3.0 Watershed Resource Inventory

3.1 Geology and Climate

Geology

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.

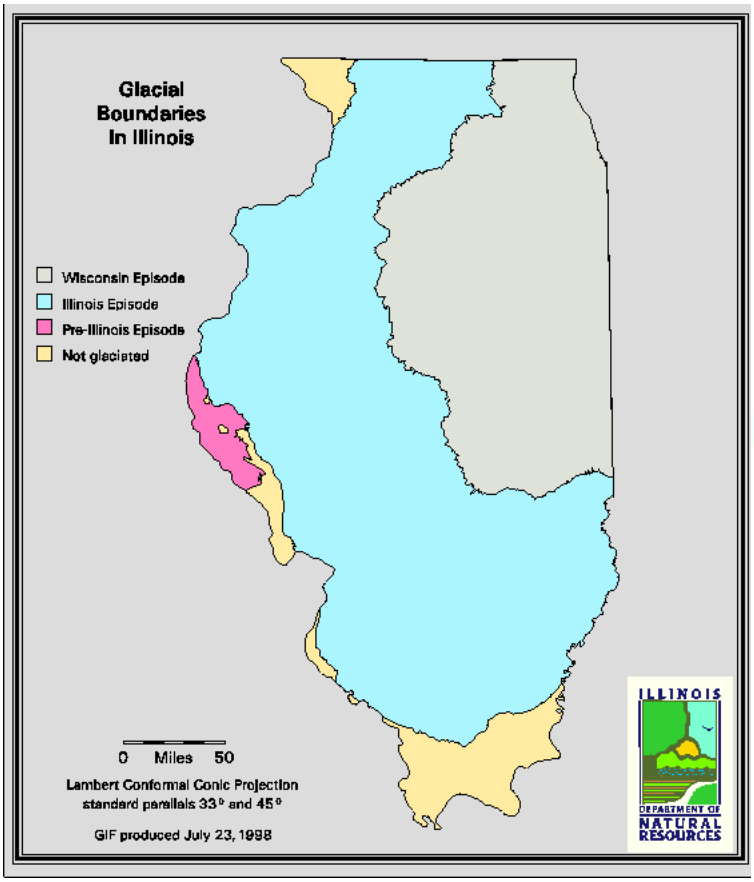
The nearby Bloomington Morainic System was created during the retreat of the Wisconsin glaciation, with later erosion of that system carving out the South Branch Kishwaukee River valley (Figure 5). These moraines are what cause the drainage of the Kishwaukee to generally flow north (ISGS, 2004). The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

Climate

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.

The Weather Channel website (www.weather.com) provides an excellent summary of climate statistics including monthly averages and records for most locations in Illinois. Data for DeKalb represents the climate and weather patterns experienced in Upper South Branch Kishwaukee watershed (Figure 6). The winter months are cold averaging highs around 28° F while winter lows are around 13° F. Summers are warm with average highs around 83° F and summer lows around 63° F. The highest recorded temperature was 103° F in August of 1995 while the lowest temperature was -27° F in January 1985.

Fairly typical for the Midwest, the current climate of Upper South Branch Kishwaukee watershed consists of an average rainfall of around 36.6 inches and snowfall around 32.5 inches annually. According to data collected in DeKalb, the most precipitation on average occurs in May (4.57 inches) while January receives the least amount of precipitation with 1.48 inches on average.



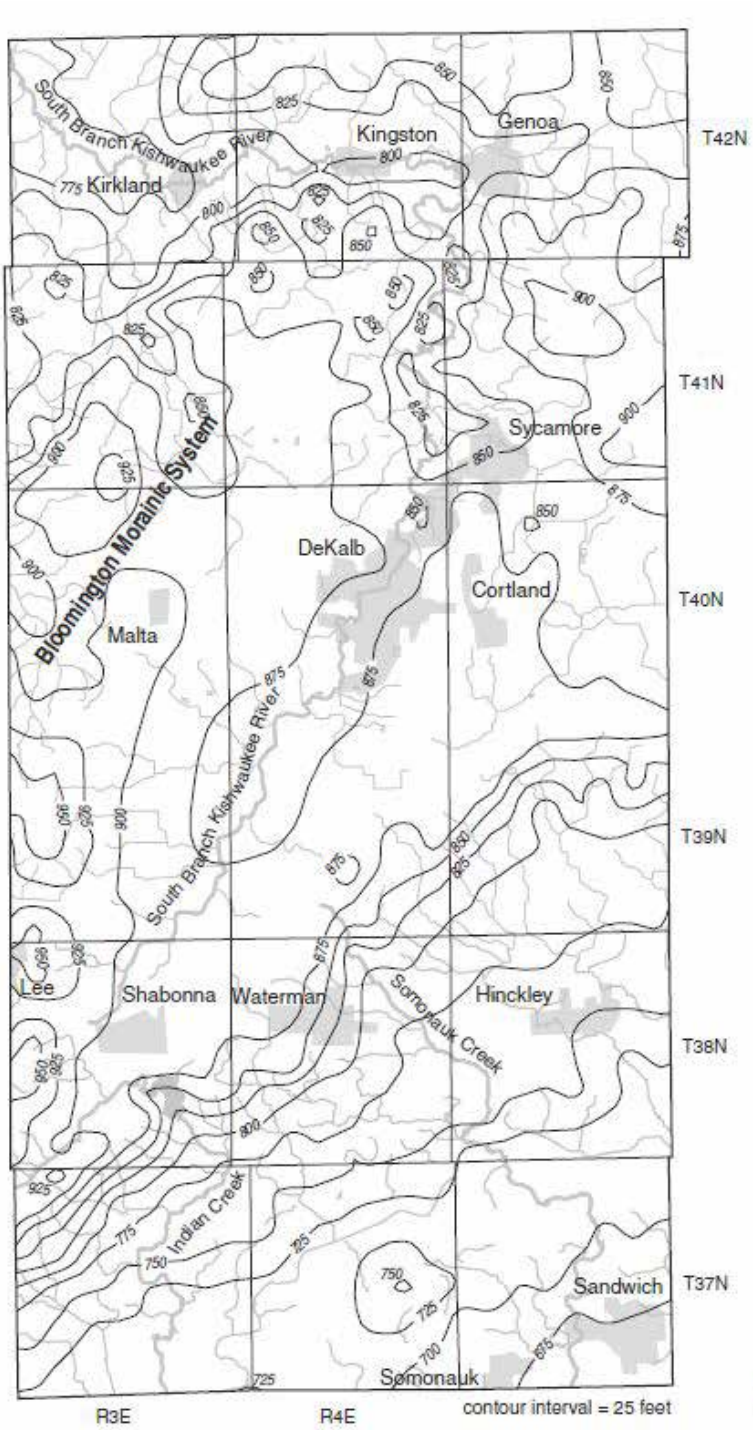


Figure 4 & 5. Glacial boundaries in Illinois (left) and land surface elevation (right) (Source: ISGS, 2004).

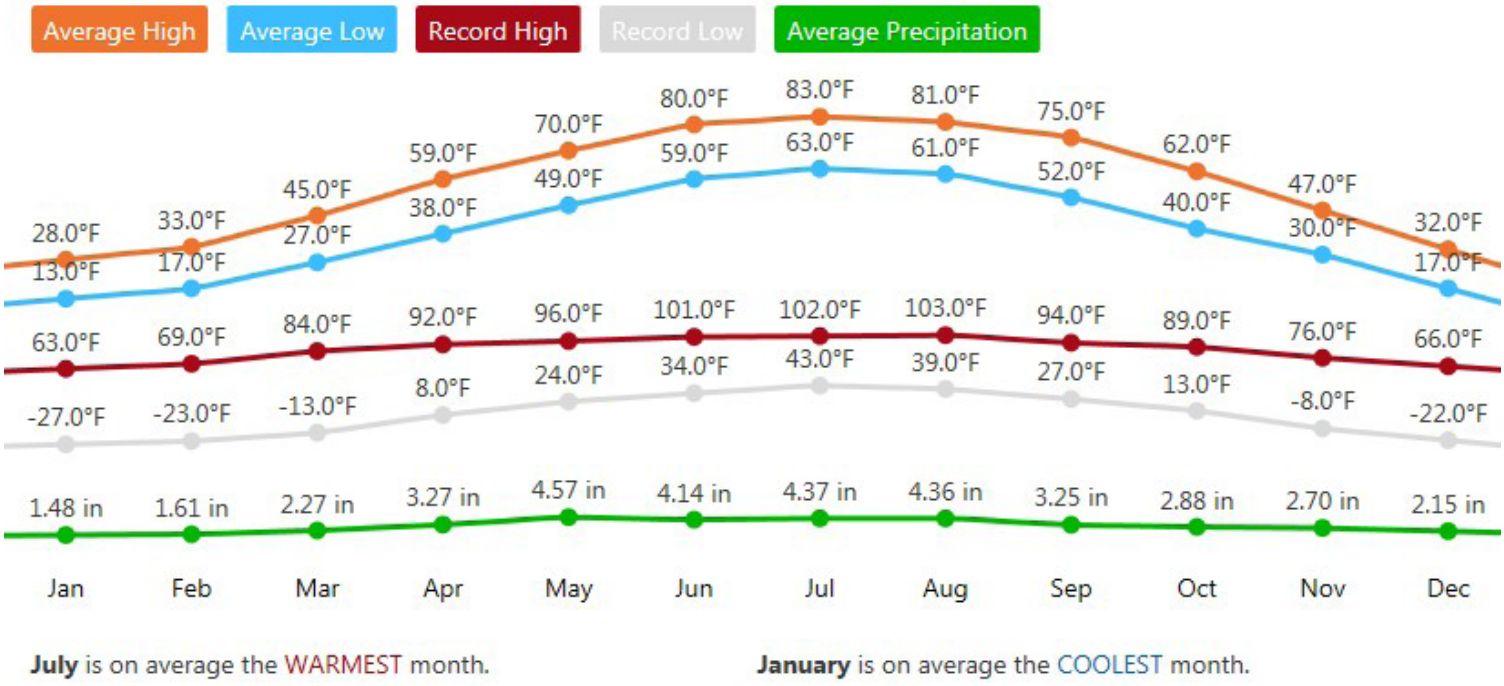


Figure 6. Climate records for DeKalb, IL (Source: the Weather Channel).

Storm clouds rolling through watershed.

3.2 Pre-European Settlement Landscape Compared to Present 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). 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

"The surface of the town, like the remainder of the County, is mostly occupied by handsome rolling prairie, but, unlike some others, it is favored with a handsome stream, the head waters of one branch of the Kishwaukee, and is liberally supplied with timber from an extensive grove bordering this stream, formerly known far and wide as Huntley's Grove."

– Boies, 1922

DeKalb was originally named Huntley's Grove after Russell Huntley who owned the largest claim where the City of DeKalb now sits. The railroad was built through DeKalb and the city was platted, both in 1853.

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 overwhelming majority of the Upper South Branch Kishwaukee River watershed as "Prairie" with stretches of "Timber" along the main stem of the Kishwaukee near DeKalb and a few pockets of "Marsh" scattered throughout, particularly along the western portions of the watershed (Figure 7). This mixture of "Prairie" and "Timber" across the landscape was widely described in the mid-1800s as the surveyors and early settlers moved west out of the heavily forested eastern portion of the United States and encountered a much more open environment that ecologists now refer to as "Savanna." Prior to settlement, the prairie-savanna 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 "Timber" were stretches of continuous forest along the banks of the Kishwaukee comprised of white, red, and burr oaks, interspersed with poplar, maple, butternut, black-walnut and hickory.

250-year plus bur oak in residential DeKalb

During pre-European settlement times most of the water that fell as precipitation was absorbed in upland prairie and savanna communities and within the extensive wetlands that existed along stream corridors. Infiltration and absorption of water was so great and the land was so flat that most of the defined stream channels seen today were simply wet prairies or wetland complexes. This is true for most of the watershed outside of the main stem of the Upper South Branch Kishwaukee River. In fact, none of the tributaries that exist today and only the lower two-thirds of the main stem of the Upper South Branch Kishwaukee river were noted in the 1842 land survey mapping (Figure 7).

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 turn of the century saw other developments in the County. In 1895, Northern Illinois State Normal School opened and was later renamed Northern Illinois

University (NIU). Today NIU has grown to accommodate an annual enrollment of approximately 25,000 students and is DeKalb County's largest employer (DeKalb 2011).

The earliest aerial photographs, taken in 1939 (Figure 8), depict the Upper South Branch Kishwaukee River watershed when row crop farming was the primary land use but before residential and commercial development seen today. Some of the woodland communities described along the Kishwaukee near DeKalb were still present in 1939 but farmland clearly replaced nearly all of the prairie and wetland communities. With the advent of farming came significant changes in stormwater runoff. By 1939 defined stream channels had formed or were created throughout the watershed.

Figure 9 shows a 2017 aerial photograph of the Upper South Branch Kishwaukee River watershed. It is clear that residential and commercial development replaced some of the farmland in and around DeKalb and Sycamore as development expanded around the city centers. The darker, rounded signatures scattered throughout the watershed correlate closely with the hydric soils (discussed in Section 3.14.3). Very few woodlands and virtually no wetlands remain by 2017 compared to pre-settlement conditions.

With degraded ecological conditions comes the opportunity to implement ecological restoration to improve the condition of Upper South Branch Kishwaukee River 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.

Example of pre-European settlement prairie-savanna landscape

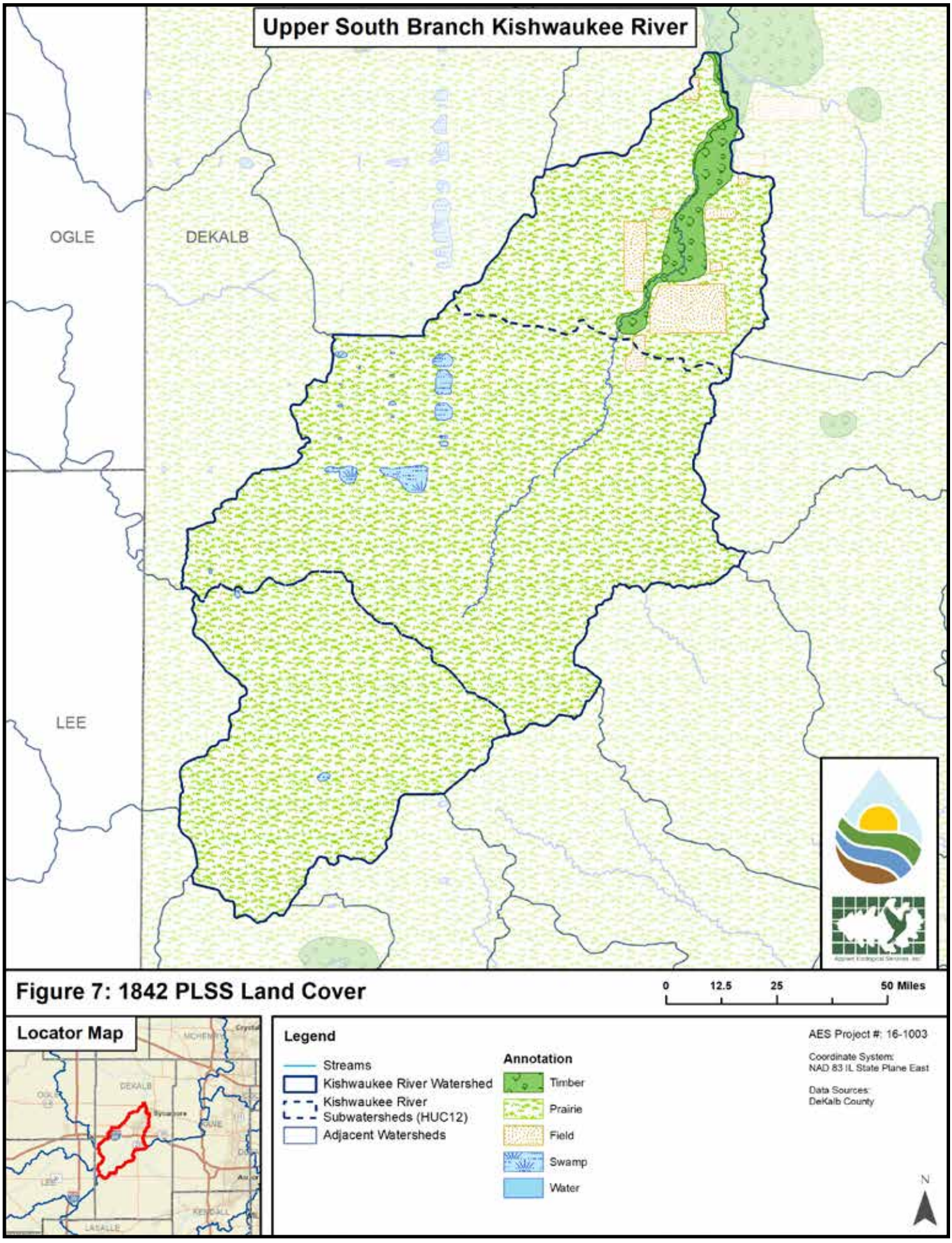


Figure 7: 1842 PLSS Land Cover

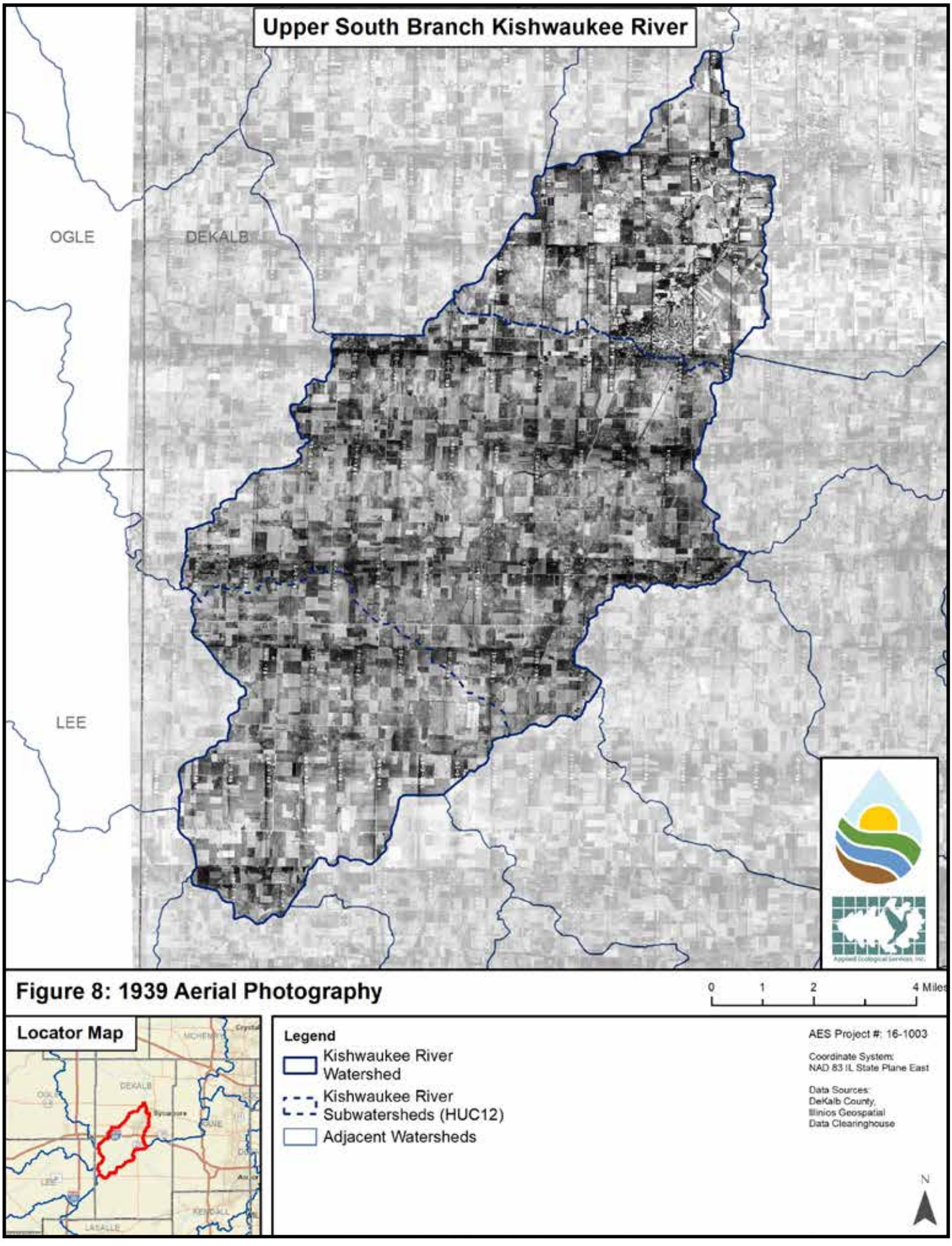
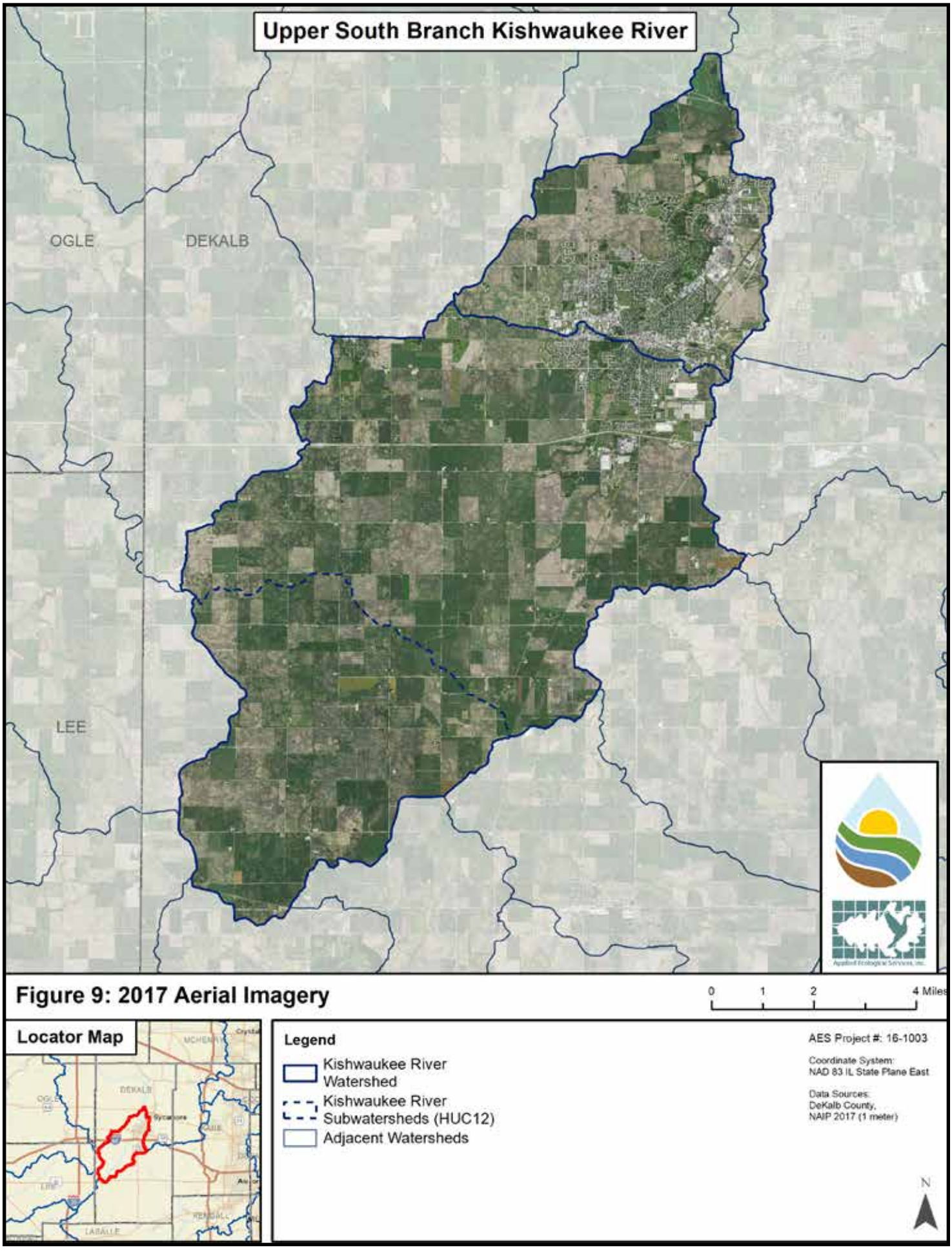


Figure 8: 1939 Aerial Photography


Upper South Branch Kishwaukee River
OGLE
DEKALB
LEE
Figure 9: 2017 Aerial Imagery
0
1
2
4 Miles
Locator Map
Legend
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
AES Project #: 16-1003
Coordinate System:
NAD 83 IL State Plane East
Data Sources:
DeKalb County,
NAIP 2017 (1 meter)
N

3.3 Topography, Watershed Boundary, & Subwatershed Management Units

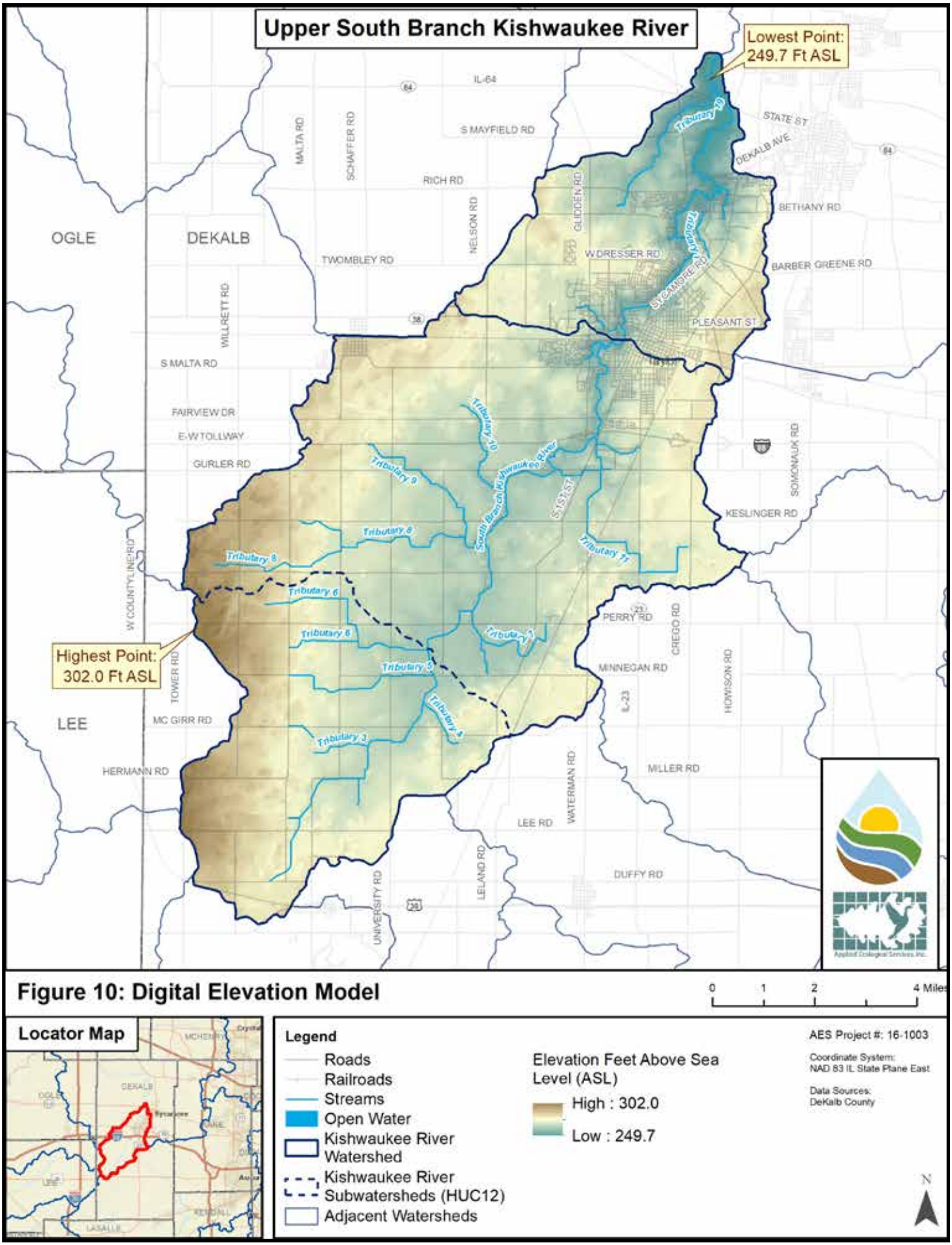
Topography & Watershed Boundary

The Wisconsin glacier that retreated 14,000 years ago formed much of the topography and defined the Upper South Branch Kishwaukee watershed boundary observed today. Topography refers to elevations of a landscape that describe the configuration of its surface and ultimately defines watershed boundaries. The specifics of watershed planning cannot begin until a watershed boundary is clearly defined.

The Upper South Branch Kishwaukee watershed boundary was updated and refined for this study using the most up-to-date 2-foot topography data available from DeKalb County. The refined watershed boundary was then input into a GIS model (Arc Hydro) that generated a Digital Elevation Model (DEM) of the watershed (Figure 10). The Upper South Branch Kishwaukee watershed is 63,219.1 acres or 98.8 square miles in size.

The Upper South Branch Kishwaukee River (AUIDs: IL_PQC-02 and IL_PQC-13) watershed generally drains from southwest to northeast 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 302 feet above sea level (ASL) to a low of 250 feet ASL for a total relief of 52 feet (Figure 10). The highest point is found in the central western portion of the watershed near the intersection of Tower Rd and Perry Rd. Higher elevations also extend along much of the western and southern portions of the watershed. As expected, the lowest elevation occurs where the Upper South Branch Kishwaukee enters the East Branch of the South Branch Kishwaukee River (IL_PQC-05) with lower elevations extending along the main stem of the Upper South Branch Kishwaukee and its many tributaries. The DEM (Figure 10) depicts the relatively flat topography of the watershed.

View of the unbroken and relatively flat agricultural landscape of the watershed.


Upper South Branch Kishwaukee River
Lowest Point: 249.7 Ft ASL
Highest Point: 302.0 Ft ASL
OGLE
DEKALB
LEE
IL-64
S MAYFIELD RD
MALTA RD
SCHAFFER RD
RICH RD
NELSON RD
GLIDDEN RD
STATE ST
DEKALB AVE
BETHANY RD
W DRESSER RD
SYCAMORE RD
BARBER GREENE RD
PLEASANT ST
TWOMBLEY RD
WILLRETT RD
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
W COUNTY LINE RD
TOWER RD
MC GIRR RD
HERMANN RD
Tributary 10
Tributary 9
Tributary 8
Tributary 6
Tributary 5
Tributary 4
Tributary 3
Tributary 2
Tributary 1
South Branch Kishwaukee River
S 1ST ST
SOMONAUK RD
KESLINGER RD
PERRY RD
CREGO RD
MINNEGAN RD
IL-23
HOWISON RD
MILLER RD
WATERMAN RD
LEE RD
DUFFY RD
LELAND RD
UNIVERSITY RD
Figure 10: Digital Elevation Model
0 1 2 4 Miles
Locator Map
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Elevation Feet Above Sea Level (ASL)
High : 302.0
Low : 249.7
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County
N

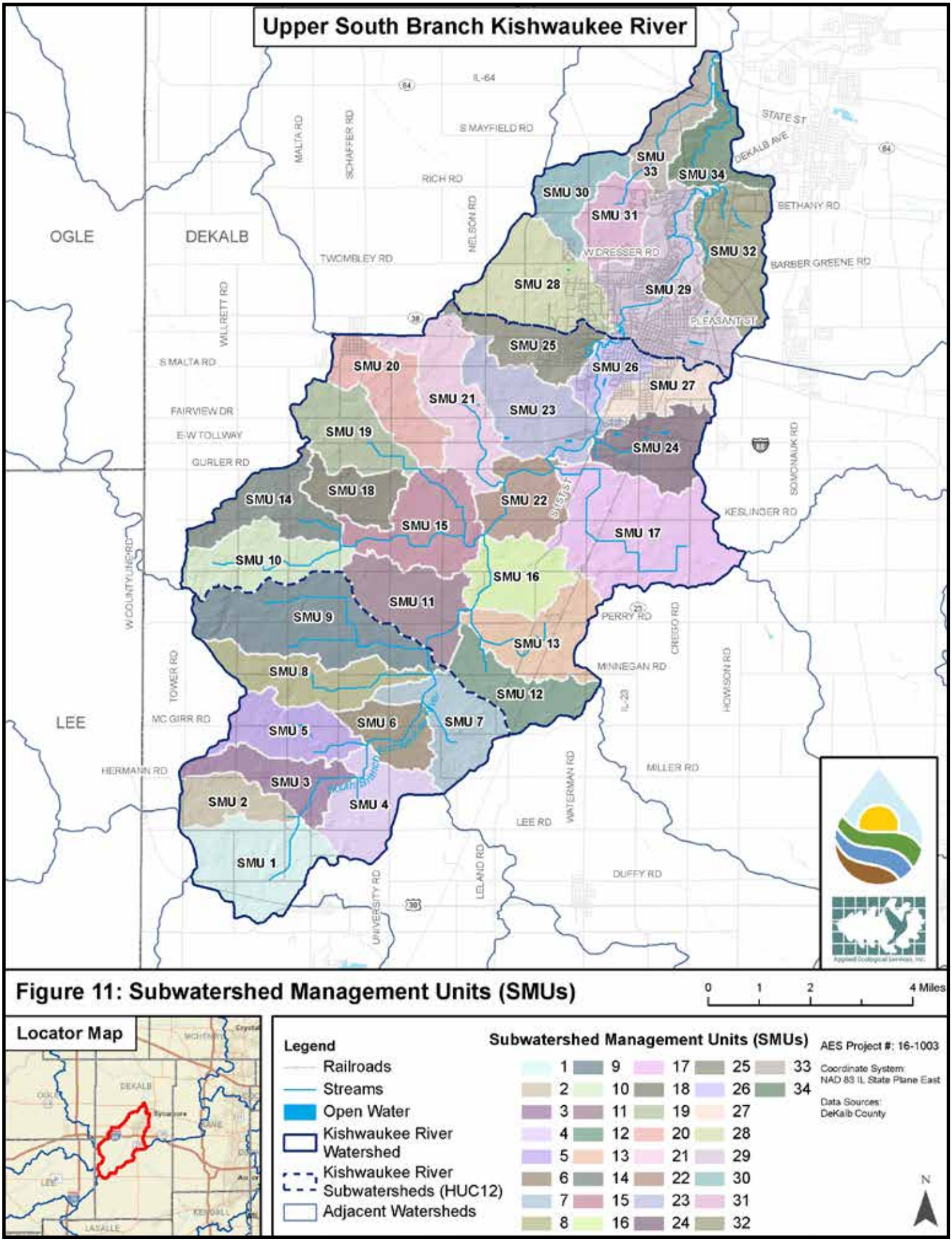
Subwatershed Management Units (SMUs)

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 Upper South Branch Kishwaukee River watershed is nearly 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 small scale, a watershed can be divided into subwatersheds called Subwatershed Management Units (SMUs). The Upper South Branch Kishwaukee River watershed was delineated into 34 SMUs by using the Digital Elevation Model (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 and size within the watershed. Figure 11 depicts the location of each SMU boundary delineated within the larger Upper South Branch Kishwaukee River watershed.

