

Central South Branch Kishwaukee River Watershed-Based Plan

A WATERSHED-BASED GUIDE TO PROTECTING AND RESTORING WATERSHED HEALTH

BAXTER & WOODMAN Consulting Engineers



MARCH 2025

DeKalb County Soil & Water Conservation District

Central South Branch Kishwaukee River Watershed-Based Plan

A Watershed-Based Guide for Protecting and Restoring Watershed Health

Funding for this project provided, in part, by the Illinois Environmental Protection Agency through Section 319 of the Clean Water Act (#3192205)

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BAXTER & WOODMAN Consulting Engineers

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DEKALB COUNTY COMMUNITY FOUNDATION

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Rufus Ajayi acted as project manager for Illinois EPA's Bureau of Water while Dean Johnson (Executive Director of the DCSWCD) acted as Watershed Coordinator for the Steering Committee and worked closely with watershed partners and Baxter & Woodman (B&W) to produce the watershed planning document.

The Steering Committee consists of representatives from various municipal, governmental, private, and public organizations as well as local landowners. Key partners include DeKalb County Soil & Water Conservation District, the DeKalb County Community Foundation, DeKalb County, City of Genoa, Village of Kirkland, Village of Kingston, DeKalb County Forest Preserve District, Genoa Park District, and local landowners. These partners played an important role in providing input on plan content, watershed goals & objectives, various planning approaches, and input on potential watershed projects.

Baxter & Woodman (B&W) conducted analysis, presented at Steering Committee and stakeholder meetings, summarized results, and authored the CSBKR Watershed-Based Plan.

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Central South Branch Kishwaukee River Watershed-Based Plan

A WATERSHED-BASED GUIDE TO PROTECTING AND RESTORING WATERSHED HEALTH

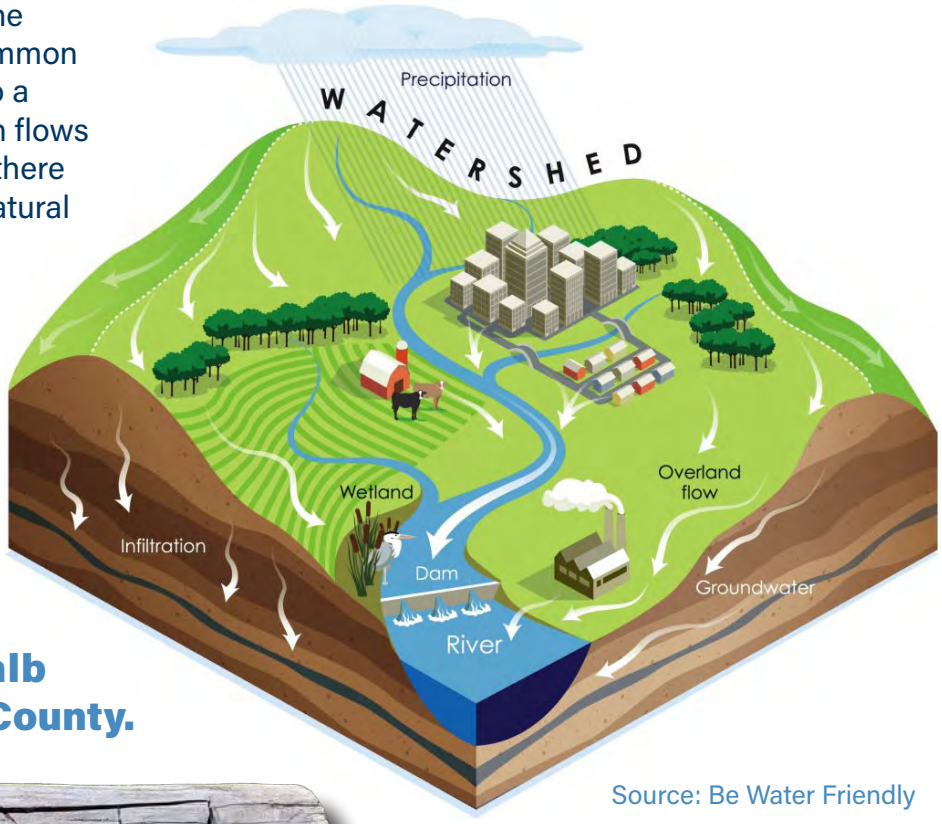
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EXECUTIVE SUMMARY
MARCH 2025

What is a watershed?

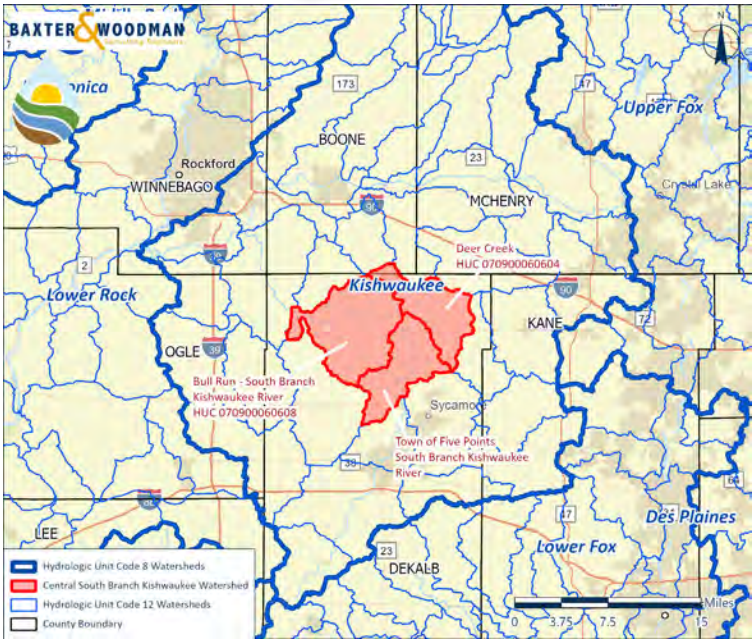
A watershed is the area of land where all the rain that falls on the surface drains to a common location such as a stream or lake, similar to a bathtub where all the water that falls within flows to the drain. Despite the simple definition, there is a complex interaction at play between natural elements (such as climate, surface water, vegetation, and wildlife) and human elements (such as development). Watersheds follow topography, not political boundaries.

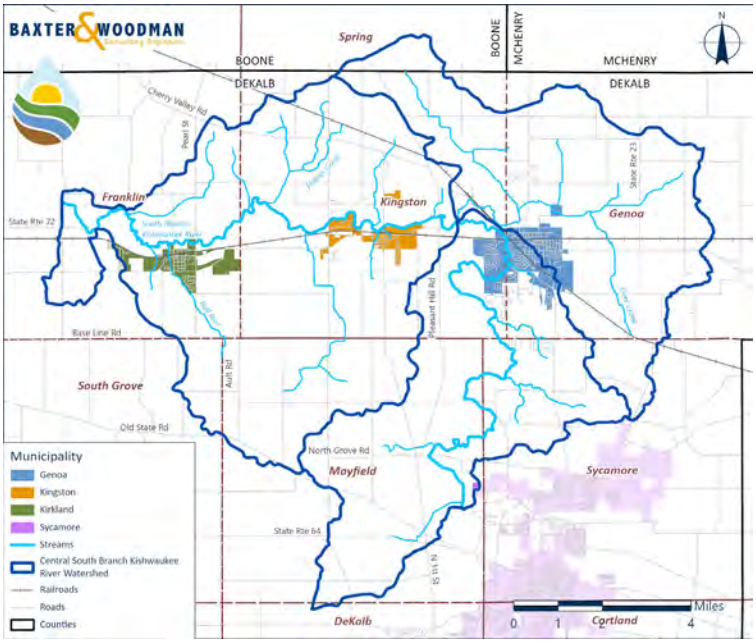


Source: Be Water Friendly

This plan is for the Central South Branch Kishwaukee River watershed. It is large, covering 103 square miles of rural, northern DeKalb County extending into Boone County.







- Includes Deer Creek (HUC 070900060604), Town of Five Points-South Branch Kishwaukee (HUC 070900060605), and Bull Run - South Branch Kishwaukee River (HUC 070900060608) subwatersheds.
- Begins in south near Sycamore and flows north to Genoa, then turns west, flowing through Kingston, Kirkland, and Kishwaukee River State Fish & Wildlife Area.
- Picks up Deer Creek, Haines Creek, Bull Run, and 13 unnamed tributaries on the way.

Planning Process

Watershed planning is a voluntary, community supported approach to protecting and improving water quality in streams, lakes, and wetlands, protecting groundwater resources, restoring habitat, providing recreational & educational opportunities, and improving quality of life for people. The Central South Branch Kishwaukee River (CSBKR) watershed planning process is supported by DeKalb County Soil and Water Conservation District, DeKalb County Community Foundation, DeKalb County Government, DeKalb County Forest Preserve District, the City of Genoa, and the Villages of Kirkland and Kingston, among others. The planning process involved countless volunteers hours from these partners, local residents, and technical experts. All of the partners recognize the value of addressing non-point source pollution.

The mission of the watershed plan is to improve water quality by reducing nonpoint source pollution, while preserving agricultural lands and improving habitat, along with increasing our knowledge to help improve the stewardship of the Central South Branch Kishwaukee River watershed.

Goals

1. *Encourage agricultural techniques and soil conservation practices that will protect and conserve topsoil, improve soil health, and protect our water resources.*
2. *Improve surface water quality to meet water quality standards.*
3. *Build stakeholder awareness of watershed issues through education and stewardship while increasing communication and coordination among stakeholders.*
4. *Protect and manage natural and cultural components of the Green Infrastructure Network and improve fish and wildlife habitat.*
5. *Protect groundwater quantity and quality.*



Landscape Change

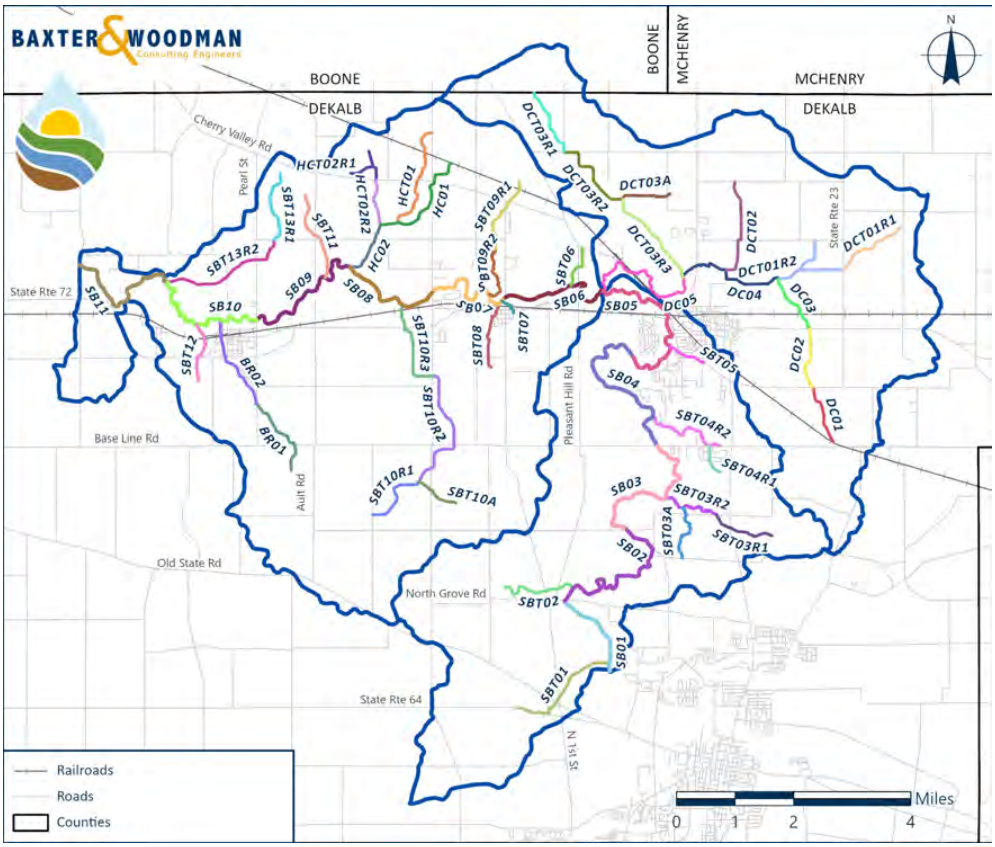
Pre-European settlement ecological communities in CSBKR watershed were balanced ecosystems with clean water and diverse plant and wildlife populations. The mosaic of open prairie, wetlands, and oak woodlands were largely maintained by frequent fires ignited by both lightning and the Native Americans that inhabited the area. Herds of bison and elk helped maintain the ecosystem by large scale grazing. During these times most of the water that fell as precipitation was absorbed in prairie and wooded communities and within the extensive wet prairies that likely existed where the upper stream and tributaries exist today.



Ecological conditions changed quickly and drastically following European settlement in the mid-1800s. Large scale fires ceased, and bison and elk were extirpated. Most wooded communities were harvested, prairies were tilled, and tile systems were installed to drain wetlands as farming became the primary land use. Development patterns continued to urbanize within the Genoa, Kirkland, and Kingston and today are dominated by pockets of primarily residential and commercial uses.

As development increased and the landscape changed, the health of the watershed and its ecosystems deteriorated. Impervious surfaces greatly reduce the ability of precipitation to infiltrate into the ground and instead cause stormwater runoff to quickly reach streams and tributaries. This in turn results in downcutting, widening, and bank erosion causing sediment and nutrient loading downstream. Meanwhile, streams were disconnected from their floodplains and invasive species established within the riparian areas causing loss of wildlife habitat and reduced floodplain function. Nutrients from agricultural land, eroding streams, and other urbanized sources are negatively impacting the biological communities in CSBKR.

Example of pre-European settlement prairie-savanna landscape at Kishwaukee Forest Preserve



Stream Facts

- 84 miles of streams
- South Branch Kishwaukee River and Deer Creek are impaired for Aquatic Life, Fish Consumption, and Primary Contact
- Excess nitrogen and phosphorus are a concern
- Agricultural lands and eroding streambanks are the biggest contributors of nutrients to streams
- Almost 20 miles of streams are listed as Priority Areas for restoration



Aerial view of the South Branch Kishwaukee River in Kishwaukee Forest Preserve looking downstream from Glidden Road

Important N



POTAWATOMI WOODS



PRAIRIE OAKS FOREST PRESERVE



Important Natural Areas provide large naturalized green spaces that support native species, maintain natural ecological processes, and contribute to the health and quality of life of their communities. These spaces are integral to protecting water quality and habitat and need to be taken care of to perform those functions optimally. The watershed is home to one State Wildlife Area, 12 DeKalb County Forest Preserve District properties, and 12 community parks, totaling 1,737.9 acres.

KISHWAUKEE RIVER STATE FISH & WILDLIFE AREA

latural Areas





WALNUT GROVE

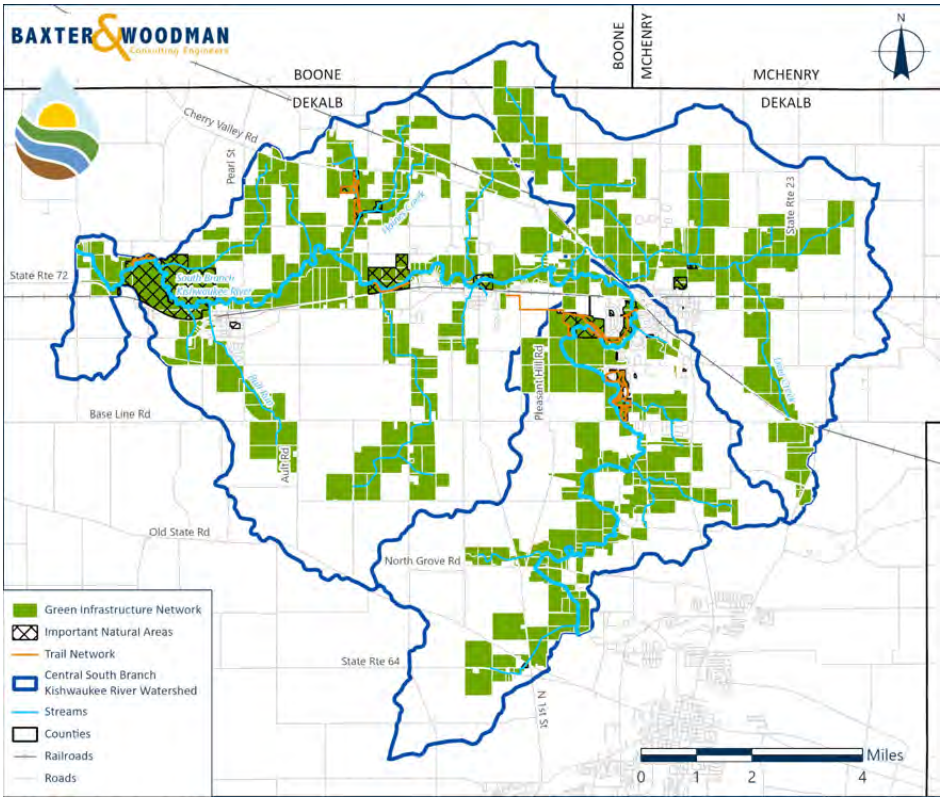


KNUTE OLSON, JR. FOREST PRESERVE

Green Infrastructu

A Green Infrastructure Network is a connected system of natural areas and open space that conserves natural ecosystems, sustains clean air and water, and provides a wide array of benefits to wildlife and people. Such a network consists of cores, hubs and linking corridors. Cores and hubs generally consist of the largest and least fragmented areas such as Kishwaukee River State Fish and Wildlife Area, Potawatomi Woods, Kishwaukee Forest Preserve, Russell Woods Forest Preserve, Riverwood Forest Preserve, and the Haines Creek Corridor. Corridors are formed by smaller, privately held parcels along the South Branch Kishwaukee River, tributaries, and trail network. Corridors are extremely important because they provide biological conduits between hubs for wildlife. However, most corridors are not ideal habitat until landowners embrace managing them as green infrastructure.

GREEN INFRASTRUCTURE NETWORK





Any property owner can improve green infrastructure. You can create a safe place for wildlife by providing food, water, cover, and a place for wildlife to raise their young. The National Wildlife Federation's Certified Wildlife Habitat® and the Conservation Foundation's Conservation@Home programs can help you get started.

IF YOU SEE ANY OF THESE PLANTS

PHRAGMITES



BUCKTHORN



REED CANARY GRASS

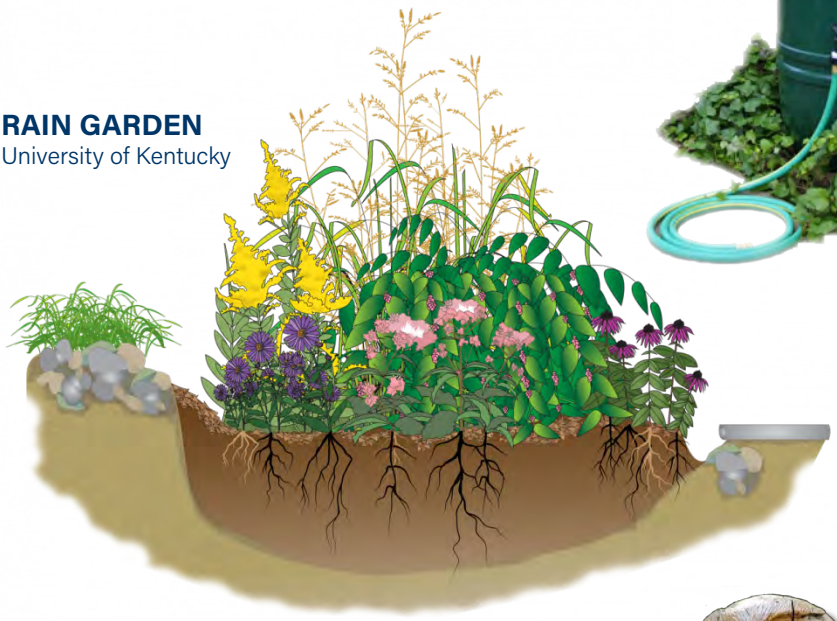


re & Your Backyard

RAIN BARREL



RAIN GARDEN
University of Kentucky



If a portion of a stream runs through your backyard, follow these tips:

1. **A NATURAL, MEANDERING STREAM IS A HAPPY STREAM**
   Work with experts to restore degraded streams and protect healthy ones.
2. **REMOVE NON-NATIVE SPECIES**
   Identify and remove plants that are out of place (see below).
3. **PLANT NATIVE VEGETATION**
   Plants adapted to the Midwest climate can help control erosion by stabilizing banks.
4. **NO DUMPING**
   Avoid dumping yard waste and remove debris jams.
5. **MANAGE CHEMICAL USE**
   Avoid over fertilizing lawns or spilling/dumping chemicals, especially near waterways.

Creating a rain garden, or a small vegetated depression, to capture water is another way of promoting infiltration while beautifying your yard and providing additional habitat. Disconnecting your roof down spouts and capturing that runoff in rain barrels not only reduces the amount of runoff entering streams, but also serves as a great source of water for irrigating your yard.



For to find out more, see Lake County Stormwater Management Commission's booklet, "Riparian Area Management: A Citizen's Guide," at www.lakecountyil.gov/stormwater.

ON YOUR PROPERTY, REMOVE THEM!

PURPLE LOOSESTRIFE



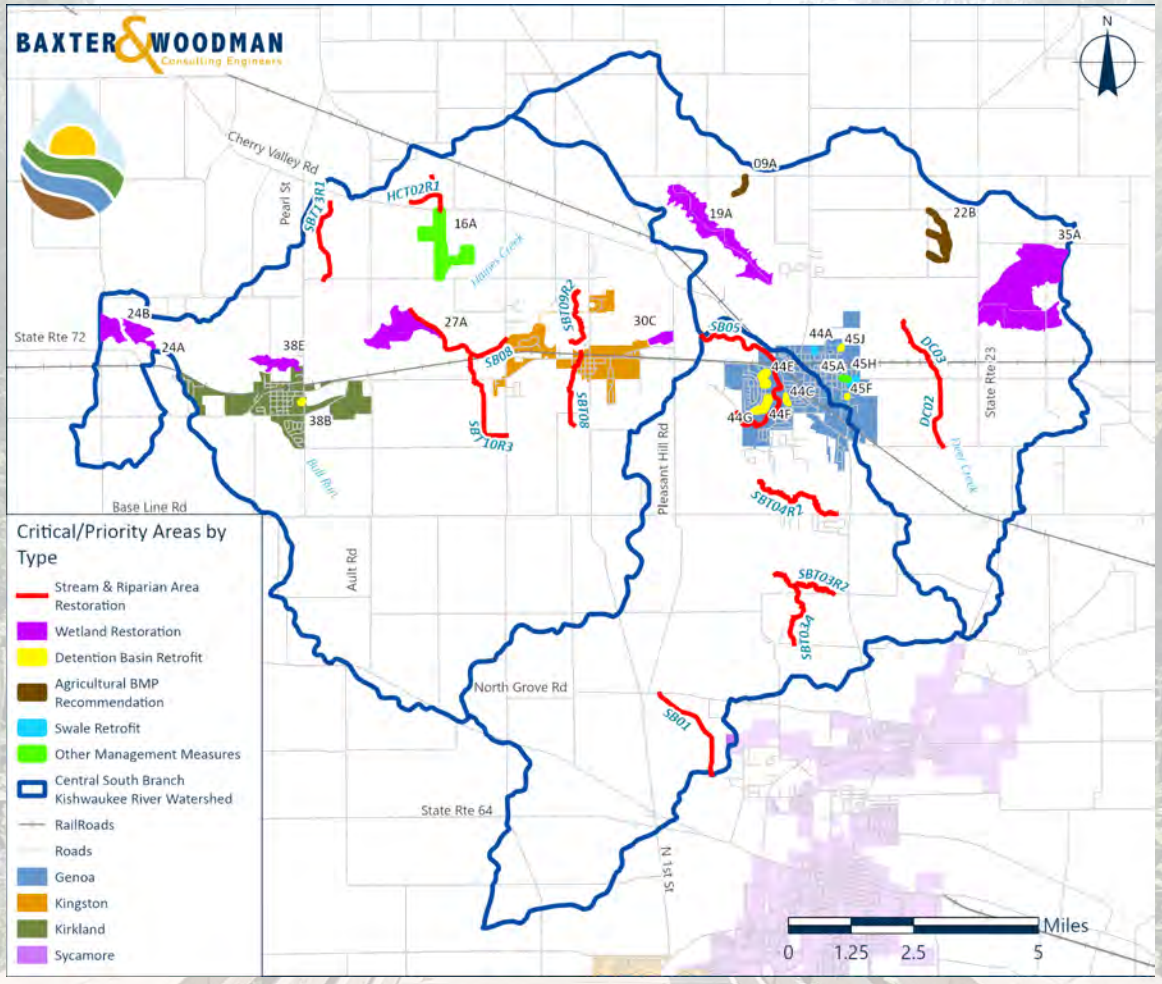
GARLIC MUSTARD

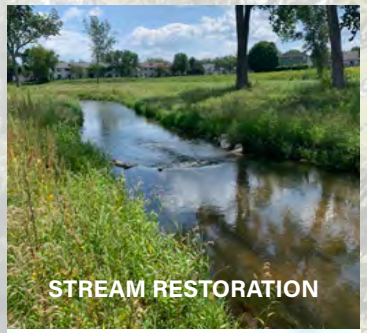


TEASEL



Action Plan & Priority Areas









The Central South Branch Kishwaukee River Watershed-Based Plan includes a voluntary Action Plan developed to provide stakeholders with recommendations to address plan goals. The Action Plan includes programmatic and site-specific recommendations. Programmatic recommendations are general watershedwide remedial, preventatitve, and regulatory actions. Site-specific recommendations include actual locations where conditions are best to implement projects that can improve water quality, green infrastructure, and aquatic and terrestrial habitats. Priority Area recommendations (mapped above) are most urgent in restoring water quality.

Programmatic recommendations include...

- Ordinance and Policy Recommendations
- Rainwater Harvesting & Re-use
- Native Landscaping
- Street Sweeping
- Septic System Maintenance
- Green Infrastructure Planning
- Conservation Design & Low Impact Development
- Water Quality Trading & Adaptive Management

Site-specific recommendations include...

- Detention Basin Retrofits
- Wetland Restoration
- Stream & Riparian Area Restoration
- Agricultural Management Practices
- Other Management Measures:
- Natural Area Restoration
- Golf Course Naturalization
- Parking Lot BMPs

The recommended programmatic and site-specific management measures provide a solid foundation for protecting and improving watershed conditions over time, and should be updated using the Report Cards established for each goal as projects are completed or other opportunities arise. Key implementation stakeholders are encouraged to organize partnerships and develop various funding arrangements to help delegate and implement the recommended actions. More details on the action plan, report cards, and implementation can be found in the full watershed plan document.

Agricultural Land Management

Agricultural land uses represent roughly 89% of the watershed, and nearly all of it is row crop farmland. According to the nonpoint source pollutant loading analysis, cropland contributes the highest loads of nitrogen (255,964 lbs/yr: 20%), phosphorus (53,084 lbs/yr: 65%), and sediment (25,626 t/yr: 51%), in large part due to the extent of agricultural land in the watershed. Agricultural land can be a significant contributor of nutrients and sediment to local streams when practices such as grass swales, filter strips, and reduced tillage farming are not in place. Additional conservation practices and increases in the extent of reduced tillage practices in the CSBKR watershed are necessary to reduce cropland pollutant loading.

A 16% increase (9,351 acres) in the number of agricultural landowners practicing mulch till, reduced till, or no till would improve water quality substantially. This change alone could reduce watershed wide pollutant loads by 12,625 lbs/year of nitrogen, 5,923 lbs/year of phosphorus, and 3,184 tons/year of sediment and is considered a Priority Area Management Measure. These land management changes could occur on any lands currently practicing conventional tillage.

Recommended agricultural BMPs include:

- Conservation tillage
- Principals of soil health
- Regenerative agriculture
- Tile drainage management
- Bioreactors
- Vegetated swales
- Filter strips

There are numerous agricultural measures and funding sources that can be utilized by farmers to implement practices on their land to improve water quality and soil health, while reducing soil and nutrient losses. Many recommended programs are offered through the DeKalb County Soil and Water Conservation District (SWCD), U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), and Farm Service Agency (FSA). More information on all of these practices can be found in the full watershed plan document at: http://www.dekalbcountywatersheds-il.org.



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CENTRAL SOUTH BRANCH KISHWAUKEE RIVER WATERSHED-BASED PLAN

The water quality seen today in the Central South Branch Kishwaukee River (CSBKR) Watershed is a result of almost 200 years of landscape change. Fortunately, the plan outlines actions that can mitigate existing issues and improve water quality over time. The future health of the watershed is largely dependent on how water and natural resources are managed. That includes implementing environmental restoration practices, such as those identified in the watershd plan, to improve water quality and stream health.

You can help the CSBKR Watershed by starting in your own backyard and supporting local water quality improvement efforts. It will take a community-supported approach and actions at every scale in order to positively impact watershed resources. This watershed-based plan is the first step in helping landwonders understand what can be done to protect and restore the CSBKR Watershed.

Funding for the development of the CSBKR Watershed-Based Plan was provided in part through the USEPA Section 319(h) of the Clean Water Act distributed through the Illinois Environmental Protection Agency. The findings and recommendations herein are not necessarily those of the funding agencies. Funding and support was also provided by the DeKalb County Community Foundation, DeKalb County Soil & Water Conservation District, DeKalb County, the City of Genoa, the Villages of Kirkland and Kingston, Northern Illinois University, and the Steering Committee.

For more information on how you can help, contact Dean Johnson at the DeKalb County Soil & Water Conservation District: 815-756-3234 ext. 3, Dean.Johnson@il.nacdnet.net, visit the DeKalb County Watershed website at: www.dekalbcountywatersheds-il.org, or scan the QR code (right).



All photos by Baxter & Woodman unless otherwise noted.

DEKALB COUNTY COMMUNITY FOUNDATION



1 Introduction

1.1 Central South Branch Kishwaukee River Watershed Setting

People live, work, and play in their watershed every day. A watershed is best described as an area of land where surface water drains to a common location such as a stream, river, lake, or other body of water (Figure 1), similar to a bathtub where all the water that falls within flows to the drain. The source of groundwater recharge to streams, rivers, and lakes is also considered part of a watershed. Despite the simple definition, there is a complex interaction at play between natural elements (such as climate, surface water, groundwater, vegetation, and wildlife) and human elements (such as agriculture and urban development). Watersheds do not follow political boundaries.



Figure 1. Hypothetical watershed setting (Be Water Friendly).

The Central South Branch of the Kishwaukee River (CSBKR) watershed, at 103 square miles in size, is a large watershed located in a rural area of northern DeKalb County and extending into Boone County (Figure 2). It includes the City of Genoa, Villages of Kirkland & Kingston, and unincorporated communities of Wilkinson, Five Points, and Colvin Park. It is made up of Deer Creek (HUC 070900060604; IL_PQCE), the Town of Five Points-South Branch Kishwaukee River (HUC 070900060605; IL_PQC-05), and the Bull Run - South Branch Kishwaukee River (HUC 070900060608; IL_PQC-09) subwatersheds. This watershed is all part of the South Branch Kishwaukee River which flows north and east and then west to its confluence with the Kishwaukee River southeast of Rockford before joining the Rock River. The Rock River then flows southwest to join the Mississippi near Moline, Illinois.

The Central South Branch Kishwaukee River is a part of the larger Kishwaukee River system. "There are two main branches [of the Kishwaukee River], one north originating in McHenry County and the 'South Branch' getting its start in DeKalb County. But then there is the matter of two parts to the south branch, a western tributary emerging north of Shabbona and an eastern one originating between Cortland and Sycamore, not far from the intersection of Pleasant Street and Hartman Road (Schrader, 2009)." The western tributary that emerges north of Shabbona refers to the Upper South Branch Kishwaukee River while the eastern portion refers to the East Branch of the South Branch of the Kishwaukee River Watershed Plan, both of which drain to the Central South Branch Kishwaukee River and have approved watershed-based plans in place.

Pre-European settlement ecological communities in Central South Branch Kishwaukee River watershed and surrounding area were balanced ecosystems with clean water and diverse plant and wildlife populations. The mosaic of open prairie, wetlands, and oak woodlands were largely maintained and shaped by frequent fires ignited by both lightning and the Native Americans that inhabited the area. Herds of bison and elk also helped maintain the ecosystem via large scale grazing. During these times most of the water that fell as precipitation was absorbed in prairie and wooded communities and within the extensive wet prairies that likely existed where the upper stream and tributaries exist today.

Ecological conditions changed quickly and drastically following European settlement in the mid-1800s. Large scale fires no longer occurred, and bison and elk were extirpated. Significant portions of wooded communities and nearly all prairies were tilled, and tile systems were installed to drain wetland areas as farming became the primary land use by the early 1900s. Development patterns continued to urbanize within the City of Genoa, and Villages of Kirkland & Kingston and today those portions of the watershed are dominated by pockets of primarily residential and commercial uses.

With increasing development and landscape changes in the watershed

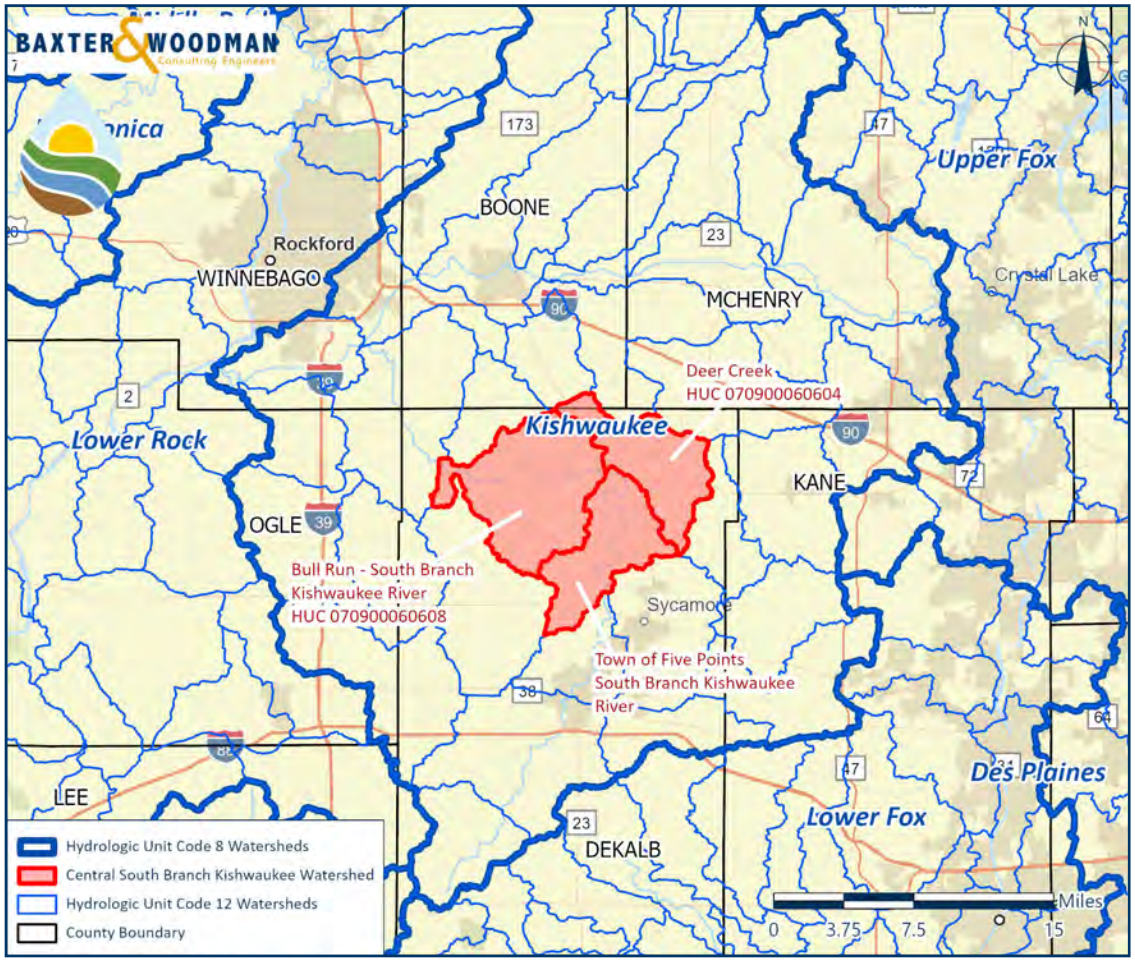


Figure 2. Watershed locator map.

comes negative impacts to the environment. Impervious surfaces greatly reduce the ability of precipitation to infiltrate into the ground and instead cause stormwater runoff to quickly reach streams and tributaries. This in turn results in downcutting, widening, and bank erosion causing sediment and nutrient loading downstream. Meanwhile, streams were disconnected from their floodplains and invasive species established within the riparian areas causing loss of wildlife habitat and reduced floodplain function. Nutrients from agricultural land and residential and urban lawn fertilizers are negatively impacting the biological communities in CSBKR. Discharged water from various sources that flow overland and not from a permitted source are referred to as "non-point source pollution" and are the primary focus of this plan.

Today, the CSBKR faces a number of urgent concerns including three 303d Listed reaches (Deer Creek and 2 reaches of South Branch Kishwaukee River, together totaling nearly 35 miles), almost no vegetated stream buffers, heavy channelization, little in-stream habitat, a predominantly agricultural landscape with few agricultural best management practices in place, very little remaining open space/green infrastructure, and a number of rare, threatened or endangered species are found within the watershed. Several reaches of the CSBKR are failing the designated uses of Fish and Aquatic Life and Fish Consumption, due to causes such as mercury, polychlorinated biphenyls, and other unknown causes. The sources of these pollutants are unknown.

The watershed is also home to one state wildlife area owned by the Illinois Department of Natural Resources (IDNR), four DeKalb County Forest Preserve District properties, and a permanent conservation easement held by the Conservation Foundation, together totaling over one thousand acres. The Kishwaukee River State Fish and Wildlife Area, owned by IDNR, consists of hardwood forest with some interspersion of grassy open areas, wetlands, areas recently planted to woody tree and shrub seedlings and a portion of the Central South Branch Kishwaukee River. DeKalb County Forest Preserve District maintains MacQueen Forest Preserve, Potawatomi Woods Forest Preserve, Russel Woods Forest Preserve, and Knute Olson, Jr. Forest Preserve, within the watershed, all harboring valuable natural resources, and unique and uncommon species.

1.2 Project Scope & Purpose

The DeKalb County Soil & Water Conservation District (DCSWCD), the Watershed Steering Committee, and the DeKalb County Community Foundation applied for and received Illinois Environmental Protection Agency (Illinois EPA) funding in 2023 through Section 319 of the Clean Water Act to undergo a watershed planning effort and produce a comprehensive Watershed-Based Plan to act as a guidance document for stakeholders in Central South Branch Kishwaukee River watershed that would meet requirements as defined by the United States Environmental Protection Agency (USEPA). Ultimately, the intent of 319 funding is to develop and implement Watershed-Based Plans designed to achieve water quality standards through nonpoint source pollution control. DCSWCD hired Baxter & Woodman (B&W) to develop the plan.

The watershed planning process is a voluntary, collaborative effort intended to restore impaired waters and protect unimpaired waters by developing an ecologically-based management plan for the Central South Branch Kishwaukee River (CSBKR) watershed. The plan is meant to improve the quality of life for people in the watershed for current and future generations by improving water quality, protecting green infrastructure, creating protection policies, implementing ecological restoration, and educating the public.

The primary purpose of this plan is to spark interest and give stakeholders a better understanding of the CSBKR watershed to promote and initiate plan recommendations that will accomplish the goals and objectives of this plan. This plan was produced via a comprehensive watershed planning approach that involved input from stakeholders and analysis of complex watershed issues by Baxter & Woodman's watershed planners, ecologists, GIS specialists, and environmental engineers.

The CSBKR Steering Committee held regular, public meetings from August 2023 through October 2024 to guide the watershed planning process by establishing goals and objectives to address watershed issues and to encourage participation of stakeholders to develop planning and support for watershed improvement projects and programs.

Interests, issues, and opportunities identified by the Steering Committee were addressed and incorporated into the Watershed-Based Plan. The plan acknowledges the importance of protecting and restoring green infrastructure where necessary to meet many of the goals and objectives in the plan while providing scientific and practical rational for restoring lands, protecting appropriate green infrastructure, and encouraging partnerships amongst public, private, and non-profit entities to manage these properties and maximize watershed benefits. In addition, ideas and recommendations in this plan are designed to be updated through adaptive management that will strengthen the plan over time as additional information becomes available. It is important to note that all recommendations in this plan are for guidance only and not required by any federal, state, or local agency.

The USEPA's Nine Elements are as follows:

Element A: 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;

Element B: Estimate of the pollutant load reductions expected following implementation of the management measures described under Element C below;

Element C: Description of the BMPs (non-point source management measures) that are expected to be implemented to achieve the load reductions estimated under Element B above and an identification of the critical areas in which those measures will be needed to implement;

Element D: 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;

Element E: Public information/education component that will be implemented to enhance public understanding of the project and encourage early and continued participation in selecting, designing, and implementing/maintaining non-point source management measures that will be implemented;

Element F: Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious;

Element G: Description of interim, measurable milestones for determining whether non-point source management measures or other control actions are being implemented;

Element H: Set of environmental or administrative criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards;

Element I: Monitoring component to evaluate effectiveness of implementation efforts over time.

1.3 USEPA Watershed-Based Plan Requirements

In March 2013, the United States Environmental Protection Agency (USEPA) released watershed protection guidance entitled Non-point Source Program and Grant Guidelines for States and Territories. The document was created to ensure that Section 319 funded Watershed-Based Plans and projects make progress towards restoring waters impaired by non-point source pollution. Baxter & Woodman consulted USEPA's Handbook for Developing Watershed Plans to Restore and Protect Our Waters (USEPA 2008) and Chicago Metropolitan Agency for Planning's (CMAP's) Guidance for Developing Watershed Implementation Plans in Illinois (CMAP 2007) to create this watershed plan. Having a Watershed-Based Plan will allow USBKR watershed stakeholders to access 319 Grant funding for watershed improvement projects recommended in this plan. Under USEPA guidance, Nine Elements are required in order for a plan to be considered a Watershed-Based Plan.

1.4 Planning Process

The DeKalb County Soil and Water Conservation District (DCSWCD) and the DeKalb County Stormwater Management and Planning Committee have been working together with the DeKalb County Community Foundation (DCCF) since 2009 to identify opportunities to address stormwater management issues throughout DeKalb County. Water quality and stormwater issues have been identified as common and important concerns facing all communities within the County, as well as private property owners in unincorporated areas. The work by DCSWCD, Stormwater Committee, and Community Foundation has resulted in a commitment to taking a watershed-based approach to stormwater assessment and planning across DeKalb County. As a result of this commitment, DCCF and DCSWCD have completed watershed-based plans for the East Branch of the South Branch of the Kishwaukee River which included the Union and Virgil Ditch systems and for the Upper South Branch Kishwaukee River watershed

and sees a watershed-based plan for the Central South Branch Kishwaukee River as the next step in protecting and restoring the extensive water resources within DeKalb County. Implementation of the previous plans is ongoing with over 110 acres of wetland restoration and filter strip projects that have been installed. Education projects have been completed which included a Summer Ag Institute for Educators on Water Quality in cooperation with the DeKalb County Farm Bureau, along with new educational features on the watershed website with others underway.

The CSBKR watershed planning process is supported in full by the DCSWCD, the DeKalb County Community Foundation (DCCF), DeKalb County Government, DeKalb County Forest Preserve District, the City of Genoa, the Villages of Kirkland and Kingston, the Genoa Township Park District, University of Illinois Extension, and the HomeTown Association of REALTORS®; nearly all of these partners are contributing both dollars and time in support of this effort, and countless volunteers hours from local residents and technical experts have been contributed. All of the partners recognize the value of addressing non-point source pollution.

Table 1. CSBKR Watershed-based Plan meeting schedule.

Date	Meeting Topics
August 31, 2023	Kickoff, Watershed Planning Summary, Stakeholder Involvement, Watershed Field Inventory Results
October 19, 2023	Watershed Background: Part 1, Code & Ordinance Review
January 18, 2024	Watershed Background: Part 2
March 21, 2024	Water Quality Inventory, Pollutant Loading Model Results, Goals Workshop discussion
April 18, 2024	Goals Workshop
June 15, 2024	Watershed Bus Tour
August 8, 2024	Programmatic and Site-Specific Action Plan
October 10, 2024	Executive Summary, Water Quality Monitoring Plan, Plan Evaluation Report Cards, Information and Education Program

The CSBKR Watershed Steering Committee, comprised of 12 regular members and 2 alternates, first met in August 2024 to kick off the watershed planning process. Volunteer stakeholders representing the Steering Committee met 8 times throughout the planning process. The committee generally consisted of representatives from various municipal, governmental, private, and public organizations as well as local residents. The Steering Committee and stakeholders developed goals and objectives for the watershed and identified problem areas and opportunities. Meetings were initiated by the Watershed Coordinator and generally covered one or more watershed topics. Meetings were devoted to development of watershed assessment findings, goals and objectives, and action plan items. A list of the meetings is summarized in Table 1. Complete meeting minutes are included in Appendix A.



Looking upstream at South Branch Kishwaukee River Reach 1

1.5 Using the Watershed-Based Plan

The information provided in this plan is intended to be user-friendly tool for landowners to identify restoration projects and take actions related to watershed issues and opportunities. The pages below summarize what can be found in each major section of the plan. All recommendations in this plan are for guidance only and not required by any federal, state, or local agency.

Section 2: Mission, Goals, and Objectives. Goal topics include education, stewardship, and communication; the green infrastructure network and habitat, surface water quality, agriculture, and groundwater. In addition, measurable objectives were developed for each goal so that the progress toward meeting each goal can be measured in the future.

Section 3: Watershed Resource Inventory. An inventory of the watershed characteristics, problems, and opportunities is examined. Resulting analysis of the inventory data led to recommended watershed actions and also helped identify causes and sources of watershed impairment as required under USEPA's Element A. This section also includes a summary and analysis of available water quality data, watershed-wide pollutant modeling assessment, identification of the causes and sources of watershed impairment and critical areas and an estimate of pollutant load reductions following implementation of action plan recommendations.

Section 4: Management Measures Action Plan. The Action Plan is divided into a Programmatic Action Plan and a Site-Specific Action Plan. Programmatic recommendations are described in paragraph format; site specific recommendations are presented in paragraph, figure, and table formats with references to entities that would provide consulting, permitting, or other technical services needed to implement specific measures. The site-specific tables also outline project priority, pollutant reduction efficiency, implementation schedule, sources of technical and financial assistance, and cost estimates. This section also contains a watershed-wide summary table of specific information for all recommended site-specific management measures combined.

Section 5: Implementation Strategy. An Information & Education Program is provided to enhance public understanding and to encourage early and continued participation in the plan implementation process. Additional guidance is provided on how to implement the plan, including a list of key stakeholders and how to form partnerships to implement watershed improvement projects. A Water Quality Monitoring Plan identifying locations and methods of future monitoring programs and one report card for each goal are also included to help track progress toward achieving reduction targets, water quality improvement, and implementation over time.

Section 6: Works Cited followed by an Appendix which is available digitally only.

1.6 Prior Studies & Projects

Various studies have been completed describing and analyzing conditions within CSBKR watershed. This Watershed-Based Plan uses existing data to analyze and summarize work that has been completed by others and integrates new data and information. A list of known studies or work that this report relied on is summarized below.

1. In 2004, the Illinois State Geological Survey produced a study entitled Groundwater Geology of DeKalb County, Illinois with Emphasis of the Troy Bedrock Valley that detailed geological and groundwater conditions for the watershed.

2. The DeKalb County Soil and Water Conservation District supplied much valuable insight and leadership on agricultural best management practices, NRCS programs, and also data points such as the results from their Soil Transect surveys.

3. A number of Northern Illinois University professors and staff provided guidance, ongoing education, and the results of ongoing work in their fields to stakeholders throughout the process. These included Mike Konen from the Department of Geography (extensive knowledge about the formation of the watershed and existing conditions today), Melissa Lenczewski from the Environmental Science Department (water quality monitoring, studies and results), and retired professor Carl Von Ende (an expert of invertebrates).

4. The Illinois State Water Survey completed a groundwater survey in 2012 entitled Northeastern Illinois Water Supply Planning Investigations: Opportunities and Challenges of Meeting Water Demand in Northeastern Illinois.

5. In 2006, Illinois Environmental Protection Agency published a study of the Rock River basin that supplied valuable geologic and groundwater data within the watershed planning area. The study is titled Rock River Basin Assessment: An Overview of the Rock River Watershed in Illinois.

6. Illinois Tollway, represented by Kelsey Musich, supplied the Steering Committee with studies and best practices guides related to road salt reduction, re-use, and recycling, studies on chlorides, and converting invasive species to energy. They are also developing additional biological water quality monitoring support and advanced research to the Steering Committee.

7. Comprehensive plans and development guidance are available for DeKalb County (2011), City of Genoa (2003), and the Village of Kingston (2003); the Kirkland Department of Building Safety & Zoning regulates zoning and maintains a zoning map for the Village of Kirkland.

8. Existing DeKalb County and DeKalb County Soil and Water Conservation District Geographic Information System (GIS) data for CSBKR watershed was obtained and used to analyze various data related to wetlands, soils, land use, demographics, and other relevant information.



2

Mission, Goals & Objectives

2.1 CSBKR Watershed-Based Plan Mission Statement

The Watershed Coordinator, Steering Committee, and stakeholders of the Central South Branch Kishwaukee River (CSBKR) watershed developed a mission statement to guide the watershed plan. That mission is as follows:

> *The mission of the watershed plan is to improve water quality by reducing nonpoint source pollution, while preserving agricultural lands and improving habitat, along with increasing our knowledge to help improve the stewardship of the Central South Branch Kishwaukee River watershed.*

2.2 Places-of-the-Heart

During an April 18, 2024 public open house meeting devoted to gathering feedback from the community on the development of the plan and goals, stakeholders were given the opportunity to participate in an exercise called Places-of-the-Heart. Participants were asked to place heart-shaped stickers on a map of the watershed to indicate places they felt a connection to and to explain to the group why they placed their stickers where they did. Figure 3 depicts where participants placed their hearts and Table 2 summarizes what participants shared with the group. Stakeholders were also asked to put an "X" on the map to locate any Flood Problem Areas (none were noted).

Table 2. Location and description of Places-of-the-Heart group exercise.

Heart #	Description
1	Potawatomi Forest Preserve – the wildflowers, hiking trails and river all calms me. I love to watch the eagles.
2	My property
3	A 63-acre parcel - I have spent 20 years to protect Haines Creek and develop a natural area (all CRP)
4	My COBS (Cann Ostchard Burger Stevens) preservation partnership
5	Russel Woods – I grew up going on field trips here w/school. This area provided outdoor access and education. Now, for me, this area provides walking paths and relaxation in nature. This area is important to be preserved to educate and enrich the community. Children need to understand and have a relationship w/nature. It is something I do not take for granted anymore now that I have grown up and experienced life outside of Genoa. Other people just don't know the importance of the natural world around them. Young education is where this should start. I am 22 years old.
6	Hoppe wetland
7	Family farm
8	This is my residential neighborhood
9	Recreation, wildlife conservation, home, all deep rooted memories
10	Summertime swimming hole
12	Kishwaukee River Forest Preserve
13	My house and (livelihood?)
14	Waded into the stream here after a long, hot day working and rekindled a friendship of many years
15	Home, wildlife
16	Home
17	The field of bluebells near the Russell Woods bridge is pure magic in full bloom.
18	Its where I grew up playing in the Deer Creek
19	Weekend home and recreation
20	Home
21	Family farm – I grew up in that river and still spend lots of time trapping and hunting there
22	Potential for flooding – edge of floodplain
23	Russel Woods
24	Kishwaukee Park near Potawatomi Woods – future Urban Stream Research Center for Mussel Propagation



Presentation at April 18, 2024, Goals Workshop

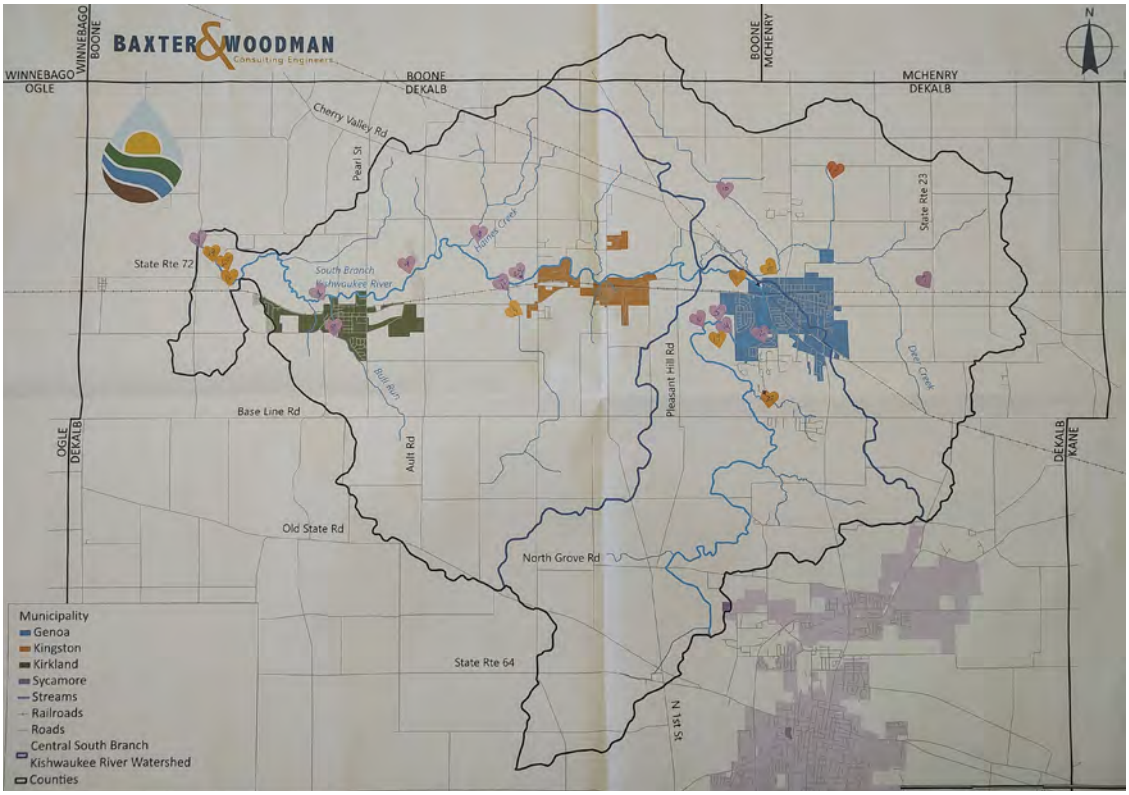


Figure 3. Places-ot-the-Heart mapping exercise.

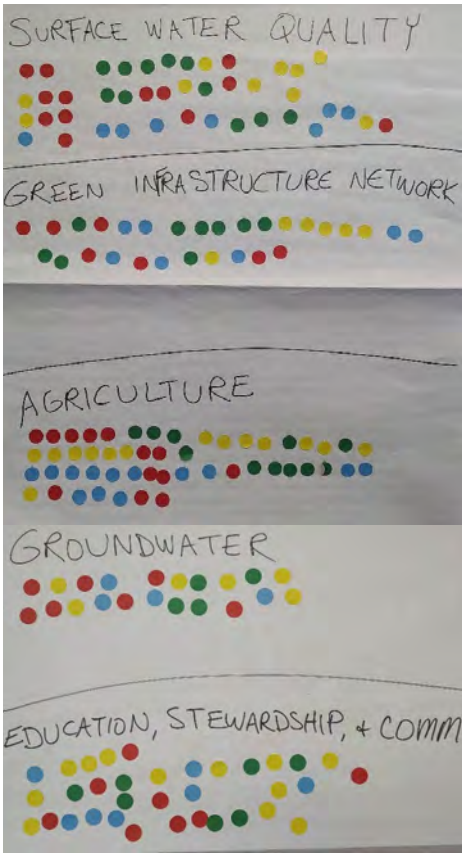
2.3 Goals & Objectives

Watershed stakeholders were first presented with information about the character, existing conditions, and quality of watershed resources over the course of several meetings prior to developing goals. Five general goal topics were chosen by the CSBKR Steering Committee to address issues that were brought up during those meeting as important in the Central South Branch Kishwaukee River watershed. Stakeholders were then given the opportunity to vote on goals they felt were most important as a way of prioritizing those goals.

The voting process occurred during the Goals meeting held on April 18, 2024 and included over fifty stakeholders from the community. Each stakeholder was given six votes to distribute amongst the goals to reflect how those goals should be prioritized to them personally. The voting process helped focus on goals that need to be adequately addressed in the planning process and within this watershed plan report. Tallied votes by goal topic were as follows:

Agriculture – 51 votes
Surface Water Quality – 42 votes
Education, Stewardship, & Communication – 34 votes
Green Infrastructure Network & Habitat– 29 votes
Groundwater – 21 votes

Finally, stakeholders that attended the Goals meeting participated in a World Café exercise dedicated to a facilitated brainstorming session around the watershed plan mission statement, goals, and objectives. Facilitators led successive groups of stakeholders through questions and prompting around each goal and the mission statement, taking notes on stakeholder ideas and feedback. This information was then used to refine the mission, the goals, and the objectives of the plan, as well as incorporated into the plan document where appropriate.



Final Goal Prioritization results held during the April 18, 2024, Goals Workshop

Objectives for each goal were further refined to be specific where appropriate and designed to be measurable so that future progress toward meeting goals can be assessed. Goals and objectives ultimately lead to the development of action items and project recommendations. The Management Measures Action Plan section of this report is geared toward addressing watershed goals by recommending programmatic and site-specific Management Measure actions to address each goal. The goals and objectives are examined in more detail in the discussion of the measurement of plan progress and success via milestones and Report Cards outlined in Section 5.3.2.



Stakeholder participation during the April 18, 2024, Goals Workshop

***Goal 1:** Encourage agricultural techniques and soil conservation practices that will protect and conserve topsoil, improve soil health, and protect our water resources.*

Objectives:

1. Educate and inform agricultural landowners about federal and state cost-share programs, which provide incentives for landowners to enroll in conservation programs and implement conservation practices.
2. Encourage landowners to utilize existing programs and agencies such as the Natural Resource Conservation Service, the DeKalb County Soil and Water Conservation District and the Farm Service Agency to install conservation practices that protect soil loss and water quality.
3. Increase support for and develop additional financial assistance programs targeted at increasing the installation of conservation practices.
4. Encourage landowners and farmers to follow the principles of soil health and/or regenerative agriculture on their land.
5. Implement 2 site-specific agricultural best management practice recommendations.
6. Implement of reduced tillage on an additional 9,351 acres of agricultural land.
7. Encourage landowners and farmers to support the Illinois Nutrient Loss Reduction Strategy by implementing practices that reduce annual loading of nitrate-nitrogen and total phosphorus to the CSBKR.

Goal 2: Improve surface water quality to meet water quality standards.

Objectives:

1. Continue existing water quality monitoring programs and implement the Water Quality Monitoring Plan outlined within the plan.
2. Implement additional policy recommendations that focus on improving watershed conditions by preserving green infrastructure, protecting groundwater, minimizing road salts, minimizing lawn fertilizer, sustainable management of stormwater, and allowances for native landscaping.
3. Restore 441,747 linear feet of stream and riparian areas along CSBKR and its tributaries.
4. Retrofit 72 acres of detention basins recommended in the action plan.
5. Implement 2,205 acres of wetland restoration recommended in the action plan.
6. Implement 652 acres of other management measures recommended in the action plan.
7. Implement of reduced tillage on an additional 9,351 acres of agricultural land and 45 acres of grass waterways or swales recommended in the action plan.
8. Track changes in water quality over time and make adaptive management changes to the plan as necessary to ensure water quality improvements toward meeting identified pollutant load reductions.

Goal 3: Build stakeholder awareness of watershed issues through education and stewardship while increasing communication and coordination among stakeholders.

Objectives:

1. All municipal partners implement the CSBKR WBP Information & Education Campaign.
2. Increase environmental stewardship opportunities and encourage stakeholders to participate in watershed plan implementation.
3. Inform public officials of the benefits of conservation design and low impact development and the importance of ordinance language changes that promote these developments.
4. Create and distribute targeted educational information for agricultural landowners.
5. Create and distribute targeted educational information for stream and riparian landowners.
6. Install watershed interpretation signage at public access points, major roads, and installed best management measures.
7. Develop policy recommendations and alternatives for the use of fertilizer, road salt, and the disposal of pet waste.

Goal 4: Protect and manage natural and cultural components of the Green Infrastructure Network and improve fish and wildlife habitat.

Objectives:

1. Include the identified Green Infrastructure Network in all county and municipal comprehensive plans and development review maps.
2. Encourage private landowners with parcels within the Green Infrastructure Network to manage their land for ecological and water quality benefits.
3. Reconnect the stream to its floodplain as part of 1,410 acres of Priority Area wetland restoration recommendations.
4. Improve habitat in degraded stream reaches using natural and ecological design approaches.
5. Implement conservation design or low impact development standards where new or redevelopment occurs.
6. Ensure adequate funding is in place for future operations and maintenance of natural areas and restorations.

Goal 5: Protect groundwater quantity and quality.

Objectives:

1. Encourage the DeKalb County Health Department to monitor the extent and current condition of septic tanks in the watershed and to educate septic tank owners on how to properly maintain their systems.
2. Educate stakeholders about potential groundwater contamination issues and encourage private well testing.
3. Encourage landowners to install downspout disconnection practices such as rain gardens and rain barrels and utilize pavement alternatives to improve groundwater recharge.
4. Encourage use of Stormwater Treatment Train, Conservation Design, or Low Impact Development within new and redevelopment.
5. Encourage agricultural landowners and farmers to improve soil health, thereby increasing infiltration.



3

Watershed Resource Inventory

3.1 Geology and Climate

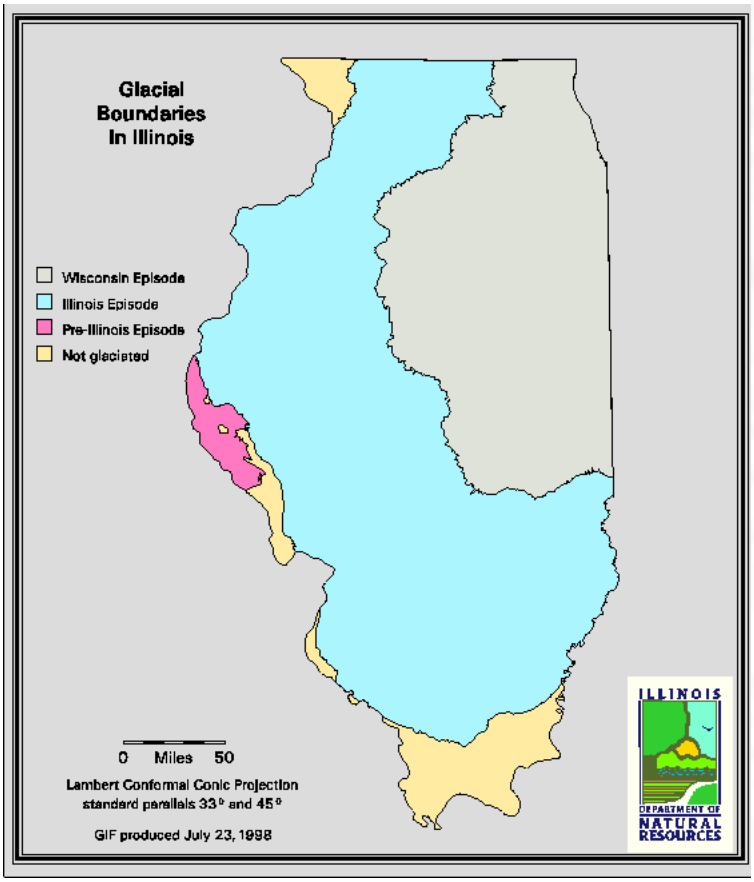
The terrain of the Midwestern United States was created over thousands of years as glaciers advanced and retreated during the Pleistocene Era or "Ice Age". Some of these glaciers were a mile thick or more. The Illinois glacier extended to southern Illinois between 300,000 and 125,000 years ago. It is largely responsible for the flat, farm-rich areas in the central portion of the state that were historically prairie. Only the northeastern part of Illinois was covered by the most recent glacial episode known as the Wisconsin Episode that began approximately 70,000 years ago and ended around 14,000 years ago (Figure 4). During this period the earth's temperature warmed and the ice slowly retreated leaving behind moraines and glacial ridges where it stood for long periods of time (Hansel, 2005). A tundra-like environment covered by spruce forest was the first ecological community to colonize after the glaciers retreated. As temperatures continued to rise, tundra was replaced by cool moist deciduous forests and eventually by oak-hickory forests, oak savannas, marshes, and prairies.

The nearby Bloomington Morainic System was created during the retreat of the Wisconsin glaciation, with later erosion of that system carving out the South Branch Kishwaukee River valley (Figure 5). These moraines are what cause the drainage of the Kishwaukee to generally flow north (ISGS, 2004). The bedrock of the Central South Branch Kishwaukee River (CSBKR) watershed consists of layers of sandstone, dolomite, limestone, and shale deposits, with Paleozoic rocks of Cambrian, Ordovician, and Silurian age (ISGS, 2004).

The northern Illinois climate can be described as temperate with cold winters and warm summers where great variation in temperature, precipitation, and wind can occur on a daily basis. Surges of polar air moving southward or tropical air moving northward cause daily and seasonal temperature fluctuations. The action between these

two air masses fosters the development of low-pressure centers that generally move eastward and frequently pass over Illinois, resulting in abundant rainfall. Prevailing winds are generally from the west but are more persistent and blow from a northerly direction during winter.

Climate records for Kingston, IL have been use to represent the climate and weather patterns experienced in CSBKR watershed as the most central location in the watershed (Figure 6). The winter months are cold averaging highs around 23° F while winter lows are around 14° F. Summers are warm with average highs around 84° F and summer lows around 62° F. Fairly typical for the Midwest, the current climate of CSBKR watershed consists of an average annual precipitation of 15.48". The most precipitation on average occurs in May (2.03 inches) while February receives the least amount of precipitation with 0.59 inches on average (CustomWeather, 2023).



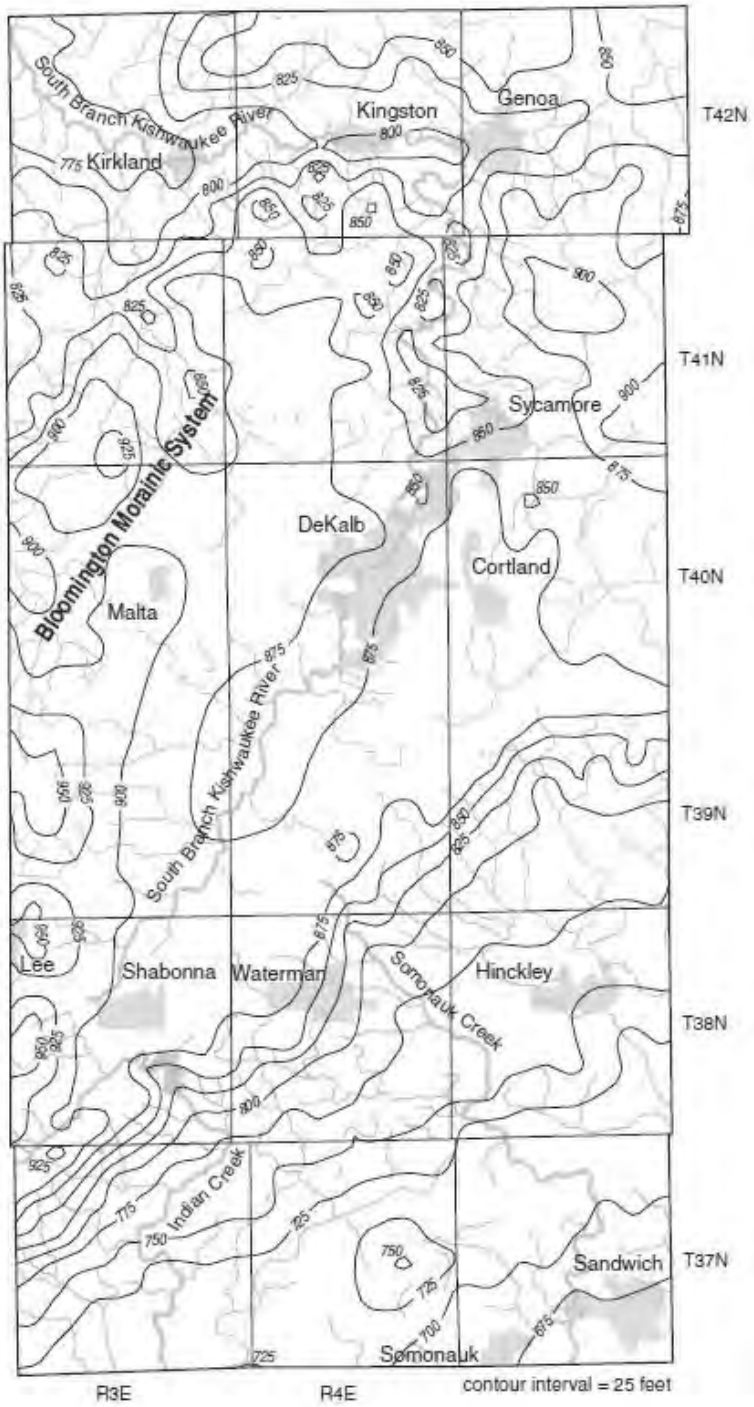


Figure 4 & 5. Glacial boundaries in Illinois (left) and land surface elevation (right) (Source: ISGS, 2004).

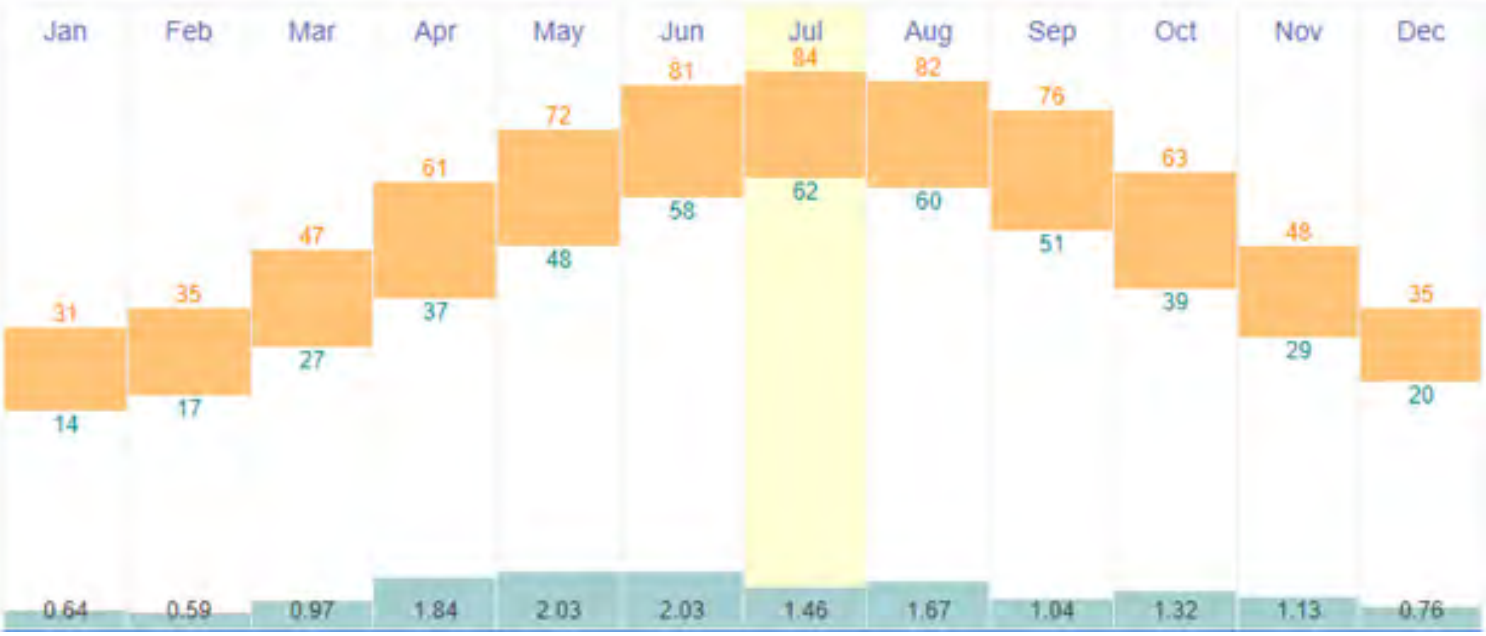


Figure 6. Annual weather averages near Kingston, IL (CustomWeather, 2023).

Fog across the watershed headwaters.

