occurred between 1836 and 1848. Built prior to the advent of sewage treatment, the I&M Canal provided a means for the first steps in water quality improvement by providing a southerly outlet for the Chicago River. Water was pumped from the South Branch into the canal for barge traffic between Chicago and LaSalle Streets. The water that was pumped was heavily laden with raw sewage. One can only imagine the stench created by the decomposing sewage carried along the shallow barge canal to the Illinois River. Canal traffic peaked in 1882, then dropped due to the development of rail access and the Chicago Sanitary and Ship Canal (Meyer and Wade, 1969).

The pumping of Chicago River water into the I&M Canal created improved water quality in the main channel. One description called it "comparatively pure with little odor." By 1871, the flow of the Chicago River was directed in a southerly direction via the I&M Canal. In 1880, 90 sewers drained untreated, raw sewage directly into the Chicago River. Both the North Branch and South Branch (Bubbly Creek) were very polluted, discolored and produced "considerable odor." Water supply and sewage disposal were still problematic. The death rate from typhoid reached 174 per 100,000 in 1891. Improvement in the water quality of the Chicago River did not occur until the early part of the 20th century with completion of the CSSC and diversion of Lake Michigan water.

Construction of the CSSC in 1900 required excavation of more earth than the Panama Canal. The CSSC breached the continental drainage divide between the Chicago and Des Plaines Rivers and connected the Lake Michigan drainage basin with the Mississippi drainage basin. The canal carried sewage away from the city, reduced flooding and created navigation facilities for barges. In this latter respect, it replaced the then obsolete I&M canal. Additional improvements to the water quality of the Chicago River did not occur until treatment of municipal and industrial effluents improved.

The CSSC District, founded in 1889, was formed because the natural drainage areas did not conform to existing political boundaries, and the sewage disposal scheme extended beyond Chicago's city limits. When first formed, the CSSC District, encompassed 185 square miles. By 1969, the metropolitan sanitary district had increased to 860 square miles.

The advent of active sewage treatment, along with the dilution effect of Lake Michigan diversion and flushing the pollutants downstream via the Des Plaines River, did much to improve the water quality of the Chicago River. The packing and slaughter houses cooperated in the development of sewage treatment systems to decrease the suspended solids in the river. Once the slaughter/packing house and tannery wastes were controlled, the water quality of the river stabilized for a period of time. Further improvements occurred with improved waste treatment. However, the combined sewer system, which carried both storm water and sewage, overflowed into the river during heavy storms, causing periodic water quality problems.

EXISTING CHICAGO WATERWAY SYSTEM

Today, the north branches of the Chicago River, including the West Fork, Middle Fork, and Skokie River, flow through low-lying urbanized reaches of the northern metropolitan area. The streams carry runoff from light and heavy industries, as well as residential neighborhoods, parks, and golf courses. Due to urban encroachment, the streams have become increasingly restricted, incised channels. Urbanization has created more impermeable surfaces, increasing both the volume and rate of runoff after storm events. These streams carry relatively high volumes of surface runoff, which cause flooding.

The original Chicago Waterway System consisted of wet prairies, marshes, and marshy interconnecting streams. The system is largely a network of both natural and excavated channels originally constructed to promote drainage for agriculture, flood control, and commercial navigation.

Today, the Chicago Waterway System provides drainage for a watershed extensively developed for urban uses. It is still heavily used for commercial navigation. From the standpoint of biological diversity, much has been lost. The waterway does not even remotely resemble its marshy, meandering precursor; however, the corridor and its remnant wetlands, prairies, and oak woodlands are now largely confined to forest preserves. These areas harbor significant biological diversity, and the corridor provides vital open space in a densely populated urban area.

In north suburban Lake and Cook Counties, the predominant land use adjacent to the Chicago Waterway System is a mix of high and low density residential and commercial development, as well as golf courses, forest preserves, and limited areas still in agriculture. Significant forest preserve holdings are located along the NBCR and the Skokie River in northern Cook County and on the north side of the City of Chicago. Within the City of Chicago, both residential and industrial uses become more prevalent. Downtown Chicago is primarily high-rise commercial, with a few high-rise residential buildings. South of downtown, land uses are mixed open space (vacant industrial sites) and active industrial, with limited residential development.

Industry dominates land use activities along the CSSC. Examples of businesses include active and abandoned stone quarries, oil terminals, MWRDGC sludge treatment facilities, chemical processors, manufacturing plants, barge operations, and salvage companies. Residential development predominates near the towns of Summit and Willow Springs. Oil refineries, chemical tank farms, barging support facilities, and numerous old quarry operations are common further south. Residential development occurs primarily along the eastern and southern channel banks between Lemont and Lockport.

Although a portion of the waterway system passes through the heavily industrialized communities of Hegewisch, South Deering, and the southeast side of the City of Chicago, the banks of the Cal-Sag Channel are not completely developed. Except for reaches near Lake Calumet and the Calumet River, much of the land adjacent to this waterway remains dedicated open space and preserved by the county forest preserve system.

Industries, such as Acme Steel, ore and mineral storage areas, freighter terminals, and abandoned industrial land, dominate land uses adjacent to the river channel in Reaches 10B and 10C. Reach 10C, however, includes a remnant of the original Calumet wetlands, which is among the most important wetlands for wildlife in the entire corridor.

The Illinois Environmental Protection Agency has established water quality classifications for waterbodies in Illinois. General Use standards are intended to protect aquatic life, primary (swimming) and secondary (boating) recreation, agriculture, and industrial uses. General Use standards apply to most waters in Illinois. Reaches assessed as Secondary Use waters do not support recreation, such as swimming, but do support boating. Secondary Use classification is applied only to certain stream and canal sections in the Chicago area.

The Chicago River, South Branch, and the CSSC were constructed or modified to handle municipal and industrial waste, as well as to provide shipping to the Gulf of Mexico. As a result of municipal and industrial wastewater discharges into the shallow, slow-flowing river system, the water quality has historically been extremely poor. Though no historic monitoring records exist, the water quality of the Chicago River has improved since the 1930's and has shown measurable improvement since 1975 when monthly monitoring was initiated. The classification of several reaches of the Chicago River as Secondary Use waters is indicative of the continuing burden placed upon the river to carry treated wastes downstream and of their modified habitats.

Due to the influence of Lake Michigan diversion water, the North Shore Channel above the Northside Treatment Facility and the mainstem Chicago River (Lake Michigan to Wolf Point) have better water quality than the downstream reaches. These two reaches and the North Branch above the confluence with the North Shore Channel are the only reaches to be classified as General Use waters.

The remaining stream reaches in the Chicago area are classified as Secondary Use waters. These include the South Branch of the Chicago River; South Fork of the South Branch of the Chicago River; the North Branch of the Chicago River from the confluence with the North Shore Channel south to the confluence with the South Branch; East Channel of the North Branch of the Chicago River (Goose Island); the Chicago Sanitary and Ship Canal (CSSC), and the North Shore Channel downstream from the North Side Water Reclamation Plant. The location of stream reaches addressed in this report are delineated in Figure 1.

Metropolitan Water Reclamation District of Greater Chicago Monitoring Results

Since 1975, the MWRD has monitored 25 water quality parameters on a monthly basis (Table 54) at the stations listed in Table 55.

Figures 10-22 illustrate mean annual values for selected water quality parameters at 16 locations on the Chicago River and 9 locations on the Calumet River from 1975 through 1991. Parameters listed but not illustrated did not exceed the standard during the record period. Certain locations consistently exhibit violations of water quality standards, yet the frequency of violations appears to be decreasing. In general, stations exhibiting poor water quality in the mid-1970's have improved in recent years.

The 1992 water quality report for monitoring during 1991 indicated General Use waters of the Chicago and Calumet Rivers had eighteen parameters in complete compliance and eight parameters in partial compliance (Table 56). Water quality samples from Chicago area Secondary Contact waters exhibited fifteen parameters in complete compliance. Six other parameters were in partial compliance (Table 57).

Because the water quality standards are stricter for the General Use waters, these waters experience more frequent violations of dissolved oxygen, iron concentrations, and fecal coliform counts than the Secondary Use waters. Of the parameters monitored, fecal coliform counts exhibited the lowest rate of compliance. Fecal coliform counts are familiar to many people as a water quality measurement because of its use for beach closure. Because the river is small and is used to carry waste from a metropolitan area, even those reaches of the river classified for General Use will most likely not be safe for swimming throughout the year. No one in the 1994 user survey reported swimming in these reaches of the river.

Secondary Use waters, which comprise most of the system, had water quality violations involving ammonia-nitrogen 5.4 percent of the time. Violations were reported for total dissolved solids (TDS), pH, oil and grease, copper, and chromium. There are no fecal coliform standards for Secondary Use waters.

During the early 1980's, average annual fecal coliform counts (cts) ranged as high as 100 to 150 times the 400 cts/100 ml standard used by the MWRD. Concentrations of fecal coliform bacteria have decreased in recent years, but in 1991, average annual counts still exceeded the MWRD standard by 25 times at County Line Road on the Skokie River and by about 50 times at Orr Road on Thorn Creek. Outer Drive on the mainstem, Central Avenue on the north branch, County Line Road on the west fork, and Wolf Lake on the Calumet River were the only stations that had average annual means in compliance with the MWRD standard. These are the stations most influenced by the Lake Michigan diversion waters. Again, these means do not indicate the range of readings which, at times, may exceed the MWRD water quality standard.

Tunnel and Reservoir Project (TARP)

Interception of combined sewer overflows prior to entry into the river will stabilize and improve the water quality of the river. The Tunnel and Reservoir Project (TARP) is intended to provide this interception and storage capacity for waste and storm water treatment.

The TARP system intercepts the combined sewer overflow prior to discharge into the river. By decreasing the number of combined sewer overflow (CSO) events, the TARP system protects the water quality of the Chicago and Calumet Rivers. The overflow is stored in reservoirs, passed through the treatment system, then returned to the river. Ideally, the system will carry storm-related flows to reservoirs for treatment rather than discharging the effluence directly into the river. Until the TARP system is completed, combined overflows will continue during severe storm events. When they occur, these overflows will adversely affect the condition of the river.

The 31-mile long mainstream tunnel system began operation in May 1985. Phase I of TARP has improved water quality in the river as shown by water quality measurements taken before and after TARP went on-line. The West Southwest Wastewater Treatment Plant treats the CSOs captured by the mainstream tunnel and discharges the treated wastewater to the CSSC. Between January 1986 and June 1993, the mainstream tunnel system collected 186.1 billion gallons of CSO. Based on measurements of biological oxygen demand (BOD), total suspended solids (TSS) and ammonia-nitrogen concentration in the pumpback flows, 79 million pounds of BOD, 413.12 million pounds of TSS and 11.62 million pounds of ammonia-nitrogen were removed by the mainstream TARP during the 6½ year period (Table 58). This reduction in pollutant loading has improved water quality by reducing the oxygen demand and nutrient levels in the stream.

Water quality data collected from monthly samples at six stations on the North Shore Channel, the Chicago River, and the CSSC were summarized for 72 months before TARP operation began (January 1979 through December 1984) and 72 months after TARP operation began (January 1986 through December 1991). Comparison of pre- and post-TARP conditions showed a general increase in dissolved oxygen concentrations and a reduction in biological oxygen demand, ammonia, and total phosphorus concentrations (Tables 59 and 60).

Aquatic Habitat

Improvements in aquatic habitat have occurred since May 1985 due to the elimination of chlorination treatment of plant effluence discharged into Secondary Use waters. By decreasing the chlorine in the waterway, fish and aquatic vegetation less tolerant of polluted conditions have been able to recolonize the river. Perhaps the other most limiting factors for aquatic life are the dissolved oxygen and ammonia concentrations. Without enough oxygen dissolved in the water, aquatic organisms will suffocate. Ammonia is toxic and can kill aquatic organisms at concentrations as low as 5 ppm.

Mean dissolved oxygen concentrations on the Chicago and Calumet Rivers show that dissolved oxygen is adequate for aquatic life at most stations. These mean levels are based on monthly samples, and there is no indication of minimum levels encountered during or between monitoring events. The lowest dissolved oxygen concentration, rather than the mean concentration, becomes the limiting factor over time. Similarly, the monthly mean concentration of ammonia at the sampling sites does not indicate the peak concentrations that would adversely affect aquatic populations.

Additional TARP reservoirs could further decrease the frequency of CSO events, and, in turn, decrease pollutant loadings to area waterways. This would result in higher dissolved oxygen levels and lower biological oxygen demand, ammonia-nitrogen levels and nutrient concentrations (COE, 1986). Even with TARP Phase I completed, combined sewer overflow events will continue to degrade the water quality in area waterways. Most reaches will remain suitable only for secondary contact because of treated municipal and industrial wastewater and surface runoff. With improvements in water quality, additional stream reaches may support a more diverse aquatic fauna; however, other forms of environmental degradation, such as sediment contamination, may continue.

STUDY CORRIDOR

The Chicago Waterway System is primarily located in Lake and Cook Counties, Illinois, with small areas passing through Will and DuPage Counties. The study area begins at the northern headwaters of each of the three Chicago River branches (West Fork, Middle Fork, and Skokie River), and extends south and west to Lockport and east along the Cal-Sag Channel and Calumet River to Lake Michigan. The study corridor extends one-half mile on either side of the waterway and stretches 156 miles in length.

The river corridor is divided into 10 reaches, some of which are divided into subreaches (Figure 1). The reaches are generally defined by the location of confluences that comprise the Chicago Waterway System. These 10 reaches are described below.

Reach 1: West Fork of the North Branch of the Chicago River

Limits: Headwater north of Everett Road, Lincolnshire, Lake County to confluence with mainstem North Branch Chicago River at Golf Road, Morton Grove, Cook County.

Length: 14 miles

Communities: Lincolnshire, Riverwoods, Deerfield, Northbrook, Glenview, Morton Grove

Reach 2 (including 2A and 2B): Middle Fork of the North Branch of the Chicago River

Limits: Headwaters at Belvidere Road, Park City, Lake County to confluence with West Fork at Golf Road, Morton Grove, Cook County. Reach 2A includes confluence with Skokie River in Wilmette to confluence with West Fork in Morton Grove. Reach 2B includes headwaters to confluence with Skokie River in Wilmette.

Length: 24 miles (3 miles for 2A and 21 miles for 2B)

Communities: Park City, Lake Bluff, Lake Forest, Highland Park, Deerfield, Northfield, Wilmette, Morton Grove

Reach 3: Skokie River

Limits: Headwaters north of Il. Rt. 137, North Chicago, Lake County to confluence with North Branch north of Lake Avenue, Wilmette, Cook County.

Length: 17 miles

Communities: Lake Bluff, Lake Forest, Highland Park, Northfield, Winnetka, Wilmette

The West Fork (Reach 1); the North Branch, including Middle Fork (Reach 2A,B); and the Skokie River (Reach 3) are approximately parallel. The West Fork and North Branch lie between 1.12 and 1.75 miles apart. The North Branch and the Skokie River lie between 0.5 and 1.5 miles apart.

Reach 4: North Shore Channel

Limits: Lake Michigan at Wilmette Harbor, Wilmette, Cook County to confluence with North Branch near Lake Avenue, Wilmette, Cook County.

Length: 7.6 miles

Avg. Width/Depth: 150 feet/8 feet

Communities: Wilmette, Evanston, Lincolnwood, Skokie, City of Chicago

Reach 5 (including 5A and 5B): North Branch of the Chicago River

Limits: Confluence with West Fork north of Beckwith Road/ Church Street bridge, Morton Grove, Cook County to confluence with mainstem Chicago River at Wolf Point, Wacker Drive and Lake Street, Chicago, Cook County. Reach 5A extends from confluence with West Fork in Morton Grove to confluence with North Shore Channel in Wilmette. Reach 5B extends from the confluence with North Shore Channel to the confluence with the mainstem Chicago River at Wolf Point.

Length: 5A is 10.5 miles; 5B is 7.2 miles

Width/Depth (Authorized Federal Channel): 150-200 feet/ 9-21 feet

Communities: Morton Grove, Niles, Wilmette, City of Chicago

Reach 6: Chicago River

Limits: Confluence with North Branch at Wacker Drive and Lake Street to mouth of Chicago Harbor, Lake Michigan.

Length: 1.4 miles

Width/Depth (Authorized Federal Channel): 180-400 feet/ 21 feet

Communities: City of Chicago

Reach 7: South Branch of the Chicago River and South Fork of the South Branch of the Chicago River

Limits: Confluence with mainstem Chicago River at Wolf Point, Wacker Drive and Lake Street, Chicago, to the Ashland Avenue bridge, Chicago. Includes South Fork South Branch (Bubbly Creek) and the turning basin east of Ashland Avenue.

Length: 3.9 miles

Width/Depth (Authorized Federal Channel): 150 feet/17 feet

Communities: City of Chicago

Reach 8: Chicago Sanitary and Ship Canal (Ashland Avenue to Interstate 55)

Limits: Ashland Avenue bridge, Chicago, to the I-55 bridge in Summit, Cook County

Length: 8.2 miles

Width/Depth (Authorized Federal Channel): 300 feet/17 feet

Communities: City of Chicago, Stickney, Summit, Forest View

Reach 9 (including Reaches 9A and 9B): Chicago Sanitary and Ship Canal (Interstate 55 to Lockport)

Limits: I-55 bridge in Summit, Cook County to the Metropolitan Water Reclamation District lock in Lockport, Will County. Reach 9A extends from the I-55 bridge to the confluence with the Cal-Sag Channel. Reach 9B extends from the confluence with the Cal-Sag Channel to the lock at Lockport.

Length: 22.5 miles (10 and 12.5 miles for Reaches 9A and 9B, respectively)

Width/Depth (Authorized Federal Channel): 160-200 feet/ 23 feet

Communities: Summit, Bedford Park, Justice, Willow Springs, unincorporated DuPage County, Lemont, unincorporated Cook County, Romeoville, unincorporated Will County, and Lockport

Reach 10 (including Reaches 10A, 10B, and 10C): Calumet-Sag Channel, Little Calumet River, and Calumet River

Limits: Confluence with Chicago Sanitary and Ship Canal, Route 83 and Route 171, DuPage County to Calumet Harbor at Lake Michigan, Chicago. Reach 10A extends from the confluence with the Chicago Sanitary and Ship Canal to the confluence with the Little Calumet River. Reach 10B extends from the Little Calumet River to O'Brien Lock. Reach 10C includes the Calumet River from O'Brien Lock to Lake Michigan.

Length: 29.8 miles (15.9, 7.1, and 6.8 miles for Reaches 10A, 10B, and 10C, respectively)

Width/Depth (Authorized Federal Channel): 300-450 feet/ 9-27 feet

Communities: City of Chicago, Palos Park, Palos Hills, Palos Heights, Alsip, Crestwood, Robbins, Blue Island, and Calumet Park.

Reach 10 extends 29.8 miles and is divided into three shorter reaches: Reach 10A (Cal-Sag Channel proper from Chicago Sanitary and Ship Canal at mile 303.5 to Little Calumet River at mile 319.4); Reach 10B (Little Calumet River and Calumet River from Cal-Sag Channel at mile 319.4 to O'Brien Lock at mile 326.5); and Reach 10C (Calumet River from O'Brien Lock at mile 326.5 to Lake Michigan at mile 333.3).

Reach 10A extends 15.9 miles (mile 303.5 to mile 319.4); Reach 10B extends 7.1 miles (mile 319.4 to mile 326.5); and Reach 10C extends 6.8 miles (mile 326.5 to mile 333.3).

STUDY METHODOLOGY

Wetlands Characterization

Overview

The purpose of this part of the study is to refine and update the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) mapping, which was completed for the study area in 1981. Since that time, extensive urban development has occurred, particularly in the northern reaches. This effort involved: 1) summarizing existing NWI wetlands data for each reach, including the total number and acreage of wetlands by type; 2) documenting the effects of development on wetlands known to exist in 1981; 3) identifying additional wetlands which have either appeared since 1981 or which were not identified by NWI because of the limits of resolution; and 4) establishing new wetland baseline conditions for planning purposes. This portion of the natural resource inventory study represents most of the work conducted during the 1993 field season.

This updated mapping exercise is not a NWI work product, and the results are not comparable to the original NWI mapping. The materials and procedures used differed between NWI and this mapping exercise. However, the updated mapping accurately identifies those wetlands that were previously shown in the NWI, but which no longer exist. It cannot be assumed that all wetlands identified in this study represent "new" wetlands that have appeared on the landscape since 1981. Most of these wetlands probably were not shown in NWI because the resources were beyond NWI's limits of resolution or because they did not meet NWI's existing definition of a wetland. All wetlands discussed in this study can be identified according to the 1987 Corps of Engineers Wetlands Delineation Manual.

Mapping Procedures

National Wetlands Inventory (NWI) maps were used as the basis for locating and mapping wetlands within the study corridor. All wetlands were identified using aerial photography then compared with NWI mapped wetlands. Color aerial photos on a scale of 1″ = 500′ were taken in May 1993 for Reaches 1, 2A, 2B, and 3. In September 1993, Reaches 6, 7, 8, 9A, and 9B were flown and color aerial photos at the same scale were produced. Both of these sets of aerial photographs were produced in overlapping pairs for stereoscopic analysis. Color aerial photos were taken at varying scales of Reaches 4, 5A, and 5B in July 1993. Reaches 10A, 10B, and 10C were evaluated using 1″ = 500′ black and white aerial photos, dated September 1992.

Comparisons between wetland photosignatures and corresponding NWI maps along the study corridor were made to determine if the NWI wetlands mapped in 1981 were: 1) still present and, if so, if the wetland had changed in size or had been altered and a new wetland code was needed; or 2) no longer existed. The comparisons were also conducted to determine if wetlands now were present where none had previously been mapped.

A stereoscope was used for interpreting photos available in stereo pairs. The added depth helped to identify the existence of a wetland. Typical wetland photosignatures included standing or open water, dark phototones indicative of saturated soils, and rough textures associated with robust emergent vegetation. Hydric soils were also used as a factor to confirm the presence of wetlands. Soil surveys prepared by the Natural Resource Conservation Service and the Illinois Agricultural Experiment Station were used in conjunction with the NWI maps and aerial photographs to identify wetlands. Advanced Identification (ADID) maps were also used to help identify new or existing wetlands for portions of the river corridor in Lake County.

An ADID study was conducted by the U.S. Environmental Protection Agency (USEPA) and the U.S. Army Corps of Engineers (COE) to identify those wetlands which were considered to have high functional values and which were considered undesirable for filling. This study involved both wetland mapping and wetland evaluation components. The study was conducted in conjunction with the Lake County Wetland Inventory, which involved mapping all wetlands in the county as part of the 1985 Food Security Act requirements. The final ADID maps were produced in 1992.

Most of the identification, verification, and mapping of wetlands within the study corridor involved the use of aerial photographs; however, limited ground-truthing in the field was also conducted. All field work was conducted between June and December 1993.

Boundaries of existing wetlands that appeared to have changed between 1981 and 1993 were verified and documented in the field. Forested wetlands and flatwoods were also confirmed in the field. These were among the most difficult wetlands to identify in the 1993 photos because trees had already leafed out at the time the photos were taken. Wetlands that had apparently disappeared since the original mapping was conducted were also field-checked. Other wetlands were also field-checked, if photos showed a potential for habitat restoration.

All changes that have occurred since the original NWI mapping in 1981 were documented and mapped during this exercise. Typically, these included the appearance of previously unidentified wetlands, boundary changes to existing wetlands, and documentation of the absence of previously mapped wetlands. The approximate acreage of each wetland was determined using a planimeter after first outlining the wetland on a mylar that was overlain on an aerial photo. To aid in identifying locations of the new wetlands, major roads, railroads, and "landmark" cultural features were also drawn on the mylars. The mylars were sent to a Geographic Information System (GIS) lab located at the U.S. Army Construction Engineering Research Lab in Champaign, Illinois. The GIS lab digitized outlines of the new and modified wetlands. These new and modified wetland areas are delineated in Figures 4-9.

Wetlands Classification System

Although this part of the study focuses on wetlands because of their special biological attributes, the NWI classification system includes both wetlands and deepwater habitats (Cowardin et al., 1979). The boundary between the two areas is the point at which water depths exceed 6.6 feet. This is the general limit of light penetration required to support aquatic or wetland vegetation. It should be understood that the modified NWI maps appended to this report show both wetlands and deepwater habitats, and the term "wetlands" is used inclusively to refer to any mapping unit, whether it is technically a wetland or a deepwater habitat.

The NWI wetland classification system classifies wetlands and deepwater habitats by major systems, subsystems, classes, subclasses, and various special modifiers (Figure 2). All wetlands within the study corridor fall into one of three major wetland systems: palustrine, lacustrine, or riverine.

Palustrine wetlands are the most common wetlands in the study corridor. In general, these include all freshwater wetlands dominated by trees, shrubs, and emergent herbaceous plants. They also include other water bodies lacking such vegetation that are less than 20 acres and have maximum water depths of less than 6 feet. Palustrine wetlands include areas traditionally known as marshes, swamps, bogs, fens, wet prairies, and ponds. The three most common classes of palustrine wetlands are defined by vegetation type, such as forested, shrub-scrub, and emergent. A fourth class, open water, is used to classify ponds.

Lacustrine wetlands occur in topographical depressions, have less than 30-percent coverage of trees, shrubs, or emergent vegetation, and are larger than 20 acres. Smaller water bodies are also included in this category, if the greatest water depth exceeds 6.6 feet. In the study corridor, lacustrine wetlands are represented by open water sloughs and shallow lakes adjacent to some of the southern river reaches (e.g., Saganashkee Slough, Lake Calumet).

Riverine wetlands include all wetlands and deepwater habitats contained within a channel, except for areas dominated by trees, shrubs, or other emergent vegetation which are considered part of the palustrine system. In the study corridor, riverine wetlands are represented by the river, canal channels, and tributary streams.

Throughout this report, wetland classifications are identified by letter and number codes. The first 2 or 3 symbols represent the system and class (e.g., PEM = palustrine emergent). The remaining symbols are modifiers that describe other characteristics such as hydrology, soils, or dominant vegetation. A key to all of the codes used in the text is shown in Figure 2.

Additional Wetland Information

Where specific data are available concerning individual wetlands of importance, such as those used by threatened or endangered species or other wildlife, published surveys, or that have Illinois Natural Areas Inventory or Nature Preserve designation, information is provided in the text. Although

SYSTEM: R – RIVERINE

SUBSYSTEM: 1 – TIDAL | 2 – LOWER PERENNIAL | 3 – UPPER PERENNIAL | 4 – INTERMITTENT | 5 – *UNKNOWN PERENNIAL*

CLASS / Subclass	RB – ROCK BOTTOM	UB – UNCONSOLIDATED BOTTOM	*SB – STREAMBED	AB – AQUATIC BED	RS – ROCKY SHORE	US – UNCONSOLIDATED SHORE	**EM – EMERGENT	OW – *OPEN WATER/ Unknown Bottom*
	1 Bedrock	1 Cobble-Gravel	1 Bedrock	1 Algal	1 Bedrock	1 Cobble-Gravel	2 Nonpersistent	
	2 Rubble	2 Sand	2 Rubble	2 Aquatic Moss	2 Rubble	2 Sand		
		3 Mud	3 Cobble-Gravel	3 Rooted Vascular		3 Mud		
		4 Organic	4 Sand	4 Floating Vascular		4 Organic		
			5 Organic	5 *Unknown Submergent*		5 Vegetated		
			6 Vegetated	6 *Unknown Surface*				

*STREAMBED is limited to TIDAL and INTERMITTENT SUBSYSTEMS, and comprises the only CLASS in the INTERMITTENT SUBSYSTEM.
**EMERGENT is limited to TIDAL and LOWER PERENNIAL SUBSYSTEMS

SYSTEM: P – PALUSTRINE

CLASS / Subclass	RB – ROCK BOTTOM	UB – UNCONSOLIDATED BOTTOM	AB – AQUATIC BED	US – UNCONSOLIDATED SHORE	ML – MOSS SHORE	EM – EMERGENT	SS – SCRUB SHRUB	FO – FORESTED *Unknown Bottom*	OW – *OPEN WATER/ Unknown Bottom*
	1 Bedrock	1 Cobble-Gravel	1 Algal	1 Cobble-Gravel	1 Moss	1 Persistent	1 Broad-Leaved Deciduous	1 Broad-Leaved Deciduous	
	2 Rubble	2 Sand	2 Aquatic Moss	2 Sand	2 Lichen	2 Nonpersistent	2 Needle-Leaved Deciduous	2 Needle-Leaved Deciduous	
		3 Mud	3 Rooted Vascular	3 Mud			3 Broad-Leaved Evergreen	3 Broad-Leaved Evergreen	
		4 Organic	4 Floating Vascular	4 Organic			4 Needle-Leaved Evergreen	4 Needle-Leaved Evergreen	
			5 *Unknown Submergent*	5 Vegetated			5 Dead	5 Dead	
			6 *Unknown Surface*				6 *Deciduous*	6 *Deciduous*	
							7 *Evergreen*	7 *Evergreen*	

SYSTEM: L – LACUSTRINE

SUBSYSTEM: 1 – LIMNETIC

CLASS / Subclass	RB – ROCK BOTTOM	UB – UNCONSOLIDATED BOTTOM	AB – AQUATIC BED	DW – *OPEN WATER/ Unknown Bottom*
	1 Bedrock	1 Cobble-Gravel	1 Algal	
	2 Rubble	2 Sand	2 Aquatic Moss	
		3 Mud	3 Rooted Vascular	
		4 Organic	4 Floating Vascular	
			5 *Unknown Submergent*	
			6 *Unknown Surface*	

SUBSYSTEM: 2 – LITTORAL

CLASS / Subclass	RB – ROCK BOTTOM	UB – UNCONSOLIDATED BOTTOM	AB – AQUATIC BED	RS – ROCKY SHORE	US – UNCONSOLIDATED SHORE	EM – EMERGENT	DW – *open water/ Unknown Bottom*
	1 Bedrock	1 Cobble-Gravel	1 Algal	1 Bedrock	1 Cobble-Gravel	2 Nonpersistent	
	2 Rubble	2 Sand	2 Aquatic Moss	2 Rubble	2 Sand		
		3 Mud	3 Rooted Vascular		3 Mud		
		4 Organic	4 Floating Vascular		4 Organic		
			5 *Unknown Submergent*		5 Vegetated		
			6 *Unknown Surface*				

MODIFIERS

In order to more adequately describe wetland and deepwater habitats one or more of the water regime, water chemistry, soil, or special modifiers may be applied at the class or lower level in the hierarchy. The farmed modifier may also be applied to the ecological system.

WATER REGIME

Non-Tidal

- A Temporarily Flooded
- B Saturated
- C Seasonally Flooded
- D *Seasonally Flooded/ Well Drained*
- E *Seasonally Flooded/ Saturated*
- F Semipermanently Flooded
- G Intermittently Exposed
- H Permanently Flooded
- J Intermittently Flooded
- K Artificially Flooded
- W Intermittently Flooded/ Temporary
- Y Saturated/Semi-permanent/Seasonal
- Z Intermittently Exposed/ Permanent
- U *Unknown*

Tidal

- K *Artificially Flooded*
- L Subtidal
- M Irregularly Exposed
- N Regularly Flooded
- P Irregularly Flooded
- *S Temporary-Tidal
- *R Seasonal-Tidal
- *T Semipermanent-Tidal
- *V Permanent-Tidal
- U *Unknown*

WATER CHEMISTRY

Coastal Halinity

- 1 Hyperhaline
- 2 Euhaline
- 3 Mixohaline *(Brackish)*
- 4 Polyhaline
- 5 Mesohaline
- 6 Oligohaline
- 0 Fresh

Inland Salinity

- 7 Hypersaline
- 8 Eusaline
- 9 Mixosaline
- 0 Fresh

pH Modifiers for All Fresh Water

- a Acid
- I Circumneutral
- i Alkaline

SOIL

- g Organic
- n Mineral

SPECIAL MODIFIERS

- b *Beaver*
- d *Partially Drained/Ditched*
- f Farmed
- h *Diked/Impounded*
- r Artificial Substrate
- s *Spoil*
- x Excavated

Source: Atlas of National Wetlands Inventory Maps in the Chicago Metro Area, U.S. Fish and Wildlife Service and IL Department of Conservation 1992.

FIGURE 2 Cowardin Wetland Classification System

comprehensive wildlife inventories of wetlands in the corridor were not conducted, observations of most fauna made during site visits were recorded.

Fishes and Benthic Invertebrates

Fish and benthic invertebrate data for the lower reaches of the Chicago Waterway System were based mainly on published reports. Actual field sampling for this study was restricted to the upper reaches of the North Branch where little sampling had previously been conducted.

Fishes and benthic invertebrates were collected at 17 stations in the upper five reaches between July and September 1993 (Table 1). These stations were chosen because they represented a diversity of habitat types. Habitat variables considered in site selection included water depth, channel width, substrate, type of shoreline vegetation, and the presence of structures, such as outfalls and bridges.

Fishes and larger crustaceans were collected using a 10-foot, 1/4″ bar mesh minnow seine. Riffle, pool, and run habitats were sampled with a single seine haul at each station. Approximately 30 minutes of sampling was made at each station. Specimens collected and identified in the field were later released. Some were preserved for later identification in the laboratory. Fishes were identified in the laboratory using Smith (1979). Common and scientific names of fishes referenced in this report follow Robins et al. (1991) and are listed in Table 2.

Macroinvertebrates were collected using dip nets and by hand picking from submerged rocks, logs, and other debris. Dip nets were used to sweep vegetation and undercut banks and other in-stream structures. Specimens that could not be identified in the field were preserved for laboratory identification.

The quality of the fish and benthic invertebrate communities were assessed using the Index of Biotic Integrity (IBI) (Karr et al., 1986) and the Macroinvertebrate Biotic Index (MBI) (Hite and Bertrand, 1989). The IBI assesses the overall health and integrity of a stream using the fish community as an indicator. The strength of the IBI is its ability to integrate information from individual, population, community, zoogeographic, and ecosystem levels into a single ecologically based index representing the quality of a water resource (Karr, 1981; Karr et al., 1986; Hite and Bertrand, 1989).

IBI uses 12 fish community metrics to characterize a range of attributes of fish assemblages. The 12 community metrics fall into 3 broad categories: species composition, trophic composition, and fish abundance and condition. Data were obtained for each of these metrics at a given site and evaluated based on an unimpacted or relatively unimpacted site located in a similar geographic region and in a stream of comparable size. A number rating was assigned to each metric, based on whether its evaluation deviated strongly, slightly, or approximated expectations. The sum of the 12 metric ratings yielded an overall IBI score. IBI scores ranged from 1 to 60, indicating the quality of a site. The lower the score, the lower the quality of the site.

Illinois streams have been evaluated through the Biological Stream Characterization (BSC) study conducted by the Illinois Department of Natural Resources (IDNR) and the Illinois Environmental Protection Agency (IEPA) (Hite and Bertrand, 1989). The BSC developed a five-tiered stream classification system based primarily on IBI scores. The five categories are:

- CLASS A. Excellent stream quality for fish. IBI from 51 to 60, a unique aquatic resource, comparable to the best situations without human disturbance.
- CLASS B. Good stream quality for fish. IBI from 41 to 50, a highly valued aquatic resource, a good sport fishery.
- CLASS C. Fair stream quality for fish. IBI from 31 to 40, a moderate aquatic resource, bullhead, sunfish, and carp.
- CLASS D. Poor stream quality for fish. IBI from 21 to 30, a limited aquatic resource, carp or other less desirable species.
- CLASS E. Very poor stream quality for fish. IBI less than or equal to 20, a restricted-use aquatic resource, no sport fishery, few fish of any species present (Hite and Bertrand, 1989; Karr, 1981).

This stream ranking system was used by MWRDGC to evaluate the biological integrity of the Chicago Waterway System, based on sampling conducted by MWRDGC. Scores based on recent fish collection data were presented for each reach, where available.

Although fishes are still being used extensively as indicators of habitat quality, macroinvertebrates are also being used in some studies as primary indicators (Resh and Unzicker, 1975). Macroinvertebrates are most reliably used as indicators of stream impairment resulting from organic wastes discharged from municipal wastewater treatment facilities. Some of the advantages of using macroinvertebrates as indicators are:

1. limited mobility,
2. relatively long life cycles,
3. important members of aquatic food chains,
4. sensitivity to a wide range of contaminants,
5. known environmental requirements for key indicator groups,
6. ubiquitous distribution (occur where fish may not be present), and
7. ease of collection.

The Macroinvertebrate Biotic Index (MBI) is a modification of a biotic index developed by Hilsenhoff (1977; 1982) for the Illinois Biological Stream Characterization Study (Hite and Bertrand, 1989). The MBI was used to evaluate those streams lacking fish population data or streams which ranked in the D or E categories based on IBI scores. The index provides a standard way of measuring water quality based on the degree of pollution tolerance for different species of macroinvertebrates. Each taxon is assigned a pollution tolerance value.

These are weighted by taxon abundance and then totaled to obtain the index according to the following formula:

MBI = sum of (ni x ti)/N

where: ni =number of individuals in each taxon
ti =tolerance value of each taxon
N =total number of individuals in sample

The MBI index ranges from 0 to 11, with low values representing good water quality and high values indicating degraded water quality. MBI values between 7.5 and 10 correlate with the Class D stream category (Limited Aquatic Resource).

Waterway Characterization

During the summer of 1993, the USFWS and the COE characterized and assessed the physical habitat of the stream channel and the stream banks at 38 stations (Figures 4-9) throughout the 10 reaches (Table 3). The characterization stations were selected based on factors similar to those used to determine stations for fish and macroinvertebrate sampling.

Stream and streambank parameters selected for characterization were based on those features expected to contribute the most to fish and wildlife habitat quality. These included any previous channel modifications, such as dredging, channelization, mining, levees, etc. Information concerning the streambanks, including bank heights, bank composition, presence and types of bank, structural stabilization, and adjacent land uses, was recorded. Bank slopes were measured with a handheld clinometer. Riparian vegetation was characterized, including the type and percentage of instream cover and the percentage of canopy shading.

Channel substrate composition was determined by hand-sampling from shallow water or by using a petite Ponar dredge in deeper water. If the river could be waded, water depth was measured in the middle of the channel using a 6-foot pole marked in 1-inch increments. A boat-mounted electronic depth finder was used to measure water depths in the southern reaches of the Chicago River.

Natural Areas and Other Natural Land Features

As used in this study, these features include not only natural areas identified through the on-going Illinois Natural Areas Inventory (INAI), but also dedicated open space that functions primarily as natural land. The purpose of this portion of the study was to inventory and document: 1) the presence of threatened and endangered species, 2) locations and sizes of recognized natural area remnants, 3) designated nature preserves, and 4) county forest preserve district holdings.

The Illinois Department of Natural Resources, Division of Natural Heritage, was contacted for a list of locations of State and federally listed threatened and endangered (T&E) species within the study corridor. Additional information on federally listed species was obtained from the USFWS and The Nature Conservancy.

Natural areas, dedicated open space, and other natural features were identified by reviewing the INAI maps, the Directory of Illinois Nature Preserves (McFall, 1991), maps from forest preserve districts within the study corridor, and NWI maps. The Illinois Natural Areas Inventory is maintained by the IDNR on their Natural Heritage Database, which is updated as new sites are discovered. IDNR staff furnished maps of all INAI sites in Lake, Cook, Will, and DuPage Counties.

Designated Illinois Nature Preserves were identified by using the Directory of Illinois Nature Preserves (McFall, 1991). However, several sites were granted preserve status since publication of this directory. The Illinois Nature Preserves Commission provided maps of these sites.

Other natural area and open space locations were identified by contacting groups such as Lake Forest Open Lands Association and the county forest preserve districts. U.S. Geological Survey (USGS) quadrangle maps and aerial photographs were also referenced. Summary descriptions of natural areas, State nature preserves, and county forest preserves are listed in Tables 4-6.

Literature Review

Substantial information is available on the natural resources within the Chicago Waterway System study corridor. Selective literature is summarized to provide an overview of the system and to illustrate trends in the quality of the resource. Much of this literature consists of aquatic inventories conducted over the last 20 years by MWRDGC, IEPA, and others.

Pollution control requirements established by the 1972 Clean Water Act created the need for baseline biological data on streams and rivers. To develop baseline water quality and fisheries data as a foundation for a water quality management plan for northeastern Illinois, the Northeastern Illinois Planning Commission (NIPC) contracted with the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) to conduct fish sampling in all northeastern Illinois watersheds, including the Chicago River watershed. This work was conducted in 1976 and is described in Brigham et al, 1978.

The Illinois State Water Survey, also under contract to NIPC, sampled benthic macroinvertebrates in the North Branch Chicago River and the Skokie Lagoons as part of a sediment oxygen demand study in support of the development of a comprehensive water quality model. This work is described in Butts and Evans (1978).

MWRDGC is responsible for water quality in the streams and canals within its jurisdictions. MWRDGC has an ongoing annual program of fish, aquatic invertebrates, and water quality sampling. Two of their earliest reports reviewed for this document are the 1980 and 1981 annual summaries of biological monitoring (Schmeelk et al., 1984; 1985).

More recent fishery data, summarized in Dennison, et al. (1992), describe the results of a comprehensive water quality evaluation conducted by MWRDGC. Fish populations were sampled in 1991 using electroshocking at 20 stations distributed throughout the navigable portions of the Chicago

Waterway System. These stations ranged from the mouth of the North Shore Channel to the confluence of the CSSC and the Cal-Sag Channel, then extended eastward to the Calumet River. This report contains information on the numbers and weights of fish collected and the quality of the streams.

As part of this same study, MWRDGC conducted surveys of benthic macroinvertebrates during 1989-1991 at sampling stations throughout this same stretch. Sampling was conducted with a Ponar Grab. The results of these surveys are described in MWRDGC (1990) and Polls, et al. (1991; 1992).

Commonwealth Edison has three power generating stations along the lower reaches of the study corridor. To determine a relationship between thermal discharges from power stations and aquatic plant and animal communities, the utility company initiated ecological studies of the lower waterway system. Data from several of the reports generated from these studies have been reviewed and are cited. These include the results of fisheries investigations (EA Engineering, Science & Technology, 1992, 1994, 1995; Lawler, Matusky & Skelly Engineers, 1993); aquatic macrophytes (Environmental Science and Engineering, 1994a); and benthic invertebrates (Environmental Science and Engineering, 1994b, 1995).

STUDY RESULTS

Reach 1: West Fork of the North Branch of the Chicago River

Wetlands Characterization

NWI identified 127 wetlands, totaling 291.5 acres, within the study corridor in Reach 1. Although a variety of wetland types occurred in the study area, numerically the most abundant wetland types were POWGx (52 wetlands), PEMC/PEMCd (32 wetlands), and PFO1C (18 wetlands). These wetlands ranged from 0.1 to 26.27 acres and averaged 2.3 acres. The largest wetland type in Reach 1 was L1OWGx (2 wetlands), which covered 43.2 acres.

Currently, 178 wetlands, totaling 355.5 acres, exist within Reach 1, representing nearly 22 percent more wetlands than were mapped by NWI in 1981 (Table 15). Five wetlands originally mapped by NWI are larger by approximately 1.1 acres, and one wetland is approximately 2 acres smaller due to filling. Only one NWI wetland (PFO1C, 0.7 acres) no longer exists. This loss represents less than a 1-percent decrease in the number of originally mapped wetlands. A total of 52 unmapped wetlands, totaling 64.7 acres and averaging 1.2 acres per wetland, were identified. Numerically, the most abundant, previously unmapped wetlands are POWGx (26 wetlands) and PEMC (12 wetlands).

In total area, the most extensive wetland types are POWGx/POWG (143.6 acres; 40 percent of the total wetland acreage), PEMC (62.2 acres; 18 percent), L1OWGx (43.2 acres; 15 percent), and PFO1C (50.2 acres; 17 percent).

Four wetlands were field-checked. One is no longer present, and the others are classified as PEMC, PFO1C, and PFO/SS1A wetland types. Herbaceous plant species typical of these wetland types include blue flag iris, reed canary grass, common reed, blue vervain, dark green bulrush, and wool grass. Commonly occurring trees and shrubs include red ash, white oak, swamp white oak, bur oak, common buckthorn, and American elm.

Fishes and Benthic Invertebrates

During August and September 1993, a total of 183 fish, representing 14 species at 4 stations in Reach 1, were collected (Figure 4). The collection of an Iowa Darter, a State-threatened species at Station 1, was the most significant species found.

For all sampling stations in Reach 1, green sunfish, fathead minnows, and bluegills were the most abundant species collected, representing 33 percent, 22 percent, and 10 percent of the combined collections, respectively. The largest collection (170 individuals; 93 percent of the total) was made at Station 2. No fish were collected at Station 4; 8 were collected at Station 1, and 5 fish were collected at Station 3 (Table 8).

In 1976, the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) conducted fish sampling in Reach 1 at Dundee Road (Station 51, Figure 4) (Brigham et al., 1978). A total of 69 fish, comprised of 5 species and one hybrid shiner, were collected (Table 9). Green sunfish, fathead minnows, and pumpkinseed represented 96 percent of the total collected. Green sunfish was the most abundant species, representing 43 percent of the total number of fish collected (Brigham et al., 1978).

In 1980 and 1981, MWRDGC collected fish at two sites in Reach 1 (Figure 4) (Schmeelk, 1984, 1985). All fish were collected with electrofishing gear. Combined collections made at Deerfield Road (Station 280) consisted of fathead minnows and green sunfish. These two species, plus goldfish, carp, bluegills, large mouth bass, golden shiners, and carp x goldfish hybrids, were collected at Dundee Road (Station 51) over the two-year sampling period. Green sunfish, the most abundant species collected at both stations, represented 50 percent of the combined sample in 1980 and 61 percent of the combined sample in 1981 (Tables 10 and 11). Hite and Bertrand (1989) classified this reach as a Class D stream (limited aquatic resource), based on IBI or MBI scores.

During August and September 1993, 14 major groups of macroinvertebrates, comprised of 111 individual organisms, were collected from the four stations in Reach 1. The most abundant groups were Mollusca (23 percent), Hemiptera (21 percent), Coleoptera (14 percent), Isopoda (12 percent), Zygoptera (12 percent), Neuroptera (5 percent), and Trichoptera (4 percent). Based on the number of organisms and taxa collected, an MBI value was calculated for each station in Reach 1. Index values ranged from 5.6 to 6.1, which indicated a community of moderately pollution-tolerant species (Table 12).

A freshwater sponge (Porifera) collected at Station 4 could not be identified. Some sponge species are tolerant of highly

Waterway System. These stations ranged from the mouth of the North Shore Channel to the confluence of the CSSC and the Cal-Sag Channel, then extended eastward to the Calumet River. This report contains information on the numbers and weights of fish collected and the quality of the streams.

As part of this same study, MWRDGC conducted surveys of benthic macroinvertebrates during 1989-1991 at sampling stations throughout this same stretch. Sampling was conducted with a Ponar Grab. The results of these surveys are described in MWRDGC (1990) and Polls, et al. (1991; 1992).

Commonwealth Edison has three power generating stations along the lower reaches of the study corridor. To determine a relationship between thermal discharges from power stations and aquatic plant and animal communities, the utility company initiated ecological studies of the lower waterway system. Data from several of the reports generated from these studies have been reviewed and are cited. These include the results of fisheries investigations (EA Engineering, Science & Technology, 1992, 1994, 1995; Lawler, Matusky & Skelly Engineers, 1993); aquatic macrophytes (Environmental Science and Engineering, 1994a); and benthic invertebrates (Environmental Science and Engineering, 1994b, 1995).

STUDY RESULTS

Reach 1: West Fork of the North Branch of the Chicago River

Wetlands Characterization

NWI identified 127 wetlands, totaling 291.5 acres, within the study corridor in Reach 1. Although a variety of wetland types occurred in the study area, numerically the most abundant wetland types were POWGx (52 wetlands), PEMC/PEMCd (32 wetlands), and PFO1C (18 wetlands). These wetlands ranged from 0.1 to 26.27 acres and averaged 2.3 acres. The largest wetland type in Reach 1 was L1OWGx (2 wetlands), which covered 43.2 acres.

Currently, 178 wetlands, totaling 355.5 acres, exist within Reach 1, representing nearly 22 percent more wetlands than were mapped by NWI in 1981 (Table 15). Five wetlands originally mapped by NWI are larger by approximately 1.1 acres, and one wetland is approximately 2 acres smaller due to filling. Only one NWI wetland (PFO1C, 0.7 acres) no longer exists. This loss represents less than a 1-percent decrease in the number of originally mapped wetlands. A total of 52 unmapped wetlands, totaling 64.7 acres and averaging 1.2 acres per wetland, were identified. Numerically, the most abundant, previously unmapped wetlands are POWGx (26 wetlands) and PEMC (12 wetlands).

