North Branch Chicago River Watershed-Based Plan






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STORMWATER MANAGEMENT COMMISSION

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COMMON ACRONYMS/ABBREVIATIONS USED IN CHAPTER 1

AUID - Assessment Unit ID

BMP – Best Management Practices

CWA – Clean Water Act

FEMA - Federal Emergency Management Agency

FOCR - Friends of the Chicago River

FPDCC – Forest Preserve District of Cook County

HUC – Hydrologic Unit Codes

Illinois EPA – Illinois Environmental Protection Agency

NEIU - Northeastern Illinois University

MWRDGC – Metropolitan Water Reclamation District of Greater Chicago

NBCR – North Branch Chicago River

NBCR Planning Area – North Branch Chicago River Watershed Planning Area

NBWW – North Branch Chicago River Watershed Workgroup

SMC – Lake County Stormwater Management Commission

TMDL – Total Maximum Daily Load

US EPA - United States Environmental Protection Agency

1 INTRODUCTION

1.1 WHAT IS A WATERSHED?

A **watershed** is the area of land drained by a river, stream, or other body of water (see Figure 1-1 for a diagram of a watershed system). Other common names given to watersheds include **drainage basins** and **catchments**.

Watersheds vary in size and shape, larger rivers and streams have larger drainage areas that can be divided into several **subwatersheds**, which are subdrainage areas within that watershed. Each subwatershed has at least one flowline that represent the concentrated flow in that particular subwatershed.

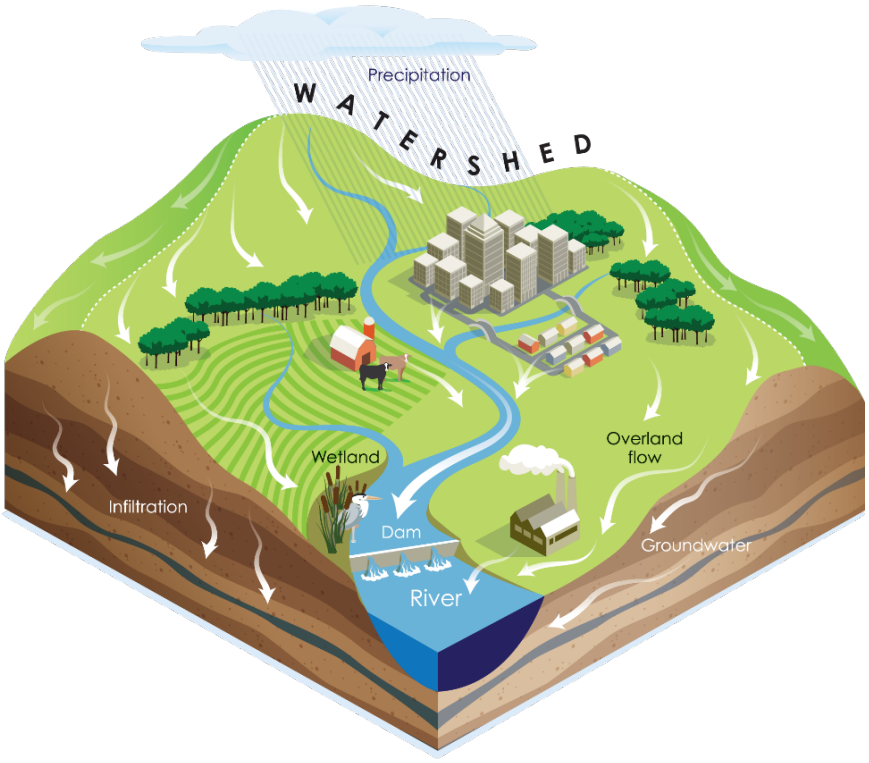


Figure 1-1: Diagram of a Watershed

As simple as the definition sounds, a watershed is actually a complex interaction between ground, climate, water, vegetation, and animals. In today's developed watersheds, other elements such as storm sewers, agricultural drainage, **impervious cover** (surfaces), stormwater, and erosion can all be detrimental to the health of the watershed. The health of a waterbody is a direct reflection of how the land in the watershed is used and managed. Some of the benefits of a healthy watershed are: improved water quality, fewer flooding problems, enhanced wildlife habitat, recreational opportunities, and better quality of life.

WATERSHED: Land area that drains water to a given point, usually a river, stream or lake. The land area above a given point on a waterbody (river, stream, lake, wetland) that contributes runoff to that point is considered the watershed. The North Branch Chicago River watershed planning area is approximately 95 square miles.

DRAINAGE BASIN: Synonymous with "watershed," though often used to describe the watersheds of larger rivers or hydrologic systems (e.g., the "Mississippi River drainage basin" or "Great Lakes drainage basin").

CATCHMENTS: Small unit of a watershed or subwatershed that is delineated and used in watershed planning efforts because the effects of impervious cover are easily measured, there is less chance for confounding pollutant sources, boundaries have fewer political jurisdictions, and monitoring/mapping assessments can be done in a relatively short amount of time.

SUBWATERSHED: A smaller basin within a larger drainage area that all drains to a central point of the larger watershed. The 4 subwatersheds in the North Branch Chicago River planning area ranging in size from 3,743 – 22,450 acres. See Chapter 3, section 3.4.1 for more information about the 4 subwatersheds in the North Branch Chicago River planning area.

IMPERVIOUS SURFACES: A surface that does not allow water to infiltrate to the soil layer, including pavement, rooftops, and roads.

1.1.1 WHY A WATERSHED-BASED PLAN?

Water is elemental to our lives. Plants and animals, including humans, are largely composed of water, and generally require clean water to survive. Our communities, food systems, energy sources, and countless products that we consume everyday are dependent upon water. Despite this dependence, water is often taken for granted until it negatively affects us, usually due to short supply, inundation, or pollution.

This watershed-based plan is important because it specifically addresses water-related issues in communities within the North Branch Chicago River (NBCR) watershed planning area. Clean and abundant water, healthy streams and lakes, and safety from flooding are important to residents and business and therefore play a significant role in the quality of life, health and economic vitality of our communities. Healthy watersheds make communities more desirable for residents and businesses. Lakes, rivers, and streams in the planning area provide recreational destinations for watershed residents as well as tourists and are a highly visible indicator of watershed health. These waterbodies support a diverse variety of water-dependent plants and animals and are critical to local ecosystems.

Water does not generally flow according to political boundaries. Consequently, we recognize the watershed as the appropriate scale to address most water resource issues, which often involves multiple political jurisdictions. The North Branch Chicago River watershed planning process brought together numerous watershed stakeholders to provide input towards the management and enhancement of water resources in the planning area, culminating in the 2000 and 2008 watershed plans (Lake County Stormwater Management Commision, 2000; ibid., 2008). During the 2019-2020 plan update process, critical data was obtained from a comprehensive water quality monitoring effort conducted on the watershed streams in Lake and Cook County. This update to the watershed-based plan utilizes these sources of current information as well as historical data to provide a comprehensive summary of existing watershed conditions and trends. It recommends actions stakeholders can take to protect resources that are in good condition and restore those that have been degraded. As a resident, landowner, business or community official, you make a difference.

1.2 NORTH BRANCH CHICAGO RIVER WATERSHED PLANNING AREA

1.2.1 CHICAGO RIVER WATERSHED

The Chicago River watershed covers 270 square miles (or 172,998 acres) in northeastern Illinois. The North Branch Chicago River begins in Lake County as three tributaries, or “forks”: the Skokie River (Assessment Unit ID (AUID): IL_HCCD-01), with its headwaters located south east of Routes 131 and 132 in Waukegan; the Middle Fork North Branch Chicago River (AUID: IL_HCCC-02), which rises a quarter mile south of the Route 120 and Tri-State Tollway (I-94) intersection in Waukegan; and the West Fork (AUID: IL_HCCB-05), which flows out of a series of ponds northwest of Everett Road and the Tri-State Tollway in Mettawa (see Figure 1-2). From their origins in Lake County, these tributaries flow south into Cook County where they converge to form the mainstem of the North Branch Chicago River (AUID: IL_HCCC-04). The North Branch Chicago River flows south through Cook County to its confluence with the North Shore Channel (NSC) on Chicago’s north side and meets the Main Stem and South Branch of the river in downtown Chicago.

Prior to 1900, the Chicago River flowed into Lake Michigan. However, due to pollution and health concerns

that arose from the city's sewage discharge from the river into the lake (Chicago's drinking water supply) and the need for a larger navigational channel than the Illinois and Michigan Canal, the flow of the Chicago River was reversed and diverted from Lake Michigan into the Mississippi River basin through the Chicago Sanitary and Ship Canal which opened on January 2, 1900. The flow of the Main Stem and South Branch were reversed and the North Branch and Main Stem presently flow into the South Branch. The South Branch flows into the Chicago Sanitary and Ship Canal where flow from the Chicago River watershed is diverted westward, joining with the Des Plaines River as a tributary of the Illinois River. The Illinois River flows southwest across the state and is a major tributary of the Mississippi River.

1.2.2 North Branch Chicago River Watershed Planning Area

The North Branch Chicago River watershed planning area (NBCR planning area) covers approximately 35% of the entire North Branch Chicago River watershed, or approximately 95 square miles (60,540 acres). The NBCR planning area encompasses portions of southeast Lake and northeast Cook Counties in Illinois, with portions of 26 municipalities, 11 townships (see Figure 1-3), 4 drainage districts, 55 miles of streams, 5,631 acres of wetland, and 10 lakes (see Section 3.13 for more information on lakes). Figure 1-2 depicts the size and location of the Chicago River Watershed compared to the NBCR planning area. The NBCR planning area incorporates the portion of the Chicago River watershed that includes the subwatersheds of the West Fork and Middle Fork tributaries, and Skokie River as well as a short reach of the mainstem (North Branch Chicago River). The NBCR planning area is comprised of four 12-digit Hydrologic Unit Codes (HUCs), see Table 1-1.

Table 1-1: North Branch Chicago River Subwatersheds & 12-digit HUCS

SUBWATERSHED	12-DIGIT HUC	HUC NAME
Middle Fork North Branch Chicago River	071200030102	Upper North Branch Chicago River
North Branch Chicago River	071200030105	Middle North Branch Chicago River
Skokie River	071200030101	Skokie River
West Fork North Branch Chicago River	071200030103	West Fork North Branch Chicago River

Noteworthy: Hydrologic unit code (HUC)

A hydrologic unit can accept surface water directly from upstream drainage areas, and indirectly from associated surface areas such as remnant, noncontributing, and diversions to form a drainage area with single or multiple outlet points. Hydrologic units are only synonymous with classic watersheds when their boundaries include all the source area contributing surface water to a single defined outlet point. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to twelve digits based on the six levels of classification:

- 2-digit HUC first-level (region)
- 4-digit HUC second-level (subregion)
- 6-digit HUC third-level (accounting unit)
- 8-digit HUC fourth-level (cataloguing unit)
- 10-digit HUC fifth-level (watershed)
- 12-digit HUC sixth-level (subwatershed)

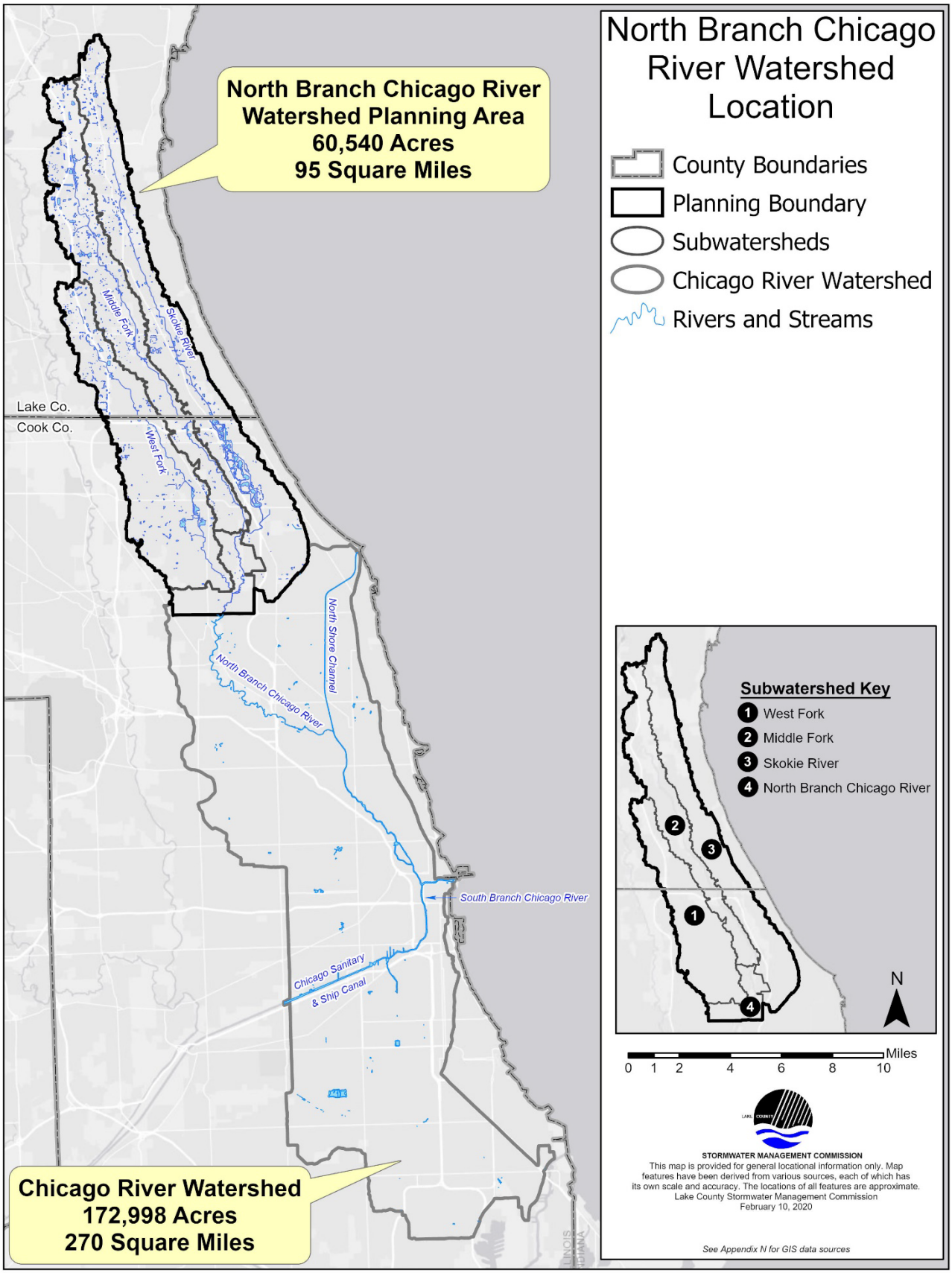


Figure 1-2: North Branch Chicago River Watershed Location Map

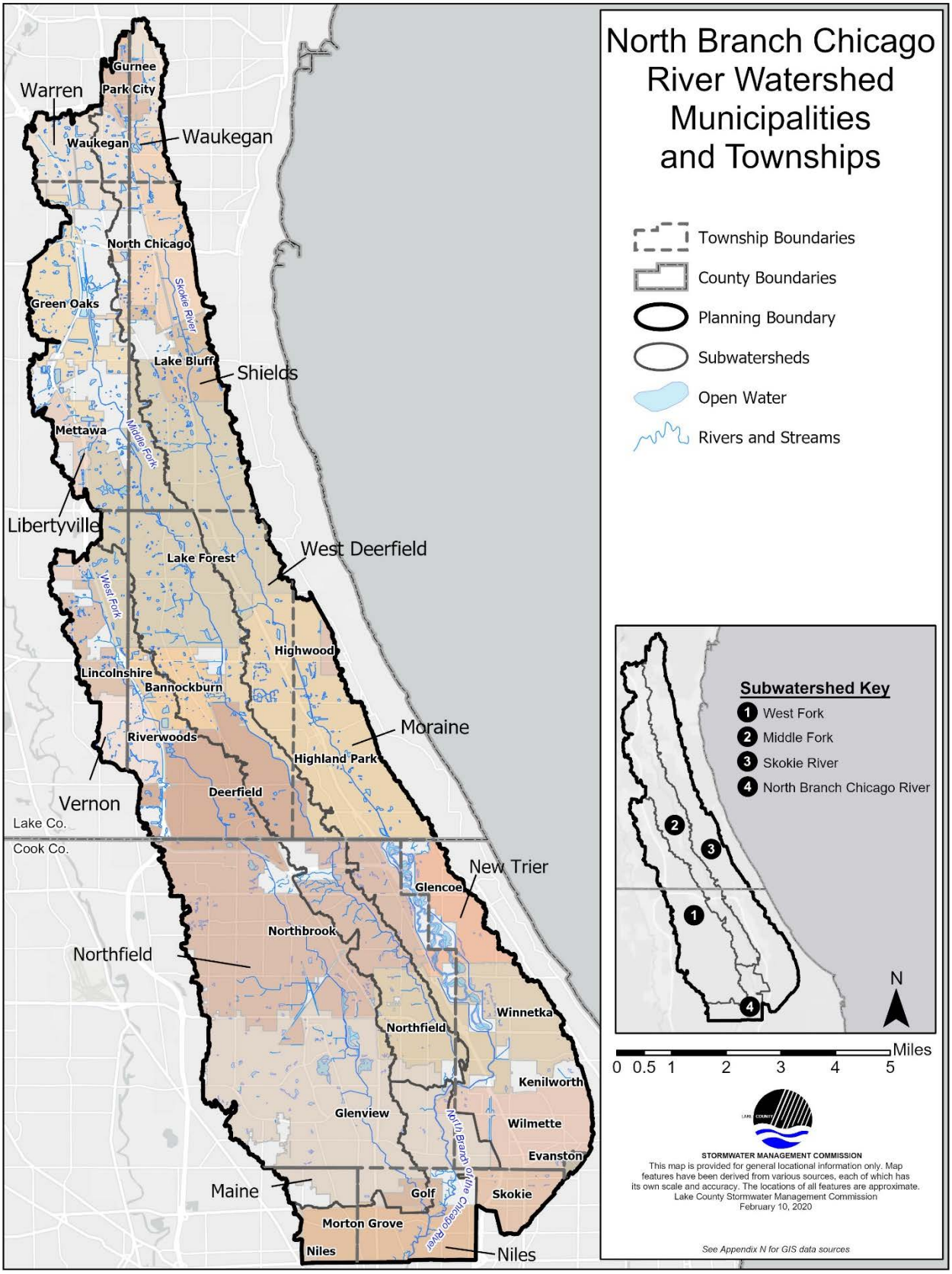


Figure 1-3: NBCR Watershed Planning Area Municipalities & Townships

1.2.2.1 North Branch Chicago River Watershed Partnerships

The North Branch Chicago River watershed partnership originated from an ad hoc group *(Voices From the Stream)* coordinated by the non-profit river advocacy organization Friends of Chicago River (FOCR) in the early 1990s. This ad hoc group co-sponsored two watershed stakeholder public meetings in 1991 and 1992 at the Chicago Botanic Gardens known as "Voices From the Stream: Our Watershed Speaks". The Voice's workshops were dedicated to identifying issues important to North Branch Chicago River watershed stakeholders and providing a vision for the future of the watershed.

Following Voices from the Stream, a congressional appropriation sponsored by Congressman Sidney Yates prompted the National Park Service to initiate the ChicagoRivers Demonstration Project in 1993. A number of government agencies participated in the project along with the FOCR and other volunteers from the ad hoc partnership workgroup. As part of the project, the government agencies studied and assessed the condition of the entire 156 miles of the Chicago River waterway system - including natural resources such as wetlands, fish and macroinvertebrates, water pollution and sediment contamination and resident attitudes towards the river. The ChicagoRivers project was intended to galvanize local interest in the conservation and use of the Chicago River and to promote local stewardship. During the same time the ChicagoRivers study was being conducted, a core group of watershed partners continued to work on improving the North Branch Chicago River through restoration projects. The North Branch Chicago River Watershed Project was born out of the continued interest and commitment demonstrated by these partners as they worked on successive projects in the North Branch Chicago River.

In 1996, the North Branch Steering Committee established by FOCR and Lake County Stormwater Management Commission (SMC) became the North Branch Planning Committee – Technical Assessment and Strategy Team formed for the purpose of creating a watershed plan.

1.2.2.2 North Branch Chicago River Watershed Planning

Based on their active involvement in watershed projects throughout this time period, FOCR received an Illinois Environmental Protection Agency (Illinois EPA) Section 319 Grant in 1996 to develop a more formal watershed partnership, and a strategy for restoring and managing the 95 square mile area of the North Branch Chicago River watershed. The watershed strategy would be embodied in a watershed management plan that identified solutions for water pollution, flood reduction, and protection and restoration of natural resources.

FOCR contracted with Kirk Gregory, a professor at Northeastern Illinois University (NEIU), to complete a watershed assessment and plan for the Cook County portion of the North Branch Chicago River. NEIU students conducted a watershed assessment under the guidance of Professor Gregory, and NEIU would become a watershed partner in future projects to study and monitor the condition of the river. At the same time, FOCR entered into a cooperative agreement with SMC to assess the watershed condition and develop a management plan for the Lake County portion of the watershed. SMC has no planning authority or funding support to develop a management plan for the Cook County project area, but had coordinated with Cook County entities in restoration initiatives in the NBCR planning area in the past. SMC and NEIU worked together to select a methodology for the stream assessment, a nonpoint source pollutant loading model, and to identify sources of data for other components of the watershed assessment. A watershed assessment for the Cook County portion of the NBCR planning area was completed in 1998, but insufficient funding and the lack of a

designated planning authority precluded the completion of a more detailed watershed assessment and full watershed management plan for Cook County.

The first draft of the Lake County watershed assessment and plan was completed in February 1999. Following revisions based on comments from Illinois EPA, SMC staff and FOCR, a second draft of the plan was completed and mailed out for a 60-day public review in August 1999. A public hearing was held in September of 1999. Comments from the public, peer agency and municipal review received through mid-November 1999 were compiled for the North Branch Planning Committee. Over 300 individual comments were incorporated into a comment/response summary. The North Branch Planning Committee discussed comment responses that would result in substantive changes to the plan at meetings in December 1999 and January 2000. Technical guidance for responding to comments related to the water quality and hydrology and hydraulics sections of the plan was provided by the Water Quality Work Group and SMC technical staff respectively at meetings in December 1999. The resulting revisions were incorporated into the Final Draft which was adopted by the Lake County board in fall 2000.

Although there was considerable difference in the level of detail between the Lake and Cook County assessments and plans, the North Branch Planning Committee decided to combine the Cook County and Lake County watershed assessments in the 2008 watershed-based plan to provide a more complete view of the NBCR planning area. As a result, while the watershed assessment in the 2008 watershed-based plan reflects the most up-to-date information (at the time) for the NBCR planning area, there are some discontinuities between the Cook and Lake County portions of the watershed assessment due to differences in informational detail and mapping. Applicable content from the 2005 North Branch Chicago River Open Space Plan (NBOSP) was incorporated into the 2008 plan. This plan (2020) also incorporates the United States Environmental Protection Agency (US EPA) nine elements of a watershed-based plan. The ultimate goal of the North Branch Chicago River Watershed Project for the 2008 watershed-based plan was to develop a watershed action plan for the entire NBCR planning area including both Lake and Cook Counties. The original 2000 plan, 2008 updated plan and the 2020 updated plan were all funded in part by the Illinois Environmental Protection Agency (Illinois EPA) through Section 319 of the Clean Water Act (CWA). This current watershed-based plan update, along with the 2000 & 2008 plan, was developed with the assistance and input of a variety of watershed stakeholders.

1.3 WATERSHED PLAN PURPOSE

The purpose of updating the 2008 watershed-based plan is to be more effective and efficient in reducing the impacts of water pollution and flood damage; restoring watershed lakes, streams, and wetlands to a healthy condition; gathering more accurate watershed information; and letting watershed stakeholders move forward with implementation of the plan. This watershed-based plan does not address groundwater quality issues, focusing instead on stormwater and surface water runoff. A broad representation of watershed stakeholders participated in the planning process and updated and support this plan. Significant objectives of this planning effort and the implementation of the plan going forward are to reduce flood damages and return the 19

IMPAIRED WATERS:
The Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards with current pollution control technologies alone.

waterbodies (stream segments and lakes) in the NBCR planning area that have listed **impairments** on the 2018 Illinois 305(b) report to conditions that fully support their designated uses (Illinois EPA, 2018). These include pollutants and waterbody AUIDs for which a Total Maximum Daily Load (TMDL) has been developed and have subsequently been removed from the 303(d) list (Illinois EPA, 2020). Figure 1-4 depicts the waterbodies that are impaired in the NBCR planning area.

This plan identifies best management practices (BMPs) to remedy or mitigate water quality impairment, flood damages, and the loss or degradation of natural resources. The plan also recommends watershed stakeholders implement actions to preserve, manage, and restore natural resources, as well as prevent actions that will cause or exacerbate unintended water quality and flood damage problems.

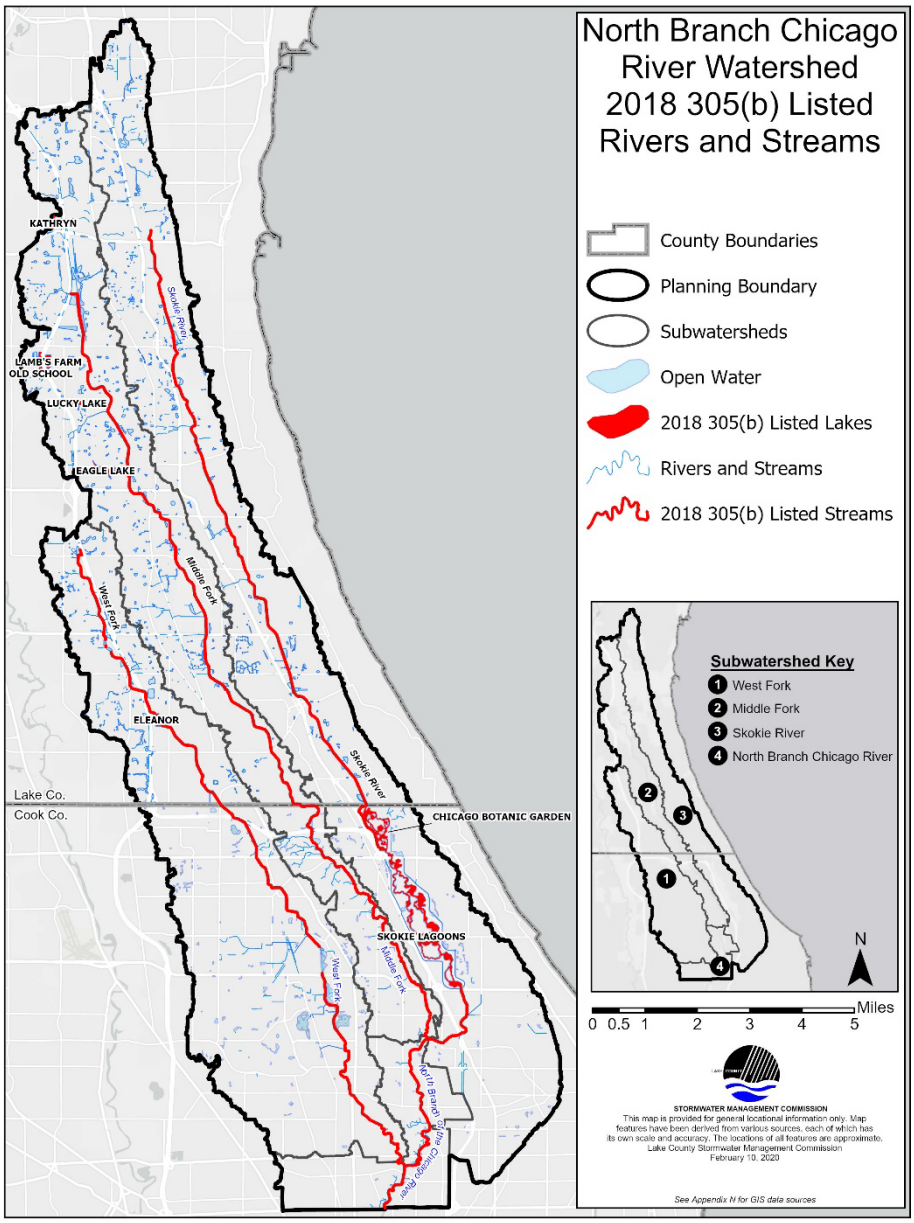


Figure 1-4: North Branch Chicago River Watershed 305(b) Impaired Waterbodies

The watersheds do not coincide with political boundaries, so watershed planning improves coordination and cooperation among communities and the land and water resources they share and impact.

1.4 WATERSHED PLAN REQUIREMENTS, PROCESS, AND ORGANIZATION

The primary scope of this project is the development of a comprehensive watershed-based management plan for the 95-square mile NBCR planning area that identifies actions to improve water quality and reduce flood risks. The planning approach was designed to help stakeholders from multiple jurisdictions and with various interests to better understand and become engaged in the watershed.

The desired planning outcome is to spur implementation of watershed improvement projects and programs that will accomplish the goals and objectives established in this plan. SMC worked with numerous stakeholders, including public agencies, local units of government, landowners, and private sector professionals with interests in the watershed.

The North Branch Chicago River Watershed-Based Plan update was funded, in part, by the Illinois EPA through Section 319 of the CWA. The North Branch Chicago River Watershed-Based Plan follows Illinois EPA guidance and is designed to meet the nine elements required by the US EPA for a watershed-based plan.

Pursuant to its mission and authority for stormwater management and watershed planning (55 ILCS 5/5-1062), SMC develops watershed-based plans and follows the adoption process outlined below (for Lake County portions of the planning area):

1. *Draft version of the watershed-based plan is submitted to the Illinois EPA for review*
2. *SMC Board approves a 30-day public comment through a public hearing and local publication*
3. *SMC revises the draft watershed-based plan based on comments received*
4. *Illinois EPA determines the plan meets the watershed-based planning guidance*
5. *The plan is brought before the Lake County Stormwater Management Commission & Lake County Board for adoption as an amendment to the Lake County Comprehensive Stormwater Management Plan.*
6. *SMC seeks community adoption of the watershed-based plan from the NBCR planning area entities.*

NOTEWORTHY – US EPA'S NINE ELEMENTS OF A WATERSHED –BASED PLAN

1. Identification of the causes and sources, or groups of similar sources, of pollution that will need to be controlled to achieve the pollutant load reductions estimated in the watershed-based plan;
2. Estimate of the pollutant load reductions expected following implementation of the management measures described under number 3 below;
3. Description of the nonpoint source management measures that will need to be implemented to achieve the load reductions estimated under number 2 above, and an identification of the critical areas in which those measures will be needed to implement the plan;
4. Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the plan;
5. Public information/education component that is designed to change social behavior;
6. Plan implementation schedule;
7. Description of interim, measurable milestones;
8. Set of criteria that can be used to determine whether pollutant loading reductions are being achieved over time;
9. Monitoring component to evaluate the effectiveness of the implementation efforts over time.

1.5 PREVIOUS AND RELATED STUDIES AND PLANS

Stakeholder groups and local, state and federal agencies have completed studies and compiled data on various aspects of the North Branch Chicago River watershed. Floodplain, biological, habitat, water quality, and

demographic/geographic data for this plan were compiled from several previous and concurrent studies of the watershed. Past studies have a dual purpose in that they contain information on the watershed that can be used directly in ongoing watershed planning efforts and also provide background information for comparison to current conditions. This information was collected, analyzed, summarized, and supplemented with newly collected field data, and was then used to reach conclusions regarding the condition of the resources in the watershed. Field studies completed in association with this planning effort include: detailed stream and detention basin inventories performed by SMC, Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) and Forest Preserve District of Cook County (FPDCC), and an expansive biological and water quality monitoring of the NBCR watershed performed by the North Branch Chicago River Watershed Workgroup (NBWW) and the Illinois EPA. References for previous reports and studies and summaries of field data collected and reports compiled specifically for this planning effort are listed below in Table 1-2.

NOTEWORTHY – NBWW

The North Branch Chicago River Watershed Workgroup (NBWW) is a voluntary, dues-paying organization with a mission to bring together a diverse coalition of stakeholders to preserve and enhance water quality in the North Branch Chicago River and its tributaries within Lake County and portions of Cook County, Illinois. The goals of the NBWW are to facilitate collection and analysis of water quality monitoring data, as well as provide education and outreach, to achieve attainment of water quality standards and designated uses for the watershed. The NBWW supports the North Branch Watershed Planning Committee and the North Branch Watershed Consortium through fostering general membership forums. The NBWW officially formed in 2018 with the intent of improving water quality through a collaborative, locally led process.

Table 1-2: Previous Studies and Plans

PREVIOUS & RELATED STUDIES/PLANS	YEAR COMPLETED	AUTHOR/OWNER
Lake County Flood Problem Areas Inventory	2021	SMC
North Branch Chicago River Watershed Workgroup Biological and Water Quality Assessment of the North Branch Chicago River Watershed	2021	Midwest Biodiversity Institute
Stage 3 TMDL Report for the North Branch Chicago River Watershed	2020	Illinois EPA, CDM Smith
Lake County Wetland Restoration and Preservation Plan	2020	SMC
Lake County All-Natural Hazards Plan	2017	SMC
Lake County Green Infrastructure Model and Strategy	2016	LCPFD
Discovery Report Chicago River Watershed, HUC # 07120003	2015	FEMA
Detailed Watershed Plan for the North Branch of the Chicago River and Lake Michigan Watershed: Volume 1	2011	MWRDGC; HDR Engineering, Inc; 2IM Group, LLC; Cushing and Company; FluidClarity, Ltd; Huff & Huff, Inc; Lin Engineering, Ltd; M.P.R. Engineering, Corp., Inc; V3 Companies of Illinois Ltd.
Upper North Branch Chicago River Watershed TMDL Stage 1 Report	2009	Illinois EPA, AECOM, Inc.

PREVIOUS & RELATED STUDIES/PLANS	YEAR COMPLETED	AUTHOR/OWNER
North Branch Chicago River Watershed-Based Plan	2008	SMC
Skokie Headwaters and North Chicago Flood Damage Reduction Feasibility Study	2006	SMC, STS Consultants, LTD.
Lake County & Cook County Flood Insurance Studies	2006	FEMA
North Branch of the Chicago River Open Space (Green Infrastructure) Plan	2005	Futurity, Inc., FOCR, SMC
North Branch Chicago River Watershed Assessment and Management Plan	2000	SMC, FOCR, Northeastern Illinois University
Water Resources Data Illinois Water, Volume 1: Illinois except Illinois River Basin	1997	U.S. Geological Survey, U.S. Department of the Interior

Please note: Additional water quality studies are refereneced throughout the watershed-based plan.

1.6 USE OF THE PLAN

1.6.1 WHO SHOULD USE THIS PLAN?

This plan will be of limited success without the commitment of watershed stakeholders to improve, restore, manage, and steward watershed resources. Municipal and county agencies and elected officials, as the primary land use, development, and infrastructure authorities in the watershed, will have a significant amount of influence and responsibility for implementing this plan. These public agencies represent the interests of their constituents and are strongly influenced by every community resident or landowner. Therefore, each community member has the potential to influence the actions that occur in the NBCR watershed through active participation.

State and federal agencies, elected officials, and private organizations, such as homeowner associations, Friends of the Chicago River and private conservation organizations, will also play an important role. State and federal agencies can support the implementation of this plan by approving projects in a timely fashion, supporting projects with funding, and providing technical information, tools, and resources to assist local authorities and watershed organizations in their efforts. Private associations and organizations have connections with their members and can provide significant contributions to land and water protection. Individual watershed residents and landowners must also manage their own land and water resources responsibly and work with other to implement this plan.

All jurisdictions, organizations, businesses and institutions, private landowners, and residents will have to work together to successfully protect and restore the watershed. The power of water is immense, as anyone who has experienced flooding can attest. The flow of water also does not respect property lines or jurisdictional boundaries; therefore, everyone needs to share the long-term stewardship responsibility and the costs and benefits of watershed improvements.

The success of plan implementation will also be determined by the ability of stakeholders to organize, coordinate, communicate, and manage activities in the watershed. Watershed organizations are generally

formed from the organizations and/or individuals who participated in the watershed planning process. Watershed organizations often become the drivers implementing the watershed plan and providing educational outreach to the community. A watershed organization will be the primary mechanism to engage the general public in watershed activities, to support the implementation of the watershed plan, and to voice their concerns and celebrate their successes in restoring watershed resources.

1.6.2 How To Use This Plan

For those unfamiliar with watershed planning, this document may appear overwhelming. There are pages of information to navigate, containing numerous tables and maps reporting the condition of the watershed, and many costly recommendations that a lone individual cannot likely implement. These recommendations are for public agencies to consider. But there are also a number of straightforward actions that individuals can take to improve the watershed. Every action, no matter how small, when undertaken by many or by key landowners can have a positive impact on improving the watershed. For a general understanding of what this plan is about, please read the Executive Summary, which also includes a list of top priority actions for the next ten years. For additional details, browse the table of contents and advance to the section you are interested in.

To find out…

- What this plan is intended to accomplish; read about the watershed issues, opportunities, goals, and objectives for improving watershed health and improving water quality in **Chapter 2**.
- Detailed information about watershed resources and conditions; read the section(s) of interest in **Chapter 3**.
- What the problems are facing the watershed; **Chapter 4** includes a summary and analysis of watershed problems that need to be addressed by the action plan.
- Detailed information about flooding, including the flood events, flood problem inventory, and strategies for flood damage reduction; turn to **Chapter 5**.
- What kind of actions can be taken to improve the watershed; the action plan in **Chapter 6 and Appendix M** includes a watershed-wide programmatic action plan that includes general recommendations; and a site-specific action plan directed to critical areas of the watershed that identifies actions that can improve water quality in specific areas. A web application has been created (https://lakecountyil.maps.arcgis.com/apps/webappviewer/index.html?id=26b1867e34954ba6bcbd3753292b37a6) that allows watershed stakeholders to access the site-specific action plan recommendations in the DPR planning area through a mapping tool.
- What kind of funding may be available to provide cost share for implementing watershed improvement projects; refer to the funding sources in **Chapter 7**.
- What sort of outreach and education is needed so that watershed stakeholders understand the watershed problems, their role in the watershed, and have the capability to implement the Action Plan; refer to **Chapter 8**. SMC will continue to coordinate the stormwater activities in the watershed planning area to improve water quality, reduce flood damage, and restore and enhance the natural drainage systems.

- Who (watershed stakeholders) participated in 2020 watershed-based plan update; refer to **Appendix A**.

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CHAPTER TWO: WATERSHED ISSUES, OPPORTUNITIES, GOALS & OBJECTIVES

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COMMON ACRONYMS/ABBREVIATIONS USED IN CHAPTER

BMP – Best Management Practices
FOCR – Friends of the Chicago River
G&O - Goals and Objectives
IDNR - Illinois Department of Natural Resources
Illinois EPA – Illinois Environmental Protection Agency
NBOSP - 2005 North Branch Open Space Plan
NBPC - North Branch Planning Committee
NBWW – North Branch Chicago River Watershed Workgroup
SMC – Lake County Stormwater Management Commission

2 WATERSHED ISSUES, OPPORTUNITIES, GOALS, AND OBJECTIVES

Chapter 2, "Watershed Issues, Opportunities, Goals and Objectives" of the North Branch Chicago River Watershed-Based Plan was most recently updated in June 2019. See Figure 2-1 for a flowchart of the North Branch Chicago River watershed planning efforts.

North Branch Chicago River Watershed Partnership

The North Branch Chicago River watershed planning efforts started in the early 1990s through the Friends of the Chicago River (FOCR), non-profit river advocacy organization. The FOCR coordinated an ad hoc group called the North Branch Chicago River watershed partnership, that co-sponsored two watershed stakeholder workshops in 1991 and 1992 at the Chicago Botanic Gardens known as *Voices from the Stream*.

The *Voices* workshops were dedicated to identifying issues important to North Branch watershed residents and providing a vision for the future of the watershed. The vision for the watershed and issues identified by watershed stakeholders provided a baseline for developing goals and objectives for the 2000 North Branch Chicago River Watershed Assessment and Management Plan.

2000 North Branch Chicago River Watershed Assessment and Management Plan

Historically, a first draft of the Goals and Objectives (G&O) was developed for the 2000 North Branch Chicago River Watershed Assessment and Management Plan from a list of issues and opportunities identified through stakeholder and partner forums (see section above). Some specific actions for attaining the G&O were also identified during this process.

The draft G&O statement was distributed to all jurisdictional stakeholders for their input and was shared with the general public for comment at the

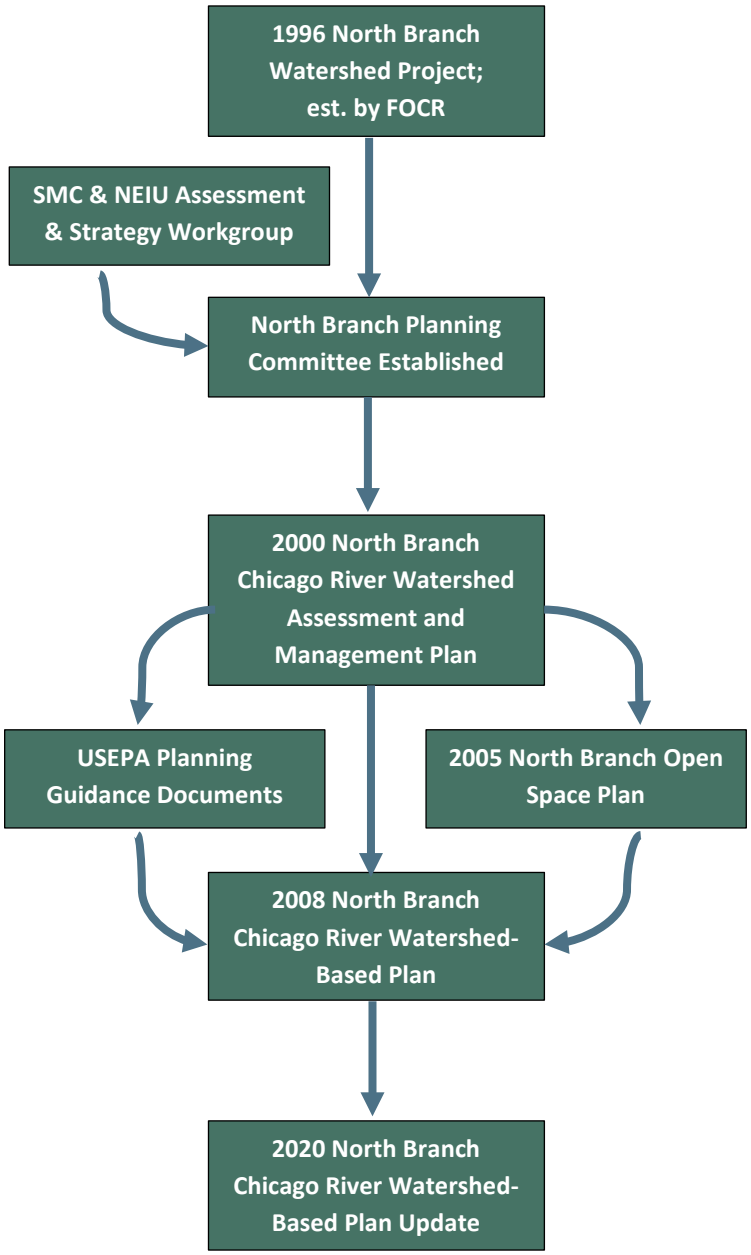


Figure 2-1 Timeline flowchart of North Branch Chicago River Watershed Planning Efforts

March 1997 project kick-off meeting and the North Branch Watershed Project "River Rap" meeting session in November 1997. River Rap participants identified and prioritized additional watershed problems and opportunities that are also reflected in the goals and objectives statement. The goals and objectives developed in the 2000 Watershed Assessment and Management Plan were translated into the 2008 watershed-based plan.

2008 North Branch Chicago River Watershed-Based Plan

The 2008 watershed-based plan identified five goals that were established for the watershed plan to address the issues and opportunities raised in the planning process. The 2008 G&O statements were developed with some potential action steps. Action steps were identified during planning meetings associated with the 2000 North Branch Chicago River Watershed Assessment and Management Plan and identified in the 2005 North Branch Open Space Plan (NBOSP). The NBOSP was developed in 2005 as a follow-up to the 2000 watershed-based plan, by Futurity Inc. in cooperation with FOCR and Lake County Stormwater Management Commission (SMC). There were seven identified goals included in the NBOSP.

The five goals from the 2000 plan and seven goals from the 2005 Plan were combined into eight goals and were distributed to the North Branch Planning Committee (NBPC) for the July 12, 2006 meeting for discussion and comment. Subsequent refinement and condensing reduced the eight goals into five. These five goals and corresponding objectives were incorporated into a Building Blocks Worksheet (December 2003 USEPA's "Getting in Step, A Guide for Conducting Watershed Outreach Campaigns"). The NBPC received the G&O Building Blocks Worksheet via email on February 27, 2007, and suggestions were received for inclusion and discussion. The NBPC discussed and completed the G&O from the Building Blocks Worksheet on March 14, 2007.

2020 North Branch Chicago River Watershed-Based Plan Update

The watershed G&O section below was based on the 2008 North Branch Chicago River Watershed-Based Plan. Proposed revisions to the 2008 existing watershed issues, opportunities, goals, objectives and indicators were brought to a public forum for stakeholder input at the February 13, 2019 North Branch Chicago River Watershed Workgroup (NBWW) General Membership Meeting. A 30-day comment period followed the February 13, 2019 meeting to allow stakeholders to provide additional feedback. Meeting notes from applicable NBWW General Membership public meetings are included in Appendix A.

2.1 2020 WATERSHED ISSUES & OPPORTUNITIES

One of the first tasks the North Branch Chicago River Watershed-Based Plan update was bringing the existing watershed issues and opportunities to watershed stakeholders at a NBWW General Membership Meeting (see Appendix A for stakeholder meeting minutes). A full list of the issues and opportunities watershed stakeholders developed in Table 2-1.

Table 2-1: North Branch Chicago River Watershed Plan Issues & Opportunities

KEY ISSUES & OPPORTUNITIES
• Poor water quality due to nonpoint and point source pollution.
• Substantial flood damage.
• Need for protection and expansion of natural resources and open space.
• Need for improved watershed-based public information and education.
• Need for increased participation and coordination of government agencies, representative stakeholder organizations, schools and individual and business property owners in watershed improvement activities.

2.2 WATERSHED VISION

WATERSHED VISION:
Serves to focus the aim of the watershed stakeholders.

The 2020 North Branch Chicago River Watershed-Based Plan update did not change the **watershed vision** section of the plan. The 2008 watershed vision section was a comprehensive summary of the current goals and objectives of the plan and given that the goals and objectives did not significantly change during this update, the vision section did not change. SMC received no additional feedback or comments on the watershed vision section from watershed stakeholders at the February 13, 2019 NBWW General Membership meeting or 30-day comment period.

2.2.1 INTO THE FUTURE…A VISION FOR THE NORTH BRANCH

…We All Live "Downstream"

Watershed stakeholders have expressed concerns about the condition of the North Branch Chicago River for many years, but because of its large number of jurisdictions, coordination and cooperation opportunities for watershed restoration were limited. The North Branch Partnership, expanded through this project, provides a base of coordination for development and implementation of this watershed management plan, and for collaborating local resources to fund and complete projects.

Demonstration projects and watershed management planning efforts around the country are showing that watersheds can be improved. Committed people supported by sound science and technical information are doing the same in the North Branch Chicago River watershed. Watershed planning provides the guidance for these restoration and management efforts. The North Branch Chicago River Watershed-Based Plan supplies direction and targets resources for watershed improvement projects. *The plan serves as a blueprint for improving water quality, reducing flood damage, and protecting natural resources - and for preventing existing watershed problems from worsening with future land development.*

While the North Branch Chicago River and watershed are not without their problems, they also have extraordinary potential to become a great resource for Chicagoland residents. Environmentally friendly land development and management practices and protecting open space will prevent watershed degradation

(maintaining stream quality, reducing runoff and protecting natural resources) as we move into the future. In addition to employing practices and programs that prevent future degradation, weaknesses and failings in the built drainage system can also be retrofitted to improve water quality and reduce flooding. While the North Branch Chicago River will probably never be restored to its pre-settlement condition, opportunities for restoring wetlands, naturalizing the riverbanks, reducing runoff and pollutant loads to the river and reestablishing a riparian corridor abound in the watershed. Recreational trails and greenways will connect people to the river, making it a focal point rather than being hidden in a "back alley". A healthy river will improve the quality of life for all watershed residents.

Success in restoring the watershed and improving the health of the river will depend on how well stakeholders interact with the river and manage their activities that affect the watershed. The North Branch Chicago River Watershed-Based plan also includes a significant public outreach and education component to reach watershed residents and communities. Watershed awareness is the first step in changing behavioral patterns that degrade the river. In addition to bringing watershed awareness to residents, communities will also work together on a cooperative basis and combine their resources with county, state, federal and private technical and financial assistance, as well as, cost-share funds to complete a number of the recommended watershed improvement projects and programs. The bottom line is residents and communities of the watershed need to work together to successfully protect and restore the North Branch Chicago River watershed. While this stakeholder collaboration includes sharing the costs, it also includes sharing the benefits of watershed improvements.

2.3 WATERSHED GOALS AND OBJECTIVES

Watershed Goals and Objectives were updated in June 2019. The five existing watershed goals are aimed to address watershed stakeholder issues/concerns. The watershed goals are essential to the development of the watershed action plan (Chapter 6). The goals and objectives reflect watershed conditions, address watershed stakeholder priority issues, consider changes, and meet the expectations of current and future stakeholders.

SMC proposed revisions to existing watershed goals, objectives and indicators at a public forum for stakeholder input at the February 13, 2019 NBWW General Membership Meeting. Measurable indicators were assigned to objectives to measure future progress toward achieving each goal as the watershed action plan is implemented. A 30-day comment period followed the February 13, 2019 meeting to allow stakeholders to provide additional feedback. Recommendations of the action plan include:

- Programmatic actions that address flooding; water quality; stormwater management and drainage; maintenance and protection of natural resources; and education, outreach, coordination, and implementation goals; and
- Site-specific actions that recommend Best Management Practice (BMPs) for specific problem locations identified during inventories and assessments; and

- Plan Implementation and Evaluation (Chapter 7), and Evaluation Scorecards (Appendix L) to examine the watershed plan goals by looking at their performance and progress. These sections evaluate milestones related to measurable indicators for the watershed goals and objectives.

NOTEWORTHY: WHAT ARE GOALS VERSUS OBJECTIVES?

GOALS:

- Mini vision statements or targets for the watershed plan.
- The desired change or outcome you wish to achieve.
- Driven by stakeholder issues and problems identified by the watershed assessment.
- Ideally will be clear, concise, and measurable.

OBJECTIVES:

- Specific, more precise steps needed to attain goals.
- Position reached or purpose achieved by some activity by a specific time.
- Objective outcomes should be measurable, attainable, relevant, and time-based.
- There may be multiple objectives to achieve a goal(s).

2.3.1 WATERSHED GOAL #1: IMPROVE WATER QUALITY IN THE WATERSHED

OBJECTIVES:

1. Measurably reduce nonpoint and point source pollutant loadings.

   Indicators:

   a) Watershed stream annual monitoring program support (number of NBWW members) and number of monitoring locations. (see Figure 2-2).

   b) Number of water bodies and/or causes of impairment (including legacy pollutants) removed from the Illinois Environmental Protection Agency (Illinois EPA) Integrated Water Quality Report.

   c) Trends of phosphorus concentrations based on the NBWW monitoring data.

2. Reduce streambank and streambed erosion.

   Indicator: Number of restoration projects and linear feet restored.

3. Reduce phosphorus loads by removing phosphorus from wastewater discharges, upgrading poorly functioning septic systems and reducing nonpoint sources.

   Indicator: See Indicator 1(c)

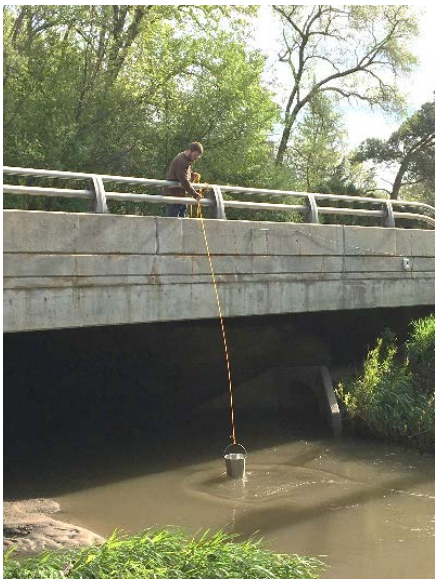


Figure 2-2: NBWW water column chemistry sampling

4. Find ways and work with communities to reduce the quantity of road salt (sodium chloride) and/or utilize road salt alternatives needed for safe and cost-effective winter maintenance to reverse the current trend of rising chloride levels in water bodies.

   Indicator: Number of municipal Winter Maintenance Programs that include policy and manual development, de-icing workshop attendance and certification.

2.3.2 Watershed Goal #2: Reduce Flood Damage In The Watershed

OBJECTIVES:

1. Reduce flow rates and volumes from existing developed areas and prevent increases in flow rates and volumes from new development.

   Indicator: Number of municipalities that have codes that allow or require green infrastructure for stormwater management.

2. Protect and restore floodplain functions.

   Indicator: Number of projects within the floodplain that protect/restore floodplain functions.

3. Mitigate flood damages (see Figure 2-3) using both remedial and preventive measures including property protection.



Figure 2-3: City of Park City July 2017 roadway flooding along the Dady Slough

   Indicators:

   a) Number of Voluntary Buyout properties purchased *(also satisfies Goal 2, Obj. 2)*
   b) Number of structures removed that are chronically damaged by flooding and ac/ft of flood storage gained.

4. Determine potential locations and feasibility of regional flood storage sites.

   Indicators:

   a) Number of detailed studies completed and number of participants.
   b) Number of storage facilities constructed, and ac/ft of storage created.

2.3.3 Watershed Goal #3: Protect and enhance natural resources and provide associated recreational opportunities

OBJECTIVES:

1. Protect and restore wetlands, streams and lakes to improve water quality and aquatic habitat.

   Indicators:

   a) Additional wetland acres protected and/or restored.

b) Number/linear feet of stream restoration projects completed. See Figure 2-4.

c) Number/linear feet of wetland and lake restoration projects completed.

d) Number of native fish species and population identified in the watershed based on NBWW and/or Illinois Department of Nature Resources (IDNR) data.



Figure 2-4: Skokie River Stream Daylighting Project, Two-Stage Channel

2. Protect and enhance native plant communities, native wildlife habitat and biodiversity.

   Indicator: Acres of terrestrial native natural area restoration projects completed.

3. Identify and develop areas for river-based recreational opportunities such as hiking, fishing, canoeing, running, biking, birding, peace of mind and a tranquil setting for both personal and social benefit.

   Indicator: Area of open space identified and preserved for environmental and recreational natural areas.

4. Protect and restore riparian greenways and buffers along and around all water resources.

   Indicator: Length of native plant buffers and riparian greenways along water bodies maintained, expanded, and/or restored.

2.3.4 Watershed Goal #4: Develop & Implement a public information and education program within the watershed

OBJECTIVES:

1. Develop and implement a primary and secondary school-based river curriculum.

   Indicator: Number of schools participating.

2. Provide public information and education program for community leaders, elected officials, businesses and homeowners. See Figure 2-5.

   Indicator:

   a) Number of attendees at NBWW general membership meetings (per year).

   b) Number of subscribers to NBWW website (per year).



Figure 2-5: The Village of Glenview led a BMP public tour at NBWW's 2018 Annual Meeting

2.3.5 WATERSHED GOAL #5: IMPROVE COMMUNITY & AGENCY PARTICIPATION AND COORDINATION IN WATERSHED IMPROVEMENT ACTIVITIES

OBJECTIVES:

1. Encourage watershed communities to adopt or officially support the North Branch Chicago River Watershed-Based Plan update and coordinate plan implementation activities.

   Indicators:

   a) Number of municipalities, counties, and natural resource agencies that have adopted or otherwise indicated official support of the 2020 North Branch Chicago River Watershed-Based Plan update.

   b) Number of action recommendations completed.

   c) Number of grant applications received by SMC (Watershed Management Board Grant Program, Stormwater Infrastructure Repair Fund, & Illinois EPA Section 319 Grants)



Figure 2-6: Students volunteer to help implement a streambank stabilization project adjacent to Deerfield High School

2. Watershed committee annually assesses community participation on active plan implementation and provides updates to the watershed-based plan every 10 years.

   Indicator: Number of watershed stakeholders providing feedback for the watershed scorecard.

3. Improve stewardship of the North Branch Chicago River and its aquatic resources by increasing public participation in the upkeep of the river (see Figure 2-6).

   Indicator: Number of participants during the annual Chicago River Day event.

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COMMON ACRONYMS/ABBREVIATIONS USED IN CHAPTER 3

ADID – Advance Identification
ALK – Alkalinity
BMP – Best Management Practices
BOD – Biological Oxygen Demand
DOTH - Cook County Department of Transportation and Highways
Cl^{-} Chloride
CMAP – Chicago Metropolitan Agency for Planning
COND – Specific Conductivity
CWA – Clean Water Act
DEM – Digital Elevation Models
DO - Dissolved Oxygen
DST- Decision Support Tool
DTM - Digital Terrain Model
E. coli- Escherichia coli
fIBI- Fish Index of Biotic Integrity
FLU – Future Land Use
FPDCC - Forest Preserve District of Cook County
FQI – Floristic Quality Assessment
GIMS - Green Infrastructure Model and Strategy
GIS – Geographic Information System
GIV - Green Infrastructure Vision
GPS – Global Positioning System
H&H - Hydrologic and Hydraulic
HOA - Homeowner Associations
HQAR- High Quality Aquatic Resources
HSG – Hydrologic Soil Groups
HUC - Hydrologic Unit Code
IDNR – Illinois Department of Natural Resources
IDOT – Illinois Department of Transportation
Illinois EPA – Illinois Environmental Protection Agency
INAI – Illinois Natural Areas Inventory
INHS - Illinois Natural History Survey
INT – Institutional
IWLC- Isolated Waters of Lake County
IWW - Industrial, Warehousing and Wholesale
LCDOT – Lake County Division of Transportation
LCFPD – Lake County Forest Preserve District
LCHD-ES – Lake County Health Department – Ecological Services
LCWI- Lake County Wetland Inventory
LiDAR - Light Detection and Ranging
LRR- Lateral Recession Rate
MGD – Millions of Gallons Per Day
mIBI- Macroinvertebrate Index of Biotic Integrity
MS4s - Municipal Separate Storm Sewer Systems
MWRD- Metropolitan Water Reclamation District of Greater Chicago
NAVD88 – North American Vertical Datum of 1988
NBCR – North Branch Chicago River
NBCR Planning Area – North Branch Chicago River Watershed Planning Area
NFIP - National Flood Insurance Program
NH_3-N – Ammonia
NLCD – National Land Cover Database
NO_{2-} - Nitrite
NO_{3-} - Nitrate
NOI – Notice of Intent
NPDES - National Pollutant Discharge Elimination System
NPS – Nonpoint Source

NRCS – Natural Resources Conservation Service
NSWRD – North Shore Water Reclamation District
NWI- National Wetlands Inventory
PAH- Polycyclic Aromatic Hydrocarbons
PCB - Polychlorinated biphenyl
PRW- Potentially Restorable Wetlands
RAP-M - Rapid Assessment Point Method
RES - Residential
s.u. – Standard Unit
SCS - Soil Conservation Service
SECCHI - Secchi Disk Depth
SMC – Lake County Stormwater Management Commission
SRP – Soluble Reactive Phosphorous
STV - statistical threshold value
SWPPP – Stormwater Pollution Prevention Plan
T&E - Threatened and Endangered
TAG- Technical Advisory Group
TCU - Transportation, Communication, and Utilities
TDS - Total Dissolved Solids
TKN – Total Kjeldahl Nitrogen
TMDL – Total Maximum Daily Load
Tollway – Illinois Tollway Authority
TP – Total Phosphorus
TS - Total Solids
TSS - Total Suspended Solids
TVS - Total Volatile Solids
USDA – United States Department of Agriculture
USEPA – United States Environmental Protection Agency
USFWS- United States Fish and Wildlife Service
USGS – United States Geological Survey
WDO – Watershed Development Ordinance
WOUS - Waters of the United States
WRAPP- Wetland Restoration and Preservation Plan
WWTP- Wastewater Treatment Plant

3 WATERSHED CHARACTERISTICS ASSESSMENT

3.1 WATERSHED SETTING

The North Branch Chicago River watershed originates in Lake County, Illinois as three tributaries, or "forks": the Skokie River, with its headwaters located southeast of Routes 131 and 132 in Waukegan; the Middle Fork, which rises a quarter mile south of the Route 120 and Tri-State Tollway (I-94) intersection in Waukegan; and the West Fork, which flows out of a series of ponds northwest of Everett Road and the Tri-State Tollway in Mettawa. From their origins in Lake County, these tributaries flow south into Cook County where they converge to form the mainstem of the North Branch Chicago River (NBCR).



Figure 3-1: Tributary Drainage Area to the Mississippi River Basin

The NBCR flows south through Cook County to its confluence with the North Shore Channel on Chicago's north side and meets the mainstem and south branch of the river in downtown Chicago. The south branch flows into the Chicago Sanitary and Ship Canal in Lockport, Illinois where it is diverted westward joining with the Des Plaines River as a tributary of the Illinois River; a major tributary of the Mississippi River (Figure 3-1). The Illinois River flows about 334 miles through the State of Illinois and joins the Mississippi at Grafton, about 25 miles north of St. Louis, Missouri. The Mississippi flows another 1,169 miles to the Gulf of Mexico.

This watershed-based plan focuses on the NBCR watershed planning area of the Chicago River Watershed; hereinafter referred to as "NBCR planning area". The NBCR planning area includes four subwatersheds; West Fork North Branch Chicago River, Middle Fork North Branch Chicago River, Skokie River and North Branch Chicago River subwatersheds. All figures and tables focus only on this NBCR planning area within the Chicago River Watershed. The NBCR planning area is approximately 95 square miles (60,540 acres). Fifty-one square miles (32,428 acres) of the NBCR planning area is in Lake County, Illinois and forty-four square miles (28,112 acres) is in Cook County, Illinois.

3.1.1 GEOLOGY- THE WATERSHED STAGE

The NBCR watershed is shaped by surficial geology formed during the most recent glacial period known as the Wisconsin stage of the Pleistocene Era or "Ice Age" that began approximately 85,000 years ago and ended 10,000-14,000 years ago. During this time, 80% of Illinois was covered with one or more sheets of glacial ice (Neely and Heister 1987). Although the NBCR planning area was most likely glaciated repeatedly during the Ice Age, the retreat and re-advance of the Lake Michigan lobe of the North American ice sheet during the Wisconsin glaciation resulted in almost all the surficial geologic features present today (Figure 3-2) (Barnhardt et al., 2015). These features are composed of materials deposited less than 30,000 years ago and include **loess, outwash valley deposits,** and **till**. Glacial till deposits range from a few feet to more than 250 feet in thickness.

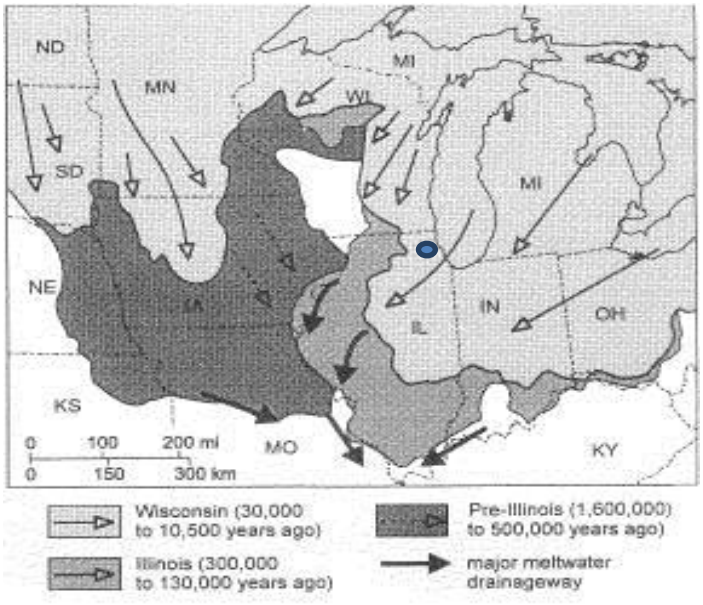


Figure 3-2: Geology of the Midwest

The blue circle represents the approximate location of the NBCR watershed planning area. This area has been affected by all three phases of glaciation: most recently the Wisconsin Period (Fryxell 1927).

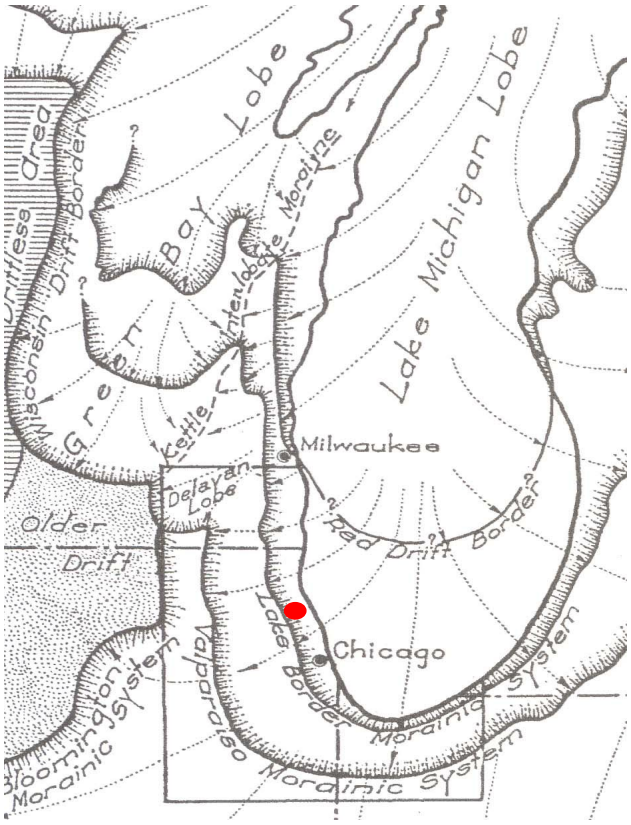


Figure 3-3: Moraine Deposits Developed from Advancing and Retreating Glaciers

The latest deposit is the Wisconsin glacier (Fryxell 1927). The red circle represents the approximate location of the NBCR watershed planning area.

Topographic features in the NBCR planning area are largely a result of the movement of the Lake Michigan lobe of the ice sheet, which extended as far south as Shelbyville, Illinois. Its retreat resulted in the deposition of **moraines** and till plains. The recessional moraines that formed at the ice margin following stages of retreat and re-advance presently appear as concentric belts (or arcs) of low topographic ridges around southern Lake Michigan and the Chicago region, generally parallel to modern Lake Michigan shoreline (Figure 3-3). Recessional moraines in the NBCR planning area are oriented along north-south axes, resulting in the general pattern of north-to-south flow of major streams in the landscape today. These parallel ridges are known as the Valparaiso and Lake Border moraine systems.

Moving from east to west away from Lake Michigan, four moraines (Highland Park, Blodgett, Deerfield and Park Ridge) make up the low ridges that define the NBCR drainage system. The valleys between these moraines are the current locations of the three forks of the NBCR: the West and Middle Forks of the NBCR and the Skokie River. The unsorted till deposited by the glacier between the moraines ranges from relatively flat to **hummocky** and is pock-marked with depressions containing younger peat, muck, **marl**, and organic materials.

LOESS: Small sediment formed by the accumulation of wind-blown dust.

OUTWASH: Deposits of sand and gravel carried by running water from the melting ice of a glacier and laid down in stratified deposits.

TILL: Unsorted glacial sediment.

MORAINE: Low ridge formed by till deposited at the margin of a stagnant or retreating glacier.

HUMMOCKY: Extremely irregular surface.

MARL: A loose or crumbling earthy deposit that contains a substantial amount of calcium carbonate.

The bedrock of the NBCR planning area is composed primarily of dolomite, limestone, sandstone, shale, and coal. Fossils indicate that bedrock was formed during a geologic period known as the Silurian that began

approximately 440 million years ago. Rock formed during this period is found at the surface only in the northern third of the state. Today, these rock formations are economically important because they yield limestone and other important minerals.

3.1.2 The Watershed Over Time

Following the most recent glacial retreat, the tributaries flowed through lands that developed into **marshes**, wet **prairie** and **meadow**, **savanna** and **woodland** (Figure 3-4). The streams were relatively small, shallow and undefined, and meandered through a series of wetlands and small lakes on their path southward. In the late 19th and early 20th centuries, the landscape of the NBCR planning area was changed as the stream **channels** were converted to ditches to help drain the surrounding land for agriculture. The ditching of the three forks began the process of changing the way the land of the NBCR planning area was used, first for agriculture and more recently for suburban development.

3.1.2.1 Pre-European Settlement Vegetation

The distribution of pre-European settlement vegetation of the NBCR planning area was derived from the pre-European settlement natural vegetation communities map, available in Geographical Information System (GIS) format, prepared by the Illinois Natural History Survey (INHS) using Government Land Office maps and land surveyors' notes. Prior to European settlement, most of the NBCR planning area was savanna interspersed with small pockets of dry mesic forest in the uplands. The exceptions to this landscape include two substantial prairies and the marsh and wet meadows that followed the floodplain of the NBCR tributaries. One large tract of prairie was located in the upper portion of the NBCR planning area; the other was south of present-day Deerfield Road in the West Fork NBCR subwatershed. Remnants of native plant communities still exist at

PRAIRIE/MEADOW: An extensive flat or rolling area dominated by grasses. Prairie grasslands once covered much of central North America.

SAVANNA: A type of woodland characterized by open spacing between trees and intervening grassland.

WETLAND: Low-lying land that is saturated or inundated with water to an extent that plants that are adapted to living in wet conditions grow there. Marshes, swamps, bogs, sloughs, wet prairie, rivers, streams, ponds and the edges of lakes are typically classified as wetlands.

MARSH: Low-lying land area that is usually saturated or inundated with surface or ground water that is dominated by herbaceous plants.

WOODLANDS: Land that is mostly covered with trees and shrubs.

CHANNEL: Any river, stream, creek, brook, ditch, gully, ravine, swale or wash, into which surface or groundwater flows, either perennially or intermittently.



Figure 3-4: Pre-European Settlement Landscape

relatively small sites throughout the watershed including the Middlefork Savanna, Florsheim Park, McLaughlin Prairie, Shaw Prairie, Berkley Prairie and others. Prairie was the dominant vegetation in most of the West Fork NBCR in Cook County. Original surveyors' field notes and the surveyors' interpretation of plant communities helped detail the pre-European vegetation landscape.

From the information provided, the eastern banks of the streams were likely dominated by wet forest, while the western banks were prairies. In the southern portion of the study area and to the east of the wet forest occurred a large area of oak-hickory forest. Additionally, a pocket of oak savanna occurred on the very eastern edge of the study area straddling what is now Central Avenue. The area now occupied by the Skokie Lagoons and Skokie River system was mostly marshland, swamp and slough.

3.1.3 Climate and Precipitation

The NBCR planning area is situated midway between the western Continental Divide and the Atlantic Ocean, and it is often underneath the polar jet-stream, which creates low pressure systems that bring clouds, wind and precipitation to the region. The NBCR planning area's mid-latitude position results in seasonal variations in the regional solar energy input causing warm summers and cold winters. The planning area is classified as a humid continental climate, meaning the coldest month has an average temperature below freezing, the warmest month has an average temperature above 71.6 degrees Fahrenheit, and there is not a pronounced wet or dry season. The presence and density of buildings, roads, parking lots and industrial activities also influence the climate in comparison to surrounding rural areas, often increasing the temperature (National Climatic Data Center, 2009).

Lake Michigan influences the climate of the planning area. Lake Michigan's large thermal mass moderates both the heat of the summer and the cold of the winter. While weather conditions in the NBCR planning area west of Lake Michigan area are not affected to the same degree as areas on the eastern shore (e.g., increased winter cloudiness and significantly higher snowfall) data suggests that winter temperatures are slightly warmer and summer temperatures slightly cooler than areas located further inland to the west. Lake effect snowfall occurs within the watershed, though not as frequently as it occurs in western Michigan and northern Indiana due to the prevailing westerly wind patterns.

Climate Normals:
30-year averages of climatological variables including temperature and precipitation.

The Illinois State Climatologist Office and the National Climatic Data Center track climate normals for numerous sites in Illinois. Two current reporting sites, Waukegan (on IL 120, west of IL 131) and Chicago Botanic Garden, are within the NBCR Planning area. Additional sites located along the perimeter of the planning area at Waukegan Regional Airport and Gurnee are included here as they "frame" the watershed and provide some additional context. The monthly mean temperature and precipitation normals from 1981-2010 for these four sites are summarized in Table 3-1 and Table 3-2, respectively (Temperature only for Waukegan and precipitation only for Gurnee). As indicated by the climate classification for the region, winters are cold, with average temperatures below freezing while summers are relatively warm or hot. The warmest and wettest site year-round appears to be Chicago Botanic Garden.

Table 3-1: Mean Monthly Temperature Normals (Degrees Fahrenheit), 1981-2010

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN.

Waukegan (IL 120 W of IL 131)	22.5	26.5	35.9	46.9	56.8	67.0	72.3	71.3	63.4	51.6	39.8	27.3	48.5
Waukegan Regional Airport	23.0	25.9	35.2	46.1	55.7	65.7	71.3	69.9	62.2	51.0	39.1	27.5	47.8
Chicago Botanic Garden	23.7	27.4	36.8	47.3	57.3	67.3	72.8	71.8	64.1	52.1	40.8	28	49.2

(Illinois State Climatologist's Office & National Climatic Data Center, 2010) Data provided by the Illinois State Climatologist's Office, a part of the Illinois State Water Survey (ISWS) located in Champaign and Peoria, Illinois, and on the web at www.isws.illinois.edu/atmos/statecli.
Note: Monthly temperature normal data not available for Gurnee

Table 3-2: Mean Monthly Precipitation Normals (Inches), 1981-2010

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN.
Gurnee	1.80	1.82	2.35	3.59	3.96	3.69	3.79	2.90	3.29	2.85	2.90	2.28	35.22
Waukegan Regional Airport	1.39	1.66	2.32	3.48	4.01	3.88	3.88	3.83	3.46	2.92	2.76	2.00	35.59
Chicago Botanic Garden	1.81	1.73	2.37	3.58	4.01	3.67	3.63	4.77	3.48	3.24	3.06	2.40	37.75

(Illinois State Climatologist's Office & National Climatic Data Center, 2010) Data provided by the Illinois State Climatologist's Office, a part of the Illinois State Water Survey (ISWS) located in Champaign and Peoria, Illinois, and on the web at www.isws.illinois.edu/atmos/statecli.
Note: Monthly precipitation normal data not available for Waukegan (IL 120 W of IL 131)

Illinois exhibits wide variability in annual precipitation. Average annual precipitation varies by more than 2 inches among sites in or near the NBCR planning area. Despite the spatial variability of annual precipitation, seasonal variations in precipitation are similar between sites within or near the planning area, with relatively wetter summers and drier winters. Annual snowfall totals are typically higher than annual precipitation, due to the low density of snow compared to liquid water. The wetter summer months are the result of thunderstorm-derived precipitation. These storm events tend to distribute rainfall variably and it is not uncommon for heavy rainfall to occur in some parts of the NBCR planning area while other parts receive little to no precipitation. The spatial variability of this precipitation source may account for some of the overall variation in the normal rainfall amounts across the sites in Table 3-2.

DIGITAL ELEVATION MODELS (DEM):
A digital cartographic/geographic dataset of elevations in xyz coordinates. DEMs are derived from hypsographic data (contour lines) and/or photogrammetric methods using USGS 7.5-minute, 15-minute, 2-arc-second (30- by 60-minute), and 1-degree (1:250,000-scale) topographic quadrangle maps.

The variety of climate and weather conditions creates diverse watershed conditions. For example, during winter months the watershed experiences precipitation in the form of snow, this precipitation may affect flooding if there is a sustained warm period following heavy snow accumulation. Likewise, rain on frozen ground or snow melt in spring combined with rain may also result in stream and localized flooding. During spring, the planning area will usually experience warming temperatures and wet weather conditions. In contrast, during fall, the watershed experiences cooling temperatures and precipitation frequency decreases. There have been prolonged "wet" periods of above-average annual precipitation, most recently during the 1970s and 1980s and the late 2010s. There have also been major multi-year droughts in the 1930s and 1950s. Illinois has rainstorms which cause 40 or more flash-floods annually, each with several inches of rainfall in a few hours, in localized areas. In July 2017, this type of rainstorm

delivered up to 8 inches of rainfall in less than 24 hours in some portions of the watershed planning area, resulting in localized flash flooding.

3.2 TOPOGRAPHY

Topographic data is used in the planning process to develop floodplain maps, water quality models, flood mitigation recommendations, catchments, **Digital Elevation Models (DEM)** and regionally significant depressional storage areas.

Figure 3-5 represents the NBCR planning area and topography from a compilation of two data sets: the 2017 Lake County **Digital Terrain Models (DTM)**, and 2008 Cook County DTM. The Middle Fork NBCR and the Skokie River tributaries drain into the NBCR mainstem from the north, while the West Fork NBCR drains into the NBCR mainstem from the west. The lowest elevation in the NBCR planning area is 592 feet North American Vertical Datum of 1988 (NAVD88) above mean sea level in the southern end of Techny Basin near the southwest corner of Willow Road and Waukegan Road

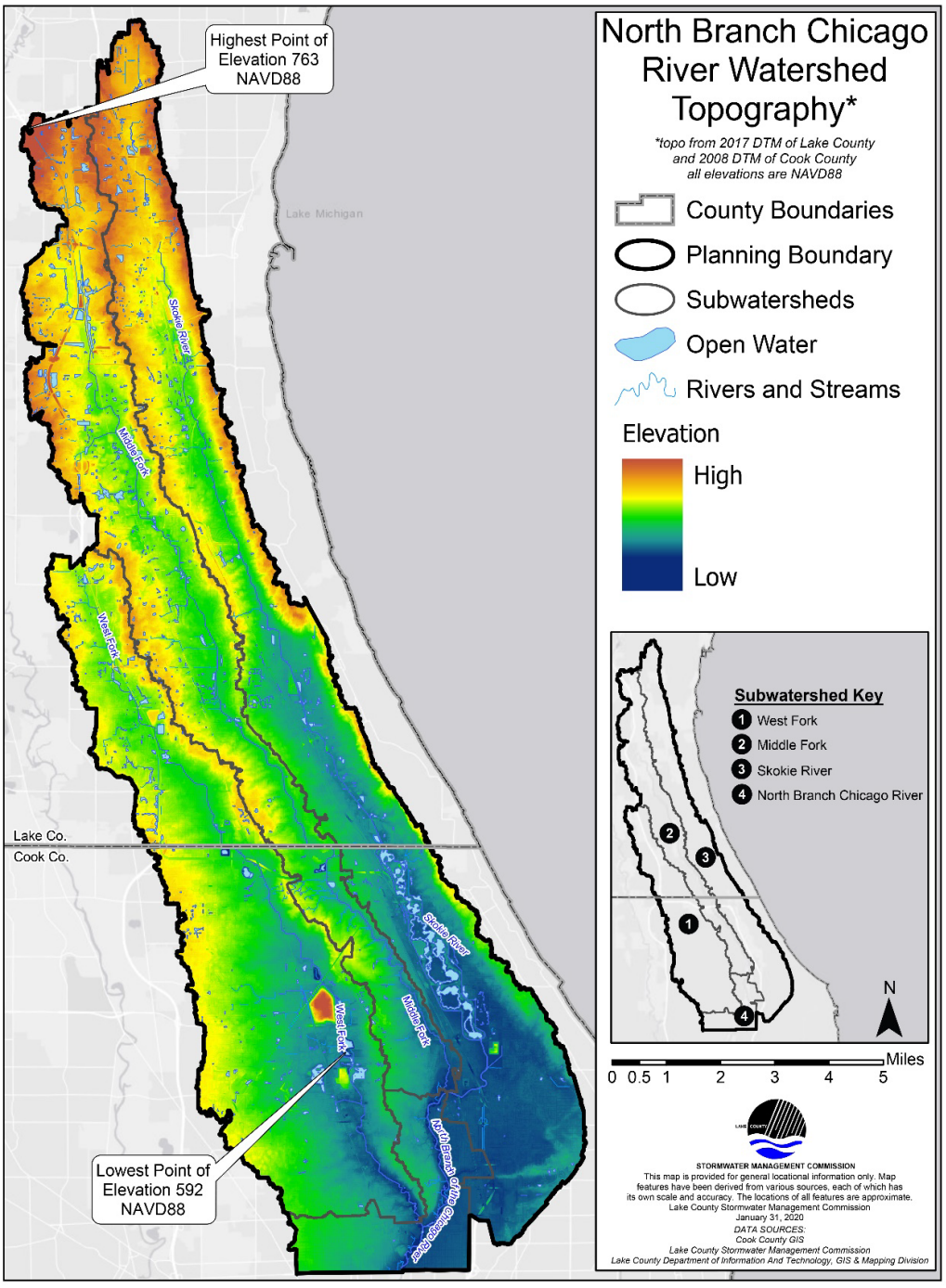


Figure 3-5: Topography

Digital Terrain Models (DTM):
A digital cartographic/geographic dataset of elevations in xyz coordinates that contains information on geographical elements and natural features.

(Illinois Route 43) in the Village of Glenview. The highest elevation in the NBCR planning area is 763 feet NAVD88 above mean sea level just south of the Illinois Route 120 and I-94 intersection in the upper most reaches of the Middle Fork within the City of Waukegan.

3.3 SOIL

INFILTRATION: That portion of rainfall or surface runoff that moves downward into the subsurface soil.

SOIL PHASE: A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Deposits left during the last glacial period are the raw materials of present soil types in the NBCR planning area. A combination of physical, biological and chemical variables, such as topography, drainage patterns, climate, erosion and vegetation, have interacted over centuries to form the variety of soils found in the watershed. These soils were formed under wetland, forest and prairie plant communities, and they are identified by a name associated with each series or class of soils with similar characteristics. A soil series name generally is derived from a town or landmark in or near the area where the soil series was first recognized, although naming conventions vary by county.

Soils determine the water-holding capacity and include both the erosion potential and **infiltration** capabilities. Soil characteristics indicate the way soils in an area will interact with water in the environment, and therefore are useful in watershed planning. These soil characteristics can help guide where restoration and best management practices (BMP) are likely to be successful and where there may be constraints to project implementation. The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) has produced a detailed soil survey for Lake and Cook County. These soil surveys contain information regarding the physical and chemical properties, as well as, information regarding human use for each soil series and **soil phase** in the NBCR planning area. The soil surveys were utilized to extract detailed soil data for the NBCR planning area. Table 3-3 includes the major soil series (more than 3%) present in the NBCR planning area and the amount of area occupied by each.

Table 3-3: Major Soil Types

SOIL SERIES	SOIL SERIES NAME	ACRES	HYDROLOGIC SOIL GROUP	HYDRIC RATING (Y/N/Partial)	% OF WATERSHED
465	Montgomery	5,910.03	D	Y	9.76%
805	Orthents	5,031.62	D	N	8.31%
320	Frankfort	4,839.33	C	N	7.99%
228	Nappanee	4,331.72	D	N	7.16%
530	Ozaukee	3,992.61	C	N	6.59%
2822	Alfic Udarents, clayey-Urban land Elliott complex	3,468.79	D	N	5.73%
533	Urban Land	3,063.04	N/A	N	5.06%
854	Markham-Ashkum-Beecher complex	2,905.23	C/D	Partial	4.80%
232	Ashkum	2,061.49	B/D	Y	3.41%
192	Del Rey	2,058.31	C	N	3.40%
Other Soil Series (>3% of the watershed)		*22,878.11*	--	--	*37.79%*
TOTAL:		**60,540.28**			**100%**

*Partial Hydric: At least some components of the soil are hydric.

3.3.1 HYDRIC SOILS

Hydric soils form in areas of the landscape that are seasonally or permanently saturated with water. These conditions are conductive to the growth of **hydrophytic vegetation**; therefore, the presence of hydric soils is indicative of present or historical wetland conditions or may indicate areas of depression. Areas with hydric soils and drained hydric soils that do not presently contain wetlands may be utilized for wetland restoration projects. Figure 3-6 maps hydric soils in the NBCR planning area. Hydric soils cover approximately 12,897 acres (21%) and partially hydric soils cover 3,127 acres (5%), while non-hydric soils cover about 44,517 acres (74%) of the NBCR planning area. Most of the streams, lakes, and other surface waters in the NBCR planning area have hydric soils.

HYDRIC SOILS: A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part. These conditions alter the physical, biological and chemical characteristics of the soil, thereby influencing the species composition or growth, or both, of plants on those soils.

HYDROPHYTIC VEGETATION: Plants that tolerate or require saturated soil or standing water.

3.3.2 SOIL ERODIBILITY

Soil erodibility is largely determined by the tendency of soil particles to become detached and mobilized by water and the ground slope. Highly erodible soils in the NBCR planning area are highly susceptible to erosion by water due to a combination of slope, particle size, and cohesion, but they are not prone to erosion by wind. Highly erodible soils are considered in the watershed-based plan because erosion from these soils can potentially end up in surface waters, contributing to high amounts of total suspended solids and sediment accumulation in streams and lakes. The movement or loss of soil resulting from erosion may also cause damage to property as buildings and infrastructure are undermined. The removal and disposal of sediment accumulated in lakes, ponds, detention ponds and the storm drainage system can be an expensive maintenance activity.

In the NBCR planning area, 11,165 acres (18%) are classified by NRCS as highly erodible soil. This suggests that a substantial amount of the soils in the watershed have the potential to negatively impact water quality. Highly erodible soils do not include hydric soils and are represented by hydrologic soil groups (HSG) “B” and “C”. Erodible soils along lakeshores, stream channels, and disturbed land surfaces (e.g., construction sites) are most susceptible to erosion. Stabilization practices near shorelines and stream channels could substantially reduce erosion. Additionally, land developers are required to follow the National Pollutant Discharge Elimination System (NPDES) and the Lake County Watershed Development Ordinance (WDO) regulations regarding soil erosion and sediment control measures during construction.

NOTEWORTHY: SOIL ERODIBILITY & POLLUTION

Soil characteristics, especially the tendency of soil particles to become detached and mobilized by water runoff, have considerable impact on water quality. For instance, sandy soils are more prone to erosion than clayey soils, although pollutants are more likely to be attached to clay particles.

It is important to map highly erodible soils because they represent areas that may contribute large amounts of total suspended solids (TSS) to streams and lakes. High TSS levels can result in stream degradation as a result of silt deposition and pollution. Some pollutants frequently attach to TSS particles and wash into lakes and streams, polluting the water and sediments and decreasing water clarity.

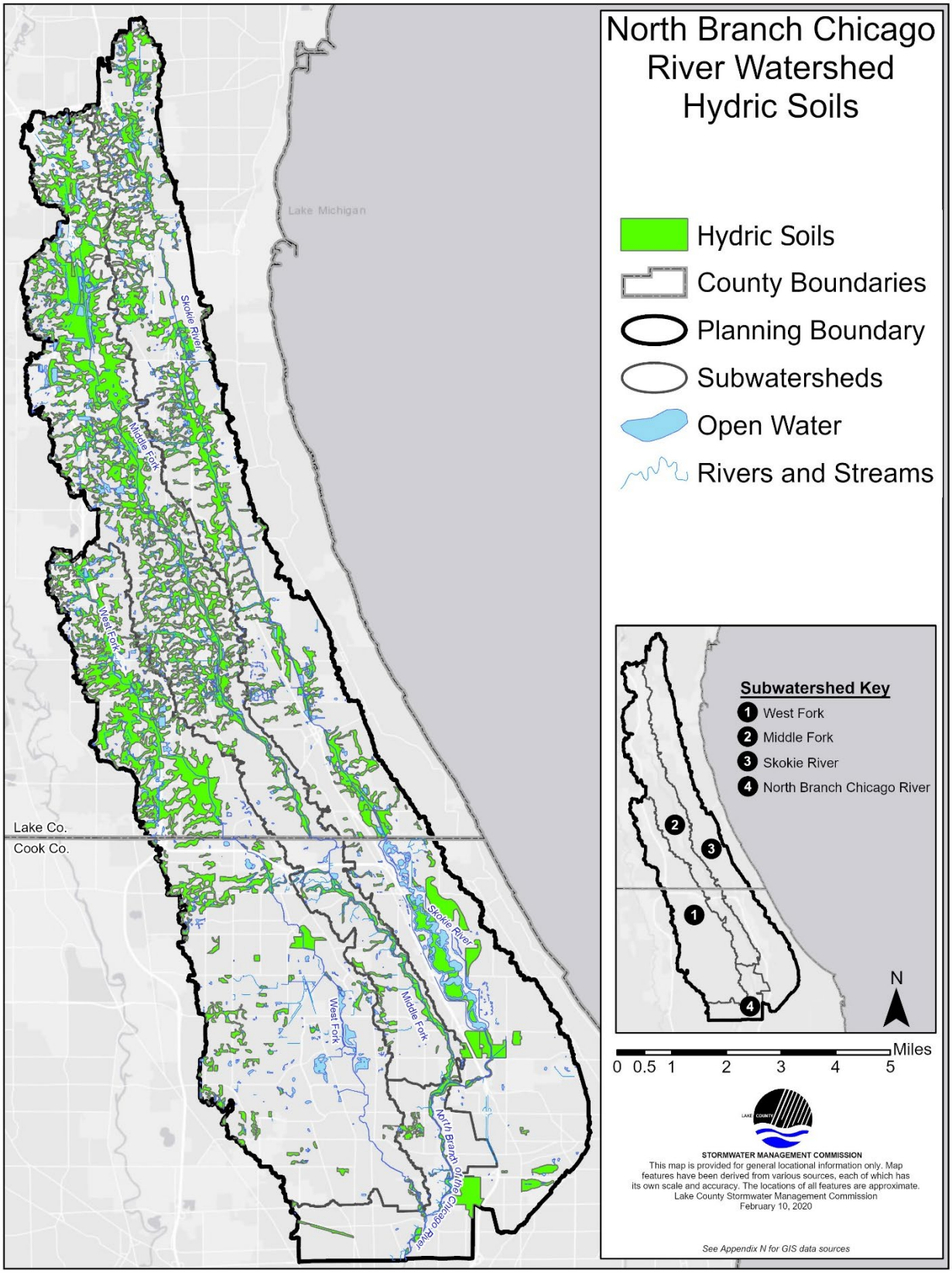


Figure 3-6: Hydric Soils

NRCS 2017 Lake County Soil Survey and 2011 Cook County Soil Survey

3.3.3 HYDROLOGIC SOIL GROUPS

The NRCS broadly classifies soils based on their drainage characteristics into four different HSGs. The classification considers soil texture, drainage description, runoff potential, infiltration rate and transmission rate (permeability). An HSG is a group of soils having similar runoff potential under similar storm and cover conditions. Group A is comprised of the most permeable soil types (e.g., sandy soils) and has the least runoff potential while group D includes the most impermeable soil types (e.g. clay) and has the greatest runoff potential. HSGs should be considered when identifying potential stormwater best management practice and retrofit opportunities. The main HSGs are separated into four categories: A, B, C, and D; see Table 3-4 for HSG permeability and surface runoff characteristics and Figure 3-7 for mapped HSGs in the NBCR planning area.

Table 3-4: HSGs and Corresponding Attributes

HSG	SOIL TEXTURE	DRAINAGE DESCRIPTION	RUNOFF POTENTIAL	INFILTRATION RATE	TRANSMISSION RATE	ACRES (% OF WATERSHED)
A	Sands (and Gravels), Loamy Sand, or Sandy Loam	Well to Excessively Drained	Low	High	High (greater than 0.30 in/hour)	183 (<1%)
B	Silt Loam or Loam	Moderately Well to Well Drained	Moderate	Moderate	Moderate	12,959 (21.4%)
C	Sandy Clay Loam	Somewhat Poorly Drained	High	Low	Low	17,257 (28.5%)
D	Clay Loam, Silty Clay Loam, Sandy Clay Loam, Silty Clay, or Clay	Poorly Drained	High	Very Low	Very Low	17,804 (29.4%)
					TOTAL:	**60,540**

There are also areas of the NBCR planning area with combined soil groups such as: HSG-A/D, HSG-B/D and HSG-C/D and N/A – water, landfills, urban areas, etc. (totaling 20.4% of the watershed). These combined soil groups are a combination of soil types and exhibit a combination of permeability and surface runoff characteristics. The soil characteristics can change depending on saturation, slope and time of year. If these soils can be adequately drained (with underground drain tiles or other techniques), then they are assigned to dual HSGs based on their saturated hydraulic conductivity and the water table depth when drained. The first letter applies to the drained condition and the second to the un-drained condition (e.g., HSG A/D). Overall, soils in the NBCR planning area are not well drained.

Runoff curve numbers classify the runoff potential of different soil types with different types of land cover. The curve numbers are a function of HSGs, land cover or usage and antecedent soil moisture conditions. The curve number value ranges from 0 - 100. Lower runoff curve numbers indicate low runoff potential, while larger runoff curve numbers indicate increased runoff potential.

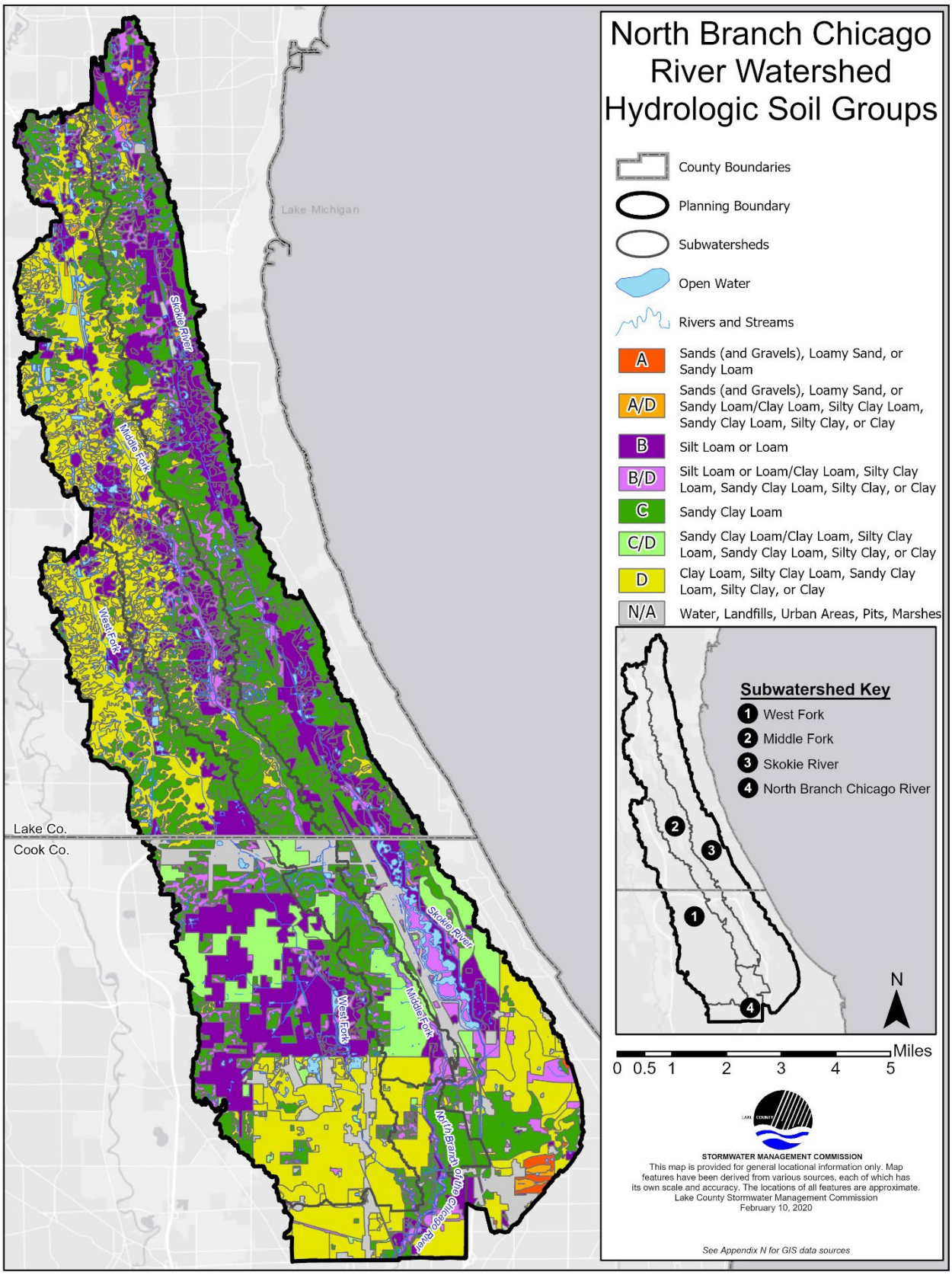


Figure 3-7: HSGs

3.4 WATERSHED HYDROLOGY & HYDRAULICS

Hydrology is the study of the occurrence, circulation, distribution, and properties of water. Earth's water is constantly being cycled between oceans, the atmosphere, and land through different pathways at different rates. The movement of the earth's water through these various pathways is called the hydrologic cycle. Although the hydrologic cycle is inherently complex, one can gain a general understanding of how it works by envisioning the following process. Clouds form over the ocean due to the evaporation of water. Wind carries the clouds ashore where they produce rain. Excess rainfall (e.g., stormwater runoff) flows into lakes, rivers, wetlands, and groundwater. Over time, water stored in the lakes, rivers, and wetlands, either evaporates back into the atmosphere or flows back into the ocean, beginning the cycle anew.

Primarily, hydrology involves studying the flow of water through the various hydrologic pathways that can be found within a geographical region or area. These pathways connect every component of the landscape and can generally be divided into surface and ground water hydrologic pathways. Surface water includes all hydrologic pathways at or above the earth's surface, including precipitation, evapotranspiration and surface water flow. Ground water includes all hydrologic pathways below the earth's surface including infiltration, interflow, and groundwater flow. Hydrology is the study of surface water pathways, and hydrogeology is the study of ground water pathways. Primary areas of study within science include developing methods for directly measuring flows through the various hydrologic pathways and developing and/or applying models for estimating flows through the various hydrologic pathways. When applied to a watershed, hydrology typically involves studying the flow of water between the surface water hydrologic pathways that connect the air, land, lakes, rivers, and wetlands found within the watershed.

NOTEWORTHY: HYDROLOGIC CYCLE

The hydrologic cycle describes the continuous movement of water on, above, and below the surface of the earth. The total mass of water on earth remains relatively constant over time, but the amount of water in each of its three primary states: solid (e.g., ice), liquid (e.g. water), and gas (e.g. water vapor), is variable depending on a wide range of climate-related variables. Water moves from one state to another through various hydrologic pathways, such as evaporation, transpiration, condensation, precipitation, infiltration, surface water flow, and interflow (e.g., shallow groundwater flow). As water moves between states, energy is exchanged, which affects temperatures on the surface of the earth. For example, when water evaporates, energy is absorbed, and the surface of the earth is cooled through the process of evaporative cooling. When water condenses, energy is released, and the surface of the earth is warmed. These energy exchanges, which occur on a global scale, powered by solar energy, have a significant influence on the earth's climate, as does water, in its three primary states (e.g., water vapor absorbs and emits energy back toward the surface of the earth; however, when water vapor forms into clouds, it reflects a significant amount of solar radiation back into space). Water and the hydrologic cycle are responsible for earth's mild climate and makes life possible on earth.

Hydrology and hydraulics are terms used to describe the effects of precipitation including infiltration, runoff, and evaporation on land surfaces that drain to streams and lakes. Hydrologic studies of watersheds typically determine how topography naturally delineates the land into watersheds, subwatersheds and smaller catchments. Hydraulics is the branch of science that deals with practical application of liquid in motion Hydraulics addresses how water flows over the land surface, within sewers and stream channels, over and under bridges and dams, and through culverts, wetlands, lakes and impoundments (detention basins and reservoirs). A hydraulic assessment of the NBCR planning area is a study of the flow paths, velocities and stages of water as it is conveyed, as a concentrated flow, through the watershed.

The most recent comprehensive hydrologic and hydraulic (H&H) studies of the NBCR planning area were completed in 1994 using H&H modeling. Limited H&H studies were performed on portions of the NBCR planning area after the 1994 comprehensive modeling, as described herein. The intent of the studies was to re-map the 100-year floodplain for purposes of the National Flood Insurance Program (NFIP). The H&H assessment for this plan included:

- an analysis of the hydrographs for the NBCR watershed planning area,
- a review of the original NBCR watershed H&H studies, as well as a review of the most recent studies associated with the November 6, 2006 Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRM) and the July 21, 2006 Skokie Headwaters and North Chicago Flood Damage Reduction Feasibility Study Report,
- mapping stormsewer systems within the NBCR planning area (based on best available data),
- reporting on hydraulic impoundments including a detention basin inventory,
- a review of the regulatory release rates for the NBCR planning area and
- an evaluation of future H&H needs.

3.4.1 WATERSHED HYDROLOGY

Prior to extensive land settlement, most precipitation in the NBCR planning area infiltrated into the ground, was intercepted by vegetation or was stored in the depressional areas or wetlands of the watershed. Because under natural conditions the river channels had less water to transport, they were generally shallower and wider (more marsh-like) than they are today. In the late 1800s and early 1900s, wetlands and other poorly drained land areas in the NBCR planning area were tiled to improve drainage for agriculture. The channels of the river were subsequently straightened and ditched in the early 1900s in order to better collect and transport the increased drainage from the land. Suburbanization of the NBCR planning area throughout the 1900s has resulted in more drainage improvements to the land, and hydrology continues to change as the farmland and open spaces were converted to residences and businesses.

Like many other urban watersheds, substantial increases in impervious surface, drain tile and stormsewer drainage improvements in the NBCR planning area have resulted in a watershed with an extremely “flashy flow pattern” and little capacity for excess stormwater runoff. A “flashy flow pattern” means that the water level in the river goes up very quickly during a storm and down quickly afterward. Low flows in the river are lower, and high flows are considerably higher than the pre-development conditions. Increased drainage and developments have made land in the NBCR planning area more economically valuable. However, during and after rain events, the river must convey large volumes of urban runoff traveling at high velocities that carries pollutants to the river, leads to more frequent flooding and results in significant streambank erosion and possible streambed scouring. Both the degraded river channel and flood damage are problems that frequently require expensive solutions. In addition to the problems caused by too much water, extreme low flows during dry periods (like the summer months) result in low dissolved oxygen (DO) levels in the river making it inhospitable to fish and other aquatic life. A high degree of imperviousness, coupled with an efficient network of stormsewers, results in even larger runoff volumes and peak discharges than would occur naturally in the NBCR planning area.

3.4.2 SUBWATERSHEDS

Table 3-5 and Figure 3-8 display the major **subwatersheds** in the NBCR planning area. Prior to the 2020 North Branch Chicago River Watershed-Based Plan update, the NBCR planning area was mapped as 3 subwatersheds. Upon further analysis of Metropolitan Water Reclamation District of Greater Chicago's (MWRD) current catchment and stormsewer data, Lake County Stormwater Management Commission (SMC) revised mapping to include 4 subwatersheds ranging in size from approximately 6 square miles (North Branch Chicago River) to 35 square miles (Skokie River).

The subwatersheds in the NBCR planning area are similar to United States Geological Survey (USGS) Hydrologic Unit Code (HUC) 12 boundaries in size; however, the subwatersheds in the NBCR planning area are not official USGS HUC boundaries. These boundaries have been altered as more detailed data, such as remapping from floodplain studies, stormsewer system best available data, incorporating additional Cook County data and higher resolution topographic data, has become available.

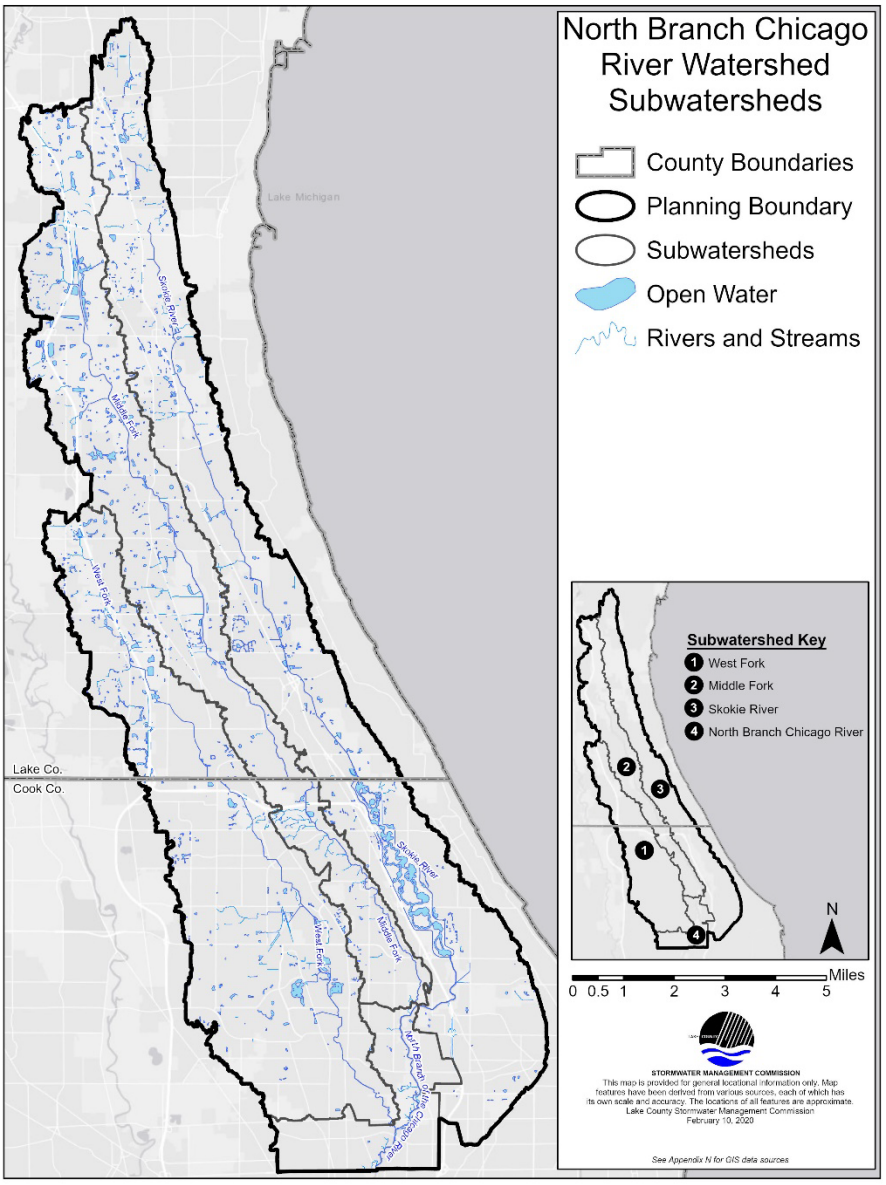


Figure 3-8 : Subwatersheds

SUBWATERSHED: perimeter of the catchment area of a stream tributary. Watersheds are broken down into these smaller geographic units.

Table 3-5: Subwatersheds

SUBWATERSHEDS	SQUARE MILES	ACRES	% OF WATERSHED
Middle Fork North Branch Chicago River	25	16,073	26%
North Branch Chicago River	6	3,743	6%
Skokie River	35	22,450	37%
West Fork North Branch Chicago River	29	18,274	31%
TOTALS:	**95**	**60,540**	

3.4.3 CATCHMENT

The NBCR planning area consists of 247 **catchments** ranging in size from 12 to 2,206 acres, with the average (mean) size of 245 acres. As part of the watershed delineation discussed in Section 3.4.1, the NBCR planning area was further divided into 247 catchments using 2017 Light Detection and Ranging (LiDAR) data from Lake County, IL, and 2008 LiDAR data from Cook County, IL. The LiDAR datasets were used to produce a seamless raster and catchments were developed using models in ArcGIS. The boundaries developed in GIS were further augmented and refined using the latest aerial photography as well as other datasets such as water, roads, storm sewer lines and culverts.

The catchments represent surface drainage and sub-surface (storm sewers and culverts) drainage areas. Cook County catchments were provided by MWRD. Stormsewer data was utilized from the following sources: Village of Bannockburn, Village of Deerfield, Village of Lincolnshire, City of Lake Forest, City of Highland Park, City of Lake Forest, Village of Lake Bluff, City of Waukegan, Village of Gurnee, City of North Chicago, and the City of Highwood.

Table 3-6 and Figure 3-10 summarize the delineated catchments by subwatershed.

CATCHMENTS: Small unit of a watershed or subwatershed that is delineated and used in watershed planning efforts because the effects of impervious cover are easily measured, there is less chance for compounded pollutant sources, boundaries have fewer political jurisdictions, and monitoring/mapping assessments can be done in a relatively short amount of time.

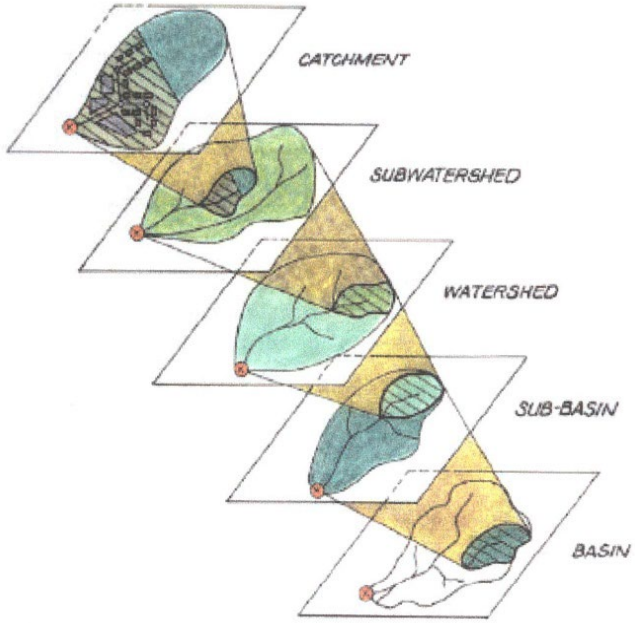


Figure 3-9: Defining Watershed, Subwatershed, and Catchment Boundaries

Table 3-6: Subwatershed Catchment Compilation Data

SUB-WATERSHEDS	NUMBER OF CATCHMENTS	TOTAL ACRES	AVERAGE (MEAN) ACREAGE OF CATCHMENTS
Middle Fork	76	16,073.01	211.49
North Branch Chicago River	9	3,742.63	415.84
Skokie River	84	22,449.55	267.26
West Fork	78	18,274.35	234.29
TOTAL:	**247**	**60,539.55**	**245.10**

The catchment data in this table reflects the known stormsewered areas within the NBCR planning area, based the data available to SMC.

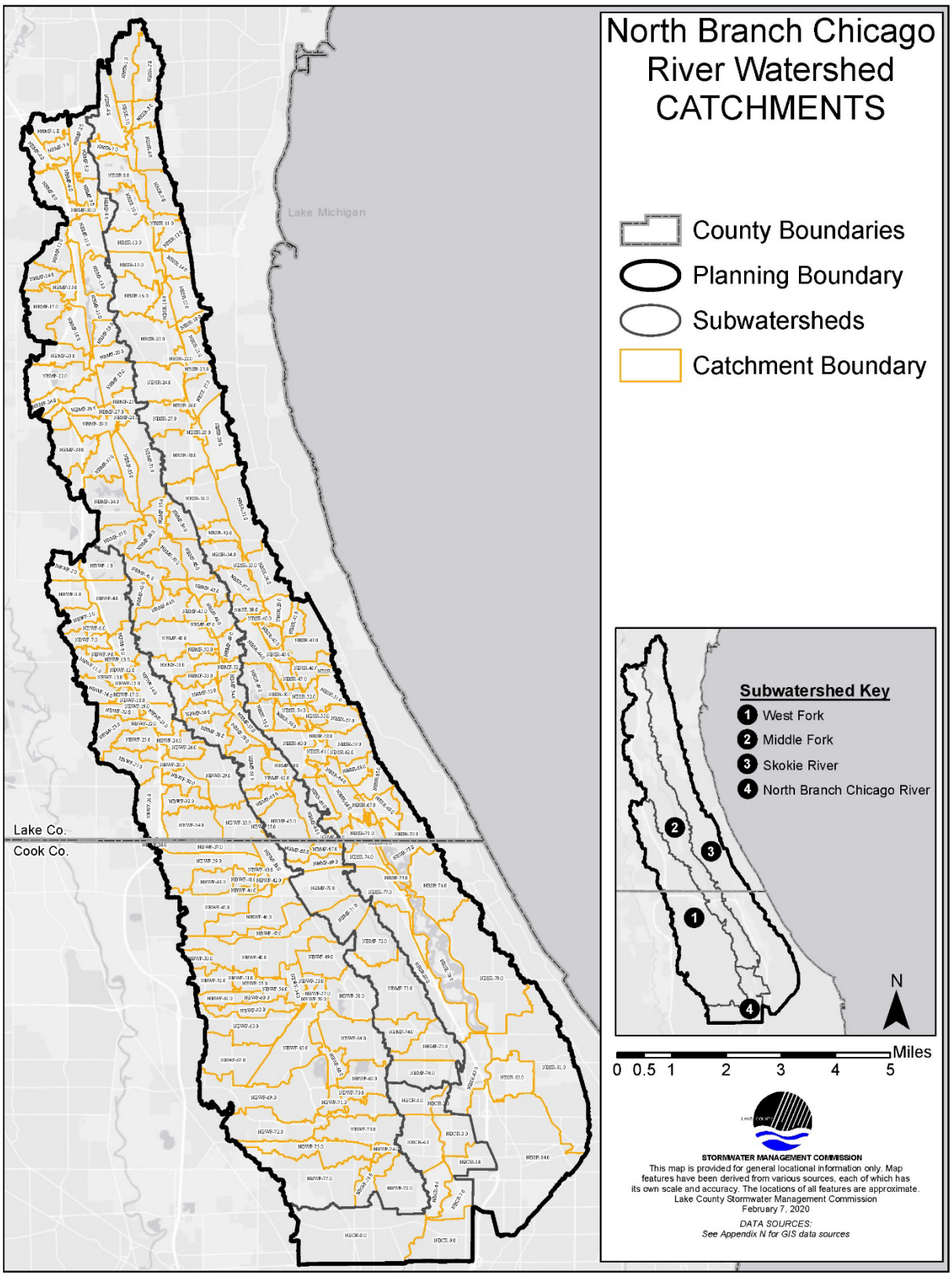


Figure 3-10: Catchments

3.4.4 STREAM HYDROLOGY

Discharge (volumetric rate of flowing water) in the NBCR planning area is derived from three general sources of flow:

- Baseflow and interflow, the discharge of groundwater and shallow subsurface flow to lakes, streams, and wetlands.
- Overland flow and surface runoff, discharge of water flowing over the ground surface as a result of direct precipitation, snowmelt, ground saturation, or other sources of water. Flow in streams, surface waters and wetlands is included in this category.
- Treated effluent and return flow, discharge of water that has been used for some human activity such as treated wastewater from public water supplies or industrial uses, cooling and process water, and irrigation. Treated effluent is a significant source of overall streamflow in the NBCR planning area. Return flows from cooling, industrial processes, and irrigation are not significant.

Under pre-settlement landscape conditions, discharge during much of the year in all streams within the watershed was driven by baseflow, interflow, and tributary flow (runoff) from other wetlands and water bodies. Runoff from precipitation had a less pronounced effect on stream discharge compared to present conditions. The streams themselves were much different than they are today. Each of the three forks of the NBCR were characterized as wide, slow-moving wetlands or sloughs. These wetlands were channelized in the first half of the 20th century to drain the surrounding land. The creation of these channelized streams or ditches would have had a significant impact on stream hydrology. Urban development in the NBCR planning area has also had an effect on stream hydrology, and the addition of impervious surfaces and efficient drainage systems such as stormsewers and drainage tile has also resulted in changes to the hydrology of these streams.

As the NBCR planning area has developed, baseflow and interflow has almost certainly been reduced with surface runoff contributing a greater proportion of the volume of annual discharge. Tiling, channelization of streams and ditching of wetlands (particularly along the three forks of the NBCR) as well as low-lying areas lowered shallow groundwater levels in some areas. Consequently, stream hydrology in the NBCR planning area has been extensively altered since European settlement. Additionally, the NBCR planning area receives hydrologic inputs from the Great Lakes basin through public water supply systems that transport water from Lake Michigan to potable water systems. Much of the effluent discharged in the NBCR planning area is derived from Lake Michigan and is treated and discharged to streams. All three forks of the NBCR receive flow inputs from effluent discharges within the NBCR planning area. These inputs are most noticeable during periods of baseflow or low flow, when “natural” sources of streamflow are augmented by flows from wastewater treatment plant (WWTP) discharges. The addition of WWTP effluent flows to the NBCR is also discussed in Section 3.17.

Stream hydrology in the NBCR planning area has changed over time, initially due to channelization of the three forks of the NBCR and watershed urbanization. Hydrology has also changed in the past several decades. Streamflow (discharge) has been steadily increasing on all three forks of the NBCR since record-keeping began in the 1950s. This is likely indicative of a more widespread pattern of both increasing precipitation and increasing streamflow in the Upper Midwest over the last 50 years (Groisman, et al., 2004; USGS, 2005).

Changes in stream hydrology are likely most evident to people during flood events. Water levels in the NBCR planning area rise and fall more quickly during flood events relative to streams in nearby watersheds. In particular, the streams respond quickly to runoff from precipitation events. This is problematic because floods can occur with little warning if forecast precipitation amounts are exceeded, a circumstance which occurs in association with thunderstorms. Additionally, heavy rainfall events and peak streamflows (the highest recorded flows in a given year) appear to be increasing in magnitude and frequency (Groisman, et al., 2004; Markus and Angel, 2019). At most stream gage stations in the NBCR planning area, peak annual streamflows display an increasing trend since the 1950s. The exception is the West Fork NBCR subwatershed, which does not display the same general trend of increasing peak flows after 1980. This is likely due to the construction and operation of flood control reservoirs on the West Fork NBCR subwatershed. On all forks, lowest annual peak flow values (annual peaks with the lowest values relative to other annual peaks) appear to be increasing, as well.

There are numerous stream classification systems and characterization terms in use by the community of engineers, watershed and natural resource managers, and researchers engaged in watershed planning. This plan recognizes the utility of these systems and terms but does not specify or apply them to streams in the NBCR planning area. In particular, the concepts of stream order and headwater streams are recognized as potentially significant to determining the feasibility of attaining certain water quality thresholds (such as indices of biotic integrity). The NBCR planning area likely includes many streams that meet one or more definitions of "headwater", specifically as headwaters of tributaries to the NBCR. The spatial position of streams, permanence of flow, and the effect of anthropogenic changes to watershed and stream hydrology will require additional scrutiny and agreement among watershed managers, policy-makers, and regulators if these types of classifications are intended to define future watershed goals.

NOTEWORTHY: STREAM CLASSIFICATION

Numerous classification systems and characterizations for streams exist and are generally based on drainage area size, stream network pattern, stream channel morphology, spatial relationship to other streams, and discharge characteristics.

Stream order is a common method used to classify streams (usually hierarchically) within a drainage network but is dependent on underlying cartography. Similarly, it is generally agreed by hydrologists, ecologists, and watershed managers that "headwater" streams are of significance, though there is not a universal definition. Fritz, Johnson, and Walters (2006) have summarized the issue of stream order and headwater characterization well:

> "Stream order is a measure of stream position within a drainage network system (Horton 1932, Strahler 1945, Shreve 1966). Headwater streams are typically considered to be first- and second-order streams (Gomi et al. 2002, Meyer and Wallace 2001), meaning streams that have no upstream tributaries (e.g., "branches") and those that have only first-order tributaries, respectively. Use of stream order to define headwater streams is problematic because stream-order designations vary depending upon the accuracy and resolution of the stream delineation (Mark 1983, Hanson 2001). Lack of agreement among maps with different mapping resolution is common when identifying headwater stream[s], determining stream order, and determining total stream [length]... The smallest headwater streams are not designated as channels on topographic maps and may be difficult to discern in aerial photographs. Thus, stream order designations based on maps are typically underestimated (Hughes and Omernik 1983), prompting some investigators to characterize such streams as zero-order streams (e.g., Brown et al. 1997). Most "blue line" designations on topographic maps are not based on field studies but are "drawn to fit a rather personalized aesthetic" of the cartographer (Leopold 1994) or drawn with standards that exclude a proportion of headwater channels (Drummond 1974)."

3.5 WATERSHED JURISDICTIONS AND DEMOGRAPHICS

3.5.1 UNITS OF GOVERNMENT

The NBCR planning area has numerous political jurisdictions, including municipal, township, and other local, state, and federal elective and agency jurisdictions. The boundaries of these jurisdictions are seldom drawn to coincide with watershed boundaries. 89.51% of the NBCR planning area is incorporated, within 26 municipalities (totaling 54,191.23 acres). The City of Lake Forest is the largest municipality by area with 8,242.78 acres, or about 13.62% watershed coverage. 10.49% of the NBCR planning area is unincorporated, made up of 10 townships (totaling 6,348.77 acres). Libertyville Township contains the largest unincorporated township area with 2,396.18 acres, or about 3.96% watershed coverage. Municipalities and townships in the NBCR planning area are shown in Figure 3-11 and Table 3-7**.** Drainage district boundaries reflect more of a watershed perspective. The four drainage districts within the watershed planning area have the authority (within their respective easements) and responsibility to perform stream maintenance for different sections of the stream. Other parties with jurisdiction in the NBCR planning area include Great Lakes Naval Training Center, Park Districts, County Forest Preserve Districts, U.S. Congressional Districts and State Senatorial and Representative Districts.

Table 3-7: Municipalities and Townships

MUNICIPALITIES		
NAME	ACRES	% OF WATERSHED
Bannockburn	1,319.25	2.18%
Deerfield	3,550.29	5.86%
Evanston	80.98	0.13%
Glencoe	1,215.69	2.01%
Glenview	7,502.53	12.39%
Golf	291.60	0.48%
Green Oaks	1,830.45	3.02%
Gurnee	74.08	0.12%
Highland Park	5,394.74	8.91%
Highwood	165.42	0.27%
Kenilworth	1.10	0.00%
Lake Bluff	978.41	1.62%
Lake Forest	8,242.78	13.62%
Lincolnshire	797.16	1.32%
Mettawa	707.85	1.17%
Morton Grove	2,006.05	3.31%
Niles	89.97	0.15%
North Chicago	2,129.61	3.52%
Northbrook	7,332.70	12.11%
Northfield	2,063.78	3.41%
Park City	495.54	0.82%
Riverwoods	974.45	1.61%
Skokie	865.22	1.43%
Waukegan	2,443.56	4.04%
Wilmette	2,038.08	3.37%
Winnetka	1,599.92	2.64%
TOTAL	54,191.23	89.51%

TOWNSHIPS		
NAME	UNINC. ACRES	% OF WATERSHED
Libertyville Township	2,396.18	3.96%
Maine Township	177.87	0.29%
New Trier Township	985.44	1.63%
Niles Township	252.79	0.42%
Northfield Township	1,274.88	2.11%
Shields Township	524.40	0.87%
Vernon Township	300.77	0.50%
Warren Township	13.02	0.02%
Waukegan Township	9.03	0.01%
West Deerfield Township	414.41	0.68%
TOTAL	6,348.77	10.49%

DRAINAGE DISTRICTS (DD)		
NAME	STREAM MILES	% OF TOTAL STREAM MILES
East Skokie DD	16.37	20.32%
Union One Middle Fork DD	3.10	3.85%
Union One West Fork DD	4.95	6.14%
West Skokie DD	11.9	14.77%
TOTAL	36.32	45.08%

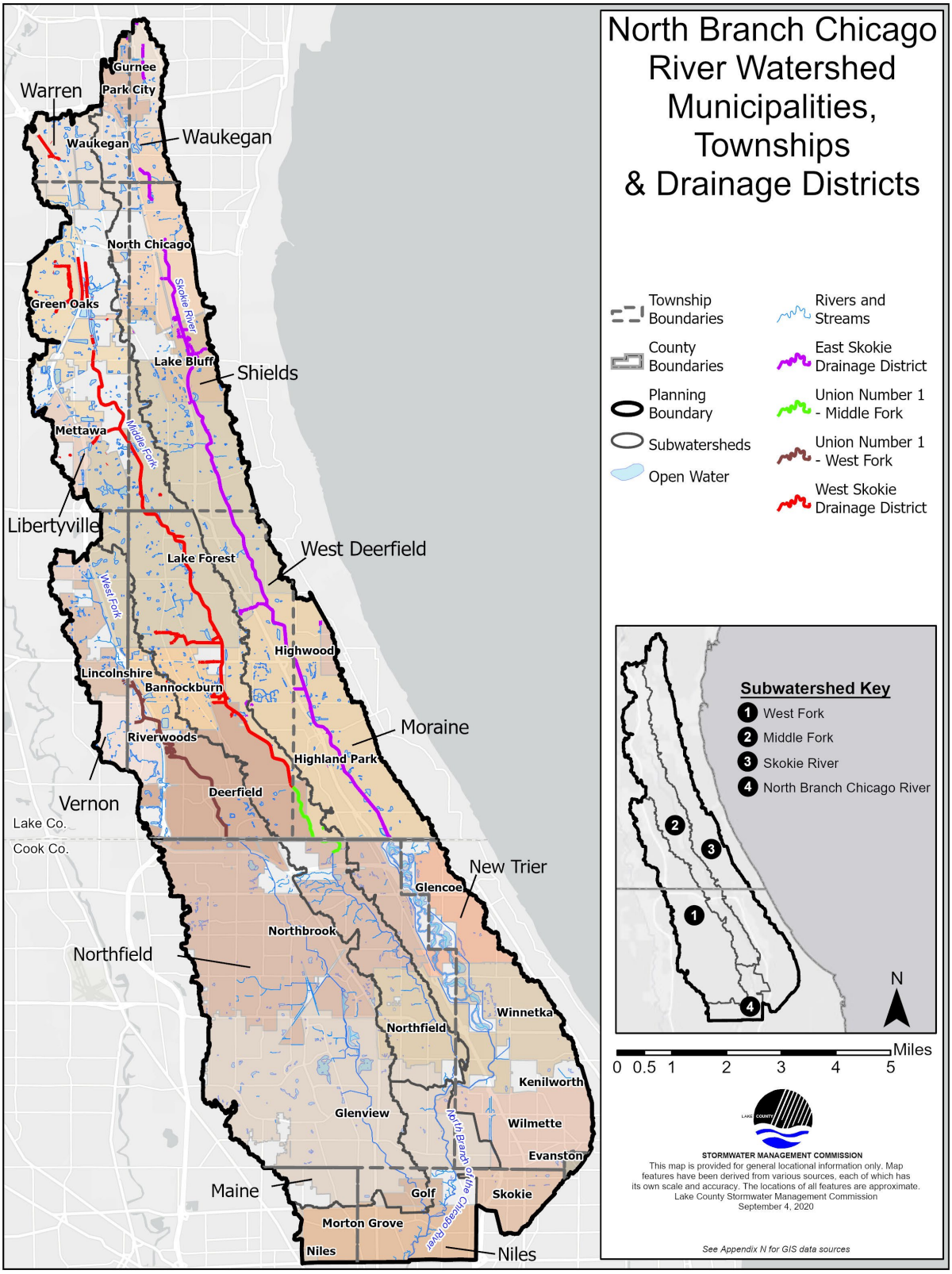


Figure 3-11: Municipalities, Townships & Drainage Districts

3.5.2 Roles and Responsibilities of Each Unit of Government

One of the challenges of creating and implementing watershed-based plans is that a watershed usually includes multiple jurisdictions that have varying interests, resources, and responsibilities. This variability can be beneficial if the jurisdictions actively work together to collaborate on policies, projects, and practices, but frequently it presents watershed coordination challenges for efficiently implementing BMP projects and for providing program, policy, and regulatory consistency. In some cases, independent actions by one community or jurisdiction can have a detrimental impact on watershed neighbors, or a good project may not be as effective as it could have been if resources had been pooled to expand the scope of the project to cover a broader area of the watershed, thereby providing economies of scale.

Watershed planning brings communities together to protect and improve the land and water resources that they share and impact. Watershed activities and projects offer many opportunities for communities and other government agencies to operate outside of their traditional "silos." When communities meet regularly as a watershed group, it provides opportunities to share information and coordinate activities. For instance, when a community or agency develops or updates a comprehensive plan, disagreement and costly competition among agencies/jurisdictions can be averted if the watershed plan and the plans of neighboring communities and sister agencies (such as parks departments or drainage districts) are considered. This level of coordination benefits the watershed. As an example, a municipality may receive a development proposal for a land parcel that the local parks department has identified as environmentally sensitive and has included in their long-term conservation plan. Although the underlying zoning for the land may allow the proposed development, both the community and the developer are likely going to face challenges from competing interests, and with land development standards so that it does not negatively impact the features that made it environmentally sensitive. Sharing information about the land during the comprehensive planning process can prevent these kinds of problems. See Table 3-8 for more jurisdiction roles and responsibilities.

Table 3-8: Jurisdiction Roles & Responsibilities

TYPE OF JURISDICTIONS	ROLES & RESPONSIBLITIES						
	LAND USE PLANNING & REGULATION	SW ORDINANCE ADMIN.	SW INFRAST. MGMT.	BMP MGMT.	NPS MGMT.	ROADWAY MGMT.	WASTEWATER TREATMENT & SANITARY SEWER MGMT.
*County	X	X	X	X	X	X	X
*Municipalities	X	X	X	X	X	X	X
*State	X	X	X	X	X	X	
*Townships			X	X	X	X	
Drainage Districts			X	X	X		
Forest Preserve District			X	X	X		
Park Districts			X	X	X		
Water Reclamation & Sanitary Districts		X	X	X			X

**Street, Highway and Transportation Departments are included in these jurisdiction categories*

3.5.3 POPULATION

Based on the 2015 decennial census, the total population within the NBCR planning area is approximately 204,279 as shown in Figure 3-12.

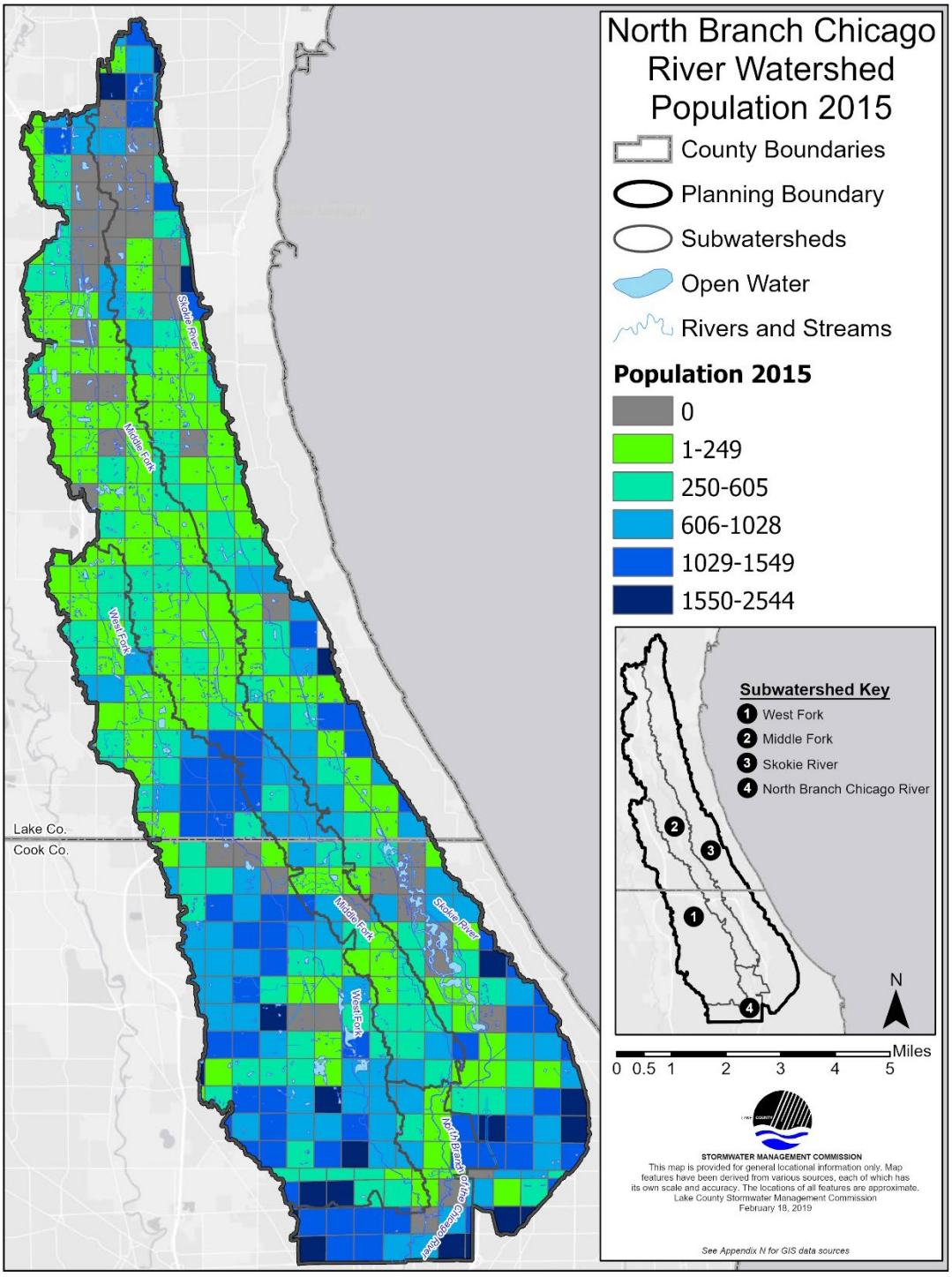


Figure 3-12: Population

Note: Each "square" on the map represents a quarter section of the Public Land Survey System. CMAP (data source) represents this data in quarter sections.

3.5.4 Population Change

Population is forecasted to increase from 204,279 to 252,043 (23%) by 2050 (Figure 3-13).

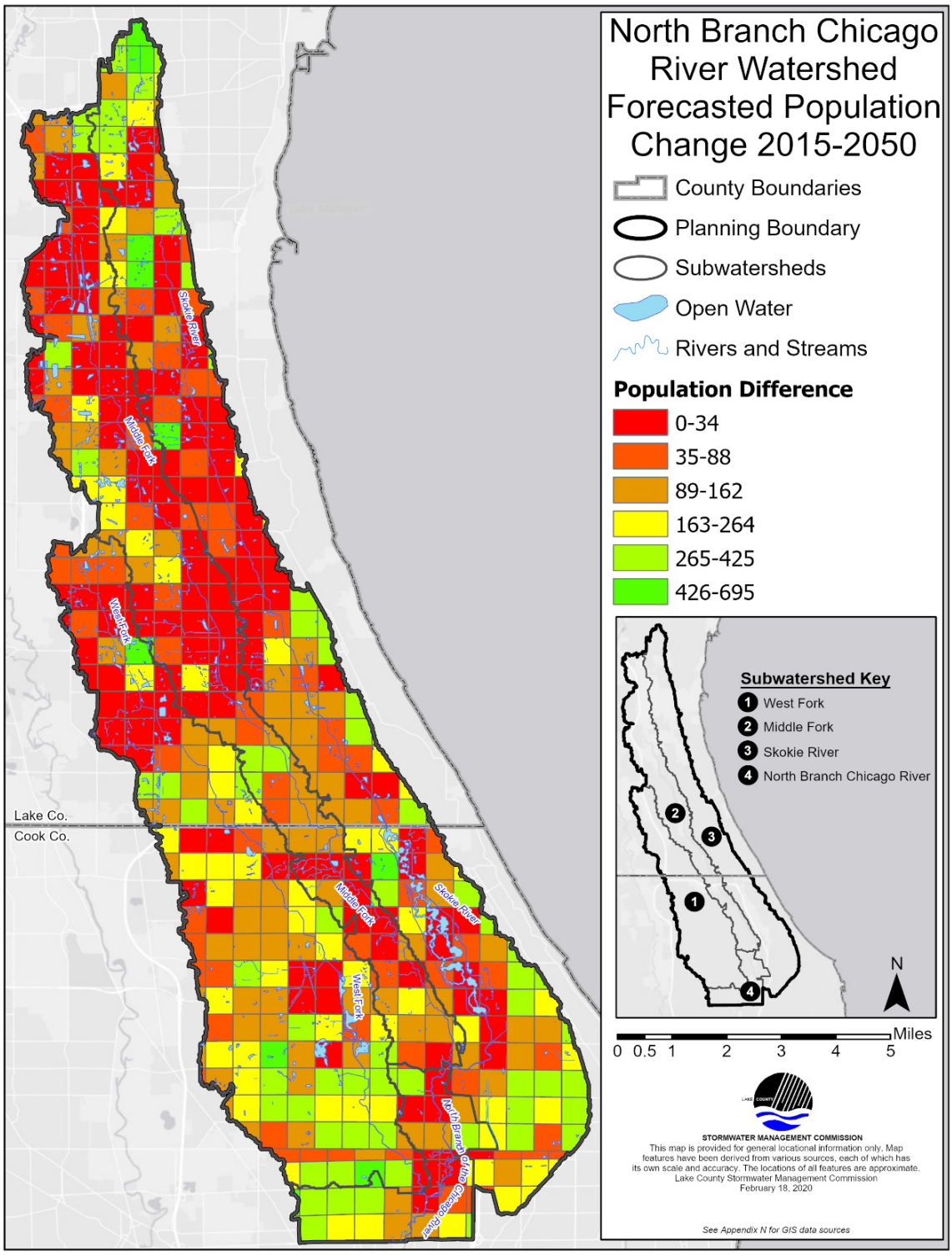


Figure 3-13: Population Change

Note: Each "square" on the map represents a quarter section of the Public Land Survey System. The data sources of CMAP represent this data in quarter sections.

3.5.5 GROWTH FORECASTS

The population change that is described in Section 3.5.4 is expected to increase the number of homes in the watershed, especially in those areas where population growth is expected to increase the most (Figure 3-15). There is a 27,700 (36%) increase in the number of households predicted within the NBCR planning area. As of 2010, there were approximately 162,504 jobs in the NBCR planning area, but Chicago Metropolitan Agency for Planning (CMAP) forecasts employment to increase by 16% by the year 2050 (Figure 3-14) (CMAP, 2018). The CMAP population and employment forecast is based on a model that accounts for local future development and land use plans, as well as other land use, demographic, and economic variables and trends. Due to the NBCR planning area incorporating only a small portion of the entire CMAP population forecast area, the results should be considered as an example or indicator of how the NBCR planning area could develop over the next few decades. This plan does not draw conclusions or recommendations from any single evaluation unit (square) in the forecast map.

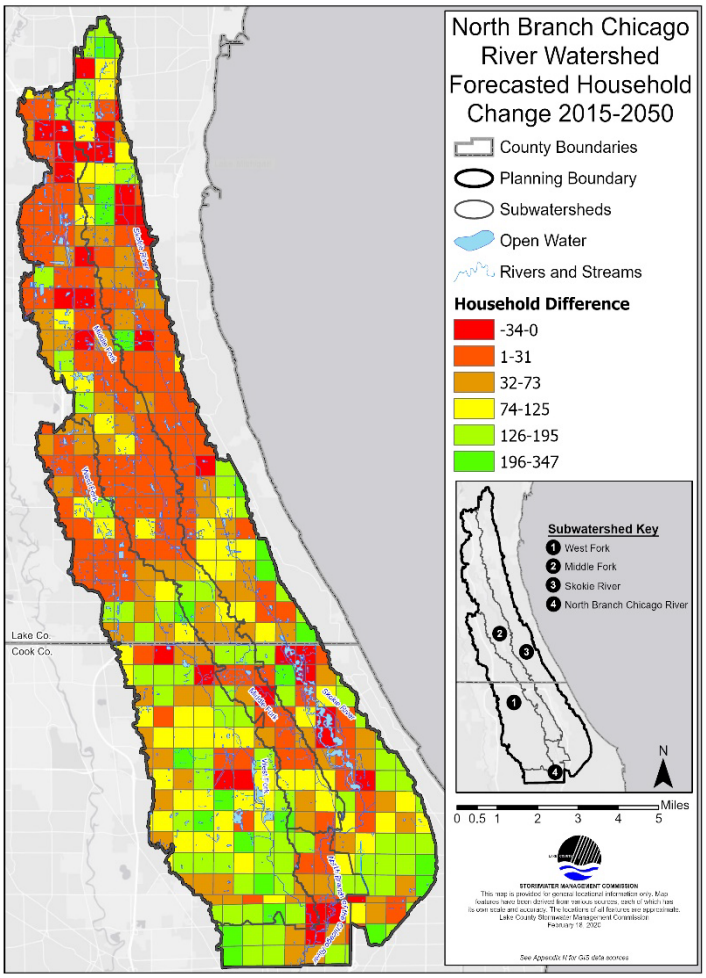


Figure 3-15: Forecasted Household Change

Note: Each "square" on the map represents a quarter section of the Public Land Survey System. The data sources of CMAP represent this data in quarter sections.

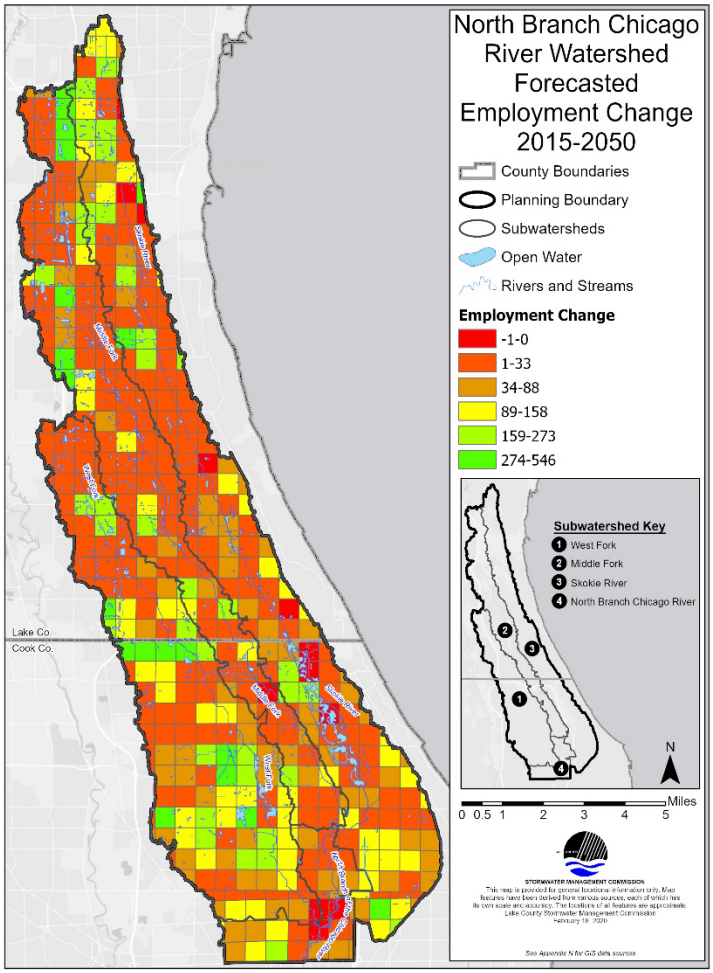


Figure 3-14: Forecasted Employment Change

Note: Each "square" on the map represents a quarter section of the NBCR planning area. The data sources of CMAP represent this data in quarter sections.

3.5.6 MEDIAN AGE

Median age is a statistic that provides information on the age distribution of a population. When considered with other factors this information can inform estimates of future consumption, mobility, and development patterns, which impact water resources. The median age in the NBCR planning area in 2010 was 39.3, compared to the median age of 37.7 from the 2017 census data for the State of Illinois (2013-2017 American Community Survey 5-year estimates). Median census block age ranged from 1 to 97.5 in the NBCR planning area. The 2010 median age by census block is displayed in Figure 3-16.

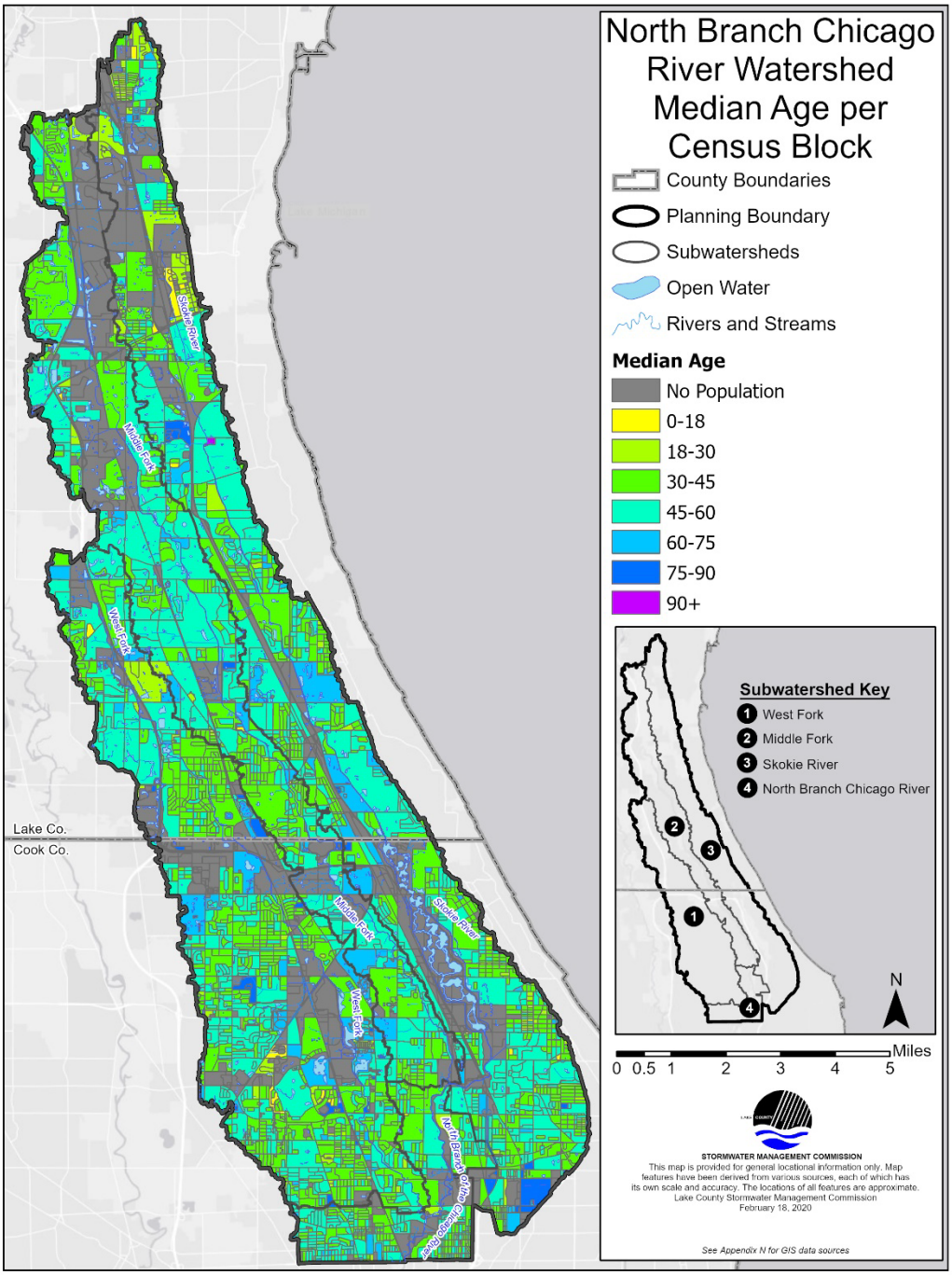


Figure 3-16: Median Age

3.5.7 MEDIAN INCOME

The median household income for the NBCR planning area is $118,134 (Figure 3-17) compared to $61,229 which was the median household income for the State of Illinois in 2017 (U.S. Census Bureau, 2017). The U.S. Census Bureau includes incomes of people 15 or older in income calulations. Median incomes are used as measures because the values are less skewed by extremely high or low outliers.

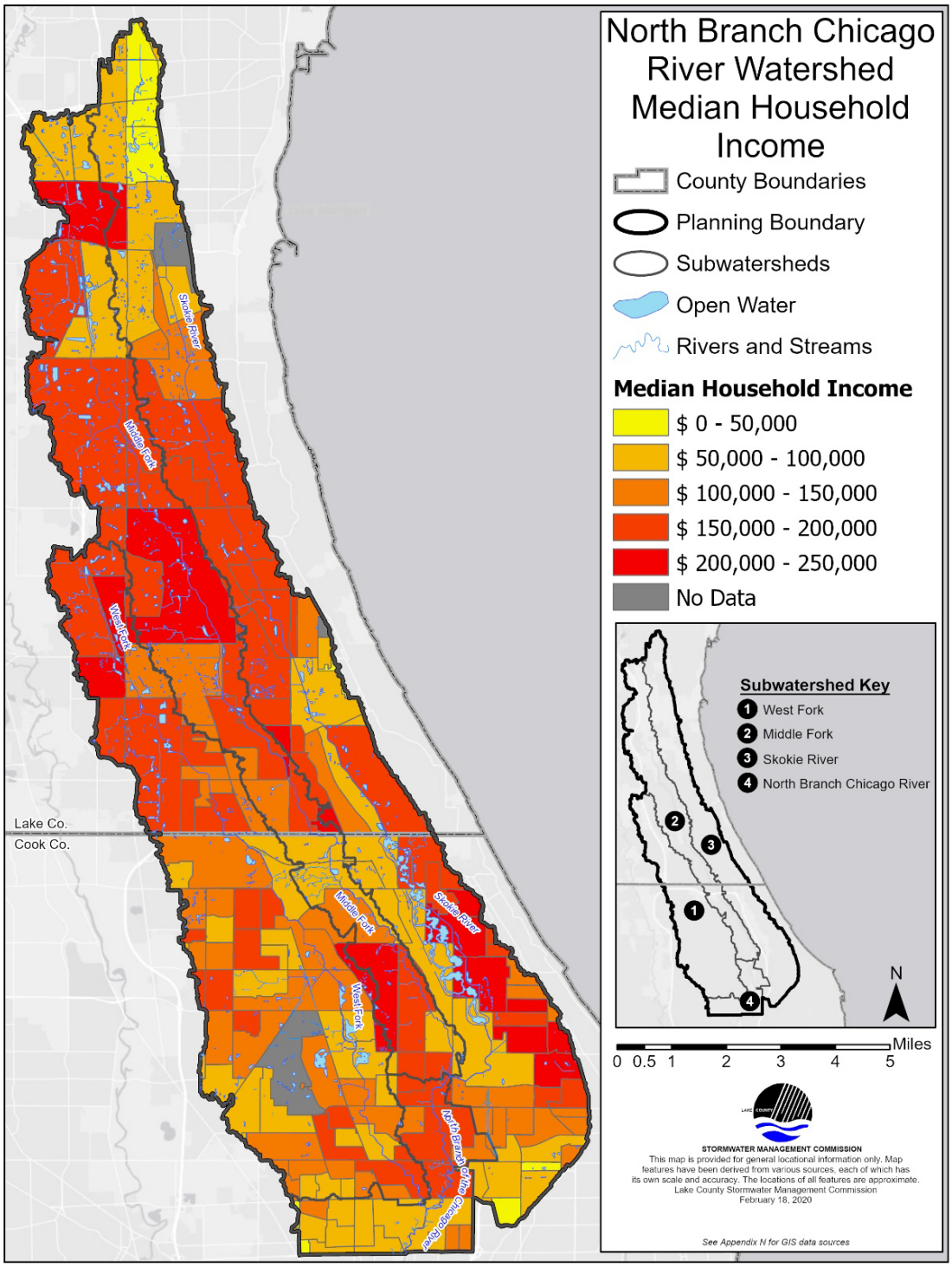


Figure 3-17: Median Income from 2013-2017

3.5.8 EMPLOYMENT

The number of employed people per census block is closely related to the population. The number of employed people per block in the NBCR planning area ranges from 0 to 5,232 with an average of 425. The distribution of employed people in the NBCR planning area is shown in Figure 3-18.

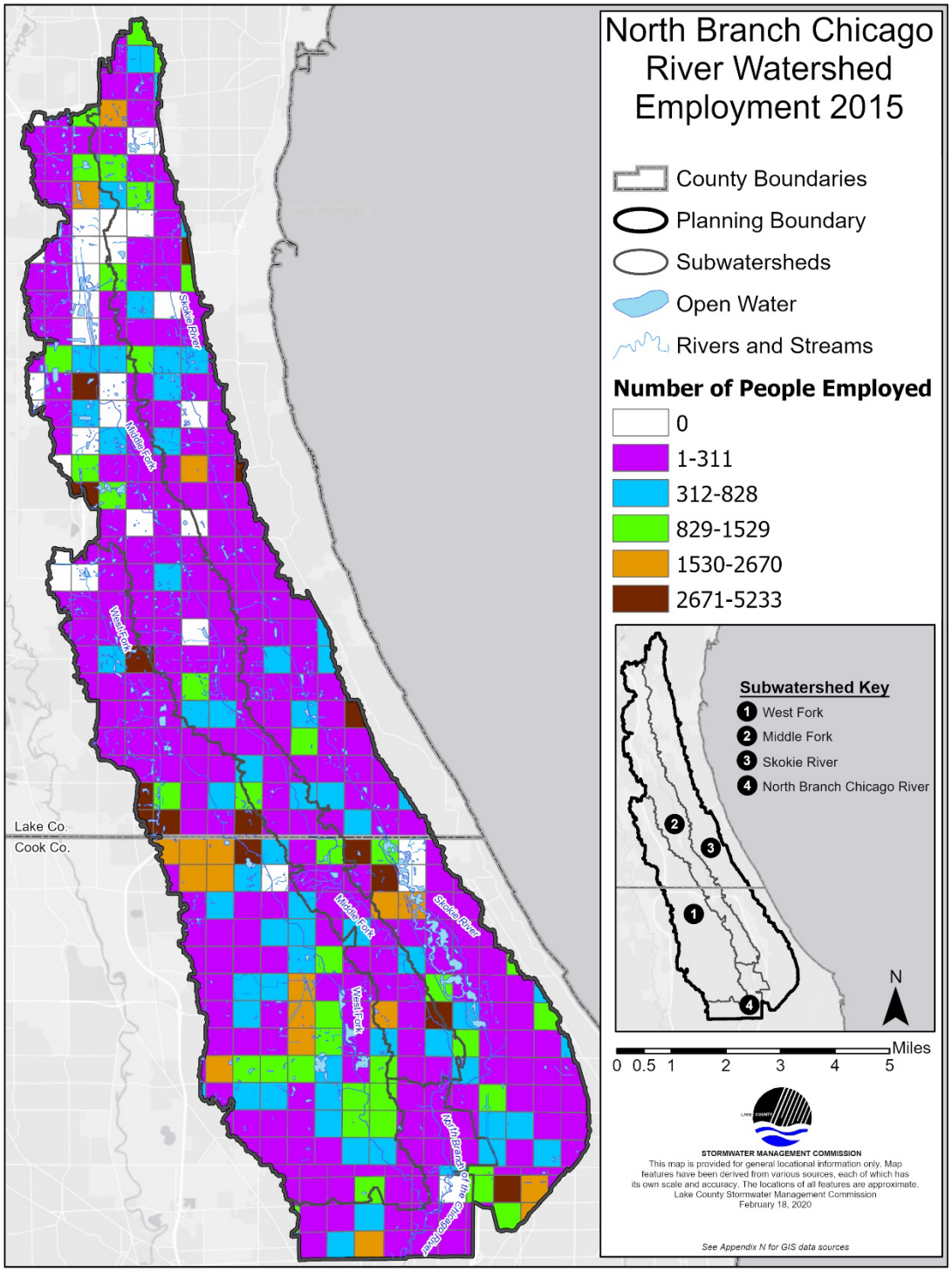


Figure 3-18: Employment in 2015

3.6 LAND USE AND LAND COVER

3.6.1 HISTORIC LAND COVER

Pre-settlement vegetation within the NBCR planning area was evaluated in the using CMAP's Green Infrastructure Vision (GIV) dataset and the INHS's Historic Vegetation database.

Prior to European settlement, the **land cover** was predominately savanna and prairie in the NBCR planning area. Based on this analysis, pre-European settlement land cover included approximately 7,042 acres of wetland (indicated below as marsh, wet meadow/prairie and wetland) within the NBCR planning area. The pre-European settlement land cover is listed on Table 3-9 and shown in Figure 3-19. The abrupt difference between Lake and Cook County in Figure 3-19 is due to different data sources; Lake County used internal data and the Cook County portion utilized CMAP data. Following European settlement, most of this land was converted to agricultural uses, followed by residential and commercial land uses.

Table 3-9: Historical Land Cover

VEGETATION TYPE	ACRES	% OF WATERSHED
Savanna	19,559.01	32.31%
Prairie	16,141.60	26.66%
Upland Forest	12,324.43	20.36%
Wetland/Marsh	5,781.38	9.55%
Oak Woodland/Savanna	5,264.87	8.70%
Wet Meadow/Prairie	1,023.83	1.69%
Floodplain Forest	236.73	0.39%
Water	138.36	0.23%
Slough	70.09	0.12%
	60,540	**100**

SLOUGH: A swamp or shallow lake system, usually a backwater to a larger body of water.

LAND USE: The type of human activity that takes place on a particular area of land.

LAND COVER: The physical material that covers the surface of the Earth. Such categories include forest, urban, water, prairie, etc.

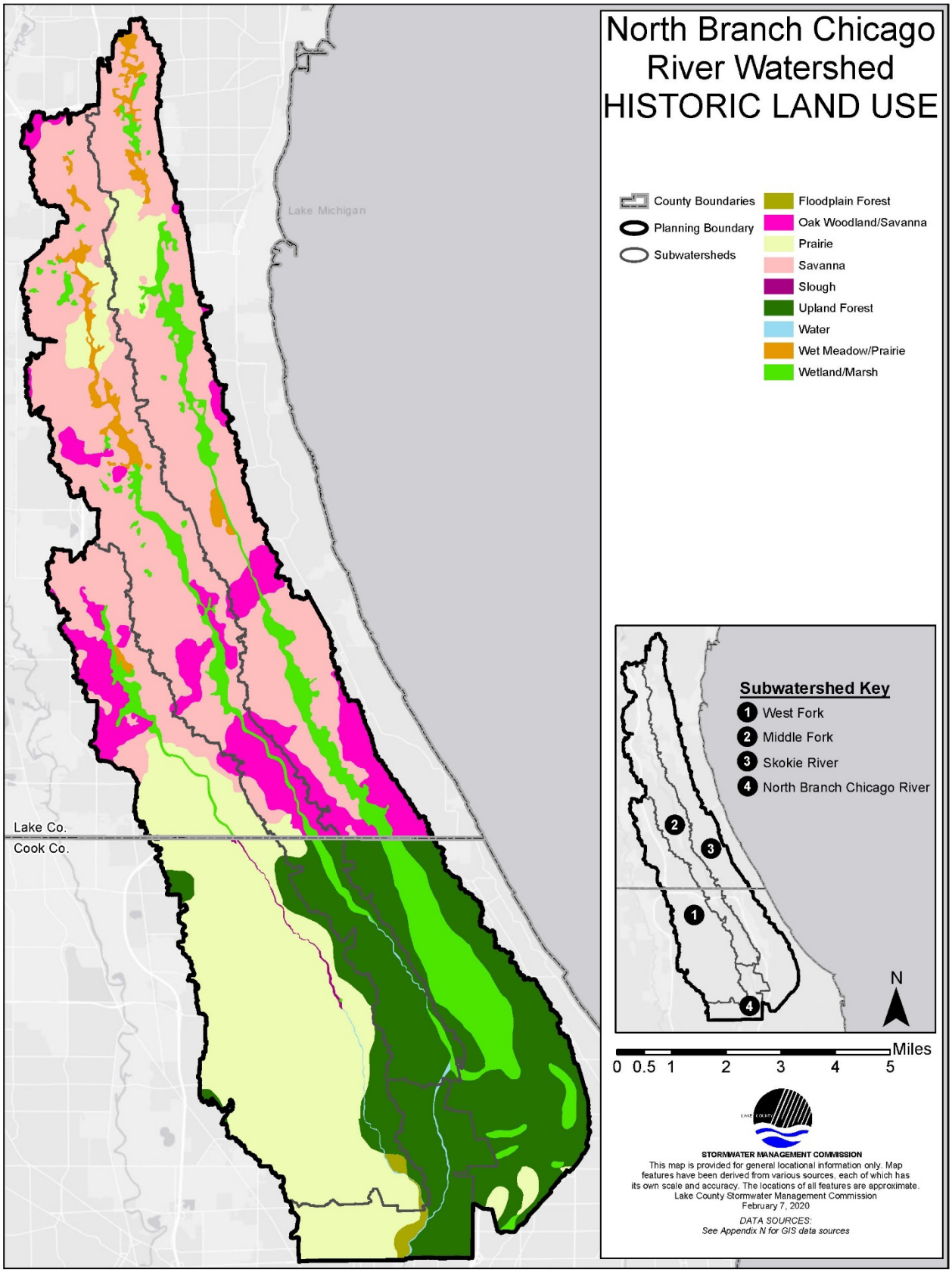


Figure 3-19: Historic Land Use

3.6.2 EXISTING LAND USE IN THE NBCR PLANNING AREA

Existing land use of the NBCR planning area was determined using land use data from CMAP (Cook County) and Lake County GIS (Lake County). To ensure land use and land cover represented the most recent watershed conditions, this layer was updated by interpreting aerial imagery. Any observed discrepancies between the imagery and the land use/cover data, such as where development has recently occurred, were noted and corrected. Additionally, land use categories were simplified by grouping and re-naming similar land use codes and by extracting land cover designations from land use (e.g., cropland in a forest preserve was separated into row crops and open space conservation). Table 3-10 includes land use/cover categories, including acreage and overall percentage, and Figure 3-20 illustrates land use in map format.

The residential (single-family and multi-family) land use class accounts for the greatest area of the NBCR planning area with 21,996 acres (36.33%). Total open space, including all open land (agricultural, private/public open space, forest/grassland/beach) comprises 18,104 acres or 29.90% of the NBCR planning area. Total developed land, including residential, commercial/retail/mixed use, government/institutional, industrial, office and research parks, transportation, and utilities accounts for 40,761 acres or 67.33% of the NBCR planning area. The developed land uses in the NBCR planning area contain varying degrees of impervious cover.

Table 3-10: Land Use Type

LAND USE TYPE	TOTAL AREA (ACRES)	PERCENT OF WATERSHED
Agriculture	475.52	0.79%
Government/Institutional	2,710.85	4.48%
Industrial	2,318.22	3.83%
Office and Research Parks	658.71	1.09%
Public/Private Open Space	17,628.59	29.12%
Residential	21,996.39	36.33%
Retail/Commercial/Mixed Use	3,215.27	5.31%
Transportation/Utility/Waste Facility	9,861.68	16.29%
Water	1,674.86	2.77%
Total:	**60,540**	**100.0%**

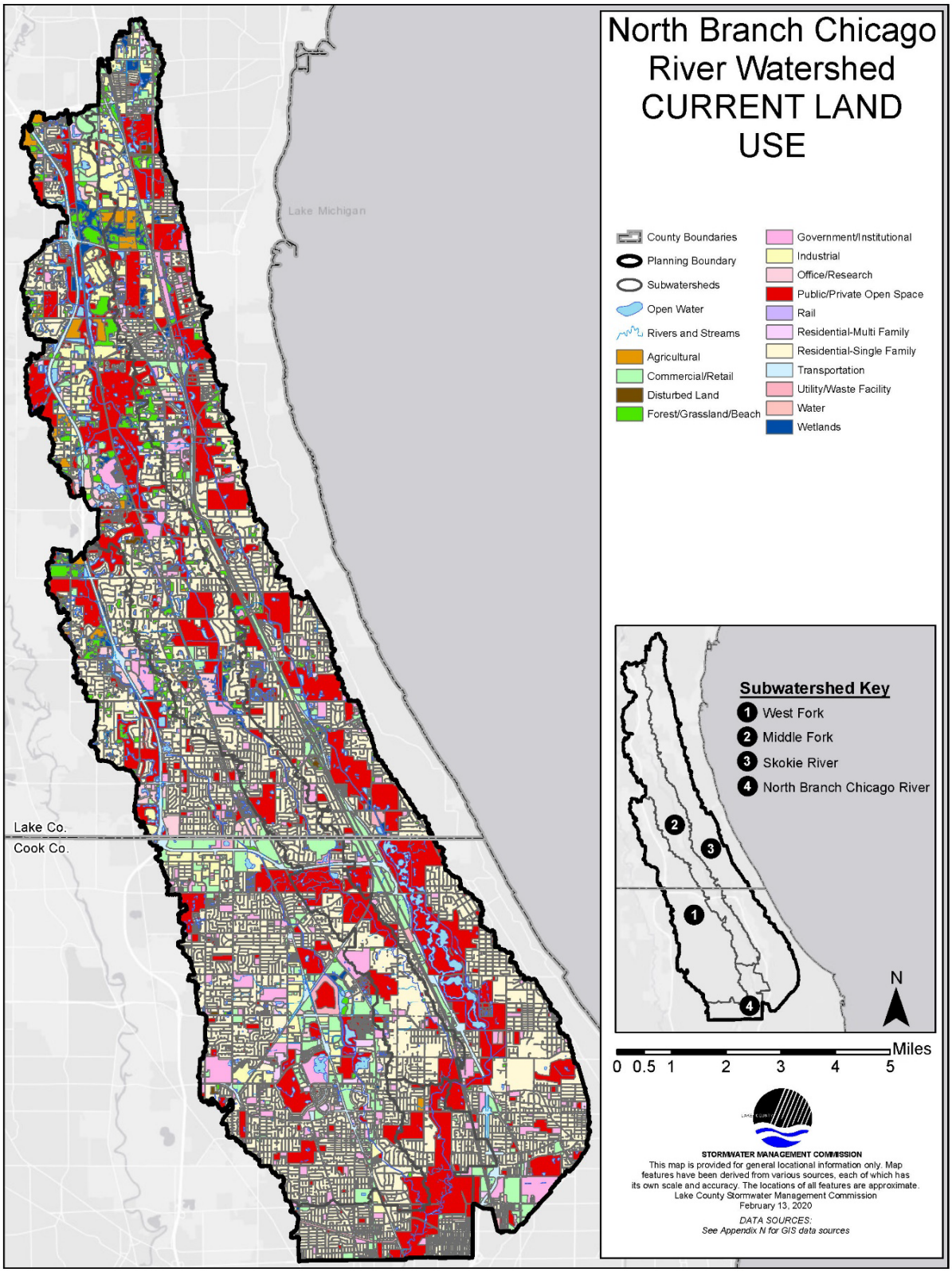


Figure 3-20: Current Land Use

3.6.3 Existing and Projected Future Percent Imperviousness

3.6.3.1 Existing Imperviousness

Impervious cover is the direct result of altering a native soil's permeability by replacing natural surfaces with impermeable/impervious surfaces. Impervious surfaces such as buildings, roads, parking lots, sidewalks, and compacted open space, which are common in urban areas, prevent precipitation from infiltrating into the ground. This increases direct stormwater runoff and **nonpoint source pollution (NPS)** stressors into wetlands, ponds, streams, and rivers, thereby impacting local water quality (USEPA Impervious Surface Growth Model, 2017).

Nonpoint Source Pollution (NPS): The cumulative effect of rainfall runoff that flows over or through the land and collects pollutants and nutrients prior to entering waterways. The cumulative effect of this pollution throughout the watershed represents the contribution of nonpoint source pollution.

Analysis of impervious surface impacts in the NBCR planning area was conducted using planimetric GIS datasets that were derived and interpreted from LiDAR acquired data. These datasets delineated the measured area or constructed footprint of major contributors to impervious surfaces including buildings, roads, and parking lots. Roads and parking lots are included in the edge of pavement footprints. Impacts of construction and development that were not included in the planimetric datasets include driveways, private roads, sidewalks, gravel surfaces (trails, parking lots, road shoulders), railroad right of ways and embankments, select built structures, and compaction of soils. Planimetric data used in this analysis was developed by Lake County GIS, Cook County GIS and SMC. The results of the planimetric impervious cover analysis are summarized in Table 3-11 and Table 3-12 and displayed in Figure 3-21.

Table 3-11: Building footprints by subwatershed

SUBWATERSHED	ACRES	% of SUBWATERSHED
Middle Fork	1,129.96	7.03%
North Branch Chicago River	479.43	12.81%
Skokie River	2,125.62	9.47%
West Fork	2,268.28	12.41%
TOTAL:	**6,003**	**9.92% of Planning Area**

Table 3-12: Edge of pavement footprints by subwatershed

SUBWATERSHED	ACRES	% of SUBWATERSHED
Middle Fork	1,416.09	8.81%
North Branch Chicago River	373.41	9.98%
Skokie River	2,524.54	11.25%
West Fork	1,945.28	10.64%
TOTAL:	**6,259**	**10.34% of Planning Area**

Impervious surface coverage was also determined from the 2016 National Land Cover Database (NLCD) impervious cover model (MRLC, 2016). The data used to develop the NLCD impervious cover model was derived from Landsat Enhanced Thematic Mapper+ and classified land use data. The percentage of impervious cover was calculated in 30 meter 2-pixel units of geography. This is measured by multiplying the watershed area classified as: urban (e.g., low, medium, and high density residential; commercial; industrial; etc.) by the appropriate impervious surface coefficient for each land use type, then averaging the value of imperviousness within a 30 meter 2-pixel unit of geography, ranging from 0-100% impervious cover. The NLCD impervious

surface data set is an aggregated total impervious area value for each pixel rather than individual impervious features. Results of the NCLD impervious cover model in the NBCR planning area are shown in Figure 3-22.

Research conducted in many geographic areas, concentrating on many different variables, and employing widely different methods, has yielded a similar conclusion - stream degradation occurs at relatively low levels of imperviousness, with 10% imperviousness impacting water quality and greater than 30% imperviousness severely degrading water quality (Schueler, 1994). The impervious cover data is presented as a percentage of impervious surfaces within the NBCR planning area in three categories (Table 3-13):

- 0.0 - 9% (open space with little to no development)
- 10 - 29% (residential and small-scale development) and
- 30 - 100% (medium to large scale development).

Table 3-13: Breakdown of NLCD Percent Impervious Cover within each Subwatershed

SUBWATERSHED	NLCD PERCENTAGE (0-9%)		NLCD PERCENTAGE (10-29%)		NLCD PERCENTAGE (30-100%)	
	ACRES	% of Subwatershed	ACRES	% of Subwatershed	ACRES	% of Subwatershed
Middle Fork	5,444.98	33.88%	5,913.41	36.79%	4,690.38	29.18%
North Branch Chicago River	806.74	21.56%	862.06	23.03%	2,070.17	55.31%
Skokie River	4,992.11	22.24%	8,124.08	36.19%	9,278.03	41.33%
West Fork	2,245.74	12.29%	5,573.69	30.50%	10,422.22	57.03%
Total	**13,490**	**22.28 % of NBCR Planning Area**	**20,473**	**33.82 % of NBCR Planning Area**	**26,461**	**43.71% of NBCR Planning Area**

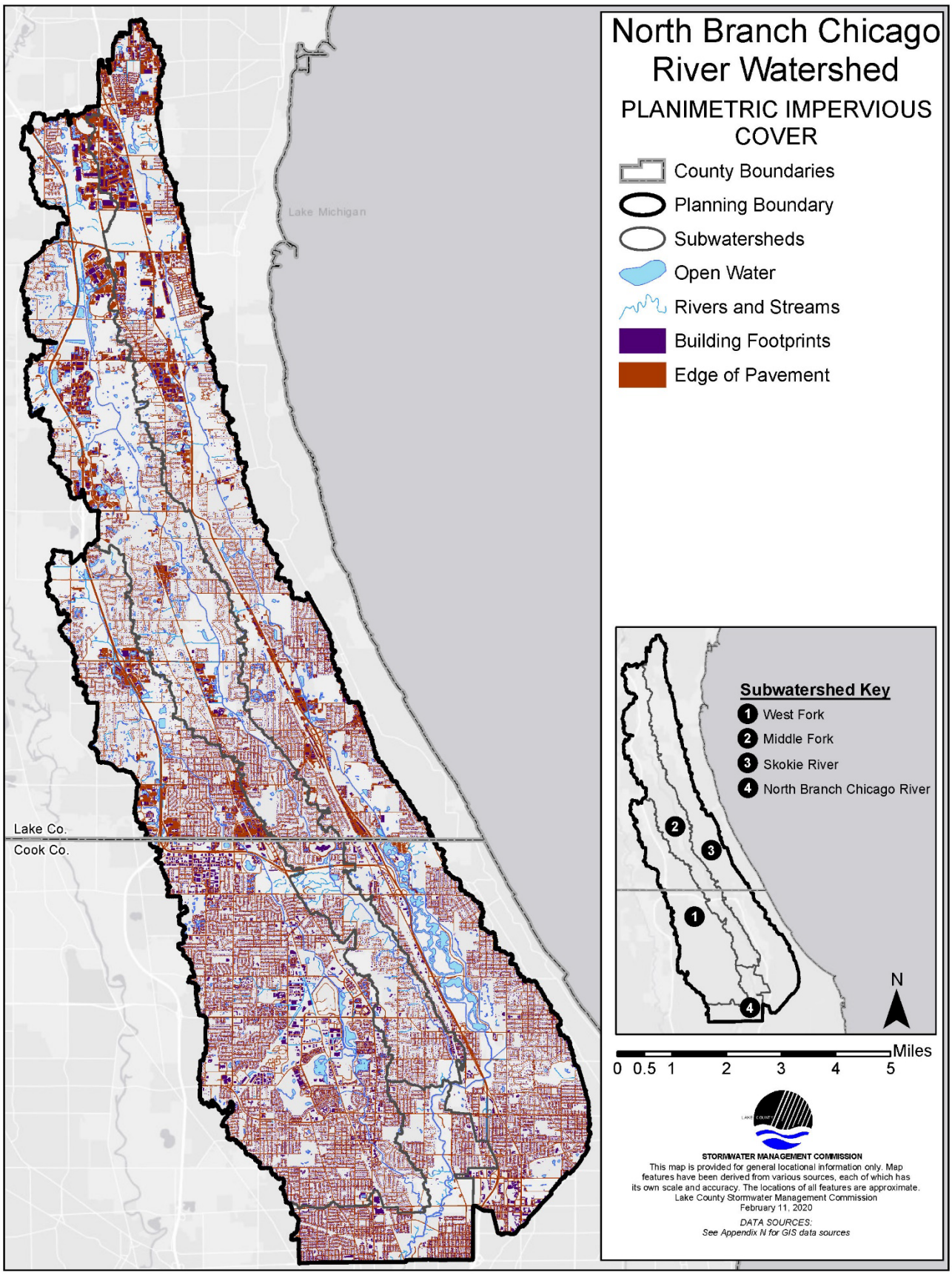


Figure 3-21: Planimetric Imperviousness of Table 3-11 and Table 3-12

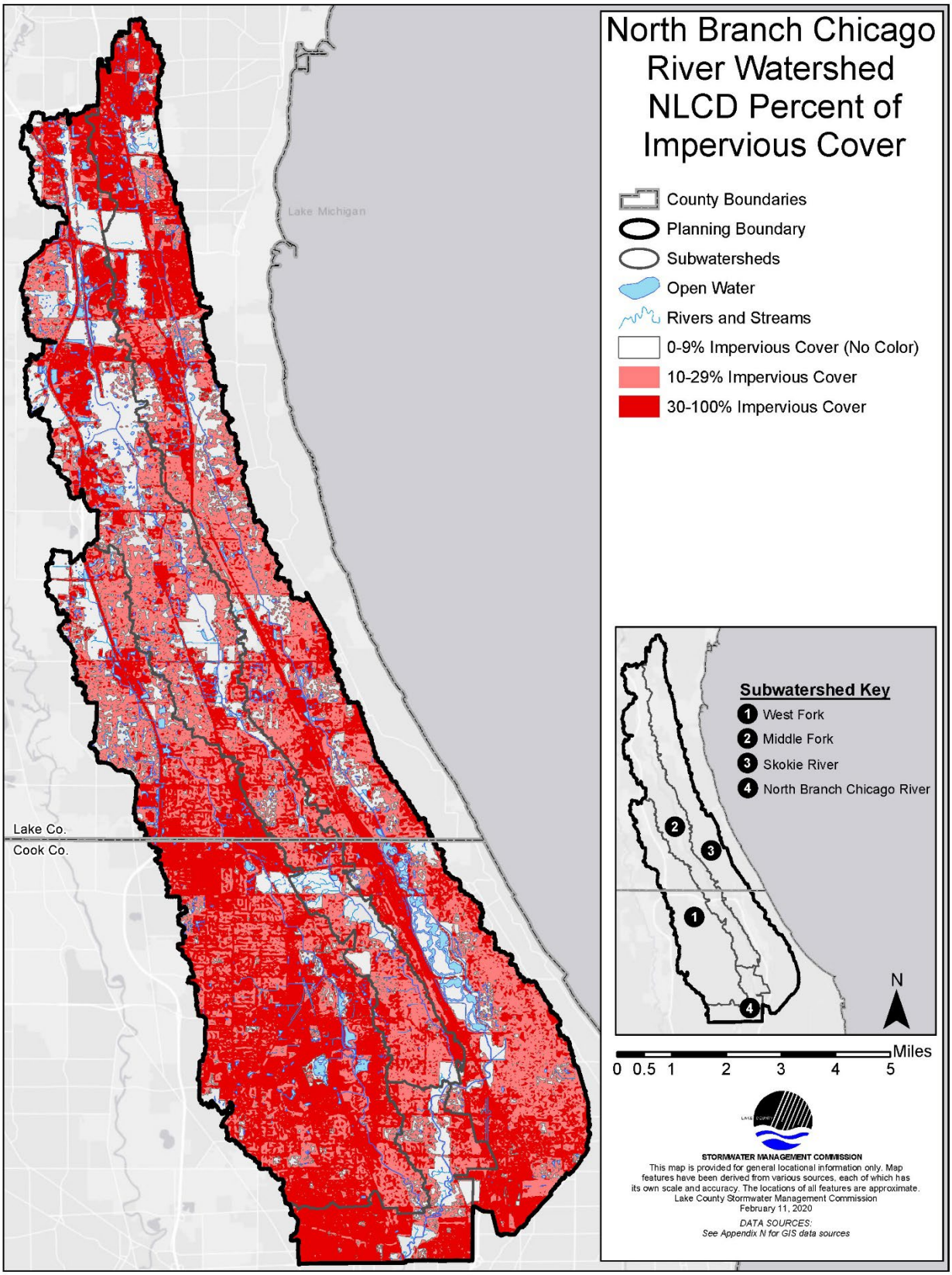


Figure 3-22: NLCD 2011 Imperviousness of Table 3-13 Data

3.6.4 FUTURE LAND USE PROJECTIONS

Future land use (FLU) projections were based on a review of municipal and county FLU maps. FLU is of interest in watershed planning because changes in land use may result in additional impervious acres or may otherwise affect water resources. The FLU datasets consulted in this plan do not necessarily have a "date", i.e., there may not be an estimated year at which the planned use will be present. Land use plans from which the data are gleaned, however, may have dates or planning "windows" sometime into the future (typically around 20 years from the time of publication/adoption). FLU data from Lake County is compiled by the Lake County Department of Planning, Building and Development from municipal and County comprehensive land use plans and is not assigned a projected date. A comparable countywide FLU dataset has not been compiled for Cook County, so the project team consulted available comprehensive land use plans for municipalities and unincorporated Cook County areas within the NBCR planning area. Because of this difference in the nature of available data, further discussion of FLU in this section is divided by county.

3.6.4.1 LAKE COUNTY

The Lake County portion of the NBCR planning area (32,428 acres) is largely built-out, however several large developable tracts of Agricultural and Private Open Space lands remain in the northern ends of the Skokie River and Middle Fork subwatersheds (north of Illinois Route 176). Table 3-14 shows projected changes in land use by land use type and Figure 3-23 maps FLU predicted for build-out conditions in the Lake County portion of the NBCR planning area. Data indicates decreases in the area of Agriculture and Public/Private Open Space while Residential, Industrial, and Office and Research Parks are expected to increase in area. Agriculture within the Lake County portion of the NBCR planning area is largely located north of Illinois Route 176 and west of U.S. Highway 41, with much of it located in the headwaters of the Middle Fork subwatershed. This land is privately owned and forecast to be converted to Industrial and Residential use at some point in the future. Changes from Public/Private Open Space to Residential and Industrial are also forecast to occur in these same general areas.

The decrease in future Public/Private Open Space acreage can likely also be attributed to artifacts of the manner in which current and future land use are mapped. Current land use is mapped at the parcel and in some cases, sub-parcel scale, while future land use is often mapped at a coarser scale. Because the current land use is more granular, areas identified as Public/Private Open Space may be combined with other land uses in maps of future land use. Commonly, Residential and Office and Research Parks have large areas of open space (such as stormwater facilities) that are combined into the dominant land use category for simplicity. This also accounts for a portion of the increase in these categories in the future land use data. A similar explanation is probably valid for the small decrease in Transportation/Utility/Waste Facilities and the change in Water/Other land uses. The large percentage increase in Office and Research Parks, while partially explained by the inclusion of open spaces areas identified in the current land use data, is also due to an apparent change in categorization of the light industrial/office area north of Martin Luther King Drive between Illinois Route 43 and U.S. Highway 41. This area is identified as largely Industrial in current land use and is categorized as Office and Research Parks in the future land use data.

Table 3-14: Projected Land Use Change by Land Use Type in Lake County

LAND USE TYPE	CURRENT ACRES	PROJECTED FUTURE ACRES	% CHANGE FROM CURRENT TO FUTURE
Agriculture	457	64	-86%
Public/Private Open Space	11,452	7,039	-39%
Transportation/Utility/Waste Facility	4,776	4,590	-4%
Government/Institutional	1,094	1,847	+7%
Residential	10,457	13,303	+27%
Industrial	1,548	2,553	+65%
Retail/Commercial/Mixed Use	1,127	1,067	-5%
Office and Research Parks	638	1,525	+139%
Water/Other	879	440	-50%

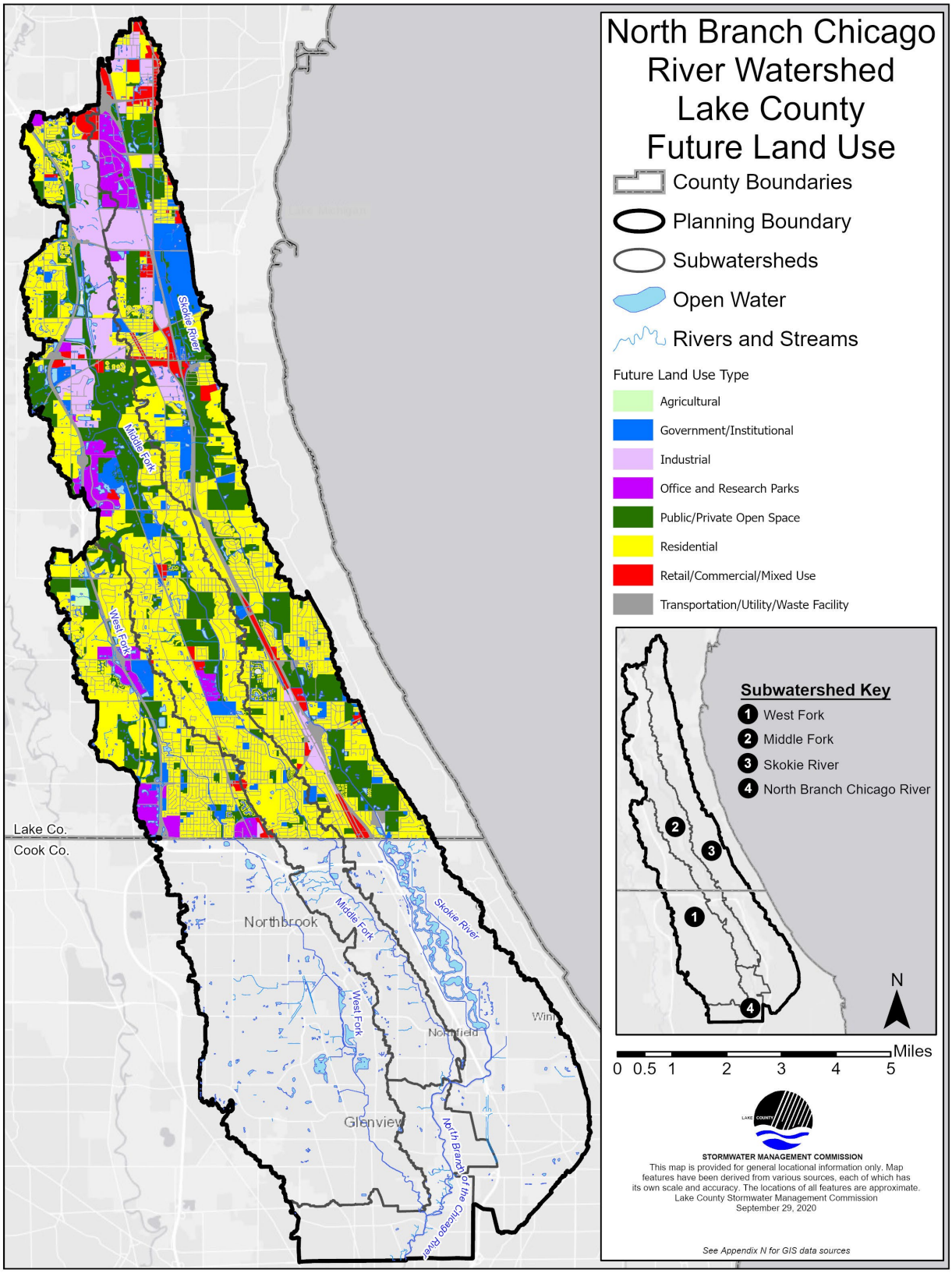


Figure 3-23: Future Land Use Projections, Lake County

3.6.4.2 COOK COUNTY

The Cook County portion of the NBCR planning area is also almost entirely built-out and has less land available for new development (compared to redevelopment) relative to the Lake County portion of the NBCR planning area. As such, potential future impacts to the watershed related to land use changes are likely to be localized or minimal in Cook County. Due to the lack of a countywide future land use dataset for Cook County, comprehensive land use plans for each municipality were consulted to determine if significant changes are envisioned in the future. For the most part, most community land use plans focus on redevelopment of existing sites or areas rather than large-scale new development. Exceptions to this are in Northbrook and Glenview, where the Techny (Northbrook) and Valley Lo (Glenview) areas may provide opportunities for future development of relatively undeveloped sites. The review of future land use changes in Cook County municipalities is summarized in Table 3-15.

Table 3-15: Future Land Use Change Summary for Cook County Municipalities in the NBCR Planning Area

Municipality	Land Use Plan Date	Summary of Anticipated Future Land Use Changes
Evanston	2000	Built-out, future changes related to redevelopment
Glencoe	1996	Built-out, future changes related to redevelopment
Glenview	2017	Mostly built-out, Valley Lo area could be developed as a planned development in future
Golf	ND	No plan available
Morton Grove	1999	Built-out, future changes related to redevelopment
Niles	2011	Built-out, future changes related to redevelopment
Northbrook	2010	Mostly built-out, Techny area has some land that may still be available for development
Northfield	1999	Built-out, future changes related to redevelopment
Skokie	2005	Built-out, future changes related to redevelopment
Wilmette	2000	Built-out, future changes related to redevelopment
Winnetka	1999	Built-out, future changes related to redevelopment

3.7 TRANSPORTATION

The NBCR planning area includes approximately 2,651 miles of roads, 190 miles of trails and 54 miles of railroads that make up the existing network of transportation corridors. Although not analyzed in detail in this section, other important components of the transportation network include the public bus transit system, parking lots, rail stations, and the public works and transportation maintenance yards that support the roads, trails and railroads in the NBCR planning area.

3.7.1 TRANSPORTATION AND NONPOINT SOURCE POLLUTION

Transportation corridors in the NBCR planning area connect residents to points within and outside of the watershed. “Car habitat”; the combined area of roads, parking lots, driveways and garages is significant in the NBCR planning area. Parking lots and roads are the largest components of car habitat and can have a significant influence on stormwater runoff and water quality.

Studies have shown that streets are a major source of NPS pollution in urban settings. Several factors contribute to high pollutant loading from streets. Streets are most often connected to the drainage system and tend to be the collector of stormwater runoff and pollution from sidewalks, driveways, lawns and rooftops as well as from emissions and leaks from vehicles, atmospheric deposition and winter road maintenance practices. The design, construction, and maintenance of transportation facilities and corridors can have substantial beneficial and detrimental impacts on human and watershed health.

3.7.2 TRANSPORTATION INFRASTRUCTURE

3.7.2.1 Roads

Multiple local and state entities manage approximately 2,651 miles of roadway within the NBCR planning area, as shown in Figure 3-24. The transportation network in the NBCR planning area is composed of several main thoroughfares that are maintained by multiple agencies in two counties. The roadway network includes local roads, township roads, county roads, and state highways. U.S. Highway 41 is the main north-south highway bisecting the NBCR planning area and several major highways, such as State Highways 137, 176, 22, 68 and 58, run roughly east-west between the NBCR planning area boundaries. The largest stretches of existing major roadway in the NBCR planning area are U.S. Route 41, which is 102.6 miles long, and Interstate 94, which is 99.2 miles long. For more information on roadway classifications see Table 3-16.

Roadway Jurisdictions:

- *Lake County: roads and roadway planning are the responsibility of multiples entities including the Lake County Division of Transportation (LCDOT), Illinois Department of Transportation (IDOT), Illinois Tollway Authority (Tollway), Lake County Forest Preserve District (LCFPD) and individual townships and municipalities.*
- *Cook County: roads and roadway planning are the responsibility of multiples entities including the DOTH, IDOT, Tollway, Forest Preserve District of Cook County (FPDCC) and individual townships and municipalities.*

Table 3-16: Roadway Classifications

ROADWAY TYPES	LAKE COUNTY ROADWAY CLASSIFICATION (MILES)			COOK COUNTY ROADWAY CLASSIFICATION (MILES)			TOTAL MILES
	1-LANE OR SPECIAL SERVICE	2-LANE	4+ LANES	1-LANE	2-LANE	4+ LANES	
Interstate/Expressway	0.77	--	25.85	--	--	27.14	53.76
U.S. Highway	--	--	30.13	--	--	17.62	47.74
State Highway	--	--	33.13	0.25	0.74	98.44	132.56
County Highway	--	0.21	9.86	--	12.54	94.03	116.63
Township Road	--	13.5	0.51	--	--	--	14.01
Township/Local Road	--	--	--	10.34	380.42	1,504.80	1,895.56
Local Road	17.84	327.58	45.38	--	--	--	390.80
TOTAL MILES	**18.61**	**341.29**	**144.86**	**10.59**	**393.70**	**1,742.03**	**2,651.07**

Please note: Cook County and Lake County denote some of their roadway types differently.

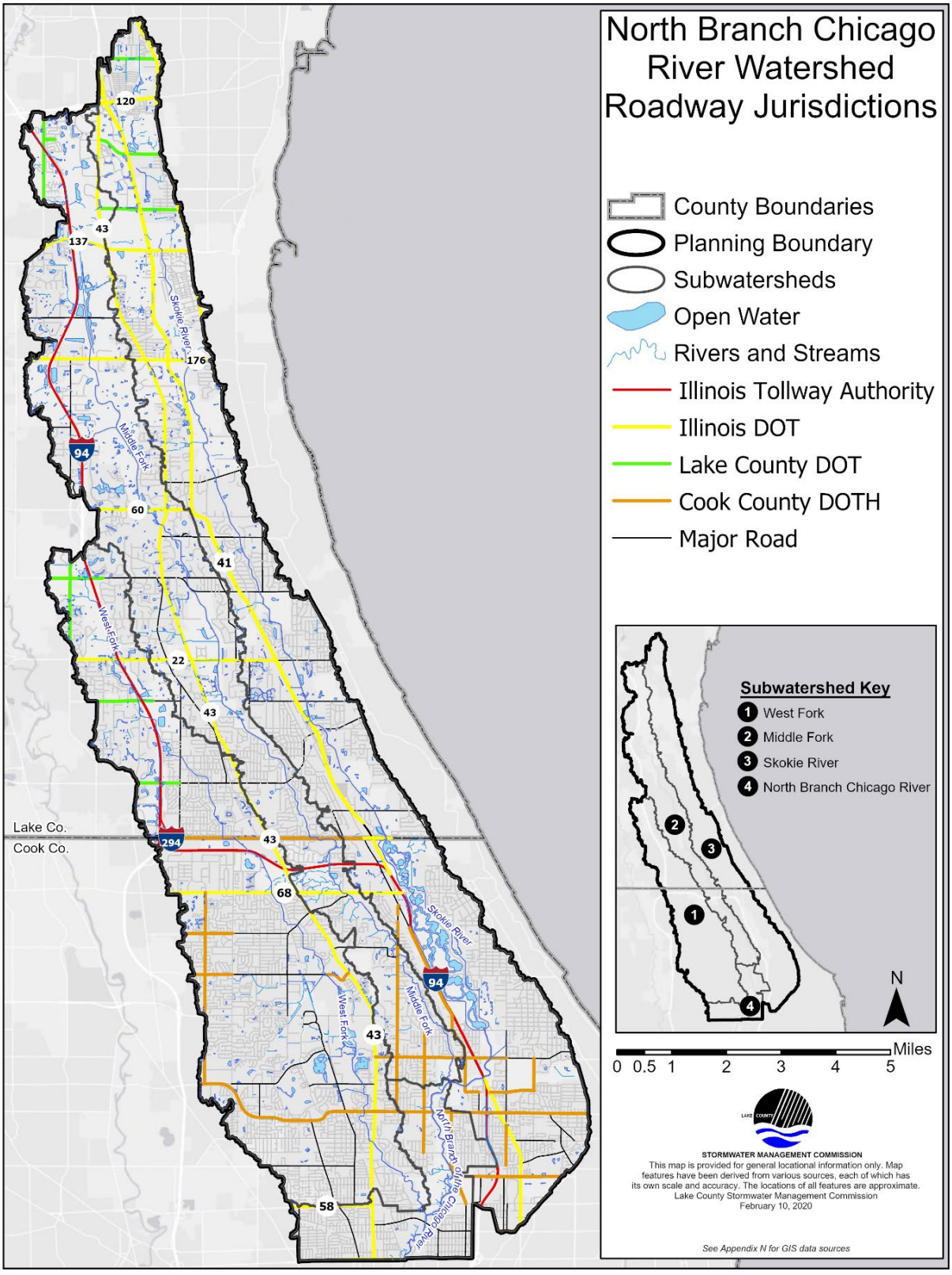


Figure 3-24: Roadway Jurisdictions

3.7.2.2 Trails

There are currently approximately 190 miles of pedestrian and bicycle trails in the NBCR planning area, including mowed footpaths, gravel, concrete, and asphalt trails. See Figure 3-25 for an example of a mowed trail (footpath). These trails are in various forms ranging from mowed footpaths to concrete or asphalt and are designed for single or multiple purpose users. The largest existing trail system in the NBCR planning area is the North Branch Trail System and the Skokie Valley Bike Path (37.9 miles).



Figure 3-25: Deerfield Park District Briarwood Park Trails

Several jurisdictions develop and manage trails in the NBCR planning area including the Forest Preserve Districts, Park Districts, Municipalities, Townships, Homeowner Associations (HOAs), DOTH and LCDOT. Several villages and townships support trail systems along and across roadways within their jurisdiction. Park Districts also provide and maintain a trail network to connect people to parks and other community centers. The Forest Preserves provide a large trail network within and connecting forest preserves. HOAs provide neighborhood trails within the subdivision which connect to community trail systems and neighborhood parks. Additionally, there are short segments of connector trails constructed and maintained by the LCDOT and townships.

3.7.2.3 Railroads

There are four major railroads that exist within the NBCR planning area boundaries. Railroads in the NBCR planning area range from commuter rail lines (transporting passengers from the suburb areas into the City of Chicago) to large freight rails transporting goods regionally and nationally. There is a total of 54 miles of railway in the NBCR planning area (Table 3-17). See Figure 3-27 for railroad locations in the NBCR planning area.

Table 3-17: Miles of Roadway in the NBCR Planning Area

RAILROAD OWNER	SUBWATERSHED MILES			
	WEST FORK	MIDDLE FORK	SKOKIE RIVER	NBCR
Canadian National Railway	0	2.4	1.6	0
Canadian Pacific Railway	0	4.2	0	0
Northeast Illinois Regional Commuter (NIRC)	10.2	11.2	0	1.2
Union Pacific Railroad	4.3	0.7	18.2	0
WATERSHED MILEAGE TOTALS	**14.5**	**18.5**	**19.8**	**1.2**

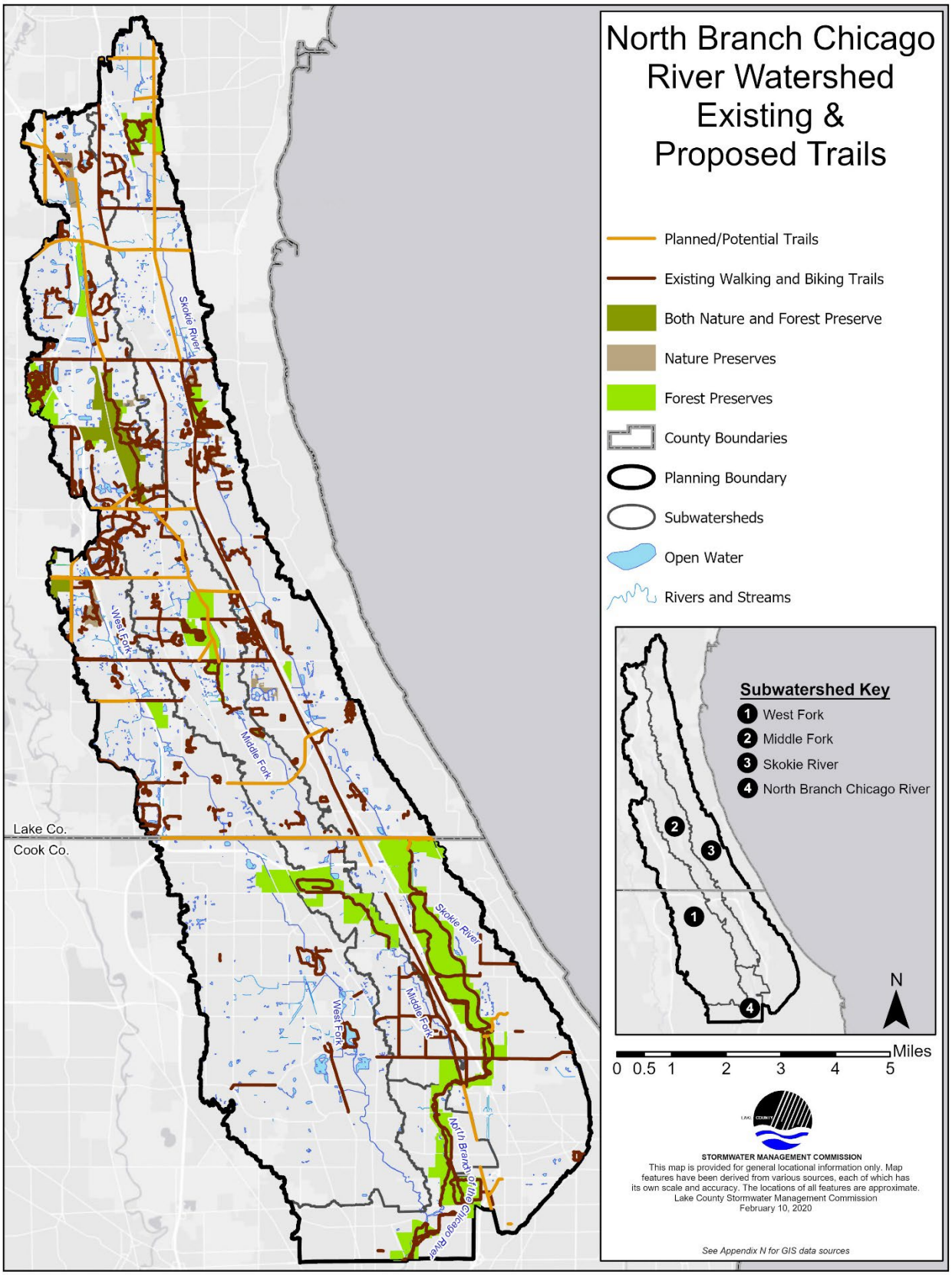


Figure 3-26: Existing and Proposed Trails

3.7.3 PLANNED TRANSPORTATION PROJECTS

> *The Transportation Goal is to "reduce congestion and improve transportation systems in Lake County". The strategic statement to meet this goal is to "promote development of State, County and municipal transportation systems that provide for efficient, flexible, and uncongested movement through an integrated network of road, rail, public transit, and non-motorized (bicycle, pedestrian) modes of travel.*
>
> *LCDOT 2040 Transportation Plan*

Information about planned roadway improvements in the NBCR planning area was gathered through local, regional, and state transportation contacts and from best available road planning reports. The compiled list of planned roadway improvements includes all major county, regional, and state planned projects; however, this is not an exhaustive list of all planned roadway projects in the NBCR planning area. There are likely additional local roadway improvement plans that were not captured in this analysis.

Planned roadway improvements that increase or impact the amount of existing impervious surfaces are shown in Figure 3-27. Roadway improvement projects are intended to benefit watershed and county residents and the local economy by providing better transportation access. The design of rights-of-way has a substantial impact on the livability of communities' health, safety and welfare of residents, and the quality of aquatic resources. Transportation agencies face several challenges in addressing the volume of runoff from roadways and the pollutants typical in roadway runoff. A transportation jurisdiction frequently has limited control of the pollutants entering its right of way (including pollutants generated from atmospheric deposition, vehicle operation, litter, organic debris, and surrounding land uses).

3.7.3.1 Roads

There are 6.95 miles of proposed roadway, which includes roadway widening, adding auxiliary lanes, interchange reconstruction and bridge replacement. As the NBCR planning area is already highly urbanized, there are not a lot of planned new impervious surfaces for roadway projects. The largest stretch of proposed major roadway in the NBCR planning area is the Willow Road corridor from I-294 to Sunset Ridge Road (approximately 4.77 miles). Traffic congestion on the highways and roads in Lake County negatively impacts the local economy and quality of life.

Road improvement and construction are vital to economic stability and growth but have the potential to negatively impact the environment. The effects of impervious surface on water quantity and quality are discussed in sections 3.4 and 3.6.3. Road construction also increases the potential for soil erosion to nearby waters if erosion control measures are not implemented before, during and after construction. Because runoff from "car habitat" may contain additional pollutants, collecting and minimizing the mobilization of this material on streets and highways is the goal of successful roadway runoff management. Common pollutants related to "car habitat" are listed in Table 3-18.

Table 3-18 : Highway Runoff Constituents and Their Primary Sources

CONSTITUENTS	PRIMARY SOURCES
Cadmium	Tire wear (filler material), insecticide application
Chromium	Metal plating, moving engine parts, brake lining wear
Copper	Metal plating, bearing and bushing wear, moving engine parts, brake lining wear, fungicides and insecticides

CONSTITUENTS	PRIMARY SOURCES
Cyanide	Anti-cake compound (ferric ferrocyanide, sodium ferrocyanide, yellow prussiate of soda) used to keep deicing salt granular
Iron	Auto body rust, steel highway structures (guard rails etc.), moving engine parts
Lead	Leaded gasoline (auto exhaust), tire wear (lead oxide filler material, lubricating oil and grease, bearing wear)
Manganese	Moving engine parts
Nickel	Diesel fuel and gasoline (exhaust), lubricating oil, metal plating, bushing wear, brake lining wear, asphalt paving
Nitrogen, Phosphorus	Atmosphere, roadside fertilizer application
Particulates	Pavement wear, vehicles, atmosphere, maintenance
Polychlorinated biphenyl (PCB)	Spraying of highway rights-of-way, background atmospheric deposition, PCB catalyst in synthetic tires
Petroleum	Spills, leaks or blow-by motor lubricants, antifreeze and hydraulic fluids, asphalt surface leachate
Sodium, Calcium, Chloride	Deicing salts
Sulphate	Roadway beds, fuel, deicing salts
Zinc	Tire wear (filler material), motor oil (stabilizing additive), grease

Source: US DOT, FHWA, Report No. FHWA/RD-84/057-060, June 1987; USEPA 1993.

3.7.3.2 Trails

There are 43.5 miles of proposed trail and bikeway systems over the next five to twenty-four years (Lake County, 2014 and CMAP, 2010, respectively). See Figure 3-26 for NBCR planning area existing and proposed trails. If constructed, many of the proposed trails would connect the network of existing trails within and outside the NBCR planning area such as the Ryerson Conservation Area Trail, Des Plaines River Trail, Independence Grove Forest Preserve Trail, Lake Carina Forest Preserve Trail and Lake Cook Road. The longest stretches of proposed trail systems in the NBCR planning area is State Road 132 to State Route 176 (5.9 miles) and from Illinois-94 to Greenbay Road (5.0 miles).

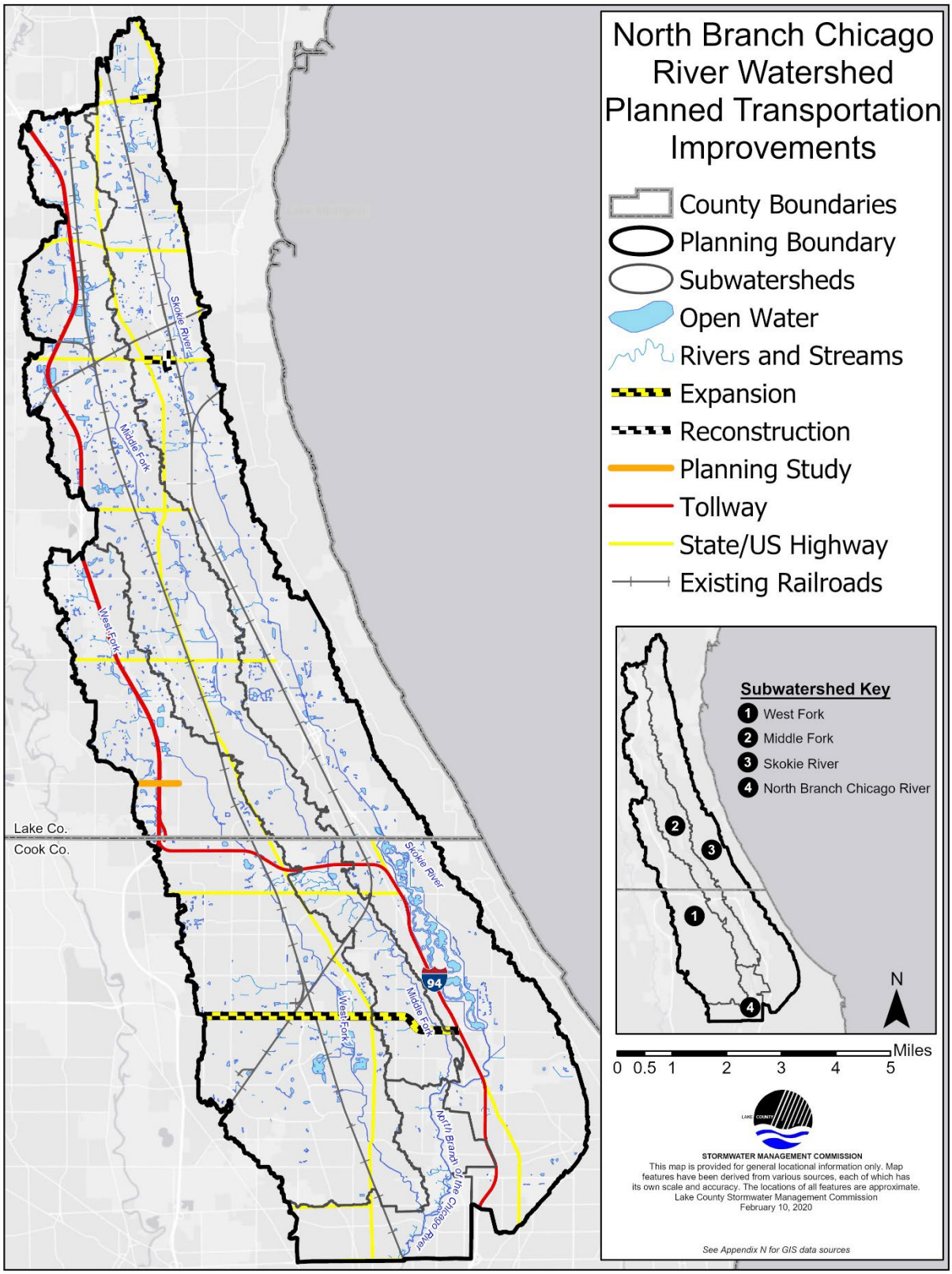


Figure 3-27: Planned and Potential Roadway Improvements

3.8 GREEN INFRASTRUCTURE

3.8.1 GREEN INFRASTRUCTURE MODEL AND STRATEGY FOR LAKE COUNTY, ILLINOIS

The Lake County Green Infrastructure Model and Strategy (GIMS) encapsulates facets of green infrastructure beyond those related to just stormwater. The GIMS provides a more comprehensive assessment of the overall green infrastructure values in our stormwater-based assessment. The following text is taken directly from the "project summary" (page 5) of the Lake County GIMS "Technical Report" (2017):

> *The Lake County GIMS builds on the previous efforts of the Chicago Wilderness Regional Green Infrastructure Vision through building a more refined infrastructure network model with higher resolution and more up-to-date GIS data. The GIMS also builds on the efforts of The Conservation Fund's (the Fund) support to the Chicago Metropolitan Agency for Planning (CMAP) to access ecosystem service valuation in Lake and six other Illinois counties in its planning area. The Lake County GIMS provides a framework for identifying land conservation and restoration opportunities for the county's major native landscape types: woodland/forest. Prairie/grassland/savanna, wetlands, and freshwater aquatic systems. The primary products of the Lake County GIMS are derived GIS datasets and models, which describe and characterize the regional green infrastructure network, restoration opportunities, and ecosystem service values of this network. The derived GIS datasets include core areas, functional connections, restoration building blocks, and composite layers that combine the science-based, data driven ecological network with the inventory of protected and managed lands. Included in the functional connections are corridor linkages for woodland/forest, prairie/grassland/savanna, wetlands, and steam buffers, as well as functional connectivity within Lake County's trail network.*

For more information on the GIMS for Lake County, Illinois, please visit http://www.lcfpd.org /conservation/greenstrategy/. For more information on CMAP's GIV, please visit https://www.cmap.illinois.gov /programs/sustainability/open-space/green-infrastructure-vision.

3.8.2 GREEN INFRASTRUCTURE

Green Infrastructure is a stormwater management approach that saves money, supports sustainability, and more efficiently uses limited financial and natural resources. It is achieved by capturing raindrops where they fall, reducing runoff volumes, and recharging groundwater supplies. By integrating natural processes into the built environment, green infrastructure provides stormwater management, flood mitigation, economic benefits, air quality management, and much more. Green infrastructure can be planned and implemented on local and regional scales:

- Local scale: Green infrastructure on a local scale consists of site-specific BMPs (such as naturalized detention facilities, vegetated swales, porous pavement, rain gardens, and green roofs) that are designed to maintain natural hydrologic functions by absorbing and infiltrating precipitation where it falls.
- Regional Scale: Green infrastructure at the regional scale consists of the interconnected network of open spaces and natural areas that mitigate stormwater runoff, naturally recharge aquifers, and improve water quality while providing recreational opportunities and wildlife habitat (Figure 3-29).
    - Regional scale green infrastructure aims to create an unbroken chain of natural areas and encourages planners to design interconnected hubs of natural space. This connection enhances the health of open spaces and promotes species diversity.

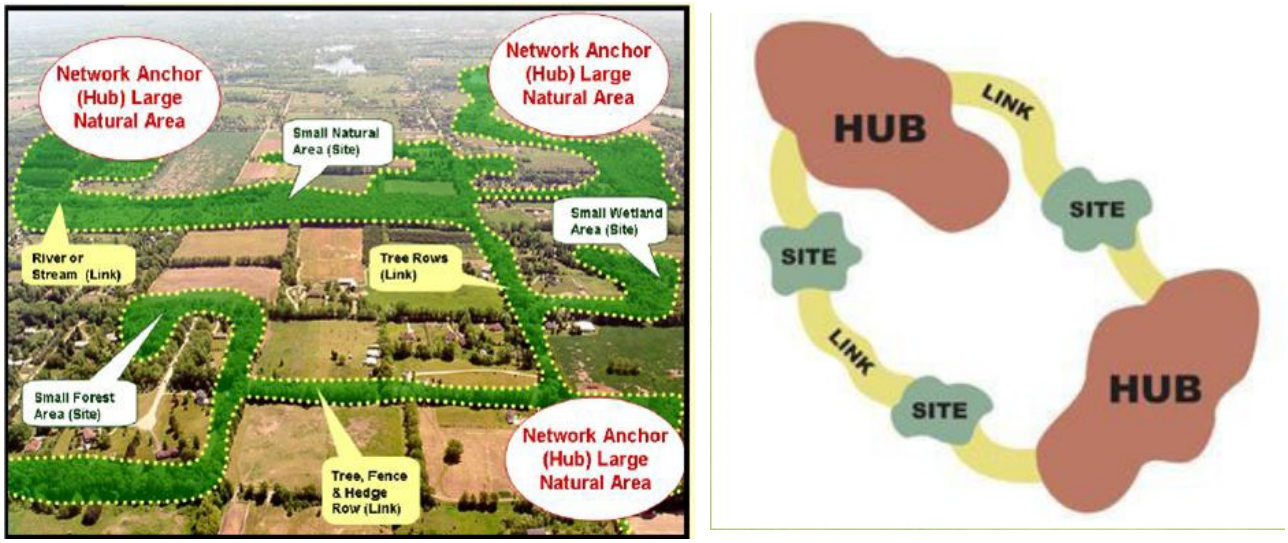


Figure 3-28: Diagram of Regional Scale Green Infrastructure

The North Branch Chicago River Watershed-Based Plan addresses the condition and quality of water resources and flood damage in the NBCR planning area. Stormwater runoff is a major cause of water pollution and flooding in developed and semi-developed watersheds like the NBCR planning area. Impervious surfaces such as rooftops, driveways, parking lots, and streets generate stormwater runoff that conveys pollutants to components of the natural drainage or green infrastructure system (ex. wetlands, lakes, and streams). Higher flows of stormwater can also cause erosion and flooding in urban streams, damaging habitat, property, and infrastructure. Since green infrastructure substantially influences how water moves in and on the landscape, it is an important element in the North Branch Chicago River Watershed-Based Plan for assessing current and planning for future conditions. There are three goals that can be met by increasing the green infrastructure in the NBCR planning area. These summarized goals pertaining to green infrastructure are taken from Chapter 2.3 – Watershed Goals and Objectives. For a more detailed explanation of the goals, objectives, and indicators, please review Chapter 2.3.

1. *Improve Water Quality: Minimize runoff volumes, velocities, and pollutants to waterways utilizing wetlands, natural landscapes, and stormwater BMPs as infiltration and pollutant filtration systems. Objective include measurably reducing nonpoint and point source pollutant loadings, reducing streambank and streambed erosion, and reducing phosphorus loads by removing phosphorus from wastewater discharges, upgrading poorly functioning septic systems and reducing NPS.*
2. *Reduce Flood Damage: Use infiltration and evapotranspiration provided by green infrastructure to reduce flow rates and volumes from existing developed areas and prevent increases in flow rates and volumes from new development. Protect and restore floodplain functions. Mitigate flood damages by using both remedial and preventive measures and determine potential locations and feasibility of regional flood storage sites.*
3. *Protect and Enhance Natural Resources and Provide Associated Recreational Opportunities: Utilize good natural resource management practices and green infrastructure on private and public property to protect, enhance, and restore natural resources. This maintains and enhances native plant and wildlife*

communities, natural hydrology, and buffers for streams, lakes, and wetlands while expanding environmental corridors that provide ecological, educational, and recreational benefits. Objectives include protecting and restoring wetlands, stream, lakes and riparian greenways and buffers to improve water quality and aquatic habitat. Protecting and enhancing native plant communities, native wildlife and biodiversity. Identify and develop areas for river-based recreational opportunities such as hiking, fishing, canoeing, running, biking, birding, peace of mind and a tranquil setting for both personal and social benefit.

Local and regional scale green infrastructure work in concert to infiltrate and store precipitation, thereby reducing the amount of stormwater runoff and the need to treat the water. Green infrastructure also brings many other environmental, social, and economic benefits. These benefits promote urban livability by improving the environment and preserving open space, which supports sustainable communities.

3.8.3 Hubs and Functional Connections

The hubs and functional connection analysis for the NBCR planning area will use existing data from *The Green Infrastructure Model and Strategy for Lake County, Illinois* (Allen et al., 2016), or GIMS, and the Green Infrastructure Vision (CMAP et al., 2015), or GIV. For the North Branch Chicago River Watershed-Based Plan update (2020) GIMS was utilized for Lake County data and the GIV was utilized for Cook County data. Methodologies between the two studies regarding the generation of hubs and functional connections are similar with the Lake GIMS building on "previous efforts of the Chicago Wilderness regional Green Infrastructure Vision (GIV)" (Allen et al., 2016). The main difference being the Lake County GIMS focuses on Lake County and uses local data, whereas the CMAP GIV uses regional data for a seven-county area including Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will in northeastern Illinois.

The majority of hubs and functional connections in terms of acreage (4,840 acres) are found in the Skokie River subwatershed which also contains the greatest amount of land devoted to public protected areas such as preserves and parks (3,675 acres). There are nine major hubs or "hub complexes" in the Skokie River subwatershed. The hubs or "hub complexes" can be seen in northern part of the subwatershed with the Greenbelt Forest Preserve (City of Waukegan and City of North Chicago); Foss Park Forest Preserve (City of North Chicago); Lake Bluff Golf Club (Village of Lake Bluff); and working south towards Oriole Grove Forest Preserve, Skokie River Nature Preserve and Derwen Mawr Nature Preserve complex (Village of Lake Bluff and City of Lake Forest); Danny Cunniff Park/Skokie River Woods complex (City of Highland Park); Sunset Valley Golf Club and Larry Fink Memorial Park hubs (City of Highland Park); and Chicago Botanic Garden, Skokie Lagoons and Winnetka Golf Club complex (Villages of Glencoe, Winnetka and Northfield).

NOTEWORTHY: Hubs & Functional Connections

Hubs: "Hubs are aggregations of core areas that combine landscape types in an effort to treat areas as unfragmented blocks that include an array of habitats" (Allen et al., 2016). Hubs, as defined in the GIMS and GIV reports, contain the following four core landscape features (core woodlands/forest, core prairies, grasslands and savannas, core wetlands, and core lakes and streams) to create an Ecological Network. The Ecological Network is then combined with a "protected lands" layer (e.g., Illinois Department of Natural Resources - IDNR managed lands, conservation easements, forest preserve districts) to form a composite layer, or the "hub".

Functional Connections: Functional connections, as defined in the GIMS, are linkages between the various hubs, or cores. Functional connections "are corridor linkages for woodland/forest, prairie/grassland/savanna, wetlands, stream buffers, as well as functional connectivity within the Lake County trail network" (Allen et al., 2016).

Several other major hubs and "hub complexes" can be seen in the West Fork, Middle Fork, and North Branch Chicago River subwatersheds. See Table 3-19 for a breakdown per subwatershed.

Many of the identified functional connections follow streams and lakes as well as trails systems and serve as natural riparian areas and greenway connections to hubs. Major roadways may act as barriers to functional connections between hubs. This is especially evident by the Tri-State Tollway (I-94 and I-294) and the Edens Expressway Spur (I-94) in places where the expressways split hubs. An example of this in Lake County can be seen along the Tri-State Tollway (I-94) just north of Deerfield Road with the Deerfield District Golf Club on the west side of the Tollway and the Duffy Stormwater Facility, Lake Eleanor, and Clavey Park on the east side of the Tollway. Another example can be seen in Cook County along the Edens Expressway Spur (I-94) with the hubs and functional connections are split with Somme Woods Forest Preserve on the south side of the spur and functional connections on the north side of the spur.

Enhancing and protecting functional connections along riparian areas, especially those adjacent to unprotected stream sections, will improve water quality and help preserve and enhance biodiversity. Riparian functional connection buffers should be restored to widths that benefit not only water quality but also benefit aquatic and terrestrial life. Functional connections identified within open space such as agricultural land can be restored to natural land cover types more easily. Furthermore, enhancing existing and restoring/creating wetlands within functional connections will mitigate impacts from stormwater, improve water quality, and provide critical habitat components. Figure 3-30 shows locations of hubs and functional connections throughout the NBCR planning area.

Table 3-19: Hub and Functional Connection Total Area per Subwatershed

SUBWATERSHED	AREA (acres)	% of SUBWATERSHED	% of PLANNING AREA
Middle Fork	4,303	27%	7%
North Branch Chicago River	1,015	27%	2%
Skokie River	4,840	22%	8%
West Fork	2,486	14%	4%
TOTAL	**12,644**		**21%**

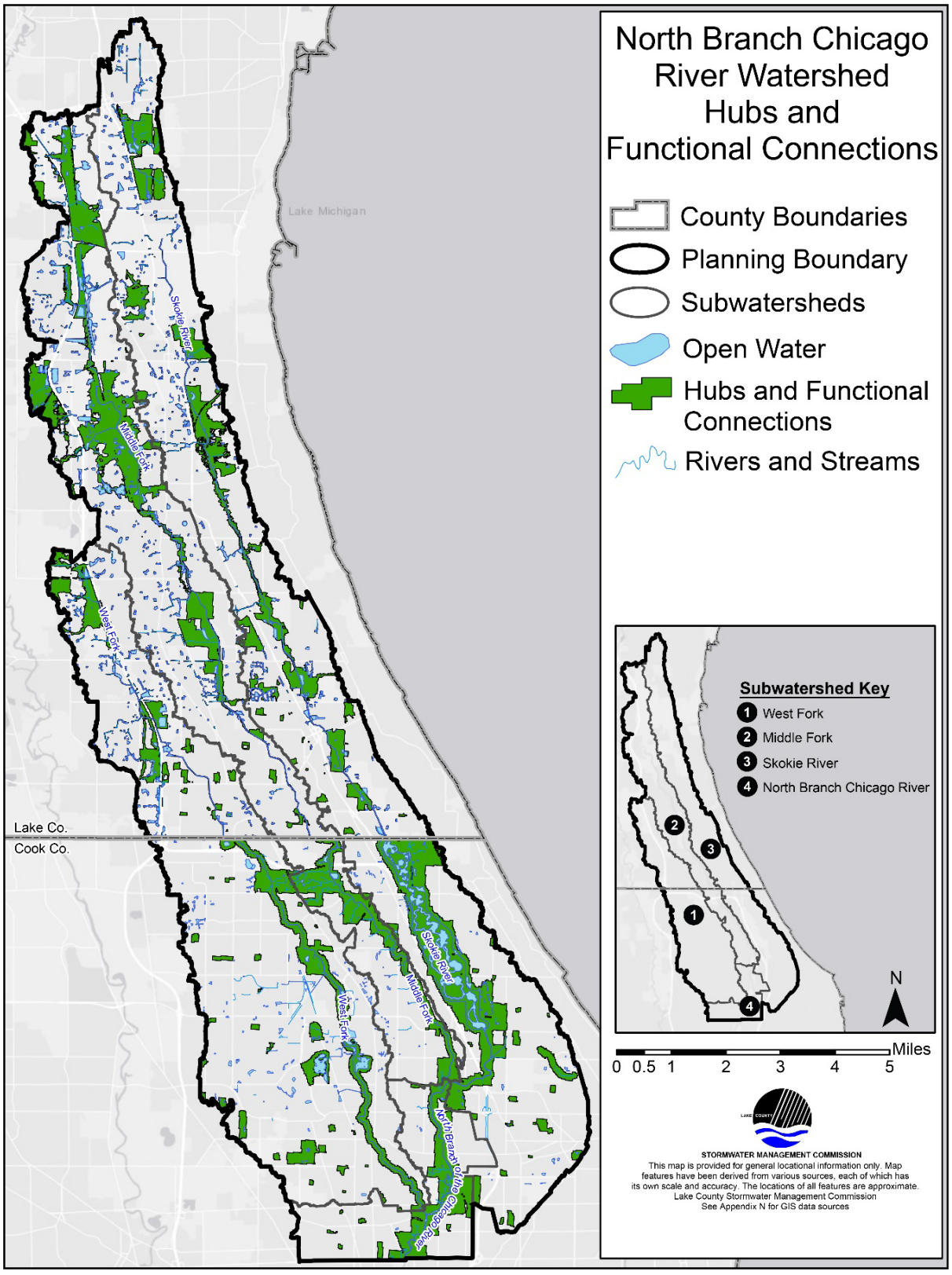


Figure 3-29: Hubs and Functional Connections

3.8.4 PROTECTION STATUS

Protected and managed land differs from unprotected land because it can't be utilized for developed land uses. The land is either permanently chartered as open land or in a permanent deed restriction such as a conservation easement. Publicly protected and managed lands include forest preserve districts, state nature preserves, and park districts. Privately protected and managed lands include homeowners/business association-owned land with deed restrictions or conservation easements, and land owned by land trusts and other conservation organizations. The conversion of open space to other uses reduces the watershed benefits provided by open land. Conversion of open space to traditionally developed land uses may increase runoff, water quality degradation, and loss of wildlife habitat area and connectivity.

This section will use Protected and Managed Lands already identified using the following data sources:

1. Protected Areas Database of the US (PAD-US) - CBI Edition 1.1, 2010, (Data Source: USGS)
2. National Conservation Easement Database (NCED)
3. LCFPD
4. IDNR: INAI and State Parks
5. IDOT Mitigation Banks and Sites (Data Source: Resource Management Mapping Service)
6. Citizens for Conservation (Data Source: Prairie State Conservation Coalition)
7. Conserve Lake County (Data Source: Prairie State Conservation Coalition)
8. Lake Forest Open Lands Association (Data Source: Prairie State Conservation Coalition)
9. RIBITS - Regional In-Lieu Fee and Bank Information Tracking System. (PAD-US & USACOE)

Table 3-20 represents the acres and percent of protected and managed lands in each of the four subwatersheds and Figure 3-30 represents the geographic distribution.

Table 3-20: Protection Status Summary in the NBCR Planning Area

SUBWATERSHED	AREA (acres)	% of SUBWATERSHED	% of PLANNING AREA
Middle Fork	3,262	20%	5%
North Branch Chicago River	1,035	28%	2%
Skokie River	4,772	21%	8%
West Fork	1,867	10%	3%
TOTAL	**10,936**		**18%**

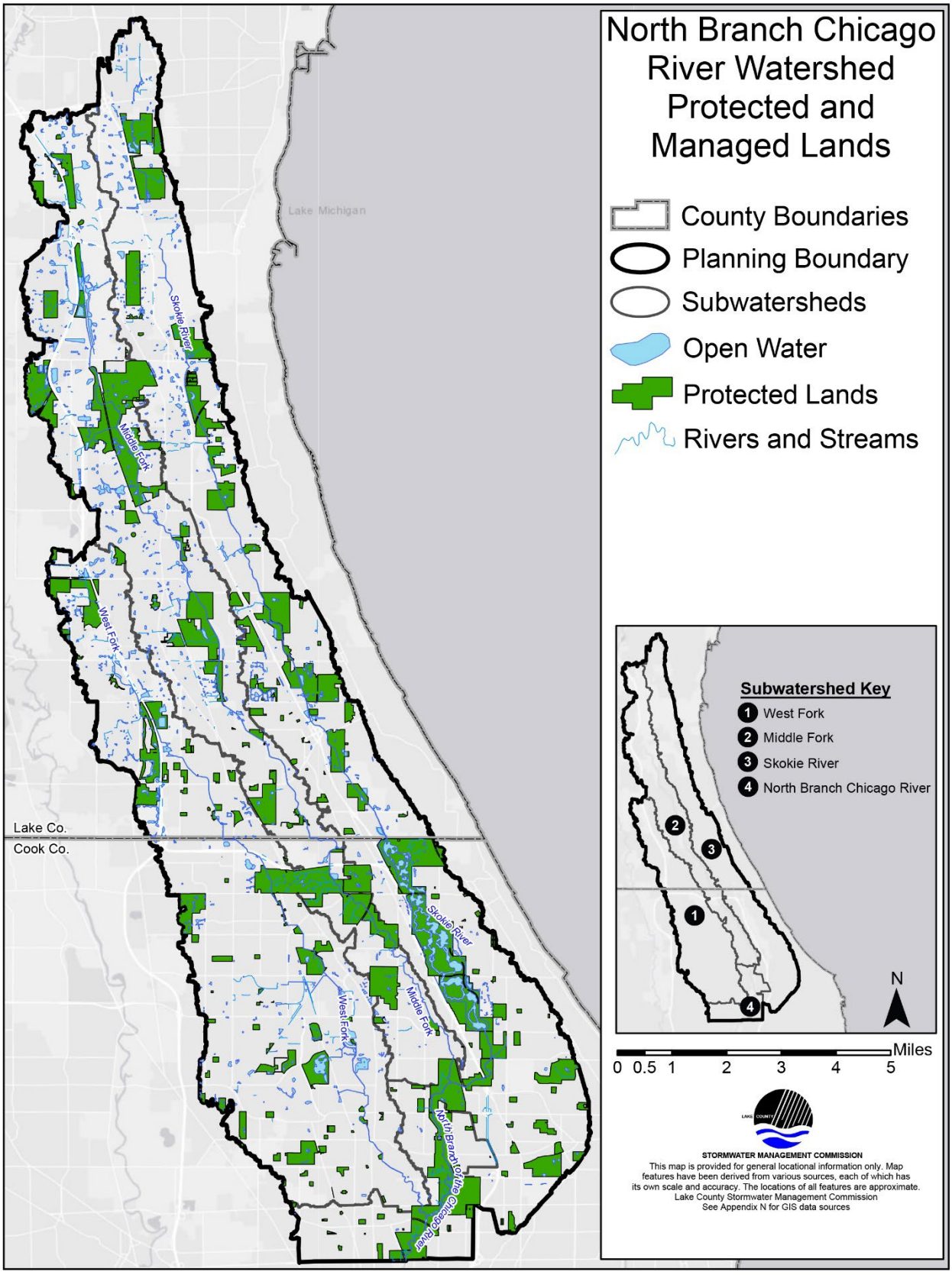


Figure 3-30: Protected and Managed Lands

3.8.5 RESTORATION OPPORTUNITIES

The GIV and GIMS identify "restoration building blocks" based on landscape type (Allen et al., 2016). Other areas of potential restoration can be gleaned from the 2008 North Branch Chicago River Watershed-Based Plan (for Lake County). The green infrastructure BMP categories represented in the 2008 watershed-based plan include detention basin retrofit (correct short circuiting), green infrastructure preservation/restoration (mainly preserving stormwater green infrastructure benefits and wetlands with open space areas), wetland enhancement (enhancing existing wetlands), and wetland restoration (restoring and managing hydric soils and wetlands to improve hydraulic functions and water quality benefits).

Table 3-21 lists the restoration building block layers used in the GIV and the equivalent layers used in the GIMS. Figure 3-31 represents mapped restoration opportunities in the NBCR planning area including the referenced building blocks in Table 3-21 as well as the potential restoration areas in Lake County from the 2008 North Branch Chicago River Watershed-Based Plan.

Table 3-21: Restoration Building Blocks Data Layers

GIV Restoration Building Block (pg. 6 GIV)	GIMS Restoration Building Block (pg. 91 GIMS)
Woodland sites (Forest_lyr5)	Forest_Sites
Pre-settlement woodland/forest (Forest_lyr6)	Forest_Restoration
Pre-settlement prairie/grassland/savanna (PGS_lyr4)	PGS_Restoration
Wetland sites (Wetland_lyr6)	Wetland_Sites
Wetland complexes (wetland_lyr7)	Wetland_Complexes
NHD+ raster buffer (stream_lyr2)*	Water_AllBuffer*

For more information on how these layers were compiled, refer to page 6 of the GIV and page 91 of the GIMS.
**NHD+ refers to National Hydrology Dataset Plus (or NHDPlus) dataset from the USGS. More information can be found here https://www.usgs.gov/core-science-systems/ngp/national-hydrography/nhdplus-high-resolution.*

Freshwater systems (stream_lyr4)	Water_FreshWaterSystems

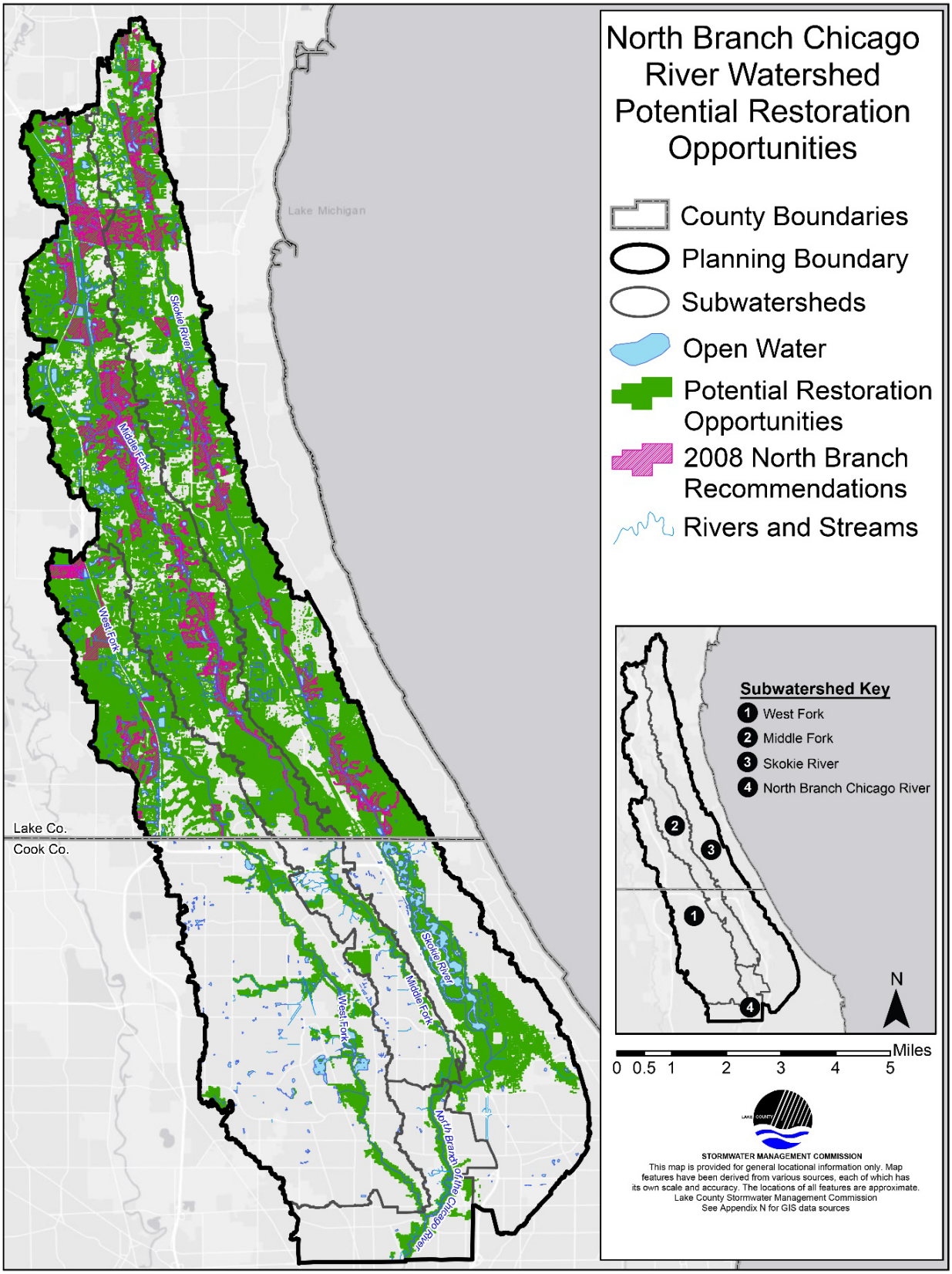


Figure 3-31: Potential Restoration Opportunities

3.9 PARKS AND RECREATION

3.9.1 PARKS AND OPEN SPACE

One hundred and eighty-two (182) parks totaling approximately 2,226 acres were identified within the NBCR planning area. For the purposes of this plan, "parks" are defined as publicly owned open space not owned by a Forest Preserve District, including all open space owned by park districts, municipalities, townships, and the State of Illinois. Management, programming, and use of these lands is varied, and includes active and passive recreation, wildlife management, hunting and fishing, and nature preserves. This plan does not include golf courses in this definition, see Section 3.9.2 for additional information on golf courses in the NBCR planning area. The average park size is approximately 12 acres. The number of parks per county and jurisdiction is presented in Table 3-22 and Table 3-23, respectively. Figure 3-32 displays an example of a park in the NBCR planning area and all the park locations are displayed in Figure 3-33.