3.2 Pre-European Settlement Landscape

The last Native American Indian tribe to call the area home was the Potawatomie. The Kishwaukee River was originally known as the Sycamore River; the name "Kishwaukee" originated in the Indian word for "sycamore tree" and the river was renamed for the tree found upon its banks (Schrader, 2009 and Boies, 1968). They grew rice and corn and refined maple sugar (Worden, 1982). However, they were removed from the land with the signing of a treaty in 1833. A history book on DeKalb County printed in 1868 details what the land was like prior to settlement:

> *"In the broad, billowy prairies, extending as far as the eye can reach, we have the element of vastness as in scarce any other land; we have a luxuriant sward of emerald greenness, clothing the whole land, down to the very margin of the waters; we have meandering streams, clear as crystal, now smooth, quiet and glassy, then ruffled by winds or rapids; we have clumps of trees, charming groves, disposed with an effect of beauty that might baffle a landscape gardener; now crowning the grassy height, now clothing the green slope with their pleasing shade. From the gentle heights of the rolling prairies, the country, even before the hand of man had broken its surface, wore the aspect of cultivated meadows and rich pasture grounds, irrigated by frequent rivulets."*
>
> – Boies, 1868

Kingston, Genoa, and Kirkland were settled in 1835, 1836, and 1837, respectively, and include some of the oldest settlements in the County. Kingston became a hub for the Chicago, Milwaukee and St. Paul railroad, while Genoa was situated along the Galena-Chicago stagecoach route. A description of Genoa at the time is as follows:

> *"The rolling prairie land which occupies the greater portion of the township is diversified by more than the average extent of natural groves and is watered by several fine streams. The Kishwaukee flows through a portion of the town, giving a tolerable water-power,—not so powerful as at an earlier day, when, as everywhere, the streams were larger and their flow more constant,—but capable of being put to use, and contributing to the growth of the town and convenience of the people. Wood and water are the two great wants of this land of the prairies, and these Genoa possesses, if not in abundance, yet in much more liberal quantities than most parts of the County."*
>
> – Boies, 1922

In 1875, W.T. Kirk, original settler and namesake of Kirkland, agreed to give the railroad a portion of his land if every passenger train would stop at Kirkland. This led to altering the course of the Kishwaukee River and the building of the railroad through town (Worden, 1982).

The original public land surveyors that worked for the office of U.S. Surveyor General in the early and mid-1800s mapped and described natural and man-made features and vegetation communities while creating the "rectangular survey system" for mapping and sale of western public lands of the United States (Daly & Lutes et. al., 2011). Ecologists know by interpreting survey notes and hand drawn Federal Township Plats of Illinois (1804-1891) that a complex interaction existed between several ecological communities including prairies, savannas, woodlands, and wetlands prior to European settlement in the 1830s.

The surveyors detailed the majority of the CSBKR watershed as "Prairie" (69%) with stretches of "Forest" and "Bottomlands" (totaling 25%) along the main stem of the Kishwaukee, a few pockets of "Swamp/marsh" (3%), and "Cultural" (2%) which were settled fields and barns (Figure 7). This mixture of "Prairie" and "Forest" across the landscape was widely described in the mid-1800s and today is known as savanna. Prior to settlement, the landscape was maintained and renewed by frequent lightning strike fires, fires ignited by Native Americans, and grazing by bison and elk. Fires ultimately removed dead plant material, exposing the soils to early spring sun, and returning nutrients to the soil. Running through the prairie-savanna landscape were meandering stream corridors and low wet depressions consisting of sedge meadow, marsh, and wet prairie. The areas of Forest and Bottomlands were stretches of continuous forest along the banks of the Kishwaukee River. These areas were typically comprised of silver maple, elm, and ash within the floodplains and white, red, and burr oaks, interspersed with poplar, maple, butternut, black-walnut and hickory further upland. Much of what is identified as Bottomlands was likely the floodplain that was continually reshaped by the meandering of the South Branch Kishwaukee River and the deposition of soils and debris after floods (Illinois State Museum, 2000).



Kishwaukee Valley Heritage Museum, Genoa, IL

During pre-European settlement European settlement resulted in drastic changes to the fragile ecological communities. Fires no longer occurred, prairie and wetlands were tilled under or drained for farmland or developed, and many channels/ditches were excavated through wet areas to further drain the land for farming purposes.

The earliest aerial photographs, taken in 1939 (Figure 8), depict the Central South Branch Kishwaukee River watershed when row crop farming was already the primary land use. With the advent of farming came significant changes in stormwater runoff. By 1939 defined stream channels had formed or were created to drain fields efficiently. The extensive woodland communities described along the banks of the South Branch Kishwaukee River were mostly cut for timber by 1939 and farmland replaced nearly all of the prairie and wetland communities. Kirkland, Kingston, and Genoa all appear on the 1939 aerial. Figure 9 depicts a 2023 aerial photograph of the CSBKR watershed. The most visible changes are the consolidation of many smaller farms to larger row crop farming, the Vulcan Materials Company quarry, and the loss of a few more wooded corridors. Very few woodlands and virtually no wetlands remain by 2023 compared to pre-settlement conditions.

With degraded ecological conditions comes the opportunity to implement ecological restoration to improve the condition of CSBKR watershed. Present day knowledge of how pre-European settlement ecological communities formed and evolved provides a general template for developing present day natural area restoration and management plans. One of the primary goals of this watershed plan is to identify, protect, restore, and manage remaining natural areas.

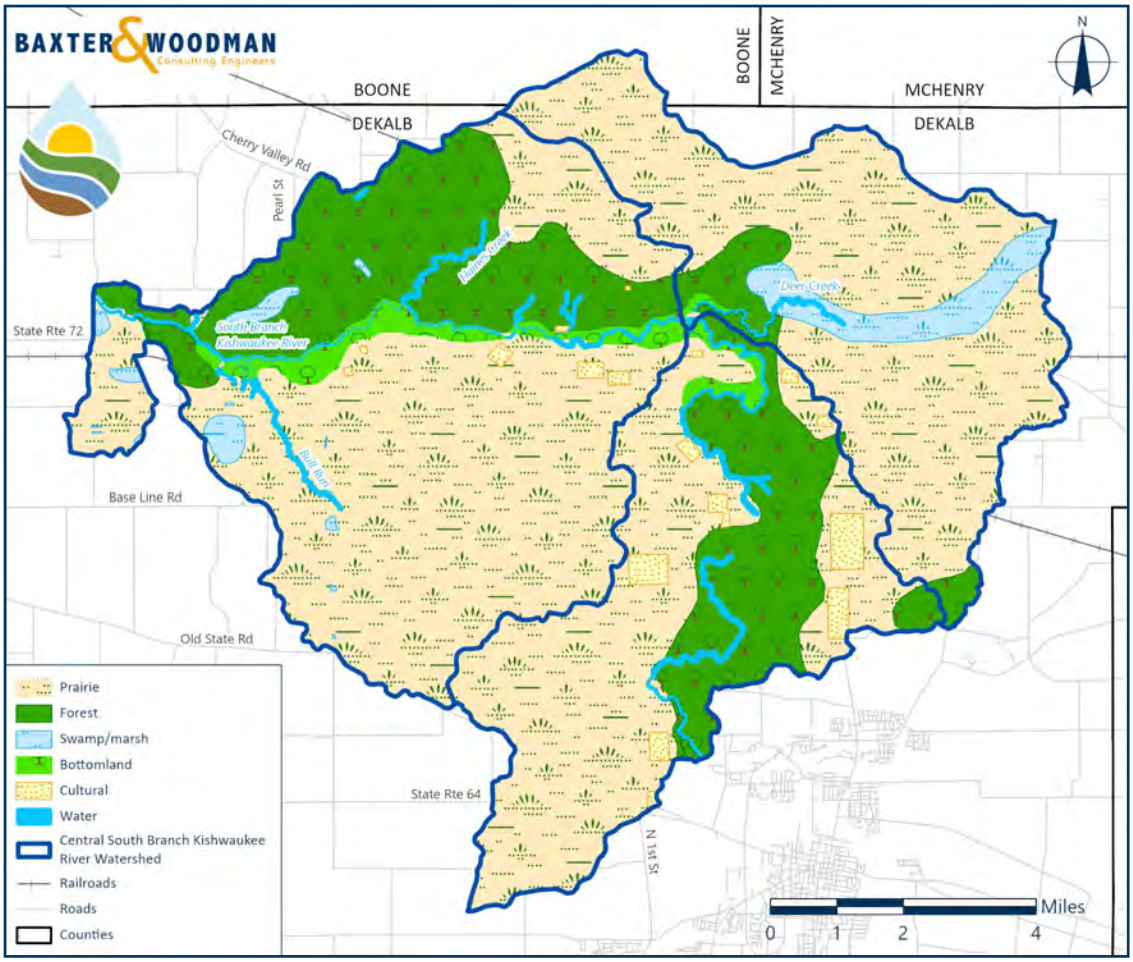


Figure 7. 1800s Public Land Survey System land cover.



Example of pre-European settlement prairie-savanna landscape at Kishwaukee Forest Preserve

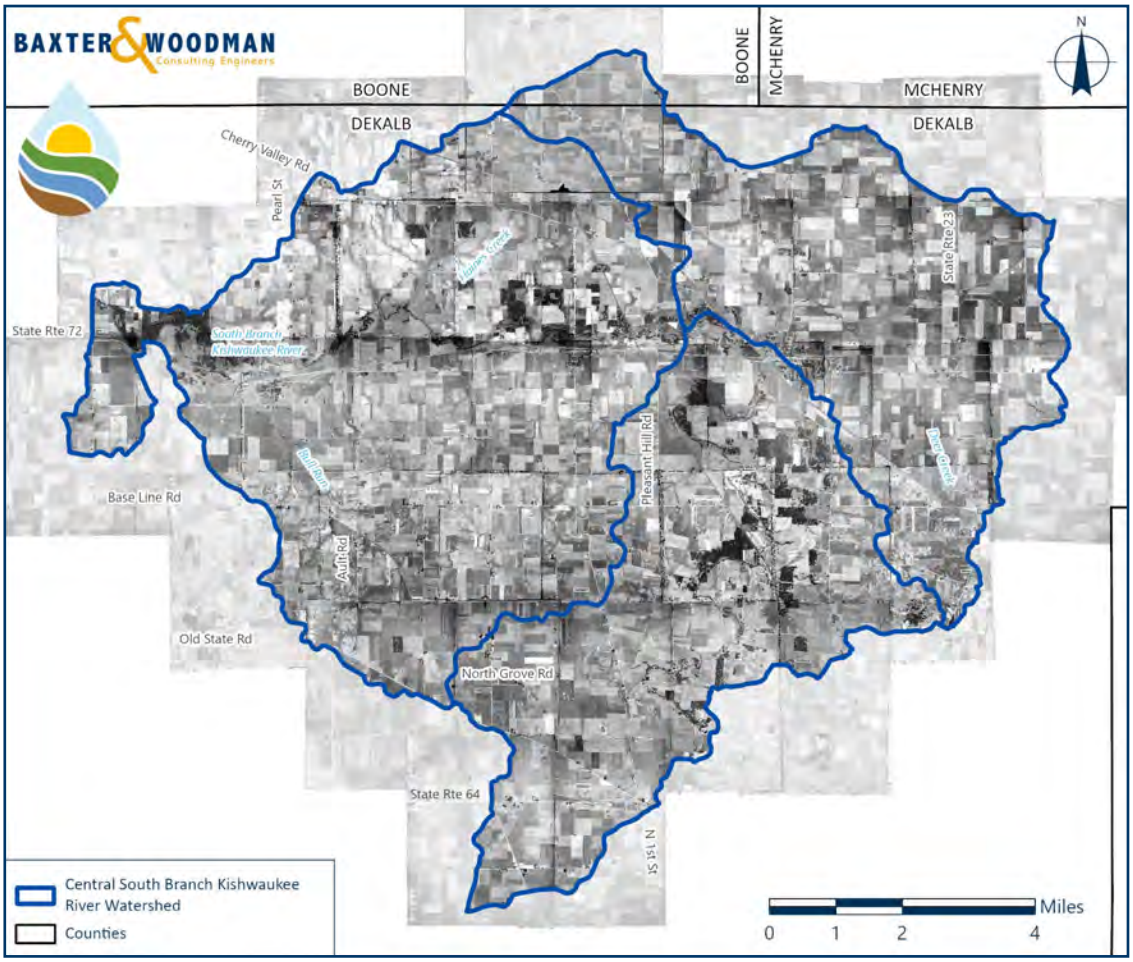


Figure 8. 1939 Aerial Photography.

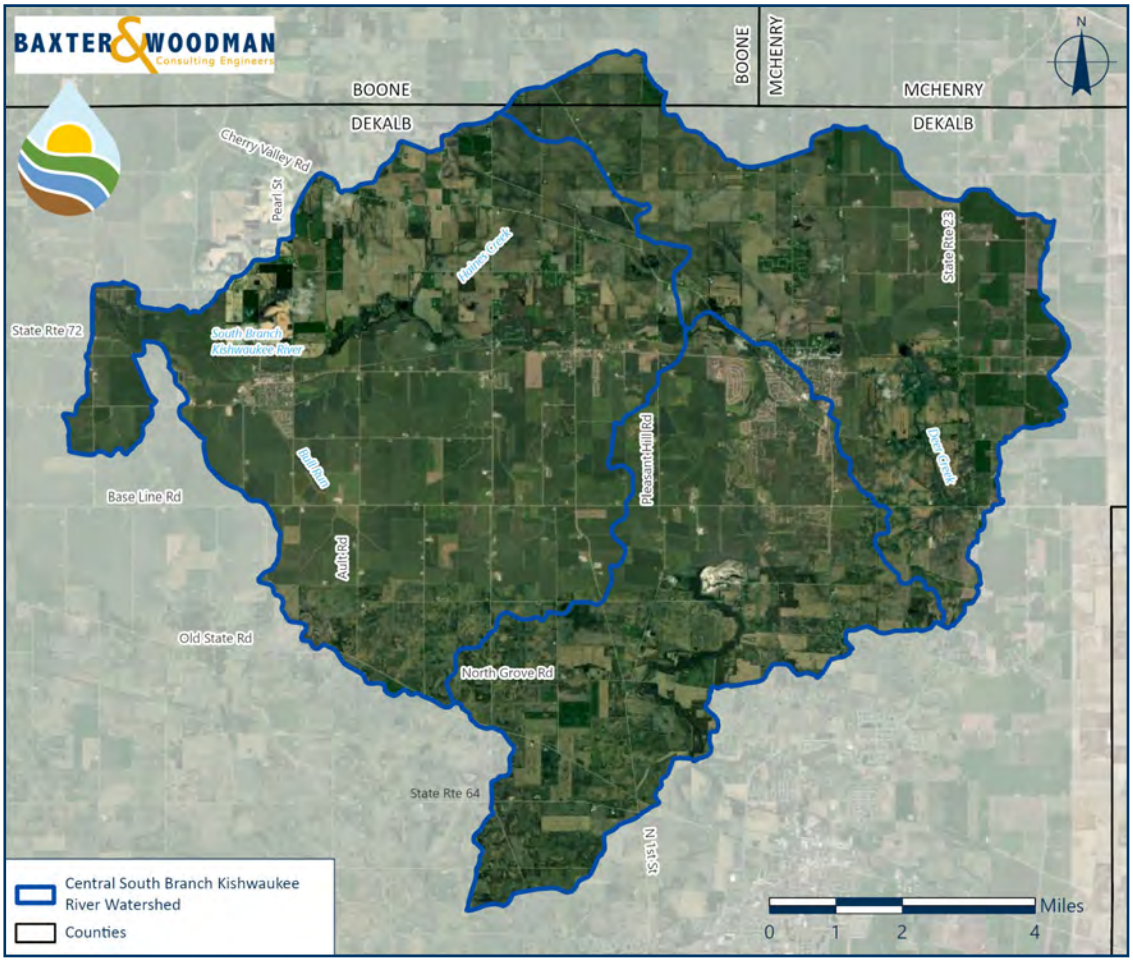


Figure 9. 2023 Aerial Imagery.

3.3 Topography, Watershed Boundary, & Subwatersheds

The Wisconsin glacier that retreated 14,000 years ago formed much of the topography and defined the CSBKR watershed boundary observed today. Topography refers to elevations of a landscape and describe the configuration of its surface and ultimately defines watershed boundaries.

A digital elevation model (DEM) of the watershed is depicted in Figure 10 based on 2018 DeKalb County lidar data. The CSBKR watershed is 66,040.4 acres or 103.2 square miles in size. Data for Boone County was not available for this exercise.

The Central South Branch Kishwaukee River (AUIDs: IL_PQCE, IL_PQC-05, and IL_PQC-09) watershed generally drains from south to Genoa and the west past Kirkland before entering the Kishwaukee River (at IL_PQ-12) and eventually the Rock River (at IL_P-14). Elevation within the watershed ranges from a high of 949 feet above sea level (ASL) to a low of 736 feet ASL for a total relief of 213 feet (Figure 10), while the bottom of the Vulcan Materials quarry is 451 feet ASL. The highest point is found in the east edge of the watershed near the intersection of Moose Ridge and Whipple Roads. Outside of the quarry (which bottoms out at 451 Ft ASL), the lowest elevation occurs at Irene Rd where the South Branch Kishwaukee River outlets to the next watershed.

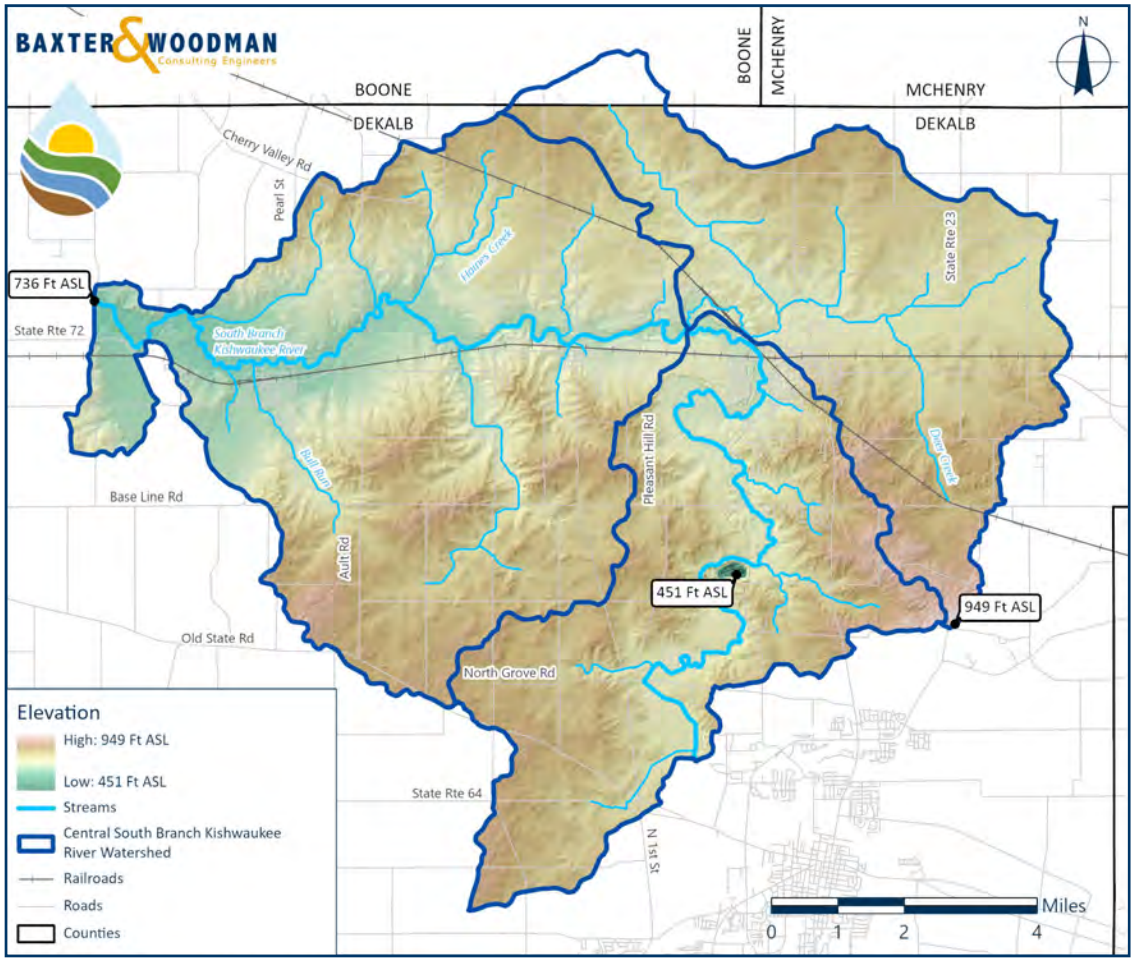


Figure 10. Digital Elevation Model.

Subwatershed Management Units (SMUs)

The Center for Watershed Protection (CWP) is a leading watershed planning agency and has defined watershed and subwatershed sizes appropriate to meet watershed planning goals. In 1998, the CWP released the "Rapid Watershed Planning Handbook" (CWP 1998) as a guide to be used by watershed planners when addressing issues within urbanizing watersheds. The CWP defines a watershed as an area of land that drains up to 100 square miles. Broad assessments of conditions such as soils, wetlands, and water quality are generally evaluated at the watershed level and provide some information about overall conditions. The CSBKR is just over 100 square miles, therefore a more detailed analysis of smaller drainage areas must be completed to find site-specific problem areas or Critical Areas that need immediate attention.

To address issues at a smaller scale, the CSBKR was divided into subwatersheds called subwatershed management units (SMUs). The CSBKR watershed was delineated into 12 SMUs by using the DEM. Information obtained at the SMU scale allows for detailed analysis and better recommendations for site-specific management measures otherwise known as best management practices (BMPs). Table 3 presents each SMU by size and included stream reaches. Figure 11 depicts the location of each SMU boundary delineated within the larger CSBKR watershed.



View of the topography and landscape of CSBKR watershed

Table 3. Subwatershed management units by size and stream reach.

SMU #	Acres	Square Miles	Stream Reach
SMU 1	7,479.3	11.7	South Branch Kishwaukee River Reach 1, South Branch Tributaries 1 and 2
SMU 2	4,992.3	7.8	South Branch Kishwaukee River Reach 2 and 3, South Branch Tributary 3
SMU 3	5,826.1	9.1	South Branch Kishwaukee River Reach 4 and 5, South Branch Tributary 4 and 5
SMU 4	3,736.4	5.8	Deer Creek Reaches 1-3
SMU 5	4,894.7	7.6	Deer Creek Tributary 1
SMU 6	4,292.6	6.7	Deer Creek Reach 4 and 5, Deer Creek Tributary 2
SMU 7	4,797.1	7.5	Deer Creek Tributary 3
SMU 8	5,830.0	9.1	South Branch Kishwaukee River Reach 6 and 7, South Branch Tributaries 6-9
SMU 9	8,506.2	13.3	South Branch Tributary 10
SMU 10	3,687.9	5.8	Haines Creek
SMU 11	3,067.8	4.8	Bull Run
SMU 12	8,930.1	14.0	South Branch Kishwaukee River Reaches 8-11, South Branch Tributaries 11-13
Totals	**66,040.4**	**103.2**	

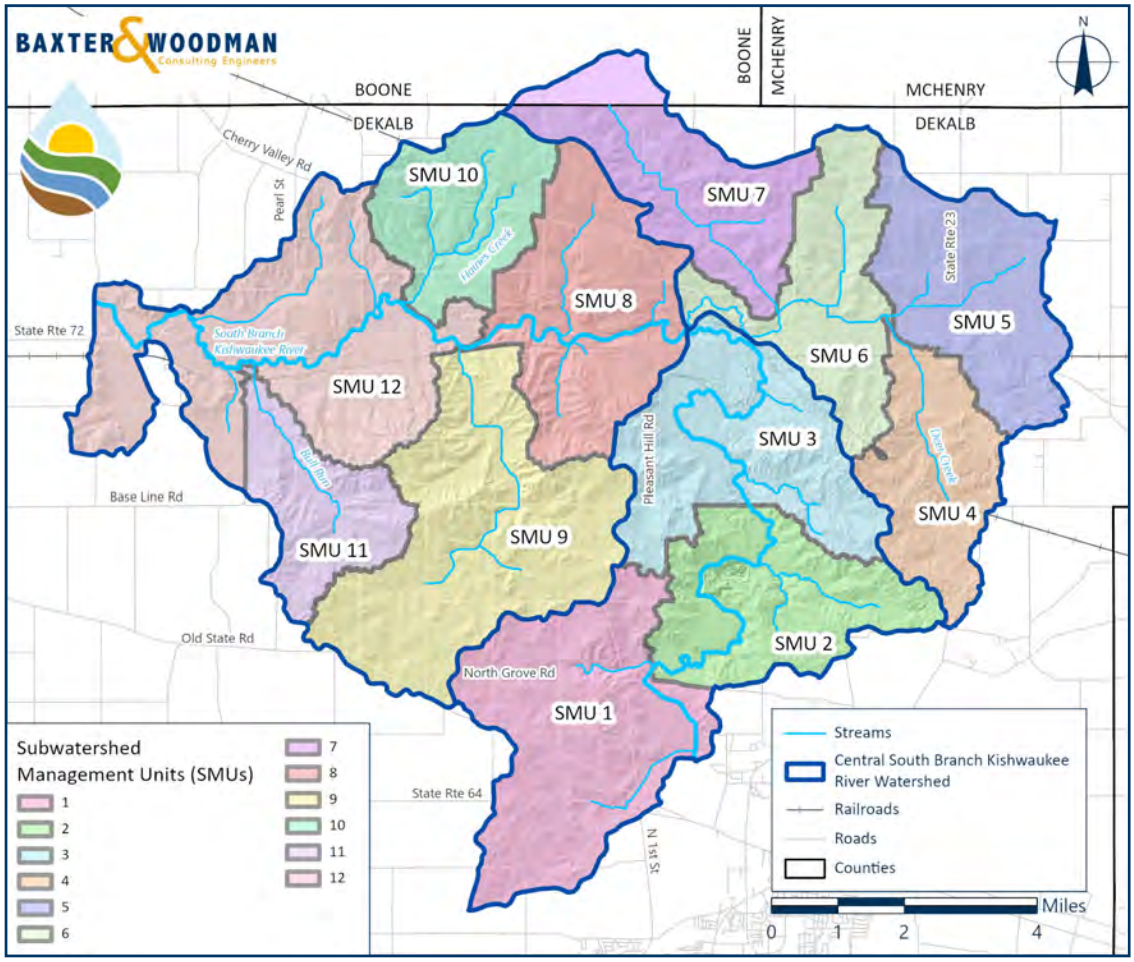


Figure 11. Subwatershed management units (SMUs).

3.4 Soils

Deposits left by the Wisconsin glaciation 14,000 years ago are the raw materials of present soil types in the watershed. These raw materials include till (debris) and outwash. A combination of physical, biological, and chemical variables such as topography, drainage patterns, climate, and vegetation, have interacted over centuries to form the complex variety of soils found in the watershed. Most soils formed under prairie, wetland, and woodland vegetation. The most up to date soils mapping provided by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) was used to summarize the extent of soil types, including hydric soils, soil erodibility, and hydrologic soil groups within the watershed (Tables 4 and 5; Figures 12-14).

Hydric Soils

Wetlands or "Hydric Soils" generally form over poorly drained clay material associated with wet prairies, marshes, and other wetlands and from accumulated organic matter from decomposing surface vegetation. Hydric soils form under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions. Hydric soils are important because they indicate the presence of existing wetlands or drained wetlands where restoration may be possible. Most of the wetlands in CSBKR watershed were intact until the late 1830s when European settlers began to alter significant portions of the watershed's natural hydrology and wetland processes. Where it was feasible wet areas were drained, streams channelized, and prairie and woodland cleared to farm the rich soils. There are 16,481.8 acres of hydric soils (25% of the watershed), which is equivalent to the extent of historic wetlands. Approximately 49,558.6 acres were not hydric. The location of hydric soils in the watershed is depicted on Figure 12.

Soil Erodibility

Soil erosion is the process whereby soil is removed from its original location by flowing water, wave action, wind, and other factors. Sedimentation is the process that deposits eroded soils on other ground surfaces or in bodies of water such as streams and lakes. Soil erosion and sedimentation reduces water quality by increasing total suspended solids (TSS) in the water column and by carrying attached pollutants such as phosphorus, nitrogen, and hydrocarbons. When soils settle in streams and lakes, they often blanket rock, cobble, and sandy substrates needed by fish and aquatic macroinvertebrates for habitat, food, and reproduction.

The potential erosion hazard of the soils is mapped in Figure 13; it is important to know the location of the most highly erodible soils because these areas have the highest potential to degrade water quality during farm tillage and development. Based on mapping, very few areas, less than 1% (367 acres) were rated as having a severe potential erosion hazard, while 31,940 acres (48%) were rated as a moderate potential erosion hazard. This is mostly due to the relatively flat landscape in the watershed; the lack of steep slopes reduces the potential erosion hazard of soils.

Hydrologic Soil Groups

Soils also exhibit different infiltration capabilities and have been classified to fit Hydrologic Soil Groups (HSGs). HSGs are based on a soil's infiltration and transmission (permeability) rates and are used by experts to estimate stormwater runoff potential. Knowing how a soil will hold water ultimately affects the type and location of recommended infiltration Management Measures such as wetland restorations and detention basins. More importantly they can identify possible groundwater recharge areas.

HSGs are classified into four primary categories; A, B, C, and D, and three dual classes, A/D, B/D, and C/D, as detailed in Table 4 below. Dual classes refer to areas where the water table is within 24" of the surface. In these cases, "the first letter applies to the drained condition and the second to the undrained condition (USDA, 2007)". Figure 14 depicts the location of each HSG in the watershed. The HSG categories and their corresponding soil texture, drainage description, runoff potential, infiltration rate, and transmission rate are shown in Table 4 while Table 5 summarizes the acreage and percent of each HSG. Group C soils are dominant throughout the watershed at about 53% coverage and are found along the main stem and southeastern most portions of CSBKR watershed. Group B/D soils make up approximately 28% of the watershed followed by C/D at 15%.

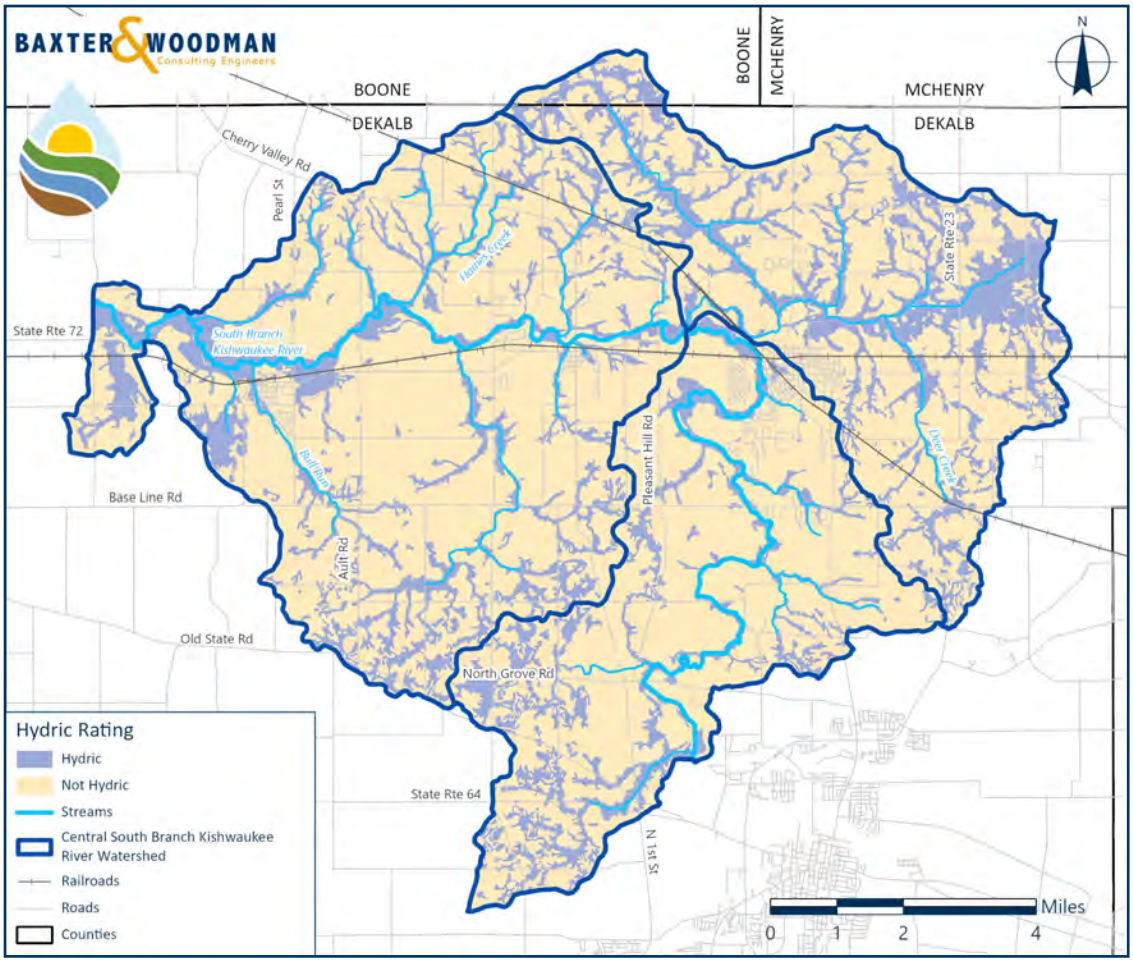


Figure 12. Hydric Soils.

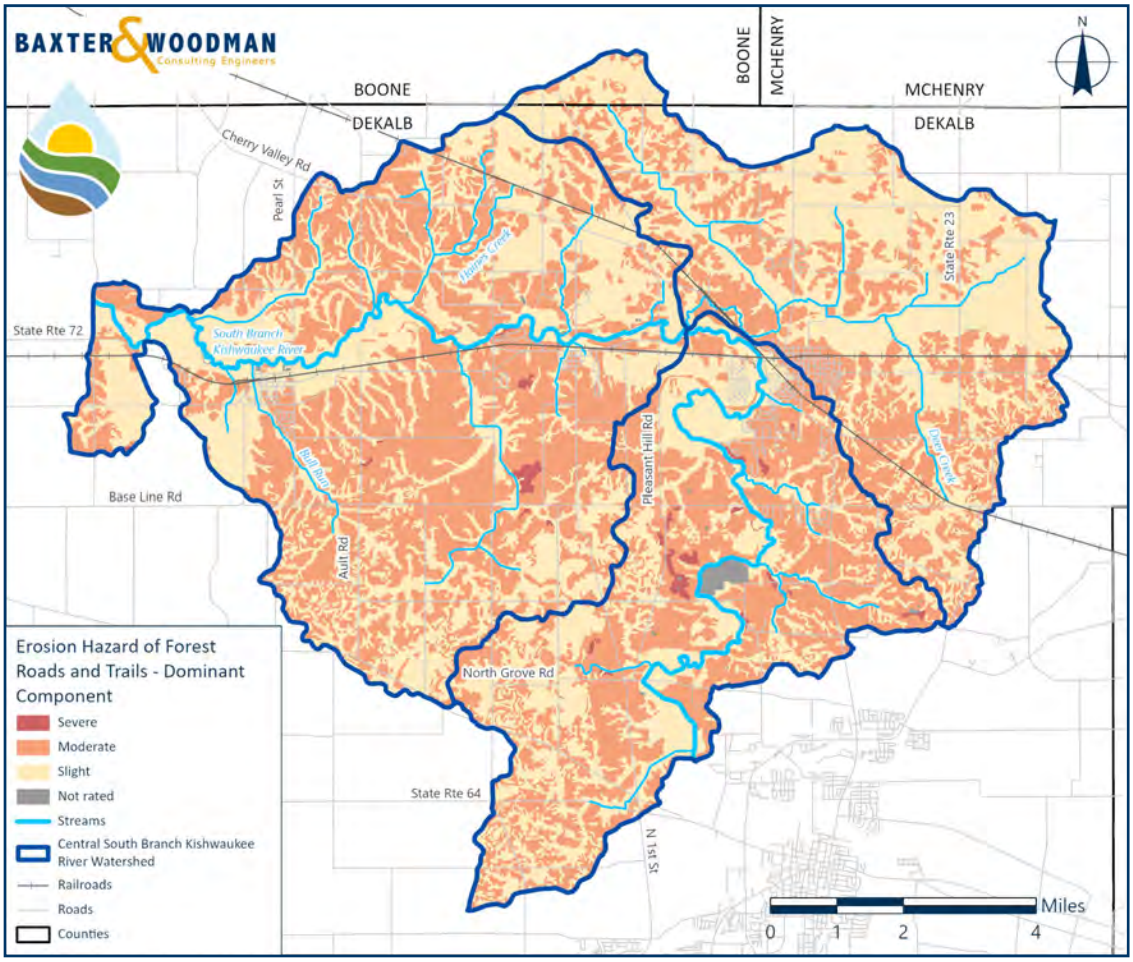


Figure 13. Potential Erosion Hazard.

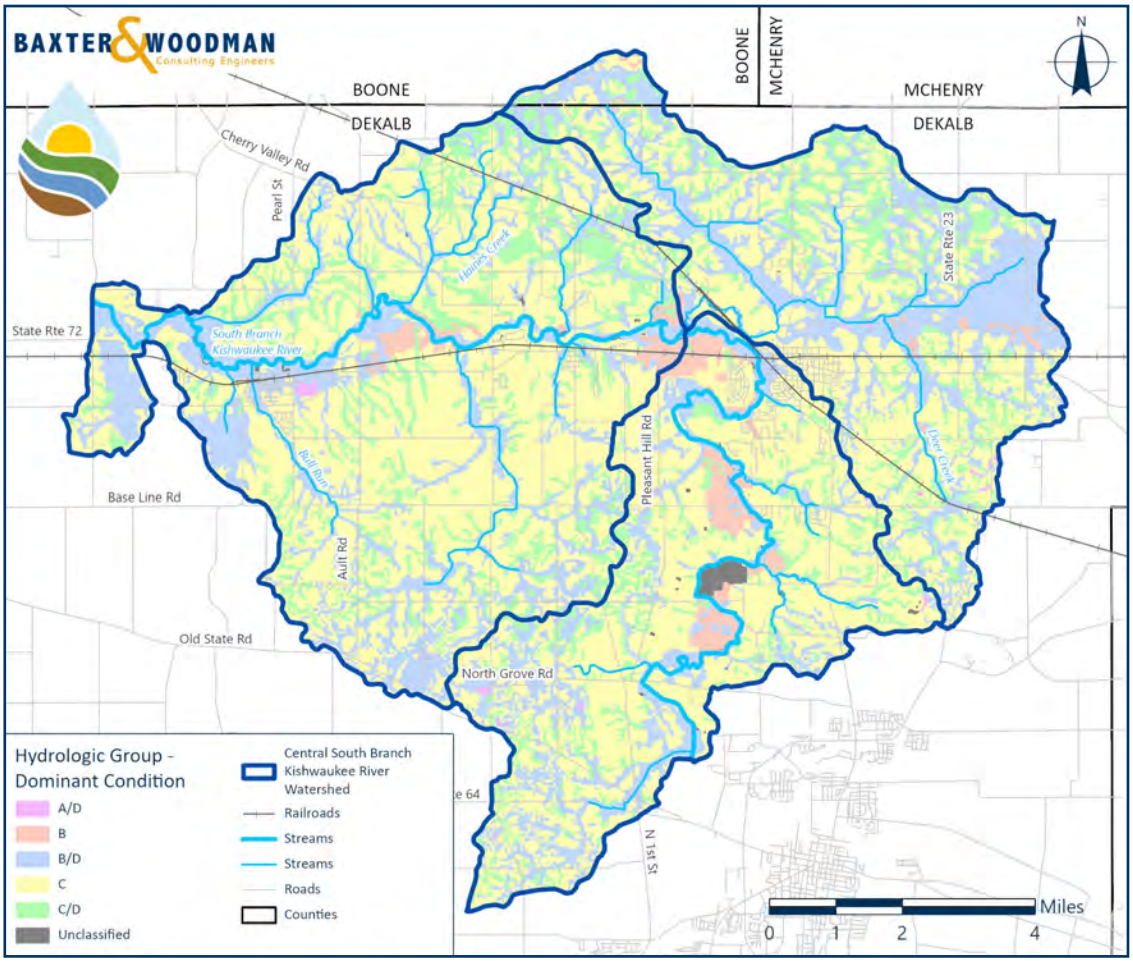


Figure 14. Hydrologic Soil Groups.

Table 4. Hydrologic Soil Groups and their corresponding attributes.

HSG	Soil Texture	Drainage Description	Runoff Potential	Infiltration Rate	Transmission Rate
A	Sand, Loamy Sand, or Sandy Loam	Well to Excessively Drained	Low	High	High
B	Silt Loam or Loam	Moderately Well to Well Drained	Moderate	Moderate	Moderate
C	Sandy Clay Loam	Somewhat Poorly Drained	High	Low	Low
D	Clay Loam, Silty Clay Loam, Sandy Clay Loam, Silty Clay, or Clay	Poorly Drained	High	Very Low	Very Low

Table 5. Hydrologic Soil Groups including acreage and percent of watershed.

Hydrologic Soil Group	Area (acres)	% of Watershed
A/D	116.4	0.2%
B	1,625.2	2.5%
B/D	18,465.9	28.0%
C	35,147.8	53.2%
C/D	10,135.3	15.3%
Unclassified	549.8	0.8%
Totals	**66,040.4**	**100.0%**

3.5 Jurisdictions, Roles, & Protections

The CSBKR watershed is located across two counties, portions of eight townships, and four municipalities (Table 6, Figure 15). Almost 99% of the watershed is within DeKalb County, with the remainder in Boone County. Most of the watershed includes unincorporated townships including Kingston, Mayfield, Genoa, Franklin, Sycamore, South Grove, Spring, and DeKalb Townships. Of the municipalities in the watershed, the City of Genoa has the largest share with 1,688.8 acres (2.6%), followed by the Villages of Kirkland and Kingston with 778.2 (1.2%) and 655.2 acres (1%), respectively. Less than a tenth of one percent of the watershed (15.7 acres) of the City of Sycamore falls within the CSBKR watershed boundary.

Within the CSBKR watershed, less than 1% of the watershed is covered by drainage districts. The Drainage District Coon #1 touches the eastern border of the watershed, while the Drainage District Mayfield DeKalb #2 comes just over the southeastern most edge of the watershed.

Table 6. County, township, unincorporated, and municipal jurisdictions.

Jurisdiction	Area (acres)	% of Watershed
County	**66,040.4**	**100**
DeKalb	65,295.5	98.9
Boone	744.9	1.1
Unincorporated Township Areas	**62,900.0**	**95.2**
Unincorporated Kingston	20,649.8	31.3
Unincorporated Mayfield	15,426.2	23.4
Unincorporated Genoa	12,447.0	18.8
Unincorporated Franklin	7,255.9	11.0
Unincorporated Sycamore	5,283.1	8.0
Unincorporated South Grove	1,063.8	1.6
Unincorporated Spring	744.9	1.1
Unincorporated DeKalb	29.3	0.0
Municipalities	**3,137.9**	**4.8**
Genoa	1,688.8	2.6
Kirkland	778.2	1.2
Kingston	655.2	1.0
Sycamore	15.7	0.0

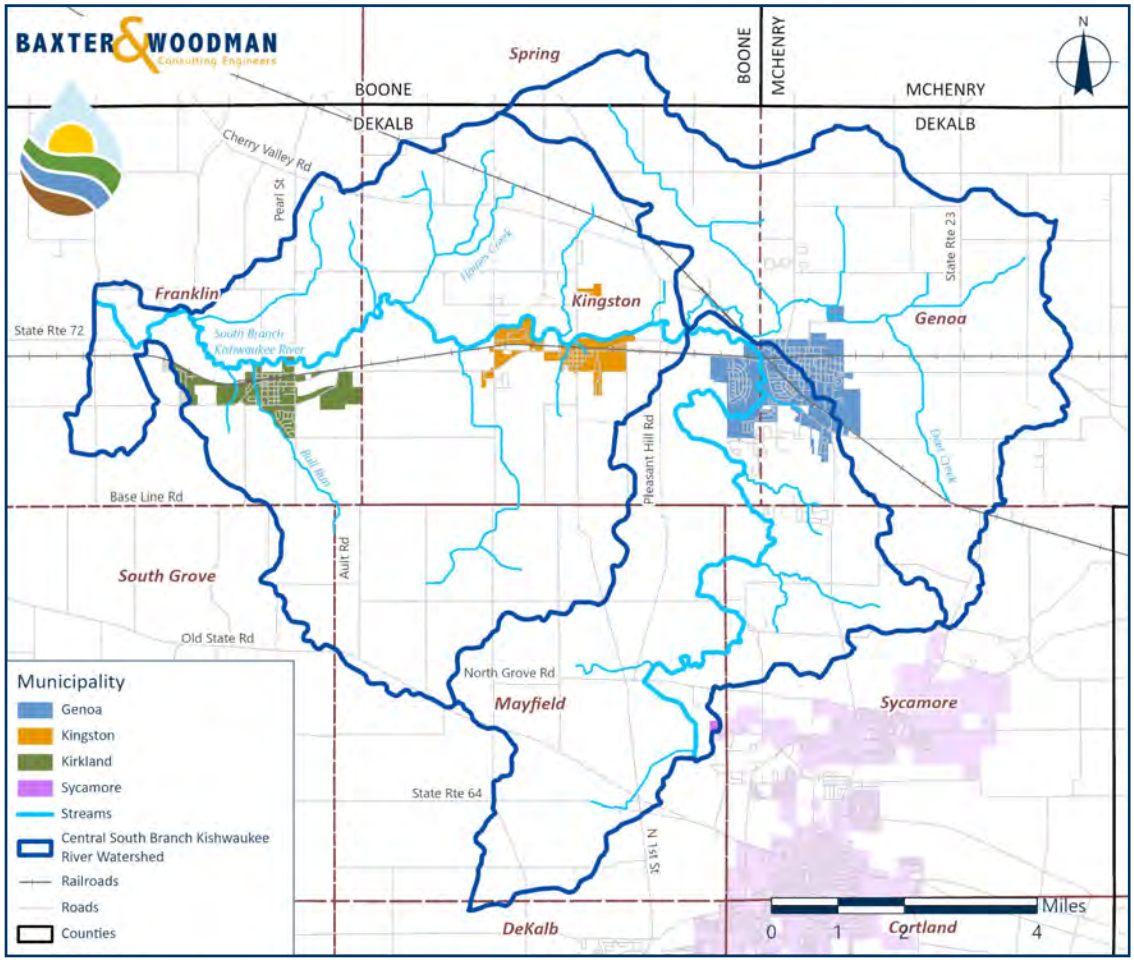


Figure 15. Jurisdictions.

Table 7. Hierarchy of jurisdictions.

Level of Jurisdiction	Entities
Federal	US Environmental Protection Agency (USEPA)
	- Office of Water
	US Army Corps of Engineers (USACE)
	US Department of Agriculture (USDA)
	- Natural Resources Conservation Service (NRCS)
	- Farm Service Agency (FSA)
	- Agricultural Research Service (ARS)
	- Forest Service (FS)
	- National Institute of Food and Agriculture (NIFA)
	- Rural Utilities Service (RUS)
	US Fish and Wildlife Service (USFWS)
	US Department of Transportation (USDOT)
State	Illinois Environmental Protection Agency (IEPA)
	- Bureau of Land
	- Bureau of Water
	Illinois Department of Natural Resources (IDNR)
	- Office of Water Resources (OWR)
	- Illinois Nature Preserves Commission (INPC)
	Illinois Department of Agriculture (IDOA)
County	DeKalb & Boone County Boards
	DeKalb County Community Development Department
	Boone County Planning Department
	DeKalb & Boone County Health Departments
	DeKalb & Boone County Highway Departments
	DeKalb & Boone County Soil and Water Conservation Districts
	DeKalb County Forest Preserve District
Local	City of Genoa
	Village of Kirkland
	Village of Kingston
	City of Sycamore
Township	Unincorporated Kingston Township
	Unincorporated Mayfield Township
	Unincorporated Genoa Township
	Unincorporated Franklin Township
	Unincorporated Sycamore Township
	Unincorporated South Grove Township
	Unincorporated Spring Township
	Unincorporated DeKalb Township

Jurisdictional Roles and Protections

Natural resources throughout the United States are protected to some degree under federal, state, and/or local law, also referred to as regulations. A regulation is a rule or directive made and maintained by an authority, such as a law, act, or municipal ordinance. Jurisdiction authority is a hierarchy (Table 7), starting at the federal level, with subsequent levels (state, county, local, etc.) needing to follow the regulations of all the levels above it. For example, the City of Genoa would need to follow all the Federal guidelines, all of the guidelines provided by the State of Illinois, all DeKalb County regulations, and then can also create and maintain regulations within the City limits. Lower levels of jurisdiction can be more restrictive, but not less restrictive. Watershed boundaries do not correlate with political boundaries and therefore, to properly protect water and other natural resources, cooperation and coordination among all these entities is essential.

Federal Government Roles and Protections

United States Army Corps of Engineers (USACE) - In the CSBKR watershed, the U.S. Army Corps of Engineers (USACE) regulates wetlands through Section 404 of the Clean Water Act. Land development affecting water resources (rivers, streams, lakes, wetlands, and floodplains) is regulated by the USACE when "Waters of the U.S." are involved. These types of waters include any wetland or stream/river that is hydrologically connected to navigable waters. The USACE primarily regulates filling activities and requires buffers or wetland mitigation for developments that impact jurisdictional wetlands.

United States Department of Agriculture (USDA) - The United States Department of Agriculture, is the federal department responsible for developing and executing federal laws related to farming, forestry, rural economic development, and food. Agencies within the USDA include: Agricultural Marketing Service (AMS), Agricultural Research Service (ARS), Animal and Plant Health Inspection Service (APHIS), Center for Nutrition Policy and Promotion (CNPP), Economic Research

Service (ERS), Farm Service Agency (FSA), Food and Nutrition Service (FNS), Food Safety and Inspection Service (FSIS), Foreign Agricultural Service (FAS), Forest Service (FS), National Agricultural Library (NAL), National Institute of Food and Agriculture (NIFA), Natural Resources Conservation Service (NRCS), Risk Management Agency (RMA), Rural Development (RD), Rural Utilities Service (RUS), Rural Housing Service (RHS), and Rural Business-Cooperative Service (RBS). The programs most relevant to management of the CSBKR watershed are discussed further in the following paragraphs.

USDA Agricultural Research Service (ARS) - ARS is USDA's principal in-house research agency studying agricultural research and information. National Research Programs such as Nation Program 211: Water Availability and Watershed Management serve to manage water resources while protecting the environment and human and animal health effectively and safely. This goal is pursued by characterizing potential hazards, developing management practices, strategies and systems to alleviate problems, and providing practices, technologies, and decision support tools for the benefit of customers, stakeholders, partners, and product users.

USDA Farm Service Agency (FSA) - The Farm Service Agency implements agricultural policy, administers credit and loan programs, and manages conservation, commodity, disaster and farm marketing programs through a national network of offices. The FSA strives to support a market-oriented, economically and environmentally sound American agriculture that delivers an abundant, safe, and affordable food and fiber supply while sustaining quality agricultural communities.

USDA Forest Service (FS) - The Forest Service works to sustain the health, diversity and productivity of America's forests and grasslands. The Forest Service seeks to support nature in sustaining life through their stewardship work. The Forest Service works in collaboration with communities and partners in providing access to resources and experiences that promote economic, ecological, and social vitality; and connecting people to the land and one another.

USDA National Institute of Food and Agriculture (NIFA) - The National Institute of Food and Agriculture (NIFA) provides leadership and funding for programs that advance agriculture-related sciences. NIFA's mission is to invest in and advance agricultural research, education, and extension to solve societal challenges. NIFA invests in and supports initiatives that ensure the long-term viability of agriculture. NIFA applies an integrated approach to ensure that discoveries in agriculture-related sciences and technologies reach the people who can put them into practice.

USDA Natural Resources Conservation Service (NRCS) - NRCS is the primary federal agency that works with private landowners to help them conserve, maintain and improve their natural resources to implement conservation practices that clean the air, conserve and clean the water, prevent soil erosion and create and protect wildlife habitat. They are also responsible for providing technical assistance to the USDA Farm Service Agency for sodbuster, wetland and highly erodible land determinations and compliance issues.

USDA Rural Utilities Service (RUS) - RUS provides much-needed infrastructure and infrastructure improvements to rural communities. This includes water and wastewater treatment, electric power and telecommunications services. These services help to expand economic opportunities and improve the quality of life for rural residents. The Water and Environmental Programs (WEP) provides loans, grants and loan guarantees for drinking water, sanitary sewer, solid waste and storm drainage facilities in rural areas and cities and towns of 10,000 or less. Public bodies, non-profit organizations and recognized Indian tribes may qualify for assistance. WEP also makes grants to non-profit organizations to provide technical assistance and training to help rural communities with their water, wastewater and solid waste problems.

United States Department of Transportation (USDOT) - USDOT's mission is to serve the United States by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future.

United States Environmental Protection Agency (USEPA) - The mission of the USEPA is to protect human health and the environment. The EPA works to ensure that Americans have clean air, land and water, and that National efforts to reduce environmental risks are based on the best available scientific information. They also work to ensure that Federal laws protecting human health and the environment are administered and enforced fairly and effectively.

As environmental stewardship is integral to U.S. policies concerning natural resources, human health, economic growth, energy, transportation, agriculture, industry, and international trade; these factors are similarly considered in establishing environmental policy. As well as ensuring that all parts of society have access to accurate information sufficient to effectively participate in managing human health and environmental risks. They also oversee that contaminated lands and toxic sites are cleaned up by potentially responsible parties and revitalized and chemicals in the marketplace are reviewed for safety.

United States EPA Office of Water (OW) - The Office of Water (OW) ensures drinking water is safe, and restores and maintains oceans, watersheds, and their aquatic ecosystems to protect human health, support economic and recreational activities, and provide healthy habitat for fish, plants and wildlife. OW is responsible for implementing the Clean Water Act and Safe Drinking Water Act, among others.
United States Fish and Wildlife Service (USFWS)- USFWS and Illinois Department of Natural Resources (IDNR), along with Illinois Nature Preserves Commission (INPC) and Forest Preserve Districts, are responsible for protecting federal and state threatened and endangered species in the watershed--which are often

found on land that contains wetlands, lakes, ponds, and streams. The USFWS and IDNR play a critical role in natural resource protection, particularly for rare or high-quality habitat and threatened and endangered species. They protect and manage land that often contains wetlands, lakes, ponds, and streams. Their programs function to enforce federal wildlife laws, protect endangered species, manage migratory birds, restore nationally significant fisheries, conserve and restore wildlife habitat such as wetlands, help foreign governments with their international conservation efforts, and distribute hundreds of millions of dollars, through their Wildlife Sport Fish and Restoration program.

State Government Roles and Protections

Illinois Department of Agriculture (IDOA) - IDOA advocates for Illinois' agricultural industry and provides necessary regulatory functions to benefit consumers, agricultural industry, and Illinois' natural resources. The IDOA's vision is to promote and regulate agriculture in a manner which encourages farming and agribusiness while protecting Illinois' consumers and our natural resources. The IDOA regulates pesticides and pesticide applicators, as well as the siting and construction of livestock production facilities, reduction of soil erosion on agricultural land, and oversees the Illinois Groundwater Well Monitoring Network.

There are four IDOA Conservation Practices Program sites in the watershed, two Streambank Stabilization and Restoration Program (SSRP) sites, and one Well Decommissioning Program site. The Conservation Practices Program seeks protect and enhance natural resources and outdoor recreation in Illinois, with the Illinois Department of Agriculture overseeing the agriculture-related components. The primary goals of the SSRP are to develop and demonstrate low-cost bio-engineering techniques for stabilizing streambanks and to encourage adoption of such practices by providing financial incentives, technical assistance, and educational information to landowners with critically eroding streambanks. The Well Decommissioning Program seeks to seal abandoned wells to protect groundwater from direct contamination.

Illinois Department of Natural Resources (IDNR) - IDNR works to manage, conserve, and protect Illinois' natural, recreational, and cultural resources, further the public's understanding and appreciation of those resources, and promote the education, science and public safety of Illinois' natural resources for present and future generations. Offices within IDNR include Architecture, Engineering and Grants; Compliance, Equal Employment Opportunity and Ethics; Grant Management & Assistance; Law Enforcement; Land Management (State Parks); Legal Affairs; Legislation; Mines & Minerals; Oil & Gas; Realty & Capital Planning; Resource Conservation; State Museums; Strategic Services; Water Resources; and World Shooting & Recreational Complex.

There is one IDNR-owned park in the watershed – Kishwaukee River State Fish and Wildlife Area.

IDNR Office of Water Resources (OWR) - The Office of Water Resources is the lead state agency for water resources planning, navigation, floodplain management, the National Flood Insurance Program, water supply, drought, and interstate organizations on water resources. Interagency duties include the state water plan, drought response, flood emergency situation reports, and the comprehensive review of Illinois water use law. The Office of Water Resources consists of three Divisions: The Division of Capital Programs, the Division of Resource Management, and the Division of Regulatory Programs.

The Division of Capital Programs administers the Urban Flooding Mitigation program, water supply planning including water withdrawals from Federal reservoirs, stream gaging, and operation and maintenance of state facilities. The Division of Capital Programs is the Technical Liaison to the Illinois Emergency Management Agency and provides daily briefings on flood conditions of monitored streams throughout the state and its boundary waters during and following a flood or other disasters. The Division of Regulatory Programs administers regulatory programs over construction in the floodways of rivers, lakes, and streams; construction in the shore waters of Lake Michigan; construction and operation of dams; construction in public bodies of water; and diversion of water from Lake Michigan. Resource Management inspects dams, gives permits, coordinates the National Flood Insurance Program and regulates floodplains.

IDNR Illinois Nature Preserves Commission (INPC) - The mission of the Illinois Nature Preserves Commission (INPC) is to assist private and public landowners in protecting high quality natural areas and habitats of endangered and threatened species, in perpetuity, through voluntary dedication or registration of such lands into the Illinois Nature Preserves System. The Commission promotes the preservation of these significant lands and provides leadership in their stewardship, management, and protection.

Illinois Environmental Protection Agency (IEPA) - IEPA works to safeguard the state's natural resources from pollution to provide a healthy environment for its citizens. Through partnership with businesses, local governments, and citizens, IEPA works to continue protection of the air we breathe and our water and land resources. IEPA Bureau of Air, Bureau of Land, Bureau of Water, and Office of Energy operate within their respective fields.

IEPA Bureau of Land (BOL) - The BOL protects human health and the environment by regulating the transfer, storage, and disposal of waste, and by overseeing the cleanup of contaminated properties. The BOL's permitting programs regulate a wide range of waste related activities, including those involving municipal waste, landscape waste, composted material, construction and demolition debris, potentially infectious medical waste, and hazardous waste.

IEPA Bureau of Water (BOW) - The BOW is committed to ensuring that Illinois' rivers, streams, and lakes will support all uses for which they are designated including protection of aquatic life, recreation, drinking water supply and fish consumption. The BOW works to ensure that every Illinois

public water system provides water that is superior quality, meets all regulatory requirements, and that Illinois' groundwater resources are protected for designated drinking water and other beneficial uses. To accomplish this mission, the BOW monitors the quality of the state's surface and groundwater resources; runs a municipal, stormwater, and industrial effluent permitting program; administers a permit program for community water supplies; regularly inspects sources of water pollution and drinking water treatment facilities; responds to citizen complaints; ensures compliance with regulatory standards; and enforces applicable regulatory requirements. To assist, the BOW provides a number of loan and grant programs designed to upgrade or build new wastewater, stormwater treatment and public water supply infrastructure, reduce nonpoint source pollution, conduct green infrastructure projects, and protect and restore Illinois' inland lakes and streams.

IEPA is the designated state agency in Illinois to receive 319 federal funds from U.S. EPA. The purpose of IEPA's 319 program is to work cooperatively with units of local government and other organizations toward the mutual goal of protecting the water quality in Illinois through the control of nonpoint source (NPS) pollution. The program includes providing funding to these groups to implement projects that utilize cost-effective best management practices (BMPs) on a watershed scale. Projects may include structural BMPs such as detention basins and filter strips, non-structural BMPs such as construction erosion control ordinances and setback zones to protect community water supply wells. Technical assistance and information/education programs are also eligible.

NPDES Phase II Stormwater Permit Program

The IEPA BOW regulates wastewater and stormwater discharges to streams and lakes by setting effluent limits, and monitoring/reporting on results. The BOW oversees the National Pollutant Discharge Elimination System (NPDES) program. The NPDES program was initiated under the federal Clean Water Act to reduce pollutants to the nation's waters. This program requires permits for discharge of 1) treated municipal effluent; 2) treated industrial effluent; and 3) stormwater from municipal separate stormsewer systems (MS4's) and construction sites.

The IEPA's NPDES Phase I Stormwater Program began in 1990 and applies only to large and medium-sized municipal separate stormsewer systems (MS4s), several industrial categories, and construction sites hydrologically disturbing 5 acres of land or more. The NPDES Phase II program began in 2003 and differs from Phase I by including additional MS4 categories, additional industrial coverage, and construction sites hydrologically disturbing greater than 1 acre of land. More detailed descriptions can be viewed on the IEPA's web site.

Under NPDES Phase II, all municipalities with small, medium, and large MS4s are required to complete a series of Best Management Practices (BMPs) and measure goals for six minimum control measures:

1. Public education and outreach
2. Public participation and involvement
3. Illicit discharge detention and elimination
4. Construction site runoff control
5. Post-construction runoff control
6. Pollution prevention and good housekeeping

The Phase II Program also covers all construction sites over 1 acre in size. For these sites the developer or owner must comply with all requirements such as completing and submitting a Notice of Intent (NOI) before construction occurs, developing a Stormwater Pollution Prevention Plan (SWPPP) that shows how the site will be protected to control erosion and sedimentation, completing final stabilization of the site, and filing a Notice of Termination (NOT) after the construction site is stabilized.

DeKalb County and DeKalb, Mayfield, Sycamore, and Spring Townships all maintain MS4 permits. There are 4 NPDES permits in the watershed: Kirkland North STP, Walcamp Outdoor Ministries STP, Lucent Tech (treated groundwater), and Ellwood Green Utility Corp STP. For more detailed information regarding NPDES permits see Section 3.17.

IEPA BOW also manages the states Total Maximum Daily Load (TMDL) program. The TMDL program determines the greatest amount of a given pollutant that a water body can receive without violating water quality standards and designated uses and also sets reduction goals necessary to improve impaired waters. Similar to a watershed-based plan, a TMDL takes a watershed approach in determining the pollutant loads that can be allowed in a given lake or stream but takes into account both point and non-point sources. There are no TMDLs within the watershed.

IEPA administers a program to manage discharges from Combined Animal Feeding Operations (CAFOs) under their General NPDES permits. The rules target improvement of the CAFO regulations' effectiveness to help correct improper management practices. There are no permitted CAFOs within the watershed.

County and Local Government Roles and Protections

DeKalb County Board - DeKalb County operates under the township form of county government. The governing body is the County Board. As the legislative element, the County Board is responsible for developing all ordinances for the governance of DeKalb County and which laws are contained in the DeKalb County Code; establishing budget for several funds as well as levying taxes; circulating policies to the general public; and developing rules and regulations for the management of County operations. The County Board has eight (8) standing committees, which meet regularly once each month. Each member serves on two (2) committees. Standing Committees are as follows: Committee of the Whole; County Highway; Economic Development; Executive; Finance; Forest Preserve Operations; Health & Human Services; Law & Justice; and Planning & Zoning. Additionally, there is one current ad-hoc committee: Stormwater Management.

Boone County Board - Boone County operates under the Committee of the Whole (COTW) structure in which a legislative body or other deliberative assembly is considered one large committee. All members of the legislative body are members of such a committee. The board includes 12 elected members and has two standing COTW committees: Administrative & Legislative Committee and Finance, Taxation & Salaries Committee.

DeKalb County Community Development - The primary function of the Community Development Department, (formerly Planning, Zoning and Building Department) is to help direct and manage growth and land use changes in DeKalb County. The principal way in which the Department aids in such management is through the interpretation, application and enforcement of the County's Unified Comprehensive Plan, Zoning Ordinance, Subdivision Regulations, building codes and Stormwater Management Regulations by facilitating an efficient development process and influencing investment in the community.

The Department provides staff support and offers advice and assistance to the County Board, Planning and Zoning Committee, Zoning Hearing Officers, Economic Development Committee, DeKalb County Business Incubator and other County departments, as well as to local communities and residents. Stormwater Management, Environmental protection, and land development in DeKalb County are regulated by the DeKalb County Stormwater Management Ordinance. Land development located on unincorporated land within DeKalb County is ultimately regulated by the DeKalb County Zoning Ordinance. Unincorporated areas include 62,900 acres across 8 townships.

Boone County Planning Department - The mission of the Boone County Planning Department is to coordinate a vision of growth that incorporates the needs of the community for balanced, controlled, and smart growth and to communicate that vision to stakeholders while guiding the development community towards the goals of that vision. The main tools for bringing the long-term visions outlined in the various plans for the area to fruition are the zoning and subdivision ordinance. Additionally, the department maintains a comprehensive plan, a regional stormwater management plan, and land use planning for the County (Boone County, 2021).

DeKalb County Health Department- The mission of the DeKalb County Health Department is to promote optimal health for all county residents. Health promotion includes preventative health services, health protection services and health education. Working in partnership with other organizations, programs help individuals, families, and the community prevent, as well as manage, health problems and risks. DeKalb County Health Department has a strong commitment to delivering quality public health services with competence and skill, while respecting the dignity and rights of all individuals. The Health Department has three divisions: The Administration Division, The Health Protection Division, and The Community Health and Prevention Division. The Health Protection Division goal is to safeguard food and water from contamination. Services include regulation of private sewage systems and potable water.

Boone County Health Department - The mission of the Boone County Health Department is to serve the County by preventing the spread of disease, promoting optimal wellness & protecting the public's health. A volunteer, 11-member Board of Health is appointed by the county board chairman and approved by the county board. The Environmental Health Services section regulates a Private Sewage Program, Private Well Program, and a Well/Septic Evaluation Program.

DeKalb and Boone County Highway Departments- Duties of the Highway Department include maintaining the shoulders, ditches, drainage structures and pavement surfaces on county roads. The DeKalb County Engineer, under the direction of the County Board, makes improvements to and maintains the highway system. The County Highway Department maintains 188 miles of bituminous-paved highways and 44 bridge structures on the county road system. These interconnect with over 801 miles of township roads and 142 township bridges of the nineteen townships. The Department also provides inspection of all county and township bridges every two years, reporting those findings to the Illinois Department of Transportation as required by Statute. The County Engineer and his staff also provide engineering expertise and advise to township highway commissioners. Highways in the rural area of Boone County are under the jurisdiction of several agencies. The townships have approximately 60 percent of rural mileage, county has approximately 18 percent of rural mileage, state as around 14 percent, the Toll Highway Authority has approximately 2 percent, and the remaining rural mileage is private. The County maintains approximately 196 lane miles of road and fourteen bridges with a crew of five employees, a County Engineer, and an administrative assistant (Boone County, 2021).

DeKalb (DCSWCD) and Boone County Soil and Water Conservation Districts - DCSWCD provides technical assistance to the public and other regulatory agencies. It is their mission to responsibly protect our healthy soil and clean water for all generations. DCSWCD is a local resource for natural resource concerns for the residents of DeKalb County. DCWCD is actively involved with watershed planning in DeKalb County, serves as a resource for natural resources education for youth and adults, and advocates for preserving prime farmland in DeKalb County. Although the DCSWCD has no regulatory authority, it influences watershed protection through soil and sediment control and pre- and post-development site inspections. DCSWCD is also the lead agency in developing this watershed-based plan. The Boone County SWCD works to promote protection, maintenance, improvement, and wise use of the soil, water, and related resources. The Boone County SWCD provides multiple public services including Natural Resource Information Reports, soil borings for analysis of septic suitability, in cooperation with the Boone County

Health Department, soil fertility testing, sediment and erosion control, public education, and technical assistance with both IDOA and USDA conservation programs (Boone County, 2021).

DeKalb County Forest Preserve District - The mission of the DeKalb County Forest Preserve District (DCFPD) is to acquire lands in order to preserve, protect, restore and restock the flora, the fauna and the natural beauties of such lands, in their natural state and condition, for the education and recreation of the citizens of DeKalb County. DCFPD maintains 12 properties within the CSBKR watershed: MacQueen Forest Preserve, Russel Woods Forest Preserve, Potawatomi Woods, Knute Olsen Jr. Forest Preserve, the Haines Creek Conservation Corridor (which includes Prairie Oaks, Swanson Grove, Nelson Prairie), Hoppe Heritage Farmstead, South Branch Prairie, Forest Garden, Kishwaukee Forest Reserve, and Riverwood Forest Preserve. These preserves are covered in more detail in Section 3.9 Natural Areas and Green Infrastructure.

Townships and Municipalities- Townships perform three mandatory functions: administering a general assistance program to qualifying residents, maintaining township road district highways and bridges, and assessing real property. Municipalities in the watershed can provide additional watershed protection above and beyond existing watershed ordinances under local Village Codes. Municipal codes present opportunities for outlining and requiring recommendations in this plan such as conservation development, Special Service Area (SSA) or watershed protection fees, and native landscaping.

Planning and zoning within the City of Genoa is regulated under the City's Comprehensive Plan (2003), which is in the process of being updated, and Unified Development Ordinance. The Kirkland Department of Building Safety & Zoning regulates zoning and maintains a zoning map for the Village of Kirkland. The Village of Kingston completed a comprehensive plan in 2003, has a Planning Commission and Zoning Board, but not City Zoning in effect.

Special Jurisdiction Roles and Protections

DeKalb County Community Foundation- The mission of DeKalb County Community Foundation is to enhance the quality of life in DeKalb County, IL by proactively addressing community needs and expanding, managing, and distributing philanthropic resources. The Community Foundation is governed by a volunteer board of directors and oversees the investment and management of charitable funds for individuals, families, nonprofit organizations and corporate donors. Although these monies are pooled for investment purposes, each of the component funds within the Foundation retains its unique identity and charitable intent as specified by the donor. The DeKalb County Community Foundation helps to identify community needs and partners with others through our grantmaking and community leadership resources to bring about positive change and solve problems.

Drainage Districts - Drainage Districts are "local bodies formed for the purpose of draining, ditching, and improving land for agriculture and sanitary purposes (OISS, 2019)." Drainage districts have the authority to tax land within the boundaries for the purpose of building and maintaining drains and levees- this does not include tile drainage. The Illinois Constitution of 1870 authorized the General Assembly to pass laws giving landowners drainage rights, including the use of adjoining land for ditching purposes. Though the law has been amended and changed throughout the years, the law has set up legal procedures for local citizens to petition the county courts for drainage works, assessing and collecting the costs of the drainage construction from the owners of the lands to be benefited by the work, and compensating the owners of land which would be entered for ditching purposes.

Within the CSBKR watershed, less than 1% of the watershed is covered by drainage districts. The Drainage District Coon #1 touches the easter border of the watershed, while the Drainage District Mayfield DeKalb #2 comes just over the southeastern most edge of the watershed.



Downtown Genoa

3.6 Existing Policies and Ordinance Review

Protection of natural resources and green infrastructure during future urban growth will be important for the future health of CSBKR watershed. To assess how future growth might further impact the watershed, an assessment of local municipal ordinances was performed to determine how development currently occurs in each municipality. In this way, potential improvements to local ordinances can be identified. As part of the assessment, municipal governments were asked to compare their local ordinances against model policies outlined by the Center for Watershed Protection (CWP) in a publication entitled "Better Site Design: A Handbook for Changing Development Rules in Your Community" (CWP, 1998) and complete The Code & Ordinance Worksheet: A Tool for Evaluating Development Rules in Your Community (CWP, 2017).

CWP's recommended ordinance review process involves assessments of four general categories including Residential Streets & Parking Lots, Lot Development, Conservation of Natural Areas, and Runoff Reduction. Various questions with point totals are examined under each category. The maximum score is 111 points and final scores are depicted as a percentage of the total. CWP also provides general rules based on scores. Scores between 60 and 80 suggest that it may be advisable to reform local development ordinances. Scores less than 60 generally mean that local ordinances are not environmentally friendly and serious reform may be needed. Local government scores ranged from 26 to 60 with an average score of 43. DeKalb County scored the highest with 60 points followed by the City of Genoa with 26 points. Although scores seem relatively low, it should be noted that this assessment is meant to be a tool to local communities to help guide development of future ordinances. The ordinance review was timely as some local communities were kicking off the process of updating their Uniform Development Ordinance. Various policy recommendations are included in the Action Plan section of the report to address general ordinance deficiencies. The results of the review for each municipality can be found in Appendix B.