Table 3. Subwatershed Management Units and size.

SMU #	Acres	Square Miles	Stream Reach
SMU 1	2,515.2	3.9	South Branch Kishwaukee River Reach 1
SMU 2	1,115.7	1.7	Tributary 1 Reach 1
SMU 3	1,481.3	2.3	South Branch Kishwaukee River Reach 2
SMU 4	1,722.6	2.7	Tributary 2 Reach 1
SMU 5	1,610.6	2.5	Tributary 3 Reach 1 and 2
SMU 6	1,139.8	1.8	South Branch Kishwaukee River Reach 3 and 4
SMU 7	1,761.7	2.8	Tributary 4 Reach 1
SMU 8	1,867.0	2.9	Tributary 5 Reach 1, 2, and 3
SMU 9	3,503.5	5.5	Tributary 6 Reach 1, 2, 3, and 4
SMU 10	1,845.0	2.9	Tributary 8 Reach 1 and 2
SMU 11	1,990.0	3.1	South Branch Kishwaukee River Reach 5
SMU 12	1,612.1	2.5	Tributary 7 Reach 2
SMU 13	1,943.5	3.0	Tributary 7 Reach 1, 2, and 3
SMU 14	1,691.5	2.6	Tributary 8 Reach 3
SMU 15	2,296.2	3.6	Tributary 8 Reach 4 and 5 and Tributary 9 Reach 2 and 3
SMU 16	1,623.6	2.5	South Branch Kishwaukee River Reach 6 and 7
SMU 17	4,124.3	6.4	Tributary 11 Reach 1, 2, 3, and 4
SMU18	1,135.2	1.8	None
SMU19	1,764.9	2.8	Tributary 9 Reach 1
SMU 20	1,861.0	2.9	None
SMU 21	2,289.0	3.6	Tributary 10 Reach 1 and 2
SMU 22	1,543.0	2.4	None
SMU 23	2,345.3	3.7	South Branch Kishwaukee River Reach 8 and 9
SMU 24	1,693.5	2.6	Tributary 12 Reach 1 and Tributary 13 Reach 1 and 2
SMU 25	1,416.0	2.2	Tributary 14 Reach 1
SMU 26	901.0	1.4	South Branch Kishwaukee River Reach 10 and 11
SMU 27	1,103.4	1.7	None
SMU 28	2,628.3	4.1	Tributary 15 Reach 1 and 2
SMU 29	3,610.0	5.6	South Branch Kishwaukee River Reach 12 and 13 and Tributary 16 Reach 1
SMU 30	1,202.5	1.9	None
SMU 31	1,244.6	1.9	None
SMU 32	2,158.3	3.4	Tributary 17 Reach 1 and 2 and Tributary 18 Reach 1
SMU 33	1,226.6	1.9	South Branch Kishwaukee River Reach 16 and Tributary 19 Reach 1 and 2
SMU 34	1,252.7	2.0	South Branch Kishwaukee River Reach 14 and 15
Totals	63,219.1	98.8	


Upper South Branch Kishwaukee River
OGLE
DEKALB
LEE
SMU 1
SMU 2
SMU 3
SMU 4
SMU 5
SMU 6
SMU 7
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SMU 9
SMU 10
SMU 11
SMU 12
SMU 13
SMU 14
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SMU 33
SMU 34
IL-64
S MAYFIELD RD
RICH RD
TWOMBLEY RD
W DRESSER RD
BETHANY RD
BARBER GREENE RD
PLEASANT ST
STATE ST
DEKALB AVE
MALTA RD
SCHAFFER RD
NELSON RD
WILLRETT RD
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
W COUNTYLINE RD
TOWER RD
MC GIRR RD
HERMANN RD
PERRY RD
CRESO RD
MINNEGAN RD
HOWISON RD
SOMONAUK RD
KESLINGER RD
MILLER RD
WATERMAN RD
LEE RD
DUFFY RD
LELAND RD
UNIVERSITY RD
Figure 11: Subwatershed Management Units (SMUs)
0 1 2 4 Miles
Locator Map
Legend
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Subwatershed Management Units (SMUs)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32
33 34
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County
N

3.4 Hydric Soils, Soil Erodibility, & Hydrologic Soil Groups

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 Upper South Branch Kishwaukee River 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 are important because they indicate the presence of existing wetlands or drained wetlands where restoration may be possible. Most of the wetlands in Upper South Branch Kishwaukee River 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.

Historically there were approximately 25,734 acres of wetlands (41% of the watershed; as hydric soils) in the watershed. Approximately 37,485 acres were not hydric. According to existing wetland inventories, 1,570 acres or 6% of the pre-European settlement wetlands remain. The location of hydric soils in the watershed is depicted on Figure 12. Existing wetlands and wetland restoration opportunities are discussed in detail in Section 3.14.3.

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, no areas were rated as having a severe potential erosion hazard and 23,266 acres (37%) 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.

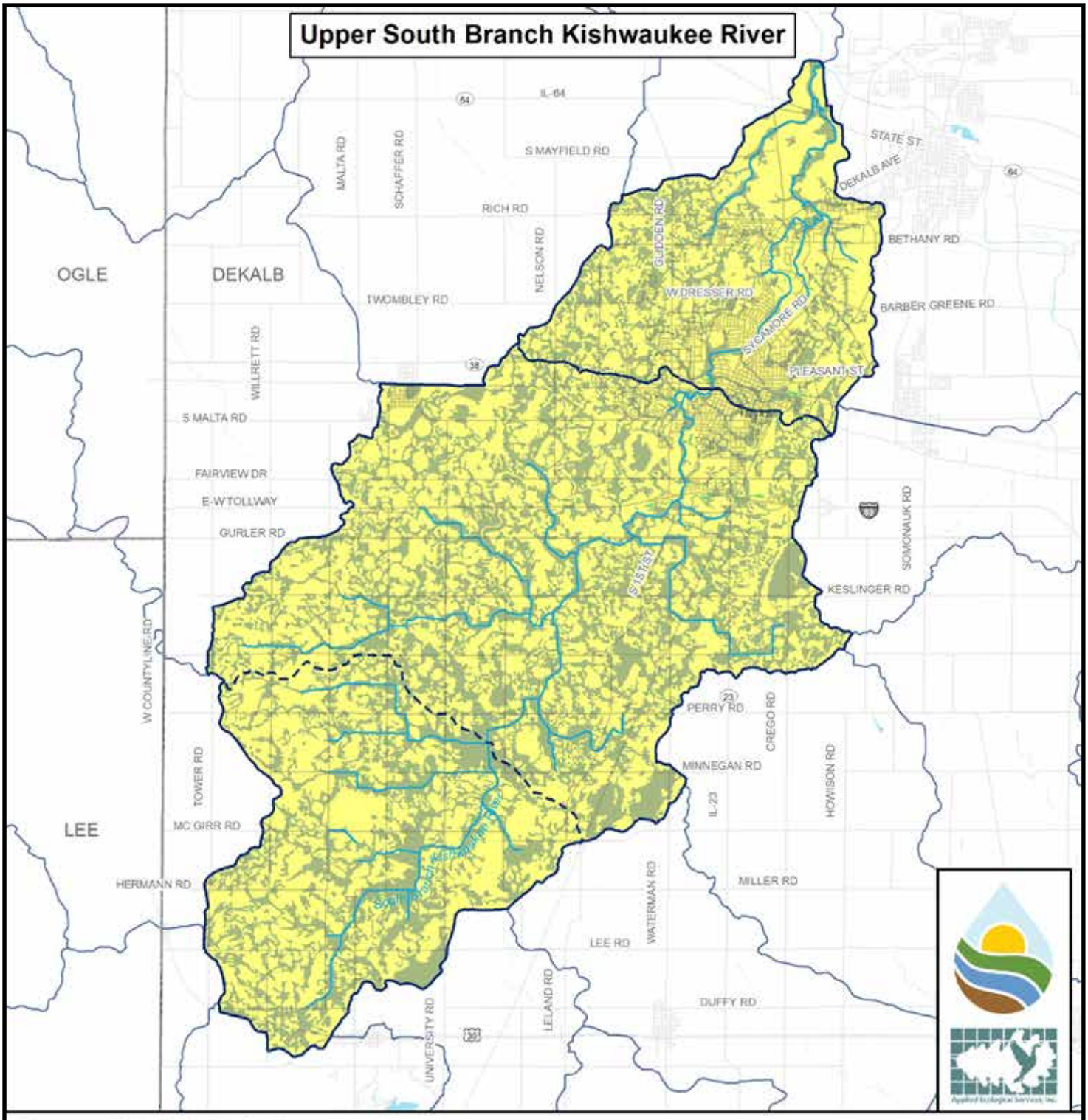
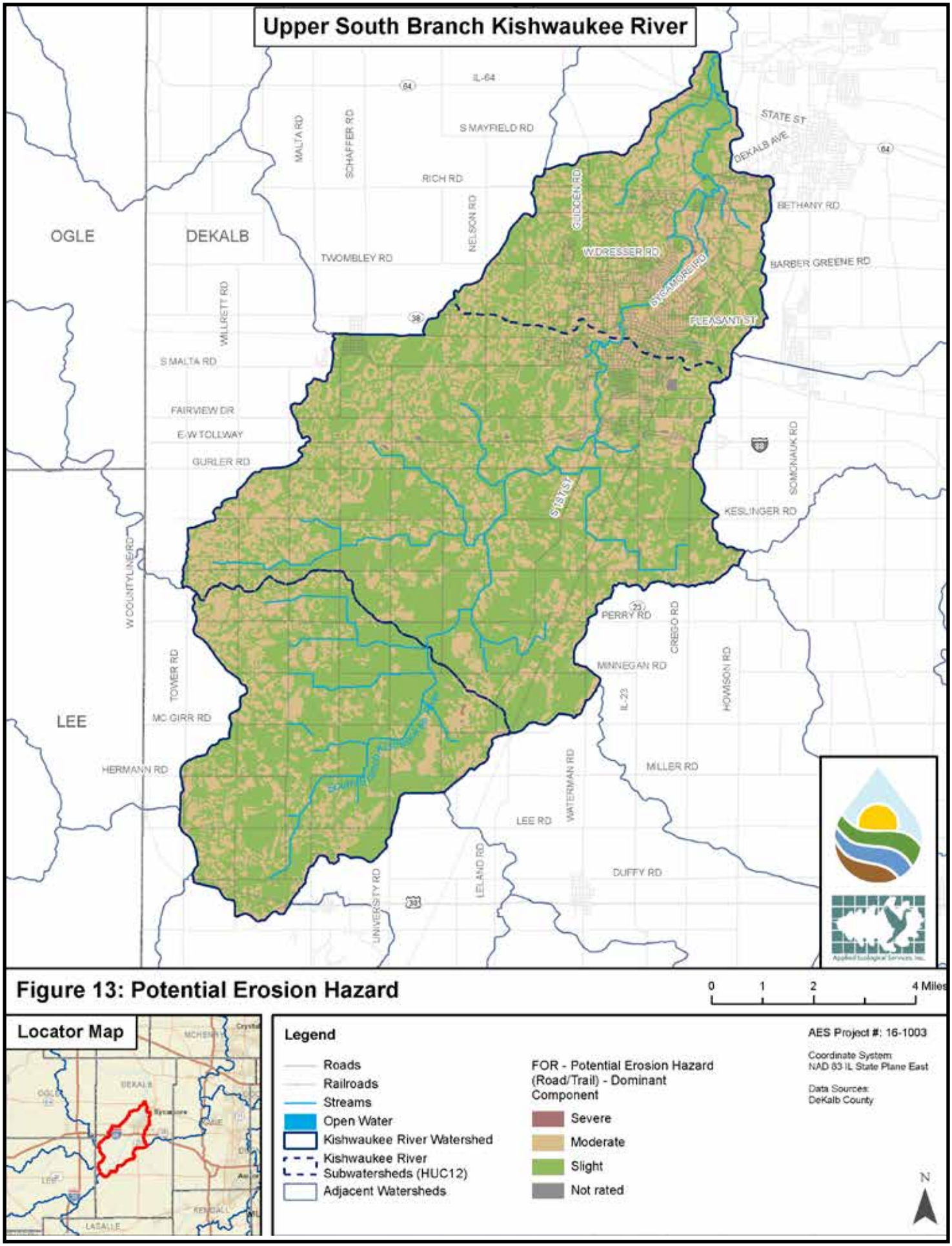


Figure 12: Hydric Soils


Upper South Branch Kishwaukee River
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IL-64
S MAYFIELD RD
STATE ST
DEKALB AVE
BETHANY RD
BARBER GREENE RD
RICH RD
MALTA RD
SCHAFFER RD
NELSON RD
GLIDDEN RD
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SYCAMORE RD
PLEASANT ST
TWOMBLEY RD
WILLRETT RD
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
SOMONAUK RD
KESLINGER RD
S 1ST ST
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MC GIRR RD
HERMANN RD
PERRY RD
CREGO RD
HOWSON RD
MINNEGAN RD
IL-23
MILLER RD
WATERMAN RD
LEE RD
DUFFY RD
LELAND RD
UNIVERSITY RD
Figure 13: Potential Erosion Hazard
0 1 2 4 Miles
Locator Map
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
FOR - Potential Erosion Hazard (Road/Trail) - Dominant Component
Severe
Moderate
Slight
Not rated
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County
N

Hydrologic Soil Groups
Soils also exhibit different infiltration capabilities and have been classified to fit what are known as "Hydrologic Soil Groups" (HSGs). HSGs are based on a soil's infiltration and transmission (permeability) rates and are used by engineers and planners 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 however is the link between hydrologic soil groups and groundwater recharge areas. Groundwater recharge is discussed in Section 3.16.

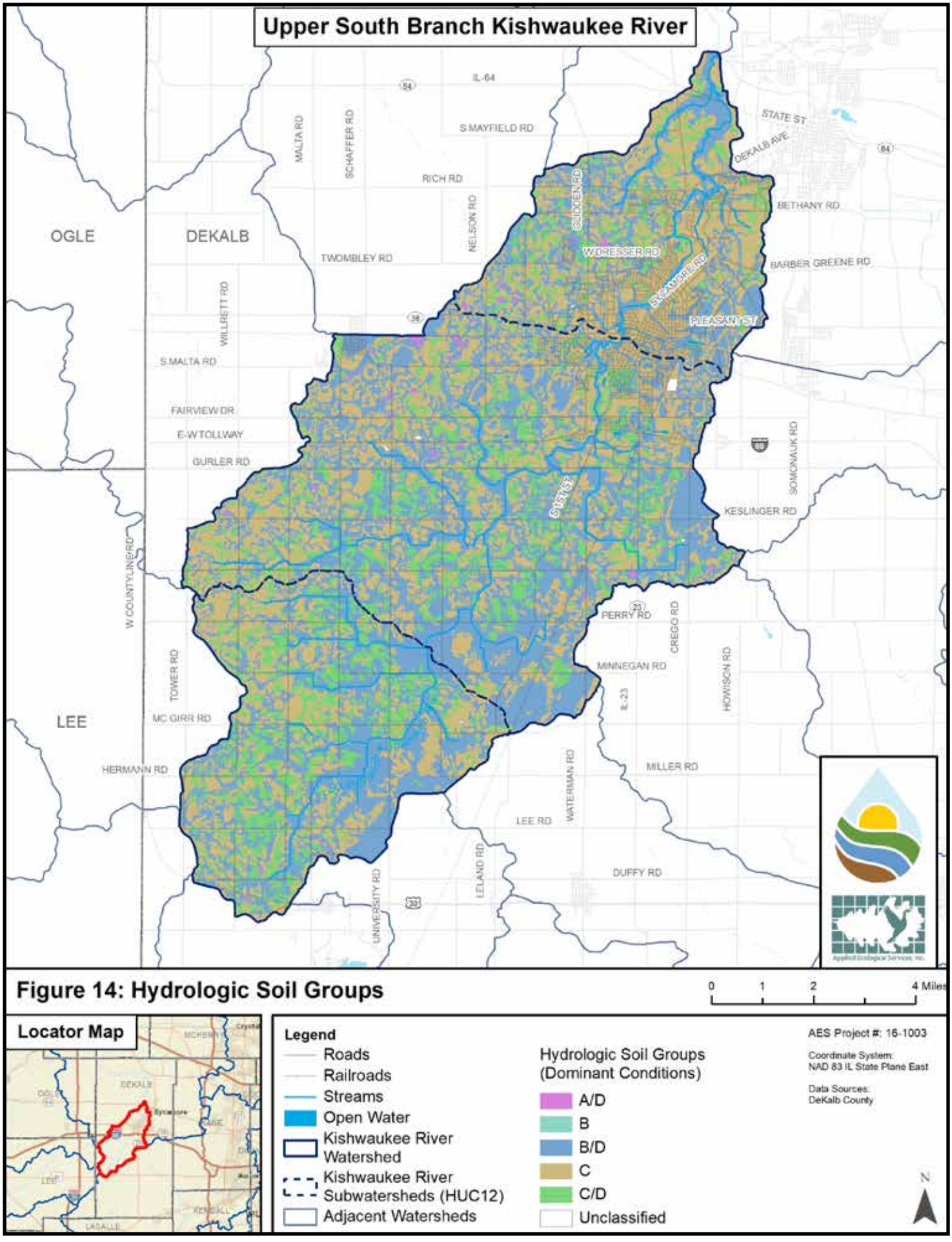
HSGs are classified into four primary categories; A, B, C, and D, and three dual classes, A/D, B/D, and C/D, as detailed in Table 4 below. Dual classes refer to areas where the water table is within 24" of the surface. In these cases, "the first letter applies to the drained condition and the second 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 B/D soils are dominant throughout the watershed at about 44% coverage and are found along the main stem and southeastern most portions of Upper South Branch Kishwaukee River watershed. Group C soils also make up a significant portion of the watershed at around 40%.

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	189.9	0.3%
B	36.0	0.1%
B/D	27,936.1	44.2%
C	25,157.4	39.8%
C/D	9,780.2	15.5%
Unclassified	119.6	0.2%
Totals	**63,219.1**	**100.0%**


Upper South Branch Kishwaukee River
OGLE
DEKALB
LEE
IL-64
S MAYFIELD RD
MALTA RD
SCHAFFER RD
RICH RD
NELSON RD
GLIDDEN RD
TWOMBLEY RD
WORESSER RD
SYCAMORE RD
STATE ST
DEKALB AVE
BETHANY RD
BARBER GREENE RD
PLEASANT ST
WILLRETT RD
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
SYCAMORE ST
SOMONAUK RD
KESLINGER RD
W COUNTYLINE RD
PERRY RD
CREGO RD
MINNEGAN RD
IL-23
HOWNSON RD
TOWER RD
MC GIRR RD
HERMANN RD
WATERMAN RD
MILLER RD
LEE RD
LELAND RD
DUFFY RD
UNIVERSITY RD
Figure 14: Hydrologic Soil Groups
0 1 2 4 Miles
Locator Map
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Hydrologic Soil Groups (Dominant Conditions)
A/D
B
B/D
C
C/D
Unclassified
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County
N

3.5 Jurisdictions, Roles, & Protections

The Upper South Branch Kishwaukee watershed is located in one county, portions of 10 townships, and four municipalities (Table 6, Figure 15). The watershed falls entirely within DeKalb County and within portions of DeKalb, Milan, Afton, Shabbona, Malta, and Mayfield Townships, as well as very small pieces (<1%) in Cortland, Clinton, Pierce, and Sycamore Townships.

Of the municipalities in the watershed, the City of DeKalb has the largest share with 9,585.4 acres (15.3%), while the City of Sycamore (752.0 acres; 1.2%), the Village of Shabbona (217.1 acres; <1%), and the Village of Malta (133.9 acres; <1%) cover one percent or less of the watershed. The remaining areas fall on unincorporated township and county land.

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

Jurisdiction	Area (acres)	% of Watershed
County	63,219.1	100
DeKalb	63,219.1	100
Unincorporated Township Areas	52,530.7	83
Unincorporated Milan Township	17,469.7	27.6
Unincorporated Afton Township	13,339.7	21.1
Unincorporated DeKalb Township	9,857.4	15.5
Unincorporated Shabbona Township	5,419.3	8.6
Unincorporated Malta Township	4,292.2	6.8
Unincorporated Mayfield Township	1,845.7	2.9
Unincorporated Cortland Township	251.8	<1
Unincorporated Clinton Township	48.4	<1
Unincorporated Pierce Township	6.3	<1
Unincorporated Sycamore Township	0.2	<1
Municipalities	10,688.4	17
DeKalb	9,585.4	15.3
Sycamore	752.0	1.2
Shabbona	217.1	<1
Malta	133.9	<1

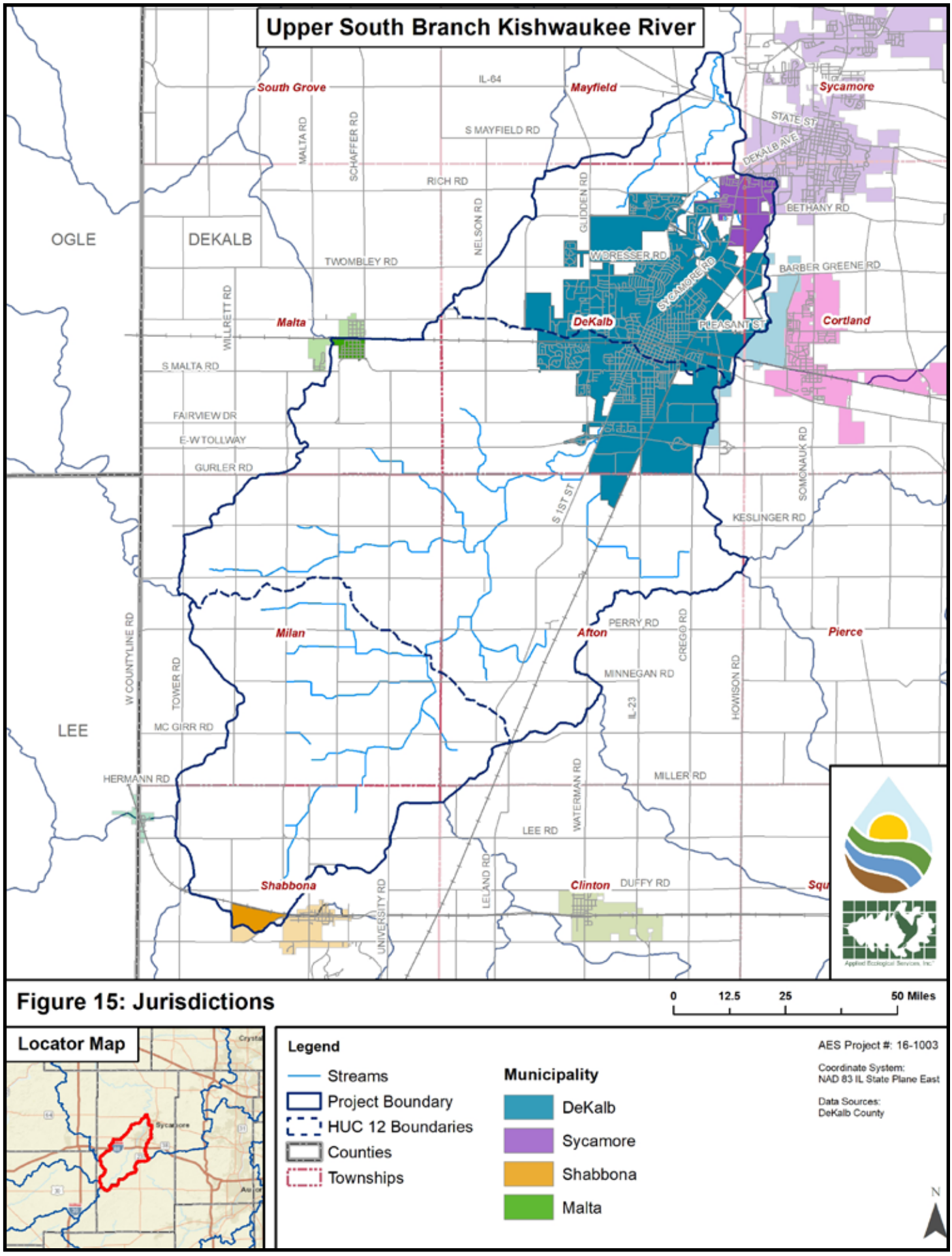


Figure 15: Jurisdictions

0 12.5 25 50 Miles

Locator Map

Legend

- Streams
- Project Boundary
- HUC 12 Boundaries
- Counties
- Townships

Municipality

- DeKalb
- Sycamore
- Shabbona
- Malta

AES Project #: 16-1003

Coordinate System: NAD 83 IL State Plane East

Data Sources: DeKalb County

N

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 DeKalb 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, in order to properly protect water and other natural resources, cooperation and coordination among all these entities is essential.

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)
	- Federal Aviation Administration (FAA)
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)
	Illinois Tollway
County	DeKalb County Board
	DeKalb County Community Development Department
	DeKalb County Health Department
	DeKalb County Highway Department
	DeKalb County Soil and Water Conservation District
	DeKalb County Forest Preserve District
Local	City of DeKalb
	City of Sycamore
	Village of Shabbona
	Village of Malta
Township	Unincorporated Milan Township
	Unincorporated Afton Township
	Unincorporated DeKalb Township
	Unincorporated Shabbona Township
	Unincorporated Malta Township
	Unincorporated Mayfield Township
	Unincorporated Cortland Township
	Unincorporated Clinton Township
	Unincorporated Pierce Township
	Unincorporated Sycamore Township

Right: Table 7. Levels of Jurisdiction.

Federal Government Roles and Protections

United States Army Corps of Engineers (USACE) - In the DeKalb area, the U.S. Army Corps of Engineers (USACE) regulate 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 the management of the Upper South Kishwaukee 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 effectively and safely manage water resources while protecting the environment and human and animal health. 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, and portions of the Coastal Zone Act Reauthorization Amendments of 1990, Resource Conservation and Recovery Act, Ocean Dumping Ban Act, Marine Protection, Research and Sanctuaries Act, Shore Protection Act, Marine Plastics Pollution Research and Control Act, London Dumping Convention, the International Convention for the Prevention of Pollution from Ships and several other statutes.

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.

Federal Aviation Administration (FAA)- FAA's mission is to provide a safe, efficient aerospace system. The Federal Aviation Administration (FAA) plays a role in land use planning through advisory circulars such as AC 150/5200-33C "Hazardous Wildlife Attractants on or near Airports" which provides guidance on certain land uses that have the potential to attract hazardous wildlife on or near public-use airports. It also discusses airport development projects (including airport construction, expansion, and renovation) affecting aircraft movement near hazardous wildlife attractants. In which they recommend land uses such as wetlands, landfills, or detention basins should be outside of a 1-5-mile buffer zone, depending on the types of aircraft serviced by the airport.

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 is one Illinois Department of Agriculture Conservation Practices Program site in the watershed and two Illinois Department of Agriculture Well Decommissioning Program sites. 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 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.

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 including Stratton Lock and Dam and Sinnissippi dam. 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.

The 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 (MS4s) 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 MS4's 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. Ilicit 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, the City of DeKalb, and the City of Sycamore all maintain active MS4 permits. Kishwaukee Water Reclamation District holds the only NPDES permit within the watershed (Permit No. IL0023027). For more detailed information regarding Kishwaukee Water Reclamation District and their permit 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 CAFOs or TMDLs within the watershed.

Illinois Tollway - The Illinois Tollway builds, operates, and maintains toll roads throughout Illinois. The Tollway is committed to achieving the following goals: increasing collaboration with regional transportation and planning agencies; promoting the regional economy; maintaining financial integrity; fostering environmental responsibility and sustainability; maintaining the safety and efficiency of the Tollway system; furthering transparency and accountability; enhancing customer service; and maintaining public trust.

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.

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 52,530.7 acres across ten townships.

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.

DeKalb County Highway Department- 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

DeKalb County Soil and Water Conservation District (DCSWCD)- 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.

Townships and Municipalities- 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 DeKalb is regulated under the City's Comprehensive Plan (March 2005) and Unified Development Ordinance. Likewise, planning and development within the City of Sycamore is regulated under their Comprehensive Plan (June 2014) and Unified Development Ordinance. The Village of Malta adopted a Comprehensive Plan in 2003. The Village of Shabbona maintains Building & Development, Zoning, and Subdivision Ordinances.

Mural along Lincoln Highway in downtown DeKalb

Special Jurisdiction Roles and Protections

Northern Illinois University (NIU)- Northern Illinois University is a significant presence in the watershed as well, with a campus spanning roughly 950 acres in DeKalb and a student population of around 20,000. Northern Illinois University's vision is to be an engine for innovation to advance social mobility; promote personal, professional and intellectual growth; and transform the world through research, artistry, teaching and outreach. Northern Illinois University's Facilities Management and Campus Services department through its divisions of Architectural and Engineering Services, Grounds, and Environmental Health and Safety oversees the management of campus resources and sustainability.

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.

Kishwaukee Water Reclamation District - The Kishwaukee Water Reclamation District is located in DeKalb and serves the city of DeKalb as well as some of the outlying areas around of the city. The Mission of the Kishwaukee Water Reclamation District is to protect public health and the environment by providing collection, treatment, and disposal of wastewater for customers in an efficient and economical manner. In doing so, the District strives to adhere to environmental regulations as established by the Illinois Pollution Control Board. The District collects and treats between 4-9 million gallons of wastewater daily though issues with infiltration and inflow from storm events sometimes causes levels on the scale of 30-50 MGD. The Water Reclamation District plays a key role in treating the wastewater generated daily, but also assists in the planning of future development such that the plant can adequately treat the wastewater load. More information regarding the Kishwaukee Water Reclamation District and their wastewater permit can be found in Section 3.17.

Drainage Districts- According to Article III of Illinois Compiled Statute 70 ILCS 605, 3-1- "Drainage districts may be formed to construct, maintain, or repair drains or levees or to engage in other drainage or levee work for agricultural, sanitary or mining purposes." Drainage districts (discussed further in Section 3.7) are local bodies formed for the purpose of draining, ditching, and improving land for agricultural and sanitary purposes.

School Districts- The DeKalb County Regional Office of Education (ROE) works to provide high quality educational services for communities in DeKalb County across eight (8) school districts. They work to ensure that school personnel have the resources necessary to carry out their mission, and act collaboratively with the Illinois State Board of Education to advance safe, efficient, and effective schools. Within the watershed are the DeKalb #428 and Indian Creek #425 school districts which serve students enrolled in PreK-12.

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 Upper South Branch Kishwaukee River 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 25 to 60 with an average score of 40. DeKalb County scored the highest with 60 points followed by the City of DeKalb with 34 and the City of Sycamore with 25 points. Although all scores are 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. 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 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.

There are nine drainage districts within the Upper South Branch Kishwaukee River Watershed that govern a network of drainage ditches located in the rural areas of DeKalb County (Table 8; Figure 16). The Afton Milan DeKalb Drainage #4 comprises the largest area within the watershed (18,180.3 ac.), followed by Malta Milan Afton DeKalb Drainage # 11 (8,879.0 ac.) and Shabbona Milan Drainage #6 (8,539.3 ac.). The remaining 6 districts have a combined total of 7,227.1 ac.

Table 8. Drainage Districts within the watershed.