Figure 3-32: Willow Park, Northfield

Table 3-22: Distribution of Parks Per County

PARK LOCATION (COUNTY)	NUMBER OF PARKS	SIZE (ACRES)	% OF THE WATERSHED
Cook	91	924	1.53%
Lake	91	1302	2.15%
TOTALS	**182**	**2,226**	**3.68%**

Table 3-23: Jurisdictional Distribution of Parks

PARK LOCATION (JURISDICTION)	NUMBER OF PARKS	SIZE (ACRES)	% OF THE WATERSHED
City of Evanston	1	18	0.03%
City of Highland Park	26	444	0.73%
City of Highwood	2	3	<0.01%
City of Lake Forest	11	319	0.53%
City of North Chicago	2	3	<0.01%
City of Park City	2	11	0.02%
City of Waukegan	5	26	0.04%
Libertyville Township	0	0	0%
Maine Township	0	0	0%
New Trier Township	0	0	0%
Niles Township	0	0	0%
Northfield Township	1	2	<0.01%
Shields Township	2	5	0.01%
Vernon Township	0	0	0%
Village of Bannockburn	0	0	0%
Village of Deerfield	21	179	0.30%

PARK LOCATION (JURISDICTION)	NUMBER OF PARKS	SIZE (ACRES)	% OF THE WATERSHED
Village of Glencoe	9	20	0.03%
Village of Glenview	26	368	0.61%
Village of Golf	1	3	<0.01%
Village of Green Oaks	3	154	0.25%
Village of Gurnee	1	2	<0.01%
Village of Kenilworth	0	0	0%
Village of Lake Bluff	3	23	0.04%
Village of Lincolnshire	6	60	0.10%
Village of Mettawa	6	69	0.11%
Village of Morton Grove	11	58	0.10%
Village of Niles	1	1	<0.01%
Village of Northbrook	15	215	0.36%
Village of Northfield	5	40	0.07%
Village of Riverwoods	1	5	0.01%
Village of Skokie	3	12	0.02%
Village of Wilmette	9	97	0.16%
Village of Winnetka	9	89	0.15%
Warren Township	0	0	0%
Waukegan Township	0	0	0%
West Deerfield Township	0	0	0%
TOTALS	**182**	**2,226**	**3.98%**

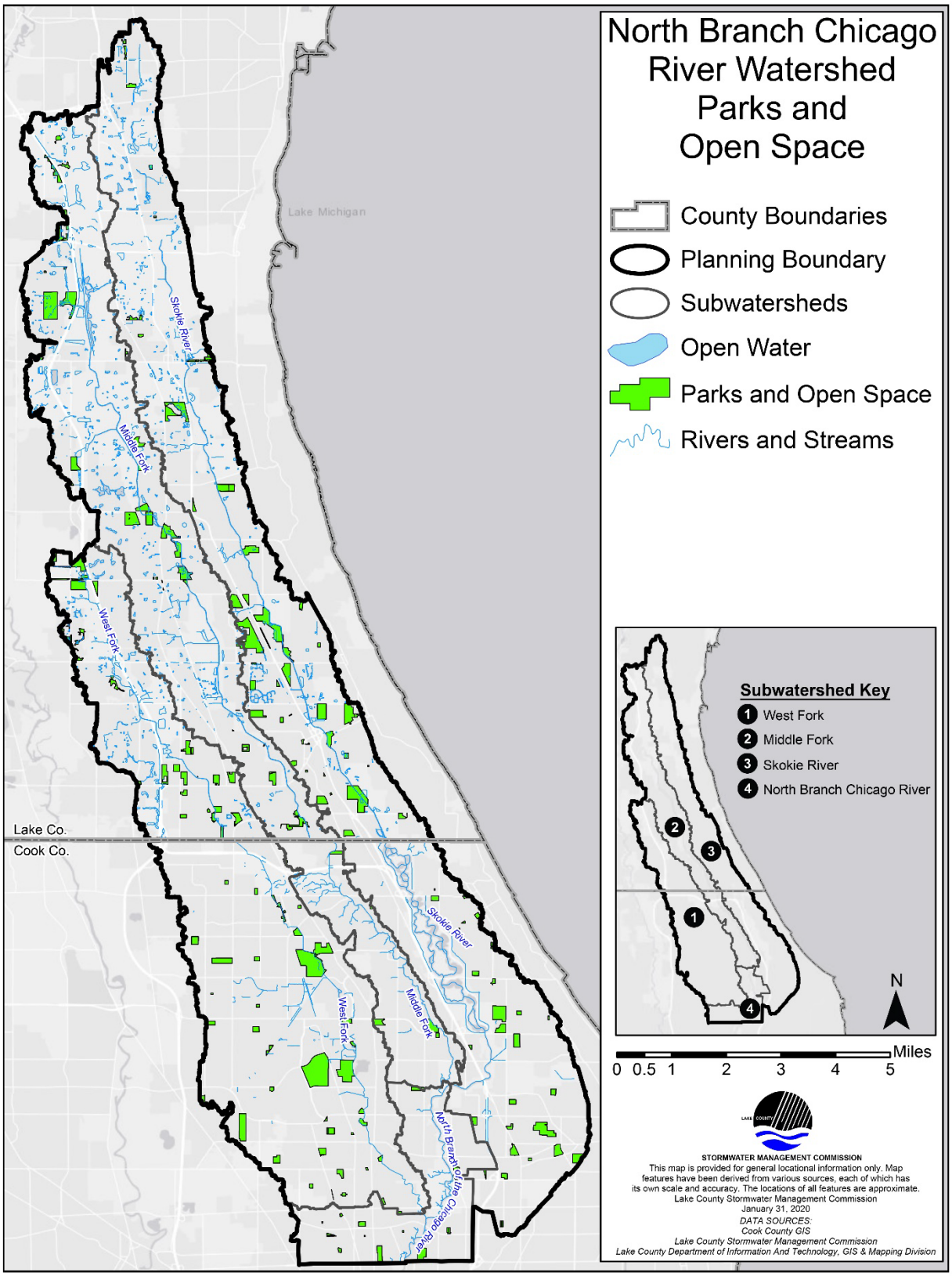


Figure 3-33: Location of Parks & Public Open Space

3.9.2 GOLF COURSES

Thirty-five golf courses totaling approximately 4,976 acres are located within the NBCR planning area. Stormwater runoff from many of these golf courses flows directly into the North Branch Chicago River. Landscaping and maintenance practices at golf courses directly impact the watershed. While fertilizers and pesticides maximize productivity and performance of turf grass, the NBCR planning area may be at risk from spills of concentrated chemicals used to mix fertilizers and pesticides for application. Of the many nutrients applied to golf turf and the primary contaminants of concern in fertilizers are nitrogen and phosphorus, which contribute to algal growth, weeds, and the impairment of water.

Pesticides may be toxic to aquatic and terrestrial systems depending on their solubility, toxicity, and chemical breakdown rate. Other potentially hazardous materials, such as fuels and paints that are used in everyday operation and maintenance, can contaminate water quality accidentally. Golf course BMPs should be followed for maintenance operations to prevent contamination from accidental releases. Another significant source of pollution from golf courses is waterfowl. Shallow ponds surrounded by mowed turf grass attract significant populations of waterfowl. Deposits of fecal matter by resident and migrating waterfowl (primarily Canada geese) may contribute to high levels of fecal coliform in the watershed. The distribution of golf courses by jurisdiction is summarized in Table 3-24, and graphically displayed in Figure 3-34 and Figure 3-35.

Table 3-24: Distribution of Golf Courses within the NBCR Planning Area

GOLF COURSE LOCATION (JURISDICTION)	NUMBER OF GOLF COURSES	SIZE (ACRES)	% OF THE WATERSHED
City of Evanston	0	0	0%
City of Highland Park	6	956	1.58%
City of Highwood	0	0	0%
City of Lake Forest	4	747	1.23%
City of North Chicago	2	363	0.60%
City of Park City	0	0	0%
City of Waukegan	0	0	0%
Libertyville Township	0	0	0%
Maine Township	0	0	0%
New Trier Township	1	130	0.21%
Niles Township	0	0	0%
Northfield Township	0	0	0%
Shields Township	0	0	0%
Vernon Township	0	0	0%
Village of Bannockburn	0	0	0%
Village of Deerfield	1	156	0.26%
Village of Glencoe	2	277	0.46%
Village of Glenview	5	561	0.93%
Village of Golf	1	187	0.31%
Village of Green Oaks	0	0	0%
Village of Gurnee	0	0	0%
Village of Kenilworth	0	0	0%
Village of Lake Bluff	1	152	0.25%
Village of Lincolnshire	0	0	0%
Village of Mettawa	0	0	0%
Village of Morton Grove	1	157	0.26%
Village of Niles	0	0	0%

GOLF COURSE LOCATION (JURISDICTION)	NUMBER OF GOLF COURSES	SIZE (ACRES)	% OF THE WATERSHED
Village of Northbrook	4	511	0.84%
Village of Northfield	1	127	0.21%
Village of Riverwoods	2	303	0.50%
Village of Skokie	1	16	0.03%
Village of Wilmette	2	233	0.38%
Village of Winnetka	1	100	0.17%
Warren Township	0	0	0%
Waukegan Township	0	0	0%
West Deerfield Township	0	0	0%
TOTAL	**35**	**4,976**	**8.22%**

Recommended BMPs for golf courses (Cornell University, 2014) include:

- *Maintain a 100-foot buffer around waterways for chemical storage and mixing. Storage areas should have a raised berm on all sides and an impervious surface for containment. Facilities should be equipped with "spill containment material".*
- *Grass clippings and debris removed from equipment should be disposed of properly and not released into waterways.*
- *Determine accurate supplemental nutrient needs based on soil chemical and physical analysis.*
- *Assess nutrient application efficiency through regular equipment calibration.*
- *Maintain turf with high shoot density to minimize runoff and maximize infiltration.*



Figure 3-34: Foss Park Golf Course Streambank Stabilization Project

- *Manage the surface accumulation of organic matter to maintain a permeable system that minimizes runoff and maximizes subsurface retention.*
- *Select turf that is well adapted to site conditions. Well-adapted species require reduced amounts of fertilizer and pesticides, and if selected for drought tolerance, requires less water to survive and maintain playability.*
- *Minimize the amount of fertilizer and chemicals used during the establishment phase as establishing turf does not provide the needed uptake to prevent runoff and leaching.*
- *Implement methods such as core cultivation, deep slicing and water injection to alleviate soil compaction and remove organic material, resulting in increased infiltration and reduced runoff.*
- *Utilize proper topdressing material to maintain permeable turf.*
- *Utilize a combination of preventative and reactive strategies to manage pest problems. Select management options according to site conditions instead of the calendar.*
- *Establish wetland fringes around ponds to reduce populations of geese (geese prefer open water with closely mowed visible banks to they can see predators approaching).*

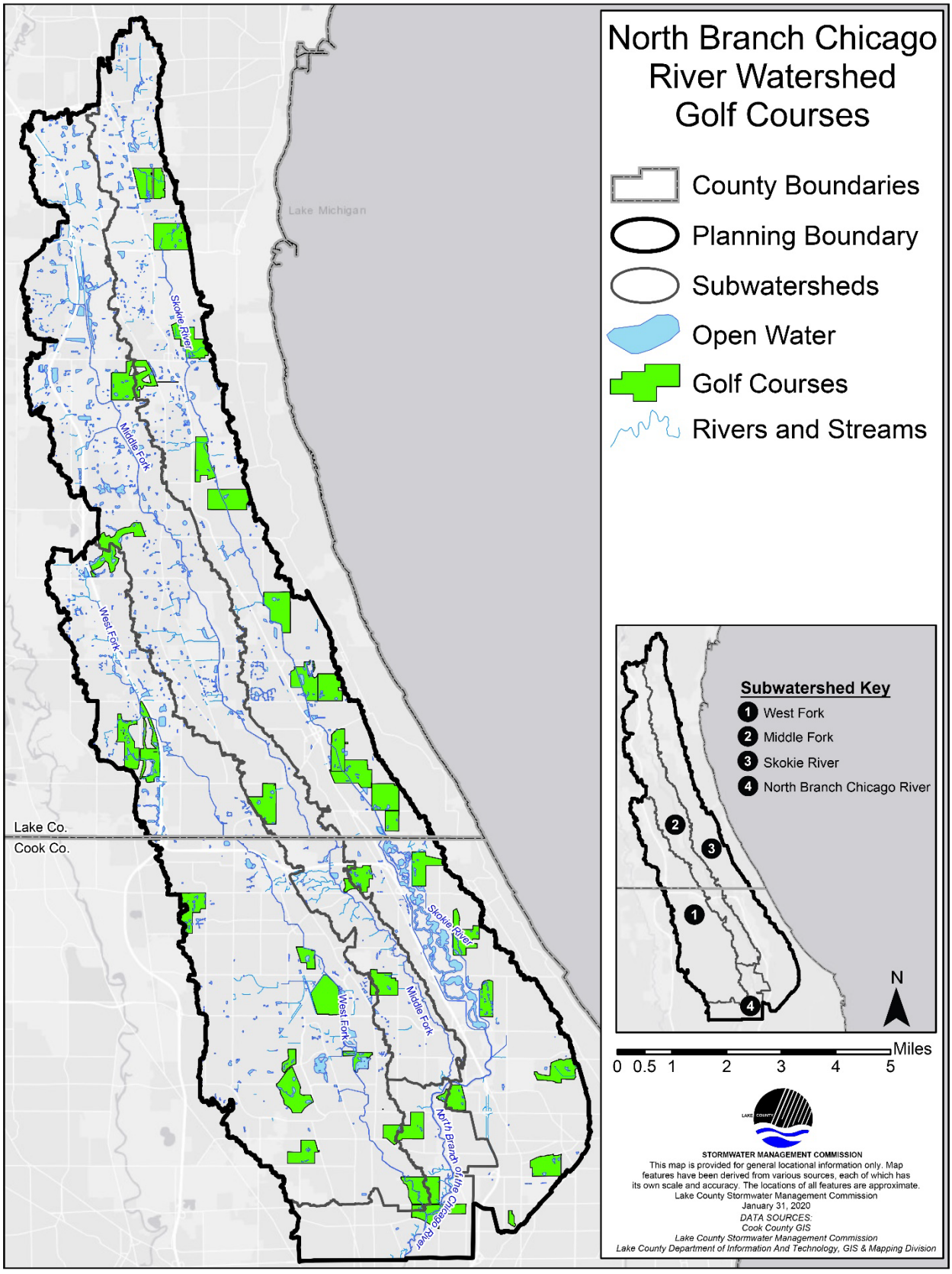


Figure 3-35: Golf Courses

3.10 NATURAL AREAS

3.10.1 NATURE PRESERVES & FOREST PRESERVES



Figure 3-36: Middlefork Savanna Forest Preserve

Several dedicated Illinois Nature Preserves, Lake County Forest Preserves, and Cook County Forest Preserves are in the NBCR planning area. There are 28 forest preserves totaling 5,069 acres in the NBCR planning area (1,936 acres in Lake County and 3,133 acres in Cook County). See Figure 3-36 for an example of a forest preserve within the NBCR planning area. Twenty-one of the approximately eighty-one miles of the four mainstems (West Fork, Middle Fork, Skokie River, North Branch Chicago River) and their tributaries flow through forest preserves in Lake and Cook Counties. Forest preserves are a key component of the system of hubs and corridors creating the regional green infrastructure system in the NBCR planning area. In particular, the network of Cook County forest preserves along the Skokie River in Cook County and the Lake County Forest preserves along the Middle Fork North Branch Chicago River provide significant flood damage reduction, water quality, habitat, and quality of life benefits to the NBCR planning area. Forest preserve districts are therefore key partners in successful implementation of this plan. See Table 3-25 for a list of forest preserve properties within the NBCR planning area, and

Table 3-27 for the acres of forest preserve in each subwatershed. There are eighteen nature preserve properties totaling 1,581 acres in the NBCR planning area, as listed in Table 3-26. Six of these properties are entirely within a forest preserve property, one is partially within a forest preserve property, and eleven are located outside of forest preserve properties. Forest and nature preserve properties are mapped in Figure 3-37.

Table 3-25: Forest Preserves in the NBCR Planning Area

SITE	ACRES	SITE	ACRES
Atkinson Stormwater Facility	78	Linne Woods	170
Berkeley Prairie Forest Preserve	19	Middlefork Savanna Forest Preserve	648
Blue Star Memorial Woods	144	Old School Forest Preserve	257
Captain Daniel Wright Woods	64	Oriole Grove Forest Preserve	86
Chicago Botanic Garden/Mary Mix McDonald Woods	376	Prairie Wolf Forest Preserve	428
Chipilly Woods	150	Skokie River Woods	25
Duffy Stormwater Facility	77	Somme Prairie Nature Preserve	74
Erickson Woods	580	Somme Prairie Woods	90
Forest Way Grove	547	Somme Woods	271
Glen Grove Equestrian Center	20	St. Paul Woods	2
Glenview Woods/Harms Woods Nature Preserve	232	Sunset Ridge Woods	145
Grainger Woods Conservation Preserve	20	Turnbull Woods	13
Greenbelt Forest Preserve	234	Watersmeet Woods	184
Harms Flatwoods Nature Preserve	110	Wayside Woods	25
		TOTAL:	**5,069**

Table 3-26: Nature Preserves in the NBCR Planning Area

NATURE PRESERVE	ACRES	ACRES IN FOREST PRESERVE
Berkeley Prairie Nature Preserve	16	16
Dokum Mskoda Sedge Meadow Nature Preserve	101	0
Elm Road Woods Nature Preserve	60	60
Florsheim Park Nature Preserve	105	0
Glenbrook North High School Prairie Nature Preserve	2	0
Glenview Naval Air Station Prairie Nature Preserve	31	0
Grainger Woods Nature Preserve	9	9
Harms Flatwoods Nature Preserve	102	102
Harms Woods Nature Preserve	169	169
Highmoor Park Nature Preserve	10	0
Hybernia Nature Preserve	26	0
Jean Farwell Woods Land and Water Reserve	11	0
Kennicott's Grove Nature Preserve	19	0
Middlefork Savanna Nature Preserve	681	621
Morton Grove Prairie Nature Preserve	1	0
Skokie River Nature Preserve	140	0
Skokie River Prairie Land and Water Reserve	24	0
Somme Prairie Nature Preserve	74	74
TOTAL:	**1,581**	**3,787.3**

Table 3-27: Forest Preserve Acreages in the NBCR Planning Area Subwatersheds

SUBWATERSHED	FOREST PRESERVE ACRES	% OF SUBWATSHED
Middle Fork	2,050	12.75%
North Branch Chicago River	754	20.14%
Skokie River	1,930	8.60%
West Fork	335	1.83%
TOTALS	**5,069**	**Percent of Planning Area 8.37%**

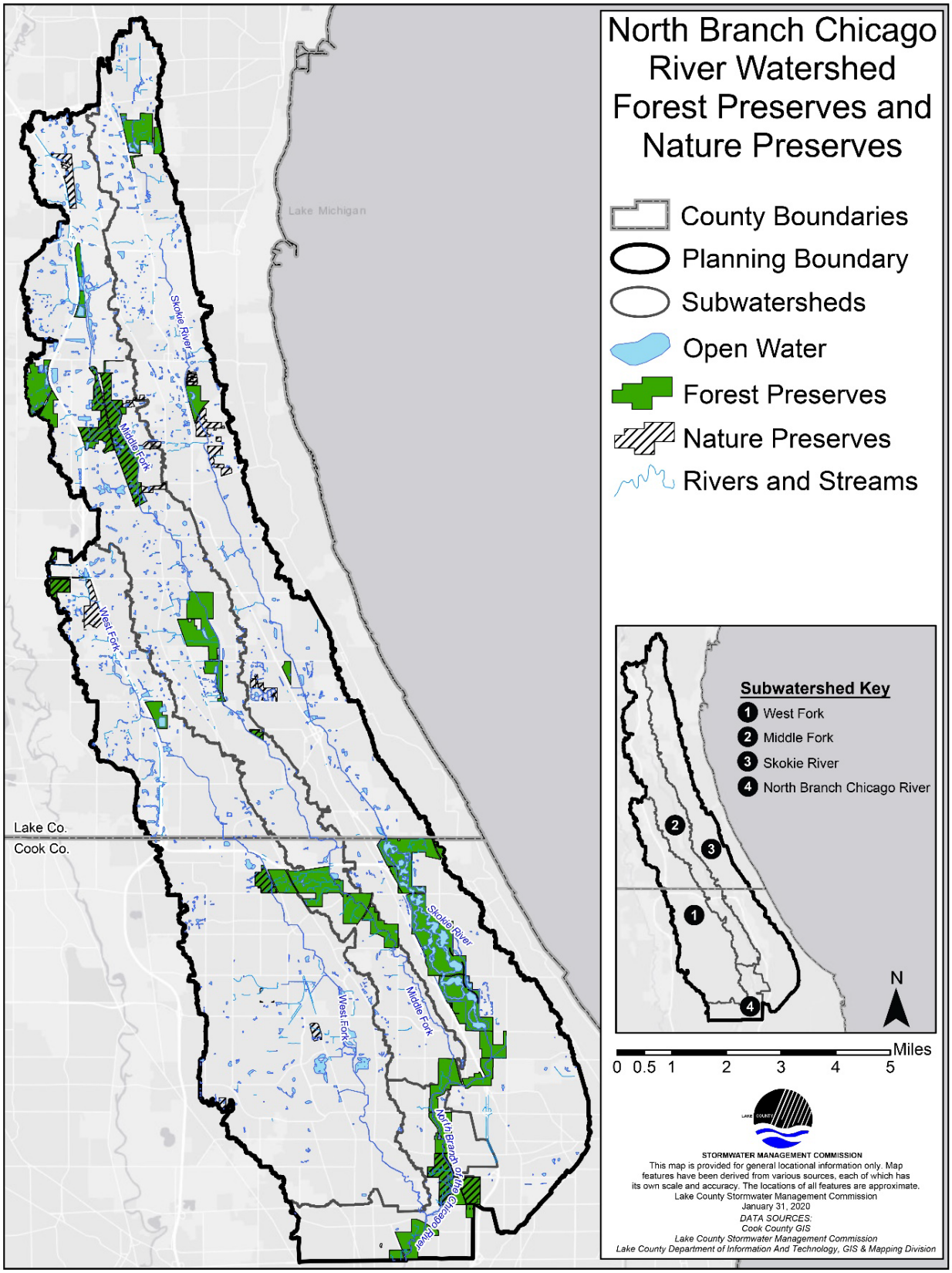


Figure 3-37: Forest and Nature Preserves

3.10.2 Threatened and Endangered Species

High quality natural resources in the NBCR planning area include **threatened** and **endangered** (T&E) species and communities, rare habitats, and important natural areas, including natural area inventory sites, forest preserves, nature preserves, and high-quality advanced identification **(ADID)** wetlands. Three federally endangered species have been observed in the NBCR planning area. As of 2020, there were 46 Illinois listed threatened and endangered species in the NBCR planning area including 29 vascular plant species, 4 vertebrate animal species, 8 bird species, 4 terrestrial communities, and 1 invertebrate.

Table 3-28 includes the Illinois listed threatened or endangered species in the NBCR planning area and provides additional information, including status and type, and Table 3-29 lists the number of Illinois threatened and endangered species in each subwatershed. Ecologically significant and protected areas in the watershed provide habitat for threatened or endangered species and contain examples of high-quality natural communities. These areas include ADID (high quality) wetlands, fifteen INAI sites, twenty-two forest preserves, and sixteen nature preserves.

ENDANGERED SPECIES: A species in danger of extinction throughout all or a substantial portion of its range.

THREATENED SPECIES: A species likely to become endangered in the near future.

ADID SITES: Aquatic sites that have been determined to provide biological value by the USACE, Chicago District and the USEPA.

Noteworthy: Identifying High Quality Natural Resources

The Illinois Natural Heritage Database provides information on the presence of the state's threatened and endangered plants and animals, INAI sites, Illinois Nature Preserves, and Forest Preserve lands. The database's information was gathered from the INAI inventory (conducted in the mid 1970's), as well as by IDNR biologists, resource managers, and volunteers. Lake County threatened and endangered species information was also assembled during Lake County Health Department – Ecological Services water quality and plant sampling of the lakes, in addition to 20 years of threatened and endangered species data from the LCFPD queried through the IDNR Element Occurrence Records reports.

Table 3-28: Illinois Listed T&E Species within the NBCR Planning Area

COMMON NAME	SCIENTIFIC NAME	TYPE	COUNTY	STATUS
American Burnet	Sanguisorba canadensis	Vascular Plant	Cook	Endangered
American Slough Grass	Beckmannia syzigachne	Vascular Plant	Cook	Endangered
Bald Eagle	Haliaeetus leucocephalus	Vertebrate Animal	Cook	Threatened
Bearded Wheat Grass	Elymus trachycaulus	Vascular Plant	Lake	Endangered
Blackchin Shiner	Notropis heterodon	Vertebrate Animal	Lake	Threatened
Black-crowned Night-Heron	Nycticorax nycticorax	Vertebrate Animal	Lake	Endangered
Blanding's Turtle	Emydoidea blandingii	Vertebrate Animal	Lake	Endangered
Common Bog Arrow Grass	Triglochin maritima	Vascular Plant	Lake	Threatened
Common Gallinule	Gallinula galeata	Vertebrate Animal	Lake	Endangered
Downy Solomon's Seal	Polygonatum pubescens	Vascular Plant	Cook	Threatened
Dwarf Raspberry	Rubus pubescens	Vascular Plant	Cook	Threatened
*Eastern Prairie Fringed Orchid	Platanthera leucophaea	Vascular Plant	Cook	Endangered
Flatwoods, Central Midwest Type	Sand flatwoods	Terrestrial Community	Cook	--
Forked Aster	Aster furcatus	Vascular Plant	Cook; Lake	Threatened
Golden Sedge	Carex aurea	Vascular Plant	Lake	Threatened
Ground Juniper	Juniperus communis	Vascular Plant	Cook	Threatened
Hairgrass	Deschampsia flexuosa	Vascular Plant	Cook	Endangered
Ill-scented Trillium	Trillium erectum	Vascular Plant	Lake	Endangered

COMMON NAME	SCIENTIFIC NAME	TYPE	COUNTY	STATUS
Iowa Darter	Etheostoma exile	Vertebrate Animal	Lake	Threatened
Kalm's St. John's Wort	Hypericum kalmianum	Vascular Plant	Cook	Endangered
King Rail	Rallus elegans	Vertebrate Animal	Lake	Endangered
Kittentails	Besseya bullii	Vascular Plant	Cook	Threatened
Lakeside Daisy	Tetraneuris herbacea	Vascular Plant	Cook	Endangered
*Leafy Prairie Clover	Dalea foliosa	Vascular Plant	Cook	Endangered
Marsh Speedwell	Veronica scutellata	Vascular Plant	Lake	Threatened
Mountain Blue-eyed Grass	Sisyrinchium montanum	Vascular Plant	Cook	Endangered
Northern Cranesbill	Geranium bicknellii	Vascular Plant	Cook	Endangered
Northern flatwoods	Northern flatwoods	Terrestrial Community	Lake	--
Northern Harrier	Circus cyaneus	Vertebrate Animal	Cook	Endangered
*Northern Long-eared Myotis	Myotis septentrionalis	Vertebrate Animal	Lake	Threatened
Oval Milkweed	Asclepias ovalifolia	Vascular Plant	Cook	Endangered
Pale Vetchling	Lathyrus ochroleucus	Vascular Plant	Lake	Threatened
Purple-flowering Raspberry	Rubus odoratus	Vascular Plant	Lake	Threatened
Queen-of-the-prairie	Filipendula rubra	Vascular Plant	Lake	Threatened
Red Honeysuckle	Lonicera dioica var. glaucescens	Vascular Plant	Lake	Endangered
Rich Savanna	Mesic savanna	Terrestrial Community	Lake	--
Royal Catchfly	Silene regia	Vascular Plant	Cook	Endangered
Rusty Patched Bumble Bee	Bombus affinis	Invertebrate Animal	Cook	Endangered
Sedge	Carex formosa	Vascular Plant	Cook	Endangered
Shadbush	Amelanchier sanguinea	Vascular Plant	Lake	Endangered
Short-eared Owl	Asio flammeus	Vertebrate Animal	Cook	Endangered
Swollen Sedge	Carex intumescens	Vascular Plant	Cook	Endangered
Tallgrass Prairie	Mesic prairie	Terrestrial Community	Cook	--
Tuckerman's Sedge	Carex tuckermanii	Vascular Plant	Cook	Endangered
Upland Sandpiper	Bartramia longicauda	Vertebrate Animal	Cook	Endangered
Wilson's Phalarope	Phalaropus tricolor	Vertebrate Animal	Lake	Endangered

**These species are also federally listed.*

Table 3-29: Number of Species that are State-Threatened or Endangered by Subwatershed

SUBWATERSHED	NUMBER OF STATE T&E SPECIES
Middle Fork North Branch Chicago River	13
North Branch Chicago River	6
Skokie River	13
West Fork North Branch Chicago River	14

3.11 WETLAND INVENTORY

WETLANDS: Areas with a high potential for exhibiting hydric soil, hydrophytic vegetation, and required hydrologic conditions.

WATERBODY TYPE: A distinction in the underlying nature of the wetland based on size and shape of the associated water component: Lake, Pond, River, or Stream.

European settlers to the region altered much of the NBCR planning area's natural hydrology and **wetland** processes. They drained wet areas, channelized streams, plowed prairie land, and cleared forests to farm the rich soils. Even after these alterations, the underlying soil retains clues to its prior condition. Hydric soils can help identify the locations of pre-settlement wetlands.

Several wetland types exist in the NBCR planning area. These wetlands are characterized based on the location in the landscape, soil, vegetation, and hydrology. Marshes, often a mix of emergent vegetation and open water, are probably the most recognizable wetland type in the NBCR planning area and form in many different landscapes, including in isolated depressions, along stream corridors and lakes, and in low-lying floodplain areas along the three forks of the NBCR. Wet meadows (areas with saturated soil conditions for much of the year) were once a common wetland type in the NBCR planning area but have been reduced since the time of European settlement because of drainage and agriculture. Flatwoods, a forested wetland type that is relatively uncommon in northern Illinois, are found in several locations along the forks of the North Branch. Vernal pools (forested wetland pockets that hold standing water during spring and early summer) are in the woodlands along the crests of the moraines that form the perimeter of the NBCR planning area.

The first comprehensive effort to inventory and map wetland resources in the NBCR planning area was the National Wetlands Inventory (NWI), undertaken by the United States Fish and Wildlife Service (USFWS) in the mid-1980s. NWI maps initially were developed by interpreting high-altitude aerial photographs using stereoscope, pen, and ink. Image interpretation for the NWI has evolved to now use geospatial software. There are 2,440 acres of wetlands identified in the NWI in the NBCR planning area in Lake and Cook Counties. This acreage includes streams, lakes, and ponds.

3.11.1.1 Lake County Wetlands

In 1990 a countywide wetland mapping effort was undertaken. The Lake County Wetland Inventory (LCWI) was initially published in 1993, comprehensively updated in 2002, and the current version has a publication date of 2009. By way of comparison, the LCWI reflects nearly twice the acreage of wetland resources for Lake County as the NWI and more than three times the acreage for the NBCR planning area in Lake County.

While the NWI offers a classification of wetland areas based on vegetation and hydrology, in 1992, the United States Environmental Protection Agency (USEPA) completed an ADID study of high-function wetlands in Lake County using the LCWI as a base. The ADID study identified about 200 wetland complexes

NOTEWORTHY: LAKE COUNTY WETLAND INVENTORY

The *Lake County Wetland Inventory (LCWI)* was originally developed in 1993 by a multi-agency team using a combination of information sources, including wetland inventory maps and the 1970 Soil Survey of Lake County by the USDA-Soil Conservation Service (SCS), National Wetland Inventory (NWI) maps by the USFWS, and various years of aerial photography. The LCWI was updated in 2002 using high resolution aerial photography and enhanced with Lake County GIS topographic information (elevation contours). The updated 2002 LCWI maps identify five different wetland types: *wetlands, farmed wetlands*, *artificial wetlands*, *converted wetlands*, and *ADID wetlands*. The LCWI is intended to improve the understanding and management of the County's wetland resources.

NOTEWORTHY: HIGH FUNCTIONALITY ADID WETLANDS

In 1992, Lake County implemented the *Advanced Identification (ADID)* process to identify high functionality wetlands that should be protected. The ADID program is a USEPA program developed to shorten permit processing time and provide information to local governments to aid in zoning, permitting and land acquisition decisions. Three primary functions were used by the USEPA and U.S. Army Corps of Engineers (USACE) to evaluate wetlands during the ADID process: biological functions (e.g., threatened or endangered species, wildlife habitat, and plant species diversity), hydrologic functions (e.g. stormwater storage), and water quality mitigation functions (e.g. sediment and toxicant retention, shoreline/bank stabilization).

in the county that were predicted to have high ecological, stormwater management, and water quality enhancement functionality. Twenty-four wetland complexes totaling 768 acres in the NBCR planning area in Lake County have been identified as high-quality wetlands through the ADID process. The three primary functions evaluated were ecological value based on wildlife habitat quality and plant species diversity; hydrologic functions such as stormwater storage value and/or shoreline/bank stabilization value; and water quality values such as sediment/toxicant retention and nutrient removal/ transformation function. Of the twenty-four ADID sites, 5 are in the West Fork subwatershed, 16 are in the Middle Fork subwatershed and 3 are in the Skokie River subwatershed.

The Lake County Wetland Restoration and Preservation Plan (WRAPP), which builds on these previous studies, provides the most current iteration of wetland resources and their functionality within the county. According to the WRAPP, approximately 3,000 acres or 28% of the pre-settlement wetlands remain in the NBCR planning area, along with 906 acres of streams, lakes and ponds. Estimated rates of historic wetland loss in the NBCR planning area (72%) are much greater than the overall estimated rate for Lake County (55%). The NBCR planning area also has the lowest percentage of existing wetland coverage of any major watershed in Lake County at approximately 9% of total area. The high rate of historic wetland loss and low percentage of existing wetland cover are attributed to the channelization and drainage of the large intermorainal wetland complexes that once existed along each of the three forks of the NBCR as well as the older relative age of urban development in the watershed. Figure 3-38 depicts the location of wetlands, as documented in the WRAPP.

FARMED WETLANDS: Agricultural cropped areas on hydric soil that have been cleared, partially drained, or filled.

ARTIFICIAL WETLANDS: Man-made water features typically constructed on non-hydric soil.

ADID WETLANDS: High functional wetlands identified by USEPA and others, based on biological, hydrological and water quality functions.

CONVERTED WETLANDS: Areas that have been drained or filled and no longer exhibit Wetland or Farmed Wetland characteristics.

HYDROGEOMORPHIC DESCRIPTORS: Characteristics that emphasize geomorphic and hydrologic attributes such as the landscape position, landform, water flow path, and waterbody type of a wetland or water body rather than biological characteristics.

WATER FLOW PATH: Descriptors that characterize the direction of water flow (inflow, outflow, throughflow, bidirectional flow, etc.)

LANDSCAPE POSITION: The physical setting of a wetland relative to a water body, if present (e.g. a wetland associated with a lake, a river, or a depression surrounded by uplands).

LANDFORM: The large-scale landscape features that affect the physical shape of a wetland or water feature (e.g. basin, flat, slope, island, or fringe).

POTENTIALLY RESTORABLE WETLANDS: Areas with predominantly hydric soils that are not mapped as wetlands on the LCWI and have not been converted to urban land use.

WETLAND ENHANCEMENT: Augmenting wetland functions beyond the current conditions; enhancement of one function sometimes can occur at the expense of other functions.

NOTEWORTHY: WETLAND RESTORATION AND PRESERVATION PLAN

The Wetland Restoration and Preservation Plan (WRAPP) was developed by SMC in 2018, with input from a 13-member Technical Advisory Group (TAG). Its dataset reflects enhancements of the 2002 LCWI maps using high resolution aerial photography and LiDAR collected since 2002, as well as existing information from the Lake County ADID study, soil surveys, and other available mapping products. Each WRAPP polygon was enhanced with descriptors associated with the NWI classification system and *hydrogeomorphology*. Using this combined information, the WRAPP estimates the functions (services) of mapped wetland and water resources for both existing and pre-settlement conditions within Lake County. The WRAPP will support watershed-based assessments of wetland function, identify locations of *potentially restorable wetlands (PRWs),* and identify opportunities for *wetland enhancement* and *preservation*. The WRAPP will include an on-line decision support tool (DST) to help users prioritize restoration and preservation opportunities based on acreage, wetland function or functional loss. This will allow the user to make informed decisions on wetland restoration and preservation options targeted to user-specific goals and objectives.

3.11.1.2 Cook County Wetlands

Based on the National Wetland Inventory there are an estimated 1,157 acres of wetlands within the NBCR planning area in Cook County. This includes 558 acres of streams, lakes, and ponds. As seen in Figure 3-38, these wetlands are found primarily in the floodplains immediately adjacent to the streams. Of the total wetland area, 973 acres (approximately 84%) lie within the land holdings of the CCFPD, and most of the forest preserve district wetlands are located within the Skokie Lagoons. The remaining 184 acres are located on public lands such as municipal parks, or on privately owned lands

3.11.2 WETLAND FUNCTION AND TYPE

Wetlands filter sediments and nutrients from runoff, provide wildlife habitat, reduce flooding, and help maintain water levels in streams. They also provide areas where groundwater is recharged by surface water. By performing these functions, wetlands improve the water quality and biological health of streams and lakes located downstream and protect public safety. The WRAPP evaluated thirteen wetland functions, which fall under three general groups: hydrologic functions, biodiversity functions, and water quality functions. As indicated in Table 3-30, not all wetlands within the NBCR planning area in Lake County perform all functions, and they also do not perform all functions equally well.

Table 3-30: Wetland Functions and Acreages Rating for the NBCR Planning Area

CATEGORY	FUNCTION	ACRES OF HIGH FUNCTIONAL SIGNIFICANCE
Hydrologic Functions	Flood Water Storage	2,434
	Stream Baseflow Maintenance	764
Biodiversity Functions	Native Fish Habitat	128
	Waterfowl Habitat	318
	Other Wetland-dependent Bird Habitat	767
	Woodland Amphibian Habitat	131
	Unique Wetland Resources	1,142
	Stream Shading	645
	Wildlife Movement Corridors	2,652
Water Quality Functions	Nutrient Transformation (P-focus)	39
	Sediment and Other Particulate Retention	1,120
	Shoreline/Stream Bank Stabilization	929
	Carbon Sequestration	715

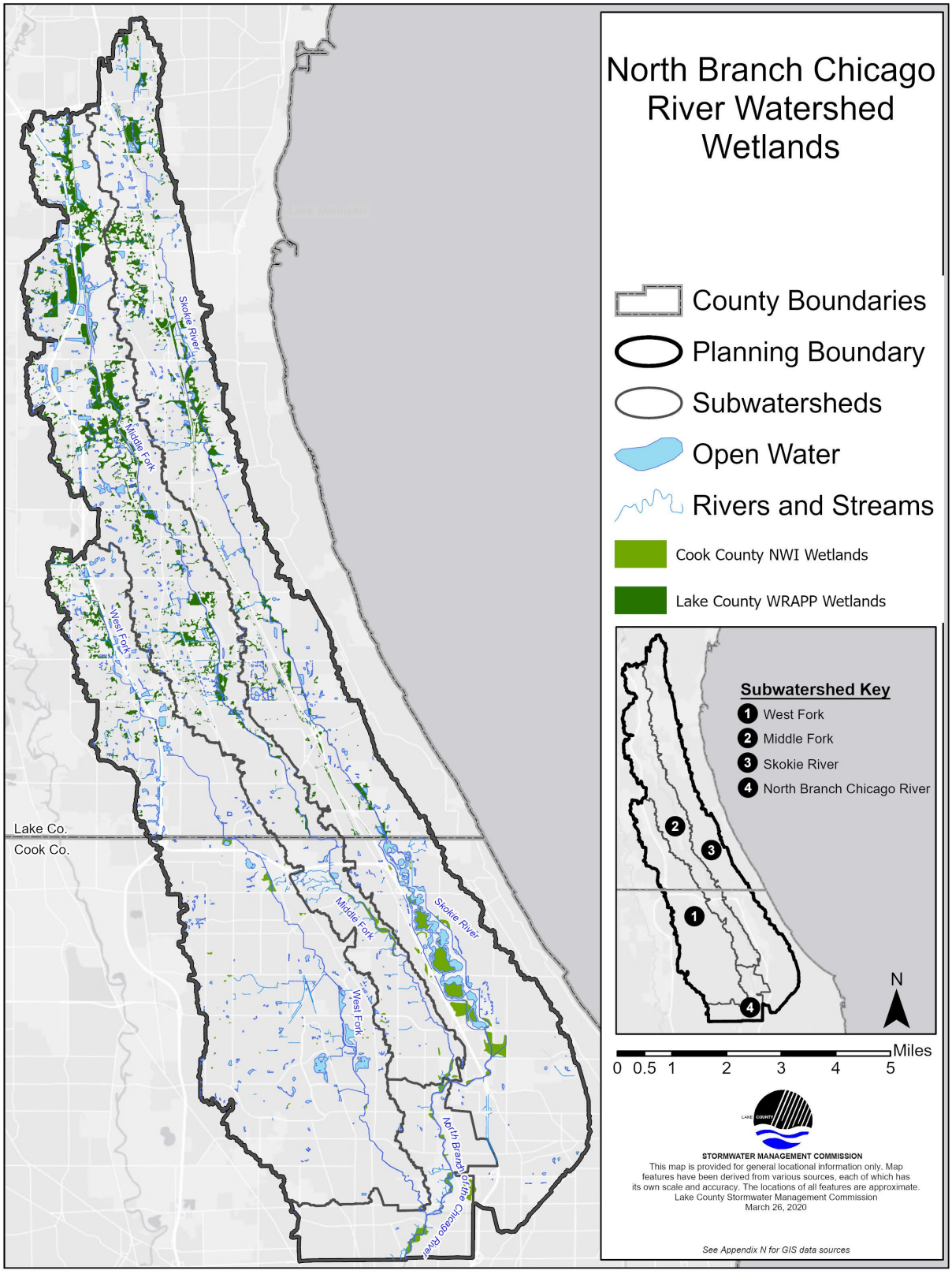


Figure 3-38: Wetland Locations

3.11.3 Approaches to and Tools for Wetland Management

Mitigation Banking: A system of credits and debits to offset environmental impacts associated with site development and achieve no net loss, typically accomplished via restoration, creation, enhancement, or preservation of similar wetland, stream, or natural habitats near the area of impact with the specific goal of compensating for unavoidable impacts to aquatic resources.

Wetland Preservation: Actions taken to maintain the size and functions of an existing wetland or water body.

Within a watershed, wetlands are managed using multiple approaches and various tools, including planning efforts, regulations, and voluntary activities. Advanced planning efforts can help identify wetland needs and potential locations. Countywide planning efforts include the WRAPP, the LCWI, and the ADID wetland studies previously described. Other efforts target specific areas of the county (e.g., select creeks in Fox River Watershed and the North Branch Chicago River watersheds, per Hey 2001a). Regulation of wetland impacts by agencies and municipalities is arguably the most visible approach for wetland management. This typically involves permits and may require mitigation which can occur at the national (USACE), state, county, and local (municipal) level.

At the county level, Lake and Cook County regulate wetlands through the WDO and WMO, respectively. In Lake County, the WDO establishes a no-net-loss policy for wetland impact, with a goal of net gain in function. The WDO sets the minimum requirements for the county, including the need for a permit to approve wetland impacts and requirement for mitigation if impacts exceed the minimum threshold. Wetland impacts within Lake County are to be mitigated within the county on a watershed basis. Wetland mitigation can take the form of mitigation banking, or a site-specific mitigation project involving wetland restoration, enhancement or, in rare cases, **preservation**. In Cook County, the WMO discourages wetland impacts, but allows for wetland mitigation in some cases. The WMO states the preferred wetland mitigation method is payment to **mitigation banks**. Voluntary wetland restoration and management efforts are performed not as a required activity adjunct to a regulatory action but in response to a desire to restore or manage a target wetland for a specific purpose (e.g., duck habitat, flood water storage, etc.). Typical approaches include wetland preservation, restoration or enhancement through on-the-ground activities that may include, but are not limited to, tile disablement, selective herbicide application, prescribed burning, on-line flow restriction, and water level control.

Noteworthy: Wetlands Protection in Lake County

Wetlands protection is provided under existing regulatory programs, including federal and state floodplain development restrictions, the USACE's Section 404 CWA wetland permit program, and the WDO. A permit/approval is required for any development that will impact wetlands in Lake County. The USACE Chicago District issues permits for impacts to federal *Waters of the U.S.* (WOUS), while Lake County issues written approvals for impacts to *Isolated Waters of Lake County* (IWLC). The USACE-Chicago District normally issues regional permits for impacts to less than 1.0 acre of non-high quality WOUS and compensatory mitigation typically is required at a minimum 1.5:1 replacement ratio for impacts over 0.1 acre to these wetlands. An individual permit from the USACE usually is required for proposed impacts to federal ADID sites, as ADID sites are generally considered unsuitable for filling activities. The individual permit process requires permit applicants to identify and assess practicable alternatives for avoiding and minimizing impacts to the federal ADID sites. In cases where an IP is issued for impacts to federal ADID sites, the USACE usually requires mitigation at a 3:1 or higher ratio. Lake County issues written approvals for IWLC impacts as part of the Watershed Development Permit process, in accordance with the WDO regulations. Compensatory mitigation is required at a 1.5:1 ratio for impacts to 0.1 acre or more of non-high quality IWLC and 3:1 or higher for impacts to high quality IWLC. The USACE-Chicago District's regulatory program and the WDO also require buffers of native vegetation around preserved wetlands to provide a natural transition between wetlands and developed upland areas and help treat stormwater runoff by filtering sediments and pollutants before the runoff reaches the wetlands. Required buffer widths vary depending on the size, type (linear vs. water body), and quality of the wetlands. For *High Quality Aquatic Resources* (HQAR), which include ADID sites, a 100-foot-wide buffer is required under both the USACE-Chicago District's regulatory program and the WDO. A 30- to 50-foot-wide buffer typically is required around all other wetland areas, depending on wetland size and type.

3.12 STREAM INVENTORY

3.12.1 INTRODUCTION AND METHODS

SMC conducted a stream inventory within the Lake County portions of the NBCR planning area (Table 3-31). SMC requested assistance from the MWRD to perform the stream inventories for the Cook County portion of the NBCR planning area because SMC does not have jurisdiction in Cook County. MWRD received assistance from the FPDCC and Triton Community College (Professor and students) to perform the stream inventory in the Cook County portion of the NBCR planning area. The NBCR planning area stream miles were divided into smaller stream reaches to be assessed for the inventory. There are approximately 80.58 miles of stream (175 stream reaches) within the NBCR planning area, but 11.17 stream miles (18 stream reaches) were unable to be assessed as part of this stream inventory. Action recommendations to inventory the remaining 11 stream miles to better assess the stream conditions will be addressed in Chapter 6. The following stream inventory information is based on the 69.41 miles (157 stream reaches) of assessed stream in Lake and Cook County. These assessments recorded qualitative information on several easily observed and measured parameters that provide information on the "baseline" conditions of the stream channel and riparian areas. The results provide a framework for prioritizing and implementing watershed management strategies.

The stream assessment includes the geomorphic characterization of the channel; identifying erosion, evaluating discharge points and hydraulic structures, obstructions, areas of deficient (riparian) buffer zones, and areas with significant detrimental impact on the stream. Visual observations include vegetation, water quality conditions, habitat assessments, and aquatic and terrestrial life. This allows for a more comprehensive assessment of the stream conditions. Information captured during the inventory process includes notes and comments about the stream not represented in the other forms, such as specific restrictions to stream, restoration efforts or conversations with residents. A copy of the Stream Inventory Methodology and Inventory Report Form is in Appendix B.

The NBCR planning area stream network is divided within each subwatershed into reaches; smaller geographically defined stream segments, for which data is aggregated and evaluated. A team of two observers wade the center line or if the stream was not accessible walk along the edge of bank of each reach to collect data. At representative points within each reach, the observers measure the channel dimensions and relative velocity at the surface of the stream. The observers photograph and document all areas of moderate to severe ***erosion***, significant ***sediment deposition***, debris jams, ***hydraulic structures,*** and ***discharge points***. Equipment to collect this data utilizes a global positioning system (***GPS)*** which provides geographic coordinates that translate point locations into GIS for analysis and mapping of data collected in the field. For determining bank erosion (lateral recession) additional measurements obtained include bank height, lateral recession rate (LRR),

EROSION: The process by which the surface of the earth is worn away by the action of water, glaciers, winds, waves

SEDIMENT DEPOSITION: The geological process in which sediments, soil and rocks are added to a landform or land mass.

HYDRAULIC STRUCTURES: Bridges, culverts, dams, weirs, or other structures spanning or crossing the stream channel.

DISCHARGE POINTS: The location where all sanitary, storm sewer and agricultural drainpipes surface or stormwater flows back into a lake or stream channel. Discharge points also include open channels, swales, gullies and other significant tributaries.

GPS: A system of earth-orbiting satellites, transmitting signals continuously towards the earth that enables the position of a receiving device on or near the earth's surface to be accurately estimated from the difference in arrival times of the signals.

DEFINED CHANNEL: Clearly discernable bed and banks of a flowing watercourse.

severity, and lateral recession characteristics. The stream inventory only assesses reaches that can be safely waded or walked on the banks and have a ***"defined" channel***. Reaches excluded from assessments are open-water ponds, lakes, impoundments, wetland complexes (without defined channel), roadside swales, small minor tributaries, or areas with restricted access or that create a hazard for the observer(s): depth of water, unstable substrate, velocity of water or a combination of the three. The following types of data were collected during the inventory and summarized in the following section:

- Channel conditions (dimensions of the banks and bed)
- Channelization
- Pool-riffle development
- Bank & channel erosion
- Sediment accumulation and debris loading
- Hydraulic structures (bridges, culverts, dams, etc.)
- Discharge points (storm sewers, pipes and overland flow draining to the stream)
- Riparian corridor (vegetated buffer along the stream)

Appendix B summarizes subwatershed and reach by in-stream and over-bank debris loads, substrate composition, channelization and sinuosity, bank erosion and channel dimensions.

3.12.2 Stream Network Description/Stream Reaches

The NBCR planning area stream inventory is comprised of four subwatersheds with three mainstem rivers that merge in the NBCR subwatershed (Figure 3-39). The NBCR planning area stream network has 80.58 miles of flow path through streams, wetlands, and lakes. The stream inventories assessed 69.41 miles of stream channel as shown in Table 3-31 and detailed information on the stream reaches in Appendix C. Each of the subwatersheds in the NBCR planning area are described below:

1. **Middle Fork Subwatershed:** The Middle Fork subwatershed encompasses 20.09 square miles (12,860.52 acres) of southeast Lake County and 5.02 square miles (3,212.5 acres) of north central Cook County. The Middle Fork and the Skokie River merge just outside the southeastern boundary of Northfield.

2. **North Branch Chicago River Subwatershed:** The North Branch Chicago River subwatershed encompasses 5.85 square miles (3,742.63 acres) of north Cook County. All three tributaries merge in this NBCR planning area to create the North Branch Chicago River.

3. **Skokie River Subwatershed:** Skokie River subwatershed encompasses 21.67 square miles (13,867.26 acres) of southeast Lake County and 13.41 square miles (8,582.3 acres) of north central Cook County.

4. **West Fork Subwatershed:** The West Fork subwatershed encompasses 8.91 square miles (5,700.1 acres) of southeast Lake County and 19.65 square miles (12,574.25 acres) of north central Cook County. The Middle and Skokie river connect with the West Fork in the northeast portion of Morton Grove.

Table 3-31: Stream Inventory Miles in the NBCR Planning Area

SUBWATERSHED	12-DIGIT HUC(s)	NO. OF STREAM REACHES	ASSESSED MILES
Middle Fork	071200030102	51	21.97
North Branch Chicago River	071200030105	7	5.00
Skokie River	071200030101	55	18.27
West Fork	071200030103	62	24.17
TOTALS		**175**	**69.41**

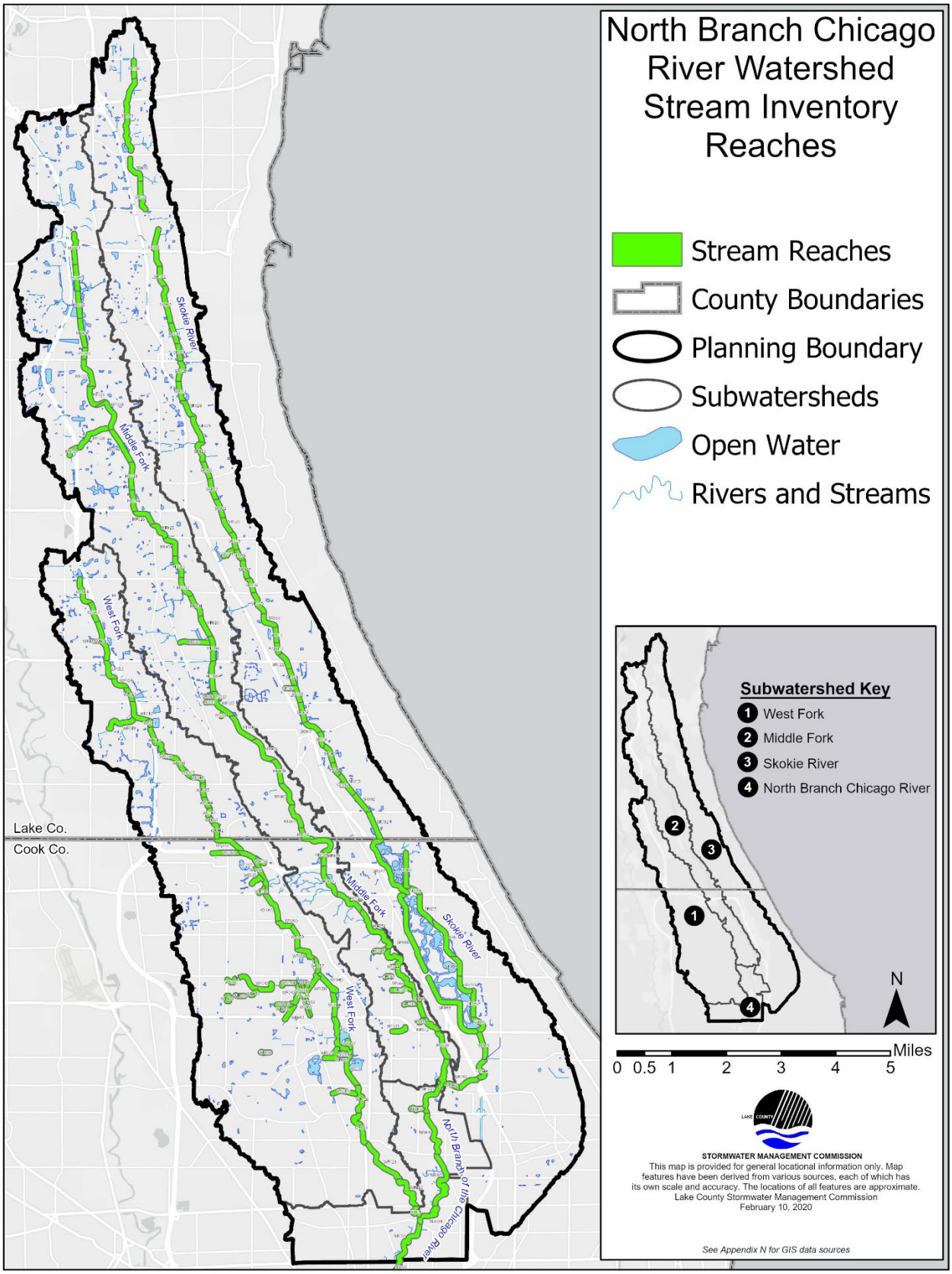


Figure 3-39: Stream Inventory Reaches

3.12.2.1 Channel Conditions

LOW OR HIGH FLOW CONDITIONS: Typically measured as a 7-day average of the lowest or highest water flow rates annually.

Measurements of the physical dimensions of the stream channel reflect the shape of the channel and the amount of water that it can transport under **low or high flow conditions**. A summary of channel conditions by subwatershed is shown in Table 3-32. There are significant differences in size and stability of the channels when considering the less developed northern areas of the Middle Fork and West Fork subwatersheds versus the highly developed middle to southern section of these subwatersheds and within Cook County. The Skokie River, unlike the Middle and West Fork, and North Branch Chicago River, has more pool/riffle development, less sediment accumulation, and lower debris loads. The Skokie River also has large sections of the headwater reaches piped underground.

Table 3-32: Channel Conditions in the NBCR Planning Area

SUBWATERSHED	BANK HEIGHT (FT.)		CHANNEL WIDTH TOP (FT.)		CHANNEL WIDTH BOTTOM (FT.)	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Middle Fork	0.4	12	2.0	50	1.0	32
North Branch Chicago River	1.0	15	2.8	110	2.6	92
Skokie River	0.4	13	2.0	167	1.0	139
West Fork	0.1	20	2.0	92	1.2	92

3.12.2.2 Channelization



Figure 3-40: Channelization in the Middle Fork Subwatershed

Stream channelization describes any activity that moves, straightens, shortens, cuts off, diverts, or fills in a stream channel (Figure 3-40). These activities, which include widening, narrowing, or lining a stream channel, alter the discharge and increase the velocity of water flowing through the streams. In natural meandering streams, channelization decreases the length of the stream and increases the gradient of the channel. Channelized streams may be susceptible to bank instability and channel erosion, because it is the nature of concentrated, flowing water to create meandering channels with overbank floodplains that dissipate the energy of the flowing water. Modifications in one area of the watershed or stream channel affect other areas upstream, downstream and within the immediate area. Table 3-33 and Figure 3-41 illustrate the degree of channelization of assessed reaches in each subwatershed within the NBCR planning area. In the NBCR planning area, the three main stems serve as stormwater conveyance systems and have been extensively channelized by the drainage districts to improve drainage from surrounding lands. The degree of channelization is ranked based on the percentage of channelization. Reaches with channelization of 1%-33% ranks “low”, 33%-66% ranks “moderate”, and >66% of a reach channelized ranks “high”. Reaches ranked as “None” have no indication of channelization.

The majority (86%) of stream reaches assessed in the NBCR planning area had “moderate” or a “high” degree of channelization, 13% had a low degree of channelization and 1% had no degree of channelization. The Skokie River watershed had the highest percentages of channelization with 88% of its reaches being channelized. The

stream reaches adjacent to the Skokie Lagoons were not assessed during this inventory, so the Skokie River channelization percentage results may be slightly skewed.

Table 3-33: Degree of Channelization in the NBCR planning area

SUBWATERSHED	DEGREE (# OF REACHES)				
	NONE	LOW	MODERATE	HIGH	TOTAL
Middle Fork	1	7	14	25	47
North Branch Chicago River	0	6	0	0	6
Skokie River	0	1	4	38	43
West Fork	0	6	18	37	61
TOTAL	1	20	36	100	157

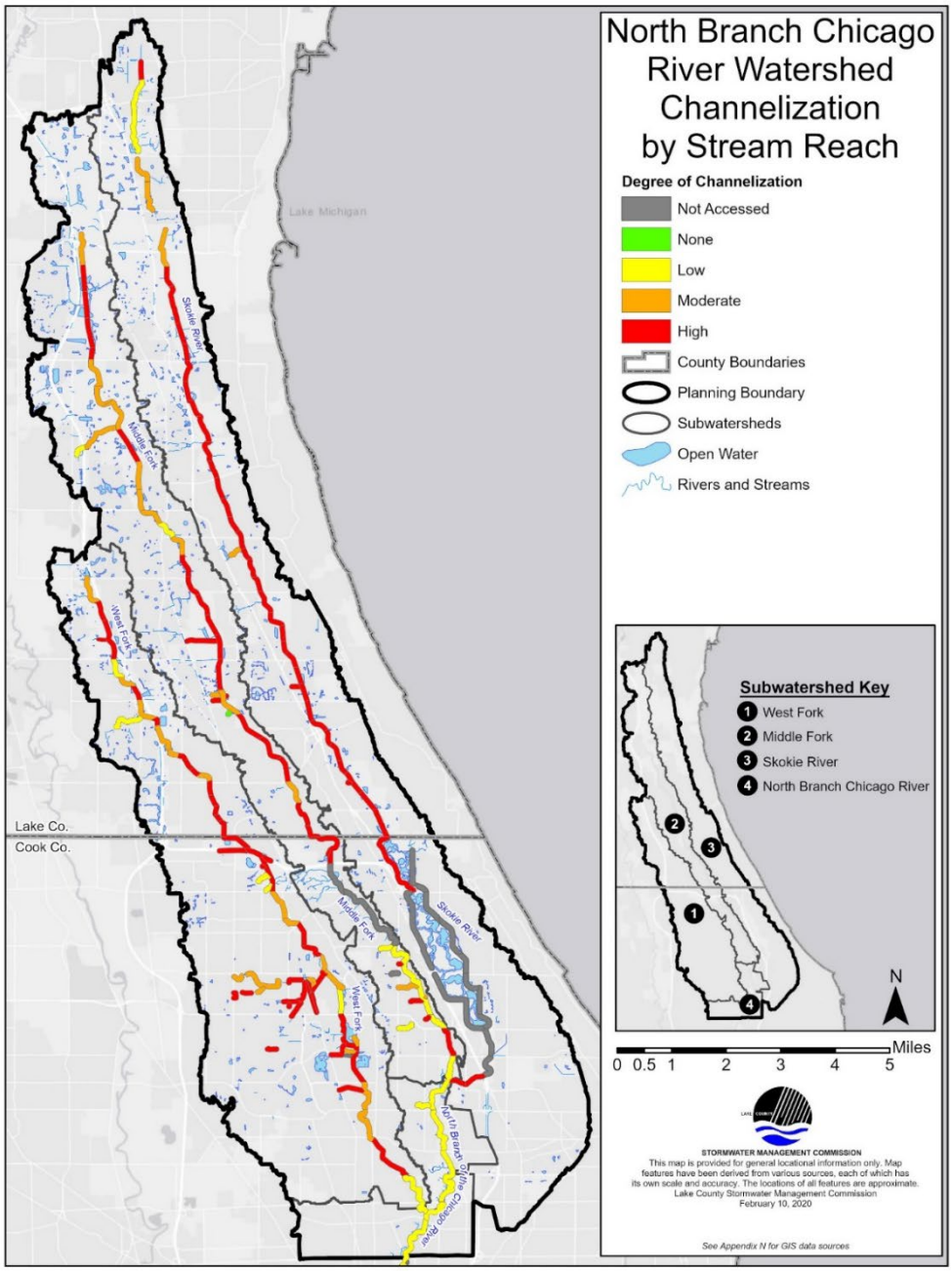


Figure 3-41: Channelization by Stream Reach

3.12.2.3 Pool-Riffle Development

Under baseflow conditions, pools are low-gradient areas of deeper water with slower velocity and riffles are high-gradient areas of shallow water with higher velocity. During baseflow conditions, sediment erodes from riffles and is deposited into pools. During bankfull conditions, the relationship of relative velocity in riffles and pools is reversed and sediments along with substrate material are scoured from pools and the channel bed and deposited on riffles or bars. During periods of elevated flow when the velocity in pools exceeds that over riffles, deposition and bar formation tend to occur in areas adjacent to pools (Figure 3-42).

In a single-**thalweg** meandering channel, pools are typically associated with the outer portions of meander bends while riffles are typically located above or below pools and bars typically form alongside pools or runs. Pools and riffles exhibit very different physical conditions and are often adjacent to one another in the channel. Due to there typically shallow depth, increased gradient and large sediment size, riffles cause turbulence throughout the water column which aerates the stream, causing oxygen to dissolve from the air into the water. Pools have slower velocities and increased depth, offering habitat to a wide range of aquatic species for a variety of uses. Channelization often reduces the extent of pool-riffle sequences in a stream. Most stream channels in the NBCR planning area exhibit some degree of pool-riffle development as shown in Table 3-34 and Table 3-35.

THALWEG: the line of lowest elevation within a valley or watercourse.

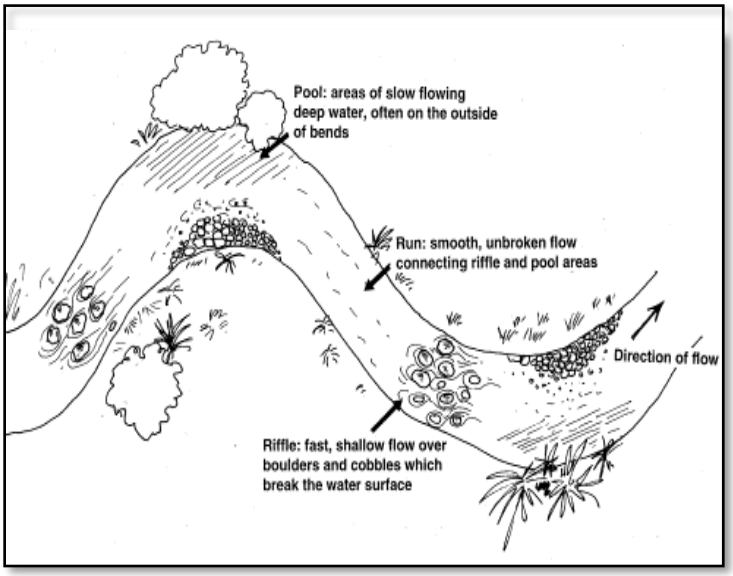


Figure 3-42: Pool/Riffle Sequence
Source: National Institute of Water and Atmospheric Research

A majority of stream reaches in the NBCR planning area exhibited 0-10% of the reach having a riffle/pool development. Most of the NBCR main stems are moderately or highly channelized so it would make sense that there would be low pool/riffle development in those reaches. The direct correlation between highly channelized streams and low pool/riffle development is evident in the West Fork subwatershed where 60% of stream reaches exhibited high channelization, 80% of stream reaches exhibited 0-10% of riffle development and 96% of stream reaches exhibited 0-10% of pool development.

Table 3-34: Percent of Stream Reaches with Riffle Development in the NBCR planning area

SUBWATERSHED	0-10%	11-30%	31-50%	51-75%	75%+
Middle Fork	83%	13%	4%	0%	0%
North Branch Chicago River	83%	17%	0%	0%	0%
Skokie River	65%	30%	5%	0%	0%
West Fork	80%	17%	3%	0%	0%
AVERAGE PERCENTAGE	**77%**	**19%**	**4%**	**0%**	**0%**

Table 3-35: Percent of Stream Reaches with Pool Development in the NBCR planning area

SUBWATERSHED	0-10%	11-30%	31-50%	51-75%	75%+
Middle Fork	65%	33%	2%	0%	0%
North Branch Chicago River	83%	0%	17%	0%	0%
Skokie River	67%	26%	7%	0%	0%
West Fork	96%	28%	7%	0%	0%
AVERAGE PERCENTAGE	**69%**	**25%**	**5%**	**1%**	**0%**

3.12.2.4 Streambank Erosion

The Rapid Assessment Point Method (RAP-M) assesses lateral recession and provides the degree of streambank erosion (Windhorn, 2000). LRR evaluates streambanks along the right and left bank (facing upstream) for each assessed reach. Segments with LRR characteristics were photo documented and measurements of left and right bank height and length were collected. The combined analysis allows for an overall assessment regarding the severity of the entire reach, including review of photographs, and repeatable measurements taken in the field. The methodology for lateral recession can be found in Appendix B.



Figure 3-43: Streambank Erosion in Skokie River Subwatershed

Streams are dynamic systems, in a perpetual state of flux, therefore, all banks exhibit some form of erosion (Figure 3-43). Streambank erosion is one of the most significant and visible problems for the NBCR planning area. Surface runoff to streams contributes to streambank erosion and is dependent upon key factors such as the duration, timing, and amount of precipitation; the type and condition of soil within the NBCR planning area; and land use and vegetative buffers. The NBCR planning area stream inventory assessed the degree of streambank erosion for each stream reach. The description of qualitative assessment criterion for streambank erosion is shown in Table 3-36 and the results of the streambank erosion assessment are summarized below in Table 3-37.

Table 3-36: Bank Erosion Criteria in the NBCR Planning Area

CATEGORY	DESCRIPTION
Low (1-10%)	Some bare bank but active erosion not apparent. Some rills but no vegetative overhang. No exposed tree roots.
Moderate (11-33%)	Bank is predominantly bare, with some rills and vegetative overhang.
Severe (34-66%)	Bank is bare, with rills and severe vegetative overhang. Some exposed tree roots and some fallen trees and slumps or slips. Minor changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped.
Very Severe (67-100%)	Bank is very bare, with deep rills and severe vegetative overhang. Many exposed tree roots and fallen trees and slumps or slips. Extreme changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section is U-shaped.

Table 3-37: Percent of Stream Reaches with Streambank Erosion in the NBCR Planning Area

EXTENT OF EROSION	NONE (% OF MILES ASSESSED)	LOW (% OF MILES ASSESSED)	MODERATE (% OF MILES ASSESSED)	SEVERE (% OF MILES ASSESSED)
Middle Fork	2%	35%	49%	14%
North Branch Chicago River	8%	3%	60%	30%
Skokie River	5%	48%	41%	7%
West Fork	0%	30%	31%	39%
PERCENT OF TOTAL STREAM REACHES	**2%**	**35%**	**42%**	**21%**

The results of the stream inventory indicate 42% of the stream miles were moderately eroded, 21% of stream miles were severely eroded and 37% of stream miles had low or no erosion. Some stream reaches assessed and exhibiting "none" or "low" bank erosion had portions of the flow path through wetland complexes.

3.12.2.5 Sediment Accumulation

Sediment erosion, transport and deposition are naturally occurring processes in stream systems. Land use changes and anthropogenic modifications within the watershed can amplify the magnitude of these processes (see Figure 3-44). Typically, a stream generates, suspends, and transports sediment through high-gradient reaches and deposits sediment in low gradient reaches and/or in areas where velocity decreases. These low-velocity areas may be naturally occurring areas such as pools or sloughs. They may also occur behind debris jams or beaver dams or upstream of channel constrictions (such as culverts) or dams.



Figure 3-44: Sediment Accumulation in the West Fork

Fluctuations in discharge rate results in a stepwise movement of deposition and storage of sediment within the stream network. Increased sediment transported during storm events will increase sedimentation rates in downstream channels. Excessive sediment deposition affects fish and the benthic community in several ways including: the suspended sediment can interfere with food gathering or filtering organisms; decrease light levels which impact productivity and reproduction; and sediment accumulation on the bottom of channels can bury organisms to the point of starvation or death. Once sediment has entered waterways it is difficult and expensive to remove, requiring engineering solutions and heavy equipment. Preventative measures such as the revegetation of riparian areas and streambanks can help reduce sediment transport and bank erosion.

Most reaches in the NBCR planning area had "Low" or "Moderate" sediment accumulation (Table 3-38). Of the assessed reaches for the Skokie River, 63% exhibited low sediment accumulation. Also, a quarter of the reaches in the West Fork exhibited moderate sediment accumulation.

Table 3-38: Percent of Sediment Accumulation in the NBCR Planning Area

SUBWATERSHEDS	NONE (% OF REACHES)	LOW (% OF REACHES)	MODERATE (% OF REACHES)	HIGH (% OF REACHES)
Middle Fork	20%	54%	22%	4%

SUBWATERSHEDS	NONE (% OF REACHES)	LOW (% OF REACHES)	MODERATE (% OF REACHES)	HIGH (% OF REACHES)
North Branch Chicago River	0%	17%	66%	17%
Skokie River	16%	63%	16%	5%
West Fork	16%	38%	25%	21%
AVERAGE PERCENTAGE	**17%**	**48%**	**24%**	**11%**

None: 0%, Low: 1-33%, Moderate: 34-66%, High: 67-100%

3.12.2.6 Debris Loading

In addition to sediment, most streams transport debris (organic material typically originating outside the stream itself, such as tree limbs, brush, and leaves). Debris transport is a naturally-occurring stream process that can provide habitat and contribute to a diverse instream environment, however, too much debris can be problematic and may result in large debris jams, causing backwater flooding and sediment deposition (Figure 3-45). Debris jams can also cause erosion of the streambanks which can damage riparian lands and property. The instream and overbank debris load test assessed the extent to which debris was causing problems or had the potential to cause problems in the channel or on the banks such as obstructing flow or deflecting stream flow into the bank causing erosion.



Figure 3-45: Debris Jam in the Middle Fork

In the NBCR planning area, reaches having a moderate or high debris load are considered to have the potential to be problematic. In some cases, these reaches may be in natural or open space areas and no action is needed or warranted. In other cases, moderate or high debris loads may be problematic, and, for example, debris jams may warrant removal. Table 3-39 summarizes the reaches with moderate or high instream and/or overbank debris loads. These reaches exhibit multiple debris jams, beaver dams, or overhanging debris obstructions extending across all or significant portions of the channel and/or onto the banks. In NBCR planning area, 39 reaches (26.2% of reaches assessed) exhibited moderate to high debris loads.

Table 3-39: Percent of Debris Loading in the NBCR Planning Area

SUBWATERSHEDS	INSTREAM DEBRIS	OVERBANK DEBRIS
Middle Fork	20%	22%
North Branch Chicago River	17%	83%
Skokie River	16%	21%
West Fork	38%	23%
TOTAL	**26%**	**25%**

3.12.2.7 Hydraulic Structures

Hydraulic structures are bridges, culverts, dams, weirs, or other structures spanning or crossing the stream channel (Figure 3-46). These structures modify or have the potential to modify the pattern or amount of flow in the stream channel and may act as constriction points under certain flow conditions (such as heavy rainfall

events), leading to backwater flooding. Additionally, dams and weirs can impede the movement of fish and other aquatic organisms within the stream network. Culverts may create temporary or permanent barriers if scouring causes the bottom of the culvert to become elevated above the water level of the stream. Problem hydraulic structures include obstructed culverts and bridges, culverts that are undermined or collapsed, bridges, culverts, dams and weirs that have been washed out, and beaver dams that are causing severe bank erosion or impounding a significant volume of water or length of stream channel. Structures listed as "problem" structures were identified as needing further inspection; however, this designation is not a definitive determination that the structure is defective.



Figure 3-46: Culvert in the West Fork subwatershed

Many areas of the NBCR planning area were modified by channelization and the construction of hydraulic structures. These changes result in a decreased quantity of pool-riffle complexes, increased sediment accumulation, increased debris loads, habitat alteration and decreased biological productivity. Bridges were present in all four subwatersheds. The number of bridges per subwatershed ranged from 12 – 66 and the number of culverts per subwatershed ranged from 2 – 95 from the stream inventory assessment. Higher concentrations of bridges and culverts may be related to urbanization and development of areas in a subwatershed. A total of 8 dams were assessed during the stream inventory, of which over half of the dams were located in the West Fork subwatershed. Table 3-40 contains a summary of hydraulic structures in the NBCR planning area.

"Problem Hydraulic Structures," defined as structures that may require further inspection or repair, were found in three out of the four subwatersheds of the NBCR planning area. The West Fork had the most problem structures but the North Branch Chicago River subwatershed had no problem hydraulic structures. Appendix B contains the complete summary of the 447 hydraulic structures recorded during the NBCR planning area stream inventory. Figure 3-47 maps the problem hydraulic structures identified.

Table 3-40: Problem Hydraulic Structures in the NBCR Planning Area

SUBWATERSHEDS	BRIDGE	CULVERT	*DAM	OTHER	TOTAL STRUCTURES	PROBLEM STRUCTURES	% OF STRUCTURES IDENTIFIED AS PROBLEM STRUCTURES
Middle Fork	52	58	2	3	115	13	11%
North Branch Chicago River	12	2	1	0	15	0	0%
Skokie River	83	65	0	1	147	23	16%
West Fork	66	95	5	4	170	25	15%
TOTALS	**213**	**220**	**8**	**8**	**447**	**61**	**14% of the Total Structures**

**Dams located on reaches not assessed were not included in the stream inventory.*

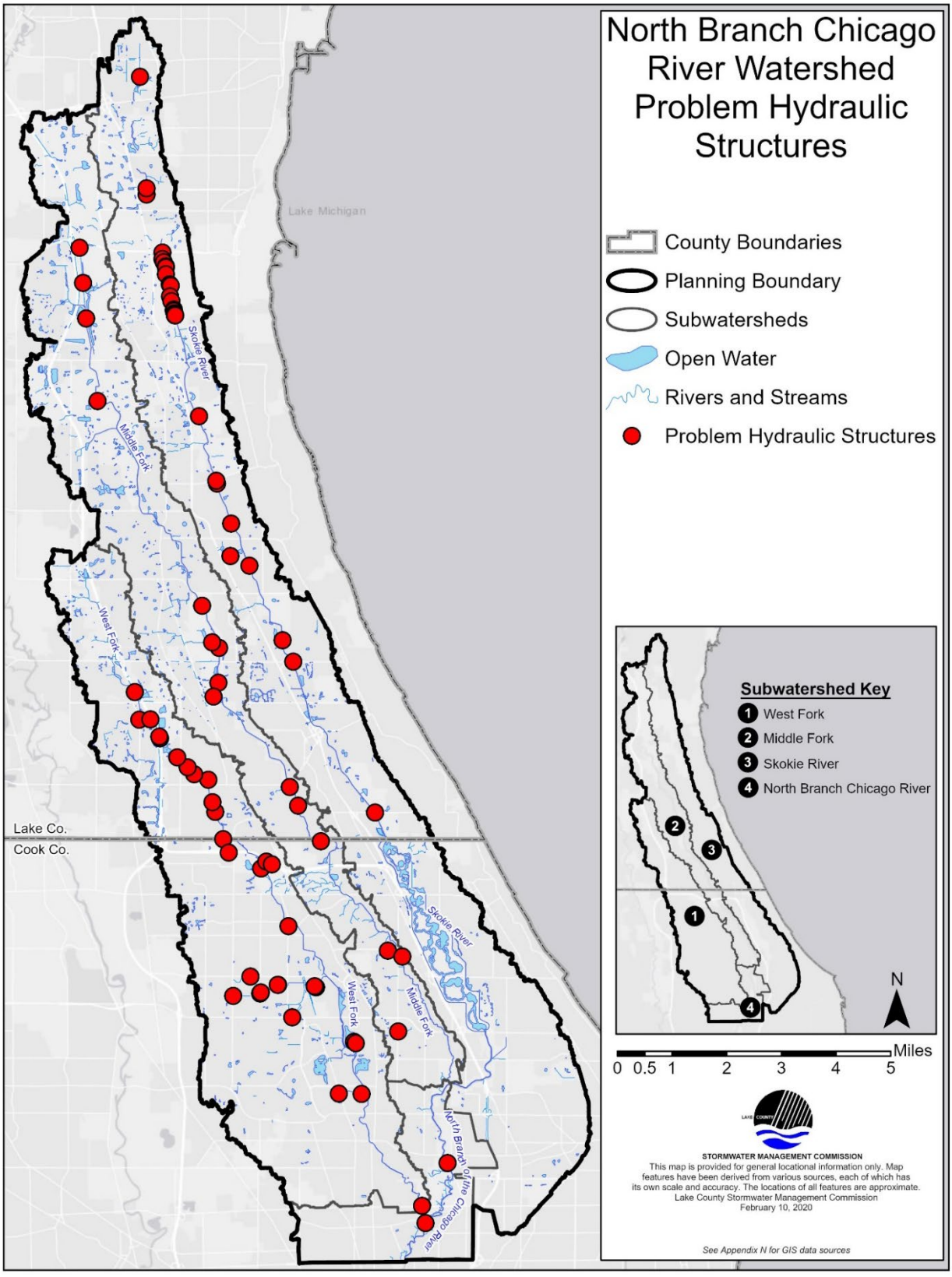


Figure 3-47: Problem Hydraulic Structures

3.12.2.8 Discharge Points

Discharge points are identified as outfalls that discharge into streams including "pipes" such as drain tile outlets, sump pump discharges, storm sewers and "open channel" discharges such as drainage swales, gullies, and small tributaries (Figure 3-48). The stream inventory documented 1,468 discharge points into the stream network. Discharge points were most common in urban and residential areas where sump pump and stormsewer outfalls are frequent. The West Fork subwatershed contained the largest number of discharge points and the highest density of discharge points per stream mile where a substantial portion of the watershed is suburban and residential development.



Figure 3-48: Example of a Discharge Point

Problem discharge points in the NBCR planning area contribute to streambank and channel erosion and the transport of excess sediment and associated nutrients to the stream channel. The location of these points is summarized in Table 3-41 and shown in Figure 3-49. Pipes commonly cause erosion below the end of the pipe, resulting in a positive feedback loop of bank erosion near the pipe, which may result in pipe, end section, apron, or supporting structure failure. Gullies and other open channels can also result in bank erosion, as they deliver concentrated flow to the stream channel. Pipes that appeared to have discolored discharge, substances other than water, or substantial damage were noted in the inventory.

Table 3-41: Problem Discharge Points in the NBCR Planning Area

DISCHARGE POINTS	SWALES, GULLIES, & TRIBUTARIES	PIPES, STORM SEWERS, & CULVERTS	TOTAL DISCHARGE POINTS	PROBLEM DISCHARGE POINTS	DISCHARGE POINTS PER ASSESSED STREAM MILE
Middle Fork	83	276	359	88	16.34
North Branch Chicago River	13	59	72	37	14.40
Skokie River	49	389	438	143	23.97
West Fork	79	520	599	181	24.78
TOTALS	**224**	**1,244**	**1,468**	**449**	**21.15**

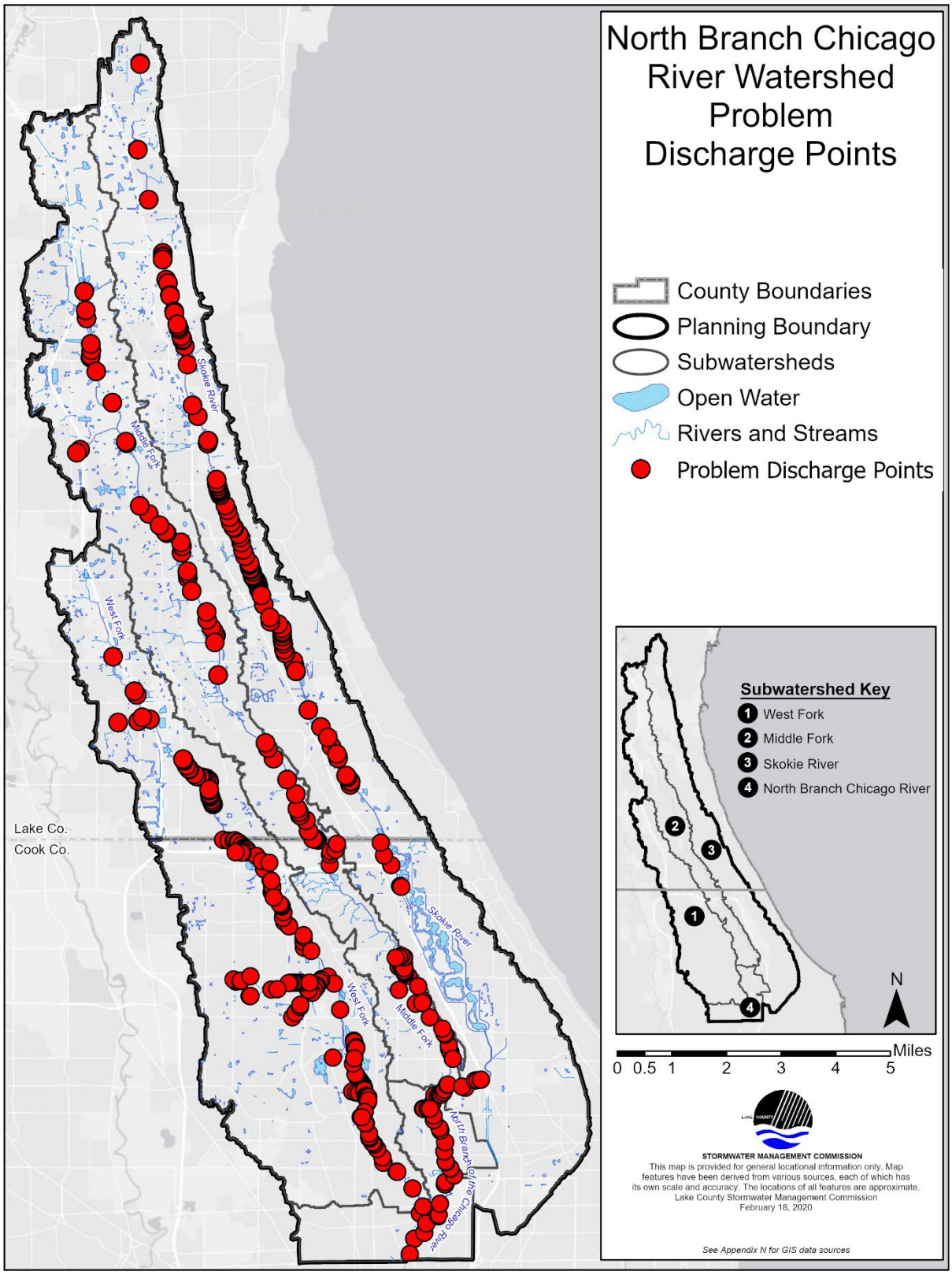


Figure 3-49: Problem Discharge Locations

3.12.2.9 Riparian Buffers

The riparian zone is the area extending 100 feet from the left and right side of the stream channel (Figure 3-50). Vegetated riparian buffers are of interest because riparian vegetation can make streambanks more resistant to erosion, buffers act as filters for runoff and pollutants, and riparian areas offer habitat for wildlife and can be important links in the watershed green infrastructure network. Riparian vegetation also provides beneficial shading to streams and lakes which helps to avoid temperature stress on fish and aquatic organisms. The width and quality of vegetated riparian buffers were visually assessed while walking the stream channel throughout the inventory and checked with aerial photography for each reach, including several reaches that were not otherwise assessed in the inventory. Table 3-42 summarizes the assessment criterion for buffer width, while Figure 3-51 maps the observed vegetated riparian buffer quality in 2019-2020. Throughout the NBCR planning area, riparian buffer width was related to riparian land use, with wide riparian buffers ("High" buffer width) in locations where the stream flows through open space areas and narrow buffers ("Low" buffer width) to no buffers ("None" buffer width) in locations where the stream flows through developed areas. Generally, less urbanized areas had wider riparian buffers and flows through more open space areas. Urban areas had narrower buffers.



Figure 3-50: Example of a Riparian Buffer

RIPARIAN ZONES

NONE: <20 feet buffer width and zone contain little or no riparian vegetation due to human activities.

LOW: 20–40-foot buffer width and zone is impacted a great deal by human activities

MODERATE: 40–60-foot buffer width and zone is impacted minimally by human activities.

HIGH: >60-foot buffer width and zone is not impacted by human activities (e.g. no parking lots, roadbeds, lawns, crops.

Table 3-42: Riparian Buffer Widths in the NBCR Planning Area

SUBWATERSHED	STREAM REACH RIPARIAN BUFFER WIDTH CONDITIONS *(based on assessed stream inventory data)*			
	NONE (miles)	LOW (miles)	MODERATE (miles)	HIGH (miles)
	<20' buffer	20-40' buffer	40-60' buffer	>60' buffer
Middle Fork	0.61	9.61	4.53	7.28
North Branch Chicago River	0.00	0.30	1.61	2.99
Skokie River	0.00	9.97	6.65	1.76
West Fork	8.62	8.63	6.55	0.59
TOTALS:	**9.23**	**28.51**	**19.34**	**12.62**

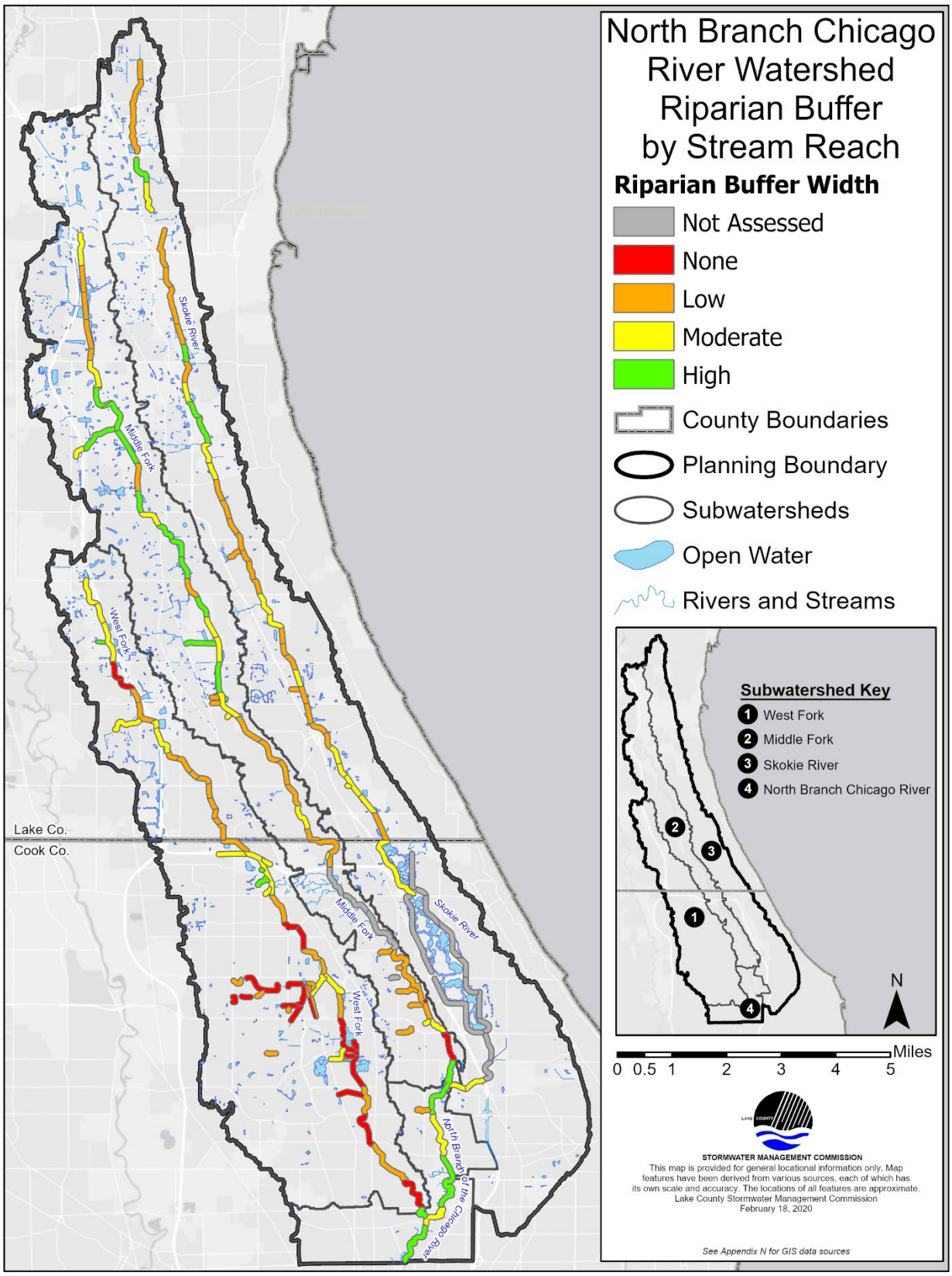


Figure 3-51: Riparian Buffers by Stream Reach

3.13 LAKE INVENTORY

3.13.1 INTRODUCTION AND METHODS

The Illinois Environmental Protection Agency (Illinois EPA) defines lakes as open bodies of water greater than 6 acres. Lake County defines lakes as open bodies of water greater than 20 acres (Figure 3-52). This assessment was conducted on all lakes greater than 20 acres and lakes less than 20 acres that the Illinois EPA lists as impaired. Using these criteria, ten lakes were identified in the NBCR planning area.

A lake inventory was conducted to assess the health of lakes within the NBCR planning area and provide information on natural and anthropogenic impacts to lake systems. Additionally, water quality parameters were assessed by the Lake County Health Department – Ecological Services (LCHD-ES), Illinois EPA, and IDNR to measure chemical, physical, and biological aspects of water quality. The parameters assessed at each lake are summarized in Table 3-43: Parameters Assessed by Lake. Collectively this data provides essential information for watershed planning and management. See Section 3.16 for a summary of fish, aquatic plants, FQI and water quality data.

Table 3-43: Parameters Assessed by Lake

LAKE	SHORELINE EROSION	FISH	AQUATIC PLANTS	FQI	WATER QUALITY MONITORING	MONITORING AGENCY
Chicago Botanic Garden	X				X	Illinois EPA, SMC
Eagle Lake	X		X	X	X	LCHD, SMC
Lake Eleanor	X		X	X	X	LCHD, SMC
Lake Glenview	X	X	X		X	LCHD, SMC
Lake Kathryn	X		X	X	X	LCHD, SMC
Lambs Farm Lake	X	X	X	X	X	LCHD, SMC
Lucky Lake	X			X	X	LCHD, SMC
Old School Lake	X	X	X	X	X	LCHD, SMC
Skokie Lagoons	X					Illinois EPA, FPDCC, SMC
Valley Lo Lake	X					SMC

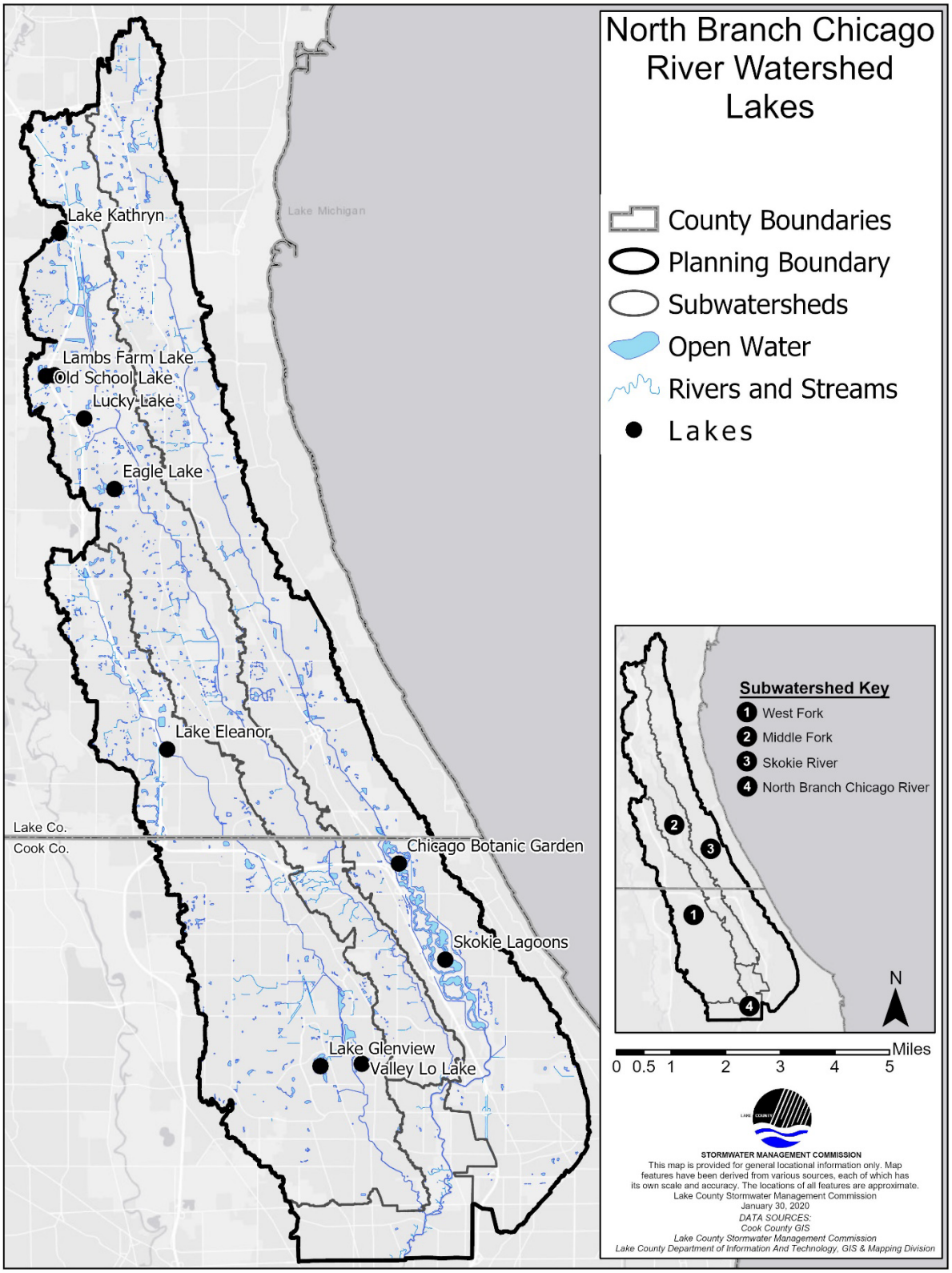


Figure 3-52: Lakes

3.13.2 Shoreline Erosion

Shoreline erosion is a natural process which results in the loss of sediment from a shoreline. Shoreline erosion occurs gradually; however, anthropogenic influences such as clearing of vegetation or rocks and increased stormwater runoff can substantially accelerate this process. Sediments eroded from shorelines are transferred to the lake's water column, which increases turbidity and introduces nutrients and contaminates which are attached to the sediment. This sediment is mostly deposited on the lake bed, which can result in degraded habitat for fish and aquatic life.

SHORELINE EROSION CATEGORICAL VALUES

NONE: No visible erosion. Includes purpose-built erosion control structures such as rip-rap and sea walls.

SLIGHT: Minimal observable erosion. Generally considered stable.

MODERATE: Obvious recession and/or eroded banks. Area may exhibit some exposed roots, fallen vegetation or minor slumping.

SEVERE: Recession is characterized by eroding of exposed soil on nearly vertical banks, exposed roots, fallen vegetation, extensive slumping of bank material, undercutting, washouts, or fence posts exhibiting realignment.

SMC assessed shoreline erosion at 10 lakes in the NBCR planning area. Assessments were conducted by canoeing the perimeter of the waterbody and assigning a categorical value (none, slight, moderate or severe) for each segment of shoreline erosion. Values were recorded in ESRI collector using an iPad and photographs were taken at each shoreline segment. Of the 10 assessed lakes, 8 had moderate or severe shoreline erosion (Table 3-44). Shoreline erosion categorized as moderate or severe may warrant implementation of erosion control practices; however, further site investigation is needed to determine if remedial action is necessary.

Table 3-44: Lake Shoreline Erosion Assessment Results

LAKE NAME	% NONE	% SLIGHT	% MODERATE	% SEVERE
Chicago Botanic Garden	72	24	4	0
Eagle Lake	11	72	17	0
Lake Eleanor	82	18	0	0
Lake Glenview	12	80	9	0
Lake Kathryn	2	32	65	0
Lambs Farm Lake	37	23	40	1
Lucky Lake	22	45	32	1
Old School Lake	96	4	0	0
Skokie Lagoons*	2	41	53	4
Valley Lo Lake	45	50	6	0

**Assessment includes a portion of Skokie Lagoons categorized as Skokie River. Percentage values for some lakes may not total 100% due to rounding errors.*

3.14 STORMSEWER NETWORK

The natural drainage system of the NBCR planning area has changed where transportation, residential, commercial, institutional and industrial land uses have replaced open lands. These land use/cover changes limit the land's capacity to infiltrate and store precipitation and runoff. In these portions of the NBCR planning area, a stormsewer network or **stormsewershed** drains runoff directly to a stream or lake, or into a detention basin, which collects water before discharging it into a stream or lake. Stormsewersheds

STORMSEWERSHED: The land area drained by a stormsewer or stormsewer network.

were delineated in the watershed by reviewing available stormsewer GIS data intersecting with SMC and MWRD catchment data. The NBCR planning area contains 47,466.17 acres (78% of NBCR planning area) of stormsewersheds (see Table 3-45 and Figure 3-53).

Table 3-45: Stormsewersheds in the NBCR Planning Area

SUBWATERSHEDS	TOTAL ACRES	ACRES OF SEWERED AREA	PERCENT OF SUBWATERSHED SEWERED
Middle Fork	16,073.01	10,822.59	67%
North Branch Chicago River Upstream	3,742.63	3,289.10	88%
Skokie River	22,449.55	17,133.69	76%
West Fork	18,274.35	16,220.78	89%
TOTALS:	**60,540**	**47,466**	**Total % of Watershed: 78%**

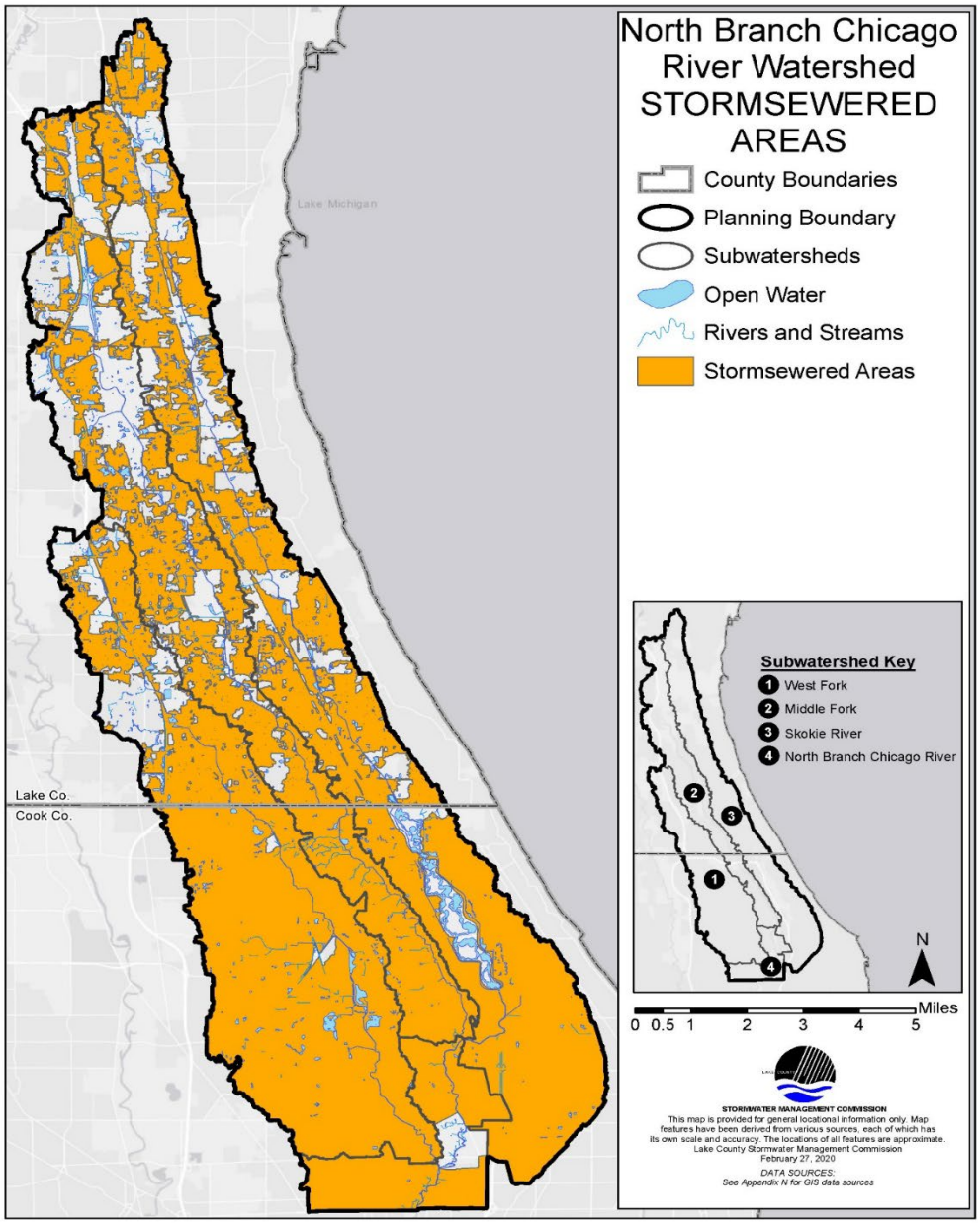


Figure 3-53: Stormsewered Areas

Undeveloped areas, lands used for agriculture, and many older residential developments do not have stormwater detention facilities as they were built before detention basins were required by ordinances. Communities, primarily in Lake County utilize road drainage through a series of vegetated ditches and culverts.

Open space areas that utilize drain tiles to transport stormwater runoff were not included in stormsewersheds unless GIS data indicated the presence of stormsewer data; drain tiles act as rural stormsewersheds.

3.15 DETENTION BASIN INVENTORY

In 2019, SMC conducted a detention basin inventory in the NBCR planning area. The inventory was conducted by combining data from the 1999 and 2006 North Branch detention basin inventories in Lake County and conducting field assessments in 2019 at detention basins in Cook County. The recommendations from the 1999 and 2006 (Lake County) detention basin inventories were updated to reflect current best management practices and plan priorities. Detention basins were identified using aerial imagery analysis and field inspections. Basins were assessed for location (latitude/longitude), design features, maintenance and design

needs, potential safety problems, and retrofit opportunities. Assessments were conducted at 666 detention basins (Table 3-46 and Figure 3-54). Appendix C summarizes the detention basin inventory results.

3.15.1 Constructed Basins, Pre and Post 1992

In 1992, the Lake County WDO restricted stormwater release rates for all new development within Lake County. The WDO was generally more restrictive than the municipal ordinances it superseded. The WDO limited release rates from the 2-year recurrence interval design storm to 0.04 cfs per acre of development area and limited release rates from the 100-year recurrence interval design storm to 0.15 cfs per development acre. Basins built after the adoption of the WDO are required to meet these discharge rates. Basins within Cook County were not included in this analysis because the WDO is not applicable in Cook County. Of the assessed basins, 307 were built before 1992 and 134 were built after 1992.

3.15.2 Basin Type, Location, and Maintenance/Retrofit Needs

A total of 666 basins were inventoried during this assessment (Figure 3-55). Of these, 455 basins were classified as **wet**, 39 were classified as underground, 116 were classified as **dry** and 56 were classified as wetland (see Table 3-46). The inventory assessed 519 basins for maintenance and retrofit needs. This assessment identified 22 basins that could benefit from maintenance or improvement. The most common retrofit/maintenance needs were stabilizing shoreline erosion and removing accumulated debris. The inventory did not assess 147 basins for maintenance or retrofit needs. It is recommended that these 147 basins are assessed for maintenance and retrofit needs in future detention basin inventories.

WET DETENTION BASINS: A stormwater control structure that provides both retention and treatment of contaminated stormwater runoff. It contains a perennial pool of water, which holds runoff from one rainfall event until displaced by a new rainfall event.

DRY DETENTION BASINS: Basins that temporarily stores water before discharging to river or lake and usually dry up following large rainstorms or snow melt events. Typically, not effective at removing pollutants.

Table 3-46: Detention Basin Inventory

SUBWATERSHED	TOTAL BASINS	WET BASINS	UNDERGROUND BASINS	DRY BASINS	WETLAND BASINS
Middle Fork North Branch Chicago River	188	104	21	43	20
North Branch Chicago River Upstream	8	7	0	0	1
Skokie River	216	133	10	54	19
West Fork North Branch Chicago River	254	211	8	19	16
TOTALS:	**666**	**455**	**39**	**116**	**56**

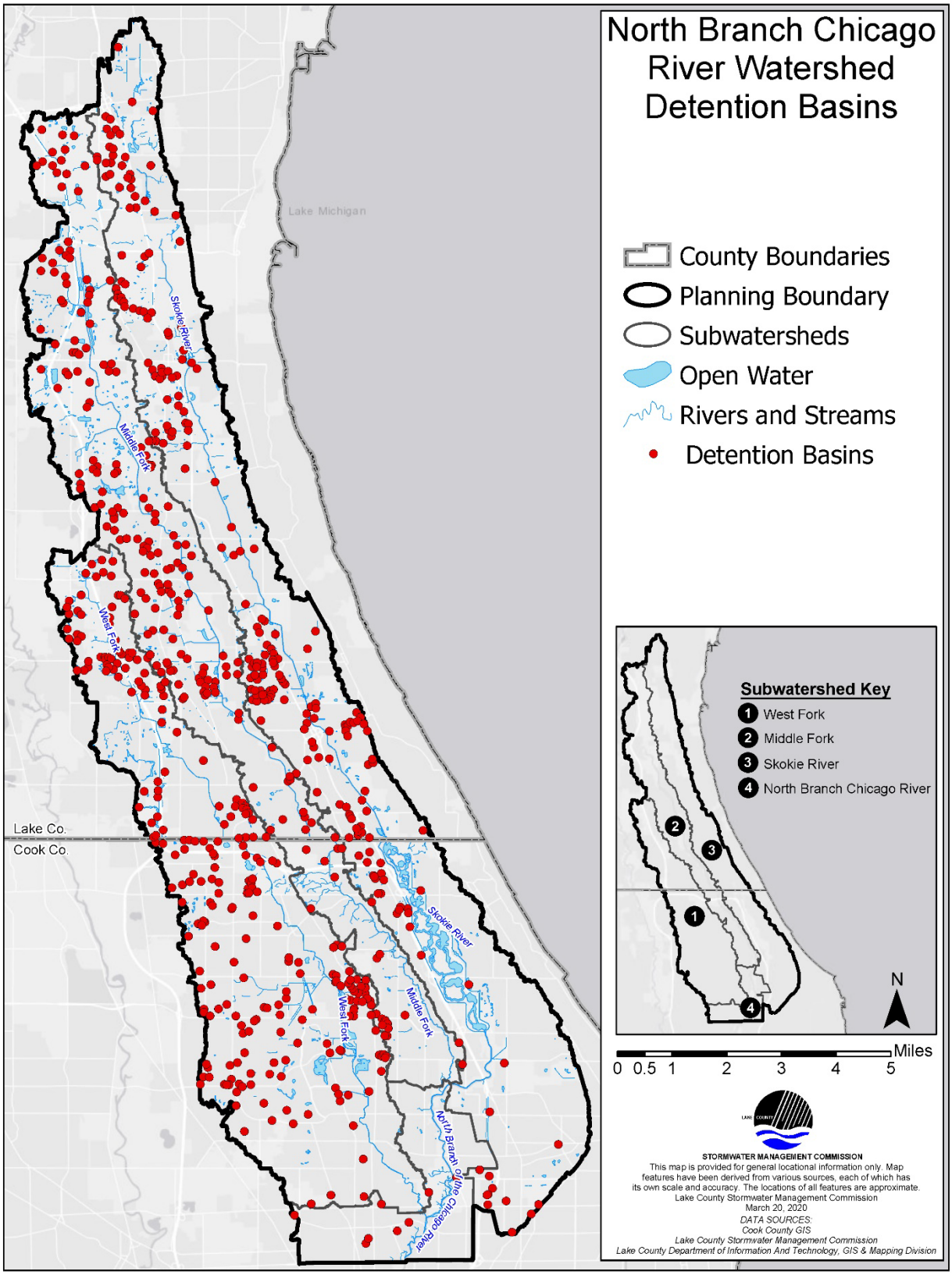


Figure 3-54: Detention Basins

3.16 LAKE AND STREAM WATER QUALITY

Water quality refers to a waterbody's ability to support a variety of aquatic life and recreational uses such as swimming, fishing, boating, and drinking. Water quality assessments also incorporate the aesthetic value of the water body. Water pollution reduces the health of aquatic ecosystems and may be harmful to human (public) health. Pollutants from multiple points and NPS impact water quality. During storms, pollutants on the landscape are washed from the ground and impervious surfaces into storm sewers, roadside drainage ditches, and natural drainageways and ultimately into the watershed's receiving streams and lakes.

Physical changes in the watershed, such as stream channelization and the loss of riparian vegetation and wetlands, reduce the ability of the natural drainage system to filter pollutants and infiltrate water into the ground, and contribute sediment and other pollutants to the stream and lakes, thereby reducing the quality of aquatic habitat. Water quality problems can be a result of many years of modification of the watershed landscape. These changes include modification of the stream channel, floodplain, wetlands, and other water resource-related landscape features.

Water quality degradation is also caused by an increase in watershed impervious cover (e.g. paving, concrete, rooftops) that has led to an increase in the volume and rate of runoff in the watershed. The increased quantity of runoff causes problems such as excessive streambank erosion and the deepening of the stream channel. This water quality summary includes information from water quality reports, data from stream inventories and recent water quality monitoring. Figure 3-55 shows the NBCR planning area 2018 303(d) listed streams and lakes.

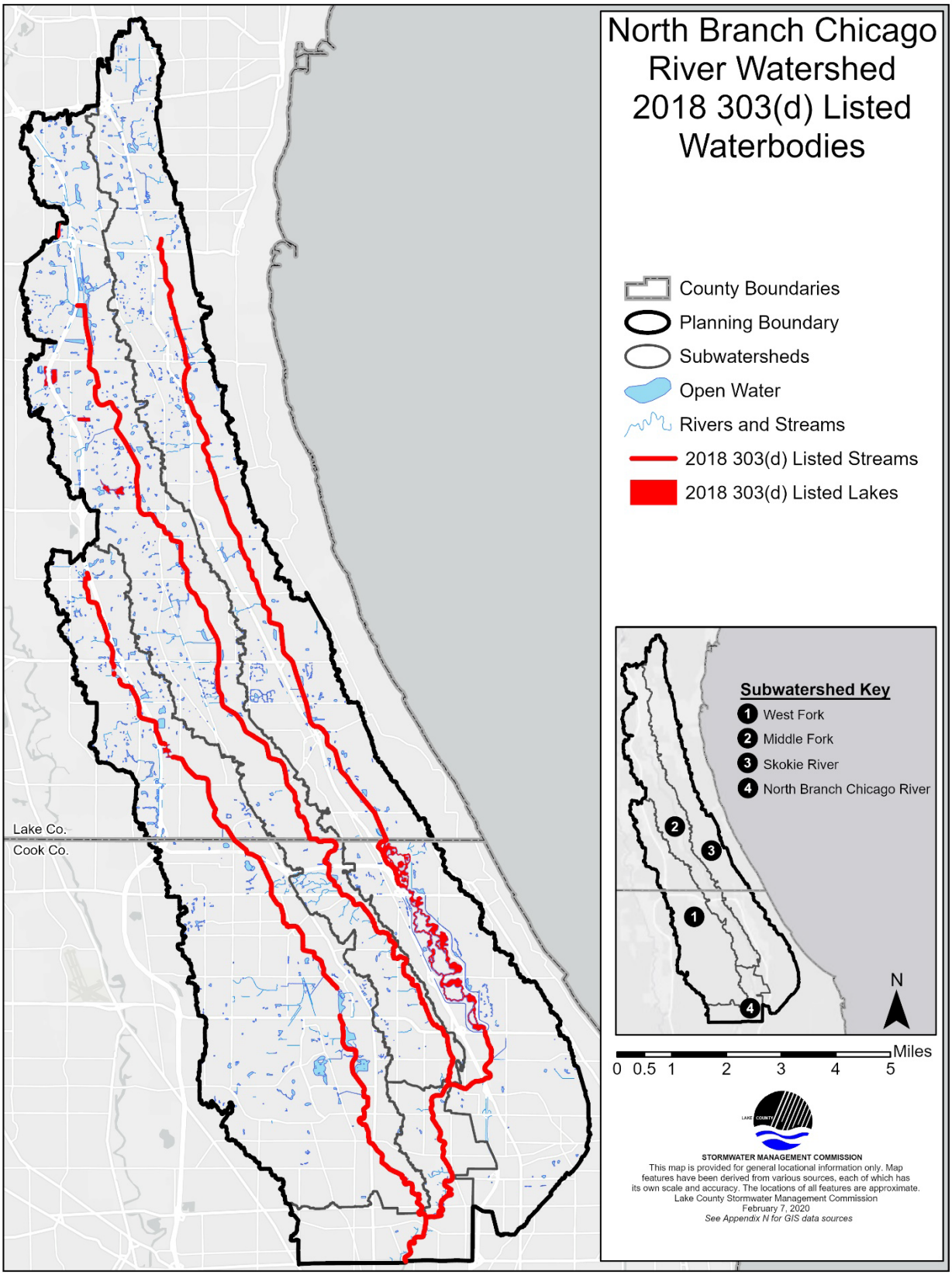


Figure 3-55: 2018 303(d) listed Streams and Lakes

3.16.1 STATUS OF DESIGNATED USE SUPPORT

The Illinois EPA produces a biennial report on the water quality of surface waters and groundwater in Illinois. The "Integrated Water Quality Report and Section 303(d) List" ("Integrated Report") is based on federal guidance for meeting the requirements of Sections 305(b), 303(d) and 314 of the Clean Water Act (CWA). Discussion of the Integrated Report in this section is specifically related to surface water (lakes and streams) in the 2018 Integrated Report. Assessment of water quality for an individual water body or stream segment is expressed in terms of support of "designated uses". Designated uses assessed in the 2018 Integrated Report applicable to lakes and streams in the NBCR planning area include Aquatic Life, Fish Consumption, Primary Contact, and Aesthetic Quality. These uses are determined to be fully supported, not supported, not assessed, or to have insufficient information to make a determination.

Illinois EPA evaluates physical, biological, and chemical monitoring data to make these assessments of designated use support. For some uses, monitoring data may indicate non-support or "impairment". For example, depauperate fish or invertebrate taxa may indicate impairment of the aquatic life designated use. In these cases, physical and/or chemical monitoring data are compared to numeric water quality standards to determine if pollutants are present in sufficient quantities to cause an impairment of one or more designated uses. In other cases, exceedance or violation of the water quality standard is enough to list the use as not supported and the water as "impaired". For example, exceedance of the fecal coliform standard results in non-support of the Primary Contact designated use, if it is an assessed use for a given water. Waters with one or more pollutants identified as the cause of impairment are added to the "303(d) list" of impaired waters and put onto a schedule for development of a Total Maximum Daily Load (TMDL) study for the pollutant(s) of concern. The Illinois EPA typically only creates TMDLs for pollutants with numeric water quality standards. Starting in 2012, the Illinois EPA began including load reduction strategies (LRS) in TMDL reports for pollutants without a numeric water quality standard. In some cases, "non-pollutants" are identified as the cause of non-support. Non-pollutants are typically non-chemical causes of impairment such as modification of flows in a stream by dams, alteration of habitat, or the presence of non-native invasive species. Once a surface water assessment is made, it typically remains unchanged in subsequent editions of the Integrated Report unless new data is obtained by Illinois EPA. Changes from previous editions are reported by Illinois EPA in an appendix to the report.

3.16.1.1 Streams

There are six stream segments in the NBCR planning area and all have been assessed by Illinois EPA for support of designated uses as indicated by applicable water quality standards. These segments consist of 53 miles of rivers and streams. Of these, two are segments of the Skokie River (15 total miles), two are segments of the Middle Fork (22 total miles), one is a segment of the West Fork (14 miles), and one is a segment of the North Branch Chicago River (1 mile within the NBCR planning area). The 2018 Integrated Report identified all the assessed segments in the planning area as impaired for one or more designated uses. All six segments did not support the Aquatic Life or Primary Contact Recreation designated uses. Three segments (IL_HCCC-04, IL_HCC-07 and IL_HCCD-09) did not support the fish consumption designated use. The IL_HCCD-09 segment in the Skokie River and IL_HCCC-02 segment in the Middle Fork North Branch Chicago River did not support the aesthetic quality designated use.

Twenty-Seven causes of impairment have been identified and multiple causes may affect a single stream segment. Causes of impairment and sources of pollution are summarized in Table 3-47 and Table 3-48, respectively. Phosphorus and total suspended solids (TSS) are no longer used by Illinois EPA to assess aquatic life use attainment in streams, but any listings prior to 2012 will not be removed unless new data indicates full support of the use. The mercury and polychlorinated biphenyls causes are related to non-support of the fish consumption use. The fecal coliform cause is related to non-support of the primary contact designated use. Sources of pollution fall into eighteen categories and multiple sources may affect a single segment. The most common sources within the NBCR planning area are urban runoff/storm sewers (6 segments), contaminated sediments (5 segments), channelization (5 segments), municipal point source discharges (4 segments) and unknown source(s) (4 segments).

Table 3-47: Causes of Stream Impairments in the NBCR Planning Area

CAUSE OF IMPAIRMENT	SEGMENTS AFFECTED
Aldrin	2
Alteration in Stream-Side or Littoral Vegetative Covers	5
Aquatic Algae	1
Aquatic Plants (Macrophytes)	1
Barium	1
Bottom Deposits	2
Cadmium	1
Changes in Stream Depth and Velocity Patterns	2
Chlordane	1
Chloride	6
Chromium	1
Copper	1
DDT	4
Endrin	2
Fecal coliform	6
Hexachlorobenzene	4
Lead	1
Low Dissolved Oxygen	6
Mercury	3
Nickel	1
Other Flow Regime Alterations	1
Phosphorus*	6
Polychlorinated Biphenyls (PCBs)	2
Sedimentation/Siltation	3
Silver	1
Total Suspended Solids*	5
Water Temperature	1

**Phosphorus and total suspended solids used to identify causes prior to 2012*

Table 3-48: Sources of Stream Impairments in the NBCR Planning Area

SOURCE OF POLLUTION	SEGMENTS AFFECTED
Atmospheric Deposition	1
Channelization	5
Combined Sewer Overflows	2
Contaminated Sediments	5
Dam or Impoundment	1
Golf Courses	1
Highway/Road/Bridge Runoff (Non-Construction Related)	2
Impacts from Hydrostructure Flow	1
Loss of Riparian Habitat	2
Municipal Point Source Discharges	4
Other Recreational Pollution Sources	1
Runoff from Forest/Grassland/Parkland	1
Site Clearance (Land Development or Redevelopment)	1
Streambank Modifications/Destabilization	2
Unknown Source(s)	4
Upstream Impoundments	1
Urban Runoff/Storm Sewers	6
Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	1

*See Bold font indicates the Designated Use and cause(s) of impairment for which the water appears on the 303(d) list. *Indicates pollutant causes of impairment for which a TMDL has been developed. + indicates pollutant causes for which a LRS has been developed.*

Table 3-49 for a list of stream impairments in the NBCR planning area. A draft Stage 3 TMDL Report has been developed for all six stream segments within the NBCR planning area.

*Bold font indicates the Designated Use and cause(s) of impairment for which the water appears on the 303(d) list. *indicates pollutant causes of impairment for which a TMDL has been developed. + indicates pollutant causes for which a LRS has been developed.*

Table 3-49: Stream Impairments List in the NBCR Planning Area

STREAM	ILLINOIS EPA AUID	DESIGNATED USE(S) & LEVEL OF SUPPORT	CAUSE(S)	SOURCE(S)
Middle Fork North Branch Chicago River	IL_HCCC-02	**Aquatic Life: Non-Support** Fish Consumption: Not Assessed **Primary Contact Recreation: Non-Support** **Aesthetic Quality: Non-Support**	Alteration in stream-side or littoral vegetative covers, **Chloride***, **DDT**, **Hexachlorobenzene**, **DO***, **Sedimentation/Siltation**+, **Total Suspended Solids (TSS)**+, **Fecal Coliform***, **Phosphorus (Total)**+, **Bottom Deposits**, Aquatic Plants (Macrophytes)	Channelization, Loss of Riparian Habitat, Streambank Modifications/destabilization, Urban Runoff/Storm Sewers, Contaminated Sediments

STREAM	ILLINOIS EPA AUID	DESIGNATED USE(S) & LEVEL OF SUPPORT	CAUSE(S)	SOURCE(S)
Middle Fork North Branch Chicago River	IL_HCCC-04	**Aquatic Life: Non-Support** **Fish Consumption: Non-Support** **Primary Contact Recreation: Non-Support** Aesthetic Quality: Full Support	Alteration in stream-side or littoral vegetative covers, **Barium, Cadmium**, **Chloride***, **Chromium (total)**, **Copper, DDT**, **Endrin**, **Hexachlorobenzene**, **Lead**, **Mercury**, **Nickel**, **DO***, **Sedimentation/Siltation**[+], **Silver**, **Water Temperature**, **Total Suspended Solids (TSS)**[+], **Phosphorus (Total)**[+], **Polychlorinated biphenyls**, **Fecal Coliform***	Channelization, Contaminated Sediments, Municipal Point Source Discharges, Urban Runoff/Storm Sewers, Source Unknown, Golf Courses, Runoff from Forest/Grassland/Parkland, Other Recreational Pollution Sources
North Branch Chicago River	IL_HCC-07	**Aquatic Life: Non-Support** **Fish Consumption: Non-Support** **Primary Contact Recreation: Non-Support** Aesthetic Quality: Full Support	**Aldrin**, Alteration in stream-side or littoral vegetative covers, **Chloride***, **DDT**, **Hexachlorobenzene**, **DO***, **Total Suspended Solids (TSS)**[+], **Phosphorus (Total)**[+], **Mercury**, **Polychlorinated biphenyls**, **Fecal Coliform***	Contaminated Sediments, Channelization, Streambank Modifications/destabilization, Combined Sewer Overflows, Highway/Road/Bridge Runoff (Non-construction Related), Municipal Point Source Discharges, Urban Runoff/Storm Sewers, Atmospheric Deposition - Toxics, Source Unknown
Skokie River	IL_HCCD-01	**Aquatic Life: Non-Support** Fish Consumption: Not Assessed **Primary Contact Recreation: Non-Support** Aesthetic Quality: Not Assessed	**Chloride***, **DO***, **Total Suspended Solids (TSS)**[+], **Phosphorus (Total)**[+], **Fecal Coliform***	Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Urban Runoff/Storm Sewers
Skokie River	IL_HCCD-09	**Aquatic Life: Non-Support** **Fish Consumption: Non-Support** **Primary Contact Recreation: Non-Support** **Aesthetic Quality: Non-Support**	Alteration in stream-side or littoral vegetative covers, **Chlordane**, **Chloride***, Other flow regime alterations, **DO***, **Sedimentation/Siltation**[+], **Phosphorus (Total)**[+], Aquatic Algae, Changes in Stream Depth and Velocity Patterns, **Mercury**, **Fecal Coliform***, **Bottom Deposits**	Channelization, Contaminated Sediments, Municipal Point Source Discharges, Urban Runoff/Storm Sewers, Impacts from Hydrostructure Flow, Upstream Impoundments (e.g., Pl-566 NRCS Structures), Dam or Impoundment, Combined Sewer Overflows, Source Unknown

STREAM	ILLINOIS EPA AUID	DESIGNATED USE(S) & LEVEL OF SUPPORT	CAUSE(S)	SOURCE(S)
West Fork North Branch Chicago River	IL_HCCB-05	**Aquatic Life: Non-Support** Fish Consumption: Not Assessed **Primary Contact Recreation: Non-Support** Aesthetic Quality: Full Support	**Aldrin**, Alteration in stream-side or littoral vegetative covers, **Chloride***, **DDT**, **Endrin**, **Hexachlorobenzene**, **DO***, **Total Suspended Solids (TSS)**+, **Phosphorus (Total)**+, Changes in Stream Depth and Velocity Patterns, **Fecal Coliform***	Contaminated Sediments, Channelization, Loss of Riparian Habitat, Site Clearance (Land Development or Redevelopment), Highway/Road/Bridge Runoff (Non-construction Related), Municipal Point Source Discharges, Urban Runoff/Storm Sewers, Source Unknown

3.16.1.2 Lakes

There is a total of ten lakes in the NBCR planning area that is based on lakes greater than 20 acres. Thirteen lakes in the NBCR planning area appear on Illinois EPA's list of assessed waters for 2018. The three additional lakes are due to lakes that were assessed by the Illinois EPA using the former 6-acre size criteria. Of the thirteen lakes, two lakes do not have an assessed designated use. Two lakes have "insufficient data" to conclude whether the lake supports or does not support designated uses. Pulaski Pond is the only lake that fully supports all assessed designated uses. Eight lakes do not support the aesthetic quality designated use, making it the most common designated use impairment for lakes in the NBCR planning area. Lake Elanor does not support the aquatic life designated use and the Skokie Lagoons does not support the fish consumption designated use. None of the lakes in the NBCR planning area were assessed for the primary contact designated use. Seven causes of impairment were identified, and multiple causes may affect a single lake. Causes of impairment for the impaired lakes are summarized in Table 3-50. Phosphorus (5 lakes), TSS (5 lakes) and aquatic plants (4 lakes) are the most common causes of impairment. Sources of pollution fall into ten categories and multiple sources may affect a single lake. Sources of pollution are summarized in Table 3-51 and causes of impairment and sources of pollution are detailed for each lake in Table 3-52.

Table 3-50: Causes of Impairment for Impaired Lakes

CAUSE OF IMPAIRMENT	LAKES AFFECTED
Aquatic Algae	1
Aquatic Plants	4
Mercury	1
Non-Native Fish, Shellfish or Zooplankton	1
Phosphorus	5
Total Suspended Solids	5
Unknown Cause(s)	2

Table 3-51: Sources of Pollution for Impaired Lakes

SOURCE OF POLLUTION	LAKES AFFECTED
Atmospheric Deposition	1
Internal Nutrient Recycling	1
Littoral/Shore Area Modifications (non-riverine)	2
Runoff from Forest/Grassland/Parkland	2
Rural (residential areas)	1
Specialty Crop Production	1
Unknown	7

SOURCE OF POLLUTION	LAKES AFFECTED
Urban Runoff/Stormsewers	1
Waterfowl	1
Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	1

*Underlined bold font indicates waterbodies which have a TMDL. Bold font indicates the Designated Use and cause(s) of impairment for which the water appears on the 303(d) list. *Indicates pollutant causes of impairment for which a TMDL has been developed. [+] indicates pollutant causes for which a LRS has been developed.*

Table 3-52: Causes of Impairment and Source of Pollution by Lake

LAKE	ILLINOIS EPA AUID	DESIGNATED USE(S) AND LEVEL OF SUPPORT	CAUSE(S)	SOURCE(S)
CHICAGO BOTANIC GARDEN	IL_RHJA	Aquatic Life: Full Support Fish Consumption: Not Assessed Primary Contact: Not Assessed **Aesthetic Quality: Non-Support**	**Phosphorus (Total)***, Aquatic Algae	Littoral/shore Area Modifications (Non-riverine), Specialty Crop Production, Waterfowl, Runoff from Forest/Grassland/Parkland
EAGLE LAKE	IL_UHH	Aquatic Life: Full Support Fish Consumption: Not Assessed Primary Contact: Not Assessed **Aesthetic Quality: Non-Support**	**Total Suspended Solids (TSS)[+]**, **Phosphorus (Total)***, Aquatic Plants (Macrophytes)	Source Unknown
ELEANOR	IL_RHK	**Aquatic Life: Non-Support** Fish Consumption: Not Assessed Primary Contact: Not Assessed **Aesthetic Quality: Non-Support**	Nonnative Fish, Shellfish or Zooplankton, **Total Suspended Solids (TSS)**, **Phosphorus (Total)**	Source Unknown
KATHRYN	IL_SGS	Aquatic Life: Full Support Fish Consumption: Not Assessed Primary Contact: Not Assessed **Aesthetic Quality: Non-Support**	**Cause Unknown**, Aquatic Plants (Macrophytes)	Source Unknown, Rural (Residential Areas)
LAMB'S FARM	IL_UHA	Aquatic Life: Full Support Fish Consumption: Not Assessed Primary Contact: Not Assessed **Aesthetic Quality: Non-Support**	**Total Suspended Solids (TSS)**, Aquatic Plants (Macrophytes)	Source Unknown
LUCKY LAKE	IL_UHB	Aquatic Life: Full Support Fish Consumption: Not Assessed Primary Contact: Not Assessed **Aesthetic Quality: Non-Support**	**Total Suspended Solids (TSS)**, **Phosphorus (Total)**	Source Unknown

LAKE	ILLINOIS EPA AUID	DESIGNATED USE(S) AND LEVEL OF SUPPORT	CAUSE(S)	SOURCE(S)
OLD SCHOOL	IL_WGZI	Aquatic Life: Full Support Fish Consumption: Not Assessed Primary Contact: Not Assessed **Aesthetic Quality: Non-Support**	**Cause Unknown**, Aquatic Plants (Macrophytes)	Source Unknown
SKOKIE LAGOONS	IL_RHJ	Aquatic Life: Full Support Fish Consumption: Non-Support Primary Contact: Not Assessed **Aesthetic Quality: Non-Support**	Mercury, Total Suspended Solids (TSS)+, **Phosphorus (Total)***	Atmospheric Deposition - Toxics, Source Unknown, Littoral/shore Area Modifications (Non-riverine), Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO), Urban Runoff/Storm Sewers, Runoff from Forest/Grassland/Parkland, Internal Nutrient Recycling

3.16.2 TOTAL MAXIMUM DAILY LOAD FOR NORTH BRANCH CHICAGO RIVER

Section 303(d) of the CWA requires Illinois EPA to identify all waters that do not meet water quality standards. For waters impaired by pollutants, Section 303(d) requires the development of a **TMDL**.

TOTAL MAXIMUM DAILY LOAD (TMDL): An estimation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. It assesses contributing point and NPS and identifies pollution reductions necessary for designated use attainment.

Illinois EPA developed the North Branch Chicago River Watershed Stage 3 TMDL Report in 2017, covering 3 lakes and 6 stream segments within the NBCR planning area. TMDLs were developed for parameters with numeric water quality standards. To do this, the loading capacity was determined for each waterbody. The load capacity was divided into a waste load allocation, load allocation, margin of safety and reserve capacity. The waste load allocation is the portion of the load capacity assigned to existing or future point sources. The load allocation is the portion of the load capacity assigned to existing or future NPS and natural background sources. The margin of safety is a non-allocated portion of the load capacity to account for uncertainty in the TMDL. The reserve capacity is the portion of the loading capacity allocated for future growth within the watershed. Load reduction strategies (LRS) were created for parameters with narrative water quality standards. Load reduction strategies only determine the loading capacity of the waterbody to provide guidance for voluntary NPS pollution reduction. The report directly addresses the pollutants phosphorus, fecal coliform, chloride, TSS, and sedimentation/siltation. The water temperature impairment in the Middle Fork (HCCC-04) was not addressed because there was insufficient data to support the current impairment status. TMDLs were not created for DO because model results indicated the impairments were caused by low reaeration and high sediment oxygen demand, not by external loading. The results of the report are summarized in Table 3-53.

Table 3-53: Load reductions needed to attain water quality standards for TMDL Pollutants

Source: 2013 Illinois EPA North Branch Chicago River Watershed TMDL Report

WATERBODY	TMDL/LRS POLLUTANT	LOAD REDUCTION NEEDED TO ATTAIN WATER QUALITY STANDARD	MUNICIPAL MS4S OR NPDES PERMITTED POINT SOURCES TRIBUTARY TO TMDL WATER BODY AND ASSIGNED WASTE LOAD ALLOCATION
Chicago Botanic Garden Lake	Total phosphorus	43%	Northbrook, Highland Park, and Glencoe
Eagle Lake	Total phosphorus	60%	Mettawa and Lake Forest
Middle Fork Chicago River (HCCC-02)	Fecal Coliform	63.2-99.3%*	Deerfield, Glenview, Mettawa, Northfield, Bannockburn, Highland Park, Waukegan, North Chicago, Green Oaks, Northbrook, Lake Forest, and Knollwood
Middle Fork Chicago River (HCCC-02)	Chloride	0-13%*	Deerfield, Glenview, Mettawa, Northfield, Bannockburn, Highland Park, Waukegan, North Chicago, Green Oaks, Northbrook, Lake Forest, and Knollwood
Middle Fork Chicago River (HCCC-02)	Total phosphorus**	26-70%*	No waste load allocations for LRS.
Middle Fork Chicago River (HCCC-02)	Total Suspended Solids**	19-94%*	No waste load allocations for LRS.
Middle Fork Chicago River (HCCC-02)	Sedimentation/Siltation	41-96%	No waste load allocations for LRS.
Middle Fork Chicago River (HCCC-04)	Fecal Coliform	64-99%*	Bannockburn, Cook County Highway Dept., Deerfield, Evanston, Glencoe, Glenview, Golf, Green Oaks, Highland Park, Highwood, IDOT, Tollway, Lake Bluff, Lake County, Lake Forest, Morton Grove, North Chicago, Northbrook, Northfield, Park City, Skokie, Waukegan Wilmette and Winnetka
Middle Fork Chicago River (HCCC-04)	Chloride	0-39%*	Deerfield, Glenview, Golf, Wilmette, Winnetka, Kenilworth, Mettawa, Skokie, Morton Grove, Northfield, Bannockburn, Highland Park, Lake Bluff, Highwood, Park City, Waukegan, North Chicago, Green Oaks, Northbrook, Evanston, Glencoe, Lake Forest, and Knollwood
Middle Fork Chicago River (HCCC-04)	Total phosphorus**	76-95%*	No waste load allocations for LRS.
Middle Fork Chicago River (HCCC-04)	Total Suspended Solids**	30-88%*	No waste load allocations for LRS.
Middle Fork Chicago River (HCCC-04)	Sedimentation/Siltation	54-92%*	No waste load allocations for LRS.

WATERBODY	TMDL/LRS POLLUTANT	LOAD REDUCTION NEEDED TO ATTAIN WATER QUALITY STANDARD	MUNICIPAL MS4S OR NPDES PERMITTED POINT SOURCES TRIBUTARY TO TMDL WATER BODY AND ASSIGNED WASTE LOAD ALLOCATION
North Branch Chicago River (HCC-07)	Fecal Coliform	84-100%*	Deerfield, Glenview, Golf, Wilmette, Winnetka, Kenilworth, Park Ridge, Mettawa, Skokie, Chicago, Morton Grove, Northfield, Bannockburn, Highland Park, Highland Park, Lake Bluff, Highwood, Park City, Riverwoods, Waukegan, Lincolnshire, North Chicago, Green Oaks, Niles, Northbrook, Evanston, Glencoe, Lake Forest, and Knollwood
North Branch Chicago River (HCC-07)	Chloride	0-22%*	Deerfield, Glenview, Golf, Wilmette, Winnetka, Kenilworth, Park Ridge, Mettawa, Skokie, Chicago, Morton Grove, Northfield, Bannockburn, Highland Park, Highland Park, Lake Bluff, Highwood, Park City, Riverwoods, Waukegan, Lincolnshire, North Chicago, Green Oaks, Niles, Northbrook, Evanston, Glencoe, Lake Forest, and Knollwood
North Branch Chicago River (HCC-07)	Total phosphorus**	77-94%*	No waste load allocations for LRS.
North Branch Chicago River (HCC-07)	Total Suspended Solids**	4-88%*	No waste load allocations for LRS.
Skokie Lagoons	Total phosphorus	86%	Deerfield, Glencoe, Green Oaks, Gurnee, Highland Park, Highwood, Knollwood, Lake Bluff, Lake Forest, North Chicago, Northbrook, Northfield, Park City, Waukegan, and Winnetka
Skokie River (HCCD-01)	Fecal Coliform	51-100%*	Deerfield, Highland Park, Lake Bluff, Highwood, Park City, Waukegan, North Chicago, Green Oaks, Northbrook, Lake Forest, and Knollwood
Skokie River (HCCD-01)	Chloride	0-18%*	Deerfield, Highland Park, Lake Bluff, Highwood, Park City, Waukegan, North Chicago, Green Oaks, Northbrook, Lake Forest, and Knollwood
Skokie River (HCCD-01)	Total phosphorus**	22-94%*	No waste load allocations for LRS.
Skokie River (HCCD-01)	Total Suspended Solids**	0-94%*	No waste load allocations for LRS.
Skokie River (HCCD-09)	Fecal Coliform	0-98%*	Deerfield, Wilmette, Winnetka, Kenilworth, Northfield, Highland Park, Lake Bluff, Highwood, Park City, Waukegan, North Chicago, Green Oaks, Northbrook, Glencoe, Lake Forest, Knollwood, and North Shore Water Reclamation District (NSWRD)
Skokie River (HCCD-09)	Chloride	0%	Deerfield, Wilmette, Winnetka, Kenilworth, Northfield, Highland Park, Lake Bluff, Highwood, Park City, Waukegan, North Chicago, Green Oaks, Northbrook, Glencoe, Lake Forest, Knollwood, and NSWRD
Skokie River (HCCD-09)	Total phosphorus**	89-96%*	No waste load allocations for LRS.

WATERBODY	TMDL/LRS POLLUTANT	LOAD REDUCTION NEEDED TO ATTAIN WATER QUALITY STANDARD	MUNICIPAL MS4S OR NPDES PERMITTED POINT SOURCES TRIBUTARY TO TMDL WATER BODY AND ASSIGNED WASTE LOAD ALLOCATION
Skokie River (HCCD-09)	Sedimentation/Siltation	36-74%*	No waste load allocations for LRS.
West Fork Chicago River (HCCB-05)	Fecal Coliform	47-100%*	Deerfield, Glenview, Golf, Mettawa, Morton Grove, Northfield, Bannockburn, Riverwoods, Lincolnshire, Niles, Northbrook, Lake Forest, and Village of Deerfield POTW
West Fork Chicago River (HCCB-05)	Chloride	0-58%*	Deerfield, Glenview, Golf, Mettawa, Morton Grove, Northfield, Bannockburn, Riverwoods, Lincolnshire, Niles, Northbrook, Lake Forest, and Village of Deerfield POTW
West Fork Chicago River (HCCB-05)	Total phosphorus**	87-97%*	No waste load allocations for LRS.
West Fork Chicago River (HCCB-05)	Total Suspended Solids**	56-93%*	No waste load allocations for LRS.

**Percent reduction needed to achieve water quality standards changes based on flow conditions. **Also addresses DO impairment*

3.16.3 SUMMARY OF PREVIOUS STUDIES AND NBWW MONITORING PROGRAM

In the last two decades, dozens of efforts to monitor, sample, and collect field data on chemical, physical, and biological parameters related to water quality have been undertaken in the NBCR planning area. Data have been gathered by various investigators for different purposes and therefore are not always directly comparable. While it is beyond the scope of this watershed plan to provide an exhaustive review of all sources of water quality data available across the NBCR planning area, a list of studies and datasets that have been generated in the last 20 years is included for reference (see Table 3-54). Generally, the data in this watershed plan falls into one or more of the following categories: 1) data collected by a public agency; 2) data that is available publicly; 3) data/study that is cited or referenced in previous watershed-based plans.

Table 3-54: Summary of relevant recent stream water quality studies and monitoring efforts within the NBCR planning area

STREAM (STATION LOCATION)	YEAR	INVESTIGATOR(S)	NOTES
North Branch Watershed, Cook County	1998	Kirk Gregory/Friends of the Chicago River	Watershed Assessment for the Cook Co. Portion of the North Branch, includes historical water quality summary
Middle Fork (Prairie Wolf Slough)	1998-2008	J. Montgomery, M. Eames	Case study of impact of wetland restoration on water column phosphorus
Skokie River (Chicago Botanic Garden)	2004-2006	Illinois EPA, Volunteer Lake Monitoring Program	Water Quality samples at 3 sites
Skokie River (Skokie Lagoons)	2018	FPDCC	Water Quality Samples at 6 sites, throughout water column
Middle Fork (downstream of Deerfield WWTP discharge)	2013-2015	Village of Deerfield, Illinois EPA	Water Quality samples related to WWTP operations/permitting
Skokie River, Middle Fork, West Fork, and North Branch Chicago River	2001-2016	IDNR	Report titled "Status of Fish Communities and Stream Quality in the Lake Michigan Basin: 2001-2016"
Skokie River, Middle Fork, West Fork, and North Branch Chicago River	1999-2018	Illinois EPA	Water Quality sample data from ambient water quality monitoring program, includes macroinvertebrates. Data summarized and

STREAM (STATION LOCATION)	YEAR	INVESTIGATOR(S)	NOTES
			used to develop biannual Integrated Water Quality Reports
Skokie R. (Lake-Cook Rd.); Middle Fork (Lake-Cook Rd.); North Branch (Dempster St.); North Branch (Glenview Rd.); Skokie R. (Frontage Rd.); West Fork (Dundee Rd.); West Fork (Golf Rd.)	1972-2018	MWRD	Ambient water quality monitoring data
Skokie R. at: Old Elm Rd., Clavey Rd., Lake-Cook Rd., Tower Rd., Winnetka Ave./Frontage Rd., and Church St.	2003-2017	NSWRD	Ambient water quality monitoring data
25 sites on Skokie R., Middle Fork, West Fork and North Branch Chicago R.	2018-2019	NBWW	Comprehensive water quality monitoring and bioassessment

The results of the NBWW comprehensive monitoring report (MBI, 2020) are summarized in the following parameter sections (Sections 3.16.3.1-3.16.3.9.2) and cover data that were collected in 2018-2019 in the NBCR planning area. The Midwest Biodiversity Institute (MBI) developed effect thresholds for numerous water quality parameters for northeastern Illinois streams based on field data analysis from several watersheds in the region and defined these within the Integrated Prioritization System (IPS) (MBI, 2020). Unless otherwise noted, the parameter summaries in the following sections are excerpted or paraphrased from the MBI summary and thresholds described are those developed for the northeastern Illinois IPS. Readers interested in more detail related to this data are encouraged to view the original report posted on the NBWW website.

3.16.3.1 Dissolved Oxygen

Exceedances of dissolved oxygen (D.O.) were assessed with continuous data obtained from Datasonde deployments during August of 2018 & 2019. Short-term deployments of Datasonde continuous recorders recorded exceedances of parts of the Illinois EPA D.O. criteria. Exceedances of the 3.5 mg/L minimum criterion occurred at five (5) sites and were most pronounced in the West Fork at Deerfield Road where half of the values were below 3.5 mg/L. Exceedances of the minimum also occurred in the Skokie River upstream of Foss Park Golf Course and in the Skokie Lagoons, in the Middle Fork at Westleigh Road, and in the West Fork NBCR at Willow Road. Median values were used to assess exceedances of the 6.0 mg/L average criterion which occurred at all except for three (3) sites. Of these the median value of 3.5 mg/L at the West Fork at Deerfield Road was the largest exceedance of the average criterion. Only three sites (Middle Fork at Westleigh Rd., Skokie Lagoons, and West Fork at Willow Road) had diel fluctuations at or more than 6.5 mg/L (MBI, 2020).

3.16.3.2 Nitrogen

The water quality standard for ammonia nitrogen in Illinois waters is 15 mg/L; no exceedances were detected in NBWW's 2018 or 2019 data. The other water quality standards in Illinois for nitrogen apply to public and food processing water supply (10mg/L for nitrate + nitrite, 10 mg/L for nitrate, 1 mg/L for nitrite) and therefore are not applicable to the NBCR planning area for the determination of designated use impairments under the State's water quality standards. More broadly, however, nitrogen is of concern throughout the Mississippi River basin as it, along with phosphorus, is one of the main contributors to seasonal hypoxia in the Gulf of Mexico.

Most ammonia-N concentrations in the Skokie River in 2018 were either just above or below the NE Illinois IPS "good" threshold of 0.15 mg/L at all sites with no values that exceeded the "fair" threshold (0.19mg/L). "Fair" values located at Rockland Rd., Deerpath Rd., in the Skokie Lagoons and downstream of the Skokie Lagoons. The 2019 ammonia concentration levels were observed at higher levels throughout the Skokie River and were generally "fair" except for Lake-Cook Rd., exceeding the fair threshold of <0.19 mg/L (Figure 7). Increased precipitation during 2019 triggered higher ammonia concentrations throughout the Skokie River indicates that the sources are likely non-point sources (MBI, 2020).

Ammonia concentration levels in 2018 ranged from "fair" to "excellent" in the West Fork. The Deerfield WRF increased ammonia concentrations in the West Fork, but not above the 0.10 mg/L "good" IPS threshold. Two values on the lower West Fork rated "fair" are downstream of the Village of Glenview, 1800 E Lake Ave. lift station. The 2019 ammonia concentration levels were higher than 2018 values, rating from "poor" to "good." The Deerfield WRF had a greater influence on ammonia concentrations. Downstream of the WWTP exceeded the 0.19 mg/L IPS threshold and rated "poor." The highest median value occurred immediately downstream of the Village of Glenview lift station (MBI, 2020).

Median concentrations of ammonia in the Middle Fork in 2018 did not exceed 0.05 mg/L and were "excellent" at all sites. The North Branch Chicago River had median ammonia concentrations that exceeded 0.10 mg/L within the range of the "fair" IPS threshold. Median concentrations in 2019 ranged from "excellent" to "fair." The longitudinal trend indicates point source influence from the Deerfield WRF excess flow outfall 004 in 2019. The Skokie River impacted ammonia concentration levels in the lower Middle Fork in 2019, inputting discernable amounts which decreased the ratings downstream. This impacted ammonia concentrations in the North Branch, causing elevated levels compared to the upper Middle Fork. The North Branch site exceeded the 0.10 mg/L "fair" IPS threshold (MBI, 2020).

Median nitrate levels in the Skokie River for 2018 were consistently low and ranged from "good" to "excellent" at all sites. All sites were well within the "excellent" threshold of 3.767 mg/L except downstream of the Skokie Lagoons which did not exceed the "good" rating. In 2019, the Skokie River nitrate concentrations were generally "excellent" except the site downstream of the Skokie Lagoons which exceeded 5.050 mg/L and rated "fair." Median concentrations of nitrate-N increased downstream of the Clavey Rd. WRF at the location below the outfall downstream from the Skokie Lagoons dam (MBI, 2020).

Median nitrate values in 2018 were "excellent" at West Fork sites and well within the Illinois WQS criterion of 10 mg/L. The highest value observed at Lake-Cook Rd. downstream of the Deerfield WRF did not exceed the 3.767 mg/L "excellent" IPS threshold. Median values in 2019 ranged from "fair" to "excellent" and below the Illinois nonstandard of 7.8 mg/L. The highest value which exceeded the 5.020 mg/L "good" IPS threshold was downstream from the Deerfield WRF. Concentrations of nitrate then fell sharply downstream to the "excellent" range (MBI, 2020).

Nitrate concentration levels in the Middle Fork were generally "excellent" in 2018 with the exception of downstream of the confluence with the Skokie River. Nitrate concentrations increased markedly and exceeded the 3.767 mg/L IPS "good" threshold. The Middle Fork site downstream of Glenview Rd. had the highest nitrate concentrations at the high end of the "good" range. The North Branch Chicago River site had "excellent" nitrate concentrations in 2018. Concentrations of nitrate in 2019 ranged from "excellent" to "fair"

with the “fair” values downstream of the confluence of the Middle Fork and Skokie River. The “fair” values caused by elevated nitrate levels in the Skokie River influenced the North Branch site. No values exceeded the Illinois WQS criterion or the Illinois non-standard threshold (MBI, 2020).

Median total organic nitrogen measured by Total Kjeldahl Nitrogen (TKN), an indicator of the living or recently dead fraction of sestonic algae, is an informative indicator of organic and nutrient enrichment. While TKN is not a direct effect parameter, it is indicative of the effects of organic enrichment by nitrogenous biomass, the latter primarily resulting from increased algal biomass. The median TKN concentrations in the Skokie River in 2018 were generally “excellent,” but ranged from “excellent” to “poor.” The Skokie River at Half Day Road was the only “poor” value observed in 2018. The 2018 results roughly follow ammonia concentrations, while the 2019 TKN concentrations roughly follow nitrate concentrations. The 2019 median TKN concentrations ranged from “excellent” to “poor.” TKN concentrations increased downstream to “poor” values in the lower section of the Skokie River in the Skokie Lagoons and at the Edens Frontage Road in 2019 (MBI, 2020).

Median TKN concentrations on the West Fork ranged from “fair” to “excellent” in 2018. The sites downstream of the Deerfield WRF and the Village of Glenview lift station had the highest observed TKN concentrations and were the only two “fair” values. Median TKN concentrations in 2019 ranged from “good” to “poor” and varied longitudinally. The highest concentration was observed downstream of the Village of Glenview lift station and most closely followed the longitudinal ammonia concentration pattern (MBI, 2020).

Median TKN concentrations in the Middle Fork in 2018 ranged from “excellent” to “fair.” Upstream of the confluence with the Skokie River median TKN concentrations were “good” to “excellent.” Downstream of the confluence TKN levels rose above the 1.12 mg/L “good” IPS threshold to the upper “fair” range at the lower two sites. The North Branch site appears unaffected by the influence of the Skokie River as TKN median concentration did not exceed the “excellent” threshold. Median TKN concentrations ranged widely in 2019 with “excellent,” “good,” “fair” and “poor” median values were observed, increasing longitudinally to “poor” at Dundee Rd. before declining to below the “excellent” threshold at Winnetka Rd. The median TKN value in the North Branch exceeded the 1.12 mg/L threshold for “good” to the low “fair” range. TKN median values roughly track nitrate concentrations in the Middle Fork (MBI, 2020).

3.16.3.3 Phosphorus

Prior to 2012, Illinois EPA used a non-standard based criterion of 0.61mg/L to determine whether total phosphorus was a potential cause of aquatic life impairment in streams. Median concentrations of total phosphorus (TP) in 2018 were consistently low and in the “excellent” IPS range except for the lowermost site on the Skokie River (Frontage Rd. immediately downstream the Edens Expressway) where the median concentration exceeded the “excellent” threshold (0.106 mg/L) but was within the “good” range (<0.277 mg/L). The Clavey Rd. WRF had a minimal, yet measurable influence on TP concentrations in the Skokie River. Median concentrations of TP in 2019 were consistently excellent in the Skokie River below the 0.106 mg/L threshold at all sites (MBI, 2020).

In the West Fork, median concentrations of TP in 2018 were consistently low, rating “good” to “excellent.” Median concentrations of P in 2019 were consistently low at all sites except downstream of the Deerfield WRF. The highest value was observed at Willow Road which exceeded the 1.002 mg/L threshold for a rating of “fair.” A sharp decline in TP concentration levels occurred downstream of Willow Road with values decreasing to

"good" and "excellent" values. Only the 2019 Willow Road value exceeded the 0.61 mg/L Illinois non-standard threshold, but all values exceeded the US EPA ecoregion 54 benchmark of 0.072 mg/L. The Deerfield WRF has a noticeable influence on TP concentrations in the West Fork with significantly greater inputs observed in 2019 (MBI, 2020).

Median phosphorus concentrations in the Middle Fork were "excellent" at all sites in 2018. Highest values are observed downstream of the confluence with the Skokie River. Upstream from the Skokie River confluence values were consistently below 0.20 mg/L. Median 2019 phosphorus concentrations ranged from "good" to "excellent" in the Middle Fork. The lone value exceeding 0.106 mg/L is downstream of the confluence with the Skokie River (MBI, 2020).

The North Branch Chicago River concentration of TP was within the "excellent" threshold in both 2018 and 2019. No value exceeded the Illinois non-standard threshold of 0.61 mg/L, but all values exceeded the U.S. EPA Ecoregion 54 benchmark of 0.072 mg/L (MBI, 2020).

3.16.3.4 Total Suspended Solids (TSS)

Currently, no water quality standard exists for TSS in Illinois streams. Prior to 2012, the Illinois EPA used a non-water quality standard-based criterion of 116 mg/L to determine whether TSS was a potential cause of aquatic life impairment in streams. TSS can indicate inorganic suspended sediment and/or organic matter in the form of sestonic algae.

The median TSS values were generally "poor" to "very poor" in the Skokie River in 2018. The Skokie Lagoons impoundment apparently promoted to settling of suspended solids resulting in reduced TSS at the Edens Frontage Rd. Median TSS values in 2019 were about one-third of the levels in 2018 with values generally ranging from "excellent" to "good" (MBI, 2020).

The median TSS values were generally "good" in 2018 in the West Fork. The highest values were observed downstream of the Village of Glenview lift station and downstream of the Deerfield WRF. Concentrations of TSS in 2019 range from "poor" to "excellent." The highest observed value was recorded at the most upstream site (Deerfield Golf Course), declining to "excellent" upstream of the Deerfield WRF. TSS inputs from the WWTP increased concentrations to just above the 17.5 mg/L IPS threshold for "excellent" levels (MBI, 2020).

The median TSS values were generally "good" in 2018 in the upper Middle Fork with "fair" values observed in the downstream sites that were 300% higher. The North Branch median TSS was recorded in the lower "good" range, just above the 17.5 mg/L "excellent" threshold. Median TSS values ranged from "excellent" to "good" and were longitudinally more variable in 2019. The North Branch Chicago River median value was within the upper limits of the "excellent" threshold. During each of the survey years the site below the confluence with the Skokie River observed an increase in TSS in the Middle Fork. The 2018 values at the five (5) lower mainstem sites were in the "fair" range and higher than the 2019 results (MBI, 2020).

3.16.3.5 Metals

Water samples for the analysis of 14 metals and a scan for organic parameters were collected once annually at 8 sites in the watershed. While the low frequency of sample collection limits analysis, there were some notable observations of metals and organics in relation to detections and IPS thresholds. Nine (9) of the 14

metal parameters were either below detection or within the “excellent” IPS threshold. The remaining five (5) parameters exhibited exceedances from infrequent to frequent and “fair” to “very poor” (MBI, 2020)

Sodium had the highest frequency of IPS threshold exceedances with all 16 samples exceeding three of the IPS thresholds: 4 “fair,” 6 “poor” and 6 “very poor.” These were also allied with chloride exceedances reflecting runoff containing deicing salts. Copper, a common constituent in urban stormwater, had the next highest frequency of IPS threshold exceedances with 9 of 16 samples exceeding three of the IPS thresholds: 2 “fair,” 1 “poor” and 6 “very poor.” Zinc, another common urban stormwater pollutant, had seven exceedances of the “very poor” IPS threshold. Nickel had two exceedances of the “fair” IPS threshold. Iron exceeded the Illinois WQS three times with no exceedances of any of the IPS thresholds. The number of exceedances at any single site ranged from one parameter at four sites up to five parameters in 2018 at Foss Park Golf Course which is the upstream most site on the Skokie River. The Middle Fork at Rockland Road had four parameter exceedances in 2019 and the Skokie River at the Edens Frontage Road had three in 2018. Only one site (West Fork at Lake-Cook Rd.) had three parameters exceeding the “poor” or “very poor” IPS threshold. In terms of the POTWs, only the Clavey Rd. WWTP has a site in close enough proximity to a metals sampling site (Skokie River at Edens Frontage Road) and had three parameter exceedances in 2018 and 2019 with two exceeding the “very poor” thresholds for copper (2018) and zinc (2018, 2019) (MBI, 2020).

Sediment samples were also evaluated for heavy metals, which are commonly associated with runoff from roads, highways and industrial and municipal sources. Exceedances of the new IPS thresholds were extensive for aluminum, lead, zinc, chromium, copper, and nickel with numerous exceedances of “poor” and “very poor” values. These occurred throughout the NBWW survey area with aluminum being the most prevalent. Aluminum concentration values were “poor” or “very poor” at 19 of the 25 sites. Copper concentrations were “poor” or “very poor” at 16 sites. Zinc concentration levels were “poor” or “very poor” at 15 sites, while lead concentration levels were “poor” or “very poor” at 11 sites. Chromium and nickel each had seven “poor” and nine “very poor” values. Metal concentration levels in the Middle Fork at Dundee Rd. and Sunset Drive as well as in the West Fork at Willow Rd., Lake Ave. and Long Valley Drive did not exceed the “good” IPS threshold for any of the parameters. Reduced concentration levels occur in the Skokie River in the Skokie Lagoons caused by dilution and lethargic flow rates allowing for contaminants to fall from the water column prior to reaching the site at Tower Rd. Concentration levels in the Skokie River downstream of the Skokie Lagoons abruptly increase to ” poor” and “very poor” levels for aluminum, copper, lead, and zinc. This increase appears to be attributed to an increase in wastewater inputs (MBI, 2020).

3.16.3.6 Organic Compounds

Sediment chemistry monitoring data indicates that elevated levels of numerous PAHs are present in sediment throughout the NBCR planning area (MBI, 2020). PAHs are the product of hydrocarbon combustion, and their geographic distribution has been linked to urban and transportation related land uses (such as coal tar sealants) (Baldwin et al., 2016). Likewise, the urban nature of the NBCR planning area increases the presence of these chemicals, which are attributed primarily to roads, parking lots and industrial centers as likely sources in the watershed (MBI, 2020).

3.16.3.7 Fecal coliform/*Escherichia coli* bacteria

The Illinois general use criteria are expressed as counts of fecal coliform bacteria, which were not measured by NBWW, which measures *Escherichia coli* (*E. coli*) bacteria. U.S. EPA national criteria are in terms of a 90-day

geometric mean (126 cfu/100mL) and a maximum statistical threshold value (STV) (410 cfu/100mL) for *E. coli* and were used by MBI (2020) in evaluating the NBWW data.

E. coli samples frequently exceeded the geometric mean and STV values throughout the NBCR planning area in 2018 and 2019. In 2018, all 25 sample sites exceeded the geometric mean and 24 sites exceeded the maximum STV. In 2019, 21 sites exceeded the geometric mean and maximum STV, of which 20 sites exceeded both the geometric mean and STV. No longitudinal trend is evident for *E. coli* exceedances. The MBI analysis suggested that the Skokie Lagoons appear to aid in the reduction of *E. coli* in the Skokie River while the confluence of the Skokie and Middle Fork appears to reduce *E. coli* at Lake Avenue (MBI, 2020).

3.16.3.8 Chloride

Median total chloride concentrations (mg/L) in the Skokie River in 2018 ranged from "poor" (>185 mg/L) in the upper section to "good" (<120 mg/L) at the most downstream site. The 2019 median chloride concentration levels were generally higher than in 2018 and ranged from "very poor" (>250mg/L) in the upper section to "good" at the most downstream site. There is a longitudinal pattern of decline in median chloride concentrations in both 2018 and 2019, indicating the principal source(s) of chlorides are in the upper Skokie River (MBI, 2020).

Median concentration levels of chloride in the West Fork in 2018 ranged from "good" to "fair" (<185mg/L) increasing from upstream to downstream. Downstream sites contained median values in the low "fair" range and upstream values were observed in the high "good" range. The Deerfield WRF increases chloride concentrations slightly, but not significantly enough to exceed the 120 mg/L IPS "good" threshold. Median chloride concentrations in 2019 were higher than the previous year, ranging from "fair" to "very poor," but followed a similar longitudinal pattern. Lower concentrations were observed in the upper section of the river and increasing to the "poor" range in the lower section with no clear sources being apparent (MBI, 2020).

Median total chloride concentration levels in the Middle Fork ranged from "very poor" to "fair" in 2018. The longitudinal pattern generally shows decreasing concentrations of chlorides in a downstream direction. The median chloride concentrations in 2019 have the same threshold range and generally follow the same longitudinal pattern of decreasing levels downstream. The North Branch Chicago River site in both 2018 and 2019 exceeded the 120 mg/L "good" threshold and rated "fair." The Deerfield excess overflow discharge 004 and the confluence with the Skokie River do not appear to have an appreciable influence on chloride concentrations in the lower Middle Fork or the North Branch Chicago River mainstem. Chloride source(s) appear to be located in the upper section of the Middle Fork (MBI, 2020).

3.16.3.9 Biological Monitoring

The biological communities of the streams in the watershed were sampled in 2018 and 2019 by the NBWW and MBI. Previous biological sampling has been done by other agencies over the years in the watershed including IDNR, Illinois EPA, and MWRD. Biological monitoring data is used to compute an Index of Biotic Integrity for aquatic macroinvertebrates (mIBI) and fish (fIBI). These indices are used to determine if the water body meets Illinois aquatic life/general use standards or if the water body is impaired for this use. Previous studies and the 2008 North Branch Chicago River Watershed-Based Plan indicate that both macroinvertebrate and fish communities were severely impacted by a likely combination of habitat alteration and pollution (SMC, 2008). Results of IDNR monitoring of the fish community over 15 years (2001-2016) also indicate that the

biology of the NBCR planning area is limited due to the effects of habitat alteration, water quality and downstream dams, one of which was removed in 2018 (Pescitelli and Widloe, 2018).

3.16.3.9.1 Aquatic Macroinvertebrates

Macroinvertebrate samples were collected for the Skokie River, North Branch, and lower Middle Fork in 2018 and the remainder of the Middle Fork and West Fork in 2019. The macroinvertebrate community quality ranged from "poor" (mIBI <20.9) to "fair" (mIBI <41.8, >20.9) according to Illinois EPA criteria. Samples included 109 unique taxa and most were indicative of poor water quality. The majority of the most numerous species were moderately tolerant or tolerant of disturbed conditions. None of the sample sites met the Illinois aquatic life/general use criteria for mIBI of 41.8. The Middle Fork generally had higher mIBI values with all sites but one rating in the "fair" category (MBI, 2020). Figure 3-56 displays the results for each stream in the NBCR planning area.

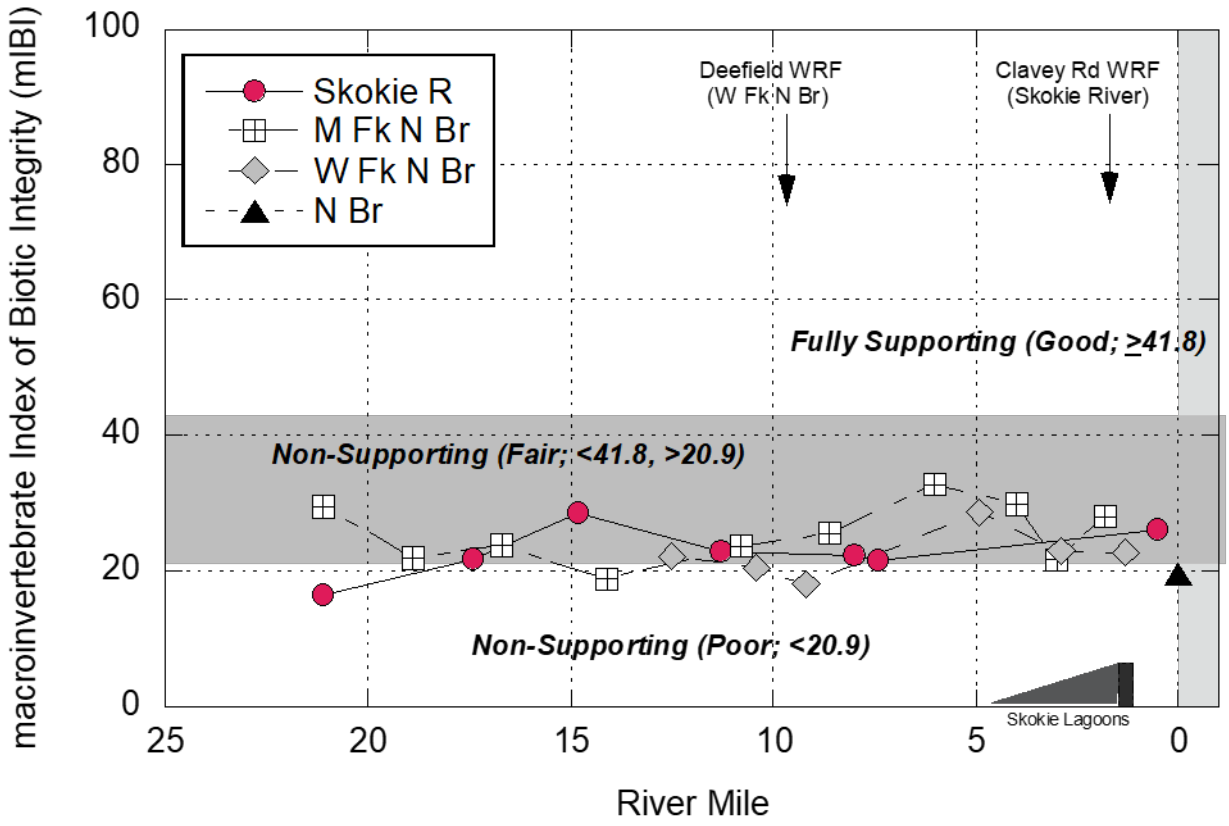


Figure 3-56: mIBI scores for sites in the NBWW study area, 2018-2019.
Graphic excerpted from "Biological and Water Quality Assessment of the North Branch Chicago River: 2018-19" (MBI, 2020).

3.16.3.9.2 Fish

Similar to results reported in previous studies, NBWW monitoring in 2018 and 2019 indicates a fish community dominated by species that are tolerant and moderately tolerant of disturbed conditions. During the survey, 20 native species and three non-native species of fish were collected (along with three hybrids). Dominant species by number of fish and by weight are indicated in Table 3-55. Six of these species are highly tolerant, two are moderately tolerant, and none are sensitive or intolerant of disturbed conditions, indicating a high

level of stream disturbance and degraded or limited habitat. The Illinois aquatic life/general use criterion for fIBI of 41 was not met at any site. All sites were in the "poor" (fIBI <20) category except the Skokie Lagoons which was in the "fair" (fIBI <41, >20) category. MBI suggests that the score at this site might be influenced by stocking of game species (walleye, northern pike, channel catfish and largemouth bass) annually at the Skokie Lagoons. Figure 3-57 shows the distribution of fIBI scores throughout the planning area. The only discernible pattern among the streams is a slight increase in fIBI scores in the Skokie River from upstream to downstream. Overall, however, the high proportion of tolerant species limits the fIBI scores and thus the potential for sites to achieve water quality criteria needed to support the aquatic life/general beneficial use.

Table 3-55: 10 most abundant fish species in the NBWW survey area by number of fish (top) and total weight (bottom), 2018-2019.

Tolerance to disturbance shown for Illinois and Ohio studies (T = highly tolerant, P = moderately tolerant, Blank cells = intermediate). Table excerpted from "Biological and Water Quality Assessment of the North Branch Chicago River: 2018-19" (MBI, 2020).

Species	Tolerance		No./Wt. Collected	% By Number
	IL	OH		
Species Ranks by Numbers				
Bluegill		P	911	16.9
Green Sunfish	T	T	779	14.5
White Sucker	T	T	724	13.4
Largemouth Bass		P	627	11.6
Gizzard Shad			581	10.8
Goldfish	T	T	432	8.0
Blackstripe Topminnow			364	6.8
Common Carp	T	T	251	4.7
Yellow Bullhead	T	T	236	4.4
Golden Shiner	T	T	179	3.3
Species Ranks by Weight (Kg)				
White Sucker	T	T	2.8	31.1
Common Carp	T	T	2.7	30.1
Largemouth Bass		P	0.6	6.9
Bluegill		P	0.6	6.5
Green Sunfish	T	T	0.4	4.6
Walleye			0.4	4.3
Goldfish	T	T	0.4	4.0
Gizzard Shad			0.3	3.8
Yellow Bullhead	T	T	0.3	3.8
Black Bullhead		P	0.1	1.3

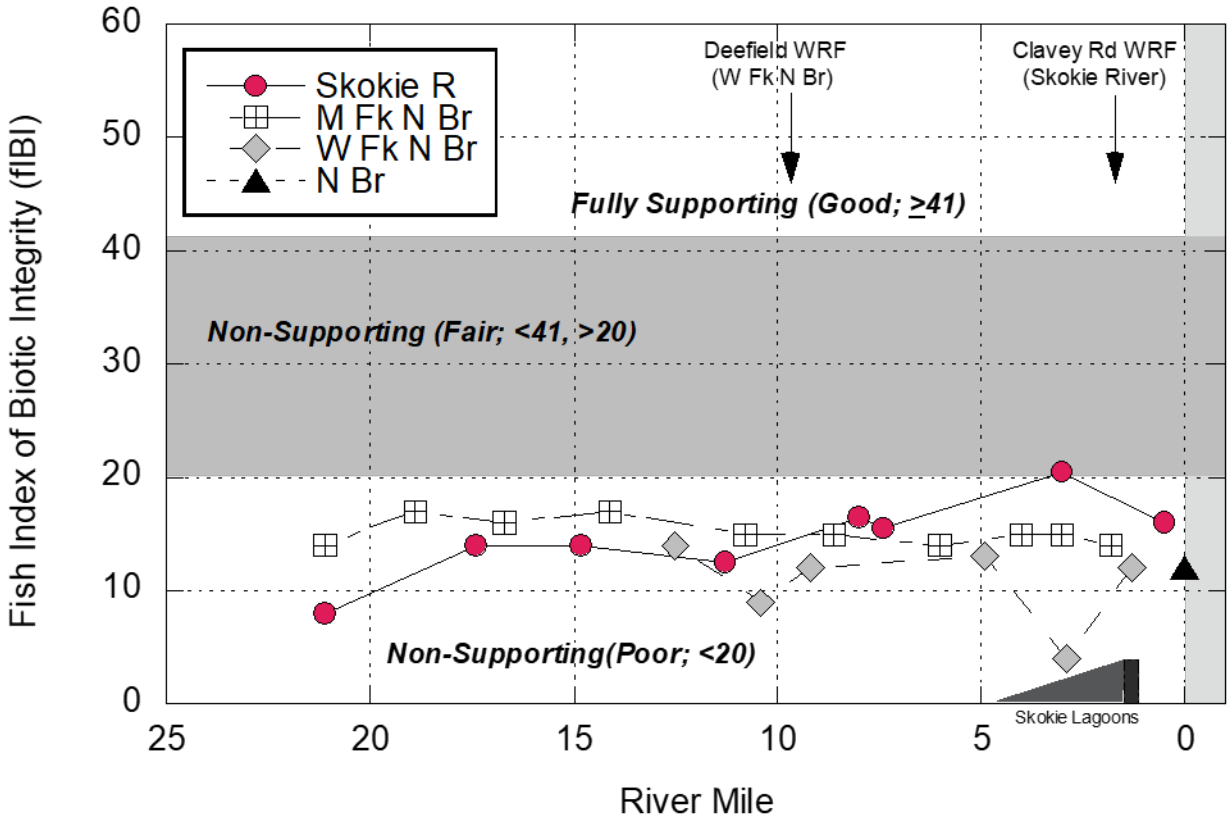


Figure 3-57: Fish Index of Biotic Integrity (fIBI) scores for sites in the NBWW study area, 2018-2019.
Graphic excerpted from "Biological and Water Quality Assessment of the North Branch Chicago River: 2018-19" (MBI, 2020).

3.16.4 Summary of Previous Lake Studies and Data

Historical physical and chemical data for lakes in the NBCR planning area has been gathered by the LCHD-LMU, the Illinois EPA and Aquatic Ecosystems Management. Results from this monitoring are summarized below.

3.16.4.1 Fish and Plants

Four lakes in the NBCR planning were surveyed for the number of fish present, seven lakes were surveyed for aquatic plant species and five lakes were surveyed for FQI as summarized in Table 3-56. The number of fish species observed ranged from 7-17 and the number of native plant species observed ranged from 2-11.

Floristic quality index (FQI) is a metric that evaluates how close the flora of an area is to undisturbed conditions. It can be used to identify natural areas, compare floristic quality between or within lakes, monitor long-term changes in floristic quality, or monitor habitat restoration efforts. To determine FQI, each floating and submerged plant species is assigned a number based on its sensitivity to disturbance, and the average of the assigned numbers is multiplied by the square root of the number of plant species found in the lake. FQI scores between 1-19 indicate low vegetative quality, scores between 20-35 indicate high vegetative quality, and scores >35 indicate undisturbed vegetative quality. All five assessed lakes had low vegetative quality.

Table 3-56: Number of Fish and Plant Species Identified in Assessed Lakes

LAKE NAME	YEAR ASSESSED (FISH)	FISH SPECIES	YEAR ASSESSED (PLANTS)	PLANT SPECIES	YEAR ASSESSED (FQI)	FQI
Chicago Botanic Garden	-	-	-	-	-	-
Eagle Lake	-	-	2002	7	2002	14
Lake Eleanor	-	-	2001	4	2001	7.5
Lake Glenview	2019	9	2019	8	-	-
Lake Kathryn	-	-	2004	11	2004	19.6
Lambs Farm Lake	2004	7	2003	9	-	-
Lucky Lake	-	-	2001	2	2004	8.5
Old School Lake	2004	8	2003	8	2003	13.1
Skokie Lagoons	2016-2018	17	-	-	-	-
Valley Lo Lake	-	-	-	-	-	-

- = Not Assessed

3.16.4.1 Water Quality

The water quality of nine lakes in the NBCR planning area was assessed utilizing multiple parameters including total phosphorus (TP), soluble reactive phosphorus (SRP), total Kjeldahl nitrogen (TKN), ammonia (NH_3-N), nitrate (NO_{3-}), secchi disk depth (SEECHI), total solids (TS), total dissolved solids (TDS), total volatile solids (TVS), TSS, chloride (Cl^-), alkalinity (ALK), specific conductivity, and pH. The most recent year of water quality data was used for each lake, which ranged from 1991 – 2019. Water quality data that is older than 10 years may not be representative of the current lake conditions and should be interpreted carefully. In-depth analysis and reports for individual lakes within Lake County can be accessed at http://www.lakecountyil.gov/2400 /Lake-Reports. Table 3-57 summarizes the arithmetic mean of the most recent year of data for each parameter assessed at each lake.

Table 3-57: Water Quality in Lakes for Most Recent Year Assessed

*The value for each parameter is the arithmetic mean of all samples for the most recent assessment year. If most recent assessment was > 10 years before this lake inventory summary (2020), results may not be representative of the current lake conditions. -: No data, *Inflow and outflow data last assessed in 2001*

LAKE NAME	YEAR LAST ASSESSED	TP (mg/L)	SRP (mg/L)	TKN (mg/L)	NH3-N (mg/L)	NO3-N (mg/L)	SECCHI (ft)	TS (mg/L)	TDS (mg/L)	TSS (mg/L)	TVS (mg/L)	ALK (mg/L CaCO3)	COND (µS/cm)	Cl- (mg/L)	pH (s.u.)
Chicago Botanic Garden	2006	0.027	-	0.63	-	0.18	2.4	-	-	20.8	14	179	1,647	-	8.06
Eagle Lake	2002	0.085	0.005	1.57	0.21	0.03	3.4	721	672	11.5	160	182	1,240	256	7.78
Lake Eleanor*	1991	0.126	0.006	1.37	0.14	0.09	1.1	-	-	34.7	-	155	-	-	8.37
Lake Glenview	2019	0.042	0.024	1.54	-	0.10	2.3	-	581	-	-	137	783	186	8.11
Lake Kathryn	2004	0.020	0.000	0.61	0.00	0.00	9.4	195	172	2.1	64	130	316	-	8.72
Lambs Farm Lake	2003	0.031	0.000	0.77	0.00	0.01	4.2	559	524	5.1	96	129	983	204	8.31
Lucky Lake	2001	0.048	0.009	0.98	0.03	0.00	3.2	613	589	8.1	123	145	1,055	-	8.16
Old School Lake	2003	0.031	0.004	0.82	0.00	0.00	9.4	291	268	1.7	87	124	467	-	8.36
Skokie Lagoons	2016	0.197	-	1.09	-	1.05	1.9	-	-	17.7	7	170	-	124	-
Valley Lo Lake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

- = Data not collected

3.16.4.2 Nutrients

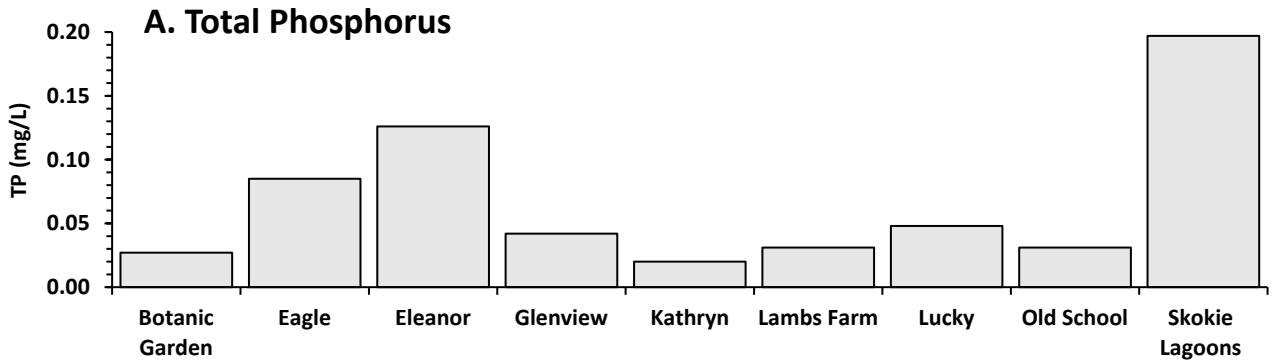
Plants and algae require nutrients from their environment to grow. The primary nutrients necessary for plant and algal growth in lakes are nitrogen and phosphorus. TP is a measure of all organic and inorganic phosphorus in the water column. Lakes with TP concentrations greater than 0.05 mg/L are classified as impaired by the Illinois EPA, because they can support excessive algal growth. The most recent yearly average of total phosphorus for the assessed lakes ranged from 0.02 - 0.197 mg/L, as shown in Figure 3-58. The Illinois EPA's 0.05 mg/L TP standard was exceeded in at least one sample at seven of the nine assessed lakes (Table 3-58). The Skokie Lagoons, Lake Elanor and Eagle Lake exceeded the Illinois EPA TP standard in the majority of samples.

Soluble reactive phosphorus is a measure of phosphorus in the dissolved form that is readily available for plant and algal growth. The most recent yearly average of soluble reactive phosphorus for the assessed lakes ranged from 0 - 0.024 mg/L. Total Kjeldahl nitrogen is a measure of organic nitrogen, which is typically bound by aquatic vegetation. The most recent yearly average of total Kjeldahl nitrogen for the assessed lakes ranged from 0.61 - 1.57 mg/L. Ammonia and nitrate are measures of inorganic nitrogen, which can support seasonal algal blooms if present in sufficient quantities. The most recent yearly average of ammonia ranged from 0 - 0.21 mg/L**.** The most recent yearly average of nitrate ranged from 0 - 1.05 mg/L**.**

Table 3-58: Percent Exceedance of the Illinois EPA Phosphorus Standard by Lake

LAKE NAME	YEAR ASSESSED	*NO. OF SAMPLES	% EXCEEDANCE
Chicago Botanic Garden	2006	40	5
Eagle Lake	2002	10	90
Lake Eleanor	1991	3	100
Lake Glenview	2019	6	33
Lake Kathryn	2004	5	0
Lambs Farm Lake	2003	5	0
Lucky Lake	2001	5	40
Old School Lake	2003	5	0
Skokie Lagoons	2016	9	100

**Number of samples assessed for total phosphorus. % Exceedance: Percentage of samples that exceeded the Illinois EPA phosphorus standard.*



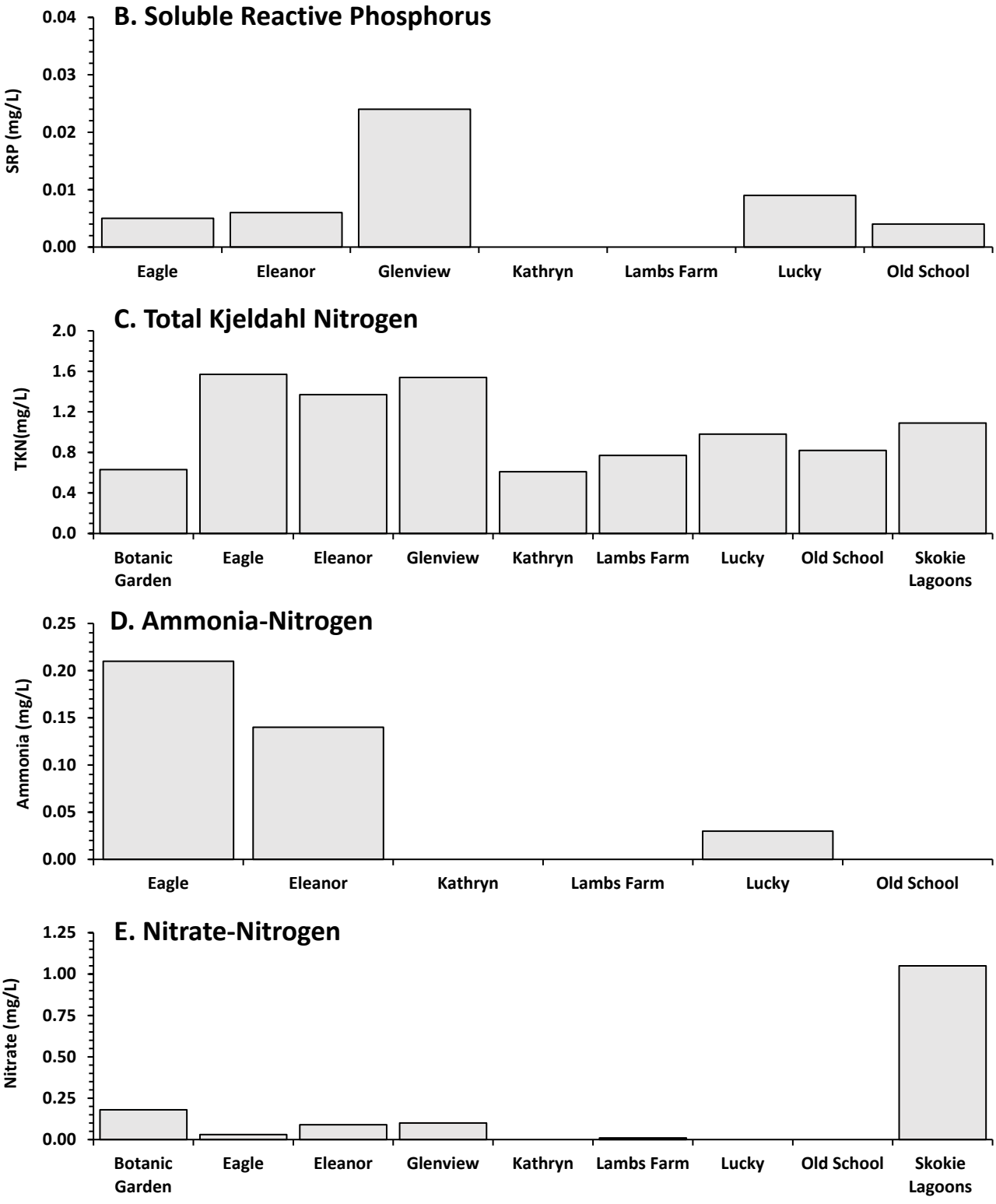


Figure 3-58: Most Recent Yearly Average of A. Total Phosphorus, B. Soluble Reactive Phosphorus, C. Total Kjeldahl Nitrogen, D. Ammonia-Nitrogen and E. Nitrate-Nitrogen by Lake

Lakes are excluded from charts if no data was collected.

3.16.4.3 SECCHI Depth

SECCHI is a measurement of the depth that light penetrates through the water column. This is measured by lowering a SECCHI disk with alternating black and white patterns into the water column until it can't be seen. The depth at which this occurs is known as the SECCHI depth. SECCHI depth can be used as a proxy to estimate the amount of suspended and dissolved material in a lake such as algae, plankton, and sediment. Since suspended and dissolved material scatters light that enters the water column, increases in suspended sediments result in decreases in SECCHI depth. Increases in the SECCHI depth number do not necessarily mean a healthy lake, the SECCHI depth number needs to be analyzed against the ecology of the lake. The most recent yearly average of SECCHI depth for the assessed lakes ranged from 1.1 - 9.4 feet, as summarized in Figure 3-59.

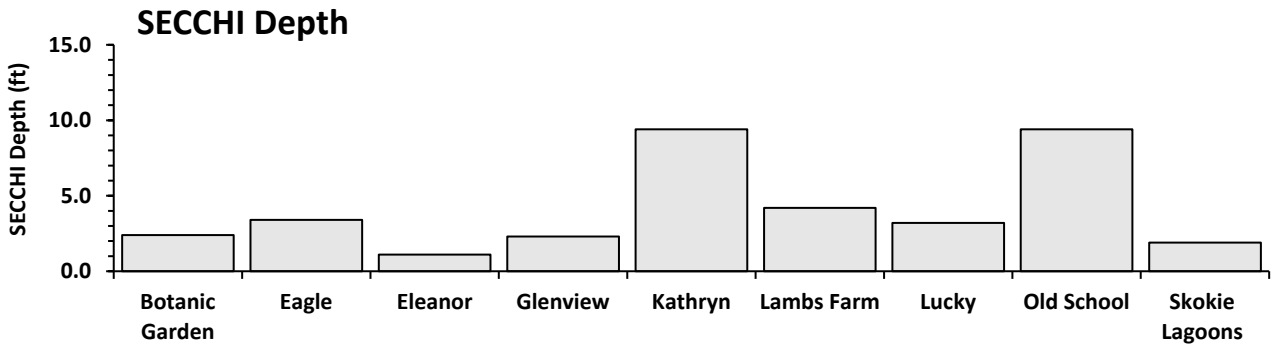


Figure 3-59: Most Recent Yearly Average of SECCHI by Lake

3.16.4.4 Solids

Solids in the water column of a lake consist of suspended and dissolved material. Total solids is a measure of all suspended and dissolved solids in the water column. The most recent yearly average of total solids for the assessed lakes ranged from 195 - 721 mg/L, as summarized in Figure 3-60. Total dissolved solids is a measure of all the dissolved solids in a water column. The most recent yearly average of total dissolved solids for the assessed lakes ranged from 172 - 672 mg/L**.** Total volatile solids is a measure of organic solids in the water column, including algae, plant material, and zooplankton. Lakes with high total volatile solids typically have large quantities of aquatic plants and algae. The most recent yearly average of total volatile solids for the assessed lakes ranged from 7 - 160 mg/L. Total suspended solids is a measure of all organic and inorganic solids suspended in the water column including algae and sediment. High total suspended solid concentrations can negatively impact multiple aspects of lake ecosystems. The most recent yearly average of total suspended solids for the assessed lakes ranged from 1.7 - 34.7 mg/L.

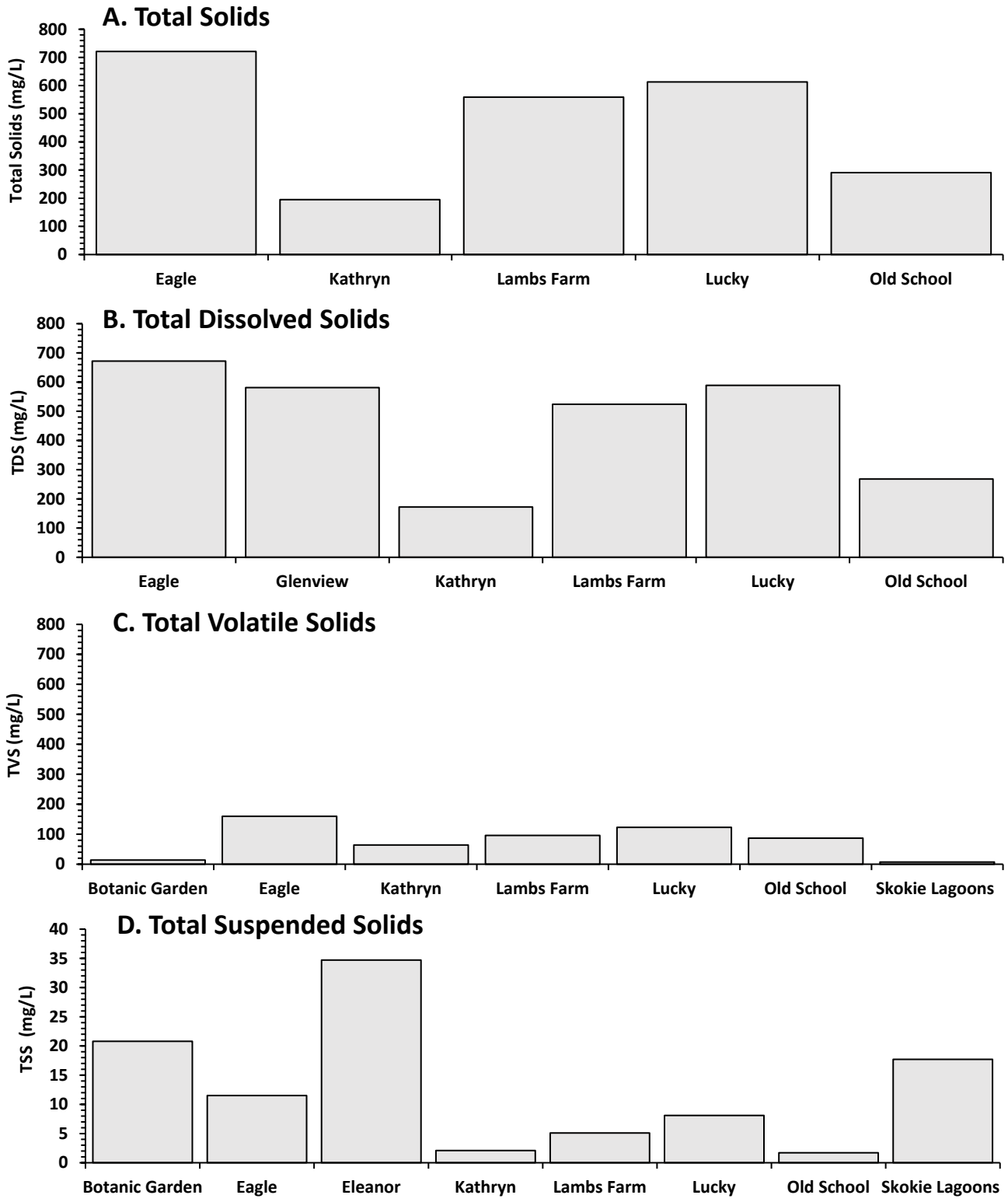


Figure 3-60: Most Recent Yearly Average of A. Total Solids, B. Total Dissolved Solids, C. Total Volatile Solids and D. Total Suspended Solids by Lake

3.16.4.5 Specific Conductivity (COND) and Chloride (Cl^-)

Specific conductivity is measured to approximate the quantity of dissolved ions in a solution. Yearly average specific conductivity values ranged from 316 - 1,647 µS/cm as summarized in Figure 3-61**.** Yearly average chloride concentrations ranged from 124 - 256 mg/L in assessed lakes. Chloride concentrations were the highest in spring months and gradually decreased in summer and fall. These chloride concentrations assessments were conducted between April and October. Chloride concentrations are likely higher during times when road salt is typically applied.

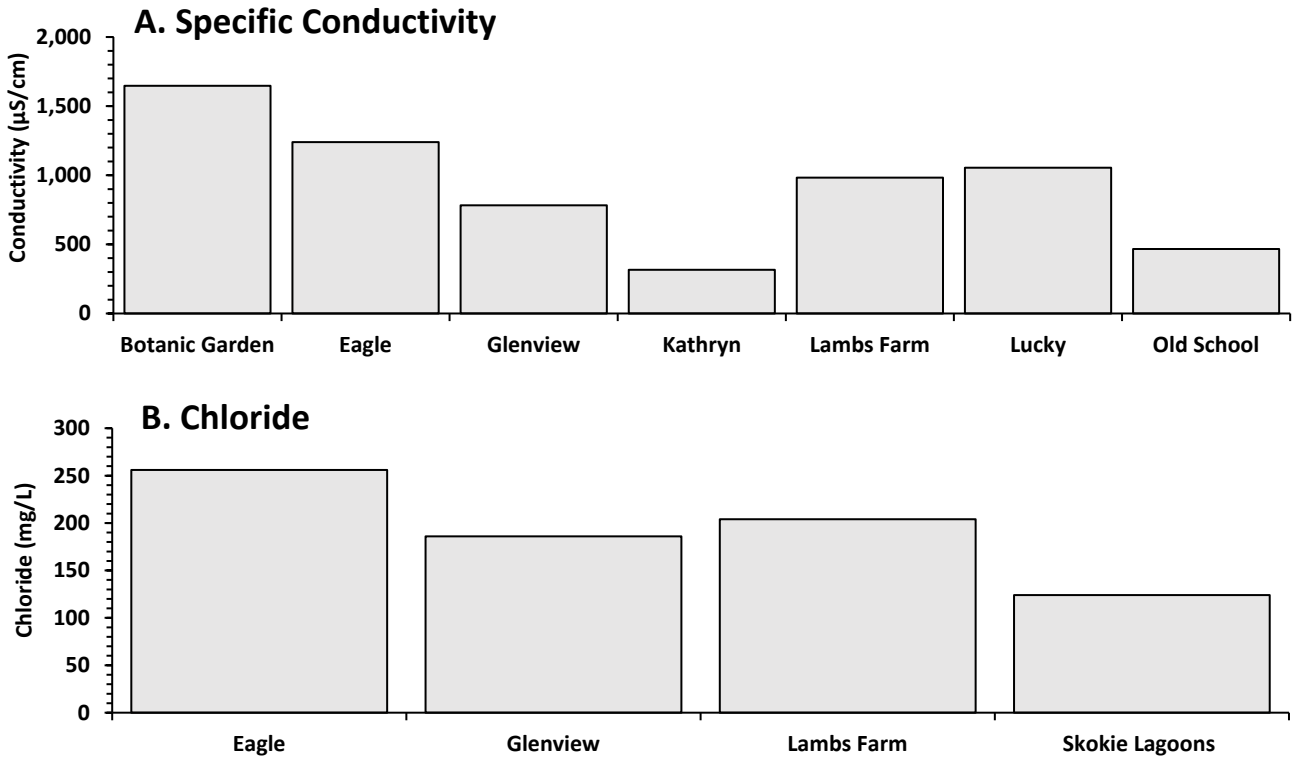


Figure 3-61: Most Recent Yearly Average of A. Specific Conductivity and B. Chloride by Lake

3.16.4.6 pH and Alkalinity

pH is a measure of the concentration of the hydrogen ion in water, which affects multiple chemical processes within a lake such as the carbonate equilibrium cycle. The range of pH that is supportive of aquatic life is 5 – 9 standard units (s.u.). Values outside of this range can be harmful to aquatic life. Yearly average pH values ranged from 7.78 - 8.72 s.u. in assessed lakes.

Alkalinity (ALK) is a measure of the buffering capacity of water, which is influenced by the minerals in surrounding sediment and bedrock. ALK is an important factor in reaction kinetics (such as the carbonate equilibrium cycle) and knowing the buffering capacity of the lake. Lakes with high ALK have greater buffering capacities than lakes with lower ALK. The most recent yearly average for assessed lakes ranged from 124-182 mg/L, as summarized in Figure 3-60. Given how similar the alkalinity results were (no significant swings were noted), the alkalinity results should mainly be looked at as a function of watershed geology.

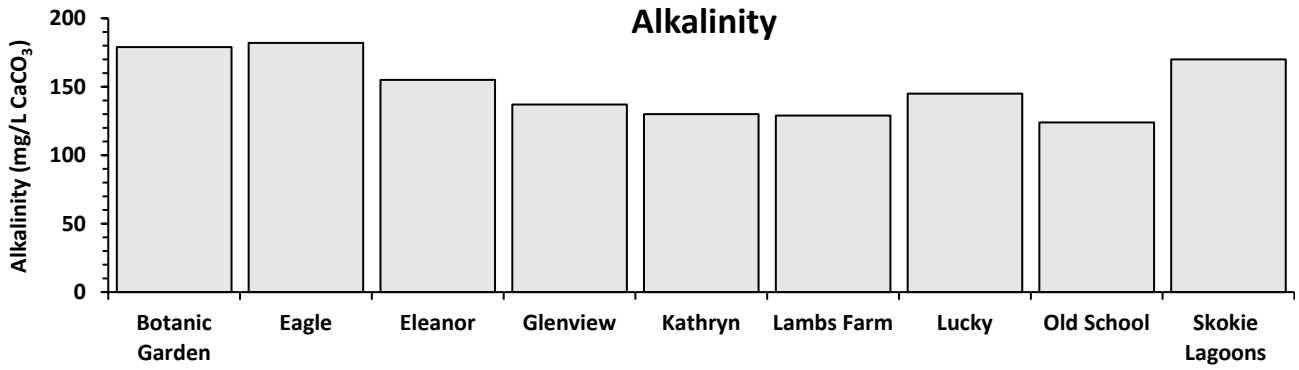


Figure 3-62: Most Recent Yearly Average ALK by Lake

3.17 NPDES POINT SOURCE PERMITS

The USEPA under the Federal Water Pollution Control Act Amendments of 1972, regulates and monitors point source industrial and wastewater pollutant discharges into the nation's waterways (Public Law 92-500; 33 U.S.C. 1251 et seq.). Authorized under amendments made to the 1977 CWA in 1987 and implemented in 1990, the USEPA developed a two-phased NPDES permit program to address industrial and Municipal Separate Storm Sewer Systems (MS4s), serving populations of greater than 100,000, requiring a permit to discharge stormwater from their outfalls into waterways. NPDES Phase 2, enacted into law in 1999 and implemented in 2003, builds upon the existing Phase I program by regulating stormwater discharges from small MS4s located in urbanized areas (as defined by the latest decennial census) and construction sites that disturb one to five acres obtain a permit to discharge stormwater from their outfalls into waterways. Additional information regarding the NPDES program and specifically permit basics and definitions are available from USEPA NPDES website (USEPA WMPD, 2012; USEPA, 2017). See Section 3.18 for more information on NBCR planning area NPDES permits that are currently active at the time of compiling this report.

Point sources are defined as discrete conveyances including but not limited to any pipe, ditch, channel, or conduit from which pollutants are or may be discharged into waterways. Point source regulation through NPDES includes WWTPs, industrial discharges, concentrated animal feeding operations, combined sewer overflows, sanitary sewer overflows, urban stormwater runoff and MS4 urban stormwater discharges. The NPDES program plays a key role in restoring water quality because it sets discharge limits, requires monitoring and reporting requirements, and limits discharge of specific pollutants including biological oxygen demand (BOD), TSS, ammonia nitrogen, fecal coliform, DO, and phosphorus.

3.17.1 NPDES WASTEWATER DISCHARGES

The Illinois EPA permit programs are among the basic tools the agency uses to regulate wastewater discharges to Illinois streams and lakes. They provide facility owners and the public with a discharge specific interpretation of the law and regulations. They provide a specific set of effluent limits, a monitoring schedule and a reporting schedule. Permits can also provide the facility owner with approval of the treatment systems designed to be built. The state construction/operating permit program is based on the state Environmental Protection Act and the regulations developed by the Pollution Control Board. Permits are required for the

construction of new sewers, sewage pumping stations, and for connections to the public sewers which are 1,500 gallon per day or larger or serve two or more buildings. Permits are also required for the construction of new sewage treatment plants, pretreatment equipment and industrial wastes treatment plants. Permits are required for new or modifications to sewage treatment plants, pretreatment facilities and industrial waste treatment plants.

State permits are required for the land application of treated municipal sludges to cropland or other areas. State permits are required for the operators of non-discharge wastewater treatment systems, such as spray irrigation of treated wastewater.

NOTEWORTHY: WWTPS

WWTP's are vital to public health. Sewers collect sewage and wastewater from homes, businesses, and industries and deliver it to wastewater treatment facilities to remove pollutants from water impacted by human waste which can be either discharged to water bodies or land or reused.

Sewage treatment processes typically use a series of processes to treat wastewater prior to discharge. The typical series of unit processes includes:

- preliminary treatment or screening to remove large solids,
- primary clarification (or preliminary sedimentation) to remove floating and settleable solids,
- biological treatment (also referred to as secondary treatment) to remove biodegradable organic pollutants and suspended solids, and
- disinfection to deactivate pathogens.

Some facilities also provide more advanced treatment which is designed to reduce constituents, such as nitrogen and phosphorus, that are not removed in any significant quantity by traditional biological treatment processes. Some municipalities currently experience high peak influent flows during periods of increased wet weather that exceed the treatment capacity of existing biological or advanced treatment units. Under these 'peak flow conditions,' in order to prevent damage to the WWTP, some plant operators divert a portion of the flow around biological or advanced treatment units. The diverted flow is then either recombined with flows from the biological treatment units or discharged directly into waterways (USEPA, 2016).

Within the NBCR planning area, there are 11 active permittees for wastewater discharge into waters of the state. There are 6 WWTPs permitted to have a specific million gallons per day (MGD) discharge requirement of varying capacity, function and treatment capabilities based on the USEPA Facility Registry System database and the Illinois EPA database (Table 3-59 and Figure 3-63) (USEPA, 2020; Illinois EPA 2020). Of the 11 permittees identified, four are operated by a public government body and support a minimum population of 83,000 based on the Village of Deerfield water reclamation facility and the NSWRD-Clavey Road Plant service areas. Based on the available data from current NPDES permits, the WWTPs in the NBCR planning area contribute a permitted 22.4196 MGD of treated water into the North Branch Chicago River system. The 11 WWTPs within the NBCR planning area have the capacity to process a permitted 36 MGD of treated water into the NBCR system. Table 3-60 lists permitted wastewater discharges in the NBCR planning area direct discharge locations & violations.

Table 3-59: WWTPs

**PERMIT NO.	WWTP	ACTUAL AVERAGE FACILITY FLOW (MGD)	FACILITY DESIGN FLOW (MGD)	RESIDENTS SERVED	SITE FUNCTION
IL0002739	Underwriters Labs-Northbrook	0.053	NONE	Varies	NON-CONTACT COOLING WATER: screw compressor cooling, air compressor cooling, compressed air driers, refrigeration condenser cooling, and office building chiller condenser cooling
IL0028347	Village of Deerfield WRF	3.5	8	23,000 (est.)	TREATING DOMESTIC WASTEWATER
IL0030171	NSWRD-Clavey Road STP	17.8	28	60,000 (est.)	TREATING DOMESTIC WASTEWATER
IL0066435	Abbott Laboratories	0.99	NONE	Varies	NON-CONTACT COOLING WATER: RO reject, cooling tower blowdown, water distillation blowdown, filter backwash, and stormwater
IL0066991	Prairie Materials-Yard 21	Intermittent	NONE	Varies	STORMWATER RETENTION BASIN
IL0068951	Central Lake County Joint Action Water Agency	0.061	NONE	Varies	NON-CONTACT COOLING WATER: cool ozone generators and a liquid ring compressor
IL0070025	Norstates Bank-Westside Fac	0.0156	NONE	Varies	NON-CONTACT COOLING WATER: cooling air conditioning equipment
IL0072389	Village of Golf CSOs	Varies	NONE	Varies	COMBINED SEWER OVERFLOWS
IL0074128	Abbott Laboratories-Abbott Park	Unknown	NONE	Varies	NON-CONTACT COOLING WATER: RO reject, cooling tower blowdown, water distillation blowdown, filter backwash, and stormwater
IL0074691	Unocal Corporation-Northfield	Unknown	Unknown	Unknown	TREATED CONTAMINATED GROUND WATER
IL0077542	Autoparts City	Intermittent	Unknown	Unknown	STORMWATER RETENTION BASIN
	TOTALS:	**22.4196**	**36.00**		

Table 3-60: WWTP Direct Discharges and Violations

PERMIT NO.	WASTEWATER PERMITTEE	ACTUAL AVERAGE FACILITY FLOW (MGD)	DIRECT DISCHARGE LOCATION	VIOLATION ISSUES 2018-2020*
IL0002739	Underwriters Labs-Northbrook	0.053	West Fork North Branch Chicago River via Cooling Ponds	No Issues
IL0028347	Village of Deerfield WRF	3.5	West Fork North Branch Chicago River	Concentration of Coliform, fecal general; Quantity of Silver, total [as Ag]; Concentrating of Solids, total suspended; Quantity of Solids, total suspended;
IL0030171	NSWRD-Clavey Road STP	17.8	Skokie River	Concentrations of Solids, total suspended; Concentration of Coliform, fecal general; Concentration of Chlorine, total;
IL0066435	Abbott Laboratories	0.99	Middle Fork North Branch Chicago River via Ponds	Concentration of Chloride [as Cl];
IL0066991	Prairie Materials-Yard 21	Intermittent	West Fork North Branch Chicago River	No Data Available
IL0068951	Central Lake County Joint Action Water Agency	0.061	Skokie River	No Issues
IL0070025	Norstates Bank-Westside Fac	0.0156	Skokie River via Storm Sewer	No Data Available
IL0072389	Village of Golf CSOs	Unknown	West Fork North Branch Chicago River	No Data Available
IL0074128	Abbott Laboratories-Abbott Park	Unknown	Middle Fork North Branch Chicago River via Ponds	No Data Available
IL0074691	Unocal Corporation-Northfield	Unknown	Middle Fork North Branch Chicago River	No Data Available
IL0077542	Autoparts City	Intermittent	Unnamed Tributary of the Middle Fork North Branch Chicago River	No Concentration Limits Set by Permit
TOTAL:		**22.4196 (known)**		

** A violation is noted as per the EPA Discharge Monitoring Report Pollutant Loading Tool as one or more exceedances of permit effluent limits for this pollutant sometime during the year recorded.*

*** IL00 permits are issued based on permittee requests and Illinois EPA determination; the length of the permit is approximately 5 years.*

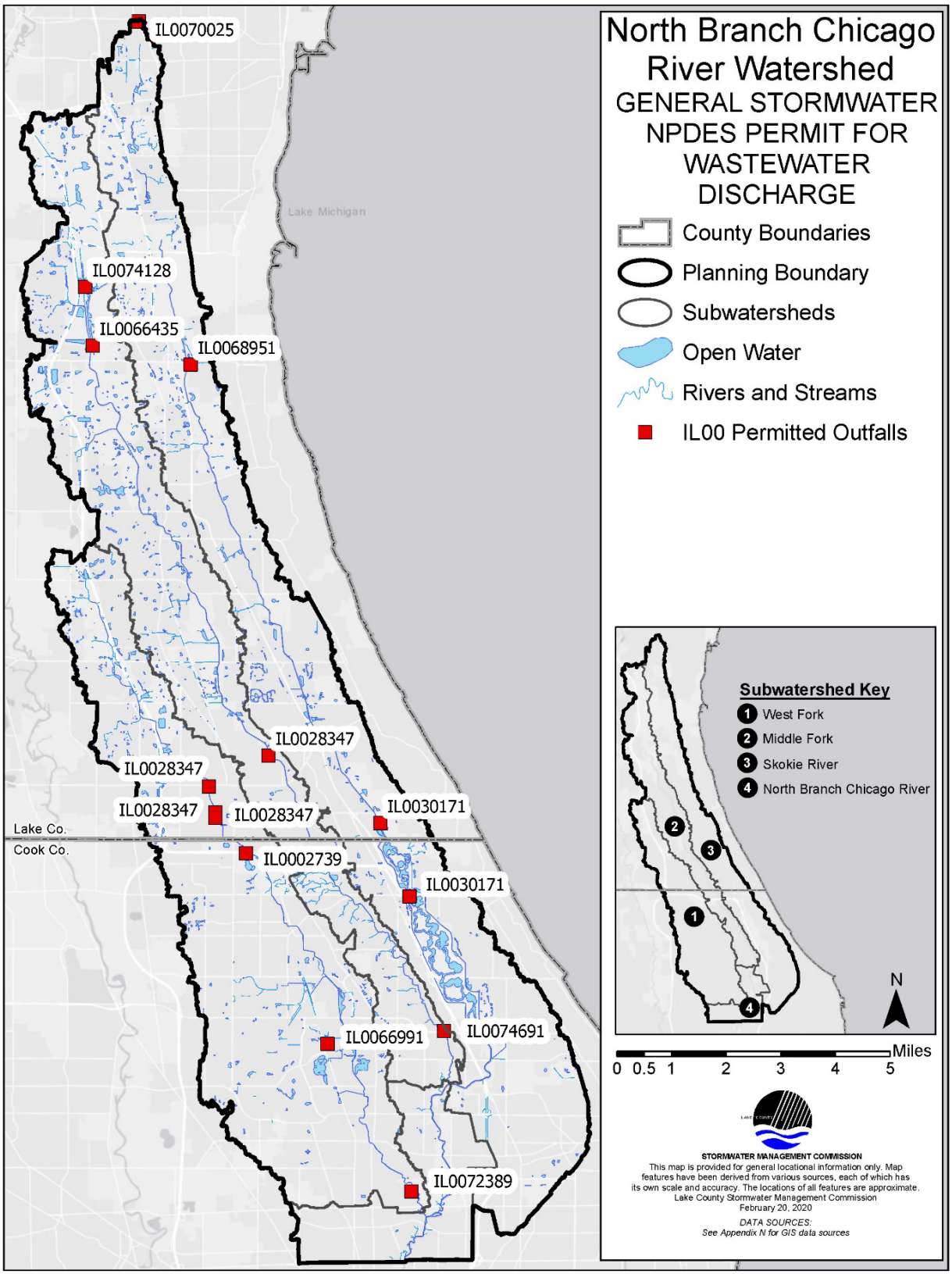


Figure 3-63: Active WWTP Discharges

3.17.2 Other Point Sources

3.17.2.1 Pesticide Point Source Discharge

Pesticide Application Point Source Discharges regulates point source discharges of biological pesticides and chemical pesticides that leave a residue over or into Waters of the United States (WOUS) and requires a permit under the USEPA NPDES pesticides general permit (Illinois EPA, 2011). The USEPA's pesticides general permit authorizes discharges to WOUS from the application of biological pesticides and chemical pesticides that leave a residue for mosquito and other flying insect pest control, aquatic weed and algae control, aquatic nuisance animal control, forest canopy pest control and other pest control activities.

Agricultural runoff and/or irrigation return flows that contain pesticides are exempt from NPDES permitting requirements as authorized by Congress in 1987 with an amendment to the CWA for the exemption. In Illinois, the Pesticide Application Point Source Discharges permit is NPDES Permit No. ILG87, that currently has a permit issued for November 1, 2016 – October 31, 2021. Within the study area are 22 NPDES Pesticide Application Point Source Discharge permits (USEPA, 2020), issued for Public Entities see Table 3-61 for individual NPDES pesticide permits.

Table 3-61: ILG87 Permits Issued to Public Entities in the NBCR Planning Area

PERMITTEE	NPDES PERMIT NO.	CITY	PERMITTEE	NPDES PERMIT NO.	CITY
Chicago Botanic Garden	ILG870235	Glencoe	Metropolitan Water Reclamation District of Greater Chicago	ILG870391	Chicago
Cook County Department of Public Health	ILG870016	Bridgeview	Village of Niles	ILG870111	Niles
City of Evanston	ILG870109	Evanston	North Shore Mosquito Abatement District	ILG870088	Northfield
Forest Preserve District of Cook County	ILG870401	River Forest	Park District of Highland Park	ILG870292	Highland Park
Illinois Department of Transportation	ILG870234	Springfield	Village of Skokie	ILG870110	Skokie
Illinois State Toll Highway Authority	ILG870228	Oak Brook	Village of Glenview	ILG870649	Glenview
Lake Bluff Park District	ILG870134	Lake Bluff	Village of Morton Grove	ILG870277	Morton Grove
Lake County Forest Preserve District	ILG870192	Libertyville	Warren Township	ILG870360	Gurnee
Lake County Health Department	ILG870262	Libertyville	Winnetka Park District	ILG870125	Winnetka
Lincolnshire, Village of	ILG870473	Lincolnshire	Woodland CC SD 50	ILG870788	Gurnee

Data Source: USEPA Facility Registry Service (FRS)

Within the study area are 9 NPDES Pesticide Application Point Source Discharge permits (USEPA, 2020), issued for private entities for use at properties within their ownership or oversight; see Table 3-61 for individual NPDES pesticide permits.

Table 3-62: ILG87 Permits Issued to Private Entities with Properties in the NBCR Planning Area

PERMITTEE	NPDES PERMIT NO.	CITY	PERMITTEE	NPDES PERMIT NO.	CITY
Commonwealth Edison	ILG870073	Oakbrook Terrace	Knollwood Club	ILG870190	Lake Forest
Conway Farms Golf Club	ILG870066	Lake Forest	Openlands	ILG870900	Chicago
Exmoor Country Club	ILG870167	Highland Park	Sunset Ridge Country Club	ILG870752	Northbrook
Glencoe Golf Club	ILG870345	Glencoe	The Glen Club	ILG870737	Glenview
Green Acres Country Club	ILG870072	Northbrook			

Data Source: USEPA Facility Registry Service (FRS)

Within the study area are 31 NPDES Pesticide Application Point Source Discharge permits (USEPA, 2020), issued for consultant/contractor entities for use at project sites under their contractual obligation. The selection of permittees in this list is based on municipal origin in the NBCR planning area as well as permittees known to have worked within the NBCR planning area. See Table 3-63 for individual NPDES pesticide permits. There may be additional commercial organizations with an NPDES pesticides general permit performing work on public and private property within the study area but are not included within this inventory as their activities cannot be determined at this time.

Table 3-63: ILG87 Permits Issued to Organizations located within a Muncipality with Jurisdiction in the NBCR Planning Area

PERMITTEE	NPDES PERMIT NO.	CITY	PERMITTEE	NPDES PERMIT NO.	CITY
Advanced Maintenance and Pest Solutions LLC	ILG870564	Norridge	Keystone Hatcheries LLC	ILG870198	Richmond
Apex Landscaping	ILG870764	Hawthorn Woods	Koukol Mosquito	ILG870784	Woodstock
Aquatics Unlimited Inc	ILG870155	Harvard	McCloud Aquatic Services	ILG870010	Elburn
Cardno JFNew	ILG870229	Monee	McCloud Services	ILG870639	Hoffman Estates
Christopher B Burke Engineering Ltd	ILG870273	Rosemont	McGinty Bros Inc	ILG870369	Long Grove
Clarke Aquatic Services Inc	ILG870183	Roselle	Michael Gowe, Scientific Aquatic Weed Control, Inc.	ILG870196	Gurnee
Clarke Aquatic Services Inc	ILG870458	Roselle	Orkin LLC	ILG870902	Crystal Lake
Clarke Mosquito Control	ILG870182	Roselle	Orkin LLC	ILG870905	Skokie
Conservation Land Stewardship Inc	ILG870558	Elmhurst	Pizzo And Associates	ILG870718	Leland
Encap Inc	ILG870028	Sycamore	Pizzo And Associates Ltd	ILG870035	Leland

PERMITTEE	NPDES PERMIT NO.	CITY	PERMITTEE	NPDES PERMIT NO.	CITY
Environmental Aquatic Management LLC	ILG870081	Crystal Lake	Rose Pest Solutions	ILG870472	Northfield
Hampton Lenzini And Renwick Inc	ILG870467	Elgin	Skeeter Beater, LLC	ILG870889	Hawthorn Woods
Hey and Associates Inc	ILG870029	Volo	Smithereen Pest Management	ILG870252	Niles
Homer Environmental, LLC	ILG870853	Lockport	Tallgrass Restoration LLC	ILG870014	Schaumburg
Homer Tree Service, Inc.	ILG870857	Lockport	V3 Companies	ILG870026	Woodridge
Integrated Lakes Management	ILG870013	Waukegan			

Data Source: USEPA Facility Registry Service (FRS)

3.18 NPDES PHASE II STORMWATER PERMITS

The NPDES Phase II Program regulates stormwater discharges from small MS4s, industrial and construction site activities, all spanning a 5-year permit length. Stormwater runoff is identified as a key method of conveying pollutants from impervious surfaces into local rivers and streams allowing untreated water to degrade water quality. Polluted runoff or NPS pollution substantially impacts water quality. Polluted runoff is caused by rainfall or snowmelt moving over and through the ground picking up natural and human–made pollutants, depositing them into rivers, lakes, wetlands and groundwater.

Under the permitting requirements of the NPDES Phase II, permittees are required to implement certain practices that control pollution in stormwater runoff. They are required to prevent the contamination of stormwater runoff and develop a Stormwater Pollution Prevention Plan (SWPPP). NPDES Phase II, is intended to reduce negative impacts to water quality and aquatic habitats by preventing and controlling unregulated sources of stormwater discharge, educating communities about water quality and improving water quality.

3.18.1 INDUSTRIAL ACTIVITY STORM WATER POINT SOURCE DISCHARGE (STORMWATER DISCHARGES FROM INDUSTRIAL ACTIVITIES, 2020)

Storm Water Discharges from Industrial Activities into WOUS require a permit under the USEPA NPDES. This permit is applicable to stormwater discharges associated with industrial activity from areas where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to stormwater in the state of Illinois. Runoff from rainfall or snowmelt that comes in contact with these industrial activities can pick up pollutants and transport them directly to a nearby river or lake coastal water or indirectly via a storm sewer and degrades water quality. This permit provides a list of facility types that are included and excluded under a General NPDES Permit for Industrial Storm Water Discharge into WOUS. In Illinois, the Industrial Activity Storm Water Point Source

Discharge is NPDES Permit No. ILR00 (Illinois EPA, 2016), under an April 5, 2017 – March 31, 2022 permit, that regulates 11 categories of industrial activities:

- Category One (i): Facilities subject to federal stormwater effluent discharge standards at 40 CFR Parts 405-471
- Category Two (ii): Heavy manufacturing (e.g. paper mills, chemical plants, petroleum refineries, steel mills and foundries)
- Category Three (iii): Coal and mineral mining and oil and gas exploration and processing
- Category Four (iv): Hazardous waste treatment, storage, and disposal facilities
- Category Five (v): Landfills, land application sites, and open dumps with industrial wastes
- Category Six (vi): Metal scrapyards, salvage yards, automobile junkyards, and battery reclaimers
- Category Seven (vii): Steam electric power generating plants
- Category Eight (viii): Transportation facilities that have vehicle maintenance, equipment cleaning, or airport deicing operations
- Category Nine (ix): Treatment works treating domestic sewage with a design flow of 1 MGD or more
- Category Ten (x): Construction sites that disturb 5 acres or more (permitted separately)
- Category Eleven (xi): Light manufacturing (e.g. food processing, printing and publishing, electronic and other electrical equipment manufacturing, public warehousing and storage)

There are 25 NPDES Industrial Activity Storm Water Point Source Discharge permits located within the NBCR planning area (Illinois EPA, 2020). Table 3-64 and Figure 3-64 identifies individual NPDES industrial stormwater discharge permits.

Table 3-64: ILR00 Permits Issued to Organizations located within the NBCR Planning Area

PERMITTEE	NPDES PERMIT NO.	CITY	PERMITTEE	NPDES PERMIT NO.	CITY
Acme Die Casting Corporation	ILR002932	Northbrook	Lake Bluff #546	ILR005993	Lake Bluff
Amazon.com Services, Inc - MDW8	ILR007518	Waukegan	Liquid Controls, LLC	ILR001333	Lake Bluff
Auto Parts City Inc -	ILR006906	Gurnee	Nestle Waters North America	ILR007388	Northbrook
Baker & Son Co-Lake Bluff	ILR003862	Lake Bluff	Northbrook Transfer Station	ILR002921	Northbrook
Bell Flavors & Fragrances Inc	ILR006613	Northbrook	Ozinga Ready Mix Concrete-Lake Bluff	ILR003680	Lake Bluff
C&D Recycling	ILR007619	Northbrook	Peter Baker and Sons	ILR003841	Lake Bluff
Clavey Rd Sewage Treatment Plt	ILR004381	Highland Park	Rondout Iron & Metal Co Inc	ILR005968	Lake Bluff
Deerfield	ILR006260	Deerfield	Signode Industrial Group	ILR005975	Glenview
EWL Trucking Inc	ILR001896	Glenview	The Gillette Company	ILR000938	North Chicago
Fareva Morton Grove, Inc.	ILR001138	Morton Grove	The Popcorn Factory	ILR003173	Lake Forest
First Student Inc #11487	ILR004143	Northbrook	UPS - Northbrook Shermer Rd	ILR003126	Northbrook
Helio Precision Products	ILR006537	Lake Bluff	UPS Northbrook Willow Rd	ILR003125	Northbrook
International Precision Components Corp-Lake Forest	ILR007367	Lake Forest			

Data Source: Illinois EPA, Database of Storm Water Notices of Intent for Industrial Activities

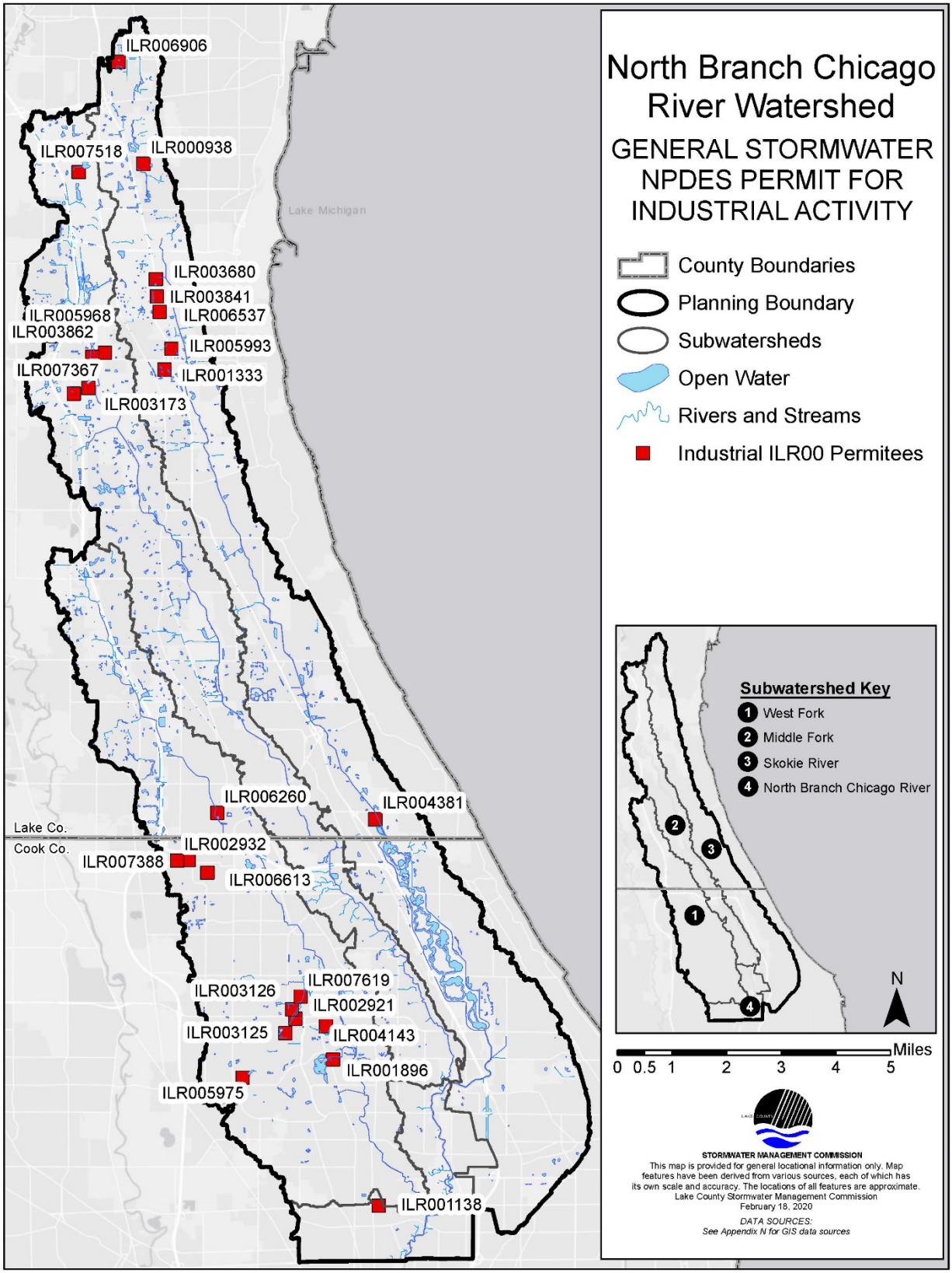


Figure 3-64: Industrial Activity Point Source Discharge Permits

3.18.2 Construction Site Activities Storm Water Discharge ("General Stormwater NPDES Permit for Construction Activities," 2010)

A USEPA NPDES permit is required for stormwater discharges into WOUS from construction sites where one or more acres of land is disturbed. Smaller sites within a larger construction project or development must consider the total disturbance of the project when determining if a USEPA NPDES permit is required. Many permittees in Illinois obtain permit coverage for their construction projects under the State's General Storm Water NPDES Permit for Storm Water Discharges from Construction Site Activities. In order for stormwater discharges from construction sites to be authorized under this General Permit, the owner must submit a Notice of Intent (NOI) in accordance with the requirements of the general permit. Permittees must develop and implement a SWPPP to effectively manage the discharge of pollutants from the site.

In Illinois, the Storm Water Discharges from Construction Site Activities is Permit No. ILR10 (Illinois EPA, 2018-2023), that currently has a permit issued for August 3, 2018 – July 31, 2023. Within the study area 40 NPDES ILR10 permits are identified as being located within the NBCR planning area from July 2018 to February 2020 (Illinois EPA, 2019[i]). Table 3-65 identify individual NPDES construction site activity stormwater point source discharge permits.

Table 3-65: ILR10 Permits Issued to Organizations located within the NBCR Planning Area

PERMITTEE	NPDES PERMIT NO.	PROJECT NAME	CITY
Rockland Industrial Properties 176 LLC	ILR10AF44	Green Oaks Mixed Use Development	Green Oaks
Mike Bousis	ILR10AG93	1885 Hilltop Lane Single Family Residence	Bannockburn
Jim & Lisa Challanger	ILR10AM06	225 Old Farm Rd	Northfield
1200 Shermer LLC	ILR10AN61	Bank of America	Northbrook
Northpond Partners LLC	ILR10AN62	Glenview Marketplace Starbucks	Glenview
West Northfield School District 31	ILR10AQ29	Field Middle School Asphalt Paving & Site Improvements	Northbrook
Glenview Park District	ILR10AQ37	Glenview Park District Community Ice Center	Glenview
Panattoni Development Company	ILR10AQ67	Green Oaks Industrial	Green Oaks
Illinois State Toll Highway Authority	ILR10AQ70	Tri-State I-94 Rr-16-4277r Pavement Rehabilitation	Deerfield
Illinois Tollway	ILR10AR40	Contract 4373 Eden's Spur	Northbrook
John Staton	ILR10AS75	Single Family Residence	Lake Forest
Northbrook Park District	ILR10AT56	Northbrook Park District Activity Center	Northbrook
Il State Toll Highway Authority	ILR10AU66	Contract 4453 Building Removals	Cook County
North Shore School District 112	ILR10AU76	Northwood Middle School	Highland Park
Illinois Department of Transportation	ILR10AV06	IDOT Contract 60n83. Mar '19 Letting Item 4. Sn-016-0533 Carrying Willow Rd	Glenview
Deerfield Park District	ILR10AV08	Jewett Park	Deerfield
Village of Northfield	ILR10AV39	1039 Northfield Rd Winnetka Rd	Northfield
Highland Park Community Nursery School & Day Care Center	ILR10AV74	Site Improvements	Highland Park
Alex Zdanov	ILR10AW19	Homes at Lakewood Estates	Glenview
Brookfield Properties Retail	ILR10AW80	Northbrook Court Macy's Redevelopment	Northbrook
Il State Toll Highway Authority	ILR10AX15	Eden's Spur Reconstruction Contract 4374	Northbrook
Artis Senior Living of Wilmette LLC	ILR10AX38	Artis Senior Living of Wilmette	Wilmette
School District 31	ILR10AX46	Winkelman Elementary Asphalt Paving & Site Improvements	Glenview

PERMITTEE	NPDES PERMIT NO.	PROJECT NAME	CITY
Cardinal Health	ILR10AX72	Cardinal Health Parking Lot	Waukegan
Albion Jacobs Highland Park LLC	ILR10AZ25	Albion At Highland Park	Highland Park
Fountain Square Hospitality Inc	ILR10AZ52	Marriot Town Place Suites	Waukegan
J Emil Anderson & Son Inc	ILR10AZ86	2019 Parking Lot Improvements	Lake Bluff
Chicago Botanic Garden	ILR10BA12	Shade Evaluation Garden & Shoreline Restoration	Glencoe
Lincolnshire-Prairie View School District 103	ILR10BA38	Storm Water Improvements: Daniel Wright Junior High School	Lincolnshire
Richland Creek Willowhill LLC	ILR10BA62	Willowhill Sports Facility Dome Building	Northbrook
Mi Homes of Chicago LLC	ILR10BB16	Sterling Place	Northbrook
Equestrian Connection, NFP	ILR10BC92	Equestrian Connection Engineering and Permitting	Lake Forest
Village of Deerfield	ILR10BD70	Woodvale Avenue Improvements Project	Deerfield
Oracle Corporation	ILR10BD73	Innovation Lab Phase 2	Deerfield
Glenview Park District	ILR10BD87	Wagner Farm Phase 1	Glenview
GW Glenview LLC	ILR10BF09	Pfingston & Willow Commercial Development	Glenview
Northbrook Park District	ILR10BF45	Sportsmans Country Club Improvements	Northbrook
Avoca School District 37	ILR10BF55	Avoca Center Demolition Phase 2	Wilmette
True North Energy, LLC	ILR10BG05	True North Gas Station - Waukegan	Waukegan
North American Corporation of Illinois	ILR10BG12	Proposed Expansion	Glenview

[1]*IL EPA Storm Water Notices of Intent Information for Construction and Industrial Activities, 2019*

3.18.3 ILR40, Discharges from Small Municipal Separate Storm Sewer Systems

Per Permit No. *ILR40* (Illinois EPA, 2016), Storm Water Discharges from Small MS4s into WOUS require a permit under the USEPA NPDES program as many units of government have distinct roles and responsibilities related to water quality and NPS pollution control. Discharges from small MS4s in USEPA Region 5 states are regulated under each state's general NPDES Permit No. ILR40 (Illinois) (USEPA, 2016), that currently has a permit issued for March 1, 2016 – February 28, 2021. In the NBCR planning area, the state NPDES program administrator is the Illinois EPA. The ILR40 permit requires that MS4 operators develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants. A permittee's stormwater management program must include six minimum control measures:

1. Public education and outreach on stormwater impacts
2. Public involvement and participation
3. Illicit discharge detection and elimination
4. Construction site stormwater runoff control
5. Post construction stormwater management in new development and redevelopment
6. Pollution prevention / good housekeeping for municipal operations

To define its stormwater management program, a permittee must define BMPs and measurable goals for each of the six minimum control measures. In the NBCR planning area, there are 2 units of county government, 7 units of township government, 24 units of municipal government, 4 drainage districts and 2 state agencies operating as MS4's with distinct roles and responsibilities related to activities and water quality control (Figure 3-65).

3.18.3.1 Municipal

In the NBCR planning area, there are 25 units of municipal government, located within 1 state and 2 counties (Table 3-66). There are 11 municipal units of government that are located in Cook County, IL. There are 14 municipal units of government that are located in Lake County, IL. The Village of Mettawa in Lake County is the only municipality without an active NPDES ILR40. The following NPDES MS4 tables detail the municipality by name and the NPDES MS4 permit number.

Table 3-66: ILR10 Permits Issued to Municipalities located within the NBCR Planning Area

PERMITTEE	PERMIT NO.	PERMITTEE	PERMIT NO.
City of Evanston	ILR400335	Village of Gurnee	ILR400204
City of Highland Park	ILR400352	Village of Lake Bluff	ILR400366
City of Highwood	ILR400353	Village of Lincolnshire	ILR400375
City of Lake Forest	ILR400367	Village of Morton Grove	ILR400391
City of North Chicago	ILR400402	Village of Niles	ILR400398
City of Park City	ILR400420	Village of Northbrook	ILR400404
City of Waukegan	ILR400465	Village of Northfield	ILR400405
Village of Bannockburn	ILR400284	Village of Riverwoods	ILR400431
Village of Deerfield	ILR400324	Village of Skokie	ILR400447
Village of Glencoe	ILR400198	Village of Wilmette	ILR400473
Village of Glenview	ILR400343	Village of Winnetka	ILR400476
Village of Golf	ILR400200		
Village of Green Oaks	ILR400203	Village of Mettawa	No Permit

Data Source: Illinois EPA Storm Water Notices of Intent Information for Construction and Industrial Activities

3.18.3.2 Townships

There are 10 townships located in Lake and Cook County, Illinois (Table 3-67). Seven of the townships have active NPDES permits and 3 townships do have an NPDES permit.

Table 3-67: NBCR Planning Area Township ILR40 Issued Permits

PERMITTEE	NPDES PERMIT NO.	COUNTY
Libertyville Township	ILR400077	Lake
Maine Township	ILR400686	Cook
New Trier Township	*No Permit	Cook
Niles Township	*No Permit	Cook
Northfield Township	ILR400098	Cook
Shields Township	ILR400123	Lake
Vernon Township	*No Permit	Lake
Warren Township	ILR400145	Lake
Waukegan Township	ILR400148	Lake
West Deerfield Township	ILR400150	Lake

Data Source: USEPA Facility Registry Service (FRS)[ii]

**Townships with no active permit within the ILR40 permit program: MS4 designation is through the Code of Federal Regulation Title 40. Protection of Environment, specific to 40 CFR 122.32(a)(1) and 40 CFR 122.32(a)(2). The Illinois EPA does not have a permit number for these programs within its database. The Illinois EPA would need to determine compliance.*

3.18.3.3 Drainage Districts

There are four drainage districts in the NBCR planning area (Table 3-68), all of which are located in Lake County.

Table 3-68: ILR40 Permits Issued to Drainage Districts located within the NBCR Planning Area

PERMITTEE	NPDES PERMIT NO.
East Skokie Drainage District	ILR400491
Union Drainage District No. 1 West Fork	ILR400487
Union Drainage District No. 1 Middle Fork	ILR400518
West Skokie Drainage District Middle Fork	ILR400490

Data Source: Illinois EPA Storm Water Notices of Intent Information for Construction and Industrial Activities

3.18.3.4 Counties

There are 2 units of county government, located within the NBCR planning area that require an NPDES permit.

Table 3-69: ILR40 Permits Issued to Counties located within the NBCR Planning Area

PERMITTEE	NPDES PERMIT NO.
Cook County Highway Department	ILR400485
Lake County	ILR400517

Data Source: Illinois EPA Storm Water Notices of Intent Information for Construction and Industrial Activities

3.18.3.5 State

There are 2 units of state government, located within the NBCR planning area that require an NPDES permit.