3.7 Demographics

The United States Census Bureau tracts population statistics for the nation, down to census tract and block level data. B&W used the 2020 Census Demographic Data Map Viewer by census tract to estimate the CSBKR population and household estimates (USCB, 2020). It is important to note that census information is limited in its granularity to census tracts and blocks so exact population counts for the watershed cannot be calculated. B&W used GIS to overlay the CSBKR watershed boundary onto the 2020 Census Block data. If any part of a census block fell inside the watershed boundary, the statistics for the entire census block were included. It is important to note that this methodology makes best use of the data limitations but likely represents an overestimation. According to the 2020 census, the total population of the CSBKR watershed was estimated to be approximately 20,343 people (Table 8) and the total number of households estimated at 7,666 (Table 8). The highest population and household densities are in and around Genoa and the eastern portion of the watershed. Figure 16 maps population density per square mile by census tract from the 2020 American Community Survey.

The DeKalb County Comprehensive Plan (2011) includes county-wide population statistics, trends, and growth forecasts out to 2030. Woods and Poole Economics, Inc., supplied county economic and demographic projections based on historic growth trends. Woods and Poole Economics'



Figure 16. Population density per square mile by census tract, 2020.

2010 to 2030 forecasts of population was used to project how these attributes will impact CSBKR watershed population statistics (Table 8; DeKalb County, 2011). In consultation with the watershed committee, B&W assumed that the population of the CSBKR watershed will grow at the same rate as the estimated growth for DeKalb County, as calculated by Woods & Poole Economics. According to Woods and Poole Economics, the population of DeKalb County is expected to reach 138,252 by 2030, an 11.99% increase over the 2020 population. Therefore, B&W assumes that the population of the CSBKR watershed is expected to increase from roughly 20,343 in 2020 to 22,782 by 2030, or an 11.99% increase.

Socioeconomic Status

According to the United States Census Bureau, the City of Genoa is the largest in the watershed, with a 2020 population of 5,902, followed by Kirkland and Kingston with populations of 1,524 and 1,183, respectively. The demographics of the watershed are detailed in Table 9 by location and assumes that the unincorporated portions of the watershed are likely similar to the statistics shown for the three municipalities. The CSBKR watershed can generally be described as having a predominately middle-aged, white population with a median age between 34.5 and 39.5 years old and ranging from 81.9 – 91.7% white. Median household income ranges from $63,708 in Kirkland to $84,375 in Kingston, while median property values range between $149,400 in Kirkland to $164,600 in Kingston. Kirkland has the highest percentage of its population below the poverty line with 12.8%, while Kingston has the lowest at 5.8%. The CSBKR watershed does not contain any environmental justice areas, according to USEPA's Environmental Justice Screening and Mapping Tool. Finally, manufacturing is the largest industry in all three municipalities in the watershed.

Table 8. CSBKR population statistics and growth forecast.

Data Category	2020	2030 Projection	Change (2020-2030)	Percent Change
CSBKR Population Estimates	20,343	22,782	2,439	+11.99%

Source: United States Census Bureau 2010 Census; Illinois Department of Public Health Population Projections, July 1 2010 to July 10, 2025.

Table 9. Demographic data by location, USCB 2020 ACS 5-Year Estimate.

Municipality/ Location	Median Age	Ethnicity (% White)	Median Household Income	Median Property Value	% Below Poverty Line	2020 Population
Genoa	39.5	84.4 %	$72,795	$158,100	8.8 %	5,092
Kirkland	34.5	91.7 %	$63,708	$149,400	12.8 %	1,524
Kingston	37.3	81.9 %	$84,375	$164,600	5.8 %	1,183



Example of typical subdivision on Northwood Drive

3.8 Land Use and Impervious Cover Analysis

2023 Land Use/Land Cover

Highly accurate land use/land cover data was produced for CSBKR watershed using several sources of data. First, DeKalb County land use data was used as a base layer. Next, the most recent land use/land cover data from the municipalities in the watershed was obtained from comprehensive plans and adjustments were made where data was missing. 2023 aerial photography of the watershed was also overlaid on existing land use data in GIS so that additional discrepancies could be corrected. Finally, several corrections were made to land use based on field notes taken by B&W during the 2023 watershed resource inventory. The 2023 land use/land cover data and map for CSBKR watershed is depicted on Figure 17 and detailed in Table 10. Land cover classifications, as detailed in the DeKalb County Unified Comprehensive Plan, are defined in the Land Use/Land Cover Definitions text box.

Agricultural land uses are by far the most abundant land use in the watershed at 58,442.5 acres or 88.5%. Agricultural land has dominated the watershed since the late 1800s. Agricultural areas dominate the watershed outside of Kirkland, Kingston, and Genoa. Residential land uses, both single family and multi-family, make up the next largest share of the watershed at 2,655.9 acres (4.0%), followed by transportation/utility land uses (2,127.5 acres; 3.2%) and open space at 1,959.7 acres (3.0%). The remaining land uses, including mixed-use, mining, municipal, commercial, industrial, and vacant all make up less than 1% of the watershed. Residential, mixed-use, commercial, and municipal land uses are generally clustered around Kirkland, Kingston, Genoa, and the rail lines generally. Open space land uses tend to follow the South Branch Kishwaukee River and its tributaries and include state, county, and municipal parks and preserves.

Table 10. 2023 land use/land cover classifications and acreage.

Land Use	Area (Acres)	% of Watershed
Agriculture	58,442.5	88.5%
Residential	2,655.9	4.0%
Transportation/Utility	2,127.5	3.2%
Open Space	1,959.7	3.0%
Mixed-Use	232.1	0.4%
Mining	223.2	0.3%
Municipal	165.7	0.3%
Commercial	117.7	0.2%
Industrial	96.5	0.1%
Vacant	19.7	0.0%
Total	66,040.4	100.0%

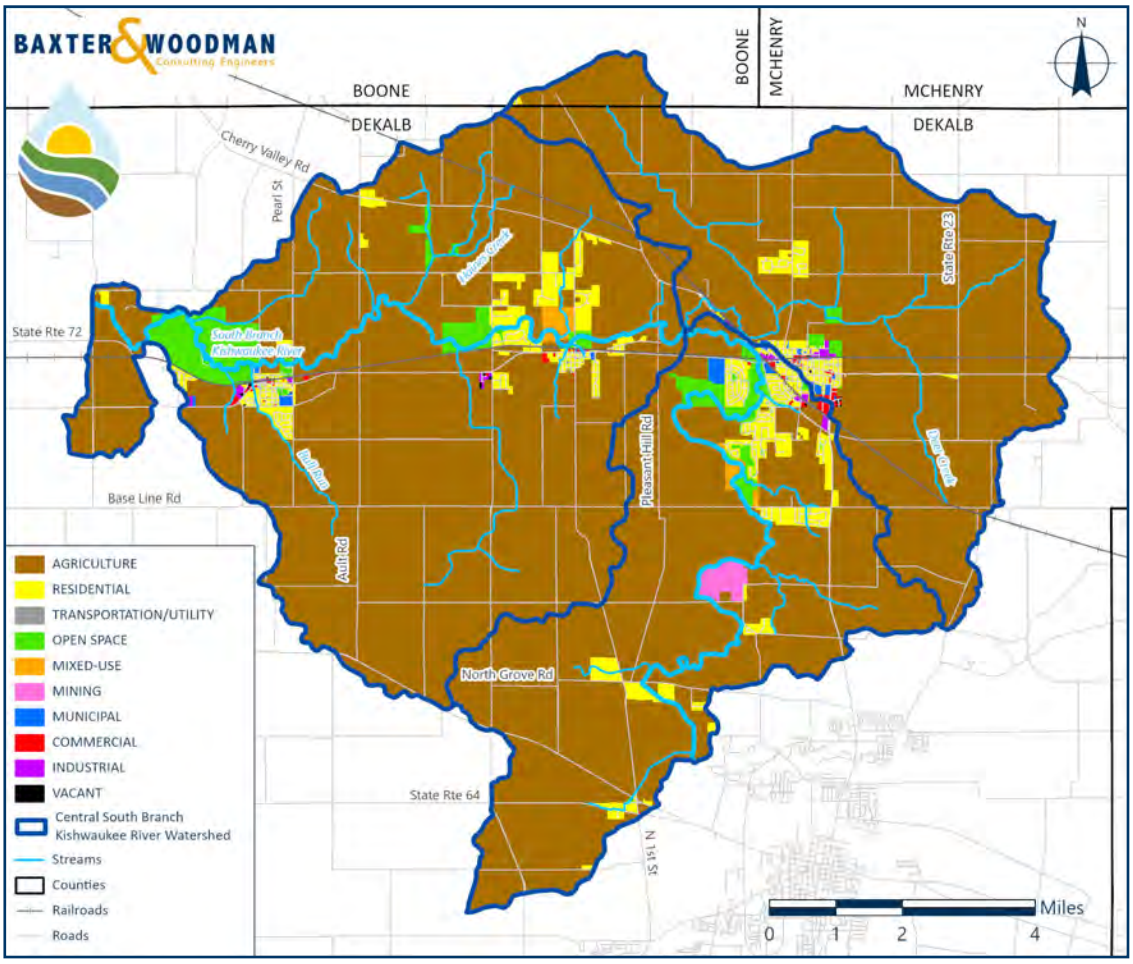


Figure 17. 2023 Land use/land cover.

Land Use/Land Cover Definitions:

Agriculture: Agriculture is shown in areas best utilized to produce cash crops and should be protected from urban development because of its value as an irreplaceable resource within the County. Portions of these areas are used for farmsteads and very low-density residential uses.

Commercial: This land use category includes retail and service uses, as well as some office uses, which provide needed goods and services to residents and businesses.

Industrial: Industrial land use includes non-agricultural manufacturing, warehousing, wholesale operations, and distribution and logistics facilities which provide jobs and products for DeKalb County residents.

Mining: Land and/or buildings or structures used for the removal of gravel, stone, sand, earth, clay, fill, mineral or other similar substance for construction, industrial or manufacturing purposes; and includes Accessory Uses.

Mixed-Use: This land use category designates the areas suitable for residential development in a manner that emulates the established neighborhoods in the municipalities and combines residential, commercial, cultural, or institutional functions into a building, block, or neighborhood.

Municipal: Civic uses are properties owned and operated by federal, state, or local government and include schools, cemeteries, or governmental administration and services. Institutional uses are private uses which generally serve the public and include religious facilities and private schools.

Open Space: Open space is land that is either used or is designated for future use as public or private parks, golf courses, natural areas, and low-intensity land uses such as stormwater management facilities.

Residential: Land use that includes low and medium density residential uses and multifamily residences. These include all residential building types, including single-family, multi-family, duplex, townhouse units, apartment complexes, retirement complexes, mobile home parks, trailer courts, condominiums, and associated parking on lots.

Transportation/Utility: Land use that includes railroads, rail yards, linear transportation such as streets and highways, and airport transportation; and land use that includes telephone, radio and television towers, dishes, gas, sewage pipeline, rights-of-way, wastewater facilities, etc.

Future Land Use/Land Cover Predictions

Information on predicted future land use/land cover for the watershed was obtained from the Unified Future Land Use Plan within the DeKalb County Unified Comprehensive Plan through the year 2030. Predicted land use/land cover changes are summarized in Figure 18 and Table 11. Areas shown in white on Figure 19 reflect no change is predicted land use/land cover classification.

Table 11 compares existing land use/land cover acreage to predicted future land use/land cover acreage. The largest loss of a current land use/land cover is expected to occur on agricultural land where approximately 8,244.3 acres of the existing 58,442.5 acres (12.5% decrease) is expected to be converted to residential and open space land uses, among others. The majority of these changes are expected to occur surrounding Genoa, Kingston, and Kirkland as they continue to develop. Lands designated as residential are expected to increase by 3,928.2 acres (6.0%) and open space is planned to increase by 3,294.6 acres (5.0%).

Table 11. Comparison between 2023 and predicted future (2030) land use/land cover statistics.

Land Use/ Land Cover	Current Area (acres)	Current % of Watershed	Predicted Area (acres)	Predicted % of Watershed	Change (acres)	Percent Change
Agriculture	58,442.5	88.5%	50,198.2	76.0%	-8,244.3	-12.5%
Residential	2,655.9	4.0%	6,584.1	10.0%	3,928.2	6.0%
Transportation/Utility	2,127.5	3.2%	1,082.5	1.6%	-1,045.0	-1.6%
Open Space	1,959.7	3.0%	5,254.3	8.0%	3,294.6	5.0%
Mixed-Use	232.1	0.4%	780.0	1.2%	547.9	0.8%
Mining	223.2	0.3%	223.2	0.3%	0.0	0.0%
Municipal	165.7	0.3%	290.6	0.4%	124.9	0.1%
Commercial	117.7	0.2%	880.5	1.3%	762.8	1.1%
Industrial	96.5	0.1%	747.0	1.1%	650.5	1.0%
Vacant	19.7	0.0%	0.0	0.0%	-19.7	0.0%

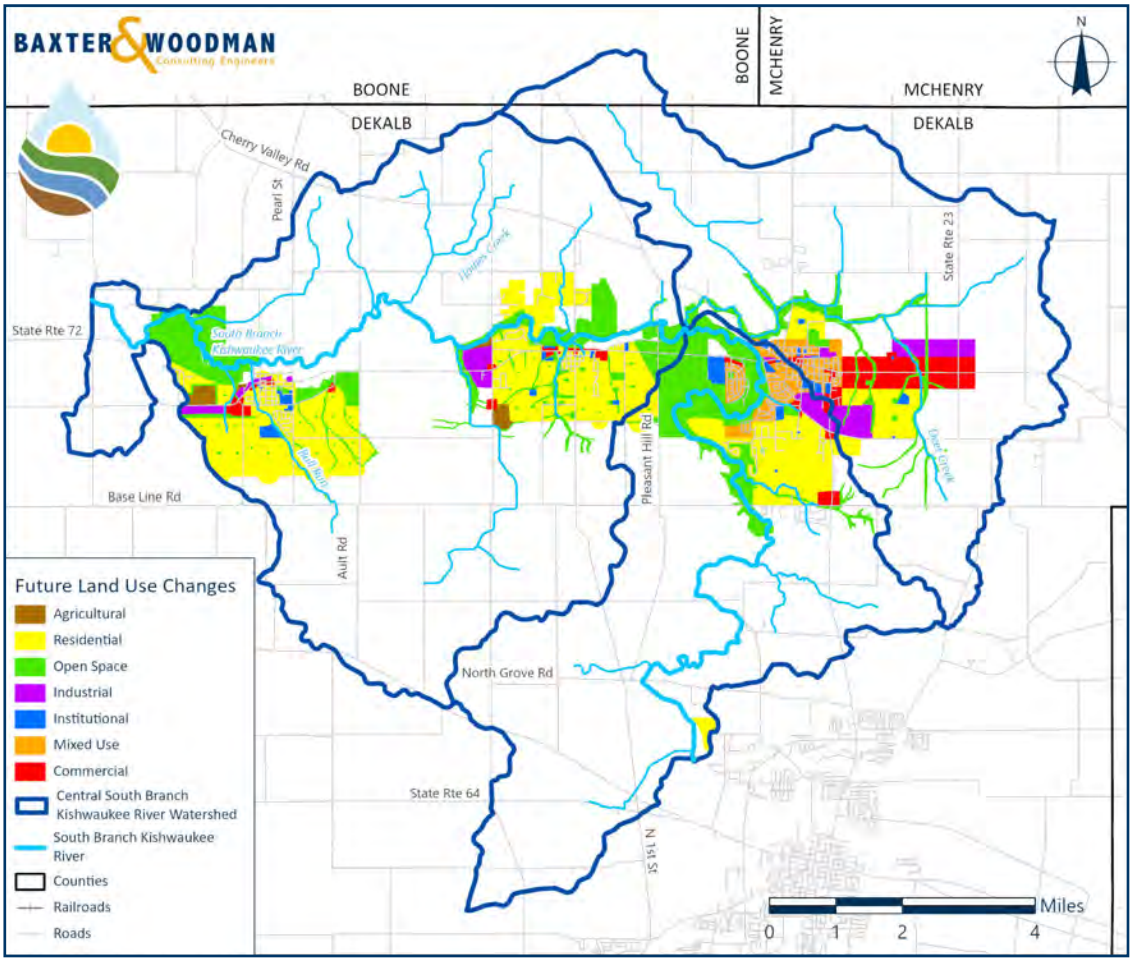


Figure 18. Future (2030) land use/land cover changes.

Impervious Cover

Impervious cover is defined as surfaces of an urban landscape that prevent infiltration of precipitation (Scheuler, 1994). Imperviousness is an indicator used to measure the impacts of urban land uses on water quality, hydrology and flows, flooding/depressional storage, and habitat related to streams (Figure 19). Based on studies and other background data, Scheuler (1994) and the Center for Watershed Protection (CWP) developed an Impervious Cover Model used to classify streams within subwatersheds into three quality categories: Sensitive, Impacted, and Non-Supporting (Table 12). In general, Sensitive subwatersheds have less than 10% impervious cover, stable channels, good habitat, good water quality, and diverse biological communities whereas streams in Non-Supporting subwatersheds generally have greater than 25% impervious cover, highly degraded channels, degraded habitat, poor water quality, and poor-quality biological communities. In addition, runoff over impervious surfaces collects pollutants and warms the water before it enters a stream resulting in a shift from sensitive species to ones that are more tolerant of pollution and hydrologic stress.

Increasing impervious cover impacts water quality, hydrology, flow, flooding, and habitat. Higher amounts of impervious surfaces affect water quality in streams and lakes by increasing pollutant loads and water temperature. Impervious surfaces accumulate pollutants from the atmosphere, vehicles, roof surfaces, lawns and other diverse sources. During a storm event, pollutants such as nutrients (nitrogen and phosphorus), metals, oil/grease, and bacteria are delivered to streams and lakes. According to monitoring and modeling studies, increased imperviousness is directly related to increased urban pollutant loads (Schueler, 1994). Furthermore, impervious surfaces can increase stormwater runoff temperature as much as 12 degrees compared to vegetated areas (Galli, 1990). According to the Illinois Pollution Control Board (IPCB), water temperatures exceeding 90°F (32.2°C) can be lethal to aquatic fauna and can generally occur during hot summer months.

Higher impervious cover translates to greater runoff volumes thereby changing hydrology and flows in streams. If unmitigated, high runoff volumes can result in higher floodplain elevations (Schueler, 1994). In fact, studies have shown that even relatively low percentages of imperviousness (5% to 10%) can cause peak discharge rates to increase by a factor of 5 to 10, even for small storm events. Impervious areas come in two forms: 1) disconnected and 2) directly connected. Disconnected impervious areas are represented primarily by rooftops, so long as the rooftop runoff does not get funneled to impervious driveways or a stormsewer system. Significant portions of runoff from disconnected surfaces usually infiltrate into soils more readily than directly connected impervious areas such as parking lots that typically end up as stormwater runoff directed to a stormsewer system that discharges directly to a waterbody.

Flooding is an obvious consequence of increased flows resulting from increased impervious cover. As stated above, increased impervious cover leads to higher water levels, greater runoff volumes, and high floodplain elevations. Higher floodplain elevations usually result in more flood problem areas. Furthermore, as development increases, wetlands and other open space decrease. A loss of these areas results in increased flows because wetlands and open space typically soak up rainfall and release it slowly via groundwater discharge to streams and lakes. Detention basins can and do minimize flooding in highly impervious areas by regulating the discharge rate of stormwater runoff, but detention basins do not reduce the overall increase in runoff volume.

A threshold in habitat quality exists at approximately 10% to 15% imperviousness (Booth and Reinelt, 1993). When a stream receives more severe and frequent runoff volumes compared to historical conditions, channel dimensions often respond through the process of erosion by widening, downcutting, or both, thereby enlarging the channel to handle the increased flow. Channel instability leads to a cycle of streambank erosion and sedimentation resulting in physical habitat degradation (Schueler, 1994). Streambank erosion is one of the leading causes of sediment suspension and deposition in streams leading to turbid conditions that may result in undesirable changes to aquatic life (Waters, 1995). Sediment deposition alters habitat for aquatic plants and animals by filling interstitial spaces in substrates important to benthic macroinvertebrates and some fish species. Physical habitat degradation also occurs when high and frequent flows result in loss of riffle-pool complexes.

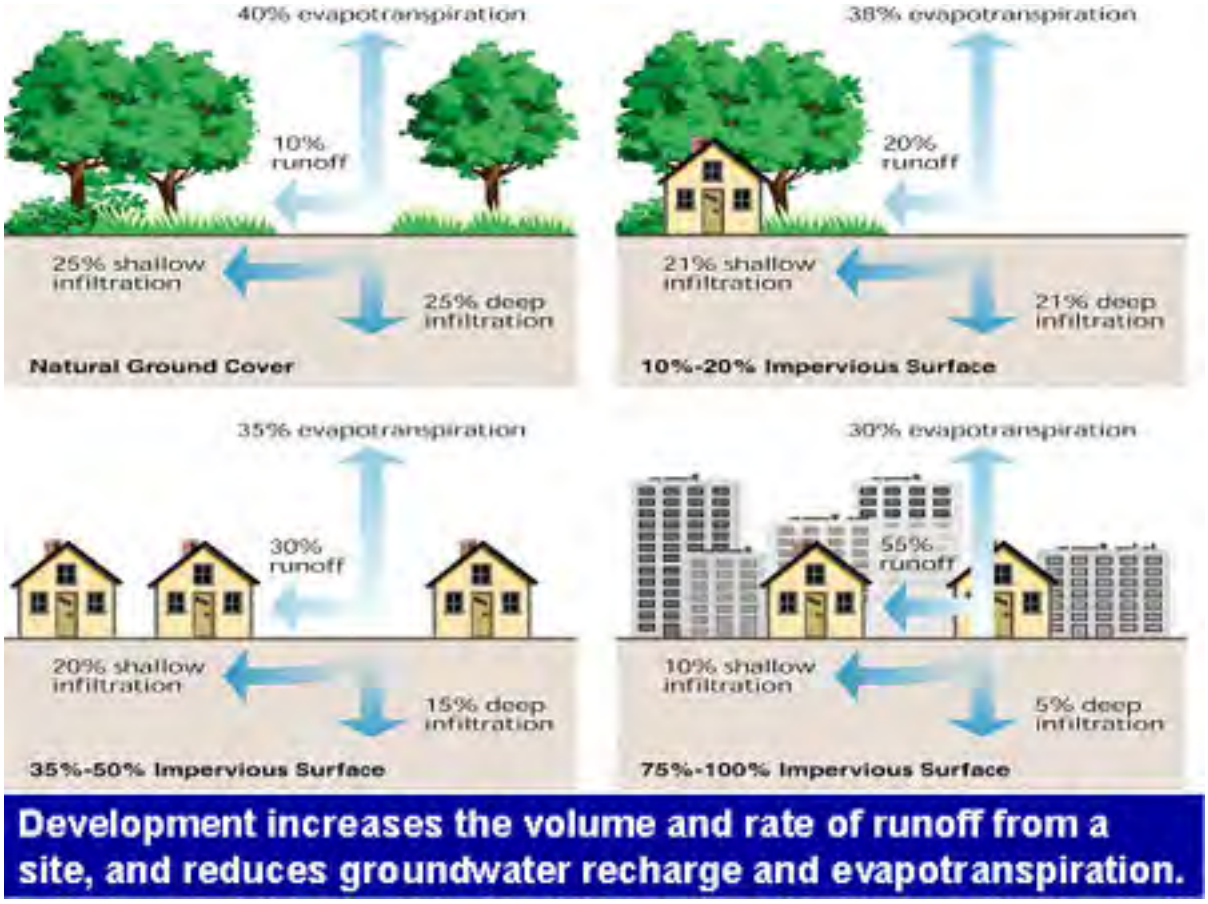


Figure 19. Relationship between development, evapotranspiration, and infiltration (Source: USPEA, 2023).

Table 12. Impervious category, percent impervious, & stream condition (Source: Zielinski 2002).

Category	% Impervious	Stream Condition within Subwatershed
Sensitive	<10%	Stable stream channels, excellent habitat, good water quality, and diverse biological communities
Impacted	>10% but <25%	Somewhat degraded stream channels, altered habitat, decreasing water quality, and fair-quality biological communities.
Non-Supporting	>25%	Highly degraded stream channels, degraded habitat, poor water quality, and poor-quality biological communities.



Sensitive Stream



Impacted Stream



Non-Supporting Stream

2023 Impervious Cover Estimate & Future Vulnerability

In 1998, the Center for Watershed Protection (CWP) published the Rapid Watershed Planning Handbook. This document introduced rapid assessment methodologies for watershed planning. The CWP released the Watershed Vulnerability Analysis as a refinement of the techniques used in the Rapid Watershed Planning Handbook (Zielinski, 2002). The vulnerability analysis focuses on existing and predicted impervious cover as the driving forces impacting potential stream quality within a watershed. It incorporates the Impervious Cover Model described at the beginning of this subsection to classify Subwatershed Management Units (SMUs).

Baxter & Woodman used a modified Vulnerability Analysis to compare each SMU's vulnerability to predicted land use changes across CSBKR watershed. Three steps were used to generate a vulnerability ranking of each SMU. The results were used to make and rank recommendations in the Action Plan related to curbing the negative effects of predicted land use changes on the watershed.

Step 1: Existing Impervious Cover Classification

The first step of the Vulnerability Analysis is an existing classification of each SMU based on 2023 land use/land cover and measured impervious cover. 2023 impervious cover was calculated by assigning an impervious cover percentage for each land use/land cover category based upon the United States Department of Agriculture's (USDA) Technical Release 55 (TR55) (USDA 1986). Highly developed land such as commercial/retail for example is estimated to have over 70% impervious cover while a typical medium density residential development exhibits around 25% impervious cover. Open space areas such as forest preserves generally have less than 5% impervious cover. GIS analysis was used to estimate the percent impervious cover for each SMU in the watershed using 2023 land use/land cover data. Each SMU then received an initial classification (Sensitive, Impacted, or Non-Supporting) based on percent of existing impervious cover (Table 13). This resulted in ten SMUs classified as Sensitive and two SMUs classified as Impacted.

Step 2: Predicted Future Impervious Cover Classification

Predicted future impervious cover was evaluated in the second step of the vulnerability analysis by classifying each SMU as Sensitive, Impacted, or Non-Supporting based on predicted future (2030) land use changes. Table 13 summarize and depict predicted future impervious cover classifications for each SMU. This step identifies SMUs that are most vulnerable to future development pressure. SMUs 4, 6, and 11 changed from Sensitive to Impacted. These changes are attributed to planned growth and development in and surrounding Genoa, Kingston, and Kirkland.

Step 3: Vulnerability Ranking

Vulnerability to future development for each SMU was categorized as Low, Medium, or High according to the following criteria:

Low = no change in classification; <2% change in impervious cover
Medium = no change in classification and 2-5% change in impervious cover
High = classification change and/or >5% change in impervious cover

The vulnerability analysis resulted in 4 High, 3 Medium, and 5 Low ranked SMUs (Table 13; Figure 20). Subwatershed Management Units 3, 4, 6, and 11 are ranked as highly vulnerable to future impacts associated with impervious cover because each is expected to change classification and/or will undergo an increase of impervious cover of more than 5%. SMUs 5, 8, and 12 are ranked as moderately vulnerable to predicted land use changes and remaining SMUs are less vulnerable to predicted future land use changes.

The results of this analysis clearly point to the importance of mitigating the impacts of traditional development patterns in the future. It will be important to consider utilizing Conservation Design or Low Impact Development standards that incorporate the most effective and reliable Stormwater Treatment Train practices whereby stormwater is routed through various Management Measures prior to being released from the site.

Table 13. Existing 2023, predicted (2030) impervious cover, and vulnerability by SMU.

SMU #	Acres	Existing Impervious %	Existing (2019) Impervious Classification	Predicted Impervious %	Predicted (2030) Impervious Classification	Percent Change	Vulnerability Ranking
1	7,479.3	5.7%	Sensitive	6.1%	Sensitive	0.4%	Low
2	4,992.3	5.6%	Sensitive	5.6%	Sensitive	0.0%	Low
3	5,826.1	10.3%	Impacted	17.8%	Impacted	7.5%	High
4	3,736.4	5.7%	Sensitive	14.6%	Impacted	8.9%	High
5	4,894.7	5.4%	Sensitive	8.1%	Sensitive	2.7%	Medium
6	4,292.6	9.0%	Sensitive	19.6%	Impacted	10.5%	High
7	4,797.1	5.2%	Sensitive	5.2%	Sensitive	0.0%	Low
8	5,830.0	10.3%	Impacted	13.4%	Impacted	3.1%	Medium
9	8,506.2	5.2%	Sensitive	6.8%	Sensitive	1.6%	Low
10	3,687.9	5.8%	Sensitive	5.8%	Sensitive	0.0%	Low
11	3,067.8	6.2%	Sensitive	11.5%	Impacted	5.2%	High
12	8,930.1	6.4%	Sensitive	9.2%	Sensitive	2.8%	Medium

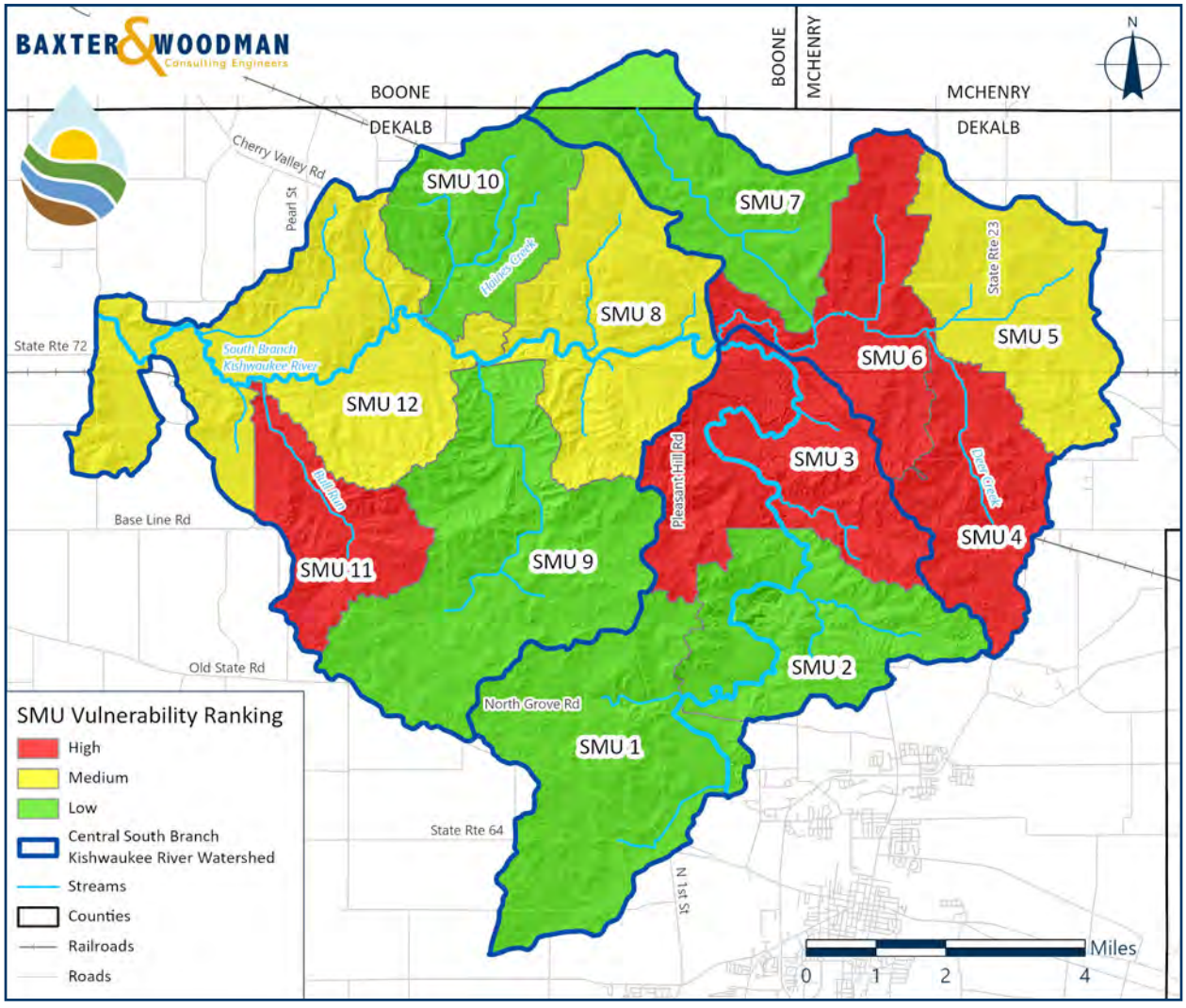


Figure 20. SMU Vulnerability Ranking .

3.9 Natural Areas and Green Infrastructure

Important Natural Areas

Important Natural Areas provide large greenway corridors that interconnect land and waterways, support native species, maintain natural ecological processes, and contribute to the health and quality of life for communities and people. These natural areas are important keys to protecting water quality and habitat and need to be managed or restored to perform those functions optimally. The CSBKR watershed is fortunate to be home to many Important Natural Areas, including one State Wildlife Area, 12 DeKalb County Forest Preserve District properties, and 12 municipal or township parks (Table 14; Figure 21). In total there are 1,737.9 acres of Important Natural Areas in the watershed.

Table 14. Important natural area summary data.

Natural Area	Owner	Size (acres)
Kishwaukee River State Fish and Wildlife Area	Illinois Department of Natural Resources	420.0
Potawatomi Woods	DeKalb County Forest Preserve District	416.5
Kishwaukee Forest Preserve	DeKalb County Forest Preserve District	233.5
Russell Woods Forest Preserve	DeKalb County Forest Preserve District	125.8
Riverwood Forest Preserve	DeKalb County Forest Preserve District	103.4
Genoa Prairie	Genoa Township Park District	100.1
South Branch Prairie	DeKalb County Forest Preserve District	54.3
Kingston Park	Kingston Township	51.3
Prairie Oaks	DeKalb County Forest Preserve District	44.1
Swanson Grove	DeKalb County Forest Preserve District	38.6
MacQueen Forest Preserve	DeKalb County Forest Preserve District	31.6
Chamberlain Park	Genoa Township Park District	29.1
Knute Olson, Jr. Forest Preserve	DeKalb County Forest Preserve District	23.9
Nelson Prairie	DeKalb County Forest Preserve District	15.8
Franklin Township Park	Village of Kirkland	10.7
David Carroll Memorial Citizens Park	Genoa Township Park District	9.0
Kiernan Park	Genoa Township Park District	8.0
Hoppe Heritage Farmstead	DeKalb County Forest Preserve District	5.0
Forest Garden	DeKalb County Forest Preserve District	4.2
Riverbend Park	Genoa Township Park District	4.1
Lions Corner Park	Genoa Township Park District	3.8
Oak Creek Park	Genoa Township Park District	2.2
Genoa Woods	Genoa Township Park District	1.5
Derby Line Park	Genoa Township Park District	1.2
Durham Park	Genoa Township Park District	0.2

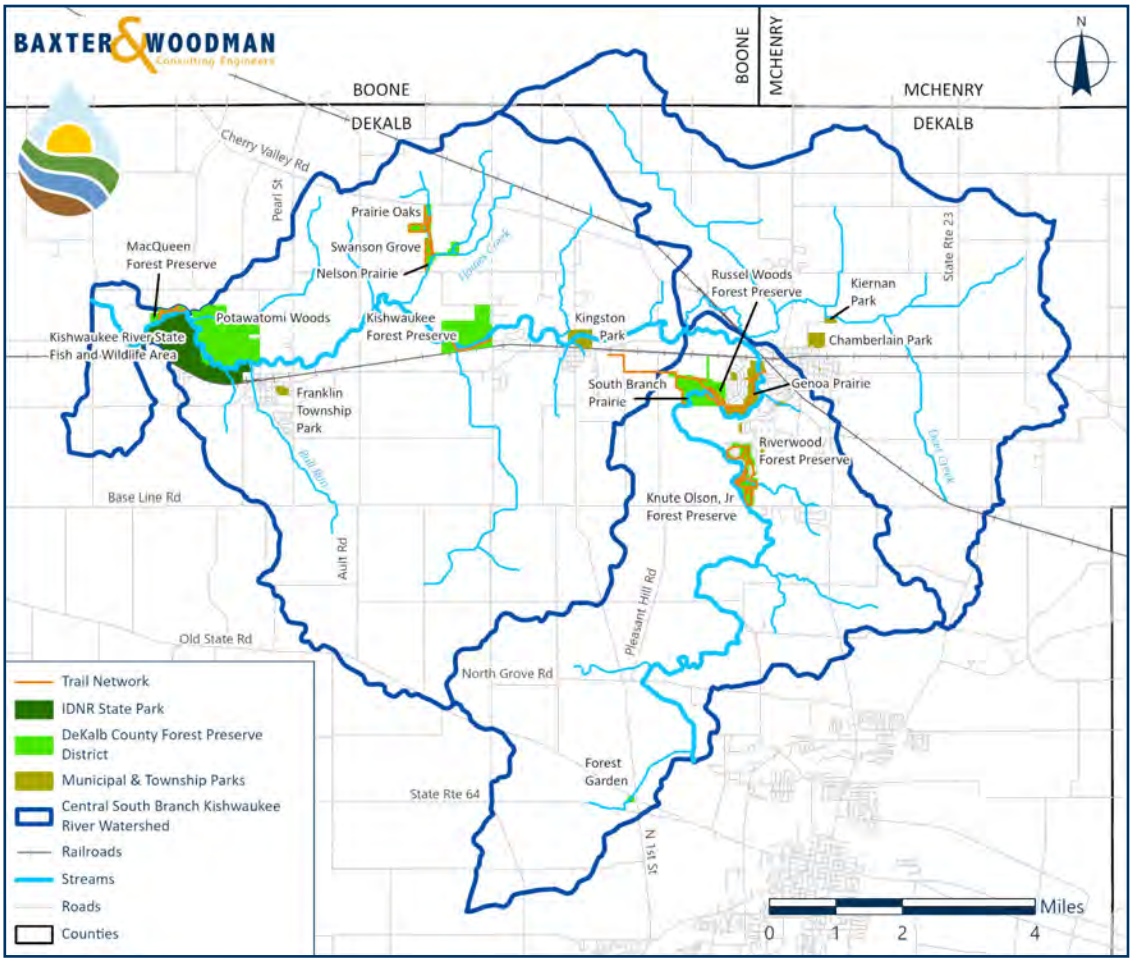


Figure 21. Important Natural Areas and Trail Network .



Restored prairie at Potawatomi Woods

Kishwaukee River State Fish and Wildlife Area

Kishwaukee River State Fish and Wildlife Area is owned by the Illinois Department of Natural Resources (IDNR) and consists of 584 acres, 420 of which are within the CSBKR watershed. This preserve has a unique mix of grass-covered meadows, upland mesic and bottom woodlands, a native fen, and a man-made lake. The area borders the South Branch Kishwaukee River and consists of hardwood forest with grassy open areas, wetlands, and agricultural acreage (IDNR, 2023). Kishwaukee River State Fish and Wildlife Area has limited public amenities but allows deer and turkey hunting and furbearer trapping. Kishwaukee River State Fish and Wildlife Area abuts Potawatomi Woods and MacQueen Forest Preserve, both owned by DeKalb County Forest Preserve District. Historically, these areas were stretches of continuous forest along the banks of the Kishwaukee River, typically comprised of silver maple, elm, and ash within the floodplains and white, red, and burr oaks, interspersed with poplar, maple, butternut, black-walnut and hickory further upland. Much of this preserve was likely floodplain that was continually reshaped by the meandering of the South Branch Kishwaukee River and the deposition of soils and debris after floods (Illinois State Museum, 2000).



Banks of the South Branch Kishwaukee River within Kishwaukee River State Fish and Wildlife Area

DeKalb County Forest Preserve District

The DeKalb County Forest Preserve District (DCFPD) owns and actively manages 12 sites, totaling 1,096.7 acres, including Potawatomi Woods, Kishwaukee Forest Preserve, Russell Woods Forest Preserve, Riverwood Forest Preserve, South Branch Prairie, Prairie Oaks, Swanson Grove, MacQueen Forest Preserve, Knute Olson, Jr. Forest Preserve, Nelson Prairie, Hoppe Heritage Farmstead, and Forest Garden. The largest of these – Potawatomi Woods, abuts the Kishwaukee Rier State Fish and Wildlife Area, as does MacQueen Forest Preserve. Most of the preserve is forested floodplain, including a grove of Swamp White Oaks. It also boasts a restored prairie and a relatively intact remnant prairie and sedge meadow – home to many uncommon plant and animal species, including the rare Smooth Green Snake. The portions of the South Branch Kishwaukee River that run through this preserve hold endangered mussels and is known for Smallmouth Bass fishing (DCFPD, 2023).

Kishwaukee Forest Preserve meanders along a one-mile stretch of the South Branch Kishwaukee River. The area south of the river is open to the public and includes prairie, wetland, and woodland restorations, as well as hiking trails, canoe, kayak and fishing access and a small picnic area. Further upstream, Russell Woods Forest Preserve harbors upland forest and low wet woodlands. The river through this site is designated as a "unique aquatic resource" by the Illinois Department of Natural Resources and the Illinois



South Branch Kishwaukee River at Russell Woods Forest Preserve





Restored prairie at Kishwaukee Forest Preserve (right) and restored golf course at Riverwood Forest Preserve (right)

Natural History Survey and is rich in aquatic species and native freshwater mussels (DCFPD, 2023). Around a couple more bends of the South Branch Kishwaukee River you'll find Riverwood Forest Preserve – a gorgeous restoration of the former Oak Club golf course to a conservation and recreation area. Turf grass was converted to native prairie, pollinator meadow, and oak savanna with trails throughout. Trails connect to Knute Olson, Jr. Forest Preserve to the south, which holds floodplain and upland forests, prairie, and oak savanna restorations. Fishing and canoe access can be found near the parking lot.

Another ecological gem owned and managed by the DCFPD is the Haines Creek Conservation Corridor which includes Prairie Oaks, Swanson Grove, and Nelson Prairie. Together, these three parks total almost 100 acres and an additional site – Haines Prairie, will be included in 2026, bringing the total acreage to 160 acres. The Haines Creek Conservation Corridor is a high-quality natural area and includes restored savanna, woodland, prairie, wetland, and marsh communities as well as a rare fen



Restored fen and prairie at Prairie Oaks Forest Preserve within the Haines Creek Conservation Corridor





River Run Disc Golf (left) and Chamberlain Park (right)

along more than a mile of Haines Creek, all connected by hiking trails.

Municipal or Township Parks

After DCFPD, Genoa Township Park District is the largest natural area landowner, including Genoa Prairie, Chamberlain Park, David Carrol Memorial Citizens Park, Kiernan Park, Riverbend Park, Lions Corner Park, Oak Creek Park, Genoa Woods, Derby Line Park, and Durham Park. These parks offer a range of natural areas including native prairie and woodland communities and sections of South Branch Kishwaukee River. A multitude of recreational options are available at these parks including playgrounds, shelters, ball fields, trails, and more. Kingston Park and Franklin Township Park, owned by the Kingston Township and the Village of Kirkland, respectively, offer additional recreational opportunities for their communities.

Trails

13.5 miles of trails are available in the CSBKR watershed, most of which are within the various forest preserves and parks. Over five miles of trails connect Genoa and Kingston through various municipal parks, road connections, and two forest preserves. Trails through Riverwood and Knute Olson, Jr Forest Preserves total 3.9 miles and the Haines Creek Corridor trail system totals 2.9 miles. Additional trails can be found at MacQueen Forest Preserve and Kishwaukee Forest Preserve.



Trail at Knute Olson, Jr. Forest Preserve

A green infrastructure network provides continuous habitat for wildlife such as depicted in the diagram below (Source: greeninfrastructure.net)

Green Infrastructure Network

A Green infrastructure Network is best defined as an interconnected network of natural areas and other open space that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife (Benedict 2006). It is a connected system of Cores, Hubs, and linking Corridors that connect natural features such as stream corridors, wetlands, floodplain, buffers, and other natural components. Cores and Hubs generally consist of the largest and least fragmented areas such as Kishwaukee River State Fish and Wildlife Area, Potawatomi Woods, Kishwaukee Forest Preserve, Russell Woods Forest Preserve, Riverwood Forest Preserve, the Haines Creek Corridor, and the remaining parks and preserves. Corridors are generally formed by smaller or privately held parcels along the South Branch Kishwaukee River, tributaries, and trail network. Corridors are extremely important because they provide biological conduits for wildlife between hubs. However, most parcels forming corridors are not ideal green infrastructure until residents, businesses, and landowners embrace the idea of managing them as green infrastructure.



Green infrastructure planning helps communities to identify and prioritize conservation opportunities and plan development in ways that optimize the use of open lands to meet the needs of people and nature (Benedict, 2006). Green infrastructure planning provides a framework for future growth that identifies areas that should be protected from future development, areas suitable for development but which should incorporate conservation/low impact design standards, and areas that do not affect green infrastructure.

Open Space Analysis

An assessment of the available open space in the watershed is necessary to determine what lands and features should be included and excluded in the CSBKR Green Infrastructure Network. Natural features such as stream corridors, wetlands, floodplain, woodlands, and prairies are the primary components of green infrastructure. Working lands such as farms and partially developed areas including parks, ball fields, school grounds, detention basins, large residential parcels, and any lot that includes a stream corridor are also considered components of a Green Infrastructure Network. Parcel level green infrastructure planning is important because land purchases, acquisitions, and land use changes almost always occur at the parcel level. A three-step process was used to create a parcel-based Green Infrastructure Network for the CSBKR watershed:

Step 1: All parcels were categorized as open/partially open or developed.
Step 2: All open and partially open parcels were prioritized based on a set of criteria important to green infrastructure.
Step 3: Prioritized open and partially open parcels were configured to form a contiguous Green Infrastructure Network.

For this watershed plan, an "open space" parcel is generally defined as any parcel that is not developed and/or has few to no impervious surfaces such as a nature preserve or agricultural field. "Partially open" parcels have been developed to some extent, but the parcels still offer potential green infrastructure opportunities. Examples of partially open parcels include school grounds, large municipal or church grounds, and residential lots generally greater than two to three acres with minimal development. Parcels that are mostly built out such as commercial/retail areas, small residential lots, and roads are considered "developed." Public versus private and protected versus unprotected status of open and partially open space parcels are other important green infrastructure attributes that were also analyzed as part of this exercise.

The second step in creating a Green Infrastructure Network for CSBKR watershed included GIS analysis to rank open and partially open parcels against 11 criteria important to green infrastructure. If an open or partially open parcel met a criterion it received one point. If the parcel did not meet that criterion, it did not receive a point. This process was repeated for each open and partially open parcel and for all criteria. The total points received for each parcel were aggregated to determine parcel prioritization - parcels with the highest number of points are more important to green infrastructure than parcels that met fewer criteria.

Criteria used to prioritize parcels for a Green Infrastructure Network:

1. Open or partially open parcels that intersect FEMA Floodway or 100-year floodplain
2. Open or partially open parcels that are within 100 feet of a stream or significant open water
3. Open or partially open parcels within 0.25-miles of any headwater stream
4. Open or partially open parcels that intersect a wetland
5. Open or partially open parcels that include a potentially restorable wetland
6. Open or partially open parcels equal to or greater than 20 acres
7. Open or partially open parcels in a "Highly Vulnerable" Land Use/Land Cover SMU
8. Open or partially open parcels that intersect an Important Natural Area property
9. Open or partially open parcels adjacent to protected open space
10. Open or partially open parcels that intersect existing trails
11. Open or partially open parcels that intersect the historic Bottomlands and Forest

The combined highest possible total of points any one parcel could accumulate was 11 (11 of 11 total criteria met). The highest actual total value received by a parcel in the ranking process was 9 (having met 9 of the 11 criteria). After completion of the prioritization, parcels were categorized as High, Medium, or Low Priority based on point totals. Parcels meeting 5-9 of the criteria were designated High Priority for inclusion into the Green Infrastructure Network while parcels meeting 3-4 criteria were designated Medium Priority. Parcels with a combined value of 0-3 were categorized as Low Priority but were not necessarily excluded from the Green Infrastructure Network based on their location or position as linking parcels. Figure 22 depicts the results of the parcel prioritization.

Finally, the parcel prioritization was reviewed in detail to create an interconnected network of green space along the streams and trails that included all the Important Natural Area parcels, information gathered during the field inventory, and stakeholder recommendations. The Green Infrastructure Network (GIN) created for CSBKR watershed captures all the natural components and other green infrastructure such and, in some cases, developed or low priority parcels were added to the network to complete links and ensure that all GIN parcels were connected. The Green Infrastructure Network for the CSBKR watershed is illustrated on Figure 23. It includes 583 parcels and a total of 23,335 acres, of which only the Important Natural Areas are protected. The Action Plan section of this report contains recommendations for implementing the Green Infrastructure Network.

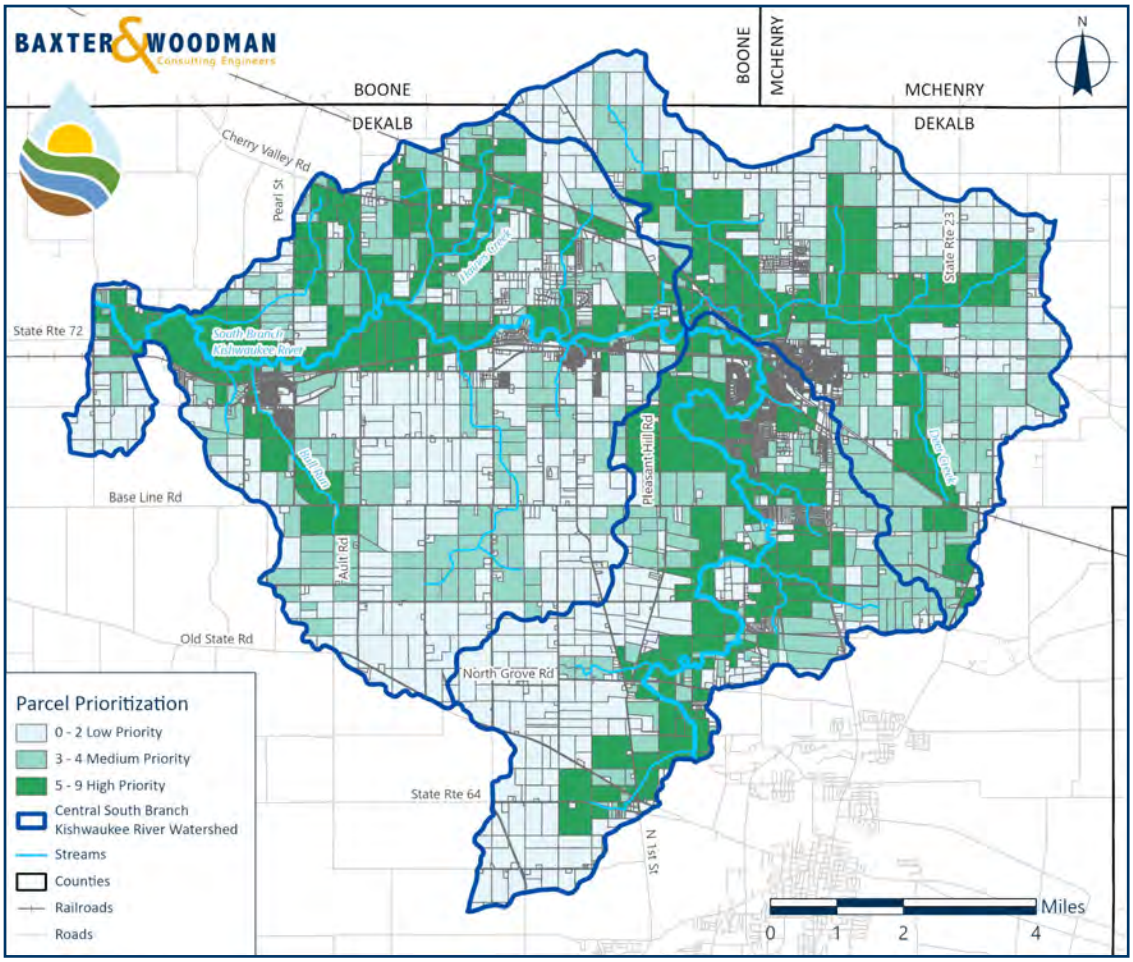


Figure 22. Parcel Prioritization.

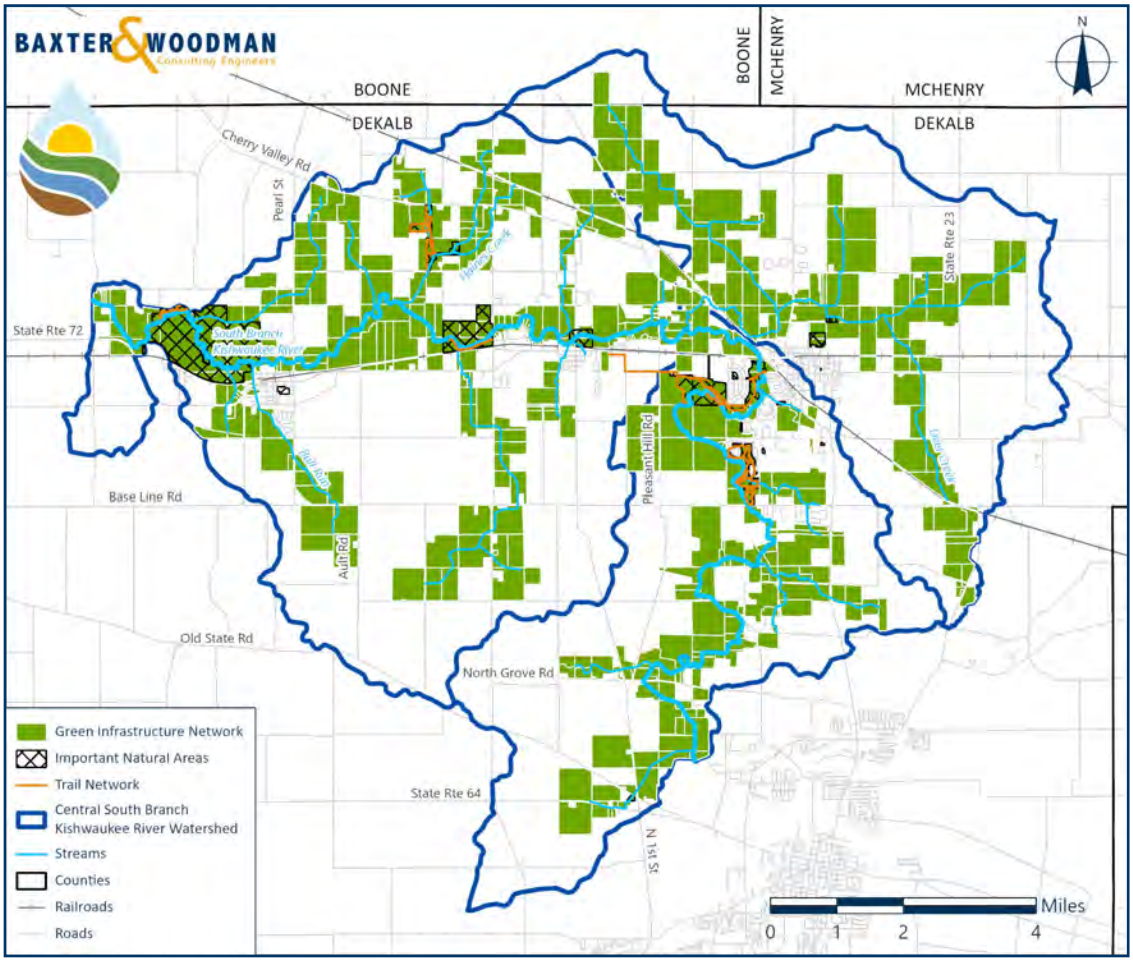


Figure 23. Green Infrastructure Network



Restoration at Prairie at Walnut Grove

3.10 Watershed Drainage System

South Branch Kishwaukee River and Tributaries

In summer 2023, Baxter & Woodman completed a field inventory of South Branch Kishwaukee River and its tributaries. All streams and tributaries were assessed based on divisions into Stream Reaches - defined as stream segments having similar hydraulic, geomorphic, riparian condition, and adjacent land use characteristics. Methodology included walking accessible portions of streams, collecting measurements, taking photos, and noting stream conditions on Stream Inventory/BMP Data Forms as well as making map notations as appropriate. All completed data sheets and field maps can be found in Appendix C.

More specifically, Stream Data Forms have six primary categories to document stream reach conditions:

Channel/Streambank Conditions: Documentation of stream channelization, sinuosity, riffle-pool development, bank erosion, and bank height/width. Ditched streams are highly channelized while more natural streams are sinuous (meandering) and generally exhibit more riffles and pools. Bank erosion ranges from None-Low-Moderate-High. Low bank erosion is present when less than 33% of banks are eroded versus greater than 66% when banks are highly eroded. Streambank height and width measurements are also documented and important when determining channel incision and estimates of pollutant loading.

Debris Jams: Debris jams form in stream channels when debris accumulates and forms blockages that can lead to bank erosion and overbank flooding. Debris jams are classified as either Low, Moderate, or High depending how much and how many debris jams are present.

Sediment Accumulation: Eroded soil from streambanks can settle and accumulate leading to degraded stream substrate. This scenario generally occurs in channelized streams whereas more sinuous streams tend to naturally transport sediment downstream.

Riparian Vegetation: The ecological condition of riparian areas is an important indicator of overall steam health. High quality riparian areas exhibit intact native plant ecosystems that are generally classified as being in good condition whereas degrading and degraded ecosystems are classified as average and poor respectively.

BMP Recommendations: Based on existing stream channel, bank, and riparian area conditions documented above, ecological restoration recommendations are made to stabilize eroded streambanks, improve channel conditions, and restore riparian areas.

BMP Priority: Ecological restoration recommendations are rated at Low, Medium, or High depending on the overall need for ecological restoration based on various factors. Those areas requiring immediate attention are Critical Areas.

Baxter & Woodman assessed 83.7 miles (441,746.8 LF) of stream and divided them into 51 reaches (Figure 24; Table 15). The South Branch Kishwaukee River (AUIDs: IL_PQC-05 and IL_PQC-09) is the primary stream draining the CSBKR watershed. The South Branch Kishwaukee River has 13 unnamed tributaries and three named tributaries – Deer Creek (AUID: IL_PQCE), Haines Creek, and Bull Run. The South Branch Kishwaukee River is 27.9 miles long (11 reaches) with another 27.5 miles of unnamed tributaries (21 reaches). Deer Creek is 7.9 miles long (5 reaches) with 10.3 miles of tributaries (7 reaches), Haines Creek is 3 miles long (2 reaches) with 3.9 miles of tributaries (3 reaches), and Bull Run is 3.2 miles long (2 reaches). For the South Branch Kishwaukee River main stem, Reaches 1-5 are AUID IL_PQC-05, while Reaches 6-11 are AUID IL_PQC-09). Deer Creek Reaches 1-5 are AUID IL_PQCE). No other streams or tributaries in the watershed have AUID codes.

Table 15. Summary of stream and tributary reaches and length.

Stream or Tributary Name	Reach Code	Number of Reaches	Stream Length Assessed (Ft)	Stream Length Assessed (Mi)
South Branch Kishwaukee River	SB	11	147,551.7	27.9
South Branch Kishwaukee River Tributaries	SBT	21	145,100.4	27.5
Deer Creek	DC	5	41,737.2	7.9
Deer Creek Tributaries	DCT	7	54,132.8	10.3
Haines Creek	HC	2	15,901.4	3.0
Haines Creek Tributaries	HCT	3	20,379.8	3.9
Bull Run	BR	2	16,943.4	3.2
Totals		**51**	**441,746.8**	**83.7**

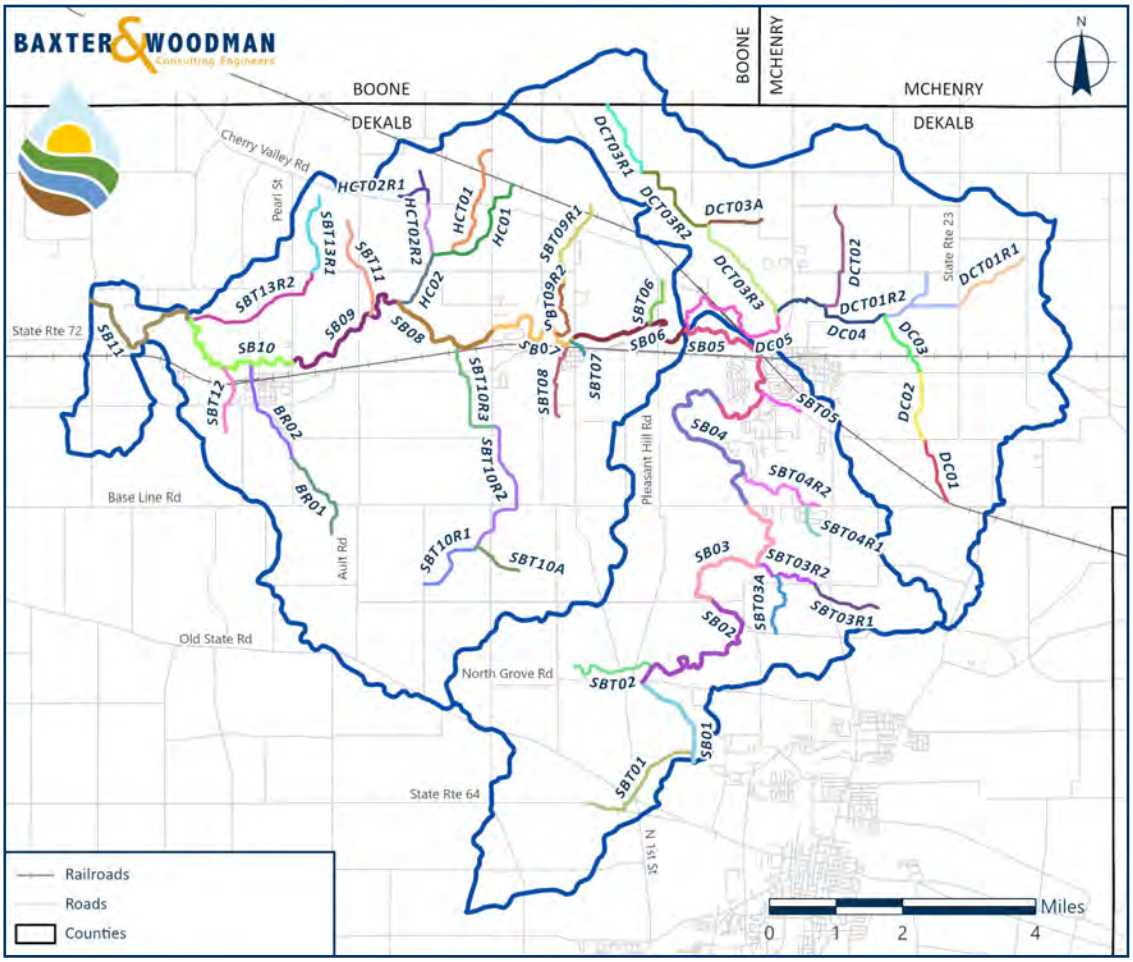


Figure 24. Stream Reaches.

South Branch Kishwaukee River

Within CSBKR watershed, the South Branch Kishwaukee River (Reach Code SB and totaling 147,551.7 lf) begins as a large stream just downstream of the junction of the South Branch Kishwaukee River and the East Branch of the South Branch of the Kishwaukee River west of Sycamore. From there, the stream flows north through agricultural and residential areas to Genoa, where it picks up Deer Creek then continues west through Kingston and Kirkland, picking up Haines Creek and Bull Run. It then flows through Kishwaukee River State Fish & Wildlife Area and ends at Irene Road. It was divided into 11 distinct stream reaches (Figure 25; Table 15).

Reach 1 (SB01) begins in unincorporated DeKalb County west of Sycamore just north of Dovetail Point. From there it meanders generally north to N Grove Rd. This reach is 8,514 lf, highly channelized, moderately eroded, with low sinuosity and pool/riffle development. The riparian area is in average condition and consists of second growth floodplain forest and degraded wetlands and debris jams are moderate. This reach, and all stream reaches except for Deer Creek Reach 2, exhibits low stream bed erosion. Reach 2 (SB02) flows from N Grove Rd to Aldrich Rd for 17,204 lf and then Reach 3 (SB03) continues for 15,452 lf to Baseline Rd. Reaches 2 and 3 have the same characteristics – they have low channelization and pool/riffle development and are moderately sinuous and eroded. Their riparian areas are in average condition with second growth trees and shrubs and degraded wetland in floodplain forest and debris jams are low.

Reach 4 (SB04) is 17,606 lf from Base Line Rd through the end of the Russell Woods Forest Preserve Property (just past the pedestrian bridge). It has moderate channelization, sinuosity, pool/riffle development, and levels of erosion, and the riparian area is in good condition including a mesic and dry mesic woodland, generally managed by DCFPD. Debris jams are low.

Reaches 5, 6, and 7 are 16,447 lf, 11,726 lf, and 10,384 lf, respectively, and end at the confluence with Deer Creek, E Five Points Rd, and Glidden Rd. These reaches meander through portions of Genoa and Kingston and exhibit low channelization and moderate erosion and low to moderate sinuosity and pool/riffle development. Debris jams are moderate and riparian condition is average along all three reaches. Reach 5's riparian area is degraded floodplain forest dominated by second growth trees. Reach 6 has no floodplain, flows through a valley with steep slopes and is mostly mesic woodland. Reach 7's riparian area is a mix of floodplain forest and mesic woodland with lots of second growth trees and shrubs.

Reach 8, at 9,930 lf, runs from Glidden Rd west to the confluence of Haines Creek. It is moderately eroded and channelized with low sinuosity and pool/riffle development. Debris jams are low and the riparian area is in poor condition with a narrow buffer of second growth mesic woodland through heavily farmed areas. From the confluence of Haines Creek, South Branch Kishwaukee Reach 9 continues west for 14,077 lf to end at Pearl St. From there, Reach 10 flows 13,650 lf to the confluence with South Branch Tributary 13. Reaches 9 and 10 have low levels of channelization and erosion with moderate sinuosity and pool/riffle development. Reach 9 has moderate debris jams and is in good ecological condition with a mostly wide floodplain forest and generally intact floodplain. Reach 10 exhibits few debris jams and is in average ecological condition and is a floodplain forest with adjacent agriculture uses and good wetland reconnection potential. Reaches 11 flows 12,562 lf to Irene Rd and the downstream end of the CSBKR watershed. It exhibits low channelization and pool/riffle development, and moderate sinuosity and erosion. Debris jams are low and the riparian area is in poor condition with a wide floodplain forest along the south bank.



South Branch Kishwaukee River Reach 1



South Branch Kishwaukee River Reach 3



South Branch Kishwaukee River Reach 5



South Branch Kishwaukee River Reach 8



South Branch Kishwaukee River Reach 9



South Branch Kishwaukee River Reach 11

Tributaries to South Branch Kishwaukee River

South Branch Kishwaukee River has three named tributaries – Deer Creek, Haines Creek, and Bull Run, and thirteen unnamed tributaries.

Deer Creek

Deer Creek Reach 1 (DC01) starts just above of the railroad tracks north of Base Line Rd west of Crane Ct and flows north to Derby Line Rd for 5,465 lf through agricultural lands. It is highly channelized, with low levels of sinuosity, pool/riffle development, and erosion. Debris jams are low on this reach and all Deer Creek reaches and tributaries. Ecological condition of the riparian area is poor – it's a grass waterway through agricultural land with a channel. Deer Creek Reach 2 (DC02) continues for 5,665 lf from Derby Line Rd to Route 23/72 and from there Reach 3 (DC03) continues for 5,923 lf to the confluence with Deer Creek Tributary 1 in agricultural land. Reaches 2 and 3 are severely eroded and highly channelized with low levels of sinuosity and pool/riffle development. Both have riparian areas in poor condition consisting of narrow grass and fescue waterways. Deer Creek Reach 2 is the only reach in the CSBKR to exhibit moderate stream bed erosion.

Deer Creek Reach 4 (DC04) flows generally west for 10,887 lf from the confluence of Deer Creek Tributary 1 to the confluence with Deer Creek Tributary 3 west of N State St. Channelization is high with low sinuosity, moderate pool/riffle development, and moderate levels of erosion. The riparian area is in average condition, consisting of agricultural land and turf with second growth trees and shrubs. The portions being farmed are grass waterways and reed canary grass, with some banks recovering and forming floodplain shelves. Reach 5 (DC05) meanders west from there for 13,796 lf to end at the confluence with South Branch Kishwaukee River in northwestern Genoa. Reach 5 exhibits low channelization and pool/riffle development with moderate sinuosity and erosion. The riparian area is in average ecological condition and is a low-quality floodplain forest, with some areas of oak woodland and lots of second growth trees.

Deer Creek has three tributaries, further broken into several reaches. Conditions along these reaches are fairly consistent – they exhibit low levels of sinuosity and pool/riffle development, are highly channelized, and have either low or moderate levels of erosion. All, save Deer Creek Tributary 3 Subtributary A (DCT03A), have riparian areas in poor condition consisting of narrow grass waterways through agricultural land. DCT03A has a riparian area in average condition and is a recovering channel within a ditch and appears to be part of a planting program.

Haines Creek

Haines Creek Reach 1 (HC01) starts below the railroad tracks near the intersection of Glidden Rd and Cherry Valley Rd. From there it flows generally southwest for 10,663 lf to the confluence with Haines Creek Tributary 2 (HCT02). Reach 1 is highly channelized with low levels of sinuosity, pool/riffle development, and erosion. The riparian area is in average ecological condition and is a wide prairie restoration in its second year. Reach 2 (HC02) continues for 5,238 lf to the confluence with South Branch Kishwaukee River. Reach 2 has low levels of channelization and pool/riffle development and moderate sinuosity and erosion. The riparian area is in average ecological condition; the immediate buffer is mostly second growth trees and shrubs, while the larger buffer is restored prairie.

Haines Creek has two tributaries that generally exhibit low channelization and pool/riffle development and moderate to low levels of erosion. The riparian area condition is generally average, with the exception of HCT02R2 which flows through Prairie Oaks Forest Preserve and has been restored to good condition with a wide prairie and oak savanna buffer with sections of oak hickory woodland.

Bull Run

Bull Run has two very similar reaches through agricultural land south of Kirkland. Reach 1 (BR01) starts in a field southwest of the intersection of Base Line and Ault Roads and continues generally northwest for 7,769 lf to Pearl St. From there Reach 2 (BR02) continues in the same direction for 9,175 lf to the confluence with South Branch Kishwaukee River near the Kirkland Sewer Plant. Both reaches are highly channelized with low levels of sinuosity, pool/riffle development, and erosion. Debris jams are low and the ecological condition of both riparian areas is poor.

Unnamed Tributaries

South Branch Tributary 1 (SBT01) begins along Route 64 near Five Points and flows east and north through rural agricultural lands for 10,952 lf to join the South Branch Kishwaukee River. It is highly channelized, with low levels of sinuosity and pool/riffle development, and moderately eroded. Debris jams are low and the ecological condition of the riparian is poor, consisting of partially second growth trees and shrubs and old field vegetation with the remaining being grass waterway through farm fields. Nearby, South Branch Tributary 2 starts in agricultural land near the intersection of Church and N Grove Roads. SBT02 flows east for 7,656 lf before joining the main stem and is in the same condition as SBT01 except for being moderately channelized.

South Branch Tributary 3 is made up of two reaches and one subtributary. Reach 1 (SBT03R1) is 5,963 lf and starts in a farm field south of the hairpin turn on Lloyd Rd. From there it flows northwest and ends where it crosses Lloyd Rd. This reach is highly channelized and moderately eroded with low sinuosity and pool/riffle development. Debris jams are moderate and the riparian area is in poor condition, consisting of a narrow agricultural buffer dominated by second growth trees and shrubs and old field vegetation. SBT03R2 picks up where SBT03R1 leaves off and flows for 7,172 lf through a private wooded area. It exhibits low channelization, moderate pool/riffle development, is highly sinuous and severely eroded. The riparian area is a mesic woodland



South Branch Tributary 1



South Branch Tributary 4 Reach 2



Deer Creek Reach 4



South Branch Tributary 10 Reach 3



Haines Creek Reach 2



Bull Run Reach 2

in average ecological condition with a naturally meandering channel. Debris jams are moderate. South Branch Tributary 3 Subtributary A, which flows north from Whipple Rd for 6,426 lf, is in the same ecological condition. SBT03A is not channelized, but highly sinuous with moderate pool/riffle development and is severely eroded. Debris jams are moderate.

South Branch Tributary 4 Reach 1 (SBT04R1) starts in a farm field southwest of Base Line Rd and Route 23 and flows northwest for 2,877 lf through a residential area until it joins Reach 2 just north of Base Line Rd. This reach is highly channelized with low sinuosity, pool/riffle development, and erosion. Debris jams are low and the riparian area is in poor condition – it is very narrow with second growth trees and shrubs, old field vegetation, and turf grass in the residential areas. SBT04R2 continues from there through some residential areas and Riverwood Forest Preserve before joining the main stem. It is 9,963 lf, moderately sinuous with low channelization and pool/riffle development, but erosion is severe. The riparian area is in average ecological condition, made up of mesic woodland upstream and a remnant oak savanna with turf understory downstream. Some areas have been restored to prairie within the Forest Preserve and debris jams are low.