Drainage District	Acres
Afton Milan DeKalb Drainage #4	18,180.3
Malta Milan Afton DeKalb Drainage #11	8,879.0
Shabbona Milan Drainage #6	8,539.3
Afton DeKalb Drainage #5	4,179.1
Normal Drainage #13	2,362.1
Malta DeKalb Drainage #3	414.8
Clinton Shabbona Drainage #7	152.0
Mayfield DeKalb Drainage #2	102.4
Cortland Pierce Drainage #15	16.7
Total	**42,825.7**

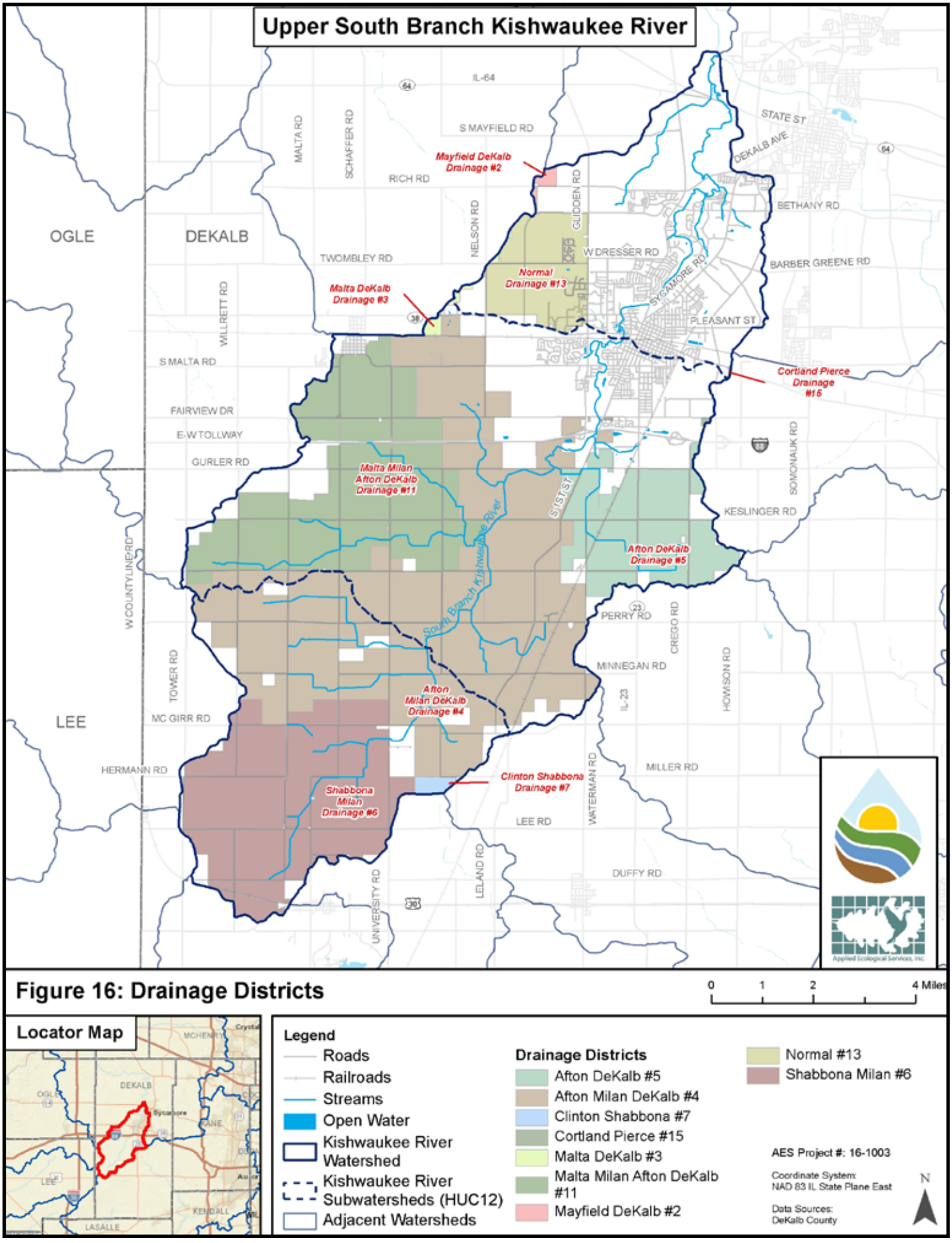


Figure 16: Drainage Districts

Bridge at Hopkins Park

3.8 Transportation Network

Roads

There are approximately 317 miles of roads in the watershed. Two lane roads make up 293 miles and four lane roads make up the remaining 24 miles. Four lane roads include Interstate 88 and sections of Lincoln Hwy, Annie Glidden, Sycamore, Peace, and Bethany Roads, among others. Interstate 88 (E-W Tollway) is the most highly used road in the watershed and connects I-80 from near Moline to I-290 and I-294 outside of Chicago (Figure 17). Lincoln Hwy (US Route 30) is one of the earliest transcontinental highways in the US, stretching from New York, NY to San Francisco, CA.

Several other major roads are worth mentioning. Major east-west roads include Rich Rd, Malta Rd, Fairview Dr, Gurler Rd and Keslinger Rd. Major north-south roads include DeKalb Avenue, 1st St, 4th St, Waterman Rd, University Rd, and Shabbona Rd.

As discussed in Section 3.5, maintenance of roads in the watershed is within the purview of the County Highway Department when they fall outside of municipal boundaries or are the responsibility of the municipal jurisdiction in which the roads exist.

Railroads

Two sections of rails for freight trains (no passenger trains) currently run through the watershed. The Union Pacific Railroad runs east-west through the watershed and is part of the second largest rail system in the US. The portion that connects Chicago to DeKalb was completed in 1853 and is still in use today and services routes that extend from Chicago to the west coast and as far south as Texas and New Orleans.

Part of the Northern Illinois Railroad, built in 1885 and once extending from Spring Valley to Belvidere through DeKalb, runs through the eastern portion of the watershed. Passenger service on this line was discontinued in stages over the last century, but a portion from DeKalb to south of Mendota is still in use and owned by Union Pacific Railroad.

In 2015, DeKalb Sycamore Area Transportation Study (DSATS), an organization responsible for transportation planning in the area, released its 2040 Long Range Transportation Plan, which looked at the current state of region's transportation and set the priorities for the next 25 years. The plan listed an extension of Chicago's Metra passenger service to DeKalb as one of its long-term goals (Studenkov 2018). Currently, the Union Pacific West Metra Line extends only to Elburn, but there are many hurdles that would need to be overcome in order to make such an extension possible.

Railroad crossing at Perry Rd.

Trails/Bike Paths

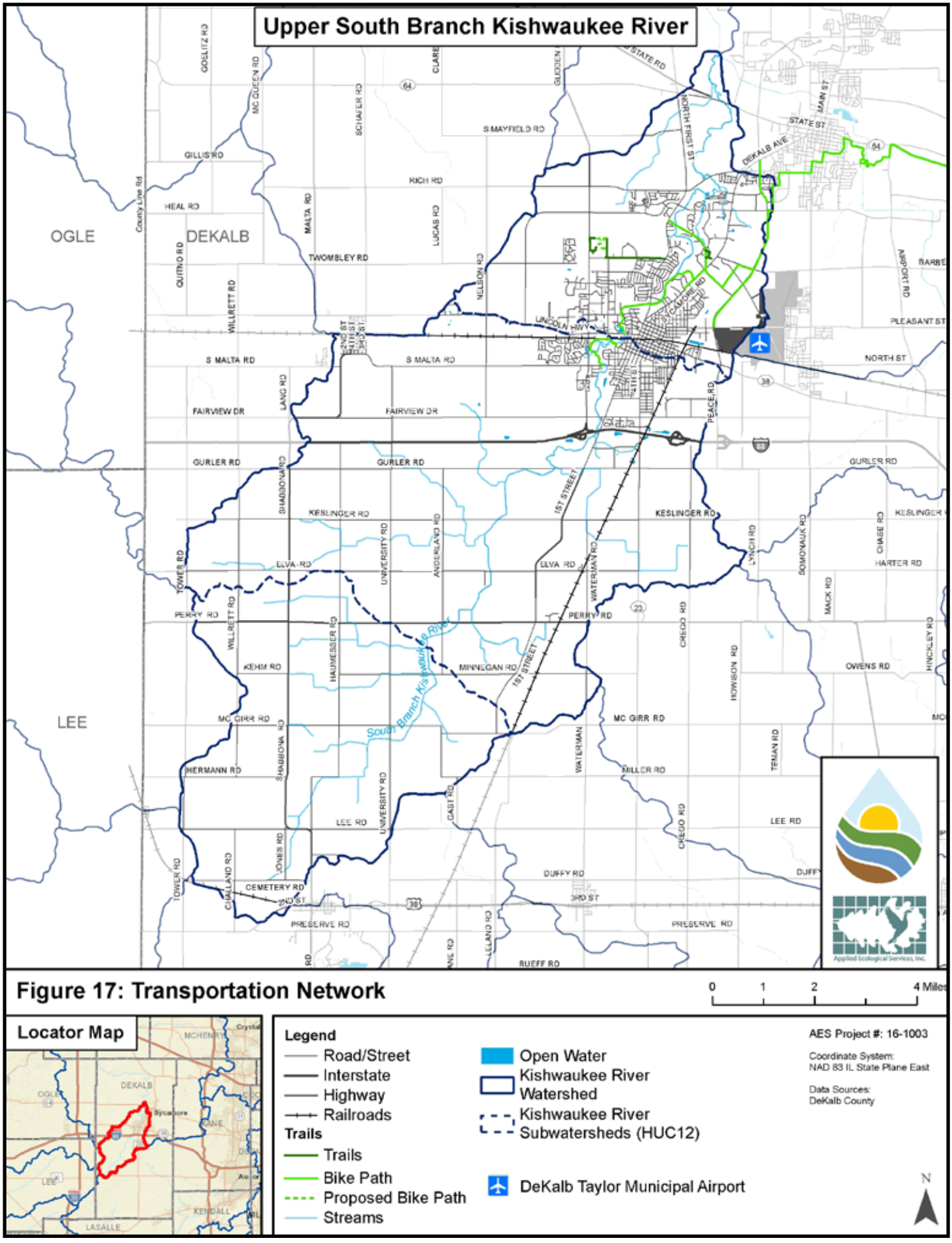
Available data on the location of existing trails and bike paths in the watershed reveals a relatively small network (Figure 17). Some of the existing trails include the DeKalb Nature Trail, Peace Road Trail, and connections to the Great Western Trail. The City of DeKalb and the Park District have done the best job of creating and connecting trail sections, but many opportunities remain, especially in the southern and western portions of the watershed. The City of DeKalb's Comprehensive Plan and the DeKalb Park District's mission show a commitment to connectivity and bike/pedestrian paths. A good system of trails throughout the watershed would give the community a unique opportunity to interact with nature and see the benefits of green infrastructure planning.

Extensions to the existing bike pass have been proposed on the DeKalb County Health Department campus.

DeKalb Taylor Municipal Airport

The DeKalb Taylor Municipal Airport (DTMA) in DeKalb, IL, sits on 920 acres and opened in 1944. It serves the greater DeKalb community with two runways, two privately-owned corporate hangars, 16 privately-owned corporate condo hangars, and 51 city-owned hangars; it also houses one turbo-prop aircraft, four twin-engine aircraft, and 80 single-engine aircraft. The DTMA is the most active airstrip in the County. The airport features a 4,200-foot, east-west runway and a 7,000+-foot, northeast-southwest runway supported by a visual flight recognition and instrument flight recognition navigational aids. The facility has a flight-based operator and is designed to accommodate private and corporate aircraft (DeKalb, 2011). Air freight, charter, flight instruction and aircraft rental and sales services are available at DTMA and the airport leases 360 acres of its land to farmers (City of DeKalb, 2019). Section 3.5 discusses the role of the Federal Aviation Administration in the operation and planning of airports.

Right: Trail through woodland at Ellwood House Museum. Below: DeKalb Taylor Municipal Airport (Source: City of DeKalb).


Upper South Branch Kishwaukee River
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CEMETERY RD
PRESERVE RD
RUEFF RD
MILLER RD
OWENS RD
HARTER RD
NORTH ST
PLEASANT ST
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DEKALB AVE
LINCOLN HWY
1ST STREET
South Branch Kishwaukee River
0 1 2 4 Miles
Figure 17: Transportation Network
Locator Map
Legend
Road/Street
Interstate
Highway
Railroads
Trails
Trails
Bike Path
Proposed Bike Path
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
DeKalb Taylor Municipal Airport
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County
N

3.9 Demographics

The Illinois Department of Public Health (IDPH) provides 2025 population projections for Illinois to plan more effectively with growth forecasts using 2010 census data from the United States Census Bureau (USCB). IDPH's 2010 to 2025 forecasts of population was used to project how these attributes will impact Upper South Branch Kishwaukee River watershed (Table 9). The IDPH does not forecast household or employment population and therefore the impact of household or employment growth cannot be calculated. IDPH develops these forecasts by using a demographic cohort-component projection model which calculates projections for each component of population change (birth, deaths, and net migration) separately for each five-year birth cohort and sex (IDPH, 2015). Note: Applied Ecological Services, Inc. (AES) used GIS to overlay the Upper South Branch Kishwaukee River watershed boundary onto the 2010 Census Block data. If any part of a census block fell inside the watershed boundary, the statistics for the entire quarter section were included. It is important to note that this methodology makes best use of the data limitations but likely increases estimates, especially for municipalities.

According to the 2010 census, the total population of the Upper South Branch Kishwaukee watershed was roughly 50,539 people (Figure 18), the total number of households was 18,290 (Figure 19), and the total employed population was 32,335 (Figure 20) in 2010. Due to the nature of the census block and census block group data, these estimates represent a slight overestimation. The location and density of the total number of households is similar to that for the total population (Figures 18 and 19). The highest population and household densities are located in and around Northern Illinois University (NIU) along Annie Gliddon Rd. in DeKalb (Figure 19). The highest employed population is located near NIU and in the census block just south of the university, as well as eastern DeKalb and north Sycamore (Figure 20).

There is no regional planning body that covers the DeKalb area and therefore finding future demographic projections for the watershed is difficult. AES was able to locate population projections by county created by the Illinois Department of Public Health. These projections are based on 2010 census data and on a specific set of assumptions, laid out in full in IDPH's Population Projections: Illinois, Chicago and Illinois Counties by Age and Sex: July 1, 2010 to July 1, 2025 (2014 Edition). In consultation with the watershed committee, AES assumed that the population of the Kishwaukee watershed will grow at the same rate as the estimate for DeKalb County, as calculated by IDPH. According to IDPH, the population of DeKalb County is expected to increase from 105,160 in 2010 to 126,927 by 2025, a 20.7% increase. Therefore, AES assumes that the population of Kishwaukee watershed is expected to increase from 50,539 in 2010 to 61,000 by 2025, or a 20.7% increase.

Table 9. USCB and IDPH Population Projections 2010-2025.

Data Category	2010	2025	Change (2010-2025)	Percent Change
Population	50,539	61,000	10,461	+20.7
Household	18,290	-	-	-
Employed Population	32,335	-	-	-

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

Socioeconomic Status

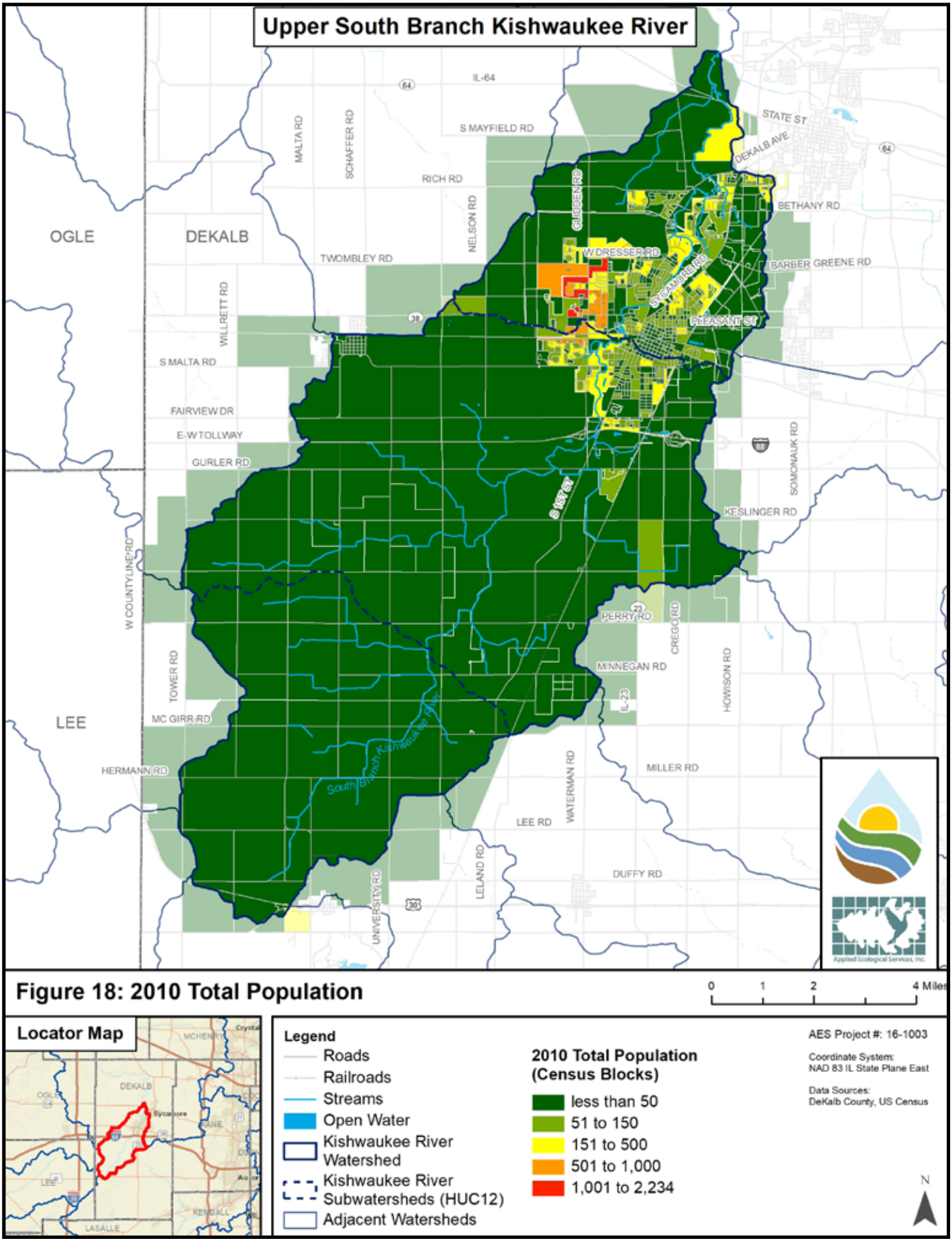
The Cities of DeKalb and Sycamore are the largest in the watershed. Despite their proximity, they differ significantly in socioeconomic status. Sycamore can be described as predominately white-collar, working-class composed primarily of a white population (90.5%). It has a median income of about $70,000 a year with over 64% of the population living in owned occupied housing. Over 38% of Sycamore's residents have a bachelor's degree or higher. DeKalb is also a white-collar community, but with average income significantly lower than Sycamore (about $41,000 annual income) and over 30% of the population living below the poverty line. The demographics of the watershed are detailed by location in Table 10.

This data seems to be skewed by the large proportion of the population that consists of students at Northern Illinois University (NIU) which is reflected in a lower median age (24.7) and a lower percentage of those living in owner occupied housing (38%). This area has a large portion of temporary residents due to the presence of Northern Illinois University (NIU) which also provides employment opportunities directly from the university as well as the many area business that support the student population. The seasonality of a large percentage of the community and high poverty level is reflected in home ownership with less than 38% of the community living in owner occupied housing. Advanced education in DeKalb is comparable to Sycamore however with over 37% of the residents holding bachelor's degrees or higher.

The demographic data for the communities of Shabbona and Malta as well as areas within the watershed but outside of municipalities is more in line with the demographics of Sycamore. Shabbona, Malta, and the unincorporated (rural) areas of the watershed respectively have median ages of 49.9, 34.9, and 37.6; primarily white populations (98.9%, 96.4%, 90.9%); median household incomes of: $54,327, $67,188, and $70,320; percentages of bachelor's degree holders of: 13.4%, 23.3%, 34.0%; percentage below the poverty line: 5.8%, 12.7%, and 12.1%; and percentage of those who live in owner-occupied housing of: 59%, 89%, and 69%.

Table 10. Demographic data by location..

Municipality/ Location	Median Age	Ethnicity (% White)	Median Household Income	% with Bachelor's or Higher	% Below Poverty Line	% Owner-Occupied Housing
Sycamore	34.9	90.5 %	$67,188	38.7 %	8.0 %	64 %
DeKalb	24.7	73.2 %	$41,009	37.1 %	30.8 %	38 %
Shabbona	49.9	98.9 %	$54,327	13.4 %	5.8 %	59 %
Malta	34.9	96.4 %	$67,188	23.3 %	12.7 %	89 %
Unincorporated (Rural) Areas	37.6	90.9 %	$70,320	34.0 %	12.1 %	69 %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South Branch Kishwaukee River
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LELAND RD
DUFFY RD
UNIVERSITY RD
Applied Ecological Services, Inc.
Figure 18: 2010 Total Population
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Locator Map
MCHENRY
DEKALB
Sycamore
KENDALL
LASALLE
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
2010 Total Population (Census Blocks)
less than 50
51 to 150
151 to 500
501 to 1,000
1,001 to 2,234
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County, US Census
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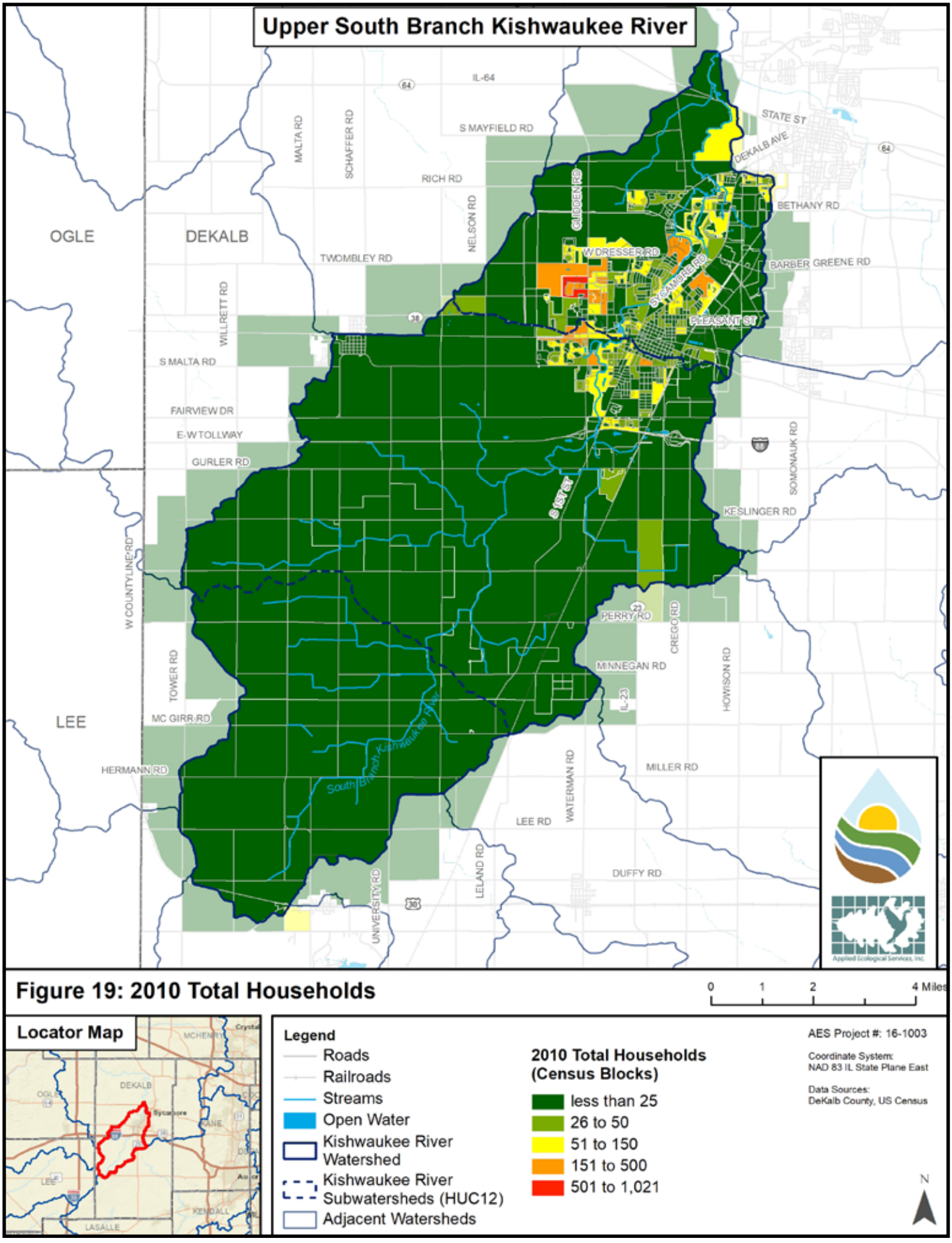
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HERMANN RD
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WATERMAN RD
LEE RD
LELAND RD
DUFFY RD
UNIVERSITY RD
Applied Ecological Services, Inc.
Figure 19: 2010 Total Households
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Locator Map
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KENDALL
LASALLE
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
2010 Total Households (Census Blocks)
less than 25
26 to 50
51 to 150
151 to 500
501 to 1,021
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County, US Census
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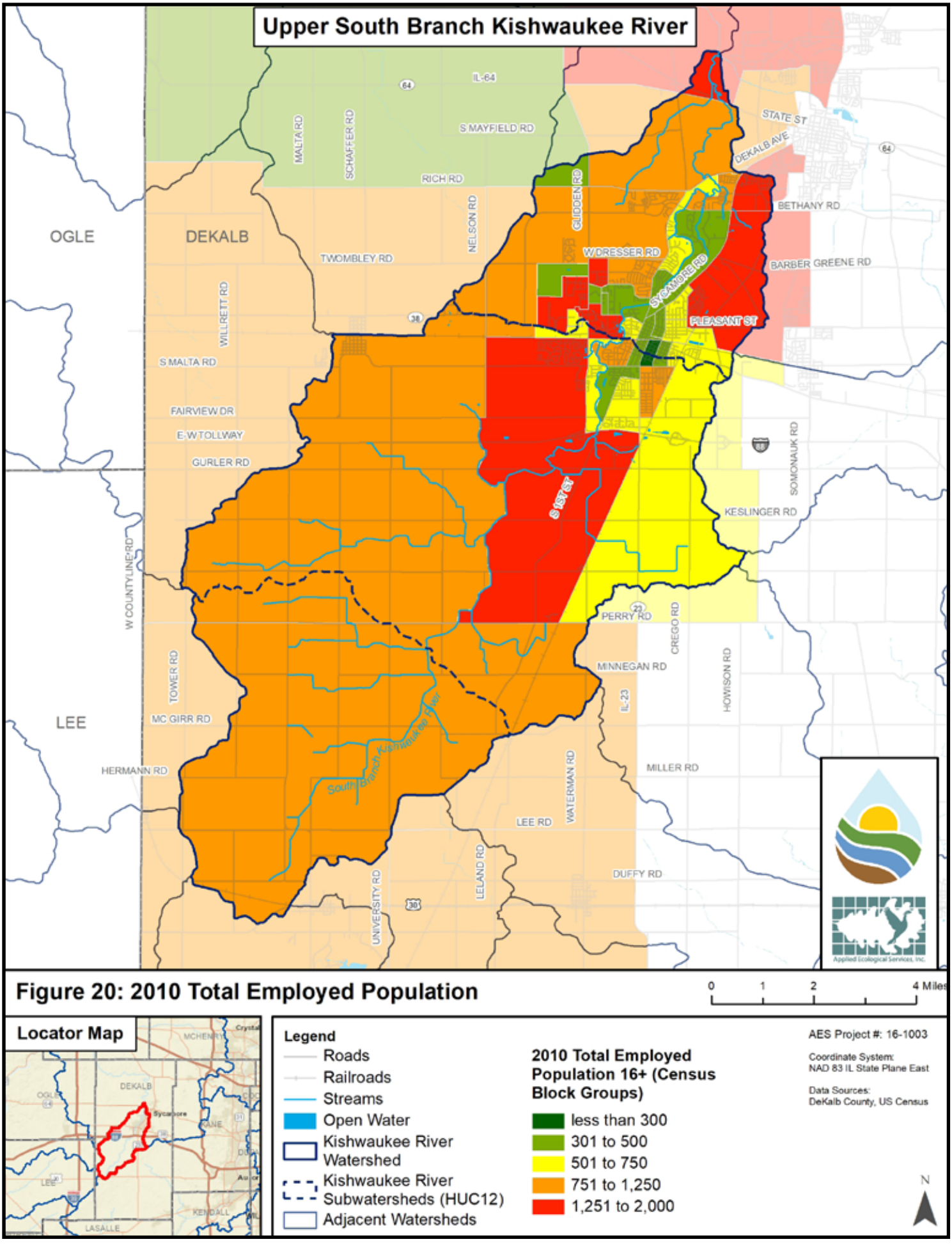
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MILLER RD
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LELAND RD
DUFFY RD
UNIVERSITY RD
Applied Ecological Services, Inc.
Figure 20: 2010 Total Employed Population
0 1 2 4 Miles
Locator Map
MCHENRY
DEKALB
Sycamore
KANE
LEE
KENDALL
LASALLE
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
2010 Total Employed Population 16+ (Census Block Groups)
less than 300
301 to 500
501 to 750
751 to 1,250
1,251 to 2,000
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County, US Census
N

Bridges of Rivermist Subdivision in DeKalb

3.10 Existing & Future Land Use/Land Cover

2019 Land Use/Land Cover

Highly accurate land use/land cover data was produced for Upper South Branch Kishwaukee River 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. 2017 USDA 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

Table 11. 2019 land use/land cover classifications and acreage.

Land Use	Area (Acres)	% of Watershed
Agriculture	50,404.7	79.7%
Single-Family Residential	3,412.3	5.4%
Transportation/Utility	3,243.8	5.1%
Industrial	2,052.1	3.2%
Multi-Family Residential	1,180.4	1.9%
Commercial/Retail	1,048.7	1.7%
Municipal/Institutional	729.6	1.2%
Open Space	741.0	1.2%
Industrial/Business Park	269.3	0.4%
Res/Commercial Mixed	77.0	0.1%
Wetlands	60.2	0.1%
Total	**63,219.1**	**100.0%**

made to land use based on field notes taken by Applied Ecological Services, Inc (AES) during the spring of 2019 watershed resource inventory. The 2019 land use/land cover data and map for Upper South Branch Kishwaukee River watershed is included in Table 11 and depicted on Figure 21. Land cover classifications, as detailed in the DeKalb County Unified Comprehensive Plan, are defined in the "Noteworthy- Land Use/Land Cover Definitions" text box.

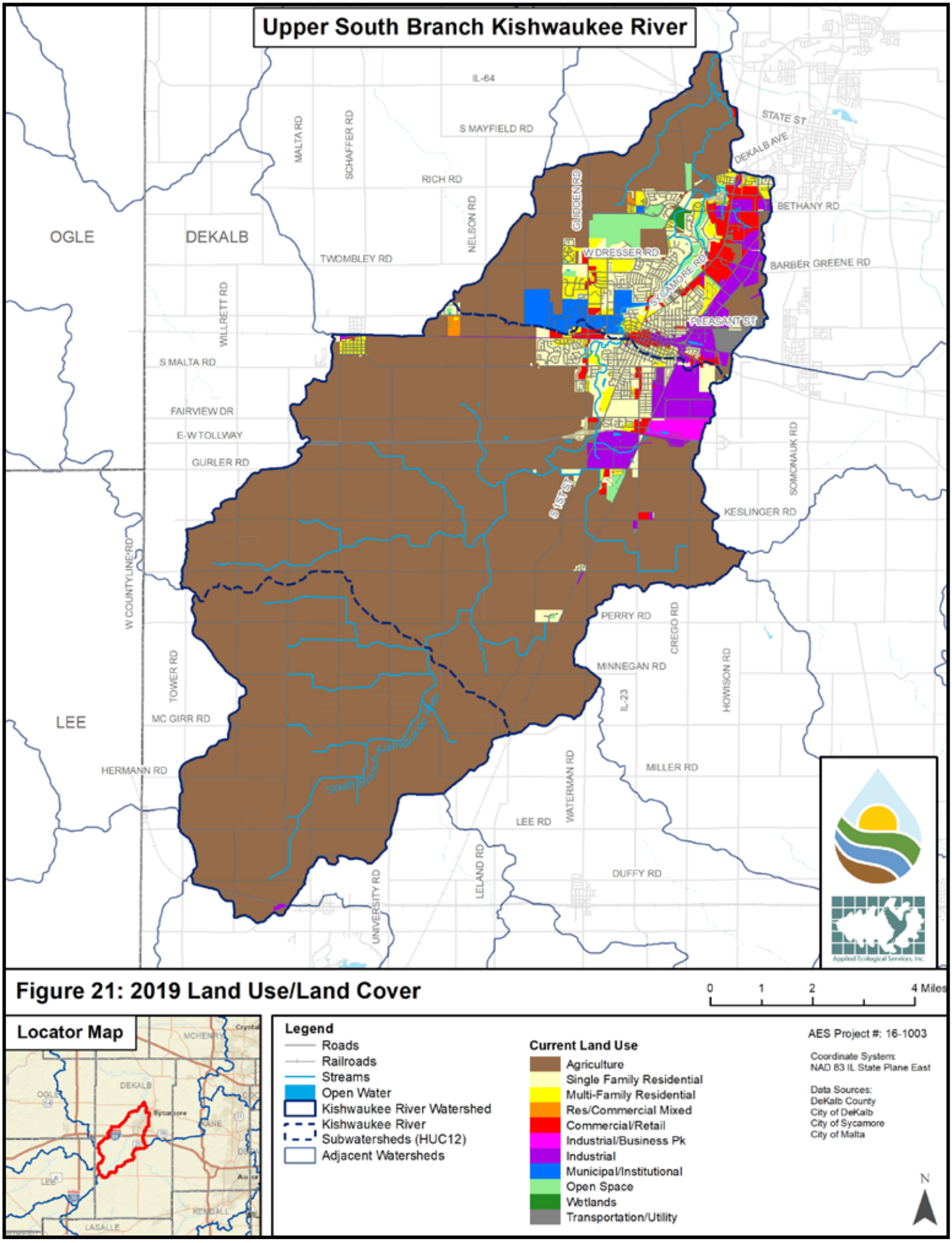
Agricultural land uses are by far the most abundant land use in the watershed at 50,405 acres or 79.7%. Residential land uses, both single family and multi-family, make up the next largest share of the watershed at 4,592.7 acres (7.3%), followed by transportation/utility land uses (3,243.8 acres; 5.1%).

Remaining land uses in the watershed include industrial (2,052.1 acres; 3.2%), commercial and retail (1,048.7 acres; 1.7%), municipal and institutional (729.6 acres; 1.2%), and open space (741.0 acres; 1.2%). Industrial or business park, mixed use, and wetlands all make up less than 1% of the watershed. There are no woodlands in the watershed. Agricultural land has dominated the watershed since the late 1800s. Agricultural row crops and hay operations make up over 50,000 acres or 80% of the watershed in 2019. Agricultural areas dominate just about all areas of the watershed outside of DeKalb and Sycamore, concentrated predominantly towards the south and west. For more detailed information about agricultural lands, see Section 3.15.

Single family residential areas comprise the second-most acreage at 3,412.3 acres or 5.4%. Most of this is located in the northeast, including western portions of DeKalb and Sycamore. More dense multi-family residential development is located surrounding NIU and along the edges of the oldest parts of DeKalb and Sycamore, making up another 1,180.4 acres or 1.9% of the watershed.

The roads, transportation network and utility areas are abundant and take up 3,243.8 acres or 5.1%. This includes the DeKalb Taylor Municipal Airport on the east side of DeKalb and the Kishwaukee Water Reclamation District, as well as a dense network of roads throughout the watershed and concentrated around the most urbanized areas. For more detailed information about the transportation network, see Section 3.8.