In total area, the most extensive wetland types are POWGx/POWG (143.6 acres; 40 percent of the total wetland acreage), PEMC (62.2 acres; 18 percent), L1OWGx (43.2 acres; 15 percent), and PFO1C (50.2 acres; 17 percent).

Four wetlands were field-checked. One is no longer present, and the others are classified as PEMC, PFO1C, and PFO/SS1A wetland types. Herbaceous plant species typical of these wetland types include blue flag iris, reed canary grass, common reed, blue vervain, dark green bulrush, and wool grass. Commonly occurring trees and shrubs include red ash, white oak, swamp white oak, bur oak, common buckthorn, and American elm.

Fishes and Benthic Invertebrates

During August and September 1993, a total of 183 fish, representing 14 species at 4 stations in Reach 1, were collected (Figure 4). The collection of an Iowa Darter, a State-threatened species at Station 1, was the most significant species found.

For all sampling stations in Reach 1, green sunfish, fathead minnows, and bluegills were the most abundant species collected, representing 33 percent, 22 percent, and 10 percent of the combined collections, respectively. The largest collection (170 individuals; 93 percent of the total) was made at Station 2. No fish were collected at Station 4; 8 were collected at Station 1, and 5 fish were collected at Station 3 (Table 8).

In 1976, the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) conducted fish sampling in Reach 1 at Dundee Road (Station 51, Figure 4) (Brigham et al., 1978). A total of 69 fish, comprised of 5 species and one hybrid shiner, were collected (Table 9). Green sunfish, fathead minnows, and pumpkinseed represented 96 percent of the total collected. Green sunfish was the most abundant species, representing 43 percent of the total number of fish collected (Brigham et al., 1978).

In 1980 and 1981, MWRDGC collected fish at two sites in Reach 1 (Figure 4) (Schmeelk, 1984, 1985). All fish were collected with electrofishing gear. Combined collections made at Deerfield Road (Station 280) consisted of fathead minnows and green sunfish. These two species, plus goldfish, carp, bluegills, large mouth bass, golden shiners, and carp x goldfish hybrids, were collected at Dundee Road (Station 51) over the two-year sampling period. Green sunfish, the most abundant species collected at both stations, represented 50 percent of the combined sample in 1980 and 61 percent of the combined sample in 1981 (Tables 10 and 11). Hite and Bertrand (1989) classified this reach as a Class D stream (limited aquatic resource), based on IBI or MBI scores.

During August and September 1993, 14 major groups of macroinvertebrates, comprised of 111 individual organisms, were collected from the four stations in Reach 1. The most abundant groups were Mollusca (23 percent), Hemiptera (21 percent), Coleoptera (14 percent), Isopoda (12 percent), Zygoptera (12 percent), Neuroptera (5 percent), and Trichoptera (4 percent). Based on the number of organisms and taxa collected, an MBI value was calculated for each station in Reach 1. Index values ranged from 5.6 to 6.1, which indicated a community of moderately pollution-tolerant species (Table 12).

A freshwater sponge (Porifera) collected at Station 4 could not be identified. Some sponge species are tolerant of highly

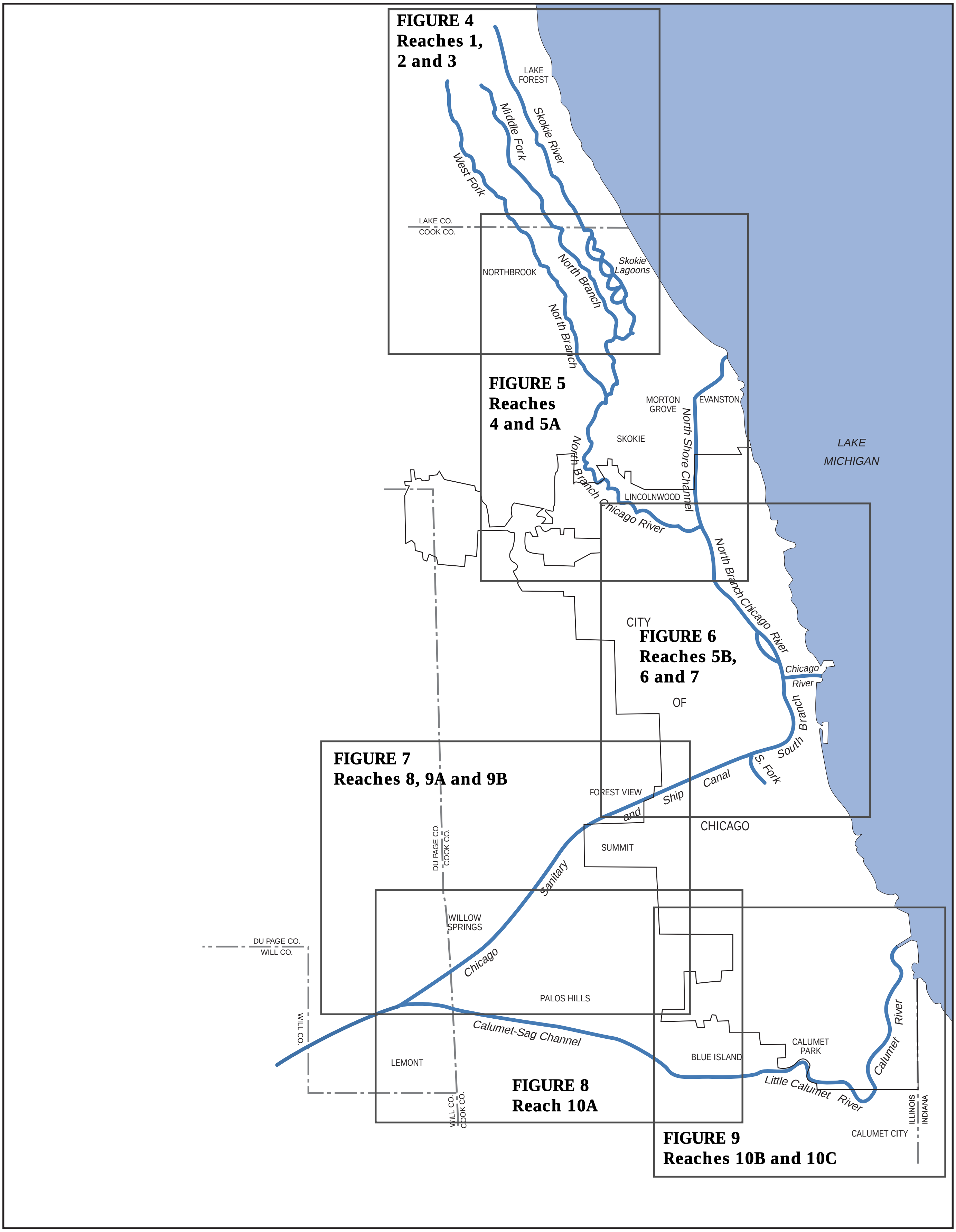


FIGURE 3
Map of Study Reaches with Location of Survey Sampling Site and Wetland Area Maps

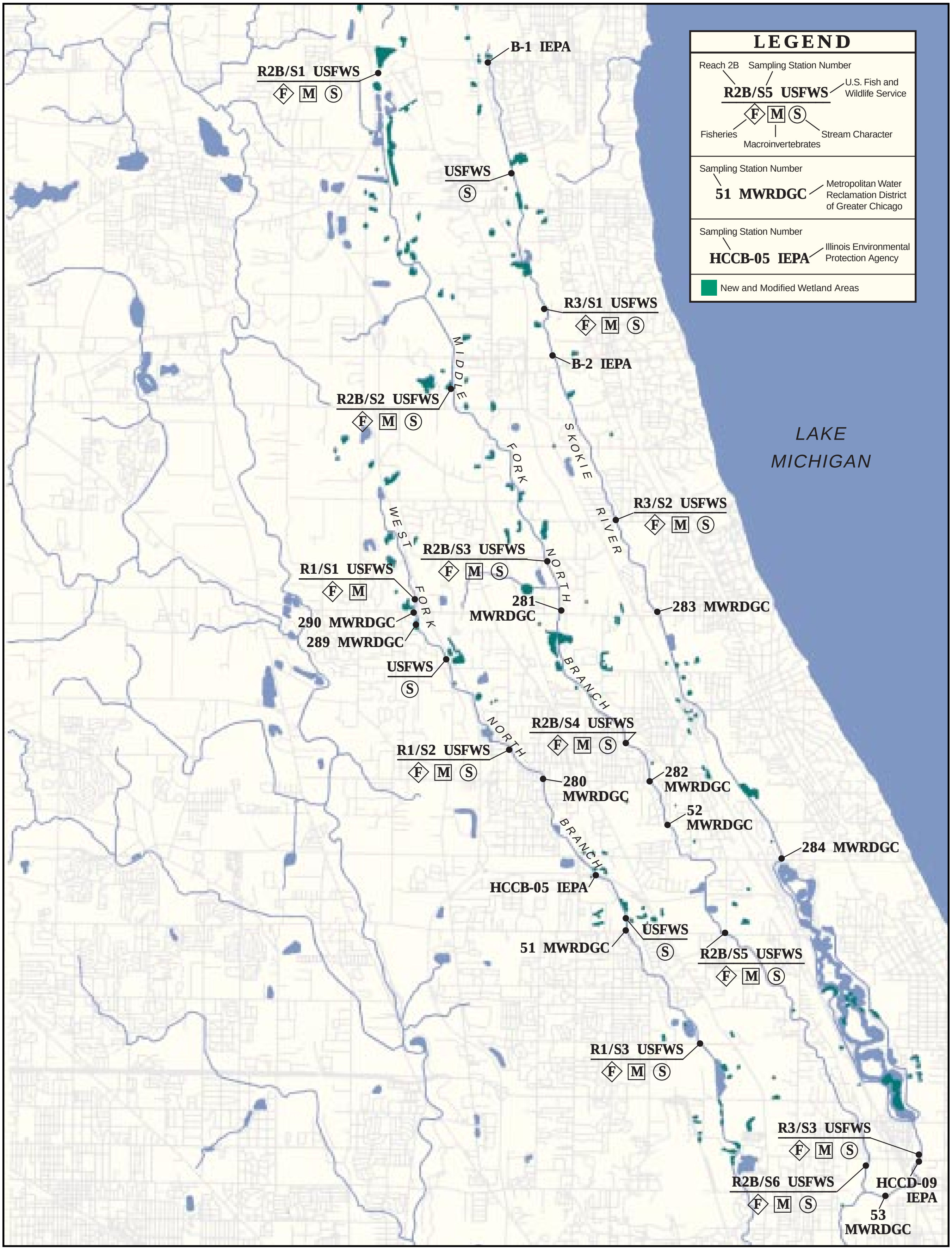


FIGURE 4
Survey Sampling Sites and Wetland Areas, Reaches 1, 2 and 3

eutrophic conditions, living in water with high coliform and siltation levels and low oxygen levels, but there are many species that cannot tolerate heavily polluted waters.

In 1983, IEPA staff sampled macroinvertebrates in the West Fork of the Chicago River at a site located near Dundee Road (Station 05) as part of a study of the DesPlaines River Basin (Figure 4). Eight taxa were recorded. Aquatic sowbugs (Isopoda) of the genus Caecidotea, snails of the genus Physa, and fingernail clams of the family Sphaeriidae were the dominant organisms. These represented 63 percent of the total macroinvertebrates collected (IEPA, 1988) (Table 13). The calculated MBI value for this collection was 6.6, which indicated a community of moderately tolerant species.

Waterway Characterization

Reach 1 (West Fork of the North Branch of the Chicago River) has been channelized and highly modified over the years. The headwaters of Reach 1 is a very narrow, shallow ditch with brush-lined banks. The banks are composed chiefly of clay with some rock mixed with silt. The bank heights vary from 4 feet to 10 feet and average 8 feet. The slope of the banks averages 35 degrees with no artificial stabilization evident. Water depths average 18 inches in August 1993. The substrate is composed primarily of silt at all six stations. Both silt and gravel substrates were recorded farther downstream at Station 4 (Figure 5).

The in-stream cover for fish and aquatic invertebrates in Reach 1 is quite diverse and includes submerged tree roots, logs, and aquatic vegetation. Concrete pieces were observed at one station (Table 3). Throughout much of the reach, the tree canopy cover over the channel varies from 20 percent (sparse) to 70 percent (dense) and averages 40 percent (moderate) (Figures 4 and 5). Conditions at Station 4 represent the lowest extreme of canopy cover. A golf course is situated on both sides of the stream and turf extends to the streambank. Elsewhere silver maple, box elder, American elm, and white mulberry are the dominant trees and shrubs that form the canopy along the channel banks. Typical herbaceous plants include reed canary grass, giant ragweed, purple loosestrife, and tall goldenrod (Table 14).

Natural Areas and Other Natural Land Features

There is relatively little natural area or dedicated open space along the Lake County portion of the West Fork North Branch Chicago River. The sole LCFPD holding is a 79-acre parcel known as the Bannockburn site, located at I-94 and Duffy Lane. This is the site of Reservoir 27, a regional flood control project constructed by the Army Corps of Engineers in 1990. There is no developed access to the site.

Somme Woods, a 375-acre site, lies within the Cook County portion of Reach 1. This site extends eastward to the Middle Fork North Branch Chicago River (Reach 2B). Additional FPDCC holdings, contiguous with Somme Woods, extend southward along the Middle Fork, and are discussed in the Reach 2B section of this document.

The 70-acre Somme Prairie Nature Preserve is located within Somme Woods. Major plant communities found in this area are marsh, wet prairie, mesic prairie, and oak savanna. The prairie communities of pre-settlement quality support conservative native prairie plant species, such as leadplant, cream false indigo, prairie brome, prairie gentian, hoary puccoon, and prairie phlox.

Approximately 454 acres of dedicated natural open space, representing approximately 5 percent of the total land area within the corridor segment, exists within Reach 1 (Table 6).

Recent records exist for four State-listed threatened or endangered plant species in the vicinity of the Chicago River in Reach 1 (Table 7). Most species are found on protected forest preserve land. There are no recent records identifying federally listed species in this reach.

Reach 2A: Middle Fork of the North Branch of the Chicago River (Skokie River to West Fork)

Wetlands Characterization

In 1981, NWI identified and mapped 17 wetlands, totaling 66.2 acres, within Reach 2A. Although a variety of wetland types occurred in the study area, numerically the most abundant wetland types shown on the NWI were PFO1A (11 wetlands) and POWGx (5 wetlands). These wetlands ranged between 0.2 and 26.3 acres and averaged 3.9 acres. The most extensive wetland type in Reach 2A was PFO1A, which covered 63.6 acres. One wetland (PEMA) in Reach 2A was a linear wetland, totaling 0.15 linear miles.

Seven previously unmapped wetlands, totaling 10.5 acres and averaging 1.5 acres per wetland, were identified. Numerically, the most abundant, previously unmapped wetland types are PFO1A, PFO1C, and PFO1C/PEMC (6 wetlands). With the addition of the 17 wetlands that NWI mapped, there are currently 24 wetlands, totaling 76.7 acres, that occur within the study corridor in Reach 2A. This represents a total wetland acreage that is 16 percent larger than mapped by NWI (Table 15). In total, the most extensive wetland types are PFO1A (66.4 acres; 87 percent acreage) and POWGx (3.2 acres; 4 percent acreage).

Three wetlands, representing PEMC, PFO1C/PEMC, and PFO1A wetland types, were field-checked. Some of the characteristic species of herbaceous plants recorded at these sites include sweetflag, fowl mannagrass, narrow-leaved cattail, broadleaf arrowhead, hop sedge, and water parsnip. Common trees and shrubs in the area are shagbark hickory, red ash, and American elm.

Fishes and Benthic Invertebrates

In 1980, MWRDGC collected fish on two separate dates at a sampling station at Glenview Road (Station 285, Figure 5) (Schmeelk et al., 1984). All fish were collected using electrofishing gear. Green sunfish, carp, and fathead minnows were the only species collected at this station. Green sunfish was the most abundant species, representing 73 percent of the total collection (Table 10).

Sampling on two separate dates in 1981 by MWRDGC at the Glenview Road station yielded largemouth bass, black crappies, and pumpkinseeds, as well as the species collected in 1980. Green sunfish was again the most abundant species recorded at this station, representing 96 percent of the sample (Table 11) (Schmeelk et al., 1985). Hite and Bertrand (1989) classified this reach as a Class D stream (limited aquatic resource), based on IBI and MBI values.

During August 1993, only 6 fish were collected, representing six species collected at two stations in Reach 2A (Figure 5; Table 8). All were common species adaptable to a wide range of environmental conditions.

Six major groups of macroinvertebrates, comprised of 62 individual organisms, were collected in Reach 2A (Table 12). The five most abundant groups were Trichoptera (42 percent), Crustacea (34 percent), Megaloptera (10 percent), Hemiptera (8 percent), and Zygoptera (5 percent). The caddisfly *(Hydropsyche sp.)* was the most abundant organism. This genus is commonly associated with freshwater habitats that have an adequate oxygen supply and running water. The calculated MBI values for Stations 1 and 2 are 4.9 and 5.1, respectively, which are indicative of moderately tolerant species.

In 1984, IEPA staff sampled macroinvertebrates in the Middle Fork of the Chicago River at a site near Golf Road (Station 04, Figure 5) (IEPA, 1988). Eight taxa were recorded. Isopoda, Trichoptera, Ephemeroptera, and Mollusca were the most abundant taxa collected (Table 13). The calculated MBI value for the collection was 6.6, which is within the moderately tolerant range. Represented in the collection were genera of mayflies (Ephemeroptera), which are somewhat less pollution-tolerant than other species.

Waterway Characterization

The stream channel at the Glenview Road station in Reach 2A was characterized. At the time of the assessment (March 1994), the stream was at high flow with water depths ranging from 3.5 feet to 4 feet. The bank slope was 2 degrees on the left and 45 degrees on the right. The bank was composed mainly of clay and sand, and was not artificially stabilized. The substrate was composed of silt and sand.

In Reach 2A, the in-stream cover is comprised of undercut banks, submerged tree roots and aquatic vegetation (Table 3). Total canopy cover over the channel is 60 percent (dense) (Figure 5). Some of the dominant trees and shrubs comprising the canopy cover are cottonwood, swamp white oak, American elm, and green ash. Some of the herbaceous plants are bur sedge, hop sedge, yellow swamp buttercup, blue flag iris, Virginia wild rye, and moneywort (Table 14).

Natural Areas and Other Natural Land Features

FPDCC lands form a continuous corridor along the entire 3-mile length of Reach 2A. Forest Preserve District holdings total 650 acres and include Blue Star Memorial Woods, Glenview Woods, Camp Glenview, and Harms Woods. This represents approximately 34 percent of the total area within the Reach 2A corridor (Table 6). There are no INAI sites, dedicated Illinois Nature Preserves, or records of threatened or endangered species in Reach 2A.

Reach 2B: Middle Fork of the North Branch of the Chicago River (headwaters to Skokie River)

Wetlands Characterization

NWI identified and mapped 170 wetlands, totaling 555.2 acres, within the study corridor in Reach 2B. Although a variety of wetland types occurred in the study area, the most abundant wetland types were POWHx (59 wetlands), PEMC (32 wetlands), PFO1C (13 wetlands) and PEMF (12 wetlands). The wetlands ranged in size from 0.1 to 47.2 acres and averaged 3.5 acres. The most extensive wetland type in Reach 2B was POWHx, which covered 142.5 acres. Nine of the wetlands in Reach 2B were linear, totaling 0.35 linear miles.

Of the 170 wetlands originally mapped by NWI, nine totaling 9.6 acres no longer exist, leaving 161 wetlands (545.6 acres). This represents less than a 1-percent decrease in the number of originally mapped NWI wetlands. Sixty-six previously unmapped wetlands, totaling 122.5 acres and averaging 1.9 acres per wetland, were identified.

The most abundant previously unmapped wetlands identified were POWGx (34 wetlands) and PFO1C (11 wetlands). With the addition of the 66 wetlands, there are currently 227 wetlands, totaling 668.1 acres that occur within Reach 2B. This represents a 20-percent increase in total wetland acreage compared to the original NWI mapping (Table 15).

As previously stated, POWHx, PEMC, PFO1C, and PEMF are the most abundant wetland types in Reach 2B. In total area, the most extensive wetland types are POWGx/POWHx (188.4 acres; 28 percent of the total acreage), PFO1C (152.6 acres; 23 percent), PEMC (110.0 acres; 16 percent), and PFO1A (87.4 acres; 13 percent) (Table 15).

Thirty-seven wetlands, representing PAB4F, PEMA, PEMC, PFO1C, and PFO1A wetland types, were field-checked. Some of the characteristic species of herbaceous plants recorded at these sites were small water plantain, blue joint grass, water hemlock, blue flag iris, reed canary grass, blue vervain, dark green rush, and wool grass. Commonly occurring trees and shrubs were box elder, silver maple, white ash, white oak, swamp white oak, bur oak, common buckthorn, and American elm.

In 1991 and 1993, faunal surveys were conducted at the Middle Fork Savanna for the LCFPD (Mierzwa and Beltz, 1994). Thirteen species of amphibians and reptiles were either collected or observed (Table 17). The most abundant species was the blue-spotted salamander *(Ambystoma laterale),* which comprised 28 percent of the total collection. Larvae of five of the most common species were collected from wetlands in the project area.

Fishes and Benthic Invertebrates

In 1976, MWRDGC collected fishes from a single sampling site (Station 52, Figure 4) in Reach 2B (Brigham et al., 1978).

The total collection included green sunfish, fathead minnows, and bluegills. Green sunfish represented 67 percent of the total collection (Table 9).

In 1980, MWRDGC electrofished Reach 2B for two days at Half Day Road and Route 22, and at Lake Cook Road (Stations 281 and 282, Figure 4) (Schmeelk, 1984). Eight fish species and one hybrid were collected. The collection at the upstream location consisted of four species. Downstream at the Lake Cook station, seven species and one hybrid were collected. Green sunfish was the most abundant species, representing 63 percent of the total collection (Table 10).

In 1981, MWRDGC again sampled fish at both stations (Schmeelk, 1985). Seven species and one hybrid were collected at the upstream Station 281, and 11 species were collected at the downstream Lake Cook Station 282. As in 1980, green sunfish was the most abundant species collected at both sites, representing 61 percent of the sample (Table 11). Hite and Bertrand (1989) classified this reach as a Class D stream (limited aquatic resource), based on IBI and MBI scores.

In May 1993, fish sampling was included as part of a faunal survey conducted at the Middle Fork Savanna for the LCFPD (Mierzwa and Beltz, 1994). This collection consisted of six species, with fathead minnows representing 91 percent of the sample (Table 16). During this study, 15 major groups of benthic invertebrates, comprised of 365 individual organisms at six stations in Reach 2B were collected. The five most abundant groups were Crustacea (53 percent), Hemiptera (14 percent), Coleoptera (8 percent), Mollusca (6 percent), and Trichoptera (4 percent). The calculated MBI values for Stations 1-6 ranged from 5.3 to 6.4 (Table 12), which reflected a community of moderately pollution-tolerant species.

During August and September 1993, a total of 171 fish, representing 15 species at 6 stations in Reach 2B, were collected (Figure 4). Green sunfish, bluegill, and white sucker represented 33 percent, 19 percent, and 16 percent, respectively. The largest collection (102 individuals; 60 percent of total) was made at Station 6. No fish were collected at Station 1 (Table 8).

Waterway Characterization

Reach 2B has been channelized and highly modified. Bank heights at six stations ranged from 2 to 9 feet and averaged 7 feet. Slopes ranged from 7 degrees to 80 degrees and averaged 40 degrees.

Similar to the other upper reaches, banks are not stabilized and their composition is predominantly clay mixed with silt, rock, or gravel. The channel substrate, similar to Reaches 1 and 2A, consists of gravel, sand, and silt. The water depths in the channel ranged from 4 inches to 3 feet during low flow conditions in August 1993.

Compared to stations on Reaches 1 and 2A, the six stations on Reach 2B have more diverse in-stream cover (Table 3). Average tree canopy cover is 85 percent (very dense). Characteristic streambank trees and shrubs include box elder, silver maple, American elm, swamp white oak, cottonwood, common buckthorn, red-osier dogwood, and pale dogwood. Herbaceous species include the exotic garlic mustard, purple-leaved willow herb, spotted-touch-me-not, purple loosestrife, and narrow-leaved cattail (Table 14).

Natural Areas and Other Natural Land Features

Four LCFPD holdings are located along the Lake County portion of the Middle Fork North Branch Chicago River. These holdings total 995 acres and are Berkeley Prairie, Middle Fork Savanna, Lake Forest Preserve, and the Atkinson Road Reservoir (Table 6).

Berkeley Prairie is an 18-acre mesic and wet-mesic prairie remnant of moderate natural quality located south of Berkeley Avenue near Deerfield. It is currently managed by the LCFPD and volunteers, using prescribed burning and seed collection as the primary management activities.

Middle Fork Savanna extends 2.7 miles from Route 176 on the north to Route 60 on the south. This 478-acre site is the most biologically significant site within Reach 2B, and perhaps within the entire region. It contains a representative community type (rich savanna, Midwest type) that is considered globally endangered. Some consider it one of the two best remaining examples of tall grass savanna in the world. A variety of baseline biotic inventories of the site have been conducted, including inventories of mammals, birds, herptiles, beetles, and vascular and non-vascular vegetation (for citations see Mierzwa and Beltz, 1994).

Lake Forest Preserve, centered north and south of Route 22 along the Middle Fork on 431 acres, consists of recently abandoned agricultural land, old field, degraded and partially drained wetlands, and small tracts of oak woodland. The portion of the preserve south of Route 22 is currently being restored to wetland, prairie, and savanna communities as part of the ChicagoRivers Demonstration Project. The area north of Route 22 has been proposed as a possible site for a regional flood control project.

Atkinson Road Reservoir, also Station 15, is a 69-acre site located north of Atkinson Road. This site has been developed by the Army Corps of Engineers as a regional flood control project. There is no public access to this site.

Perhaps the most significant undeveloped tract not in public ownership in this reach is the parcel known as the Wrigley tract, managed and owned by Abbott Laboratories. This site, located north of Route 137 and west of Route 43, includes native wet and wet-mesic prairie, sedge meadow, marsh, and oak woodland. This site has important natural area and wildlife habitat values.

Three contiguous FPDCC Preserves are situated along the Middle Fork North Branch Chicago River in Cook County. Somme Woods, discussed in Reach 1, spans the area between the West and Middle Forks. Chipilly Woods and Sunset Ridge Woods, totaling approximately 280 acres, are located south of Somme Woods.

Four INAI sites and three dedicated nature preserves are within or adjacent to Reach 2B (Tables 4 and 5). Approximately 1,300 acres of dedicated natural open space exist within the Reach 2B corridor, representing approximately 10 percent of the total area in this segment.

Recent records exist for four State-listed endangered and threatened plant species in the vicinity of the Chicago River in Reach 2B, one of which is also listed as a federally threatened species (Table 7). Most of these species are found on protected forest preserve land.

Reach 3: Skokie River

Wetlands Characterization

NWI identified and mapped 177 wetlands, totaling over 600.2 acres. Although a variety of wetland types were shown in the study area, the most abundant wetland types were POWGx (59 wetlands), PFO1A (28 wetlands), PEMC (22 wetlands), and PEMF (17 wetlands). These wetlands ranged from 0.1 to 41.8 acres, and averaged 3.4 acres. The most extensive wetland type in Reach 3 was PFO1A (28 wetlands), covering 261.3 acres.

Only one of the wetlands originally mapped by NWI (4.8 acres) no longer exists. This loss represents less than a 1-percent decline in the number of originally mapped wetlands. Twenty-six previously unmapped wetlands, totaling 50.3 acres and averaging 1.9 acres per wetland, were identified. Of these, 13 wetlands are constructed ponds (POWx). Fifteen wetlands originally mapped by NWI have been modified. With the addition of the 26 wetlands, there are currently 202 wetlands, totaling 676.4 acres, that occur within Reach 3. This total is 13 percent larger than the area mapped by NWI (Table 15).

The most extensive wetland types in the area are PFO1A (261.3 acres or 39 percent of the total wetland acreage), POWGx (72.4 acres or 11 percent of the total wetland acreage), and PSS1A (68.5 acres or 10 percent of the total wetland acreage). More than 50 percent of the new wetlands are POWGx.

Fourteen wetlands were field-checked. Most of these wetlands are either PEMC or PEMF. Characteristic herbaceous plant species recorded at these sites include big bluestem, crested oval sedge, common tussock sedge, reed canary grass, dark green rush, sawtooth sunflower, spotted touch-me-not, wild bergamot, and yellow coneflower. Commonly occurring trees and shrubs are box elder, cottonwood, sandbar willow, and black willow.

There are no known rookeries in the immediate vicinity of Reach 3. Several great egrets and black-crowned night herons, which are State-listed endangered species, were observed roosting in trees along the banks of the Chicago River. The birds observed were likely juveniles or post-breeding adults.

Fishes and Benthic Invertebrates

In 1976, MWRDGC collected fishes from Station 53 (Figure 4) in Reach 3 (Brigham et al., 1978). The most abundant species collected were green sunfish, bluegill, goldfish, and carp, which represented 69 percent of the total collection. Green sunfish, represented 37 percent of the total number of fish collected (Table 9).

In 1980, MWRDGC made fish collections both upstream and downstream of the Skokie Lagoons (Schmeelk et al., 1984) (Figure 4). All fish were collected with electrofishing gear. Upstream of the Lagoons at Halfday Road (Station 283), six species and one hybrid were collected. Green sunfish was the only species captured at Lake Cook Road (Station 284). Downstream of the lagoons, near W. Frontage Road (Station 53), five species were collected. Green sunfish was the most abundant species, representing 49 percent of the total number of fish collected (Table 10).

Additional fish collections were made by MWRDGC in 1981. All the species collected at Halfday Road (Station 283) in 1980 were again collected in 1981, with the addition of golden shiner and black crappie (Schmeelk et al., 1985). At Lake Cook Road, three species were collected. Downstream of the Lagoons, seven species and one hybrid comprised the sample. Green sunfish was the most abundant species, representing 50 percent of the total number of fish collected (Table 11). Hite and Bertrand (1989) have classified various sections of this reach as a Class C (moderate aquatic resource) or Class D (limited aquatic resource) stream, based on IBI and MBI scores.

During August and September 1993, a total of 88 fish, representing 9 species at 3 stations in Reach 3, were collected (Figure 4). Young of the year black bullheads, carp, and bluegills comprised 63 percent, 15 percent, and 7 percent of the total collections, respectively, and represented approximately 85 percent of the total. The largest collection of fishes (63 individuals, 72 percent of the total) was made at Station 3 (Table 8).

During the MWRDGC study, nine major groups of macroinvertebrates, comprised of 103 individual organisms from three stations in Reach 3, were collected. The five most abundant groups of macroinvertebrates were Crustacea (37 percent), Hirudinea (17 percent), Mollusca (16 percent), Hemiptera (14 percent), and Coleoptera (5 percent). All of the taxa collected were moderately pollution-tolerant, which was reflected in the 6.2 to 6.5 MBI scores (Table 12).

Benthic invertebrate sampling was conducted at stations in the Skokie Lagoons in 1976 by the Illinois State Water Survey (Butts and Evans 1978). Aquatic worms (Oligachaeta) and midges (Chironomidae) were the dominant organisms (Table 18). Both taxa are tolerant of pollution, and their dominance indicated fair to poor water quality and degraded sediment conditions within the lagoons (Butts and Evans, 1978).

In 1978, Matsunaga and Murphy (1979) conducted macroinvertebrate sampling throughout most of the Skokie River system. Macroinvertebrates were collected from 12 stations along the 23-mile-long study area, with 5 stations upstream and 1 station downstream of the Skokie Lagoons. For the five upstream stations, an average of eight macroinvertebrate species per station was recorded. Aquatic worms (Oligachaeta), midges (Chironomidae), damselflies (Coenagrionidae), water boatmen (Corixidae), and fingernail clams (Sphaeriidae) were the dominant organisms upstream of the lagoons. Within the lagoons, aquatic worms (Oligachaeta) and midges (Chironomidae) were dominant. Downstream of the lagoons at Winnetka Road, midges and scuds (Hyalellidae) comprised 58 percent of the organisms collected (Table 19). In general, highly pollution-tolerant species tended to dominate in the soft sediments of the lagoons, whereas upstream and downstream stations also included moderately tolerant species.

In 1981, NIPC conducted a benthic macroinvertebrate survey of the Skokie Lagoons. Sampling stations were established at Clavey Road Bridge, Lagoon 7, Lagoon 4, Lagoon 1, and Willow Road. Midges *(Polypedilum sp.)* and aquatic worms *(Limnodrilus cervix, L. hoffmeisteri, Peloscolex multisetosus longidentus)* were the most common organisms collected at the sampling stations. Fingernail clams (Sphaeriidae) were found only at Clavey Road. Greatest species diversity occurred downstream of the lagoons at the Willow Road station (Kirschner, 1983) (Table 20).

In November 1983, IEPA staff sampled macroinvertebrates in the Skokie River at Willow Road (Station 09, Figure 4) as part of a study of the DesPlaines River Basin (IEPA, 1988). Three taxa were recorded. Moderately pollution-tolerant aquatic sowbugs (Isopoda) and scuds (Amphipoda) were the dominant organisms, as reflected in the 5.9 MBI score (Table 13).

The Illinois Natural History Survey (INHS) maintains voucher specimens of fish, mussels, and crustaceans collected from the Skokie River System. A July 21, 1981, fish collection consisted of black bullhead, warmouth, green sunfish, orangespotted sunfish, and largemouth bass. INHS also holds voucher specimens of two species of crayfish *(Procambarus acutus* and *Orconectes virilis)*. INHS collections also contain mussels (*Anadonta grandis* and *Toxolasma parvus)* collected from the Skokie Marsh in 1908 by Frank Collins Baker.

Waterway Characterization

The appearance and condition of the upper and lower portions of the Skokie River are characteristic of a highly modified, artificial system. Most of the upper segments of Reach 3 are linear, with few natural meanders or oxbows. The northern part of Reach 3 resembles an agricultural drainage ditch and is lined with dense brush. Throughout this reach, the instream cover for fish and other aquatic life consists of undercut banks, submerged tree roots, submerged logs, and aquatic vegetation (Table 3).

The channel substrate material does not vary appreciably in segments north of the Skokie Lagoons. This material consists primarily of silt, with occasional sand and gravel in areas of swifter current. Downstream of the lagoons, the channel substrate consists of thick silt deposits. Most of the silt deposits in the lagoons have been removed as part of a lake rehabilitation project conducted under USEPA's Clean Lakes Program.

Channel banks are generally very steep with some evidence of erosion. Bank slopes range from 5 to 45 degrees. The most severe slopes are located in the southern segments near the Chicago Botanic Gardens and immediately south of the Skokie Lagoons from Willow Road to Happ Road. The channel banks are primarily composed of hard compacted clay. The channel segments passing through Lake Forest, however, have banks composed of a mix of clay and sand. The banks of the channel at the Old Elm Road sampling station are a mix of clay, sand, and gravel (Table 3). Construction rubble is strewn on the banks and is used to a limited degree as a bank stabilizer.

Long stretches of streambank that were nearly denuded within 10 feet of the edge of the stream were observed. A thick canopy of deciduous trees is located within 30 feet of the channel, but seasonal high water levels, compact bank soil, and dense shading contribute to a lack of herbaceous growth beneath the trees. Ground cover, when present, is typically a mix of the exotic garlic mustard, riverbank grape, and poison ivy (Table 3). The Laurel Avenue fish sampling station is one of the areas where major canopy gaps persist, allowing growth of more dense vegetation.

Cottonwood, box elder, ash, and common buckthorn dominate the tree canopy. The streambanks are wooded along approximately 75 percent of the total stream length. Upstream of the lagoons, the tree canopy ranges from 75 to 90 percent, creating very shaded conditions during peak sun hours.

Natural Areas and Other Natural Land Features

Two LCFPD preserves are located within the Reach 3 corridor in Lake County. The 559-acre Greenbelt Preserve is located at the extreme headwaters of Reach 3 near Park City. The 84-acre Lake Bluff Preserve is located near Route 41, west of Lake Forest.

FPDCC lands form a continuous corridor on both sides of the river for its entire length in the Cook County portion of this reach. Most of this land consists of the Skokie Lagoons within the William E. Erickson Preserve. Other preserves include Turnbull Woods east of the Lagoons at Lake Cook Road, and additional holdings along the Skokie River at Hibbard and Winnetka Roads in Winnetka. Total acreage of these lands is approximately 1,600 acres.

As mentioned in the Human Settlement and Watershed Development section of this document, the Skokie Lagoons occupy a portion of the former Skokie Marsh. These lagoons were excavated largely by hand in the 1930's and early 1940's. As a result of erosion from agriculture and urban development, the lagoons had become significantly silted by the 1970's. This condition was exacerbated by wastewater discharges rich in organics and nutrients, causing highly eutrophic conditions. Algal blooms, low oxygen concentrations and high turbidity caused by resuspension of sediments from carp created highly degraded ecological communities.

Two actions undertaken in the 1980's have significantly improved water quality in the lagoon. First, wastewater discharges from the Clavey Road wastewater treatment plant were diverted around the lagoons, eliminating a source of nutrients. Secondly, a grant through the USEPA's Clean Lakes Program enabled removal of much of the accumulated sediment, resulting in a deepening of the lagoons and eliminating in-place organics and flocculent sediments. The fish community was subsequently rehabilitated by removal of rough fish and stocking of sport fish. Shoreline stabilization using biotechnical techniques has been undertaken by the FPDCC and other cooperators. Plans are under development for wetland habitat enhancement within the lagoons. All of these actions have vastly improved habitat conditions within the lagoons.

Two dedicated nature preserves and seven INAI sites are located within or adjacent to the Reach 3 corridor (Tables 4 and 5). In total, approximately 2,360 acres of dedicated natural open space are found in the Reach 3 corridor. Of this acreage, 2,243 acres are dedicated Forest Preserve District lands, which represent 22 percent of the total land area in this reach.

Although not included in the natural open space land calculations, 10 golf courses are situated along the Reach 3 corridor from Waukegan south to Glencoe. The channel bisects or borders all of these courses, many of which occupy floodplains and/or former wetlands.

Records show five State-listed endangered or threatened species in or near the study corridor in Reach 3 (Table 7). One of these species is also listed as federally threatened. Most of these species occur on protected FPDCC land.

Reach 4: North Shore Channel

Wetlands Characterization

The only wetland identified in Reach 4 is R2OWHx, which is the channel proper (Table 15). This wetland reflects the highly modified and developed character of the corridor within this reach.

Several great egrets and black-crowned night herons, a State-listed endangered species, were observed roosting in trees along the channel banks. These birds may represent post-breeding adults or juveniles, although black-crowned night herons have been known to nest occasionally along the North Shore Channel (Alan Anderson, North Shore Bird Club, pers. comm.).

Fishes and Benthic Invertebrates

MWRDGC collected fish from the North Shore Channel in the mid-1970's (Brigham, 1978). Collections were made at Sheridan Road in Wilmette, Dempster Street in Skokie and Devon Avenue in Lincolnwood (Stations 57-59, Figure 5). The greatest species diversity and overall abundance of fish were recorded at the Sheridan Road station, which is the station closet to Lake Michigan. A total of 234 individuals were collected, representing 12 species and 2 hybrids. The most abundant species were bluntnose minnow, alewife, and orangespotted sunfish (Table 21).

Species diversity progressively decreased farther away from the mouth of the river at Lake Michigan. The collection made at the Dempster Street sampling station consisted only of carp, goldfish, and fathead minnows. Carp and spottail shiners were the only two species collected at Devon Avenue (Table 21).

In 1991, MWRDGC collected fishes using electrofishing gear at four sampling stations along the North Shore Channel: Sheridan Road in Wilmette, Dempster Street in Skokie, Touhy Avenue in Lincolnwood, and Peterson Avenue in Chicago (Stations 1-4, Figure 5). A total of 6,027 fish, comprised of 25 species, was collected. The predominant species was bluntnose minnow and the most important species by weight was carp. Harvestable-size fish included black bullhead, black crappie, bluegill, carp, and white sucker (Dennison et al., 1992) (Table 22). Hite and Bertrand (1989) classified this reach as a Class D stream (limited aquatic resource), based on IBI and MBI scores.

In 1989, 1990 and 1991, the MWRDGC conducted surveys of aquatic macroinvertebrates in the Chicago Waterway System (MWRDGC, 1990; Polls et al., 1991; 1992). Six sampling stations were established on the North Shore Channel: two at Linden Street in Wilmette, two at Dempster Street in Skokie, and two at Touhy Avenue in Lincolnwood (Figure 5).

In 1989, 90 species were collected at the six sampling stations, including midges, naidid worms, tubificid worms, leeches, clams, snails, and amphipods. The most abundant species were naidid worms and tubificid worms, which represented 46.6 percent and 43.9 percent, respectively, of the combined samples. The naidid worm *(Nais elinguis)* was the dominant benthic invertebrate (Table 23).

The 1990 collection consisted of 73 species with similar species composition. Numerically, naidid and tubificid worms comprised more than 96 percent of the combined sample. The naidid worms *(Nais elinguis* and *N. simplex)* were the dominant benthic invertebrates (Table 24).

In 1991, 62 species were collected. The most diverse species were naidid worms, chironomid midges, and tubificid worms. Numerically, tubificid worms and naidid worms comprised more than 94 percent of the combined samples. The naidid worms *(Dero digitata)* and the tubificid worms *(Limnodrilus hoffmeisteri* and *L. cervix)* were the dominant macroinvertebrates (Table 25). Oligochaete worms proliferate in silty, organically rich substrates, and their dominance in all collections reflected poor sediment quality.

Waterway Characterization

The stream channel and streambanks were characterized at one station representative of Reach 4 (Table 3). The physical characteristics of Reach 4 are mostly homogenous throughout the entire length. Although the North Shore Channel is entirely artificially constructed, its banks have become naturalized over time. Banks are steep, with 35- to 65-degree slopes. Bank heights range from 15 feet to 20 feet. Both banks are composed primarily of clay with no gullies or rills and minimal erosion.

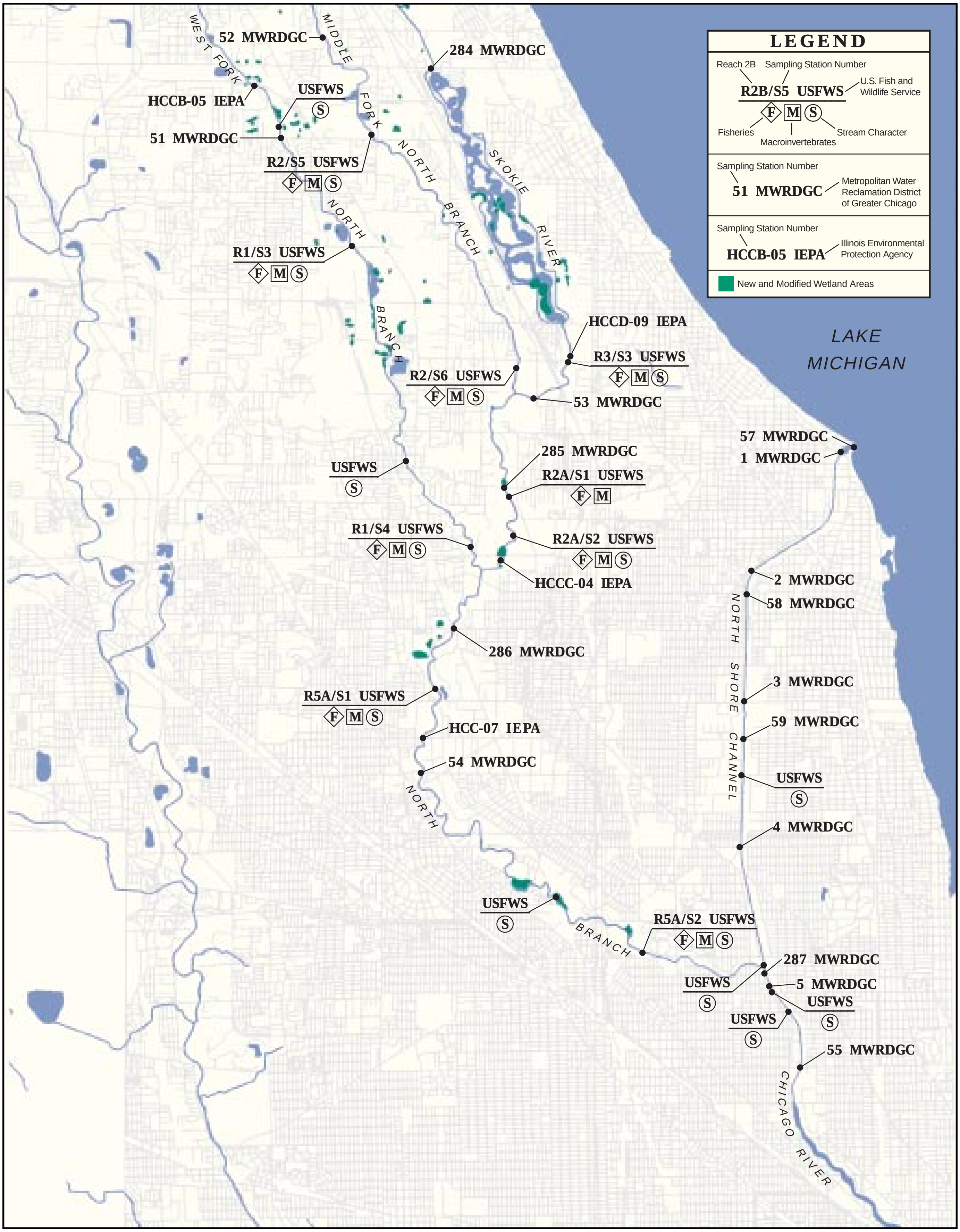


FIGURE 5
Survey Sampling Sites and Wetland Areas, Reaches 4 and 5A

Large piles of household refuse and construction debris are found on the upper portions of the banks. Most of the debris is on the east bank within the Lincolnwood and City of Chicago segments. Vegetation has overgrown several refuse piles and trees are commonly found growing through debris. Thick stands of deciduous trees, such as cottonwood, box elder, and common buckthorn, dominate the banks. Herbaceous groundcover, limited by tree shading, consists of maintained turfgrass or a mix of exotic garlic mustard, poison ivy, riverbank grape, and common buckthorn seedlings.

Undercut banks, submerged tree roots, and submerged terrestrial vegetation occur as in-stream cover. Aquatic macrophytes are frequently observed near bridge columns within the channel, and aquatic macrophyte beds are more extensive in the area above the discharge from the North Side Water Reclamation Plant (Irwin Polls, MWRDGC, pers. comm.). Aquatic flora was not sampled. The channel substrate is composed of clay overlain with silt. The canopy cover at the characterization station on Reach 4 is approximately 25 percent, and is representative of the entire reach. Most of the trees grow vertically out of the steeply inclined banks and have twisted or distorted bases.

Natural Areas and Other Natural Land Features

An open space corridor has been established along most of the 4-mile length of the North Shore Channel on land owned by the MWRDGC. Within the limits of the City of Chicago, open space is primarily parkland along the east bank. This greenway is the only open space associated with the reach, excluding city parks and ballfields. No FPDCC lands or other natural open space areas are located along this portion of the study corridor. There are no INAI sites, dedicated Illinois Nature Preserves, or recent records of State or federally listed endangered or threatened species along Reach 4.

The Ladd Arboretum is a segment of the parkland in Evanston. Recreational trails are common along and within the northern parkland areas. This 20-acre reforested area is a refuge for native songbirds. Between 1974 and 1991, naturalists from the Evanston Environmental Center recorded 132 bird species at the Ladd Arboretum, including a variety of warblers, raptors, sparrows, and thrushes.

Reach 5A: North Branch of the Chicago River (West Fork to North Shore Channel)

Wetlands Characterization

NWI identified and mapped 46 wetlands, totaling nearly 200 acres within the study corridor in Reach 5A. Although a variety of wetlands occur in the study area, numerically the most abundant wetland types are PFO1A (24 wetlands), POWG/POWH (9 wetlands), and PFO1C (6 wetlands). The wetlands range in size from 0.1 to 28 acres and average 4.3 acres. Six of the wetlands in Reach 5A are linear, and total 0.67 linear miles.