South Branch Tributaries 5 (SBT05), 6 (SBT06), and 7 (SBT07) are similar, shorter reaches through a mix of residential and agricultural areas, and are 3,430, 4,054, and 1,696 lf, respectively. They are all highly channelized with little sinuosity or pool/riffle development and their riparian areas are in poor ecological condition and generally narrow with a mix of old field vegetation and second growth trees and shrubs. Tributary 5 is moderately eroded with moderate amounts of debris jams, while Tributaries 6 and 7 exhibit little erosion and few debris jams.

South Branch Tributary 8 (SBT08) is 6,529 lf and starts in a farm field south of Kingston and flows north to join the main branch just north of the railroad in Kingston. This reach exhibits low channelization and pool/riffle development and moderate sinuosity and erosion levels. The riparian area is in average condition, made up of mostly second growth trees and shrubs.

South Branch Tributary 9 consists of two distinct reaches. SBT09R1 flows south for 7,427 lf starting in agricultural lands northeast of Cherry Valley Rd and E Five Points Rd. It is highly channelized with little sinuosity, pool/riffle development, erosion, or debris jams. The riparian area is narrow and in poor condition with second growth trees and shrubs and old field vegetation. SBT09R2 runs south for 5,940 lf from the start of the woodland south of Hagen Drive till it joins the main stem. It has little channelization, but has moderate levels of sinuosity, pool/riffle development, erosion, and debris jams. The riparian area is an average quality, wide mesic woodland along both banks.

South Branch Tributary 10 is made up of three reaches and one subtributary, all with very similar conditions. SBT10R1 starts at Johnson Rd north of Aldrich Rd and flows northeast for 6,404 lf until it joins Subtributary A from the east (4,051 lf). From there, SBT10R2 flows north for 12,530 lf through more agricultural fields to end at Glidden Rd. SBT10R3 continues for 8,738 lf until it joins the main stem in Kishwaukee Forest Preserve. SBT10 Reach 1 and 2 and Subtributary A are all highly channelized with little sinuosity, pool/riffle development, erosion, or debris jams and their riparian areas are grass waterways that make for poor ecological condition. SBT10R3, meanwhile, is moderately channelized, sinuous, and eroded with little pool/riffle development or debris jams. The riparian area is generally wide old field vegetation and grass waterway buffer in poor condition.

South Branch Tributaries 11 and 12 are 8,381 lf and 5,729 lf, respectively. SBT11 begins in a farm field west of Myelle Rd and flows south, while SBT12 begins in a farm field west of Malta Rd and flows north to join the main branch. Both are highly channelized with little sinuosity, pool/riffle development, erosion, or debris jams, with riparian areas in poor condition. Both have riparian areas that are narrow and mix of old field vegetation and grass waterways through agricultural land.

Finally, South Branch Tributary 13 is divided into two reaches. SBT13R1 starts in a farm field southeast of Cherry Valley Rd and Pearl St and flows south for 7,110 lf to Wold Rd; SBT13R2 picks up from there and continues generally southwest for 12,068 lf through agriculture land and wooded areas before joining the main stem. SBT13R1 exhibits little channelization and pool/riffle development, moderate sinuosity, and is severely eroded. Debris jams are few and the riparian area is in good condition – the immediate corridor is degraded riparian vegetation, beyond is restored prairie. SBT13R2 is highly channelized with little sinuosity or pool/riffle development and is moderately eroded. The riparian area is in poor condition, made up of a narrow corridor of old field vegetation with scattered second growth trees and shrubs. Debris jams are few along this reach.

Stream Channelization

Channelization is the process of straightening or redirecting natural streams, typically done to alter drainage patterns, redirect water flow, or to accommodate development. Naturally meandering streams generally provide riffles and pools that benefit the system by providing various habitats while oxygenating the water during low flow or summer heat. Channelized or ditched streams are often void of or have low quality riffles and pools. Berms are also common along channelized streams where landowners placed soils excavated from the channel. These spoil piles often inhibit natural flooding into adjacent floodplains.

Each stream reach in the watershed was characterized as either having little-to-no channelization (highly sinuous, no human disturbance), moderate channelization (some sinuosity but altered), or highly channelized (straightened by humans) (Table 16; Figure 25). According to the stream inventory, 44% (194,057 lf) of stream and tributary length is naturally meandering; approximately 11% (48,571 lf) is moderately channelized; 45% (199,119 lf) is highly channelized.

Channelized areas present opportunities for Management Measure projects such as artificial riffle and pool restoration

and regrading or breaking of adjacent spoil piles for reconnection of the stream to adjacent floodplains. The Action Plan section of this report addresses opportunities for improving many of the channelized stream reaches.

Table 16. Summary of stream and tributary channelization.

Stream or Tributary Name	Reach Code	Stream Length Assessed	None or Low Channelization		Moderate Channelization		High Channelization	
		(feet)	(feet)	(%)	(feet)	(%)	(feet)	(%)
South Branch Kishwaukee River	SB	147,551.7	111,501.8	75	27,535.6	19	8,514.3	6
South Branch Kishwaukee River Tributaries	SBT	145,100.4	43,141.3	30	16,393.7	11	85,565.4	59
Deer Creek	DC	41,737.2	13,795.8	33	0	0	27,941.4	67
Deer Creek Tributaries	DCT	54,132.8	0	0	4,641.7	9	49,491.1	91
Haines Creek	HC	15,901.4	5,237.8	33	0	0	10,663.6	67
Haines Creek Tributaries	HCT	20,379.8	20,379.8	100	0	0	0	0
Bull Run	BR	16,943.4	0	0	0	0	16,943.4	100
Totals		441,746.8	194,056.5	44	48,571.0	11	199,119.2	45

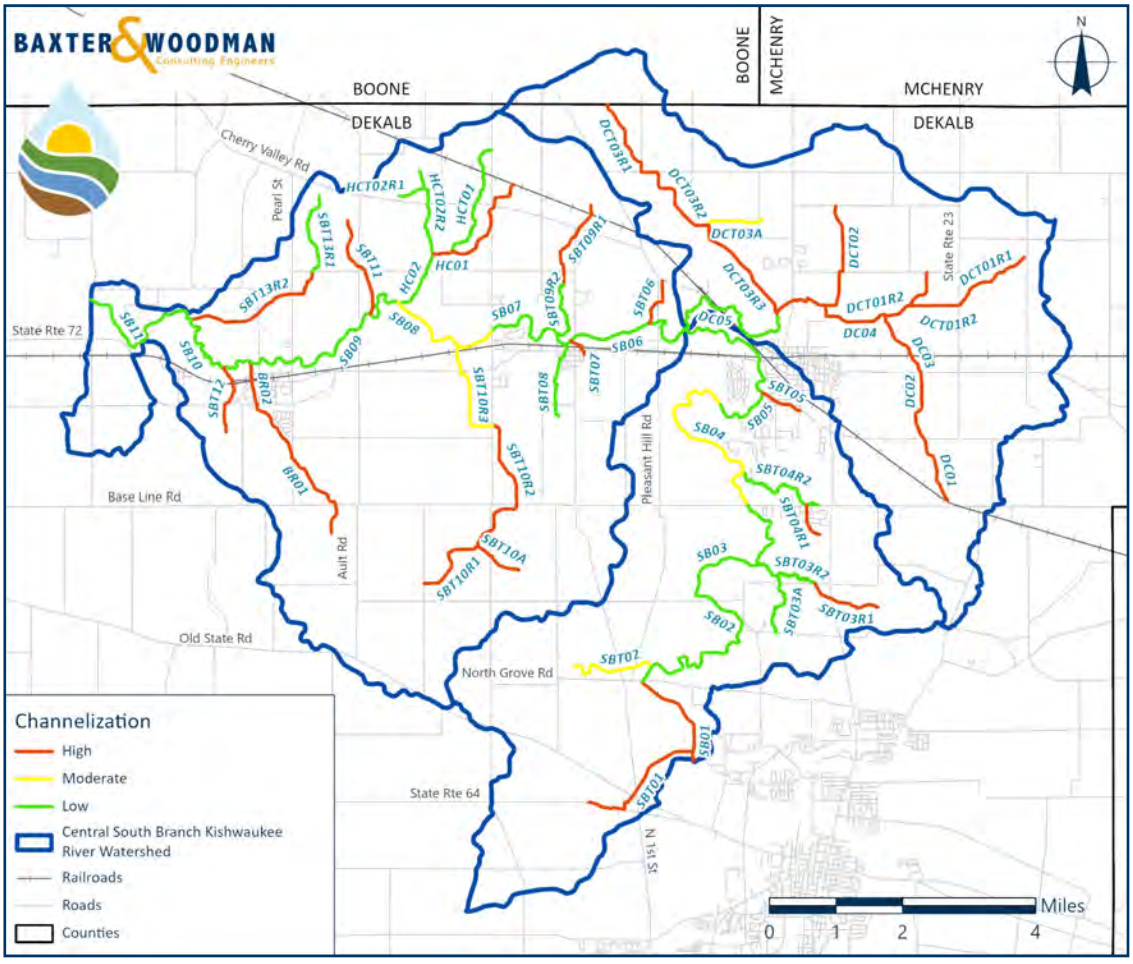


Figure 25. Stream Channelization.

Representative Photos of Stream Channelization



South Branch Tributary 3 Reach 1



South Branch Tributary 6



Deer Creek Tributary 1 Reach 2



South Branch Tributary 10 Reach 2



South Branch Tributary 11



Bull Run Reach 1

Recovering Stream Channels

Creating or converting natural streams to drainage ditches in low areas within agricultural fields was widely used and accepted in the agricultural industry to drain water from the land thereby increasing yields. It is then standard practice for farmers to maintain these ditches by periodically digging out sediment allowing water to run deeper and more quickly while reducing flooding on adjacent fields.

Fluvial geomorphology is the study of how streams and rivers change shape and direction over time based on natural and human induced changes to the environment. Studies show that streams go through a highly predictable process as they change and mature known as the Schumm Channel Evolution Model, as depicted in Figure 26.

In Stage 1, a stream is in stable condition and flood water can spill into a wide floodplain. In Stage 2, a stream channel becomes incised due to environmental and/or human changes such as creating drainage ditches. In Stage 3, flood water is no longer able to leave the channel and ends up widening the channel causing streambank erosion and slumping. In Stage 4, the slumping streambanks deposit soil and begin to stabilize the stream channel. In Stage 5, the stream channel "recovers" by forming what is commonly referred to as a two-stage channel.

Many stream reaches in the watershed are highly channelized as a result of agricultural ditching practices. However, some of these channelized streams exhibit very little streambank erosion because they are in Stages 4 & 5 of the Stream Evolution Model. This observation is extremely important as it relates to improving water quality in the watershed. When farmers maintain streams by removing the two-stage channel that forms during Stage 5, the stream reverts to Stage 2 and additional streambank erosion occurs as the stream again goes through the recovery process. The takeaway is that a stable two-stage channel (Stage 5) that forms should be encouraged and protected during maintenance activities.

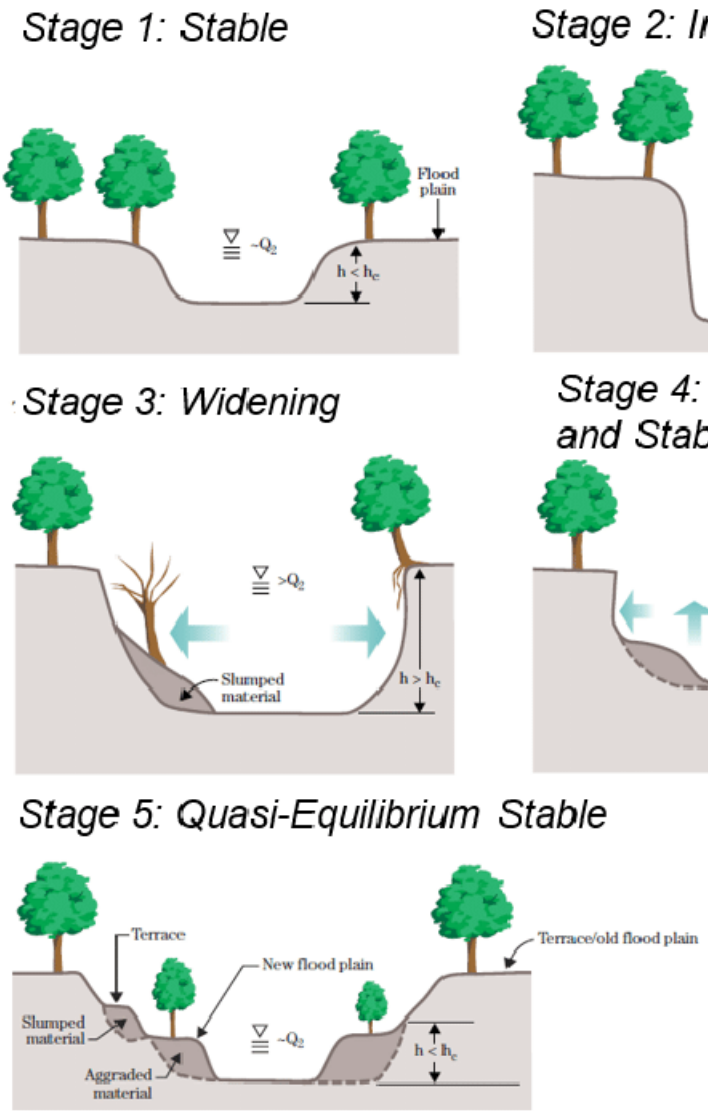


Figure 26. Stream Evolution Model (Schumm, 1984).



Farmer salvaging Stage 5 Two-Stage Channel (Source: Center for Livable Future)

Streambank Erosion

Unnatural streambank erosion generally results following an instability in flow rate or volume in the stream channel, due to human alteration such as channelization, or change in streambank vegetation. Resulting sediment accumulation and transportation downstream can cause significant water quality problems. Streambank erosion is generally moderate throughout the watershed and reflects increased impervious cover and stormwater runoff as well as man-made stream channels.

The location and severity of streambank erosion in the watershed is summarized in Table 17 and depicted on Figure 27. Approximately 35% (153,748 lf) of the total stream and tributary length exhibits no or low bank erosion while moderate erosion is occurring along 55% (245,738 lf) of streambanks. Highly eroded streambanks account for 10% (42,261

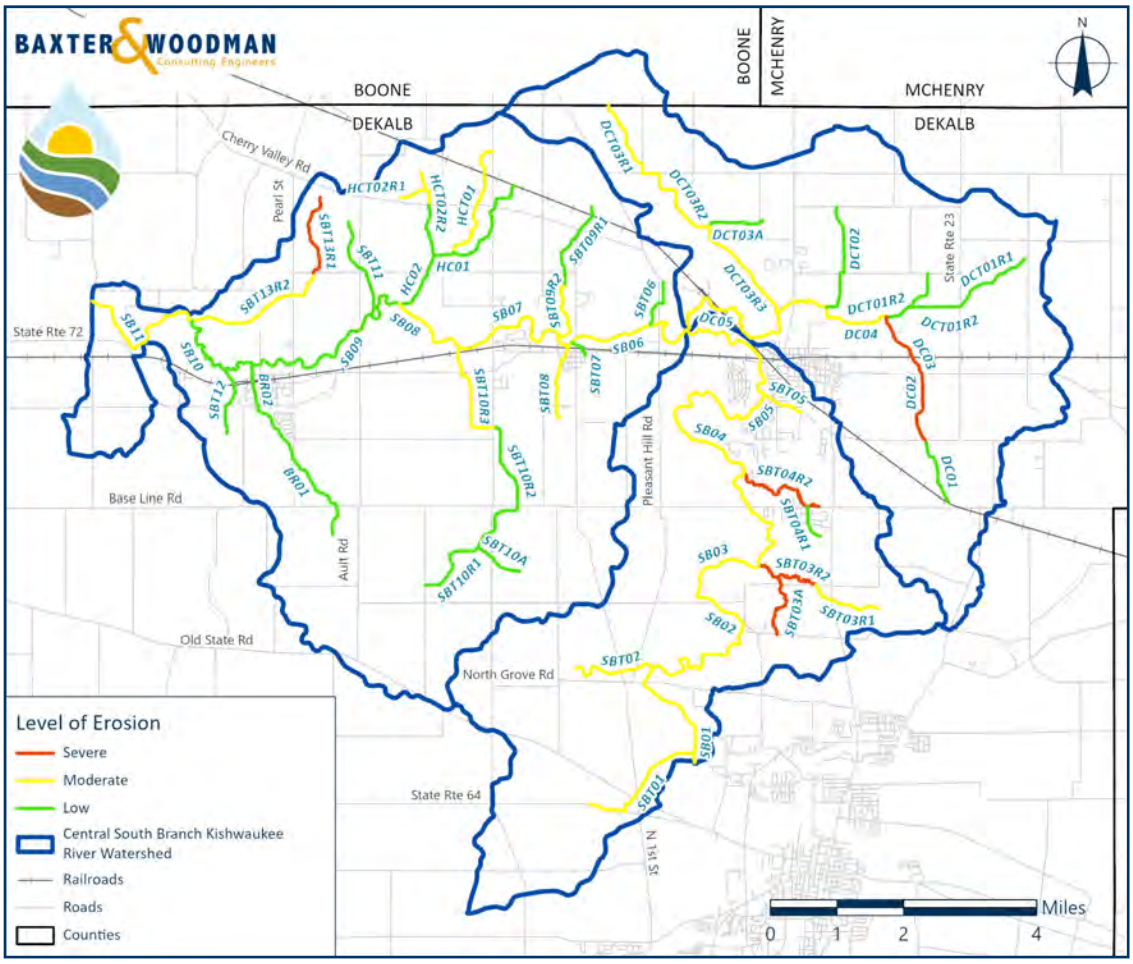


Figure 27. Streambank Erosion.

Table 17. Summary of stream and tributary bank erosion.

Stream or Tributary Name	Reach Code	Stream Length Assessed	None or Low Erosion		Moderate Erosion		High Erosion	
		(feet)	(feet)	(%)	(feet)	(%)	(feet)	(%)
South Branch Kishwaukee River	SB	147,551.7	27,727.4	19	119,824.3	81	0	0
South Branch Kishwaukee River Tributaries	SBT	145,100.4	53,151.4	37	61,276.4	42	30,672.6	21
Deer Creek	DC	41,737.2	5,465.5	13	24,683.3	59	11,588.4	28
Deer Creek Tributaries	DCT	54,132.8	30,146.4	56	23,986.4	44	0	0
Haines Creek	HC	15,901.4	15,901.4	100	0	0	0	0
Haines Creek Tributaries	HCT	20,379.8	4,412.7	22	15,967.1	78	0	0
Bull Run	BR	16,943.4	16,943.4	100	0	0	0	0
Totals		441,746.8	153,748.2	35	245,737.5	55	42,261.0	10

lf) of the total stream length. All of the highly eroded reaches are considered "Critical Areas" because they are actively contributing significant sediment loads downstream. All highly eroded and some moderately eroded streambanks provide excellent opportunities for streambank stabilization projects. The Action Plan section of this report addresses and prioritizes opportunities for reducing streambank erosion.



South Branch Tributary 3 Reach 2

Representative Photos of Streambank Erosion



South Branch Tributary 3 Subtributary A



South Branch Tributary 4 Reach 2



South Branch Tributary 13 Reach 1



Deer Creek Reach 2

Riparian Area Condition

Riparian areas buffer streams by filtering pollutants, providing beneficial wildlife habitat, and connecting green infrastructure. Riparian areas along streams and tributaries were assessed during the stream inventory by noting the "Condition" as it relates to function and quality of plant communities present. Areas in "Good" condition connect hydrologically with streams and tributaries during flood events and have remnant or restored wetland plant communities. These riparian areas are generally wider than 100 feet and consist of high-quality plant communities such as marsh, sedge meadow, wet prairie, or floodplain forest dominated by native species. "Average" condition riparian areas retain some hydrological connection to the adjacent stream with somewhat degraded plant communities. These areas are generally at least 50 feet wide and typically consists of native plant communities found in "Good" condition riparian areas but are degrading due to invasion by invasive species and lack of ecological management. Areas in "Poor" condition are usually found along channelized streams that have been heavily farmed or disturbed in the past causing degraded plant communities to establish. These riparian areas are generally less than 50 feet wide and usually consist of highly degraded plant communities such as old field vegetation (previously disturbed areas left fallow and unmanaged), reed canary grass and common reed dominated wetlands, or woodlands dominated by second growth and invasive woody species.

The location and condition of riparian areas in the watershed is summarized in Table 18 and Figure 28. Approximately 42% (along 186,639 linear feet of streams) of the riparian areas are "Poor" quality. Another 211,901 linear feet or 48% of riparian areas are in "Average" condition and 10% (43,206 linear feet) are in good condition.

Riparian areas in "Good" condition include areas with wide, naturalized buffers. Riparian areas in "Moderate" condition are typically found along the main stem of South Branch Kishwaukee River where floodplain forests exist but are degrading. "Poor" riparian areas are found throughout the watershed, most commonly on agricultural land. Invasive species including common reed (Phragmites australis), reed canary grass (Phalaris arundinacea), common buckthorn (Rhamnus cathartica), and box elder (Acer negundo) contribute most to degraded conditions. Fortunately, ecological restoration helps eradicate these species and encourages native plant establishment. The Action Plan lists and prioritizes opportunities for improving riparian areas.

Table 18. Summary of stream and tributary riparian area condition.

Stream or Tributary Name	Reach Code	Stream Length Assessed	Good Condition		Average Condition		Poor Condition	
		(feet)	(feet)	(%)	(feet)	(%)	(feet)	(%)
South Branch Kishwaukee River	SB	147,551.7	31,682.8	21	105,939.2	72	9,929.6	7
South Branch Kishwaukee River Tributaries	SBT	145,100.4	7,110.7	5	44,768.3	31	93,221.3	64
Deer Creek	DC	41,737.2	0	0	24,683.2	59	17,053.9	41
Deer Creek Tributaries	DCT	54,132.8	0	0	4,641.7	9	49,491.0	91
Haines Creek	HC	15,901.4	0	0	15,901.4	100	0	0
Haines Creek Tributaries	HCT	20,379.8	4,412.7	22	15,967.0	78	0	0
Bull Run	BR	16,943.4	0	0	0	0	16,943.4	100
Totals		441,746.8	43,206.3	10	211,901.0	48	186,639.3	42

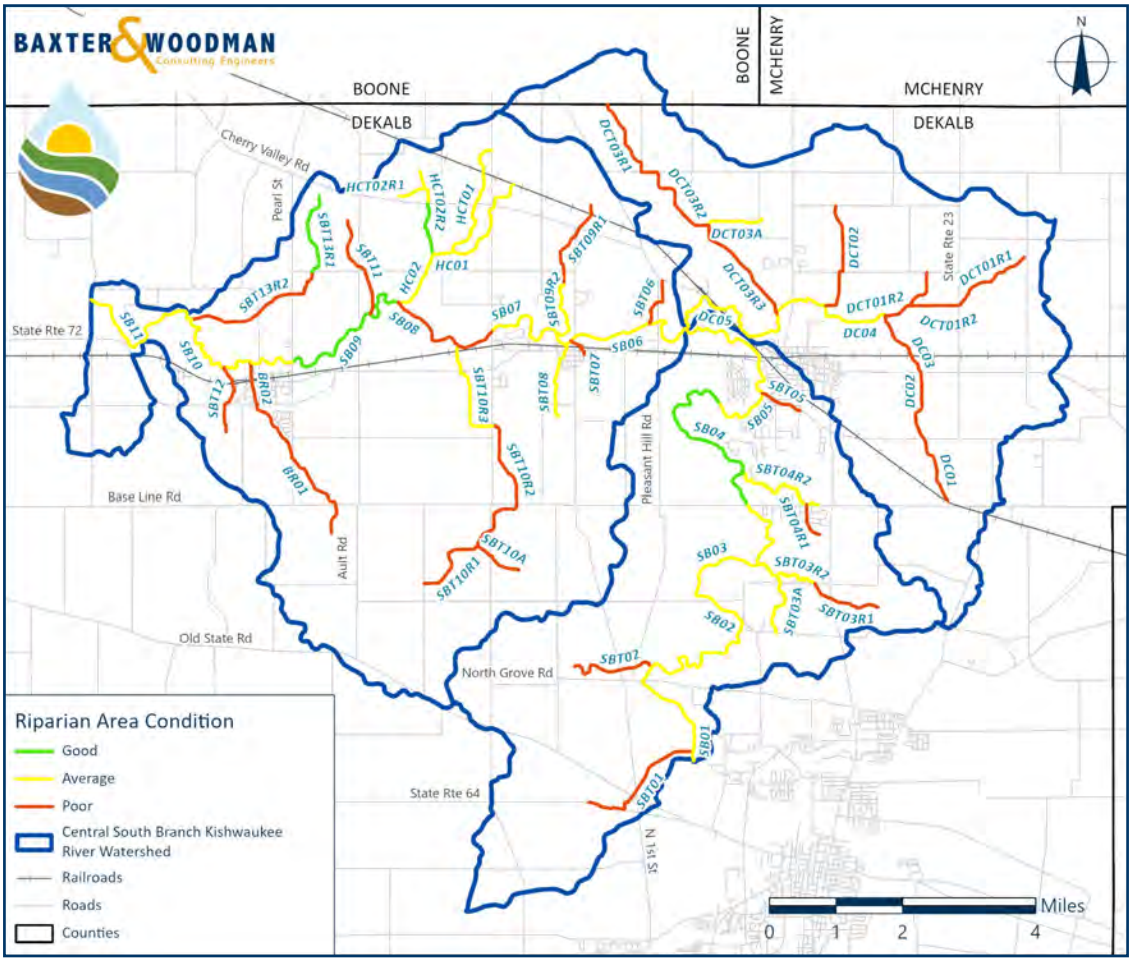


Figure 28. Riparian Area Condition.

Representative Photos of Riparian Area Condition



South Branch Tributary 4 Reach 1



South Branch Tributary 6



Deer Creek Reach 4



South Branch Reach 6



South Branch Reach 10



South Branch Tributary 12

Lakes

There are no lakes or shorelines in the CSBKR watershed.

Wetlands

A diverse network of wetlands and wet prairie remained intact in CSBKR watershed until the late 1830s when European settlers began to alter significant portions of the watershed's natural hydrology and wetland processes. Where it was feasible, wet prairie, sedge meadow, and marsh communities were drained, streams channelized, and existing vegetation cleared to farm the rich soils. There were approximately 16,481.8 acres of wetlands (25% of the watershed, based on hydric soils) in the watershed prior to European settlement (NRCS). According to existing wetland inventories, about 2,117 acres or 3% of the historic wetlands remain (Figure 29) meaning a historic wetland loss of approximately 87% since the early 1800s.

Functional wetlands do more for water quality improvement and flood reduction than any other natural resource. In addition, intact wetlands typically provide habitat for a wide variety of plant and animal species. They provide groundwater recharge, filter sediments and nutrients, and slowly discharge to streams thereby maintaining water levels in streams during both droughts and flooding. General wetland information and mapping is available for the CSBKR watershed via the United States Fish and Wildlife Service's (USFWS) National Wetland Inventory (NWI). B&W updated this data set based on the field inventory conducted in summer 2023. This wetland data was used to map and describe the existing wetlands and to help identify potential wetland restoration sites.

Most remaining wetlands are within the floodplain areas and are dominated by second growth invasive native and non-native species; mostly cottonwood (*Populus sp.*), box elder (*Acer negundo*), elm (*Ulmus sp.*), buckthorn (*Rhamnus sp.*), and honeysuckle (*Lonicera periclymenum*).

Wetlands connected to "Waters of the United States" are protected in DeKalb County by the U.S. Army Corps of Engineers (USACE) - Rock Island District via section 404 of the Clean Water Act. The USACE will generally require an Individual Permit (IP) for modifications to high quality wetlands although most high-quality wetlands are generally considered unmitigable. In rare cases where mitigation is allowed, as much as a 5:1 mitigation ratio is required. Additionally, high quality wetlands located within developed areas require a 100-foot buffer to aid in protection. Mitigation for impacts to low quality wetlands is set at a 1.5:1 ratio. DeKalb County does not identify high-quality or ADID wetlands within their jurisdiction.

The USACE does not have jurisdiction over "Isolated Wetlands." The County and municipalities have jurisdiction over isolated wetlands via countywide ordinances. However, these ordinances do not prevent the net loss of isolated wetlands. It is recommended that local municipalities and counties pass local ordinances to protect isolated wetlands.

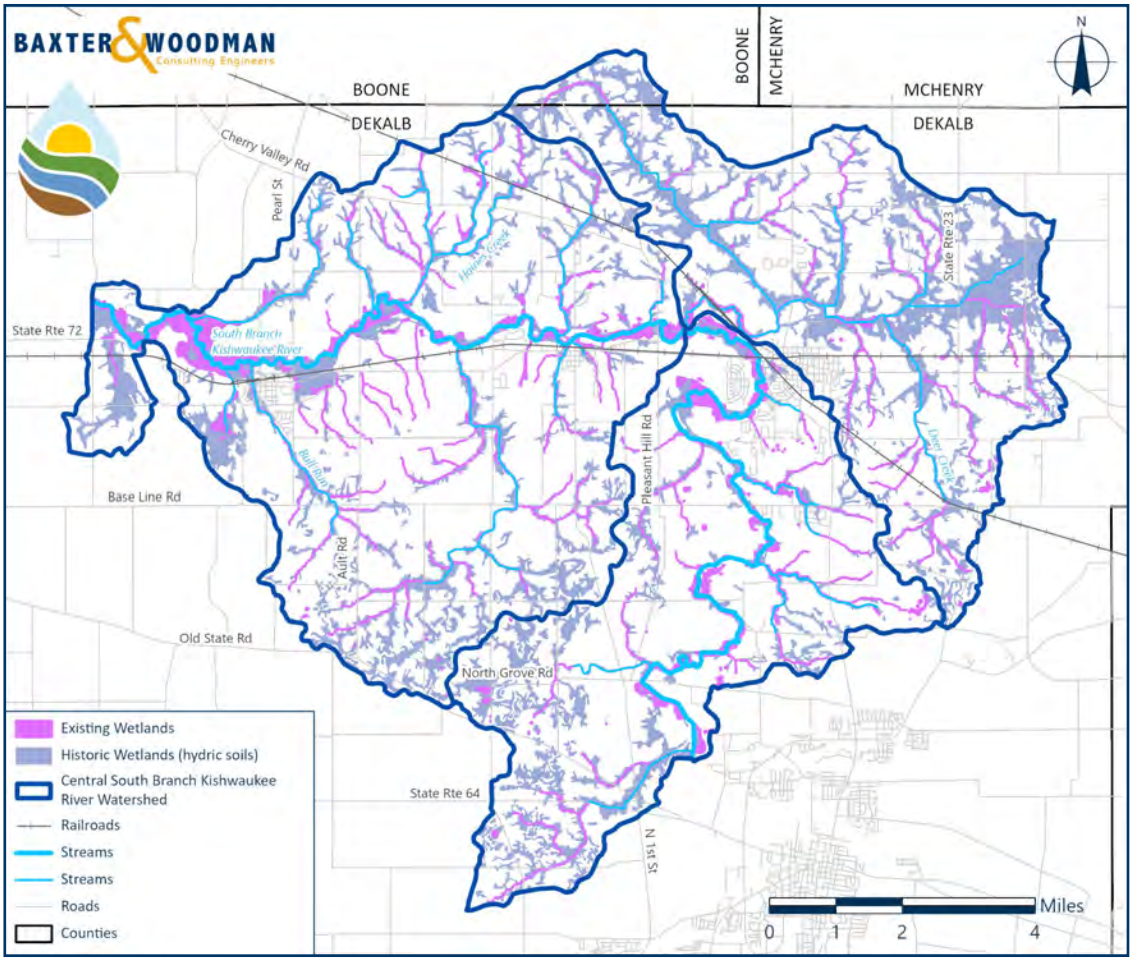


Figure 29. Existing and Historic Wetlands.



Restored wetland at Prairie Oaks Forest Preserve

Detention Basins

Over the past 30+ years, the drainage system in the more urbanized portions of CSBKR watershed has changed from farmland driven drain tiles, channels, and ditches to one that is driven by runoff from developed areas. Planners and engineers quickly realized the benefits of storing stormwater runoff in detention basins near development. A detention basin is a human-made structure for the temporary storage of stormwater runoff with a controlled release rate. For example, the required controlled release rate for basins in the watershed is regulated by the DeKalb County Stormwater Ordinance between 0.2 and 0.15 cfs/acre for the 100-year frequency rain event. Detention basins can also provide excellent wildlife habitat and improve water quality if designed with the proper configuration, slopes, and water depths then planted with native prairie and wetland vegetation and maintained.

Detention basins can be designed as wet bottom, wetland bottom, or dry bottom and planted with various types of natural or manicured vegetation. Wet and wetland bottom basins typically hold water, the elevation of which is controlled by an outlet structure. This design promotes water quality treatment and supports wildlife. Wet bottom basins are usually greater than 3 feet deep and do not have emergent vegetation throughout whereas wetland bottom detention basins are shallow enough to be dominated by emergent wetland plants. Dry bottom basins are designed to drain completely after temporarily storing stormwater following rain events. They can be planted to either turf grasses or naturalized with native species to provide water quality benefits.

The CSBKR watershed has 26 detention basins (Table 19, Figure 30). Baxter & Woodman completed a basic assessment of each detention basin in summer 2023. Assessment methodology included a visit to each site and collection of data relevant to existing conditions. Each basin was assigned a Site ID based on the inventory map on which it was located and the order in which it was identified. Detailed notes were recorded related to existing ecological/water quality improvement condition and potential retrofit Management Measures for eventual inclusion into the Action Plan section of this report. Results of the inventory and detailed summaries of each detention basin can be found in Appendix C.

The inventory resulted in 15 dry bottom basins, 8 wetland bottom basins, and 3 wet bottom basins (Table 19). All the detention basins in the watershed are located in and surrounding the City of Genoa and the Villages of Kirkland and Kingston. Additionally, of the 26 basins, none provide "Good" ecological and water quality benefits. Eight basins (31%) likely provide "Average" benefits, while the remaining 18 basins (69%) likely provide "Poor" ecological and water quality benefits because most were designed simply to meet stormwater storage volume requirements. Designs that also improve water quality and wildlife habitat were not necessarily considered because they are not required under local and federal regulations.

Dry bottom basins are the most common. Dry bottom basins planted with turf grass hold water for shorter periods following rain events and infiltrate less water compared to dry bottom basins naturalized with deep rooted vegetation. Most dry bottom basins are relatively easy to naturalize with native plantings and concrete structures and drains can be manipulated to store and infiltrate water as desired. The 8 wetland bottom detention basins are naturalized with native vegetation but need ongoing maintenance to manage invasive species. The slopes of the remaining dry and wet bottom basins can be naturalized, and emergent areas of the wet basins can be retrofitted with native vegetation relatively easily.

Right: Excellent wetland detention basin example 56C



Table 19. Summary of detention basin types, ecological condition, and acreage.

Site ID	Basin Type	Ecological Condition	Size (Acres)
20A	dry turf detention basin	Poor	0.5
38B	dry turf detention basin	Poor	1.4
38C	wetland bottom detention	Average	2.4
38D	wetland bottom detention	Average	2.3
41A	dry turf detention basin	Poor	1.3
42B	dry turf detention basin	Poor	3.8
43A	wetland bottom detention	Average	2.1
43B	wetland bottom detention	Average	4.1
44C	dry turf detention basin	Poor	2.3
44D	dry turf detention basin	Poor	1.7
44E	wet bottom detention	Poor	12.4
44F	wet bottom detention	Poor	10.1
44G	wet bottom detention	Poor	3.7
45B	dry turf detention basin	Poor	1.3
45C	dry turf detention basin	Poor	0.4
45D	dry turf detention basin	Poor	0.5
45E	dry turf detention basin	Poor	0.2
45F	dry turf detention basin	Poor	0.6
45J	dry turf detention basin	Poor	1.0
50A	dry turf detention basin	Poor	7.2
56A	dry turf detention basin	Poor	0.9
56B	dry turf detention basin	Poor	2.0
56C	wetland bottom detention	Average	2.3
57A	wetland bottom detention	Average	0.9
57B	wetland bottom detention	Average	3.6
57C	wetland bottom detention	Average	2.5

FEMA Floodplain

Functional floodplains along stream and river corridors perform a variety of green infrastructure benefits such as flood storage, water quality improvement, passive recreation, and wildlife habitat. The most important function however is the capacity of the floodplain to hold water following significant rain events to minimize flooding downstream. The 100-year floodplain is defined by the Federal Emergency Management Agency (FEMA) as the area that would be inundated during a flood event that has a one percent chance of occurring in any given year (100-year flood). 100-year floods can and do occur more frequently, however the 100-year flood has become the accepted national standard for floodplain regulatory and flood insurance purposes and was developed in part to guide floodplain development to lessen the damaging effects of floods. The 100-year floodplain also includes the floodway. The floodway is the portion of the stream or river channel that comprises the adjacent land areas that must be reserved to discharge the 100-year flood without increasing the water surface.

The floodplain in the watershed closely follows the South Branch Kishwaukee River and some of its tributaries. Figure 31 depicts the FEMA Flood Hazard Zones. The Regulatory Floodway totals 4,116.3 acres, the 100-Year Floodplain totals 1,033.3 acres, and the 500-Year Floodplain, another 223.3 acres. The most extensive floodplain areas are associated with the main stem of the South Branch Kishwaukee River.

Documented Flood Problem Areas

No documented flood problem areas were identified by stakeholders over the course of meetings or during the April 18, 2024, Goals Workshop, likely because the floodplains of the CSBKR watershed are generally intact and functioning appropriately during large storm events.

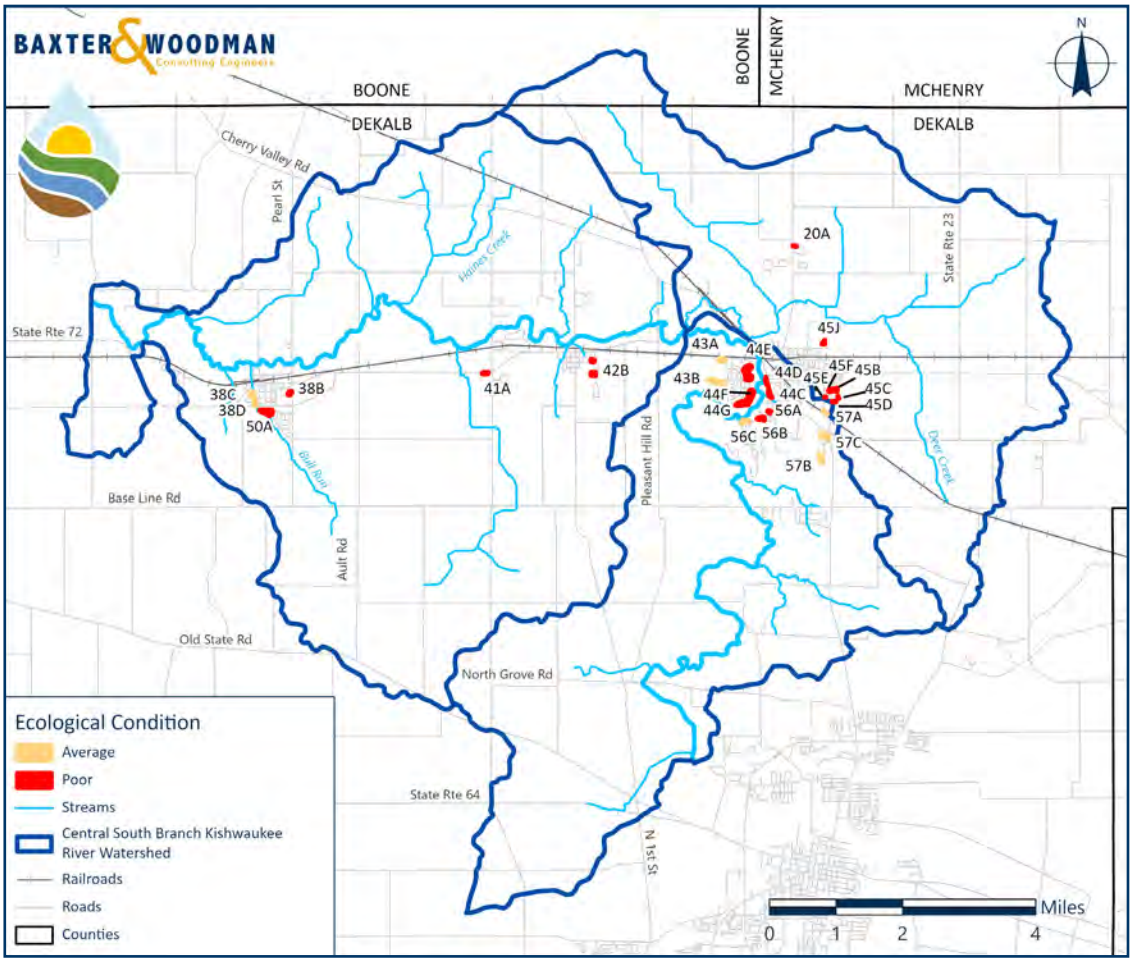


Figure 30. Ecological Condition of Detention Basins.

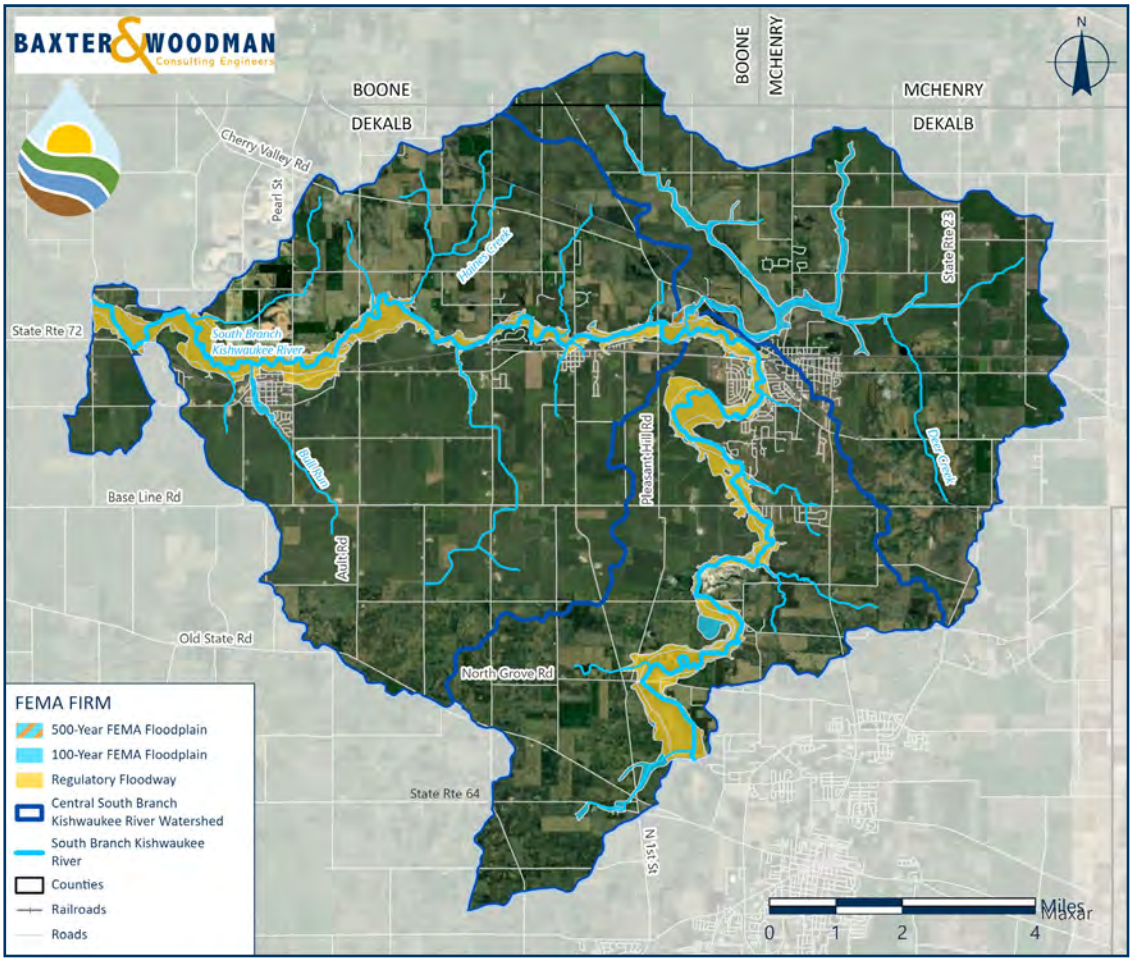


Figure 31. FEMA Flood Hazard Zones.

3.11 Agricultural Land

Agricultural land uses dominate much of the watershed outside of Genoa, Kirkland, and Kingston, and include row crops, hay, pasture, and livestock uses. While Illinois is known for its food production, how this land is managed can have a significant effect on water quality. According to the Environmental Protection Agency's (EPAs) National Water Quality Inventory for 2000, "agricultural nonpoint source (NPS) pollution was the leading source of water quality impacts on surveyed rivers and lakes... Agricultural activities that cause NPS pollution include... plowing too often or at the wrong time; and improper, excessive or poorly timed application of pesticides, irrigation water and fertilizer. (EPA, 2005)" According to the nonpoint source pollutant modeling conducted by Baxter & Woodman, agricultural land uses are the leading source of nutrients and sediment in the watershed.

Summarizing agricultural land across the watershed can be difficult because not only do crops change from year to year on some fields, but each farm has unique agricultural practices and equipment at their disposal. The United States Department of Agriculture's (USDAs) National Agricultural Statistics Service produces a yearly, crop-specific inventory of land across the United States based on satellite imagery and the spectral signatures of various land cover types. The USDA 2022 Cropland data for the CSBKR watershed (Figure 32, Table 20) shows that corn and soybeans as the most abundant cropland types at nearly 42% and 34%, respectively. Deciduous Forest, Grassland/Pasture, and Developed/Low Intensity each cover roughly 5% of the watershed. Winter Wheat, Developed/Open Space, Woody Wetlands, Developed/Medium Intensity, and all other crop types combined cover less than 3% each of the watershed.

According to the Livestock Management Facilities Act, livestock facilities in Illinois that house 300 or more animal units (for example, 750 finishing hogs, 214 dairy cows, or 300 beef cattle) are required to have at least one person certified in the environmental protection aspects manure management. The certificate is administered by the Illinois Department of Agriculture and is valid for three years. Certification for Livestock Managers includes attending a workshop and completing online training for those owners with less than 1,000 animal units and additional paper-based tests for those with more than 1,000 animal units (Illinois Extension, 2023). There are five Certified Livestock Managers in the watershed - four with more than 1,000 livestock each and one with less than 1,000. There are no combined animal feeding operations (CAFOs) in the watershed.

Conventional tillage is the standard practice in agriculture and involves plowing fields and removing all plant residue from previous crops before planting a new one; relative to other practices, conventional tillage involves the most soil disturbance. Conservation tilling or reduced tillage is an effective method of reducing non-point source pollution within agriculture areas. "Conservation tillage is an agricultural management approach that aims to minimize the frequency and intensity of tillage operations" (UC Davis, 2017). Conservation tillage has environmental benefits such as improving soil health, reducing runoff, and limiting the extent of erosion, as well as economic benefits such as less reliance on farm machinery and equipment and overall reduction in fuel and labor costs (UC Davis, 2017). Another tillage practice that can be effective at reducing pollution is mulch tilling which is "any other reduced tillage system that leaves at least one third of the soil surface covered with crop residue (Dunnum, 2016)." A related and even more effective method of reducing non-point source pollution from agricultural areas includes the practice of no-till in which tilling or disturbing the soil is eliminated between harvest of the previous crop to harvest of the current crop (Claassen, 2018).

Agricultural areas in DeKalb County were inventoried for tillage practices during the 2018 Illinois Soil Conservation Transect Survey conducted by DeKalb County Soil and Water Conservation District (DCSWCD) and are the most recent available. These surveys help

Table 20. USDA 2022 Cropland Data for cropland cover types.

Cropland Type	Acres	Percent of Cropland
Corn	27,433.7	41.5%
Soybeans	22,198.7	33.6%
Deciduous Forest	3,746.5	5.7%
Grassland/Pasture	3,367.7	5.1%
Developed/Low Intensity	3,124.3	4.7%
Winter Wheat	1,830.3	2.8%
Developed/Open Space	1,498.4	2.3%
Woody Wetlands	813.8	1.2%
Developed/Med Intensity	796.5	1.2%
All other cropland types combined	1,230.6	1.9%
Total Cropland	**66,040.4**	**100%**

Right, top to bottom: Tractors in a wheat field, row crop soy beans, and alpacas at a Certified Livestock Manager site







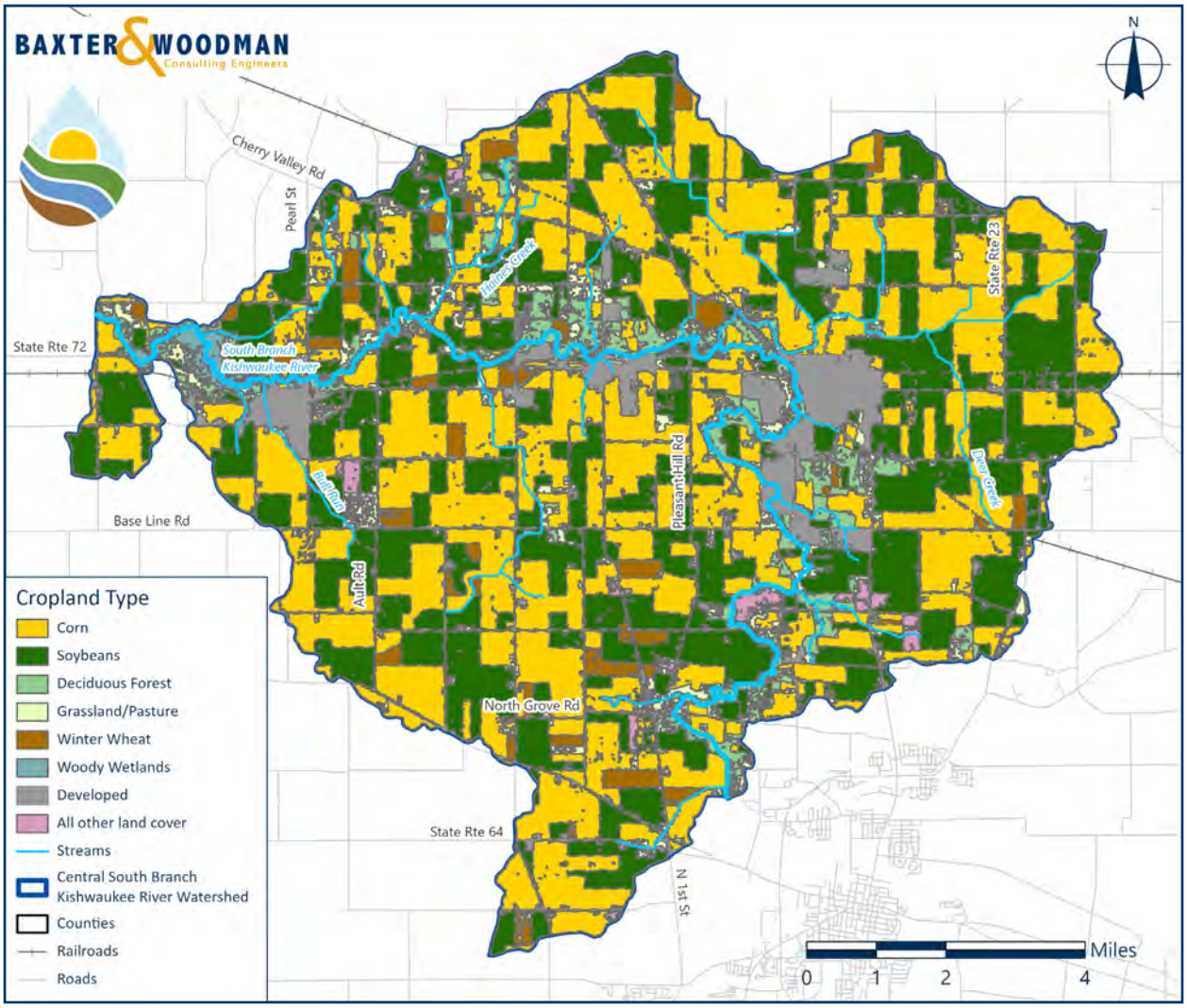


Figure 32. USDA 2022 Cropland Data.

identify baseline agricultural conditions and practices in the watershed. The survey covered 87 transects in the agricultural areas within the watershed. In 2018, corn was the single largest agricultural cover type at 48 transects or 55.2% of the watershed. Soybeans was the second largest crop with 32 transects (36.8%). Two transects included hay (2.3%) and one included small grains (1.1%). Four transects (4.6%) contained Conservation Reserve Program (CRP) cover. Tilling practices were divided into 4 categories: conventional till, reduced till, mulch till, and no till. Within the CSBKR watershed, the most common tillage practice found was conventional tillage with 30 of fields (34% of fields). Mulch till was practiced on 21 fields (24%), while reduced tillage was found on 19 of fields (22%). No-till was found at 11 sites, or 13% of the surveyed sites. Most farmers understand the inherent value in reducing soil and nutrient losses on their farms and consider it good business practice to do so.

In summer 2023, Baxter & Woodman completed a windshield survey of the watershed, including agricultural land within the CSBKR watershed. It was too late in the season to be able to consistently identify tillage practices, but it should be noted that the vast majority of streams on agricultural lands were already utilizing grass waterways (as opposed to tilling all the way to the stream edge). Only two fields were in need of implementing grass waterways on fields.

While no entity regulates or maintains an inventory of drain tiles in the watershed, NRCS provides a map depicting the tile drainage probability of land in Illinois based on soil characteristics (Figure 33). This map was created using the assumption "that very poorly and poorly drained soils that are rapidly permeable to moderately slowly permeable would be very likely to be tile drained. Soils that are somewhat poorly drained, that are rapidly permeable to moderately slowly permeable are likely to be tile drained. Soils that are slowly or very slowly permeable are unlikely to be tile drained (NRCS, 2009)." This data has not been verified and is only for general guidance purposes, but it depicts the likely extent of drain tiles within the watershed. According to NRCS' map, most of the CSBKR watershed is likely to very likely tile drained.

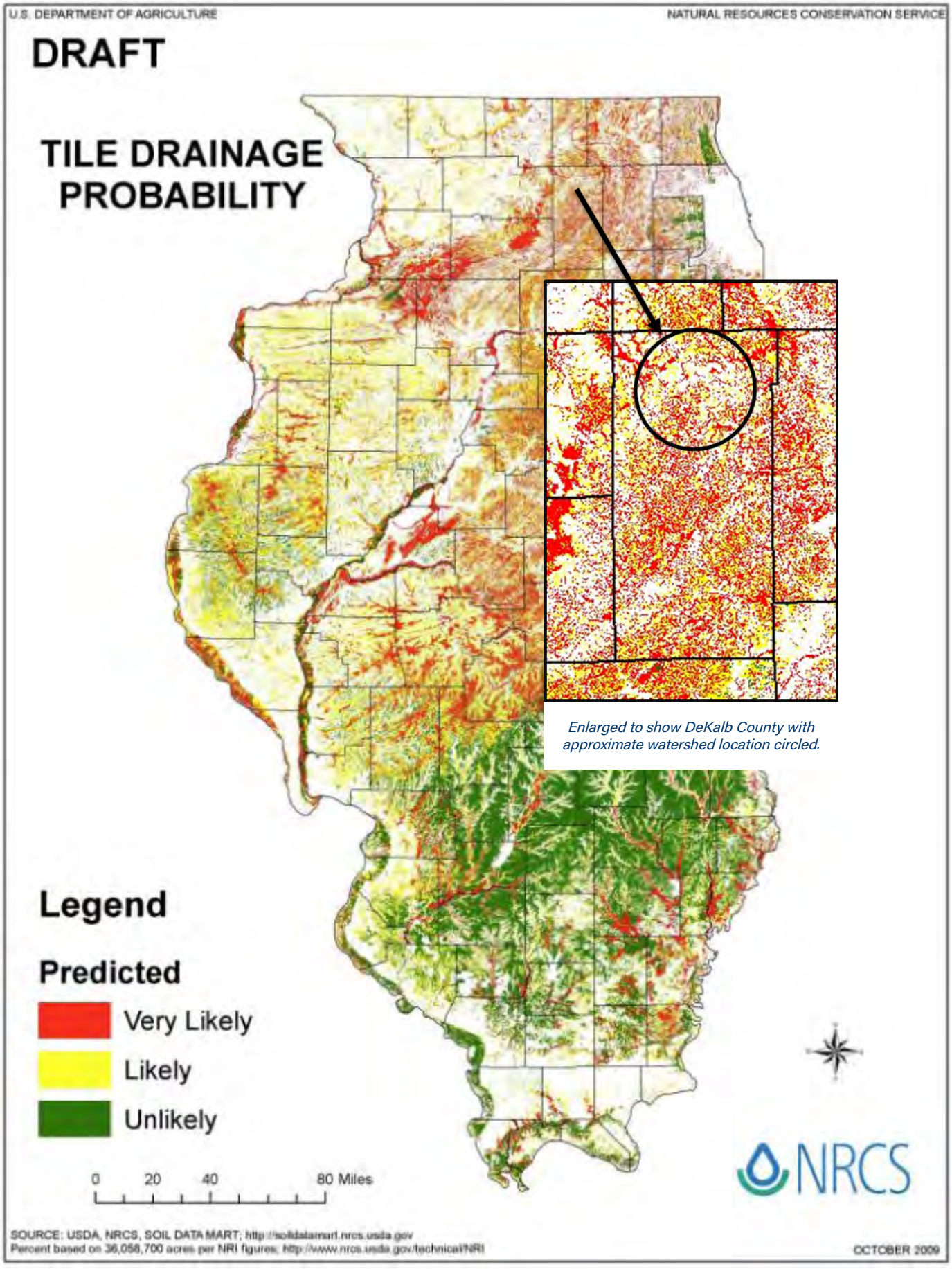


Figure 33. Tile drainage probability in Illinois (Source: USDA, 2009).

3.12 Groundwater Aquifers & Community Water Supply

Groundwater Aquifers

Groundwater is water that saturates small spaces between sand, gravel, silt, clay particles, or crevices in underground rocks. Groundwater is found in aquifers or underground formations that provide readily available quantities of water to wells, springs, or streams. Groundwater sources available to Northeastern Illinois are found in shallow aquifer units and deep aquifer units (Figure 34). The shallow aquifers are found in unconsolidated sand and gravels within the Quaternary Unit. An impermeable layer of bedrock separates the shallow aquifers from the deep aquifers found in layers of sandstone within the Ancell Unit, Ironton-Galesville Unit, and Mt. Simon Unit. Both shallow and deep aquifers are tapped and used by residences, farms, or entire communities.

Groundwater modeling studies conducted for the 11-county Northeastern Illinois Regional Water Supply Planning area by the Illinois State Water Survey (ISWS) (ISWS, 2012) suggest that relatively modest increases in groundwater withdrawals will be seen between 2005 and 2050 of up to about 5 Mgd in the Quaternary and future water levels in the deep bedrock aquifers are projected to remain stable in the CSBKR watershed planning area. Modeling also suggests that drawdown could reach 150 feet in the Ancell Unit and up to 700 feet in the Galesville Unit by 2050 (Figure 35). Ultimately, groundwater models suggest that drawdown, changes in stream base flow, and/or changes in the depth of groundwater for deep wells are expected to remain relatively stable in the future relative to areas closer to the Chicagoland region (ISWS, 2012).

Groundwater Recharge

Groundwater recharge is the process by which precipitation reaches and re-supplies the groundwater. Generally, only a portion of precipitation will reach an aquifer. The groundwater recharge rate can be affected by several factors, "including intensity and amount of precipitation, surface evaporation, vegetative cover, plant water demand, land use, soil moisture content, depth and shape of the water table, distance and direction to a stream or river, and hydraulic conductivity of soil and geologic materials. (IEPA, 2006)" According to a 2006 IEPA study of the Rock River Basin, the CSBKR watershed area generally has a moderate potential for groundwater recharge (Figure 36) with the highest potential recharge areas following the main stem of the South Branch Kishwaukee River.

No data was available regarding potential groundwater contamination in the watershed.

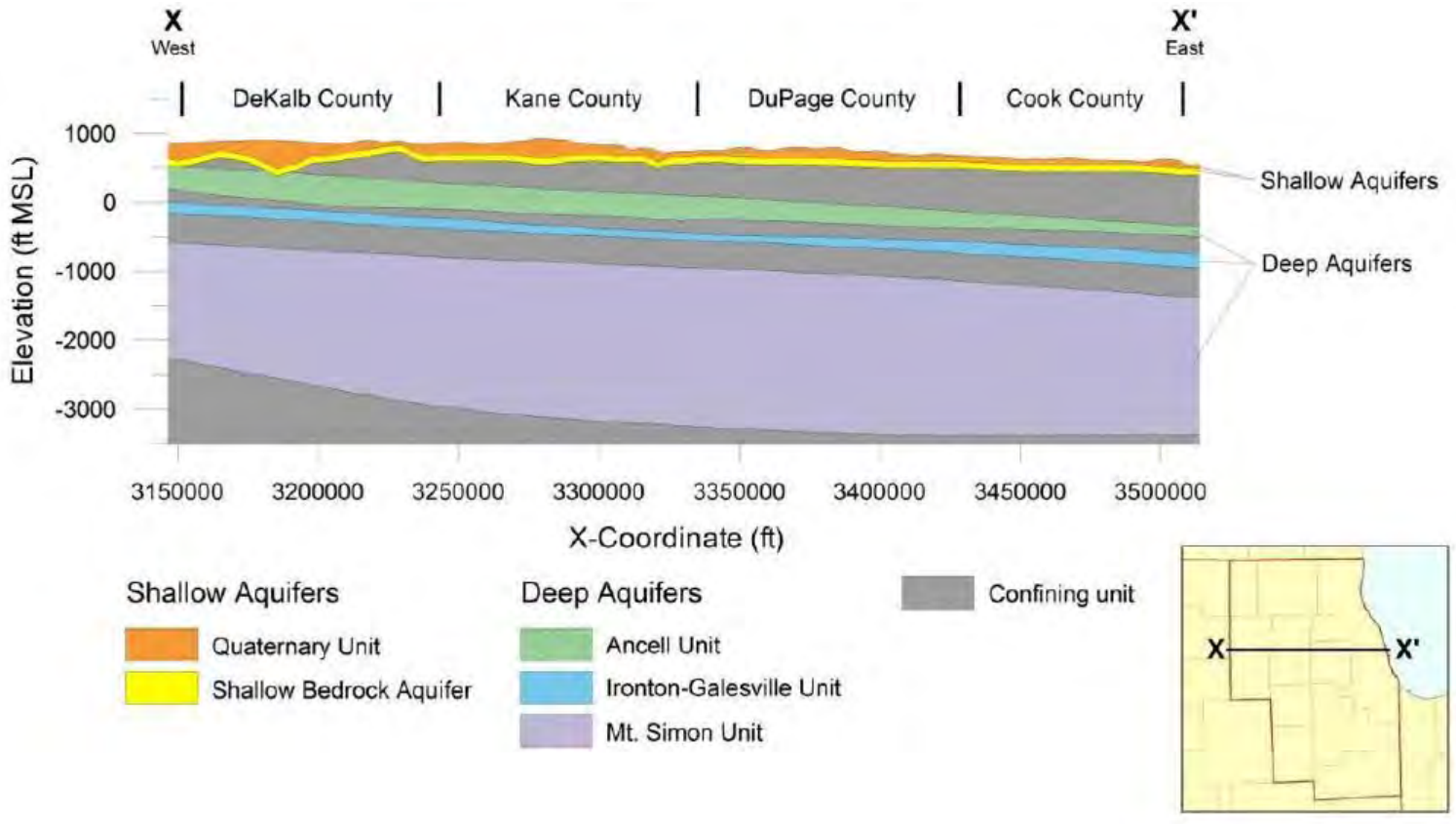


Figure 34. Cross section of the NE Illinois deep and shallow aquifer units.

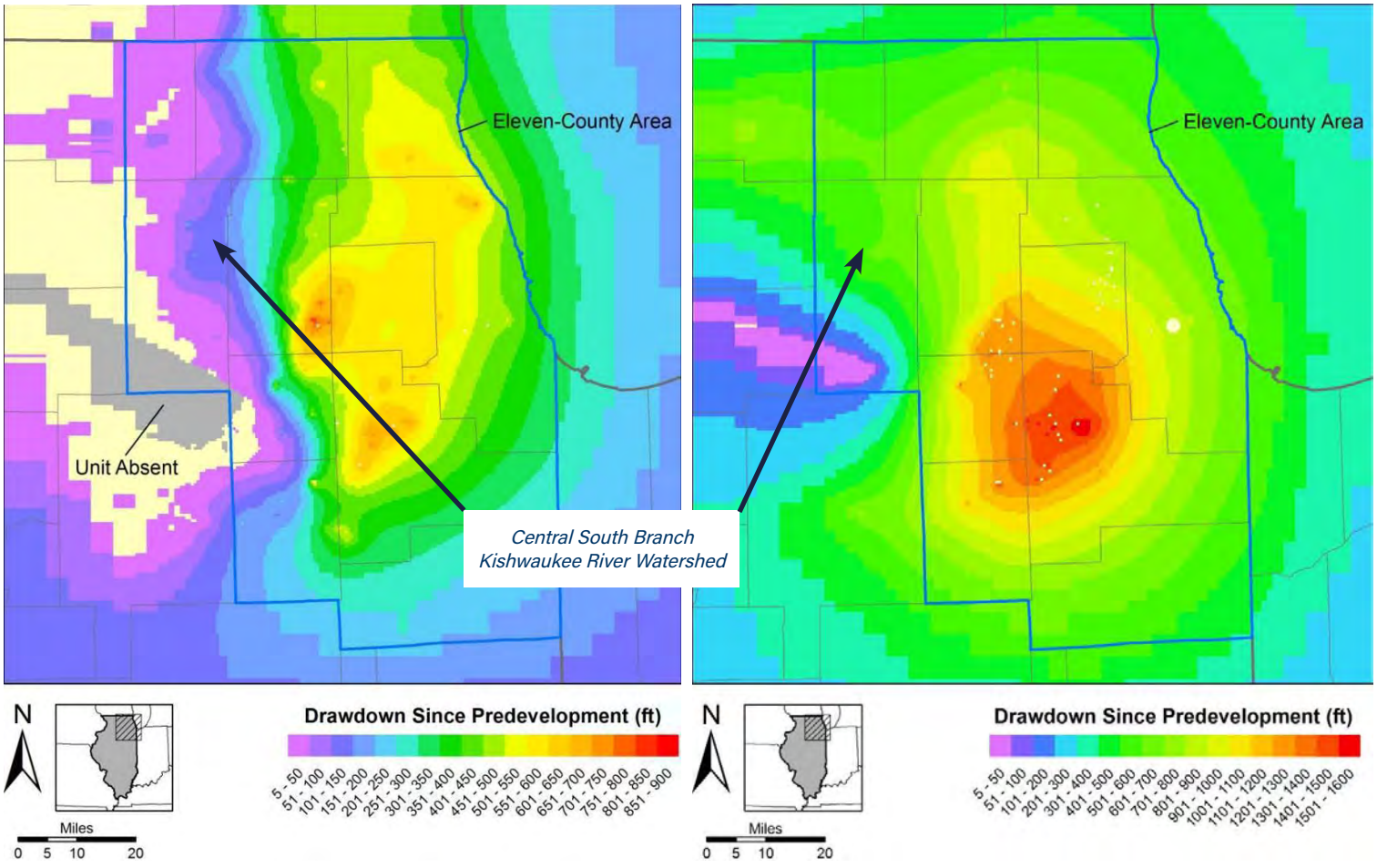


Figure 35. Year 2050 modeled groundwater drawdown in the Ancell Unit (left) and Ironton-Galesville Unit (right).

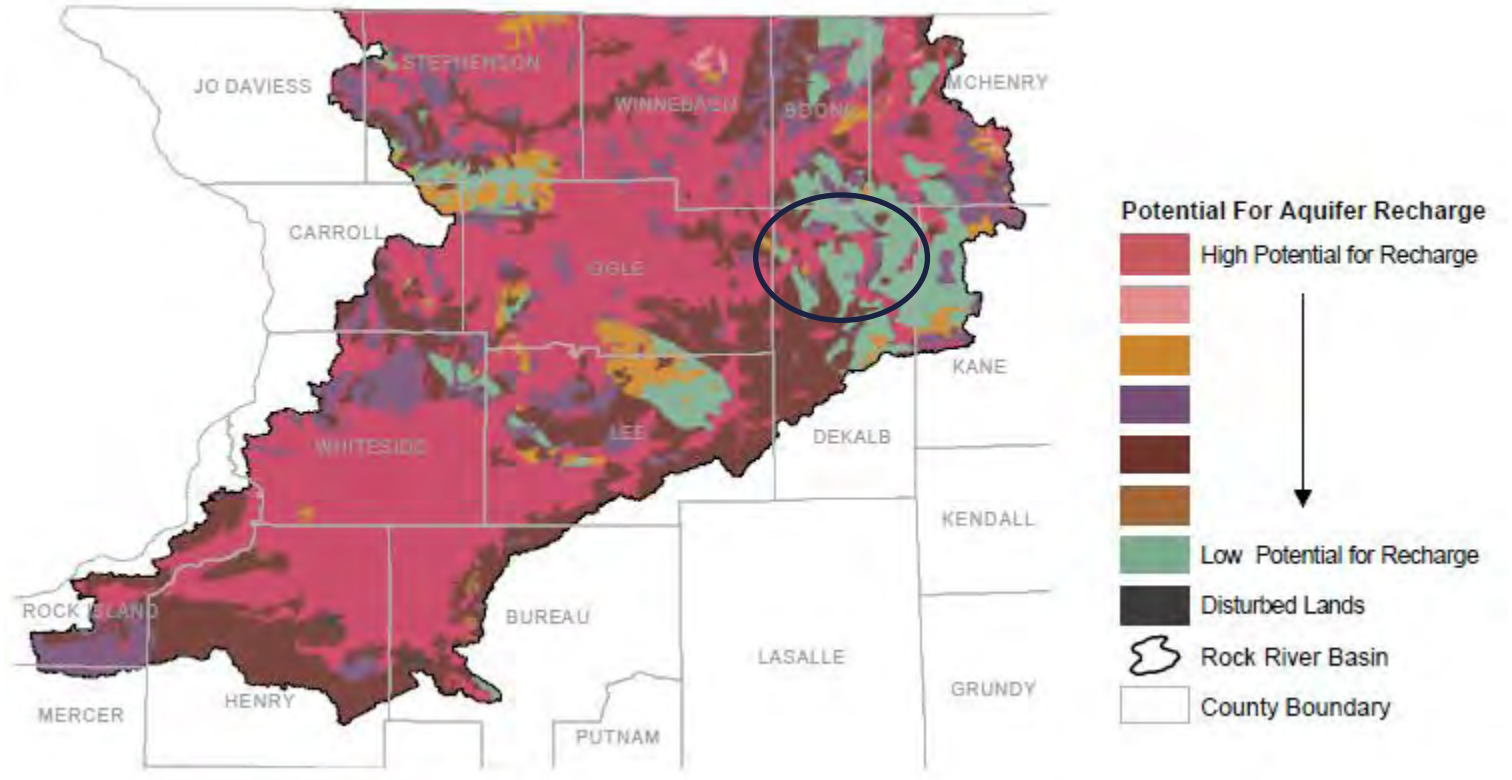


Figure 36. Aquifer recharge potential in the Rock River Basin (Source: IEPA, 2006).

Community Water Supply

Groundwater is an essential resource within the CSBKR watershed as underlying aquifers provide the drinking water supply for many people. The water supply in communities within the watershed comes primarily from wells. Most unincorporated areas get water from private wells, including the rural cropland that makes up most of the watershed. Thirteen (13) community water supply wells are located within the watershed, but only 11 are active (Table 21). Most shallow wells are drilled into the Quaternary Unit, while deeper wells are drilled into the Ordovician System. It is important to note that future development projects that include infiltration best management practices will mostly benefit the shallow aquifers and not deep aquifers.

There are two Illinois Department of Agriculture Well Decommissioning Program sites in the CSBKR watershed. The first was decommissioned in 2007 (DCSWCD application number 037-00046) and the second was decommissioned in 2008 (Boone County SWCD application number 007-00027).

Table 21. Community water supply wells within the watershed (Source: IEPA Source Water Assessment Protection Program).

