

1.0 Introduction

1.1 Upper 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). The source of groundwater recharge to streams, rivers, and lakes is also considered part of a watershed. Despite the simple definition for a watershed, they are complex in that there is interaction between natural elements such as climate, surface water, groundwater, vegetation, and wildlife as well as human elements such as agriculture and urban development that produce polluted stormwater runoff, increase impervious surfaces thereby altering stormwater flows, and degrade or fragment natural areas. Other common names given to watersheds, depending

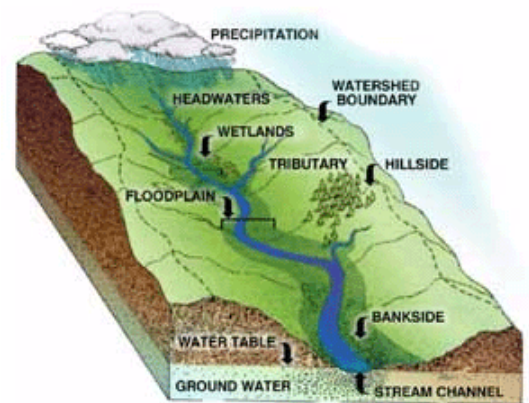
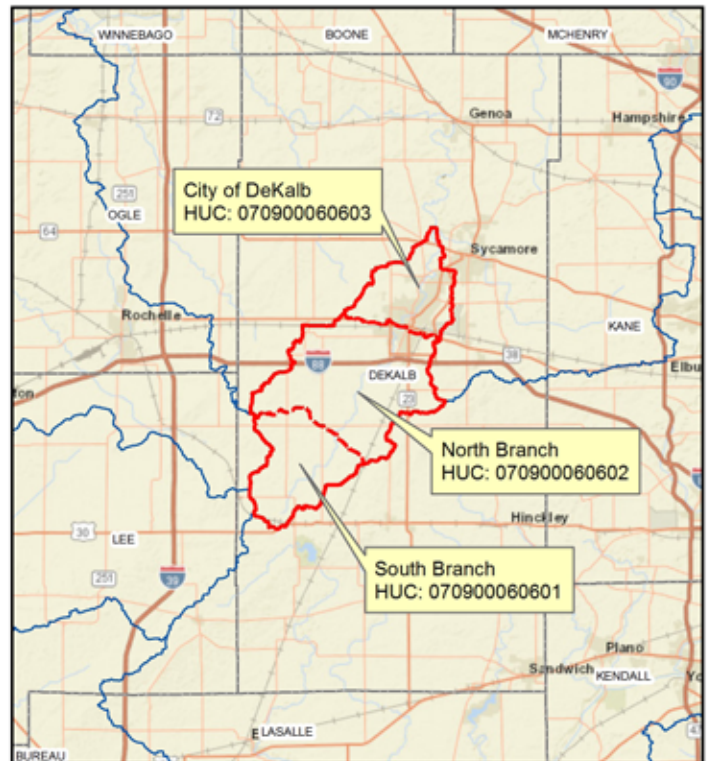


Figure 1. Hypothetical Watershed Setting (Source: City of Berkeley-Public Works).

on size, include basins, sub-basins, subwatersheds, and Subwatershed Management Units (SMUs).

The Upper South Branch of the Kishwaukee River (USBKR) watershed, at 98.8 square miles in size, is a large watershed located



Upper South Branch Kishwaukee Watersheds DeKalb County

Data Sources:
AES
ESRI
U.S. Geological Survey
Illinois State Geological Survey



Figure 2. Watershed locator maps.

in central DeKalb County (Figure 2). It includes three HUC-12-scale watersheds: the South Branch South Branch Kishwaukee River (HUC 070900060601), the North Branch South Branch Kishwaukee River (HUC 070900060602), and the City of DeKalb - South Branch Kishwaukee River (HUC 070900060603). 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 Upper 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 watershed and the subject of the watershed plan. The headwaters begin in

agricultural drain tiles roughly one half mile west of the intersection of Shabbona and Cemetery Roads.

Pre-European settlement ecological communities in Upper South Branch Kishwaukee River watershed and surrounding area were balanced ecosystems with clean water and diverse with 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



Headwaters of the Upper South Branch Kishwaukee River

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 DeKalb and today that portion of the watershed is dominated by primarily residential and commercial uses.

With increasing development pressures and landscape changes in the watershed 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 Upper South Branch Kishwaukee

River. Discharged water from various sources that flow overland and not from a permitted source are referred to as “non-point source pollution” - the primary focus of this plan.

According to Illinois EPA's most recent *2018 Integrated Water Quality Report and Section 303(d) List*, Upper South Branch Kishwaukee River (IEPA Segment Codes: IL_PQC-02 and IL_PQC-13) are “Fully Supporting” for *Aquatic Life*, “Not Supporting” for *Fish Consumption*, and the upper half of the Kishwaukee is also “Not Supporting” for *Aesthetic Quality*, neither reach was assessed for *Primary Contact Recreation*. Recent data also suggests moderate impairment to Upper South Branch Kishwaukee River.