Table 3-70: ILR40 Permits Issued to State Entities located within the NBCR Planning Area

PERMITTEE	NPDES PERMIT NO.
Illinois Department of Transportation	ILR400493
Illinois Toll Highway Authority	ILR400494

Data Source: Illinois EPA Storm Water Notices of Intent Information for Construction and Industrial Activities

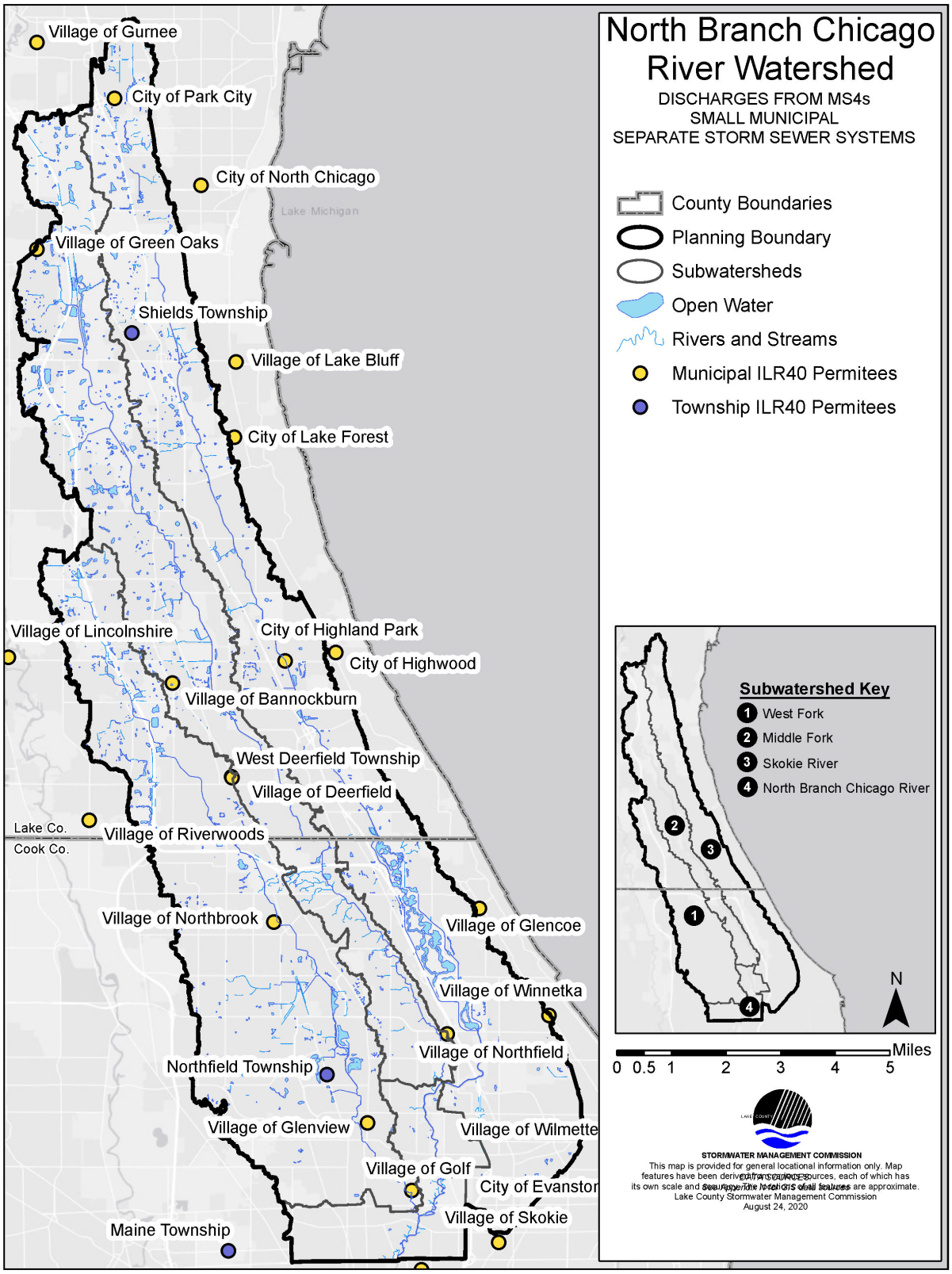


Figure 3-65: Small Municipal Separate Storm Sewer Systems

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COMMON ACRONYMS/ABBREVIATIONS USED IN CHAPTER 4

AC- ACRE

BMP – Best Management Practices

BOD - Biological Oxygen Demand

CFU - Colony Forming Unit

Cd- Cadmium

COD - Chemical Oxygen Demand

Cu - Copper

CWP – Center for Watershed Protection

DO – Dissolved Oxygen

DP – Dissolved Phosphorus

E. coli - Escherichia coli

EMC - Event Mean Concentration

FLU – Future Land Use

FOCR – Friends of the Chicago River

FPD - Forest Preserve Districts

FPDCC - Forest Preserve District of Cook County

GIS- Geographic Information System

IC – Impervious Cover

IDNR – Illinois Department of Natural Resources

IDOT- Illinois Department of Transportation

Illinois EPA – Illinois Environmental Protection Agency

Lb- Pounds

LCFPD- Lake County Forest Preserve District

LID- Low Impact Development

LRR- Lateral Recession Rates

MBI - Midwest Biodiversity Institute

MLSWCD – McHenry-Lake Soil & Water Conservation District

MWRD – Metropolitan Water Reclamation District of Greater Chicago

NBCR – North Branch Chicago River

NBCR Planning Area – North Branch Chicago River Watershed Planning Area

NBWW – North Branch Chicago River Watershed Workgroup

NCSWCD – North Cook Soil & Water Conservation District

NIPC - Northeastern Illinois Planning Commission

NLCD - National Land Cover Database

NPDES- National Pollutant Discharge Elimination System

NPDES II- National Pollutant Discharge Elimination System Phase Two

NPS – Nonpoint Source

NRCS- Natural Resources Conservation Service

NSWRD – North Shore Water Reclamation District

PAH – Polycyclic Aromatic Hydrocarbons

Pb - Lead

PB&D –Planning, Building and Development

PEC- Probable Effect Concentration

SMC – Lake County Stormwater Management Commission

TDS – Total Dissolved Solids

TEC- Threshold Effect Concentration

TKN - Total Kjeldahl Nitrogen

TMDL – Total Maximum Daily Load

TN – Total Nitrogen

TP – Total Phosphorus

TSS – Total Suspended Solids

UDO – Unified Development Ordinance

USACE- United Stated Army Corps of Engineers

USEPA- United States Environmental Protection Agency

WOUS – Waters of the United States

WDO – Watershed Development Ordinance

WMO – Watershed Management Ordinance

Yr.- Year

Zn - Zinc

4 WATERSHED PROBLEM ASSESSMENT

This chapter assesses in detail the problems identified in Chapter 3 Watershed Characteristics Assessment. The Watershed Problem Assessment chapter sections describe the effect of land use and land cover change on water resources in the NBCR planning area; estimate the most prevalent causes and sources of pollution in rivers, streams and lakes; estimate nonpoint source pollutant loading in the NBCR planning area; and identify critical areas where programmatic or site-specific actions or projects are likely to result in nonpoint source pollutant reductions. This chapter also assesses how jurisdictional roles, including regulatory oversight, can be better coordinated to improve the condition of water resources.

4.1 LAND USE IMPACTS AND IC CHANGES

As discussed in Chapter 3, impervious cover (IC) is the result of altering or replacing native soil permeability through various land use functions. IC produces an increase in direct storm water runoff and nonpoint source pollution stressors into wetlands, ponds, streams, and rivers thereby impacting local water quality. Stressors increase pollutant loads in stormwater runoff, alter stream flow, decrease bank stability, increase water temperatures, and reduce wetland capacity and function. These impacts affect terrestrial and aquatic wildlife, plant establishment, habitat function, recreational opportunities, environmental health, and property use and value.

As discussed in Chapter 3, research also shows that IC impacts water quality at relatively low levels of development and land use (0-9% IC or **Low IC**). Symptoms of water quality impact from land use stressors have been observed at 10-29% IC (or **Medium IC**) of a watershed, and research has quantified and observed degradation of natural water bodies when IC is between 30-100% (**High IC**) of the watershed. Figure 4-1 visualizes percent imperviousness based on impacted land use (Chabaeva, 2007).

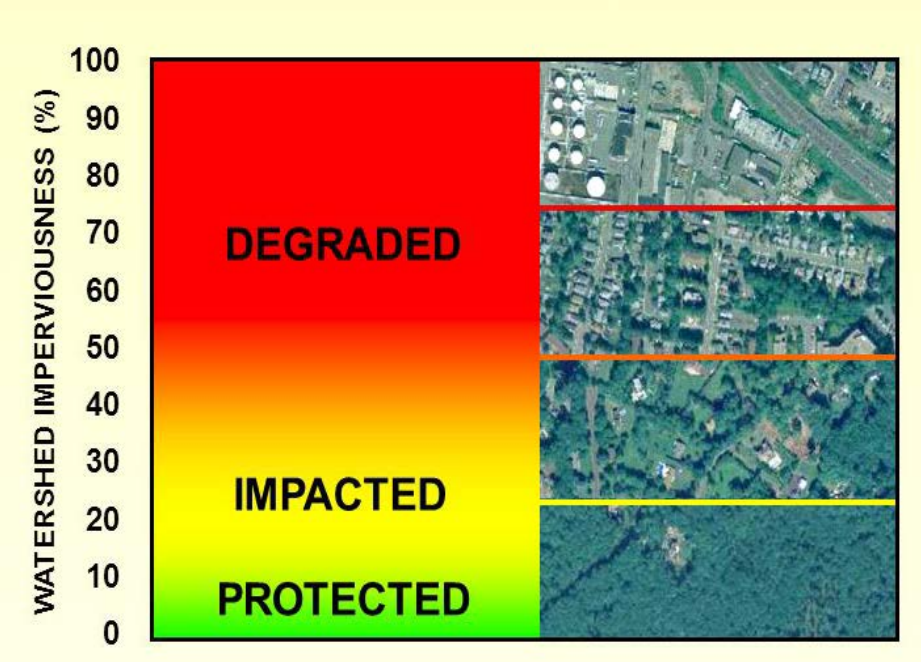


Figure 4-1: Comparison of percent imperviousness to land use

IMPERVIOUS COVER (IC) CLASSIFICATION: As mentioned in section 3.6.3 Existing and Projected Future Percent Imperviousness, water quality is impacted at 10% and degradation of water quality is consistent at greater than 30% impervious cover. The impervious cover is analyzed by impacts:

Low IC – Land use changes increase impervious cover to 0-9% of the watershed with minimal impact to water quality.

Medium IC – Land use changes increase impervious cover to 10-29% of the watershed with water quality impacts noticeable.

High IC – Land use changes increase impervious cover to 30-100% of the watershed with water quality degradation expected.

4.1.1 Effects of Land Use Change on Water Quantity

Land disturbance associated with land use modification has a direct effect on stormwater quantity. When a natural site is disturbed, its hydrology is essentially altered due to impacts to the native soils and vegetation. Plowing, clearing, and tree removal eliminate vegetation that reduces stormwater runoff volumes through the hydrologic processes of interception, evaporation, and transpiration. Earthwork and grading disturb native soils and may remove areas with natural depressions that collect, infiltrate, and retain rainfall and stormwater runoff onsite. Soil compaction resulting from the operation of heavy machinery over and across the site reduces the infiltration capacity of underlying soil. Land use changes that increase impervious surfaces, such as roads, parking lots, driveways and rooftops, further reduce the infiltration capacity of an area and increase stormwater runoff volume and velocity.

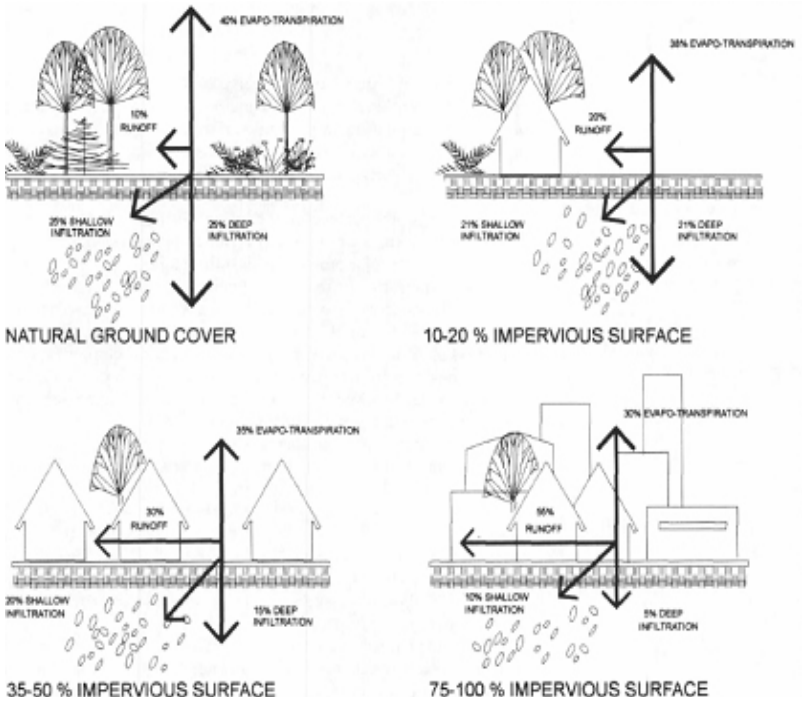


Figure 4-2: Influence of impervious surface on the fate of precipitation

The installation of drainage improvements (e.g., channelization, dredging, or artificial drainage systems) further reduces a site's ability to retain rainfall. Collectively these impacts result in substantially increased stormwater runoff volumes and velocities (Figure 4-2) and reductions in groundwater recharge (Pitt, 1994; Shueler, 1987; Thompson, 2009). Increased stormwater runoff volumes and velocities result in increased peak discharge rates, which can be at least two to five times higher on developed sites than undeveloped sites, resulting in increased flooding risk (Figure 4-3). Reduced groundwater recharge decreases baseflow to aquatic resources, including streams and wetlands.

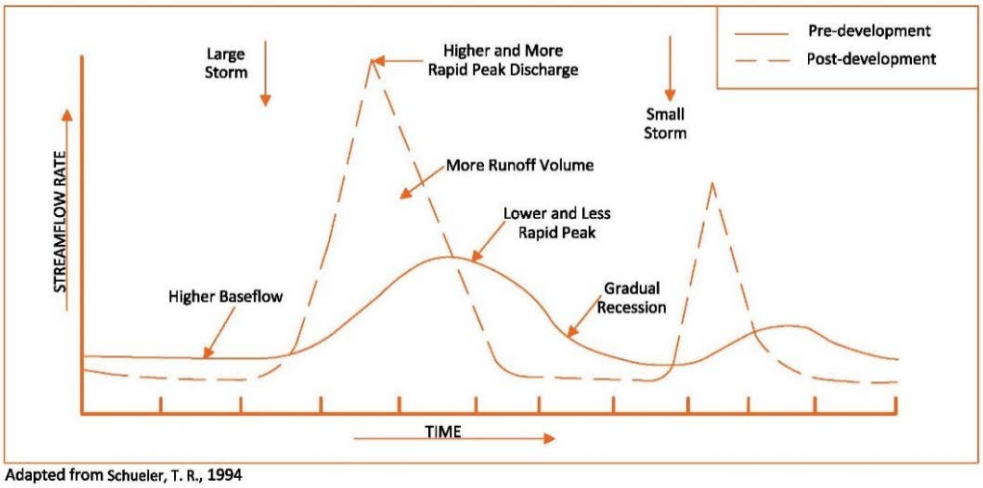


Figure 4-3: Pertinent impacts of urbanization on hydrology at the catchment scale

4.1.2 Effects of Land Use Change on Water Quality

Land use change also affects stormwater quality. Impervious and compacted surfaces, such as roadways, parking lots, lawns, parks, athletic fields, etc… accumulate pollutants including sediment, nutrients, trash, and debris during dry weather. These pollutants are quickly transferred to receiving waters during precipitation events, often through artificial drainage systems, resulting in increased pollutant loads to aquatic resources (Figure 4-4). Tables in sections 3.16.1 Status of Designated Use Support, 3.16.2 Total Maximum Daily Load for North Branch Chicago River, 3.16.3 Summary of Previous Studies and North Branch Chicago River (NBWW) Monitoring Program, and 3.16.4.3 Water Quality, characterize water quality impacts, causes and sources to lakes and streams.

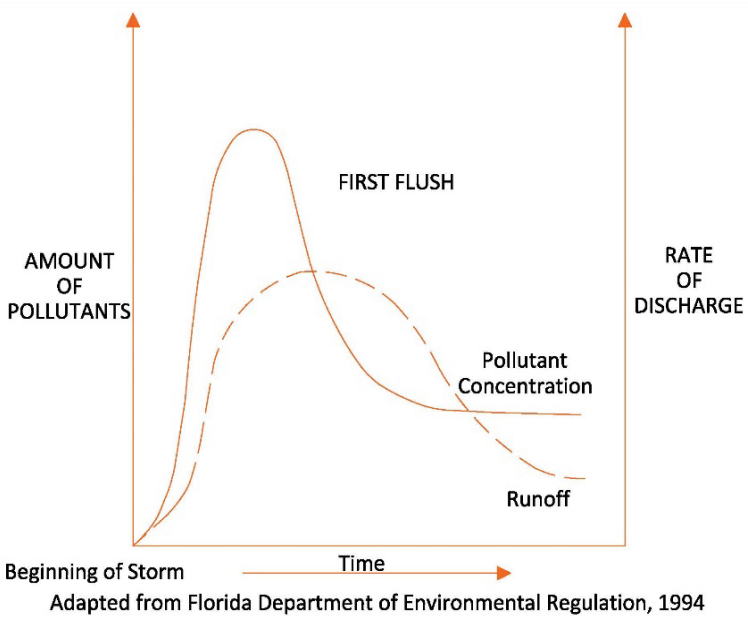


Figure 4-4: Influence of impervious surface on fate of pollutant concentrations

Stormwater pollutants come from a variety of diffuse and scattered sources, many of which are a direct or indirect result of land use change. These nonpoint source pollutants include:

- Sediment: Sources of sediment to stormwater runoff include land disturbing activities, atmospheric deposition, and surface or streambank erosion. Sediment particles can adsorb other stormwater pollutants, such as nutrients, metals, hydrocarbons, and pesticides, and transport them into receiving streams, wetlands, and other aquatic resources.
- Nutrients: Sources of nutrients such as nitrogen and phosphorus to stormwater runoff include fertilizer, pet and animal waste, leaves, grass clippings, sanitary sewer overflows, septic system discharges, and atmospheric deposition.
- Bacteria: Sources of bacteria and pathogens to stormwater runoff include pet and animal waste, sanitary sewer overflows, and septic system discharges. Runoff impacted by these sources typically exceeds public health standards for recreational contact.
- Organic Matter: Sources of organic matter to stormwater runoff include leaves, grass clippings, pet and animal waste, sanitary sewer overflows, and septic system discharges. The decomposition of this organic matter can decrease dissolved oxygen to levels that are detrimental to aquatic life.
- Metals: Sources of heavy metals, such as lead, zinc, copper, and cadmium, to stormwater runoff include atmospheric deposition, vehicle wear, and commercial, industrial, and hazardous waste sites.
- Hydrocarbons: Sources of hydrocarbons (i.e., PAHs or coal tar sealants) to stormwater runoff include vehicle wear, chemical spills, restaurant grease traps, and improper handling and disposal of waste oil and grease.
- Pesticides: Sources of insecticides, herbicides, and other pesticides to stormwater runoff include lawn care and maintenance activities, chemical spills, and atmospheric deposition.

- Chemicals: Sources of chemicals, such as chlorine, solvents, soaps and detergents, degreasers, drain cleaners, vehicular liquids and paint, to stormwater runoff include residential, commercial, industrial, and hazardous waste sites.
- Chlorides: Sources of chlorides to stormwater runoff include winter sidewalk, driveway, roadway, and parking lot anti-icing and deicing activities. Water softeners contribute chloride via wastewater effluent.
- Trash and Debris: Considerable quantities of trash and debris typically accumulate on impervious or compacted pervious surfaces and are transferred to receiving waters by stormwater runoff. This trash and debris can accumulate in stormwater conveyance systems, potentially causing clogging and nuisance flooding.

As outlined below, an extensive and ever-growing body of research shows that these nonpoint source pollutants have substantial negative impacts on streams, wetlands, and other aquatic resources. Negative impacts include impaired water quality, reduced dissolved oxygen levels, increased primary productivity (e.g., eutrophication, algal blooms), sediment contamination, degradation of habitat, and a general decline in the abundance and diversity of wildlife and aquatic animals.

4.1.3 Effects of Land Use Change on Stormwater Temperature

Land use changes also affect stormwater temperature. The compacted pervious and impervious surfaces resulting from land use change absorb and retain heat, especially when exposed to sunlight. The heating of these surfaces is exacerbated by reduced shade resulted from the clearing of vegetation. During precipitation events, these heated surfaces increase the temperature of stormwater runoff, resulting in increased water temperatures and decreased dissolved oxygen in receiving waters.

4.1.4 Impacts on Aquatic Resources

Changes in hydrology and stormwater runoff characteristics (e.g., increased stormwater runoff rates, volumes, and pollutant loads) resulting from changes in land use can have a wide range of negative impacts on the aquatic resources of the NBCR planning area. Detailed information about these impacts is provided below.

4.1.4.1

Streams

Impacts on the stream resources within the NBCR planning area are characterized in sections 3.12.2 Stream Network Description/Stream Reaches and 3.16.3 Summary of Previous Studies and NBWW Monitoring Program. Changes in stormwater quantity, quality, and temperature resulting from changes in land use can have multiple negative impacts on freshwater streams. These well-documented impacts (CWP, 2003; CWP, 2009; Cruse et al., 2012) include:

- Increased Channel Forming Events: Increased stormwater runoff rates and volumes resulting from land use changes increase the frequency and duration of channel forming bankfull and near-bankfull events, resulting in changes in channel form, stream channel enlargement (e.g., stream down-cutting and widening), and streambank erosion.

- Increased Flooding: Increased stormwater runoff rates and volumes resulting from land use changes also increase the frequency, duration, and severity of overbank and extreme flooding events. These flooding events can cause property damage and endanger public health and safety.
- Decreased Baseflow: Increased stormwater runoff volumes resulting from land use changes reduce the amount of recharge to shallow groundwater aquifers which supply baseflow to streams and rivers.
- Stream Channel Enlargement: Stream channels enlarge (e.g., downcut and widen) to accommodate the increased peak discharges resulting from land use changes.
- Streambank Erosion: As stream channels enlarge to accommodate an increased frequency and duration of channel forming events and the increased peak discharges resulting from land use changes, streambanks are gradually undercut, scoured, and eroded away.
- Loss of Riparian Vegetation: As stream channels enlarge and streambanks are gradually eroded away, the roots of vegetation along the stream corridor may become exposed, undercut, uprooted, and conveyed downstream.
- Degradation of Habitat: Increased stormwater runoff rates and volumes resulting from land use changes scour stream beds and degrade aquatic habitat. The increased sediment loads that result from land use changes and erosion can also degrade aquatic habitat by filling in streambeds and destroying the important pool-riffle structure found in many streams.
- Increased Temperatures: Increased stormwater runoff temperatures resulting from land use changes can raise the temperature of freshwater streams. Since aquatic organisms can only survive within a specific temperature range (e.g., some darter fish species and other cool water species), increased stream temperatures can lead to a decline in wildlife abundance and diversity.
- Degradation of Water Quality: Increased stormwater pollutant loads resulting from land use changes reduce the overall water quality of freshwater streams. This water quality degradation negatively impacts many of the ecological functions that these important natural resources provide.
- Reduced Dissolved Oxygen Levels: Increased amounts of organic matter found in urban stormwater runoff, and increased stormwater runoff temperatures that result from land use changes, reduce the amount of dissolved oxygen found in freshwater streams. Fish kills and the loss of other aquatic organisms can occur if dissolved oxygen levels decrease enough. Low dissolved oxygen levels can also cause the release of harmful pollutants such as metals, nutrients, hydrocarbons, and pesticides that have accumulated within stream bottom sediment.
- Decline in Wildlife Abundance and Diversity: Increased stormwater runoff rates, volumes, and pollutant loads resulting from land use changes degrade habitat and water quality. This reduces the abundance and diversity of aquatic organisms found in freshwater streams. Sensitive keystone or indicator organisms that require high quality habitat may become stressed and be gradually replaced by organisms more tolerant of degraded conditions. For more detailed information on threatened and endangered species see section 3.10.2.
- Reduced Recreational and Aesthetic Value: Increased trash, debris, and pollutant loads found in stormwater runoff can accumulate in freshwater streams and detract from their natural beauty and recreational value.

Lakes and Wetlands

Impacts on aquatic lake resources within the NBCR planning area are characterized in sections 3.13.2 Shoreline Erosion and 3.16 Lake and Stream Water Quality. Impacts on aquatic wetland resources within the NBCR planning area are characterized in section 3.11 Wetland Inventory. Changes in stormwater quantity and quality resulting from changes in land use can have multiple negative impacts on lakes and wetlands.

4.1.4.2 The water quality of lakes, particularly man-made lakes, is substantially negatively impacted by increased stormwater pollutant loads. Since lakes function as sinks within the landscape, incoming sediment, nutrient, bacteria, metals, hydrocarbons, pesticides, chlorides, and trash and debris can remain in a lake for a long time. The accumulation of these various pollutants can reduce overall water quality, contaminate sediments, increase primary productivity (e.g., increase algal growth), and negatively impact many of the important ecological functions that lakes provide. Elevated total suspended solids and phosphorus concentrations were observed in many of the lakes in the NBCR planning area, causing impairments to aesthetic quality and aquatics. Moderate to severe shoreline erosion were observed at most of the assessed lakes (section 3.13.2). Chloride concentrations have been increasing over time in lakes throughout the NBCR planning area (see Chapter 3).

As documented above, land use changes can have a wide range of impacts on the health of terrestrial and aquatic resources. These impacts, which range from additional runoff volume to degraded water quality to a decline in wildlife abundance and diversity, have been well documented by an extensive and ever-growing body of research. These impacts have been observed within the aquatic resources of the NBCR planning area, as described in Chapter 3 and can, in part, be linked to the changes in hydrology and stormwater runoff characteristics (i.e., increased stormwater runoff rates, volumes, and pollutant loads) resulting from land use changes. Changes in stormwater quantity and quality resulting from changes in land use can have multiple negative impacts on lakes and wetlands. These well-documented impacts (Wright et al., 2006; Cruse et al., 2012) include:

- Increased Ponding: Increased stormwater runoff rates and volumes resulting from land use changes can cause increased ponding within wetlands. This can stress native wetland plant communities, especially in wetlands that did not previously receive large inputs of stormwater runoff.
- Increased Water Level Fluctuations: Increased stormwater runoff rates and volumes resulting from land use changes can cause increased water level fluctuations in wetlands. This can stress native wetland plant communities and reduce plant and wildlife abundance and diversity.
- Decreased Baseflow: Increased stormwater runoff volumes resulting from land use changes reduce the amount of precipitation available to recharge shallow groundwater aquifers and provide a steady supply of baseflow to wetlands, particularly during dry weather.
- Shoreline Erosion: Increased ponding and water level fluctuations and decreased baseflow resulting from land use changes can stress native wetland plant communities and leave portions of wetland shorelines unvegetated, making them vulnerable to undercutting, scour, and erosion.
- Degradation of Habitat: Increased ponding and water level fluctuations and decreased baseflow resulting from land use changes can stress native wetland plant communities and degrade wetland habitat. Increased sediment loads resulting from land use changes and surface and streambank erosion can also degrade wetland habitat.

- Degradation of Water Quality: Increased stormwater pollutant loads resulting from land use changes reduce the overall water quality of wetlands. This negatively impacts many of the ecological functions these important natural resources provide.
- Increased Primary Productivity: Increased nutrient loads in stormwater runoff increases the primary productivity of wetlands, promoting algal growth and forcing native wetland plant communities to compete for available nutrients. This competition can stress native wetland plant communities and reduce plant and wildlife abundance and diversity.
- Sediment Contamination: Metals, hydrocarbons, and pesticides in stormwater runoff can become attached to sediment particles and accumulate within wetlands. This can cause sediment contamination and expose aquatic and terrestrial organisms to the harmful effects of these pollutants.
- Decline in Wildlife Abundance and Diversity: When increased stormwater runoff rates, volumes, and pollutant loads resulting from land use changes degrade habitat and water quality, the abundance and diversity of plants, animals, and other organisms found in freshwater wetlands may be significantly reduced. In these situations, native wetland plant communities tend to be replaced by invasive species, and sensitive macroinvertebrate, amphibian, reptile, and bird populations become stressed and gradually replaced by populations that are more tolerant of the degraded conditions. This can result in the local extinction of native aquatic and terrestrial organisms. For more detailed information on threatened and endangered species see section 3.10.2.
- Reduced Aesthetic Value: Trash, debris, and pollutant loads in stormwater runoff can accumulate in wetlands, detracting from their natural beauty and aesthetic value.

4.1.5 Assessing the Impacts of Forecasted Land Use Changes

4.1.5.1 *Impervious Cover by Catchment*

Geographic Information System: A computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface.

Assessing impacts of forecasted land use changes within the NBCR planning area involves further analysis of current land use impacts and IC. Section 3.6.3 presents two data sources on IC: planimetric **GIS** data and the NLCD. These data sets were compared for each catchment using simple linear regression to determine if they reasonably represent impervious cover in the watersheds. Except in a few outlier catchments, planimetric imperviousness reasonably predicts NLCD IC and vice-versa. IC percentages were generated for each land use category in the watershed based on the IC datasets. These percentages were applied to the Existing and Future Land Use data to determine the expected change in impervious cover in the future within each catchment. Due to slight differences in the way that land use and future land use are classified and the uncertainty of the future land use layer, catchments are analyzed by comparing standard deviations rather than calculated acres of impervious cover change or percent change. This allows for a determination of whether the estimated future IC change in a particular catchment is similar to that of other catchments or if it appears to be of greater magnitude.

The impervious cover data was analyzed by catchment within the NBCR planning area. This information was used to determine IC within each catchment (Figure 4-5) and subwatershed (Table 4-1), which differs from the analysis in Section 3.6 (which is strictly by subwatershed). More than 55% of the catchments in the Middle Fork, Skokie River and West Fork subwatersheds fall in the “Medium” IC category. Most catchments in the

NBCR planning area are in the "Medium" IC category (73.39%). The 51.7% of the NBCR planning area falls in the "High" IC category. Given the built-out existing land use of the watershed, there were no catchments with "Low" IC category. This analysis aligns with Section 3.6, in that all of the subwatersheds have high levels of existing urban development.

Table 4-1: Catchment Impervious Cover by Subwatershed

SUBWATERSHED	CATCHMENT IC PERCENTAGE 0-9% (Low)		CATCHMENT IC PERCENTAGE 10-29% (Medium)		CATCHMENT IC PERCENTAGE 30-100% (High)	
	ACRES	% AREA	ACRES	% AREA	ACRES	% AREA
Middle Fork	--	--	17,232.39	94.30%	1,041.96	5.70%
North Branch Chicago River	--	--	7,763.98	48.30%	8,309.03	51.70%
Skokie River	--	--	17,312.91	77.12%	5,136.64	22.88%
West Fork	--	--	2,117.71	56.58%	1,624.93	43.42%
Planning Area Totals	--	--	44,426.99	73.39%	16,112.56	26.61%

To assess potential changes in IC associated with future land use conditions, the current IC model data is first associated with current land use data to develop observational trends for a forecast model. The prediction model then compares the relative IC of current land use categories to anticipated future land use (FLU) data (Table 3-14) to present a forecast future IC. A couple adjustments were made to the forecast future IC. First, future land use data does not exist for the Cook County portion of the planning area. As indicated the Cook County portion of the planning area is built-out, so the assumption was made that IC in this area would not change. Likewise, for the purposes of this analysis, an assumption was made for the rest of the catchments that IC would not decrease in the future. Therefore, any catchments for which the model indicated a decrease in future IC were adjusted to have no change in IC; as it is assumed that modeled decreases are likely artefacts of the differences in the way that existing and future land use are classified and the scale at which they are mapped. Table 4-2 identifies IC changes at a catchment scale based on future land use mapping.

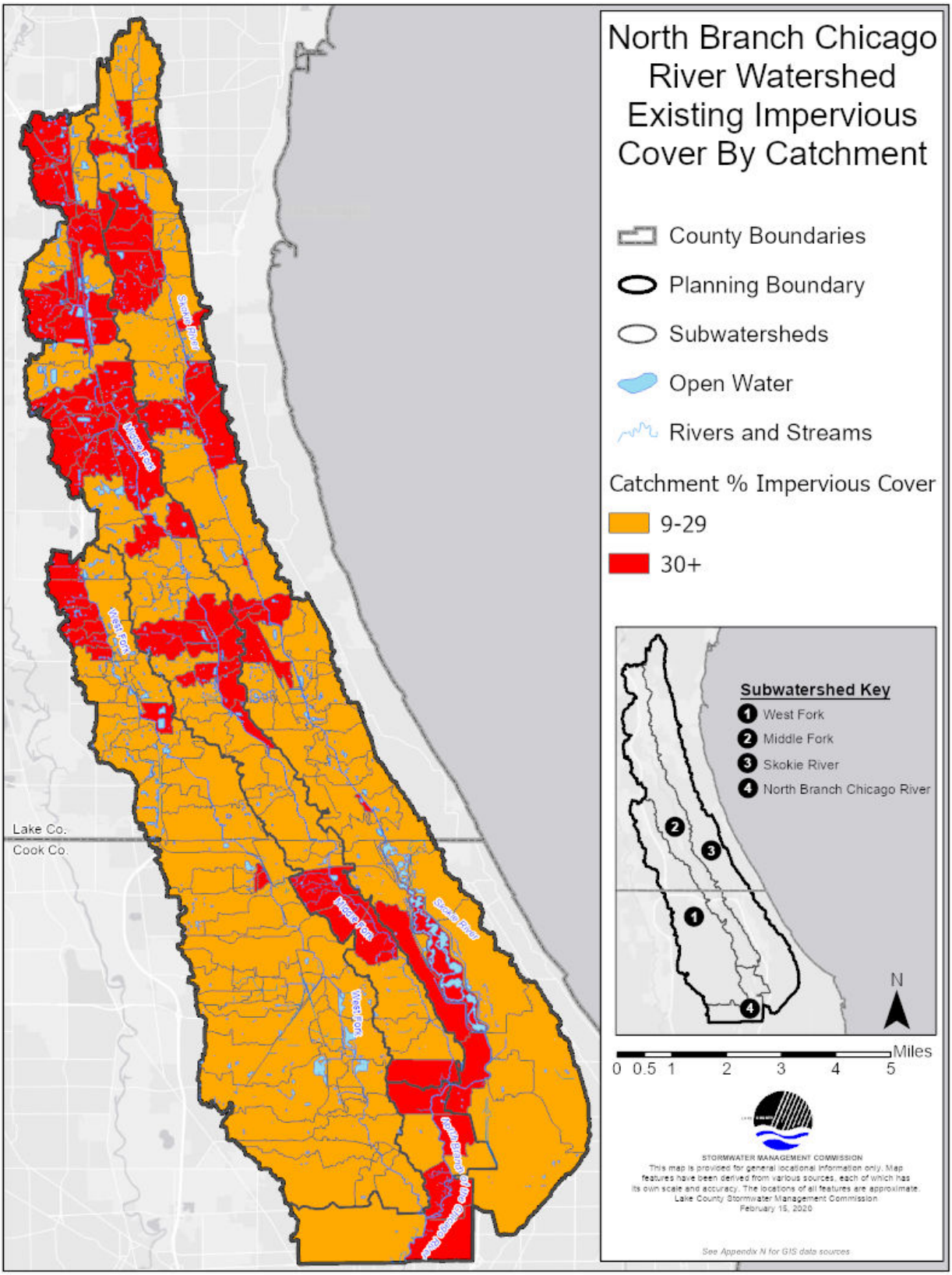


Figure 4-5: Existing Impervious Cover by Catchment
Data from Table 4-1

Table 4-2: Estimated Planning Area IC associated with Future Land Use

SUBWATERSHEDS	CATCHMENT IC PERCENTAGE 0-9% (Low)		CATCHMENT IC PERCENTAGE 10-29% (Medium)		CATCHMENT IC PERCENTAGE 30-100% (High)	
	ACRES (Change)	% AREA (Change)	ACRES (Change)	% AREA (Change)	ACRES (Change)	% AREA (Change)
West Fork	-	-	16,445.25 (-787.14)	89.99% (-4.31%)	1,829.10 (+787.14)	10.01% (+4.31%)
Middle Fork	-	-	7,553.92 (-210.06)	47.00% (-1.31%)	8,519.09 (+210.06)	53.00% (+1.31%)
Skokie River	-	-	15,037.95 (-2,274.96)	66.99% (-10.13%)	7,411.60 (+2,274.96)	33.01% (+10.13%)
North Branch Chicago River	-	-	2,117.71 (0)	56.58% (0%)	1,624.93 (0)	43.42% (0%)
Planning Area Totals	-	-	41,154.83 (-3272.16)	67.98% (-5.40%)	19,384.72 (+3,272.16)	32.02% (+5.40%)

Impervious Cover Changes Related to Future Land Use Changes Mapping

4.1.5.2 As identified in Section 3.6, much of the NBCR planning area is largely developed. Where land use is expected to change in the future, it is expected that impervious cover will intensify. As indicated in Table 4-2, the number of catchments in the "Medium" (10-29%) IC categories is expected to decrease while the number of catchments in the "High" (30-100%) IC category is expected to increase, but not significantly. As noted previously, there were no catchments with "Low" (0-9%) IC category so no shifts were noted. Based on Future Land Use map conditions, it is expected that most catchments in all four subwatersheds within the NBCR planning area will have greater than 30% IC at some point in the future (see Figure 4-6). This result suggests that critical catchments for IC are those indicated to have the greatest potential change from existing imperviousness to future imperviousness (see Figure 4-7).

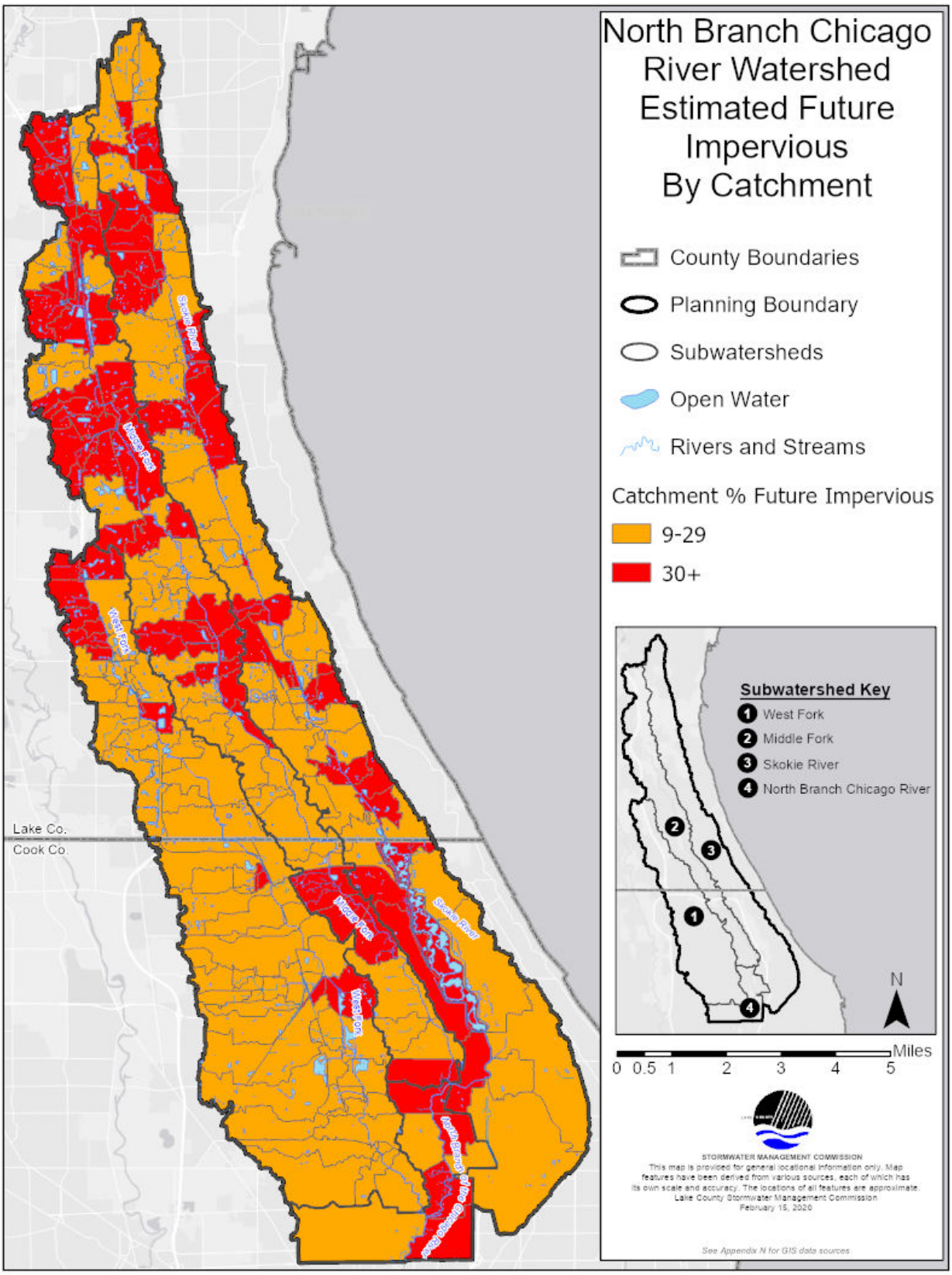


Figure 4-6: Estimated Impervious Cover by Catchment Based on Future Land Use Mapping

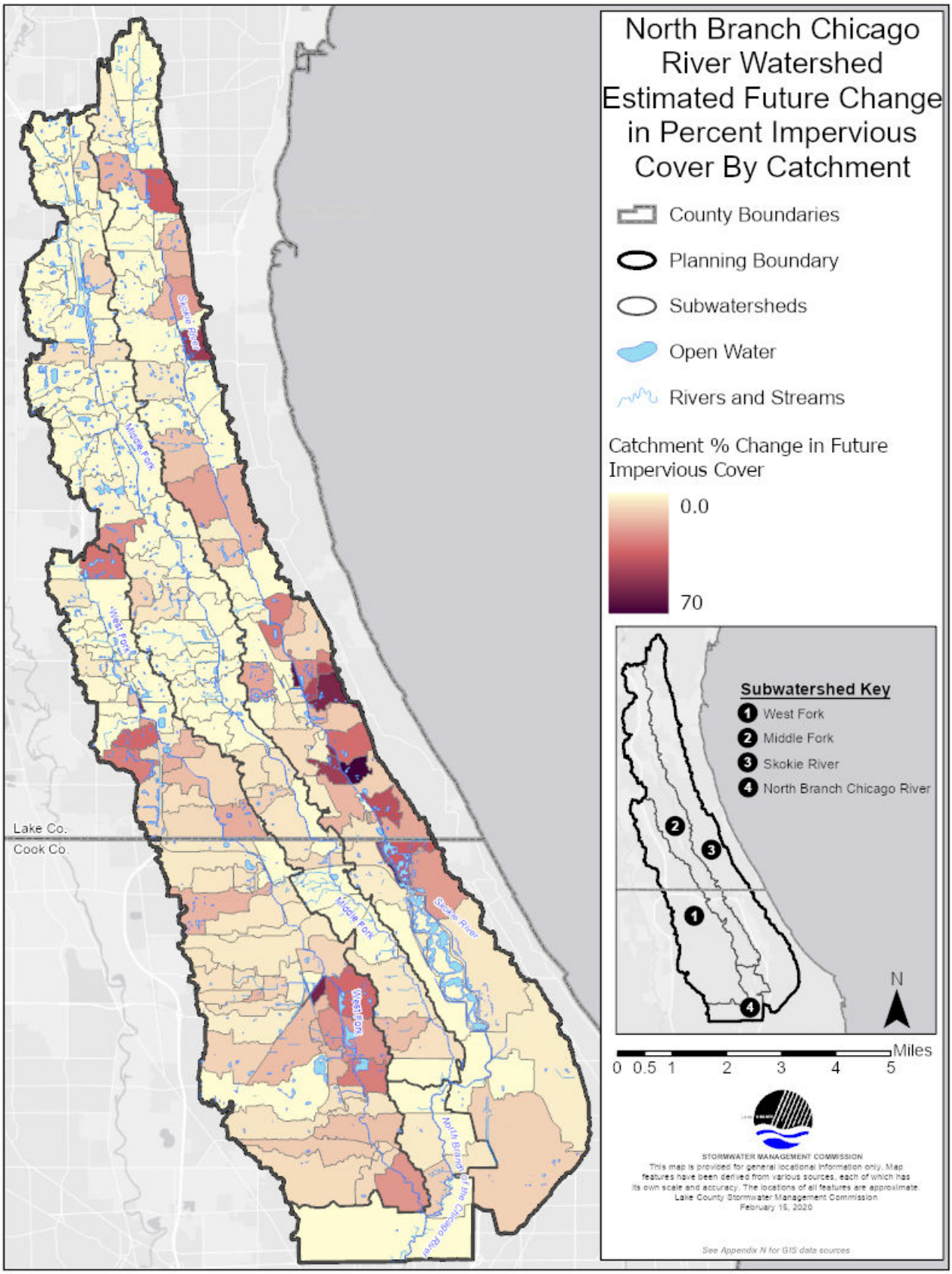


Figure 4-7: Estimated Percent Change in Catchment Impervious Cover Based on Future Land Use Mapping

4.1.6 Reducing Land Use Impacts Through Development Standards and Policy

The North Branch Chicago River Watershed-Based Plan update recommends actions for protecting and restoring natural resources, improving water quality, and reducing and preventing flood damage in the watershed. These actions include both remedial and preventative measures for communities to support. Among the most significant and influential are preventative measures such as policies and regulatory programs, which are proactive practices rather than costly remedial measures after the problems become unavoidable.

This watershed-based plan does not recommend specific land uses or zoning; however, it does consider the health of watershed lakes, streams, and wetlands, which is a direct reflection of land use and land management. Therefore, consideration of land management and development impacts by local land use authorities is necessary for effective watershed planning. Current water resource problems and consideration of potential land use changes signal the need to review and modify policies, standards, and practices guiding land development and management in the NBCR planning area.

Floodplains: Floodplains are lowlands, adjacent to rivers, streams and creeks that are subject to recurring floods. Mapped regulatory floodplains are defined as the area of land, which is inundated with water during 100-year flood events.

Floodway: A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

It is anticipated that stormwater runoff volume and pollution will continue to increase as IC increases within the NBCR planning area. Municipalities and counties should review relevant ordinances to evaluate policies, standards, and regulations for new and retrofitted development, and for land management as it pertains to stormwater runoff volume, detention, water quality, **floodplains/floodways**, and wetlands. Both watershed development regulations and policies focused on stormwater management and local ordinances and policy that direct development practices that influence IC and drainage should be reviewed based on their potential to positively influence watershed health by preventing negative land development impacts.

4.1.6.1

Stormwater Management

Current stormwater regulations are enforced locally with minimum requirements for development based on local ordinance and NPDES minimum requirements. Section 3.5.2 Roles and Responsibilities of Each Unit of Government identifies roles and jurisdictions of development programs. Section 3.18 NPDES Phase II Stormwater Permits identifies national stormwater requirements. Future local ordinance revisions could consider conditions unique to individual subwatersheds that warrant consideration for developing and administering watershed-specific stormwater management regulations to address the technical issues of concern in the subwatershed.

The primary technical issues of concern related to stormwater management are:

- Hydrologic changes have resulted in stream channel changes. Deepening and widening of the stream corridors in some locations has created excessive erosion and sedimentation, property loss, debris loads and blockages, and aquatic habitat impairments.
- Current IC and land use vary within an individual catchment or jurisdiction.

- Current drainage infrastructure varies within an individual catchment and/or jurisdiction with undersized, older, not maintained, or inadequate infrastructure which largely contributes to urban flooding.
- Significant increases in impervious surface and resulting hydrologic changes are projected for areas that are currently naturalized or vacant land uses.
- Nonpoint source pollution from urban land uses, and transportation infrastructure and maintenance practices are projected to impair watershed lakes.

The effects of increased runoff volume resulting from land use changes can be addressed in a variety of ways, including the following examples:

- Institute more effective and consistent runoff volume reduction practices as up to 18,794 acres of undeveloped lands in the watershed (agricultural, open space, and water) are projected to convert to land uses with greater IC (e.g., residential, commercial/retail, transportation).
- Review the detention volume/release rate requirements for the watershed and determine if unique conditions warrant adjustments or changes to storage and release regulations.
- Review and revise ordinance and policy language to ensure that the disconnection and minimization of impervious surfaces are allowed by right.
- LID practices and the use of green infrastructure best practices (that maintain natural hydrology post-development) could be expanded by municipal and county ordinances for all new development and significant redevelopment.
- Mitigate unavoidable wetland loss within the watershed or subwatershed where the wetland impact/loss occurs.
- Utilize tree preservation ordinances that protect mature healthy native trees and stands of forest/savanna for stormwater reductions, habitat value and increased urban tree canopy coverage.

Water quality has been identified as a major watershed issue and concern. Local community ordinances can be reviewed and revised to ensure that development codes do not preclude but rather encourage BMPs to protect and improve water quality. Examples of such BMPs include:

- The use of native vegetation in home, business and open space landscaping.
- Sustainable street designs, including alternative transportation opportunities (complete streets) and bio-swales or other vegetated conveyance systems for stormwater management instead of traditional curb and gutter.
- Infiltration for a significant portion of increased runoff volume due to land development. The WDO was amended in 2013 to include runoff volume reduction requirements.
- Preservation of natural retention and infiltration areas recognized as green infrastructure to reduce polluted runoff.
- Rainwater harvesting such as through the use of rain barrels and cisterns.

Site-specific erosion issues were identified as a concern. Many of these erosion issues can be addressed with the following:

- Requirements or incentives for stream corridor buffering and restoration for stream reaches located on new development sites could provide water quality, flood reduction, and habitat enhancement

benefits. Currently stream corridor enhancements are not required as part of land development activities.

- Developing stream maintenance and restoration standards that can be applied throughout the NBCR planning area.
- Continued education and outreach to riparian landowners on proper maintenance and protections.
- Development and support for standardized long-term maintenance and monitoring protocols for naturalized stormwater drainage systems and natural areas. Development of a standardized protocol for monitoring and maintenance plans for new developments and required endowment funds for long-term implementation of the plans.

Local Municipal and County Policies and Ordinances

Policy and regulatory changes regarding land use are the responsibility of the county and municipal planning and development departments. All of those entities should consider developing and implementing sound environmental long-term planning goals in their guiding documents. Planning documents vary in function (e.g., master plans, comprehensive plans, overlay or area-specific plans) but can seek balanced land use, land preservation, and development guidelines to positively affect watershed response. Development guidelines may be the best avenue for incorporating watershed-specific development standards and practices that prevent flood damage and protect water quality. Because elected officials change, long-term planning guidelines support county and municipal staff in preserving watershed health through the available resources for enforcement and recommendations.

4.1.6.2

Planning and zoning guidance provides the next level of watershed protection. Most planning and zoning regulation is in the form of local comprehensive land use plans and development-related ordinances that regulate onsite land use practices to ensure adequate floodplain, wetland, stream, lake, pond, soil conservancy, and other natural resource protection. Zoning ordinances, and overlay districts in particular, define the allowed type of development and where it can be located relative to natural resources. Other examples of planning/zoning resource protection include riparian and wetland buffers, impervious area reduction, open space/greenway dedication, and conservation development.

An excellent source of information on model development principles and a sample code and ordinance review worksheet can be found in Better Site Design: A Handbook for Changing Development Rules in Your Community (CWP, 1998). In addition, the CWP and USEPA have self-appraisal checklists that watershed communities may use to evaluate their existing codes and ordinances to identify where they can change or modify regulations to improve the preservation and use of green infrastructure in the NBCR planning area. Adopting watershed-friendly codes and ordinances will elevate protection and enhancement of watershed resources. Watershed communities should perform this self-appraisal and establish an action plan to revise ordinances and codes where needed. Improved coordination and communication between county and local government would benefit water resource protection. Local enforcement officers, local planners, and zoning boards should be very familiar with watershed development regulations and should consider revising local ordinances that address watershed and site-specific water, natural resource, and flooding issues not covered by county, regional, or state program requirements.

NOTEWORTHY: COMMUNITY PROGRAMS AND REGULATIONS INFLUENCE WATERSHED HEALTH

Many codes and ordinances influence the health and function of a watershed. The table below includes typical types of codes and ordinances to evaluate and potentially change or modify to help improve watershed conditions.

SUBJECT OF REGULATION	CODE/ORDINANCE/REGULATION
Erosion and Sediment Control	Zoning Ordinance, Stormwater Ordinance
Environmental Regulations	Subdivision Codes, Stormwater Ordinance, Planned Unit Development Agreements, Special Use Permits
Floodplain Regulations	Zoning Ordinance, Stormwater Ordinance, Subdivision Codes, Building Code
Stormwater Management and Drainage	Stormwater Ordinance, Subdivision Codes, Zoning Ordinance, Planned Unit Development Agreements, Street Standards and Road Design, Building Code, Fire Code
Tree Protection and Landscaping	Tree Protection Ordinance, Landscape Ordinance, Nuisance Ordinance, Planned Unit Development Agreements, Building Code, Fire Code
Parking Requirements	Zoning Ordinance; Planned Unit Develop. Agreements, Special Use Permit, Grading Ordinance

NOTEWORTHY: CONSERVATION AND LID

County and local governments can work together to develop incentives for conservation and LID. Conservation development is the ideal compromise between economic development and water resource protection. Some ways to incorporate conservation development into developing communities and provide incentives for developers include:

- Allow conservation development "by-right" (does not require variances)
- Establish a joint review dept./agency application process to reduce review time for conservation development
- Reduce fees for conservation development application review
- County and municipalities work together to locate appropriate parcels for future conservation development, and then zone those parcels as conservation development (parcels in the green infrastructure network that are proposed for development would be good candidates)
- Require all developments have a certain percentage of preserved open space
- Develop native landscaping ordinances
- Reduce setback requirements between lots and encourage multi-level and clustered residential development to reduce land consumption
- Provide credit for combining natural buffers with recreational opportunities
- Require native plantings in all detention basins
- Provide detention credit for green infrastructure BMPs

Conservation development zoning could be applied to rezoning changes in rural areas. The conservation development zoning classification should outline the intent, design guidelines, density bonus, and the specific areas where conservation development zoning changes would be permitted. The areas that may be rezoned to a conservation development might include areas that are adjacent to ecologically significant lands or are identified in the green infrastructure system. Rural residential districts or less productive agricultural areas may also be considered. Areas that are defined as rural residential could provide a transition from higher density residential to rural. Design guidelines for conservation developments should include LID practices, a detailed outline of the process used to define the environmentally sensitive areas on the site, and identify areas on the site that are developable. Because each site will have different developable areas and sizes, design guidelines should be flexible and should consider different development characteristics, such as roadway length, width, and lot size. Density bonuses may be written into the zoning code and could include bonuses for the following: use of native vegetation throughout the development including individual lots, reduction in pavement or impervious surface, use of permeable pavements, increased percentages of open space, trail or sidewalk connections to other developments or regional trails, additional expanded buffering of natural areas and adjacent spaces, and creation of wildlife habitat.

4.2 WATERSHED RESOURCE PROBLEMS ASSESSMENT

This section assesses the problems and concerns identified in Chapter 2 and Chapter 3 in order to better understand them and guide informed and prioritized actions to address them. Many lakes and streams in the watershed have poor water quality which negatively affects aesthetic value, aquatic habitat, recreational value, and fish consumption uses. Phosphorus, total suspended solids (TSS), aqautic plants, polycyclic aromatic hydrocarbons (PAHs), metals/toxicity, low macroinverebrate habitat, low DO and organic enrichment are the most common causes of impairments for both streams and lakes in the NBCR planning area. The following subsections describe further analysis used to assess how watershed conditions are affecting the water quality, natural resources, and green infrastructure throughout the NBCR planning area.

4.2.1 LAKE IMPAIRMENTS

Based on the 2018 Illinois EPA 303(d) list, 8 out of 13 lakes in the NBCR planning area have statutory impairments, as thoroughly detailed in Chapter 3. More robust monitoring programs are beneficial to thoroughly characterize a waterbody, its watershed, and understand the issues that affect aquatic life and the overall health and function of the system. Of the 8 lakes in the NBCR planning area with impairments, 5 are listed as impaired for phosphorus and total suspended solids, 4 for aquatic plants, and 2 for unknown causes. Other causes listed (for affecting only 1 lake) are aquatic algae, mercury and non-native fish, shellfish or zooplankton.

Many of the lakes are in poor water quality condition due to nonpoint sources of phosphorus and total suspended sediment. The lakes suffering from high sediment and nutrient concentrations are vulnerable to low dissolved oxygen, algae blooms, and invasive aquatic plant growth which negatively affect recreational, habitat, and aesthetic value. In addition to nonpoint sources of sediment and phosphorus, internal lake processes contribute to nutrient and sediment issues. Algae blooms and invasive species are responsible for decreasing the biological productivity and limit the diversity of both fish and macroinvertebrate species. Lake shoreline erosion is also another consideration; as inventoried in Chapter 3, and further analyzed in section 4.2.5; shoreline erosion impacts the water quality of the lakes and contributes to the loss of shoreline and property.

4.2.2 STREAM IMPAIRMENTS

There are 6 stream segments in the NBCR planning area and all of those stream segments as listed as impaired for one or more designated uses (based on the Illinois EPA 2018 Integrated Report). Twenty-seven different causes are listed for the impairments. The predominant causes are phosphorus, low dissolved oxygen, fecal coliform, alteration in stream-side or littoral vegetative covers, total suspended solids, and chloride. These statutory impairments are based on a limited set of data and more robust monitoring programs are beneficial to thoroughly characterize a watershed and understand the issues that affect aquatic life and the overall health and function of the watershed. In 2018, the NBWW implemented a comprehensive water quality monitoring program for the NBCR planning area, and this data, along with commissioned studies (MBI, 2020), have been instrumental in further characterizing watershed problems and how water quality is affecting aquatic health throughout the NBCR planning area. Figure 4-9 shows major causes associated with aquatic life

impairments based on MBI's 2018-2019 Monitoring Report performed for the NBWW. The monitoring data and study help analyze trends, prioritize actions, and will help monitor and measure success of watershed management activities and augment the limited data used to determine the statutory water quality impairments.

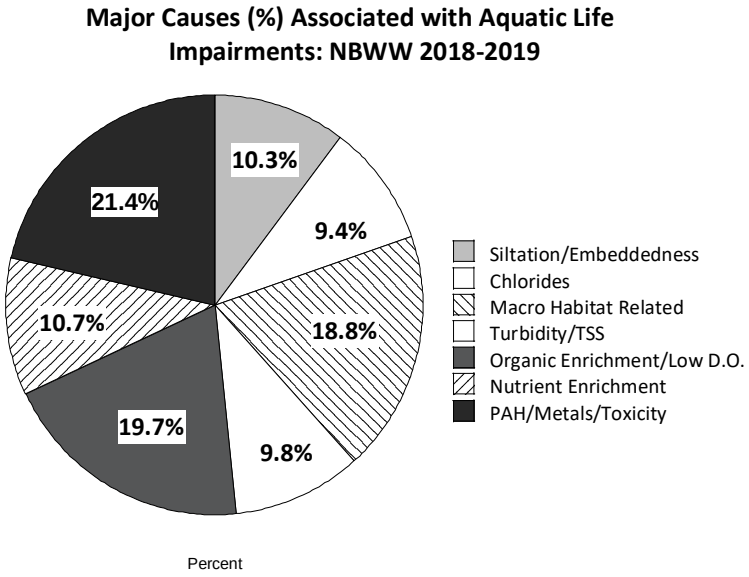


Figure 4-8: Major Causes Associated with Aquatic Life Impairments Identified by the NBWW Monitoring Data, 2018-2019

4.2.3 Causes and Sources

Chapter 3 introduced and identified problems and impairments in the NBCR planning area, and this section aims at better understanding the causes and sources of impairments. Various sources of quantitative and qualitative data and information were analyzed with the goal to identify the causes and sources of water pollution that will need to be managed to achieve the estimated pollutant load reductions and the goals and objectives of this plan.

The combined efforts outlined in the inventory presented in Chapter 3, the MBI 2021 Monitoring Report (2018-2019 data), 2020 North Branch Chicago River Watershed TMDL Report and the Illinois EPA Integrated Report (2018) study provide a wealth of data, scientific assessment, and watershed knowledge to assess the stream impairments and better understand the causes and sources. Table 4-5 provides a planning level inventory of impairments, causes, and sources based on the characterization and inventory of the NBCR planning area. This table serves as a summary to document the issues and provides a baseline to further characterize them in a sufficient manner to recommend priority areas and specific actions.

Table 4-3: Summary of Causes and Sources of Pollution and Impairments

IMPAIRMENT	CAUSES	SOURCES	PRIORITY	SUBWATERSHEDS & LAKES
Aquatic Life	Chloride	▪ Urban Runoff/Storm Sewers ▪ Municipal Point Source Discharges o Salt application for deicing of parking lots and roadways ▪ Contaminated Sediments ▪ Highway/Road/Bridge Runoff (Non-construction Related) ▪ Wastewater treatment plants (MBI Report) ▪ Impacts from Hydrostructure Flow ▪ Upstream Impoundments (e.g. PI-566 NRCS Structures)	HIGH	Middle Fork, North Branch Chicago River, Skokie River, West Fork

IMPAIRMENT	CAUSES	SOURCES	PRIORITY	SUBWATERSHEDS & LAKES
Aquatic Life	Total Suspended Sediment (TSS)	Streams / Rivers ▪ Urban runoff/storm sewers ▪ Channelization ▪ Loss of Riparian Habitat ▪ Streambank modifications/destabilization ▪ Municipal Point Source Discharges ▪ Bank Erosion ▪ Increased Flooding (TMDL) ▪ Construction Activity near waterbodies (TMDL) ▪ Site Clearance (Land Development or Redevelopment) ▪ Highway/Road/Bridge Runoff (Non-construction Related) Lakes ▪ Littoral/Shore area modifications (non-riverine) (Illinois EPA)	HIGH	Middle Fork, North Branch Chicago River, Skokie River, West Fork Lakes Eleanor
	Siltation / Sedimentation			Middle Fork, Skokie River
	Organic Enrichment (MBI Report) Nutrient Enrichment (MBI Report)	▪ General nonpoint source (NPS) runoff ▪ Urban NPS runoff ▪ Flow modifications	HIGH	Middle Fork, North Branch Chicago River, Skokie River, West Fork
	Dissolved Oxygen	▪ Streambank Modifications/destabilization ▪ Channelization ▪ Urban runoff/ storm sewers ▪ Low Flow or Stagnant Conditions (TMDL) ▪ Municipal Point Source Discharges ▪ Low reaeration (TMDL) ▪ High sediment oxygen demand (SOD) (TMDL) ▪ Wastewater treatment plants (TMDL)	HIGH	Middle Fork, North Branch Chicago River, Skokie River, West Fork
	Total Phosphorus	Streams/Rivers ▪ Wastewater treatment plants ▪ Urban Runoff/storm sewers ▪ Other Recreational Pollution Sources ▪ Golf Courses ▪ Runoff from Forest/Grassland/Parkland ▪ Municipal Point Source Discharges ▪ Impacts from Hydrostructure Flow ▪ Upstream Impoundments (e.g. Pl-566 NRCS Structures) Lakes ▪ Internal nutrient recycling (TMDL) ▪ Municipal Point Sources (TMDL) ▪ Lawn & garden activity (TMDL)	HIGH	Middle Fork, North Branch Chicago River, Skokie River, West Fork (Wastewater Treatment Plants) Lakes Eleanor

IMPAIRMENT	CAUSES	SOURCES	PRIORITY	SUBWATERSHEDS & LAKES
Aquatic Life		▪ Littoral/Shore area modifications (TMDL)		
	Other flow regime alterations	▪ Impacts from Hydrostructure Flow ▪ Upstream Impoundments (e.g. PI-566 NRCS Structures) ▪ Dam or Impoundment	LOW	Skokie River
	Changes in Stream Depth and Velocity Patterns	▪ Channelization ▪ Impacts from Hydrostructure Flow ▪ Upstream Impoundments (e.g. PI-566 NRCS Structures), Dam or Impoundment	LOW	Skokie River, West Fork
	DDT	▪ Atmospheric Deposition - Toxics ▪ Contaminated Sediments	MEDIUM	Middle Fork, North Branch Chicago River, West Fork
	Macro Habitat Related (MBI Report)	▪ Habitat alteration ▪ General nonpoint source (NPS) runoff ▪ Urban NPS runoff	HIGH	Middle Fork, North Branch Chicago River, Skokie River, West Fork
	Aquatic Algae (Streams)	▪ Contaminated Sediments ▪ Municipal Point Source Discharges ▪ Urban Runoff/Storm Sewers ▪ Dam or Impoundment	LOW	Skokie River
	Aquatic Plants (Macrophytes)	▪ Channelization ▪ Streambank modifications/destabilization ▪ Loss of Riparian Habitat ▪ Urban Runoff/Storm Sewers ▪ Contaminated Sediments	LOW	Middle Fork
	Alterations in stream-side or littoral vegetative cover (Illinois EPA)	▪ Channelization ▪ Streambank modifications/destabilization ▪ Loss of Riparian Habitat ▪ Impacts from Hydrostructure Flow	MEDIUM	Middle Fork, North Branch Chicago River, Skokie River, West Fork
	PAHs/Metals/Toxicity (MBI Report)	▪ Flow modifications ▪ General nonpoint source (NPS) runoff ▪ Urban NPS runoff	HIGH (PAHs) LOW (OTHERS)	Middle Fork, North Branch Chicago River, Skokie River, West Fork
	Mercury	▪ Contaminated Sediments ▪ Atmospheric Deposition - Toxics ▪ Source Unknown	LOW	Middle Fork
	Chlordane	▪ Contaminated Sediments ▪ Source Unknown	LOW	Skokie River
	Aldrin	▪ Contaminated Sediments ▪ Source Unknown	MEDIUM	North Branch Chicago River, West Fork
	Endrin	▪ Contaminated Sediments ▪ Municipal Point Source Discharges ▪ Source Unknown	LOW	Middle Fork, West Fork
	Silver	▪ Contaminated Sediments ▪ Municipal Point Source Discharges ▪ Source Unknown	LOW	Middle Fork
	Nickel			
	Copper			
	Lead			
	Barium			

IMPAIRMENT	CAUSES	SOURCES	PRIORITY	SUBWATERSHEDS & LAKES
Aquatic Life	Cadmium			
	Chromium (total)			
	Hexachlorobenzene	▪ Atmospheric Deposition - Toxics ▪ Contaminated Sediment ▪ Source Unknown	MEDIUM	Middle Fork, North Branch Chicago River, West Fork
	Temperature, water	▪ Stream Water used as a coolant for point source dischargers (TMDL) ▪ Watershed Urbanization (TMDL) ▪ Urban Runoff/Storm Sewers ▪ Municipal Point Source Discharges ▪ Golf Courses	LOW	Middle Fork
Aesthetic Quality	Phosphorus (Total)	▪ Internal nutrient recycling ▪ Urban Runoff/Storm Sewers ▪ Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO) ▪ Littoral/Shore area modifications ▪ Runoff from Forest/Grassland/Parkland ▪ Waterfowl ▪ Sources Unknown	HIGH	Middle Fork <u>Lakes</u> Chicago Botanic Garden, Eagle Lake, Eleanor, Lucky Lake, Skokie Lagoons
	Total Suspended Solids (TSS)	▪ Waterbody uses (TMDL) ▪ Sources unknown ▪ Runoff from Forest/Grassland/Parkland	HIGH	Eagle Lake, Eleanor, Lamb's Farm, Lucky Lake, Skokie Lagoons
	Causes (Unknown)	▪ Sources unknown ▪ Rural (Residential Areas) (Illinois EPA)	LOW	Kathryn, Old School
	Aquatic Algae (Lakes)	▪ Littoral/shore Area Modifications (Non-riverine) ▪ Specialty Crop Production ▪ Waterfowl ▪ Runoff from Forest/Grassland/Parkland	LOW	Chicago Botanic Garden
	Nonnative Fish, Shellfish or Zooplankton	▪ Source Unknown	LOW	Eleanor
	Aquatic Plants (Macrophytes)	▪ Rural (residential areas) ▪ Source Unknown	MEDIUM	Kathryn, Eagle Lake, Lamb's Farm, Old School
Aesthetic Quality	Bottom Deposits	▪ Streambank Modifications/destabilization ▪ Channelization ▪ Loss of Riparian Habitat ▪ Impacts from Hydrostructure Flow ▪ Upstream Impoundments (e.g. Pl-566 NRCS Structures)	LOW	Middle Fork, Skokie River
Primary Contact Recreation	Fecal Coliform Bacteria	▪ Illicit sewer connections (TMDL) ▪ Groundwater inputs (TMDL) ▪ Failed septic systems (TMDL) ▪ Urban Runoff/Storm Sewers ▪ Municipal Point Source Discharges	HIGH	Middle Fork, North Branch Chicago River, Skokie River, West Fork

IMPAIRMENT	CAUSES	SOURCES	PRIORITY	SUBWATERSHEDS & LAKES
		▪ Loss of Riparian Habitat ▪ Golf Courses		
Fish Consumption	Polychlorinated biphenyls (PCBs)	▪ Contaminated Sediments ▪ Source Unknown	LOW	Middle Fork, North Branch Chicago River
	Mercury	▪ Atmospheric Deposition - Toxics ▪ Impacts from Hydrostructure Flow ▪ Upstream Impoundments (e.g. Pl-566 NRCS Structures) ▪ Sources Unknown	MEDIUM	Middle Fork, North Branch Chicago River, Skokie River Lake Skokie Lagoons

North Branch Chicago River Watershed Workgroup (NBWW), Monitoring data 2018 – 2019; MBI, 2020; Illinois Environmental Protection Agency (Illinois EPA). 2018 303(d) List & Stage 3 Total Maximum Daily Load (TMDL) Report; 2020.

4.2.4 Pollution Loading and Nonpoint Sources

Pollutant loading from a watershed is the sum of point sources and nonpoint sources. Nonpoint source pollution is a primary concern related to water quality in the NBCR planning area based on the watershed characterization and MBI's 2020 Biological and Water Quality Assessment of the North Branch Chicago River: 2018-19. Based on the data available, priority impairments and problems have been identified to address in this watershed-based plan as detailed in Table 4-5.

Point sources are also major contributors to the overall watershed pollutant loads, especially phosphorus, nitrogen, and chloride. Existing regulatory permit processes and enforcement address point source pollution; however, some parameters are not regulated and contribute to watershed problems and stakeholder concerns. The permitted point source facilities within the NBCR planning area include two (2) wastewater treatment facilities. All permitted facilities are subject to regulatory monitoring and reporting requirements, which are all public records.

4.2.4.1

Nonpoint Source Pollution Load Model

The Northeastern Illinois Planning Commission (NIPC) excel based model was used to estimate nonpoint source pollutant loads for twelve (13) parameters: total suspended solids (TSS), total dissolved solids (TDS), total phosphorus (TP), dissolved phosphorus (DP), total nitrogen (TN), total kjeldahl nitrogen (TKN), 5-day chemical oxygen demand (COD), 5-day biological oxygen demand (BOD), cadmium (Cd), lead (Pb), copper (Cu), zinc (Zn) and fecal coliform. The output quantifies the estimated nonpoint source loading in the NBCR planning area by catchment.

The model used to estimate pollutant loads incorporates the land use described in Chapter 3. Runoff volumes are based on the impervious area associated with a given land use and annual rainfall. **Event mean concentrations (EMCs)** were applied to the runoff volumes based on land use mapping. The EMCs are established based on literature sources, water quality studies (Price, T., 2007 &

EVENT MEAN CONCENTRATION (EMC):
Method for characterizing pollutant concentrations in stormwater runoff. The pollutant concentrations are measured in studies and on-going research that collects and analyzes runoff from various land-use practices in different geographic and climatic regions. The values are determined by compositing (in proportion to flow rate) a set of samples, taken at various points in time during a runoff event, into a single sample for analysis.

NIPC, 1993), and professional experience. See Appendix F for more information.

Nonpoint Source Loading, Current Conditions

Figure 4-9 through Figure 4-21 illustrate the spatial distribution of nonpoint source loading for TSS, TDS, TP, DP, TN, TKN, COD, BOD, Cd, Pb, Cu, Zn and Fecal Coliform respectively. Table 4-4 through Table 4-5 display the total pollutant load results for the NBCR planning area by subwatershed for lb/year and lb/acre/year. The Skokie River subwatershed had the highest nonpoint source pollution loading for most parameters. The North
4.2.4.2 Branch Chicago River subwatershed was the lowest for all types of nonpoint source pollution loading both in loading estimates and rates.

Table 4-4: Annual Nonpoint Source Loading Estimates by Subwatershed

Pollutant Loading (Lb/Year)	Middle Fork	North Branch Chicago River	Skokie River	West Fork
Total Suspended Solids	7,482,439	1,563,682	12,664,659	10,090,750
Total Dissolved Solids	16,285,713	2,337,930	26,930,504	15,710,739
Biological Oxygen Demand	261,126	68,793	432,852	408,129
Chemical Oxygen Demand	2,641,231	436,831	4,361,343	3,029,790
Dissolved Phosphorus	3,152	1,128	5,213	5,747
Total Phosphorus	10,126	2,539	16,259	14,119
Total Kjeldahl Nitrogen	55,777	8,748	90,754	61,122
Total Nitrogen	72,191	19,735	117,855	111,307
Cadmium	78	25	140	130
Copper	1,440	246	2,467	1,692
Lead	7,605	1,656	13,261	10,131
Zinc	10,838	2,150	17,729	13,495
Fecal Coliform (Billons of CFU/YR)	441,672	130,307	671,774	691,397

Table 4-5: Average Nonpoint Source Loading Rate By Subwatershed

Average Loading Rate (Lb/Acre/Year)	Middle Fork	North Branch Chicago River	Skokie River	West Fork
Total Suspended Solids	35,658	2,888	49,834	45,150
Total Dissolved Solids	79,634	5,218	116,330	75,990
Biological Oxygen Demand	1,219	126	1,566	1,742
Chemical Oxygen Demand	12,717	858	17,903	13,892
Dissolved Phosphorus	14	2	17	24
Total Phosphorus	48	5	61	61
Total Kjeldahl Nitrogen	269	18	375	281
Total Nitrogen	339	37	424	477
Cadmium	0	0	1	1
Copper	7	0	10	8
Lead	37	3	53	47
Zinc	52	4	70	61
Fecal Coliform (Billons of CFU/AC/YR)	2,054	249	2,240	2,864

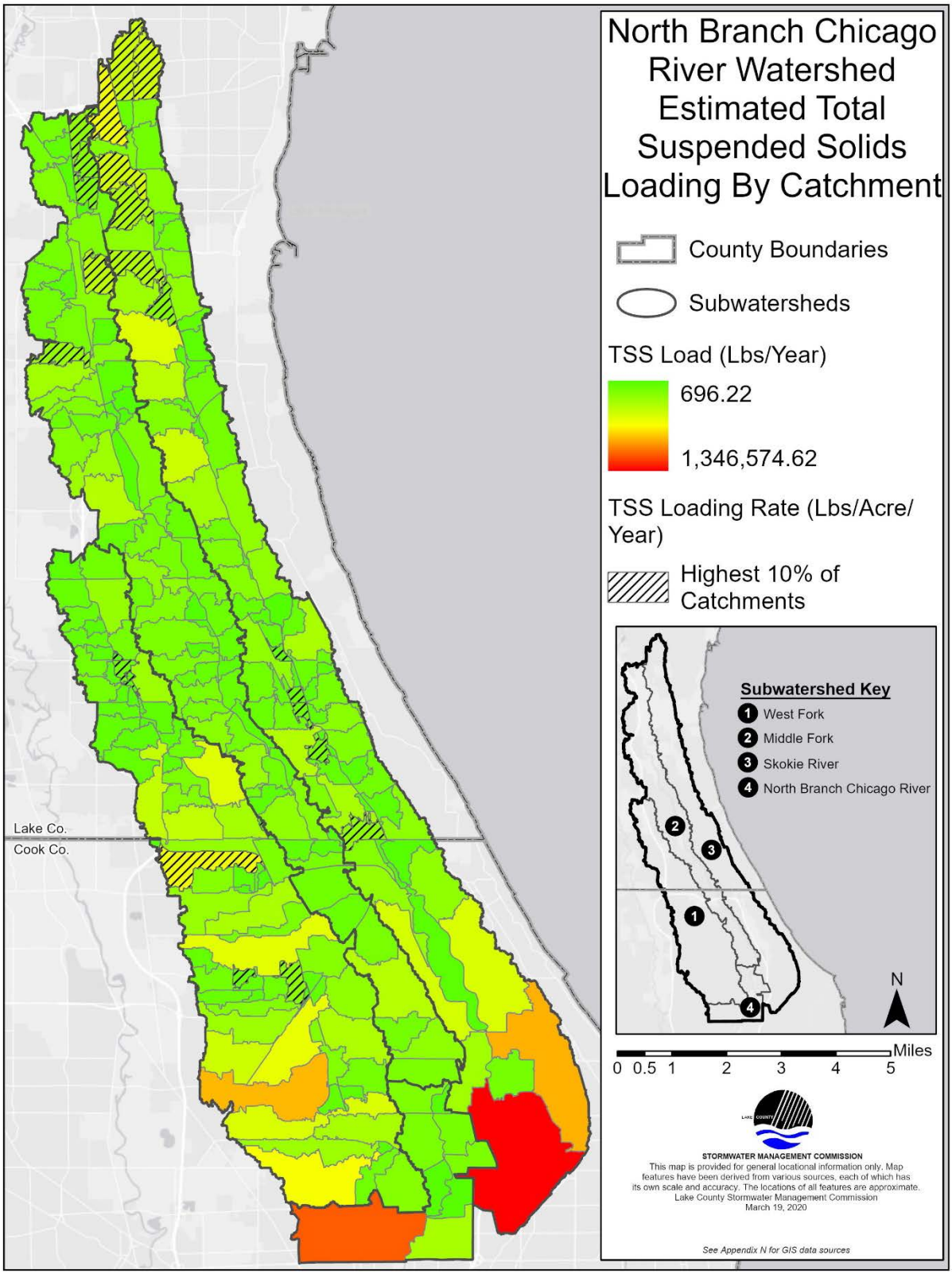


Figure 4-9: Estimated Annual Nonpoint Source Total Suspended Solids Loading

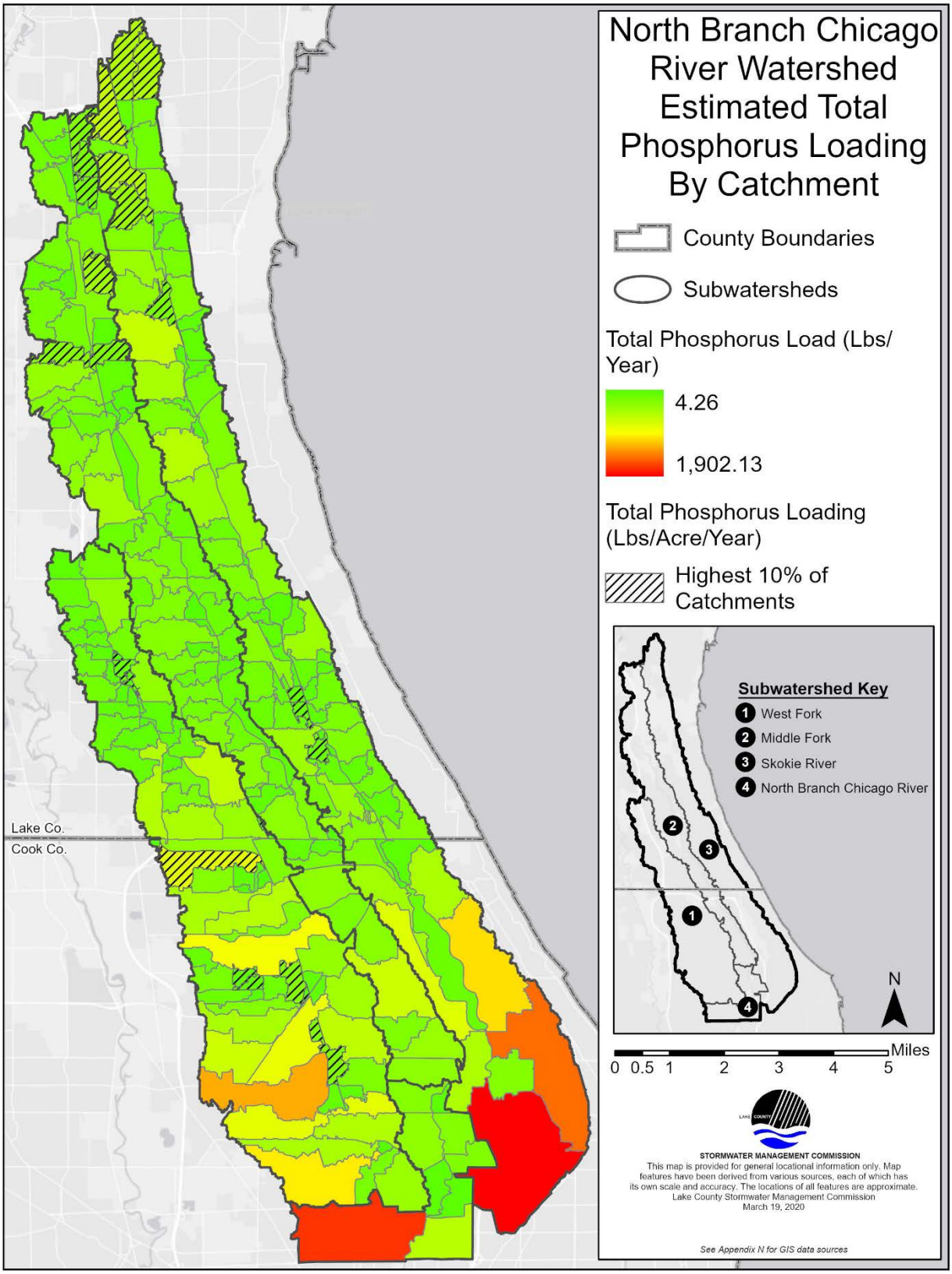


Figure 4-10: Estimated Annual Nonpoint Source Total Phosphorus Loading

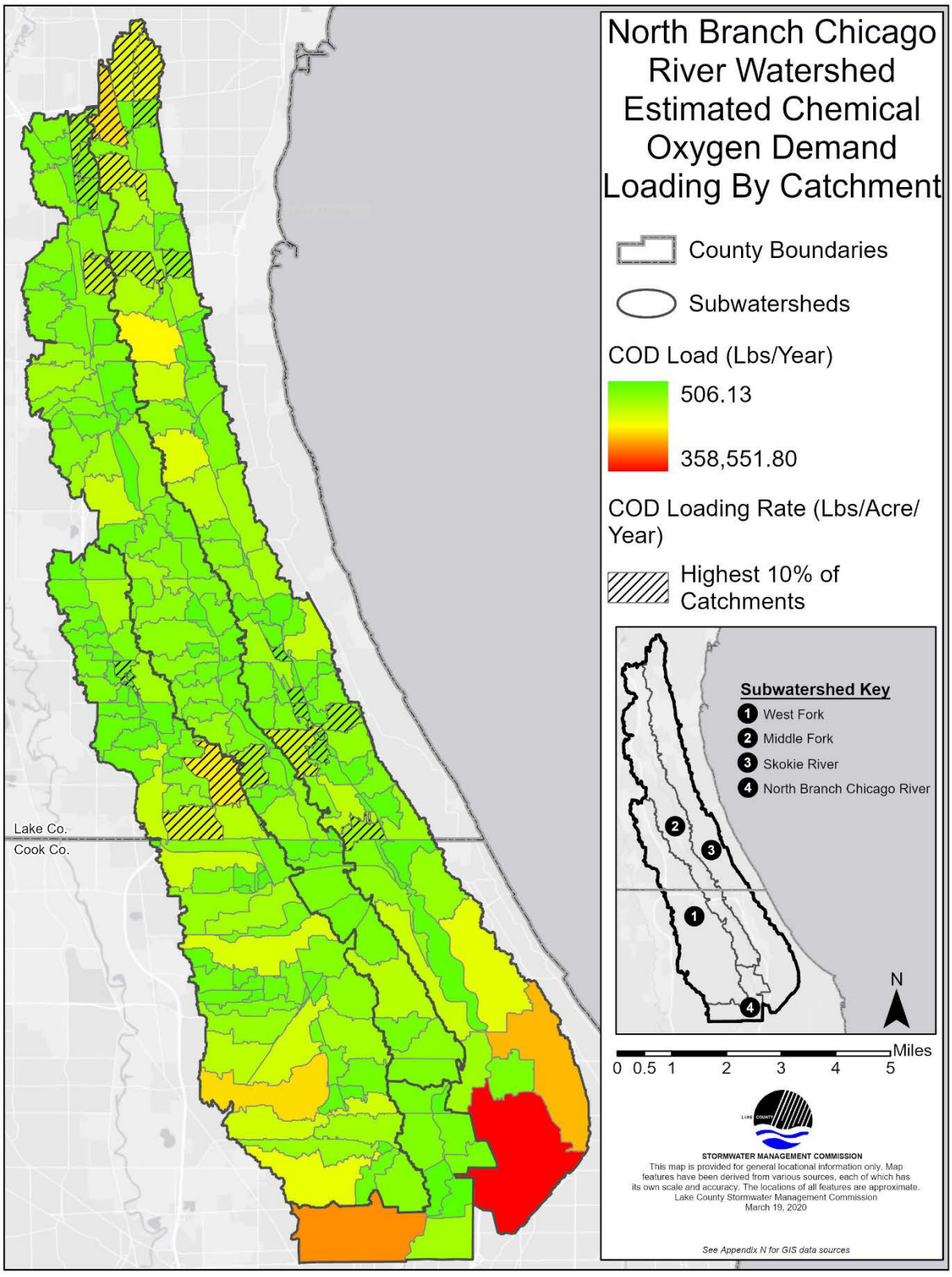


Figure 4-11: Estimated Annual Nonpoint Source Chemical Oxygen Demand Loading

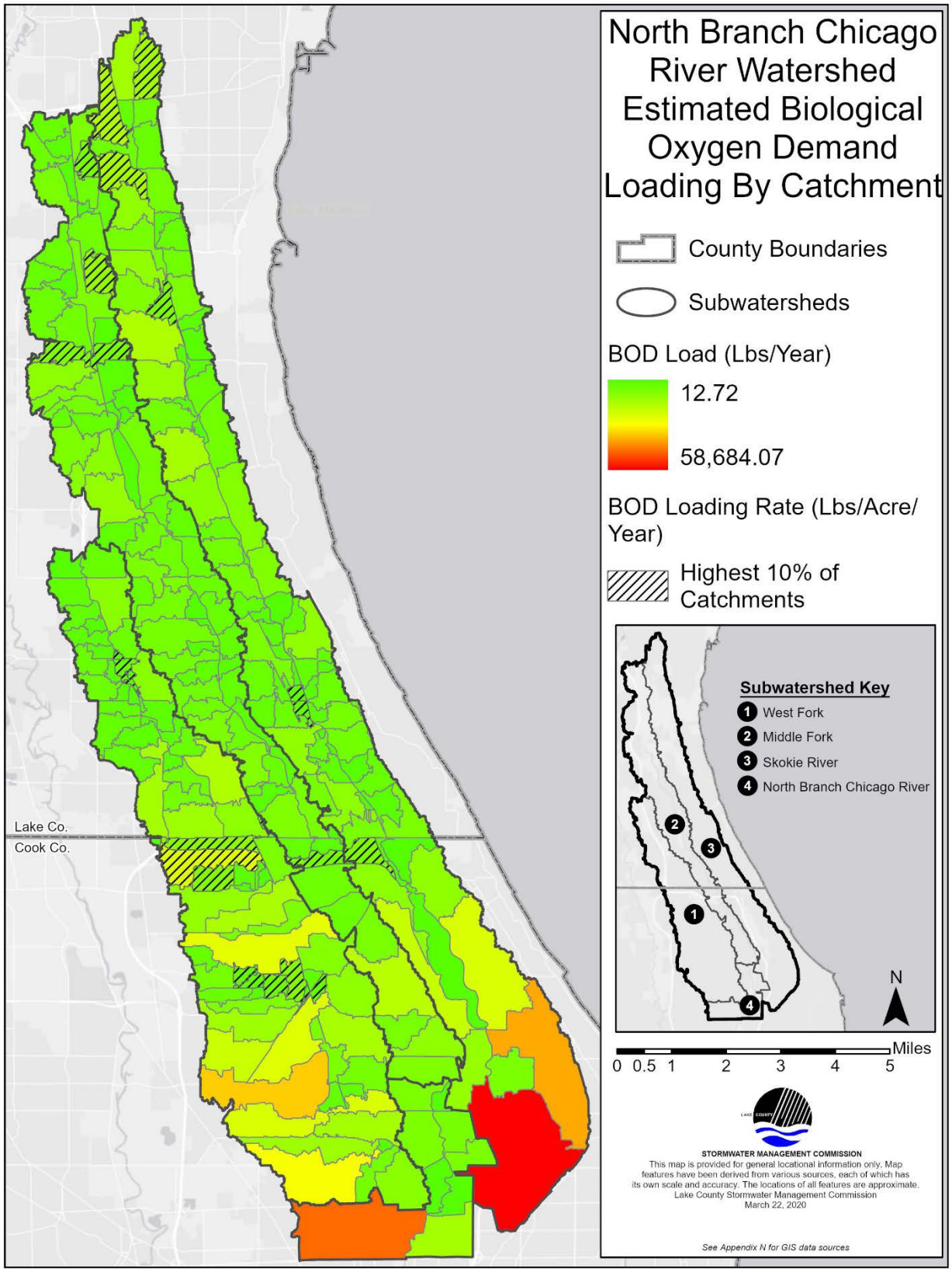


Figure 4-12: Estimated Annual Nonpoint Source Biological Oxygen Demand Loading

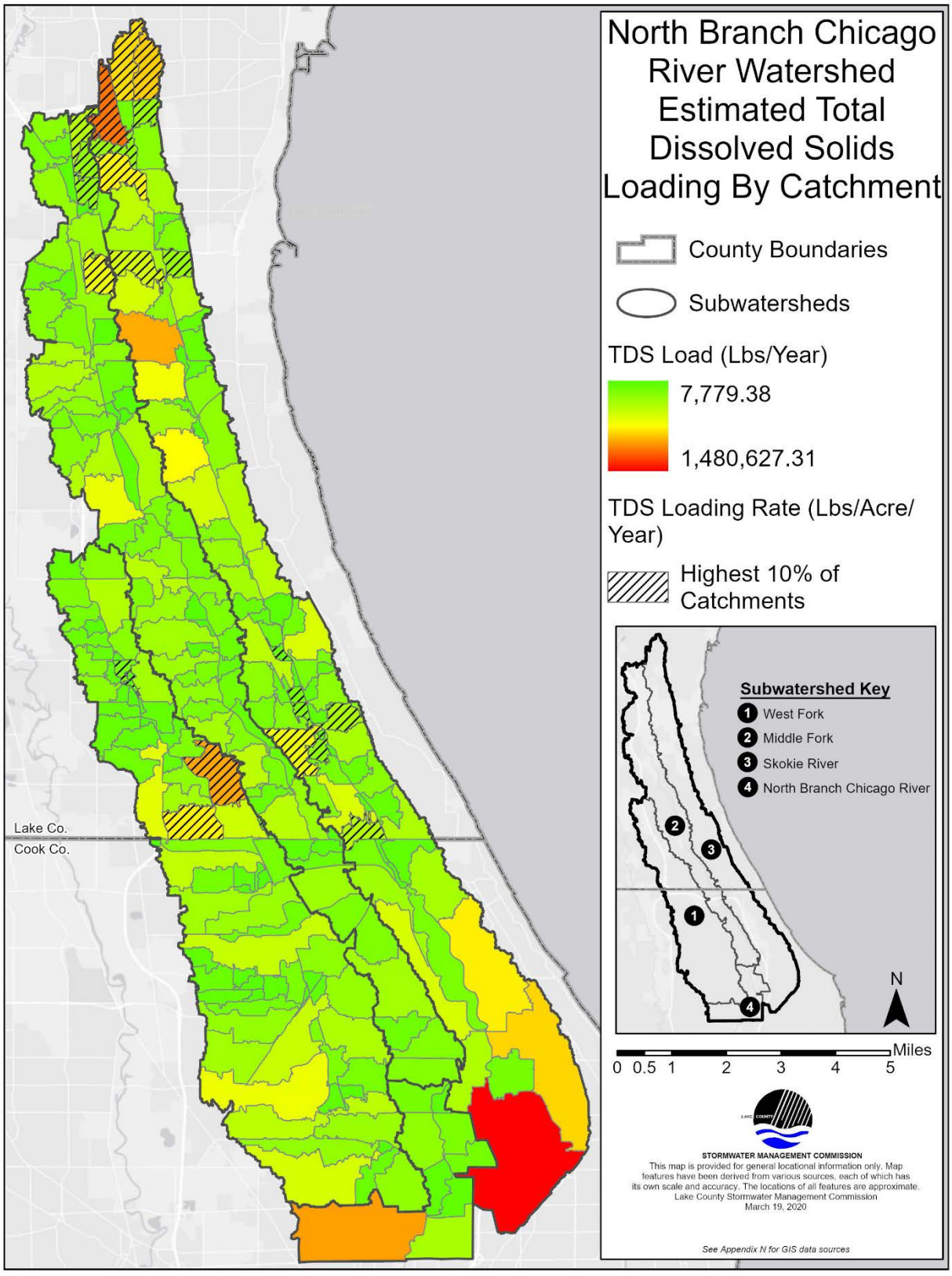


Figure 4-13: Estimated Annual Nonpoint Source Total Dissolved Solids Loading

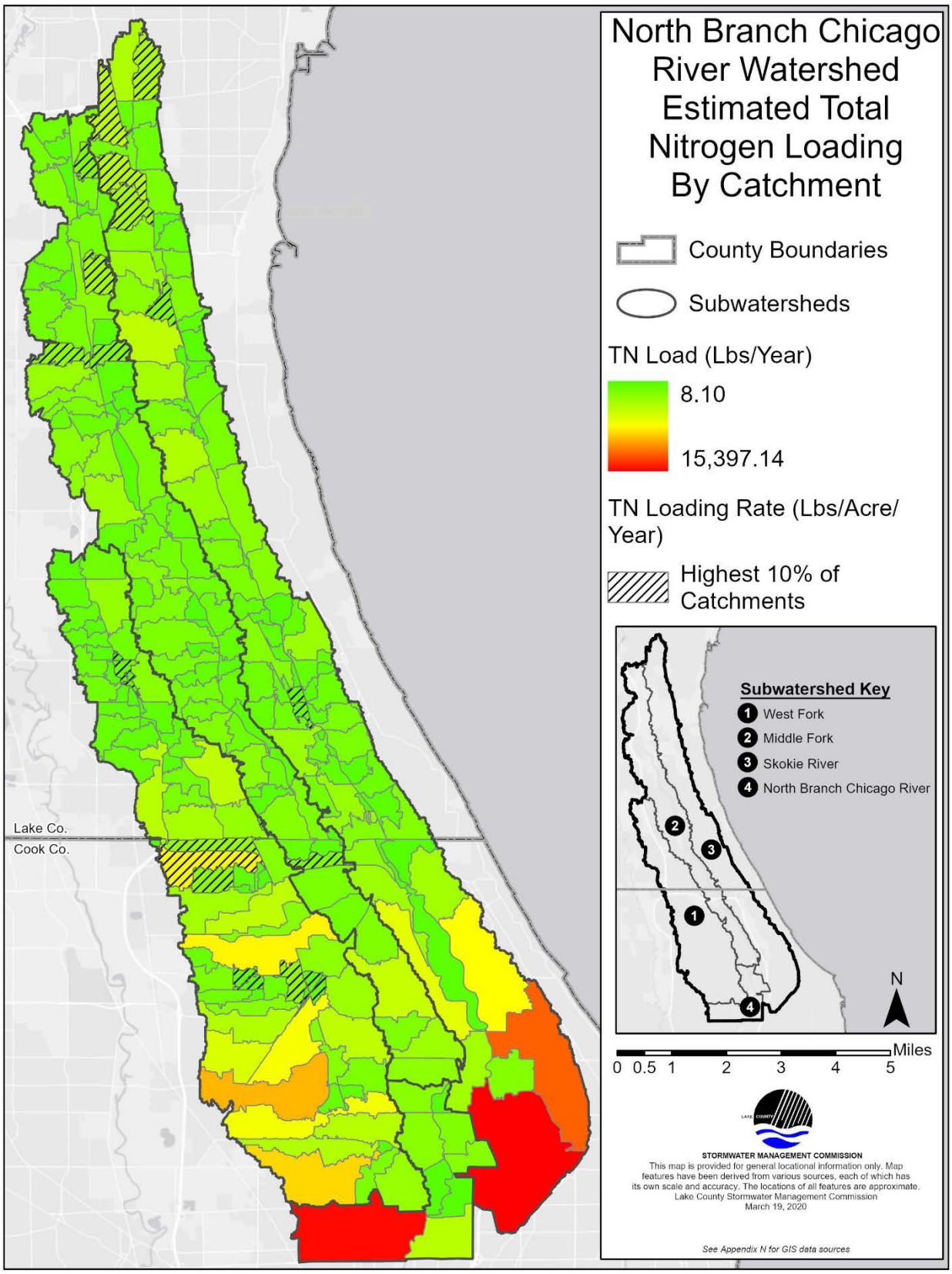


Figure 4-14: Estimated Annual Nonpoint Source Total Nitrogen Loading

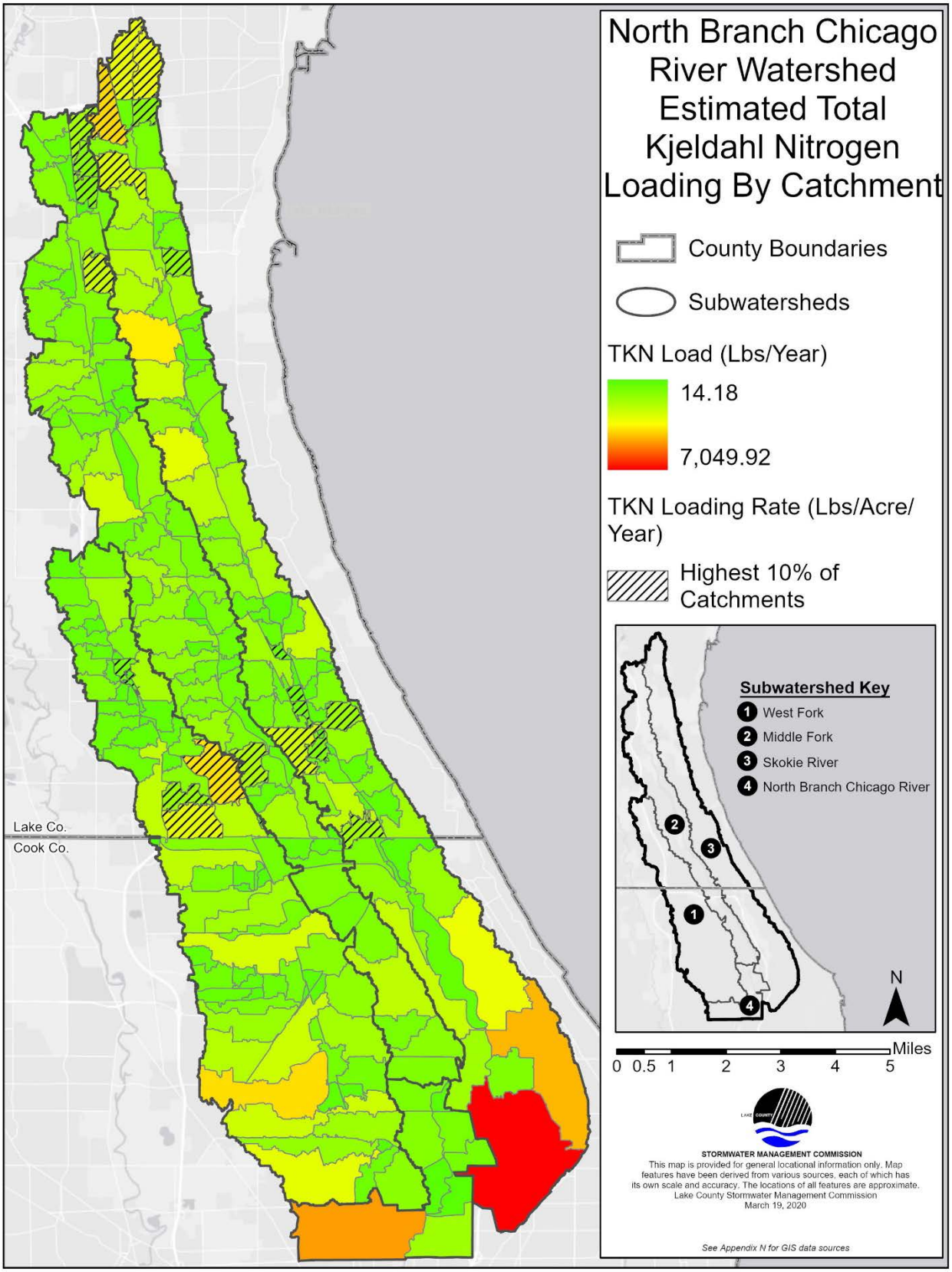


Figure 4-15: Estimated Annual Nonpoint Source Total Kjeldahl Nitrogen Loading

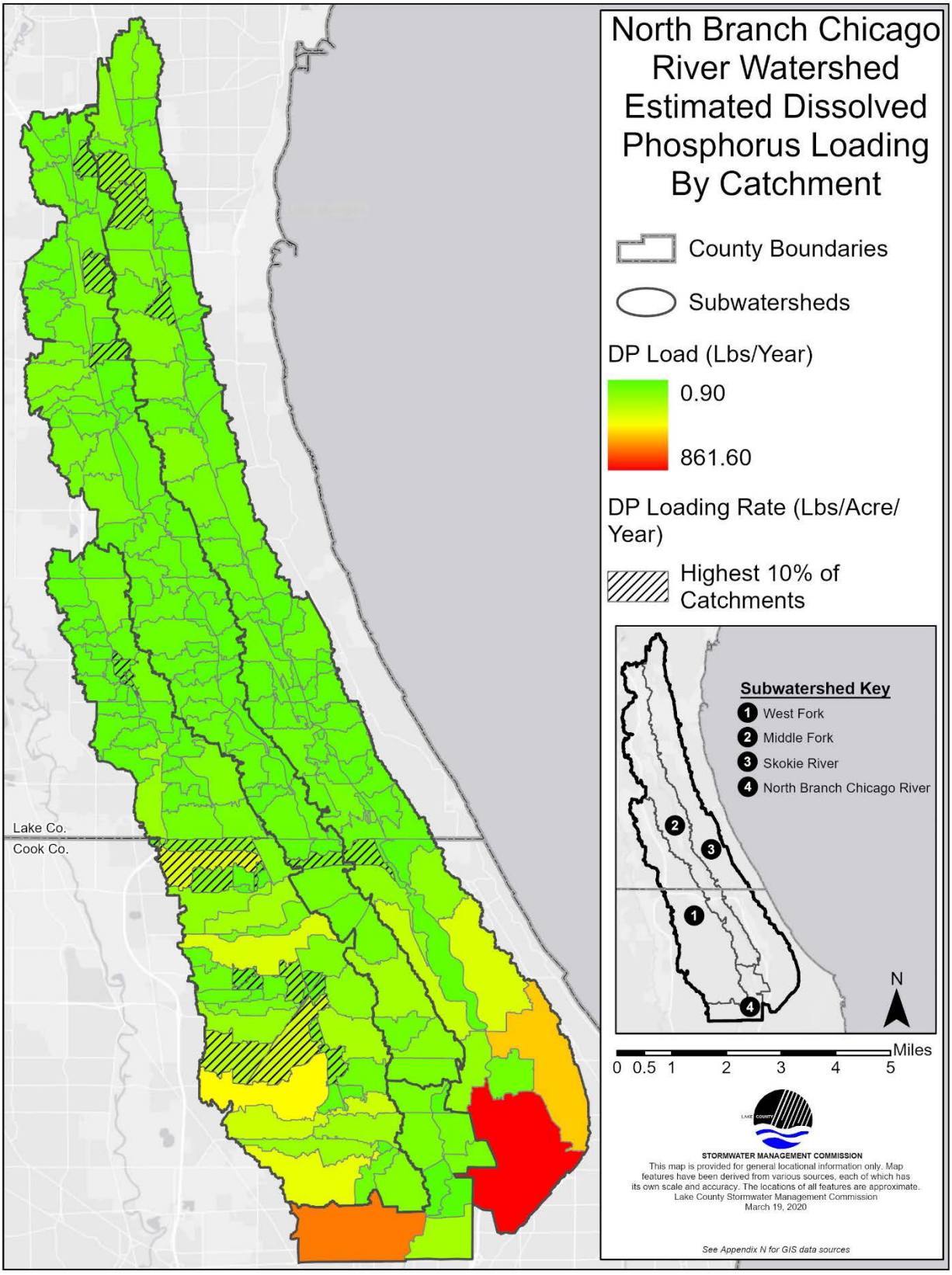


Figure 4-16: Estimated Annual Nonpoint Source Dissolved Phosphorus Loading

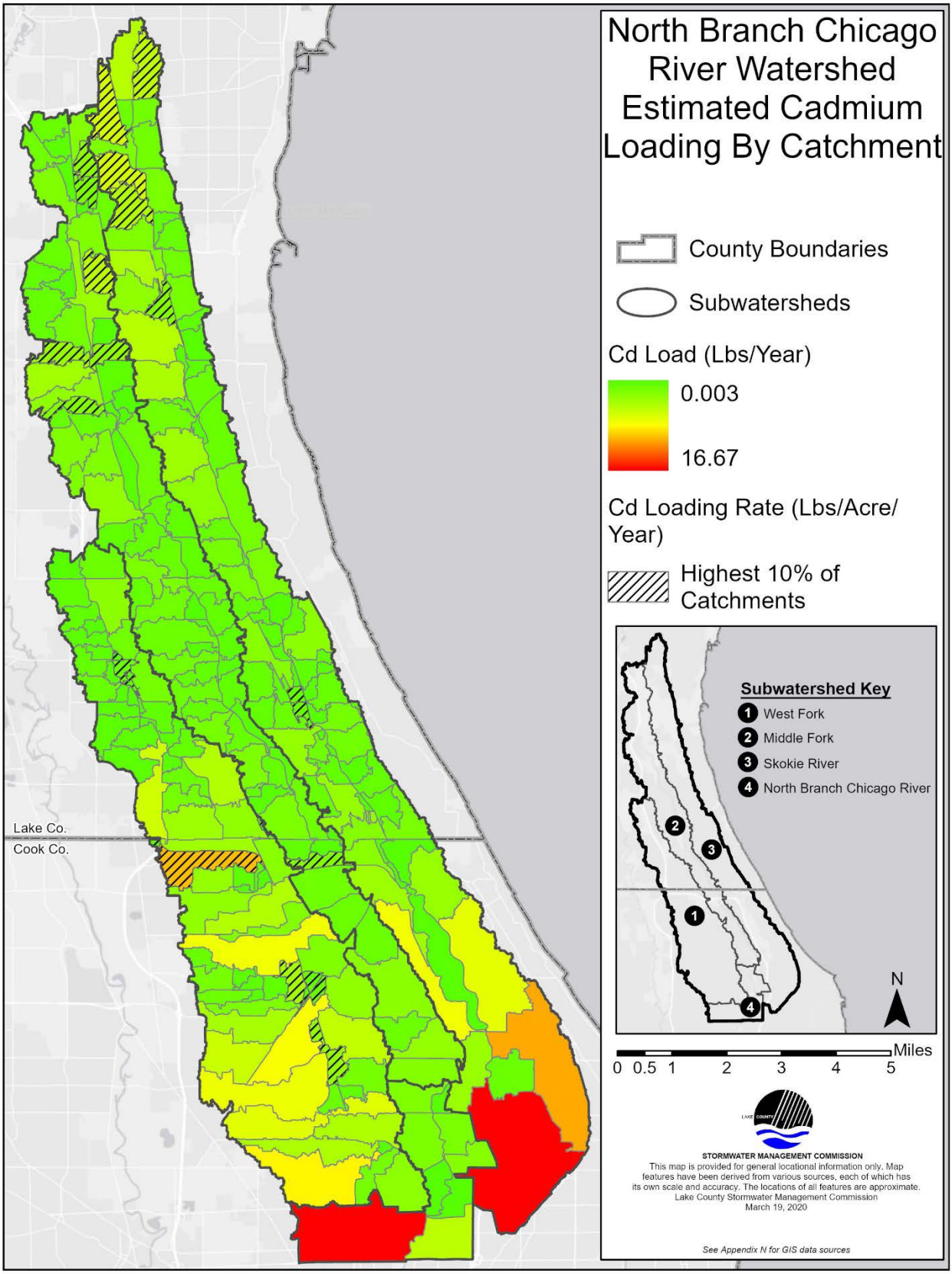


Figure 4-17: Estimated Annual Nonpoint Source Cadmium Loading

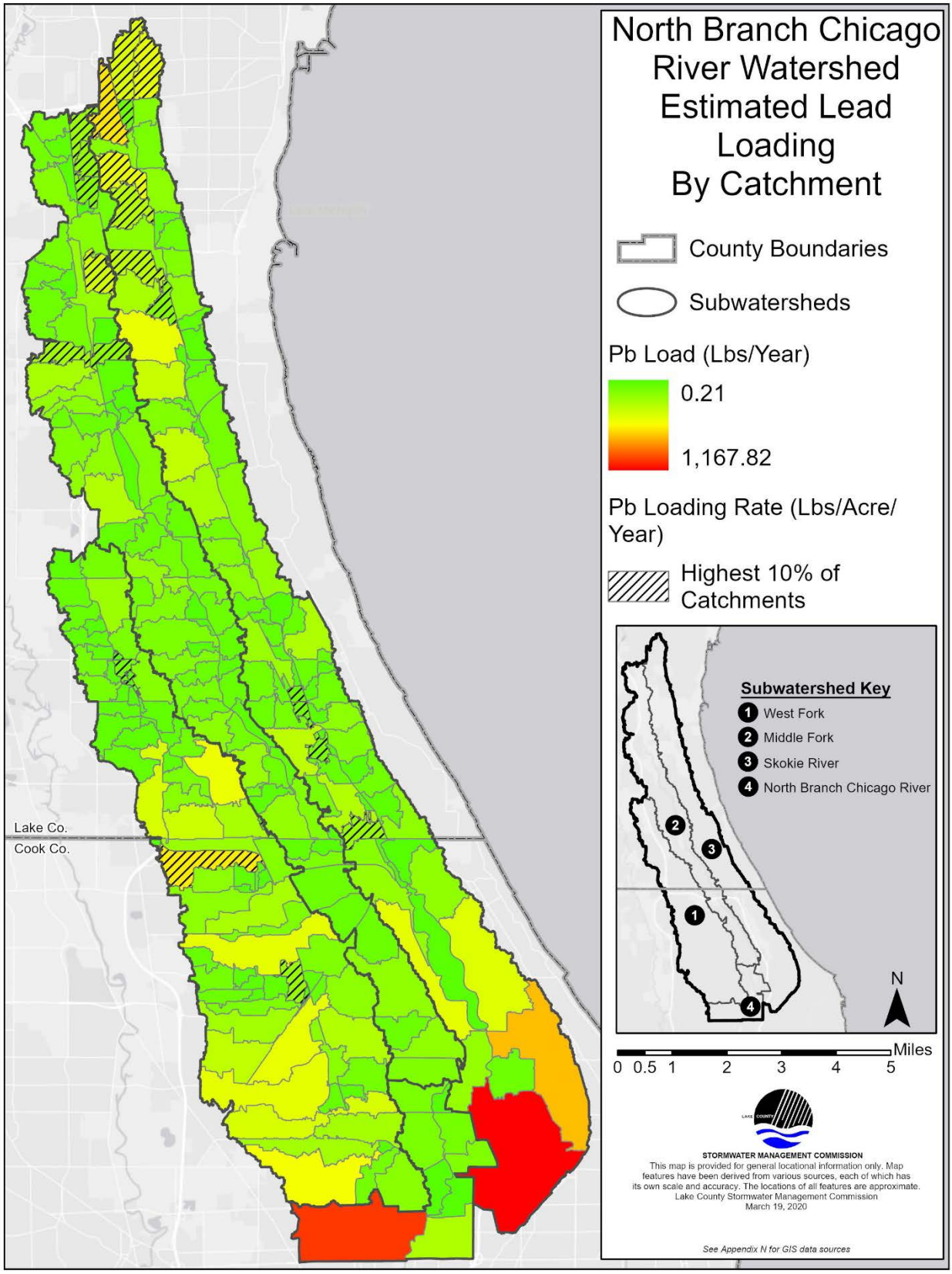


Figure 4-18: Estimated Annual Nonpoint Source Lead Loading

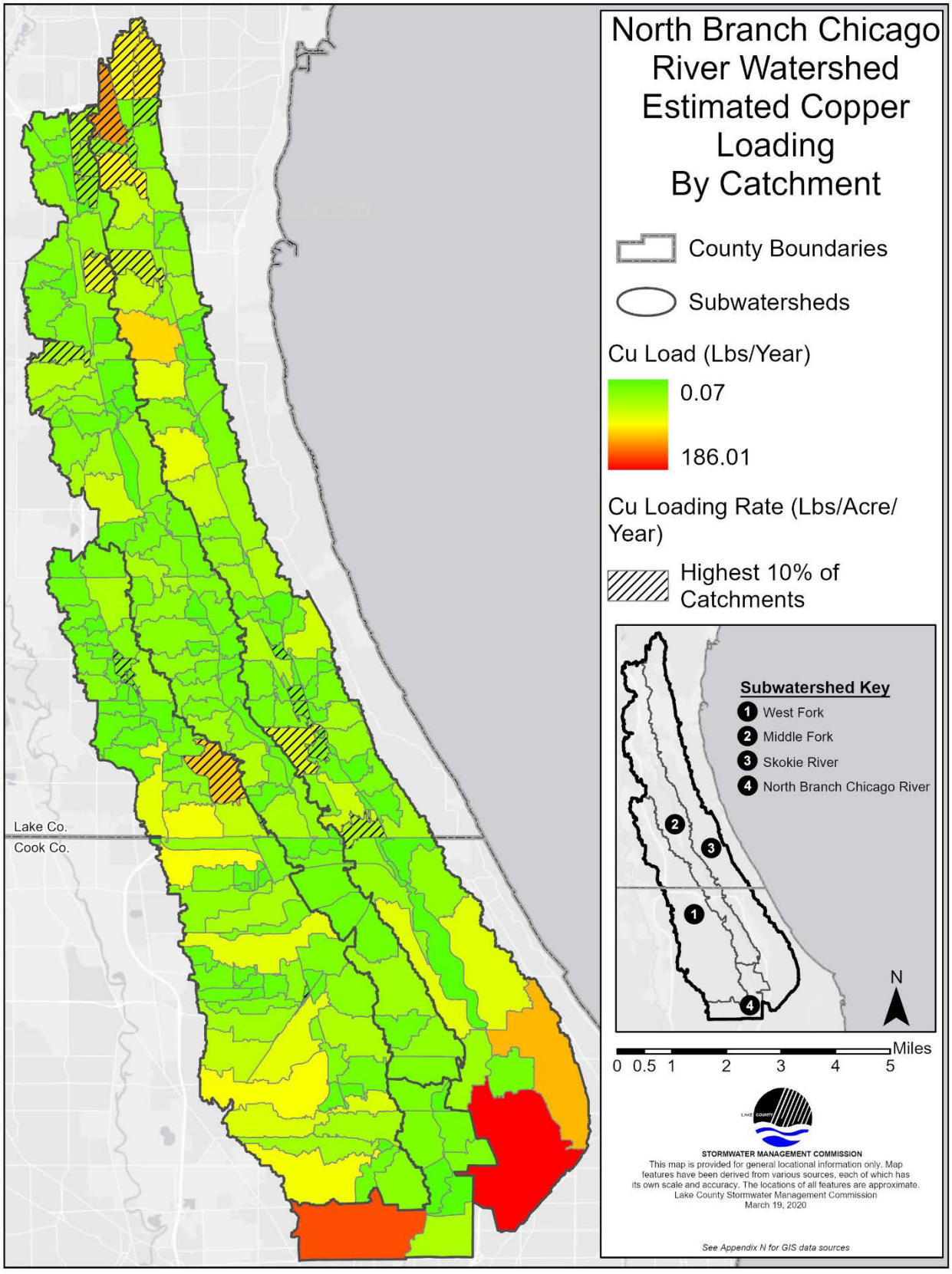


Figure 4-19: Estimated Annual Nonpoint Source Copper Loading

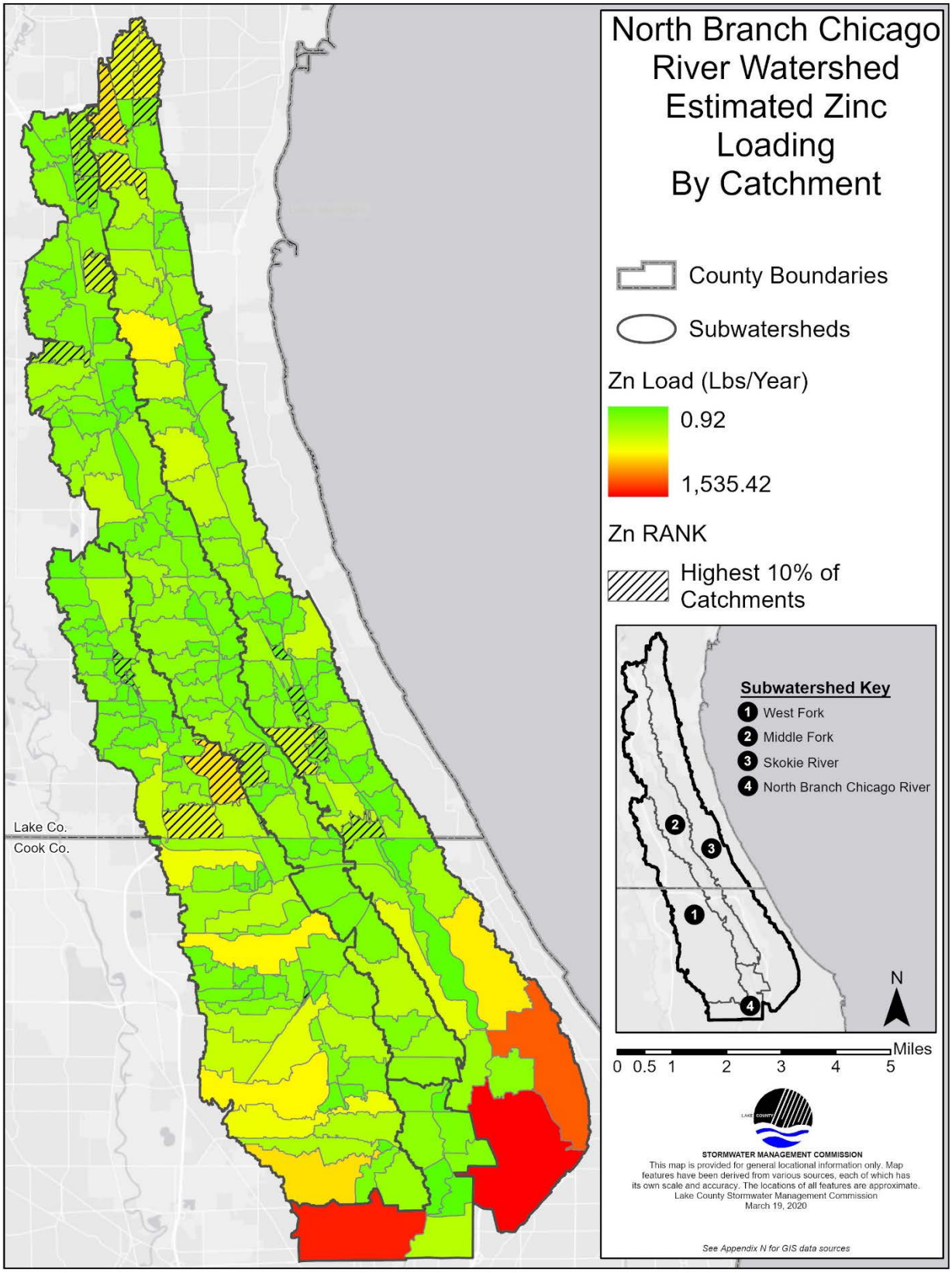


Figure 4-20: Estimated Annual Nonpoint Source Zinc Loading

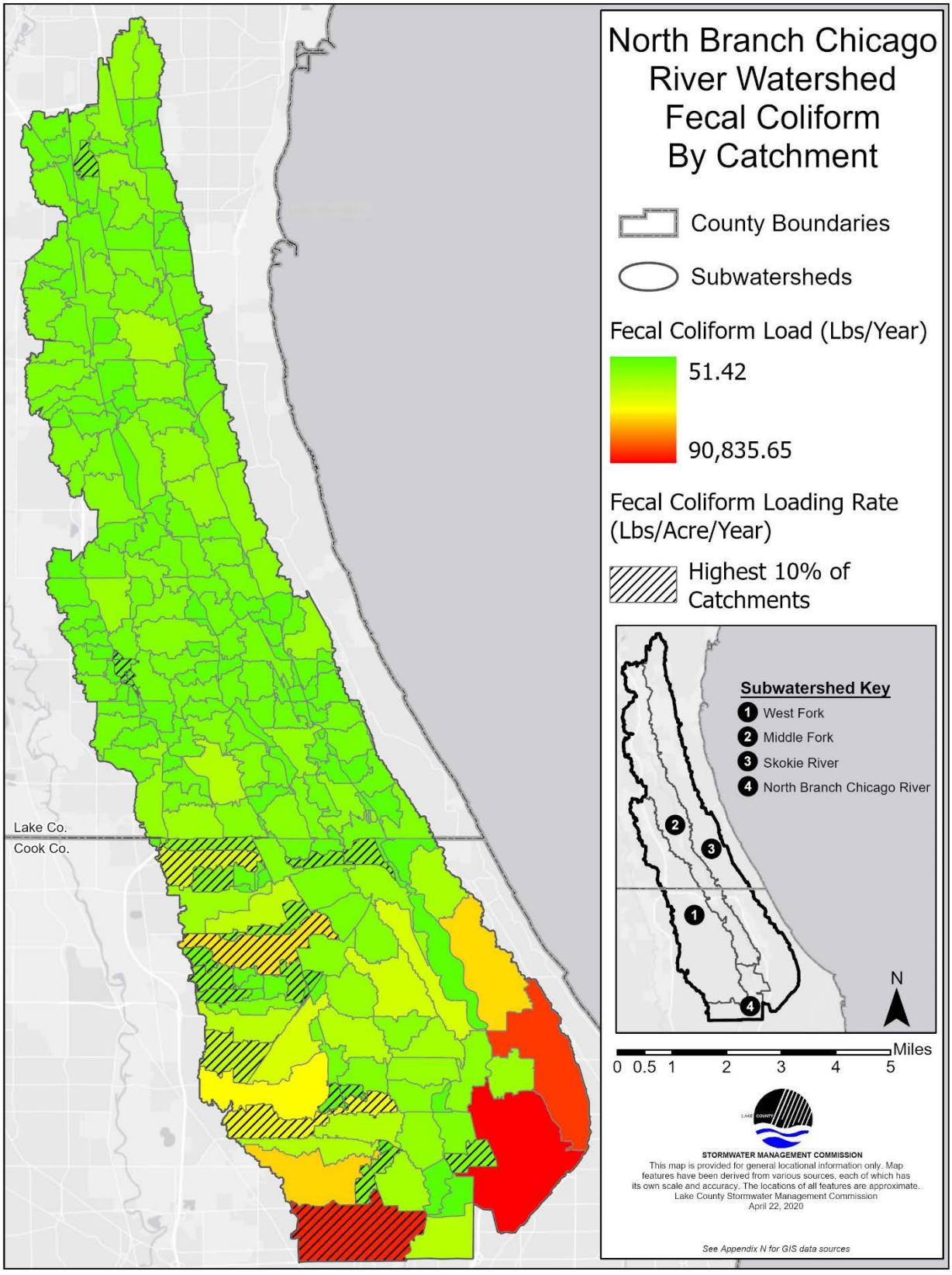


Figure 4-21: Estimated Annual Nonpoint Source Fecal Coliform Loading

Point Source Loading

Permitted point source discharge locations that report phosphorus, nitrogen, sediment, chloride and fecal coliform were tabulated to estimate pollution loading and are shown in Table 4-6.

- Sediment from point sources is estimated at 62 tons/yr, which is 0.5% of the total watershed loading.
- Total nitrogen from point sources is estimated at 1,282,659 lb/yr, which equates to approximately 82% of the total watershed loading.

4.2.4.3

- Phosphorus from point sources is estimated to be in the range of 62,441 lb/yr; which equates to approximately 63% of the total watershed loading.
- Chloride loading from point sources is estimated to be 29,048,596 lb/yr.
- Fecal Coliform loading from point sources is estimated to be 58,865,740 millions of fecal coliform bacteria colonies per year.

Point source discharges are a significant source of nitrogen, phosphorus, chlorides and fecal coliform in the NBCR planning area. Using measured data below, point sources appear to be a substantial contributor of chloride. Point sources do not appear to be a major contributor of sediment, and further data is necessary to evaluate the fecal coliform bacteria loading from point sources.

Table 4-6: Loading Estimates from Point Sources

FACILITY	PERMIT NUMBER	DESIGN AVG. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	2020 ANNUAL FLOW (MG)	ANNUAL PHOS-PHORUS LOAD (LB/YR)	[2]ANNUAL TOTAL NITROGEN LOAD (LB/YR)	ANNUAL SEDIMENT LOAD (TONS/YR)[3]	CHLORIDE LOAD (LB/YR)[4]	[3] FECAL COLIFORM LOADING (M COL/YR)
Abbott Laboratories	IL0066435	0.99	ND	207.87	ND	ND	ND	1,275,617	ND
[1]NSWRD-Clavey Road STP	IL0030171	17.8	28	1,938.15	36,028	1,054,829	33.91	ND	49,193,240
Underwriters Labs-Northbrook	IL0002739	0.053	ND	405.15	ND	ND	ND	ND	ND
Village of Deerfield WRF[2]	IL0028347	3.5	8	956.3	26,413	227,830	27.88	679,029	9,672,500
Village of Golf CSOs	IL0072389	Varies	ND	ND	ND	ND	ND	ND	ND
TOTALS		**22.42**	**36.00**	**3,507.47**	**62,441**	**1,282,659**	**61.79**	**29,048,596**	**58,865,740**

ND – No data available or reported, [1] NSWRD annual loads for Phosphorus & Nitrogen from 2020 data and sediment loads were averaged from 2018-2019 data, [2]Data source: 2020, [3]Fecal Coliform loads were from the 2020 North Branch Chicago River Watershed TMDL Report. The wasteload allocations (WLAs) are based upon two flow conditions; Illinois EPA used the design average flow (DAF) of the facilities for the lower streamflow regimes (30%-100%) and the design maximum flow (DMF) of the facilities for the high streamflow regime (0%-30%). The appropriate flow was multiplied by the water quality standard of 200 counts/100 mL geometric mean for the wastewater treatment facilities.

Sediment Source Analysis

The nonpoint source model does not directly account for significant sources of streambank erosion. Estimates for significant streambank erosion were made based on a 2018-2019 stream inventory data collected by the Lake County SMC, MWRD staff, FPDCC and Triton College students throughout the NBCR planning area (Chapter 3).

4.2.4.4 Sediment Loading in the Watershed

- Nonpoint sources: 15,901 tons/yr.
- Streambank erosion: 8,168 tons/yr.
- Lake shorelines: 651 tons/yr.
- NPDES point sources: 62 tons/yr.

Streambank Erosion

Table 4-7 summarizes the streambank load estimates. Streambank erosion was estimated using data collected by SMC throughout the NBCR planning area, specifically lateral recession rates (LRRs) and eroding bank heights. For streams that were unassessed by a field team, average eroding bank heights and LRRs were generated from similarly assessed tributary segments in the same subwatershed and applied to populate stream reaches. It is estimated that at least 8,167 tons of sediment are delivered to waterways annually as the result of streambank erosion sources in the NBCR planning area.

4.2.4.5

Table 4-7: Streambank Pollutant Loading Estimates

SUBWATERSHED	TOTAL NITROGEN (lb/yr)	TOTAL PHOSPHORUS (lb/yr)	TOTAL SEDIMENT (tons/yr)
Middle Fork	2,733	1,366	1,366
North Branch Chicago River	6,752	3,376	3,376
Skokie River	3,001	1,501	1,501
West Fork	3,850	1,925	1,925
TOTALS	**16,336**	**8,168**	**8,168**

4.2.4.6

Lake Shoreline Erosion

Lake shoreline erosion was assessed at 10 lakes in the NBCR planning area by through shoreline assessment data provided by the LCHD and SMC in 2019. As described in Chapter 3, assessed lakes (only those greater than 20 acres in size) were assigned an erosion rank ranging from 0 (no erosion) to 3 (severe erosion). In order to quantify pollutant loading, the 2017 LiDAR data was used to determine average eroding bank height and lateral recession rate was determined by the erosion ranks assigned during the shoreline assessment. Total sediment and nutrient loading from assessed shorelines are summarized in Table 4-8. The annual sediment loading from lake shorelines is estimated at 649.7 tons, total annual nitrogen loading is 1,299.3 pounds, and total annual phosphorus loading is 649.7 pounds.

Table 4-8: Pollutant Load Estimates from Lake Shorelines

LAKES	TOTAL SEDIMENT LOAD (tons/yr)	TOTAL NITROGEN LOAD (lb/yr)	TOTAL PHOSPHORUS LOAD (lb/yr)
Chicago Botanic Garden	15	31	15
Eagle Lake	28	56	28
Lake Eleanor	2	5	2
Lake Glenview	4	7	4
Lake Kathryn	11	22	11

LAKES	TOTAL SEDIMENT LOAD (tons/yr)	TOTAL NITROGEN LOAD (lb/yr)	TOTAL PHOSPHORUS LOAD (lb/yr)
Lambs Farm Lake	15	29	15
Lucky Lake	9	17	9
Old School Lake	0.2	0.3	0.2
Skokie Lagoons*	565	1,129	565
Valley Lo Lake	2	4	2
TOTALS	**651**	**1,300**	**651**

Septic Systems Analysis

Pollutant loading from failing septic systems was estimated using data generated from the presence of a septic system being assumed for each building with a planimetric footprint greater than 100 square feet located within a nonsewered area. Similar to the previous watershed-based plans, a 2% septic system failure rate was applied to estimate loading.

4.2.4.7

Septic system loading for phosphorus and nitrogen was calculated using STEPL Version 4.4b and the methodology outlined by Lowe *et al.* (2007) and is presented in Table 4-10. Assuming 2.43 people per system and an average of 0.15 billion CFU/person/day, it is estimated that failing septic systems may contribute an annual load of 2,283.12 lb/yr of nitrogen, 711.89 lb/yr of phosphorus, and an annual fecal coliform bacteria load of 5,853.87 billion CFU/yr. Figure 4-21 depicts the distribution of potential septic systems in all previously unplanned areas of the NBCR planning area.

Table 4-9: Septic Systems Analysis and Associated Pollutant Load Estimates

WATERSHED	ESTIMATED NO. OF FAILING SEPTIC SYSTEMS	TOTAL NITROGEN LOAD (lb/yr)	TOTAL PHOSPHORUS LOAD (lb/yr)	TOTAL FECAL COLIFORM LOAD (billion CFU/yr)
Middle Fork	17	888	277	2,262
North Branch Chicago River	2	70	22	266
Skokie River	14	751	234	1,863
West Fork	11	573	179	1,463
TOTAL	**44**	**2,283**	**712**	**5,854**

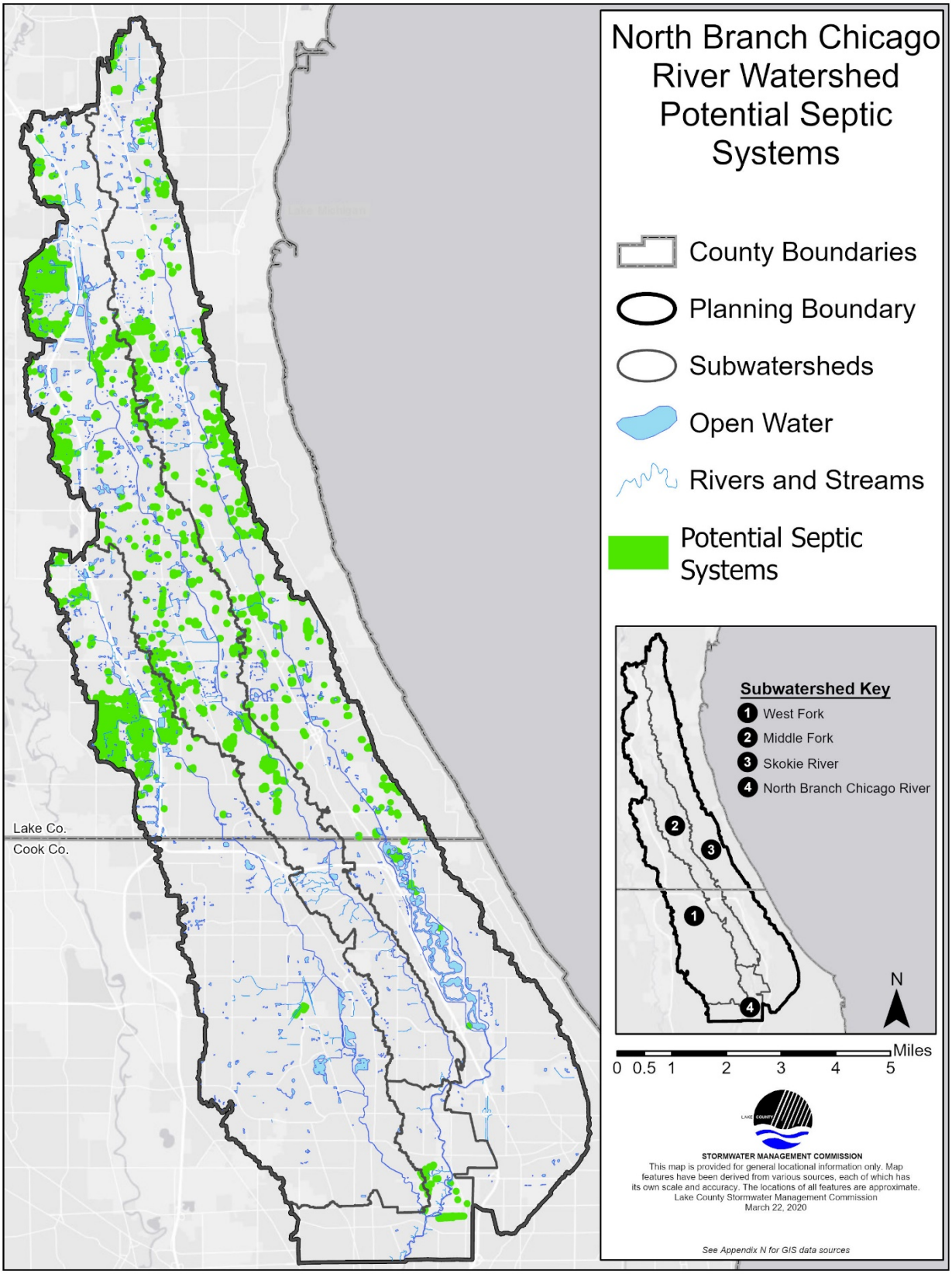


Figure 4-22: Septic System Distribution in the NBCR Planning Area

Pollution Loading Hotspots

Pollution loading hotspots are defined as the catchments with the highest annual nonpoint source load contributions. Understanding hotspots helps to focus and prioritize BMP implementation to achieve the goals and objectives of the plan. Nonpoint pollution loading hotspots were determined from each modeled parameter. Using the model described in Section 4.2.4.1, pollutant loading hotspot catchments are identified as the catchments with the highest 5% of total estimated loading for each pollutant. The highest 5% of each pollutant were compared between lb/year and lb/ac./year, then sorted by the highest 50% of the pollutant loadings.

4.2.4.8

The Skokie River and West Fork North Branch Chicago River subwatersheds both contain the most total hotspot catchments (10 each). The West Fork North Branch Chicago River subwatershed contains the most hotspot catchments for Total Nitrogen (7), and Total Phosphorus (6). Meanwhile, the Skokie River subwatershed contains the most hotspot catchments for Total Dissolved Solids (8) and Total Suspended Sediments (6). Table 4-10 lists nonpoint pollution loading hotspot catchments for each pollution parameter, along with their associated subwatersheds and pollutant parameter criteria.

Table 4-10: Hotspot Catchments for Nonpoint Source Pollution Loading

PARAMETERS	HOTSPOT CATCHMENTS (BY SUBSHED/CATCHMENT#)			
	NBCR	NBMF	NBSR	NBWF
Fecal Coliform	NBCR - 8	NBMF - 69	NBSR - 79, 81, 84	NBWF - 39
Total Dissolved Solids *Proxy for Chlorides*	NBCR - 8	NBMF - 13	NBSR - **2, 4, 8,** 20, 52, 54, 61, 84	NBWF - 29, 35
Total Nitrogen	NBCR - 8	NBMF - 5, 13	NBSR - 81, 84	NBWF - 10, **39,** 48, 54, 59, 69, 77
Total Phosphorus	NBCR - 8	NBMF - 13	NBSR - 52, 54, 79, 81, 84	NBWF - 10, 12, 35, 59, 69, 77
Total Suspended Solids	None	NBMF - 13	NBSR - **4**, 8, 52, 54, 81, 84	NBWF - 10, 12, 35, 69, 77

BOLD*= this catchment has been duplicated for the same parameter under the pollutant loading of lb/yr & lb/ac/yr.*

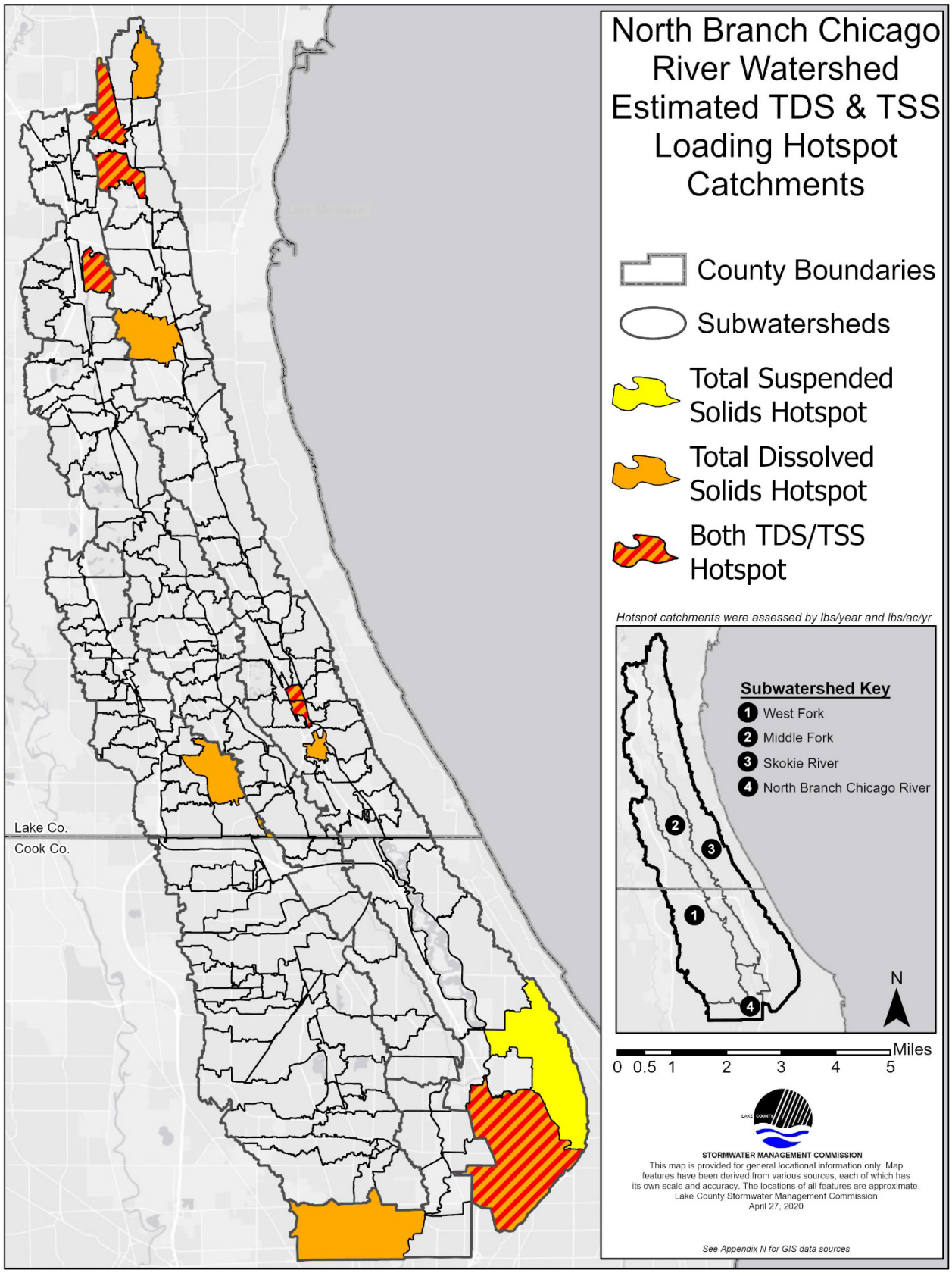


Figure 4-23: TSS & TDS Loading Hotspot Catchments

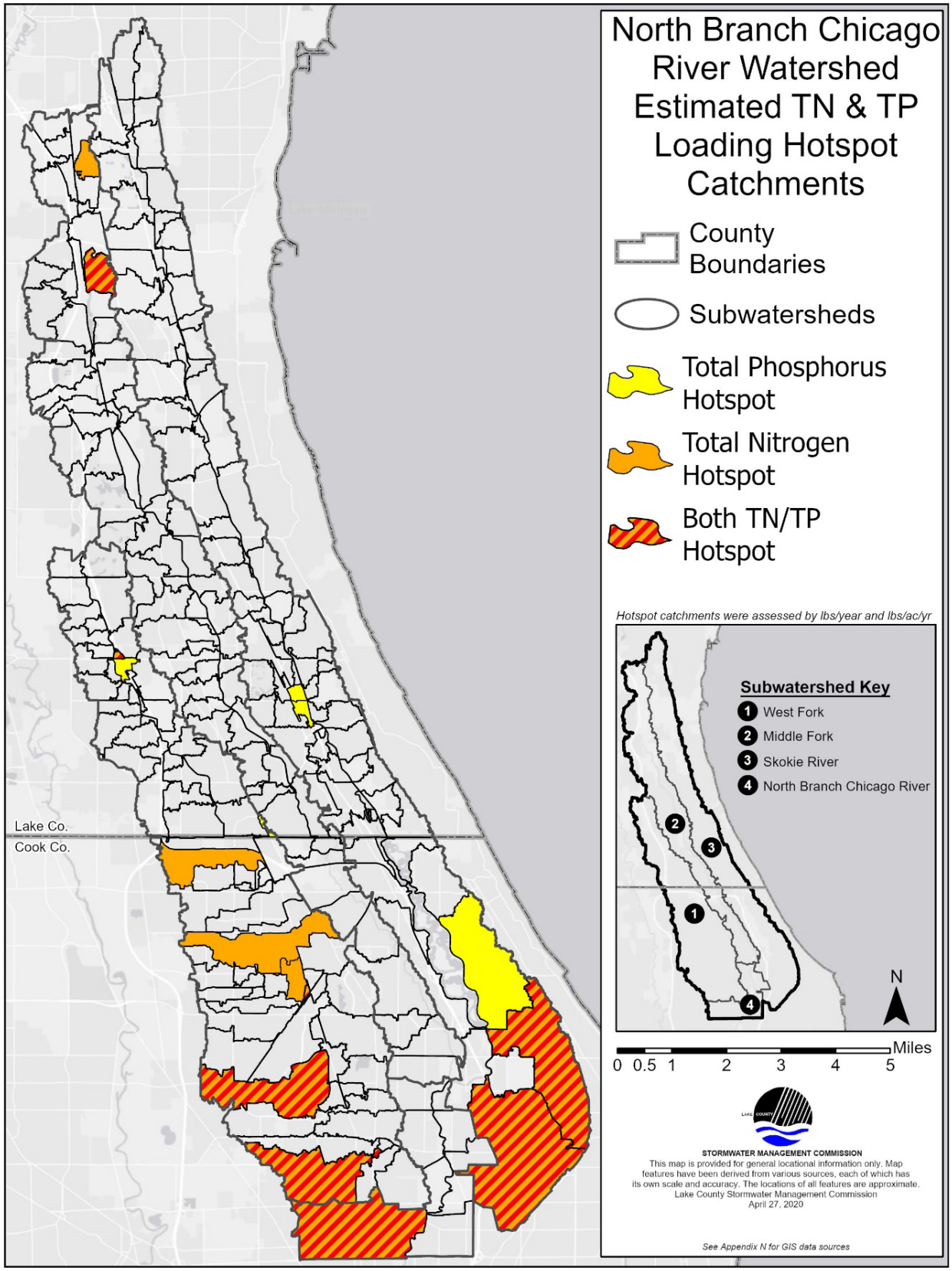


Figure 4-24: TP & TN Loading Hotspot Catchments

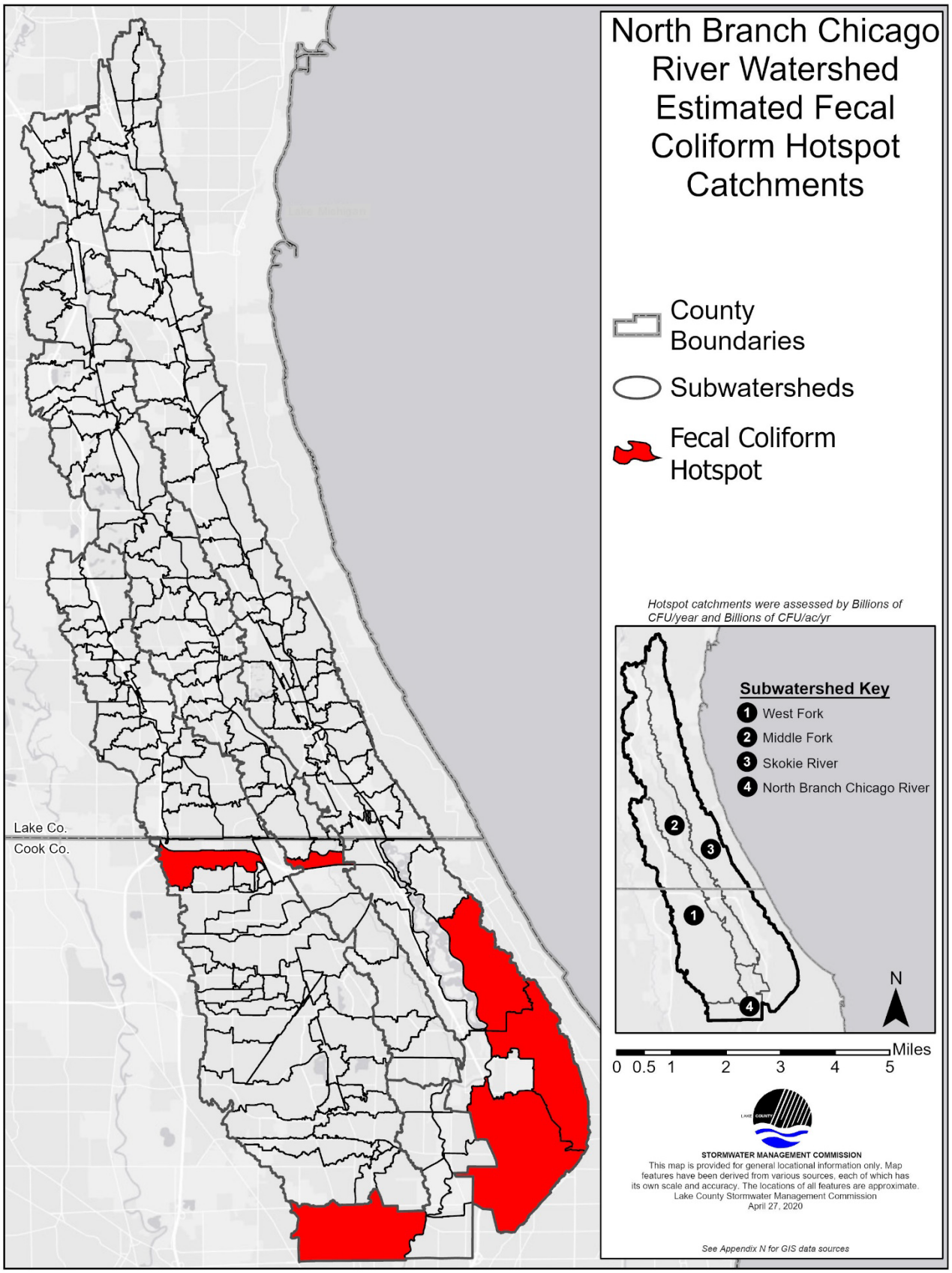


Figure 4-25: Fecal Coliform Loading Hotspot Catchments

4.2.5 Critical Areas Analysis

Critical areas are defined as catchments in the watershed best suited to focus implementation efforts to help achieve the goals and objectives of the watershed-based plan. Critical areas represent catchments that likely contribute to water quality impairments and problems in the watershed and present opportunities where project implementation would provide the greatest value and benefit. Four separate critical area analyses were performed in the NBCR planning area. These include:

1. Pollutant loading critical catchments, based on both the non-point source model and NBWW 2018 - 2019 monitoring data.
2. Chloride critical catchments, based on both the non-point source model for TDS and NBWW 2018 - 2019 monitoring data
    a. Chloride is a major cause of water quality impairments in the NBCR planning area and problematic to address using traditional practices. As a result, a separate critical areas analysis was performed for chloride in order to better focus efforts aimed at reducing nonpoint source chloride loads in the NBCR planning area.
3. Streambank erosion critical reaches, based on streambanks assessed by SMC.

PAHs exceeded the threshold effect concentration and/or probable effect concentration at every NBWW monitoring location and are not well-suited determinants of critical areas. Due to the widespread prevalence of potential PAH impact, watershed action recommendations should be programmatic in nature.

The methodology uses a ranking system based on the criteria below and detailed in Table 4-11 & Table 4-12. The analysis was performed on the entire NBCR planning area. Although each catchment met some or all the criteria, only the highest-ranked catchments were selected as priority. A total of 23 catchments (~9% of all catchments) were selected as critical. Table 4-11, Table 4-12 and Figure 4-26 show the final critical areas, their scoring and ranking, and method of selection. Chapter 6 outlines recommended actions for the critical area catchments.

Table 4-11: Aggregate Critical Area Criteria

CRITICAL AREA CRITERIA	DESCRIPTION	TOP CATCHMENTS
Nonpoint source pollution loading hotspots (6)	Catchments with the highest percentile (per unit acre) of nonpoint source pollutant loading for total phosphorus, total suspended sediment, total nitrogen and fecal coliform bacteria; calculated from nonpoint source pollutant model.	NBMF-13, NBSR-54, NBWF-10, NBWF-35, NBWF-54, NBWF-59
NBWW 2018 – 2019 monitoring data for each hotspot pollutant (15)	Catchments that are the highest 12% for total phosphorus, total suspended sediment, TKN, total nitrates and e. coli bacteria based on the NBWW 2018-2019 monitoring median data.	TP: NBSR-82, NBWF-37, NBWF-64 E. Coli: NBSR-47, NBSR-71, NBSR-69 TSS: NBSR-78, NBMF-70, NBCR-2 Total Nitrates: NBCR-2, NBCR-5, NBSR-82 TKN: NBSR-6, NBWF-37, NBWF-72
TDS Nonpoint Source Pollution Loading Hotspots (4)	Catchments with the highest percentile (per unit acre) of nonpoint source pollutant loading for	NBMF-13, NBSR-52, NBSR-54, NBWF-35

CRITICAL AREA CRITERIA	DESCRIPTION	TOP CATCHMENTS
	total dissolved solids from nonpoint source pollutant model.	
Highest geometric mean chloride concentrations (5)	Catchments directly tributary to or that include the top 4 NBWW monitoring stations with the highest geometric mean chloride concentrations.	NBSR-6, NBSR-7, NBSR-22, NBMF-20, NBMF-21

Streambank Erosion Critical Areas

4.2.5.1

Streambank erosion critical areas are banks exhibiting high rates of failure or those best suited for stabilization efforts to reduce sediment and nutrient loading. Streambank erosion was discussed previously in Chapter 3 and quantified in Section 4.2.4.5. A total of ten miles of streambank were selected as critical areas, which fall into 20 stream reaches, based on the SMC's 2019 stream inventory. Table 4-12 and Figure 4-29 shows the location of critical streambank erosion areas.

Table 4-12: Streambank Erosion Critical Areas Sediment Loading by Stream

CRITICAL AREA CRITERIA	DESCRIPTION	Critical Stream Reaches
Highest scoring 10 stream miles based on high (severe) stream erosion (20)	Analysis of the total length of high streambank erosion in each stream reach multiplied by the percent of the overall reach that has high erosion. The highest scoring 10 stream miles in Lake and Cook County was used for the critical areas.	MF016, MF034, MF046, MF037, WF008, WF007, WF006, WF002, WF001, WF031, WF023, SR027, SR019, SR017, SR016, SR014, SR012, SR006, SR002, SR033

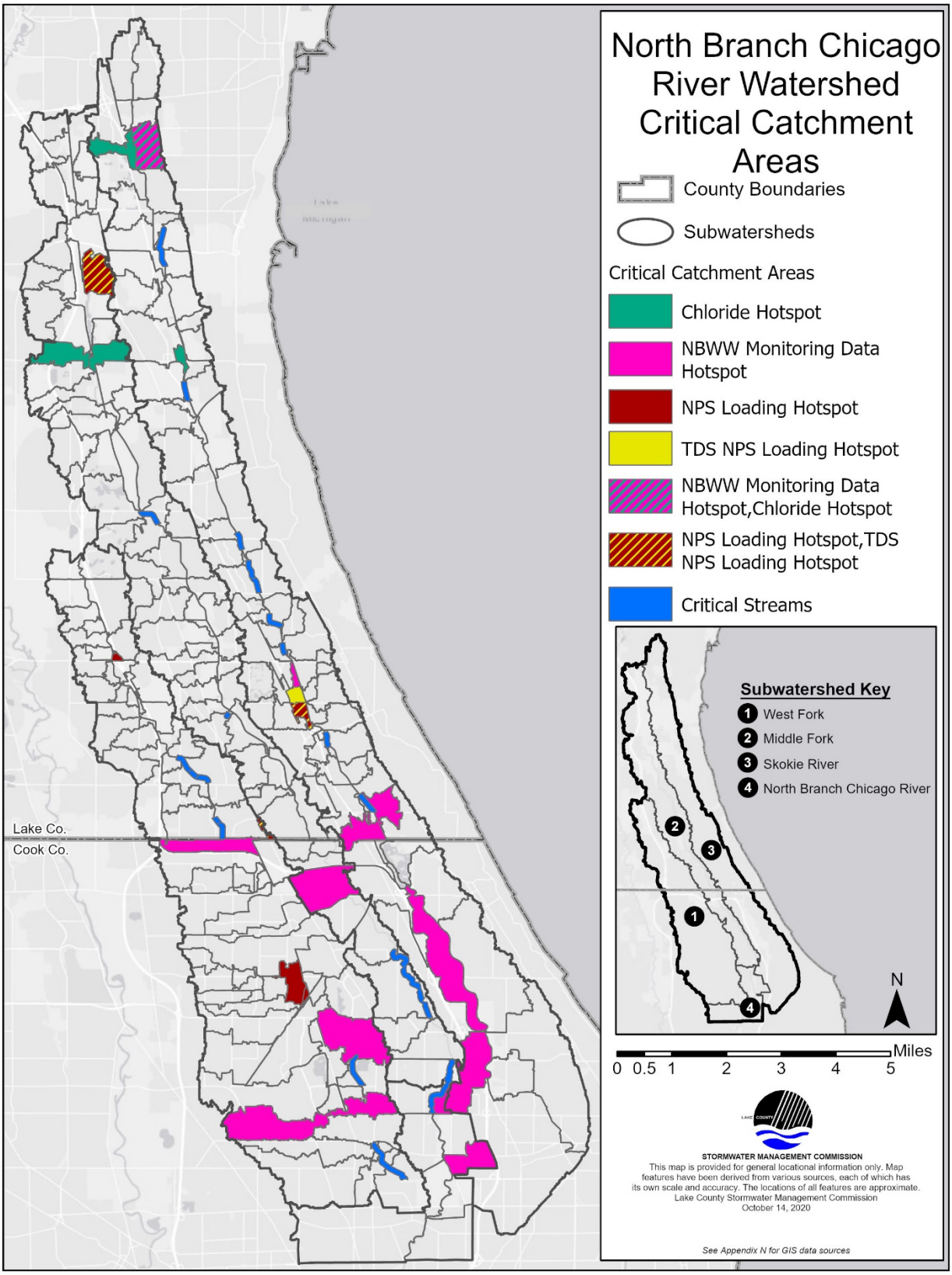


Figure 4-26: Critical Area Catchments & Stream Reaches

4.3 WATERSHED JURISDICTIONAL COORDINATION

Watershed protection, which is a shared responsibility of multiple jurisdictions in the NBCR planning area, is problematic because the jurisdictions operate with different policies, practices, and regulations. A coordinated and consistent watershed management effort does not exist due to the multiple authorities and jurisdictions and their divergent management practices and development requirements related to land and water resources. Requirements for and application of BMPs also vary based on county, municipal, township, drainage, park, forest preserve, and school district policies, standards, requirements, and incentives.

4.3.1 ISSUES TO BE ADDRESSED BY COORDINATED JURISDICTIONAL EFFORT

The watershed planning process identified multiple issues that would be most effectively addressed at the watershed level through a coordinated effort of watershed jurisdictions, with the support of private stakeholders, including:

- Volume of stormwater runoff
- Poor water & habitat quality
- Lack of water quality data
- Flood damage/regional flood storage
- Protection & restoration of natural resources
- Education & outreach of watershed issues

Table 4-28 includes a summary of the issues identified in the watershed planning process that would be best addressed through coordinated partnership efforts. See section 6.2 Programmatic Action Plan for more information on the issues, strategies and potential actions below.

Table 4-13: Issues to be addressed with watershed-level coordination

ISSUE	STRATEGIES TO ADDRESS ISSUE	POTENTIAL ACTIONS
Poor water quality (NPS & point source pollution)	Utilization of NBWW monitoring data	Implement targeted projects and programs based on NBWW data to reduce the number of water quality impairments.
	Phosphorus ban	Adopt ban(s).
	Stream, wetland, and lake maintenance program and restoration strategy; Dam repair/removal	Develop and adopt standards for stream, wetland, and lake maintenance and restoration.
	Reduce sodium chloride application with alternative practices and chemicals	Form buying consortium(s) to share equipment and reduce cost of alternative products.
	Consistent snow removal policies and application rates	Determine model policy and application rates as a base from which jurisdictions develop or modify individual policies.
Substantial flood damage	Evaluating stormwater infrastructure	Clear, repair, or replace blocked, damaged, and failing stormwater infrastructure to maintain or improve conveyance.
	Reduce flow rates and volumes from existing developed areas and prevent increases in flow rates and volumes from new development.	Encourage municipalities to have codes that allow or require green infrastructure for stormwater management.
	Flood mitigation projects	Utilizing local and regional partnerships to fund and implement flood mitigation projects such as buy-outs

ISSUE	STRATEGIES TO ADDRESS ISSUE	POTENTIAL ACTIONS
	Regional flood storage sites	Assess if regional flood storage will mitigate or prevent flood damage and implement priority storage sites.
Protection and expansion of natural resources and open space	Communities participate in invasive plant control; Inform private landowners about invasive plant control	Each community and transportation agency adds invasive plant management to maintenance programs (technical support from invasive plant network and FPDs). Coordinate outreach with established programs like NPDES II and FPD education programs.
	Habitat protection, & wetland and stream restoration	Restoration of hydrology and native plant communities in existing natural areas.
Improved watershed-based public information and education	Inform residents about BMP's, water quality and water resources, and agency roles; Promote volunteer opportunities	Coordinate outreach with established programs. See Chapter 8.
Increased participation and coordination of all watershed stakeholders in watershed improvement activities	Participate in NBWW monitoring program and general membership meetings	Communities, agencies and individuals participate in workgroup.
	Installing and maintaining neighborhood and site scale green infrastructure; native landscaping; downspout disconnection; rain garden program	Review ordinances and land management standards to allow by right and set up voluntary incentive programs.

4.3.2 Watershed Roles and Responsibilities

Watershed management in the NBCR planning area is a shared responsibility of both public and private interests. Watershed protection provided by jurisdictional entities and private stakeholders comes in several forms: policy, regulation, planning, zoning, development and land management standards/incentives, education, outreach, and in-the-ground BMP projects.

Municipal and county governments share the greatest responsibility for watershed protection because they influence and oversee development impacts to the watershed through land use planning, land management and development policies, and regulatory oversight. Transportation infrastructure improvements are necessary to accommodate business and population growth. Roadways are initiated and maintained by multiple stakeholders including townships, municipalities, counties, the IDOT, and the Illinois Tollway Authority. Other agencies and private entities with watershed or technical advisory roles include the North Shore Water Reclamation District (NSWRD), MWRD, LCFPD, FPDCC, park districts, drainage districts, Openlands, NBWW, FOCR, NCSWCD, and the MLSWCD.

4.3.2.1

Watershed Development

Development practices that affect water resources (rivers, streams, lakes, isolated wetlands, and floodplains) are largely regulated by the UDO in Cook County and the WDO in Lake County, along with county and municipal ordinances and land use plans. In addition to local regulations, the USACE regulates discharge of "fill" material into WOUS (including adjacent and connected wetlands), and the IDNR has floodplain/floodway regulatory and oversight authority. IDOT and the Illinois State Toll Highway Authority design and construct roadways in the NBCR planning area. State and federal projects are not required to meet local regulatory requirements but are governed by state and federal policies and regulations.

In Lake County, the WDO is administered and enforced by SMC or a Certified Community. A community can be fully certified with authority to review and enforce both the standard stormwater and the isolated wetland provisions of the WDO, or partially certified with delegation to review and enforce one aspect of the WDO (either the standard or isolated wetland provisions). Development practices within unincorporated areas are guided by the Lake County Framework Plan and must meet the requirements of the UDO. The Lake County PB&D administers the UDO on unincorporated parcels. Development affecting water resources in the unincorporated areas of the townships must be reviewed by Lake County PB&D, except publicly funded projects in the floodway, which are reviewed by SMC. Lake County PB&D reviews may involve coordination with SMC on issues such as base (100-year) flood elevation determinations. Authority for local land use planning and development regulation within municipalities (incorporated areas) within Lake County rests with the municipality and its municipal codes and regulations. All development in Lake County municipalities must meet the minimum standards set forth by the WDO (many municipalities are certified to administer WDO standards). The IDNR has floodplain/floodway regulatory and oversight authority within Cook and Lake counties. IDNR has delegated floodplain/floodway review authority for Lake County to SMC. For the most up-to-date information on Lake County regulatory authority, visit Lake County's website.

In Cook County, the WMO is administered and enforced by MWRD or an Authorized Municipality. MWRD retains certain review authorities, primarily for developments that are tributary to combined sewers; developments proposing outfalls to the waterways or Lake Michigan within Cook County; and certain modifications and reconfigurations to existing detention facilities. The WMO allows local municipalities whose corporate boundary lies within both Cook County and an adjacent collar county (such as Lake County) to adopt and enforce the ordinance of the adjacent county in lieu of the WMO. Those municipalities must enter into an IGA with MWRD to follow the indicated ordinance. Municipalities, whether Authorized/Certified or not, can always enforce more stringent provisions for development if they determine there are conditions that warrant stricter requirements for their community. For the most up-to-date information on Cook County regulatory authority, visit Cook County's website.

4.3.2.2

In-the-Ground Projects

In-the-ground projects are encouraged and incentivized when local units of government throughout the county adopt a watershed-based plan. Plan adoption should be followed by close coordination and development of funding mechanisms, timelines, and shared responsibilities for implementing the projects prioritized by watershed planning efforts. Implementation of projects identified within the watershed-based plan requires partnerships between stakeholder groups, including homeowner associations, nonprofit organizations, businesses, schools, and community agencies, who must coordinate, fundraise, secure grants, and oversee project implementation. The experience and success that partnerships often gain from working together on a watershed project can influence regulatory changes and increase cooperation among policy-makers.

The watershed action plan (Chapter 6 and Appendix M) identifies lead and support roles for multiple units of government to assist private landowners and watershed groups. Specific types of aid that governments can provide to private landowners can include BMP project cost-share funding or technical assistance, particularly for studies or plans. Private entities as partners can also provide cost-share for design, consulting, and

construction work for projects, and in-kind BMP services, such as seeding, planting, restoration work, trail construction, and interpretive education.

Watershed projects benefit from partnerships that share design, permitting, material, and labor costs. Public/private partnerships are also important for securing state or federal funding for in-the-ground projects. Projects with shared costs and benefits often result in more successful project outcomes because of the relationships built among partners who share a vested interest in the success of their projects. Partnership on a first project may establish an institutional relationship that results in implementing projects in the future.

Post-Construction Monitoring and Maintenance

Opportunities should also be identified for establishing partnerships to improve the effectiveness and efficiency of monitoring and maintenance. Partnerships could share responsibility for stream monitoring and maintenance, stormwater monitoring, road and parking lot deicing, detention basin monitoring and maintenance, and invasive plant management. Additionally, partnerships may be established to share technical expertise; develop maintenance guidelines or standards; share services, equipment, or storage locations; or combine contracts with neighboring jurisdictions for similar activities, such as winter road maintenance and invasive plant management. Information on work responsibilities for each organization/jurisdiction should be available online to all watershed partners and residents to increase transparency and information availability. Interjurisdictional coordination may entail doing business in a new or different way; however, it results in watershed goals being achieved in a more efficient, effective, and sustainable manner. The NBWW is an example of an interjurisdictional partnership providing some of the services identified above.

4.3.2.3

NOTEWORTHY: NBWW'S TECHNICAL ROLE IN THE WATERSHED

NBWW's continuous monitoring efforts will accurately assess the water quality problem and identify specific locations for implementation projects that will provide the greatest cost/benefit ratio. It will also allow for a consistent measure of progress. By monitoring over an extended period, using a consistent methodology, NBWW will identify BMPs that are successful at reducing nonpoint source pollution and improving water quality.

4.4 REFERENCES

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COMMON ACRONYMS/ABBREVIATIONS USED IN CHAPTER 5

AC-FT – Acre-Feet
AMC – Antecedent Moisture Conditions
ANHMP - All-Natural Hazards Mitigation Plan
BFE – Base Flood Elevation
CFS – Cubic Feet Per Second
CMAP – Chicago Metropolitan Agency for Planning
CRS – Community Rating System
DCEO – Department of Commerce and Economic Opportunity
DHSEM – Cook County Department of Homeland Security and Emergency Management
DMA 2000 - Disaster Mitigation Act of 2000
DWP – Detailed Watershed Plan
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map
FIA – Federal Insurance Administration
FIS – Flood Insurance Study
FPA – Flood Problem Area
FPAI – Flood Problem Areas Inventory
FPDCC – Forest Preserve District of Cook County
FSI – Flood Susceptibility Index
GIS – Geographic Information System
GRS80 - Geodetic Reference System 1980
HEC – Hydrologic Engineering Center
HEC-FDA – Hydrologic Engineering Center's Flood Damage Analysis
HEC-HMS – Hydrologic Engineering Center-Hydrologic Modeling System
HEC-RAS – Hydrologic Engineering Center-River Analysis System
H&H – Hydrologic and Hydraulic
HMPC – Hazard Mitigation Planning Committee
IDNR – Illinois Department of Natural Resources
IDOT – Illinois Department of Transportation
IEMA – Illinois Emergency Management Agency
ISWS – Illinois State Water Survey
LiDAR – Light Detection and Ranging
MWRD – Metropolitan Water Reclamation District of Greater Chicago
NAD 83 - North American Datum of 1983
NBCR – North Branch Chicago River Watershed
NFIP – National Flood Insurance Program
NOAA - National Oceanic and Atmospheric Administration
NRCS – Natural Resources Conservation Service
NWI – National Wetland Inventory
OWR – Office of Water Resources
PAS – Planning Assistance to States
ROW – Right of Way
RVR – Runoff Volume Reduction
SCS – Soil Conservation Service
SFHA – Special Flood Hazard Areas
SMC – Lake County Stormwater Management Commission
UTM - Universal Transverse Mercator
USACE – United States Army Corps of Engineers
USDA – United States Department of Agriculture
USGS – United States Geological Survey
WDO – Lake County Watershed Development Ordinance
WMO – Cook County Watershed Management Ordinance
WRAPP – Wetland Restoration & Preservation Plan

5 FLOOD PROBLEM ASSESSMENT

Floodplains and floodways along stream and river corridors provide a variety of benefits, including aesthetic value, flood storage, water quality, and plant and wildlife habitat. The capacity of the floodplain to hold water during significant runoff events to minimize flood damage is of primary interest for this discussion. Upland areas outside of the floodplains and floodways can experience urban flooding, which is common in older sections of communities where older storm sewers may not be designed to present-day standards (modern stormwater and floodplain regulations). Urbanization has increased runoff, and climate is trending to more frequent and intense storm events (Illinois Urban Flooding Awareness Act, 2015). Increased stormwater runoff, in combination with areas with inadequate and poorly maintained stormwater infrastructure, lead to flash flooding in these urbanized areas.

5.1 FLOOD EVENTS

Flooding is a problem many North Branch Chicago River watershed (NBCR) planning area residents have experienced, whether at home, in their yard, in their neighborhood, at work, or on area roadways. During the North Branch Chicago River Watershed-Based Plan update, more information was needed about when and where flooding occurs that impacts residents in the NBCR planning area. As part of the watershed planning process, there was a need to identify locations in the NBCR planning area that are at risk of flooding so that the watershed-based plan can include reasonable solutions to reduce flood damage in a cost-effective manner. Numerous additional historical floods have occurred in the watershed and are mentioned below. The description of these floods below was obtained through various historical resources, including hydrologic atlases and flood hazard mitigation plans and reports.

5.1.1 1938

The 1938 flood was one of the more notable floods that occurred in Lake County. In 1938 flooding impacted Southern Wisconsin and Northern Illinois, including Lake County. The flood event caused multiple major road closures. This flood event was considered “the greatest” since the 1913 flood event or earlier on the West Fork of the NBCR at Northbrook (Ellis, 1964). The Skokie River inundation pattern was affected by temporary dikes and diversion channels (outside of the dike to accommodate stormwater runoff) that were being utilized during the construction of the Skokie Lagoons (by the Forest Preserve District of Cook County, FPDCC). Post-construction of the Skokie Lagoons (1940), the lagoons provide 1,500 acre-feet of flood storage (control) with a series of four dams.

5.1.2 1950s

Heavy showers and thunderstorms inundated Chicago and its suburbs from October 9-11, 1954. The Army Corps of Engineers (USACE) estimated that there was approximately $5,300 in flood damages in the Village of Northbrook from this event (Daniels, 1958). The West Fork of the NBCR flooded in 1957, from mile marker 15 to 31 the river was flooded with the most extensive flooding occurring between mile marker 23 and 26. The tributaries at this point were mildly flooded as well. During the construction of the Tri-State Tollway (1957-58),

the West Fork of the NBCR was related in a new channel, which has since provided flood storage capacity (Ellis, 1963).

5.1.3 1960s

During the winter of 1959-1960, the southern portion of Wisconsin and Northern Illinois received an extreme amount of snowfall. Since March 1960 was the coldest March on record, much of the snow was still on the ground at the end of the month. Since March 1960 was the coldest March on record, much of the snow was still on the ground at the end of the month. Long rainstorms fell in this area from March 30-31, which caused major rivers to go outside their banks in the southern portions of the NBCR planning area (Rostvedt, 1965). The floods of April 1960 resulted from snowmelt followed by heavy rains which eventually overwhelmed the available floodplain storage. The Skokie River was characterized by low swampy terrain with no defined channel, with portions of the river drained by numerous broken-field tiles which contribute to frequent ponding. The 1967 flood, approximately a 5-percent-annual-chance flood event, caused damage along the entire Chicago River, NBCR and West Fork (DEMRS, 2019).

5.1.4 1980s

July 22, 1982 more than 7 inches of rain fell over 12 hours which resulted in flooding along the NBCR and West Fork in the Village of Northbrook and was the most extreme event recorded since the early 1950s on the West Fork (DEMRS, 2019). On December 2, 1982 a major storm, which had been preceded by a very wet 30-day period, occurred bringing rainfall amounts from 3 to 4 inches (over a 1- to 2-day period). The peak discharge of 740 cubic feet per second (cfs) was recorded at the Dundee Road gage (DEMRS, 2019).

The 1986 flood was triggered by widespread regional rainfall with varying intensity and duration which had been preceded by two weeks of nearly continuous rain falling across northern regions of the Des Plaines River, NBCR and Fox River watersheds. As a result, flooding occurred in rivers and streams across Lake, McHenry, northern Cook Counties (Juhl, 2018). The 1986 floods were scattered throughout northeastern Illinois and were most severe in Lake and Cook Counties in Illinois. October 7, 1986, the President declared that Illinois had suffered a major disaster because of the severe storms and flooding (G.O. Balding and A.L Ishii, 1993). See Figure 5-1 for an aerial view of the 1986 flooding at the Abbott Facility in North Chicago, Illinois.



Figure 5-1: Flooding September 27, 1986 at the Abbott Facility

The 1987 flooding was caused by short duration high intensity storms, dropping up to 13 inches of rainfall in some regions in less than 24 hours (concentrated across Cook & DuPage counties) (Juhl, 2018). The flooding affected 11,500 single family units and caused $53 million in private property damage in northern Illinois. A

peak stream flow of 1,190 cfs, with a river stage of 10.10 feet, was observed on the West Fork of this riverine system on August 14, 1987 (Tetra Tech, 2014)

The 1986 and 1987 floods generated enough public awareness of the continued problems of drainage and flooding for the Illinois General Assembly to pass legislation authorizing the formation of countrywide stormwater management programs. Such programs, in conjunction with state and federal programs, are providing stormwater management planning, watershed planning, regulation of construction within floodplain areas, and new sources of funding to manage local drainage and flooding problems. Lake County adopted a comprehensive stormwater management plan and ordinance to address increased flooding and improve water quality. Existing development, however, is still subject to flooding. As a result, the lake County Stormwater Management Commission (SMC) in cooperation with local, state and federal agencies initiated a flood mitigation program to reduce flooding in developed areas.

5.1.5 2002

Thunderstorms produced very heavy rainfall across far northern Illinois during the early morning hours of August 22, 2002. Significant flooding of roads, creeks, and basements was reported across several counties in northern Illinois. The hardest hit areas extended from central Winnebago county through southern Boone, southern McHenry, to northern Kane and northern Cook counties (National Weather Service, 2002). In Cook[1] county, sections of Interstates 290 and Interstate 94 were closed with estimated total rainfall reports of 4.90 inches in Cook County and 4.30 inches of rainfall in Deerfield, Lake County. The Metropolitan Water Reclamation District of Greater Chicago (MWRD) opened the locks at Wilmette Harbor and at the Chicago River, releasing 850 million gallons of storm and sewage water into Lake Michigan (National Weather Service, 2002).

5.1.6 2008

In 2008, multiple storm events associated with the remnants of Hurricane Ike led to 51 consecutive hours of precipitation in Northeastern Illinois. The heavy rains, which largely fell in a 6-hour period on September 13, 2008, resulted in flash flood conditions, particularly along the NBCR. The flooded homes and extensive damage to basements caused large-scale evacuations such as Glenview (3,000 people) and those that lived along the NBCR (2,800). The cleanup from this flood event in Cook County $3.5 million (NBCR planning area only is a portion of that cleanup cost) (Changnon, 2010). The Governor of Illinois acted after the flooding began and



Figure 5-2: April 2013 flood event at the WKRS Radio Station in Waukegan

identified seven counties as Disaster Areas. These included Cook, DeKalb, DuPage, Grundy, Kane, La Salle and Will (Chicago Tribune, 2008).

5.1.7 2013

In 2013, a massive rainstorm on April 17-18, 2013 delivered between 4-7 inches of rainfall to Northern Illinois (National Oceanic and Atmospheric Administration (NOAA) National Weather Service, 2014). The late snow melt and heavy rains in early April combined with the two-day rain event on April 17-18th, 2013 resulted in extended, widespread riverine flooding in the NBCR planning area. Major flood stage, as defined by the National Weather Service is "extensive inundation of structures and roads." On April 18th, 2013, the Skokie River at the Highland Park stream gage reached peak water level of 9.83 feet, just shy of the record 9.95 feet set in 2002. The peak water level on the Middle Fork near Deerfield reached 11.35 feet, just shy of the record 11.55 feet set in 2002. (USACE, 2017).

The heavy rains overwhelmed storm and sanitary sewer systems, caused sewer backups, localized and riverine flooding throughout Lake County. Floods damaged an estimated 3,200 properties, forced evacuations, and caused numerous power outages and road closures. See Figure 5-2 for an example of the extent of flood damage at the WKRS Radio Station in Waukegan. In response to flooding and severe storms, President Obama declared that a major disaster exists in the State of Illinois. This declaration made federal disaster assistance available for Individuals and Public Assistance. In Lake County, 1,159 individuals and/or households received upwards of $2.7 million dollars in federal disaster assistance.

5.1.8 2017

Torrential rounds of heavy rain began late on the night of July 11th, 2017 and continued into the morning of July 12th 2017. Multiple rounds of rain continued over the same locations produced 3-7 inches of rain which brought flash flooding by daybreak and continued throughout the entire day and into the next night. Flooding occurred, and at times very rapidly, affecting flood-prone areas as well as communities that had not experienced this type of flooding before. The heavy rain overwhelmed stormwater infrastructure and the rapid rise of several feet of water along the NBCR and its tributaries, which led to widespread flooding.



Figure 5-3: Flooding in North Chicago (July 2017)

Major roads were closed, and residents in several areas were evacuated. Hundreds of homes and properties sustained major damage and another 3,000 homes had less severe damage. Record crests were recorded for the Middle Fork-NBCR (12.96 feet), Skokie River at

Highland Park (10.38 feet) and Skokie River at Lake Forest (9.09 feet) stream gage locations. Three Illinois counties including Lake County were proclaimed disaster areas by Governor Bruce Rauner, however federal assistance for a major disaster declaration was denied because the total amount of flood damages did not meet the state threshold for federal assistance. Figure 5-3 shows the extent of flash flooding that occurred flooding at Strawberry Condominiums in North Chicago during the July 2017 flood event.

5.1.9 JUNE 2015 ILLINOIS URBAN FLOODING AWARENESS ACT FINAL REPORT

In August 2014, the Illinois General Assembly through PA98-0858 tasked the Illinois Department of Natural Resources (IDNR) to prepare a report on the extent, cost, prevalence, and policies related to urban flooding (IDNR, 2015). In addition, IDNR was tasked to identify resources and technology that may lead to mitigating the impacts of urban flooding. Flooding in urban areas has received increasing attention in the last decade, with at least $2.319 billion in documented damages between 2007 and 2014, of which $1.240 billion were private claims that typically represent basement flooding and sewer backup (IDNR, 2015). The Urban Flooding Awareness Act requires the Federal Emergency Management Agency (FEMA) to direct a study to quantify these facts and develop recommendations to assist federal, state, and local governments in their efforts to prevent and provide relief from urban flooding to homeowners and businesses across the country. The Urban Flooding Awareness Act specifically identifies the following nine topics to be addressed in the report:

1. Prevalence and costs associated with urban flooding events across the state and the trends in frequency and severity over the past two decades.
2. Apparent impact of global climate change on urban flooding.
3. The impact of county stormwater programs on urban flooding over the past two decades, including a list of projects and programs and the flood damages avoided.
4. An evaluation of policies such as using the 100-year storm as the standard for designing urban stormwater detention infrastructure and the 10-year storm for the design of stormwater conveyance systems.
5. Review of technology to evaluate the risk of property damage from urban flooding and whether a property is in or adjacent to a 1% (100-year) floodplain or not, including Light Detection and Ranging (LiDAR) and GIS.
6. Strategies for minimizing damage to property from urban flooding, with a focus on rapid, low-cost approaches such as nonstructural and natural infrastructure, and methods for financing them.
7. The consistency of the criteria for state funding of flood control projects between IDNR, Illinois Emergency Management Agency (IEMA), and Department of Commerce and Economic Opportunity (DCEO).
8. Strategies for increasing participation in the National Flood Insurance Program (NFIP) and Community Rating System (CRS).
9. Strategies and practices to increase the availability, affordability, and effectiveness of flood insurance and basement backup insurance.

5.2 FLOOD PROBLEM AREAS INVENTORY

5.2.1 CHARACTERIZATION OF FLOOD PROBLEM AREAS

SMC conducted the countywide **Flood Problem Areas** Inventory (FPAI) in 1995-1996 and updated it in 2002. The FPAI, and a flood risk assessment based on mapped floodplains, identified structures that have been or may be damaged by flood events that are less than the 100-year event. The FPAI is used to locate flood damage problem areas based on reports of flood damage by residents or communities. The FPAI identifies the primary cause of flood damage for each area and is used to recommend flood mitigation priorities. The flood risk assessment identifies additional locations where structures occur in mapped floodplain areas and are likely at risk of flood damage. The purpose was to identify those structures that are at risk of flooding so that the plan can recommend ways to reduce flood damage.

FLOOD PROBLEM AREA (FPA): One or more structures in a geographical area that are damaged by the same primary source or cause of flooding. Structures include transportation, utility infrastructure, buildings, and well and septic failure caused by flooding. Areas also include locations where road flooding results in damage to infrastructure, loss of critical access, or threatens safety.

As part of the watershed planning process, SMC updated the inventory of local FPAs to identify the sources of flooding, improve opportunities for reducing flood damage, aid decision-makers about determining adequate downstream capacity when issuing development permits in proximity to FPAs, and reduce flood damage at existing sites from nearby development projects. In November 2019, SMC provided 45 watershed municipalities, townships, and large jurisdictions the current flood problem area Webapplication link for their jurisdiction to update flood problem information (identify new or revise existing flood problems). The FPAI information was collected and summarized in February 2020; 8 jurisdictions responded to this inventory update with new information. Before starting the NBCR watershed planning process, 136 FPAs were known in the NBCR planning area. As a result of this FPAI update, SMC received 18 new FPAs to the inventory. Currently, there are 147 known FPAs in the NBCR planning area (see Figure 5-8); this number does not include all the flood data collected from the July 2017 flood event. The FPAI includes many areas affected by storms less than the 100-year event; the July 2017 flood event data is excluded given the larger magnitude of that storm. Table 5-1 summarizes the NBCR planning area community FPA data; some communities do not have FPA data.

5.2.2.1 *July 2017 Flood Event FPAs and Critical Facilities*

From July 11-12, 2017 a major precipitation event resulted in rainfall amounts between 3.4 and 7.2 inches in Lake County causing substantial flooding. SMC, Lake County Planning, Building & Development, and local municipalities surveyed impacted areas to identify FPAs, impacted properties, and impacted critical facilities using data from resident self-reporting and the IEMA. SMC defined FPAs as areas that experienced flooding during the event. FPAs varied in size, with some impacting one property and others impacting over 100 properties. Critical facilities are areas that may require a special response because of human needs or potential environmental impacts, including daycares, schools, gas stations, nursing homes, long term care facilities, and similar facilities. SMC identified 162 FPAs that impacted 361 properties in the NBCR planning area. Approximately 36 July 2017 flood events overlapped with existing FPAs in the Lake County portion of the NBCR planning area (see Figure 5-4). During the July 2017 survey, structure damage from flooding and multiple forms

of flooding were observed, including sewer backups; street, yard, and driveway flooding; and structure flooding. Table 5-2 summarizes the number of July 2017 FPAs data in each community. This flood impacted multiple municipalities within the NBCR planning area, with Highland Park, Lake Forest, Deerfield and North Chicago having the largest number of impacted properties (Table 5-2).

Table 5-1: NBCR Planning Area Flood Problem Areas

MUNICIPALITY OR TOWNSHIP	NO. OF FPAS	NO. OF IMPACTED PROPERTIES	TYPES OF FLOODING						
			SANITARY SEWER /SEPTIC FAILURE	STREET/ YARD/ DRIVEWAY	STRUCTURAL DAMAGE	DEPRESSIONAL STORAGE	LOCAL DRAINAGE PROBLEM	OVERBANK	BANK EROSION
Bannockburn	4	3	--	4	1	1	1	--	--
Deerfield	2	14	--	--	--	--	--	2	--
Glencoe	2	4	--	2	3	1	1	1	--
Glenview	29	--	--	13	--	3	5	4	8
Green Oaks	3	2	2	2	--	1	--	2	--
Highland Park	13	227	3	12	5	--	--	10	--
Lake Bluff	2	--	--	1	--	--	--	1	--
Lake Forest	18	137	--	11	--	--	13	5	--
Libertyville Township	3	2	--	--	2	--	2	1	--
Lincolnshire	3	--	3	--	--	--	--	--	--
Morton Grove	5	--	--	7	--	--	--	--	1
New Trier Township	1	--	--	1	--	--	--	--	--
Niles Township	1	1	--		--	--	--	--	2
North Chicago	6	6	--	4	--	--	2	2	--
Northbrook	18	--	--	10	--	1	1	9	3
Northfield	14	4	--	9	1	--	1	5	6
Northfield Township	1	1	--		--	--	--	1	--
Park City	1	--	--	2	--	--	--	1	--
Riverwoods	1	--	--	2	--	--	1	--	--
Shields Township	8	6	2	1	4	1	4	--	--
Skokie	5	--	--	7	--	--	--	1	--
Waukegan	2	14	--	4	--	1	1	--	--
West Deerfield Township	1	20	--		--	1	--	--	--
Wilmette	3	1	--	2	--	--	--	1	--
Winnetka	1	--	--		--	--	--	1	--
TOTAL	**147**	**442**	**10**	**94**	**16**	**10**	**32**	**47**	**20**

Please note: some flood problem areas did not indicate what type of flooding and how many properties were impacted. Local Drainage Problems include "maintenance issues".

Table 5-2: Lake County July 2017 Flood Problem Areas

MUNICIPALITY OR UNINC. TOWNSHIP	NO. OF FPAS	IMPACTED PROPERTIES	TYPES OF FLOODING		
			SEWER BACKUP	STREET/YARD/ DRIVEWAY	STRUCTURAL
Bannockburn	1	1			1
Deerfield	21	29	4	9	29
Green Oaks	4	5			5
Gurnee					
Highland Park	56	178	17	27	178
Highwood	1	1			1
Lake Bluff	4	17			17
Lake Forest	45	55	11	21	52
Libertyville Township	2	2		1	2
Lincolnshire					
Mettawa	2	3		1	3
North Chicago	10	23	3	4	22
Park City	4	21	2	2	21
Riverwoods	1	1	1	1	1
Shields Township	7	21	2	3	21
Waukegan	3	3		2	3
Waukegan Township	1	1	1	1	1
TOTALS:	**162**	**361**	**41**	**72**	**357**

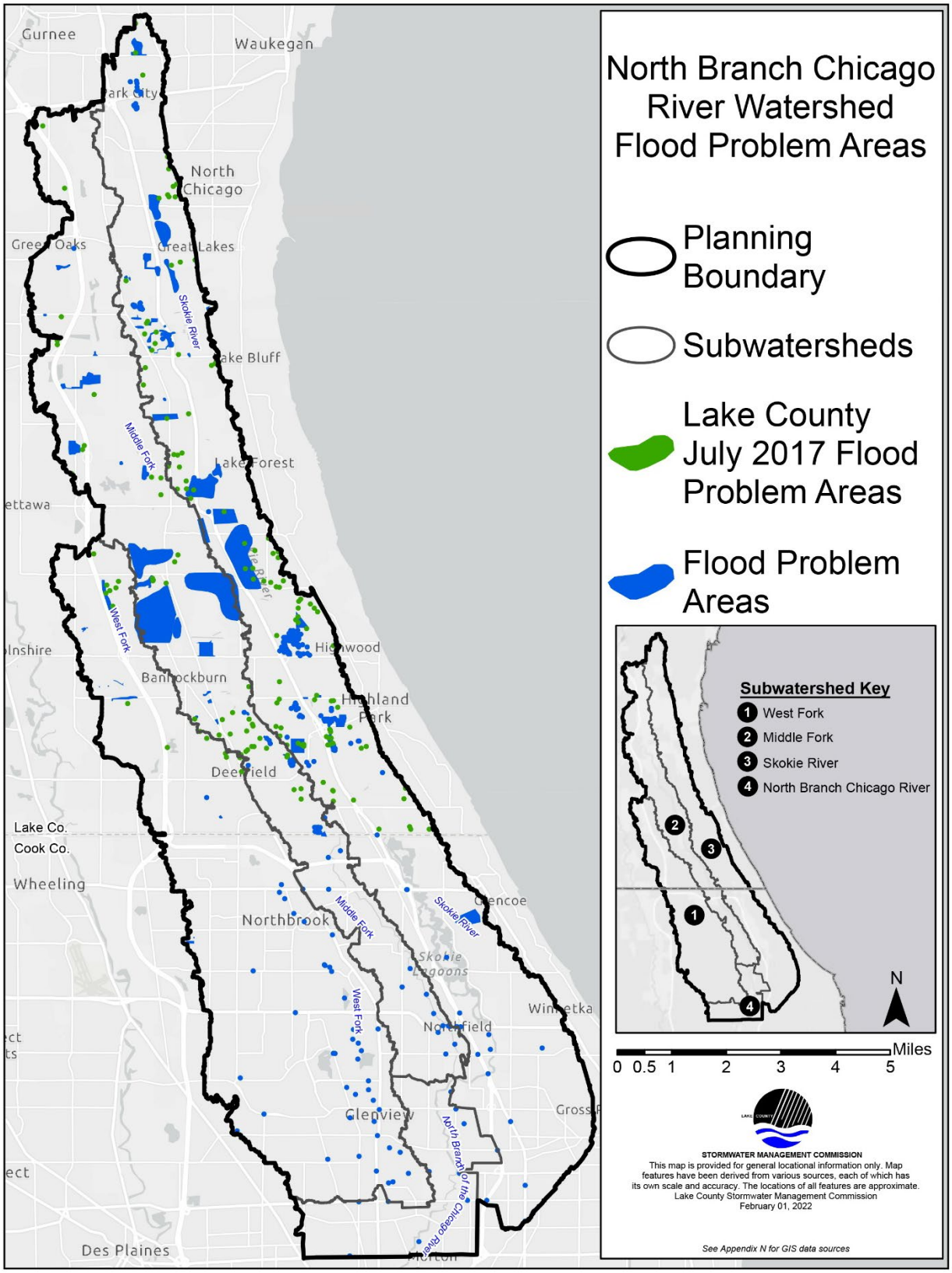


Figure 5-4: Flood Problem Areas

5.3 FLOOD RISK ASSESSMENT – STRUCTURES IN THE FLOODPLAIN

Flood risk areas are Special Flood Hazard Areas (SFHA) where structures have been identified as being at risk for flood damage because they are located in the 100-year floodplain. SMC compared the revised floodplain maps with the Lake County 2017 topography and Cook County 2008 LiDAR data to locate structures in the floodplain. All structures located within the 100-year floodplain are shown in Figure 5-5. Approximately 233 structures have been identified as in or near potential FPAs. An estimated 2,045 structures (schools; churches; businesses; and residences, including garages, sheds, and gazebos), are at risk of flooding due to their location in the 100-year floodplain. Of the 2,045 structures, approximately 1,216 properties are within the 100-year floodplain.

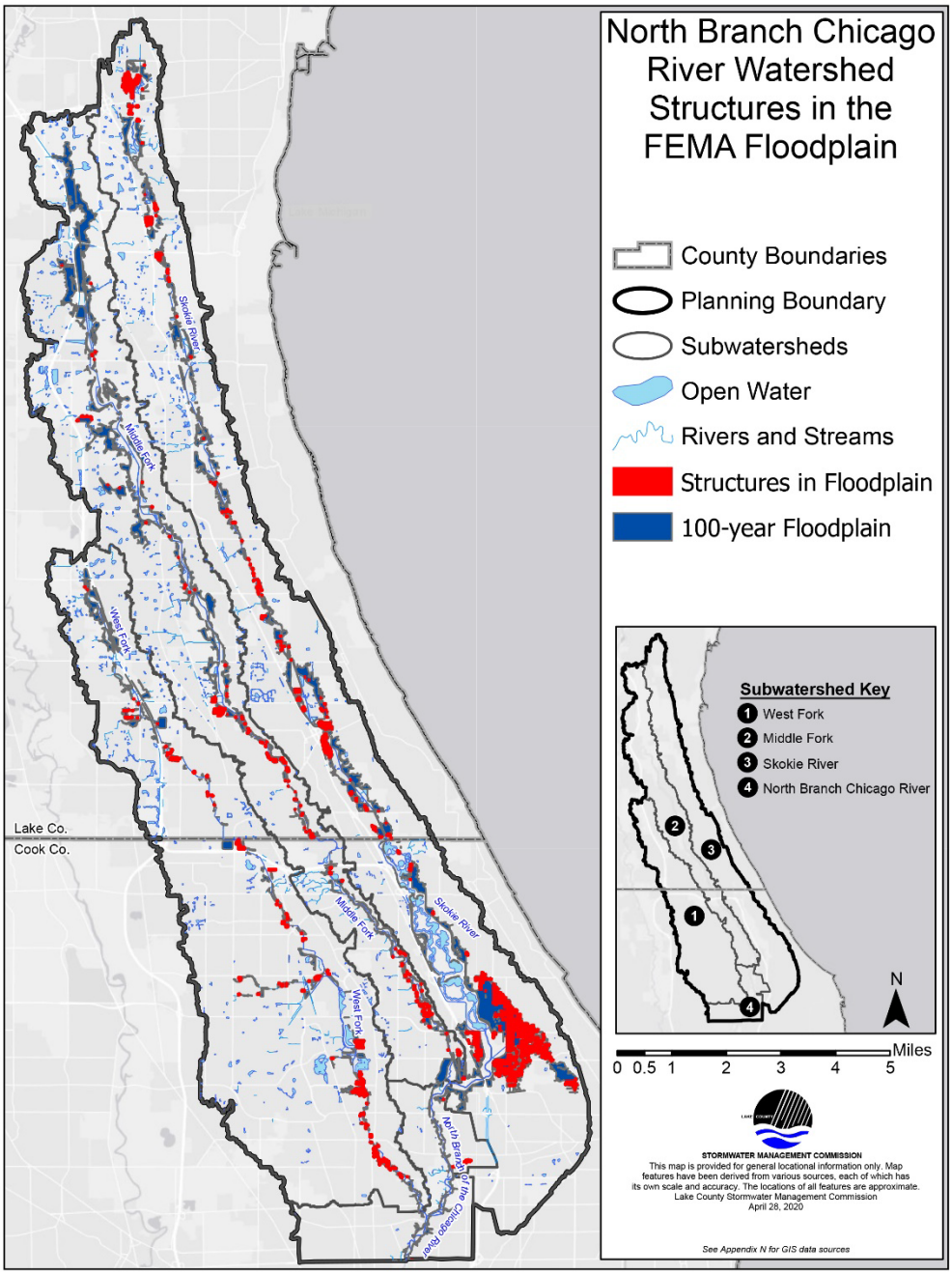


Figure 5-5: Structures in the FEMA Floodplain

5.4 FLOODPLAIN STUDY SUMMARY

Hydrologists assign statistical probabilities to different size floods to characterize common, less likely, and severe floods for individual streams. For example, a 2-year flood event has a 50% probability of occurring in any year, and a 100-year flood has a 1% chance of being equaled or exceeded in any year. The 100-year flood event, also referred to as the "base flood," is the standard used by the NFIP to determine the need for flood insurance. The 100-year flood event has become the accepted national standard for floodplain regulatory purposes and was developed in part to guide floodplain development that lessens the damaging effects of floods. The **100-year floodplain** may also include a designated floodway. The floodway is the portion of the stream or river channel that must be reserved to discharge the base flood without increasing the water surface elevation more than 0.1-foot. A graphic representation of a typical floodplain and floodway is shown in Figure 5-6.

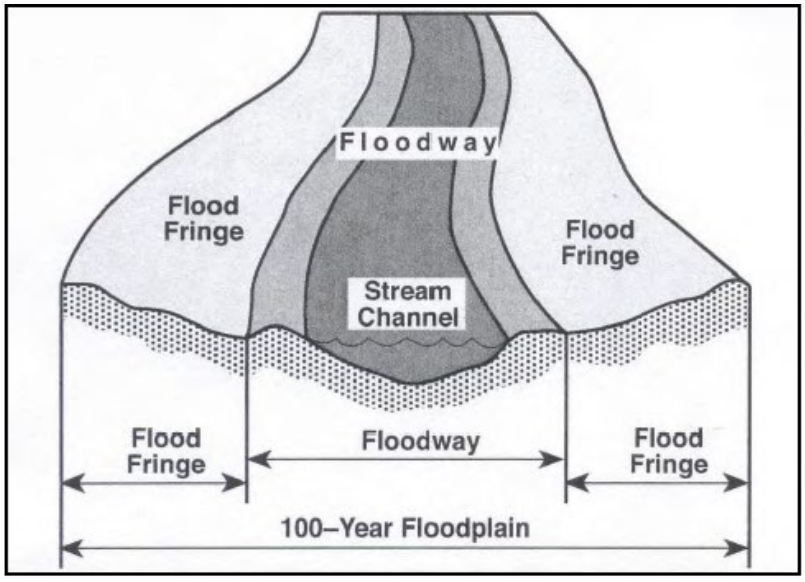


Figure 5-6: Graphical representation of the typical floodplain and floodway

FEMA has conducted **Flood Insurance Studies** (FIS) that assess a watershed's **hydrology**, land use, and drainage characteristics to identify areas that have the highest probability of flooding. FIS are used to produce **Flood Insurance Rate Maps** (FIRM). These maps depict the probable extent of the floodplain during a 100-year flood event. The FIRM are used to determine flood insurance requirements and calculate insurance costs. The maps are also used in concert with local, state, and federal ordinances to regulate development and building protection requirements within and adjacent to floodplain areas. Multiple communities located within the NBCR planning area completed hydrologic and **hydraulic** (H&H) analyses.

FLOOD INSURANCE STUDY (FIS): Studies conducted by FEMA to determine areas that have the highest probability for flooding.

HYDROLOGY: Hydrology is the study of the occurrence, circulation, distribution, and properties (e.g., quality) of Earth's water.

HYDRAULICS: Hydraulics is the study of how water flows over the land surface. This includes flows within sewers, culverts, stream channels, wetlands, lakes, impoundments, etc.

FLOOD INSURANCE RATE MAP (FIRM): A map prepared by FEMA that depicts the SFHA within a community. The FIRM includes zones for the 100-year and 500-year floodplains and may or may not depict Regulatory Floodways.

5.4.1 LAKE COUNTY

The original hydraulic models were developed using source data from the Natural Resource Conservation Service (NRCS-formerly Soil Conservation Service (SCS)) WSP-2 model (1972) and the USACE Hydrologic Engineering

Center (HEC)-2 model (1983) as a base. Updated surveyed cross-sections were inserted into each tributary where appropriate. The hydrograph calibration procedure was formulated to base selected hydrograph parameters (rainfall distribution, runoff parameters, antecedent moisture conditions (AMC), Clarke's "R" value 'storage coefficient') on a range of historical events, while assuring that they did not significantly vary from expected values. The HEC-1 and HEC-2 models for the West & Middle Forks were calibrated using rainfall data from 5 separate events from 1982 through 1991, while the Skokie HEC models were calibrated using 8 rainfall events from 1982 through 1993. The models were considered calibrated if the computed peak discharges fell within the 95 percent confidence interval of the flow frequency analysis (period of record). Runoff volume was not calibrated. The Lake County portion of the NBCR planning area made up the northern portion of a comprehensive floodplain study for the entire NBCR planning area. The H&H models were constructed for the watershed area north of Touhy Avenue in Niles, Illinois (Cook County) to the headwaters in Lake County.

5.4.2 Cook County

The NBCR and Lake Michigan Detailed Watershed Plan (DWP) Volume 1 was developed in January 2011 by the MWRD. This DWP developed H&H models for the watershed and the "H&H models were developed within the USACE Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS) Version 3.1.0 modeling application and Hydrologic Engineering Center-River Analysis System (HEC-RAS) Version 4.0" (MWRD, 2011).The Chicago Metropolitan Agency for Planning (CMAP) developed an urban flood susceptibility index (FSI) for Cook County municipalities (1=lowest, 10=highest susceptibility), this data is based on 10 risk levels during 2007 -2017 data and based on the combined frequency ratio scores from the following flood related factors: Topographic Wetness Index, combined sewer service areas, property elevation compared to nearest Base Flood Elevation, impervious coverage, age of first development, and precipitation variation (MWRD, 2019). Evanston (8), Glenview (5), Kenilworth (8), Morton Grove (8), Niles (9), Skokie (9) and Wilmette (7) are all listed at "5" or above on the FSI. Table 5-3 contains floodplain and H&H studies within the NBCR planning area.

Table 5-3: Floodplain & H&H Studies in the NBCR Planning Area

LOCATIONS	CONTRACTOR	TYPE OF STUDY	STUDY COMPLETED	Data Source
Village of Deerfield	SCS	H&H Study	December 1973	FEMA 2016 Lake County FIS
Village of Riverwoods	United States Geological Survey (USGS), for the Federal Insurance Administration (FIA)	H&H Study (for an FIS report dated February 1980)	September 1978	FEMA 2016 Lake County FIS
Village of Lincolnshire	USGS, for the FIA	H&H Study (for an FIS report dated January 1980)	October 1978	FEMA 2016 Lake County FIS
City of Highland Park	Harza Engineering Company for the FIA	H&H Study (for an FIS report dated May 1980)	November 1978	FEMA 2016 Lake County FIS
Village of Green Oaks	Roy F. Weston, Inc. for the FIA	H&H Study	Completed: August 1978, revised January 1979	FEMA 2016 Lake County FIS

LOCATIONS	CONTRACTOR	TYPE OF STUDY	STUDY COMPLETED	Data Source
Village of Gurnee	USGS, for the FIA	H&H Study (for an FIS report dated June 1980)	March 1979	FEMA 2016 Lake County FIS
City of Lake Forest	Harza Engineering Company for the FIA	H&H Study (for an FIS report dated August 18, 1980)	April 1979	FEMA 2016 Lake County FIS
Village of Lake Bluff	Harza Engineering Company for the FIA	H&H Study (for an FIS report dated July 16, 1980)	April 1979	FEMA 2016 Lake County FIS
City of Waukegan	Harza Engineering Company for the FIA	H&H Study (for an FIS report dated December 15, 1980)	May 1979	FEMA 2016 Lake County FIS
City of Park City	Roy F. Weston, Inc., for the FIA	H&H Study (for an FIS report dated April 15, 1981)	September 1979	FEMA 2016 Lake County FIS
Lake County (unincorporated)	Roy F. Weston, Inc. for FEMA	H&H Study for FIRM (May 3, 1982)	November 1979	FEMA 2016 Lake County FIS
Middle Fork & West Fork Subwatersheds	T-Y-Lin International – BASCOR	Revised H&H Study	March 1994	FEMA FIS, Lake County, Illinois & Incorporated Areas; Revised November 16, 2006
Skokie River Subwatershed	Illinois Department of Transportation (IDOT) Office of Water Resources (OWR)	Revised H&H Study	August 1994	NBCR, Skokie River, Restudy for FEMA, Study Narrative, Lake County
Cook County, Unincorporated Areas; Villages of Glenview, Golf, Skokie and Wilmette, Morton Grove, Northbrook, Northfield (Chicago River North Branch)	N/A	H&H Model (for an FIS report dated November 6, 2000)	December 1994	FEMA FIS, Cook County, Illinois and Incorporated Areas (Preliminary Revised November 22, 2019)
Cook County, Unincorporated Areas; Villages of Glencoe, Northbrook Northfield, Wilmette and Winnetka (Skokie River Subwatershed)	Illinois State Water Survey	H&H Model (for an FIS report dated November 6, 2000)	November 6, 2000	FEMA FIS, Cook County, Illinois and Incorporated Areas (Preliminary Revised November 22, 2019)
Village of Deerfield (Cook County)	PBS&J	H&H Model (for an FIS report dated August 19, 2008)	September 6, 2002	FEMA FIS, Cook County, Illinois and Incorporated Areas (Preliminary Revised November 22, 2019)
Skokie River Subwatershed	Prepared by: STS Consultants, Ltd. for Lake County SMC	Skokie Headwaters and North Chicago Flood Damage Reduction Feasibility Study	July 21, 2006	Based on the original HEC-1 and HEC-2 computer models for the Skokie River and were updated with more detailed topography and better-defined watershed

LOCATIONS	CONTRACTOR	TYPE OF STUDY	STUDY COMPLETED	Data Source
				characteristics and input parameters
Cook County NBCR & LM Watersheds	HDR Engineering, Inc. et. al., prepared for MWRD	Watershed Plan with H&H Analysis	January 2011	Detailed Watershed Plan for the North Branch of the Chicago River and Lake Michigan Watershed: Volume 1

N/A = Data Not Available

5.4.3 Flood Insurance Studies

The most up-to-date FEMA Lake County FIS is dated February 17, 2016 (updated version of the September 18, 2013 FIS). Cook County FEMA FIS reports are compiled on an individual basis by municipalities and Cook County unincorporated areas. See Table 5-4 for Lake County FIS reports and Table 5-5 for Cook County FIS reports.

Table 5-4: Lake County FIS

FIS DATE	UPDATES (PERTAINING TO NBCR WATERSHED)
September 3, 1997 (Initial Countywide FIS)	Revised hydrologic and hydraulic analyses for the Middle Fork NBCR and the West Fork NBCR were prepared by T.Y. Lin International BASCOR, Inc., for FEMA (March 1994). Revised hydrologic and hydraulic analyses for the Skokie River were prepared by IDOT-DWR (August 1994)
December 5, 1997	Flood Insurance Rate Map updated only.
September 7, 2000	No updates in the NBCR planning area
November 6, 2000	The digital base map files were provided by the Lake County Department of Management Services. The roads and hydrographic features in these files were digitized from 1"=200' orthophotographs dated 1984 to 1986. The section lines and corners in these files were derived from USGS 7.5-Minute Series Topographic Maps. The digital FIRMs were produced in Universal Transverse Mercator coordinates referenced to the North American Datum of 1927 and the Clarke 1866 spheroid. The base map was enhanced through the addition of roads, railroads, and corporate limits. This information was taken from effective FIRMs, USGS 7.5-Minute Series Topographic Maps, and mapping supplied by the affected communities.
November 16, 2006	Revision was initiated by a Physical Map Revision request submitted by the City of Highland Park on September 18, 2002.
September 18, 2013	Base map information was derived from digital orthophotos provided by the Lake County Department of Information and Technology, Geographic Information System (GIS) Division. The digital orthophotos were photogrammetrically compiled from aerial photography obtained in 2007.
February 17, 2016	Base map information for the 16 map panels affected by this PMR was provided in digital format by the Lake County Department of Information and Technology, GIS Division. Digital orthoimagery with 6-inch spatial resolution were compiled from aerial photography acquired in 2007. The coordinate system used for the production of the digital FIRMs is Universal Transverse Mercator (UTM) North American Datum of 1983 (NAD 83) Geodetic Reference System 1980 (GRS80) spheroid.

Table Data Source: Federal Emergency Management Agency, Flood Insurance Study, Lake County, Illinois and Incorporated Areas

Table 5-5: Cook County FIS

FIS DATE(S)	LOCATION	PUBLISHER/ISSUER (PLACE OF PUBLICATION)
December 1978	Village of Morton Grove	DHUD, Federal Insurance Administration (Washington D.C.)
June 1979	Village of Northfield	DHUD, Federal Insurance Administration (Washington D.C.)
May 1980	Village of Winnetka	FEMA, Federal Insurance Administration (Washington D.C.)

FIS DATE(S)	LOCATION	PUBLISHER/ISSUER (PLACE OF PUBLICATION)
June 1980	Village of Glencoe	FEMA, Federal Insurance Administration (Washington D.C.)
May 1984 December 1990 October 1998	Village of Northbrook	FEMA (Washington D.C.)
December 1984 November 2000 December 2002 February 2004 June 2005 November 2006 April 2007 August 2008	Cook County, Illinois (Unincorporated Areas)	FEMA (Washington D.C.) FEMA (Oakton, VA)
October 1988	Village of Deerfield (Lake & Cook County)	FEMA (Washington D.C.)
October 1998	Village of Glenview	FEMA (Washington D.C.)

Table Data Source: Federal Emergency Management Agency, Flood Insurance Study, Cook County, Illinois and Incorporated Areas (Volume 3 of 8)

5.5 FLOOD DAMAGE REDUCTION

Flooding is a common issue in the NBCR planning area because of urban development and a relatively flat regional topography. Urban development has increased impervious surfaces and modified or built in natural storage and floodplain areas, resulting in increased stormwater runoff volumes and rates. The relatively flat topography of the region results in excess water dispersing over a large area. Protection of the existing flood storage capacity of the landscape, including depressional areas, wetlands, and floodplains, is necessary to prevent increased flood risks in the region. Flood damage reduction is necessary to reduce the extent, frequency, and impact of flooding where development has already occurred. Flood damage reduction can be accomplished utilizing preventative or remedial measures.

5.5.1 PREVENTATIVE MEASURES

Flood prevention techniques, including zoning, regulation, land acquisition, and runoff reduction, seek to prevent flooding problems before they occur. Zoning and floodplain regulations seek to prevent flood damages by limiting development in areas where flooding is most likely to occur. Land acquisition maintains open space, preserving rainfall infiltration and natural storage areas. Runoff reduction techniques reduce flood damage potential at the source by decreasing the amount of runoff from a developed site. This is accomplished by reducing on-site drainage, minimizing impervious surfaces, and implementing natural drainage measures.

5.5.1.1 *Floodplain Zoning*

Zoning ordinances regulate development by dividing the community into zones or districts and setting development criteria for each district. Zoning can prevent increased flood risks by controlling where new development or redevelopment occur. Zoning ordinances can establish separate zoning districts or overlay zoning. Separate districts designate floodplains as a special zoning districts that only allow development that is not susceptible to flood damage, such as some recreational uses, conservation, or agriculture. Overlay zoning

adds special development limitations to the underlying zoning (i.e., residential, commercial, industrial, etc.) in areas subject to flooding. Special development limitations can include local, state or federal building requirements related to flood safety and can restrict the types of development occurring in overlay zoning districts or require additional permitting or oversight in these districts.

5.5.1.2 *Floodplain Regulations*

Regulations that restrict construction in floodplains are usually found in one or more of the following documents: subdivision ordinances, building codes, and separate stand-alone floodplain ordinances such as the Lake County Watershed Development Ordinance (WDO) and Cook County Watershed Management Ordinance (WMO). If the zoning for a site allows a structure to be built, then the applicable subdivision and building regulations impose construction standards to protect buildings from flood damage and will require compensatory storage to prevent the development from aggravating the flooding problem. Subdivision ordinances specifically govern how land will be subdivided into lots and regulate standards for infrastructure provided by the developer, including roads, sidewalks, utilities, stormwater detention, storm sewers, and drainage ways. Both building codes and the countywide and local ordinances establish flood protection standards for all structures. Individual communities can adopt floodplain regulations that are more restrictive than the minimum WDO, WMO, or NFIP requirements.

NOTEWORTHY – LAKE COUNTY WDO REGULATIONS

The Lake County WDO defines adequate downstream stormwater capacity as a system that can be shown to "store or convey up to and including the 100-year stormwater runoff without increasing damage to adjoining properties or to a point downstream known to the Enforcement Officer to be a restriction causing significant backwater."

All development in Lake County floodplains requires a WDO permit. The WDO restricts development in mapped floodways and limits development in the 100-year floodplain. Lowest floor elevations (including basements) must be a minimum of 2 feet above the base flood elevation (BFE) for residential structures constructed in the floodplain. Nonresidential structures must also meet these lowest floor elevation requirements or be dry-flood-proofed to 2 feet above the BFE, and compensatory storage must be provided for water storage lost due to floodplain fill at a ratio of 1.2:1 for riverine floodplain and 1:1 for depressional floodplain (SMC, 2015).

FLOOD PROTECTION AREA: Regulatory floodplains, regulatory floodways, riparian environments, wetlands, and wetland buffers.

Cook County communities must adhere to the standards required in the WMO as minimum development requirements for their community. All development in a **Flood Protection Area** requires a Watershed Management Permit. The WMO restricts development in mapped floodways and limits development in the 100-year floodplain. Compensatory storage must be provided for floodplain storage lost due to floodplain fill at a ratio of 1.1:1 (MWRD, 2019).

All local floodplain ordinances must meet the minimum requirements of the NFIP. Floodplain ordinances are adopted at the local level in the same manner as any other ordinance. Enforcement of the floodplain regulations is the responsibility of local officials. For most communities, the responsible official is the Zoning Administrator. Every community that participates in the NFIP must have the FIRMs and FIS available for the public. Communities that do not adequately enforce the local floodplain ordinance can be penalized by FEMA through probation or suspension from the NFIP.

5.5.1.3 *Runoff Volume Reduction*

Runoff volume reduction can be accomplished utilizing techniques that improve infiltration, site design, or stormwater regulation. Improved infiltration techniques include natural landscaping with deep-rooted plants, permeable pavers or porous pavement, and bio infiltration devices. Improved site design techniques include preserving natural drainage systems, impervious surface reduction, alternative streetscapes that reduce and infiltrate runoff, alternative parking lot designs, and green roofs. Examples of runoff volume reduction best management practices can be found here: http://www.lakecountyil.gov/2261/Stormwater-Best-Practices.

Stormwater regulations can also reduce the quantity of runoff from developments. Due to a trend of increasing Runoff Volume Reduction (RVR) requirements of the Illinois EPA, both the WDO and WMO have adopted both qualitative and quantitative RVR provisions. The WDO is a credit-based system designed to capture a percent of the annual rainfall event to the maximum extent practicable. The WMO is tied to the first inch of runoff from the impervious area of a development site, defined as the control volume. These measures will decrease the volume and flow rate of stormwater that is discharged off a site thereby preventing future flood damage.

5.5.2 Remedial Measures

Flooding problems are reduced or eliminated by both structural and non-structural means. Structural flood mitigation measures focus on reducing the probability of flooding (i.e. removing or reducing the ability of flood waters to reach a property or structure) while nonstructural flood mitigation measures focus on reducing the consequences of flooding (i.e., flood-proofing a structure located in the floodplain). Several common types of structural and nonstructural mitigation measures are described below.

5.5.2.1.1 *Structural Flood Mitigation Measures*

Structural measures control or contain water and are designed to prevent floodwaters from reaching buildings or property. Structural alternatives include reservoirs, levees and floodwalls, diversions, stream channel conveyance improvements, and drainage and storm sewer improvements. Improved conveyance practices should be designed to ensure that adjacent and downstream properties and waterways will not be negatively impacted by increased flows. Large or complex structural flood mitigation alternative projects are often costly to implement, so local agencies and private landowners often request help from state or federal agencies such as the IDNR-OWR, the USACE, and the United States Department of Agriculture (USDA) NRCS. Structural flood control is generally the most expensive type of mitigation measure because of installation time and costs, maintenance requirements, and environmental impacts. Thorough assessment of alternatives prior to selecting a structural flood control measure can minimize costs and impacts.

5.5.2.1.2 *Reservoirs and Regional Detention*

Reservoirs and regional detention are large structures that control flooding by holding water behind dams or in storage basins. After a flood peaks, water is released or pumped out slowly at a rate that is equal to or less than the capacity of the downstream channel. Reservoirs that maintain a normal water level may be used for water supply or to provide water-based recreational benefits. Additionally, wet or dry detention basins can serve multiple uses by doubling as parks or other open space uses.

The amount of land needed, coupled with the expense of construction, management, and maintenance, limit the use of reservoirs. Additionally, reservoirs may fail to prevent flood s that exceed their design levels, eliminate the natural and beneficial functions of the floodplain, and negatively impact water quality and aquatic habitat.

Eight flood control reservoirs have been constructed over the years in the NBCR planning area. Some of the reservoir construction resulted from flood damage studies that began in the 1970s.

5.5.2.1.3 *Detention Basins*

Some localized flooding problems can be minimized by enlarging or adjusting flows through existing detention basins or by constructing new basins. Detention basins are effective at flood reduction in watersheds of up to 30 square miles. While regional detention is generally more cost-effective than constructing numerous small detention facilities, in some cases there may not be sufficient land available for regional detention. Smaller detention basins may be the most cost-effective solution for localized flood problems (Figure 5-7). Slowing release rates from new and existing detention basins can reduce the downstream flood risk and impacts of short duration-high-velocity events on the stream channel. Retrofitting older detention basins to improve functionality or storage volume or constructing new detention basins are often viable flood mitigation alternatives, especially for smaller tributary areas (less than 100 acres).



Figure 5-7: Naturalized detention basin
Installed in Glenview to help alleviate localized (neighborhood) flood problems

5.5.2.1.4 *Underground & Pumped Detention*

Pumped detention is similar to retention or detention basins but include an area with an impoundment which does not allow that area to be drained by gravity (it must be pumped out). Underground detention is a specialized form of storage where stormwater is detained in underground facilities such as vaults or tunnels. Underground detention may also be pumped. Both of these remedial measures require open space and/or space without structures (HDR Engineering, Inc., 2011).

5.5.2.1.5 *Levees and Floodwalls*

Earthen levees or concrete floodwalls are constructed between rivers and at-risk properties to mitigate overbank flooding. Levees and floodwalls confine water to the stream channel by artificially raising the bank. Regulatory levees must meet very strict and onerous design and permitting requirements. A serious concern with levees is that they frequently offer a false sense of security. In some cases, land use behind a levee can change to high intensity, high-value occupation under the false assumption that all future floods will be controlled by the levee, when in reality, large floods may overtop or breach the levee creating more flood damage than would have occurred. Problems also arise when the present runoff volume in the channel exceeds the design capacity of older levees that were constructed for lower flow conditions.

Levees and floodwalls have other limitations, levees and floodwalls are placed along the river or stream edge, where they degrade riparian and aquatic habitat. Levees are expensive to construct, require considerable land

and maintenance, and are more likely to push floodwater onto other properties upstream or downstream. In some cases, it may be necessary to include expensive and noisy pumping operations for internal drainage. Levees also act as barriers to river access, block views, and disrupt local drainage patterns.

5.5.2.1.6 *Barriers*

Constructing barriers such as nonregulatory low floodwalls and berms around an individual property can keep floodwaters from reaching the structure. Berms are commonly used in areas subject to shallow flooding; see Figure 5-8 for a diagram of a backyard berm. Not considered engineered structures, berms are made by regrading or filling an area. Low floodwalls may be built around stairwells to protect the basements and lower floors of structures. By keeping water away from the structure walls, the problems of seepage and hydrostatic pressure are reduced. Barriers are commonly referred to as nonregulatory since a barrier typically cannot be used to remove a structure or property from the regulatory floodplain.



Figure 5-8: Example of a backyard berm
Diagram Courtesy of Seattle Public Utilities (Seattle.gov)

As with levees, the use of low floodwalls and berms must also include a plan to install drainpipes or sump pumps to handle leaks and water seepage through or under the barrier, and to remove water that may collect within the barrier. Care must be taken in the design, location, and installation of low floodwalls or berms to ensure that flood waters are not inadvertently pushed onto adjacent properties.

5.5.2.1.7 *Improved Channel Conveyance*

Channel conveyance improvements alter channels to increase drainage rate and volume. Improvements include making channels wider, deeper, smoother, or straighter. Some channels in urban areas have also been lined with concrete or put in underground pipes. Straightening, deepening, or widening a stream or river channel, commonly referred to as channelization, has been traditionally utilized to reduce riverine overbank flooding problems. Channelized rivers and streams drain water faster from areas adjacent to and upstream of the channel but can increase or create new flooding problems downstream as larger volumes of water are transported at a faster rate. Channelized waterways tend to be less stable and more susceptible to streambank erosion; therefore, the need for periodic reconstruction, streambank stabilization, and silt removal becomes cyclic, making stream and channel maintenance extremely expensive. Dredging is another type of conveyance improvement; however, it is frequently cost prohibitive due to dredged material disposal costs. Additionally, dredged areas typically fill in relatively quickly if upstream erosion is not reduced. Channel conveyance improvements (such as channelization and dredging) are environmentally destructive with respect to habitat and water quality and are frequently unsustainable. Erosion control options for improving channel conveyance can include: natural stabilization through native vegetation and erosion control blanket, rip rap armoring, gabion baskets, cellular grid systems, interlocking concrete (i.e. a-jacks) to help stabilize the stream (HDR Engineering, Inc., 2011).

All three tributaries of the NBCR planning area were converted from meandering streams and wetlands to straightened channels in the early 1900s. Changing the hydraulics of water transport with channelization has permanently changed the hydrology of the NBCR watershed. The big advantage of improving conveyance in the NBCR planning area was that it made more land available first for agriculture and later for suburban development. The disadvantages of the tributary channelization include the costs associated with the continual need for channel stabilization and maintenance, habitat loss, degraded water quality, and the costs of remedying the resulting downstream flood damages (see Figure 5-9).



Figure 5-9: Flooding of the Skokie River in Highland Park

5.5.2.1.8 *Drainage Improvements*

Drainage improvements can include open ditches, swales, storm sewers or culvert/bridge replacements. Man-made ditches and storm sewers help drain areas where surface drainage is inadequate or where underground drainageways may be safer or more practical. Drainage and storm sewer improvements can be a quick and relatively cost-effective way to safely convey runoff for a wide range of smaller storm events. Storm sewer improvements may include the installation of new sewer lines or inlets, modifications to existing sewer inlets, installation of larger pipes, construction of better defined or more effective overland flow routes, and the use of mechanical measures, such as pumps or backflow preventers. Since drainage improvements typically result in runoff being more efficiently conveyed to a downstream location, these mitigation measures should only be used when the receiving waterway has sufficient capacity to handle the additional volume and flow of water. To prevent cumulative downstream flood impacts, drainage improvements are often combined with other storage volume creation or runoff reduction measures.

Performing regular maintenance on stormwater infrastructure for drainage improvements, such as channel clearing, dredging, storm sewer cleaning, or clogged debris removal, can be the most cost-effective measure in reducing future larger, more expensive infrastructure problems. “All stormwater management systems, whether gray or green, require maintenance. Appropriate operation and maintenance activities ensure that green (and gray) infrastructure will continue to function properly and yield expected water quality and environmental benefits, protect public safety, meet legal standards, and protect communities’ financial investment.” (U.S. Environmental Protection Agency - Office of Water, 2013).

5.5.2.2 *Nonstructural Flood Mitigation Measures*

Flooding problems can also be addressed using nonstructural measures. Nonstructural flood control techniques include flood-proofing, and elevation or relocation of a structure. More communities and county-wide agencies could get involved in nonstructural programs such as acquisition by helping to identify repetitively flooded properties. RVR techniques may also be used by individual homeowners or neighborhood associations in retrofit

projects to lessen flooding problems. Nonstructural mitigation alternatives include practices such as acquisition or relocation of flood-prone structures, flood-proofing, or implementation of ordinances and codes.

5.5.2.2.1 *Buyouts and Acquisitions*

Acquisition ensures that structures in a flood-prone area will cease to be subject to flood damage. The major difference is that acquisition is undertaken by a government agency, so the cost is not borne by the property owner, and the land is converted to an appropriate permanent public use such as a park. Acquiring and clearing structures from the floodplain is the best long-term flood protection measure, one which converts a flood problem area into a community asset that can provide environmental and recreational benefits. To achieve maximum benefits from this type of public investment, acquisition and land reuse should be a component of a community's redevelopment plan, and be incorporated as a strategy in park, greenways, and capital improvement plans.

5.5.2.2.2 *Structure Relocation*

Moving a structure to higher ground is an extremely effective way to protect it from flooding. In many cases structure relocation is cost prohibitive because of the size, condition, and type of structure and the cost of acquiring a relocation site. Structure relocation can be cost effective where flooding is relatively severe or frequent. Structures that have suffered damage or contamination from frequent or long duration flooding should not be considered for relocation.

Structure relocations have high initial costs, but they may be more cost-efficient than paying for repetitive flood damages or high flood insurance premiums. Relocation is typically the responsibility of the structure owner; however, government-sponsored loans or grants may be available for cost-share.

5.5.2.2.3 *Structure Elevation*

Raising a structure above the floodplain elevation is the best way to protect a structure that cannot be removed from the floodplain. The structure is elevated on a foundation or piers so that the lowest floor is above the BFE. When flooding occurs, water levels stay below the main floor, causing minimal damage to the structure or its contents. Raising a structure above the flood level is less expensive than moving it and can be less disruptive to a neighborhood. Commonly practiced in flood-prone areas nationwide, this protection technique is required by law for new and substantially damaged residences located in a 100-year floodplain.

Although flood damages can be reduced or eliminated through structure elevation, remaining in a flood-prone location has some limitations. While the structure itself is sufficiently elevated to be protected from flood damage, flooding may isolate the building and make it inaccessible. Flood waters surrounding the structure can also result in a loss of utility service or septic use, making the structure uninhabitable. Additionally, pollutant contamination in flood waters may present health and safety concerns.

5.5.2.2.4 *Flood Proofing*

Flood-proofing measures include dry flood-proofing or wet flood-proofing. In areas where there is shallow flooding, dry flood-proofing measures can be used to prevent water from entering at-risk structures. Dry flood-proofing is a combination of practices that are used to make a building watertight, so flood waters do not enter

the structure, including the basement or crawl space. Various FEMA and the USACE publications highlight the range of practices that can be used to dry flood-proof a structure

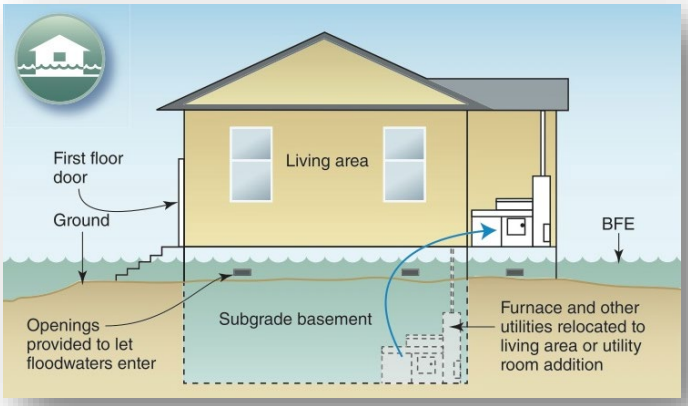


Figure 5-10: Wet flood-proofing

As defined by FEMA, wet flood-proofing includes permanent or contingent measures applied to a structure or its contents that prevent or provide resistance to damage from flooding while allowing flood waters to enter the structure or area. Wet flood-proofing allows water to enter the structure, but minimizes the damage to the structure and its contents. Wet flood-proofing includes some of the least expensive and easiest mitigation practices to install. Generally, this includes properly anchoring the structure, using flood resistant materials below the BFE, protecting mechanical and utility equipment, and using openings or breakaway walls. Several low-cost steps can be taken to wet floodproof a structure. For example, simply moving furniture and electrical appliances out of the flood-prone portions of the structure can prevent thousands of dollars in damages. One strong advantage of wet flood-proofing is that flood damage can be reduced through some common sense, low or no-cost practices. Figure 5-10 shows an example of wet flood proofing practices.

5.5.3 All-Natural Hazards Mitigation Plan Recommendations

The NBCR planning area is subject to natural hazards that potentially threaten life and property. Flooding, severe summer and winter storms, extreme cold and heat, and tornadoes are the most significant natural hazards that affect Lake County (including the NBCR planning area).

To prepare for and mitigate the effects of natural hazards, counties within the NBCR planning area have developed hazard mitigation plans. FEMA, through the Disaster Mitigation Act of 2000 (DMA 2000) and the Stafford Act, requires that each community develop and adopt a FEMA-approved All-Natural Hazards Mitigation Plan (ANHMP) in order to be eligible for hazard mitigation grant funds. DMA 2000 and the Stafford Act require that the mitigation ANHMP be updated and readopted every five years to maintain grant eligibility. An ANHMP assesses the natural hazards that affect counties, sets mitigation goals, considers mitigation efforts currently being implemented, evaluates additional mitigation strategies, and recommends mitigation

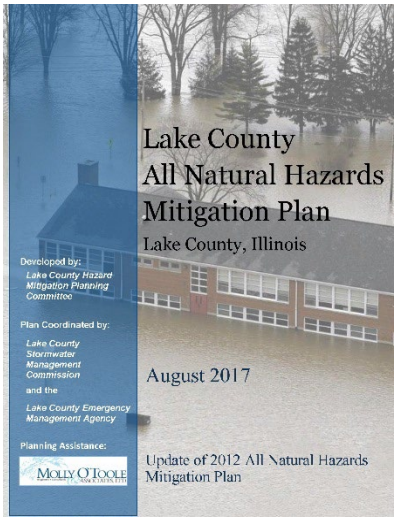


Figure 5-12: Lake County ANHMP

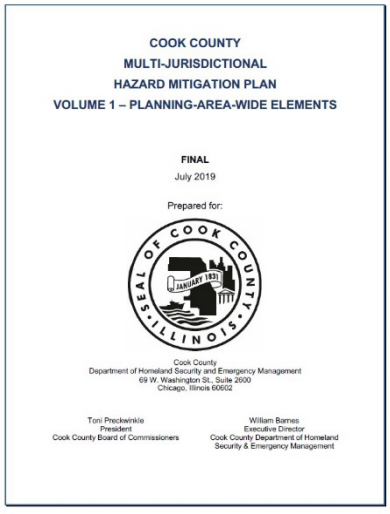


Figure 5-12: Cook County ANHMP

actions to be implemented over the next five years. The mitigation actions are designed to utilize both public and private sectors to protect the people and assets of the counties. Implementation of all action items is contingent on the availability of staff and funding.

Lake County and the Hazard Mitigation Planning Committee (HMPC) developed and adopted the Lake County Countywide ANHMP in 2006 as a multi-jurisdictional plan; the plan was updated in 2012 and again in 2017 (see Figure 5-11). The 2017 update to the ANHMP was developed by the Lake County HMPC as a multi-jurisdictional ANHMP to meet federal mitigation planning requirements. The 2017 ANHMP is adopted by resolution by the County and each participating municipality. The 2017 ANHMP will be implemented and maintained through both countywide and individual initiatives, as funding and resources become available.

The Cook County Department of Homeland Security and Emergency Management (DHSEM) and expert consultants developed the Cook County Multi-Jurisdictional Hazard Mitigation Plan (Figure 5-12) in 2014 and updated the plan in 2019 with guidance from a steering committee comprised of planning partners and local stakeholders. The plan update was developed in coordination with 121 municipal planning partners and was supplemented by a grant to the DHSEM from FEMA through the IEMA. That plan incorporated existing local and state plans, studies, reports, and technical information.

5.5.4 Ongoing Projects & Studies

5.5.4.1 *NBCR Middle Fork & Skokie Rivers USACE Chicago District PAS Report*

The City of Highland Park has been coordinating with USACE on the results of the Planning Assistance to States (PAS) Report for both the Skokie River and Middle Fork subwatersheds. The purpose of this study was to aid non-federal sponsors in developing future plans for addressing flood damages. Recent flooding prompted communities in these watersheds to seek a better understanding of the current conditions. In 2018 the City of Highland Park reached out to SMC, East Skokie Drainage District and neighboring municipalities (Lake Forest, Deerfield), also known in this report as the non-federal sponsors, to request a regional plan to mitigate major flooding in the area.

This report presents updated hydrology and hydraulic data, and an estimate of average annual economic damages to provide a better understanding of the problem and determine the potential for future flood risk management efforts. To characterize existing flood conditions, this watershed evaluation made use of available hydrology and hydraulics models and updated precipitation frequencies. The hydrology and hydraulics were updated using data from the MWRD, USGS and FEMA. USACE analyzed the sourced data and performed calibrations, as needed and the updated Illinois State Water Survey (ISWS) Bulletin 70 data was incorporated into the models. The models were used to produce outputs in the HEC-RAS software for the economic analyses.

In addition, an evaluation was completed to test the performance of a reservoir on each river and demonstrate the possible effectiveness of structural features. The effectiveness of these structural features was estimated by reduced flood stages, and the resulting reductions in structure damages. The following reservoirs were selected based on the primary areas reported as flooded during the July 2017 flood event: a 130-acre-foot reservoir at the Highland Park Country Club and a 250-acre-foot reservoir at the Prairie Wolf Forest Preserve (See Figure 5-13). It

is assumed that reservoirs located upstream near the primary flood sites would be most efficient reservoir location for reducing flooding at the selected flood areas downstream. USACE partitioned its economic analyses into two primary tasks. The first task involved developing an updated structure inventory and inputs for the Hydrologic Engineering Center's Flood Damage Analysis (HEC-FDA) software using source data from the IDNR. The second task involved performing an economic evaluation to understand the frequency, severity, and location of flood damages anticipated within the study area while also analyzing the effectiveness of the two reservoirs in reducing flood damages.

The economic evaluation compared the economic damages over a 50-year period of analysis, from 2019 to 2068, for two conditions. The future without-project condition assumed that there would be no measures taken to mitigate flood damages within the period of analysis. The future with-project condition assumed the construction of the two reservoirs to reduce flood damages. The estimated flood damages for both conditions were compared to understand the efficacy of these structural alternatives and their economic viability. The economic evaluation revealed that the reservoirs would not significantly reduce flood damages in the Skokie River or Middle Fork watersheds; less than 5% of the total average annual damages were reduced under the evaluated future with-project conditions, for both rivers. Additionally, the scale of damages for the entire study area indicates that it is unlikely a structural measure would be a cost-effective (i.e., the average annual reduction in structural flood damages (benefits) would not exceed the average annual cost of implementing a structural measure). It is assumed reservoirs located upstream near the primary flood sites would be most efficient reservoir location for reducing flooding at the selected flood areas downstream.

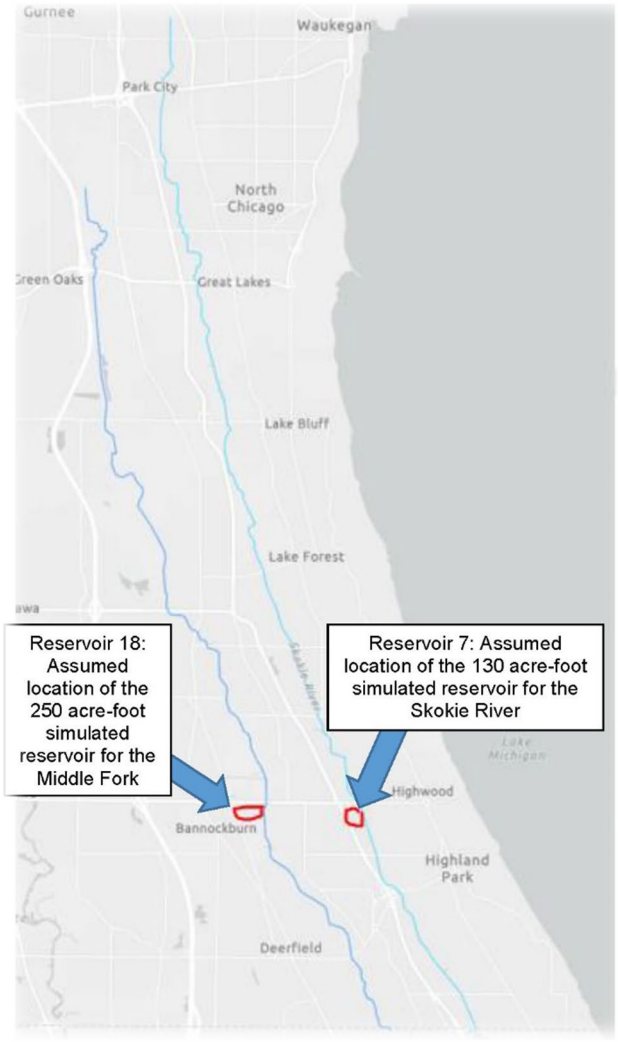


Figure 5-13: Potential Project Storage Basin Locations in 2019 PAS Report

Given the evaluated reservoirs had little impact on reducing flood damages, USACE does not believe there is a federal interest in proceeding to a specifically authorized study. Based on the analysis, it is unlikely an economically viable structural alternative (i.e., one resulting in a benefit-to-cost ratio greater than 1.0) could be identified. Factors considered in this assessment are the locations of the evaluated structures which are geographically spread across a large area, as well as limited real estate available to implement structural measures, and the scale of damages for the entire study area indicates that it is unlikely a structural measure would be a cost-effective. USACE recommends nonstructural alternatives be considered by the local communities, including structure elevation, structure relocation, buyouts, floodproofing, implementation of a flood warning system, and floodplain regulation.

5.5.4.2 *Lake Bluff Flood Storage Site Feasibility Study Skokie River Watershed*

The Oriole Grove Forest Preserve (84 acres) in Lake Bluff, Illinois was considered as a flood storage site as part of the 2009 Lake Bluff Flood Storage Site Feasibility Study Skokie River Watershed. A wide range of conceptual reservoir sizes were analyzed in the current study, from a 250 acre-foot gravity wetland flood storage facility to a 2,000 acre-foot deep, pump-evacuated reservoir (Christopher Burke, 2009). The economic analysis for this study considered 2,000 ac-ft of flood storage at Oriole Grove (Lake Bluff Flood Storage Site) but the benefit to cost ratio showed a small percentage of benefits to Cook County for flood benefits given the distance from the site to Lake-Cook Road and the estimated costs would be significant. This project is not being considered at this time for flood storage in the watershed.

5.5.4.3 *IL Route 41 & Skokie River Regional Flood Mitigation Engineering Study*

The Skokie River and certain tributaries within the City of North Chicago, along Route 41 and through the Naval Station Great Lakes, has a history of flood damage and road closures (see Figure 14). Some of the issues are contributed to by increased regional rainfall, undersized or deteriorating culverts within the Skokie River, tributary drainage from impervious surfaces, and stream blockages. These flooding issues are interjurisdictional, and a consensus was made by local, county, state and federal partners to coordinate holistically on a solution.



Figure 5-14: July 2017 flooding along Route 41 in North Chicago and adjacent properties

In September 2020, SMC, IDOT, the City of North Chicago and the Naval Station Great Lakes partnered to perform a hydrologic and hydraulic engineering study in North Chicago, Illinois. Along Route 41 and through the Naval Station Great Lakes properties. The purpose of this study was to evaluate and determine recommended drainage infrastructure improvements for locations along the Skokie River (inside and outside the Naval Station Great Lakes properties) with an overall intent to enhance volumetric flow rate in this area while reducing flood occurrences. This study utilized existing watershed models, IDOT drainage investigations, and supplemental field survey to develop an unsteady hydraulic analysis of the proposed drainage improvements to verify they reduce flood risk while not adversely impacting downstream communities.

The result of this study concluded that the following scope of work was necessary to provide flood mitigation to this area of North Chicago, without adversely impacting any of the Skokie River downstream communities.