Well ID	CWS Name	Depth (ft)	Status	Aquifer Depth	Min. Setback
01613	KIRKLAND	560	Active	Deep	200
11424	KIRKLAND	737	Inactive	Deep	0
11425	KIRKLAND	636	Active	Deep	400
00997	KINGSTON	610	Active	Deep	200
01104	KINGSTON	310	Active	Shallow	200
11454	VALLEY VIEW SBDV	475	Active	Shallow	200
11421	KINGSTON	755	Active	Deep	200
11422	KINGSTON	717	Active	Deep	200
01103	KINGSTON	720	Active	Deep	200
01091	GENOA	107	Active	Shallow	200
11414	GENOA	730	Inactive	Deep	0
11415	GENOA	732	Active	Deep	200
11416	GENOA	770	Active	Deep	200

3.13 Wastewater Treatment Plants & Septic Systems

National Pollution Discharge Elimination System (NPDES)

There are three IEPA National Pollution Discharge Elimination System (NPDES) permits in the CSBKR watershed, as detailed in Table 22. All three have a single outfall and discharge limitations, monitoring and reporting requirements monitored by IEPA. The City of Genoa is required to stay within established discharge rates for carbonaceous biochemical oxygen demand (CBOD), suspended solids, pH, fecal coliform, chlorine residual, ammonia nitrogen, and dissolved oxygen. These discharge limits are outlined in Table 23. The Kirkland North STP has established discharge rates for CBOD, suspended solids, pH, fecal coliform and chlorine residual (Table 24). The remaining NPDES permits are smaller and not included in this report. Up-to-date permit data can be found online at https://webapps.illinois.gov/EPA/DocumentExplorer/Attributes.

NPDES Permit Data

City of Genoa STP discharges under NPDES Permit No. IL0055182. Under its permit (Table 23), Genoa is required to stay within established discharge rates for carbonaceous biochemical oxygen demand (CBOD), suspended solids, pH, fecal coliform, chlorine residual, ammonia nitrogen, and dissolved oxygen. For the purposes of this plan, Genoa provided two years' worth (January 2022 - December 2023) of monitoring data and the average water quality value for ammonia nitrogen (NH3) and total suspended solids. Ammonia nitrogen (NH3) averaged 0.48 mg/L and total suspended solids (TSS) averaged 10.4 mg/L, both well within permit limits.

Kirkland North STP discharges under NPDES Permit No. IL0064092. Under its permit (Table 24), Kirkland is required to stay within established discharge rates for carbonaceous biochemical oxygen demand (CBOD), suspended solids, pH, fecal coliform, and chlorine residual, and must monitor ammonia nitrogen and dissolved oxygen. For the purposes of this plan, Kirkland provided two years' worth (January 2022 - December 2023) of monitoring data and the average water quality value for total suspended solids (TSS) was 10.56 mg/L - well within permit limits.

This data is important for generating pollutant loading targets as discussed in Section 3.16. These levels are well within typical levels for WWTP effluent based on literature (IEPA, 2009). It is important to note that as permitted point sources, Genoa and Kirkland do an excellent job of staying within permitted discharge limits.

Load limits are computed based on a design average flow (DAF) of 0.78 MGD for Genoa and 0.31 MGD for Kirkland.

Table 22. NPDES Permits.

NPID	Facility Name	Description
IL0055182	City of Genoa-STP	STP Outfall
IL0064092	Kirkland North STP	STP Outfall
IL0023841	Walcamp Outdoor Ministries STP	STP Outfall
IL0037036	Aqua Illinois - Ellwood Greens	STP Outfall

Table 23. City of Genoa NPDES permit requirements.

	LOAD LIMITS lbs/day DAF (DMF)*			CONCENTRATION LIMITS mg/L		
Parameter	Monthly Average	Weekly Average	Daily Maximum	Monthly Average	Weekly Average	Daily Maximum
$CBOD_5$	163 (407)	260 (651)		25	40	
Suspended Solids	195 (488)	293 (732)		30	45	
pH	Shall be in the range of 6 to 9 Standard Units					
Fecal Coliform	Daily Maximum shall not exceed 400 per 100 mL (May through October)					
Chlorine Residual						0.05
Ammonia Nitrogen: March	9.8 (24)	25 (62)	28 (70)	1.5	3.8	4.3
April-October	9.8 (24)		25 (62)	1.5		3.8
November-February	26 (65)		28 (70)	4	NA	4.3
				Monthly Avg. not less than	Weekly Avg. not less than	Daily Minimum
Dissolved Oxygen March-July				NA	6.25	5.0
August-February				6	4.5	4

Table 24. Kirkland North NPDES permit requirements.

	LOAD LIMITS lbs/day DAF (DMF)*			CONCENTRATION LIMITS mg/L		
Parameter	Monthly Average	Weekly Average	Daily Maximum	Monthly Average	Weekly Average	Daily Maximum
$CBOD_5$	65 (209)	103 (334)		25	40	
Suspended Solids	96 (309)	116 (375)		37	45	
pH	Shall be in the range of 6 to 9 Standard Units					
Fecal Coliform	Daily Maximum shall not exceed 400 per 100 mL (May through October)					
Chlorine Residual						0.05

Septic Systems

Septic systems are common within the more rural, unincorporated portions of DeKalb County. When septic systems are not maintained or fail, they pose real threats to groundwater and surface water quality, especially when they are located near streams or other water bodies. Failing septic systems can contribute high levels of nutrients (phosphorus and nitrogen) and bacteria (fecal coliform) to the environment. The failure rate of septic systems in the watershed is unknown. However, literature sources across the nation indicate a failure rate of approximately 20% (Brown, 1998; Mancl, 1984; Stout, 2003; UKCE, 2012).

While no specific data was available regarding the number or condition of septic systems within the watershed, B&W was able to estimate the number at 1,760. This number was calculated based on the assumption that each household outside of a municipal boundary is likely to have a septic system. This estimate will be incorporated into the PLET modeling (see Section 3.15). Table 25 depicts the estimated number of rural households/septic systems by subwatershed management unit (SMU). Septic systems in DeKalb County are regulated under the Water Wells and Waste and Sewage Disposal section of the DeKalb County Code and run by DeKalb County Health Department.

The United States Environmental Protection Agency (USEPA) provides an excellent guide for septic system owners called "A Homeowner's Guide to Septic Systems" (USEPA, 2005). The guide makes it clear that septic system maintenance is the responsibility of the owner. The guide also explains how septic systems work, why and how they should be maintained, and what makes a system fail. Septic system owners or those proposing to install new systems are encouraged to regularly maintain septic systems and seek guidance from DeKalb County as needed (accessible at well.septic@dekalbcounty.org).

Table 25. Estimated number of rural households/septic systems by SMU.

SMU #	Estimated Number of Rural Households
1	145
2	183
3	483
4	46
5	37
6	161
7	85
8	234
9	155
10	69
11	17
12	145
TOTAL	**1,760**

3.14 Water Quality Inventory

The primary goal of this watershed plan is to guide efforts to protect and restore surface water quality in Central South Branch Kishwaukee River watershed. Section 305(b) of the Federal Clean Water Act requires Illinois and all other states to submit to the USEPA a biennial report of the quality of the state's surface and groundwater resources called the Illinois Integrated Water Quality Report and Section 303(d) List. These reports must also describe how Illinois waters meet or do not meet water quality standards specific to each "Designated Use" as defined by the Illinois Pollution Control Board (IPCB). When a waterbody is determined to be impaired, Illinois EPA must list potential causes and sources for impairment in the 303(d) impaired waters list. There are seven "Designated Uses" in Illinois; Illinois EPA has assigned four of these uses to South Branch Kishwaukee River -Aquatic Life, Fish Consumption, Primary Contact Recreation, and Aesthetic Quality.

According to Illinois EPA's most recent 2022 Integrated Water Quality Report and Section 303(d) List, South Branch Kishwaukee River IEPA Assessment Unit ID (AUID) IL_PQC-05 (Reaches 1-6) and IL_PQC-09 (Reaches 7-10) are Fully Supporting for Aquatic Life and Aesthetic Quality, Not Supporting for Fish Consumption due to Mercury and PCBs, and Not Assessed for Primary Contact Recreation (Table 26). South Branch Kishwaukee River IEPA AUID IL_PQC-06 (Reach 11) is Not Supporting for Aquatic Life due to Algae, Dissolved Oxygen, and pH; Not Supporting for Fish Consumption due to Mercury and PCBs; Not Supporting for Primary Contact Recreation due to Fecal Coliform; and Not Assessed for Aesthetic Quality. Deer Creek IEPA AUID IL_PQCE is Not Supporting for Aquatic Life due to Unknown Causes and Not Assessed for the remaining designated uses. Haines Creek AUID IL_PQCN and Bull Run AUID IL_PQCD, have not been assessed for designated uses. The sources of impairment are unknown for all segments. The remaining waterbodies within the watershed do not have AUIDs assigned by IEPA.

Table 26. Illinois EPA 2022 Designated Uses and Impairments.

Designated Use	Use Attainment	Impaired?	Cause of Impairment	Source of Impairment
South Branch Kishwaukee River: IL_PQC-05 (Reaches 1-6) and IL PQC-09 (Reaches 7-10)				
Aquatic Life	Fully Supporting	No	None	N/A
Fish Consumption	Not Supporting	Yes	Mercury, PCBs	Source Unknown
Primary Contact Recreation	Not Assessed	-	-	-
Aesthetic Quality	Fully Supporting	No	None	N/A
South Branch Kishwaukee River: IL_PQC-06 (Reach 11)				
Aquatic Life	Not Supporting	Yes	Algae, Dissolved Oxygen, pH	Source Unknown
Fish Consumption	Not Supporting	Yes	Mercury, PCBs	Source Unknown
Primary Contact Recreation	Not Supporting	Yes	Fecal Coliform	Source Unknown
Aesthetic Quality	Not Assessed	-	-	-
Deer Creek: IL_PQCE				
Aquatic Life	Not Supporting	Yes	Unknown	N/A
Fish Consumption	Not Assessed	-	-	-
Primary Contact Recreation	Not Assessed	-	-	-
Aesthetic Quality	Not Assessed	-	-	-
Haines Creek: IL_PQCN and Bull Run (IL_PQCD)				
Not Assessed				

Water Chemistry Monitoring

A variety of chemical monitoring stations have been sampled in recent years to document the baseline conditions of Central South Branch Kishwaukee River watershed. Table 27 lists all known chemical/physical water quality monitoring sites in the watershed, including the entities that conducted the sampling, the dates of sampling, and sampled parameters, while Figure 37 depicts the location of each monitoring site where data was collected. In total there were ten water quality monitoring sites, two of which were sampled by both IEPA and NIU (IL-06/IR and IL-01/CP).

B&W pulled ten years of historical water quality data (2014-2023) within the watershed and found four monitoring locations – IL-G-A1, IL-01, IL-09, and IL-06 (Table 27). These sites were monitored by Illinois EPA and included Intensive Basin Surveys at all sights and a Special Study at IL-01; sites IL-01, IL-09, and IL-06 were sampled in 2021, while IL-G-A1 and IL-01 were sampled in 2016. The parameters for the Special Study included total Kjeldahl nitrogen, total phosphorus, ammonia-nitrogen, inorganic nitrogen (NO2+NO3), volatile suspended solids, and total suspended solids, while the Intensive Basin studies included analysis of up to 70 parameters including all of the parameters from the Special Study as well as pH, chloride, dissolved oxygen and water temperature.

Additionally, eight monitoring sites were sampled monthly by Northern Illinois University (NIU) from July - December 2023. Note, the CP site is a sample from the Genoa WWTP discharge pipe, not from the South Branch Kishwaukee River. NIU sampled several parameters under this monitoring program, but data relevant to this planning effort include pH, electrical conductivity (EC), dissolved oxygen (DO), ammonia, nitrite (NO2), nitrate (NO3), and phosphate.

Illinois EPA lists South Branch Kishwaukee River as being impaired for Fish Consumption with the last reach additionally impaired for Aquatic Life or Primary Contact Recreation and Deer Creek is Not Supporting for Aquatic Life according to the 2022 Integrated Water Quality Report and Section 303(d) List. Recent water quality data collected within the Central South Branch Kishwaukee River watershed indicates likely overall impairment from elevated total phosphorus and total nitrogen.
Note: For the Central South Branch Kishwaukee River watershed, the IL_EPA_WQX-PQC-06 (IL-06) and Irene Rd (IR), are the most downstream water quality monitoring locations in the watershed and are considered the most representative of watershed-wide water quality conditions. Therefore, these will be used as the measure of watershed-wide water quality results and summaries.

B&W analyzed historical water quality for CSBKR watershed available via EPA's WQX/Storet water quality database for the last ten years (2014 through 2023). Average sample results at IL-GA-01, IL-01, IL-09, and IL-06 for pH, dissolved oxygen, total suspended solids, chloride, total phosphorus, ammonia, inorganic nitrogen (NO2+NO3), total Kjeldahl nitrogen, and total nitrogen (calculated) are reported in Table 28. Monitoring results at IL-06 show that phosphorus is above the criteria at 0.183 mg/L and that both inorganic nitrogen and total nitrogen are above the guideline at 3.633 mg/L and 3.973 mg/L, respectively. Total suspended solids are below the threshold with an average of 17 mg/L. Notice that for all reported parameters, water quality is showing improvement from upstream to downstream.

Table 27. List of chemical/physical surface water quality monitoring sites (2014-2023).

Site ID	Site Name	Sampling Entity	Date	Sampled Parameters
IL-G-A1	IL_EPA_WQX-PQC-G-A1; Russel Woods	Illinois EPA	2016	Intensive Basin Survey
IL-01	IL_EPA_WQX-PQC-01; David Carroll Park	Illinois EPA	2021, 2016	Intensive Basin Survey, Special Study
IL-09	IL_EPA_WQX-PQC-09; Glidden Rd	Illinois EPA	2021	Intensive Basin Survey
IL-06	IL_EPA_WQX-PQC-06; Irene Rd	Illinois EPA	2021	Intensive Basin Survey
G	N Grove Rd	NIU	2023	NIU Sampling Parameters
BL	Base Line Rd	NIU	2023	NIU Sampling Parameters
CP	David Carroll Park – Genoa WWTP	NIU	2023	NIU Sampling Parameters
DC	Deer Creek	NIU	2023	NIU Sampling Parameters
KP	Kingston Park	NIU	2023	NIU Sampling Parameters
KRP	Kishwaukee River Park	NIU	2023	NIU Sampling Parameters
PW	Potawatomi Woods	NIU	2023	NIU Sampling Parameters
IR	Irene Rd	NIU	2023	NIU Sampling Parameters

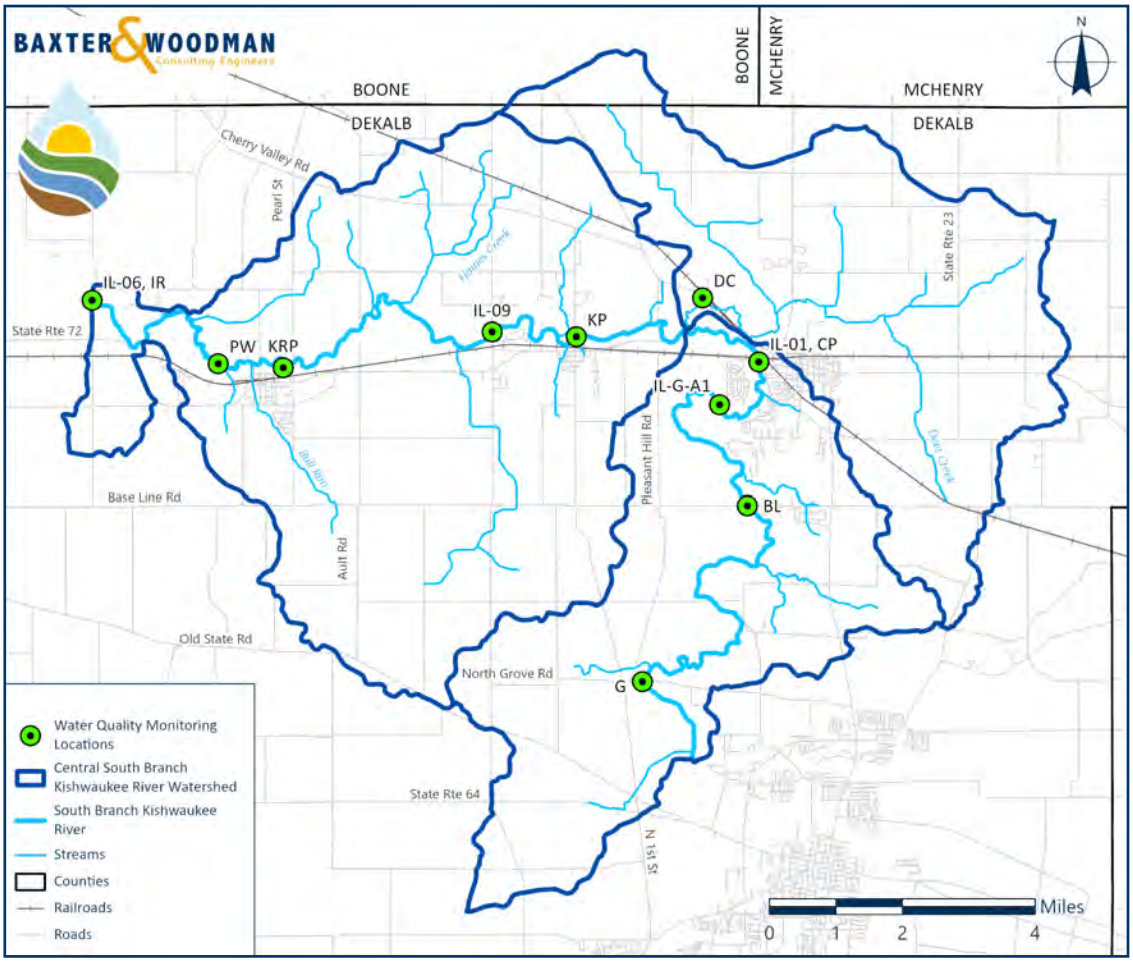


Figure 37. Water Quality Monitoring Locations.

Table 28. Illinois EPA water chemistry data (averages) by location (2014-2023), upstream to downstream.

ID Code/ Parameter	Statistical, Numerical, or General Use Guidelines	IL-GA-01	IL-01	IL-09	IL-06
Average of pH	>6.5 or <9.0*	8	7.9	-	-
Average of Dissolved Oxygen (mg/L)	>5.0 mg/l*	9.3	8.1	-	-
Average of TSS (mg/L)	<19 mg/l***	12	39	23	17
Average of Chloride (mg/L)	<500 mg/l*	97.1	74.5	74.1	86.2
Average of Total Phosphorus (mg/L)	<0.0725 mg/l**	0.463	0.399	0.158	0.183
Average of Ammonia (mg/L)	see TN below	ND	0.056	0.065	0.04
Average of NO2+NO3	1.798 mg/L**	4.020	5.715	4.190	3.633
Average of Total Kjeldahl Nitrogen (mg/L)	see TN below	0.600	0.883	0.515	0.340
Average of Total Nitrogen (TN) (mg/L), calculated	<2.461 mg/l**	4.620	6.598	4.705	3.973

-Cells highlighted in red exceed recommended statistical, numerical, or General Use guidelines, ND=not detected
* Illinois EPA General Use Standard
** Ambient Water Quality Criteria Recommendations: Rivers and Streams in Nutrient Ecoregion VI (USEPA 2000)
*** Present and Reference Concentrations and Yields of Suspended Sediment in Streams in the Great Lakes Region and Adjacent Areas (USGS 2006)

The water quality monitoring results performed by NIU (Table 29) depict elevated levels of inorganic nitrogen (NO2+NO3) and phosphate at almost all locations on South Branch Kishwaukee River, including at Irene Rd which is the most downstream and fully representative of watershed conditions. The NIU sampling at Irene Rd shows average phosphate at 0.240 ppm; the phosphate guideline, converted from the phosphorus standard, is 0.222 ppm. Nitrogen levels are elevated across the watershed, with NIU's data depicting 8.50 mg/l average for inorganic nitrogen (NO2+NO3) at Irene Rd on a guideline of 1.798 mg/l. All other parameters are within criteria guidelines. Notice that for all reported parameters except phosphorus, water quality is showing improvement from upstream to downstream.

Noteworthy: Numeric Water Quality Standards

USEPA expects states to establish numeric water quality standards for nutrients (phosphorus and nitrogen) in lakes and streams. Currently, Illinois EPA has a numeric phosphorus standard for lakes and is working on developing nutrient criteria for streams. To date, Illinois EPA has not developed numeric standards for turbidity/total suspended solids (TSS) in streams. Numeric criteria have been proposed by USEPA (USEPA, 2000) for nutrients based on a reference stream method for the Corn Belt and Northern Great Plains Ecoregion (Ecoregion VI) which includes Central South Branch Kishwaukee River watershed. The values presented in this document generally represent nutrient levels that protect against adverse effects of nutrient over enrichment. The USGS has published a document outlining recommended numeric criteria for sediment in streams for Ecoregion VI (USGS, 2006). These criteria are used in this report to assess the quality of Central South Branch Kishwaukee River and tributaries to develop pollution reduction targets and measure future successes, even though Illinois EPA has not adopted these criteria as standards.

Illinois EPA and others have developed statistical guidelines for various pollutants other than nutrients and suspended sediment. Illinois also provides General Use water quality standards that apply to almost all waters and are intended to protect aquatic life, wildlife, agriculture, primary contact, secondary contact, and most industrial uses. Statistical guidelines and General Use water quality guidelines are also used in this report as a means to measure impairment and to determine pollutant reduction needs in Central South Branch Kishwaukee River watershed.

Table 29. NIU water chemistry data (averages) for sites on CSBKR (2023).

Site ID/ Parameter	Statistical, Numerical, or General Use Guidelines	G	BL	DC	KP	KRP	PW	IR
Average of pH	>6.5 or <9.0*	7.4	7.5	7.6	7.6	7.6	7.5	7.3
Average of EC (uS/cm)	<1,667 µmhos/cm	1093.0	1018.9	727.2	911.4	879.3	883.0	855.5
Average of DO (mg/L)	>5.0 mg/l*	8.0	10.6	9.7	10.9	10.0	10.0	9.1
Average of Ammonia (ppm)	<15 mg/l* (<15.017 ppm)	0.03	0.02	0.28	0.00	0.00	0.00	0.00
Average of Nitrite (NO2) (ppm)	see NO2+NO3 below	0.10	0.03	0.01	0.01	0.12	0.04	0.00
Average of Nitrate (NO3) (ppm)	see NO2+NO3 below	9.17	6.60	7.35	15.35	8.03	8.98	8.50
Average of NO2+NO3, calculated	1.798 mg/L** (1.800 ppm)	9.317	6.635	7.350	15.350	8.173	9.013	8.500
Average of Phosphate (ppm)	0.222 ppm (converted from phosphorus standard)**	0.225	0.363	0.180	0.570	0.683	0.345	0.240
Sampling Abbreviations: EC= electrical conductivity, DO= dissolved oxygen, NO2= nitrite, NO3= nitrate								

-Cells highlighted in red exceed recommended statistical, numerical, or General Use guidelines, ND=not detected
* Illinois EPA General Use Standard
** Ambient Water Quality Criteria Recommendations: Rivers and Streams in Nutrient Ecoregion VI (USEPA 2000)
*** Present and Reference Concentrations and Yields of Suspended Sediment in Streams in the Great Lakes Region and Adjacent Areas (USGS 2006)

Nutrients such as phosphorus and nitrogen are a necessary component of plant growth and are therefore included in many fertilizers. Unfortunately, both have adverse effects on water quality, with phosphorus being particularly detrimental to aquatic systems in excess quantities. These nutrients are applied as fertilizer, either in an agricultural setting or by applicators and the excess nutrients not absorbed by plants are then washed into waterways. Excess nutrients can cause algal blooms, accelerated plant growth, decreasing oxygen levels, and can lead to fish kills. USEPA recommends that total phosphorus be less than 0.0725 mg/l and total nitrogen less than 2.461 mg/l.

The ability to control erosion and excess sediment in waterways, and thereby total suspended solids, can be linked to the control of how development is handled as well as the condition of streambanks in the watershed. The construction process generally involves significant land disturbance and ecosystem destruction. The grading of sites, removal of vegetation, rerouting of natural drainage systems, and the addition of impervious surfaces, such as roads and parking lots, all interfere with water quality both in the short and long term. Removing vegetation and trees near the stream or floodplain removes the stability of the soil and increases bank erosion and sedimentation to nearby waterways. Alteration of natural drainage patterns can also significantly reduce the ability of the ecosystem to compensate for such increase in contaminants and sedimentation. Eroding streambanks also contribute additional sediments, particularly during and after rain events as peak flows scour away banks. High suspended sediment levels are problematic when light penetration is reduced, oxygen levels decrease, fish and macroinvertebrate gills are clogged, visual needs of aquatic organisms is reduced, and when sediment settles out in streams and lakes. There is no Illinois state guideline for total suspended solids, but the United States Geological Survey (USGS) recommends TSS not exceed 19 mg/l for streams.

Fecal coliform or *E. coli* can be used as indicators that a waterbody is contaminated by improperly functioning septic systems, wildlife, or runoff from urban and agricultural areas, which could carry other possible pathogens such as bacteria, viruses, and protozoans. While potential pathogens are too numerous to test for individually, the USEPA recommends *E.coli* testing "as the best indicator of health risk from water contact in recreational waters (USEPA, 2012)." Not only does the presence of excessive *E. coli* counts suggest there is a possible health risk in recreational contact with those waters, but the bacteria "can also cause cloudy water, unpleasant odors, and an increased oxygen demand (USEPA, 2012)." The Illinois general use standard requires that *E. coli* or fecal coliform levels do not exceed 235 MPN (most probable number) per 100 ml of sample.

CSBKR watershed-wide averages for TP, TN, and TSS were calculated by taking all the individual sample results for these parameters from 2014-2023 at the IL-06 and Irene Rd sites and averaging them. **The watershed-wide average reading was 0.141 mg/L of total phosphorus, 3.973 mg/L of total nitrogen, and 17 mg/L of total suspended solids.** These watershed-wide averages will be used in the calculation of watershed-wide reduction targets.

Effects of Pollutants on Water Quality

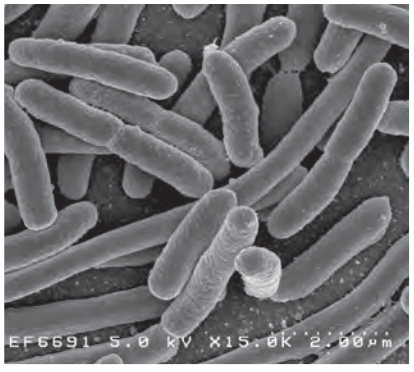
Nutrients (phosphorus and nitrogen)
- **Necessary component for plant growth**
- **Detrimental to water quality and aquatic systems**
- **Can cause algal blooms, accelerated plant growth, decreasing oxygen levels, and can lead to fish kills**



Total suspended solids
- **Linked to development, construction practices, streambank and riparian condition**
- **Reduces light penetration and oxygen levels**
- **Can clog gills and reduce visual needs of fish**
- **Sediments eventually settle out in streams and lakes**



Fecal coliform and *E. coli*
- **Indication a waterbody is contaminated with pathogens**
- **Possible health risk during recreational contact**
- **Sources include septic systems, wildlife, or runoff from urban and agricultural areas**
- **Can also cause cloudy water, unpleasant odors, and increased oxygen demand**



Biological Monitoring

No biological monitoring data could be found for the watershed within the last ten years, but IEPA did calculate Qualitative Habitat Evaluation Index (QHEI) scores during their Intensive Basin Surveys. Stream habitat assessments comprise a major component of physical water quality monitoring. Many habitat assessment methods are available for assessing streams such as those developed by Illinois DNR and Ohio EPA. The QHEI is used by the Illinois EPA to assess "Aquatic Life" Use Attainment in streams. It is composed of six criteria that are scored individually then summed to provide the total QHEI score. The best possible score is 100. QHEI scores from hundreds of stream segments indicate that habitat values greater than 60 generally support average quality warm-water fauna. Scores greater than 80 typify pristine habitat conditions that can support exceptional warm-water fauna (Ohio EPA, 1999). Areas with habitat scores lower than 60 may support warm-water fauna but usually exhibit significant degradation. Table 30 summarizes QHEI score classifications.

A QHEI score was calculated at the IL-01 site as 49.5 (Fair) in July of 2021, another at the IL-09 site as 59 (Fair) in July of 2021, and 66 (Good) in June 2021 at the IL-06 site. Similar to the results of the chemical/physical water quality data, QHEI scores improve the further downstream the site is.

Table 30. QHEI score classes and characteristics.

QHEI	Class	Usual Characteristics
80-100	Excellent	Comparable to pristine conditions; exceptional assemblage of habitat types; sufficient riparian zone
60-79	Good	Impacts to riparian zone
30-59	Fair	Impacts to riparian zone; channelization; most in-stream habitat gone
0-29	Poor	All aspects of habitat in degraded state



Macroinvertebrate sampling workshop

Causes and Sources of Impairment

According to Illinois EPA's most recent 2022 Integrated Water Quality Report and Section 303(d) List, South Branch Kishwaukee River IEPA Assessment Unit ID (AUID) IL_PQC-05 (Reaches 1-6) and IL_PQC-09 (Reaches 7-10) are Fully Supporting for Aquatic Life and Aesthetic Quality, Not Supporting for Fish Consumption due to Mercury and PCBs, and Not Assessed for Primary Contact Recreation. South Branch Kishwaukee River IEPA AUID IL_PQC-06 (Reach 11) is Not Supporting for Aquatic Life due to Algae, Dissolved Oxygen, and pH; Not Supporting for Fish Consumption due to Mercury and PCBs; Not Supporting for Primary Contact Recreation due to Fecal Coliform; and Not Assessed for Aesthetic Quality. Deer Creek IEPA AUID IL_PQCE is Not Supporting for Aquatic Life due to Unknown Causes and Not Assessed for the remaining designated uses. Haines Creek AUID IL_PQCN and Bull Run AUID IL_PQCD, have not been assessed for designated uses. The sources of impairment are unknown for all segments. The remaining waterbodies within the watershed do not have AUIDs assigned by IEPA.

Recent water quality data collected within the CSBKR watershed indicates likely overall impairment from elevated total phosphorus and total nitrogen. There are also non-water quality related impairments in the watershed such as habitat degradation, loss of open space, and hydrologic and flow changes. Many different causes and sources are related to these impairments. Table 31 summarizes all known or potential causes and sources of watershed impairment as documented by Illinois EPA, items identified during the watershed resource inventory, and input from the Watershed Steering Committee who met during the planning process to discuss impairments.

Table 31. Known and potential causes and sources of watershed impairment.

Illinois EPA or other Impairment	Cause of Impairment	Known or Potential Source of Impairment
Aquatic Life	Nutrients (Phosphorus & Nitrogen) - known impairment	Agricultural row crop runoff Streambank erosion Residential, ag, and commercial lawn fertilizer Failing septic systems Inadequate nutrient restrictions/policy Level of landowner education Wastewater treatment plants
Aquatic Life	Algae, dissolved oxygen, pH - known impairment	Excess nutrients (algae/dissolved oxygen) Point source pollution (pH) Mining (pH)
Fish Consumption	Polychlorinated Biphenyls (PCBs) and Mercury - known impairment	Urban runoff Historic commercial and industrial runoff Atmospheric deposition (mercury)
Primary Contact Recreation	Fecal coliform	Agricultural animal or wildlife waste Agricultural manure application Failing septic systems Wastewater treatment plants Runoff from urban and ag areas
Habitat Degradation	Invasive/non-native plant species in riparian and natural areas - known impairment	Spread from existing and introduced populations Lack of maintenance and management Level of public education
Habitat Degradation	Loss and fragmentation of open space/natural habitat due to development - known impairment	Inadequate protection policy Traditional development design Stream and riparian modification Lack of appropriate land management Lack of restoration and maintenance funds Wetland loss
Hydromodification and Flow Changes	Alteration of natural drainage channels; impervious surfaces - known impairment	Historic channelization and ditching of streams Drain tiles Wetland loss Existing & future urban runoff

3.15 Pollutant Loading Analysis

The USEPA modeling tool called PLET (Pollutant Load Estimation Tool) was used to estimate the pollutant loading of nutrients (nitrogen & phosphorus) and sediment from Central South Branch Kishwaukee River watershed as a whole and by individual Subwatershed Management Unit (SMU). The model uses land use/cover category types, precipitation, soils information, existing best management practices, and other existing conditions data information. The model outputs average annual pollutant loads for each of the land use/cover types. The results of this analysis combined with known outfall information from the wastewater treatment plants was used to estimate the total watershed load for nitrogen, phosphorus, and sediment and to identify and map pollutant load "Hot Spot" SMUs. It is important to note that PLET is not a calibrated model, although every effort was taken to include all current and available data.

The City of Genoa and Kirkland North STP permitted facilities contribute nitrogen, phosphorous, and sediment to CSBKR watershed. Based on permitting data and sampling provided by NIR, the City of Genoa contributes 22,662 lbs/yr of nitrogen, 1,821 lbs/yr of phosphorus, and 10 tons/yr of sediment, while Kirkland North STP contributes 3 tons/yr of sediment. Unfortunately, there was not enough monitoring data to estimate nutrient loading for Kirkland North STP (Table 32). **It is important to note that both facilities are permitted point sources and do an excellent job of staying within permitted discharge limits.**

Central South Branch Kishwaukee River watershed lies downstream of both the Upper South Branch Kishwaukee River Watershed and the East Branch of the South Branch Kishwaukee River Watershed. Fortunately, watershed-based plans are in place for both upstream watersheds to address water quality. Nevertheless, both watersheds are contributing pollutants to Central South Branch Kishwaukee River watershed. The most upstream, accessible location in the watershed and downstream of both contributing watersheds is N Grove Rd (G). Based on flow data from the nearest USGS stream gage and the water quality sampling results at Grove, upstream watersheds contribute 947,498 lbs/yr of nitrogen loading and 7,461 lbs/yr of phosphorus loading. No sediment monitoring data was available for the Grove location. For the purposes of this watershed plan, B&W assumed that these percent contributions were representative of the total overall pollutant loading contributions and used these percentages to back calculate an estimate of total upstream loading. Loading values for all pollutants are **underestimates** due to insufficient monitoring data.

The results of the PLET model run at the watershed scale combined with available point source and upstream loading estimates indicate that total loading to CSBKR watershed is approximately 1,308,596 lbs/yr of nitrogen, 81,687 lbs/yr of phosphorus, and 49,962 tons/yr of sediment (Table 33; Figure 38). **Excluding the wastewater and upstream estimated contributions to pollutant loading**, cropland contributes the highest loads of nitrogen (255,964 lbs/yr: 20%), phosphorus (53,084 lbs/yr: 65%), and sediment (25,626 t/yr: 51%). Cropland is expected to be a significant pollutant contributor since it is the single largest land use in the watershed. Streambank erosion contributes the second highest loads, with 31,708 lbs/yr (2%) of nitrogen, 12,208 lbs/yr (15%) of phosphorus, and 23,271 tons (47%) of sediment per year. Urban land uses contribute the third highest loads with 28,171 lbs/yr (2%) of nitrogen, 4,492 lbs/yr (6%) of phosphorus, and 658 tons (1%) of sediment per year. Complete PLET Model results can be found in Appendix D.

Table 32. Estimated average annual pollutant loads from other sources.

	Average Flow MGD	Average Concentration (mg/l)			Annual Pollutant Load*		
		NO2+NO3 (mg/l)	TP (mg/l)	TSS (mg/l)	NO2+NO3 (lbs/yr)	TP (lbs/yr)	TSS (t/yr)
City of Genoa	0.63	11.825	0.95	10.4	22,662	1,821	10
Kirkland North	0.2	NA	NA	10.56	NA	NA	3
Upstream watersheds	33.6	9.27	0.073	NA	947,498	7,461	NA

*Average daily flow (MGD) × average concentration (mg/l) × 3,042 (L-d-lb/gal-y-mg) = average annual load (lb-t/y)

Table 33. Estimated annual pollutant load by source at the watershed scale.

PLET Source	N Load (lbs/yr)	% of Total Load	P Load (lbs/yr)	% of Total Load	Sediment (tons/yr)	% of Total Load
Urban	28,171	2%	4,492	6%	658	1%
Cropland	255,964	20%	53,084	65%	25,626	51%
Pastureland	21,127	2%	1,942	2%	361	1%
Forest	1,075	0%	525	1%	34	0%
Septic	392	0%	153	0%	0	0%
Streambank	31,708	2%	12,208	15%	23,271	47%
City of Genoa*	22,662	2%	1,821	2%	10	0%
Kirkland North STP*	ND	0%	ND	0%	3	0%
Upstream Watersheds*	947,498	72%	7,461	9%	ND	0%
Total	1,308,596	100%	81,687	100%	49,962	100%

ND= no data available
*Not included in PLET model, calculated based on available data. Reported loading is underestimated due to insufficient data.

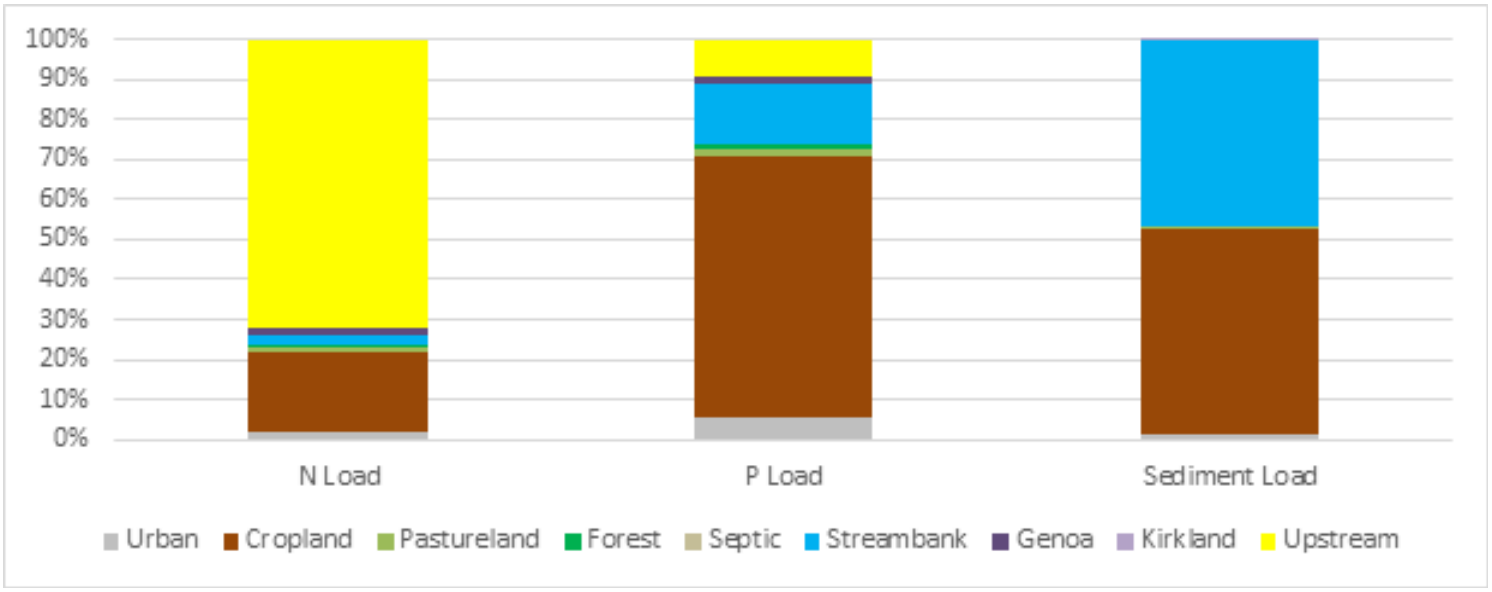


Figure 38. Estimated percent contributions to pollutant load by source.

The results of the PLET model were also analyzed for nonpoint source pollutant loads at the Subwatershed Management Unit (SMU) scale. This analysis does not incorporate the wastewater and upstream watershed contributions. This allows for a more refined breakdown of nonpoint pollutant sources and leads to the identification of pollutant load "Hot Spots". Hot Spot SMUs were selected by calculaing pollutant load concentration (load/acre) for each pollutant. Next, pollutant concentrations were calculated based for each SMUs total load per acre. SMUs with a total load concentration of 7.2 or higher were categorized as "High Concentration" pollutant load hot spots, while SMUs scoring a total load concentration between 6.7 and 7.1 were determined to be "Moderate Concentration pollutant load hot spots. The remaining SMUs contribute a "Low Concentration" of pollutants relative to other SMUs. Table 34 and Figure 39 depict and summarize the results of the SMU scale pollutant loading analysis. SMUs 2, 3, 4, and 6 are considered "High Concentration" pollutant load Hot Spots, while SMUs 1, 7, 8, and 10 are considered "Moderate Concentration" pollutant load Hot Spots. SMUs 5, 9, 11, and 12 contribute "Low Concentrations" of pollutants relative to the other watersheds. Generally agricultural lands and eroding streambanks are driving are driving the Hot Spot results.

Table 34. Nonpoint Source Pollutant load "Hot Spot" SMUs.

Hot Spot SMU	Size (acres)	N Load lbs/yr	N Load lbs/yr/ac	P Load (lbs/yr)	P Load (lbs/yr/ac)	Sediment (tons/yr)	Sediment (tons/yr/ac)	Aggregate Load Concentration
High Concentration Hot Spot SMUs								
SMU 4	3,736.4	23,523	6.3	5,234	1.4	3,834	1.0	8.7
SMU 2	4,992.3	29,245	5.9	7,000	1.4	7,128	1.4	8.7
SMU 3	5,826.1	29,417	5.0	6,648	1.1	6,044	1.0	7.2
SMU 6	4,292.6	22,856	5.3	4,799	1.1	3,041	0.7	7.2
Moderate Concentration Hot Spot SMUs								
SMU 7	4,797.1	25,219	5.3	5,328	1.1	3,132	0.7	7.0
SMU 8	5,830.0	28,637	4.9	6,174	1.1	4,690	0.8	6.8
SMU 10	3,687.9	18,836	5.1	3,848	1.0	2,211	0.6	6.8
SMU 1	7,479.3	37,725	5.0	7,842	1.0	4,901	0.7	6.7

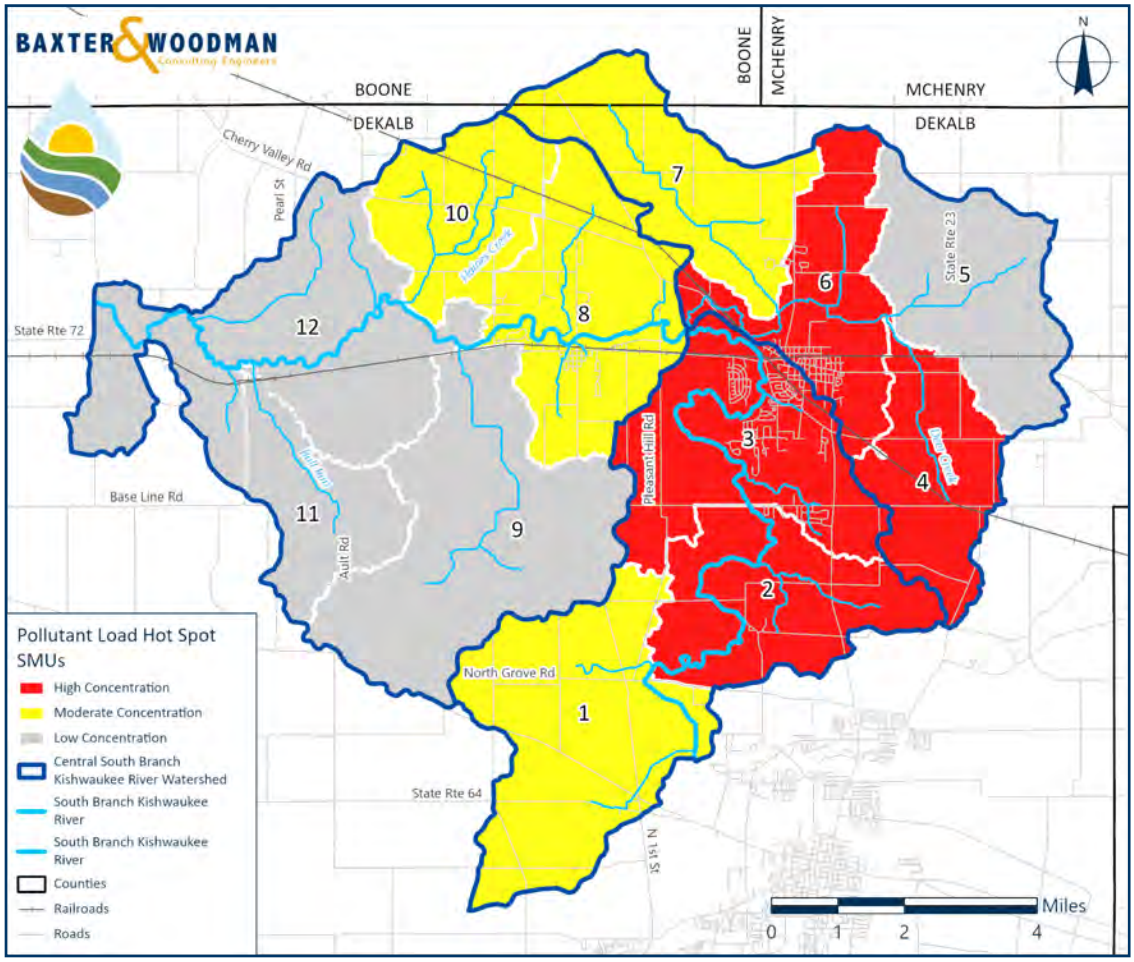


Figure 39. Nonpoint Source Pollutant Loading Hot Spot SMUs.

3.16 Watershed Impairment Reduction Targets

Establishing Impairment Reduction Targets provides a means to measure how implementation of Management Measures at Critical Areas is expected to reduce watershed impairments over time. Table 35 summarizes the basis for known impairments and nonpoint source reduction targets. Since the City of Genoa and Kirkland North STP are permitted source under IEPA's NPDES permit system and the upstream portions of South Branch Kishwaukee River are outside this watershed planning area (and already have watershed-based plans in place), their relative contributions to pollutant loading were not included in the calculation of reduction targets. Reduction targets listed in Table 35 are based on documented information, PLET modeling results, average water quality sampling results at the Irene Rd monitoring location, and water quality standards and criteria set by the Illinois Pollution Control Board (IPCB, 2011), USEPA (2000), and USGS (2006). It is important to note that the assumption is made that percent decrease in sample concentration (mg/l) needed correlates to the percent reduction in annual load (lbs/yr or tons/yr) for phosphorus, nitrogen, and sediment reduction targets. In addition, Table 35 summarizes the load reduction of phosphorus and nitrogen, expected from addressing Critical Areas.

Based on the results of the water quality inventory (as identified in Section 4.1), an 89% decrease in total phosphorus (TP) and a 26% decrease in total nitrogen (TN) are needed in CSBKR watershed from all sources combined to reach target levels based on recommended numeric criteria proposed by USEPA (USEPA 2000), USGS (USGS 2006) and IEPA (2011). No decrease in total suspended solids is needed – TSS is well within target criteria guidelines based on the water quality inventory. Furthermore, based on the pollutant load modeling (Table 35), the relative NPS contribution from CSBKR watershed to total pollutant loads are 43% of phosphorus loading and 10% of nitrogen.

Watershed-Wide Reduction Targets for Phosphorus, Nitrogen, and Suspended Solids

Watershed-wide total phosphorus reduction targets could not be attained by addressing Critical Areas alone according to the pollutant reduction calculations; however, the total nitrogen reduction target can be met. Critical Areas alone would remove 17,951 lbs/yr (57% of the target) and 47,397 lbs/yr (141% of the target) of phosphorus and nitrogen, respectively. The phosphorus target could be attained by implementing all recommended management measures in this plan, which would remove 31,643 lbs/yr of phosphorus. No estimate is shown for total suspended solids because, based on IEPA data and the water quality inventory, it is within target criteria guidelines; however, Critical Area recommendations alone would remove approximately 14,478 tons/yr of sediment from the watershed.

Additional watershed-wide reduction targets were established for habitat degradation, and hydromodification and flow changes. Habitat degradation and hydromodification and flow changes targets could be met by implementing riparian area restoration and by restoring wetlands.

Table 35. Basis for known impairments, nonpoint source reduction targets, & impairment reduction from Critical Areas.

Impairment: Cause of Impairment	Basis for Impairmenbnt	Nonpoint Source Reduction Target	Reduction from Critical Areas	Target Attainable?
Watershed-Wide Reduction Targets				
Water Quality/ Aquatic Life: Phosphorus in South Branch Kishwaukee River	72,405 lbs/yr of phosphorus loading based on PLET model loading; 0.141 mg/l of total phosphorus based on average water quality samples & 89% relative NPS contribution to total phosphorus loading	**>43.3% or 31,351 lbs/yr reduction in phosphorus** loading to achieve 0.0725 mg/l total phosphorus USEPA numeric criteria for streams in Ecoregion VI	6,377 lbs/yr or 20% reduction from critical ag. land	
			131 lbs/yr or <1% reduction from critical detention basin retrofits	
			262 lbs/yr or 1% reduction from critical wetland restorations	
			11,168 lbs/yr or 36% reduction from critical stream & riparian area reaches	
			13 lbs/yr or <1% reduction from other management measures	
		TOTAL	**17,951 lbs/yr or 57% total phosphorus reduction from all Critical Areas**	**No**
Water Quality/ Aquatic Life: Nitrogen South Branch Kishwaukee River	338,436 lbs/yr of total nitrogen loading based on PLET model loading; 3.973 mg/l of total nitrogen based on average water quality samples & 26% relative NPS contribution to total phosphorus loading	**>9.9% or 33,505 lbs/yr reduction in nitrogen** loading to achieve 2.461 mg/l total nitrogen USEPA numeric criteria for streams in Ecoregion VI	13,477 lbs/yr or 40% reduction from critical ag. land	
			989 lbs/yr or 3% reduction from critical detention basin retrofits	
			2,797 lbs/yr or 8% reduction from critical wetland restorations	
			30,059 lbs/yr or 90% reduction from critical stream & riparian area reaches	
			75 lbs/yr or <1% reduction from other management measures	
		TOTAL	**47,397 lbs/yr or 141% total nitrogen reduction from all Critical Areas**	**Yes**
Habitat Degradation: Invasive/non-native plant species in riparian areas and loss and fragmentation of natural habitat	1,014 acres of riparian areas are currently in poor condition	**203 acres or 20%** of riparian areas ecologically restored	237.4 acres or 23% of riparian areas restored along critical riparian areas	Yes
Hydromodification and Flow Changes	14,339 acres (87%) of wetlands lost since pre-settlement	**7 critical wetlands restored** accounting for 1,409.7 acres	1,409.7 or 100% critical wetland acres restored	Yes



4

Management Measures Action Plan

Earlier sections of this plan summarized the CSBKR watershed's characteristics and identified causes and sources of watershed impairment. This section is an Action Plan that provides stakeholders with recommended Management Measures (Best Management Practices) to address plan goals at general and site-specific scales. The Action Plan is divided into two subsections:

Programmatic Measures: general remedial, preventive, and policy watershed-wide Management Measures that can be applied across the watershed by various stakeholders.

Site-Specific Measures: actual locations where Management Measure projects can be implemented to improve surface and groundwater quality, green infrastructure, and flooding.

The recommended programmatic and site-specific Management Measures provide a solid foundation for protecting and improving watershed conditions but should be updated as projects are completed, or other opportunities arise. Lead implementation stakeholders are encouraged to organize partnerships with key stakeholders and develop various funding arrangements to help delegate and implement the recommended actions. The key stakeholders in the watershed are listed in Table 36. Note: all recommendations in this Section are for guidance only and not required by any federal, state, or local agency.

Table 36. Key CSBKR watershed partners.

Key Watershed Partner	Abbreviation
Boone County	Boone
Central South Branch Kishwaukee River Watershed Steering Committee	Steering
City of Genoa	Genoa
City of Sycamore	Sycamore
DeKalb County	DeKalb Co.
DeKalb County Community Development Department	DCCDD
DeKalb County Community Foundation	DCCF
DeKalb County Forest Preserve District	DCFPD
DeKalb County Soil and Water Conservation District	DCSWCD
Genoa Township Park District	GTPD
Golf Courses	GC
Illinois Department of Natural Resources	IDNR
Illinois Environmental Protection Agency	IEPA
United States Army Corps of Engineers	USACE
United States Fish & Wildlife Service	USFWS
University of Illinois Extension	Extension
Village of Kingston	Kingston
Village of Kirkland	Kirkland

4.1 Programmatic Management Measures Action Plan

Numerous types of programmatic Management Measures are recommended to address watershed objectives for each plan goal. The following pages include recommended measures that are applicable throughout the watershed and information needed to facilitate implementation of specific actions. A summary of the general programmatic measure types is included below:

Policy: Local, state, and federal government can help prevent watershed impairments in various ways through policy but specifically by adopting and/or supporting (via a resolution) the CSBKR watershed plan, implementing green infrastructure policy, requiring conservation developments for new developments, protecting groundwater, reducing road salt usage and lawn fertilizers, requiring natural detention basins and naturalization of existing basins, and allowing use of native vegetation/landscaping.

Non-Structural: This includes a broad group of practices that prevent impairment through maintenance and management of Management Measures or programs that are ongoing in nature and designed to control pollutants at their source. Such programs include the Audubon Cooperative Sanctuary Program (ACSP) for golf courses, many of the agricultural programs available to farmers, and street sweeping.

Structural: This includes a broad group of practices that prevent impairment via installation of in-the-ground measures. This plan focuses on implementation of naturalized stormwater measures/retrofits, permeable paving, vegetated filter strips/buffers, natural area restoration, wetland restoration, and use of rainwater harvesting devices.

Educational: Outreach is important to inform the public related to environmental impacts of daily activities and to build support for watershed planning and plan implementation. Topics typically address watersheds, water quality, land management, pet waste management, lawn fertilizer use, good housekeeping, etc.

4.1.1 Policy Recommendations

Various recommendations are made throughout this report related to how local governments can improve the condition of CSBKR watershed through policy. Policy recommendations focus on improving watershed conditions by preserving green infrastructure, protecting groundwater, minimizing road salts, minimizing lawn fertilizer, sustainable management of stormwater, and allowances for native landscaping. To be successful, the CSBKR Watershed-Based Plan would need to be adopted and/or supported by local communities. The process of creating and implementing policy changes can be complex and time consuming. And, although there are numerous possible policy recommendations for the watershed, the following policy recommendations are considered the most important and highest priority for implementation.

Plan Adoption & Implementation Policy Recommendations

- Watershed Partners adopt and/or support (via a resolution) the CSBKR Watershed Improvement Plan and incorporate plan goals, objectives, and recommended actions into comprehensive plans and ordinances.

Green Infrastructure Network Policy Recommendations

- Each municipality consider incorporating the identified Green Infrastructure Network (GIN) into comprehensive plans and development review maps.
- Utilize tools such as protection overlay zones, setbacks, open space zoning, conservation easements, conservation and/or low impact development, etc. in municipal comprehensive plans and zoning ordinances to protect environmentally sensitive areas within identified Green Infrastructure Network parcels.
- Utilize tools such as Development Impact Fees, Stormwater Utility Taxes, Special Service Area (SSA) Taxes, etc. to help fund implementation of plan and future management of green infrastructure components where new and redevelopment occurs.
- Require developers to protect sensitive natural areas, restore degraded natural areas and streams, and then encourage donation of all natural areas and naturalized stormwater management systems to a public agency or conservation organization for long term management with dedicated funding such as Development Impact Fees, Stormwater Utility Taxes, Special Service Area (SSA) Taxes, etc. In general, it is not recommended that these features be turned over to HOA's to manage, as they lack the resources and experience to do so effectively.
- Establish incentives for developers who propose sustainable or innovative approaches to implement the watershed-based plan, including priority for preserving green infrastructure and using naturalized stormwater treatment trains.
- Require mitigation for all wetlands lost prior to allowing development within the watershed.

Groundwater Policy Recommendations

- Encourage extensive stormwater management practices that clean and infiltrate water in any development or redevelopment.
- Limit impervious cover within new and redevelopments occurring within Subwatershed Management Units 3, 6, and 11 which are ranked as highly vulnerable to future impervious cover.

Road Salt Policy Recommendations

- Each municipality/township supplements existing programs with deicing best management practices such as utilizing alternative deicing chemicals, anti-icing or pretreatment, controlling the amount and rate of spreading, controlling the timing of application, utilizing proper application equipment, equipment calibration, and educating/training deicing employees.
- Establish additional new best management practice recommendations based on the results of various ongoing studies and research being produced by Illinois Tollway to reduce, re-use, and offset the impacts of winter roadway operations. These include converting invasives to energy, to harvest cattails for the purpose of removing excess nutrients, potentially quantifying chloride removal, re-using the plant mass for compost or compressed into an Energy product or potentially using the byproducts of the biomass as a replacement for beet juice on roadways (Illinois Tollway, 2019; Paap, 2019; and Wetlands Research, 2019).

Lawn Fertilizer and Paving Policy Recommendations

- Local governments extend phosphorus regulation to all non-commercial applicators, require soil testing pre-application, or ban out-right.
- Local governments ban coal tar sealants within their jurisdiction.
- Local governments permit the use of pavement alternatives such as permeable pavers in appropriate areas.

Stormwater Management Policy Recommendations

- Require new development and redevelopment to use stormwater management techniques/ facilities that serve multiple functions including storage, water quality benefits, infiltration, and wildlife habitat.
- Require reduced runoff volume from new and retrofitted detention basins.
- Local governments allow stormwater trees or create a stormwater tree program.

Native Landscaping/Natural Area Restoration

- Allow native landscaping within local ordinances.
- Ensure local "weed control" ordinances do not discourage or prohibit native landscaping.
- Include short- and long-term management with performance standards for restored natural areas and stormwater features within new and redevelopment.

4.1.2 Detention Basins

Detention basins are best described as human made depressions for the temporary storage of stormwater runoff with controlled release following a rain event. Most of the detention basins in CSBKR watershed are associated with residential and urban development. Most existing wet bottom basins are essentially ponds planted with turf grass along the slopes, and the majority of the dry bottom basins are similarly planted with turf grass from end to end. These attributes do not promote water quality improvement, good infiltration, or wildlife habitat capabilities.

Studies reveal the benefits of detention basins that serve multiple functions. According to USEPA, properly designed dry bottom infiltration basins reduce total suspended solids (sediment) by 58%, total phosphorus by 26%, and total nitrogen by 30%. Wet bottom basins designed to have wetland characteristics reduce total suspended solids (sediment) by 78%, total phosphorus by 44% and total nitrogen by 20% (MDEQ, 1999).

Detention Basin Recommendations

Future detention basin design within the watershed should consist of naturalized basins that serve multiple functions, including appropriate water storage, water quality improvement, natural aesthetics, and wildlife habitat. There are also many opportunities to retrofit existing dry or wet bottom detention basins by incorporating minor engineering changes and naturalizing with native vegetation. Site-specific retrofit opportunities are identified in the Site-Specific Action Plan. Location, design, establishment, and long-term maintenance recommendations for naturalized detention basins are included below. Note: requirements of the DeKalb County Stormwater Ordinance, such as volume and release rates, will apply to the design recommendations included below.

Detention Location Recommendations

- Naturalized detention basins should be restricted to natural depressions or previously drained hydric soil areas and adjacent to other existing green infrastructure to aesthetically fit and blend into the landscape. Use of existing isolated wetlands for detention should be evaluated on a case-by-case basis.
- Basins should not be constructed in any average to high quality ecological community.
- Outlets from detentions should not enter sensitive ecological areas.

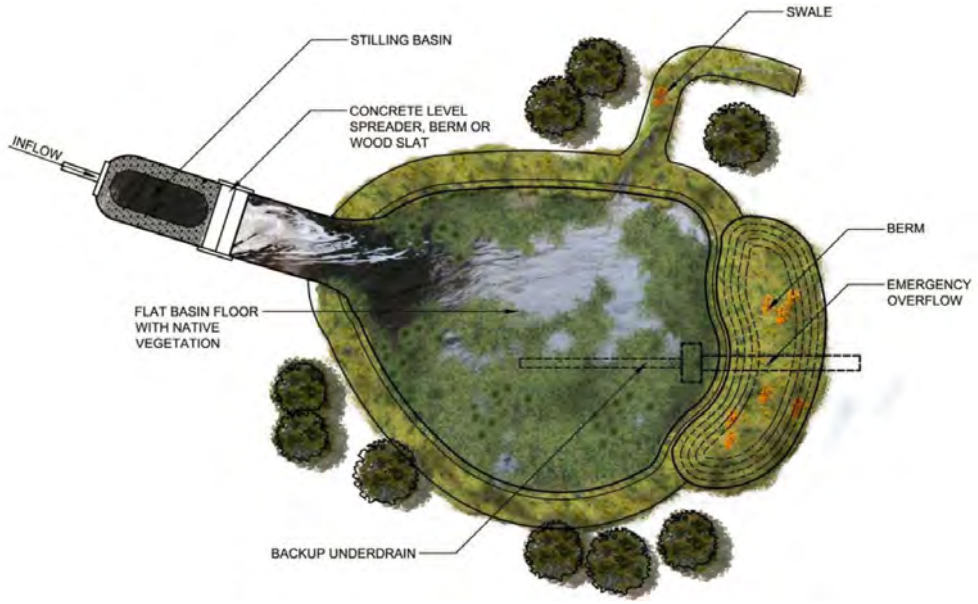


Figure 40. Naturalized dry bottom detention basin design.

Detention Design Recommendations

- One appropriately sized, large detention basin should be constructed across multiple development sites rather than constructing several smaller basins.
- Side slopes should be no steeper than 4H:1V, at least 25 feet wide, planted to native mesic prairie, and stabilized with erosion control blanket. Native oak trees (*Quercus sp.*) and other fire-tolerant species should be the only tree species planted on the side slopes.
- Dry bottom basins should be planted to mesic or wet-mesic prairie depending on site conditions.
- A minimum 5-foot-wide shelf planted to native wet prairie and stabilized with erosion control blanket should be constructed above the normal water level in wet and wetland bottom basins. This area should be designed to inundate after every 0.5-inch rain event or greater.
- A minimum 10-foot-wide shelf planted with native emergent plugs should extend from the normal water level to 2 feet below normal water level in wet and wetland bottom basins.
- Permanent pools in wet and wetland bottom basins should be at least 4 feet deep.
- Irregular islands and peninsulas should be constructed in wet and wetland bottom basins to slow the movement of water through the basin. They should be planted to native mesic or wet prairie depending on elevation above normal water level.
- A 4-6-foot-deep forebay, accessible to operations & maintenance crews, should be built at inlet(s) of wet/wetland bottom basins to capture sediment; a 4-6-foot-deep micro pool should be constructed at the outlet to prevent clogging.

Short Term (3 Years) Native Vegetation Establishment Recommendations

In most cases, the developer or owner should be responsible for implementing short term management of detention basins and other natural areas to meet a set of performance standards. A minimum of three years of management is needed to establish native plant communities within detention basins. Measures needed include mowing during the first two growing seasons following seeding to reduce annual and

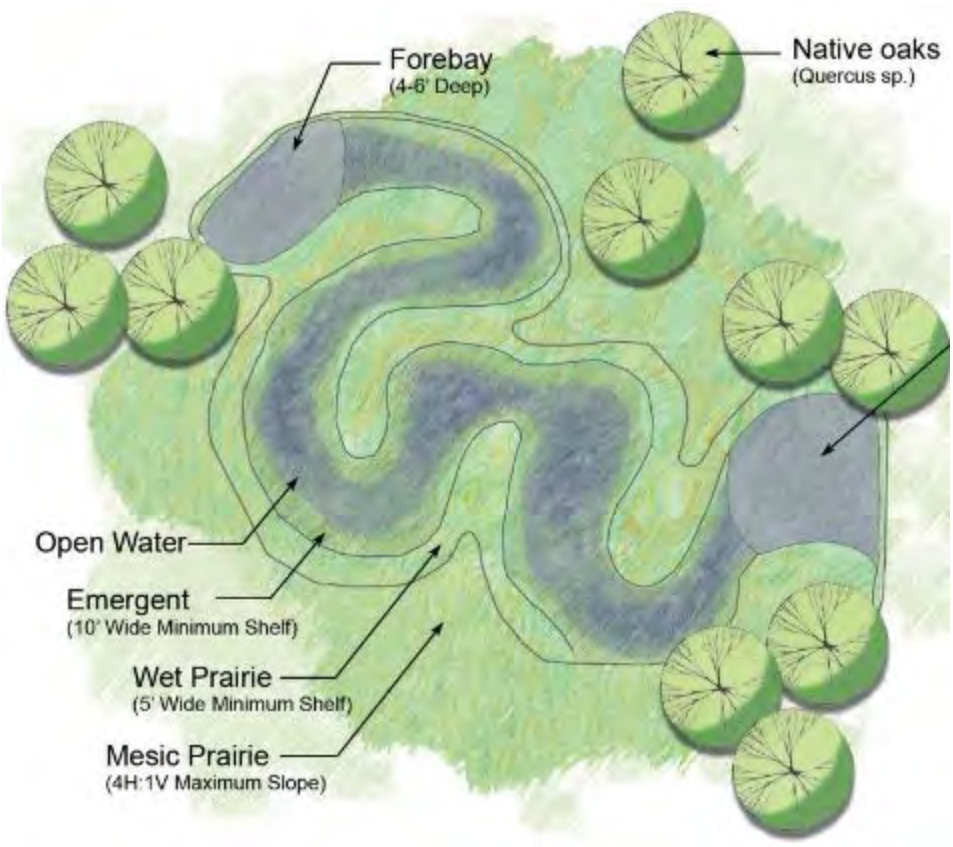


Figure 41. Naturalized wet bottom detention basin design.

biennial weeds. Spot herbiciding is also needed to eliminate problematic non-native/invasive species such as thistle, reed canary grass, common reed, purple loosestrife, and emerging cottonwood, willow, buckthorn, and box elder saplings. In addition, the inlet and outlet structures should be checked for erosion and clogging during every site visit. A three-year schedule appropriate to establish native plantings around naturalized detention basins is outlined below.

Year 1 Recommendations

- Mow prairie areas to a height of 6-12 inches in May, July, and September.
- Spot herbicide non-native/invasive species throughout site in late May and again in August/September. Target thistle, reed canary grass, common reed, purple loosestrife, and all emerging woody saplings.
- Check for clogging and erosion control at inlet and outlet structures during site visit & after >1" rain event.

Year 2 Recommendations

- Mow prairie areas to a height of 12 inches in June and August.
- Spot herbicide non-native/invasive species throughout site in May and again in August/September. Target thistle, reed canary grass, common reed, purple loosestrife, and all emerging woody saplings.
- Plant additional emergent plugs if needed and reseed any failed areas in fall.
- Check for clogging and erosion control at inlet and outlet structures during site visit & after >1" rain event.

Year 3 Recommendations

- Spot herbicide non-native/invasive species throughout site in May and again in August/September. Target thistle, reed canary grass, common reed, purple loosestrife, and all emerging woody saplings.
- Check for clogging and erosion control at inlet and outlet structures during site visit & after >1" rain event.

Long Term (3 Years +) Native Vegetation Maintenance Recommendations

Long term management of most detention basins associated with development should be the responsibility of the homeowner or business association or local municipality. Often, these groups lack the knowledge and funding to implement long term management of natural areas resulting in the decline of these areas over time. Future developers should be encouraged to donate naturalized detention basins and other natural areas to a local municipality or conservation organization for long term management who receive funding via a Special Service Area (SSA) tax. A cyclical long-term schedule appropriate to maintain native vegetation around detention basins; this schedule starts in year 4 and should be repeated every three years.

Year 1 of Maintenance Cycle

- Conduct controlled burn in early spring. Mow to height of 12 inches in November if burning is restricted.
- Spot herbicide problematic non-native/invasive species throughout site in mid-August. Specifically target thistle, reed canary grass, common reed, and emerging woody saplings such as willow, cottonwood, buckthorn, and box elder.
- Check for clogging and erosion control at inlet and outlet structures during site visit & after >1" rain event.

Year 2 of Maintenance Cycle

- Spot herbicide problematic non-native/invasive species throughout site in August. Specifically target thistle, reed canary grass, common reed, and emerging woody saplings such as willow, cottonwood, buckthorn, and box elder.
- Mow prairie areas to a height of 6-12 inches in November.
- Check for clogging and erosion control at inlet and outlet structures during site visit & after >1" rain event.

Year 3 of Maintenance Cycle

- Spot herbicide problematic non-native/invasive species in August. Specifically target thistle, reed canary grass, common reed, and emerging woody saplings. Cut and herbicide stumps of some woody saplings as needed.
- Check for clogging and erosion control at inlet and outlet structures during site visit & after >1" rain event.

Cycle begins again with Year 1 of Maintenance Cycle above



Rain garden adjacent to a single-family home

4.1.3 Rain Gardens

Rain gardens have become a popular way of creating a perennial garden that cleans and infiltrates stormwater runoff from rooftops and sump pump discharges. A rain garden is a small shallow depression that is typically planted with deep rooted native wetland vegetation. These small gardens can be installed in a variety of locations but work best when located in existing depressional areas or near gutters and sump pump outlets. Not only do rain gardens clean and infiltrate water, they also provide food and shelter for many birds, butterflies, and insects. Rain gardens are typically 100-300 square feet in size, should be installed outside of wetlands and floodplains, and planted with native plants to improve water quality and habitat benefits. They should be placed at least 10 feet away from any building or structure and need to be excavated to a depth of 18-24 inches below the exiting grade. Soil amendments are usually required to ensure support of native plants. After installation, rain gardens require ongoing maintenance to ensure they are performing properly.

The intent of a rain garden program for residents is to encourage and provide an incentive for applicants to install rain gardens on private property to "micro-manage" stormwater runoff as close to the source (like downspouts, driveways, sump pump discharges) as possible. Typically, this incentive comes in the form of a cost-share program designed to reimburse residents for a portion of the costs incurred by installing a rain garden on their property.

Rain Garden Recommendations

Information programs in the watershed should focus on teaching residents and businesses the beneficial uses of rain gardens and how to build and maintain them. Local governments and public agencies in the watershed should also install demonstration rain gardens as a way for the public to better understand their application. Local governments and the DeKalb County Soil and Water Conservation District could hold rain garden training seminars and potentially provide partial funding to residents and businesses that install rain gardens.

4.1.4 Vegetated Swales (Bioswales)

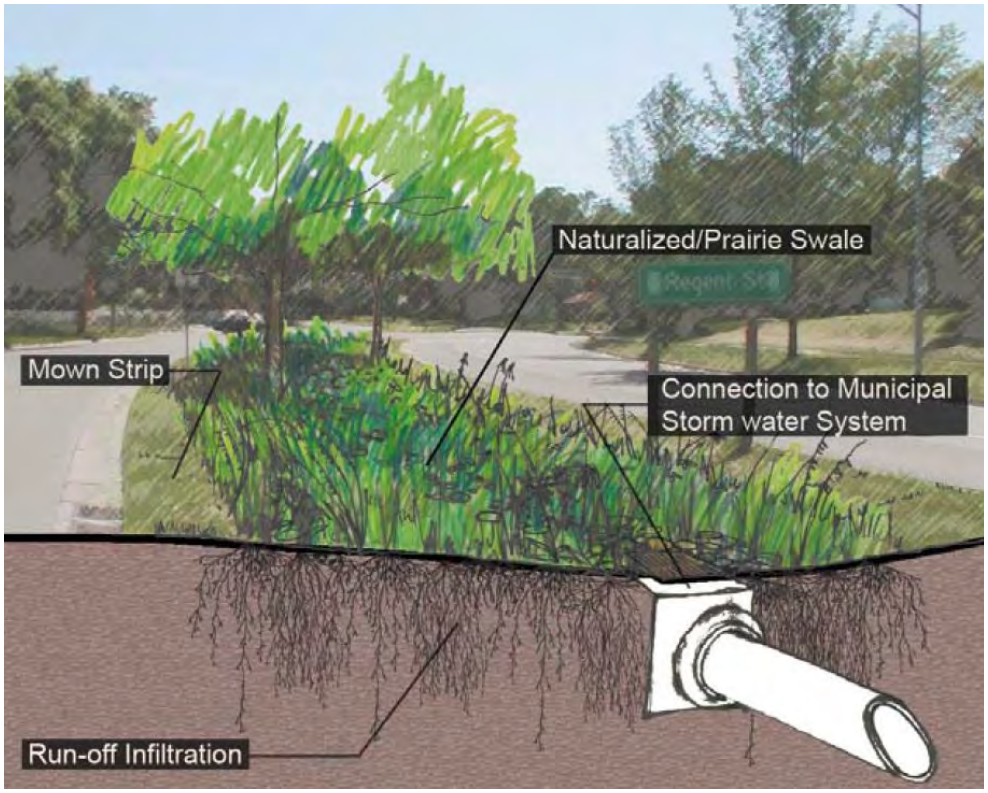
Vegetated swales, also known as bioswales, are designed to convey water and can be modified slightly to capture and treat stormwater for the watershed. Vegetated swales are designed to remove suspended solids and other pollutants from stormwater running through the length of the swale. The type of vegetation can dramatically affect the functionality of the swale. Turf grass is not recommended because it removes less suspended solids than native plants. In addition, vegetated swales can add aesthetic features along a roadway or trail. They can be planted with wetland plants, or a mixture of rocks and plant materials can be used to provide interest.