Watershed at a Glance

- Upper South Branch Kishwaukee River and its tributaries drain 98.8 square miles of land in DeKalb County, Illinois.
- Municipalities in the watershed include DeKalb, Sycamore, Shabbona, and Malta.
- Watershed population in 2010 was over 50,500 and expected to increase to 61,000 by 2025.
- Upper South Branch Kishwaukee River is 26.1 miles in length, with another 43.6 tributary miles.
- Upper South Branch Kishwaukee River is moderately impacted by nutrients, sediment, & riparian modification.
- 23% of streams and tributaries are naturally meandering; 77% are moderately to highly channelized.
- 52% of streams and tributaries exhibit minimal bank erosion; 48% are moderately to highly eroded.
- 15% of riparian areas are in “Good” or “Moderate” condition; 85% are in “Poor” condition or non-existent.
- Prairie, marsh, and woodland were the primary land cover types prior to European settlement in the 1830s.
- There were 25,734 acres of wetlands prior to European settlement; 1,570 acres or 6% remain in 2019.
- Today agriculture is the dominant land use (80%) followed by residential and urban land uses.
- 79 detention basins were assessed and only 8 (10%) provide “Good” ecological/water quality benefits.
- The Green Infrastructure Network totals 27,592 acres and 611 parcels, only 3% of which are protected.
- Important Natural Areas in the watershed include P.A. Nehring Forest, County Farm Woods, Elwood Park, Hopkin's Park, and Prairie Park.
- Corn was the most abundant cropland type at nearly 67% of watershed ag land, followed by soybeans (29%).
- According to a 2018 IL Soil Conservation Transect Survey, the most common tillage practice was reduced till on 39% of fields, followed by mulch till (31%), conventional tillage (23%) and no-till (6%).
- There is one NPDES permitted WWTP discharge to the River – Kishwaukee Water Reclamation District.
- Excluding the wastewater contributions to pollutant loading, cropland contributes the highest loads of nitrogen (231,584 lbs/yr: 28%), phosphorus (47,159 lbs/yr: 37%), and of sediment (17,813 t/yr: 53%).
- >74.2% phosphorus, >51.2% nitrogen, & >6% suspended solid reduction is needed to meet water quality targets for the Upper South Branch Kishwaukee River.

1.2 Project Scope & Purpose

In 2016, 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 2018 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 Upper 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 Applied Ecological Services, Inc. (AES) in November 2018 to develop the plan.

The watershed planning process is a collaborative effort involving voluntary stakeholders with the primary scope to restore impaired waters and protect unimpaired waters by

developing an ecologically-based management plan for the Upper South Branch Kishwaukee River (USBKR) watershed that focuses on improving water quality by protecting green infrastructure, creating protection policies, implementing ecological restoration, and educating the public. Another important outcome is to improve the quality of life for people in the watershed for current and future generations.

The primary purpose of this plan is to spark interest and give stakeholders a better understanding of the Upper South Branch Kishwaukee River (USBKR) 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 Applied Ecological Service’s watershed planners, ecologists, GIS specialists, and environmental engineers.

The USBKR Steering Committee held regular, public meetings from February 2019 through August 2020

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 Improvement 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 rationale 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.

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. Applied Ecological Services, Inc. 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.

USEPA Nine Elements

- 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 the effectiveness of the implementation efforts over time.



1.4 Planning Process

Watershed Steering Committee

The Upper South Branch Kishwaukee River Watershed Steering Committee, comprised of 13 regular members and 3 alternates, first met in February 2019 to kick off the watershed planning process. At this meeting, Applied Ecological Services, Inc. (AES) provided stakeholders with an overview of the steps involved in the watershed planning process. The Watershed Coordinator engaged

stakeholders by explaining how their input and participation would benefit the overall outcome of the project. 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. Local experts and watershed residents were also invited to give presentations on specific topics. A list of the meetings is summarized in Table 1. Complete meeting minutes are included in Appendix A.

Upper South Branch Kishwaukee River Watershed Goals Workshop



Table 1. Upper South Branch Kishwaukee River Watershed Steering Committee meeting schedule.