All of the wetlands originally mapped by NWI in 1981 are still present. Eight previously unmapped wetlands, totaling 111.8 acres and averaging 14.0 acres per wetland, were identified. Numerically, the most abundant previously unmapped wetlands are PEMB/C (4 wetlands) and PFO1C/A (4 wetlands). With the addition of these 8 wetlands, there are currently 54 wetlands totaling 311.4 acres within Reach 5A. This represents a total wetland area that is 56 percent larger than the area mapped by NWI (Table 15).

As previously stated, PFO1A, PFO1C, and POWG/POWH are the most abundant wetland types in Reach 5A. In total area, the most extensive wetland types are PFO1A (274.8 acres; 88 percent of the total wetland acreage), PFO1C (17.1 acres; 5.5 percent of the total wetland acreage), and POWG/POWH (2.4 acres; 0.7 percent of the total wetland acreage).

Based on a field-check, two areas are PFO1C wetland types, one of which is located in the Edgebrook Flatwoods. Flatwoods are unique forested wetland communities that form in shallow claypan depressions. These depressions collect surface runoff, and the underlying impervious clay or glacial till prevents infiltration which causes shallow seasonal ponding. Swamp white oak is the typical dominant flatwoods tree in this area.

Some of the characteristic species of herbaceous plants recorded at these sites are Virginia wild rye, fowl mannagrass, bottlebrush grass, rice cutgrass, small water plantain, Short's aster, white trout lily, blue flag iris, and water parsnip. Commonly occurring trees and shrubs are red ash, white oak, swamp white oak, common buckthorn, and spicebush.

Fishes and Benthic Macroinvertebrates

Although fish sampling was conducted at two stations in Reach 5A (Figure 5), no fish were collected at either station (Table 8). MWRDGC sampled fish populations at a single station at Touhy Avenue in Niles in the mid-1970's (Figure 5) (Brigham et al., 1978). No fish were collected despite three sampling attempts. Absence of fish was assumed to be due to degraded water conditions.

In 1980, MWRDGC made fish collections at Dempster Street in Morton Grove and at Albany Street in Chicago along the North Branch (Stations 286 and 287, Figure 5) (Schmeelk et al., 1984). Both sites are south of the Middle Fork and West Fork confluence, and north of the confluence of the North Branch and North Shore Channel. All fish were collected with electrofishing gear. These collections consisted of only carp and pumpkinseeds at Dempster Street and fathead minnows at Albany Street (Table 10).

In 1981, MWRDGC again sampled fish populations at the Dempster Street and Albany Street stations (Schmeelk, 1985). Six species were collected at Dempster Street (Station 286), with green sunfish in greatest abundance. Green sunfish was the only species collected at Albany Street (Station 287) (Table 11).

In 1990, researchers from the North American Water Quality Assessment Program (NAWQA) sampled fish populations at Hart Road in Niles. Only four species, white suckers (3), yellow bullheads (2), green sunfish (2), and largemouth bass

(1), were collected (Warren, 1991). Hite and Bertrand (1989) classified this reach as a Class D stream (limited use aquatic resource), based on IBI and MBI scores.

During the study, four major groups of benthic invertebrates, comprised of 276 organisms, were collected from Stations 1 and 2 in Reach 5A. The four most abundant groups were Crustacea (66 percent), Hirudinea (13 percent), Pelecypoda (11 percent), and Gastropoda (9 percent). The calculated MBI values in this reach were 5.3 and 6.3, which suggested a community of moderately pollution-tolerant species (Table 12).

In 1976, the Illinois State Water Survey collected benthic macroinvertebrates at nearly 100 sites in the Chicago Waterway System (Butts and Evans, 1978). One of these sites was located on the North Branch approximately 0.5 miles north of Oakton Street in Miami Woods. The collection at this site (Station 73) consisted of mayflies *(Caenis)*, phantom midges *(Chaoborum* sp), unidentified chironomid midges (Chironomidae) and aquatic worms (Oligochaetae). Of the total 385 organisms collected, midges (Chironomidae) and aquatic worms (Oligochaetae) comprised 77 percent of the sample (Table 18). Both oligochaetes and chironomidae are tolerant of pollution, and their presence indicates fair to poor water quality and degraded sediment conditions at the sampled site (Butts and Evans, 1978).

In 1983, the IEPA sampled macroinvertebrates at Touhy Avenue along the North Branch (Station 07, Figure 5). A total of 94 organisms, representing 6 taxa, were collected. The most abundant taxa were flatworms (Turbellaria), aquatic sowbugs (Isopoda), and leeches (Hirudinea) (Table 13).

In 1989, IEPA again sampled for macroinvertebrates at Touhy Avenue. A total of 308 individuals, representing 22 species, were collected. The most abundant species was the isopod, *Caecidotea intermedia*. Tubificid worms and turbellarian flatworms were also abundant in the sample (Essig, 1994). The calculated MBI at this station was 6.2, indicating a community of moderately pollution-tolerant species.

NAWQA researchers collected 15 species of aquatic invertebrates at the Hart Road site in 1989 (NAWQA, 1994). The most abundant groups were isopods, leeches, and the planarian flatworms, *Cura foremanii* and *Cricipterus sp.* At the same location in 1990, the most abundant groups collected were isopods, midges, fingernail clams, and turbellarian flatworms. In addition to these species, three species of crayfish *(Procambarus acutus, Orconectes virilis,* and *O. immunis)*, totaling 11 individuals, were also collected from this station (Cummings, 1990).

A review of Illinois Natural History Survey (INHS) collections identified a fish collection made at Dempster Street in 1981. This collection consisted of spotfin shiner, fathead minnow, black bullhead, green sunfish, bluegill, largemouth bass, and black crappie. Other INHS collections included the giant floater mussel collected from Dempster Street in 1992 and 1993, and the mussel *Lasmigona complanata* collected at Beckwith Road along the North Branch in 1992.

Waterway Characterization

The appearance and condition of the 10-mile-long segment of the North Branch differs from the upstream river reaches. While upstream reaches have been channelized and straightened, the channel in Reach 5A retains a sinuous, meandering pattern. Natural meanders, ox-bow lakes and backwater channels are found on FPDCC land at Miami Woods and St. Paul Woods.

The stream and channel banks at four locations (Figure 5) along the river in Reach 5A were characterized (Table 3). These are, from north to south, Oakton Street in Morton Grove (Station 1); Central Avenue (Station 2); Foster Avenue (Station 3); and near Albany Avenue (Station 4). Stations 2, 3, and 4 are located within the limits of the City of Chicago.

Bank characteristics vary throughout this reach. At Miami Woods, the west bank rises 8 to 10 feet above the river and has a slope of 35 degrees. The east bank rises only 3 feet and has a slope of less than 5 degrees. Similar bank characteristics are found at Station 2; however, the west bank is 30 to 35 feet high with a 35-degree slope, and the east bank rises 3 feet with a 5-degree slope. At Station 3, both banks rise about 4 feet above the river, but are steep, with slopes of 55 to 60 degrees. The stream banks are hand-laid limestone and brick walls approximately 400 feet south of Station 3.

Two distinct bank terraces are present at Station 4. The first set of banks closest to the river are 5 feet high and have a 35-degree slope. The second set of banks are formed by long, high-cut limestone rock and concrete walls approximately 30 feet from the edge of the river. This feature forms a box canyon channel.

Throughout the reach, channel banks are primarily composed of hard compacted clay, with silt as a minor constituent of banks at Stations 1 and 3. Engineered bank stabilization structures are not apparent along the reach. Construction rubble strewn on the banks near bridge abutments and outfalls is used for bank stabilization.

The predominant streambed material is silt. Station 1 at Oakton Street and Station 3 at Foster Avenue revealed gravel in addition to silt as a substrate component.

Dense stands of deciduous trees comprise the dominant streambank vegetation on FPDCC land, but seasonally high water levels, compacted bank soil, and dense shading have contributed to the nearly complete loss of herbaceous vegetation within these areas. Long stretches of nearly denuded banks have occurred. Dominant trees along the river include cottonwood, American elm, ash, box elder, and common buckthorn. Stands of large oaks are found at FPDCC Bunker Hill, St. Paul Woods, and Miami Woods. Groundcover is typically a mix of exotic garlic mustard, poison ivy, riverbank grape, and common buckthorn seedlings (Table 14). Dense herbaceous vegetation is present in areas where large gaps in the tree canopy exist, or where the land is being actively managed and kept open. Some examples of open areas are located near the Miami Woods Prairie, north of Oakton Street and along a river ox-bow approximately 1/2 mile north of Devon Avenue in Chicago.

Native herbaceous vegetation becomes more prevalent and diverse beyond the 100-foot zone immediately adjacent to the river within the floodplain. Species such as prairie cord grass, yellow swamp buttercup, bur sedge, fowl mannagrass, common water plantain, blue flag iris, tall water parsnip, white vervain, and clearweed are found near Station 1 (Table 14).

The canopy along Reach 5A is variable. At Miami Woods, the dense canopy (75 percent cover) shades 80 percent of the water surface. The less dense canopy at Central Avenue provides 50 percent cover, shading 60 to 75 percent of the stream surface. Downstream at Foster Avenue near the St. Lucas Cemetery, the tree canopy is 60 percent. The channel at Station 2 is slightly wider than upstream at Oakton Street and the canopy shades only 40 percent of the water surface. Near Albany Avenue, a canopy with 50 percent total cover provides 50 percent shading of the water surface.

In-stream cover for fish and other aquatic life is very abundant in the river at all four sampling sites. Undercut banks, submerged tree roots, brush jams, submerged logs, and submerged terrestrial vegetation provide excellent escape, resting, and foraging habitat for both adult fish and fish fry, as well as attachment surfaces for aquatic macroinvertebrates (Table 3).

Natural Areas and Other Natural Land Features

FPDCC holdings total approximately 1,800 acres within Reach 5A, and include Chick Evans Golf Course, Linne Woods, Wayside Woods, Miami Woods, St. Paul Woods, Bunker Hill/Caldwell Woods, Edgebrook Woods, Billy Caldwell Golf Course, Indian Road Woods, Forest Glen, and LaBagh Woods East and West. Approximately 75 percent of the total length of the river in this reach is within forest preserve holdings. FPDCC lands comprise most of the dedicated natural open space (28 percent) within the corridor (Table 6). One dedicated nature preserve and six INAI sites are located within or adjacent to the Reach 5A corridor (Tables 4 and 5).

IDNR records show nine State-listed threatened or endangered plant species and one federally listed species along Reach 5 (Table 7).

Reach 5B: North Branch of the Chicago River (North Shore Channel to Chicago River)

Wetlands Characterization

There are no wetlands within the study corridor in Reach 5B except for the channel proper. These wetlands are designated R2OWHx and total 133.9 acres (Table 15). All other wetlands have long since been converted to urban uses.

Fishes and Benthic Invertebrates

In 1976, MWRDGC collected fishes from Reach 5B between Montrose and Wilson, a short distance downstream from its confluence with the North Shore Channel. The collection consisted of only one of each of four species (goldfish, black bullhead, bluegill, and black crappie) and seven specimens of the carp/goldfish hybrid (Table 21) (Brigham et al., 1978).

While electrofishing at this same general location in 1991 (Wilson Avenue sampling Station 5), MWRDGC collected 16 species and 3 hybrid combinations (Figure 6). At Grand Avenue (Station 6), 10 species were collected as part of this same sampling program. The combined collections at these two stations consisted of 568 individuals of 16 species (Table 26). The most abundant species was the goldfish, and carp was the dominant species by weight (Dennison et al., 1992).

In 1989, 1990, and 1991, MWRDGC conducted surveys of aquatic macroinvertebrates in the Chicago Waterway System. Four sampling stations were established on the North Branch of the Chicago River: two at Wilson Avenue and two at Grand Avenue (MWRDGC, 1990; Polls et al., 1991; 1992) (Figure 6).

The 1989 collection consisted of 34 species, including 16 species of naidid worms, 10 species of tubificid worms, and 8 species of fingernail clams. The most abundant species were the naidid worm *(Dero digitata)*, the tubificid worm *(Limnodrilus hoffmeisteri)*, the clam *(Sphaerium corneum)*, and the isopod *(Caecidotea intermedia)* (Table 27).

The 1990 collection consisted of 45 species, including 11 species of naidid worms, 10 species of tubificid worms, 10 species of midges, 8 species of fingernail clams, 3 species of leeches, and 3 species of snails. The most common benthic invertebrate in Reach 5B was the tubificid worm *(Quistadrilus multisetosus)*, the naidid worm *(N. elinguis)*, and the tubificid worm *(L. hoffmeisteri)* (Table 28).

In 1991, a total of 54 species were collected, including 11 species of tubificid worms, 14 species of naidid worms, 11 species of fingernail clams, 9 species of midges, and 3 species of leeches. Predominant benthic organisms were the tubificid worms (*L. hoffmeisteri* and *Quistadrilus multisetosus)* (Table 29). All of the dominant species in the 3 years of collections were moderately to highly tolerant of organic pollution and tended to be found in poor quality environments with silty, organically rich substrates.

Waterway Characterization

Reach 5B, which is entirely within the limits of the City of Chicago, has been modified and channelized. The stream and channel banks at three stations along this reach are characterized as stable, composed primarily of clay with silt substrates. Bank heights range from 8 to 20 feet and average 16 feet; bank slopes range from 30 degrees to 90 degrees and average 45 degrees. Sheet piling is used for additional stabilization in places. Water depths in the channel range from 8 to 13 feet (Table 3).

Compared to the other stations on the upper reaches, the three stations on Reach 5B have the smallest variety of in-stream cover. The tree canopies average 15 percent (very sparse) coverage. Deciduous trees (80 percent) and shrubs (20 percent) dominate the riparian vegetation on both banks of the river.

FIGURE 6
Survey Sampling Sites and Wetland Areas, Reaches 5B, 6 and 7

Natural Areas and Other Natural Land Features

Reach 5B includes portions of the river in the City of Chicago that have been intensively developed for residential, commercial, and industrial purposes. There are no natural areas or forest preserves located along this stretch of the river, nor are there records of known threatened or endangered species. However, several city parks comprise the only open space within this reach.

Reach 6: Chicago River

Wetlands Characterization

No wetlands exist within Reach 6 except for the channel proper, which is classified as R2OWHx.

Fishes and Benthic Invertebrates

In 1976, MWRDGC sampled fish populations with electrofishing gear at Station 60 located at the Chicago Locks (Figure 6) (Brigham et al., 1978). A total of 209 individuals, representing 14 species, were collected. Rock bass, bluntnose minnow, and alewife were the most abundant species. By contrast, a downstream sample at Station 67, located near the confluence of the North and South Branches (Reach 7), showed only 43 individuals, representing 5 species. Goldfish, alewife, and carp were the most abundant species collected (Table 21).

The higher water quality at the sampling station nearest Lake Michigan was due to the diversion of lake water into the Chicago Waterway System. This higher water quality accounted for the disparity in collection size, diversity, and percentage of intolerant species between the two collections. The influence of Lake Michigan water rapidly decreased as the water flowed downstream until only a degraded fishery remained (Brigham et al., 1978).

In 1991, MWRDGC conducted fish sampling at two stations in Reach 6: one in the Loop (Station 19) and one in the Inner Harbor (Station 18, Figure 6). The total catch at both stations was 1,196 fish, composed of 23 species and 2 hybrid combinations (Table 30). The bluntnose minnow was the most abundant species and carp was the most abundant species by weight (Dennison et al., 1992).

The differences between the two stations was reflected in the IBI values. Based on four separate collection dates, Station 18, nearest Lake Michigan, had a maximum IBI of 38 (Class C stream, moderate aquatic resource) and a minimum IBI of 26. Station 19, the more inland station, had a maximum IBI score of 30 (Class D Stream, limited aquatic resource) and a minimum IBI of 22.

In 1989, 1990, and 1991, the MWRDGC conducted surveys of aquatic macroinvertebrates at two sampling stations near the mouth of the river at Outer Drive (Figure 6) (MWRDGC, 1990; Polls, et al., 1991; 1992). Nineteen species were collected from these sites in 1989, including 7 species of tubificid worms, 5 species of midges, 4 species of naidid worms, 2 species of leeches, and one clam species. The dominant species was the tubificid worm *(Quistadrilus multisetosus)* (Table 31). The 1990 collection effort revealed 22 species, including 9 species of tubificid worms, 5 species of midges, 4 species of naidid worms, 2 species of leeches, and one clam species. The most abundant species was the tubificid worm *(Quistadrilus multisetosus)* (Table 32).

In 1991, 32 species were identified from the two sites, including 10 species of tubificid worms, 9 species of midges, 8 species of naidid worms, and 5 species of clams. The most abundant species were the tubificid worm *(Q. multisetosus)* and the naidid worm *(Vejdovskyella intermedia)* (Table 33). The dominance of these species indicated poor sediment quality.

Waterway Characterization

Reach 6 is situated entirely within downtown Chicago and extends from Wolf Point to the mouth of the Chicago River at Chicago Harbor. The total water surface of the channel is 47.7 acres. There is no natural vegetation present within this reach. The river is completely contained within sheet piling and bulkheads, behind which is high-rise commercial and residential development.

Natural Areas and Other Natural Land Features

There are no natural areas, forest preserves, or records of known Federal or State-listed threatened or endangered species located along Reach 6 of the Chicago River.

Reach 7: South Branch of the Chicago River and South Fork of the South Branch of the Chicago River

Wetlands Characterization

NWI identified and mapped two wetlands located within the study corridor in Reach 7. The channel proper is mapped as R2OWHx, totaling 101.3 acres. The only other mapped wetland is an excavated pond classified as POWHx (Table 15). The absence of natural wetlands or other water bodies within this reach is due to the long history of industrial use.

Fishes and Benthic Invertebrates

In 1976, MWRDGC sampled fish populations in this reach using electrofishing gear at Station 67, which extended from Kinzie Street on the north to Randolph Street on the south (Figure 6) (Brigham et al., 1978). The northern end of this sample station actually extended into Reach 5B, but is considered because of the potential effect of Lake Michigan water on the sample as a whole. Only 43 individuals, representing 5 species and 1 hybrid combination, were collected. Goldfish, alewife, and carp were the most abundant species collected (Table 21).

In 1989, 1990, and 1991, MWRDGC sampled at two stations (Jackson Boulevard and South Branch) in Reach 7 for benthic macroinvertebrates (Figure 6) (MWRDGC, 1990; Polls et al., 1991, 1992). In 1989, the combined collection for the reach consisted of 23 species, comprised of 9 species of tubificid worms, 4 species of naidid worms, 3 species of midges, 3 species of clams, 2 species of leeches, and 2 species of snails (Table 35). In 1990, 21 species were collected, including 8 species of tubificid worms, 4 species of clams, 3 species of naidid worms, 2 species of midges, and 2 species of leeches (Table 36). In 1991, 23 species were collected, including 8 species of tubificid worms, 4 species of clams, 4 species of naidid worms, and 5 species of midges (Table 37). The dominant species collected in all three years were the tubificid worms *(Limnodrilus hoffmeisteri* and *Quistadrilus multisetosus)* and the fingernail clam *(Sphaerium corneum)*. All of the species collected are tolerant of degraded sediment conditions except for the fingernail clam, which has broad ecological tolerances but is considered relatively intolerant of pollution.

In 1991, MWRDGC collected fish with electrofishing gear in Reach 7 at Station 20, located at the junction of the North and South Branches of the Chicago River (Figure 6). The combined collection at both Stations 20 and 67 was 548 individuals, composed of 17 species and 1 hybrid combination (Table 34). The most abundant species was the gizzard shad. Carp was the most abundant species by weight (Dennison et al., 1992). The maximum IBI of 4 sampling dates for this site was 32 (Class C stream, moderate aquatic resource), although the remaining 3 samples each had IBI scores of 22. No individual collection had fewer than 7 species.

The Commonwealth Edison thermal discharge study established three fish sampling stations within this reach (Stations 101-103). Fish were collected by electrofishing and gill netting. A total of 60 individual fish were collected during 1993, representing 12 species and 1 hybrid. Largemouth bass, green sunfish, and bluntnose minnow were the most abundant species collected (EA Engineering, Science and Technology, 1994).

As part of the Commonwealth Edison thermal discharge study, a benthic macroinvertebrate investigation was conducted in the southern reaches of the Chicago River (Stations 1 and 2). The most abundant groups collected were tubificid and naidid worms, and chironomid midges (Environmental Science & Engineering, Inc., 1994).

Waterway Characterization

Years ago, the South Branch of the Chicago River was channelized to accommodate barge and commercial boat traffic. The stream channel and channel banks are unstable and mainly devoid of vegetation due to industrialized development up to the edge of the river. Banks are composed primarily of clay and rock and the substrate is primarily silt (Table 3). Tree cover is sparse (approximately 5 percent) and consists of scattered cottonwood and box elder. The slopes at the assessment stations are approximately 25 degrees on both banks. In-stream cover visible from the surface is limited, although beds of aquatic vegetation have begun to re-establish, responding presumably to improvements in water quality.

In 1992 and 1993, an aquatic macrophyte study was conducted for the Commonwealth Edison Company. Narrow fringing communities of aquatic vegetation were found along the main channel border. Sago pondweed and water milfoil were the dominant species of submersed aquatic vegetation, followed by curlyleaf pondweed and eelgrass (Environmental Science & Engineering, Inc., 1994a).

Some of the dominant species of submersed aquatic vegetation identified through the Commonwealth Edison study included common arrowhead, narrow-leaved cattail, common reed, and river bulrush. Other species collected included reed canary grass, rice cutgrass, purple loosestrife, and common cattail.

Natural Areas and Other Natural Land Features

There are no natural areas or forest preserves located along Reach 7 of the Chicago River.

The peregrine falcon *(Falco peregrinus)*, listed as both federally and State endangered, has been successfully reintroduced into the South Loop area as part of the Chicago Peregrine Release and Restoration Project. Since 1986, captive bred falcons have been released at a number of locations in northeastern Illinois (and at other midwestern locations). Falcons have occupied a territory at 125 South Wacker Drive since 1987, and have successfully fledged young at least five times since that time.

Reach 8: Chicago Sanitary and Ship Canal (Ashland Avenue to Interstate 55)

Wetlands Characterization

NWI identified and mapped 33 wetlands, totaling 480.0 acres. Of the total area, the canal proper is comprised of 330.6 acres and is designated R2OWHx. Although a variety of wetland types occur in the study area, the most abundant wetland types are POWKh (11 wetlands) and POWHx (5 wetlands). Excluding the canal, the wetlands range from 0.1 - 22.1 acres and average 5.1 acres. The largest non-riverine wetland type is POWKh, covering 113.4 acres. Three of the wetlands in Reach 8 are linear, totaling 0.59 linear miles.

Two wetlands mapped by NWI, totaled 0.6 acres, but are no longer present. This represents a loss of less than 1 percent of the originally mapped wetlands, leaving 31 wetlands (479.4 acres). Three previously unmapped wetlands, totaling 3.2 acres and averaging 1.1 acres per wetland, were identified and classified as PEMA, PEMC, and POWGx. Currently, there are 34 wetlands totaling 482.6 acres within Reach 8, representing an area less than 1 percent greater than originally mapped by NWI (Table 15). POWKh, POWHx, and POWKHx are numerically the most abundant non-riverine wetland types and also have the greatest areal coverage (128.02 acres, or 26.5 percent of the total wetland acreage).

Fishes and Benthic Invertebrates

MWRDGC sampled fish populations in 1976 using electrofishing gear at Station 48 near Cicero Avenue (Table 21) (Brigham et al., 1978). Only four species (alewife, goldfish, carp, and black crappie) and one hybrid, totaling 17 individuals, were collected.

In 1989, MWRDGC sampled benthic macroinvertebrates at 10 stations in the Chicago Sanitary and Ship Canal (CSSC), which corresponded to Reaches 8, 9A, and 9B (Fig. 14) (MWRDGC, 1990). A total of 49 species were collected from all 10 stations, including 15 species of naidid worms, 11 species of tubificid worms, 8 species of clams, 7 species of midges, 5 species of snails, and 3 species of leeches. The tubificid worms were numerically the most abundant species. Predominant benthic organisms were the tubificid worms *(Quistadrilus multisetosus* and *L. hoffmeisteri),* the fingernail clams *(S. corneum* and *Pisidium casertaneum),* and the naidid worm *(Dero digitata)* (Table 39).

In 1990, sampling at these 10 stations resulted in a total collection of 45 species, including 15 species of naidid worms, 9 species of tubificid worms, 8 species of leeches, 7 species of clams, 4 species of midges, and 2 species of snails. The tubificid worms were numerically the dominant species. Predominant benthic organisms were the tubificid worm *(L. hoffmeisteri)* and the naidid worm *(Naias elinguis)* (Table 40) (Polls et al., 1991).

In 1991, MWRDGC again sampled benthic macroinvertebrates at the 10 stations. A total of 49 species were collected, including 14 species of naidid worms, 11 species of tubificid worms, 9 species of fingernail clams, 6 species of leeches, 5 species of midges, and 4 species of snails. The tubificid worms were numerically the dominant species. Predominant benthic organisms were the naidid worm *(Naias elinguis)* and tubificid worms *(L. hoffmeisteri* and *Q. multisetosis)* (Table 41) (Polls et al., 1992).

The dominance of tubificid and naidid worms indicates a community of pollution-tolerant species. However, the abundance of fingernail clams, which are tolerant of a broad range of ecological conditions, but tend to be relatively intolerant of pollution, may suggest that conditions are improving in this portion of the waterway.

In 1991, MWRDGC collected fish at Station 7, Damen Avenue; Station 8, Cicero Avenue; and Station 9, Harlem Avenue (Figure 7). The total catch was 1,908 individuals, composed of 18 species and 1 hybrid combination (Table 38). The most abundant species was the bluntnose minnow; carp was the dominant species by weight (Dennison et al., 1992). The IBI score of four separate collection dates ranged from a high of 30 (Class D stream, limited aquatic resource) to a low of 22.

Nine fish sampling stations (Stations 104-106 and 201-206) were established in this reach as part of Commonwealth Edison's thermal discharge study. In 1993, a total of 3,417 fish were collected by electrofishing and gill netting. The most abundant species were bluntnose minnow, gizzard shad, and largemouth bass (EA Engineering, Science and Technology, 1994).

Waterway Characterization

The bank heights at the three sampling stations range from 8 to 40 feet, with steep slopes occurring at all three stations. The composition of the banks includes clay, rock, gravel, sand, silt, and sheet pilings. At two stations, the banks are stabilized with sheet piling or rock and the bottom substrate is primarily silt (Table 3). Although there is riparian vegetation along the shoreline, it does not form an appreciable canopy over the canal, nor does it contribute to any in-stream cover. Cottonwood and box elder are the dominant trees and garlic mustard is the most abundant herbaceous plant.

Aquatic macrophyte beds can be found in channel border locations in this reach. In 1992 and 1993, surveys of aquatic macrophytes were conducted for Commonwealth Edison. The "Waterway Characterization" section in Reach 7 summarizes the findings for Reach 8 (Environmental Science and Engineering, Inc., 1994a).

Natural Areas and Other Natural Land Features

The Reach 8 study corridor has largely been developed for industrial and commercial uses. The only dedicated natural open spaces within the corridor is Chicago Portage Woods and a portion of Ottawa Trail South, which are FPDCC holdings along the Des Plaines River where it joins the CSSC. The total area of these preserves within the study corridor is approximately 80 acres (Table 6). Only 2 percent of the total corridor in this reach is dedicated natural open space. There are no INAI sites or nature preserves in this reach, nor are there any records of known federally or State-listed endangered or threatened species.

Reach 9A: Chicago Sanitary and Ship Canal (Interstate 55 to Calumet-Sag Channel)

Wetlands Characterization

NWI identified and mapped 100 wetlands, totaling 1,594.4 acres. Of this total, 1,069.7 acres included the I&M Canal, the Des Plaines River, and the CSSC. These wetlands were distributed among 15 mapping polygons and designated R2OWHx. Excluding the river channel and canals, the most abundant wetland types were POWKh (32 wetlands, primarily diked lagoons), PEMC (13 wetlands), and POWHx (8 wetlands). These wetlands ranged from 0.2 to 45.9 acres and averaged 6.4 acres. Six linear water bodies, primarily small streams, were classified as R2OWHx and totaled 3.43 linear miles (Table 15).

Two of the wetlands originally mapped by NWI, totaling 10.7 acres, are no longer in existence, leaving 98 wetlands (1,583.7 acres). This loss represents a decline of less than 1 percent of NWI originally mapped wetlands. Four previously unmapped wetlands, totaling 5.6 acres and averaging 1.4 acres per wetland, were identified. One wetland was 1.52 acres larger than originally mapped. With the addition of these 4 wetlands, there are currently 102 wetlands, totaling 1,589.3 acres within Reach 9A. This represents a total wetland area slightly larger (less than 1 percent) than the wetlands originally mapped by NWI.

Those wetlands with the greatest total areal coverage are R2OWHx (1,069.7 acres; 67.1 percent of total wetland and

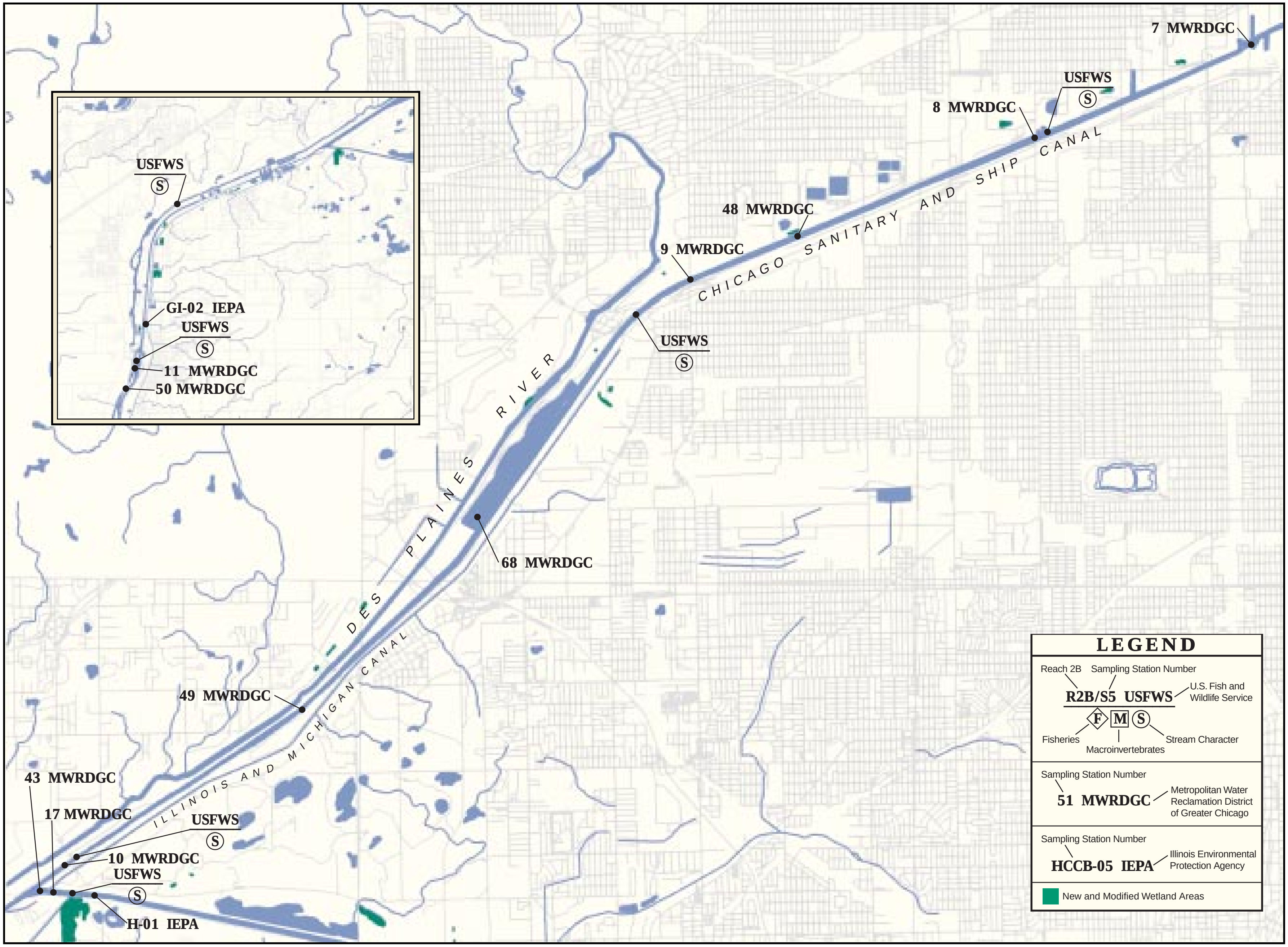


FIGURE 7
Survey Sampling Sites and Wetland Areas, Reaches 8, 9A and 9B

aquatic habitat acreage), POWKH (279.2 acres; 18 percent of the total wetland acreage) and PFO1A (117.2 acres; 7 percent of the total wetland acreage) (Table 15). The most numerically abundant, previously unmapped wetlands are three POWKx areas (75 percent of the total number of new wetlands).

Six wetlands were field-checked: two PEMC, two PEMF, one PFO1A, and one POWKh. Some of the characteristic species of herbaceous plants recorded at these sites are common tussock sedge, big bluestem, little bluestem, jack-in-the-pulpit, heath aster, reed canary grass, common reed, blue vervain, river bulrush, and prairie dock. Commonly occurring trees and shrubs include red ash, white oak, common buckthorn, and red osier dogwood.

Fishes and Benthic Invertebrates

In 1976, MWRDGC sampled fish populations near Willow Springs Road and the Argo Shell Plant in Justice (Stations 49 and 68; Figure 7) (Brigham et al., 1978). Six species were collected at Station 68, with green sunfish and goldfish representing 84 percent of the total number. Only one carp and one goldfish were collected at Station 49 (Table 21).

In 1989, 1990, and 1991, MWRDGC sampled 10 sites in the CSSC for benthic macroinvertebrates. The results were pooled for Reaches 8, 9A, and 9B, and are presented in the "Fishes and Benthic Invertebrates" section of Reach 8.

In 1991, the MWRDGC made 4 fish collections at Station 10 near Willow Springs Road (Figure 7) (Dennison et al., 1992). Nine species and two hybrids were collected, all of which were moderately to highly tolerant of polluted waters. The three most abundant species were carp, bluntnose minnow, and goldfish (Table 42). The IBI score ranged from 16 to 20 (Class E stream, restricted use aquatic resource).

INHS collections for this reach included only one specimen of goldfish collected near Willow Springs Road on May 2, 1988, and specimens of the mussel *(Dreissena polymorpha),* which were collected near Archer Avenue on October 3, 1991.

Waterway Characterization

The physical appearance and character of Reach 9A is nearly identical to that presented for Reach 8. The banks heights average 10 feet and are sheer-sided vertical walls of hand-cut limestone. The channel's original construction is rectangular in cross section. In places where the rock wall has been damaged or is severely eroded, the banks are stabilized with concrete or rock rubble. The channel substrate was not sampled due to barge traffic. The bottom material is composed of silt overlying rock (Environmental Science and Engineering, Inc., 1994a).

Both canopy and visible in-stream cover are sparse. The entire canopy is estimated at 15 percent, and trees lining both channel banks shade approximately 10 percent of the water surface. Rock ledges provide the only visible in-stream cover (Table 3). It is unlikely that any significant submerged cover exists because of the regular maintenance of the canal for commercial navigation by the Corps of Engineers.

The rock walls are barren of vegetation except for small trees growing occasionally from rock crevices near the waterline. Cottonwoods and box elder are the dominant trees in the area.

In 1992-93, a study of aquatic macrophytes was conducted in the upper Illinois Waterway for the Commonwealth Edison Company. No aquatic macrophytes were collected near the southern end of Reach 9A, and aquatic macrophyte coverage near the upper segment of the reach was sparse. Species collected in this reach included duckweed, water milfoil, pondweed, and broad-leaved arrowhead (Environmental Science & Engineering, Inc., 1994a).

Natural Areas and Other Natural Land Features

The northern half of this reach is largely developed for industrial and commercial purposes. The southern half contains the 320-acre Little Red Schoolhouse Marsh, the 11-acre Santa Fe Prairie, the 4-acre Reavis High School INAI sites, and Cranberry Slough and Paw Paw Woods Nature Preserves managed by FPDCC (Tables 4 and 5).

Distinctive woodland, marsh, and prairie remnants are found on Mount Forest, which is the area between the CSSC and the Cal-Sag Channel. Most of this land is located within county forest preserves and totals over 6,300 acres. Much of this area includes Columbia Woods, Paw Paw Woods, Henry DeTony Woods, Red Gate Woods, Pulaski Woods, Wolf Road Woods, Maple Lake, Willow Springs Woods, Buffalo Woods, Pioneer Woods, Crooked Creek Woods, White Oak Woods, Little Red Schoolhouse Marsh, Spears Woods, Hidden Pond, and Tomahawk Slough. Many of these sites are managed for ecological restoration purposes by the FPDCC and The Nature Conservancy's volunteer stewardship network.

Forest preserve lands extend well beyond the limits of the 1-mile-wide study corridor. Considering only those portions within the corridor, about 25 percent of the corridor in this reach is dedicated natural open space (Table 6).

Sixteen known State and federally listed threatened and endangered species of flora and fauna persist along Reach 9 (Table 7).

Reach 9B: Chicago Sanitary and Ship Canal (Calumet-Sag Channel to Lockport)

Wetlands Characterization

NWI mapped 168 wetlands, totaling 2,408.8 acres, of which 373.2 acres comprise the I&M Canal, Des Plaines River, and the CSSC. These wetlands were distributed among 15 mapping polygons and were designated R2OWHx and R2UBHx. The most abundant wetland types in this reach were PUBGx (33 wetlands), PFO1C (29 wetlands), and PFO1Ch (15 wetlands). These wetlands ranged in size from 0.1 to 308.8 acres, and averaged 13.6 acres. Nine of the wetlands in Reach 9B were linear wetlands, totaling 7.97 linear miles.

Five wetlands originally mapped by NWI, totaling 14.9 acres, are no longer in existence, leaving 163 wetlands (2,393.9 acres). This loss represents less than 1 percent of the originally mapped NWI wetlands. Two NWI wetlands appear to have decreased by more than 2 acres due to a quarry expansion. Eight previously unmapped wetlands, totaling 47.1 acres and averaging 5.9 acres per wetland, were identified.

With the addition of these 8 wetlands, there are currently 171 wetlands, totaling 2,441.1 acres, within Reach 9B. This represents approximately 2 percent more wetlands than originally mapped by NWI (Table 15). Wetland types with the greatest total areal coverage are PEMF (394.5 acres; 16.2 percent), PFO1C (380.4 acres; 15.6 percent), R2OW and R2UB (373.2 acres; 15.3 percent), and PEMC (351.30 acres; 15 percent). The most abundant, previously unmapped wetlands are PEMC.

Of the eight wetlands field-checked, one wetland is no longer in existence. The remaining wetlands are PEMA, PEMF, POWGx, and PFO1C. Some of the characteristic species of herbaceous plants recorded at these sites are redtop, hop sedge, common tussock sedge, reed canary grass, common reed, heath aster, panicled aster, late goldenrod, and narrow-leafed cattail. Common trees and shrubs include red osier dogwood, swamp white oak, and pussy willow.

A wetland inventory of northeastern Illinois was conducted on 5 acres or larger (Southern et al., 1981). Factors used to rank the value of these wetlands included the percentage of open water, vegetative interspersion, water depth, quality rating, surrounding land use, and threats. The Mount Vernon Memorial Park Cemetery, located between Illinois Route 171, McCarthy Road, and Bell Road, near Lemont, was examined. Although this wetland is located just beyond the 1/2-mile study limits, the site ranked in the highest quality category. This site is a 127-acre deep cattail marsh that provides nesting habitat for a variety of uncommon marsh birds. Species recorded from the site include soras, blue-winged teal, Canada geese, wood ducks, black-crowned night herons, great egrets, and common moorhens.

In 1990, the wetlands of Goose Lake, which are part of the FPDCC Black Partridge Preserve, were surveyed for endangered and threatened birds. This survey identified 66 great blue heron nests at the site, although there were no bird sightings (Glass, 1990).

Fishes and Benthic Invertebrates

In 1976, MWRDGC sampled fish populations in this reach at Station 50 (Figure 7), located near 16th Street in Lockport (Brigham et al., 1978). Four species and one hybrid were collected (Table 21). The sample was dominated by carp and goldfish.

In 1991, MWRDGC made four collections at this same site (Dennison et al., 1992). Carp and goldfish again dominated the collection, but the total number of species collected increased to nine and one hybrid (Table 43). The IBI score of the four collections ranged from 18 to 22 (Class D stream, limited aquatic resource).

Commonwealth Edison established three fish sampling stations in this reach (Stations 301, 302, 302A) as part of their thermal discharge study. A total of 699 fish were collected, the most abundant of which were gizzard shad, emerald shiner, fathead minnow, and bluntnose minnow (EA Engineering, Science and Technology, 1994).

Commonwealth Edison also conducted a winter fisheries survey in early 1993 using a variety of sampling gear. Collections were made at five locations in the upper Illinois Waterway System. All sampling stations but one were associated with a Commonwealth Edison power plant. A 3-mile stretch of the river adjacent to the Will County Station was sampled. A total of 115 fish were collected, representing 8 species and one hybrid. Emerald shiner and carp were the most abundant species collected, comprising 71 percent of the total fish collected (Lawler, Matusky & Skelly Engineers, 1993).

The INHS collections contained a single specimen of the emerald shiner collected near 16th Street in Lockport in October 1988.

In a basinwide survey of the Des Plaines River in 1983, IEPA sampled macroinvertebrates at Station 02 (Figure 7) at Lockport. Twenty-one individuals, representing 10 species, were collected, including four species of aquatic worms (Oligochaeta) and six species of midges (Chironomidae) (Table 13) (IEPA, 1988).

Benthic macroinvertebrate populations were evaluated as part of the upper Illinois Waterway Study for Commonwealth Edison. Two sampling stations were located near the Will County power station and a third was established in Lockport. At the station upstream of the Will County station, 10 species were collected, with tubificid worms dominating the collection. Downstream of the station, isopods *(Caecidotea sp.)* comprised nearly 58 percent of the organisms collected, followed by tubificid worms. At the far southern extent of the reach in Lockport, aquatic worms were again the dominant group of organisms collected (EA Engineering, Science and Technology, 1994b).

Waterway Characterization

The physical appearance and character of Reach 9B closely resemble the character of Reach 9A and are fairly homogeneous throughout the reach. The stream channel and banks were characterized near the Stevens Street bridge in Lemont and the 16th Street bridge in Lockport. Continuous observations were made along the entire length during a boat reconnaissance.

Banks along Reach 9B are sheer-sided, vertical walls of cut limestone. The channel exhibits a rectangular cross-section as originally constructed. Banks heights are 10 to 15 feet from the water's edge to the top of the rock wall. Portions of the rock wall have been reinforced with concrete or rubble where barge damage occurred. Although the channel substrate was not sampled due to barge traffic, Environmental Science and Engineering, Inc. (1994a) reported that the bottom material is composed of silt overlying the solid rock basement (Table 3).

The tree canopy and in-stream cover are sparse at the Lemont sampling station and at Lockport. Between these widely separated sampling points, trees cover no more than 10 percent of the water. Shading ranges from 0-10 percent.

The walls forming the channel along Reach 9B are devoid of vegetation. Throughout the Lemont section, no trees exist along the banks due to industrial development. Between Lemont and Lockport, deciduous trees become more prevalent. Many undeveloped parcels of land adjoining the channel are well-vegetated with herbaceous plants, shrubs, and trees. A channelside vegetation inventory along this stretch was not completed. However, a wetland field-check near the channel showed that the dominant trees along the banks are cottonwood, willow, and box elder. Rock ledges provide the only visible in-stream cover. Regular channel maintenance by the Corps of Engineers prevents the establishment of significant submerged cover.

Surveys of aquatic macrophytes in the upper Illinois Waterway were conducted in 1992 and 1993 for the Commonwealth Edison Company. Reach 9B corresponds to the section of this study that covers the confluence of the CSSC and the Cal-Sag Channel south to Lockport. Several beds of aquatic macrophytes were found in this area. Prominent submersed aquatic beds were found at the confluence of the CSSC and Cal-Sag Channel at Material Service's embayment, the Cargill Corporation facility dock, and the spillway at the Lockport Lock and Dam. The dominant vegetation types were elodea and pondweed. Other species observed included duckweed, arrowhead, and water milfoil (Environmental Science and Engineering, Inc., 1994a).

Natural Areas and Other Natural Land Features

Most of the natural open space within this reach is owned and managed by the Forest Preserve Districts of Cook, DuPage, and Will Counties. The WCFPD owns 5 sites, totaling 819 acres, within the Reach 9B study corridor. These sites are Keepataw, 216 acres; Veterans Woods, 77 acres; Romeoville Prairie, 251 acres; Lockport Prairie, 254 acres; and Runyon Preserve, 21 acres.

Only a very short segment of Reach 9B is located within Cook County. The only FPDCC holding in this reach is the 438.2-acre Black Partridge Woods.

The FPDDC owns and manages the 2,470-acre Waterfall Glen Forest Preserve, which is contiguous to the Argonne National Laboratory Reservation and the 234-acre Wood Ridge site. These two sites comprise about 12 percent of the FPDDC's total holdings.

Approximately 25 percent of the Reach 9B corridor is dedicated to natural open space (Table 6). Four dedicated Illinois Nature Preserves are located in this reach. These are the 254-acre Lockport Prairie, the 108.4-acre Romeoville Prairie, and the 70-acre O'Hara Woods, all under WCFPD management. The 80-acre Black Partridge Woods is managed by FPDCC (Table 5).

The INAI identified six sites along this reach in addition to the nature preserves previously identified. These include an intermittent stream habitat near Lemont known as the Bowl; two Lemont Geological Areas; Long Run Seep; Lockport Prairie East; Waterfall Glen Forest Preserve; and the Material Service Prairie. A privately owned dolomite prairie, located south of the UNO-VEN refinery along New Avenue in Will County, is a significant natural area, but not a formal INAI site (Table 4).

Some of the rarest and most unique biological communities in the study corridor and in the entire northeastern Illinois region are represented by the dolomite prairies along the lower Des Plaines River where the river parallels and eventually merges with the CSSC. These prairies were developed in shallow soils over dolomite bedrock that had been exposed when waters from Glacial Lake Chicago scoured the glacial deposits and created the existing Des Plaines River Valley. Unique plant communities in this area include wet to mesic dolomite prairie, sedge meadow, and graminoid fen. The federally listed endangered Hines Emerald Dragonfly is largely restricted to these dolomitic wetland communities.

Nearly the entire valley floor of this reach originally consisted of these wet prairies and marshes. Much of the corridor has been developed by industries that were attracted by good water transportation and mining opportunities. Although development has radically altered the valley, enough of the original character of the valley can still be observed. The best remaining examples of these prairies can be found at Lockport Prairie and Romeoville Prairie Nature Preserves. (See Table 7 for a combined list of State and federally listed threatened and endangered species found in Reaches 9A and 9B.)

Reach 10A: Calumet-Sag Channel

Wetlands Characterization

NWI identified and mapped 126 wetlands in Reach 10A, totaling 922.2 acres. Although a variety of wetland types existed in the study area, the most abundant wetland types were POWHx (27 wetlands), PEMC (25 wetlands), and PEMF (19 wetlands). The single largest wetland, Saganashkee Slough, totaled 359.4 acres and was classified as L2OWH. Excluding Saganashkee Slough, the remaining wetlands ranged from 0.11 acres to 45.9 acres and averaged 5.1 acres. Four watercourses (3 R2OWHx and 1 PFO1A) totaled 2.68 linear miles (Table 15).

Thirteen of the wetlands originally mapped by NWI, totaling 14.1 acres, no longer exist, leaving 113 wetlands (908.1 acres). This loss represents a decline of less than 1 percent of the number of originally mapped wetlands. Eighteen previously unmapped wetlands, totaling 75.8 acres and averaging 4.2 acres per wetland, were identified. With the addition of these 18 wetlands, there are currently 131 wetlands totaling 983.9 acres within the study corridor in Reach 10A, or 6.7 percent more wetlands than were mapped by NWI (Table 15).