Swales can be designed as either wet or dry swales. Dry swales include an underdrain system that allows filtered water to move quickly through the stormwater treatment train. Wet swales retain water in small wetland like basins along the swale. Wet swales act as shallow, narrow wetland treatment systems and are often used in areas with poor soil infiltration or high water tables.

Water quality is improved by filtration through engineered soils in dry swales and through sediment accumulation and biological systems in wet swales. According to USEPA, vegetated swales reduce total suspended solids (sediment) by 65%, total phosphorus by 25%, and total nitrogen by 10% (MDEQ, 1999).

Vegetated Swale Recommendations

Vegetated swales should be used in place of pipes or curbs in new and redevelopment where feasible. Swales can easily be integrated into various urban fabrics with curb cuts for water to access them from roadways, or they can be added between existing lots or in the grassy parkways between roads and sidewalks. Typically, swales are used in lower density settings where infiltration might be maximized. Dry swales should be used for smaller development areas with small drainages. Wet swales should be used along larger roadways, small parking areas, and commercial developments.



Rendering of dry vegetated swale with engineered soils



Permeable pavers

4.1.5 Pavement Alternatives

Pervious concrete, permeable asphalt, and paver systems are potential alternatives to conventional asphalt or concrete parking lots and roadways. These alternatives allow for natural infiltration of the water by allowing water that falls on the surface to flow to a storage gallery through holes in the pavement. Areas that are paved with pervious pavement produce less stormwater runoff than conventionally paved areas.

Traditionally, the quantity and quality of water running off of paved and other impermeable surfaces are the primary reason for the need for stormwater treatment. Pavement alternatives reduce runoff rates and volumes and can be used in almost every capacity in which traditional asphalt, concrete, or pavers are used.

Pavement alternatives capture first flush rainfall events and allow water to percolate into the ground. Pavement alternatives treat stormwater through soil biology and chemistry as the water slowly infiltrates. Groundwater and aquifers are recharged and water that might otherwise go directly to streams will slowly infiltrate, reducing flooding and peak flow rates entering drainage channels. Studies documented by USEPA show that properly designed and maintained pervious pavements reduce total suspended solids (sediment) by 90%, total phosphorus by 65%, and total nitrogen by 85% (MDEQ, 1999).

In recent years, concerns have been raised about the environmental effects of the use of coal-tar sealants. Coal-tar sealant is a surface treatment typically applied to protect asphalt on driveways and parking lots which contains polycyclic aromatic hydrocarbons (PAHs). PAHs are a group of chemicals that have been linked to cancer in humans and have been shown to be toxic to aquatic life and damaging to the environment (Needleman, 2015). According to studies, "PAHs are significantly elevated in stormwater flowing from parking lots and other areas where coal-tar sealcoats were used as compared to stormwater flowing from areas not treated with the sealant (USEPA, 2016)." Pervious concrete, permeable asphalt, and paver systems are all potential alternatives to the need for coal-tar sealants. Additionally, several states and municipalities have banned the use and/or sale of coal-tar sealants to further protect their communities.

Pavement Alternatives Recommendations
Future development and redevelopment in the CSBKR watershed should consider the use of pavement alternatives, particularly for parking lots that receive high levels of public use. Pavement alternatives can be used in a variety of settings including parking lots, parking aprons, private roads, fire lanes, alleys, residential driveways, sidewalks, and bike paths. It is important to note that there are limitations to using pavement alternatives based on subsoil composition and they do require annual maintenance to remain effective over time.

4.1.6 Vegetated Filter Strips

Vegetated filter strips are shallowly sloped vegetated surfaces that remove suspended sediment, and nutrients from sheet flow stormwater that runs across the surface. This Management Measure is often referred to as a buffer strip. The type of vegetation can dramatically affect the functionality of the filter strip. Filter strips can either be planted or can be comprised of existing vegetation. Turf grass should be avoided as it removes less total suspended solids than filter strips planted with native vegetation.

The wider they are the more effective filter strips are because the amount of time water has for interception/interaction with the plants and soil within the filter strip is increased. When installed and functioning properly, the USEPA has documented that filter strips can reduce total suspended solids (sediment) by 73%, total phosphorus by 45%, and total nitrogen by 40% (MDEQ, 1999).

Vegetated Filter Strip Recommendations
Vegetated filter strips work in a variety of locations. Vegetated filter strips in rural and urban areas should be installed along streams, lakes, or ponds. Additionally, they can be used adjacent to buildings and parking lots that sheet drain. The water would then pass through the vegetated filter strip and into a waterway, such as a vegetated swale, stream, lake, pond, or other stormwater feature.

4.1.7 Natural Area Restoration & Native Landscaping

Natural area restoration and native landscaping are essentially one in the same but at different scales. Natural area restoration involves transforming a degraded natural area into one that exhibits better ecological health and is typically done on larger sites such as nature/forest preserves. Native landscaping is done at smaller scales around homes or businesses and is often formal in appearance. Both require the use of native plants to create environments that mimic historic landscapes such as prairie, woodland, and wetland. Native plants are defied as indigenous terrestrial or aquatic plant species that evolved naturally in an ecosystem. The use of native plants in natural area or native landscaping is well documented. They adapt well to environmental conditions, reduce erosion, improve water quality, promote water infiltration, do not need fertilizer, provide wildlife food and habitat, and have minimal maintenance costs.

Several environmental agencies support the use of native plants including Illinois Nature Preserves Commission (INPC), Illinois Department of Natural Resources (IDNR), DeKalb County Forest Preserve District (DCFPD), DeKalb County Soil and Water Conservation District (SWCD), U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), National Wildlife Federation (NWF), and the Conservation Foundation (TCF).

Natural Area Restoration/Native Landscaping Recommendations
Large residential lots with existing natural components such as oak woodlands and wetlands and golf courses provide many of the best opportunities for natural area restoration and native landscaping at a larger scale. Homeowners interested in restoring natural areas or implementing native landscaping can find guidance through the agencies listed above or by contacting a local ecological consulting company. Backyard habitats can be certified through the National Wildlife Federation's Certified Wildlife Habitat program or Conservation Foundation's Conservation@Home program.

4.1.8 Wetland Restoration

Over 14,000 acres or 87% of the historic wetlands in CSBKR watershed have been lost to farming and other development practices since European settlement in the 1830s. Wetlands are essential for water quality improvement and flood reduction in any watershed and also provide habitat for a wide variety of plant and animal species.



Filter strip along municipal building in Algonquin, IL

Over 2,200 acres of drained wetland was discovered in areas of the watershed where wetland restoration might be possible. These areas are located on land that is either part of the existing floodplain or are currently in agricultural production. The wetland restoration process involves returning hydrology (water) and vegetation to soils that once supported wetlands. The USEPA estimates that wetland restoration projects can reduce suspended solids (sediment) by 77.5%, total phosphorus by 44%, and total nitrogen by 20% (MDEQ, 1999).

Wetland Restoration Recommendations

Local governments should strongly consider requiring Conservation Design that incorporates wetland restoration on parcels slated for future development. Another potential option is to restore wetlands as part of a wetland mitigation bank where wetlands are restored on private land. Then, developers can buy wetland mitigation credits from the wetland bank for wetland impacts occurring elsewhere in the watershed. It is also possible that in the future, Illinois EPA may require more strict nutrient policies for wastewater treatment plants. Wetland banks may provide an opportunity for WWTP owners to buy water quality trading credits. The Site-Specific Action Plan section of this report identified sites where wetland restoration might be feasible.



Wetland restoration at Carrington Reserve Conservation Development in West Dundee, IL

4.1.9 Stormwater Trees/Tree Planting Program

Trees provide extensive evapotranspiration and cooling benefits, improve water and air quality, provide habitat, increase property values, and improve aesthetics in urban landscapes (see Figure 42). Trees play a valuable role in trapping absorbing stormwater, reducing pollutants, and holding soils in place during rain events and help to recharge groundwater supplies. A 25-foot canopy diameter tree can process the runoff of a 2,400 square foot adjacent impervious surface (EPA, 2016). Depending on the size and species, one tree can store 100 gallons or more of stormwater (Fazio, 2010).

Implementing a successful stormwater tree program can be complicated. Space and soil quality constraints can often be the limiting factors on whether a site is appropriate for installing stormwater trees. Other constraints include finding an appropriate species of tree, steep slopes, utility lines, impervious surfaces, and pre-existing structures. With a little planning and engineering, many of these constraints can be overcome. In 2016, the USEPA produced a Technical Memorandum on Stormwater Trees that provides detailed information on the benefits and challenges to implementing an effective Stormwater Tree program and maintaining the trees over time. This report is available on the USEPA's website at https://www.epa.gov/green-infrastructure/stormwater-trees.

Municipalities in the watersheds should consider adopting a stormwater tree or tree planting program where these are not already in place.

4.1.10 Street Sweeping & Yard Waste Management

Street sweeping is often overlooked as a Management Measure option to reduce pollutant loading in watersheds. With over 2,100 acres of transportation and roads in the watershed, municipal street sweeping programs could significantly reduce non-point source pollutants from urban areas in CSBKR watershed. Street sweeping works because pollutants such as sediment, trash, road salt, oils, nutrients, and metals that would otherwise wash into stormsewers and streams following rain events are gathered and disposed of properly. The USEPA and Center for Watershed Protection (CWP) report similar pollutant removal efficiencies for street sweeping; weekly street sweeping can remove between 9% and 16% of sediment and between 3% and 6% of nitrogen and phosphorus (MDEQ, 1999; CWP 2017).

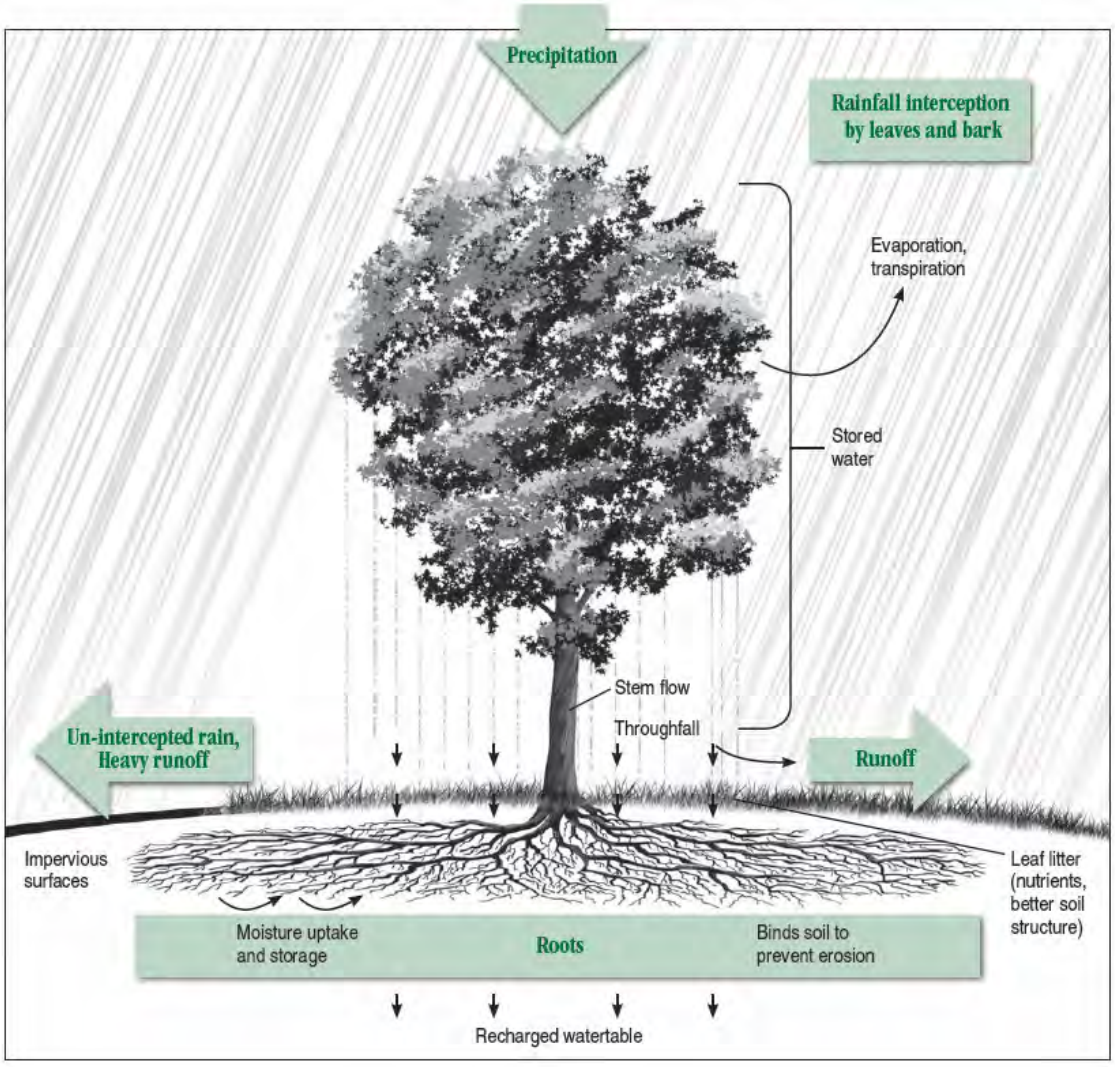


Figure 42. Illustration of how trees help with stormwater management (Fazio, 2010).

Yard waste, such as grass clipping and leaf litter, can also impact water quality when not managed correctly. "Grasscycling and composting are two techniques homeowners can use to reduce waste disposal and possible water contamination as well as save time, money and energy while returning valuable nutrients back into their lawns and gardens. (Gibb, 2012)" Composting of yard waste and grasscyclying, or leaving grass clippings on a lawn, can keep nutrients such as nitrogen in place. When grasscycling or composting, it is important to keep clippings on the lawn and off sidewalks, driveways, or other impervious surfaces where they might otherwise get washed into adjacent drainage systems or become a safety hazard (Gibb, 2012).

Street Sweeping Recommendations

It is likely that several if not all the municipalities in the watershed already implement street sweeping to some degree. The frequency of street sweeping is a matter of time and budget and should be determined by each municipality. Weekly street sweeping would provide the best results, but bi-weekly sweeping is cited as being sufficient in most cases. Homeowners should also compost yard waste and practice grasscycling at home.



Source: USGS

4.1.11 Stream & Riparian Area Restoration & Maintenance

Streambank erosion is fairly limited in CSBKR watershed, while channelization is common in and around the watershed's agricultural areas. Stream surveys reveal that about 10% (42,261 lf) of stream length in the watershed is highly eroded and 45% (199,119 lf) is highly channelized. Pollutant modeling indicates that over 23,271 tons/yr of sediment or 47% of sediment loading comes from eroded streambanks. In addition, riparian areas adjacent to streams are suffering as 42% are in poor ecological condition.

Stream and riparian area restoration is one of the best Management Measures that can be implemented to improve degraded stream and riparian area conditions. This work involves improvements to a stream channel using artificial pool-riffle complexes, streambank stabilization using a combination of bioengineering with native vegetation and hard armoring with rock if needed, and adjacent riparian area improvements via removal of non-native vegetation and replacement with native species. These practices are typically done together to improve water quality by reducing sediment transport, increasing oxygen, and improving habitat. The USEPA cites that as much as 90% of sediment, phosphorus, and nitrogen can be reduced following stream restoration. The downside to stream restoration is that it is technical and expensive. Stream restoration projects include detailed construction plans, often complicated permitting, and construction that must be done by a qualified contractor.

With so many individual landowners with parcels intersecting CSBKR and its tributaries, routine maintenance of stream systems is challenging. In many cases, landowners simply do not have the knowledge or are not physically capable of maintaining streams on their property. Stream maintenance includes an ongoing program to remove blockages caused by accumulated sediment, fallen trees, etc. and is a cost-effective way to prevent flooding and streambank erosion.

Riparian buffers are defined as land adjoining any water body including ponds, lakes, streams, and wetlands. In 2010 the Southeastern Wisconsin Regional Planning Commission (SEWRPC) produced a document entitled "Managing the Water's Edge: Making Natural Connections" (SEWRPC, 2010). The research presented in SEWRPC's document was conducted to determine if an optimal riparian buffer design or width could be determined that effectively reduces pollutants, provides water quality protection, helps prevent channel erosion, provides adequate fish and wildlife habitat, enhances environmental corridors, augments baseflow, and moderates water temperature.

No consensus of optimal buffer width could be determined but what is apparent is that many riparian corridors no longer fulfill their potential due to encroachment by agricultural and urban development. SEWRPC's document summarizes how to maximize both water quality protection and conservation of aquatic and terrestrial wildlife populations using buffers as shown in Figure 43.

As described in SERWPC's document, implementing the green infrastructure

network to connect open space and other natural area features should be embraced, whereby 75% minimum of the total stream length should be naturally vegetated to protect the functional integrity of the water resource and 75-foot-wide minimum riparian buffers are recommended from the top edge of each stream bank that are naturally vegetated to protect water quality.

Finally, the majority of stream reaches in the watershed are highly channelized because of agricultural ditching practices. However, most of these channelized streams exhibit very little streambank erosion because they are in the final stages of the Stream Evolution Model (see Section 3.10 for more information). This observation is extremely important as it relates to improving water quality in the watershed, and stable two stage channels that form on agricultural lands should be protected and maintained during landowner maintenance activities.

Stream & Riparian Area Recommendations

There are many opportunities to implement stream and riparian area restoration in the watershed. These opportunities are identified in the Site-Specific Action Plan. Where existing riparian area buffers are less than 75 feet, recommendations have been made to extend buffers where possible; that said, extending a riparian buffer to 75 feet where no buffer exists in not always achievable. In these cases, typically recommendations included increasing the buffer to 50 feet along each bank. Finally, where a stable two stage channel (Stage 5) forms in agricultural ditches, it should be protected and maintained during landowner maintenance activities. All stream and riparian area opportunities are identified in the Site-Specific Action Plan.

As far as stream maintenance goes, the Lake County Stormwater Management Commission (LCSMC) is a leader in the Chicago land area when it comes to managing stormwater and has developed an excellent guide for riparian owners called "Riparian Area Management: A Citizen's Guide." This short flyer can be found on Lake County's website and is intended to educate landowners about debris removal and riparian landscaping. It is also important to note that not all debris in streams is harmful. The American Fisheries Society has created a short document called "Stream Obstruction Removal Guidelines" which is meant to clarify the appropriate ways to maintain obstructions in streams to preserve fish habitat.



Stream restoration project in Barrington, IL

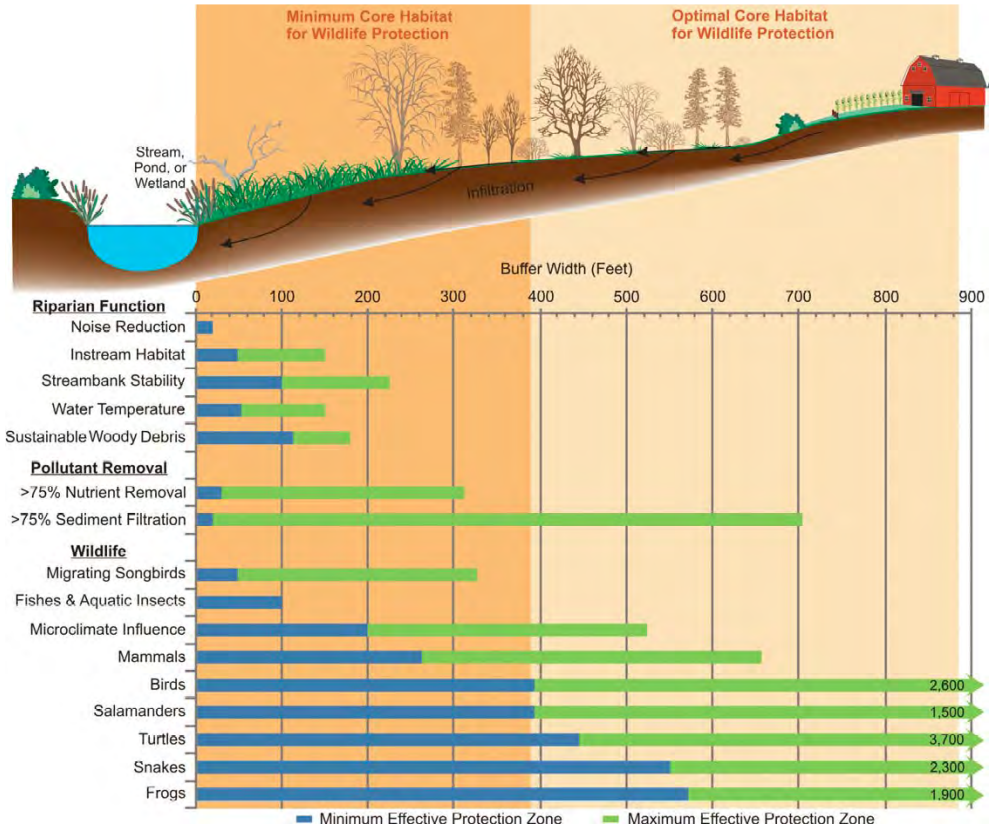


Figure 43. Riparian benefits for various buffer widths (Source: SEWRPC, 2010).

4.1.12 Septic System Maintenance

Septic systems are common in the more rural portions of the CSBKR watershed; it is estimated that over 1,700 septic systems likely exist in the watershed. Septic systems in DeKalb County are regulated under the Water Wells and Waste and Sewage Disposal section of the DeKalb County Code. When septic systems are not maintained and subsequently fail, they can contribute high levels of nutrients and bacteria to the surrounding environment. The failure rate of septic systems in the watershed is unknown. However, literature sources across the nation indicate a failure rate of approximately 20% (Brown, 1998; Mancl, 1984; Stout, 2003; UKCE, 2012). According to the pollutant loading analysis, septic systems are likely contributing 392 lbs/yr of total nitrogen loading and 153 lbs/yr of total phosphorus loading in the watershed.

Septic System Recommendations

Septic owners should contact the DeKalb County Health Department (DCHD) to schedule a septic system inspection to ensure that they are designed and operating properly. The County also has additional guidelines and restrictions for septic system owners including restrictions on the proximity of lawn sprinkler systems, upgrade requirements for hot tubs, garbage grinders, or building additions, and how landscaping might affect septic systems. More information and resources are available online at https://health.dekalbcounty.org/services/well-septic/. USEPA also provides an excellent guide for septic system owners called "A Homeowner's Guide to Septic Systems (USEPA, 2005)." The guide explains how septic systems work, why and how they should be maintained, and what makes a system fail. DCHD should also conduct an inventory of septic systems within the watershed and the condition that they are in as well as hold educational workshops for septic system owners about proper maintenance techniques.

4.1.13 Agricultural Management Practices

Agriculture is an integral part of the CSBKR watershed and is by far the most dominant land use, covering a total of 58,443 acres or 89% of the watershed. Pollutant loading estimates using USEPA's PLET model point to cropland as the largest nonpoint source contributor of nutrient and sediment loading in the watershed, with estimates at 255,964 lbs/yr of nitrogen (20% of total loads), 53,084 lbs/yr of phosphorus (65% of total loads), and 25,626 tons/yr of sediment (51% of total loads). As such, watershed-wide changes to agricultural practices can have a dramatic effect on pollutant loading in the watershed. Fortunately, there are numerous agricultural measures and funding sources that can be utilized by farmers to implement practices on their land to improve water quality and soil health, while reducing soil and nutrient losses. Many recommended programs are offered through the DeKalb County Soil and Water Conservation District (SWCD), U.S. Department of Agriculture (USDA) Natural Resource Conservation Program (NRCS), and Farm Service Agency (FSA). These agencies are discussed in depth in Section 3.5.

On Nov. 16, 2023, President Biden signed into law H.R. 6363, the Further Continuing Appropriations and Other Extensions Act, 2024, which extended the Agriculture Improvement Act of 2018, more commonly known as the 2018 Farm Bill (NRCS, 2024).

USDA NRCS - Environmental Quality Incentive Program (EQIP)

The NRCS's Environmental Quality Incentive Program (EQIP) is a voluntary conservation program that provides technical and financial assistance to individuals/entities to address soil, water, air, plant, animal, and other related natural resource concerns on their land. EQIP offers financial and technical help to assist participants to install or implement structural and management practices on eligible agricultural land. As the most popular and most utilized conservation program offered by NRCS, EQIP assists thousands of producers annually in working towards reducing contamination from agricultural sources such as animal feeding operations, efficiently utilizing nutrients and therefore reducing input costs and nonpoint source pollution and increasing soil health to improve resiliency to drought and increasingly volatile weather.

This program is available to farmers, ranchers, and forest landowners who own or rent agricultural land. EQIP assistance can be used for agricultural operations such as: conventional and organic agriculture, specialty and commodity crops, forestry and wildlife, livestock operations, and historically underserved farmers. Historically underserved farmers including beginning farmers, farmers with limited resources or those in socially disadvantaged groups, as well as military veterans, are eligible for increased or advance payments following changes in the 2018 Farm Bill.

Other expansions of EQIP under the 2018 Farm Bill include expanding eligibility regarding with whom NRCS can enter into an EQIP contract. Under these expansions, NRCS can enter into contracts with water management entities when they are in support of water conservation or an irrigation efficiency project. Eligible entities include states, irrigation districts, ground water management districts, or other similar entities.

Beginning in 2020, States may provide increased EQIP payment rates for high-priority practices. Eligible high-priority practices include those that address specific causes of ground or surface water impairment relating to excessive nutrients, address the conservation of water to advance drought mitigation and declining aquifers, meet other environmental priorities and other priority resource concerns identified in habitat or other area restoration plans, or is geographically targeted to address a natural resource concern in a specific watershed. NRCS State Conservationists may designate up to 10 practices to be eligible for increased payments.

No-till is a land management option within the EQIP program and is the leading recommendation for farmers in CSBKR watershed. With no-till, the land



Conservation tillage (no till) farming

is left undisturbed from harvest through planting, preserving a canopy of crop residue on the surface to protect the soil from erosion. Along with soil conservation benefits, high fuel prices are driving a switch to no-till for many farmers. Eliminating tillage passes reduces both fuel and labor expenses (USDA, 2020).

Agricultural Conservation Easement Program (ACEP)

The Agricultural Conservation Easement Program (ACEP) was created in the 2014 Farm Bill through the combination of the previously separate Wetlands Reserve Program (WRP), Grassland Reserve Program (GRP), and Farm and Ranch Lands Protection Program (FRPP). ACEP assists landowners, land trusts, and other entities protect, restore, and enhance wetlands, grasslands, and working farms and ranches through conservation easements. There are two components to ACEP, the Agricultural Land Easements component and the Wetland Reserve Easement component. The NRCS Agricultural Land Easements component helps American Indian tribes, state and local governments, and nongovernmental organizations protect working agricultural lands and limit non-agricultural uses of the land. NRCS Wetland Reserve Easements component, helps to restore, protect, and enhance enrolled wetlands through the purchase of easements and assistance in restoration (NSAC, 2019).

ACEP - Wetland Reserve Easements (WRE)

The Wetlands Reserve Easement program (WRE) is a voluntary program offering farmers the opportunity to protect, restore, enhance, and protect wetlands on their property. The NRCS provides technical and financial support to help landowners with their wetland restoration efforts. The goal of NRCS is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection.



Land that's eligible for enrollment in ACEP as a Wetland Reserve Easement includes farmed or converted wetland that can be successfully restored as natural wetland habitat in a cost-effective manner. NRCS prioritizes applications for Wetland Reserve Easements based upon their potential for protecting and enhancing habitat for migratory birds and other wildlife.

NRCS enters into purchase agreements with eligible landowners which include the right to develop and implement a wetland reserve restoration easement plan. These plans aim to restore, protect, and enhance the functions and value of the site's wetlands. Landowners who choose to enroll land in a Wetland Reserve Easement may sell a conservation easement or enter into a cost-share restoration agreement with NRCS to restore and protect wetlands. These easement options include:

- Permanent Easements – These are conservation easements in perpetuity, with NRCS paying 100 percent of the value of the easement to purchase it, and 75 to 100 percent of the cost to restore it.
- 30-Year Easements – Under 30-year easements, NRCS pays 50 to 75 percent of the value of the easement to purchase it, and 50 to 75 percent of the cost to restore it.
- Term Easements – The length of term easements is determined by applicable state laws. NRCS pays 50 to 75 percent the value of the easement to purchase, and 50 to 75 percent of the cost to restore it.
- 30-Year Contracts – 30-year contracts are only available to enroll acreage owned by American Indian Tribes, and program payment rates are like that of 30-year easements.

Landowners and NRCS then develop a plan for the restoration and maintenance of the wetland. As a requirement of the program, landowners voluntarily limit future use of the land yet retain private ownership.

ACEP's wetlands component also includes a wetlands reserve enhancement partnership option (formerly known as the Wetlands Reserve Enhancement Program, WREP) through which NRCS partners with states, non-governmental organizations, or Native American Tribes to protect, restore, and enhance high priority wetlands.

This partnership option is a voluntary program in which NRCS, and eligible partners sign an agreement to leverage resources in restoring high priority wetland protection, restoration, and enhancement to improve habitat for migratory birds and other wildlife. Benefits include wetland restoration and protection of critical areas, ability to cost-share restoration or enhancement beyond NRCS requirements through leveraging resources, and the ability to participate in the management and monitoring of projects with the support of the NRCS's expertise in restoration practices.

Wetland reserve easements enable landowners to reduce impacts from flooding, recharge groundwater, enhance and protect wildlife habitat and provide outdoor recreational and educational opportunities. As with the original WREP, producers can retain grazing rights as part of a wetland easement if the grazing activity is consistent with long-term wetland protection and enhancement goals for which the easement was established. The easement payment would be reduced by an amount equal to the grazing value (USDA, 2020).

Agricultural Land Easements (ALE)
The purpose of the Agricultural Land Easement (ALE) component is to protect farms and ranches from development, specifically to ensure farm viability for future generations, and to conserve grazing land, rangeland, pasture and shrub land. NRCS provides financial assistance to eligible partners for purchasing Agricultural Land Easements that protect the agricultural use and conservation values of eligible land.

In the case of working farms, the program helps farmers and ranchers keep their land in agriculture. The program also protects grazing uses and related conservation values by conserving grassland, including rangeland, pastureland and shrubland. Eligible partners include American Indian tribes, state and local governments and non-governmental organizations that have farmland, rangeland or grassland protection programs.

For Agricultural Land Easements, NRCS can contribute up to 50 percent of the fair market value of the agricultural land easement. Where NRCS determines that grasslands of special environmental significance will be protected, NRCS may contribute up to 75 percent of the fair market value of the agricultural land easement. Eligible entities can now include cash contributions, landowner contributions, or other non-USDA federal funding to satisfy the match requirements.

The 2018 Farm Bill removed the requirement that all agricultural land easement enrollments under ACEP must have a conservation plan, it is now required only for the portions of the agricultural land easement that are highly erodible cropland. Additionally, the 2018 Farm Bill adds a new priority in evaluating proposals for easements that maintain agricultural viability. This priority includes easements that allow a producer to productively operative a farm or ranch on the protected land; maintain the long-term affordability of the protected land; maintain an economically sustainable farm business on the land; and maintain the land in a way that enables its agricultural use for future generations. The 2018 Farm Bill also allows for entities holding an ALE to add deed terms that address mineral development. In instances when mineral development rights are reserved and exercised under ACEP, the activity should be consistent with the conservation and agricultural purposes of the land and all provisions of the program.

Under the agricultural land easement component, ACEP funds are provided to non-profits (such as land trusts), state and local agencies, and Indian tribes to purchase easements. Agricultural land easements are permanent; in states that do not allow permanent easements, the easements will be as long-term as allowed by law.

To qualify for an ALE the easement must have prime, unique, or productive soil (or contain historical or archaeological resources, protect grazing uses by restoring and conserving land, or further a state or local policy consistent with program purposes.) The easement must also be either cropland, rangeland, or grassland; contain forbs or shrub land for which grazing is the predominant use; be located in an area which is historically grassland, forbs, or shrubs and could provide ecologically significant habitat; or be pastureland or non-industrial private forestland which contributes to economic viability of a parcel and serves as a buffer to protect such land from development (USDA, 2020).

Farm Service Agency (FSA)-Conservation Reserve Program (CRP)
The USDA Farm Service Agency's (FSA) CRP is a voluntary program that contracts with agricultural producers so that environmentally sensitive agricultural land is devoted to conservation benefits. The Food Security Act of 1985, as amended, authorized CRP. The program is implemented by FSA on behalf of USDA's Commodity Credit Corporation. In exchange for a yearly rental payment, farmers enrolled in the program agree to remove environmentally sensitive land from agricultural production and plant species that will improve environmental health and quality. Contracts for land enrolled in CRP are 10-15 years in length.

CRP participants establish long-term, resource-conserving vegetative species, such as approved grasses or trees (known as "covers"), to control soil erosion, improve the water quality and enhance wildlife habitat. The long-term goal of the program is to re-establish valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat. CRP protects millions of acres of American topsoil from erosion and is designed to safeguard the nation's



Grass waterway on highly erodible soils (Source: NRCS)

natural resources. By reducing water runoff and sedimentation, CRP protects groundwater and helps improve the condition of lakes, rivers, ponds and streams. The vegetative covers also make CRP a major contributor to increased wildlife populations in many parts of the country.

Additionally, there is a CRP Grasslands program which helps landowners and operators protect grassland, rangeland, and pastureland while maintaining the areas as grazing lands. The program emphasizes support for grazing operations, plant and animal biodiversity, and grassland and land containing shrubs and forbs under the greatest threat of conversion.

The following conservation practices are eligible under CRP, and thus land must be suitable for any of these practices: Grass Waterway, Shallow Water Area for Wildlife, Contour Grass Strip, Filter Strip, Riparian Buffer, Denitrifying Bioreactor on Filter Strip and Riparian Buffer, Saturated Filter Strip and Riparian Buffer, Habitat Buffers for Upland Birds, Wetland and Buffer SAFE Practices, Wetland Restoration on Floodplain and Non-Floodplain, Prairie Strips, Windbreaks, Shelterbelts, Living Snow Fences, Marginal Pastureland Wetland Buffer and Wildlife Habitat Buffers, Long Leaf Pine Establishment, Duck Nesting Habitat, Pollinator Habitat, Bottomland Timber Establishment on Wetlands, Farmable Wetlands Program (FWP) Constructed Wetland, FWP Aquaculture Wetland Restoration, FWP Flooded Prairie Wetland, Farmable Wetlands and Farmable Wetland Buffer, and Wellhead Protection Area Practices.

To be eligible for the CRP, the landowner must have owned or operated the land for at least 12 months prior to submitting the offer (or there are certain extenuating circumstances). Cropland must be planted to an agricultural commodity, have a weighted average erosion risk of eight or higher, be enrolled in a CRP contract currently, or be in a CRP conservation priority area; there are no CRP conservation priority areas in the watershed.

Enrollment in CRP is offered in the form of general enrollment or continuous enrollment. In general enrollment, during annual enrollment periods, producers can offer land for the program which is then ranked according to the factors of the Environmental Benefits Index. This index considers: wildlife habitat benefits resulting from covers on enrolled land, water quality benefits, on-farm benefits from reduced erosion, long-term benefits that will endure beyond the contract period, air quality benefits from reduced wind erosion, and cost. Under continuous enrollment, environmentally sensitive land may be enrolled at any time though is not subject to competitive bidding (FSA, 2019).

Principles of Soil Health

Improving water quality in runoff from agricultural lands can often be achieved by maintaining soil health and following soil health principles. There are five principles of soil health; they include soil armor, minimizing soil disturbance, plant diversity, continual live plant/root, and livestock integration. Armoring the soil refers to cover for the soil and controls erosion and evaporation rates, maintains soil temperatures, reduces compaction, suppresses weed growth and provides habitats for species. Minimizing soil disturbance reduces erosion, increases infiltration, and helps keep organic matter in the soil. Diversifying crop rotations can improve biodiversity, improves infiltration and nutrient cycling, and reduces pests. Providing some type of live plant root on a year-round basis is important for building soil health, ensuring that there is food for the soil web continuously throughout the year. Finally, integrating animals or livestock in the form of grazing can help balance the carbon to nitrogen ration, manage crop rotation, and help suppress weeds by fulfilling the natural symbiotic relationships between plants, animals, and the soil web (Fuhrer, 2018). Landowners should work with their local USDA-NRCS representative and cropping consultant to implement a system that will work for them.

Regenerative Agriculture

Regenerative agriculture promotes a method of farming that encourages the regeneration of topsoil, improves water quality, increases biodiversity, and supports carbon sequestration in effort to mitigate the effects of climate change (Terra Genesis International, 2016). The practice is guided by a holistic approach of making appropriate, context-specific recommendations for farmers based on agroecology and restoration ecology methodologies with the goal of rebuilding quantity and quality of topsoil while creating equitable and just relationships amongst all stakeholders. By rebuilding soil organic matter and soil health, yields should increase, and fewer inputs should be needed over time. Simultaneously, the improved biomass helps to sequester carbon and offset greenhouse gases, while the reduced disturbance of the soil improves water quality (Regeneration International, 2019). Many of the practices involved are recommended by NRCS, the DeKalb County Soil and Water Conservation District, and the principles of soils health. Potential practices include "no-till/minimum tillage techniques, the use of cover crops, crop rotations, compost, and animal manures, the inoculation of soils with composts or compost extracts to restore soil microbial activity, and managed grazing (CSU Chico, 2017)."

The regenerative agriculture approach, research, and methodologies are ever evolving and need to be tailored to the context of individual farms. Many sources of additional information are available including online resources available from Regeneration International, Terra Genesis International, and California State University – Chico, among others.

Subsurface (Tile) Drainage Best Management Practices- Drainage Water Management

Subsurface drain tiles are a commonly used practice by farmers to help lower the water table of poorly drained fields and/or wet areas within fields. Unfortunately, nitrogen and phosphorus often find their way into tiles through cracks and macropores in the soil. The tiles then carry these nutrients to local streams.

Drainage Water Management, or management of the water table through control structures at drain tile outlets, is an approach to reduce the amount of nutrients that exit the tile lines. DWM is the process of managing the timing and the amount of water discharged

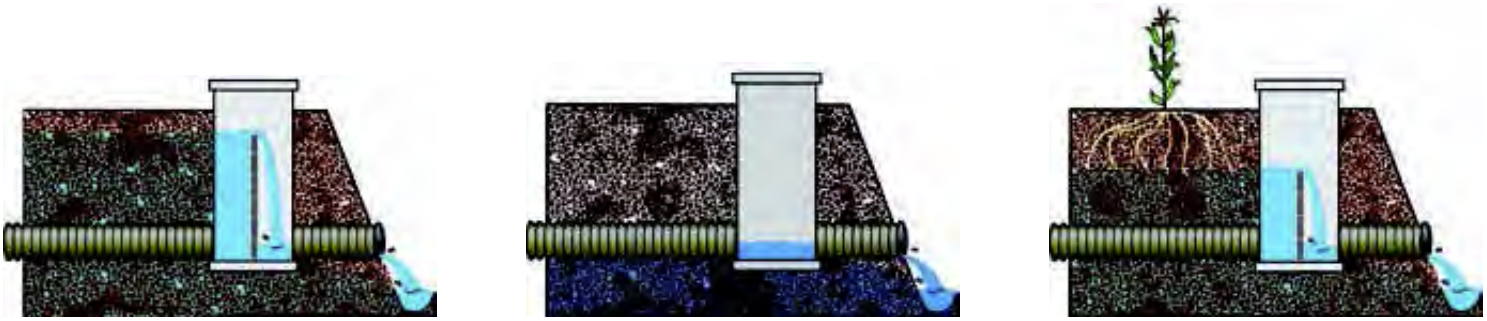


Figure 44. Use of tile control to raise water table after harvest (left), drawdown prior to seeding (middle), and raised again in midsummer (right) (Source: Purdue University).

from agricultural drainage systems. DWM is based on the premise that the same drainage intensity is not always required during the year (Figure 44). This is accomplished by adjusting the control structure so that the water table rises after harvest to limit drainage during the off-season. The water table can then be lowered a few weeks prior to planting in spring. The water table can also be raised in midsummer to store water for crops. With DWM, both water quality improvement and production benefits are possible. Water quality benefits are derived by minimizing unnecessary drainage, reducing the amount of nitrate that leaves farm fields. Producers who use DWM enjoy being able to better control their drainage water instead of the water controlling them (Cooke, 2004).

To ensure successful implementation of a DWM system on agricultural tile drainage, it is essential to have a DWM Plan. A properly prepared DWM plan considers landscape, soils, slope, and current or planned drainage systems as well as the size and location of water control structures and detailed sets of instructions for their operation and maintenance. This includes identification of the zones of influence for each water control structure and the target water elevations for each of the seasonal land uses. The Golden Rule of Drainage (as advocated by NRCS) is only release the amount of water necessary to ensure trafficable conditions for field operations and to provide an aerated crop root zone- any drainage more than this likely carries away nitrate and water that is no longer available for crop uptake (NRCS, 2020).

Subsurface (Tile) Drainage Best Management Practices- Subsurface Bio-Reactors

While properly designed and installed subsurface drainage tiles can reduce sediment and phosphorus losses on fields, they can expedite the movement of nitrate-nitrogen to nearby surface waters. BMPs such as subsurface Bioreactors seek to mitigate this issue by providing a subsurface solution to a subsurface problem. Bioreactors consist of a substrate (gravel and a carbon source, typically woodchips, though alternative substrates are being researched) placed underground through which tile water flows. The systems are designed to maintain drainage effectiveness and once installed, do not require additional land to be taken out of production. The reactors are constructed such that during periods of high flow, the bioreactor is bypassed and water flows through the tile as usual.

Bioreactors (Figure 45) work by providing a carbon source on which soil organisms colonize. These colonies consume the carbon from the woodchips, and "breathe in" the nitrate from the water which is then "breathed out" as nitrogen gas which enters the atmosphere (like how humans breathe in oxygen and breathe out carbon dioxide (Purdue University, 2020).

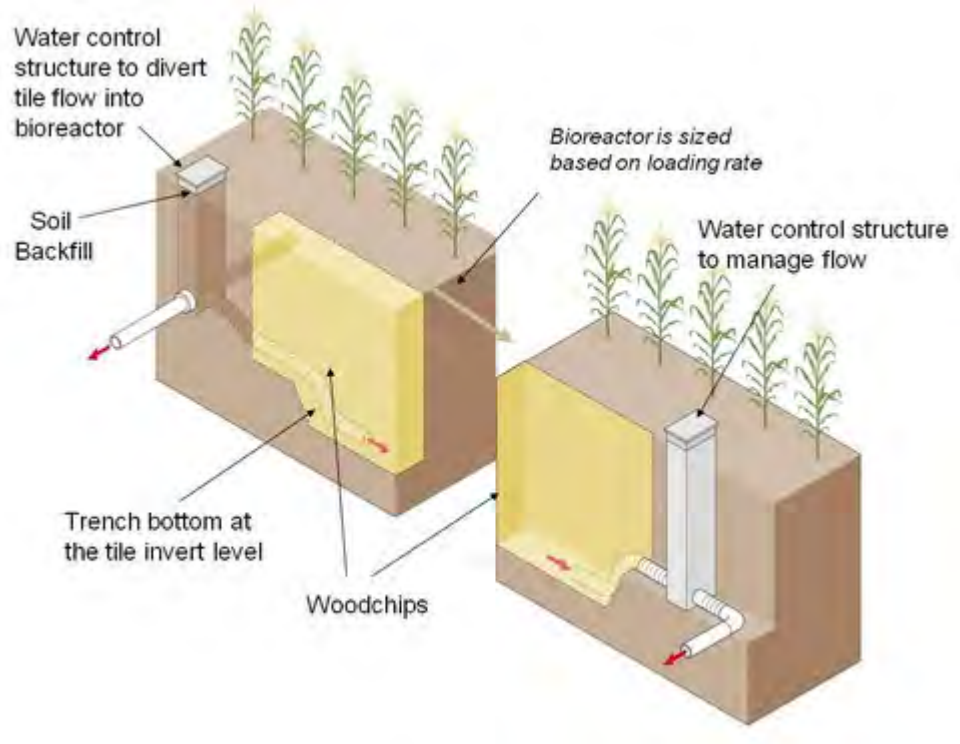


Figure 45. Subsurface bioreactor (Source: Frankenberger).

Waste (Manure) Management
Livestock production within the agricultural industry is a producer of waste materials that need management. While there is not currently livestock production in the watershed, there could be in the future. These wastes primarily include manure from livestock; livestock manure is rich in plant nutrients. Manure that is properly applied increases soil fertility and may also improve soil physical properties, improperly applied manure can contaminate surface water and groundwater. To protect water quality while maximizing nutrient efficiency, producers must select the relevant best management practice for their crops.

The NRCS has produced the Agricultural Waste Management Field Handbook (AWMFH) to provide specific guidance for planning, designing, and managing systems where agricultural wastes are involved. It can help assist agricultural producers in organizing a comprehensive plan that results in the safe integration of waste management into overall farm operations. Material in this handbook covers a wide range of activities from incorporating available manure nutrients into crop nutrient budgets to proper disposal of waste materials that do not lend themselves to resource recycling (NRCS, 2020).

One of the most important manure best management practices is the development of a nutrient management plan; this involves accounting for all sources of crop-available nitrogen, performing manure testing to determine nutrient content, determining manure application rates based on crop nitrogen needs, and then applying fertilizer to manured fields only when needed to satisfy crop nutrient needs (UIUC - Extension, 2020).

Best management practices should be applied to the application of manure as well as the stockpiling and storage. When applying manure attention should be given to not apply manure to sites with excessive slopes or highly erodible soils, or frozen or saturated soils. Manure should only be applied with properly calibrated equipment. Manure should be incorporated into soils as soon as possible after application to reduce losses. Other considerations are the establishment of a buffer zone of at least 100 feet between manure application and water resources, and the planting of permanent vegetation strips between surface waters and croplands to filter runoff. Similarly, manure stockpiles and livestock enclosures should be at least 100 feet away from any water supply, additionally vegetated filter strips should be established around the downhill side of stockpiles and enclosures. Stormwater should be redirected such that flow through stockpiles and enclosures is eliminated or reduced; and enclosures should be frequently cleaned (Colorado State University Extension, 2020).

4.1.14 Downspout Disconnection/Rainwater Harvesting & Re-Use

Downspout disconnection and rain barrel programs help reduce the amount of clean water that is used as well as reduce the amount of wastewater discharged to streams. Water harvesting and re-use via rain barrels and cisterns are important options to decrease the amount of stormwater runoff in a watershed. It is a simple, economical solution that can be done by any homeowner or business. On most homes and buildings, the water from roofs flows into downspouts and then onto streets, parking areas, or into storm sewers. Disconnecting downspouts and using either rain barrels or cisterns for re-use later can reduce the flood levels in local streams.

Water re-use differs based on the type of storage and water treatment. A rain barrel is typically attached to a downspout and collects water for later use, such as irrigation purposes. In many areas, irrigation can account for almost 50 percent of residential water consumption. Re-using water collected in a rain barrel is a great way of minimizing outdoor water consumption and reduce water bills.

A cistern also stores water from rooftop runoff to be used later. However, a cistern is often larger, sealed, and the water can be filtered for a wider variety of uses. Cistern water can be used many outdoor uses such as lawn and garden watering, irrigation, car washing, and window cleaning.

The primary purpose of rain barrels and cisterns is water storage. Rain barrels typically store 55 gallons each. Cisterns can store greater amounts. Rain barrels and cisterns also reduce outdoor water demand in summer months by reducing the potable water used for irrigation or other outdoor household uses.

Rainwater Harvesting & Reuse Recommendations
Education programs in the watershed should focus on teaching residents and businesses the beneficial uses of downspout disconnection, rain barrels and cisterns. Local governments in the watershed should aim to install demonstration projects as a way for the public to better engage in their water use and re-use around residential homes and businesses. Local governments and conservation organizations such as the DeKalb County Soil and Water Conservation District, the CSBKR Watershed Steering Committee, the DeKalb County Community Foundation, and University of Illinois Extension office should sponsor programs where residents and businesses can purchase rain barrels.


Rain barrel with disconnected downspout

4.1.15 Conservation Design & Low Impact Development

Conservation design facilitates development density needs while preserving the most valuable natural features and ecological functions of a site. It does this by reducing lot size, especially lot width, while increasing the available land area to allow for open space and natural resources (Figures 46 - 48). The open space is typically preserved or restored as natural areas that are integrated with newer natural Stormwater Treatment Train features and recreational trails and serve as an amenity to the entire development. The open space allows the residents to feel like they have larger or more private lots because most of the lots adjoin the open space system.

Such flexibility is intended to retain or increase the development rights of the property owner and the number of occupancy units permitted by the underlying zoning designation, while encouraging environmentally responsible development. Conservation design is most appropriate in areas having natural and open space resources to be protected and preserved such as floodplains, groundwater recharge areas, wetlands, woodlands, streams, wildlife habitat, etc. It can also be used to preserve and integrate agricultural uses into the land pattern. The approach first considers the natural landscape and ecology of a development site rather than determining design features based on pre-established density criteria. The following steps are a general guide when designing the layout of a development site:



Figure 46. Traditional (left) vs. Conservation Design (right), Elkhorn, WI.

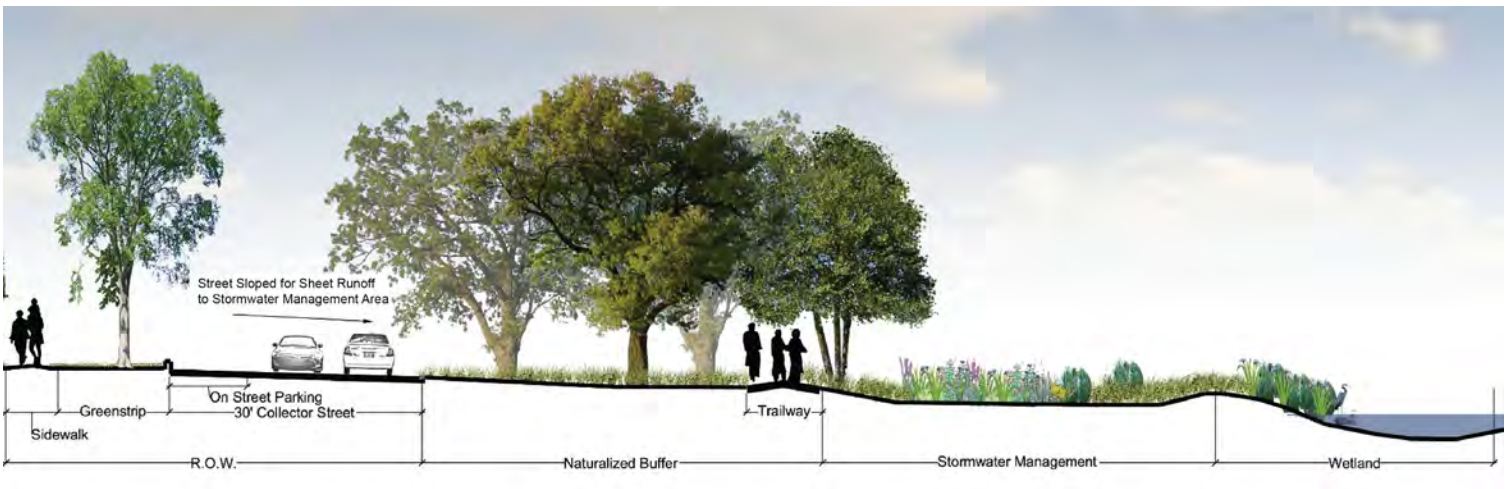


Figure 47. Stormwater Treatment Train example.

Step 1: Identify natural resources, conservation areas, open space areas, physical features, and scenic areas and preserve and protect these areas from any negative impacts generated because of the development.

Step 2: Locate building sites to take advantage of open space and scenic views by requiring smaller lot sizes or cluster housing as well as to protect the development rights of the property owner and the number of occupancy units permitted by the underlying zoning of the property.

Step 3: Design the transportation system to provide access to building sites and to allow movement throughout the site and onto adjoining lands; roads should not traverse sensitive natural areas.

Step 4: Prepare engineering plans which indicate how each building site can be served by essential public utilities.



Figure 48. Conservation design/low impact development example.

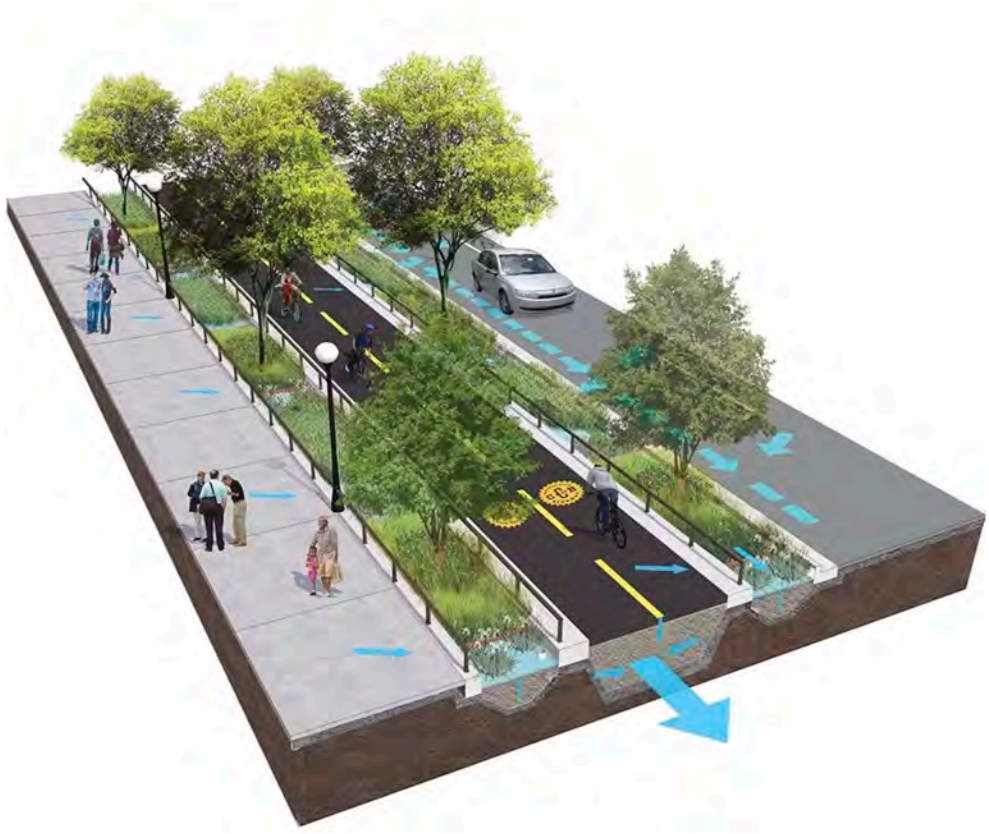


Figure 49. Greener streetscape using LID practices (Roads & Bridges, 2018).

Low impact development (LID) focuses on the hydrologic impact of development and tries to maintain pre-development hydrologic systems, treating water as close to the source as possible (see Figure 49). LID principles can be incorporated into development or stormwater ordinances and used in new development or retrofitting existing developments. Green infrastructure systems are created to mimic natural processes that promote water infiltration, native plant evapotranspiration, and stormwater reuse.

Low impact development seeks to keep stormwater out of pipes and instead keep the entire infrastructure more natural and above ground. Solutions start at the lot scale such as rain gardens and overflows to swales adjacent to roads. Larger impervious areas, such as a commercial development may utilize constructed wetlands for stormwater storage while adding value to the area by enhancing aesthetics, site interest and the ecology. Entities such as Milwaukee Metropolitan Sewerage District have been influential in determining pollutant reductions for various LID methodologies.

Both conservation developments and low impact developments (LID) are not only environmentally sound choices, but economical ones for both developers and municipalities. Conservation design can produce some of its biggest cost savings in infrastructure costs such as site preparation, stormwater management, site paving, and sidewalks (Conservation Research Institute, 2005). According to a study conducted by Applied Ecological Services, Inc., the average savings created by choosing conservation development over more traditional footprints is 24% (Table 37) (AES, 2007). Not only do lots in conservation developments typically cost less to install, but they also "carry a price premium ... and sell more quickly than lots in conventional subdivisions

Table 37. Savings of Conservation Design over traditional subdivision design for 10 Midwestern conservation development projects (AES, 2007).

Savings of Conservation Development over Traditional Subdivision Design (P=Project)

Positive numbers are savings of Conservation Development over Traditional.
Negative numbers are costs of Conservation Development over Traditional.

Project:	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Average
ITEM											
Grading	-$214,740	$257,832	$1,813,726	$2,215,025	$1,856,206	$1,862,988	$796,705	$291,957	$302,497	$2,852,312	51.00%
Roadway	$84,702	$18,754	-$16,477	-$130,230	$1,464,599	$1,187,386	$205,168	$9,231	-$9,963	$801,484	18.00%
Storm Sewer	$181,611	$31,220	$6,648	$89,676	$974,689	$547,184	$210,289	$65,501	$110,021	$678,302	40.00%
Sanitary Sewer	$41,614	-$4,365	$0	-$203,064	$850,962	$224,776	$72,436	-$15,502	$5,960	$423,458	6.00%
Water	$44,483	-$4,671	-$63,680	-$215,881	$905,157	$240,064	$76,815	-$16,257	$5,973	$451,084	5.00%
Ecological	-$56,500	-$74,857	-$277,472	-$400,321	-$407,131	-$625,084	-$160,341	-$93,954	-$264,513	-$380,992	-154.00%
Amenities	$17,572	-$16,202	-$94,399	-$226,216	$552,667	$221,666	$7,825	-$15,749	-$39,274	$266,982	6.00%
Contingencies	$132,055	$51,928	$342,087	$282,247	$1,549,287	$914,745	$302,225	$56,307	$27,675	$1,273,157	24.00%
Total Savings	$660,277	$259,639	$1,710,433	$1,411,235	$7,746,436	$4,573,725	$1,511,124	$281,534	$138,377	$6,365,787	
Total Percent Savings	19.00%	20.00%	33.00%	15.00%	43.00%	32.00%	25.00%	15.00%	4.00%	37.00%	24.30%*
Cost Savings Per Lot	$8,725.00	$6,978.00	$147,012.00	$29,012.00	$7,904.00	$20,077.00	$7,346.00	$4,078.00	$4,959.00	$67,676.00	$30,376.70

* Total Savings Percentage is *not* the percentage savings of all individual Items added together, because dollar-values of Items are different.
Visit www.appliedeco.com for more detailed info.

(Mohamed, 2006)." Another study conducted in Concord, Massachusetts found that over an eight-year period, a cluster development with protected open space had a 2.6% higher annual appreciation rate over "residential properties with significantly larger private yards, but without the associated open-space (Lacy, 1990)."

While low impact development covers a range of stormwater practices, it has some of the same cost benefits as conservation design. Typically LID practices "can cost less to install, have lower operations and maintenance costs, and provide more cost-effective stormwater management and water-quality services than conventional stormwater controls (ECONorthwest, 2007)." Like conservation design, cost savings from utilizing LID practices can be found as a reduction in the amount of drainage infrastructure and land disturbance required; additionally, property values can be increased by 12 - 16% (UNH Stormwater Center, 2011).

There is also evidence that combining both conservation and low impact development practices through holistic site design can create deeper cost savings for developers as well as increased ecosystem benefits – particularly by combining clustered site designing and naturalized stormwater management systems (Conservation Research Institute, 2005). Not only do conservation and low impact development practices provide a more economical possibility for developers and municipalities, but they can improve water quality, habitat, and property values in the watershed.

4.1.16 Green Infrastructure Network Planning

A green infrastructure network provides communities with a tool to identify and prioritize open space land use or conservation opportunities and plan development that benefits both people and nature by providing a framework for future growth. It identifies areas not suitable for development, areas suitable for development but that should incorporate conservation or low impact design standards, and areas that do not affect green infrastructure.

Park Districts, Forest Preserve Districts, IDNR, and watershed stakeholders can use green infrastructure plans for trail routing, open space linkages, and natural area restoration decisions. Residents can use green infrastructure recommendations to reduce runoff from their properties and to see how their properties fit into the larger network. A Green Infrastructure Network for the watershed was developed in Section 3.9.

Green Infrastructure Network *implementation* has several actions:

- Protect specific unprotected green infrastructure parcels through acquisition, regulation, and/or incentives.
- Incorporate conservation or low impact design standards on green infrastructure parcels where development is planned.
- Incorporate agricultural preservation and enhanced agricultural best management practices on green infrastructure parcels where appropriate.
- Limit future subdivision of green infrastructure parcels.
- Implement long-term management of green infrastructure.

Green Infrastructure Recommendations

A Green Infrastructure Network can only be realized by coordinated planning efforts of local municipalities, park districts, developers, and private landowners. Stakeholders should follow the recommended process below to initiate and implement the Green Infrastructure Network for the CSBKR watershed.

- Include all green infrastructure parcels in updated community comprehensive plans and development review maps.
- Utilize tools such as protection overlays, setbacks, open space zoning, conservation easements, conservation and/or low impact

development, agricultural preservation, etc. on all green infrastructure parcels.
- Utilize tools such as Development Impact Fees, Stormwater Utility Taxes, Special Service Area (SSA) Taxes, etc. to help fund future management of green infrastructure components where new and redevelopment occurs.
- Identify important unprotected green infrastructure parcels not suited for development then protect and implement long term management.
- Work with private landowners along stream/tributary corridors to manage their land for green infrastructure benefits.
- Use the Green Infrastructure Network to identify new trails and trail connections.

4.1.17 Water Quality Trading & Adaptive Management

While Illinois has not yet set up policies or a system to implement water quality trading or adaptive management, nearby Wisconsin has developed policies and a number of resources for both and their guidance could be used as a model or example to follow in Illinois. The following information is cited directly from a Wisconsin Department of Natural Resources (WDNR) document entitled "A Water Quality Trading How to Manual" (WDNR, 2013).

Water Quality Trading presents a way for municipal and industrial NPDES permit holders to demonstrate compliance with water quality-based effluent limitations. Generally, trading involves a point source facing relatively high pollutant reduction costs compensating another party to achieve less costly pollutant reduction with the same or greater water quality benefit. In other words, trading provides point sources with the flexibility to acquire pollutant reductions from other sources in the watershed to offset their point source load so that they will comply with their own permit requirements, while simultaneously helping to fund water quality improvements nearby. Trading is not a mandatory program or regulatory requirement, but rather a market-based option that may enable some industrial and municipal facilities within the watershed to meet regulatory requirements more cost-effectively. With ever-tightening water quality standards and restrictions going into effect, trading may become economically preferable to other compliance options.

There are many benefits to trading:
- Permit compliance through trading may be economically preferable to other compliance options.
- New and expanding point source discharges can utilize trading to develop new economic opportunities in a region, while still meeting water quality goals.
- Permittees, and the point and nonpoint sources that work cooperatively with them, can demonstrate their commitment to the community and to the environment by working together to protect and restore local water resources.

Adaptive management is sometimes confused with trading, since both options allow permittees to work with nonpoint or other point sources of phosphorus in a watershed to reduce the overall phosphorus load to a given waterbody. In Wisconsin, which has developed a numeric phosphorus criterion, adaptive management is solely focused on phosphorus compliance and improving water quality so that the applicable phosphorus criterion is met. Trading is not limited to phosphorus and may be used to meet limits for any pollutant for which a criterion has been established. Trading focuses on compliance with a discharge *limit* while adaptive management focuses on compliance with phosphorus *criteria*.

Water quality trading has seven components: pollutant, trading participants, pollution reduction credit, credit threshold, trade ratio, location, and timing (Figure 50). Each of these components must be adequately addressed in a trading strategy. The "pollutant" is simply the contaminant being traded. The "trading participants" are entities involved in the trade. "Credit" is the amount of a given pollutant that is available for trading. "Credit Threshold" is the amount of pollutant reduction that needs to be achieved before credits are generated. "Trade ratios" are put in place due to uncertainty margins. "Location" refers to the fact that the credit user and generator must discharge to the same waterbody. "Timing" is important because credits must be generated before they can be used to offsite the pollution.

For more information and guidance on water quality trading and adaptive management, see Wisconsin Department of Natural Resources (WDNR) document entitled "A Water Quality Trading How to Manual" (WDNR, 2013).



Figure 50. Water quality trading components (Source: WDNR).

4.2 Site-Specific Management Measures Action Plan

Site Specific Management Measure (Best Management Practice [BMP]) recommendations made in this section of the report are backed by findings from the watershed field inventory, overall watershed resource inventory, and input from stakeholders. In general, the recommendations address sites where watershed problems and opportunities can best be addressed to achieve watershed goals and objectives. The Site-Specific Management Measures Action Plan is organized by the jurisdiction in which recommendations are located making it easy for users to identify the location of project sites and corresponding project details. It is important to note that project implementation is voluntary and there is no penalty or reduction in future grant opportunities for not following recommendations. Site Specific Management Measures were identified within the following jurisdictional boundaries and are included in the Action Plan:

- DeKalb County
- City of Genoa
- Village of Kingston
- Village of Kirkland

Management Measure categories in the Site-Specific Management Measures Action Plan include:

- Streambank & Riparian Area Restoration
- Detention Basin Retrofits & Maintenance
- Wetland Restoration
- Other Management Measures

Descriptions and location maps for each Management Measure category follow. Table 40 includes useful project details such as site ID#, Location, Units (size/length), Existing Condition, Management Measure Recommendation, Pollutant Load Reduction Efficiency, Priority, Owner/Responsible Entity, Sources of Technical Assistance, Cost Estimate, and Implementation Schedule.

Project importance, technical and financial needs, cost, feasibility, and ownership type were taken into consideration when prioritizing and scheduling Management Measures for implementation. High, Medium, or Low Priority was assigned to each recommendation. Critical/Priority are all High Priority and highlighted in red on project category maps and the Action Plan table. For this watershed plan a Critical/Priority Area is best described as a location in the watershed where existing or potential future causes and sources of an impairment or existing function are significantly worse than other areas of the watershed and where expected pollutant load reductions are highest. Cost estimates were typically developed based on a per acre or per linear foot cost (see Appendix D for details). Implementation schedule varies greatly with each project but is generally based on the short term (within 1-10 years) for High Priority/Critical Area projects and 10-20+ years for the remaining projects. Maintenance projects are ongoing.

The Site-Specific Management Measures Action Plan is designed to be used in one of two ways.

Method 1: The user should find the respective jurisdictional boundary (listed alphabetically in Table 40) then identify the Management Measure category of interest within that boundary. A Site ID# can be found in the first column under each recommendation that corresponds to the Site ID# on a map (Figures 51-55) associated with each category.

Method 2: The user should go to the page(s) summarizing the Management Measure category of interest then locate the corresponding map and Site ID# of the site-specific recommendations for that category. Next, the user should go to Table 40 and locate the jurisdiction where the project is located, then go to the project category and Site ID# for details about the project.

Pollutant Load Reduction Estimates

Where applicable, pollutant load reductions and/or estimates for total suspended solids (TSS), nitrogen (TN), and phosphorus (TP) were evaluated for each recommended Management Measure based on efficiency calculations developed for the USEPA's Region 5 Model. This model uses "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual" (MDEQ, 1999) and PLET to provide estimates of total suspended solids and nutrient load reductions from the implementation of agricultural Measures. Estimate of total suspended solids and nutrient load reduction from implementation of urban Measures is based on efficiency calculations developed by Illinois EPA. This watershed-based plan is focused on nutrients and total suspended solids because of the models used for estimating pollutant loading and reductions and references total suspended solids in tons per year (not pounds) in all cases.

Estimates of pollutant load reduction using the Region 5 Model are measured in weight/year (tons/yr for total suspended solids and lbs/yr for nitrogen and phosphorus). The model was generally used to calculate weight of pollutant reductions for all recommended Management Measures where calculation of such data is applicable. In summary, pollutant reductions were calculated for 51 stream & riparian area restoration projects, 26 detention basin retrofit projects, 20 wetland restoration projects, 2 agricultural management projects (plus another 9,351 acres of additional agricultural practices), and 20 other management measure recommendations. Spreadsheets used to determine pollutant load reductions can be found in Appendix D.

For context and as a general guide, estimated percent removal of total suspended solids, nitrogen, and phosphorus based on the Region 5 Model are depicted for various Management Measures in Table 38.

Watershed-Wide Summary of Action Recommendations

All Site-Specific Management Measures, Information & Education Program (Section 5.2), and Monitoring Plan (Section 5.3.1) recommendation information is condensed by Category in Table 39. This information provides a watershed-wide summary of the "Total Units" (size/length), "Total Cost," and "Total Estimate of Pollutant Load Reduction" if all the recommendations in the Site-Specific Management Measures Action Plan, Education Plan, and Monitoring Plan are implemented. Key points include:

- 13,356 acres of ecological restoration with a total cost of $26,850,000.
- 441,747 linear feet of stream and riparian area restoration costing

Table 38. Region 5 Model percent pollutant removal efficiencies for various Management Measures.

Management Measures	TSS	TN	TP
Vegetated Filter Strips	73%	40%	45%
Wet Pond/Detention	60%	35%	45%
Wetland Detention	77.5%	20%	44%
Dry Detention	57.5%	30%	26%
Infiltration Basin	75%	60%	65%
Streambank/Lake Shoreline Stabilization	90%	90%	90%
Weekly Street Sweeping	16%	6%	6%
Porous Pavement	90%	85%	65%
Manure Waste Management	na	80%	90%

Table 39. Watershed-wide summary of Management Measure recommendations for implementation.

Management Measure Category	Total Units (size/length)	Total Cost	Estimated Load Reduction		
			TSS (tons/yr}	TN (lbs/yr)	TP (lbs/yr)
Detention Basin Retrofits & Maintenance	71.5 acres	$1,620,000	138	384	2,712
Wetland Restoration	2,205.1 acres	$23,205,000	244	434	4,620
Stream & Riparian Area Restoration					
Streams	441,746.8 lf	$213,776,000	23,000	24,319	78,869
Riparian Areas	1,014.1 acres				
Agricultural Management Practices					
Grass waterways or swales installed	45 acres	$489,000	331	454	852
Implement mulch till, reduced till, or no till on additional 16% of farmlands	9,350.8 acres	na	3,184	5,923	12,625
Other Management Measures					
13 swale retrofits	546.6 acres	$368,000	33	106	733
4 Natural area restorations	103.5 acres	$1,058,000	7	19	139
2 Green Alley Retrofits	1.3 acres	$105,000	2	4	55
1 Rain Garden Retrofit	0.1 acres	$5,000	0	0	5
Information & Education Plan	Entire Plan	>$25,500	na	na	na
Water Quality Monitoring Plan	Entire Plan	>$21K/year	na	na	na
TOTALS	13,356 acres	$26,850,000	26,940 tons/yr	31,643 lbs/yr	100,610 lbs/yr
	441,746.8 lf	$213,776,000			
	Education	>$25,500/yr			
	Monitoring	>$21,000/yr			

$213,776,000.

- 31,643 pounds/year of phosphorus (TP) would potentially be reduced each year, representing 100% of the 31,351 pounds/year Reduction Target identified in Section 3.16.
- 100,610 pounds/year of nitrogen (TN) would potentially be reduced each year, representing well over the 33,505 pounds/year Reduction Target identified in Section 3.16.
- 26,940 tons/year of total suspended solids (TSS) would potentially be reduced each year, despite not needing to reduce total suspended solids to maintain water quality criteria.
- Education programs will cost at least $25,500 annually to implement (see Section 5.2).
- A monitoring plan will cost at least $21,000 annually to implement (see Section 5.3.1).

4.2.1 Streambank & Riparian Area Restoration Recommendations

Baxter & Woodman (B&W) completed a general inventory of CSBKR and its tributaries in 2023. All streams and tributaries were assessed based on divisions into "Stream Reaches". Fifty-one (51) stream reaches were assessed accounting for 441,747 linear feet or 83.7 linear miles. Detailed notes were recorded for each stream reach related to potential Management Measure recommendations such as improving streambank and channel conditions, restoring riparian areas, and maintaining these reaches long term. The results of the stream inventory are summarized in Section 3.10; detailed field investigation datasheets can be found in Appendix C.

The condition of stream reaches in the watershed varies. According to the stream inventory, 44% (194,057 lf) of stream and tributary length is naturally meandering; approximately 11% (48,571 lf) is moderately channelized; 45% (199,119 lf) is highly channelized. Approximately 35% (153,748 lf) of the total stream and tributary length exhibits no or low bank erosion while moderate erosion is occurring along 55% (245,738 lf) of streambanks. Highly eroded streambanks account for 10% (42,261 lf) of the total stream length. On the other hand, approximately 42% (along 186,639 linear feet of streams) of the riparian areas are "Poor" quality. Another 211,901 linear feet or 48% of riparian areas are in "Average" condition and 10% (43,206 linear feet) are in good condition. Most of the tributaries that exist today were not defined stream channels prior to European settlement.