- Installation of 1,535 linear feet of 60” storm sewer running along Bittersweet Avenue (North Chicago, Illinois), across U.S. Route 41 to the Skokie River. This new storm sewer provides much needed flow capacity to the existing undersized storm sewer system that is currently in place.
- The removal of the three 7’ by 4’ Virginia Avenue culverts within the Skokie River (on the Great Lakes Naval Station property) and restoring the channel. This project also includes the replacement of the 12’ by 7’ Alabama Avenue culvert within the Skokie River (also on the Great Lakes Naval Station property) with an

upsized 12’ by 7’ box culvert. Both culvert crossings are restrictors in the Skokie River, are in poor condition and cause frequent debris-jams that exacerbate flooding in this area.

- Replacement of 1,200 linear feet of existing 36” storm sewer with 60” storm sewer, as well as, replacing an outlet control structure coming from the Shorecrest Pond in North Chicago (upstream of the Skokie River). The new outlet control structure and upsized storm sewer will alleviate some overbank flooding on the north end of the pond which floods the Strawberry Condominium homeowners.
- Replacement of 490 linear feet of existing 18 -24” storm sewer with 36 - 42” storm sewer, as well as, replacing an outlet control structure coming from a small pond within the Strawberry Condominium in North Chicago (upstream of the Skokie River). The new outlet control structure and upsized storm sewer will alleviate some overbank flooding around this pond which floods the Strawberry Condominium homeowners.
- Construction of at least 40 acre-feet of compensatory storage. This compensatory storage allows for the infrastructure improvements proposed upstream of the Skokie River and within the Skokie River without adversely impacting downstream communities.

5.5.4.4 *NBCR Planning Area Flood Damage Reduction Projects*

PROJECTS	FLOODING HISTORY	PROJECT DESCRIPTION
Strawberry Condominium Complex Projects	From 2013 -2019, this complex has experienced two incidents where over 50 residential units experienced first floor structural flood damage during each incident.	2015: SMC installed an overland flow path through the northern berm of the Shorecrest Detention basin and upsized the outlet structure to alleviate flooding within the Strawberry Condominium Complex (see Figure 5-15).
		2016: Two existing storm sewers were reconfigured to be connected via a storm structure (with a trash rack) with two flared end sections to provide better stormwater conveyance during regular storm events.
		2020: Construction an overland flow channel and installed a 36” stormsewer to divert floodwaters around Strawberry Condominiums during major flood events.
City of Highland Park & SMC Voluntary Buyout Grants *Three buyout grants for a total of eight properties*	The Middle Fork and the Skokie River in Highland Park are particularly susceptible to flash flooding. The intensity and distribution of rainfall, land use, and topography all influence flooding in Highland Park.	FEMA Pre-Disaster Mitigation Grant: Two flood-prone properties located within the regulatory floodway and within 50-80 feet from the Middle Fork. These homes regularly have 10-year flood waters reaching the exterior of their foundations and flooding the lowest living floor area.
		2018 IDNR-OWR Flood Mitigation Program: 5 properties, located in the Middle Fork and Skokie River subwatersheds. Floodwaters have entered homes and filled basements up and over the first floor a several structures.
		2019 IDNR-OWR Flood Mitigation Program: 1 Highland Park home located in the floodplain of the Skokie River, and is repetitively flood damaged, with a history of NFIP flood claims. This Highland Park property has recently implemented a combination of floodproofing measures to reduce their risk of flood damages.

PROJECTS	FLOODING HISTORY	PROJECT DESCRIPTION
City of Highland Park's Prioritized Capital Improvement Program	Debris blockages to culvert systems have occurred in the past and have an immediate impact to flood heights and create dangerous flow conditions both upstream and downstream of those blockages.	2020: The City of Highland Park and SMC are working collaboratively to address flooding issues in the Skokie River subwatershed. Drainage improvements within the Taylor-Hillary Neighborhood area of the Skokie River. The scope of work includes stormsewer system improvement with pipes and backflow preventers and cleaning out the Skokie River to maintain its carrying capacity (cleaning out debris blockages to culvert systems).
Dady Slough Area Drainage Improvements Project	Heavy or prolonged rain events impacts transportation routes, inundates homes, businesses, communication centers, and creates a financial hardship for economically disadvantaged residents.	The project scope of work includes increasing the size of the downstream stormwater conveyance system between Dady Slough Wetland Complex and Greenbelt Forest Preserve. This project would also increase both the flood storage capacity within Dady Slough and include restoration with high quality wetland vegetation. Currently funding is being pursued for this project through several funding sources.
Jaime Wetland Projects *Location: 10 acres of land located south of Martin Luther King Jr. Drive and east of US Route 41 in North Chicago, Illinois*	The Jaime Property flood storage improvements have been a phased approach (I, II, II, IV-Future Expansion) undertaken by SMC since 2012 when the property was donated by Gerardo Jaime, Sr. SMC is currently evaluating Phase IV for possible wetland enhancement and additional flood storage opportunities	2012-2013: Phase I-II project included excavation and revegetation of 2.5 acres on the southeast part of the property, which added about 1.45 acre-feet of flood water storage and doubled the size of the onsite wetland from 1 to 2 acres to provide mitigation for an offsite project wetland impact within the same watershed.
		2015 - 2017: Phase III project involved clearing of an approximate 3-acre degraded woodland area on the southwest part of the property, followed by excavation and revegetation to add about 3 acre-feet of flood water storage and increase the onsite wetland area from 0.64 acre to 2.70 acres to provide mitigation for another offsite project wetland impact within the same watershed. See Figure 5-16.
		2017-Present: Phase IV-expansion project includes approximately 4.5 acres of degraded woodland in the central and northeast areas of the property. Most of Phase IV (about 4 acres) is existing wetland covered with invasive trees and shrubs.



Figure 5-16: 2015 Strawberry Condominium overland flow path



Figure 5-15: Jaime Property Phase III wetland area

5.6 EXISTING FLOOD STORAGE

Existing flood storage is defined as depressional areas and floodplains that are presently storing, or potentially could store, stormwater runoff to decrease flooding in the watershed. Besides flood protection, flood storage areas can be used for the mitigation of wetland losses (wetland restoration), channel protection, and water quality protection. Flooding is a common problem in the NBCR planning area. Creating or enhancing storage would provide many benefits including reducing runoff to streams and minimizing channel erosion. Storage areas that are created through wetland restoration would improve water quality and habitat and increase groundwater recharge. The criteria used to identify existing storage locations in the North Branch Chicago River Watershed-Based Plan are:

- Mapped FEMA 100-year SFHAs
- USGS Flood of Record: only available for Lake County
- Wetlands with high flood storage function
    - Lake County Wetland Restoration and Preservation Plan (WRAPP)
    - National Wetland Inventory (NWI) used in Cook County
    - Stream corridors are included
- Detention Basins
    - WRAPP was used to identify detention basins in Lake County
    - Cook County hydro layer was used to identify basins in Cook County
- Flood Storage Reservoirs
    - 5 reservoirs in Cook County and 3 reservoir in Lake County

The existing flood storage locations are identified in Figure 5-17**.** These locations range from 1-1,091 acre-feet of storage with a mean storage of 12 acre-feet. The total of 1,724 storage areas encompass 10,459 acres (17% of the NBCR planning area) with an estimated potential to store a total of 20,463 acre-feet of water. Existing flood storage areas are compartmentalized into subwatershed catchment areas which are not shown on the map.

Table 5-6: Acres of Existing Flood Storage

SUBWATERSHED	ACRE-FEET OF EXISTING FLOOD STORAGE
Middle Fork	8,094
North Branch Chicago River Upstream	66
Skokie River	6,860
West Fork	5,443
TOTALS	**20,463**

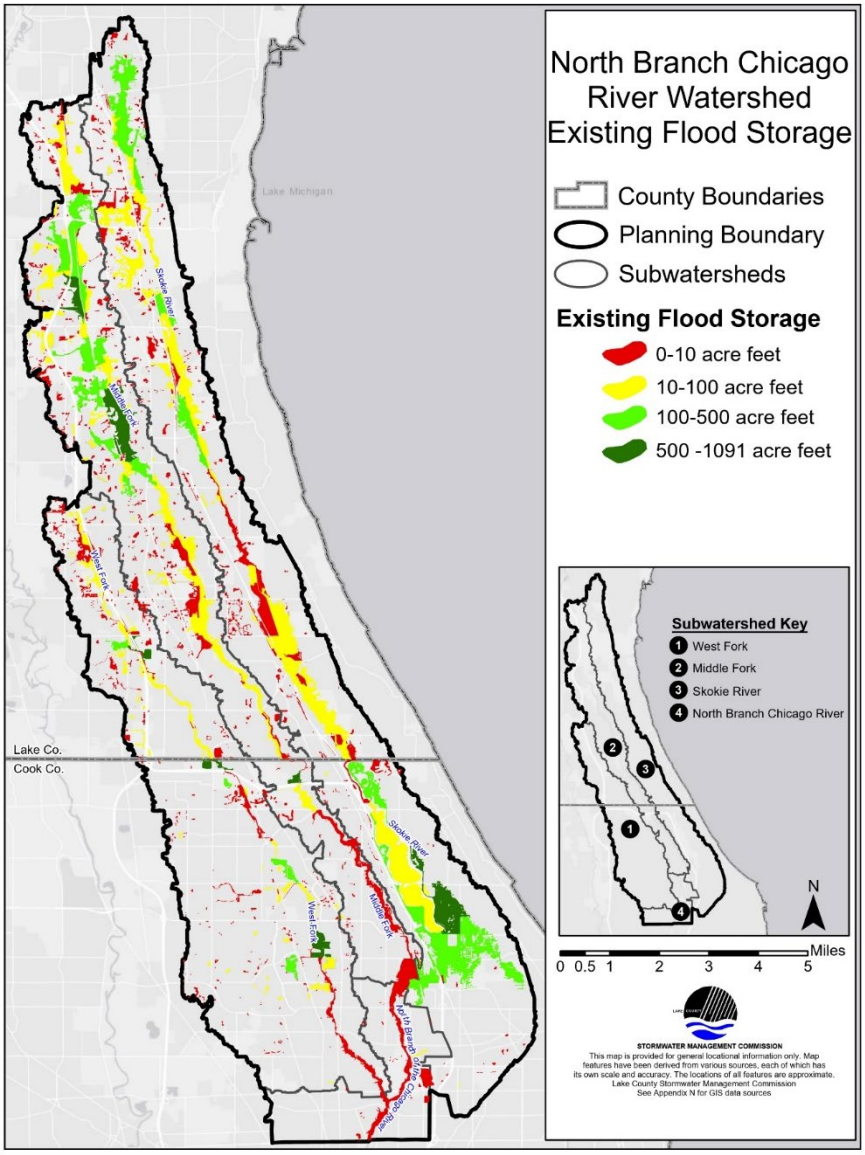


Figure 5-17: North Branch Chicago River Watershed Existing Flood Storage

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COMMON ACRONYMS/ABBREVIATIONS USED IN CHAPTER 6

BMP – Best Management Practices
C – Counties
CBG – Chicago Botanic Garden
CBL - Corporation and Business Landowners
CCDPH - Cook County Department of Public Health
CCPW - Cook County Public Works
CLC – College of Lake County
CMAP - Chicago Metropolitan Agency for Planning
DD - Drainage District
DH - Developers and Homebuilders
DOT - Departments/Divisions of Transportation
NBWW – North Branch Chicago River Watershed Workgroup
EIG - Environmental Interest Groups
IEMA - Illinois Emergency Management Agency
EO - Elected Officials
EXT - County Extension Services
FEMA - Federal Emergency Management Agency
FOCR – Friends of the Chicago River
FPD - Forest Preserve Districts
GC – Golf Courses
GI – Green Infrastructure
GIS – Geographic Information System
HOA - Homeowners Associations
IDNR - Illinois Department of Natural Resources
IL DOA - Illinois Department of Agriculture
Illinois EPA - Illinois Environmental Protection Agency
ISD - LC Health Department Individual Sewage Disposal Program
ISGS - Illinois State Geological Survey
ISWS - Illinois State Water Survey
LA - Lake Associations
LCHD - Lake County Health Department
LCPW - Lake County Public Works Department
M - Municipalities
MS4 – Municipal Separate Storm Sewer Systems
MWRD - Metropolitan Water Reclamation District of Greater Chicago
NBCR planning area – North Branch Chicago River Watershed Planning Area
N/L - Nursery and Landscaping Business
NRCS - Natural Resources Conservation Service
NSGL – Naval Station Great Lakes
OL – OpenLands, Lake Forest Open Lands, Lake Bluff Open Lands
PAH – Polycyclic Aromatic Hydrocarbons
PB&D - County Planning, Building, and Development (Includes Cook and Lake counties)
PC - Snow Removal and Deicing Private Contractors and Consultants
PD - Parks and Recreation Districts
PO – Property Owners
POA - Property Owners Associations
POTW - Publicly Owned Treatment Works
PR - Private Residential
RL - Riparian Landowner
RR – Railroads
SI - Schools and Institutions
SMC - Lake County Stormwater Management Commission
SWA – Solid Waste Agencies
SWANCC – Solid Waste Agency of Northern Cook County
SWALCO - Solid Waste Agency of Lake County &
SWCD - Soil and Water Conservation District
T - Townships
TMDL – Total Maximum Daily Load
TSS – Total Suspended Solids
UDO – Unified Development Ordinance
USACE - U.S. Army Corps of Engineers
USFWS - U.S. Fish and Wildlife Service
USGS - United States Geological Survey
UT – Utilities
VLM - Volunteer Lake Monitoring
WDO – Watershed Development Ordinance
WPC - Watershed Planning Committee(s)
WRAPP – Wetlands Restoration and Preservation Plan
WWTP - Wastewater Treatment Plants
YCC – Youth Conservation Corps

6 PRIORITIZED ACTION PLAN SUMMARY

NOTEWORTHY – ACTION PLAN RECOMMENDATIONS

The action plan recommendations in this Prioritized Action Plan Summary are to be interpreted as guidance recommendations (projects) for watershed stakeholders and not a regulatory document.

A variety of best management practices (BMPs) and programs are discussed in this prioritized action plan summary as potential options for the mitigation of pollutant issues in the NBCR planning area. In this chapter, specific ***recommendations*** are made to meet the goals of the watershed-based plan, including the identification of specific locations for BMPs in the NBCR planning area. This chapter presents specific recommended action items developed jointly by the SMC, NBWW and watershed planning committee (watershed stakeholders) to meet the goals of this watershed-based plan. Due to the size of the planning area and sheer number of site-specific action recommendations developed during the course of the planning process, readers of the plan are encouraged to use the ***online mapping application*** (https://lakecountyil.maps.arcgis.com/apps/webappviewer/index.html?id=26b1867e34954ba6bcbd3753292b37a6). The individual recommendations are also listed in tables, organized by jurisdiction, in Appendix M. Maps showing the action recommendations are also included in Appendix M, but users are encouraged to use the online mapping application. The critical implementation partners for the watershed are identified in Section 6.1.

SITE-SPECIFIC ACTION PLAN ONLINE MAPPING APPLICATION

An online mapping application was developed for stakeholders to view the action recommendations from this plan. Because the planning area covers 95 square miles and there are thousands of individual action recommendations across dozens of jurisdictions, it is likely easier for plan users to navigate to their individual areas of interest or browse areas they are familiar with for certain types of project recommendations. Printable maps are included in Appendix M, but due to the scale of the NBCR planning area, most users will likely find more utility in the online application, which can be accessed at: https://lakecountyil.maps.arcgis.com/apps/webappviewer/index.html?id=26b1867e34954ba6bcbd3753292b37a6 or via the North Branch Chicago River Watershed-Based Plan page on the Lake County Stormwater Management Commission website (http://www.lakecountyil.gov/stormwater).

There are two primary types of action plan recommendations presented in this chapter: 1) programmatic actions and 2) site-specific project actions including critical area (pollutant load "hotspot") actions. The action plan recommendations identify specific locations for projects and activities recommended for implementation at the watershed-scale.

1. "Programmatic Actions" represent program, policy, regulatory, and project actions that are applicable throughout the watershed. The actions are based on achieving the goals and objectives of the watershed-based plan as outlined in **Chapter 2**.
2. "Site-Specific Actions" address site-specific project opportunities or issues that have been identified throughout the NBCR planning area. Site-specific projects were identified through the stream and detention basin inventories, local stakeholders and agency staff and the NBWW. Some of the site-specific practices were identified using existing map data and have not been field verified; however, they do represent actual locations where recommended BMPs are applicable. Overall, these site-specific actions are the result of watershed assessment activities, a detailed analysis of existing watershed data and stakeholder input.

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a. "Critical Area Actions" identify critical catchments, streambanks and lake shorelines based on the "Pollutant Load Hotspot Analysis" to focus actions. These areas include hotspot catchments identified in **Chapter 4**. Actions implemented in these critical areas will provide the greatest value and benefit to the watershed.

For each of the five watershed goals identified in **Chapter 2**, there is an action table that describes each recommended action including its 1) priority, 2) cost estimate (if applicable), 3) lead partners and support partners (if applicable) and 4) recommended implementation timeframe.

1. Priority was assigned to each of the recommended actions and classified as H (high), M (medium) or L (low). Priority was based on multiple factors including lead partners, land ownership, cost, and technical requirements based on circumstances and conditions observed at the time the plan was written. These circumstances and conditions will likely change over time resulting in changes to the priority of projects. This watershed-based plan is considered a living document that can be updated and adapted as conditions and priorities change.
2. Cost estimates are provided only for those watershed improvement actions that involve remedial projects, such as planting native vegetation, retrofitting detention basins, etc. Cost estimates are not provided for preventative measures such as education and regulatory action. Cost estimates should not be considered price quotes but used as a way to compare the relative costs of proposed treatments. Furthermore, BMP implementation projects vary drastically by specific technique employed, size of area, access to location, property values, and other factors.
3. Lead and support partners are those organizations or agencies that have the greatest potential to implement each recommended action.
4. Timeframe refers to the period of time in which the recommended action could be implemented. Timeframe is classified into three categories including:
    - S (Short = 1-5 years)
    - M (Medium = 6-10 years)
    - L (Long = 10+ years)

Chapter 7 outlines an implementation and evaluation strategy for the action plan, and **Chapter 8** identifies outreach and education strategies and tools that will provide watershed stakeholders with the knowledge and skills necessary to implement the watershed-based plan.

6.1 IMPLEMENTATION PARTNERS

Throughout the prioritized action plan tables and narrative, responsible parties are suggested for taking the lead partner role or providing a supporting partner role in plan implementation. This section presents the responsible parties as well as a brief description of their role. Table 6-1 provides a concise reference or key of implementation partners for reviewing the programmatic and site-specific action plan tables that follow. Implementation partners do not necessarily have the resources to complete a

LEAD PARTNERS: Identify the lead public or private landowner, agency or other stakeholder with the greatest potential to implement the action.

SUPPORT PARTNERS: Include parties that could be involved in assisting in the action implementation related to regulation, permitting, coordination, technical needs and funding assistance.

recommendation, but these recommendations can be implemented through coordination with other partners, grant funding, and more.

Table 6-1: NBCR Planning Area Implementation Partners

ACRONYM	RESPONSIBLE PARTY	GENERAL RESPONSIBILITY
C	Counties	Land use and development, technical and financial support, and drainage system management.
CBG	Chicago Botanic Garden	Management and maintenance of open space, natural resources and riparian areas. Implementation and maintenance of stormwater BMPs.
CBL	Corporation and Business Landowners	Grounds management and maintenance. Implementation and maintenance of stormwater BMPs.
CCDPH	Cook County Department of Public Health	Permit well and private sewage disposal systems in Cook County. Enforce Cook County and Illinois state laws relating to environmental health issues. Regularly inspect, monitor, regulate, educate, and advise the public on environmental health concerns that adversely impact human health.
CCPW	Cook County Public Works	Manage water and wastewater facilities in Cook County.
CMAP	Chicago Metropolitan Agency for Planning	Technical, planning, training, and funding assistance.
DD	Drainage Districts	Maintain conveyance, stability, and function of drainage ways within district boundaries. *Includes East Skokie Drainage District, West Skokie Drainage District, Union One Middle Fork Drainage District & Union One West Fork Drainage District.
DH	Developers and Homebuilders	Land development, stormwater management system design and construction.
DOT	Departments/Divisions of Transportation	Maintain, design, and construct transportation infrastructure in the watershed including stream, lake, and wetland crossings. *Includes State, Illinois Tollway, County, Municipal and Township Highway and Streets Departments.
EIG	Environmental Interest Groups	Advocate group positions on topics including environmental and land management. *Includes: Sierra Club & League of Women Voters
EO	Elected Officials	Decision-making authority for county policies and ordinances [including the Watershed Development Ordinance (WDO) and Unified Development Ordinance (UDO)].
EXT	County Extension Services	Provides education and technical support. *Includes University of Illinois Extension.
FEMA	Federal Emergency Management Agency	National Flood Insurance Program, floodplain mapping and enforcement, and mitigation funding.
FOCR	Friends of the Chicago River	Manage, install and maintain green infrastructure, natural areas, and open space. Provides education and technical support.
FPD	Forest Preserve Districts	Manage and maintain green infrastructure, natural areas, and open space. *Includes Cook and Lake County Forest Preserve Districts.
GC	Golf Courses	Management and maintenance of open space, natural resources and riparian areas.
HOA/POA	Homeowners Associations/Property Owners Associations	Management of common areas and natural and constructed drainage systems.
IDNR	Illinois Department of	Natural area preservation and management, research, technical, and

ACRONYM	RESPONSIBLE PARTY	GENERAL RESPONSIBILITY
	Natural Resources	financial assistance.
IEMA	Illinois Emergency Management Agency	Flood and disaster planning, emergency response, and hazard mitigation.
Illinois EPA	Illinois Environmental Protection Agency	Water resource monitoring, pollution regulation and control, technical assistance and project funding.
ISD	LC Health Department Individual Sewage Disposal Program	Regulates the use of septic systems in incorporated and unincorporated areas of Lake County where sanitary sewer systems are not yet available. Regulation involves inspecting, planning, and installing septic systems.
ISGS/USGS	Illinois State Geological Survey & United States Geological Survey	Gather and manage geologic and water quality data.
ISWS	Illinois State Water Survey	Flood risk modeling and floodplain mapping
LA	Lake Associations	Lake management for water quality and recreation.
LCHD	Lake County Health Department	Monitor, manage, and provide technical support for water resources. Includes environmental services unit.
LCPW	Lake County Public Works Department	Manages water and wastewater facilities in Lake County.
M	Municipalities	Land use and development, technical and financial support, and drainage system management.
MWRD	Metropolitan Water Reclamation District of Greater Chicago	Controls municipal sewer construction permits outside the city of Chicago. Administers the Watershed Management Ordinance in suburban Cook County.
N/L	Nursery and Landscaping Business	Grow and maintain landscaping plant materials. This includes irrigation or watering and storage of equipment and materials.
NBWW	North Branch Chicago River Watershed Workgroup	Voluntary dues paying consortium of publicly operated treatment works (POTWs) and MS4s (municipal separate storm sewer system permit holders) organized to improve water quality throughout the North Branch Chicago River Watershed in Lake & Cook County and remove the North Branch Chicago River waterways from the Illinois EPA 303(d) impaired waters list.
NRCS/SWCD	Natural Resources Conservation Service Soil and Water Conservation District	Provide technical and financial assistance for natural resource management. *Includes McHenry-Lake and North Cook SWCDs.
NSGL	Naval Station Great Lakes	Maintain conveyance, stability, and function of drainage ways within Navy-owned properties.
OL	Openlands	Provide technical assistance for land acquisition and preservation *Includes Openlands, Lake Forest Open Lands and Lake Bluff Open Lands
PB&D	County Planning, Building, and Development (Includes Cook and Lake counties)	Land use planning and permitting for unincorporated areas, natural resources and system management.
PC	Snow Removal and Deicing Private Contractors & Consultants	Land and pavement management and maintenance for snow removal and deicing.
PD	Parks and Recreation Districts	Management and maintenance of parks and open space.
PO	Property Owner	The owner on record for a particular tax parcel.

ACRONYM	RESPONSIBLE PARTY	GENERAL RESPONSIBILITY
PR/RL	Private Residential/Riparian Landowner	Land management and maintenance including stream channels and riparian corridors.
RR	Railroad	Land Management in railroad right of way.
SI	Schools and Institutions	Schools and institutions with large properties or campus settings. *Includes College of Lake County and secondary schools
SMC	Lake County Stormwater Management Commission	Technical and financial assistance for flooding, watershed planning, and water quality. Administers the Watershed Development Ordinance in Lake County.
SWA	Solid Waste Agencies	Implements the Lake & Cook County Solid Waste Management Plans. *Includes Solid Waste Agency of Lake County (SWALCO) & Solid Waste Agency of Northern Cook County (SWANCC).
T	Townships	Road maintenance and support for watershed improvement projects.
USACE	U.S. Army Corps of Engineers	Wetland protection and regulation and restoration funding.
USFWS	U.S. Fish and Wildlife Service	Threatened and endangered species protection, technical and financial assistance for habitat restoration.
UT	Utilities	Land Management in utility right of way
WPC	Watershed Planning Committee(s)	Coordinate watershed plan implementation, education and outreach. Planning and support for watershed improvement projects. Currently the NBWW General Membership meeting offer a forum for the watershed planning committee meetings.
WWTP	Wastewater Treatment Plants	Maintain wastewater treatment regulatory standards. *Includes privately and publicly owned treatment works
YCC	Youth Conservation Corps	Conduct youth education and outreach.

6.2 PROGRAMMATIC ACTION PLAN

6.2.1 GOAL #1: IMPROVE WATER QUALITY IN THE WATERSHED

Table 6-2: Actions for Goal #1

ACTION #	ACTION	PRIORITY	LEAD PARTNERS	SUPPORTING PARTNERS	TIME FRAME
1	Develop and implement a watershed monitoring program to assess whether water quality standards are being met and evaluate watershed implementation effectiveness.	H	C, CCDPH, ISWS, LCHD, M, MWRD, NBWW, USGS	FOCR, IDNR, Illinois EPA, SMC, WPC	S-L
2	Continue to support (and improve) Lake County Health Department and Illinois EPA's Volunteer Lake Monitoring Programs.	L	LA, LCHD	CMAP, IDNR, Illinois EPA, M, MWRD, NBWW, SI, SMC	M
3	Continue to conduct intensive basin surveys for Illinois Integrated Water Quality Report on five-year rotational basis.	M	IDNR, Illinois EPA	LCHD, NBWW, SMC, WPC	M
4	Reduce the quantity of road salt (sodium chloride) needed for safe and cost-effective winter maintenance to address rising chloride levels in local water bodies.	H	CBL, DOT, EO, HOA/POA, M, N/L, PC, PR/RL, PD, PO	CCDPH, Illinois EPA, LCHD, MRWD, NBWW, SMC, T	S
5	Establish and publish watershed-wide recommended guidance for winter de-icing BMPs including road salt application rates and alternatives.	H	DOT, LCHD, M, SMC, T	CBL, CMAP, IDNR, Illinois EPA, NBWW, PB&D, PC, PR/ RL, WPC	S
6	Maintain golf courses using BMPs that minimize nutrient loads and impacts to water quality.	M	FPD, GC, M, PD	EIG, MWRD, SMC	M
7	Develop a cost-share mechanism to help private property owners upgrade/fix aging/failing septic systems and eliminate illicit connections.	M	CCDPH, Illinois EPA, ISD, LCHD	HOA/POA, M, NBWW, PR/RL, SI	L
8	Work with Illinois EPA to evaluate wastewater treatment systems for overall water quality impacts, upgrade plants to accommodate phosphorus control, and address problem discharges if any are identified.	H	Illinois EPA, LCPW, M, MWRD, NBWW, WWTP	LCHD, WPC	M
9	Where appropriate, remove or retrofit impoundments, dams, piped stream conveyance, and weirs in streams to support fish passage and migration, hydraulic connectivity.	H	DD, FOCR, FPD, IDNR, M, PD, PO, T, USACE, USFWS	Illinois EPA, LCHD, NBWW, SMC, WPC	M
10	Reduce streambank, shoreline, and construction-related erosion.	H	CBG, DD, FPD, HOA/POA, LA, M, MWRD, PD, PR/RL	DOT, IDNR, Illinois EPA, NRCS/SWCD, PB&D, SMC, USACE	M
11	Identify and restore degraded stream banks and beds where possible.	M	CBG, DD, M, PR/RL, SMC, T	IDNR, NBWW, PD, USACE	L

ACTION #	ACTION	PRIORITY	LEAD PARTNERS	SUPPORTING PARTNERS	TIME FRAME
12	Conduct routine well and septic evaluations and repairs.	L	CCDPH, HOA/POA, ISD, LCHD, PO	C, EO, ISD	M
13	Remediate aging and failing sanitary sewer lines that cross-connect with stormsewers and seasonally high groundwater tables.	H	C, CCPW, LCPW, M, PB&D, PO, T	DOT	M-L
14	Minimize runoff volumes, velocities, and pollution to waterways by creating/restoring wetlands, natural landscapes, and stormwater best management practices such as infiltration and pollutant filtration systems.	M	CBG, FOCR, FPD, M, PD, PO, PR/RL, T	CMAP, IDNR, Illinois EPA, MWRD, NBWW, NRCS/SWCD, OL, SMC, USACE	M
15	Replace riprap, concrete and turf grass shorelines with deep-rooted native landscaping and bioengineering where possible.	L	CBG, CBL, DH, FPD, HOA/POA, LA, M, PD, PR/RL, SI	CMAP, EXT, FPD, IDNR, Illinois EPA, NRCS/SWCD, PB&D, SMC, USACE, USFWS, WPC	M
16	Install filtration BMPs (ex. sand, filtration basins, treatment wetlands) downstream of government maintenance, industrial and commercial facilities; new infrastructure and improvement projects; transportation runoff collection points; and other land uses potentially generating a heavy load of pollutants.	M	C, CBL, DH, DOT, M, PO, PR/RL, SI, T	Illinois EPA, MWRD, NBWW, PB&D, SMC, USACE	L
17	Identify opportunities for wetland protection and enhancement on high priority parcels identified to maintain or improve water quality.	M	FPD, M, MWRD, PD, PO, SMC, T	Illinois EPA, NBWW, USACE, WPC	S
18	Implement projects identified by NBWW monitoring and watershed models that reduce or remove causes of impairment and/or help to attain the aquatic life use standard for impaired waters	H	NBWW, PO	IDNR, Illinois EPA, NBWW members	M
19	Implement BMPs that reduce pollutants with a TMDL	H	C, CBG, CBL, DD, DH, FOCR, FPD, HOA/POA, M, PD, PO, PR/RL, T	CMAP, DOT, IDNR, Illinois EPA, LCHD, LCPW, PB&D, SI, SMC, WPC	S-L

6.2.2 Goal #2: Reduce Flood Damage in the Watershed

Table 6-3: Actions for Goal #2

ACTION #	ACTION	PRIORITY	LEAD PARTNERS	SUPPORTING PARTNERS	TIME FRAME
1	Identify and increase additional flood storage at regional wetland/lake restoration or flood storage sites.	H	FPD, GC, IDNR, M, MWRD, OL, PD, SMC, T	CMAP, DD, LCHD, NSGL, PB&D, PR/RL, USACE	M

ACTION #	ACTION	PRIORITY	LEAD PARTNERS	SUPPORTING PARTNERS	TIME FRAME
2	Reduce the rate and volume of stormwater runoff from existing or new development by minimizing impervious cover and implementing green infrastructure practices.	H	CBL, DH, DOT, HOA/POA, M, PB&D, PO, SI	CMAP, MWRD, SMC	M
3	Restore historical floodplain function by removing spoil piles along channelized stream reaches.	L	C, DD, FPD, GC, M, NSGL, PR/RL, T	MWRD, NRCS/SWCD, SMC, USACE	M
4	Evaluate, preserve, and enhance the flood storage functions of existing depressional, floodplain, and riparian areas in open and undeveloped parcels.	H	C, DOT, FPD, GC, M, MWRD, OL, PD, PR/RL, SMC, T	CMAP, FEMA, IDNR, NSGL, PB&D, USACE, WPC	L
5	Restore and enhance under-utilized space at commercial, industrial, and residential developments with stormwater green infrastructure practices.	M	CBL, DH, HOA/POA, NSGL, PO, SI	CMAP, Illinois EPA, MWRD, PB&D, SMC, WPC	L
6	Maintain golf courses using BMP's that increase soil permeability and minimize stormwater runoff.	M	FPD, GC, M, NSGL, PD	EIG, MWRD, SMC	S
7	Require more specific/stringent maintenance and drainage easement requirements for stormwater features in new developments and re-developments.	H	C, EO, Illinois EPA, MWRD, PB&D, SMC	CBL, DH, HOA/POA, WPC	S
8	Communities adopt and implement "no adverse impact" floodplain management standards.	H	C, EO, M, MWRD, PB&D, SMC, T	CMAP, EIG, FEMA, Illinois EPA, USACE	S
9	Maintain and increase local drainage system capacity to improve resiliency for changing precipitation patterns.	H	C, CBG, DD, DOT, FOCR, FPD, GC, M, PD, T	CCPW, LCPW, MWRD, SMC	L
10	Evaluate and implement watershed-specific release rates for the 100-year storm event.	L	C, M, MWRD, PB&D, SMC	EIG, EO, IDNR, USACE	M
11	Develop and implement a stream inspection and maintenance program throughout the watershed. Remove excessive debris loads in channels to maintain conveyance and reduce streambank erosion.	H	C, DD, FOCR, FPD, M, MWRD, PB&D, PD, PR/RL, SMC	CCPW, CMAP, DOT, IDNR, Illinois EPA, LCPW, NBWW, T, USACE, WPC	S
12	Support flood hazard map updates, including the FEMA Flood Insurance Study, to accurately identify current flood hazard areas and streams of high concern.	H	C, CMAP M, FEMA, ISWS, MWRD, SMC, T	IDNR, PB&D, USACE	S
13	Develop flood inundation maps to show varying depths of flooding and respective area of inundation, in coordination with the Lake County All-Natural Hazards Mitigation Plan and Cook County Multi-Jurisdictional Hazard Mitigation Plan.	H	C, CMAP, M, MWRD, PB&D, SMC	FEMA	M
14	Purchase and remove structures that are chronically flood damaged through the voluntary buyout program.	H	M, PO, SMC	EO, FEMA, FPD, IDNR, MWRD, PB&D	L
15	National Flood Insurance Program (NFIP) communities participate in the Community Rating System (CRS) program to mitigate flood damage and reduce flood insurance rates for residents.	M	C, FEMA, M, PB&D	MWRD, SMC	M
16	Implement floodproofing measures or elevate at-risk structures.	H	C, CBL, M, MWRD, PB&D, PO, SMC	DOT, FEMA, IDNR	M

6.2.3 GOAL #3: PROTECT AND ENHANCE NATURAL RESOURCES AND PROVIDE ASSOCIATED RECREATIONAL OPPORTUNITIES

Table 6-4: Actions for Goal #3

ACTION #	ACTION	PRIORITY	LEAD PARTNERS	SUPPORTING PARTNERS	TIME FRAME
1	Develop resource conservation and management plans, especially for ADID wetlands and other biodiversity sites.	M	FOCR, FPD, IDNR, M, OL, PD, SMC, T	CMAP, NRCS/SWCD, USACE, USFWS	M
2	Restore degraded terrestrial and aquatic resources (lakes, wetlands and streams) using BMPs to improve habitat. This includes in-stream habitat features, such as natural channel substrates and pools and riffles to improve water quality and aquatic biodiversity.	H	CBG, DD, FPD, GC, IDNR, OL, PD, PR/RL	FOCR, Illinois EPA, M, MWRD, NRCS/SWCD, PB&D, SMC, USACE	M
3	Incorporate naturalized stream restoration as part of new developments where applicable.	M	DH, HOA/POA, PO	C, CMAP, EO, M, MWRD, PB&D, SMC	M
4	Modify, retrofit or eliminate hydraulic restrictions along the stream corridors to promote natural stream morphology and maintain conveyance for adequate drainage.	H	C, DD, FPD, M, PR/RL, T, USACE	CMAP, FEMA, IDNR, MWRD, SMC	L
5	Maintain, expand, or restore high quality native plant buffers along river, streams, lakes, and wetlands.	H	CBG, CBL, DD, FPD, HOA/POA, IDNR, LA, OL, PD, PR/RL, SMC	CMAP, NRCS/SWCD, USACE, USFWS	M
6	Include high quality stream reaches in green infrastructure plan for conservation and protection.	H	C, CMAP, DD, FPD, M, SMC, T	IDNR, Illinois EPA, NBWW, PB&D	S
7	Preserve, restore, and create wetlands areas.	H	FOCR, FPD, IDNR, Illinois EPA, M, NSGL, OL, PB&D, SMC, T	CMAP, EO, USACE	L
8	Identify and preserve natural areas that provide important ecological, environmental education, and recreational opportunities.	H	CBG, CMAP, FOCR, FPD, GC, IDNR, M, OL, PD, SI, SMC, T	Illinois EPA, MWRD	L
9	Municipalities and County review development standards and policies and adopt changes as needed to implement the watershed plan and preserve and protect healthy aquatic life and good water quality.	H	C, EO, M	CMAP, DOT, IDNR, MWRD, PB&D, SMC, T	S
10	Clearly identify and designate areas prioritized in the Green Infrastructure Plan as green infrastructure conservation areas in county, park district, and municipal comprehensive plans and maps.	H	C, FPD, M, PB&D, PD, T	CMAP, IDNR, MWRD, OL, SMC	M

ACTION #	ACTION	PRIORITY	LEAD PARTNERS	SUPPORTING PARTNERS	TIME FRAME
11	Require developers to maximize open space through conservation easements and dedications.	L	C, EO, M, PB&D, SMC, T	CMAP, Illinois EPA, MWRD	M
12	Identify high quality areas for protection, acquisition, wetland protection, and habitat enhancement.	M	DD, FPD, IDNR, PB&D, PD, SMC	C, Illinois EPA, M, MWRD, NRCS/SWCD , USACE	S
13	Maximize buffers, habitat and natural areas in golf courses.	M	FPD, GC, M, NSGL, PD	CMAP, EIG, MWRD, SMC	M
14	Identify, map and restore environmental corridors across community, county and state lines, and trail connections between new and existing parks and forest preserves where appropriate.	M	CMAP, DOT, FPD, M, PB&D, PD, T	HOA/POA, IDNR, MWRD, NBWW, OL, SMC, WPC	L
15	Assess current fish population and reduce or eradicate common carp and other invasive aquatic species.	H	HOA/POA, IDNR, LA, LCHD, NBWW, PO	ISGS/USGS, USFWS	M
16	Remove invasive species.	M	CBL, DD, EIG, FOCR, FPD, HOA/POA, IDNR, LA, OL, PC, PD, PO, SI	CMAP, Illinois EPA, SMC, WPC	L

6.2.4 GOAL #4: DEVELOP & IMPLEMENT A PUBLIC INFORMATION AND EDUCATION PROGRAM WITHIN THE WATERSHED

Table 6-5: Actions for Goal #4

ACTION #	ACTION	PRIORITY	LEAD PARTNERS	SUPPORTING PARTNERS	TIME FRAME
1	Provide information and training to riparian landowners on best practices for stream and lake shoreline restoration and maintenance that will reduce erosion and increase water quality.	M	HOA/POA, LA, LCHD, MWRD, NRCS/SWCD, SMC, WPC	C, CBG, CMAP, FOCR, M, NBWW, OL, PD, PR/RL, T	S
2	Integrate education of watershed issues and connections to water systems into primary and secondary school-based curriculums.	H	CBG, FOCR, NRCS/SWCD, PD, SMC, WPC	C, CMAP, HOA/POA, LCHD, M, NBWW, OL, T	M
3	Continue to educate local municipalities, landowners, and public works staff on road salt alternatives and application BMPs to minimize the use of road salt by public and private snow removal providers.	H	DOT, LCHD, LCPW, SMC	C, CCDPH, Illinois EPA, M, MWRD, NBWW, T, WPC	S
4	Inform the public and distribute educational materials on the importance of watershed health (water quality, flood prevention/mitigation, soil conservation and agricultural production, green infrastructure, water-based recreation) to the economy of watershed communities.	H	SMC, WPC,	C, CMAP, EIG, EXT, FPD, HOA/POA, IDNR, LCHD, M, MWRD, NBWW, OL, SI, SMC, T	S
5	Inform homeowners and municipalities about water quality problems associated with sump pump, septic systems, and illicit storm drain hookups.	M	CCPHD, LCHD, MWRD, PB&D, SMC	C, EIG, Illinois EPA, M, T	S
6	Offer and provide technical assistance to the public and local government for funding and cost-share opportunities and support with project development to implement the watershed plan.	M	CMAP, MWRD, NRCS/SWCD, SMC, WPC	C, Illinois EPA, LCHD, M, NBWW, T	M
7	Provide watershed residents with a 5 and 10-year report card that illustrates the ecological health of the watershed and reports progress towards watershed goals.	H	WPC	C, Illinois EPA, LCHD, M, MWRD, NBWW, SMC, T	M-L
8	Facilitate public training and engage students, teachers, riparian landowners, lake associations, and homeowner associations to volunteer for lake, stream, and natural area stewardship (i.e. stream and lake clean-up days) and monitoring of water resources.	M	CMAP, HOA/POA, LA, LCHD, NBWW, PD, SI, WPC	DD, Illinois EPA, M, MWRD, OL	M
9	Non-profit organizations choose a school to work with to naturalize open space and potentially adopt into the green infrastructure network.	M	CBG, FPD, OL, SI	CMAP, SMC	M
10	Promote the removal of invasive plants by providing trainings aimed at species identification/control (species such as: phragmites, teasel, garlic mustard, buckthorn).	L	EIG, EXT, HOA/POA, OL, SI	CCDPH, CMAP, FPD, LCHD, MWRD, N/L, NBWW, PD, SMC, WPC	S
11	Outreach campaign, demonstration site, and workshop promoting the	L	EIG, EXT, HOA/POA, OL, SI	CCDPH, CMAP, FPD, LCHD, MWRD,	M

ACTION #	ACTION	PRIORITY	LEAD PARTNERS	SUPPORTING PARTNERS	TIME FRAME
	establishment of native plants and proper plant selection.			N/L, NBWW, PD, SMC, WPC	
12	Provide outreach and workshops for the public affected by flood damage to educate them about the causes of flooding, flood mitigation practices, and ways to prevent local and regional flood damage.	H	MWRD, PB&D, SMC	CCPW, DOT, FEMA, IDNR, LCPW	S
13	Encourage all riparian landowners to incorporate native plants in landscaping and to consider riparian buffers and filter strip	M	LA, M, HOA/POA	SWCD, NRCS, SMC, MWRD, OL, Illinois EPA, FOCR, WPC	S

6.2.5 GOAL #5: IMPROVE COMMUNITY & AGENCY PARTICIPATION AND COORDINATION IN WATERSHED IMPROVEMENT ACTIVITIES

Table 6-6: Actions for Goal #5

ACTION #	ACTION	PRIORITY	LEAD PARTNERS	SUPPORTING PARTNERS	TIME FRAME
1	Watershed communities adopt the North Branch Chicago River Watershed-Based Plan.	H	C, EO, M, SMC, WPC	CMAP, Illinois EPA, NBWW members	S
2	The NBWW will continue to monitor water quality and develop strategies to address water quality impairments in the North Branch Chicago River watershed.	H	NBWW	C, CMAP, DD, FPD, Illinois EPA, M, MWRD, PB&D, PD, SMC, T, WPC	S-L
3	Establish a watershed organization or committee with funding and support to guide watershed plan implementation, provide technical assistance to watershed stakeholders, and coordinate multi-partner projects, and determine the roles of existing watershed communities, councils, organizations, and groups.	H	NBWW, WPC	C, CMAP, DD, FPD, Illinois EPA, LCHD, M, MWRD, PB&D, PD, SMC, T	S
4	Develop a model or template for an intergovernmental agreement for participation in cooperative watershed projects.	M	C, CMAP, M, SMC, WPC	CBL, DOT, FPD, HOA/POA, MWRD	M
5	Incorporate watershed plan recommendations or green infrastructure protection into community and county comprehensive land use plans.	H	C, CMAP, FPD, M, PB&D, T	NBWW, SMC, WPC	M
6	Increase participation and stewardship in the Annual Chicago River Day event for cleaning up the North Branch Chicago River.	H	FOCR, WPC	IDNR, NBWW, SMC	S
7	Watershed committee annually assesses progress on plan implementation and updates the watershed-based plan no less frequently than every 10 years.	H	WPC	Illinois EPA, NBWW, WPC	S-L

6.2.6 Regulatory and Policy Programmatic Actions

This watershed-based plan does not include land use recommendations because land use planning and development decisions are the right and responsibility of watershed municipalities and counties. This plan does consider the health of NBCR planning area lakes, streams and wetlands, which is a direct reflection of land use and management. Therefore, municipal and county consideration of land management and development impacts is necessary for effective watershed planning. Modifications and changes to local regulations and policy can have a significant influence on improving the ecological, environmental, safety and economic conditions of the watershed. Design standards, ordinances, codes and other regulatory tools are key mechanisms for implementing a vision for the watershed that will prevail into the future. The way that many codes and ordinances are written may encourage or require design approaches that unintentionally neglect preserving and enhancing watershed health. Local regulating entities are encouraged to provide incentives for design approaches, development and redevelopment standards, codes and ordinances that allow innovative watershed development that reduces flood damage, improves water quality and preserves or includes green infrastructure.

During the watershed planning process, opportunities were identified for policy and regulatory changes to benefit the NBCR planning area and address flooding, water quality and natural resource concerns. Programmatic actions related to public policy and regulatory review/modification generally address issues or opportunities that fall into the categories or topic areas listed below. The subsequent list of regulatory and policy programmatic actions is essentially a subset of the larger programmatic action plan:

- Development and Stormwater Runoff
- Water Quality and Pollution Prevention
- Stream Monitoring and Maintenance
- Wetlands and Floodplains
- Stormwater Green Infrastructure
- Transportation Sustainability Practices

Table 6-7 illustrates the most significant local entities in the watershed that influence, develop and enforce local policy and regulation. State and federal agencies are not highlighted because state and federal regulation and policy change should not be the focus of a locally led watershed planning effort.

Table 6-7: Regulatory/Policy Action Recommendations

ID	ACTION	PRIORITY	LEAD PARTNERS	SUPPORTING PARTNERS
RP-1	Review and modify land and transportation development standards, practices, codes and ordinances for new development and redevelopment to allow and incentivize low impact development design and stormwater green infrastructure practices.	H	M, PB&D, DOT	SMC, MWRD, Illinois EPA
RP-2	Provide programs with incentives to retrofit existing development and new developments with green infrastructure BMPs to reduce runoff volumes and rates and mitigate water quality impacts.	H	M, PB&D	SMC, MWRD, Illinois EPA
RP-3	Encourage or require disconnection of downspout and sump pump discharges from the storm sewer systems and direct into rain gardens, lawns, drywells or other infiltration practices.	M	M, PB&D	HOA/POA, MWRD, CMAP, SMC
RP-4	Jurisdictions with transportation maintenance authority should have an adopted winter maintenance/snow and ice removal policy.	H	M, DOT, T, FPD	SMC, LCHD, CCDPH, MWRD, Illinois EPA
RP-5	Municipalities should require that all chemical applicators whether public or private must be registered with the jurisdiction and have appropriate training.	H	M, DOT, T, FPD	SMC, LCHD, CCDPH, MWRD, Illinois EP
RP-6	Ban the use of fertilizer with phosphorus unless a soil test indicates it is needed.	H	M, PB&D	LCHD, CCDPH, NBWW
RP-7	Investigate limiting or banning the use of coal tar seal-coating products and lawn pesticides known to runoff and pollute waters.	M	M, PB&D	LCHD, CCDPH, NBWW
RP-8	In compliance with Illinois EPA, establish total suspended solids (TSS) or other numerical water quality performance standard for new developments and redevelopment in NBCR planning area.	M	SMC, MWRD, NBWW	M, PB&D
RP-9	Develop and implement stream maintenance program.	M	SMC, M, MWRD, IDNR	LCHD, FPD, CCDPH
RP-10	Require in-watershed (NBCR planning area) mitigation for all wetland impacts.	H	SMC, MWRD, USACE, IDNR, C	M, PB&D
RP-11	Develop and implement roadway design standards that include environmentally friendly stream crossings that protect aquatic habitat, route roadways away from sensitive waters and wetlands where possible and consider and incorporate wildlife crossings.	H	M, DOT, T	IDNR, SMC
RP-12	Consider impervious surface coverage regulations at appropriate scales such as parcels or catchments to reduce runoff volumes from new development and redevelopment.	M	M, PB&D, WPC, SMC, NBWW, CMAP	USACE, IDNR, Illinois EPA, EIG, OL

See Section 6.1 Implementation Partners for descriptions of the Lead/Support Partners.

6.2.7 NBWW RECOMMENDATIONS

The NBWW is in the process of finalizing a biological and water quality assessment of the North Branch Chicago River: 2018-2019. In general, the assessment focused on biological indicators of stream health and what causes, and sources of impairments are present in the watershed. As noted in the report, fourteen (14) causes across seven (7) major categories and four different source categories were identified. For causes, three (3) were habitat-related (QHEI score, channel modification, substrate quality) and eleven (11) were chemical (low dissolved oxygen [D.O.], Max D.O., 5-day biochemical oxygen demand [BOD5], total suspended solids [TSS], organic enrichment, water column metals, sediment metals, polycyclic aromatic hydrocarbons [PAHs], nutrient enrichment, chlorides, turbidity, volatile suspended solids [VSS]). PAHs were designated as very poor (IPS narrative categories of quality) at all but one site in the Skokie River and multiple PAHs exceeded IPS thresholds at every site while poor macro habitat related causal stressors were recorded at 21 of the 25 NBWW monitoring sites. Sources included habitat alteration, general nonpoint source (NPS) runoff, urban NPS runoff and flow modifications. Urban runoff is the major contributor of pollution within the watershed including dissolved substances, heavy metals, and polycyclic aromatic hydrocarbons. It also plays a major role in habitat alterations and heavy silt coverage that are also ubiquitous throughout the survey area. (MBI, 2020).

The report provides a thorough synthesis of results and draws meaningful conclusions from the data; this was used to generate a series of recommendations that should be considered when determining what plan actions should be prioritized or considered to address water quality (including an Integrated Prioritization System and Nutrient Assessment Reduction Plan). Other considerations for the NBWW recommendations came from the NPDES permit-related requirements and upcoming watershed modeling.

1. Consideration of updating the NBWW Bylaws goals and objectives to incorporate high priority watershed improvement projects based on the action plan recommendations from the North Branch Chicago River Watershed-Based Plan and watershed studies, stream monitoring and models. These watershed improvement projects should focus on primary stressors and causes identified from the stream monitoring data.
    a. Excessive stream siltation associated with habitat alterations and altered hydrology from urban and suburban runoff is the primary stressor (macro habitat related) in the watershed. Actions that reduce instream sediment loads, address altered hydrology and address habitat improvement should receive priority.
    b. Sediment contamination with PAH, metals and toxicity compounds observed throughout the watershed. Detention and retention practices that trap and filter these pollutants should be targeted to heavily urbanized areas of the watershed.
    c. Chloride concentrations are increasing, and chlorides were identified as the prevalent cause of biological impairment. Efforts that reduce the application of road salts is critically important throughout the watershed and to implement the Chloride Reduction Strategy.
    d. Fecal coliform is a pollutant identified as an impairment at several stream segments in the North Branch Chicago River Watershed Total Maximum Daily Load (TMDL) Report. The identification of illicit

discharge locations in the watershed and tracking those discharges to their source, as well as, field reconnaissance of continuous and intermittent sewage discharges to prevent illicit discharges should be considered a high priority. Sand filtration basins, stormwater retention ponds, and bio-retention cells could be constructed near discharge areas to streams.

e. Phosphorus is a pollutant identified as an impairment at three lakes in the in North Branch Chicago River Watershed TMDL Report. Phosphorus loads in all three lakes originates from internal and external sources. Wetlands, stormwater retention basins, sand filtration basins, and bio-retention cells could be constructed at the upstream end of select lakes or at a location of more concentrated inflow to the selected lake. Filter strips; riparian buffers; vegetated swales; and stormwater reduction techniques may also be employed in select areas to help control overland flow and the associated transport of sediment and pollutants.

2. Utilize the Integrated Prioritization System (IPS) and supporting tools consisting of in-depth analysis of all chemical, physical and biological data collected in past watershed assessments to develop a library of data analysis tools and prioritization mechanisms related to future impairment restoration activities.

3. Develop a Preliminary Nutrient Assessment Reduction Plan (NARP) Workplan to be utilized to plan and budget the multi-year development and completion of a NBWW NARP. Develop NBWW NARP in accordance with the NPDES permit program.

4. Continue comprehensive water quality monitoring program consisting of bioassessment monitoring, flow monitoring, and water column and sediment chemistry sampling and analysis; modify these programs as necessary to meet NARP objectives and NPDES permit requirements.

6.3 SITE-SPECIFIC ACTION PLAN

Project or site-specific action items and recommendations are tied to a particular location or locations in the watershed. As with the programmatic actions, these site-specific recommendations were developed to address watershed problems, to improve watershed resources and to achieve goals and objectives. Due to the size of the planning area and sheer number of site-specific action recommendations developed during the course of the planning process, readers of the plan are encouraged to use the ***online mapping application*** (https://lakecountyil.maps.arcgis.com/apps/webappviewer/index.html?id=26b1867e34954ba6bcbd3753292b37a6). The individual recommendations are also listed in tables, organized by jurisdiction, in Appendix M. Maps showing the action recommendations are included in Appendix M, but users are encouraged to use the online mapping application.

NOTEWORTHY: PROJECT SPECIFIC ACTIONS

Site-specific watershed projects/actions include urban and agricultural BMPs, detention basin retrofits, problem hydrologic/hydraulic structure modification, flood mitigation solutions, streambank and lake bank stabilization, and wetland preservation/restoration and creation priorities.

During development of the watershed-based plan, many methods were used to identify specific project sites, which are outlined below:

- Direct stakeholder input

- Detention basin inventory
- Stream inventory and assessment
- Lake shoreline inventory and assessment
- Flood problem area inventory
- Flood storage area analysis
- Lake County Wetland Restoration & Preservation Plan (WRAPP)
- GIS analysis and water quality modeling
- Previously planned projects

The identification of specific sites suited for watershed improvement projects has been ongoing during past planning efforts in the NBCR planning area. This chapter is not a comprehensive inventory of all possible projects in the NBCR planning area; it is only intended to provide guidance on where to "kick start" implementation. For the purposes of this plan, wetland enhancement includes only existing wetlands and restoring their natural function, efficiency and biodiversity whereas wetland restoration and creation includes creating wetlands where they do not currently exist. Opportunity sites for flood mitigation and regionally significant storage site action recommendations are also highlighted.

NOTEWORTHY: SITE-SPECIFIC ACTIONS VS. BASIN-WIDE SITE-SPECIFIC ACTIONS

SITE-SPECIFIC ACTIONS:
Recommendations for a specific geographic location in the planning area. Sites may be represented by single points, linear features (such as stream banks), or polygons (specific areas, such as a wetland).

BASIN-WIDE SITE-SPECIFIC ACTIONS:
Recommendations that can be applied to a specific geographic location but which are generally identified across the planning area based on land use/land cover or some other "mappable" geographic characteristic. Opportunities for runoff volume reduction are an example of basin-wide site-specific actions.

This section outlines and summarizes **site-specific actions** and **basin-wide site-specific actions**. Where applicable, the action recommendations are coded by jurisdictional coding for basin-wide site-specific actions (Table 6-8) and subwatershed coding for site-specific actions (Table 6-9). Site-specific actions are summarized by priority in Table 6-10 and Table 6-11 and basin-wide site-specific actions are summarized by priority in Table 6-12 and Table 6-13. Actions and projects are then further described and summarized, by major action category and jurisdiction in Section 6.3.5. Individual site-specific actions and their attributes and details are available through the online web application hosted by SMC and in detailed jurisdictional tables located in Appendix M. Chapter 7 includes overall cost estimates, pollutant load reductions, and implementation strategies. There are 3,042 site-specific and basin-wide site-specific action recommendations, spanning 40 separate jurisdictions. These actions are summarized in Table 6-18, Table 6-19 and Table 6-20. If implemented, the actions would benefit nearly 7,000 acres and 45.25 miles of shoreline.

Table 6-8: Basin-Wide Jurisdiction Coding

ABBREVIATIONS	JURISDICTION
EVA	City of Evanston
HLD	City of Highland Park
HWD	City of Highwood
LFT	City of Lake Forest
NCH	City of North Chicago
PRK	City of Park City

ABBREVIATIONS	JURISDICTION
GLN	Village of Glencoe
GLV	Village of Glenview
GLF	Village of Golf
NIL	Village of Niles
NBK	Village of Northbrook
WKA	Village of Winnetka

ABBREVIATIONS	JURISDICTION
WAK	City of Waukegan
CFP	Forest Preserve District of Cook County
TOL	Illinois State Toll Highway Authority
LFP	Lake County Forest Preserve District
TLIB	Libertyville Township
TMNE	Maine Township
TNTT	New Trier Township
TNIL	Niles Township
TNFD	Northfield Township
TSHT	Shields Township
SIL	State of Illinois
NAV	United States Department of the Navy
TVRN	Vernon Township
BAN	Village of Bannockburn
DFD	Village of Deerfield

ABBREVIATIONS	JURISDICTION
GRN	Village of Green Oaks
GUR	Village of Gurnee
KEN	Village of Kenilworth
LKB	Village of Lake Bluff
LSH	Village of Lincolnshire
MET	Village of Mettawa
NGR	Village of Morton Grove
NFD	Village of Northfield
RIV	Village of Riverwoods
SKO	Village of Skokie
WIL	Village of Wilmette
TWAR	Warren Township
TWAK	Waukegan Township
TWDF	West Deerfield Township

Table 6-9: Site-Specific Action Subwatershed Coding

SUBWATERSHED SPECIFIC ACTION CATEGORY	ID CODE
Middle Fork	25-
North Branch Chicago River	27-
Skokie River	24-
West Fork	26-

These site-specific action plan recommendation ID codes begin with the subwatershed code number followed by a chronological numbering system.

Table 6-10: Summary of Site-Specific Actions by Priority

BMP TYPE	# OF PROJECTS				UNIT OF PRACTICE			
	H	M	L	TOTAL	H	M	L	TOTAL
Debris Jam	15	1	3	19	N/A	N/A	N/A	N/A
Detention Basin Retrofit	0	0	169	169	N/A	N/A	N/A	N/A
Flood Damage Reduction	14	10	6	30	N/A	N/A	N/A	N/A
Infrastructure Management	2	0	0	2	N/A	N/A	N/A	N/A
Shoreline Stabilization	3	4	2	9	5,619 linear feet	5,559 linear feet	4,964 linear feet	16,141 linear feet
Stabilization (Points)	15	32	5	52	N/A	N/A	N/A	N/A
Stormwater Infrastructure Retrofit	2	6	1	9	N/A	N/A	N/A	N/A
Stream Improvement	16	6	1	23	90,960 linear ft.	17,517 linear ft.	2,159 linear ft.	110,636 linear ft.
Water Infrastructure	56	34	15	105	N/A	N/A	N/A	N/A

BMP TYPE	# OF PROJECTS				UNIT OF PRACTICE			
	H	M	L	TOTAL	H	M	L	TOTAL
Wetland Restoration	209	385	499	1,093	839 ac	1,020 ac	809 ac	2,668 ac
Wetland Enhancement	32	6	1	39	1,586 ac	175 ac	114 ac	1,875 ac
Totals	**364**	**484**	**702**	**1,550**	**96,579 linear ft. 2,425 ac**	**23,076 linear ft. 1,195 ac**	**7,123 linear ft. 923 ac**	**126,777 linear ft. 4,543 ac**

Table 6-11: Summary of Site-Specific Action Costs by Priority

BMP TYPE	ESTIMATED COST			
	H	M	L	TOTAL
Debris Jam	$ 165,000	$ 87,000	N/A	$ 252,000
Detention Basin Retrofit	N/A	N/A	$ 1,160,000	$ 1,160,000
Flood Damage Reduction	$ 2,063,532	$ 506,000	$ 375,000	$ 2,944,562
Infrastructure Management	$ 38,735,972	N/A	N/A	$38,735,972
Shoreline Stabilization	$ 618,042	$ 611,446	$ 546,037	$ 1,775,525
Stabilization (Points)	$ 727,000 - $ 1,112,000	$176,000 - $ 1,056,000	$ 27,500 - $ 165,000	$ 930,500 - $ 2,333,000
Stormwater Infrastructure Retrofit	$ 75,000	$ 10,813,000	$ 75,000	$ 10,963,000
Stream Improvement	$ 29,561,907	$ 5,692,928	$ 10,000	$ 35,264,835
Water Infrastructure	$ 322,000	$ 253,000	$ 115,500	$ 690,500
Wetland Restoration	$ 72,990,961	$ 88,742,551	$ 70,350,175	$ 232,083,687
Wetland Enhancement	$ 52,327,051	$ 5,767,066	$ 3,770,727	$ 61,864,845
TOTAL	**$197,586,465 - $197,971,465**	**$112,648,990 - $113,528,990**	**$76,429,939 - $76,567,439**	**$386,665,424 - $388,067,924**

Table 6-12: Summary of Acres of Recommended Basin-Wide Site-Specific Actions by Priority

BMP TYPE	UNITS OF PRACTICE			
	HIGH PRIORITY	MEDIUM PRIORITY	LOW PRIORITY	TOTAL
Green Infrastructure	601 ac	405 ac	32 ac	1,038 ac
Road Salt Management	6,199 ac	0	0	6,199 ac
Runoff Volume Reduction	0	0	35 ac	35 ac
Stream Dredging	0	0	112,072 linear feet	112,072 linear feet
Wetland Enhancement	0	1,338 ac	0	1,338 ac
Total	**6,800 acres**	**1,743 acres**	**67 acres 112,072 linear feet**	**8,610 acres 112,072 linear feet**

Table 6-13: Summary of Cost of Recommended Basin-Wide Site-Specific Actions by Priority

TYPE	TOTALS
Green Infrastructure	$0
Road Salt Management	--
Runoff Volume Reduction	$10,766,620 – $ 53,833,094
Stream Dredging	$ 34,966,423.81
Wetland Enhancement	$ 44,163,379.17
Total	**$ 89,896,422.98 – $ 132,962,896.98**

6.3.1 Critical Area Actions

Critical areas are defined in Chapter 4. Actions addressing these critical areas will have the greatest value and benefit to the NBCR planning area. Table 6-14 summarizes the critical area categories, relevant jurisdictions, and relevant actions. Jurisdictions can reference this table to review which critical areas are relevant. Site specific actions that fall within critical areas and the categories listed in Table 6-14 are considered high priority.

Table 6-14: Critical Area Categories, Jurisdictions, and General Actions

CRITICAL AREA CATEGORY	JURISDICTIONS	GENERAL RELEVANT ACTIONS
Nonpoint Source Pollution Loading Hotspot Catchments (Aggregate)	**Townships:** Libertyville, Vernon, Northfield, **Municipalities:** City of North Chicago, City of Highland Park, Village of Lincolnshire, Village of Deerfield, Village of Northbrook **State/Forest Preserve:** N/A **Drainage Districts:** East Skokie Drainage District, West Skokie Drainage District, Union One West Fork Drainage District	Urban BMPs, enhance and expand green infrastructure, wetland restoration restoration/creation and enhancement, maintain infiltration and hydrology of catchment, stream maintenance, detention basin retrofits, monitoring
Critical Catchments (Chloride)	**Townships:** Warren, Shields, Libertyville **Municipalities:** City of North Chicago, City of Waukegan, Village of Lake Bluff, Village of Green Oaks, City of Lake Forest **State/Forest Preserve:** Greenbelt Forest Preserve, Old School Forest Preserve, Middlefork Savanna Forest Preserve	Road Salt management and reduce application, detention/retention, monitoring,
TDS Nonpoint Source Loading Critical Catchments	**Townships:** Libertyville **Municipalities:** City of North Chicago, City of Highland Park, Village of Deerfield **State/Forest Preserve:** N/A **Drainage Districts:** East Skokie Drainage District, West Skokie Drainage District	Urban BMPs, detention/retention, general erosion control from urban areas, monitoring
NBWW Monitoring Data Hotspot Critical Catchments	**Townships:** Northfield, New Trier, West Deerfield, Niles **Municipalities:** Village of Northfield, Village of Wilmette, Village of Glenview, Village of Deerfield, Village of Northbrook, City of Highland Park, Village of Winnetka, Village of Glencoe, Village of Skokie, City of North Chicago, City of Waukegan **State/Forest Preserve:** Chicago Botanic Garden/Mary Mix	Urban BMPs, enhance and expand green infrastructure, wetland restoration restoration/creation and enhancement, maintain infiltration and hydrology of catchment, stream maintenance, detention basin retrofits, monitoring

CRITICAL AREA CATEGORY	JURISDICTIONS	GENERAL RELEVANT ACTIONS
	McDonald Woods, Somme Woods, Chipilly Woods, Watersmeet Woods, Glenview Woods/Harms Woods Nature Preserve, Erickson Woods, Watersmeet Woods, Greenbelt Forest Preserve **Drainage Districts:** East Skokie Drainage District, Union One West Fork Drainage District, Union One Middle Fork Drainage District	
Streambank Erosion	**Townships:** Northfield **Municipalities:** City of North Chicago, Village of Lake Bluff, City of Lake Forest, City of Highland Park, Village of Deerfield, Village of Northfield, Village of Northbrook, Village of Glenview, Village of Wilmette, Village of Golf **State/Forest Preserve:** Oriole Grove Forest Preserve, Watersmeet Woods **Drainage Districts:** East Skokie Drainage District, West Skokie Drainage District, Union One West Fork Drainage District	Stabilize severely eroding streambanks

6.3.2 Flood Problem Area Mitigation Actions

Lake County SMC has advanced progress towards flood mitigation efforts by inventorying and maintaining a database of flood problem areas as reported by watershed residents and stakeholders. Maps and summary information of the flood problem areas are included in Chapter 5, and this chapter intends to guide and direct actions to address the problems. During the planning process, SMC scheduled meetings with local municipalities, townships, forest preserve districts, park districts and open space jurisdictions to request updates and new information for potential flood problem areas in the watershed. There are 147 known flood problem areas (and 162 July 2017 reported incidents) located within the NBCR planning area (Chapter 5). The Skokie River subwatershed has the most reported problem areas (Table 6-15). It is not within the scope or objectives of this plan to assess each individual problem and propose specific mitigation actions, however it is important to enable jurisdictions and stakeholders to better understand the problems to address and prioritize actions. The flood problem area data was reviewed, and a planning-level GIS analysis was applied to guide and focus actions.

The mitigation projects are ranked as high (H), medium (M) and low (L) based on the type of flooding problem area reported, number of July 2017 flood incidents reported and the number of structures. Priorities given to flood problem area inventory sites from the 2008 North Branch Chicago River Watershed-Based Plan were carried over for this ranking process.

A high priority (H) was given to reported if one of the following was observed: structural or roadway flooding on annual basis (or more frequent), structural damage from flooding, structural flooding in the floodplain (FEMA SFHA), or FPAs impacting 5 or more structures. In total, the 52 high priorities included 200 structures. Medium priority (M) was applied to other structural or roadway flooding not captured under “HIGH” or FPAs impacting 1-4 structures. In total, there were 137 medium priority sites with 312 structures. Low priority (L) was applied to nuisance flooding and sewer backup (remaining sites). In total, there were 120 low priority sites with 14 structures. This prioritization exercise is for planning purposes only, all flood problem areas outlined in

this plan warrant attention and have reported impacts. Skokie River subwatershed has the greatest number of high priority actions and the highest number of flood impacted structures.

Table 6-15: Summary of Flood Action Priorities by Subwatershed

SUBWATERSHED	FLOOD PROBLEM AREA INVENTORY SITES	JULY 2017 FLOOD INCIDENTS	# HIGH PRIORITY ACTIONS	# OF STRUCTURES
Middle Fork	39	42	13	77
North Branch Chicago River	10	0	0	0
Skokie River	52	108	36	283
West Fork	46	12	3	14
Planning Area Totals	**147**	**162**	**52**	**374**

6.3.2.1 *Approach to Flood Mitigation Actions*

Field reconnaissance is necessary to first evaluate the sites; this should be followed by a detailed flood study or drainage analysis in combination with some level of engineering design and property owner(s) input to define alternatives and the most feasible mitigation measures for a specific problem area.

Flood problems are often complex and require specialized expertise; numerical modeling is sometimes necessary to adequately understand and diagnose the problem and design solutions. Flood mitigation activities also require a comprehensive understanding of regulations, local ordinances, and floodplain management. Professional engineers, certified floodplain managers and stormwater managers need to be engaged in addressing flooding problems and the design of mitigation solutions.

An important action recommendation is to avoid a strict focus of directly addressing flood problems alone; a more holistic approach should be adopted to consider the flood problem locations and integrating these issues in all planning, permitting, development, and infrastructure processes so that the issues can potentially be addressed, and precautions can be taken so the problems do not worsen. It is also important to consider the toolbox of programmatic recommendations, preventative mitigation strategies and industry standard structural and non-structural flood mitigation best practices which are discussed in Chapter 5. Section 6.3.5 defines actions based on jurisdictions, and Appendix M includes supporting details for each of the sites.

6.3.3 Potential Regional Flood Storage Sites

Based on watershed stakeholder feedback, there are two (2) potential regional storage locations identified in the watershed. The first potential site is the Lake Bluff Park District Golf Course site location, owned by the Lake Bluff Park District, and the second potential location is The Preserves (formerly known as the Highland Park Country Club), owned by the Park District of Highland Park. Prioritization should be considered for sites that would benefit localized flood problem areas. Storage at most of these sites could potentially be created in the watershed by constructing berms and performing moderate grading and excavation. It is important to note that significantly more storage is available in the watershed in existing open water lakes and large wetland complexes; however, these areas were excluded from this analysis in order to focus on watershed stakeholder input.

6.3.4 Potential Wetland Enhancement and Restoration Sites

As described in Chapter 3, the Lake County Wetland Restoration and Protection Plan (WRAPP) identified specific opportunities for the enhancement of existing wetlands and the restoration or creation of wetlands or those that are potentially restorable for the Lake County portion of the NBCR Planning Area. For the Cook County portion, potentially restorable wetlands were identified by removing wetlands mapped in the National Wetland Inventory (existing wetlands) from the hydric soils mapped in the Cook County Soil Survey. The remaining hydric soils were then visually screened to determine sites that might be suitable for wetland restoration projects (e.g., mapped hydric soils between homes in a residential development would be removed). Potentially restorable wetlands in Lake County were prioritized based on criteria from the WRAPP while a separate set of criteria was used for those in Cook County (see Appendix I). Potential wetland restoration sites are included in the Site-Specific Action Plan. Existing wetlands, which may be enhanced (rather than restored) were included in the Basin-Wide Site-Specific Action Plan.

6.3.4.1 *Wetland Enhancement*

Wetland enhancement can be described as those existing wetlands that could benefit from remedial actions that enhance their extent or function(s). Approximately 3,000 acres of existing wetland are identified in the WRAPP (along with more than 900 acres of streams, lakes and ponds) in the NBCR planning area within Lake County. Over 1,800 of these acres are included in this plan for wetland enhancement. Table 6-16 shows the wetland enhancement acreage by subwatershed (see Figure 6-1).

Table 6-16: Wetland Enhancement by Subwatershed

SUBWATERSHED	WETLAND ENHANCEMENT (acres)	% TOTAL ENHANCEMENT
Middle Fork	1,102	59%
North Branch Chicago River	0	0%
Skokie River	638	34%
West Fork	135	7%
TOTAL	**1,875**	**100%**

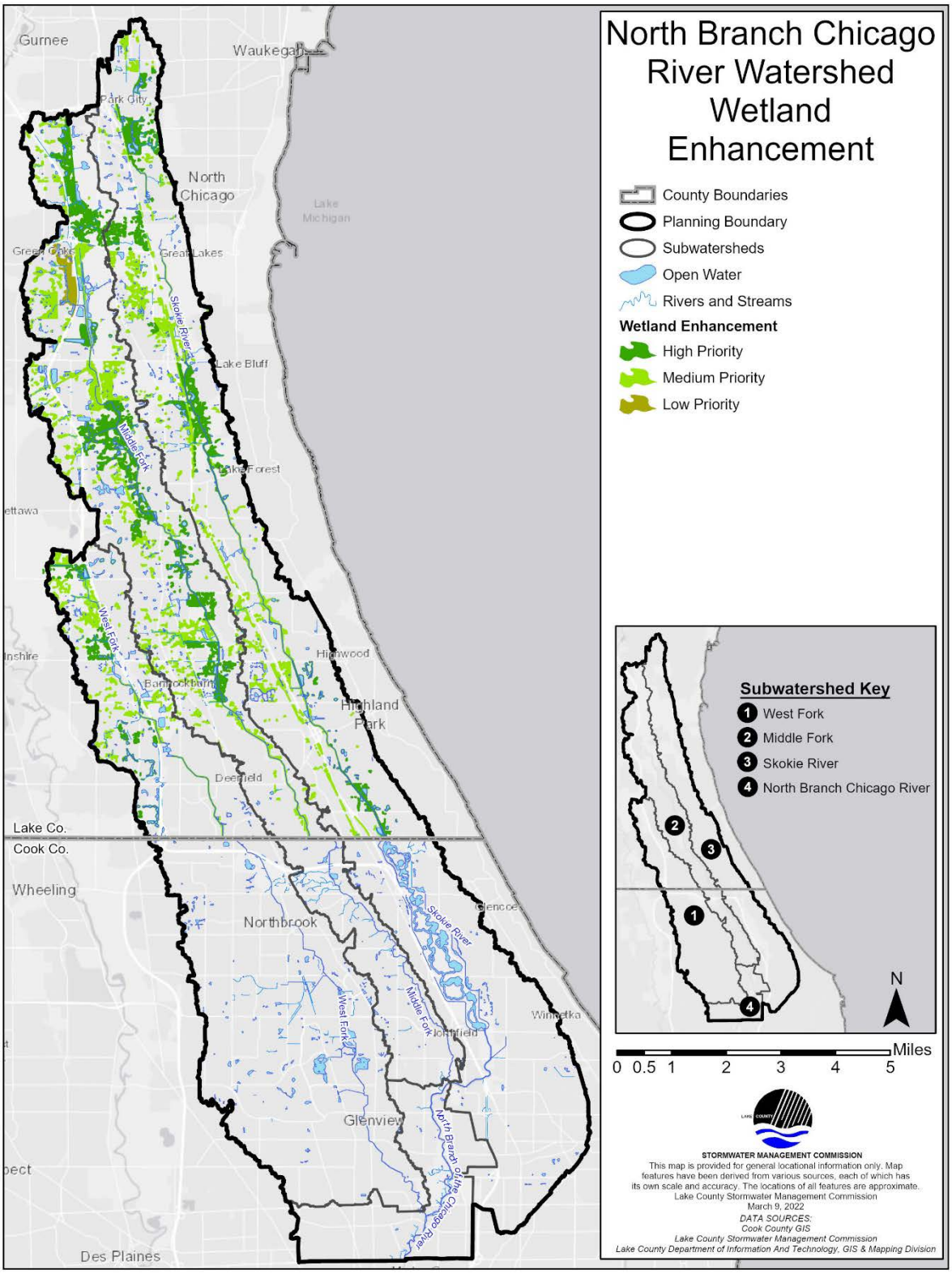


Figure 6-1: Potential Wetland Enhancement

6.3.4.2 *Wetland Restoration/Creation*

Wetland restoration/creation locations are predictors of the best places to attempt wetland restoration based on historic wetland conditions and existing land use/land cover; although not necessarily specific land management practices or behaviors. Site-specific actions were generated from the Potentially Restorable Wetland sites identified in the Lake County WRAPP and the potential wetland restoration sites identified in Cook County based on the methods described in Appendix F. Prioritization (high, medium, low) for sites in Lake County is based on the functional criteria in the WRAPP. Prioritization of sites in Cook County is described in Appendix F, but in short, high priority sites are located in FEMA floodplains on publicly-owned open space while medium priority sites are located in critical catchments.

The NBCR planning area contains a total of 2,668 acres of potentially restorable wetlands of which 839 acres (31%) are considered high priority (Figure 6-2). The Skokie River subwatershed has the highest amount of potential wetland restoration acreage, the highest amount of high priority potential wetland restoration acreage, and the highest percentage of high priority acreage relative to total potential wetland restoration acreage (Table 6-17). A total of 1,093 locations were identified as potential wetland restoration sites within the NBCR Planning Area, of which 209 or 19% are high priority. High priority sites are, on average, nearly twice the size of potential wetland restoration sites in general.

Table 6-17: Wetland Restoration/Creation by Subwatershed

SUBWATERSHED	TOTAL RESTORATION / CREATION (acres)	HIGH PRIORITY (acres)	HIGH PRIORITY AS % OF TOTAL RESTORATION / CREATION
Middle Fork	818	295.28	36%
North Branch Chicago River	228	54.12	24%
Skokie River	1,064	414.32	39%
West Fork	558	75.25	14%
TOTAL	**2,668**	**839**	**31%**

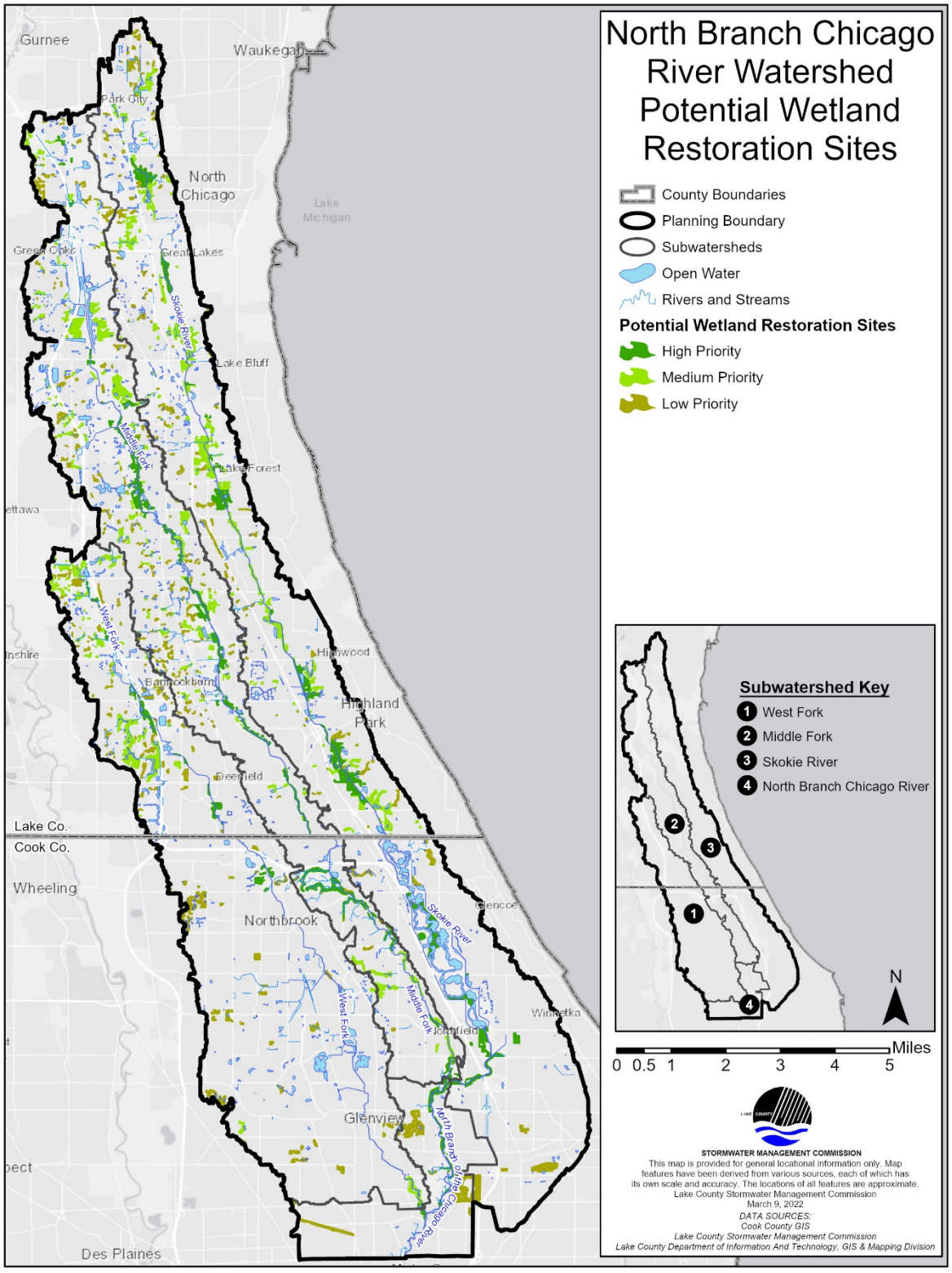


Figure 6-2: Potential Wetland Restoration/Creation

6.3.5 Site-Specific Actions By Jurisdiction

The following section summarizes previously planned actions and new project specific recommendations or actions for each jurisdictional area within the NBCR planning area. Due to the large number of practices, specific details on individual actions are included in Appendix M and available through the Lake County SMC web application. Appendix M therefore includes tables containing specific actions by jurisdiction, subwatershed, and catchment; these tables include unique action item codes, type, a description, catchment, subwatershed, quantities and units, cost estimates (if applicable), coordinates, priority status and timeline, critical catchment status, plan goals addressed, supporting partners, implementation status, and load reductions if applicable.

This section is organized by major action category: previously planned high priority actions, site-specific practices, basin-wide site-specific actions, problem discharge locations, and flood problem areas and regional flood storage.

6.3.5.1 *Previously Planned High Priority Actions*

Site-specific actions were compiled by SMC from previous watershed-based plans and are presented by jurisdiction. All 2008 North Branch Chicago River Watershed-Based Plan action plan recommendations were included in the update. Action recommendations and stream and detention basin inventory recommendations that were no longer valid were removed. Table 6-18 summarize and display the action recommendations from the 2008 watershed-based plan major categories. There are a total of 255 action plan recommendations spanning 18 individual jurisdictions. Stormwater infrastructure retrofit practices account for 62% of all actions, followed by best management practices (28%) and stream & lake bank maintenance & restoration (8%).

Table 6-18: Previously Planned High Priority Action Summary

JURISDICTION	BMP[1]	STORMWATER INFRASTRUCTURE RETROFIT[2]	STREAM & LAKE BANK MAINTENANCE & RESTORATION[3]	DRAINAGE[4]	TOTAL
City of Highland Park	12	30	4	5	**51**
City of Lake Forest	18	49	3	--	**70**
City of North Chicago	5	2	--	--	**7**
City of Park City	--	1	--	--	**1**
City of Waukegan	4	1	--	2	**7**
Lake County Forest Preserve District	10	10	3	--	**23**
Libertyville Township	5	6	--	--	**11**
State of Illinois	1	--	1	--	**2**
United States Department of the Navy	2	11	1	--	**14**
Village of Bannockburn	2	3	--	--	**5**
Village of Deerfield	--	23	6	--	**29**
Village of Green Oaks	2	3	--	--	**5**
Village of Lake Bluff	--	4	--	--	**4**
Village of Lincolnshire	--	3	1	--	**4**
Village of Mettawa	4	3	--	--	**7**

JURISDICTION	BMP[1]	STORMWATER INFRASTRUCTURE RETROFIT[2]	STREAM & LAKE BANK MAINTENANCE & RESTORATION[3]	DRAINAGE[4]	TOTAL
Village of Riverwoods	2	4	1	--	**7**
Village of Riverwoods	2	--	--	--	**2**
West Deerfield Township	3	3	--	--	**6**
TOTAL ACTIONS	**72**	**156**	**20**	**7**	**255**
East Skokie Drainage District[5]	41	1	3	3	48
Union Number 1 - Middle Fork Drainage District[5]	--	--	--	--	--
Union Number 1 - West Fork Drainage District[5]	4	5	2		11
West Skokie Drainage District[5]	39	1	1		42

[1] Includes the following: bioretention, retention basin, stormwater wetland, wetland restoration and enhancement. [2] Includes the following: culvert, outfall maintenance, problem hydraulic structure, problem outfall, stormwater (water) infrastructure, stormwater infrastructure retrofit, maintenance. [3] Includes the following: debris and sediment removal, streambank stabilization, stream maintenance and restoration. [4] Includes flood problem resolution. [5]Drainage district easements are located within several watershed jurisdictions (listed above). Action recommendations located within and/or adjacent to drainage easements are tabulated separately and are a subset of the total recommendations by jurisdiction. Drainage district action recommendation summaries are not included in the total table summary to prevent double counting of action recommendations.

6.3.5.2 *Site-Specific Actions*

Site-specific actions are comprised of project recommendations and are based on lake and stream inventories, coordination with stakeholders, the WRAPP recommendations and known flood problem areas. The practice applies to a single specific geographic location. This section also includes stakeholder recommendations tied to a physical location. Table 6-19 summarizes all new actions by jurisdiction; a detailed table of each individual action items, complete with all applicable attributes is located in Appendix M. Figure 6-3 shows the location of all site-specific practices. It is important to note that many of the actions align with recommendations developed from NBWW monitoring efforts, designed specifically to address causes and sources of biological impairments.

Table 6-19: Site-Specific Action Summary

JURISDICTION	DETENTION BASIN RETROFITS	STABILIZATION	SHORELINE/ STREAMBANK STABILIZATION	WETLAND RESTORATION /ENHANCEMENT	WATER INFRASTRUCTURE[2]	STORMWATER INFRASTRUCTURE RETROFIT	FLOOD DAMAGE REDUCTION	DEBRIS JAMS	INFRASTRUCTURE MANAGEMENT
	#	#	FEET	ACRES	#	#	#	#	#
City of Highland Park	--	12	13,949.31	474.01	18	2	7	--	--
City of Lake Forest	--	13	16,761.35	639.05	24	3	9	--	--
City of North Chicago	--	--	--	112.51	--	1	--	--	--
City of Park City	--	--	--	21.22	1	--	--	--	--
City of Waukegan	--	--	--	278.33	--	--	2	--	--
Forest Preserve District of Cook County	1	2	22,829.31	379.42	3	--	1	1	--
Illinois State Toll Highway Authority	--	1	630.33	49.05	--	--	--	--	--

JURISDICTION	DETENTION BASIN RETROFITS	STABILIZATION	SHORELINE/ STREAMBANK STABILIZATION	WETLAND RESTORATION /ENHANCEMENT	WATER INFRASTRUCTURE [2]	STORMWATER INFRASTRUCTURE RETROFIT	FLOOD DAMAGE REDUCTION	DEBRIS JAMS	INFRASTRUCTURE MANAGEMENT
	#	#	FEET	ACRES	#	#	#	#	#
Lake County Forest Preserve District	--	6	2,159.25	940.85	7	--	--	4	--
Libertyville Township	--	2	--	355	--	--	1	1	--
Maine Township	1	--	--	3	--	--	--	--	--
Northfield Township	3	--	--	--	1	--	--	--	--
Shields Township	--	--	--	50	--	1	2	--	--
United States Dept. of the Navy	--	1	6,044	30	17	--	--	1	--
Vernon Township	--	--	--	82	--	--	--	2	--
Village of Bannockburn	--	--	--	55	1	1	1		--
Village of Deerfield	11	11	14,666	72	20	1	1	1	--
Village of Glencoe	1	--	--	17	--	--	--	--	--
Village of Glenview	39	--	18,383	140	2	--	--	2	--
Village of Golf	--	--	--	19	--	--	--	--	--
Village of Green Oaks	--	--	3,929	142	--	--	2	--	--
Village of Gurnee	--	--	--	0.3	--	--	--	--	--
Village of Lake Bluff	--	1	3,831	99	--	--	2	2	--
Village of Lincolnshire	--	2	--	29	3	--	--	2	--
Village of Mettawa	--	--	--	71	2	--	--	--	--
Village of Morton Grove	4	--	--	33		--	--	--	--
Village of Northbrook	91	--	--	112	3	--	--	1	--
Village of Northfield	8	--	23,596	62	--	--	--	--	--
Village of Riverwoods	--	--	--	205	2	--	1	2	--
Village of Skokie	8	--	--	37	--	--	--	--	--
Village of Wilmette	2	--	--	6	--	--	--	--	--
Village of Winnetka	--	--	--	10	--	--	--	--	2
West Deerfield Township	--	1	--	20	1	--	1	--	--
TOTAL UNITS	**169**	**52**	**126,777**	**4,542**	**105**	**9**	**30**	**19**	**2**
East Skokie Drainage District[4]	--	13	34,209	1,036	51	2	3	3	--
Union Number 1 - Middle Fork Drainage District[4]	--	--	--	53	1	1	--	--	--
Union Number 1 - West Fork Drainage District[4]	1	11	13,299	66	17	--	--	2	--
West Skokie Drainage District[4]		21	6,682	769	20	1	2	4	--

[1] Stabilization refers to stabilizing erosion at specific locations and/or stabilizing an eroding swale. [2] Water Infrastructure includes one of the following: remove sediment obstructing flow, repair or replace discharge point, bridge, hydraulic structure, or culvert, or investigate potential illicit discharge. [3] Infrastructure Management refers to projects proposed in the Village of Winnetka's Stormwater Master Plan for installation of relief storm sewers. [4]Drainage district easements are located within several watershed jurisdictions (listed above). Action recommendations located within and/or adjacent to drainage easements are tabulated separately and are a subset of the total recommendations by jurisdiction. Drainage district action recommendation summaries are not included in the total table summary to prevent double counting of action recommendations.

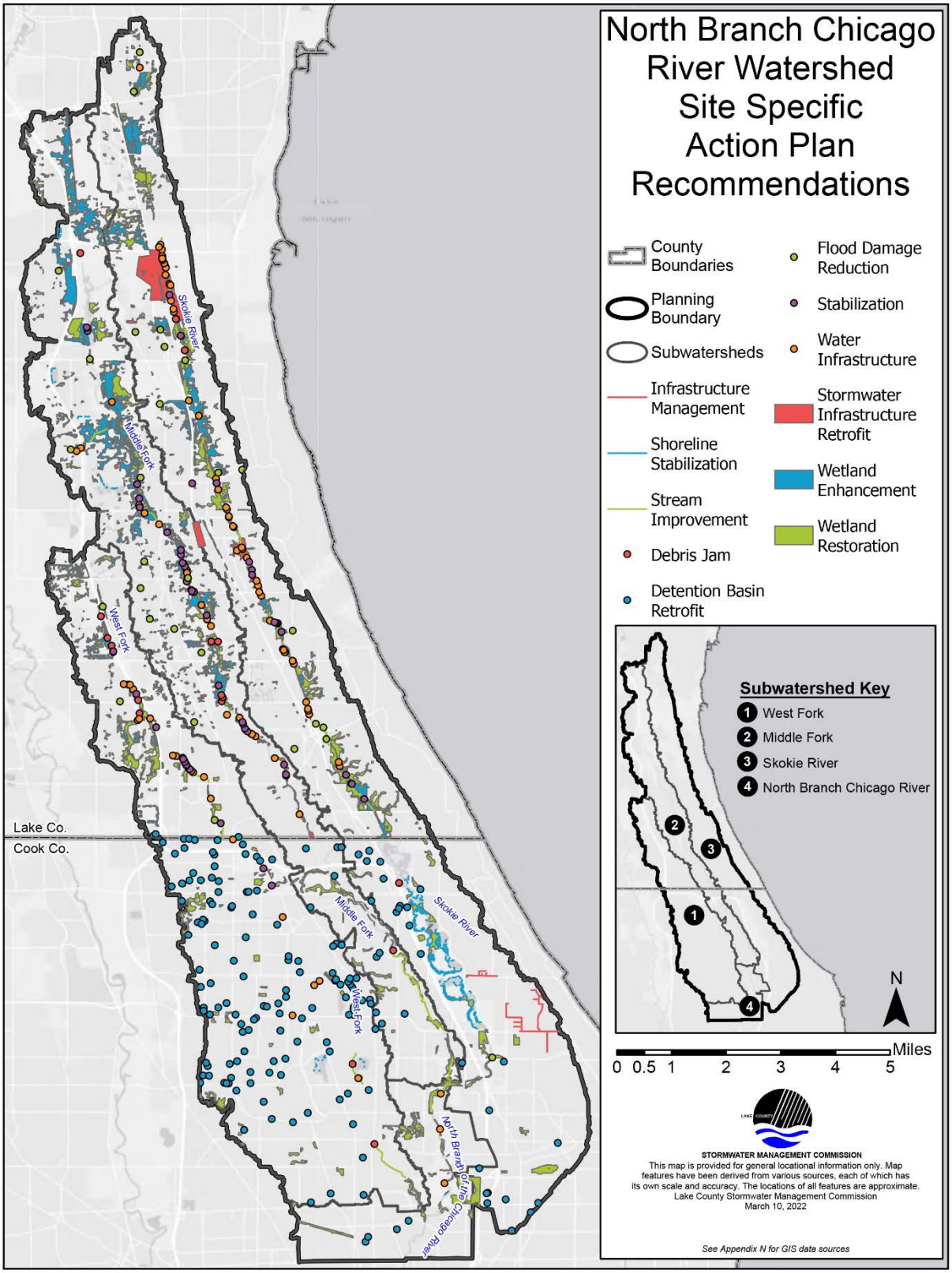


Figure 6-3: North Branch Chicago River Watershed Site-Specific BMPs

6.3.5.3 *Basin-Wide Site-Specific Actions*

Basin-wide site-specific project recommendations are those practices that can be implemented at specific geographic locations, but for which there are a wide array of opportunities across the NBCR planning area. They are based on GIS analysis and although they are "site specific," they are mapped across a large geographic area. Table 6-20 summarizes all basin-wide site-specific actions by jurisdiction; detailed tables of each individual action item, by jurisdiction, complete with all applicable attributes is located in Appendix M. Figure 6-4 shows the location of all basin-wide site-specific practices.

Table 6-20: Basin-Wide Site-Specific Action Summary by Jurisdiction

JURISDICTION	GREEN INFRASTRUCTURE	WETLAND ENHANCEMENT	ROAD SALT MANAGEMENT	RUNOFF VOLUME REDUCTION	STREAM DREDGING
	ACRES	ACRES	ACRES	ACRES	LINEAR FEET
City of Evanston	--	--	9	0.2	--
City of Highland Park	20	121	554	0.9	17,001
City of Highwood	--	--	18	--	--
City of Lake Forest	96	204	578	--	21,298
City of North Chicago	10	35	198	0.2	--
City of Park City	28	18	114	0.6	--
City of Waukegan	212	52	561	4.3	--
Forest Preserve District of Cook County	--	--	89	0.1	--
Illinois State Toll Highway Authority	--	1	9	--	--
Lake County Forest Preserve District	--	217	12	--	18,057
Libertyville Township	265	58	264	1.2	8,853
Maine Township	--	--	19	0.5	--
New Trier Township	--	--	13	0.1	--
Niles Township	--	--	3	--	--
Northfield Township	--	--	40	0.4	--
Shields Township	--	17	49	0.8	--
State of Illinois	--	90	3	--	--
U.S. Dept. of the Navy	--	10	95	--	7,382
Vernon Township	--	3	17	0.1	2,763
Village of Bannockburn	11	66	151	0.1	1,162
Village of Deerfield	114	68	606	1.6	14,158
Village of Glencoe	--	--	71	0.9	--
Village of Glenview	--	--	640	3.7	--
Village of Golf	--	--	9	--	--
Village of Green Oaks	122	130	153	0.1	1,173
Village of Gurnee	19	17	14	--	--
Village of Lake Bluff	--	64	127	0.2	7,897
Village of Lincolnshire	--	80	89	0.2	--
Village of Mettawa	127	40	61	--	1,263
Village of Morton Grove	--	--	248	4	--
Village of Niles	--	--	16	0.4	--
Village of Northbrook	--	--	663	4.5	--
Village of Northfield	--	--	165	--	--
Village of Riverwoods	16	41	31	--	6,537
Village of Skokie	--	--	102	2.3	--

JURISDICTION	GREEN INFRASTRUCTURE	WETLAND ENHANCEMENT	ROAD SALT MANAGEMENT	RUNOFF VOLUME REDUCTION	STREAM DREDGING
	ACRES	ACRES	ACRES	ACRES	LINEAR FEET
Village of Wilmette	--	--	228	5	--
Village of Winnetka	--	--	101	3	--
Warren Township	--	--	0.7	--	--
Waukegan Township	--	--	0.6	--	--
West Deerfield Township	--	6	80	--	4,529
TOTALS	**1,038**	**1,339**	**6,200**	**35**	**112,073**
East Skokie Drainage District*	96	100	--	--	68,646
Union Number 1 - Middle Fork Drainage District*	--	18	--	--	5,738
Union Number 1 - West Fork Drainage District*	26	30	--	--	16,187
West Skokie Drainage District*	167	182	--	--	47,476

*Drainage district easements are located within several watershed jurisdictions (listed above). Action recommendations located within and/or adjacent to drainage easements are tabulated separately and are a subset of the total recommendations by jurisdiction. Drainage district action recommendation summaries are not included in the total table summary to prevent double counting of action recommendations.

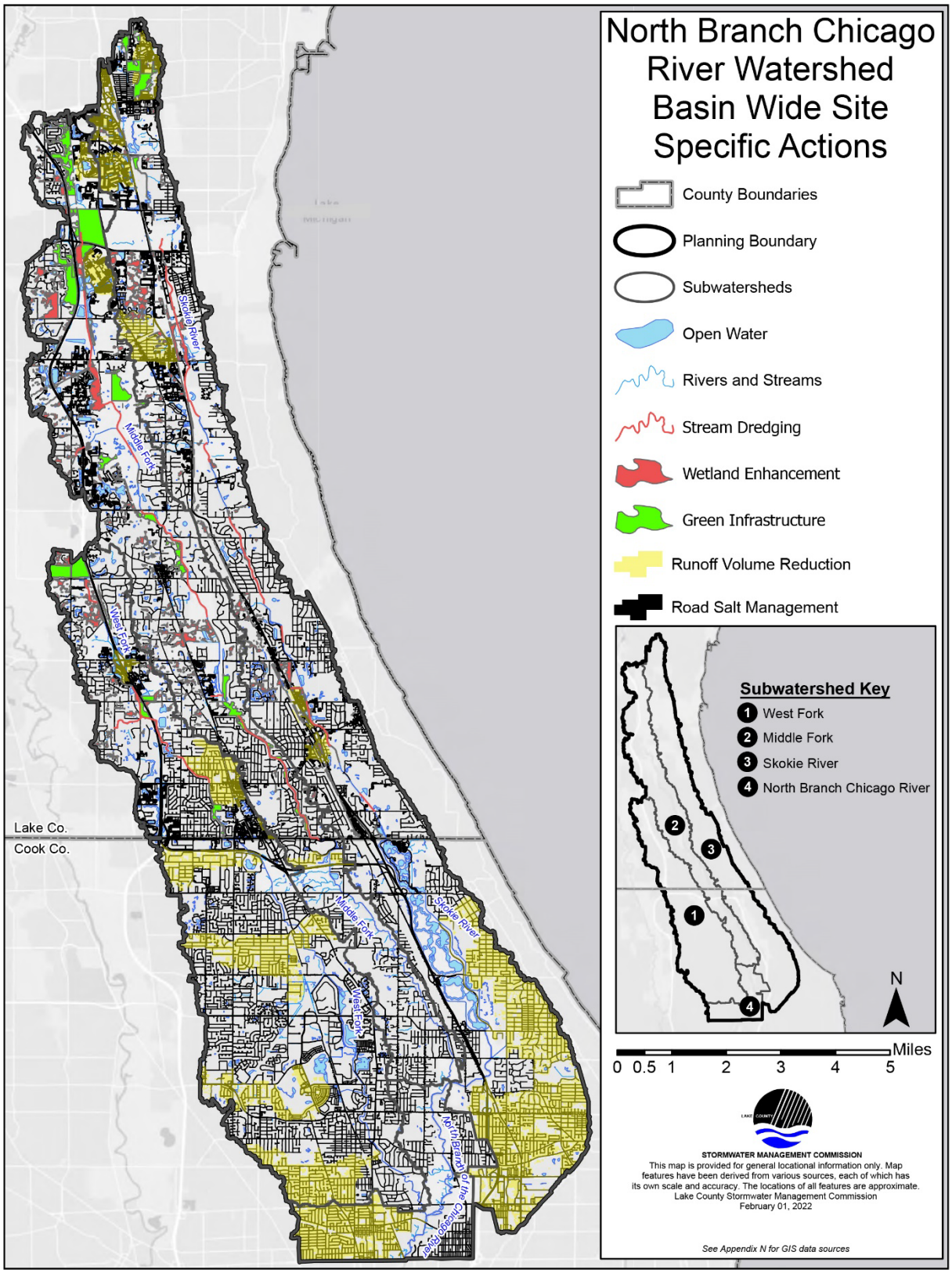


Figure 6-4: North Branch Chicago River Watershed Basin-Wide Site-Specific BMPs

6.3.5.4 *Flood Problem Area Mitigation*

Table 6-21, Table 6-22 and Table 6-23 summarize the flood problem areas and the July 2017 flood incidents within each jurisdiction. It is important to note that some of the flood problem areas inventory sites overlap with reported flood problems from the July 2017 flood event (see Chapter 5). Figure 6-5 shows the distribution of flood problem are inventory sites throughout the NBCR planning area. There are 52 high priority action projects (sites), which include 200 structures and spread across 10 municipalities and 1 township. The City of Highland Park and City of Lake Forest have the greatest number of high priority actions. The City of Highland Park has the greatest number of affected structures from flooding (120 structures).

Table 6-21: Summary of High Priority Flood Mitigation Actions by Jurisdiction

JURISDICTION	# OF HIGH PRIORITY PROJECTS	ESTIMATED # OF AFFECTED STRUCTURES
City of Highland Park	20	120
City of Lake Forest	9	11
City of North Chicago	2	11
City of Park City	3	20
Shields Township	3	15
Village of Deerfield	3	6
Village of Glencoe	2	3
Village of Green Oaks	1	1
Village of Lake Bluff	1	13
Village of Lincolnshire	1	0
Village of Northfield	7	Unknown
TOTAL	**52**	**200**

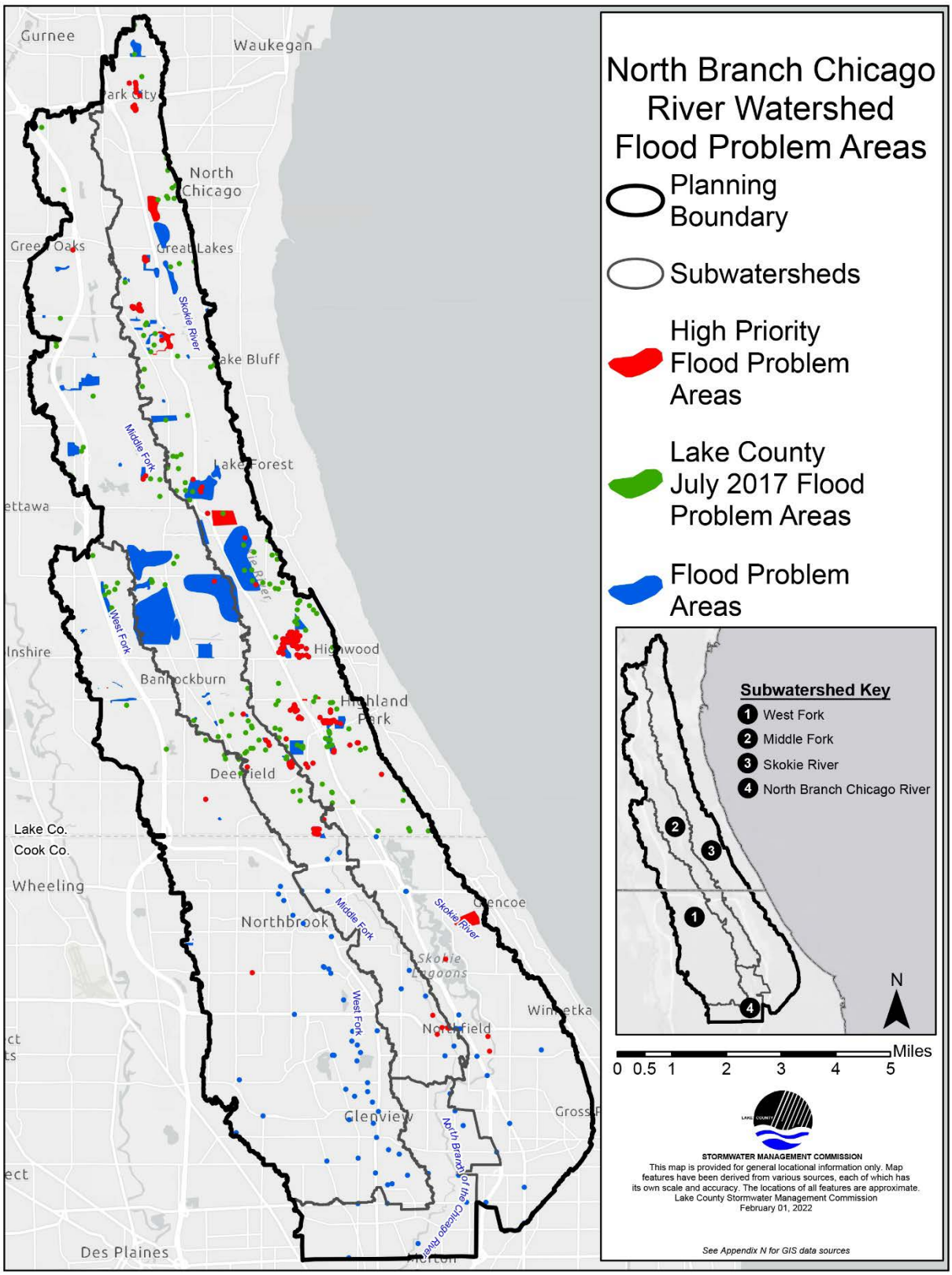


Figure 6-5: NBCR Planning Area Flood Problem Areas

6.3.6 LAKE ACTIONS

6.3.6.1 *Lake Action Recommendations*

This section identifies 35 actions for 9 lakes and is largely based on data and recommendations identified in Lake County Health Department Lake Reports, Skokie River 10-Year Vision and Action Plan, Lake Glenview 2019 Annual Report and the 2019 SMC Lake Assessments (Table 6-24). Lake-specific actions include programmatic, planning, and BMP recommendations. In some cases, the age of the lake report suggests that additional monitoring should be done before implementing any of the other recommendations for that lake. Because the recommendations are based on lake reports, actions may reflect the uses of a particular lake. In general, the most important recommendations across all lakes from a water quality perspective include the development of (and adherence to) lake management plans, implementation of NPS pollution reduction BMPs (particularly for chloride and TMDL pollutants), shoreline restoration, and the management/control of aquatic invasive and exotic species. Similar to the other types of action recommendations in this plan, lake actions have been given a unique ID, priority, time frame for implementation, lead partners are identified, and estimated cost is provided. Lakes with action recommendations are listed in Table 6-25. Lake action recommendations are also included in the online mapping application for the North Branch Chicago River Watershed-Based Plan.

Table 6-22: Summary of Lake Action Recommendations

PRIORITY	NUMBER OF ACTIONS	ESTIMATED COST
High	4	$177,470 - $278,570
Medium	11	$942,700 - $1,500,300
Low	20	$226,732 – $241,032
Total	**35**	**$1,346,902 - $2,769,804**

Table 6-23: Recommended Lake Actions

Lake Name	TMDL	Plan ID	Recommended Actions	Priority	Time Frame	Lead Partner(s)	Cost
Lake Eleanor	N/A	NBLK1	Update Lake Report and monitoring data (Most recent report is >10 years old)	L	L	LCHD	$12,000
		NBLK2	Investigate interest and feasibility of dredging to depths of >10 ft in 25% of lake and installing a wing dam to reduce sediment accumulation, based on local stakeholder interest in previous planning efforts.	L	L	LA	N/A
		NBLK3	Promote spread of native aquatic vegetation (20-40% of lake bottom). Native plant establishment may be difficult if sedimentation is not addressed.	M	L	LA	$8,700 - $17,300
Lake Glenview	N/A	NBLK21	Monitor inlets for nutrients, sediment, and erosion	M	M	M	$20,000
		NBLK22	Create bathymetric map.	L	L	M	$2,000 - $5,000
		NBLK23	Public Education for Landscape Fertilization	L	L	M, PD,	$1,500

Lake Name	TMDL	Plan ID	Recommended Actions	Priority	Time Frame	Lead Partner(s)	Cost
			Practices			HOA	
		NBLK24	Stabilize shoreline erosion.	L	L	M	$50,064
Eagle Lake	TP	NBLK4	Update Lake Report and monitoring data (Most recent report is >10 years old)	L	L	LCHD	$12,000
		NBLK5	Participate in the VLMP	L	L	SI, Illinois EPA	$200
		NBLK6	Create bathymetric map.	L	L	SI, LCHD	$2,000 - $5,000
		NBLK7	Stabilize shoreline erosion.	M	L	SI	$84,600
		NBLK8	Remove invasive shoreline vegetation.	L	L	SI	$4,600 - $6,900
		NBLK9	Install native buffer strip.	L	L	SI	$8,200
		NBLK10	Establish native emergent vegetation along shoreline.	L	L	SI	$8,744
		NBLK11	Create lake management plan that addresses dissolved oxygen and aquatic plant management	M	M	SI	$12,000
Valley Lo Lake	N/A	NBLK29	Establish native emergent vegetation along shoreline.	L	L	PO	$5,480
		NBLK30	Stabilize shoreline erosion.	L	L	PO	$19,500
		NBLK31	Install 25 ft wide riparian buffer where possible.	L	L	PO	$13,700
Old School Lake	N/A	NBLK12	Create bathymetric map.	L	L	LCHD	$2,000 - $5,000
		NBLK13	Monitor Eurasian watermilfoil and curly leaf pondweed	M	M	LCFPD	$3,200- $10,000
		NBLK14	Control invasive shoreline vegetation.	H	M	LCFPD	$2,300 - $3,400
		NBLK15	Install 25 ft wide riparian buffer width while maintaining public access for fishing.	H	M	LCFPD	$5,470
Skokie Lagoons	TP	NBLK25	Remove invasive emergent vegetation and replace with natives.	M	M	FPDCC	$35,000 - $70,000
		NBLK26	Remove invasive shoreline vegetation and replace with natives.	M	L	FPDCC	$700,000 - $1,200,000
		NBLK27	Monitor inlets/outlets for nutrients, sediment, and erosion. Share existing and future monitoring data between agencies.	M	L	FPDCC, CBG, M, NBWW	$20,000
		NBLK28	Assess aging infrastructure including dams and water control structures.	H	L	FPDCC, CBG, M	$100,000 - $200,000
Lucky Lake	N/A	NBLK32	Stabilize shoreline erosion.	M	M	PO	$52,000
		NBLK33	Install 25 ft wide riparian buffer where possible.	L	L	PO	$4,928
Lambs Farm Lake	N/A	NBLK34	Stabilize shoreline erosion.	L	L	PO	$72,600
		NBLK35	Install 25 ft wide riparian buffer where possible.	L	L	PO	$5,016
Lake Kathryn	N/A	NBLK16	Update bathymetric map.	L	L	M, LCHD	$2,000 - $5,000

Lake Name	TMDL	Plan ID	Recommended Actions	Priority	Time Frame	Lead Partner(s)	Cost
		NBLK17	Participate in the VLMP.	L	L	M, Illinois EPA	$200
		NBLK18	Stabilize shoreline erosion.	H	M	M	$69,700
		NBLK19	Remove invasive shoreline vegetation and increase riparian buffer width to at least 25 ft where possible.	M	L	M	$4,000 - $4,400
		NBLK20	Control Eurasian watermilfoil	M	L	M	$3,200 - $10,000

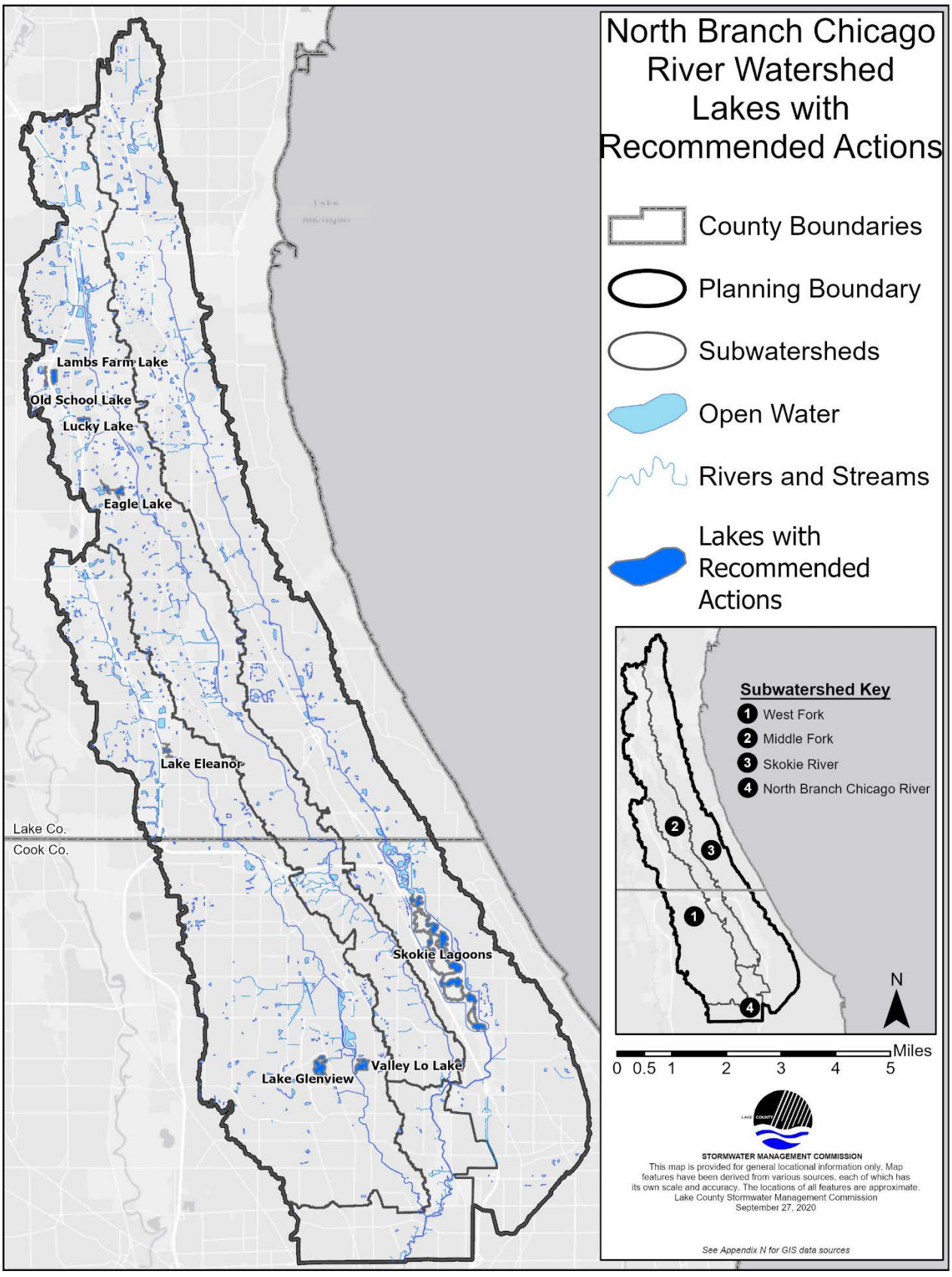


Figure 6-6: Lakes with Action Plan Recommendations

6.4 REFERENCES

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COMMON ACRONYMS/ABBREVIATIONS USED IN CHAPTER 7

BMP – Best Management Practices

CFU – Colony Forming Unit

NBCR planning area – North Branch Chicago River Watershed Planning Area

NBWW – North Branch Chicago River Watershed Workgroup

DRG – Stream Dredging

FEMA – Federal Emergency Management Agency

GI – Green Infrastructure

IDNR – Illinois Department of Natural Resources

Illinois EPA – Illinois Environmental Protection Agency

INLRS – Illinois Nutrient Loss Reduction Strategy

LCFPD – Lake County Forest Preserve District

LCHD – Lake County Health Department

LMU – Lakes Management Unit

NGRREC – National Great Rivers Research and Education Center

QAPP – Quality Assurance Project Plan

RVR – Runoff Volume Reduction

SMC – Lake County Stormwater Management Commission

TKN - Total Kjeldahl Nitrogen

TMDL – Total Maximum Daily Load

TSS – Total Suspended Solids

US EPA – United States Environmental Protection Agency

USGS – United States Geological Survey

VLMP – Illinois Volunteer Lake Monitoring Program

WLE – Wetland Enhancement

WRAPP – Wetlands Restoration and Preservation Plan

WWTP – Wastewater Treatment Plant

7 PLAN IMPLEMENTATION AND EVALUATION

This chapter identifies a strategy and provides guidance to support transition from planning to implementation and to evaluate the effectiveness of implementation toward the goals and objectives of the plan. The primary components of this chapter include:

- Pollution load reduction estimates of action recommendations
- Estimated costs of plan implementation
- Leaders and supporters for plan implementation
- Initial steps for plan implementation
- Funding resources and opportunities
- Implementation schedule
- Evaluating plan performance
- Indicator and milestone grading system
- Water quality monitoring strategy
- Updating the watershed plan

How readily this plan is used and implemented by NBCR planning area stakeholders is a major indicator of its success and is easily measured by tracking the actions taken. Improvement in watershed resources or water quality are other indicators of success achieved through monitoring. Successful plan implementation will require significant cooperation and coordination among lead and support partners to secure and allocate resources and apply them to actions in the NBCR planning area. This watershed-based plan can be considered a living document and has the flexibility for stakeholders to make revisions over time that reflect shifts in local priorities or watershed conditions.

7.1 ESTIMATE OF POLLUTANT LOAD REDUCTIONS AND TARGETS

Pollution load estimates were made using the nonpoint source model described in Chapter 4. The purpose of estimating pollutant load reductions and targets in the NBCR planning area is to present a general idea of BMP implementation benefits and to outline the practices that result in the greatest benefit to the watershed and achieve plan goals.

Load reduction estimates were **not** performed for all actions identified in Chapter 6; estimates were made for projects with specific on-the-ground locations, where project information was collected, and reduction efficiencies are available in literature sources. Many actions presented in Chapter 6 are planning level actions, and do not have the detail of information at this time to support load reduction estimates; estimates are calculated for individual implementation projects during the design stage of the project as site information is generated. Table 7-1 includes the action recommendation category codes. Site specific actions are coded with a watershed number and a sequential project number (ex. 24-0001). Basin Wide Site-Specific actions are coded with a BMP type abbreviation followed by an abbreviation of the jurisdiction the centroid of the action is

within (ex. RVR-LFP). Table 7-2 outlines the pollutant load reduction efficiencies for each action plan recommendation category using the USEPA Region 5 Model; certain project categories have ranges in efficiencies due to variations in contributing watershed area.

Table 7-1: Action Recommendation Category Codes

ID CODE	ACTION CATEGORY	ID CODE	ACTION CATEGORY
SITE-SPECIFIC ACTION PLAN RECOMMENDATION CODES – BY SUBWATERSHED			
24	Skokie River	**26**	West Fork
25	Middle Fork	**27**	North Branch Chicago River
BASIN WIDE ACTION PLAN RECOMMENDATION CODES – BY JURISDICTION			
GI	Green Infrastructure	**DRG**	Stream Dredging
RVR	Runoff Volume Reduction	**WLE**	Wetland Enhancement
BASIN WIDE ACTION PLAN RECOMMENDATION CODES – BY JURISDICTION			
EVA	City of Evanston	**GLN**	Village of Glencoe
HLD	City of Highland Park	**GLV**	Village of Glenview
HWD	City of Highwood	**GLF**	Village of Golf
LFT	City of Lake Forest	**NIL**	Village of Niles
NCH	City of North Chicago	**NBK**	Village of Northbrook
PRK	City of Park City	**WKA**	Village of Winnetka
WAK	City of Waukegan	**GRN**	Village of Green Oaks
CFP	Forest Preserve District of Cook County	**GUR**	Village of Gurnee
TOL	Illinois State Toll Highway Authority	**KEN**	Village of Kenilworth
LFP	Lake County Forest Preserve District	**LKB**	Village of Lake Bluff
TLIB	Libertyville Township	**LSH**	Village of Lincolnshire
TMNE	Maine Township	**MET**	Village of Mettawa
TNTT	New Trier Township	**NGR**	Village of Morton Grove
TNIL	Niles Township	**NFD**	Village of Northfield
TNFD	Northfield Township	**RIV**	Village of Riverwoods
TSHT	Shields Township	**SKO**	Village of Skokie
SIL	State of Illinois	**WIL**	Village of Wilmette
NAV	United States Department of the Navy	**TWAR**	Warren Township
TVRN	Vernon Township	**TWAK**	Waukegan Township
BAN	Village of Bannockburn	**TWDF**	West Deerfield Township
DFD	Village of Deerfield		

7.1.1 Reduction Estimates for Site Specific Actions

Load reduction estimates are provided for the majority of project/site-specific recommendations throughout the NBCR planning area that are summarized in the action plan (Chapter 6) and detailed in Appendix M. Load reductions also include basin-wide site-specific BMPs, streambank, and lake shoreline stabilization BMPs.

Table 7-2 and Table 7-3 summarizes the annual load reduction estimates by project type for all BMPs identified for the NBCR planning area during the planning process. Estimates also do not account for load reductions from programmatic, education and outreach, and policy and regulatory actions since direct impacts are not easily determined at this stage of the planning process.



Figure 7-1: Skokie River Streambank Stabilization Project in Lake Forest.

Based on the review of reduction estimates, project/site-specific and basin-wide site-specific actions identified in the watershed-based plan are effective for addressing water quality problems and impairments in the watershed such as sediment, nitrogen, and phosphorus. Those actions are moderately effective in addressing fecal coliform and chloride, and programmatic and regulatory actions will be more effective at addressing these pollutants throughout the watershed. Due to the proportion of pollutant loading that originates from point sources, alignment, and coordination with the WWTPs will also be critical for addressing chloride, nitrogen, and phosphorus loading.

Table 7-2: Estimated Annual Basin-Wide BMP Load Reductions

BMP	QUANTITY OF BMP	NITROGEN REDUCTION (lbs/yr)	PHOSPHORUS REDUCTION (lbs/yr)	CHLORIDE REDUCTION (lbs/yr)	SEDIMENT REDUCTION (tons/yr)	BACTERIA REDUCTION (BILLION CFU/YR)
Basin-Wide Site-Specific BMPs						
Green Infrastructure	1,038 ac	N/A	N/A	N/A	N/A	N/A
Road Salt Management	6,199 ac	N/A	N/A	2,030,247	N/A	N/A
Runoff Volume Reduction	35 ac	66	13	6,630	15,656	654
Stream Dredging	112,072 ln ft	N/A	N/A	N/A	N/A	N/A
Wetland Enhancement	1,338 ac	N/A	N/A	N/A	N/A	N/A
Total		**66**	**13**	**2,036,878**	**15,656**	**654**

Table 7-3: Estimated Annual Site-Specific BMP Load Reductions

BMP	QUANTITY OF BMP	NITROGEN REDUCTION (lbs/yr)	PHOSPHORUS REDUCTION (lbs/yr)	CHLORIDE REDUCTION (lbs/yr)	SEDIMENT REDUCTION (tons/yr)	BACTERIA REDUCTION (BILLION CFU/YR)
Debris Jam	19 each	NA	N/A	N/A	N/A	N/A
Detention Basin Retrofit	169 each	N/A	N/A	N/A	N/A	N/A
Flood Damage Reduction	30 each	N/A	N/A	N/A	N/A	N/A
Infrastructure Management	2 each	N/A	N/A	N/A	N/A	N/A
Shoreline Stabilization	16,141 ln ft	464	232	N/A	224	N/A
Stabilization	9 each	86.81	43.91	N/A	42.76	N/A
Stormwater Infrastructure Retrofit	9 each	N/A	N/A	N/A	N/A	N/A
Stream Improvements	110,636 ln ft	7,096	3,548	N/A	3,513	N/A
Water Infrastructure	105 each	N/A	N/A	N/A	N/A	N/A
Wetland Restoration	2,668 acres	3,679	568	130,446	322	9,891
Wetland Enhancement	1,875 acres	N/A	N/A	N/A	N/A	N/A
TOTAL REDUCTION ESTIMATES		**11,326**	**4,391**	**130,446**	**4,101**	**9,891**

7.1.1.1 *Load Reduction Targets*

Water quality targets were established based on review of the North Branch Chicago River Watershed Stage 3 TMDL Report. The TMDL Report was used as guidance for chloride, Total phosphorus, Total Suspended Solids (TSS), Sedimentation/Siltation and fecal coliform. The Illinois Nutrient Loss Reduction Strategy (INLRS) would be adopted for sediment, nitrogen, and phosphorus. Pollutant load reduction targets for nitrogen, phosphorus, sediment, chlorides and fecal coliform are shown in Table 7-4.

Table 7-4: Nonpoint and Point Source Load Reduction Targets

POLLUTANT	REDUCTION TARGET (%)	NOTES
Nitrogen	**45%**	Based on the INLRS
Phosphorus (lbs/yr)	**45%**, except for lakes with a phosphorus TMDL, where the TMDL targets apply.	Based on TMDL estimates and the INLRS. See Section 3.16.2 for TMDL load reduction targets for specific lakes.
Sediment (tons/yr)	**45%**, except for stream segments with a TSS or Sedimentation/Siltation TMDL, where the TMDL targets apply.	Based on INLRS target for phosphorus. See Section 3.16.2 for TMDL load reduction targets for specific stream segments with TSS or Sedimentation/Siltation TMDL.

POLLUTANT	REDUCTION TARGET (%)	NOTES
Chloride (lbs/yr)	**10%**, planning area-wide; except for stream segments with a Chloride TMDL, where TMDL targets apply.	Target represents a range for streams modeled in the North Branch Chicago River TMDL and is consistent with TMDL recommendations. See Section 3.16.2 for TMDL load reduction targets for TMDL stream segments.
Fecal Coliform (billion CFU)	**82%** planning area-wide; except for stream segments with a Fecal Coliform TMDL, where TMDL targets apply.	The fecal coliform target is based on the North Branch Chicago River TMDL average of the modeled reductions over a range of flows; a reduction target of 82% was selected which accounts for seasonal variability. See Section 3.16.2 for TMDL load reduction targets for stream segments with a Fecal Coliform TMDL.

Comparing the nonpoint and point source load reduction estimates to the total modelled pollutant loads suggests that moderate reductions may result from BMP implementation. Table 7-5 shows the breakdown of estimated nonpoint and point source pollutant loads in comparison to the total pollutant loads. Table 7-6 shows the estimated percent reductions in nonpoint source pollutant loads that can be achieved through BMP implementation. The key points to consider are:

1. Project/site-specific and basin-wide site-specific actions are most effective at addressing sediment. Focusing on wide-spread adoption of field borders and riparian native buffers, as well as streambank and shoreline stabilization, will help address sediment loading and exceed the target reduction.
2. Project/site-specific and basin-wide site-specific actions are nominally effective in addressing nitrogen, phosphorus, and chloride. Load reduction targets can also be achieved by reducing contributions from point sources.
3. Programmatic and regulatory actions may better address chloride by greatly reducing application rates. BMPs typically have poor chloride removal efficiencies because chloride is dissolved in the water. Furthermore, the cost of implementing BMPs to address chloride throughout dense urban areas (primary source) is high.
4. Watershed-wide detention practices, wetland restoration and streambank stabilization can reduce a relatively large percentage of the nonpoint source component of phosphorus and nitrogen loading.
5. Project/site-specific and basin-wide site-specific actions are moderately effective in addressing nonpoint source fecal coliform and must be focused at addressing the major urban area sources. Watershed-wide adoption of urban detention practices are necessary to achieve more noticeable reductions in fecal coliform.

Table 7-5: NBCR Planning Area Estimated Pollutant Loading (Nonpoint & Point Sources)

POLLUTANT	ESTIMATED NONPOINT SOURCE POLLUTANT LOADING[1]	ESTIMATED POINT SOURCE POLLUTANT LOADING	TOTAL POLLUTANT LOADING
Nitrogen (lbs/yr)	341,005	1,282,659	**1,623,664**
Phosphorus (lbs/yr)	52,572	62,441	**115,013**
Sediment (tons/yr)	24,718	62	**24,780**
Chloride (lbs/yr)	61,264,885	29,048,596	**90,313,481**
Fecal Coliform (billion CFU/yr)	1,935,149	58,865,740	**60,800,889**

[1] – Nonpoint source loading totals includes stream and shoreline erosion, gully erosion and failing septic systems

Table 7-6: Estimated Nonpoint Source (NPS) Pollutant Load Reductions from BMPs

POLLUTANT	TOTAL ESTIMATED NPS POLLUTANT LOADING	ESTIMATED SITE-SPECIFIC BMP ANNUAL NPS POLLUTANT LOAD REDUCTIONS (%)	ESTIMATED BASIN-WIDE BMP ANNUAL NPS POLLUTANT LOAD REDUCTIONS (%)	ESTIMATED ANNUAL NPS LOAD REDUCTIONS (%)
Nitrogen (lbs/yr)	341,005	3.3	0.02	**3.32**
Phosphorus (lbs/yr)	52,572	8.4	0.03	**8.43**
Sediment (tons/yr)	24,718	16.6	63.3	**79.9**
Total Dissolved Solids (lbs/yr)	61,264,885	0.2	3.3	**3.5**
Fecal Coliform (billion CFU)	1,935,149	0.5	0.03	**0.53**

7.2 COST ESTIMATES

Actions recommended in this plan will be implemented by numerous lead and supporting partners (as indicated in Chapter 6 and Appendix M), and therefore the estimated costs of plan implementation are spread across various watershed stakeholders. The summary of cost estimates that follows is intended to provide a general idea of the scope of all projects considered in the plan but is not to be construed as a single "project cost" to be borne by a lone watershed entity. Table 7-7 summarizes the estimated funding required for the site-specific actions identified in the action plan (Chapter 6). The identified site-specific actions represent the main projects that are recommended for implementation. Table 7-8 summarizes the estimated funding required for the basin-wide site-specific actions identified in the action plan. The identified basin-wide site-specific actions represent all the projects that are needed to meet the full potential of non-point source pollution reduction in the NBCR planning area. The cost estimates are for direct implementation projects and not the administrative, project management, and watershed coordinator costs. For all BMPs, an additional 20% should be considered to account for engineering/permitting and annual maintenance.

Cost estimates are generated from a combination of technical experience, previous watershed-based plans, and the USDA's average practice cost list. Cost estimates are generalized for watershed-scale planning purposes and these estimates should not be used to calculate costs for individual projects, as costs may range significantly depending on site conditions. Appendix J includes criteria and assumptions used to develop the cost estimates listed in Table 7-7. Potential funding sources are included in Appendix K.

Table 7-7: Cost Estimates for Site-Specific Action Recommendations

TYPE	# OF PROJECTS/ACTIONS	ACRES PRACTICE	ESTIMATED TOTAL COST
Debris Jam	19	N/A	$ 252,000
Detention Basin Retrofit	169	N/A	$ 1,160,000
Flood Damage Reduction	30	N/A	$ 2,944,562
Infrastructure Management	2	N/A	$38,735,972
Shoreline Stabilization	9	16,141 ln ft	$ 1,775,524

TYPE	# OF PROJECTS/ACTIONS	ACRES PRACTICE	ESTIMATED TOTAL COST
Stabilization	52	N/A	$ 930,500 - $ 2,333,000
Stormwater Infrastructure Retrofit	9	N/A	$ 10,963,000
Stream Improvement	23	110,636 ln ft	$ 35,264,835
Water Infrastructure	105	N/A	$ 690,500
Wetland Restoration	1,093	2,668 Acres	$ 232,083,687
Wetland Enhancement	39	1,875 Acres	$ 61,864,845
Lake Actions	*35*	*N/A*	*$ 1,346,902 - $ 2,769,804*
		TOTALS:	**$ 388,012,326 - $ 390,873,728**

Note: Lake Actions are a mixture of both site-specific and basin-wide site-specific action plan recommendations. For more information on lake action recommendations see Chapter 6, Section 6.3.6.

Table 7-8: Summary of Cost of Recommended Basin-Wide Site-Specific Actions by Priority

TYPE	ESTIMATED COST			
	HIGH PRIORITY	MEDIUM PRIORITY	LOW PRIORITY	TOTAL
Green Infrastructure	--	--	--	--
Road Salt Management	--	--	--	--
Runoff Volume Reduction	--	--	$ 10,766,620 – $ 53,833,094	$ 10,766,620 – $ 53,833,094
Stream Dredging	--	--	$ 34,966,424	$ 34,966,424
Wetland Enhancement	--	$ 44,163,379	--	$ 44,163,379
Total	--	**$ 44,163,379**	**$ 45,733,044 – $ 88,799,518**	**$ 89,896,423 – $ 132,962,897**

When basin-wide site-specific BMPs are included, the cost estimate for all possible nonpoint source reduction projects totals over $500 million. It is important to consider that there are many complimentary benefits in addition to water quality improvements that are not necessarily quantified in this estimate. When evaluating implementation strategies, it is important to consider the benefits such as green infrastructure enhancement, improved habitat, increased recreational value, and reduced flooding issues.

7.3 NEXT STEPS FOR PLAN IMPLEMENTATION

Often, the greatest challenge of any watershed management process is its coordinated implementation. Successful implementation requires widespread coordination, effective partnerships and support, local leadership, financial and technical resources, time, and a genuine willingness to translate planning to action on-the-ground. The NBCR planning area includes many implementation partners and supporters that will have to coordinate efforts to implement the recommendations in the action plan. No single partner has the financial or technical resources to accomplish the plan goals and objectives; partners working together are necessary to

achieve meaningful results. Responsible entities are defined as jurisdictions; these entities have primary responsibility over actions or practices within their boundaries. Jurisdictions include municipalities, townships, counties, forest preserve districts, and the State of Illinois. Supporting partners are described in Section 6.1 Implementation Partners. Responsible entities or lead jurisdictions as well as supporting partners are further detailed in the individual action item tables located in Appendix M.

Combining and coordinating resources, funding, effort, and leadership will be the most efficient and effective means of maintaining watershed health. Implementation of this plan will also require the development of partnerships with local, state, and federal organizations for implementation, technical assistance, and funding. These efforts require the investment of a significant amount of time and resources. Table 7-9 below shows five immediate, year-one priorities. The following subsections describe the key components of successful and sustainable plan implementation.

Table 7-9: Year One Plan Implementation Priorities

RECOMMENDED ACTION/PRIORITY
1. Working with NBWW, the North Branch Chicago River Watershed Planning Committee and North Branch Watershed Consortium to determine specific year-1 implementation actions; coordinate with NBWW on short term monitoring and modeling priorities.
2. Research funding and technical assistance to implement recommendations identified in the action plan.
3. Submit grant applications, if applicable, and secure additional funding sources for plan implementation.
4. Coordinate available programs, policy changes, and other local initiatives and programs where private landowners are responsible for participation or implementation.
5. Promote and adopt the plan; prioritize and incorporate plan recommendations into existing programs, activities, and budgets.

7.3.1 Plan Adoption

Support of the goals, objectives and recommendations of the North Branch Chicago River Watershed-Based plan update should be formalized through adoption by primary implementation entities (jurisdictions) and lead and support partners. Jurisdictions should adopt the watershed-based plan so that there is a basis for the incorporation of plan recommendations into the operations and procedures of the organization and its pursuit of project funding and implementation relevant to the NBCR planning area. Chapter 6 outlines the NBCR planning area jurisdictions and lead and support partners responsible for implementing the action recommendations of the watershed-based plan.

7.3.2 Support and Maintain Exiting Watershed Planning Committee(s)

One important step for plan implementation will be continued support for existing watershed organizations to lead, organize, and coordinate plan actions. The North Branch Chicago River Watershed Planning Committee and North Branch Watershed Consortium (watershed planning committees) are a well-established planning group for the NBCR planning area as a whole and is made up of representatives throughout the watershed. These two watershed planning committees have combined their efforts with the North Branch Chicago River Watershed Workgroup (NBWW) for better education and outreach efforts and to reduce duplicated efforts.

Responsibilities of the committee(s) include administration, coordination of stakeholders to support individual watershed projects, and working with regulatory partners on recommended policies and programs.

Throughout the watershed planning process, the existing watershed planning committees have provided valuable input regarding issues, resources, priorities, and actions. The committees can continue to hold regular meetings, take a lead in facilitating plan recommendations, organize watershed field trips, host educational workshops and forums, and bring watershed stakeholders and multiple units of government together to discuss issues and opportunities. The watershed planning committees are encouraged to generate stakeholder interest and involvement with implementation. As projects are initiated, the positive environmental, aesthetic, and community benefits will lead to additional participation.

7.3.3 Stakeholder Participation and Engagement

There are tangible benefits to stakeholder participation in watershed activities, from positive media attention to improved quality of life for residents. Increased involvement also can yield and leverage significant local, state, and federal funding opportunities to help share the cost of project implementation. Some actions can be added to existing capital improvement and maintenance plans, budgets, and schedules. This is a fairly quick and easy approach to implementing recommendations within the purview of specific jurisdictions. In other cases, an action recommendation will require the involvement of multiple stakeholders, such as residents, a municipality, and a county, state, or federal agency to provide financial and technical support. Some actions require cross-jurisdictional coordination for issues; for example, establishing a green infrastructure corridor along a stream channel, or natural area preservation and restoration often require interjurisdictional cooperation and may require a longer time frame for implementation. Other actions will require the cooperation of individuals or groups of landowners, whether they are residents, homeowners' associations, businesses, or institutions.

7.3.4 Identify Implementation Champions

Implementation actions require a leader or a single champion for the project, to organize resources and keep the project(s) moving forward. This champion may be the watershed organization, or a single entity such as a landowner, a subwatershed group, or a municipality. In some cases, actions recommend the adoption of new policies, plans, or standards that modify the form, intensity, or type of development or redevelopment in the watershed in a way that better protects resources. These actions will require some effort on the part of municipalities to understand how plans and policies can be modified and to discuss and adopt new, or modify existing, policies, plans, and standards.

7.3.5 Resources and Funding

Funding implementation and watershed coordination actions are a priority. Securing sources of funding engages contract-level accountability and performance requirements that stakeholders are often more responsive to. There are numerous sources of funds available to help support projects or provide cost-share to match other sources of funds. A list of numerous local, regional, state, and federal funding sources is identified in Appendix L. Most of the programs require a local match of funds or in-kind services. Although these funding sources can provide a good source of revenue, significant local investment of time and money will be required

to move this plan forward. These soft costs must be evaluated and incorporated into the operating strategies of the individual partners.

Many federal, state, local, and private programs are available. There are numerous sources of funding available to support projects or provide cost-share to match other sources of funds. Appendix K outlines the most common and available potential sources of funding for the technical assistance and actions identified in the plan; most BMPs recommended **are** eligible for some form of funding. Information regarding potential funding sources is readily available online and applicants should research available programs ahead of time to understand the funding cycles, conditions, and terms. Most grant programs require financial or labor match, thus applications that leverage multiple sources also have the highest probability of being successful.

7.3.6 Implementation Partners

Parties who are key potential partners whose support will lead to the realization of identified goals for the NBCR planning area are listed in Chapter 6 and in the detailed action plan tables in Appendix M as implementation partners. These organizations are listed as such because they are expected to fulfill one or more of the following functions:

- Oversee or implement watershed protection, restoration, and remediation strategies
- Acquire funding for watershed plan implementation
- Organize or participate in data collection
- Provide regulatory or technical guidance and issue permits
- Monitor the success of the watershed plan
- Acquire land for green infrastructure restoration or protection purposes
- Develop education strategies

Because implementation of the watershed-based plan will largely rest with local units of government, it is critical that they be involved from the beginning. They usually have the most to gain by participating and the most up-to-date information on the structure, needs, and available resources of the community. In addition, some of the most powerful tools for implementation, such as planning, controlling development standards, and zoning reside at the local, jurisdictional level.

7.4 EVALUATING PLAN PERFORMANCE

An important component of any watershed planning initiative is the ability to monitor performance towards goals and objectives. This section focuses on the administrative-based monitoring that tracks the activities of stakeholders and the range of actions that are implemented. Section 7.5 discusses direct monitoring of quantitative criteria such as water quality and aquatic health that indicate the effectiveness of implementation actions.

7.4.1 Evaluating Plan Implementation Performance

It is necessary to monitor the progress towards achieving the five watershed goals of this watershed-based plan outlined in Chapter 2. Tracking progress relevant to these is as simple as an organized system in each

jurisdiction to keep track of what is happening in their portion of the watershed. Communicating and reporting progress towards goals is equally as important as tracking them in the first place.

The following recommendations are included to help track progress and achieve the goals with plan implementation.

- In the early stages of the plan implementation process, stakeholders should establish a sustainable and active watershed committee that will meet biennially to quarterly to discuss activities and progress towards goals. A list of completed actions, proposed, and in-progress actions should be tracked for each jurisdiction.
- The plan should be evaluated every five years to assess the progress made as well as to revise the plan, if appropriate, based on the progress achieved. The plan should also have a comprehensive review and update after 10-years Section 7.7). Amendments and changes may be made more frequently as laws change or new information becomes available that will assist in providing a better outlook for the watershed. As goals are accomplished and additional information is gathered, efforts may need to be shifted to issues of higher priority.
- The watershed planning committees should request each major jurisdiction and project partner in the watershed to provide an annual update, which could be in the form of a scorecard that tracks progress towards goal objectives via measurable milestones. The scorecard system is presented in Section 7.4.2 and Appendix L. It is an easy and effective way to compile and track progress in a measurable way and evaluate the effectiveness of achieving short, medium, and long-term goals. Scorecards are an effective way to identify what needs attention and what stakeholders should focus on in the next year.
- Other opportunities for evaluating the status of plan implementation include the completion of quarterly project reports or group meeting minutes. Since this plan is a flexible tool, changes/modifications are anticipated based on usability and changes in priority throughout implementation.

7.4.2 Measureable Milestones and Scorecard System

Interim measurable milestones are directly tied to the NBCR planning area performance indicators. Milestones are essential when determining if management measures are being implemented and how effective they are at achieving plan goals and objectives over given time periods. This allows for periodic plan updates and changes that can be made if milestones are not being met. Watersheds are complex systems with varying degrees of interaction and interconnection between physical, chemical, biological, hydrological, habitat, and social characteristics. Indicators that reflect these characteristics may be used as a measure of watershed health. Goals and objectives in the plan determine which indicators should be monitored to assess success. Physical indicators could include amount of sediment entering a steam reach or presence or lack of adequate stream buffers, whereas chemical and biological indicators could include nitrogen loads or macroinvertebrate health. Social indicators can be measured using demographic data or, for example, the number of landowners adopting conservation practices. NBCR planning area scorecards were developed for each of the watershed-based plan goals and are located in Appendix L. Table 7-10 provides an example indicator and associated milestones for each goal as taken from the complete scorecards in Appendix L.

Table 7-10: Example Indicators and Milestones for Each Goal

GOAL	EXAMPLE INDICATOR	SHORT TERM MILESTONE (1-5 YRS)	MEDIUM TERM MILESTONE (6-10 YRS)	LONG TERM MILESTONE (10+ YRS)
1. Water Quality Improvements	Number of waterbodies removed from the Illinois EPA's impaired list.	2 lakes / 1 stream segment	6 Lakes / 3 stream segments	30 Lakes / 6 steam segments
2. Flood Damage Reduction	Percentage of structures with flood insurance in the 100-year floodplain.	25%	50%	100%
3. Protect & Enhance Natural Resources	Area of degraded natural communities restored.	1,000 acres	5,000 acres	10,000 acres
4. Public Information & Education Program	Number of people reached by outreach campaign.	Establish outreach campaign	5,000	10,000
5. Community and Agency Participation and Coordination	Number of municipalities, counties, and natural resource agencies that adopt the North Branch Chicago River Watershed-Based Plan Update.	25 Agencies	All Agencies	All Agencies

This scorecard system should serve as an organizational monitoring plan and a tool for tracking progress toward meeting plan goals and specific recommendations and action items. Realistic short, medium, and long-term milestones are included for each indicator in the scorecards (Table 7-15 through Table 7-19). Each milestone is a specific action recommendation and is intended to fulfill plan objectives if executed. Indicators are to be used as measurement tools when determining if each milestone has or has not been met. If the measurement of each indicator becomes problematic, the watershed planning committee should revisit and make adjustments where needed. It is up to local stakeholders to determine the priority of each milestone based on their ability to follow through with them. Scorecard evaluation on an annual basis is an effective way to identify priorities and what stakeholders should focus on in the next planning year. Milestones in the scorecards can be graded based on the following criteria: A = Met or exceeded milestone(s); B = Milestone(s) 75% achieved; C = Milestone(s) 50% achieved; D = Milestone(s) 25% achieved; F = Milestone(s) not achieved

7.4.3 Plan Implementation Schedule

Implementing actions should occur immediately where specific projects and willing stakeholders have been identified. A general implementation schedule is presented in Table 7-11. More detailed timeframes are included in Appendix M for each site-specific action.

Table 7-11: General Implementation Schedule

TASK	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
Promote and adopt the plan	X									

Determine specific year-1-5 implementation actions; coordinate with NBWW on short term monitoring priorities.	X	X								
Research funding and technical assistance to implement priority recommendations identified in the action plan.	X	X	X	X						
Submit grant applications if applicable and secure additional funding sources for plan implementation.	X	X	X	X	X	X	X	X		
Coordinate available programs, policy changes and other local initiatives and those programs where private landowners are responsible for signing up.	X	X	X	X	X	X	X	X	X	
Project planning, site surveys and project design and budget development		X	X	X	X	X	X	X	X	
Prioritize and incorporate plan recommendations into existing programs, activities, and budgets.	X	X	X	X	X	X	X	X	X	X
Implementation and construction of projects			X	X	X	X	X	X	X	X
Report and monitor progress	X	X	X	X	X	X	X	X	X	X
Communicate success stories		X	X	X	X	X	X	X	X	X
Evaluate accomplishments			X			X				X
Update Watershed-Based Plan (2032)										X

7.5 WATER QUALITY MONITORING STRATEGY

The need for water quality-monitoring has clearly been defined and communicated by stakeholders. As detailed in Chapter 3, the NBWW implemented a comprehensive watershed-wide monitoring program and quality assurance project plan with over twenty-five monitoring stations and started data collection in April 2018. The NBWW monitoring effort should be continued and financed to support further characterization of problems and to monitor conditions and health of the watershed through time. The NBWW monitoring will support quantitative means to assess the effectiveness of plan implementation and the cumulative contribution towards goals and objectives.

Figure 7-2 shows the location of existing NBWW monitoring sites, Illinois EPA monitoring sites, USGS gage stations, and publicly owned WWTPs. For more information about the monitoring strategy and monitoring locations view NBWW's website and monitoring strategy (https://www.nbwwil.org/). The NBWW water quality monitoring data has proven valuable throughout the planning process to characterize the watershed and prioritize actions. The feedback and recommendations summarized below are the result of analyzing and applying the NBWW monitoring data:

1. Pairing NBWW monitoring data with USGS gage stations is important and the relevant stations should be maintained. Key NBWW stations that coincide and near adjacent with important USGS gages include SR-5, SR-6, WF-21 and MF-12.
2. From a watershed planning standpoint, the important parameters to continue monitoring are:
    a. Nitrogen, Kjeldahl, Total
    b. Nitrogen, Ammonia

c. Nitrate, Total
d. Nitrite, Total
e. Phosphorus, Total
f. Chloride, Total
g. Total Suspended Solids
h. E. Coli
i. Total Dissolved Solids
j. Conductivity
k. pH
l. Diel Dissolved Oxygen
m. Temperature
n. Total Organic Carbon (TOC)
o. Fish Community, Fish Index of Biotic Integrity (fIBI)
p. Aquatic macroinvertebrate Community, Macroinvertebrate Index of Biotic Integrity (mIBI)

Section 7.4 tracks progress through achievement of actions, while this section outlines a strategy to directly monitor the effectiveness of the actions from a water quality perspective. Table 7-12 summarizes the proposed monitoring categories and associated recommendations.

Table 7-12: Summary of Monitoring Categories and Recommendations

MONITORING CATEGORY	SUMMARY OF RECOMMENDATIONS
Streamflow	USGS, Illinois EPA and the NBWW maintain functioning gages in watershed; baseline hydrographs have been developed. Continue NBWW streamflow measurements.
Ambient water quality (streams)	Support and utilize current and future NBWW monitoring efforts.
Physical and biologic assessment (streams)	Support and utilize current and future NBWW monitoring efforts.
BMP effectiveness	Monitoring BMP effectiveness of specific practices or clusters of practices; coordinate with NBWW.
RiverWatch program	Partner with National Great Rivers Research and Education Center (NGRREC) to enhance the volunteer monitoring program in the watershed.
LCHD Lake monitoring	• Incorporate quantifiable and spatial monitoring of aquatic invasive species in lakes. • Incorporate monitoring for algal toxins. • Sample and assess all lakes in the watershed in the same year and on the same schedule. • Collect storm-event water quality samples from all lake inlets as part of program; install staff gages. • Conduct a lake nutrient balance assessment and evaluate available phosphorus in lake sediment. • Incorporate additional parameters into lake shoreline assessments to better quantify sediment and nutrient loads; this includes eroding bank height and estimated lateral recession rates. Collect lake bank soil cores to determine soil nutrient concentrations.
Illinois Volunteer Lake Monitoring Program (VLMP)	
Continuous watershed model	Develop a continuous flow and water quality model for the watershed to effectively evaluate future land use changes and climate change impacts on water balance and water quality for streams and lakes.
Storm event runoff monitoring	Support and utilize current and future NBWW monitoring efforts.

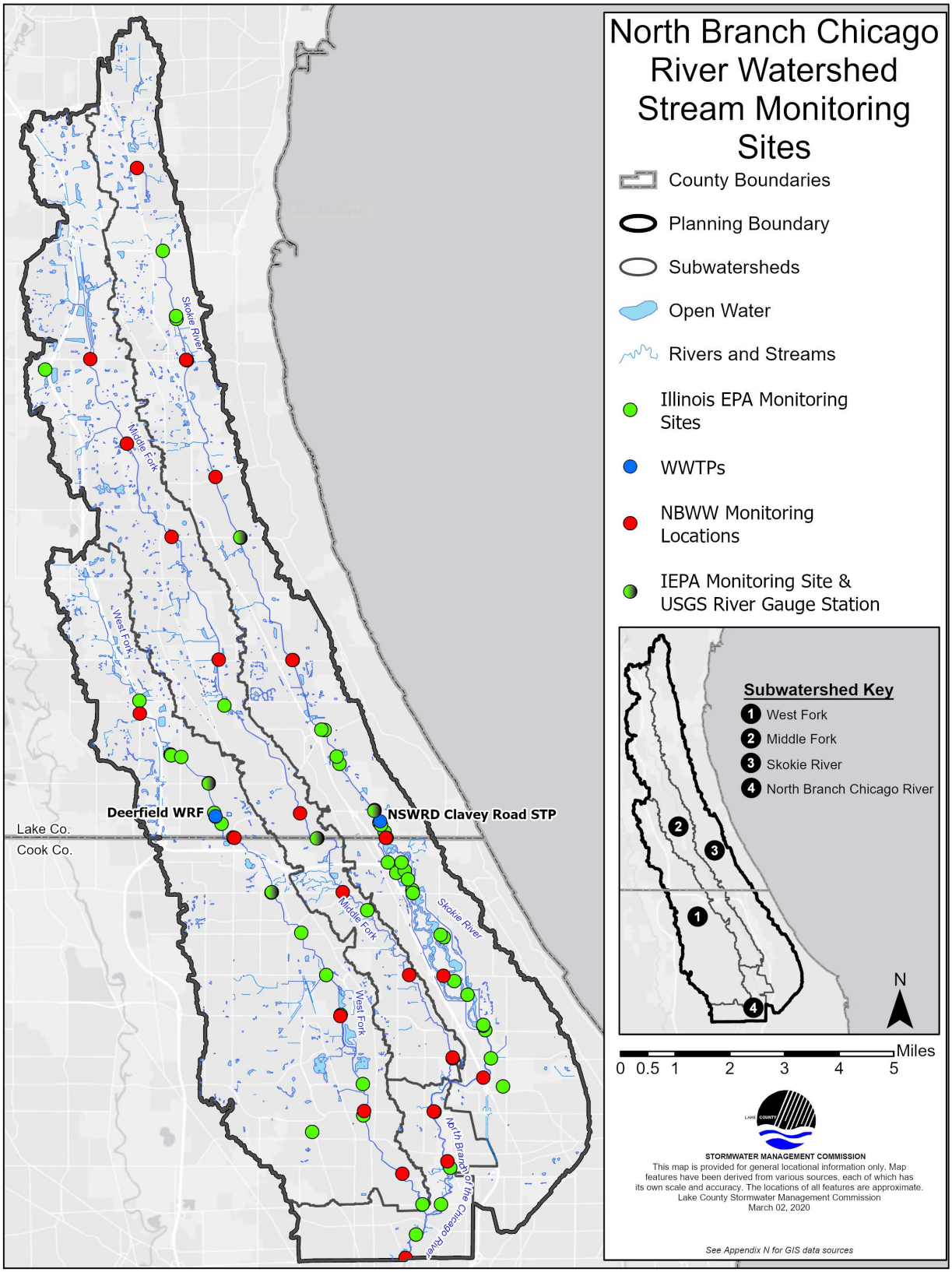


Figure 7-2: Existing Stream Monitoring Sites & WWTPs

7.5.1 BMP Effectiveness Monitoring

As funding allows, BMP effectiveness monitoring should be performed on projects to assess if actions are achieving the watershed-based plan goals and objectives. It is recommended to incorporate monitoring into the budget of BMP projects. Monitoring should be conducted by environmental consultants or independent agency staff experienced in sampling and monitoring methods. Monitoring can be used to determine the overall effectiveness of individual or multiple spatially clustered BMPs on achieving the watershed-based plan goals. It is usually necessary to collect and analyze water quality and perform bioassessment sampling if the BMP is directly addressing a stream reach. This can be accomplished by monitoring prior to the practice (inflow) and downstream of the practice (outflow) or monitoring baseline and post-implementation conditions. It is also important to monitor the hydraulic performance and channel changes. Urbanized areas typically increase the total volume and rate of stormwater runoff that enters receiving streams and storm sewer systems. This causes changes in both hydrology and morphology. A goal of BMPs is usually to attenuate these flows and morphological impacts.

Table 7-13 includes minimum parameters that can be used as guidelines in designing and evaluating a monitoring program to evaluate BMP effectiveness. Benchmark indicators are based on water quality criteria and standards, the 2021 MBI report, or expert examination of water quality conditions to identify values representative of conditions that support designated uses and biological integrity and quality. The 2021 MBI Report and 2019 NBWW QAPP should also be referenced prior to initiating a monitoring program in order to maintain consistency. Evaluation of the progress toward meeting targets indicates whether implemented BMPs are effective. If implemented BMPs are determined to be ineffective, the approach should be reconsidered or changed altogether.

Table 7-13: Baseline Water Quality Analysis Parameters

PARAMETERS	BENCHMARK INDICATORS
Total Phosphorus	0.05 mg/L for lakes (Illinois criteria) / 0.072 mg/L (regional reference non-effect benchmark; NBWW report)
Total Suspended Solids (TSS)	28 mg/L (regional reference non-effect benchmark)
Total Dissolved Solids (TDS)	296 mg/L (regional reference non-effect benchmark)
Ammonia-N	15 mg/L (Illinois general use criteria)
Total Kjeldahl Nitrogen (TKN)	0.78 mg/L (regional reference non-effect benchmark; NBWW Report)
Nitrate-N	10 mg/L (Illinois drinking water standard)
Chloride	500 mg/L (Illinois criteria)
Fecal Coliform Bacteria	126 cfu/100 ml (US EPA geometric mean criteria; recreational use standard)
Dissolved Oxygen	No less than 5.0 mg/L (Illinois criteria)
Temperature	Less than 90° F (Illinois criteria)
pH	Between 6.5 – 9.0 (Illinois criteria)
Conductance, Specific	922 µS/cm (regional reference non-effect benchmark; NBWW report)
Flow	--
Fish	Fish Index of Biotic Integrity (fIBI) 41 or greater
Aquatic Macroinvertebrates	Macroinvertebrate Index of Biotic Integrity (mIBI) 41.8 or greater

7.5.2 RIVERWATCH VOLUNTEER PROGRAM

The National Great Rivers Research and Education Center (NGRREC) administers the RiverWatch program, which educates and trains volunteers to collect data from Illinois streams. The NGRREC holds open labs and workshops throughout the state to train volunteers. The RiverWatch program was previously called EcoWatch and was administered by the IDNR.

While the RiverWatch monitoring program collects basic information about macroinvertebrates and aquatic habitat, it provides a real opportunity to engage stakeholders and volunteers to actively participate in the watershed in a meaningful way. A continuous and consistent monitoring program under RiverWatch would be a valuable tool to supplement work being done by the NBWW, evaluate the evolving condition of the watershed, and monitor the effectiveness of watershed-based plan implementation. A RiverWatch program, however, should not be seen as a replacement for physical and biologic assessments performed by the NBWW.

It is recommended that the watershed planning committees work with the NBWW to select several designated RiverWatch stream reaches in the watershed. The reaches are typically 200-300 feet in length, depending on the type of macroinvertebrate habitat. The designated reaches should either be on public land or private lands with landowner permission. Stream reaches within Forest Preserve District property should be evaluated. The designated reaches should be communicated to the NGRREC so that volunteers in the area are focused to the designated stream reaches. The watershed planning committees may want to consider a public relations program to educate the public regarding the RiverWatch program and enlist volunteers. Funding opportunities should be considered to reimburse travel expenses for volunteers to attend the necessary training provided by NGRREC.

7.5.3 LAKE MONITORING

There are several lakes in the NBCR planning area that are characterized as part of Chapter 3. The lakes are a tremendous resource for recreation and watershed health and function. Lake monitoring should be considered a priority to maintain and manage the lake systems and their value as an ecological and recreational resource. Currently the Illinois EPA, LCHD, and Lake Associations administer lake monitoring programs in the NBCR planning area. These programs should be supported and enhanced by the watershed stakeholders and implementation partners.

7.5.3.1 *LCHD Lake Monitoring*

The Ecological Services Unit of the LCHD has been collecting water quality data on Lake County lakes since the late 1960s. Starting in 1999, approximately 12 -15 lakes per year are monitored, equating to about a 8-year period between lake monitoring. Data collection includes temperature, dissolved oxygen, phosphorus, nitrogen, suspended solids, pH, alkalinity, conductivity, water clarity, plant community, and shoreline characteristics. Detailed reports are written for each lake and include data analyses, a list of problems specific to each lake, and recommendations on how to reduce or eliminate those problems. Reports are available online, although the information is not readily available in a database format. It is recommended that the watershed planning committee continue support of this existing lake monitoring program and track the results of each of the monitored lakes in the watershed to monitor the effectiveness of plan implementation.

7.5.3.2 *Illinois Volunteer Lake Monitoring Program (VLMP)*

The Illinois EPA established the VLMP program in 1981 to engage and educate the public about lake health and lake management while developing a means to collect data and observations about lakes throughout Illinois. The program funds volunteer training programs, technical and administrative support to volunteers, and laboratory analysis costs. As volunteers gain experience, they can graduate to higher tiers of data collection and lake assessment as shown in Table 7-14. In 2019, the Illinois EPA suspended the VLMP program. Select opportunities still exist through Lake County.

The LCHD Ecological Services Unit works directly with the Illinois EPA and the VLMP volunteers relative to Lake County. Not all lakes in the watershed have a volunteer commitment through the VLMP program. The VLMP program does not include quantity or spatial-based monitoring of aquatic invasive species, although the volunteers are free to provide narrative descriptions about aquatic invasive species.

Table 7-14: Monitoring Tiers of the Illinois VLMP

TIER LEVEL	DESCRIPTION OF VLMP MONITORING TIERS
Tier 1	Volunteers perform Secchi disk transparency monitoring and field observations only. Monitoring is conducted twice per month from May - October, typically at 3 in-lake sites. Field observations include the presence of invasive species including installation and monthly observations of zebra mussel plate installed near boat launch.
Tier 2	In addition to the tasks of Tier 1, volunteers collect water samples for nutrient and suspended solid analysis at the representative lake site (site 1). Water quality samples are taken only once per month, May - August, and October in conjunction with one Secchi transparency monitoring trip.
Tier 3	In addition to the tasks of Tier 1 and 2, volunteers collect water samples at up to three sites on their lake. Their samples are analyzed for nutrients and suspended solids. They also collect and filter their own chlorophyll samples. Dissolved oxygen and temperature profiles may also be performed, depending on equipment availability. Data collected in Tier 3 is used in the category 5 Integrated Report and is subject for use in designating state impaired waters.

7.5.3.3 *Lake Monitoring Recommendations*

In addition to efforts currently being performed by individual Lake Associations, LCHD, and the Illinois VLMP, the following recommendations should be considered to enhance current monitoring activity that is performed on lakes, and should be considered at a minimum for all lakes 20 acres or greater, but should be applied to all other lakes as resources allow:

1. Incorporate quantifiable and spatial monitoring of aquatic invasive species in lakes.
2. Develop a rugged and long-lasting watershed-specific aquatic invasive species educational sign, if one doesn't currently exist, and install at all boat ramps.
3. Incorporate monitoring for algal toxins in lakes used for recreation.
4. Sample and assess all lakes within a five-year rotation (or shorter) and on the same schedule.

5. Per stakeholder input, collect storm-event water quality samples from all lake inlets as part of program; install staff gages.
6. Assess lake nutrient balance; evaluate available phosphorus in lake sediment.
7. Incorporate additional parameters into lake shoreline assessments by the LCHD to better quantify sediment and nutrient loads; this includes eroding bank height and estimated lateral recession rates. Collect lake bank soil cores to determine soil nutrient concentrations.

7.6 PLAN IMPLEMENTATION MILESTONES

This section includes goals, objectives, indicators, and milestones, consistent with implementation scorecards found in Appendix L. Table 7-15 through Table 7-19 list all consensus milestones established by the watershed planning committee. The "Objective ID" columns references Chapter 2, Section 2.3 goals and objectives.

7.6.1 WATERSHED GOAL #1 MILESTONES: IMPROVE WATER QUALITY

Improve water quality and prevent future pollution impacts to streams, lakes, ponds, and wetlands within the planning area. Timeframe: Short (**S**): 1-5 years, Medium (**M**): 6-10 years, Long (**L**): 10+ years.

Table 7-15: Water Quality Improvement Milestones

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
1a	Watershed stream annual monitoring program support.	S	Continue water quality monitoring through NBWW monitoring program
		M	
		L	
	Implementation of watershed monitoring program for lakes.	S	1. Enroll 1 lake in the Volunteer Lake Monitoring Program (VLMP) 2. Install staff gages at VLMP Lake 3. Begin Lake inlet water quality monitoring
		M	1. Enroll 3 lakes in the Volunteer Lake Monitoring Program 2. Analysis of monitoring and VLMP data 3. Estimate/assess nutrient loads from watershed for 5 lakes with sufficient data.
		L	1. Enroll 5 lakes in the Volunteer Lake Monitoring Program 2. Analysis of 5–10-year water quality trends for lakes with sufficient data
1b	Number of water bodies removed from the Illinois EPA's impairments list.	S	1 lake/stream segment
		M	2 lakes/stream segments
		L	4 lakes/steam segments
	Number of causes of impairment removed.	S	1 lake/stream segment
		M	2 lakes/stream segments

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
		L	4 lakes/steam segments
	Concentration of PAHs detected in water quality/sediment monitoring efforts.	**S**	Identify locations of high PAH concentrations
		M	Develop a management and remedial action plan
		L	Plan implementation
	Concentrations of identified sources of fecal coliform detected in water quality monitoring efforts.	**S**	Identify and quantify sources of fecal coliform pollution
		M	Develop a management and remedial action plan
		L	Plan implementation
1c	Reduction in concentrations of phosphorus.	**S**	10%
		M	20%
		L	45%
2	Linear feet of streambank and shoreline restored.	**S**	10,000 linear ft
		M	20,000 linear ft
		L	30,000 linear ft
3	Number of exceedances of permitted phosphorus concentrations from wastewater treatment plant effluent.	**S**	No increase in exceedances
		M	25% reduction in exceedances
		L	50% reduction in exceedances
	Number of upgraded septic systems.	**S**	10
		M	25
		L	50
	Number of local units of government that adopt a phosphorous ordinance.	**S**	10
		M	20
		L	All municipalities
4	Winter Maintenance Program establishment includes policy and manual development, de-icing workshop attendance and certification.	**S**	25% of municipal programs
		M	50% of municipal programs
		L	100% of municipal programs
	Number of public agencies and local private contractors attending the annual Lake County De-icing Workshop.	**S**	15 public agencies; 30 local private contractors
		M	30 public agencies; 60 local private contractors
		L	All public agencies with winter maintenance responsibilities; 100 local private contractors
	Number of public agencies with winter maintenance responsibilities that use alternative de-icing products.	**S**	15
		M	30
		L	All

7.6.2 Watershed Goal #2 Milestones: Reduce Flood Damage

Reduce current flood damage in the NBCR planning area and prevent future flooding from worsening in the watershed. Timeframe: Short (**S**): 1-5 years, Medium (**M**): 6-10 years, Long (**L**): 10+ years.

Table 7-16: Flood Damage Reduction Milestones

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
1	Number of municipalities that have codes that allow or require green infrastructure for stormwater management.	S	10
		M	20
		L	All municipalities
2	Number of projects within the floodplain that protect/restore floodplain functions.	S	Identify at least one potential project
		M	1 project
		L	3 projects
3	Number of Voluntary Floodplain Buyouts.	S	10
		M	25
		L	50
	Number of flood problem areas positively affected by flood mitigation projects implemented.	S	10
		M	20
		L	30
	Number of Lake County Floodproofing Workshop attendees.	S	150
		M	300
		L	600
4	Number of new or restored flood storage sites.	S	Identify at least one potential site
		M	1 site
		L	2 sites
	Number of detailed flood mitigation studies completed and number of participants (entities).	S	1 study / 3 participants
		M	2 studies / 5 participants
		L	3 studies / 10 participants

7.6.3 Watershed Goal #3 Milestones: Protect & Enhance Natural Resources & Provide Associated Recreational Opportunities

Protect, enhance, and restore natural resources (soil, water, plant communities, and fish and wildlife) by employing good natural resource management practices. Expand riparian greenways and buffers to provide ecological, educational, and recreational benefits. Timeframe: Short (**S**): 1-5 years, Medium (**M**): 6-10 years, Long (**L**): 10+ years.

Table 7-17: Protect & Enhance Natural Resources Milestones

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
1a	Acres of wetlands enhanced and/or restored.	S	50 acres
		M	100 acres

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
		L	200 acres
1b	Linear feet of streambank and shoreline restored.	**Addressed by Goal #1 Objective ID 2**	
1c	Number of wetland and lake restoration projects completed. Linear feet reported if available.	**S**	5 projects
		M	10 projects
		L	15 projects
1d	Number of native fish species identified based on NBWW and/or IDNR data. Currently 20 native species identified (not including hybrid species).	**S**	22
		M	24
		L	26
2	Acres of terrestrial native natural area restoration projects completed.	**S**	500
		M	1,000
		L	1,500
3	Acres of riparian open space preserved for environmental and recreational natural areas. Acres are in addition to 2021 baseline open space acres.	**S**	50
		M	100
		L	150
4	Length of native plant buffers and riparian greenways along water bodies maintained, expanded, and/or restored.	**S**	10 miles
		M	20 miles
		L	40 miles

7.6.4 Watershed Goal #4 Milestones: Education and Outreach

Provide watershed stakeholders with the knowledge, skills, and motivation needed to take action to implement the watershed plan. Timeframe: Short (**S**): 1-5 years, Medium (**M**): 6-10 years, Long (**L**): 10+ years.

Table 7-18: Education and Outreach Milestones

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
1	Number of primary and secondary schools participating in school-based river curriculums.	**S**	Establish outreach campaign
		M	5
		L	10
2	Continuous increase in number of contacts on the NBWW and North Branch Chicago River Watershed database lists.	**S**	5% increase
		M	10% increase
		L	20% increase

7.6.5 Watershed Goal #5 Milestones: Community and Agency Participation and Coordination

Improve community and agency participation and coordination for research and decision-making among public, private, and nonprofit entities to help achieve watershed plan goals and objectives. Timeframe: Short (**S**): 1-5 years, Medium (**M**): 6-10 years, Long (**L**): 10+ years.

Table 7-19: Community and Agency Participation and Coordination Milestones

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
1a	Number of municipalities, counties, and natural resource agencies that adopt the North Branch Chicago River Watershed-Based Plan Update.	**S**	20 agencies
		M	40 agencies
		L	All agencies
1b	Number of action recommendations completed.	**S**	50 action plan recommendations
		M	100 action plan recommendations
		L	200 action plan recommendations
1c	Number of grant applications received by Lake County Stormwater Management Commission for local grant funding opportunities.	**S**	30 applications
		M	50 applications
		L	100 applications
2	Number of watershed stakeholders providing feedback for the watershed report cards.	**S**	30
		M	40
		L	50
3	Number of volunteers participating in the annual Chicago River Day event (within the NBCR planning area).	**S**	450
		M	600
		L	750

7.7 UPDATING THE WATERSHED-BASED PLAN

Watershed-based plans are required by the Illinois EPA to be updated every 10 years. Furthermore, the watershed-based plan should be revised, as necessary, as new information is received, and progress is made. For example, as NBWW monitoring efforts continue, additional data can be used to revise loading estimates and determine if implementation efforts are achieving stated goals, milestones, and reduction targets. Plan updates do not require an entire rewrite; typical elements that will likely require a major update or revision are summarized in Table 7-20.

Table 7-20: Plan Update Elements and Responsibilities

MAJOR PLAN ELEMENT REQUIRING UPDATE	ELEMENT COMPONENT REQUIRING UPDATE	LEAD RESPONSIBLE ENTITY (S)	PRIMARY SUPPORTING PARTNERS
Watershed Characterization	• Land use information • Water quality data/analysis • Stream/lake impairments • Climate • Demographics • Jurisdictions • Pollution loading	Lake County SMC	• Jurisdictions (Chapter 6) • NBWW • Watershed Planning Committees
Action and Implementation Plan Components	• Project recommendations • Expected load reductions • Milestones, timeframes, and priorities • Responsible parties and support partners • Monitoring plan	Lake County SMC	• Jurisdictions (Chapter 6) • NBWW • Watershed Planning Committees

7.8 REFERENCES

North Branch Chicago River Watershed Workgroup (NBWW). 2019. Quality Assurance Project Plan (QAPP): Water Quality and Sediment Chemistry, and Bioassessment Monitoring of the North Branch Chicago River Watershed. Lake County, Illinois. Technical Report.

Midwest Biodiversity Institute (MBI). 2021. Biological and Water Quality Assessment of the North Branch Chicago River. Cook County and Lake County, Illinois. Technical Report MBI. Columbus, OH 43221-0561. 77 pp. + appendices.

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COMMON ACRONYMS/ABBREVIATIONS USED IN CHAPTER 8

BMP – Best Management Practices

CLC – College of Lake County

CMAP – Chicago Metropolitan Agency for Planning

FEMA – Federal Emergency Management Agency

FOCR – Friends of the Chicago River

HOA – Homeowners Association

IDNR – Illinois Department of Natural Resources

Illinois EPA – Illinois Environmental Protection Agency

ILMA – Illinois Lakes Management Association

LA – Lake Associations

LCHD – Lake County Health Department

LCTV – Lake County Television

LFOLA – Lake Forest Open Lands Association

MWRD – Metropolitan Water Reclamation District of Greater Chicago

NBCR Planning Area – North Branch Chicago River Watershed Planning Area

NBWW – North Branch Chicago River Watershed Workgroup

NRCS – Natural Resources Conservation Service

PB&D – Planning Building & Development

PSA- Public Service Announcement

SMC – Lake County Stormwater Management Commission

SWALCO - Solid Waste Agency of Lake County

SWANCC – Solid Waste Agency of Northern Cook County

SWCDs –Soil & Water Conservation Districts (McHenry-Lake & North Cook)

USEPA – U.S. Environmental Protection Agency

USGS – United States Geological Survey

WWTPs – Wastewater Treatment Plants (including publicly owned treatment works)

YCC – Youth Conservation Corps

8 EDUCATION AND OUTREACH STRATEGIES AND TOOLS

This chapter provides a strategy for all watershed stakeholders for information, education, and public involvement to address watershed topics and issues. The education and outreach strategy provides messaging and motivation for each target audience (Section 8.3) to help achieve watershed goals and objectives in order to ultimately realize the vision for the North Branch Chicago River (NBCR) watershed. The Vision is restated below.

WATERSHED VISION:

*Success in restoring the watershed and improving the health of the river will depend on how well stakeholders interact with the river and manage their activities that affect the watershed. The North Branch Chicago River Watershed-Based Plan also includes a significant public education and outreach component to reach watershed residents and communities. Watershed awareness is the first step in changing behavioral patterns that degrade the river. In addition to bringing watershed awareness to residents, communities will also work together on a cooperative basis and combine their resources with county, state, federal and private cost-share funds to complete a number of the recommended watershed improvement projects and programs. The bottom line is residents and communities of the watershed will have to work together to successfully protect and restore the North Branch - sharing the costs and the benefits of watershed improvements****....WE ALL LIVE "DOWNSTREAM"***

8.1 WATERSHED INFORMATION AND EDUCATION NEEDS

Community engagement, education and outreach are essential components of the North Branch Chicago River Watershed-Based Plan. The education and outreach strategy is designed to:

- Raise public awareness about watershed issues and foster support for solutions;
- Educate stakeholders, the public, and other identified target audiences to increase awareness and encourage behavioral changes (see Figure 8-1);
- Provide engaged stakeholders the knowledge and skills they need to become watershed stewards and implement the watershed-based plan;
- Leverage public and private partnerships to implement action items.



Figure 8-1: August 10, 2016 Annual North Branch Chicago River watershed planning meeting at the Chicago Botanic Gardens.

8.2 RECOMMENDED PROGRAMS

Development of an education and outreach program begins by defining education and outreach goals and objectives. Lake County Stormwater Management Commission (SMC) proposed revisions to the 2008 NBCR watershed-based plan education and outreach strategy (Building Blocks, and Appendix N Sample Education & Participation Plan). During the February 13, 2019 North Branch Chicago River Watershed Workgroup (NBWW) General Membership meeting, stakeholders discussed and provided additional input to the proposed revisions. Following the stakeholder input at the February 13, 2019 meeting, the revisions were discussed and modified again at the May 13, 2019 NBWW General Membership meeting and

incorporated into the 2020 update to the watershed-based plan.

EDUCATION & OUTREACH GOAL: Develop a public information and education program within the watershed.

OBJECTIVES & INDICATORS:

1. Develop and implement a primary and secondary school-based river curriculum.

   INDICATOR: Number of schools participating.

2. Provide public information and education program for community leaders, elected officials, businesses and homeowners.

   INDICATOR(S):

   a) Number of attendees at NBWW general membership meetings (per year).
   b) Number of subscribers to NBWW website (per year).

8.3 TARGET AUDIENCES

The audiences for specific education and outreach activities and topics include organizations, watershed residents, general public, and professionals within watershed communities. These audiences have a wide range of understanding of watershed issues and needs for further education and outreach. Education and outreach aim to be responsive to existing partners, attract stakeholders that have not previously participated in watershed improvement activities, and align messages with audience knowledge levels and motivations. Education and outreach partners include the entities listed and discussed below.

8.3.1 Local Government Officials and Agencies

Continued support from local governments and public landowners will be critical to implementing the education and outreach strategy. These officials and agencies develop policies and regulations and manage land and projects within the watershed. They need to commit to projects on public lands and communicate with and motivate residents to participate in watershed improvements. The local government target audience includes:

- Municipalities
- Townships
- County agencies
- Elected officials and policy makers
- Drainage districts
- Park districts & forest preserve districts



Figure 8-2: Stakeholders participating in a North Branch Chicago River Watershed Planning Meeting (May 11, 2016).

- Public works agencies
- Transportation agencies (Highway Commissioners)

8.3.2 Residents and Businesses

Numerous residents and businesses in the NBCR watershed have participated in one or more NBWW general membership meetings (see Figure 8-2). The target audience includes the following:

- All residents and landowners (see section 8.3.2.1 for riparian and lakeshore landowners)
- Not-for-profit and environmental interest groups
- Businesses and institutions (i.e., golf courses, shopping centers, churches and chambers of commerce)

8.3.2.1 Riparian and Lakeshore Landowners

Riparian landowners may have a disproportionate impact on stream and wetland areas and often have a vested interest in improving watershed conditions to protect their property, comply with regulations, or enhance property values. Riparian areas are critical locations because they contribute to watershed problems or hold the key to solutions. Therefore, the riparian and lakeshore property owners should be targeted for special attention in the education and outreach strategy. The target audience includes the following groups of riparian and lakeshore landowners:

- Homeowner and lake associations (HOAs/LAs)
- Single family residences
- Commercial and multifamily residential properties
- Owners of undeveloped land
- Railroads
- Utility companies located in floodplains or along streams, lakes, and wetlands
- Forest preserves
- Golf courses

8.3.3 North Branch Chicago River Watershed Workgroup

The NBWW's goals include support of the North Branch Watershed Planning Committee and the North Branch Watershed Consortium through fostering stakeholder forums at general membership meetings, as well as, providing education and outreach targeted at achieving attainment of water quality standards and designated uses for the watershed.

8.3.4 Schools and Youth Groups

Education and outreach programs and messages are targeted towards students in schools and youth groups which are needed to set a foundation in order to achieve long-term sustainable improvements. Youth involvement in activities, such as stream clean-ups and habitat restoration days or even smaller tasks such as not littering and responsible recycling, is an effective way to engage groups in learning about and acting to improve watershed conditions. The student target audience includes the following schools and youth groups:

- Primary and secondary schools
- College of Lake County (CLC)

- Youth groups (Boy Scouts, Girl Scouts)

8.3.5 Developers & Homebuilders

The land development process has the potential to adversely affect watershed conditions, but development interests can be balanced with watershed goals if identified prior to or early in the design and development process. Developers and homebuilders need to adopt a variety of best development standards and comply with regulations, codes, and ordinances to protect watershed resources.

8.3.6 Consultants and Contractors Working in the Watershed

Several engineering, environmental and other consultants have participated in stakeholder meetings and provided their expertise towards the watershed planning process. The watershed-based plan will provide consultants and contractors with resources to share with their clients and support for prioritization of future projects. Consultants and contractors can deliver outreach and education messages to their clients to motivate best management practices (BMP) adoption for watershed improvements. The target audience of consultants and contractors is:

- Engineering, landscape architectural, and environmental consulting firms
- Restoration contractors
- Legal counsel
- Insurance companies
- Winter maintenance product/equipment suppliers
- Winter maintenance (snow removal) contractors

8.3.7 Landscapers & Nurseries

Landscapers, lawn and garden centers, nurseries, hardware stores, large retail establishments, and snow removal contractors can make a huge impact by learning and following watershed-friendly lawn care and winter maintenance practices, especially by reducing their use of pesticides, herbicides and chemicals such as chloride and phosphorus. Local government entities can support education by maintaining registries for lawn care, nurseries, and winter maintenance providers. The target audience of landscapers and nurseries is:

- Lawn & garden centers

8.4 PARTNER ORGANIZATIONS

Organizations that will be responsible for implementing the watershed plan recommendations can assist in education and outreach and can also be one of the targeted audiences. Each partner organization should couple plan implementation efforts with parallel efforts to inform and educate. Several educational programs are currently being implemented by other organizations that watershed stakeholders may take advantage of

for the NBCR watershed education and outreach strategy. See Table 8-1 below for a list of potential partner organizations to engage and implement the watershed plan recommendations.

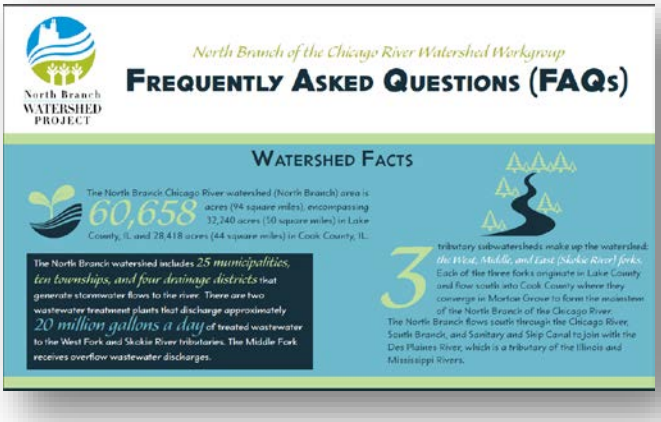
Table 8-1 Partner Organizations

Watershed Residents & Landowners	IDNR	Park Districts
Businesses and Institutions	Illinois EPA	Schools
CLC	ILMA	SWALCO & SWANCC
CMAP	Lake County (including PB&D)	SMC
Cook County	LCHD	Townships
Drainage Districts	LFOLA	Transportation Departments
Environmental Interest Groups	Master Gardeners	USEPA
FEMA	Municipalities (including Public Works Depts.)	USGS
Forest Preserve Districts	MWRD	Watershed Planning Committees
FOCR	NBWW	WWTPs
HOAs/LAs	NRCS / SWCDs	YCC

8.5 GUIDANCE FOR IMPLEMENTATION

The following list provides general guidance for implementing the education and outreach strategy. More detailed recommendations for addressing specific watershed issues are included in Table 8-3.

- Use words that the general public can understand, and which speak to their existing values and priorities.
  - Include basic watershed science education (e.g., biology, the water cycle, and stream ecology) as it may be needed for the audiences that have little knowledge about rivers, streams, lakes, wetlands or watersheds.
  - Identify and provide for different levels of understanding and the needs of various audience groups. When interacting with a group, start by stressing the aspects of the project most applicable to them. For example, when interacting with homeowners, focus on items such as rain gardens, lawn care, pollution prevention and restoration, and management of riparian buffers. Develop a similarly targeted menu of topics and look for opportunities to "cross train" target audiences.


North Branch of the Chicago River Watershed Workgroup

FREQUENTLY ASKED QUESTIONS (FAQs)

North Branch WATERSHED PROJECT

WATERSHED FACTS

60,658 acres (94 square miles), encompassing 32,240 acres (50 square miles) in Lake County, IL and 28,418 acres (44 square miles) in Cook County, IL.

The North Branch watershed includes *25 municipalities, ten townships, and four drainage districts* that generate stormwater flows to the river. There are two wastewater treatment plants that discharge approximately *20 million gallons a day* of treated wastewater to the West Fork and Skokie River tributaries. The Middle Fork receives overflow wastewater discharges.

3 tributary subwatersheds make up the watershed: *the West, Middle, and East (Skokie River) forks.* Each of the three forks originate in Lake County and flow south into Cook County where they converge in Morton Grove to form the headwaters of the North Branch of the Chicago River. The North Branch flows south through the Chicago River, South Branch, and Sanitary and Ship Canal to join with the Des Plaines River, which is a tributary of the Illinois and Mississippi Rivers.

Figure 8-3: NBWW Frequently Asked Questions Factsheet was distributed to potential members in 2018 to provide education on the purpose of forming a workgroup.

  - Inform the audience about actions they can take and behaviors they can change to help address watershed problems and issues.

- Develop multiple messages and update existing messages as needed; use one broad message for the general public and a series of more specifically targeted messages for specific audiences (e.g., landowners, business owners, and municipalities).
  - Keep the message simple and straightforward with only two or three take-home points at a time, use graphics and photos to illustrate the message, and repeat it frequently. Keep messages positive (see Figure 8-3).
  - Emphasize the connections between the watershed stakeholder issues and watershed issues. For example, connect the message to storms, streams, lakes, the North Branch Chicago River, land management, the urban landscape, and streets.
- Coordinate the education and outreach strategy with partner organizations to combine efforts, achieve economies of scale, tap into one another's networks, share costs, and ensure consistent messages.
- Use websites and other social media, as well as public places, such as libraries and village halls, to post and promote your message.
  - All materials and messages should promote the local watershed groups, with contact information and information on how to get involved.
  - Develop materials and messages that anyone can use.

8.6 MESSAGE FORMATS AND DELIVERY MECHANISMS

Numerous existing programs, tools, and materials are available that can be used or customized to accelerate education and outreach efforts. See Table 8-2 below for examples of education and outreach through print, electronic, visual and personal contact communication efforts.

Table 8-2: Examples of Education & Outreach Mechanisms

PRINT	ELECTRONIC	VISUALS	PERSONAL CONTACT
Brochures	Social Media	Displays/Exhibits	Demonstrations
Fact sheets	Websites Story maps	Signage	Field Trips
Newsletters	E-News/emails	Posters/ Bulletin boards	Watershed Tours
News releases	Videos/local cable channel	Presentations	Presentations (meetings, events, workshops, classes, seminars, trainings, open houses etc.…)
Manuals or plans; Technical resources	Public Service Announcements (PSA)		Interviews
Inserts/utility bills	Bulletin boards		Surveys
Flyers	Surveys		Targeted/one-on-one discussions and technical assistance
Direct mail			
Feature articles			
Media kit			
Curriculums			

8.7 EVALUATING PLAN OUTREACH

Watershed plan evaluation provides a feedback mechanism for ongoing improvement of an outreach effort and for assessing whether the effort is successful support for further activities and funding. It also builds support for further funding. The entity or persons responsible for implementing the education and information campaign should customize the following ideas.

For a number of these evaluation strategies, collect baseline information or survey current knowledge before the outreach activities begin and check periodically throughout the outreach campaign to help measure progress and effectiveness. Evaluations conducted early in the effort will help determine which programs are working and which ones are not. Based on this information, money and time can be saved by focusing on the programs that work and discarding those that do not. Indicators to evaluate, monitor, and provide a timeframe for each watershed goal are listed in Chapter 7 & Appendix L Evaluation Scorecards.

8.8 WATERSHED INFORMATION AND EDUCATION RESOURCES

Watershed education and outreach is not new, there are many resources already available that include effective education and outreach messages, delivery techniques, watershed management planning, media relations, and strategies to assist with developing an outreach campaign. Although larger educational activities, such as training workshops and demonstration projects, may require public or private grant sources, many of SMC's Stormwater Best Practices (http://www.lakecountyil.gov/2261/Stormwater-Best-Practices) can be established into partner work activities, projects, and education programs.

Table 8-3 provides educational messages, outreach vehicles and methods, target audiences, and partner leads to implement the NBCR watershed education and outreach strategy. It is important to note that Table 8-3 is based on North Branch Chicago River Watershed-Based Plan Chapter 2 Watershed Issues, Opportunities, Goals & Objectives. The vehicles and methods, partner leads, and messages columns listed below are not comprehensive, but are noted most effective means of disseminating education and outreach topics to that target audience. This table (and Chapter 8) were created to act as an education and outreach strategy and roadmap for watershed stakeholders and to help guide partner leads (identified below) for their own education and outreach strategies and activities. Although partner leads are identified below, there could be other appropriate partner and support leads not listed.

Table 8-3: Educational Topics, Messages & Partners

Target Audience (Section 8.3)	Watershed Goals	Vehicle/ Method	Partner Leads	Messages (Topics/Actions)
8.3.1 Local Government Officials & Agencies	1, 2, 3, 4, 5	Emails, newsletters, websites, social media, targeted/one-on-one discussions and technical assistance, manuals or plans, technical resources	NBWW (and members), watershed planning committee, Illinois EPA, MWRD, CMAP, FOCR	Encourage participation in the NBWW Financial and economic benefits of water quality improvement and flood mitigation efforts
				Adoption and implementation of the NBCR watershed-based plan
8.3.2 Residents & Businesses	1, 2, 3, 4, 5	Social media, brochures, newsletters, factsheets, inserts/utility bills, education signage at demonstration sites	SMC, MWRD, CMAP, FOCR	Financial and economic benefits of water quality improvement and flood mitigation efforts
		Social media, brochures, newsletters, factsheets	Local governments, forest preserve districts, FOCR, LFOLA	Participate in environmental stewardship and river-based recreational opportunities
8.3.3 North Branch Chicago River Watershed Workgroup	1, 4, 5	Presentations (meetings), newsletters, targeted/one-on-one discussions (interjurisdictional coordination), technical assistance	NBWW members and consultants, SMC, MWRD, FOCR	Utilize monitoring data for water quality improvement project implementation
		Emails, newsletters, websites, targeted/one-on-one discussions	NBWW, SMC	Financial and economic incentives for MS4 community participation
		Presentations (meetings), brochures, newsletters, websites, field trips, demonstrations and watershed tours	Illinois EPA, USEPA, SMC, NBWW members	Adoption and implementation of the NBCR watershed-based plan
8.3.4 Schools and Youth Groups	1, 3, 4, 5	Social media, emails, newsletters, inserts/utility bills, education signage at demonstration sites, targeted/one-on-one discussions	Schools, MWRD, CMAP, FOCR, LFOLA, Forest Preserve Districts, SMC, local governments	Participate in environmental stewardship and river-based recreational opportunities
		Emails, factsheets, social media, field trips, demonstrations and trainings, targeted/one-on-one discussions	Forest preserve districts, park districts, local governments	Encourage school-based river curricula
8.3.5 Developers & Homebuilders	1, 2, 4, 5	Manuals or plans, technical assistance and resources, development planning and permitting process	Counties, municipalities, townships, SMC, MWRD	Design and implement green infrastructure beyond current development requirements

Target Audience (Section 8.3)	Watershed Goals	Vehicle/ Method	Partner Leads	Messages (Topics/Actions)
8.3.6 Consultants and Contractors Working in the Watershed	1, 2, 3, 4, 5	Presentations (meetings), emails, newsletters, websites, targeted/one-on-one discussions	NBWW, watershed planning committee, Illinois EPA, SMC, MWRD	Advocate for water quality improvement projects Participation in NBWW membership and/or public meeting forums
		Manuals or plans, technical assistance and resources	SMC, MWRD, CMAP, FOCR	Implement NBCR watershed-based plan action recommendations
8.3.7 Landscapers & Nurseries	1, 3, 4, 5	Brochures, newsletters, social media, websites, education signage at demonstration sites, targeted/one-on-one discussions	Master Gardeners, forest preserve districts, park districts, SMC, MWRD, CMAP, FOCR, LFOLA	Promote native vegetation Take advantage of local native restoration trainings, workshops and demonstrations

CHAPTER 9: GLOSSARY OF TERMS

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9 GLOSSARY OF TERMS

100-Year Floodplain: Areas with a 1% annual chance of flooding.

2 Year - 100 Year Flood: For each river, engineers assign statistical probabilities to different size floods to describe a common or ordinary flood versus a less likely or a severe flood. A 100-year flood is a flood that has a 1-percent chance of being equaled or exceeded in any given year. The 100-year flood, also referred to as the "base flood", is the standard used by the National Flood Insurance Program (NFIP) for floodplain management and is used to determine the need for flood insurance. A structure located within the 100-year special flood hazard area shown on an NFIP map has a 26 percent chance of suffering flood damage during the term of a 30-year mortgage. A two-year flood event has a 50% probability of occurring in any year; 2-year rain events are important because they form the general shape of our stream systems and are the cause for much of the pollutant loading.

303(d): A state's list of impaired or threatened waters. The Federal Clean Water Act requires states to submit a list of impaired waters to the USEPA for review and approval using water quality assessment data from the Section 305(b) Water Quality Report. States are then required to develop total maximum daily load analyses (TMDLs) for waterbodies on the 303(d) list.

305(b): In the 305(b) report, states must also explain how they determined the resource quality of the waters of the state in terms of the degree to which predefined beneficial uses (i.e., designated uses) of those waters are attained (i.e., supported). Also in the 305(b) report, when any designated use for any waterbody is not fully supported (i.e., impaired), the state must report potential reasons (causes and sources) for the impairment.

Advance Identification Wetlands: Wetlands that were identified through the Advanced Identification (ADID) process. Completed in 1992, the ADID process sought to identify wetlands that should be protected because of their high functional value. The primary functions evaluated were ecological value based on wildlife habitat quality and plant species diversity, hydrologic functions such as stormwater storage value and/or shoreline/bank stabilization value, and water quality values such as sediment/toxicant retention and/or nutrient removal/transformation function.

Alkalinity (ALK): A measure of the buffering capacity of water.

Ammonia (NH_3-N): A form of inorganic nitrogen.

Aquatic Plant Management Plan (APMP): A plan that provides a coordinated strategy for managing aquatic plants.

Artificial Wetlands: A designed wetland, created for human use, such as wastewater or sewage treatment, habitat to attract wildlife, or land reclamation after mining or other disturbances.

Bankfull: The point at which water flow in a stream fills the channel to the top of its banks just to the point where water begins to overflow onto the adjacent floodplain.

Barrens: An area with vegetation that is scattered with stunted woody growth and an exposed infertile substrate that supports species adapted to fire and drought and occurs in areas climatically suitable for forest growth of large trees.

Baseflow: Stream discharge that is not directly attributed to direct runoff or melting snow. It is usually sustained by groundwater.

Best Management Practices (BMPs): Non-structural practices, such as site planning and design aimed to reduce stormwater runoff and avoid adverse development impacts, or structural practices that are deigned to store or treat stormwater runoff to mitigate flood damage and reduce pollution. BMPs used in urban areas include stormwater detention ponds, restored wetlands, vegetative filter strips, porous pavement, silt fences and biotechnical streambank stabilization.

Biological Oxygen Demand (BOD): The amount of dissolved oxygen that is required by microscopic organisms to decompose organic matter in waterbodies.

Bioswale: Vegetated ditches that collect, convey, filter and infiltrate stormwater runoff.

Bog: A low nutrient peatland, usually in a glacial depression, that is acidic in the surface stratum and often dominated at least in part by the genus *Sphagnum.*

Catchments: Small unit of a watershed or subwatershed that is delineated and used in watershed planning efforts because the effects of impervious cover are easily measured, there is less chance for confounding pollutant sources, boundaries have fewer political jurisdictions, and monitoring/mapping assessments can be done in a relatively short amount of time.

Center for Watershed Protection (CWP): Non-profit corporation that provides local government, activists, and watershed organizations with the technical tools for protecting some of the nation's natural resources such as streams, lakes, and rivers.

Certified Community: Community authorized by SMC to administer and enforce most of the provisions of the WDO. A community can be a fully certified community (delegated to review both standard general stormwater provisions and isolated waters (wetland) aspects of the WDO) or partially certified community (delegated to review either standard or isolated wetland aspects of the WDO). SMC retains certain review authorities, primarily with respect to the floodplain and floodway provisions of the WDO in certified communities.

Channel: Any river, stream, creek, brook, ditch, gully, ravine, swale or wash, into which surface or groundwater flows, either perennially or intermittently.

Channelized stream: A stream that has been artificially straightened, deepened or widened.

Chicago Metropolitan Agency for Planning (CMAP): A regional planning agency that plans for the most effective public and private investments in northeastern Illinois region and to better integrate plans for land use and transportation. CMAP provides technical assistance and training opportunities to local governments to improve watershed management activities including watershed planning and stormwater management.

Chloride (Cl^-): A common non-point source pollutant, largely introduced into the environment through the use of deicing agents

Clean Water Act (CWA): The CWA is the basic framework for federal water pollution control and has been amended in subsequent years to focus on controlling toxins and improving water quality in areas where compliance with nationwide minimum discharge standards is insufficient to meet the CWA's water quality goals.

Climate Normals: 30-year averages of climatological variables including temperature and precipitation

Colony Forming Unit (CFU): A measure of viable bacterial or fungal numbers. Unlike direct microscopic counts where all cells, dead and living, are counted, CFU measures viable cells.

Conductivity: A measure of the ability of water to pass an electrical current that is used as a proxy for the concentration of inorganic dissolved solids in water**.**

Conservation Easement: The transfer of land use rights without the transfer of land ownership. Conservation easements can be attractive to property owners who do not want to sell their land, but would support perpetual protection from further development. Conservation easements can be donated or purchased.

Converted Wetlands: Areas that have been drained or filled and no longer exhibit wetland or farmed wetland characteristics.

Critical Areas: Catchments in the watershed best suited to focus implementation efforts to help achieve the goals and objectives of the watershed plan. Critical areas represent catchments that likely contribute to impairments and problems in the watershed, and present opportunities where project implementation would provide the greatest value and benefit.

Defined Channel: Clearly discernable bed and banks of a flowing watercourse.

Developed Parcels: Parcels that are mostly occupied by structures and/or impervious cover.

Digital Elevation Model (DEM): A digital cartographic/geographic dataset of elevations in xyz coordinates.

Digital Terrain Models (DTM): A digital cartographic/geographic dataset of elevations in xyz coordinates that contains information on geographical elements and natural features.

Discharge Point: The location where all sanitary, storm sewer and agricultural drainpipes surface or stormwater flows back into a lake or stream channel. Discharge points also include open channels, swales, gullies and other significant tributaries.

Dissolved Oxygen: The amount of oxygen in water, usually measured in milligrams/liter (mg/L).

Drain Tile: A drainage system that removes excess water from the soil below the surface.

Drainage Basin: Land surface region drained by a length of stream channel; usually 1,000 to 10,000 square miles in size.

Dry Detention Basin: Basins that temporarily stores water before discharging to river or lake and usually dry up following large rainstorms or snow melt events. Typically, not effective at removing pollutants.

Dry Flood Proofing: A combination of practices that are used to make a building watertight, so flood waters do not enter the structure, including the basement or crawl space.

***E. coli*:** A species of fecal coliform bacteria that is specific to fecal material from warm-blooded animals, that is used as an indicator of health risk from water contact.

Emergent Vegetation: Vegetation that is rooted in the bottom sediment of a waterbody with leaves and stems that extend out of the water.

Endangered Species: A species in danger of extinction throughout all or a substantial portion of its range.

Erosion: Displacement of soil particles on the land surface due to water or wind action.

European Settlement: A period in the early 1800's when European settlers moved across the United States. During this movement, natural plant communities were altered for farming and related development.

Event Mean Concentration (EMC): Method for characterizing pollutant concentrations in stormwater runoff. Pollutant concentrations are measured in studies and on-going research that collects and analyze s runoff from various land-use practices in different geographic and climatic regions. The values are determined by compositing (in proportion to flow rate) a set of samples, taken at various points in time during a runoff event, into a single sample for analysis.

Farmed Wetlands: Agricultural cropped areas on hydric soil that have been cleared, partially drained, or filled.

Fecal Coliforms: Bacteria that is specific to fecal material from warm-blooded animals, that is used as an indicator of health risk from water contact.

Federal Emergency Management Agency (FEMA): Government agency within the Department of Homeland Security that responds to, plans for, recovers from, and mitigates against disasters/emergencies, both natural and man-made.

Fens: A peatland, herbaceous (including calcareous floating mats) or wooded, with calcareous groundwater flow.

Flared End Section (FES): A structure commonly found at the end of pipes near waterbodies. FES are used to reduce erosion from pipe discharge and minimize debris accumulation at pipe openings.

Flash Flood: A quickly rising and falling overflow of water in stream channels that is usually the result of increased amounts of impervious surface in the watershed.

Flood Insurance Rate Map (FIRM): A map prepared by FEMA that depicts the SFHA within a community. The FIRM includes zones for the 100-year and 500-year floodplains and may or may not depict Regulatory Floodways.

Flood Insurance Study (FIS): Studies conducted by the FEMA to determine areas that have the highest probability for flooding.

Floodplain: Floodplains are lowlands, adjacent to rivers, streams and creeks that are subject to recurring floods. Mapped regulatory floodplains are defined as the area of land, which is inundated with water during 100-year flood events.

Flood Problem Area (FPA): One or more structures in a geographical area that are damaged by the same primary source/cause of flooding. Structures include transportation, utility infrastructure, buildings, and well and septic failure caused by flooding. Areas also include locations where road flooding results in damage to infrastructure, loss of critical access, or is a threat to safety.

Flood Protection Area: Regulatory floodplains, regulatory floodways, riparian environments, wetlands, and wetland buffers.

Floodway: A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

Floristic Quality Assessment (FQI): A metric that evaluates how close the flora of an area is to undisturbed conditions.

Forest Preserve District: Districts designed to protect large natural areas and provide passive recreation.

Friends of the Chicago River (FOCR): A non-profit river advocacy organization with a mission to improve and protect the Chicago River system for people, plants, and animals.

Functional Connections: Functional connections, as defined in the GIMS, are linkages between the various hubs, or cores.

Geographic Information System (GIS): A computer-based approach to interpreting maps and images and applying them to analysis of systems and problem-solving.

Glacial Slough: Shallow, wetland-type lake that are formed during glacial retreat

Global Positioning System (GPS): Satellite mapping systems that enables locators and mapping to be created via satellite.

Goal: A clear, concise, and measurable statement or target for the watershed plan that identifies a change or outcome to be achieved.

Gray Infrastructure: A network of transportation, power, communication and other human constructed systems that are designed to connect across multiple jurisdictions and incorporate facilities that function at different scales.

Green Infrastructure: Defined by the Lake County Stormwater Management Commission as: on a local scale, municipal or neighborhood, green infrastructure consists of site-specific best management practices (such as naturalized detention facilities, vegetated swales, porous pavements, rain gardens, and green roofs) that are designed to maintain natural hydraulic functions by absorbing and infiltrating precipitation where it falls. On the regional scale, green infrastructure consists of the interconnected network of open spaces and natural areas (such as forested areas, floodplains and wetlands, greenways, parks, and forest preserves) that mitigate stormwater runoff, naturally recharge aquifers, and improve water quality while providing recreational opportunities and wildlife habitat.

Green Infrastructure Model and Strategy (GIMS): A GIS based model that provides a framework for identifying land conservation and restoration opportunities to guide regional and local green infrastructure planning.

Green Infrastructure Network: Use of vegetation, soils, and natural processes to manage water and create healthier urban environments.

Green Infrastructure Vision (GIV): A GIS based regional scale green infrastructure vision that consists of spatial data and policies that identify the most important natural areas to protect in the Chicago region.

Gully Erosion: The removal of soil along drainage lines by surface water runoff. Once started, gullies will continue to move by headward erosion or by slumping of the side walls until the disturbance is stabilized.

Homeowners Association (HOA): An organization in a subdivision, planned community or condominium that makes and enforces rules for the properties within its jurisdiction.

Hubs: Hubs, as defined in the GIMS and GIV reports, contain the following four core landscape features (core woodlands/forest, core prairies, grasslands and savannas, core wetlands, and core lakes and streams) to create an Ecological Network.

Hummocky: Extremely irregular surface.

Hydraulics: A branch of science that deals with practical applications of liquid in motion.

Hydraulic Conductivity: A measure of a material's capacity to transmit water.

Hydraulic Structures: Bridges, culverts, dams, weirs, or other structures spanning or crossing the stream channel.

Hydric Soils: A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part. These conditions alter the physical, biological and chemical characteristics of the soil, thereby influencing the species composition or growth, or both, of plants on those soils.

Hydrogeomorphic Descriptors: Characteristics that emphasize geomorphic and hydrologic attributes such as the landscape position, landform, water flow path, and waterbody type of a wetland or water body.

Hydrologic Cycle: The continuous movement of water on, above, or below the surface of the Earth.

Hydrologic Soil Groups (HSG): Soils are classified by the Natural Resource Conservation Service into four Hydrologic Soil Groups based on the soil's runoff potential. The four Hydrologic Soils Groups are A, B, C and D. A's generally have the smallest runoff potential and D's the greatest.

Hydrologic Unit Code (HUC): A hydrologic unit can accept surface water directly from upstream drainage areas, and indirectly from associated surface areas such as remnant, noncontributing, and diversions to form a drainage area with single or multiple outlet points. Hydrologic units are only synonymous with classic watersheds when their boundaries include all the source area contributing surface water to a single defined outlet point. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to twelve digits based on the six levels of classification:

- 2-digit HUC first-level (region)
- 4-digit HUC second-level (subregion)
- 6-digit HUC third-level (accounting unit)
- 8-digit HUC fourth-level (cataloguing unit)
- 10-digit HUC fifth-level (watershed)
- 12-digit HUC sixth-level (subwatershed)

Hydrology: The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Hydrophytic Vegetation: Plant life growing in water, soil or on a substrate that is at least periodically deficient in oxygen because of excessive water content; one of the indicators of a wetland.

Illinois Department of Natural Resources (IDNR): A government agency established to manage, protect and sustain Illinois' natural and cultural resources, provide resource-compatible recreational opportunities and to promote natural resource-related issues for the public's safety and education.

Illinois Department of Transportation (IDOT): The Illinois Department of Transportation focuses primarily on the state's policies, goals and objectives for Illinois' transportation system and provides an overview of the department's direction for the future.

Illinois Environmental Protection Agency (Illinois EPA): Government agency established to safeguard environmental quality, consistent with the social and economic needs of the State, to protect health, welfare, property, and the quality of life.

Illinois Natural Areas Inventory (INAI): A survey conducted by the Illinois Department of Natural Resources to catalog high quality natural areas, threatened and endangered species and unique plant, animal and geologic communities for maintaining biodiversity.

Impaired Waters: The Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards with current pollution control technologies alone.

Impervious Cover: An area covered with solid material or that is compacted to the point where water cannot infiltrate underlying soils (e.g. parking lots, roads, houses, patios, swimming pools, tennis courts, etc.). Stormwater runoff velocity and volume can increase in areas covered by impervious surfaces.

Index of Biotic Integrity (IBI): A numeric rating based on fish surveys that is dependent on the abundance and composition of the fish species in a stream. Fish communities are useful for assessing stream quality because fish represent the upper level of the aquatic food chain and therefore reflect conditions in the lower levels of the food chain. Fish population characteristics are dependent on the physical habitat, hydrologic and chemical conditions of the stream, and are considered good indicators of overall stream quality because they reflect stress from both chemical pollution and habitat perturbations. For example, the presence of fish species that are intolerant of pollution is an indicator that water quality is good. The IBI is calculated on a scale of 12 to 60, with higher scores indicating better water quality.

Infiltration: The portion of rainfall or surface runoff that moves into the subsurface soil.

Instream Habitat: The environment within a stream in which an animal normally lives or grows.

Intergovernmental Agreement (IGA): An agreement between two or more jurisdictions in cooperation to solve problems of mutual concern.

Kettle Lake: Shallow, glacial lakes that are formed when partially buried ice blocks from glaciers melt creating a depression that fills with water.

Lake County Health Department – Ecological Services (LCHD-ES): Government agency initiated to monitor the quality of Lake County's surface water in order to maintain or improve water quality and alleviate nuisance conditions, promote healthy and safe lake conditions, and protect and improve ecological diversity.

Lake County Planning Building and Development (LC PB&D): A government agency that is responsible for land use planning and permitting in unincorporated areas, and natural resources and systems management in Lake County.

Lake County Stormwater Management Commission (SMC): The Lake County Stormwater Management Commission established and existing under state statute [55 ILCS 5/5-1062] for the purposes of developing, revising, and implementing a countywide stormwater management plan.

Lake County Watershed Development Ordinance (WDO): One part of the adopted Lake County Comprehensive Stormwater Management Plan. It sets forth the minimum requirements for the stormwater management aspects of development in Lake County.

Lakeowner Association (LA): An organization that makes and enforces rules for the lakes within its jurisdiction.

Land Cover: The physical material that covers the surface of the Earth, including forests, urban areas, water, prairies, etc.

Landform: The large-scale landscape features that affect the physical shape of a wetland or water feature (e.g., basin, flat, slope, island, or fringe).

Landscape Position: The physical setting of a wetland relative to a water body, if present (e.g., a wetland associated with a lake, a river, or a depression surrounded by uplands).

Land Use: The type of human activity that takes place on an area of land.

Lateral Recession Rate (LRR): The rate a channel or shoreline is receding due to erosion.

Lead Partners: Identify the lead public or private landowner, agency or other stakeholder with the greatest potential to implement the action.

Light Detection and Ranging (LiDAR): A remote sensing method that uses a pulsated laser to measure distances to the Earth to generate three-dimensional data of the Earth's surface.

Loess: A fine-grained unstratified accumulation of clay and silt deposited by wind.

Low Impact Development (LID): A development practice that retains and infiltrates rainfall on-site utilizing site design and planning techniques that mimic the natural infiltration-based, groundwater-driven hydrology of the landscape.

Low or High Flow Conditions: Typically measured as a 7-day average of the lowest or highest water flow rates annually.

Macroinvertebrates: Invertebrates that can be seen by the unaided eye. Most benthic invertebrates in flowing water are aquatic insects or the aquatic stage of insects, such as stonefly nymphs, mayfly nymphs, caddisfly larvae, dragonfly nymphs and midge larvae. They also include mussels and worms. The presence of benthic macroinvertebrates that are intolerant of pollutants is an indicator of good water quality.

Marl: A loose or crumbling earthy deposit that contains a substantial amount of calcium carbonate.

Marsh: Low-lying land area, dominated by herbaceous plants, that is usually saturated or inundated with surface or ground water.

McHenry-Lake Soil and Water Conservation District (MLSWCD): A government agency that assists McHenry and Lake County residents and business with conserving and protecting land, air, water and other resources.

Metropolitan Water Reclamation District of Greater Chicago (MWRD): An independent government and taxing body that treats wastewater in Cook County.

Mitigation Banking: A system of credits and debits to offset environmental impacts associated with site development and achieve no net loss, typically accomplished via restoration, creation, enhancement, or preservation of similar wetland, stream, or natural habitats near the area of impact with the specific goal of compensating for unavoidable impacts to aquatic resources.

Municipal Separate Storm Sewer Systems (MS4s): A water conveyance owned by a state, city, town, village, or other public entity that discharges to waters of the United States, that is designed or used to collect or convey stormwater and is not a combined with sewage infrastructure. Certain operators of MS4s are required to obtain NPDES permits and develop stormwater management programs.

Moraines: A mass of rocks and sediment transported and deposited by glaciers, typically as ridges at its edges or extremity.

National Flood Insurance Program (NFIP): Managed by the Mitigation Division within the Federal Emergency Management Agency, participants in the NFIP adopt and enforce floodplain management ordinances to reduce future flood damage and in exchange are eligible to receive federally funded flood insurance.

National Land Cover Database (NLCD): A national land cover product created by the Multi-Resolution Land Characteristics (MRLC) Consortium.

National Pollutant Discharge Elimination System (NPDES): Clean Water Act law requiring smaller communities and public entities that own and operate an MS4 to apply and obtain an NPDES permit for stormwater discharges. Permittees at a minimum must develop, implement, and enforce a stormwater program designed to reduce the discharge of pollutants from the MS4 to the maximum extent practicable. The stormwater management program must include these six minimum control measures:

- Public education and outreach on stormwater impacts
- Public involvement/participation
- Illicit discharge detection and elimination
- Construction site stormwater runoff control
- Post-construction stormwater management in new development and redevelopment
- Pollution prevention/good housekeeping for municipal operations

Natural Community: An assemblage of plants and animals interacting with one another and their physical environment.

Natural Resource Conservation Service (NRCS): NRCS provides technical expertise and education on conservation, development, management, and wise use of natural resources to landowners and land managers. Areas of expertise include streambank stabilization and soil erosion/ sediment control, wetland and habitat restoration, agricultural conservation, water quality protection, conservation planning, and natural resource maps and reports. NRCS administers several cost-share programs targeted to water quality, wetland restoration, and other watershed priorities.

Nitrate (NO_3^-): A form of inorganic nitrogen.

Non-Point Source Pollution (NPS): Refers to pollutants that accumulate in waterbodies from a variety of sources including runoff from the land, impervious surfaces, the drainage system and deposition of air pollutants.

North American Vertical Datum of 1988 (NAVD88): The vertical control datum of orthometric height established for vertical control surveying in the United States of America based upon the General Adjustment of the North American Datum of 1988.

North Branch Chicago River Watershed Planning Area: The 95 square mile portion of the North Branch Chicago River watershed assessed for this watershed plan. The NBCR planning area incorporates the portion of the Chicago River watershed that includes the subwatersheds of the West Fork and Middle Fork tributaries, and Skokie River as well as a short reach of the mainstem (North Branch Chicago River) in Lake County and Cook County, Illinois.

North Branch Chicago River Watershed Workgroup (NBWW): Consortium of publicly operated treatment works and MS4s organized to improve water quality throughout the North Branch Chicago River Watershed in Lake and Cook County and remove the North Branch Chicago River waterways from the Illinois EPA 303(d) impaired waters list.

North Shore Water Reclamation District (NSWRD): A municipal body that collects and conveys wastewater from local sewer systems from 17 communities in Lake County to water reclamation facilities in Gurnee, Waukegan, and Highland Park.

Objectives: Specific, precise, measurable, attainable, relevant, and time-based steps needed to attain watershed plan goals.

Onstream (or Online) Basins: Basins that are connected to a "natural" surface waterway (creek, stream, river etc.), whether that waterway flows in and/or out of the pond.

Outwash: Sand and gravel deposits removed or washed out from a glacier.

Pesticides General Permit (PGP): A permit issued under the Clean Water Act's National Pollutant Discharge Elimination System, that regulates point source discharges of biological and chemical pesticides that leave a residue.

pH: A measure of the concentration of the hydrogen ion in water, which affects multiple chemical processes within a lake such as the carbonate equilibrium cycle.

Point Source Pollution: Discharges from a single source such as an outfall pipe conveying wastewater from an industrial plant or wastewater treatment facility.

Polychlorinated biphenyl (PCB): An organic compound that was banned in the United States in 1979 because it is hazardous to human and environmental health. PCBs do not easily break down or degrade and are persistent in the environment.

Polycyclic Aromatic Hydrocarbons (PAH): A class of chemicals commonly present in urban and suburban non-point source pollution. PAH's are naturally formed in coal, crude oil, and gasoline, and can be formed when coal, oil gas, wood, garbage, or tobacco is burned.

Potentially Restorable Wetlands: Areas with predominantly hydric soils that are not mapped as wetlands on the LCWI and have not been converted to urban land use.

Prairie: An extensive flat or rolling area dominated by grasses. Prairie grasslands once covered much of central North America.

Probable Effect Concentration: A consensus based sediment quality guideline. Concentrations of a substance higher than the PEC are expected to frequently cause adverse effects to biota.

Problem Hydraulic Structures: Structures that may require further inspection or repairs.

Publicly Owned Treatment Works (POTWs): A sewage treatment plant that is owned by a government agency.

Rainwater Harvesting: Onsite collection, storage, and reuse of rainwater.

Rapid Assessment Point Method (RAP-M): A method used to capture erosion and sediment information on a watershed scale.

Riparian: The riverside or riverine environment next to the stream channel, e.g., riparian, or streamside, vegetation.

River Watch: A volunteer stream monitoring program that seeks to engage Illinois adults by training them as Citizen Scientists to collect consistent, high-quality data on the conditions of local streams.

Runoff: The portion of rain or snow that does not infiltrate into the ground and is discharged into streams by flowing over the ground instead.

Savanna: A type of woodland characterized by open spacing between trees and intervening grassland.

Secchi Disk: A circular disk with an alternating black and white pattern used to measure water transparency or turbidity.

Sediment Deposition: The geological process in which sediments, soil and rocks are added to a landform or land mass.

Sedimentation: The process that deposits soils, debris and other materials on ground surfaces or in bodies of water or watercourses.

Seep: A wetland, herbaceous or wooded, with saturated soil or inundation resulting from the diffuse flow of groundwater to the surface stratum.

Shoreline Erosion: Shoreline erosion is a natural process which results in the loss of sediment from a shoreline.

Slough: A swamp or shallow lake system, usually a backwater to a larger body of water.

Soil Phase: A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Soil Series: A level of classification in the USDA Soil Taxonomy classification system hierarchy.

Soil Survey Geographic Database (SSURGO): A database that contains information about soil that was collected by the National Cooperative Soil Survey.

Solid Waste Agency of Lake County (SWALCO): An agency in Lake County that implements a regional approach to solid waste management.

Spatial Watershed Assessment and Management Model (SWAMM^{TM}): A spatially based GIS model and management system for estimating non-point source pollution loading and identifying locations for BMP implementation.

Spreadsheet Tool for Estimating Pollutant Load (STEPL): A spreadsheet that employs simple algorithms to calculate nutrient and sediment loads from different land uses and the load reductions that would result from the implementation of various BMPs.

Stormsewershed: The land area drained by a stormsewer or stormsewer network.

Subwatershed: A smaller basin within a larger drainage area that all drains to a central point of the larger watershed.

Support Partners: Include parties that could be involved in assisting in the action implementation related to regulation, permitting, coordination, technical needs and funding assistance.

Thalweg: A line connecting the lowest points of successive cross-sections along the course of a valley or river.

Threatened Species: A species likely to become endangered.

Threshold Effect Concentration (TEC): A consensus based sediment quality guideline. Concentrations of a substance lower than the TEC are not expected to cause adverse effects to biota.

Till: A heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders deposited directly by and underneath a glacier without stratification.

Total Maximum Daily Load (TMDL): The maximum amount of point and non-point source pollutants a stream can take in during a single day and still support its designated uses.

Total Dissolved Solids (TDS): A measure of the dissolved solids in a water sample.

Total Kjeldahl Nitrogen (TKN): A measure of organic nitrogen and ammonia in a water sample.

Total Phosphorus: A measure of all organic and inorganic phosphorus in a water sample.

Total Solids (TS): A measure of all suspended and dissolved solids in a water sample.

Total Suspended Solids (TSS): A measure of organic and inorganic material greater than 0.45 microns in size that are suspended in the water column.

Total Volatile Solids (TVS): A measure of organic solids in the water column, including algae, plant material, and zooplankton.

Unified Development Ordinance (UDO): Ordinance that regulates zoning, subdivision, signs and site development in unincorporated Lake County.

United States Environmental Protection Agency (USEPA): A federal government agency created to protect human and environmental health by writing and enforcing regulations.

United Stated Army Corps of Engineers (USACE): Federal group of civilian and military engineers and scientists that provide services to the nation including planning, designing, building and operating water resources and other Civil Works projects. These also include navigation, flood control, environmental protection, and disaster response.

United States Geological Survey (USGS): Government agency established in 1879 with the responsibility to serve the Nation by providing reliable scientific information to describe and understand the Earth, minimize the loss of life and property from natural disasters, manage water, biological, energy, and mineral resources, and enhance and protect our quality of life.

Universal Soil Loss Equation (USLE): A mathematical model commonly used to estimate yearly soil loss.

University of Illinois Extension: The University of Illinois Urbana-Champaign outreach effort that provides technical assistance and educational outreach relating to energy and environmental stewardship, food safety and security, economic development and workforce preparedness, family health financial security and wellness, and youth development.

Waterbody Type: A distinction in the underlying nature of the wetland based on size and shape of the associated water component: Lake, Pond, River, or Stream.

Water Clarity: A measure of the depth that light penetrates through the water column.

Water Flow Path: Descriptors that characterize the direction of water flow (inflow, outflow, throughflow, bidirectional flow, etc.).

Watershed: Land area that drains to a given stream or river. The land area above a given point on a waterbody (river, stream, lake, wetland) that contributes runoff to that point is considered the watershed.

Watershed Development Ordinance (WDO): One part of the adopted Lake County Comprehensive Stormwater Management Plan. It sets forth the minimum requirements for the stormwater management aspects of development in Lake County.

Watershed Management Ordinance (WMO): Ordinance that establishes uniform, minimum, and comprehensive countywide stormwater management regulations for Cook County.

Watershed Planning Committee: A committee comprised of SMC staff and watershed stakeholders, with a goal of updating the watershed-based plan for the North Branch Chicago River watershed and reducing nonpoint source pollution.

Wastewater Treatment Plant (WWTP): A facility that treats sewage and wastewater prior to discharging it into the environment.

Wet Detention Basin: A permanent pool of water with designed dimensions, inlets, outlets and storage capacity, constructed to collect, detain, treat and release stormwater runoff.

Wet Flood Proofing: Wet flood-proofing allows water to enter the structure, but minimizes the damage to the structure and its contents.

Wetland: Land that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, under normal conditions, a prevalence of vegetation adapted for life in saturated soil conditions. A wetland is identified based on hydrology, soils, and vegetation as mandated by the current Federal wetland determination methodology.

Wet Meadows: A type of wetland away from stream or river influence with water made available by general drainage and consisting of non-woody vegetation growing in saturated or occasionally flooded soils.

Waters of the United States (WOUS): For the purpose of the Watershed Development Ordinance the term Waters of the United States refers to those water bodies and wetland areas that are under the U.S. Army Corps of Engineers jurisdiction.

Wetland Creation: Development of a wetland in an area that was not previously a wetland (i.e., not in a drained or otherwise modified hydric soil).

Wetland Enhancement: Augmenting wetland functions beyond the current conditions; enhancement of one function sometimes can occur at the expense of other functions.

Wetland Preservation: Actions taken to maintain the size and functions of an existing wetland or water body.

Wetland Restoration: The re-establishment of wetlands in areas where they previously existed and were altered by drainage activities or landscape modifications.

Wetlands Restoration and Preservation Plan (WRAPP): A plan, developed by SMC in 2018, with input from a technical advisory group. The WRAPP estimates functions of mapped wetlands and water resources for existing and pre-European settlement conditions within Lake County. The WRAPP will include an on-line decision support tool to help users prioritize restoration and preservation opportunities based on acreage, wetland function or functional loss. (https://www.lakecountyil.gov/2531/Wetland-Restoration-Preservation-Plan)

Woodland: An area that is mostly covered with trees and shrubs.

APPENDIX A:
2018- 2020 STAKEHOLDER MEETING REPORTS

North Branch Chicago River Watershed Workgroup (NBWW) General Membership Meeting

Wednesday, February 13, 2019 * 1:00pm – 3:00pm
Heller Nature Center, 2821 Ridge Rd, Highland Park, IL 60035

NBWW GENERAL MEMBERSHIP MEETING MINUTES

1. **Introductions**
   Matt Farmer, North Branch Chicago River Watershed Workgroup (NBWW) Vice-President, welcomed attendees at 1:03pm to the February 13, 2019 NBWW General Membership Meeting. Everyone introduced themselves (meeting attendees below). NBWW Executive Board Members in attendance included: Mark Olszewski, Village of Deerfield; Matt Farmer, Village of Northbrook; James Tigue, Village of Glenview, James Bernahl, Village of Winnetka; Al Giertych, Lake County Division of Transportation (LCDOT); Matt Ueltzen, Lake County Forest Preserve District (LCFPD); and Rob Flood, North Shore Water Reclamation District (NSWRD).

2. **Public Comment** - None

3. **Guest Speaker(s)**

   a. **Friends of the Chicago River Dam Removal Projects**

   John Quail, Director of Watershed Planning, Friends of the Chicago River (FOCR)

   John Quail gave an overview of FOCR's education and outreach efforts, planning and policies and on-the ground project types. FOCR has been involved in multiple projects with Lake County Stormwater Management Commission (SMC) and with the North Branch Watershed Project when watershed planning efforts began in the North Branch Chicago River watershed (1996). Over the years, FOCR has been involved with multiple projects throughout the watershed including, streambank restorations, restored open space (native restorations) and dam removals along the river. One of FOCR's objectives includes dam removals focusing on the fish species effects upstream and downstream in the river. A couple dams that were highlighted in the North Branch Chicago River watershed were Chick Evans, Tam O'Shanter, Winnetka Road and River Park Dam. John went through the dam removal process at the River Park Dam and some of the best management practices implemented (pool-riffle structures, stabilized streambanks, stone-toe, tree revetments, etc…). This dam removal project included the removal of 390 linear feet of concrete lining the steam and allowed 48 miles of upstream river connectivity.

   Q/A

   1. Was there any risk/benefit discussion before removing the cement liner portion of the project?
      The liner needed to go come to install the riffles in the stream, so the project could not get implemented without the liner removal. Metropolitan Water Reclamation District of Great Chicago (MWRDGC) is the owner of the dam and provided 30% match for the grant. MWRDGC found it was beneficial to get rid of any dam liability by removing the dam and additional cement liner.

   2. Were there concerns that removing the dams will increase the number of unwanted (invasive) fish species upstream? (Example: Asian Carp)
      Asian carp right now are not in the Chicago River, they have not made it past the electric barrier downstream. It is not anticipated that Asian carp will not desire to come up the Chicago River given their life cycle, but one of the ways FCOR is combating Asian carp and other invasive species is creating better native species populations. If you have a healthy native fish species that can help combat the invasive species and Asian carp.

b. North Branch Planning Committee Meeting: North Branch Chicago River Watershed-Based Plan Update

Project Managers: Ashley Strelcheck, Water Resource Professional & Mike Prusila, Planning Supervisor, Lake County Stormwater Management Commission

Mike Prusila gave a brief introduction of the North Branch Chicago River watershed-based plan update currently being performed by SMC. The Illinois EPA awarded SMC a Section 319 grant to update the 2008 North Branch Chicago River Watershed-Based Plan in November 2018. Ashley Strelcheck gave a kick-off presentation about the watershed update planning process and what watershed stakeholders should expect. Ashley explained that because this watershed-based plan is undergoing an "update" and not a brand new plan, certain sections will only require minor revisions and others may be completely new/adding in new information. SMC will be looking to the watershed stakeholders both at the watershed planning meetings during the NBWW quarterly meetings and one-on-one to provide feedback on certain sections of the plan update.

Today's task for watershed stakeholders was to review proposed modifications to the watershed vision, issues and opportunities, and goals, objectives and indicators. SMC proposed some modifications to the 2008 plan Chapter 2 sections for stakeholder review. These modifications are based on SMC's experience with watershed- based planning. The vision paragraph in the watershed plan was a general reflection of the existing goals and objectives so SMC did not feel it needed to be updated. Watershed stakeholders agreed it was fine to change the minor proposed modifications to the issues and opportunities and goal (categories) since the meanings were not altered. Ashley opened the meeting up to discussion for the proposed modifications to the objectives and indicators. The feedback received during this portion of the meeting is reflected at the end of the meeting minutes. *Please note:* ***Black*** *text is the original 2008 North Branch Chicago River Watershed-Based Plan Goals, Objectives and Indicators, the Red text is the proposed modifications from SMC and the Blue text is modifications proposed at the meeting from the stakeholders.*

4. NBWW Executive Board Business

a. Approve NBWW November 14, 2018 General Membership Meeting Summary
First Motion: Matt Ueltzen, LCFPD
Second Motion: Al Giertych, LCDOT
Approved by unanimous consensus.

b. Financial Report

Ashley Strelcheck gave updates on the current revenues, expenditures, and invoices. The 2018 carryover reserves (revenue) and three expenditure bills (2 - Midwest Biodiversity and 1 - SMC) needed to be ratified by the NBWW Executive Board.

Motion to Ratify Revenues/Expenditures:
1st motion to approve: James Bernahl, Village of Winnetka
2nd by: Al Giertych, LCDOT
The motion was passed with a unanimous vote.

c. Monitoring Committee Updates

Rob Flood gave the NBWW Monitoring Committee update to the workgroup. NSWRD will be starting it's first round of 2019 water sampling this week and is awaiting a response from the

Illinois EPA on the revised Quality Assurance Project Plan (QAPP). Rob and Ashley have been given indication that the Illinois EPA should be getting them a response to the QAPP within the next week. Once the QAPP is approved by the Illinois EPA, NBWW will send them the Draft Monitoring Strategy.

d. Old Business

i. NBWW 2018 Annual Newsletter & Workplan Scorecard Evaluation
Ashley reminded NBWW attendees that the final and approved versions of the NBWW 2018 annual newsletters and workplan scorecard evaluations are located at the back of the room for attendees to take. The newsletters can be useful to bring to boards and committees to explain who NBWW is and what the workgroup has been accomplishing. The scorecard evaluations include what NBWW has accomplished in relation to National Pollutant Discharge Elimination System (NPDES) permitting sections. This information is beneficial to NBWW members to use for their NPDES permitting requirements.

e. New Business

i. Joe Robinson explained the current efforts being put together by the Illinois Nutrient Science Advisory Committee Final (Draft) Report. This biennial report (see links below) contains an update to the original science assessment including nutrient load data from 2011-2015 for both point and non-point sources as well as sector by sector reports on activities conducted during the last two years targeted at nutrient loss reduction. Local watershed workgroups in northeastern Illinois have been collaborating on reviewing this report and providing feedback to the Illinois EPA. If any NBWW members have any feedback on this document please relay that information to Mike Adam, madam@lakecountyil.gov.

Illinois EPA Illinois Nutrient Loss Reduction Strategy Implementation Website: https://www2.illinois.gov/epa/topics/water-quality/watershed-management/excess-nutrients/Pages/nutrient-loss-reduction-strategy.aspx. Biennial Report 2015-2017 https://www2.illinois.gov/epa/Documents/iepa/water-quality/watershed-management/excess-nutrients/NLRS-Biennial-Report/NLRS%20Biennial%20Report.pdf

1. North Branch Watershed Consortium Updates or Other Discussions

Mike Adam announced the 2019 De-icing Leadership Summit being hosted by Lake County with assistance from American Public Works Association (APWA). This Summit event is different than the Lake County annual De-icing Workshop held in the fall. The Summit is targeting Lake County winter maintenance leaders, management and decision-makers to target higher-level winter maintenance decisions. If you are interested in attending please contact Mike Adam, madam@lakecountyil.gov or Ashley Strelcheck, astrelcheck@lakecountyil.gov.

Ashley Strelcheck mentioned that SMC, Center for Neighborhood Technology (CNT), and the City of North Chicago entered into an agreement to implement a Rain Ready North Chicago Pilot Program. This education and outreach aimed towards flood mitigation awareness pilot program is similar to CNT's efforts in Cook County for their Rain Ready Program (example: https://www.cnt.org/rainready). This is very exciting for the North Chicago area and the watershed.

North Branch Chicago River Watershed Workgroup (NBWW) General Membership Meeting

Wednesday, February 13, 2019 * 1:00pm – 3:00pm
Heller Nature Center, 2821 Ridge Rd, Highland Park, IL 60035

2. **Adjournment - 2:57 pm.**
   1st motion to approve: James Bernahl, Village of Winnetka
   2nd by: Rob Flood, NSWRD
   Approved by unanimous consensus.

North Branch Watershed Workgroup Meeting Attendees

Name	Organization
Al Giertych	Lake County Division of Transportation
Alvaro Melara	Congressman Brad Schneider
Ashley Strelcheck	Lake County Stormwater Management Commission
Bill Schrimpf	East Skokie Drainage District
Bud Reed	East Skokie Drainage District
Caitlin Burke	Gewalt Hamilton Assoc.
Chris Johnson	Sierra Club
David Johannesen	James Anderson Co.
Eric Otto	Forest Preserves of Cook County
Jacob Jozefowski	Lake County Stormwater Management Commission
James Bernahl	Village of Winnetka
James Tigue	Village of Glenview
Joe Robinson	North Shore Water Reclamation District
John Weinberger	Citizen
Keith Gray	Integrated Lakes Management
Leon Rockingham	City of North Chicago
Mac McKavanagh	Union Drainage District No. 1 West Fork
Marc Facchini	Village of Lincolnshire
Mark Olszewski	Village of Deerfield
Matt Farmer	Village of Northbrook
Matt Ueltzen	Lake County Forest Preserve District
Mike Adam	Lake County Health Department
Mike Prusila	Lake County Stormwater Management Commission
Nick Kollias	Metropolitan Water Reclamation District of Greater Chicago
Nimrod Warda	City of North Chicago
Peter Winkler	Land Conservancy of Lake County
Ramesh Kanapareddy	City of Highland Park
Rebecca Grill	Park District of Highland Park
Rishab Mahajan	Geosyntec
Rob Flood	North Shore Water Reclamation District
Robert Ells	City of Lake Forest
Robyn Flakne	Village of Glenview
Ryan London	Lake Forest Open Lands Association

Next NBWW General Membership Meeting (& NBCR Watershed Planning Meeting) – May 8, 2019, 1:00 pm – 3:00 pm at the Lake Forest Municipal Center (800 N Field Dr, Lake Forest, IL 60045)

North Branch Chicago River Watershed Workgroup (NBWW) General Membership Meeting

Wednesday, May 8, 2019 * 1:00pm – 3:00pm
Lake Forest Municipal Center, 800 N Field Dr, Lake Forest, IL 60045

NBWW GENERAL MEMBERSHIP MEETING MINUTES

1. **Introductions**
   Brandon Janes, North Branch Chicago River Watershed Workgroup (NBWW) President, welcomed attendees at 1:02 pm to the May 8, 2019 NBWW General Membership Meeting. Everyone introduced themselves (meeting attendees below). NBWW Executive Board Members in attendance included: Brandon Janes (Village of Deerfield), Matt Ueltzen (Lake County Forest Preserve District, LCFPD), James Tigue (Village of Glenview), Al Giertych (Lake County Div. of Transportation, LCDOT), James Bernahl (Village of Winnetka), and Rob Flood (North Shore Water Reclamation District, NSWRD).

2. **Public Comment** – None

3. **Guest Speaker(s)**

   a. **Libby Hill, Author**

   Libby Hill, Author: *The Chicago River, A Natural & Unnatural History, Revised Edition*

   Libby introduced herself and her book, *The Chicago River, A Natural & Unnatural History, Revised Edition.* She explained the revised version of her book includes topics previously omitted from the original first edition publication; such as: migration of Asian Carp, the process of public policy creation (featuring a case study of water disinfection in the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC)), green infrastructure, and the construction of the Chicago River Walk. Her research on the Chicago River is heavily based on the Cook County section of the Chicago River. Libby briefly chronicled the natural history and anthropogenic development of the Chicago River, beginning in 1763 through present day. She explained how the development of the Sanitary and Ship Canal, as well as the opening of the St. Lawrence Seaway, created a pathway for aquatic invasive species to travel into the Chicago River. After World War II, populations in both Lake and Cook Counties grew exponentially.

   The latter half of Libby's presentation focused on the unintended consequences of human interactions with the River. Libby mentioned issues like the spread of invasive species, the persistence of the Dead Zone in the Gulf of Mexico, and the potential for future conflicts to arise over water accessibility in certain parts of the country. The presentation also touched on green infrastructure, stormwater best management practices (BMPs), and their implementation throughout the watershed. The presentation concluded with a lively discussion about the perception of the Chicago River in Lake and Cook Counties, and how the implementation of certain BMP's affects public perception.

   Discussion:
   After Libby's presentation, she opened up the meeting for discussion focusing on the Lake County portion of the watershed. Libby wanted to discuss additional projects in the Lake County portion of the watershed, that she was not aware of. During her research, she had difficulties finding all of the projects she was aware of in the Lake County portion of the watershed and wanted feedback from the meeting attendees who have local knowledge of the watershed. The feedback from the meeting attendees was that there were many projects in Lake County and they would be happy to share those projects with Libby.

b. North Branch Planning Committee Meeting: North Branch Chicago River Watershed-Based Plan Update

Project Managers: Ashley Strelcheck, Water Resource Professional & Mike Prusila, Planning Supervisor, Lake County Stormwater Management Commission (SMC)

i. Ashley gave an overview of the Education and Outreach Strategy from the 2008 North Branch Chicago River Watershed-Based Plan and how that information would translate into the 2018 plan update. The overall goals for the strategy are to inform watershed stakeholders on the issues and opportunities within the watershed, foster broad and individual support for implementing solutions, and to provide guidance to watershed partners. Ashley outlined the six steps for the strategy: define driving forces and purpose, identify target audience, package the message, distribute the message, evaluate the effectiveness. Within the 2018 'Education and Outreach Strategy' strategies for dissemination of information include: social media, direct mailing, media and marketing, technical workshops, manuals, public involvement, school-based education, and demonstration projects.

There was a brief discussion on whether it would be advantageous to put funding towards media campaigns, whether those be public service announcements (PSA) or boosting posts on social media. A point was made that the Stevenson Center experimented with boosting posts on a small scale but did not see a significant effect. It was clarified that you can pay to have a public notice appear on a certain date, but you can also submit a public service announcement fee-free and but would be circulated at an unknown date. Additional changes between the 2008 to the 2018 'Education and Outreach Strategy' include: *stormwater marking* is being used instead of the term *stormwater stenciling*, and the Incident Reporting Hotline has been disconnected and illicit discharges are referenced in Chapter 3. At the end of her presentation, Ashley asked that questions and comments concerning the 'Education and Outreach Strategy' be sent to astrelcheck@lakecountyil.gov by May 22nd, 2019. A draft version of the 2018 Education & Outreach Strategy will be posted on SMC's North Branch Chicago River watershed webpage: http://www.lakecountyil.gov/2433/North-Branch-Chicago-River-Watershed.

Q/A
Where is the list of all the funding resources and programs available for watershed projects? Is there a focus on educational funding sources?

There will be an appendix in the 2018 North Branch Chicago River Watershed-Based Plan that addresses potential funding sources and information about those opportunities. There are a few funding sources that are focused or allow a secondary benefit of educational components. Appendix L in the Des Plaines River Watershed-Based Plan, on the Lake County Stormwater website (http://www.lakecountyil.gov/2376/Des-Plaines-River-Watershed) is a good example of how the funding sources appendix will be formatted.

4. NBWW Executive Board Business

a. Approve NBWW February 13, 2019 General Membership Meeting Summary
First Motion: James Bernahl, Village of Winnetka

Second Motion: Matt Ueltzen, LCFPD
Approved by unanimous consensus.

b. Financial Report

Ashley Strelcheck gave an update on the NBWW budget, expenditures and revenues, and current membership dues status. In 2019, the Village of Morton Grove and West Deerfield Township joined the NBWW for the first time; their membership dues have been added to the 2019 budget.