Industrial development is concentrated along the easternmost portions of the cities of DeKalb and Sycamore and take up 2,052.1 acres or 3.2%. The largest industrial employers in the watershed include 3M, Target Distribution Center, Tegrant/ Sonoco Alloyd, Ideal Industries, Nestle, and Panduit Corporation, most of which are located in DeKalb close to the I-88 corridor.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UNIVERSITY RD
South Branch Kishwaukee River
Figure 21: 2019 Land Use/Land Cover
0 1 2 4 Miles
Locator Map
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River
Subwatersheds (HUC12)
Adjacent Watersheds
Current Land Use
Agriculture
Single Family Residential
Multi-Family Residential
Res/Commercial Mixed
Commercial/Retail
Industrial/Business Pk
Industrial
Municipal/Institutional
Open Space
Wetlands
Transportation/Utility
AES Project #: 16-1003
Coordinate System:
NAD 83 IL State Plane East
Data Sources:
DeKalb County
City of DeKalb
City of Sycamore
City of Malta
N

Land Use/Land Cover Definitions:

Agriculture: Agriculture is shown in areas best utilized for the production of cash crops and should be protected from urban development because of its value as an irreplaceable resource within the County. Portions of the land in this category are used for farmsteads and very low density residential uses. Several isolated residential subdivisions are also included in the agriculture land use category. These subdivisions were approved prior to development of stronger County agricultural preservation policies.

Commercial/Retail: 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. The expansion of commercial uses will be needed as residential growth increases in order to provide more goods and employment opportunities. All of the areas recommended for Commercial use are located near or within existing communities, and along primary or secondary arterial roads.

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.

Industrial/Business Park: This land use category is defined as areas suited for office, research and limited manufacturing uses in a campus-like environment.

Open Space: Open space is land within a municipal planning jurisdiction 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.

Multi-Family Residential: Land use that includes multifamily residences. These include duplex and townhouse units, apartment complexes, retirement complexes, mobile home parks, trailer courts, condominiums, and associated parking on lots less than 1/8 acre with impervious cover around 65%.

Municipal/Institutional: 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.

Residential/Commercial Mixed: This land use category designates the areas suitable for residential development in a manner that emulates the established neighborhoods in the municipalities. In this land use category, all residential building types, including single-family and multi-family, are permitted, but should not exceed the maximum ratios established by the municipality. This land use category is defined as areas suited for a mix of residential land use with a maximum density between three and six dwelling units per acre. Multiple-family buildings may be permitted in areas designated for Mixed-Residential as a special use.

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, right-of-ways, waste water facilities, etc.

Wetland: Wetland areas including marshes, wet prairie, meadows, bogs, etc.

Future Land Use/Land Cover Predictions

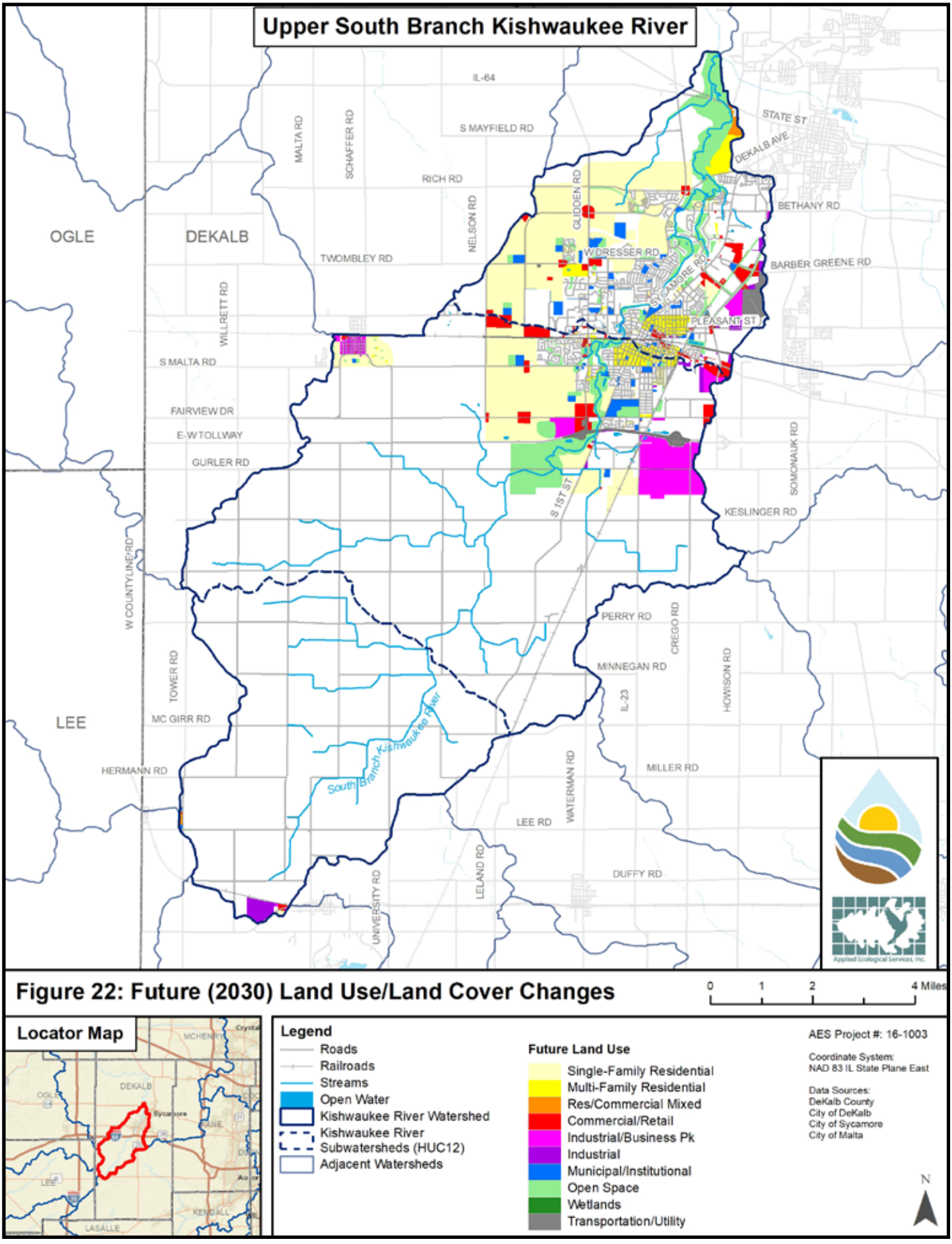
Information on predicted future land use/land cover for the watershed was obtained primarily from the Unified Future Land Use Plan within the DeKalb County Unified Comprehensive Plan through the year 2030. Available data was analyzed and GIS used to map predicted land use/land cover changes. The results are summarized in Table 12 and Figure 22.

Table 12 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 9,148.5 acres of the existing 50,404.7 acres (14.5% decrease) is expected to be converted mostly to residential areas as well as some other land uses. The majority of these changes are expected to occur surrounding the edges of City of DeKalb and the Village of Malta.

Additionally, lands designated as open space are planned to increase by 1,410.9 acres (2.2%), while additional wetland losses of 16.5 acres are expected in the future.

Table 12. Comparison between 2019 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	50,404.7	79.7%	41,256.2	65.3%	-9,148.5	-14.5%
Commercial/Retail	1,048.7	1.7%	1,700.3	2.7%	651.6	1.0%
Industrial	2,052.1	3.2%	1,921.7	3.0%	-130.4	-0.2%
Industrial/Business Park	269.3	0.4%	1,237.5	2.0%	968.3	1.5%
Multi-Family Residential	1,180.4	1.9%	1,268.4	2.0%	88.0	0.1%
Municipal/Institutional	729.6	1.2%	1,247.0	2.0%	517.4	0.8%
Open Space	741.0	1.2%	2,151.9	3.4%	1,410.9	2.2%
Res/Commercial Mixed	77.0	0.1%	117.4	0.2%	40.3	0.1%
Single-Family Residential	3,412.3	5.4%	8,574.8	13.6%	5,162.5	8.2%
Transportation/Utility	3,243.8	5.1%	3,700.2	5.9%	456.3	0.7%
Wetlands	60.2	0.1%	43.7	0.1%	-16.5	0.0%


Upper South Branch Kishwaukee River
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Applied Ecological Services, Inc.
Figure 22: Future (2030) Land Use/Land Cover Changes
0
1
2
4 Miles
Locator Map
MCHENRY
DEKALB
Sycamore
KANE
KENDALL
LASALLE
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Future Land Use
Single-Family Residential
Multi-Family Residential
Res/Commercial Mixed
Commercial/Retail
Industrial/Business Pk
Industrial
Municipal/Institutional
Open Space
Wetlands
Transportation/Utility
AES Project #: 16-1003
Coordinate System:
NAD 83 IL State Plane East
Data Sources:
DeKalb County
City of DeKalb
City of Sycamore
City of Malta
N

3.11 Impervious Cover Impacts

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 23). 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 13). 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.

Figure 23. Relationship between impervious surfaces, evapotransporation, & infiltration. Source: The Federal Interagency Stream Restoration Working Group, 1998 (Rev. 2001).

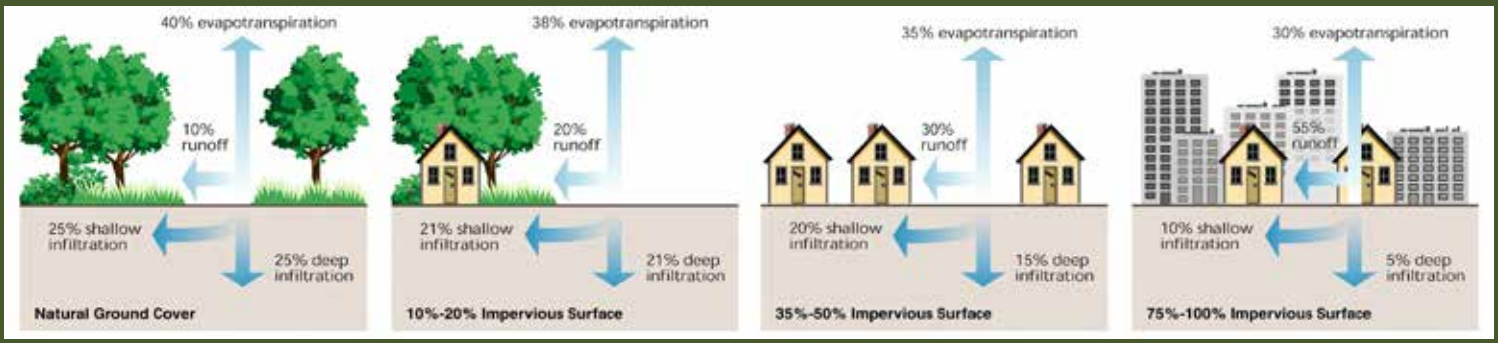


Table 13. Impervious category, percent impervious, & stream condition (Source: Zielinski 2002).

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

Water Quality Impacts

Imperviousness affects 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.

Hydrology and Flow Impacts

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 and Depressional Storage Impacts

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.

Habitat Impacts

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.

2019 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). SMUs are defined and examined in more detail in Section 3.3.

Applied Ecological Services, Inc. (AES) used a modified Vulnerability Analysis to compare each SMU's vulnerability to predicted land use changes across Upper South Branch Kishwaukee River 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. The three steps are listed below and described in detail on the following pages:

Step 1: Existing impervious cover classification of SMUs based on 2019 land use/land cover

Step 2: Predicted future impervious cover classification of SMUs based on predicted land use/land cover changes

Step 3: Vulnerability Ranking of SMUs based on changes in impervious cover and classification

Step 1: Existing Impervious Cover Classification

Step 1 in the Vulnerability Analysis is an existing classification of each SMU based on 2019 land use/land cover and measured impervious cover. 2019 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 2019 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 14; Figure 24).

To summarize, 25 SMUs (SMUs 1-23, 30, and 33) were classified as Sensitive, three as Impacted (SMUs 25, 31, & 34), and six as Non-Supporting (SMUs 24, 26-29, & 32) based on 2019 impervious cover estimates. Sensitive SMUs are concentrated predominantly in the southern and western portions of the watershed where agriculture is the dominant land use; two sensitive land SMUs, SMU 30 and 33 are located in the northwest corner of the watershed, again, in an area dominated by agriculture. All of the Impacted and Non-Supporting SMUs are associated with the most densely populated urban and residential areas in and around the Cities of DeKalb and Sycamore, including all portions of the Northern Illinois University campus.

Table 14. Existing 2019, predicted (2030) impervious cover, and vulnerability by SMU.

SMU #	Acres	Step 1: Existing Impervious %	Existing (2019) Impervious Classification	Step 2: Predicted Impervious %	Predicted (2030) Impervious Classification	Percent Change	Step 3: Vulnerability
1	2,515.2	3.6%	Sensitive	7.6%	Sensitive	4.0%	Low
2	1,115.7	1.5%	Sensitive	2.4%	Sensitive	0.9%	Low
3	1,481.3	1.9%	Sensitive	1.9%	Sensitive	0.0%	Low
4	1,722.6	1.1%	Sensitive	1.1%	Sensitive	0.0%	Low
5	1,610.6	2.0%	Sensitive	2.0%	Sensitive	0.0%	Low
6	1,139.8	1.6%	Sensitive	1.6%	Sensitive	0.0%	Low
7	1,761.7	1.6%	Sensitive	1.6%	Sensitive	0.0%	Low
8	1,867.0	2.1%	Sensitive	2.1%	Sensitive	0.0%	Low
9	3,503.5	1.9%	Sensitive	1.9%	Sensitive	0.0%	Low
10	1,845.0	2.1%	Sensitive	2.1%	Sensitive	0.0%	Low
11	1,990.0	2.0%	Sensitive	2.0%	Sensitive	0.0%	Low
12	1,612.1	1.6%	Sensitive	1.6%	Sensitive	0.0%	Low
13	1,943.5	4.5%	Sensitive	4.5%	Sensitive	0.0%	Low
14	1,691.5	2.4%	Sensitive	2.4%	Sensitive	0.0%	Low
15	2,296.2	1.6%	Sensitive	1.6%	Sensitive	0.0%	Low
16	1,623.6	1.9%	Sensitive	1.9%	Sensitive	0.0%	Low
17	4,124.3	5.2%	Sensitive	10.1%	Impacted	4.8%	High
18	1,135.2	1.9%	Sensitive	1.9%	Sensitive	0.0%	Low
19	1,764.9	4.8%	Sensitive	4.8%	Sensitive	0.0%	Low
20	1,861.0	7.5%	Sensitive	10.4%	Impacted	2.9%	High
21	2,289.0	3.8%	Sensitive	5.6%	Sensitive	1.8%	Low
22	1,543.0	1.4%	Sensitive	1.7%	Sensitive	0.3%	Low
23	2,345.3	5.7%	Sensitive	29.6%	Non-Supporting	24.0%	High
24	1,693.5	42.6%	Non-Supporting	70.7%	Non-Supporting	28.1%	High
25	1,416.0	23.4%	Impacted	41.6%	Non-Supporting	18.2%	High
26	901.0	35.8%	Non-Supporting	42.4%	Non-Supporting	6.5%	Medium
27	1,103.4	54.6%	Non-Supporting	62.3%	Non-Supporting	7.7%	Medium
28	2,628.3	25.3%	Non-Supporting	44.5%	Non-Supporting	19.2%	High
29	3,610.0	45.2%	Non-Supporting	51.5%	Non-Supporting	6.3%	Medium
30	1,202.5	3.5%	Sensitive	24.5%	Impacted	21.0%	High
31	1,244.6	18.3%	Impacted	36.7%	Non-Supporting	18.4%	High
32	2,158.3	55.6%	Non-Supporting	62.9%	Non-Supporting	7.3%	Medium
33	1,226.6	2.4%	Sensitive	7.6%	Sensitive	5.3%	Medium
34	1,252.7	10.1%	Impacted	23.7%	Impacted	13.6%	High

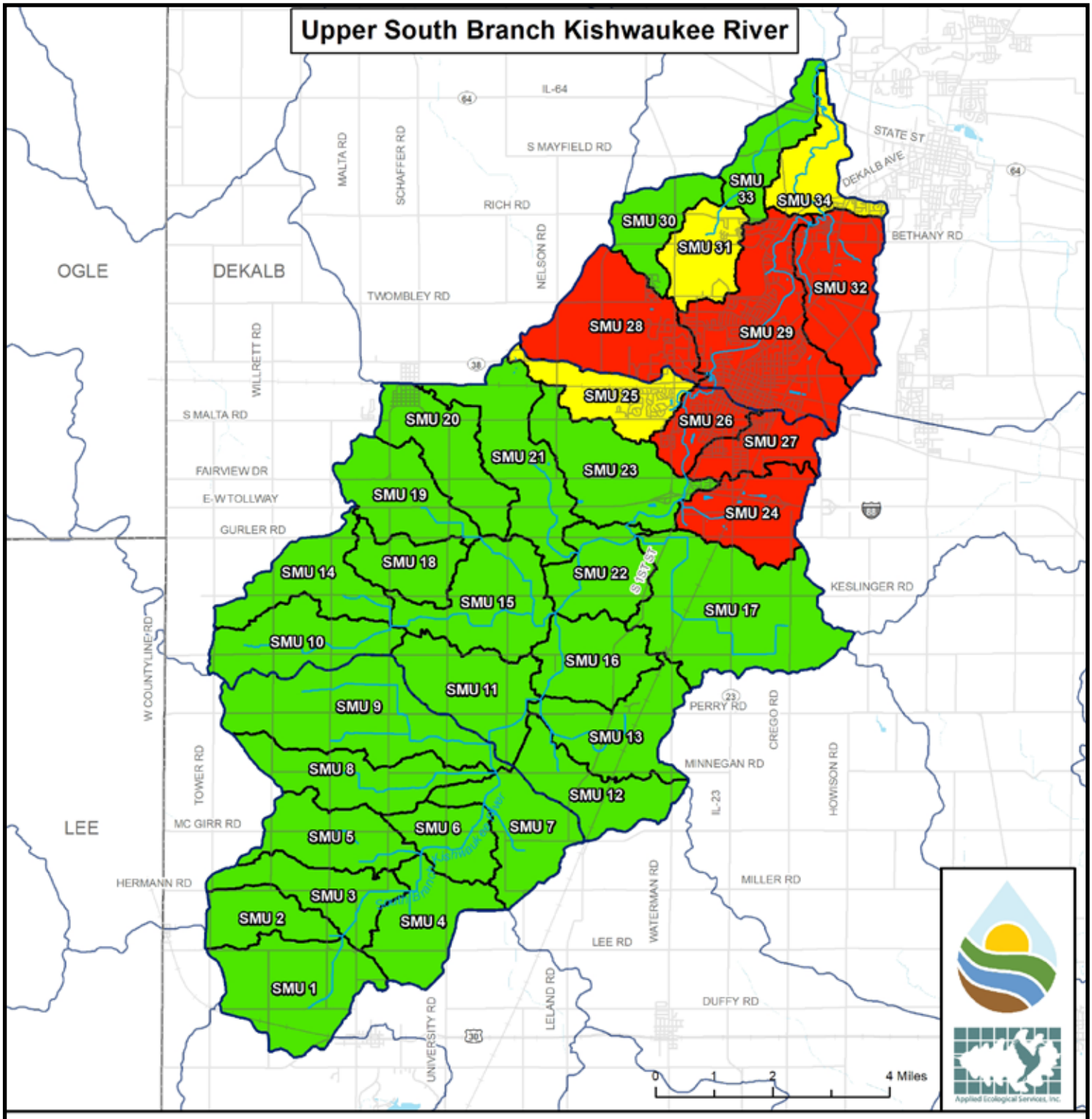


Figure 24: Impervious Cover Classification by SMU based on 2019 Land Use/Land Cover

Legend

- Roads
- Railroads
- Streams
- Open Water
- Kishwaukee River Watershed
- Kishwaukee River Subwatersheds (HUC12)
- Adjacent Watersheds

2019 Impervious Cover by SMU

- Sensitive (<10%)
- Impacted (>10% but <25%)
- Non-Supporting (>25%)

AES Project #: 16-1003

Coordinate System:
NAD 83 IL State Plane East

Data Sources:
DeKalb County

N

Step 2: Predicted Future Impervious Cover Classification
Predicted future impervious cover was evaluated in Step 2 of the vulnerability analysis by classifying each SMU as Sensitive, Impacted, or Non-Supporting based on predicted land use changes. Table 14 and Figure 25 summarize and depict predicted future impervious cover classifications for each SMU. This step identifies Sensitive and Impacted SMUs that are most vulnerable to future development pressure. SMUs 17, 20, and 30 changed from Sensitive to Impacted and SMUs 23, 25, and 31 changed from either Sensitive or Impacted to Non-Supporting. These changes are attributed to planned residential, industrial and commercial growth and development in and immediately surrounding DeKalb, Sycamore, and Malta.

Step 3: Vulnerability Ranking
The vulnerability of each SMU to predicted future land use changes was determined by considering the following questions:

1. Will the SMU classification change?
2. Does the SMU classification come close to changing (within 2%)?
3. What is the absolute change in impervious cover from existing to predicted conditions?

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

Low = no change in classification; <5% change in impervious cover
Medium = classification close to changing (within 2%) and/or 5-10% change in impervious cover
High = classification change and/or >10% change in impervious cover

The vulnerability analysis resulted in 9 High, 5 Medium, and 20 Low ranked SMUs (Table 14; Figure 26). Subwatershed Management Units 17, 20, 23-25, 28, 30, 31, and 34 are ranked as highly vulnerable to future problems associated with impervious cover because each is expected to change classification and/or will undergo an increase of impervious cover of more than 10%. Planned residential, industrial and commercial growth and development surrounding DeKalb (SMUs 17, 23, 24, 25, 28, 30, and 31), Sycamore (SMU 34), and Malta (SMU 20) that are currently dominated by agricultural uses are the cause of the increases in impervious cover.

SMUs 26, 27, 29, 32, and 33 are ranked as moderately vulnerable to predicted land use changes. SMUs 26, 27, 29, and 32 are areas that are generally already urbanized that will see continued increases in impervious cover in the future, while SMU 33 is currently predominantly agricultural, but will see more transition to land uses with higher amounts of impervious cover. The 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 residential and commercial/retail development 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 development site.

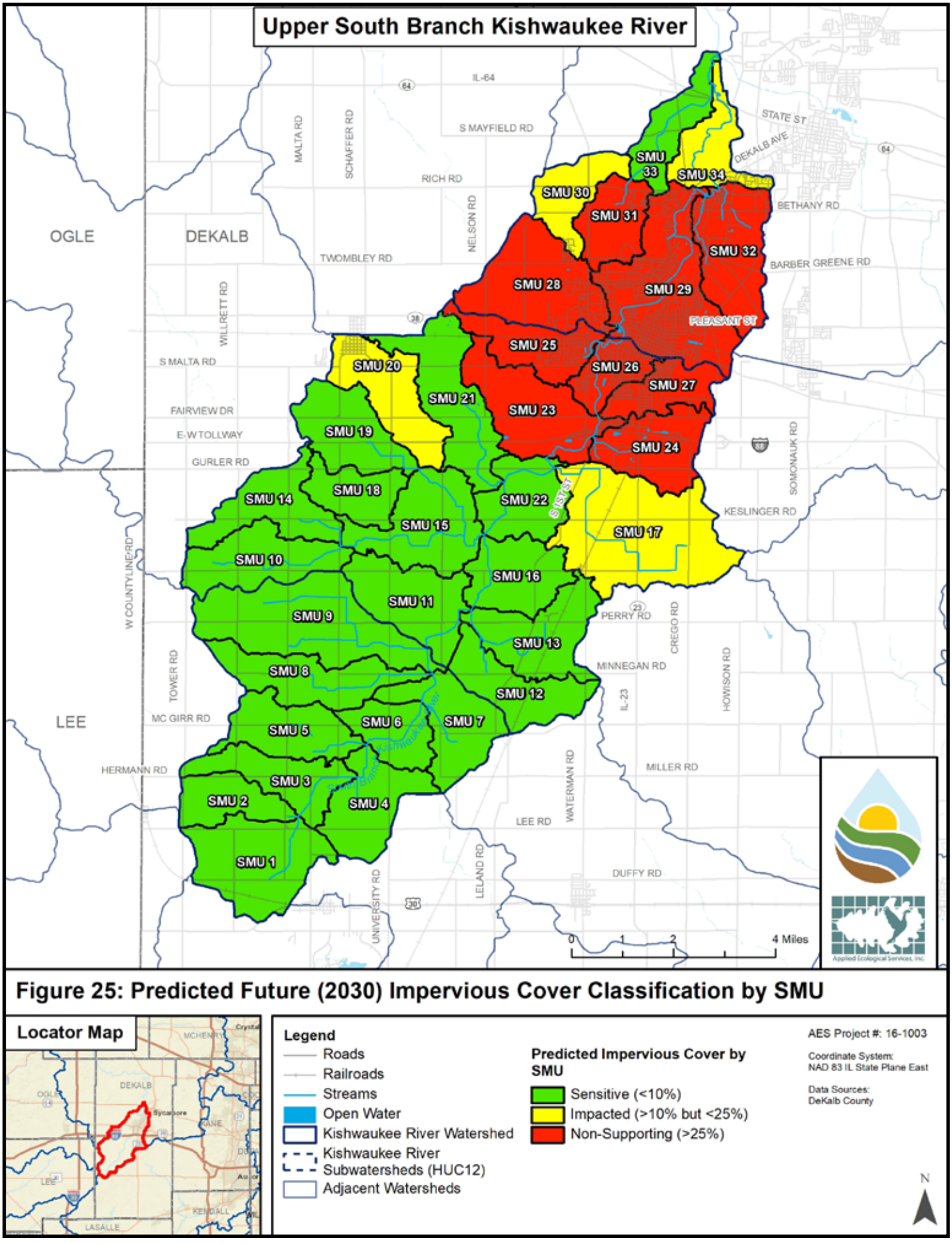


Figure 25: Predicted Future (2030) Impervious Cover Classification by SMU

Legend

- Roads
- Railroads
- Streams
- Open Water
- Kishwaukee River Watershed
- Kishwaukee River Subwatersheds (HUC12)
- Adjacent Watersheds

Predicted Impervious Cover by SMU

- Sensitive (<10%)
- Impacted (>10% but <25%)
- Non-Supporting (>25%)

AES Project #: 16-1003

Coordinate System:
NAD 83 IL State Plane East

Data Sources:
DeKalb County

N

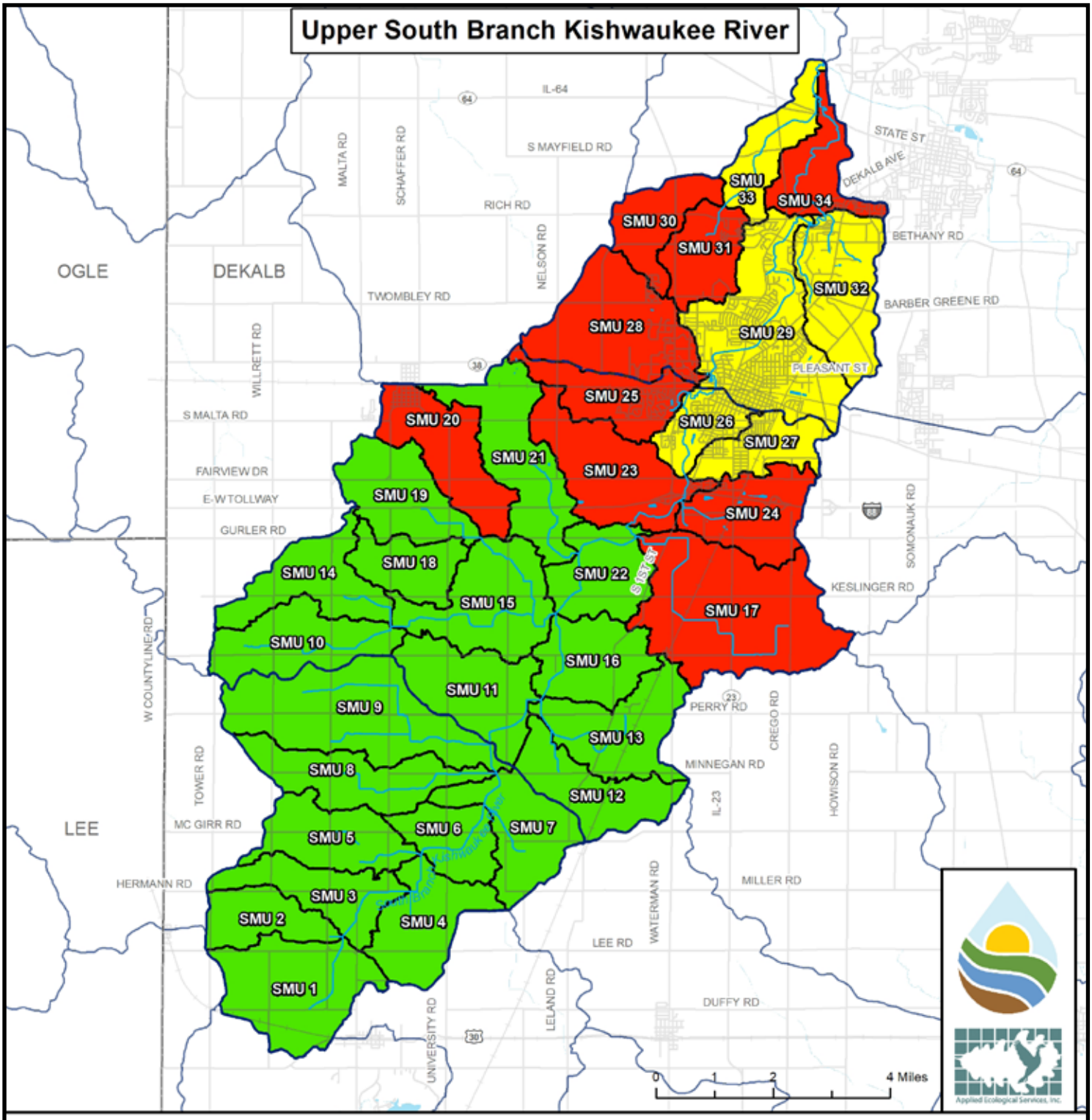


Figure 26: Vulnerability Ranking of SMUs based on Predicted Future Land/Land Cover Changes

Legend

- Roads
- Railroads
- Streams
- Open Water
- Kishwaukee River Watershed
- Kishwaukee River Subwatersheds (HUC12)
- Adjacent Watersheds

Vulnerability Ranking

- High
- Medium
- Low

AES Project #: 16-1003

Coordinate System:
NAD 83 IL State Plane East

Data Sources:
DeKalb County

N

3.12 Open Space Inventory, Prioritization, & Green Infrastructure Network

A major component of watershed planning includes an examination of open space to determine how it best fits into a "Green Infrastructure Network". Green infrastructure 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). Natural features such as stream corridors, wetlands, floodplain, woodlands, and grassland are the primary components of green infrastructure. Working lands such as farms and partially developed areas including parks, ball fields, golf courses, school grounds, detention basins, large residential parcels, and any residential lot that includes a stream corridor are also considered components of a Green Infrastructure Network. A three-step process was used to create a parcel-based Green Infrastructure Network for the Upper South Branch Kishwaukee River watershed:

Step 1: All parcels of land in the watershed were categorized as open space, partially open space, 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 Green Infrastructure Network.

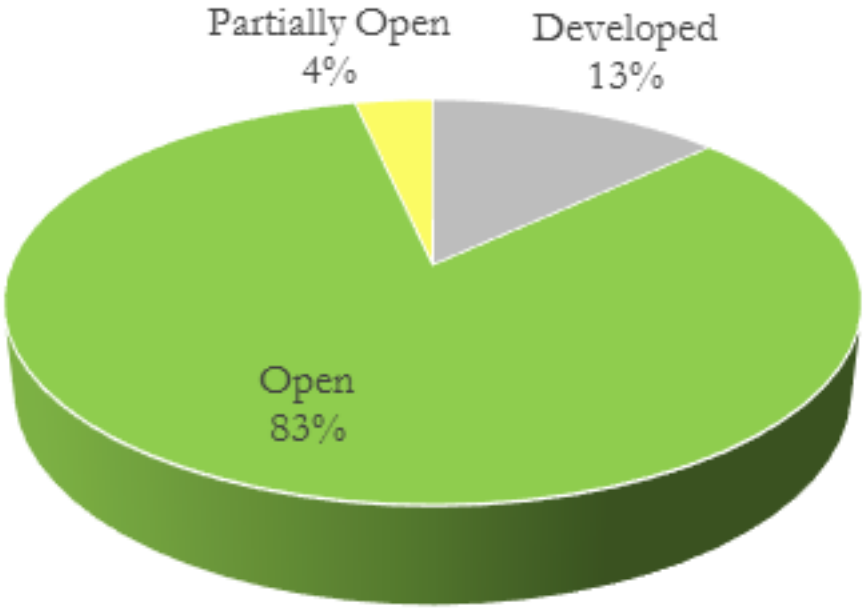
For this watershed plan, an "open space" parcel is generally defined as any parcel that is not developed such as a nature preserve or agricultural field. "Partially open" parcels have been developed to some extent, but the parcels still offer potential green infrastructure opportunities. Examples of partially open parcels include golf courses, school 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 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 are discussed in more detail below. Parcels range in size from less than 1 acre to 346 acres with a 32-acre average.