Stream and riparian area recommendations for this watershed plan generally focus on restoring and improving the riparian corridor, with some spot stabilization of banks recommended where appropriate since there is little channel erosion in the watershed. Where existing buffers are less than 75 feet, recommendations have been made to extend buffers where possible; that said, extending a riparian buffer to 75 feet where no buffer exists is not always achievable. In these cases, typically recommendations included increasing the buffer to 50 feet along each bank where possible. Some of the highly channelized agricultural reaches in the watershed are in the more advanced stages of recovering a stable two-stage channel, which should be encouraged and protected during other restoration and maintenance activities. In general, the addition of riffles or improvement of in-stream habitat is not recommended since attempts to address these issues could result in worsening channel conditions.

Most stream restoration projects include at least one of the following three water quality and habitat improvement components; 1) removal of existing invasive vegetation including trees and shrubs from the banks and extending buffers where none currently exist followed by; 2) spot stabilization of banks using bioengineering, regrading of banks, and installation of native vegetation where necessary; and 3) restored riffles/grade controls in the stream channel to simulate conditions found in naturally meandering streams and to improve in-stream habitat. Short- and long-term maintenance then follows and is critically important in the development process and to maintain restored conditions.

Figure 51 shows the location of all potential streambank and riparian area restoration projects by reach ID# and priority while Table 40 lists project details about each recommendation within the appropriate jurisdictional boundary. Potential streambank and riparian area restoration projects on public land and reaches exhibiting severe problems on private land are generally assigned as higher priority for implementation. Medium and Low priority was generally assigned to stream reaches exhibiting less urgent problems. Recommendations are not made for stream reaches where restoration is not needed. In total, 103,428 linear feet of stream are considered Critical/Priority Area projects.



Example stream restoration in Barrington, Illinois

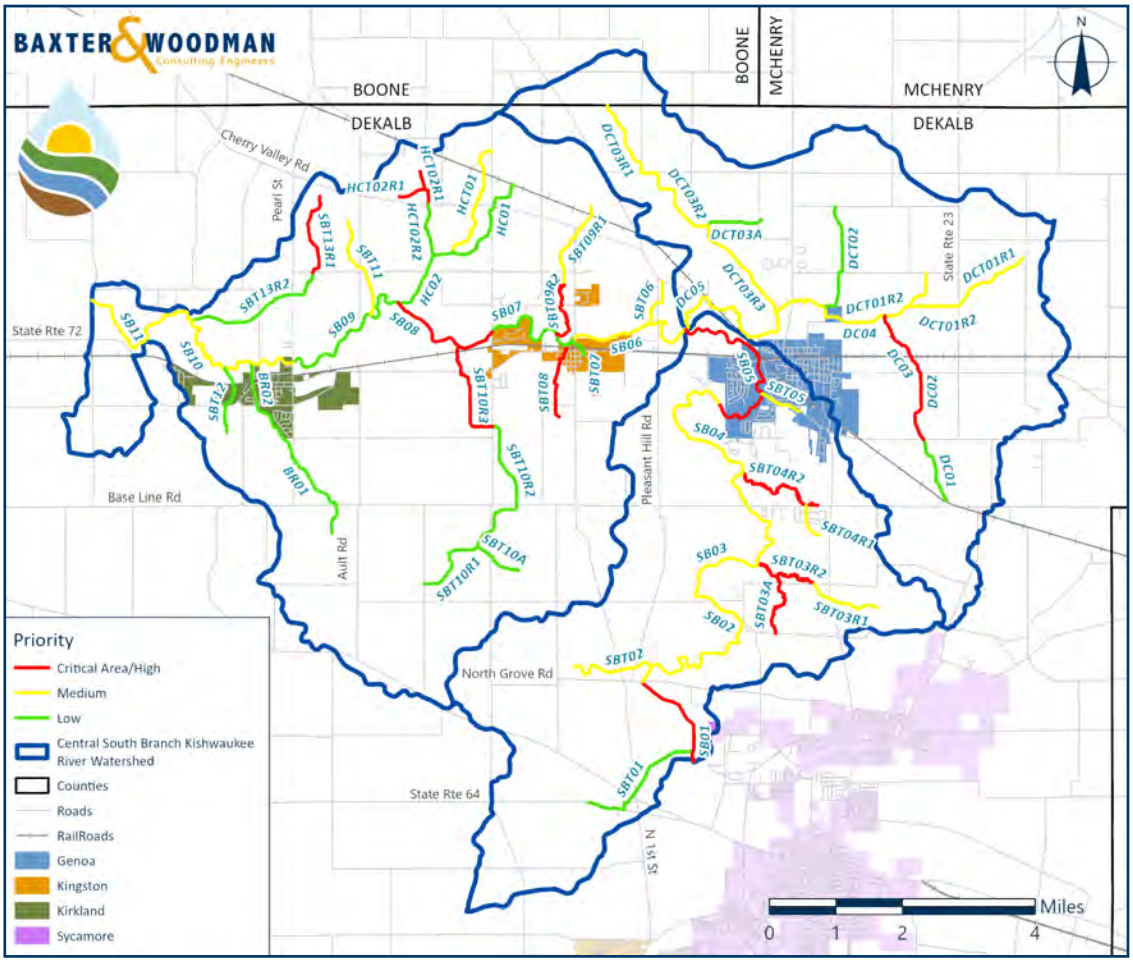


Figure 51. Streambank & Riparian Area Restoration Recommendations.

4.2.2 Detention Basin Retrofits & Maintenance Recommendations

During the inventory, 26 detention basin retrofit opportunities were identified in CSBKR watershed, predominantly in the municipal portions of the watershed. Most detention basins provide little by way of water quality improvement, infiltration capability, and wildlife habitat. In the future it is recommended that new standards for detention basins be implemented in local and county development ordinances (see Section 4.1.2). B&W conducted an inventory of detention basins in 2023. The results of the detention basin inventory are summarized in Section 3.10. Detailed field investigation datasheets and maps can be found in Appendix C.

The type and ecological condition of the detention basins in the watershed varies. The inventory resulted in 15 dry bottom basins, 8 wetland bottom basins, and 3 wet bottom basins. Additionally, of the 26 basins, none provide "Good" ecological and water quality benefits. Eight basins (31%) likely provide "Average" benefits, while the remaining 18 basins (69%) likely provide "Poor" ecological and water quality benefits because most were designed simply to meet stormwater storage volume requirements. Most detention basins are located within the municipalities of Genoa, Kirkland, and Kingston. Many of the detention basins are planted with turf grass side slopes. Many of the basins in the watershed present excellent retrofit opportunities. Most would be relatively easy to naturalize with native plantings.

All recommended detention basin retrofits and/or maintenance recommendations are shown in Figure 52 by priority and Site ID# which correspond with the ID# used in the field investigation. Details about each recommendation can be found in the Action Plan Table (Table 40) within the appropriate jurisdictional boundary. All the High priority recommendations are considered "Critical Areas." Most of these are basins were prioritized based on their ability to treat polluted stormwater runoff, have significant problems, or present a good opportunity for retrofitting. Low or Medium priority is generally assigned to smaller private basins and those with fewer problems or maintenance needs.

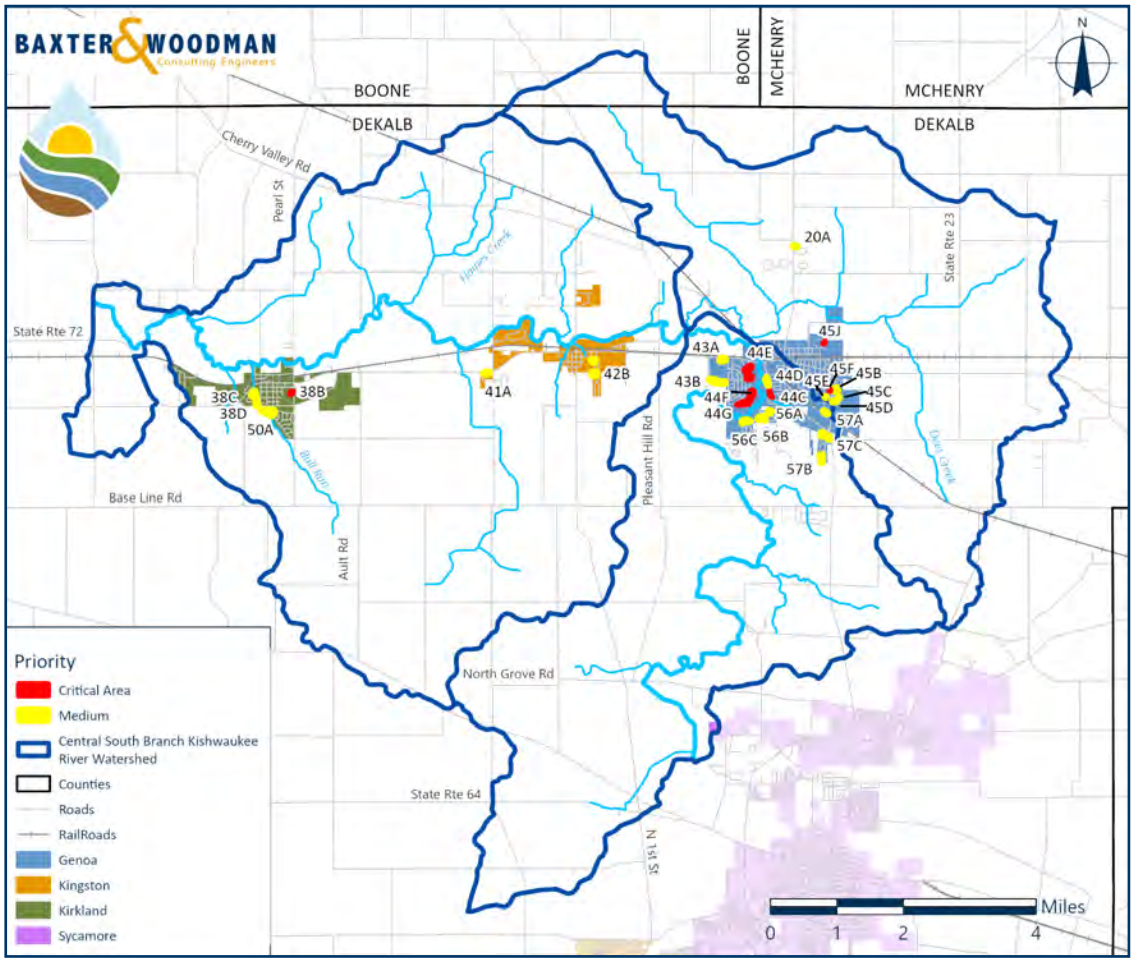


Figure 52. Detention Basin Retrofit Recommendations.



Example wetland restoration

4.2.3 Wetland Restoration Recommendations

Wetland restoration is the process of bringing back historic wetlands in areas where they have been drained. This section does not include enhancement and maintenance for existing wetlands. Restoration can be important for mitigation purposes or done simply to benefit basic environmental functions that historic wetlands once served. Improvement in water quality is the greatest benefit provided by wetland restoration. Other benefits include reducing flood volumes/rates and improved habitat to increase plant and wildlife biodiversity. The wetland restoration process is generally the same for all sites. First a study must be completed to determine if restoration at the site is actually feasible. If it is, a design plan is developed, permits obtained, then the project is implemented by breaking existing drain tiles and/or regrading soils to attain proper hydrology to support wetland vegetation. Planting with native wetland species is the next step followed by short- and long-term maintenance and monitoring to ensure establishment.

Potential wetland restoration sites confirmed during the inventory to meet specific criteria essential for restoration of a functional and beneficial wetland. The analysis resulted in 20 sites meeting the criteria and considered as potentially feasible wetland restoration sites. Figure 53 includes the location of all the potential wetland restoration sites by site priority and site ID#. Seven sites were determined to be high priority/critical area restorations. Details about each recommendation can be found in the Action Plan Table (Table 40) within the appropriate jurisdictional boundary. In general, large sites adjacent to streams were the highest priority sites.

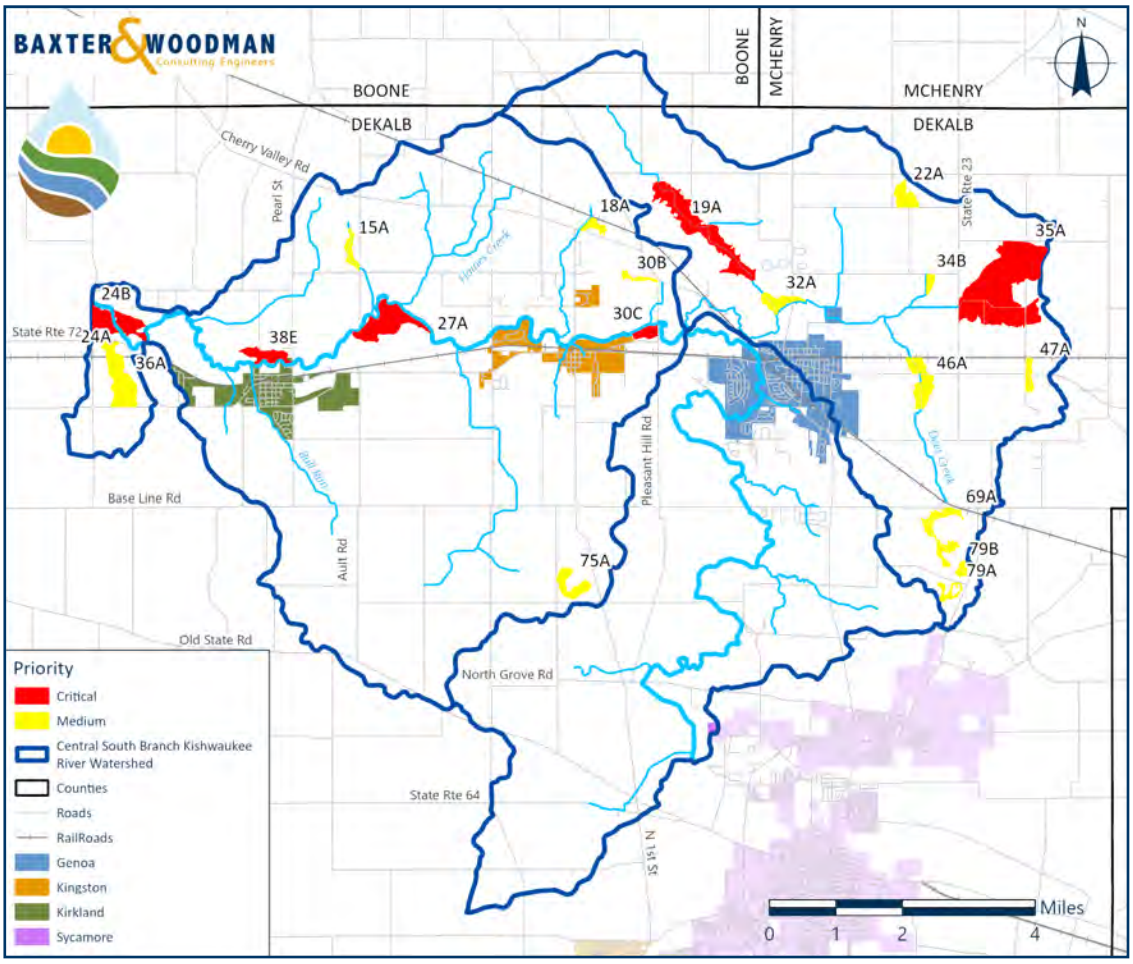


Figure 53. Wetland Restoration Recommendations.

4.2.4 Other Management Measure Recommendations

While completing the general inventory of CSBKR watershed, B&W noted potential Management Measure projects that fit under miscellaneous other categories. In total there were 22 projects identified as other management measures. Detailed field investigation datasheets for these projects can be found in Appendix C. Figure 54 shows the location of all "Other Management Measure" recommendations by ID# while Table 40 lists details about each recommendation within the appropriate jurisdictional boundary.

Potential projects include:

- 2 Agricultural BMPs
- 13 Swale Retrofits
- 4 Natural area restorations
- 2 Green Alley Retrofits
- 1 Rain Garden Retrofit

Agricultural land uses represent roughly 89% of the watershed, and nearly all of it is row crop farmland. According to the nonpoint source pollutant loading analysis, cropland contributes the highest loads of nitrogen (255,964 lbs/yr: 20%), phosphorus (53,084 lbs/yr: 65%), and sediment (25,626 t/yr: 51%), in large part due to the extent of agricultural land in the watershed. Agricultural land can be a significant contributor of nutrients and sediment to local streams when practices such as grass swales, filter strips, and reduced tillage farming are not in place. Observations made during B&W's field inventory in 2023 indicate that practices such as additional grass waterways or vegetated swales may be necessary on two (2) fields. Implementing these practices where obviously eroded swales have been identified could significantly reduce pollutant loading.

Additional conservation practices and increases in the extent of reduced tillage practices in the CSBKR watershed are necessary to reduce cropland pollutant loading. According to the 2018 Illinois Soil Conservation Transect Survey, the most common tillage practice found was conventional tillage with 30 of fields (34% of fields). Mulch till was practiced on 21 fields (24%), reduced tillage was found on 19 of fields (22%), and no-till was found at 11 sites, or 13% of the surveyed fields. B&W recommends an additional 16% of agricultural landowners currently practicing conventional tillage (9,351 acres) implement mulch till, reduced till, or no till. This change alone could reduce watershed wide pollutant loads by 12,625 lbs/year of nitrogen, 5,923 lbs/year of phosphorus, and 3,184 tons/year of sediment and is considered a Critical Area Management Measure. Because these additional practices are meant to occur across agricultural land generally, they are not mapped to specific fields – they could occur on any lands currently practicing conventional tillage.

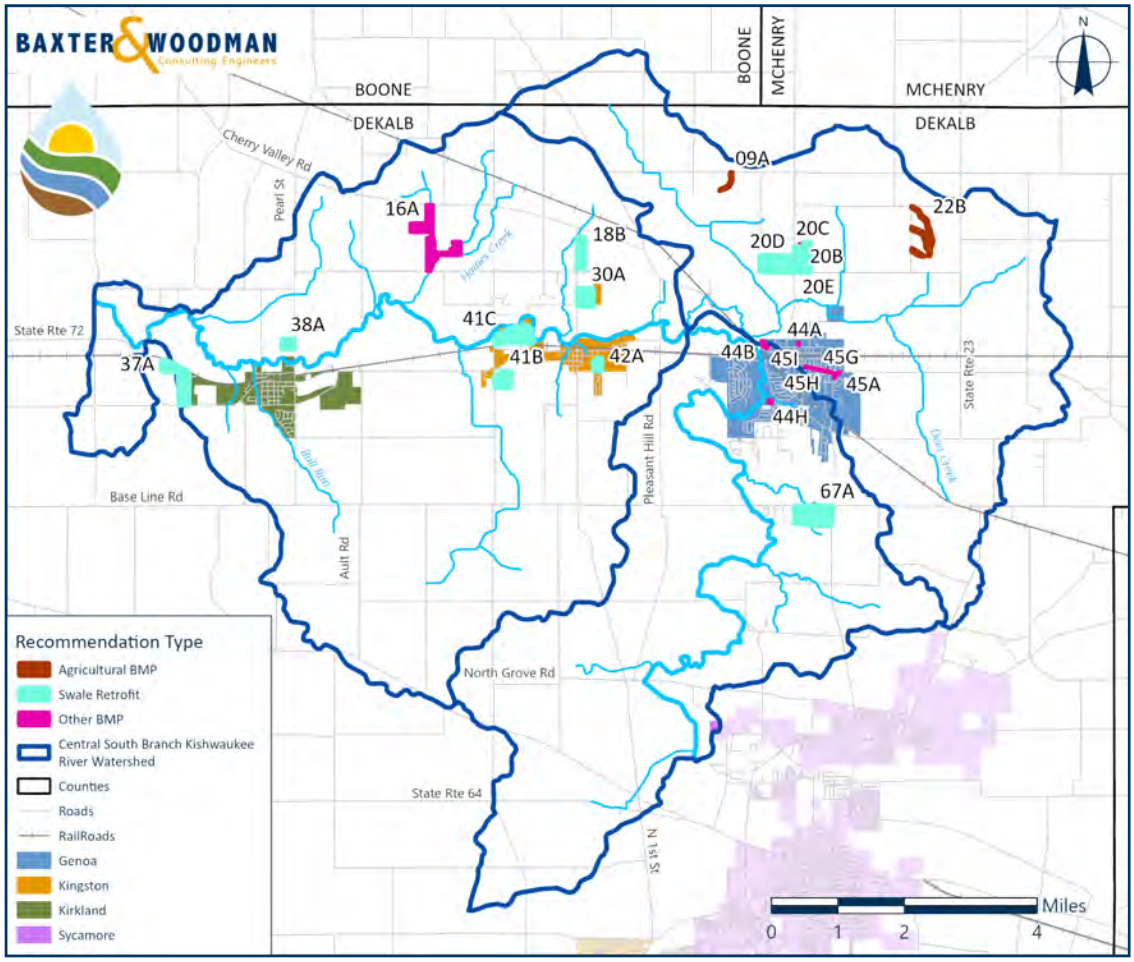


Figure 54. Other Management Measure Recommendations.

4.2.5 Critical/Priority Areas & Practices

For this watershed plan a Critical/Priority Area is best described as a location in the watershed where existing or potential future causes and sources of an impairment or existing function are significantly worse than other areas of the watershed. Five Critical Area types were identified in CSBKR watershed and include:

1. highly degraded stream and riparian area reaches;
2. large, drained wetland complexes;
3. poorly designed/functioning detention basins or detention needs;
4. agricultural areas in need of additional infield practices; and
5. other management measure recommendations.

Short descriptions of each Critical/Priority Area type are included below. The list of Critical Areas identified in the following paragraphs is a subset of the full site-specific management measures as found in this Action Plan (each highlighted in red in Priority, Table 40. Figure 55 maps the location of each Critical/Priority Area.

Pollutant load reductions were calculated for the Critical Area Management Measures based on efficiency calculations developed for the USEPA's Region 5 Model. This model uses "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual" (MDEQ, 1999) and PLET to provide estimates nutrient and sediment load reductions from the implementation of agricultural Management Measures. Estimate of nutrient and sediment load reduction from implementation of urban Management Measures is based on efficiency calculations developed by Illinois EPA. Illinois EPA pollutant load reduction worksheets for each Management Measure, including Critical Areas, are in Appendix D.

Critical Stream and Riparian Area Reaches

Critical stream and riparian area reaches are those with highly eroded streambanks that are a major source of total suspended solids (sediment) carrying attached phosphorus and nitrogen and/or where buffers adjacent to stream reaches are in poor ecological condition or areas lacking a buffer but with excellent ecological restoration and remediation potential to improve water quality and habitat conditions. Streambank stabilization using bioengineering where necessary, installation of artificial riffles in stream, and improved and expanded riparian areas on Critical Area stream reaches will greatly reduce sediment and nutrient transport downstream while improving habitat and increasing oxygen levels. Thirteen (13) stream reaches totaling 103,427.7 linear feet were identified as Critical Areas; these include Reached DC02, DC03, HCT02R1, SB01, SB08, SBT03A, SBT03R2, SBT04R2, SBT09R2, SBT10R3, SBT13R1, SB05, and SBT08. Section 3.10 includes a complete summary of streams, tributaries, and riparian areas in the watershed.

Critical Wetland Restoration Sites

Critical wetlands restoration sites are generally associated with large areas that were historically wetland prior to European settlement in the 1830s but were drained for agricultural purposes and are typically adjacent sections of stream where floodplain reconnection is possible. Many of these historic wetlands can be restored by breaking existing drain tiles and planting with native vegetation. Wetland restorations are among the most recommended projects to improve water quality, reduce flooding, and improve wildlife habitat. Seven Critical Area wetland restoration recommendations were identified in the watershed totaling 1,409.7 acres. These include wetland restoration projects 19A, 24A, 24B, 27A, 30C, 35A, and 38E. Critical Area status was assigned based on location, size, and restoration potential. A detailed summary of the extent of drained wetlands and restoration opportunities in the watershed is included in Section 3.10.

Critical Detention Basins

Critical detention basins are generally defined as existing basins that provide poor ecological and water quality benefits in areas where these attributes are needed. Seven (7) detention basins meet the criteria of a Critical Area based of their location, function, and size; these include Detention Basin Retrofits 44C, 44E, 44F, 44G, 45F, 45J, and 38B. All the Critical Area detention basin retrofit recommendations are located within the City of Genoa, except for 38B, which is in the Village of Kirkland. The most common recommendation is to naturalize areas of turf grass with native vegetation to provide better water quality improvement, greater infiltration, and improve wildlife habitat. A summary of the detention basins in the watershed is included in Section 3.10.

Critical Agricultural Land Management

It is well documented that agricultural land is a significant contributor of nutrients and sediment in the watershed. According to modeling, agricultural areas contribute between 65% and 57% of the nutrient load and 20% of the sediment load in the watershed. There are currently 58,442.5 acres of cropland in the watershed, covering nearly 89% of the land mass. Two (2) agricultural areas (totaling 45 acres) in need of additional grass waterways or vegetated swales were identified as Critical Areas based on their size and/or location in the watershed.

As an additional Critical Area recommendation, B&W recommends encouraging an additional 16% (9,350.8 acres) of cropland landowners currently utilizing conventional tillage practices implement mulch till, reduced till, or no till on their lands. This change alone could reduce watershed wide pollutant loads by 5,923 lbs/year of phosphorus, 12,625 lbs/year of nitrogen, and 3,184 tons/year of sediment, constituting the single largest pollutant reduction potential in the watershed. For a full summary of agricultural areas, see Section 3.11.

Other Critical Management Measures

Several potential Management Measure projects were identified that fit under miscellaneous other categories. In total there were four Critical Area projects that fell into the other management measures, including two Swale Retrofit, one Natural area restoration, and one Green Alley Retrofit opportunity. These areas were typically determined to be Critical Areas due to existing or potential future causes and sources of an impairment or where existing function is significantly worse than other areas

of the watershed. More information about other management measure recommendations can be found in Section 4.2.4.

Implementing all Critical Area Management Measure project recommendations would remove 17,951 lbs/yr (57% of the reduction target) and 47,397 lbs/yr (141% of the reduction target) of phosphorus and nitrogen, respectively, and 14,478 tons/yr of sediment from the watershed. The phosphorus target could be attained by implementing all recommended management measures in this plan (not just the Critical Area projects), which would remove 31,643 lbs/yr of phosphorus.

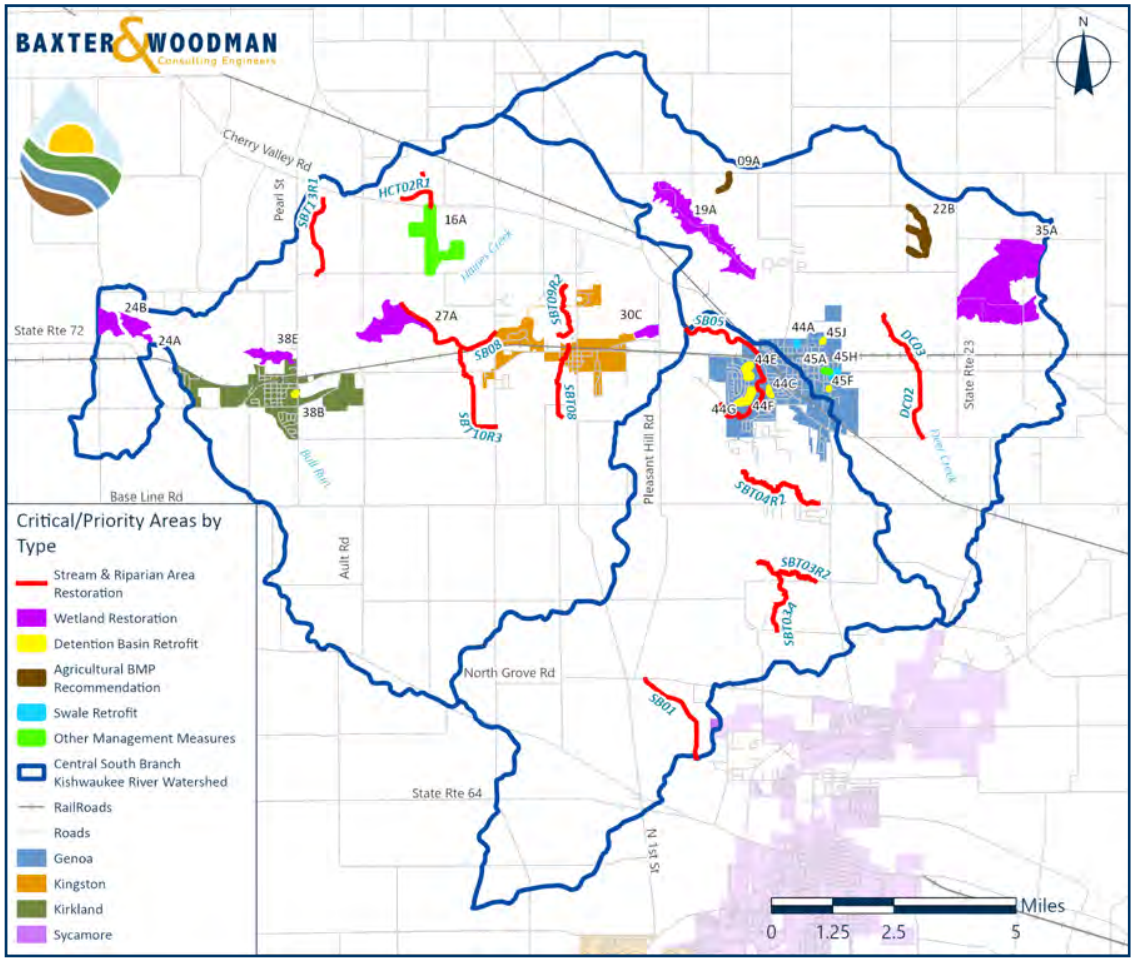


Figure 55. Critical/Priority Areas.

4.2.6 Site-Specific Management Measures Action Plan Table

Table 40. Site-specific management measures action plan.

DEKALB COUNTY

ID#	Location	Units (Acres or Linear Feet)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Owner & Responsbile Entity	Sources of Technical Assistance	Cost Estimate	Implementation Scheudle (Years)
					TSS (tons /yr)	TP (lbs/yr)	TN (lbs/yr)					
DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 52). Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is relatively low while financial assistance needs are moderate. Private landowners will need the greatest assistance.												
20A	See Figure 52	0.5	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	4	7	88	Medium	Private Owner	Ecological Consultant/ Contractor	$20K to design and construct. $3K to implement three year M&M.	5-15 Years
OTHER MANAGEMENT MEASURES (SEE FIGURE 54). Technical and Financial Assistance Needs: Technical and financial assistance needed to implement these projects varies depending on complexity.												
09A	See Figure 54	6.6	Traditional row crop agricultural field with obviously eroded swale draining land	Design and implement a project to install vegetated swales on private agricultural land and maintain.	47	62	116	Critical Area/ High	Private Owner	NRCS, DCSWCD	$66K to design and construct. $20K to implement three year M&M.	1-10 Years
16A	See Figure 54	98.8	Prairie Oaks Forest preserve comprised of prairie, savanna, fen, and high-quality wetland.	Design and implement a project to manage and maintain area.	1	9	12	Critical Area/ High	Private Owner		$988K to design and construct restoration.	1-10 Years
18B	See Figure 54	38.0	Mowed turf swale in unsewered subdivision with turf roadside; spot erosion possible at culvert.	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years.	2	7	47	Medium	Private Owner / HOA	Ecological Consultant/ Contractor, Engineer	$18K to design and construct restoration.	5-15 Years
20B	See Figure 54	1.3	Lot comprised of old growth oaks with turf understory.	Design and implement a project to remove turf, plant with natives and maintain for three years to establish savanna understory.	0	0	1	Medium	Private Owner	Ecological Consultant/ Contractor	$20K to design and construct restoration.	5-15 Years
20C	See Figure 54	25.8	Mowed turf swale in unsewered subdivision with turf roadside; spot erosion possible at culvert.	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years.	1	5	32	Medium	Private Owner / HOA	Ecological Consultant/ Contractor, Engineer	$12K to design and construct restoration.	5-15 Years
20D	See Figure 54	83.1	Mowed turf swale in unsewered subdivision with turf roadside; spot erosion possible at culvert.	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years.	5	15	103	Medium	Private Owner / HOA	Ecological Consultant/ Contractor, Engineer	$46K to design and construct restoration.	5-15 Years
20E	See Figure 54	30.2	Mowed turf swale in unsewered subdivision with turf roadside; spot erosion possible at culvert.	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years.	2	5	37	Medium	Private Owner / HOA	Ecological Consultant/ Contractor, Engineer	$20K to design and construct restoration.	5-15 Years
22B	See Figure 54	38.4	Traditional row crop agricultural field with obviously eroded swale draining land	Design and implement a project to install vegetated swales on private agricultural land and maintain.	284	392	736	Critical Area/ High	Private Owner	NRCS, DCSWCD	$307K to design and construct. $96K to implement three year M&M.	1-10 Years
38A	See Figure 54	19.4	Mowed turf swale in unsewered subdivision with turf roadside; spot erosion possible at culvert.	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years.	1	4	24	Medium	Private Owner / HOA	Ecological Consultant/ Contractor, Engineer	$11K to design and construct restoration.	5-15 Years
41B	See Figure 54	37.3	Mowed turf swale in unsewered subdivision with turf roadside; spot erosion possible at culvert.	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years.	2	7	46	Medium	Private Owner / HOA	Ecological Consultant/ Contractor, Engineer	$15K to design and construct restoration.	5-15 Years
67A	See Figure 54	106.6	Mowed turf swale in unsewered subdivision with turf roadside; spot erosion possible at culvert.	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years.	6	19	132	Medium	Private Owner / HOA	Ecological Consultant/ Contractor, Engineer	$70K to design and construct restoration.	5-15 Years
NA	Not mapped - across all agricultural land	9,350.8	Agricultural land utilizing conventional tillage practices.	Implement mulch till, reduced till, or no till on and additional 16% of agricultural lands	3,184	5,923	12,625	Critical Area/ High	Various Private Owners	NRCS, DCSWCD	Not applicable	1-10 Years

ID#	Location	Units (Acres or Linear Feet)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Owner & Responsbile Entity	Sources of Technical Assistance	Cost Estimate	Implementation Scheudle (Years)
					TSS (tons /yr)	TP (lbs/yr)	TN (lbs/yr)					
STREAMBANK & RIPARIAN AREA RESTORATION RECOMMENDATIONS (See Figure 51). Technical and Financial Assistance Needs: Stream restorations are complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex in areas that flow through several governing bodies or multiple private residences. Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris.												
BR01	See Figure 51	7,768.8	Grassy waterway with scattered second growth trees and shrubs. Stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition.	Design and implement a project to manage and maintain riparian area.	130	163	1,362	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$3.5M to design and construct. $268K to implement three year M&M.	10-20+ Years
DC01	See Figure 51	5,465.5	Grass waterway through agricultural land. Stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition.	Design and implement a project to manage and maintain riparian area.	37	48	439	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.5M to design and construct. $188K to implement three year M&M.	10-20+ Years
DC02	See Figure 51	5,665.3	Fescue Grass waterway through agricultural land. Stream exhibiting high channelization, severe levels of erosion and poor overall riparian area condition.	Design and implement a project to restore two-stage channel and increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment.	799	830	2,615	Critical Area/ High	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.5M to design and construct. $195K to implement three year M&M.	1-10 Years
DC03	See Figure 51	5,923.1	Grass waterway through agricultural land. Stream exhibiting high channelization, severe levels of erosion and poor overall riparian area condition.	Design and implement a project to restore two-stage channel and increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment.	1,027	1,059	3,128	Critical Area/ High	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.7M to design and construct. $204K to implement three year M&M.	1-10 Years
DC04	See Figure 51	10,887.4	Grass waterway through agricultural land. Stream exhibiting high channelization, moderate levels of erosion and average overall riparian area condition. This riparian area is characterized by agricultural land and patched of small trees and shrubs.	Design and implement a project to restore two-stage channel and increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment.	216	233	887	Medium	Private Owner / GTPD District	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$4.9M to design and construct. $375K to implement three year M&M.	5-15 Years
DC05	See Figure 51	13,795.9	Stream in agricultural and second growth floodplain forest. Stream exhibiting low channelization, moderate levels of erosion and average overall riparian area condition.	Design and implement a project to manage and maintain riparian area through thinning floodplain forest and oak woodland.	597	609	1,590	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$6.2M to design and construct. $475K to implement three year M&M.	5-15 Years
DCT01R1	See Figure 51	6,794.7	Grass waterway through agricultural land. Stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition.	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment.	128	141	689	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$3.1M to design and construct. $234K to implement three year M&M.	5-15 Years
DCT01R2	See Figure 51	9,551.1	Grass waterway through agricultural land. Stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition.	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment.	164	176	714	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$4.3M to design and construct. $330K to implement three year M&M.	5-15 Years

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DCT02	See Figure 51	9,159.0	Grass waterway through agricultural land. Stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition.	Design and implement a project to manage and maintain riparian area.	76	91	648	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$4.1M to design and construct. $315K to implement three year M&M.	10-20+ Years
DCT03A	See Figure 51	4,641.7	Grass waterway through agricultural land. Stream exhibiting moderate channelization, low levels of erosion and average overall riparian area condition. Shows characteristics of a previous planting program.	Design and implement a project to manage and maintain riparian area.	35	47	443	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.1M to design and construct. $160K to implement three year M&M.	10-20+ Years
DCT03R1	See Figure 51	6,331.8	Grass waterway through agricultural land. Stream exhibiting high channelization, moderate levels of erosion and poor overall riparian area condition.	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment.	229	242	909	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.8M to design and construct. $218K to implement three year M&M.	5-15 Years
DCT03R2	See Figure 51	8,289.1	Grass waterway through agricultural land. Stream exhibiting high channelization, moderate levels of erosion and poor overall riparian area condition.	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment.	293	307	1,067	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$3.7M to design and construct. $285K to implement three year M&M.	5-15 Years
DCT03R3	See Figure 51	9,365.5	Grass waterway through agricultural land. Stream exhibiting high channelization, moderate levels of erosion and poor overall riparian area condition.	Design and implement a project to manage and maintain riparian area.	334	358	1,271	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$4.2M to design and construct. $323K to implement three year M&M.	5-15 Years
HC01	See Figure 51	10,663.6	Recently restores wide prairie restoration in second year of establishment. Stream exhibiting high channelization, low levels of erosion, and average ecological condition.	Design and implement a project to manage and maintain riparian area.	97	117	871	Low	Private Owner / DCFPD	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$4.8M to design and construct. $367K to implement three year M&M.	10-20+ Years
HC02	See Figure 51	5,237.8	Immediate buffer primarily second growth trees and shrubs with the wider buffer being restored prairie. Stream exhibiting low channelization, low levels of erosion, and average ecological condition.	Design and implement a project to manage and maintain riparian area.	77	95	749	Low	Private Owner / DCFPD	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.4M to design and construct. $180K to implement three year M&M.	10-20+ Years
HCT01	See Figure 51	10,897.7	Buffer primarily second growth trees and shrubs possible be old CRP. Stream exhibiting low channelization, moderate levels of erosion, and average ecological condition.	Design and implement a project to manage and maintain and remove invasives from riparian area.	267	285	1,118	Medium	Private Owner / DCFPD	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$4.9M to design and construct. $375K to implement three year M&M.	5-15 Years
HCT02R1	See Figure 51	5,069.4	Buffer primarily second growth trees and shrubs. Stream exhibiting low channelization, moderate levels of erosion, and average ecological condition.	Design and implement a project to remove invasives and restore riparian buffer with native vegetation and. Regrade banks, naturalize channel, install pools and riffles, and restore buffer; maintain for three years to ensure establishment.	184	196	741	Critical Area/ High	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.3M to design and construct. $175K to implement three year M&M.	1-10 Years

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					TSS (tons /yr)	TP (lbs/yr)	TN (lbs/yr)					
HCT02R2	See Figure 51	4,412.7	Previously restored prairie and oak savanna as well as oak hickory woodland. Stream exhibiting low channelization, moderate levels of erosion, and average ecological condition.	Design and implement a project to manage and maintain riparian area.	32	37	228	Low	DCFPD	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.0M to design and construct. $152K to implement three year M&M.	10-20+ Years
SB01	See Figure 51	8,514.3	Stream in second growth floodplain forest and degraded wetland. Exhibiting high channelization, moderate levels of erosion, and average ecological condition.	Design, permit, and implement a project to manage and maintain, remove invasives from riparian are and break spoil piles to reconnect floodplain.	911	920	2,096	Critical Area/ High	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$3.8M to design and construct. $293K to implement three year M&M.	1-10 Years
SB02	See Figure 51	17,203.6	Stream in second growth floodplain forest and degraded wetland. Exhibiting low channelization, moderate levels of erosion, and average ecological condition.	Design and implement a project to manage and maintain and remove invasives from riparian area.	807	846	2,906	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$7.7M to design and construct. $592K to implement three year M&M.	5-15 Years
SB03	See Figure 51	15,452.4	Stream in second growth floodplain forest and degraded wetland. Exhibiting low channelization, moderate levels of erosion, and average ecological condition.	Design and implement a project to remove invasives and restore riparian buffer with native vegetation; maintain for three years to ensure establishment.	1,446	1,514	5,137	Medium	Private Ownership / Vulcan Materials	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$7.0M to design and construct. $532K to implement three year M&M.	5-15 Years
SB04	See Figure 51	17,606.0	Stream in mesic and dry mesic woodland managed by DCFPD. Stream exhibiting moderate channelization, moderate levels of erosion, and good ecological condition.	Design and implement a project to manage and maintain riparian area.	954	967	2,356	Medium	Private Owner / DCFPD	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$7.9M to design and construct. $606K to implement three year M&M.	5-15 Years
SB08	See Figure 51	9,929.6	Stream in second narrow buffer of second growth mesic woodland through highly farmed land. Exhibiting moderate channelization, moderate levels of erosion, and poor ecological condition.	Design, Permit, and implement a project to remove invasives, restore riparian buffer with native vegetation and break berms to reconnect floodplain; maintain for three years to ensure establishment.	857	869	2,080	Critical Area/ High	Private Owner / DCFPD	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$4.5M to design and construct. $342K to implement three year M&M.	1-10 Years
SB09	See Figure 51	14,076.9	Stream in wide floodplain forest with generally intact floodplain. Exhibiting low channelization, low levels of erosion, and good ecological condition.	Design and implement a project to manage and maintain riparian area.	223	248	1,247	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$6.3M to design and construct. $485K to implement three year M&M.	10-20+ Years
SB10	See Figure 51	13,650.5	Stream in floodplain forest, good condition wetland. Exhibiting low channelization, low levels of erosion, and average ecological condition.	Design, Permit, and implement a project to remove invasives, restore riparian buffer with native vegetation and reconnect floodplain at PWR 38E; maintain for three years to ensure establishment.	297	313	1,092	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$6.1M to design and construct. $470K to implement three year M&M.	5-15 Years
SB11	See Figure 51	12,561.9	Stream in wide floodplain forest on south side with excellent connection to PWR 24A and 24B. Exhibiting low channelization, Moderate levels of erosion, and average ecological condition.	Design, Permit, and implement a project to remove invasives, restore riparian buffer with native vegetation and break berms to reconnect floodplain at PWR 24A and 24B; maintain for three years to ensure establishment.	1,098	1,118	2,850	Medium	Private Owner / IDNR / DCFPD	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$5.7M to design and construct. $433K to implement three year M&M.	5-15 Years
SBT01	See Figure 51	10,952.4	Stream in partially second growth trees and shrubs and vegetated grass waterway. Exhibiting high channelization, moderate levels of erosion, and poor ecological condition.	Design and implement a project to manage and maintain riparian area.	533	567	2,176	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$4.9M to design and construct. $377K to implement three year M&M.	10-20+ Years

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SBT02	See Figure 51	7,655.9	Stream in narrow second growth trees and shrubs. Exhibiting moderate channelization, moderate levels of erosion, and poor ecological condition	Design, permit, and implement a project to pull back banks, increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	383	411	1,698	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$3.4M to design and construct. $264K to implement three year M&M.	5-15 Years
SBT03A	See Figure 51	6,426.4	Stream in naturally meandering channel through average quality mesic woodland. Exhibiting low channelization, low levels of erosion, and average ecological condition.	Design and implement a project to remove invasives and restore riparian buffer with native vegetation and. Regrade banks, naturalize channel, install pools and riffles, and restore buffer; maintain for three years to ensure establishment.	857	869	2,124	Critical Area/ High	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.9M to design and construct. $221K to implement three year M&M.	1-10 Years
SBT03R1	See Figure 51	5,963.6	Steam in narrow agriculture buffer dominated comprised of second growth trees and old field vegetation. Exhibiting high channelization, moderate levels of erosion, and poor ecological condition.	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	285	302	1,105	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.7M to design and construct. $205K to implement three year M&M.	5-15 Years
SBT03R2	See Figure 51	7,172.0	Buffer Mesic woodland, naturally meandering channel through woodland. Stream exhibiting low channelization, severe levels of erosion, and average ecological condition.	Design and implement a project to remove invasives and restore riparian buffer with native vegetation and. Regrade banks, naturalize channel, install pools and riffles, and restore buffer; maintain for three years to ensure establishment.	953	966	2,313	Critical Area/ High	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$3.2M to design and construct. $247K to implement three year M&M.	1-10 Years
SBT04R1	See Figure 51	2,877.1	Buffer very narrow second growth trees and shrubs, old field veg, and turf grass. Stream exhibiting high channelization, low levels of erosion, and poor ecological condition.	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	32	49	371	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$1.3M to design and construct. $99K to implement three year M&M.	5-15 Years
SBT04R2	See Figure 51	9,963.4	Upstream buffer is mesic woodland, while downstream is remnant oak savanna with mix turf and some prairie conversion. Stream exhibiting low channelization, severe levels of erosion, and average ecological condition.	Design and implement a project to remove invasives and restore riparian buffer with native vegetation and. Regrade banks, naturalize channel, install pools and riffles, and restore buffer; maintain for three years to ensure establishment.	1,319	1,335	3,131	Critical Area/ High	Private Owner / DCFPD	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$4.5M to design and construct. $343K to implement three year M&M.	1-10 Years
SBT06	See Figure 51	4,054.0	Stream in narrow buffer made of old agriculture vegetation. Exhibiting high channelization, low levels of erosion, and poor ecological condition.	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	29	32	194	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$1.8M to design and construct. $140K to implement three year M&M.	5-15 Years
SBT09R1	See Figure 51	7,427.3	Buffer narrow second growth trees, shrubs, and old field vegetation. Stream exhibiting high channelization, low levels of erosion, and poor ecological condition.	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment.	110	149	1,103	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$3.3M to design and construct. $256K to implement three year M&M.	5-15 Years

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SBT09R2	See Figure 51	5,939.7	Stream in average quality wide mesic woodland. Exhibiting low channelization, moderate levels of erosion, and average ecological condition.	Design, permit, and implement a project to remove invasives and restore riparian buffer with native vegetation and. Regrade banks, naturalize channel, install pools and riffles, remove weir, and restore buffer; maintain for three years to ensure establishment.	215	237	877	Critical Area/ High	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.7M to design and construct. $205K to implement three year M&M.	1-10 Years
SBT10A	See Figure 51	4,050.6	Grassy waterway through agriculture. Stream exhibiting high channelization, low levels of erosion, and poor ecological condition.	Design and implement a project to manage and maintain riparian area.	39	44	235	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$1.8M to design and construct. $139K to implement three year M&M.	10-20+ Years
SBT10R1	See Figure 51	6,404.9	Grassy waterway through agriculture. Stream exhibiting high channelization, low levels of erosion, and poor ecological condition.	Design and implement a project to manage and maintain riparian area.	130	161	1,295	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.9M to design and construct. $221K to implement three year M&M.	10-20+ Years
SBT10R2	See Figure 51	12,530.5	Grassy waterway through agriculture with CRP tree plantings. Stream exhibiting high channelization, low levels of erosion, and poor ecological condition.	Design and implement a project to manage and maintain riparian area.	170	206	1,537	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$5.6M to design and construct. $431K to implement three year M&M.	10-20+ Years
SBT10R3	See Figure 51	8,737.8	Grassy waterway through agriculture with Second growth trees. Stream exhibiting moderate channelization, moderate levels of erosion, and average ecological condition.	Design and implement a project to remove invasives and restore riparian buffer with native vegetation and. Regrade banks, naturalize channel, install pools and riffles, and restore buffer; maintain for three years to ensure establishment.	527	559	2,100	Critical Area/ High	Private Owner / DCFPD	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$3.9M to design and construct. $301K to implement three year M&M.	1-10 Years
SBT11	See Figure 51	8,381.5	Buffer is a narrow comprised of old field vegitatoin through agriculture. Stream exhibiting high channelization, low levels of erosion, and poor ecological condition.	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment.	99	117	788	Medium	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$3.8M to design and construct. $289K to implement three year M&M.	5-15 Years
SBT13R1	See Figure 51	7,110.8	Immediate buffer is degraded riparian vegetation, beyond is previously restored prairie. Stream exhibiting low channelization, severe levels of erosion, and good ecological condition.	Design and implement a project to remove invasives and restore riparian buffer with native vegetation and. Regrade banks, naturalize channel, install pools and riffles, and restore buffer; maintain for three years to ensure establishment.	1,171	1,182	2,699	Critical Area/ High	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$3.2M to design and construct. $245K to implement three year M&M.	1-10 Years
SBT13R2	See Figure 51	12,067.6	Narrow buffer with old field vegetation and scattered second growth trees and shrubs. Stream exhibiting high channelization, moderate levels of erosion, and poor ecological condition.	Design and implement a project to manage and maintain riparian area.	561	586	1,945	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$5.4M to design and construct. $416K to implement three year M&M.	10-20+ Years
WETLAND RESTORATION RECOMMENDATIONS (See Figure 53). Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.												
15A	See Figure 53	37.7	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	10	19	201	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$565K to design and construct restoration.	5-15 Years

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18A	See Figure 53	30.7	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	4	7	76	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$460K to design and construct restoration.	5-15 Years
19A	See Figure 53	300.1	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary, reconnect floodplain, and revegetate with native vegetation/seed; maintain for three years until established.	29	54	576	Critical Area/ High	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$3M to design and construct restoration.	1-10 Years
22A	See Figure 53	62.6	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	7	14	146	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$626K to design and construct restoration.	5-15 Years
24A	See Figure 53	70.5	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary, reconnect floodplain, and revegetate with native vegetation/seed; maintain for three years until established.	9	17	180	Critical Area/ High	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$705K to design and construct restoration.	1-10 Years
24B	See Figure 53	69.4	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary, reconnect floodplain, and revegetate with native vegetation/seed; maintain for three years until established.	7	13	135	Critical Area/ High	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$694K to design and construct restoration.	1-10 Years
27A	See Figure 53	186.1	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary, reconnect floodplain, and revegetate with native vegetation/seed; maintain for three years until established.	17	32	343	Critical Area/ High	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$1.9M to design and construct restoration.	1-10 Years
30B	See Figure 53	22.5	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	4	7	73	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$338K to design and construct restoration.	5-15 Years
30C	See Figure 53	35.7	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary, reconnect floodplain, and revegetate with native vegetation/seed; maintain for three years until established.	3	6	64	Critical Area/ High	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$535K to design and construct restoration.	1-10 Years
32A	See Figure 53	60.5	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary, reconnect floodplain, and revegetate with native vegetation/seed; maintain for three years until established.	6	11	121	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$605K to design and construct restoration.	5-15 Years
34B	See Figure 53	20.6	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	4	7	72	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$309K to design and construct restoration.	5-15 Years

ID#	Location	Units (Acres or Linear Feet)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Owner & Responsbile Entity	Sources of Technical Assistance	Cost Estimate	Implementation Scheudle (Years)
					TSS (tons /yr)	TP (lbs/yr)	TN (lbs/yr)					
35A	See Figure 53	677.7	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	68	127	1,357	Critical Area/ High	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$6.8M to design and construct restoration.	1-10 Years
36A	See Figure 53	184.6	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	27	26	275	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$1.8M to design and construct restoration.	5-15 Years
38E	See Figure 53	70.3	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary, reconnect floodplain, and revegetate with native vegetation/seed; maintain for three years until established.	7	13	142	Critical Area/ High	Private Owner & DCFPD	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$703K to design and construct restoration.	1-10 Years
46A	See Figure 53	110.8	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary, reconnect floodplain, and revegetate with native vegetation/seed; maintain for three years until established.	11	20	215	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$1.1M to design and construct restoration.	5-15 Years
47A	See Figure 53	33.3	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	6	11	114	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$500K to design and construct restoration.	5-15 Years
69A	See Figure 53	103.2	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	13	25	266	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$1M to design and construct restoration.	5-15 Years
75A	See Figure 53	73.5	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	9	17	177	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$735K to design and construct restoration.	5-15 Years
79A	See Figure 53	32.9	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	3	5	56	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$493K to design and construct restoration.	5-15 Years
79B	See Figure 53	22.5	Farmed and/or tile-drained hydric soils confirmed in field as good candidate sight for potential wetland restoration	Design, permit, and construct a project to stop farming hydric soils, restore hydrology by breaking drain tiles if necessary and revegetate with native vegetation/seed; maintain for three years until established.	2	3	31	Medium	Private Owner	USACE, IEPA, DeKalb County, Environmental Consultant/ Contractor	$337K to design and construct restoration.	5-15 Years

ID#	Location	Units (Acres or Linear Feet)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Owner & Responsbile Entity	Sources of Technical Assistance	Cost Estimate	Implementation Scheudle (Years)
					TSS (tons /yr)	TP (lbs/yr)	TN (lbs/yr)					
DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 52). Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is relatively low while financial assistance needs are moderate. Private landowners will need the greatest assistance.												
43A	See Figure 52	2.1	Wetland bottom basin strip invasives present with mowed turf slopes in average ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish	13	22	141	Medium	Private Owner / Genoa-Kingston High School	Ecological Consultant/ Contractor	$43K to design and construct. $7K to implement three year M&M.	5-15 Years
43B	See Figure 52	4.1	Wetland bottom basin with naturalized side slopes, invasives present in average ecological condition	Design and implement a project to remove invasives, plant sides slopes and buffer with natives and maintain for three years to establish.	15	25	158	Medium	Private Owner / Genoa-Kingston High School	Ecological Consultant/ Contractor	$82K to design and construct. $14K to implement three year M&M.	5-15 Years
44C	See Figure 52	2.3	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	5	22	132	Critical Area/ High	Private Owner	Ecological Consultant/ Contractor	$46K to design and construct. $8K to implement three year M&M.	1-10 Years
44D	See Figure 52	1.7	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	4	16	93	Medium	Private Owner	Ecological Consultant/ Contractor	$34K to design and construct. $6K to implement three year M&M.	5-15 Years
44E	See Figure 52	12.4	Wet-bottomed basin with 4 to 1 mowed turf side slopes in Poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish	6	25	147	Critical Area/ High	Private Owner / GTPD District / HOA	Ecological Consultant/ Contractor	$199K to design and construct. $31K to implement three year M&M.	1-10 Years
44F	See Figure 52	10.1	Wet-bottomed basin with 4 to 1 mowed turf side slopes in Poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish	5	19	115	Critical Area/ High	Private Owner / GTPD District	Ecological Consultant/ Contractor	$162K to design and construct. $25K to implement three year M&M.	1-10 Years
44G	See Figure 52	3.7	Wet-bottomed basin with 4 to 1 mowed turf side slopes in Poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish	6	26	152	Critical Area/ High	Private Owner / HOA	Ecological Consultant/ Contractor	$75K to design and construct. $13K to implement three year M&M.	1-10 Years
45B	See Figure 52	1.3	Dry-bottomed mowed turf & swale grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	1	1	16	Medium	Private Owner	Ecological Consultant/ Contractor	$26K to design and construct. $4K to implement three year M&M.	5-15 Years
45C	See Figure 52	0.4	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	2	4	52	Medium	Private Owner	Ecological Consultant/ Contractor	$20K to design and construct. $3K to implement three year M&M.	5-15 Years
45D	See Figure 52	0.5	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	5	10	124	Medium	Private Owner	Ecological Consultant/ Contractor	$20K to design and construct. $3K to implement three year M&M.	5-15 Years
45E	See Figure 52	0.2	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	2	4	49	Medium	Private Owner	Ecological Consultant/ Contractor	$20K to design and construct. $3K to implement three year M&M.	5-15 Years
45F	See Figure 52	0.6	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish; Add signage for education.	4	8	48	Critical Area/ High	Private Owner	Ecological Consultant/ Contractor	$20K to design and construct. $3K to implement three year M&M.	1-10 Years
45J	See Figure 52	1.0	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	3	5	62	Critical Area/ High	Private Owner	Ecological Consultant/ Contractor	$20K to design and construct. $3K to implement three year M&M.	1-10 Years
56A	See Figure 52	0.9	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	2	10	61	Medium	Private Owner / HOA	Ecological Consultant/ Contractor	$20K to design and construct. $3K to implement three year M&M.	5-15 Years
56B	See Figure 52	2.0	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	3	14	86	Medium	Private Owner / HOA	Ecological Consultant/ Contractor	$41K to design and construct. $7K to implement three year M&M.	5-15 Years

ID#	Location	Units (Acres or Linear Feet)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Owner & Responsbile Entity	Sources of Technical Assistance	Cost Estimate	Implementation Scheudle (Years)
					TSS (tons /yr)	TP (lbs/yr)	TN (lbs/yr)					
56C	See Figure 52	2.3	Wetland bottom basin with naturalized side slopes, invasives present in average ecological condition.	Design and implement a project to maintain and remove invasives for three years to establish	4	17	99	Medium	Private Owner / HOA	Ecological Consultant/ Contractor	$47K to design and construct. $8K to implement three year M&M.	5-15 Years
57A	See Figure 52	0.9	Wetland bottom basin with naturalized side slopes, invasives present in average ecological condition.	Design and implement a project to maintain and remove invasives for three years to establish	3	12	69	Medium	Private Owner	Ecological Consultant/ Contractor	$20K to design and construct. $3K to implement three year M&M.	5-15 Years
57B	See Figure 52	2.5	Wetland bottom basin with naturalized side slopes, invasives present in average ecological condition.	Design and implement a project to maintain and remove invasives for three years to establish	2	8	50	Medium	Private Owner/ HOA	Ecological Consultant/ Contractor	$50K to design and construct. $9K to implement three year M&M.	5-15 Years
57C	See Figure 52	3.6	Wetland bottom basin with naturalized side slopes, invasives present in average ecological condition.	Design and implement a project to maintain and remove invasives for three years to establish	2	9	56	Medium	Private Owner/ HOA	Ecological Consultant/ Contractor	$72K to design and construct. $13K to implement three year M&M.	5-15 Years
OTHER MANAGEMENT MEASURES (SEE FIGURE 54). Technical and Financial Assistance Needs: Technical and financial assistance needed to implement these projects varies depending on complexity.												
44A	See Figure 54	0.2	Eroded turf swale that drains multi-family apartments.	Design and implement a project to retrofit to bioinfiltration swales, maintain for three years.	0	1	7	Critical Area/ High	Private Owner	Ecological Consultant/ Contractor, Engineer	$2K to design and construct restoration.	1-10 Years
44B	See Figure 54	2.2	Lot comprised of old growth oaks with turf understory.	Design and implement a project to remove turf, plant with natives and maintain for three years to establish savanna understory.	5	7	107	Medium	Private Owner	Ecological Consultant/ Contractor	$34K to design and construct restoration.	5-15 Years
44H	See Figure 54	1.1	Large center of cul de sac on Stone Circle comprised of turf grass area.	Design and implement a project to remove turf, install low grow forb-heavy prairie with trails and signs, and maintain for three years to establish. savanna understory.	1	3	19	Medium	Private Owner/ HOA	Ecological Consultant/ Contractor	$16K to design and construct restoration.	5-15 Years
45A	See Figure 54	1.2	Mowed dry turf swale that wraps around building property.	Design and implement a project to remove turf, naturalize, spot stabilization, install signage, and maintain for three years.	1	2	29	Critical Area/ High	Private Owner	Ecological Consultant/ Contractor, Engineer	$18K to design and construct restoration.	1-10 Years
45G	See Figure 54	0.1	Mowed dry turf depressional area	Design and implement a project to remove turf and convert to a rain garden.	0	0	5	Medium	Private Owner	Ecological Consultant/ Contractor, Engineer	$5K to design and construct restoration.	5-15 Years
45H	See Figure 54	0.2	Paved alley with concrete channel in center.	Design and implement a project to retrofit to a green alley.	1	1	27	Critical Area/ High	Private Owner	Engineer, DeKalb County	$13M to design and construct restoration	1-10 Years
45I	See Figure 54	1.1	Paved alley with concrete channel in center.	Design and implement a project to retrofit to a green alley.	1	3	28	Medium	Private Owner	Engineer, DeKalb County	$92M to design and construct restoration	5-15 Years
STREAMBANK & RIPARIAN AREA RESTORATION RECOMMENDATIONS (See Figure 51). Technical and Financial Assistance Needs: Stream restorations are complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex in areas that flow through several governing bodies or multiple private residences. Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris.												
SB05	See Figure 51	16,446.8	Stream in second growth floodplain forest and degraded wetland. Exhibiting low channelization, moderate levels of erosion, and average ecological condition.	Design, Permit, and implement a project to remove invasives, restore riparian buffer with native vegetation and break berms to reconnect floodplain; maintain for three years to ensure establishment.	1,621	1,766	4,524	Critical Area/ High	Private Owner / GTPD District	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$7.4M to design and construct. $566K to implement three year M&M.	1-10 Years
SBT05	See Figure 51	3,430.4	Stream in narrow channel and buffer dominated by second growth trees and shrubs bordered by turf and residential. Exhibiting high channelization, moderate levels of erosion, and poor ecological condition.	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	132	187	733	Medium	Private Owner / GTPD District / HOA	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$1.5M to design and construct. $118K to implement three year M&M.	5-15 Years

KINGSTON

ID#	Location	Units (Acres or Linear Feet)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Owner & Responsbile Entity	Sources of Technical Assistance	Cost Estimate	Implementation Scheudle (Years)
					TSS (tons /yr)	TP (lbs/yr)	TN (lbs/yr)					
DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 52). Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is relatively low while financial assistance needs are moderate. Private landowners will need the greatest assistance.												
41A	See Figure 52	1.3	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	8	14	102	Medium	Private Owner	Ecological Consultant/ Contractor	$25K to design and construct. $4K to implement three year M&M.	5-15 Years
42B	See Figure 52	3.8	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	10	25	148	Medium	Private Owner/ HOA	Ecological Consultant/ Contractor	$76K to design and construct. $13K to implement three year M&M.	5-15 Years
OTHER MANAGEMENT MEASURES (SEE FIGURE 54). Technical and Financial Assistance Needs: Technical and financial assistance needed to implement these projects varies depending on complexity.												
30A	See Figure 54	43.8	Mowed turf swale in unsewered subdivision with turf roadside; spot erosion possible at culvert.	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years.	2	8	54	Medium	Private Owner / HOA	Ecological Consultant/ Contractor, Engineer	$22K to design and construct restoration.	5-15 Years
41C	See Figure 54	81.9	Mowed turf swale in unsewered subdivision with turf roadside; spot erosion possible at culvert.	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years.	5	15	102	Medium	Private Owner / HOA	Ecological Consultant/ Contractor, Engineer	$36K to design and construct restoration.	5-15 Years
42A	See Figure 54	16.3	Mowed turf swale in unsewered subdivision with turf roadside; spot erosion possible at culvert.	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years.	1	3	20	Medium	Private Owner / HOA	Ecological Consultant/ Contractor, Engineer	$43K to design and construct restoration.	5-15 Years
STREAMBANK & RIPARIAN AREA RESTORATION RECOMMENDATIONS (See Figure 51). Technical and Financial Assistance Needs: Stream restorations are complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex in areas that flow through several governing bodies or multiple private residences. Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris.												
SB06	See Figure 51	11,725.8	No existing floodplain, stream flows through valley with steep slopes made of mesic woodland. Stream exhibiting low channelization, moderate levels of erosion, and average ecological condition.	Design and implement a project to manage and maintain and remove invasives from riparian area.	1,270	1,304	3,169	Medium	Private Owner / Kingston Township	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$5.3M to design and construct. $404K to implement three year M&M.	5-15 Years
SB07	See Figure 51	10,383.9	Mix of floodplain forest and mesic woodland with second growth trees and shrubs. Stream exhibiting low channelization, moderate levels of erosion, and average ecological condition.	Design and implement a project to remove invasives and restore riparian buffer with native vegetation; maintain for three years to ensure establishment.	680	712	1,797	Low	Private Owner / Kingston Township	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$4.7M to design and construct. $358K to implement three year M&M.	10-20+ Years
SBT07	See Figure 51	1,696.4	Stream in very narrow dominated by old field vegetation and turf within residential area. Exhibiting high channelization, low levels of erosion, and poor ecological condition.	Design and implement a project to increase buffer width to 50 feet on either side of stream, remove invasives/existing as necessary, and restore with native vegetation; maintain for three years to ensure establishment	28	55	288	Low	Private Owner / Kingston Township	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$763K to design and construct. $58K to implement three year M&M.	10-20+ Years
SBT08	See Figure 51	6,528.9	Buffer mostly second growth trees and shrubs. Stream exhibiting low channelization, moderate levels of erosion, and average ecological condition.	Design and implement a project to remove invasives and restore riparian buffer with native vegetation and. Regrade banks, naturalize channel, install pools and riffles, and restore buffer; maintain for three years to ensure establishment.	335	380	1,632	Critical Area/ High	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.9M to design and construct. $225K to implement three year M&M.	1-10 Years

KIRKLAND

ID#	Location	Units (Acres or Linear Feet)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency			Priority	Owner & Responsbile Entity	Sources of Technical Assistance	Cost Estimate	Implementation Scheudle (Years)
					TSS (tons /yr)	TP (lbs/yr)	TN (lbs/yr)					
DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 52). Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is relatively low while financial assistance needs are moderate. Private landowners will need the greatest assistance.												
38B	See Figure 52	1.4	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	15	26	333	Critical Area/ High	Private Owner	Ecological Consultant/ Contractor	$29K to design and construct. $5K to implement three year M&M.	1-10 Years
38C	See Figure 52	2.4	Wetland bottom basin with naturalized side slopes, invasives present in average ecological condition.	Design and implement a project to remove invasives, plant sides slopes and buffer with natives and maintain for three years to establish.	2	8	48	Medium	Private Owner / HOA	Ecological Consultant/ Contractor	$47K to design and construct. $8K to implement three year M&M.	5-15 Years
38D	See Figure 52	2.3	Wetland bottom basin with naturalized side slopes, invasives present in average ecological condition.	Design and implement a project to remove invasives, plant sides slopes and buffer with natives and maintain for three years to establish.	2	7	43	Medium	Private Owner / HOA	Ecological Consultant/ Contractor	$45K to design and construct. $8K to implement three year M&M.	5-15 Years
50A	See Figure 52	7.2	Dry-bottomed mowed turf grass basin in poor ecological condition.	Design and implement a project to remove turf, plant sides slopes and buffer with natives and maintain for three years to establish.	10	40	240	Medium	Private Owner/ HOA	Ecological Consultant/ Contractor	$129K to design and construct. $22K to implement three year M&M.	5-15 Years
OTHER MANAGEMENT MEASURES (SEE FIGURE 54). Technical and Financial Assistance Needs: Technical and financial assistance needed to implement these projects varies depending on complexity.												
37A	See Figure 54	80.9	Mowed turf swale in unsewered subdivision with turf roadside; spot erosion possible at culvert.	Design and implement a project to remove turf, naturalize, spot stabilization, maintain for three years.	5	15	100	Medium	Private Owner / HOA	Ecological Consultant/ Contractor, Engineer	$55K to design and construct restoration.	5-15 Years
STREAMBANK & RIPARIAN AREA RESTORATION RECOMMENDATIONS (See Figure 51). Technical and Financial Assistance Needs: Stream restorations are complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex in areas that flow through several governing bodies or multiple private residences. Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris.												
BR02	See Figure 51	9,174.6	Narrow buffer through residential area. Stream exhibiting high channelization, low levels of erosion and poor overall riparian area condition.	Design and implement a project to remove invasives and restore riparian buffer with native vegetation; maintain for three years to ensure establishment.	116	197	1,107	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$4.1M to design and construct. $316K to implement three year M&M.	10-20+ Years
SBT12	See Figure 51	5,729.0	Upstream buffer is narrow grass waterway with old field vegetation with second growth trees and shrubs downstream. Stream exhibiting high channelization, low levels of erosion, and poor ecological condition.	Design and implement a project to manage and maintain riparian area.	94	119	696	Low	Private Owner	Environmental Consultant/ Contractor, DeKalb County, DCSWCD	$2.6M to design and construct. $197K to implement three year M&M.	10-20+ Years



5 Implementation Strategy

5.1 Plan Implementation

Plan Implementation Roles and Coordination Responsibilities

Identification of responsible entities for implementation of Management Measure recommendations was first mentioned in the Action Plan section of this report. These entities are key stakeholders that will be responsible in some way for sharing the responsibility required to implement the Watershed-Based Plan (WBP). However, no single stakeholder has the financial or technical resources to implement the plan alone. Rather, it will require working together and using the strengths of individual stakeholders to successfully implement this plan. Key stakeholders are identified in the Section 4.0 Action Plan, Table 36.

There are several important first steps that the Central South Branch Kishwaukee River (CSBKR) Watershed Steering Committee partners will need to accomplish prior to beginning plan implementation. Watershed partners are encouraged to adopt and/or support (via a resolution) the CSBKR WBP. The partners will need to extend the Steering Committee or recruit "champions" within each municipality and other stakeholder groups to form a Watershed Implementation Committee that actively implements the Watershed-Based Plan and conducts progress evaluations. The watershed partners may also need to hire and fund a Watershed Implementation Coordinator or find an employee internally to follow through on plan implementation.

Early in the plan implementation process, the Steering Committee should assign or hire a Watershed Implementation Coordinator to call meetings and update the committee on plan implementation progress by way of the Report Cards (Section 5.3.2). If needed, adaptive management should be implemented accordingly by referencing the adaptive management recommendations on each Report Card then developing a strategy to either change the milestone(s) or decide how to implement projects or actions to achieve the milestone(s).

Report Cards can be evaluated at any time. However, it is recommended that they be evaluated at least every five years

to determine if sufficient progress is being made toward achieving milestones or if adaptive management is needed.

Implementation Schedule

The Watershed Steering Committee should meet at least quarterly after the plan is completed and approved to guide the implementation of the CSBKR WBP. The development of an implementation schedule is important in the watershed planning process because it provides a timeline for when each recommended Management Measure should be implemented in relation to others. High Priority Critical Area projects, for example, are generally scheduled for implementation in the short term (1-10 years). A schedule also helps organize project implementation evenly over a given time period, allowing reasonable time availability for developing funding sources and opportunities.

For this plan, each Site-Specific Management Measure recommendation located in the Action Plan (Section 4.2.5, Table 40) contains a column with a recommended Implementation Schedule based on the short term (1-10 years) for High Priority Critical Areas and 10-20+ years for medium and low priority project recommendations. Other recommendations such as maintenance activities have ongoing or as needed schedules. Some projects that are high priority could be recommended for long term implementation based on selected practices, available funds, technical assistance needs, and time frame. In addition, the Information & Education plan (Section 5.2) and the Monitoring Plan (Section 5.3) are designed to be conducted annually and evaluated at least every five years to determine if progress is being made toward achieving plan goals and objectives.

Funding

Opportunities to secure funds for watershed improvement projects are widespread due to the variety and diversity of Management Measure recommendations found in the Action Plan. Public and private organizations that administer various conservation and environmental programs are often eager to form partnerships and leverage time and funds for land preservation, restoration, and environmental education. In this way, funds invested by partners in CSBKR watershed can be doubled or tripled, although actual dollar amounts are difficult to measure.

Funds generally fall into two relatively distinct categories. The first includes existing grant programs, funded by a public agency or by other sources. These funds are typically awarded following a competitive application process. The IEPA Nonpoint Source Management Program (Section 319 Grants) is an example: an applicant will submit a grant application to the program, and, if the proposed project meets the required criteria and if the funds appropriated have not been exhausted, a grant may be awarded.

The second category, one that can provide greater leverage, might be called "money to be found." The key to this money is to recognize that any given project may have multiple benefits. It is important to explore all the potential project benefits from the perspective of potential partners and to then engage those partners. Partners may wish to become involved because they believe the project will achieve their objectives, even if they are unaware of the specific objectives of the Watershed-Based Plan.

It is not uncommon for an exciting and innovative project to attract additional funds that can be allocated at the discretion of project partners. When representatives of interested organizations gather to talk about a proposed project, new partnerships can form. New partners might be willing to commit discretionary funds simply because the proposed project is attractive, is a priority, might buy them political capital, or will help the agency achieve its mission.