The most numerically abundant, previously unmapped wetlands are POWHx (5 wetlands), POWGx (4 wetlands), and PEMC (4 wetlands). One PEMFh wetland appears to have been excavated, which increased its area by 12 acres and

FIGURE 8
Survey Sampling Sites and Wetland Areas, Reach 10A

changed its classification to POWGx. Several other previously mapped wetlands are no longer in existence, due most likely to filling activities. Wetland types with the greatest total areal coverage are L2OWHx (359.39 acres; 36.5 percent of the total wetland acreage), PFO1A/C (160.6 acres; 16.3 percent), PEMF (115.8 acres; 11.8 percent), POWHx (89.8 acres; 9.1 percent), and PEMC (85.9 acres; 8.7 percent).

Eleven wetlands, most of which are PEMC wetland types, were field-checked. Some of the characteristic species of herbaceous plants recorded at these sites are common tussock sedge, reed canary grass, common reed, wild golden glow, prairie cord grass, and river bulrush. Commonly occurring trees and shrubs include common buckthorn, pale dogwood, and cottonwood.

Southern et al. (1981) conducted an inventory of wetlands 5 acres or larger and ranked them from A (highest quality) to C (lowest quality) based on wildlife habitat value. Factors used in this ranking included the percentage of open water, vegetative interspersion, water depth, surrounding land use, and threats. Three sites, identified as C-27, C-45 and C-46, are located in Reach 10A.

Area C-27, a "B" site, is a 10-acre shallow lake with an emergent wetland located north of McCarthy Road and west of Will-Cook Road.

Area C-45, Saganashkee Slough, is ranked as a category A site. Saganashkee Slough is a large wetland with extensive shallow open water. Willows are the dominant shoreline vegetation. Southern et al. (1981) observed several State-listed threatened or endangered birds at this site, including pied-billed grebe, double-crested cormorant, and great egret. Other species observed included blue-winged teal, great blue heron, American coot, red-winged blackbird, barn swallow and green heron.

Area C-46, a "C" site, is a 9.5-acre cattail marsh located north of McCarthy Road and west of Flavin Road on FPDCC property.

Wetlands are also evaluated as part of an annual IDNR survey of endangered and threatened bird species in northeastern Illinois. Within Reach 10A, McGinnis Slough, also known as Orland Lake, has been censused regularly for listed bird species since 1985. This site is located 2.5 miles south of the Cal-Sag Channel at U.S. Route 45 and 143rd Street in Orland Park.

Information from these surveys is available for 1985 through 1989. State-listed birds observed during these surveys include pied-billed grebe, common moorhen, great egret, yellow-headed blackbird, double-crested cormorant, black-crowned night heron, and least bittern. All but the least bittern were sighted and recorded again in 1991 (Glass, 1990, 1991; Heidorn et al., 1991).

Black-crowned night herons, a State-listed endangered species, were observed roosting in trees along the river banks in this reach. A night heron rookery is located east of this reach near Lake Calumet. These birds most likely use this area for feeding and roosting, especially during the post-breeding dispersal period.

Fishes and Benthic Invertebrates

In 1976, MWRDGC sampled fish populations at eight stations along the Cal-Sag Channel (Brigham et al., 1978). The stations were distributed along the entire length of the channel, including the confluence with the Chicago Sanitary and Ship Canal (Station 43), the confluence with the western end of Stony Creek (Stations 182, 183, and 185), the confluence with Tinlet Creek (Stations 44, 175, and 186), and the confluence with the eastern end of Stony Creek (Station 171) (Table 21; Figures 7 and 8).

Fifteen species of fishes and 2 hybrids, consisting of 363 individuals, were collected at these 8 stations. The number of species collected per station ranged from 2 to 10, with a mean of 5 species per station. The most abundant species were creek chub, goldfish, green sunfish, and carp, which constituted 70 percent of the total number of fish for all collections.

In 1983, an INHS fish collection was made by Dennison and Dorkin at Ashland Avenue. This collection consisted of gizzard shad, goldfish, carp, fathead minnow, green sunfish, and largemouth bass. An additional collection made by Dennison and Dorkin at the same site in October 1983 included gizzard shad, central mudminnow, brook stickleback, green sunfish and bluegill. These collections compare with a collection made by G. J. Tichacek and P. Vidal near Willow Springs Road in July 1967, which consisted of goldfish, carp, creek chub, white sucker, black bullhead, green sunfish, and bluegill.

In 1991, MWRDGC collected fishes from Station 16 at Cicero Avenue and from Station 17 at Route 83 on the Cal-Sag Channel (Figure 8). A total of 314 fish were caught, representing 14 species and 2 hybrids. Of the total catch, 91 percent was composed of gizzard shad, goldfish, carp, green sunfish, and bluegill (Table 44) (Polls et al., 1992). Maximum IBI scores for the 2 stations were 22 and 24 (Class D stream, limited aquatic resource).

In addition to fish sampling, MWRDGC also conducted surveys of aquatic macroinvertebrates in this reach in 1989, 1990, and 1991 (MWRDGC, 1990; Polls et al., 1991; 1992). Six sampling stations were established on the Cal-Sag Channel: two at Western Avenue in Blue Island, two at Southwest Highway in Worth, and two at Route 83 in Lemont (Figure 8).

In the 1989 survey, these 6 sampling stations yielded a total of 28 benthic species, including 9 species of tubificid worms, 5 species of midges, 4 species of leeches, 4 species of naidid worms, and 3 species of clams. The naidid and tubificid worms were the dominant taxa. The two most abundant species were the tubificid worms *(Limnodrilus hoffmeisteri* and *Quistadrilus multisetosus)* (Table 45).

In 1990, 24 benthic species were collected from all stations, including 9 species of tubificid worms, 4 species of midges, 4 species of naidid worms, and 3 species of leeches. Tubificid worms were most abundant in 1990, comprising 91.1 percent of the invertebrates collected. The tubificid worm *(Quistadrilus multisetosus)* was the most abundant species collected in the channel (Table 46).

In 1991, 23 benthic species were collected from the 6 stations, including 10 species of tubificid worms, 3 species of leeches, 3 species of clams, and 3 species of naidid worms. As with preceding years, tubificid worms were most abundant, comprising 93.1 percent of all organisms collected. The predominant species were the tubificid worms *(Limnodrilus hoffmeisteri* and *Quistadrilus multisetosus)* (Table 47). In September 1983, IEPA staff sampled macroinvertebrates in the Cal-Sag Channel at Route 83 (Station 01, Figure 8) as part of a study of the DesPlaines River Basin. No specimens were collected during this sampling effort (Table 13) (IEPA, 1988).

Waterway Characterization

The physical features of the Cal-Sag Channel are nearly homogenous throughout its length due to its artificial construction. Characterization data were collected at three locations: 1) Kedzie Avenue, Blue Island, 2) Illinois Route 7, 86th Street, Worth, and 3) Route 83 near Lemont (Table 3). Banks of the eastern segment near the Little Calumet River in Blue Island have a 70-degree slope and are composed of large rock rubble and exposed clay. Near Illinois Route 7, walls of cut limestone reveal a slope of 50 degrees, and the banks are composed of less severely sloped rock rubble piles. At the extreme south and west end of the reach, banks are sheer-sided vertical limestone walls. The channel substrate was mainly silt in the central and southern portions of the reach (Table 3).

Canopy and in-stream cover are sparse across the entire length of the Cal-Sag Channel. Canopy cover is absent at the Lemont sampling station, and is only 5 percent in Worth, near Illinois Route 7. Between these widely separated sampling points, canopy cover is no more than 10 percent, resulting in a low degree of shading. Canopy cover is also less than 10 percent at Kedzie Avenue.

A nearly continuous narrow band of cottonwood, willow, and box elder trees occurs on each bank along the length of the reach. These trees create a screen, blocking views of residential and industrial land uses from the waterway.

Though canopy and shading are absent, in-stream cover is present. Undercut banks, aquatic vegetation, and rock ledges, which are beneficial to fish and macroinvertebrates for attachment and cover, are present. Channel maintenance for navigation likely contributes to the absence of other cover, such as fallen trees and log jams.

Natural Areas and Other Natural Land Features

Three Illinois Nature Preserves and five INAI sites are located near the Cal-Sag Channel (Tables 4 and 5). One of the largest and first areas to be granted Illinois Nature Preserve status is the 1,530-acre Cap Sauers Holdings Nature Preserve, owned and managed by FPDCC. This site contains examples of typical glacial topography, including a well-defined esker. The site is vegetated with forest and savanna communities which are under restoration by FPDCC and The Nature Conservancy's volunteer stewardship network.

Palos Fen is another dedicated nature preserve in this reach. Located at 107th Street and Kean Avenue in Palos Hills, this 70-acre parcel is owned and managed by the FPDCC. Fen communities are unique types of wetlands that develop in association with calcium-rich groundwater seepage. This site represents the only known remaining graminoid fen on the former Chicago lakeplain.

The third designated nature preserve in this reach is the 12-acre Sagawau Canyon, located near the FPDCC Camp Sagawau Preserve along 111th Street in Lemont. This preserve has a high-quality dolomite canyon, cliffs, and ravine forests. The cliff community supports some of the most unusual and uncommon plant communities in northeastern Illinois (McFall, 1991).

Five additional INAI sites, totaling 1,275.3 acres, are found in this reach. These are the 40-acre Moraine Valley Community College Nature Area; the 29-acre Chicago Ridge Prairie at Central Avenue and 105th Street; the 2.3-acre Worth Outdoor Classroom near 115th and Ridgeland Avenue; the 1,170-acre McGinnis Slough near 131st Street and 96th Avenue; and the 34-acre Oak Lawn Prairie near Central and 111th Street.

McGinnis Slough is one of the more important wildlife habitats in this reach. Because of its large size and deep marsh habitat structure, it is used by a variety of wetland birds that have become scarce due to habitat loss. Bird species known to use this site include the State-listed endangered yellow-headed blackbird and pied-billed grebe, and the State-listed threatened common moorhen.

FPDCC controls large areas of land both north and south of the Cal-Sag Channel in the western third of Reach 10A. Land south of the Cal-Sag Channel is locally referred to as Sag Valley. North of the channel is Mt. Forest, otherwise known as the Palos Division.

To calculate forest preserve acreage nearest this reach, all Sag Valley Division land and a portion of the Palos Division acreage were considered. Because FPDCC lands near the confluence of the CSSC and the Cal-Sag Channel are located within both Reach 9A and Reach 10A, only acreages for Palos Division tracts south of 107th Street extending to the channel were used. This avoided double-counting open space assigned to Reach 9A.

FPDCC land near the Cal-Sag Channel encompasses 7,190.81 acres. Included in this figure is the acreage of the aforementioned State nature preserves. Other areas in the forest preserve system include Teasons Woods, Tampier Lake, Saganashkee Slough, Camp Sagawau, and Swallow Cliff Woods. Dedicated open space comprises about 40 percent of the Reach 10A corridor (Table 6).

Nine State and federally listed endangered and threatened species are known to occur in Reach 10, including plants, birds, and one insect (Table 7).

Reach 10B: Little Calumet River

Wetlands Characterization

NWI identified and mapped 68 wetlands, totaling 812.8 acres, in Reach 10B. Of this total, 520.7 acres were comprised of the Little Calumet River and adjoining channels designated R2OWHx. Excluding the river channel, the most abundant wetland types were POWHx (16 wetlands), PFO1C (10 wetlands), and PEMC (7 wetlands). These wetlands ranged in size from 0.1 to 33.4 acres and averaged 4.6 acres.

Seven wetlands originally mapped by NWI, totaling 1.1 acres, are no longer in existence, leaving 61 wetlands (811.7 acres). This represents a loss of only 1 percent of the number of originally mapped wetlands.

Seven previously unmapped wetlands, totaling 45.8 acres and averaging 6.5 acres per wetland, were identified during the field inventory. With the addition of these seven newly discovered wetlands, there are currently 68 wetlands, totaling 857.5 acres within Reach 10B (Table 15). This represents a total area 5.5 percent greater than the area previously mapped by NWI.

Three wetlands originally mapped by NWI are larger by 70.62 acres. A POWGx wetland type increased by more than 50 acres. This is an artificially constructed wetland, built mainly for water storage. An additional 19 acres of forested wetland were also mapped in association with an existing forested wetland (PFO1C). This discrepancy is probably due to the margin of error associated with mapping forested wetlands from aerial photography.

Wetland types with the greatest areal coverage include R2OWHx (520.7 acres; 59.8 percent of total wetland and aquatic habitat area), L1OWHx (60.5 acres; 417.1 percent), PEMC/F (56.8 acres; 6.6 percent), PEMA (37.1 acres; 4.3 percent), POWHx (34.8 acres; 4.1 percent), and PFO1A (32.5 acres; 3.4 percent).

Four wetlands, including PEMC, PEMF, and POWGx wetland types, were field-checked. Some of the most abundant herbaceous plants found at these sites were reed canary grass, common reed, river bulrush, and narrow-leaved cattail. Commonly occurring trees were cottonwood and box elder.

Surveys of State-listed endangered and threatened bird species were conducted at Powderhorn Lake from 1985 to 1989. This lake and wetland complex, owned and managed by FPDCC, is larger than 50 acres. It was used in the past as a borrow site.

State-listed species observed at this site included common moorhen, pied-billed grebe, black-crowned night heron, and least bittern (Heidorn et al., 1991). Black-crowned night herons, a State-listed endangered species, were observed roosting in trees along the banks of the Little Calumet River. Rookeries near Lake Calumet exist, and both adults and young likely use the riverbanks for roosting, as well as the river for foraging.

Fishes and Benthic Invertebrates

In 1976, MWRDGC sampled fish populations along the Little Calumet River near Halsted Street (Station 40) and near the Calumet Expressway (Station 165) (Figure 9) (Brigham et al., 1978). In total, 11 species and one hybrid were collected at the two stations using electrofishing. A total of 67 individuals, representing 7 species and 1 hybrid combination, were collected near Halsted Street. Green sunfish, the most abundant species, represented 82 percent of the total number of individuals collected. The collection made at the Calumet Expressway site consisted of 114 individuals, including 7 species and 1 hybrid combination. Gizzard shad, carp, and goldfish were the most abundant species, representing 79 percent of the collection (Table 48).

In 1991, MWRDGC collected fish from the Little Calumet River on four separate occasions at the two stations sampled in 1976 (Figure 9). A total of 963 fish, representing 15 species and 2 hybrids, were collected. The most abundant species were gizzard shad, goldfish, carp, and white perch. One grass pickerel was collected at the Halsted Street site. This species is significant because it is one of the few recent collections made of a pollution-intolerant species in the Chicago and Calumet River Waterway Systems (Table 49). The two sampling stations had maximum IBI values of 28 (Class D stream, limited aquatic resource) and 32 (Class C stream, moderate aquatic resource).

In 1989, the U.S. Geological Survey (USGS) initiated the National Water Quality Assessment Program (NAWQA), a program that evaluated streams across the United States based on the quality of the fisheries, in-stream habitat, and macroinvertebrates. Three of the stations sampled by USGS are within the study corridor. One station is located on the Little Calumet River at Halsted Street. Collections made at this site in August 1990 consisted of white sucker, green sunfish, carp, grass pickerel, bluntnose minnow, goldfish, gizzard shad, fathead minnow, creek chub, and bluegill (Warren, 1991).

NAWQA staff also collected a moderate diversity of aquatic macroinvertebrates, representing the phyla Annelida, Mollusca, and Arthropoda. Although macroinvertebrate data had not yet been published at the time the resource inventory was completed, NAWQA researchers indicated that the most abundant taxa were aquatic worms (Tubificidae), fingernail clams (Sphaerium), isopods (Caecidotea sp), and midge larva (Chironomidae) (T. Cuffney, personal comm).

During May through October 1976, macroinvertebrate sampling was conducted by NIPC in the Little Calumet River as part of a sediment oxygen demand study (Butts and Evans, 1978). Two sampling points were located west of Halsted Street near the juncture of the Little Calumet River and the Cal-Sag Channel. Six taxa were represented in the collection made at Station 79, including leeches *(Myzobdella moorei)*, fingernail clams *(Sphaerium transversum)*, aquatic sow bugs *(Asellus sp.* and *A. communis)*, midge larvae (Chironomidae) and aquatic worms (Oligochaetae). The

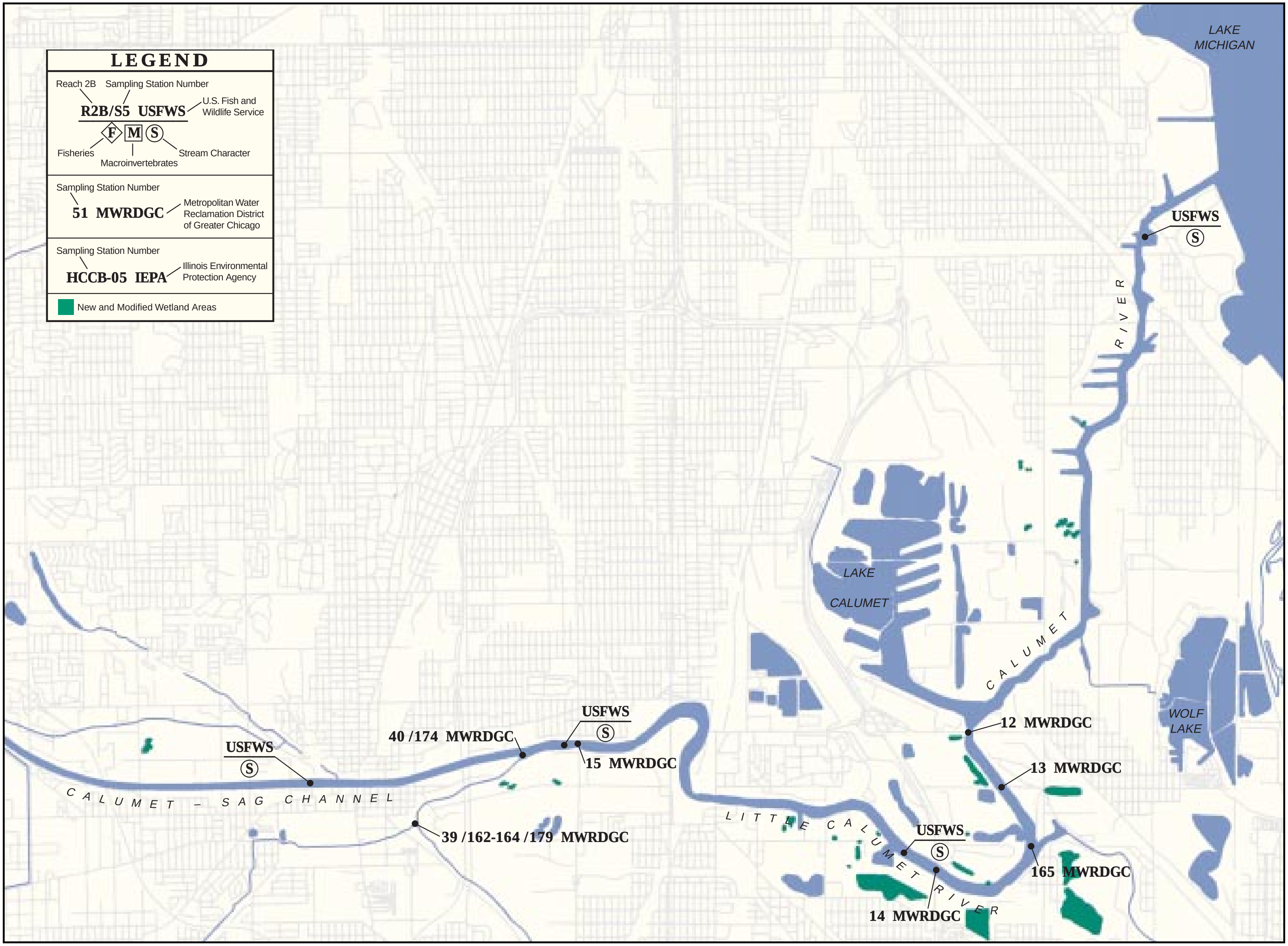


FIGURE 9
Survey Sampling Sites and Wetland Areas, Reaches 10B and 10C

collection made at Station 80 was dominated by aquatic worms (Oligochaetae) but midge larvae (Chironomidae) and the leech *(Myzobdella moorei)* were also included. Stations 74-78 were sampled along the Little Calumet River, and aquatic oligochates and chironomids dominated all collections (Table 18) (Butts and Evans, 1978).

In 1989, 1990, and 1991, MWRDGC sampled for benthic macroinvertebrates. The sampling data and results are discussed in Reach 10A.

INHS collections included specimens of banded killifish and longear sunfish collected by Forbes and Richardson in 1880. In 1967, G.J. Tichacek and P. Vidal collected green sunfish. The crustaceans, *Crangonyx pseudogracilis, Gammarus fasciatus, Orconectes virilis, O. rusticus,* and *Cambarus diogenes,* were collected in 1974. In 1975, L.M. Page collected brown bullhead, mudminnow, banded killifish, green sunfish, pumpkinseed, and largemouth bass. S.G. Dennison made a series of collections from 1988 through 1991 that included alewife, spottail shiner, goldfish, white perch, and orangespotted sunfish.

Waterway Characterization

This stretch (Reach 10B) of the Little Calumet River was dredged and channelized many years ago and is currently maintained to accommodate barges and commercial boat traffic. Stream characterization data were collected at two representative stations (Halsted Street bridge and at the Calumet Expressway). The bank heights at these stations range from 6 to 15 feet. The channel banks are stabilized primarily with sheet pilings. In areas where there are no sheet pilings, the banks are composed of clay, rock, or sand. The bank slope at one station is 30 degrees, whereas the other station has banks with 90-degree slopes. The channel substrate is primarily silt (Table 3).

Instream cover is limited to submerged aquatic vegetation, rock ledges, and submerged tree roots. Trees, shrubs, and forbs can be found along the shoreline, but the canopy is very sparse (5 to 10 percent coverage). Cottonwood and box elder are the dominant trees, and garlic mustard is the most abundant forb.

Natural Areas and Other Natural Land Features

No designated Illinois Nature Preserves are located along this reach. The INAI identified five natural areas near the corridor, including the 50-acre Dolton Avenue Prairie, the 79-acre Burnham Prairie, and the 133-acre Calumet City Prairie. None of these sites is located within the corridor (Table 4). These sites, along with several other prairie remnants located outside the corridor, are a few remnants of the vast lakeplain prairies that formerly ringed Lake Michigan in northeastern Illinois and northwestern Indiana.

Despite their small size, these sites still support significant biological diversity. Collectively, 11 remnant natural areas in the Chicago lakeplain region contain over 760 native vascular plant species. Calumet City Prairie alone has 259 native plant species. These prairies are the only potential habitat where the plant, *Thismia americana,* known only from the Lake Calumet region and currently thought to be extinct, may yet be found. The 222-acre Powderhorn Lake, which includes a marsh and a sand prairie, and Riverdale Marsh, which contains an active heron colony, are two other INAI sites.

There are several forest preserves owned and managed by the FPDCC, located within the Reach 10B corridor. These are Calumet Woods, Joe Louis Golf Course, Whistler Preserve, Beaubien Preserve, and Flatfoot Lake. These preserves comprise about 600 acres, or about 13 percent of the total area within the Reach 10B corridor (Table 6).

Refer to Reach 10A for a listing of known State and federally listed endangered and threatened species that are also found in Reach 10B (Table 7).

Reach 10C: Calumet River

Wetlands Characterization

NWI identified and mapped 69 wetlands, totaling 484.02 acres. Of this total, 210.9 acres were comprised of the Calumet River and associated channels and were designated R2OWHx. Eight additional linear mapping units, totaling 0.9 miles, were designated R2OWHx and were found within this reach. Excluding the riverine mapping units, the most numerically abundant wetland types were PEMF (15 wetlands), POWHx (9 wetlands), and POWFx (8 wetlands). The wetlands ranged from 0.1 acres to 29.4 acres and averaged 5.7 acres. The largest water body closely associated with, but technically beyond this reach, is Lake Calumet, a 3,161.8-acre lake classified as L1OWHx.

Fourteen wetlands originally mapped by NWI, totaling 17.3 acres, are no longer in existence, leaving 56 wetlands (466.7 acres). This represents a loss of 6 percent of the number of originally mapped wetlands. Four previously unmapped wetlands, totaling 4.3 acres, were identified and averaged 1.07 acres per wetland. There are currently 60 wetlands, totaling 471.0 acres, that are located within the study corridor in Reach 10C (Table 15). This represents a total wetland area only slightly larger than the area mapped by NWI. Five wetlands originally mapped by NWI appear to be larger by 1.1 acres. One wetland decreased in size by nearly 2 acres due to filling activities. Wetland types with the greatest total areal coverage include R2OWHx (210.9 acres; 44.8 percent), PEMF (148.2 acres; 31.5 percent), POWFx (32.3 acres; 6.8 percent), and POWHx (29.8 acres; 6.3 percent).

One PFO1C wetland was field-checked. Some of the characteristic species of herbaceous plants recorded at the site were reed canary grass, common reed, and narrow-leaved cattail. Commonly occurring trees included box elder, silver maple, cottonwood, and black willow.

Southern et al. (1981) conducted an inventory of northeastern Illinois wetlands 5 acres or larger and ranked them according to their wetland wildlife habitat value. Factors used in this ranking included percentage of open water, vegetative interspersion, water depth, surrounding land use, and threats.

Ten sites collectively identified as Station C-19 were inventoried in Reach 10C and were ranked Category A (highest quality). Category A includes predominantly deep cattail marshes with good interspersion of open water and emergent vegetation. Most areas provide good habitat for several State-listed endangered and threatened species that depend on semimarsh conditions. In 1981, these 10 sites encompassed 623 acres. As of 1993, 3 of the 10 sites had been filled or highly altered.

Since 1981, surveys for State-listed endangered and threatened species have been conducted at this site. Between 1985 and 1990, 4 of the 10 Station C-19 areas were surveyed. A summary of these surveys by site is provided below (Glass, 1990, 1991; Heidorn et al., 1991).

Wetland C19A is located west of Torrence Avenue and south of 120th Street. Between 1985 and 1989, this wetland was the site of a heron rookery and provided suitable habitat for adult black terns, black-crowned night herons, common moorhens, great egrets, and yellow-headed blackbirds (Heidorn et al., 1991).

Station C19B is located on the north side of 120th Street. According to Heidorn & Glass (1991), adult black terns, black-crowned night herons, common moorhens, and yellow-headed blackbirds were consistently observed between 1985 and 1989. One American bittern was recorded at C19B in 1986, and a pied-billed grebe was noted in 1985. Common moorhens were among the nine species reported for the 1990 survey (Glass, 1990). Glass (1991) reported 15 bird species at this wetland in 1991, including black-crowned night herons, yellow-headed blackbirds, common moorhens, and great egrets.

Deadstick Pond (Station C19C), located near the end of 120th Street at Lake Calumet, was also surveyed. Pied-billed grebes, black-crowned night herons, yellow-headed blackbirds,and common moorhens have each been recorded during at least one survey.

Station C19D, also known as the 130th Street Marsh, is situated south of the Chicago South Shore and South Bend Railway and west of Torrence Avenue. Common moorhens, yellow-headed blackbirds, pied-billed grebes and black-crowned night herons were observed during at least one survey.

Fishes and Benthic Invertebrates

Since 1876, the fishes of the Calumet River have been periodically surveyed (Nelson, 1876; Meek and Hildebrand, 1910; Dennison, 1978; Greenfield and Rogner, 1984), as have the fishes of Lake Calumet (Forbes and Richardson, 1920; Vidal and Wight, 1975; Polls et al., 1980; Greenfield and Rogner, 1984). Nelson (1876) cited records of nine fish species collected from the Calumet River, including lake sturgeon, longnose gar, blackchin shiner, pirate perch, green sunfish, bluegill, largemouth bass, yellow perch, and log perch.

Meek and Hildebrand (1910) also cite records of grass pickerel, northern pike, white sucker, bowfin, lake chubsucker, golden shiner, black bullhead, yellow bullhead, and bluegill.

Dennison (1978) collected 13 fish species from the river, including alewife, gizzard shad, bluntnose minnow, carp, goldfish, spottail shiner, emerald shiner, black crappie, orangespotted sunfish, green sunfish, pumpkinseed, yellow perch, and largemouth bass (Greenfield and Rogner, 1984).

Polls et al. (1980) collected the following species from Turning Basin Station 5: gizzard shad, central mudminnow, bluntnose minnow, fathead minnow, carp, goldfish, golden shiner, sand shiner, spottail shiner, emerald shiner, black crappie, orangespotted sunfish, bluegill, green sunfish, pumpkinseed, yellow perch, and largemouth bass (Greenfield and Rogner, 1984).

In 1991, fishes were collected using electrofishing gear by MWRDGC from the Calumet River at 130th Street and downstream at the O'Brien Lock & Dam (Figure 9). The station located near the O'Brien Lock & Dam is technically in Reach 10B, but because the data were combined for both stations, the results from both Calumet River fish sampling stations are presented here.

Approximately 1,150 individual fish, representing 26 species and 3 hybrids, were collected from the Calumet River station. By number, the most abundant fish were gizzard shad, bluntnose minnow, green sunfish, bluegill and largemouth bass. Although only 57 carp were collected, their total weight was more than half of the total sample weight (Table 50). The 2 sampling stations had maximum IBI scores of 32 and 34 (Class C stream, moderate aquatic resource).

Fish collections made by S. G. Dennison between 1988 through 1991, and maintained by INHS, included quillback, black buffalo, white perch, white bass, spottail shiner, stickleback sp., warmouth, pumpkinseed x bluegill, pumpkinseed x green sunfish, and pumpkinseed x orangespotted sunfish.

In addition to fish sampling, MWRDGC also sampled benthic macroinvertebrates from two stations in this reach in 1989, 1990, and 1991 (MWRDGC, 1990; Polls et al., 1991, 1992). The two sampling stations were located at 95th Street and at 130th Street, upstream from the O'Brien Lock & Dam (Figure 9).

Fifty-six benthic species were collected from the Calumet River during the 1989 survey. The most abundant species were naidid and tubificid worms and chironomid midges. The most numerically abundant species were the midge *(Procladius sp.)*, the naidid worm *(Vejdovskyella intermedia)* and the tubificid worms *(L. hoffmeisteri* and *Q. multisetosus)* (Table 51).

Sixty-five species were identified from the 1990 survey. Tubificid worms comprised more than 60 percent of the total number of individuals collected. Common macroinvertebrates from this sampling period were the midge *(Procladius sp)*, the naidid worm *(N. variabilis)*, and the tubificid worm *(L. udekemainus)* (Table 52). In 1991, 44 species were collected. Tubificid and naidid worms again comprised the most abundant species groups. The most abundant species were the naidid *(V. intermedia)* and the midge *(Procladius sp.)* (Table 53).

Waterway Characterization

The physical appearance and character of Reach 10C is similar to those of the South Fork of the Chicago River and the upper portions of the CSSC. Physical features are homogenous throughout. Data were collected at Turning Basin Station 1 near East 95th Street in South Chicago. Water depth in Turning Basin Station 1 ranges from 25 to 30 feet. A single sediment sample collected in this reach was composed of approximately 80 percent silt and 20 percent sand. The banks along Reach 10C are lined with steel sheet pilings, backfilled and stabilized in places with large rocks. From the channel waterline, both banks have a slope of 90 degrees and are 10 feet in height from the waterline to the top of the bank (Table 3).

Land use is dominated by heavy industry, ore, mineral storage areas, and freighter terminals requiring river access. Riverside industrial development has precluded the growth of woody vegetation that might provide shading. The only vegetation along the channel consists of weedy grasses and herbs. The river banks are devoid of vegetation at the Acme Steel and Wisconsin Steel sites. The coal, slag, and mineral piles present harsh environmental conditions that prevent plant growth. Total plant cover never exceeds 40 percent in those areas with vegetation. Tree canopy and in-stream cover are conspicuously absent throughout Reach 10C.

Natural Areas and Other Natural Land Features

Although there are no dedicated Illinois Nature Preserves in Reach 10C, four INAI sites were identified in or near this reach (Table 4). The 130th Street Marsh is the only one of the four INAI sites actually located within the study corridor. This area is recognized for breeding populations of rare marsh nesting birds.

A second site consists of Lake Calumet and its associated marshlands, which, combined, total 3,145 acres. Despite having been significantly altered by industry and associated activities, this area receives extensive use by migratory waterfowl, shorebirds, and other marsh birds, and supports breeding populations of a variety of wetland-dependent marsh birds. One of these adjacent wetlands, popularly known as Big Marsh, has supported the largest breeding colony of black-crowned night herons Illinois.

Most of these wetlands are located in an area bounded by Lake Calumet on the west, Torrence Avenue on the east, 103rd Street on the north, and 127th street on the south. Lake Calumet and its associated marshlands are the most significant wildlife habitats in or near the entire study corridor. The Calumet Sedge Meadow near Lake Calumet at 96th Street and Wolf Lake, owned by IDNR, are INAI sites. Wolf Lake, like the preceding two areas, lies slightly beyond the study limits. Eggers Grove and Wolf Lake Overlook, two FPDCC holdings totaling 249 acres, are located along the northern segment of Wolf Lake. According to FPDCC documents, a population of Sassafras trees uncommon to Cook County are located within Eggers Grove. Eggers Grove and Wolf Lake Overlook are the sole FPDCC holdings within or adjacent to this subreach (Table 6).

Despite the significant natural areas and wildlife habitat within or adjacent to Reach 10C, relatively little land within or adjacent to the corridor is dedicated public natural open space. This is largely due to the extensive commercial and industrial use of the area.

For a list of recent records of federally or State-listed endangered and threatened species, see discussion under Reach 10A and Table 7.

CONCLUSIONS

Wetlands

The purpose of this portion of the study is to summarize existing National Wetlands Inventory information by reach and to update the NWI mapping. Because of extensive land development that occurred during the decade since the original NWI mapping was conducted, significant changes could have occurred in the distribution of wetlands in the corridor. Revised mapping would provide a more accurate baseline for future watershed planning.

In reviewing the wetlands data generated through this work, it is important to understand that NWI identifies and maps areas other than natural vegetated wetlands. In addition to wetlands, NWI maps deepwater habitats which are commonly referred to as lakes. Because of the operational definition of a wetland, shallow open water areas that lack vegetation, commonly known as ponds, are identified as wetlands. Such areas are identified and mapped whether they are natural or artificial. In a landscape as altered by human activity as the Chicago region, artificial waters and wetlands are expected to comprise a significant proportion of all aquatic and wetland habitats.

Of the 15 reaches and subreaches studied, Reaches 4, 5B, and 6 have no wetlands associated with them outside of the channel itself. These reaches are in densely developed portions of the City of Chicago. In 9 of the remaining 12 reaches, artificial open water bodies ranked first among wetland types in *total number* of wetlands, and in 7 of these reaches, artificial open water bodies ranked first among wetland types in *total acreage.*

When considering only “new” (previously unmapped) wetlands, artificial open water bodies comprised the most abundant wetland type in 6 of the 12 reaches. Most of these open water wetlands are urban stormwater detention basins that were constructed to meet local or regional stormwater management ordinances.

Because most new residential or commercial construction requires stormwater detention, the greatest abundance of such wetlands, especially those that have appeared since the original NWI mapping, can be expected to be located in areas that experience the most rapid development. In fact, 85 percent of the total “new” wetlands are located in Reaches 1, 2B, and 3, where open water wetlands comprise the most abundant “new” wetland type. These reaches traverse Lake County and portions of northern Cook County, where explosive development has occurred since the 1980’s.

Although these areas collectively represent a significant area, they are of limited value as wildlife habitat. Most wetlands are small and isolated from other habitat by development. Water quality is typically poor, since the primary source of water is runoff from streets, parking lots, and other impervious surfaces.

Wetland losses were expected to be significant during the interval between the original NWI mapping and the inventory conducted for this study. Losses in all reaches were less than 1 percent, with the exception of Reach 10C, which experienced a 6-percent loss. Presumably, regulatory programs such as Section 404 of the Clean Water Act, State floodplain regulations, and local stormwater ordinances, as well as a better public understanding of the importance of wetlands, have helped to limit wetland losses.

Upon a cursory review, the most startling findings might be the overall net increases in wetland acreage that were reported for all reaches. These increases ranged from less than 1 percent (Reach 10C) to 56 percent (Reach 5A). Increases in Reaches 1, 2B, and 3 were all 23 percent. Smaller increases were seen in lower reaches, although they ranged from 1 to 8 percent. To a great extent, these increases reflected the number of excavated ponds constructed during the intervening period. These would likely have been identified using the methods employed by the original NWI, and therefore are directly comparable to the original NWI maps. However, as stated in the Study Methodology section, the results of this inventory are not directly comparable to the NWI effort because mapping procedures and materials differed significantly. The differences would be most pronounced in the identification of previously unmapped natural wetlands, especially those that are seasonally saturated or inundated for only brief periods.

This study used low-altitude, high-resolution aerial photographs, that were supported by extensive ground-truthing. Published data, such as soil surveys and notes on plant communities, were used to supplement the data.

Wetlands that are difficult to identify using NWI procedures (e.g., forested wetlands, temporarily inundated or saturated wetlands) were identified with greater certainty. For example, this study identified 11 previously unmapped forested wetlands in Reach 2B. It is unlikely that these truly represent "new" wetlands that appeared on the landscape, but rather are wetlands that were beyond the limits of resolution of NWI or were outside of the operational definition of wetlands used by NWI at the time of mapping.

Fishes and Benthic Macroinvertebrates

Fish communities in undisturbed habitats have characteristic structure and composition that change when the physical habitat or chemical/water quality is altered. Populations become grossly imbalanced in favor of habitat "generalists," such as green sunfish and fathead minnows, at the expense of habitat "specialists," such as darters that are intolerant of habitat degradation. Overall species richness decreases, as does the proportion of top carnivores. Physical simplification of the habitat occurring through stream channelization eliminates species-isolating mechanisms and promotes hybridization. These and other community characteristics have been developed into a series of metrics and incorporated into an Index of Biotic Integrity (IBI), which is an accepted standard for evaluating stream fish communities in the Midwest (Karr et al., 1986).

Biotic indices of benthic macroinvertebrates use the concept of the indicator species, which are species that have specific tolerances relative to a known set of physical or chemical conditions. Biotic indices assess the degree of pollution in an aquatic system, based on known tolerances or sensitivities of macroinvertebrate species to specific pollutants (Rosenberg and Resh, 1993). For example, in most regions, chironomid midges are reliable indicators of organic pollution. Similarly, the abundance of the tubificid worm *(Limnodrilus hoffmeisteri)* increases with organic pollution. Thus, the dominance of these taxa strongly suggests significant environmental disturbance, especially in the absence of taxa that are intolerant of environmental disturbance.

Over the past 20 years, periodic fish sampling has been conducted in most reaches of the Chicago Waterway System. In general, fish populations that are severely impacted by habitat degradation caused by physical habitat modification, sediment contamination, point and non-point discharges, high flows, combined sewer overflows, and other factors occur throughout most of the reaches. However, improvement in the fish community has occurred over the last 20 years. This improvement is a key trend because the fish communities in most reaches are still moderately to severely degraded.

Collections throughout most of the system were dominated by green sunfish, carp, and goldfish, species that are tolerant of high turbidity and low dissolved oxygen. Carnivorous fishes were sporadically present in low numbers, and are moderately pollution-tolerant species (e.g., black crappie; largemouth bass). Hybrids of carp and goldfish and of various sunfishes were also present in most surveys. Hybrids are also indicative of environmental stresses and the breakdown of species-isolating mechanisms. As a result of the long history of municipal and industrial pollutant discharges and from urban runoff, fish populations, as a whole, are limited to the more pollution-tolerant species.

Similarly, benthic invertebrate communities range from moderately tolerant to highly tolerant. The most depauperate invertebrate communities occur in the soft sediments of the deep draft reaches of the waterway system. Some evidence shows that the number of benthic invertebrate species has increased over the years and the percentage composition has changed. However, benthic invertebrate communities overall remain degraded.

Because the upper reaches of the Chicago Waterway System comprise the headwaters and have not been as intensively developed for urban use as have the middle and lower reaches, the three upper forks of the North Branch appear not to have been subject to the severity of habitat degradation as have the lower reaches. This is somewhat obscured by a less well-developed historic collection record and by the fact that species diversity naturally tends to increase from headwaters to lower reaches.

A total of 14, 16, and 9 fish species were collected from Reaches 1, 2B, and 3, respectively, which compares favorably with collections made by MWRDGC in the early 1980's (Brigham et al., 1978). The collections, however, were all dominated by species considered pollution-tolerant, and were disproportionately represented by green sunfish and fathead minnows.

Hite and Bertrand (1989) classified the Middle Fork (Reach 2B) as a Grade D stream, or a limited aquatic resource. Mierzwa and Beltz (1994), however, calculated an IBI score of 31 for the same reach, based on a single collection. This equates to a Grade C classification, or a moderate aquatic resource. Water quality data cited in Brigham et al. (1978) showed elevated levels of ammonia nitrogen, silver, and cyanide in the upper reaches, suggesting chemical pollution as an important factor impacting fish populations. Still, with only 11 fish species known historically from these reaches, there is little evidence that species richness has declined over time. It is also not known how thoroughly these reaches were sampled prior to large-scale habitat alteration.

Collection of an Iowa darter, a State-listed endangered species, from the West Fork (Reach 1) is significant. Originally, the Iowa darter was common throughout the northern portion of Illinois, but was presumably decimated by increased turbidity and the drainage of natural bodies of standing water (Smith, 1979). As a group, darters are considered to be intolerant of habitat degradation, although some can withstand low oxygen concentrations. Others (e.g., Johnny darter) are widely distributed and are routinely found in rather degraded conditions.

Other noteworthy species collected include a young-of-the-year northern pike and one of the native madtoms *(Noturus* sp.) from the Middle Fork (Reach 2B). The northern pike is significant because it suggests reproduction is occurring by a relatively intolerant species. A single madtom was the only record for this genus in the Chicago Waterway System.

Fish community composition in this waterway is limited by structural habitat diversity, water quality, and sediment contamination. The extent that water quality or sediment contamination has on fish populations in the upper reaches is unknown. However, stream habitat structure in all three forks of the North Branch has been greatly simplified through stream channelization. The presence of these three fish species (Iowa darter, northern pike, and native madtoms) suggests that water quality, although poor, may not be limiting. It is possible that in-stream habitat enhancement and streamside wetland creation could be directed at these upper reaches in ways that could benefit remnant fish species diversity.

Benthic invertebrate populations are also more diverse in the upper reaches than in the lower reaches, probably due to the same influences affecting fish communities. MBI scores for Reaches 1, 2A, 2B, 3, 5A and 5B are all within the moderately pollution-tolerant range. The benthic invertebrate communities found in the upper reaches are significantly more diverse than downstream. These communities consist of beetles, true bugs, mayflies, caddisflies, dragonflies, sowbugs, snails, and clams. None of the benthic taxa collected are considered intolerant of pollution, but are considerably less tolerant than than the predominant species collected in the lower reaches.

Fish species diversity appears to decline in Reach 5A below the confluence of the three forks of the North Branch and upstream of the North Shore Channel. Repeated collection attempts by MWRDGC in 1976 in this reach produced no fish (cited in Brigham et al, 1978). Only three species were collected at two stations by MWRDGC in 1980 (Schmeelk et al., 1984), and six species were collected at one station in 1981 (Schmeelk, 1985). Sampling conducted through NAWQA in 1990 resulted in collecting only four species (Warren, 1991), and no fish were collected at two stations in 1993. The fish species represented in these surveys (carp, pumpkinseed, fathead minnow, green sunfish, white sucker, yellow bullhead, and largemouth bass) are considered moderately to highly tolerant of degraded habitat conditions.

Low fish species diversity in this reach seems somewhat anomalous because the stream channel retains far more natural habitat than the three forks which support a more diverse fish community. This occurrence is also counter to the trend for fish species diversity which increases with greater stream order and higher habitat complexity associated with the downstream versus upstream reaches. Either water quality may be limiting fish species diversity or the small sample sizes may be due to sampling bias.

Fish and invertebrate communities remain significantly degraded in the middle and lower reaches, although improvement has been documented in recent years largely due to improvements in municipal waste treatment.

One of the most dramatic improvements in water quality in the Chicago Waterway System during the last 20 years is in the fish species composition in the North Shore Channel (Reach 4). In 1976, MWRDGC collected 12 species from this reach, all of which were represented at the Sheridan Road Station nearest Lake Michigan.

Collections made at two stations located downstream on the North Shore Channel totaled three and two species, respectively (Brigham et al, 1978). The greater diversity of species at the Sheridan Road Station was due to the proximity to Lake Michigan, which is the upstream source of water for the channel. Diversity was greatly reduced downstream because of progressively poorer water quality.

In contrast, sampling conducted by MWRDGC at four North Shore Channel Stations in 1991 from upstream (nearest lake Michigan) to downstream, resulted in collecting 21, 15, 15, and 16 species, respectively, for a total of 25 species from the entire Reach (Dennison et al., 1992). This corresponds to a period of significant increases in dissolved oxygen and reductions in ammonia nitrogen and suspended solids downstream of the MWRDGC North Side Water Reclamation Plant (Polls et al., 1994).

Despite this increase in fish species richness, overall biotic integrity remains poor to fair. Calculated IBI values for the four sampling stations on the North Shore Channel ranged from 20 (very poor stream quality, a restricted use aquatic resource) to 34 (fair stream quality, a moderate aquatic resource), with an average IBI of 27 for all samplings at all stations (Dennison et al., 1992).

A similar trend is noted in the deep draft portion of the North Branch of the Chicago River (Reach 5B). Four fish species were collected at one station and no fish were collected at a second station (Brigham et al., 1978). Dennison, et al (1992) recorded 16 species at 2 stations in this same reach. IBI values, however, ranged from 18 (very poor stream quality, a restricted use aquatic resource) to 24 (poor stream quality, limited aquatic resource).

The southern reaches of the waterway system, including the South Branch, Chicago Sanitary and Ship Canal, and the Cal-Sag Channel, are all characterized by pollution-tolerant fish communities, reflecting a long history of habitat degradation caused by of channelization, dredging, pollutant discharges, contaminated urban runoff, and sediment contamination. The fish community tends to be highly imbalanced and dominated by relatively few habitat generalists that are tolerant of habitat degradation.

Existing conditions have been documented through two collections. In 1994, a fisheries investigation of the upper Illinois Waterway conducted for Commonwealth Edison by EA Engineering, Science, and Technology (1995) described the fish assemblage in the Lockport Pool (Reaches 8, 9A, and 9B) as very poor. The fish community was characterized by low fish abundance and was dominated by highly tolerant species.

Collections made by MWRDGC (Dennison et al., 1992) in the Chicago Sanitary and Ship Canal resulted in 19 species, but were overwhelmingly dominated by carp, goldfish, and bluntnose minnows. IBI values at the sampling stations in this reach ranged from 16 to 30 (very poor to poor stream quality). In the same reach, MWRDGC collected only four species of fish in 1977, reflecting considerable improvement in habitat quality (cited in Brigham et al., 1978) .

The Cal-Sag Channel is similar to the Chicago Sanitary and Ship Canal in the quality of its fish communities. Dennison, et al (1992), however, found a greater species richness and higher IBI values in the Calumet River, reflecting its connection and proximity to Lake Michigan and Lake Calumet. This phenomenon was also observed near the mouths of the Chicago River and the North Shore Channel.

In summary, fish communities throughout the Chicago Waterway System and in the lower reaches have become significantly more diverse during the last 20 years. However, they remain moderately to severely degraded by objective standards. The degraded condition of the fish communities is related both to physical habitat simplification that has occurred as a result of navigational dredging and to poor water quality caused by large inputs of urban runoff and residual contamination.

The benthic invertebrate community also reflects extremely degraded sediment quality. Surveys conducted throughout the middle and lower reaches were dominated by naidid and tubificid worms and by chironomid midges, which proliferate in silty, organically rich substrates. The long history of municipal and industrial discharges, bank and upland erosion throughout the watershed, and a low energy depositional environment have resulted in a buildup of organically rich silt deposits. These present a poor substrate for invertebrate colonization.

Maintenance dredging for navigation has removed most in-stream structures that would otherwise serve as attachments for benthic invertebrates. Commercial vessels create constant turbulence which physically displace benthic invertebrates and resuspend silt, causing chronic turbidity (Environmental Science and Engineering, 1995). All of these factors combine to create a hostile environment for all but the most tolerant invertebrates.

Waterways

Reaches 1, 2A, 2B, 3, and 5A have distinctive physical habitat and faunal characteristics. Although these stream segments have been extensively channelized, they retain a distinct headwater character, including shallows, limited riffle and pool sequences, and in-stream structure. By contrast, middle and lower reaches have been deepened for navigation and more closely resemble lotic habitat. These reaches have also been more severely degraded from municipal and industrial pollution which, although significantly abated in recent years, continues to pollute sediments.