Date	Agenda	Summary
February 5, 2019	<ul style="list-style-type: none"> • Kickoff • Watershed Planning Summary • Stakeholder Involvement 	The Watershed Coordinator detailed the background on why a watershed plan is needed and who helped make it happen. AES summarized the Nine Elements needed in a USEPA approved watershed plan and outlined the planning process.
Apr. 3, 2019	<ul style="list-style-type: none"> • Watershed Background: Part 1 • Code & Ordinance Review 	AES updated stakeholders with watershed information including geology, pre-settlement conditions. Topography, jurisdictions, & demographics. AES also detailed the process for the Code & Ordinance review. A discussion followed regarding water quality monitoring sites.
June 8, 2019	<ul style="list-style-type: none"> • USBKR Watershed Bus Tour 	The Watershed Coordinator and a number of watershed partners led a bus tour of the watershed. Highlights included visits with DCSWCD, several NIU staff and departments, Bayer research farm, the Kishwaukee Water Reclamation District, and the DeKalb Park District
Aug. 7, 2019	<ul style="list-style-type: none"> • Watershed Field Inventory Results 	AES summarized the results of the “Watershed Resource Inventory” field investigation including the inventory methodology and survey results for the streams, riparian areas, detention basins, agricultural BMPs, natural/open space areas, and drained wetland sites. The group also discussed the need to use 2018 as the baseline for ag since 2019 was extraordinary.
Oct. 2, 2019	<ul style="list-style-type: none"> • Watershed Background: Part 2 	AES updated stakeholders with watershed information including the existing and future land use, impervious cover, open space parcel prioritization, important natural areas, the green infrastructure network, cropland and agricultural data, and groundwater.
Dec. 10, 2019	<ul style="list-style-type: none"> • Water Quality Inventory • Pollutant Loading Model Results • Goals Workshop discussion 	AES summarized the designated use impairments, wastewater treatment plant, water quality monitoring locations and results, the results of the pollutant loading model, “hot spot” analysis, and water quality targets in the watershed. This was followed by a discussion on the potential goal topics and the process for the upcoming Goals Workshop.
Feb. 5, 2020	<ul style="list-style-type: none"> • Goals Workshop 	AES and the Steering Committee led a goals workshop for USBKR stakeholders that began with detailing the existing conditions in the watershed. This was followed by a World Café exercise to develop the goals and objectives, stakeholder prioritization of the goals, and Places-of-the-Heart and flood problem areas mapping.
Apr. 7, 2020	<ul style="list-style-type: none"> • Programmatic Action Plan • Site Specific Action Plan 	This in-person meeting was post-poned due to COVID-19. AES presented the “Programmatic” and “Site Specific” Action Plan to the Steering Committee at the following meeting.
Jun. 9, 2020	<ul style="list-style-type: none"> • Review of April Presentation • Water Quality Monitoring Plan • Plan Evaluation Report Cards • Education and Outreach 	AES first reviewed the presentation prepared for the post-poned April meeting covering the Action Plan section of the report. Then they presented a water quality monitoring plan for the watershed and reviewed the report cards developed for each plan goal/objective. Finally, the Watershed Coordinator reviewed the Information and Education Plan with the Steering Committee.

1.5 Using the Watershed Management Plan

The information provided in this Watershed-Based Plan is prepared so that it can be easily used as a tool by any stakeholder including

elected officials, federal/state/county/municipal staff, and the general public to identify and take actions related to watershed issues and opportunities. The pages below summarize what the user can expect to find in each major “Section” of the Watershed-Based

Plan. All recommendations in this plan are for guidance only and not required by any federal, state, or local agency.

Section 2.0: Mission, Goals, and Objectives

Section 2.0 of the plan contains the

Upper South Branch Kishwaukee River Watershed mission, goals, and objectives. Goal topics include education, stewardship, and communication; the green infrastructure network and habitat, surface water quality, agriculture, groundwater, and flooding. In addition, “Measurable Objectives” were developed where possible for each goal so that the progress toward meeting each goal can be measured in the future by evaluating information included in Section 9.0: Measuring Plan Progress & Success.

Section 3.0: Watershed Resource Inventory

An inventory of the watershed characteristics, problems, and opportunities in Upper South Branch Kishwaukee River watershed is examined in Section 3.0. Resulting analysis of the inventory data led to recommended watershed actions that are included in Section 6.0: Management Measures Action Plan. Inventory results also helped identify causes and sources of watershed impairment as required under USEPA’s *Element A* and found in Section 5.0.

Section 3.0 includes summaries and analysis of the following inventory topics:

Section 4.0: Water Quality & Pollutant Modeling Assessment

A summary and analysis of available water quality data for the watershed and pollutant modeling assessment is included in its own section because of its importance in the watershed planning process. This section includes a detailed summary of all physical, chemical, and biological data available for Upper South Branch Kishwaukee River. The pollutant loading assessment identifies pollutant loads from various land cover types and the WWTP. Water quality data combined with pollutant loading data provides information that sets the stage for developing pollutant reduction targets outlined in Section 5.0.