Public and private organizations that administer various conservation and environmental programs are often eager to form partnerships and leverage funds to meet shared goals. Baxter & Woodman reviewed state and federal opportunities in late 2024, but it is important to note that grant programs are subject to change and will need to be updated at least annually. Current grant opportunities that may be applicable to CSBKR project recommendations are summarized in the following categories:

- Water Quality
- Restoration
- Agriculture
- Flooding & Stormwater Management
- Recreation and Trails
- Wildlife

Water Quality

Illinois Environmental Protection Agency

IEPA's *Non-Point Source Management Program (Section 319)* grants are given each year to local units of government and other organizations to protect water quality in Illinois. Projects must address water quality issues relating directly to nonpoint source pollution. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands and even our underground sources of drinking water. It has been determined that over 60% of the (national) documented water pollution problem can be traced to nonpoint sources.

The Section 319(h) Grant Program prioritizes Projects addressing Illinois waters for which NPS pollution is a significant cause of water quality impairment. Funds can be used for the development, update, and implementation of watershed-based management plans including the development of education programs and installation of BMPs. Eligible restoration projects include wetlands, streams, lakes, agricultural, urban, resource extraction, riparian zone, education and outreach activities, and monitoring for environmental and/or social indicators.

Section 319 typically offers up to 60% of approved costs, with an application deadline in August. Section 319(h) Grant Program funds are available to any entity that has legal status to accept funds from the State of Illinois. This can include local watershed groups; land conservancies or trusts; public and private profit and nonprofit organizations and institutions; units of county, municipal, township, and state governments; universities and colleges; park districts and other local land managing agencies; soil and water conservation districts; conservation organizations; and others. For more information, visit https://epa.illinois.gov/topics/water-quality/watershed-



management/nonpoint-sources/grants.html.

IEPA's *Wastewater/Stormwater and Drinking Water Loans* program offers low-interest loans through the State Revolving Fund (SRF). The SRF includes two loan programs: the Water Pollution Control Loan Program (WPCLP) which funds both wastewater and storm water projects, and the Public Water Supply Loan Program (PWSLP) for drinking water projects. These programs are annually the recipients of federal capitalization funding which is combined with state matching funds, interest earnings, repayment money, and the sale of bonds to form a source of financing for infrastructure projects.

Eligible projects include new drinking water or wastewater infrastructure construction; upgrading or rehabilitating existing infrastructure; storm water-related projects that benefit water quality; and a variety of other projects that protect or improve the quality of Illinois's rivers, streams, and lakes. The State Revolving Fund (SRF) yearly cycle is based on the State of Illinois fiscal year, which starts July 1st and ends June 30th. For more information, visit https://epa.illinois.gov/topics/grants-loans/state-revolving-fund.html.

Restoration

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers *Continuing Authorities Program Section 206* gives the Corps authority to conduct an aquatic ecosystem restoration and protection. Such projects generally include manipulation of the hydrology in and along bodies of water, including wetlands and riparian areas. A project is adopted for construction only after a detailed investigation determines that the project will improve the quality of the environment and is in the best interest of the public. Federal funds may be used for feasibility studies, planning, engineering, construction, supervision, and administration.

The initial study is 100% federally funded up to $100,000. All planning costs after the first $100,000 are cost shared 50/50. All design and construction costs are cost shared 65% Federal and 35% non-Federal. The Federal cost limit is $10,000,000. For more information visit: https://www.mvr.usace.army.mil/Business-With-Us/Outreach-Customer-Service/Ecosystem-Restoration/Section-206.

The *Project Modification for Improvements to the Environment* program (Section 1135 of the Water Resources Development Act of 1986, as amended) authorizes the U.S. Army Corps of Engineers to assist in the restoration of degraded ecosystems through the modification of Corps of Engineers' structures, operations, or implementation of measures in affected areas. The initial study is 100% federally funded up to $100,000. All planning costs after the first $100,000 are cost shared 50/50. All design and construction costs are cost shared 75% Federal and 25% non-Federal. The Federal cost limit is $5,000,000. For more information, visit https://www.mvr.usace.army.mil/Business-With-Us/Outreach-Customer-Service/Ecosystem-Restoration/Section-1135.

U.S Fish and Wildlife Service

The U.S. Fish and Wildlife Service's *North American Wetlands Conservation Act* U.S. Standard grants are competitive, matching grants that support public-private partnerships carrying out projects in the U.S. that involve long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats for the benefit of all wetlands-associated migratory birds. Partners must match their grants request at no less than a 1-to-1 ratio. For example, partners requesting a $1 million grant would need to also contribute at least $1 million in partner funds (from nonfederal sources) towards the project. Each grant and match dollar, except for indirect costs, must be linked to an acre acquired, restored, enhanced, and/or established. For more information, visit https://www.fws.gov/service/north-american-wetlands-conservation-act-nawca-us-standard-grants.

The North American Wetlands Conservation Act (NAWCA) Small Grants program is like the US Standard grants program but is capped at $250,000 and proposals must be fore on-the-ground

projects and prioritizes projects focused on acquisition, restoration, enhancement or establishment activities. For more information, visit https://www.fws.gov/service/north-american-wetlands-conservation-act-nawca-us-small-grants.

U.S. Environmental Protection Agency
The EPA's *Wetlands Program Development Grant* (WPDG) gives eligible applicants an opportunity to conduct projects that promote the coordination and acceleration of research, investigations, experiments, training, demonstrations, surveys, and studies related to the cause and reduction of water pollution. The goal of the program is to help governmental entities build capacity to increase the quantity and quality of wetlands in the U.S. by conserving and restoring wetland acreage, improving wetland condition, and to use monitoring and assessment, voluntary protection, regulatory approaches, and/or wetland-specific water quality standards to achieve those goals. More information can be found at https://www.epa.gov/wetlands/wetland-program-development-grants-and-epa-wetlands-grant-coordinators.

U.S. Forest Service
The *Urban and Community Forestry Program* (UCF) of the U.S. Department of Agriculture's Forest Service is the only Federal program dedicated to growing and maintaining urban trees, forests, and green spaces. The U.S. Forest Service supplies technical aid to state forestry agencies, local and tribal governments, and the private sector to improve natural resource management of trees, forests, and open spaces in urban areas via this grant program. Funded projects can include tree-planting programs, tree inventories and management, invasive species removals, workforce development programs related to urban forestry, and urban agricultural programs. For more information visit https://www.fs.usda.gov/managing-land/urban-forests/ucf.

National Fish and Wildlife Foundation
The National Fish and Wildlife Foundation's *Five Star and Urban Waters Restoration Program* seeks to develop nationwide community stewardship of local natural resources, preserving these resources for future generations and enhancing habitat for local wildlife. Grants seek to address water quality issues in priority watersheds, such as erosion due to unstable streambanks, pollution from stormwater runoff, and degraded shorelines caused by development. Its goal is to meet the conservation needs of important species and habitats, providing measurable and meaningful conservation and educational outcomes.

The program requires the establishment and/or enhancement of diverse partnerships and an education/outreach component that will help shape and sustain behavior to achieve conservation goals. Funding priorities for this program include on-the-ground wetland, riparian, in-stream and/or coastal habitat restoration; meaningful education and training activities through community outreach and curriculum integration; measurable ecological, educational, and community benefits; and fostering partnerships. Five Star projects should engage a diverse group of community partners to achieve ecological and educational outcomes. More information can be found at https://www.nfwf.org/programs/five-star-and-urban-waters-restoration-grant-program.

Illinois Environmental Protection Agency
The *Streambank Cleanup and Lakeshore Enhancement* (SCALE) program provides funds to assist groups that have established a recurring stream or lakeshore cleanup. Funds are typically used for safety attire, dumpster rentals, landfill tipping fees and promotional materials. Funds cannot be used for water quality monitoring, invasive species removal or food/drink. The program is currently undergoing changes and unavailable, but updates can be found at https://epa.illinois.gov/topics/water-quality/surface-water/scale.html.

Agriculture
National Fish & Wildlife Foundation
The *Conservation Partners Program* provides vital grant funding to support organizations that provide staff and technical assistance to private landowners to maximize the benefits of Farm Bill programs on working lands. Private landowners are stewards of more than two-thirds of our nation's land, including some of the most important fish and wildlife habitats in the United States. Every year, farmers, ranchers, and forest landowners voluntarily participate in federal Farm Bill conservation programs designed to address some of the nation's most pressing conservation issues.

The Conservation Partners Program awards competitive grants that accelerate the adoption of regenerative agriculture principles and conservation practices on private lands. Grant recipients provide technical assistance to landowners and operators to help them:

- Develop management plans,
- Design and implement best practices,
- Participate in Farm Bill programs, and
- Share their experiences and lessons learned.

Grants are geographically targeted to place expert staff where they can both fulfill unmet technical assistance needs and maximize the soil, water, and wildlife benefits of Farm Bill conservation programs. More information can be found at https://www.nfwf.org/programs/conservation-partners-program.

In partnership with the *Farmers for Soil Health* collaboration and with pending support from the U.S. Department of Agriculture's Partnerships for Climate Smart Commodities, the National Fish and Wildlife Foundation (NFWF) anticipates awarding competitive grants to accelerate the voluntary adoption of cover crops on corn and soybean farms in 20 states. Farmers for Soil Health is a collaboration of National Corn Growers Association, the United Soybean Board, the National Pork Board, and other partners, with a goal of encouraging farmers to expand their adoption of cover crops to 30 million acres nationwide by 2030.

As of the 2017 USDA Census, cover crops represented 15.4 million acres. Although corn and soybeans represent more than half of all U.S. row crop acres, at about 180 million acres, according to USDA's Ag Resource Management Survey, only about 5 percent of corn and 8 percent of soybean acres utilize cover crops. Cover crops are grown between harvested crops to protect soil from erosion, store nutrients, increase water infiltration, and improve soil structure. The conservation impact of cover cropping systems is significant—increased carbon sequestration, improved water quality, and even habitat benefits for pollinators

or other wildlife.

Farmers for Soil Health will accelerate long-term cover crop adoption by creating a platform to incentivize farmers through a marketplace that efficiently quantifies, verifies, and facilitates the sale of ecosystem benefits. FSH will create a new transition program that will build cover crop capacity nationwide. Through this funding opportunity, FSH will support and expand technical assistance, enrollment, and education programs in its targeted states. This funding opportunity is limited to the 20 states targeted in the Farmers for Soil Health Partnership: Delaware, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Minnesota, Missouri, Nebraska, New York, North Carolina, North Dakota, Ohio, Pennsylvania, South Dakota, Tennessee, Virginia, and Wisconsin. For more information and open grant opportunities, visit https://www.nfwf.org/programs/farmers-soil-health.

U.S. Department of Agriculture, Natural Resources Conservation Service

The *Agricultural Conservation Easement Program* (ACEP) protects the agricultural viability and related conservation values of eligible land by limiting nonagricultural uses which negatively affect agricultural uses and conservation values, protect grazing uses and related conservation values by restoring or conserving eligible grazing land, and protecting and restoring and enhancing wetlands on eligible land. ACEP provides financial and technical assistance to help conserve agricultural lands and restore wetlands. Under the Agricultural Land Easements (ALE) component, NRCS helps state and local governments, Indian tribes, and non-governmental organizations protect working agricultural lands and limit non-agricultural uses of the land. Under the Wetlands Reserve Easements (WRE) component, NRCS helps to restore, protect and enhance wetlands that have been altered for agriculture. For more information, visit https://www.nrcs.usda.gov/programs-initiatives/acep-agricultural-conservation-easement-program.

The *Conservation Stewardship Program* (CSP) helps build on existing conservation efforts while strengthening farm operations. CSP can help improve grazing conditions, increase crop resiliency, or develop wildlife habitat with a custom plan to meet those goals. The program can help identify natural resource problems in an operation and provide technical and financial assistance to solve those problems or attain higher stewardship levels in an environmentally beneficial and cost-effective manner. More information can be found at https://www.nrcs.usda.gov/programs-initiatives/csp-conservation-stewardship-program.

The *Environmental Quality Incentives Program* (EQIP) is NRCS' flagship conservation program that helps farmers, ranchers and forest landowners integrate conservation into working lands. EQIP provides technical and financial assistance to agricultural producers and forest landowners to address natural resource concerns, such as improved water and air quality, conserved ground and surface water, increased soil health, reduced soil erosion and sedimentation, improved or created wildlife habitat, and mitigation against drought and increasing weather volatility. NRCS works one-on-one with producers to develop a conservation plan that outlines conservation practices and activities to help solve on-farm resource issues. Producers implement practices and activities in their conservation plan that can lead to cleaner water and air, healthier soil and better wildlife habitat, all while improving their agricultural operations. EQIP helps producers make conservation work for them. Financial assistance for practices may be available through EQIP. Some producers may also qualify for advance payment. More information can be found by visiting https://www.nrcs.usda.gov/programs-initiatives/eqip-environmental-quality-incentives.

The *Regional Conservation Partnership Program* (RCPP) is a partner-driven approach to conservation that funds solutions to natural resource challenges on agricultural land. By leveraging collective resources and collaborating on common goals, RCPP demonstrates the power of public-private partnerships in delivering results for agriculture and conservation. RCPP projects fall under two different categories: RCPP Classic and RCPP Alternative Funding Arrangements (AFAs). RCPP Classic projects are implemented using NRCS contracts and easements with producers, landowners and communities, in collaboration with project partners. Through RCPP AFAs, NRCS provides funding to partners to support conservation activities with eligible producers and landowners on eligible land. RCPP AFA funding reimburses partners for conservation activities done for or on behalf of producers, landowners, or other entities. For more information, visit https://www.nrcs.usda.gov/programs-initiatives/rcpp-regional-conservation-partnership-program.

Flooding & Stormwater Management

Illinois Emergency Management Agency (IEMA)/Federal Emergency Management Agency (FEMA)

FEMA offers three grant programs via the Illinois Emergency Management Agency (IEMA) that could be used for flood-risk reduction projects: Flood Mitigation Assistance (FMA), Hazard Mitigation Grant Program (HMGP), and Building Resilient Infrastructure and Communities (BRIC).

Flood Mitigation Assistance (FMA) grants are available to implement measures to reduce or eliminate risk of severe, repetitive flood damage to buildings insured by the National Flood Insurance Program (NFIP). The program prioritized proposals that address community flood risk and seek to fund two types of community flood mitigation activities: Advance Assistance for flood mitigation design and development of community flood mitigation projects and Mitigation projects that address community flood risk to reduce NFIP flood claim payments.

The *Hazard Mitigation Grant Program* (HMGP) provides funding to state, local, tribal, and territorial governments so they can develop hazard mitigation plans and rebuild in a way that reduces or mitigates future disaster losses in their communities. This grant funding is available after a presidentially declared disaster.

Building Resilient Infrastructure and Communities (BRIC) supports states, local governments, tribes, and territories as they work to reduce hazard risk. The Building Resilient Infrastructure and Communities program aims to categorically shift the federal focus away

from reactive disaster spending and toward research-supported, proactive investment in community resilience. The program aims to support communities as they build capability and capacity, encourage innovation, and foster partnerships. Examples of BRIC projects are ones that demonstrate innovative approaches to partnerships, such as shared funding mechanisms, and/or project design.

For more information on these programs and current funding opportunities, visit https://iemaohs.illinois.gov/recovery/fundingopps.html.

United States Army Corps of Engineers (USACE)
Section 205 gives the Army Corps authority to develop and construct Small Flood Control Projects. The types of studies and projects are tailored to be site-specific, and projects can be flood risk management projects and non-structural measures. Typical flood risk management projects may include structural projects such as levees, floodwalls, impoundments, pumping stations, and channel modifications. Non-structural measures are activities such as flood proofing, relocation of structures, and flood warning and preparedness systems.

Before the Federal government can take part in implementing a flood risk management project, a planning study must be conducted to decide if the project is economically justified (benefits exceed the costs), technically feasible, and environmentally acceptable. Initial study is 100% federally funded up to $100,000. The remainder of the project is cost shared 65% Federal and 35% non-Federal. For more information, visit https://www.mvr.usace.army.mil/Business-With-Us/Outreach-Customer-Service/Flood-Risk-Management/Section-205/.

Illinois Environmental Protection Agency
The IEPA's *Green Infrastructure Grant Opportunities* (GIGO) program funds projects containing green infrastructure best management practices (BMPs) that prevent, eliminate, or reduce stormwater runoff, reducing localized or riverine flooding in Illinois' rivers, streams, and lakes. Projects that implement treatment trains (multiple BMPs in series) and/or multiple BMPs within the same watershed are encouraged as they may be more effective and efficient than a single large green infrastructure BMP.

For the GIGO program, green infrastructure is defined as any stormwater management technique or practice employed with the primary goal to preserve, restore, mimic, or enhance natural hydrology. Green infrastructure includes, but is not limited to, methods of using soil and vegetation to promote soil percolation, evapotranspiration, and filtering or the harvesting and reuse of precipitation.

GIGO typically offers 75% of approved project costs, up to $2.5M, with an application deadline in August. GIGO funds are available to any Grant Accountability and Transparency Act (GATA) Pre-Qualified entity that has legal status to accept funds from the State of Illinois. More information can be found at https://epa.illinois.gov/topics/grants-loans/water-financial-assistance/gigo.html.

Recreation and Trails
Illinois Department of Natural Resources (IDNR)
The IDNR manages several recreational and trail-related funding opportunities. The *Recreational Grants-in-Aid Program* supplies grants for capital improvements to create and enhance recreational amenities. These include OSLAD/Federal LWCF, Boating Access, PARC, and bikeway, snowmobile, off-highway vehicle, natural areas stewardship grants, and federal recreational trails programs. For an up-to-date listing of IDNR programs and recent notices of funding, visit https://dnr.illinois.gov/grants.html.

The *Open Space Lands Acquisition and Development Program* (OSLAD) is a state-financed grant program that supplies funding aid to local government agencies for acquisition or development of land for public parks and open space. Eligible projects include acquisition of land for new parks or expansions, water frontage, nature study, and natural resource preservation. Other eligible projects include a variety of other projects to provide recreation opportunities, including sports courts, picnic facilities, swimming pools and beaches, campgrounds, and winter sports facilities. The grant program includes funding for architectural and engineering services necessary for proper design and construction of approved project components. OSLAD funds up to 50% of approved project costs. Grant awards up to $1,725,000.00 are available for acquisition projects, while development/renovation projects are limited to a $600,000 grant maximum. For more information about OSLAD visit https://dnr.illinois.gov/grants/openspacelandsaquisitiondevelopment-grant.html.

The federal *Land & Water Conservation Fund* program (known as both LWCF and LAWCON) is a similar program to Open Space Lands Acquisition and Development (OSLAD) with similar objectives. LWCF grants are available to units of local government that are authorized by Illinois law to expend public funds for the acquisition and development of land for public outdoor park, recreation, or conservation purposes are eligible to apply for funding assistance. School districts are not eligible. Eligible Projects include acquisition of land for new park sites or park expansion, water frontage, nature study, and natural resource preservation. Funding assistance is up to 50% of eligible expenses. Grant awards of up to $1,725,000.00 are available for acquisition projects. For more information, visit https://dnr.illinois.gov/grants/lwcf.html.

Wildlife
Illinois Department of Natural Resources
The Office of Resource Conservation's Division of Wildlife Resources administers four special grant programs that are funded by Illinois sportsmen through the purchase of Habitat Stamps and Migratory Waterfowl Stamps. These Special Wildlife Funds are the *Illinois Habitat Fund, State Pheasant Fund, State Furbearer Fund,* and the *Migratory Waterfowl Stamp Fund*. Together, these programs are designed to protect, acquire, enhance or manage wildlife habitat and to support limited research and educational programs to further advance this mission. For more details about these programs and the latest funding opportunities, visit https://dnr.illinois.gov/grants/special-wildlife-funds-grant-program.html.

National Fish and Wildlife Foundation
The *America the Beautiful Challenge*

is a public-private grant program for locally led ecosystem restoration projects that invest in watershed restoration, resilience, equitable access, workforce development, corridors and connectivity, and collaborative conservation, consistent with the America the Beautiful Initiative.

The America the Beautiful Challenge coordinates funding from multiple Federal agencies and private philanthropy into one competitive grant program. This streamlines the application process, enabling larger, more impactful cross-boundary projects, while making it easier for states, Tribes, territories, local groups, non-governmental organizations, and others to apply for multiple funds with one application. This one-stop-shop solicitation is the result of financial contributions from the U.S. Department of the Interior through the Fish and Wildlife Service, the U.S. Department of Agriculture through the Natural Resources Conservation Service and the Forest Service, the U.S. Department of Defense, and Native Americans in Philanthropy, as well as private philanthropy.

The America the Beautiful Challenge seeks to advance conservation and restoration projects that are consistent with the principles outlined in the Conserving and Restoring America the Beautiful report and that focus on at least one of the following core areas of need:

- Conserving and restoring rivers, coasts, wetlands, and watersheds
- Conserving and restoring forests, grasslands, and other important ecosystems that serve as carbon sinks
- Connecting and reconnecting wildlife corridors, large landscapes, watersheds, and seascapes
- Improving ecosystem and community resilience to coastal flooding, drought, and other climate-related threats
- Expanding access to the outdoors, particularly in underserved communities.

Applicants are encouraged to develop large landscape scale and/or cross jurisdictional projects that advance existing conservation plans or are informed by Indigenous Traditional Knowledge. For more information, visit https://www.nfwf.org/programs/america-beautiful-challenge.

Leveraging and Partnerships

It is critically important to recognize that no one program exists that will simply match the overall needed investment from the CSBKR watershed partners to implement the Watershed-Based Plan. Rather, partnerships are most likely to be developed in the context of individual and specific land preservation, restoration, or education projects recommended in the Plan. Partners attracted to one acquisition may not have an interest in another located elsewhere for jurisdictional, programmatic, or fiscal reasons.

Almost any land or water quality improvement project ultimately requires the support of those who live nearby if it is to be successful over the long term. Local environmental groups, neighborhood associations, homeowner associations, and similar groups interested in protecting water resources, open space, or protecting wildlife habitat and scenic vistas can make the best partners for specific projects. Those organizations should be contacted in the context of supporting relevant projects.

The development of such partnerships that will leverage funding or goodwill can be a time-consuming process. In many cases, it takes more time and effort to develop partnerships that will leverage support for a project than it does to negotiate with the landowners for use or acquisition of the property. Each protection or restoration project will be different; each will raise different ecological, political and financial issues, and each will attract different partners. It is also likely that the process will not be fully replicable. Each jurisdiction or partner will have a unique process and requirements.

Dedicating staff to develop relationships and leverage funding is important to successful implementation and will require concerted and tailored efforts. Successful partnerships are almost always the result of one or two enthusiastic individuals or "champions" who believe that engagement in this process is in the interests of their agency. Partnerships can also leverage intergovernmental agreements, letters of support, and in-kind matching to help advance engagement and implementation. By entering partnerships with some agencies, organizations, or even neighborhood groups, a stakeholder will leverage valuable goodwill, and relationships that have the potential to lead to funds and other support, including political support, from secondary sources.

Additional Investigations

Over the course of the planning process several instances were identified that were beyond the scope of the initial planning process where additional research or discovery in the future might further plan goals and implementation. Additional potential watershed investigations that the Steering Committee could pursue in the future include, but are not limited to, the following:

- More detailed inventory or existing septic systems and their condition
- Feasibility studies related to wetland restoration projects
- Demand analysis and/or feasibility study into creating a wetland restoration bank
- Biological water quality monitoring
- Use of satellite imagery to calculate and track a minimum Normalized Difference Tillage Index (NDTI)
- Ways in which the Steering Committee might leverage the Illinois Working Lands, Water and Wildlife Conservation Partnership RCPP award to support farm economic resiliency with willing landowners and producers while providing benefits to Illinois water and lands

These additional investigations are considered High Priority/Critical Areas for future funding should the Steering Committee decide to pursue them in the future.

Plan Amendments

Data, research, and methodologies are continuously updating and evolving. To accommodate new and updated information, the Steering Committee may decide to update the plan by way of Amendment as often as yearly, if necessary. The Steering Committee will lead the process for updating the plan and include amendments as agreed to and documented by the Steering Committee and attached to the final watershed-based plan as an Amendment.

Amendments should be written as stand-alone documents that reference the plan and appropriate plan sections. The process is outlined as follows:

- Steering Committee research and documents Amendment
- Steering Committee approves Amendment
- Steering Committee sends Amendment to IEPA for review and approval
- IEPA and Steering Committee agree to and make edits as necessary
- Steering Committee publishes Amendment

Amendments might include additional projects that were not identified during the planning process; new practices, methodologies, or programs that will improve implementation our watershed outcomes; the results or outcomes of any new investigations; NRCS updates or updates to the Illinois Urban Manual; or any similar findings that the Steering Committee and IEPA agree to.

The Steering Committee will house a link to the approved watershed-based plan and any approved amendments on its website, currently available at https://dekalbcountywatersheds-il.org/ or scan the QR code below.

5.2 Information and Education Program

The health of the CSBKR watershed faces challenges and threats from degrading water quality, land use changes, poor land management practices, a lack of natural habitat, and invasive species. Since a significant portion of the CSBKR watershed is held privately, any efforts to improve water quality must include significant education and outreach efforts to those landowners and key stakeholders.

This Information & Education Program (I&E Program) details how the Steering Committee will get the word out about the Plan and its recommendations. It recommends actions that are designed to enhance understanding of the challenges and opportunities within the CSBKR watershed. The intention is to promote general acceptance and stakeholder participation in selecting, designing, and implementing recommended Management Measures to improve watershed conditions. The first step in understanding the issues, problems, and opportunities within CSBKR watershed is to gain a better perspective on how the watershed evolved over time into what exists today.

The goal of the I&E Program is to equip municipal staff, elected officials, and other key stakeholders with the tools necessary to establish watershed-based practices and engrain these tools into their respective activities and procedures. Recommended actions encourage landowners and developers to follow guidelines that consider watershed health and play an active role in protecting and restoring the river and its tributaries. The program is designed to inform landowners and create changes in behaviors that will lead to measurable improvement in water quality and watershed health.

Due to the current conditions of water quality within the watershed, it is imperative that the Management Measure recommendations are closely linked with watershed information and education programs. Thorough public information and stakeholder education efforts will ultimately inspire landowners and community members to adopt recommended implementation actions. The cumulative actions of individuals and communities' watershed-wide can accomplish the goals of the watershed plan. Watershed health is of primary importance for the people of the CSBKR watershed. As people begin to understand the issues related to water quality and natural resource protection, they learn how a change in their actions and activities can lead to improvement in the overall health of the watershed.

Many of the stakeholders in the watershed have been active in the creation and leadership of the CSBKR WBP. Key stakeholders include the DeKalb County Community Foundation, DeKalb County Soil & Water Conservation District, DeKalb County, the City of Genoa, the Villages of Kirkland and Kingston, the Forest Preserve District of DeKalb County, Illinois Tollway, Illinois Environmental Protection Agency, Northern Illinois University, Illinois Department of Natural Resources, and many private residents and landowners. These groups, led by the DeKalb County Soil & Water Conservation District and the DeKalb County Community Foundation, are actively engaging the public in watershed activities such as: educational seminars, watershed outings and bus tours, Regenerative Agriculture workshops, Name-That-Stream programs, water quality monitoring, and extensive public education programs and outreach events. The watershed planning process for the watershed formally began in 2020, but many of the local outreach programs have been underway for much longer. The planning process has allowed watershed partnerships to form that will help with implementing the watershed plan and initiating projects.

Recommended Information & Education Campaigns

A successful I&E Program first raises awareness among stakeholders of watershed issues, problems, and opportunities and provide them with information on alternatives to address them. This I&E Program includes the following components as referenced in USEPA's "Handbook for Developing Watershed Plans to Restore and Protect Our Waters" (USEPA 2008):

- Define I&E goals and objectives.
- Identify and analyze the target audiences.
- Create the messages for each audience.
- Package the message to various audiences.
- Distribute the message.
- valuate the I&E program.

Goals and Objectives

Development of an effective I&E Program begins by defining goals and objectives. Goals were established for the CSBKR watershed based on

facilitated stakeholder engagement, voting, and responses during the April 18th Goals Workshop. The goals and objectives were then refined during the planning process. Objectives assigned to each goal are intended to be measurable where appropriate so that future progress can be assessed. The following goals refer to education and communication goals and objectives only (objectives unrelated to communications have been left out of this section).

Goal 1: Encourage agricultural techniques and soil conservation practices that will protect and conserve topsoil, improve soil health, and protect our water resources.

Objectives:

1. Educate and inform agricultural landowners about federal and state cost-share programs, which provide incentives for landowners to enroll in conservation programs and implement conservation practices.
2. Encourage landowners to utilize existing programs and agencies such as the Natural Resource Conservation Service, the DeKalb County Soil and Water Conservation District and the Farm Service Agency to install conservation practices that protect soil loss and water quality.
3. Increase support for and develop additional financial assistance programs targeted at increasing the installation of conservation practices.
4. Encourage landowners and farmers to follow the principles of soil health and/or regenerative agriculture on their land.
7. Encourage landowners and farmers to support the Illinois Nutrient Loss Reduction Strategy by implementing practices that reduce annual loading of nitrate-nitrogen and total phosphorus to the CSBKR.

Goal 3: Build stakeholder awareness of watershed issues through education and stewardship while increasing communication and coordination among stakeholders.

Objectives:

1. All municipal partners implement the CSBKR WBP Information & Education Campaign.
2. Increase environmental stewardship opportunities and encourage stakeholders to participate in watershed plan implementation.
3. Inform public officials of the benefits of conservation design and low impact development and the importance of ordinance language changes that promote these developments.
4. Create and distribute targeted educational information for agricultural landowners.
5. Create and distribute targeted educational information for stream and riparian landowners.
6. Install watershed interpretation signage at public access points, major roads, and installed best management measures.
7. Develop policy recommendations and alternatives for the use of fertilizer, road salt, and the disposal of pet waste.

Goal 4: Protect and manage natural and cultural components of the Green Infrastructure Network and improve fish and wildlife habitat.

Objectives:

2. Encourage private landowners with parcels within the Green Infrastructure Network to manage their land for ecological and water quality benefits.

Goal 5: Protect groundwater quantity and quality.

Objectives:

1. Encourage the DeKalb County Health Department to monitor the extent and current condition of septic tanks in the watershed and to educate septic tank owners on how to properly maintain their systems.
2. Educate stakeholders about potential groundwater contamination issues and encourage private well testing.
3. Encourage landowners to install downspout disconnection practices such as rain gardens and rain barrels and utilize pavement alternatives to improve groundwater recharge.
4. Encourage use of Stormwater Treatment Train, Conservation Design, or Low Impact Development within new and redevelopment.
5. Encourage agricultural landowners and farmers to improve soil health, thereby increasing infiltration.

Target Audiences

The recommended target audience for each education campaign is selected based on the ability to attain objectives. The target audience is a group of people with a common denominator who are intended to be reached by a particular message. The target audience of the watershed includes people of all demographics, locations, occupations, and watershed roles. There can be multiple target audiences depending on which topic is being presented. The overall umbrella target audiences selected to meet watershed goals and objectives include landowners, homeowners, general public, local government, elected officials, businesses, schools, and stakeholders/ residents. Once the target audience is identified for a specific education campaign, existing local programs and communication vehicles should be leveraged to help distribute the message.

Public Input

Creating and distributing a message for each audience is done via campaigns that address education goal objectives. The I&E Program objectives for the CSBKR watershed were determined by the Steering Committee with feedback from stakeholder meetings. An I&E Program matrix (Table 41) was developed as a tool to help implement the I&E Program. Not only does the matrix include recommended education campaigns, it also includes information regarding 1) Target Audience, 2) Communications Vehicles, 3) Priority/ Schedule, 4) Lead & Supporting Organizations, 5) Outcomes/ Change in Action, and 6) Estimated Cost.

Table 41. Information and Education Program Matrix.

Education Action of Campaign	Target Audience	Communication Vehicles	Priority/ Schedule	Lead (Supporting) Organization	Outcomes, Change in Action	Estimated Cost
Regenerative Agriculture Workshop	Farmers and Ag Industry	Social Media, Websites, local publications	Critical/ Fall/ Winter 2025/2026; Every other year	SWCD (NRCS)	Understanding of the Nutrient Loss Reduction Strategy, improved water quality and soil health.	$1,000
Water Quality Educator Resources	DeKalb County Educators	Emails, Communication with School Districts	Critical/ Ongoing	U of I Extension, DeKalb County Farm Bureau Ag Literacy Coordinator, (SWCD)	Provide useful tools to educate the Educators and Students on understanding watersheds and how to improve water quality in DeKalb County	$1,500
Water Quality Monitoring	Stakeholders	Social Media, Watershed Website	Critical/ Ongoing	DeKalb County Community Foundation, SWCD and NIU (Steering Committee)	Collect data that establishes baseline information and identifies issues and accomplishments	$15,000
Educate Elected Officials about the completed plan to 1) encourage them to adopt the Central South Branch Kishwaukee Watershed Improvement Plan 2) encourage amendments of municipal comprehensive plans, codes and ordinances to include watershed plan goals/objectives	Elected Officials, Community Leaders	Meetings with boards, special presentations with community leaders	Critical/ Immediately following completion of the plan	SWCD, DeKalb County Community Foundation (Steering Committee)	All communities within the watershed adopt the plan and encourage implementation of identified watershed issues within their jurisdiction	N/A
Critical Planning Areas Bus Tour	Stakeholders and Elected Officials	Newspaper, Social Media	Medium/ 2026	DeKalb County Community Foundation (SWCD)	Bring attention to areas identified as critical planning areas in the watershed plan to encourage buy-in to implement recommended BMPs	$2,500
Citizens Mobilization Programs: (storm drain stenciling, River Clean Ups)	Residents, Volunteers, and Landowners	Newspaper, Social Media and websites	Medium/ Seasonally	Municipalities, Park Districts (SWCD)	Create awareness, activism and ownership of the watershed within the community	TBD

Education Action of Campaign	Target Audience	Communication Vehicles	Priority/ Schedule	Lead (Supporting) Organization	Outcomes, Change in Action	Estimated Cost
Urban Educational Seminars: Examples Rain Gardens, Rain Barrel, Lawn to River Webinar	Stakeholders	Newspaper, Social Media, Websites	Critical/ Ongoing	U of I Extension, SWCD, Park Districts, SWCD (Municipalities)	Encourage Homeowners to install BMPs to control runoff and implement water quality improvements	TBD
Inform Farmland owners and renters about the plan and recommended actions, Inform and support farmland owners and renters to evaluate and implement recommended actions within the watershed plan	Agricultural landowners and farmers	Meetings of farmland owners and operators	Critical/ Ongoing	SWCD, NRCS (Steering Committee)	Encourage implementation of identified watershed projects and discuss funding mechanisms to install BMPs	$500
Provide the School Districts within the Central South Branch of the Kishwaukee River Watershed with information about the watershed as a means to support outdoor curriculum within the watershed's green infrastructure.	Schools, Students and Educators	Emails, letters and Social Media	Critical/ Annually	U of I Extension, DeKalb County Farm Bureau Ag Literacy Coordinator and SWCD (Steering Committee)	Students within the watershed will have the understanding of how our environmental community works together through curriculum created and delivered by Natural Resource Educators	$5,000
Outreach Programs that inform the community of ways to improve water quality within the watershed.	Stakeholders	Articles, Social Media, face to face meetings	Critical/ Ongoing	U of I Extension, SWCD (Steering Committee)	Create Awareness	TBD

Evaluation

The I&E Program should be evaluated regularly to provide feedback regarding the effectiveness of the outreach campaigns. Evaluation conducted early in the effort will help determine campaigns that are successful and those that are not. Based on the evaluation, information, money, and time can be saved by focusing on the campaigns that work. Those that do not work should adapted to achieve outcomes or discontinued. Section 9.2 of this plan contains a Report Card with milestones related to watershed education that can be used to evaluate I&E Program implementation efforts.

The plan will be made available electronically on the DeKalb County Watersheds website upon IEPA approval at https://dekalbcountywatersheds-il.org/.

5.3 Measuring Plan Progress and Success

A monitoring plan and evaluation component is crucial to evaluating plan implementation progress and success over time. This watershed plan includes two monitoring/evaluation components:

Water Quality Monitoring Plan: Includes methods and locations where monitoring should occur and a set of criteria (indicators & targets) used to determine whether impairment reduction targets and other watershed improvement objectives are being achieved over time.

Report Cards: One developed for each goal that include interim, measurable milestones linked to evaluation criteria that can be evaluated by the planning committee over time.

5.3.1 Water Quality Monitoring Plan & Evaluation Criteria

This subsection provides a monitoring plan that can be implemented to measure changes in watershed impairments related to water quality. Water quality monitoring is performed by first collecting physical, chemical, biological, and/or social indicator data. This data is then compared to criteria (indicators & targets) related to established water quality objectives.

Available water quality data collected for the CSBKR watershed is summarized in Section 3.14. Illinois EPA lists South Branch Kishwaukee River as being impaired for Fish Consumption with the last reach additionally impaired for Aquatic Life or Primary Contact Recreation and Deer Creek is Not Supporting for Aquatic Life according to the 2022 *Integrated Water Quality Report and Section 303(d) List.* Recent water quality data collected within the Central South Branch Kishwaukee River watershed indicates likely overall impairment from elevated total phosphorus and total nitrogen.

The water quality monitoring plan is designed to: 1) capture snapshots of water quality within the CSBKR watershed over time; 2) assess changes in water quality following implementation of Management Measures, and 3) assess the public's social behavior related to water quality issues. It is crucial that representative water quality samples be carefully collected using method appropriate handling procedures. Unrepresentative samples or samples contaminated during collection or handling can prove useless. It is important that future monitoring be completed using protocol and methods used by the EPA for QAQC purposes. EPA Quality Assurance Project Plans (QAPPs) and Standard Operating Procedures (SOPs) can be found at https://www.epa.gov/sites/production/files/2015-06/documents/vol_qapp.pdf.

Physical, chemical, and biological water quality indicators in streams are typically measured during base flow and after significant (≥ 1.5 inch) storm events. Chemical parameters typically include nutrients (nitrogen and phosphorous) and total suspended solids. All samples should be analyzed by certified labs to ensure accurate results. Physical parameters, such as temperature, dissolved oxygen, pH, and water clarity (turbidity) should be collected in the field using properly maintained and calibrated field equipment. It is also important to obtain stream discharge calculations as a determination of potential pollutant loading. These calculations are easily obtained by measuring the stream width, average depth, and flow rate at the monitoring location. Biological (fish and macroinvertebrate) and habitat assessments may also be performed, site assessment criteria dependent.

Monitoring should ideally take place both before and after implementation of Management Measures to track the effectiveness of those projects. Management Measure implementation sampling locations should include points of water ingress and egress, such as the inflow and outflow points on a retrofitted detention basin as an example. To achieve the best results with respect to performance, Management Measure implementation monitoring should occur during or shortly after large rain events (≥ 1.5 inch). Biological and/or habitat assessments should also be included on any habitat improvement project, such as a stream restoration. Because funding for post implementation monitoring is typically limited, money should be built into the initial Management Measures project budget.

Monitoring Plan Implementation

Existing and recommended water quality monitoring regimes, including recommended monitoring entity, monitoring locations, schedule/monitoring frequency, type of parameters sampled, and expected costs, are outlined in Table 42. All existing monitoring should continue, and B&W recommends that E. coli and macroinvertebrate sampling should be conducted every 5 years. The Steering Committee and partners should work together to accommodate this additional sampling. This monitoring will yield data that can track water quality over time. Figure 56 includes the location of all recommended monitoring locations. Note: monitoring locations related to individual Management Measures are not detailed as this will occur as projects are implemented.

Table 42. Recommended water quality monitoring programs/locations.

Monitoring Entity/Program	Monitoring Location	Schedule/ Monitoring Frequency	Parameters Sampled	Cost to Implement
Existing Monitoring Programs				
Illinois EPA Intensive Basin Survey and Special Study	IL-G-A1, IL-01, IL-06, IL-09	Every 5 years	Physical; Chemical	Not Applicable
NIU	8 sites along CSBKR and tributaries	Yearly	Physical; Chemical	$15K/year
New Monitoring Programs				
Steering Committee or other partners	IL-06, IL-01, G	Every five years	E. coli	$1,000 each 5-year cycle
Illinois RiverWatch or NIU	IL-06, IL-01, G	Every five years	Biological	$5,000 each 5-year cycle
Project lead or landowner	Varies by project	Pre and post implementation	Physical, Chemical	$5,000 for each project

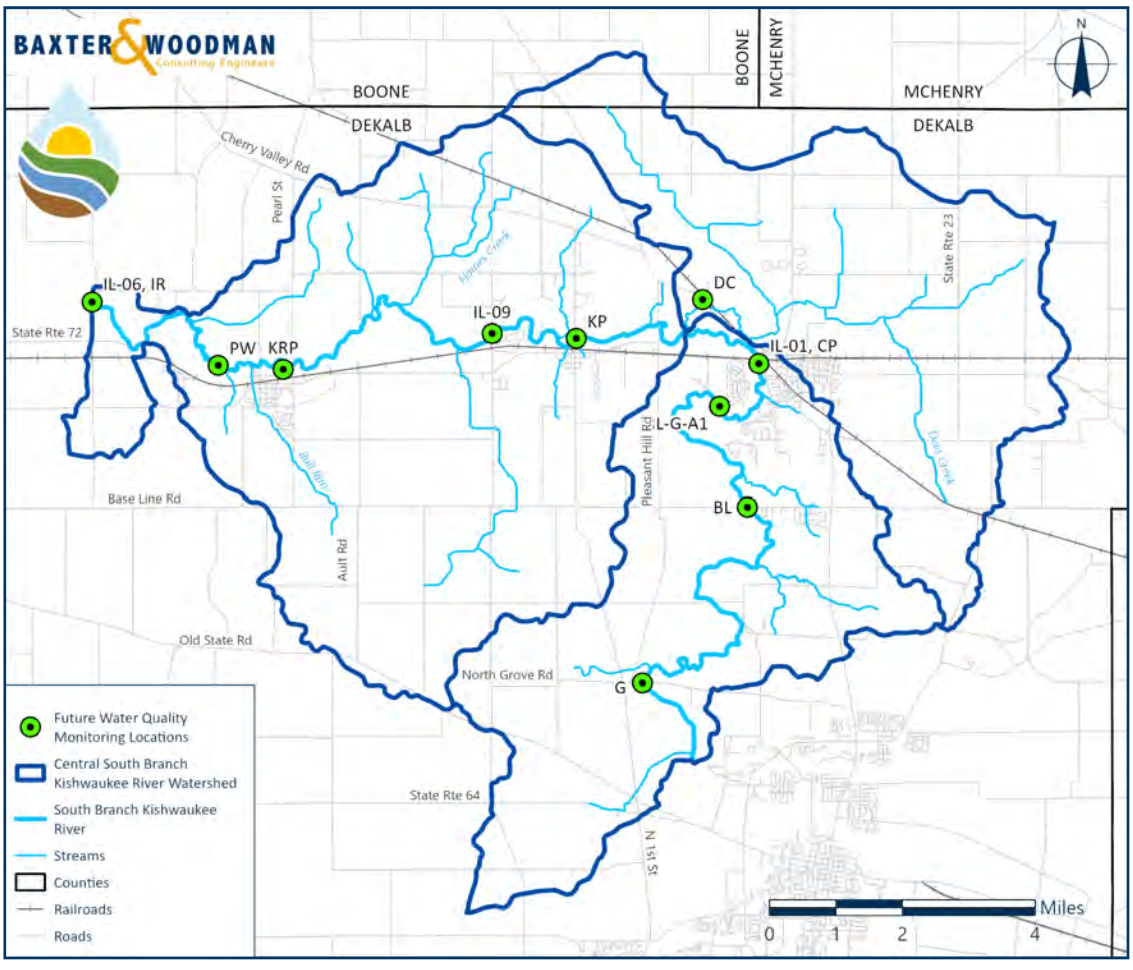


Figure 56. Future Water Quality Monitoring Locations.

Physical and Chemical Monitoring and Methods

Physical and chemical monitoring of water can be time consuming and expensive depending on the complexity of the monitoring program. Usually the budget and/or personnel available for monitoring limit the amount of data that can be collected. Therefore, the monitoring program should be developed to maximize the usable data given the available funding and personnel. Any monitoring program should be flexible and subject to change to collect additional information or use newer equipment or technology when available while maintaining a link to past data.

Future physical/chemical monitoring should continue according to the existing schedule/frequency, averaged annually for each parameter, and then compared to target water quality values. Many different parameters can be included in physical monitoring of water quality in streams. Measurements of temperature, pH, conductivity, dissolved oxygen, and turbidity should be collected in the field for any monitoring done on CSBKR using portable instruments. The measurements can then be recorded on data sheets in the field or the units can be taken back to the lab and the data downloaded. Chemical parameters should generally include total phosphorus, total nitrogen, total suspended solids, chloride, and E. coli at a minimum, all of which are already be monitored by NIU except for E. Coli, which we recommend adding to the sampling regime. Unlike physical monitoring, chemical monitoring requires grab samples be collected and taken to certified labs for analysis and collection needs to follow handling procedures for samples as outlined in Table 43. The collected samples should be submitted for analysis to a laboratory certified by the National Environmental Laboratory Accreditation Conference (NELAC). Alternatively, one of the Steering Committee partners could work with one of the local water reclamation districts to save on sampling costs. Generally, the laboratory will work closely with the monitoring entity to assure that the samples are collected in the proper containers with preservatives for the parameter of interest.

Biological Monitoring Methods and Recommendations

Illinois EPA uses biological data for determining *Aquatic Life* Use Attainment in streams because fish and macroinvertebrates are relatively easy to sample/identify and reflect specific and predictable responses to human induced changes to the landscape, stream habitat, and water quality.

Two indices have been developed that measure water quality using fish and macroinvertebrates - fish Index of Biotic Integrity (fIBI) and Macroinvertebrate Biotic Index (MBI). These indices are best applied prior to a project such as a stream restoration to obtain baseline data and again following restoration to measure the success of the project but can also be conducted to assess resource quality in a stream or tributary reach.

Fish Index of Biotic Integrity (fIBI)

The fIBI is designed to assess water quality and biological health based on the attributes of fish communities in streams. After the fish have been collected and identified, the data is used

Table 43. Physical/chemical monitoring parameters, collection and handling procedures.

Parameter	Statistical, Numerical, or General Use Guideline	Container	Volume	Preservative	Max. Hold Time
Physical Parameters Measured in Field					
pH	>6.5 or <9.0	These parameters are measured in the field			
Conductivity	<1,667 µmhos/cm				
Dissolved Oxygen	>5.0 mg/l				
Temperature	<90 F				
Turbidity	<14 NTU				
Physical Parameters Measured in Field					
Total Suspended Solids	<19 mg/l	Plastic	32 oz	Cool 4 oC	7 days
Biochemical Oxygen Demand	<5.0 mg/l	Plastic	32 oz	Cool 4 oC	48 hours
Ammonia Nitrogen, Nitrate-Nitrite, & Total Kjeldahl Nitrogen	Total Nitrogen (mg/L) *calculated* <2.461 mg/l	Plastic	32 oz	Cool 4 oC, 20% Sulfuric Acid	28 days
Total Phosphorus	<0.0725 mg/l (streams)	Plastic	4 oz	Cool 4 oC, 20% Sulfuric Acid	28 days
Chloride	<500 mg/l	Plastic	32 oz	Cool 4 oC	28 days
E. coli	<235 MPN/100mL	Plastic	4 oz	Cool 4 oC	<6 hours



Biologists collecting fish in stream (Source: UW-Platteville)

to evaluate how closely the population approximates values typically found in a high-quality reference stream. The sum of these ratings gives a total IBI score for the site. The best possible IBI score is 60. The Illinois EPA has determined that a score less than 41 indicates a stream is not fully supporting for *Aquatic Life* (Table 44). A manual for calculating IBI scores for streams in Illinois is available from Illinois DNR.

Fish sampling was historically conducted by IEPA during the 1990s, but no additional ongoing fIBI monitoring recommendations are made due to limited resources. Where possible however, fish sampling and calculation of fIBI values should be built into future stream restoration projects.

Macroinvertebrate Biotic Index (MBI)

The MBI is designed to rate water quality using aquatic macroinvertebrate taxa tolerance to degree and extent of organic pollution in streams. The MBI is calculated by taking an average of tolerance ratings weighted by the number of individuals in the sample. The Illinois EPA has determined that an MBI score greater than 5.9 indicates a stream is not fully supporting *Aquatic Life* (Table 44). A manual for collecting and calculating MBI scores for streams is available from Illinois EPA.

Future monitoring should include macroinvertebrate sampling conducted by Illinois RiverWatch or NIU and occur at sites IL-06, IL-01, and G every five years to capture data that better reflects the impact of pollutants (Table 42; Figure 56).

Table 44. IEPA indicator of aquatic life impairment using MBI and fIBI scores (Source: Integrated Water Quality Report, 2010).

Biological Indicator	MBI and fIBI Scores		
MBI	> 8.9	5.9 < MBI < 8.9	≤ 5.9
fIBI	≤ 20	20 < IBI< 41	≥ 41
Impairment Status - Use Support - Resource Quality			
Impairment Status	Severe Impairment	Moderate Impairment	No Impairment
Designated Use Support	Not Supporting	Not Supporting	Fully Supporting
Resource Quality	Poor	Fair	Good

Habitat Monitoring Methods and Recommendations

Stream habitat assessments comprise a major component of physical water quality monitoring. Many habitat assessment methods are available for assessing streams such as those developed by Illinois DNR and Ohio EPA. The Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA is a quick, accurate, and straightforward analysis with dependable and repeatable results found to correlate well with biological integrity of streams in the Midwest. The QHEI is also used by the IEPA to assess *Aquatic Life* Use Attainment in streams. It is composed of six criteria that are scored individually then summed to provide the total QHEI score. The best possible score is 100. QHEI scores from hundreds of stream segments indicate that habitat values greater than 60 generally support average quality warm-water fauna. Scores greater than 80 typify pristine habitat conditions that can support exceptional warm-water fauna (Ohio EPA 1999). Areas with habitat scores lower than 60 may support warm-water fauna but usually exhibit significant degradation. Section 3.14, table 30 summarizes QHEI score classifications. Stream restoration projects should strive to create conditions that produce QHEI scores of at least 60.

The index should be used on streams and stream restoration projects to document improvements. Prior to stream restoration, a QHEI evaluation should be completed by the project watershed coordinator, ecologist, or engineer. A follow-up QHEI for comparison purposes should be conducted by the same individual at least 2-4 years following project implementation after plant material grows and in-stream structures have had time to perform. QHEI forms and a narrative explaining how to use the index can be located on the web at http://rock.geo.csuohio.edu/norp/qhei.htm.

Tillage Practices and Residue Management

Changes in agricultural management practice implementation, such as tillage conditions within watersheds can be difficult to assess and track over time. NRCS currently conducts transect surveys to estimate tillage practices across the county. Recently, analysis of satellite imagery has been used to track these changes in conservation practices at the watershed scale as an alternative method of collecting the same data. Since tillage takes place at different times, a series of satellite images can be analyzed in spring and fall months to calculate a minimum Normalized Difference Tillage Index (NDTI) for the CSBKR watershed. The NDTI estimates crop residue levels based on shortwave infrared wavelengths. This analysis of imagery can also be used to track implementation of cropping practices in a watershed as more years of imagery is collected, since satellites are always updating aerial imagery (Meyer, 2018).

For more information, a webinar produced by Elliot Meyer of WI Land+Water+Media called "Satellite Imagery Used in Conservation" as well as a document on how to calculate vegetation indices using ArcMap and Earth Explorer can be found online at http://wislandwatermedia.org/2018/05/02/webinar-satellite-imagery-used-in-conservation/.

Social Indicators of Water Quality

Quantifying social indicators of success of a watershed planning initiative is difficult. It is often subjective and complaints about poor conditions are more likely to be voiced than compliments on improvements. The Great Lakes Regional Water Program (GLRWP), a leading organization that addresses water quality research, education, and outreach, defines social indicators as standards of comparison that describe the context, capacity, skills, knowledge, values, beliefs, and behaviors of individuals, households, organizations, and communities at various geographic scales. GLRWP suggests that social indicators used in water quality management plans and outreach efforts are effective because they:

- Help watershed committees evaluate projects related to education and outreach.
- Help support improvement of water quality projects by identifying why certain groups install Management Measures while other groups do not.
- Measure changes that take place within grant and project timelines.
- Help watershed committees with information on policy, demographics, and other social factors that may impact water quality.
- Measure outcomes of water quality programs not currently examined.

GLRWP has developed a Social Indicators Data Management and Analysis Tool (SIDMA) to assist watershed stakeholders with consistent measures of social change by organizing, analyzing, and visualizing social indicators related to non-point source (NPS) management

efforts. Detailed information about GLRWP's social indicator tool can be found at: http://35.8.121.111/si/Home.aspx. The SIDMA tool uses a seven-step process to measure social indicators as shown in Figure 57.

The Steering Committee Several could evaluate potential social indicators by using different strategies to assess changes in water quality. For example, surveys, public meetings, and establishment of interest groups can give an indication of the public feelings about water quality in the watershed. It is important to involve the public in the water quality improvement process early on through public meetings detailing plans for improvement and monitoring. Table 45 includes a list of potential social indicators and measures that could be used by the Steering Committee to evaluate the social changes related to water quality issues.

Monitoring social indicators in the watershed should be the responsibility of CSBKR Steering Committee. Online surveys are among the most popular method to gauge social behavior toward water quality. Demographic information on a county basis can be obtained from the U.S. Census Bureau and modified to fit the watershed. Then a survey can be developed that identifies citizens' perceptions of water quality problems and protections strategies. The results of the survey can be used to develop appropriate media, citizen awareness, and watershed management activities to support social behavior that will improve the watershed.



Figure 57. Steps to measure social indicators (Source: GLRWP).

Table 45. Social indicators and measures to evaluate social change.

Social Indicator	Measure
Media Coverage	# of articles related to watershed protection # of press releases relate to watershed protection # of social media posts related to watershed protection
Resident Awareness	# of residents aware a watershed plan exists # of informational flyers distributed per given time period % of citizens able to identify where pollution is originating from % change in volunteer participation to protect water quality % change in attendance at water quality workshops and Volunteer Days
Watershed Management Activities	# of watershed partners who adopt the watershed management plan # of watershed groups implementing plan recommendations # of watershed signage along roads # of schools helping implement the watershed monitoring plan # of residents that perform ecological restoration on their properties # of stream miles cleaned up per year

Water Quality Evaluation Criteria

Water quality criteria (expressed as measurable indicators and targets) have been developed so that water quality objectives can be evaluated over time. The criteria are designed to be compared against data gathered from the Monitoring Plan and then analyzed to determine the success of the watershed plan in terms of protecting and improving water quality. These criteria also support an adaptive management approach by providing ways to reevaluate the implementation process if adequate progress is not being made toward achieving water quality objectives.

Section 2 of this plan includes a water quality goal (Goal 2) with 8 objectives. Below, criteria are selected for each water quality objective to determine whether components of the water quality goal are being met. Criteria are based on Illinois EPA water quality criteria, data analysis, reference conditions, literature values, and/or expert examination. Criteria are also designed to address potential or known sources of water quality impairment identified in Section 3. Future evaluation of the criteria will allow the Steering Committee to gage plan implementation success or determine if there is a need for adaptive management. Note: evaluation criteria are included for the water quality goal only; criteria for other plan goals are examined within the appropriate progress evaluation Report Cards in the following section.

Goal 2: Improve surface water quality to meet water quality standards.

Objectives:

1. Continue existing water quality monitoring programs and implement the Water Quality Monitoring Plan outlined within the plan.

Criteria:

- Number of Monitoring Programs that continue: All existing monitoring continue.
- Number of additional parameters sampled: Both *E. coli* and macroinvertebrates added to existing monitoring programs.
- Number of implementation projects that include monitoring: All implementation projects conduct monitoring before and after installation.

2. Implement additional policy recommendations that focus on improving watershed conditions by preserving green infrastructure, protecting groundwater, minimizing road salts, minimizing lawn fertilizer, sustainable management of stormwater, and allowances for native landscaping.

Criteria:

- Number of policy changes or additions that occur at the local government level: Additional and more protective policies put in place that address preserving green infrastructure, protecting groundwater, minimizing road salts, minimizing lawn fertilizer, sustainable management of stormwater, and allowances for native landscaping.
- Social Indicator: 100% of municipal decision makers know the importance of additional policy and protections that improve watershed conditions.

3. Restore 441,747 linear feet of stream and riparian areas along CSBKR and its tributaries.

Criteria:

- Linear Feet of Restored Stream Reaches: All 441,747 lf of riparian areas buffers and spot stream stabilization along High Priority and Medium Priority stream reaches implemented.
- Chemical & Physical Water Quality Standards: <19 mg/l TSS, <0.0725 mg/l TP, and <2.461 mg/l TN in stream water quality samples.
- Biotic Indexes: Macroinvertebrate and fish communities achieve at least "Fair" resource quality based on MBI scores respectively.
- Social Indicator: >50% of surveyed residents know that stream and riparian area conditions are a problem in the watershed and support stream restoration efforts.

4. Retrofit 72 acres of detention basins recommended in the action plan.

Criteria:

- Acres of detention basins retrofitted: All 72 acres of detention basins retrofitted implemented.
- Social Indicator: >50% of surveyed residents know the importance of detention basin retrofit projects.

5. Implement 2,205 acres of wetland restoration recommended in the action plan.

Criteria:

- Acres of wetlands restored: All 2,205 acres of wetland restoration implemented.
- Social Indicator: >50% of surveyed residents know the importance of wetland restoration.

6. Implement 652 acres of other management measures recommended in the action plan.

Criteria:

- Acres of other management measures restored: All 652 acres of other management measures implemented.
- Social Indicator: >50% of surveyed residents know the importance of other management measure restoration projects.

7. Implement of reduced tillage on an additional 9,351 acres of agricultural land and 45 acres of grass waterways or swales recommended in the action plan.

Criteria:

- Number of Landowners Increasing Residue: Additional 9,351 acres of existing cropland landowners implement reduced tillage or more on their lands.
- Acres of Site-Specific Projects Installed: All 45 acres of grass waterways or vegetated swales installed.
- Social Indicator: >75% of farmers know the importance of reduced or no-till farming for reducing pollutants to CSBKR.

8. Track changes in water quality over time and make adaptive management changes to the plan as necessary to ensure water quality improvements toward meeting identified pollutant load reductions.

Criteria:

- Monitor changes in TP, TN, and TSS: Track changes in TP, TN, and TSS over time.
- Chemical & Physical Water Quality Standards: <19 mg/l TSS, <0.0725 mg/l TP, and <2.461 mg/l TN in stream water quality samples.
- Number of Adaptive Management Changes Needed: Track any additional adaptive management changes needed as goal milestone report cards are completed over time.

5.3.2 Goal Milestones/Implementation & Progress Evaluation Report Cards

Milestones are essential when determining if Management Measures are being implemented and how effective they are at achieving plan goals over given time periods. Tracking milestones allows for adaptive management whereby periodic plan updates and changes 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. Criteria that reflect these characteristics may be used as a measure of watershed health. Goals and objectives in the watershed plan determine which criteria should be monitored to evaluate the success of the watershed plan. A successful watershed plan involves stakeholder participation to get projects completed and must include a feedback mechanism to measure progress toward meeting goals. Report Cards were developed for each goal to track this information. Each Report Card provides:

- Summaries of current conditions for each goal to set the stage for what efforts are needed
- Most important performance criteria related to goal objectives
- Milestones to be met for various time frames
- Monitoring needs and efforts required to evaluate milestones
- Remedial actions to take if milestones are not met
- Notes section

Report Cards were developed for each of the five plan goals. The milestones are generally based on Short Term (1-10 years) and Long Term (10-20 years) objectives. Grades for each milestone term should be calculated using the following scale: 80%-100% of milestones met = A; 60%-79% of milestones met = B; 40%-59% of milestones met = C; and < 40% of milestones met = failed. Report Cards should be used to identify and track plan implementation to ensure that progress is being made towards achieving goals and to make corrections as necessary.

The Steering Committee should assign or hire a Watershed Implementation Coordinator to call meetings and update the committee on plan implementation progress by way of the Report Cards. If needed, adaptive management should be implemented accordingly by referencing the adaptive management recommendations on each Report Card then developing a strategy to either change the milestone(s) or decide how to implement projects or actions to achieve the milestone(s). Report Cards can be evaluated at any time; however, it is recommended they be evaluated at least every five years to determine if sufficient progress is being made toward achieving milestones or if adaptive management is needed.

Goal 1 Report Card: Encourage agricultural techniques and soil conservation practices that will protect and conserve topsoil, improve soil health, and protect our water resources.

Current Condition:

- Agricultural land comprises 89% of the watershed and nearly all of it is row crop farmland.
- Agricultural lands are the biggest contributor of nutrients and sediments to streams.
- 2 Agricultural BMPs were noted as Priority Areas
- A 16% increase (9,351 acres) in the number of farmers practicing mulch till, reduced till, or no till would improve water quality substantially and is a Priority Area/Practice

Criteria/Targets to Meet Goal Objectives:

- 1 agricultural workshop dedicated to the topics of cost-share programs, regenerative agriculture and/or the principles of soil health, and the importance of buffers held annually
- 1 workshop dedicated to implementation of additional conservation practices held annually
- Both Priority/Critical Area agricultural BMP recommendations implemented
- 16% (9,351 acres) more agricultural landowners practice mulch till, reduced till, or no till
- # of farmers utilizing NRCS cost share programs and supporting IL NLRS increases over time

Goal/Objective Milestones Short Term (1-10 years):	Grade
1. 10 agricultural workshops dedicated to cost-share programs, regenerative agriculture and/or the principles of soil health, and the importance of buffers are held. 2. 10 workshops dedicated to implementation of additional conservation practices held. 3. 1 Priority/Critical Area agricultural BMP recommendation is implemented. 4. 8% (4,678 acres) more farmers practice implement mulch till, reduced till, or no till. 5. 5% increase in landowners utilizing NRCS programs and supporting IL NLRS.	

Goal/Objective Milestones Long Term (10-20+ years):	
1. 10 agricultural workshops dedicated to cost-share programs, regenerative agriculture and/or the principles of soil health, and the importance of buffers are held. 2. 10 workshops dedicated to implementation of additional conservation practices held. 3. 2 Priority/Critical Area agricultural BMP recommendation is implemented. 4. 16% (9,351 acres) more farmers practice implement mulch till, reduced till, or no till. 5. 10% increase in landowners utilizing NRCS programs and supporting IL NLRS.	

Monitoring Needs/Efforts:

- Track # of conservation practice workshops, cost-share programs, regenerative agriculture and/or the principles of soil health, and buffers workshops held every 10 years.
- Track # of farmers participating in NRCS cost-share programs.
- Track #/acres of recommended agricultural BMPs or increased residue are implemented.

Remedial Actions:

- Counties work with NRCS/SWCD to increase participation in existing programs.
- NRCS/SWCD approach farmers to offer assistance with implementing management practices.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal 2 Report Card: Improve surface water quality to meet water quality standards.

Current Condition:

- South Branch Kishwaukee River and Deer Creek are impaired for Aquatic Life, Fish Consumption, and Primary Contact
- Excess nitrogen and phosphorus are a concern based on available water quality data
- Agricultural lands and eroding streambanks are biggest contributors of nutrients to streams

Criteria/Targets to Meet Goal Objectives:

- 441,725 LF of stream and riparian area reaches restored.
- 72 acres of detention basins retrofitted.
- 2,205 acres of wetlands restored.
- 652 acres of recommended other management measures implemented.
- 16% (9,351 acres) more agricultural landowners practice mulch till, reduced till, or no till

Goal/Objective Milestones Short Term (1-10 years):	Grade
1. 103,428 lf of Priority/Critical Area stream and riparian area reaches are restored. 2. 7 Priority/Critical Area detention basins retrofitted. 3. 1,410 acres of Priority/Critical Area wetlands are restored. 4. 100 acres of Priority/Critical Area other managements measures implemented. 5. 8% (4,678 acres) more farmers practice implement mulch till, reduced till, or no till.	
Goal/Objective Milestones Long Term (10-20+ years): 1. 441,725 lf of stream and riparian area reaches are restored. 2. 72 acres of detention basins retrofitted. 3. 2,205 acres wetlands are restored. 4. 652 acres of other managements measures implemented. 5. 16% (9,351 acres) more farmers practice implement mulch till, reduced till, or no till.	

Monitoring Needs/Efforts:

- Track implementation of restoration projects (agricultural, stream, detention basin, wetland, other management measures.
- Track implementation of additional tillage practices on cropland by acre.

Remedial Actions:

- Locate and track grants that are being submitted for recommended stream, wetland, detention basin, and other management measure projects and determine success rate.
- NRCS/SWCD contact farmers to determine barriers to implementing higher residue tillage practices.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal 3 Report Card: Build stakeholder awareness of watershed issues through education and stewardship while increasing communication and coordination among stakeholders.

Current Condition:

The key stakeholders identified in the plan, led by the DeKalb County Soil & Water Conservation District and the DeKalb County Community Foundation, are actively engaging the public in watershed activities such as: educational seminars, watershed outings and bus tours, Regenerative Agriculture workshops, Name-That-Stream programs, water quality monitoring, and extensive public education programs and outreach events.

Criteria/Targets to Meet Goal Objectives:

- # of Education Actions completed from Information & Education Campaign.
- # of public officials that support conservation design and low impact development ordinance language changes.
- # of farmers that are informed about healthy land management.
- # of riparian landowners that are informed about healthy land management.
- # of educational and environmental interpretation signs posted throughout the watershed.
- # of attendees @ public education events on fertilizer, road salt, and pet waste disposal.

Goal/Objective Milestones Short Term (1-10 years):	Grade
1. At least half of Education Actions completed from Information & Education Program. 2. At least 1 municipality adopts conservation design and LID within their ordinances. 3. At least 25% of farmers are educated about healthy land management. 4. At least 25% of riparian landowners are educated about healthy land management. 5. Educational signage is installed in at least three locations in the watershed. 6. At least 50 ppl/yr attend fertilizer, road salt, and pet waste disposal events.	
Goal/Objective Milestones Long Term (10-20+ years): 1. All Education Actions completed from Information & Education Program. 2. At least 3 municipalities or county adopt conservation design, LID in ordinances. 3. At least 50% of farmers are educated about healthy land management. 4. At least 50% of riparian landowners are educated about healthy land management. 5. Educational signage is installed in at least six locations in the watershed. 6. At least 100 ppl/yr attend fertilizer, road salt, and pet waste disposal events.	

Monitoring Needs/Efforts:

- Track # of Education Actions completed from Information & Education Campaign
- Track # of public officials with each municipality that support conservation design and LID.
- Track # of informational opportunities targeted to agricultural and riparian landowners.
- Track # of educational signs that are installed in the watershed.
- Track # of attendees to fertilizer, road salt use, and pet waste educational campaigns.

Remedial Actions:

- Ask partners for funding to implement watershed plan and I&E Program.
- Meet with public officials to discuss importance of conservation design and LID.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal 4 Report Card: Protect and manage natural and cultural components of the Green Infrastructure Network and improve fish and wildlife habitat.

Current Condition:

- Ecological communities were balanced ecosystems with clean water and diverse plant and wildlife populations prior to European settlement in the 1830s.
- Following European settlement, fires rarely occurred, prairies were tilled for farmland, wetlands were drained, woodland corridors were harvested for timber, and streams were channelized.
- Degraded riparian areas are causing loss of wildlife habitat and reduced floodplain function.
- The watershed is home to one State Wildlife Area, 12 DeKalb County Forest Preserve District properties, and 12 community parks, totaling 1,737.9 acres.

Criteria/Targets to Meet Goal Objectives:

- All local governments include the Green Infrastructure Network (GIN), conservation design, and LID standards in comprehensive plans and development review maps.
- Stream is reconnected to its floodplain as part of 1,410 acres of Priority Area wetland restoration recommendations.
- Riparian areas are restored along degraded stream reaches using natural design approach.

Goal/Objective Milestones Short Term (1-10 years):	Grade
1. At least half of local governments include the GIN, conservation design, and LID in comprehensive plans and development review maps. 2. Stream is reconnected to its floodplain as part of at least 705 acres of Priority Area wetland restoration recommendations. 3. At least half of riparian areas are restored along degraded stream reaches. 4. At least 25% of GIN landowners manage their land for green infrastructure benefits.	
Goal/Objective Milestones Long Term (10-20+ years): 1. At least half of local governments include the GIN, conservation design, and LID in comprehensive plans and development review maps. 2. Stream is reconnected to its floodplain as part of 1,410 acres of Priority Area wetland restoration recommendations. 3. All riparian areas are restored along degraded stream reaches. 4. At least 50% of GIN landowners manage their land for green infrastructure benefits.	

Monitoring Needs/Efforts:

- Track number of local governments adopting GIN, conservation design and LID standards.
- Track number of acres of wetland restoration with floodplain reconnection in Priority Areas.
- Track number of riparian buffer projects implemented that include ecological benefits.
- Track landowner management practices within the GIN.

Remedial Actions:

- Work with IEPA, DCSWCD, and others to find funding for riparian are restoration projects.
- Hold additional meetings with landowners to educate them on need for managing their land as part of the green infrastructure network.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal 5 Report Card: Protect groundwater quantity and quality.

Current Condition:

- Both shallow and deep aquifers are tapped and used by residences, farms, or entire communities.
- A 2012 study by Illinois State Water Survey suggests that drawdown could reach 150 feet in the Ancell Unit and up to 700 feet in the Galesville Unit by 2050.
- Septic systems are common in throughout the unincorporated portions of DeKalb County and estimated at 1,760 systems in the watershed; little is known about conditions of these systems.
- Traditional development over the past 30-40 years generally did not incorporate groundwater infiltration practices.

Criteria/Targets to Meet Goal Objectives:

- DeKalb County identifies and encourages replacement of potentially failing septic systems.
- DeKalb County educates homeowners on septic system maintenance and private well testing.
- 10 downspout disconnection practices installed at homes or businesses every 10 years.
- Stormwater Treatment Train, Conservation Design, or LID practices are used in all new and redevelopment.

Goal/Objective Milestones Short Term (1-10 years):	Grade
1. Counties/homeowners identify and replace half of potentially failing septic systems. 2. At least 1 workshop conducted annually regarding septic system maintenance and private well testing. 3. At least 10 downspout disconnection practices are installed at homes or businesses. 4. Stormwater Treatment Train, Conservation Design, or LID practices used in all new and redevelopment.	
Goal/Objective Milestones Long Term (10-20+ years): 1. Counties/homeowners identify and replace all potentially failing septic systems. 2. At least 1 workshop conducted annually regarding septic system maintenance and private well testing. 3. At least 20 downspout disconnection practices are installed at homes or businesses. 4. Stormwater Treatment Train, Conservation Design, or LID practices are used in all new and redevelopment.	

Monitoring Needs/Efforts:

- Track # of potentially failing septic systems and number replaced each year.
- Track # of workshops conducted regarding septic system maintenance and private well testing.
- Track # of downspout disconnection practices installed each year.
- Track development that uses Stormwater Treatment Train, Conservation Design, or LID practices.

Remedial Actions:

- County develops additional funding for homeowners to replace potentially failing septic systems.
- Municipalities develop funding for homeowners/businesses to disconnect downspouts.
- Meet with municipalities to review policy changes related to developments.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.



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BAXTER & WOODMAN Consulting Engineers

CENTRAL SOUTH BRANCH KISHWAUKEE RIVER WATERSHED-BASED PLAN

The water quality seen today in the Central South Branch Kishwaukee River (CSBKR) Watershed is a result of almost 200 years of landscape change. Fortunately, the plan outlines actions that can mitigate existing issues and improve water quality over time. The future health of the watershed is largely dependent on how water and natural resources are managed. That includes implementing environmental restoration practices, such as those identified in the watershd plan, to improve water quality and stream health.

You can help the CSBKR Watershed by starting in your own backyard and supporting local water quality improvement efforts. It will take a community-supported approach and actions at every scale in order to positively impact watershed resources. This watershed-based plan is the first step in helping landwonders understand what can be done to protect and restore the CSBKR Watershed.

Funding for the development of the CSBKR Watershed-Based Plan was provided in part through the USEPA Section 319(h) of the Clean Water Act distributed through the Illinois Environmental Protection Agency. The findings and recommendations herein are not necessarily those of the funding agencies. Funding and support was also provided by the DeKalb County Community Foundation, DeKalb County Soil & Water Conservation District, DeKalb County, the City of Genoa, the Villages of Kirkland and Kingston, Northern Illinois University, and the Steering Committee.

For more information on how you can help, contact Dean Johnson at the DeKalb County Soil & Water Conservation District: 815-756-3234 ext. 3, Dean.Johnson@il.nacdnet.net, visit the DeKalb County Watershed website at: www.dekalbcountywatersheds-il.org, or scan the QR code (right).



All photos by Baxter & Woodman unless otherwise noted.

DEKALB COUNTY COMMUNITY FOUNDATION