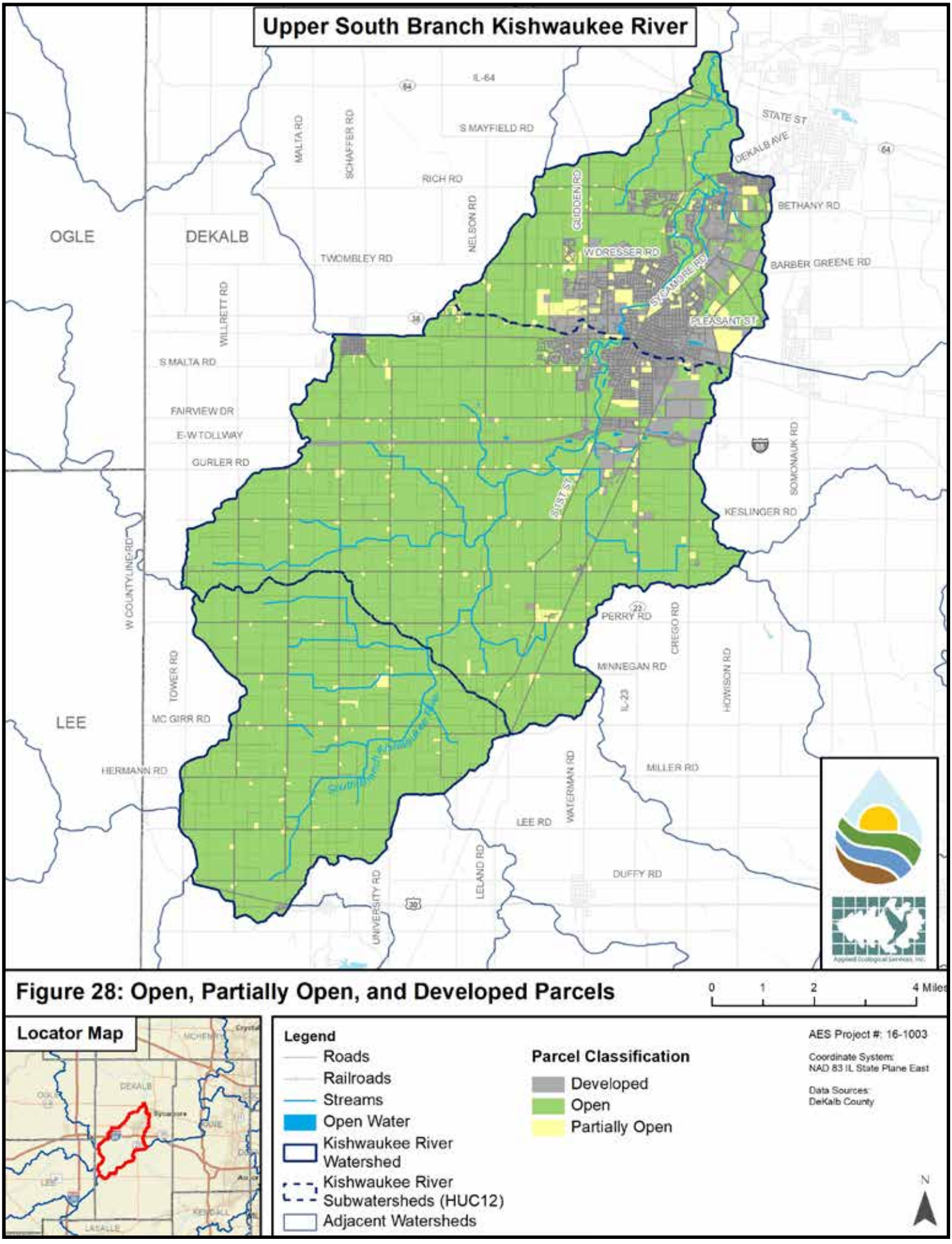
Open, Partially Open, & Developed Parcels

Step 1 in creating a Green Infrastructure Network was completed by categorizing all parcels in the watershed as "open," "partially open," or "developed." Figures 27 and 28 summarize and depict Step 1 results used to develop the Green Infrastructure Network. Open space parcels comprise approximately 52,658 acres or 83% of the watershed. Most open parcels are located on agricultural land.

Partially open parcels make up another 2,210 acres or 4% of the watershed. Parcels range from less than 1 acre to 91 acres with a 3.7-acre average. Developed parcels account for the remaining 8,351 acres or 13% of the watershed.

Figure 27. Distribution of open, partially open, and developed parcels.




Upper South Branch Kishwaukee River
OGLE
DEKALB
LEE
IL-64
S MAYFIELD RD
MALTA RD
SCHAFFER RD
RICH RD
NELSON RD
GIDDEN RD
STATE ST
DEKALB AVE
BETHANY RD
BARBER GREENE RD
W DRESSER RD
SYCAMORE RD
PLEASANT ST
TWOMBLEY RD
WILLRETT RD
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
SYST ST
SOMONAUK RD
KESLINGER RD
W COUNTY LINE RD
TOWER RD
PERRY RD
CREGO RD
HOWISON RD
MINNEGAN RD
IL-23
MC GIRR RD
HERMANN RD
MILLER RD
WATERMAN RD
LEE RD
DUFFY RD
LELAND RD
UNIVERSITY RD
Figure 28: Open, Partially Open, and Developed Parcels
0 1 2 4 Miles
Locator Map
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Parcel Classification
Developed
Open
Partially Open
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County
N

Public/Private Ownership of Open and Partially Open Parcels

The public or private ownership of each open and partially open parcel was determined from available parcel data. Developed parcels are not included in this summary. Publicly owned parcels include those owned by state, county, township, or municipal government or school districts. Public open and partially open parcels account for 2% and 1% of the open and partially open acreage respectively (Figures 29 & 31). Public open and partially open parcels are owned by county forest preserves, the park district, and municipalities. Private ownership types include agricultural, residential, homeowners/business associations, commercial, etc. Private open parcels comprise 94% of the open and partially open acreage whereas private partially open parcels comprise 3% (Figures 29 & 31).

Protected Status of Open and Partially Open Parcels

Preservation of open space is critical to maintaining and expanding green infrastructure and is an important component of sustaining water quality, hydrological processes, ecological function, and the general quality of life for both wildlife and people. Without preservation, open space can be converted to other less desirable land uses in the future. Protected open and partially open parcels account for about 1.7% of the open and partially open parcel acreage in the watershed while unprotected open and partially open parcels account for the remaining 98.3% (Figures 30 & 32). Most protected open or partially open parcels are owned by state, county, township, homeowner association, or municipal government.

The most critical unprotected open and partially open parcels include undeveloped agricultural areas and the golf courses adjacent to the main stem of the Upper South Branch Kishwaukee River. Many of these areas fall within the most developed areas of the City of DeKalb. Most of the agricultural areas will likely be developed to mostly residential in the future. In these cases, future development that incorporates conservation design and/or Stormwater Treatment Train systems will be extremely important in these areas to improve water quality and reduce stormwater runoff volume to an already stressed Upper South Branch Kishwaukee River.

Figure 29. Distribution of private and public open and partially open parcels.

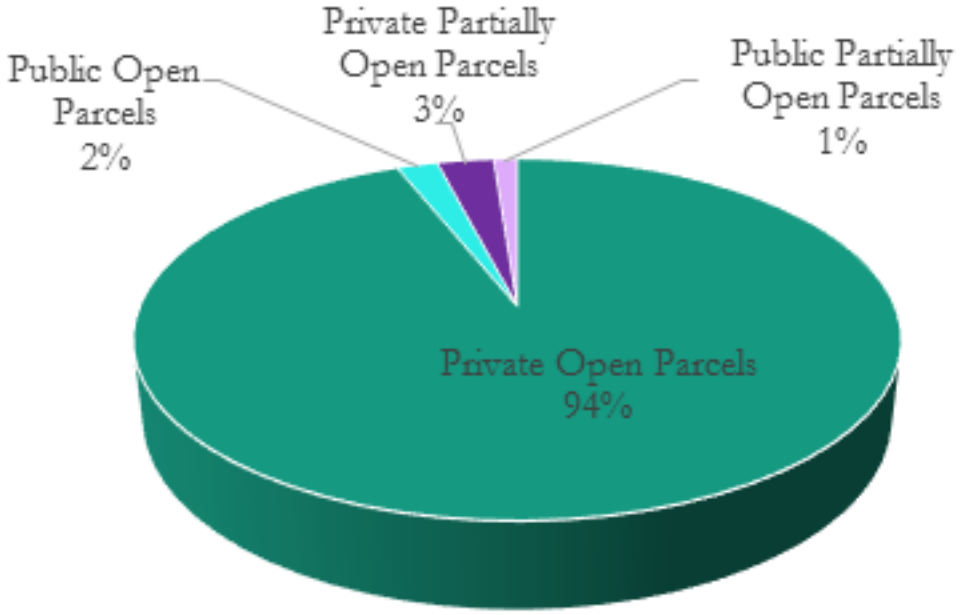
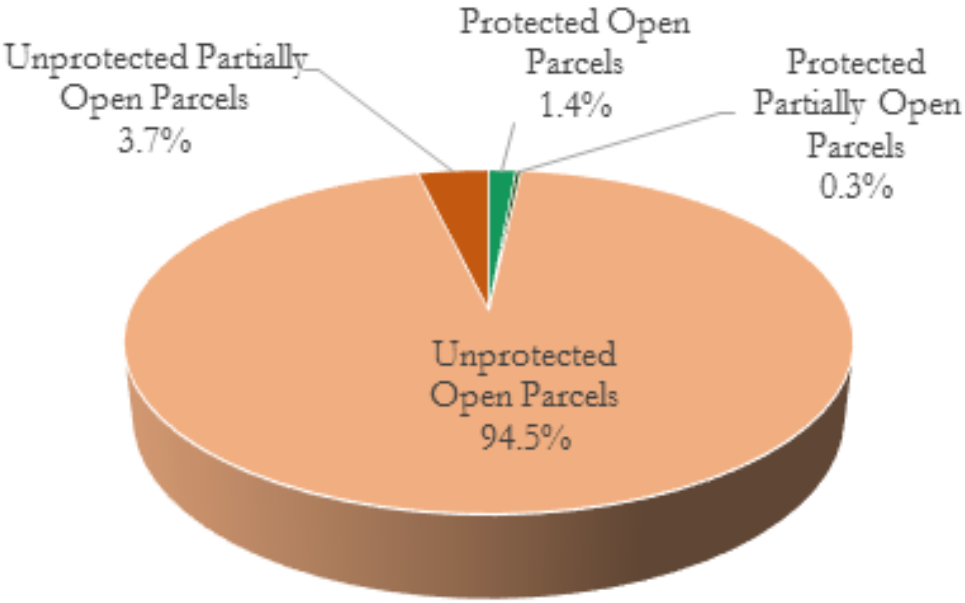
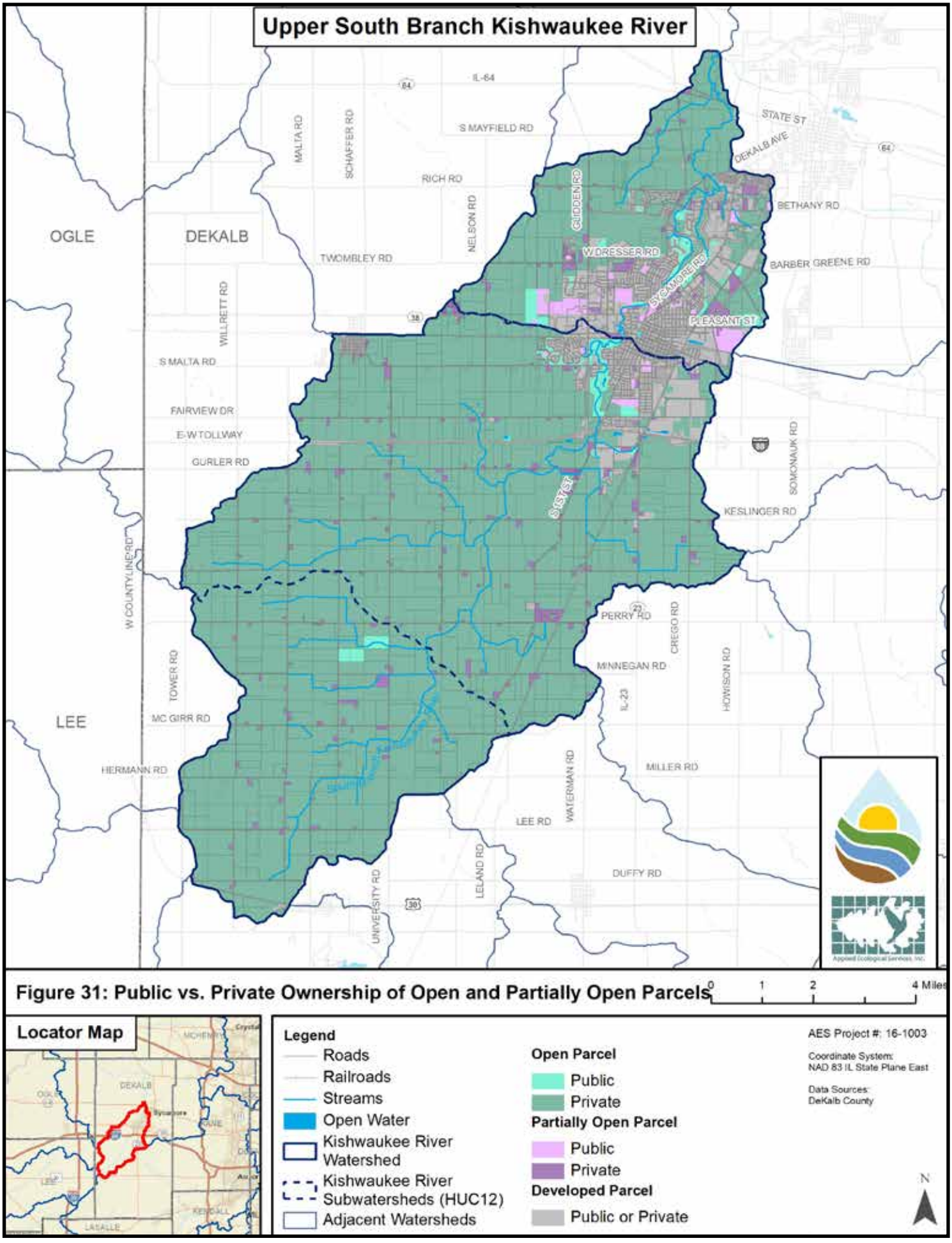


Figure 30. Distribution of protected and unprotected open and partially open parcels.



Heron enjoying the Upper South Branch Kishwaukee River at Hopkin's Park


Upper South Branch Kishwaukee River
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BETHANY RD
BARBER GREENE RD
TWOMBLEY RD
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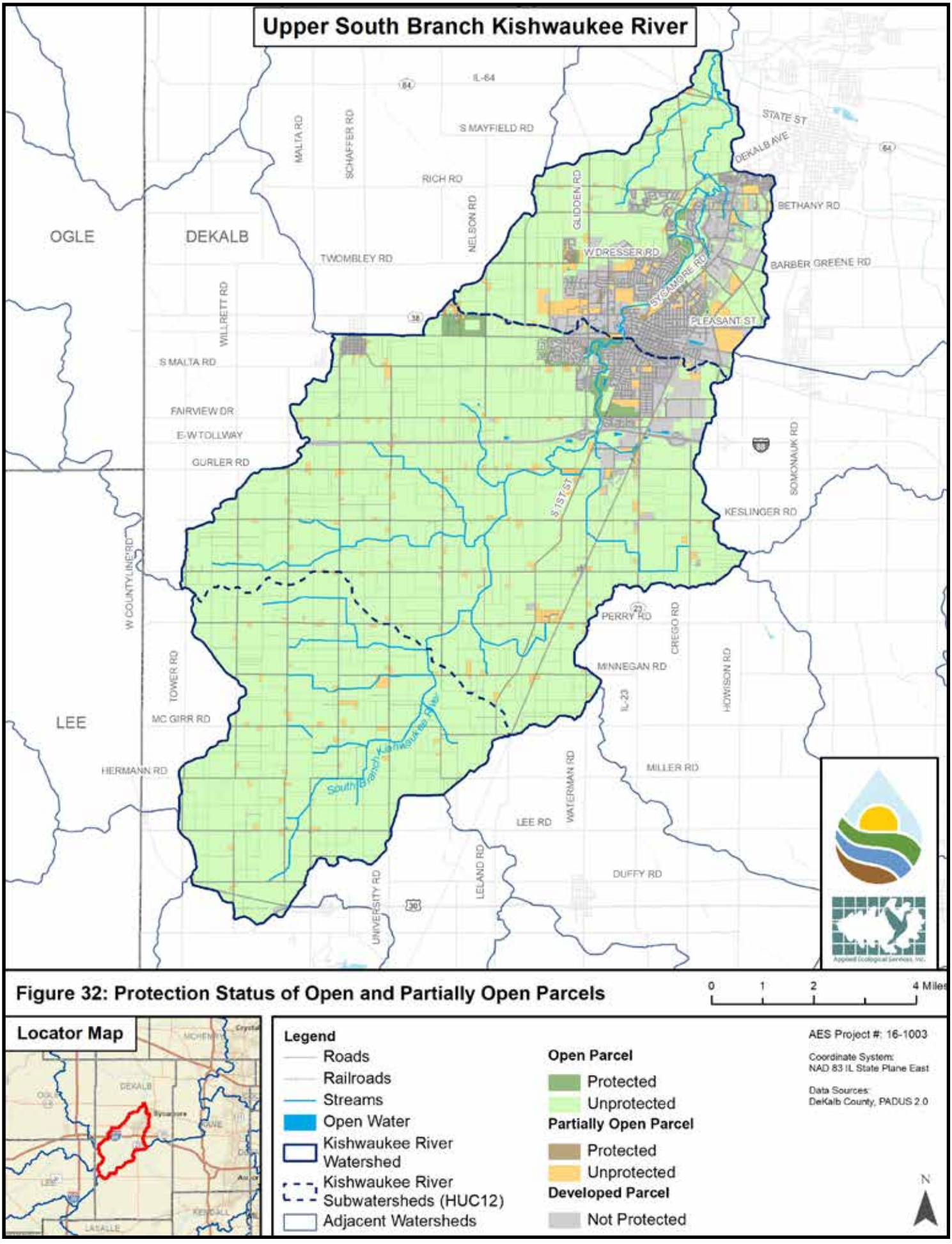
SYCAMORE RD
PLEASANT ST
WILLRETT RD
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
SOMONAUK RD
KESLINGER RD
S 1ST ST
W COUNTY LINE RD
PERRY RD
CREGO RD
HOWISON RD
TOWER RD
MINNEGAN RD
IL-23
MC GIRR RD
HERMANN RD
MILLER RD
WATERMAN RD
LEE RD
DUFFY RD
LELAND RD
UNIVERSITY RD
Figure 31: Public vs. Private Ownership of Open and Partially Open Parcels
0
1
2
4 Miles
Locator Map
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Open Parcel
Public
Private
Partially Open Parcel
Public
Private
Developed Parcel
Public or Private
AES Project #: 16-1003
Coordinate System:
NAD 83 IL State Plane East
Data Sources:
DeKalb County
N


Upper South Branch Kishwaukee River
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S MAYFIELD RD
MALTA RD
SCHAFFER RD
RICH RD
NELSON RD
GLIDDEN RD
STATE ST
DEKALB AVE
BETHANY RD
BARBER GREENE RD
TWOMBLEY RD
W DRESSER RD
SYCAMORE RD
PLEASANT ST
WILLRETT RD
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
S 1ST ST
SOMONAUK RD
KESLINGER RD
W COUNTYLINE RD
PERRY RD
CREGO RD
TOWER RD
MINNEGAN RD
IL-23
HOWISON RD
MC GIRR RD
HERMANN RD
South Branch Kishwaukee River
MILLER RD
WATERMAN RD
LEE RD
LELAND RD
DUFFY RD
UNIVERSITY RD
Figure 32: Protection Status of Open and Partially Open Parcels
0 1 2 4 Miles
Locator Map
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Open Parcel
Protected
Unprotected
Partially Open Parcel
Protected
Unprotected
Developed Parcel
Not Protected
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County, PADUS 2.0
N

Open Space Parcel Prioritization

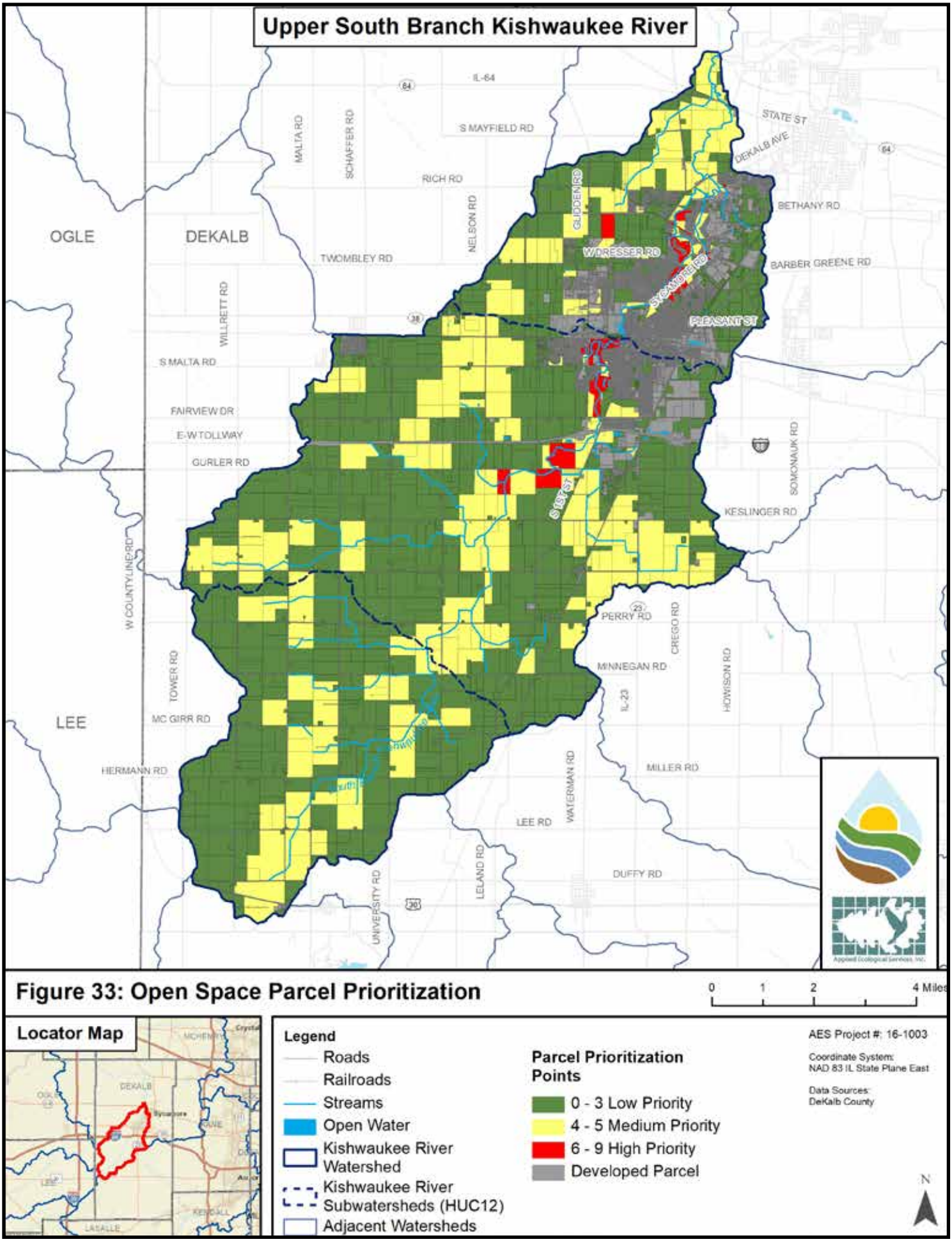
Step 2 in creating a Green Infrastructure Network for Upper South Branch Kishwaukee River watershed was completed by prioritizing open and partially open parcels. For this step, 11 prioritization criteria important to green infrastructure were examined via a GIS analysis (Table 15). If an open or partially 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 prioritization process was not completed for developed parcels. The total points received for each parcel were summed to determine parcel prioritization within the Green Infrastructure Network - parcels with the highest number of points being more important to green infrastructure than parcels that met fewer criteria.

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 weighting process was 9 (having met 9 of the 11 criteria). After completion of the prioritization, parcels were categorized as "High Priority," "Medium Priority," or "Low Priority" based on point totals. Parcels meeting 6-9 of the criteria were designated High Priority for inclusion into the Green Infrastructure Network while parcels meeting 4-5 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 33 depicts the results of the parcel prioritization. The Green Infrastructure Network for the Upper South Branch Kishwaukee River watershed follows both the existing streams and tributaries and upstream or headwater wetland areas. The High Priority parcels typically include parks, natural areas, golf courses, and private agricultural land adjacent the lower half of the main stem of the Kishwaukee River. Many of the Medium Priority parcels intersect tributary streams or wetlands. Low Priority parcels are generally isolated from other natural features and include many privately-owned agricultural parcels in upland areas.

Table 15. Criteria used to prioritize parcels for a Green Infrastructure Network.

Green Infrastructure Criteria
1. Open or partially open parcels that intersect FEMA 100-year floodplain
2. Open or partially open parcels within 0.5-miles of any headwater stream
3. Open or partially open parcels that intersect a wetland
4. Open or partially open parcels that include a potentially restorable wetland
5. Open or partially open parcels equal to or greater than 10 acres
6. Open or partially open parcels that are within 100 feet of a stream or significant open water
7. Open or partially open parcels in a "Highly Vulnerable" Land Use/Land Cover SMU
8. Open or partially open parcels adjacent to or including private or public protected open space
9. Open or partially open parcels managed by the DeKalb Park or Forest Preserve District
10. Open or partially open parcels that intersect existing trails
11. Open or partially open parcels that include or intersect an "Important Natural Area"


Upper South Branch Kishwaukee River
OGLE
DEKALB
LEE
IL-64
S MAYFIELD RD
MALTA RD
SCHAFFER RD
RICH RD
NELSON RD
GLIDDEN RD
STATE ST
DEKALB AVE
BETHANY RD
W DRESSER RD
SYCAMORE RD
BARBER GREENE RD
PLEASANT ST
TWOMBLEY RD
WILLRETT RD
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
S 1ST ST
SOMONAUK RD
KESLINGER RD
W COUNTY LINE RD
PERRY RD
CREGO RD
TOWER RD
MINNEGAN RD
IL-23
HOWISON RD
MC GIRR RD
HERMANN RD
MILLER RD
WATERMAN RD
LEE RD
LELAND RD
DUFFY RD
UNIVERSITY RD
Figure 33: Open Space Parcel Prioritization
0 1 2 4 Miles
Locator Map
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Parcel Prioritization Points
0 - 3 Low Priority
4 - 5 Medium Priority
6 - 9 High Priority
Developed Parcel
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County
N

Green Infrastructure Network

The final step (Step 3) in creating a Green Infrastructure Network for the Upper South Branch Kishwaukee River watershed involves laying out the network by incorporating: 1) prioritized open space results from Steps 1 & 2, 2) information gathered during the watershed resource field inventory conducted by AES in 2019, and 3) stakeholder recommendations.

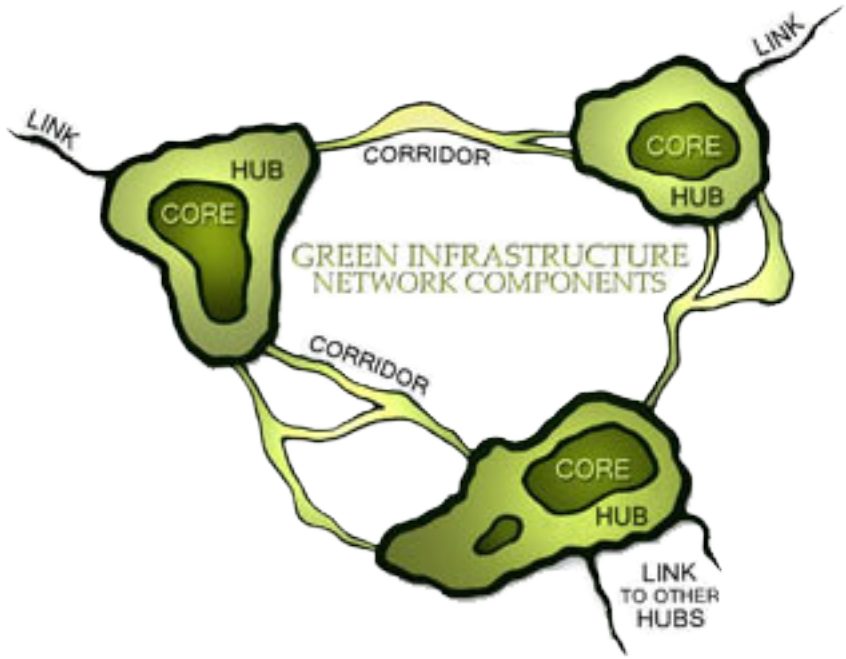
A Green Infrastructure Network is a connected system of Hubs and linking Corridors (Figure 34). County and region-wide green infrastructure plans generally focus on natural features such as stream corridors, wetlands, floodplain, buffers, and other natural components. Hubs generally consist of the largest and least fragmented areas such as P.A. Nehring Forest Preserve, Prairie Park, Hopkins Park, several agricultural areas, and the public golf courses. Corridors are generally formed by smaller private/ unprotected parcels along the Upper South Branch Kishwaukee River and tributaries. Corridors are extremely important because they provide biological conduits between hubs. However, most parcels forming corridors are not ideal green infrastructure until residents, businesses, and landowners embrace the idea of managing stream corridors.

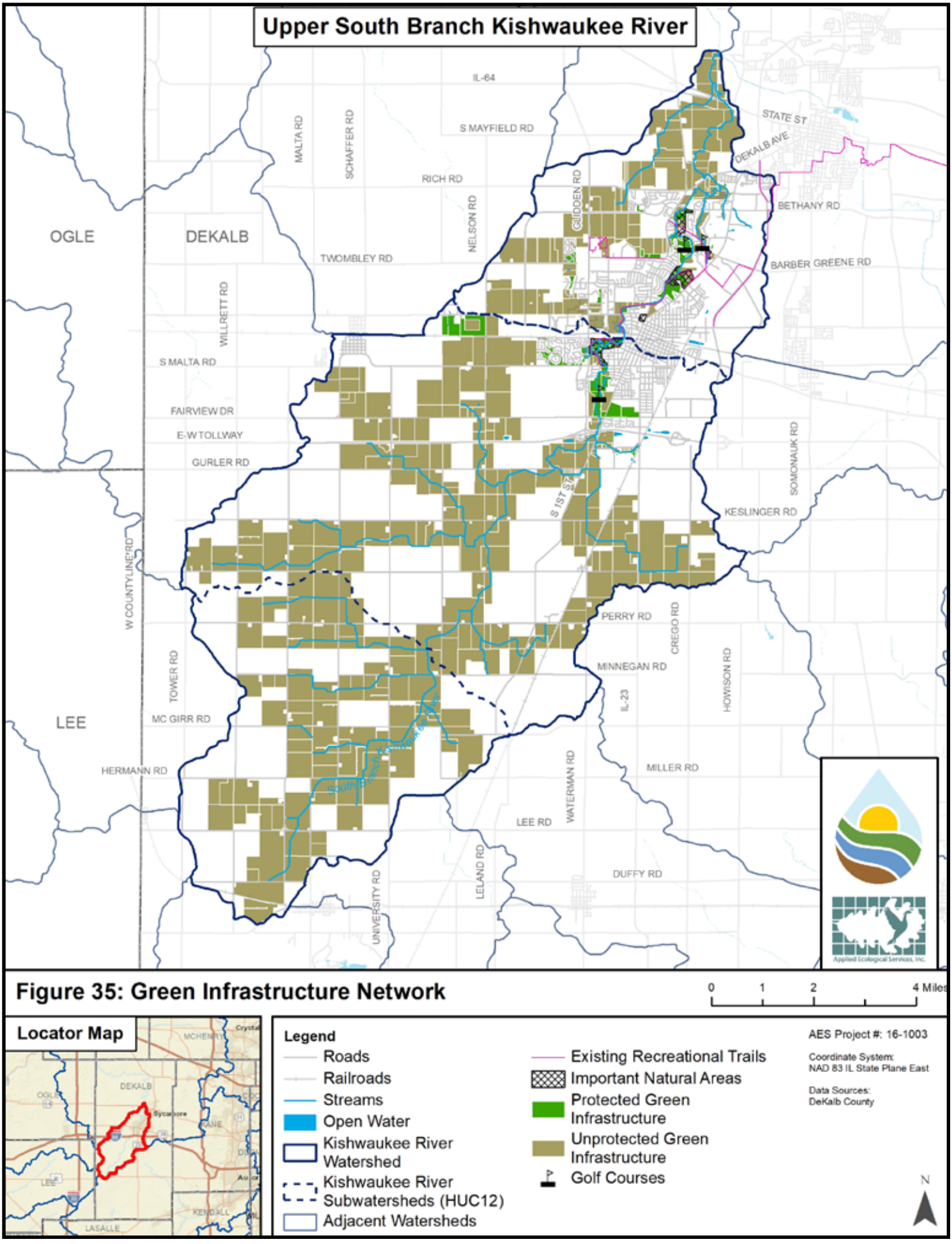
Perhaps the most important aspect of green infrastructure planning is that it helps communities identify and prioritize conservation opportunities and plan development in ways that optimize the use of land to meet the needs of people and nature (Benedict, 2006). Green infrastructure planning provides a framework for future growth that identifies areas not suitable for development, areas suitable for development but which should incorporate conservation/low impact design standards, and areas that do not affect green infrastructure. The Action Plan section of this report contains recommendations for implementing the Green Infrastructure Network.

The Green Infrastructure Network (GIN) created for the Upper South Branch Kishwaukee River watershed captures all the natural components and other green infrastructure such as recreational parks, agricultural lots, large residential lots, school grounds, and golf courses at the parcel level. In some cases, developed or low priority parcels were added to the network to complete links and ensure that all GIN parcels were connected.

Parcel level green infrastructure planning is important because land purchases, acquisitions, and land use changes almost always occur at the parcel level. The Green Infrastructure Network for the Upper South Branch Kishwaukee River watershed is illustrated on Figure 35. It includes 611 parcels and a total of 27,592 acres, 854 acres (3%) of which are protected.

Figure 34. Green Infrastructure components. Source: greeninfrastructure.net.