Upper reaches are generally smaller and shallower and have at least some areas of firm substrate. Stream velocities, particularly under high-flow conditions, are much higher than the deep draft portions of the waterway which allow for some bottom scouring and bedload transport. This situation minimizes the accumulation of organically rich, contaminated bottom sediments. Sunlight penetrates to the stream bottom in many of the shallowest reaches, and there is often an abundance of course particulate organic material (e.g. sticks, leaves, and root masses) which serves as attachment sites for benthic invertebrates.

Upper reaches are also above most point-source discharges, and the watershed is less intensively developed. Less development results in a lower volume of contaminated urban discharges to the stream. A combination of better water quality and greater habitat diversity is likely responsible for the greater species diversity found in the upper reaches.

The remainder of the Chicago Waterway System from the mouth of the North Shore Channel in Wilmette south to the Lockport lock and eastward through the Cal-Sag Channel to Calumet Harbor has been repeatedly dredged and deepened for commercial navigation. This area has also served the Chicago metropolitan area's waste disposal needs since the 1800's. Thus, its basic character is radically different from upstream reaches, as reflected by different fauna.

Aquatic macrophytes are extremely limited in areal extent in the lower reaches, although occasional aquatic macrophyte beds can be found in channel border locations (Environmental Science and Engineering, Inc., 1994a). Prior to the 1980's, aquatic macrophytes were absent in the lower reaches of the waterway system (Irwin Polls, MWRDGC, pers. comm.). Macrophytes are important to aquatic systems for a variety of reasons. Several functions that aquatic macrophytes perform are nutrient retention and removal, stormwater detention/flood flow alteration, sediment detention, fish and wildlife habitat, shoreline stabilization, and water quality improvement. These plant communities also provide habitat for aquatic invertebrates and fish, as well as food supply and nesting habitat for waterfowl and wading birds (Adamus et al., 1991).

Overall, water quality in the lower reaches is probably adequate to support aquatic macrophytes and a host of invertebrates dependent on them if physical habitat characteristics were not limiting. Turbidity, poor sediment quality, and excessive water depths have been identified as factors limiting plant growth in the pool above Lockport (Tazik, 1995). In these reaches, main channel borders provide the only available habitat, but even these areas are generally unsuitable because they typically are lined with seawalls or riprap, which create a high energy, scouring environment. The result has been a very limited distribution of macrophyte beds, consisting of common species that are relatively pollution-tolerant.

Water quality, as reflected in the recent diversification of fish communities, has improved markedly during the last 20 years (Polls et al., 1994). Further improvements in water quality will likely occur as the benefits of the recently constructed Sidestream Elevated Pool Aeration systems are realized. Other factors, such as watershed characteristics, sediment quality, and physical habitat limitations, will limit the extent of recovery and rehabilitation.

Nearly the entire Chicago Waterway System has been channelized, which has created uniform habitat conditions unsuitable for habitat specialists. This condition is most prevalent throughout the southern two-thirds of the project area, where the channel has been greatly enlarged and modified for commercial navigation and the banks have been supported with steel sheet piling or riprap. Structurally, this modification has created continuous, uniform pool habitat without riffle and pool sequences, raceways, undercut banks, debris piles, sand and gravel bars, or marshy backwaters. Species typically adapted to such habitats are lost from the system.

Upper reaches of the waterway are much narrower and shallower than the lower reaches. Some stretches either retain or are redeveloping instream and streamside habitat structure. The greatest opportunity to reconstruct stream habitat as a means of further diversifying aquatic communities is available in the upper reaches. Headwaters also hold the greatest potential for such activities. If habitat structure can be redeveloped, then there is further opportunity to improve aquatic communities through watershed management practices. The upper reaches provide the greatest opportunity for watershed management activities because they are less densely developed. These activities could include a combination of wetland restoration, stormwater detention pond retrofitting, streamside buffers, vegetated drainage swales and other practices.

Historically, water quality in the Chicago Waterway System has been poor due to municipal and industrial discharges. Since the enactment of the Clean Water Act, these pollution sources have been significantly abated, and the recent diversification in the fish populations is mostly attributable to lower levels of pollutants in point source discharges.

Additional improvements may be seen as the Tunnel and Reservoir Project becomes fully implemented. It is possible, however, that the most significant improvements reflected in overall stream biodiversity have already occurred. Efforts to further curtail municipal and industrial discharges may be met with diminishing returns due to the fixed characteristics of the watershed.

The Chicago Waterway System watershed is largely urbanized and is mainly characterized by impervious surfaces. Impervious surfaces collect pollutants deposited from various sources where they are quickly washed into receiving waters during rainfall. Several recent studies (discussed in Schueler, 1994) show that water quality cannot be maintained under a certain threshold of imperviousness, and that common indicators of stream health (e.g., benthic invertebrate diversity) show significant drops in urban streams, sometimes with as little as 10-15 percent surrounding imperviousness. At this threshold, intolerant or specialized invertebrates begin to be replaced by tolerant species such as chironomids and tubificid worms, which are the dominant benthic fauna in the Chicago Waterway System. Not only do impervious surfaces affect stream communities due to pollutant loads, higher peak flows occur, which destabilize and simplify channel structure. These events affect the structural component of habitat quality.

Elimination of future municipal and industrial waste discharges can be achieved through regulatory programs aimed at principal polluters. However, when pollutant sources are as diffuse as atmospheric deposition and automobile use, or consist of in-place pollutants associated with stable sediments whose removal is neither logistically nor economically practical, the remedy is not easy. Modifying watershed runoff characteristics in fully developed areas to reduce this pollutant source will require a sustained and coordinated watershed planning effort involving many local governments and planning bodies. A small-scale demonstration project in the Chicago area could demonstrate how such modifications could be achieved.

TABLE 1
Fish and Benthic Invertebrate Sampling Locations, 1993

REACH	STATION	LOCATION	DATE SAMPLED
1	1	Lincolnshire, I-294 near Old Mill Road	9-10-93
1	2	Deerfield, Greenwood Ave at Wilmont Road	8-26-93
1	3	Techny, north and south of Techny Road bridge	8-26-93
1	4	Golf, north of Golf Road bridge	8-26-93
2A	1	Glenview, north of Golf Road bridge	8-12-93
2A	2	Glenview, north of Glenview Road bridge	8-26-93
2B	1	Waukegan, between Atkinson Road & IL Route 137.	8-20-93
2B	2	Lake Forest, north of IL Route 60	8-20-93
2B	3	Lake Forest, north and south of Old Mill Road bridge	8-20-93
2B	4	Deerfield, at Warwick Road pump house	8-20-93
2B	5	Northbrook, north of Dundee Road bridge	8-20-93
2B	6	Northfield, north and south of Winnetka Road bridge	9-10-93
3	1	Lake Forest, west of Laurel Avenue, north of foot bridge	8-12-93
3	2	Lake Forest, north of Old Elm Road bridge	8-12-93
3	3	Winnetka, north of Winnetka Road bridge to weir	8-12-93
5A	1	Morton Grove, north of Oakton Street bridge	9-10-93
5A	2	Chicago, west of Pulaski Avenue bridge, at St. Lucas Cemetary	9-10-93

Sources: U.S. Fish and Wildlife Service and U.S. Army Corps of Engineers, 1993.

TABLE 2
Fishes Known to Occur in Chicago Waterways

Common name	Scientific name
ORDER CLUPEIFORMES	
Clupeidae - herrings	
Alewife	*Alosa pseudoharengus*
Gizzard shad	*Dorosoma cepedianum*
ORDER CYPRINIFORMES	
Cyprinidae - carps and minnows	
Bluntnose minnow	*Pimephales notatus*
Bullhead minnow	*Pimephales vigilax*
Carp	*Cyprinus carpio*
Creek chub	*Semotilus atromaculatus*
Emerald shiner	*Notropis atherinoides*
Fathead minnow	*Pimephales promelas*
Golden shiner	*Notemigonus crysoleucas*
Goldfish	*Carassius auratus*
Longnose dace	*Rhinichthys cataractae*
Pugnose minnow	*Notropis emiliae*
Sand shiner	*Notropis stramineus*
Silvery minnow	*Hybognathus sp.*
Spottail shiner	*Notropis hudsonius*
Carp x goldfish hybrid	
Catostomidae - suckers	
Black buffalo	*Ictiobus niger*
Quillback	*Carpiodes cyprinus*
Shorthead redhorse	*Moxostoma macrolepidotum*
White sucker	*Catostomus commersoni*
Cobitidae - loaches	
Oriental weatherfish	*Misgurnus anguillicaudatus*
ORDER SILURIFORMES	
Ictaluridae - bullhead catfishes	
Black bullhead	*Ameiurus melas*
Yellow bullhead	*Ameiurus natalis*
Channel catfish	*Ictalurus punctatus*
Madtom catfish	*Noturus sp.*
ORDER SALMONIFORMES	
Esocidae - pikes	
Grass pickerel	*Esox americanus vermiculatus*
Northern pike	*Esox lucius*
Umbridae - mudminnows	
Central mudminnow	*Umbra limi*
Osmeridae - smelts	
Rainbow smelt	*Osmerus mordax*
Salmonidae - trouts	
Brown trout	*Salmo trutta*
Chinook salmon	*Oncorhynchus tshawytscha*
Coho salmon	*Oncorhynchus kisutch*
Rainbow trout	*Oncorhynchus mykiss*
ORDER PERCOPSIFORMES	
Percopsidae - trout-perches	
Trout-perch	*Percopsis omiscomaycus*
ORDER GADIFORMES	
Gadidae - cods	
Burbot	*Lota lota*
ORDER ATHERINIFORMES	
Poeciliidae - livebearers	
Western mosquitofish	*Gambusia affinis*
ORDER GASTEROSTEIFORMES	
Gasterosteidae - sticklebacks	
Ninespine stickleback	*Pungitius pungitius*
Threespine stickleback	*Gasterosteus aculeatus*
ORDER SCORPAENIFORMES	
Cottidae - sculpins	
Mottled sculpin	*Cottus bairdi*
ORDER PERCIFORMES	
Centrarchidae - sunfishes	
Black crappie	*Pomoxis nigromaculatus*
Bluegill	*Lepomis macrochirus Rafinesque*
Green sunfish	*Lepomis cyanellus Rafinesque*
Largemouth bass	*Micropterus salmoides*
Orangespotted sunfish	*Lepomis humilis*
Pumpkinseed	*Lepomis gibbosus*
Rock bass	*Ambloplites rupestris*
Smallmouth bass	*Micropterus dolomieu*
White crappie	*Pomoxis annularis*
Green sunfish x pumpkinseed hybrid	
Green sunfish x bluegill hybrid	
Pumpkinseed x bluegill hybrid	
Percidae - perches	
Iowa darter	*Etheostoma exile*
Johnny darter	*Etheostoma nigrum*
Yellow perch	*Perca flavescens*
Percichthyidae - temperate perches	
White bass	*Morone chrysops*
White perch	*Morone americana*
Yellow bass	*Morone mississippiensis*
Sciaenidae - drums	
Freshwater drum	*Aplodinotus grunniens*

Source: U.S. Fish and Wildlife Service, 1994.

TABLE 3
Stream Channel Morphology and Cover Characteristics of Chicago Waterways, 1993

Reach	Station	Channel Modification	Bank Height (feet)	Slope (Degrees)	Bank Stabilized	Bank Composition	Channel Substrate	In-Stream Cover*	Percentage of Canopy
1	Duffy Lane	Old Channelization	10	30	No	Clay	Silt-mud	4,8	50%
1	Dundee Road	Old Channelization	10	25	No	Clay	Silt-mud	6,7	30%
1	Techny Road	Old Channelization	4	35	No	Clay	Gravel, Silt-mud	4,2,8	50%
1	Glenview Road	Old Channelization	10	35	No	Rock, Clay	Gravel	2,4,7	70%
1	Greenwood Road	Old Channelization	8	45	No	Clay	Gravel, Sand, Silt	4,8 & Concrete	60%
1	Golf Road	Old Channel w/Rock	5	30	Yes	Silt & Rock	Silt-mud, Gravel	7,8	20%
2A	Near Glenview Road	Old Channelization	3,12	2,45	No	Clay, Sand	Silt-mud, Sand	2,4,8	60%
2B	Atkinson Road	Old Channelization	4	80	No	Clay w/rock	Gravel, Sand, Silt	2,4,5,6,7,8	100%
2B	IL Route 60	Old Channelization	8	35	No	Clay, Silt	Silt-mud	2,4,5,6,7	75%
2B	Old Mill Road	Old Channelization	8	35	R bank only	Clay	Gravel, Sand	1,2,4,5,6,7	100%
2B	Warwick Road	Old Channelization	9	45	No	Clay w/gravel	Gravel, Silt-mud	1,2,4,6,7	90%
2B	Dundee Road	Old Channelization	6	30	No	Clay	Silt-mud	4,8,6, & Bricks	80%
2B	Winnetka Road	Old Channelization	2,5	7	No	Clay, Silt	Gravel, Silt-mud	None	75%
3	1/2 mile north of Route 176	Old Channelization	10,4	20,5	No	Clay, Sand	Sand, Gravel, Silt-mud	4,5,6,8 & Concrete	60%
3	Laurel Avenue	Old Channelization	8	30	No	Clay, Sand	Gravel, Sand	2,4,6,7	90%
3	Old Elm Road	Old Channelization	5	45	No	Clay, Sand, Gravel	Gravel, Silt-mud	2,4,6,7	75%
3	Winnetka Road	Old Channelization	9	30	No	Clay	Silt-mud	2,4,8	50%
4	Touhy Avenue	Old Channelization	15	35	No	Clay	Silt, compacted soil	2,4,8	25%
5A	Oakton Street	Old Channelization	3,10	35,5	No	Clay, Silt	Silt-mud, Gravel	2,4,5,6,8	75%
5A	Foster @ Pulaski	Old Channel with stone walls	4	55	No	Clay, Silt	Silt-mud, Gravel, Logs	2,4,5,6,7,8	60%
5A	Central Avenue	Old Channelization	3,30	35,5	No	Clay	Silt-mud	4,6,8	50%
5A	Confluence w/NSC	Old Channel with concrete walls	5	35	Yes	Clay	Silt-mud	2,4,6,8, & Trash	50%
5B	Lawrence Avenue	Old Channelization	10	30	Yes	Clay, Silt	Silt-mud	7,8	20%
5B	Wilson Avenue	Old Channelization	15-20	85	Yes	Clay	Silt-mud	Piers	10%
5B	Division Street	Old Channelization	8	90	Yes	Silt, Sheet Pilings	Silt-mud	None	0
7	Ashland Avenue	Old Channelization	15	25	No	Clay, Rock	Silt-mud	8	5%
8	Western Avenue	Old Channelization	8	90	Yes	Silt, Sheet Pilings	Silt-mud	None	0
8	Pulaski Avenue	Old Channelization	40	30	No	Clay, Rock, Gravel Sand	Silt-mud	None	0
8	IL Route 171 @ US 55	Old Channelization	10	30	Yes	Rock, Clay	Unknown	Tree limbs	0
9A	IL Route 83	Old Channelization	10	90	Yes	Rock	Unknown	3	15%
9B	16th Street bridge	Old Channelization	10	90	Yes	Rock	Unknown	None	5%
9B	Stevens Street bridge	Old Channel, Mining & Bank Stabilization	10-15	90	Yes	Rock	Unknown	3,7	0
10A	Kedzi Road	Old Channel & Bank Stabilization	15	70	Yes	Rock	Claypan, compacted soil	1,2,3,7	10%
10A	IL Route 7/ 86th Street	Old Channel & Bank Stabilization	>15	50	Yes	Rock, Clay	Silt-mud	2,7,8	5%
10A	West of IL Route 83	Old Channel, Mining & Bank Stabilization	10	80	Yes	Rock Wall	Silt-mud	None	0
10B	At Calumet Exp.	Old Channel & Turning Basin	10-15	30	Yes	Clay, Sand, Rock	Silt-mud	4	10%
10B	Halsted Street bridge	Old Channelization	6	90	Yes	Sheet Pilings	Silt-mud	3,7	5%
10C	Turning Basin #1	Old Channelization	10	90	Yes	Rock, Sheet Pilings	Silt-mud, Sand	None	0

*CODES: 1=BOULDERS, 2=UNDERCUT BANK, 3=ROCK LEDGE, 4=SUBMERGED TREE ROOTS, 5=BRUSH JAMS, 6=SUBMERGED LOGS, 7=AQUATIC VEGETATION, 8=SUBMERGED TERRESTRIAL VEGETATION

Source: U.S. Fish and Wildlife Service, 1993.

TABLE 4
Illinois Natural Areas Inventory Sites within the Chicago Waterways Study Corridor

Site Name (general location)	Reach	County	Acreage	Unique Features
Dolton Ave Prairie (Dolton Avenue @ Torrence, Dolton, IL.)	10B	Cook	50	wet-mesic prairie
Burnham Prairie (146th Street and Burnham Avenue)	10B	Cook	79	dry-mesic prairie wet-mesic prairie
Calumet City Prairie (146th Street @ Torrence Avenue)	10B	Cook	133	dry-mesic sand prairie mesic prairie
The Bowl (McCarthy Road @ Route 83, Lemont)	9B	Cook	18	stream
Lemont Geological Area (New Road @ DesPlaines River, Lemont)	9B	DuPage/Cook	49	outstanding fossils
Lemont Bluff Geological Area (McCarthy @ IL Route 83, Lemont)	9B	Cook	25	unique rock formations
Moraine Valley Community College Nature Area	10A	Cook	40	wetland and prairie
Little Red Schoolhouse Nature Center (95th Street @ Flavin Road)	9A	Cook	320	marsh
Chicago Ridge Prairie (Central Avenue @ 105th Street)	10A	Cook	29	mesic gravel prairie
Worth Outdoor Classroom (115th Avenue @ Ridgeland)	10A	Cook	2.3	marsh
Oak Lawn Prairie (Central Ave @ 111th Street)	10A	Cook	34	mesic gravel prairie
Lake Calumet	10C	Cook	3145	outstanding avi-fauna, marsh systems
Powderhorn Lake (Burnham Avenue @ Brainard Avenue)	10B	Cook	222	marsh, sand prairie
Santa Fe Prairie	9A	Cook	11	mesic gravel prairie
Reavis High School Natural Area	9A	Cook	4	—
Edgebrook Flatwoods (Devon @ Caldwell, Chicago)	5A	Cook	70	sand flatwoods
Glencoe Balsam Poplar Site	3	Cook	4	unique trees
130th Street marsh	10C	Cook		breeding marsh birds
Calumet Sedge Meadow (Lake Calumet @ 96th Street)	10C	Cook		sedge meadow
Clayton Smith Forest Preserve (Touhy @ Caldwell, Chicago & Niles)	5A	Cook		—
Indigo Oak Openings (Dempster @ Waukegan Roads, Morton Grove)	5A	Cook		—
Miami Woods Prairie (Oakton Street @ Caldwell Avenue, Morton Grove)	5A	Cook		prairie remnant
Riverdale Marsh Heron Colony (Halsted @ 138th Street)	10B	Cook		heron colony
Sauganash Prairie (Bryn Mawr Ave @ Pulaski, Chicago)	5A	Cook		prairie remnant
Somme Prairie Grove (Dundee @ Waukegan Roads, Northbrook)	1	Cook		prairie/savanna remnant
Wayside Prairie (Lehigh @ Dempster, Morton Grove)	5A	Cook		prairie remnant
Wolf Lake (114th Street @ S. State Street, Chicago)	10C	Cook		bird habitat
McGinnis Slough (143rd & IL Route 45)	10A	Cook		bird habitat
Middle Fork Savanna	2B	Lake	477	mesic savanna
Waterfall Glen (Argonne Labs property)	9B	DuPage	1185	dolomite cliff community
Getz Property (Everett at Riverwoods Roads)	1	Lake	15	wetlands
Barat Ravine	3	Lake	52	dry-mesic forest, bluff community
McCormick Nature Preserve	3	Lake	135	dry-mesic forest, bluff community
Berkeley Prairie	2B	Lake	18	mesic prairie
Lake Forest High School Natural Area	2B	Lake	16	stream
Oak Grove White Fringed Orchid site	2B	Lake	3	sedge meadow, mesic prairie, orchids
McLaughlin Prairie	3	Lake	21	mesic prairie
Shaw Prairie	3	Lake	29	sedge meadow
Tangley Oaks	3	Lake	83	dry-mesic upland forest
Crabtree Farm Woods	3	Lake	37	dry-mesic upland forest
Romeoville Prairie	9B	Will	200	dolomite prairie
Lockport Prairie East	9B	Will	53	dolomite prairie
Material Service Prairie	9B	Will	72	mesic dolomite prairie
Long Run Seep	9B	Will	120	seep

Source: Illinois Nature Preserves Commission, 1994.

TABLE 5
Location and Size of Illinois Nature Preserves within Chicago Waterways Study Corridor

Illinois Nature Preserve	County	Acres	Dedicated	Reach
Somme Prairie	Cook	70	1984	1
Liberty Prairie	Lake	47.1	1990	2B
Oak Openings	Lake	16.1	1990	2B
Hybernia	Lake	27	1990	2B
Highmoor Park	Lake	10	1991	3
Skokie River	Lake	100	1992	3
Morton Grove Prairie	Cook	1.3	1979	5A
Cranberry Slough	Cook	372	1965	9A
Paw Paw Woods	Cook	105	1965	9A
Black Partridge Woods	Cook	80	1965	9B
Lockport Prairie	Will	254	1983	9B
O'Hara Woods	Will	70	1982	9B
Romeoville Prairie	Will	108.4	1984	9B
Cap Sauers Holdings	Cook	1,520	1965	10A
Palos Fen	Cook	70	1984	10A
Sagawau Canyon	Cook	12	1984	10A
TOTAL ACRES		**2,862.9**		

Source: Illinois Nature Preserves Commission, 1994.

TABLE 6
Forest Preserve District Lands Within or Contiguous to Chicago Waterways Study Corridor

Reach	River Miles	Acres*
1	14	454
2A	3	650
2B	21	995
3	17	2,243
4	17.6	0
5A	10	1,800
5B	7.2	0
6	1.4	0
7	3.9	0
8	8.2	80
9A	10	6,635
9B	12.5	3,961
10A	15.9	7,190
10B	7.1	600
10C	6.8	249
TOTALS	**156**	**24,857**

*Includes forest preserve lands adjacent to the river, but not in direct contact with it.
Source: U.S. Fish and Wildlife Service, 1994.

TABLE 7
State and Federally Listed Threatened and Endangered Species in or Near Study Corridor

SPECIES	STATUS[a]	REACH 1	2A	2B	3	4	5A	5B	6	7	8	9A&B	10A,B&C
PLANTS													
American Slough Grass *Beckmannia syzigachne*	SE	X			X		X[b]						
Beaked Spikerush *Eleocharis rostellata*	ST											X	
Crawe's Sedge *Carex crawei*	ST						X					X	
Downy Solomon's Seal *Polygonatum pubescens*	ST			X			X						
Dwarf Raspberry *Rubus pubescens*	ST			X	X[b]		X[b]						
Ear-Leafed Foxglove *Tomanthera auriculata*	ST											X	
Eastern Prairie Fringed Orchid *Platanthera leucophaea*	SE FT			X	X[b]		X[b]						
Grass Pink Orchid *Calopogon tuberosus*	SE											X	
Ground Juniper *Juniperus communis*	ST				X[c]								
Hairy White Violet *Viola incognita*	SE						X						
Lakeside Daisy *Actinea herbacea*	SE FT											X	
Leafy Prairie Clover *Petalostemum foliosum*	SE FE											X	
Mountain Blue-eyed Grass *Sisyrinchium montanum*	SE			X			X						
Oval Milkweed *Asclepias ovalifolia*	SE	X											
Seaside Crowfoot *Ranunculus cymbalaria*	SE	X											
Slender Bog Arrowgrass *Triglochin palustris*	SE											X	
Slender Sandwort *Arenaria patula*	ST											X	
Small Sundrops *Oenothera perennis*	SE						X						
Spreading Sedge *Carex laxiculmis*	ST				X[b]		X[b]						
White Lady's Slipper *Cypripedium candidum*	SE											X	X
REPTILES													
Spotted Turtle *Clemmys guttata*	SE											X	
BIRDS													
Black-crowned Night Heron *Nycticorax nycticorax*	SE												X
Black Tern *Chlidonias niger*	SE												X
Common Moorhen *Gallinula chloropus*	ST											X	X
Great Egret *Casmerodius albus*	ST												X

(Continued on next page)

TABLE 7 (Continued)
State and Federally Listed Threatened and Endangered Species in or Near Study Corridor

		REACH											
SPECIES	STATUS[a]	1	2A	2B	3	4	5A	5B	6	7	8	9A&B	10A,B&C
King Rail *Rallus elegans*	ST											X	
Least Bittern *Ixobrychus exilis*	SE											X	
Peregrine Falcon *Falco peregrinus*	SE FE			X									
Pied-billed Grebe *Podilymbus podiceps*	ST											X	X
Veery *Catharus fuscescens*	ST												X
Yellow-headed Blackbird *Xanthocephalus xanthocephalus*	SE												X
FISHES													
Iowa Darter *Etheostoma exile*	SE	X											
INSECTS													
Hine's Emerald Dragonfly *Somatochlora hineana*	SE FE											X	
MAMMALS													
River Otter *Lutra canadensis*	SE											X	X

[a]SE = State Endangered; ST = State Threatened; FE = Federally Endangered; FT = Federally Threatened

Source: Illinois Department of Natural Resources Natural Heritage Database, 1994, except Ruederbusch and Green, 1993(b); Schwartz and Thomas, 1993(c).

TABLE 8
Fishes Collected from Upper Reaches of Chicago Waterways, 1993

	REACH:	3	3	3	2A	2A	2B	2B	2B	2B	2B	2B	1	1	1	1	5A	5A		Percentage
SPECIES	**STATION:**	**1**	**2**	**3**	**1**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**1**	**2**	**Totals**	**of Total**
ICTALURIDAE																				
Black Bullhead	*Ameiurus melas*	—	—	55	—	1	—	—	1	—	—	—	—	—	—	—	—	—	57	12.72%
Madtom Catfish	*Noturus sp.*	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	2	0.44%
Yellow Bullhead^T	*Ameiurus natalis*	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0.22%
CENTRARCHIDAE																				
Bluegill	*Lepomis macrochirus*	—	1	4	1	—	—	12	5	—	3	13	4	15	—	—	—	—	58	12.95%
Green Sunfish^T	*Lepomis cyanellus*	—	3	—	—	—	—	1	8	5	1	42	2	54	3	—	—	—	119	26.56%
Largemouth Bass	*Micropterus salmoides*	2	1	1	—	1	—	4	1	1	1	4	—	7	—	—	—	—	23	5.13%
Pumpkinseed	*Lepomis gibbosus*	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	0.22%
Sunfish	*Lepomis YOY*	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0.22%
CYPRINIDAE																				
Fathead Minnows^T	*Pimephales promelas*	—	4	—	—	—	—	—	1	1	3	2	—	40	—	—	—	—	51	11.38%
Minnow	*Cyprinidae*	—	—	—	—	—	—	—	9	2	3	—	—	33	1	—	—	—	48	10.71%
Bluntnose Minnows^T	*Pimephales notatus*	—	—	—	—	—	—	—	—	—	—	—	—	5	—	—	—	—	5	1.12%
Bullhead Minnows	*Pimephales vigilax*	—	—	1	—	—	—	—	—	—	—	5	—	—	—	—	—	—	6	1.34%
Pugnose Minnows	*Notropis emiliae*	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	2	0.45%
Carp^T	*Cyprinus carpio*	4	9	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	14	3.13%
Emerald Shiner	*Notropis atherinoides*	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	0.22%
Golden Shiner^T	*Notemigonus crysoleucas*	—	—	2	—	1	—	—	—	—	—	5	—	8	1	—	—	—	17	3.79%
UMBRIDAE																				
Central Mudminnows^T	*Umbra limi*	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	0.22%
CLUPEIDAE																				
Gizzard Shad	*Dorosoma cepedianum*	—	—	—	—	—	—	—	—	—	—	4	—	3	—	—	—	—	7	1.56%
PERCIDAE																				
Iowa Darter	*Etheostoma exile*	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	0.22%
POECILIIDAE																				
Mosquitofish	*Gambusia affinis*	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	—	3	0.67%
ESOCIDAE																				
Northern Pike	*Esox lucius*	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	0.22%
CATOSTOMIDAE																				
White Sucker^T	*Catostomus commersoni*	—	—	—	—	—	—	—	—	1	1	26	—	1	—	—	—	—	29	6.47%
TOTALS:		**6**	**19**	**63**	**3**	**3**	**0**	**18**	**26**	**13**	**12**	**102**	**8**	**170**	**5**	**0**	**0**	**0**	**448**	**100.00%**

T = tolerant species

Sources: U.S. Fish and Wildlife Service and U.S. Army Corps of Engineers, 1993.

TABLE 9
Fishes Collected from Reaches 1, 2B and 3, North Branch Chicago River, 1976.

FISHES — REACH: / STATION:	1 / 51	2B / 52	3 / 53	TOTAL NUMBER	PERCENTAGE OF TOTAL
CYPRINIDAE					
Carp	—	—	18	18	7
Goldfish	—	—	26	26	10
Fathead minnow	29	2	8	39	15
Carp x goldfish (hybrid)	—	—	8	8	3
ICTALURIDAE					
Black bullhead	—	—	16	16	6
CENTRARCHIDAE					
Green sunfish	30	8	56	94	37
Pumpkinseed	7	—	—	7	3
Orangespotted sunfish	—	—	2	2	1
Bluegill	2	2	35	39	15
Largemouth bass	1	—	4	5	2
Black crappie	—	—	2	2	1
NUMBER OF INDIVIDUALS	69	12	175	256	100%
NUMBER OF SPECIES	5	3	10	11	—

Source: W.U. Brigham, D.A. McCormick, M.J. Wetzel, The watersheds of Northeastern Illinois: quality of the aquatic environment based upon water quality and fishery data, 1978.

TABLE 10
Fishes Collected from the North Branch Chicago River and its Tributaries, 1980.

Reach	Station No.	Station Name	Stream*	Sample Date	Species	Number Collected
1	280	DEERFIELD RD	W.FK.NBCR	6/13	FATHEAD MINNOW	1
1	280	DEERFIELD RD	W.FK.NBCR	6/13	GREEN SUNFISH	5
1	51	DUNDEE RD	W.FK.NBCR	7/3	FATHEAD MINNOW	1
1	51	DUNDEE RD	W.FK.NBCR	7/3	GREEN SUNFISH	10
1	51	DUNDEE RD	W.FK.NBCR	7/3	LARGEMOUTH BASS	4
1	51	DUNDEE RD	W.FK.NBCR	11/19	GOLDFISH	6
1	51	DUNDEE RD	W.FK.NBCR	11/19	GOLDEN SHINER	2
1	51	DUNDEE RD	W.FK.NBCR	11/19	FATHEAD MINNOW	1
1	51	DUNDEE RD	W.FK.NBCR	11/19	GREEN SUNFISH	1
1	51	DUNDEE RD	W.FK.NBCR	11/19	LARGEMOUTH BASS	1
2	53	W. FRONTAGE RD	SKOKIE R.	11/19	LARGEMOUTH BASS	1
2A	285	GLENVIEW RD	NBCR	7/1	GREEN SUNFISH	4
2A	285	GLENVIEW RD	NBCR	11/18	CARP	1
2A	285	GLENVIEW RD	NBCR	11/18	FATHEAD MINNOW	2
2A	285	GLENVIEW RD	NBCR	11/18	GREEN SUNFISH	4
2B	281	HALF DAY RD	M.FK.NBCR	6/13	BLUNTNOSE MINNOW	2
2B	281	HALF DAY RD	M.FK.NBCR	6/13	GREEN SUNFISH	65
2B	281	HALF DAY RD	M.FK.NBCR	6/13	BLUEGILL	6
2B	281	HALF DAY RD	M.FK.NBCR	6/13	GREEN X PUMPKINSEED	1
2B	282	LAKE COOK RD	M.FK.NBCR	7/3	GOLDFISH	1
2B	282	LAKE COOK RD	M.FK.NBCR	7/3	GOLDEN SHINER	6
2B	282	LAKE COOK RD	M.FK.NBCR	7/3	FATHEAD MINNOW	5
2B	282	LAKE COOK RD	M.FK.NBCR	7/3	GREEN SUNFISH	11
2B	282	LAKE COOK RD	M.FK.NBCR	7/3	BLUEGILL	1
2B	282	LAKE COOK RD	M.FK.NBCR	7/3	LARGEMOUTH BASS	14
2B	282	LAKE COOK RD	M.FK.NBCR	11/19	GOLDFISH	1
2B	282	LAKE COOK RD	M.FK.NBCR	11/19	WHITE SUCKER	7
3	283	HALF DAY RD	SKOKIE R.	6/13	GOLDFISH	2
3	283	HALF DAY RD	SKOKIE R.	6/13	CARP	12
3	283	HALF DAY RD	SKOKIE R.	6/13	CARP X GOLDFISH	3
3	283	HALF DAY RD	SKOKIE R.	6/13	FATHEAD MINNOW	1
3	283	HALF DAY RD	SKOKIE R.	6/13	BLACK BULLHEAD	4
3	283	HALF DAY RD	SKOKIE R.	6/13	GREEN SUNFISH	16
3	283	HALF DAY RD	SKOKIE R.	6/13	BLUEGILL	1
3	284	LAKE COOK RD	SKOKIE R.	7/3	NO FISH	0
3	284	LAKE COOK RD	SKOKIE R.	7/3	GREEN SUNFISH	1
3	284	LAKE COOK RD	SKOKIE R.	11/18	GREEN SUNFISH	35
3	53	W. FRONTAGE RD	SKOKIE R.	11/19	GOLDEN SHINER	1
3	53	W. RONTAGE RD	SKOKIE R.	11/19	BLACK BULLHEAD	1
3	53	W. FRONTAGE RD	SKOKIE R.	11/19	GREEN SUNFISH	18
3	53	W. FRONTAGE RD	SKOKIE R.	11/19	PUMPKINSEED	1
3	53	W. FRONTAGE RD	SKOKIE R.	11/19	BLUEGILL	2
5A	286	DEMPSTER ST	NBCR	7/11	CARP	1
5A	287	ALBANY AVE	NBCR	7/3	NO FISH	0
5A	287	ALBANY AVE	NBCR	7/3	NO FISH	0
5A	286	DEMPSTER ST	NBCR	11/18	PUMPKINSEED	5
5A	287	ALBANY AVE	NBCR	11/18	FATHEAD MINNOW	1

*NBCR = NORTH BRANCH OF THE CHICAGO RIVER, W. FK. = WEST FORK, M. FK. = MIDDLE FORK.

Source: The Metropolitan Sanitary District of Greater Chicago, Annual Report No. 84-2-B, 1980.

TABLE 11
Fishes collected from the North Branch Chicago River and its forks by MWRDGC in 1981

Reach	Station No.	Station Name	Stream*	Sample Date	Species	Number Collected
1	290	HALF DAY RD	W.FK.NBCR	7/2	FATHEAD MINNOW	2
1	290	HALF DAY RD	W.FK.NBCR	7/2	BLUEGILL	1
1	289	HALF DAY RD	W.FK.NBCR	7/2	LARGEMOUTH BASS	8
1	51	DUNDEE RD	W.FK.NBCR	7/14	CARP X GOLDFISH	1
1	51	DUNDEE RD	W.FK.NBCR	7/14	GOLDEN SHINER	3
1	51	DUNDEE RD	W.FK.NBCR	7/14	GREEN SUNFISH	5
1	51	DUNDEE RD	W.FK.NBCR	7/14	BLUEGILL	1
1	51	DUNDEE RD	W.FK.NBCR	7/14	LARGEMOUTH BASS	5
1	51	DUNDEE RD	W.FK.NBCR	7/14	CARP	1
1	51	DUNDEE RD	W.FK.NBCR	7/14	GOLDEN SHINER	2
1	51	DUNDEE RD	W.FK.NBCR	7/14	GREEN SUNFISH	8
1	51	DUNDEE RD	W.FK.NBCR	7/14	BLUEGILL	2
1	51	DUNDEE RD	W.FK.NBCR	7/14	LARGEMOUTH BASS	1
1	51	DUNDEE RD	W.FK.NBCR	11/19	GOLDEN SHINER	2
1	51	DUNDEE RD	W.FK.NBCR	11/19	FATHEAD MINNOW	1
1	51	DUNDEE RD	W.FK.NBCR	11/19	GREEN SUNFISH	32
2A	285	GLENVIEW RD	NBCR	7/16	CARP	2
2A	285	GLENVIEW RD	NBCR	7/16	FATHEAD MINNOW	8
2A	285	GLENVIEW RD	NBCR	7/16	GREEN SUNFISH	13
2A	285	GLENVIEW RD	NBCR	7/16	NO FISH	0
2A	285	GLENVIEW RD	NBCR	7/16	LARGEMOUTH BASS	3
2A	285	GLENVIEW RD	NBCR	7/16	BLACK CRAPPIE	1
2A	285	GLENVIEW RD	NBCR	7/16	FATHEAD MINNOW	2
2A	285	GLENVIEW RD	NBCR	7/16	NO FISH	0
2A	285	GLENVIEW RD	NBCR	11/12	GREEN SUNFISH	15
2A	285	GLENVIEW RD	NBCR	11/12	PUMPKINSEED	1
2A	285	GLENVIEW RD	NBCR	11/12	GREEN SUNFISH	11
2B	281	HALF DAY RD	M.FK.NBCR	6/23	GOLDEN SHINER	2
2B	281	HALF DAY RD	M.FK.NBCR	6/23	FATHEAD MINNOW	3
2B	281	HALF DAY RD	M.FK.NBCR	6/23	BLACK BULLHEAD	1
2B	281	HALF DAY RD	M.FK.NBCR	6/23	GREEN SUNFISH	30
2B	281	HALF DAY RD	M.FK.NBCR	6/23	BLUEGILL	30
2B	281	HALF DAY RD	M.FK.NBCR	6/23	GREEN X BLUEGILL	1
2B	281	HALF DAY RD	M.FK.NBCR	6/23	BLACK CRAPPIE	1
2B	281	HALF DAY RD	M.FK.NBCR	6/23	FATHEAD MINNOW	3
2B	281	HALF DAY RD	M.FK.NBCR	6/23	GREEN SUNFISH	15
2B	281	HALF DAY RD	M.FK.NBCR	6/23	BLUEGILL	3
2B	281	HALF DAY RD	M.FK.NBCR	6/23	LARGEMOUTH BASS	2
2B	281	HALF DAY RD	M.FK.NBCR	6/23	BLACK CRAPPIE	1
2B	282	LAKE COOK RD	M.FK.NBCR	7/23	FATHEAD MINNOW	12
2B	282	LAKE COOK RD	M.FK.NBCR	7/23	GREEN SUNFISH	11
2B	282	LAKE COOK RD	M.FK.NBCR	7/23	PUMPKINSEED	2
2B	282	LAKE COOK RD	M.FK.NBCR	7/23	BLUEGILL	3
2B	282	LAKE COOK RD	M.FK.NBCR	7/23	CARP	1
2B	282	LAKE COOK RD	M.FK.NBCR	7/23	FATHEAD MINNOW	1
2B	282	LAKE COOK RD	M.FK.NBCR	7/23	WHITE SUCKER	5
2B	282	LAKE COOK RD	M.FK.NBCR	7/23	GREEN SUNFISH	2
2B	282	LAKE COOK RD	M.FK.NBCR	7/23	BLUEGILL	3
2B	282	LAKE COOK RD	M.FK.NBCR	7/23	LARGEMOUTH BASS	3

TABLE 11 (Continued)
Fishes collected from the North Branch Chicago River and its forks by MWRDGC in 1981

Reach	Station No.	Station Name	Stream*	Sample Date	Species	Number Collected
2B	282	LAKE COOK RD	RESERVOIR	7/23	GREEN SUNFISH	53
2B	282	LAKE COOK RD	RESERVOIR	7/23	GREEN X BLUEGILL	2
2B	282	LAKE COOK RD	RESERVOIR	7/23	BLUEGILL	1
2B	282	LAKE COOK RD	RESERVOIR	7/23	LARGEMOUTH BASS	1
3	283	HALF DAY RD	SKOKIE R.	7/14	CARP	5
3	283	HALF DAY RD	SKOKIE R.	7/14	FATHEAD MINNOW	9
3	283	HALF DAY RD	SKOKIE R.	7/14	GREEN SUNFISH	10
3	283	HALF DAY RD	SKOKIE R.	7/14	BLUEGILL	1
3	283	HALF DAY RD	SKOKIE R.	7/14	BLACK CRAPPIE	1
3	283	HALF DAY RD	SKOKIE R.	6/25	NO FISH	0
3	283	HALF DAY RD	SKOKIE R.	6/25	GOLDEN SHINER	1
3	283	HALF DAY RD	SKOKIE R.	7/14	CARP X GOLDFISH	1
3	283	HALF DAY RD	SKOKIE R.	7/14	FATHEAD MINNOW	1
3	283	HALF DAY RD	SKOKIE R.	7/14	GREEN SUNFISH	4
3	284	LAKE COOK RD	SKOKIE R.	6/30	CARP	3
3	284	LAKE COOK RD	SKOKIE R.	6/30	GREEN SUNFISH	3
3	53	W.FRONTAGE RD	SKOKIE R.	7/7	FATHEAD MINNOW	40
3	53	W.FRONTAGE RD	SKOKIE R.	7/7	WHITE SUCKER	1
3	53	W.FRONTAGE RD	SKOKIE R.	7/7	BLACK BULLHEAD	1
3	53	W.FRONTAGE RD	SKOKIE R.	7/7	GREEN SUNFISH	1
3	53	W.FRONTAGE RD	SKOKIE R.	7/7	BLACK BULLHEAD	240
3	53	W.FRONTAGE RD	SKOKIE R.	7/7	GREEN SUNFISH	26
3	53	W.FRONTAGE RD	SKOKIE R.	7/7	GREEN X BLUEGILL	1
3	53	W.FRONTAGE RD	SKOKIE R.	7/7	BLUEGILL	1
3	53	W.FRONTAGE RD	SKOKIE R.	7/7	LARGEMOUTH BASS	2
3	53	W.FRONTAGE RD	SKOKIE R.	11/19	ORANGESPOTTED SUNFISH	2
3	284	LAKE COOK RD	SKOKIE R.	11/17	GREEN SUNFISH	4
3	284	LAKE COOK RD	SKOKIE R.	11/17	ORANGESPOTTED SUNFISH	1
3	284	LAKE COOK RD	SKOKIE R.	11/17	GREEN SUNFISH	4
3	53	W.FRONTAGE RD	SKOKIE R.	11/19	BLACK BULLHEAD	2
3	53	W.FRONTAGE RD	SKOKIE R.	11/19	GREEN SUNFISH	32
3	53	W.FRONTAGE RD	SKOKIE R.	11/19	PUMPKINSEED	2
3	53	W.FRONTAGE RD	SKOKIE R.	11/19	BLUEGILL	2
3	53	W.FRONTAGE RD	SKOKIE R.	11/19	LARGEMOUTH BASS	3
5A	286	DEMPSTER ST	NBCR	7/21	FATHEAD MINNOW	2
5A	286	DEMPSTER ST	NBCR	7/21	BLACK BULLHEAD	3
5A	286	DEMPSTER ST	NBCR	7/21	GREEN SUNFISH	18
5A	286	DEMPSTER ST	NBCR	7/21	BLUEGILL	13
5A	286	DEMPSTER ST	NBCR	7/21	SUNFISH FRY	22
5A	286	DEMPSTER ST	NBCR	7/21	LARGEMOUTH BASS	2
5A	286	DEMPSTER ST	NBCR	7/21	BLACK CRAPPIE	1
5A	286	DEMPSTER ST	NBCR	7/21	FATHEAD MINNOW	1
5A	286	DEMPSTER ST	NBCR	7/21	GREEN SUNFISH	4
5A	286	DEMPSTER ST	NBCR	11/12	GREEN SUNFISH	11
5A	286	DEMPSTER ST	NBCR	11/12	GREEN SUNFISH	2
5A	287	ALBANY AVE	NBCR	11/12	GREEN SUNFISH	4

* NBCR = NORTH BRANCH OF THE CHICAGO RIVER; W.FK. = WEST FORK; M.FK. = MIDDLE FORK.

Source: The Metropolitan Sanitary District of Greater Chicago, Annual Report No. 84-2-B, 1981.

TABLE 12
Benthic Macroinvertebrates Collected from the Chicago River, 1993

REACH	1	1	1	1	2A	2A	2B	2B	2B	2B	2B	2B	3	3	3	5A	5A	Tolerance Values
STATION	1	2	3	4	1	2	1	2	3	4	5	6	1	2	3	1	2	
PORIFERA				1				2										—
ANNELIDA																		
HIRUDINEA		1	1				1	4	1	6	5	1	9	6	2		36	8
ARTHROPODA																		
CRUSTACEA																		
ISOPODA																		
Asellidae																		
Caecidotea communis	3		3	7			36	41	10	13	17	4	10	8		2	179	6
AMPHIPODA																		
Gammeridae							10											3
DECAPODA																		
Cambarinae	1				12	9		7	33	17		5	4	2	12			5
Procambarus clarki		1		1											2			5
Orconectes virilis										1								5
INSECTA																		5
EPHEMEROPTERA										3								5
Baetidae				1														5
Heptageniidae				1														2
ODONATA																		
ANISOPTERA																		
Aeshnidae																		
Aeshna		1					2											4
Libellulidae							2											4
Orthemis	1																	3
Plathemis		1																3
ZYGOPTERA																		
Coenagrionidae	5		6															6
Enallagma		1		1		3	4	3							5			6
Lestidae																		
Archilestes												2						1
HEMIPTERA																		—
Belostomatidae																		—
Belostoma							10	4										—
Corixidae																		—
Corixinae								3										—
Trichocorixa		2	6	3			5					1						—
Cymatinae																		—
Cymatia														1				—
Gerridae							2											—
Limnoporus	1												2		1	1	1	—
Trepobates						1							4	3		2	1	—
Gerris	10				2	2	3	3	4		4				3			—
Rheumatobates												2						—
Notonectidae																		—
Martarega				1														—
Notonecta							3	6										—
Pleidae																		—
Neoplea							1											—
MEGALOPTERA																		

TABLE 12 (Continued)
Benthic Macroinvertebrates Collected from the Chicago River, 1993

REACH	1	1	1	1	2A	2A	2B	2B	2B	2B	2B	2B	3	3	3	5A	5A	Tolerance Values
STATION	1	2	3	4	1	2	1	2	3	4	5	6	1	2	3	1	2	
Corydalidae																		
Chauliodes					4	2	7											4
Sialidae																		
Sialis									1									4
NEUROPTERA																		
Sisyridae																		1
Climacia				5														1
TRICHOPTERA																		
Hydropsychidae																		
Arctopsyche			4															5
Hydropsyche					26		3		3	7			7	1				5
COLEOPTERA																		
Chrysomelidae																		
Donacia												1						—
Dytiscidae							7											—
Laccophilinae	1						1	1										—
Gyrinidae																		—
Dineutus		6						1										—
Gyrinus			1					1	1									—
Haliplidae																		—
Peltodytes	1		1	1			3	1	1	1					1			—
Haliplus			1															—
Hydrophilidae															1			—
Tropisternus					1			1							2			—
Hydrophilus							6											—
Berosus		1	2				3						1					—
Hydrochara								1										—
DIPTERA																		
Stratiomyidae		1	1															
Brachycera												1						5
Dolichopodidae																		5
Tipulidae															1			5
Adult - species unknown												1						5
MOLLUSCA																		
GASTROPODA																		
Hydrobiidae																		
Amnicola																		4
Lymnaeidae																	1	
Lymnaea stagnalis							5							1		3		7
Physidae				1								4						8
Physa		1	1	11			5	1		2	1		1		3		3	9
Planorbidae																		
Gyraulus			2	3					1						1			6
Helisoma				1			1	1			1		1		6		18	7
PELECYPODA																		
Sphaeriidae																		
Musculium				1								1						5
Pisidium																	7	5
Sphaerium		1	1	2				3		1	4					4	19	5
TOTAL NO. OF TAXA	8	11	13	16	5	5	22	18	9	9	6	11	10	5	15	4	9	
MACROINVERTEBRATE BIOTIC INDEX	5.6	5.6	5.9	6.1	4.9	5.1	5.6	6	5.3	5.8	6.4	5.6	6.4	6.5	6.2	5.3	6.3	
DATE SAMPLED	9/10/1993	8/26/1993	8/26/1993	8/26/1993	8/12/1993	8/26/1993	8/26/1993	8/26/1993	8/26/1993	8/26/1993	8/20/1993	9/10/1993	8/12/1993	8/12/1993	8/12/1993	9/10/1993	9/10/1993	

Source: U.S. Fish and Wildlife Service and Illinois Environmental Protection Agency, 1993.