Motion to Ratify Revenues/Expenditures:
1st motion to approve: Rob Flood, NSWRD
2nd by: James Bernahl, Village of Winnetka
The motion was passed with a unanimous vote.

c. Monitoring Committee Updates

Rob Flood gave the NBWW Monitoring Committee update to the meeting attendees. The February 2019 water quality sampling has been completed, and May sampling has begun. A conference call with Chris Yoder (Midwest Biodiversity Institute (MBI)) has been scheduled for next week to discuss the second year of biological monitoring. Last year the Skokie River (11 sites) was sampled, and this year the Middle and West Fork (14 sites) will be sampled.

d. Old Business

Ashley mentioned that the Quality Assurance Project Plan (QAPP) and the Bioassessment 2-Year Monitoring Strategy were approved in April (2019) by the Illinois EPA. This is important because it validates the monitoring data being collected by the NBWW. The QAPP and Bioassessment 2-Year Monitoring Strategy are available at: https://www.nbwwil.org/plans-and-reports/

e. New Business

i. Meetings Certificates

NBWW, Des Plaines River Watershed Workgroup (DRWW), and Municipal Advisory Committee (MAC) meetings will now offer PDH certificates / MS4 Program fulfillment credits at each quarterly general membership meeting. The certificates can be used towards maintenance of professional licenses or fulfillment of MS4 BMP requirements.

ii. Lake County Deicing Summit

The Deicing Summit was a level 2 training for winter maintenance decision makers. This meeting was well attended and spurred interesting discussion on current winter maintenance practices in Lake County, as well as ways entities can improve their winter maintenance procedures. The breakfast was sponsored in part by the NBWW.

5. Watershed Project Updates or Other Announcements/Discussion - None

6. Adjournment
1st motion to approve: Rob Flood, NSWRD
2nd by: Matt Ueltzen, LCFPD

North Branch Chicago River Watershed Workgroup (NBWW) General Membership Meeting

Wednesday, May 8, 2019 * 1:00pm – 3:00pm
Lake Forest Municipal Center, 800 N Field Dr, Lake Forest, IL 60045

Approved by unanimous consensus, and the meeting adjourned at 2:57 pm.

North Branch Watershed Workgroup Meeting Attendees

Name	Organization
Al Giertych	Lake County Division of Transportation
Ashley Strelcheck	Lake County Stormwater Management Commission
Bill Gaeding	Morton Grove Public Works
Bill Rickert	RHMG & Village of Green Oaks
Brandon Janes	Village of Deerfield
Bud Reed	East Skokie Drainage District
Caitlin Burke	Gewalt Hamilton Assoc.
Chris Johnson	Sierra Club
Eric Otto	Forest Preserves of Cook County
James Bernahl	Village of Winnetka
James Tigue	Village of Glenview
Jim Baxa	Village of Northbrook
Justin Vick	Metropolitan Water Reclamation District of Greater Chicago
Joan O'Shaughnessy	Chicago Botanic Garden
JoAn Sabonjian	Representative for State Senator Julie Morrison
Joe McJohn	Citizen
Kate Amoruso	Village of Wilmette
Larry Bridges	East Skokie Drainage District
Libby Hill	Author, Guest Speaker
Lisa Woolford	Integrated Lakes Management
Linda Englund	Sierra Club
Maria Lasday	Village of Bannockburn
Matt Ueltzen	Lake County Forest Preserve District
Mike Prusila	Lake County Stormwater Management Commission
Paula Miller	Morton Grove Public Works
Peter Nagel	Chicago Botanic Gardens
Peter Winkler	Land Conservancy of Lake County / Trinity UCC
Ramesh Kanapareddy	City of Highland Park
Rob Flood	North Shore Water Reclamation District
Robert Ells	City of Lake Forest
Robyn Flakne	Village of Glenview
Rosemary Heilemann	Sierra Club
Thomas Burke	Christopher B. Burke Eng., Ltd.
Tom Polzin	Hey & Associates
Vern Witthuhn	Strand Associates

Next NBWW General Membership Meeting (& NBCR Watershed Planning Meeting) – August 14, 2019, 1:00 pm – 3:00 pm at the Lake Forest Municipal Center, 800 N Field Dr, Lake Forest, IL 60045

North Branch Chicago River Watershed Workgroup (NBWW) General Membership Meeting

Wednesday, August 14, 2019 * 1:00pm – 3:30pm
Lake Forest Municipal Center, 800 N Field Dr, Lake Forest, IL 60045

NBWW GENERAL MEMBERSHIP MEETING SUMMARY

1. **Introductions**
   Brandon Janes, North Branch Chicago River Watershed Workgroup (NBWW) President, welcomed attendees at 1:05 pm to the August 14, 2019 NBWW General Membership Meeting. Everyone introduced themselves (meeting attendees below). NBWW Executive Board Members in attendance included: Brandon Janes (Village of Deerfield), Matt Ueltzen (Lake County Forest Preserve District, LCFPD), James Tigue (Village of Glenview), Al Giertych (Lake County Div. of Transportation, LCDOT), Matt Farmer (Village of Northbrook), and Rob Flood (North Shore Water Reclamation District, NSWRD).

2. **Public Comment** – None

3. **North Branch Planning Committee Meeting: North Branch Chicago River Watershed-Based Plan Update**
   a. **Presentation & Stakeholder Discussion** – *Recent Water Quality Data for the North Branch Chicago River Watershed*
   Mike Prusila, Planning Supervisor, SMC
   Mike Prusila gave a summary presentation on recent water quality data for the North Branch Chicago River watershed. This presentation included water quality assessments published by Illinois EPA that resulted in the list of "impairments" to water bodies (lakes and streams) and their causes and designated uses in the watershed. Mike presented historic biological and chemical data for pollutants identified by Illinois EPA, as well as, a summary of recent historical biological monitoring data collected by the Illinois Department of Natural Resources (IDNR), *Lake Michigan Basin Fishery Report, 2001 -2016*.

   The presentation summarized the Illinois EPA's Draft 2018 Total Maximum Daily Load (TMDL) report for parameters with numeric standards and load reductions (Fecal Coliform, Chloride, Total Phosphorus (TP) and Dissolved Oxygen (DO) – no TMDL) needed to attain water quality standards. Mike briefly explained that the 2008 North Branch Chicago River Watershed-Based Plan (data from 2006) was compiled with much of the historic data presented and will be integrated into the 2018 watershed-based plan update. One of the action plan recommendations from the 2008 watershed plan was to have a more robust monitoring program, which now exists with the North Branch Chicago River Watershed Workgroup. For the 2018 watershed plan update the next steps include incorporating the Year 1 & 2 NBWW monitoring data and formulate and revise action plan recommendations. The next watershed plan update (November 13, 2019) meeting topic will be focused on the flood problem area inventory update.

   Questions/Answers:
   1. What were the three lakes evaluated for Total Phosphorus reductions (according to the 2018 TMDL Report) in the watershed?
      - Botanic Gardens, Skokie Lagoons, and Eagle Lake (Lake Forest Academy).

4. **Guest Speaker – Chris Yoder, Midwest Biodiversity Institute (MBI)**
   Year 1 - 2018 NBWW Water Quality Monitoring Results
   Chris Yoder gave a presentation about the Biological and Water Quality Assessment of the Skokie River and Lower Middle Fork Chicago River (Year 1 NBWW Monitoring Rotation). The presentation included the DuPage & Salt Creek watershed's assessment plan approach (which is similar to NBWW's). MBI uses a variety of field (chemical/physical) and Illinois

EPA sampling methods and processes including water column grab sampling, depth integrated sampler, automatic composite samplers, and time-of-travel injections. MBI is currently performing a two-year cycle for NBWW water quality monitoring (11 sites in 2018 & 14 sites in 2019) with active sampling from June – October.

Chris graphically presented the water quality results for several parameters including TP, Chloride, Specific Conductance (specific to the 7 data sonde locations), Total Nitrate (TN), DO, QHEI, Fish IBI and Macroinvertebrate IBI. The Year 1 data indicated that none of the 11 monitoring sites sampled meet Fully Supporting macroinvertebrate and fish IBI results. MBI will be working on the causes and sources of these impairments. MBI is currently evaluating chemical water quality criteria and threshold effects for an ongoing compilation of a northeastern Illinois Integrated Prioritization System (IPS) Model (which includes, DRSCWG, DRWW and Illinois EPA databases). The IPS model is a potential alternative path to TMDL implementation or waterwater treatment plant upgrades (that can be very expensive). An IPS model supports multiple restoration & protection objectives and projects, provides rankings of restorability for impairments at the site, reach, & subwatershed scale and an accounting of limiting stressors and provides rankings of threat/susceptibility for attaining sites, reaches, & subwatersheds.

Questions/Answers:

1. Clarification: the threshold levels (presented) for the various chemical/physical parameters; those came primarily from Illinois EPA data that's from outside areas the urban areas the workgroup operates within because that data did not have good enough scores as reference sites? Correct?
    - The majority of the threshold level data was from the workgroup study areas. The majority of the sites within the workgroup areas were listed as fair, poor and very poor so MBI needed to find sites outside the workgroup so the data would not be too skewed (meaning not having any good or excellent score sites).

    Follow-up Question: When looking at chloride thresholds those are based on reference sites, correct?
    - They are not exactly reference sites; they are Illinois EPA basin assessment sites. It may include some of their reference sites (roughly 20 sites).

2. One of the sites had improved from the graph presentation. What is going on at that site that is causing that improvement?
    - That is the next step is to figure that question out (next steps) – are at this step for the DRWW right now. That improvement could possibly be from pollution control and it can take longer in some areas then others. Fish has always been a limiting factor; dams preclude fish diversity upstream and the northeast region of Illinois has had a lot of dam removal over the past 15 years or so and that may be helpful for this.
3. One your range of WRF results (by river mile – from upstream to downstream), was the NSWRD Clavey Road WRF monitoring site sample collected at the location of the plant or where the effluent meets the river?
    - The sampling location is where the effluent meets the river.
4. Based on the Year 1 data collected, are you (MBI) happy with the locations of the monitoring locations?
    - So far (preliminary, have not written the report yet), yes, MBI is happy with the locations and feel that no critical locations are not being missed.

Future suggestion: translating or superimposing the monitoring location numbers (i.e. SR1) on all graphic data representations not just the river miles.

5. How is effluent discharge data being collected, how is that data being obtained?
    - The two WRF's (Clavey Road and Deerfield) are required to provide discharge data (specific data parameters) from their plants for their permits and they have provided that to the NBWW and MBI for compiling into the overall water quality data.
6. From the presentation, it looks like all of the QHEI scores are very poor, is MBI going to provide the tools/resources to manipulate (improve) the habitat?
    - MBI has a more detailed matrix of good and modified attributes and NBWW will be able to focus on those attributes that will impact/achieve the most. Even if you can control all the pollution, it may not impact the habitat enough to improve those scores so it's a two- part approach to improving this. Achieving TMDL's for parameters but not aquatic life parameters – habitat does not improve the QHEI.
7. There were concerns that were mentioned regarding the diurnal swings with DO data; is there a magnitude where you have concerns, such as 6 mg/L, between your high and low values?
    - (In the DRWW report) there are ranges for the width of swings that have causes for concerns. There is so much focus on DO and benthic chlorophyll a, that's all people will look at. Although it may be related to the benthic chlorophyll a but it needs to be related back to biota.

Mike Prusila and Chris Yoder's presentations can be found in the NBWW meeting summary webpage: https://www.nbwwil.org/meetings/meetings-archive/.

5. NBWW Executive Board Business

a. Amendment to NBWW August 14, 2019 Agenda: Change to the current date (August 14, 2019)

First Motion: Matt Farmer, Village of Northbrook
Second Motion: Matt Ueltzen, LCFPD
Approved by unanimous consensus.

b. Approve NBWW May 8, 2019 General Membership Meeting Summary

First Motion: Al Giertych, LCDOT
Second Motion: Rob Flood, NSWRD
Approved by unanimous consensus.

c. Financial Report

i. Brandon Janes presented the NBWW budget, expenditures and revenues, and current membership dues to the meeting attendees.

Motion to Ratify Revenues/Expenditures:
First Motion: Matt Farmer, Village of Northbrook
Second Motion: Matt Ueltzen, LCFPD
Approved by unanimous consensus.

ii. Sponsorship of 2019 Lake County Deicing Workshop: This agenda item was tabled for discussion until the September 11, 2019 NBWW Executive Board meeting where Ashley Strelcheck can provide more details about this event and sponsorship.

d. Monitoring Committee Updates

Rob Flood gave the NBWW Monitoring Committee update to the meeting attendees. NSWRD finishing up the August 2019 water quality monitoring (all 25 sites are being monitored). MBI is currently collecting the Year 2 fish, habitat, sediment and macroinvertebrate monitoring data. The dissolved oxygen (DO) datasondes were placed and retrieved last week.

e. Old Business: None.

f. New Business: None.

6. Watershed Project Updates or Other Announcements/Discussion

i. Next NBWW General Membership Meeting (November 13, 2019): Includes Watershed Consortium, North Branch Chicago River & Lake Michigan Watershed Planning Meetings. The topic is flood problem area inventory.

ii. The USACE flood storage study did conclude that there was not enough cost-benefit evidence for additional watershed flood storage (for Skokie River and Middlefork). Currently, Highland Park is asking for some additional information from USACE. The study (final report) did not provide conclusionary evidence that further mitigation is required.

7. Adjournment

First Motion: Matt Farmer, Village of Northbrook
Second Motion: Matt Ueltzen, LCFPD
Approved by unanimous consensus, and the meeting adjourned at 2:52 pm.

Optional Project Tour took place at the Middlefork Savanna following the meeting (lead by Matt Ueltzen)

North Branch Watershed Workgroup Meeting Attendees

Name	Organization
Al Giertych	Lake County Division of Transportation
Bill Gaeding	Morton Grove Public Works
Brandon Janes	Village of Deerfield
Bud Reed	East Skokie Drainage District
Caitlin Burke	Gewalt Hamilton Assoc.
Chelsey Grassfield	Friends of the Chicago River
Chris Johnson	Sierra Club
Chris Yoder	Midwest Biodiversity Institute
Damon Cederberg	Libertyville Township
Dan Manis	Village of Wilmette
Dudley Onderdonk	Glencoe Park District
Eric Otto	Forest Preserves of Cook County
Ernesto Huaracha	Lake County Stormwater Management Commission

Name	Organization
Gordon McKavanagh	Union One West Fork Drainage District
Jack Bielak	Cook County Department of Transportation & Highways
James Tigue	Village of Glenview
Jeff Nehila	Deerfield Park District
Joe Robinson	North Shore Water Reclamation District
Justin Vick	Metropolitan Water Reclamation District of Greater Chicago
Larry Bridges	East Skokie Drainage District
Leilani Kobzina	Village of Glenview
Linda Englund	Sierra Club
Lisa Mende	Village of Glenview
Lisa Schwartz	League of Woman Voters Deerfield Area
Maggie Jones	Friends of the Chicago River
Marc Facchini	Village of Lincolnshire
Maria Lasday	Village of Bannockburn
Matt Ueltzen	Lake County Forest Preserve District
Mike Prusila	Lake County Stormwater Management Commission
Monika Jalowiecka	Village of Round Lake Beach
Nimrod Warda	City of North Chicago
Patty Werner	Citizen
Paula Miller	Morton Grove Public Works
Peter Winkler	Land Conservancy of Lake County / Trinity UCC
Ramesh Kanapareddy	City of Highland Park
Rob Flood	North Shore Water Reclamation District
Robert Ells	City of Lake Forest
Robyn Flakne	Village of Glenview
Rosemary Heilemann	Sierra Club
Ryan London	Lake Forest Open Lands Association
Tom Polzin	Hey & Associates
Vern Witthuhn	Strand Associates

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North Branch Chicago River Watershed Workgroup (NBWW) General Membership Meeting

Wednesday, November 13, 2019 * 1:00pm – 3:00pm
Heller Nature Center, 2821 Ridge Rd, Highland Park, IL 60035

NBWW GENERAL MEMBERSHIP MEETING SUMMARY

1. Introductions

Brandon Janes, North Branch Chicago River Watershed Workgroup (NBWW) President, welcomed attendees at 1:02 pm to the November 13, 2019 NBWW General Membership Meeting. Everyone introduced themselves (meeting attendees below). NBWW Executive Board Members in attendance included: Brandon Janes (Village of Deerfield), Matt Ueltzen (Lake County Forest Preserve District, LCFPD), Robyn Flakne (Village of Glenview), Al Giertych (Lake County Div. of Transportation, LCDOT) and Rob Flood (North Shore Water Reclamation District, NSWRD).

2. Public Comment - None

3. North Branch Chicago River & Lake Michigan Watershed Plan Meeting

Mike Prusila, Lake County Stormwater Management Commission (SMC) Planning Supervisor, gave a brief introduction for the North Branch Chicago River & Lake Michigan watershed planning portion of the meeting. This portion of the NBWW meeting is a joint watershed planning effort to discuss flooding and flood problem areas in the watersheds.

a. *Flooding in the North Branch Chicago River & Lake Michigan Watersheds*

Sharon Østerby, SMC Water Resource Professional, gave a presentation on flooding and flood mitigation measures in the North Branch Chicago River & Lake Michigan watersheds. Sharon's presentation included different types of flooding that are reported to SMC and FEMA; depressional flooding, overbank flooding, erosion problems, local drainage problems, septic system failure and sanitary sewer backup. Sharon presented many ways that watershed stakeholders can implement preventative measures or take action against flood damage. Some flood damage prevention measures include acquisition & demolition, applying for SMC's buyout program, building elevation or relocation, barriers such as floodwalls & driveways, dry or wet proofing and implementing flood control projects. Two areas of flood preparedness Sharon presented are SMC's annual meetings for the All-Natural Hazard Mitigation Plan for local units of governments that encourages the development and maintenance of a Flood Emergency Preparedness Plan and the National Flood Insurance Program (NFIP) which provides insurance to property owners and encourages communities to adopt and enforce floodplain management regulations.

b. *Flood Damage Mitigation Projects*

Kurt Woolford, SMC Chief Engineer, gave an overview of projects within the North Branch Chicago River and Lake Michigan watersheds and discussed efforts to identify projects to alleviate flooding. The North Branch Chicago River watershed was studied in the early 2000s to identify projects to alleviate flooding. This study has guided and helped prioritize flood mitigation projects since then. Several projects along the Skokie River presented have increased flood storage, improved water quality and removed piped stream segments ("daylighting"). Some of those projects include:

- The Dady Slough Flood Control and Wetland Enhancement Project involves mutiple watershed partners such as the City of Park City and Waukegan, Cristo Rey St. Martin College Prep, East Skokie Drainage District, SMC and Illinois Department of Transportation for additional flood storage to alleviate local flooding. This project is in the conceptual design phase.
- Jaime Mitigation Project in North Chicago implemented in phases with multiple project partners and provided floodplain storage capacity, wetland restoration and mitigation, water quality enhancement and stormwater conveyance improvement.
- Strawberry Condo Drainage Improvements is a multi-agency phased approach that started in 2014 and is still in progress to provide additional storage and flow capacity for an area that has

frequent flooding problems. Past work included enhancing conveyance through the stormwater management facilities and currently SMC is working to reconstruct a small berm to divert flows around the site.

- In the future, SMC is coordinating with the Great Lakes Naval Base to upsize some culverts on their property to alleviate local flooding.

Kurt explained that Lake Michigan is a coast and is being remapped as a coastal floodplain by FEMA. These coastal zones will be designated as "VE" on the maps. Kurt showed the "triple divide" point in Lake County (Grand Avenue) for the Des Plaines River, North Branch Chicago River and Lake Michigan watersheds. Kurt also mentioned that when it comes to flooding and flood mitigation, sometimes property measures are not enough to eliminate flood damage and the buyout program may be the best option. There are many buyout properties that SMC has been a part of and is currently working with (such as Beach Park and Highland Park). On that note, SMC is seeing predictions of higher rainfall amounts and SMC anticipates the need for more buyout properties to increase.

US Army Corps of Engineers (USACE) Sombra, Ontario Video

*Questions/*Answers

1. *Is SMC's Buyout Program partnered with FEMA's program?*
   Yes, although SMC does partner with other agencies for the buyout program as well; IDNR and local communities. In-kind services have in the past been provided by local communities. There is a couple different agencies SMC applies for grant funding for the buyout program and there are different criteria for different agencies.

2. *Does the new "VE" coastal floodplain designation have any effect on how projects will be approved/reviewed along Lake Michigan?*
   Yes, we anticipate effects due to the wave run-up and velocities factors in these areas. SMC will update the Watershed Development Ordinance (WDO) with the appropriate coastal regulations, but there is not a confirmed date for those regulations. The preliminary maps (with the "VE" zones) will be available to the public from FEMA in Spring 2020.

3. *Most of the Lake Michigan communities have bluff projects and right now they only go through US Army Corps of Engineers (USACE) and IDNR permitting, once the VE maps go into effect, will homeowners have to get additional FEMA permits?*
   No, you will just need to comply with the regulations, SMC will update the Watershed Development Ordinance (WDO) to include coastal regulations. Certified communities will still be able to permit. If the projects are in Lake Michigan, an applicant would still go through the IDNR and USACE for permitting.

4. *Is there a map further south in the watershed showing opportunities for flood storage capacity?*
   The Lake Bluff feasibility study (42 different analysis performed) concluded that additional storage further downstream such as the Lake Bluff reservoir would not alleviate flooding in the headwaters of the Skokie River; only decentralized nodes of storage along the Skokie would alleviate headwater flooding. A main component of the study was a hypothetical storage facility at Oriole Grove Forest Preserve in Lake Bluff. Additional analysis suggested that storage at this location would not provide significant benefits further downstream due to the narrow geography of the watershed.

   The USACE (in conjunction with ESDD, Highland Park, Deerfield and Lake Forest) have been working on a recent Planning Assistance to States (PAS) study to investigate potential flood storage in southern portions of the Middle Fork and Skokie River watersheds (Lake County only).

The USACE has concluded that benefit cost-benefit ratio was not more than 1.0, which is their requirement to move forward with a project. Right now, Highland Park is in the process of expanding that study for additional considerations, more localized flooding (particularly in Highland Park) in their analysis and focusing on localized storage sites in combination with the buyout program. What has been observed along the channels is that clearing obstructions such as the work performed by ESDD has been very beneficial for flood reduction.

5. *With the increased rainfall being observed and predicted, has there been any consideration for new impervious surface implementation (new development or retrofits) for not to exceed amounts?*
   Yes, the standard that all Illinois regulatory programs use for new development is based on a state water survey report (Bulletin 70), that has been recently updated and the values that Lake County uses has been updated (that has been approved through the Technical Advisory committee). SMC expects that update in the WDO to come out early next year but those values for the rainfall have increased on average 30%. SMC will use those increased rainfall amounts and the requirements will reflect those new thresholds (more/larger systems for stormwater detention). What the WDO cannot assist with is old development or retrofitting old developments but does apply to new development. During the July 2017 flood event (new rainfall records), the flooding analysis post-flood event showed that 95% of the homes damaged from the event were constructed prior to the 1992 WDO.

6. *Is it feasible to develop a retrofit volunteer-based program for pre-WDO developments? Or a cost-share program?*
   There are different incentive programs out there and some programs like utility fees. There are communities in Lake County that have adopted a stormwater utility program that calculate a fee based on a property's impervious surface and give homeowners an incentive to implement stormwater runoff reduction measures to offset the amount of stormwater runoff leaving their property. SMC can start looking into more cost-share programs or expanding existing programs possibly with the recent approval of SMC project funding.

7. *With the updated Bulletin 70 based on past rainfall amount, is there a chance the updated WDO will consider predicted increases in rainfall amounts? Is SMC confident that rainfall will no longer increase beyond this updated standard?*
   No, the updated WDO is unlikely to consider estimated or predicted future rainfall depth/duration frequencies. The other local counties are using the past rainfall analysis approach and it is more defensible with the analyzed data to increase the standards verses "predicted" amounts. Each municipality will have any opportunity to increase the standard above the updated WDO standard (some do), but that suggestion has been brought up before and has not been used. SMC is not confident that rainfall will no longer increase beyond this updated standard, but the model trends are showing (with 90% confidence) that the rainfall amounts are increasing. The models have many factors and they are not perfect, but they do predict increases in rainfall amounts.

8. *What is the status of flood storage at Oriole Grove Forest Preserve, would that help flooding anywhere or has that idea been abandoned?*
   The previous study (Christopher Burke Engineering) mentioned earlier, looked at alleviating flooding in the headwaters and this site did not show any measurable benefits. Ramesh Kanapareddy, City of Highland Park, does hope that Oriole Grove may still be considered in the USACE's expanded study (mentioned above) because that site is upstream of Highland Park. Pati Vitt, Lake County Forest Preserves, mentioned that to LCFPD's knowledge, there are not flood reduction benefits to implementing a flood retention project at this site based on the model results. As far as restoration is concerned, the LCFPD is planning on restoring the site to a wet meadow site, but not as a retention basin.

c. *Flood Problem Areas & Webapplication Demonstration*

Ashley Strelcheck, SMC Water Resource Professional, gave a brief presentation on existing (and reported) flood problem areas (FPA) in the North Branch Chicago River & Lake Michigan watersheds. Flood problem areas are identified from a combination of flood damage reports and anecdotal information provided by communities, homeowner associations and elected officials. There are approximately 138 FPAs in the North Branch Chicago River watershed and 50 FPAs in the Lake Michigan watershed. The most common flooding types that are reported include: local drainage problems (including pavement flooding), overbank flooding and erosion problems. Ashley also presented other types of reported flood areas including self-reports form the July 2017 flood event and Illinois Emergency Management Agency (IEMA) report submissions. Combined, the July 2017 event had 935 self-reports of flooding from residents and 393 IEMA report submissions from that flood event. From this information, SMC needs local communities, townships and transportation agencies to provide updates to the existing FPA database and provide information on any new FPAs that are not documented. This information will assist SMC with the watershed planning efforts to identify additional flood problem areas and prioritize flood mitigation projects.

SMC has created a Web application of all FPAs in the North Branch Chicago River and Lake Michigan watersheds and looking for stakeholder input. Michelle Pope, SMC GIS Specialist/Engineering Technician, presented the Webapplication to the meeting attendees and provided step-by-step instructions on updating existing FPAs and creating new FPAs in the Webapplication. Local communities, townships and transportation agencies will be receiving an email with the Webapplication FPA information

*Questions/*Answers

9. *Do you have FPA priority criteria (for the watershed planning process)?*
   No, that would be one of the items that SMC would develop after receiving the updated FPA information.

10. *Where did the July 2017 data layer come from?*
    That July 2017 data/layer came from the July 2017 self-reports received by local residents during the flood event. The existing FPA data has been developed from mid-1990's from countywide community assistance to develop a database and through each watershed planning process the FPAs have been updated and additional FPAs have been identified.

4. NBWW Business

a. Approve NBWW August 14, 2019 General Membership Meeting Summary

First Motion: Rob Flood, NSWRD
Second Motion: Matt Ueltzen, LCFPD
Approved by unanimous consensus.

b. Financial Report

Ashley Strelcheck presented the NBWW budget, expenditures and revenues. No motion to ratify revenues/expenditures was needed.

c. Monitoring Committee Update

Rob Flood, Monitoring Committee Chair, gave the NBWW Monitoring Committee update to the meeting attendees. NSWRD just finished up the 2019 water column chemistry sampling, which completed the Year 2 monitoring (and one full cycle of data). NBWW has collected one full cycle of water quality monitoring data, meaning that each site (all 25 sites) has been sampled ten times for water quality parameters, fish sampling, macroinvertebrates, qualitative habitat evaluation index performed, sediment sampling and benthic chlorophyll a at 14 samples with datasondes. Only one sample site was missed in February 2019

due to the water being frozen. Midwest Biodiversity (MBI) is finished collecting the Year 2 fish, habitat, sediment and macroinvertebrate monitoring data. Rob did a brief overview of the draft water quality data collected in Year 1 & 2. Some of the elevated levels that were observed from the data include: elevated levels of chlorides at every site in February (exceeded the 500 mg/L limit), elevated levels of dissolved oxygen (DO) levels in the low flow summer months at several sites and almost all sites exceeded the 235 mg/L limit for E.coli (contact recreation).

NSWRD and MBI will begin Year 3 monitoring (February 2020) in the coming months and this will focus on the Skokie River sampling and a few sites on the Middle Fork. NBWW has voted to provide up to $7,000 to the DuPage River Salt Creek Workgroup to contribute to MBI's Identification and Prioritization System Model (IPS) Model completion.

*Questions/*Answers

1. *Were nutrients sampled? Any correlation between DO and nutrients?*
   Yes, NSWRD and MBI have not done a thorough analysis of the data yet so we are not sure. As part of MBI's contract, they will provide a report to NBWW with more detailed information.

d. Old Business - None

e. New Business - None

5. North Branch Watershed Consortium Updates or Other Discussions

a. North Branch Watershed Consortium:

- Bannockburn
- Deerfield
- East Skokie Drainage District
- Green Oaks
- Highland Park
- Highwood
- Lake Bluff
- Lake Forest
- Lincolnshire
- Mettawa
- North Chicago
- Park City
- Riverwoods
- Union Drainage District #1 (West Fork)
- Waukegan
- West Skokie Drainage District

- Ashley gave an announcement that 3 projects have been award Illinois Environmental Protection Agency (Illinois EPA) Section 319 grants in the 2019 grant cycle. The three projects include:

  1. East Skokie Drainage District (ESDD) Skokie River Stream Stabilization Project
     a. Bud Reed, ESDD Engineer, gave an update that ESDD is awaiting permits from the USACE.
  2. Village of Glenview For Pine Street Streambank Stabilization & Open Space Project
  3. Park District of Highland Park for Highland Park Country Club Shoreline Restoration & Wetland Enhancement Project
- Bill Rickert, RHMG, gave an update on the Village of Green Oaks that purchased and demolished a home in the Tax Increment Finance (TIF) District and converted it into open space.

b. Next NBWW General Membership Meeting – February 12, 2020

6. Adjournment

First Motion: Matt Ueltzen, LCFPD
Second Motion: Rob Flood, NSWRD
Approved by unanimous consensus, and the meeting adjourned at 2:58 pm.

North Branch Watershed Workgroup Meeting Attendees

Name	Organization
Al Giertych	Lake County Division of Transportation
Alvaro Melara	Representative of Congressman Schneider
Ashley Strelcheck	Lake County Stormwater Management Commission
Bill Gaeding	Morton Grove Public Works
Bill Rickert	RHMG
Brandon Janes	Village of Deerfield
Bud Reed	East Skokie Drainage District
Caitlin Burke	Gewalt Hamilton Assoc.
Carla Ojha	City of Lake Forest
Casey Sebetto	Illinois Department of Natural Resources Costal Management
Charles Frank	Sierra Club
Chip Taylor	Cardno, Inc.
Chris Johnson	Sierra Club
Chuck Bodden	North Shore Water Reclamation District
Donald Hey	Wetlands Research
Dudley Onderdonk	Glencoe Park District
Eric Otto	Forest Preserves of Cook County
Heidi Natura	Living Habitats
Henrietta Saunders	Natural Resources Commission of Glenview
Jack Bielak	Cook County Department of Transportation & Highways
Jacob Jozefowski	Lake County Stormwater Management Commission
James Tigue	Village of Glencoe
Jeff Nehila	Deerfield Park District
Jim Anderson	James Anderson Company
John Beardsley	Illinois State Water Survey
John Quail	Friends of the Chicago River
Justin Vick	Metropolitan Water Reclamation District of Greater Chicago
Kate Amoruso	Village of Wilmette
Kurt Woolford	Lake County Stormwater Management Commission
Larry Bridges	East Skokie Drainage District
Lisa Krause	Illinois Department of Natural Resources
Mac McKavanagh	Union One Drainage District
Matt Ueltzen	Lake County Forest Preserve District
Melanie Rummel	City of Lake Forest
Mike Burke	Christopher B. Burke Engineering
Mike Clayton	Village of Riverwoods
Mike Prusila	Lake County Stormwater Management Commission
Ramesh Kanapareddy	City of Highland Park
Rob Flood	North Shore Water Reclamation District
Robert Ells	City of Lake Forest
Robyn Flakne	Village of Glenview
Ryan London	Lake Forest Open Lands Association
Sarah Surroz	Openlands
Silvia Klostermeier	Resident

Name	Organization
Susie Schrieber	Waukegan Harbor Citizens Advisory Group
Ted Haffner	Openlands
Tim Girmscheid	Waukegan Park District
Tom Polzin	Hey & Associates

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North Branch Chicago River Watershed Workgroup (NBWW) General Membership Meeting

Wednesday, February 12, 2020 * 1:00pm – 3:00pm
Heller Nature Center, 2821 Ridge Rd, Highland Park, IL 60035

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2. Public Comment - None

3. Guest Speaker – Chris Hanchett, V3 Companies

Chris Hanchett, V3 Companies and design engineer for East Skokie Drainage District's (ESDD) Lake Forest Streambank Stabilization Project, gave an overview presentation of the upcoming streambank stabilization project. Chris provided a history of stream inventory assessments for the project area and how this project was prioritized for ESDD. V3 Companies was contracted to provide a more in-depth analysis of the streambank conditions and create a design to stabilize the streambanks. Chris showed images of the current streambank erosion issues, debris in the stream and problem discharge locations. In 2018, an emergency repair was necessary to repair a section of the streambank in the project area that had collapsed into the stream. This current project will implement a variety of stabilization practices that will vary along the length of the river depending on the severity of the erosion (toe protection, gabion baskets, soil lifts, slop re-shaping and grading, and revegetation). This project is currently obtaining the necessary easements from homeowners and going out to bid in the next few months, followed by construction this year. Funding for this project is provided, in part, by the ESDD Annual Assessment funds and the Illinois EPA through Section 319 of the Clean Water Act.

Questions/Answers

1. *How long do tree revetments last?* Approximately 20-25 years
2. *Was there any consideration for habitat enhancement during the design of the project?* In the initial stages yes, but it wasn't the main priority of the project and ultimately no habitat enhancements were included in the design.
    a. *Any riffle pools in stream?* No
3. *How do you move forward with the project with homeowners that do not issue easements?* If homeowners do not grant an easement on their property, then the project will not be implemented within their property area and will be designed around their property.
    a. *If the homeowners doesn't grant an easement and the ESDD skips their property what happens to that property?* The existing erosion at that project would likely continue, the approach taken will be site-specific.
4. *Did the projects affect property value?* There will be no assessments of property values performed by the ESDD. The benefits of this project to homeowners is that the project limits loss of their property into the stream.
5. *What are the plans to replant after the project is complete; any native vegetation?* Any disturbed area from project will at a minimum be restored to existing condition. Tree revetments and slopes will be native vegetation and anything above top of bank will be restored with turf grass or if the prior condition was native vegetation then that will be replanted. The project will also replace removed (desirable) trees but not the same size.

6. *Are the homeowners responsible for maintenance of this project?* No, there will be a public utility easement that the ESDD will be responsible for maintaining.
7. *Was there consideration of adding river access (for individual homeowners)?* No, that was not a part of the project designs.
    a. *Has ESDD thought about establishing a special service area to pay for the project?* No, the ESDD has not asked for more funding for river access.
8. *Did the ESDD make sure not to increase the flow downstream?* Yes, that is a requirement in the permitting process. Models have shown there will be no increase in flows or water levels (upstream/downstream).

4. North Branch Chicago River Watershed-Based Plan Update

Ashley Strelcheck, Lake County Stormwater Management Commission (SMC) Water Resource Professional, gave a brief introduction for the North Branch Chicago River Watershed-Based Plan Update efforts that have been taking place during the NBWW general membership meeting over the past year. Ashley gave a brief presentation of the North Branch Chicago River watershed prioritized action plan that will be compiled over the next couple of months. SMC will compile programmatic (watershed-wide) and site-specific action plan recommendations within the watershed-based plan, which provides guidance to watershed stakeholders for implementing projects and programs. As part of the prioritized action plan process, SMC will be collecting information from a variety of sources including existing action plan recommendations from the 2008 watershed-based plan, direct stakeholder input, stream and detention basin inventory, lake shoreline inventory, flood problem area inventory, desktop analysis, water quality data and modeling and total maximum daily load (TMDL) data. The next steps for this process include continuing to gather information for the prioritized action plan and collecting site-specific action recommendations from watershed stakeholders.

*Questions/*Answers

1. *Is the stream inventory results available to the public?* It's being reviewed right now and considered "draft", but it will be available, probably closer to the end of 2020 when the watershed-based plan update is being finalized.

Ashley also presented a draft version of the education and outreach strategy table that was revised for Chapter 8 of the watershed-based plan update to resemble more of a strategy/roadmap for education and outreach. The table was revised to focus on messages to specific target audiences outlined in Chapter 8 and presented to the meeting attendees for any additional feedback for this chapter.

Watershed Stakeholder Feedback

1. Add in language in the local government officials and agencies, and residents and businesses target audience sections about a monitory value to quantify impacts on property values for environmental projects and programs. On the similar note, adding in financial incentive language to those target audiences and even the NBWW target audience (for participation).

5. NBWW Business

a. Approve NBWW November 13, 2019 General Membership Meeting Summary

First Motion: Matt Ueltzen, LCFPD
Second Motion: Rob Flood, NSWRD
Approved by unanimous consensus.

b. Financial Report

Ashley Strelcheck presented the NBWW budget, expenditures and revenues. Motion to ratify revenues/expenditures:
First Motion: Matt Farmer, Village of Northbrook

Second Motion: Matt Ueltzen, LCFPD
Approved by unanimous consensus. Roll call was taken.

c. Monitoring Committee Update

Rob Flood, NSWRD and Monitoring Committee Chair, gave the NBWW Monitoring Committee update to the meeting attendees. NSWRD & MBI finished all of the 2019 water quality sampling, which completed the Year 2 NBWW monitoring (and one full cycle of data). MBI is currently analyzing the 1st cycle of monitoring data (Years 1 & 2) for a comprehensive monitoring report that will be sent (in "draft" form) to NBWW in August 2020. NSWRD and MBI have started Year 3 monitoring efforts in the watershed.

*Questions/*Answers

1. *Are there any preliminary results from the water quality data?* There were elevated levels of chlorides and fecal coliform. Rob wanted to defer to MBI for the advanced chemical analysis of the data.
2. *Where are the monitoring sites?* There is a map of monitoring site locations on NBWW's website (https://www.nbwwil.org/maps-and-photos/).

d. Old Business – None

e. New Business – Approve the 2019 Annual Newsletter. No question or comments were received.
First Motion: Matt Farmer, Village of Northbrook
Second Motion: Rob Flood, NSWRD
Approved by unanimous consensus

6. Watershed Project Updates or Other Announcements/Discussion

a. Next NBWW General Membership Meeting: May 13, 2020, 1:00pm – 3:00pm at the Heller Nature Center in Highland Park, Illinois.

b. April 15, 2020 the Village of Highland Park plans to host another Regional Flood Mitigation Meeting, more information to follow.

c. The PDHP Community Park Conversion Project (Preserves of Highland Park) is getting close to finalizing agreements and starting bid documents for the project, which includes at least 50 acres of preserved wetlands.

7. Adjournment

First Motion: Matt Ueltzen, LCFPD
Second Motion: Rob Flood, NSWRD
Approved by unanimous consensus, and the meeting adjourned at 2:36 pm.

North Branch Watershed Workgroup Meeting Attendees

Name	Organization
Alvaro Melara	Representative of Congressman Schneider
Ashley Strelcheck	Lake County Stormwater Management Commission
Bill Schrimpf	East Skokie Drainage District
Brandon Janes	Village of Deerfield
Bud Reed	East Skokie Drainage District
Chris Buckley	Clark Dietz
Chris Hanchett	V3 Companies
Chuck Frank	Sierra Club

Name	Organization
Damon Cederberg	Libertyville Township
Dudley Onderdonk	Glencoe Park District
Ernesto Huaracha	Lake County Stormwater Management Commission
Jacob Jozefowski	Lake County Stormwater Management Commission
James Tigue	Village of Glencoe
Joan O'Shaughnessy	Chicago Botanical Garden
Joe Robinson	North Shore Water Reclamation District
Kate Amoruso	Village of Wilmette
Kim Stone	City of Highland Park
Larry Bridges	East Skokie Drainage District
Maria Lasday	Village of Bannockburn
Matt Farmer	Village of Northbrook
Matt Ueltzen	Lake County Forest Preserve District
Melanie Rummel	City of Lake Forest
Melissa Madara	Stantec / Highland Park Resident
Mike Zemaitis	Lake County Division of Transportation
Nimrod Warda	City of North Chicago
Paula Miller	Village of Morton Grove
Ramesh Kanapareddy	City of Highland Park
Randy Ebertowski	Gurnee Mills
Rebecca Connolly	Stantec
Rebecca Grill	Park District of Highland Park
Rob Flood	North Shore Water Reclamation District
Robert Ells	City of Lake Forest
Robyn Flakne	Village of Glenview
Ryan London	Lake Forest Open Lands Association
Scott Griffith	Christopher B. Burke Engineering
Stuart Nissenbaum	Lake County Stormwater Management Commission
Tatiana Papakos	Resident
Tom Polzin	Hey & Associates

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MS4 Program BMP fulfillment. *If attendees want to apply NBWW meetings and education towards their MS4 Program BMP Measurable Goals, keep the certificate, agenda and minutes with sign-in sheets. Acceptance of these materials for MS4 program credit is at the discretion of the Illinois EPA.*

NORTH BRANCH CHICAGO RIVER WATERSHED WORKGROUP ANNUAL MEETING MINUTES

Wednesday, August 12, 2020 * 1:00pm – 3:00pm

NBWW GENERAL MEMBERSHIP MEETING MINUTES

1. **Introductions**
   Brandon Janes, North Branch Chicago River Watershed Workgroup (NBWW) President, welcomed attendees at 1:03 pm to the August 12, 2020 NBWW General Membership Meeting. The meeting was held virtually, and Ashley Strelcheck introduced meeting attendees via the zoom participant list and ask for designated NBWW voting delegates (meeting attendees below). NBWW Executive Board Members in attendance included: Brandon Janes (Village of Deerfield), Matt Ueltzen (Lake County Forest Preserve District, LCFPD), Jim Baxa (Village of Northbrook), Robyn Flakne (Village of Glenview), Al Giertych (Lake County Div. of Transportation, LCDOT), James Bernahl (Village of Winnetka) and Rob Flood (North Shore Water Reclamation District, NSWRD). An Executive Board quorum was present.

2. **Public Comment** - None

3. **Guest Speaker – Chris Yoder, Midwest Biodiversity Institute (MBI)**
   Chris Yoder, Midwest Biodiversity Institute (MBI), gave an overview of the *Biological and Water Quality Assessment of the North Branch Chicago River Watershed, Years 1 and 2 (monitoring) Rotation*. Chris started by giving an overview of the bioassessment sampling terminology, the importance of monitoring different parameters and the criteria for assessing samples. The different chemical and physical field procedures for different types of sampling included water column grab sampling, depth integrated sampler, automatic composite samplers, time-of-travel dye injection and electrofishing methods. The North Branch Chicago River Watershed Bioassessment Report (currently being developed by MBI) includes a full analysis of all of the 2018 and 2019 monitoring data (all 25 NBWW monitoring sites). Each monitoring site was sampled for fish, macroinvertebrates, and habitat, which makes this report a baseline for water quality for the NBWW. The aquatic life use attainment including causes and sources are enhanced by the new IPS model thresholds and tools that is under review by the local watershed workgroups right now. "Combined" assessment for nutrient enrichment (modified SNAP procedure) and restorability factors are calculated per the Northeastern Illinois IPS model and all the data added to Power BI platform. Chris talked about the Northeastern Illinois IPS model indicating that it allows a user to examine assessed data such as use attainment status and associated causes & sources of impairment. NBWW plans to be a user of this model when it is completed for the North Branch Chicago River watershed. Chris explained that the modified stream nutrient assessment procedure (SNAP) was also utilized to analyze the 25 NBWW monitoring sites, which categorize the results from very poor to excellent per parameter. Several tables were presented that summarize the findings of the 2018-2019 NBWW monitoring data. For more information, Chris Yoder's presentation can be found below in the attachments.

   Questions/Answers *(took place at the end of the meeting agenda)*

   1. *(Chris mentioned in his presentation) random sampling of macroinvertebrates stop at 300 individuals; is that 300 individuals or 300 individuals of a species? Please explain protocol.*
      A. *300 Individuals. MBI produces a reduced sample out of the raw sample, which is the protocol (300 individuals) that Illinois has adopted. States vary in this amount.*

John Quail, Friends of the Chicago River (FOCR) – *presentation moved to the end of the agenda*

John Quail, Friends of the Chicago River (FOCR), gave an overview presentation of the recently formed Chicago River Watershed Council. The vision for the Chicago River Watershed Council is the collaboration between the public and private sectors for effective nature-based stormwater solutions throughout the watershed. The Chicago River Watershed Council has already recognized local entities past and current stormwater and green infrastructure work, and identifying the community flooding issues and combined

stormsewer systems issues. Climate crisis increased rainfall has had a local impact with increasing property and infrastructure (investments at risk), and community health and resilience. There is a need for equitable investment and environmental justice, which is a major resource consideration for the Watershed Council. FOCR is currently looking at the blue-green corridor and keeping that system (nature-based) in mind moving forward. One of the focus' of this work is utilizing resources and funding efficiently for nature-based green infrastructure so costs and complexity is reduced and over time more resiliency. FOCR took a look at many opportunities within the river corridors and found 37,000 acres of open space and 28,000 acres are publicly owned. As the Chicago River Watershed Council continues to develop, FOCR and/or SMC will provide updates to the NBWW. John Quail's presentation is located at the end of the meeting minutes.

4. North Branch Chicago River Watershed-Based Plan Update

Ashley Strelcheck, Lake County Stormwater Management Commission (SMC) Water Resource Professional, gave a brief overview of the North Branch Chicago River Watershed-Based Plan Update efforts. SMC has completed draft versions of Chapters 1, 2, 3, 5 & 8 (out of 9 chapters), which are at various stages of revisions. Currently, SMC is revising Chapter 3 (Water Resource Inventory) based on Illinois EPA's suggested revisions and starting work on Chapters 4, 6 & 7. Over the past few months, SMC has been coordinating with local communities in the North Branch Chicago River and Lake Michigan watersheds to set up meetings to discuss action plan recommendations. Ashley asked if any watershed stakeholders had action plan recommendations to add into the watershed-based plans to please contact her in the next two months. SMC will continue to compile programmatic (watershed-wide) and site-specific action plan recommendations within the watershed-based plan, which provides guidance to watershed stakeholders for implementing projects and programs.

5. NBWW Business

a. Approve NBWW February 12, 2020 General Membership Meeting Summary

First Motion: Matt Ueltzen, LCFPD
Second Motion: Bob Ells, City of Lake Forest
Approved by voice NBWW Membership roll call vote (see results below)

b. Financial Report

Ashley Strelcheck presented the NBWW budget, expenditures and revenues. Motion to ratify revenues/expenditures:
First Motion: Matt Ueltzen, LCFPD
Second Motion: Al Giertych, LCDOT
Approved by voice NBWW Membership roll call vote (see results below)

c. Monitoring Committee Update

Rob Flood, NSWRD and Monitoring Committee Chair, gave the NBWW Monitoring Committee update to the meeting attendees. NSWRD & MBI have been working on their 2020 water quality sampling, which is considered the Year 3 monitoring sampling. NSWRD has successfully sampled in February, May and July for all the parameters and they have been analyzed. MBI field crews are sampling (focus on the 11 sites on the Skokie River) in July and August this year and have been successful in collecting their samples.

d. Old Business – None

e. New Business

Approve the 2020 – 2020 NBWW Executive Board Member nominees. No new nominations were received by Ashley Strelcheck, only minor changes to alternate positions and one Executive Board member/alternate position switch. No discussion or questions were asked.
First Motion: James Bernahl, Village of Winnetka

Second Motion: Rob Flood, NSWRD
Approved by voice NBWW Membership roll call vote (see results below)

6. Watershed Project Updates or Other Announcements/Discussion

a. Next NBWW General Membership Meeting: November 18, 2020, 1:00pm – 3:00pm.

7. Adjournment

First Motion: Matt Ueltzen, LCFPD
Second Motion: Rob Flood, NSWRD
Approved by unanimous consensus, and the meeting adjourned at 2:29 pm.

North Branch Watershed Workgroup Meeting Attendees

Name	Organization
Al Giertych	Lake County Division of Transportation
Amy Call	Resident
Anitha Dasappa	Cook County
Ashley Strelcheck	Lake County Stormwater Management Commission
Austin McFarlane	Lake County Public Works
Barry Stuedemann	Huff & Huff/GZA GeoEnvironmental, Inc.
Bill Rickert	RHMG and Village of Green Oaks
Brandon Janes	Village of Deerfield
Brian Joyce	City of Lake Forest
Bud Reed	Reed Engineering & East Skokie Drainage District
Chris Johnson	Resident
Chris Yoder	Midwest Biodiversity Institute
Christine Davis	Illinois Environmental Protection Agency
Damon Cederberg	Libertyville Township
Dave Miller	North Shore Water Reclamation District
Drew Irvin	Village of Lake Bluff
Dudley Onderdonk	Resident
Edward Wilmes	City of North Chicago
Emmanuel Gomez	City of Highland Park
Eric Otto	Forest Preserve District of Cook County
Erin Pande	ERA Consultants
Henrietta Saunders	Resident
Jacob Jozefowski	Lake County Stormwater Management Commission
James Bernahl	Village of Winnetka
James Tigue	Village of Glencoe
Jeff Edstrom	Illinois Coastal Management Program
Jeff Nehila	Deerfield Park District
Jim Baxa	Village of Northbrook
Jim Jabcon	Chicago Botanical Garden
Joan O'Shaughnessy	Chicago Botanical Garden
John Quail	Friends of the Chicago River
Jonathan Happ	Libertyville Township
Justin Vick	Metropolitan Water Reclamation District of Greater Chicago

Name	Organization
Kate Amoruso	Village of Wilmette
Kurt Woolford	Lake County Stormwater Management Commission
Larry Bridges	East Skokie Drainage District
Linda Englund	Illinois Sierra Club
Lisa Mende	Resident
Lisa Woolford	Integrated Lakes Management
Mac McKavanagh	Resident
Maria Lasday	Village of Bannockburn
Marion Cartwright	Resident
Mark Dupree	Trotter & Associates, Inc.
Matt Ueltzen	Lake County Forest Preserve District
Melanie Rummel	City of Lake Forest
Michael Prusila	Lake County Stormwater Management Commission
Michael Warner	Lake County Stormwater Management Commission
Mike Adam	Lake County Health Department
Patty Werner	Resident
Paula Miller	Village of Morton Grove
Penny Bouchard	Baxter and Woodman
Peter Nagle	Chicago Botanical Garden
Rebecca Connolly	Stantec
Rob Flood	North Shore Water Reclamation District
Robert Ells	City of Lake Forest
Robyn Flakne	Village of Glenview
Rosemary Heilemann	Illinois Sierra Club
Ryan London	Lake Forest Open Lands Association
Scott Griffith	Christopher B. Burke Engineering
Steven Waters	North Shore Water Reclamation District
Tatiana Papakos	Resident
Ted Anderson	James Anderson Company
Tom Polzin	Hey & Associates
Vern Witthuhn	Strand Associates
Wally Dittrich	Village of Lincolnshire

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NORTH BRANCH CHICAGO RIVER WATERSHED WORKGROUP ANNUAL MEETING MINUTES

Wednesday, November 18, 2020 * 1:00pm – 3:00pm

NBWW GENERAL MEMBERSHIP MEETING MINUTES

1. **Introductions**

   Brandon Janes, North Branch Chicago River Watershed Workgroup (NBWW) President, welcomed attendees at 1:04 pm to the November 18, 2020 NBWW General Membership Meeting. The meeting was held virtually, and Ashley Strelcheck performed roll call of NBWW members and ask for designated NBWW voting delegates (meeting attendees and roll call sheet below). A total of 26 members (tallying 96 votes) were in attendance, so an NBWW meeting quorum was present. NBWW Executive Board Members in attendance included: Brandon Janes (Village of Deerfield), Matt Ueltzen (Lake County Forest Preserve District, LCFPD), Matt Farmer (Village of Northbrook), Robyn Flakne (Village of Glenview), Al Giertych (Lake County Div. of Transportation, LCDOT), James Bernahl (Village of Winnetka) and Rob Flood (North Shore Water Reclamation District, NSWRD).

2. **Public Comment** – None

3. **Guest Speakers**

   - **Brandon Janes, Village of Deerfield, *What is a N.A.R.P?***

     Brandon Janes, Village of Deerfield Water Reclamation Facility Superintendent, gave an introduction presentation of the Nutrient Assessment and Reduction Plan (NARP). Wastewater dischargers are required to have a NARP because they are located upstream of phosphorous related (stream) impairment or risk of eutrophication. Brandon gave an overview of the North Branch Chicago River watershed wastewater dischargers National Pollutant Discharge Elimination System (NPDES) permit requirements, which specifies that a discharger (or a watershed workgroup) must develop a NARP by December 31, 2024. The NARP requirements include developing your own (science based) watershed specific target levels, determining source(s) of impairments and how to address them, implementation schedule and allows for the possibly nutrient trading for addressing impairments. The NARP has been an impetus for the NBWW since it's formation in January of 2018. The Illinois EPA NPDES permit deadlines are December 31, 2021 for the NARP Workplan (guidance document to complete the NARP) and December 31, 2024 for submitting the NARP to the Illinois EPA. For more information, Brandon Janes' presentation can be found below in the attachments.

     <u>*Questions*/Answers</u>

     Clarification: The NARP will cover the wastewater dischargers in the North Branch Chicago River watershed (NBWW planning area) but since the NBWW is pursuing the NARP, this will cover the entire watershed workgroup? Currently NBWW submits stream monitoring data on behalf of the NBWW NPDES permit holders to satisfy their stream monitoring permit requirements. Currently, MS4 permit holders in Illinois have not seen a NARP requirement but there are other states that do have an MS4 NPDES NARP requirements.

   - **Deanna Doohaluk, DuPage River Salt Creek Watershed Workgroup, Nutrient Assessment & Reduction Plans (NARPs)**

     Deanna Doohaluk, DuPage River Salt Creek Watershed Workgroup and The Conservation Foundation, gave an in-depth presentation of NARP permitting requirements, what to expect, coordination with the Illinois EPA and examples of NARPs. Deanna went into detail about the coordination efforts between the Illinois EPA and the Nutrient Science Advisory Committee (NSAC) about setting a numeric standard for Illinois and development of a NARP. One of the important points that Deanna mentioned is that the Illinois EPA has a defined deadline for the NARP workplan and completion of the NARP (December 31, 2024), but in conversations with the Illinois EPA, the overall goal is to move forward on eliminating the

impairments and risk and continuing to work on the NARP goals. The NARP methods/process whether it be a model or other tool, can be proposed to the Illinois EPA for review on whether it would be an acceptable method for the NARP prior to starting work. The overall goal of the NARP (the outcomes) are the projects that are identified, the schedules that are set and the target levels set (once approved by the Illinois EPA) will be put into an NPDES permit. Currently, other permitted facilities and dischargers are required to have a NARP but getting their participation may be beneficial because they may be incorporated in the future. Although NARPs do not require non-point source project consideration, if a watershed feels that non-point source projects would have a positive impact on removing impairments then add it in (gives watersheds the power to determine how to improve the water quality).

The elements of the NARP should at a minimum include: watershed group members, impairments, phosphorus input sources, stream monitoring, modeling used and findings, goals or target levels of phosphorous reductions, water quality based reductions, water quality trading provisions, point source controls, schedule for phosphorus input reductions or other stream improvements, additional stream monitoring identified and NPDES permit modification to include NARP requirements. Examples of a NARP include the Fox River Study Groups 2015 Fox River Implementation Plan (FRIP) and the DuPage River Salt Creek Watershed Workgroup (DRSCW) Nutrient Implementation Plan (NIP). Deanna went through a couple examples of projects that DRSCW have implemented and the positive results of those projects.

The DRSCW focus' is on biological integrity and biological health is the single largest driver of local NPDES permits and an integrative view of river health. The DRSCW is working on utilizing the Identification ad Prioritization System (IPS) model, QUAL2Kw modeling, NPS feasibility analysis, Nutrient Trading Program, Chloride Reduction and expanded DO monitoring and chlorophyll A monitoring. Deanna gave an overview of the IPS benefits of prioritizing your projects and the other methods for improving water quality in the watershed. Deanna gave some considerations for the NBWW for the NARP development:

What are your goals and objectives for your watershed/NARP?

- Do you want to accept the NSAC TP recommendation or develop your own watershed-specific target?
- Do you want your NARP to focus on nutrient concentrations vs nutrient expression?
- What realistically can you do on your permitted timeline?
- Do you want to just focus on nutrients or include all your "stressors"?
- Local water quality or gulf hypoxia/NLRS goals?

For more information, Deanna Doohaluk's presentation is located at the end of the meeting minutes.

Comments/Discussion

The NARP requirements are currently NPDES requirements and given the current pandemic the current deadlines are not automatically waived, that would be subject to negotiations. Extensions of the current deadlines would need a good reasoning for adjusting that deadline. Downstream waters are also an important factor to keep in mind.

4. NBWW Business

a. Approve NBWW August 12, 2020 General Membership Meeting Summary

First Motion: James Bernahl, Village of Winnetka
Second Motion: Al Giertych, LCDOT
Approved by voice NBWW Membership roll call vote (see results below)

b. Financial Report

Ashley Strelcheck presented the NBWW budget, expenditures and revenues. There were no new revenues or expenditures to ratify. No questions were asked.

c. Monitoring Committee Update

Rob Flood, NSWRD and Monitoring Committee Chair, gave the NBWW Monitoring Committee update to the meeting attendees. Year 3 (Fiscal Year 2020) stream monitoring has been completed by MBI and NSWRD with no known problems with sampling. Year 3 sampling focused on the Skokie River for bioassessment and Tier 3 sampling (last sampling event was October 2020). The stream monitoring data is currently being analyzed for the year. In February, NSWRD will start the FY21 stream monitoring sampling for Year 4 (which will complete the second cycle of data). MBI has submitted the draft 2018-2019 Monitoring Report to NBWW for review and the Monitoring Committee and Executive Board has been reviewing and providing revisions to MBI. The report is considered DRAFT but the NBWW is hoping to have a final product around the end of 2020.

d. Old Business

NARP Preliminary Workplan – Brandon explained the next steps for NBWW pursuing a NARP, which would be to start compiling a preliminary NARP workplan (deadline December 31, 2020). To compile a NARP Workplan a Request for Qualifications (RFQ) or a Request for Proposals (RFP) would be needed to work with a consultant to assist NBWW. The explanation between the two approaches is in the meeting minutes below. Ashley drafted a scope of work and sent it to the NBWW Monitoring Committee and Executive Board for their feedback and asked for opinions for an RFP or RFQ. Eight NBWW board and committee members agreed with an RFQ approach and one NBWW member agreed with an RFP approach. Based on the feedback, Brandon recommended an RFQ approach based on the NBWW Board and Monitoring Committee, and staff level of knowledge with the NARP. The RFQ approach would allow NBWW to choose a consultant based on their qualifications, then NBWW would work with the selected consultant to put together a proposal that meets the needs of the NARP, NBWW's goals and objectives and price points. There were no questions or discussion items. Brandon asked for a motion to pursue an RFQ for the Preliminary NARP Workplan.

First Motion: Bob Ells, City of Lake Forest
Second Motion: Matt Ueltzen, Lake County Forest Preserve District
Approved by voice NBWW Membership roll call vote (see results below).

e. New Business

Ashley Strelcheck presented the MBI FY21 Contract, NSWRD FY21 Contract and SMC FY21 Contracts for the NBWW's review and approval. MBI's FY21 Contract will focus on Year 3 monitoring data analysis and Year 4 sampling for a total of $47,595.05, NSWRD's FY21 Contract will perform water column chemistry sampling and analysis for a total of $46,327.50 and SMC's FY21 Administrative and NARP Technical Services contract is a not-to-exceed total of $24,000. No questions were asked. The motions and roll call vote were for all three contract approvals.

First Motion: Ramesh Kanapareddy, City of Highland Park
Second Motion: Marc Facchini, Village of Lincolnshire
Approved by voice NBWW Membership roll call vote (see results below). Ashley Strelcheck, Lake County Stormwater Management Commission and Rob Flood, North Shore Water Reclamation District both abstained from voting since both of their contracts were a part of this combined vote.

5. Watershed Project Updates or Other Announcements/Discussion

a. North Branch Chicago River Watershed-Based Plan Update

Ashley Strelcheck, Lake County Stormwater Management Commission (SMC) Water Resource Professional, gave a brief overview of the North Branch Chicago River Watershed-Based Plan Update efforts. Over the past few months, SMC has been coordinating with local communities in the North Branch Chicago River and Lake Michigan watersheds to set up meetings to discuss action plan recommendations and update known flood problem areas within the watershed. SMC will continue to compile programmatic (watershed-wide) and site-specific action plan recommendations within the

watershed-based plan, which provides guidance to watershed stakeholders for implementing projects and programs. The next steps include bringing draft NBWW recommendations to the December or January NBWW Monitoring Committee and Executive Board meetings for feedback for the watershed-based plan. The Draft North Branch Chicago River Watershed-Based Plan deadline to the Illinois EPA is January 29, 2021.

b. Next NBWW General Membership Meeting: February 10, 2020, 1:00pm – 3:00pm.

6. Adjournment – 2:49pm

First Motion: Ramesh Kanapareddy, City of Highland Park
Second Motion: Matt Farmer, Village of Northbrook
Approved by voice NBWW Membership roll call vote (see results below)

North Branch Watershed Workgroup Meeting Attendees

Name	Organization
Al Giertych	Lake County Division of Transportation
Albert Ettinger	Environmental Law & Policy Center of the Midwest
Alvaro Melara	Representative of Congressman Schneider
Ashley Strelcheck	Lake County Stormwater Management Commission
Bill Rickert	RHMG and Village of Green Oaks
Brandon Janes	Village of Deerfield
Brian Valleskey	Geosyntec Consultants, Inc.
Caitlin Burke	Resource Environmental Solutions
Charles Frank	Resident
Chris Yoder	Midwest Biodiversity Institute
Christine Davis	Illinois Environmental Protection Agency
Damon Cederberg	Libertyville Township
Dave Miller	North Shore Water Reclamation District
David Souther	Resident
Deanna Doohaluk	DuPage River Salt Creek Workgroup & The Conservation Foundation
Edward Rankin	Midwest Biodiversity Institute
Eric Otto	Forest Preserve District of Cook County
Erin Pande	ERA Consultants
Frederick Chung	Village of Libertyville
George Duberstein	Village of Hainesville
Jacob Jozefowski	Lake County Stormwater Management Commission
James Bernahl	Village of Winnetka
James Tigue	Village of Glencoe
Jodi McCarthy	Gewalt Hamilton Associates, Inc. representing Villages of Riverwoods, Northfield & Bannockburn
John Quail	Friends of the Chicago River
Justin Vick	Metropolitan Water Reclamation District of Greater Chicago
Kate Amoruso	Village of Wilmette
Katherine Andersen	Resident
Kurt Woolford	Lake County Stormwater Management Commission
Linda Englund	Illinois Sierra Club
Mac McKavanagh	Resident

Name	Organization
Marc Facchini	Village of Lincolnshire
Matt Farmer	Village of Northbrook
Matt Ueltzen	Lake County Forest Preserve District
Michael Prusila	Lake County Stormwater Management Commission
Michael Warner	Lake County Stormwater Management Commission
Nimrod Warda	City of North Chicago
Paul Frank	Lake County Board Member (District 11)
Penny Bouchard	Baxter and Woodman
Ramesh Kanapareddy	City of Highland Park
Rebecca Connolly	Stantec
Rebecca Grill	Park District of Highland Park
Rob Flood	North Shore Water Reclamation District
Robert Ells	City of Lake Forest
Robyn Flakne	Village of Glenview
Rufus Ajayi	Resident
Ryan London	Lake Forest Open Lands Association
Scott Griffith	Christopher B. Burke Engineering
Stephen McCracken	DuPage River Salt Creek Workgroup & The Conservation Foundation
Steve Waters	North Shore Water Reclamation District
Tatiana Papakos	Resident
Tracy Gastfield	Vernon Township

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APPENDIX B:
STREAM INVENTORY REPORT

LAKE COUNTY STORMWATER MANAGEMENT COMMISSION

2019

NORTH BRANCH CHICAGO RIVER WATERSHED



Stream Inventory Summary | Summer 2019

STREAM INVENTORY SUMMARY

INTRODUCTION

The Lake County Stormwater Management Commission (SMC) conducted a stream inventory of the North Branch Chicago River watershed during the summer of 2019 in addition to a number of other studies and projects related to the development of a watershed-based plan in the North Branch Chicago River watershed. The purpose of this assessment was to record quantitative and qualitative stream information, including the capture of visual information on the stream conditions in the North Branch Chicago River watershed. The information collected will provide a baseline of the overall stream conditions, which can be further extrapolated to indicate the conditions of the stream network of the watershed. The results will be incorporated into the watershed-based plan and provide a framework for prioritizing and implementing watershed management strategies.

CHANNEL OVERVIEW

The North Branch Chicago River watershed covers approximately 95 square miles in both eastern Lake and Cook counties. The watershed begins in the City of Waukegan and extends south into the Cook County, Village of Morton Grove. The watershed comprises 26 municipalities, 11 townships, 4 drainage districts, and 2 wastewater treatment plants. The North Branch Chicago River watershed is comprised of three tributaries (Skokie River, Middle Fork North Branch Chicago River and West Fork North Branch Chicago River) that originate in Lake County and flow south into Cook County where they eventually combine to form the main stem of the North Branch Chicago River. The North Branch Chicago River flows south through Cook County to its confluence with the North Shore Channel on Chicago's north side and meets the Main Stem and South Branch of the river in downtown Chicago. The South Branch flows into the Chicago Sanitary and Ship Canal where flow from the Chicago River watershed is diverted westward, joining with the Des Plaines River as a tributary of the Illinois River. The Illinois River flows southwest across the state and is a major tributary of the Mississippi River.

TABLE NB-01: STREAM REACHES

REACHES	NUMBER OF REACHES	AVERAGE REACH LENGTH (mi.)	TOTAL LENGTH (mi.)	PERCENT OF WATERSHED
Assessed Reaches (Lake County)	94	0.45	42.1	47.64%
Unassessed Reaches (Lake County)	0	0.0	0.0	0%
Assessed Reaches (Cook County)	63	0.50	34.32	38.83%
Unassessed Reaches (Cook County)	19	0.70	11.96	23.53%
Total Reaches	**176**	**0.55**	**88.38**	**100%**

THE STREAM INVENTORY ASSESSMENT

The stream assessment includes the geomorphic characterization of the channel by identifying erosion, evaluating discharge points and hydraulic structures, obstructions, areas of deficient buffer zones, and areas with significant detrimental impact on the stream. Visual observations regarding vegetation, water quality conditions, habitat assessments, and aquatic and terrestrial life are included in the stream inventory and allow for a more comprehensive assessment of the stream conditions. Also, information captured during the inventory process

includes notes and comments about the stream that may not be well represented in the other forms, such as specific restrictions to streams, restoration efforts or conversations with local residents. The stream inventory data is captured through a uniform and standard process to ensure it is accurate and reproducible.

DATA COLLECTION AND METHODOLOGY

The stream network within the watershed was divided into reaches, smaller geographically defined segments, for which data is aggregated. Data was collected by teams of two observers who walked the tributaries and canoed the mainstem for the entire length of every reach assessed. At representative points within each reach, the observers measured the channel dimensions and relative velocity (at the surface) of the stream, noted streambank and riparian conditions, and documented hydraulic structures and discharge points using a standardized database. For the purpose of determining bank erosion (lateral recession) additional measurements were obtained, including bank height, lateral recession rate, severity, and lateral recession characteristics. The Rapid Assessment Point Method (RAP-M) was used for observing lateral recession rates. The observers used an iPad along with ESRI's Collector Application to take photos and record data. Data collected includes points of erosion, significant sediment deposition and debris jams, hydraulic structures and discharge points, and photos of the stream channel that are representative of the conditions throughout the reach. Then the data is transferred to a geographic information system (GIS) which then manipulates, analyzes, and presents the data geographically. This combined method and technology allows for analysis and mapping of the collected data.

CHANNEL CONDITIONS

TABLE NB-02: CHANNEL CONDITIONS

WATERSHED	RANGE & AVERAGE	BANK HEIGHT (ft.)	WATER DEPTH (ft.)	VELOCITY (ft./s)	TOP CHANNEL WIDTH (ft.)	BOTTOM CHANNEL WIDTH (ft.)
Accessible Reaches	Range	0-71	0-5.2	0-9.8	2-167	1-139
	Average	3.67	1.45	0.70	24.88	17.78

CHANNELIZATION

Stream channelization describes any activity that moves, straightens, shortens, cuts off, diverts, or fills in a stream channel. These activities, which include widening, narrowing, or lining a stream channel, alter the discharge and velocity of water flowing through it. Consequently, modifications aimed to address a problem in one area of the watershed or stream channel is shifted to another area upstream, downstream or within the immediate area.

For instance, shortening the reach of a stream moves flooding from the channelized reach to a downstream reach. The degree of channelization is ranked according to the percent of channelization. Reaches with channelization of 1%-33% are ranked "Low", 33%-66% are ranked "Moderate", and >66% are ranked "High". Reaches ranked as "None" have no indication of channelization. Table NB-03 summarizes the degree of channelization in the North Branch Chicago River. The North Branch Chicago River watershed was predominantly composed of reaches with moderate to high degrees of channelization (86.6%). Approximately 13% of the watershed stream reaches have little to no channelization.

TABLE NB-03: DEGREE OF CHANNELIZATION

DEGREE OF CHANNELIZATION	WATERSHED TOTAL				
	None	Low	Moderate	High	Total
Watershed Total	1	20	36	100	157
Percentage of Watershed	0.64%	12.7%	22.9%	63.7%	100%

POOL/RIFFLE DEVELOPMENT



Under baseflow conditions, pools are low-gradient areas of deeper water with slower velocity and riffles are high-gradient areas of shallow water with higher velocity. In general, pools represent localized deeper areas, whereas riffles represent localized shallow areas. During baseflow conditions, sediment erodes from riffles and is deposited into pools. During bankfull conditions, the relationship of relative velocity in riffles and pools is reversed and sediments along with substrate material are scoured from pools and the channel bed, then are deposited on riffles or bars. During periods of elevated flow when the velocity in pools exceeds that over riffles, deposition and bar formation tend to occur in areas adjacent to pools. Channelization often reduces the extent of pool-riffle sequences in a stream. Most channels in the North Branch Chicago River watershed exhibit little to no pool-riffle development (see Table NB-04). The North Branch Chicago River watershed stream reaches are very linear, which could be responsible for the lack of pool-riffle development.

TABLE NB-04: POOL/RIFFLE DEVELOPMENT IN NORTH BRANCH CHICAGO RIVER WATERSHED

DEGREE OF POOL/RIFFLE DEVELOPMENT	WATERSHED TOTAL			
	POOL REACHES		RIFFLE REACHES	
	#	%	#	%
0-10%	108	69%	119	77%
11-30%	39	25%	30	19%
31-50%	7	5%	6	4%
51-75%	1	1%	0	0%
75%+	0	0%	0	0%
Total	**155**	**100%**	**149**	**100%**

STREAMBANK EROSION

Streams are dynamic systems, in a perpetual state of flux, therefore, all banks exhibit some form of erosion. Streambank erosion in the North Branch Chicago River watershed tends to occur in developed areas, particularly residential neighborhoods and urban areas. Surface runoff to streams contributes to streambank erosion and is dependent upon key factors such as storm events (the duration, timing, and amount of precipitation that falls and subsequently runs off). Other key factors include the type and condition of the soil, land use, and vegetative

buffers. In some reaches there is severe streambank erosion due to increased runoff from urban development, channelization, sediment "starvation" caused by dams, local changes in stream gradient, and soil type. The qualitative assessment criterion for each rating is none, slight, moderate, and severe which can be found in Table NB-05. Table NB-06 summarizes streambank erosion in the North Branch Chicago River. Generally, the majority of the reaches in the watershed had low to moderate erosion, with less than 23 percent having severely eroded banks.

TABLE NB-05: BANK EROSION CRITERIA

CATEGORY	DESCRIPTION
None (<1%)	No visible erosion. Often due to hardscape such as rip-rap or sea-wall
Low (1% - 33%)	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang. No exposed tree roots.
Moderate (33% - 66%)	Bank is predominantly bare with some rills and vegetative overhang.
Severe (66% - 100%)	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped.

TABLE NB-06: EXTENT OF EROSION (POINTS)

EXTENT OF EROSION	PERCENTAGE OF STREAM BANKS
None	2%
Low	35%
Moderate	42%
Severe	21%

LATERAL RECESSION

The lateral recession rate is a qualitative way to assess width or thickness of eroding surfaces of a channel. The Rapid Assessment Point Method (RAP-M) for assessing lateral recession was employed to determine the degree of streambank erosion in the North Branch Chicago River watershed. Lateral Recession Rate (LRR) evaluates streambanks along the right and left bank (facing upstream) for each assessed reach. Within each reach, a segment of the channel with specific LRR characteristics is identified. Measurements include bank height/width and the lateral recession rate in feet per year, while several criteria including undercutting, bare bank, overhanging vegetation, fallen trees, exposed roots, and slips or slides are noted. This is repeated up the left and right side of each bank, connecting each segment to the end of the reach. For the North Branch Chicago River watershed, LRR was predominantly low. About 84% of the watershed had low lateral recession rates, about 15% of the reaches had moderate lateral recession rates, and less than 2% had severe lateral recession.

SEDIMENT ACCUMULATION

Typically, a stream generates, suspends, and transports sediment through high-gradient reaches and deposits sediment in low gradient reaches and/or in areas where velocity decreases. These low-velocity areas may be naturally occurring areas such as pools or sloughs. They may also occur behind debris jams, beaver dams, or upstream of channel constrictions (such as culverts). Decreasing discharge in the downstream direction thus

promotes a stepwise movement of deposition and storage of sediment within a stream network. The effect results in sediment movement that does not always reach the watershed outlet but is instead remobilized during the next flow and redistributed within the watershed's channel network.

The amount of sediment transported downstream during storm events will increase sedimentation rates in downstream channels. This increased sediment load can have negative effects on channel stability, fish, invertebrates, and overall stream productivity. When small or headwater streams are replaced with paved floodways during land development, sediment production may decrease, causing an increase in downstream erosion as sediment starved waters move through the watershed. The majority of reaches in the North Branch Chicago River watershed exhibit a low to moderate degree of sediment accumulation (see Table NB-07).



TABLE NB-07: SEDIMENT ACCUMULATION

DEGREE OF SEDIMENT ACCUMULATION	MAINSTREAM REACHES	
	NUMBER	PERCENT
None	26	17%
Low	76	48%
Moderate	37	24%
High	18	11%

**None = 0%; Low = 1-33%; Moderate = 34-66%; and High = 67-100% of the reach had sediment accumulations.*
**Percent based on total number of reaches for each branch.*

STREAM DEBRIS LOAD

Like sediment, all streams transport some amount of debris. Large organic debris such as tree limbs and branches can provide habitat, divert currents to create pools, bars, and slow-water habitat for aquatic organisms, and provide allochthonous energy inputs to the ecosystem that are not produced within the stream. Allochthonous inputs are those that enter the stream from some outside source, such as organic matter like leaves from terrestrial plants and trees that are washed into the stream. However, too much debris can be problematic and may result in debris jams. These debris jams may cause backwater flooding and sediment deposition and can divert current into one or both banks, leading to streambank erosion.



Table NB-08 summarizes the debris loading in the North Branch Chicago River watershed. A reach that has failed the debris loading test has a level of debris higher than 33%. Not many reaches in this watershed failed the test for both instream and overbank debris loading (approximately 15%). However, failing both was more common than failing in either instream or overbank. Overall, the debris loading in the North Branch Chicago River watershed was low to moderate.

TABLE NB-08: DEBRIS LOADING

FAILED TEST*	WATERSHED REACHES	
	#	%
Instream	15	9.55%
Overbank	13	8.28%
Both	24	15.28%

**Reaches that failed the test for debris accumulation.*

HYDRAULIC STRUCTURES

Hydraulic structures are any bridges, culverts, dams, weirs, levees, and fences in or across the stream channel. These structures modify the pattern or amount of flow and may act as constriction points causing backwater flooding. Culverts may act as temporary or permanent barriers if a plunge pool develops, causing the bottom of the culvert to become elevated above the water level of the pool. Additionally, dams and weirs can impede the movements of fish and other aquatic organisms within the stream network. On average, the North Branch Chicago River watershed contained approximately 5.0 hydraulic structures per mile. Overall, culverts were the most common type of hydraulic structure in this watershed, with bridges being close behind as second most common hydraulic structure. 14% percent of hydraulic structures in the watershed were described as problematic and needing maintenance.

TABLE NB-09: HYDRAULIC STRUCTURES

HYDRAULIC STRUCTURES	WATERSHED TOTAL
Bridges	213
Culverts	220
Dams	8
Weirs	0
Other	8
Total	447
Hydraulic structures per stream mile	5.0
Problem* hydraulic structures	61 structures (14% of all structures)

** Problem structure indicates maintenance was recommended.*

DISCHARGE POINTS

Discharge points include sanitary, storm sewer, agricultural drain tile, and sump pump pipes. They also include open channels, swales, gullies, and other significant tributaries. In the North Branch Chicago River watershed there were 1,468 discharge points, of which 1,244 were pipes, storm sewers, culverts or drain tiles (see Table NB-10). Discharge points are



most common in urban and residential areas where sump pump and stormsewer outfalls are numerous. Problem discharge points in the watershed contribute to streambank erosion and/or transport excess sediment to the stream channel. Another problem noted during the stream inventory is the state of disrepair of some drain tiles, particularly those constructed of clay and concrete. As the streambank erodes, longer sections of the tile become exposed and eventually collapse under their own weight. This effectively shortens the pipe, causing the point at which runoff discharges from the pipe to retreat from the channel, further eroding the streambank.

TABLE NB-10: DISCHARGE POINTS

DISCHARGE POINTS	WATERSHED TOTAL
Swales, gullies, and tributaries	224
Pipes, storm sewers, and culverts	1,244
Total Discharge Points	1,468
Discharge Points (per stream mile)	21

VEGETATION & LAND USE

TABLE NB-11: DOMINANT LAND USE

TYPE OF LAND USE	PERCENTAGE OF WATERSHED Left Bank	PERCENTAGE OF WATERSHED Left Bank
Agriculture	1.3%	1.3%
Open Space	53.5%	53.5%
Recreational	3.0%	3.0%
Commercial/Industrial	16.1%	16.1%
Residential	26.1%	26.1%
Other	0%	0.8%

FLOODPLAIN VEGETATION

Floodplain vegetation serves as an important function in protecting the physical, biological, and chemical integrity of water. Vegetation acts as a natural barrier by dissipating the energy of flowing water and provides protection from flooding and erosion. Vegetation filters sediments originating from land while slowing overland flows and surface run-off into water bodies, and filters incoming floodwaters from materials scoured from the channel bank and bed. This filtering process can add nutrients to the floodplain soil. Slowed runoff across the floodplain allows additional time for infiltration and groundwater recharge. The slowing of runoff provides the additional benefit of natural purification of water as local runoff or overbank floodwater infiltrates through the floodplain alluvium. Vegetation provides habitat and nutrients for a wide variety of terrestrial and aquatic organisms in, adjacent to, and for downstream ecosystems. The floodplain vegetation (land cover) is vegetation within 100 feet of the stream bank and summarized in Table NB-12. Land cover refers to the percent of the area occupied by the given land cover. Each reach in the watershed was assessed for land cover and percentages are represented in Table NB-12. In the North Branch Chicago River watershed, trees, lawn, and impervious were the predominant land cover. Herbaceous plants, shrubs, and wetland were also present, but are not as common. Throughout the watershed, trees were the main type of land cover found on both right and left banks.

TABLE NB-12: LAND COVER

Land Cover	Left Bank	Right Bank
Tree	25.81%	27.65%
Lawn	21.40%	20.97%
Wetland	6.74%	5.99%

Land Cover	Left Bank	Right Bank
Crop	0.70%	0.46%
Shrub	11.86%	11.98%
Herbaceous	10.93%	10.60%
Impervious	17.91%	19.12%
Water	4.65%	3.23%
Other	0%	0%

VEGETATED BUFFER (RIPARIAN ZONE)

The riparian zone is the area extending 100 feet from the stream channel on both the left and right side of the stream channel. Riparian vegetation also provides beneficial shading to streams and lakes which helps to avoid temperature stress on fish and aquatic organisms. The quality of the riparian zone, the width, and land use characteristics were visually assessed during the North Branch Inventory. Table NB-13 summarizes the assessment criterion for the width of the riparian zone and is a visual representation of the quality of the riparian zone observed in 2019.

TABLE NB-13: RIPARIAN ZONE ASSESSMENT CRITERIA

Riparian Zone	None	Low	Moderate	High
Buffer Width	<20 feet	20-40 feet	40-60 feet	>60 feet
Description	Zone contains little or no riparian vegetation due to human activities	Zone is impacted a great deal by human activities	Zone is impacted minimally by human activities	Zone is not impacted by human activities (i.e., no parking lots, roadbeds, lawns, crops)

Throughout the North Branch Chicago River watershed, the width of the riparian zone is impacted by anthropogenic changes in land use resulting in two types of riparian buffers. In wide riparian buffer zones ("High" buffer width) the stream flows through open space areas with minimal to no impact and in narrow buffer zones ("Low" buffer width) the stream flows through developed areas. Generally, the stream network has wider riparian buffers and flows through more open space areas, with the exception of neighborhoods. There are only a few reaches in the watershed in which there is no riparian buffer, comprising about 9 miles of the total watershed. Table NB-14 summarizes the Riparian Zones assessed along the North Branch Chicago River watershed.

TABLE NB-14: RIPARIAN ZONE WIDTH CONDITIONS

BUFFER WIDTH	MILES OF WATERSHED	% OF WATERSHED
None	9.23	13.24%
Low	28.51	40.9%
Moderate	19.34	27.75%
High	12.62	18.11%

BANK VEGETATION

Bank Vegetation (Predominant Vegetation) is vegetation existing within 10 feet of the stream bank. The most significant role of bank vegetation is its ability to control erosion, which in turn prevents sediment and other forms of pollution from entering the stream. Sedimentation is a very significant problem and though erosion is a

natural process, it is often sped up through human activities, directly or indirectly. The increased rate of erosion and sedimentation affects the geomorphology of the stream channel, water quality, and aquatic life in the stream channel and throughout the watershed. Streams surrounded by vegetated riparian zones, have intricate root systems that help to stabilize the bank and prevent erosion. Woody stemmed plants, sedges, and grasses help physically trap sediment by slowing water runoff from the surrounding areas, allowing the sediment to settle out instead of entering the stream. Additionally, vegetated banks tend to lead to deep and narrow channels as a result of their stability and lack of heavy sedimentation. In the North Branch Chicago River watershed, the streambank vegetation is predominantly unmowed grass, shrubs, and trees. Streams with no vegetation on the banks were also very common, most likely in reaches that possess higher rates of erosion. The least common type of bank vegetation was crops, wetland, and lawn (See Table NB-15).





TABLE NB-15: PREDOMINANT BANK VEGETATION

Bank Vegetation	Left Bank	Right Bank
Unmowed Grass	22.73%	23.72%
Lawn	2.84%	2.28%
Wetland	4.92%	4.36%
Trees	19.70%	21.25%
Shrubs	17.05%	17.27%
Crops	0.38%	0%
Herbaceous	15.15%	14.42%
None	17.23%	16.70%

INSTREAM COVER FOR FISH

A diverse habitat with regard to instream cover is essential for diverse fish assemblages and other aquatic organisms. Instream fish cover availability was evaluated based on the presence of a number of structural elements and habitats, consisting of undercut banks, pools over 28 inches deep, aquatic macrophytes, logs, overhanging vegetation, rootwads, boulders, and backwaters. The presence of woody debris (logs and rootwads) in streams is a significant component of fish habitat which they utilize for spawning, rearing, and foraging. Woody debris creates areas of low flow, providing a refuge for fish during periods of high flow. Woody debris also provides cover for fish, lowering the risk of predation. Overhanging vegetation and canopy cover provide two important benefits: providing shade to the stream helps keep the temperature in the stream cool, and leaf litter

and organic material provide nutrients to macroinvertebrates and other aquatic organisms. These aquatic organisms in turn, become an important source of food for fish and other animals in the ecosystem.

For the North Branch Chicago River watershed, overhanging vegetation and undercut banks were the most abundant cover type, appearing in a large number of stream reaches, whereas backwaters and boulders are least abundant. Logs and other large woody debris (LWD) in stream systems and habitat restoration efforts is a matter of consideration. The presence of logs and other LWD divert flow, provide habitat and play an important role in pool, riffle, and bar development. The attenuation of flood flows, drainage of riparian wetlands, land use changes, management of beaver populations, and invasive species are all factors that can contribute to the reestablishment of the riparian forest. Backwater areas have decreased over time and presently occur in wetlands and low-lying areas behind dams and debris jams.

TABLE NB-16: INSTREAM COVER

COVER TYPE	REACHES	
	#	%
Undercut banks	85	56.29%
Pools	47	43.52%
Macrophytes	49	33.11%
Overhanging vegetation	118	76.62%
Rootwads	75	50.0%
Boulders	44	29.73%
Backwaters	26	17.81%

AQUATIC INSTREAM VEGETATION

Aquatic instream vegetation is an important part of the watershed ecosystem. Plants in the stream are important in food webs. Each organism has characteristic feeding preferences and patterns, and can itself be prey to other consumers. Plants provide habitat and shelter for fish, waterfowl, and other wildlife. Since all plants, including those that grow underwater, produce oxygen as they photosynthesize, they are the major source of oxygen for aquatic animal life. Rooted plants stabilize shorelines and stream beds. They also absorb nutrients and filter pollutants from runoff, which improves water quality.

Certain non-native plant species such as milfoil can be extremely aggressive, taking over large areas of aquatic habitat. Invasive plant species can completely destroy stands of native vegetation. An overabundance of aquatic plants and algae can reduce oxygen levels in the water, which can contribute to fish kills. Decomposing of dead fish and algae also contributes to oxygen depletion. Too much vegetation can impede water flow in stream channels, drainage ditches, and culverts or back up water completely. These areas can trap sediment and debris, and over time lead to a gradual filling in of lakes and channels.

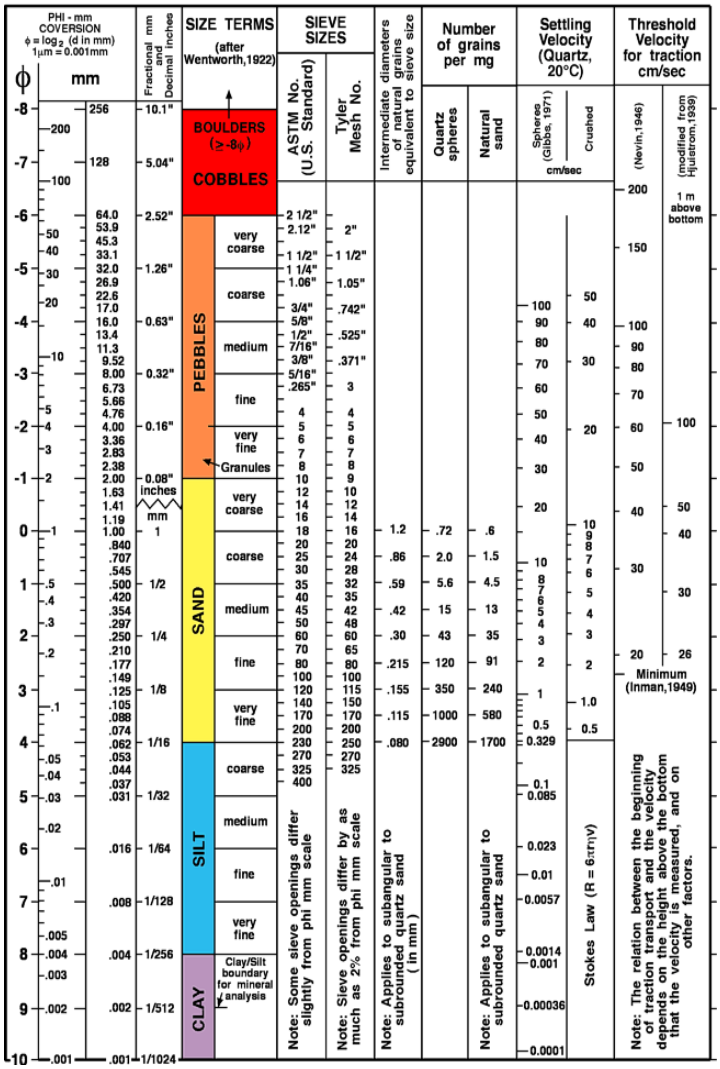
The Aquatic Instream Vegetation assessed in the North Branch of the Chicago River watershed show a majority of reaches with rooted submergent vegetation present. The North Branch reaches have each type of aquatic vegetation within the watershed, with rooted submergent being the most abundant at 66.8% of reaches containing rooted submergent vegetation. The North Branch Chicago watershed exhibits adequate vegetation diversity. Rooted emergent and attached algae were also very common in the watershed (See Table NB-17).

TABLE NB-16: INSTREAM AQUATIC VEGETATION

INSTREAM AQUATIC VEGETATION	TOTAL REACHES	PERCENTAGE OF REACHES
Rooted Emergent	18	11.46%
Rooted Submergent	105	66.88%
Rooted Floating	32	20.38%
Free Floating	32	20.38%
Floating Algae	37	23.57%
Attached Algae	96	61.15%
No Vegetation	14	8.92%

SUBSTRATE COMPOSITION AND WATER QUALITY

The North Branch Chicago River streambeds are composed of a variety of sediment grains that range in diameter from extremely fine clays (<1/1000th of an inch) to relatively coarse cobbles and boulders (>1 foot). Generally, fine sediments are transported in suspension until velocity slows enough that they are deposited on the streambed. Larger sediments are not transported as readily and may only move during increased flows. Clays are typically regarded as cohesive sediments that naturally adhere to one another (and are therefore more difficult to erode) while silts are more easily eroded. Sands and larger sediments (e.g., gravels and cobbles) are less cohesive. Clay and silt-dominated banks and beds, therefore, tend to be associated with narrow, incised channels while sand, gravel, and cobble-dominated channels are more often shallow and wide. These relationships, however, are also contingent upon a number of other contributing factors such as gradient, bank slope, and bank vegetation.



Substrate is also an important measure of habitat quality. Extremely fine sediments, such as clays, adhere closely to one another and may bury the streambed. Coarse-grained sediments like gravels present abundant interstices, allowing water, oxygen, and other dissolved and suspended materials to infiltrate the hyporheic zone. The hyporheic zone refers to the area surrounding the stream channel that is saturated and through which there is some percolation or flow. Essentially, the hyporheic zone is the area where the surface water and groundwater interface and mix. These interstitial pores also provide habitat to benthic (bottom-dwelling) macroinvertebrates, which play important roles in both aquatic food webs and ecosystem functioning. Excessive deposition of

clays, silts, and fine particulate organic matter reduces the potential for infiltration and accessibility to the hyporheic zone. Excessive deposition also negatively affects filter feeders such as mussels, and may cause oxygen depletion in the streambed as organic materials decompose.

In the North Branch Chicago River watershed, most reaches contain one or two predominant substrates. Table NB-18 summarizes the relationship of these substrate types in the river. Across the entire watershed silt (27%), organic matter (26%), and sand (20%) are the predominant substrate types recorded.

TABLE NB-18: SUBSTRATE COMPOSITION

SUBSTRATE COMPOSITION	# OF REACHES*	PERCENTAGE OF REACHES	PERCENTAGE OF WATERSHED
Claypan	6	3.8%	3.3%
Silt	50	31.8%	27.6%
Sand	37	23.6%	20.4%
Gravel	28	17.8%	15.5%
Cobble	8	5.1%	4.4%
Boulder	2	1.3%	1.1%
Concrete	3	1.9%	1.7%
Organic Matter	47	29.9%	26.0%

*Reaches included have >10% of given substrate.

WATER QUALITY

Turbidity

Visual inspections of several water quality indicators were made during the stream inventory. Turbidity, water color, and the presence of grease and oil in the sediment or water column were assessed. Turbidity is the measure of relative clarity of water. Material that causes water to be turbid includes clay, silt, fine inorganic and organic matter, algae, organic compounds, and plankton and other microscopic organisms. During periods of low flow, water in streams is clear, and the turbidity is low. During high flow events, sediment and material from the surrounding surfaces are washed into the stream. As the velocity and volume of water increases, sediments and other materials are stirred up causing the water to become muddy, brown, and turbid.

Low to moderate turbidity in the North Branch Chicago River was very common. Only four reaches in the watershed were recorded to have little to no turbidity recordings. Otherwise, around 97.5% of the reaches possessed some degree of turbidity (See Table NB-19).

TABLE NB-19: WATER QUALITY

WATER QUALITY	PERCENTAGE OF WATERSHED	
	# OF REACHES	% OF TOTAL REACHES
Turbidity		
None	4	2.5%
Low	62	39.5%
Moderate	49	31.2%
High	39	24.8%
Grease & Oil (Water)		
None	95	60.5%
Low	52	33.1%
Moderate	4	2.5%
High	1	0.64%

WATER QUALITY	PERCENTAGE OF WATERSHED	
	# OF REACHES	% OF TOTAL REACHES
Grease & Oil (Sediment)		
None	115	73.2%
Low	27	17.2%
Moderate	6	3.8%
High	0	0%

Grease & Oil

Grease and oil are present in only a small percentage of the watershed. There were 57 reaches that had some degree of grease and oil in the water and 33 reaches that contained grease and oil in sediment. The presence of grease and oil in the water was much more common than the presence of grease and oil in the sediment. The origination of the grease and oil does not relate to any one particular site or land use and therefore is likely due to non-point source run-off. An additional note: iron bacteria are present in many soils in Illinois and can cause yellow, orange, red, or brown stains and colored water. It can also cause a rainbow colored, oil-like sheen on the water or in soil and sediments. Simple water testing is available to determine if the oil-like substance present is iron bacteria. Grease and oils enter the stream during storm events as oil and grease from surrounding parking lots, roads, and bridges flush into the storm sewer system, often overflowing directly into the stream. Other potential sources of oil and grease results from illegal dumping that originate from automotive and transportation related services. Grease and oil in the water column and sediment will degrade the water quality of receiving streams by adding biological and chemical oxygen demand to the stream. Table NB-19 summarizes the turbidity, grease and oil in the North Branch Chicago River watershed.

Algae

Algae are an indicator of high nutrient loads. Generally, algae were not a significant problem in the North Branch Chicago River watershed; however, attached algae was quite common in the majority of the watershed. Excessive algae growth can negatively impact aquatic organisms and habitat. Algae are photosynthetic and therefore take up carbon dioxide during the day and release oxygen into the water column and the air. At night, algae respire, taking oxygen out of the water column and releasing carbon dioxide. Therefore, larger populations of algae have greater potential to cause large daily oxygen fluctuations. In addition, abundant algae populations are often aesthetically undesirable and typically detract from the visual quality of water resources.

AQUATIC AND TERRESTRIAL ORGANISMS

Stream aquatic integrity in urban settings is directly affected by physical changes in the watershed, some of which result in the degradation of the chemical and/or physical condition of the stream. Habitat information is extremely important for discriminating between physical and chemical effects. The inventory addressed aquatic and riparian life where possible or identifiable. Organisms were not specifically sampled during the stream inventory, but some animals were observed during the inventory. A wide variety of aquatic and terrestrial organisms were observed during the stream inventory of the North Branch Chicago River watershed both in Lake and Cook counties. Terrestrial organisms observed included deer and snakes. Species of fish present included carp, green sunfish, bluegill, bass, fathead minnows, white suckers, and miscellaneous minnows. Mussel beds were also found in some of the reaches as well. Snails, sow bugs, leeches, worms, mayflies, beetles, water striders, crayfish, tadpoles, and dragon and damsel fly nymphs were visible in the North Branch Chicago River

watershed. Mallard ducks, Canadian geese, herons, hawks, swans, kingfishers, and sandpipers, amongst other amphibians and mammals were also encountered during the inventory.

APPENDIX A

Stream Inventory Procedures and Form Guide

Stream Inventory Procedure

The Lake County Stormwater Management Commission conducts stream inventories in as part of the overall watershed planning process. Water quality sampling is not performed as part of the stream inventory, but the sources and causes of water quality impairment in the streams were investigated. An important component of the assessment process is the evaluation of current hydraulic, geomorphic, and aquatic stream characteristics. The major stream characteristics assessed and noted include:

- channel conditions such as bank height, erosion problems and bank vegetation
- hydraulic structures such as bridges and culverts in the river or floodplain
- point discharges into the river
- land use and vegetative cover in the riparian corridor
- channel substrate and degree of sedimentation.
- lateral recession rates

These characteristics are identified for each stream reach using the stream inventory procedure described below. Several procedures were considered self-explanatory and were therefore not described. The discussion below is organized in the same order as the data was collected on the stream inventory report form (SIRF).

Stream Inventory Report Form

Reach Boundaries

A stream reach is defined as a stream segment having fairly homogenous hydraulic, geomorphic and riparian cover and land use characteristics (such as all ditched agriculture or all natural and wooded). Reaches generally should not exceed 2,000 feet in length. Where possible, beginning and end stations should be established along the stream using permanent physical landmarks such as bridges that are readily recognized.

Channel Flow Status (Stream Stage)

The degree to which the channel is filled with water. The flow status will change as the channel enlarges (e.g., aggrading stream beds with actively widening channels) or as flow decreases as a result of dams and other obstructions, diversions for irrigation, or drought. When water does not cover much of the streambed, the amount of suitable substrate for aquatic organisms is limited. In high-gradient streams, the decrease in water level exposes logs and snags, thereby reducing the areas of good habitat. Channel flow is especially useful for interpreting biological condition under abnormal or lowered flow conditions. This parameter becomes important when more than one biological index period is used for surveys or the timing of sampling is inconsistent among sites or annual periodicity.

Channel Conditions

Channelization

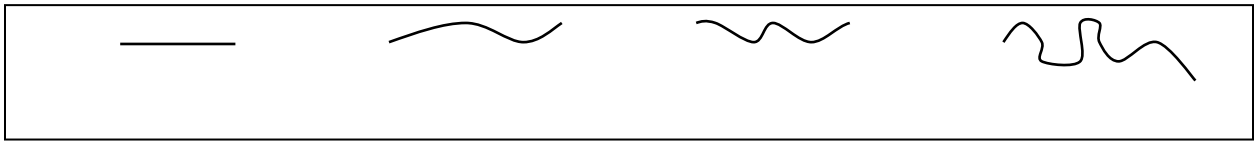
Channelization refers to channel modifications performed by humans. 'The one-third rule should be applied again where low means < 33% of the reach is channelized, moderate means 33 to 66% and high means > 66% of the reach is channelized. The presence of a pilot channel should be noted under 'Pilot Channel Formed' for channelized streams. A narrow, meandering pilot channel may develop within the wide and flat trapezoidal ditch that was excavated during channelization. A pilot channel is indicative of recovery from channelization.

Sinuosity

Sinuosity is dependent on the stream stage in many channelized reaches. For instance, in many cases a narrow, highly sinuous pilot channel has developed during low stream stage within a wider, non-sinuous channel that was excavated during channelization. Therefore, sinuosity should be estimated for both baseflow conditions (describing sinuosity in the pilot channel) and for the bankfull-flow events. However, if the stream inventory report form is completed during bankfull flow, then sinuosity during baseflow conditions will be difficult to estimate. Figure 1 should be used for estimating the degree of sinuosity.

Figure 1

Sinuosity Estimation Guide



Pool/Riffle Development

The proportion represented by riffles, runs, and pools should be noted to describe the morphological heterogeneity of the reach. Pools should be well-defined areas of deeper than average water. Pools generally do not extend in length more than three or four times the stream width. Pools should almost immediately be followed by a riffle environment for the stream to be characterized as having high pool/riffle development. A riffle is characterized by shallower water and higher velocities with rippling or disturbances to the surface water tension that allow turbulence and mixing to occur. Many streams in Lake County will have low or no pool/riffle development.

Bank Erosion

Severe bank erosion is a significant concern for Lake County's stream and rivers. Severely eroded banks have exposed soil on nearly vertical banks extending from the top of bank to the low water mark so erosion is constantly occurring. Highly eroded streambanks contribute heavy loads of sediment and erode during times of higher flows. Active slumping and sloughing may be apparent where fresh, moist, loose soil and other signs of recent bank movement such as exposed tree roots or suspended fences extending into the stream are found. Eroded areas are most prevalent in the outer edges of bends and

meanders. All cases of severe erosion should be photographed and noted on the form and the map or aerial photo. If the photo is taken looking up/down stream the aspect should be noted. Structures that are present and threatened by slumping should also be recorded. Right and left bank are determined by facing upstream. On impounded areas of streams, the absence of bank or littoral vegetation along the normal water mark resulting in constant erosion would also be considered severe.

Lateral Recession Rates

This rate is a qualitative way to assess width or thickness of eroding surface on a channel. It is used to estimate an actual quantitative measurement. Recession rates of eroding banks for Illinois streams and gullies typically range from 0.05 feet 0.5 feet per year. Values in the range of 0.05 feet to 0.40 feet are the most typical in perennial streams and rates of 0.05 feet to 0.3 feet most typical in intermittent flow channels. Stream banks with retreat rates of 1 or more feet per year do occur, but are uncommon and not usually widespread within a given watershed. Apply the rates as uniformly and consistently as you can along both sides of each channel. Remember, these numbers are used to obtain *average annual rates*, not those that occur after a 4-inch rain that washes out a bridge abutment. Rates in the "Very Severe" category of 0.5+ feet of bank recession per year generally only occur in Illinois on segments of channels scattered throughout steep watersheds.

If these rates were applied throughout the entire watershed, so much sediment would be produced that the current stream systems could not move it through; it would pile up as huge sediment bars that would block the actual flow of water. Bottom scour of some channels also occurs in some watersheds. Usually this is not as noticeable or as severe as bank erosion for a given channel. Rates of 0.05 feet to 0.4 feet are typical where the scour is occurring. Include any scour erosion totals with the bank erosion on the Channel Inventory Form. See RAP-M Rapid Assessment, Point Method – Inventory and Evaluation of Erosion and Sedimentation for Illinois R.D. Windhorn 12/00.

Armoring

Armoring refers to the placement of gabions, wood, metal, riprap or other similar artificial materials along the streambank to reduce bank erosion. The one-third rule should be applied again where low means < 33% of the reach is armored, moderate means 33 to 66% and high means > 66% of the reach is armored. Portions of armoring that are failing should be noted.

Sediment Accumulations

Sediment accumulations that affect the channel capacity and flow conveyance should be described. Sediment deposition measures the amount of sediment that has accumulated in pools and the changes that have occurred to the stream bottom as a result of deposition. Deposition occurs from large-scale movement of sediment. Sediment deposition may cause the formation of islands, point bars (areas of increased deposition usually at the beginning of a meander that increase in size as the channel is diverted toward the outer bank) or shoals, or result in the filling of runs and pools. In some cases, sediment accumulations may not impact channel conveyance.

Mid-Stream Bars and Islands

Record whether exposed mid-stream bars or islands are present. Although these structures may increase habitat availability for organisms, they also reduce the unobstructed stream width and may enhance the debris-accumulating potential of the stream reach.

Mean Water Depth

Water depth should be measured at the deepest portion of the channel cross section (known as the thalweg) with a sturdy 4- to 5-foot rod inscribed with depth marks in inches. The range of water depths should reflect the variation between the deepest and shallowest portions of the channel cross-section in the reach.

Mean Bank Height, Top Mean Channel Width and Bottom Mean Channel Width

Mean bank height should be measured from the top to the bottom of the streambank. The top of the bank occurs where there is a convex-shaped transition in bank slope between the stream bank and the outlying floodplain. The bottom of the bank occurs where there is a concave-shaped transition in slope between the stream substrate and the stream banks, and it may be below the water level.

Top and bottom mean bank widths refer to the mean bank-to-bank width across the top and across the bottom of the banks. If the top of one bank is higher in elevation than the top of the opposite bank, the top mean channel width should be measured from the elevation of the lowest bank. In estimating these and other values, the investigator should be conscious of longitudinal changes in bank dimensions in order to arrive at estimated values.

Beaver Activity

Low beaver activity includes an occasional bank slide or chewed stump within the reach. These features must become progressively more apparent to rate as moderate activity. High activity is characterized by almost constant activity in the wooded areas with felled trees in excess of 12 inches; slides and beaver cut brush being common in the stream. All dams and lodges should be noted and indicate high beaver activity.

Stream Debris Load

1. Instream Debris Load

Stream debris load refers to natural and man-made debris including leaves, sticks, logs, lumber, trash and sediment. The one-third rule should be applied again where low means < 33% of the reach contains debris obstructing or deflecting flow, moderate means 33 to 66% and high means > 66% of the reach is characterized by large accumulations of lodged and partially compacted debris spanning the entire stream width.

2. Overbank Debris Load

The overbank debris load refers to loosened, floatable materials that are prevalent enough to potentially cause debris jams at culverts and bridges during high flows events. The locations and types

of debris as well as how it may impact the reach should be noted. Similarly to the instream debris load section, the one-third rule should be applied.

Hydraulic Structures

Hydraulic structures include low head dams, weirs, bridges, levees, and culverts. Dimensions as well as construction materials should be measured and recorded. Structures should be photographed and their locations should be recorded by taking a GPS waypoint. Elevations will be determined from existing data or field survey dependent upon the approved scope of work. Notes should include condition, drop or change in elevation, blockages and other characteristics.

Point Discharges

Point discharges include all sanitary, storm sewer and agricultural drainpipes greater than 4 inches in diameter. They also include open channels, swales, gullies and other significant tributaries. Locations of all point discharges should be recorded by taking a GPS waypoint. Check the problem column (see SIRF) if the condition of the discharge point is blocked, cracked, etc. The volume of flow should be noted in the appropriate column using the following categories: none, trickle, moderate, substantial, other. Notes should include comments on odors, sheens or high turbidity if present.

Vegetation and Land Use

Floodplain Vegetation (within 100 ft of stream)

For the respective banks the land use and vegetative cover should be noted as percentages of the floodplain surface area (note: percentages should total 100%). The vegetated buffer is given a score from 0-10 (see SIRF for specific criteria).

Predominant Bank Vegetation (%) and Predominant Tree/Shrub Species

These measurements provide an indication of bank stability and the potential for the development of debris blockages in the channel. For the respective banks the predominant vegetation type should be noted as percentages of the bank surface area (note: percentages should total 100%). Due to the rapid colonization capabilities of some tree and shrub species, the presence or absence of tree and shrub types should be documented even if trees or shrubs were uncommon in the stream reach. Also, where possible, tree and shrub species included in the 'Other' category should be identified. Canopy cover should be estimated as a percentage of shaded coverage of the channel.

Aquatic Vegetation

The general type and relative dominance of aquatic plants are documented in this section. Besides being an ecological assemblage that responds to perturbation, aquatic vegetation provides a refuge and food for aquatic fauna. Filamentous algae can grow in fast or slow flowing streams over solid surfaces within the stream channel. Extensive filamentous algae coverage is indicative of excessive nutrient levels. Submergent, emergent, free floating, rooted floating or no vegetation should also be considered when estimating percentage of aquatic vegetation over the total area of the reach.

Substrate and Water Quality

Substrates

The substrate in the stream channel should be classified using the following definitions:

Claypan (Hardpan): Claypan is made up of particles less than 0.0002 inches in diameter, which forms a dense, gummy surface that is difficult to penetrate.

Silt: Silt particles are between 0.0002 to 0.002 inches in diameter. Silt is a fine material that generally feels "greasy" when rubbed between fingers.

Sand: Sand is made up of materials from 0.002 to 0.08 inches in diameter. Sand exhibits a gritty texture when rubbed between fingers.

Grave: Gravel is a mixture of rounded coarse material from 0.08 to 2.5 inches in size.

Cobble: Cobble is made up of stones from 2.5 to 10 inches in diameter.

Boulder: Boulders are defined as rounded stones over 10 inches in diameter or large "slabs" over 10 inches in length.

Organic: Organic substrate refers to living or decaying plant material.

Concrete: Channels lined with concrete or other man-made materials should be noted.

Substrate Stability

Substrate stability will be assessed according to how well the stream substrate supports the weight of the observer walking within the stream. Assessing substrate stability requires that the observers walk through representative lengths of the stream channel in the reach. To help ensure the safety of the observers, waders should be worn at all times to prevent cuts and infections, and at least two observers should walk each reach together. Stream channels should not be walked if the safety of the recorder is in jeopardy at any time because of strong current, deep-water sections, soft substrate, or any other potential danger. Substrate stability classified as 'None' indicates that the substrate can't support the observer's weight and the observer quickly sinks into the substrate. These substrate types are usually deep silts that for obvious safety reasons must not be walked in. 'Low' substrate stability can be walked over, but the observer will sink several inches into the substrate if he stands for an extended time period. These substrates may include silts and loose sand or gravel. 'Moderate' substrate stability would describe substrate that can be walked over without sinking more than an inch or two into the substrate and may include coarse gravel, cobble, perhaps mixed with some boulders. 'High' substrate stability can be readily walked on without sinking into the substrate. 'High' substrate stability often occurs when cobble, boulders, shale or claypan covers the stream bottom.

Substrate Embeddedness

Substrates should be considered embedded if more than 50% of the surface of the substrates are surrounded, impacted in or covered by unnatural accumulations of fine material such as sand or silt.

Embedded substrates can't be easily dislodged. Naturally silty or sandy streams are not considered embedded; however, if sedimentation has buried the natural coarse substrates with sand or silt then the stream reach should be considered embedded. The degree of embeddedness can often be determined by jabbing a sturdy rod into the stream bottom to determine whether the underlying stream substrate is coarse material, or sand and silt. Embeddedness is the extent to which cobbles, gravel, and boulder substrates are embedded. High embeddedness would occur if over 66% of the site area was embedded (as defined above), moderate embeddedness would occur if from 33 to 66% of the site area was embedded and low means less than 33% of the area was embedded. 'N/A' ratings should be applied to stream channels that are naturally composed of silt and sand, because in such channels embeddedness of coarse substrates is 'not applicable.'

Instream Cover

All types of cover present should be noted. Cover should not be counted when it is in areas of the stream with insufficient depth. General comments on perceived abundance of various cover types should be reported.

Aquatic and Terrestrial Organisms

Some measurements for the Aquatic and Terrestrial Organisms section (SIRF Section G) require that riffles be distinguished from runs and pools. Pools and riffles were defined in section D.1.2.3. Runs are deeper than riffles, have relatively rapid, non-turbulent flow and are generally located downstream from riffles where the stream narrows. The streambed is often flat beneath a run and therefore the water surface is not visibly broken.

Biological information (versus chemical or physical information) is widely regarded as the most reliable type of data collection for evaluating the ecological conditions of stream reaches. Although SMC does not sample for fish, macroinvertebrates or birds, their presence will be noted when they were encountered in a stream reach.

Macroinvertebrates

NOTE: SMC only observes and notes the presence of macroinvertebrates and DOES NOT sample based on the procedures outlined below. This section has been left in as a placeholder in the event sampling is required in the future.

If sufficient flow exists, macroinvertebrates should be sampled by kick net (approximately 3' x 3' screens) in riffle areas at least once per reach. The observer should stand upstream of the kick net and use one or both feet to disrupt the substrate and dislodge macroinvertebrates from the substrate so that they drift downstream into the kick net screen. If sufficient flow does not exist for the effective use of kick nets, macroinvertebrates should be handpicked from rocks in riffle areas. The presence should be noted of major groups of macroinvertebrates such as stonefly, mayfly and caddisfly larvae, snails, water pennies, riffle beetles, damselfly and dragonfly nymphs, isopods and sowbugs, leeches, and worms. If riffle areas and rocks do not exist such as in recently channelized streams, impounded streams, or under low-flow conditions, then macroinvertebrates should be sampled from vegetation, debris or other instream material.

Fish

NOTE: SMC only observes and notes the presence of fish and DOES NOT sample based on the procedures outlined below. This section has been left in as a placeholder in the event sampling is required in the future.

Fish sampling should be performed with a seine (or ideally, electroshocking equipment) at three or more stream locations. The types and relative abundances (percent composition of the catch by species) should be noted for each fish species captured. However, high flow may in some circumstances not permit safe and effective seining. In such instances, visual observations of types of fish present should be made where water clarity permits. Based on past experience, some species or groups that can be tentatively identified by visual observation alone without sampling gear include carp, goldfish, minnows, panfish and bass. In all biological evaluations, presence of rare or threatened and endangered animal and plant species is of great interest.

Birds

During the field investigation, types and numbers of birds that utilize streams and adjacent aquatic habitat should also be noted. Such birds that are common to Lake County include ducks, geese, herons, kingfishers, sandpipers, plovers, gulls, terns, swifts and some swallows.

Note: Any reptiles, amphibians or mammals observed should be noted as specific as possible.

Additional Comments

Additional notes or comments should include any irregularities such as cars in the stream, floodplain construction activity, presence of livestock in the stream, foul smelling discharges, errors in existing mapping or other peculiarities. Opportunities and obstacles to access should also be noted on each form.

Suggested Equipment List

- Stocking foot pants/waders (2 pairs)
    - *Hip length recommended with "stocking foot" that slip into wading boots*
- Wading boots
    - *SMC recommends NOT using the boots with felt bottoms*
- digital GPS camera, waterproof recommended
- tablet (iPad, MS Surface, or comparable device for GIS feature collect and data entry)
- Paper copies of the Stream Inventory Report Form (SIRF) in the event of technical difficulties
- Pens, pencils, notepads
- polarized sunglasses
- 100+ foot tape measure
- 4-foot wood rod with depth marks or metal yard stick
- watch with second hand

Access

Approval for access on private property is important. It is also important as a common courtesy to inform public landholders (park districts, forest preserve districts, etc.) that an inventory is taking place and field crews may be present on their property.

Golf courses present a unique hazard. Call beforehand and stop in and visit with golf course pro shop personnel before entering these properties. Stay in the stream, move quickly through these areas and do not disrupt play on the course.

Access to any sensitive areas such as nature preserves, military installations, and power plants cannot be assumed and MUST be coordinated in advance. These entities must grant permission in writing before field crews can gain access to sites within these areas.

Be kind and courteous when approached by citizens or property owners. Introduce yourself and let them know you are with the Lake County Stormwater Management Commission and if they are interested, explain what you are doing. For the most part, people are just curious as to what you are doing and many times, may provide information important to the inventory.

The Lake County Stormwater Management Commission will notify watershed stakeholders in advance of an inventory. A letter and watershed map will be mailed out to riparian landowners owner equal to or greater than 5 acres along the stream corridor. See Figure 2 and Figure 3. Each member of the field crews will also carry the same letter granting authority to conduct the inventory at all times.

In addition, an email containing a letter and watershed map (similar to Figure 2 and Figure 3) will be sent out to officials within the watershed. Field crews will also carry a letter signed by the Executive Director of the Lake County Stormwater Management Commission granting the crews authority to conduct the inventory.

Figure 2 Sample letter TO RIPARIAN LANDOWNERS

Dear North Branch Watershed Community Official/Resident:

The Lake County Stormwater Management Commission (SMC) is developing an update to the North branch of the Chicago River watershed-based plan in Lake County that includes updates to watershed plans completed in 2006/2007. As part of this process, SMC will be completing a detailed stream inventory throughout the watershed. The inventory will assess channel conditions such as bank height, erosion problems, bank vegetation, lateral recession rates, hydraulic structures such as bridges, culverts, and dams, pipes and swales draining to the stream, land use and vegetative cover along the stream corridor, available habitat in the stream, and channel substrate and degree of sedimentation.

Two Stream Inventory Interns, David Messmer and Emma Wilkinson, will perform the stream inventory during the summer of 2019. The above individuals are allowed to gain reasonable access to North Branch streams to perform the inventory. I wanted to make you aware that these staff members will be in the field this summer in case you see them on your property or receive calls or questions from your staff or constituents regarding the purpose of their work. SMC is also sending notifications to other jurisdictions in the watershed to make them aware of SMC's presence for the assessment. Local authorities will be notified in advance of site visits, so they are aware of staff presence

The information collected in the stream inventory will be used in the development of the management plan for the North Branch of the Chicago River. This plan will address water quality impairments, flooding problems and natural resource protection along with other problems and opportunities identified by watershed stakeholders. The anticipated completion date of the stream inventory is September 2019. The watershed plan is expected to be completed in 2020.

If you would like additional information on the stream, detention basin, and ravine assessments, please contact Jeff Laramy, GIS Analyst at 847-377-7709 or jlaramy@lakecountyil.gov.

If you are interested in participating in the watershed planning process as a stakeholder, please contact Ashley Strelcheck astrelcheck@lakecountyil.gov (847) 377-7710.

Thank you for your cooperation. Sincerely,



Mike Warner

Executive Director

Sample Stream Inventory Report Form

STREAM NAME:_____REACH ID:_____ DATE:_____

REACH BOUNDARY- DOWNSTREAM:_____ GPS Photo. #_____

REACH BOUNDARY-UPSTREAM:_____ GPS Photo #_____

APPROX. LENGTH (ft):_____ TEMP. (°F)_____ TIME:_____

INVESTIGATORS:_____ RECENT RAIN: (Now, 12, 24, 48 hours, week)_____

GAGE READING:_____

LOOKING UPSTREAM

WATER DEPTH	DEPTH (FT)	GPS PHOTO#	AVERAGE	RANGE
1				
2				
3				
MEAN WATER DEPTH				
BOTTOM CHANNEL WIDTH (FT)	WIDTH (FT)	GPS PHOTO#	AVERAGE	RANGE
1				
2				
3				
MEAN BOTTOM CHANNEL WIDTH (FT)				
TOP CHANNEL WIDTH (FT)	WIDTH (FT)	GPS #	AVERAGE	RANGE
1				
2				
3				
MEAN TOP CHANNEL	WIDTH (FT)	GPS #	AVERAGE	RANGE

WIDTH (FT)				
BANK HEIGHT	**HEIGHT (FT)**	**WIDTH**	**SLOPE RUN/RISE**	**PHOTO #**
1 LEFT				
1 RIGHT				
2 LEFT				
2 RIGHT				
3 LEFT				
3 RIGHT				
MEAN BANK LEFT				
MEAN BANK RIGHT				
VELOCITY (FT/S)				
1				
2				
3				
MEAN VELOCITY (FT/S)				

A. BANK EROSION

***Photos of Moderate to Very Severe will be taken**

LRR (ft./yr.)	Category	Description
0.01 - 0.05	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang. No exposed tree roots.
0.06 - 0.2	Moderate	Bank is predominantly bare with some rills and vegetative overhang.
0.3 - 0.5	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped
0.5+	Very Severe	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains and culverts eroding out and changes in cultural features as above. Massive slips or washouts common. Channel cross-section is U-shaped and streamcourse or gully may be meandering.

Lateral Recession Assessment

PHOTO #	L=left R=Right C=Center Looking Upstream	Aspect U=Up D=Down	Bank Height (ft.)	LRR Category Slight, Moderate, Severe, VerySev., ExtremelySev.	LRR (ft/yr)	LRR Characteristics (circle those that apply)	Notes (Use "many"or "some" where appropriate)
	L C R	U D		SL Mod Sev VerySev ExtSev		undercutting-bare bank overhanging veg.-fallen trees exposed roots-(fine or woody) rotational slips or slides	
	L C R	U D		SL Mod Sev VerySev ExtSev		undercutting-bare bank overhanging veg.-fallen trees exposed roots-(fine or woody) rotational slips or slides	
	L C R	U D		SL Mod Sev VerySev		undercutting-bare bank	

PHOTO #	L=left R=Right C=Center Looking Upstream	Aspect U=Up D=Down	Bank Height (ft.)	LRR Category Slight, Moderate, Severe, VerySev., ExtremelySev.	LRR (ft/yr)	LRR Characteristics (circle those that apply)	Notes (Use "many"or "some" where appropriate)
				ExtSev		overhanging veg.-fallen trees exposed roots-(fine or woody) rotational slips or slides	

B. DISCHARGE POINTS:

(Pipes, ditches, swales, tributaries; note numbers, sizes and locations of discharges with diameters of 4 inches or more.)

TYPE & MATERIAL	DIMENSIONS (inches)	PHOTO #	L/R or Center of Channel	P♣	FLOW•	NOTES

NOTES (ex: suspicious effluent etc.):_____

♣P= Problem (check for Yes)

***None, Trickle, Moderate, Substantial, Other**

C. HYDRAULIC STRUCTURES:

(Note sizes & locations in channel or adjacent floodplain.

TYPE & MATERIAL	**DIMENSIONS L/W (INCHES)**	**L/R or Center of Channel Looking upstream**	**P ♣**	**PHOTO #**	**NOTES:**

♣P= Problem (check for Yes)

D. CHANNEL CONDITIONS:

CHANNEL FLOW (STREAM STAGE):

NONE	LOW	MODERATE	NORMAL	HIGH
Very little water in channel and mostly present as standing pools	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed	Water fills > 75% of the available channel; or <25% of channel substrate is exposed	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water levels are higher than the base of both banks
0 1	2 3 4	5 6	7 8	9 10

CHANNELIZATION: NONE____ LOW____ MODERATE____ HIGH_____

PILOT CHANNEL FORMED (YES / NO)

SPOILS PILES ON BANKS (Left / Right / Both)

BANKFULL SINUOSITY: NONE____ LOW____ MODERATE____ HIGH____

BASEFLOW SINUOSITY: NONE____ LOW____ MODERATE____ HIGH____

POOL/RIFFLE DEVELOPMENT: % POOL ____ % RIFFLE ____ % RUN ____

DEGREE OF BANK EROSION:

NONE	MODERATE	*SEVERE	*VERY SEVERE
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; less than 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-33% bank has areas of erosion.	Moderately unstable; 33-66% of bank has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 66-100% of bank with erosional scars.
Left Bank 10 9	8 7 6	5 4 3	2 1 0
Right Bank 10 9	8 7 6	5 4 3	2 1 0

***Photos of Moderate to Very Severe Erosion will be taken**

DEGREE OF ARMORING: NONE____ LOW____ MODERATE____ HIGH____

TYPES OF HIGH CASES: _____GPS PHOTO #_____

TYPES OF HIGH CASES: _____GPS PHOTO #_____

TYPES OF HIGH CASES: _____GPS PHOTO #_____

TYPES OF HIGH CASES: _____GPS PHOTO #_____

TYPES OF HIGH CASES: _____GPS PHOTO #_____

E. SEDIMENT ACCUMULATIONS:

NONE	LOW	MODERATE	HIGH
Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment depositions	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected, sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increase bar development; more than 80% bottom changing frequently, pools almost absent due to substantial sediment deposition
10 9	8 7 6	5 4 3	2 1 0

TYPES OF HIGH CASES: _____GPS PHOTO #_____

TYPES OF HIGH CASES: _____GPS PHOTO #_____

TYPES OF HIGH CASES: _____GPS PHOTO #_____

TYPES OF HIGH CASES: _____GPS PHOTO #_____

TYPES OF HIGH CASES: _____GPS PHOTO #_____

TYPES OF HIGH CASES: _____GPS PHOTO #_____

COMMENTS:

_____

_____

_____

MID-STREAM BARS AND ISLANDS: YES:_____ NO:_____

GPS PHOTO #_____

GPS PHOTO #_____

GPS PHOTO #_____

GPS PHOTO #_____

BEAVER ACTIVITY: NONE_____ LOW_____ MODERATE_____ HIGH_____

DAM/LODGE: YES (NUMBER OF DAMS)_____ NO_____

STREAM DEBRIS LOAD (as defined in methodology):

INSTREAM: LOW _____ MODERATE _____ HIGH _____

OVERBANK: LOW _____ MODERATE _____ HIGH _____

NOTES:_____

F. DEBRIS JAM: PHOTO #: _____ LENGTH: _____ WIDTH: _____HEIGHT: _____

PHOTO #: _____ LENGTH: _____ WIDTH: _____HEIGHT: _____

PHOTO #: _____ LENGTH: _____ WIDTH: _____HEIGHT: _____

IMPOUNDED: YES:_____ NO:_____

COMMENT:_____

SOURCE:_____

G. FLOODPLAIN VEGETATION(within 100 ft of stream)

DOMINANT LAND USE (%):

LEFT: AGRICULTURAL:_____ OPEN SPACE:_____ RECREATIONAL: _____

COMMERCIAL/INDUSTRIAL:_____RESIDENTIAL:_____ OTHER:_____

RIGHT: AGRICULTURAL:_____ OPEN SPACE:_____ RECREATIONAL:_____

COMMERCIAL/INDUSTRIAL:_____ RESIDENTIAL:_____OTHER:_____

LAND COVER (%):

LEFT: TREES: _____ LAWN:_____ WETLANDS:_____ CROPS:_____ SHRUBS:_____

HERBACEOUS: _____ IMPERVIOUS:_____ WATER:_____OTHER: _____

RIGHT: TREES:_____ LAWN:_____ WETLANDS:_____ CROPS:_____ SHRUBS:_____

HERBACEOUS:_____ IMPERVIOUS:_____ WATER:_____OTHER:_____

WIDTH OF VEGETATED BUFFER:

NONE	LOW	MODERATE	HIGH
Width of riparian zone <20 feet; little or no riparian vegetation due to human activities	Width of riparian zone 20-40 feet; human activities have impacted zone a great deal	Width of riparian zone 40-60 feet; human activities impacted zone minimally	Width of riparian zone >60 feet; human activities (parking lots, roadbeds, lawns, crops) have not impacted zone
Left Bank 0 1 2	3 4 5	6 7 8	9 10
Right Bank 0 1 2	3 4 5	6 7 8	9 10

Notes_____
_____

_____

H. BANK VEGETATION (within 10 ft of stream):

PREDOMINANT VEGETATION (%)

LEFT BANK: UNMOWED GRASS:___ LAWN:___ WETLAND:___ TREES:___ SHRUB:___

CROP:___ HERBACEOUS: ___ NONE:___ OTHER:_____

RIGHT BANK: UNMOWED GRASS:___ LAWN:___ WETLAND:___ TREES:___ SHRUB:___

CROP:___ HERBACEOUS: ___ NONE:___ OTHER:_____

PREDOMINANT TREE/SHRUB SPECIES ON BANKS (CHECK ALL PRESENT)

WILLOWS_____ BOX ELDER_____ HONEYSUCKLE_____

BUCKTHORN_____ HARDWOODS_____ OTHER_____

CANOPY (PERCENT SHADED COVERAGE OF CHANNEL):_____

I. AQUATIC/INSTREAM VEGETATION

VEGETATION (%): ROOTED EMERGENT:_____ ROOTED SUBMERGENT:_____

ROOTED FLOATING:_____ FREE FLOATING:_____ FLOATING ALGAE:_____

ATTACHED ALGAE:_____ NO VEGETATION:_____

J.SUBSTRATE AND WATER QUALITY:

SUBSTRATE COMPOSITION (%): CLAYPAN_____ SILT_____ SAND_____ GRAVEL_____

COBBLE_____BOULDER_____ CONCRETE_____ ORGANIC MATTER_____

CATEGORIZE AS "NONE", "LOW", "MODERATE", OR "HIGH" (Locate worst cases.):

SUBSTRATE STABILITY OF ENTIRE REACH:_____

SUBSTRATE EMBEDDEDNESS OF ENTIRE REACH:_____

GREASE & OIL IN WATER COLUMN_____ GREASE & OIL IN SEDIMENT_____

TURBIDITY (including tributaries, point discharges; LOW, MODERATE, HIGH):_____

WATER COLOR: CLEAR_____ BROWN_____ GREEN_____ GRAY_____

COMMENTS/PROBABLE CAUSES:_____

K. INSTREAM COVER FOR FISH:

(Check all that apply.)

UNDERCUT BANKS_____ POOLS OVER 28" DEEP_____ MACROPHYTES_____ LOGS_____

OVERHANGING VEGETATION_____ ROOTWADS_____ BOULDERS_____ BACKWATERS_____

COMMENTS:_____

_____

L. AQUATIC AND TERRESTRIAL ORGANISMS:

(Check or note all that were observed.)

MACROINVERTEBRATES:

MAYFLIES:_____ CADDISFLIES:_____ DRAGONFLY/DAMSELFLY NYMPHS:_____

SNAILS:_____ SCUDS:_____ SOWBUGS:_____ LEECHES:_____ WORMS: _____

WATER PENNIES:_____ BEETLES:_____ OTHER:_____

FISH:

CARP:____ BLACK BULLHEADS:____ CREEK CHUBS:____ GREEN SUNFISH:____ BLUEGILL: ____
LARGEMOUTH BASS:____ JOHNNY DARTERS:___ FATHEAD MINNOWS:____ GOLDEN SHINERS:

OTHERS:_____

BIRDS:

DUCKS:___GEESE:___ HERONS:___ KINGFISHERS:___ SANDPIPERS/PLOVERS:
GULLS/TERNS:_____ OTHERS:_____

REPTILES:_____

AMPHIBIANS:_____

MAMMALS:_____

MUSSEL BEDS: NO ___ YES ___ IF YES: GPS #'S ____ ____ ____

APPENDIX B: Stream Reach Mileages

**Missing information because reach was not assessed*

REACH	STREAM MILES	COMPLETED	DATE COMPLETED	STAFF	COMMENTS
MF001	0.388889	Y	6/19/2019	DM/EW	
MF002	0.529964	Y	6/19/2019	DM/EW	
MF003	0.492147	Y	6/19/2019	DM/EW	
MF004	0.518828	Y	6/21/2019	DM/EW	
MF005	0.616339	Y	6/21/2019	DM/EW	
MF006	0.662948	Y	6/21/2019	DM/EW	
MF007	0.63083	Y	7/8/2019	DM/EW	Some tribes inaccessible with debris jams. Scouted ends of them
MF008	0.624398	Y	7/8/2019	DM/EW	
MF009	0.496977	Y	7/9/2019	DM/EW	
MF010	0.448227	y	7/9/2019	DM/EW	
MF011	0.457891	Y	7/10/2019	DM/EW	
MF012	0.437986	Y	7/10/2019	DM/EW	
MF013	0.460402	Y	6/6/2019	DM/EW	
MF014	0.480082	Y	6/6/2019	DM/EW	
MF015	0.423867	Y	6/10/2019	DM/EW/CS	
MF016	0.486474	Y	6/4/2019	DM/EW	
MF017	0.442297	Y	7/16/2019	DM/EW	
MF018	0.558587	Y	7/17/2019	DM/EW	
MF019	0.745963	Y	7/17/2019	DM/EW	Would not recommend inventorying this reach in the future. Substrate stability was at dangerous levels the entire reach, we sunk to about waist level in substrate every step. Safety risk.
MF020	0.760586	Y	7/17/2019	DM/EW	Walked on bank, substrate stability was too much of an issue
MF021	0.605252	Y	7/25/2019	DM/EW	
MF022	0.630405	Y	7/25/2019	DM/EW	
MF023	0.253065	Y	6/3/2019	DM/EW	
MF024	0.578617	Y	6/3/2019	DM/EW	

REACH	STREAM MILES	COMPLETED	DATE COMPLETED	STAFF	COMMENTS
MF025	0.536402	Y	7/8/2019	DM/EW	Half reach inaccessible with barely any water with heavy vegetation. Stream starts again at end, strong odor present. Several tires in water.
MF026	0.524345	Y	7/31/2019	DM/EW	Mostly dried up
MF027	0.651257	Y	7/31/2019	DM/EW	
MF028	0.771362	Y	7/31/2019	DM/EW	
MF029	0.264536	Y	7/17/2019	DM/EW	Barely any water. Some pools by discharge but no flow overall
*MF030	0.63868	Y			
*MF031	0.249646	Y			
MF032	0.067309	Y	7/8/2019	DM/EW	
*MF033	0.205054	Y			
MF034	0.124052	Y	6/27/2019	DM/EW	
SR001	0.656024	Y	7/2/2019	DM/EW	
SR002	0.462187	Y	7/2/2019	DM/EW	
SR003	0.475544	Y	8/2/2019	DM/EW	
SR004	0.306538	Y	8/2/2019	DM/EW	
SR005	0.399469	Y	8/2/2019	DM/EW	Swans
SR006	0.321928	Y	7/26/2019	DM/EW	
SR007	0.368316	Y	7/1/2019	DM/EW	
SR008	0.4146	Y	7/1/2019	DM/EW	
SR009	0.363982	Y	6/26/2019	DM/EW	
SR010	0.365421	Y	7/1/2019	DM/EW	Golf course is very confusing on who owns it and what it is going to be in the future
SR011	0.367322	Y	6/12/2019	DM/EW/CS	
SR012	0.263778	Y	6/12/2019	DM/EW/CS	
SR013	0.326728	Y	6/14/2019	DM/EW	
SR014	0.423273	Y	6/14/2019	DM/EW	
SR015	0.483745	Y	6/18/2019	DM/EW	
SR016	0.328129	Y	5/28/2019	EW	A lot of debris dumping on right residential. Large clay pipes scattered.
SR017	0.391638	Y	6/7/2019	DM/EW	

REACH	STREAM MILES	COMPLETED	DATE COMPLETED	STAFF	COMMENTS
SR018	0.28663	Y	6/7/2019	DM/EW	
SR019	0.354609	Y	6/20/2019	DM/EW	
SR020	0.353863	Y	6/20/2019	DM/EW	
SR021	0.402091	Y	6/26/2019	DM/EW	Owentsia Golf Course
SR022	0.448842	Y	6/26/2019	DM/EW	
SR023	0.368929	Y	7/23/2019	DM/EW	
SR024	0.461644	Y	7/23/2019	DM/EW	
SR025	0.557487	Y	7/23/2019	DM/EW	
SR026	0.407358	Y	7/24/2019	DM/EW	
SR027	0.42584	Y	7/24/2019	DM/EW	
SR028	0.443738	Y	7/24/2019	DM/EW	
SR029	0.364001	Y	8/1/2019	DM/EW	
SR030	0.426211	Y	8/1/2019	DM/EW	
SR031	0.479199	Y	7/30/2019	DM/EW/JL/AS	
SR032	0.684294	Y	7/30/2019	DM/EW/JL/AS	Fence posts frequently spotted in stream
SR033	0.310576	Y	7/30/2019	DM/EW/JL/AS	
SR035	0.57975	Y	7/12/2019	DM/EW	
SR036	0.572004	Y	7/12/2019	DM/EW	
SR037	1.414838	Y	7/22/2019	DM/EW	Reach is part stream part wetland
*SR038	0.403351	Y			
SR039	0.122499	Y	8/2/2019	DM/EW	
SR040	0.218638	Y	6/20/2019	DM/EW	A lot of trash
SR041	0.30537	Y	6/7/2019	DM/EW/CS	
WF001	0.403289	Y	6/11/2019	DM/EW/CS	Strong smell of gas
WF002	0.216529	Y	6/11/2019	DM/EW/CS	
WF003	0.251546	Y	6/11/2019	DM/EW/CS	
WF004	0.300331	Y	6/11/2019	DM/EW/CS	
WF005	0.338431	Y	6/11/2019	DM/EW/CS	

REACH	STREAM MILES	COMPLETED	DATE COMPLETED	STAFF	COMMENTS
WF006	0.350534	Y	5/31/2019	DM/EW	
WF007	0.267443	Y	6/10/2019	DM/EW/CS	
WF008	0.423449	Y	6/10/2019	DM/EW/CS	
WF009	0.281339	Y	6/10/2019	DM/EW/CS	Leads into Lake Eleanor
WF010	0.623037	Y	7/3/2019	DM/EW	
WF011	0.237717	Y	7/3/2019	DM/EW	Stops at the detention basin.
WF012	0.594574	Y	7/11/2019	DM/EW	
WF013	0.343479	Y	6/17/2019	DM/EW	Consistent lateral recession and high bank debris load
WF014	0.367084	Y	6/17/2019	DM/EW	Tons of logs, branches, and trunks on banks
WF015	0.449665	Y	7/15/2019	DM/EW	
WF016	0.845246	Y	7/15/2019	DM/EW	Large number of debris jams
WF017	0.446405	Y	7/15/2019	DM/EW	
WF018	0.627828	Y	7/15/2019	DM/EW	
WF019	0.659525	Y	6/18/2019	DM/EW	Golf course ponds
*WF020	0.176647	Y		DM/EW	Could not access fully
MF001	0.37	Y	8/28/2019	PK/PBL	This reach cut through yards in a private community. We were able to follow the reach at the east end and west ends, but there was a section in the middle we could not access. It was a small stream with some lawn areas and some forested riparian zones.
*MF002	0.21	N			
*MF004	0.09	N			
MF006	1.28	Y	4/12/2019	ST	
MF011	0.71	Y	5/17/2019	ST	
MF021	1.37	Y	6/14/2019	SPT	Flooded during assessment
MF022	0.97	Y	7/12/2019	Triton College	
MF023	0.35	Y	8/27/2019	PBL/SB	First half upstream in open canopy cow pasture, second half in closed canopy restricted stream, at base of reach downstream turned into braided stream with wide floodplain by river
MF025	1.36	Y	8/9/2019	Triton College	North fork after split at Skokie river experiences lots of sediment downstream. Upstream clearer

REACH	STREAM MILES	COMPLETED	DATE COMPLETED	STAFF	COMMENTS
MF028	0.63	Y	9/9/2019	PBL/LJ	Residential, mainly on left bank. Erosion throughout, very little armoring. Mussel beds throughout, possibly Heelsplitters, one Floater relict. Met residents who described severe lateral recession and flooding, especially over last 4 years.
MF029	0.19	Y	9/16/2019	PK/SB	Bank full during assessment and main stem was at high level. There was a lot of vegetation on banks, but there was still a fair amount of sedimentation, which was likely due to persistent flooding.
MF030	0.31	Y	9/16/2019	PK/SB	Eroded banks throughout reach. Property lines are being eroded by runoff and need bank stabilization. Small snapping turtle found near end of reach.
MF031	0.09	Y	10/18/2019	PK/BS	More of a swale than stream reach.
MF032	0.46	Y	9/26/2019	PBL/LJ	Water was high. Flow rate was relatively high. Evidence of high recession rate. Erosion most of banks. Bordered by park on west. Park employee said flooding occurs often and green infrastructure has been employed.
MF034	0.16	Y	9/16/2019	PK/SB	Very eroded banks with moderate sedimentation. Substantial debris load.
MF035	0.31	Y	9/18/2019	PBL/SB	Meandering stream, west end residential in private property, sporadic photos as no access, slightly flooded stage on east end by river connection, forested riparian zone
MF038	1.87	Y	10/18/2019	SB/PK/LJ/BS	Multiple down trees at top of reach causing a large dam with notable water depth difference at top and bottom. Severe erosion throughout with undercut banks and property lines.
*MF042	0.70	N			
MF044	0.16	Y	10/10/2019	PK/SB	Overflow drainage into basin
MF045	0.93	Y	10/22/2019	SB/PBL	Section from top of reach to detention basin had heavy sedimentation in channel that restricted ability to be in stream. Sank into mud about a 1 to 1.5 feet. Did sections of inventory on stream bank due to inaccessibly. Noticeably heavy in stream debris
*MF051	0.72	N			
*MF060	1.12	N			
SR001	0.36	Y	10/24/2019	LJ/SB	Heavy sedimentation in stream throughout entire reach.
SR002	0.47	Y	10/25/2019	LJ/SB	Bottom third heavy sediments I stream up to foot thick. Remaining stable
*SR004	0.57	N			
*SR007	0.58	N			
*SR010	1.72	N			

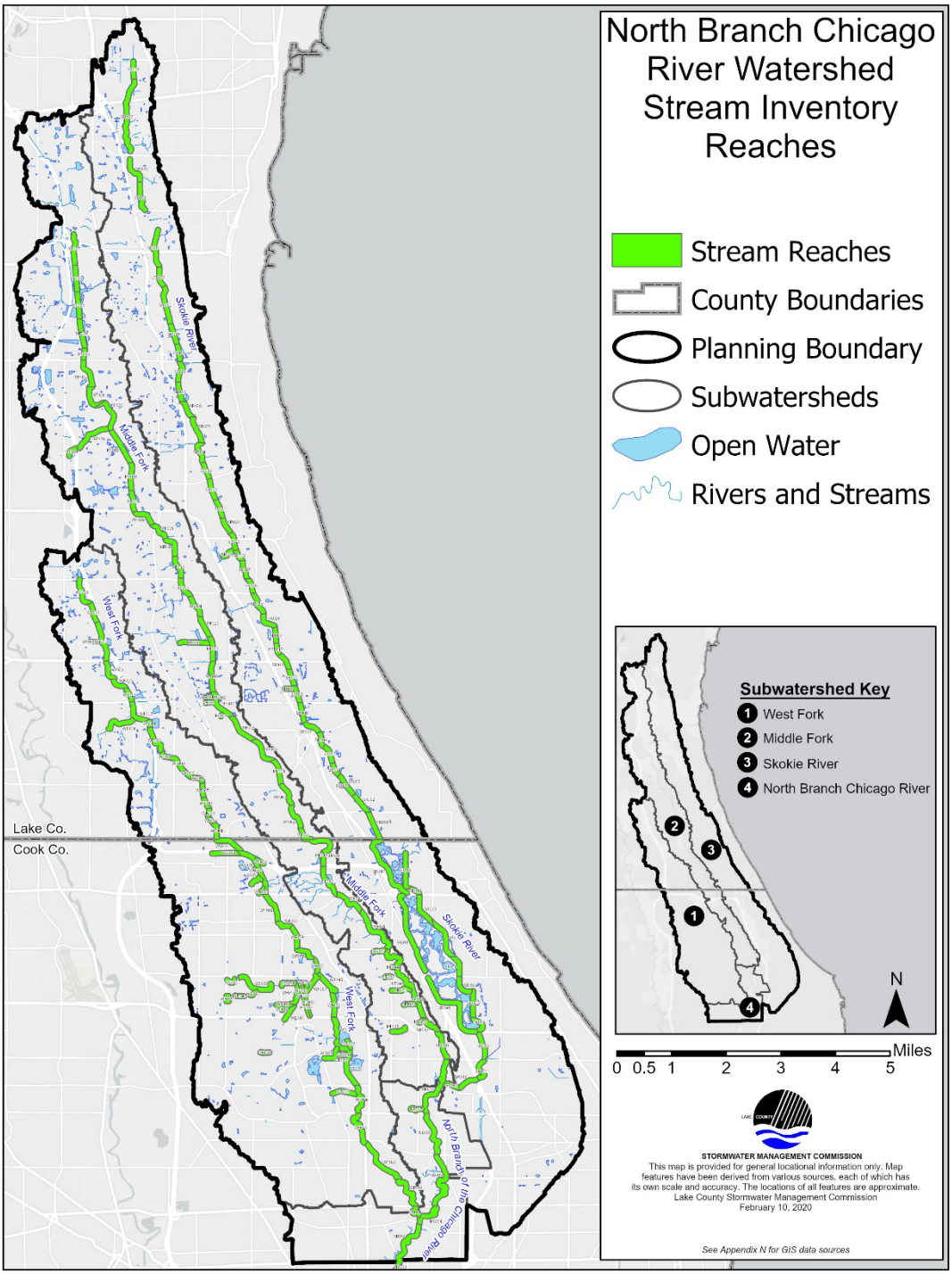
REACH	STREAM MILES	COMPLETED	DATE COMPLETED	STAFF	COMMENTS
*SR011	0.41	N			
*SR012	0.56	N			
*SR013	0.50	N			
*SR014	0.48	N			
*SR015	0.86	N			
*SR017	0.70	N			
*SR022	1.68	N			
*SR023	0.28	N			
SR024	1.45	Y	11/6/2019	LJ/SB	Bottom 1/3 of the reach were mudflats turning into a deep wide river. Upstream 2/3 riffle run pool stream. By the mudflats there was sedimentation.
*SR025	0.76	N			
*WF001	0.38	N			
WF003	0.85	Y	8/22/2019	SB/LJ	Reach in golf course, saw mussel relics
WF004	1.03	Y	8/22/2019	PK/AE	
WF005	0.82	Y	8/29/2019	PBL/AE	Replacing riverbank armoring near south end.
WF006	0.68	Y	8/29/2019	PK/SB/JW	
WF007	0.54	Y	8/23/2019	PK/SB	The first/ west portion of the reach had good substrate stability, there was abundant aquatic plants, and there were many fish. The second half of the reach suffered from severe erosion and sedimentation from housing development at edge of stream.
W008	0.70	Y	8/21/2019	PK/AE	Mostly inventoried on 8/20. We're not able to finish because of thunderstorm. Reach was very channelized and has experienced severe erosion along the banks throughout the entire reach. There was heavy in stream debris load.
WF009	0.29	Y	8/21/2019	PK/AE	
WF010	0.95	Y	8/19/2019	PK/AE/PK	Used 12-foot johnboat. Hazardous sedimentation.
WF011	0.25	Y	8/9/2019	PK/SB	South half of reach near spillway had high sedimentation and needs attention. The north half of reach had some erosion but was overall in much better condition.
WF012	0.48	Y	8/08/2019	PK/SB	Mussel relics, deer, frogs
WF013	0.26	Y	8/21/2019	PK/AE	
WF014	0.51	Y	6/26/2019	PBL/PK	Managed like a reservoir, slow moving water, mostly shallow with deeper

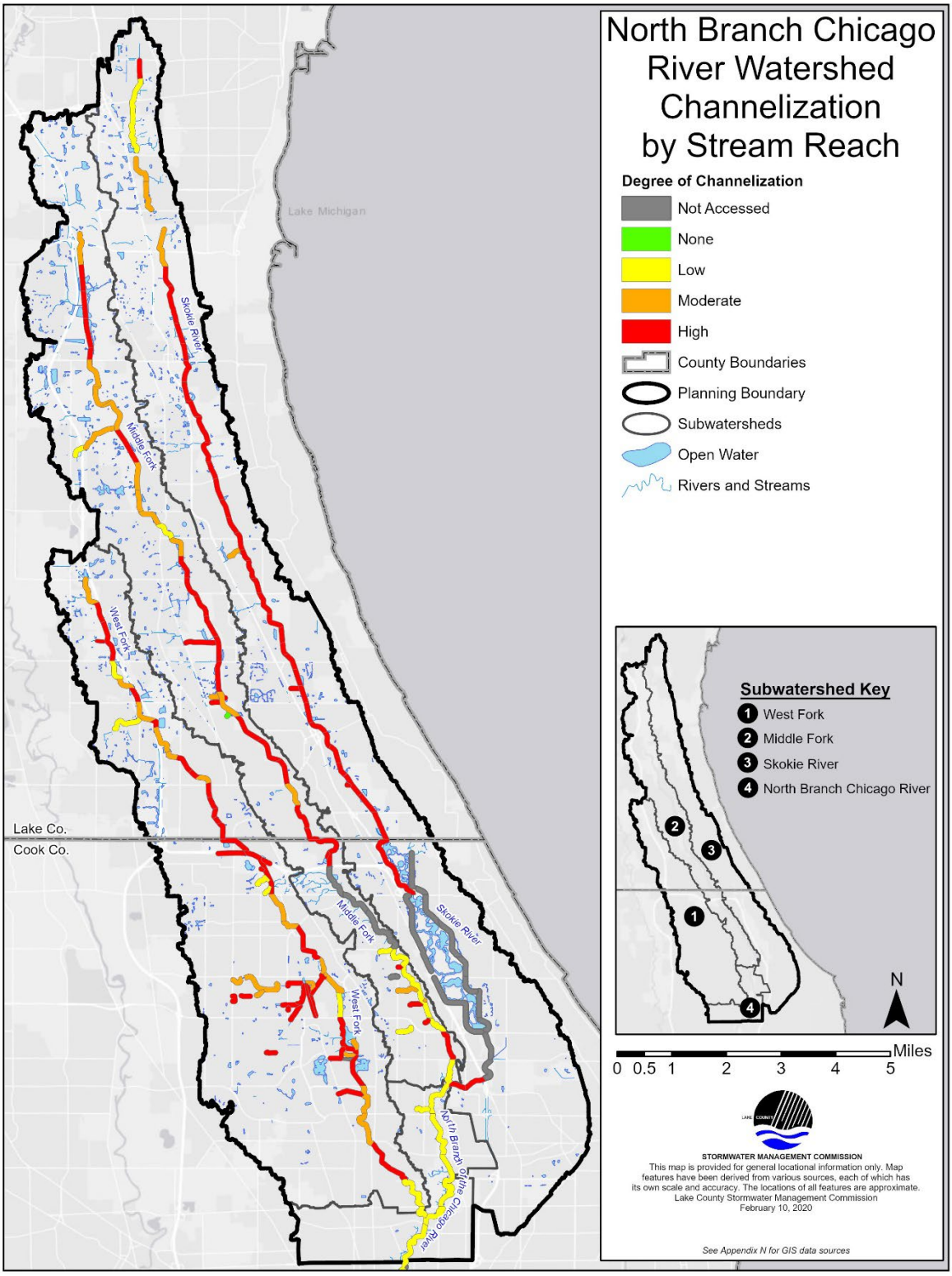
REACH	STREAM MILES	COMPLETED	DATE COMPLETED	STAFF	COMMENTS
					portions near dam, very high sedimentation, entire east bank was armored, a lot of macrophytes, dozens of spawning common carp, relic corbicula and floater mussels.
WF015	0.55	Y	6/18/2019	PK/LJ	
WF016	0.53	Y	6/19/2019	PK/LJ	High erosion and sedimentation. Armoring needs to be repaired. Good diversity of wildlife, but it could be better with targeted restoration. Stream was very segmented in quality.
WF017	0.32	Y	8/12/2019	LJ/AE/PBL	
WF018	0.44	Y	8/13/2019	LJ/PBL	Drainage ditch along railroad. Full of Fragilities and other vegetation.
WF019	0.44	Y	6/21/2019	LJ/PBL	Drainage ditch along Railroad. Lots of Instream Vegetation, Cattails
WF020	0.25	Y	6/21/2019	LJ/PBL	Cat tails throughout reach. RR side of reach armored by gravel.
WF021	0.28	Y	6/21/2019	PBL/LJ	Overgrown drainage ditch
WF022	0.91	Y	8/15/2019	LJ/SB	Several large sections with great armoring, other sections with erosion. Sections by the high school had restored native vegetation with stream stabilization
WF022	0.37	Y	8/12/2019	LJ/AE	
WF024	0.23	Y	7/16/2019	AE/PK	Part of reach heavily armored and incorporated in a personal backyard. Middle of section was severely eroded and in need of maintenance. Middle to end (downstream) was part of a retention basin and nature reserve with many native plants.
WF025	0.25	Y	7/16/2019	PK/AE	Manmade drainage ditch with heavy sedimentation. Did not resemble a stream at many points.
WF026	0.29	Y	7/8/2019	PL/LJ	Low flow stream with very severe sedimentation throughout the reach. In desperate need of bank Stabilization to stop erosion. Trees are at risk of being undercut. Any ripples formed were mostly from sedimentation. Very little wildlife in stream.
WF027	0.25	Y	7/8/2019	PH/LJ	Stream was a small neighborhood drainage ditch. Most of the reach was grass with a small pilot channel and almost no water. Zero flow throughout. Some sections of emergent vegetation.
WF028	0.49	Y	8/13/2019	PBL/LJ	This reach was very overgrown and choked with vegetation. We were unable to get through to walk the reach in stream bed. The banks were also impassable due to Buckthorn and other vegetation
WF029	0.38	Y	8/9/2019	SB/PK	Found live mussel
WF030	0.15	Y	8/9/2019	SB/PK	

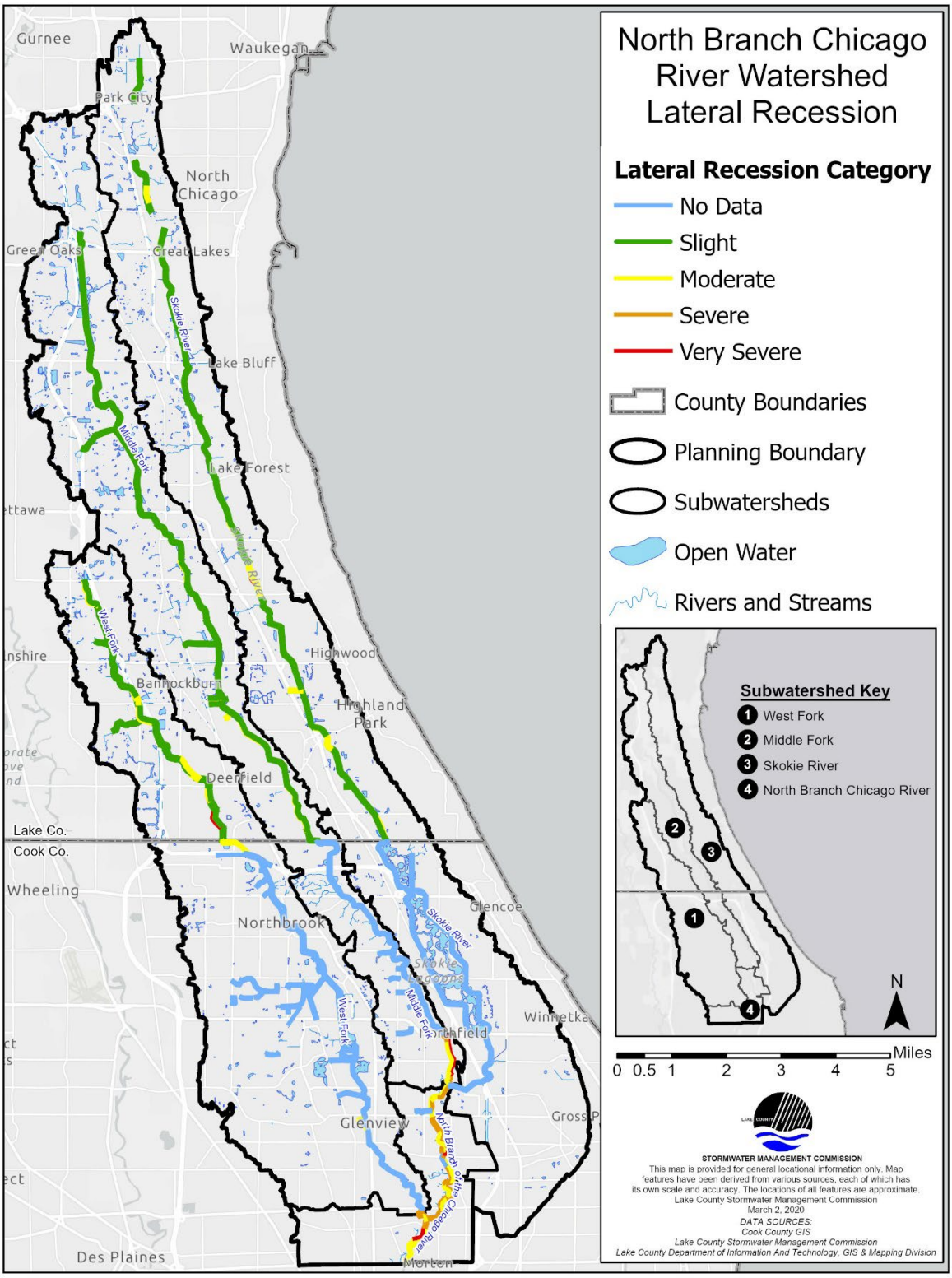
REACH	STREAM MILES	COMPLETED	DATE COMPLETED	STAFF	COMMENTS
WF031	0.39	Y	8/28/2019	PBL/PK	The gradient is opposite and creates stagnant water with bacteria buildup. Needs attention. South end of reach is not connecting with north end.
WF032	0.34	Y	6/7/2019	PBL/AE	Relict corbilcula mussels, relict Heelspliter. Banks well stabilized with vegetation.
WF033	0.26	Y	6/8/2019	NK/SB/PK	Wetland with cattails, sedges, with channel extending halfway before succumbing to wetland only
WF034	0.45	Y	6/7/2019	NK/SB/PK	
WF035	0.49	Y	6/6/2019	NK/PBL/AE	Moderate to severe Erosion along fifty percent of the reach. Fifty percent stream bank improvement and riffle/pool complex added.
WF036	0.37	Y	4/23/2019	NK/LJ/PK	Bank stabilization throughout. Rip rap throughout. Sections with gabions and Stabilization matting.
WF037	0.63	Y	5/17/2019	NK/AE/LJ	One live mussel, many corbicula relics, Severe erosion throughout entire reach.
WF038	1.10	Y	6/11/2019	AE/SB/PBL/PK	Saw a fawn and deer. Saw mussel relics. Corbicula relicts
WF039	0.24	Y	6/17/2019	PBL/PK	Wetland
WF044	0.37	Y	6/17/2019	PK/PBL	Mostly wetland. Lots of wildflowers.
WF045	0.13	Y	6/17/2019	PK/PBL	Heavy debris load, lots of logs, some litter, heavy erosion, slow current.
WF046	0.24	Y	10/10/2019	PK/SB	Newly constructed sides with fresh grass and vegetation netting. Erosion remediation
WF047	0.61	Y	4/9/2019	NK/PBL/SB	Found 3 live mussels. 1 Large crayfish. Saw snake, snail relic
WF048	0.54	Y	9/20/2019	PK/SB	Downstream end of reach turbid with brown water, quickly changed to clear water. End of upstream was a culvert with an unknown length but at least 400 ft.
	88.38	**TOTAL MILES**			
	76.42	**MILES COMPLETE**			
	11.96	**MILES REMAINING**			
	86.47%	**% COMPLETE**			

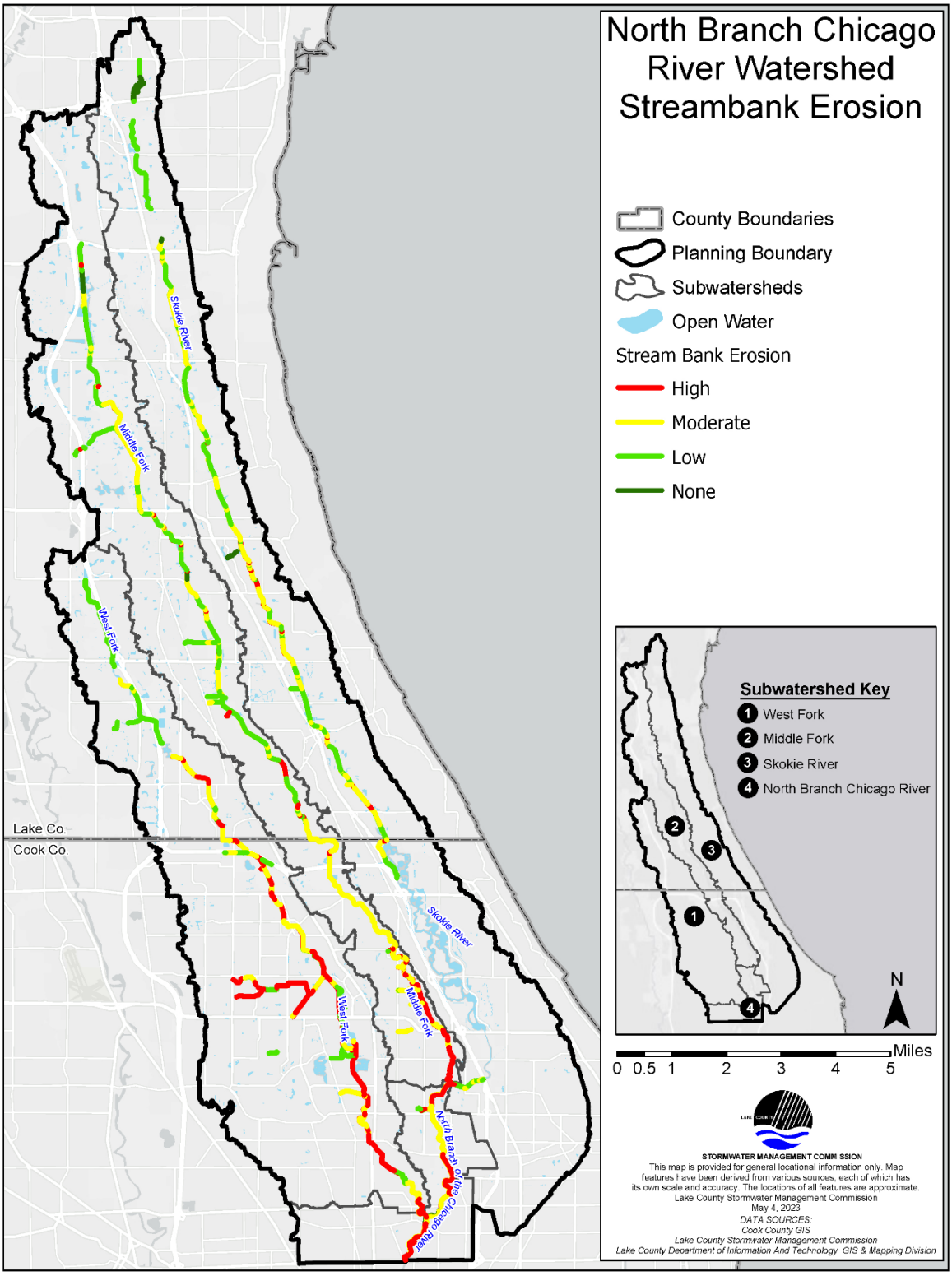
APPENDIX C

STREAM MAPS




North Branch Chicago River Watershed Channelization by Stream Reach
Degree of Channelization
Not Accessed
None
Low
Moderate
High
County Boundaries
Planning Boundary
Subwatersheds
Open Water
Rivers and Streams
Lake Michigan
Skokie River
Middle Fork
West Fork
North Branch Chicago River
Lake Co.
Cook Co.
Subwatershed Key
1 West Fork
2 Middle Fork
3 Skokie River
4 North Branch Chicago River
N
0 0.5 1 2 3 4 5 Miles
STORMWATER MANAGEMENT COMMISSION
This map is provided for general locational information only. Map features have been derived from various sources, each of which has its own scale and accuracy. The locations of all features are approximate.
Lake County Stormwater Management Commission
February 10, 2020
See Appendix N for GIS data sources


North Branch Chicago River Watershed Lateral Recession
Lateral Recession Category
No Data
Slight
Moderate
Severe
Very Severe
County Boundaries
Planning Boundary
Subwatersheds
Open Water
Rivers and Streams
Subwatershed Key
1 West Fork
2 Middle Fork
3 Skokie River
4 North Branch Chicago River
N
0 0.5 1 2 3 4 5 Miles
STORMWATER MANAGEMENT COMMISSION
This map is provided for general locational information only. Map features have been derived from various sources, each of which has its own scale and accuracy. The locations of all features are approximate.
Lake County Stormwater Management Commission
March 2, 2020
DATA SOURCES:
Cook County GIS
Lake County Stormwater Management Commission
Lake County Department of Information And Technology, GIS & Mapping Division
Gurnee
Waukegan
Park City
North Chicago
Green Oaks
Great Lakes
Lake Bluff
Lake Forest
Highwood
Highland Park
Bannockburn
Deerfield
Lake Co.
Cook Co.
Wheeling
Northbrook
Glencoe
Winnetka
Northfield
Glenview
Des Plaines
Morton
Skokie River
Middle Fork
West Fork
North Branch Chicago River


North Branch Chicago River Watershed Streambank Erosion
County Boundaries
Planning Boundary
Subwatersheds
Open Water
Stream Bank Erosion
High
Moderate
Low
None
Subwatershed Key
1 West Fork
2 Middle Fork
3 Skokie River
4 North Branch Chicago River
N
0 0.5 1 2 3 4 5 Miles
Lake Co.
Cook Co.
Skokie River
Middle Fork
West Fork
North Branch Chicago River
STORMWATER MANAGEMENT COMMISSION
This map is provided for general locational information only. Map features have been derived from various sources, each of which has its own scale and accuracy. The locations of all features are approximate.
Lake County Stormwater Management Commission
May 4, 2023
DATA SOURCES:
Cook County GIS
Lake County Stormwater Management Commission
Lake County Department of Information And Technology, GIS & Mapping Division

APPENDIX D

Miscellaneous points

In the summer 2019 inventory of the North Branch Chicago River watershed some points were collected as miscellaneous points. These included incidences that were not classified as channel characteristics but were considered worthy of being noted in the inventory. Below is a table of total miscellaneous points. These contributed to things such as debris jams, bank erosion, water quality and water levels.

MISCELLANEOUS POINT (COMMENTS)		
2 concrete arches	Fallen trees in stream	Power cable tower in river
Aeration system	Flooded area	Private Property (note conditions)
Algae	Inaccessible Reach or Tributary	Pumping water from stream/tributary
Aquatic vegetation/ emergent vegetation	Instream debris	Riprap or rock within stream
Armoring	Iron flocculate or rust color noted	Rootwads and undercut banks
Backwater/ backwater pool	Manhole	Rotting/ dead tree in stream
Beaver activity	Metal cage within stream	Sediment accumulation in stream
Bedrock shelf in stream	Metal gate	Sheet metal
Bike in stream	Metal grate	Shopping carts
Braided stream	Metal post in stream	Silt fence
Broken pipe	Metal signs in stream	Snow fence
Cattails	Mud flats (dimensions)	Stream overflow into basin
Cloudy water color	Mussels noted	Telephone pole in stream
Concrete slabs and pieces	Oil Sheen noted	Temporary work bridge
Concrete structure; unknown purpose	Old discharge point	Tire
Construction waste	Open channel tributary	Vegetation too dense to pass
Cow pasture	Over hang veg with debris	Water hazard for golf course
Dead animal	Phone pole in stream	Weir
Development up to edge of stream	Phragmites	Wetland as part of reach
Disconnected pipe	Pile of gravel	Wire sticking out of the ground
Dry stream bed	Pooling	
Electrical box falling into river	Possible buried discharge point	
Failed concrete structure	Possible Discharge point (rubber)	
Failing armoring	Possible fish kill	
Fallen Fence in Stream	Possible floating vegetation mat	
Fallen live wire	Private dock	

APPENDIX C:
DETENTION BASIN INVENTORY REPORT

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Bannockburn	25-113	42.196889	-87.858873	-	Middle Fork	N	Dry
Bannockburn	25-104	42.190150	-87.866055	-	Middle Fork	N	Wet
Bannockburn	25-105	42.193931	-87.867682	-	Middle Fork	N	Wet
Bannockburn	25-106	42.197145	-87.879850	-	Middle Fork	N	Wet
Bannockburn	25-109	42.201894	-87.866589	-	Middle Fork	N	Wet
Bannockburn	25-110	42.200602	-87.864486	-	Middle Fork	N	Wet
Bannockburn	25-111	42.197591	-87.869428	-	Middle Fork	N	Wet
Bannockburn	25-112	42.198236	-87.858519	-	Middle Fork	N	Wet
Bannockburn	25-118	42.194505	-87.854604	-	Middle Fork	N	Wet
Bannockburn	25-115	42.195169	-87.858565	-	Middle Fork	N	Wet
Bannockburn	25-114	42.195683	-87.860383	-	Middle Fork	N	Wet
Bannockburn	25-117	42.194383	-87.859832	-	Middle Fork	N	Wet
Bannockburn	25-119	42.193036	-87.855119	-	Middle Fork	N	Wet
Bannockburn	25-125	42.191870	-87.858681	-	Middle Fork	N	Wet
Bannockburn	25-124	42.190925	-87.858119	-	Middle Fork	N	Wet
Bannockburn	25-123	42.191465	-87.857375	-	Middle Fork	N	Wet
Bannockburn	25-131	42.190517	-87.865672	-	Middle Fork	Y	Wet
Bannockburn	25-116	42.195020	-87.857078	-	Middle Fork	Y	Wet
Bannockburn	25-121	42.193120	-87.857998	-	Middle Fork	Y	Wet
Bannockburn	25-122	42.191719	-87.854443	-	Middle Fork	Y	Wet
Bannockburn	25-126	42.197151	-87.873654	-	Middle Fork	Y	Wet
Bannockburn	25-128	42.197496	-87.870472	-	Middle Fork	Y	Wet
Bannockburn	25-129	42.199149	-87.871475	-	Middle Fork	Y	Wet
Bannockburn	25-130	42.199743	-87.871749	-	Middle Fork	Y	Wet
Bannockburn	V3_26-17	42.192503	-87.879363	-	West Fork	N	Wet
Bannockburn	V3_26-18	42.183762	-87.873527	-	West Fork	N	Wet
Bannockburn	26-52	42.187292	-87.873259	-	West Fork	N	Wet
Bannockburn	26-53	42.190880	-87.872920	-	West Fork	N	Wet
Bannockburn	26-54	42.192681	-87.873762	-	West Fork	N	Wet
Bannockburn	26-56	42.191058	-87.879257	-	West Fork	N	Wet
Bannockburn	26-59	42.198303	-87.886442	-	West Fork	N	Wet
Bannockburn	26-65	42.197143	-87.879837	-	West Fork	N	Wet
Bannockburn	26-55	42.193506	-87.873947	-	West Fork	N	Wet
Bannockburn	26-62	42.202763	-87.888705	-	West Fork	N	Wet
Bannockburn	26-63	42.203413	-87.889346	-	West Fork	N	Wet
Bannockburn	25-107	42.200809	-87.878530	-	West Fork	N	Wet
Bannockburn	25-127	42.194510	-87.872354	-	West Fork	N	Wet
Bannockburn	V3_26-01	42.202348	-87.885250	-	West Fork	Y	Wet

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Bannockburn	V3_26-02	42.200472	-87.882294	-	West Fork	Y	Wet
Bannockburn	26-57	42.193707	-87.880870	-	West Fork	Y	Wet
Bannockburn	26-58	42.194648	-87.881793	-	West Fork	Y	Wet
Bannockburn	26-60	42.200980	-87.885197	-	West Fork	Y	Wet
Bannockburn	26-61	42.201947	-87.887826	-	West Fork	Y	Wet
Bannockburn	26-64	42.202363	-87.884080	-	West Fork	Y	Wet
Bannockburn	25-108	42.201766	-87.877565	-	West Fork	Y	Wet
Deerfield	25-27	42.155240	-87.822524	-	Middle Fork	N	Dry
Deerfield	25-29	42.166576	-87.841168	-	Middle Fork	N	Dry
Deerfield	25-28	42.157974	-87.830702	-	Middle Fork	N	Dry
Deerfield	25-26	42.155262	-87.835133	-	Middle Fork	N	Underground
Deerfield	25-30	42.184493	-87.846263	-	Middle Fork	Y	Dry
Deerfield	26-28	42.157969	-87.841471	-	West Fork	N	Dry
Deerfield	26-23	42.161569	-87.853130	-	West Fork	N	Dry
Deerfield	26-30	42.173693	-87.858922	-	West Fork	N	Underground
Deerfield	26-29	42.153343	-87.836617	-	West Fork	N	Underground
Deerfield	26-33	42.161500	-87.847570	-	West Fork	N	Underground
Deerfield	V3_26-28	42.165919	-87.875094	-	West Fork	N	Wet
Deerfield	26-34	42.153292	-87.843943	-	West Fork	N	Wet
Deerfield	26-27	42.153351	-87.841256	-	West Fork	N	Wet
Deerfield	26-22	42.181208	-87.868168	-	West Fork	N	Wet
Deerfield	26-26	42.156688	-87.851591	-	West Fork	N	Wet
Deerfield	26-25	42.158703	-87.849257	-	West Fork	N	Wet
Deerfield	26-415	42.152189	-87.859013	-	West Fork	NA	Dry
Deerfield	26-25	42.150379	-87.856815	-	West Fork	NA	Wet
Deerfield	26-414	42.146371	-87.832970	-	West Fork	NA	Wet
Deerfield	26-32	42.162391	-87.844902	-	West Fork	Y	Dry
Deerfield	26-21	42.170737	-87.872665	-	West Fork	Y	Dry
Deerfield	26-31	42.161567	-87.844074	-	West Fork	Y	Underground
Deerfield	V3_26-21	42.164009	-87.875207	-	West Fork	Y	Wet
Deerfield	V3_26-25	42.163295	-87.847063	-	West Fork	Y	Wet
Deerfield	26-20	42.165662	-87.880203	-	West Fork	Y	Wet
Deerfield	26-36	42.160953	-87.844939	-	West Fork	Y	Wet
Deerfield	26-35	42.160513	-87.843486	-	West Fork	Y	Wet
Deerfield	26-38	42.159787	-87.842986	-	West Fork	Y	Wet
Deerfield	26-37	42.159408	-87.843871	-	West Fork	Y	Wet
Deerfield	26-0184	42.152649	-87.865882	Inventory basin.	West Fork	NA	Dry
Deerfield	26-0188	42.152367	-87.862019	Inventory basin.	West Fork	NA	Dry

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Deerfield	26-0193	42.152267	-87.853947	Inventory basin.	West Fork	NA	Dry
Deerfield	26-0173	42.151759	-87.873441	Inventory basin.	West Fork	NA	Wet
Deerfield	26-0182	42.147065	-87.834504	Inventory basin.	West Fork	NA	Wetland
Deerfield	26-0183	42.150258	-87.865765	Inventory basin.	West Fork	NA	Wetland
Deerfield	26-0185	42.152691	-87.864040	Inventory basin.	West Fork	NA	Wetland
Deerfield	26-0171	42.153501	-87.876806	Inventory basin.	West Fork	Y	Wet
Deerfield	26-0172	42.153999	-87.875955	Inventory basin.	West Fork	Y	Wet
Deerfield	26-0186	42.153081	-87.846433	Inventory basin.	West Fork	Y	Wet
Deerfield	26-22	42.151124	-87.844963	Stabilize shoreline erosion.	West Fork	NA	Wet
Glencoe	24-296	42.138923	-87.781824	1. Repair inlet. 2. Remove debris from outlet. 3. Stabilize shoreline erosion.	Skokie River	NA	Wet
Glencoe	24-432	42.121832	-87.781806	Inventory basin.	Skokie River	NA	Wetland
Glenview	26-309	42.055798	-87.796531	-	North Branch Chicago River Upstream	NA	Dry
Glenview	26-8000	42.087249	-87.845705	-	West Fork	NA	Dry
Glenview	26-9	42.088041	-87.846726	-	West Fork	NA	Wet
Glenview	26-110	42.082203	-87.847965	-	West Fork	NA	Wet
Glenview	26-224	42.086793	-87.812543	-	West Fork	NA	Wet
Glenview	26-284	42.081012	-87.829905	-	West Fork	NA	Wet
Glenview	26-406	42.085022	-87.811468	-	West Fork	NA	Wet
Glenview	26-407	42.091286	-87.795862	-	West Fork	NA	Wet
Glenview	26-445	42.096550	-87.810458	-	West Fork	NA	Wet
Glenview	26-457	42.096829	-87.810831	-	West Fork	NA	Wet
Glenview	26-8	42.090506	-87.836011	1. Unclog inlet. 2. Repair outlet. 3. Remove temporary construction shoring 4. Stabilize shoreline erosion.	West Fork	NA	Wet
Glenview	26-0128	42.058441	-87.814396	Inventory basin.	West Fork	NA	Dry
Glenview	26-0131	42.089271	-87.849578	Inventory basin.	West Fork	NA	Dry
Glenview	26-0132	42.087789	-87.850424	Inventory basin.	West Fork	NA	Dry
Glenview	26-0142	42.096272	-87.844798	Inventory basin.	West Fork	NA	Dry
Glenview	26-0145	42.103514	-87.845851	Inventory basin.	West Fork	NA	Dry
Glenview	26-0197	42.087812	-87.842674	Inventory basin.	West Fork	NA	Dry
Glenview	26-0202	42.077405	-87.827647	Inventory basin.	West Fork	NA	Dry
Glenview	26-5	42.093513	-87.847625	Inventory basin.	West Fork	NA	Wet
Glenview	26-6	42.092934	-87.850043	Inventory basin.	West Fork	NA	Wet
Glenview	26-7	42.090640	-87.842947	Inventory basin.	West Fork	NA	Wet

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Glenview	26-104	42.101404	-87.845335	Inventory basin.	West Fork	NA	Wet
Glenview	26-105	42.098545	-87.815471	Inventory basin.	West Fork	NA	Wet
Glenview	26-113	42.076791	-87.806298	Inventory basin.	West Fork	NA	Wet
Glenview	26-139	42.057962	-87.802763	Inventory basin.	West Fork	NA	Wet
Glenview	26-288	42.101708	-87.831748	Inventory basin.	West Fork	NA	Wet
Glenview	26-298	42.106207	-87.832200	Inventory basin.	West Fork	NA	Wet
Glenview	26-0129	42.085842	-87.800628	Inventory basin.	West Fork	NA	Wet
Glenview	26-0130	42.087976	-87.860627	Inventory basin.	West Fork	NA	Wet
Glenview	26-0137	42.089956	-87.859517	Inventory basin.	West Fork	NA	Wet
Glenview	26-0138	42.089940	-87.831809	Inventory basin.	West Fork	NA	Wet
Glenview	26-0139	42.093599	-87.834362	Inventory basin.	West Fork	NA	Wet
Glenview	26-0140	42.094241	-87.830197	Inventory basin.	West Fork	NA	Wet
Glenview	26-0153	42.107649	-87.820551	Inventory basin.	West Fork	NA	Wet
Glenview	26-0194	42.106026	-87.847850	Inventory basin.	West Fork	NA	Wet
Glenview	26-0206	42.084916	-87.808038	Inventory basin.	West Fork	NA	Wet
Glenview	26-13	42.082860	-87.838023	Inventory basin.	West Fork	NA	Wet
Glenview	26-229	42.104870	-87.824177	Inventory basin.	West Fork	NA	Wet
Glenview	26-0133	42.087942	-87.852028	Inventory basin.	West Fork	NA	Wetland
Glenview	26-0134	42.087817	-87.851238	Inventory basin.	West Fork	NA	Wetland
Glenview	26-0135	42.092426	-87.857912	Inventory basin.	West Fork	NA	Wetland
Glenview	26-0136	42.093291	-87.858432	Inventory basin.	West Fork	NA	Wetland
Glenview	26-0141	42.096100	-87.814425	Inventory basin.	West Fork	NA	Wetland
Glenview	26-0198	42.101909	-87.843213	Inventory basin.	West Fork	NA	Wetland
Glenview	26-0201	42.078290	-87.835181	Inventory basin.	West Fork	NA	Wetland
Glenview	26-0203	42.079861	-87.822358	Inventory basin.	West Fork	NA	Wetland
Glenview	26-0208	42.067920	-87.802820	Inventory basin.	West Fork	NA	Wetland
Glenview	26-10	42.085868	-87.847703	Stabilize shoreline erosion.	West Fork	NA	Wet
Glenview	26-116	42.075732	-87.845061	Stabilize shoreline erosion.	West Fork	NA	Wet
Glenview	26-225	42.083262	-87.810925	Stabilize shoreline erosion.	West Fork	NA	Wet
Golf	27-0001	42.058998	-87.779512	-	North Branch Chicago River Upstream	NA	Dry
Green Oaks	V3_25-12	42.303176	-87.911190	-	Middle Fork	N	Wet
Green Oaks	V3_25-11	42.305686	-87.911734	-	Middle Fork	N	Wet
Green Oaks	V3_25-20	42.288148	-87.916204	-	Middle Fork	N	Wet
Green Oaks	V3_25-22	42.281994	-87.904772	-	Middle Fork	N	Wet
Green Oaks	V3_25-23	42.281920	-87.903489	-	Middle Fork	N	Wet
Green Oaks	V3_25-24	42.283125	-87.899899	-	Middle Fork	N	Wet
Green Oaks	V3_25-25	42.281422	-87.902647	-	Middle Fork	N	Wet

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Green Oaks	V3_25-26	42.284991	-87.904121	-	Middle Fork	N	Wet
Green Oaks	25-2	42.306851	-87.915254	-	Middle Fork	N	Wet
Green Oaks	25-3	42.301966	-87.907005	-	Middle Fork	N	Wet
Green Oaks	25-4	42.300053	-87.906743	-	Middle Fork	N	Wet
Green Oaks	25-5	42.294918	-87.908100	-	Middle Fork	N	Wet
Green Oaks	25-6	42.295553	-87.908577	-	Middle Fork	N	Wet
Green Oaks	25-8	42.283944	-87.910990	-	Middle Fork	N	Wet
Green Oaks	25-9	42.311284	-87.906344	-	Middle Fork	N	Wet
Green Oaks	25-15	42.278671	-87.893594	-	Middle Fork	N	Wet
Green Oaks	25-10	42.272236	-87.910260	-	Middle Fork	N	Wet
Green Oaks	25-1	42.303575	-87.915919	-	Middle Fork	N	Wetland
Green Oaks	V3_25-28	42.276715	-87.889289	-	Middle Fork	Y	Wet
Green Oaks	V3_25-29	42.276867	-87.891815	-	Middle Fork	Y	Wet
Green Oaks	V3_25-30	42.276854	-87.907195	-	Middle Fork	Y	Wet
Green Oaks	V3_25-34	42.277427	-87.916052	-	Middle Fork	Y	Wet
Green Oaks	25-14	42.276787	-87.903039	-	Middle Fork	Y	Wet
Green Oaks	25-16	42.278872	-87.890864	-	Middle Fork	Y	Wet
Green Oaks	25-13	42.268551	-87.898798	-	Middle Fork	Y	Wet
Green Oaks	25-12	42.267401	-87.899655	-	Middle Fork	Y	Wet
Green Oaks	V3_25-07	42.309209	-87.909276	-	Middle Fork	Y	Wetland
Green Oaks	V3_25-08	42.308912	-87.905448	-	Middle Fork	Y	Wetland
Green Oaks	V3_25-09	42.307622	-87.906877	-	Middle Fork	Y	Wetland
Green Oaks	V3_25-10	42.306993	-87.905611	-	Middle Fork	Y	Wetland
Green Oaks	V3_25-31	42.275978	-87.906324	-	Middle Fork	Y	Wetland
Highland Park	24-72	42.153152	-87.812153	-	Middle Fork	N	Dry
Highland Park	25-92	42.157165	-87.820532	-	Middle Fork	N	Dry
Highland Park	25-93	42.158453	-87.822785	-	Middle Fork	N	Dry
Highland Park	25-94	42.159852	-87.823462	-	Middle Fork	N	Dry
Highland Park	25-95	42.168094	-87.828777	-	Middle Fork	N	Dry
Highland Park	25-96	42.168531	-87.827921	-	Middle Fork	N	Dry
Highland Park	25-97	42.169392	-87.828169	-	Middle Fork	N	Dry
Highland Park	25-98	42.177115	-87.834421	-	Middle Fork	N	Dry
Highland Park	24-96	42.170103	-87.825714	-	Middle Fork	N	Wet
Highland Park	25-99	42.186172	-87.846120	-	Middle Fork	N	Wet
Highland Park	25-100	42.198497	-87.850645	-	Middle Fork	N	Wet
Highland Park	25-101	42.201381	-87.851608	-	Middle Fork	N	Wet
Highland Park	25-102	42.199577	-87.846415	-	Middle Fork	N	Wet
Highland Park	25-103	42.196490	-87.846586	-	Middle Fork	N	Wet

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Highland Park	25-132	42.196136	-87.850534	-	Middle Fork	N	Wet
Highland Park	24-142	42.210553	-87.836648	-	Skokie River	N	Dry
Highland Park	24-141	42.211113	-87.837778	-	Skokie River	N	Dry
Highland Park	24-138	42.206956	-87.832935	-	Skokie River	N	Dry
Highland Park	24-130	42.200489	-87.842486	-	Skokie River	N	Dry
Highland Park	24-155	42.188585	-87.818722	-	Skokie River	N	Dry
Highland Park	24-156	42.187364	-87.818741	-	Skokie River	N	Dry
Highland Park	24-157	42.186202	-87.804201	-	Skokie River	N	Dry
Highland Park	24-144	42.203123	-87.821575	-	Skokie River	N	Dry
Highland Park	24-119	42.184243	-87.838277	-	Skokie River	N	Dry
Highland Park	24-99	42.177069	-87.819548	-	Skokie River	N	Dry
Highland Park	24-91	42.165124	-87.818441	-	Skokie River	N	Dry
Highland Park	24-83	42.161846	-87.810353	-	Skokie River	N	Dry
Highland Park	24-73	42.153075	-87.807160	-	Skokie River	N	Dry
Highland Park	24-87	42.172365	-87.800225	-	Skokie River	N	Dry
Highland Park	24-88	42.172866	-87.798369	-	Skokie River	N	Dry
Highland Park	24-140	42.208968	-87.839466	-	Skokie River	N	Underground
Highland Park	24-139	42.207570	-87.838681	-	Skokie River	N	Underground
Highland Park	24-134	42.201918	-87.833704	-	Skokie River	N	Underground
Highland Park	24-133	42.200551	-87.832128	-	Skokie River	N	Underground
Highland Park	24-132	42.200241	-87.833985	-	Skokie River	N	Underground
Highland Park	24-150	42.193814	-87.829627	-	Skokie River	N	Underground
Highland Park	24-149	42.194488	-87.830402	-	Skokie River	N	Underground
Highland Park	24-148	42.195314	-87.830975	-	Skokie River	N	Underground
Highland Park	24-147	42.196286	-87.831566	-	Skokie River	N	Underground
Highland Park	24-146	42.198567	-87.833133	-	Skokie River	N	Underground
Highland Park	24-145	42.199546	-87.833848	-	Skokie River	N	Underground
Highland Park	24-158	42.184888	-87.802805	-	Skokie River	N	Underground
Highland Park	24-117	42.181912	-87.822875	-	Skokie River	N	Underground
Highland Park	24-114	42.182973	-87.808311	-	Skokie River	N	Underground
Highland Park	24-113	42.182389	-87.807987	-	Skokie River	N	Underground
Highland Park	24-112	42.182624	-87.807334	-	Skokie River	N	Underground
Highland Park	24-111	42.183678	-87.806504	-	Skokie River	N	Underground
Highland Park	24-108	42.183486	-87.805220	-	Skokie River	N	Underground
Highland Park	24-107	42.183942	-87.803819	-	Skokie River	N	Underground
Highland Park	24-106	42.183153	-87.801547	-	Skokie River	N	Underground
Highland Park	24-105	42.181301	-87.800364	-	Skokie River	N	Underground
Highland Park	24-103	42.181348	-87.808104	-	Skokie River	N	Underground

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Highland Park	24-104	42.179928	-87.807396	-	Skokie River	N	Underground
Highland Park	24-98	42.178463	-87.820166	-	Skokie River	N	Underground
Highland Park	24-84	42.161174	-87.808060	-	Skokie River	N	Underground
Highland Park	24-82	42.159324	-87.806953	-	Skokie River	N	Underground
Highland Park	24-81	42.158706	-87.806737	-	Skokie River	N	Underground
Highland Park	24-80	42.158021	-87.806255	-	Skokie River	N	Underground
Highland Park	24-79	42.156062	-87.803004	-	Skokie River	N	Underground
Highland Park	24-76	42.154376	-87.802608	-	Skokie River	N	Underground
Highland Park	24-77	42.154700	-87.803982	-	Skokie River	N	Underground
Highland Park	24-78	42.155505	-87.804513	-	Skokie River	N	Underground
Highland Park	V3_24-23	42.187828	-87.820363	-	Skokie River	N	Wet
Highland Park	V3_24-24	42.162980	-87.802570	-	Skokie River	N	Wet
Highland Park	V3_24-25	42.160048	-87.800758	-	Skokie River	N	Wet
Highland Park	24-131	42.201558	-87.836674	-	Skokie River	N	Wet
Highland Park	24-169	42.189743	-87.841220	-	Skokie River	N	Wet
Highland Park	24-170	42.189249	-87.839651	-	Skokie River	N	Wet
Highland Park	24-125	42.192085	-87.834959	-	Skokie River	N	Wet
Highland Park	24-124	42.192323	-87.833658	-	Skokie River	N	Wet
Highland Park	24-173	42.190971	-87.834589	-	Skokie River	N	Wet
Highland Park	24-122	42.190304	-87.834965	-	Skokie River	N	Wet
Highland Park	24-172	42.189742	-87.835821	-	Skokie River	N	Wet
Highland Park	24-171	42.189576	-87.836973	-	Skokie River	N	Wet
Highland Park	24-168	42.191332	-87.837548	-	Skokie River	N	Wet
Highland Park	24-167	42.192061	-87.838410	-	Skokie River	N	Wet
Highland Park	24-121	42.191050	-87.839938	-	Skokie River	N	Wet
Highland Park	24-126	42.192441	-87.841723	-	Skokie River	N	Wet
Highland Park	24-161	42.195522	-87.841838	-	Skokie River	N	Wet
Highland Park	24-165	42.194984	-87.839589	-	Skokie River	N	Wet
Highland Park	24-163	42.196299	-87.837404	-	Skokie River	N	Wet
Highland Park	24-164	42.198097	-87.837733	-	Skokie River	N	Wet
Highland Park	24-159	42.198475	-87.841438	-	Skokie River	N	Wet
Highland Park	24-160	42.199378	-87.840580	-	Skokie River	N	Wet
Highland Park	24-129	42.199263	-87.837782	-	Skokie River	N	Wet
Highland Park	24-128	42.199507	-87.839461	-	Skokie River	N	Wet
Highland Park	24-127	42.198352	-87.839662	-	Skokie River	N	Wet
Highland Park	24-166	42.192251	-87.840472	-	Skokie River	N	Wet
Highland Park	24-162	42.196248	-87.840337	-	Skokie River	N	Wet
Highland Park	24-143	42.207748	-87.818669	-	Skokie River	N	Wet

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Highland Park	24-118	42.185985	-87.822167	-	Skokie River	N	Wet
Highland Park	24-116	42.183406	-87.821950	-	Skokie River	N	Wet
Highland Park	24-120	42.190952	-87.837661	-	Skokie River	N	Wet
Highland Park	24-92	42.173971	-87.813981	-	Skokie River	N	Wet
Highland Park	24-85	42.165456	-87.801570	-	Skokie River	N	Wet
Highland Park	24-151	42.189743	-87.829952	-	Skokie River	N	Wetland
Highland Park	24-100	42.174304	-87.817786	-	Skokie River	N	Wetland
Highland Park	24-93	42.173673	-87.821809	-	Skokie River	N	Wetland
Highland Park	24-74	42.152959	-87.799875	-	Skokie River	N	Wetland
Highland Park	24-75	42.153669	-87.803967	-	Skokie River	N	Wetland
Highland Park	24-101	42.181206	-87.813908	-	Skokie River	Y	Dry
Highland Park	24-86	42.154864	-87.780795	-	Skokie River	Y	Dry
Highland Park	24-137	42.204203	-87.836011	-	Skokie River	Y	Underground
Highland Park	24-136	42.203226	-87.834429	-	Skokie River	Y	Underground
Highland Park	24-115	42.184682	-87.819246	-	Skokie River	Y	Wet
Highland Park	24-89	42.173800	-87.798599	-	Skokie River	Y	Wet
Illinois Tollway	V3_26-13	42.199667	-87.889565	-	West Fork	N	Wet
Illinois Tollway	V3_26-20	42.168431	-87.875451	-	West Fork	Y	Wet
Illinois Tollway	26-19	42.155316	-87.873361	-	West Fork	Y	Wetland
Lake Bluff	24-3	42.269301	-87.871035	-	Skokie River	N	Dry
Lake Bluff	24-13	42.277200	-87.876174	-	Skokie River	N	Dry
Lake Bluff	24-11	42.277594	-87.873057	-	Skokie River	N	Dry
Lake Bluff	24-9	42.275460	-87.872816	-	Skokie River	N	Dry
Lake Bluff	24-5	42.275550	-87.875300	-	Skokie River	N	Dry
Lake Bluff	24-4	42.270270	-87.866959	-	Skokie River	N	Dry
Lake Bluff	24-12	42.279109	-87.877788	-	Skokie River	N	Dry
Lake Bluff	24-10	42.276555	-87.872947	-	Skokie River	N	Dry
Lake Bluff	V3_24-15	42.282418	-87.865183	-	Skokie River	N	Wet
Lake Bluff	V3_24-16	42.277494	-87.860481	-	Skokie River	N	Wet
Lake Bluff	24-18	42.286252	-87.870407	-	Skokie River	N	Wet
Lake Bluff	24-15	42.279158	-87.862226	-	Skokie River	N	Wet
Lake Bluff	24-16	42.279900	-87.865713	-	Skokie River	N	Wet
Lake Bluff	24-8	42.276855	-87.870693	-	Skokie River	N	Wet
Lake Bluff	24-17	42.288332	-87.866104	-	Skokie River	N	Wetland
Lake Bluff	24-6	42.274753	-87.873687	-	Skokie River	Y	Dry
Lake Bluff	V3_24-10	42.293492	-87.883060	-	Skokie River	Y	Wet
Lake Bluff	V3_24-11	42.292838	-87.880774	-	Skokie River	Y	Wet
Lake Bluff	V3_24-12	42.292588	-87.879343	-	Skokie River	Y	Wet

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Lake Bluff	V3_24-13	42.292371	-87.876555	-	Skokie River	Y	Wet
Lake Bluff	V3_24-14	42.290931	-87.878014	-	Skokie River	Y	Wet
Lake Bluff	24-14	42.275578	-87.867605	-	Skokie River	Y	Wet
Lake Bluff	24-7	42.275086	-87.869267	-	Skokie River	Y	Wetland
Lake County Forest Preserve	V3_25-19	42.292336	-87.901724	-	Middle Fork	N	Wet
Lake County Forest Preserve	25-36	42.243058	-87.879608	-	Middle Fork	Y	Wet
Lake Forest	25-41	42.230873	-87.864780	-	Middle Fork	N	Dry
Lake Forest	V3_25-49	42.218803	-87.870969	-	Middle Fork	N	Wet
Lake Forest	25-90	42.218201	-87.843552	-	Middle Fork	N	Wet
Lake Forest	25-32	42.254545	-87.878741	-	Middle Fork	N	Wet
Lake Forest	25-45	42.241057	-87.870946	-	Middle Fork	N	Wet
Lake Forest	25-42	42.227900	-87.862804	-	Middle Fork	N	Wet
Lake Forest	25-66	42.226071	-87.867739	-	Middle Fork	N	Wet
Lake Forest	25-43	42.222450	-87.863770	-	Middle Fork	N	Wet
Lake Forest	25-46	42.244889	-87.894165	-	Middle Fork	N	Wet
Lake Forest	25-47	42.240910	-87.897236	-	Middle Fork	N	Wet
Lake Forest	25-48	42.241764	-87.894816	-	Middle Fork	N	Wet
Lake Forest	25-49	42.240785	-87.888836	-	Middle Fork	N	Wet
Lake Forest	25-56	42.239581	-87.890799	-	Middle Fork	N	Wet
Lake Forest	25-57	42.235756	-87.892826	-	Middle Fork	N	Wet
Lake Forest	25-58	42.234717	-87.890320	-	Middle Fork	N	Wet
Lake Forest	25-91	42.232256	-87.888159	-	Middle Fork	N	Wet
Lake Forest	25-59	42.232565	-87.885879	-	Middle Fork	N	Wet
Lake Forest	25-62	42.230508	-87.879797	-	Middle Fork	N	Wet
Lake Forest	25-61	42.230027	-87.878492	-	Middle Fork	N	Wet
Lake Forest	25-68	42.229128	-87.879981	-	Middle Fork	N	Wet
Lake Forest	25-67	42.227926	-87.877358	-	Middle Fork	N	Wet
Lake Forest	25-69	42.223587	-87.879362	-	Middle Fork	N	Wet
Lake Forest	25-70	42.223201	-87.876080	-	Middle Fork	N	Wet
Lake Forest	25-64	42.228716	-87.874569	-	Middle Fork	N	Wet
Lake Forest	25-72	42.224537	-87.870227	-	Middle Fork	N	Wet
Lake Forest	25-71	42.224227	-87.871433	-	Middle Fork	N	Wet
Lake Forest	25-74	42.220471	-87.871279	-	Middle Fork	N	Wet
Lake Forest	25-75	42.217740	-87.870025	-	Middle Fork	N	Wet
Lake Forest	25-76	42.216053	-87.867504	-	Middle Fork	N	Wet
Lake Forest	25-77	42.212130	-87.867855	-	Middle Fork	N	Wet
Lake Forest	25-78	42.214072	-87.867037	-	Middle Fork	N	Wet

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Lake Forest	25-79	42.217892	-87.863835	-	Middle Fork	N	Wet
Lake Forest	25-80	42.213982	-87.875731	-	Middle Fork	N	Wet
Lake Forest	25-83	42.207182	-87.878389	-	Middle Fork	N	Wet
Lake Forest	25-86	42.216697	-87.879182	-	Middle Fork	N	Wet
Lake Forest	25-87	42.220641	-87.874626	-	Middle Fork	N	Wet
Lake Forest	25-88	42.219786	-87.873968	-	Middle Fork	N	Wet
Lake Forest	25-89	42.218526	-87.873587	-	Middle Fork	N	Wet
Lake Forest	25-40	42.233237	-87.869144	-	Middle Fork	N	Wetland
Lake Forest	25-44	42.213349	-87.856630	-	Middle Fork	N	Wetland
Lake Forest	25-60	42.232497	-87.882059	-	Middle Fork	N	Wetland
Lake Forest	25-51	42.251003	-87.897692	-	Middle Fork	Y	Dry
Lake Forest	25-81	42.208250	-87.876647	-	Middle Fork	Y	Dry
Lake Forest	25-52	42.253346	-87.897625	-	Middle Fork	Y	Dry
Lake Forest	25-50	42.250101	-87.896243	-	Middle Fork	Y	Dry
Lake Forest	V3_26-07	42.212521	-87.883106	-	Middle Fork	Y	Wet
Lake Forest	V3_25-38	42.258449	-87.876553	-	Middle Fork	Y	Wet
Lake Forest	V3_25-39	42.258356	-87.877662	-	Middle Fork	Y	Wet
Lake Forest	V3_25-40	42.251650	-87.896205	-	Middle Fork	Y	Wet
Lake Forest	V3_25-46	42.238553	-87.890324	-	Middle Fork	Y	Wet
Lake Forest	V3_25-47	42.237763	-87.890323	-	Middle Fork	Y	Wet
Lake Forest	V3_25-45	42.239232	-87.886972	-	Middle Fork	Y	Wet
Lake Forest	V3_25-50	42.208350	-87.872720	-	Middle Fork	Y	Wet
Lake Forest	25-34	42.252190	-87.877965	-	Middle Fork	Y	Wet
Lake Forest	25-33	42.251965	-87.876853	-	Middle Fork	Y	Wet
Lake Forest	25-35	42.251416	-87.877117	-	Middle Fork	Y	Wet
Lake Forest	25-37	42.240628	-87.877820	-	Middle Fork	Y	Wet
Lake Forest	25-38	42.239065	-87.875591	-	Middle Fork	Y	Wet
Lake Forest	25-39	42.237102	-87.875772	-	Middle Fork	Y	Wet
Lake Forest	25-65	42.230886	-87.864773	-	Middle Fork	Y	Wet
Lake Forest	25-73	42.224591	-87.866000	-	Middle Fork	Y	Wet
Lake Forest	25-53	42.252289	-87.889333	-	Middle Fork	Y	Wet
Lake Forest	25-54	42.250356	-87.889083	-	Middle Fork	Y	Wet
Lake Forest	25-55	42.249749	-87.889922	-	Middle Fork	Y	Wet
Lake Forest	25-63	42.231677	-87.877844	-	Middle Fork	Y	Wet
Lake Forest	25-31	42.256658	-87.880574	-	Middle Fork	Y	Wetland
Lake Forest	25-84	42.205983	-87.869601	-	Middle Fork	Y	Wetland
Lake Forest	24-66	42.235445	-87.848483	-	Skokie River	N	Dry
Lake Forest	24-60	42.262374	-87.871188	-	Skokie River	N	Dry

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Lake Forest	24-63	42.261125	-87.863731	-	Skokie River	N	Wetland
Lake Forest	V3_24-22	42.229662	-87.840493	-	Skokie River	N	Wet
Lake Forest	24-62	42.262752	-87.863615	-	Skokie River	N	Wet
Lake Forest	24-69	42.230037	-87.851819	-	Skokie River	N	Wet
Lake Forest	24-70	42.227965	-87.847648	-	Skokie River	N	Wet
Lake Forest	24-71	42.229004	-87.845314	-	Skokie River	N	Wet
Lake Forest	24-68	42.215057	-87.843552	-	Skokie River	Y	Dry
Lake Forest	24-61	42.261093	-87.870591	-	Skokie River	Y	Dry
Lake Forest	24-59	42.259677	-87.869686	-	Skokie River	Y	Dry
Lake Forest	V3_24-17	42.263094	-87.865036	-	Skokie River	Y	Wet
Lake Forest	V3_24-18	42.260678	-87.875223	-	Skokie River	Y	Wet
Lake Forest	V3_24-19	42.258357	-87.875132	-	Skokie River	Y	Wet
Lake Forest	V3_24-20	42.257803	-87.872605	-	Skokie River	Y	Wet
Lake Forest	V3_24-21	42.251003	-87.864829	-	Skokie River	Y	Wet
Lake Forest	24-57	42.267665	-87.866956	-	Skokie River	Y	Wet
Lake Forest	24-56	42.266339	-87.865069	-	Skokie River	Y	Wet
Lake Forest	24-58	42.260825	-87.869323	-	Skokie River	Y	Wet
Lake Forest	24-64	42.257043	-87.863957	-	Skokie River	Y	Wet
Lake Forest	24-65	42.247379	-87.854132	-	Skokie River	Y	Wet
Lake Forest	26-46	42.211718	-87.891972	-	West Fork	N	Dry
Lake Forest	26-49	42.225881	-87.898239	-	West Fork	N	Wet
Lake Forest	26-51	42.226492	-87.890605	-	West Fork	N	Wet
Lake Forest	26-50	42.226929	-87.894556	-	West Fork	N	Wet
Lake Forest	26-45	42.214484	-87.891200	-	West Fork	N	Wet
Lake Forest	26-43	42.217572	-87.888830	-	West Fork	N	Wet
Lake Forest	26-42	42.217625	-87.888080	-	West Fork	N	Wet
Lake Forest	26-44	42.216642	-87.886614	-	West Fork	N	Wet
Lake Forest	26-47	42.210091	-87.892048	-	West Fork	N	Wet
Lake Forest	26-48	42.205792	-87.889927	-	West Fork	N	Wet
Lake Forest	26-40	42.222472	-87.896864	-	West Fork	Y	Wet
Lake Forest	26-39	42.223610	-87.894184	-	West Fork	Y	Wet
Lake Forest	26-41	42.222490	-87.891460	-	West Fork	Y	Wet
Libertyville Township	V3_25-37	42.274075	-87.898658	-	Middle Fork	N	Dry
Libertyville Township	V3_25-14	42.301299	-87.899488	-	Middle Fork	N	Wet
Libertyville Township	V3_25-15	42.298506	-87.898218	-	Middle Fork	N	Wet

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Libertyville Township	V3_25-16	42.300930	-87.891228	-	Middle Fork	N	Wet
Libertyville Township	V3_25-18	42.295250	-87.899282	-	Middle Fork	N	Wet
Libertyville Township	V3_25-27	42.289740	-87.898543	-	Middle Fork	N	Wet
Libertyville Township	V3_25-17	42.297088	-87.898731	-	Middle Fork	N	Wetland
Libertyville Township	V3_24-08	42.300651	-87.887080	-	Skokie River	N	Wet
Libertyville Township	V3_24-09	42.300040	-87.885827	-	Skokie River	N	Wet
Lincolnshire	V3_26-10	42.200577	-87.893516	-	West Fork	N	Dry
Lincolnshire	26-13	42.198539	-87.899769	-	West Fork	N	Dry
Lincolnshire	26-11	42.206030	-87.906504	-	West Fork	N	Dry
Lincolnshire	26-14	42.197753	-87.901279	-	West Fork	N	Dry
Lincolnshire	26-12	42.200110	-87.899666	-	West Fork	N	Dry
Lincolnshire	26-10	42.208714	-87.907114	-	West Fork	N	Dry
Lincolnshire	26-15	42.197779	-87.903721	-	West Fork	N	Dry
Lincolnshire	26-04	42.207293	-87.903671	-	West Fork	N	Dry
Lincolnshire	V3_26-05	42.213460	-87.903548	-	West Fork	N	Wet
Lincolnshire	V3_26-06	42.212472	-87.902105	-	West Fork	N	Wet
Lincolnshire	V3_26-08	42.201219	-87.895316	-	West Fork	N	Wet
Lincolnshire	V3_26-09	42.201246	-87.893706	-	West Fork	N	Wet
Lincolnshire	V3_26-11	42.201177	-87.892487	-	West Fork	N	Wet
Lincolnshire	V3_26-12	42.200648	-87.891583	-	West Fork	N	Wet
Lincolnshire	V3_26-14	42.197857	-87.890671	-	West Fork	N	Wet
Lincolnshire	V3_26-15	42.195757	-87.888569	-	West Fork	N	Wet
Lincolnshire	26-01	42.216105	-87.906421	-	West Fork	N	Wet
Lincolnshire	26-02	42.214499	-87.907258	-	West Fork	N	Wet
Lincolnshire	26-08	42.206746	-87.902110	-	West Fork	N	Wet
Lincolnshire	26-07	42.205484	-87.903684	-	West Fork	N	Wet
Lincolnshire	26-16	42.198580	-87.892441	-	West Fork	N	Wet
Lincolnshire	26-17	42.197610	-87.893518	-	West Fork	N	Wet
Lincolnshire	26-03	42.212606	-87.906452	-	West Fork	Y	Dry
Lincolnshire	26-16	42.199178	-87.893304	-	West Fork	Y	Wet
Maine Township	26-0127	42.056146	-87.821407	Inventory basin.	West Fork	NA	Wet
Mettawa	V3_25-42	42.247042	-87.902158	-	Middle Fork	Y	Wet
Mettawa	V3_25-43	42.245846	-87.902231	-	Middle Fork	Y	Wet
Mettawa	V3_25-41	42.249818	-87.902656	-	Middle Fork	Y	Wetland

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Mettawa	V3_26-04	42.223424	-87.900426	-	West Fork	N	Wet
Morton Grove	25-259	42.048871	-87.790944	1. Stabilize shoreline erosion. 2. Remove debris from inlet.	North Branch Chicago River Upstream	NA	Wet
Morton Grove	27-0002	42.045588	-87.802069	Inventory basin.	North Branch Chicago River Upstream	NA	Dry
Morton Grove	27-0003	42.046889	-87.801157	Inventory basin.	North Branch Chicago River Upstream	NA	Dry
Morton Grove	27-0004	42.051083	-87.786740	Inventory basin.	North Branch Chicago River Upstream	NA	Dry
Niles	25-219	42.053143	-87.827322	-	North Branch Chicago River Upstream	NA	Wet
North Chicago	V3_24-07	42.311189	-87.866315	-	Skokie River	N	Dry
North Chicago	24-44	42.296346	-87.888660	-	Skokie River	N	Wet
North Chicago	24-41	42.296386	-87.887303	-	Skokie River	N	Wet
North Chicago	24-43	42.295418	-87.887387	-	Skokie River	N	Wet
North Chicago	24-40	42.295160	-87.886307	-	Skokie River	N	Wet
North Chicago	24-55	42.293971	-87.886099	-	Skokie River	N	Wet
North Chicago	24-53	42.307703	-87.887088	-	Skokie River	N	Wet
North Chicago	24-48	42.304630	-87.880300	-	Skokie River	N	Wet
North Chicago	24-51	42.322029	-87.878472	-	Skokie River	N	Wet
North Chicago	24-52	42.318039	-87.867651	-	Skokie River	N	Wet
North Chicago	24-46	42.307295	-87.878750	-	Skokie River	N	Wetland
North Chicago	24-45	42.298778	-87.889178	-	Skokie River	Y	Wet
North Chicago	24-42	42.297336	-87.888409	-	Skokie River	Y	Wet
North Chicago	24-47	42.308125	-87.877250	-	Skokie River	Y	Wet
North Chicago	24-50	42.319173	-87.875230	-	Skokie River	Y	Wet
North Chicago	24-49	42.331356	-87.876422	-	Skokie River	Y	Wetland
Northbrook	25-30	42.146869	-87.815784	-	Middle Fork	NA	Wet
Northbrook	24-35	42.143593	-87.795784	-	Skokie River	NA	Wet
Northbrook	24-38	42.142186	-87.797879	-	Skokie River	NA	Wet
Northbrook	24-52	42.138226	-87.796171	-	Skokie River	NA	Wet
Northbrook	24-53	42.138201	-87.796924	-	Skokie River	NA	Wet
Northbrook	24-192	42.142834	-87.798535	-	Skokie River	NA	Wet
Northbrook	24-341	42.133189	-87.786211	-	Skokie River	NA	Wet
Northbrook	24-453	42.142894	-87.798530	-	Skokie River	NA	Wet

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Northbrook	26-81	42.117563	-87.807227	-	West Fork	NA	Wet
Northbrook	26-91	42.112398	-87.802555	-	West Fork	NA	Wet
Northbrook	26-92	42.111773	-87.801811	-	West Fork	NA	Wet
Northbrook	26-108	42.152013	-87.876031	-	West Fork	NA	Wet
Northbrook	26-194	42.141733	-87.842768	-	West Fork	NA	Wet
Northbrook	26-195	42.139672	-87.843445	-	West Fork	NA	Wet
Northbrook	26-240	42.110039	-87.806925	-	West Fork	NA	Wet
Northbrook	26-245	42.109805	-87.804671	-	West Fork	NA	Wet
Northbrook	26-264	42.114055	-87.802129	-	West Fork	NA	Wet
Northbrook	26-265	42.115313	-87.801578	-	West Fork	NA	Wet
Northbrook	26-363	42.141128	-87.842146	-	West Fork	NA	Wet
Northbrook	26-371	42.139971	-87.841897	-	West Fork	NA	Wet
Northbrook	26-422	42.110440	-87.801049	-	West Fork	NA	Wet
Northbrook	26-424	42.113263	-87.801721	-	West Fork	NA	Wet
Northbrook	26-425	42.113571	-87.803256	-	West Fork	NA	Wet
Northbrook	26-443	42.116610	-87.812380	-	West Fork	NA	Wet
Northbrook	26-496	42.142375	-87.841697	-	West Fork	NA	Wet
Northbrook	26-8001	42.105946	-87.799975	-	West Fork	NA	Wet
Northbrook	24-70	42.129467	-87.785762	1. Repair outlet and stabilize erosion. 2. Stabilize shoreline erosion	Skokie River	NA	Wet
Northbrook	24-337	42.146228	-87.796305	1. Stabilize inlet erosion. 2. Stabilize shoreline erosion.	Skokie River	NA	Wet
Northbrook	24-177	42.134573	-87.789048	1. Stabilize shoreline erosion. 2. Remove accumulated sediment from basin 3. Add FES grates	Skokie River	NA	Wet
Northbrook	26-31	42.147832	-87.840002	1. Stabilize shoreline erosion. 2. Stabilize inlets.	West Fork	NA	Dry
Northbrook	26-196	42.138509	-87.843640	1. Stabilize shoreline erosion. 2. Unclog outlet. 3. Install flared end section grate on outlet.	West Fork	NA	Wet
Northbrook	24-175	42.134275	-87.786498	1. Unclog inlets and outlets. 2. Stabilize shoreline erosion.	Skokie River	NA	Wet
Northbrook	26-23	42.148532	-87.843983	Install passive outlet.	West Fork	NA	Wet
Northbrook	25-0276	42.134356	-87.820942	Inventory basin.	Middle Fork	NA	Dry
Northbrook	25-72	42.121059	-87.797519	Inventory basin.	Middle Fork	NA	Wet
Northbrook	25-328	42.142633	-87.812359	Inventory basin.	Middle Fork	NA	Wet
Northbrook	25-26	42.149932	-87.822358	Inventory basin.	Middle Fork	NA	Wet
Northbrook	25-0275	42.103360	-87.795747	Inventory basin.	Middle Fork	NA	Wetland
Northbrook	24-0318	42.135957	-87.799214	Inventory basin.	Skokie River	NA	Dry
Northbrook	24-0322	42.146499	-87.800754	Inventory basin.	Skokie River	NA	Dry

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Northbrook	24-0323	42.149245	-87.799893	Inventory basin.	Skokie River	NA	Dry
Northbrook	24-0316	42.132931	-87.790275	Inventory basin.	Skokie River	NA	Wet
Northbrook	24-0317	42.133896	-87.789486	Inventory basin.	Skokie River	NA	Wetland
Northbrook	26-0155	42.112424	-87.829853	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0159	42.115497	-87.804712	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0166	42.124432	-87.855081	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0167	42.127199	-87.864544	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0168	42.132541	-87.841547	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0175	42.141644	-87.864013	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0176	42.141682	-87.859969	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0177	42.142341	-87.856018	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0178	42.145376	-87.855025	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0179	42.148781	-87.869117	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0180	42.148452	-87.855097	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0181	42.149101	-87.855593	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0187	42.143615	-87.862667	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0189	42.089843	-87.857418	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0190	42.107928	-87.853995	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0191	42.138557	-87.853710	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0192	42.141424	-87.853595	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0195	42.134401	-87.849139	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0196	42.134798	-87.848853	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0199	42.126516	-87.844045	Inventory basin.	West Fork	NA	Dry
Northbrook	26-0207	42.124311	-87.809948	Inventory basin.	West Fork	NA	Dry
Northbrook	26-16	42.130889	-87.858699	Inventory basin.	West Fork	NA	Wet
Northbrook	26-18	42.140875	-87.866634	Inventory basin.	West Fork	NA	Wet
Northbrook	26-56	42.136234	-87.866761	Inventory basin.	West Fork	NA	Wet
Northbrook	26-62	42.136075	-87.856689	Inventory basin.	West Fork	NA	Wet
Northbrook	26-63	42.135272	-87.855957	Inventory basin.	West Fork	NA	Wet
Northbrook	26-78	42.120291	-87.848411	Inventory basin.	West Fork	NA	Wet
Northbrook	26-82	42.117117	-87.824815	Inventory basin.	West Fork	NA	Wet
Northbrook	26-85	42.116125	-87.844917	Inventory basin.	West Fork	NA	Wet
Northbrook	26-87	42.114319	-87.856556	Inventory basin.	West Fork	NA	Wet
Northbrook	26-94	42.109130	-87.851066	Inventory basin.	West Fork	NA	Wet
Northbrook	26-95	42.108205	-87.837838	Inventory basin.	West Fork	NA	Wet
Northbrook	26-96	42.108039	-87.836743	Inventory basin.	West Fork	NA	Wet
Northbrook	26-98	42.107870	-87.859165	Inventory basin.	West Fork	NA	Wet
Northbrook	26-100	42.107101	-87.859198	Inventory basin.	West Fork	NA	Wet

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Northbrook	26-102	42.105044	-87.840611	Inventory basin.	West Fork	NA	Wet
Northbrook	26-103	42.104629	-87.841331	Inventory basin.	West Fork	NA	Wet
Northbrook	26-132	42.120435	-87.828928	Inventory basin.	West Fork	NA	Wet
Northbrook	26-199	42.131191	-87.859263	Inventory basin.	West Fork	NA	Wet
Northbrook	26-201	42.130739	-87.861306	Inventory basin.	West Fork	NA	Wet
Northbrook	26-232	42.121380	-87.828849	Inventory basin.	West Fork	NA	Wet
Northbrook	26-237	42.120037	-87.825414	Inventory basin.	West Fork	NA	Wet
Northbrook	26-295	42.108888	-87.832576	Inventory basin.	West Fork	NA	Wet
Northbrook	26-385	42.130078	-87.859957	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0146	42.111901	-87.804176	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0147	42.109603	-87.802753	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0148	42.107799	-87.805774	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0149	42.107293	-87.805906	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0150	42.105809	-87.805872	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0151	42.105810	-87.807448	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0152	42.110434	-87.808543	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0157	42.115229	-87.812023	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0158	42.113815	-87.810424	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0160	42.112315	-87.805672	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0161	42.113134	-87.806305	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0162	42.113859	-87.806957	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0163	42.114571	-87.807681	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0164	42.115430	-87.807065	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0174	42.140071	-87.870366	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0204	42.124687	-87.811813	Inventory basin.	West Fork	NA	Wet
Northbrook	26-0143	42.098759	-87.825926	Inventory basin.	West Fork	NA	Wetland
Northbrook	26-0144	42.106084	-87.856986	Inventory basin.	West Fork	NA	Wetland
Northbrook	26-0154	42.110607	-87.829877	Inventory basin.	West Fork	NA	Wetland
Northbrook	26-0156	42.114880	-87.812319	Inventory basin.	West Fork	NA	Wetland
Northbrook	26-0165	42.117969	-87.860616	Inventory basin.	West Fork	NA	Wetland
Northbrook	26-0169	42.129780	-87.832825	Inventory basin.	West Fork	NA	Wetland
Northbrook	26-0170	42.138874	-87.839990	Inventory basin.	West Fork	NA	Wetland
Northbrook	26-0200	42.146780	-87.838793	Inventory basin.	West Fork	NA	Wetland
Northbrook	26-0205	42.124035	-87.812963	Inventory basin.	West Fork	NA	Wetland
Northbrook	26-388	42.138517	-87.843006	Remove debris from inlet and outlet.	West Fork	NA	Wet
Northbrook	24-39	42.141800	-87.794840	Remove sediment from outlet.	Skokie River	NA	Wet
Northbrook	24-263	42.150233	-87.811293	Stabilize shoreline erosion.	Middle Fork	NA	Wet
Northbrook	24-266	42.150148	-87.809804	Stabilize shoreline erosion.	Middle Fork	NA	Wet

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Northbrook	25-285	42.122209	-87.796407	Stabilize shoreline erosion.	Middle Fork	NA	Wet
Northbrook	24-20	42.148201	-87.803738	Stabilize shoreline erosion.	Skokie River	NA	Wet
Northbrook	26-430	42.116874	-87.813173	Stabilize shoreline erosion.	West Fork	NA	Wet
Northfield	25-246	42.105065	-87.795939	-	Middle Fork	NA	Dry
Northfield	25-241	42.100484	-87.794185	-	Middle Fork	NA	Wet
Northfield	25-250	42.100518	-87.794813	-	Middle Fork	NA	Wet
Northfield	25-251	42.104617	-87.794713	-	Middle Fork	NA	Wet
Northfield	25-252	42.104322	-87.794493	-	Middle Fork	NA	Wet
Northfield	25-253	42.103708	-87.793847	-	Middle Fork	NA	Wet
Northfield	25-254	42.102554	-87.793632	-	Middle Fork	NA	Wet
Northfield	24-343	42.098553	-87.768450	-	Middle Fork	NA	Wet
Northfield	26-349	42.095549	-87.796133	-	West Fork	NA	Wet
Northfield	26-358	42.095434	-87.797004	-	West Fork	NA	Wet
Northfield	26-361	42.095180	-87.795699	-	West Fork	NA	Wet
Northfield	26-401	42.095571	-87.795325	-	West Fork	NA	Wet
Northfield	26-404	42.095029	-87.794632	-	West Fork	NA	Wet
Northfield	26-405	42.094671	-87.794751	-	West Fork	NA	Wet
Northfield	25-0278	42.105944	-87.787655	Inventory basin.	Middle Fork	NA	Dry
Northfield	25-0277	42.106282	-87.797803	Inventory basin.	Middle Fork	NA	Wet
Northfield	24-0315	42.093106	-87.752423	Inventory basin.	Skokie River	NA	Wet
Northfield	26-197	42.109633	-87.800059	Inventory basin.	West Fork	NA	Wet
Northfield	26-244	42.101936	-87.798108	Inventory basin.	West Fork	NA	Wet
Northfield	26-380	42.108722	-87.799648	Inventory basin.	West Fork	NA	Wet
Northfield	24-213	42.092725	-87.767310	Stabilize shoreline erosion.	Middle Fork	NA	Wet
Northfield Township	26-90	42.113418	-87.860161	Inventory basin.	West Fork	NA	Wet
Park City	24-1	42.348200	-87.883003	-	Skokie River	N	Wetland
Park City	V3_24-01	42.362759	-87.887933	-	Skokie River	Y	Wet
Riverwoods	V3_26-16	42.192074	-87.884332	-	West Fork	N	Wet
Shields Township	24-54	42.287161	-87.870690	-	Skokie River	Y	Wet
Skokie	25-124	42.062882	-87.769720	-	North Branch Chicago River Upstream	NA	Wet
Skokie	25-166	42.063171	-87.758065	-	Skokie River	NA	Wet
Skokie	24-8000	42.059934	-87.757099	-	Skokie River	NA	Wet
Skokie	24-0310	42.053099	-87.743225	Inventory basin.	Skokie River	NA	Dry
Skokie	24-0312	42.064879	-87.761441	Inventory basin.	Skokie River	NA	Dry
Skokie	24-0321	42.055598	-87.740552	Inventory basin.	Skokie River	NA	Dry
Skokie	24-0319	42.055657	-87.758647	Inventory basin.	Skokie River	NA	Wet

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Skokie	24-0324	42.058373	-87.758505	Inventory basin.	Skokie River	NA	Wet
Skokie	24-0325	42.058179	-87.758892	Inventory basin.	Skokie River	NA	Wet
Skokie	24-0311	42.056581	-87.752117	Inventory basin.	Skokie River	NA	Wetland
Skokie	24-0320	42.048293	-87.750047	Inventory basin.	Skokie River	NA	Wetland
Vernon Township	V3_26-03	42.217761	-87.902233	-	West Fork	N	Wet
Waukegan	V3_25-01	42.339331	-87.903939	-	Middle Fork	N	Wet
Waukegan	V3_25-06	42.331550	-87.900231	-	Middle Fork	N	Wet
Waukegan	25-25	42.324642	-87.902338	-	Middle Fork	N	Wet
Waukegan	25-18	42.339569	-87.907977	-	Middle Fork	N	Wet
Waukegan	25-22	42.331508	-87.917236	-	Middle Fork	N	Wetland
Waukegan	V3_25-02	42.332782	-87.908505	-	Middle Fork	Y	Wet
Waukegan	V3_25-03	42.331467	-87.911500	-	Middle Fork	Y	Wet
Waukegan	V3_25-04	42.329565	-87.910053	-	Middle Fork	Y	Wet
Waukegan	V3_25-05	42.329571	-87.906585	-	Middle Fork	Y	Wet
Waukegan	25-20	42.335711	-87.907116	-	Middle Fork	Y	Wet
Waukegan	25-21	42.334978	-87.911565	-	Middle Fork	Y	Wet
Waukegan	25-17	42.340963	-87.915253	-	Middle Fork	Y	Wet
Waukegan	25-24	42.325777	-87.908265	-	Middle Fork	Y	Wet
Waukegan	25-23	42.332557	-87.915069	-	Middle Fork	Y	Wetland
Waukegan	24-36	42.345728	-87.875706	-	Skokie River	N	Dry
Waukegan	V3_24-05	42.333817	-87.895838	-	Skokie River	N	Wet
Waukegan	V3_24-06	42.332942	-87.895740	-	Skokie River	N	Wet
Waukegan	24-29	42.332156	-87.890674	-	Skokie River	N	Wet
Waukegan	24-28	42.334164	-87.889903	-	Skokie River	N	Wet
Waukegan	24-37	42.329045	-87.883959	-	Skokie River	N	Wet
Waukegan	24-34	42.339535	-87.890710	-	Skokie River	N	Wet
Waukegan	24-35	42.343665	-87.890787	-	Skokie River	N	Wet
Waukegan	24-33	42.339623	-87.887367	-	Skokie River	N	Wet
Waukegan	24-30	42.332113	-87.892505	-	Skokie River	N	Wet
Waukegan	24-27	42.333613	-87.885414	-	Skokie River	N	Wet
Waukegan	24-26	42.331463	-87.886757	-	Skokie River	N	Wet
Waukegan	24-20	42.320202	-87.881773	-	Skokie River	N	Wet
Waukegan	24-38	42.327731	-87.883677	-	Skokie River	N	Wet
Waukegan	24-39	42.328132	-87.884655	-	Skokie River	N	Wet
Waukegan	V3_24-02	42.344453	-87.892547	-	Skokie River	Y	Dry
Waukegan	V3_24-03	42.340783	-87.888858	-	Skokie River	Y	Dry
Waukegan	V3_24-04	42.340612	-87.892040	-	Skokie River	Y	Wet
Waukegan	24-25	42.328433	-87.892556	-	Skokie River	Y	Wet

Jurisdiction	Basin ID	Latitude	Longitude	Preliminary Retrofit Opportunities	Subwatershed	Post WDO?	Basin Type
Waukegan	24-31	42.335805	-87.889901	-	Skokie River	Y	Wet
Waukegan	24-24	42.329018	-87.891195	-	Skokie River	Y	Wet
Waukegan	24-23	42.328475	-87.892588	-	Skokie River	Y	Wet
Waukegan	24-21	42.325364	-87.883532	-	Skokie River	Y	Wet
Waukegan	24-22	42.323316	-87.882062	-	Skokie River	Y	Wet
Waukegan	24-19	42.320074	-87.883893	-	Skokie River	Y	Wet
Waukegan	24-32	42.336408	-87.891281	-	Skokie River	Y	Wetland
West Deerfield Township	V3_26-22	42.161453	-87.882006	-	West Fork	N	Wet
West Deerfield Township	V3_26-23	42.157370	-87.877242	-	West Fork	N	Wet
West Deerfield Township	V3_26-24	42.158788	-87.875575	-	West Fork	N	Wet
Wilmette	24-0313	42.071471	-87.733415	Inventory basin.	Skokie River	NA	Wetland
Wilmette	24-0314	42.080198	-87.757757	Inventory basin.	Skokie River	NA	Wetland
Winnetka	24-326	42.114799	-87.765363	-	Skokie River	NA	Wet

-: No action recommendation, **N/A**: Not applicable because basin is not in Lake County

APPENDIX D:
LAKE SHORELINE ASSESSMENT SUMMARY

Lake Shoreline Assessment

Visual assessments of lake shorelines were conducted to characterize shoreline erosion.

The degree of shoreline erosion was categorically defined as none, slight, moderate, or severe. Below are brief descriptions of each category.

None: No visible erosion. Includes purpose-built erosion control such as riprap and sea walls.

Slight: Minimal or observable erosion. Generally considered stable.

Moderate: Obvious recession and/or eroded banks. Area may exhibit some exposed roots, fallen vegetation or minor slumping.

Severe: Recession is characterized by eroding of exposed soil on nearly vertical banks, exposed roots, fallen vegetation or extensive slumping of bank material, undercutting, washouts or fence posts exhibiting realignment.

The lake shoreline assessment results are summarized in **table 1**. Full results of the lake shoreline assessment can be accessed via the Lake Assessment Web Application.

Table 1 Lake Shoreline Assessment Results.

Lake	Shore Erosion	Lateral Recession Rate (ft/yr)	Segment Length (ft)	Object ID
Chicago Botanic Garden	None	0.00	68.4	307
	None	0.00	69.0	308
	None	0.00	650.8	314
	None	0.00	687.6	315
	None	0.00	385.3	316
	None	0.00	421.8	317
	None	0.00	193.8	318
	None	0.00	389.1	319
	None	0.00	324.0	320
	None	0.00	211.0	321
	None	0.00	302.0	322
	None	0.00	316.4	323
	None	0.00	437.9	324
	None	0.00	453.9	325
	None	0.00	228.4	326
	None	0.00	278.1	327
	None	0.00	341.8	328
	None	0.00	175.5	329
	None	0.00	224.5	330
	None	0.00	361.6	331
	None	0.00	497.4	332
	None	0.00	559.0	333
	None	0.00	315.2	334

Lake	Shore Erosion	Lateral Recession Rate (ft/yr)	Segment Length (ft)	Object ID
	None	0.00	212.6	335
	None	0.00	660.8	336
	None	0.00	482.4	337
	None	0.00	531.1	338
	None	0.00	624.8	339
	None	0.00	492.2	340
	None	0.00	325.2	341
	None	0.00	259.8	342
	None	0.00	425.5	343
	None	0.00	1332.7	347
	None	0.00	649.5	349
	None	0.00	1119.6	350
	None	0.00	1627.6	354
	None	0.00	1201.9	355
	None	0.00	339.3	356
	None	0.00	457.3	357
	None	0.00	665.1	358
	None	0.00	671.1	359
	None	0.00	368.7	360
	None	0.00	599.0	361
	None	0.00	480.7	362
	None	0.00	361.4	363
	None	0.00	438.3	364
	None	0.00	2942.3	365
	Slight	0.03	1196.3	303
	Slight	0.03	957.6	304
	Slight	0.03	1809.5	309
	Slight	0.03	178.0	310
	Slight	0.03	1160.0	312
	Slight	0.03	2554.0	313
	Slight	0.03	273.0	344
	Slight	0.03	320.3	346
	Moderate	0.20	785.1	302
	Moderate	0.20	5.6	305
	Moderate	0.20	147.8	306
	Moderate	0.20	140.4	311
	Moderate	0.20	350.1	345
Eagle Lake	None	0.00	68.4	509
	None	0.00	212.9	511
	None	0.00	739.3	513
	None	0.00	93.3	515
	Slight	0.03	437.6	505
	Slight	0.03	569.5	508
	Slight	0.03	784.6	510
	Slight	0.03	116.1	512

Lake	Shore Erosion	Lateral Recession Rate (ft/yr)	Segment Length (ft)	Object ID
	Slight	0.03	158.1	514
	Slight	0.03	3345.1	516
	Slight	0.03	261.8	518
	Slight	0.03	1373.6	520
	Moderate	0.20	259.4	506
	Moderate	0.20	581.1	507
	Moderate	0.20	183.6	517
	Moderate	0.20	667.4	519
Lake Eleanor	None	0.00	461.7	54
	None	0.00	677.8	56
	None	0.00	499.6	58
	None	0.00	344.6	60
	None	0.00	33.9	62
	None	0.00	1600.3	64
	None	0.00	600.4	66
	None	0.00	281.5	68
	None	0.00	247.8	378
	None	0.00	96.4	380
	None	0.00	302.6	382
	Slight	0.03	409.0	55
	Slight	0.03	102.3	57
	Slight	0.03	121.0	59
	Slight	0.03	97.7	61
	Slight	0.03	79.0	63
	Slight	0.03	271.1	65
	Slight	0.03	57.4	67
Lake Glenview	None	0.00	279.3	78
	None	0.00	692.7	80
	None	0.00	53.1	82
	None	0.00	138.0	85
	None	0.00	131.9	91
	None	0.00	41.2	98
	Slight	0.03	142.2	69
	Slight	0.03	112.9	71
	Slight	0.03	76.1	73
	Slight	0.03	261.5	75
	Slight	0.03	254.7	77
	Slight	0.03	496.3	79
	Slight	0.03	104.1	81
	Slight	0.03	742.0	83
	Slight	0.03	1040.5	86
	Slight	0.03	1029.8	88
	Slight	0.03	490.6	90
	Slight	0.03	350.4	93
	Slight	0.03	276.7	95

Lake	Shore Erosion	Lateral Recession Rate (ft/yr)	Segment Length (ft)	Object ID
	Slight	0.03	1913.5	97
	Slight	0.03	641.7	99
	Slight	0.03	339.0	395
	Slight	0.03	155.1	397
	Slight	0.03	37.2	399
	Slight	0.03	53.5	401
	Slight	0.03	602.4	403
	Moderate	0.20	52.1	70
	Moderate	0.20	24.8	72
	Moderate	0.20	52.0	74
	Moderate	0.20	60.8	76
	Moderate	0.20	65.4	84
	Moderate	0.20	180.5	87
	Moderate	0.20	313.7	89
	Moderate	0.20	62.6	92
	Moderate	0.20	70.4	94
	Moderate	0.20	119.1	96
Lake Kathryn	None	0.00	40.0	16
	None	0.00	10.2	21
	Slight	0.03	28.9	18
	Slight	0.03	38.9	20
	Slight	0.03	88.2	23
	Slight	0.03	223.4	25
	Slight	0.03	102.9	27
	Slight	0.03	209.3	29
	Moderate	0.20	197.9	17
	Moderate	0.20	83.0	19
	Moderate	0.20	241.1	22
	Moderate	0.20	519.9	24
	Moderate	0.20	233.8	26
	Moderate	0.20	74.3	28
	Moderate	0.20	43.5	30
Lambs Farm Lake	None	0.00	1085.3	491
	None	0.00	87.3	493
	None	0.00	69.9	495
	None	0.00	101.3	498
	Slight	0.03	227.4	492
	Slight	0.03	76.7	494
	Slight	0.03	77.7	497
	Slight	0.03	64.4	499
	Slight	0.03	377.3	501
	Moderate	0.20	62.5	496
	Moderate	0.20	760.9	500
	Moderate	0.20	68.6	502
	Moderate	0.20	560.2	504

Lake	Shore Erosion	Lateral Recession Rate (ft/yr)	Segment Length (ft)	Object ID
	Severe	0.40	20.1	503
Lucky Lake	None	0.00	78.1	34
	None	0.00	15.2	36
	None	0.00	83.7	38
	None	0.00	62.1	40
	None	0.00	137.6	45
	None	0.00	193.1	47
	None	0.00	120.0	52
	Slight	0.03	96.2	32
	Slight	0.03	451.0	35
	Slight	0.03	234.2	37
	Slight	0.03	71.4	42
	Slight	0.03	64.1	44
	Slight	0.03	89.3	46
	Slight	0.03	160.4	50
	Slight	0.03	287.1	53
	Moderate	0.20	223.2	31
	Moderate	0.20	65.3	33
	Moderate	0.20	37.6	39
	Moderate	0.20	116.4	41
	Moderate	0.20	270.1	43
	Moderate	0.20	89.5	49
	Moderate	0.20	156.1	51
	Moderate	0.20	81.1	376
	Severe	0.40	23.5	48
Old School Lake	None	0.00	509.7	487
	None	0.00	4008.3	489
	Slight	0.03	24.3	488
	Slight	0.03	142.3	490
Skokie Lagoons	None	0.00	53.4	117
	None	0.00	100.1	119
	None	0.00	124.9	133
	None	0.00	380.4	141
	None	0.00	113.0	142
	None	0.00	120.6	152
	None	0.00	241.2	170
	None	0.00	150.0	173
	None	0.00	64.1	175
	None	0.00	41.8	176
	None	0.00	111.4	213
	None	0.00	146.1	214
	None	0.00	146.2	222
	None	0.00	83.2	224
	Slight	0.03	84.9	118
	Slight	0.03	36.8	121

Lake	Shore Erosion	Lateral Recession Rate (ft/yr)	Segment Length (ft)	Object ID
	Slight	0.03	124.8	123
	Slight	0.03	170.5	125
	Slight	0.03	208.3	127
	Slight	0.03	168.8	129
	Slight	0.03	363.1	134
	Slight	0.03	1466.7	136
	Slight	0.03	207.8	138
	Slight	0.03	486.6	140
	Slight	0.03	692.3	143
	Slight	0.03	316.3	145
	Slight	0.03	427.1	147
	Slight	0.03	191.8	149
	Slight	0.03	571.3	153
	Slight	0.03	156.8	155
	Slight	0.03	466.8	157
	Slight	0.03	219.3	159
	Slight	0.03	290.3	162
	Slight	0.03	118.8	171
	Slight	0.03	693.2	174
	Slight	0.03	50.5	177
	Slight	0.03	204.9	180
	Slight	0.03	309.4	182
	Slight	0.03	253.1	184
	Slight	0.03	298.6	186
	Slight	0.03	433.2	187
	Slight	0.03	202.7	189
	Slight	0.03	255.6	192
	Slight	0.03	192.7	194
	Slight	0.03	454.2	196
	Slight	0.03	292.5	198
	Slight	0.03	1060.5	202
	Slight	0.03	126.7	204
	Slight	0.03	173.4	206
	Slight	0.03	67.8	212
	Slight	0.03	1546.1	216
	Slight	0.03	512.5	218
	Slight	0.03	74.2	220
	Slight	0.03	334.2	226
	Slight	0.03	351.3	228
	Slight	0.03	1329.0	230
	Slight	0.03	88.7	232
	Slight	0.03	79.1	235
	Slight	0.03	606.7	238
	Slight	0.03	490.9	240
	Slight	0.03	1150.8	242

Lake	Shore Erosion	Lateral Recession Rate (ft/yr)	Segment Length (ft)	Object ID
	Slight	0.03	1081.5	245
	Slight	0.03	224.8	247
	Slight	0.03	330.5	249
	Slight	0.03	452.1	251
	Slight	0.03	569.8	253
	Slight	0.03	537.4	255
	Slight	0.03	1159.3	257
	Slight	0.03	625.0	259
	Slight	0.03	523.8	261
	Slight	0.03	174.1	263
	Slight	0.03	338.4	270
	Slight	0.03	731.0	272
	Slight	0.03	203.5	274
	Slight	0.03	147.9	276
	Slight	0.03	413.3	278
	Slight	0.03	339.4	287
	Slight	0.03	338.9	289
	Slight	0.03	432.5	291
	Slight	0.03	319.3	293
	Slight	0.03	997.5	295
	Slight	0.03	811.5	301
	Slight	0.03	184.9	406
	Slight	0.03	746.6	426
	Slight	0.03	264.7	438
	Slight	0.03	130.0	442
	Slight	0.03	291.1	444
	Slight	0.03	813.7	446
	Slight	0.03	238.2	448
	Slight	0.03	526.8	450
	Slight	0.03	393.8	452
	Slight	0.03	180.9	455
	Slight	0.03	170.8	461
	Slight	0.03	227.7	463
	Slight	0.03	824.2	465
	Slight	0.03	538.5	467
	Slight	0.03	187.3	469
	Slight	0.03	360.1	476
	Moderate	0.20	113.8	120
	Moderate	0.20	156.9	122
	Moderate	0.20	68.0	124
	Moderate	0.20	354.7	126
	Moderate	0.20	354.3	128
	Moderate	0.20	439.7	130
	Moderate	0.20	168.8	132
	Moderate	0.20	291.7	135

Lake	Shore Erosion	Lateral Recession Rate (ft/yr)	Segment Length (ft)	Object ID
	Moderate	0.20	324.4	137
	Moderate	0.20	706.1	139
	Moderate	0.20	768.4	144
	Moderate	0.20	1220.2	146
	Moderate	0.20	154.6	148
	Moderate	0.20	359.7	150
	Moderate	0.20	553.7	154
	Moderate	0.20	764.2	156
	Moderate	0.20	268.0	158
	Moderate	0.20	439.9	160
	Moderate	0.20	215.2	161
	Moderate	0.20	937.0	163
	Moderate	0.20	325.4	165
	Moderate	0.20	224.2	167
	Moderate	0.20	302.6	169
	Moderate	0.20	357.7	179
	Moderate	0.20	628.8	181
	Moderate	0.20	300.3	183
	Moderate	0.20	752.7	185
	Moderate	0.20	204.8	188
	Moderate	0.20	244.5	190
	Moderate	0.20	496.5	191
	Moderate	0.20	418.3	193
	Moderate	0.20	309.7	195
	Moderate	0.20	178.2	197
	Moderate	0.20	333.0	199
	Moderate	0.20	1287.0	201
	Moderate	0.20	438.8	203
	Moderate	0.20	225.0	205
	Moderate	0.20	712.9	207
	Moderate	0.20	177.1	209
	Moderate	0.20	119.2	211
	Moderate	0.20	299.5	215
	Moderate	0.20	298.8	217
	Moderate	0.20	328.5	219
	Moderate	0.20	321.2	221
	Moderate	0.20	117.7	223
	Moderate	0.20	534.8	225
	Moderate	0.20	284.6	227
	Moderate	0.20	259.8	229
	Moderate	0.20	763.4	231
	Moderate	0.20	778.4	233
	Moderate	0.20	489.9	234
	Moderate	0.20	613.9	237
	Moderate	0.20	101.2	239

Lake	Shore Erosion	Lateral Recession Rate (ft/yr)	Segment Length (ft)	Object ID
	Moderate	0.20	83.1	241
	Moderate	0.20	337.2	243
	Moderate	0.20	110.7	244
	Moderate	0.20	456.5	246
	Moderate	0.20	269.4	248
	Moderate	0.20	99.2	250
	Moderate	0.20	253.2	252
	Moderate	0.20	238.9	254
	Moderate	0.20	305.3	256
	Moderate	0.20	747.9	258
	Moderate	0.20	359.2	260
	Moderate	0.20	700.2	262
	Moderate	0.20	379.0	264
	Moderate	0.20	628.4	265
	Moderate	0.20	602.8	267
	Moderate	0.20	374.9	269
	Moderate	0.20	190.5	271
	Moderate	0.20	1405.4	273
	Moderate	0.20	330.4	275
	Moderate	0.20	2724.2	277
	Moderate	0.20	302.1	286
	Moderate	0.20	845.7	288
	Moderate	0.20	684.0	290
	Moderate	0.20	925.1	292
	Moderate	0.20	628.2	294
	Moderate	0.20	608.7	297
	Moderate	0.20	128.4	299
	Moderate	0.20	523.2	300
	Moderate	0.20	237.6	404
	Moderate	0.20	340.4	408
	Moderate	0.20	160.4	410
	Moderate	0.20	100.2	412
	Moderate	0.20	271.8	414
	Moderate	0.20	278.7	416
	Moderate	0.20	222.9	418
	Moderate	0.20	230.2	420
	Moderate	0.20	314.8	422
	Moderate	0.20	107.8	424
	Moderate	0.20	141.8	428
	Moderate	0.20	92.1	430
	Moderate	0.20	724.4	432
	Moderate	0.20	150.9	434
	Moderate	0.20	516.8	436
	Moderate	0.20	652.8	440
	Moderate	0.20	341.7	454

Lake	Shore Erosion	Lateral Recession Rate (ft/yr)	Segment Length (ft)	Object ID
	Moderate	0.20	266.3	457
	Moderate	0.20	254.9	459
	Moderate	0.20	208.7	471
	Moderate	0.20	166.7	472
	Moderate	0.20	300.3	474
	Moderate	0.20	518.5	478
	Moderate	0.20	686.5	480
	Moderate	0.20	711.3	482
	Moderate	0.20	431.0	484
	Moderate	0.20	181.9	486
	Severe	0.40	90.2	131
	Severe	0.40	536.5	164
	Severe	0.40	136.6	166
	Severe	0.40	122.5	168
	Severe	0.40	143.2	172
	Severe	0.40	229.3	178
	Severe	0.40	620.5	200
	Severe	0.40	71.0	208
	Severe	0.40	184.3	210
	Severe	0.40	250.7	236
	Severe	0.40	244.6	266
	Severe	0.40	170.9	268
	Severe	0.40	114.4	296
	Severe	0.40	211.8	298
Valley Lo Lake	None	0.00	159.5	108
	None	0.00	241.2	110
	None	0.00	1915.5	112
	None	0.00	440.9	114
	None	0.00	163.9	387
	None	0.00	143.3	389
	Slight	0.03	124.4	100
	Slight	0.03	95.7	101
	Slight	0.03	121.2	104
	Slight	0.03	159.7	105
	Slight	0.03	228.5	107
	Slight	0.03	419.4	109
	Slight	0.03	624.3	111
	Slight	0.03	135.3	113
	Slight	0.03	531.4	115
	Slight	0.03	35.3	383
	Slight	0.03	448.0	391
	Slight	0.03	489.1	393
	Moderate	0.20	37.0	102
	Moderate	0.20	149.5	103
	Moderate	0.20	89.6	106

Lake	Shore Erosion	Lateral Recession Rate (ft/yr)	Segment Length (ft)	Object ID
	Moderate	0.20	27.2	116
	Moderate	0.20	86.6	385

Lakeshore Buffer Condition

Lakeshore buffer condition was assessed using an area up to 25 feet inland from the shoreline for each reach. A 25 foot buffer was chosen based on research that indicates a 25-foot vegetated buffer is the minimum effective width for in-lake habitat maintenance (a 15 foot buffer is the minimum effective width for bank stability). The assessment was conducted utilizing 2018 and 2019 aerial images in ArcGIS. The aerial images were visually assessed to determine vegetation and impervious surface cover. The lakeshore buffers were categorized as good, fair, or poor. Below are brief descriptions of each category.