Upper South Branch Kishwaukee River
OGLE
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S MAYFIELD RD
MALTA RD
SCHAFFER RD
RICH RD
NELSON RD
GUDDEN RD
STATE ST
DEKALB AVE
BETHANY RD
BARBER GREENE RD
TWOMBLEY RD
WILLRETT RD
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
S 1ST ST
SOMONAUK RD
KESLINGER RD
W COUNTYLINE RD
PERRY RD
CREGO RD
HOWISON RD
TOWER RD
MINNEGAN RD
IL-23
MC GIRR RD
HERMANN RD
WATERMAN RD
MILLER RD
LEE RD
LELAND RD
DUFFY RD
UNIVERSITY RD
South Branch Kishwaukee River
Applied Ecological Services, Inc.
Figure 35: Green Infrastructure Network
0
1
2
4 Miles
Locator Map
MCHENRY
DEKALB
Sycamore
KANE
KENDALL
LASALLE
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Existing Recreational Trails
Important Natural Areas
Protected Green Infrastructure
Unprotected Green Infrastructure
Golf Courses
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County
N

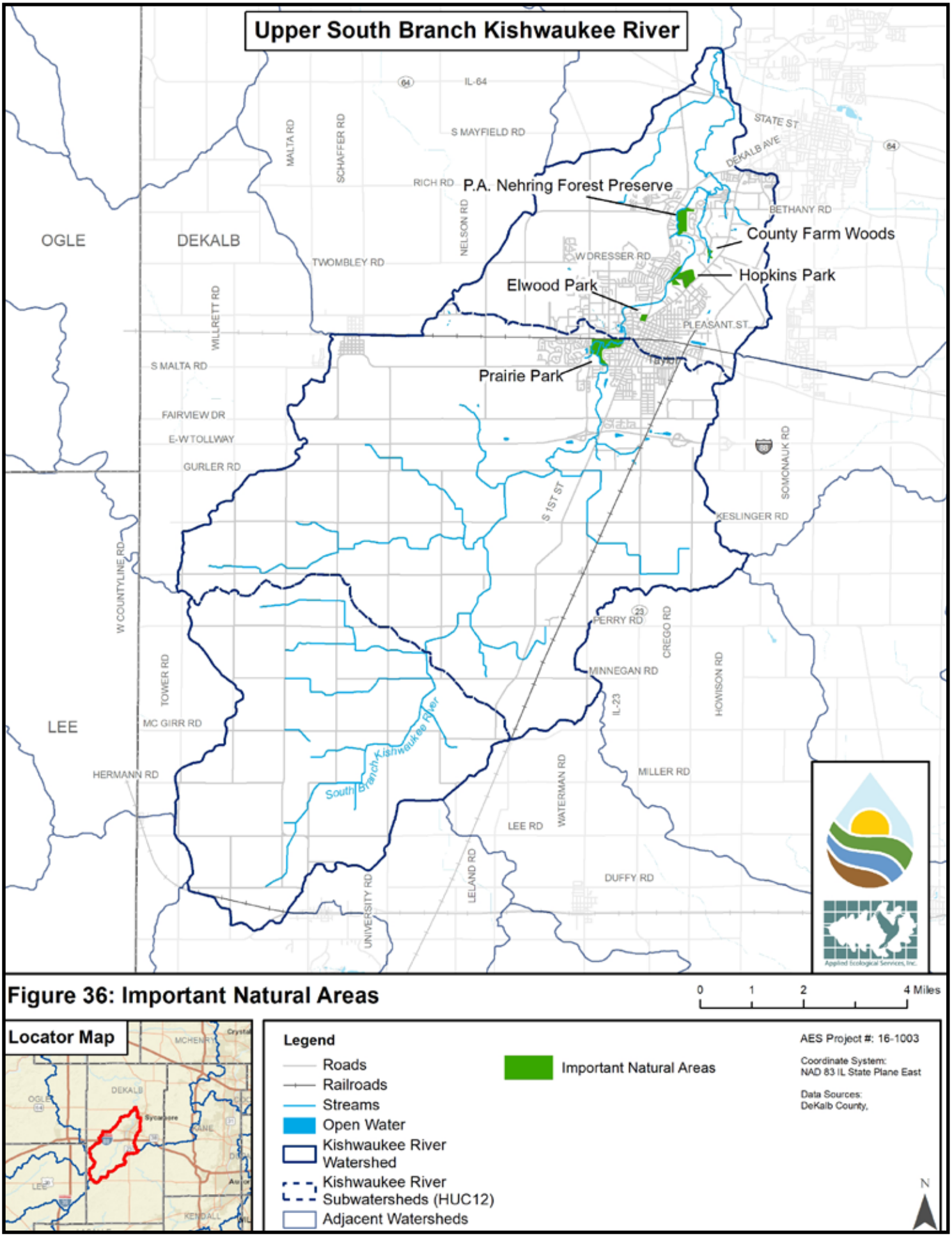
A green infrastructure network provides continuous habitat for wildlife

3.13 Important Natural Areas

For this watershed plan, "Important Natural Areas" include protected woodlands within DeKalb County Forest Preserve and DeKalb Park District (Table 16; Figure 36). 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 in order to perform those functions optimally. Several Important Natural Areas are located in the watershed including 2 forest preserves and 3 city owned parks.

Table 16. Important natural area summary data.

Natural Area	Size (acres)	Description
Forest Preserve District of DeKalb County		
P.A. Nehring Forest	58.6 ac	Public preserve comprised of overgrown mesic oak woodlands located in a floodplain on the banks of the South Branch of the Kishwaukee River.
County Farm Woods	8.3 ac	Degraded, remnant oak woodland connected to the DeKalb Nature trail
City of DeKalb Park District		
Elwood Park	11.4	Degraded, remnant mesic oak woodland located on the grounds of Elwood House
Hopkin's Park	14.6	Turf park with remnant oak woodlands connected to the DeKalb Nature Trail
Prairie Park	106.3	Degraded remnant, mesic oak woodland with a connected to the DeKalb Nature Trail


Upper South Branch Kishwaukee River
P.A. Nehring Forest Preserve
County Farm Woods
Hopkins Park
Elwood Park
Prairie Park
OGLE
DEKALB
LEE
IL-64
S MAYFIELD RD
MALTA RD
SCHAFFER RD
RICH RD
NELSON RD
STATE ST
DEKALB AVE
BETHANY RD
W DRESSER RD
TWOMBLEY RD
WILLRETT RD
PLEASANT ST
Fayette
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
S 1ST ST
SOMONAUK RD
KESLINGER RD
W COUNTYLINE RD
PERRY RD
CREGO RD
TOWER RD
MINNEGAN RD
IL-23
HOWISON RD
MC GIRR RD
HERMANN RD
South Branch Kishwaukee River
WATERMAN RD
MILLER RD
LEE RD
LELAND RD
UNIVERSITY RD
DUFFY RD
Applied Ecological Services, Inc.
Figure 36: Important Natural Areas
0
1
2
4 Miles
Locator Map
MCHENRY
DEKALB
OGLE
LEE
KENDALL
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Important Natural Areas
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County,
N

Forest Preserves

The Upper South Branch Kishwaukee River watershed has 58.6 acres of land within P.A. Nehring Forest which is owned and managed by the DeKalb County Forest Preserve District (Table 16; Figure 36). The preserve is located on a floodplain next to the South Branch of the Kishwaukee River and is comprised of an overgrown mesic woodland of mature oaks, maples, and basswood.

Formerly a nursing home and dumpsite (neither of which remain on the property), County Farm Woods is a small 8.3-acre forest preserve owned by the DeKalb County Forest Preserve and contains some of the oldest oak trees in DeKalb as well as a naturalized detention basin along with the DeKalb Nature Trail and the South Branch Kishwaukee River. It is comprised of a degraded oak woodland with many overcrowded young oak trees.

County Farm Woods

P.A. Nehring Forest

Trails at Ellwood Park

City of DeKalb Park District

Ellwood Park is an 11.4-acre park on the Ellwood House Museum property owned by the City of DeKalb Park District and honoring Isaac Ellwood, who was instrumental in the development of barbed wire. In addition to the historic house, the grounds contain formal gardens and a degraded, remnant oak woodland in need of maintenance and management.

Hopkin's park is managed by the DeKalb Park District and contains 14.6 acres of turf grass under a remnant oak woodland. The park hosts the start of the DeKalb Nature trail which connects Hopkin's Park to Prairie Park. The park has many of amenities, including a swimming pool, baseball field, basketball court, tennis court, playground, and flower garden.

Hopkin's Park

Prairie Park is a 106.3-acre park and the largest park in the watershed; it is managed by DeKalb Park District. Amenities at the park include a disc golf course, picnic tables, and walking trails. The park contains a degraded remnant oak woodland and prairie along the South Branch Kishwaukee River and DeKalb Nature Trail.

Other Open Space - Golf Courses

Three golf courses are located within the watershed and serve as important open space along portions of South Branch Kishwaukee River. River Heights Golf Course is owned and managed by DeKalb Park District and consists of 18 holes on roughly 140 acres generally located between Route 38 and Fairview Drive on the south side of DeKalb. Reach 10 of South Branch Kishwaukee River flows north through the Golf Course and often overtops its banks thereby flooding portions of the Golf Course leading to closures. Ecological restoration to riparian areas could help alleviate flood issues and reduce course closures.

Kishwaukee Country Club is a 138-acre, 18-hole private golf course located north of Route 23 in the northern portion of the City of DeKalb. The southern half of Reach 13 of South Branch Kishwaukee River flows northeast through the course. Portions of this course consist of rolling hills that harbor remnant old grow oak trees that were once part of a savanna ecosystem. This course presents the best opportunities for ecological restoration within rough areas.

Prairie Park

River Heights Golf Course (Source: DeKalb Park District)

Kishwaukee Country Club (Source: Kishwaukee Country Club)

Buena Vista Golf Course (Source: DeKalb Park District)

Buena Vista Golf Course is owned and managed by DeKalb Park District. This 87-acre, 9-hole course is located east of 1st Street in the northern portion of DeKalb and adjacent to Kishwaukee County Club. The northern half of Reach 13 of South Branch Kishwaukee River flows northwest through the course. Like Kishwaukee County Club, this course in located in part on rolling topography that was once oak savanna which presents opportunities for ecological restoration within rough areas. In addition, golf course open space forms an important green infrastructure connection to Nehring Forest Preserve to the north.

Upper South Branch Kishwaukee River through Hopkin's Park

3.14 Watershed Drainage System

3.14.1 Upper South Branch Kishwaukee River & Tributaries

The main stem of Upper South Branch Kishwaukee River (AUIDs: IL_PQC-02 and IL_PQC-13) is the primary stream draining the watershed. Twenty (20) tributary streams are also found in the watershed (Table 17; Figure 37). South Branch Kishwaukee River alone is over 26.1 linear miles in length while the tributaries account for another 43.1 linear miles. In total, 57 stream reaches were assessed accounting for 370,289 linear feet or 69.7 linear miles. For the Upper South Branch Kishwaukee River main stem, Reaches 1-8 are AUID IL_PQC-13, while Reaches 9-16 are AUID IL_PQC-2). Tributary 6 and Tributary 8 are they only other streams in the watershed with AUIDs and they are IL_PQCG (Middle Branch South Branch Kishwaukee River) and IL_PQCF (North Branch South Branch Kishwaukee River). No other streams or tributaries in the watershed have AUID codes.

Upper South Branch Kishwaukee River officially begins as a channelized ditch in an agricultural field in the southwest portion of the watershed and fed by a series of drain tiles. From there, the stream flows northwest through agriculture for 14.1 miles. The channelized stream continues to flow northwest through the River Heights Golf Course and enters Prairie Park where it temporarily changes to a natural stream channel. From Prairie Park, it is rechannelized and passes under Rt. 38 and through Northern Illinois University and residential neighborhoods for about 2.0 miles before flowing into Hopkin's Park, Buena Vista Golf Course, and P.A. Nehring Forest Preserve. From the forest preserve, the river winds through about 2.6 miles of privately owned wooded riparian corridors before flowing into 2.9 miles of agricultural fields where it joins the main branch of the Kishwaukee River west of Dovetail Point.

Table 17. Summary of Upper South Branch Kishwaukee River and tributary reaches and length.

Stream or Tributary Name	Abbreviation	Number of Reaches	Stream Length Assessed (Ft)	Stream Length Assessed (Mi)
Upper South Branch Kishwaukee River	SB	16	137,878	26.1
Tributary 1	Trib1	1	1,201	0.2
Tributary 2	Trib2	1	2,778	0.5
Tributary 3	Trib3	2	9,281	1.8
Tributary 4	Trib4	1	6,090	1.1
Tributary 5	Trib5	3	17,392	3.3
Tributary 6	Trib6	4	29,683	5.6
Tributary 7	Trib7	3	18,559	3.5
Tributary 8	Trib8	5	36,768	7.0
Tributary 9	Trib9	3	20,787	3.9
Tributary 10	Trib10	2	12,561	2.3
Tributary 11	Trib11	4	28,788	5.4
Tributary 12	Trib12	1	4,929	0.9
Tributary 13	Trib13	2	4,974	0.9
Tributary 14	Trib14	1	3,222	0.6
Tributary 15 (aka: Watson Creek)	Trib15	2	5,381	1.0
Tributary 16	Trib16	1	989	0.2
Tributary 17	Trib17	2	6,528	1.2
Tributary 18	Trib18	1	3,958	0.7
Tributary 19	Trib19	2	18,542	3.5
Totals		**57**	**370,289**	**69.7**

Note: Illinois EPA does not monitor to the level of detail included in this plan. A localized waterbody code system was developed for this plan and therefore, the codes used are not found in the Illinois EPA's *Illinois Integrated Water Quality Report and Section 303d List.*

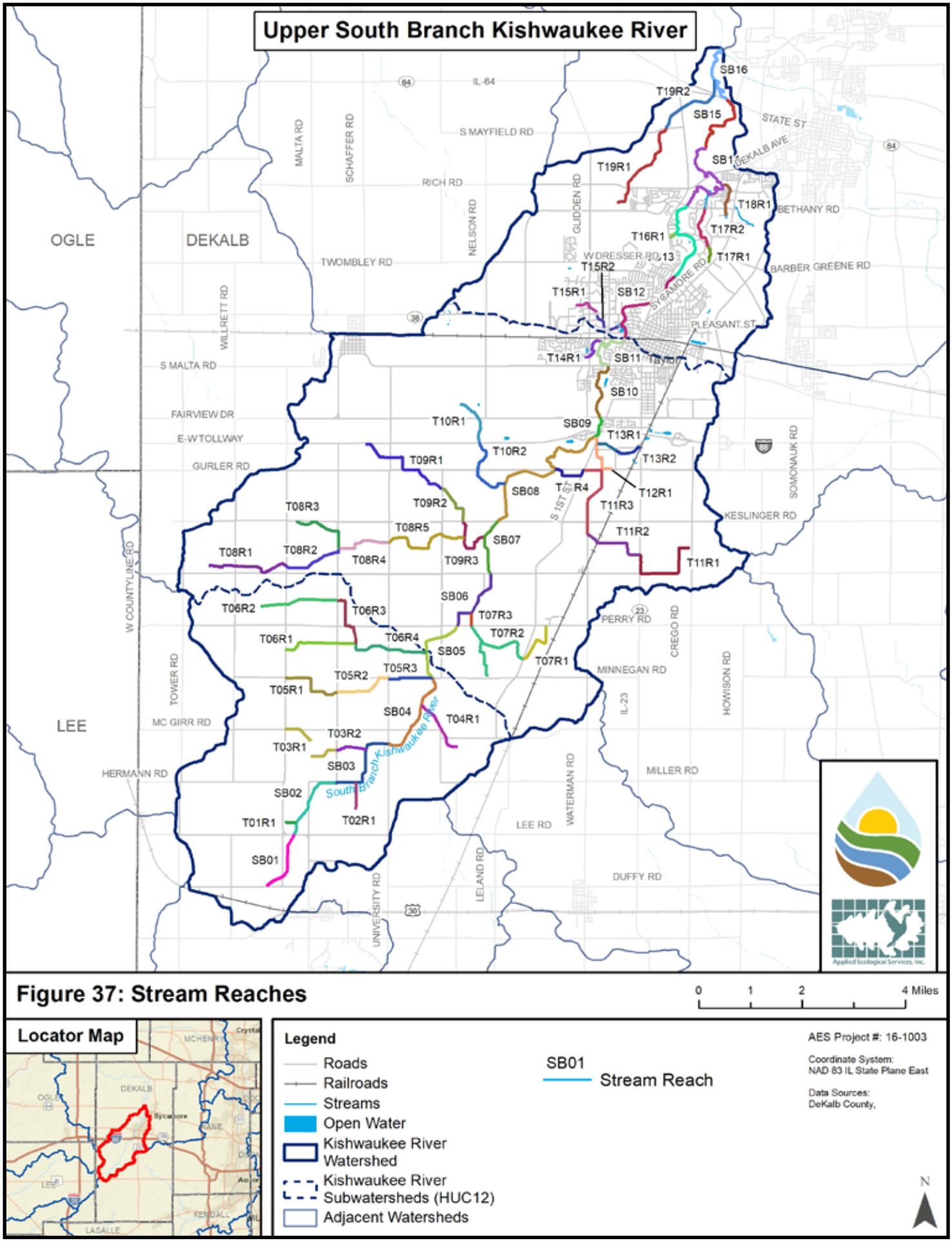


Figure 37: Stream Reaches

0 1 2 4 Miles

Locator Map

Legend

- Roads
- Railroads
- Streams
- Open Water
- Kishwaukee River Watershed
- Kishwaukee River Subwatersheds (HUC12)
- Adjacent Watersheds
- SB01 Stream Reach

AES Project #: 16-1003

Coordinate System:
NAD 83 IL State Plane East

Data Sources:
DeKalb County,

N

In spring 2019, Applied Ecological Services, Inc. (AES) completed a field inventory of South Branch Kishwaukee River and its tributaries. All streams and tributaries were assessed based on divisions into "Stream Reaches" (Table 17; Figure 37). Reaches are defined as stream segments having similar hydraulic, geomorphic, riparian condition, and adjacent land use characteristics. Methodology included walking all or portions of the stream and tributary reaches, collecting measurements, taking photos, and noting channel, streambank, and riparian corridor 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, AES 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 considered to be "Critical Areas".

Upper South Branch Kishwaukee River

Upper South Branch Kishwaukee River (Reach Code SB and totaling 26.1 miles) was divided into 16 distinct "Stream Reaches" beginning at the headwaters near Shabbona and ending at the Main Branch Kishwaukee River (Table 17; Figure 37).

Upper South Branch Kishwaukee Reach 1 through 5 (SB01 through SB05) are similar reaches. Reach 1 begins just west of Shabbona as a channelized ditch that drains an agriculture field through drain tiles. Reach 1 flows northwest for 6,858 linear feet to Lee Road. Reach 2 is 7,774 linear feet which flows from Lee Rd. to Haumesser Road. Reach 3 flows for 8,867 linear feet from Haumesser Road to University Road. Reach 4 continues from University Road to Minnegan Road for 9,637 linear feet. Reach 5 extends from Minnegan Road to Perry Road for 7,537 linear feet. This reach is highly channelized with steep banks ranging from 10-15 feet high. Reach 3 shows evidence of channel recovering with some meandering occurring within the channel. Reaches 1-5 do not contain any pools or riffles, and exhibit low streambank erosion, and low sediment accumulation along the channel bottom. The immediate riparian area consists of a narrow band of "old field' vegetation made up of invasive grasses and other herbaceous species surrounded by agricultural land.

Upper South Branch Kishwaukee Reach 6 (SB06) and 7 (SB07) display similar characteristics. Reach 6 flows northwest for 7,530 linear feet from Perry Road to Elva Road through argriculture fields. Reach 7 extends for 5,963 linear feet from Elva Road to Keslinger Road. Reach 6 has more sinouosity and riffling then Reach 7. Both reaches are highly channelized with steep side slopes, low erosion and have wide Conservation Reserve Program (CRP) buffers of native prairie vegetation.

Upper South Branch Kishwaukee River Reach 8 (SB08) begins at Keslinger Road and flows northwest for 18,352 linear feet to Gurler Road through agriculture. Reach 8 has high channelization, low sinuosity, low erosion and low sediment accumulation. The Reach 8 buffer contains a narrow degraded secondary growth woodland and non-native "old field" grasses.

Upper South Branch Kishwaukee

Upper South Branch Kishwaukee River Reach 4

Upper South Branch Kishwaukee River Reach 9

Upper South Branch Kishwaukee River Reach 10

Upper South Branch Kishwaukee River Reach 11

River Reach 9 (SB09) transitions out of agriculture and into a secondary growth wooded and reed canary grass buffer beginning at Harvestore Drive and extends 2,243 linear feet northeast to Fairview drive. The reach has moderate channelization with low sedimentation, moderate bank erosion and low riffle development and sinuosity.

Upper South Branch Kishwaukee River Reach 10 (SB10) runs from Fairview Drive to West Taylor Street and flows 6,589 linear feet through the DeKalb Park District managed, River Heights Golf Course. Reach 9 has moderate channel sinuosity and channelization, low riffles and pools, bank erosion, and sediment build up. The stream buffers within the golf course are very narrow with mown turf grass up to the edge and reed canary grass on the side slopes.

Upper South Branch Kishwaukee Reach 11 (SB11) flows for 7,015 linear feet through DeKalb Park District managed Prairie park from West Taylor Street to the railroad tracks south of Route 38. Reach 11 contains a moderately channelized reach in the southern portion with an oxbow channel and a naturally meandering northern portion. Sinuosity is moderate within Reach 11 with low sedimentation, pool and riffle development as well as moderate bank erosion and debris jams. The riparian area surrounding Reach 11 includes a degraded savannah and remnant large open grown oak, walnut, and hackberry trees with an overgrown understory of honeysuckle and buckthorn.

Reach 12 (SB12) starts at Route 38 and runs northwest for 10,535 linear feet to the DeKalb Nature Trail Bridge east of East Royal Drive. Reach 12 flows through the Northern Illinois University campus on the west bank and a residential neighborhood on the east. At North 1st street it passes through light commercial properties and Clinton Rosette Middle School Athletic fields. Reach 12 then

passes under East Hillcrest drive where it flows through a residential neighborhood before passing the Kishwaukee Water Reclamation District water treatment facility. Reach 12 has high channelization with very narrow buffers of old field vegetation and much of the toe slopes are stabilized with riprap.

Reach 13 (SB 13) flows through DeKalb Park District's Hopkin's Park and Buena Vista Golf Course and DeKalb County Forest Preserve's P.A. Nehring Forest Preserve for 10,139 linear feet. Within DeKalb Park District managed properties, mowed turf is maintained up to the banks of the South Branch Kishwaukee with old golf course grasses growing along the banks and slope. Within the forest preserve, the buffer is a mixture of overgrown secondary

Above: Upper South Branch Kishwaukee River Reach 12; Below: Upper South Branch Kishwaukee River Reach 13 through Hopkin's Park

Upper South Branch Kishwaukee River Reach 13 through Buena Vista Golf Course

Upper South Branch Kishwaukee River Reach 13 through P.A. Nehring Forest

Upper South Branch Kishwaukee River Reach 16 at Broken Bridge Monitoring Location

growth woody species. The channel of Reach 13 has moderate amounts of erosion and some pool and riffle development.

Reach 14 (SB14) winds northwest for 13,575 linear feet beginning at Bethany Rd through a corridor of privately owned second growth, weedy woodland and ends northeast of South Mayfield Road. The channel through Reach 14 is more naturalized with low channelization, moderate sinuosity, and moderate erosion. Debris jams and sedimentation within the channel are also low.

Reach 15 (SB15) flows through 7,820 linear feet of predominately agriculture from northeast of South Mayfield Road to Route 64. Unlike the southern agricultural reaches, Reach 15 has a more natural, sinuous channel with only moderate channelization. The reach however, still has low pool and riffle development and moderate erosion within the channel, but low sedimentation and minimal debris jams.

Reach 16 (SB16) flows from Route 64 northwest for 7,708 linear feet and enters the main branch of the Kishwaukee River on private property. The buffer area surrounding Reach 16 contains varying thicknesses of second growth floodplain woodlands. The natural stream channel exhibits low channelization with moderate streambank erosion and low riffle and pool development and low sedimentation and debris jams.

Tributary Streams

Nineteen (19) tributary streams are found in the watershed (Table 17; Figure 37). A brief description of each tributary stream is included below.

Tributary 1 (Trib01): This tributary flows for 1,201 linear feet east from Shabbona Road and drains approximately 1,203 acres. It consists of a narrow, channelized ditch which drains agricultural fields through a swale and drain tiles and the roadway.

Tributary 2 (Trib02): This 2,778-linear foot tributary flows north as a channelized drainage ditch in an agricultural field north of Lee Road prior to joining South Branch Kishwaukee River at just east of Haumesser Road. Tributary 2 drains approximately 986 acres of land.

Tributary 3 (Trib03): Tributary 3 is a channelized ditch through agriculture which contains two reaches totaling 3,980 linear feet and draining about 2,253 acres. Reach 1 begins at McGirr Road and travels southeast before disappearing underground and reappearing approximately 1,800 linear feet south and flows northeast to Haumasser Road. Reach 2 begins at Haumasser Rd and flows east where it meets up with the South Branch Kishwaukee River west of University Road.

Tributary 4 (Trib04): This 6,690 linear-foot channelized ditch drains approximately 1,024 acres and begins in an agriculture field east of Miller Road and South of McGirr Road. It flows northwest where it meets with the South Branch of the Kishwaukee River south of Minnegan Road.

Tributary 5 (Trib05): Tributary 5 is a 17,392 linear-foot channelized ditch divided into three reaches that drains 2,061 acres. The tributary starts at Shabbona Road and flows east along Minnegan Road before connecting to the South Branch Kishwaukee River east of Anderland Road.

Tributary 6 (Trib06): This tributary is 29,683 linear feet, drains about 3,469 acres, and is divided into four reaches making it the second longest tributary in the watershed. Reach 1 begins at Shabbona Road and flows east through agriculture, connecting with Reach 4 east of Haumesser Rd. Reach 2 begins north of Shabbona Road and also flows east through agriculture. Reach 2 connects to Reach 3 at Haumesser where it flows south and connects to Reach 4 at the same intersection as Reach 1. Reach 4 flows east and connects to the South Branch Kishwaukee west of Anderland Road.

Tributary 1 Reach 1

Tributary 3 Reach 2

Tributary 6 Reach 1

Tributary 12 Reach 1 at Harveststore Drive

Tributary 14 Reach 1 through Prairie Park

Tributary 15 Reach 1 at Northern Illinois University

Tributary 7 (Trib07): Tributary 7 consists of three reaches totaling 18,559 linear feet and drains about 3,558 acres. The tributary begins at Perry Road and flows south through agriculture before turning and flowing northwest and joining the Upper South Branch Kishwaukee River north of Perry Road.

Tributary 8 (Trib08): Is the longest tributary in the Upper South Branch Kishwaukee Watershed divided into five reaches which total 36,768 linear feet. Tributary 8 begins as a channelized ditch in an agriculture field west of Willret Road and flows east through Reaches 1 and 2. Tributary 8, Reach 3 begins separately at Keslinger Road and to meet Tributary 8 between Reach 2 and 4 east of Haumasser Road. From there Reaches 4 and 5 flow due east before emptying into Tributary 9 east of Anderland Road. In total, Tributary 8 drains approximately 3,949 acres of land.

Tributary 9 (Trib09): Tributary 9 drains about 4,333 acres and consists of three channelized reaches in agricultural fields totaling 20,789 linear feet. Tributary 9 begins south of Interstate 88 and flows south east before meeting with Tributary 8 south of Kelinger Road and turning northeast to meet with the Upper South Branch Kishwaukee River a short distance later.

Tributary 10 (Trib10): Tributary 10 is a channelized ditch that begins just north of Fairview Drive in agriculture and flows 12,561 linear feet through 2 reaches before joining the Upper South Branch Kishwaukee south of Gurler Road. Tributary 10 drains approximately 3,738 acres of land.

Tributary 11 (Trib11): This tributary, divided into four reaches, begins east of Crego Road and flows northwest for 28,788 linear feet before meeting the Upper South Branch Kishwaukee River at Gurler Road. The first three reaches of Tributary 11 flow through agriculture fields while Reach 4 is routed around a residential neighborhood and contains a buffer of second

growth, weedy trees. In total, Tributary 11 drains approximately 4,173 acres.

Tributary 12 (Trib12): Tributary 12 begins at a detention pond southeast of the Good Year Tire/ Midwest Logistics warehouse. The 4,929 linear-foot tributary is channeled west and north around the warehouse before joining the South Branch Kishwaukee River west of South 1st Street and drains about 749 acres.

Tributary 13 (Trib13): Tributary 13 is a narrow tributary that is 4,974 linear feet long with a riparian area of second growth trees and shrubs and reed canary grass and divided into two reaches. The tributary drains a series of connected detention ponds within an industrial complex along Harveststore Drive and a wetland complex south of Veteran's Park. In total, it drains 1,101 acres.

Tributary 14 (Trib14): This tributary drains approximately 1,818 acres of a residential subdivision located west of Annie Glidden Road. It flows east 3,222 linear feet through a partially restored, but unmanaged riparian corridor of before joining the South Branch Kishwaukee River in Prairie Park.

Tributary 15 (Trib15, Watson Creek): Tributary 15, also known locally as Watson Creek, is divided into two reaches and is a heavily eroded channel with mowed turf grass buffers located within the Northern Illinois University campus. It begins at a detention pond north of Stevenson Drive North and flows southeast for 5,381 linear feet to drain 2,042 acres. The tributary is piped underneath a parking garage before daylighting west of Normal Road and emptying into East Lagoon detention pond.

Tributary 16 (Trib16): Tributary 16 is a small 989 linear-foot tributary that drains an agricultural field west of North 1st Street and flows eastward through Buena Vista Golf Course where it meets the South Branch Kishwaukee River north of Lilac Lane. Tributary 16 drains about 320 acres.

Tributary 17 (Trib17): This tributary, divided into two reaches, begins west of Sycamore road and flows 6,258 linear feet northwest through County Farm Woods, Buena Vista Golf Course, and into a network of detention ponds in a residential neighborhood before emptying into the South Branch Kishwaukee River. Tributary 17 drains about 768 acres.

Tributary 18 (Trib18): Tributary 18 is a 3,958 linear-foot tributary that begins at a detention pond south of Health Service Drive through the Kishwaukee Community Hospital Campus and residential neighborhoods before entering the South Branch Kishwaukee River in a second growth woodland, north of Hawthorne Lane. Tributary 18 drains approximately 1,235 acres.

Tributary 19 (Trib19): Tributary 19 begins in an agricultural field south of Route 38 in the northmost portion of the watershed and broken into two reaches. It flows northeast for 18,542 linear feet before entering the South Branch Kishwaukee River north of Route 64 and drains approximately 3,488 acres of land.

Tributary 18 Reach 1

Tributary 20 Reach 1

Stream Channelization

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 none or low channelization (highly sinuous, no human disturbance), moderate channelization (some sinuosity but altered), or highly channelized (straightened by humans) (Table 18; Figure 39). According to the stream inventory, 13% (49,108 lf) of stream and tributary length is naturally meandering; approximately 9% (33,004 lf) is moderately channelized; 78% (288,177 lf) is highly channelized. The most severe channelization is found along where the Upper South Branch Kishwaukee River and its tributaries flow through croplands where agricultural ditching practices were common.

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.

Recovering Stream Channels

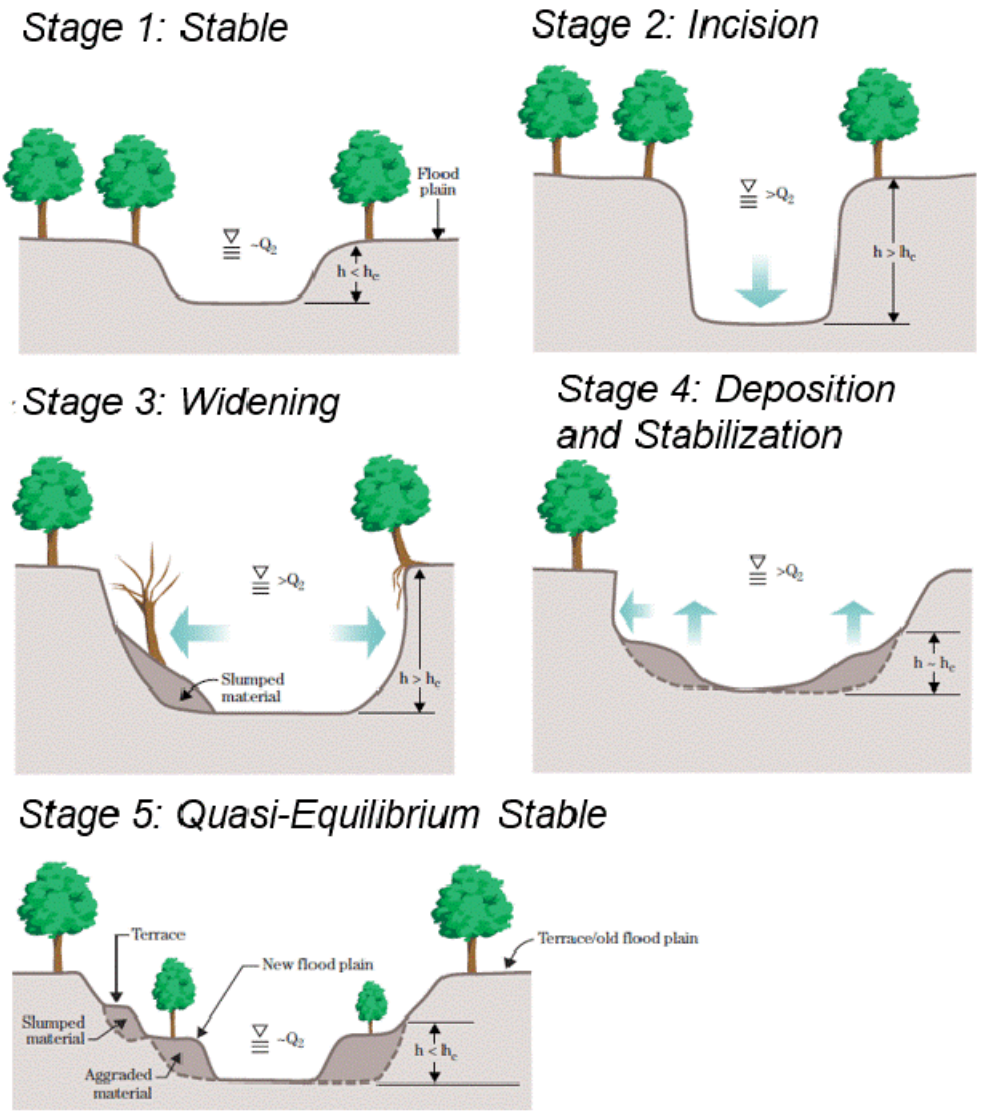
Creating or converting natural streams to drainage ditches in low areas within agricultural fields was widely used and accepted in the agricultural industry as a means to drain water from the land thereby increasing yields. It is then standard practice for farmers to maintain these ditches by periodically 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 38.