Section 5.0: Causes/Sources of Impairment & Reduction Targets

This section of the plan includes a list of causes and sources of watershed impairment as identified in Section 3.0 that affect Illinois EPA “Designated Uses” for water quality and other watershed features. As required by USEPA, Section 5.0 also addresses all or portions of *Elements A, B, & C* including an identification of the “Critical Areas”, pollutant load reduction targets, and estimate of pollutant load reductions following implementation of Critical Area Management Measures

identified in Section 6.0.

Section 6.0: Management Measures Action Plan

A “Management Measures Action Plan” is included in Section 6.0. 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. As required by Illinois EPA, this section also contains a watershed-wide summary table of specific information for all recommended site-specific management measures combined including “Units,” “Cost,” and “Estimated Pollutant Load Reduction”. This section addresses all or a portion of USEPA *Elements C & D*. All recommendations in the Action Plan are for guidance only and not required by any federal, state, or local agency.

Section 7.0: Information & Education Plan

This section is designed to address USEPA Element E by providing an Information & Education component to enhance public understanding and to encourage early and continued participation in selecting, designing, and implementing recommendations provided in the Watershed-Based Plan. This is accomplished by providing a matrix that outlines each education objective followed by primary and secondary recommended education activities. For each activity, a target audience, package (vehicle and pathways for reaching audiences), priority/schedule, lead and supporting agencies, what the expected outcomes or behavior change will be, and estimated costs to implement is provided.

Watershed Resource Inventory Topics *Included* in the Plan

- | | |
|---|---|
| 3.1 Geology & Climate | 3.12 Open Space and Green Infrastructure |
| 3.2 Pre-European Settlement Landscape & Present Landscape | 3.13 Natural Areas |
| 3.3 Topography, Watershed Boundary, Subwatersheds | 3.14 Watershed Drainage System |
| 3.4 Soils | • USBKR and Tributaries |
| 3.5 Jurisdictions | • Detention Basins |
| 3.6 Existing Policies & Ordinance Review | • Wetlands |
| 3.7 Drainage Districts | • Floodplain and Flood Problem Areas |
| 3.8 Transportation Network | 3.15 Agricultural Land |
| 3.9 Demographics | 3.16 Groundwater and Community Water |
| 3.10 Existing & Future Land Use | 3.17 Wastewater Treatment Plants & Septic |
| 3.11 Impervious Cover Impacts | |

Sections 8.0 & 9.0: Plan Implementation & Measuring Plan Progress & Success

A list of key stakeholders and discussion about forming a Watershed Implementation Committee that forms partnerships to implement watershed improvement projects is included in Section 8.0. Section 9.0 includes two monitoring components: 1) a “Water Quality Monitoring Plan” that includes specific locations and methods where future monitoring programs should focus and a set of water quality “Criteria” that can be used to determine whether pollutant load reduction targets are being achieved over time and 2) “Report Cards” for each plan goal used to measure milestones and to determine if Management Measures are being implemented on schedule, how effective they are at achieving plan goals, and need for adaptive management if milestones are not being met. Sections 8.0 and 9.0 address USEPA *Elements F, G, H, and I*.

Sections 10.0 & 11.0: Literature Cited and Glossary of Terms

Section 10.0 includes a list of literature that is cited throughout the report. The Glossary of Terms (Section 11.0) includes definitions or descriptions for many of the technical words or agencies that the user may find useful when reading or using the document.

Appendix

The Appendix to this report is included on the attached CD located on the back cover (hard copies only). It contains Steering Committee meeting minutes (Appendix A), Center for Watershed Protection local ordinance review summary (Appendix B), results of the watershed resource field inventory (Appendix C), the complete STEPL pollutant loading model and assumptions and Site-Specific Action Plan reduction calculations (Appendix D), and a list of potential funding opportunities (Appendix E).

1.6 Prior Studies and Projects

Various studies have been completed describing and analyzing conditions within Upper South Branch Kishwaukee River 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. From late 2017 through 2019, Kishwaukee Water Reclamation District systematically replaced its aging plant “with a modern, more efficient, treatment facility designed to meet current regulatory requirements, easily accommodate future growth and regulatory changes, and allow for the District’s current facility to be re-tasked to better handle wet weather events (KWRD, 2019).”
3. 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.
4. 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).
5. 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*.
6. In 2006, Illinois Environmental Protection Agency published a study of the Rock River basin that supplied valuable geologic and groundwater data for the report. The study is titled *Rock River Basin Assessment: An Overview of the Rock River Watershed in Illinois*.
7. 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.
8. Comprehensive plans and development guidance are available for DeKalb County (2011), City of DeKalb (2005), City of Sycamore (2014), and the Village of Malta (2003); the Village of Shabbona maintains Building & Development, Zoning, and Subdivision Ordinances.
9. Existing DeKalb County, City of DeKalb, and DeKalb County Soil and Water Conservation District Geographic Information System (GIS) data for Upper South Branch Kishwaukee River watershed was obtained and used to analyze various data related to wetlands, soils, land use, demographics, and other relevant information.