TABLE 13
Macroinvertebrates Collected from Chicago Waterways, 1983-84
Macroinvertebrate Biotic Index (MBI) Values

	REACH					
	3 (HCCD-09)	2A (HCCC-04)	1 (HCCB-05)	5A (HCC-07)	10A (H-01)	9B (GI-02)
TURBELLARIA		6	5	42		
OLIGOCHAETA		4				
Chaetagaster sp.						1
Dero pectinata						1
Limnodrilus cervix						1
Limnodrilus hoffmeisteri						6
Limnodrilus sp.			1			
HIRUDINEA						
Erpobdellidae	2	1	10			
Erpobdella punctata				1		
Helobdella triserialis				1		
CRUSTACEA						
Isopoda						
Caecidotea sp.		30				
Caecidotea intermedia	53		22	27		
Amphipoda						
Hyalella azteca	53					
EPHEMEROPTERA						
Baetis sp.		13				
Stenacron interpunctatum		12				
ODONATA						
Zygoptera						
Argia sp.		3	3			
Enallagma sp.		3				
Anisoptera						
Anax sp.			1			
TRICHOPTERA						
Cheumatopsyche sp.		41				
DIPTERA						
Chironomidae						
Cryptochironomus sp.		3				
Cryptochironomus fulvus			1			1
Dicrotendipes neomodestus						3
Glyptotendipes sp.		6				
Orthocladius sp.						2
Polypedilum illinoense			2			3
Polypedilum scalaenum		1				
Procladius sp.		2	11			1
Thienemannimyia gr.		6	1			2
MOLLUSCA						
Amnicola sp.				1		
Ferrissia sp.				8		
Gyraulus sp.				1		
Lymnaea sp.					1	
Physa sp.			7	41	10	6
Sphaeriidae					11	17
Sphaerium sp.				4		
TOTAL NUMBER OF ORGANISMS	**108**	**131**	**64**	**126**	**22**	**44**
Total number of taxa	**3**	**8**	**8**	**4**	**1**	**3**
MBI	5.9	6.6	6.6	6.2	—	7.6
Sample type (hp=hand picked; p=plate)	hp	hp	hp	hp	p	p
Date sampled	11-27-83	7-19-84	9-9-83	8-2-84	8-2 to 9-14-83	8-2 to 9-14-83

Source: Illinois Environmental Protection Agency, An Intensive Survey of the Des Plaines River Basin from the WI State Line to Joliet, IL, 1988.

TABLE 14
Characteristic Streambank Vegetation at Fish and Invertebrate Sampling Stations Along Upper Reaches of Chicago Waterways, 1993

		REACH				
		1	2A	2B	3	5A
TREES & SHRUBS						
American Elm	*Ulmus americana*	•	•	•	•	•
Amur Honeysuckle	*Lonicera maackii*				•	
Black Willow	*Salix nigra*	•				•
Box Elder	*Acer negundo*	•		•	•	
Buttonbush	*Cephalanthus occidentalis*		•			
Common Buckthorn	*Rhamnus cathartica*			•	•	•
Cottonwood	*Populus deltoides*		•	•	•	•
Green Ash	*Fraxinus pennsylvanica*		•	•	•	•
Hawthorn	*Crategus sp.*			•		
Maple-leaved Viburnum	*Viburnum acerifolium*			•		
Red-osier Dogwood	*Cornus stolonifera*			•		
Silver Maple	*Acer saccharinum*	•		•	•	•
Swamp White Oak	*Quercus bicolor*		•	•		
White Mulberry	*Morus alba*	•				
GRASSES & SEDGES						
Bur Sedge	*Carex grayii*		•	•		
Hop Sedge	*Carex lupulina*		•			
Orchard Grass	*Dactylis glomerata*				•	
Reed Canarygrass	*Phalaris arundinacea*	•		•		
Silky Wild Rye	*Elymus villosus*				•	•
Virginia Wild Rye	*Elymus virginicus*		•			
FORBS						
Arrow-leaved Aster	*Aster sagittifolius*				•	•
Beggars Tick/Sticktight	*Bidens frondosa*			•	•	
Bittersweet Nightshade	*Solanum dulcamara*	•		•		
Blue Iris	*Iris virginica shrevei*		•	•	•	•
Blue-Stemmed/Wreath Goldenrod	*Solidago caesia*				•	
Broad-leafed Cattail	*Typha latifolia*	•				
Clearweed/Richweed	*Pilea pumila*			•	•	
Cluster Snakeroot	*Sanicula gregaria*				•	•
Common Arrowhead	*Sagittaria latifolia*			•	•	
Common Burdock	*Arctium minus*			•		
Common Dandelion	*Taraxacum officinale*				•	
Enchanter's Nighshade	*Circaea quadrisulcata canadensis*				•	
Garlic Mustard	*Alliaria officinalis*			•	•	•
Great Ragweed	*Ambrosia trifida*	•	•			
Horse Nettle	*Solanum carolinense*	•				
Jumpseed/Virginia Knotweed	*Tovara virginiana*				•	•
Lesser Duckweed	*Lemna minor*			•		
Lizard's Tail	*Saururus cernuus*		•			
Moneywort	*Lysimachia nummularia*		•	•		
Narrow-leaved Cattail	*Typha angustifolia*			•		
Poison Ivy	*Rhus radicans*	•		•	•	
Purple-leaved Willow Herb	*Epilobium coloratum*			•		
Purple Loosestrife	*Lythrum salicaria*	•		•	•	
Riverbank Grape	*Vitis riparia*	•		•	•	•
Rose sp.	*Rosa sp.*			•		
Rough Avens	*Geum laciniatum trichocarpum*	•			•	
Smartweed	*Polygonum punctatum*				•	•
Sneezeweed	*Helenium autumnale*				•	•
Spotted Touch-Me-Not	*Impatiens capensis*	•		•	•	
Tall Goldenrod	*Solidago altissima*	•		•		
Tall Nettle	*Urtica procera*			•		
Virginia Creeper	*Parthenocissus quinquefolia*	•		•	•	•
White Vervain	*Verbena urticifolia*			•		
Yellow Swamp Buttercup	*Ranunculus septentrionalis*		•			

• = OCCURRENCE
Source: U.S. Fish and Wildlife Service, 1994.

TABLE 15
Distribution, Abundance, and Area of Wetlands in Study Corridor

Reach	Total Number of Wetlands	Total Acres	Most Abundant	Percentage of Total	Most Area	Percentage of Total	% Increase from NWI (Total Wetland Area)
1	17B	355.5	POWGx	43.8	POWGx	40.0	21.9
2A	24	76.7	PFO	70.8	PF01A	87.0	15.8
2B	227	668.1	POWx	41.0	POWx	28.0	20.3
3	202	676.4	POWGx	35.6	Pf01A	40.4	12.7
4	1	86.5	R20WHx	100.0	R20WHx	100.0	—
5A	54	311.4	PF01A/C	63.0	PF01A/C	93.7	56.0
5B	1	133.9	R20WHx	100.0	R20WHx	100.0	—
6	1	47.7	R20WHx	100.0	R20WHx	100.0	—
7	2	102.7	R20WHx	50.0	R20WHx	98.6	—
8	34	482.6	POW	50.0	R20WHx	68.9	<1.0
9A	102	1,598.3	POWkh	31.4	POWkh	17.6	<1.0
9B	171	2,441.1	PUBGx	19.3	PEMF	16.2	2.0
10A	131	983.9	POWHx	24.4	L20WHx	36.5	6.7
10B	68	857.5	POWx	30.9	R20WHx	59.8	5.5
10C	60	471.0	PEMF	21.7	R20WHx	44.8	<1.0

Source: U.S. Fish and Wildlife Service, 1994.

TABLE 16
Fishes Collected in the Middle Fork of the North Branch Chicago River (Reach 2B), 1993

Species		Number Collected
Golden shiner	*Notemigonas crysoleucas*	8
Fathead minnow	*Pimephales promelas*	202
White sucker	*Catostomus commersoni*	5
Black bullhead	*Ameiurus melas*	1
Green sunfish	*Lepomis cyanellus*	5
Largemouth Bass	*Micropterus salmoides*	1

Source: K.S. Mierzwa and E. Beltz, Habitat Associations and Distribution of Amphibians and Reptiles at Middle Fork Savanna, Lake County Illinois, 1994.

TABLE 17
Amphibians and Reptiles Collected at Middle Fork Savanna, 1991 and 1993

SPECIES	1991	1993	TOTAL COLLECTED	% OF TOTAL
Blue-spotted salamander *Ambystoma laterale*	1	121	122	28.0
Tiger salamander *Ambystoma tigrinum*	0	24	24	6.0
American toad *Bufo americanus*	0	56	56	13.0
Western chorus frog *Pseudacris triseriata*	0	84	84	20.0
Bullfrog *Rana catesbeiana*	0	1	1	0.2
Northern leopard frog *Rana pipiens*	0	26	26	6.0
Snapping turtle *Chelydra serpentina*	0	2	2	0.5
Blanding's turtle *Emydoidea blandingii*	1	0	1	0.2
Painted turtle *Chrysemys picta*	0	5	5	1.2
Smooth green snake *Opheodrys vernalis*	1	11	12	2.8
Plains garter snake *Thamnophis radix*	1	0	1	0.2
Common garter snake *Thamnophis sirtalis*	1	87	88	20.5
Redbelly snake *Storeria occipitomaculata*	0	8	8	1.9
TOTAL	**5**	**425**	**430**	**100**

Source: K.S. Mierzwa and E. Beltz, Habitat Associations and Distibution of Amphibians and Reptiles at Middle Fork Savanna, Lake County, Illinois, 1994.

TABLE 18
Benthic Invertebrates Collected from Chicago Waterways, 1976

Tolerance Category	Species	STATION NUMBER										
		70	71	72	73	74	75	76	77	78	79	80
		(Individuals/m²)										
F	*Caenis sp.* (mayfly)					43						
F	*Myzobdella moorei* (leech)							86	402	38		
M	*Sphaerium partemium* (fingernail clam)							86				
M	*S. transversum* (fingernail clam)									861		
M	*Asellus sp.* (aquatic sow bug)									43	1569	
M	*A. communis* (aquatic sow bug)									43	823	
T	*Chaoborum sp.* (phantom midge)	619	153	43								
T	*Chironomidae sp.* (midge)	57	38	57	171		7061	23250	387	128	670	498
T	Oligochaetae (aquatic worm)	19	325	421	128	12961	12745	259	293814	3186	2794	18193
T	Physa sp. (snail)									302		

Note: Stations 70-72 are in Reach 3, Station 73 is in Reach 5A, and Stations 74-80 are in Reach 10B

Source: T.L. Butts and R.L. Evans, Sediment Oxygen Demand Studies of Selected Northeastern Illinois Streams, Northeastern Illinois Planning Commission Staff Paper No. 29, 1979.

TABLE 19
Benthic Invertebrates Collected from the Skokie River and Skokie Lagoons, 1978

Tolerance	Species	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9	B-10	B-11	B-12
	ARTHROPODA												
	Crustacea												
	Decapoda												
I	Astacidae (crayfishes)			1	1								3
	Amphipoda												
	Hyalellidae (scuds)												
I	*Hyalella azteca*												6
	Isopoda												
	Asellidae (aquatic sowbugs)												
M	*Asellus sp.*				7								
	INSECTA												
	Ephemeroptera												
	Caenidae (mayflies)												
F	*Caenis sp.*		2										4
	Odonata												
	Coenagrionidae (damselflies)												
I	*Ischnura sp.*	1	2	8	6								
	Libellulidae (dragonflies)												
M	*Libellula sp.*	1											
	Hemiptera												
F	Corixidae (water boatman)		4	1	1	1							
	Coleoptera												
	Helodidae (beetles)												
F	*Cyphon sp.*												2
F	Unidentified	1											
	Diptera												
I	Tipulidae (crane flies)	1											
T	Ephydridae (shoe flies)	1											
	Chaoboridae (phantom midges)												
T	*Chaoborus sp.*									4	4	2	
	Chironomidae (midges)												
M	*Cryptochironomus sp.*			8									2
M	*Cricotopus sp.*					4							
F	*Procladius sp.*		1	1						4		1	
F	*Ablabesmyia sp.*		1	1									1
F	*Thienemannimyia group*				3								
T	*Glyptotendipes sp.*												17
T	*Chironomus sp.*						25	14	2	2			
	MOLLUSCA												
	Pelecypoda												
	Sphaeriidae (fingernail clams)												
M	*Pisidium sp.*			16									
	Gastropoda (snails)												
	Lymnaeidae												
F	*Lymnaea sp.*		1			1							
	Planorbidae												
F	*Helisoma sp.*	1											
	Physidae												
T	*Physa sp.*	10	8	9	1								4
	PLATYHELMINTHES												
	Turbellaria												
M	Tricladida (flatworms)				4								
	ANNELIDA												
T	Oligochaeta (aquatic earthworms)	75	6	37	4	2	54		2	2		2	
T	Hirudinea (leeches)		1	1	1								
TOTAL NUMBER OF ORGANISMS		**91**	**27**	**85**	**29**	**28**	**68**	**2**	**4**	**10**	**4**	**5**	**40**
TOTAL NUMBER OF TAXA		**8**	**10**	**10**	**9**	**3**	**2**	**1**	**2**	**3**	**1**	**3**	**9**
PERCENT INTOLERANT ORGANISMS		**1.1**	**11.1**	**10.6**	**24.1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**22.5**
STREAM CLASSIFICATION		**SP**	**UB**	**UB**	**UB**	**SP**	**P**	**P**	**P**	**P**	**P**	**P**	**UB**

*Stations B-6 through B-11 are in the Lagoons, and Station B-12 is downstream of Lagoons. Skokie River Stations 1-5 and 12 were hand-picked. Stations 6-11, in the Skokie Lagoons, were sampled with a Petite Ponar dredge. Data represent actual numbers of organisms collected.

Source: Matsunaga, W.O. and P.M. Murphy, An intensive survey of the Skokie River, Illinois Environmental Protection Agency, 1979.

TABLE 20
Benthic Invertebrates Collected at Skokie Lagoons, 1981

	Clavey Rd. Bridge			Lagoon #7			Lagoon #4			Lagoon #1			Willow Rd. Bridge		
Taxa	1	2	Mean	1	2	Mean	1	2	Mean	1	2	Mean	1	2	Mean
	# individuals/m2														
ARTHROPODA															
Insecta															
Diptera															
Chaoboridae															
Chaoborus sp. (T)	—	—	—	—	X	—	—	—	—	86	—	43	—	43	22
Chironomidae															
Cryptochironomus sp. (F)	—	86	43	—	X	—	—	—	—	—	—	—	43	—	22
Glyptotendipes sp. (T)	—	—	—	—	X	—	—	—	—	—	—	—	603	172	388
Polypedilum sp. (F)	43	43	43	—	X	—	—	—	—	—	—	—	259	129	194
Procladius sp. (F)	—	—	—	43	X	43	—	—	—	86	—	43	—	—	—
Trichoptera															
Leptoceridae															
Oecetis sp. (M)	—	—	—	X	—	—	—	—	—	—	—	86	43	65	
ANNELIDA															
Oligochaeta															
Naididae															
Pristina sp. (F)	—	—	—	—	X	—	—	—	—	—	—	—	—	86	43
Specaria josinae (F)	—	—	—	—	X	—	—	—	—	—	—	—	—	86	43
Tubificidae															
Limodrilus cervix (T)	43	86	65	172	X	172	172	259	215	86	—	43	86	172	129
Limodrilus hoffmeisteri (T)	43	215	129	86	X	86	43	43	43	—	—	—	646	474	560
Peloscolex multisetosus multisotosus (T)	—	—	—	—	X	—	—	—	—	—	—	—	129	86	108
Peloscolex multisetosus longidentus (T)	X	—	—	—	—	—	—	—	215	129	172				
(immature with hair setae) (T)	—	—	—	86	X	86	—	—	—	—	—	—	43	129	86
(immature without hair setae) (T)	172	1,209	690	259	X	259	819	259	539	—	—	—	2,112	2,112	2,112
MOLLUSCA															
Pelecypoda															
Sphaeriidae (M)	43	—	22	—	X	—	—	—	—	—	—	—	—	—	—
TOTAL NUMBER OF TAXA	**5**	**5**	**6***	**5**	**X**	**5**	**3**	**3**	**3***	**3**	**0**	**3***	**10**	**12**	**13***
TOTAL NUMBERS OF INDIVIDUALS	**344**	**1,639**	**992**	**646**	**X**	**646**	**1,034**	**561**	**797**	**258**	**0**	**129**	**4,222**	**3,661**	**3,944**
TOTAL NUMBER OF TAXA	**5**	**5**	**6***	**5**	**X**	**5**	**3**	**3**	**3***	**3**	**0**	**3***	**10**	**12**	**13***
TOTAL NUMBERS OF INDIVIDUALS	**344**	**1,639**	**992**	**646**	**X**	**646**	**1,034**	**561**	**797**	**258**	**0**	**129**	**4,222**	**3,661**	**3,944**

KEY: I - intolerant of polluted conditions; M - moderately intolerant of polluted conditions; F - faculatively tolerant of polluted conditions;
T - tolerant of polluted conditions; * - total number of taxa in both replicate samples; and
1 and 2 = replicate sample analysis, except lagoon #7 (only one sample taken)

Source: Northeastern IL Planning Commission, Phase 1 Diagnostic/Feasibility Study of the Skokie Lagoons, 1983.

TABLE 21
Fishes Collected from Chicago Waterway System, 1976

REACH	4	4	4	5B	6	6	8	9A	9A	10A	10A	10A	10A	10A	10A	10A	10A	9B	Total	Percentage
STATIONS	57	58	59	55	67	60	48	68	49	171	44	186	175	182	183	185	43	50	number	of Total
CLUPEIDAE																				
Alewife	41	—	—	—	11	36	2	—	—	1	—	—	—	—	—	—	—	—	91	9
Gizzard shad	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	3	<1
SALMONIDAE *																				
Coho salmon *	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
OSMERIDAE																				
Rainbow smelt	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	<1
UMBRIDAE																				
Central mudminnow	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	1	1	—	4	<1
CYPRINIDAE																				
Goldfish	18	6	—	1	12	18	7	11	1	—	12	—	10	17	15	—	1	38	167	17
Carp	12	3	2	—	10	9	3	1	1	—	10	—	6	11	17	1	—	15	101	10
Golden shiner	—	—	—	—	6	2	—	—	—	—	1	—	8	—	—	—	—	—	17	2
Emerald shiner	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	<1
Spottail shiner	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	<1
Sand shiner	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	<1
Bluntnose minnow	86	—	—	—	—	—	—	—	—	—	—	10	26	—	—	—	—	—	122	1
Fathead minnow	22	1	—	—	1	61	—	1	—	—	—	—	—	—	—	—	—	—	8	9
Creek chub	—	—	—	—	—	—	—	—	—	—	2	91	4	—	—	—	—	—	97	10
Carp x goldfish	7	—	—	7	3	1	4	—	—	—	—	—	1	1	4	—	—	6	34	3
Silvery minnow *	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
Longnose dace *																				
CATOSTOMIDAE																				
White sucker	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	3	<1
Shorthead redhorse *																				
ICTALURIDAE																				
Black bullhead	—	—	—	1	—	1	—	1	—	—	3	—	—	2	5	2	—	4	19	2
Channel catfish	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	<1
PERCOPSIDAE *																				
Trout-perch *	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
GADIDAE *																				
Burbot *	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
GASTEROSTEIDAE																				
Ninespine Stickleback	2	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	4	<1
PERCICHTHYIDAE *																				
White bass *		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
Yellow bass *	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
CENTRARCHIDAE																				
Rock bass	—	—	—	—	—	63	—	—	—	—	—	—	—	—	–	—	—	—	63	6
Green sunfish	14	—	—	—	—	3	—	20	—	—	25	4	21	5	3	—	—	—	95	10
Pumpkinseed	2	—	—	—	—	4	—	—	—	—	—	—	—	—	1	—	—	—	7	1
Orangespotted Sunfish	24	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	24	2
Bluegill	—	—	—	1	—	3	—	3	—	—	5	—	14	9	3	—	—	—	38	4
Largemouth bass	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	4	<1
Black crappie	—	—	—	1	—	1	1	—	—	—	—	—	1	1	—	—	—	1	6	1
Green sunfish x Pumpkinseed	2	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	4	<1
White crappie *	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
PERCIDAE																				
Yellow perch	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	<1
Johnny darter *	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
SCIAENIDAE *																				
Freshwater drum *	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
COTTIDAE *																				
Mottled sculpin *	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
TOTAL NUMBER OF INDIVIDUALS	**234**	**10**	**3**	**11**	**43**	**207**	**17**	**39**	**2**	**4**	**60**	**105**	**95**	**47**	**50**	**4**	**2**	**64**	**919**	**98**
TOTAL NUMBER OF SPECIES	**14**	**3**	**2**	**5**	**6**	**14**	**5**	**7**	**2**	**2**	**9**	**3**	**11**	**8**	**9**	**3**	**2**	**5**	**27**	**—**

*Fish species present prior to 1905
SOURCE: Brigham, W.U., D. McCormick, and M.J. Wetzel, The Watersheds of northeastern Illinois: quality of the aquatic environment based upon water quality and fishery data, Northeastern Illinois Planning Commission Staff Paper No. 31, 1978.

TABLE 22
Number and Weight of Fish Collected from North Shore Channel, 1991

Species	Number Collected	Total Weight (Grams)
Alewife	234	428.96
Gizzard shad	244	14,366.96
Rainbow trout	1	1,890.00
Brown trout	5	962.90
Rainbow smelt	1	0.89
Central mudninnow	3	36.75
Grass pickerel	1	72.00
Goldfish	357	29,708.50
Carp *	41	46,052.46
Carp x goldfish hybrid	59	39,758.61
Golden shiner	606	2,065.43
Spottail shiner	195	333.59
Bluntnose minnow	3,202	2,582.10
Fathead minnow	766	993.93
White sucker *	12	4,724.50
Oriental weatherfish	4	32.26
Black bullhead *	26	3,410.44
Threespine stickleback	1	1.30
Rock bass	13	17.52
Green sunfish	167	1,986.09
Pumpkinseed sunfish	21	87.47
Orangespotted sunfish	3	34.75
Bluegill *	47	1,264.26
Largemouth bass *	6	489.02
Black crappie *	8	767.00
Green sunfish x pumpkinseed hybrid	2	2.23
Yellow perch	2	9.26
TOTAL NUMBER OF FISH	**6,027**	
TOTAL NUMBER OF SPECIES	**25**	
TOTAL NUMBER OF HYBRIDS	**2**	
TOTAL WEIGHT		**152,079.18**

*Species found in harvestable size during 1991.

Source: Dennison, et al., Comprehensive water quality evaluation: fish survey of the Chicago Waterway System during 1991, MWRDGC Report #92-17, 1992.

TABLE 23
Benthic Invertebrates Collected from North Shore Channel, 1989

COELENTERATA
- *Hydra sp.*

ANNELIDA
- Oligochaeta
  - Naididae
    - *Amphichaeta leydigi*
    - *Chaetogaster diastrophus*
    - *Chaetogaster limnaei*
    - *Chaetogaster setosus*
    - *Dero digitata*
    - *Dero furcata*
    - *Dero lodeni*
    - *Dero trifida*
    - *Haemonais waldvogeli*
    - *Nais communis*
    - *Nais elinguis*
    - *Nais pardalis*
    - *Nais pseudobtusa*
    - *Nais simplex*
    - *Nais variabilis*
    - *Ophidonais serpentina*
    - *Pristina aequiseta*
    - *Stylaria lacustris*
    - *Vejdovskyella intermedia*
  - Tubificidae
    - *Aulodrilus pigueti*
    - *Aulodrilus pluriseta*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus claparedianus*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus spiralis*
    - *Limnodrilus tortilipenis*
    - *Limnodrilus udekemianus*
    - *Potamothrix moldaviensis*
    - *Quistadrilus multisetosus*
  - Hirudinea
    - *Abloglossiphonia heteroclitia*
    - *Dina parva*
    - *Glossiphonia complanata*
    - *Helobdella fusca*
    - *Helobdella stagnalis*
    - *Helobdella triserialis*
    - *Mooreobdella microstoma*
    - *Nephelopsis obscura*

CRUSTACEA
- Decapoda
  - *Cambarus robustus*
- Amphipoda
  - *Crangonyx sp.*
  - *Gammarus faciatus*
  - *Hyalella azteca*
- Isopoda
  - *Caecidotea intermedia*

INSECTA
- Ephemeroptera
  - *Caenis sp.*
- Odonata
  - Coenagrionidae
    - *Enallagma sp.*
    - *Ishnura/Anomalagrion sp.*
- Coleoptera
  - Haliplidae
    - *Haliplus sp.*
- Diptera
  - *Chironomidaes sp.*
  - *Ablabesmyia sp.*
  - *Chironomus anthracinus-gr.*
  - *Chironomus fluviatilis-gr.*
  - *Chironomus plumosus-gr.*
  - *Chironomus semi-reductus-gr.*
  - *Cladopelma sp.*
  - *Cladotanytarsus mancus-gr.*
  - *Cricotopus (I.) sylvestris-gr.*
  - *Cryptochironomus cf. fulvus*
  - *Dicrotendipes sp.*
  - *Glyptotendipes sp.*
  - *Heterotrissocladius cf. changi*
  - *Mondiamesa cf. tuberculata*
  - *Parachironomus arcuatus-gr.*
  - *Paracladopelma camptolabis-gr.*
  - *Parakiefferiella sp.*
  - *Paratanytarsus sp.*
  - *Phaenopsectra sp.*
  - *Polypedilum cf. scalaenum*
  - *Polypedilum cf. simulans/digitifer*
  - *Potthastia cf. longimanus*
  - *Procladius sp.*
  - *Pseudochironomus sp.*
  - *Tanytarsus sp.*
  - *Thienemanniella sp.*

MOLLUSCA
- Gastropoda
  - *Ferrissia parallela*
  - *Gyraulus parvus*
  - *Physella sp.*
  - *Valvta tricarinata*
- Pelecypoda
  - *Musculium lacustre f. jayense*
  - *Musculium transversum*
  - *Pisidium casertanum*
  - *Pisidium compressum*
  - *Pididium ferrugineum*
  - *Sphaerium corneum*

Source: MWRDGC, Comprehensive evaluation of water quality: distribution of benthic invertebrate species in the Chicago Waterway System during 1989, Report #90-30, 1990.

TABLE 24
Benthic Invertebrates Collected from North Shore Channel, 1990

COELENTERATA
Hydra sp.
TURBELLARIA
ANNELIDA
Oligochaeta
Naididae
Amphichaeta leydigi
Chaetogaster diaphanus
Chaetogaster diastrophus
Dero digitata
Haemonais waldvogeli
Nais communis
Nais elinguis
Nais pardalis
Nais simplex
Nais variabilis
Ophidonais serpentina
Paranais frici
Stylaria lacustris
Vejdovskyella intermedia
Tubificidae
Aulodrilus limnobius
Aulodrilus pigueti
Aulodrilus pluriseta
Ilyodrilus templetoni
Limnodrilus cervix
Limnodrilus cervix variant
Limnodrilus claparedianus
Limnodrilus hoffmeisteri
Limnodrilus spiralis
Limnodrilus tortilipenis
Limnodrilus udekemianus
Potamothrix moldaviensis
Quistadrilus multisetosus
Tubifex tubifex
HIRUDINEA
Erpobdella punctata punctata
Helobdella stagnalis
Mooreobdella microstoma
Nephelopsis obscura
CRUSTACEA
Isopoda
Caecidotea intermedia
Insecta
Ephemeroptera
Caenis sp.
Tricoptera
Oecetis sp.
DIPTERA
Empididae
Hemerodromia sp.
Psychodidae
Psychoda sp.
Chironomidae
Ablabesmyia sp.
Chironomus anthracinus-gr.
Chironomus fluviatilis-gr.
Chironomus plumosus-gr.
Cladopelma sp.
Cricotopus (I.) sylvestris-gr.
Cryptochironomus cf. digitatus
Cryptochironomus cf. fulvus
Dicrotendipes sp.
Glyptotendipes sp.
Heterotrissocladius cf. changi
Microtendipes cf. pedellus
Monodiamesa cf. tuberculata
Parachironomus arcuatus-gr.
Paracladopelma camptolabis-gr.
Parakiefferiella sp.
Paratanytarsus sp.
Polypedilium cf. convictum
Polypedilium cf. scalaenum
Polypedilum cf. simulans/digitifer
Procladius sp.
Pseudochironomus cf. articaudus
Tanytarsus sp.
MOLLUSCA
Gastropoda
Ferrissia sp.
Gyraulus circumstriatus
Physella gyrina gyrian
Physella integra integra
Valvata tricarinata
Pelecypoda
Musculium lacustre f. jayense
Musculium transversum
Pisidium casertanum
Pisidium compressum
Pisidium variabilis
Sphaerium corneum

Source: Polls, et al., Comprehensive evaluation of water quality: distribution of benthic invertebrate species in the Chicago Waterway System during 1991, Report #92-22, 1991.

TABLE 25
Benthic Invertebrates Collected from North Shore Channel, 1991

COELENTERATA
Hydra sp.
TURBELLARIA
ANNELIDA
Oligochaeta
Naididae
Amphichaeta leydigi
Chaetogaster diaphanus
Dero digitata
Dero furcata
Dero furcata/lodeni
Haemonais waldvogeli
Nais barbata
Nais communis
Nais elinguis
Nais pardalis
Nais simplex
Nais variabilis
Ophidonais serpentina
Paranais frici
Pristina aequiseta
Pristinella osborni
Pristinella sima
Slavina appendiculata
Stylaria lacustris
Vejdovskyella intermedia
Tubificidae
Aulodrilus pigueti
Ilyodrilus templetoni
Limnodrilus cervix
Limnodrilus cervix variant
Limnodrilus claparedianus
Limnodrilus hoffmeisteri
Limnodrilus spiralis
Limnodrilus tortiplipenis
Limnodrilus udekemianus
Potamothrix moldaviensis
Quistadrilus multisetosus
Tubifex tubifex
Hirudinea
Helobdella stagnalis

CRUSTACEA
Amphipoda
Gammarus fasciatus
Gammarus sp.
Isopoda
Caecidotea intermedius
INSECTA
Ephemeroptera
Caenis yongi
Odonata
Coenagrionidae
Diptera
Empididae
Hemerodromia sp.
Chironomidae
Chironomous anthracinus-gr.
Chironomus fluviatilis-gr.
Chironomus plumosus-gr.
Cladopelma laccophilus-gr.
Cricoptopus (C.) bicinctus-gr.
Cricotopus (I.) sylvestris-gr.
Cryptochironomus cf. digitatus
Cryptochironomus cf. fulvus
Dicrotendipes modestus
Nanocladius sp.
Parachironomus arcuatus-gr.
Paracladopelma camptolabis-gr.
Parakiefferiella sp.
Phaenospectra sp.
Polypedilium cf. scalaenum
Polypedilum cf. simulans/digitifer
Procladius sp.
MOLLUSCA
Gastropoda
Dreissena polymorpha
Physella integra integra

Source: Polls, et al., Comprehensive evaluation of water quality: distribution of benthic invertebrate species in the Chicago Waterway System during 1991, 1992.

TABLE 26
Number and Weight of Fish Collected at Two Stations on the North Branch Chicago River, Reach 5B, 1991

SPECIES	TOTAL NUMBER COLLECTED	TOTAL WEIGHT (GRAMS)
Goldfish	106	16,398.57
Carp	85	110,638.09
Carp x goldfish hybrid	44	40,476.35
Golden shiner	55	401.81
White sucker	2	749.00
Black bullhead	4	691.94
Green sunfish	67	1,096.04
Bluegill	34	1,261.61
Green sunfish x bluegill hybrid	3	50.22
Pumpkinseed x bluegill hybrid	1	29.50
Gizzard shad	77	3,961.25
Bluntnose minnow	59	138.22
Largemouth bass	4	35.01
Alewife	5	82.89
Spottail shiner	4	8.64
Fathead minnow	4	8.98
Pumpkinseed	10	118.01
Black crappie	2	176.38
Emerald shiner	2	19.28
TOTAL	**568**	**176,341.79**

Source: Dennison, et al., Comprehensive Water Quality Evaluation: Fish Survey of the Chicago Waterway System During 1991, MWRDGC Report No. 92-17, 1992.

TABLE 27
Benthic Invertebrates Collected from North Branch Chicago River, Reach 5B, 1989

TURBELLARIA

ANNELIDA

- Oligochaeta
  - Enchytraeidae
  - Naididae
    - *Chaetogaster diaphanus*
    - *Chaetogaster limnaei*
    - *Dero digitata*
    - *Dero furcata*
    - *Dero lodeni*
    - *Haemonais waldvogeli*
    - *Nais communis*
    - *Nais elinguis*
    - *Nais pseudobtusa*
    - *Nais simplex*
    - *Nais variabilis*
    - *Ophidonais serpentina*
    - *Pristina osborni*
    - *Stylaria fossularis*
    - *Stylaria lacustris*
    - *Vejdovskyella intermedia*
  - Tubificidae
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus claparedianus*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus spiralis*
    - *Limnodrilus tortilipenis*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
    - *Tubifex tubifex*
  - Hirudinea
    - *Abloglossiphonia heteroclitia*
    - *Dina parva*
    - *Helobdella stagnalis*
    - *Mooreobdella microstoma*

CRUSTACEA

- Isopoda
    - *Caecidotea intermedia*

INSECTA

- Diptera
  - Chironomidae
    - *Chironomus anthracinus-gr.*
    - *Chironomus plumosus-gr.*
    - *Cladopelma sp.*
    - *Cricoptopus (C.) bicinctus*
    - *Cricotopus (I.) sylvestris-gr.*
    - *Dicrotendipes sp.*
    - *Parachironomus arcuatus-gr.*
    - *Procladius sp.*

MOLLUSCA

- Gastropoda
    - *Physella sp.*
- Pelecypoda
    - *Musculium lacustre f. jayense*
    - *Musculium transversum*
    - *Pisidium casertanum*
    - *Pisidium henslowanum*
    - *Pisidium lilljeborgi f. lilljeborgi*
    - *Pisidium subtruncatum*
    - *Sphaerium corneum*
    - *Sphaerium simile*

Source: Metropolitan Water Reclamation District of Greater Chicago, Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1989, Report No. 90-30, 1990.

TABLE 28
Benthic Invertebrates Collected from North Branch Chicago River, Reach 5B, 1990

COELENTERATA
- *Hydra sp.*

TURBELLARIA

ANNELIDA
- Oligochaeta
  - Aeolosomatidae
  - Enchytraeidae
  - Naididae
    - *Chaetogaster diaphanus*
    - *Chaetogaster diastrophus*
    - *Dero digitata*
    - *Nais communis*
    - *Nais elinguis*
    - *Nais simplex*
    - *Nais variabilis*
    - *Ophidonais serpentina*
    - *Paranais frica*
    - *Slavina appendiculata*
    - *Stylaria lacustris*
  - Tubificidae
    - *Aulodrilus pigueti*
    - *Aulodrilus pluriseta*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus claparedianus*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
    - *Tubifex*
  - Hirudinea
    - *Helobdella stagnalis*
    - *Mooreobdella microstoma*
    - *Nephelopsis obscura*
    - *Crustacea*
    - *Isopoda*
    - *Caecidotea intermedia*

INSECTA
- Diptera
  - Chironomidae
    - *Conchapelopia sp.*
    - *Cricotopus (C.) bicinctus-gr.*
    - *Cricotopus (C.) fuscus-gr.*
    - *Cricotopus (I.) sylvestris-gr.*
    - *Cryptochironomus cf. digitatus*
    - *Dicrotendipes sp.*
    - *Nanocladius sp.*
    - *Parachironomus arcuatus-gr.*
    - *Polypedilium cf. covictum/obtusum*
    - *Procladius sp.*

MOLLUSCA
- Gastropoda
    - *Ferrissia rivularis*
    - *Menetus dilatus*
    - *Physella gyriana gyrina*
- Pelecypoda
    - *Musculium lacustre f. jayense*
    - *Musculium transversum*
    - *Pisidium casertanum*
    - *Pisidium compressum*
    - *Pisidium subtruncatum*
    - *Pisidium variabile*
    - *Sphaerium corneum*
    - *Sphaerium simile*

Source: Polls, et al., Comprehensive Water Quality Evaluation-Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1990, MWRDGC Report No. 91-22, 1991.

Table 29
Benthic Invertebrates Collected from North Branch Chicago River, Reach 5B, 1991

COELENTERATA
- *Hydra sp.*

TURBELLARIA

ANNELIDA
- Oligochaeta
  - Aeolochaeta
  - Enchytraeidae
  - Naididae
    - *Chaetogaster diaphanus*
    - *Chaetogaster limnaei*
    - *Dero digitata*
    - *Nais barbata*
    - *Nais communis*
    - *Nais elinguis*
    - *Nais pseudobtusa*
    - *Nais simplex*
    - *Nais variabilis*
    - *Ophidonais serpentina*
    - *Paranais frici*
    - *Slavina appendiculata*
    - *Stylaria lacustris*
    - *Vejdovskyella intermedia*
  - Tubificidae
    - *Aulodrilus pigueti*
    - *Aulodrilus pluriseta*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus claparedianus*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus spiralis*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
    - *Tubifex tubifex*
  - Hirudinea
    - *Dina dubia*
    - *Helobdella stagnalis*
    - *Mooreobdella microstoma*

CRUSTACEA
- Isopoda
  - *Caecidotea intermedia*

INSECTA
- Diptera
  - Psychodidae
    - *Pericoma sp.*
    - *Chironomidae*
    - *Chironomus anthracinus-gr.*
    - *Chironomus plumosus-gr.*
    - *Cricotopus (C.) bicinctus-gr.*
    - *Dicrotendipes sp.*
    - *Nanocladius sp.*
    - *Parachironomus arcuatus-gr.*
    - *Procladius sp.*

MOLLUSCA
- Gastropoda
  - *Mentus (M.) dilatatus*
  - *Valvata bicarinata bicarinata*
- Pelecypoda
  - *Musculium lacustre f. jayense*
  - *Musculium jayennnse f. jayense*
  - *Musculium transversum*
  - *Pisidium adamsi/casertanum*
  - *Pisidium casertanum*
  - *Pisidium compressum*
  - *Pisidium nitidum f. pauperculum*
  - *Pisidium subtruncatum*
  - *Pisidium variabile*
  - *Sphaerium corneum*
  - *Sphaerium simile*

Source: Polls, et al., Comprehensive Water Quality Evaluation-Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1991, MWRDGC Report No. 92-22, 1992.

TABLE 30
Number and Weight of Fish Collected at Stations 18 and 19 in Reach 6 of the Chicago River, 1991

SPECIES	NUMBER OF FISH COLLECTED	TOTAL WEIGHT (GRAMS)
Alewife	4	14.46
Rainbow trout	1	853.50
Goldfish	15	4,146.50
Carp	99	300,516.85
Carp x goldfish hybrid	7	7,702.50
Black bullhead	4	844.00
Rock bass	132	4,583.97
Green sunfish	126	2,629.16
Pumpkinseed	24	380.21
Bluegill	77	680.39
Largemouth bass	48	5,921.38
Brown trout	3	67.65
Golden shiner	1	3.52
Bluntnose minnow	513	1,040.38
Threespine stickleback	1	2.29
Smallmouth bass	23	451.20
Black crappie	1	153.00
Johnny darter	3	1.83
Spottail shiner	50	183.53
Troutperch	2	4.89
Green sunfish x pumpkinseed hybrid	1	40.00
Yellow perch	11	263.66
Gizzard shad	47	2,334.46
Chinook salmon	1	17.56
Fathead minnow	2	5.51
TOTAL	**1,196**	**332,842.40**

Source: Dennison et al., Comprehensive Water Quality Evaluation: Fish Survey of the Chicago Waterway System During 1991l, MWRDGC Report No. 92-17, 1992.

TABLE 31
Benthic Invertebrates Collected from Reach 6 of the Chicago River, 1989

ANNELIDA
- Oligochaeta
  - Naididae
    - *Amphichaeta leydigi*
    - *Ophidonais serpentina*
    - *Paranais frici*
    - *Vejdovskyella intermedia*
  - Tubificidae
    - *Aulodrilus limnobius*
    - *Aulodrilus pigueti*
    - *Ilyodrilus templetoni*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
  - Hirudinea
    - *Helobdella stagnalis*
    - *Mooreobdella microstoma*

INSECTA
- Diptera
  - Chironomidae
    - *Chironomus anthracinus-gr.*
    - *Chironomus plumosus-gr.*
    - *Claydopelma sp.*
    - *Cryptochironomus cf. digitatus*
    - *Procladius sp.*

MOLLUSCA
- Pelecypoda
    - *Pisidium casertanum*

Source: Metropolitan Water Reclamation District of Greater Chicago, Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1989, Report No. 90-30, 1990.

TABLE 32
Benthic Invertebrates Collected from Reach 6 of the Chicago River, 1990

TURBELLARIA
ANNELIDA
- Oligochaeta
  - Naididae
    - *Amphichaeta leydigi*
    - *Nais pardalis*
    - *Paranais frici*
    - *Vejdovskyella intermedia*
  - Tubificidae
    - *Aulodrilus limnobius*
    - *Aulodrilus pigueti*
    - *Aulodrilus pluriseta*
    - *Ilyodrilus templetoni*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus udekemianus*
    - *Potamothrix vejdovskyi*
    - *Quistadrilus multisetosus*
- Hirudinea
    - *Helobdella stagnalis*
    - *Mooreobdella microstoma*

CRUSTACEA
  - Amphipoda
    - *Gammarus sp.*

INSECTA
- Diptera
  - Chironomidae
    - *Chironomus anthracinus-gr.*
    - *Chironomus plumosus-gr.*
    - *Cladopelma sp.*
    - *Cryptochironomus cf. digitatus*
    - *Procladius sp.*

MOLLUSCA
- Pelecypoda
    - *Pisidium punctatum*

Source: Polls, et al., Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1990, MWRDGC Report No. 91-22, 1991.

TABLE 33
Benthic Invertebrates Collected from Reach 6 of the Chicago River, 1991

TURBELLARIA
ANNELIDA
- Oligochaeta
  - Enchytraeidae
  - Naididae
    - *Amphichaeta leydigi*
    - *Chaetogaster diaphanus*
    - *Nais pardalis*
    - *Nais variabilis*
    - *Paranais frici*
    - *Pristinella acuinata*
    - *Specaria josinae*
    - *Vejdovskyella intermedia*
  - Tubificidae
    - *Aulodrilus limnobius*
    - *Aulodrilus pigueti*
    - *Aulodrilus pluriseta*
    - *Ilyodrilus templetoni*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus udekemianus*
    - *Potamothrix moldaviensis*
    - *Potamothrix vejdovskyi*
    - *Quistadrilus multisetosus*

CRUSTACEA
- Amphipoda
    - *Gammarus sp.*

INSECTA
- Diptera
  - Chironomidae
    - *Chironomus anthracinus-gr.*
    - *Chironomus plumosus-gr.*
    - *Cladopelma laccophilus-gr.*
    - *Cryptochironomus cf. digitatus*
    - *Monodiamesa depectinata*
    - *Polypedilium cf. scalaenum*
    - *Polypedilium cf. simulans/digitifer*
    - *Procladius sp.*
    - *Pseudochironomus sp.*

MOLLUSCA
- Pelecypoda
    - *Dreissena polymorpha*
    - *Musculium lacustre f. jayense*
    - *Pisidium casertanum*
    - *Pisidium punctatum*
    - *Sphaerium corneum*

Source: Polls, et al., Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1991, MWRDGC Report No. 92-22, 1992.

TABLE 34
Number and Weight of Fish Collected from One Station in Reach 7, Junction of North Branch and South Branch, 1991

SPECIES	NUMBER OF FISH COLLECTED	TOTAL WEIGHT (GRAMS)
Alewife	26	213.52
Gizzard shad	210	7,866.06
Goldfish	40	9,225.22
Carp	65	172,200.03
Carp x goldfish hybrid	8	13,839.20
Emerald shiner	2	13.77
Spottail shiner	11	23.30
Bluntnose minnow	133	328.11
Rock bass	4	707.00
Green sunfish	12	246.98
Pumpkinseed	4	124.46
Bluegill	19	740.05
Largemouth bass	7	798.73
Golden shiner	1	56.82
White perch	3	305.72
Orangespotted sunfish	1	9.00
Black crappie	1	11.00
Yellow perch	1	24.00
TOTAL	**548**	**206,732.97**

Source: Dennison et al. Comprehensive Water Quality Evaluation: Fish Survey of the Chicago Waterway System During 1991, MWRDGC Report No. 92-17, 1992.

TABLE 35
Benthic Invertebrates Collected from Reach 7 of the South Branch Chicago River, 1989

TURBELLARIA
ANNELIDA
- Oligochaeta
  - Naididae
    - *Chaetogaster diaphanus*
    - *Chaetogaster limnaei*
    - *Dero digitata*
    - *Vejdovskyella intermedia*
  - Tubificidae
    - *Aulodrilus pigueti*
    - *Aulodrilus pluriseta*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus spiralis*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
  - Hirudinea
    - *Helobdella stagnalis*
    - *Mooreobdella microstoma*

INSECTA
- Diptera
  - Chironomidae
    - *Chironomus anthracinus-gr.*
    - *Chironomus plumosus-gr.*
    - *Procladius sp.*

MOLLUSCA
- Gastropoda
    - *Bithynia tentaculata*
    - *Valvata tricarinata*
- Pelecypoda
    - *Pisidium casertanum*
    - *Pisidium compressum*
    - *Sphaerium corneum*

Source: Metropolitan Water Reclamation District of Greater Chicago., Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1989, Report No. 90-30, 1990.

TABLE 36
Benthic Invertebrates Collected from Reach 7 of the South Branch Chicago River, 1990

TURBELLARIA
ANNELIDA
- Oligochaeta
  - Naididae
    - *Chaetogaster diaphanus*
    - *Dero digitata*
    - *Stylaria lacustris*
  - Tubificidae
    - *Aulodrilus pigueti*
    - *Aulodrilus pluriseta*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
  - Hirudinea
    - *Helobdella stagnalis*
    - *Mooreobdella microstoma*
- Crustacea
  - Isopoda
    - *Caecidotea intermedia*

INSECTA
- Diptera
  - Chironomidae
    - *Nanocladius sp.*
    - *Procladius sp.*

MOLLUSCA
- Pelecypoda
    - *Musculium transversum*
    - *Pisidium casertanum*
    - *Pisidium compressum*
    - *Sphaerium corneum*

Source: Polls et al., Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1990, MWRDGC Report No. 91-22, 1991.

TABLE 37
Benthic Invertebrates Collected from Reach 7 of the South Branch Chicago River, 1991

TURBELLARIA
ANNELIDA
- Oligochaeta
  - Aeolosomatidae
  - Enchytraeidae
  - Naididae
    - *Chaetogaster diaphanus*
    - *Dero digitata*
    - *Paranais frici*
    - *Stylaria lacustris*
  - Tubificidae
    - *Aulodrilus limnobius*
    - *Aulodrilus pigueti*
    - *Aulodrilus pluriseta*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix variant*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
  - Hirudinea
    - *Helobdella stagnalis*

CRUSTACEA
- Isopoda
    - *Caecidotea intermedia*

INSECTA
- Diptera
  - Chironomidae
    - *Chironomus plumosus-gr.*
    - *Cladopelma laccophilus-gr.*
    - *Cricotopus (C.) bicinctus-gr.*
    - *Nanocladius sp.*
    - *Procladius sp.*

MOLLUSCA
- Pelecypoda
    - *Musculium transversum*

Source: Polls, et al, Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1991, MWRDGC Report No. 92-22, 1992.