Channelization along Upper South Branch Kishwaukee River Reach 2

- In Stage 1, a stream is in stable condition and flood water is able to 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.

The majority of stream reaches in the watershed are highly channelized as a result of agricultural ditching practices. However, most 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 back to Stage 2 and additional streambank erosion occurs as the stream again goes through the recovery process. The take away is that a stable two stage channel (Stage 5) that forms in most agricultural ditches should be encouraged and protected during maintenance activities.



Top Right: **Figure 38.** Stream Evolution Model (Schumm, 1984).

Bottom Right: Farmer salvaging Stage 5 Two Stage Channel (Source: Center for Livable Future).

Table 18. Summary of stream and tributary channelization.

Stream or Tributary Name	Abbreviation	Stream Length Assessed	None or Low Channelization		Moderate Channelization		High Channelization	
		(feet)	(feet)	(%)	(feet)	(%)	(feet)	(%)
South Branch Kishwaukee River	SB	137,878	31,422	23	23,666	17	82,790	60
Tributary 1	Trib1	1,201		0		0	1,201	100
Tributary 2	Trib2	2,778		0		0	2,778	100
Tributary 3	Trib3	9,281		0		0	9,281	100
Tributary 4	Trib4	6,090		0		0	6,090	100
Tributary 5	Trib5	17,392		0		0	17,392	100
Tributary 6	Trib6	29,683		0		0	29,683	100
Tributary 7	Trib7	18,559		0		0	18,559	100
Tributary 8	Trib8	36,768		0		0	36,768	100
Tributary 9	Trib9	20,787		0		0	20,787	100
Tributary 10	Trib10	12,561		0		0	12,561	100
Tributary 11	Trib11	28,788		0		0	28,788	100
Tributary 12	Trib12	4,929	4,929	100		0		0
Tributary 13	Trib13	4,974	4,974	100		0		0
Tributary 14	Trib14	3,222	3,222	100		0		0
Tributary 15	Trib15	5,381		0	5,381	100		0
Tributary 16	Trib16	989		0		0	989	100
Tributary 17	Trib17	6,528	4,561	70		0	1,967	30
Tributary 18	Trib18	3,958		0	3,958	100		0
Tributary 19	Trib19	18,542		0		0	18,542	100
Totals		**370,289**	**49,108**	**13**	**33,004**	**9**	**288,177**	**78**

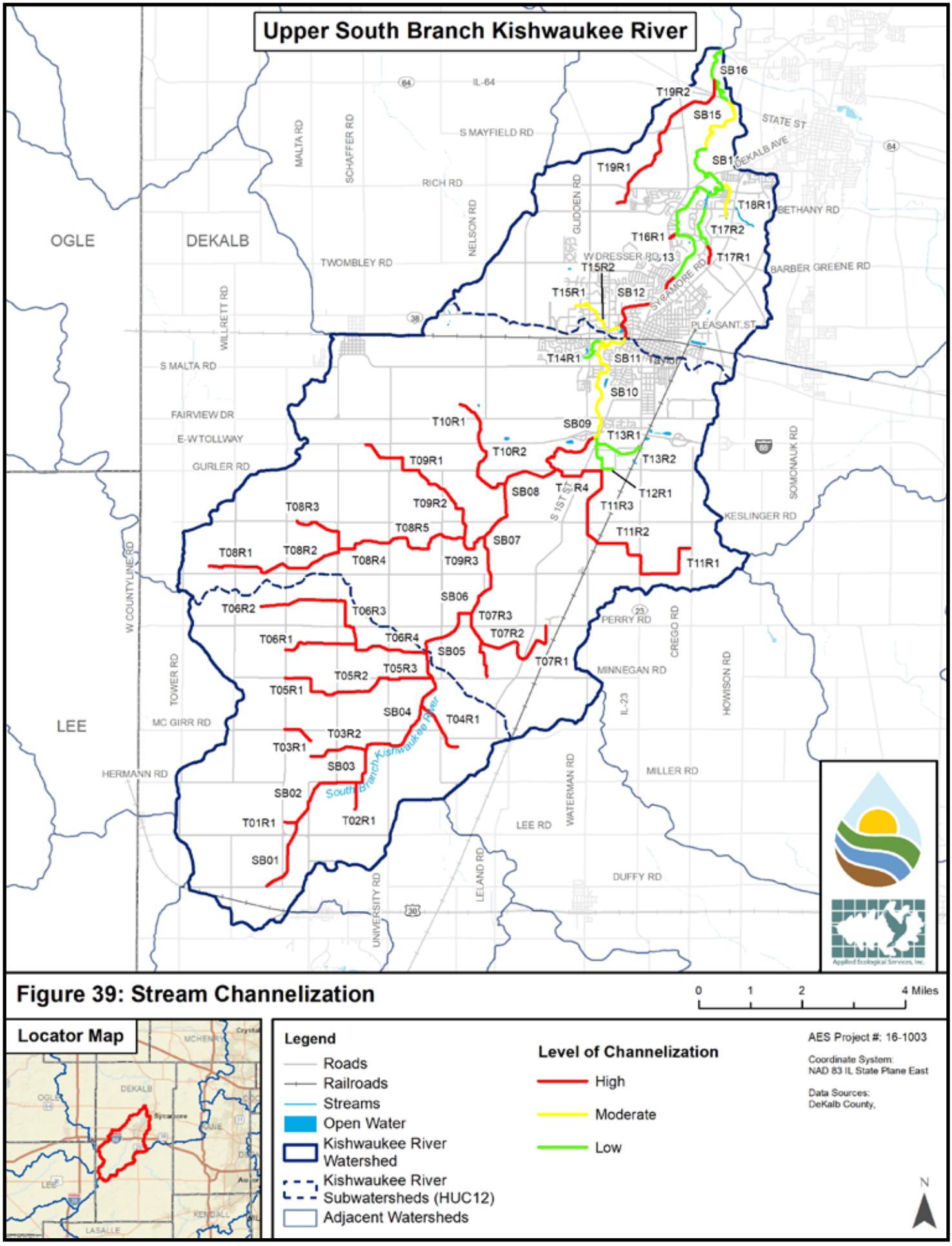


Figure 39: Stream Channelization

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 moderate on average throughout the watershed and is a reflection of 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 19 and depicted on Figure 40. Approximately 77% (284,692 lf) of the total stream and tributary length exhibits no or low bank erosion while moderate erosion is occurring along 18% (65,516 lf) of streambanks. Highly eroded streambanks are most common in the downstream portions of the watershed accounting for 5% (20,081 lf) of the total stream length. Many 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.

Highly eroded streambank along Tributary 15 Reach 1

Table 19. Summary of stream and tributary bank erosion.

Stream or Tributary Name	Abbreviation	Stream Length Assessed	None or Low Erosion		Moderate Erosion		High Erosion	
		(feet)	(feet)	(%)	(feet)	(%)	(feet)	(%)
South Branch Kishwaukee River	SB	137,878	71,027	52	56,712	41	10,139	7
Tributary 1	Trib1	1,201	1,201	100		0		100
Tributary 2	Trib2	2,778	2,778	100		0		100
Tributary 3	Trib3	9,281	9,281	100		0		100
Tributary 4	Trib4	6,090	6,090	100		0		100
Tributary 5	Trib5	17,392	17,392	100		0		100
Tributary 6	Trib6	29,683	29,683	100		0		100
Tributary 7	Trib7	18,559	18,559	100		0		100
Tributary 8	Trib8	36,768	36,768	100		0		100
Tributary 9	Trib9	20,787	20,787	100		0		100
Tributary 10	Trib10	12,561	12,561	100		0		100
Tributary 11	Trib11	28,788	24,958	87	3,830	13		0
Tributary 12	Trib12	4,929	4,929	100		0		0
Tributary 13	Trib13	4,974		0	4,974	100		0
Tributary 14	Trib14	3,222	3,222	100		0		0
Tributary 15	Trib15	5,381		0		0	5,381	100
Tributary 16	Trib16	989		0		0		0
Tributary 17	Trib17	6,528	1,967	30		0	4,561	70
Tributary 18	Trib18	3,958	3,958	100		0		0
Tributary 19	Trib19	18,542	18,542	100		0		0
Totals		**370,289**	**284,692**	**77**	**65,516**	**18**	**20,081**	**5**

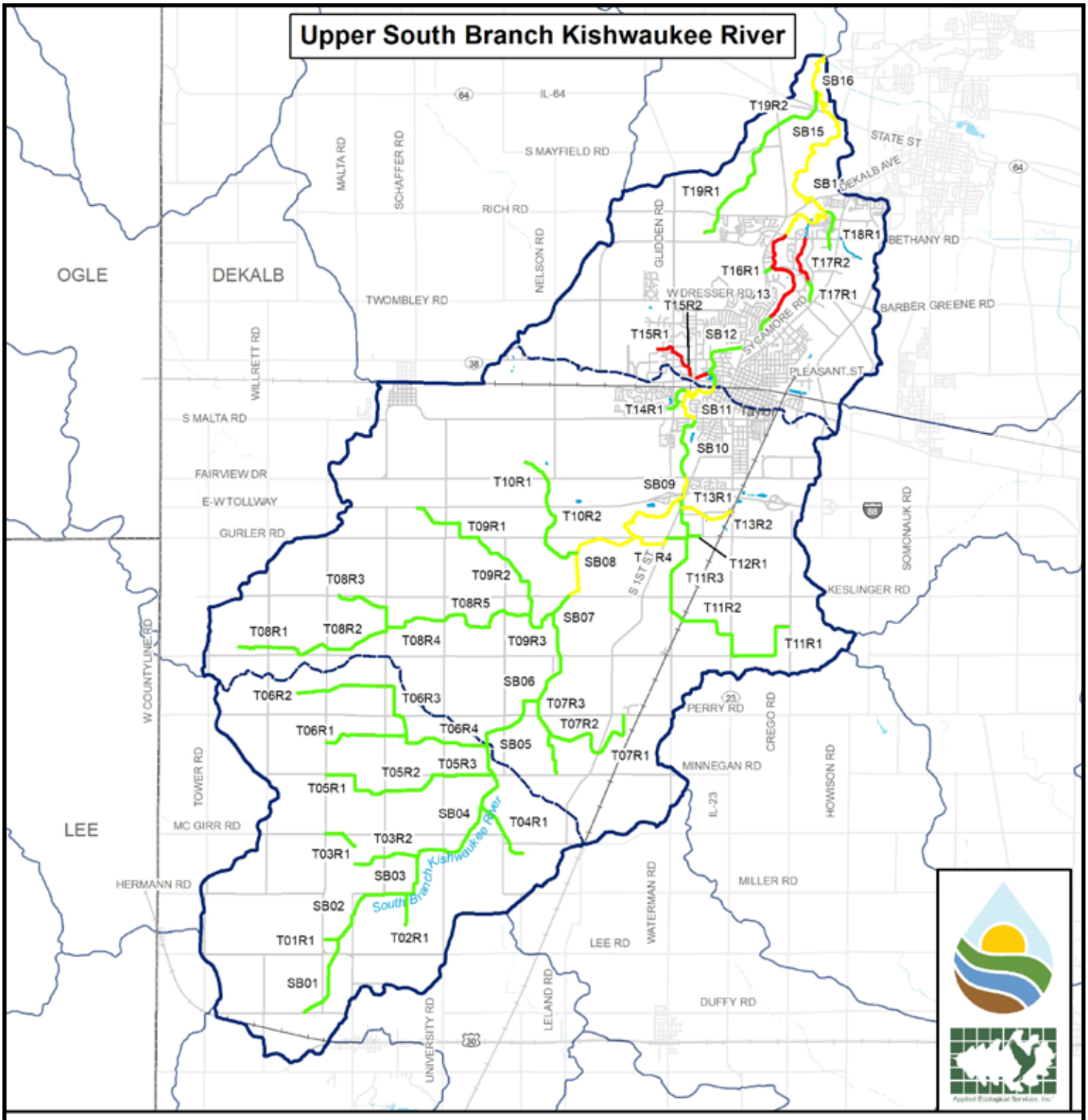


Figure 40: Streambank Erosion

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 in the past causing degraded plant communities to establish. These riparian areas are generally less than 50 feet wide and usually consist of high degraded plant communities such as old fields (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.

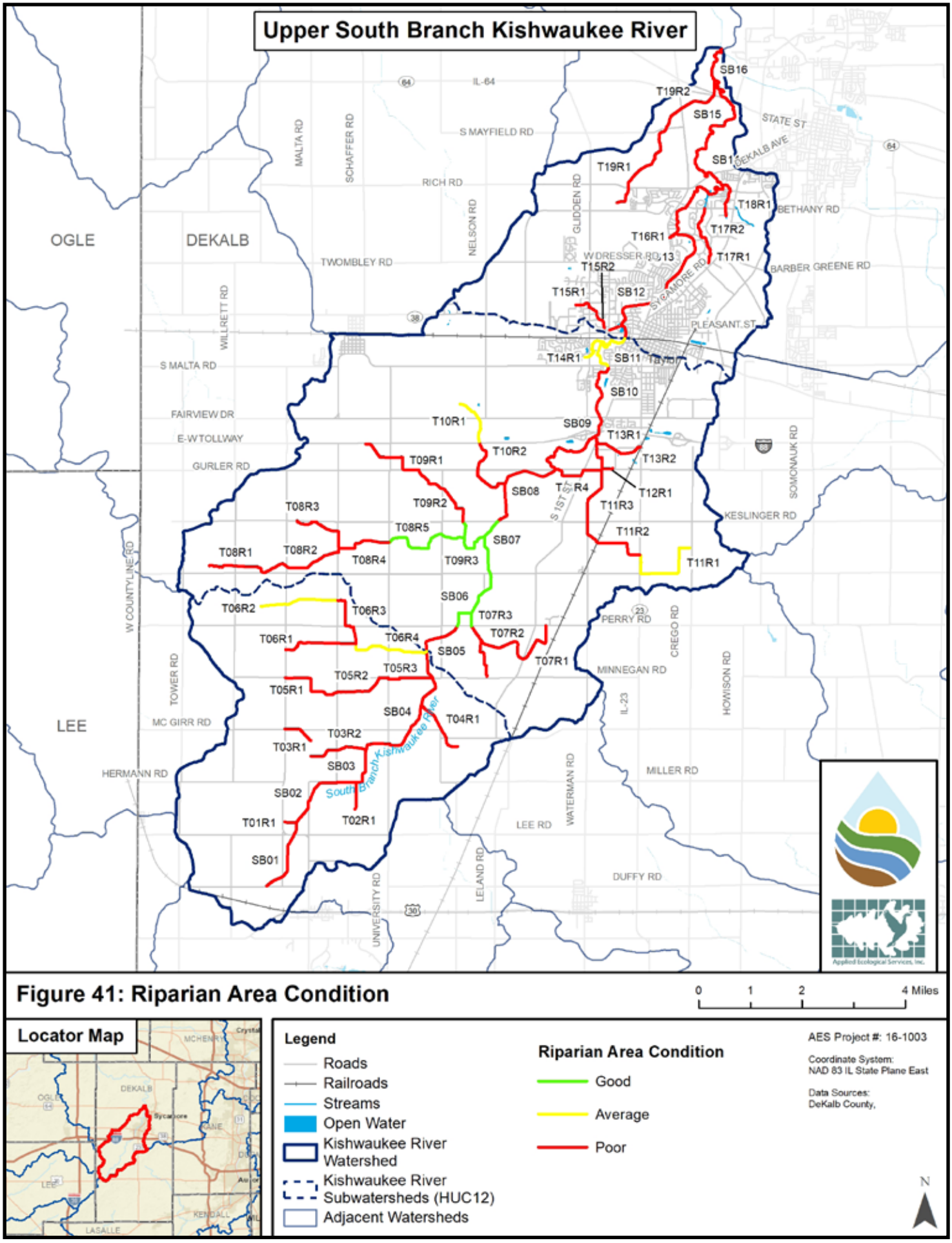
The location and condition of riparian areas in the watershed is summarized in Table 20 and Figure 41. Approximately 81% (along 299,515 linear feet of streams) of the riparian areas are "Poor" quality. Of the remaining reaches, 40,712 linear feet or 11% of riparian areas are in "Moderate" condition and 8% (30,062 linear feet) are in good condition.

Riparian areas in "Good" condition include areas through agriculture with wide, naturalized buffers. Riparian areas in "Moderate" condition are typically found along tributaries. "Poor" riparian areas are found throughout the watershed; these correlate closely with stream reaches that are highly channelized and more typical agricultural patterns where fields are planted right up to stream-edge. 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.

Degraded riparian area along Tributary 18

Table 20. Summary of stream and tributary riparian area condition.

Stream or Tributary Name	Abbreviation	Stream Length Assessed	Good Condition		Average Condition		Poor Condition	
		(feet)	(feet)	(%)	(feet)	(%)	(feet)	(%)
South Branch Kishwaukee River	SB	137,878	13,493	10	7,015	5	117,371	85
Tributary 1	Trib1	1,201		0		0	1,201	100
Tributary 2	Trib2	2,778		0		0	2,778	100
Tributary 3	Trib3	9,281		0		0	9,281	100
Tributary 4	Trib4	6,090		0		0	6,090	100
Tributary 5	Trib5	17,392		0		0	17,392	100
Tributary 6	Trib6	29,683		0	16,094	54	13,589	46
Tributary 7	Trib7	18,559	1,335	0		0	17,224	93
Tributary 8	Trib8	36,768	9,669	26		0	27,099	74
Tributary 9	Trib9	20,787	5,566	27		0	15,221	73
Tributary 10	Trib10	12,561		0	4,982	40	7,579	60
Tributary 11	Trib11	28,788		0	9,399	33	19,388	67
Tributary 12	Trib12	4,929		0		0	4929	100
Tributary 13	Trib13	4,974		0		0	4,974	100
Tributary 14	Trib14	3,222		0	3,222	100		0
Tributary 15	Trib15	5,381		0		0	5381	100
Tributary 16	Trib16	989		0		0	989	100
Tributary 17	Trib17	6,528		0		0	6,528	100
Tributary 18	Trib18	3,958		0		0	3,958	100
Tributary 19	Trib19	18,542		0		0	18,542	100
Totals		**370,289**	**30,062**	**8**	**40,712**	**11**	**299,515**	**81**


Upper South Branch Kishwaukee River
OGLE
DEKALB
LEE
SB16
SB15
SB14
SB13
SB12
SB11
SB10
SB09
SB08
SB07
SB06
SB05
SB04
SB03
SB02
SB01
T19R2
T19R1
T18R1
T17R2
T17R1
T16R1
T15R2
T15R1
T14R1
T13R1
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T12R1
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T06R3
T06R4
T05R1
T05R2
T05R3
T04R1
T03R1
T03R2
T02R1
T01R1
S MAYFIELD RD
RICH RD
TWOMBLEY RD
W DRESSER RD
S MALTA RD
FAIRVIEW DR
E-W TOLLWAY
GURLER RD
PLEASANT ST
STATE ST
DEKALB AVE
BETHANY RD
BARBER GREENE RD
KESLINGER RD
PERRY RD
MINNEGAN RD
MILLER RD
LEE RD
DUFFY RD
HERMANN RD
MC GIRR RD
South Branch Kishwaukee River
Figure 41: Riparian Area Condition
0 1 2 4 Miles
Locator Map
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Riparian Area Condition
Good
Average
Poor
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County,
N

3.14.2 Detention Basins

Over the past 30+ years, the drainage system in the northern portion of the Upper South Branch Kishwaukee River 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. Today, detention basins capture runoff from about a third of the watershed making the quality and quantity of water leaving these basins critically important to the health of the Upper South Branch of the Kishwaukee River.

Detention basins can be designed and constructed 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 that is controlled by the elevation of the 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 (which provide little to no water quality benefits) or naturalized with native species.

The Upper South Branch Kishwaukee River watershed has 79 known detention basins (Table 21, Figure 42). Applied Ecological Services, Inc. completed a basic assessment of each detention basin in spring 2019. Assessment methodology included a visit to each site and collection of data relevant to existing conditions. Each basin was assigned an AES 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

Ecologically designed basin at DeKalb High School

Typical wet bottom detention with turf slopes at Basswood Lane and Poplar Lane, DeKalb

can be found in Appendix C. The inventory resulted in 34 wet / wetland bottom with turf slopes, 25 dry-bottom with turf slopes, 18 naturalized wet/wetland bottom, and 2 naturalized dry bottom basins (Table 21). All of the detention basins in the watershed are located in and surrounding the Cities of DeKalb and Sycamore. Additionally, of the 79 basins, only 8 (10%) likely provide "Good" ecological and water quality benefits while 24 basins (30%) likely provide "Average" benefits. The remaining 47 basins (60%) 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.

Wet and wetland bottom detention basins are the most common type of basin in the watershed. Individual development sites tend to have basins that are all similarly planted. For example, most wet and wetland bottom basins in a development are planted with either turf grass along the basin slopes or are naturalized with native vegetation along the slopes and emergent edge. Basins planted with turf grass were designed with stormwater storage in mind and not necessarily the potential water quality and habitat benefits. Because of this, most homeowner and business associations will likely disapprove of installing water quality retrofits such as native plant buffers unless they can be designed to look formal and need minimal maintenance. Eighteen (18) of the 52 wet and wetland bottom detention basins in the watershed are naturalized with native vegetation. Like most dry bottom basins, the side slopes and emergent areas of wet and wetland bottom basins can be retrofitted with native vegetation relatively easily.

Recently Constructed Naturalized Dry Bottom Detention Basin at DeKalb High School

Typical dry bottom basin with concrete channel in Echo Park

Almost all (25 of 27) of the dry bottom basins in the watershed are planted with turf grass, providing little to no water quality benefits, wildlife habitat, or infiltration to replenish groundwater. 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. In addition, many of the dry bottom basins are constructed with either concrete low flow channels that run directly from the inlet to the outlet or have outlet drains flush with the bottom of the basin. In these cases, polluted stormwater runoff following smaller rain events travels directly through the basin without being stored, treated, or infiltrated. These designs should be avoided in the future. Many of the dry bottom basins in the watershed present excellent retrofit opportunities. 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.

Table 21. Summary of detention basin types, ecological condition, and acreage.

AES ID	Basin Type	Ecological Condition	Size (Acres)
10A	Wet	Poor	3.1
10B	Wet	Poor	12.3
11A	Wet	Average	6.5
12A	Wet	Average	2.5
12B	Wetland	Poor	4.0
12C	Dry	Poor	1.6
14A	Wet	Poor	0.4
14B	Wet	Average	2.1
14C	Wet	Poor	2.4
15A	Dry	Good	1.9
15C	Wet	Good	3.2
16A	Wet	Good	2.3
16B	Wet	Good	2.9
16C	Dry	Poor	0.9
17C	Wet	Good	3.0
18B	Wet	Poor	1.2
18F	Dry	Poor	1.4
18H	Dry	Poor	1.2
18I	Dry	Poor	1.8
21A	Wet	Average	20.1
21B	Wet	Average	1.9
21E	Wet	Poor	2.3
21F	Dry	Poor	1.6
21G	Wet	Poor	10.5
21H	Dry	Poor	0.8
21I	Dry	Poor	0.3
21J	Wet	Average	5.2
24A	Wet	Poor	1.1
24B	Wet	Poor	1.0
24C	Wet	Poor	2.3
24E	Wet	Poor	3.1
24D	Wet	Poor	1.0
24F	Wet	Poor	2.9
24G	Wet	Poor	0.2
24H	Wet	Poor	0.4
24I	Wet	Poor	1.5
24J	Wet	Average	1.7
25A	Dry	Poor	2.4

30A	Dry	Poor	1.8
30B	Wet	Average	1.5
30C	Wet	Poor	2.8
31A	Dry	Poor	0.5
31B	Wet	Average	3.9
31D	Wet	Poor	8.1
33A	Wet	Average	1.4
33C	Wet	Poor	16.6
33D	Dry	Poor	1.1
34B	Dry	Poor	6.6
41B	Wet	Average	5.6
41A	Wetland	Average	1.2
41C	Wet	Poor	7.9
41D	Wet	Good	2.0
41E	Dry	Average	2.3
42A	Wet	Average	11.0
42B	Wet	Average	15.8
42C	Dry	Poor	1.9
42D	Dry	Poor	0.9
42E	Dry	Poor	1.2
42F	Dry	Poor	0.8
43A	Wetland	Good	9.6
43B	Dry	Average	6.2
51A	Dry	Poor	0.5
51B	Dry	Poor	0.6
51C	Dry	Poor	2.3
51D	Wet	Average	10.0
51E	Dry	Poor	0.5
51F	Wetland	Average	1.7
51G	Wetland	Average	0.7
51H	Wetland	Average	3.2
51I	Dry	Poor	2.9
51K	Dry	Poor	0.7
52A	Wet	Average	21.6
52B	Wetland	Average	0.6
53A	Wetland	Good	5.8
62A	Dry	Poor	0.3
62B	Dry	Poor	0.6
62C	Dry	Poor	2.5
62D	Wet	Poor	5.2
62E	Wet	Poor	2.7

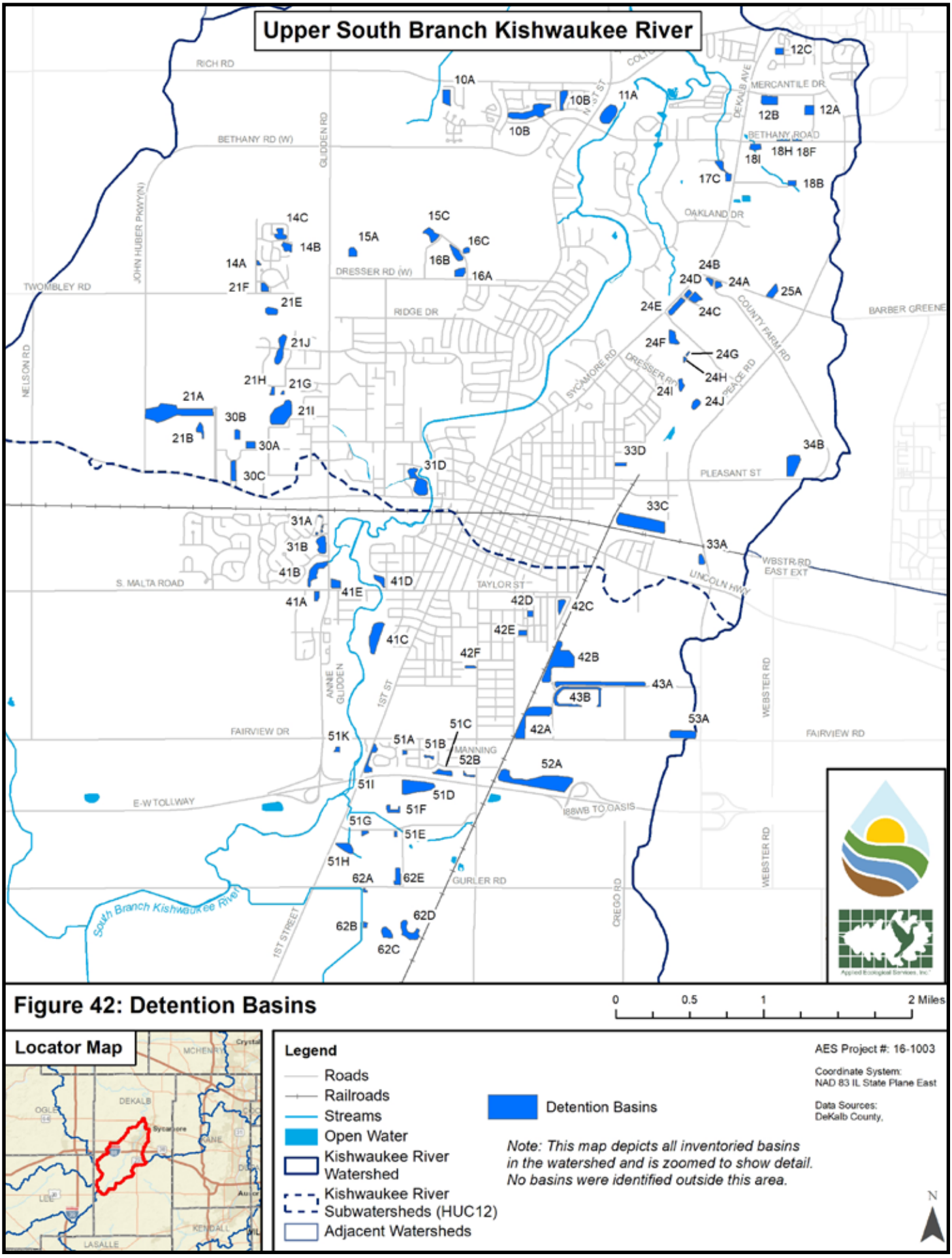


Figure 42: Detention Basins

0 0.5 1 2 Miles

Locator Map

Legend

- Roads
- Railroads
- Streams
- Open Water
- Kishwaukee River Watershed
- Kishwaukee River Subwatersheds (HUC12)
- Adjacent Watersheds
- Detention Basins

Note: This map depicts all inventoried basins in the watershed and is zoomed to show detail. No basins were identified outside this area.

AES Project #: 16-1003

Coordinate System: NAD 83 IL State Plane East

Data Sources: DeKalb County,

N

3.14.3 Wetlands & Potential Wetland Restoration Sites

A diverse network of wetlands and wet prairie remained intact in Upper South Branch Kishwaukee River 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 25,734 acres of wetlands (40% of the watershed, based on hydric soils) in the watershed prior to European settlement based on the most up to date hydric soils mapping provided by the USDA Natural Resources Conservation Service (NRCS). According to existing wetland inventories, about 1,570 acres or 6% of the pre-European settlement wetlands remain (Figure 43).

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 also provide groundwater recharge, filter sediments and nutrients, and slowly discharge to streams thereby maintaining water levels in streams during drought periods. General wetland information and mapping is available for the Upper South Branch Kishwaukee River watershed via the United States Fish and Wildlife Service's (USFWS) National Wetland Inventory (NWI). Applied Ecological Services, Inc. updated the NWI wetland boundaries and noted the location of wetlands not included in the NWI during a field inventory of the watershed conducted in spring 2019. The wetland data collected during the field inventory was used to map and describe the existing wetlands in the watershed and to help locate potential wetland restoration sites.

Farmed wetland north of Fairview Drive

Most of the wetlands are farmed wetlands drained by tiles that are scattered about the agricultural areas of the watershed. The remainder lie along Upper South Branch Kishwaukee River and tributaries and were drained or degraded by farming practices at some point in the last 150 years. Invasive species such as purple loosestrife (*Lythrum salicaria*), common and glossy buckthorn (*Rhamnus sp.*), reed canary grass (*Phalaris arundinacea*), and common reed (*Phragmites australis*) now dominate.

DeKalb County does not identify high-quality or ADID wetlands within their jurisdiction and no high-quality wetlands were found during the field inventory.

Noteworthy - Wetland Protection

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 unmitigatable. 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.

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.

Riser structure draining a farmed wetland

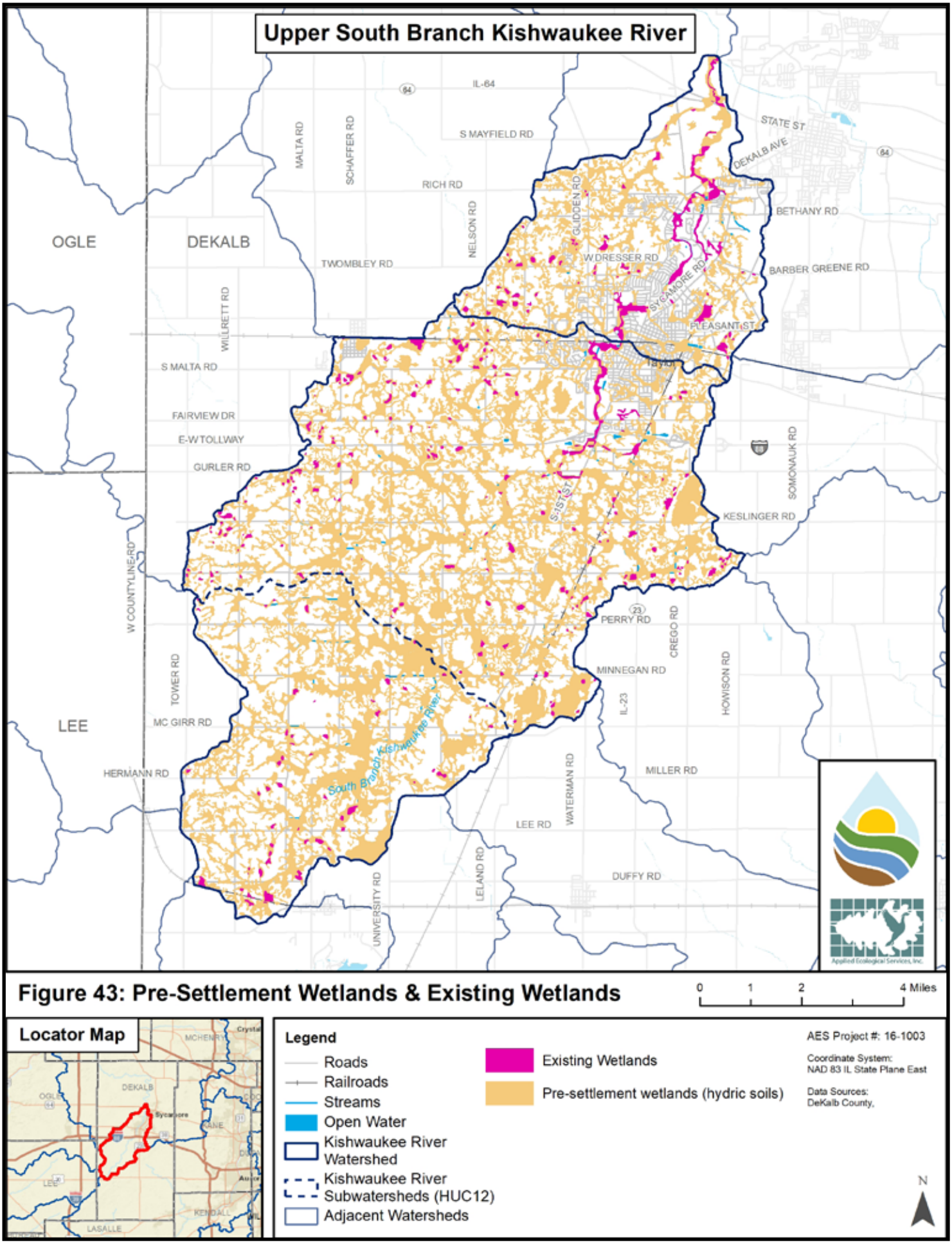


Figure 43: Pre-Settlement Wetlands & Existing Wetlands

0 1 2 4 Miles

Locator Map

Legend

- Roads
- Railroads
- Streams
- Open Water
- Kishwaukee River Watershed
- Kishwaukee River Subwatersheds (HUC12)
- Adjacent Watersheds
- Existing Wetlands
- Pre-settlement wetlands (hydric soils)

AES Project #: 16-1003

Coordinate System: NAD 83 IL State Plane East

Data Sources: DeKalb County,

N

Potential Wetland Restoration Sites

Wetland restoration projects are among the most beneficial in the context of improving watershed health. Wetlands are vitally important because they improve basic environmental functions such as storing floodwaters, increasing biodiversity, creating green infrastructure, and improving water quality. The wetland restoration process involves returning hydrology (water) and vegetation to soils that once supported wetlands but no longer do because of human impacts such as tile and ditch draining and/or filling. Potential wetland restoration sites were identified during the spring 2019 inventory by identifying hydrologic indicators such as sparse vegetation, geomorphic position, standing water and drift deposits.