Good: ≥ 70% unmowed grasses, forbs, trees and/or shrubs and ≤ 5% impervious surfaces

Fair: ≥ 50% unmowed grasses, forbs, trees and/or shrubs or > 5% - ≤ 50% impervious surfaces

Poor: ≤ 50% unmowed grasses, forbs, trees and/or shrubs or ≥ 50% impervious surfaces

Results for the lakeshore buffer condition assessment are summarized in **table 2.** Full results of the buffer condition assessment can be accessed via the Lake Assessment Web Application.

Table 2 Lakeshore Buffer Condition Assessment Results.

Lake	Buffer Condition	Segment Length (ft)	Object ID
Chicago Botanic Garden	Good	760.2	117
	Good	224.4	119
	Good	952.8	121
	Good	209.2	128
	Good	549.7	131
	Good	1921.6	133
	Good	105.6	135
	Good	76.7	137
	Good	155.3	141
	Good	343.6	143
	Good	468.8	145
	Good	304.7	149
	Good	666.4	151

Lake	Buffer Condition	Segment Length (ft)	Object ID
	Good	208.4	153
	Good	211.5	159
	Good	603.1	163
	Good	365.8	165
	Good	1663.1	170
	Good	1207.7	173
	Good	212.0	175
	Good	988.0	176
	Good	493.1	178
	Good	1113.6	180
	Good	285.9	183
	Good	406.2	184
	Good	1433.3	187
	Fair	96.1	118
	Fair	61.2	123
	Fair	100.1	125
	Fair	183.9	127
	Fair	12.6	130
	Fair	236.8	136
	Fair	516.5	138
	Fair	124.7	140
	Fair	127.8	146
	Fair	110.2	148
	Fair	93.6	156
	Fair	87.7	157
	Fair	131.1	160
	Fair	50.9	166
	Fair	217.6	168
	Fair	73.7	181
	Poor	79.2	120
	Poor	23.5	122
	Poor	103.6	124
	Poor	376.0	126
	Poor	42.5	129
	Poor	1417.7	132
	Poor	45.9	134
	Poor	616.1	139
	Poor	92.9	142
	Poor	515.8	144
	Poor	102.0	147
	Poor	90.7	150
	Poor	21.6	152
	Poor	203.7	154
	Poor	324.7	155
	Poor	228.3	158
	Poor	1406.6	162

Lake	Buffer Condition	Segment Length (ft)	Object ID
	Poor	151.2	164
	Poor	109.1	167
	Poor	1435.1	169
	Poor	266.6	171
	Poor	21.7	172
	Poor	17.1	174
	Poor	13.2	177
	Poor	44.3	179
	Poor	41.1	182
Eagle Lake	Good	4584.4	223
	Good	710.9	225
	Good	298.7	228
	Fair	998.6	229
	Poor	1364.8	224
	Poor	859.8	227
	Poor	337.8	230
Lake Eleanor	Good	225.2	34
	Good	74.5	35
	Fair	70.9	33
	Poor	3055.2	36
	Poor	2576.8	37
Lake Glenview	Good	881.6	20
	Good	545.5	21
	Good	420.4	22
	Good	642.3	23
	Good	195.3	24
	Good	1006.5	25
	Good	364.1	26
	Good	1074.4	27
	Good	1397.4	28
	Good	339.6	29
	Good	703.6	30
	Good	1053.2	31
	Fair	143.0	4
	Fair	19.1	7
	Fair	21.0	8
	Fair	12.5	9
	Fair	35.6	12
	Fair	52.5	15
	Fair	136.9	16
	Poor	16.4	5
	Poor	70.2	6
	Poor	53.6	10
	Poor	151.3	11
	Poor	19.4	13
	Poor	8.8	14

Lake	Buffer Condition	Segment Length (ft)	Object ID
	Poor	8.4	17
	Poor	11.9	18
	Poor	14.5	19
Lake Kathryn	Good	870.7	115
	Fair	195.5	113
	Poor	1069.2	116
Lambs Farm Lake	Good	489.6	76
	Good	965.1	77
	Fair	189.0	72
	Fair	40.4	73
	Fair	37.1	75
	Poor	1731.6	71
	Poor	186.8	74
Lucky Lake	Good	71.2	44
	Good	794.9	46
	Good	193.6	47
	Fair	660.8	38
	Fair	119.0	43
	Poor	239.3	39
	Poor	734.3	41
	Poor	393.2	45
Old School Lake	Good	168.8	64
	Good	267.3	65
	Good	251.4	66
	Good	983.3	67
	Good	251.0	68
	Good	160.2	69
	Good	220.1	70
	Fair	33.7	48
	Fair	17.6	51
	Fair	576.1	52
	Fair	61.3	53
	Fair	132.3	56
	Fair	23.2	58
	Fair	134.2	59
	Fair	44.5	61
	Fair	40.5	63
	Poor	136.4	49
	Poor	232.0	50
	Poor	734.2	55
	Poor	69.8	57
	Poor	38.6	60
	Poor	108.6	62
Skokie Lagoons	Good	5264.9	188
	Good	12231.0	189
	Good	16443.0	190

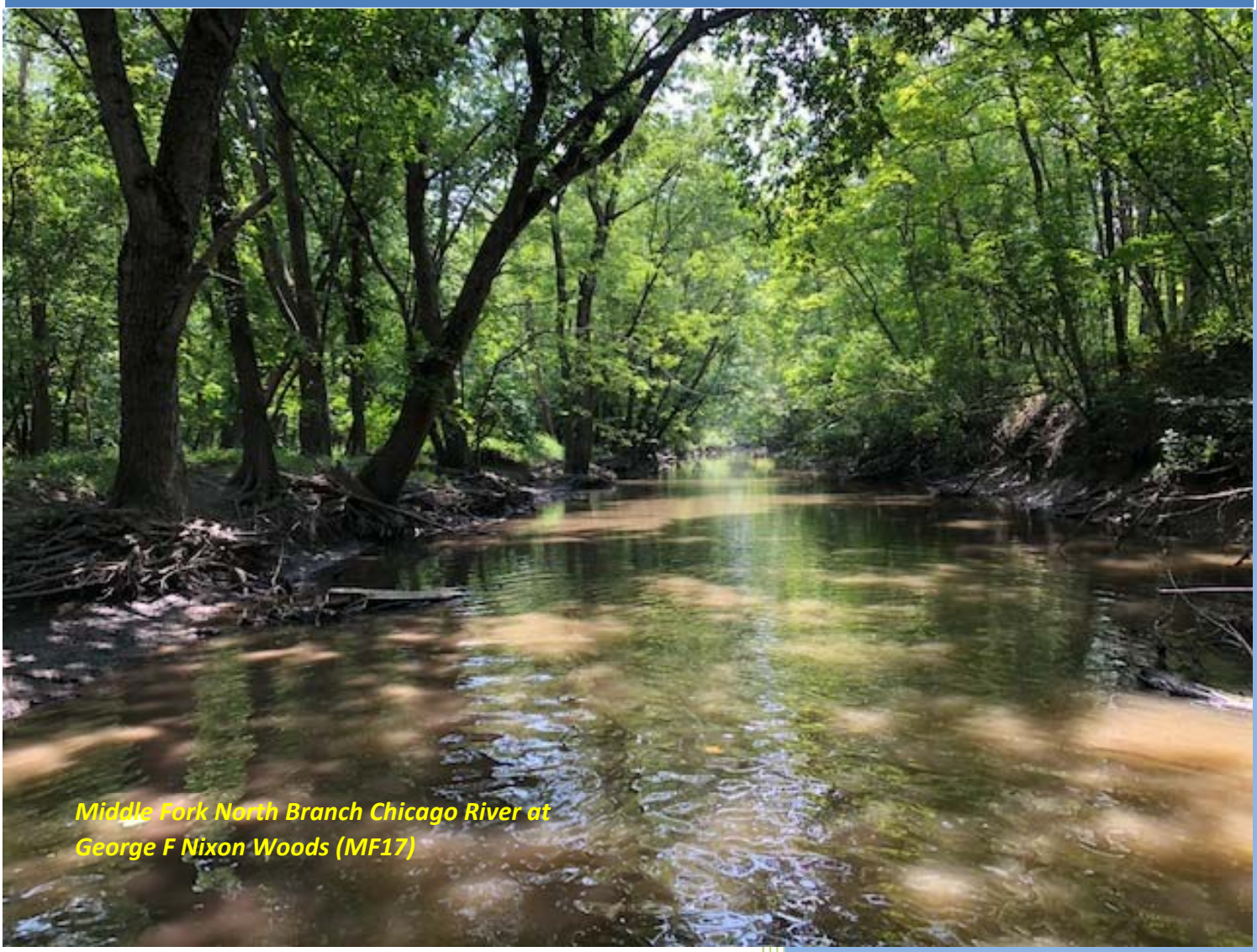
Lake	Buffer Condition	Segment Length (ft)	Object ID
	Good	339.9	191
	Good	5841.7	194
	Good	846.6	196
	Good	6773.3	198
	Good	2347.7	200
	Good	273.3	204
	Good	1274.3	205
	Good	3972.2	207
	Good	425.7	209
	Good	3441.8	211
	Good	1360.2	213
	Good	431.6	216
	Good	7029.1	217
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	Fair	97.5	199
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	Fair	114.1	212
	Fair	125.1	214
	Fair	29.9	215
	Fair	51.2	221
	Poor	77.5	185
	Poor	74.7	186
	Poor	212.5	192
	Poor	150.8	193
	Poor	53.7	195
	Poor	108.3	197
	Poor	55.0	201
	Poor	47.3	202
	Poor	67.4	203
	Poor	267.3	206
	Poor	618.4	220
Valley Lo Lake	Fair	65.6	1
	Poor	5902.1	2

APPENDIX E:
BIOLOGICAL & WATER QUALITY ASSESSMENT REPORT

Midwest Biodiversity Institute

NORTH BRANCH CHICAGO RIVER WATERSHED WORKGROUP

Biological and Water Quality Assessment of the North Branch Chicago River: 2018-19



Middle Fork North Branch Chicago River at George F Nixon Woods (MF17)

Peter A. Precario, Executive Director
James B. Lane, Board President

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Biological and Water Quality Assessment of the North Branch Chicago River 2018-19

Cook County and Lake County, IL

Technical Report MBI/2020-8-12

December 31, 2020

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FOREWORD

What is a Biological and Water Quality Survey?

A biological and water quality survey, or "bioassessment", is an interdisciplinary monitoring effort coordinated on a waterbody specific or a watershed scale. This may involve a relatively simple survey that focuses on one or two small streams, one or two principle stressors and a handful of sampling sites or a much more complex effort including entire watersheds, multiple and overlapping stressors and tens of sites. The NBWW survey included the Skokie River, Middle and West Forks of the North Branch Chicago River, and the North Branch Chicago River. The principle focus of the NBWW bioassessment is on the status of the Illinois General Use for aquatic life and recreation.

Scope of the NBWW Biological and Water Quality Assessment

The Midwest Biodiversity Institute (MBI) was contracted by the North Branch Chicago River Watershed Workgroup (NBWW) to develop a biological and water quality monitoring and assessment plan for the North Branch Chicago River and tributaries in Cook and Lake Counties, IL. The plan was incorporated into at Quality Assurance Project Plan (QAPP; NBWW 2019) that was submitted to and approved by Illinois EPA. The spatial sampling design consisted of an intensive pollution survey and geometric allocation of sites. This design was employed to fulfill multiple purposes and goals in addition to the determination of the existing status of the biological assemblages and their relationship to chemical, physical and biological stressors. Targeted sites were positioned upstream and downstream of major discharges, other sources of potential releases and contamination, and major tributaries to provide a "pollution profile" of the major streams and rivers. The major objectives include:

1. Determine the aquatic life status of each sampling location in quantitative terms, i.e., not only if a waterbody is impaired, but the spatial extent and severity of the impairment and the respective departures from established criteria;

2. Determine the proximate stressors that correspond to observed impairments for the purpose of targeting appropriate management actions to those stressors; and,

3. Screen for any potential issues with use attainability.

To meet these objectives data was collected with methods that provide high quality results and are in conformance with the practices of Illinois EPA (Illinois EPA 2010a,b; 2011a-g; 2014a,b) and Illinois DNR (2010a,b) and under a project QAPP approved by Illinois EPA (NBWW 2019).

EXECUTIVE SUMMARY

Aquatic Life Condition Assessment

The primary indicators of the status of the Illinois General Use for aquatic life are the Illinois fish and macroinvertebrate Indices of Biotic Integrity and generally following the guidance in the 2018 Integrated Report (Illinois EPA 2018) with certain exceptions. The status of aquatic life is reported here in the form of an attainment table (Table 1) and expressed as full, partial or non-support and based on the most limiting of either the fish or macroinvertebrate results. Non-support is further subdivided into non-support fair and non-support poor; a partial support category is added to clarify instances where only one of the two assemblages attain the General Use support fish or macroinvertebrate threshold. Of the 25 sites assessed for the General Use for aquatic life all were non-support poor.

Causes and Sources of Non-attainment

Newly derived IPS thresholds for water and sediment chemistry and physical habitat attributes (MBI 2020a) were available to better assess causes of impairment and their comparative severity. The approach for deriving these thresholds included a more refined stratification of biological effect threshold values for parameters that showed valid relationships with biological responses based on species and taxa level analyses and then correlated with the corresponding fish and macroinvertebrate IBI attainment thresholds and narrative ratings (MBI 2020a). This produced thresholds across four or five narrative categories of quality (excellent, good, fair, poor, and very poor). This replaces the formerly used binary (i.e., “pass/fail”) approach to evaluating exceedances of chemical and physical effect thresholds and criteria providing for a graded approach to the assignment of causes and sources of Illinois General Use biological impairments. The new IPS framework also offers the semblance of a tiered aquatic life use (TALU) stratification of goals and thresholds that has been incorporated into all IPS outputs to support local restoration and protection efforts by the respective watershed groups and stakeholders.

Causes and Sources were determined for each impaired site and included categorical or parameter level associations and their sources (if known). These were compared to the Illinois EPA derived causes involves using a lines of evidence approach where chemical and physical threshold exceedances within a causal category (or of a parameter) is logically related to a biological impairment, not just simply based on the coincidental exceedance of a criterion or other threshold (Illinois EPA 2018). With the recent availability of more comprehensive and regionally relevant analyses of stressors in the Northeast Illinois via the Integrated Prioritization System (NE Illinois IPS; MBI 2020a), assigning causes can be done at a better level of detail and reliability. This approach still involves using a lines of evidence approach where chemical and physical threshold exceedances generated by the NE Illinois IPS within a causal category (or for a parameter) is related to a biological impairment. This goes well beyond the association of a coincidental exceedance of a criterion or other effect threshold with a biological impairment.

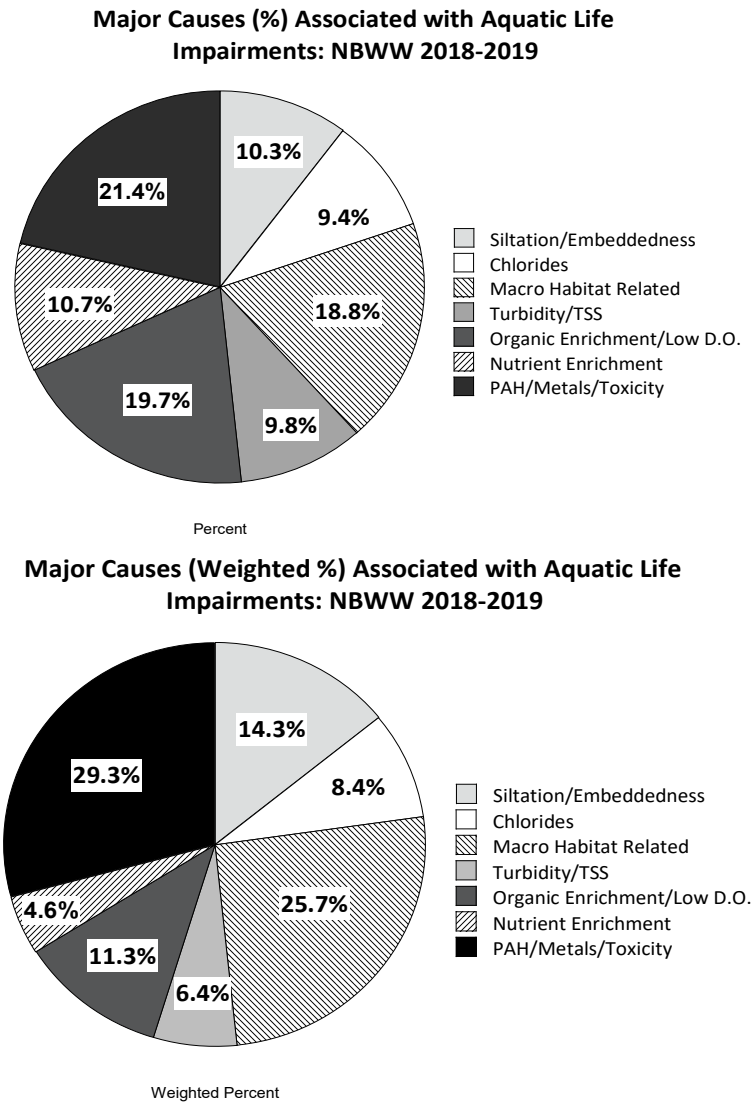


***Figure 1**. Categorical causes associated with aquatic life impairments in the NBWW survey area in 2018 and 2019 based on the number of observations (upper) and the weighted observations (lower), the latter based on the narrative rating of threshold exceedances (very poor = 5, poor = 3, and fair = 1).*

Knowing the relationships that are supported by prior empirical observations in previous studies as well as our own experiences boosts the confidence in casual assignments. This process varies somewhat from that of Illinois EPA in that additional effect thresholds were used to assign causes beyond those used by Illinois EPA.

Fourteen (14) causes across seven (7) major categories and four (4) source categories were identified for the North Branch Chicago River survey are in 2018 and 2019 (Figure 1). Of the 14 causes, three (3) were habitat related (QHEI score, channel modification, substrate quality) and eleven (11) were chemical (low dissolved oxygen [D.O.], Max D.O., 5-day biochemical oxygen demand [BOD_5], total suspended solids [TSS], organic enrichment, water column metals, sediment metals, polycyclic aromatic hydrocarbons [PAHs], nutrient enrichment, chlorides, turbidity, volatile suspended solids [VSS]). The proportion of causes was assessed based on the number of observations and weighted observations (Figure 1), the latter being based on the severity of the expression of the cause in chemical water column, sediment chemistry, or habitat measures. A higher weighting was assigned based on the narrative rating of an exceedance with 5 for very poor, 3 for poor and 1 for fair. PAH/Metals/Toxicity were the leading causes with a weighted frequency of 29.3%. More than six metals exceeded Illinois EPA guidelines or the IPS thresholds at numerous sites in the Skokie River and Middle Fork of the North Branch as well as at the North Branch mainstem site. PAHs were very poor at all but one site in the Skokie River and multiple PAHs exceeded IPS thresholds at every site. Macro Habitat Related issues were the next highest causes of impairment to aquatic life. Overall QHEI scores and channel modifications were the primary indicators used to

determine macro habitat related limitations. Only the sites of MF14 and MF19 did not possess a habitat limitation listed as a cause of aquatic life impairment. Four (4) sites in the Skokie River and one (1) site in the Middle Fork of the North Branch Chicago River were limited by very poor macro habitat related causes (Table 1). Poor Macro Habitat Related causal stressors were recorded at 21 of the 25 sites in the NBWW survey area. Legacy effects from channel modifications, urban encroachment on riparian corridors, and limited instream habitat were recorded 44 times (18.8%, 25.7% weighted). Siltation/Embeddedness of natural substrates was the most widely observed causal category (10.3%, 14.3% weighted), being identified at 24 sites (Table 1). Instances of the substrate category being listed in the poor and very poor categories caused the weighted frequency of impairment to be the second most influential stressor, and is still very prevalent throughout the survey area. Siltation/Embeddedness is closely related to the Macro Habitat Related category as it is included in the overall habitat evaluation score. Siltation and muck substrates were prevalent at nearly every site and are indicative of the legacy effects from urbanization and the alteration of land use from a wetland to the urban/residential majority observed during the 2018-2019 survey. Organic Enrichment/Low D.O. represented the most frequent (19.7%) of the causes with a weighted frequency of 11.3%. Low D.O. and elevated BOD_5 were also prevalent throughout each of the subwatersheds. Nutrient Enrichment (10.7%) can affect D.O. concentrations, diel D.O. swings and spurn the growth of nuisance algae. TKN values were the most frequent nutrient listed as a causal stressor, often listed in the fair category and throughout the survey area. The related Turbidity/TSS category (9.8%) possessed levels in the fair and poor categories in each subwatershed, but was primarily limiting in the Skokie River. The elevated levels of BOD_5 and low D.O. levels could be attributed to the high organic content in sediments and bacterial action that breaks down organic matter thus depleting D.O. levels. Chloride levels ranked lowest (9.4%), primarily poor to very poor levels in the West Fork of the North Branch, fair to poor in the Middle Fork of the North Branch, and fair in the Skokie River.

Habitat alteration, general nonpoint source (NPS) runoff, urban NPS runoff and flow modifications were listed as sources for 100% of the causes. No other causes were identified. The causes and sources were derived from the analyses described in the **SYNTHESIS** section (pp. 70) where the rationale for assigning causes and sources is detailed. These constitute the principal causes and sources that would need to be addressed to resolve the aquatic life impairments listed in Table 1. Illinois EPA (2018) listed causes at four (4) of the 17 mainstem sites which corresponded to some of the MBI causes including D.O., TSS, and siltation. The listing of a wider variety causes by MBI is due to the use of a wider array of effect thresholds, differences in the interpretation of impairments, and most of all to differences in the spatial survey design.

Synthesis of Results

The 2018 and 2019 results yielded poor and very poor results for both the macroinvertebrate and fish assemblages in each of the subwatersheds and the mainstem of the North Branch Chicago River. Urban runoff is the major contributor of pollution within the watershed including dissolved substances, heavy metals, and polycyclic aromatic hydrocarbons. It also plays a major

role in habitat alterations and heavy silt coverage that are also ubiquitous throughout the survey area. High diel D.O. swings and low D.O. concentrations can likely be attributed to the high organic matter content of the sediments as chlorophyll concentrations for both sestonic and benthic algal communities were mostly in the good or excellent IPS threshold ranges at all sites. Fish IBIs (fIBI) were primarily in the very poor to low poor range. The highest fIBI was found in the Skokie Lagoons (SR-7) and likely due to stocking efforts that included Walleye, Channel Catfish, Northern Pike, and various Sunfish species. The macroinvertebrate IBI (mIBI) scores were generally poor with a single site in the lower fair range. The Middle Fork site MF14 supported the highest percent of EPT taxa (43.6%) and attained the highest mIBI score (32.8). This site offered the highest quality habitat in the survey area (QHEI = 67.0). The AQLU attainment status for the NBWW survey area is consistently non-poor at each site.

Neither of the two major point sources (NSWRD Clavey Rd. and Deerfield WRFs) played a major role in the observed results with the exception of minor increases in some chemical constituents associated with municipal wastewater. No distinguishable signatures of excessive nutrient enrichment were apparent in the modified SNAP analysis even though the two WRFs heavily dominate the low flows of their receiving streams. Nor did wastewater effluents have any apparent beneficial effects as was observed in 2016 and 2018 with the entry of large volumes of treated wastewater discharges in the Upper Des Plaines River (MBI 2020b).

Perhaps the most important observation from the 2018-2019 bioassessment is that the overall habitat in each of the subwatersheds and in the mainstem North Branch Chicago River site is mostly poor. Heavy silt coverage and muck substrates coupled with the lingering effects of legacy channel and hydrological modifications reduce the habitat available for macroinvertebrates and fish and hamper the assimilation of pollution in general. Urban runoff contributes to toxic levels of PAHs and metals in sediments that are prevalent throughout the survey area. The biological results are associated with numerous exceedances of IPS thresholds with no sites meeting the Illinois EPA General Use designation for aquatic life.

Reinforcing these observations are the low and very low Restorability scores generated by the NE Illinois IPS (see Table 17, p. 72) which means that the challenges with restoring the streams of the NBWW study area to attaining the Illinois General Use for aquatic life are greater and dependent of restoration actions that address the most limiting chemical and physical factors as is demonstrated by the consistent repetition of very poor and poor causes of impairment related to urban land uses coupled with flow and habitat alterations.

***Table 1**. Aquatic life use attainment status in the 2018-19 study area with causes and sources of impairment listed for non-supporting sites determined by this study (see footnotes for fIBI and mIBI use support thresholds). fIBI, MIwb, and mIBI values are color coded in accordance with meeting five narrative classes (red = very poor; orange = poor; yellow = fair). See glossary of terms used next page.*

Site ID	River Mile	Drainage Area (sq. mi.)	Year	AQLU Status	fIBI[1]	mIBI[2]	QHEI[3]	2018 and 2019 Causes by Stressor Threshold Narrative Category			2018 and 2019 Sources	NE IL IPS Restorability Score (0-100)
								Very Poor[11]	Poor[11]	Fair[11]		
Skokie River												
SR1	21.1	2.7	2018	Non-Poor	8.0	18.4	33.5	Urban-WS;Dev-WS; Substr; Chan; WC Metals; PAH	Imperv-500m; TKN; QHEI;	Low DO; BOD; Chloride; VSS; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	11.8
SR2	17.4	7.8	2018	Non-Poor	14.0	21.8	33.5	Urban-WS;Dev-WS; Substr; PAH	QHEI; Chan;	Imperv-500m;TP; TKN; BOD; Nitrate;	Urban, NPS, Altered Flow, Habitat Mod.	16.7
SR3	14.8	11.5	2018	Non-Poor	14.0	28.6	40.5	Urban-WS;Dev-WS; Substr; PAH	Imperv-500m; BOD; QHEI; Chan; TSS;	Low DO; Chloride; VSS; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	21.1
SR4	11.3	15.0	2018	Non-Poor	12.5	22.9	47.0	Chan; PAH	Imperv-500m;Urban-WS;Dev-WS; QHEI; TSS;	Low DO; BOD; Substr; Chloride; VSS; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	24.5
SR5	8.0	20.6	2018	Non-Poor	16.5	22.4	45.5	Urban-WS;Dev-WS; PAH	QHEI; Substr; Chan; TSS;	Imperv-500m; TKN; BOD; Chloride; VSS;	Urban, NPS, Altered Flow, Habitat Mod.	19.5
SR6	7.4	21.5	2018	Non-Poor	15.5	21.6	36.3	Urban-WS;Dev-WS; PAH	BOD; QHEI; Substr; Chan; TSS;	Imperv-500m; Low DO; TKN; Chloride; VSS; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	19.2
SR7	3.0	23.7	2018	Non-Poor	20.5	N/A	32.5	Urban-WS;Dev-WS; Chan;	QHEI; Substr; TSS;	Imperv-500m;Imperv-30;Imperv-30C; Low DO; BOD; Chloride; VSS; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	22.4
SR18	0.5	30.9	2018	Non-Poor	16.0	28.2	38.5	Urban-WS;Dev-WS; Substr; Chan; PAH	QHEI;	Imperv-500m; Low DO; BOD; Chloride; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	25.1
Middle Fork N. Branch												
MF8	21.1	5.8	2019	Non-Poor	14.0	29.6	34.0	Substr; PAH	Urban-WS;Dev-WS; Low DO; QHEI; Chan; Chloride; WC Metals;	Imperv-500m; Conduct;	Urban, NPS, Altered Flow, Habitat Mod.	16.4
MF9	18.9	8.9	2019	Non-Poor	17.0	21.9	28.0	Low DO; PAH	Urban-WS; QHEI; Substr; Chan; Chloride;	Imperv-500m;Dev-WS; TKN; Max DO; Conduct;	Urban, NPS, Altered Flow, Habitat Mod.	24.6
MF10	16.7	11.9	2019	Non-Poor	16.0	23.9	43.0	PAH	Urban-WS;Dev-WS; Low DO; QHEI; Substr; Chan; Chloride;	Imperv-500m; TKN; Max DO; Conduct;	Urban, NPS, Altered Flow, Habitat Mod.	25.7
MF11	14.1	16.1	2019	Non-Poor	17.0	18.8	45.5	PAH	Urban-WS;Dev-WS; Low DO; QHEI; Substr; Chan; Chloride;	Imperv-500m; TKN; Max DO; Conduct;	Urban, NPS, Altered Flow, Habitat Mod.	24.4
MF12	10.8	19.2	2019	Non-Poor	15.0	23.7	41.5	PAH	Urban-WS;Dev-WS; Low DO; QHEI; Substr; Chan; Chloride;	Imperv-500m; TKN; Max DO; Conduct; TSS;	Urban, NPS, Altered Flow, Habitat Mod.	20.8
MF13	8.6	21.0	2019	Non-Poor	14.0	25.6	54.5	Substr; PAH	Urban-WS;Dev-WS; Chan; TSS;	Imperv-500m; Low DO; TKN; QHEI; Chloride; VSS; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	27.7
MF14	6.0	22.5	2019	Non-Poor	14.0	32.8	67.0	PAH	Urban-WS;Dev-WS; Chloride;	Imperv-500m; Low DO; TKN; Max DO; QHEI; Substr; Conduct; TSS; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	37.5
MF15	4.0	24.3	2019	Non-Poor	15.0	29.9	59.0	PAH	Urban-WS;Dev-WS; Substr; Chloride; TSS;	Imperv-500m; BOD; Max DO; QHEI; Chan; Conduct; WC Metals;	Urban, NPS, Altered Flow, Habitat Mod.	25.9
MF16	3.0	56.1	2018	Non-Poor	15.0	21.7	44.0	Substr; PAH	Urban-WS;Dev-WS; QHEI; Chan; VSS;	Imperv-500m; TKN; BOD; Nitrate; Chloride; TSS;	Urban, NPS, Altered Flow, Habitat Mod.	28.2
MF17	1.8	57.3	2018	Non-Poor	14.0	28.0	45.0	Chan; PAH	Urban-WS;Dev-WS; QHEI; Substr;	Imperv-500m; Low DO; TKN; BOD; TSS; VSS; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	26.2
West Fork N. Branch												
WF20	12.5	3.9	2019	Non-Poor	16.0	22.2	30.5	Substr; PAH	Urban-WS;Dev-WS; Low DO; QHEI; Chan; Chloride;	Imperv-500m; TKN; BOD; Conduct; TSS;	Urban, NPS, Altered Flow, Habitat Mod.	14.8
WF21	10.4	7.0	2019	Non-Poor	9.0	20.5	40.5	PAH	Urban-WS;Dev-WS; Low DO; QHEI; Chan;	Imperv-500m; TKN; BOD; Max DO; Substr; Chloride;	Urban, NPS, Altered Flow, Habitat Mod.	19.4
WF22	9.2	9.4	2019	Non-Poor	12.0	18.1	46.0	Urban-WS;Dev-WS; WC Metals; PAH	Low DO; QHEI; Substr; Chan; Chloride;	Imperv-500m;Imperv-30;Imperv-30C;TP; TKN; BOD; Conduct;	Urban, NPS, Altered Flow, Habitat Mod.	11.3
WF23	4.9	17.9	2019	Non-Poor	13.0	28.7	38.5	Urban-WS;Dev-WS; Substr; Chloride; PAH	Imperv-500m;Imperv-30;Imperv-30C; Low DO; QHEI; Chan;	TP; TKN; Max DO; Conduct;	Urban, NPS, Altered Flow, Habitat Mod.	18.3
WF24	2.9	24.5	2019	Non-Poor	4.0	23.1	53.5	Urban-WS;Dev-WS; Chloride; PAH	Imperv-500m; TKN; Conduct;	Imperv-30;Imperv-30C;TP; Low DO; Max DO; QHEI; Substr; Chan; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	19.6
WF25	1.3	28.0	2019	Non-Poor	12.0	22.8	45.5	Urban-WS;Dev-WS; Chloride; PAH	Imperv-500m; Low DO; QHEI; Substr; Chan; Conduct;	TP; TKN; Max DO;	Urban, NPS, Altered Flow, Habitat Mod.	20.8
North Branch												
MF19	18.6	93.4	2018	Non-Poor	12.0	19.5	49.0	Urban-WS;Dev-WS; PAH	Imperv-30;Imperv-30C;	Imperv-500m; Low DO; Chloride; VSS; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	30.2

[1] fIBI: full support >41; nonsupport-fair >20<41; nonsupport-poor <20; [2] mIBI: full support >41.8; nonsupport-fair >20.9<41.8; nonsupport-poor <20.9; [3] From Table 6 - IPS thresholds for habitat attributes; [4] IPS derived primary, secondary, and tertiary causes assigned by weighting the stressor rank *FIT factor - primary causes rank >8-10, secondary causes rank >6-8, tertiary causes rank >4-6.

Glossary of terms used in Table 1					
Acronym	Description	Acronym	Description	Acronym	Description
Urban-WS	Urban land use HUC12	Substr	Substrate condition from QHEI	VSS	Volatile suspended solids
Dev-WS	Developed land HUC12	NPS	Nonpoint source	Conduct	Specific conductivity
Imperv-30	Impervious surface 30 meter buffer	Mod.	Modification	TKN	Total Kjeldahl nitrogen
Imperv-30C	Imprevious surface 30 m buffer clipped	PAH	Polycyclic aromatic hydrocarbons	TP	Total phosphorus
Imperv-500	Impervious surface 500 meter buffer	WC Metals	Metals concentration in water column	BOD	Biochemical oxygen demand
QHEI	Qualitative Habitat Evaluation Index (QHEI)	DO	Dissolved oxygen	Max.	Maximum
Chan	Channel condition from QHEI	TSS	Total suspended solids		

Recreational Use Assessment

Levels of fecal bacteria in the form of *Escherichia coli* (*E. coli*) cfu[2]/100 mL were used to assess the status of recreation in and on the water. The Illinois EPA General Use criteria are expressed as counts of fecal coliform bacteria, which were not measured here, hence the U.S. EPA national criteria for *E. coli* were used instead. The U.S. EPA *E. coli* criteria are expressed in terms of a 90-day geometric mean and a statistical threshold value (STV) which is the 90th percentile of the data distribution that is not be exceeded by more than 10% of the samples. Given the small sample size limitations, mean values were used as an approximation of the 90-day geometric mean and maximum values as the STV. The U.S. EPA recommended 90-day geometric mean criteria value is 126 cfu/100 ml and the STV criteria value is 410 cfu/100 ml (U.S. EPA 2012).

E. coli results for the North Branch Chicago River and tributaries are available from all 25 locations in each of the 2018 and 2019 sampling years. The frequency of exceedances of the U.S. EPA recommended geometric mean and STV criteria was very high in the NBWW survey area. Among the 25 sites sampled for *E. coli* in 2018 all exceeded the geometric mean and twenty-four (24) exceeded the maximum STV (Table 2). The 25 sites were re-sampled in 2019, and among the sites twenty-one exceeded the geometric mean and twenty-one (21) exceeded the maximum STV. Twenty (20) exceeded for both geometric mean and maximum STV in 2019 (Table 2). There is no discernable longitudinal pattern in *E. coli* exceedances. The only sites to not exceed the geometric mean and maximum STV are SR7 (RM 3.0 in the Skokie River) and MF16 (RM 3.0 in the Middle Fork North Branch Chicago River) during the 2019 sampling year (Table 2). The only non-exceedance during the 2018 sampling year was the maximum STV at MF8 (RM 21.1 of the Middle Fork North Branch Chicago River) and only five sites not exceeding in both the geometric mean and maximum STV in 2019 (Table 2). The Skokie Lagoons appear to aid in the reduction of *E. coli* in the Skokie River with declines occurring at SR7 (RM 3.0) during both 2018 and 2019 (Table 2). The confluence of the Skokie River with the Middle Fork North Branch appears to also reduce *E. coli* colonies at MF16. Fewer exceedances of the geometric mean and maximum STV occurred in 2019 when elevated flows were recorded due to higher volumes of precipitation. The increased flows in 2019 diluted the *E. coli* colonies throughout the North Branch Chicago River watershed.

***Table 2**. E.coli values (cfu/100 ml) for samples collected in the North Branch Chicago River study area during May-October 2018 and 2019. Yellow shaded cells exceed the recommended U.S. EPA (2012) 90-day geometric mean (126 cfu/100 ml); red shaded cells exceed the maximum statistical threshold value (STV; 410 cfu/100ml). Grey shading is a histogram of the relative values at each site.*

Site ID	River Mile	Drainage Area (sq. mi.)	Samples	Minimum	Mean	Maximum
Skokie River: 2018						
SR1	21.1	2.7	6	73	620	24200
SR2	17.4	7.8	6	404	1058	19900
SR3	14.8	11.5	5	119	1009	14100
SR4	11.3	15	5	687	1709	13000
SR5	8	20.6	5	344	1719	15500
SR6	7.4	21.5	5	272	2191	12000
SR7	3	23.7	5	34	498	2380
SR18	0.5	30.9	6	345	1017	2910
Skokie River: 2019						
SR1	21.1	2.7	4	10	189	1050
SR2	17.4	7.8	4	74	142	365
SR3	14.8	11.5	5	142	223	579
SR4	11.3	15	4	683	1145	1990
SR5	8	20.6	4	517	814	2420
SR6	7.4	21.5	3	770	1127	1550
SR7	3	23.7	4	31	79	345
SR18	0.5	30.9	5	79	219	461
Middle Fork North Branch Chicago River: 2018						
MF8	21.1	5.81	3	148	252	377
MF9	18.9	8.91	3	270	459	617
MF10	16.7	11.9	3	296	696	1220
MF11	14.1	16.11	3	338	929	2280
MF12	10.8	19.23	3	270	919	3080
MF13	8.6	20.96	3	218	878	3870
MF14	6	22.48	3	148	900	4610
MF15	4	24.29	3	296	1417	6870
MF16	3	56.1	5	203	560	2990
MF17	1.8	57.3	5	345	1137	3870
Middle Fork North Branch Chicago River: 2019						
MF8	21.1	5.81	7	10	109	1300
MF9	18.9	8.91	6	26	166	1730
MF10	16.7	11.9	6	10	102	2420
MF11	14.1	16.11	6	36	251	2420
MF12	10.8	19.23	6	66	320	2420
MF13	8.6	20.96	5	48	169	2420
MF14	6	22.48	6	96	270	2420
MF15	4	24.29	6	156	599	2420
MF16	3	56.1	4	36	121	261
MF17	1.8	57.3	4	64	132	253

***Table 2**. (continued)*

Site ID	River Mile	Drainage Area (sq. mi.)	Samples	Minimum	Mean	Maximum
West Fork North Branch Chicago River: 2018						
WF20	12.5	3.87	3	298	487	1050
WF21	10.4	7.02	3	504	609	808
WF22	9.2	9.41	3	570	786	1480
WF23	4.9	17.86	3	907	1179	1350
WF24	2.9	24.52	3	446	780	1140
WF25	1.3	27.97	3	662	1023	1470
West Fork North Branch Chicago River: 2019						
WF20	12.5	3.87	6	56	239	1730
WF21	10.4	7.02	7	36	270	2420
WF22	9.2	9.41	7	51	317	3650
WF23	4.9	17.86	7	72	334	6490
WF24	2.9	24.52	6	91	290	2280
WF25	1.3	27.97	6	249	773	3870
North Branch Chicago River: 2018						
MF19	18.6	93.4	6	538	943	2010
North Branch Chicago River: 2019						
MF19	18.6	93.4	4	148	397	2100

Biological and Water Quality Assessment of the North Branch Chicago River Watershed: 2018-2019

STUDY AREA DESCRIPTION

Lake and Cook Counties are densely populated with 5.8 million residents comprising 46% of the Illinois population, according to the 2014 U.S. Census. The North Branch Chicago River watershed consists of 25 municipalities and 10 townships (Lake Co. SMC 2020). The North Branch Chicago River originates in Glenview, IL where the West Fork and Middle Fork of the North Branch Chicago River converge. The watershed drains 112 square miles of Cook and Lake Counties via the Skokie River and West and Middle Forks of the North Branch Chicago River. The NBWW study area included the North Branch Chicago River, the West Fork of the North Branch Chicago River, the Middle Fork of the North Branch Chicago River and the Skokie River. The Middle Fork of the North Branch Chicago River (63.3 $mi.^2$) has the largest watershed in the NBWW, which includes the Skokie River. The Skokie River (31.1 $mi.^2$) has the second largest watershed, and flows a distance of 17 miles beginning in Gurnee, IL to its confluence with the Middle Fork North Branch Chicago River in the Cook County Forest Preserve Watersmeet Woods. The West Fork of the North Branch Chicago River (28.7 $mi.^2$) has the smallest drainage area and flows the shortest distance (14 mi) from its headwaters near Mettawa, IL to its confluence with the North Branch mainstem near Morton Grove, IL (Lake Co. SMC 2020).

General Landscape Setting

The North Branch Chicago River watershed lies entirely within the level III ecoregion Central Corn Belt Plains. The NBWW study area is primarily located in the level IV subregion of Valparaiso-Wheaton Morainal Complex with the exception of site MF19 which is located in the Chicago Lake Plain subregion Table 3). The Valparaiso-Wheaton Morainal Complex is characterized by its hilly, hummocky rolling area containing moraines, kames, eskers and outwash plains with numerous small lakes and marshes. Soils are largely derived from thick late-Wisconsin glacial drift and thin loess deposits where they occur. Prior to modern development the subregion possessed natural oak-hickory forests and bluestem prairie on dry, well-drained moraines. In poorly drained uplands swamp white oak forests were common and cattails, common reed and bulrushes were dominant in marshes. Prairies dominated the subregion, but through fire suppression their removal allowed for increased forest density. Land use is primarily residential (36.3%) followed by public/private open space (29.1%), transportation/utilities (16.3%) retail/commercial (5.3%), governmental/institutional (4.5%), industrial (3.8%), water (2.8%), office parks (1.1%), and agriculture (0.8%) (Lake County SMC 2020).

Table 3. *Level IV subregions in the 2018-2019 North Branch Chicago River watershed study area and their key attributes (from Woods et al. 1995).*

Level IV Subregion	Physiography	Geology	Soils	Potential Natural Vegetation	Land Use/Land Cover
Chicago Lake Plain (54b)	Nearly level to flat, paleo-lake plain containing beach ridges, swales, sand dunes, paleo-spits, paleo-sand bars, bluffs, and both morainal and bedrock ridges	Quaternary lacustrine sediments, beach deposits, outwash deposits, and glacial till	Mollisols (Endoaquolls, Argiaquolls), Entisols (Udipsamments); Also Histosols (Medisaprists)	A mosaic of bluestem prairie and oak–hickory forest.	Mostly urbanized
Valparaiso-Wheaton Morainal Complex (54f)	Glaciated, hilly, hummocky to rolling area containing moraines, kames, eskers, rolling till plains, outwash plains, kettle holes, and ravines. Small lakes and marshes are common.	Wisconsinan-age glacial till and Quaternary lake deposits, thin loess (< 20”) and alluvium. Ordovician and Silurian dolomite, limestone and shale	Alfisols (Epiaqualfs, Hapludalfs), Mollisols (Endoaquolls, Argiudolls), Inceptisols (Eutrudepts)	A mosaic of oak–hickory forest and bluestem prairie. Dry prairie and dry upland forest on dry soils. In marshes: cattails, bulrushes and common reed.	Mostly growing urban and suburban developments, but wooded areas, wetlands, and pastureland are common

Major Point Sources

Significant point sources of pollution were inventoried as part of the North Branch Chicago River Watershed bioassessment to understand the extent of their potential impact and for developing the intensive pollution survey monitoring design. The NBWW 2018-19 survey area includes two major discharges, the Deerfield Water Reclamation Facility (WRF) that discharges into the West Fork of the North Branch Chicago River at river mile 10.0, and the Clavey Road WRF that discharges into the Skokie River at river mile 1.0 just downstream for the Skokie Lagoons dam (Table 4). The Clavey Road WRF treats 17.8 MGD with any inflow in excess of the design flow being diverted into retention basins until flows reach 28 MGD; the stored sewage is then treated by the plant (CSWEA 2010). The Dundee Road lift station is located further upstream just upstream from the Skokie Lagoons, but it has not been active for several years. The Deerfield WRF treats 2-3 million gallons of wastewater per day (MGD) while serving the Villages of Deerfield and Bannockburn, as well as portions of Highland Park (Village of Deerfield 2020). Advanced treatment is conducted at both WRFs. The Village of Glenview, which is served by the Metropolitan Water Reclamation District of Great Chicago (MWRD), has a lift station overflow that impacts the lower West Fork. These sources are depicted in the graphs of the key water quality parameters, habitat, and biological indicators in all three branches throughout the report.

***Table 4**. Major wastewater treatment facilities that discharge directly (river miles are indicated) to 2018-2019 survey area streams (NSWRD– North Shore Water Reclamation District; WRF - Water Reclamation Facility). Treatment levels and nutrient information from U.S. EPA Discharge Monitoring Report (DMR) Pollutant Loading Tool.*

Facility	Receiving Water Body	River Mile	Latitude	Longitude	Avg. Flow 2018 (MGD)[1]	Avg. Flow 2019 (MGD)[1]	Design Avg. Flow (MGD)[2]	Treat-ment Type[3]	Nutrient Removal[4]
NSWRD Clavey Rd. WRF	Skokie River	1.0	42.10188	-87.75883	12.9	17.0	17.8	AWT	B
Deerfield WRF	West Fork North Branch Chicago R.	7.6	42.15944	-87.85472	2.3	2.9	3.5	AWT	M

[1] Effluent quality reported to MBI by DRWW and individual POTWs; [2] Design average flow from NPDES fact sheet; [3] AWT – Advanced Wastewater Treatment – generally 10-20 mg/L CBOD5, 1.5-3.0 NH3-N; 12-24 mg/L TSS; Secondary – generally 30 mg/L CBOD5/TSS, and no NH3-N removal; [4] B – biological phosphorus removal; M – nutrient (N and P) monitoring only; P – 1.0 mg/L limitation.

NPDES Permit Special Conditions

The two major permitted WWTPs in the NBWW study area are subject to Special Conditions related to the discharge of nutrients. The first special condition states:

"The Permittee shall, within eighteen (18) months of the permit effective date, prepare and submit to the Agency a feasibility study that identifies the method, timeframe, and costs of reducing phosphorus levels in its discharge to a level meeting a potential future effluent standard of 0.5 and 0.1 mg/L. The study shall evaluate the costs of the application of these limits on a monthly, seasonal, and annual average basis."

Special condition 23 (using the Clavey Rd. WRF NPDES permit as an example) states:

"The Agency has determined that the Permitee's treatment plant effluent is located upstream of a waterbody or stream segment that has been determined to have a phosphorus related impairment. This determination was made upon reviewing available information concerning the characteristics of the relevant waterbody/segment and the relevant facility (such as quantity of discharge flow and nutrient load relative to the stream flow).

A phosphorus related impairment means that the downstream waterbody or segment is listed by the Agency as impaired due to dissolved oxygen and/or offensive condition (algae and/or other aquatic plant growth) impairments that is related to excessive phosphorus levels.

The permittee shall develop, or be part of a watershed group that develops, a Nutrient Assessment Reduction Plan (NARP) that will meet the following requirements:

A. The NARP shall be developed and submitted to the Agency by December 31, 2024. This can be accomplished by the Permittee, by participation in an existing watershed group, or by creating a new group. The NARP shall be supported by data and sound scientific rationale.

B. The permittee shall cooperate with and work with other stakeholders in the watershed to determine the most cost-effective means to address the phosphorus related impairment. If other stakeholders in the watershed will not cooperate in developing the NARP, the permittee shall develop its own NARP for submittal to the Agency to comply with this condition.

C. In determining target levels of various parameters necessary to address the phosphorus related impairment, the NARP shall either utilize the recommendations of the Nutrient Science Advisory Committee or develop its own watershed-specific target levels.

D. The NARP shall identify phosphorus input reductions by point source discharges and non-point source discharges in addition to other measures necessary to remove phosphorus related impairments in the watershed. The NARP may determine, based on an assessment of relevant data, that the watershed does not have an impairment related to phosphorus, in which case phosphorus input reductions or other measures would not be necessary. Alternatively, the NARP could determine that phosphorus input reductions from point sources are not necessary, or that phosphorus input reductions from both point and nonpoint sources are necessary, or that phosphorus input reductions are not necessary and that other measures, besides phosphorus input reductions, are not necessary.

E. The NARP shall include a schedule for the implementation of the phosphorus input reductions by point sources, non-point sources and any other measures necessary to remove phosphorus related impairments. The NARP schedule shall be implemented as soon as possible and shall identify specific timelines applicable to the Permittee.

F. The NARP can include provisions for water quality trading to address the phosphorus related impairments in the watershed. Phosphorus/Nutrient trading cannot result in violations of water quality standards or applicable antidegradation requirements.

G. The Permittee shall request modification of the permit within 90 days after the NARP has been completed to include necessary phosphorus input reductions identified within the NARP. The Agency will modify the NPDES permit if necessary.

H. If the permittee does not develop or assist in developing the NARP, and such a NARP is developed for the watershed, the Permittee will become subject to effluent limitations necessary to address the phosphorus related impairments. The Agency shall calculate these effluent limits by using the NARP and any applicable data. If no NARP has been developed, the effluent limits shall be determined for the Permittee on a case-by-case basis, so as to ensure that the Permittee's discharge will not cause or contribute to violations of the dissolved oxygen or narrative water quality standards."

In addition all of the WWTPs that are members of the NBWW are subject to Special Condition 24 in their respective NPDES permits as follows:

"The Permittee shall participate in the North Branch Chicago River Watershed Workgroup (NBWW). The Permittee shall work with other watershed members of the NBWW to determine the most cost effective means to remove dissolved oxygen (DO) and offensive condition impairments in the North Branch Chicago River Watershed to the extent feasible."

A. The NBWW will conduct the following activities in accordance with the Plan during the term of this permit:

1. Develop and Integrated Prioritization System (IPS) and supporting tools consisting of in-depth analysis of all chemical, physical and biological data collected in past watershed assessments to develop a library of data analysis tools and prioritization mechanisms related to future impairment restoration activities.

2. Develop a Nutrient Assessment Reduction Plan (NARP) sequenced as follows:

a. Develop a preliminary NARP Workplan to be utilized to plan and budget the multiyear development and completion of a NBWW NARP. The preliminary NARP Workplan shall be completed by December 31, 2021.
b. Develop NBWW NARP in accordance with the requirements in Special Condition 24.

3. Continue comprehensive water quality monitoring program consisting of bioassessment monitoring, flow monitoring, and water column and sediment chemistry sampling and analysis; modify these programs as necessary to meet NARP objectives.

B. The Permittee shall submit an annual progress report on the activities identified in (A) above, which includes the monitoring data from the previous year, to the Agency by March 31st of each year. The Permittee may work cooperatively with the NBWW to prepare a single annual progress report that is common among NBWW members.

C. In its application for renewal of this permit, the Permittee shall consider and incorporate recommended NBWW activities listed in any annual progress report or Nutrient Assessment Reduction Plan that the Permittee will implement during the next permit term."

Nutrient Assessment Reduction Plan (NARP)

The State of Illinois developed the Illinois Nutrient Loss Reduction Strategy (NLRS; State of Illinois 2018) to deal with the enrichment of Illinois surface waters by primary nutrients (N and P). As part of the NLRS Illinois EPA developed a process termed the Nutrient Assessment Reduction Plan (NARP) which is to be developed for major wastewater treatment facilities by December 31, 2023. The two major WWTPs that are members of the NBWW have recently initiated planning for meeting the NARP requirements as specific in their NPDES permits.

Depending on the findings of the NBWW NARP process, additional controls on discharges of N and P could be forthcoming.

Nonpoint Sources

Nonpoint sources in the NBWW study area primarily include urban sources of varying intensities that range from light suburban to heavy urban and industrial. Hydromodification of stream and river flows, and habitat modifications occur throughout the survey area with the latter primarily in the form of channelization and riparian encroachment by urban and suburban development. A dam located upstream of Willow Rd on the lower Skokie River that creates the Skokie Lagoons impounds 4 miles of the river.

Spatial Survey Design

The spatial monitoring design employed a combined geometric (stratified-random) and targeted-intensive pollution surveys that evaluates pollution from all sources and in keeping with its definition in the CWA. This design was employed primarily to determine the status of aquatic life and recreational use attainment at the same scale at which pollution sources are being managed and regulated within NE Illinois watersheds. Given that there are hundreds of point sources, numerous stormwater structures, varying degrees of urban and suburban development, legacy pollutants, and habitat and hydrologic alterations, an intensive pollution survey design is needed to capture and characterize the numerous and overlapping pollution gradients that result from these sources. This requires more sites than a condition survey which relies on a comparatively greater extrapolation of data from fewer sampled sites to many more unsampled sites and reaches. This design can result in overlooking local impairments that can evade less spatially intensive condition assessments. The pollution survey design is intended to make quantitative indicators and tools available to guide and support restoration and protection efforts undertaken by NBWW, other watershed groups, and their respective stakeholders. The data and assessments provided by these periodic watershed assessments and by the Northeastern Illinois Integrated Prioritization System (IPS) framework (MBI 2020), that provides supporting analyses and information on a regional basis to support the restoration of impaired streams and rivers and the protection of high quality sites, reaches, and watersheds from further degradation.

A tiered design was adopted by the NBWW that monitors water chemistry more frequently and comprehensively the watershed. This consists of sampling 25 sites located throughout the three North Branch Chicago River main tributaries (Figure 2). All sites were sampled for biological assemblages and habitat, sediment chemistry, water chemistry via grab samples and Datasondes were set at 7 sites (continuous data for D.O., temperature, conductance, and pH) and benthic chlorophyll was collected in conjunction with the retrieval of the Datasondes. Each site was assigned a unique NBWW numeric site code, a river mile and UTM coordinates (Table 5).

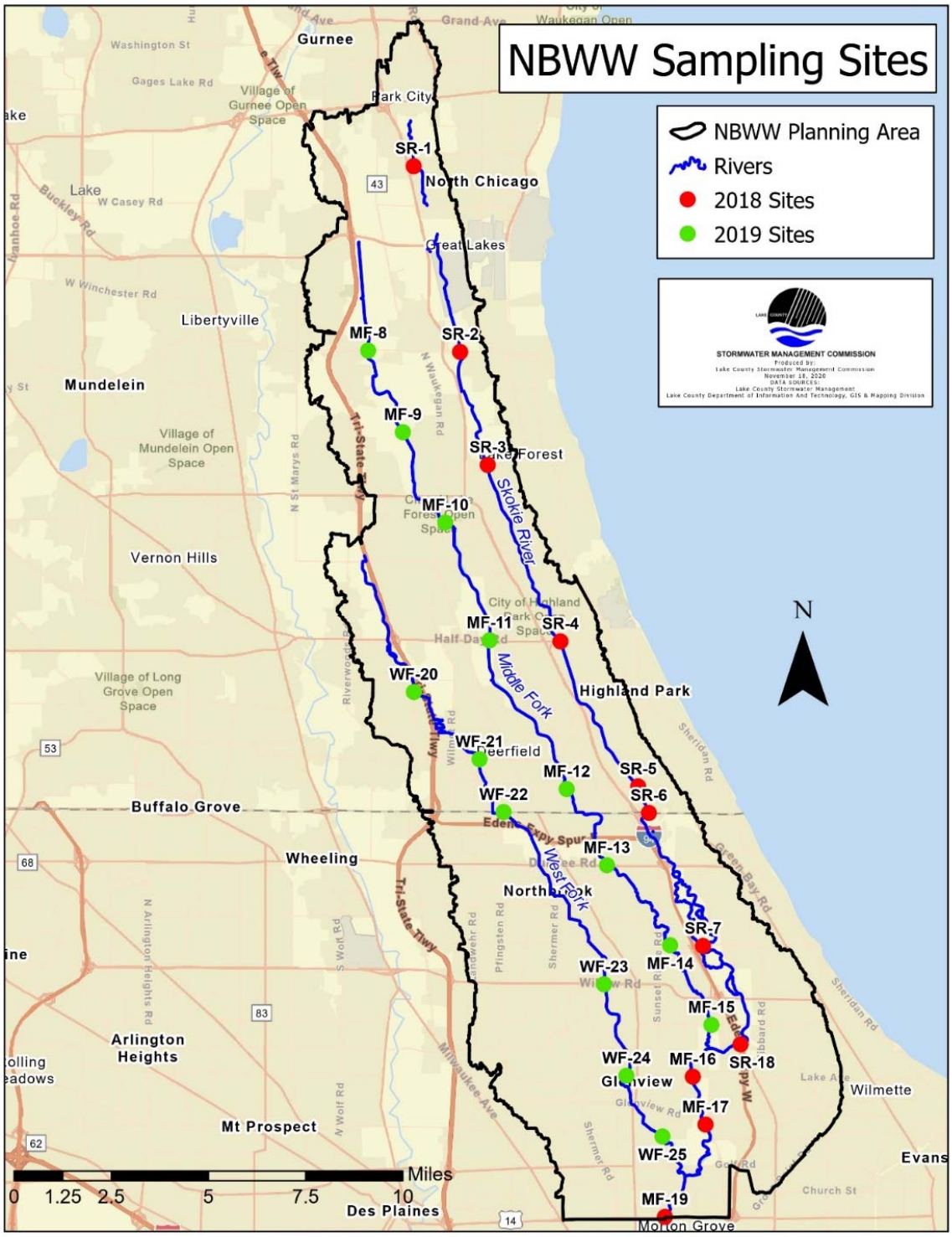


***Figure 2**. Location of biological, chemical and habitat sampling sites in the NBWW survey area in 2018 (red symbols) and 2019 (green symbols). Site codes correspond to the sites listed in Table 5.*

***Table 5**. Locations of sampling sites in the NBWW survey area in 2018-19 showing the site ID, river, river mile and what sampling was performed at each site (F - Fish; MH - multihabitat macroinvertebrate; QHEI - Qualitative Habitat Evaluation Index; Datasonde; Benthic Chlorophyll a, and water chemistry in accordance with Tier 1-3 designation).*

NBWW Site ID	River_Stream Name	Drainage Area (mi.^{2})	RIVER MILE	YEAR	Latitude	Longitude	Geographic Location	Biota	Habitat	DataSonde/ Benthic Chla	Water Chemistry		
											Tier 1	Tier 2	Tier 3
Skokie River													
SR1	Skokie River	2.78	21.1	2018	42.33089	-87.88161	adj. Gillett Plant	MH, F	QHEI	X	1		3
SR2	Skokie River	7.87	17.4	2018	42.27941	-87.86409	ust. IL 176	MH, F	QHEI			2	3
SR3	Skokie River	11.56	14.8	2018	42.24616	-87.85333	dst. Deerpath Rd.	MH, F	QHEI	X		2	3
SR4	Skokie River	15.07	11.3	2018	42.20196	-87.82955	ust. Half Day Rd.	MH, F	QHEI			2	3
SR5	Skokie River	20.67	8.0	2018	42.16077	-87.79907	ust. Clavey Rd.	MH, F	QHEI	X		2	3
SR6	Skokie River	21.51	7.4	2018	42.15269	-87.79392	Ust. Lake Cook Rd.	MH, F	QHEI			2	3
SR7	Skokie River	23.73	3.0	2018	42.11398	-87.77361	Skokie Lagoon	F	QHEI	X		2	3
SR18	Skokie River	30.90	0.5	2018	42.08834	-87.76299	dst. I-94	MH, F	QHEI	X	1		3
Middle Fork North Branch Chicago River													
MF08	Middle Fork North Branch Chicago River	5.80	21.1	2019	42.28013	-87.89854	Ust. Rockland Rd.	MH, F	QHEI		1		3
MF09	Middle Fork North Branch Chicago River	8.90	18.9	2019	42.25635	-87.88459	Dst. foot bridge	MH, F	QHEI			2	3
MF10	Middle Fork North Branch Chicago River	11.90	16.7	2019	42.23196	-87.86841	Dst. Westleigh St.	MH, F	QHEI	X		2	3
MF11	Middle Fork North Branch Chicago River	16.10	14.1	2019	42.19861	-87.85362	Dst. IL22	MH, F	QHEI			2	3
MF12	Middle Fork North Branch Chicago River	19.20	10.8	2019	42.15927	-87.8247	Ust. Carriage Way	MH, F	QHEI	X		2	3
MF13	Middle Fork North Branch Chicago River	20.90	8.6	2019	42.13879	-87.81029	Ust. IL68	MH, F	QHEI			2	3
MF14	Middle Fork North Branch Chicago River	22.40	6.0	2019	42.11541	-87.78472	Dst. Sunset Dr.	MH, F	QHEI	X		2	3
MF15	Middle Fork North Branch Chicago River	24.20	4.0	2019	42.09294	-87.77116	Dst. Winnetka Ave.	MH, F	QHEI	X	1		3
MF16	Middle Fork North Branch Chicago River	56.15	3.0	2018	42.08152	-87.7786	ust. E. Lake Rd.	MH, F	QHEI			2	3
MF17	Middle Fork North Branch Chicago River	57.31	1.8	2018	42.06667	-87.7731	dst. Glenview Rd.	MH, F	QHEI	X		2	3
West Fork North Branch Chicago River													
WF20	West Fork North Branch Chicago River	3.80	12.5	2019	42.18624	-87.88178	Adj. Saundrers Rd.	MH, F	QHEI		1		3
WF21	West Fork North Branch Chicago River	7.00	10.4	2019	42.16572	-87.85696	Dst. Deerfield Rd.	MH, F	QHEI	X		2	3
WF22	West Fork North Branch Chicago River	9.40	9.2	2019	42.15161	-87.84602	Dst. Lake-Cook Rd.	MH, F	QHEI		1		3
WF23	West Fork North Branch Chicago River	17.80	4.9	2019	42.10279	-87.80994	Dst. Willow Rd.	MH, F	QHEI	X		2	3
WF24	West Fork North Branch Chicago River	24.50	2.9	2019	42.07891	-87.80765	Dst. Lake Ave.	MH, F	QHEI			2	3
WF25	West Fork North Branch Chicago River	27.90	1.3	2019	42.06345	-87.78887	Ust. walking bridge	MH, F	QHEI	X	1		3
North Branch Chicago River													
MF19	North Branch Chicago River	93.41	18.6	2018	42.04128	-87.78799	ust. Dempster St.	MH, F	QHEI	X	1		3
								25	25	14			

METHODS

All methods followed Illinois EPA and DNR procedures, except as modified to meet the needs of the NBWW, but with the goal of providing comparable data to evaluate aquatic life and recreational use attainment. This includes fish, macroinvertebrates, habitat, bacteria, chemical parameters (water and sediment), continuous data for select parameters, and benthic and sestonic chlorophyll a. Recreational use attainment was evaluated with *Escherichia coli* and using the U.S. EPA national criteria since none were available from Illinois EPA.

Chemical/Physical Water Quality

Water Sampling

The specific methods of data collection followed Illinois EPA (2012a) and chemical laboratory analyses were provided by the North Shore Water Reclamation District laboratory. The chemical/physical parameter categories (demand, nutrients, metals, and organics) and the frequency of sample collection are summarized in the Monitoring Strategy for the North Branch Chicago River (2018). NBWW assigned tiers to the 25 sampling sites as follows:

- **Tier 1**: Eight (8) sites, three (3) in the West Fork North Branch Chicago River, three (3) in the Middle Fork North Branch Chicago River, and two (2) in the Skokie River, were sampled four times for demand, nutrient, and bacteria parameters, and once annually for metals and organics.
- **Tier 2**: Seventeen (17) sites divided into each of the three subwatersheds are monitored four times for the majority of the demand parameters, all nutrients, and bacteria parameters.
- **Tier 3**: Two additional monitoring events for demand, nutrients, and bacteria parameters at bioassessment sites during the bioassessment seasonal index period.

While NBWW collects water samples in February along with more frequently collected samples during the May-October seasonal index period, only the latter period data is included as it coincides with the bioassessment seasonal index period of mid-June to mid-October.

Sediment Sampling

Surficial sediments were sampled for bulk chemical analysis once at all 25 locations in early October following Illinois EPA methods (Illinois EPA 2011b). Eleven (11) samples were collected in the Skokie River in 2018 and 14 samples were collected in the Middle and West Forks of the North Branch Chicago River in 2019 and analyzed by Eurofins/Test America.

Nutrient Effect Assessment Procedure

A new methodology to assess the effects of nutrient enrichment was used in the NBWW bioassessment for 2018-19 (MBI 2019). Modeled after the Stream Nutrient Assessment Procedure (SNAP) developed by Ohio EPA (2015b), it includes the width of the diel variation in continuously measured D.O., the biomass of chlorophyll a in benthic algae analyzed by the

University of Washington Marine Sciences Laboratory, sestonic chlorophyll a, and the concentration of total phosphorus and dissolved inorganic nitrogen (nitrate + nitrite-N). Other potentially related parameters such as volatile suspend solids (VSS), turbidity, and total Kjeldahl nitrogen (TKN) were included when they were collected at the 14 Datasonde and benthic chlorophyll a locations (Table 5). Datasondes were deployed for consecutive 5-7 day periods during times of low stream flow and elevated summer ambient temperatures (YSI 2012 2017). The number of phosphorus sensitive species derived from the NE Illinois IPS stressor analyses and a Nutrient Ranking Index that was also developed with IPS outputs were also used in this analysis (Appendix E).

Together these results were used to determine five degrees of nutrient enrichment (none, low, moderate, high, and severe). A summary of the number of water and sediment parameters and samples collected in 2018 and 2019 are found in Table 6. The parameters analyzed and frequencies of collection varied by NBWW tier assignment as was previously described.

Table 6*. Summary of the number of water chemistry parameters and samples collected by parameter category for water column (left) and surficial sediment (right).*

Parameters Category	Water		Sediment	
	Parameters	Samples	Parameters	Samples
All	112	3573	109	2,886
E. Coli	1	140	0	0
Field pH & Temp.	2	268	0	0
Demand[1]	2	274	0	0
Nutrients[2]	6	630	2	52
Ionic Strength[3]	3	284	0	0
Suspended Materials[4]	2	216	0	0
Metals	14	247	20	520
Organic Compounds	83	1,514	87	2,314

1 Includes dissolved oxygen and turbidity
2 Includes total ammonia, total phosphorus, total nitrate, TKN, benthic chlorophyll a, sestonic chlorophyll a
3 Includes total chloride, and conductivity
4 Includes total suspended solids and volatile suspended solids

Biological Assemblage Methods

Biological assemblages in the 2018-19 NBWW study area included fish and macroinvertebrates at 25 instream locations. Biological and habitat sampling adhered to a summer-early fall index period of June 16-October 15 for fish and July 1-September 30 for macroinvertebrates. All sites were sampled for fish twice, excepting in 2019 when recurring high flow events precluded a second pass, while macroinvertebrates were sampled once with a 10% resample. A habitat evaluation was performed at all fish sites using the QHEI (Ohio EPA 2006) and a site description accompanied the Illinois EPA multihabitat macroinvertebrate sample. All sampling occurred during periods of summer-fall base flows; periods of high flows and runoff were avoided.

Fish Assemblage Methods

Fish were collected once at each site with pulsed D.C. electrofishing units including a Wisconsin AbP-3 battery powered backpack, a 2500 Watt generator controlled by a Smith-Root 2.5 GPP pulse box, or a 5000 Watt generator controlled by a Smith-Root 5.0 GPP pulse box. Deference was given to the most effective method based on the prevailing site and water characteristics. The upper boundary for using the battery-powered backpack electrofishing unit was two times the depth and five times the width of the net ring (anode). Wider and deeper sites were sampled with the 2500 Watt generator and Smith-Root 2.5 GPP pulse box unit as either a bank set longline or floated on a roller barge. The primary net ring served as the anode and a woven steel cable cathode trailed from the backpack unit, the longline or the roller barge. A long-handled dip net was used to assist in the collection of stunned fish. The 5000 Watt generator and Smith-Root 5.0 GPP pulse box were mounted to an inflatable 16 foot Wing raft with an electrode array, which was used at site SR7 in the Skokie Lagoons. Woven steel droppers extended out in front of the raft on a telescoping boom served as the anode and steel dishwasher hoses extending off the side of the frame served as the cathodes. A two or three person crew consisting of a fish crew leader and one or two field technicians conducted the sampling under summer base flow conditions. Sampling effort was standardized by distance and included a 150-200 meter reach for all wadeable sites and a 500 meter reach for raft sites.

Captured fish were placed in a live well for later processing. Water was regularly replaced and/or aerated to maintain adequate oxygen levels to minimize fish mortality. Samples from each site were processed by enumerating weights by species and by life stage (young-of-the-year, juvenile, and adult) on a field data sheet. The incidence of external anomalies was recorded following the procedures outlined by Ohio EPA (1996, 2015a) and refinements made by Sanders et al. (1999). Fish were released back into the stream after they were identified to species, examined for any external anomalies and weighed either individually or in batches. Larval fish were not included in the sample and fish measuring less than 25 mm in length were generally excluded as a matter of practice (excepting adults of small species). All sites were marked with GPS coordinates (beginning, middle and end of the sampling reach) and site data was recorded on a standard field form.

Any fish collected that were not identifiable were required to be vouchered for identification in the laboratory. Vouchered specimens were preserved in borax buffered 10% formalin solution and labeled by site, date, and geographic identifier (e.g. river mild and/or site number). Regional ichthyology keys were used including the Fishes of Illinois (Smith, 1979) and updates available through the Illinois Natural History Survey (INHS). Identification was made to species level at a minimum. Scientific nomenclature followed Page et al. (2012). Vouchers were deposited at Midwest Biodiversity Institute in Hilliard, OH. The data were used to calculate the Illinois Fish Index of Biotic Integrity (fIBI; Smogor 2000, 2005) as the primary assessment of fish assemblage quality.

Macroinvertebrate Methods

Macroinvertebrate methods followed the Illinois EPA multi-habitat method (Illinois EPA 2011 c,d) at all sites (Appendix Table A-1). The Illinois EPA multi-habitat method requires the

selection of a sampling reach that is representative of the instream and riparian habitat conditions of the assessment reach. Sampling requirements included flow conditions characteristic of typical summer base flows, absence of highly influential tributary streams, the presence of one riffle/pool sequence or run/bend meander or alternate point-bar sequence, if present, and a length of 300 feet. Collection methods included using a D-frame dip-net to sample all bottom- and bank-zone habitat types within a site. All sites were marked with GPS coordinates (beginning and end of sampling reach) and site data was recorded on a standard field form.

Multi-habitat macroinvertebrate samples were field preserved in borax buffered 10% formalin solution. Once samples were delivered to the lab in Hilliard, Ohio the samples were transferred to 70% ethyl alcohol. Laboratory procedures followed the Illinois EPA (2011e) methodology which requires the field sample to be subsampled into a 300-organism count following the pre-pick of large and/or rare taxa. Taxonomic resolution was at the lowest practicable taxonomic level for the common macroinvertebrate assemblage groups (mayflies, stoneflies, midges, and crustaceans), which goes beyond the genus level requirement by Illinois EPA (2011g). Calculation of the Macroinvertebrate IBI (mIBI) adhered to the Illinois EPA methods by using genus as the benchmark level of taxonomic resolution.

Habitat Assessment Methods

The QHEI (Rankin 1989, 1995; Ohio EPA 2006) was the principle aquatic habitat assessment method used at each site. Assessments were completed as a part of the fish assemblage sampling by the fish crew leader who is trained and experienced in using the QHEI. The QHEI measures six categories of important attributes to the aquatic biota with a scoring range of 0-100. QHEI scores of 55 in headwaters and 60 in larger streams are generally regarded as sufficient to support the General Use for aquatic life. Scores below 45 indicate substantial deficiencies in the habitat that can preclude attainment of General Use. A QHEI matrix (Rankin 1995) showing the occurrence of good and modified attributes was also examined to evaluate the overall capacity of the stream habitat to support the General Use at each site.

Data Management

All data was managed by MBI in internal databases that permit ready access and analysis. Biological and habitat data is stored in a routine based on the Ohio ECOS format that MBI uses for all biological data management tasks. Biological data analysis included the calculation of Illinois fish and macroinvertebrate IBIs for determining General Use aquatic life status and the accompanying data attributes to enhance the diagnosis of impairments. Habitat data was analyzed using the QHEI and also via a QHEI attributes matrix to aid in assessing habitat related impairments. Summaries of species/taxa relative abundance and QHEI metrics at each site and by sampling date are provided in Appendices B-D.

Determining Use Attainability

Illinois EPA offers a single aquatic life use designation that applies to all rivers and streams through the General Use provision of the Illinois WQS. An assessment of aquatic life use attainability was not conducted as the General Use designation was presumed for all rivers and streams in the 2018-2019 study area. The data collected is adequate to determine if habitat is a limiting factor in any instances of non-support.

Determining Use Attainment

The determination of the attainment status of the Illinois General Use for aquatic life generally followed the guidance in the Illinois EPA 2018 Integrated Report (Illinois EPA 2018). The General Use for aquatic life is applicable to all streams in the NBWW 2018-2019 study area. Attainment of the fIBI and mIBI thresholds were expressed as fully supporting excellent, fully supporting good, partially supporting, non-supporting fair, non-supporting poor, and non-supporting very poor with the most limiting result of either the fish or macroinvertebrates determining the narrative assignment of fair, poor or very poor. Narrative ratings were assigned based on the Integrated Prioritization System (NE Illinois IPS; MBI 2020a). The addition of a partial support category goes beyond the current Illinois EPA structure and was done to highlight where one assemblage attained their respective fIBI or mIBI biocriterion.

Determining Causal Associations

Using the results, conclusions, and recommendations of this assessment requires an understanding of the methodology used to determine biological status and assigning associated causes and sources of impairment utilizing the accompanying chemical/physical data and source information (e.g., point source loadings, land use). New in 2018 was the availability of outputs from the Northeastern Illinois Integrated Prioritization System (NE Illinois IPS; MBI 2020a). These outputs included regionally derived stressor thresholds for more than 70 chemical and habitat variables, Restorability rankings for impaired sites, and Susceptibility and Threat rankings for sites that attained the Illinois General Use biological criteria.

Causal Diagnosis

Describing the causes and sources associated with observed biological impairments relies on an interpretation of multiple lines of evidence including water chemistry data, sediment chemistry data, habitat data, effluent data, land use data, and biological response signatures (Yoder and Rankin 1995; Yoder and DeShon 2003). Thus the assignment of associated causes and sources of biological impairment in this report represents the association of impairments (based on response indicators) with stressor and exposure indicators using linkages to the bioassessment data based on previous experiences with analogous situations and impact types. This was done by relating exceedances of chemical thresholds such as chronic and acute water quality criteria and relevant biological effects thresholds for water and sediment chemistry from the NE Illinois IPS tool and dashboard to further refine the relative importance of categorical and/or

parameter specific causes. The reliability of the identification of associated causes and sources is increased where other such prior associations have been observed. This process relies on multiple lines of evidence concerning the biological response which is the ultimate measure of success in water quality management. The NE Illinois IPS derived exceedance thresholds for chemical and habitat parameters used in the causal analyses were also used in the tabular and graphical presentation of the chemical water and sediment results. When combined with the Restorability and Susceptibility/Threat rankings this improved the certainty of the assignment of causes and sources to an observed biological impairment.

Hierarchy of Water Indicators

A carefully conceived ambient monitoring approach, using cost-effective indicators comprised of ecological, chemical, and toxicological measures, can ensure that all relevant pollution sources are judged objectively on the basis of environmental results. A tiered approach that links the results of administrative actions with true environmental measures was employed in the analyses. The integrated approach is outlined in Figure 3 and includes a hierarchical continuum from administrative to true environmental indicators. The six "levels" of indicators include:

- Level 1 - actions taken by regulatory agencies (permitting, enforcement, grants);
- Level 2 - responses by the regulated entity (treatment works, pollution prevention);
- Level 3 - changes in discharged quantities (pollutant loadings);
- Level 4 - changes in ambient conditions (chemical/physical water quality, habitat);
- Level 5 - changes in uptake and/or assimilation (tissue contamination, biomarkers, assimilative capacity); and,
- Level 6 - changes in health, ecology, or other effects (ecological condition, human and wildlife health).

In this process the results of administrative activities (Levels 1 and 2) are linked to water quality (Levels 3, 4, and 5) which translates to a response (Level 6). An example is the aggregate effect of billions of dollars spent on water pollution control in the U.S. since the early 1970s that have been determined with quantifiable measures of environmental condition. In this case the hierarchy was applied to a specific stream reach that is impacted by multiple point and nonpoint sources. The administrative steps taken by Illinois EPA to issue NPDES permits (Level 1) and the steps taken by the permit holders (Level 2) are easily described and quantified. Quantifying changes in the loadings of pollutants (Level 3) can be affected by the quality and completeness of the effluent monitoring which includes the capture of stressors that actually affect the receiving streams. Likewise, documenting changes in ambient conditions (Level 4) can also be affected by the quality and completeness of the chemical/physical monitoring that not only includes the parameters but also the spatial design in relation to sources of pollution.

This in turn informs about how pollution sources tax the assimilative capacity (Level 5) of a receiving stream. The end result of all the above is portrayed by the response in the biological indicators which is expressed as attainment or non-attainment of the Illinois General Use

aquatic life thresholds for the fish and macroinvertebrate IBIs (Illinois EPA 2016). Symptoms expressed by the biota beyond the index scores can be useful in aiding the causal diagnosis as a feedback loop in the hierarchy of indicators process.

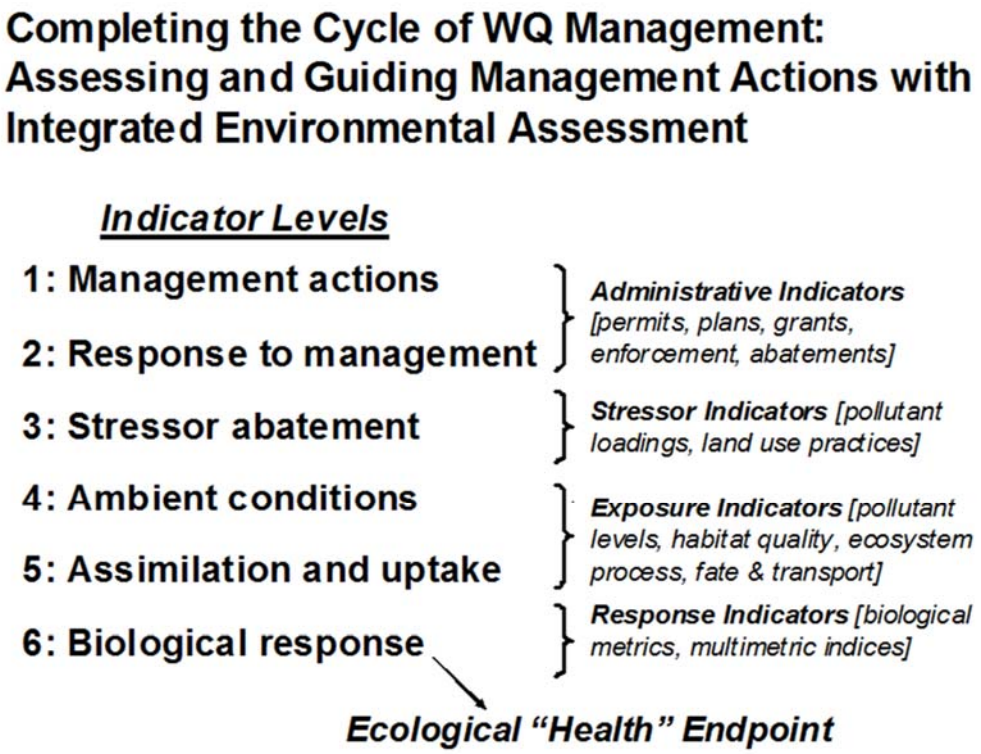


***Figure 3**. The hierarchy of administrative and environmental indicators which can be used to support monitoring and assessment, reporting, and an evaluation of the effectiveness of pollution controls on a receiving stream. This is patterned after a model developed by U.S. EPA (1995a,b) and enhanced by Karr and Yoder (2004).*

Superimposed on this hierarchy is the concept of stressor, exposure, and response indicators.

- Stressor indicators generally include activities which have the potential to degrade the aquatic environment such as pollutant discharges (permitted and unpermitted), land use effects, and habitat modifications.
- Exposure indicators are those which measure the effects of stressors and can include whole effluent toxicity tests, tissue residues, and biomarkers, each of which provides evidence of biological exposure to a stressor or bioaccumulative agent.
- Response indicators are generally composite measures of the cumulative effects of stress and exposure and include the more direct measures of community and population response that are represented here by the biological indices which comprise the Illinois EPA biological endpoints.

This classification of indicators represents the essential technical elements for the pollution survey design that was employed in the North Branch bioassessments by using each indicator within its most appropriate role for each (Yoder and Rankin 1998).

Causal Associations

Describing the causes and sources associated with biological impairments in the study area involved the interpretation of multiple lines of evidence that included water chemistry, sediment chemistry, habitat, and effluent data, a general knowledge about upstream land uses, and biological response signatures within the biological data itself. The assignment of causes and sources of biological impairment result from the association of the impairment with exceedances of water quality criteria or other response-based thresholds and the proximity to sources of pollution. This process was strengthened by the availability of regionally derived stressor effect thresholds from the NE Illinois IPS (MBI 2020a) that classified stressor levels into excellent, good, fair, poor, and very poor categories.

RESULTS – CHEMICAL/PHYSICAL WATER QUALITY

Chemical/physical water quality in the NBWW study area was characterized by grab sample data collected from the water column three times at each Tier 1-2 sites with an additional two collections at Tier 3 sites during summer-fall base flows. Sediment chemistry was determined from samples collected at all 25 Tier 1-3 sites in October 2018 and 2019. Commonly detected chemical parameters were compared either to the criteria in the Illinois WQS, Illinois EPA non-standard benchmarks, reference benchmarks, and most commonly to biologically derived thresholds from the newly available NE Illinois IPS tool and dashboard (MBI 2020a). As such, the chemical/physical data herein serves as an indicator of the degree of exposure and stress in support of using the biological data to assess the attainment of designated aquatic life uses and to assist in assigning associated causes and sources. Parameter groupings included field, demand, ionic strength, nutrients, heavy metals, and organic compounds. Bacteria data were collected by grab samples and were used primarily to determine the status of recreational uses in accordance with U.S. EPA National Water Quality Criteria (U.S. EPA 2012).

Flow Regime

The flow regime for the NBWW study area during the period of January 1 – December 31 for both years of NBWW monitoring during 2018 and 2019 is depicted in Figure 4 based on the gages operated by the U.S. Geological Survey on the West Fork North Branch Chicago River at Northbrook, IL (USGS 05535500), on the Middle Fork North Branch Chicago River at Deerfield, IL (USGS 05534500), on the Skokie River at Highland Park, IL (USGS 05535070) and on the N Br Chicago River at Niles, IL (USGS 05536000). Flows in 2018 were lower during the August and September months compared to 2019 when recurrent elevated flows occurred. Low flows were observed during the latter part of July into August during the 2018 sampling year, falling below the 90% duration value in the Middle Fork North Branch Chicago River, Skokie River, and the West Fork North Branch Chicago River (Figure 4). Higher flows in September 2018 and 2019 exceeded the flood stage in the Skokie River and Middle Fork North Branch Chicago River. These elevated flows and high flows in June and July prevented a second fish pass in 2019 at all sites and at MF19 in 2018. Flows were sufficiently “normal” in mid-July and August.

Point Source Effluent Quality

Point source discharges of treated wastewater are a major contribution of pollutant loadings in the West Fork North Branch Chicago River and the Skokie River with design average flows of 17.8 MGD and 3.0 MGD (27.5 cubic feet/second and 4.6 cubic feet/second) contributed by the Clavey Rd. WRF and the Deerfield WRF, respectively (Table 3). The 2018 discharge for the Clavey Rd. WRF averaged 12.9 MGD (19.96 cfs) and the Deerfield WRF averaged 2.3 MGD (3.55 cfs). These totals are 33.6 times the $Q_{7,10}$ flow of 0.7 cfs for the Skokie River at Highland Park, IL and 10.7 times the $Q_{7,10}$ flow of 2.2 cfs of the West Fork North Branch Chicago River at Northbrook, IL. The 2019 average discharges averaged 17.0 MGD (26.3 cfs) for the Clavey Rd. WRF and 2.9 MGD (4.48 cfs) for the Deerfield WRF. These are 44 times the Q710 flow of 0.7 cfs for the Skokie River at Highland Park, IL and 14 times the $Q_{7,10}$ flow of 2.2 cfs of the West Fork North Branch Chicago River at Northbrook, IL. As a result of these discharges, the Skokie River and the West Fork North Branch Chicago River are "effluent dominated" where the total flow consists primarily of treated wastewater (Onnis-Hayden et al. 2006). The Deerfield WRF and Clavey Rd. WRF are the only two WWTPs in the NBWW survey area and provide the major portion of the low flows of their respective receiving streams. Summaries of the 2018 and 2019 effluent flow and loads from each facility appear in Table 3 and Figure 5.

North Shore Water Reclamation District (NSWRD) Clavey Road WRF

The North Shore Water Reclamation District (NSWRD) Clavey Rd. WRF discharged an annual flow of 12.9 MGD in 2018 and 17.0 MGD in 2019 (NPDES Permit No. IL0030171; Table 3). The Clavey Rd. WRF discharges to the Skokie River downstream of the Skokie Lagoons, upstream of the confluence with the Middle Fork North Branch Chicago River. The design average flow (DAF) for the facility is 17.8 MGD and the design maximum flow (DMF) is 28 MGD. Treatment consists of screening, grit removal, floating and settled solids removal, sedimentation filtration, sludge handling, biological nutrient and ammonia removal, and ultraviolet disinfection. In terms of effluent, in 2018 the Clavey Rd. WRF discharged $CBOD_5$ (118.1 lbs./day), TSS (139.3 lbs./day), NH_3-N (5.7 lbs./day), NO_3-N (2082.5 lbs./day), and P (69.1 lbs./day). In 2019 $CBOD_5$ (138.5 lbs./day), TSS (232.9 lbs./day), NH_3-N (7.4 lbs./day), NO_3-N (1852.6 lbs./day), and P (204.3 lbs./day) were discharged into the Skokie River.

Village of Deerfield WRF

The Village of Deerfield Water Reclamation Facility (NPDES Permit No. IL0028347) discharged an annual flow of 2.3 MGD in 2018 and 2.9 MGD in 2019. The Deerfield WRF discharges into the West Fork North Branch Chicago River 0.4 miles upstream of the Lake and Cook Counties boundary line. The design average flow (DAF) for the facility is 3.5 MGD and the design maximum flow (DMF) is 9.2 MGD. Treatment consists of screens, comminutor, aerated grit tank, primary clarifiers, trickling filters, activated sludge, final clarifiers and UV disinfection.

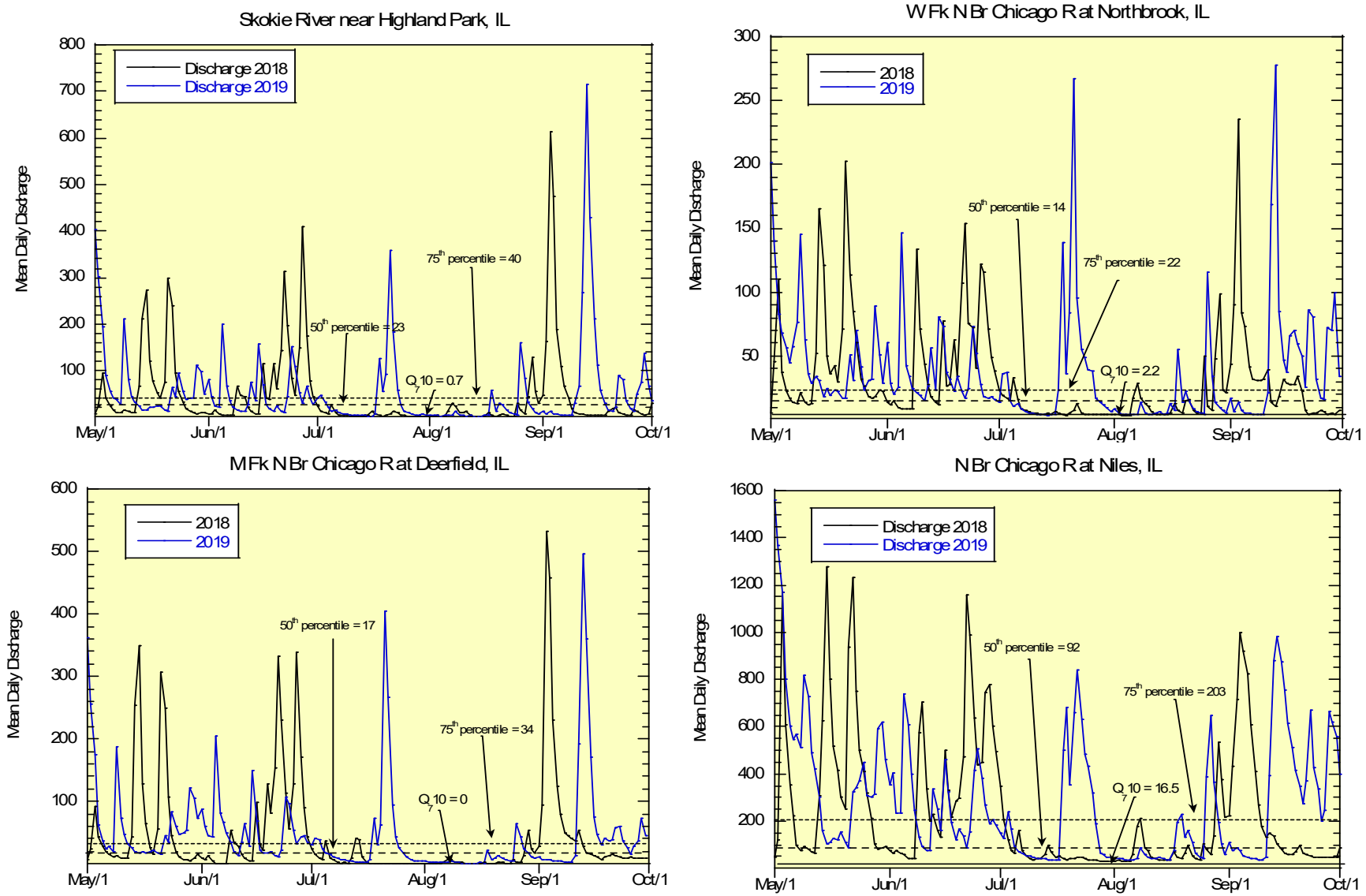


***Figure 4**. Daily flow measured at the USGS gages on the Skokie River (USGS 05535070, upper left) near Highland Park, the West Fork North Branch Chicago River (USGS 05535500, upper right) near Northbrook, the Middle Fork North Branch Chicago River (USGS 05534500, lower left) at Deerfield, and the North Branch Chicago River at Niles (USGS 05536000, lower right) for the years of 2018 and 2019. The horizontal lines are the 75thpercentile, 50thpercentile, and the seven-day, ten year (Q7,10) critical low flows.*



***Figure 5**. Proportions of effluent flow (MGD) and pollutant loadings (lbs./day) discharged by two major WWTPs to the NBWW survey area in 2018 and 2019. Proportions and loadings are based on the annual averages of each parameter. Discharges are listed in the inset table (bottom right).*

Facility	Flow (MGD)	$CBOD_5$ (lbs/day)	TSS (lbs/day)	NH_3-N (lbs/day)	NO3 - N (lbs/day)	Total P (lbs/day)
2019						
Clavey Rd. WRF	17.0	138.5	232.9	7.4	1,852.6	204.3
Deerfield WRF	2.9	55.1	121.4	2.6	193.4	32.0
2018						
Clavey Rd. WRF	12.9	118.1	139.3	5.7	2,082.5	69.1
Deerfield WRF	2.3	64.7	114.9	3.8	265.6	42.5

Water Column Chemistry

The water column chemistry results were analyzed for spatial (longitudinal) patterns resulting from the pollution survey design in the North Branch Chicago River and its tributaries. The results were screened for exceedances of Illinois WQS, Illinois non-standard benchmarks, regional reference benchmarks, and most commonly for exceedances of the tiered biological effect thresholds derived from the NE Illinois IPS (Appendix A; Tables 7 and 8). Exceedances of these benchmarks and thresholds are indicated on the plots and tables of the 2018-2019 chemical results.

Exceedances of Biological Effect and Reference Thresholds

The principal purpose of chemical sampling in a bioassessment is to provide data that supports the interpretation and the assignment of associated causes of biological impairments. Chemical exceedances of biological effect thresholds is essential to that process and has previously included the Illinois water quality criteria, regional reference benchmarks, and national and regional biological effects compendia. Some consist of correlations between concentrations of substances that correspond to biological quality gradients across wide geographical areas while others are toxicological endpoints derived from laboratory studies. Two regional studies that have been used include correlative effects levels of different chemicals by the DuPage River Salt Creek Workgroup (DRSCW; Miltner et al. 2010) in northeastern Illinois and the Metropolitan Sewer District of Greater Cincinnati (MSDGC; MBI2015) in southwest Ohio. NOAA Screening Quick Reference Tables (SQRT; Buchman 2008) were also used especially for chemicals that are not included in the Illinois WQS.

The NE Illinois IPS (MBI 2020a) thresholds for water column chemical parameters that are applicable to assessing the results in the NBWW study area appear in Table 7. Sediment chemical thresholds are provided in Table 8 and were also evaluated against threshold and probable effect levels (TEL and PEL) established by MacDonald et al. (2000) and elevation levels by Illinois EPA (Short 1998). NE Illinois IPS thresholds derived for water column chemicals, sediment chemistry, and habitat and land use variables also appear in Appendix A. The severity of exceedances of these values offered by the multiple narrative classes (i.e., excellent, good, fair, poor, and very poor) were used to support the assignment of causes of biological impairment provided that there was a logical linkage of an exceedance with a biological impairment. The chemical results are also displayed graphically for selected parameters and in tables of exceedances of the IPS and other relevant effect thresholds for selected parameter groups for both water column and sediment chemistry results. With the exception of D.O. there were no exceedances of the parameters that have Illinois EPA water quality criteria.

Demand and Nutrient Related Parameters

Demand and nutrient parameters consist of those related to the discharges of treated and untreated sewage, organic enrichment from point and nonpoint sources, nutrient parameters and their effects, and physical parameters such as total suspended solids and temperature.

Table 7. *Biological effect thresholds derived from Northeast Illinois streams and rivers for selected water column parameters as part of the NE Illinois IPS model and used to assess chemical sample results from the NBWW study area. The most limiting of the fish or macroinvertebrate assemblages for each parameter are indicated along with thresholds for excellent, good, fair, poor, and very poor biological condition. The goodness of fit score (FIT) and reference site values are also provided.*

Parameter Code	Variable Name	Units	Parameter Group	Limiting Assemblage	FIT Score	Sample N	Thresholds by Narrative Condition Category					Reference Site Values (Median-2X IQR)	Reference Site N
							Excellent	Good	Fair	Poor	Very Poor		
P665	Total Phosphorus	mg/L	Nutrients	Fish	0.04	1464	≤0.106	>0.106	>0.277	>1.002	>1.726	0.088 (0.062-0.115)	35
P94	Conductivity	µS/cm	Ionic	Fish	0.05	1464	≤739	≥739	>1038	>1208	>1378	922 (705-1158)	40
P70300	Total Dissolved Solids	mg/L	Ionic	Fish	0.10	1464	≤453.8	>453.8	>558.0	>651.2	>744.5	614 (512-664)	28
DO_MIN	Minimum DO	mg/L	Demand	Macros	0.10	985	>8.0	≥6.5	>5.47	<4.44	<3.4	8.6 (6.5-9.6)	29
P1092	Zinc, Total	µg/L	Metal_Tox	Fish	0.13	1464	≤7.47	>7.47	>9.78	>11.00	>12.22	2.0 (2.0-7.0)	23
P625	Total Kjeldahl Nitrogen	mg/L	Demand	Macros	0.14	985	≤1.07	>1.07	>1.12	>1.63	>2.14	0.74 (0.30-0.99)	30
P940	Chloride, Total	mg/L	Ionic	Fish	0.17	1464	≤40.00	>40.00	>120.0	>184.9	>249.8	154 (80.3-171.3)	33
P310	BOD (5-Day)	mg/L	Demand	Macros	0.21	985	≤1.30	>1.30	>2.35	>3.45	>4.54	2 (2.0-2.2)	27
P610	Total Ammonia	mg/L	Nutrients	Macros	0.28	985	≤0.084	>0.084	>0.100	>0.190	>0.280	0.1 (0.10-0.10)	34
P630	Nitrate-N	mg/L	Nutrients	Fish	0.29	1464	≤3.767	>3.767	>5.045	>7.344	>9.643	0.39 (0.29-0.97)	32
P929	Sodium, Total	mg/L	Ionic	Fish	0.29	1464	≤16275	>16275	>45000	>79056	>113112	14200 (10375-22500	21
P530	Total Suspended Solids	mg/L	Demand	Fish	0.32	1464	≤17.50	>17.50	>31.60	>35.15	>38.69	9.2 (5.4-20.3)	33
P1027	Cadmium, Total	µg/L	Metal_Tox	Fish	0.93	1464	≤0.937	>0.937	>0.974	>0.983	>0.991	<MDL (0.17)	23
DO_MAX	Maximum DO	mg/L	Demand	Macros	0.94	985	≤10.36	≥10.36	>12.21	>14.24	>16.28	8.74 (8.21-9.45)	29
P1042	Copper, Total	µg/L	Metal_Tox	Fish	1.75	1464	--	≤4.480	>4.480	>4.969	>5.458	2.00 (1.96-4.15)	22
P1051	Lead, Total	µg/L	Metal_Tox	Macros	2.11	985	≤2.851	>2.851	>3.335	>3.884	>4.434	0.24 (0.20-0.57)	23
P82078	Turbidity	NTU	Demand	Macros	2.61	985	--	≤19.3	>19.3	>25.9	>32.5	11.0 (4.5-24.5)	7
P1055	Manganese, Total	µg/L	Metal_Tox	Macros	2.74	985	≤53.71	>53.71	>77.03	>107.1	>137.2	32.0 (24.1-38.2)	23
P549	Volatile Suspended Solids	mg/L	Demand	Fish	2.81	1464	≤5.000	>5.000	>7.769	>9.825	>11.88	6.0 (4.8-7.4)	5
P1067	Nickel, Total	µg/L	Metal_Tox	Macros	3.26	985	--	≤3.470	>3.470	>9.585	>15.70	5 (1.5-21)	14
P945	Sulfate, Total	mg/L	Ionic	Macros	6.49	985	≤58.27	>58.27	>73.10	>83.45	>93.81	74.6 (61.8-81.8)	4
P1002	Arsenic	µg/L	Metal_Tox	Macros	9.19	985	--	≤3.616	>3.455	>5.029	>6.603	Insufficient Data	
P937	Potassium, Total	mg/L	Ionic	Macros	10.13	985	≤3158	>3158	>6300	>7718	>9129	2400 (1574-2817)	21
P1007	Barium, Total	µg/L	Metal_Tox	Fish	4.77	1464	≤74.1	>74.09	>84.88	>101.8	>118.6	56.3 (44.3-64.7)	21
P1034	Chromium, Total	µg/L	Metal_Tox	Fish	10.17	1464	≤1.398	>1.398	>1.540	>2.682	>3.824	1.73 (1.30-2.00)	6
P1082	Strontium	µg/L	Metal_Tox	Fish	2.69	1464	≤169.1	>169.1	>190.8	>280.4	>370.1	150 (135-181)	21
P1105	Aluminum, Total	µg/L	Metal_Tox	Fish	4.54	1464	≤310.0	>310.0	>393.3	>560.2	>727.0	200 (128-449)	21
P916	Calcium, Total	mg/L	Ionic	Fish	Unimodal	1464	≤84425	>84425	>86067	>86313	>86559	54,000 (80-74,250)	21
P299	Mean Dissolved Oxygen	mg/L	Demand	Macros	0.21	985	≥9.42	<9.42	<9.25	<6.11	<3.05	8.6 (7.9-9.0)	40
P615	Nitrite-N	mg/L	Nutrients	Macros	0.41	985	≤0.014	>0.014	>0.040	>0.068	>0.096	0.01 (0.01-0.01)	27
P720	Cyanide, Total	µg/L	Metal_Tox	Macros	5.17	985	≤8	>8	>10	>10	>10	3 (2-10)	6

***Table 8**. Biological effect thresholds derived from Northeast Illinois streams and rivers for selected sediment chemical parameters as part of NE Illinois IPS model and used to assess chemical sample results from the NBWW study area. The most limiting of the fish or macroinvertebrate assemblages for each parameter are indicated along with thresholds for excellent, good, fair, poor, and very poor biological condition. The goodness of fit score (FIT) and reference site values are also provided.*

Parameter Code	Variable Name	Units	Parameter Group	Limiting Assemblage	FIT Score	Sample N	Thresholds by Narrative Condition Category					Reference Site Values Median (IQR)
							Excellent	Good	Fair	Poor	Very Poor	
P1093	Zinc	mg/kg	Metal_Tox	Macros	2.22	985	≤75.00	>75.00	>100.0	>133.9	>167.8	
P34524	Benzo(g,h,i)perylene	µg/kg	PAH	Macros	2.32	985	--	< 335.0	>335.0	>792.1	>1249	
P34406	Indeno(1,2,3-cd)pyrene	µg/kg	PAH	Macros	2.41	985	--	< 260.5	>260.5	>623.3	>986.2	
P1043	Copper	mg/kg	Metal_Tox	Macros	2.42	985	≤19.00	>19.00	>29.78	>40.45	>51.12	
P34233	Benzo(b)fluoranthene	µg/kg	PAH	Macros	2.51	985	--	<520.8	>520.8	>1437	>2354	
P1068	Nickel	mg/kg	Metal_Tox	Macros	2.67	985	--	<19.50	>19.50	>22.52	>25.53	
P34250	Benzo(a)pyrene	µg/kg	PAH	Macros	2.85	985	--	<230.0	>230.0	>798.3	>1367	
P34472	Pyrene	µg/kg	PAH	Macros	2.85	985	--	< 393.0	>393.0	>1570	>2747	
P1052	Lead	mg/kg	Metal_Tox	Macros	3.01	985	≤15.50	>15.50	>24.80	>33.04	>41.27	
P34529	Benzo[a]anthracene	µg/kg	PAH	Macros	3.48	985	--	< 239.0	>239.0	>699.4	>1160	
P34323	Chrysene	µg/kg	PAH	Macros	3.51	985	--	<266.0	>266.0	>958.3	>1651	
P34379	Fluoranthene	µg/kg	PAH	Macros	3.91	985	--	<774.0	>774.0	>2432	>4091	
P1083	Strontium	mg/kg	Metal_Tox	Macros	4.44	985	--	<81.80	>81.80	>106.8	>131.9	
P34559	Dibenz(a,h)anthracene	µg/kg	PAH	Macros	4.57	985	--	< 101.0	>101.0	>167.3	>233.7	
P34223	Anthracene	µg/kg	PAH	Macros	5.10	985	--	<78.00	>78.00	>119.9	>161.8	
P34464	Phenanthrene	µg/kg	PAH	Macros	5.10	985	--	< 243.5	>243.5	>803.3	>1363	Insufficient Data
P1003	Arsenic	mg/kg	Metal_Tox	Macros	6.21	985	--	≤8.65	>8.65	>15.82	>23.67	
P1029	Chromium	mg/kg	Metal_Tox	Macros	6.29	985	≤20.53	>20.53	>23.30	>26.22	>29.15	
P1053	Manganese	mg/kg	Metal_Tox	Macros	7.08	985	≤841.0	>841.0	>845.5	>996.8	>1148	
P1078	Silver	mg/kg	Metal_Tox	Macros	7.11	985	--	<0.483	>0.483	>1.261	>2.039	
P1108	Aluminum	mg/kg	Metal_Tox	Macros	8.26	985	--	<6480	>6480	>8272	>10064	
P1008	Barium	mg/kg	Metal_Tox	Macros	8.88	985	--	≤141.0	>132.0	>150.3	>168.7	
P1028	Cadmium	mg/kg	Metal_Tox	Macros	11.00	985	--	≤0.933	>0.745	>1.354	>1.963	
P1013	Beryllium	mg/kg	Metal_Tox	Macros	ND[a]	985	--	≤0.411	>0.411	>0.496	>0.581	
P1103	Tin	mg/kg	Metal_Tox	Macros	ND	985	--	<8.86	>11.00	>16.73	>24.60	
P34203	Acenaphthylene	µg/kg	PAH	Macros	ND	985	--	<86.38	>86.38	>103.6	>120.9	
P34208	Acenaphthene	µg/kg	PAH	Macros	ND	985	--	<84.25	>84.25	>104.8	>125.3	
P34262	Delta-BHC	µg/kg	PAH	Macros	ND	985	--	<2.098	>2.098	>6.19	>10.28	
P34384	Fluorene	µg/kg	PAH	Macros	ND	985	--	<84.25	>84.25	>104.8	>125.3	
P34445	Naphthalene	µg/kg	PAH	Macros	ND	985	--	< 86.38	>86.38	>103.6	>120.9	

[a] - Not determined (ND) due to a high number of non-detects

Dissolved Oxygen (D.O.)

Exceedances of dissolved oxygen (D.O.) were assessed with continuous data obtained from Datasonde deployments during August. Short-term deployments of Datasonde continuous recorders in mid-August 2018 and 2019 recorded exceedances of parts of the Illinois EPA D.O. criteria (Figure 6). All of the deployments were made after August 1 hence the minimum was evaluated against the 3.5 mg/L criterion and the 6 mg/L 7-day average criterion. Exceedances of the 3.5 mg/L minimum criterion occurred at five (5) sites and were most pronounced in the West Fork of the North Branch at WF21 (RM 10.4) where half of the values were below 3.5 mg/L (Figure 6). Exceedances of the minimum also occurred in the Skokie River at SR1 (RM 21.1) and in the Skokie Lagoons (SR7, RM 3.0), in the Middle Fork of the North Branch at MF10 (RM 16.7), and in the West Fork of the North Branch downstream of the Clavey Rd. WRF (WF23, RM 4.9; Figure 6). Median values were used to assess exceedances of the 6.0 mg/L average criterion which occurred at all except for three (3) sites. Of these the median value of 3.5 mg/L at WF21 was the largest exceedance of the average criterion. Only three sites MF10, SR7, and WF23 had diel fluctuations at or more than 6.5 mg/L. This further evaluated as symptom of excessive nutrient enrichment in the modified SNAP assessment.

Skokie River

Ammonia-Nitrogen (N)

Most ammonia-N concentrations in 2018 were either just above or below the NE Illinois IPS good threshold of 0.15 mg/L at all sites with no values that exceeded the fair threshold (Figure 7). Values ranged from excellent to fair with fair values located at SR2, SR3 and SR7 in the Skokie Lagoons, and downstream of the Skokie Lagoons (SR18; Figure 7). The 2019 ammonia concentration levels were observed at higher levels throughout the Skokie River (Figure 7). Concentration levels were generally fair except for SR6, downstream of the Clavey Rd. WRF, exceeding the fair threshold of <0.19 mg/L (Figure 7). Increased precipitation during 2019 triggered higher ammonia concentrations throughout the Skokie River indicates that the sources are likely non-point sources. Ammonia concentration levels did not exceed Illinois WQS criteria during either survey.

Total Phosphorus

Median concentrations of total phosphorus (P) in 2018 were consistently low and in the excellent range except for the lowermost site on the Skokie River (SR18). The median concentration exceeded the excellent threshold, but was within the good range (Figure 8). 0.106 mg/L threshold at all sites (Figure 8). The Clavey Rd. WRF had a minimal, yet measurable influence on TP concentrations in the Skokie River. The role of TP (and other indicators) as a contributor to overall nutrient enrichment effects was evaluated as part of the modified SNAP procedure (Ohio EPA 2015b) discussed later. Median concentrations of TP in 2019 were consistently excellent in the Skokie River below the 0.106 mg/L threshold at all sites (Figure 8).

Total Nitrate-N (NO_3-N)

Median nitrate levels in 2018 were consistently low and ranged from good to excellent at all

sites in the Skokie River (Figure 9). All sites were well within the excellent threshold of 3.767 mg/L except SR18 downstream of the Skokie Lagoons which did not exceed the narrative good rating (Figure 9). In 2019 the Skokie River nitrate concentrations were generally excellent except the site downstream of the Skokie Lagoons which exceeded 5.050 mg/L and rated fair. Median concentrations of nitrate-N increased downstream of the Clavey Rd. WRF at the MF19 location below the outfall downstream from the Skokie Lagoons dam. The role of total nitrate-N and other indicators as a contributor to overall nutrient enrichment effects was considered as part of the modified SNAP procedure (Ohio EPA, 2015b).

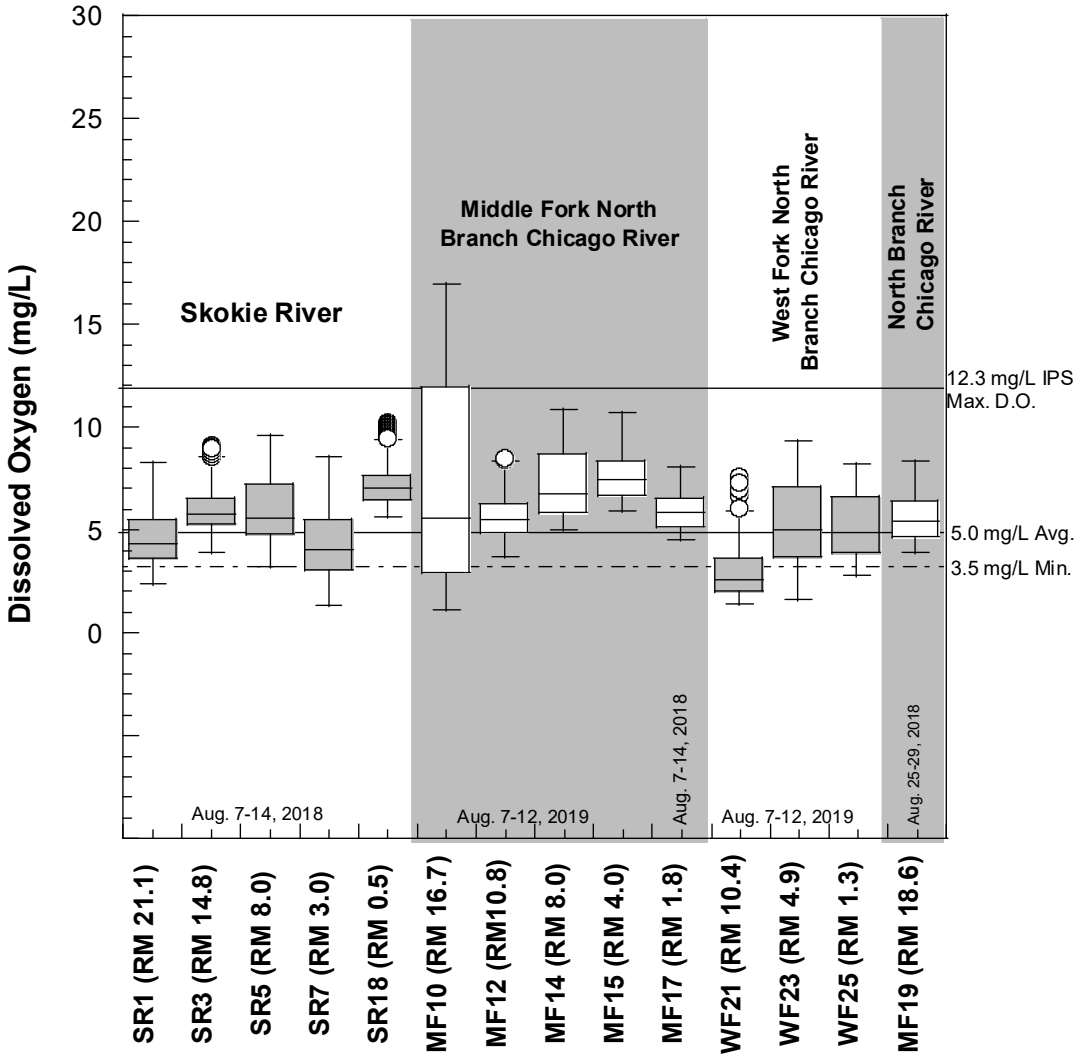


***Figure 6**. Dissolved oxygen (D.O.) concentrations (mg/L) measured continuously by Datasondes deployed for 5-7 day periods during August 7-14, 2018 and August 7-12, 2019 at 14 locations. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The Illinois EPA August-February minimum (3.5 mg/L) and the 7-day average D.O. criteria are shown by solid and dashed lines.*

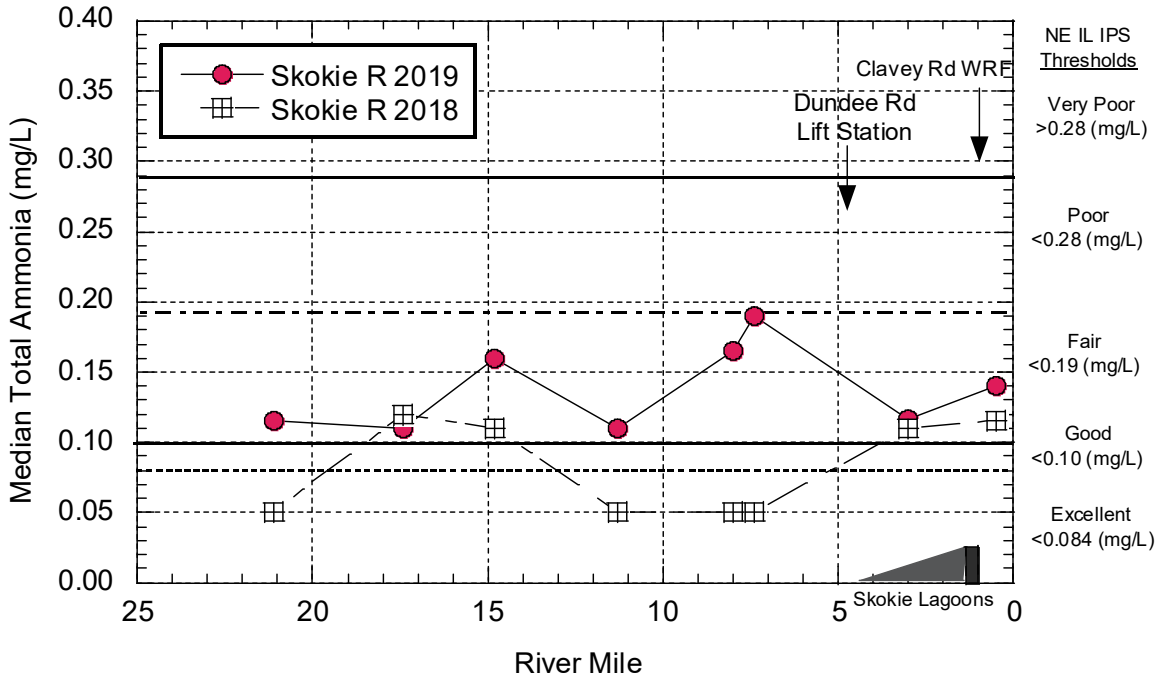


***Figure 7**. Concentrations of median ammonia-N in the Skokie River during May-October 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

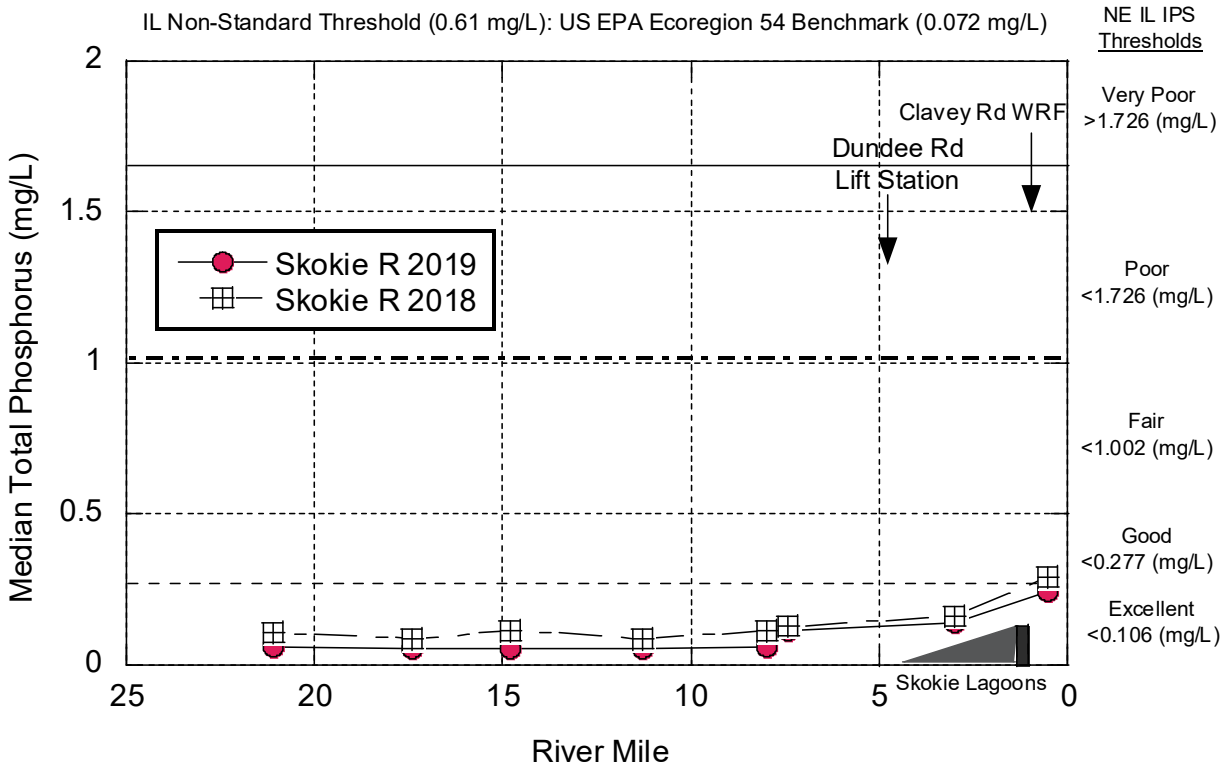


***Figure 8**. Concentrations of median total phosphorus in the Skokie River during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

Total Kjeldahl Nitrogen (TKN)

Median total organic nitrogen measured by Total Kjeldahl Nitrogen (TKN), an indicator of the living or recently dead fraction of sestonic algae, is an informative indicator of organic and nutrient enrichment. While TKN is not a direct effect parameter, it is indicative of the effects of organic enrichment by nitrogenous biomass the latter primarily resulting from increased algal biomass. The median TKN concentrations in 2018 were generally excellent, but ranged from excellent to poor (Figure 10). The Skokie River at SR4 (RM 11.3) was the only poor value observed in the 2018 sampling year. The 2018 results roughly follow ammonia concentrations, while the 2019 TKN concentrations roughly follow nitrate concentrations. The 2019 median TKN concentrations ranged from excellent to poor (Figure 10). TKN concentrations increased downstream from the Clavey Rd. WRF to poor values in the lower section of the Skokie River in the Skokie Lagoons and at SR18 (RM 0.5) in 2019 (Figure 10).

Total Suspended Solids (TSS)

Total suspended solids can indicate inorganic suspended sediment and/or organic matter in the form of sestonic algae. The median TSS values were generally poor to very poor in the Skokie River (Figure 11). The Skokie Lagoons impoundment apparently promoted to settling of suspended solids resulting in reduced TSS at SR18 (Figure 11). Median TSS values in 2019 were about one-third of the levels in 2018 with values generally ranging from excellent to good (Figure 11). Because TSS and Turbidity can also reflect the effects of nutrient enrichment they are included in the modified SNAP procedure.

West Fork North Branch Chicago River

Ammonia-Nitrogen (N)

Ammonia concentration levels in 2018 ranged from fair to excellent (Figure 12). The longitudinal plot shows that the Deerfield WRF increased ammonia concentrations in the West Fork, but not above the 0.10 mg/L IPS threshold. Two values on the lower West Fork rated fair are downstream of the Village of Glenview 1800 E Lake Ave lift station. The 2019 ammonia concentration levels were higher than 2018 values, rating from poor to good. The Deerfield WRF had a greater influence on ammonia concentrations. Downstream of the WWTP exceeded the 0.19 mg/L IPS threshold and rated poor (Figure 12). The highest median value occurred immediately downstream of the Village of Glenview lift station. There were no ammonia values in the West Fork of the North Branch Chicago River that exceeded the Illinois WQS criteria.

Total Phosphorus

Median concentrations of phosphorus (P) in 2018 were consistently low rating good to excellent (Figure 13). The highest value exceeded the 0.106 mg/L IPS threshold at WF24 yet remained in the lower good range. Median concentrations of P in 2019 were consistently low at all sites except downstream of the Deerfield WRF (Figure 13). The highest value was observed at WF23 which exceeded the 1.020 mg/L IPS threshold for a rating of fair. A sharp decline in P concentration levels occurred from WF23 to WF24 with values decreasing to good and excellent values.

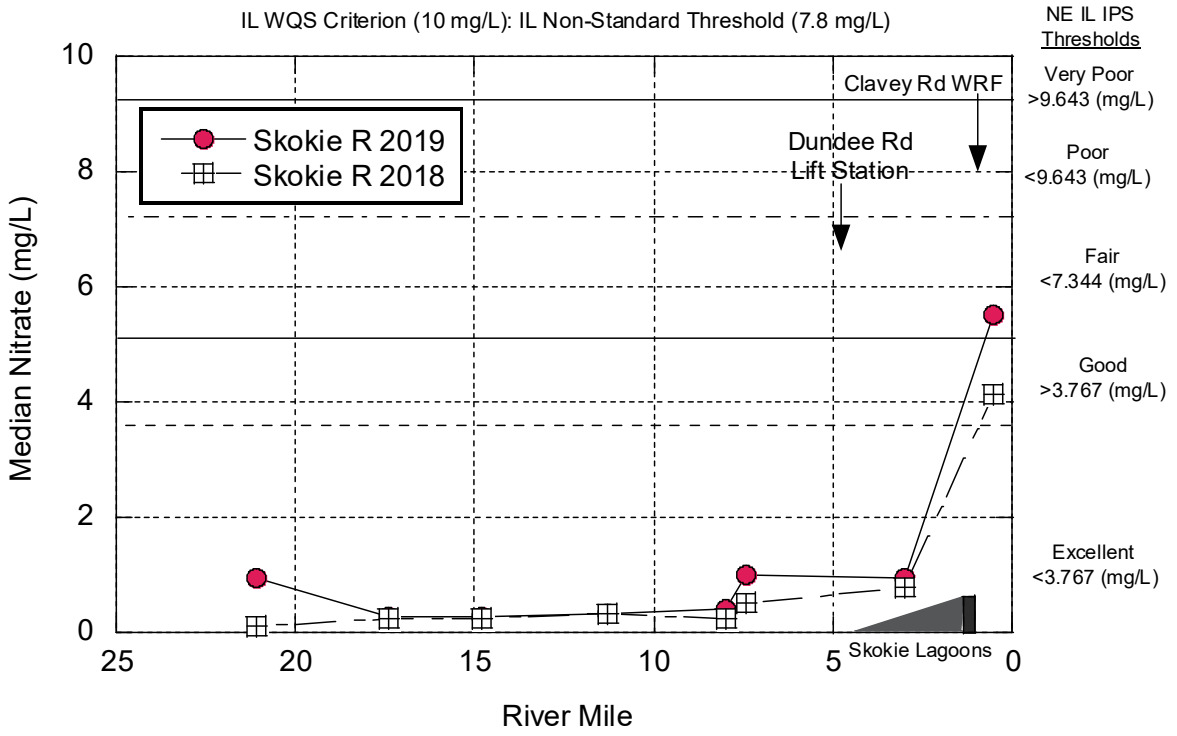


***Figure 9**. Concentrations of median total Nitrate-N in the Skokie River during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

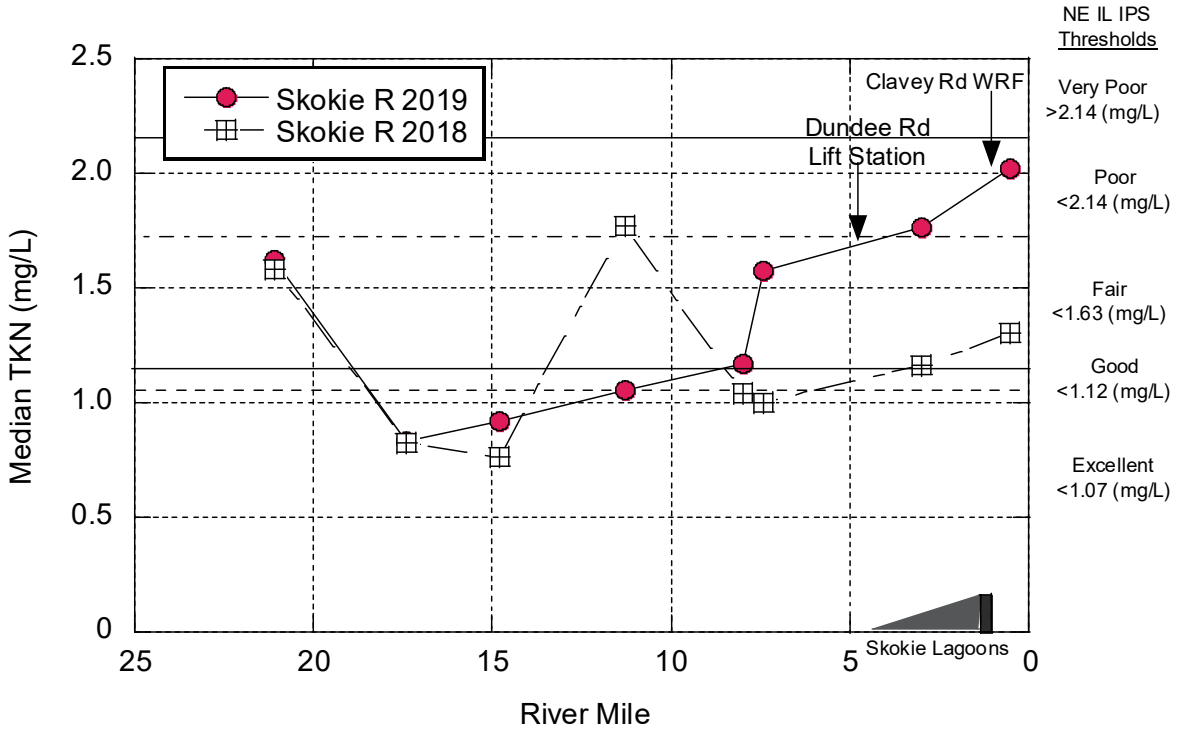


***Figure 10**. Concentrations of median total Kjeldahl nitrogen (TKN) in the Skokie River during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

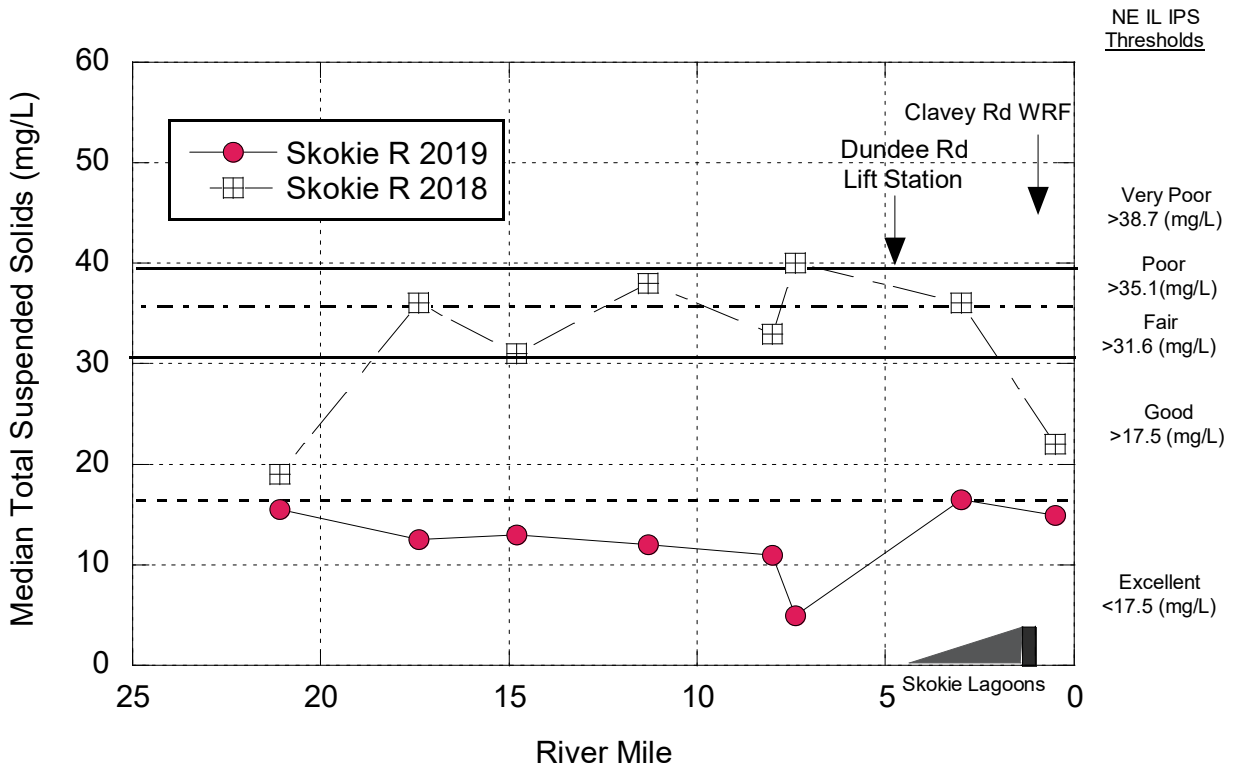


***Figure 11**. Concentrations of median total suspended solids in the Skokie River during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

Only the 2019 WF23 value exceeded the 0.61 mg/L Illinois non-standard threshold, but all values exceeded the US EPA ecoregion 54 benchmark of 0.072 mg/L (Figure 13). The Deerfield WRF has a noticeable influence on P concentrations in the West Fork with significantly greater inputs observed in 2019.

Total Nitrate-N (NO_3-N)

Median nitrate values in 2018 were excellent at West Fork sites and well within the Illinois WQS criterion of 10 mg/L (Figure 14). The highest value observed at WF22 downstream of the Deerfield WRF did not exceed the 3.767 mg/L excellent IPS threshold. Median values in 2019 ranged from fair to excellent and below the Illinois nonstandard of 7.8 mg/L. The highest value which exceeded the 5.020 mg/L good IPS threshold downstream from the Deerfield WRF. Concentrations of nitrate then fell sharply at WF24 to the excellent range.

Total Kjeldahl Nitrogen (TKN)

Median TKN concentrations ranged from fair to excellent in 2018 (Figure 15). The sites downstream of the Deerfield WRF and the Village of Glenview lift station possessed the highest observed TKN concentrations and were the lone two fair values. Median TKN concentrations in 2019 ranged from good to poor and varied longitudinally. The highest concentration was observed downstream of the Village of Glenview lift station and most closely followed the longitudinal ammonia concentration pattern.

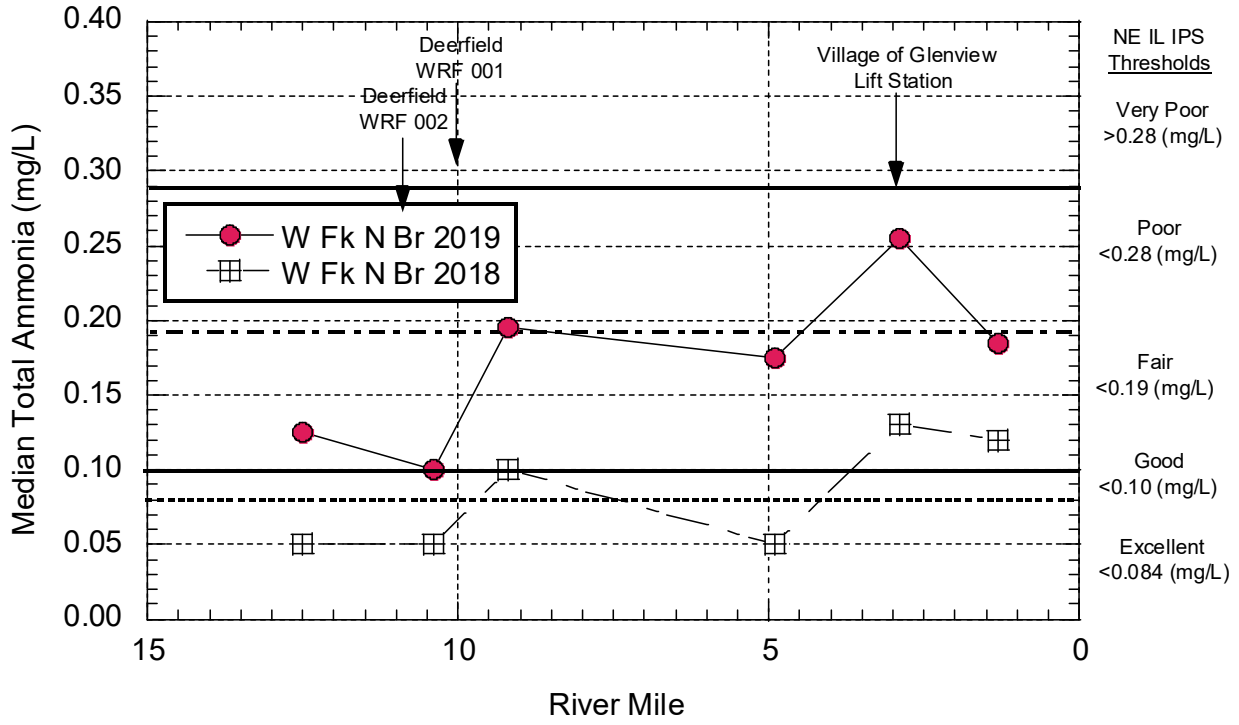


Figure 12. *Concentrations of median total ammonia-N in the West Fork North Branch Chicago River during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

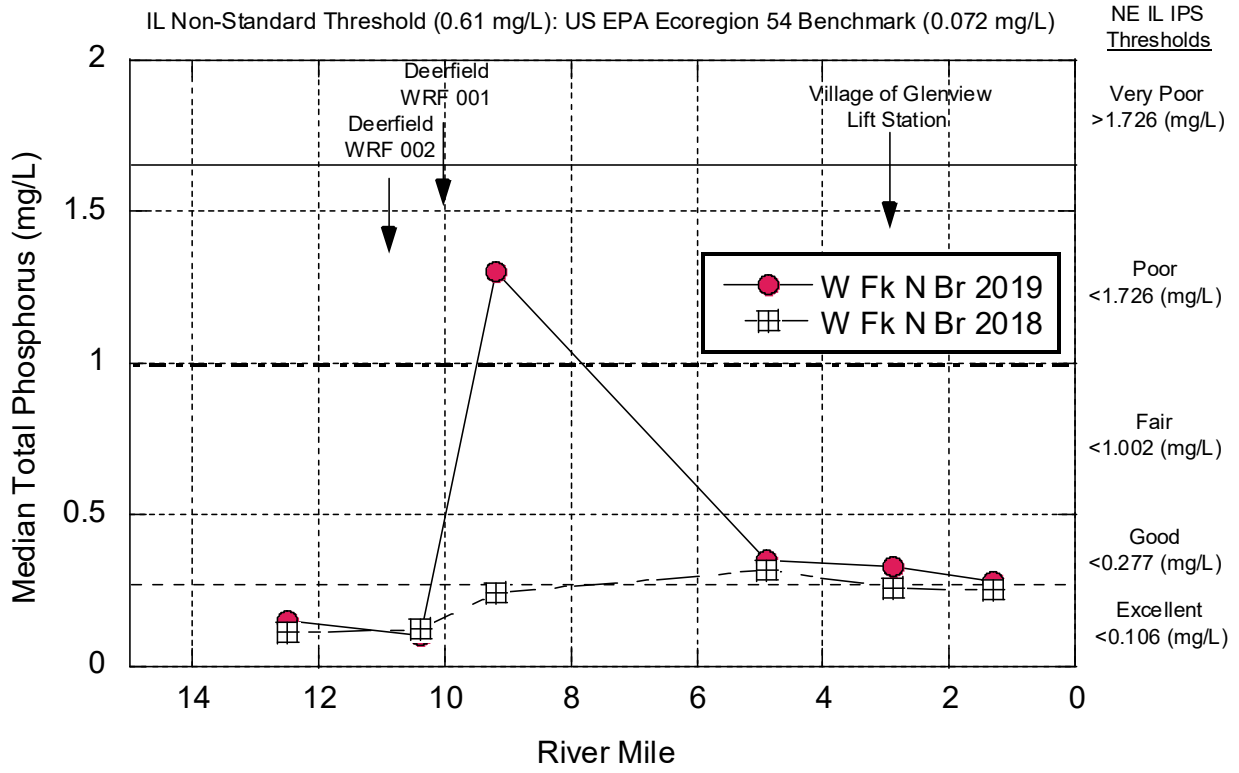


Figure 13*. Concentrations of median total phosphorus in the West Fork North Branch Chicago River during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

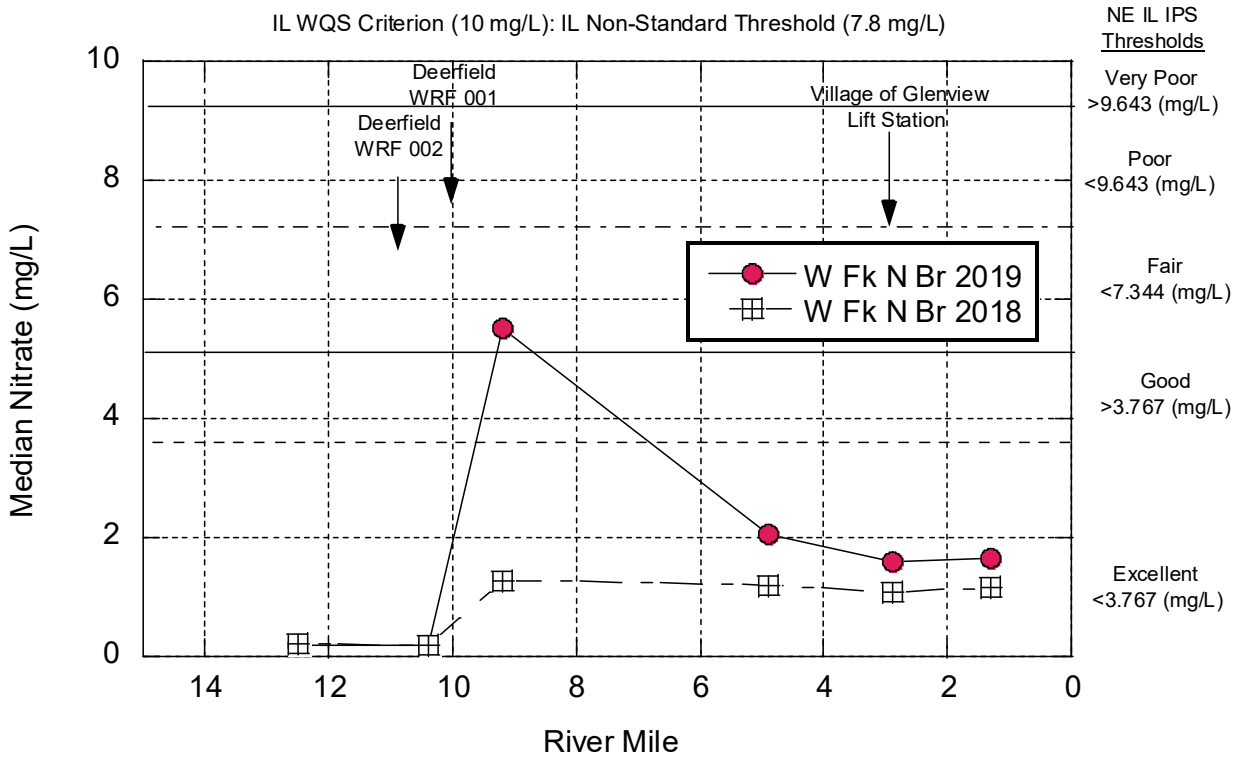


***Figure 12**. Concentrations of median nitrate-N in the West Fork North Branch Chicago River during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

Total Suspended Solids

The median TSS values were generally good in 2018 in the West Fork (Figure 16). The highest values were observed downstream of the Village of Glenview lift station and downstream of the Deerfield WRF. Concentrations of TSS in 2019 range from poor to excellent (Figure 16). The highest observed value was recorded at the most upstream site (WF20), declining to excellent upstream of the Deerfield WRF. TSS inputs from the WWTP increased concentrations to just above the 17.5 mg/L IPS threshold for excellent levels

Middle Fork North Branch Chicago River & North Branch Chicago River

Ammonia-Nitrogen (N)

Median concentrations of ammonia in 2018 did not exceed 0.05 mg/L and were excellent at all sites (Figure 17). The North Branch Chicago River site (MF19) had median ammonia concentrations that exceeded 0.10 mg/L and within the range of the fair IPS threshold. Median concentrations in 2019 ranged from excellent to fair in the Middle Fork Chicago River. The longitudinal plot indicates point source influence from the Deerfield WRF excess flow outfall 004 input in 2019. The Skokie River impacted ammonia concentration levels in the lower Middle Fork in 2019, inputting discernable amounts which decreased the rating of MF18 to fair and MF17 to good. This impacted ammonia concentrations in the North Branch, causing elevated levels compared to the upper Middle Fork.

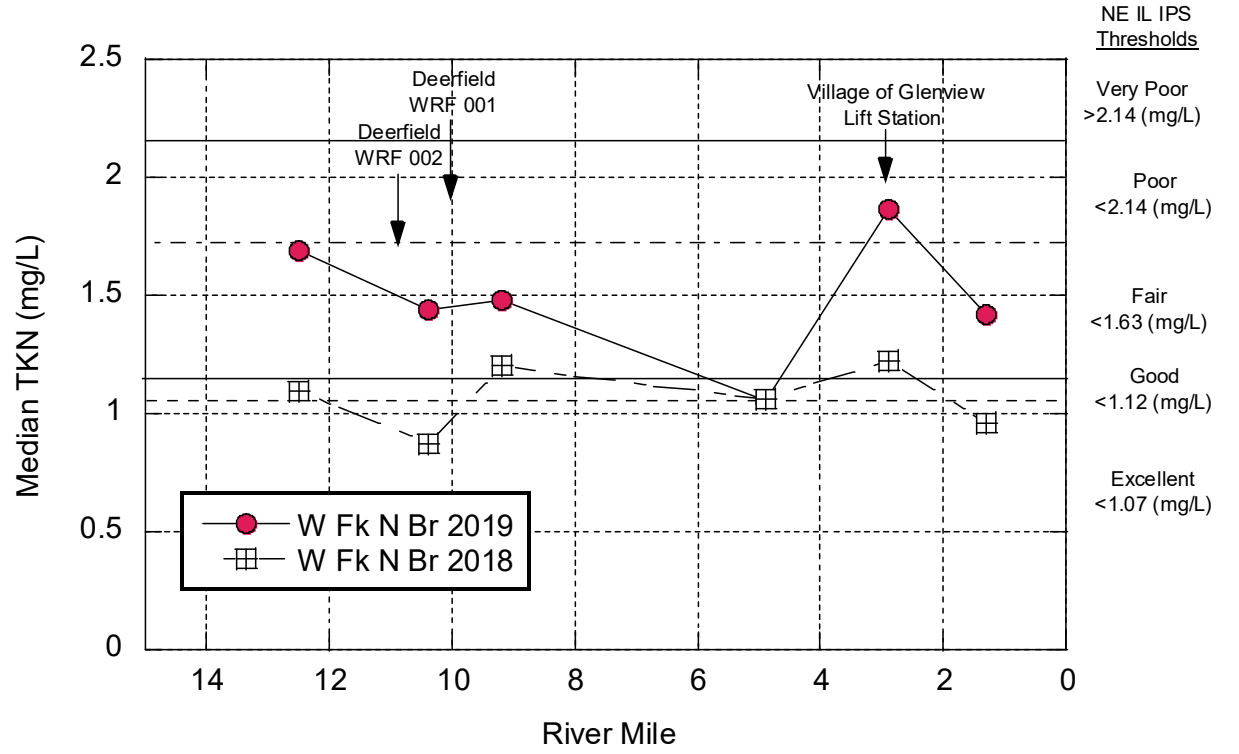


***Figure 13**. Concentrations of median total Kjeldahl nitrogen (TKN) in the West Fork North Branch Chicago River during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

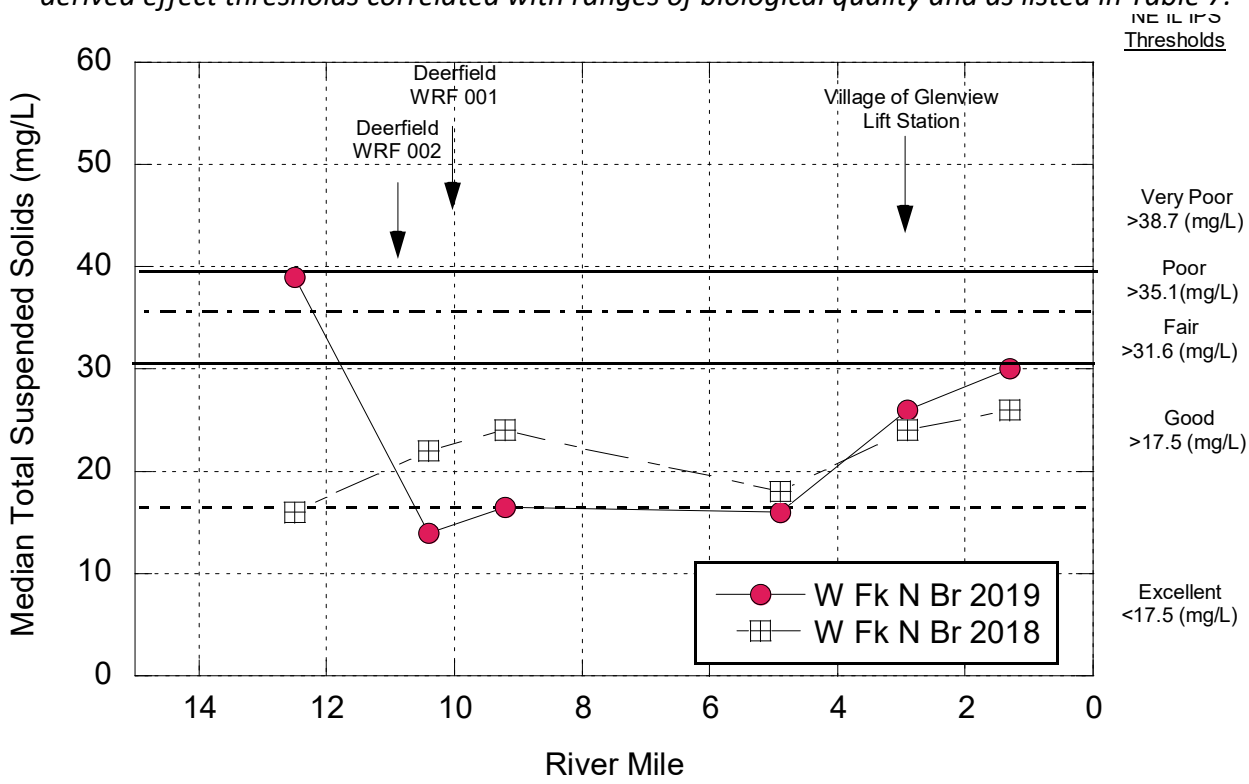


***Figure 14**. Concentrations of median total suspended solids in the West Fork North Branch Chicago River during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

The North Branch site exceeded the 0.10 mg/L fair IPS threshold. None of the exceedances were excessive, but were the only detections in the Middle Fork and North Branch.

Total Phosphorus

Median phosphorus concentrations in the Middle Fork Chicago River were excellent at all sites in 2018 (Figure 18). Highest values are observed downstream of the confluence with the Skokie River. Upstream from the Skokie River confluence values were consistently below 0.20 mg/L. The North Branch Chicago River concentration of total phosphorus remained within the excellent threshold. Median 2019 phosphorus concentrations ranged from good to excellent in the Middle Fork Chicago River (Figure 18). The lone value to exceed 0.106 mg/L is downstream of the confluence with the Skokie River. The North Branch Chicago River site phosphorus concentration levels remained excellent in 2019. No value exceeded the Illinois non-standard threshold of 0.61 mg/L, but all values exceeded the U.S. EPA Ecoregion 54 benchmark of 0.072 mg/L.

Total Nitrate-N (NO_3-N)

Nitrate concentration levels in the Middle Fork North Branch Chicago River are generally excellent on 2018 with the exception of downstream of the confluence with the Skokie River. Nitrate concentrations increased markedly and exceed the 3.767 mg/L IPS good threshold. The Middle Fork site MF 17 had the highest nitrate concentrations at the high end of the good range. The North Branch Chicago River site possessed excellent nitrate concentrations in 2018 (Figure 19). The Middle Fork North Branch Chicago River generally recorded excellent levels. Concentrations ranged from excellent to fair with the fair values downstream of the confluence with the Skokie River. The fair values caused by elevated nitrate levels in the Skokie River influenced the North Branch site. While the concentration of nitrates at MF19 are within the good range, they are considerably higher due to the Skokie River. No values exceeded the Illinois WQS criterion or the Illinois non-standard threshold.

Total Kjeldahl Nitrogen (TKN)

Median TKN concentrations in 2018 ranged from excellent to fair (Figure 20). Upstream of the confluence with the Skokie River median TKN concentrations were good to excellent. Downstream of the confluence TKN levels rose above the 1.12 mg/L good IPS threshold to the upper fair range at the lower two sites. The North Branch site appears unaffected by the influence by the Skokie River as TKN median concentration did not exceed the excellent threshold. Median TKN concentrations ranged widely in 2019 (Figure 20). Excellent, good, fair and poor median values were observed, increasing longitudinally to poor value at MF13 (RM 8.6) before declining to below the excellent threshold at MF15 (RM 4.0; Figure 20). The median TKN value in the North Branch exceeded the 1.12 mg/L threshold for good values to the low fair range. TKN median values roughly track nitrate concentrations in the Middle Fork North Branch Chicago River.

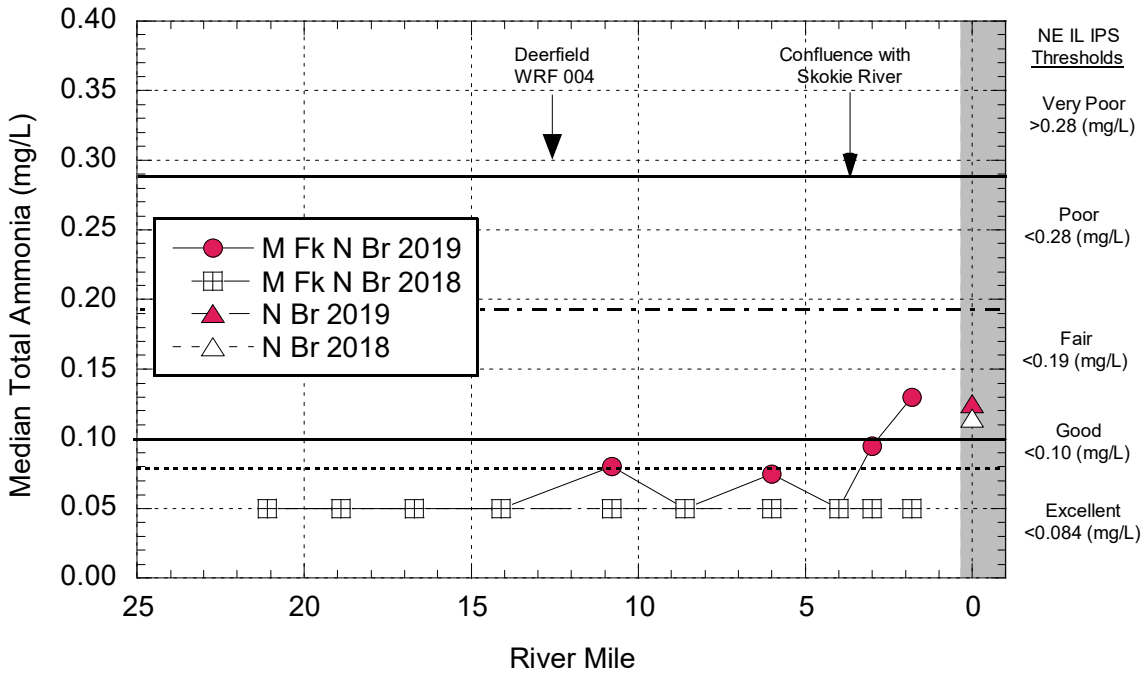


Figure 17. *Concentrations of median ammonia-N in the Middle Fork North Branch Chicago River and the North Branch Chicago River mainstem during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

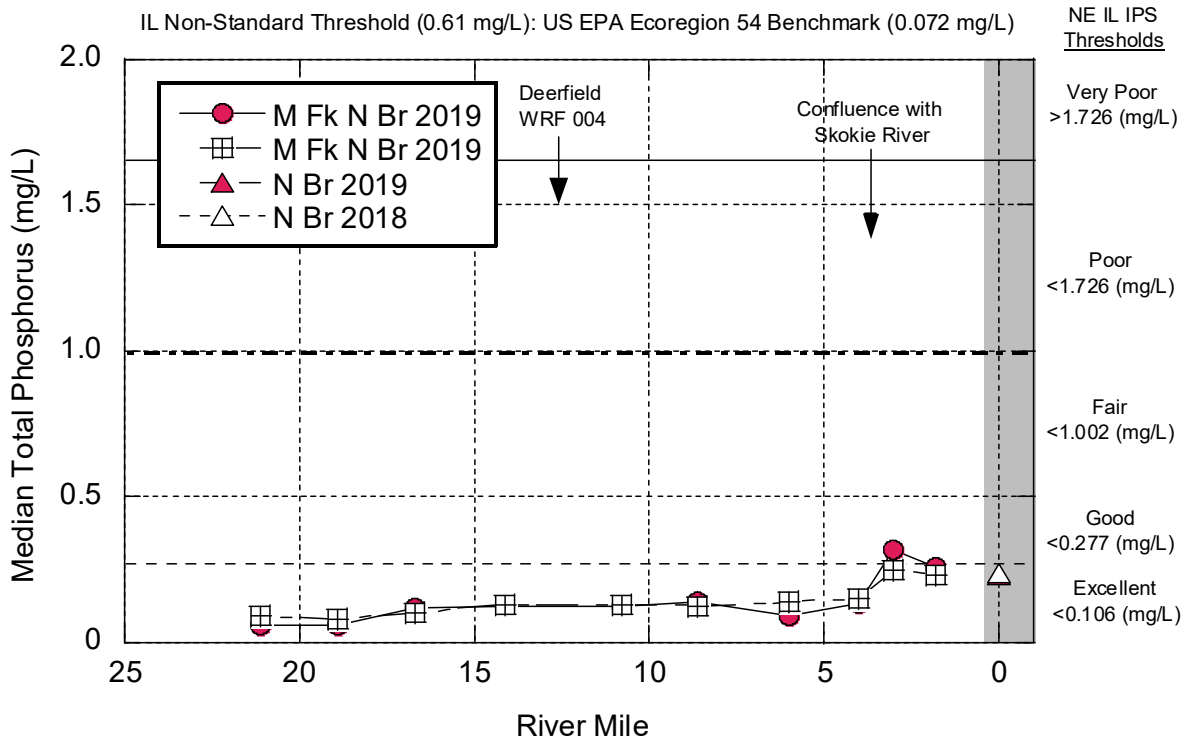


Figure 18. *Concentrations of median total phosphorus in the Middle Fork North Branch Chicago River and the North Branch Chicago River mainstem during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

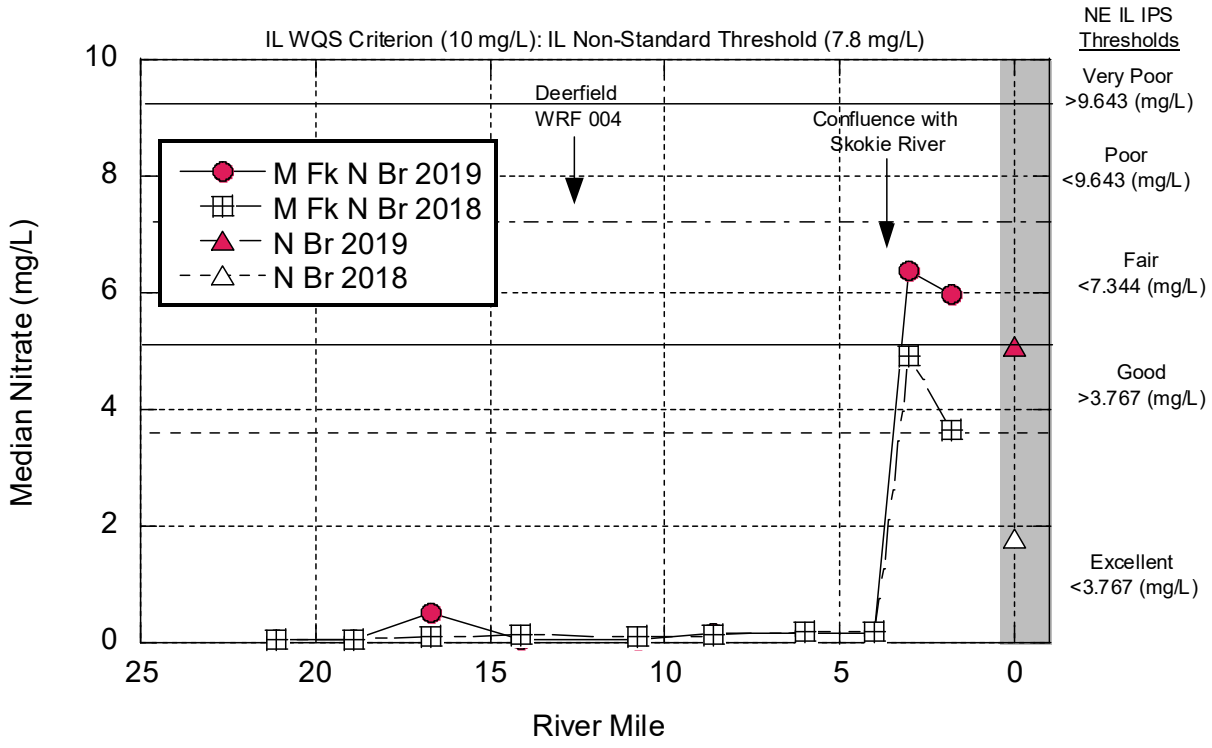


Figure 15. *Concentrations of median nitrate-N in the Middle Fork North Branch Chicago River and the North Branch Chicago River mainstem during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

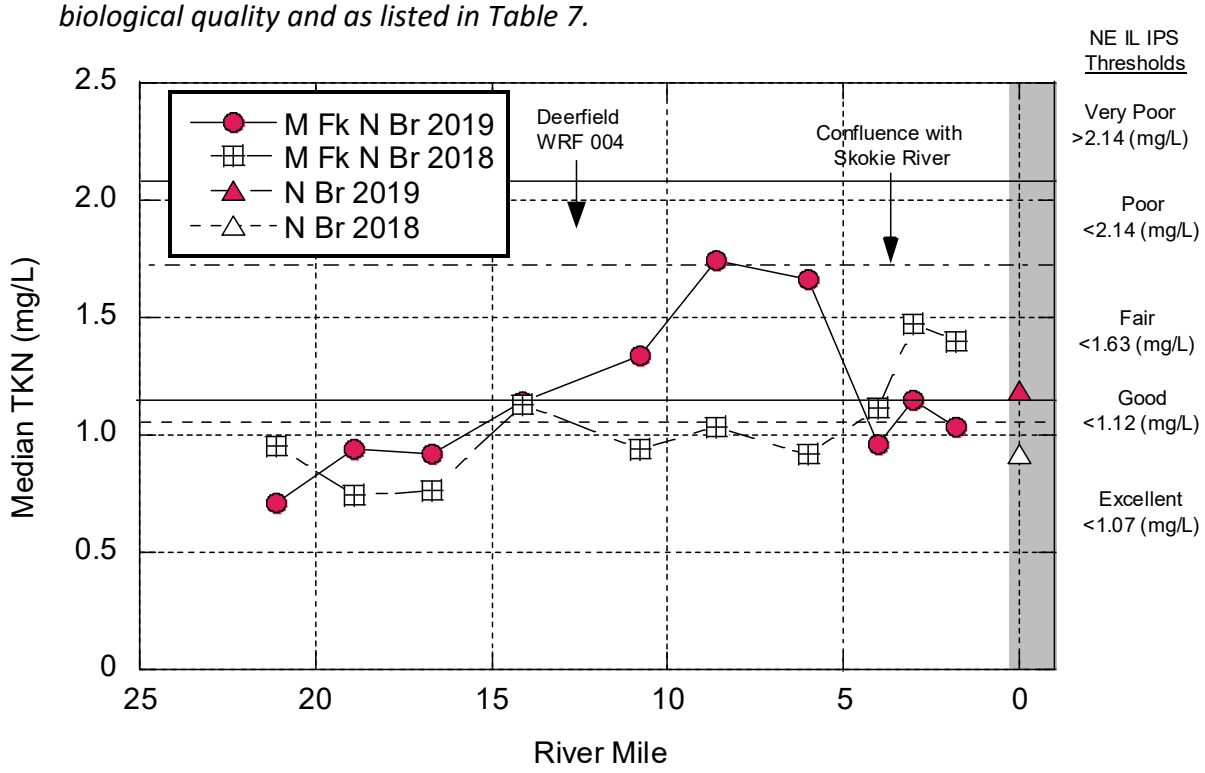


Figure 16*. Concentrations of median total Kjeldahl nitrogen in the Middle Fork North Branch Chicago River and the North Branch Chicago River mainstem during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

Total Suspended Solids (TSS)

The median TSS values were generally good in 2018 in the upper Middle Fork with fair values observed in the downstream sites that were 300% higher (Figure 21). The North Branch median TSS was recorded in the lower good range, just above the 17.5 mg/L excellent threshold. Median TSS values ranged from excellent to good and were longitudinally more variable in 2019 (Figure 21). The North Branch Chicago River median value was within the upper limits of the excellent threshold. During each of the survey years the site below the confluence with the Skokie River observed an increase in TSS in the Middle Fork. The 2018 values at the five (5) lower mainstem sites were in the fair range and higher than the 2019 results.

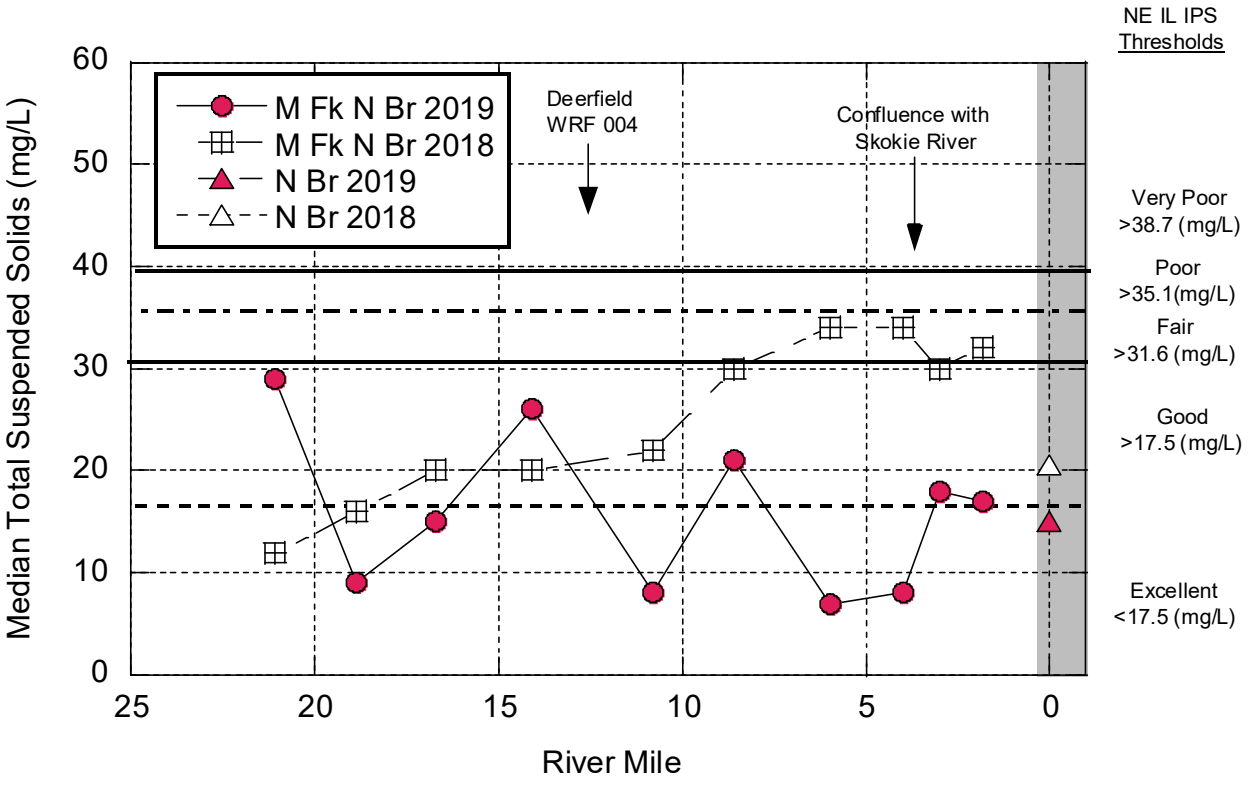


Figure 17. *Concentrations of median total suspended solids in the Middle Fork North Branch Chicago River and the North Branch Chicago River mainstem during May-October in 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

Nutrient Effects Assessment

The impact of nutrients on aquatic life has been well documented (e.g., Allan 2004), but serious attempts to derive nutrient criteria in terms of their form and application are only recently emerging. Because of the widely varying efforts to develop nutrient criteria by the States, conflicting U.S. EPA oversight, and the potential cost of additional nutrient controls, the impact of nutrients on aquatic life has been controversial (Evans-White et al. 2014). Unlike toxicants, the influence of nutrients on aquatic life is indirect and primarily via their influence on algal

photosynthesis and respiration, the resulting increased magnitude of diel D.O. swings, by the biochemical oxygen demand exerted by algal decomposition, and cascading effects therefrom. Nutrients can also affect food sources for macroinvertebrates and fish and the response of aquatic life to elevated nutrients is co-influenced by habitat (e.g., substrate composition), stream flow (e.g., scouring and dilution), temperature, and exposure of the water column to sunlight. Illinois is the leading state in terms of nitrogen (16.8%) and phosphorus (12.9%) loadings exported via the Illinois and Upper Mississippi Rivers towards the Gulf of Mexico where an anoxic zone has developed (U.S. EPA 2008). In Illinois, as in neighboring Midwestern states that drain to the Mississippi River, efforts are underway to develop and modernize nutrient water quality criteria (NSAC 2018). However, nutrient export is not the only concern – local and river reach scale impacts are also important and the focus of this evaluation is on such effects in the NBWW streams and rivers given the localized emphasis of the biological and water quality assessment.

The combined effects of nutrient enrichment were assessed to supplement the preceding descriptions of concentrations of each of the key nutrient related parameters. A multi-parameter approach modified from the Ohio SNAP method (Ohio EPA 2015a), and as described in the Methods section, was employed in a manner similar to its first use in the DRWW Years 1 and 2 study areas of the upper Des Plaines River watershed in 2017 (MBI 2018) and 2018 (MBI 2020b). The findings of the Illinois Nutrient Science Advisory Committee (NSAC 2018) were also used. A relatively new addition to the assessment of nutrient impacts is a Nutrient Ranking Index (NRI) that is part of the NE Illinois IPS outputs (MBI 2020a; Appendix E). The NRI consists of a summed ranking of each of the individual nutrient or nutrient-related stressor parameters with each weighted based on a tightness of fit coefficient (FIT). At this point it is a standalone indicator that can be compared to the modified SNAP outcome, but its application in watershed assessments is new and potentially subject to change as more is learned via future assessments.

The results are detailed in a matrix that shows the fish and macroinvertebrate IBIs, the QHEI score, total P, nitrate-N, TKN, the maximum and minimum D.O. (based on Datasondes), the width of the diel D.O. swing, benthic chlorophyll a (as biomass), and an overall rating of the degree of nutrient enrichment based on the frequency and magnitude of exceedances of thresholds for the aforementioned indicators and parameters (Table 9). The overall degree of nutrient enrichment effects are represented by five narrative ratings of Enrichment Status that results from the degree to which each of the available nutrient parameters and SNAP indicators exceeded their respective thresholds, the minimum and maximum D.O., the width of the diel D.O. swing, benthic chlorophyll a, and sestonic chlorophyll a biomass. The Highly Enriched and Enriched narratives are assigned where the indicators are exceeded in terms of the number and magnitude of exceedances and that are associated with a biological impairment. The Possibly Nutrients narrative is where there are either an insufficient number and/or magnitude of exceedances to warrant an Enriched status (see Rationale for Enrichment Status column in Table 9) thus it serves as an indication where a threat for excessive nutrient enrichment effects exist. The two Not Nutrients narratives rule out nutrient effects as a cause of impairment and are also assigned to sites with full attainment of the General Use biocriteria regardless of

***Table 9**. Results of applying an interim modified Stream Nutrient Assessment Procedure (SNAP) to 25 sites in the 2018-19 NBWW study area. Descriptions of how the results reflect the degree of nutrient enrichment and resulting assignment of enrichment status are provided at the bottom of the matrix along with the source(s) of the thresholds for each parameter. Biological sampling sites that lacked sufficient continuous D.O., chemical, and chlorophyll a data are included for comparison purposes and assessed with the available data.*

Site ID	River Mile	Drain-age Area ($mi.^2$)	Year	QHEI	AQL Attainment Status	TP (mg/L)	Nitrate (mg/L)	Max D.O. (mg/L)	Min D.O. (mg/L)	D.O. Swing (mg/L)	D.O. Swing Narrative	Benthic Chloro-phyll a (mg/m^3)	Benthic Chloro-phyll a Narrative	VSS (mg/L)	TKN (mg/L)	Sestonic Chloro-phyll a (mg/L)	Enrichment Status	Rationale for Enrichment Status
SR1	21.1	2.7	2018	33.5	NON-Poor	0.107	0.12	8.31	2.38	5.05	High	23.3	Very Low	2.5	1.58	4.2	Enriched	Min. D.O.; D.O. swing; TKN
SR2	17.4	7.8	2019	33.5	NON-Poor	0.086	0.26							9.0	0.82	3.1	Not Nutrients	VSS
SR3	14.8	11.5	2019	40.5	NON-Poor	0.110	0.25	9.09	3.91	5.07	High	31.7	Very Low	2.5	0.76	3.0	Possible Nutrients	Min. D.O.; D.O. swing
SR4	11.3	15.0	2019	47.0	NON-Poor	0.086	0.33							7.0	1.77	2.2	Possible Nutrients	TKN
SR5	8.0	20.6	2019	45.5	NON-Poor	0.110	0.26	9.62	3.25	5.77	High	44.3	Low	6.0	1.04	3.4	Possible Nutrients	Min. D.O.; D.O. swing
SR6	7.4	21.5	2019	36.3	NON-Poor	0.127	0.53							8.0	1.00	3.8	Not Nutrients	VSS
SR7	3.0	23.7	2019	32.5	(NON-Poor)	0.160	0.78	8.54	1.33	6.47	High	43.3	Low	5.0	1.16	25.0	Enriched	Min. D.O.; D.O. swing;TKN; Ses.Chloro.
SR18	0.5	30.9	2019	38.5	NON-Poor	0.290	4.13	10.24	5.64	3.99	Low	47.4	Low	6.5	1.31	14.0	Enriched	TP; TKN; Ses.Chloro.
MF8	21.1	5.8	2019	34.0	NON-Poor	0.060	0.05							1.5	0.71	5.6	Not Nutrients	Ses.Chloro.
MF9	18.9	8.9	2018	28.0	NON-Poor	0.060	0.05							1.5	0.94	3.7	Not Nutrients	none
MF10	16.7	11.9	2018	43.0	NON-Poor	0.115	0.10	16.93	1.12	15.25	Wide	20.6	Very Low	2.8	0.92	4.5	Highly Enriched	Max. D.O.,Min. D.O.; D.O. swing
MF11	14.1	16.1	2019	45.5	NON-Poor	0.120	0.12							1.8	1.14	4.3	Not Nutrients	none
MF12	10.8	19.2	2019	41.5	NON-Poor	0.125	0.11	8.5	3.72	3.64	Low	31.1	Very Low	1.5	1.34	1.1	Possible Nutrients	Min. D.O.; TKN
MF13	8.6	21.0	2019	54.5	NON-Poor	0.140	0.14							1.5	1.74	1.2	Possible Nutrients	TKN
MF14	6.0	22.5	2019	67.0	NON-Poor	0.090	0.17	10.86	5.02	5.24	High	27.9	Very Low	1.5	1.66	1.4	Possible Nutrients	D.O. swing; TKN
MF15	4.0	24.3	2019	59.0	NON-Poor	0.135	0.17	10.74	5.94	4.20	Moderate	31.3	Very Low	1.5	0.96	2.8	Possible Nutrients	D.O. swing
MF16	3.0	56.1	2019	44.0	NON-Poor	0.249	4.92							7.0	1.47	8.5	Possible Nutrients	TKN; Ses.Chloro.
MF17	1.8	57.3	2018	45.0	NON-Poor	0.233	3.63	8.1	4.52	2.58	Low	28.6	Very Low	6.0	1.40	3.2	Possible Nutrients	Min. D.O.; TKN
WF20	12.5	3.9	2018	30.5	NON-Poor	0.150	0.17							5.5	1.69	5.0	Possible Nutrients	TKN; Ses.Chloro.
WF21	10.4	7.0	2018	40.5	NON-Poor	0.100	0.19	7.62	1.44	5.77	High	41.3	Low	5.0	1.44	4.4	Enriched	Min. D.O.; D.O. swing; TKN
WF22	9.2	9.4	2018	46.0	NON-Poor	1.300	5.50							4.5	1.48	8.8	Possible Nutrients	TP; TKN; Ses.Chloro.
WF23	4.9	17.9	2018	38.5	NON-Poor	0.350	2.05	9.36	1.62	6.67	Wide	58.0	Low	3.8	1.06	4.4	Highly Enriched	Min. D.O.; D.O. swing
WF24	2.9	24.5	2018	53.5	NON-Poor	0.330	1.60							4.0	1.87	0.9	Possible Nutrients	TKN
WF25	1.3	28.0	2018	45.5	NON-Poor	0.280	1.64	8.21	2.77	5.16	High	30.3	Very Low	3.5	1.42	1.1	Enriched	Min. D.O.; D.O. swing; TKN
MF19	18.6	93.4	2018	49.0	NON-Poor	0.235	1.77	8.34	3.89	2.93	Low	7.5	Very Low	5.0	0.92	2.8	Not Nutrients	Min. D.O.
Condition Category Thresholds	Excellent		>84.5	FULL	≤0.106	≤3.77	<10.36	>6.9	<2.0	Normal	<35	Very Low	<5.0	<1.07	<2.5	Not Nutrients	All Excellent
	Good		>75.9	FULL	> 0.106-0.277	>3.77-5.05	>10.36-12.2	6-6.9	2.0-4.0	Low	35-79	Low	5.0-7.77	1.07-1.12	>2.5-5.1	Not Nutrients	Good, 1 exceed Fair
	Fair		<75.9	PARTIAL	>0.277-1.02	>5.05-7.34	>12.2-14.2	4.0-5.9	4.0-5.0	Moderate	79-150	Moderate	7.77-9.83	1.12-1.63	>5.1-13.8	Possible Nutrients	2-3 exceed Fair
	Poor		<50.1	NON-Fair	>1.02-1.726	>7.34-9.64	>14.2-16.3	2.0-3.9	5.0-6.5	High	150-320	High	9.83-11.88	1.63-2.14	>13.8-28.9	Enriched	2-3 exceed Poor
	Very Poor		<25	NON-Poor	≥1.726	≥9.64	≥16.3	<2.0	>6.5	Wide	>320	Very High	>11.88	>2.14	>28.9	Highly Enriched	2-3 exceed V. Poor
Source	IPS		IPS	IPS	IPS	IPS	IPS	IPS	MBI/SNAP	MBI/SNAP	MBI/SNAP/NSAC	MBI/SNAP	IPS	IPS	MBI;NSAC	MBI/SNAP	

IPS - NE Illinois Integrated Prioritization System (IPS; MBI 2020a); SNAP - Stream Nutrient Assessment Procedure (SNAP: Ohio EPA 2015); NSAC - Illinois Nutrient Science Advisory Committee (NSAC 2018)

nutrient parameter exceedances. The evaluations based on incomplete data should be regarded as preliminary. Fourteen (14) of the 25 sites had the full array of SNAP indicators due to limitations with the number of Datasondes that could be deployed. The overall results at all 25 sites using whatever data was available indicated enriched or highly enriched conditions at seven (7) locations (Table 9) each of which had the full suite of SNAP parameters. In each case there was a wide diel D.O. swing, a high maximum D.O., and a low minimum D.O. TKN values were elevated at five (5) sites and sestonic chlorophyll a was elevated at two sites. All sites had very low benthic chlorophyll a values. Possible enrichment was indicated for 12 locations of which half had the full suite of SNAP indicators with a mix of wide diel D.O. swings, low minimum D.O., elevated TKN, and elevated sestonic chlorophyll a listed as the rationale for the assigned enrichment status. Six (6) sites had no serious evidence of nutrient enrichment, but only one of these sites had the full array of SNAP parameters. Habitat was generally poor throughout the study area and at all of the enriched sites.

There were no obvious patterns between the three major branches as all had enriched sites with the highly enriched sites on the Middle Fork (MF10) and the West Fork (WF23). In some cases it was difficult to determine the definitive cause of the low minimum D.O. values, but these could have been the result of excessive organic enrichment in addition to nutrients. The *E. coli* results (see Table 2) suggest excessive organic enrichment throughout much of the Skokie River in particular. Levels of primary nutrients were comparatively low at most sites with only one nitrate-N exceedances of the excellent threshold with a value of 4.13 mg/L (Good) at SR18. Total phosphorus was elevated into the Fair range at four (4) locations and the Poor range at a single location (WF22).

Temperature

Temperature is a controlling factor for aquatic life, hence it is important to document the thermal regime and note any apparent alterations. This was done continuously during the short-term deployment of Datasondes in August 2018 and 2019. Based on continuous data collected during the Datasonde deployments in mid-late August 2018 in the Skokie River, lower Middle Fork and North Branch mainstem and mid-August 2019 in the West Fork and upper Middle Fork, there were no temperature values that exceeded the Illinois temperature standards and were not of concern in being harmful to aquatic life. Typically the potential for adverse thermal effects are evaluated based on the warmest period of the year and against temperature criteria that are intended to protect aquatic life. The Illinois EPA summer maximum criterion of 32.2°C (90°F) is at the extreme upper maximum for the most sensitive riverine fish species and is shown to be met at all times by the continuous data (Figure 21). The data collected also met the more modernized Ohio temperature criteria that are river specific with a maximum and average criteria of 31.7°C (89.0°F) and 29.4°C (85.0°F). The maximum of 29.2°C at the uppermost site in the Middle Fork North Branch, MF10, was the highest value measured in 2019 and was below the Ohio maximum criterion. The maximum temperature value measured in 2018 was 29.2°C at the uppermost site on the Skokie River, which was also below the Ohio maximum criterion. Otherwise, there is no reason to believe that temperatures are a widely limiting factor to the biota.

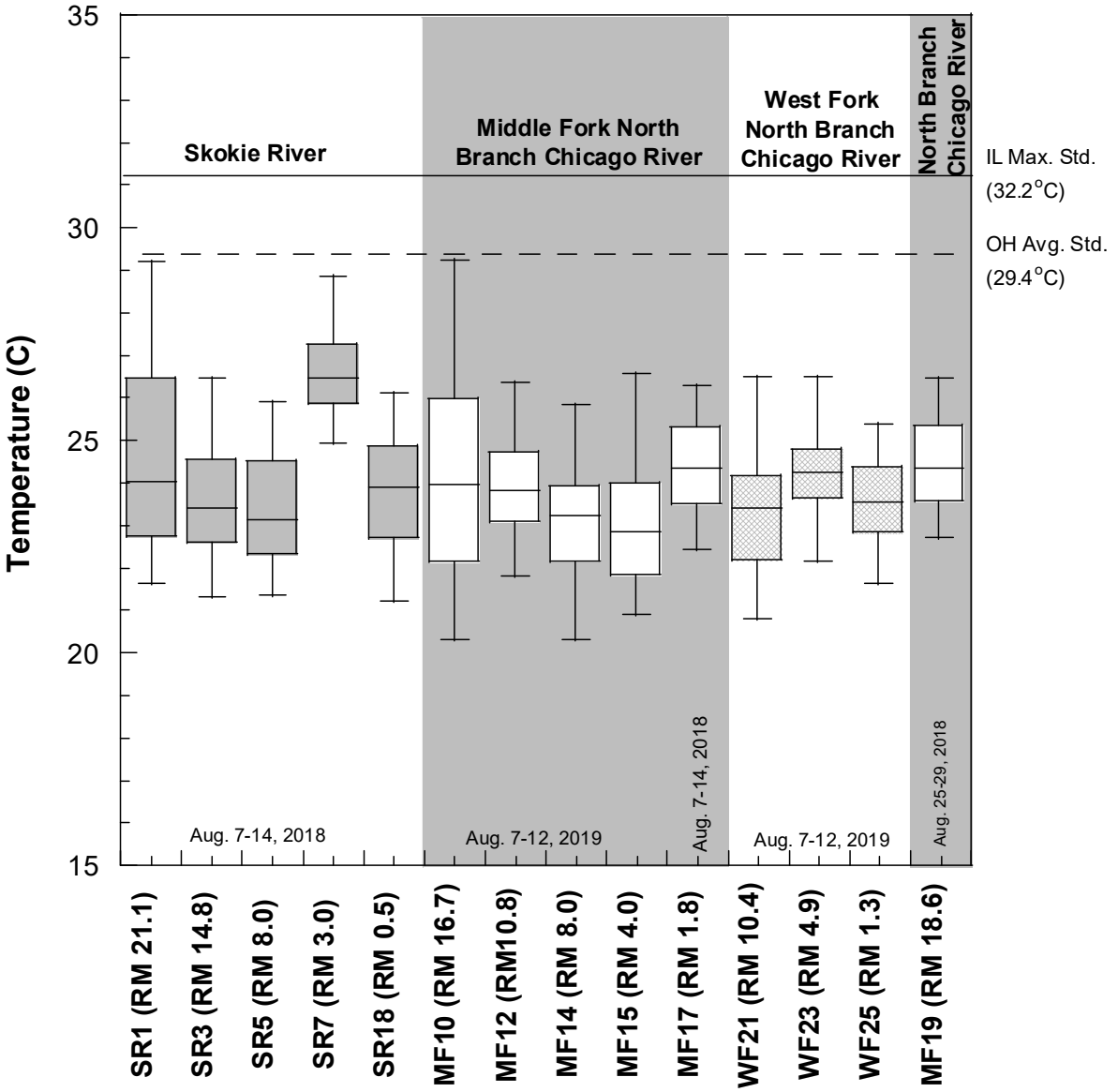


Figure 18*. Temperature (°C) measured continuously by Datasondes deployed for 5-7 day periods during mid-August at 14 locations in the 2018-19 study area. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The Illinois EPA maximum (32.2°C) and the Ohio EPA mainstem rivers average (29.4°C) criteria are shown by solid and dashed lines.*

Ionic Strength Parameters

Ionic strength parameters are generally in the form of dissolved solutes that can be delivered to rivers and streams in runoff events and point source effluents and some are associated with urban runoff specifically. These include parameters measured in the water column and commonly include conductivity, total dissolved solids, and ions such as chlorides and sulfate.

Typically, our analyses have been geared to “urban parameters” which includes certain common heavy metals such a lead, zinc, and copper, and while these were analyzed only one time in August 2018 and 2019 by NBWW the results are presented herein.

Chlorides

In temperate climates such as northern Illinois, chlorides are an emerging problem because they accumulate in soils and shallow groundwater and have been documented to reach concentrations that can threaten and impair aquatic life. Of particular concern in urban areas with high road density is the concentration of chlorides from winter road salt applications and point source loadings from water treatment blowdown. Kelly et al. (2012) identified a steadily increasing trend in chloride levels in the Illinois River at Peoria where the median increased from 20 mg/L in 1947 to nearly 100 mg/L in 2004 with high values in the 1940s of <40 mg/L rising to >300 mg/L by 2003. Chlorides do not exhibit a simple runoff and export mode of effect, but rather accumulate in near surface groundwater (Kelly 2008), soils, and land surfaces adjacent to streams. Seasonal studies have shown that elevated summer concentrations are correlated with higher and acute concentrations during late winter and spring periods (Kaushal et al. 2005). Research in New England (Kaushal et al. 2005) and Minnesota (Novotny et al. 2008) show that chlorides can accumulate in watersheds and that there is a strong association between high winter and elevated summer concentrations. Novotny et al. (2008) identified that 78% of the road salt applied in a Minnesota watershed accumulated in a given year and contributed to an increase in summer chloride concentrations.

Skokie River

Median total chloride concentrations (mg/L) in 2018 ranged from poor in the upper section to good at the most downstream site (Figure 23). The 2019 median chloride concentration levels were generally higher than in 2018, and ranged from very poor in the upper section to good at the most downstream site. There is a longitudinal pattern of decline in median chloride concentrations in both 2018 and 2019, indicating the principal source(s) of chlorides are in the upper Skokie River.

West Fork North Branch Chicago River

Median concentration levels of chloride in 2018 ranged from good to fair, increasing from upstream to downstream (Figure 24). Downstream sites contained median values in the low fair range and upstream values were observed in the high, good range. The Deerfield WRF increases chloride concentrations slightly, but not significantly enough to exceed the 120 mg/L IPS threshold. Median chloride concentrations in 2019 were higher than the previous year, ranging from fair to very poor, but followed a similar longitudinal pattern. Lower concentrations were observed in the upper section of the river and increasing to the poor range in the lower section with no clear sources being apparent.

Middle Fork North Branch and North Branch Mainstem

Median total chloride concentration levels ranged from very poor to fair in 2018 (Figure 25).

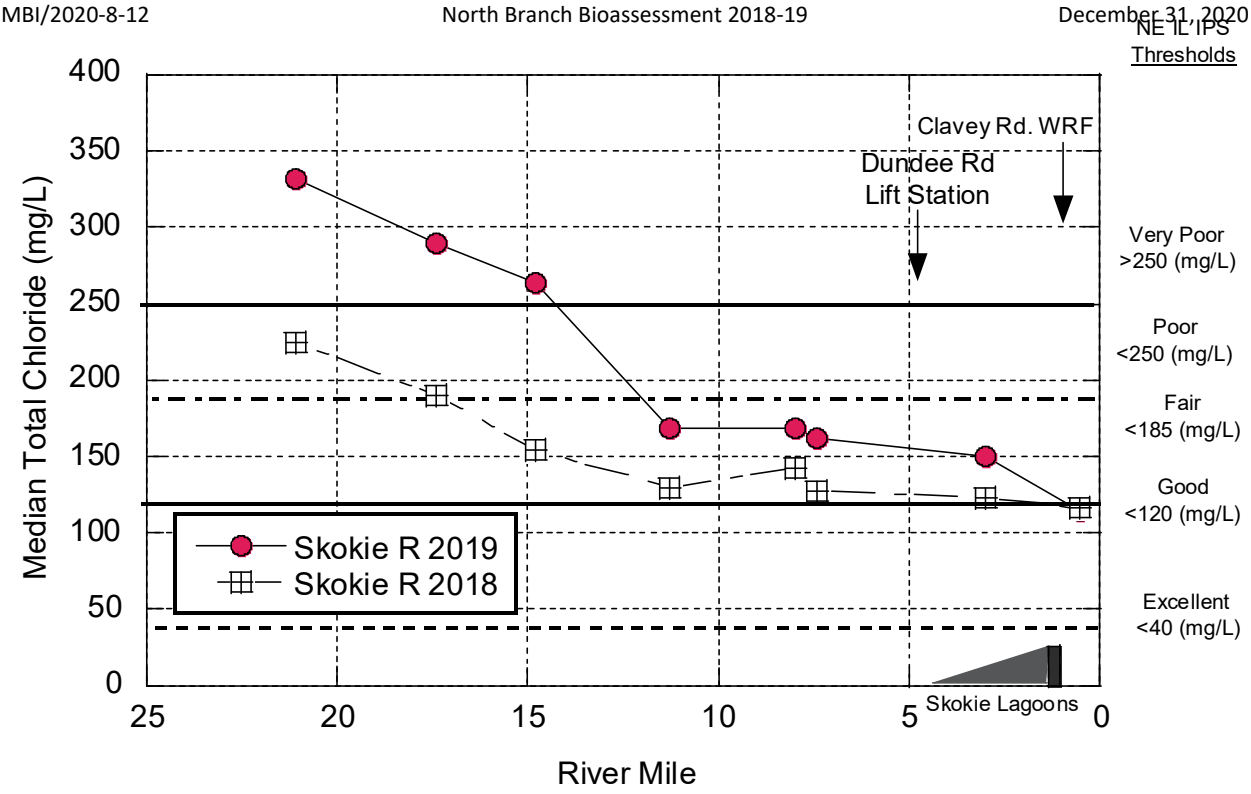


***Figure 19**. Concentrations (mg/L) of median chloride in the Skokie River during May-October 2018-2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

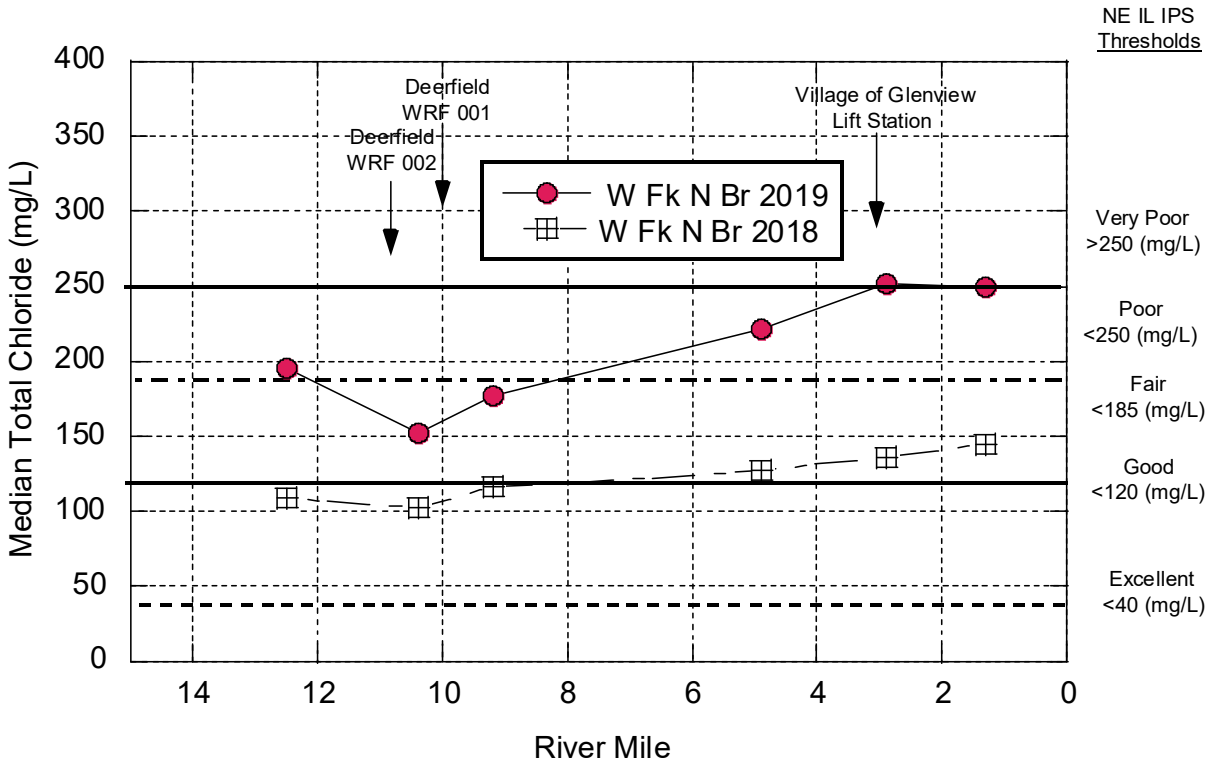


***Figure 20**. Concentrations (mg/L) of median chloride in the West Fork during May-October 2018-2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

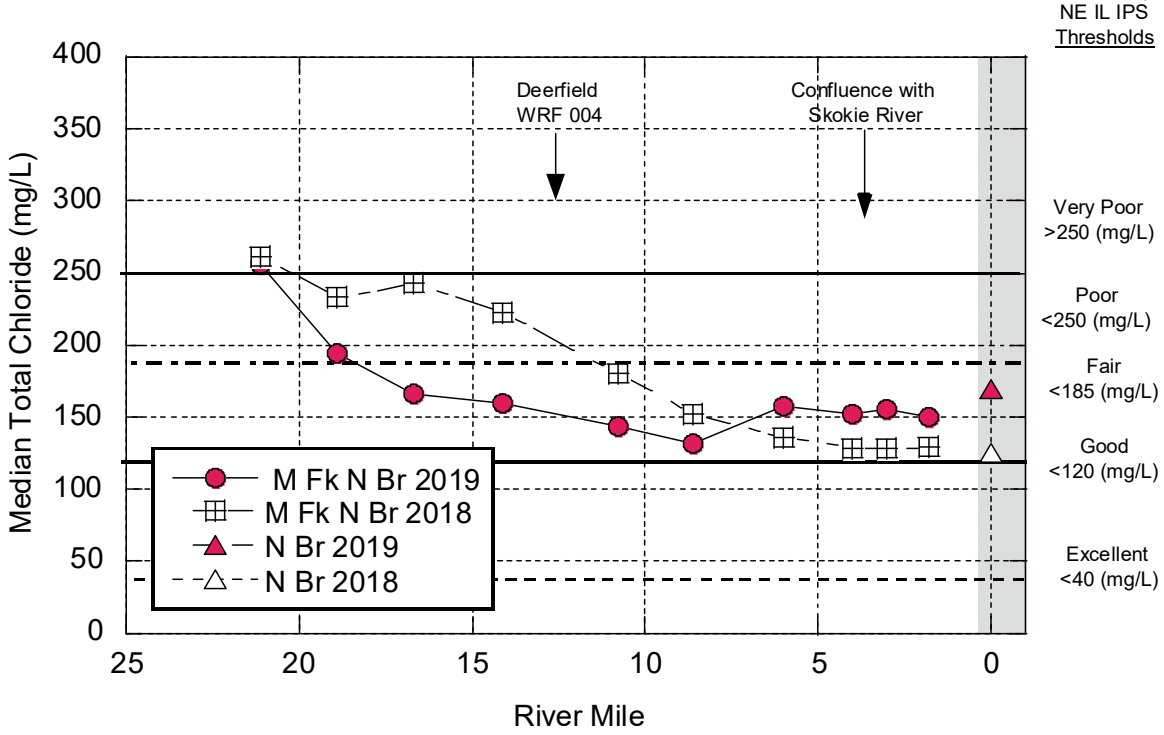


Figure 21. *Concentrations (mg/L) of median chloride in the Middle Fork of the North Branch River during May-October 2018-2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

The longitudinal pattern generally shows decreasing concentrations of chlorides in a downstream direction. The median chloride concentrations in 2019 have the same threshold range and generally follow the same longitudinal pattern of decreasing levels downstream. The North Branch Chicago River site in both 2018 and 2019 exceeded the 120 mg/L threshold and rated fair. The Deerfield excess overflow discharge 004 and the confluence with the Skokie River do not appear to have an appreciable influence on chloride concentrations in the lower Middle Fork or the North Branch Chicago River mainstem. Chloride source(s) appear to be located in the upper section of the Middle Fork.

Conductivity

Dissolved materials are also measured by specific conductance or conductivity which is depicted in Figure 26 for the short-term continuous data. Values were the highest at the upstream site (SR1) in the Skokie River where the median exceeded the very poor IPS threshold. Values declined steadily downstream with most readings within the IPS good range at SR7. Median values were similar at SR 18, but with greater variability in individual readings. All median values were within the good range in the Middle Fork and at the single North Branch site, but were elevated into the fair range at the two downstream most West Fork sites with individual values exceeding poor and very poor values. These results suggest a major sources of dissolved materials in the headwaters of the Skokie River.

Median specific conductance in the 2018 grab samples was generally lower than values observed in 2019 in the Skokie River (Figure 27) and West Fork (Figure 28), but similar in the Middle Fork (Figure 29).

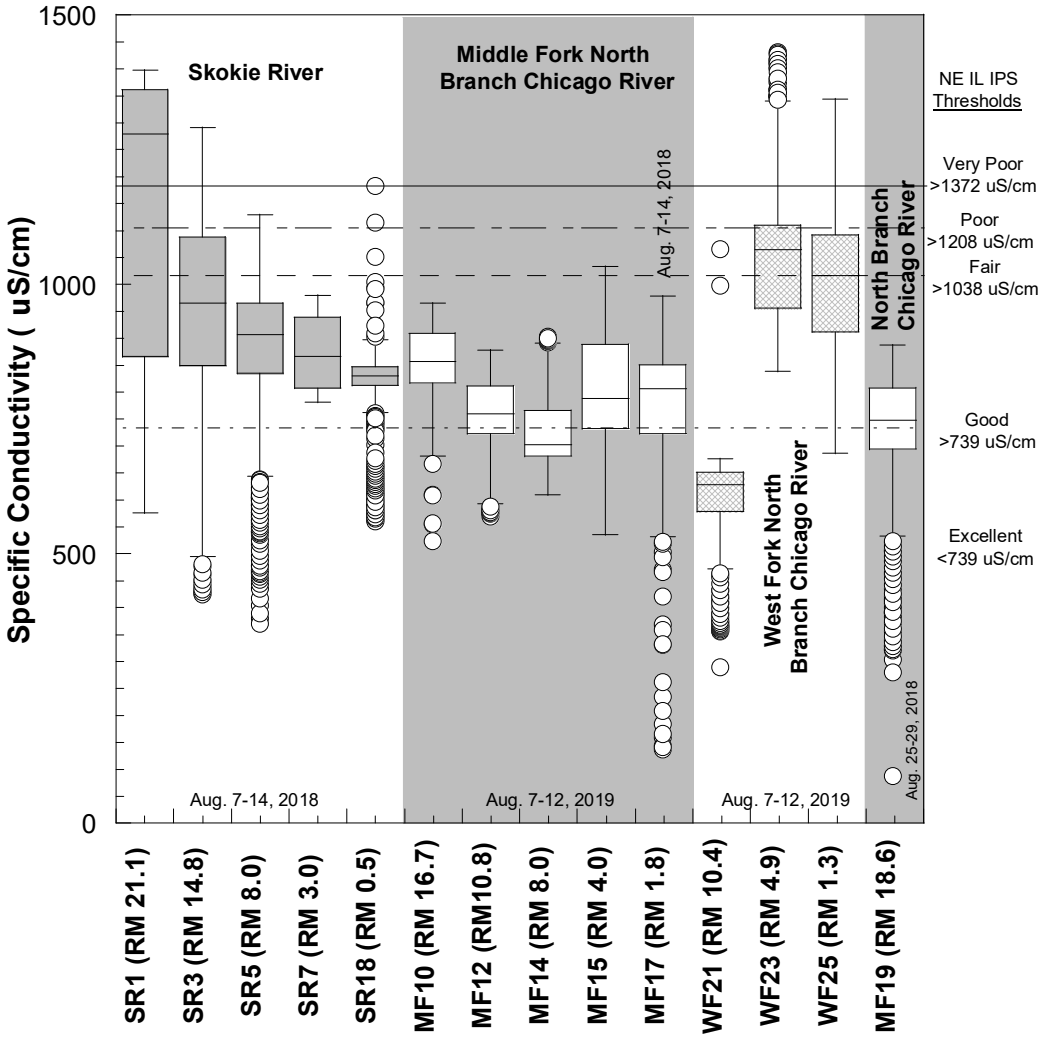


***Figure 22**. Specific conductance (µS/cm) measured continuously by Datasondes deployed for 5-7 day periods during mid-August at 13 locations in the 2018 and 2019 study area. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The IPS thresholds for five narrative ratings are shown by solid and dashed lines.*

Conductivity values mirrored chloride concentrations at all sites in 2018 and 2019. The general pattern in the Skokie River was a gradual decrease from upstream to downstream in both 2018 and 2019 (Figure 26) the same as was depicted by the continuous results in 2018. The 2018 values ranged from good to excellent while 2019 values were higher, ranging from very poor to good. The West Fork 2018 values ranged from good to excellent, with a modest increase from upstream to downstream in median conductivity levels. The 2019 values ranged from poor to good, also increasing from upstream to downstream in a near identical pattern to 2018 (Figure 27). Median conductivity values in the Middle Fork were generally good in 2018 with upper exceptional values recorded at MF15 and MF16 (Figure 28). The North Branch mainstem site was at the 739 µS/cm excellent IPS threshold in 2018 (Figure 28). All median conductivity values in 2019 were within the good IPS threshold for all sites in the Middle Fork and North Branch mainstem.

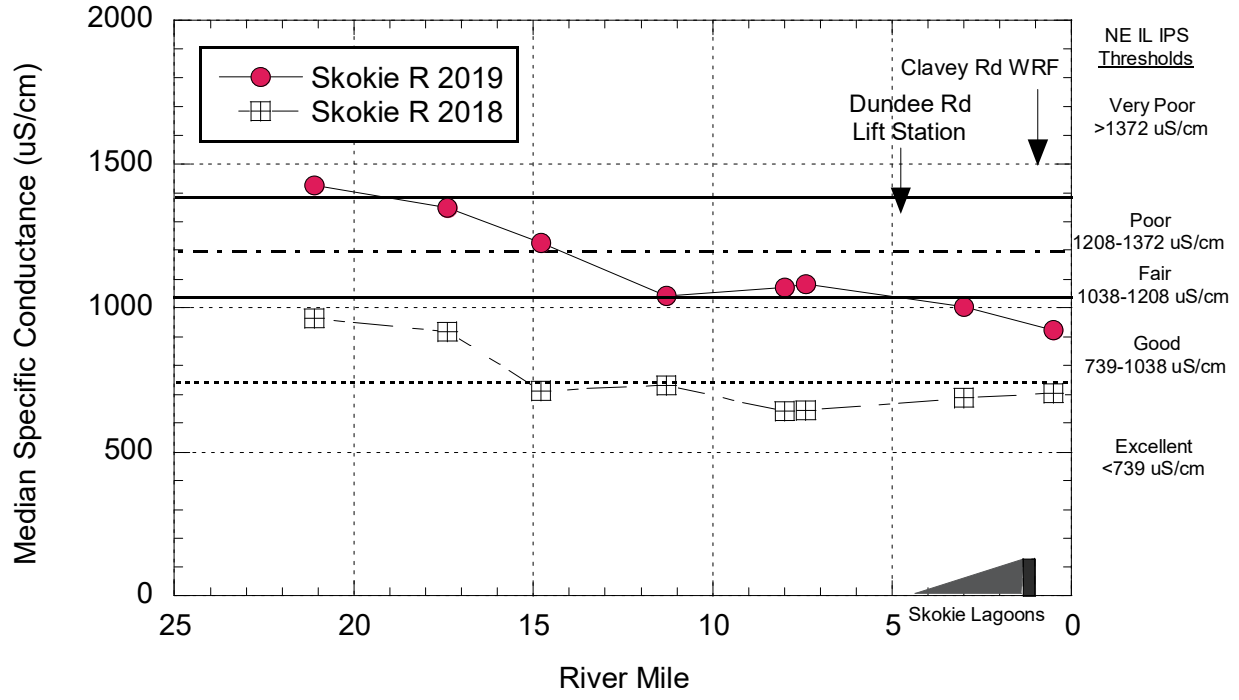


Figure 24. *Median specific conductance in the Skokie River during May-October of 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

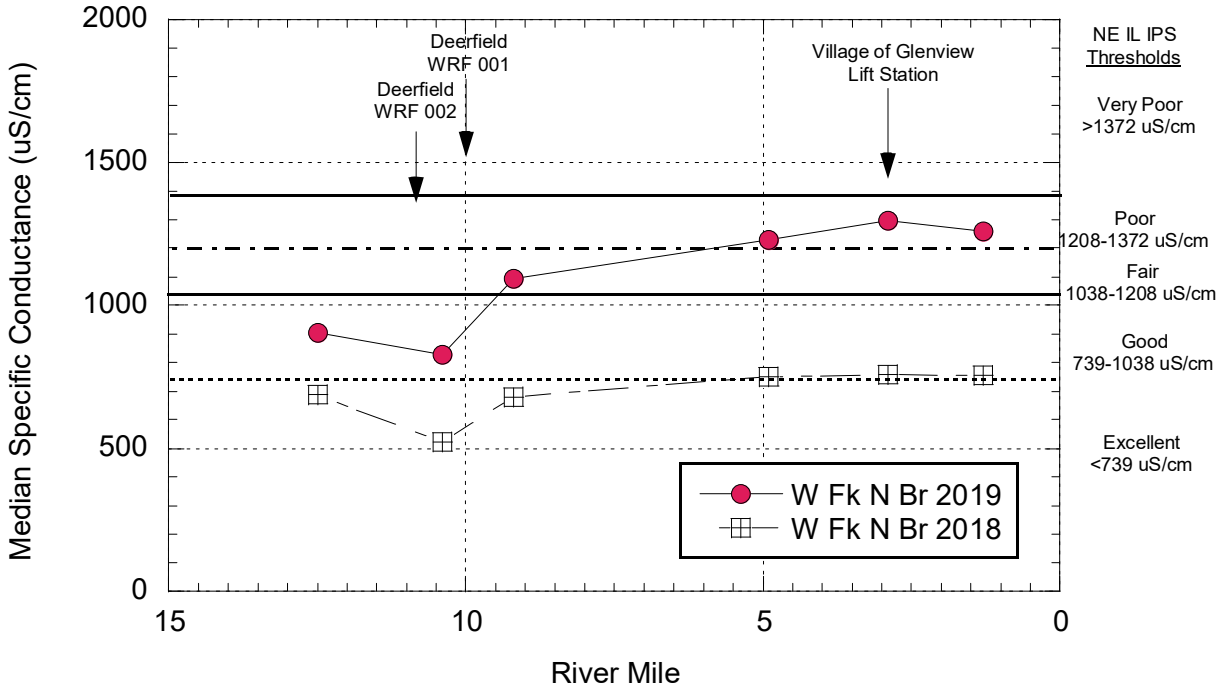


Figure 23*. Median specific conductance in the West Fork of the North Branch Chicago River during May-October of 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

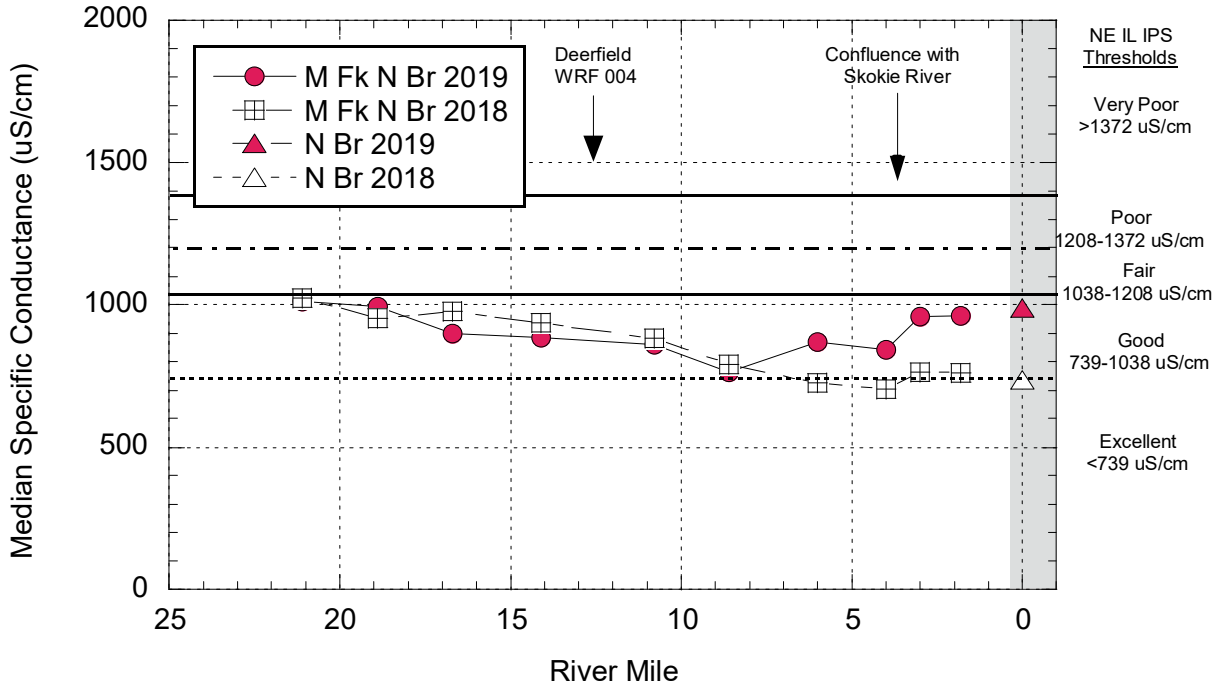


Figure 25. *Median specific conductance in the Middle Fork of the North Branch Chicago River and the North Branch Chicago River mainstem during May-October of 2018 and 2019. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7.*

Water Column Metals and Organics

Water samples for the analysis of 14 metals and a scan for organic parameters were collected once annually at the 8 Tier 1 (Table 10). While the low frequency of sample collection inherently limits our analysis, there were some notable observations of metals and organics in relation to detections and IPS thresholds. Nine (9) of the 14 metal parameters were either below detection or within the excellent IPS threshold. The remaining five (5) parameters exhibited exceedances from infrequent to frequent and fair to very poor. Sodium had the highest frequency of IPS threshold exceedances with all 16 samples exceeding three of the IPS thresholds, four (4) fair, six (6) poor, and six (6) very poor. These were also allied with chloride exceedances reflecting runoff containing deicing salts. Copper, a common constituent in urban stormwater, had the next highest frequency of IPS threshold exceedances with nine (9) of 16 samples exceeding three of the IPS thresholds, two (2) fair, one (1) poor, and six (6) very poor. Zinc, which is another common metal in urban stormwater, had seven exceedances of the very poor IPS threshold. Nickel had two (2) exceedances of the fair IPS threshold. Iron exceeded the Illinois WQS three (3) times with no exceedances of any of the IPS thresholds. The number of exceedances at any single site ranged from one (1) parameter at four sites up to five (5) parameters in 2018 at SR1 which is the upstream most site in the Skokie River. Site MF8 had four (4) parameter exceedances in 2019 and SR18 had three (3) in 2018. Only one (1) site (WF 22) had three (3) parameters exceeding the poor or very poor IPS threshold. In terms of the POTWs only the Clavey Rd. WWTP has a site in close enough proximity to a metals sampling site – SR18 had three (3) parameter exceedances in 2018 and 2019 with two (2) exceeding the very poor thresholds for copper (2018) and zinc (2018, 2019). Only one organic parameter, acetone, was detected at levels well below any reported effect levels on aquatic life or human health.

***Table 10**. Heavy metal concentrations in water samples collected once in August at selected tier 1 locations. Color shading of cells corresponds to NE Illinois IPS threshold exceedances listed at the bottom of the table. Unsampled sites are shown for reference.*

Site ID	River Mile	Drainage Area (sq. mi.)	Arsenic (µg/L)	Barium (µg/L)	Cadmium (ug/L)	Calcium (mg/L)	Chrom-ium (ug/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Magnes-ium (mg/L)	Mercury, Low Level (ng/L)	Nickel (µg/L)	Silver (µg/L)	Sodium (mg/L)	Zinc (µg/L)
Skokie River: 2019																
SR1	21.1	2.7	3.00	46	nd	53	nd	4.3	1600	1.2	21	1.70	2.30	nd	210	43
SR2	17.4	7.8	-	-	-	-	-	-	-	-	-	-	-	-		-
SR3	14.8	11.5	-	-	-	-	-	-	-	-	-	-	-	-		-
SR4	11.3	15	-	-	-	-	-	-	-	-	-	-	-	-		-
SR5	8	20.6	-	-	-	-	-	-	-	-	-	-	-	-		-
SR6	7.4	21.5	-	-	-	-	-	-	-	-	-	-	-	-		-
SR7	3	23.7	-	-	-	-	-	-	-	-	-	-	-	-		-
SR18	0.5	30.9	3.10	25.5	nd	54.5	nd	5.1	470	1.5	22	1.85	1.75	nd	94	30
Skokie River: 2018																
SR1	21.1	2.7	1.60	32	nd	21.3	nd	6.5	2300	3.1	7	4.90	3.60	nd	58.2	25
SR2	17.4	7.8	-	-	-	-	-	-	-	-	-	-	-	-		-
SR3	14.8	11.5	-	-	-	-	-	-	-	-	-	-	-	-		-
SR4	11.3	15	-	-	-	-	-	-	-	-	-	-	-	-		-
SR5	8	20.6	-	-	-	-	-	-	-	-	-	-	-	-		-
SR6	7.4	21.5	-	-	-	-	-	-	-	-	-	-	-	-		-
SR7	3	23.7	-	-	-	-	-	-	-	-	-	-	-	-		-
SR18	0.5	30.9	2.35	32	nd	32.4	nd	7.6	935	2.8	16	3.70	2.85	nd	62.4	27
Middle Fork North Branch Chicago River: 2019																
MF8	21.1	5.81	2.60	51	nd	70	nd	3.1	1100	1.8	42	4.60	3.70	nd	160	21
MF9	18.9	8.91	-	-	-	-	-	-	-	-	-	-	-	-		-
MF10	16.7	11.9	-	-		-	-	-	-	-	-	-	-	-		-
MF11	14.1	16.11	-	-	-	-	-	-	-	-	-	-	-	-		-
MF12	10.8	19.23	-	-	-	-	-	-	-	-	-	-	-	-		-
MF13	8.6	20.96	-	-	-	-	-	-	-	-	-	-	-	-		-
MF14	6	22.48	-	-	-	-	-	-	-	-	-	-	-	-		-
MF15	4	24.29	2.50	34	nd	50	nd	12.0	430	0.7	23	0.81	3.20	nd	110	nd
MF16	3	56.1	-	-	-	-	-	-	-	-	-	-	-	-		-
MF17	1.8	57.3	-	-	-	-	-	-	-	-	-	-	-	-		-
Condition Category Thresholds	Excellent		-	<74.1	<0.937	<84425	<1.398	-	-	<2.851	-	-	-	-	<16.3	<7.47
	Good		<3.616	<84.88	<0.974	<86076	<1.540	<4.480	1000	<3.335	-	1100	<3.470	5	>16.3	<9.78
	Fair		>3.616	>84.88	>0.974	>86076	>1.540	>4.480	-	>3.335	-	-	>3.470	-	>45.0	>9.78
	Poor		>5.029	>101.8	>0.983	>86313	>2.682	>4.969	-	>3.884	-	-	>9.585	-	>79.1	>11.00
	Very Poor		>6.603	>118.6	>0.991	>86559	>3.824	>5.458	-	>4.334	-	-	>11.88	-	>113.1	>12.22
Source	**IPS**		IPS	IPS	IPS	IPS	IPS	IPS	IL WQS	IPS	NONE	IL WQS	IPS	IL WQS	IPS	IPS
	Illinois WQS		50	1000	2.7	NONE	11	30.2	1000	81.3	NONE	1100	12.7	5	None	55.5
	MDL		0.23	0.73	0.17	0.027	1.1	0.5	47	0.19	0.019	0.14	0.63	0.12	0.22	6.9

`

***Table 10**. (continued)*

Site ID	River Mile	Drainage Area (sq. mi.)	Arsenic (µg/L)	Barium (µg/L)	Cadmium (ug/L)	Calcium (mg/L)	Chromium (ug/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Magnesium (mg/L)	Mercury, Low Level (ng/L)	Nickel (µg/L)	Silver (µg/L)	Sodium (mg/L)	Zinc (µg/L)
Middle Fork North Branch Chicago River: 2018																
MF8	21.1	5.81	2.10	37	nd	35.7	nd	2.8	870	0.9	15	1.40	2.30	nd	167	nd
MF9	18.9	8.91	-	-	-	-	-	-	-	-	-	-	-	-		-
MF10	16.7	11.9	-	-	-	-	-	-	-	-	-	-	-	-		-
MF11	14.1	16.11	-	-	-	-	-	-	-	-	-	-	-	-		-
MF12	10.8	19.23	-	-	-	-	-	-	-	-	-	-	-	-		-
MF13	8.6	20.96	-	-	-	-	-	-	-	-	-	-	-	-		-
MF14	6	22.48	-	-	-	-	-	-	-	-	-	-	-	-		-
MF15	4	24.29	2.20	34	nd	34.1	nd	5.8	1000	1.3	14	2.80	2.70	nd	66.6	nd
MF16	3	56.1	-	-	-	-	-	-	-	-	-	-	-	-		-
MF17	1.8	57.3	-	-	-	-	-	-	-	-	-	-	-	-		-
West Fork North Branch Chicago River: 2019																
WF20	12.5	3.87	3.70	30	nd	42	nd	1.0	470	0.3	18	1.10	1.00	nd	130	nd
WF21	10.4	7.02	-	-	-	-	-	-	-	-	-	-	-	-		-
WF22	9.2	9.41	3.00	28	nd	57	nd	5.8	440	0.6	20	1.10	2.10	nd	110	30
WF23	4.9	17.86	-	-	-	-	-	-	-	-	-	-	-	-		-
WF24	2.9	24.52	-	-	-	-	-	-	-	-	-	-	-	-		-
WF25	1.3	27.97	3.40	45	nd	56	nd	3.8	190	0.6	24	0.25	2.50	nd	150	nd
West Fork North Branch Chicago River: 2018																
WF20	12.5	3.87	1.60	32	nd	27.5	nd	3.2	410	0.3	11	1.70	1.00	nd	81.8	nd
WF21	10.4	7.02	-	-	-	-	-	-	-	-	-	-	-	-		-
WF22	9.2	9.41	1.60	67	nd	65.2	nd	4.9	920	0.5	35	3.00	2.00	nd	260	nd
WF23	4.9	17.86	-	-	-	-	-	-	-	-	-	-	-	-		-
WF24	2.9	24.52	-	-	-	-	-	-	-	-	-	-	-	-		-
WF25	1.3	27.97	1.70	34	nd	33.8	nd	5.9	820	1.8	13	3.00	2.40	nd	69.6	nd
North Branch Chicago River: 2019																
MF19	18.6	93.4	3.50	35	nd	53	nd	4.2	390	1.1	22	1.10	2.70	nd	110	20
North Branch Chicago River: 2018																
MF19	18.6	93.4	1.80	33	nd	34.6	nd	5.2	930	2.2	15	4.30	2.80	nd	66.6	nd
Condition Category Thresholds	Excellent		-	<74.1	<0.937	<84425	<1.398	-	-	<2.851	-	-	-	-	<16.3	<7.47
	Good		<3.616	<84.88	<0.974	<86076	<1.540	<4.480	1000	<3.335	-	1100	<3.470	5	>16.3	<9.78
	Fair		>3.616	>84.88	>0.974	>86076	>1.540	>4.480	-	>3.335	-	-	>3.470	-	>45.0	>9.78
	Poor		>5.029	>101.8	>0.983	>86313	>2.682	>4.969	-	>3.884	-	-	>9.585	-	>79.1	>11.00
	Very Poor		>6.603	>118.6	>0.991	>86559	>3.824	>5.458	-	>4.334	-	-	>11.88	-	>113.1	>12.22
Source	**IPS**		IPS	IPS	IPS	IPS	IPS	IPS	IL WQS	IPS	NONE	IL WQS	IPS	IL WQS	IPS	IPS
	Illinois WQS		50	1000	2.7	NONE	11	30.2	1000	81.3	NONE	1100	12.7	5	None	55.5
	MDL		0.23	0.73	0.16	0.027	1.1	0.5	0.47	0.19	0.019	0.14	0.63	0.12	0.22	6.9

Sediment Chemistry

Sediment samples were evaluated against guidelines compiled by McDonald et al. (2000), Illinois sediment metals guidelines (Short 1998), and the new IPS derived narrative ranges (see Table 7). The MacDonald et al. (2000) threshold effect levels (TEL) are where toxic effects are initially apparent and likely to affect the most sensitive organisms. Probable effect levels (PEL) are where toxic effects are more likely to be observed over a wider range of organism sensitivities. Short (1998) identified elevated and extremely elevated sediment metal concentrations for Illinois streams and rivers. The new IPS thresholds are based on analyses against the most sensitive species to each sediment metal and PAH parameter (MBI 2020a). Sediment metal sampling results from 2018 and 2019 are summarized by concentration rating and parameter class in Table 11 and polycyclic aromatic hydrocarbon (PAHs) compounds in Table 12. PAHs result from the incomplete combustion of hydrocarbons and are a common component of stormwater runoff in urban areas – they are not a direct byproduct of any manufacturing process.

Metals in Sediment

Elevated levels of heavy metals in are commonly associated with runoff from roads and highways and industrial and municipal sources. Exceedances of the new IPS thresholds were extensive for aluminum, lead, zinc, chromium, copper, and nickel with numerous exceedances of poor and very poor values. These occurred throughout the NBWW survey area with aluminum being the most prevalent. Aluminum concentration values were poor or very poor at 19 of the 24 sites (Table 11). Copper exceeded the good threshold at 18 sites, 16 sites had concentration values of poor or very poor levels. Lead and zinc each exceeded the good IPS threshold at 17 sites with zinc concentration levels poor or very pool at 15 sites, while lead concentration levels exceeded the fair IPS threshold at 11 sites. Chromium and nickel each exceeded their respective good thresholds at 16 sites with seven (7) poor and nine (9) very poor values. Metal concentration levels in the Middle Fork at MF13 and MF14 as well as in the West Fork at WF23, WF24 and WF25 did not exceed the good IPS threshold for any of the parameters. Reduced concentration levels occur in the Skokie River in the Skokie Lagoons caused by dilution and lethargic flow rates allowing for contaminants to fall from the water column prior to reaching the site SR7. Concentration levels in the Skokie River downstream of the Skokie Lagoons abruptly increase to poor and very poor levels for aluminum, copper, lead, and zinc. This increase appears to be attributed to an increase in wastewater inputs.

PAH Compounds in Sediment

The levels of PAH compounds were elevated at every site with numerous very poor values observed. Only seven (7) excellent/good values were observed in the entire study area (Table 12). Of these excellent/good values three (3) were observed at MF11, three (3) at SR7 and one (1) MF10. Most fair values were located in the middle section of the Middle Fork (MF09, MF10, and MF11) with a majority of the very poor values located in the West Fork (Table 12). Benz(b)anthracene concentrations were very poor at most sites in the NBWW study area.

***Table 11**. Heavy metal concentrations (mg/kg) in sediment at 24 sites in the NBWW survey area. Highlighted cells indicate an exceedance of one or more of the effect thresholds listed at the bottom.*

Site ID	River Mile	Drainage Area (sq. mi.)	Year	Aluminum (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Boron (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (µg/kg)	Nickel (mg/kg)	Silver (mg/kg)	Strontium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
Skokie River																				
SR1	21.10	2.70	2018	13000	7.80	68.00	19.00	0.730	26.00	11.00	45.00	25000	33.00	750.0	18.00	26.00	0.550	49.00	28.00	180.0
SR2	17.40	7.80	2018	9800	5.50	61.00	7.50	0.870	44.00	7.50	50.00	15000	96.00	410.0	270.0	19.00	0.750	33.00	21.00	270.0
SR3	14.80	11.50	2018	10000	5.40	71.00	17.00	0.930	33.00	9.00	69.00	18000	65.00	560.0	190.0	21.00	0.750	45.00	24.00	240.0
SR4	11.30	15.00	2018	14000	11.00	91.00	23.00	0.420	30.00	13.00	60.00	25000	53.00	1400.0	190.0	28.00	1.050	49.00	30.00	200.0
SR5	8.00	20.60	2018	10000	6.20	66.00	9.50	0.390	25.00	8.50	46.00	18000	44.00	750.0	420.0	19.00	0.950	43.00	22.00	160.0
SR6	7.40	21.50	2018	9800	6.90	64.00	8.50	0.870	26.00	8.00	53.00	17000	52.00	520.0	410.0	19.00	0.850	51.00	22.00	210.0
SR7	3.00	23.70	2018	9900	3.80	51.00	22.00	0.335	18.00	8.00	39.00	15000	18.00	350.0	28.50	22.00	0.850	74.00	20.00	77.0
SR18	0.50	30.90	2018	11000	4.30	70.00	17.00	0.295	24.00	7.80	58.00	17000	51.00	480.0	79.00	21.00	0.750	43.00	20.00	160.0
Middle Fork North Branch Chicago River																				
MF8	21.10	5.81	2019	15000	7.20	76.00	19.00	0.630	36.00	11.00	35.00	24000	86.00	1000.0	68.00	27.00	ND	44.00	33.00	160.0
MF9	18.90	8.91	2019	16000	6.60	80.00	19.00	0.780	29.00	12.00	44.00	23000	34.00	840.0	80.00	28.00	ND	50.00	30.00	180.0
MF10	16.70	11.90	2019	14000	7.10	68.00	18.00	0.670	25.00	12.00	41.00	23000	28.00	1100.0	57.00	27.00	ND	50.00	28.00	140.0
MF11	14.10	16.11	2019	9600	4.60	42.00	12.00	0.430	17.00	8.80	23.00	15000	20.00	510.0	40.00	18.00	ND	31.00	21.00	78.0
MF12	10.80	19.23	2019	13000	7.05	69.00	13.50	0.500	23.50	13.00	40.50	24500	29.00	645.0	61.00	27.00	ND	34.50	27.00	130.0
MF13	8.60	20.96	2019	15000	8.40	84.00	18.00	0.265	26.00	12.00	45.00	23000	33.00	910.0	74.00	27.00	ND	37.00	29.00	150.0
MF14	6.00	22.48	2019	5000	3.50	35.00	3.45	0.140	9.70	5.90	20.00	11000	15.00	440.0	37.00	11.00	ND	16.00	13.00	53.0
MF15	4.00	24.29	2019	4700	3.20	32.00	3.55	0.280	9.10	5.20	13.00	10000	15.00	440.0	33.00	10.00	ND	16.00	13.00	49.0
MF16	3.00	56.10	2018	11000	6.80	74.00	10.00	0.405	27.00	8.70	70.00	19000	58.00	500.0	110.0	21.00	1.000	48.00	23.00	200.0
MF17	1.80	57.30	2018	12000	5.50	72.00	17.00	0.690	24.00	8.70	49.00	18000	53.00	600.0	92.00	20.00	0.800	39.00	22.00	170.0
West Fork North Branch Chicago River																				
WF20	12.50	3.87	2019	11000	4.50	52.00	13.00	0.460	21.00	8.50	31.00	17000	25.00	370.0	48.00	21.00	ND	33.00	24.00	120.0
WF21	10.40	7.02	2019	10000	5.30	58.00	15.00	0.480	22.00	9.00	43.00	18000	23.00	650.0	42.00	20.00	ND	51.00	24.00	140.0
WF22	9.20	9.41	2019	13000	5.60	80.00	17.00	0.245	26.00	10.00	58.00	21000	24.00	670.0	55.00	27.00	ND	48.00	26.00	170.0
WF23	4.90	17.86	2019	5100	2.30	39.00	7.30	0.320	14.00	4.80	28.00	9800	17.00	230.0	36.00	12.00	ND	32.00	12.00	99.0
WF24	2.90	24.52	2019	4200	2.60	32.00	3.55	0.300	9.30	4.30	16.00	8700	15.00	290.0	51.00	9.50	ND	22.00	11.00	58.0
WF25	1.30	27.97	2019	3700	1.90	30.00	3.45	0.470	13.00	4.30	21.00	7500	32.00	230.0	48.00	8.90	ND	25.00	9.30	75.0
North Branch Chicago River																				
MF19	18.60	93.40	2018	19000	6.800	120.0	29.00	1.100	43.00	14.00	84.00	28000	80.00	920.0	370.0	33.00	1.300	67.00	35.00	270.0
MacDonald et al. 2000			TEC	None	9.790	None	None	0.990	43.40	None	31.60	20000	35.80	460.0	0.180	22.70	1.600	None	None	121.0
			PEC	None	33.00	None	None	4.980	111.0	None	149.0	40000	128.0	1100	1.060	48.60	2.200	None	None	459.0
Short 1998			L Elevated	None	7.200	145.0	None	2.000	37.00	None	37.00	26100	60.00	1100	0.280	26.00	None	None	None	170.0
			Highly Ele	None	18.00	230.0	None	9.300	110.0	None	170.0	53000	245.0	2300	1.400	45.00	5.000	None	None	760.0
NE IL IPS			Excellent	None	None	None	None	None	<20.53	None	<19.00	None	<15.50	<841.0	None	None	None	None	None	<75.0
			Good	<6480	<8.65	<141.0	None	<0.933	<23.30	None	<29.78	None	<24.80	<845.5	None	<19.50	<0.483	<81.80	None	<100.0
			Fair	>6480	>8.65	>141.0	None	>0.933	>23.30	None	>29.78	None	>24.80	>845.5	None	>19.50	>0.483	>81.80	None	>100.0
			Poor	>8272	>15.82	>150.3	None	>1.354	>26.22	None	>40.45	None	>33.04	>996.8	None	>22.52	>1.261	>106.8	None	>133.9
			Very Poor	>10064	>23.67	>168.7	None	>1.963	>29.15	None	>51.12	None	>41.27	>1148	None	>25.53	>2.039	>131.9	None	>167.8

Table 12. *Sediment PAH levels (mg/kg) in sediments at 25 sites in the NBWW survey area. Highlighted cells indicate an exceedance of one or more of the effect thresholds listed at the bottom (TEC – threshold effect concentration; PEC – probable effect concentration; ND – not detected).*

Site ID	River Mile	Drainage Area (sq. mi.)	Year	Acenaphtene (µg/kg)	Anthracene (µg/kg)	Benzo[a]anthracene (µg/kg)	Benzo[a]pyrene (µg/kg)	Benzo[b]fluoranthene (µg/kg)	Benzo[g,h,i]perylene (µg/kg)	Benzo[k]fluoranthene (µg/kg)	Chrysene (µg/kg)	Dibenzo[a,h]anthracene (µg/kg)	Fluoranthene (µg/kg)	Fluorene (µg/kg)	Indeno[1,2,3-cd]pyrene (µg/kg)	Phenanthrene (µg/kg)	Pyrene (µg/kg)
Skokie River																	
SR1	21.1	2.7	2018	ND	ND	1200	2000	4200	1400	1300	2600	ND	4800	ND	1600	1000	2700
SR2	17.4	7.8	2018	ND	830.0	3400	4600	7700	2700	3300	6000	810.0	13000	740.0	3100	5200	8100
SR3	14.8	11.5	2018	ND	620.0	1900	2300	4600	970.0	1600	3200	280.0	6400	290.0	1000	3400	6100
SR4	11.3	15	2018	ND	ND	2600	3300	6000	2200	1900	4400	ND	10000	890.0	2500	4700	6400
SR5	8	20.6	2018	ND	940.0	2500	3300	6300	1900	2200	4400	ND	10000	810.0	2100	4900	6100
SR6	7.4	21.5	2018	ND	880.0	3800	5800	10000	3800	3500	7100	1200	14000	800.0	4100	5200	9100
SR7	3	23.7	2018	ND	ND	ND	320.0	760	180.0	210.0	ND	ND	1600	ND	220.0	ND	ND
SR18	0.5	30.9	2018	ND	ND	2000	2900	5100	2100	1800	3600	ND	7000	ND	2300	2400	4300
Middle Fork North Branch Chicago River																	
MF8	21.1	5.81	2019	ND	ND	1100	1800	3000	750.0	670.0	1800	ND	3500	ND	910.0	1300	2800
MF9	18.9	8.91	2019	ND	ND	590.0	850.0	1300	460.0	610.0	1000	ND	1700	ND	450.0	470.0	1300
MF10	16.7	11.9	2019	ND	ND	430.0	600.0	840	340.0	370.0	690.0	ND	1200	ND	320.0	470.0	1000
MF11	14.1	16.11	2019	ND	91.00	520.0	640.0	770	310.0	460.0	770.0	65.00	1700	ND	290.0	720.0	1300
MF12	10.8	19.23	2019	ND	ND	1700	2300	3150	1300	1500	2750	ND	5150	ND	1300	2000	4000
MF13	8.6	20.96	2019	ND	360.0	1500	2000	2400	1200	1900	2500	330.0	4600	ND	1100	1700	3200
MF14	6	22.48	2019	ND	ND	710.0	1000	1300	630.0	830.0	1200	ND	2100	ND	630.0	940.0	1700
MF15	4	24.29	2019	ND	ND	800.0	1000	1400	600.0	570.0	1200	ND	2400	ND	670.0	1000	1900
MF16	3	56.1	2018	ND	3900	13000	17000	29000	11000	7900	21000	3200	42000	2000	11000	24000	32000
MF17	1.8	57.3	2018	ND	330.0	1700	2500	5500	1200	1500	3200	350.0	5400	190.0	1300	2200	4600
West Fork North Branch Chicago River																	
WF20	12.5	3.87	2019	ND	500.0	1900	2600	3700	1300	1800	3200	ND	6600	ND	1400	2300	5000
WF21	10.4	7.02	2019	ND	1600	6500	7800	12000	3900	3600	9700	1100	22000	ND	3900	9800	16000
WF22	9.2	9.41	2019	ND	930.0	4500	6500	11000	3700	3200	8600	ND	15000	ND	3700	5800	11000
WF23	4.9	17.86	2019	ND	ND	2700	3400	5400	1900	1900	4400	ND	8400	ND	1800	3500	6100
WF24	2.9	24.52	2019	ND	990.0	3600	4300	6100	2300	2100	5000	760.0	11000	ND	2200	5100	8200
WF25	1.3	27.97	2019	ND	1900	6700	7500	10000	3900	4000	9100	1100	19000	650.0	3700	9000	15000
North Branch Chicago River																	
MF19	18.6	93.4	2018	ND	ND	4200	6600	13000	4200	6100	8700	ND	18000	ND	4800	6400	10000
MacDonald et al. 2000			**TEC**	None	57.2	108	150	240	170	240	166	33	423	77.4	200	204	195
			PEC	None	845	1050	1450	13,400	320	13,400	1,290	135	2,230	536	3,200	1,170	1,520
NE IL IPS			**Exc./ Good**	<84.25	<78.00	<239.0	<230	<207.0	<335.0	<520.8	<266.0	<101.0	<774.0	<84.25	<260.5	<243.5	<393.0
			Fair	>84.25	>78.00	>239.0	>230	>207.0	>335.0	>520.8	>266.0	>101.0	>774.0	>84.25	>260.5	>243.5	>393.0
			Poor	>104.8	>119.9	>699.4	>798.3	>434.7	>792.1	>1437	>958.3	>167.3	>2432	>104.8	>623.3	>803.3	>1570
			V. Poor	>125.3	>161.8	>1160	>1367	>662.4	>1249.0	>2354	>1651	>233.7	>4091	>125.3	>986.2	>1363	>2747

Fluoranthene, phenanthene, and pyrene concentrations also exceeded the IPS very poor threshold at most sites, but fair and poor values were recorded in the Middle Fork. Only acenaphthene was not detected at any site while fluorene was detected at eight (8) sites, primarily in the Skokie River. The IPS thresholds coincide with the MacDonald et al. (2000) TEC/TEL and PEC/PEL values with the former generally less than the IPS good level and the latter only roughly consistent with the IPS very poor values. There were considerably more very poor values than non-detected PAHs with the chemicals generally being ubiquitous through the study area. The urban nature of each subwatershed increases the presence and concentrations of PAHs. Runoff from roads, parking lots and industrial centers being likely sources.