TABLE 38
Number and Weight of Fish Collected from Three Stations in Reach 8, Chicago Sanitary and Ship Canal, 1991

SPECIES	NUMBER OF FISH COLLECTED	TOTAL WEIGHT (GRAMS)
Gizzard shad	54	1692.75
Rainbow smelt	1	5.51
Goldfish	602	113,827.06
Carp	418	472,844.08
Golden shiner	47	422.76
Bluntnose minnow	628	981.52
Threespine stickleback	1	1.41
Green sunfish	7	67.63
Pumpkinseed	12	129.48
Largemouth bass	46	3,790.64
Carp x goldfish hybrid	17	12,514.61
Bluegill	12	18.94
Emerald shiner	16	75.97
Fathead minnow	24	47.99
Black bullhead	2	298.68
Alewife	1	0.79
Black crappie	1	216.00
Spottail shiner	18	27.08
Brown trout	1	454.00
TOTAL	**1,908**	**607,416.90**

Source: Dennison et al, Comprehensive Water Quality Evaluation: Fish Survey of the Chicago Waterway System During 1991, MWRDGC Report No. 92-17, 1992.

TABLE 39
Benthic Invertebrates Collected from the Chicago Sanitary and Ship Canal, Reach 8, 1989

TURBELLARIA

ANNELIDA

- Oligochaeta
  - Enchytraeidae
  - Naididae
    - *Arcteonais lomondi*
    - *Chaetogaster diaphanus*
    - *Chaetogaster diastrophus*
    - *Chaetogaster limnaei*
    - *Dero digitata*
    - *Dero furcata*
    - *Dero lodeni*
    - *Haemonais waldvogeli*
    - *Nais communis*
    - *Nais elinguis*
    - *Nais simplex*
    - *Nais variabilis*
    - *Ophidonais serpentina*
    - *Paranais frici*
    - *Stylaria lacustris*
  - Tubificidae
    - *Aulodrilus pigueti*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus claparedianus*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus spiralis*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
    - *Tubifex tubifex*
  - Hirudinea
    - *Glossiphonia complanata*
    - *Helobdella stagnalis*
    - *Mooreobdella microstoma*

CRUSTACEA

- Isopoda
    - *Caecidotea intermedius*

INSECTA

- Odonata
    - *Coenagrion/Enallagma sp.*
- Diptera
  - Sciaridae
    - *g. nr. Corynoptera sp.*
  - Ceratopogonidae
  - Chironomidae
    - *Cricotopus (I.) sylvestris-gr.*
    - *Nanocladius sp.*
    - *Parachironomus arcuatus-gr.*
    - *Polypedilum cf. illinoense*
    - *Polypedilum cf. scalaenum*
    - *Procladius sp.*
    - *Tanypus (A.) neopunctipennis*

MOLLUSCA

- Gastropoda
    - *Amnicola limosa*
    - *Bithynia tentaculata*
    - *Cincinnatia sp.*
    - *Physella sp.*
    - *Valvata tricarinata*
- Pelecypoda
    - *Musculium lacustre f. jayense*
    - *Musculium lacustre f. lacustre*
    - *Musculium transversum*
    - *Pisidium casertanum*
    - *Pisidium compressum*
    - *Pisidium fallax*
    - *Pisidium lilljeborgi*
    - *Sphaerium corneum*

Source: Metropolitan Water Reclamation District of Greater Chicago, Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1989, Report No. 90-30, 1990.

TABLE 40

Benthic Invertebrates Collected from the Chicago Sanitary and Ship Canal, Reach 8, 1990

COELENTERATA
- *Hydra sp.*

TURBELLARIA

ANNELIDA
- Oligochaeta
  - Enchytraeidae
  - Naididae
    - *Chaetogaster diaphanus*
    - *Chaetogaster diastrophus*
    - *Chaetogaster limnaei*
    - *Dero digitata*
    - *Haemonais waldvogeli*
    - *Nais communis*
    - *Nais elinguis*
    - *Nais pardalis*
    - *Nais pseudobtusa*
    - *Nais simplex*
    - *Nais variabilis*
    - *Ophidonais serpentina*
    - *Paranais frici*
    - *Stylaria fossularis*
    - *Stylaria lacustris*
  - Tubificidae
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus claparedianus*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
    - *Tubifex tubifex*
- Hirudinea
  - *Abloglossiphonia heteroclitia*
  - *Dina parva*
  - *Erpobdella punctata punctata*
  - *Glossiphonia complanata*
  - *Helobdella fusca*
  - *Helobdella stagnalis*
  - *Helobdella transversa*
  - *Mooreobdella microstoma*

CRUSTACEA
- Isopoda
  - *Caecidotea intermedius*

INSECTA
- Odonata
  - *Enallagma sp.*
- Diptera
  - Chironomidae
    - *Cricotopus (I.) sylvestris-gr.*
    - *Dicrotendipes sp.*
    - *Parachironomus arcuatus-gr.*
    - *Procladius sp.*

MOLLUSCA
- Gastropoda
  - *Bithynia tentaculata*
  - *Physella gyrina sayi*
- Pelecypoda
  - *Musculium lacustre f. jayense*
  - *Musculium transversum*
  - *Pisidium casertanum*
  - *Pisidium compressum*
  - *Pisidium subtruncatum*
  - *Pisidium variabile*
  - *Sphaerium corneum*

Source: Polls et al, Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1990, MWRDGC Report No. 91-22, 1991.

TABLE 41
Benthic Invertebrates Collected from the Chicago Sanitary and Ship Canal, Reach 8, 1991

COELENTERATA
- *Hydra sp.*

TURBELLARIA

ANNELIDA
- Oligochaeta
  - Aeolosomatidae
  - Enchytraeidae
  - Naididae
    - *Chaetogaster diaphanus*
    - *Chaetogaster limnaei*
    - *Dero digitata*
    - *Dero furcata*
    - *Dero pectinata*
    - *Haemonais waldvogeli*
    - *Nais communis*
    - *Nais elinguis*
    - *Nais simplex*
    - *Nais variabilis*
    - *Paranais frici*
    - *Pristina aequiseta*
    - *Slavina appendiculata*
    - *Stylaria lacustris*
  - Tubificidae
    - *Aulodrilus limnobius*
    - *Aulodrilus pigueti*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus claparedianus*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
    - *Tubifex tubifex*
  - Hirudinea
    - *Dina parva*
    - *Erpobdella punctata punctata*
    - *Glossiphonia complanata*
    - *Helobdella stagnalis*
    - *Mooreobdella microstoma*
    - *Nephelopsis obscura*

CRUSTACEA
- Amphipoda
  - *Hyalella azteca*
- Isopoda
  - *Caecidotea intermedia*

INSECTA
- Diptera
  - Psychodidae
    - *Pericoma sp.*
    - *Psychoda sp.*
  - Chironomidae
    - *Ablabesmyia sp.*
    - *Cricotopus (I.) sylvestris-gr.*
    - *Dicrotendipes sp.*
    - *Nanocladius sp.*
    - *Procladius sp.*

MOLLUSCA
- Gastropoda
  - *Amnicola limosa*
  - *Bithynia tentaculata*
  - *Ferrissia sp.*
  - *Menetus (M.) dilatatus*
- Pelecypoda
  - *Corbicula fluminea*
  - *Dreissena polymorpha*
  - *Musculium lacustre f. jayense*
  - *Musculium transversum*
  - *Pisidium casertanum*
  - *Pisidium compressum*
  - *Pisidium subtruncatum*
  - *Pisidium variabile*
  - *Sphaerium corneum*

Source: Polls et al, Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1991, MWRDGC Report No. 92-22, 1992.

TABLE 42
Number and Weight of Fish Collected from One Station in Reach 9A, Chicago Sanitary and Ship Canal, 1991

SPECIES	NUMBER OF FISH COLLECTED	TOTAL WEIGHT (GRAMS)
Central mudminnow	1	20.00
Goldfish	29	1,501.42
Carp	23	26,897.85
Bluntnose minnow	29	107.26
Green sunfish	8	95.60
Gizzard shad	1	102.50
Carp x goldfish hybrid	3	986.03
Pumpkinseed	2	13.00
Largemouth bass	2	24.35
Spottail shiner	1	2.09
Green sunfish x pumpkinseed hybrid	1	19.00
TOTAL	**100**	**29,769.10**

Source: Dennison et al., Comprehensive Water Quality Evaluation: Fish Survey of the Chicago Waterway System During 1991, MWRDGC Report No. 92-17, 1992.

TABLE 43
Number and Weight of Fish Collected from One Station in Reach 9B, Chicago Sanitary and Ship Canal, 1991

SPECIES	NUMBER OF FISH COLLECTED	TOTAL WEIGHT (GRAMS)
Gizzard shad	11	534.61
Goldfish	17	2,915.32
Carp	55	78,895.89
Green sunfish	3	24.14
Pumpkinseed	3	6.25
Golden shiner	2	10.10
Emerald shiner	3	16.69
Bluegill	1	16.48
Carp x goldfish hybrid	2	2,919.00
Largemouth bass	6	84.00
TOTAL	**103**	**85,422.48**

Source: Dennison et al., Comprehensive Water Quality Evaluation: Fish Survey of the Chicago Waterway System During 1991, MWRDGC Report No. 92-17, 1992.

TABLE 44
Number and Weight of Fish Collected from Two Stations in Reach 10A, Cal-Sag Channel, 1991

SPECIES	NUMBER OF FISH COLLECTED	TOTAL WEIGHT (GRAMS)
Gizzard shad	105	1,844.08
Goldfish	80	18,429.52
Carp	46	51,971.84
Carp x goldfish hybrid	3	3,209.50
Fathead minnow	1	0.91
Green sunfish	31	316.46
Bluegill	22	726.60
Black crappie	2	8.41
Central mudminnow	2	9.87
Emerald shiner	5	12.55
Largemouth bass	6	484.83
Bluntnose minnow	2	12.87
Black bullhead	1	102.00
Pumpkinseed	6	68.00
Spottail shiner	1	3.27
Green sunfish x pumpkinseed hybrid	1	71.00
TOTAL	**314**	**77,271.71**

Source: Dennison et al., Comprehensive Water Quality Evaluation: Fish Survey of the Chicago Waterway System During 1991, MWRDGC Report No. 92-17, 1992.

TABLE 45
Benthic Invertebrates Collected from the Cal-Sag Channel, Reach 10A, 1989

TURBELLARIA
ANNELIDA
- Oligochaeta
  - Enchytraeidae
  - Naididae
    - *Chaetogaster diaphanus*
    - *Chaetogaster limnaei*
    - *Dero digitata*
    - *Dero lodeni*
  - Tubificidae
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus spiralis*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
    - *Tubifex tubifex*
  - Hirudinea
    - *Helobdella fusca*
    - *Helobdella stagnalis*
    - *Helobdella triserialis*
    - *Mooreobdella microstoma*

INSECTA
- Odonata
    - *Perithemis tentera*
- Diptera
  - Ceratopogonidae
    - *Ceratopogon sp.*
  - Chironomidae
    - *Dicrotendipes sp.*
    - *Parachironomus arcuatus-gr.*
    - *Procladius freemani Subl. var. 1*
    - *Procladius sp.*
    - *Tanypus (Abbelopia) neopunctipennis*

MOLLUSCA
- Pelecypoda
    - *Musculium lacustre f. jayense*
    - *Musculium transversum*
    - *Sphaerium corneum*

Source: Metropolitan Water Reclamation District of Greater Chicago, Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1989, Report No. 90-30, 1990.

TABLE 46
Benthic Invertebrates Collected from the Cal-Sag Channel, Reach 10A, 1990

ANNELIDA
- Oligochaeta
  - Naididae
    - *Chaetogaster diaphanus*
    - *Dero digitata*
    - *Ophidonais serpentina*
    - *Stylaria lacustris*
  - Tubificidae
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus spiralis*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
    - *Tubifex tubifex*
  - Hirudinea
    - *Helobdella stagnalis*
    - *Mooreobdella microstoma*

INSECTA
- Odonata
  - Libelludidae
- Diptera
  - Chaoboridae
    - *Chaoborus punctipennis*
  - Chironomidae
    - *Nanocladius sp.*
    - *Parachironomus arcuatus-gr.*
    - *Procladius sp.*
    - *Tanypus sp.*

MOLLUSCA
- Gastropoda
    - *Physella sp.*
- Pelecypoda
    - *Musculium lacustre f. jayense*
    - *Musculium transversum*

Source: Polls et al., Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1990, MWRDGC Report No. 91-22, 1991.

TABLE 47
Benthic Invertebrates Collected from the Cal-Sag Channel, Reach 10A, 1991

TURBELLARIA
ANNELIDA
- Oligochaeta
  - Naididae
    - *Chaetogaster diaphanus*
    - *Chaetogaster limnaei*
    - *Dero digitata*
  - Tubificidae
    - *Aulodrilus pluriseta*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus claparedianus*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus udekemianus*
    - *Quistadrilus multisetosus*
    - *Tubifex tubifex*
  - Hirudinea
    - *Helobdella sp.*
    - *Mooreobdella microstoma*

INSECTA
- Coleoptera
  - Elmidae
- Tricoptera
    - *Hydropsyche sp.*
- Diptera
  - Chironomidae
    - *Procladius sp.*

MOLLUSCA
- Gastropoda
    - *Bithynia tentaculata*
- Pelecypoda
    - *Musculium lacustre f. jayense*
    - *Musculium transversum*
    - *Sphaerium corneum*

Source: Polls et al., Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1991, Report No. 92-22, 1992.

TABLE 48
Fishes Collected from the Little Calumet River, Reach 10B, 1976

SPECIES	STATION: 165	40	TOTAL
CLUPEIDAE			
gizzard shad	47	—	47
UMBRIDAE			
central mudminnow	—	1	1
CYPRINIDAE			
goldfish	19	1	20
carp	24	2	26
emerald shiner	10	—	10
bluntnose minnow	5	—	5
carp x goldfish	7	1	8
ICTALURIDAE			
black bullhead	—	1	1
POECILIIDAE			
mosquitofish	—	4	4
CENTRARCHIDAE			
green sunfish	1	55	56
pumpkinseed	1	—	1
bluegill	—	2	2
TOTAL INDIVIDUALS	**114**	**67**	**181**
TOTAL SPECIES	**7**	**7**	

Source: Brigham, W.U., D. McCormick, and M.J. Wetzel, The watersheds of Notheastern Illinois: quality of the aquatic environment based upon water quality and fishery data, 1978.

TABLE 49
Number and Weight of Fish Collected from Two Stations on the Little Calumet River, Reach 10B, 1991

SPECIES	NUMBER OF FISH COLLECTED	TOTAL WEIGHT (GRAMS)
Gizzard shad	545	15,087.13
Goldfish	108	29,741.02
Carp	112	150,754.75
Carp x goldfish hybrid	18	25,377.65
Golden shiner	9	189.53
Emerald shiner	28	130.86
Spottail shiner	16	163.24
Bluntnose minnow	12	34.14
Black bullhead	2	401.00
White perch	46	2,221.04
Green sunfish	21	211.73
Pumpkinseed	14	371.70
Bluegill	10	179.89
Green sunfish x pumpkinseed hybrid	2	52.78
Largemouth bass	18	2,768.90
Grass pickerel	1	59.00
White sucker	1	252.00
TOTAL	**963**	**227,996.36**

Source: Dennison, et al., Comprehensive Water Quality Evaluation: Fish Survey of the Chicago Waterway System During 1991, MWRDGC Report No. 92-17, 1992.

TABLE 50
Number and Weight of Fish Collected from Two Stations in Reach 10C, Calumet River, 1991

SPECIES	NUMBER OF FISH COLLECTED	TOTAL WEIGHT (GRAMS)
Alewife	1	60.00
Gizzard shad	218	20,768.48
Goldfish	7	1,987.78
Grass carp	1	9,072.00
Carp	57	153,709.31
Spottail shiner	2	18.35
Bluntnose minnow	204	548.80
Fathead minnow	8	8.91
White sucker	2	997.00
Black buffalo	1	5,925.15
White perch	53	2,355.56
Green sunfish	143	2,155.93
Pumpkinseed	69	1,459.99
Largemouth bass	129	15,754.20
Emerald shiner	91	233.28
Quillback	2	1,284.50
Channel catfish	2	1,879.50
White bass	1	553.00
Bluegill	135	2,116.15
Smallmouth bass	1	14.00
Green sunfish x pumpkinseed hybrid	5	156.79
Freshwater drum	1	809.00
Golden shiner	7	74.45
Carp x goldfish hybrid	1	715.00
Green sunfish x bluegill hybrid	4	32.00
Black bullhead	1	157.00
Black crappie	2	178.50
Yellow perch	1	3.07
Chinook salmon	1	4,110.00
TOTAL	**1,150**	**227,137.70**

Source: Dennison, et al., Comprehensive Water Quality Evaluation: Fish Survey of the Chicago Waterway System During 1991, MWRDGC Report No. 92-17, Tables AI-12,13, 1992.

TABLE 51
Benthic Invertebrates Collected from the Calumet River, Reach 10C, 1989

COELENTERATA
- *Hydra sp.*

TURBELLARIA

ANNELIDA
- Oligochaeta
  - Naididae
    - *Amphichaeta leydigi*
    - *Chaetogaster diaphanus*
    - *Chaetogaster setosus*
    - *Dero digitata*
    - *Nais bretscheri*
    - *Nais communis*
    - *Nais elinguis*
    - *Nais pardalis*
    - *Nais simplex*
    - *Nais variabilis*
    - *Paranais frici*
    - *Pristina acumineta*
    - *Specaria josinae*
    - *Vejdovskyella intermedia*
  - Tubificidae
    - *Aulodrilus limnobius*
    - *Aulodrilus pigueti*
    - *Aulodrilus pluriseta*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix*
    - *Limnodrilus cervix variant*
    - *Limnodrilus claparedianus*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus udekemianus*
    - *Potamothrix moldaviensis*
    - *Potamothrix vejdovskyi*
    - *Quistadrilus multisetosus*
  - Hirudinea
    - *Helobdella stagnalis*
    - *Mooreobdella microstoma*

CRUSTACEA
- Amphipoda
  - *Gammarus fasciatus*

INSECTA
- Tricoptera
  - *Cyrnellus fraternus*
- Diptera
  - Ceratopogonidae
    - *Ceratopogon sp.*
  - Chironomidae
    - *Chironomus anthracinus-gr.*
    - *Cladopelma sp.*
    - *Cricotopus (C.) bicinctus*
    - *Cricotopus (C.) bicinctus-gr.*
    - *Cricotopus (I.) sp.*
    - *Cryptochironomus cf. digitatus*
    - *Cryptochironomus cf. fulvus*
    - *Dicrotendipes sp.*
    - *Monodiamesa cf. tuberculata*
    - *Nanocladius sp.*
    - *Parakiefferiella sp.*
    - *Polypedilum cf. simulans/digitifer*
    - *Procladius sp.*
    - *Tanytarsus sp.*

MOLLUSCA
- Pelecypoda
  - *Corbicula fluminea*
  - *Musculium transversum*
  - *Pisidium casertanum*
  - *Pisidium compressum*
  - *Pisidium fallax*
  - *Pisidium henslowanum*
  - *Sphaerium corneum*
  - *Sphaerium simile*

Source: Metropolitan Water Reclamation District of Greater Chicago, Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1989, Report No. 90-30, 1990.

TABLE 52
Benthic Invertebrates Collected from the Calumet River, Reach 10C, 1990

COELENTERATA
- *Hydra sp.*

TURBELLARIA

ANNELIDA
- Oligochaeta
  - Enchytraeidae
  - Naididae
    - *Chaetogaster diaphanus*
    - *Dero digitata*
    - *Nais communis*
    - *Nais pardalis*
    - *Nais simplex*
    - *Nais variabilis*
    - *Ophidonais serpentina*
    - *Paranais frici*
    - *Pristinella sp.*
    - *Specaria josinae*
    - *Uncinais uncinais*
    - *Vejdovskyella intermedia*
  - Tubificidae
    - *Aulodrilus limnobius*
    - *Aulodrilus pigueti*
    - *Aulodrilus pluriseta*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix variant*
    - *Limnodrilus claparedianus*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus udekemianus*
    - *Potamothrix moldaviensis*
    - *Potamothrix vejdovskyi*
    - *Quistadrilus multisetosus*
  - Hirudinea
    - *Mooreobdella microstoma*

CRUSTACEA
- Amphipoda
  - *Gammarus fasciatus*
  - *Gammarus pseudolimnaeus*

INSECTA
- Coleoptera
  - Carabidae
  - Nitidulidae
  - Salpingidae
- Ephemeroptera
  - *Baetid sp.*
  - *Caenis sp.*
- Odonata
  - *Coenagrionidae*
- Tricoptera
  - *Hydroptila sp.*
  - *Oecetis sp.*
- Diptera
  - Ceratopogonidae
    - *Probezzia sp.*
  - Psychodidae
    - *Psychoda sp.*
- Chironomidae
  - *Ablabesmyia (A.) mallochi var. 1*
  - *Chironomus anthracinus-gr.*
  - *Chironomus plumosus-gr.*
  - *Cricotopus (C.) bicinctus-gr.*
  - *Cricotopus (C.) festivellus-gr.*
  - *Cricotopus (C.) fuscus-gr.*
  - *Cricotopus (C.) tremulus-gr.*
  - *Cricotopus (I.) reversus-gr.*
  - *Cricotopus (I.) sylvestrus-gr.*
  - *Cryptochironomus cf. fulvus*
  - *Dicrotendipes sp.*
  - *Hydrobaenus pilipes-gr.*
  - *Monodiamesa cf. tuberculata*
  - *Nanocladius sp.*
  - *Parachironomus arcuatus-gr.*
  - *Paratendipes sp.*
  - *Parakiefferiella sp.*
  - *Polypedilum cf. simulans/digitifer*
  - *Procladius sp.*

MOLLUSCA
- Pelecypoda
  - *Corbicula fluminea*
  - *Musculium transversum*
  - *Pisidium casertanum*
  - *Pisidium compressum*
  - *Pisidium punctatum*

Source: Polls et al., Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1990, MWRDGC Report No. 91-22, 1991.

TABLE 53
Benthic Invertebrates Collected from the Calumet River, Reach 10C, 1991

COELENTERATA
- *Hydra sp.*

TURBELLARIA

ANNELIDA
- Oligochaeta
  - Naididae
    - *Amphichaeta leydigi*
    - *Chaetogaster diaphanus*
    - *Chaetogaster diastrophus*
    - *Chaetogaster setossus*
    - *Dero digitata*
    - *Nais elinguis*
    - *Nais simplex*
    - *Paranais frici*
    - *Vejdovskyella intermedia*
  - Tubificidae
    - *Aulodrilus limnobius*
    - *Aulodrilus pigueti*
    - *Aulodrilus pluriseta*
    - *Branchiura sowerbyi*
    - *Ilyodrilus templetoni*
    - *Limnodrilus cervix variant*
    - *Limnodrilus claparedianus*
    - *Limnodrilus hoffmeisteri*
    - *Limnodrilus maumeensis*
    - *Limnodrilus spiralis*
    - *Limnodrilus udekemianus*
    - *Potamothrix moldaviensis*
    - *Potamothrix vejdovskyi*
    - *Quistadrilus multisetos*us

CRUSTACEA
- Amphipoda
  - *Gammarus fasciatus*
- Isopoda
  - *Caecidotea sp.*

- Insecta
  - Diptera
    - Ceratopogonidae
      - *Ceratopogon sp.*
    - Chironomidae
      - *Ablabesymia (A.) mallochi var. 1*
      - *Cryptochironomus cf. digitatus*
      - *Cryptochironomus cf. fulvus*
      - *Dicrotendipes cf. modestus*
      - *Dicrotendipes simpsoni*
      - *Polypedilium cf. simulans/digitifer*
      - *Procladius sp.*
- Mollusca
  - Gastropoda
    - *Amnicola limosa*
    - *Probythinella lacustis*
  - Pelecypoda
    - *Corbicula fluminea*
    - *Dreissena polymorpha*
    - *Musculium transversum*
    - *Pisidium casertanum*
    - *Pisidium compressum*
    - *Pisidium punctatum*
    - *Sphaerium simile*

Source: Polls et al., Comprehensive Water Quality Evaluation: Distribution of Benthic Invertebrate Species in the Chicago Waterway System During 1991, MWRDGC Report No. 92-22, 1992.

TABLE 54.
Water Quality Parameters Monitored by MWRD on General and Secondary Use Waters.

Temperature	Mercury	Total Iron
Ammonia	Phenols	Nickel
Total Dissolved Solids	Cyanide	Lead
pH	Fluoride	Arsenic
Fecal Coliforms	Dissolved Oxygen	Selenium
Chloride	Zinc	Barium
Radioactivity	Cadmium	Silver
Oil and Grease	Copper	Manganese
Sulfate	Chromium	Total Phosphorus

Source: Metropolitan Water Reclamation District of Greater Chicago, 1995.

TABLE 55.
Water Quality Sampling Locations on the Chicago and Calumet Waterway Systems.

Chicago Waterway System	Calumet Waterway System
County Line Rd., West Fork of North Branch	Wolf Lake, Burnham Ave.
County Line Rd., Middle Fork of North Branch	IHB RR Bridge, Grand Calumet River
County Line Rd., Skokie River	92nd St. and Ewing Ave., Calumet River
Dempster St., North Branch	130th St., Calumet River
Central Ave., North Shore	Indiana Ave., Calumet River Channel
Touhy Ave., North Shore Channel	Halsted St., Little Calumet River
Wilson Ave., North Branch	Ashland Ave., Cal-Sag Channel
Diversey Ave., North Branch	Cicero Ave., Cal-Sag Channel
Grand Ave., North Branch	Hwy. 83, Cal-Sag Channel
Outer Dr. Bridge, Mainstem	
Madison Ave., South Branch	
Damen Ave., South Branch	
Cicero Ave., Chicago Sanitary and Ship Canal	
Harlem Ave., Chicago Sanitary and Ship Canal	
Hwy. 83, Chicago Sanitary and Ship Canal	
Lemont Bridge, Chicago Sanitary and Ship Canal	

TABLE 56.
Illinois General Use Water Standards, 1992 Water Quality Parameters Estimated Percent Compliance for the Chicago and Calumet Rivers.

		Estimated Percent Compliance	
Parameter	Standard	Chicago	Calumet
Dissolved Oxygen	5.0 mg/l	83.3	83.3
pH	6.5 - 9.0	92.2	100
Total Dissolved. Solids	1000 mg/l	94.4	89.6
Chloride	500 mg/l	97.2	100
Total Iron	1.0 mg/l	95.6	72.2
Fluoride	1.4 mg/l	100	97.9
Silver	0.005 mg/l	100	97.9
Fecal Coliform	400 cts/100 ml	42.8	23.6
Temperature	Winter 60ºF	100	100
Temperature	Summer 90ºF	100	100
Ammonia	1.5 mg/l	100	100
Sulfate	500 mg/l	100	100
Phenols	0.1 mg/l	100	100
Cyanide	0.025 mg/l	100	100
Zinc	1.0 mg/l	100	100
Cadmium	0.05 mg/l	100	100
Copper	0.02 mg/l	100	100
Chromium	1.0 mg/l	100	100
Nickel	1.0 mg/l	100	100
Lead	0.1 mg/l	100	100
Mercury	0.0005 mg/l	100	100
Arsenic	1.0 mg/l	100	100
Selenium	1.0 mg/l	100	100
Barium	5.0 mg/l	100	100
Manganese	1.0 mg/l	100	100
Beta Radioactivity	100 p/l	100	100

Source: MWRD, 1993.

TABLE 57.
Secondary Contact Waters, 1992 Water Quality Parameters, Estimated Percentage Compliance for the Chicago and Calumet Rivers.

		Estimated Percentage Compliance	
Parameter	Standard	Chicago River	Calumet River
Dissolved Oxygen	3.0 mg/l	91.7	94.4
pH	6.0 - 9.0	98.6	100
Total Diss. Solids	1500 mg/l	100	100
Total Iron	2.0 mg/l	94.2	95.8
Silver	0.1 mg/l	100	100
Temperature	93ºF	100	100
Ammonia	2.5-4.0 mg/l	96.3	89.7
Phenols	0.3 mg/l	100	100
Cyanide	0.1 mg/l	100	100
Zinc	1.0 mg/l	100	100
Cadmium	0.15 mg/l	100	100
Copper	1.0 mg/l	100	100
Chromium	1.0 mg/l	100	100
Nickel	1.0 mg/l	100	100
Lead	0.1 mg/l	100	100
Mercury	0.0005 mg/l	100	100
Arsenic	1.0 mg/l	100	100
Selenium	1.0 mg/l	100	100
Barium	5.0 mg/l	100	100
Manganese	1.0 mg/l	99.3	98.6
Oil and Grease	15.0 mg/l	78.9	78.9

Source: MWRD, 1993.

TABLE 58.
Flows Captured and Pollutants Removed by the Mainstream TARP Tunnel System, 1986-1993.

Year	Total Gallons of CSO Pumped (Millions)	Total Pollutants Removed (lbs x 10^6) BOD$_5$	TSS	NH_4-N	Total Theoretical Oxygen Demand
1986	22,946	11.48	65.26	1.19	16.94
1987	24,559	12.31	69.96	1.17	17.69
1988	22,146	13.77	61.95	1.10	18.85
1989	17,762	4.50	31.34	1.11	9.59
1990	25,585	5.92	42.11	1.58	13.19
1991	22,659	8.12	34.50	1.39	14.51
1992	21,089	9.47	39.62	2.49	20.94
1993	29,327	13.43	68.46	1.59	20.74
Total	186,073	79.00	413.12	11.62	132.45

* Total pounds of BOD$_5$ + (4.6 x total pounds NH_4-N).
Source: MWRD personal communication.

TABLE 59.
TARP Water Quality Assessment in the North Shore Channel, Chicago River, and Chicago Sanitary and Ship Canal.

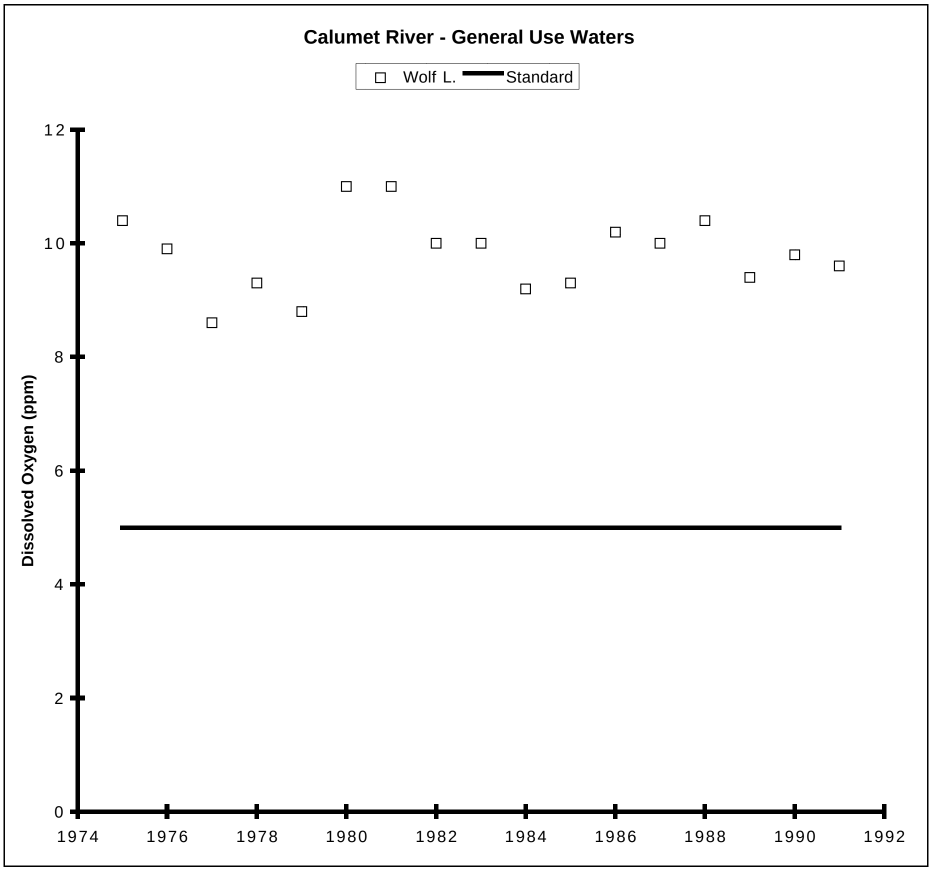
Station	Mean DO (mg/l) Pre-TARP[1]	Post-TARP[2]	Percentage Change	Mean BOD (mg/l) Pre-TARP[1]	Post-TARP[2]	Percentage Change
Touhy	7.81	7.86	+0.6	5.5	6.0	+9.1
Wilson	7.76	7.55	-2.7	6.8	5.7	-16.7
Grand	4.82	5.88	+21.9	6.7	3.3	-50.2
Damen	5.13	6.70	+30.6	4.5	2.5	-44.4
Harlem	5.53	6.87	+24.2	5.8	3.8	-34.4
Hwy. 83	4.12	5.55	+34.7	4.3	2.8	-34.1

[1]January 1979 through December 1984.
[2]January 1986 through December 1991.
Source: MWRD, 1993.

TABLE 60.
TARP Water Quality Assessment in the North Shore Channel, Chicago River, and Chicago Sanitary and Ship Canal.

Station	Mean NH_4 (mg/l) Pre-TARP[1]	Post-TARP[2]	Percentage Change	Mean Total P (mg/l) Pre-TARP[1]	Post-TARP[2]	Percentage Change
Touhy	2.9	1.6	-44.8	0.97	0.79	-18.9
Wilson	3.8	2.1	-44.7	0.97	0.80	-17.5
Grand	3.2	2.1	-34.4	1.01	0.79	-21.8
Damen	2.3	1.3	-43.5	0.64	0.46	-28.1
Harlem	2.1	1.8	-14.3	0.62	0.55	-11.3
Hwy. 83	1.9	1.7	-10.5	0.64	0.50	-21.9

[1]January 1979 through December 1984.
[2]January 1986 through December 1991.
Source: MWRD, 1993.



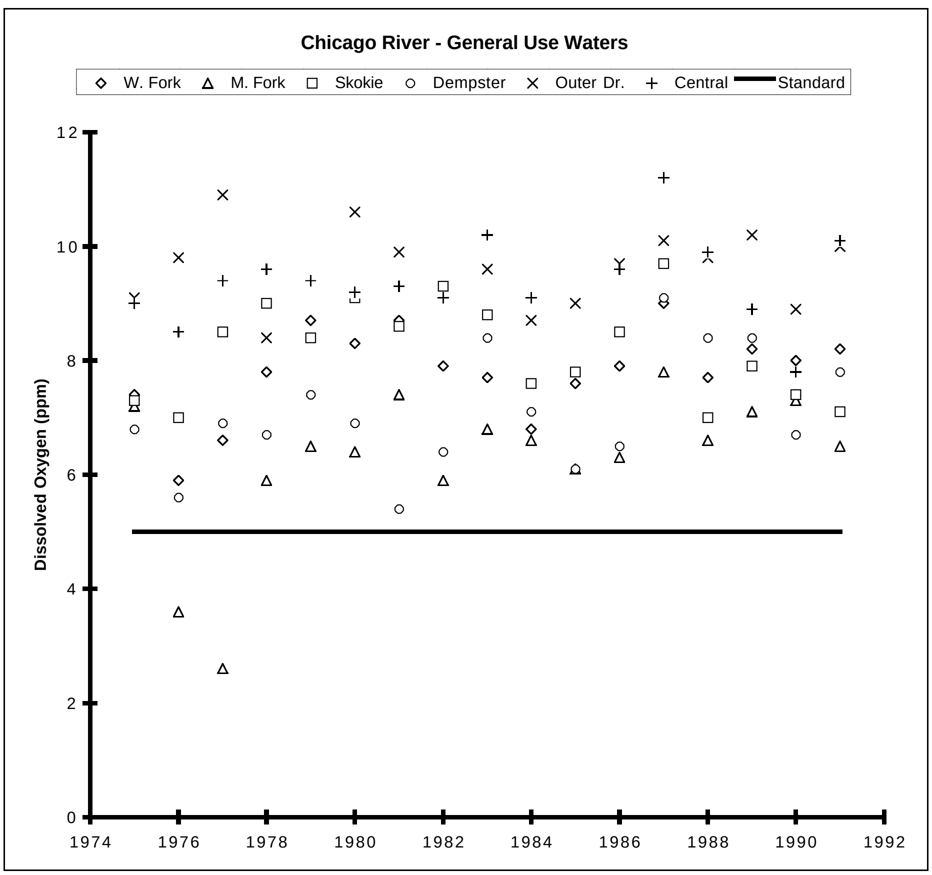
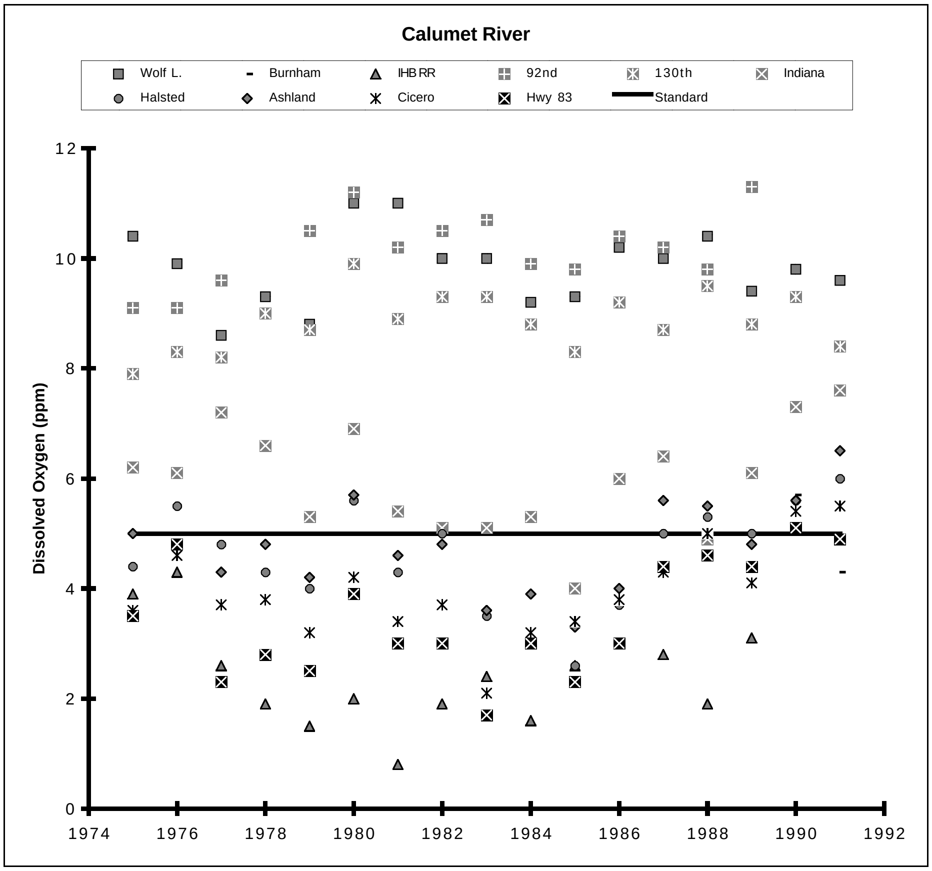


FIGURE 10
Mean Annual Dissolved Oxygen Concentration in General Use Reaches of the Chicago and Calumet River Systems, 1975-1991



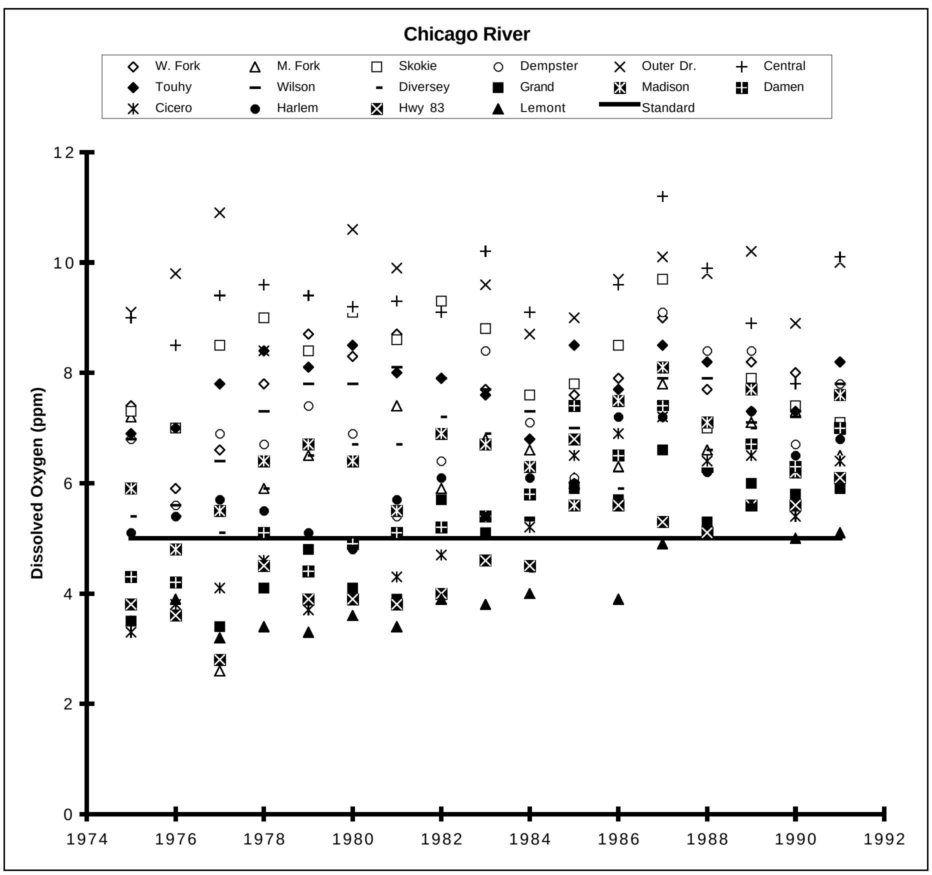
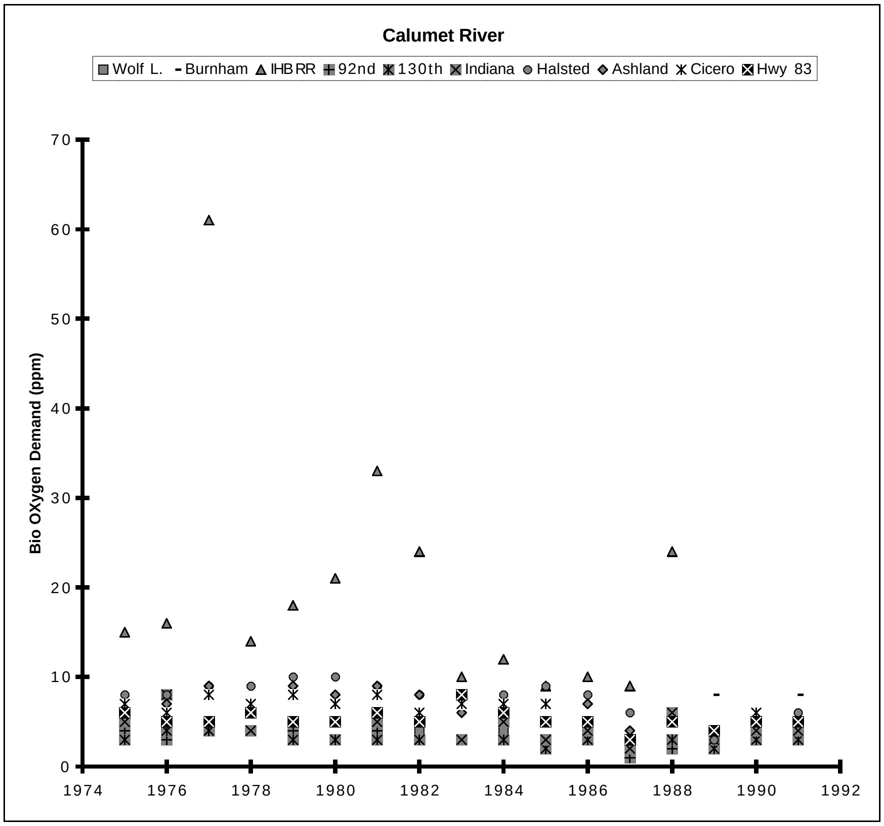


FIGURE 11
Mean Annual Dissolved Oxygen Concentration in the Chicago and Calumet River Systems, 1975-1991



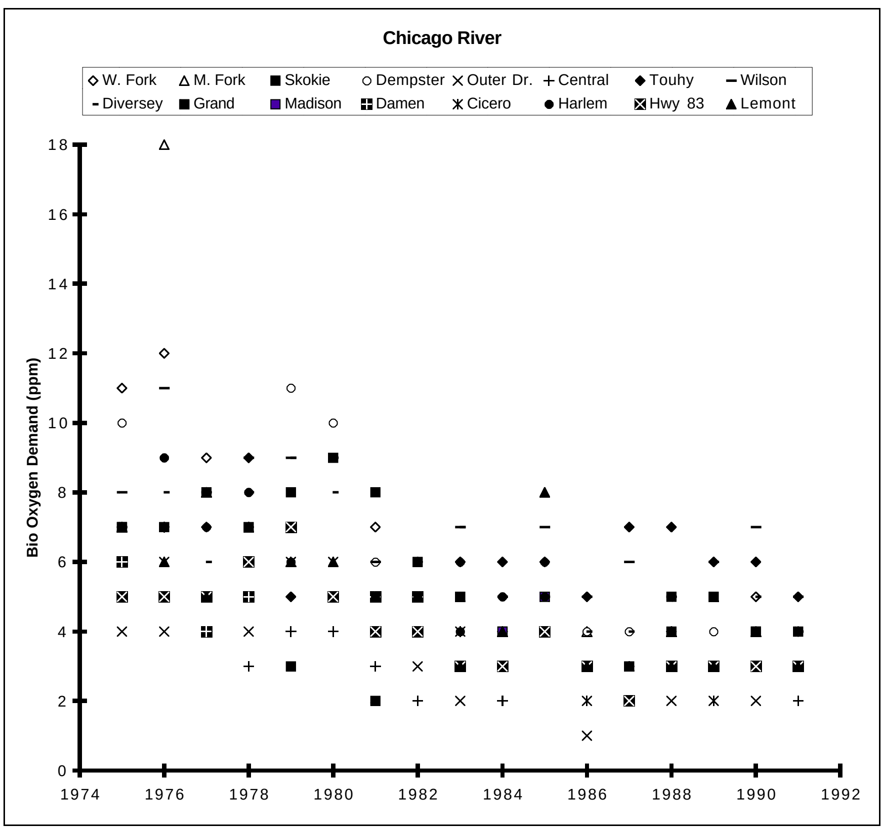
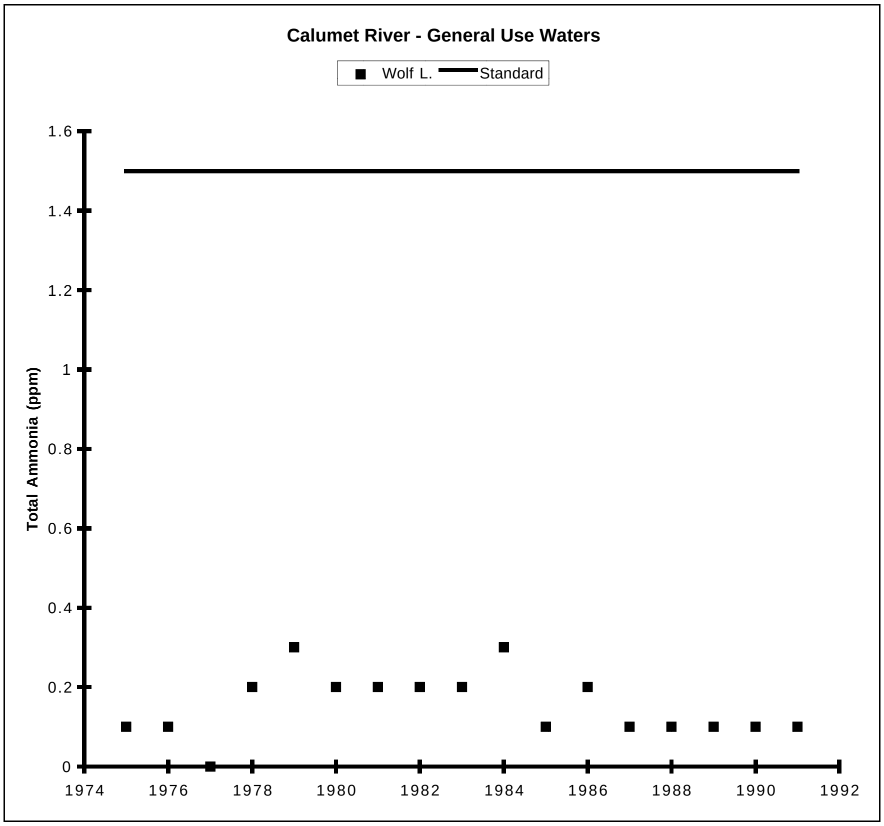