Physical Habitat Quality for Aquatic Life – QHEI

The physical habitat of a stream or river is a primary determinant of biological quality and potential. Streams in the glaciated Midwest, left in their natural state, typically offer pool-run-riffle sequences, moderate to high sinuosity, and well-developed channels with deep pools, heterogeneous substrates, and cover in the form of woody debris, hard substrates, and aquatic macrophytes. Lower gradient streams may not offer as distinct riffle habitats and are oftentimes run and glide dominated, but can still offer a diversity of substrates, well developed pool habitats, and well-developed instream cover features associated with woody debris and aquatic macrophytes. The Qualitative Habitat Evaluation Index (QHEI) categorically scores basic components of stream and riverine habitat into ranks according to the degree to which those components are found compared to a natural state, or conversely, in an altered or modified state. In the NBWW study area, QHEI scores and physical habitat attributes were recorded in conjunction with the fish sampling conducted at each site. Examples of the range of habitat offered in the study area are the Middle Fork at sites MF14 (Figure 30) and MF16 (Figure 31), the former offering the better habitat in the study area and the latter reflecting legacy modifications to the stream channel.

Based on the QHEI scores and the number and ratios of good and modified attributes (after Rankin 1989, 1995; Table 13 and Figure 32), overall habitat quality ranged from poor (nineteen sites) to fair (four sites) with three of the fair sites in the Middle Fork and one in the West Fork. The IPS derived QHEI thresholds for the five narrative categories were used and these are more stringent than the prior usage of narrative ratings from Ohio. The fair ratings for the Middle Fork North Branch sites located in the lower section (MF13, MF14, and MF15) resulted from a comparatively lower number of highly modified attributes. Other than MF14, these sites still had numerous moderate modified attributes and with very few good habitat attributes (Table 12). The highest habitat score in the NBWW survey area was recorded at MF14, which had six (6) good and four (4) modified attributes (0.70 ratio of modified:good; Table 13). The site reflected a continuation of some of the same issues affecting upstream habitat scores. There were no fast current types, moderate to high silt cover and moderate to high embeddedness of natural substrates. Moderate and high influence modified habitat attributes are common throughout the NBWW survey area.

The nineteen sites which rated poor were apportioned across each of the three subwatersheds. The Skokie River offered poor habitat throughout its length while only modest improvements in habitat were observed in the downstream sections of both the Middle and West Forks of the North Branch Chicago River. The mainstem of the North Branch offered poor quality habitat as judged by the IPS thresholds. Moderate and high influence modified attributes outnumbered



Figure 26. *The Middle Fork North Branch Chicago River downstream from Sunset Drive (MF14) during the 2019 sampling year. Only nine (9) of the twenty-five (25) sites in the NBWW survey area had riffle habitats which were moderately to extensively embedded at every site.*



Figure 27. *The Middle Fork North Branch Chicago River at E. Lake Ave. (MF16) in 2018. The long, sluggish pools with fine sediment and muck substrates were indicative of the generally poor habitat throughout the study area.*

Table 13. *QHEI matrix of good (■) and high influence (●) and moderate influence (●) modified habitat attributes for sites in the NBWW study area during 2018-19. QHEI scores are shaded in accordance with IPS derived narrative ratings; green – Good; yellow – Fair; orange – Poor. Ratios of poor to good attributes are shaded as yellow (fair >2.00), orange (poor >4.00), and red (very poor >6.00)*

			Good Habitat Attributes											High Influence Modified Attributes						Moderate Influence Modified Attributes													Ratios	
Site ID	River Mile	QHEI	No Channelization	Boulder, Cobble, Gravel	Silt Free	Good-Excellent Development	Moderate-High Sinuosity	Moderate-Extensive Cover	Fast Flow w Eddies	Little to No Embeddedness	Max Depth > 40 cm	No Riffle Embeddedness	# of Good Habitat Attributes	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse No Cover	Max Depths <40 cm	High Influence Poor Attributes	Recovering from Channelization	Mod-High Silt Cover	Sand Substrates (Boatable sites)	Hardpan Origin	Fair- Poor Development	Low Sinuosity	< 2 Cover Types	Intermittent Flow or Pools <20 cm	No Fast Current Types	Mod-Extensive Embeddedness	Mod-Extensive Riffle Embeddedness	No Riffle	# of Poor Habitat Attributes	Ratio of Poor (High) to Good	Ratio of Poor (All) to Good
Skokie River 2018																																		
SR1	21.1	33.5						■					1	●	●	●		●	4		●			●				●	●		●	5	4.0	9.0
SR2	17.4	33.5		■				■					2	●	●	●	●	●	5		●			●				●	●	●		5	2.5	5.0
SR3	14.8	40.5		■				■			■		3	●		●	●		3		●			●				●	●		●	5	1.0	2.7
SR4	11.3	47.0		■				■			■		3				●		1	●	●			●	●			●	●		●	7	0.3	2.7
SR5	8.0	45.5						■			■		2	●		●	●		3		●			●				●	●		●	5	1.5	4.0
SR6	7.4	36.3									■		1	●		●	●		3		●			●				●	●		●	5	3.0	8.0
SR7	3.0	32.5						■			■		2		●				1		●			●	●			●	●		●	6	0.5	3.5
SR18	0.5	38.5						■			■		2	●	●				2		●			●	●			●	●		●	6	1.0	4.0
Middle Fork North Branch Chicago River 2019																																		
MF08	21.1	34.0						■					1	●	●			●	3		●			●	●			●	●		●	6	3.0	9.0
MF09	18.9	28.0						■					1	●	●	●		●	4		●			●				●	●		●	5	4.0	9.0
MF10	16.7	43.0		■				■					2	●				●	2		●			●	●			●	●		●	6	1.0	4.0
MF11	14.1	45.5						■			■		2	●					1		●			●	●			●	●		●	6	0.5	3.5
MF12	10.8	41.5						■			■		2	●		●	●		3		●			●				●	●	●		5	1.5	4.0

Table 13. *QHEI matrix of good (■) and high influence (●) and moderate influence (●) modified habitat attributes for sites in the NBWW study area during 2018-19. QHEI scores are shaded in accordance with IPS derived narrative ratings; green – Good; yellow – Fair; orange – Poor. Ratios of poor to good attributes are shaded as yellow (fair >2.00), orange (poor >4.00), and red (very poor >6.00)*

			Good Habitat Attributes											High Influence Modified Attributes						Moderate Influence Modified Attributes													Ratios	
Site ID	River Mile	QHEI	No Channelization	Boulder, Cobble, Gravel	Silt Free	Good-Excellent Development	Moderate-High Sinuosity	Moderate-Extensive Cover	Fast Flow w Eddies	Little to No Embeddedness	Max Depth > 40 cm	No Riffle Embeddedness	# of Good Habitat Attributes	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse No Cover	Max Depths <40 cm	High Influence Poor Attributes	Recovering from Channelization	Mod-High Silt Cover	Sand Substrates (Boatable sites)	Hardpan Origin	Fair- Poor Development	Low Sinuosity	< 2 Cover Types	Intermittent Flow or Pools <20 cm	No Fast Current Types	Mod-Extensive Embeddedness	Mod-Extensive Riffle Embeddedness	No Riffle	# of Poor Habitat Attributes	Ratio of Poor (High) to Good	Ratio of Poor (All) to Good
MF13	8.6	54.5						■			■		2						0	●	●			●	●			●	●	●		7	0.0	3.5
MF14	6.0	67.0	■	■		■	■	■			■		6						0		●							●	●	●		4	0.0	0.7
MF15	4.0	59.0					■				■		2				●		1	●	●			●				●	●	●		6	0.5	3.5
Middle Fork North Branch Chicago River 2018																																		
MF16	3.0	44.0		■			■	■			■		4	●	●				2		●			●	●			●	●		●	6	0.5	2.0
MF17	1.8	45.0		■				■			■		3	●		●	●		3		●			●				●	●	●		5	1.0	2.7
West Fork North Branch Chicago River 2019																																		
WF20	12.5	30.5						■			■		2	●	●				2		●			●	●			●	●		●	6	1.0	4.0
WF21	10.4	40.5		■						■			2	●		●	●	●	4	●				●		●		●		●		5	2.0	4.5
WF22	9.2	46.0		■				■			■		3	●					1		●			●	●			●	●		●	6	0.3	2.3
WF23	4.9	38.5						■			■		2	●	●				2		●			●	●			●	●		●	6	1.0	4.0
WF24	2.9	53.5		■			■	■			■		4						0	●	●			●				●	●	●		6	0.0	1.5
WF25	1.3	45.5						■			■		2	●					1	●	●			●	●			●	●	●		7	0.5	4.0
North Branch Chicago River 2018																																		
MF19	18.6	49.0		■				■			■		3						0	●	●			●	●			●	●		●	7	0.0	2.3

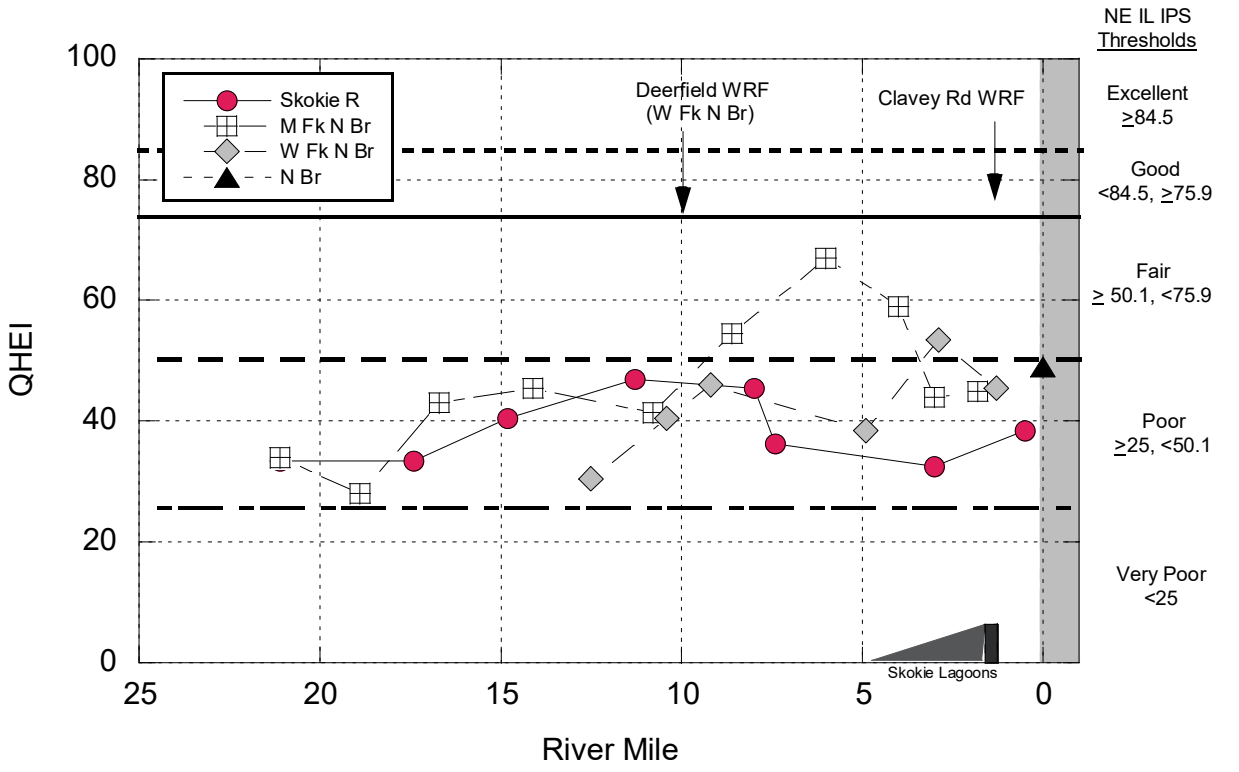


Figure 28. *Qualitative Habitat Evaluation Index (QHEI) scores in the NBWW survey area. Scores were recorded for the Skokie River, North Branch Chicago River and the lower two sites in the Middle Fork North Branch in 2018 while the West Fork North Branch and the upper Middle Fork North Branch values were recorded in 2019. The IPS narrative ranges of QHEI scores from excellent to very poor are indicated by solid and dashed lines.*

good attributes at 24 of the 25 sites in the NBWW survey area. Of these, 20 had at least one high influence modified attribute and fifteen (15) had multiple high influence modified attributes. Only two sites had a modified:good ratio <2.0 while four had very poor (>6.0), eight poor (>4.0) and 11 fair (>2.0) ratios (Table 12). Ratios <2.0 generally can support minimum biological goals such as the Illinois General Uses, but ratios >2.0 generally indicate a proportion of modified attributes that would require direct mitigation to reverse. It also means that meeting the General Use biocriteria would likely be precluded by habitat regardless of water quality conditions, thus raising concerns about use attainability (Rankin 1995). The sites with ratios <2.0 are the result of having fewer modified attributes coupled with enough good attributes to offset the negative influence of the modified attributes. All sites within the NBWW survey area lacked fast current types, possessed moderate to extensive silt coverage and all except one site had moderate to extensive embeddedness of natural substrates and fair to poor development. Most sites lacked riffles and of the sites that had riffles, they were moderately to extensively embedded by sand or silt. Low sinuosity was observed at half the sites and nearly three quarters had not recovered from historic channelization. Given the list of channel modifications and other hydrological alterations in the MWRD 2011 North Branch Watershed Plan (HDR 2011) executing needed habitat improvements may prove difficult.

Biological Assemblages – Macroinvertebrates

There were 109 unique macroinvertebrate taxa collected in the North Branch Chicago River survey area in 2018 and 2019 (Appendix C). The predominant taxa collected were mostly indicative of poor water quality. The most numerous was *Hyalella azteca,* an amphipod, followed by the genus *Gammarus sp.*, a crustacean; *Oligochaeta*, segmented worms; and the genus *Caecidotea sp.*, a crustacean (Table 14). The majority of the most numerous species collected were either of moderate tolerance or tolerant. The two most numerous species collected were significantly less tolerant than the majority of the top fifteen common species and were collected at 19 (*Hyalella azteca*) and 12 (*Gammarus sp.*) sites respectively (Table 14).

Table 14. *The fifteen (15) most abundant macroinvertebrate taxa collected in the NBWW survey area including number of times collected, total number collected, taxa group, and taxa tolerance assignments.*

Taxa Code	Scientific Name	Tolerance Group	Functional Group	Taxa Group	Times Collected	Total Numbers
06201	*Hyalella azteca*	4	CG	N	19	2220
06800	*Gammarus sp*	3	CG	N	12	1394
03600	*Oligochaeta*	10	CG	N	26	739
05800	*Caecidotea sp*	6	CG	N	21	609
84470	*Polypedilum (P.) illinoense*	6	SH	D	21	511
01801	*Turbellaria*	6	PR	N	23	352
84450	*Polypedilum (Uresipedilum) flavum*	6	SH	D	12	201
22001	*Coenagrionidae*	5.5	PR	O	23	196
83040	*Dicrotendipes neomodestus*	6	CG	D	18	185
98600	*Sphaerium sp*	5	CG	N	20	182
95100	*Physella sp*	9	SC	N	18	158
11130	*Baetis intercalaris*	4	CG	MA	3	107
52200	*Cheumatopsyche sp*	6	CF	CA	11	104
84540	*Polypedilum (Tripodura) scalaenum group*	6	SH	D	12	95
78655	*Procladius (Holotanypus) sp*	8	PR	D	11	78

Taxa Group: N - Non-Insect; MA - Mayfly; O - Odonata; CA - Caddisfly; D - Dipteran; T - Tribe Tanytarsini; CO - Coleoptera.
IL Functional Group: CG - Collecter/Gatherer; PR - Predator; CF - Collectors/Filterers; SH - Shredder; SC - Scraper.
IL Tolerance Score Ranges from 0 (Least Tolerant) to 10 (Most Tolerant).

Macroinvertebrate Assemblage

Samples were collected for the West Fork and the majority of the Middle Fork Branches of the Chicago River in 2019 with a single random resample conducted at WF20. Samples for the Skokie River, North Branch Chicago River mainstem site and the lower Middle Fork North Branch were collected in 2018 with a single random resample collected at SR3 and no sample collected at SR7 due to excessive depth. Macroinvertebrate assemblage in the NBWW survey area ranged from poor to fair (Figure 33). None of the sites met the mIBI General Use biocriterion of 41.8. The Middle Fork macroinvertebrate assemblage was generally fair with MF11 the only site with a rating in the upper poor range (Figure 33). The highest mIBI rating at MF14 coincides with the best habitat in the NBWW survey area. The site was the only site in the survey area that possessed more than 10% EPT taxa in the sample (43.6%; Table 17). The

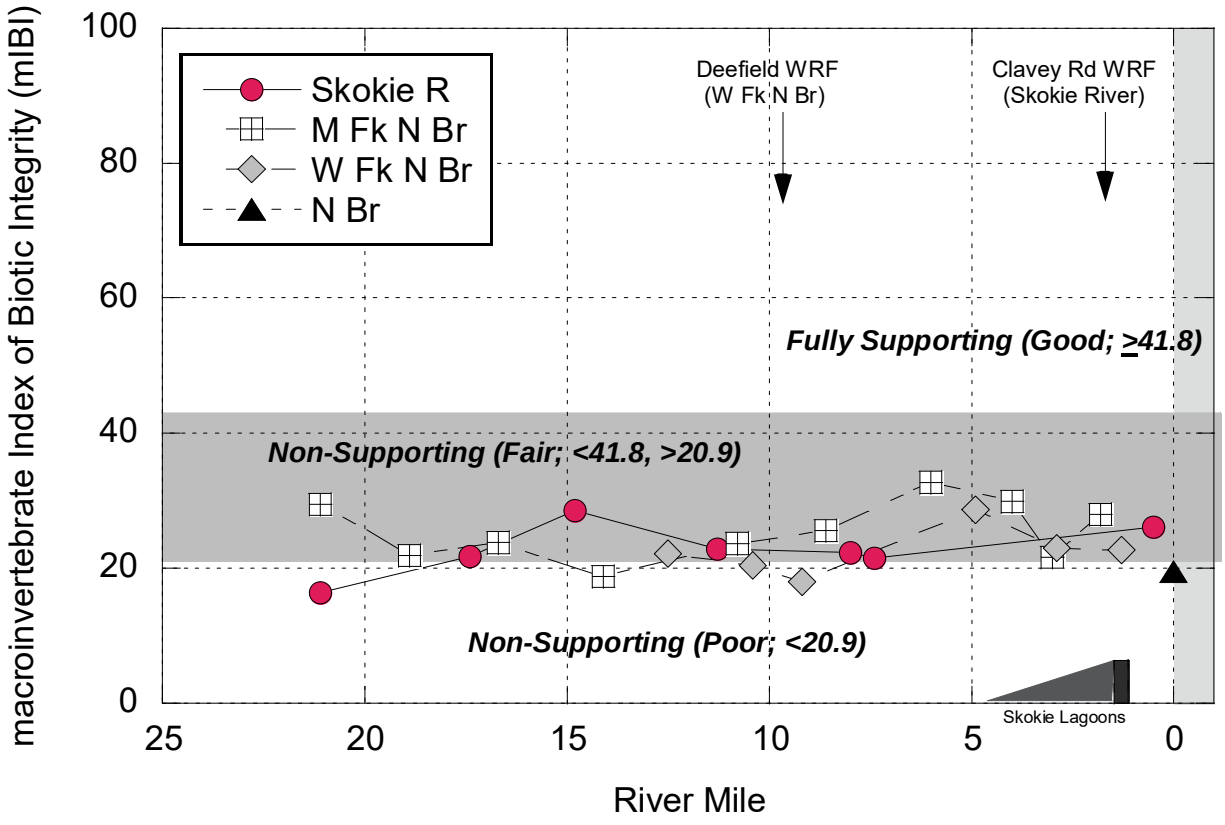


***Figure 29**. Illinois macroinvertebrate IBI (mIBI) scores for the NBWW survey area. Scores were recorded for the Skokie River, North Branch Chicago River and the lower two sites in the Middle Fork North Branch in 2018 while the West Fork North Branch and the upper Middle Fork North Branch values were recorded in 2019.*

macroinvertebrate assemblage in the North Branch Chicago River mainstem was consistent with the majority of the NBWW survey area, rating poor in the NE Illinois IPS thresholds.

Table 15 lists select mIBI metrics and other macroinvertebrate assemblage attributes, two of which are key biological response signatures associated with toxic impacts (% toxic tolerant taxa) and organic enrichment (% organic enrichment tolerant taxa; Yoder and DeShon 2003). Total taxa ranged from 7 to 27 taxa. The percent of organic enrichment taxa exceeded good thresholds at all except the lowest site in the West Fork, in the North Branch mainstem site, at half of the sites in the Skokie River and at MF16 in the Middle Fork. The West Fork North Branch organic enrichment taxa coincide with poor to fair concentrations of total phosphorus, TKN and high to wide diel D.O. swings (Table 15). Fewer sites (9) exceeded the good benchmark for the percent of toxic tolerant taxa with only two, SR3 and WF25, in the poor range (Table 15). The proportion of EPT taxa ranged from 0.0% to 43.6% with most sites in the poor range.

Table 15. *Selected fish and macroinvertebrate assemblage attributes for sites sampled in the NBWW watershed in 2018-19. Biological index scores are shaded by level of use support: Exceptional – blue; Good (fully supporting) - green; Fair (non-support) - yellow; Poor (non-support) – orange; Very Poor - red; key metrics as signatures of toxic or organic enrichment impacts are based on Yoder and DeShon (2003).*

				Fish Data							Macroinvertebrate Data								
Site ID	River Mile	Drainage Area (mi.^{2})	Year	fIBI	MIwb	Native Sp.	% DELT	Intolerant Sp.	%Mineral Spawners	% Tolerant	mIBI	Total Taxa	Intolerant Taxa	%Tolerant Taxa	EPT Taxa	%EPT	MBI	%Toxic Tolerant Taxa	%Organic Enrich. Taxa
Skokie River																			
SR1	21.10	2.70	2018	8.0		3	0.0	0	0	87.5	16.4	19.0	1.0	36.8	1	7.9	8.5	3.0	57.4
SR2	17.40	7.80	2018	14.0		5	0.0	0	0	78.0	21.8	14.0	2.0	3.2	0	0.0	4.2	0.0	5.1
SR3	14.80	11.50	2018	14.0		9	0.0	0	0	72.5	28.6	21.5	2.5	7.5	0	0.0	5.0	21.2	14.2
SR4	11.30	15.00	2018	12.5		8.5	0.0	0	0	69.0	22.9	12.0	1.0	2.8	1	8.1	4.0	1.1	2.1
SR5	8.00	20.60	2018	16.5	4.3	10.5	0.0	0	0.5	57.5	22.4	13.0	2.0	2.7	0	0.0	3.5	0.3	5.1
SR6	7.40	21.50	2018	15.5	5.5	7	0.0	0	1.0	71.5	21.5	16.0	2.0	7.7	0	0.0	5.5	10.6	35.3
SR7	3.00	23.70	2018	20.5	8.2	11	0.0	0	0	27.5									
SR18	0.50	30.90	2018	16.0	7.0	11	0.0	0	0	59.0	26.2	23.0	2.0	11.0	2	7.0	5.3	5.2	19.6
Middle Fork North Branch Chicago River																			
MF8	21.10	5.81	2019	14.0		5	0.0	0	0	40.0	29.6	13.0	1.0	4.9	3	6.7	4.6	0.0	8.7
MF9	18.90	8.91	2019	17.0		8	0.0	0	0	50.0	21.9	13.0	1.0	4.8	3	0.9	4.7	0.0	14.5
MF10	16.70	11.90	2019	16.0		7	0.0	0	0	29.0	23.9	12.0	2.0	1.4	3	2.3	4.2	0.0	2.0
MF11	14.10	16.11	2019	17.0		9	1.0	0	0	56.0	18.8	7.0	1.0	0.6	1	1.2	4.1	0.3	0.9
MF12	10.80	19.23	2019	15.0		7	0.0	0	0	57.0	23.7	17.0	2.0	2.4	2	1.2	4.4	0.0	6.6
MF13	8.60	20.96	2019	14.0	4.3	6	0.0	0	0	50.0	25.6	17.0	2.0	4.6	1	0.6	5.3	0.9	11.0
MF14	6.00	22.48	2019	14.0	5.5	12	0.0	0	0	58.0	32.8	18.0	2.0	2.9	3	43.6	5.3	0.6	12.8
MF15	4.00	24.29	2019	15.0	5.3	7	0.0	0	0	57.0	29.9	27.0	2.0	1.6	4	6.5	5.1	5.0	10.0
MF16	3.00	56.10	2018	15.0	5.3	9.5	0.3	0	0	46.5	21.7	27.0	1.0	20.2	1	0.3	6.3	16.7	25.0
MF17	1.80	57.30	2018	14.0	5.1	9.5	0.0	0	0	53.5	28	21.0	2.0	3.8	1	2.3	5.1	7.0	13.0
West Fork North Branch Chicago River																			
WF20	12.50	3.87	2019	16.0		4	0.0	0	0	50.0	22.2	17.0	0.5	16.2	0	0.0	6.5	10.3	33.6
WF21	10.40	7.02	2019	9.0		3	0.0	0	0	100.0	20.5	18.0	2.0	5.3	1	0.3	6.0	4.7	44.1
WF22	9.20	9.41	2019	12.0		6	0.9	0	0	67.0	18.1	18.0	0.0	9.6	1	0.3	6.3	4.2	57.8
WF23	4.90	17.86	2019	13.0		9	4.4	0	0	67.0	28.7	21.0	1.0	13.8	2	0.9	5.9	7.1	26.4
WF24	2.90	24.52	2019	4.0	3.2	4	0.0	0	0	100.0	23.1	26.0	0.0	7.4	2	2.3	5.8	0.8	22.2
WF25	1.30	27.97	2019	12.0	3.6	9	0.8	0	0	78.0	22.8	20.0	0.0	6.5	2	0.7	5.4	33.7	13.0
North Branch Chicago River																			
MF19	18.60	93.40	2018	12.0	4.6	10	0.0	0	0	60.0	19.5	18.0	2.0	20.9	0	0.0	6.5	3.4	35.5
Exceptional				≥50	>9.6	>29	0	≥5		≤16.1	>65.0							0	<5
Good				>41-49	>8.5	>14	<1.3	≥4	>40.7	<30.3	≥41.8	≥23	≥3	≤7.5	≥3	>24.5	≤4.9	<5	<15
Fair				30- <41	>5.8	>12	<3.0	<3	<40.7	<40	<41.8	<23	≥2	≤28	2	≥7.7	>4.9	<20	≥15
Poor				>15-29	<5.8	>7	>10	≤1	<10	>50	≤20.9	<16	<2	>28.1	1	<7.7		≥35	≥35
Very Poor				<15	<4.0	<7	>20		<0.8	≥70			0		0			>60	>60

Biological Assemblages – Fish

Twenty (20) native and three (3) non-native fish species and three (3) hybrids were collected in the NBWW survey area in 2018 and 2019. The fish assemblage was predominated by tolerant and moderately tolerant species (Table 16). Bluegill, Green Sunfish, White Sucker, Largemouth Bass, Gizzard Shad, Goldfish, Blackstripe Topminnow, Common Carp, Yellow Bullhead, and Golden Shiner were the most numerous species collected in 2018 and 2019 combined. White Sucker, Common Carp, Largemouth Bass, Bluegill, Green Sunfish, Walleye, Goldfish, Gizzard Shad, Yellow Bullhead and Black Bullhead comprised the highest percentages of biomass. Of the ten most abundant species six (6) are highly tolerant, two (2) are moderately tolerant and none are sensitive or intolerant. The species collected are common to highly disturbed streams and are adaptive to degraded or limited habitat availability.

Table 16*. The ten most abundant species by number weight collected in the NBWW survey area in 2018-19. Illinois and Ohio tolerance assignments, numbers and weight (kg) collected, and percent collected by each (T – highly tolerant; P moderately tolerant; species with blank tolerance cells are intermediate).*

Species	Tolerance		No./Wt. Collected	% By Number
	IL	OH		
Species Ranks by Numbers				
Bluegill		P	911	16.9
Green Sunfish	T	T	779	14.5
White Sucker	T	T	724	13.4
Largemouth Bass		P	627	11.6
Gizzard Shad			581	10.8
Goldfish	T	T	432	8.0
Blackstripe Topminnow			364	6.8
Common Carp	T	T	251	4.7
Yellow Bullhead	T	T	236	4.4
Golden Shiner	T	T	179	3.3
Species Ranks by Weight (Kg)				
White Sucker	T	T	2.8	31.1
Common Carp	T	T	2.7	30.1
Largemouth Bass		P	0.6	6.9
Bluegill		P	0.6	6.5
Green Sunfish	T	T	0.4	4.6
Walleye			0.4	4.3
Goldfish	T	T	0.4	4.0
Gizzard Shad			0.3	3.8
Yellow Bullhead	T	T	0.3	3.8
Black Bullhead		P	0.1	1.3

Fish Assemblage

Fish IBI (fIBI) scores are the mean of two sampling passes within the summer-early fall index period. The General Use biocriterion of 41 was not met at any sites (Table 15; Figure 34). Poor scores were recorded at all sites except for within the Skokie Lagoons (SR7) which scored in the lower fair range. The longitudinal plots for the Middle Fork and West Fork show little variation in the fish community from upstream to downstream, while the Skokie River shows some improvement from upstream to downstream. The site in the West Fork downstream of E. Lake Ave. (WF24) showed a sharp decline in the fIBI. This location is downstream of the Village of Glenview 1800 E. Lake Ave. lift station and where the highest median concentrations of

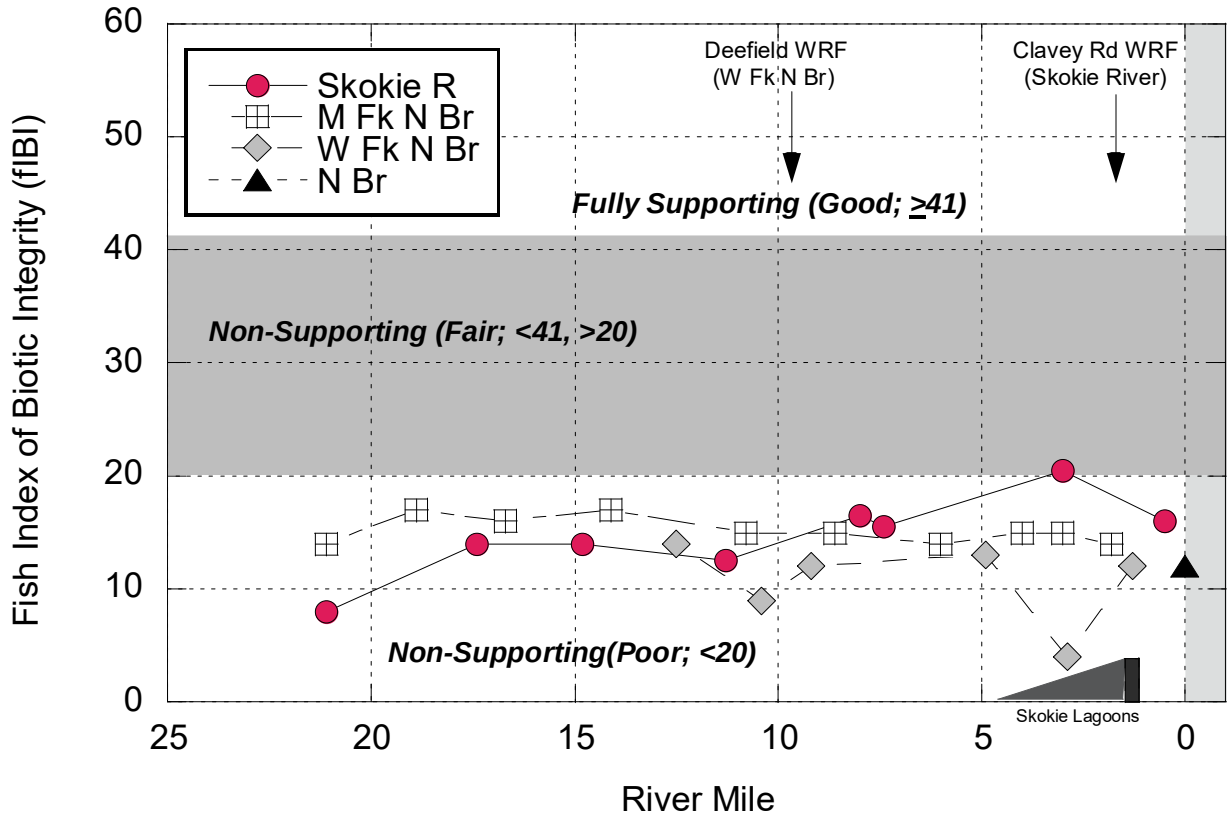


Figure 30. *Illinois fish IBI (fIBI) scores for the NBWW survey area. Scores were recorded for the Skokie River, North Branch Chicago River and the lower two sites in the Middle Fork North Branch in 2018 while the West Fork North Branch and the upper Middle Fork North Branch values were recorded in 2019.*

ammonia-N and chlorides in 2019 were located. The Skokie River site (SR7) which attained a fair rating was likely buoyed by stocking efforts by the Illinois DNR. Walleye, Northern Pike, Channel Catfish and Largemouth Bass (Figure 35) are stocked annually (Illinois DNR, 2020). Fish assemblages were dominated by tolerant, introduced and non-native species while no species that are considered sensitive or intolerant were collected. The assemblage present in the NBWW survey area provided little support for the fIBI to meet the General Use biocriterion.

The Modified Index of Well-Being (MIwb) has no formal biocriteria in Illinois, but using the Ohio biocriteria it attained the Ohio equivalent of the General Use at zero (0) sites and was fair at the lower two sites in the Skokie River. The MIwb is calculated for wadeable and boatable sites with drainage areas >20 mi^2 and was therefore assessed at twelve sites total in the NBWW survey area. Middle Fork North Branch sites possessed observed MIwb values in the poor range and the West Fork North Branch MIwb scores were very poor (Table 14). High proportions of tolerant fishes throughout the survey area limit both the MIwb and fIBI scores. The percent tolerant fish exceeded the good threshold at all but two sites (SR7 and MF10; Table 17). DELT anomalies were generally very low, with primarily good and excellent values were observed. Zero intolerant species were collected with a very limited number of sites possessing any mineral substrate spawners (Table 14).



Figure 31*. Largemouth Bass (Micropterus salmoides) collected in the Skokie Lagoons (SR7) during the first sampling event in 2018.*

Synthesis

The baseline biological condition of the North Branch River and its subwatersheds has been shaped by the naturally low gradient and wetland origins of the region. The current condition of the biological assemblages reflects the changes that have significantly altered these natural

features, mostly through hydrological and physical alterations related to suburban and urban development throughout the survey area. Both the direct and indirect influences of the altered hydrology and habitat were evident in the chemical, habitat, and bioassessment results. The legacy of hydrological and habitat alterations have resulted in sluggish flows, excessive siltation, embedded substrates, sparse instream cover, sediments high in organic matter, and indicators of excessive urban runoff that are further exacerbated by the altered flows and habitat. High levels of PAHs and metals in sediments are due to urban runoff and persist at greater concentrations during the low flow periods that occur during the summer and early fall months. Sediments that are high in organic matter have also indirectly resulted from sluggish flows and stream channel alterations that combine to exacerbate low D.O. concentrations and high to wide diel D.O. swings. The introduction of wastewater from the Clavey Rd. WRF in the Skokie River and the Deerfield WRF in the West Fork North Branch appear to be a source of nitrogen compounds including nitrites, TKN, and ammonia, but they also appear to reduce TSS and chloride levels. No site had QHEI scores that were considered good and only a few fair scores were recorded. In keeping with the same pattern, neither biological assemblage attained a rating of good or met their General Use biocriteria.

Newly derived IPS thresholds for water and sediment chemistry and physical habitat attributes (MBI 2020a) were available to better assess causes of impairment and their comparative severity. The approach for deriving these thresholds included a more refined stratification of biological effect threshold values for parameters that showed valid relationships with biological responses based on species and taxa level analyses and then correlated with the corresponding fish and macroinvertebrate IBI attainment thresholds and narrative ratings (MBI 2020a). This produced thresholds across four or five narrative categories of quality (excellent, good, fair, poor, and very poor). This replaces the formerly used binary (i.e., “pass/fail”) approach to evaluating exceedances of chemical and physical effect thresholds and criteria providing for a graded approach to the assignment of causes and sources of Illinois General Use biological impairments. The new IPS framework also offers the semblance of a tiered aquatic life use (TALU) stratification of goals and thresholds that has been incorporated into all IPS outputs to support local restoration and protection efforts by the respective watershed groups and stakeholders.

The biological criteria for fish and macroinvertebrates used by Illinois EPA (2018) establish the thresholds by which impaired sites and reaches are determined. The assignment of causes in this analysis generally attempts to follow the overall intent of the Illinois Integrated Report assessment guidelines, but is supplemented by the more extensive biological effect thresholds provided by the newly updated IPS tools and indicators (MBI 2020a) and more spatially refined by the intensive pollution survey design. The delineation of causes and sources was based on integrating and synthesizing the preceding analyses of categorical and parameter-specific stressor threshold exceedances. The most influential of these in 2018-19 are included in Table 17 along with the fish and macroinvertebrate IBI scores and other indicators of stress and response. Habitat alteration is represented by the QHEI and the QHEI modified:good attributes ratio, D.O. includes the minimum measured by Datasondes, the effect of nutrient enrichment by the diel D.O. swing narrative, the nutrient enrichment effect status, the new IPS nutrient

***Table 17**. Key chemical, physical, and biological response indicators of impairment observed at each site in the NBWW study area in 2018 and 2019. The causes associated with biological impairments are drawn from analyses of habitat, nutrient effects, chemical IPS and other threshold exceedances, sediment chemical IPS exceedances, and biological response signatures. Causes of impairment are classified as fair, poor, or very poor in accordance with the exceedance of corresponding thresholds. See footnotes for table references and biological, physical, and chemical threshold intervals.*

Site ID	River Mile	Drainage Area (mi.^{2})	Year	AQLU Status	fIBI[1]	mIBI[2]	QHEI[3]	QHEI Modified: Good Ratio[4]	Min. D.O. (Sonde) <WQC[5]	Diel D.O. Swing[5]	Diel D.O. Swing Narrative[5]	IPS Nutrient Index[6]	Chemical WQC Exceedances[7]	>Fair Chemical Thresholds[8]	No. of Sediment Metals >Thresholds[9]	No. of Sediment PAH >Thresholds[9]	Organic Enrichment Signatures[10]	Toxic Tolerant Signatures[10]	2018-19 MBI Causes by Stressor Threshold Narrative Category: Very Poor[11]	Poor[11]	Fair[11]	2018-19 MBI Sources	Restorability Score (0-100)
Skokie River 2018																							
SR1	21.1	2.7	2018	Non-Poor	8.0	18.4	33.5	9.0	2.38	5.05	High	20.2	None	Cu,Na,Zn	Al,Cr,Cu,Fe,Pb,Ni,Ag,Zn	PAH (10)	M (57.4%)	None	Urban-WS;Dev-WS; Substr; Chan; Metals-WC; PAH	Imperv-500m; TKN; QHEI	Low DO; BOD; Chloride; VSS; Turbidity; Sed. Metals	Urban, NPS, Altered Flow, Habitat Mod.	11.8
SR2	17.4	7.8	2018	Non-Poor	14.0	21.8	33.5	5.0				21.3	None	None	Al,Cr,Cu,Pb,Mn,Ag,Zn	PAH (13)	None	None	Urban-WS;Dev-WS; Substr; PAH	QHEI; Channel	Imperv-500m;TP; TKN; BOD; Nitrate	Urban, NPS, Altered Flow, Habitat Mod.	16.7
SR3	14.8	11.5	2018	Non-Poor	14.0	28.6	40.5	2.7	3.91	5.07	High	18.7	None	None	Al,Cr,Cu,Pb,Ni,Ag,Zn	PAH (13)	M (14.2%)	M (21.2%)	Urban-WS;Dev-WS; Substr; PAH	Imperv-500m; BOD; QHEI; Chan; TSS	Low DO; Chloride; VSS; Turbidity; Sed. Metals	Urban, NPS, Altered Flow, Habitat Mod.	21.1
SR4	11.3	15.0	2018	Non-Poor	12.5	22.9	47.0	2.7				16.5	None	TKN	Al,Cr,Cu,Fe,Pb,Mn,Ni,Ag,Zn	PAH (11)	None	None	Chan; PAH	Imperv-500m;Urban-WS;Dev-WS; QHEI; TSS	Low DO; BOD; Substr; Chloride; VSS; Turbidity; Sed. Metals	Urban, NPS, Altered Flow, Habitat Mod.	24.5
SR5	8.0	20.6	2018	Non-Poor	16.5	22.4	45.5	4.0	3.25	5.77	High	16.6	None	None	Al,Cr,Cu,Pb,Ag,Zn	PAH (12)	None	None	Urban-WS;Dev-WS; PAH	QHEI; Substr; Chan; TSS	Imperv-500m; TKN; BOD; Chloride; VSS	Urban, NPS, Altered Flow, Habitat Mod.	19.5
SR6	7.4	21.5	2018	Non-Poor	15.5	21.6	36.3	8.0				20.9	None	None	Al,Cr,Cu,Pb,Ag,Zn	PAH (13)	M (35.3%)	M (10.6%)	Urban-WS;Dev-WS; PAH	BOD; QHEI; Substr; Chan; TSS	Imperv-500m; Low DO; TKN; Chloride; VSS; Turbidity; Sed. Metals	Urban, NPS, Altered Flow, Habitat Mod.	19.2
SR7	3.0	23.7	2018	Non-Poor	20.5	N/A	32.5	3.5	1.33	6.47	High	18.9	None	None	Al,Cu,Ni,Ag	PAH (3)	None	None	Urban-WS;Dev-WS; Chan;	QHEI; Substr; TSS	Imperv-500m;Imperv-30;Imperv-30C; Low DO; BOD; Chloride; VSS; Turbidity; Sed. Metals; PAH	Urban, NPS, Altered Flow, Habitat Mod.	22.4
SR18	0.5	30.9	2018	Non-Poor	16.0	28.2	38.5	4.0	5.64	3.99	Low	18.8	None	Cu,Zn	Al,Cr,Cu,Pb,Ni,Ag,Zn	PAH (10)	M (19.6%)	M (5.2%)	Urban-WS;Dev-WS; Substr; Chan; PAH	QHEI, Metals-WC	Imperv-500m; Low DO; BOD; Chloride; Turbidity; Sed. Metals	Urban, NPS, Altered Flow, Habitat Mod.	25.1
Middle Fork North Branch Chicago River 2019																							
MF8	21.1	5.8	2019	Non-Poor	14.0	29.6	34.0	9.0				17.8	None	Na,Zn	Al,Cr,Cu,Fe,Pb,Mn,Ni,Zn	PAH (10)	None	None	Substr; PAH	Urban-WS;Dev-WS; Low DO; QHEI; Chan; Chloride; Metals-WC	Imperv-500m; Conduct	Urban, NPS, Altered Flow, Habitat Mod.	16.4
MF9	18.9	8.9	2019	Non-Poor	17.0	21.9	28.0	9.0				21.5	None	None	Al,Cr,Cu,Fe,Pb,Ni,Zn	PAH (10)	None	None	Low DO; PAH	Urban-WS; QHEI; Substr; Chan; Chloride	Imperv-500m;Dev-WS; TKN; Max DO; Conduct	Urban, NPS, Altered Flow, Habitat Mod.	24.6
MF10	16.7	11.9	2019	Non-Poor	16.0	23.9	43.0	4.0	1.12	15.25	Wide	21.6	None	None	Al,Cr,Cu,Fe,Pb,Mn,Ni,Zn	PAH(9)	None	None	PAH	Urban-WS;Dev-WS; Low DO; QHEI; Substr; Chan; Chloride	Imperv-500m; TKN; Max DO; Conduct	Urban, NPS, Altered Flow, Habitat Mod.	25.7
MF11	14.1	16.1	2019	Non-Poor	17.0	18.8	45.5	3.5				23.5	None	None	Al	PAH(9)	None	None	PAH	Urban-WS;Dev-WS; Low DO; QHEI; Substr; Chan; Chloride	Imperv-500m; TKN; Max DO; Conduct	Urban, NPS, Altered Flow, Habitat Mod.	24.4
MF12	10.8	19.2	2019	Non-Poor	15.0	23.7	41.5	4.0	3.72	3.64	Low	21.0	None	None	Al,Cr,Cu,Fe,Pb,Ni,Zn	PAH (10)	None	None	PAH	Urban-WS;Dev-WS; Low DO; QHEI; Substr; Chan; Chloride	Imperv-500m; TKN; Max DO; Conduct; TSS	Urban, NPS, Altered Flow, Habitat Mod.	20.8
MF13	8.6	21.0	2019	Non-Poor	14.0	25.6	54.5	3.5				18.8	None	TKN	Al,Cr,Cu,Fe,Pb,Ni,Zn	PAH (12)	None	None	Substr; PAH	Urban-WS;Dev-WS; Chan; TSS	Imperv-500m; Low DO; TKN; QHEI; Chloride; VSS; Turbidity; Sed. Metals;	Urban, NPS, Altered Flow, Habitat Mod.	27.7
MF14	6.0	22.5	2019	Non-Poor	14.0	32.8	67.0	0.7	5.02	5.24	High	19.4	None	TKN	None	PAH (10)	None	None	PAH	Urban-WS;Dev-WS; Chloride	Imperv-500m; Low DO; TKN; Max DO; QHEI; Substr; Conduct; TSS; Turbidity; Sed. Metals	Urban, NPS, Altered Flow, Habitat Mod.	37.5
MF15	4.0	24.3	2019	Non-Poor	15.0	29.9	59.0	3.5	5.94	4.2	Moderate	17.0	None	Cu,Na	None	PAH (10)	None	M (5.0%)	PAH	Urban-WS;Dev-WS; Substr; Chloride; TSS, Metals-WC	Imperv-500m; BOD; Max DO; QHEI; Chan; Conduct; WC Metals	Urban, NPS, Altered Flow, Habitat Mod.	25.9
MF16	3.0	56.1	2018	Non-Poor	15.0	21.7	44.0	2.0				21.7	None	None	Al,Cr,Cu,Pb,Ni,Ag,Zn	PAH (13)	M (25.0%)	M (16.7%)	Substr; PAH	Urban-WS;Dev-WS; QHEI; Chan; VSS	Imperv-500m; TKN; BOD; Nitrate; Chloride; TSS	Urban, NPS, Altered Flow, Habitat Mod.	28.2
MF17	1.8	57.3	2018	Non-Poor	14.0	28.0	45.0	2.7	4.52	2.58	Low	21.7	None	None	Al,Cr,Cu,Pb,Ni,Ag,Zn	PAH (13)	None	M (7.0%)	Chan; PAH	Urban-WS;Dev-WS; QHEI; Substrate	Imperv-500m; Low DO; TKN; BOD; TSS; VSS; Turbidity; Sed. Metals	Urban, NPS, Altered Flow, Habitat Mod.	26.2
West Fork North Branch Chicago River 2019																							
WF20	12.5	3.9	2019	Non-Poor	16.0	22.2	30.5	4.0				23.9	None	TKN, TSS, TP, Na	Al,Cu,Pb,Ni,Zn	PAH (11)	M (33.6%)	M (10.3%)	Substr; PAH	Urban-WS;Dev-WS; Low DO; QHEI; Chan; Chloride; Metals-WC	Imperv-500m; TKN; BOD; Conduct; TSS	Urban, NPS, Altered Flow, Habitat Mod.	14.8
WF21	10.4	7.0	2019	Non-Poor	9.0	20.5	40.5	4.5	1.44	5.77	High	23.6	None	None	Al,Cu,Ni,Zn	PAH (12)	M (44.1%)	None	PAH	Urban-WS;Dev-WS; Low DO; QHEI; Channel	Imperv-500m; TKN; BOD; Max DO; Substr; Chloride	Urban, NPS, Altered Flow, Habitat Mod.	19.4
WF22	9.2	9.4	2019	Non-Poor	12.0	18.1	46.0	2.3				27.7	None	Cu,Na,Zn	Al,Cr,Cu,Fe,Ni,Zn	PAH (11)	M (57.8%)	None	Urban-WS;Dev-WS; WC Metals; PAH	Low DO; QHEI; Substr; Chan; Chloride,Metals-WC	Imperv-500m;Imperv-30;Imperv-30C;TP; TKN; BOD; Conductivity	Urban, NPS, Altered Flow, Habitat Mod.	11.3
WF23	4.9	17.9	2019	Non-Poor	13.0	28.7	38.5	4.0	1.62	6.67	Wide	23.6	None	None	None	PAH (10)	M (26.4%)	M (7.0%), DELT (4.4%)	Urban-WS;Dev-WS; Substr; Chloride; PAH	Imperv-500m;Imperv-30;Imperv-30C; Low DO; QHEI; Chan	TP; TKN; Max DO; Conductivity	Urban, NPS, Altered Flow, Habitat Mod.	18.3
WF24	2.9	24.5	2019	Non-Poor	4.0	23.1	53.5	1.5				26.0	None	TKN	None	PAH (12)	M (22.2%)	None	Urban-WS;Dev-WS; Chloride; PAH	Imperv-500m; TKN; Conduct	Imperv-30;Imperv-30C;TP; Low DO; Max DO; QHEI; Substr; Chan; Turbidity; Sed. Metals	Urban, NPS, Altered Flow, Habitat Mod.	19.6
WF25	1.3	28.0	2019	Non-Poor	12.0	22.8	45.5	4.0	2.77	5.16	High	23.8	None	Cu,Na	None	PAH (13)	None	M (33.7%)	Urban-WS;Dev-WS; Chloride; PAH	Imperv-500m; Low DO; QHEI; Substr; Chan; Conduct;	TP; TKN; Max DO	Urban, NPS, Altered Flow, Habitat Mod.	20.8
North Branch Chicago River 2018																							
WF19	18.6	93.4	2018	Non-Poor	12.0	19.5	49.0	2.3	3.89	2.93	Low	18.2	None	Cu,Na,Zn	Al,Cd,Cr,Cu,Fe,Pb,Mn,Ni,Ag,Zn	PAH (10)	M (35.5%)	None	Urban-WS;Dev-WS; PAH	Imperv-30;Imperv-30C, Metals-WC	Imperv-500m; Low DO; Chloride; VSS; Turbidity; Sed. Metals	Urban, NPS, Altered Flow, Habitat Mod.	30.2
	Narrative Category			***Narrative Range Thresholds & Criteria***																			**Narrative**
	Excellent		FULL	≥50	>73	>84.5	<0.50	>6.9	< 2.0	Normal	<10	None	None	None	None	None	0	<5					**Very High**
	Good		FULL	>41-49	41.8-72.9	>75.9	<2.00	6-6.9	2.0-4.0	Low	10-15	1	1	1	1	<5	<15					**High**
	Fair		PARTIAL	30-<41	30-41.7	<75.9	≥2.00	4.0-5.9	4.0-5.0	Moderate	15-25	2-4	2-4	2-4	2-3	<20	≥15					**Moderate**
	Poor		Non-Fair	>15-29	>15-29	<50.1	≥4.00	2.0-3.9	5.0-6.5	High	25-35	4-6	4-6	4-6	4-6	>35	>35					**Low**
	Very Poor		Non-Poor	<15	<15	<25	≥6.00	<2.0	>6.5	Wide	>35	>6	>6	>6	>6	>60	>60					**Very Low**

[1] fIBI: full support ≥41; nonsupport-fair ≥20<41; nonsupport-poor <20.

[2] mIBI: full support ≥41.8; nonsupport-fair ≥20.9<41.8; nonsupport-poor <20.9.

[3] From Table 6 - IPS thresholds for habitat attributes.

[4] From Table 11 - QHEI matrix of good and modified attributes.

[5] From Table 8 - modified SNAP variables matrix.

[6] IPS derived nutrient index - see Appendix F.

[7] Exceedances of Illinois water quality criteria.

[8] Number and magnitude of water column chemical threshold exceedances (Appendix E).

[9] Sediment metal and organic exceedences of NE IL IPS thresholds in Table 7 or MacDonald et al. (2000) PEC/TEC or IEPA elevated levels - see Tables 9 (metals) and 10 (PAH compounds).

[10] Biological response signatures for organic enrichment - see Table 13 (M - macoinvertebrates; F - fish).

[10] Biological response signatures for general toxicity - see Table 12 (M - macoinvertebrates; F - fish).

[11] IPS derived very poor (primary), poor (secondary), and fair (tertiary) causes assigned by weighting the stressor rank * FIT factor - see Appendix E; primary causes rank >8-10, secondary causes rank >6-8, tertiary causes rank >4-6.

index, new IPS chemical threshold exceedances for water and sediment, and biological response signatures for organic enrichment and toxic tolerant indicators. The rationale for listing the predominant causal categories in 2018 and 2019 follows:

- **PAH/Metals/Toxicity** (50 observations; weighted frequency of 29.3%) – any sediment or water column metal or PAH threshold exceedance in Table 8, *PEC or PEL* exceedance, or Illinois EPA elevated thresholds and any toxic *Biological Response* in Table 17.
- **Macro Habitat Related** (44 observations; weighted frequency of 25.7%) – any high influence *Channelized/No Recovery* or moderate influence *Recovering from Channelization* in the QHEI attributes matrix (Table 13) or a poor or very poor QHEI score.
- **Siltation/Embeddedness** (24 observations; weighted frequency of 14.3%) – any high influence *Silt/Muck Substrate* and/or moderate-extensive embeddedness in the QHEI attributes matrix (Table 13).
- **Organic Enrichment/Low D.O.** (46 observations; weighted frequency of 11.3%) – any low D.O. value, any TKN value of poor or very poor (TKN used as a proxy for BOD per Miltner 2018);
- **Chlorides** (22 observations; weighted frequency of 8.4%) any chloride value >biological effect fair, poor, or very poor threshold in Table 7.
- **Turbidity/TSS** (23 observations; weighted frequency of 6.4%).
- **Nutrient Enrichment** (25 observations; weighted frequency of 4.6%) - diel D.O. Swing narrative ratings of *High* or *Wide* and/or nutrient enrichment status of *Highly Enriched, Enriched, or Likely Nutrients* as described in Table 9. SNAP narrative ratings that were accompanied by high TKN and low total P and nitrate-N were also correlated the Organic Enrichment/Low D.O. cause category in the modified upper mainstem.

While Macro Habitat Related causes were not the most frequent limiting factor to aquatic life, they were the most severe and exhibited the highest number of Poor IPS threshold exceedances. Altered hydrology and habitat are the primary factors perpetuating the Macro Habitat Related deficiencies. Poor habitat persists throughout the North Branch Chicago River watershed, containing primarily poor habitat, with only a few fair QHEI scores located in the Middle Fork of the North Branch and a single fair score in the West Fork of the North Branch. Siltation/ Embeddedness was the second most limiting factor, and despite having fewer observations than Nutrient Enrichment (weighted frequency 14.3%) was pervasive throughout the study area with very poor narrative ratings in each subwatershed. Organic Enrichment/Low D.O. had 46 observations (11.3% weighted), primarily poor and fair ratings, with mostly low D.O. levels, high diel D.O. swings and high BOD_5 afflicting each subwatershed. Chlorides were primarily limiting in the Middle Fork of the North Branch and the West Fork of the North Branch, with primarily poor narrative ratings. Turbidity/TSS had 23 observations and a weighted frequency of 6.4% primarily were limiting in the Skokie River and Middle Fork of the Chicago River. Poor TSS ratings were observed in the Skokie River and Middle Fork of the North Branch

with few fair ratings in the West Fork of the North Branch. PAH/Metals/Toxicity (weighted frequency of 29.3%) primarily were fair ratings for sediment metals located in the Skokie River as well as the lower end of the Middle Fork of the North Branch. Very poor ratings were recorded at nearly every site for PAH concentrations in the survey area. Nutrient Enrichment was the least impactful limiting factor to aquatic life with 25 observations and a weighted frequency of 4.6%. TKN was the primary nutrient with fair ratings in the Middle Fork of the North Branch and in the West Fork of the North Branch.

Neither of the two major point sources (NSWRD Clavey Rd. and Deerfield WRFs) played a major role in the observed results with the exception of minor increases in some chemical constituents associated with municipal wastewater. No distinguishable signatures of excessive nutrient enrichment were apparent in the modified SNAP analysis even though the two WRFs heavily dominate the low flows of their receiving streams. Nor did they have any apparent beneficial effects as was observed in 2016 and 2018 with the entry of large volumes of treated wastewater discharges in the Upper Des Plaines River (MBI 2020b).

Perhaps the most important observation from the 2018-2019 bioassessment is that the overall habitat in each of the subwatersheds and in the mainstem North Branch Chicago River site is mostly poor. Heavy silt coverage and muck substrates coupled with the lingering effects of legacy channel and hydrological modifications reduce the habitat available for macro-invertebrates and fish and hamper the assimilation of pollution in general. Urban runoff contributes to toxic levels of PAHs and metals in sediments that are prevalent throughout the survey area. The biological results are associated with numerous exceedances of IPS thresholds with no sites meeting the Illinois EPA General Use designation for aquatic life.

Reinforcing these observations are the low and very low Restorability scores generated by the NE Illinois IPS (Table 17) which means that the challenges with restoring the streams of the NBWW study area to attaining the Illinois General Use for aquatic life are greater and dependent of restoration actions that address the most limiting chemical and physical factors as is demonstrated by the consistent repetition of very poor and poor causes of impairment related to urban land uses coupled with flow and habitat alterations.

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APPENDIX A

IPS Derived Biological Effect Thresholds

A-1: Northeast Illinois IPS Derived Biological Effect Thresholds for Water Column Parameters

A-2: Northeast Illinois IPS Derived Biological Effect Thresholds for Sediment Chemistry Parameters

A-3: Northeast Illinois IPS Derived Biological Effect Thresholds for Habitat and Land Use Parameters

Parameter Code	Variable Name	Units	Parameter Group	Limiting Assemblage	FIT Score	Sample N	Thresholds by Narrative Condition Category					Reference Site Values (Median-2X IQR)	Reference Site N
							Excellent	Good	Fair	Poor	Very Poor		
P665	Total Phosphorus	mg/L	Nutrients	Fish	0.04	1464	≤0.106	>0.106	>0.277	>1.002	>1.726	0.088 (0.062-0.115)	35
P94	Conductivity	µS/cm	Ionic	Fish	0.05	1464	≤739	≥739	>1038	>1208	>1378	922 (705-1158)	40
P70300	Total Dissolved Solids	mg/L	Ionic	Fish	0.10	1464	≤453.8	>453.8	>558.0	>651.2	>744.5	614 (512-664)	28
DO_MIN	Minimum DO	mg/L	Demand	Macros	0.10	985	>8.0	≥6.5	>5.47	<4.44	<3.4	8.6 (6.5-9.6)	29
P1092	Zinc, Total	µg/L	Metal_Tox	Fish	0.13	1464	≤7.47	>7.47	>9.78	>11.00	>12.22	2.0 (2.0-7.0)	23
P625	Total Kjeldahl Nitrogen	mg/L	Demand	Macros	0.14	985	≤1.07	>1.07	>1.12	>1.63	>2.14	0.74 (0.30-0.99)	30
P940	Chloride, Total	mg/L	Ionic	Fish	0.17	1464	≤40.00	>40.00	>120.0	>184.9	>249.8	154 (80.3-171.3)	33
P310	BOD (5-Day)	mg/L	Demand	Macros	0.21	985	≤1.30	>1.30	>2.35	>3.45	>4.54	2 (2.0-2.2)	27
P610	Total Ammonia	mg/L	Nutrients	Macros	0.28	985	≤0.084	>0.084	>0.100	>0.190	>0.280	0.1 (0.10-0.10)	34
P630	Nitrate-N	mg/L	Nutrients	Fish	0.29	1464	≤3.767	>3.767	>5.045	>7.344	>9.643	0.39 (0.29-0.97)	32
P929	Sodium, Total	mg/L	Ionic	Fish	0.29	1464	≤16275	>16275	>45000	>79056	>113112	14200 (10375-22500	21
P530	Total Suspended Solids	mg/L	Demand	Fish	0.32	1464	≤17.50	>17.50	>31.60	>35.15	>38.69	9.2 (5.4-20.3)	33
P1027	Cadmium, Total	µg/L	Metal_Tox	Fish	0.93	1464	≤0.937	>0.937	>0.974	>0.983	>0.991	<MDL (0.17)	23
DO_MAX	Maximum DO	mg/L	Demand	Macros	0.94	985	≤10.36	≥10.36	>12.21	>14.24	>16.28	8.74 (8.21-9.45)	29
P1042	Copper, Total	µg/L	Metal_Tox	Fish	1.75	1464	--	≤4.480	>4.480	>4.969	>5.458	2.00 (1.96-4.15)	22
P1051	Lead, Total	µg/L	Metal_Tox	Macros	2.11	985	≤2.851	>2.851	>3.335	>3.884	>4.434	0.24 (0.20-0.57)	23
P82078	Turbidity	NTU	Demand	Macros	2.61	985	--	≤19.3	>19.3	>25.9	>32.5	11.0 (4.5-24.5)	7
P1055	Manganese, Total	µg/L	Metal_Tox	Macros	2.74	985	≤53.71	>53.71	>77.03	>107.1	>137.2	32.0 (24.1-38.2)	23
P549	Volatile Suspended Solids	mg/L	Demand	Fish	2.81	1464	≤5.000	>5.000	>7.769	>9.825	>11.88	6.0 (4.8-7.4)	5
P1067	Nickel, Total	µg/L	Metal_Tox	Macros	3.26	985	--	≤3.470	>3.470	>9.585	>15.70	5 (1.5-21)	14
P945	Sulfate, Total	mg/L	Ionic	Macros	6.49	985	≤58.27	>58.27	>73.10	>83.45	>93.81	74.6 (61.8-81.8)	4
P1002	Arsenic	µg/L	Metal_Tox	Macros	9.19	985	--	≤3.616	>3.455	>5.029	>6.603	Insufficient Data	
P937	Potassium, Total	mg/L	Ionic	Macros	10.13	985	≤3158	>3158	>6300	>7718	>9129	2400 (1574-2817)	21
P1007	Barium, Total	µg/L	Metal_Tox	Fish	4.77	1464	≤74.1	>74.09	>84.88	>101.8	>118.6	56.3 (44.3-64.7)	21
P1034	Chromium, Total	µg/L	Metal_Tox	Fish	10.17	1464	≤1.398	>1.398	>1.540	>2.682	>3.824	1.73 (1.30-2.00)	6
P1082	Strontium	µg/L	Metal_Tox	Fish	2.69	1464	≤169.1	>169.1	>190.8	>280.4	>370.1	150 (135-181)	21
P1105	Aluminum, Total	µg/L	Metal_Tox	Fish	4.54	1464	≤310.0	>310.0	>393.3	>560.2	>727.0	200 (128-449)	21
P916	Calcium, Total	mg/L	Ionic	Fish	Unimodal	1464	≤84425	>84425	>86067	>86313	>86559	54,000 (80-74,250)	21
P299	Mean Dissolved Oxygen	mg/L	Demand	Macros	0.21	985	≥9.42	<9.42	<9.25	<6.11	<3.05	8.6 (7.9-9.0)	40
P615	Nitrite-N	mg/L	Nutrients	Macros	0.41	985	≤0.014	>0.014	>0.040	>0.068	>0.096	0.01 (0.01-0.01)	27
P720	Cyanide, Total	µg/L	Metal_Tox	Macros	5.17	985	≤8	>8	>10	>10	>10	3 (2-10)	6

Parameter Code	Variable Name	Units	Parameter Group	Limiting Assemblage	FIT Score	Sample N	Thresholds by Narrative Condition Category					Reference Site Values Median (IQR)
							Excellent	Good	Fair	Poor	Very Poor	
P1093	Zinc	mg/kg	Metal_Tox	Macros	2.22	985	≤75.00	>75.00	>100.0	>133.9	>167.8	Insufficient Data
P34524	Benzo(g,h,i)perylene	µg/kg	PAH	Macros	2.32	985	--	< 335.0	>335.0	>792.1	>1249	
P34406	Indeno(1,2,3-cd)pyrene	µg/kg	PAH	Macros	2.41	985	--	< 260.5	>260.5	>623.3	>986.2	
P1043	Copper	mg/kg	Metal_Tox	Macros	2.42	985	≤19.00	>19.00	>29.78	>40.45	>51.12	
P34233	Benzo(b)fluoranthene	µg/kg	PAH	Macros	2.51	985	--	<520.8	>520.8	>1437	>2354	
P1068	Nickel	mg/kg	Metal_Tox	Macros	2.67	985	--	<19.50	>19.50	>22.52	>25.53	
P34250	Benzo(a)pyrene	µg/kg	PAH	Macros	2.85	985	--	<230.0	>230.0	>798.3	>1367	
P34472	Pyrene	µg/kg	PAH	Macros	2.85	985	--	< 393.0	>393.0	>1570	>2747	
P1052	Lead	mg/kg	Metal_Tox	Macros	3.01	985	≤15.50	>15.50	>24.80	>33.04	>41.27	
P34529	Benzo[a]anthracene	µg/kg	PAH	Macros	3.48	985	--	< 239.0	>239.0	>699.4	>1160	
P34323	Chrysene	µg/kg	PAH	Macros	3.51	985	--	<266.0	>266.0	>958.3	>1651	
P34379	Fluoranthene	µg/kg	PAH	Macros	3.91	985	--	<774.0	>774.0	>2432	>4091	
P1083	Strontium	mg/kg	Metal_Tox	Macros	4.44	985	--	<81.80	>81.80	>106.8	>131.9	
P34559	Dibenz(a,h)anthracene	µg/kg	PAH	Macros	4.57	985	--	< 101.0	>101.0	>167.3	>233.7	
P34223	Anthracene	µg/kg	PAH	Macros	5.10	985	--	<78.00	>78.00	>119.9	>161.8	
P34464	Phenanthrene	µg/kg	PAH	Macros	5.10	985	--	< 243.5	>243.5	>803.3	>1363	
P1003	Arsenic	mg/kg	Metal_Tox	Macros	6.21	985	--	≤8.65	>8.65	>15.82	>23.67	
P1029	Chromium	mg/kg	Metal_Tox	Macros	6.29	985	≤20.53	>20.53	>23.30	>26.22	>29.15	
P1053	Manganese	mg/kg	Metal_Tox	Macros	7.08	985	≤841.0	>841.0	>845.5	>996.8	>1148	
P1078	Silver	mg/kg	Metal_Tox	Macros	7.11	985	--	<0.483	>0.483	>1.261	>2.039	
P1108	Aluminum	mg/kg	Metal_Tox	Macros	8.26	985	--	<6480	>6480	>8272	>10064	
P1008	Barium	mg/kg	Metal_Tox	Macros	8.88	985	--	≤141.0	>132.0	>150.3	>168.7	
P1028	Cadmium	mg/kg	Metal_Tox	Macros	11.00	985	--	≤0.933	>0.745	>1.354	>1.963	
P1013	Beryllium	mg/kg	Metal_Tox	Macros	ND[a]	985	--	≤0.411	>0.411	>0.496	>0.581	
P1103	Tin	mg/kg	Metal_Tox	Macros	ND	985	--	<8.86	>11.00	>16.73	>24.60	
P34203	Acenaphthylene	µg/kg	PAH	Macros	ND	985	--	<86.38	>86.38	>103.6	>120.9	
P34208	Acenaphthene	µg/kg	PAH	Macros	ND	985	--	<84.25	>84.25	>104.8	>125.3	
P34262	Delta-BHC	µg/kg	PAH	Macros	ND	985	--	<2.098	>2.098	>6.19	>10.28	
P34384	Fluorene	µg/kg	PAH	Macros	ND	985	--	<84.25	>84.25	>104.8	>125.3	
P34445	Naphthalene	µg/kg	PAH	Macros	ND	985	--	< 86.38	>86.38	>103.6	>120.9	

Parameter Code	Variable Name	Units	Parameter Group	Limiting Assemblage	FIT Score	Sample N	Thresholds by Narrative Condition Category					Reference Site Values (Median - 2X IQR)	Reference Site N
							Excellent	Good	Fair	Poor	Very Poor		
EMBEDDED	Embeddedness Score	QHEI Units	Habitat	Fish	0.03	1393	≤1.3	>1.3	>1.6	>2.4	>3.2	2 (2-2)	29
Urban	Urban (Ust. WS)	Wtd. %	Land Use	Fish	0.03	2657	≤8.8	>8.8	>45.0	>63.2	>81.3	8.7 (3.0-9.5)	48
QHEI	QHEI Score	QHEI Units	Habitat	Fish	0.04	1393	≥84.5	>75.9	<75.9	<50.1	<25.0	84 (76-90)	34
SUBSTRAT	Substrate Score	QHEI Units	Habitat	Fish	0.04	1393	≥16.0	<16.0	<15.0	<9.9	<5.0	8 (7-9)	33
WWH_ATTR	Good Habitat Attributes	Number	Habitat	Fish	0.04	1393	≥9	<9	<8	<5	<2	16 (15-17)	34
Imperv	Impervious (30 m)	Wtd. %	Land Use	Fish	0.04	2657	≤18.3	>18.3	>30.5	>53.4	>76.4	2.1 (0.0-14.7)	48
Imperv	Impervious (30 m Clipped)	Wtd. %	Land Use	Fish	0.04	2657	≤13.4	>13.4	>26.7	>50.9	>75.1	2.1 (0.0-6.1)	48
CHANNEL	Channel Score	QHEI Units	Habitat	Fish	0.07	1393	≥16.8	<16.8	<14.00	<9.2	<4.6	16 (13-19)	34
COVER	Cover Score	QHEI Units	Habitat	Fish	0.07	1393	≥16.0	<16.0	<14.0	<9.2	<4.6	16 (16-17)	34
SILTCOVE	Silt Cover Score	QHEI Units	Habitat	Fish	0.07	1393	≤2.0	<2.0	>2.0	>2.7	>3.33	2 (2-3)	29
Develop	Developed (Ust. WS)	Wtd. %	Land Use	Fish	0.07	2657	≤9.1	>9.1	>45.6	>63.6	>81.5	9.1 (2.9-9.6)	48
RIPARIAN	Riparian Score	QHEI Units	Habitat	Fish	0.10	1393	≥6.0	>6.0	<6.0	<4.0	<2.0	7.0 (6.0-9.5)	34
Imperv	Impervious (Ust. WS)	Wtd. %	Land Use	Macros	0.10	3096	≤5.6	>5.6	>13.2	>41.8	>70.5	5.2 (2.1-5.4)	48
DEPTH	Depth Score	QHEI Units	Habitat	Fish	0.11	1393	≥10.0	>10.0	<10.0	<6.6	<3.3	10 (9-11)	33
MWH_ATTR	Poor Habitat Attributes	Number	Habitat	Fish	0.12	1393	≤1	<1	>1	>3	>6	2 (1-5)	20
HYD_QHEI	Hydro-QHEI	QHEI Units	Habitat	Fish	0.13	1393	≥17.0	>17.0	<19.5	<12.9	<6.4	20 (14-22)	33
CURRENT	Current Score	QHEI Units	Habitat	Fish	0.14	1393	≥7.0	>7.0	<7.0	<4.6	<2.3	11 (5.8-11.0)	33
POOL	Pool Score	QHEI Units	Habitat	Fish	0.15	1393	≥11.3	<11.3	<10.0	<6.6	<3.3	11.5 (10-12)	34
Heavurb	Heavy Urban (Ust. WS)	Wtd. %	Land Use	Macros	0.17	3096	≤7.7	>7.7	>29.3	>52.6	>76.0	5.5 (1.1-6.0)	48
RIFFLE	Riff< Score	QHEI Units	Habitat	Fish	0.27	1393	≥5.8	≥5.8	<5.8	<3.9	<1.9	6 (5-7)	34
GRAD_S	Gradient Score	QHEI Units	Habitat	Fish	0.31	1393	≥10.0	>10.0	<10.0	<6.6	<3.3	10 (10-10)	34
Ag	Agricultural (Ust. WS)	Wtd. %	Land Use	Macros	4.82	3096	≤87.1	<87.1	>62.1	>74.6	>87.1	83.9 (11.7-85.4)	48
GRADIENT	Gradient (ft/mi)	feet/mile	Habitat	Fish	12.20	1393	≥8.8	<8.8	<4.3	<2.8	<1.4	8.6 (4.9-11.3)	34
Ag	Agricultural (30 m)	Wtd. %	Land Use	Macros	16.66	3096	≤87.2	<87.2	>43.2	>61.9	>80.7	0.0 (0.0-0.4)	48

APPENDIX B

North Branch Chicago River 2018-2019 Fish Assemblage Data

B-1: Fish Index of Biotic Integrity (IBI) Metrics & Scores
B-2 Fish Species Grand (all sites combined)
B-3: Fish Species by Sampling Event

Appendix Table B-1. Fish IBI results for data collected in the North Branch Chicago River study area 2018-2019.

Site ID	River Mile	Type	Date	DA sq mi	Wetted Width (ft)	IL IBI Reg.	Number of: Native species	Sunfish species	Sucker species	Intolerant species	Benthic Invert. species	Minnow species	Percent: Mineral Substrate Spawners	Tolerant Fish (as Species)	Generalist Feeders	Specialized Benthic Invert-ivores	Rel.No. /(0.3km)		IBI	Modified Iwb
NORTH BRANCH CHICAGO RIVER - (95009)																				
Year: 2018																				
MF19	18.60	D	07/29/2018	93.4	79.1	3	10(2)	3(3)	1(1)	0(0)	0(0)	1(1)	0(0)	60(3)	85(2)	0(0)	252		12.0	4.6
MIDDLE FORK NORTH BRANCH CHICAGO RIVER - (95291)																				
Year: 2018																				
MF16	3.00	D	07/29/2018	56.1	69.7	3	10(2)	4(4)	1(1)	0(0)	0(0)	1(1)	0(0)	60(3)	87(2)	0(0)	219		13.0	5.9
MF16	3.00	D	09/29/2018	56.1	69.7	3	9(2)	4(4)	1(1)	0(0)	0(0)	0(0)	0(0)	33(5)	66(5)	0(0)	123	*	17.0	4.8
MF17	1.80	D	07/29/2018	57.3	70.1	3	12(2)	4(4)	1(1)	0(0)	1(1)	2(2)	0(0)	50(4)	87(2)	0(1)	327		17.0	5.6
MF17	1.80	D	09/29/2018	57.3	70.1	3	7(1)	3(3)	1(1)	0(0)	0(0)	0(0)	0(0)	57(3)	84(3)	0(0)	156	*	11.0	4.6
Year: 2019																				
MF08	21.10	F	08/14/2019	5.8	28.0	3	5(1)	2(3)	0(0)	0(0)	0(0)	0(0)	0(0)	40(4)	8(6)	0(0)	106	*	14.0	4.1
MF09	18.90	F	08/14/2019	8.9	35.9	3	8(2)	3(4)	0(0)	0(0)	0(0)	1(1)	0(0)	50(4)	32(6)	0(0)	136	*	17.0	4.9
MF10	16.70	F	08/14/2019	11.9	41.2	3	7(1)	3(4)	0(0)	0(0)	0(0)	0(0)	0(0)	29(5)	44(6)	0(0)	344		16.0	4.9
MF11	14.10	E	08/14/2019	16.1	46.8	3	9(2)	4(5)	1(1)	0(0)	0(0)	1(1)	0(0)	56(3)	61(5)	0(0)	390		17.0	7.0
MF12	10.80	E	08/13/2019	19.2	50.0	3	7(1)	3(4)	1(1)	0(0)	0(0)	0(0)	0(0)	57(3)	38(6)	0(0)	138	*	15.0	4.4
MF13	8.60	F	08/18/2019	20.9	51.6	3	6(1)	3(4)	1(1)	0(0)	0(0)	0(0)	0(0)	50(4)	64(5)	0(0)	106	*	15.0	4.3
MF14	6.00	E	08/13/2019	22.4	52.8	3	12(2)	3(4)	1(1)	0(0)	0(0)	3(2)	0(0)	58(3)	92(2)	0(0)	240		14.0	5.5
MF15	4.00	E	08/13/2019	24.2	54.3	3	7(1)	3(4)	1(1)	0(0)	0(0)	0(0)	0(0)	57(3)	56(6)	0(0)	126	*	15.0	5.3
WEST FORK NORTH BRANCH CHICAGO RIVER - (95292)																				
Year: 2019																				
WF20	12.50	F	08/14/2019	3.8	20.3	3	4(1)	3(5)	0(0)	0(0)	0(0)	0(0)	0(0)	50(4)	57(6)	0(0)	14	* *	16.0	4.1

na - Qualitative data, Modified Iwb not applicable.

X - IBI extrapolated

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table B-1. Fish IBI results for data collected in the North Branch Chicago River study area 2018-2019.

Site ID	River Mile	Type	Date	DA sq mi	Wetted Width (ft)	IL IBI Reg.	Number of: Native species	Sunfish species	Sucker species	Intolerant species	Benthic Invert. species	Minnow species	Percent: Mineral Substrate Spawners	Tolerant Fish (as Species)	Generalist Feeders	Specialized Benthic Invert-ivores	Rel.No. /(0.3km)	IBI	Modified Iwb
WF21	10.40	F	08/15/2019	7.0	31.5	3	3(0)	2(3)	0(0)	0(0)	0(0)	0(0)	0(0)	100(0)	52(6)	0(0)	42 * *	9.00	3.8
WF22	9.20	D	08/14/2019	9.4	36.9	3	6(1)	3(4)	1(2)	0(0)	0(0)	0(0)	0(0)	67(3)	91(2)	0(0)	173 *	12.0	4.6
WF23	4.90	D	08/13/2019	17.8	48.6	3	9(2)	4(5)	1(1)	0(0)	0(0)	1(1)	0(0)	67(3)	98(1)	0(0)	276	13.0	4.6
WF24	2.90	D	08/13/2019	24.5	54.5	3	4(0)	2(3)	0(0)	0(0)	0(0)	0(0)	0(0)	100(0)	98(1)	0(0)	123 *	4.00	3.2
WF25	1.30	D	08/13/2019	27.9	56.9	3	9(2)	3(4)	1(1)	0(0)	0(0)	2(2)	0(0)	78(2)	95(1)	0(0)	180 *	12.0	3.6
SKOKIE RIVER - (95403)																			
Year: 2018																			
SR1	21.10	E	07/30/2018	2.7	14.6	3	4(1)	3(6)	0(0)	0(0)	0(0)	0(0)	0(0)	75(2)	94(1)	0(0)	426	10.0	3.7
SR1	21.10	E	09/12/2018	2.7	14.6	3	2(0)	2(5)	0(0)	0(0)	0(0)	0(0)	0(0)	100(0)	99(1)	0(0)	316	6.00	1.8
SR2	17.40	E	07/30/2018	7.8	33.7	3	1(0)	1(2)	0(0)	0(0)	0(0)	0(0)	0(0)	100(0)	33(6)	0(0)	7 * *	8.00	2.0
SR2	17.40	E	09/12/2018	7.8	33.7	3	9(2)	4(6)	1(2)	0(0)	0(0)	1(1)	0(0)	56(3)	57(6)	0(0)	362	20.0	5.5
SR3	14.80	E	07/30/2018	11.5	40.8	3	9(2)	4(5)	1(1)	0(0)	0(0)	1(1)	0(0)	67(3)	90(2)	0(0)	376	14.0	5.5
SR3	14.80	E	09/29/2018	11.5	40.8	3	9(2)	4(5)	1(1)	0(0)	0(0)	2(2)	0(0)	78(2)	92(2)	0(0)	566	14.0	5.6
SR4	11.30	E	07/30/2018	15.0	45.6	3	6(1)	3(4)	1(1)	0(0)	0(0)	0(0)	0(0)	83(2)	91(2)	0(0)	508	10.0	5.2
SR4	11.30	E	09/12/2018	15.0	45.6	3	11(2)	6(6)	1(1)	0(0)	0(0)	1(1)	0(0)	55(3)	86(2)	0(0)	408	15.0	5.7
SR5	8.00	E	07/30/2018	20.6	51.4	3	10(2)	3(4)	1(1)	0(0)	0(0)	2(2)	0(0)	60(3)	85(2)	0(0)	202	14.0	3.9
SR5	8.00	E	09/12/2018	20.6	51.4	3	11(2)	5(6)	1(1)	0(0)	0(0)	2(2)	1(1)	55(3)	74(4)	0(0)	160 *	19.0	4.8
SR6	7.40	D	07/20/2018	21.5	52.1	3	7(1)	3(4)	1(1)	0(0)	0(0)	1(1)	0(0)	86(1)	50(6)	0(0)	174 *	14.0	5.5
SR6	7.40	D	09/29/2018	21.5	52.1	3	7(1)	4(5)	1(1)	0(0)	0(0)	1(1)	0(0)	57(3)	55(6)	0(0)	131 *	17.0	5.5
SR7	3.00	P	07/25/2018	23.7	53.9	3	10(2)	6(6)	0(0)	0(0)	0(0)	1(1)	0(0)	30(5)	58(6)	0(0)	788	20.0	7.6
SR7	3.00	P	09/17/2018	23.7	53.9	3	12(2)	5(6)	0(0)	0(0)	1(1)	1(1)	2(1)	25(5)	75(4)	0(1)	846	21.0	8.8

na - Qualitative data, Modified Iwb not applicable.

X - IBI extrapolated

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table B-1. Fish IBI results for data collected in the North Branch Chicago River study area 2018-2019.

Site ID	River Mile	Type	Date	DA sq mi	Wetted Width (ft)	IL IBI Reg.	Number of						Percent				Rel.No. /(0.3km)	Modified	
							Native species	Sunfish species	Sucker species	Intolerant species	Benthic Invert. species	Minnow species	Mineral Substrate Spawners	Tolerant Fish (as Species)	Generalist Feeders	Specialized Benthic Invert-ivores		IBI	Iwb
SR18	0.50	D	07/29/2018	30.9	58.7	3	10(2)	4(5)	1(1)	0(0)	0(0)	2(2)	0(0)	60(3)	85(2)	0(0)	675	15.0	7.1
SR18	0.50	D	09/19/2018	30.9	58.7	3	12(2)	4(5)	1(1)	0(0)	1(1)	3(2)	0(0)	58(3)	88(2)	0(1)	314	17.0	6.9

na - Qualitative data, Modified Iwb not applicable.

X - IBI extrapolated

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix B-2: Midwest Biodiversity Institute
Fish Species List - Grand Totals

Rivers: *North Branch Chicago River; Middle Fork North Branch Chicago River; West Fork North Branch Chicago River; Skokie River*

Years: 2018; 2019

Number of Samples: 35 Data Sources: 99 Data Types: D; E; F; P

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		581	26.7	10.79	351	3.83	13.1
34-001	CENTRAL MUDMINNOW	I	T	C		61	2.8	1.13	12	0.13	4.3
40-016	WHITE SUCKER	O	T	S	W	724	33.3	13.45	2849	31.07	85.5
43-001	COMMON CARP	O	T	M	G	251	11.6	4.66	2765	30.16	239.5
43-002	GOLDFISH	O	T	M	G	432	19.9	8.02	366	3.99	18.4
43-003	GOLDEN SHINER	I	T	M	N	179	8.2	3.32	54	0.59	6.5
43-034	SAND SHINER	I	M	M	N	1	0.1	0.02	0	0.00	3.0
43-042	FATHEAD MINNOW	O	T	C	N	24	1.1	0.45	1	0.02	1.7
43-043	BLUNTNOSE MINNOW	O	T	C	N	8	0.4	0.15	1	0.02	4.3
43-045	COMMON CARP X GOLDFISH	O	T		G	10	0.5	0.19	220	2.41	480.0
47-002	CHANNEL CATFISH			C	F	2	0.1	0.04	103	1.13	1125.0
47-004	YELLOW BULLHEAD	I	T	C		236	10.9	4.38	347	3.79	32.0
47-006	BLACK BULLHEAD	I	P	C		44	2.0	0.82	120	1.31	59.3
47-013	TADPOLE MADTOM	I		C		3	0.1	0.06	0	0.01	7.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		364	16.7	6.76	22	0.25	1.3
77-001	WHITE CRAPPIE	I		C	S	2	0.1	0.04	0	0.00	2.5
77-002	BLACK CRAPPIE	I		C	S	7	0.3	0.13	16	0.18	52.1
77-006	LARGEMOUTH BASS	C		C	F	627	28.8	11.65	633	6.90	21.9
77-008	GREEN SUNFISH	I	T	C	S	779	35.8	14.47	421	4.60	11.7
77-009	BLUEGILL SUNFISH	I	P	C	S	911	41.9	16.92	600	6.54	14.3
77-010	ORANGESPOTTED SUNFISH	I		C	S	1	0.2	0.02	0	0.00	5.0
77-012	REDEAR SUNFISH	I		C	E	18	2.7	0.33	44	0.15	16.1
77-013	PUMPKINSEED SUNFISH	I	P	C	S	63	2.9	1.17	61	0.67	21.3
77-014	BLUEGILL X PUMPKINSEED					1	0.1	0.02	1	0.02	30.0
77-015	GREEN SF X BLUEGILL SF					47	2.2	0.87	78	0.85	36.1
80-002	WALLEYE	P		S	F	8	1.2	0.15	414	1.37	341.2

No Species: 26 **Nat. Species:** 20 **Hybrids:** 3 **Total Counted:** 5384 **Total Rel. Wt. :** 9491

Appendix B-2: Midwest Biodiversity Institute
Fish Species List - Grand Totals

Rivers: *Skokie River*

Years: 2018

Number of Samples: 16 Data Sources: 99 Data Types: D; E; P

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	668	60.8	19.98	746	9.67	12.2
77-006	LARGEMOUTH BASS	C		C	F	492	44.8	14.71	911	11.80	20.3
77-008	GREEN SUNFISH	I	T	C	S	492	44.8	14.71	462	5.98	10.3
20-003	GIZZARD SHAD	O		M		413	37.6	12.35	565	7.32	15.0
40-016	WHITE SUCKER	O	T	S	W	377	34.3	11.27	1892	24.50	55.1
43-002	GOLDFISH	O	T	M	G	368	33.5	11.00	254	3.30	7.6
43-003	GOLDEN SHINER	I	T	M	N	157	14.3	4.69	80	1.04	5.6
43-001	COMMON CARP	O	T	M	G	98	8.9	2.93	1856	24.04	208.2
54-002	BLACKSTRIPE TOPMINNOW	I		M		62	5.6	1.85	7	0.10	1.3
77-013	PUMPKINSEED SUNFISH	I	P	C	S	59	5.4	1.76	116	1.51	21.6
47-006	BLACK BULLHEAD	I	P	C		34	3.1	1.02	170	2.20	55.0
77-015	GREEN SF X BLUEGILL SF					32	2.9	0.96	81	1.06	28.0
47-004	YELLOW BULLHEAD	I	T	C		28	2.6	0.84	137	1.78	53.9
43-042	FATHEAD MINNOW	O	T	C	N	19	1.7	0.57	3	0.04	1.7
77-012	REDEAR SUNFISH	I		C	E	18	1.6	0.54	26	0.34	16.1
80-002	WALLEYE	P		S	F	8	0.7	0.24	248	3.22	341.2
43-043	BLUNTNOSE MINNOW	O	T	C	N	6	0.6	0.18	2	0.04	5.0
77-002	BLACK CRAPPIE	I		C	S	6	0.6	0.18	32	0.42	60.0
47-013	TADPOLE MADTOM	I		C		2	0.6	0.06	3	0.01	5.5
77-001	WHITE CRAPPIE	I		C	S	2	0.2	0.06	0	0.01	2.5
47-002	CHANNEL CATFISH			C	F	1	0.3	0.03	411	1.59	1350.0
77-010	ORANGESPOTTED SUNFISH	I		C	S	1	0.3	0.03	1	0.01	5.0
77-014	BLUEGILL X PUMPKINSEED					1	0.1	0.03	2	0.04	30.0

No Species: 23 **Nat. Species:** 18 **Hybrids:** 2 **Total Counted:** 3344 **Total Rel. Wt. :** 8016

Appendix B-2: Midwest Biodiversity Institute
Fish Species List - Grand Totals

Rivers: *North Branch Chicago River; Middle Fork North Branch Chicago River*

Years: 2018; 2019

Number of Samples: 13 Data Sources: 99 Data Types: D; E; F

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
54-002	BLACKSTRIPE TOPMINNOW	I		M		295	40.1	19.52	54	0.55	1.3
77-008	GREEN SUNFISH	I	T	C	S	247	33.6	16.35	456	4.58	13.6
40-016	WHITE SUCKER	O	T	S	W	240	32.6	15.88	5214	52.28	159.7
77-009	BLUEGILL SUNFISH	I	P	C	S	191	26.0	12.64	470	4.72	18.1
47-004	YELLOW BULLHEAD	I	T	C		130	17.7	8.60	326	3.28	18.4
77-006	LARGEMOUTH BASS	C		C	F	113	15.4	7.48	478	4.80	31.1
43-001	COMMON CARP	O	T	M	G	107	14.6	7.08	1941	19.47	133.4
34-001	CENTRAL MUDMINNOW	I	T	C		61	8.3	4.04	36	0.37	4.3
20-003	GIZZARD SHAD	O		M		53	7.2	3.51	106	1.07	14.8
43-002	GOLDFISH	O	T	M	G	21	2.9	1.39	541	5.43	189.6
43-003	GOLDEN SHINER	I	T	M	N	21	2.9	1.39	33	0.33	11.6
77-015	GREEN SF X BLUEGILL SF					11	1.5	0.73	88	0.89	59.0
47-006	BLACK BULLHEAD	I	P	C		9	1.2	0.60	91	0.92	74.5
43-042	FATHEAD MINNOW	O	T	C	N	4	0.5	0.26	0	0.01	1.5
77-013	PUMPKINSEED SUNFISH	I	P	C	S	3	0.4	0.20	6	0.06	15.6
43-034	SAND SHINER	I	M	M	N	1	0.1	0.07	0	0.00	3.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	1	0.1	0.07	0	0.00	2.0
47-002	CHANNEL CATFISH			C	F	1	0.1	0.07	122	1.23	900.0
47-013	TADPOLE MADTOM	I		C		1	0.1	0.07	1	0.01	10.0
77-002	BLACK CRAPPIE	I		C	S	1	0.1	0.07	0	0.01	5.0

No Species: 20 **Nat. Species:** 17 **Hybrids:** 1 **Total Counted:** 1511 **Total Rel. Wt. :** 9973

Appendix B-2: Midwest Biodiversity Institute
Fish Species List - Grand Totals

Rivers: *West Fork North Branch Chicago River*

Years: 2019

Number of Samples: 6 Data Sources: 99 Data Types: D; F

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		115	31.4	21.74	174	1.56	5.5
40-016	WHITE SUCKER	O	T	S	W	107	29.2	20.23	767	6.83	26.2
47-004	YELLOW BULLHEAD	I	T	C		78	21.3	14.74	993	8.85	46.6
77-009	BLUEGILL SUNFISH	I	P	C	S	52	14.2	9.83	377	3.36	26.5
43-001	COMMON CARP	O	T	M	G	46	12.6	8.70	6945	61.83	553.0
43-002	GOLDFISH	O	T	M	G	43	11.7	8.13	320	2.86	27.3
77-008	GREEN SUNFISH	I	T	C	S	40	10.9	7.56	196	1.75	18.0
77-006	LARGEMOUTH BASS	C		C	F	22	6.0	4.16	63	0.56	10.5
43-045	COMMON CARP X GOLDFISH	O	T		G	10	2.7	1.89	1310	11.67	480.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		7	1.9	1.32	1	0.01	0.7
77-015	GREEN SF X BLUEGILL SF					4	1.1	0.76	42	0.38	38.7
43-003	GOLDEN SHINER	I	T	M	N	1	0.3	0.19	13	0.12	50.0
43-042	FATHEAD MINNOW	O	T	C	N	1	0.3	0.19	0	0.00	2.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	1	0.3	0.19	0	0.01	3.0
47-006	BLACK BULLHEAD	I	P	C		1	0.3	0.19	19	0.17	70.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	0.3	0.19	5	0.05	20.0

No Species: 16 **Nat. Species:** 12 **Hybrids:** 2 **Total Counted:** 529 **Total Rel. Wt. :** 11232

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-009 North Branch Chicago River RM: 18.60 Date: 07/29/2018

Time Fished: 1087 Distance: 0.200 Drainge (sq mi): 93.4 Depth: 0

Location: ust. Dempster St. Lat: 42.04128 Long: -87.78799

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		13	19.5	7.74	60	0.09	3.0
34-001	CENTRAL MUDMINNOW	I	T	C		3	4.5	1.79	15	0.02	3.3
40-016	WHITE SUCKER	O	T	S	W	38	57.0	22.62	14850	22.19	260.5
43-001	COMMON CARP	O	T	M	G	36	54.0	21.43	50167	74.95	929.0
43-002	GOLDFISH	O	T	M	G	10	15.0	5.95	480	0.72	32.0
43-042	FATHEAD MINNOW	O	T	C	N	1	1.5	0.60	4	0.01	3.0
47-004	YELLOW BULLHEAD	I	T	C		1	1.5	0.60	15	0.02	10.0
47-006	BLACK BULLHEAD	I	P	C		1	1.5	0.60	330	0.49	220.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		4	6.0	2.38	15	0.02	2.5
77-006	LARGEMOUTH BASS	C		C	F	18	27.0	10.71	165	0.25	6.1
77-008	GREEN SUNFISH	I	T	C	S	41	61.5	24.40	825	1.23	13.4
77-009	BLUEGILL SUNFISH	I	P	C	S	2	3.0	1.19	6	0.01	2.0

No Species: 12 **Nat. Species:** 10 **Hybrids:** 0 **Total Counted:** 168 **Total Rel. Wt. :** 66933

IBI: 26.0 **MIwb:** 4.6

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-291 Middle Fork North Branch Chicago River RM: 1.80 Date: 07/29/2018

Time Fished: 891 Distance: 0.200 Drainge (sq mi): 57.3 Depth: 0

Location: dst. Glenview Rd. Lat: 42.06667 Long: -87.77310

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		19	28.5	8.72	127	1.52	4.4
34-001	CENTRAL MUDMINNOW	I	T	C		5	7.5	2.29	60	0.71	8.0
40-016	WHITE SUCKER	O	T	S	W	66	99.0	30.28	5400	64.31	54.5
43-001	COMMON CARP	O	T	M	G	35	52.5	16.06	600	7.15	11.4
43-002	GOLDFISH	O	T	M	G	1	1.5	0.46	15	0.18	10.0
43-003	GOLDEN SHINER	I	T	M	N	7	10.5	3.21	285	3.39	27.1
43-034	SAND SHINER	I	M	M	N	1	1.5	0.46	4	0.05	3.0
47-004	YELLOW BULLHEAD	I	T	C		7	10.5	3.21	210	2.50	20.0
47-013	TADPOLE MADTOM	I		C		1	1.5	0.46	15	0.18	10.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		8	12.0	3.67	22	0.27	1.8
77-006	LARGEMOUTH BASS	C		C	F	13	19.5	5.96	120	1.43	6.1
77-008	GREEN SUNFISH	I	T	C	S	39	58.5	17.89	900	10.72	15.3
77-009	BLUEGILL SUNFISH	I	P	C	S	15	22.5	6.88	600	7.15	26.6
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	1.5	0.46	37	0.45	25.0

No Species: 14 **Nat. Species:** 12 **Hybrids:** 0 **Total Counted:** 218 **Total Rel. Wt. :** 8397

IBI: 28.0 **MIwb:** 5.6

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-291 Middle Fork North Branch Chicago River RM: 1.80 Date: 09/29/2018

Time Fished: 714 Distance: 0.200 Drainge (sq mi): 57.3 Depth: 0

Location: dst. Glenview Rd. Lat: 42.06667 Long: -87.77310

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		3	4.5	2.88	45	0.44	10.0
40-016	WHITE SUCKER	O	T	S	W	24	36.0	23.08	7725	76.28	214.5
43-001	COMMON CARP	O	T	M	G	14	21.0	13.46	825	8.15	39.2
47-004	YELLOW BULLHEAD	I	T	C		9	13.5	8.65	795	7.85	58.8
54-002	BLACKSTRIPE TOPMINNOW	I		M		12	18.0	11.54	24	0.24	1.3
77-006	LARGEMOUTH BASS	C		C	F	5	7.5	4.81	90	0.89	12.0
77-008	GREEN SUNFISH	I	T	C	S	30	45.0	28.85	585	5.78	13.0
77-009	BLUEGILL SUNFISH	I	P	C	S	7	10.5	6.73	37	0.37	3.5

No Species: 8 **Nat. Species:** 7 **Hybrids:** 0 **Total Counted:** 104 **Total Rel. Wt. :** 10126

IBI: 26.0 **MIwb:** 4.6

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-291 Middle Fork North Branch Chicago River RM: 3.00 Date: 07/29/2018

Time Fished: 1152 Distance: 0.200 Drainge (sq mi): 56.1 Depth: 0

Location: ust. E. Lake Rd. Lat: 42.08152 Long: -87.77860

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		13	19.5	8.90	945	1.22	48.4
40-016	WHITE SUCKER	O	T	S	W	34	51.0	23.29	18600	24.05	364.7
43-001	COMMON CARP	O	T	M	G	12	18.0	8.22	49050	63.42	2725.0
43-002	GOLDFISH	O	T	M	G	5	7.5	3.42	5400	6.98	720.0
43-003	GOLDEN SHINER	I	T	M	N	7	10.5	4.79	15	0.02	1.4
47-004	YELLOW BULLHEAD	I	T	C		1	1.5	0.68	75	0.10	50.0
47-006	BLACK BULLHEAD	I	P	C		1	1.5	0.68	165	0.21	110.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		2	3.0	1.37	7	0.01	2.5
77-002	BLACK CRAPPIE	I		C	S	1	1.5	0.68	7	0.01	5.0
77-006	LARGEMOUTH BASS	C		C	F	16	24.0	10.96	2160	2.79	90.0
77-008	GREEN SUNFISH	I	T	C	S	38	57.0	26.03	675	0.87	11.8
77-009	BLUEGILL SUNFISH	I	P	C	S	16	24.0	10.96	240	0.31	10.0

No Species: 12 **Nat. Species:** 10 **Hybrids:** 0 **Total Counted:** 146 **Total Rel. Wt. :** 77340

IBI: 26.0 **MIwb:** 5.9

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-291 Middle Fork North Branch Chicago River RM: 3.00 Date: 09/29/2018

Time Fished: 731 Distance: 0.200 Drainge (sq mi): 56.1 Depth: 0

Location: ust. E. Lake Rd. Lat: 42.08152 Long: -87.77860

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		1	1.5	1.22	30	0.19	20.0
34-001	CENTRAL MUDMINNOW	I	T	C		1	1.5	1.22	3	0.02	2.0
40-016	WHITE SUCKER	O	T	S	W	20	30.0	24.39	9420	61.07	314.0
43-001	COMMON CARP	O	T	M	G	2	3.0	2.44	5400	35.01	1800.0
47-006	BLACK BULLHEAD	I	P	C		1	1.5	1.22	180	1.17	120.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		15	22.5	18.29	45	0.29	2.0
77-006	LARGEMOUTH BASS	C		C	F	11	16.5	13.41	180	1.17	10.9
77-008	GREEN SUNFISH	I	T	C	S	5	7.5	6.10	90	0.58	12.0
77-009	BLUEGILL SUNFISH	I	P	C	S	25	37.5	30.49	75	0.49	2.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	1.5	1.22	3	0.02	2.0

No Species: 10 **Nat. Species:** 9 **Hybrids:** 0 **Total Counted:** 82 **Total Rel. Wt. :** 15426

IBI: 32.0 **MIwb:** 4.8

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID:	River: 95-291	Middle Fork North Branch Chicago River	RM: 4.00	Date: 08/13/2019
Time Fished:	Distance:	Drainge (sq mi):	Depth:	
497	0.150	24.2	0	
Location:		Lat:	Long:	
Dst. Winnetka Ave.		42.09294	-87.77116	

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
34-001	CENTRAL MUDMINNOW	I	T	C		2	4.0	3.17	6	0.19	1.5
40-016	WHITE SUCKER	O	T	S	W	5	10.0	7.94	900	28.94	90.0
43-002	GOLDFISH	O	T	M	G	1	2.0	1.59	4	0.13	2.0
47-004	YELLOW BULLHEAD	I	T	C		4	8.0	6.35	400	12.86	50.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		7	14.0	11.11	20	0.64	1.4
77-006	LARGEMOUTH BASS	C		C	F	14	28.0	22.22	100	3.22	3.5
77-008	GREEN SUNFISH	I	T	C	S	13	26.0	20.63	560	18.01	21.5
77-009	BLUEGILL SUNFISH	I	P	C	S	12	24.0	19.05	520	16.72	21.6
77-015	GREEN SF X BLUEGILL SF					5	10.0	7.94	600	19.29	60.0

No Species: 8 **Nat. Species:** 7 **Hybrids:** 1 **Total Counted:** 63 **Total Rel. Wt. :** 3110

IBI: 32.0 **MIwb:** 5.3

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID:	River: 95-291	Middle Fork North Branch Chicago River	RM: 6.00	Date: 08/13/2019
Time Fished:	Distance:	Drainge (sq mi):	Depth:	
1217	0.150	22.4	0	
Location:		Lat:	Long:	
Dst. Sunset Dr.		42.11541	-87.78472	

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		4	8.0	3.33	20	0.26	2.5
34-001	CENTRAL MUDMINNOW	I	T	C		2	4.0	1.67	6	0.08	1.5
40-016	WHITE SUCKER	O	T	S	W	17	34.0	14.17	4000	51.55	117.6
43-002	GOLDFISH	O	T	M	G	4	8.0	3.33	100	1.29	12.5
43-003	GOLDEN SHINER	I	T	M	N	4	8.0	3.33	10	0.13	1.2
43-042	FATHEAD MINNOW	O	T	C	N	3	6.0	2.50	6	0.08	1.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	1	2.0	0.83	4	0.05	2.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.83	1800	23.20	900.0
47-004	YELLOW BULLHEAD	I	T	C		14	28.0	11.67	200	2.58	7.1
54-002	BLACKSTRIPE TOPMINNOW	I		M		3	6.0	2.50	6	0.08	1.0
77-006	LARGEMOUTH BASS	C		C	F	4	8.0	3.33	100	1.29	12.5
77-008	GREEN SUNFISH	I	T	C	S	49	98.0	40.83	1200	15.46	12.2
77-009	BLUEGILL SUNFISH	I	P	C	S	13	26.0	10.83	108	1.39	4.1
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.83	200	2.58	100.0

No Species: 13 **Nat. Species:** 12 **Hybrids:** 1 **Total Counted:** 120 **Total Rel. Wt. :** 7760

IBI: 28.0 **MIwb:** 5.5

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID:	River: 95-291	Middle Fork North Branch Chicago River	RM: 8.60	Date: 08/18/2019
Time Fished:	Distance:	Drainge (sq mi):	Depth:	
1164	0.150	20.9	0	
Location:		Lat:	Long:	
Ust. IL68		42.13879	-87.81029	

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	11	22.0	20.75	2420	61.48	110.0
47-004	YELLOW BULLHEAD	I	T	C		4	8.0	7.55	740	18.80	92.5
54-002	BLACKSTRIPE TOPMINNOW	I		M		13	26.0	24.53	30	0.76	1.1
77-006	LARGEMOUTH BASS	C		C	F	4	8.0	7.55	140	3.56	17.5
77-008	GREEN SUNFISH	I	T	C	S	18	36.0	33.96	400	10.16	11.1
77-009	BLUEGILL SUNFISH	I	P	C	S	1	2.0	1.89	6	0.15	3.0
77-015	GREEN SF X BLUEGILL SF					2	4.0	3.77	200	5.08	50.0

No Species: 6 **Nat. Species:** 6 **Hybrids:** 1 **Total Counted:** 53 **Total Rel. Wt. :** 3936

IBI: 30.0 **MIwb:** 4.3

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-291 Middle Fork North Branch Chicago River RM: 10.80 Date: 08/13/2019

Time Fished: 1050 Distance: 0.150 Drainge (sq mi): 19.2 Depth: 0

Location: Ust. Carrige Way Lat: 42.15927 Long: -87.82470

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	14	28.0	20.29	4180	85.83	149.2
43-001	COMMON CARP	O	T	M	G	3	6.0	4.35	160	3.29	26.6
47-004	YELLOW BULLHEAD	I	T	C		3	6.0	4.35	100	2.05	16.6
47-006	BLACK BULLHEAD	I	P	C		1	2.0	1.45	180	3.70	90.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		35	70.0	50.72	100	2.05	1.4
77-006	LARGEMOUTH BASS	C		C	F	8	16.0	11.59	60	1.23	3.7
77-008	GREEN SUNFISH	I	T	C	S	3	6.0	4.35	60	1.23	10.0
77-009	BLUEGILL SUNFISH	I	P	C	S	2	4.0	2.90	30	0.62	7.5

No Species: 8 **Nat. Species:** 7 **Hybrids:** 0 **Total Counted:** 69 **Total Rel. Wt. :** 4870

IBI: 28.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: MF11 River: 95-291 Middle Fork North Branch Chicago River RM: 14.10 Date: 08/14/2019

Time Fished: 885 Distance: 0.150 Drainge (sq mi): 16.1 Depth: 0

Location: Dst. IL22 Lat: 42.19861 Long: -87.85362

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	11	22.0	5.64	4120	22.02	187.2
43-001	COMMON CARP	O	T	M	G	1	2.0	0.51	1000	5.34	500.0
43-003	GOLDEN SHINER	I	T	M	N	1	2.0	0.51	60	0.32	30.0
47-004	YELLOW BULLHEAD	I	T	C		3	6.0	1.54	600	3.21	100.0
47-006	BLACK BULLHEAD	I	P	C		1	2.0	0.51	200	1.07	100.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		63	126.0	32.31	300	1.60	2.3
77-006	LARGEMOUTH BASS	C		C	F	10	20.0	5.13	6844	36.57	342.2
77-008	GREEN SUNFISH	I	T	C	S	6	12.0	3.08	350	1.87	29.1
77-009	BLUEGILL SUNFISH	I	P	C	S	95	190.0	48.72	4900	26.18	25.7
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	2.0	0.51	40	0.21	20.0
77-015	GREEN SF X BLUEGILL SF					3	6.0	1.54	300	1.60	50.0

No Species: 10 **Nat. Species:** 9 **Hybrids:** 1 **Total Counted:** 195 **Total Rel. Wt. :** 18714

IBI: 34.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-291 Middle Fork North Branch Chicago River RM: 16.70 Date: 08/14/2019

Time Fished: 819 Distance: 0.150 Drainge (sq mi): 11.9 Depth: 0

Location: Dst. Westleigh St. Lat: 42.23196 Long: -87.86841

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
34-001	CENTRAL MUDMINNOW	I	T	C		22	44.0	12.79	240	15.35	5.4
47-004	YELLOW BULLHEAD	I	T	C		72	144.0	41.86	1000	63.94	6.9
47-006	BLACK BULLHEAD	I	P	C		2	4.0	1.16	4	0.26	1.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		69	138.0	40.12	120	7.67	0.8
77-006	LARGEMOUTH BASS	C		C	F	5	10.0	2.91	80	5.12	8.0
77-008	GREEN SUNFISH	I	T	C	S	1	2.0	0.58	40	2.56	20.0
77-009	BLUEGILL SUNFISH	I	P	C	S	1	2.0	0.58	80	5.12	40.0

No Species: 7 **Nat. Species:** 7 **Hybrids:** 0 **Total Counted:** 172 **Total Rel. Wt. :** 1564

IBI: 30.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-291 Middle Fork North Branch Chicago River RM: 18.90 Date: 08/14/2019

Time Fished: 693 Distance: 0.150 Drainge (sq mi): 8.9 Depth: 0

Location: Dst. foot bridge at FP Lat: 42.25635 Long: -87.88459

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
34-001	CENTRAL MUDMINNOW	I	T	C		24	48.0	35.29	200	9.91	4.1
43-001	COMMON CARP	O	T	M	G	3	6.0	4.41	1280	63.43	213.3
43-003	GOLDEN SHINER	I	T	M	N	2	4.0	2.94	20	0.99	5.0
47-004	YELLOW BULLHEAD	I	T	C		10	20.0	14.71	300	14.87	15.0
47-006	BLACK BULLHEAD	I	P	C		2	4.0	2.94	60	2.97	15.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		19	38.0	27.94	20	0.99	0.5
77-006	LARGEMOUTH BASS	C		C	F	3	6.0	4.41	18	0.89	3.0
77-008	GREEN SUNFISH	I	T	C	S	4	8.0	5.88	100	4.96	12.5
77-009	BLUEGILL SUNFISH	I	P	C	S	1	2.0	1.47	20	0.99	10.0

No Species: 9 **Nat. Species:** 8 **Hybrids:** 0 **Total Counted:** 68 **Total Rel. Wt. :** 2018

IBI: 30.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID:	River: 95-291	Middle Fork North Branch Chicago River	RM: 21.10	Date: 08/14/2019
Time Fished:	Distance:	Drainge (sq mi):	Depth:	
0	0.150	5.8	0	
Location:		Lat:	Long:	
Ust. Rockland Rd.		42.28013	-87.89854	

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
34-001	CENTRAL MUDMINNOW	I	T	C		2	4.0	3.77	20	15.87	5.0
43-001	COMMON CARP	O	T	M	G	1	2.0	1.89	10	7.94	5.0
47-004	YELLOW BULLHEAD	I	T	C		2	4.0	3.77	4	3.17	1.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		45	90.0	84.91	80	63.49	0.8
77-006	LARGEMOUTH BASS	C		C	F	2	4.0	3.77	8	6.35	2.0
77-009	BLUEGILL SUNFISH	I	P	C	S	1	2.0	1.89	4	3.17	2.0

No Species: 6 **Nat. Species:** 5 **Hybrids:** 0 **Total Counted:** 53 **Total Rel. Wt. :** 126

IBI: 32.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: WF25 River: 95-292 West Fork North Branch Chicago River RM: 1.30 Date: 08/13/2019

Time Fished: 1638 Distance: 0.200 Drainge (sq mi): 27.9 Depth: 0

Location: Ust. walking bridge Lat: 42.06345 Long: -87.78887

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		1	1.5	0.83	1	0.00	1.0
40-016	WHITE SUCKER	O	T	S	W	46	69.0	38.33	3990	6.24	57.8
43-001	COMMON CARP	O	T	M	G	14	21.0	11.67	46755	73.16	2226.4
43-002	GOLDFISH	O	T	M	G	29	43.5	24.17	1500	2.35	34.4
43-003	GOLDEN SHINER	I	T	M	N	1	1.5	0.83	75	0.12	50.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	1	1.5	0.83	4	0.01	3.0
43-045	COMMON CARP X GOLDFISH	O	T		G	5	7.5	4.17	10650	16.66	1420.0
47-004	YELLOW BULLHEAD	I	T	C		11	16.5	9.17	825	1.29	50.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		4	6.0	3.33	4	0.01	0.7
77-006	LARGEMOUTH BASS	C		C	F	2	3.0	1.67	12	0.02	4.0
77-008	GREEN SUNFISH	I	T	C	S	3	4.5	2.50	15	0.02	3.3
77-009	BLUEGILL SUNFISH	I	P	C	S	3	4.5	2.50	75	0.12	16.6

No Species: 11 **Nat. Species:** 9 **Hybrids:** 1 **Total Counted:** 120 **Total Rel. Wt. :** 63907

IBI: 24.0 **MIwb:** 3.6

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-292 West Fork North Branch Chicago River RM: 2.90 Date: 08/13/2019

Time Fished: 1031 Distance: 0.200 Drainge (sq mi): 24.5 Depth: 0

Location: Dst. Lake Ave. Lat: 42.07891 Long: -87.80765

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-001	COMMON CARP	O	T	M	G	2	3.0	2.44	45	0.96	15.0
43-002	GOLDFISH	O	T	M	G	3	4.5	3.66	90	1.93	20.0
47-004	YELLOW BULLHEAD	I	T	C		44	66.0	53.66	3450	73.81	52.2
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	1.5	1.22	1	0.03	1.0
77-008	GREEN SUNFISH	I	T	C	S	24	36.0	29.27	795	17.01	22.0
77-009	BLUEGILL SUNFISH	I	P	C	S	7	10.5	8.54	195	4.17	18.5
77-015	GREEN SF X BLUEGILL SF					1	1.5	1.22	97	2.09	65.0

No Species: 6 **Nat. Species:** 4 **Hybrids:** 1 **Total Counted:** 82 **Total Rel. Wt. :** 4674

IBI: 26.0 **MIwb:** 3.2

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-292 West Fork North Branch Chicago River RM: 4.90 Date: 08/13/2019

Time Fished: 865 Distance: 0.200 Drainge (sq mi): 17.8 Depth: 0

Location: Dst. Willow Rd. Lat: 42.10279 Long: -87.80994

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		101	151.5	54.89	825	1.20	5.4
40-016	WHITE SUCKER	O	T	S	W	25	37.5	13.59	795	1.16	21.2
43-001	COMMON CARP	O	T	M	G	19	28.5	10.33	52740	76.74	1850.5
43-002	GOLDFISH	O	T	M	G	10	15.0	5.43	165	0.24	11.0
43-042	FATHEAD MINNOW	O	T	C	N	1	1.5	0.54	3	0.00	2.0
43-045	COMMON CARP X GOLDFISH	O	T		G	4	6.0	2.17	12300	17.90	2050.0
47-004	YELLOW BULLHEAD	I	T	C		13	19.5	7.07	1125	1.64	57.6
47-006	BLACK BULLHEAD	I	P	C		1	1.5	0.54	105	0.15	70.0
77-006	LARGEMOUTH BASS	C		C	F	1	1.5	0.54	210	0.31	140.0
77-008	GREEN SUNFISH	I	T	C	S	1	1.5	0.54	37	0.05	25.0
77-009	BLUEGILL SUNFISH	I	P	C	S	6	9.0	3.26	300	0.44	33.3
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	1.5	0.54	30	0.04	20.0
77-015	GREEN SF X BLUEGILL SF					1	1.5	0.54	90	0.13	60.0

No Species: 11 **Nat. Species:** 9 **Hybrids:** 2 **Total Counted:** 184 **Total Rel. Wt. :** 68725

IBI: 20.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-292 West Fork North Branch Chicago River RM: 9.20 Date: 08/14/2019

Time Fished: 1066 Distance: 0.200 Drainge (sq mi): 9.4 Depth: 0

Location: Dst. Lake-Cook Rd. Lat: 42.15161 Long: -87.84602

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		13	19.5	11.30	135	0.64	6.9
40-016	WHITE SUCKER	O	T	S	W	36	54.0	31.30	165	0.79	3.0
43-001	COMMON CARP	O	T	M	G	10	15.0	8.70	17655	84.07	1177.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	1.5	0.87	1050	5.00	700.0
47-004	YELLOW BULLHEAD	I	T	C		1	1.5	0.87	45	0.21	30.0
77-006	LARGEMOUTH BASS	C		C	F	8	12.0	6.96	90	0.43	7.5
77-008	GREEN SUNFISH	I	T	C	S	9	13.5	7.83	225	1.07	16.6
77-009	BLUEGILL SUNFISH	I	P	C	S	35	52.5	30.43	1590	7.57	30.2
77-015	GREEN SF X BLUEGILL SF					2	3.0	1.74	45	0.21	15.0

No Species: 7 **Nat. Species:** 6 **Hybrids:** 2 **Total Counted:** 115 **Total Rel. Wt. :** 21000

IBI: 24.0 **Mlwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-292 West Fork North Branch Chicago River RM: 10.40 Date: 08/15/2019

Time Fished: 511 Distance: 0.150 Drainge (sq mi): 7.0 Depth: 0

Location: Dst. Deerfield Rd. Lat: 42.16572 Long: -87.85696

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-001	COMMON CARP	O	T	M	G	1	2.0	4.76	20	22.73	10.0
47-004	YELLOW BULLHEAD	I	T	C		9	18.0	42.86	20	22.73	1.1
77-006	LARGEMOUTH BASS	C		C	F	10	20.0	47.62	40	45.45	2.0
77-008	GREEN SUNFISH	I	T	C	S	1	2.0	4.76	8	9.09	4.0

No Species: 4 **Nat. Species:** 3 **Hybrids:** 0 **Total Counted:** 21 **Total Rel. Wt. :** 88

IBI: 30.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-292 West Fork North Branch Chicago River RM: 12.50 Date: 08/14/2019

Time Fished: 412 Distance: 0.150 Drainge (sq mi): 3.8 Depth: 0

Location: Adj. Saundrers Rd. Lat: 42.18624 Long: -87.88178

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-002	GOLDFISH	O	T	M	G	1	2.0	14.29	10	31.25	5.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		2	4.0	28.57	4	12.50	1.0
77-006	LARGEMOUTH BASS	C		C	F	1	2.0	14.29	6	18.75	3.0
77-008	GREEN SUNFISH	I	T	C	S	2	4.0	28.57	10	31.25	2.5
77-009	BLUEGILL SUNFISH	I	P	C	S	1	2.0	14.29	2	6.25	1.0

No Species: 5 **Nat. Species:** 4 **Hybrids:** 0 **Total Counted:** 7 **Total Rel. Wt. :** 32

IBI: 12.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 0.50 Date: 07/29/2018

Time Fished: 887 Distance: 0.200 Drainge (sq mi): 30.9 Depth: 0

Location: dst. I-94 Lat: 42.08834 Long: -87.76299

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		216	324.0	48.00	1560	10.52	4.8
40-016	WHITE SUCKER	O	T	S	W	26	39.0	5.78	5490	37.03	140.7
43-002	GOLDFISH	O	T	M	G	2	3.0	0.44	330	2.23	110.0
43-003	GOLDEN SHINER	I	T	M	N	4	6.0	0.89	7	0.05	1.2
43-042	FATHEAD MINNOW	O	T	C	N	4	6.0	0.89	12	0.08	2.0
47-004	YELLOW BULLHEAD	I	T	C		1	1.5	0.22	7	0.05	5.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		4	6.0	0.89	22	0.15	3.7
77-006	LARGEMOUTH BASS	C		C	F	57	85.5	12.67	360	2.43	4.2
77-008	GREEN SUNFISH	I	T	C	S	34	51.0	7.56	1200	8.09	23.5
77-009	BLUEGILL SUNFISH	I	P	C	S	97	145.5	21.56	5550	37.44	38.1
77-013	PUMPKINSEED SUNFISH	I	P	C	S	2	3.0	0.44	60	0.40	20.0
77-015	GREEN SF X BLUEGILL SF					3	4.5	0.67	225	1.52	50.0

No Species: 11 **Nat. Species:** 10 **Hybrids:** 1 **Total Counted:** 450 **Total Rel. Wt. :** 14824

IBI: 32.0 **MIwb:** 7.1

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 0.50 Date: 09/19/2018

Time Fished: 815 Distance: 0.200 Drainge (sq mi): 30.9 Depth: 0

Location: dst. I-94 Lat: 42.08834 Long: -87.76299

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		44	66.0	21.05	615	11.35	9.3
40-016	WHITE SUCKER	O	T	S	W	4	6.0	1.91	705	13.01	117.5
43-001	COMMON CARP	O	T	M	G	1	1.5	0.48	75	1.38	50.0
43-003	GOLDEN SHINER	I	T	M	N	7	10.5	3.35	90	1.66	8.5
43-042	FATHEAD MINNOW	O	T	C	N	1	1.5	0.48	3	0.06	2.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	6	9.0	2.87	45	0.83	5.0
47-004	YELLOW BULLHEAD	I	T	C		7	10.5	3.35	90	1.66	8.5
47-013	TADPOLE MADTOM	I		C		1	1.5	0.48	13	0.25	9.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	1.5	0.48	1	0.03	1.0
77-006	LARGEMOUTH BASS	C		C	F	18	27.0	8.61	660	12.18	24.4
77-008	GREEN SUNFISH	I	T	C	S	42	63.0	20.10	1020	18.83	16.1
77-009	BLUEGILL SUNFISH	I	P	C	S	71	106.5	33.97	1875	34.61	17.6
77-013	PUMPKINSEED SUNFISH	I	P	C	S	4	6.0	1.91	60	1.11	10.0
77-014	BLUEGILL X PUMPKINSEED					1	1.5	0.48	45	0.83	30.0
77-015	GREEN SF X BLUEGILL SF					1	1.5	0.48	120	2.21	80.0

No Species: 13 **Nat. Species:** 12 **Hybrids:** 2 **Total Counted:** 209 **Total Rel. Wt. :** 5418

IBI: 34.0 **MIwb:** 6.9

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 3.00 Date: 07/25/2018

Time Fished: 2223 Distance: 0.500 Drainge (sq mi): 23.7 Depth: 0

Location: Skokie Lagoon boat ramp Lat: 42.11398 Long: -87.77361

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		9	18.0	2.28	100	0.12	5.5
43-001	COMMON CARP	O	T	M	G	10	20.0	2.54	48090	59.29	2404.5
43-003	GOLDEN SHINER	I	T	M	N	41	82.0	10.41	170	0.21	2.0
47-006	BLACK BULLHEAD	I	P	C		1	2.0	0.25	500	0.62	250.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		12	24.0	3.05	20	0.02	0.8
77-006	LARGEMOUTH BASS	C		C	F	124	248.0	31.47	19210	23.68	77.4
77-008	GREEN SUNFISH	I	T	C	S	3	6.0	0.76	40	0.05	6.6
77-009	BLUEGILL SUNFISH	I	P	C	S	166	332.0	42.13	11020	13.59	33.1
77-010	ORANGESPOTTED SUNFISH	I		C	S	1	2.0	0.25	10	0.01	5.0
77-012	REDEAR SUNFISH	I		C	E	2	4.0	0.51	460	0.57	115.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	25	50.0	6.35	1490	1.84	29.8

No Species: 11 **Nat. Species:** 9 **Hybrids:** 0 **Total Counted:** 394 **Total Rel. Wt. :** 81110

IBI: 40.0 **MIwb:** 7.6

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 3.00 Date: 09/17/2018

Time Fished: 2171 Distance: 0.500 Drainge (sq mi): 23.7 Depth: 0

Location: Skokie Lagoon boat ramp Lat: 42.11398 Long: -87.77361

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		136	272.0	32.15	25280	28.19	92.9
43-001	COMMON CARP	O	T	M	G	6	12.0	1.42	25970	28.96	2164.1
43-003	GOLDEN SHINER	I	T	M	N	59	118.0	13.95	860	0.96	7.2
47-002	CHANNEL CATFISH			C	F	1	2.0	0.24	2700	3.01	1350.0
47-004	YELLOW BULLHEAD	I	T	C		3	6.0	0.71	2320	2.59	386.6
47-013	TADPOLE MADTOM	I		C		1	2.0	0.24	4	0.00	2.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		7	14.0	1.65	14	0.02	1.0
77-002	BLACK CRAPPIE	I		C	S	3	6.0	0.71	600	0.67	100.0
77-006	LARGEMOUTH BASS	C		C	F	64	128.0	15.13	19630	21.89	153.3
77-009	BLUEGILL SUNFISH	I	P	C	S	111	222.0	26.24	4620	5.15	20.8
77-012	REDEAR SUNFISH	I		C	E	10	20.0	2.36	1450	1.62	72.5
77-013	PUMPKINSEED SUNFISH	I	P	C	S	15	30.0	3.55	930	1.04	31.0
80-002	WALLEYE	P		S	F	7	14.0	1.65	5300	5.91	378.5

No Species: 13 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 423 **Total Rel. Wt. :** 89678

IBI: 32.0 **MIwb:** 8.8

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 7.40 Date: 07/20/2018

Time Fished: 918 Distance: 0.200 Drainge (sq mi): 21.5 Depth: 0

Location: Ust. Lake Cook Rd. Lat: 42.15269 Long: -87.79392

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	8	12.0	6.90	382	17.16	31.8
43-001	COMMON CARP	O	T	M	G	8	12.0	6.90	75	3.36	6.2
43-002	GOLDFISH	O	T	M	G	2	3.0	1.72	22	1.01	7.5
43-003	GOLDEN SHINER	I	T	M	N	1	1.5	0.86	6	0.27	4.0
47-004	YELLOW BULLHEAD	I	T	C		1	1.5	0.86	90	4.04	60.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	1.5	0.86	3	0.13	2.0
77-006	LARGEMOUTH BASS	C		C	F	54	81.0	46.55	750	33.65	9.2
77-008	GREEN SUNFISH	I	T	C	S	18	27.0	15.52	300	13.46	11.1
77-009	BLUEGILL SUNFISH	I	P	C	S	20	30.0	17.24	420	18.84	14.0
77-015	GREEN SF X BLUEGILL SF					3	4.5	2.59	180	8.08	40.0

No Species: 9 **Nat. Species:** 7 **Hybrids:** 1 **Total Counted:** 116 **Total Rel. Wt. :** 2229

IBI: 30.0 **MIwb:** 5.5

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 7.40 Date: 09/29/2018

Time Fished: 660 Distance: 0.200 Drainge (sq mi): 21.5 Depth: 0

Location: Ust. Lake Cook Rd. Lat: 42.15269 Long: -87.79392

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	4	6.0	4.60	513	44.36	85.5
43-002	GOLDFISH	O	T	M	G	8	12.0	9.20	315	27.24	26.2
43-042	FATHEAD MINNOW	O	T	C	N	1	1.5	1.15	1	0.13	1.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		25	37.5	28.74	52	4.54	1.4
77-006	LARGEMOUTH BASS	C		C	F	8	12.0	9.20	120	10.38	10.0
77-008	GREEN SUNFISH	I	T	C	S	15	22.5	17.24	52	4.54	2.3
77-009	BLUEGILL SUNFISH	I	P	C	S	20	30.0	22.99	75	6.49	2.5
77-013	PUMPKINSEED SUNFISH	I	P	C	S	5	7.5	5.75	22	1.95	3.0
77-015	GREEN SF X BLUEGILL SF					1	1.5	1.15	4	0.39	3.0

No Species: 8 **Nat. Species:** 7 **Hybrids:** 1 **Total Counted:** 87 **Total Rel. Wt. :** 1156

IBI: 32.0 **MIwb:** 5.5

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 8.00 Date: 07/30/2018

Time Fished: 876 Distance: 0.150 Drainge (sq mi): 20.6 Depth: 0

Location: ust. Clavey Rd. @ Solel Congregation Lat: 42.16077 Long: -87.79907

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		1	2.0	0.99	20	0.07	10.0
40-016	WHITE SUCKER	O	T	S	W	59	118.0	58.42	25380	90.66	215.0
43-001	COMMON CARP	O	T	M	G	3	6.0	2.97	470	1.68	78.3
43-003	GOLDEN SHINER	I	T	M	N	2	4.0	1.98	100	0.36	25.0
43-042	FATHEAD MINNOW	O	T	C	N	2	4.0	1.98	8	0.03	2.0
47-004	YELLOW BULLHEAD	I	T	C		3	6.0	2.97	750	2.68	125.0
47-006	BLACK BULLHEAD	I	P	C		4	8.0	3.96	500	1.79	62.5
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	2.0	0.99	6	0.02	3.0
77-006	LARGEMOUTH BASS	C		C	F	13	26.0	12.87	140	0.50	5.3
77-008	GREEN SUNFISH	I	T	C	S	8	16.0	7.92	320	1.14	20.0
77-009	BLUEGILL SUNFISH	I	P	C	S	4	8.0	3.96	200	0.71	25.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.99	100	0.36	50.0

No Species: 11 **Nat. Species:** 10 **Hybrids:** 1 **Total Counted:** 101 **Total Rel. Wt. :** 27994

IBI: 28.0 **MIwb:** 3.9

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 8.00 Date: 09/12/2018

Time Fished: 638 Distance: 0.150 Drainge (sq mi): 20.6 Depth: 0

Location: ust. Clavey Rd. @ Solel Congregation Lat: 42.16077 Long: -87.79907

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		4	8.0	5.00	60	0.39	7.5
40-016	WHITE SUCKER	O	T	S	W	17	34.0	21.25	14350	93.17	422.0
43-001	COMMON CARP	O	T	M	G	2	4.0	2.50	116	0.75	29.0
43-002	GOLDFISH	O	T	M	G	9	18.0	11.25	300	1.95	16.6
43-003	GOLDEN SHINER	I	T	M	N	1	2.0	1.25	4	0.03	2.0
43-042	FATHEAD MINNOW	O	T	C	N	5	10.0	6.25	12	0.08	1.2
54-002	BLACKSTRIPE TOPMINNOW	I		M		7	14.0	8.75	20	0.13	1.4
77-006	LARGEMOUTH BASS	C		C	F	4	8.0	5.00	100	0.65	12.5
77-008	GREEN SUNFISH	I	T	C	S	7	14.0	8.75	80	0.52	5.7
77-009	BLUEGILL SUNFISH	I	P	C	S	14	28.0	17.50	120	0.78	4.2
77-012	REDEAR SUNFISH	I		C	E	4	8.0	5.00	40	0.26	5.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	5	10.0	6.25	40	0.26	4.0
80-002	WALLEYE	P		S	F	1	2.0	1.25	160	1.04	80.0

No Species: 13 **Nat. Species:** 10 **Hybrids:** 0 **Total Counted:** 80 **Total Rel. Wt. :** 15402

IBI: 30.0 **MIwb:** 4.8

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 11.30 Date: 07/30/2018

Time Fished: 543 Distance: 0.150 Drainge (sq mi): 15.0 Depth: 0

Location: ust. Half Day Rd. @ Sleepy Hollow Park Lat: 42.20196 Long: -87.82955

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	89	178.0	35.04	4000	50.19	22.4
43-001	COMMON CARP	O	T	M	G	7	14.0	2.76	200	2.51	14.2
43-002	GOLDFISH	O	T	M	G	34	68.0	13.39	800	10.04	11.7
47-004	YELLOW BULLHEAD	I	T	C		2	4.0	0.79	140	1.76	35.0
47-006	BLACK BULLHEAD	I	P	C		12	24.0	4.72	680	8.53	28.3
77-006	LARGEMOUTH BASS	C		C	F	19	38.0	7.48	200	2.51	5.2
77-008	GREEN SUNFISH	I	T	C	S	82	164.0	32.28	1740	21.83	10.6
77-009	BLUEGILL SUNFISH	I	P	C	S	6	12.0	2.36	140	1.76	11.6
77-015	GREEN SF X BLUEGILL SF					3	6.0	1.18	70	0.88	11.6

No Species: 8 **Nat. Species:** 6 **Hybrids:** 1 **Total Counted:** 254 **Total Rel. Wt. :** 7970

IBI: 20.0 **Mlwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 11.30 Date: 09/12/2018

Time Fished: 503 Distance: 0.150 Drainge (sq mi): 15.0 Depth: 0

Location: ust. Half Day Rd. @ Sleepy Hollow Park Lat: 42.20196 Long: -87.82955

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		1	2.0	0.49	20	0.22	10.0
40-016	WHITE SUCKER	O	T	S	W	49	98.0	24.02	5980	65.30	61.0
43-001	COMMON CARP	O	T	M	G	14	28.0	6.86	620	6.77	22.1
43-002	GOLDFISH	O	T	M	G	30	60.0	14.71	1000	10.92	16.6
43-003	GOLDEN SHINER	I	T	M	N	9	18.0	4.41	100	1.09	5.5
47-004	YELLOW BULLHEAD	I	T	C		6	12.0	2.94	120	1.31	10.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		3	6.0	1.47	6	0.07	1.0
77-001	WHITE CRAPPIE	I		C	S	2	4.0	0.98	10	0.11	2.5
77-006	LARGEMOUTH BASS	C		C	F	19	38.0	9.31	320	3.49	8.4
77-008	GREEN SUNFISH	I	T	C	S	32	64.0	15.69	760	8.30	11.8
77-009	BLUEGILL SUNFISH	I	P	C	S	34	68.0	16.67	180	1.97	2.6
77-012	REDEAR SUNFISH	I		C	E	2	4.0	0.98	20	0.22	5.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	2.0	0.49	6	0.07	3.0
77-015	GREEN SF X BLUEGILL SF					2	4.0	0.98	16	0.17	4.0

No Species: 13 **Nat. Species:** 10 **Hybrids:** 1 **Total Counted:** 204 **Total Rel. Wt. :** 9158

IBI: 24.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 14.80 Date: 07/30/2018

Time Fished: 656 Distance: 0.150 Drainge (sq mi): 11.5 Depth: 0

Location: dst. Deerpath Rd. Lat: 42.24616 Long: -87.85333

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		1	2.0	0.53	300	1.43	150.0
40-016	WHITE SUCKER	O	T	S	W	60	120.0	31.91	10500	50.04	87.5
43-001	COMMON CARP	O	T	M	G	3	6.0	1.60	5550	26.45	925.0
43-002	GOLDFISH	O	T	M	G	2	4.0	1.06	40	0.19	10.0
43-042	FATHEAD MINNOW	O	T	C	N	3	6.0	1.60	12	0.06	2.0
47-004	YELLOW BULLHEAD	I	T	C		3	6.0	1.60	360	1.72	60.0
47-006	BLACK BULLHEAD	I	P	C		14	28.0	7.45	1760	8.39	62.8
77-002	BLACK CRAPPIE	I		C	S	1	2.0	0.53	100	0.48	50.0
77-006	LARGEMOUTH BASS	C		C	F	10	20.0	5.32	260	1.24	13.0
77-008	GREEN SUNFISH	I	T	C	S	76	152.0	40.43	1400	6.67	9.2
77-009	BLUEGILL SUNFISH	I	P	C	S	7	14.0	3.72	300	1.43	21.4
77-015	GREEN SF X BLUEGILL SF					8	16.0	4.26	400	1.91	25.0

No Species: 11 **Nat. Species:** 9 **Hybrids:** 1 **Total Counted:** 188 **Total Rel. Wt. :** 20982

IBI: 24.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 14.80 Date: 09/29/2018

Time Fished: 793 Distance: 0.150 Drainge (sq mi): 11.5 Depth: 0

Location: dst. Deerpath Rd. Lat: 42.24616 Long: -87.85333

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
40-016	WHITE SUCKER	O	T	S	W	58	116.0	20.49	16900	77.77	145.6
43-001	COMMON CARP	O	T	M	G	28	56.0	9.89	1220	5.61	21.7
43-002	GOLDFISH	O	T	M	G	31	62.0	10.95	1070	4.92	17.2
43-003	GOLDEN SHINER	I	T	M	N	32	64.0	11.31	390	1.79	6.0
43-042	FATHEAD MINNOW	O	T	C	N	3	6.0	1.06	12	0.06	2.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.35	60	0.28	30.0
47-006	BLACK BULLHEAD	I	P	C		1	2.0	0.35	100	0.46	50.0
77-002	BLACK CRAPPIE	I		C	S	2	4.0	0.71	20	0.09	5.0
77-006	LARGEMOUTH BASS	C		C	F	21	42.0	7.42	520	2.39	12.3
77-008	GREEN SUNFISH	I	T	C	S	41	82.0	14.49	860	3.96	10.4
77-009	BLUEGILL SUNFISH	I	P	C	S	64	128.0	22.61	460	2.12	3.5
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.35	120	0.55	60.0

No Species: 11 **Nat. Species:** 9 **Hybrids:** 1 **Total Counted:** 283 **Total Rel. Wt. :** 21732

IBI: 26.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 17.40 Date: 07/30/2018

Time Fished: 364 Distance: 0.130 Drainge (sq mi): 7.8 Depth: 0

Location: ust. IL 176 Lat: 42.27941 Long: -87.86409

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-002	GOLDFISH	O	T	M	G	1	2.3	33.33	69	75.00	30.0
77-006	LARGEMOUTH BASS	C		C	F	2	4.6	66.67	23	25.00	5.0

No Species: 2 **Nat. Species:** 1 **Hybrids:** 0 **Total Counted:** 3 **Total Rel. Wt. :** 92

IBI: 12.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 17.40 Date: 09/12/2018

Time Fished: 445 Distance: 0.150 Drainge (sq mi): 7.8 Depth: 0

Location: ust. IL 176 Lat: 42.27941 Long: -87.86409

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
20-003	GIZZARD SHAD	O		M		1	2.0	0.55	16	0.54	8.0
40-016	WHITE SUCKER	O	T	S	W	3	6.0	1.66	60	2.02	10.0
43-002	GOLDFISH	O	T	M	G	1	2.0	0.55	20	0.67	10.0
43-003	GOLDEN SHINER	I	T	M	N	1	2.0	0.55	10	0.34	5.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.55	20	0.67	10.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	2.0	0.55	2	0.07	1.0
77-006	LARGEMOUTH BASS	C		C	F	66	132.0	36.46	800	26.92	6.0
77-008	GREEN SUNFISH	I	T	C	S	45	90.0	24.86	1100	37.01	12.2
77-009	BLUEGILL SUNFISH	I	P	C	S	51	102.0	28.18	544	18.30	5.3
77-013	PUMPKINSEED SUNFISH	I	P	C	S	2	4.0	1.10	20	0.67	5.0
77-015	GREEN SF X BLUEGILL SF					9	18.0	4.97	380	12.79	21.1

No Species: 10 **Nat. Species:** 9 **Hybrids:** 1 **Total Counted:** 181 **Total Rel. Wt. :** 2972

IBI: 36.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 21.10 Date: 07/30/2018

Time Fished: 429 Distance: 0.150 Drainge (sq mi): 2.7 Depth: 0

Location: adj. Gillett Plant Lat: 42.33089 Long: -87.88161

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-001	COMMON CARP	O	T	M	G	16	32.0	7.51	184	13.49	5.7
43-002	GOLDFISH	O	T	M	G	177	354.0	83.10	800	58.65	2.2
47-006	BLACK BULLHEAD	I	P	C		2	4.0	0.94	200	14.66	50.0
77-006	LARGEMOUTH BASS	C		C	F	12	24.0	5.63	50	3.67	2.0
77-008	GREEN SUNFISH	I	T	C	S	3	6.0	1.41	40	2.93	6.6
77-009	BLUEGILL SUNFISH	I	P	C	S	3	6.0	1.41	90	6.60	15.0

No Species: 6 **Nat. Species:** 4 **Hybrids:** 0 **Total Counted:** 213 **Total Rel. Wt. :** 1364

IBI: 20.0 **MIwb:** N/A

Appendix Table B-3. Midwest Biodiversity Institute
Fish Species List

Site ID: River: 95-403 Skokie River RM: 21.10 Date: 09/12/2018

Time Fished: 534 Distance: 0.150 Drainge (sq mi): 2.7 Depth: 0

Location: adj. Gillett Plant Lat: 42.33089 Long: -87.88161

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-002	GOLDFISH	O	T	M	G	71	142.0	44.94	640	59.48	4.5
77-006	LARGEMOUTH BASS	C		C	F	1	2.0	0.63	6	0.56	3.0
77-008	GREEN SUNFISH	I	T	C	S	86	172.0	54.43	430	39.96	2.5

No Species: 3 **Nat. Species:** 2 **Hybrids:** 0 **Total Counted:** 158 **Total Rel. Wt. :** 1076

IBI: 22.0 **MIwb:** N/A

APPENDIX C

North Branch Chicago River 2018-2019 Macroinvertebrate Assemblage Data

C-1: Macroinvertebrate IBI Metrics and Scores
C-2: Macroinvertebrate Taxa by Site and Sample

Appendix Table C-1. Illinois Macroinvertebrate IBI metrics and values from the North Branch Chicago River study area in 2018 and 2019.

River Mile	Site ID	Sample	Date	Drainage Area (sq mi)	Sub-samp	Number of: Total Taxa	Number of: Coleoptera Taxa	Number of: Mayfly Taxa	Number of: Intolerant Taxa	MBI	Percent: Percent Scrapers	Percent: Percent EPT	MIBI
North Branch Chicago River (95-009)													
Year: 2018													
18.60	MF19		08/04/2018	93.41		18(39.0)	0(0.0)	0(0.0)	2(22.2)	6.5(73.8)	0.3(1.2)	0.0(0.0)	19.5
Middle Fork North Branch Chicago River (95-291)													
Year: 2018													
3.00	MF16		08/05/2018	56.15		27(59.0)	0(0.0)	0(0.0)	1(11.1)	6.3(77.1)	1.3(4.3)	0.3(0.4)	21.7
1.80	MF17		08/04/2018	57.31		21(46.0)	1(20.0)	0(0.0)	2(22.2)	5.1(96.7)	2.3(7.9)	2.3(3.2)	28.0
Year: 2019													
21.10	MF08		07/29/2019	5.80		13(28.0)	2(40.0)	1(9.8)	1(11.1)	4.6(100)	2.7(9.3)	6.7(9.1)	29.6
18.90	MF09		07/28/2019	8.90		13(28.0)	0(0.0)	1(9.8)	1(11.1)	4.7(100)	0.9(3.1)	0.9(1.2)	21.9
16.70	MF10		07/28/2019	11.90		12(26.0)	0(0.0)	1(9.8)	2(22.2)	4.2(100)	1.7(5.8)	2.3(3.1)	23.9
14.10	MF11		07/28/2019	16.10		7(15.0)	0(0.0)	0(0.0)	1(11.1)	4.1(100)	1.2(4.0)	1.2(1.6)	18.8
10.80	MF12		07/28/2019	19.20		17(37.0)	0(0.0)	0(0.0)	2(22.2)	4.4(100)	1.4(4.9)	1.2(1.6)	23.7
8.60	MF13		07/30/2019	20.90		17(37.0)	1(20.0)	0(0.0)	2(22.2)	5.3(93.4)	1.6(5.3)	0.6(0.9)	25.6
6.00	MF14		07/29/2019	22.40		18(39.0)	0(0.0)	1(9.8)	2(22.2)	5.3(93.4)	1.9(6.5)	43.6(58.9)	32.8
4.00	MF15		07/29/2019	24.20		27(59.0)	0(0.0)	2(19.6)	2(22.2)	5.1(96.7)	0.9(3.1)	6.5(8.8)	29.9
West Fork North Branch Chicago River (95-292)													
Year: 2019													
12.50	WF20		07/30/2019	3.80		17(37.0)	0(0.0)	0(0.0)	0(0.0)	6.3(77.1)	19.7(66.5)	0.0(0.0)	25.8
12.50	WF20	2	09/10/2019	3.80		17(37.0)	0(0.0)	0(0.0)	1(11.1)	6.6(72.1)	2.9(9.7)	0.0(0.0)	18.6
10.40	WF21		07/30/2019	7.00		18(39.0)	0(0.0)	0(0.0)	2(22.2)	6.0(82.0)	0.0(0.0)	0.3(0.4)	20.5
9.20	WF22		07/29/2019	9.40		18(39.0)	0(0.0)	0(0.0)	0(0.0)	6.3(77.1)	3.1(10.4)	0.3(0.4)	18.1
4.90	WF23		07/29/2019	17.80		21(46.0)	0(0.0)	1(9.8)	1(11.1)	5.9(83.6)	14.5(48.9)	0.9(1.2)	28.7
2.90	WF24		07/29/2019	24.50		26(57.0)	0(0.0)	0(0.0)	0(0.0)	5.8(85.3)	4.8(16.2)	2.3(3.0)	23.1

Appendix Table C-1. Illinois Macroinvertebrate IBI metrics and values from the North Branch Chicago River study area in 2018 and 2019.

River Mile	Site ID	Sample	Date	Drainage Area (sq mi)	Sub-samp	Number of				MBI	Percent:		MIBI
						Total Taxa	Coleoptera Taxa	Mayfly Taxa	Intolerant Taxa		Percent Scrapers	Percent EPT	
1.30	WF25		07/29/2019	27.90		20(43.0)	0(0.0)	0(0.0)	0(0.0)	5.4(91.8)	7.1(23.8)	0.7(0.9)	22.8
Skokie River (95-403)													
Year: 2018													
21.10	SR1		08/05/2018	2.78		19(41.0)	0(0.0)	1(9.8)	1(11.1)	8.5(41.0)	0.3(1.1)	7.9(10.7)	16.4
17.40	SR2		08/05/2018	7.87		14(30.0)	0(0.0)	0(0.0)	2(22.2)	4.2(100)	0.0(0.0)	0.0(0.0)	21.8
14.80	SR3		08/04/2018	11.56		20(43.0)	1(20.0)	0(0.0)	2(22.2)	5.0(98.4)	2.3(7.7)	0.0(0.0)	27.3
14.80	SR3	2	09/23/2018	11.56		23(50.0)	1(20.0)	0(0.0)	3(33.3)	5.0(98.4)	2.2(7.6)	0.0(0.0)	29.9
11.30	SR4		08/04/2018	15.07		12(26.0)	0(0.0)	1(9.8)	1(11.1)	4.0(100)	0.7(2.4)	8.1(11.0)	22.9
8.00	SR5		08/04/2018	20.67		13(28.0)	0(0.0)	0(0.0)	2(22.2)	3.5(100)	2.0(6.8)	0.0(0.0)	22.4
7.40	SR6		08/04/2018	21.51		16(35.0)	0(0.0)	0(0.0)	2(22.2)	5.5(90.2)	0.9(3.1)	0.0(0.0)	21.5
0.50	SR18		08/04/2018	30.90		23(50.0)	0(0.0)	0(0.0)	2(22.2)	5.3(93.4)	2.5(8.3)	7.0(9.5)	26.2

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: ust. Dempster St.

Site ID: **MF19**

Subsample:

Collection Date: 08/04/2018 River Code: 95-009 River: North Branch Chicago River RM: 18.60

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	2
03600	Oligochaeta	N	10.0	87
04664	Helobdella stagnalis	N	8.0	1
04901	Erpobdellidae	N	8.0	25
05800	Caecidotea sp	N	6.0	39
06201	Hyalella azteca	N	4.0	9
06800	Gammarus sp	N	3.0	70
21001	Calopterygidae	O	3.5	1
22300	Argia sp	O	5.0	1
77750	Hayesomyia senata or Thienemannimyia norena	D	5.0	11
78655	Procladius (Holotanypus) sp	D	8.0	2
82820	Cryptochironomus sp	D	8.0	3
83040	Dicrotendipes neomodestus	D	6.0	3
84210	Paratendipes albimanus or P. duplicatus	D	3.0	5
84470	Polypedilum (P.) illinoense	D	6.0	10
84520	Polypedilum (Tripodura) halterale group	D	6.0	1
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	10
85500	Paratanytarsus sp	T	6.0	2
85818	Tanytarsus glabrescens group sp 4	T	7.0	1
85821	Tanytarsus glabrescens group sp 7	T	7.0	1
95100	Physella sp	N	9.0	1
98600	Sphaerium sp	N	5.0	5

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 22 Total Taxa: 22

Number of Organisms: 290 mIBI: 19.45

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: ust. E. Lake Rd.

Site ID: **MF16**

Subsample:

Collection Date: 08/05/2018 River Code: 95-291 River: Middle Fork North Branch Chicago RM: 3.00

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	1
03600	Oligochaeta	N	10.0	70
04666	Helobdella papillata	N	8.0	1
04682	Placobdella montifera	N	8.0	1
04901	Erpobdellidae	N	8.0	2
05800	Caecidotea sp	N	6.0	2
06201	Hyalella azteca	N	4.0	29
06800	Gammarus sp	N	3.0	79
08250	Orconectes (Procericambarus) rusticus	N	5.0	1
59500	Oecetis sp	C	5.0	1
77500	Conchapelopia sp	D	6.0	2
77750	Hayesomyia senata or Thienemannimyia norena	D	5.0	1
78655	Procladius (Holotanypus) sp	D	8.0	42
80510	Cricotopus (Isocladius) sylvestris group	D	8.0	2
82730	Chironomus (C.) decorus group	D	11.0	1
82800	Cladopelma sp	D	6.0	5
82820	Cryptochironomus sp	D	8.0	1
83040	Dicrotendipes neomodestus	D	6.0	2
83300	Glyptotendipes (G.) sp	D	10.0	2
83400	Harnischia sp	D	6.0	1
84155	Paralauterborniella nigrohalteralis	D	6.0	1
84470	Polypedilum (P.) illinoense	D	6.0	52
84520	Polypedilum (Tripodura) halterale group	D	6.0	1
85800	Tanytarsus sp	T	7.0	2
92310	Valvata bicarinata	N	0.0	3
93200	Hydrobiidae	N	6.0	1
95100	Physella sp	N	9.0	2
95900	Gyraulus sp	N	6.0	1
97601	Corbicula fluminea	N	4.0	2
98600	Sphaerium sp	N	5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 30 Total Taxa: 30

Number of Organisms: 312 mIBI: 21.70

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: dst. Glenview Rd.

Site ID: **MF17**

Subsample:

Collection Date: 08/04/2018 River Code: 95-291 River: Middle Fork North Branch Chicago RM: 1.80

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	10
03600	Oligochaeta	N	10.0	17
04664	Helobdella stagnalis	N	8.0	2
04910	Erpobdella sp (= Dina)	N	0.0	8
05800	Caecidotea sp	N	6.0	61
06201	Hyalella azteca	N	4.0	1
06800	Gammarus sp	N	3.0	84
22001	Coenagrionidae	O	5.5	2
52200	Cheumatopsyche sp	C	6.0	7
68901	Macronychus glabratus	O	2.0	1
77750	Hayesomyia senata or Thienemannimyia norena	D	5.0	18
78655	Procladius (Holotanypus) sp	D	8.0	1
80420	Cricotopus (C.) bicinctus	D	8.0	2
82820	Cryptochironomus sp	D	8.0	1
83040	Dicrotendipes neomodestus	D	6.0	5
84450	Polypedilum (Uresipedilum) flavum	D	6.0	22
84470	Polypedilum (P.) illinoense	D	6.0	21
84520	Polypedilum (Tripodura) halterale group	D	6.0	1
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	7
85625	Rheotanytarsus sp	T	6.0	11
93200	Hydrobiidae	N	6.0	6
95900	Gyraulus sp	N	6.0	1
97601	Corbicula fluminea	N	4.0	2
98600	Sphaerium sp	N	5.0	9

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 24 Total Taxa: 24

Number of Organisms: 300 mIBI: 27.99

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Ust. Rockland Rd.

Site ID: **MF08**

Subsample:

Collection Date: 07/29/2019 River Code: 95-291 River: Middle Fork North Branch Chicago RM: 21.10

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	13
03600	Oligochaeta	N	10.0	17
06201	Hyalella azteca	N	4.0	246
17200	Caenis sp	M	6.0	15
22001	Coenagrionidae	O	5.5	7
42700	Belostoma sp	O	99.9	2
52200	Cheumatopsyche sp	C	6.0	1
53800	Hydroptila sp	C	2.0	6
60900	Peltodytes sp	O	99.9	5
65800	Berosus sp	O	99.9	8
68708	Dubiraphia vittata group	O	5.0	1
69400	Stenelmis sp	O	7.0	1
77500	Conchapelopia sp	D	6.0	1
78200	Larsia sp	D	6.0	1
93200	Hydrobiidae	N	6.0	2
98200	Pisidium sp	N	5.0	5
98600	Sphaerium sp	N	5.0	12

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 17 Total Taxa: 17

Number of Organisms: 343 mIBI: 29.61

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Dst. foot bridge at FP

Site ID: **MF09**

Subsample:

Collection Date: 07/28/2019 River Code: 95-291 River: Middle Fork North Branch Chicago RM: 18.90

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	21
03600	Oligochaeta	N	10.0	26
04664	Helobdella stagnalis	N	8.0	2
04930	Erpobdella sp	N	8.0	1
06201	Hyalella azteca	N	4.0	258
11200	Callibaetis sp	M	4.0	1
22001	Coenagrionidae	O	5.5	1
53800	Hydroptila sp	C	2.0	1
59500	Oecetis sp	C	5.0	1
78655	Procladius (Holotanypus) sp	D	8.0	2
82880	Cryptotendipes sp	D	6.0	1
84520	Polypedilum (Tripodura) halterale group	D	6.0	7
92615	Cipangopaludina japonica	N	6.0	2
98600	Sphaerium sp	N	5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 14 Total Taxa: 14

Number of Organisms: 325 mIBI: 21.89

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Dst. Westleigh St.

Site ID: **MF10**

Subsample:

Collection Date: 07/28/2019 River Code: 95-291 River: Middle Fork North Branch Chicago RM: 16.70

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	1
03600	Oligochaeta	N	10.0	5
04901	Erpobdellidae	N	8.0	1
06201	Hyalella azteca	N	4.0	323
17200	Caenis sp	M	6.0	4
22001	Coenagrionidae	O	5.5	6
42700	Belostoma sp	O	99.9	1
48610	Nigronia fasciata	O	2.0	1
52200	Cheumatopsyche sp	C	6.0	1
53800	Hydroptila sp	C	2.0	3
60900	Peltodytes sp	O	99.9	2
93200	Hydrobiidae	N	6.0	2
95100	Physella sp	N	9.0	1
98600	Sphaerium sp	N	5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 14 Total Taxa: 14

Number of Organisms: 352 mIBI: 23.85

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Dst. IL22

Site ID: **MF11**

Subsample:

Collection Date: 07/28/2019 River Code: 95-291 River: Middle Fork North Branch Chicago RM: 14.10

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
03600	Oligochaeta	N	10.0	3
04930	Erpobdella sp	N	8.0	1
06201	Hyalella azteca	N	4.0	318
22001	Coenagrionidae	O	5.5	6
23700	Anax sp	O	5.0	3
53800	Hydroptila sp	C	2.0	4
84470	Polypedilum (P.) illinoense	D	6.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 7 Total Taxa: 7

Number of Organisms: 336 mIBI: 18.82

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Ust. Carrige Way

Site ID: **MF12**

Subsample:

Collection Date: 07/28/2019 River Code: 95-291 River: Middle Fork North Branch Chicago RM: 10.80

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	8
03600	Oligochaeta	N	10.0	10
04964	Erpobdella microstoma	N	8.0	1
05800	Caecidotea sp	N	6.0	10
06201	Hyalella azteca	N	4.0	289
22001	Coenagrionidae	O	5.5	2
22300	Argia sp	O	5.0	4
52200	Cheumatopsyche sp	C	6.0	2
53800	Hydroptila sp	C	2.0	2
65800	Berosus sp	O	99.9	1
77120	Ablabesmyia mallochi	D	6.0	1
79100	Thienemannimyia group	D	6.0	2
83040	Dicrotendipes neomodestus	D	6.0	3
83050	Dicrotendipes lucifer	D	6.0	1
84210	Paratendipes albimanus or P. duplicatus	D	3.0	2
84450	Polypedilum (Uresipedilum) flavum	D	6.0	3
85800	Tanytarsus sp	T	7.0	3
85814	Tanytarsus glabrescens group	T	7.0	1
93200	Hydrobiidae	N	6.0	2
95100	Physella sp	N	9.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 20 Total Taxa: 20

Number of Organisms: 348 mIBI: 23.66

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Ust. IL68

Site ID: **MF13**

Subsample:

Collection Date: 07/30/2019 River Code: 95-291 River: Middle Fork North Branch Chicago RM: 8.60

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	20
03600	Oligochaeta	N	10.0	12
04664	Helobdella stagnalis	N	8.0	3
04930	Erpobdella sp	N	8.0	7
05800	Caecidotea sp	N	6.0	107
06201	Hyalella azteca	N	4.0	130
08200	Orconectes sp	N	5.0	1
22001	Coenagrionidae	O	5.5	5
53800	Hydroptila sp	C	2.0	2
60900	Peltodytes sp	O	99.9	1
68708	Dubiraphia vittata group	O	5.0	1
78655	Procladius (Holotanypus) sp	D	8.0	4
83040	Dicrotendipes neomodestus	D	6.0	1
84210	Paratendipes albimanus or P. duplicatus	D	3.0	3
84450	Polypedilum (Uresipedilum) flavum	D	6.0	1
84470	Polypedilum (P.) illinoense	D	6.0	3
84520	Polypedilum (Tripodura) halterale group	D	6.0	2
84612	Saetheria tylus	D	4.0	1
93200	Hydrobiidae	N	6.0	1
95100	Physella sp	N	9.0	2
98200	Pisidium sp	N	5.0	3
98600	Sphaerium sp	N	5.0	8

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 22 Total Taxa: 22

Number of Organisms: 318 mIBI: 25.55

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Dst. Sunset Dr.

Site ID: **MF14**

Subsample:

Collection Date: 07/29/2019 River Code: 95-291 River: Middle Fork North Branch Chicago RM: 6.00

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	13
03600	Oligochaeta	N	10.0	16
05800	Caecidotea sp	N	6.0	32
06201	Hyalella azteca	N	4.0	46
11130	Baetis intercalaris	M	4.0	75
22001	Coenagrionidae	O	5.5	2
22300	Argia sp	O	5.0	8
49200	Climacia sp	O	1.0	1
52200	Cheumatopsyche sp	C	6.0	56
53800	Hydroptila sp	C	2.0	5
74100	Simulium sp	D	6.0	9
77120	Ablabesmyia mallochi	D	6.0	1
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)	D	6.0	3
84450	Polypedilum (Uresipedilum) flavum	D	6.0	35
84470	Polypedilum (P.) illinoense	D	6.0	2
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	1
85265	Cladotanytarsus vanderwulpi group sp 5	T	7.0	1
85625	Rheotanytarsus sp	T	6.0	1
95100	Physella sp	N	9.0	1
98200	Pisidium sp	N	5.0	1
98600	Sphaerium sp	N	5.0	3

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 21 Total Taxa: 21

Number of Organisms: 312 mIBI: 32.84

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Dst. Winnetka Ave.

Site ID: **MF15**

Subsample:

Collection Date: 07/29/2019 River Code: 95-291 River: Middle Fork North Branch Chicago RM: 4.00

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	10
03600	Oligochaeta	N	10.0	6
04935	Erpobdella punctata punctata	N	8.0	1
04964	Erpobdella microstoma	N	8.0	1
05800	Caecidotea sp	N	6.0	85
06201	Hyalella azteca	N	4.0	96
06800	Gammarus sp	N	3.0	11
08200	Orconectes sp	N	5.0	1
11130	Baetis intercalaris	M	4.0	9
17200	Caenis sp	M	6.0	1
21001	Calopterygidae	O	3.5	9
22001	Coenagrionidae	O	5.5	4
22300	Argia sp	O	5.0	3
52200	Cheumatopsyche sp	C	6.0	9
53800	Hydroptila sp	C	2.0	2
77500	Conchapelopia sp	D	6.0	1
77750	Hayesomyia senata or Thienemannimyia norena	D	5.0	3
78140	Labrundinia pilosella	D	4.0	3
81825	Rheocricotopus (Psilocricotopus) robacki	D	6.0	1
83040	Dicrotendipes neomodestus	D	6.0	10
84450	Polypedilum (Uresipedilum) flavum	D	6.0	12
84470	Polypedilum (P.) illinoense	D	6.0	16
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	6
84612	Saetheria tylus	D	4.0	8
85265	Cladotanytarsus vanderwulpi group sp 5	T	7.0	2
85500	Paratanytarsus sp	T	6.0	2
85625	Rheotanytarsus sp	T	6.0	3
93200	Hydrobiidae	N	6.0	1
97601	Corbicula fluminea	N	4.0	3
98600	Sphaerium sp	N	5.0	2

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 30 Total Taxa: 30

Number of Organisms: 321 mIBI: 29.93

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Adj. Saundrers Rd.

Site ID: **WF20**

Subsample:

Collection Date: 07/30/2019 River Code: 95-292 River: West Fork North Branch Chicago RM: 12.50

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	39
03600	Oligochaeta	N	10.0	5
04660	Helobdella sp	N	8.0	5
04664	Helobdella stagnalis	N	8.0	18
04666	Helobdella papillata	N	8.0	2
04964	Erpobdella microstoma	N	8.0	8
05800	Caecidotea sp	N	6.0	1
06201	Hyalella azteca	N	4.0	42
06700	Crangonyx sp	N	4.0	9
22001	Coenagrionidae	O	5.5	19
23501	Aeshnidae	O	4.5	1
60900	Peltodytes sp	O	99.9	1
77140	Ablabesmyia peleensis	D	6.0	1
80510	Cricotopus (Isocladius) sylvestris group	D	8.0	3
83040	Dicrotendipes neomodestus	D	6.0	8
83050	Dicrotendipes lucifer	D	6.0	1
83051	Dicrotendipes simpsoni	D	6.0	3
84000	Parachironomus sp	D	8.0	1
84470	Polypedilum (P.) illinoense	D	6.0	37
85500	Paratanytarsus sp	T	6.0	2
95100	Physella sp	N	9.0	55
96264	Planorbella (Pierosoma) pilsbryi	N	6.5	9
98200	Pisidium sp	N	5.0	16
98600	Sphaerium sp	N	5.0	40

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 24 Total Taxa: 24

Number of Organisms: 326 mIBI: 25.80

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Adj. Saundrers Rd.

Site ID: **WF20**

Subsample:

Collection Date: 09/10/2019 River Code: 95-292 River: West Fork North Branch Chicago RM: 12.50

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	17
03600	Oligochaeta	N	10.0	66
04660	Helobdella sp	N	8.0	1
04664	Helobdella stagnalis	N	8.0	12
04964	Erpobdella microstoma	N	8.0	14
05800	Caecidotea sp	N	6.0	1
06201	Hyalella azteca	N	4.0	11
06700	Crangonyx sp	N	4.0	25
22001	Coenagrionidae	O	5.5	65
23501	Aeshnidae	O	4.5	1
28705	Pachydiplax longipennis	O	8.0	2
45900	Notonecta sp	O	99.9	1
66700	Helochares maculicollis	O	0.0	1
67700	Paracymus sp	O	99.9	1
81240	Nanocladius (N.) distinctus	D	3.0	1
83040	Dicrotendipes neomodestus	D	6.0	13
83300	Glyptotendipes (G.) sp	D	10.0	4
84470	Polypedilum (P.) illinoense	D	6.0	25
95100	Physella sp	N	9.0	8
96264	Planorbella (Pierosoma) pilsbryi	N	6.5	1
98001	Pisidiidae	N	5.0	46

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 21 Total Taxa: 21

Number of Organisms: 316 mIBI: 25.80

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Dst. Deerfield Rd.

Site ID: **WF21**

Subsample:

Collection Date: 07/30/2019 River Code: 95-292 River: West Fork North Branch Chicago RM: 10.40

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	67
03600	Oligochaeta	N	10.0	13
04664	Helobdella stagnalis	N	8.0	7
04901	Erpobdellidae	N	8.0	7
06201	Hyalella azteca	N	4.0	11
22001	Coenagrionidae	O	5.5	3
52200	Cheumatopsyche sp	C	6.0	1
74100	Simulium sp	D	6.0	3
77500	Conchapelopia sp	D	6.0	2
80350	Corynoneura sp	D	2.0	1
80420	Cricotopus (C.) bicinctus	D	8.0	1
80510	Cricotopus (Isocladius) sylvestris group	D	8.0	1
82820	Cryptochironomus sp	D	8.0	1
83000	Dicrotendipes sp	D	6.0	16
83040	Dicrotendipes neomodestus	D	6.0	12
83051	Dicrotendipes simpsoni	D	6.0	3
83300	Glyptotendipes (G.) sp	D	10.0	3
84210	Paratendipes albimanus or P. duplicatus	D	3.0	16
84400	Polypedilum sp	D	6.0	2
84450	Polypedilum (Uresipedilum) flavum	D	6.0	63
84470	Polypedilum (P.) illinoense	D	6.0	12
84520	Polypedilum (Tripodura) halterale group	D	6.0	1
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	43
85260	Cladotanytarsus vanderwulpi group	T	7.0	1
85625	Rheotanytarsus sp	T	6.0	1
98200	Pisidium sp	N	5.0	2
98600	Sphaerium sp	N	5.0	27

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 27 Total Taxa: 27

Number of Organisms: 320 mIBI: 20.52

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Dst. Lake-Cook Rd.

Site ID: **WF22**

Subsample:

Collection Date: 07/29/2019 River Code: 95-292 River: West Fork North Branch Chicago RM: 9.20

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	92
03600	Oligochaeta	N	10.0	49
04660	Helobdella sp	N	8.0	1
04666	Helobdella papillata	N	8.0	2
04964	Erpobdella microstoma	N	8.0	4
05800	Caecidotea sp	N	6.0	18
06201	Hyalella azteca	N	4.0	36
22001	Coenagrionidae	O	5.5	3
52200	Cheumatopsyche sp	C	6.0	1
77500	Conchapelopia sp	D	6.0	2
82730	Chironomus (C.) decorus group	D	11.0	1
82820	Cryptochironomus sp	D	8.0	1
83040	Dicrotendipes neomodestus	D	6.0	36
83050	Dicrotendipes lucifer	D	6.0	19
83051	Dicrotendipes simpsoni	D	6.0	1
83158	Endochironomus nigricans	D	6.0	2
84010	Parachironomus "abortivus" (sensu Simpson & Bode, 1980)	D	8.0	1
84450	Polypedilum (Uresipedilum) flavum	D	6.0	22
84470	Polypedilum (P.) illinoense	D	6.0	14
92310	Valvata bicarinata	N	0.0	4
95100	Physella sp	N	9.0	10
95501	Planorbidae	N	6.5	1
98200	Pisidium sp	N	5.0	8
98600	Sphaerium sp	N	5.0	30

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 24 Total Taxa: 24

Number of Organisms: 358 mIBI: 18.11

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Dst. Willow Rd.

Site ID: **WF23**

Subsample:

Collection Date: 07/29/2019 River Code: 95-292 River: West Fork North Branch Chicago RM: 4.90

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	1
03600	Oligochaeta	N	10.0	57
04664	Helobdella stagnalis	N	8.0	2
05800	Caecidotea sp	N	6.0	1
06201	Hyalella azteca	N	4.0	151
11200	Callibaetis sp	M	4.0	1
22001	Coenagrionidae	O	5.5	5
23700	Anax sp	O	5.0	2
53501	Hydroptilidae	C	3.5	2
60900	Peltodytes sp	O	99.9	1
77500	Conchapelopia sp	D	6.0	1
80510	Cricotopus (Isocladius) sylvestris group	D	8.0	2
82100	Thienemanniella sp	D	2.0	1
82730	Chironomus (C.) decorus group	D	11.0	1
82820	Cryptochironomus sp	D	8.0	2
83000	Dicrotendipes sp	D	6.0	1
83040	Dicrotendipes neomodestus	D	6.0	2
84010	Parachironomus "abortivus" (sensu Simpson & Bode, 1980)	D	8.0	3
84450	Polypedilum (Uresipedilum) flavum	D	6.0	5
84470	Polypedilum (P.) illinoense	D	6.0	23
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	3
92310	Valvata bicarinata	N	0.0	1
95100	Physella sp	N	9.0	22
95900	Gyraulus sp	N	6.0	25
98200	Pisidium sp	N	5.0	3
98600	Sphaerium sp	N	5.0	8

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 26 Total Taxa: 26

Number of Organisms: 326 mIBI: 28.66

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Dst. Lake Ave.

Site ID: **WF24**

Subsample:

Collection Date: 07/29/2019 River Code: 95-292 River: West Fork North Branch Chicago RM: 2.90

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	16
03600	Oligochaeta	N	10.0	24
04664	Helobdella stagnalis	N	8.0	1
04901	Erpobdellidae	N	8.0	5
05800	Caecidotea sp	N	6.0	79
06201	Hyalella azteca	N	4.0	89
08200	Orconectes sp	N	5.0	2
21001	Calopterygidae	O	3.5	1
22001	Coenagrionidae	O	5.5	15
52200	Cheumatopsyche sp	C	6.0	6
59500	Oecetis sp	C	5.0	2
77120	Ablabesmyia mallochi	D	6.0	2
77130	Ablabesmyia rhamphe group	D	6.0	2
77500	Conchapelopia sp	D	6.0	4
77750	Hayesomyia senata or Thienemannimyia norena	D	5.0	3
78655	Procladius (Holotanypus) sp	D	8.0	1
82800	Cladopelma sp	D	6.0	1
82820	Cryptochironomus sp	D	8.0	3
83040	Dicrotendipes neomodestus	D	6.0	12
84010	Parachironomus "abortivus" (sensu Simpson & Bode, 1980)	D	8.0	1
84450	Polypedilum (Uresipedilum) flavum	D	6.0	27
84470	Polypedilum (P.) illinoense	D	6.0	3
84520	Polypedilum (Tripodura) halterale group	D	6.0	2
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	14
85500	Paratanytarsus sp	T	6.0	2
85625	Rheotanytarsus sp	T	6.0	1
85800	Tanytarsus sp	T	7.0	5
93200	Hydrobiidae	N	6.0	4
95100	Physella sp	N	9.0	13
97601	Corbicula fluminea	N	4.0	8
98600	Sphaerium sp	N	5.0	8

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 31 Total Taxa: 31

Number of Organisms: 356 mIBI: 23.06

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Ust. walking bridge

Site ID: **WF25**

Subsample:

Collection Date: 07/29/2019 River Code: 95-292 River: West Fork North Branch Chicago RM: 1.30

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
03600	Oligochaeta	N	10.0	8
04664	Helobdella stagnalis	N	8.0	2
04666	Helobdella papillata	N	8.0	2
05800	Caecidotea sp	N	6.0	2
06201	Hyalella azteca	N	4.0	131
22001	Coenagrionidae	O	5.5	1
22300	Argia sp	O	5.0	1
52200	Cheumatopsyche sp	C	6.0	1
59500	Oecetis sp	C	5.0	1
66700	Helochares maculicollis	O	0.0	1
67700	Paracymus sp	O	99.9	2
77500	Conchapelopia sp	D	6.0	2
77750	Hayesomyia senata or Thienemannimyia norena	D	5.0	1
78655	Procladius (Holotanypus) sp	D	8.0	3
83000	Dicrotendipes sp	D	6.0	1
83040	Dicrotendipes neomodestus	D	6.0	5
84010	Parachironomus "abortivus" (sensu Simpson & Bode, 1980)	D	8.0	1
84450	Polypedilum (Uresipedilum) flavum	D	6.0	2
84470	Polypedilum (P.) illinoense	D	6.0	101
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	6
85625	Rheotanytarsus sp	T	6.0	2
85800	Tanytarsus sp	T	7.0	1
95100	Physella sp	N	9.0	20
95900	Gyraulus sp	N	6.0	1
98200	Pisidium sp	N	5.0	1
98600	Sphaerium sp	N	5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 26 Total Taxa: 26

Number of Organisms: 300 mIBI: 22.79

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: adj. Gillett Plant

Site ID: **SR1**

Subsample:

Collection Date: 08/05/2018 River Code: 95-403 River: Skokie River RM: 21.10

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
03600	Oligochaeta	N	10.0	148
05800	Caecidotea sp	N	6.0	3
06800	Gammarus sp	N	3.0	5
08200	Orconectes sp	N	5.0	3
11200	Callibaetis sp	M	4.0	24
21001	Calopterygidae	O	3.5	1
22001	Coenagrionidae	O	5.5	12
67800	Tropisternus sp	O	99.9	1
77355	Clinotanypus pinguis	D	6.0	1
78655	Procladius (Holotanypus) sp	D	8.0	17
79000	Tanypus sp	D	8.0	26
80420	Cricotopus (C.) bicinctus	D	8.0	2
82730	Chironomus (C.) decorus group	D	11.0	26
82820	Cryptochironomus sp	D	8.0	2
82880	Cryptotendipes sp	D	6.0	1
83158	Endochironomus nigricans	D	6.0	6
84470	Polypedilum (P.) illinoense	D	6.0	9
84520	Polypedilum (Tripodura) halterale group	D	6.0	15
85800	Tanytarsus sp	T	7.0	1
87540	Hemerodromia sp	D	6.0	1
95100	Physella sp	N	9.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 21 Total Taxa: 21

Number of Organisms: 305 mIBI: 16.38

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: ust. IL 176

Site ID: **SR2**

Subsample:

Collection Date: 08/05/2018 River Code: 95-403 River: Skokie River RM: 17.40

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	1
03600	Oligochaeta	N	10.0	13
04901	Erpobdellidae	N	8.0	4
05800	Caecidotea sp	N	6.0	58
06800	Gammarus sp	N	3.0	191
08200	Orconectes sp	N	5.0	1
21001	Calopterygidae	O	3.5	2
22001	Coenagrionidae	O	5.5	1
82730	Chironomus (C.) decorus group	D	11.0	1
82820	Cryptochironomus sp	D	8.0	1
84210	Paratendipes albimanus or P. duplicatus	D	3.0	2
84520	Polypedilum (Tripodura) halterale group	D	6.0	1
84750	Stictochironomus sp	D	5.0	8
98200	Pisidium sp	N	5.0	2
98600	Sphaerium sp	N	5.0	9

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 15 Total Taxa: 15

Number of Organisms: 295 mIBI: 21.75

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: dst. Deerpath Rd.

Site ID: **SR3**

Subsample:

Collection Date: 08/04/2018 River Code: 95-403 River: Skokie River RM: 14.80

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	7
03600	Oligochaeta	N	10.0	13
05800	Caecidotea sp	N	6.0	12
06800	Gammarus sp	N	3.0	128
21200	Calopteryx sp	O	4.0	7
22001	Coenagrionidae	O	5.5	18
48200	Chauliodes sp	O	4.0	1
69400	Stenelmis sp	O	7.0	1
77750	Hayesomyia senata or Thienemannimyia norena	D	5.0	1
78655	Procladius (Holotanypus) sp	D	8.0	2
80510	Cricotopus (Isocladius) sylvestris group	D	8.0	3
82730	Chironomus (C.) decorus group	D	11.0	4
82820	Cryptochironomus sp	D	8.0	1
83000	Dicrotendipes sp	D	6.0	1
83040	Dicrotendipes neomodestus	D	6.0	8
84470	Polypedilum (P.) illinoense	D	6.0	80
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	1
84700	Stenochironomus sp	D	3.0	3
85500	Paratanytarsus sp	T	6.0	1
85800	Tanytarsus sp	T	7.0	7
95100	Physella sp	N	9.0	6
98200	Pisidium sp	N	5.0	1
98600	Sphaerium sp	N	5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 23 Total Taxa: 23

Number of Organisms: 307 mIBI: 27.33

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: dst. Deerpath Rd.

Site ID: **SR3**

Subsample:

Collection Date: 09/23/2018 River Code: 95-403 River: Skokie River RM: 14.80

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	2
03600	Oligochaeta	N	10.0	39
04901	Erpobdellidae	N	8.0	5
05800	Caecidotea sp	N	6.0	4
06700	Crangonyx sp	N	4.0	1
06800	Gammarus sp	N	3.0	153
21200	Calopteryx sp	O	4.0	3
22001	Coenagrionidae	O	5.5	9
22300	Argia sp	O	5.0	1
68201	Scirtidae	O	7.0	1
69400	Stenelmis sp	O	7.0	1
69930	Lampyridae	O	0.0	1
80420	Cricotopus (C.) bicinctus	D	8.0	2
81231	Nanocladius (N.) crassicornus or N. (N.) "rectinervis"	D	3.0	1
82730	Chironomus (C.) decorus group	D	11.0	2
83040	Dicrotendipes neomodestus	D	6.0	1
84210	Paratendipes albimanus or P. duplicatus	D	3.0	5
84470	Polypedilum (P.) illinoense	D	6.0	51
84520	Polypedilum (Tripodura) halterale group	D	6.0	1
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	1
85500	Paratanytarsus sp	T	6.0	1
85800	Tanytarsus sp	T	7.0	1
85821	Tanytarsus glabrescens group sp 7	T	7.0	1
95100	Physella sp	N	9.0	4
95900	Gyraulus sp	N	6.0	1
98200	Pisidium sp	N	5.0	15
98600	Sphaerium sp	N	5.0	5

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 27 Total Taxa: 27

Number of Organisms: 312 mIBI: 27.33

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: ust. Half Day Rd. @ Sleepy Hollow Park

Site ID: **SR4**

Subsample:

Collection Date: 08/04/2018 River Code: 95-403 River: Skokie River RM: 11.30

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	3
03600	Oligochaeta	N	10.0	1
04935	Erpobdella punctata punctata	N	8.0	2
05800	Caecidotea sp	N	6.0	44
06800	Gammarus sp	N	3.0	179
11130	Baetis intercalaris	M	4.0	23
77500	Conchapelopia sp	D	6.0	3
82820	Cryptochironomus sp	D	8.0	8
84450	Polypedilum (Uresipedilum) flavum	D	6.0	1
84470	Polypedilum (P.) illinoense	D	6.0	3
85800	Tanytarsus sp	T	7.0	3
95100	Physella sp	N	9.0	2
98200	Pisidium sp	N	5.0	5
98600	Sphaerium sp	N	5.0	6

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 14 Total Taxa: 14

Number of Organisms: 283 mIBI: 22.90

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: ust. Clavey Rd. @ Solel Congregation

Site ID: **SR5**

Subsample:

Collection Date: 08/04/2018 River Code: 95-403 River: Skokie River RM: 8.00

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	1
03600	Oligochaeta	N	10.0	5
04964	Erpobdella microstoma	N	8.0	1
05800	Caecidotea sp	N	6.0	8
06800	Gammarus sp	N	3.0	255
22001	Coenagrionidae	O	5.5	3
82820	Cryptochironomus sp	D	8.0	4
83040	Dicrotendipes neomodestus	D	6.0	3
83158	Endochironomus nigricans	D	6.0	1
84210	Paratendipes albimanus or P. duplicatus	D	3.0	1
84470	Polypedilum (P.) illinoense	D	6.0	1
95100	Physella sp	N	9.0	6
98200	Pisidium sp	N	5.0	3
98600	Sphaerium sp	N	5.0	5

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 14 Total Taxa: 14

Number of Organisms: 297 mIBI: 22.43

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: Ust. Lake Cook Rd.

Site ID: **SR6**

Subsample:

Collection Date: 08/04/2018 River Code: 95-403 River: Skokie River RM: 7.40

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	4
03600	Oligochaeta	N	10.0	8
05800	Caecidotea sp	N	6.0	37
06800	Gammarus sp	N	3.0	129
22001	Coenagrionidae	O	5.5	5
23700	Anax sp	O	5.0	1
77750	Hayesomyia senata or Thienemannimyia norena	D	5.0	1
78655	Procladius (Holotanypus) sp	D	8.0	1
80420	Cricotopus (C.) bicinctus	D	8.0	1
82730	Chironomus (C.) decorus group	D	11.0	37
82800	Cladopelma sp	D	6.0	1
82820	Cryptochironomus sp	D	8.0	1
83040	Dicrotendipes neomodestus	D	6.0	59
83050	Dicrotendipes lucifer	D	6.0	5
84210	Paratendipes albimanus or P. duplicatus	D	3.0	2
84470	Polypedilum (P.) illinoense	D	6.0	35
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	1
95100	Physella sp	N	9.0	3

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 18 Total Taxa: 18

Number of Organisms: 331 mIBI: 21.49

Appendix Table C-2. Macroinvertebrate taxa collected in the North Branch Chicago River study area during 2018 and 2019.

Site: dst. I-94

Site ID: **SR18**

Subsample:

Collection Date: 08/04/2018 River Code: 95-403 River: Skokie River RM: 0.50

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria	N	6.0	3
03600	Oligochaeta	N	10.0	21
05800	Caecidotea sp	N	6.0	5
06201	Hyalella azteca	N	4.0	4
06800	Gammarus sp	N	3.0	110
22001	Coenagrionidae	O	5.5	2
52200	Cheumatopsyche sp	C	6.0	19
53800	Hydroptila sp	C	2.0	1
77750	Hayesomyia senata or Thienemannimyia norena	D	5.0	1
78655	Procladius (Holotanypus) sp	D	8.0	3
80420	Cricotopus (C.) bicinctus	D	8.0	5
82800	Cladopelma sp	D	6.0	1
82820	Cryptochironomus sp	D	8.0	3
83000	Dicrotendipes sp	D	6.0	1
83040	Dicrotendipes neomodestus	D	6.0	2
83051	Dicrotendipes simpsoni	D	6.0	3
83158	Endochironomus nigricans	D	6.0	2
83300	Glyptotendipes (G.) sp	D	10.0	28
84010	Parachironomus "abortivus" (sensu Simpson & Bode, 1980)	D	8.0	1
84450	Polypedilum (Uresipedilum) flavum	D	6.0	8
84470	Polypedilum (P.) illinoense	D	6.0	12
84540	Polypedilum (Tripodura) scalaenum group	D	6.0	2
85800	Tanytarsus sp	T	7.0	2
92310	Valvata bicarinata	N	0.0	1
93200	Hydrobiidae	N	6.0	6
97601	Corbicula fluminea	N	4.0	18
98001	Pisidiidae	N	5.0	22

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 27 Total Taxa: 27

Number of Organisms: 286 mIBI: 26.20

APPENDIX D

North Branch Chicago River 2018-2019 Habitat Data

D-1: North Branch Chicago River Watershed Workgroup
2018-2019 QHEI Metrics and Scores
D-2: QHEI Field Sheets 2018-2019

Appendix D-1. QHEI metric scores for sites in the Chicago River study area in 2018 and 2019.

River Mile	QHEI	QHEI Metrics: Substrate	Cover	Channel	Riparian	Pool	Riffle	Gradient / Score	Narrative
95-009	*North Branch Chicago River*								
	Year: **2018**								
18.60	**49.00**	9.0	14.0	7.0	7.0	8.0	0.0	1.36 - (4)	Poor
95-291	*Middle Fork North Branch Chicago River*								
	Year: **2018**								
3.00	**44.00**	5.0	15.0	5.5	7.5	7.0	0.0	2.27 - (4)	Poor
1.80	**45.00**	9.5	13.0	4.5	8.0	6.0	0.0	2.27 - (4)	Poor
	Year: **2019**								
21.10	**34.00**	2.0	11.0	6.0	5.0	2.0	0.0	34.50 - (8)	Poor
18.90	**28.00**	6.0	11.0	5.0	0.0	2.0	0.0	2.72 - (4)	Poor
16.70	**43.00**	9.0	12.0	6.0	8.0	2.0	0.0	5.29 - (6)	Poor
14.10	**45.50**	8.0	13.0	6.0	7.5	7.0	0.0	2.64 - (4)	Poor
10.80	**41.50**	6.0	11.0	6.0	4.5	7.0	1.0	5.56 - (6)	Poor
8.60	**54.50**	5.0	14.0	8.0	8.5	8.0	1.0	8.70 - (10)	Fair
6.00	**67.00**	14.0	17.0	15.0	4.0	9.0	2.0	3.45 - (6)	Fair
4.00	**59.00**	9.0	11.0	10.5	9.5	9.0	0.0	6.29 - (10)	Fair
95-292	*West Fork North Branch Chicago River*								
	Year: **2019**								
12.50	**30.50**	0.0	11.0	6.0	6.5	1.0	0.0	6.60 - (6)	Poor
10.40	**40.50**	14.0	4.0	8.0	5.5	4.0	1.0	4.15 - (4)	Poor
9.20	**46.00**	9.0	16.0	6.0	4.0	5.0	0.0	3.51 - (6)	Poor
4.90	**38.50**	4.0	13.0	5.0	5.5	7.0	0.0	1.99 - (4)	Poor
2.90	**53.50**	11.5	15.0	11.0	5.0	7.0	0.0	1.99 - (4)	Fair
1.30	**45.50**	7.0	13.0	7.5	5.0	8.0	1.0	1.99 - (4)	Poor
95-403	*Skokie River*								
	Year: **2018**								
21.10	**33.50**	0.0	13.0	4.0	5.5	3.0	0.0	10.50 - (8)	Poor
17.40	**33.50**	5.0	11.0	5.0	5.5	3.0	0.0	2.99 - (4)	Poor
14.80	**40.50**	10.5	11.0	4.0	5.0	4.0	0.0	4.42 - (6)	Poor
11.30	**47.00**	10.0	12.0	9.0	5.0	5.0	0.0	3.27 - (6)	Poor
8.00	**45.50**	8.0	13.0	5.0	7.5	8.0	0.0	1.44 - (4)	Poor
7.40	**36.25**	8.0	9.0	4.0	7.2	4.0	0.0	1.44 - (4)	Poor
3.00	**32.50**	0.0	14.0	3.0	6.5	5.0	0.0	1.44 - (4)	Poor
0.50	**38.50**	4.0	15.0	6.0	6.5	5.0	0.0	0.92 - (2)	Poor

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 34

River Code: 95-291 RM: 21.1 Stream: M Fk N Br Chicago R
Site Code: MF08 Project Code: NBWWS10 Location: Ust Rockland Rd
Date: 8-14-19 Scorer: MAS Latitude: 42.28013 Longitude: -87.89854

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☐ ☒ -SILT [2]		

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE))
☐ -LIMESTONE [1]
☐ -TILLS [1]
☒ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE))
SILT:
☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS:
☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate: 2 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
0 ROOTMATS [1]

TYPE: Score All That Occur
0 POOLS > 70 cm [2]
1 ROOTWADS [1]
0 BOULDERS [1]
0 OXBOWS, BACKWATERS [1]
3 AQUATIC MACROPHYTES [1]
2 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☒ -MODERATE 25 - 75% [7]
☐ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 11 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☐ -MODERATE [3]
☒ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☐ -RECOVERING [3]
☒ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☒ -MODERATE [2]
☐ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 6 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH (L R (Per Bank))
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☒ ☒ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R (Most Predominant Per Bank))
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☒ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R (Per Bank))
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☒ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☒ -POOL WIDTH < RIFFLE WIDTH [0]
☒ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 2 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☐ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 34.5 DRAINAGE AREA (sq.mi.): 5.81 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 8 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) ____

If Not, Explain: ____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: ____

Subjective Rating (1-10): 4

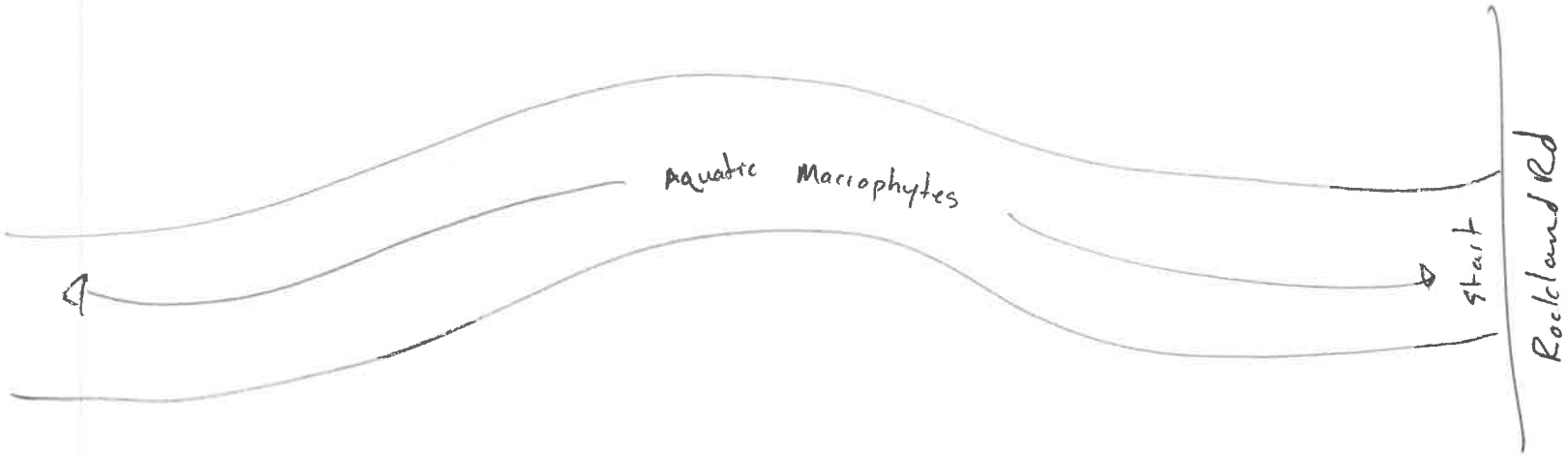
Aesthetic Rating (1-10): 4

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	100

Yes/ No	
☐ ☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐ ☐	Is there water upstream? How far:
☐ ☐	Is there water close downstream? How far:
☐ ☐	Is Dry Channel mostly natural?

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 28

River Code: 95-291 RM: 18.9 Stream: M FK N Br Chicago R
Site Code: MF09 Project Code: NBWW19 Location: Dst Foot Bridge @ EP
Date: 8-14-19 Scorer: MAS Latitude: 42.25635 Longitude: -87.88459

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☒ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☒ ☐ -MUCK [2]			☐ ☐ -SILT [2]		

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)): ☐ -LIMESTONE [1] ☐ -TILLS [1] ☒ -WETLANDS [0] ☐ -HARDPAN [0] ☐ -SANDSTONE [0] ☐ -RIP / RAP [0] ☐ -LACUSTRINE [0] ☐ -SHALE [-1] ☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE))
SILT: ☒ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2] ☐ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 6 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
0 ROOTMATS [1]

TYPE: Score All That Occur
0 POOLS > 70 cm [2]
0 ROOTWADS [1]
1 BOULDERS [1]
0 OXBOWS, BACKWATERS [1]
3 AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☒ -MODERATE 25 - 75% [7]
☐ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 11 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY: ☐ -HIGH [4] ☐ -MODERATE [3] ☐ -LOW [2] ☒ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☐ -FAIR [3] ☒ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☐ -RECOVERED [4] ☐ -RECOVERING [3] ☒ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☐ -HIGH [3] ☒ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☐ -RELOCATION ☐ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 5 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH (L R (Per Bank))
☒ ☒ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R (Most Predominant Per Bank))
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☒ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R (Per Bank))
☐ ☐ -NONE / LITTLE [3]
☐ ☐ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 0 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☒ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☒ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1] ☐ -FAST [1] ☐ -MODERATE [1] ☒ -SLOW [1] ☐ -NONE [-1]
☐ -TORRENTIAL [-1] ☐ -INTERSTITIAL [-1] ☐ -INTERMITTENT [-2] ☐ -VERY FAST [1]

Pool / Current: 2 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☐ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.72 DRAINAGE AREA (sq.mi.): 8.91 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 4 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) ____

If Not, Explain: ____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☑
- Mining ☐
- Channelization ☑
- Riparian Removal ☑
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: ____

Subjective Rating (1-10): 4

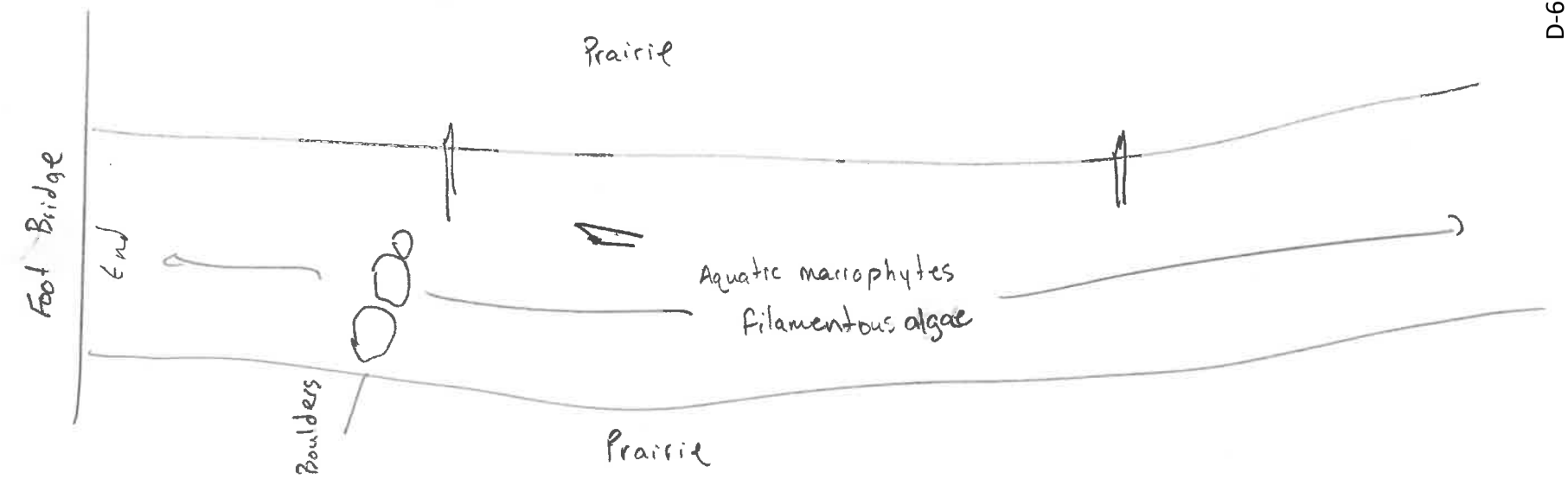
Aesthetic Rating (1-10): 4

Gradient: ☑ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	100

Yes	No	
☐	☑	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☑	☐	Is there water upstream? How far:
☑	☐	Is there water close downstream? How far:
☐	☐	Is Dry Channel mostly natural?

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 43

River Code: 95-291 RM: 16.7 Stream: M Fk N Br Chicago R
Site Code: MF10 Project Code: NBWW19 Location: Dst Westleigh St
Date: 8-14-19 Scorer: MAS Latitude: 42.23196 Longitude: -87.86841

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent)

TYPE	POOL	RIFFLE	Fine	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☑ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☑ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☐ ☐ -SILT [2]		

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2] ☑ -3 or Less [0]
(High Quality Only, Score 5 or >)

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)): ☐ -LIMESTONE [1] ☐ -TILLS [1] ☑ -WETLANDS [0] ☐ -HARDPAN [0] ☐ -SANDSTONE [0] ☐ -RIP / RAP [0] ☐ -LACUSTRINE [0] ☐ -SHALE [-1] ☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE)):
SILT: ☑ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☑ -EXTENSIVE [-2] ☐ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 9 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure):
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur:
0 POOLS > 70 cm [2]
1 ROOTWADS [1]
0 BOULDERS [1]
0 OXBOWS, BACKWATERS [1]
3 AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☑ -MODERATE 25 - 75% [7]
☐ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 12 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY: ☐ -HIGH [4] ☐ -MODERATE [3] ☑ -LOW [2] ☐ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☐ -FAIR [3] ☑ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☐ -RECOVERED [4] ☐ -RECOVERING [3] ☐ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☐ -HIGH [3] ☑ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☐ -RELOCATION ☐ -CANOPY REMOVAL ☑ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 6 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH (L R (Per Bank)):
☑ ☑ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R (Most Predominant Per Bank)):
☑ ☑ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R (Per Bank)):
☐ ☐ -NONE / LITTLE [3]
☐ ☐ -MODERATE [2]
☑ ☑ -HEAVY / SEVERE [1]

Riparian: 8 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!):
☐ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☑ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE):
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☑ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply):
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☑ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 2 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH:
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☑ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH:
☐ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE:
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS:
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☐ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 5.29 DRAINAGE AREA (sq.mi.): 11.99 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 6 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) _____ If Not, Explain: _____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: _____

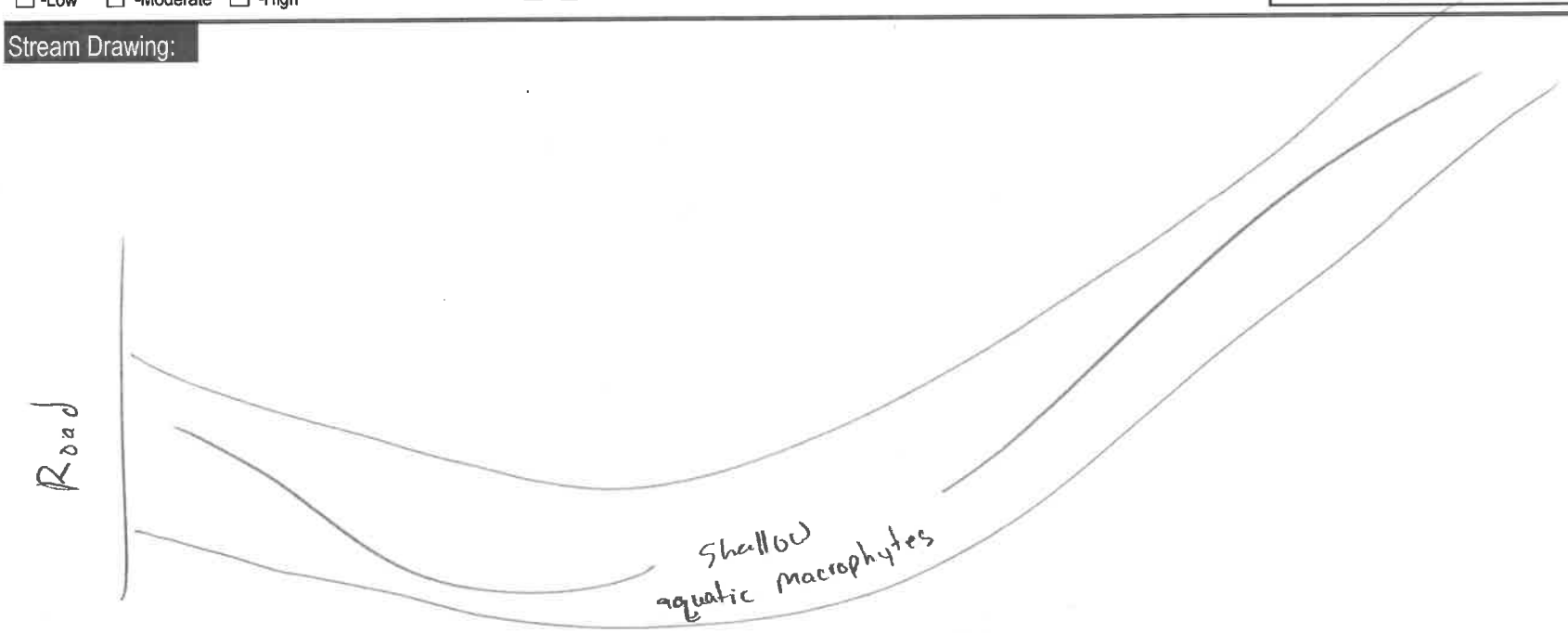
Subjective Rating (1-10)	Aesthetic Rating (1-10)
4	4

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	90

Gradient: ☐ -Low ☐ -Moderate ☐ -High

Yes/ No	
☐ ☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐ ☐	Is there water upstream? How far:
☐ ☐	Is there water close downstream? How far:
☐ ☐	Is Dry Channel mostly natural?

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

MBI Midwest Biodiversity Institute

QHEI Score: 45.5

River Code: 95-291 RM: 14.1 Stream: M Fk N Br Chicago R
Site Code: MF11 Project Code: NBCW319 Location: Dst IL 22
Date: 8-14-19 Scorer: MAS Latitude: 42.198861 Longitude: -87.85362

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☒ ☒ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☐ ☐ -SILT [2]		

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)):
☐ -LIMESTONE [1]
☐ -TILLS [1]
☒ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE)):
SILT: ☒ -SILT HEAVY [-2]; ☐ -SILT MODERATE [-1]; ☐ -SILT NORMAL [0]; ☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2]; ☐ -MODERATE [-1]; ☐ -NORMAL [0]; ☐ -NONE [1]

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >)
☐ -4 or More [2]
☒ -3 or Less [0]

Substrate: 8 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
1 SHALLOWS (IN SLOW WATER) [1]
0 ROOTMATS [1]

TYPE: Score All That Occur
3 POOLS > 70 cm [2]
1 ROOTWADS [1]
0 BOULDERS [1]
0 OXBOWS, BACKWATERS [1]
3 AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☒ -MODERATE 25 - 75% [7]
☐ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 13 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☐ -MODERATE [3]
☒ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☐ -RECOVERING [3]
☒ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☒ -MODERATE [2]
☐ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 6 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH (L R (Per Bank))
☒ ☒ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) (L R (Most Predominant Per Bank))
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☒ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R (Per Bank))
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☒ -HEAVY / SEVERE [1]

Riparian: 7.5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☒ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 7 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☐ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.64 DRAINAGE AREA (sq.mi.): 16.11 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 4 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) ____ If Not, Explain: ____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: ____

Subjective Rating (1-10): 4

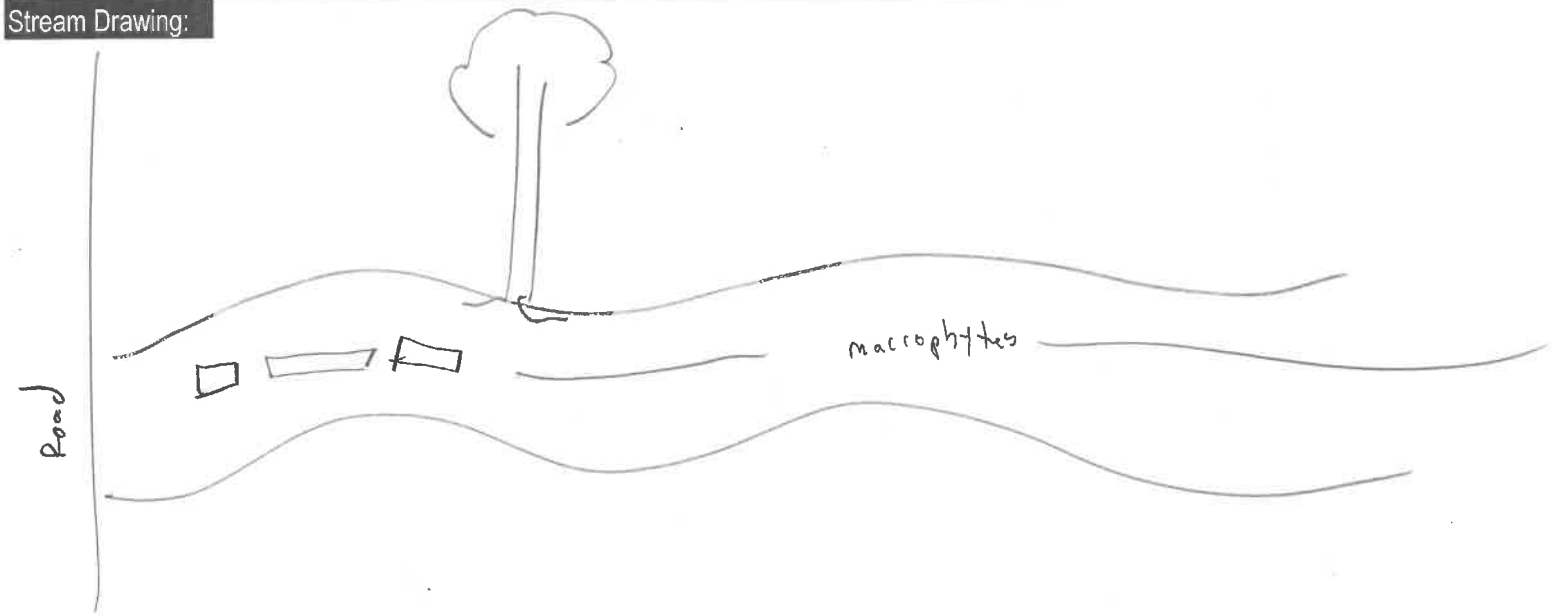
Aesthetic Rating (1-10): 4

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	E	150	Clear	Normal	100

Yes	No	
☐	☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐	☐	Is there water upstream? How far:
☐	☐	Is there water close downstream? How far:
☐	☐	Is Dry Channel mostly natural?

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 44 (42.5)

River Code: 95-291 RM: 10.8 Stream: M Fk N Br Chicago Rivers
Site Code: MF12 Project Code: NPNW19 Location: US Carriage Way
Date: 8-13-19 Scorer: MAS Latitude: 42.15927 Longitude: -87.82470

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☒ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☐ ☐ -SILT [2]		

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☐ -TILLS [1]
☒ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE)
SILT:
☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS:
☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate: 6 / Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
0 UNDERCUT BANKS [1]
1 OVERHANGING VEGETATION [1]
1 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur
2 POOLS > 70 cm [2]
1 ROOTWADS [1]
0 BOULDERS [1]
___ OXBOWS, BACKWATERS [1]
___ AQUATIC MACROPHYTES [1]
___ LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☒ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 15 (11) / Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☐ -MODERATE [3]
☐ -LOW [2]
☒ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☐ -RECOVERING [3]
☒ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☒ -HIGH [3]
☐ -MODERATE [2]
☐ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 6 / Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) — River Right Looking Downstream

RIPARIAN WIDTH (L R Per Bank)
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☒ ☒ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) (L R Most Predominant Per Bank)
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☒ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R Per Bank)
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☒ ☒ -HEAVY / SEVERE [1]

Riparian: 4.5 / Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☒ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 7 / Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☒ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☒ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run: 1 / Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 5.56 DRAINAGE AREA (sq.mi.): 19.23 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 6 / Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) _____ If Not, Explain: _____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☒
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☒
- Riparian Removal ☒
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: _____

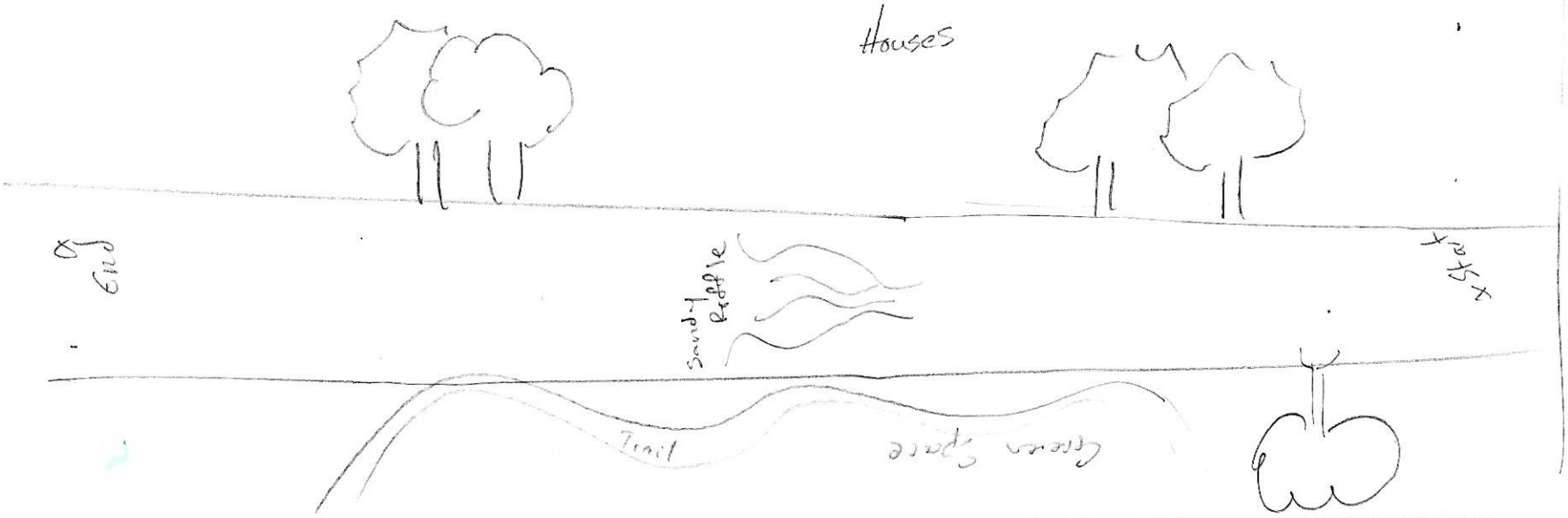
	Subjective Rating (1-10)	Aesthetic Rating (1-10)
	4	4

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	95

Gradient: ☒ -Low ☐ -Moderate ☐ -High

Yes	No	
☐	☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐	☐	Is there water upstream? How far:
☐	☐	Is there water close downstream? How far:
☐	☐	Is Dry Channel mostly natural?

Stream Drawing:



D-12

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 54.5

River Code: 95-291 RM: 8.6 Stream: M F k N Br Chicago R
Site Code: MF13 Project Code: NBWW19 Location: Ust IL-68
Date: 10-18-19 Scorer: MAS Latitude: 42 13879 Longitude: -87.81029

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent)

TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]		
☐ ☐ -Lg BOULD [10]		
☐ ☐ -BOULDER [9]		
☐ ☐ -COBBLE [8]		
☐ ☐ -HARDPAN [4]		
☐ ☐ -MUCK [2]		
☐ ☐ -GRAVEL [7]	X	
☐ ☒ -SAND [6]	X	X
☐ ☐ -BEDROCK [5]		
☐ ☒ -DETRITUS [3]	X	
☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -SILT [2]	X	

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)): ☐ -LIMESTONE [1] ☐ -TILLS [1] ☒ -WETLANDS [0] ☐ -HARDPAN [0] ☐ -SANDSTONE [0] ☐ -RIP / RAP [0] ☐ -LACUSTRINE [0] ☐ -SHALE [-1] ☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE)):
SILT: ☒ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2] ☐ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >) ☐ -4 or More [2] ☒ -3 or Less [0]

Substrate: 5 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
1 SHALLOWS (IN SLOW WATER) [1]
2 ROOTMATS [1]

TYPE: Score All That Occur
2 POOLS > 70 cm [2]
2 ROOTWADS [1]
0 BOULDERS [1]
0 OXBOWS, BACKWATERS [1]
2 AQUATIC MACROPHYTES [1]
3 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☒ -MODERATE 25 - 75% [7]
☐ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 14 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY: ☐ -HIGH [4] ☐ -MODERATE [3] ☒ -LOW [2] ☐ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☒ -FAIR [3] ☒ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☐ -RECOVERED [4] ☒ -RECOVERING [3] ☐ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☐ -HIGH [3] ☐ -MODERATE [2] ☒ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☐ -RELOCATION ☐ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 8 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) — River Right Looking Downstream

RIPARIAN WIDTH (L R (Per Bank)):
☒ ☐ -VERY WIDE > 100m [5]
☐ ☒ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R (Most Predominant Per Bank)):
☒ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R (Per Bank)):
☐ ☐ -NONE / LITTLE [3]
☐ ☐ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 8.5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!):
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE):
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☒ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply):
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 8 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH:
☐ -*Best Areas > 10cm [2]
☒ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH:
☐ - MAX > 50 cm [2]
☒ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE:
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS:
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run: 1 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 8.7 DRAINAGE AREA (sq.mi.): 20.96 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 10 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) ____

If Not, Explain: ____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☒
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: ____

Subjective Rating (1-10): 4

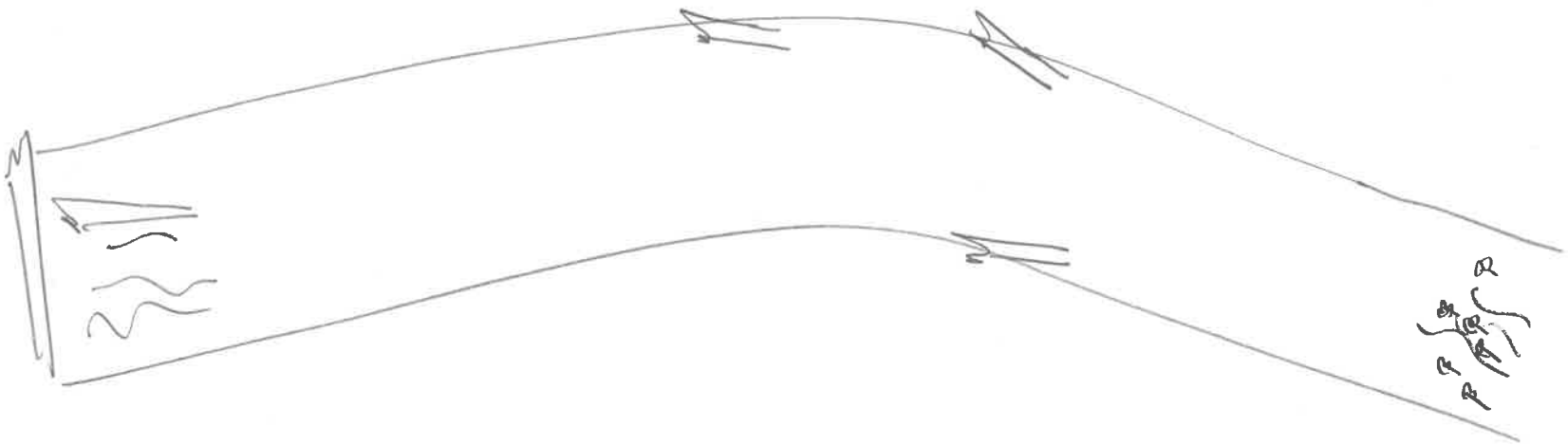
Aesthetic Rating (1-10): 4

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal-High	30

Yes	No	
☐	☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐	☐	Is there water upstream? How far:
☐	☐	Is there water close downstream? How far:
☐	☐	Is Dry Channel mostly natural?

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 67

River Code: 95-291 RM: 6.0 Stream: M Fk N Br Chicago R
Site Code: MF14 Project Code: NBWW19 Location: D+ Sunset Dr
Date: 8-13-19 Scorer: MAS Latitude: 42.11541 Longitude: -87.78472

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☒ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☒ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☐ ☐ -SILT [2]		

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)): ☐ -LIMESTONE [1]; ☒ -TILLS [1]; ☐ -WETLANDS [0]; ☐ -HARDPAN [0]; ☐ -SANDSTONE [0]; ☐ -RIP / RAP [0]; ☐ -LACUSTRINE [0]; ☐ -SHALE [-1]; ☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE)):
SILT: ☐ -SILT HEAVY [-2]; ☒ -SILT MODERATE [-1]; ☐ -SILT NORMAL [0]; ☐ -SILT FREE [1]
EMBEDDEDNESS: ☐ -EXTENSIVE [-2]; ☒ -MODERATE [-1]; ☐ -NORMAL [0]; ☐ -NONE [1]

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >) ☒ -4 or More [2]; ☐ -3 or Less [0]

Substrate: 14 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure): 1 UNDERCUT BANKS [1]; 1 OVERHANGING VEGETATION [1]; 2 SHALLOWS (IN SLOW WATER) [1]; 1 ROOTMATS [1]

TYPE: Score All That Occur: 1 POOLS > 70 cm [2]; 2 ROOTWADS [1]; 1 BOULDERS [1]; 0 OXBOWS, BACKWATERS [1]; 3 AQUATIC MACROPHYTES [1]; 2 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE): ☐ -EXTENSIVE > 75% [11]; ☒ -MODERATE 25 - 75% [7]; ☐ -SPARSE 5 - 25% [3]; ☐ -NEARLY ABSENT < 5% [1]

Cover: 17 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY: ☐ -HIGH [4]; ☐ -MODERATE [3]; ☐ -LOW [2]; ☐ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7]; ☐ -GOOD [5]; ☐ -FAIR [3]; ☐ -POOR [1]
CHANNELIZATION: ☐ -NONE [6]; ☒ -RECOVERED [4]; ☐ -RECOVERING [3]; ☐ -RECENT OR NO RECOVERY [1]; ☐ -IMPOUNDED [-1]
STABILTIY: ☐ -HIGH [3]; ☒ -MODERATE [2]; ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING; ☐ -RELOCATION; ☐ -CANOPY REMOVAL; ☐ -DREDGING; ☐ -ONE SIDE CHANNEL MODIFICATIONS; ☐ -IMPOUNDMENT; ☐ -ISLAND; ☐ -LEVEED; ☐ -BANK SHAPING

Channel: 15 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) — River Right Looking Downstream

RIPARIAN WIDTH (L R (Per Bank)):
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☒ ☒ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) (L R (Most Predominant Per Bank)):
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☒ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R (Per Bank)):
☐ ☐ -NONE / LITTLE [3]
☐ ☐ -MODERATE [2]
☒ ☒ -HEAVY / SEVERE [1]

Riparian: 4 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!):
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0}

MORPHOLOGY (Check 1 or 2 & AVERAGE):
☒ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES) (Check All That Apply):
☐ -EDDIES [1]; ☐ -FAST [1]; ☐ -MODERATE [1]; ☒ -SLOW [1]; ☐ -NONE [-1]
☐ -TORRENTIAL [-1]; ☐ -INTERSTITIAL [-1]; ☐ -INTERMITTENT [-2]; ☐ -VERY FAST [1]

Pool / Current: 9 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH:
☐ -*Best Areas > 10cm [2]
☒ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH:
☐ - MAX > 50 cm [2]
☒ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE:
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS:
☐ -NONE [2]
☐ -LOW [1]
☒ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run: 2 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 3.45 DRAINAGE AREA (sq.mi.): 22.48 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area

Gradient: 6 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) _____

If Not, Explain: _____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: _____

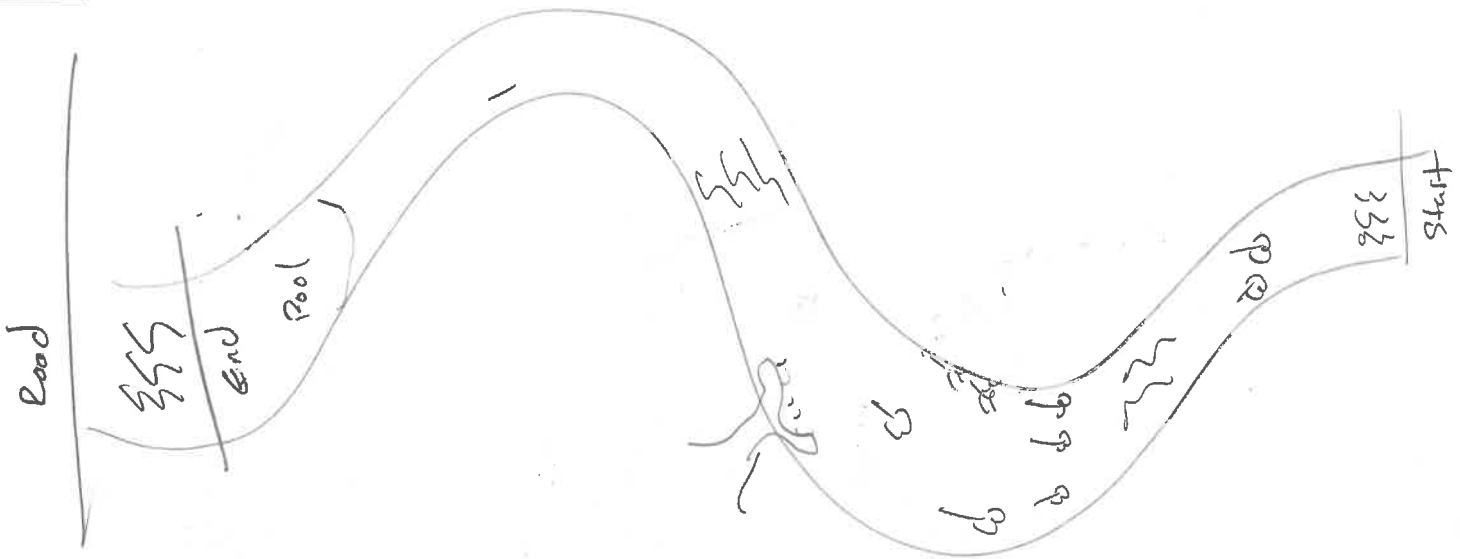
Subjective Rating (1-10)	Aesthetic Rating (1-10)
6	7

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	E	150	Clear	Normal	30

Yes/ No	
☐ ☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐ ☐	Is there water upstream? How far:
☐ ☐	Is there water close downstream? How far:
☐ ☐	Is Dry Channel mostly natural?

Stream Drawing:


Road
End
Pool
Pool
Pool

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 69

River Code: 95-291 RM: 4.0 Stream: M Fk N Br Chicago R
Site Code: MF13 Project Code: NBWW19 Location: Dst Winnetka Rd
Date: 8-13-19 Scorer: MAS Latitude: 42.09294 Longitude: -87.77116

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent)

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ -BLDR/SLBS [10]			☐ -GRAVEL [7]		
☐ -Lg BOULD [10]			☒ -SAND [6]		
☐ -BOULDER [9]			☐ -BEDROCK [5]		
☐ -COBBLE [8]			☐ -DETRITUS [3]		
☐ ☒ -HARDPAN [4]			☐ -ARTIFICIAL [0]		
☐ -MUCK [2]			☐ -SILT [2]		

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE))
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE))
SILT:
☐ -SILT HEAVY [-2]
☒ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS:
☐ -EXTENSIVE [-2]
☒ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >)
☐ -4 or More [2]
☒ -3 or Less [0]

Substrate: 9 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
1 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur
1 POOLS > 70 cm [2]
1 ROOTWADS [1]
0 BOULDERS [1]
0 OXBOWS, BACKWATERS [1]
1 AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 11 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☒ -MODERATE [3]
☐ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☒ -FAIR [3]
☐ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☒ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☒ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 10.5 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH (L R (Per Bank))
☒ ☒ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R (Most Predominant Per Bank))
☒ ☒ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R (Per Bank))
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☒ ☒ -HEAVY / SEVERE [1]

Riparian: 9.5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☒ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 9 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☒ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☒ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 6.29 DRAINAGE AREA (sq.mi.): 24.29 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 10 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) ____ If Not, Explain: ____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☑
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☑
- CSOs ☐
- Suburban Impacts ☑
- Mining ☐
- Channelization ☑
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: ____

Subjective Rating (1-10): 5

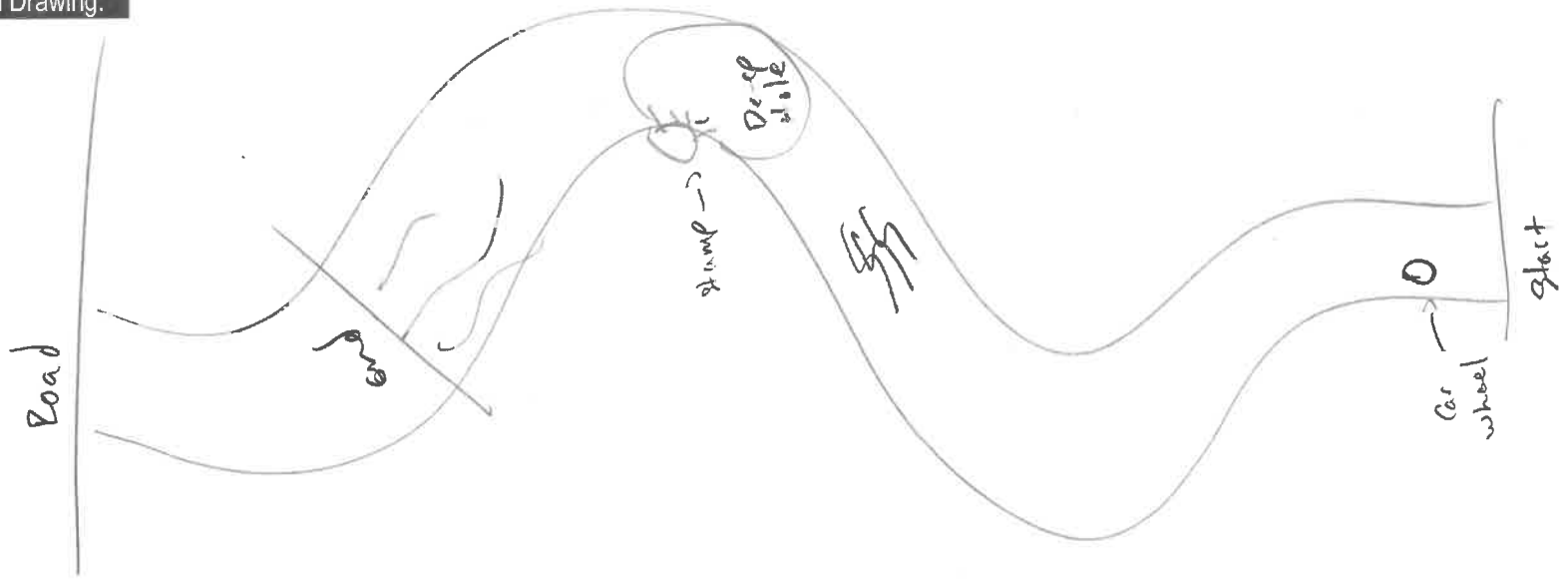
Aesthetic Rating (1-10): 5

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	150	E	Clear	Normal	100

Yes/ No	
☐ ☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐ ☐	Is there water upstream? How far:
☐ ☐	Is there water close downstream? How far:
☐ ☐	Is Dry Channel mostly natural?

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 30.5

River Code: 95-292 RM: 12.5 Stream: WFk N Br Chicago R
Site Code: WF20 Project Code: NBWW19 Location: Adj Saunders Rd
Date: 8-14-19 Scorer: MAS Latitude: 42.18624 Longitude: -87.88178

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent

TYPE	POOL	RIFFLE		POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☒ ☒ -MUCK [2]			☐ ☐ -SILT [2]		

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2] ☒ -3 or Less [0]
(High Quality Only, Score 5 or >)

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)): ☐ -LIMESTONE [1] ☐ -TILLS [1] ☒ -WETLANDS [0] ☐ -HARDPAN [0] ☐ -SANDSTONE [0] ☐ -RIP / RAP [0] ☐ -LACUSTRINE [0] ☐ -SHALE [-1] ☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE)):
SILT: ☒ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☒ -EXTENSIVE [-2] ☐ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 0 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)	TYPE: Score All That Occur	
0 UNDERCUT BANKS [1]	0 POOLS > 70 cm [2]	0 OXBOWS, BACKWATERS [1]
0 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	3 AQUATIC MACROPHYTES [1]
3 SHALLOWS (IN SLOW WATER) [1]	0 BOULDERS [1]	3 LOGS OR WOODY DEBRIS [1]
0 ROOTMATS [1]		

AMOUNT: (Check ONLY one or check 2 and AVERAGE) ☐ -EXTENSIVE > 75% [11] ☒ -MODERATE 25 - 75% [7] ☐ -SPARSE 5 - 25% [3] ☐ -NEARLY ABSENT < 5% [1]

Cover: 11 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY: ☐ -HIGH [4] ☐ -MODERATE [3] ☒ -LOW [2] ☐ -NONE [1]
DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☐ -FAIR [3] ☒ -POOR [1]
CHANNELIZATION: ☐ -NONE [6] ☐ -RECOVERED [4] ☐ -RECOVERING [3] ☒ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]
STABILTIY: ☐ -HIGH [3] ☒ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☐ -IMPOUNDMENT ☐ -RELOCATION ☐ -ISLAND ☐ -CANOPY REMOVAL ☐ -LEVEED ☐ -DREDGING ☐ -BANK SHAPING ☐ -ONE SIDE CHANNEL MODIFICATIONS

Channel: 6 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH (L R (Per Bank)):
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☒ ☒ -MODERATE 10 - 50m [3]
☐ ☐ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R (Most Predominant Per Bank)):
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☒ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R (Per Bank)):
☒ ☒ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 6.5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!):
☐ - 1m [6]
☐ - 0.7m [4]
☒ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE):
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☒ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply):
☐ -EDDIES [1] ☐ -FAST [1] ☐ -MODERATE [1] ☐ -SLOW [1] ☒ -NONE [-1]
☐ -TORRENTIAL [-1] ☐ -INTERSTITIAL [-1] ☐ -INTERMITTENT [-2] ☐ -VERY FAST [1]

Pool / Current: 1 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH:
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH:
☐ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE:
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS:
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☐ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 6.6 DRAINAGE AREA (sq.mi.): 3.87 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 6 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) ____

If Not, Explain: ____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: ____

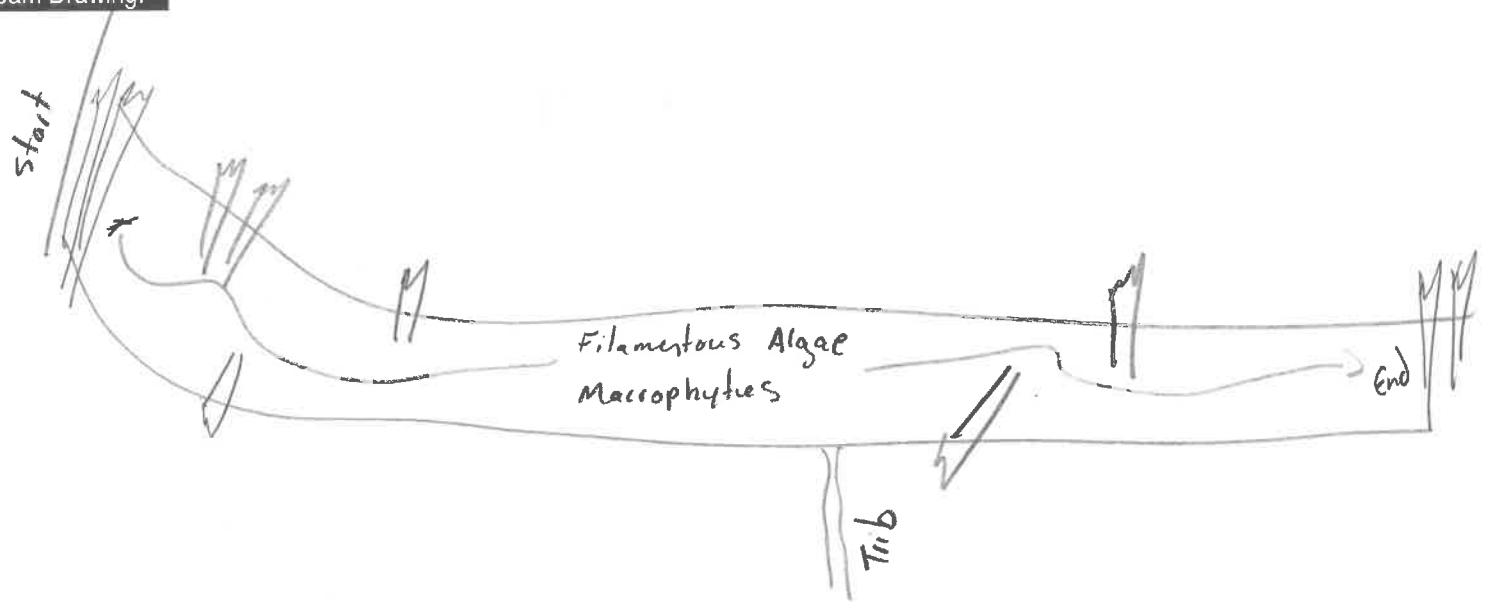
Subjective Rating (1-10)	Aesthetic Rating (1-10)
4	4

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal	50

Yes/ No	
☐ ☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐ ☐	Is there water upstream? How far:
☐ ☐	Is there water close downstream? How far:
☐ ☐	Is Dry Channel mostly natural?

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 40.5

River Code: 95-292 RM: 10.4 Stream: W Fk N Br Chicago R
Site Code: WF21 Project Code: NBWS19 Location: Dst Deerfield Rd
Date: 8-15-19 Scorer: MAS Latitude: 42.16572 Longitude: -87.85696

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent)

TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]		
☐ ☐ -Lg BOULD [10]		
☐ ☐ -BOULDER [9]		
☐ ☐ -COBBLE [8]		
☐ ☐ -HARDPAN [4]		
☐ ☐ -MUCK [2]		
☒ ☐ -GRAVEL [7] (Fine)	X	X
☐ ☒ -SAND [6]	X	X
☐ ☐ -BEDROCK [5]		
☐ ☐ -DETRITUS [3]		
☐ ☐ -ARTIFICIAL [0]	X	X
☐ ☐ -SILT [2]		

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >)
☐ -4 or More [2]
☒ -3 or Less [0]

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE))
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE))
SILT:
☐ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☒ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS:
☐ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☒ -NORMAL [0]
☐ -NONE [1]

Substrate: 14 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
___ ROOTMATS [1]

TYPE: Score All That Occur
___ POOLS > 70 cm [2]
___ ROOTWADS [1]
___ BOULDERS [1]
___ OXBOWS, BACKWATERS [1]
___ AQUATIC MACROPHYTES [1]
___ LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☐ -MODERATE 25 - 75% [7]
☒ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 4 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☐ -MODERATE [3]
☐ -LOW [2]
☒ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☒ -FAIR [3]
☐ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☒ -RECOVERING [3]
☒ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☒ -MODERATE [2]
☐ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 8 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH (Per Bank)
L R
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☒ ☒ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) (Most Predominant Per Bank)
L R
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☒ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (Per Bank)
L R
☒ ☒ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 5.5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☒ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☒ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 4 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☒ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☒ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☒ -EXTENSIVE [-1]

Riffle / Run: 1 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 4.15 DRAINAGE AREA (sq.mi.): 7.02 % POOL: ___ % GLIDE: ___ % RIFFLE: ___ % RUN: ___

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 4 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) _____ If Not, Explain: _____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☒
- CSOs ☐
- Suburban Impacts ☒
- Mining ☐
- Channelization ☒
- Riparian Removal ☒
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: _____

	Subjective Rating (1-10)	Aesthetic Rating (1-10)
	4	4

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	F	150	Clear	Normal-Low	65

Yes	No	
☐	☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐	☐	Is there water upstream? How far:
☐	☐	Is there water close downstream? How far:
☐	☐	Is Dry Channel mostly natural?

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 46

River Code: 95-292 RM: 9.2 Stream: W FK E Br Chicago R
Site Code: WF22 Project Code: NBWSC19 Location:
Date: 8-14-19 Scorer: MAS Latitude: 42.15161 Longitude: -87.84602

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent)

TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]		
☐ ☐ -Lg BOULD [10]		
☐ ☐ -BOULDER [9]		
☐ ☐ -COBBLE [8]		
☐ ☐ -HARDPAN [4]		
☐ ☐ -MUCK [2]		
☐ ☐ -GRAVEL [7] (Fine)		☒
☐ ☒ -SAND [6]		
☐ ☐ -BEDROCK [5]		
☐ ☐ -DETRITUS [3]		
☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -SILT [2]		

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >)
☐ -4 or More [2]
☒ -3 or Less [0]

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE))
☐ -LIMESTONE [1]
☐ -TILLS [1]
☒ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE))
SILT:
☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS:
☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate: 9 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
2 UNDERCUT BANKS [1]
1 OVERHANGING VEGETATION [1]
1 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur
2 POOLS > 70 cm [2]
3 ROOTWADS [1]
0 BOULDERS [1]

0 OXBOWS, BACKWATERS [1]
3 AQUATIC MACROPHYTES [1]
3 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☒ -MODERATE 25 - 75% [7]
☐ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 16 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☐ -MODERATE [3]
☒ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☐ -RECOVERING [3]
☒ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☒ -MODERATE [2]
☐ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 10 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) — River Right Looking Downstream

RIPARIAN WIDTH (L R (Per Bank))
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☒ ☒ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) (L R (Most Predominant Per Bank))
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☒ ☒ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R (Per Bank))
☐ ☐ -NONE / LITTLE [3]
☒ ☒ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 4 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☐ - 1m [6]
☒ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☒ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 5 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☐ -EXTENSIVE [-1]

Riffle / Run: 10 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 3.51 DRAINAGE AREA (sq.mi.): 9.41 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 10 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) _____ If Not, Explain: _____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: _____

Subjective Rating (1-10): 4

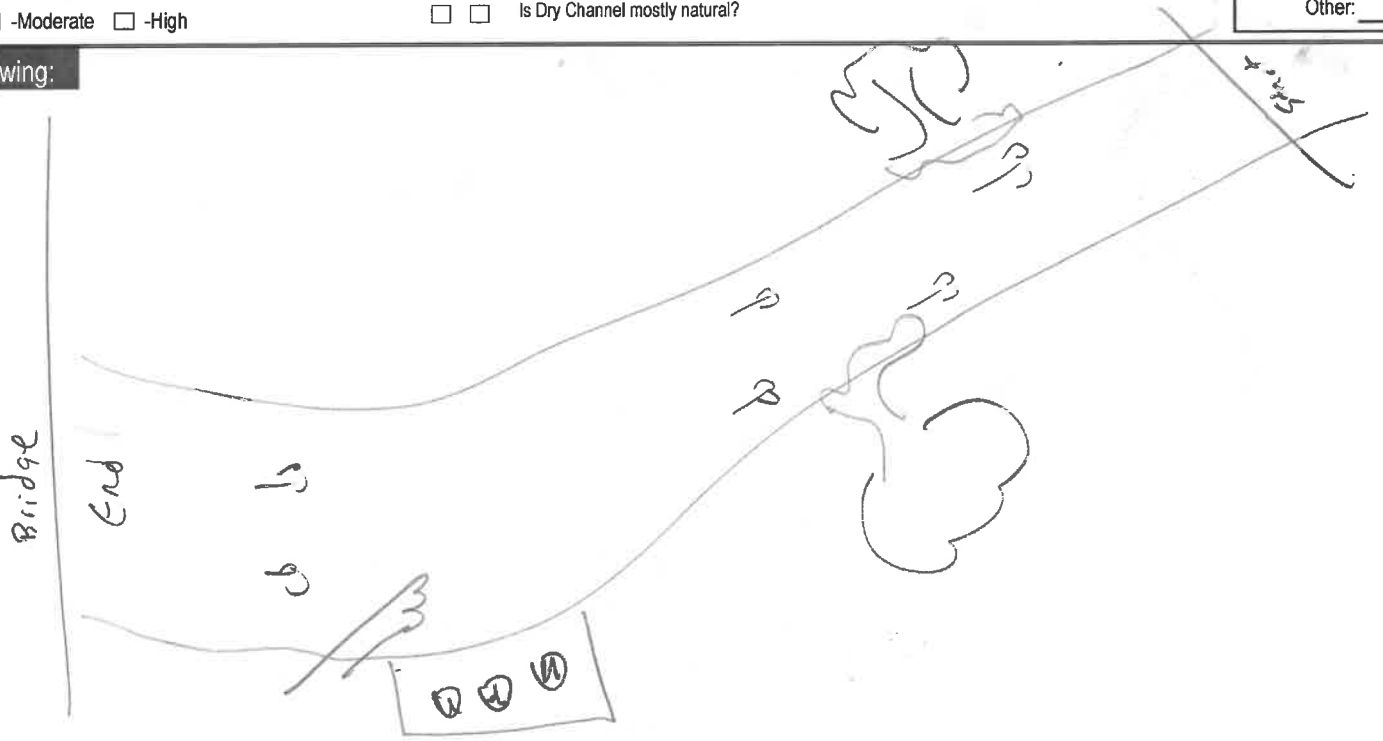
Aesthetic Rating (1-10): 4

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	D	200	Clear	Normal	50

Gradient: ☐ -Low ☐ -Moderate ☐ -High

Yes/ No	
☐ ☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐ ☐	Is there water upstream? How far:
☐ ☐	Is there water close downstream? How far:
☐ ☐	Is Dry Channel mostly natural?

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 38.5

River Code: 95-292 RM: 4.9 Stream: W Fk NBr Chicago R
Site Code: WF23 Project Code: NBWW19 Location: Dst Willow Rd
Date: 8-13-19 Scorer: MAS Latitude: 42.10279 Longitude: -87.80994

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☒ ☐ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☐ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☒ ☐ -MUCK [2]			☐ ☐ -SILT [2]		

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2]
(High Quality Only, Score 5 or >) ☒ -3 or Less [0]

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☐ -TILLS [1]
☒ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE)
SILT:
☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS:
☒ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

Substrate: 4 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
0 ROOTMATS [1]

TYPE: Score All That Occur
2 POOLS > 70 cm [2]
0 ROOTWADS [1]
0 BOULDERS [1]
2 OXBOWS, BACKWATERS [1]
3 AQUATIC MACROPHYTES [1]
2 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☒ -MODERATE 25 - 75% [7]
☐ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 13 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☐ -MODERATE [3]
☒ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☐ -FAIR [3]
☒ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☐ -RECOVERING [3]
☒ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☐ -MODERATE [2]
☒ -LOW [1]

MODIFICATIONS / OTHER
☒ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 5 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN WIDTH L R (Per Bank)	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) L R (Most Predominant Per Bank)	L R	BANK EROSION L R (Per Bank)
☐ ☐ -VERY WIDE > 100m [5]	☐ ☐ -FOREST, SWAMP [3]	☐ ☐ -CONSERVATION TILLAGE [1]	☐ ☐ -NONE / LITTLE [3]
☐ ☐ -WIDE > 50m [4]	☐ ☐ -SHRUB OR OLD FIELD [2]	☐ ☐ -URBAN OR INDUSTRIAL [0]	☒ ☒ -MODERATE [2]
☒ ☒ -MODERATE 10 - 50m [3]	☒ ☒ -RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ -OPEN PASTURE, ROWCROP [0]	☐ ☐ -HEAVY / SEVERE [1]
☒ ☒ -NARROW 5 - 10m [2]	☐ ☐ -FENCED PASTURE [1]	☐ ☐ -MINING / CONSTRUCTION [0]	
☐ ☐ -VERY NARROW < 5m [1]			
☐ ☐ -NONE [0]			

Riparian: 5.5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☒ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☒ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☒ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 7 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☐ -NO RIFFLE but RUNS present [0]
☒ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☐ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☐ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☐ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 1.99 DRAINAGE AREA (sq.mi.): 17.86 % POOL: % GLIDE:
% RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 4 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) ____ If Not, Explain: ____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☑
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☑
- CSOs ☐
- Suburban Impacts ☑
- Mining ☐
- Channelization ☑
- Riparian Removal ☑
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: Golf Course

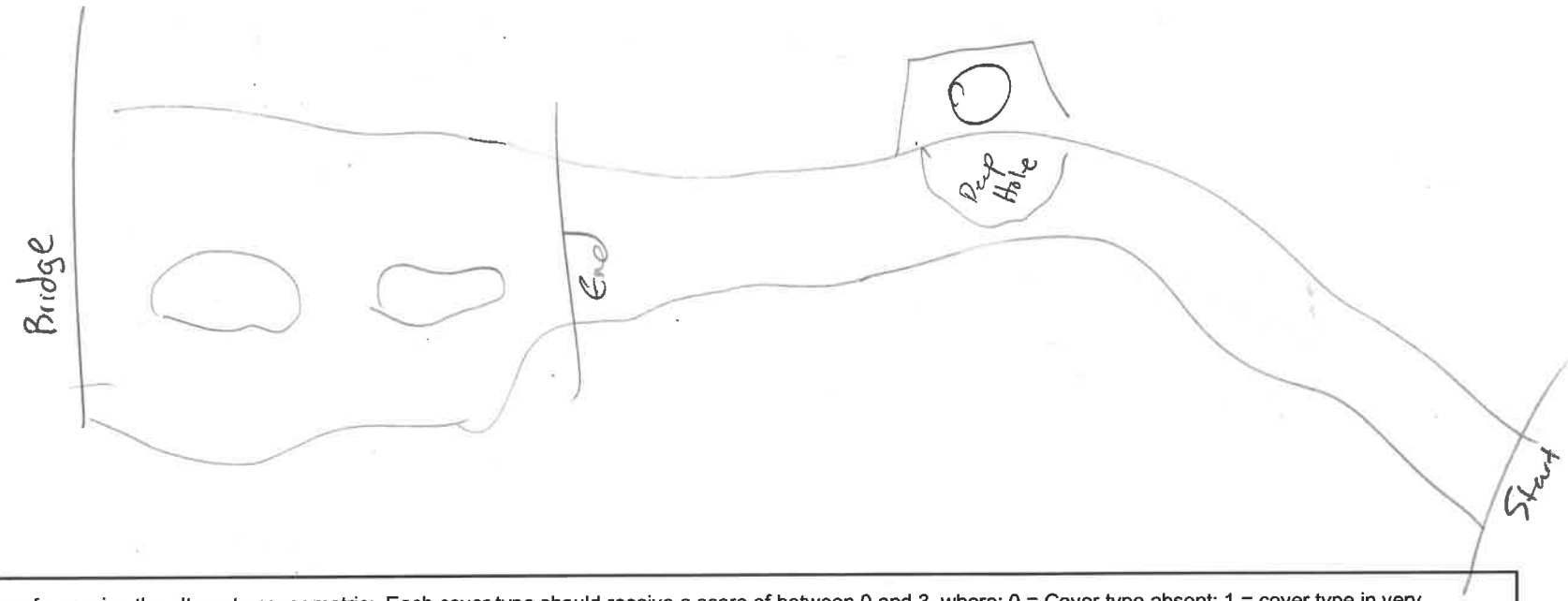
Subjective Rating (1-10)	Aesthetic Rating (1-10)
4	3

First Sampling Pass	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
	D	200	Clear	Normal	100

Gradient: ☐ -Low ☐ -Moderate ☐ -High

Yes/ No	
☐ ☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐ ☐	Is there water upstream? How far:
☐ ☐	Is there water close downstream? How far:
☐ ☐	Is Dry Channel mostly natural?

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 53.5

River Code: 95-292 RM: 2.9 Stream: W Flk N Br Chicago R
Site Code: WF29 Project Code: NBWW19 Location: Dst Lake Ave
Date: 8-13-19 Scorer: MAS Latitude: 42.07891 Longitude: -87.80765

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent

TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]		
☐ ☐ -Lg BOULD [10]		
☐ ☐ -BOULDER [9]		
☐ ☐ -COBBLE [8]		
☐ ☐ -HARDPAN [4]		
☐ ☐ -MUCK [2]		
☐ ☑ -GRAVEL [7]		
☑ ☐ -SAND [6]		
☐ ☐ -BEDROCK [5]		
☐ ☐ -DETRITUS [3]		
☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -SILT [2]		

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE))
☐ -LIMESTONE [1]
☑ -TILLS [1]
☑ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP / RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE))
SILT:
☐ -SILT HEAVY [-2]
☑ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]
EMBEDDEDNESS:
☐ -EXTENSIVE [-2]
☑ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >)
☐ -4 or More [2]
☑ -3 or Less [0]

Substrate: 11.5 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)
3 UNDERCUT BANKS [1]
1 OVERHANGING VEGETATION [1]
1 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur
2 POOLS > 70 cm [2]
3 ROOTWADS [1]
0 BOULDERS [1]

0 OXBOWS, BACKWATERS [1]
0 AQUATIC MACROPHYTES [1]
1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE)
☐ -EXTENSIVE > 75% [11]
☑ -MODERATE 25 - 75% [7]
☐ -SPARSE 5 - 25% [3]
☐ -NEARLY ABSENT < 5% [1]

Cover: 15 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY
☐ -HIGH [4]
☑ -MODERATE [3]
☐ -LOW [2]
☐ -NONE [1]

DEVELOPMENT
☐ -EXCELLENT [7]
☐ -GOOD [5]
☑ -FAIR [3]
☐ -POOR [1]

CHANNELIZATION
☐ -NONE [6]
☐ -RECOVERED [4]
☑ -RECOVERING [3]
☐ -RECENT OR NO RECOVERY [1]
☐ -IMPOUNDED [-1]

STABILTIY
☐ -HIGH [3]
☑ -MODERATE [2]
☐ -LOW [1]

MODIFICATIONS / OTHER
☐ -SNAGGING
☐ -RELOCATION
☐ -CANOPY REMOVAL
☐ -DREDGING
☐ -ONE SIDE CHANNEL MODIFICATIONS
☐ -IMPOUNDMENT
☐ -ISLAND
☐ -LEVEED
☐ -BANK SHAPING

Channel: 11 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH (L R (Per Bank))
☐ ☐ -VERY WIDE > 100m [5]
☐ ☐ -WIDE > 50m [4]
☐ ☐ -MODERATE 10 - 50m [3]
☑ ☑ -NARROW 5 - 10m [2]
☐ ☐ -VERY NARROW < 5m [1]
☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R (Most Predominant Per Bank))
☐ ☐ -FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☑ ☑ -RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R (Per Bank))
☐ ☐ -NONE / LITTLE [3]
☑ ☑ -MODERATE [2]
☐ ☐ -HEAVY / SEVERE [1]

Riparian: 5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☑ - 1m [6]
☐ - 0.7m [4]
☐ - 0.4 to 0.7m [2]
☐ - 0.2 to 0.4m [1]
☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☑ -POOL WIDTH < RIFFLE WIDTH [0]
☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☑ -SLOW [1]
☐ -NONE [-1]
☐ -TORRENTIAL [-1]
☐ -INTERSTITIAL [-1]
☐ -INTERMITTENT [-2]
☐ -VERY FAST [1]

Pool / Current: 7 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH
☐ -*Best Areas > 10cm [2]
☐ -Best Areas 5 - 10cm [1]
☐ -Best Areas < 5cm [0]
☑ -NO RIFFLE but RUNS present [0]
☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH
☐ - MAX > 50 cm [2]
☑ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE
☐ -STABLE (e.g., Gobble, Boulder) [2]
☐ -MOD. STABLE (e.g., Large Gravel) [1]
☑ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ -NONE [2]
☐ -LOW [1]
☐ -MODERATE [0]
☑ -EXTENSIVE [-1]

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 1.99 DRAINAGE AREA (sq.mi.): 24.52 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 4 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) _____ If Not, Explain: _____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: _____

Subjective Rating (1-10) ☐

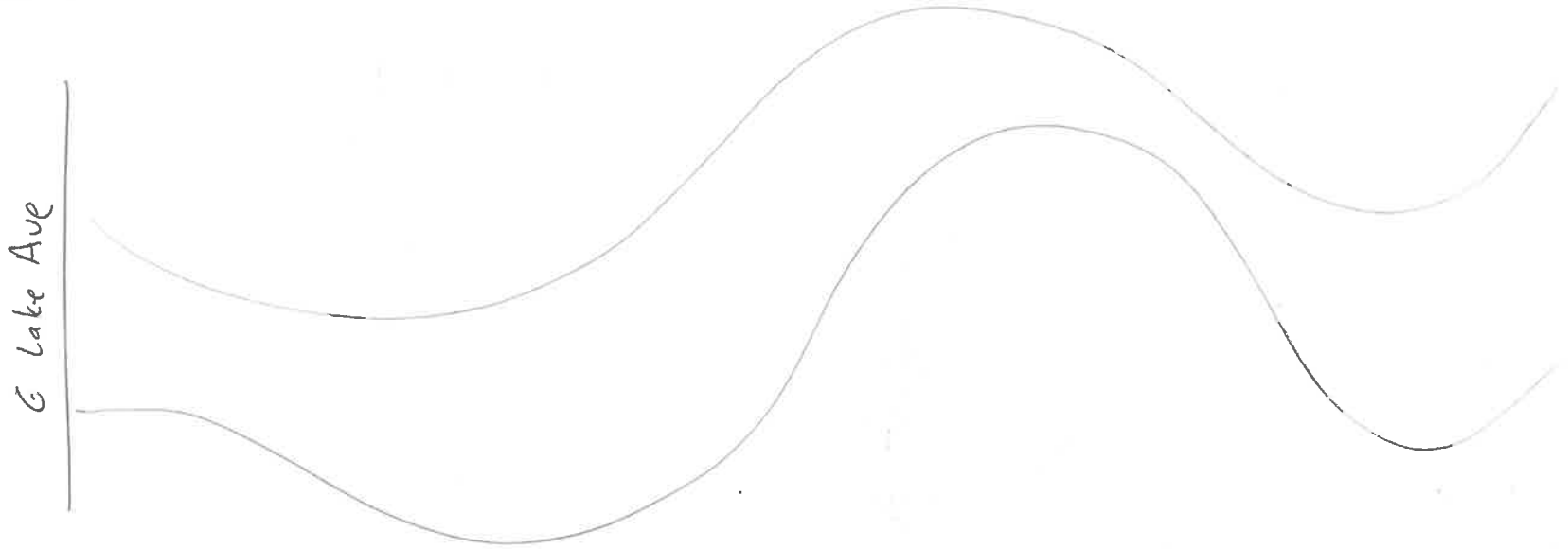
Aesthetic Rating (1-10) ☐

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass					

Gradient: ☐ -Low ☐ -Moderate ☐ -High

Yes	No	
☐	☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐	☐	Is there water upstream? How far:
☐	☐	Is there water close downstream? How far:
☐	☐	Is Dry Channel mostly natural?

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, where: 0 = Cover type absent; 1 = cover type in very small amounts or if more common of marginal quality; 2 = cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 = cover type of highest quality in moderate of greater amounts. Examples of highest quality include, very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep / fast water, or deep, well-defined, functional pools.

Qualitative Habitat Evaluation Index Field Sheet

QHEI Score: 45.5

River Code: 95-292 RM: 1.3 Stream: W Flk N Br Chicago R
Site Code: WF25 Project Code: NBNW19 Location: Ust Foot Bridge
Date: 8-13-19 Scorer: MAS Latitude: 42.06345 Longitude: -87.78887

1.) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % percent)

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐ ☐ -BLDR/SLBS [10]			☐ ☐ -GRAVEL [7]		
☐ ☐ -Lg BOULD [10]			☐ ☒ -SAND [6]		
☐ ☐ -BOULDER [9]			☐ ☐ -BEDROCK [5]		
☐ ☐ -COBBLE [8]			☐ ☐ -DETRITUS [3]		
☒ ☐ -HARDPAN [4]			☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -MUCK [2]			☐ ☐ -SILT [2]		

NUMBER OF SUBSTRATE TYPES: ☐ -4 or More [2] ☒ -3 or Less [0]
(High Quality Only, Score 5 or >)

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)): ☐ -LIMESTONE [1] ☐ -TILLS [1] ☒ -WETLANDS [0] ☐ -HARDPAN [0] ☐ -SANDSTONE [0] ☐ -RIP / RAP [0] ☐ -LACUSTRINE [0] ☐ -SHALE [-1] ☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE)): SILT: ☒ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ☐ -EXTENSIVE [-2] ☒ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 7 Max 20

COMMENTS:

2.) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure): 0 UNDERCUT BANKS [1]; 1 OVERHANGING VEGETATION [1]; 3 SHALLOWS (IN SLOW WATER) [1]; 0 ROOTMATS [1]

TYPE: Score All That Occur: 3 POOLS > 70 cm [2]; 0 ROOTWADS [1]; 0 BOULDERS [1]; 0 OXBOWS, BACKWATERS [1]; 3 AQUATIC MACROPHYTES [1]; 1 LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check ONLY one or check 2 and AVERAGE): ☐ -EXTENSIVE > 75% [11] ☒ -MODERATE 25 - 75% [7] ☐ -SPARSE 5 - 25% [3] ☐ -NEARLY ABSENT < 5% [1]

Cover: 13 Max 20

COMMENTS:

3.) CHANNEL MORPHOLOGY: (Check ONLY one PER Category OR check 2 and AVERAGE)

SINUOSITY: ☐ -HIGH [4] ☐ -MODERATE [3] ☒ -LOW [2] ☐ -NONE [1]

DEVELOPMENT: ☐ -EXCELLENT [7] ☐ -GOOD [5] ☒ -FAIR [3] ☒ -POOR [1]

CHANNELIZATION: ☐ -NONE [6] ☐ -RECOVERED [4] ☒ -RECOVERING [3] ☒ -RECENT OR NO RECOVERY [1] ☐ -IMPOUNDED [-1]

STABILTIY: ☐ -HIGH [3] ☒ -MODERATE [2] ☒ -LOW [1]

MODIFICATIONS / OTHER: ☐ -SNAGGING ☒ -RELOCATION ☒ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☒ -BANK SHAPING

Channel: 9.5 Max 20

COMMENTS:

4.) RIPARIAN ZONE AND BANK EROSION (check ONE box PER bank or check 2 and AVERAGE per bank) — River Right Looking Downstream

RIPARIAN WIDTH (L R (Per Bank)): ☐ ☐ -VERY WIDE > 100m [5] ☐ ☐ -WIDE > 50m [4] ☐ ☐ -MODERATE 10 - 50m [3] ☒ ☒ -NARROW 5 - 10m [2] ☐ ☐ -VERY NARROW < 5m [1] ☐ ☐ -NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R (Most Predominant Per Bank)): ☐ ☐ -FOREST, SWAMP [3] ☒ ☒ -SHRUB OR OLD FIELD [2] ☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1] ☐ ☐ -FENCED PASTURE [1] ☐ ☐ -CONSERVATION TILLAGE [1] ☐ ☐ -URBAN OR INDUSTRIAL [0] ☐ ☐ -OPEN PASTURE, ROWCROP [0] ☐ ☐ -MINING / CONSTRUCTION [0]

BANK EROSION (L R (Per Bank)): ☐ ☐ -NONE / LITTLE [3] ☒ ☒ -MODERATE [2] ☐ ☐ -HEAVY / SEVERE [1]

Riparian: 5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

MAX. DEPTH (Check 1 ONLY!): ☒ - 1m [6] ☐ - 0.7m [4] ☐ - 0.4 to 0.7m [2] ☐ - 0.2 to 0.4m [1] ☐ - < 0.2m [POOL = 0]

MORPHOLOGY (Check 1 or 2 & AVERAGE): ☐ -POOL WIDTH > RIFFLE WIDTH [2] ☒ -POOL WIDTH = RIFFLE WIDTH [1] ☐ -POOL WIDTH < RIFFLE WIDTH [0] ☐ -IMPOUNDED [-1]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply): ☐ -EDDIES [1] ☐ -FAST [1] ☐ -MODERATE [1] ☒ -SLOW [1] ☐ -NONE [-1] ☐ -TORRENTIAL [-1] ☐ -INTERSTITIAL [-1] ☐ -INTERMITTENT [-2] ☐ -VERY FAST [1]

Pool / Current: 8 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

RIFFLE DEPTH: ☐ -*Best Areas > 10cm [2] ☒ -Best Areas 5 - 10cm [1] ☐ -Best Areas < 5cm [0] ☐ -NO RIFFLE but RUNS present [0] ☐ -NO RIFFLE / NO RUN [Metric = 0]

RUN DEPTH: ☐ - MAX > 50 cm [2] ☒ - MAX < 50 cm [1]

RIFFLE / RUN SUBSTRATE: ☐ -STABLE (e.g., Cobble, Boulder) [2] ☐ -MOD. STABLE (e.g., Large Gravel) [1] ☒ -UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS: ☐ -NONE [2] ☐ -LOW [1] ☐ -MODERATE [0] ☒ -EXTENSIVE [-1]

Riffle / Run: 1 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 1.99 DRAINAGE AREA (sq.mi.): 27.97 % POOL: % GLIDE: % RIFFLE: % RUN:

*Best areas must be large enough to support a population of riffle-obligate species

Gradient Score from Table 2 of Users Manual based on gradient and drainage area

Gradient: 4 Max 10

Is Sampling Reach Representative of the Stream? (Y/ N) _____ If Not, Explain: _____

Lat / Long (Beg):	
Lat / Long (Mid):	
Lat / Long (End):	
Lat / Long (X-Loc):	

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☑
- WWTP ☑
- Agriculture ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☑
- CSOs ☐
- Suburban Impacts ☑
- Mining ☐
- Channelization ☑
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: _____

Subjective Rating (1-10): 4

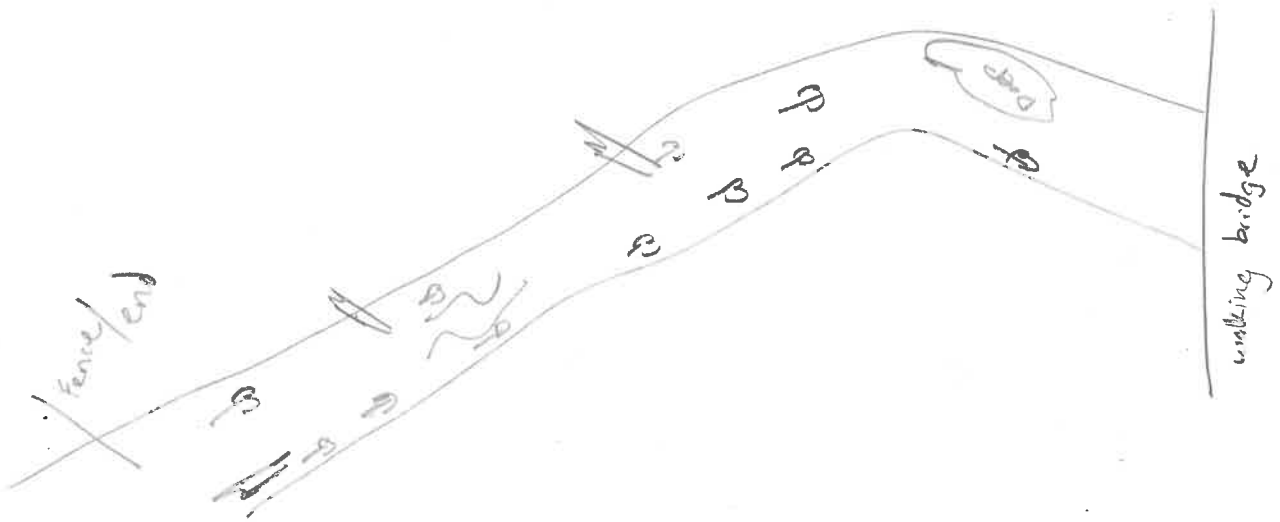
Aesthetic Rating (1-10): 4

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	D	200	Clear	Normal	90

Gradient: ☐ -Low ☐ -Moderate ☐ -High

Yes/ No	
☐ ☐	Is Stream Ephemeral (no pools, totally dry of only damp spots)?
☐ ☐	Is there water upstream? How far:
☐ ☐	Is there water close downstream? How far:
☐ ☐	Is Dry Channel mostly natural?

Stream Drawing:


fence/end
B
B
B

APPENDIX E

E-1: FIT Factors for Deriving Primary, Secondary, and Tertiary Causes of Impairment
E-2: Northeast Illinois IPS Nutrient Ranking Index

Appendix E-1: Development of FIT Factors for Deriving Primary, Secondary, and Tertiary Causes of Impairment

The NE IL IPS thresholds were developed for the primary nutrient and nutrient-related parameters based on grab sample data. The thresholds were based on relationships between that data and stressor-specific sensitive fish species and macroinvertebrate taxa. The relationship between the sensitive species/taxa with the fIBI and mIBI supported benchmarking these thresholds to the General Use criteria and an "Excellent" level of biological performance.

The FIT weighting score influences the categories of narrative condition (i.e., very poor, poor, or fair) each cause of impairment is placed. Each stressor is ranked from 0.1 (excellent) to 10 (very poor) based on the respective relationships with the number of stressor-sensitive fish species or macroinvertebrate taxa as the response variable with a particular stressor. Where the association is very strong (i.e., FIT value < 0.1) it means there were few outliers and a stronger power of prediction. The weighting factor is 1 and stressors that scored as very poor are still considered to be predictive of very poor biological assemblages. As the FIT value increases (i.e., >0.1 to 0.3) it signals increased variability (more outliers are observed). The weighting factor declines to 0.8 and a stressor value of 9 (very poor) would be down weighted to a score of 7.2 (poor) because the stress:response relationship had more outliers. While the ability to distinguish poor vs. very poor assemblages is reduced, it still reflects a severe impairment. A FIT value of >0.3-1 indicates a weaker causative relationship and has lower weighting factor (X 0.6). This would change a stressor score of 9 (very poor) to a score of 5.4 (fair). Parameters with FIT vales of >3 were not used to identify causes of impairment. A summary of FIT values for 69 variables is in Appendix Table E-2.

Appendix Table E-1. FIT weighting scores based on FIT coefficients.

FIT (< 0.10) X 1;
FIT (> 0.10 – <0.3) X 0.8
FIT (> 0.30 – < 1.0) X 0.6
FIT (> 1.00 – < 3.0) X 0.5
FIT (> 3.00 – < 10.0) X 0.2
FIT (> 10 0) X 0.1

Stressor relationships can become stronger as more data is added to the IPS databases hence the need for continued monitoring. Some parameters that have weak FIT scores are because of a lack of data along a complete stressor gradient. For example, there are fewer data points at excellent biological sites for parameters such as sediment PAHs and sediment metals. This weakens the FIT values for the excellent narrative range thus in these situations only a good narrative threshold is derived. There are other important variables (e.g., benthic chlorophyll a) where the current datasets are insufficient to develop a ranking thus highlighting the need to build up the dataset.

The severity of effect of some stressors (e.g., FIT Scores <0.1) could possibly mask the effects of other stressors. As more data is collected and as some of the more prevalent stressors are abated, the influence of masked stressors may become more evident. As such, the FIT values and scores could change in future iterations of the IPS. More data will also improve the accuracy of assigning species and taxa as sensitive or tolerant to a particular stressor.

Appendix Table E-2. *FIT values based on the deviation between ambient stressor rank vs. predicted stressor rank based on fish species or macroinvertebrate taxa for streams in the NE IL IPS study area. The algorithm for FIT calculation is summarized in the text. The cell shading is related to FIT weighting coefficients: 1.0; 0.8; 0.6; 0.5; 0.2.*

Stressor	FIT Value	Stressor	FIT Value
Impervious Land Use (500m)	0.01	Copper (Wat.)	1.75
QHEI Embeddedness Score	0.03	Lead (Wat.)	2.11
Urban Land Uses (WS)	0.03	Zinc (Sed.)	2.22
QHEI Overall Score	0.04	Benzo(g,h,i)perylene	2.32
QHEI Substrate Score	0.04	Indeno(1,2,3-cd)pyrene (Sed.)	2.41
QHEI Good Attributes	0.04	Copper (Sed.)	2.42
Total Phosphorus	0.04	Benzo(b)fluoranthene (Sed.)	2.51
Impervious Land Use (30m)	0.04	Turbidity	2.61
Impervious Land Use (30m Clipped)	0.04	Nickel (Sed.)	2.67
Conductivity	0.05	Manganese (Wat.)	2.74
QHEI Channel Score	0.07	Benzo(a)pyrene (Sed.)	2.85
QHEI Silt Cover Score	0.07	Pyrene (Sed.)	2.85
Developed Land Use (WS)	0.07	Voluble Suspended Solids	2.81
Minimum Dissolved Oxygen	0.10	Lead (Sed.)	3.01
Total Dissolved Solids	0.10	Nickel (Wat.)	3.26
Impervious Land Use (WS)	0.10	Benzo(a)anthracene (Sed.)	3.48
Hydro-QHEI Depth Score	0.11	Chrysene (Sed.)	3.51
QHEI Poor Habitat Attributes	0.12	Fluoranthene (Sed.)	3.91
Hydro-QHEI Overall Score	0.13	Strontium (Sed.)	4.44
Zinc (Wat.)	0.13	Dibenz(a,h)anthracene (Sed.)	4.57
Hydro-QHEI Current Score	0.14	Agricultural Land Use (WS)	4.82
TKN	0.14	Anthracene (Sed.)	5.10
QHEI Pool Score	0.15	Phenanthrene (Sed.)	5.10
Heavy Urban Land Use (WS)	0.17	Arsenic (Sed.)	6.21
Chloride	0.17	Chromium (Sed.)	6.29
QHEI Cover Score	0.17	Sulfate	6.49
BOD (5-Day)	0.21	Manganese (Sed.)	7.08
QHEI Riffle Score	0.27	Silver (Sed.)	7.11
Total Ammonia	0.28	Aluminum (Sed.)	8.26
Nitrate	0.29	Barium (Sed.)	8.88
Sodium	0.29	Arsenic (Wat.)	9.19
QHEI Gradient Score	0.31	Potassium (Wat.)	10.13
Total Suspended Solids	0.32	Cadmium (Sed.)	11.0
Maximum Dissolved Oxygen	0.94		
Cadmium (Wat.)	0.93		
Arsenic (Sed.)	1.26		

Appendix E-2: Northeast Illinois IPS Nutrient Ranking Index

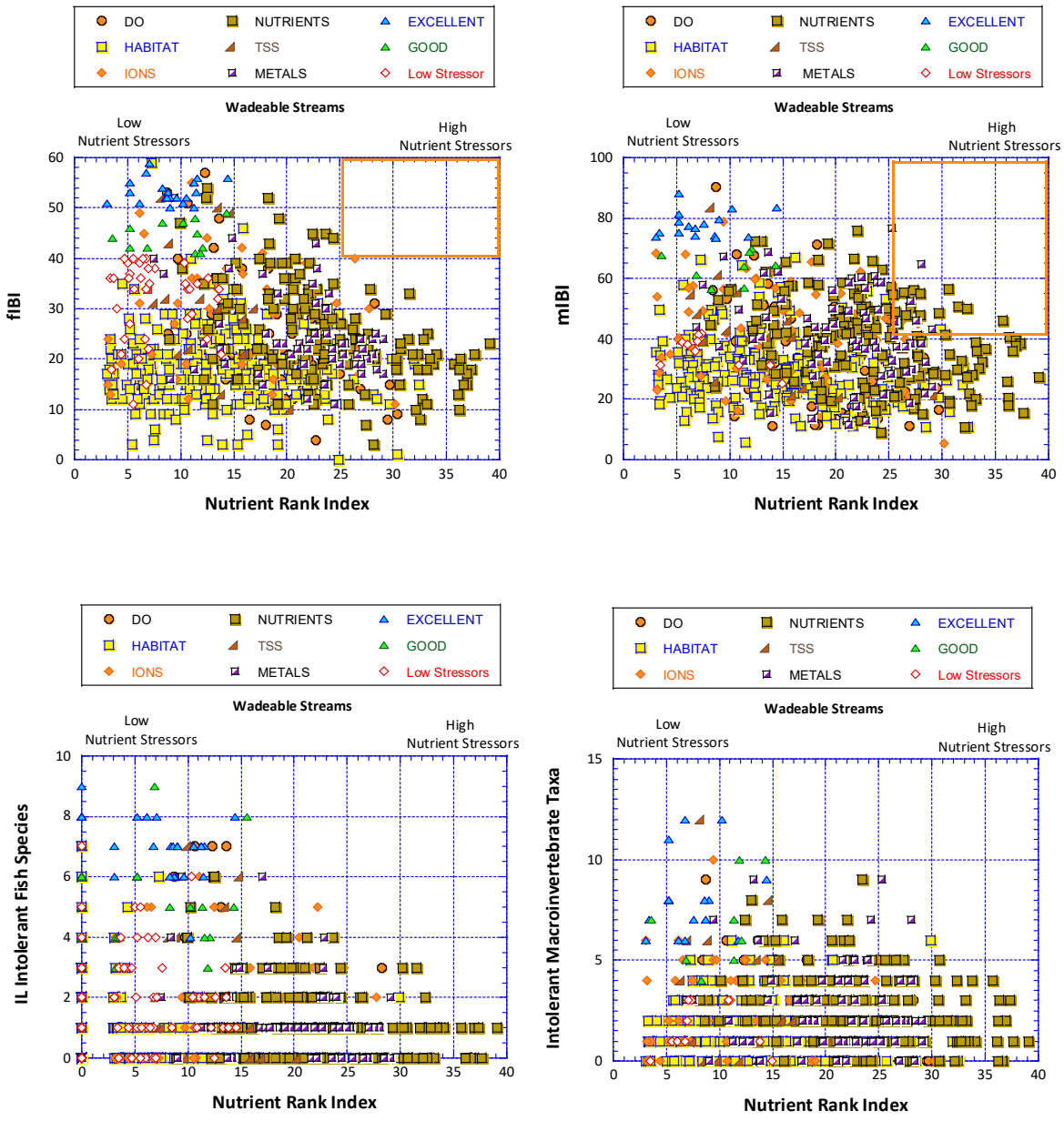
With the emphasis on nutrients in NE Illinois a Nutrient Ranking Index (NRI) was developed by summing the ranking of each of the individual primary nutrient or nutrient-related parameters with each weighted based on the FIT coefficient (Appendix Table E-2). The equation is as follows:

Nutrient Rank Index = (TPR*1) + (Min. DOR*1) + (TKNR*0.8) + (BOD_5R*0.8) + (NITRR*0.8) + (Max. DOR*0.6)

Where; TPR = Total Phosphorus Rank
Min. DOR = Minimum Dissolved Oxygen Rank
TKNR = Total Kjeldahl Nitrogen Rank
BODR = Biochemical Oxygen Demand (5-day) Rank
NITRR = Nitrate Rank
Max. DOR = Maximum Dissolved Oxygen Rank

Appendix Figure E-1 illustrates the correlation between the Nutrient Rank Index (NRI) and the fIBI (top, left), mIBI (top, right), the number of Illinois intolerant fish species (bottom, left) and the number of Illinois intolerant macroinvertebrate taxa (bottom, right). In these graphs points were coded to the strongest stressor rank for all categories of stressors (excluding land use parameters) and where the most limiting stressor rank was greater than a score of four (i.e., General Use benchmark). Boxes in the upper right corner reflect Nutrient Rank Index ranges where biological performance is clearly limited. In these plots fish appear a bit more limited than macroinvertebrates. We expect the relationship between the NRI and biological response variables to improve other indicators such as continuous dissolved oxygen-based maximum daily D.O. swings and algal indicators (benthic chlorophyll). Even so there is a strong enough relationship to make this indicator a useful marker for stressor identification efforts eutrophication in a study area. NRI values of >25 are always associated with degraded fish assemblages and often associated with degraded macroinvertebrate indices (Appendix Figure E-1).

Where a biological assemblage is of excellent quality NRI values are nearly always less than 15. The Power BI dashboard for nutrients will provide this data for all sites where it is available and will also provide individual parameter (e.g., TP, TKN, min D.O.) rankings for nutrients and other parameter categories as well. Such data can be matched to recent local data on continuous D.O., and benthic and sestonic chlorophyll where it exists. Sites with high NRI values and high D.O. swings from continuous data can be examined along with biological data responses to see if patterns of response are similar. The Power BI will also have NRI values, among other data, summarized at both the reach and Huc12 scale to determine whether nutrient signatures are rare or prevalent nearby and across the watershed. The goal for developing the NRI is to have a screening value that can then be matched to more site specific data to conduct a stressor identification analysis.



APPENDIX FIGURE E-1. *CORRELATION BETWEEN THE NUTRIENT RANK INDEX AND THE FIBI (TOP, LEFT), MIBI (TOP, RIGHT), THE NUMBER OF ILLINOIS INTOLERANT FISH SPECIES (BOTTOM, LEFT) AND THE NUMBER OF ILLINOIS INTOLERANT MACROINVERTEBRATE TAXA (BOTTOM, RIGHT). IN THESE GRAPHS POINTS ARE CODED BY THE STRONGEST STRESSOR RANK FOR ALL CATEGORIES OF STRESSORS (EXCLUDING LAND USE) AND WHERE THE MOST LIMITING STRESSOR RANK WAS GREATER THAN A SCORE OF FOUR (I.E., GENERAL USE BENCHMARK).*

APPENDIX F:
POLLUTANT LOAD MODEL RESULTS

Appendix F. Pollutant Loading Estimation

Pollutant loads were estimated based on a methodology developed by the Northeastern Illinois Planning Commission (NIPC), now the Chicago Metropolitan Agency for Planning (CMAP), for a comprehensive nonpoint source pollution study of the Lake Michigan watershed in partnership with the Lake County Stormwater Management Commission. The estimates are based on Event Mean Concentrations for several common pollutants in urban stormwater runoff. The catchments in the watershed planning area are divided into land uses and an EMC for each pollutant is assigned to each land use category. Each land use category is also assigned a runoff coefficient. The annual precipitation for the watershed, runoff coefficient, and Event Mean Concentration are used to estimate an annual pollutant loading rate (pounds/acre/year) for each pollutant and land use. Area of each land use is multiplied by the loading rate to estimate the annual pollutant load for each pollutant and land use in a catchment. All land use load estimates for each pollutant in a catchment are summed to estimate total annual load for each pollutant in a catchment.

Runoff Coefficients are calculated from the following relationship:

$Rv = 0.05 + 0.009*I$

Where

Rv = Runoff Coefficient

I = Percent impervious

Land uses were divided into "sewered" and "unsewered" to better reflect effective imperviousness. Land uses served by stormsewer systems have higher effective imperviousness and therefore higher runoff coefficients.

Land Use	**Runoff Coefficient**	
	Sewered	**Unsewered**
Commercial	0.85	0.75
Industrial	0.80	0.70
Institutional	0.50	0.30
Transportation, Auto Surface	0.85	0.50
Transportation, Utility and Waste Facilities	0.80	0.70
Residential	0.15	0.15
Agricultural	NA	0.10
Open Space	0.15	0.05
Open Water	1.00	1.00

The residential runoff coefficients were modified from the original NIPC values based on 2007 analyses for the Dead River and Kellogg Creek Watershed Management Plans, which found that the original NIPC analysis included streets within residential districts as part of the analysis. While pollutant loads in runoff from individual lots should be comparatively similar in sewered versus unsewered districts, the effect of stormsewer systems was estimated to increase the loading rate in sewered districts in the original NIPC methodology. Since that time, the roadways in which the majority of the stormsewer system is located have been removed from the residential land use polygons and set in its own land use classification (Transportation, Auto Surface). The 2007 analysis found that runoff coefficients for sewered and unsewered residential should be set equal, which is reflected in the coefficients employed here.

Pollutant loading rates (Lbs/acre/year) were calculated for each land use according to the following relationship:

Lt = [(P*CF*Rv)/12]*C*2.72

Where:

Lt = Annual pollutant loading rate (Lbs/acre/year)

P = Annual Precipitation (in)

CF = Correction Factor to adjust for storms where no runoff occurs (0.9 used)

Rv = Runoff Coefficient

C = Event Mean Concentration (usually mg/L)

EMCs used to calculate loading rates for each land use (all units mg/L except Fecal Coliform, which is Colony Forming Units/100 mL):

Land Use	BOD	COD	TSS	TDS	TN	TKN	DP	TP	Cd	Pb	Cu	Zn	Fecal Coliform
Commercial	**15**	**103**	**206**	**495**	**3.6**	**1.2**	**0.12**	**0.23**	**0.0014**	**0.180**	**0.035**	**0.27**	1800
Industrial	**9**	**48**	**230**	**239**	**2.6**	**0.8**	**0.16**	**0.27**	**0.0047**	**0.294**	**0.039**	**0.25**	2500
Institutional	**16**	**96**	**391**	**185**	**3.2**	**1.9**	**0.18**	**0.42**	**0.0011**	**0.109**	**0.030**	**0.17**	1800
Transportation, Auto Surface	**9**	**154**	**395**	**1059**	**2.3**	**3.2**	**0.04**	**0.32**	**0.0036**	**0.467**	**0.097**	**0.56**	1400
Transportation, Utility and Waste Facilities	**9**	**48**	**230**	**239**	**2.6**	**0.8**	**0.16**	**0.27**	**0.0047**	**0.294**	**0.039**	**0.25**	2500
Residential	**11**	**70**	**153**	**216**	**3.1**	**1.6**	**0.13**	**0.40**	**0.0010**	**0.116**	**0.024**	**0.45**	8400
Agricultural	**8**	**82**	**456**	**265**	**7.1**	**2.7**	**0.25**	**0.53**	**0.0005**	**0.007**	**0.013**	**0.21**	2600
Open Space	**1**	**46**	**60**	**717**	**0.7**	**1.3**	**0.08**	**0.39**	**0.0002**	**0.016**	**0.006**	**0.08**	1000
Open Water	**1**	**46**	**60**	**717**	**0.7**	**1.3**	**0.08**	**0.39**	**0.0002**	**0.016**	**0.006**	**0.08**	276

APPENDIX G:
IMPERVIOUS LAND USE COVER

Appendix G – Impervious Land Use Cover

LAND USE	MIDDLE FORK					
	0-9% IMPERVIOUS COVER		10-29% IMPERVIOUS COVER		30-100% IMPERVIOUS COVER	
	ACRES	% AREA	ACRES	% AREA	ACRES	% AREA
Agricultural Land	-	-	18.36	6.25%	275.58	93.75%
Commercial and Services	-	-	567.75	97.79%	12.82	2.21%
Forest, Grassland, And Wetlands	-	-	312.76	19.06%	1,328.31	80.94%
Industrial, Warehousing, And Wholesale	-	-	521.77	100.00%	-	-
Institutional	-	-	376.62	71.53%	149.93	28.47%
Open Space	-	-	771.40	18.73%	3,346.64	81.27%
Residential	-	-	4,925.92	87.52%	702.28	12.48%
Transportation, Communication, and Utilities	-	-	2,182.93	94.04%	138.46	5.96%
Overall Impervious Cover	**-**	**-**	**9,677.51**	**61.91%**	**5,954.01**	**38.09%**

LAND USE	NORTH BRANCH CHICAGO RIVER					
	0-9% IMPERVIOUS COVER		10-29% IMPERVIOUS COVER		30-100% IMPERVIOUS COVER	
	ACRES	% AREA	ACRES	% AREA	ACRES	% AREA
Agricultural Land	-	-	18.57	100.00%	-	-
Commercial and Services	-	-	99.20	85.79%	16.43	14.21%
Forest, Grassland, And Wetlands	-	-	8.68	100.00%	-	-
Industrial, Warehousing, And Wholesale	-	-	38.46	100.00%	-	-
Institutional	-	-	88.07	100.00%	-	-
Open Space	-	-	-	-	1,183.06	100.00%
Residential	-	-	1,529.99	100.00%	-	-
Transportation, Communication, and Utilities	-	-	760.16	100.00%	-	-
Overall Impervious Cover	**-**	**-**	**2,543.13**	**67.95%**	**1,199.49**	**32.05%**

Appendix G – Impervious Land Use Cover

LAND USE	SKOKIE RIVER					
	0-9% IMPERVIOUS COVER		10-29% IMPERVIOUS COVER		30-100% IMPERVIOUS COVER	
	ACRES	% AREA	ACRES	% AREA	ACRES	% AREA
Agricultural Land	-	-	2.92	2.51%	113.58	97.49%
Commercial and Services	-	-	1,003.91	100.00%	-	-
Forest, Grassland, And Wetlands	-	-	403.75	30.02%	941.38	69.98%
Industrial, Warehousing, And Wholesale	-	-	558.50	93.45%	39.13	6.55%
Institutional	-	-	827.25	95.17%	42.0	4.83%
Open Space	-	-	3,136.79	49.23%	3,234.97	50.77%
Residential	-	-	6,749.38	92.30%	562.74	7.70%
Transportation, Communication, and Utilities	-	-	4,317.20	94.45%	253.84	5.55%
Overall Impervious Cover	**-**	**-**	**16,999.70**	**76.62%**	**5,187.64**	**23.38%**

LAND USE	WEST FORK					
	0-9% IMPERVIOUS COVER		10-29% IMPERVIOUS COVER		30-100% IMPERVIOUS COVER	
	ACRES	% AREA	ACRES	% AREA	ACRES	% AREA
Agricultural Land	-	-	-	-	46.66	100.00%
Commercial and Services	-	-	1,436.48	100.00%	-	-
Forest, Grassland, And Wetlands	-	-	195.93	28.71%	486.62	71.29%
Industrial, Warehousing, And Wholesale	-	-	765.90	100.00%	-	-
Institutional	-	-	865.06	77.97%	244.39	22.03%
Open Space	-	-	2,115.84	71.29%	852.06	28.71%
Residential	-	-	7,373.46	98.22%	133.47	1.78%
Transportation, Communication, and Utilities	-	-	3,581.14	99.94%	2.29	0.06%
Overall Impervious Cover	**-**	**-**	**16,333.81**	**90.25%**	**1,765.49**	**9.75%**

APPENDIX H:
FLOOD PROBLEM AREA UPDATE

Strelcheck, Ashley

From: Lake County Stormwater Management Commission <LakeCountySMC@public.govdelivery.com>
Sent: Friday, November 22, 2019 12:11 PM
To: Strelcheck, Ashley
Subject: Flood Problem Area Community Update!: TEST

VIEW AS WEBPAGE

FLOOD PROBLEM AREA COMMUNITY UPDATE

Lake County Stormwater Management Commission (SMC) needs watershed stakeholder input updating flood problems areas in the North Branch Chicago River and Lake Michigan watershed planning areas.



We Need Your Input!

- **Who:** Input from North Branch Chicago River & Lake Michigan watershed communities & townships
- **What**: Please go to Lake County's Flood Problem Area Web Application to update information on existing or known flood problem areas and identify new flood problem areas.
- **Where**: Please review your community/township areas on the Web Application and update or provide new information on flood problem areas.
- **How:** Click on this link Web Application and you can use this Tutorial to for step-by-step instructions.
- **When**: Deadline to provide updated information is **January 15, 2020**

- **Why**: This information will assist SMC with the watershed planning efforts to identify additional flood problem areas and prioritize flood mitigation projects.

Please Note: This web application contains information that contains sensitive (site-specific) flood data. This web application should not be redistributed or shared publically.

For more information about the Web Application please contact:

- Ashley Strelcheck, astrelcheck@lakecountyil.gov
- Mike Prusila, mprusila@lakecountyil.gov

Funding for the North Branch Chicago River and Lake Michigan Watershed Plans are provided, in part, by the Illinois Department of Natural Resources Coastal Management Program, the Illinois Environmental Protection Agency through Section 319 of the Clean Water Act, and the Lake County Stormwater Management Commission.

For more information visit:

- **NBWW website**
- **North Branch Chicago River watershed webpage** - watershed planning efforts
- **Lake Michigan watershed webpage** - watershed planning efforts

stay connected

SMC Website | email SMC

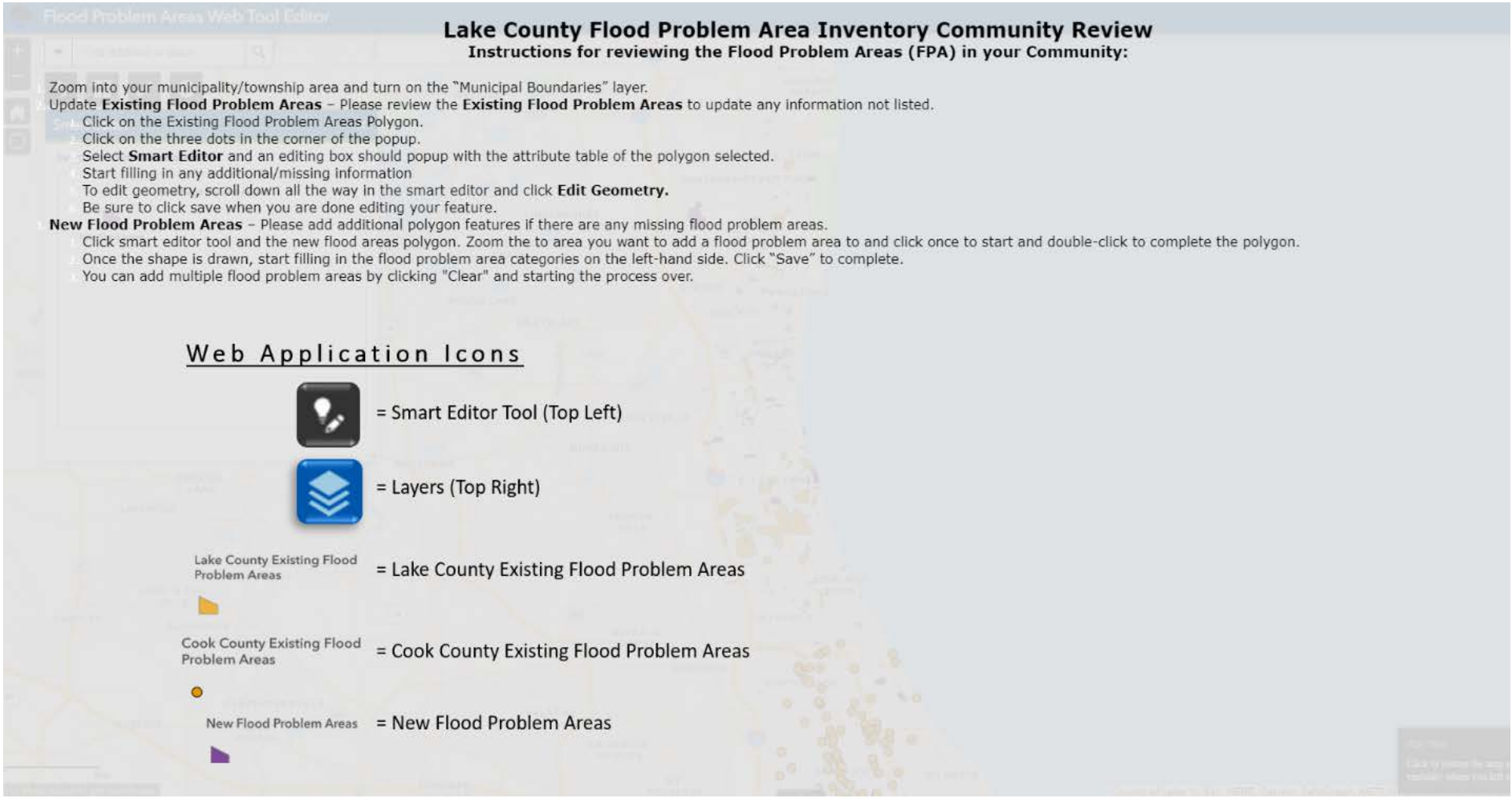
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GOVDELIVERY

Lake County Stormwater Management Commission (SMC) reached out to North Branch Chicago River watershed stakeholders for input on updating the existing flood problems area inventory between November 2019 and November 2020. SMC requested community input on the current flood problem area inventory information (via a Web Application-link) for the North Branch Chicago River Watershed-Based Plan Update (see more information below). Updates provided to current flood problem areas or newly identified flood problem areas assisted SMC to better prioritize flood problem areas and identify flood mitigation opportunities and projects. This information is important because flood problem areas have an impact on all watershed stakeholders and identifying flood problem areas in watershed-based plans helps prioritize projects for grant and cost-share funding opportunities.

Webapplication Link: https://lakecountyil.maps.arcgis.com/apps/webappviewer/index.html?id=524e79af4b52442d8e94a5227a182674



APPENDIX I:
POTENTIAL WETLAND RESTORATION SITE METHODOLOGY

POTENTIALLY RESTORABLE WETLAND SITE IDENTIFICATION METHODOLOGY

Geographic data from the Lake County Wetland Restoration and Preservation Plan (WRAPP) were used as the baseline for potential wetland restoration site selection and prioritization. The Lake County WRAPP data cover the planning area within Lake County, Illinois. Wetland restoration sites from the 2008 North Branch Chicago River Watershed-Based Plan were updated to reflect wetland geometry delineated in the WRAPP. The WRAPP dataset was augmented with polygons in Cook County portion of the NBCR planning area developed from the National Wetlands Inventory (NWI) and the Cook County Soil Survey. The Lake County WRAPP data include qualitative predictions of significance level (high, moderate, low) for various beneficial wetland functions, including ***unique wetland resources (high quality wetlands)***, ***flood water storage, nutrient transformation, sediment and particulate retention, streambank stabilization, and native fish habitat***. Additional filtering and prioritization criteria were applied to obtain a reasonable number of potential restoration sites for cost and pollutant load reduction and inclusion in the action plan. The method for prioritization is outlined below.

1) Lake County PRWs were prioritized according to the following criteria, which are weighted by the significance rating for each potentially restorable wetland (High, Moderate, Low, NA):

Function	Criteria Weight = 2.0	Criteria Weight = 1.0	Criteria Weight = 0.5	Criteria Weight = 0.25	Criteria Weight = 0
Floodwater Storage			High	Moderate	Low & NA
In Floodplain *(based on FEMA FIRM, not WRAPP)		Yes			No
Sediment and Other Particulate Retention		High	Moderate		Low
Nutrient Transformation (P-focus)		High	Moderate		Low
Shoreline/Streambank Stabilization		High	Moderate		Low & NA
Native Fish Habitat			High	Moderate	Low & NA
Unique Wetland Resource	High				NA

    a. Based on the sum of scores for each polygon, all polygons were classified as High, Medium, or Low priority.

    b. Priority distribution by acres of potentially restorable wetlands is as follows: 31% High, 49% Moderate, 20% Low.

2) PRWs in the Cook County portion of the NBCR planning area were developed by removing all NWI wetlands (i.e., existing wetlands) from hydric soil polygons in the Cook County soil survey. Roads and buildings were removed from the resulting polygons. Those polygons were then visually checked and areas unsuitable for wetland restoration based on contiguous land cover were removed (such as areas in between homes in a residential neighborhood or within a dense commercial district).

    a. Cook County PRWs were prioritized based on the following criteria:

        i. High: PRW polygons located in FEMA floodplains and in forest preserves or parks

        ii. Medium: PRW polygons located in Critical Catchments, not rated High

        iii. Low: all remaining polygons

APPENDIX J:
COST ESTIMATES FOR BMPS

ACTION	COST	BMP TYPE
Debris Jam Removal	$11,000 if debris only. $87,000 if debris and sediment.	Debris Jam
Detention Basin Debris Removal	$5,000	Detention Basin Retrofit
Detention Basin Retrofit	$55,000	Detention Basin Retrofit
Discharge Point Repair/Replacement	$5,500-$33,000	Water Infrastructure
Hydraulic Structure Repair/Replacement	$11,000-$87,000	Water Infrastructure
Illicit Discharge Investigation	$500	Water Infrastructure
Runoff Volume Reduction	$7-$35 per square foot	Runoff Volume Reduction
Streambank Stabilization	$325 per linear foot for linear features, $5,500-$33,000 for point features	Stream Improvement, Stabilization
Stream Dredging	$312-$416 per linear foot	Stream Dredging
Wetland Enhancement	$33,000 per acre	Wetland Enhancement
Wetland Restoration	$87,000 per acre	Wetland Restoration

*Action costs from detailed engineering plans not included in this Appendix.

APPENDIX K:
POTENTIAL FUNDING SOURCES

Potential Sources of Technical and Funding Assistance for Watershed Projects/Programs

The following list of potential funding sources is compiled from a variety of sources. Funding and program availability are contingent upon federal, state, and local budgets and appropriations for the budget year in which funding is being sought, so changes may have occurred that are not reflected in the list. Contact the program representative for updates or changes to program details. Watershed-specific funding sources are identified where appropriate.

Potential Sources of Technical and Funding Assistance for Watershed Projects/Programs:
https://www.lakecountyil.gov/2417/Funding-Sources

APPENDIX L:
EVALUATION SCORECARDS

Table 7-15 through Table 7-18 list all consensus milestones established by the watershed planning committee. The "Objective ID" columns references Chapter 2, Section 2.3 goals and objectives.

Watershed Goal #1 Milestones: Improve Water Quality

Improve water quality and prevent future pollution impacts to streams, lakes, ponds, and wetlands within the planning area. Timeframe: Short (**S**): 1-5 years, Medium (**M**): 6-10 years, Long (**L**): 10+ years.

Table 7-1: Water Quality Improvement Milestones

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
1a	Watershed stream annual monitoring program support.	**S**	Continue water quality monitoring through NBWW monitoring program
		M	
		L	
1b	Number of water bodies removed from the Illinois EPA's impairments list.	**S**	1 lake/stream segment
		M	2 lakes/stream segments
		L	4 lakes/steam segments
	Number of causes of impairment removed.	**S**	1 lake/stream segment
		M	2 lakes/stream segments
		L	4 lakes/steam segments
	Concentration of PAHs detected in water quality/sediment monitoring efforts.	**S**	Identify locations of high PAH concentrations
		M	Develop a management and remedial action plan
		L	Plan implementation
	Concentrations of identified sources of fecal coliform detected in water quality monitoring efforts.	**S**	Identify and quantify sources of fecal coliform pollution
		M	Develop a management and remedial action plan
		L	Plan implementation
1c	Reduction in concentrations of phosphorus.	**S**	10%
		M	20%
		L	45%
2	Linear feet of streambank and shoreline restored.	**S**	10,000 linear ft
		M	20,000 linear ft
		L	30,000 linear ft
3	Number of exceedances of permitted phosphorus concentrations from wastewater treatment plant effluent.	**S**	No increase in exceedances
		M	25% reduction in exceedances
		L	50% reduction in exceedances
	Number of upgraded septic systems.	**S**	10
		M	25
		L	50
	Number of local units of government that adopt a phosphorous ordinance.	**S**	10
		M	20
		L	All municipalities
4	Winter Maintenance Program establishment including: policy and manual	**S**	25% of municipal programs
		M	50% of municipal programs

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
	development, de-icing workshop attendance and certification.	**L**	100% of municipal programs
	Number of public agencies and local private contractors attending the annual Lake County De-icing Workshop.	**S**	15 public agencies; 30 local private contractors
		M	30 public agencies; 60 local private contractors
		L	All public agencies with winter maintenance responsibilities; 100 local private contractors
	Number of public agencies with winter maintenance responsibilities that use alternative de-icing products.	**S**	15
		M	30
		L	All

Watershed Goal #2 Milestones: Reduce Flood Damage

Reduce current flood damage in the NBCR planning area and prevent future flooding from worsening in the watershed. Timeframe: Short (**S**): 1-5 years, Medium (**M**): 6-10 years, Long (**L**): 10+ years.

Table 7-2: Flood Damage Reduction Milestones

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
1	Number of municipalities that have codes that allow or require green infrastructure for stormwater management.	**S**	10
		M	20
		L	All municipalities
2	Number of projects within the floodplain that protect/restore floodplain functions.	**S**	Identify at least one potential project
		M	1 project
		L	3 projects
3	Number of Voluntary Floodplain Buyouts.	**S**	10
		M	25
		L	50
	Number of flood problem areas positively affected by flood mitigation projects implemented.	**S**	10
		M	20
		L	30
	Number of Lake County Floodproofing Workshop attendees.	**S**	150
		M	300
		L	600
4	Number of new or restored flood storage sites.	**S**	Identify at least one potential site
		M	1 site
		L	2 sites
	Number of detailed flood mitigation studies completed and number of participants (entities).	**S**	1 study / 3 participants
		M	2 studies / 5 participants
		L	3 studies / 10 participants

Watershed Goal #3 Milestones: Protect & Enhance Natural Resources & Provide Associated Recreational Opportunities

Protect, enhance, and restore natural resources (soil, water, plant communities, and fish and wildlife) by employing good natural resource management practices. Expand riparian greenways and buffers to provide ecological, educational, and recreational benefits. Timeframe: Short (**S**): 1-5 years, Medium (**M**): 6-10 years, Long (**L**): 10+ years.

Table 7-3: Protect & Enhance Natural Resources Milestones

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
1a	Acres of wetlands enhanced and/or restored.	**S**	50 acres
		M	100 acres
		L	200 acres
1b	Linear feet of streambank and shoreline restored.	**Addressed by Goal #1 Objective ID 2**	
1c	Number of wetland and lake restoration projects completed. Linear feet reported if available.	**S**	5 projects
		M	10 projects
		L	15 projects
1d	Number of native fish species identified based on NBWW and/or IDNR data. Currently 20 native species identified (not including hybrid species).	**S**	22
		M	24
		L	26
2	Acres of terrestrial native natural area restoration projects completed.	**S**	500
		M	1,000
		L	1,500
3	Acres of riparian open space preserved for environmental and recreational natural areas. Acres are in addition to 2021 baseline open space acres.	**S**	50
		M	100
		L	150
4	Length of native plant buffers and riparian greenways along water bodies maintained, expanded, and/or restored.	**S**	10 miles
		M	20 miles
		L	40 miles

Watershed Goal #4 Milestones: Education and Outreach

Provide watershed stakeholders with the knowledge, skills, and motivation needed to take action to implement the watershed plan. Timeframe: Short (**S**): 1-5 years, Medium (**M**): 6-10 years, Long (**L**): 10+ years.

Table 7-4: Education and Outreach Milestones

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
1	Number of primary and secondary schools participating in school-based river curriculums.	**S**	Establish outreach campaign
		M	5
		L	10
2	Continuous increase in number of contacts on the NBWW and North Branch Chicago River Watershed database lists.	**S**	5% increase
		M	10% increase
		L	20% increase

Watershed Goal #5 Milestones: Community and Agency Participation and Coordination

Improve community and agency participation and coordination for research and decision-making among public, private, and nonprofit entities to help achieve watershed plan goals and objectives. Timeframe: Short (**S**): 1-5 years, Medium (**M**): 6-10 years, Long (**L**): 10+ years.

Table 7-5: Community and Agency Participation and Coordination Milestones

OBJECTIVE ID	INDICATOR	TIMEFRAME	MILESTONE
1a	Number of municipalities, counties, and natural resource agencies that adopt the North Branch Chicago River Watershed-Based Plan Update.	**S**	20 agencies
		M	40 agencies
		L	All agencies
1b	Number of action recommendations completed.	**S**	50 action plan recommendations
		M	100 action plan recommendations
		L	200 action plan recommendations
1c	Number of grant applications received by Lake County Stormwater Management Commission for local grant funding opportunities.	**S**	30 applications
		M	50 applications
		L	100 applications
2	Number of watershed stakeholders providing feedback for the watershed report cards.	**S**	30
		M	40
		L	50
3	Number of volunteers participating in the annual Chicago River Day event (within the NBCR planning area).	**S**	450
		M	600
		L	750

APPENDIX M:
SITE SPECIFIC ACTION PLAN RECOMMENDATIONS

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
24-0117	City of Highland Park	Skokie River	Flood Damage Reduction	Central Ave. & Deerfield Rd. Storm and sanitary sewer backup. Refer to Village Department of Public Works for retrofits or maintenance to culverts.	1	each	L	L	2	PO	SMC, M	ND		0	0	0	0	0	Y	Y
24-0118	City of Highland Park	Skokie River	Flood Damage Reduction	Soutland Ave. & Cavell Ave. Storm and sanitary sewer backup. Refer to Village Department of Public Works for retrofits or maintenance to culverts.	1	each	L	L	2	M	SMC	ND		0	0	0	0	0	Y	Y
24-0119	City of Highland Park	Skokie River	Flood Damage Reduction	Deerfield Villa, Sunset Manor. Overbank flooding, structures in the floodplain. Utilize existing open space area for overbank storage, perform flood mitigation alternatives.	1	each	H	S	2	M	SMC	ND		0	0	0	0	0	Y	Y
24-0115	City of Highland Park	Skokie River	Flood Damage Reduction	Trailways Subdivision, Trailway St., Parkside Dr. to Half Day Rd. Overbank flooding, structures in the floodplain. 2006 funding received to design wetland restoration site at SE corner of Hwy 41 and Half Day Rd. Wetland restoration will also increase flood storage and reduce flood problems.	1	each	H	S	2	M	SMC	ND		0	0	0	0	0	Y	Y
24-0116	City of Highland Park	Skokie River	Flood Damage Reduction	Taylor Ave. Overbank flooding, structures in the floodplain & floodway. Perform flood mitigation alternatives analysis, ensure NFIP compliance for new structures.	1	each	H	S	2	M	SMC	ND		0	0	0	0	0	Y	Y
25-0369	City of Highland Park	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, HOA	SMC, Illinois EPA, M	$5,500	$33,000	2.8	1.4	1.4	0.0	0.0	Y	N
24-0457	City of Highland Park	Skokie River	Stabilization	Stabilize erosion.	1	each	H	M	1	DD, PD	SMC, Illinois EPA, M	$5,500	$33,000	2.5	1.2	1.2	0.0	0.0	Y	N
24-0468	City of Highland Park	Skokie River	Stabilization	Stabilize erosion.	1	each	H	M	1	DD, PD	SMC, Illinois EPA, M	$5,500	$33,000	2.5	1.2	1.2	0.0	0.0	Y	N
24-0463	City of Highland Park	Skokie River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	1.5	0.7	0.7	0.0	0.0	Y	N
24-0459	City of Highland Park	Skokie River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, PD	SMC, Illinois EPA, M	$5,500	$33,000	1.4	0.7	0.7	0.0	0.0	Y	N
25-0368	City of Highland Park	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, HOA	SMC, Illinois EPA, M	$5,500	$33,000	1.2	0.6	0.6	0.0	0.0	Y	N
24-0467	City of Highland Park	Skokie River	Stabilization	Stabilize erosion.	1	each	H	M	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	1.2	0.6	0.6	0.0	0.0	Y	N
25-0374	City of Highland Park	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0.9	0.4	0.4	0.0	0.0	Y	N
24-0462	City of Highland Park	Skokie River	Stabilization	Stabilize erosion.	1	each	H	M	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0.7	0.4	0.4	0.0	0.0	Y	N
25-0370	City of Highland Park	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	H	M	1	DD, M	SMC, Illinois EPA	$650,000		29.8	14.9	14.8	0.0	0.0	Y	N
24-0466	City of Highland Park	Skokie River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0.6	0.3	0.3	0.0	0.0	Y	N
25-0373	City of Highland Park	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0.3	0.1	0.1	0.0	0.0	Y	N
25-0240	City of Highland Park	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Painters Lake Rd. Overbank flooding. Perform ditch and culvert monitoring and maintenance.	1	each	L	L	2	M, PO, DOT	SMC	ND		0	0	0	0	0	N	Y
25-0241	City of Highland Park	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Briargate Subdivision and Briargate Lane. Overbank flooding, structures in the floodplain & floodway. Perform flood mitigation alternatives analysis, review for NFIP compliance.	1	each	H	S	2	M, PO, DOT, SMC	Illinois EPA, USACE	ND		0	0	0	0	0	N	Y
25-0242	City of Highland Park	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Tanglewood Court. Overbank flooding. Perform ditch and culvert monitoring and maintenance.	1	each	L	L	2	M, PO, DOT	SMC	ND		0	0	0	0	0	N	Y
24-0114	City of Highland Park	Skokie River	Stormwater Infrastructure Retrofit	Old Trail St. & University Ave. Storm and sanitary sewer backup. Refer to Village Department of Public Works for retrofits or maintenance to culverts.	1	each	L	L	2	M	SMC, PO	ND		0	0	0	0	0	N	Y
24-0194	City of Highland Park	Skokie River	Stormwater Infrastructure Retrofit	Deerpath Rd. & Green Bay Rd. Local drainage problems. Create additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	M	M	2	M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y
24-0087	City of Highland Park	Skokie River	Stream Improvement	Stabilize and restore streambanks.	3,052	linear feet	M	M	1,3	DD, PD, M, PO	SMC, Illinois EPA, DOT	$991,829		63.7	31.8	31.5	0.0	0.0	Y	Y
24-0094	City of Highland Park	Skokie River	Stream Improvement	Stabilize and restore streambanks.	2,392	linear feet	M	M	1,3	DD, PD	SMC, Illinois EPA, M	$777,436		27.8	13.9	13.7	0.0	0.0	Y	Y
24-0097	City of Highland Park	Skokie River	Stream Improvement	Stabilize and restore streambanks.	4,136	linear feet	H	M	1,3	DD, PO, PD	SMC, Illinois EPA, M	$1,344,184		53.9	27.0	26.7	0.0	0.0	Y	Y
24-0475	City of Highland Park	Skokie River	Stream Improvement	Stabilize and restore streambanks.	4,369	linear feet	H	L	1,3	DD, PD, PO	SMC, Illinois EPA, M	$1,420,077		72.4	36.2	35.8	0.0	0.0	Y	N
24-0082	City of Highland Park	Skokie River	Water Infrastructure	Stabilize erosion. Repair outfall pipe.	1	each	M	M	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0078	City of Highland Park	Skokie River	Water Infrastructure	Determine if illicit discharge is present. Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure.	1	each	H	S	1	LCHD, DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0080	City of Highland Park	Skokie River	Water Infrastructure	Determine if illicit discharge is present. Stabilize erosion. Repair outfall pipe. Extend discharge point to stream level or install energy dissipation structure.	1	each	H	S	1	LCHD, DD, PD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
24-0074	City of Highland Park	Skokie River	Water Infrastructure	Determine if illicit discharge is present. Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure.	1	each	H	S	1	LCHD, DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0075	City of Highland Park	Skokie River	Water Infrastructure	Determine if illicit discharge is present. Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure. Repair outfall pipe.	1	each	H	S	1	LCHD, DD, PD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0076	City of Highland Park	Skokie River	Water Infrastructure	Stabilize erosion.	1	each	H	S	1	DD, PD	SMC, Illinois EPA, M	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0077	City of Highland Park	Skokie River	Water Infrastructure	Stabilize erosion.	1	each	H	S	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0070	City of Highland Park	Skokie River	Water Infrastructure	Erosion surrounding concrete, pipe has broken and water is flowing behind concrete. Stabilize erosion, repair outfall pipe.	1	each	M	M	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0071	City of Highland Park	Skokie River	Water Infrastructure	Stabilize erosion. Remove sedimentation.	1	each	H	S	1	DD, SI, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0072	City of Highland Park	Skokie River	Water Infrastructure	Stabilize erosion. Repair outfall pipe.	1	each	M	M	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0073	City of Highland Park	Skokie River	Water Infrastructure	Repair outfall pipe and concrete apron. Stabilize erosion.	1	each	M	M	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0234	City of Highland Park	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion. Repair outfall pipe.	1	each	L	L	1	DD, M, PO	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0126	City of Highland Park	Skokie River	Water Infrastructure	Stabilize stream bank to reduce erosion under bridge.	1	each	M	M	1	DD, PD	SMC, Illinois EPA, M	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0127	City of Highland Park	Skokie River	Water Infrastructure	Stabilize stream bank to reduce erosion under bridge.	1	each	M	M	1	DD, PD	SMC, Illinois EPA, M	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0121	City of Highland Park	Skokie River	Water Infrastructure	Stabilize stream bank to reduce erosion under bridge.	1	each	M	M	1	DD, PD	SMC, Illinois EPA, M	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0442	City of Highland Park	Skokie River	Water Infrastructure	Remove sediment obstructing flow.	1	each	H	M	2	DD, M	Illinois EPA	$5,500	$87,000	0	0	0	0	0	Y	N
24-0443	City of Highland Park	Skokie River	Water Infrastructure	Remove sediment obstructing flow.	1	each	H	M	2	DD, M	Illinois EPA	$5,500	$87,000	0	0	0	0	0	Y	N
24-0446	City of Highland Park	Skokie River	Water Infrastructure	Repair or replace discharge point and remove sediment obstructing flow.	1	each	M	L	1,2	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0	0	0	0	0	Y	N
24-0297	City of Highland Park	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	4.6	acre	H	S	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, DD, M	$150,826		0	0	0	0	0	N	Y
24-0298	City of Highland Park	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	5.5	acre	H	S	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, DD, M	$182,565		0	0	0	0	0	N	Y
24-0299	City of Highland Park	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	24.8	acre	H	S	1,2,3	PO, NSWRD	USFWS, USACE, SMC, Illinois EPA, DD, M	$817,809		0	0	0	0	0	Y	Y
24-0300	City of Highland Park	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	42.4	acre	H	S	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, DD, M	$1,400,587		0	0	0	0	0	Y	Y
24-0286	City of Highland Park	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	43.7	acre	M	M	1,2,3	PO, PD	USFWS, USACE, SMC, Illinois EPA, DD, M	$1,441,899		0	0	0	0	0	N	Y
24-0287	City of Highland Park	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	23.8	acre	H	S	1,2,3	PD, HOA, PO	USFWS, USACE, SMC, Illinois EPA, DD, M	$784,107		0	0	0	0	0	Y	Y
24-0705	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	26.0	acre	H	M	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$2,265,131		55.2	8.0	4.0	2,387.3	144.7	N	N
24-0103	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	43.8	acre	H	M	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$3,813,181		52.1	10.2	3.8	2,991.3	110.8	N	Y
24-0110	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	39.2	acre	H	M	1,2,3	M, PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$3,409,522		49.9	8.6	3.7	2,567.8	136.2	N	Y
24-1050	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	25.7	acre	H	M	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$2,236,460		36.8	6.3	2.7	1,881.0	108.3	N	Y
24-1004	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	16.9	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$1,471,061		28.2	4.2	2.0	1,178.3	85.1	Y	Y
24-1005	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	29.0	acre	M	L	1,2,3	PD, PO, HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$2,526,660		16.0	3.2	1.0	743.8	36.8	Y	Y
24-0643	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	10.3	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$899,990		15.3	2.5	1.1	784.4	44.6	N	N
24-0629	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	7.1	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$620,195		15.1	2.2	1.1	653.7	39.6	N	N
24-1121	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	8.9	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$778,621		12.8	2.2	0.9	654.9	37.7	N	Y
24-0303	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	17.7	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$1,541,288		8.1	2.9	0.4	735.3	28.4	N	Y
24-1115	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	3.4	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$294,072		6.7	1.0	0.5	278.5	19.6	N	Y
24-1038	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	4.9	acre	M	L	1,2,3	HOA, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$430,193		6.3	1.1	0.5	324.0	17.2	N	Y

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
24-1118	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	5.2	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$456,386		6.0	1.0	0.5	375.4	10.8	N	Y
24-0516	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	4.3	acre	M	L	1,2,3	HOA, PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$377,036		5.5	0.9	0.4	284.0	15.1	N	N
24-0595	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	2.3	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$199,207		5.5	0.8	0.4	260.7	12.5	Y	N
24-0707	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	4.3	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$371,732		4.9	0.8	0.4	305.7	8.8	N	N
24-1126	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	4.6	acre	M	L	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$403,535		4.3	0.8	0.3	186.7	13.7	N	Y
24-1049	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	8.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$697,224		3.7	1.3	0.2	332.6	12.9	N	Y
24-1124	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	2.7	acre	M	L	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$238,425		3.3	0.6	0.2	187.0	6.9	N	Y
24-0517	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	1.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$141,725		3.2	0.5	0.2	134.2	9.4	N	N
24-1120	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	2.8	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$240,020		3.2	0.5	0.3	197.4	5.7	N	Y
24-1006	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	5.6	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$486,803		3.1	0.6	0.2	143.3	7.1	Y	Y
25-0409	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$214,148		3.1	0.5	0.2	106.3	11.2	N	N
24-0481	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$91,019		2.8	0.4	0.2	154.7	5.6	N	N
24-1125	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	3.0	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$260,480		2.8	0.5	0.2	120.5	8.8	N	Y
25-0604	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$113,175		2.6	0.4	0.2	92.2	7.5	N	N
24-1122	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	5.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$450,816		2.4	0.8	0.1	215.1	8.3	N	Y
25-0395	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	H	M	1,2,3	PO, PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$101,192		2.3	0.3	0.2	82.4	6.7	N	N
24-0630	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	1.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$112,092		2.1	0.3	0.1	89.8	6.5	N	N
24-0587	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PO, PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$91,206		2.1	0.3	0.1	78.6	5.6	N	N
25-0399	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	H	M	1,2,3	HOA, M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$108,283		2.0	0.3	0.1	85.6	6.8	N	N
24-1040	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$86,632		2.0	0.3	0.1	82.1	5.8	N	Y
25-0405	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.0	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$173,621		1.8	0.3	0.1	76.1	7.1	N	N
25-0899	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.7	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$151,182		1.7	0.3	0.1	96.9	4.4	N	Y
24-0529	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$67,557		1.7	0.2	0.1	57.3	4.1	N	N
24-0100	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	1.1	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$92,188		1.6	0.3	0.1	80.3	4.6	N	Y
24-0591	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$87,431		1.5	0.2	0.1	73.2	3.4	N	N
24-1114	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$54,824		1.5	0.2	0.1	69.1	3.4	N	Y
24-0642	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$87,931		1.4	0.2	0.1	49.6	3.3	N	N
24-0555	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$84,932		1.4	0.2	0.1	47.9	3.2	N	N
25-0406	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	H	M	1,2,3	PO, HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$114,955		1.2	0.2	0.1	50.4	4.7	N	N

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
24-0594	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$43,642		1.2	0.2	0.1	57.1	2.7	Y	N
24-0505	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$60,869		1.2	0.2	0.1	48.8	3.5	N	N
24-1039	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	HOA, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$78,815		1.2	0.2	0.1	59.4	3.1	N	Y
24-0644	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$56,628		1.1	0.2	0.1	48.8	3.6	N	N
24-1048	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$68,057		1.1	0.2	0.1	57.2	3.3	N	Y
25-0543	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$75,618		1.1	0.2	0.1	34.6	4.3	N	N
24-0518	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$45,573		1.0	0.2	0.1	43.2	3.0	N	N
24-0592	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$41,566		1.0	0.2	0.1	50.4	2.6	N	N
24-0559	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$69,260		1.0	0.2	0.1	47.9	2.8	N	N
24-1047	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	H	M	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$67,961		1.0	0.2	0.1	47.0	2.8	N	Y
24-0483	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$35,149		1.0	0.1	0.1	46.0	2.2	Y	N
24-0522	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,313		0.9	0.1	0.1	47.2	1.5	Y	N
24-0523	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$54,247		0.9	0.2	0.1	45.6	2.6	N	N
24-0479	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$38,619		0.9	0.1	0.1	45.0	2.3	N	N
25-0897	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$77,186		0.9	0.2	0.1	49.5	2.2	N	Y
24-0667	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$20,668		0.8	0.1	0.1	41.8	1.4	Y	N
24-0568	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$43,164		0.8	0.1	0.1	36.1	1.7	N	N
24-0504	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$39,249		0.8	0.1	0.1	31.4	2.3	N	N
25-0408	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$50,254		0.7	0.1	0.0	24.9	2.6	N	N
24-1046	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	H	M	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$45,653		0.7	0.1	0.0	31.6	1.9	N	Y
24-0652	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$36,749		0.6	0.1	0.0	20.7	1.4	N	N
24-0596	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,769		0.6	0.1	0.0	28.5	1.4	Y	N
24-0480	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,752		0.6	0.1	0.0	30.2	1.1	N	N
24-0653	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,573		0.5	0.1	0.0	22.3	1.4	N	N
24-0593	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$36,410		0.5	0.1	0.0	23.6	1.7	N	N
24-1042	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	3.1	acre	M	L	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$273,830		0.5	0.2	0.0	50.5	2.0	N	Y
25-0425	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$24,324		0.5	0.1	0.0	18.6	1.5	N	N
24-1117	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$27,434		0.5	0.1	0.0	23.9	1.4	N	Y
25-0634	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	H	M	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$18,509		0.4	0.1	0.0	15.1	1.2	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
24-0537	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PD, HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$29,605		0.4	0.1	0.0	19.2	1.4	N	N
24-0556	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$24,652		0.4	0.1	0.0	13.9	0.9	N	N
24-0519	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,921		0.4	0.1	0.0	15.6	1.2	N	N
24-0665	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,465		0.4	0.1	0.0	13.1	0.9	N	N
24-0561	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,034		0.4	0.1	0.0	19.4	1.1	N	N
25-0400	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$34,774		0.4	0.1	0.0	15.2	1.4	N	N
24-0674	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$16,685		0.4	0.1	0.0	10.7	0.8	N	N
24-0558	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$23,657		0.4	0.1	0.0	16.4	1.0	N	N
24-0698	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$20,946		0.3	0.1	0.0	17.6	1.0	N	N
24-0538	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$24,341		0.3	0.1	0.0	15.7	1.1	N	N
25-0490	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,482		0.3	0.0	0.0	10.7	1.3	N	N
24-1123	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$54,817		0.3	0.1	0.0	26.2	1.0	N	Y
25-0401	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$24,419		0.3	0.0	0.0	10.7	1.0	N	N
24-0699	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,896		0.3	0.0	0.0	10.3	0.8	N	N
25-0697	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$13,695		0.3	0.0	0.0	10.8	0.9	N	N
24-0675	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,188		0.2	0.0	0.0	7.2	0.6	N	N
24-0700	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,142		0.2	0.0	0.0	9.7	0.7	Y	N
24-0567	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,009		0.2	0.0	0.0	9.6	0.7	N	N
24-0631	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	NSWRD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$36,858		0.2	0.0	0.0	10.9	0.5	Y	N
25-0702	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$21,631		0.2	0.0	0.0	9.5	0.9	N	N
24-0668	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PD, M	USFWS, USACE, SMC, Illinois EPA, IDNR	$12,536		0.2	0.0	0.0	10.5	0.5	N	N
24-0604	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,181		0.2	0.0	0.0	10.2	0.5	N	N
24-0676	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$10,343		0.2	0.0	0.0	8.9	0.7	N	N
24-1041	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,621		0.2	0.0	0.0	12.8	0.4	N	Y
24-0666	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,358		0.2	0.0	0.0	11.3	0.4	N	N
24-1119	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	1.2	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$101,421		0.2	0.1	0.0	18.7	0.7	N	Y
25-0696	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$12,446		0.2	0.0	0.0	6.2	0.7	N	N
25-0646	City of Highland Park	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,304		0.2	0.0	0.0	5.2	0.6	N	N
24-0695	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,625		0.2	0.0	0.0	6.9	0.5	N	N

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
24-0696	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$8,894		0.1	0.0	0.0	6.7	0.4	N	N
24-1116	City of Highland Park	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$23,993		0.0	0.0	0.0	4.4	0.2	N	Y
25-0387	City of Lake Forest	Middle Fork Chicago River	Shoreline Stabilization	Stabilize and restore shoreline.	1,691	linear feet	M	L	1,3	SI	SMC, Illinois EPA, M	$186,059		48.6	24.3	24.1	0.0	0.0	N	N
25-0367	City of Lake Forest	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	2.1	1.0	1.0	0.0	0.0	Y	N
25-0366	City of Lake Forest	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, M	SMC, Illinois EP	$5,500	$33,000	1.9	0.9	0.9	0.0	0.0	Y	N
25-0364	City of Lake Forest	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	1.2	0.6	0.6	0.0	0.0	Y	N
24-0458	City of Lake Forest	Skokie River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	1.2	0.6	0.6	0.0	0.0	Y	N
24-0465	City of Lake Forest	Skokie River	Stabilization	Stabilize erosion.	1	each	H	S	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	1.0	0.5	0.5	0.0	0.0	Y	N
24-0464	City of Lake Forest	Skokie River	Stabilization	Stabilize erosion.	1	each	H	S	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0.7	0.4	0.4	0.0	0.0	Y	N
25-0363	City of Lake Forest	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	H	M	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0.6	0.3	0.3	0.0	0.0	Y	N
25-0376	City of Lake Forest	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0.5	0.2	0.2	0.0	0.0	Y	N
25-0365	City of Lake Forest	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, LFOL	SMC, Illinois EPA, M	$5,500	$33,000	0.4	0.2	0.2	0.0	0.0	Y	N
25-0378	City of Lake Forest	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0.4	0.2	0.2	0.0	0.0	Y	N
25-0379	City of Lake Forest	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0.4	0.2	0.2	0.0	0.0	Y	N
24-0456	City of Lake Forest	Skokie River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0.2	0.1	0.1	0.0	0.0	Y	N
25-0377	City of Lake Forest	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	L	L	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0.1	0.1	0.1	0.0	0.0	Y	N
24-0193	City of Lake Forest	Skokie River	Stormwater Infrastructure Retrofit	Golf Lane. Overbank flooding. Monitor for increased flooding to yards.	1	each	L	L	2	M, PO	SMC	ND		0	0	0	0	0	N	Y
25-0126	City of Lake Forest	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Lexington Dr. Overbank flooding, structures in the floodplain. Provide storage or expand wetlands on adjacent (east bank) floodplain, perform flood mitigation alternatives analysis.	1	each	H	M	2	LFOL, PO, SMC, M	Illinois EPA, USACE	ND		0	0	0	0	0	N	Y
24-0195	City of Lake Forest	Skokie River	Stormwater Infrastructure Retrofit	Deerpath Rd. to south & Hwy. 41. Overbank flooding & local drainage problems, structures in the floodplain. NBWP funding was received in 2004 to create two ponds in the Lake Forest/Deerpath Golf Course to increase flood storage and reduce the rate and volume of water entering Skokie River, which may reduce flood damages in this area.	1	each	H	S	2	M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y
25-0129	City of Lake Forest	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Conway Rd., Oak Knoll Dr. to Waukegan Rd. Local drainage problems. Create additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	H	S	2	M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y
24-0196	City of Lake Forest	Skokie River	Stormwater Infrastructure Retrofit	Westleigh Rd. to Old Elm Rd., east of the Skokie River. Overbank flooding & local drainage problems, structures in the floodplain. Investigate expansion of storage, For structures perform flood mitigation alternatives analysis, review for NFIP compliance.	1	each	H	S	2	M, PO, DOT, SMC	Illinois EPA, USACE	ND		0	0	0	0	0	Y	Y
25-0130	City of Lake Forest	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Arcady Dr. Local drainage problems. Create additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	M	M	2	M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y
26-0666	City of Lake Forest	West Fork Chicago River	Stormwater Infrastructure Retrofit	East of I-94, Everett Rd. to Old Mill Rd. Overbank flooding, structures in the floodplain. Perform flood mitigation alternatives analysis. Look at potential for LSA or wetland restoration sites north of Everett, or diversion to a potential lateral storage area south of Florsheim.	1	each	M	M	2	M, PO, ISTHA, SMC	Illinois EPA, USACE	ND		0	0	0	0	0	N	Y
24-0197	City of Lake Forest	Skokie River	Stormwater Infrastructure Retrofit	Westleigh Rd. to Old Elm Rd., west of the Skokie River. Overbank flooding & local drainage problems, structures in the floodplain. Investigate expansion of storage, for structures perform flood mitigation alternatives analysis, review for NFIP compliance.	1	each	H	S	2	M, PO, DOT, SMC	Illinois EPA, USACE	ND		0	0	0	0	0	Y	Y
25-0131	City of Lake Forest	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Everett Rd. to Old Mill Rd., east of river. Overbank flooding & local drainage problems, structures in the floodplain. Investigate expansion of storage, for structures perform flood mitigation alternatives analysis, review for NFIP compliance.	1	each	H	S	2	M, PO, DOT, SMC	Illinois EPA, USACE	ND		0	0	0	0	0	N	Y
25-0128	City of Lake Forest	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Ridge Rd. & Westleigh Rd. Local drainage problems. Create additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	M	M	2	M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
25-0133	City of Lake Forest	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Telegraph Rd., Lawrence Ave. to James St. Local drainage problems. Create additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	M	M	2	M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y
25-0132	City of Lake Forest	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	West of Waukegan Rd., Aspen Dr. Local drainage problems. Create additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	H	S	2	M, PO, DOT, SMC, SI	Illinois EPA, USACE	ND		0	0	0	0	0	N	Y
25-0125	City of Lake Forest	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Academy Woods Rd. Local drainage problems. Create additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	M	M	2	M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y
24-0275	City of Lake Forest	Skokie River	Stormwater Infrastructure Retrofit	Waukegan Rd. & Regency Lane. Local drainage problems. Create additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	M	M	2	M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y
24-0174	City of Lake Forest	Skokie River	Stream Improvement	Stabilize and restore streambanks.	3,069	linear feet	H	S	1,3	DD, PO, M	SMC, Illinois EPA	$997,510		248.1	124.0	122.8	0.0	0.0	Y	Y
24-0176	City of Lake Forest	Skokie River	Stream Improvement	Stabilize and restore streambanks.	3,757	linear feet	H	S	1,3	DD, PO	SMC, Illinois EPA, M	$1,221,163		270.5	135.3	133.9	0.0	0.0	Y	Y
24-0180	City of Lake Forest	Skokie River	Stream Improvement	Stabilize and restore streambanks.	3,558	linear feet	M	M	1,3	DD, PO, M	SMC, Illinois EPA, DOT	$1,156,385		90.8	45.4	44.9	0.0	0.0	Y	Y
25-0388	City of Lake Forest	Middle Fork Chicago River	Stream Improvement	Stabilize and restore streambanks.	4,685	linear feet	H	L	1,3	DD, M, SI	SMC, Illinois EPA	$1,522,660		74.2	37.1	36.7	0.0	0.0	Y	N
24-0168	City of Lake Forest	Skokie River	Water Infrastructure	Stabilize erosion.	1	each	H	S	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0173	City of Lake Forest	Skokie River	Water Infrastructure	Concrete apron broken and water flowing out of disconnected point. Repair outfall pipe and concrete apron. Determine if illicit discharge is present.	1	each	H	S	1	LCHD, DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0167	City of Lake Forest	Skokie River	Water Infrastructure	Stabilize erosion. Repair outfall pipe and flared end section.	1	each	M	M	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0161	City of Lake Forest	Skokie River	Water Infrastructure	Determine if illicit discharge is present. Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure.	1	each	H	S	1	LCHD, DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0086	City of Lake Forest	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	L	L	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0087	City of Lake Forest	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion, repair outfall pipe and flared end section.	1	each	L	L	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0090	City of Lake Forest	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	H	S	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0082	City of Lake Forest	Middle Fork Chicago River	Water Infrastructure	Determine if illicit discharge is present. Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure.	1	each	H	S	1	LCHD, DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0083	City of Lake Forest	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	M	M	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0084	City of Lake Forest	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	L	L	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0210	City of Lake Forest	Skokie River	Water Infrastructure	Stabilize stream bank to reduce erosion under bridge. Remove accumulated sediment under bridge. Identify source of sediment and implement a mitigation strategy to prevent further accumulation of sediment.	1	each	M	M	1,2	DD, M	SMC, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0205	City of Lake Forest	Skokie River	Water Infrastructure	Stabilize stream bank to reduce erosion under bridge.	1	each	M	M	1	DD, PO	SMC, Illinois EPA, M	$11,000	$87,000	0	0	0	0	0	Y	Y
25-0136	City of Lake Forest	Middle Fork Chicago River	Water Infrastructure	Stabilize stream bank to reduce erosion under bridge. Remove accumulated sediment under bridge. Identify source of sediment and implement a mitigation strategy to prevent further accumulation of sediment.	1	each	H	S	1,2	DD, M, LFOL	SMC, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0198	City of Lake Forest	Skokie River	Water Infrastructure	Structure possibly failing. Investigate and repair/replace if determined problematic.	1	each	M	M	2	M	SMC	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0163	City of Lake Forest	Skokie River	Water Infrastructure	Stabilize erosion. Repair outfall pipe and flared end section.	1	each	M	M	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0165	City of Lake Forest	Skokie River	Water Infrastructure	Determine if illicit discharge is present. Stabilize erosion. Repair outfall pipe and flared end section. Extend discharge point to stream level or install energy dissipation structure.	1	each	H	S	1	LCHD, DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0166	City of Lake Forest	Skokie River	Water Infrastructure	Determine if illicit discharge is present. Stabilize erosion. Repair outfall pipe. Extend discharge point to stream level or install energy dissipation structure.	1	each	H	S	1	LCHD, DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0120	City of Lake Forest	Skokie River	Water Infrastructure	Remove accumulated sediment under bridge. Identify source of sediment and implement a mitigation strategy to prevent further accumulation of sediment.	1	each	L	L	1,2	DD, M	Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0435	City of Lake Forest	Skokie River	Water Infrastructure	Remove or repair failing bridge.	1	each	H	S	2	DD, LFOL	SMC, Illinois EPA, M	$11,000	$87,000	0	0	0	0	0	Y	N
25-0358	City of Lake Forest	Middle Fork Chicago River	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	H	M	1	DD, SI	SMC, Illinois EPA, M	$5,500	$33,000	0	0	0	0	0	Y	N
24-0444	City of Lake Forest	Skokie River	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	H	M	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
24-0445	City of Lake Forest	Skokie River	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	H	M	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N

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24-0171	City of Lake Forest	Skokie River	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	M	M	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0162	City of Lake Forest	Skokie River	Water Infrastructure	Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure.	1	each	H	S	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-1001	City of Lake Forest	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	23.9	acre	H	M	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, M	$790,244		0	0	0	0	0	N	Y
25-0261	City of Lake Forest	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	10.0	acre	M	M	1,2,3	M, PO	USFWS, USACE, SMC, Illinois EPA, DD	$329,743		0	0	0	0	0	N	Y
25-0256	City of Lake Forest	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	52.2	acre	H	S	1,2,3	PO, LFOL. M, HOA	USFWS, USACE, SMC, Illinois EPA, DD	$1,723,101		0	0	0	0	0	N	Y
25-0265	City of Lake Forest	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	10.3	acre	H	S	1,2,3	LFOL, PO,	USFWS, USACE, SMC, Illinois EPA, M	$340,582		0	0	0	0	0	N	Y
24-0305	City of Lake Forest	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	41.6	acre	H	S	1,2,3	LFOL, PO, M	USFWS, USACE, SMC, Illinois EPA, DD	$1,373,116		0	0	0	0	0	N	Y
24-0288	City of Lake Forest	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	5.8	acre	H	S	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, DD	$191,882		0	0	0	0	0	N	Y
25-0758	City of Lake Forest	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	28.7	acre	H	S	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA	$947,393		0	0	0	0	0	N	Y
24-0289	City of Lake Forest	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	13.2	acre	M	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, M	$436,029		0	0	0	0	0	N	Y
25-0266	City of Lake Forest	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	56.6	acre	H	S	1,2,3	LFOL, LCFPD, M, SI	USFWS, USACE, SMC, Illinois EPA, DD, RR	$1,868,915		0	0	0	0	0	N	Y
25-0178	City of Lake Forest	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	24.7	acre	H	S	1,2,3	SI, PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, DD, RR, M, T, PB&D	$816,109		0	0	0	0	0	N	Y
24-0708	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	36.1	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$3,138,045		71.7	10.9	5.6	2,956.5	146.7	N	N
24-1044	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	30.3	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$2,636,928		44.2	6.7	3.0	1,832.2	132.2	N	Y
24-1092	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	20.6	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$1,792,753		30.0	4.5	2.0	1,245.6	89.8	N	N
24-1045	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	17.9	acre	H	H	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$1,557,581		20.1	3.3	1.3	766.6	66.3	N	Y
26-0608	City of Lake Forest	West Fork Chicago River	Wetland Restoration	Create new wetland.	16.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$1,432,180		17.7	3.0	1.1	754.0	50.9	N	Y
25-0113	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	14.9	acre	M	L	1,2,3	LFOL, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$1,294,269		17.4	2.9	1.1	716.3	65.0	N	Y
24-0190	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	12.0	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$1,039,670		13.4	2.2	0.9	511.7	44.3	N	Y
25-0243	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	6.5	acre	H	M	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$562,771		12.8	1.9	1.0	526.8	26.7	N	Y
25-0888	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	6.5	acre	H	M	1,2,3	M, PO, LFOL, HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$566,401		9.3	1.5	0.6	373.0	29.0	N	Y
25-0906	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	7.9	acre	H	S	1,2,3	LCFPD, LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$683,424		7.1	1.2	0.5	331.2	25.1	N	N
24-0530	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	5.2	acre	L	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$451,035		6.7	1.1	0.5	319.7	19.6	N	N
25-0821	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	7.2	acre	H	S	1,2,3	M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$622,247		6.5	1.1	0.4	301.6	22.9	N	Y
26-0577	City of Lake Forest	West Fork Chicago River	Wetland Restoration	Create new wetland.	3.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$302,874		6.0	0.8	0.4	194.0	19.2	N	N
25-0542	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.9	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$256,264		5.5	0.9	0.4	247.2	11.5	N	N
24-1127	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	3.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$298,657		5.0	0.8	0.3	207.5	15.0	N	Y
25-0492	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$233,901		5.0	0.8	0.4	225.6	10.5	N	N
24-1079	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	3.3	acre	M	L	1,2,3	M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$285,575		4.8	0.7	0.3	198.4	14.3	N	N

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25-0891	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.9	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$338,921		4.7	0.7	0.3	163.9	19.1	N	Y
24-1043	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	3.0	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$262,236		4.4	0.7	0.3	182.2	13.1	N	Y
24-0510	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	2.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$207,876		4.3	0.6	0.3	175.1	12.8	N	N
24-0511	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	2.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$227,824		4.2	0.6	0.3	183.0	12.7	N	N
24-0646	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	3.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$324,290		4.2	0.7	0.3	159.6	13.8	N	N
25-0483	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$181,729		3.9	0.6	0.3	171.9	11.4	N	N
25-0883	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.1	acre	H	M	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$178,778		3.8	0.6	0.3	169.1	11.2	N	Y
24-0651	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	2.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$205,229		3.8	0.6	0.3	164.9	11.5	N	N
25-0814	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$217,381		3.7	0.6	0.2	145.6	12.1	N	Y
24-1083	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	2.5	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$213,244		3.6	0.5	0.2	148.2	10.7	N	N
26-0576	City of Lake Forest	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$148,345		2.9	0.4	0.2	95.0	9.4	N	N
24-1085	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.5	acre	M	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR	$128,041		2.9	0.4	0.2	120.6	6.0	N	N
26-0525	City of Lake Forest	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$131,275		2.9	0.4	0.2	111.1	8.5	N	N
24-0508	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$129,186		2.8	0.4	0.2	122.3	7.9	N	N
25-0878	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$272,733		2.6	0.5	0.2	118.5	8.7	N	Y
24-0625	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	2.8	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$247,765		2.6	0.4	0.1	96.4	10.1	N	N
25-0892	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.8	acre	M	L	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$244,813		2.6	0.4	0.2	118.7	9.0	N	Y
24-1000	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.9	acre	M	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$169,494		2.5	0.4	0.2	120.1	7.4	N	Y
25-0570	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$117,165		2.5	0.4	0.2	113.0	5.2	N	N
24-0535	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$109,406		2.5	0.4	0.2	103.1	5.1	N	N
25-0886	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.0	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$174,293		2.4	0.4	0.1	84.3	9.8	N	Y
24-0548	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	2.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$181,899		2.3	0.4	0.1	89.5	7.7	N	N
24-0515	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	2.0	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$173,599		2.2	0.4	0.1	85.4	7.4	N	N
25-0876	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$233,462		2.2	0.4	0.1	101.5	7.5	N	Y
25-0882	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$108,647		2.2	0.3	0.2	96.5	7.1	N	Y
25-0627	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$100,356		2.1	0.3	0.2	96.8	4.5	N	N
25-0705	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.3	acre	M	L	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$200,141		2.1	0.4	0.1	84.4	7.7	N	N
24-0534	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$84,216		1.9	0.3	0.1	79.3	3.9	N	N
25-0817	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$136,880		1.9	0.3	0.1	66.2	7.7	N	Y

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

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25-0459	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$196,508		1.9	0.4	0.1	85.4	6.3	N	N
24-0624	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	2.1	acre	M	L	1,2,3	PO, LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$178,400		1.9	0.3	0.1	69.4	7.3	N	N
24-0649	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$99,530		1.8	0.3	0.1	80.0	5.6	N	N
25-0910	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$90,555		1.8	0.3	0.1	80.4	5.9	N	Y
25-0805	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$105,319		1.8	0.3	0.1	70.5	5.8	N	N
25-0482	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$84,253		1.8	0.3	0.1	79.7	5.3	N	N
25-0598	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$174,744		1.8	0.3	0.1	73.6	6.7	N	N
24-1095	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.9	acre	M	L	1,2,3	M, LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$169,623		1.8	0.3	0.1	66.0	6.9	N	N
25-0528	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$80,975		1.7	0.3	0.1	76.6	5.1	N	N
25-0486	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$100,646		1.7	0.3	0.1	67.4	5.6	N	N
26-0562	City of Lake Forest	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$85,655		1.7	0.2	0.1	54.9	5.4	N	N
24-1091	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$73,423		1.7	0.3	0.1	69.2	3.4	N	N
24-1099	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.8	acre	M	L	1,2,3	M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$158,399		1.6	0.3	0.1	61.7	6.5	N	N
24-0656	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.8	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$155,425		1.6	0.3	0.1	80.1	6.2	Y	N
25-0412	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$74,988		1.6	0.2	0.1	72.3	3.4	N	N
24-0613	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$67,746		1.6	0.2	0.1	67.8	3.3	N	N
25-0628	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.7	acre	M	L	1,2,3	LFOL, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$147,035		1.5	0.3	0.1	71.3	5.4	N	N
25-0546	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR	$70,943		1.5	0.2	0.1	67.1	4.4	N	N
24-1081	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.7	acre	H	S	1,2,3	M, LFOL, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$145,323		1.5	0.3	0.1	56.6	5.9	N	N
25-0820	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$91,101		1.5	0.2	0.1	60.0	4.7	N	Y
24-0482	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$81,288		1.5	0.2	0.1	65.3	4.5	N	N
25-0843	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	7.3	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$631,384		1.5	0.5	0.1	107.0	6.1	N	Y
24-1080	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$88,965		1.5	0.2	0.1	61.8	4.5	N	N
25-0885	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$102,751		1.4	0.2	0.1	49.7	5.8	N	Y
25-0461	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$65,387		1.4	0.2	0.1	63.1	2.9	N	N
24-0605	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$59,539		1.4	0.2	0.1	56.1	2.8	N	N
24-0506	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$58,479		1.3	0.2	0.1	55.1	2.7	N	N
25-0881	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$79,325		1.3	0.2	0.1	39.1	2.8	N	Y
24-1082	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.2	acre	H	S	1,2,3	LFOL, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$101,830		1.3	0.2	0.1	50.1	4.3	N	N

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24-0509	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$57,911		1.3	0.2	0.1	54.8	3.6	N	N
25-0887	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$74,476		1.2	0.2	0.1	49.0	3.8	N	Y
24-1098	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	1.3	acre	M	L	1,2,3	PO, LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$116,219		1.2	0.2	0.1	45.2	4.8	N	N
24-1093	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$52,611		1.2	0.2	0.1	49.6	2.5	N	N
25-0839	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$111,784		1.2	0.2	0.1	54.2	4.1	N	Y
24-0614	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$52,440		1.2	0.2	0.1	49.6	3.2	N	N
25-0430	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.4	acre	H	M	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$119,869		1.1	0.2	0.1	52.1	3.8	N	N
24-0576	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$76,070		1.1	0.2	0.1	53.9	3.3	N	N
24-0655	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$50,326		1.1	0.2	0.1	47.6	3.1	N	N
24-0658	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$54,866		1.1	0.2	0.1	47.3	3.5	N	N
25-0487	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$63,083		1.1	0.2	0.1	42.2	3.5	N	N
25-0480	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$54,877		1.1	0.2	0.1	44.4	3.7	N	N
25-0819	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO, LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$76,965		1.1	0.2	0.1	37.2	4.3	N	Y
24-0536	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$46,382		1.1	0.2	0.1	43.7	2.2	N	N
24-0557	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$63,077		1.0	0.2	0.1	35.6	2.4	N	N
24-0657	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$51,100		1.0	0.2	0.1	44.1	3.3	N	N
26-0535	City of Lake Forest	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$79,974		1.0	0.2	0.1	42.1	2.8	N	N
25-0429	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$45,538		1.0	0.2	0.1	43.9	2.0	N	N
24-0521	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$75,218		1.0	0.2	0.1	37.0	3.2	N	N
25-0626	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$44,330		0.9	0.1	0.1	42.8	2.0	N	N
25-0529	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$54,526		0.9	0.1	0.1	36.5	3.0	N	N
25-0631	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$43,934		0.9	0.1	0.1	42.4	2.0	N	N
25-0813	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$54,207		0.9	0.1	0.1	36.3	3.0	N	N
24-0654	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$41,793		0.9	0.1	0.1	39.6	2.6	N	N
25-0445	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$42,814		0.9	0.1	0.1	40.5	2.7	N	N
25-0568	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$42,569		0.9	0.1	0.1	41.1	1.9	N	N
24-0546	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$60,632		0.9	0.2	0.1	43.0	2.6	N	N
25-0541	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$52,068		0.9	0.1	0.1	25.7	1.9	N	N
24-0507	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$38,490		0.8	0.1	0.1	36.4	2.4	N	N

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25-0494	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$82,714		0.8	0.1	0.0	34.9	3.2	N	N
25-0418	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$79,502		0.8	0.1	0.1	38.5	2.9	N	N
24-0632	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$62,979		0.8	0.1	0.1	31.0	2.7	N	N
24-0584	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$34,843		0.8	0.1	0.1	34.9	1.7	N	N
25-0629	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$77,316		0.8	0.1	0.1	37.5	2.8	N	N
25-0759	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	PO, LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$77,162		0.8	0.1	0.1	37.4	2.8	N	Y
25-0417	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	H	S	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$74,436		0.8	0.1	0.0	36.1	2.7	N	N
25-0612	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M, T, PB&D	$37,577		0.7	0.1	0.1	28.1	1.5	N	N
24-0645	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$57,722		0.7	0.1	0.0	28.4	2.5	N	N
25-0880	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$77,357		0.7	0.1	0.0	33.6	2.5	N	Y
24-1101	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$69,567		0.7	0.1	0.0	27.1	2.8	N	N
25-0884	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$33,122		0.7	0.1	0.1	31.3	2.1	N	Y
25-0545	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$31,976		0.7	0.1	0.0	30.2	2.0	N	N
25-0889	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	H	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$49,287		0.7	0.1	0.0	23.8	2.8	N	Y
26-0560	City of Lake Forest	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$33,907		0.7	0.1	0.0	21.7	2.2	N	N
25-0484	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$40,657		0.7	0.1	0.0	26.8	2.1	N	N
25-0632	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$30,974		0.7	0.1	0.1	29.9	1.4	N	N
24-0545	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$43,967		0.7	0.1	0.0	31.2	1.9	N	N
25-0493	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR	$29,974		0.6	0.1	0.0	28.3	1.9	N	N
25-0548	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$38,302		0.6	0.1	0.0	25.2	2.0	N	N
24-0618	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$60,761		0.6	0.1	0.0	23.7	2.5	N	N
25-0428	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$29,490		0.6	0.1	0.0	28.4	1.3	N	N
25-0622	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$37,448		0.6	0.1	0.0	18.4	1.3	N	N
24-0626	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$59,876		0.6	0.1	0.0	23.3	2.4	N	N
25-0544	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$44,237		0.6	0.1	0.0	20.2	2.5	N	N
25-0481	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$30,550		0.6	0.1	0.0	24.7	2.1	N	N
24-0650	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$32,424		0.6	0.1	0.0	26.0	1.8	N	N
24-0554	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$36,330		0.6	0.1	0.0	20.5	1.4	N	N
25-0890	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$42,569		0.6	0.1	0.0	20.6	2.4	N	Y

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
24-0543	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$39,078		0.6	0.1	0.0	27.7	1.7	N	N
24-0582	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$38,922		0.6	0.1	0.0	27.6	1.7	N	N
24-0583	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$24,928		0.6	0.1	0.0	24.9	1.2	N	N
24-0551	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$34,053		0.6	0.1	0.0	23.7	1.7	N	N
25-0842	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$232,206		0.6	0.2	0.0	39.3	2.3	N	Y
25-0458	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$31,467		0.5	0.1	0.0	21.1	1.7	N	N
25-0904	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$51,062		0.5	0.1	0.0	24.7	1.9	N	N
25-0448	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$26,338		0.5	0.1	0.0	23.4	1.7	N	N
25-0600	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$51,491		0.5	0.1	0.0	21.7	2.0	N	N
24-0512	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$31,075		0.5	0.1	0.0	21.6	1.6	N	N
25-0875	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$54,252		0.5	0.1	0.0	23.6	1.7	N	Y
25-0877	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$52,819		0.5	0.1	0.0	23.0	1.7	N	Y
24-0606	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$22,111		0.5	0.1	0.0	20.8	1.0	N	N
25-0491	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,491		0.5	0.1	0.0	22.7	1.1	N	N
24-0639	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$38,733		0.5	0.1	0.0	19.1	1.6	N	N
25-0485	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$29,772		0.5	0.1	0.0	19.6	1.5	N	N
24-1086	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	H	S	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$46,742		0.5	0.1	0.0	18.2	1.9	N	N
25-0879	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$28,934		0.5	0.1	0.0	14.3	1.0	N	Y
25-0488	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$27,524		0.5	0.1	0.0	18.4	1.5	N	N
25-0516	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$34,350		0.5	0.1	0.0	16.6	1.9	N	N
25-0432	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$23,315		0.5	0.1	0.0	17.5	0.9	N	N
25-0449	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$22,838		0.5	0.1	0.0	20.3	1.5	N	N
25-0815	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$33,130		0.5	0.1	0.0	16.0	1.9	N	Y
24-1088	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	H	S	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$42,938		0.4	0.1	0.0	16.7	1.8	N	N
24-0553	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, RR	$27,201		0.4	0.1	0.0	15.4	1.0	N	N
25-0656	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$20,737		0.4	0.1	0.0	20.0	0.9	N	N
24-0633	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	H	S	1,2,3	PO, LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$42,697		0.4	0.1	0.0	16.6	1.7	N	N
24-0496	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$33,737		0.4	0.1	0.0	16.6	1.4	N	N
24-1089	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$41,959		0.4	0.1	0.0	16.3	1.7	N	N

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
25-0503	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$31,887		0.4	0.1	0.0	17.6	1.6	N	N
25-0447	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,268		0.4	0.1	0.0	18.9	1.4	N	N
25-0859	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	M	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$31,705		0.4	0.1	0.0	17.4	1.6	N	N
26-0601	City of Lake Forest	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,437		0.4	0.1	0.0	13.7	1.4	N	N
25-0416	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$39,020		0.4	0.1	0.0	18.9	1.4	N	N
25-0616	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$38,726		0.4	0.1	0.0	18.8	1.4	N	N
24-0622	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$18,070		0.4	0.1	0.0	17.1	1.1	N	N
25-0535	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,003		0.4	0.1	0.0	15.4	1.3	N	N
25-0812	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$22,929		0.4	0.1	0.0	15.4	1.3	N	N
25-0810	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	RR, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,972		0.4	0.1	0.0	15.8	1.2	N	N
24-0549	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$29,780		0.4	0.1	0.0	14.7	1.3	N	N
25-0597	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$37,092		0.4	0.1	0.0	15.6	1.4	N	N
24-0580	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$25,598		0.4	0.1	0.0	18.1	1.1	N	N
24-0541	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$25,252		0.4	0.1	0.0	17.9	1.1	N	N
25-0495	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$35,946		0.4	0.1	0.0	15.2	1.4	N	N
25-0689	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,076		0.4	0.1	0.0	16.5	0.8	N	N
25-0456	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$38,032		0.4	0.1	0.0	16.5	1.2	N	N
24-0703	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$18,203		0.4	0.1	0.0	15.7	1.2	N	N
25-0547	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	HOA, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,921		0.4	0.1	0.0	14.4	1.1	N	N
25-0455	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$36,493		0.3	0.1	0.0	15.9	1.2	N	N
25-0690	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$16,177		0.3	0.1	0.0	15.6	0.7	N	N
25-0444	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$16,070		0.3	0.1	0.0	15.2	1.0	N	N
24-0619	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$32,642		0.3	0.1	0.0	12.7	1.3	N	N
25-0457	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,321		0.3	0.1	0.0	14.8	0.7	N	N
24-0682	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,032		0.3	0.0	0.0	14.0	0.7	N	N
24-1100	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO, LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$30,971		0.3	0.1	0.0	12.1	1.3	N	N
24-0628	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	LFOL, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$30,295		0.3	0.1	0.0	11.8	1.2	N	N
25-0653	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$18,758		0.3	0.1	0.0	9.2	0.7	N	N
24-0694	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$18,383		0.3	0.0	0.0	12.8	0.9	N	N

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
25-0595	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$30,016		0.3	0.1	0.0	12.7	1.2	N	N
25-0695	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$18,513		0.3	0.0	0.0	12.2	0.9	N	N
24-0701	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$15,017		0.3	0.0	0.0	13.0	1.0	N	N
25-0651	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,653		0.3	0.0	0.0	11.6	0.9	N	N
25-0580	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$13,261		0.3	0.0	0.0	12.8	0.6	N	N
24-0627	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$27,185		0.3	0.0	0.0	10.6	1.1	N	N
24-0669	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO, RR	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,050		0.3	0.0	0.0	9.6	0.6	N	N
25-0818	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$19,947		0.3	0.0	0.0	9.6	1.1	N	Y
25-0654	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO, HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,742		0.3	0.0	0.0	12.3	0.6	N	N
25-0658	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$12,435		0.3	0.0	0.0	12.0	0.6	N	N
25-0116	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$19,054		0.3	0.0	0.0	9.2	1.1	N	Y
25-0649	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,245		0.3	0.0	0.0	10.2	0.8	N	N
25-0569	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,087		0.3	0.0	0.0	11.7	0.5	N	N
24-0552	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,369		0.3	0.0	0.0	10.7	0.8	N	N
24-1097	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO, LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$24,202		0.3	0.0	0.0	9.4	1.0	N	N
25-0601	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,869		0.2	0.0	0.0	10.1	0.9	N	N
24-0547	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$18,768		0.2	0.0	0.0	9.2	0.8	N	N
25-0460	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$25,140		0.2	0.0	0.0	10.9	0.8	N	N
25-0657	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,078		0.2	0.0	0.0	10.7	0.5	N	N
25-0650	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,475		0.2	0.0	0.0	9.6	0.9	N	N
25-0694	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$13,622		0.2	0.0	0.0	9.1	0.8	N	N
25-0621	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$13,895		0.2	0.0	0.0	6.8	0.5	N	N
25-0596	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$22,436		0.2	0.0	0.0	9.5	0.9	N	N
24-0520	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,387		0.2	0.0	0.0	8.6	0.7	N	N
24-0683	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,345		0.2	0.0	0.0	9.3	0.5	N	N
25-0866	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,711		0.2	0.0	0.0	8.6	0.8	N	N
25-0652	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,457		0.2	0.0	0.0	6.1	0.4	N	N
25-0828	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	H	S	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$19,873		0.2	0.0	0.0	9.6	0.7	N	Y
24-0702	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$10,366		0.2	0.0	0.0	8.9	0.7	N	N

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
24-0693	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$13,820		0.2	0.0	0.0	9.8	0.6	N	N
26-0589	City of Lake Forest	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,258		0.2	0.0	0.0	6.6	0.7	N	N
24-0670	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,740		0.2	0.0	0.0	8.2	0.6	N	N
25-0489	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,393		0.2	0.0	0.0	7.6	0.6	N	N
24-0544	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$13,082		0.2	0.0	0.0	9.3	0.6	N	N
24-1096	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	LFOL, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$18,673		0.2	0.0	0.0	7.3	0.8	N	N
24-1087	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$18,351		0.2	0.0	0.0	7.1	0.8	N	N
24-0677	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$14,732		0.2	0.0	0.0	7.3	0.6	N	N
25-0655	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO, HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$8,794		0.2	0.0	0.0	8.5	0.4	N	N
25-0811	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$13,790		0.2	0.0	0.0	7.6	0.7	N	N
24-1084	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	H	S	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,510		0.2	0.0	0.0	6.8	0.7	N	N
24-0681	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,745		0.2	0.0	0.0	8.3	0.5	N	N
24-0664	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,675		0.2	0.0	0.0	8.3	0.5	N	N
25-0413	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$46,126		0.2	0.0	0.0	9.1	0.4	N	N
25-0414	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	HOA, SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$45,753		0.2	0.0	0.0	9.1	0.4	N	N
24-0688	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	H	S	1,2,3	PO, LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,828		0.2	0.0	0.0	5.8	0.6	N	N
24-1078	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,460		0.1	0.0	0.0	5.6	0.5	N	N
25-0692	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$13,996		0.1	0.0	0.0	6.8	0.5	N	N
24-0697	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$13,843		0.1	0.0	0.0	7.1	0.5	Y	N
24-0581	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,598		0.1	0.0	0.0	6.8	0.4	N	N
25-0816	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,039		0.1	0.0	0.0	4.9	0.6	N	Y
24-1090	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,206		0.1	0.0	0.0	4.8	0.5	N	N
25-0659	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,767		0.1	0.0	0.0	5.2	0.4	N	N
25-0647	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,893		0.1	0.0	0.0	4.6	0.4	N	N
24-1094	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,748		0.1	0.0	0.0	4.2	0.4	N	N
24-0711	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	H	S	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,709		0.1	0.0	0.0	4.2	0.4	N	N
24-0620	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,698		0.1	0.0	0.0	3.8	0.4	N	N
25-0648	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,761		0.1	0.0	0.0	4.1	0.4	N	N
25-0645	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO, LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,644		0.1	0.0	0.0	4.1	0.4	N	N

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
25-0440	City of Lake Forest	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$8,890		0.1	0.0	0.0	3.7	0.3	N	N
24-0550	City of Lake Forest	Skokie River	Wetland Restoration	Create new wetland.	0.0	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$1,676		0.0	0.0	0.0	0.8	0.1	N	N
24-0233	City of North Chicago	Skokie River	Stormwater Infrastructure Retrofit	North & south of MLK, Jr. Dr., East of Hwy. 41 to Northern Ave. Local drainage problems. In 2006 WMB funding was provided to restore a detention pond on the Foss Park Golf Course to alleviate flooding.	1	each	H	S	2	PD, M, PO, SMC, SI	Illinois EPA, USACE	ND		0	0	0	0	0	N	Y
24-0274	City of North Chicago	Skokie River	Stormwater Infrastructure Retrofit	Hwy. 41 & Bonaparte Ave. Local drainage problems. Monitor and maintain culvert system to RR, provide detention in open space west of Hwy. 41, monitor new commercial development.	1	each	M	M	2	RR. DOT, M, SMC, PO	Illinois EPA	ND		0	0	0	0	0	N	Y
24-0290	City of North Chicago	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	4.9	acre	H	S	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, RR	$161,638		0	0	0	0	0	N	Y
24-0228	City of North Chicago	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	1.9	acre	H	S	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, DD	$62,538		0	0	0	0	0	N	Y
24-0282	City of North Chicago	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	18.1	acre	M	M	1,2,3	PO, RR	USFWS, USACE, SMC, Illinois EPA, M	$598,087		0	0	0	0	0	N	Y
24-1002	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	29.2	acre	H	M	1,2,3	SI, PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$2,540,462		98.5	12.9	7.3	3,790.1	174.2	N	Y
24-1056	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	19.0	acre	H	M	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$1,654,227		29.0	4.5	2.2	1,365.3	67.2	N	Y
24-1057	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	12.8	acre	M	L	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$1,117,006		19.6	3.0	1.5	921.9	45.4	N	Y
24-1055	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	5.8	acre	M	L	1,2,3	PO, PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$500,450		19.4	2.5	1.4	746.6	34.3	N	Y
24-1007	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	2.8	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$244,088		9.5	1.2	0.7	364.2	16.7	N	Y
24-1052	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	1.7	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR	$148,173		3.9	0.6	0.3	175.2	7.2	N	Y
24-0484	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	1.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$112,017		3.9	0.5	0.2	107.0	6.6	N	N
24-0532	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	2.4	acre	M	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR	$207,593		3.6	0.6	0.3	171.3	8.4	N	N
24-0609	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$110,100		3.2	0.4	0.2	129.2	5.6	N	N
24-1053	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$90,182		3.1	0.4	0.2	86.1	5.3	N	Y
24-1054	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	1.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$131,562		2.3	0.4	0.2	108.6	5.3	N	Y
24-0612	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$111,490		2.2	0.3	0.2	117.4	4.5	N	N
24-0533	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	1.1	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR	$99,765		1.7	0.3	0.1	82.3	4.1	N	N
24-0608	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$54,955		1.6	0.2	0.1	64.5	2.8	N	N
24-0611	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$68,833		1.4	0.2	0.1	72.5	2.8	N	N
24-0610	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$45,779		1.3	0.2	0.1	53.7	2.3	N	N
24-0531	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR	$68,580		1.2	0.2	0.1	56.6	2.8	N	N
24-1051	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.9	acre	H	M	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR	$76,521		0.9	0.1	0.1	41.7	1.9	N	Y
24-0309	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$44,912		0.8	0.1	0.1	37.1	1.8	N	Y
24-0685	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$20,996		0.7	0.1	0.1	21.0	1.2	N	N
24-0607	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$22,988		0.7	0.1	0.1	27.0	1.2	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
24-0501	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$34,581		0.6	0.1	0.0	28.5	1.4	N	N
24-0690	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$20,547		0.6	0.1	0.0	24.1	1.0	N	N
24-0579	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$47,384		0.6	0.1	0.0	25.8	1.1	N	N
24-0687	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$13,396		0.4	0.1	0.0	15.7	0.7	N	N
24-0689	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$11,508		0.3	0.0	0.0	13.5	0.6	N	N
24-0500	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$13,538		0.2	0.0	0.0	11.2	0.5	N	N
24-0542	City of North Chicago	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$8,744		0.2	0.0	0.0	9.2	0.4	N	N
24-0246	City of Park City	Skokie River	Water Infrastructure	Investigate potential illicit discharge.	1	each	H	S	1	LCHD, PO	SMC, M	$500		0	0	0	0	0	Y	Y
24-0601	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	9.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$812,312		23.4	3.3	1.8	1,088.4	50.5	N	N
24-0588	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	4.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$394,676		13.7	2.0	1.2	723.5	22.5	N	N
24-0602	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	2.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$182,039		5.9	0.8	0.5	284.4	11.5	N	N
24-1069	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	1.7	acre	L	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$144,307		4.7	0.7	0.4	225.5	9.1	N	Y
24-0598	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	1.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$124,988		4.1	0.6	0.3	195.3	7.9	N	N
24-1070	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$57,426		1.7	0.2	0.1	76.9	3.6	N	Y
24-0495	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$42,489		1.1	0.2	0.1	53.9	2.3	N	N
24-0597	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$25,271		0.7	0.1	0.1	33.9	1.6	N	N
24-0600	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$25,043		0.7	0.1	0.1	33.6	1.6	N	N
24-0679	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$16,415		0.5	0.1	0.0	22.0	1.0	N	N
24-0680	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,760		0.4	0.0	0.0	16.8	0.7	N	N
24-0678	City of Park City	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,944		0.3	0.0	0.0	15.5	0.6	N	N
24-0271	City of Waukegan	Skokie River	Flood Damage Reduction	Washington Street to Monroe Street. Local drainage problems. The Skokie Headwaters and North Chicago Flood Damage Reduction Feasibility Study provided a list of alternatives to reduce flooding in this area, including creation of additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	H	S	2	M	SMC	ND		0	0	0	0	0	Y	Y
24-0272	City of Waukegan	Skokie River	Flood Damage Reduction	Trailer Park & Radio Station, Hwy. 120 to north & Dixie Ave. Depressional storage flooding and overbank flooding, loss of access and damage to critical facility (radio station). Coordinate interjurisdictional investigation of expanding storage in the wetland complex located north of 120 (primarily in Waukegan). For structures, perform flood mitigation alternatives analysis. May recommend relocation of radio station.	1	each	H	S	2	SI, M	SMC	ND		0	0	0	0	0	Y	Y
24-0249	City of Waukegan	Skokie River	Stormwater Infrastructure Retrofit	Trailer Park & Radio Station, Hwy. 120 to north & Dixie Ave. Depressional storage flooding and overbank flooding, loss of access and damage to critical facility (radio station). Coordinate interjurisdictional investigation of expanding storage in the wetland complex located north of 120 (primarily in Waukegan). For structures, perform flood mitigation alternatives analysis. May recommend relocation of radio station.	1	each	H	S	2	SMC, M, PO	Illinois EPA, USACE	ND		0	0	0	0	0	N	Y

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25-0267	City of Waukegan	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	156.6	acre	H	S	1,2,3	PO, RR, HOA	USFWS, USACE, SMC, Illinois EPA, M, T, PB&D	$5,166,498		0	0	0	0	0	Y	Y
24-0293	City of Waukegan	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	28.6	acre	H	S	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, DD, M	$943,114		0	0	0	0	0	N	Y
24-1073	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	19.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$1,713,521		56.0	8.0	4.5	2,677.5	108.0	N	Y
25-0518	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	6.8	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$588,245		10.6	1.5	0.6	327.7	28.0	N	N
25-0517	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	5.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$457,869		8.2	1.2	0.5	255.0	21.8	N	N
25-0411	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.8	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$240,207		7.7	1.0	0.6	300.9	16.1	Y	N
24-0564	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	2.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$201,156		7.0	1.0	0.6	368.7	11.5	N	N
25-0508	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$213,415		6.8	0.9	0.5	267.3	14.3	Y	N
24-0527	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	2.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$214,980		6.2	0.9	0.5	288.0	13.4	N	N
24-0268	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	2.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$179,636		5.9	0.8	0.5	280.7	11.3	N	Y
25-0534	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.8	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$243,103		5.4	0.7	0.3	130.4	10.0	N	N
24-0565	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	1.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$146,729		5.1	0.7	0.4	269.0	8.4	N	N
24-0514	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	1.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$135,854		4.7	0.6	0.3	129.7	8.0	N	N
25-0442	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$197,798		4.4	0.5	0.3	106.1	8.1	N	N
25-0502	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$175,663		3.9	0.5	0.2	94.2	7.2	N	N
24-0617	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$112,705		3.7	0.5	0.3	176.1	7.1	N	N
24-0526	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	1.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$127,087		3.7	0.5	0.3	170.3	7.9	N	N
24-0528	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	1.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$118,372		3.4	0.5	0.3	158.6	7.4	N	N
24-0566	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	1.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$93,413		3.2	0.5	0.3	171.2	5.3	N	N
25-0446	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$107,071		3.2	0.5	0.3	155.0	7.3	N	N
24-0563	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$73,216		2.8	0.4	0.2	109.2	5.0	N	N
24-0586	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	1.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$96,071		2.8	0.4	0.2	128.7	6.0	N	N
24-0562	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$76,402		2.5	0.4	0.2	119.4	4.8	N	N
25-0806	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$132,668		2.4	0.3	0.1	73.9	6.3	N	N
25-0852	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$312,513		2.3	0.4	0.1	105.3	5.4	Y	Y
25-0854	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.1	acre	H	M	1,2,3	HOA, PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$186,957		2.2	0.4	0.2	114.4	6.4	N	Y
24-0570	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$83,985		2.2	0.3	0.2	99.3	4.1	N	N
24-1066	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$87,495		2.2	0.3	0.2	111.1	4.6	N	Y
25-0808	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$119,519		2.1	0.3	0.1	66.6	5.7	N	N

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25-0536	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$91,058		2.1	0.3	0.2	90.4	3.2	N	N
25-0533	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$96,182		2.1	0.3	0.1	51.6	3.9	N	N
25-0441	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$86,065		1.9	0.2	0.1	46.2	3.5	N	N
24-1072	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$55,842		1.8	0.3	0.1	87.3	3.5	N	Y
24-0603	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$55,628		1.8	0.3	0.1	86.9	3.5	N	N
24-0569	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$46,660		1.8	0.2	0.1	69.6	3.2	N	N
25-0851	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	H	S	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$97,997		1.8	0.2	0.1	54.6	4.7	Y	Y
24-0525	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$60,362		1.7	0.2	0.1	80.9	3.8	N	N
25-0611	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$49,361		1.6	0.2	0.1	61.8	3.3	Y	N
24-0621	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$36,953		1.4	0.2	0.1	55.1	2.5	N	N
24-0616	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$34,607		1.1	0.2	0.1	54.1	2.2	N	N
25-0507	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$59,127		1.1	0.1	0.1	32.9	2.8	N	N
24-1071	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$29,811		1.0	0.1	0.1	46.6	1.9	N	Y
25-0557	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$40,432		0.9	0.1	0.1	40.1	1.4	Y	N
24-0540	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$37,144		0.9	0.1	0.1	47.1	2.0	N	N
25-0809	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$48,601		0.9	0.1	0.1	27.1	2.3	N	N
25-0856	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$45,274		0.9	0.1	0.1	36.8	2.1	N	Y
24-0599	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,518		0.8	0.1	0.1	36.7	1.5	N	N
24-0539	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$30,180		0.7	0.1	0.1	38.3	1.6	N	N
25-0855	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	H	M	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$60,200		0.7	0.1	0.1	36.9	2.1	N	Y
25-0531	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$32,651		0.7	0.1	0.0	17.5	1.3	N	N
25-0564	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$30,855		0.7	0.1	0.0	16.6	1.3	N	N
25-0558	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,094		0.7	0.1	0.0	26.4	1.4	Y	N
24-0494	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,630		0.6	0.1	0.1	32.3	1.0	N	N
25-0539	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$27,706		0.5	0.1	0.0	22.5	1.3	N	N
25-0537	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,387		0.5	0.1	0.0	21.2	0.8	N	N
25-0807	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$26,979		0.5	0.1	0.0	15.0	1.3	N	N
24-0673	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,825		0.5	0.1	0.0	21.2	1.0	N	N
25-0560	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	M, HOA, PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$38,013		0.5	0.1	0.0	23.3	1.3	N	N

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Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
25-0538	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,949		0.5	0.1	0.0	19.5	1.1	N	N
25-0850	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	H	S	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$24,740		0.4	0.1	0.0	13.8	1.2	N	Y
25-0532	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$19,395		0.4	0.1	0.0	10.4	0.8	N	N
25-0853	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$56,824		0.4	0.1	0.0	19.2	1.0	Y	Y
25-0673	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,812		0.4	0.0	0.0	9.6	0.7	N	N
25-0858	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$20,405		0.4	0.1	0.0	16.6	0.9	N	Y
25-0676	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$20,207		0.4	0.1	0.0	16.4	0.9	N	N
25-0563	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,475		0.3	0.0	0.0	8.3	0.6	N	N
25-0675	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,703		0.3	0.0	0.0	15.5	0.7	N	N
25-0857	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$16,385		0.3	0.0	0.0	13.3	0.8	N	Y
24-0615	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$8,799		0.3	0.0	0.0	13.7	0.6	N	N
25-0559	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$8,923		0.3	0.0	0.0	11.2	0.6	Y	N
24-0524	City of Waukegan	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$8,411		0.3	0.0	0.0	13.1	0.5	N	N
25-0602	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	M	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$36,504		0.3	0.1	0.0	12.3	0.6	Y	N
25-0603	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	M	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$32,618		0.2	0.0	0.0	11.0	0.6	Y	N
25-0672	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$8,834		0.2	0.0	0.0	4.7	0.4	N	N
25-0674	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,113		0.2	0.0	0.0	9.3	0.5	N	N
25-0677	City of Waukegan	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,417		0.2	0.0	0.0	7.7	0.4	N	N
24-0438	Forest Preserve District of Cook County	Skokie River	Debris Jam	Remove accumulated sediment and debris.	1	each	M	L	2	FPDCC	MWRD	$87,000		0	0	0	0	0	Y	N
24-0434	Forest Preserve District of Cook County	Skokie River	Detention Basin Retrofit	1. Repair inlet. 2. Remove debris from outlet. 3. Stabilize shoreline erosion.	1	each	L	L	1,2	FPDCC	MWRD, Illinois EPA	$55,000		0	0	0	0	0	Y	N
24-0437	Forest Preserve District of Cook County	Skokie River	Flood Damage Reduction	Increase pump station capacity. See Village of Winnetka Stormwater Master Plan for additional information.	1	each	H	M	2	M	MWRD	$1,188,562		0	0	0	0	0	Y	N
24-0471	Forest Preserve District of Cook County	Skokie River	Shoreline Stabilization	Stabilize 10% of moderately eroding shoreline.	4,574	linear feet	L	L	1,3	FPDCC	Illinois EPA	$503,150		131.5	65.7	65.1	0.0	0.0	Y	N
24-0472	Forest Preserve District of Cook County	Skokie River	Shoreline Stabilization	Stabilize and restore shoreline.	3,127	linear feet	H	M	1,3	FPDCC	Illinois EPA	$343,933		89.9	44.9	44.5	0.0	0.0	Y	N
24-0473	Forest Preserve District of Cook County	Skokie River	Shoreline Stabilization	Stabilize and restore shoreline.	1,429	linear feet	H	M	1,3	FPDCC	Illinois EPA, DOT, M	$157,189		41.1	20.5	20.3	0.0	0.0	Y	N
26-0445	Forest Preserve District of Cook County	West Fork Chicago River	Stabilization	Stabilize eroding swale.	1	each	M	L	1	PO	MWRD, Illinois EPA	$5,500	$33,000	0.3	0.2	0.2	0.0	0.0	Y	N
26-0446	Forest Preserve District of Cook County	West Fork Chicago River	Stabilization	Stabilize eroding swale.	1	each	L	L	1	FPDCC	MWRD, Illinois EPA	$5,500	$33,000	0.0	0.0	0.0	0.0	0.0	Y	N
27-0010	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Stream Improvement	Stabilize and restore streambanks.	8,086	linear feet	H	L	1,3	FPDCC	MWRD, Illinois EPA, DOT, M	$2,627,858		707.2	353.6	350.1	0.0	0.0	Y	N
25-0391	Forest Preserve District of Cook County	Middle Fork Chicago River	Stream Improvement	Stabilize and restore streambanks.	5,614	linear feet	H	L	1,3	FPDCC	MWRD, Illinois EPA, DOT, M, T	$1,824,501		822.9	411.5	407.4	0.0	0.0	Y	N
27-0006	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	H	M	1	FPDCC	MWRD, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
27-0005	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	M	L	1	FPDCC	MWRD, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
27-0007	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	M	M	1	FPDCC	MWRD, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
24-1019	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	27.6	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$2,399,394		47.8	7.6	2.8	1,219.6	109.1	Y	N
25-0797	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	27.9	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, DD, M	$2,426,857		23.1	5.1	1.1	1,010.3	76.8	Y	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
26-0650	Forest Preserve District of Cook County	West Fork Chicago River	Wetland Restoration	Create new wetland.	9.8	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$850,217		15.6	2.2	0.8	398.3	54.7	N	N
27-0027	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	71.1	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M, T	$6,189,319		14.9	4.5	0.7	1,007.8	45.1	N	N
25-0800	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	16.2	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$1,413,106		13.5	3.0	0.6	588.3	44.7	Y	N
24-1027	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	6.8	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$587,455		11.6	1.7	0.6	260.7	32.3	N	N
27-0044	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	15.0	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$1,303,470		10.9	2.7	0.5	558.5	34.6	Y	N
24-1015	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	6.2	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$538,877		10.7	1.7	0.6	273.9	24.5	Y	N
26-0651	Forest Preserve District of Cook County	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.6	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, RR, T	$401,436		9.5	1.2	0.5	139.9	29.3	N	N
24-1017	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	7.0	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M, T	$607,992		9.2	1.3	0.4	140.8	42.0	Y	N
25-0762	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	5.9	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$510,159		8.8	1.3	0.4	169.0	31.9	Y	N
26-0660	Forest Preserve District of Cook County	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.1	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, RR, T	$355,654		8.7	1.1	0.4	147.8	25.5	N	N
25-0765	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	5.7	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M, T	$498,068		8.5	1.2	0.4	165.0	31.2	N	N
27-0018	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	4.2	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M, T	$363,456		8.1	1.1	0.4	146.3	23.7	N	N
27-0043	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	11.0	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$955,369		8.0	2.0	0.4	409.3	25.3	Y	N
25-0788	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	6.1	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$534,326		6.6	1.2	0.3	191.1	24.3	N	N
24-1018	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	4.6	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$402,450		6.1	0.9	0.2	93.2	27.8	Y	N
26-0655	Forest Preserve District of Cook County	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.3	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M, T	$197,101		5.1	0.7	0.3	119.2	10.5	N	N
27-0045	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	2.5	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$218,975		4.7	0.6	0.2	71.6	14.2	N	N
27-0032	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	2.0	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M, T	$175,625		4.4	0.6	0.2	68.3	13.4	Y	N
27-0023	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	20.0	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, T	$1,739,053		4.2	1.3	0.2	283.2	12.7	N	N
24-1016	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	2.1	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, T	$182,629		3.6	0.6	0.2	92.8	8.3	Y	N
24-1031	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	2.1	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$183,554		3.6	0.5	0.2	81.5	10.1	Y	N
25-0778	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.8	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$246,073		3.4	0.6	0.2	78.2	12.3	N	N
24-1028	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	22.6	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$1,968,109		3.4	1.3	0.2	315.7	8.6	Y	N
25-0780	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.7	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$233,578		3.3	0.5	0.2	74.2	11.7	N	N
25-0789	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.0	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, DD, M	$264,936		3.3	0.6	0.1	94.8	12.1	N	N
27-0046	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	1.6	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$142,393		3.2	0.4	0.2	57.3	9.3	N	N
24-1008	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$117,423		3.1	0.4	0.2	45.3	8.3	N	N
25-0779	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.5	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$213,572		3.0	0.5	0.1	67.8	10.7	N	N
25-0782	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.1	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$186,723		2.6	0.4	0.1	59.3	9.4	N	N
27-0039	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	1.6	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$141,056		2.5	0.4	0.1	52.8	7.7	N	N
26-0653	Forest Preserve District of Cook County	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$116,435		2.1	0.3	0.1	54.5	7.5	N	N
25-0798	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.5	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$221,007		2.1	0.5	0.1	92.0	7.0	Y	N
26-0647	Forest Preserve District of Cook County	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$115,250		2.0	0.3	0.1	45.1	5.9	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
25-0796	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.4	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, DD	$208,375		2.0	0.4	0.1	86.7	6.6	Y	N
24-1029	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	12.9	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$1,123,424		1.9	0.7	0.1	180.2	4.9	Y	N
25-0791	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.3	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, DD, M	$196,978		1.9	0.4	0.1	82.0	6.2	Y	N
27-0035	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	1.2	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$104,231		1.8	0.3	0.1	39.0	5.7	N	N
24-1023	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	11.7	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$1,021,163		1.8	0.7	0.1	163.8	4.4	Y	N
26-0649	Forest Preserve District of Cook County	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M, T	$58,840		1.4	0.2	0.1	20.5	4.3	N	N
26-0654	Forest Preserve District of Cook County	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$49,601		1.3	0.2	0.1	30.0	2.6	N	N
25-0785	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$91,487		1.3	0.2	0.1	29.1	4.6	N	N
24-1020	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$55,632		1.2	0.2	0.1	18.1	3.9	Y	N
25-0763	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.8	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$67,575		1.2	0.2	0.1	22.4	4.2	N	N
27-0040	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	0.9	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$78,040		1.1	0.2	0.0	27.5	4.0	N	N
25-0786	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$85,929		1.1	0.2	0.0	30.7	3.9	N	N
25-0795	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, DD	$108,910		1.0	0.2	0.0	45.3	3.4	Y	N
25-0787	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, RR, M	$84,182		1.0	0.2	0.0	30.1	3.8	N	N
24-1014	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$51,841		1.0	0.2	0.1	26.4	2.4	Y	N
27-0037	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	0.6	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$55,643		1.0	0.1	0.0	20.8	3.0	N	N
25-0764	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M, T	$53,891		0.9	0.1	0.0	17.9	3.4	N	N
25-0792	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, DD, M	$82,647		0.8	0.2	0.0	34.4	2.6	Y	N
27-0033	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	0.3	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$29,919		0.8	0.1	0.0	11.6	2.3	Y	N
24-1030	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	5.0	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$434,254		0.7	0.3	0.0	69.7	1.9	Y	N
24-1021	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$40,422		0.6	0.1	0.0	14.7	2.2	Y	N
25-0784	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$44,142		0.6	0.1	0.0	14.0	2.2	N	N
24-1024	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, M	$37,476		0.6	0.1	0.0	13.6	2.1	N	N
24-1022	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	3.9	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$343,172		0.6	0.2	0.0	55.0	1.5	Y	N
25-0760	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$31,479		0.5	0.1	0.0	10.4	2.0	N	N
24-1012	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, RR, M	$25,388		0.5	0.1	0.0	12.9	1.2	Y	N
27-0030	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	2.5	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$218,727		0.5	0.2	0.0	35.3	1.5	Y	N
24-1035	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	3.0	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$256,903		0.4	0.2	0.0	41.0	1.1	N	N
24-1026	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	2.7	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$232,625		0.4	0.2	0.0	37.3	1.0	Y	N
25-0793	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$39,762		0.4	0.1	0.0	16.6	1.3	Y	N
25-0783	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$30,429		0.4	0.1	0.0	10.9	1.4	N	N
25-0781	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$26,122		0.4	0.1	0.0	8.3	1.3	N	N
24-1013	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$14,493		0.3	0.0	0.0	7.4	0.7	Y	N
27-0031	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	1.3	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$117,079		0.3	0.1	0.0	18.9	0.8	Y	N
27-0028	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	1.1	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$96,743		0.2	0.1	0.0	15.8	0.7	N	N
25-0790	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, DD, M	$24,465		0.2	0.1	0.0	10.2	0.8	Y	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
27-0034	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	0.1	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$12,944		0.2	0.0	0.0	4.8	0.7	Y	N
27-0025	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, T	$89,257		0.2	0.1	0.0	14.5	0.6	N	N
24-1025	Forest Preserve District of Cook County	Skokie River	Wetland Restoration	Create new wetland.	1.1	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$94,631		0.2	0.1	0.0	15.2	0.4	Y	N
25-0761	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$9,447		0.2	0.0	0.0	3.1	0.6	N	N
27-0026	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR, T	$60,511		0.1	0.0	0.0	9.9	0.4	N	N
27-0024	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	0.7	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$56,900		0.1	0.0	0.0	9.2	0.4	Y	N
25-0799	Forest Preserve District of Cook County	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$10,847		0.1	0.0	0.0	4.5	0.3	Y	N
27-0021	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	0.4	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$37,602		0.1	0.0	0.0	6.1	0.3	Y	N
27-0029	Forest Preserve District of Cook County	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	0.2	acre	H	S	1,2,3	FPDCC	USFWS, USACE, Illinois EPA, IDNR	$14,575		0.0	0.0	0.0	2.4	0.1	Y	N
25-0362	Illinois State Toll Highway Authority	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	ISTHA, PO	SMC, Illinois EPA	$5,500	$33,000	2.1	1.0	1.0	0.0	0.0	Y	N
25-0263	Illinois State Toll Highway Authority	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	49.1	acre	H	S	1,2,3	PO, ISTHA	USFWS, USACE, SMC, Illinois EPA, DD, RR, M, T, PB&D	$1,618,766		0	0	0	0	0	N	Y
25-0135	Lake County Forest Preserve District	Middle Fork Chicago River	Debris Jam	Investigate and remove if determined problematic.	1	each	L	M	2	LCFPD		$0		0	0	0	0	0	Y	Y
25-0354	Lake County Forest Preserve District	Middle Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	LCFPD, DD, PO		$11,000		0	0	0	0	0	Y	N
25-0355	Lake County Forest Preserve District	Middle Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	LCFPD		$11,000		0	0	0	0	0	Y	N
25-0357	Lake County Forest Preserve District	Middle Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	LCFPD, DD		$11,000		0	0	0	0	0	Y	N
25-0375	Lake County Forest Preserve District	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	LCFPD, DD	SMC, Illinois EPA	$5,500	$33,000	3.3	1.7	1.6	0.0	0.0	Y	N
25-0382	Lake County Forest Preserve District	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	H	M	1	LCFPD, DD	SMC, Illinois EPA	$5,500	$33,000	3.3	1.7	1.6	0.0	0.0	Y	N
26-0465	Lake County Forest Preserve District	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	H	S	1	LCFPD, DD	SMC, Illinois EPA	$5,500	$33,000	1.4	0.7	0.7	0.0	0.0	Y	N
25-0232	Lake County Forest Preserve District	Middle Fork Chicago River	Stabilization	Banks severely eroded within swale. Stabilize erosion.	1	each	H	S	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0.9	0.4	0.4	0.0	0.0	Y	Y
25-0380	Lake County Forest Preserve District	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	L	L	1	LCFPD, DD	SMC, Illinois EPA	$5,500	$33,000	0.3	0.2	0.1	0.0	0.0	Y	N
25-0381	Lake County Forest Preserve District	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	L	L	1	LCFPD, DD	SMC, Illinois EPA	$5,500	$33,000	0.2	0.1	0.1	0.0	0.0	Y	N
25-0020	Lake County Forest Preserve District	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion. Remove debris.	1	each	H	S	1	DD, LCFPD	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0079	Lake County Forest Preserve District	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure.	1	each	H	S	1	DD, LCFPD	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0080	Lake County Forest Preserve District	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	H	S	1	DD, M, LCFPD	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0081	Lake County Forest Preserve District	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	H	S	1	DD, LCFPD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0200	Lake County Forest Preserve District	Skokie River	Water Infrastructure	Stabilize stream bank to reduce erosion under bridge.	1	each	M	M	1	DD, LCFPD	SMC, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
25-0142	Lake County Forest Preserve District	Middle Fork Chicago River	Water Infrastructure	Stabilize stream bank to reduce erosion under bridge.	1	each	L	L	1	LCFPD, DD	SMC, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
25-0141	Lake County Forest Preserve District	Middle Fork Chicago River	Water Infrastructure	Stabilize stream bank to reduce erosion under bridge.	1	each	M	M	1	LCFPD, DD	SMC, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
25-0262	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	60.1	acre	H	S	1,2,3	LCFPD, PO	USFWS, USACE, SMC, Illinois EPA, DD, M	$1,984,761		0	0	0	0	0	N	Y
25-0269	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	115.8	acre	H	S	1,2,3	LCFPD, SI, DOT, PO	USFWS, USACE, SMC, Illinois EPA, DD, M, T, PB&D	$3,821,363		0	0	0	0	0	N	Y
24-0306	Lake County Forest Preserve District	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	130.8	acre	H	S	1,2,3	LCFPD, PO, M, LBOL, LFOL, HOA	USFWS, USACE, SMC, Illinois EPA, DD, RR	$4,315,272		0	0	0	0	0	Y	Y
24-0231	Lake County Forest Preserve District	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	125.6	acre	H	S	1,2,3	LCFPD, PO, M	USFWS, USACE, SMC, Illinois EPA, DD, RR, T, PB&D	$4,145,873		0	0	0	0	0	N	Y
25-0258	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	84.1	acre	M	M	1,2,3	HOA, PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, RR, M, T, PB&D	$2,774,886		0	0	0	0	0	N	Y
25-0252	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	250.7	acre	H	S	1,2,3	LCFPD, PO, LFOL	USFWS, USACE, SMC, Illinois EPA, DD, RR, M, T, PB&D	$8,273,020		0	0	0	0	0	N	Y
25-0707	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	22.4	acre	H	S	1,2,3	LCFPD, M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$1,949,606		20.3	3.5	1.3	944.9	71.7	N	N
24-1068	Lake County Forest Preserve District	Skokie River	Wetland Restoration	Create new wetland.	5.5	acre	M	L	1,2,3	LCFPD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$479,817		13.6	1.9	1.0	525.5	26.4	N	Y
25-0869	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	9.5	acre	H	S	1,2,3	LCFPD, M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$824,430		11.1	1.8	0.7	452.3	40.5	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
25-0893	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	8.2	acre	M	L	1,2,3	LCFPD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$710,310		9.6	1.5	0.6	389.7	34.9	N	N
25-0898	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	6.9	acre	H	M	1,2,3	LCFPD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M, T, PB&D	$598,340		6.7	1.2	0.5	383.5	17.4	N	Y
25-0426	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	5.8	acre	H	M	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$504,711		5.2	0.9	0.3	212.7	19.5	N	N
25-0555	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	4.6	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$402,719		4.1	0.7	0.2	169.7	15.5	N	N
24-0637	Lake County Forest Preserve District	Skokie River	Wetland Restoration	Create new wetland.	3.3	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$288,529		3.8	0.6	0.3	178.7	11.4	N	N
25-0838	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	4.1	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$359,563		3.7	0.7	0.2	174.3	13.2	N	Y
25-0831	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.9	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$335,803		3.5	0.6	0.2	162.8	12.3	N	Y
25-0708	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.5	acre	H	S	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$306,597		3.2	0.6	0.2	148.6	11.3	N	N
25-0825	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	9.5	acre	H	S	1,2,3	LCFPD, M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, RR	$825,605		3.1	0.7	0.2	163.5	6.6	N	Y
25-0903	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.3	acre	H	M	1,2,3	LCFPD, DOT	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M, T, PB&D	$287,314		2.9	0.5	0.2	121.1	11.1	N	Y
25-0862	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	11.0	acre	H	M	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$959,744		2.4	0.8	0.2	209.2	7.4	N	N
25-0427	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.6	acre	H	M	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$227,168		2.3	0.4	0.1	95.7	8.8	N	N
25-0827	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.5	acre	H	S	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$214,703		2.2	0.4	0.1	104.1	7.9	N	Y
25-0902	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.7	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$236,987		2.2	0.4	0.1	96.6	8.5	N	Y
25-0617	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.4	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$119,094		2.2	0.3	0.1	47.2	5.3	N	N
25-0830	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	6.5	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$561,531		2.1	0.5	0.1	111.2	4.5	N	Y
25-0867	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.7	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$148,655		2.0	0.3	0.1	81.5	7.3	N	N
25-0868	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$99,452		2.0	0.3	0.1	88.3	6.5	N	N
25-0840	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.8	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, T, PB&D	$152,291		1.8	0.3	0.1	62.4	3.7	N	Y
25-0835	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.9	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$166,070		1.7	0.3	0.1	80.5	6.1	N	Y
25-0572	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.6	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$141,807		1.5	0.3	0.1	59.8	5.5	N	N
25-0554	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.6	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$137,151		1.4	0.2	0.1	57.8	5.3	N	N
25-0870	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	H	M	1,2,3	LCFPD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$77,334		1.3	0.2	0.1	51.8	4.3	N	N
26-0541	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.0	acre	M	L	1,2,3	LCFPD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$170,003		1.3	0.3	0.1	84.3	3.4	N	N
24-1064	Lake County Forest Preserve District	Skokie River	Wetland Restoration	Create new wetland.	1.3	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$109,239		1.3	0.2	0.1	59.5	2.6	N	Y
25-0829	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.7	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$325,130		1.2	0.3	0.1	64.4	2.6	N	Y
25-0589	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$49,262		1.2	0.2	0.1	35.7	2.2	N	N
25-0599	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$109,928		1.1	0.2	0.1	46.3	4.2	N	N

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26-0518	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$59,031		1.1	0.1	0.1	24.8	3.4	N	N
24-1065	Lake County Forest Preserve District	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$90,393		1.1	0.2	0.1	49.3	2.2	N	Y
25-0620	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$91,827		0.9	0.2	0.1	38.7	3.5	N	N
26-0548	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$117,066		0.9	0.2	0.1	58.0	2.3	N	N
25-0582	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	LCFPD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$40,803		0.9	0.1	0.1	29.0	1.7	N	N
25-0895	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.9	acre	L	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$339,963		0.9	0.3	0.1	74.1	2.6	N	N
25-0822	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	H	S	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$81,589		0.9	0.1	0.1	39.5	3.0	N	Y
25-0415	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	H	M	1,2,3	LCFPD, SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$46,581		0.8	0.1	0.1	32.6	2.5	N	N
25-0434	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, RR, T, PB&D	$34,485		0.7	0.1	0.0	24.5	1.5	N	N
26-0549	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$93,265		0.7	0.2	0.1	46.2	1.9	N	N
25-0575	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.8	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$65,726		0.7	0.1	0.0	27.7	2.5	N	N
25-0431	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.0	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$177,456		0.7	0.2	0.0	35.2	1.4	N	N
25-0706	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$58,621		0.6	0.1	0.0	24.7	2.3	N	N
24-0659	Lake County Forest Preserve District	Skokie River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	LCFPD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$44,607		0.6	0.1	0.0	27.6	1.8	N	N
25-0403	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$53,502		0.6	0.1	0.0	23.5	2.2	N	N
25-0826	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	H	S	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$54,053		0.6	0.1	0.0	26.2	2.0	N	Y
25-0553	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$54,231		0.6	0.1	0.0	22.9	2.1	N	N
25-0863	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.5	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$215,539		0.5	0.2	0.0	47.0	1.7	N	N
25-0905	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$51,364		0.5	0.1	0.0	21.6	2.0	N	N
25-0833	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.6	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$140,605		0.5	0.1	0.0	27.9	1.1	N	Y
25-0846	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	LCFPD, HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$80,696		0.5	0.1	0.0	25.0	1.5	N	Y
26-0550	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$62,120		0.5	0.1	0.0	30.8	1.2	N	N
25-0896	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.2	acre	L	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$188,592		0.5	0.1	0.0	41.1	1.5	N	N
25-0404	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$44,615		0.5	0.1	0.0	19.6	1.8	N	N
25-0664	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, T, PB&D	$20,055		0.4	0.1	0.0	14.3	0.8	N	N
24-1067	Lake County Forest Preserve District	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	LCFPD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,303		0.4	0.1	0.0	19.4	0.8	N	Y
25-0861	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$75,885		0.4	0.1	0.0	16.1	1.6	N	N
25-0402	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$33,953		0.4	0.1	0.0	14.9	1.4	N	N
25-0837	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$91,683		0.3	0.1	0.0	18.2	0.7	N	Y

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25-0644	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$18,589		0.3	0.1	0.0	14.7	1.0	N	N
25-0394	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,110		0.3	0.0	0.0	12.7	1.1	N	N
25-0643	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$17,840		0.3	0.0	0.0	14.1	0.9	N	N
25-0864	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,498		0.3	0.0	0.0	11.7	1.0	N	N
25-0704	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$27,564		0.3	0.0	0.0	11.6	1.1	N	N
25-0663	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,149		0.3	0.0	0.0	8.5	0.5	N	N
25-0665	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,138		0.3	0.0	0.0	8.6	0.5	N	N
25-0573	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$25,294		0.3	0.0	0.0	10.7	1.0	N	N
26-0547	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$32,156		0.3	0.1	0.0	15.9	0.6	N	N
26-0528	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$31,493		0.2	0.1	0.0	15.6	0.6	N	N
25-0633	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$10,221		0.2	0.0	0.0	7.4	0.5	N	N
25-0613	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$23,159		0.2	0.0	0.0	9.8	0.9	N	N
25-0684	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$10,086		0.2	0.0	0.0	7.3	0.5	N	N
26-0555	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$29,979		0.2	0.0	0.0	14.9	0.6	N	N
26-0607	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$12,169		0.2	0.0	0.0	5.1	0.7	N	N
25-0574	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,810		0.2	0.0	0.0	9.2	0.8	N	N
25-0824	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$59,513		0.2	0.1	0.0	11.8	0.5	N	Y
25-0832	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$57,210		0.2	0.1	0.0	11.3	0.5	N	Y
25-0823	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	H	M	1,2,3	LFOL	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$18,614		0.2	0.0	0.0	9.0	0.7	N	Y
26-0551	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$24,378		0.2	0.0	0.0	12.1	0.5	N	N
25-0836	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$17,903		0.2	0.0	0.0	8.7	0.7	N	Y
25-0849	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR	$26,445		0.2	0.0	0.0	8.2	0.5	N	Y
24-0692	Lake County Forest Preserve District	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$12,157		0.2	0.0	0.0	7.5	0.5	N	N
25-0865	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$10,601		0.1	0.0	0.0	5.8	0.5	N	N
25-0860	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	H	M	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$29,301		0.1	0.0	0.0	6.2	0.6	N	N
26-0592	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	LCFPD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$17,606		0.1	0.0	0.0	8.7	0.4	N	N
24-0560	Lake County Forest Preserve District	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$11,373		0.1	0.0	0.0	6.2	0.3	N	N
25-0703	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$13,024		0.1	0.0	0.0	5.5	0.5	N	N
25-0834	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	S	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$35,900		0.1	0.0	0.0	7.1	0.3	N	Y

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26-0667	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	LCFPD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$27,002		0.1	0.0	0.0	8.0	0.3	N	Y
26-0591	Lake County Forest Preserve District	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR	$16,756		0.1	0.0	0.0	8.3	0.3	N	N
25-0847	Lake County Forest Preserve District	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,026		0.1	0.0	0.0	3.4	0.2	N	Y
25-0175	Lake County Forest Preserve District	Middle Fork Chicago River	Stream Improvement	Remove debris in stream reach.	2,159	linear feet	L	M	2	LCFPD, DD	SMC	$10,000		0.0	0.0	0.0	0.0	0.0	N	Y
25-0356	Libertyville Township	Middle Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	RR	T, PB&D	$11,000		0	0	0	0	0	Y	N
25-0360	Libertyville Township	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	PO	SMC, Illinois EPA, T, PB&D	$5,500	$33,000	0.9	0.4	0.4	0.0	0.0	Y	N
25-0361	Libertyville Township	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	PO	SMC, Illinois EPA, T, PB&D	$5,500	$33,000	0.2	0.1	0.1	0.0	0.0	Y	N
25-0124	Libertyville Township	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Bradley Rd. & Forest Ave. Local drainage problems. Coordinate interjurisdictional investigation of expanding storage. Perform flood mitigation alternatives analysis.	1	each	M	M	2	SMC, M, T, PB&D	PO, Illinois EPA	ND		0	0	0	0	0	N	Y
25-0151	Libertyville Township	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Bradley Rd. & Forest Ave. Local drainage problems. Coordinate interjurisdictional investigation of expanding storage. Perform flood mitigation alternatives analysis.	1	each	M	M	2	SMC, M, T, PB&D	PO, Illinois EPA	ND		0	0	0	0	0	N	Y
25-0711	Libertyville Township	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	89.0	acre	H	S	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, RR, M, T, PB&D	$2,936,713		0	0	0	0	0	N	Y
24-0713	Libertyville Township	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	86.6	acre	H	S	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, M, T, PB&D	$2,857,567		0	0	0	0	0	N	Y
25-0028	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	86.5	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$7,527,006		161.2	21.8	9.6	4,318.4	312.4	N	Y
25-0179	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	46.8	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$4,068,906		24.7	5.1	1.5	1,261.1	74.5	N	Y
24-1113	Libertyville Township	Skokie River	Wetland Restoration	Create new wetland.	6.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$586,931		20.3	2.4	1.3	560.5	34.6	N	Y
25-0874	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	6.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$574,053		13.4	1.9	1.0	569.6	20.4	N	Y
25-0841	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	6.7	acre	H	M	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M, T, PB&D	$579,387		6.0	1.0	0.4	280.8	21.3	N	Y
25-0590	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.8	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M, T, PB&D	$241,930		5.7	0.8	0.4	175.2	11.0	N	N
25-0520	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$234,734		4.3	0.6	0.2	93.1	10.5	N	N
25-0410	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.4	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, T, PB&D	$118,825		4.0	0.5	0.3	106.0	8.2	Y	N
25-0433	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, T, PB&D	$95,270		3.2	0.4	0.2	107.9	6.6	Y	N
25-0712	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$198,651		2.9	0.5	0.2	136.6	5.2	N	Y
25-0522	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$146,663		2.7	0.3	0.1	58.2	6.6	N	N
25-0566	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	M	L	1,2,3	SI, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$116,453		2.5	0.3	0.2	82.8	4.9	N	N
24-1108	Libertyville Township	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$66,052		2.3	0.3	0.1	63.1	3.9	N	Y
24-1109	Libertyville Township	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$36,645		1.3	0.2	0.1	35.0	2.2	N	Y
25-0549	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$51,203		1.2	0.2	0.1	37.1	2.3	N	N
25-0443	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$64,730		1.2	0.2	0.1	25.7	2.9	N	N
25-0551	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$49,826		1.2	0.2	0.1	36.1	2.3	N	N
25-0438	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$98,904		1.1	0.2	0.1	40.5	2.4	N	N

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25-0845	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, T, PB&D	$186,397		1.1	0.2	0.1	57.8	3.4	N	Y
25-0848	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.1	acre	L	L	1,2,3	HOA, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$183,460		1.1	0.2	0.1	56.9	3.4	Y	Y
24-1111	Libertyville Township	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$25,364		0.9	0.1	0.1	24.2	1.5	N	Y
25-0804	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, PB&D	$56,805		0.9	0.1	0.1	40.7	2.8	N	N
25-0686	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$19,331		0.7	0.1	0.0	17.2	1.3	Y	N
25-0615	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$43,443		0.6	0.1	0.0	29.9	1.1	N	N
24-0671	Libertyville Township	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$18,615		0.5	0.1	0.0	21.8	1.0	N	N
24-0503	Libertyville Township	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$20,485		0.5	0.1	0.0	21.4	1.1	N	N
25-0844	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.8	acre	M	L	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$153,098		0.4	0.1	0.0	25.9	1.5	N	Y
25-0661	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$15,331		0.3	0.0	0.0	6.1	0.7	N	N
25-0873	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$9,938		0.2	0.0	0.0	9.9	0.4	N	Y
25-0872	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$9,787		0.2	0.0	0.0	9.7	0.3	N	Y
24-1102	Libertyville Township	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$10,827		0.2	0.0	0.0	7.3	0.3	N	Y
25-0614	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$11,701		0.2	0.0	0.0	8.0	0.3	N	N
25-0871	Libertyville Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$11,577		0.2	0.0	0.0	8.0	0.3	N	Y
26-0127	Maine Township	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	T	$0		0	0	0	0	0	Y	N
27-0022	Maine Township	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	3.0	acre	L	L	1,2,3	SI	USFWS, USACE, Illinois EPA, IDNR, M, T	$260,021		6.9	0.9	0.3	104.3	19.9	N	N
26-0435	Northfield Township	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	T	$0		0	0	0	0	0	Y	N
26-0130	Northfield Township	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	T	$0		0	0	0	0	0	Y	N
26-0137	Northfield Township	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	T	$0		0	0	0	0	0	Y	N
26-0452	Northfield Township	West Fork Chicago River	Water Infrastructure	Repair, replace, or remove hydraulic structure.	1	each	L	L	1	PO, T	MWRD, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	N
24-0252	Shields Township	Skokie River	Stormwater Infrastructure Retrofit	Talbot Ave., east of Illinois. Depressional storage flooding. May consider constructing swale to increase outlet capacity, improving internal drainage, provide additional storage.	1	each	M	M	2	PD, M, T, PB&D, SMC, PO	Illinois EPA	ND		0	0	0	0	0	N	Y
24-0253	Shields Township	Skokie River	Stormwater Infrastructure Retrofit	Muir Ave. Local drainage problems. Create additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	M	M	2	SMC, M, T, PB&D, PO	Illinois EPA	ND		0	0	0	0	0	N	Y
24-0255	Shields Township	Skokie River	Stormwater Infrastructure Retrofit	Knollwood Subdivision, Skokie Hwy. (Hwy. 41) & Smith Ave. Overbank flooding & local drainage problems. Funding was received in 2005 to study this area and develop alternatives to reduce flooding. The alternatives may include improve/maintain internal drainage system, expand existing detention, maintain/provide drainage along Hwy 41 ROW.	1	each	H	S	2	SMC, M, T, PB&D	Illinois EPA, USACE	ND		0	0	0	0	0	N	Y
24-0301	Shields Township	Skokie River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	5.6	acre	M	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, RR, M, T, PB&D	$186,422		0	0	0	0	0	N	Y
24-1103	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	19.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$1,661,319		29.0	4.1	2.1	1,118.7	41.8	N	Y
24-1110	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	8.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$702,054		24.3	2.9	1.5	670.5	41.4	N	Y
24-0485	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	4.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$371,697		12.9	1.7	0.9	371.4	22.1	N	N
24-1112	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	1.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$149,932		5.2	0.6	0.3	143.2	8.8	N	Y

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24-0487	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	2.0	acre	M	L	1,2,3	PO, NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, T, PB&D	$175,829		5.2	0.7	0.4	206.3	9.0	N	N
24-0153	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	2.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M, T, PB&D	$194,511		4.3	0.6	0.3	203.3	10.5	N	Y
24-1104	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	1.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$138,760		2.4	0.3	0.2	93.4	3.5	N	Y
24-1107	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$63,000		2.2	0.3	0.1	60.2	3.7	N	Y
24-0577	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$63,667		1.4	0.2	0.1	66.6	3.4	N	N
24-0589	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	HOA, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$66,433		1.1	0.2	0.1	41.1	3.4	N	N
24-1106	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$28,964		1.0	0.1	0.1	27.7	1.7	N	Y
24-0590	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, T, PB&D	$54,507		0.9	0.1	0.1	33.7	2.8	N	N
24-1105	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$50,221		0.9	0.1	0.1	33.8	1.3	N	Y
24-0571	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$31,084		0.7	0.1	0.1	32.5	1.7	N	N
24-1077	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$21,675		0.5	0.1	0.0	22.7	1.2	N	N
24-0575	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$18,897		0.4	0.1	0.0	19.8	1.0	N	N
24-0572	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$15,635		0.3	0.1	0.0	16.3	0.8	N	N
24-0499	Shields Township	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$8,923		0.2	0.0	0.0	9.3	0.5	N	N
25-0383	State of Illinois	Middle Fork Chicago River	Stream Improvement	Spot treat streambank erosion as needed.	630	linear feet	M	L	1,3	DD, SI, DOT, LCFPD	SMC, Illinois EPA, T, PB&D	$204,857		11.3	5.7	5.6	0.0	0.0	N	Y
24-0439	United States Department of the Navy	Skokie River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	DD, NAVY		$11,000		0	0	0	0	0	Y	N
24-0460	United States Department of the Navy	Skokie River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, NAVY	SMC, Illinois EPA	$5,500	$33,000	2.0	1.0	1.0	0.0	0.0	Y	N
24-0234	United States Department of the Navy	Skokie River	Stormwater Infrastructure Retrofit	Great Lakes Naval Training Center. Overbank flooding on golf course, housing in the floodplain. Continue to provide civilian personnel with technical assistance and map products. Perform stream maintenance activities on an annual basis to include debris and sediment removal. Provide additional depressional storage north of Hwy. 137 on golf course. The Skokie Headwaters and North Chicago Flood Damage Reduction Feasibility Study provided a list of alternatives to reduce flooding in this area.	1	each	L	L	2	NAVY, PO	SMC, Illinois EPA, USACE	ND		0	0	0	0	0	N	Y
24-0219	United States Department of the Navy	Skokie River	Stream Improvement	Stabilize and restore streambanks.	6,044	linear feet	M	M	1,3	DD, NAVY	SMC, Illinois EPA, DOT	$1,964,152		66.7	33.3	33.0	0.0	0.0	Y	Y
24-0213	United States Department of the Navy	Skokie River	Water Infrastructure	Determine if illicit discharge is present. Stabilize erosion. Repair outfall pipe and apron.	1	each	H	S	1	LCHD, DD, NAVY	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0214	United States Department of the Navy	Skokie River	Water Infrastructure	Determine if illicit discharge is present. Stabilize erosion. Repair outfall pipe. Extend discharge point to stream level or install energy dissipation structure.	1	each	H	S	1	LCHD, DD, NAVY	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0243	United States Department of the Navy	Skokie River	Water Infrastructure	Replace/repair hydraulic structure.	1	each	H	S	1	DD, NAVY	SMC, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0240	United States Department of the Navy	Skokie River	Water Infrastructure	Stabilize erosion. Replace/repair hydraulic structure.	1	each	H	S	1	DD, NAVY	SMC, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0241	United States Department of the Navy	Skokie River	Water Infrastructure	Stabilize erosion. Replace/repair hydraulic structure.	1	each	H	S	1	DD, NAVY	SMC, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0242	United States Department of the Navy	Skokie River	Water Infrastructure	Remove accumulated sediment in culvert.	1	each	H	S	2	DD, NAVY	Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0238	United States Department of the Navy	Skokie River	Water Infrastructure	Stabilize erosion.	1	each	M	M	1	DD, NAVY	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
24-0199	United States Department of the Navy	Skokie River	Water Infrastructure	Stabilize stream bank to reduce erosion under bridge.	1	each	M	M	1	DD, NAVY	SMC, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
24-0447	United States Department of the Navy	Skokie River	Water Infrastructure	Repair or replace discharge point.	1	each	H	M	1	DD, NAVY	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
24-0448	United States Department of the Navy	Skokie River	Water Infrastructure	Repair or replace discharge point.	1	each	M	L	1	DD, NAVY	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N

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24-0449	United States Department of the Navy	Skokie River	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	H	M	1	DD, NAVY	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
24-0450	United States Department of the Navy	Skokie River	Water Infrastructure	Repair or replace failing culvert.	1	each	L	L	1	DD, NAVY	SMC, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	N
24-0451	United States Department of the Navy	Skokie River	Water Infrastructure	Investigate potential illicit discharge.	1	each	H	S	1	LCHD, NAVY	DD	$500		0	0	0	0	0	Y	N
24-0452	United States Department of the Navy	Skokie River	Water Infrastructure	Remove debris and sediment obstructing flow.	1	each	L	S	2	DD, NAVY	Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	N
24-0453	United States Department of the Navy	Skokie River	Water Infrastructure	Investigate potential illicit discharge.	1	each	H	S	1	LCHD, NAVY	DD	$500		0	0	0	0	0	Y	N
24-0454	United States Department of the Navy	Skokie River	Water Infrastructure	Remove debris and sediment obstructing flow.	1	each	L	S	2	DD, NAVY	Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	N
24-0455	United States Department of the Navy	Skokie River	Water Infrastructure	Investigate potential illicit discharge.	1	each	H	S	1	LCHD, NAVY	DD	$500		0	0	0	0	0	Y	N
24-0486	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	7.4	acre	H	M	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$647,678		22.5	3.0	1.6	647.1	38.4	N	N
24-0489	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	8.8	acre	H	M	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$766,979		13.4	1.9	1.0	516.5	19.3	N	N
24-0488	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	3.8	acre	H	M	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$328,751		8.1	1.2	0.7	387.5	17.1	N	N
24-0634	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	3.9	acre	M	L	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, T, PB&D	$335,327		7.5	1.2	0.6	361.1	17.0	N	N
24-0490	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	2.1	acre	H	M	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$182,386		4.5	0.7	0.4	215.0	9.5	N	N
24-0635	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$82,616		1.8	0.3	0.1	89.0	4.2	N	N
24-0492	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	H	M	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$62,975		1.6	0.2	0.1	74.2	3.3	N	N
24-0493	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	H	M	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$73,354		1.3	0.2	0.1	49.4	1.8	N	N
24-0491	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	H	M	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$64,239		1.1	0.2	0.1	43.3	1.6	N	N
24-0498	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR	$32,494		0.7	0.1	0.1	35.0	1.6	N	N
24-0502	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR	$24,297		0.6	0.1	0.0	28.6	1.3	N	N
24-0686	United States Department of the Navy	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	NAVY	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$16,168		0.5	0.1	0.0	19.0	0.8	N	N
26-0458	Vernon Township	West Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	PO	T, PB&D	$11,000		0	0	0	0	0	Y	N
26-0459	Vernon Township	West Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	ISTHA	T, PB&D	$11,000		0	0	0	0	0	Y	N
26-0486	Vernon Township	West Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	56.5	acre	H	S	1,2,3	LFOL, PO	USFWS, USACE, SMC, Illinois EPA, M, T, PB&D, ISTHA	$1,864,124		0	0	0	0	0	Y	N
26-0712	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	6.8	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$589,956		7.6	1.2	0.5	296.4	19.2	N	N
26-0543	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	6.9	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$596,041		4.6	1.0	0.4	295.5	12.0	N	N
26-0715	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	3.9	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$341,462		4.4	0.7	0.3	171.5	11.1	N	N
26-0704	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.8	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$154,521		2.8	0.4	0.2	126.2	9.2	N	N
26-0705	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$72,327		1.0	0.2	0.1	65.4	2.0	N	N
26-0716	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$101,237		1.0	0.2	0.1	40.5	2.8	N	N
26-0504	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$92,561		0.7	0.2	0.1	45.9	1.9	N	N
26-0714	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$59,593		0.6	0.1	0.0	23.8	1.7	N	N
26-0713	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$54,181		0.5	0.1	0.0	21.7	1.5	N	N
26-0703	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$36,292		0.5	0.1	0.0	32.8	1.0	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
26-0708	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$30,784		0.4	0.1	0.0	15.5	1.0	N	N
26-0717	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	M	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$34,589		0.3	0.1	0.0	13.8	1.0	N	N
26-0710	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$22,720		0.3	0.0	0.0	11.4	0.7	N	N
26-0707	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$11,657		0.2	0.0	0.0	5.9	0.4	N	N
26-0709	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$10,546		0.1	0.0	0.0	5.3	0.3	N	N
26-0706	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$9,482		0.1	0.0	0.0	8.6	0.3	N	N
26-0711	Vernon Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$8,793		0.1	0.0	0.0	4.4	0.3	N	N
25-0219	Village of Bannockburn	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Illinois St. Local drainage problems. Create additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	L	L	2	RR, M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y
25-0220	Village of Bannockburn	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Meadow Lane & Aitken Dr. Depressional storage flooding. May consider constructing swale to increase outlet capacity, improving internal drainage, provide additional storage.	1	each	L	L	2	M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y
26-0462	Village of Bannockburn	West Fork Chicago River	Water Infrastructure	Remove debris and sediment obstructing flow.	1	each	M	L	2	DD, ISTHA	Illinois EPA, M	$11,000	$87,000	0	0	0	0	0	Y	N
26-0481	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.7	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$408,688		9.5	1.4	0.7	304.4	17.3	N	Y
26-0536	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$248,577		5.8	0.9	0.4	185.2	10.5	N	N
26-0538	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$219,195		5.1	0.8	0.4	163.3	9.3	N	N
26-0539	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$210,167		4.9	0.7	0.4	156.5	8.9	N	N
25-0471	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$264,809		4.6	0.7	0.3	185.5	14.4	N	N
25-0466	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$166,160		3.7	0.6	0.3	106.3	9.0	N	N
26-0489	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.8	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$155,532		3.6	0.5	0.3	115.9	6.6	N	N
25-0212	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.8	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$332,396		3.4	0.6	0.2	140.1	12.8	N	Y
26-0529	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$108,007		2.5	0.4	0.2	80.5	4.6	N	N
26-0530	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$161,203		2.5	0.4	0.1	78.7	9.6	N	N
25-0594	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$211,043		2.2	0.4	0.1	88.9	8.1	N	N
26-0510	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$89,372		2.1	0.3	0.2	66.6	3.8	N	N
26-0526	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$82,525		1.9	0.3	0.1	61.5	3.5	N	N
25-0453	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$108,810		1.9	0.3	0.1	86.1	5.6	N	N
26-0540	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$76,984		1.8	0.3	0.1	57.3	3.3	N	N
25-0469	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$74,650		1.7	0.3	0.1	47.8	4.0	N	N
25-0452	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$91,351		1.6	0.2	0.1	72.3	4.7	N	N
25-0467	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$87,673		1.5	0.2	0.1	61.4	4.8	N	N
25-0454	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$84,103		1.5	0.2	0.1	66.5	4.3	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
25-0473	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$83,178		1.4	0.2	0.1	58.3	4.5	N	N
25-0625	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$62,223		1.4	0.2	0.1	55.1	4.2	N	N
25-0592	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$132,816		1.4	0.2	0.1	56.0	5.1	N	N
25-0470	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$71,138		1.2	0.2	0.1	49.8	3.9	N	N
25-0468	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$53,687		1.2	0.2	0.1	34.4	2.9	N	N
25-0504	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$50,588		1.2	0.2	0.1	44.8	3.4	N	N
25-0607	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$60,668		1.1	0.2	0.1	48.0	3.1	N	N
26-0517	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$102,274		1.0	0.2	0.0	30.5	2.9	N	N
25-0506	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$53,145		0.9	0.1	0.1	42.0	2.7	N	N
26-0527	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$38,558		0.9	0.1	0.1	28.7	1.6	N	N
25-0465	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$47,811		0.8	0.1	0.1	33.5	2.6	N	N
26-0516	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$82,708		0.8	0.1	0.0	24.6	2.4	N	N
26-0537	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$32,141		0.7	0.1	0.1	23.9	1.4	N	N
25-0505	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$28,808		0.7	0.1	0.0	25.5	1.9	N	N
25-0514	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$27,898		0.6	0.1	0.0	17.9	1.5	N	N
25-0476	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$34,451		0.6	0.1	0.0	24.1	1.9	N	N
25-0609	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$33,206		0.6	0.1	0.0	26.3	1.7	N	N
25-0478	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$38,230		0.6	0.1	0.0	29.7	1.5	N	N
25-0475	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$31,439		0.5	0.1	0.0	22.0	1.7	N	N
25-0608	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$30,141		0.5	0.1	0.0	23.8	1.5	N	N
25-0496	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$34,380		0.5	0.1	0.0	26.7	1.4	N	N
25-0624	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$27,971		0.5	0.1	0.0	22.1	1.4	N	N
25-0593	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$47,150		0.5	0.1	0.0	19.9	1.8	N	N
26-0586	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$19,797		0.5	0.1	0.0	14.7	0.8	N	N
25-0610	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$26,056		0.5	0.1	0.0	20.6	1.3	N	N
25-0635	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$19,367		0.4	0.1	0.0	12.4	1.0	N	N
25-0591	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$24,285		0.4	0.1	0.0	19.2	1.2	N	N
25-0472	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$24,150		0.4	0.1	0.0	16.9	1.3	N	N
25-0477	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$28,735		0.4	0.1	0.0	22.3	1.2	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
25-0693	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,721		0.4	0.1	0.0	17.2	1.1	N	N
25-0642	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,260		0.4	0.1	0.0	16.8	1.1	N	N
25-0515	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$16,210		0.4	0.1	0.0	10.4	0.9	N	N
25-0479	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,342		0.3	0.1	0.0	16.6	0.9	N	N
25-0451	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$18,633		0.3	0.0	0.0	14.5	0.8	N	N
25-0700	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,848		0.3	0.0	0.0	10.4	0.8	N	N
25-0623	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,699		0.3	0.0	0.0	11.6	0.8	N	N
25-0637	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,462		0.3	0.0	0.0	11.4	0.7	N	N
25-0638	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,155		0.2	0.0	0.0	11.2	0.7	N	N
25-0640	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,095		0.2	0.0	0.0	11.2	0.7	N	N
25-0641	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,135		0.2	0.0	0.0	9.6	0.6	N	N
25-0450	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,517		0.2	0.0	0.0	6.7	0.5	N	N
25-0474	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,360		0.2	0.0	0.0	6.6	0.5	N	N
25-0639	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$8,981		0.2	0.0	0.0	7.1	0.5	N	N
25-0699	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$8,969		0.2	0.0	0.0	6.3	0.5	N	N
25-0698	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,559		0.2	0.0	0.0	8.2	0.4	N	N
25-0636	Village of Bannockburn	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR	$10,471		0.2	0.0	0.0	8.1	0.4	N	N
26-0581	Village of Bannockburn	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,646		0.1	0.0	0.0	4.7	0.5	N	N
25-0353	Village of Deerfield	Middle Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	DD, SI	M	$11,000		0	0	0	0	0	Y	N
26-0022	Village of Deerfield	West Fork Chicago River	Detention Basin Retrofit	Stabilize shoreline erosion	1	each	L	L	1	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0171	Village of Deerfield	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0172	Village of Deerfield	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0173	Village of Deerfield	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0182	Village of Deerfield	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0183	Village of Deerfield	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0184	Village of Deerfield	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0185	Village of Deerfield	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0186	Village of Deerfield	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0188	Village of Deerfield	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0193	Village of Deerfield	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
25-0371	Village of Deerfield	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	H	S	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	2.9	1.4	1.4	0.0	0.0	Y	N
26-0470	Village of Deerfield	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	2.2	1.1	1.1	0.0	0.0	Y	N
26-0471	Village of Deerfield	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	1.9	0.9	0.9	0.0	0.0	Y	N
26-0464	Village of Deerfield	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	1.5	0.7	0.7	0.0	0.0	Y	N
25-0372	Village of Deerfield	Middle Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	1.2	0.6	0.6	0.0	0.0	Y	N
26-0469	Village of Deerfield	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	H	S	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	1.0	0.5	0.5	0.0	0.0	Y	N
26-0475	Village of Deerfield	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	S	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0.8	0.4	0.4	0.0	0.0	Y	N
26-0463	Village of Deerfield	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	H	M	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0.6	0.3	0.3	0.0	0.0	Y	N
26-0472	Village of Deerfield	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0.5	0.3	0.3	0.0	0.0	Y	N

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26-0473	Village of Deerfield	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	L	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0.4	0.2	0.2	0.0	0.0	Y	N
26-0474	Village of Deerfield	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	H	M	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0.4	0.2	0.2	0.0	0.0	Y	N
25-0016	Village of Deerfield	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Kenton Road. Overbank flooding, storm sewer backup. Analyze storm sewer for flap-gate or other means of backflow prevention, consider floodproofing alternatives to protect structures.	1	each	M	M	2	M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y
26-0054	Village of Deerfield	West Fork Chicago River	Stormwater Infrastructure Retrofit	Laurel Ave. Overbank flooding, storm and sanitary sewer backup. Refer to Village Department of Public Works for retrofits or maintenance to culverts.	1	each	L	L	2	M, DOT	SMC, PO	ND		0	0	0	0	0	N	Y
25-0013	Village of Deerfield	Middle Fork Chicago River	Stream Improvement	Stabilize and restore streambanks.	1,366	linear feet	H	S	1,3	DD, SI	SMC, Illinois EPA, M	$444,074		13.6	6.8	6.7	0.0	0.0	Y	Y
26-0044	Village of Deerfield	West Fork Chicago River	Stream Improvement	Stabilize and restore streambanks.	2,751	linear feet	H	M	1,3	DD, PO	SMC, Illinois EPA, M	$894,075		62.7	31.3	31.0	0.0	0.0	Y	Y
26-0046	Village of Deerfield	West Fork Chicago River	Stream Improvement	Stabilize and restore streambanks.	1,841	linear feet	M	M	1,3	DD, PO	SMC, Illinois EPA, DOT, M	$598,269		64.0	32.0	31.7	0.0	0.0	Y	Y
26-0048	Village of Deerfield	West Fork Chicago River	Stream Improvement	Stabilize and restore streambanks.	3,888	linear feet	H	M	1,3	DD, PO, M	SMC, Illinois EPA, DOT	$1,263,599		246.7	123.4	122.1	0.0	0.0	Y	Y
26-0478	Village of Deerfield	West Fork Chicago River	Stream Improvement	Stabilize and restore streambanks.	4,819	linear feet	H	L	1,3	DD, M, PO, PD	SMC, Illinois EPA, DOT	$1,566,291		322.3	161.2	159.6	0.0	0.0	Y	N
25-0227	Village of Deerfield	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure.	1	each	L	M	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0230	Village of Deerfield	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	H	S	1	DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0233	Village of Deerfield	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	L	L	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0236	Village of Deerfield	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	L	L	1	DD, PO	SMC, Illinois EPA, M	$5,500	$33,000	0	0	0	0	0	Y	Y
26-0025	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Stabilize erosion, repair outfall pipe. Determine if illicit discharge is present.	1	each	H	S	1	LCHD, DD, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
26-0026	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Determine if illicit discharge is present.	1	each	H	S	1	LCHD, M	DD	$500		0	0	0	0	0	Y	Y
26-0027	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	M	M	1	DD, M	SMC, Illinois EPA	$5,500	$87,000	0	0	0	0	0	Y	Y
26-0030	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	M	M	1	DD, PO, M	SMC, Illinois EPA	$5,500	$87,000	0	0	0	0	0	Y	Y
26-0031	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure.	1	each	M	M	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
26-0032	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	M	M	1	DD, PO, M	SMC, Illinois EPA	$5,500	$87,000	0	0	0	0	0	Y	Y
26-0033	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure.	1	each	M	M	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
26-0034	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure.	1	each	H	S	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
26-0035	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Stabilize erosion. Extend discharge point to stream level or install energy dissipation structure. Remove concrete debris.	1	each	M	M	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	Y
25-0239	Village of Deerfield	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	H	S	1	SI	SMC, Illinois EPA, M	$5,500	$87,000	0	0	0	0	0	Y	Y
26-0055	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Inspect dam to ensure proper function. If in disrepair, investigate alternatives for dam removal or dam repair/replacement. Implement recommended alternative.	1	each	M	M	1,2	DD, HOA	Illinois EPA, M	$11,000	$87,000	0	0	0	0	0	Y	Y
25-0231	Village of Deerfield	Middle Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	H	S	1	DD, M	SMC, Illinois EPA	$5,500	$87,000	0	0	0	0	0	Y	Y
26-0447	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Repair or replace discharge point and remove sediment obstructing flow.	1	each	H	M	2	PO, M	MWRD, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
26-0029	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Stabilize erosion and extend discharge point to the stream baseflow elevation or install energy dissipation structure.	1	each	H	S	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
26-0460	Village of Deerfield	West Fork Chicago River	Water Infrastructure	Extend discharge point to the stream baseflow elevation and stabilize erosion.	1	each	H	M	1	DD, PO, M	SMC, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
25-0359	Village of Deerfield	Middle Fork Chicago River	Water Infrastructure	Remove debris and sediment obstructing flow. Inspect discharge point and repair or replace if needed.	1	each	H	S	2	DD, M	Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
26-0494	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	7.8	acre	H	M	1,2,3	SI, PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$677,463		17.3	2.5	1.3	799.5	47.0	N	N
26-0490	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	7.0	acre	H	M	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$605,358		16.0	2.3	1.2	638.0	37.1	N	N
26-0523	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	8.0	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$696,685		15.9	2.4	1.2	649.8	41.1	N	N
25-0407	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	6.8	acre	H	M	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$594,943		8.5	1.3	0.5	295.3	31.2	N	N
26-0656	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.8	acre	L	L	1,2,3	SI	USFWS, USACE, Illinois EPA, IDNR, RR, M, T	$245,979		8.1	1.0	0.4	126.9	21.2	Y	N
26-0491	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	3.5	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$306,847		7.9	1.1	0.6	367.5	21.1	N	N

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26-0497	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.8	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$416,957		7.3	1.1	0.5	355.5	21.9	N	N
25-0423	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.1	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$267,862		5.2	0.8	0.3	181.5	16.6	N	N
26-0495	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.3	acre	H	M	1,2,3	M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$197,680		4.5	0.7	0.3	184.4	11.7	N	N
25-0398	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.7	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$151,860		3.5	0.5	0.2	123.7	10.1	N	N
25-0424	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.6	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$141,701		2.8	0.4	0.2	108.2	8.9	N	N
26-0557	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$97,482		2.8	0.4	0.2	88.0	5.7	N	N
26-0524	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$110,761		2.5	0.4	0.2	103.3	6.5	N	N
26-0514	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.5	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$128,817		2.5	0.4	0.2	108.1	8.2	N	N
26-0519	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.6	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$136,679		2.4	0.4	0.2	116.5	7.2	N	N
26-0521	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	HOA, SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$81,867		2.3	0.3	0.2	73.9	4.7	N	N
26-0522	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$98,323		2.2	0.3	0.2	91.7	5.8	N	N
25-0463	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$234,240		1.9	0.4	0.1	108.7	5.6	N	N
25-0420	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$93,814		1.9	0.3	0.1	71.6	5.9	N	N
25-0393	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	H	M	1,2,3	PD, M, HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$102,541		1.8	0.3	0.1	77.3	5.6	N	N
25-0421	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.8	acre	H	M	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$73,043		1.6	0.2	0.1	46.7	4.0	N	N
25-0464	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$80,006		1.6	0.2	0.1	54.2	5.0	N	N
26-0513	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$58,531		1.5	0.2	0.1	69.1	4.1	N	N
26-0559	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$47,143		1.3	0.2	0.1	42.6	2.7	N	N
25-0422	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$63,373		1.1	0.2	0.1	47.8	3.5	N	N
25-0397	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$48,957		1.1	0.2	0.1	39.9	3.2	N	N
26-0492	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$38,285		1.0	0.1	0.1	45.9	2.6	N	N
26-0496	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$42,564		1.0	0.1	0.1	39.7	2.5	N	N
26-0558	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$32,769		0.9	0.1	0.1	29.6	1.9	N	N
25-0462	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$110,104		0.9	0.2	0.1	51.1	2.6	N	N
26-0498	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$33,142		0.8	0.1	0.1	30.9	2.0	N	N
25-0396	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$31,475		0.7	0.1	0.0	25.6	2.1	N	N
26-0575	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	H	M	1,2,3	PO, HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$33,892		0.7	0.1	0.0	28.4	2.2	N	N
26-0493	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	H	M	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$22,614		0.6	0.1	0.0	26.7	1.6	N	N
26-0520	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,647		0.5	0.1	0.0	23.2	1.5	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
26-0574	Village of Deerfield	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	H	M	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$23,267		0.4	0.1	0.0	19.5	1.5	N	N
25-0512	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$24,070		0.4	0.1	0.0	18.2	1.3	N	N
25-0701	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,084		0.4	0.1	0.0	16.1	1.3	N	N
25-0392	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$22,560		0.4	0.1	0.0	17.0	1.2	N	N
25-0691	Village of Deerfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$19,071		0.4	0.1	0.0	12.9	1.2	N	N
24-0432	Village of Glencoe	Skokie River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-1034	Village of Glencoe	Skokie River	Wetland Restoration	Create new wetland.	12.0	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$1,041,739		16.6	2.6	0.8	388.7	55.2	N	N
24-1032	Village of Glencoe	Skokie River	Wetland Restoration	Create new wetland.	5.2	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$450,523		7.2	1.1	0.3	168.1	23.9	N	N
26-0454	Village of Glenview	West Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	PO	MWRD, M	$11,000		0	0	0	0	0	Y	N
26-0455	Village of Glenview	West Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	PO	MWRD, M	$11,000		0	0	0	0	0	Y	N
26-0005	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0006	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0007	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0008	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	1. Unclog inlet. 2. Repair outlet. 3. Remove temporary construction shoring 4. Stabilize shoreline erosion	1	each	L	L	1,2	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0010	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Stabilize shoreline erosion	1	each	L	L	1	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0013	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0437	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0438	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0113	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0116	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Stabilize shoreline erosion.	1	each	L	L	1	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0139	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0225	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Stabilize shoreline erosion.	1	each	L	L	1	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0229	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0288	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0298	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0128	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0129	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0131	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0439	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0133	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0134	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0135	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0136	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0138	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0440	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0140	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0141	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0142	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0145	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0153	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0189	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0194	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0442	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0198	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0444	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0202	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0203	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0206	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0208	Village of Glenview	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0476	Village of Glenview	West Fork Chicago River	Shoreline Stabilization	Stabilize and restore shoreline.	1,001	linear feet	M	L	1,3	PD	Illinois EPA, M	$110,141		28.8	14.4	14.2	0.0	0.0	N	N
26-0477	Village of Glenview	West Fork Chicago River	Shoreline Stabilization	Stabilize and restore shoreline.	390	linear feet	L	L	1,3	PO	Illinois EPA, M	$42,888		11.2	5.6	0.0	0.0	0.0	N	N
26-0479	Village of Glenview	West Fork Chicago River	Stream Improvement	Stabilize and restore streambanks.	6,748	linear feet	H	L	1,3	PO	MWRD, Illinois EPA, M	$2,193,170		586.8	293.4	290.5	0.0	0.0	Y	N
26-0480	Village of Glenview	West Fork Chicago River	Stream Improvement	Stabilize and restore streambanks.	10,244	linear feet	H	L	1,3	PO	MWRD, Illinois EPA, DOT, M	$3,329,173		704.2	352.1	348.6	0.0	0.0	Y	N
26-0450	Village of Glenview	West Fork Chicago River	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	M	L	1	PO, M	MWRD, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
26-0451	Village of Glenview	West Fork Chicago River	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	M	L	1	PO, M	MWRD, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
27-0042	Village of Glenview	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	45.5	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$3,961,415		55.9	9.1	2.4	1,397.9	203.8	N	N
26-0630	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	12.1	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$1,052,051		26.4	3.7	1.5	400.3	62.9	N	N
26-0632	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	7.9	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$686,926		22.0	2.8	1.2	405.2	48.0	N	N
26-0626	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	6.8	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$591,872		14.8	1.9	0.7	210.5	45.3	Y	N
26-0621	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	5.4	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$471,095		11.1	1.4	0.5	168.0	34.8	N	N
26-0635	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.6	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M, T	$401,538		10.8	1.4	0.6	154.1	29.8	N	N
26-0620	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	6.9	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$600,843		10.0	1.5	0.4	198.2	35.9	N	N
26-0629	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.2	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$366,360		9.2	1.3	0.5	139.4	21.9	N	N
26-0619	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	6.3	acre	L	L	1,2,3	SI	USFWS, USACE, Illinois EPA, IDNR, M	$547,903		9.1	1.3	0.4	180.8	32.7	N	N
26-0628	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.1	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$360,103		9.0	1.3	0.5	137.0	21.5	N	N
26-0634	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.5	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$389,193		8.8	1.1	0.4	129.7	29.7	N	N
26-0664	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	3.6	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$314,302		7.9	1.1	0.5	119.6	18.8	N	N
26-0625	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	3.5	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$308,670		7.6	1.0	0.4	117.8	22.0	N	N
27-0036	Village of Glenview	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	5.4	acre	H	S	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$466,082		6.6	1.1	0.3	164.5	24.0	N	N
26-0623	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.7	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$238,351		5.6	0.7	0.3	85.0	17.6	N	N
26-0631	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.1	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, RR, M	$179,883		5.5	0.7	0.3	69.7	14.2	N	N
26-0633	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.3	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$203,867		4.6	0.6	0.2	67.9	15.5	N	N
26-0663	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.0	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M, T	$171,424		4.3	0.6	0.2	65.2	10.3	N	N
26-0665	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.6	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M, T	$139,807		3.3	0.4	0.2	49.9	10.3	N	N
26-0622	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.4	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$124,006		2.9	0.4	0.1	44.2	9.1	N	N
26-0624	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$114,928		2.8	0.4	0.1	43.8	8.2	N	N
27-0041	Village of Glenview	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	2.1	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$179,755		2.5	0.4	0.1	63.4	9.2	N	N
27-0038	Village of Glenview	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	1.8	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$157,846		2.2	0.4	0.1	55.7	8.1	N	N
26-0627	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M, T	$78,778		2.0	0.3	0.1	30.0	4.7	N	N
26-0662	Village of Glenview	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$79,481		1.8	0.2	0.1	26.5	6.1	N	N
26-0616	Village of Golf	West Fork Chicago River	Wetland Restoration	Create new wetland.	5.5	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$476,675		7.9	1.2	0.3	157.3	28.5	N	N
26-0618	Village of Golf	West Fork Chicago River	Wetland Restoration	Create new wetland.	5.4	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$468,108		7.8	1.1	0.3	154.4	28.0	N	N
26-0617	Village of Golf	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.0	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$344,322		5.7	0.8	0.2	113.6	20.6	N	N
26-0615	Village of Golf	West Fork Chicago River	Wetland Restoration	Create new wetland.	3.0	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$263,490		4.4	0.6	0.2	86.9	15.7	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
26-0611	Village of Golf	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$47,300		0.8	0.1	0.0	15.6	2.8	N	N
26-0612	Village of Golf	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$40,940		0.7	0.1	0.0	13.5	2.4	N	N
26-0613	Village of Golf	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$10,652		0.2	0.0	0.0	3.5	0.6	N	N
26-0614	Village of Golf	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$9,794		0.2	0.0	0.0	3.2	0.6	N	N
25-0384	Village of Green Oaks	Middle Fork Chicago River	Shoreline Stabilization	Stabilize and restore shoreline.	1,394	linear feet	M	L	1,3	M	SMC, Illinois EPA	$153,294		40.1	20.0	19.8	0.0	0.0	N	N
25-0385	Village of Green Oaks	Middle Fork Chicago River	Shoreline Stabilization	Stabilize and restore shoreline.	1,063	linear feet	H	M	1,3	PO, HOA	SMC, Illinois EPA, M	$116,919		30.6	15.3	15.1	0.0	0.0	N	N
25-0386	Village of Green Oaks	Middle Fork Chicago River	Shoreline Stabilization	Stabilize and restore shoreline.	1,472	linear feet	M	L	1,3	PO	SMC, Illinois EPA, M	$161,953		42.3	21.2	21.0	0.0	0.0	N	N
25-0031	Village of Green Oaks	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Kenton Lane. Overbank flooding (Doe Lake). Refer to Action Recommendations of the "Mitigation Study within the Village of Green Oaks," September 1997. See Atkinson Reservoir comments below.	1	each	H	S	2	M, SMC, PO	Illinois EPA	ND		0	0	0	0	0	N	Y
25-0123	Village of Green Oaks	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Hwy. 176 at Middle Fork. Overbank & road flooding, structures & scrapyard in floodway. Bring Area into NFIP compliance, re-study Atkinson Reservoir, lower in-channel control berm, bypass culvert.	1	each	M	M	2	SMC, M, DOT, PO	Illinois EPA	ND		0	0	0	0	0	Y	Y
25-0255	Village of Green Oaks	Middle Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	114.3	acre	L	L	1,2,3	HOA, PO, M, ISTHA	USFWS, USACE, SMC, Illinois EPA, T, PB&D	$3,770,727		0	0	0	0	0	N	Y
25-0513	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M, T, PB&D	$144,566		4.9	0.6	0.3	128.9	10.0	Y	N
25-0530	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, RR, M	$130,617		4.4	0.5	0.3	116.5	9.0	Y	N
25-0630	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.5	acre	H	S	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, RR, M	$126,743		4.2	0.6	0.3	143.5	8.8	Y	N
25-0540	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$285,726		3.0	0.5	0.2	105.7	11.4	N	N
25-0029	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	4.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$380,567		2.9	0.5	0.2	119.1	11.6	N	Y
25-0550	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$115,178		2.7	0.4	0.2	83.4	5.2	N	N
25-0577	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$201,094		2.1	0.3	0.1	74.4	8.0	N	N
25-0562	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$107,938		2.0	0.2	0.1	47.1	4.4	N	N
25-0586	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$124,899		1.9	0.3	0.1	61.9	6.5	N	N
25-0584	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$49,792		1.4	0.2	0.1	46.3	2.7	N	N
25-0497	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$90,951		1.0	0.2	0.1	33.6	3.6	N	N
25-0552	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$38,591		0.9	0.1	0.1	27.9	1.7	N	N
25-0687	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$20,983		0.7	0.1	0.0	18.7	1.5	Y	N
25-0605	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$37,881		0.7	0.1	0.0	21.1	1.8	N	N
25-0585	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$37,892		0.6	0.1	0.0	18.8	2.0	N	N
25-0576	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$49,997		0.5	0.1	0.0	18.5	2.0	N	N
25-0565	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$33,476		0.5	0.1	0.0	24.0	1.6	N	N
25-0581	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,637		0.5	0.1	0.0	16.4	1.0	N	N
25-0500	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$46,091		0.5	0.1	0.0	17.0	1.8	N	N

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25-0499	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$45,073		0.5	0.1	0.0	16.7	1.8	N	N
25-0678	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$18,410		0.3	0.0	0.0	10.3	0.9	N	N
25-0561	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,683		0.3	0.0	0.0	7.7	0.7	N	N
25-0437	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO, HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$27,216		0.3	0.0	0.0	11.1	0.7	N	N
25-0588	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$20,257		0.3	0.1	0.0	14.5	1.0	N	N
25-0509	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	RR, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$28,928		0.3	0.0	0.0	10.7	1.2	N	N
25-0498	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$25,145		0.3	0.0	0.0	9.3	1.0	N	N
25-0681	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	HOA, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$16,900		0.3	0.0	0.0	8.4	0.9	N	N
25-0666	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$19,552		0.2	0.0	0.0	7.2	0.8	N	N
25-0587	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,227		0.2	0.0	0.0	8.0	0.5	N	N
25-0519	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$27,831		0.2	0.0	0.0	8.6	0.5	N	N
25-0680	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$9,354		0.2	0.0	0.0	5.2	0.4	N	N
25-0669	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$21,172		0.2	0.0	0.0	6.6	0.6	N	N
25-0679	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$8,728		0.2	0.0	0.0	4.9	0.4	N	N
25-0683	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,122		0.1	0.0	0.0	5.2	0.6	N	N
25-0670	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,156		0.1	0.0	0.0	4.5	0.5	N	N
25-0579	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,001		0.1	0.0	0.0	4.5	0.5	N	N
25-0578	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,365		0.1	0.0	0.0	4.6	0.5	N	N
25-0668	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$16,783		0.1	0.0	0.0	5.3	0.5	N	N
25-0667	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$16,645		0.1	0.0	0.0	5.2	0.5	N	N
25-0671	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	H	M	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$7,025		0.1	0.0	0.0	3.9	0.3	N	N
25-0606	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,058		0.1	0.0	0.0	3.7	0.4	N	N
25-0682	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$13,346		0.1	0.0	0.0	4.2	0.4	N	N
25-0567	Village of Green Oaks	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,315		0.1	0.0	0.0	3.4	0.4	N	N
24-0672	Village of Gurnee	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$12,951		0.4	0.1	0.0	17.4	0.8	N	N
24-0513	Village of Gurnee	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,461		0.4	0.1	0.0	16.7	0.8	N	N
24-0440	Village of Lake Bluff	Skokie River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	DD, M		$11,000		0	0	0	0	0	Y	N
24-0441	Village of Lake Bluff	Skokie River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	DD, PD	M	$11,000		0	0	0	0	0	Y	N
24-0436	Village of Lake Bluff	Skokie River	Flood Damage Reduction	Identify flood reduction measures needed to reduce underpass flooding.	1	each	H	M	2	DOT, SMC	M	ND		0	0	0	0	0	Y	N
24-0461	Village of Lake Bluff	Skokie River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, PD	SMC, Illinois EPA, M	$5,500	$33,000	0.9	0.4	0.4	0.0	0.0	Y	N

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24-0154	Village of Lake Bluff	Skokie River	Stormwater Infrastructure Retrofit	Thornwood Lane at Skokie River. Overbank flooding. Perform ditch and culvert monitoring and maintenance.	1	each	M	M	2	M, PO, DOT	SMC	ND		0	0	0	0	0	Y	Y
24-0474	Village of Lake Bluff	Skokie River	Stream Improvement	Stabilize and restore streambanks.	3,831	linear feet	H	L	1,3	DD, PO	SMC, Illinois EPA, M	$1,245,157		18.2	9.1	9.0	0.0	0.0	Y	N
24-0476	Village of Lake Bluff	Skokie River	Wetland Enhancement	Determine wetland enhancement feasibility	6.5	acre	H	M	1,2,3	M, PO	USFWS, USACE, SMC, Illinois EPA, RR, T, PB&D	$213,309		0	0	0	0	0	N	N
24-0636	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	17.4	acre	M	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, RR, M	$1,512,212		33.6	5.0	2.6	1,580.8	81.9	N	N
24-0663	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	41.8	acre	M	L	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$3,636,671		19.7	5.0	1.4	1,355.2	49.9	N	N
24-0585	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	5.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$457,766		10.6	1.5	0.8	457.9	22.5	Y	N
24-0647	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	3.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$266,255		5.8	0.8	0.4	132.8	11.5	Y	N
24-1076	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	2.9	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$253,151		5.6	0.8	0.4	264.6	13.7	N	N
24-0662	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	11.3	acre	M	L	1,2,3	PD, M	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$985,791		5.3	1.3	0.4	367.4	13.5	N	N
24-0640	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	1.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$148,199		3.2	0.4	0.2	121.8	6.2	Y	N
24-0574	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	1.5	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$131,387		2.9	0.4	0.2	137.3	7.1	N	N
24-0578	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	1.2	acre	L	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$107,927		2.2	0.3	0.2	113.6	4.3	N	N
24-0573	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$88,127		2.0	0.3	0.2	92.1	4.8	N	N
24-0660	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	1.1	acre	H	S	1,2,3	M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD	$93,158		1.2	0.2	0.1	57.7	3.7	N	N
24-0648	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO, DOT	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$52,841		1.2	0.2	0.1	26.4	2.3	Y	N
24-0497	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO, HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$64,547		1.1	0.2	0.1	39.9	3.3	N	N
24-0661	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$60,223		0.9	0.1	0.1	31.3	2.0	N	N
24-1075	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$19,533		0.4	0.1	0.0	20.4	1.1	N	N
24-0623	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$64,416		0.3	0.1	0.0	24.0	0.9	N	N
24-0638	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	0.3	acre	H	S	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$26,218		0.3	0.1	0.0	16.2	1.0	N	N
24-0691	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$13,707		0.3	0.0	0.0	6.8	0.6	Y	N
24-0684	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO, PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,672		0.3	0.0	0.0	9.7	0.8	N	N
24-1074	Village of Lake Bluff	Skokie River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$9,524		0.2	0.0	0.0	10.0	0.5	N	N
26-0103	Village of Lincolnshire	West Fork Chicago River	Debris Jam	Investigate and remove if determined problematic.	1	each	L	L	2	ISTHA	M	$0		0	0	0	0	0	Y	Y
26-0457	Village of Lincolnshire	West Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	ISTHA	M	$11,000		0	0	0	0	0	Y	N
26-0466	Village of Lincolnshire	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	L	L	1	ISTHA	SMC, Illinois EPA, M	$5,500	$33,000	0.1	0.1	0.1	0.0	0.0	Y	N
26-0467	Village of Lincolnshire	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	M	1	ISTHA	SMC, Illinois EPA, M	$5,500	$33,000	0.1	0.0	0.0	0.0	0.0	Y	N
26-0079	Village of Lincolnshire	West Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	H	S	1	DD, SI	SMC, Illinois EPA, M	$5,500	$87,000	0	0	0	0	0	Y	Y
26-0073	Village of Lincolnshire	West Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	L	L	1	DD, SI	SMC, Illinois EPA, M	$5,500	$87,000	0	0	0	0	0	Y	Y
26-0074	Village of Lincolnshire	West Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	L	L	1	HOA, M	SMC, Illinois EPA	$5,500	$87,000	0	0	0	0	0	Y	Y
26-0556	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	11.2	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$975,936		7.6	1.6	0.6	483.9	19.6	N	N
26-0506	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	H	S	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, ISTHA, PB&D	$111,347		2.2	0.3	0.1	71.3	7.1	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
26-0503	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$120,807		2.0	0.3	0.2	113.6	5.3	N	N
26-0544	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.9	acre	M	L	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$252,091		2.0	0.4	0.1	125.0	5.1	N	N
26-0532	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.4	acre	M	L	1,2,3	M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$118,877		1.5	0.2	0.1	59.7	3.9	N	N
26-0500	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.8	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$70,340		1.2	0.2	0.1	66.1	3.1	N	N
26-0554	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$56,068		1.0	0.2	0.1	45.8	3.3	N	N
26-0563	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$53,528		1.0	0.2	0.1	41.5	3.4	N	N
26-0512	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$48,359		0.9	0.1	0.1	37.5	3.0	N	N
26-0542	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$116,005		0.9	0.2	0.1	57.5	2.3	N	N
26-0505	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	H	S	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR, ISTHA	$55,766		0.8	0.1	0.1	35.3	2.3	N	N
26-0502	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$38,394		0.6	0.1	0.0	36.1	1.7	N	N
26-0545	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$45,257		0.6	0.1	0.0	28.7	1.9	N	N
26-0507	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	H	S	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$29,493		0.6	0.1	0.0	18.9	1.9	N	N
26-0533	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$41,982		0.5	0.1	0.0	21.1	1.4	N	N
26-0564	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$31,733		0.5	0.1	0.0	29.8	1.4	N	N
26-0508	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	H	S	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$26,005		0.5	0.1	0.0	16.7	1.7	N	N
26-0534	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$36,925		0.5	0.1	0.0	18.6	1.2	N	N
26-0546	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$29,297		0.4	0.1	0.0	18.6	1.2	N	N
26-0587	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR	$21,609		0.4	0.1	0.0	17.6	1.3	N	N
26-0582	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$19,496		0.4	0.1	0.0	15.1	1.2	N	N
26-0595	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	H	S	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$16,536		0.3	0.0	0.0	10.6	1.0	N	N
26-0597	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$19,073		0.3	0.0	0.0	12.1	0.8	N	N
26-0585	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,120		0.3	0.0	0.0	14.2	0.7	N	N
26-0566	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$28,374		0.2	0.0	0.0	14.1	0.6	N	N
26-0598	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	H	S	1,2,3	M, ISTHA	USFWS, USACE, SMC, Illinois EPA, IDNR	$15,511		0.2	0.0	0.0	9.8	0.6	N	N
26-0583	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,482		0.2	0.0	0.0	11.7	0.6	N	N
26-0602	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$15,407		0.2	0.0	0.0	7.7	0.5	N	N
26-0596	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	H	S	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$9,766		0.2	0.0	0.0	6.3	0.6	N	N
26-0599	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	H	S	1,2,3	M, ISTHA	USFWS, USACE, SMC, Illinois EPA, IDNR	$13,921		0.2	0.0	0.0	8.8	0.6	N	N
26-0584	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,145		0.2	0.0	0.0	9.5	0.4	N	N

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
26-0590	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$10,993		0.1	0.0	0.0	7.0	0.5	N	N
26-0588	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR	$9,273		0.1	0.0	0.0	4.7	0.3	N	N
26-0531	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$9,221		0.1	0.0	0.0	4.6	0.3	N	N
26-0600	Village of Lincolnshire	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	H	S	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$13,901		0.1	0.0	0.0	6.9	0.3	N	N
25-0154	Village of Mettawa	Middle Fork Chicago River	Water Infrastructure	Remove debris under bridge. Stabilize stream bank to reduce erosion under bridge.	1	each	H	S	1,2	ISTHA	SMC, Illinois EPA, M	$11,000	$87,000	0	0	0	0	0	Y	Y
25-0153	Village of Mettawa	Middle Fork Chicago River	Water Infrastructure	Stabilize stream bank to reduce erosion near bridge.	1	each	H	S	1	M	SMC, Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	Y
26-0484	Village of Mettawa	West Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	10.5	acre	H	S	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, M	$347,341		0	0	0	0	0	N	Y
26-0485	Village of Mettawa	West Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	12.7	acre	H	S	1,2,3	PO, M, LCFPD	USFWS, USACE, SMC, Illinois EPA	$418,569		0	0	0	0	0	N	Y
25-0527	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$287,069		5.2	0.7	0.3	113.9	12.9	N	N
25-0571	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.6	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$224,526		4.5	0.7	0.3	168.1	9.0	N	N
25-0439	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	4.4	acre	L	L	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$385,204		4.4	0.7	0.3	157.8	9.5	N	N
25-0526	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$226,726		4.1	0.5	0.2	89.9	10.2	N	N
26-0683	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.9	acre	M	L	1,2,3	M, PO	USFWS, USACE, SMC, Illinois EPA, IDNR	$256,324		3.2	0.5	0.2	134.9	9.1	N	Y
26-0678	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$375,299		1.8	0.4	0.1	111.7	3.6	N	Y
26-0674	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$375,096		1.8	0.4	0.1	111.6	3.6	N	Y
25-0556	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.8	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$158,722		1.8	0.3	0.1	65.0	3.9	N	N
25-0524	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$82,992		1.5	0.2	0.1	32.9	3.7	N	N
25-0511	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.4	acre	L	L	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$122,980		1.4	0.2	0.1	50.4	3.0	N	N
25-0618	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$68,632		1.2	0.2	0.1	27.2	3.1	N	N
26-0670	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.8	acre	L	L	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$243,189		1.2	0.2	0.1	72.4	2.3	N	Y
25-0619	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$101,501		1.2	0.2	0.1	41.6	2.5	N	N
25-0523	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$53,371		1.0	0.1	0.1	21.2	2.4	N	N
25-0436	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$74,590		0.9	0.1	0.1	30.5	1.8	N	N
25-0583	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$28,837		0.8	0.1	0.1	26.8	1.6	N	N
25-0521	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$38,438		0.7	0.1	0.0	15.2	1.7	N	N
25-0525	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$34,032		0.6	0.1	0.0	13.5	1.5	N	N
25-0435	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$52,658		0.6	0.1	0.0	21.6	1.3	N	N
25-0501	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	HOA	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,874		0.5	0.1	0.0	17.9	1.0	N	N
26-0673	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$95,500		0.5	0.1	0.0	28.4	0.9	N	Y
26-0681	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR	$90,355		0.4	0.1	0.0	26.9	0.9	N	Y

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26-0677	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.0	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$83,265		0.4	0.1	0.0	24.8	0.8	N	Y
25-0685	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,183		0.4	0.1	0.0	13.2	0.8	N	N
26-0565	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.9	acre	M	L	1,2,3	M, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$77,373		0.4	0.1	0.0	23.0	0.7	N	N
25-0660	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$16,854		0.3	0.0	0.0	6.7	0.8	N	N
26-0573	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$60,607		0.3	0.1	0.0	18.0	0.6	N	N
25-0510	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$25,624		0.3	0.0	0.0	10.5	0.6	N	N
26-0668	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	L	L	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$57,551		0.3	0.1	0.0	17.1	0.6	N	Y
26-0675	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$55,576		0.3	0.1	0.0	16.5	0.5	N	Y
26-0682	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.6	acre	M	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR	$48,940		0.2	0.0	0.0	14.6	0.5	N	Y
25-0688	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,284		0.2	0.0	0.0	4.9	0.6	N	N
26-0676	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$37,658		0.2	0.0	0.0	11.2	0.4	N	Y
26-0679	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$33,101		0.2	0.0	0.0	9.9	0.3	N	Y
26-0552	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$28,263		0.1	0.0	0.0	8.4	0.3	N	N
25-0662	Village of Mettawa	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$11,526		0.1	0.0	0.0	4.7	0.3	N	N
26-0672	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$26,759		0.1	0.0	0.0	8.0	0.3	N	Y
26-0671	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$24,213		0.1	0.0	0.0	7.2	0.2	N	Y
26-0669	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO, LCFPD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$20,823		0.1	0.0	0.0	6.2	0.2	N	Y
26-0684	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	M	USFWS, USACE, SMC, Illinois EPA, IDNR	$18,541		0.1	0.0	0.0	5.5	0.2	N	Y
26-0594	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,584		0.1	0.0	0.0	5.2	0.2	N	N
26-0553	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$13,999		0.1	0.0	0.0	4.2	0.1	N	N
26-0680	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$13,421		0.1	0.0	0.0	4.0	0.1	N	Y
26-0509	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$10,303		0.1	0.0	0.0	3.1	0.1	N	N
26-0593	Village of Mettawa	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$9,369		0.0	0.0	0.0	2.8	0.1	N	N
27-0011	Village of Morton Grove	North Branch Chicago River Upstream	Detention Basin Retrofit	1. Stabilize shoreline erosion. 2. Remove debris from inlet.	1	each	L	L	1,2	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
27-0002	Village of Morton Grove	North Branch Chicago River Upstream	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
27-0003	Village of Morton Grove	North Branch Chicago River Upstream	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
27-0004	Village of Morton Grove	North Branch Chicago River Upstream	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
27-0016	Village of Morton Grove	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	6.5	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$562,500		14.9	1.9	0.7	225.7	43.0	N	N
27-0012	Village of Morton Grove	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	5.2	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$456,523		12.1	1.5	0.6	183.2	34.9	N	N
27-0017	Village of Morton Grove	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	4.7	acre	H	S	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$411,730		10.9	1.4	0.5	165.2	31.5	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
27-0014	Village of Morton Grove	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	4.4	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$386,038		10.2	1.3	0.5	154.9	29.5	N	N
27-0015	Village of Morton Grove	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	3.6	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$317,188		8.4	1.1	0.4	127.3	24.3	N	N
27-0013	Village of Morton Grove	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	0.9	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$80,297		2.1	0.3	0.1	32.2	6.1	N	N
26-0610	Village of Morton Grove	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.4	acre	H	S	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$120,808		2.0	0.3	0.1	39.9	7.2	N	N
26-0609	Village of Morton Grove	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	H	S	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$61,662		1.0	0.2	0.0	20.3	3.7	N	N
27-0019	Village of Morton Grove	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	3.5	acre	H	S	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$300,621		0.7	0.2	0.0	49.0	2.2	N	N
27-0020	Village of Morton Grove	North Branch Chicago River Upstream	Wetland Restoration	Create new wetland.	1.5	acre	H	S	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$132,150		0.3	0.1	0.0	21.3	0.9	Y	N
25-0352	Village of Northbrook	Middle Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	PO	MWRD, M	$11,000		0	0	0	0	0	Y	N
26-0016	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0018	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0020	Village of Northbrook	Skokie River	Detention Basin Retrofit	Stabilize shoreline erosion	1	each	L	L	1	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0023	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Install passive outlet	1	each	L	L	2	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
25-0329	Village of Northbrook	Middle Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0431	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	1. Stabilize shoreline erosion. 2. Stabilize inlets.	1	each	L	L	1	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
24-0039	Village of Northbrook	Skokie River	Detention Basin Retrofit	Remove sediment from outlet.	1	each	L	L	2	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0432	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0062	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0063	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0433	Village of Northbrook	Skokie River	Detention Basin Retrofit	1. Repair outlet and stabilize erosion. 2. Stabilize shoreline erosion	1	each	L	L	1	SI	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
25-0072	Village of Northbrook	Middle Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0078	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0433	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0085	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0434	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0094	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0095	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0096	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0098	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0100	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0102	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0436	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0132	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0175	Village of Northbrook	Skokie River	Detention Basin Retrofit	1. Unclog inlets and outlets. 2. Stabilize shoreline erosion	1	each	L	L	1,2	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
24-0177	Village of Northbrook	Skokie River	Detention Basin Retrofit	1. Stabilize shoreline erosion. 2. Remove accumulated sediment from basin 3. Add FES grates	1	each	L	L	1,2	SI	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0196	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	1. Stabilize shoreline erosion. 2. Unclog outlet. 3. Install flared end section grate on outlet	1	each	L	L	1,2	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0199	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0201	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0232	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0237	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
25-0350	Village of Northbrook	Middle Fork Chicago River	Detention Basin Retrofit	Stabilize shoreline erosion	1	each	L	L	1	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
25-0351	Village of Northbrook	Middle Fork Chicago River	Detention Basin Retrofit	Stabilize shoreline erosion	1	each	L	L	1	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
25-0285	Village of Northbrook	Middle Fork Chicago River	Detention Basin Retrofit	Stabilize shoreline erosion	1	each	L	L	1	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0295	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
25-0328	Village of Northbrook	Middle Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0337	Village of Northbrook	Skokie River	Detention Basin Retrofit	1. Stabilize inlet erosion. 2. Stabilize shoreline erosion.	1	each	L	L	1,2	SI	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0385	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0388	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Remove debris from inlet and outlet.	1	each	L	L	2	PO	MWRD, Illinois EPA, M	$5,000		0	0	0	0	0	Y	N
26-0430	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Stabilize shoreline erosion	1	each	L	L	1	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0143	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0144	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0146	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
26-0147	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0148	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0149	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0150	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0151	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0152	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0154	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0155	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0156	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0157	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0158	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0159	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0160	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0161	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0162	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0163	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0164	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0165	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0166	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0167	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0168	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0169	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0316	Village of Northbrook	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0317	Village of Northbrook	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
25-0276	Village of Northbrook	Middle Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0170	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0318	Village of Northbrook	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0174	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0175	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0176	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0177	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0178	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0179	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0180	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0181	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0322	Village of Northbrook	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0323	Village of Northbrook	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0187	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0190	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0191	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0192	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0195	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0441	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0443	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0200	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0204	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0205	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0207	Village of Northbrook	West Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0448	Village of Northbrook	West Fork Chicago River	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	H	M	1	PO, M	MWRD, Illinois EPA	$5,500	$33,000	0	0	0	0	0	Y	N
26-0449	Village of Northbrook	West Fork Chicago River	Water Infrastructure	Repair or replace discharge point and stabilize erosion.	1	each	H	M	1	PO	MWRD, Illinois EPA, M	$5,500	$33,000	0	0	0	0	0	Y	N
26-0453	Village of Northbrook	West Fork Chicago River	Water Infrastructure	Investigate potential illicit discharge.	1	each	H	S	1	MWRD, M		$500		0	0	0	0	0	Y	N
26-0646	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	37.0	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$3,218,583		57.0	8.9	2.9	1,260.0	164.6	N	N
24-1033	Village of Northbrook	Skokie River	Wetland Restoration	Create new wetland.	11.3	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$980,373		19.3	2.9	1.0	435.1	53.8	Y	N
25-0775	Village of Northbrook	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	9.2	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$797,549		14.4	2.1	0.7	219.5	48.5	N	N
26-0644	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	9.1	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M, T	$794,140		14.1	2.2	0.7	310.9	40.6	N	N
26-0643	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	6.8	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$588,803		14.0	1.8	0.7	197.2	45.0	N	N
25-0776	Village of Northbrook	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	5.6	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$489,721		8.9	1.3	0.4	134.8	29.8	N	N
26-0645	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	5.7	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M, T	$497,422		8.8	1.4	0.5	194.7	25.4	N	N
26-0636	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	3.7	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$323,466		7.9	1.0	0.4	90.7	24.1	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
26-0657	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.9	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$165,628		6.9	0.8	0.4	92.0	16.0	N	N
26-0661	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.8	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$242,641		5.5	0.7	0.3	80.9	18.5	N	N
26-0637	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	3.2	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$274,878		5.3	0.8	0.3	106.0	15.3	N	N
25-0777	Village of Northbrook	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.1	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$272,973		3.8	0.6	0.2	86.7	13.7	N	N
25-0801	Village of Northbrook	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.3	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$199,569		3.6	0.5	0.2	54.9	12.1	N	N
26-0638	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$114,232		3.4	0.5	0.2	35.7	7.7	N	N
26-0652	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$96,719		3.2	0.4	0.2	41.5	8.5	N	N
26-0639	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.2	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$106,312		2.0	0.3	0.1	41.0	5.9	N	N
26-0640	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$95,644		1.8	0.3	0.1	36.9	5.3	N	N
26-0659	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$99,461		1.8	0.3	0.1	38.9	5.1	N	N
25-0794	Village of Northbrook	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.1	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, DD, M	$180,066		1.7	0.4	0.1	75.0	5.7	Y	N
26-0658	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$42,400		1.4	0.2	0.1	18.2	3.7	N	N
26-0642	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.8	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$73,450		1.3	0.2	0.1	29.0	3.9	N	N
26-0648	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$33,017		0.6	0.1	0.0	12.9	1.7	N	N
26-0641	Village of Northbrook	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$27,676		0.5	0.1	0.0	10.9	1.5	N	N
25-0277	Village of Northfield	Middle Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0197	Village of Northfield	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
25-0330	Village of Northfield	Middle Fork Chicago River	Detention Basin Retrofit	Stabilize shoreline erosion.	1	each	L	L	1	PO	MWRD, Illinois EPA, M	$55,000		0	0	0	0	0	Y	N
26-0244	Village of Northfield	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
26-0380	Village of Northfield	West Fork Chicago River	Detention Basin Retrofit	Inventory Basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0315	Village of Northfield	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
25-0275	Village of Northfield	Middle Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
25-0278	Village of Northfield	Middle Fork Chicago River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
25-0389	Village of Northfield	Middle Fork Chicago River	Stream Improvement	Stabilize and restore streambanks.	19,252	linear feet	H	L	1,3	PO	MWRD, Illinois EPA, DOT, M	$6,256,950		2009.0	1004.5	994.6	0.0	0.0	Y	N
25-0390	Village of Northfield	Middle Fork Chicago River	Stream Improvement	Stabilize and restore streambanks.	4,343	linear feet	H	L	1,3	SI, PO	MWRD, Illinois EPA, DOT, M	$1,411,467		559.0	279.5	276.7	0.0	0.0	Y	N
25-0772	Village of Northfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	19.5	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$1,697,386		30.7	4.5	1.5	467.2	103.2	N	N
25-0774	Village of Northfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	10.2	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$888,171		16.1	2.4	0.8	244.4	54.0	N	N
25-0771	Village of Northfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	6.5	acre	H	S	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$567,296		13.0	1.7	0.6	186.0	42.7	N	N
25-0770	Village of Northfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	5.1	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$443,404		10.2	1.3	0.5	145.4	33.4	N	N
25-0773	Village of Northfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	6.1	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$534,401		9.7	1.4	0.5	147.1	32.5	N	N
25-0768	Village of Northfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	4.4	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$379,697		8.7	1.1	0.4	124.5	28.6	N	N
25-0767	Village of Northfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.9	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$342,801		7.9	1.0	0.4	112.4	25.8	N	N
25-0766	Village of Northfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.8	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$157,916		3.6	0.5	0.2	51.8	11.9	N	N
25-0802	Village of Northfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.0	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$176,491		3.2	0.5	0.2	48.6	10.7	N	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
25-0769	Village of Northfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	1.6	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$142,030		2.6	0.4	0.1	36.1	9.6	N	N
24-1037	Village of Northfield	Skokie River	Wetland Restoration	Create new wetland.	0.8	acre	H	S	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$73,074		1.5	0.2	0.1	37.1	3.3	Y	N
25-0803	Village of Northfield	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	0.0	acre	M	M	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$43		0.0	0.0	0.0	0.0	0.0	N	N
26-0092	Village of Riverwoods	West Fork Chicago River	Debris Jam	Investigate and remove if determined problematic.	1	each	L	L	2	DD, DOT	M	$0		0	0	0	0	0	Y	Y
26-0456	Village of Riverwoods	West Fork Chicago River	Debris Jam	Remove debris obstructing flow using American Fisheries Society guidelines.	1	each	H	M	2	DD, PO	M	$11,000		0	0	0	0	0	Y	N
26-0090	Village of Riverwoods	West Fork Chicago River	Stormwater Infrastructure Retrofit	Duffy Lane. Local drainage problems. Create additional storage utilizing existing vacant land. Perform ditch and culvert monitoring and maintenance.	1	each	M	M	2	M, PO, DOT, SMC	Illinois EPA	ND		0	0	0	0	0	N	Y
26-0091	Village of Riverwoods	West Fork Chicago River	Stormwater Infrastructure Retrofit	Reservoir 27. Backwater flooding from Reservoir 27. Perform a complete review of operations of Reservoir 27.	1	each	M	M	2	M, PO, DOT, SMC	Illinois EPA, USACE	ND		0	0	0	0	0	N	Y
26-0082	Village of Riverwoods	West Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	M	M	1	PO, M	SMC, Illinois EPA	$5,500	$87,000	0	0	0	0	0	Y	Y
26-0461	Village of Riverwoods	West Fork Chicago River	Water Infrastructure	Remove debris and sediment obstructing flow.	1	each	M	S	2	PO, M	Illinois EPA	$11,000	$87,000	0	0	0	0	0	Y	N
26-0124	Village of Riverwoods	West Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	23.0	acre	H	S	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, M	$760,431		0	0	0	0	0	N	Y
26-0122	Village of Riverwoods	West Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	17.1	acre	H	S	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, DD, M, T, PB&D	$564,023		0	0	0	0	0	N	Y
26-0699	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	67.3	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$5,857,637		55.7	8.7	2.7	1,576.1	208.9	N	Y
26-0689	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	41.0	acre	M	L	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M, T, PB&D	$3,562,721		33.6	5.5	1.8	1,154.6	135.7	N	Y
26-0718	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	5.1	acre	L	L	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$441,358		12.6	1.7	0.8	398.5	25.6	N	Y
26-0694	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	13.6	acre	H	M	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$1,182,976		12.2	2.1	0.9	645.1	21.7	N	Y
26-0692	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	7.8	acre	H	M	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M, T, PB&D	$674,413		6.4	1.0	0.3	181.5	24.0	N	Y
26-0501	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.5	acre	H	M	1,2,3	SI, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M, T, PB&D	$387,731		5.6	0.9	0.4	234.0	20.0	N	N
26-0698	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	3.9	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$340,925		3.7	0.6	0.2	83.9	18.3	N	Y
26-0685	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.3	acre	L	L	1,2,3	PO, M	USFWS, USACE, SMC, Illinois EPA, IDNR	$375,097		3.5	0.6	0.2	121.6	14.3	N	Y
26-0691	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	4.0	acre	M	L	1,2,3	PD, PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$345,509		3.3	0.5	0.2	93.0	12.3	N	Y
26-0686	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.1	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$92,127		2.6	0.3	0.2	83.2	5.3	N	Y
26-0690	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	2.2	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$195,678		1.9	0.3	0.1	52.6	7.0	N	Y
26-0571	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$122,361		1.3	0.2	0.1	30.1	6.6	N	N
26-0693	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.8	acre	H	M	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M	$68,663		1.3	0.2	0.1	28.9	3.9	N	Y
26-0688	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	1.3	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$116,198		1.1	0.2	0.1	31.3	4.1	N	Y
26-0687	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$27,833		0.8	0.1	0.1	25.1	1.6	N	Y
26-0697	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.7	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$62,692		0.6	0.1	0.0	16.9	2.2	N	Y
26-0499	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$42,328		0.6	0.1	0.0	15.8	2.6	N	N
26-0488	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	H	M	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M, T, PB&D	$23,146		0.5	0.1	0.0	17.2	1.0	N	N

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
26-0511	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$35,173		0.5	0.1	0.0	13.2	2.1	N	N
26-0568	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$38,547		0.4	0.1	0.0	9.5	2.1	N	N
26-0696	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$35,684		0.3	0.1	0.0	9.6	1.3	N	Y
26-0572	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$23,632		0.3	0.0	0.0	8.8	1.4	N	N
26-0567	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$28,555		0.3	0.0	0.0	7.0	1.5	N	N
26-0695	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.4	acre	M	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$32,073		0.3	0.0	0.0	8.6	1.1	N	Y
26-0570	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$25,305		0.3	0.0	0.0	6.2	1.4	N	N
26-0569	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.3	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$22,255		0.2	0.0	0.0	5.5	1.2	N	N
26-0603	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$20,149		0.2	0.0	0.0	5.0	1.1	N	N
26-0606	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$20,451		0.2	0.0	0.0	6.6	0.8	N	N
26-0515	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO, PD	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$18,419		0.2	0.0	0.0	6.0	0.7	N	N
26-0604	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$17,398		0.2	0.0	0.0	5.6	0.7	N	N
26-0580	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,075		0.2	0.0	0.0	3.5	0.8	N	N
26-0605	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$15,882		0.1	0.0	0.0	5.1	0.6	N	N
26-0578	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$14,364		0.1	0.0	0.0	4.7	0.5	N	N
26-0561	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$12,822		0.1	0.0	0.0	4.2	0.5	N	N
26-0579	Village of Riverwoods	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.1	acre	L	L	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, M	$8,703		0.1	0.0	0.0	2.8	0.3	N	N
24-0310	Village of Skokie	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0311	Village of Skokie	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0312	Village of Skokie	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0319	Village of Skokie	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0320	Village of Skokie	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0321	Village of Skokie	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0324	Village of Skokie	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0325	Village of Skokie	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-1010	Village of Skokie	Skokie River	Wetland Restoration	Create new wetland.	35.3	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$3,075,277		81.4	10.7	4.3	1,185.9	218.3	N	N
24-1009	Village of Skokie	Skokie River	Wetland Restoration	Create new wetland.	2.0	acre	L	L	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$176,921		4.7	0.6	0.2	68.2	12.6	N	N
24-0313	Village of Wilmette	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-0314	Village of Wilmette	Skokie River	Detention Basin Retrofit	Inventory basin	1	each	L	L	5	MWRD	M	$0		0	0	0	0	0	Y	N
24-1011	Village of Wilmette	Skokie River	Wetland Restoration	Create new wetland.	5.6	acre	L	L	1,2,3	SI	USFWS, USACE, Illinois EPA, IDNR, M	$488,490		12.9	1.7	0.7	188.4	34.7	N	N
24-0469	Village of Winnetka	Skokie River	Infrastructure Management	Install trunk and relief sewers. Increase outlet size. See Village of Winnetka Stormwater Master Plan for additional information.	1	each	H	M	2	M	DOT	$4,266,924		0	0	0	0	0	N	N
24-0470	Village of Winnetka	Skokie River	Infrastructure Management	Install large storm sewers. See the “tunnel project” in the Village of Winnetka Stormwater Master Plan for additional information.	1	each	H	L	2	M	DOT	$34,469,048		0.0	0.0	0.0	0.0	0.0	N	N
24-1036	Village of Winnetka	Skokie River	Wetland Restoration	Create new wetland.	10.2	acre	H	S	1,2,3	PO	USFWS, USACE, Illinois EPA, IDNR, M	$883,834		18.5	2.5	0.9	287.1	61.7	N	N
26-0468	West Deerfield Township	West Fork Chicago River	Stabilization	Stabilize erosion.	1	each	M	M	1	DD, ISTHA	SMC, Illinois EPA, T, PB&D	$5,500	$33,000	0.5	0.2	0.2	0.0	0.0	Y	N

2022 North Branch Chicago River Watershed-Based Plan Site-Specific Action Plan Recommendations

Plan ID	Jurisdiction	Subwatershed	BMP Type	Action	Quantity	Quantity Unit	Priority	Time Frame	Plan Goals Addressed	Lead Partners	Supporting Partners	Cost Estimate (Low)	Cost Estimate (High)	Nitrogen Reduction (lb/yr)	Phosphorus Reduction (lb/yr)	Sediment Reduction (ton/yr)	Chloride Reduction (lb/yr)	Bacteria Reduction (billion CFU/yr)	In Critical Area?	In Previous Plan?
25-0193	West Deerfield Township	Middle Fork Chicago River	Stormwater Infrastructure Retrofit	Del Mar Woods Subdivision, Half Day Road to north, Birchwood Lane to Wildwood Lane. Depressional storage flooding and internal drainage. Complete sub-basin study and plan. May consider constructing swale to increase outlet capacity, improving internal drainage, using wetland restoration to provide additional storage.	1	each	H	S	2	SMC, M, T, PB&D, PO, DOT	Illinois EPA	ND		0	0	0	0	0	N	Y
26-0080	West Deerfield Township	West Fork Chicago River	Water Infrastructure	Stabilize erosion.	1	each	H	S	1	DD, ISTHA	SMC, Illinois EPA, T, PB&D	$5,500	$87,000	0	0	0	0	0	Y	Y
26-0125	West Deerfield Township	West Fork Chicago River	Wetland Enhancement	Enhance existing wetland to improve or increase wetland functions/services.	14.7	acre	H	S	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, T, PB&D	$484,894		0	0	0	0	0	N	Y
25-0900	West Deerfield Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	3.0	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M, T, PB&D	$257,791		2.9	0.5	0.2	165.2	7.5	N	Y
25-0901	West Deerfield Township	Middle Fork Chicago River	Wetland Restoration	Create new wetland.	2.1	acre	H	M	1,2,3	PO	USFWS, USACE, SMC, Illinois EPA, IDNR, DD, M, T, PB&D	$179,560		2.5	0.4	0.1	82.1	10.1	N	Y
26-0702	West Deerfield Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.5	acre	L	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$45,435		1.3	0.2	0.1	41.0	2.6	N	Y
26-0701	West Deerfield Township	West Fork Chicago River	Wetland Restoration	Create new wetland.	0.2	acre	M	L	1,2,3	SI	USFWS, USACE, SMC, Illinois EPA, IDNR, T, PB&D	$15,394		0.4	0.1	0.0	13.9	0.9	N	Y

APPENDIX N:
GIS DATA SOURCES

Appendix N: NBCR Watershed Data Sources

Data Sources (Year)	Chapters Referenced in
Chicago Metropolitan Agency for Planning	3,4
City of Highland Park (2019)	3
City of Highwood (2019)	3
City of North Chicago (2019)	3
City of Park City (2017)	3
City of Waukegan (2007)	3
Cook County GIS	3
Federal Emergency Management Agency	5
Forest Preserve District of Cook County	3
GIS Consortium (2019)	3, 4
Green Infrastructure Model and Strategy (GIMS) for Lake County, Illinois	3
Green Infrastructure Vision (GIV) (The Conservation Fund, Chicago Wilderness, Chicago Metropolitan Agency for Planning) (2018)	3
IEPA RMMS	3,7
Illinois Department of Natural Resources	3
Illinois Department of Transportation	3
Illinois Environmental Protection Agency (2019)	3
Illinois Natural History Survey	3
Lake County Department of Information and Technology, Gis & Mapping Division (2019)	3
Lake County Department of Transportation (2019)	3
Lake County Forest Preserve District	3
Lake County Stormwater Management Commission (2019,2020,2021)	3
Libertyville Township (2014)	3
Metropolitan Water Reclamation District of Greater Chicago	3?
Multi-Resolution Land Characteristics Consortium (2019)	3
U.S. Environmental Protection Agency (EPA) (2019)	3
U.S. Environmental Protection Agency (EPA) Enforcement and Compliance History Online (ECHO) (2019)	3
United States Census Bureau (2010, 2015)	3
United States Department of Agriculture National Resource Conservation Service	3
United States Geological Survey National Land Cover Database	4
V3 Companies, Ltd.	
Vernon Township (2017)	3
Village of Bannockburn (2019)	3
Village of Glencoe (2019)	3
Village of Green Oaks (2014)	3
Village of Gurnee (2019)	3
Village of Riverwoods (2019)	3
Warren Township (2017)	3