FIGURE 12
Mean Annual Biological Oxygen Demand in the Chicago and Calumet River Systems, 1975-1991



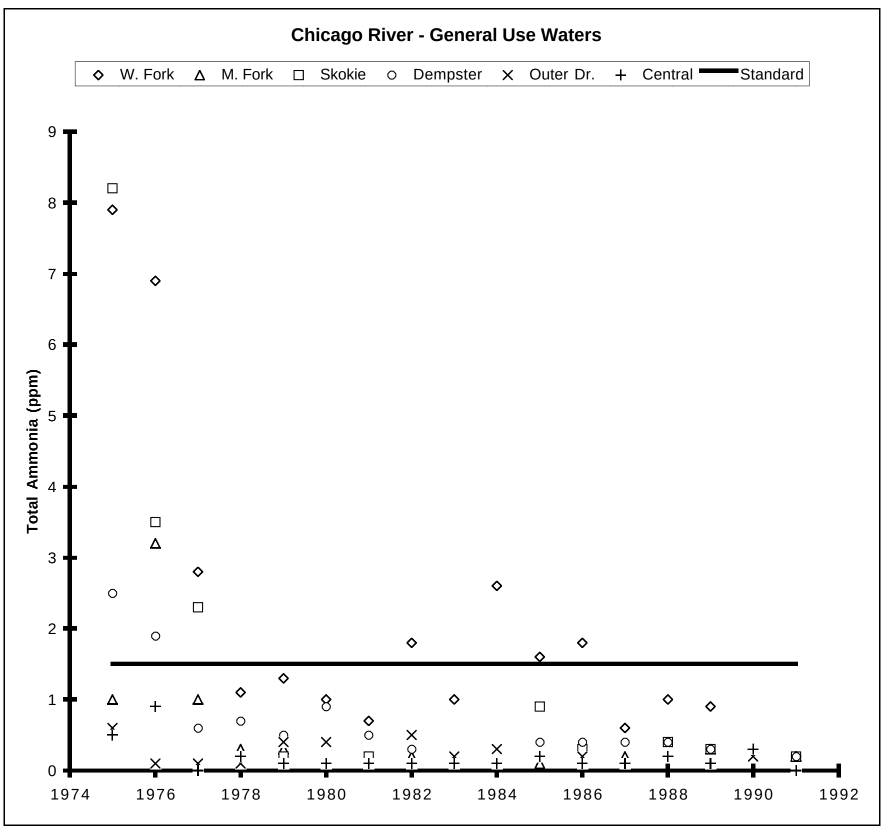
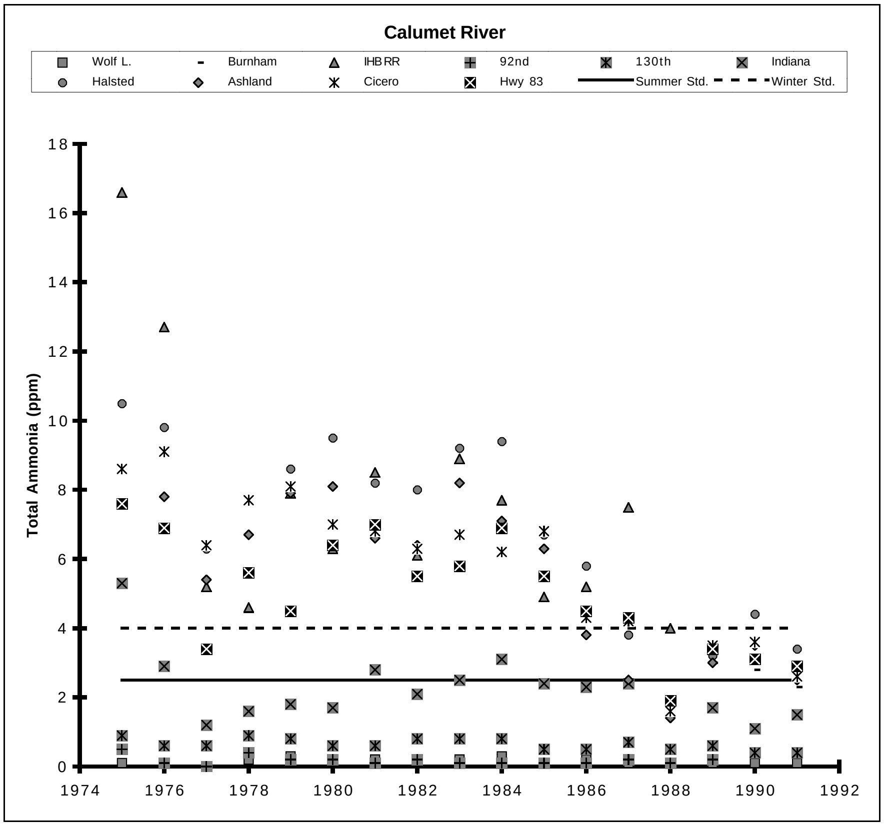


FIGURE 13
Mean Annual Total Ammonia-Nitrogen Concentrations in General Use Reaches of the Chicago and Calumet River Systems, 1975-1991



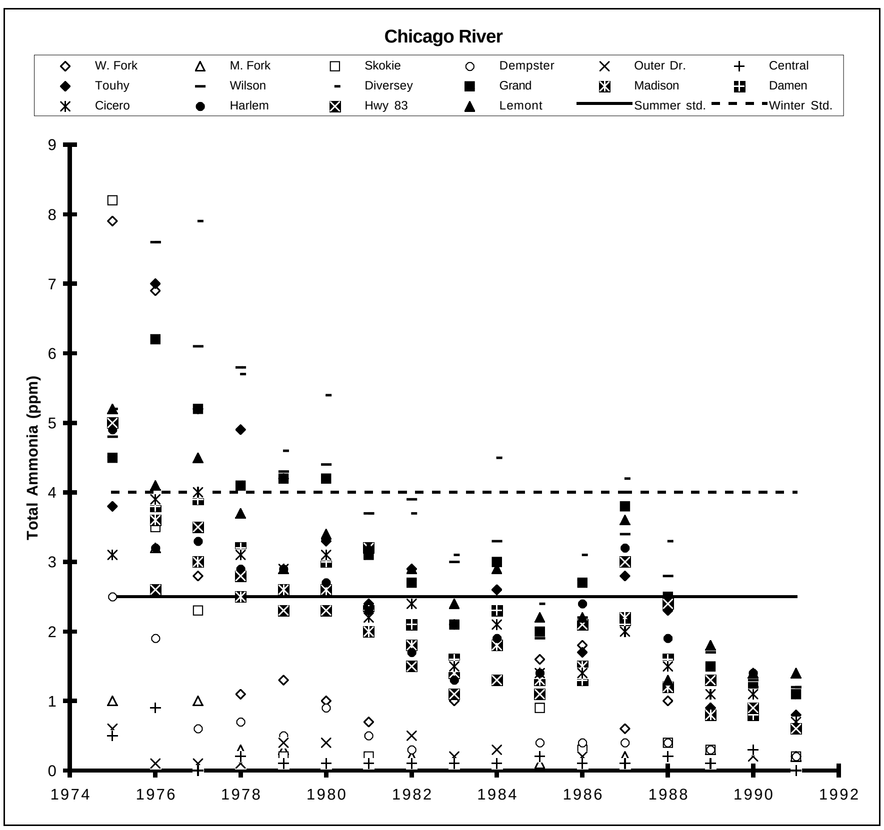
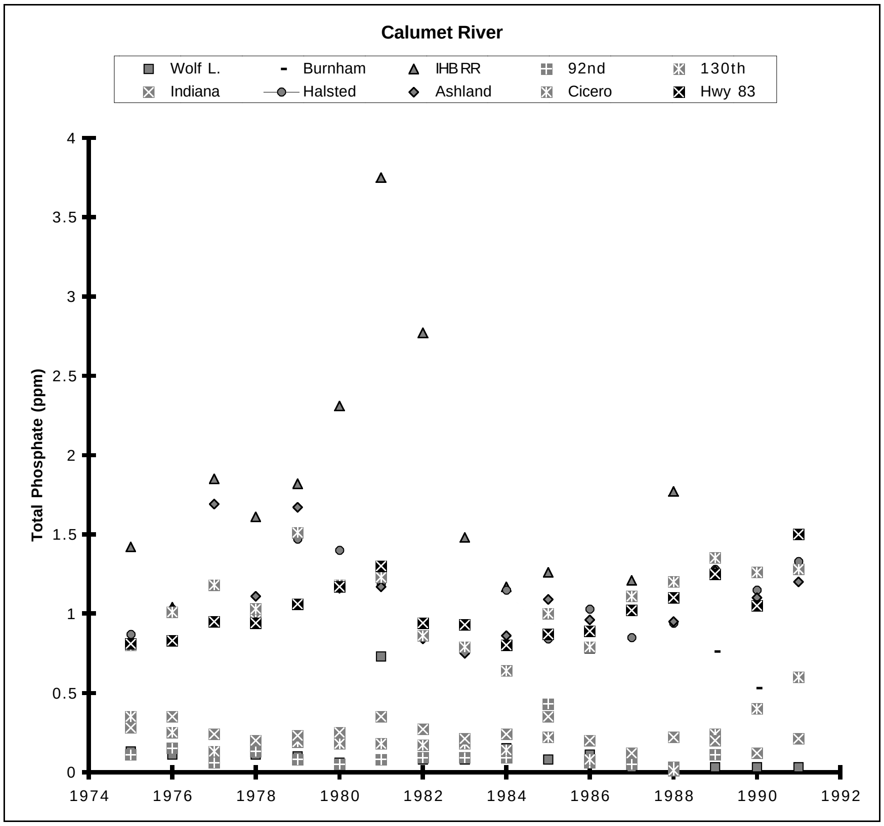


FIGURE 14
Mean Annual Total Ammonia-Nitrogen Concentrations in the Chicago and Clumet River Systems, 1975-1991



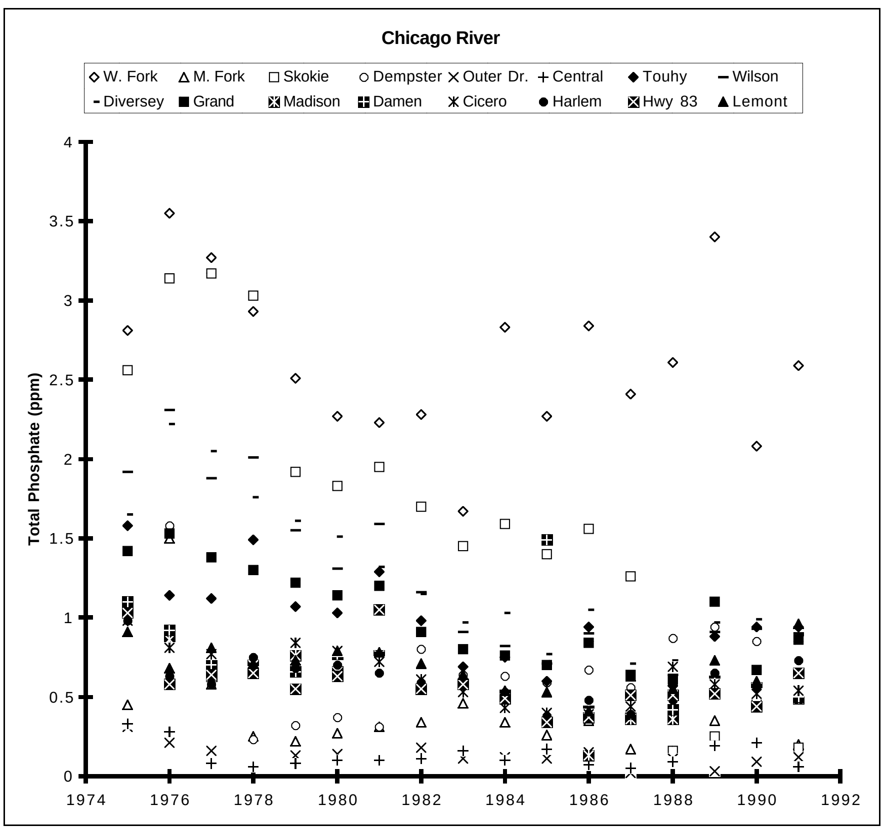


FIGURE 15
Mean Annual Total Phosphorus Concentrations at Sampling Stations in the Chicago and Calumet River Systems, 1975-1991

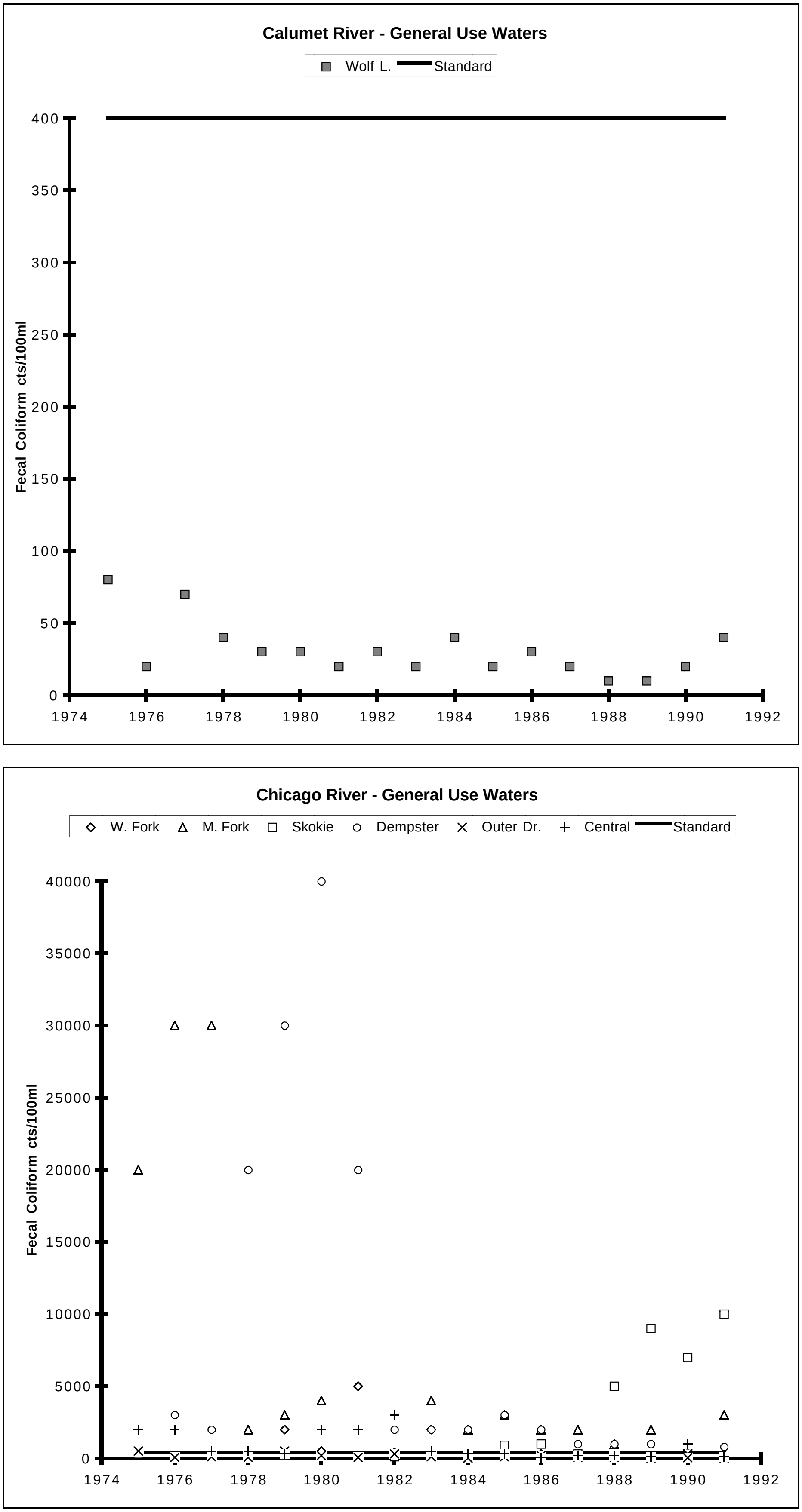
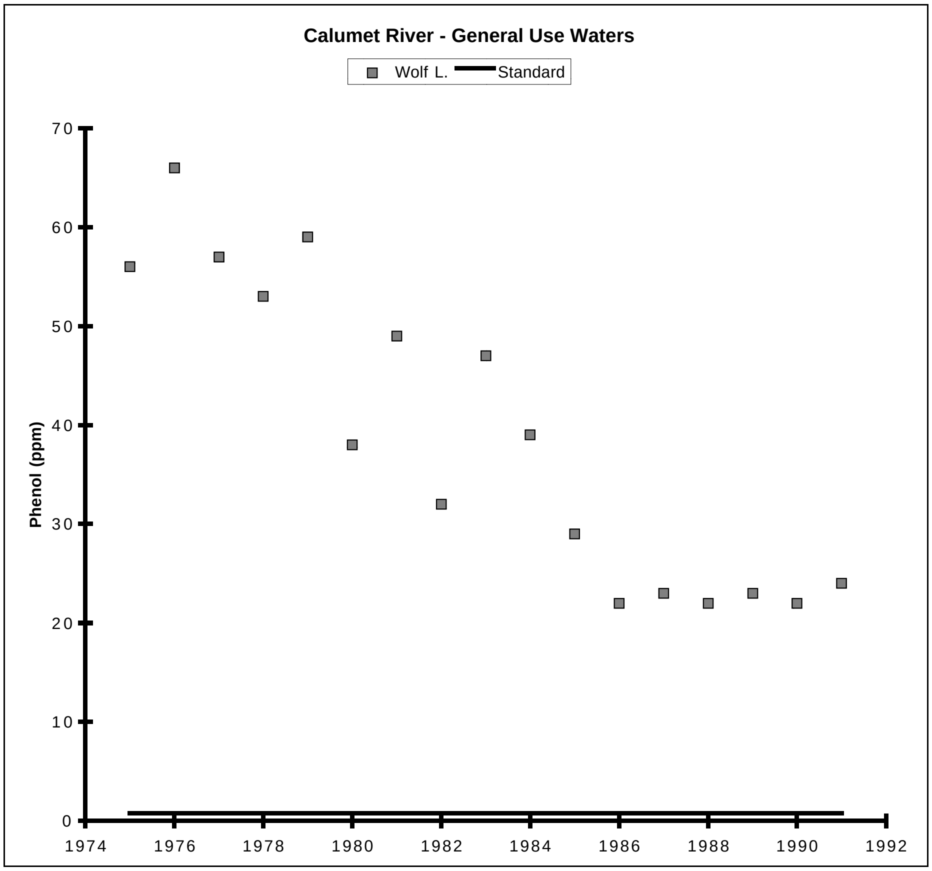


FIGURE 16
Mean Annual Fecal Coliform Counts in General Use Reaches of the Chicago and Calumet River Systems, 1975-1991



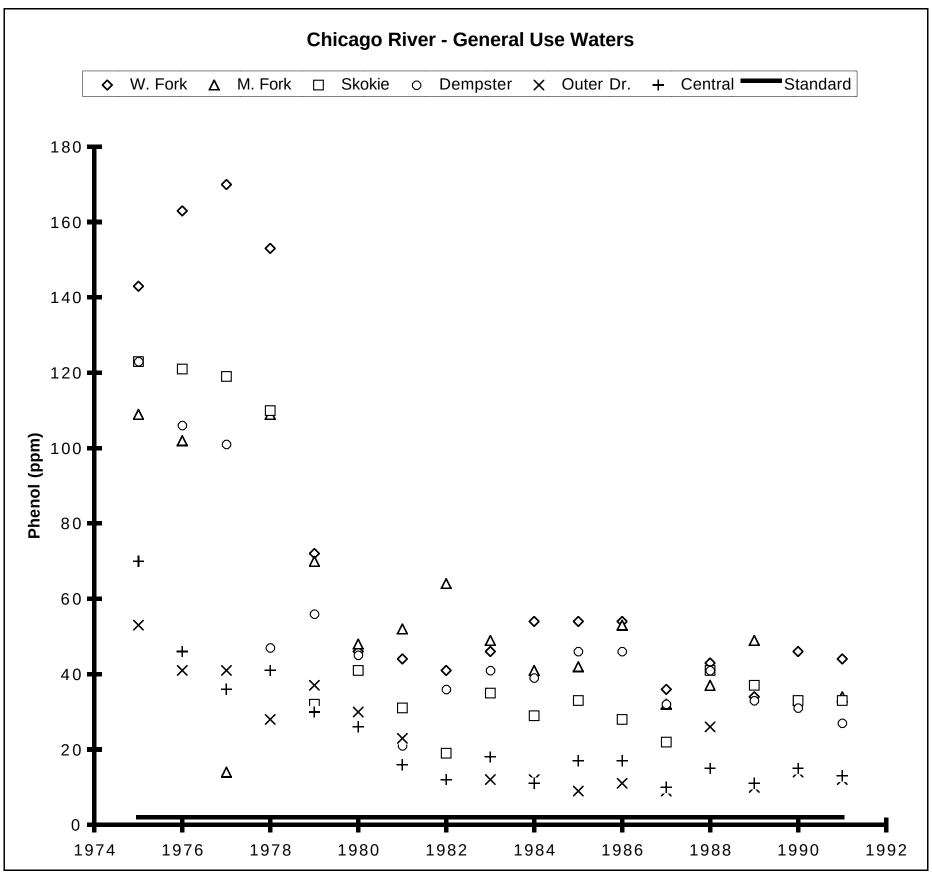
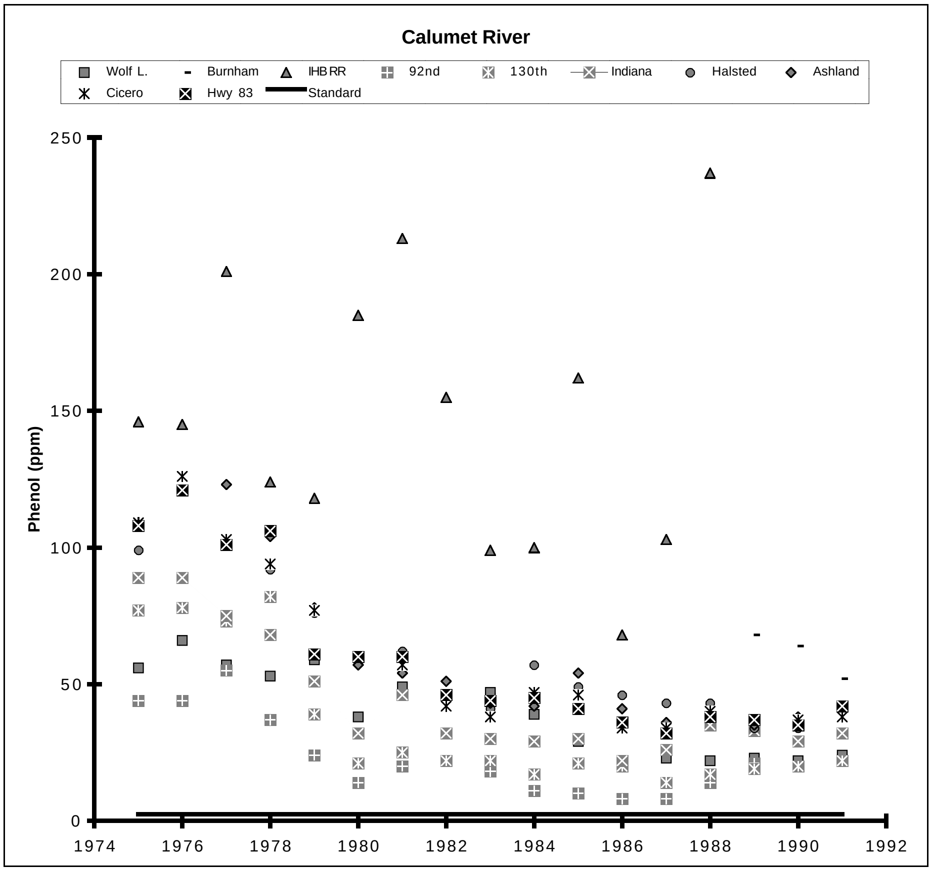


FIGURE 17
Mean Annual Phenol Concentrations in General Use Reaches of the Chicago and Calumet River Systems, 1975-1991



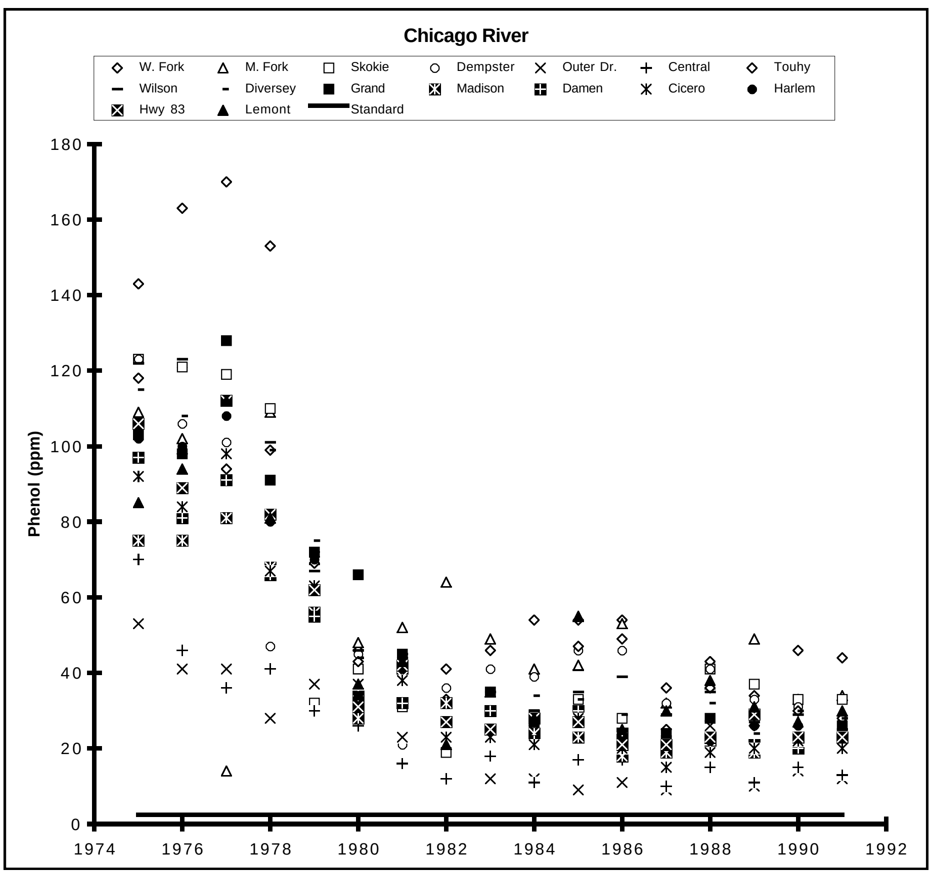
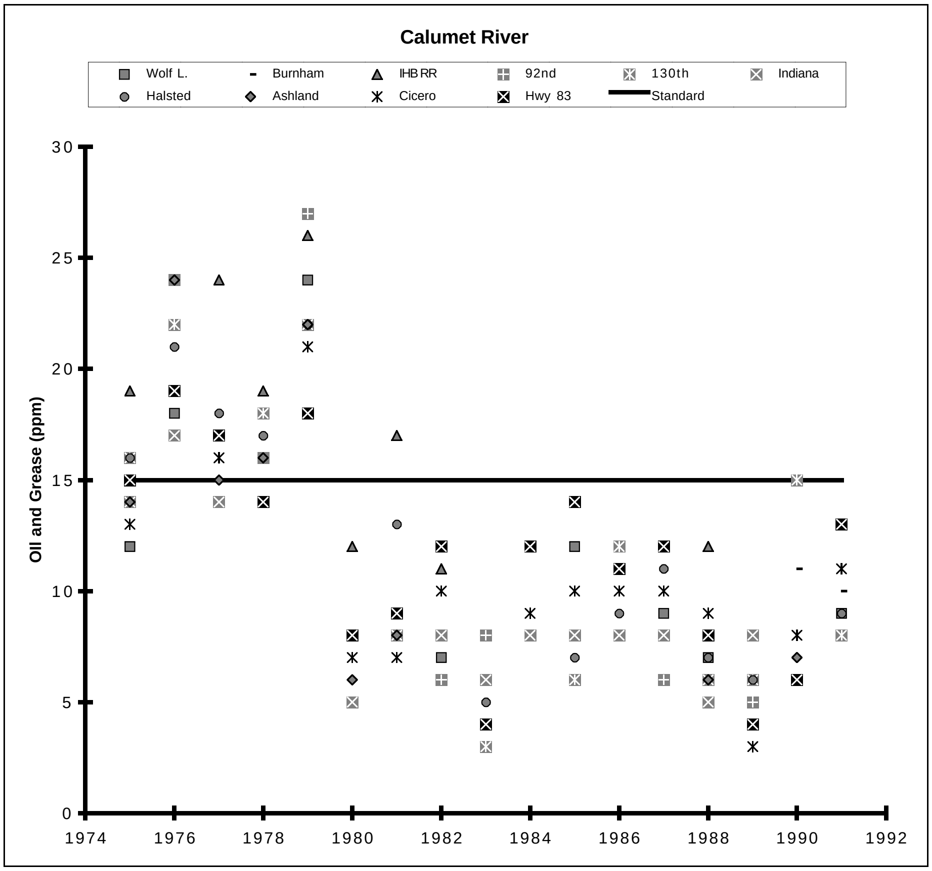


FIGURE 18
Mean Annual Phenol Concentrations in the Chicago and Calumet River Systems, 1975-1991



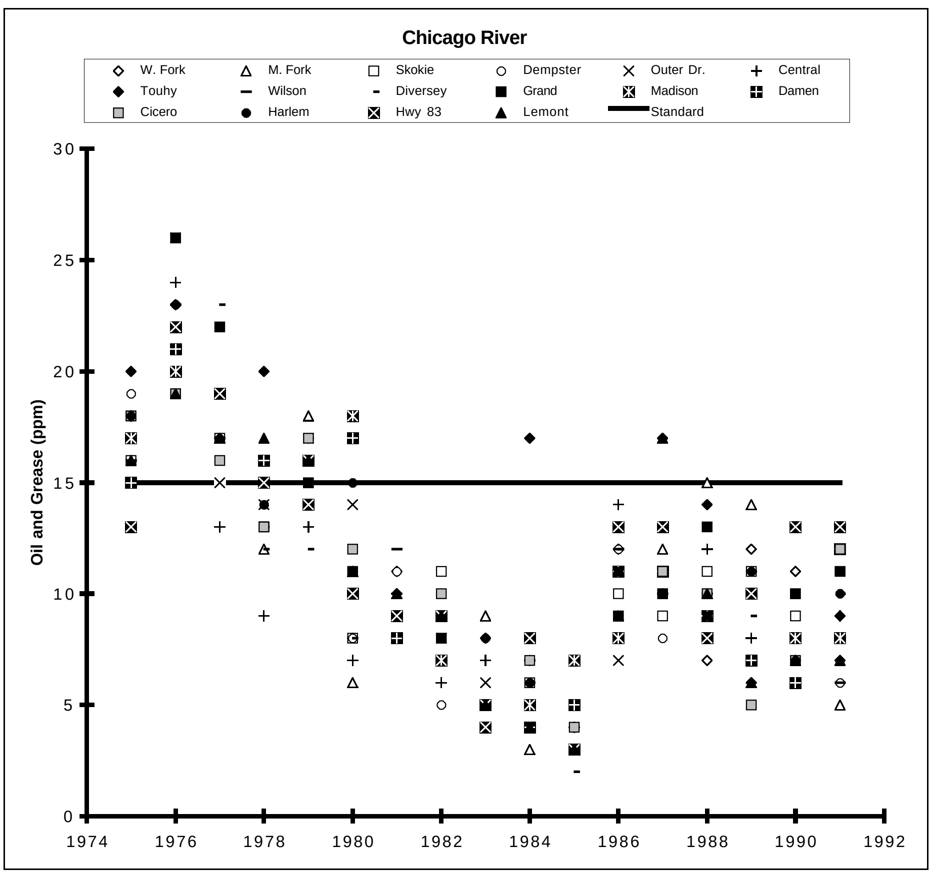
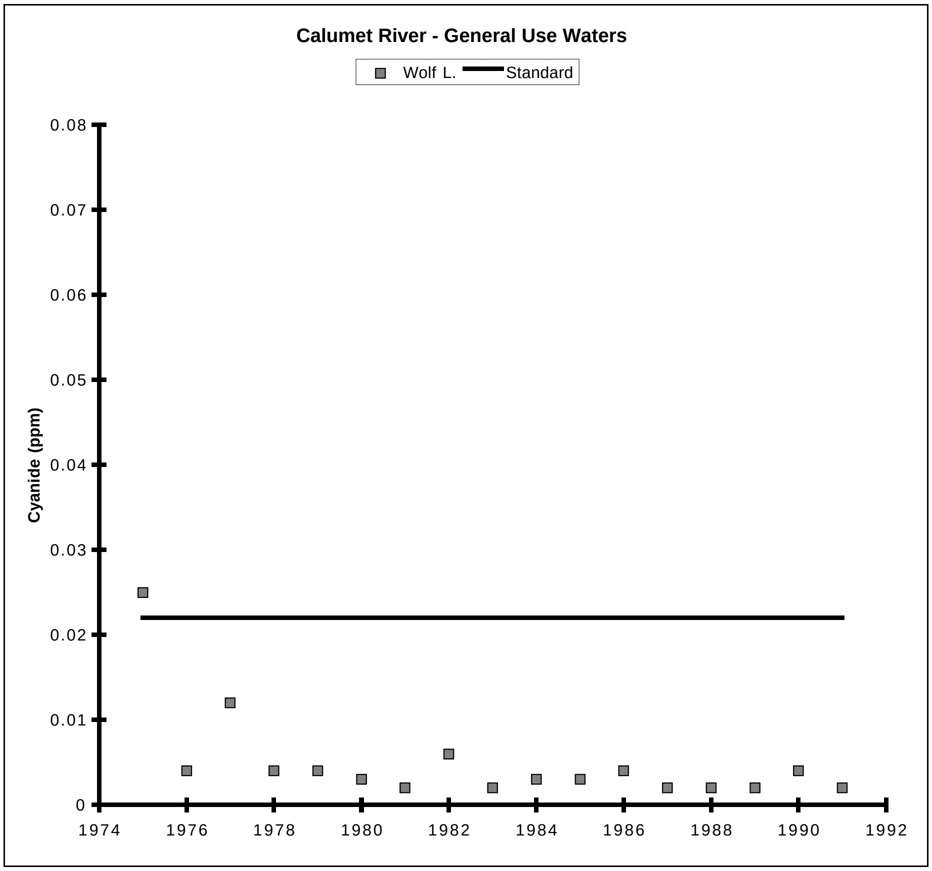


FIGURE 19
Mean Annual Oil and Grease Concentrations in the Chicago and Calumet River Systems, 1975-1991



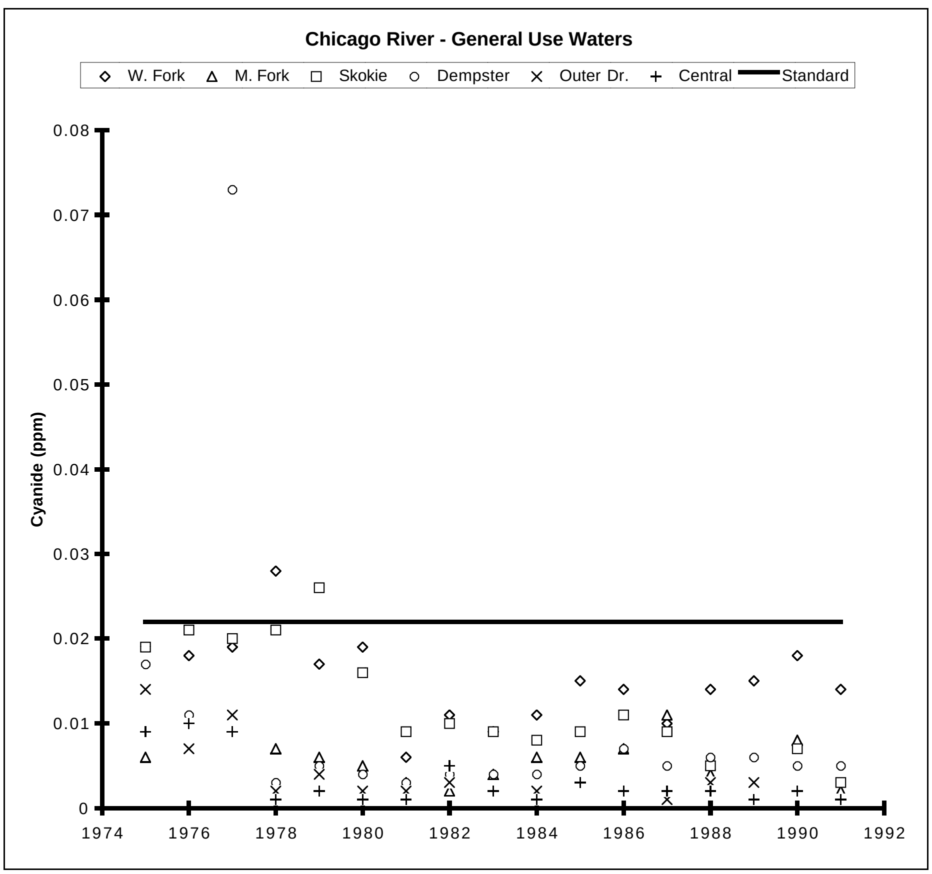
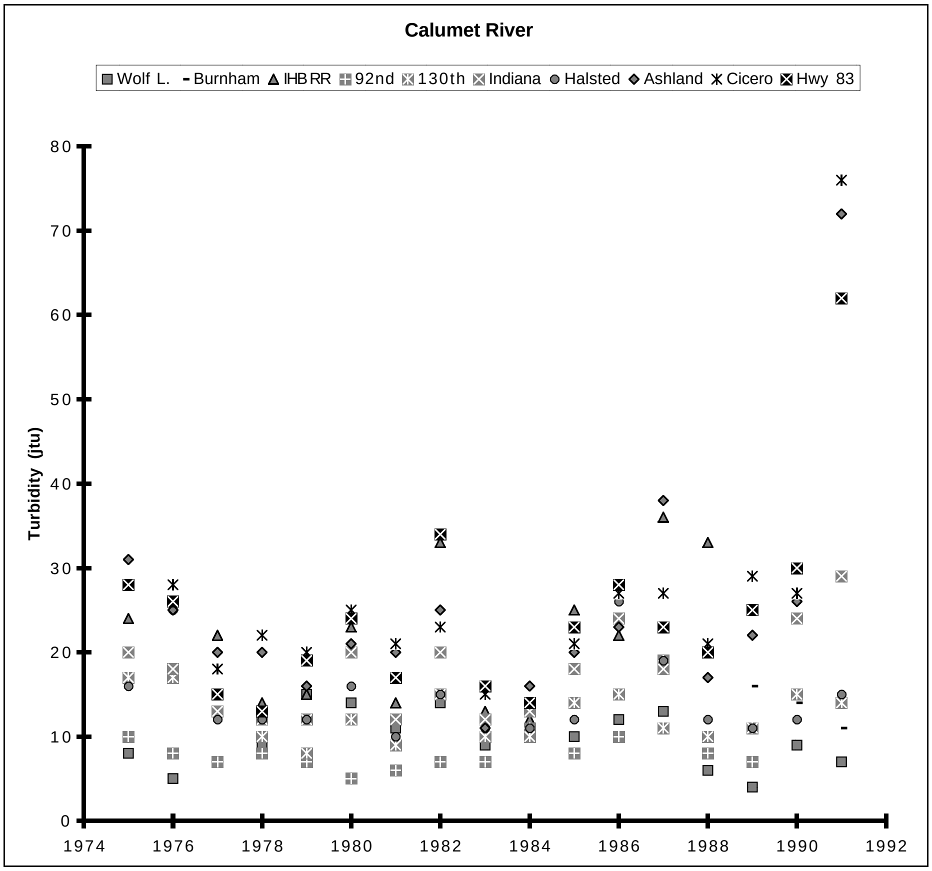


FIGURE 20
Mean Annual Total Cyanide Concentrations in General Use Reaches of the Chicago and Calumet River Systems, 1975-1991



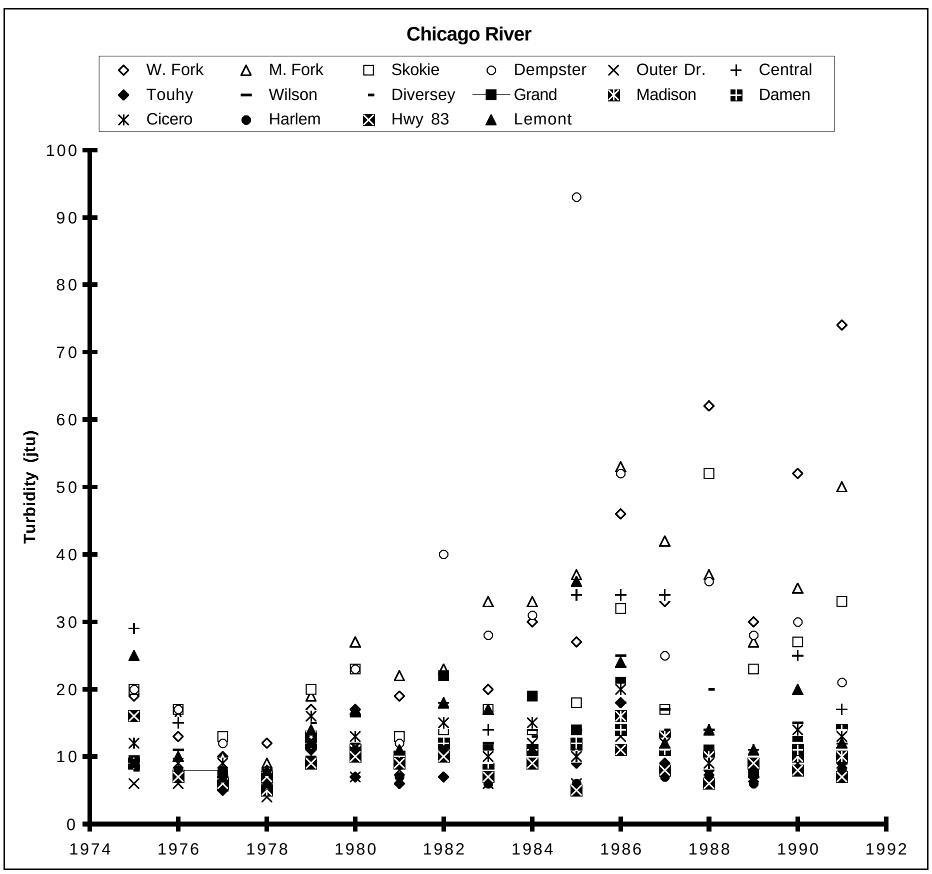
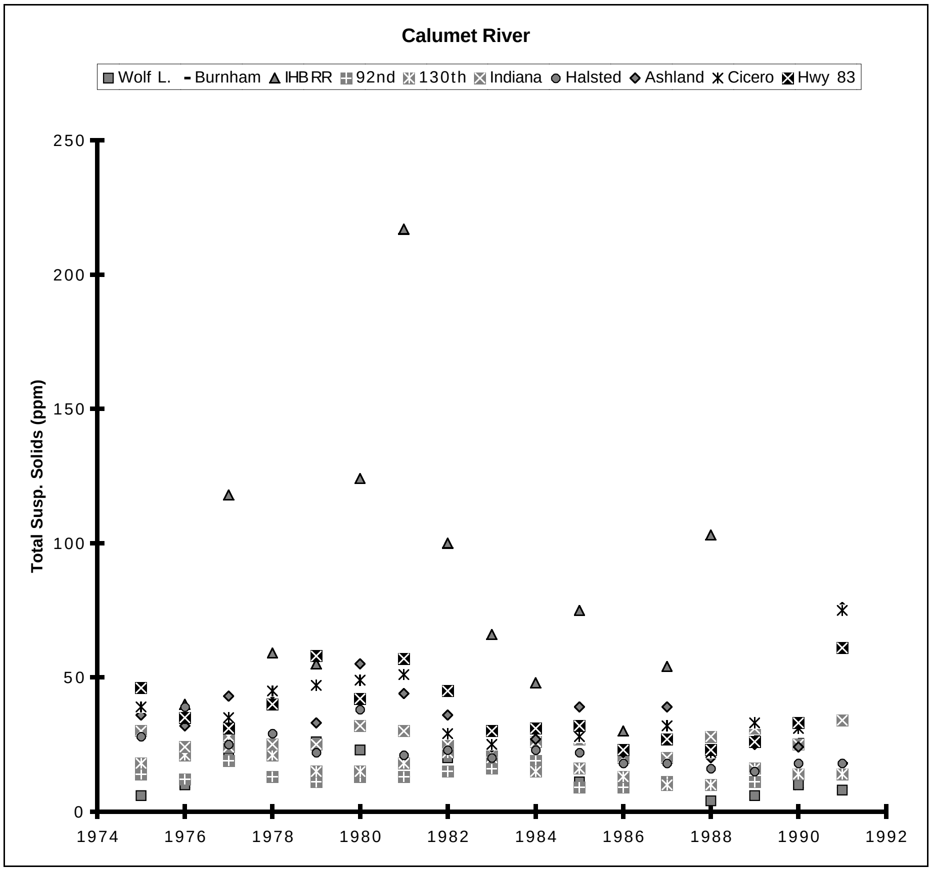


FIGURE 21
Mean Annual Turbidity in the Chicago and Calumet River Systems, 1975-1991



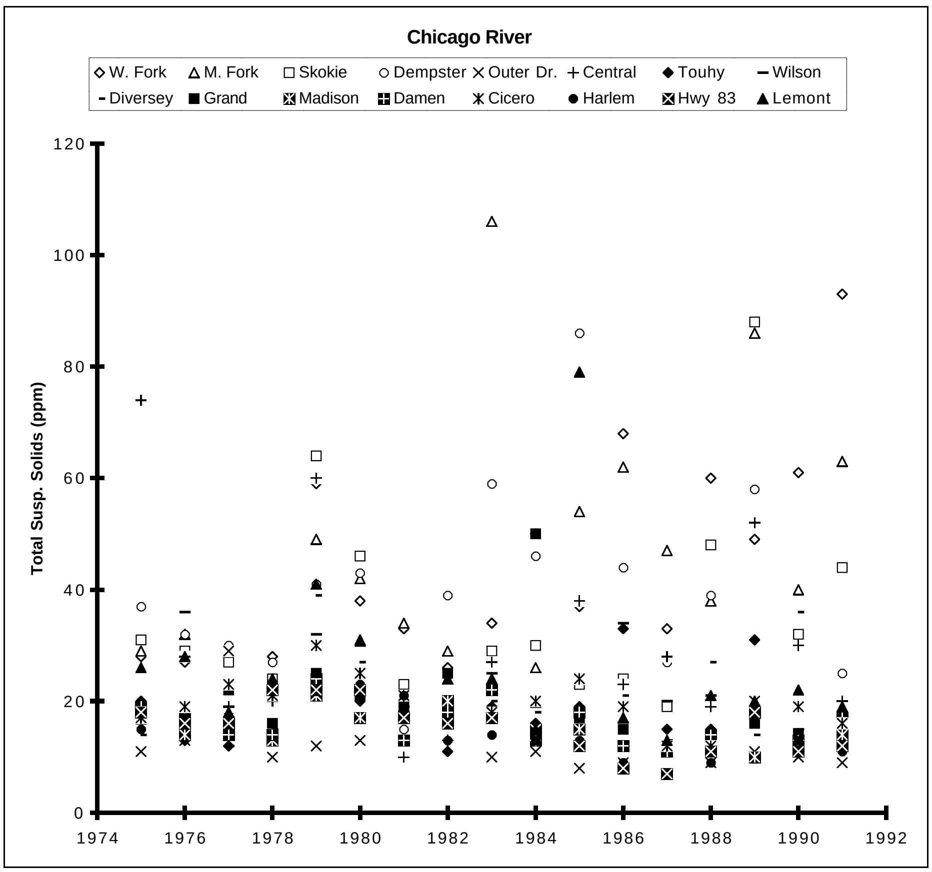


FIGURE 22
Mean Annual Total Suspended Solids Concentrations in the Chicago and Calumet River Systems, 1975-1991

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