The inventory resulted in 68 potential wetland restoration sites, ranging in size from 5.3 to 90.9 acres in size and totaling 1,345.8 acres (Table 22, Figure 44). A detailed summary of wetland restoration recommendations is included and prioritized in the Action Plan section of this report.

Municipalities should strongly consider "Conservation Design" that incorporates wetland restoration on parcels slated for future development and parks. Another potential option is to restore wetlands as part of a wetland mitigation bank. In this case, wetlands are restored on private or public land and must meet certain performance criteria before they become "fully certified." Following certification, developers are able to buy wetland mitigation credits from the wetland bank for wetland impacts occurring elsewhere in the watershed. A fully certified acre of restored wetland can sell between $40,000 and $100,000 thousand dollars. Although this may seem like an enormous expense to a developer, it is often cheaper than going through a long permitting process and providing mitigation for impacted wetlands on the development site. It is also possible that in the future Illinois EPA may require more strict nutrient policies for wastewater treatment plants. Wetland banks may increase the opportunity for WWTP owners, with older technology, to meet the new standards through the purchase of "water quality trading credits."

Note: A feasibility study will need to be completed prior to the planning and restoration of any potential wetland restoration.

Potential wetland restoration opportunity at Site 20A

Table 22. Site ID, size, and existing condition of potential wetland restorations.

AES ID	Size (Acres)	Site description
9A	9.5	Drained wetland in ag, likely tiled
14D	15.6	Drained wetland in ag, likely tiled
15B	25.8	Drained wetland in ag, likely tiled
20A	91.0	Drained wetland in ag, likely tiled
21C	15.8	Drained wetland in ag, likely tiled
21D	15.4	Drained wetland in ag, likely tiled
29A	17.1	Drained wetland in ag, likely tiled
29B	21.7	Drained wetland in ag, likely tiled
34A	12.9	Drained wetland in ag, likely tiled
36A	79.4	Drained wetland in ag, likely tiled
39A	10.2	Drained wetland in ag, likely tiled
38B	23.3	Drained wetland in ag, likely tiled
43C	7.0	Drained wetland in ag, likely tiled
45A	19.8	Drained wetland in ag, likely tiled
45B	24.5	Drained wetland in ag, likely tiled
45C	17.6	Drained wetland in ag, likely tiled
47A	7.9	Drained wetland in ag, likely tiled
48A	11.1	Drained wetland in ag, likely tiled
56A	40.7	Drained wetland in ag, likely tiled
57A	13.7	Drained wetland in ag, likely tiled
57B	21.2	Drained wetland in ag, likely tiled
60A	14.7	Drained wetland in ag, likely tiled
61A	22.7	Drained wetland in ag, likely tiled
66A	23.2	Drained wetland in ag, likely tiled
69A	14.5	Drained wetland in ag, likely tiled
68A	13.0	Drained wetland in ag, likely tiled
71A	35.1	Drained wetland in ag, likely tiled
73A	9.6	Drained wetland in ag, likely tiled
73B	46.4	Drained wetland in ag, likely tiled
73C	27.0	Drained wetland in ag, likely tiled
75A	17.9	Drained wetland in ag, likely tiled
77A	16.0	Drained wetland in ag, likely tiled
77B	8.7	Drained wetland in ag, likely tiled
78C	28.4	Drained wetland in ag, likely tiled
78D	15.5	Drained wetland in ag, likely tiled
80A	31.8	Drained wetland in ag, likely tiled
81A	10.7	Drained wetland in ag, likely tiled

AES ID	Size (Acres)	Site description
81C	15.3	Drained wetland in ag, likely tiled
82A	14.4	Drained wetland in ag, likely tiled
82B	17.0	Drained wetland in ag, likely tiled
85A	26.4	Drained wetland in ag, likely tiled
85B	18.8	Drained wetland in ag, likely tiled
85C	9.8	Drained wetland in ag, likely tiled
91A	13.8	Drained wetland in ag, likely tiled
91B	10.9	Drained wetland in ag, likely tiled
94A	28.0	Drained wetland in ag, likely tiled
96A	5.3	Drained wetland in ag, likely tiled
96C	10.5	Drained wetland in ag, likely tiled
99A	30.8	Drained wetland in ag, likely tiled
102A	12.2	Drained wetland in ag, likely tiled
108A	8.8	Drained wetland in ag, likely tiled
109A	12.9	Drained wetland in ag, likely tiled
109B	12.7	Drained wetland in ag, likely tiled
109C	32.7	Drained wetland in ag, likely tiled
110A	20.5	Drained wetland in ag, likely tiled
111A	25.1	Drained wetland in ag, likely tiled
116A	17.2	Drained wetland in ag, likely tiled
117B	10.4	Drained wetland in ag, likely tiled
122A	9.5	Drained wetland in ag, likely tiled
123A	8.0	Drained wetland in ag, likely tiled
123B	22.1	Drained wetland in ag, likely tiled
124A	36.4	Drained wetland in ag, likely tiled
126A	24.0	Drained wetland in ag, likely tiled
127A	9.4	Drained wetland in ag, likely tiled
127B	7.2	Drained wetland in ag, likely tiled
127C	6.5	Drained wetland in ag, likely tiled
127D	7.5	Drained wetland in ag, likely tiled
127E	25.3	Drained wetland in ag, likely tiled

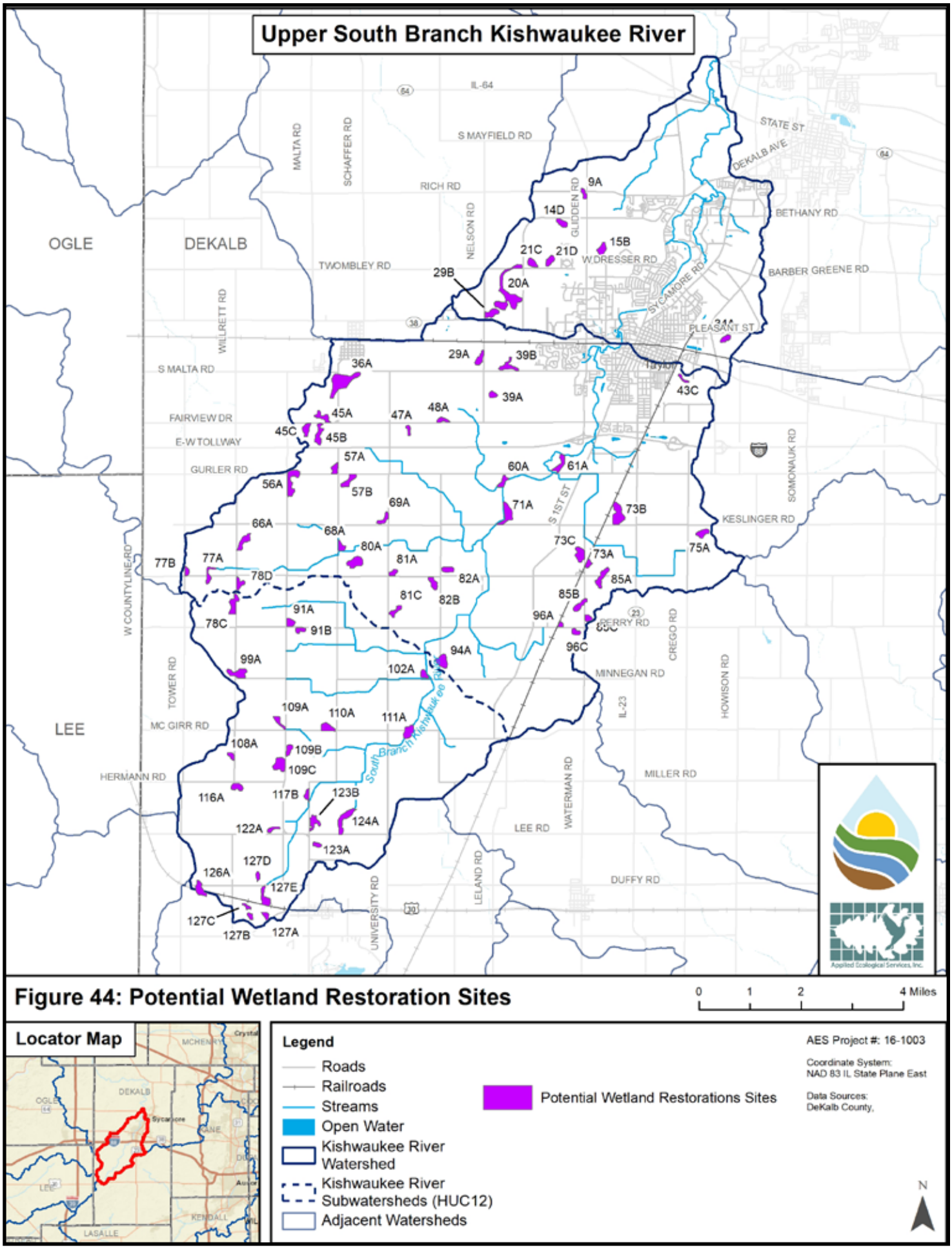


Figure 44: Potential Wetland Restoration Sites

0 1 2 4 Miles

Locator Map

Legend

- Roads
- Railroads
- Streams
- Open Water
- Kishwaukee River Watershed
- Kishwaukee River Subwatersheds (HUC12)
- Adjacent Watersheds
- Potential Wetland Restorations Sites

AES Project #: 16-1003

Coordinate System: NAD 83 IL State Plane East

Data Sources: DeKalb County,

N

3.14.4 Floodplain & Flood Problem Areas

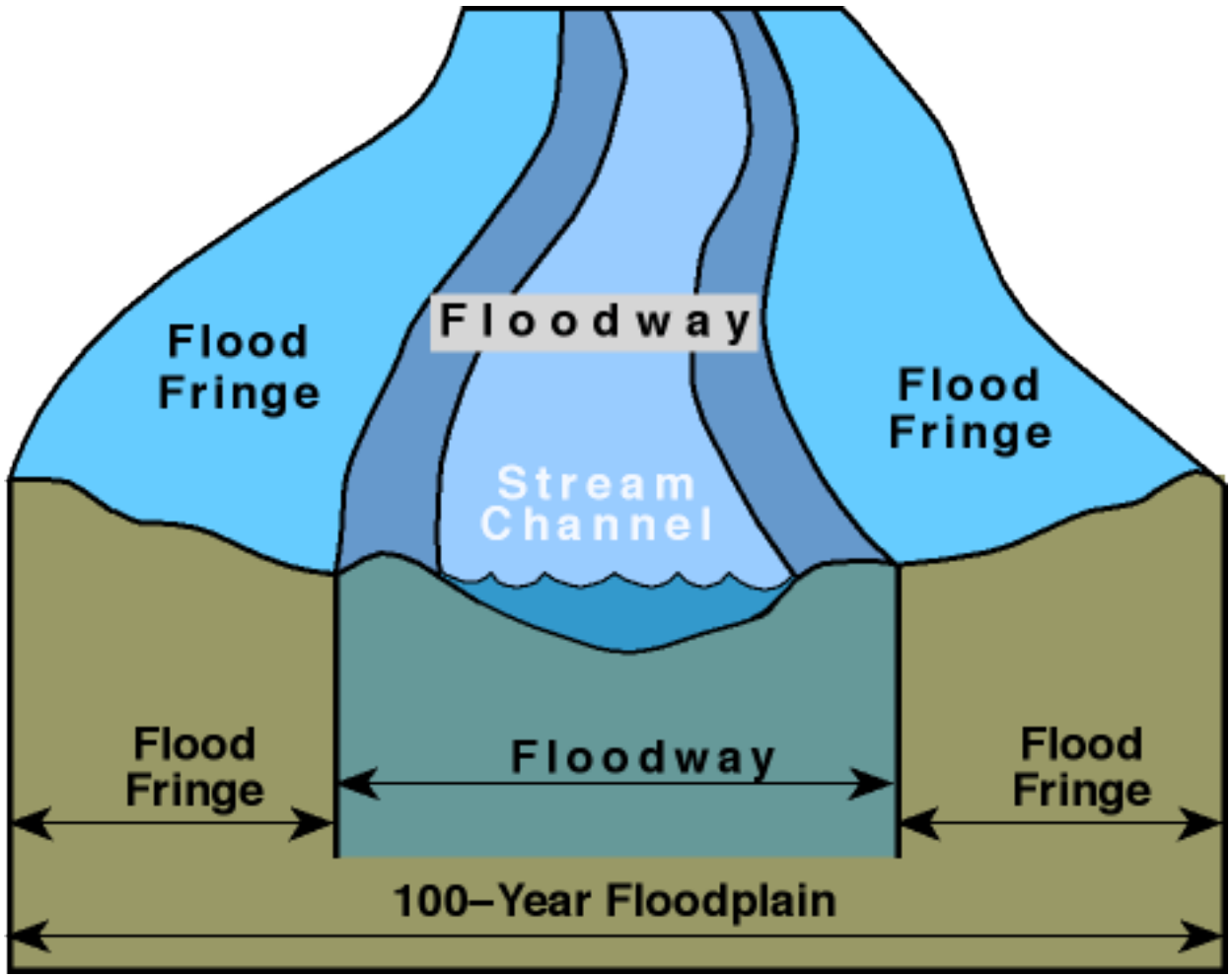
FEMA 100-Year Floodplain

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. Figure 45 depicts the 100-year floodplain and floodway in relation to a hypothetical stream channel.

As expected, the mapped floodplain in the watershed closely follows the South Branch Kishwaukee River and some of its tributaries. Figure 46 depicts the 100-year floodplain which occupies 1,828.7 acres or about 3% of the watershed. The most extensive floodplain areas are associated with the lower half of the main branch of the South Branch Kishwaukee River to the outlet in much of the most urbanized areas of DeKalb and Sycamore.

Figure 45. 100-year floodplain and floodway depiction.



Documented Flood Problem Areas
For this report, a Flood Problem Area (FPA) is defined as a location where documented overbanking is occurring. Information about the location and condition of documented FPAs was obtained directly from stakeholder feedback during the February 5th Goals Workshop meeting.

Eight documented FPAs were identified in Upper South Branch Kishwaukee River watershed (Figure 46). Information about each FPA is included in Table 23.

All eight FPAs documented in the watershed are locations where overbanking is occurring and potential mitigation measures for all eight are to reconnect the stream to the floodplain where possible to accommodate floodwaters.

Table 23. Documented Flood Problem Areas.

Flood Problem Area #	Type of Flooding	Location/Description	Potential Mitigation Measures
1	Overbank Flooding	Agricultural land south of Perry Rd and west of Anderland Rd	Reconnect the stream to the floodplain
2	Overbank Flooding	Agricultural land south of Perry Rd and west of Anderland Rd	Reconnect the stream to the floodplain
3	Overbank Flooding	Agricultural land south of Perry Rd and west of Anderland Rd	Reconnect the stream to the floodplain
4	Overbank Flooding	Agricultural land and ditch south of Keslinger Rd and east of Anderland Rd	Reconnect the stream to the floodplain
5	Overbank Flooding	Southern portion of River Heights golf course west of S 1st Streee and north of Fairview Dr	Reconnect the stream to the floodplain
6	Overbank Flooding	West of the end of Gayle Ave and south of W Taylor St, just outside Lions Park	Reconnect the stream to the floodplain
7	Overbank Flooding	North of Yorkshire Dr and west of the intersection of Clifford Dr and Glidden Ave in Prairie Park	Reconnect the stream to the floodplain
8	Overbank Flooding	West of Greenwood Acres Dr and north of Sylvan Ln in Kishwaukee Country Club	Reconnect the stream to the floodplain

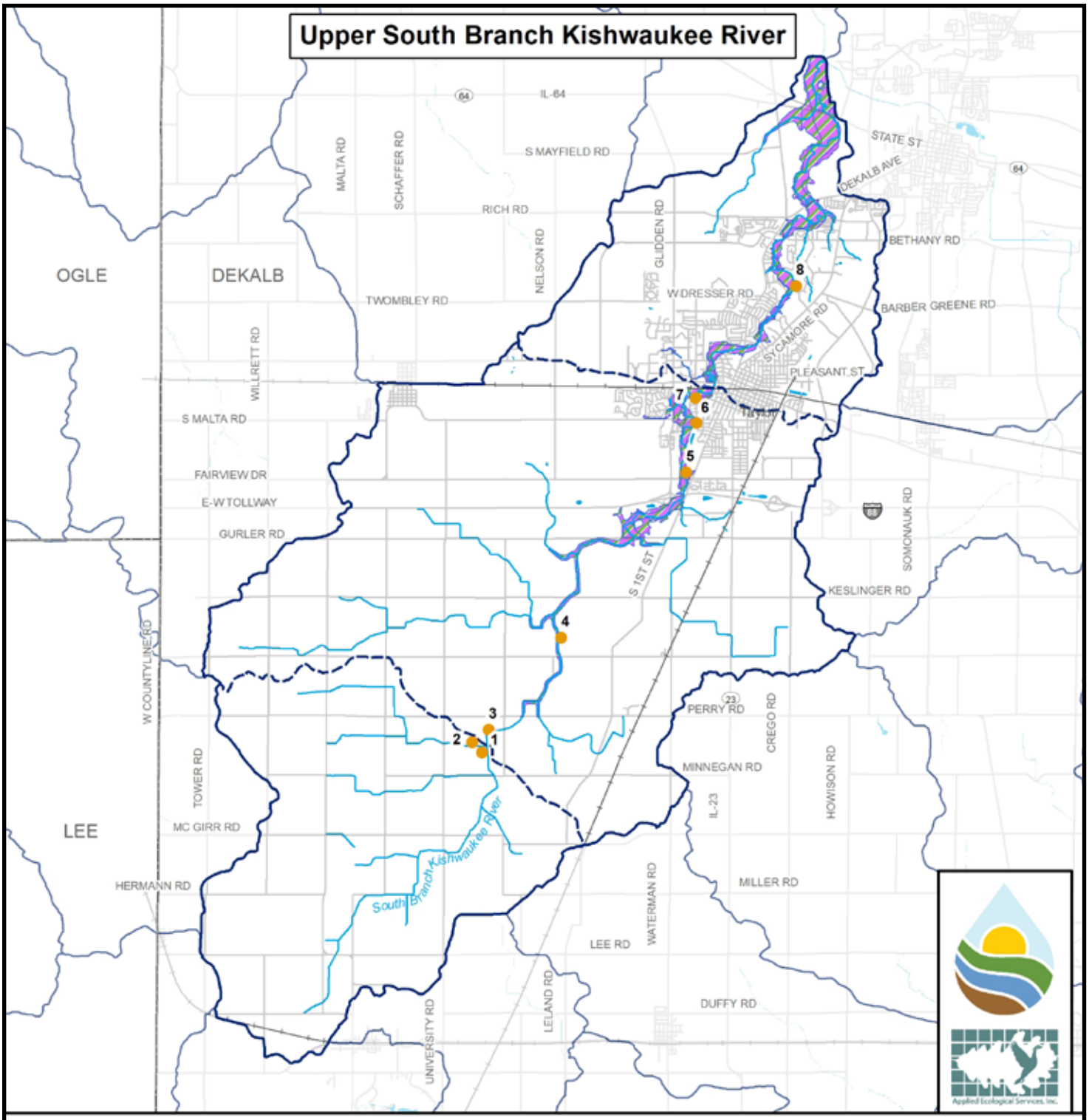


Figure 46: FEMA 100-Year Floodplain & Flood Problem Areas

0 1 2 4 Miles

Legend

- Roads
- Railroads
- Streams
- Open Water
- Kishwaukee River Watershed
- Kishwaukee River Subwatersheds (HUC12)
- Adjacent Watersheds
- FEMA 100-year Floodplain
- Flood Problem Areas

AES Project #: 16-1003

Coordinate System: NAD 83 IL State Plane East

Data Sources: DeKalb County,

N

3.15 Agricultural Land

Agricultural land uses dominate much of the watershed outside of the City of Dubuque and include row crops, hay, pasture, and livestock uses. While Iowa 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 (EPA's) 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 poorly located or managed animal feeding operations; overgrazing; plowing too often or at the wrong time; and improper, excessive or poorly timed application of pesticides, irrigation water and fertilizer. (EPA, 2013)" According to the pollutant modeling conducted by AES, agricultural land uses are the leading source of both nutrients and sediment in the watershed.

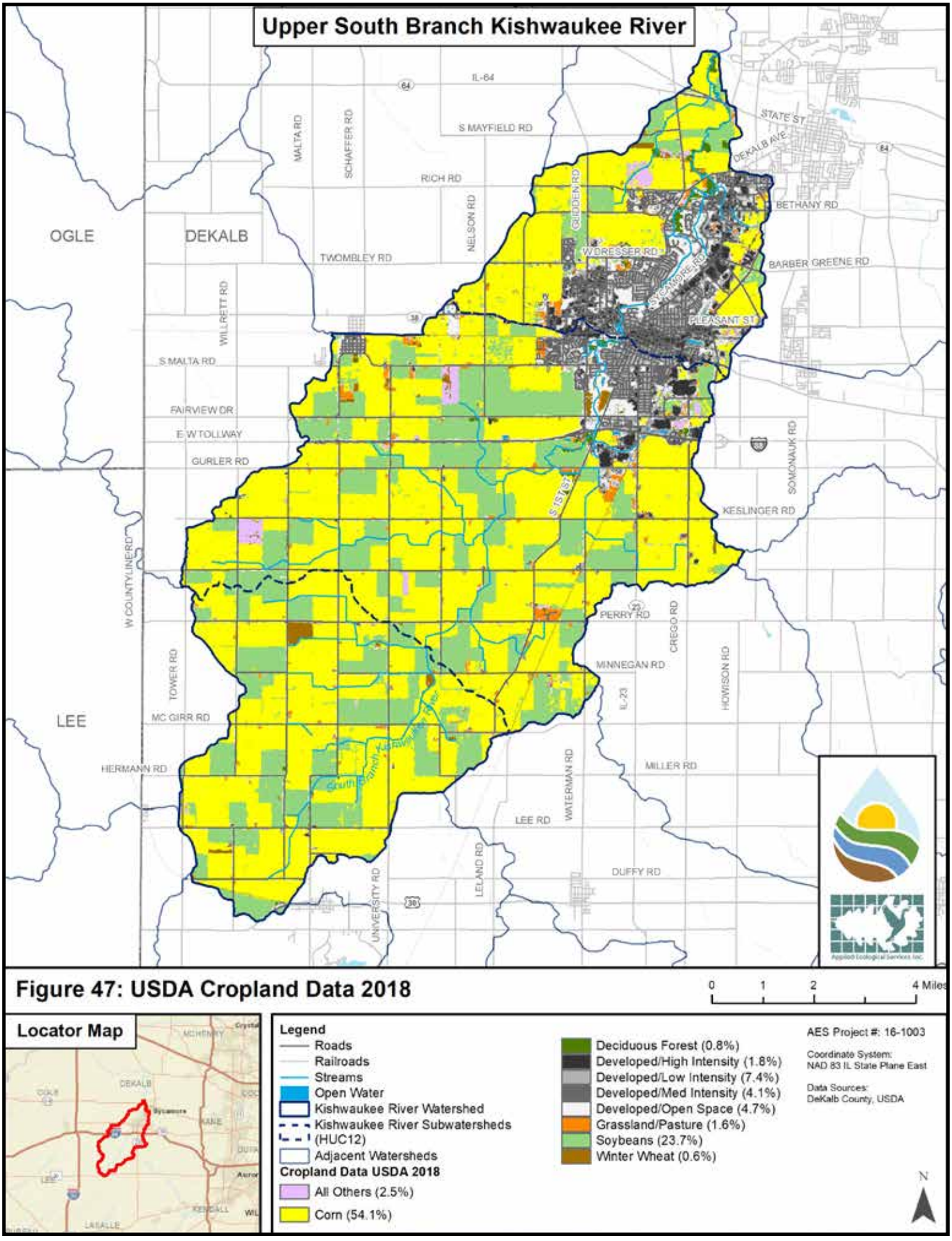
Environmental Working Group published a paper entitled "Murky Waters: Farm Pollution Stalls Cleanup of Iowa Streams," in 2012. The paper clearly identifies nutrient loading from agriculture and the lack of regulation of agricultural runoff as the largest impediment to cleaning up Iowa's streams. Currently, programs aimed at reducing agricultural nutrient loading are entirely voluntary and educational in nature and are generally underfunded. Regardless, curbing "particularly risky practices such as planting crops right up to stream banks or allowing livestock unmanaged access to streams" are detrimental to watershed health and need to be remedied. The paper also recommends reducing soil loss, better management of fertilizer and manure applications, and increased nutrient uptake through the use of constructed wetlands, filter strips, and riparian areas (Cox, 2012).

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 (USDA's) 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 2009 Iowa Cropland Data Layer was used as a snapshot of cropland for the watershed (Table 18; Figure 43). In 2009, pasture/hay was the single largest agricultural cover type at 14,211.3 acres, or 64.3% of the watershed. Corn (3,591.0 acres; 16.3%) and soybeans (1,872.2 acres; 8.5%), both representing row crops, were the second and third largest shares of agricultural cover types in the watershed with pasture/grass (1,223.6 acres; 5.5%) and alfalfa (749.4 acres; 3.4%) rounding out the predominant types.

There are no combined animal feeding operations (CAFOs) in the watershed, almost no livestock of any kind, and no issues were identified involving livestock during the field inventory.

Table 24. USDA 2018 Cropland Data for cropland cover types.

Cropland Type	Acres	Percent of Cropland
Corn	34,023.8	66.9%
Soybeans	14,922.2	29.3%
Grassland/Pasture	1,008.4	2.0%
Winter Wheat	383.2	0.8%
Oats	203.0	0.4%
Alfalfa	181.5	0.4%
Other Hay/Non-Alfalfa	133.1	0.3%
All other cropland combined	30.5	0.1%
Total Cropland	**50,885.7**	**100.0%**


Upper South Branch Kishwaukee River
OGLE
DEKALB
LEE
IL-64
S MAYFIELD RD
RICH RD
TWOMBLEY RD
W DRESSER RD
BETHANY RD
BARBER GREENE RD
PLEASANT ST
STATE ST
DEKALB AVE
S MALTA RD
FAIRVIEW DR
E W TOLLWAY
GURLER RD
KESLINGER RD
PERRY RD
MINNEGAN RD
MC GIRR RD
HERMANN RD
MILLER RD
LEE RD
DUFFY RD
MALTA RD
SCHAFFER RD
NELSON RD
GIDDEN RD
SYCAMORE RD
WILLETT RD
W COUNTYLINE RD
TOWER RD
S 1ST ST
SOMONAUK RD
CREGO RD
HOWISON RD
IL-23
WATERMAN RD
LELAND RD
UNIVERSITY RD
South Branch Kishwaukee River
Figure 47: USDA Cropland Data 2018
0 1 2 4 Miles
Locator Map
Legend
Roads
Railroads
Streams
Open Water
Kishwaukee River Watershed
Kishwaukee River Subwatersheds (HUC12)
Adjacent Watersheds
Cropland Data USDA 2018
All Others (2.5%)
Corn (54.1%)
Deciduous Forest (0.8%)
Developed/High Intensity (1.8%)
Developed/Low Intensity (7.4%)
Developed/Med Intensity (4.1%)
Developed/Open Space (4.7%)
Grassland/Pasture (1.6%)
Soybeans (23.7%)
Winter Wheat (0.6%)
AES Project #: 16-1003
Coordinate System: NAD 83 IL State Plane East
Data Sources: DeKalb County, USDA
N

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).

Since 2019 was such an unusual year for the agricultural community, data gathered by the DeKalb County Soil and Water Conservation District (DCSWCD) in 2018 was used to help identify baseline agricultural conditions and practices in the watershed. Agricultural areas in DeKalb County were inventoried for tillage practices during the 2018 Illinois Soil Conservation Transect Survey conducted by DCSWCD (Figure 48). The survey covered 87 transects in the agricultural areas within the watershed. In 2018, corn was the single largest agricultural cover type at 66 transects or 75.9% of the watershed. Soybeans was the second largest crop with 20 transects (22.9%). No other crop was grown in the transects surveyed.

Example of no-till farming

Prairie Conservation Reserve Program (CRP)

Pollinator habitat in practice in watershed

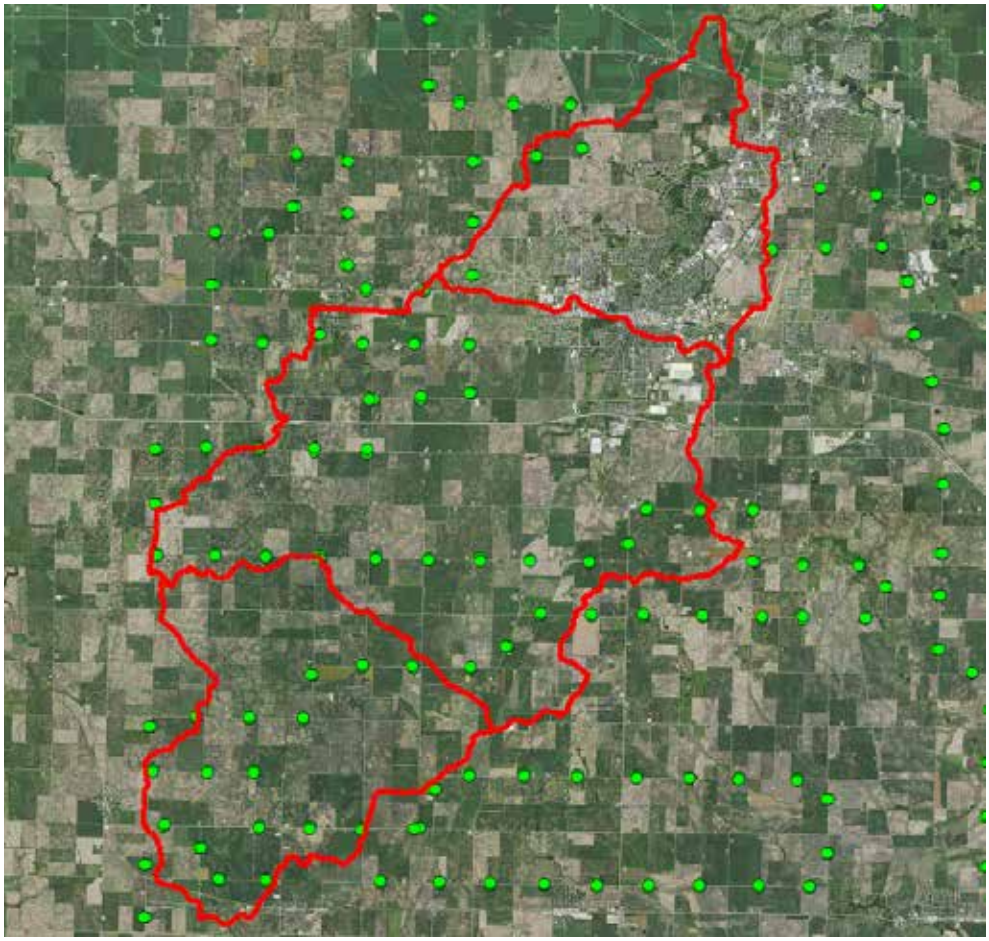
Only one transect (1.1%) contained Conservation Reserve Program (CRP) cover. Tilling practices were divided into 4 categories: conventional till, reduced till, mulch till, and no till. Within the Upper South Branch Kishwaukee River watershed, 87 fields were surveyed. The most common tillage practice found in the watershed was reduced till with 34 of fields (39.1% of fields). Mulch till was practiced on 27 fields (31.0%), while conventional tillage was found on 20 of fields (23.0%). No-till was found at 5 sites, or 5.7% of the surveyed sites.

In summer 2019, Applied Ecological Services, Inc. (AES) completed a windshield survey of the watershed, including agricultural land within the Upper South Branch Kishwaukee River watershed. Typically, this would include map notations of existing conservation practices (such as vegetated swales, contour cropping, no-till farming, etc.) as well as general agricultural land cover types (such as row crop, hay, or pasture). Areas where additional conservation practices could be implemented were also noted. Once back in the office, the map notations were then aligned with available parcel data through GIS. Unfortunately, 2019 was an unusually wet season, so much so that almost no crops went in on time, some fields were left fallow for the season, and many others followed exceptional planting practices in trying to accommodate the weather. Therefore, AES could not complete the agricultural field inventory to the extent it normally would. Results of the agricultural land inventory can be found in Appendix C.

Many agricultural parcels within the watershed are already utilizing appropriate conservation practices such as reduced tillage practices and vegetated swales, in order to reduce nutrient and sediment loading to streams. Most farmers understand the inherent value in reducing soil and nutrient losses on their farms and consider it good business practice to do so. During the AES field inventory, a number of sites were identified that could benefit from additional in-field vegetated swales or similar targeted agricultural best management practices (Figure 49). Fifteen (15) sites were identified as needing vegetated swales or grass waterways in 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 50). 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 Upper South Branch Kishwaukee River watershed is very likely to likely tile drained.

Figure 48. Transects, locations, and watershed boundaries for the 2018 IL Conservation Transect Survey.



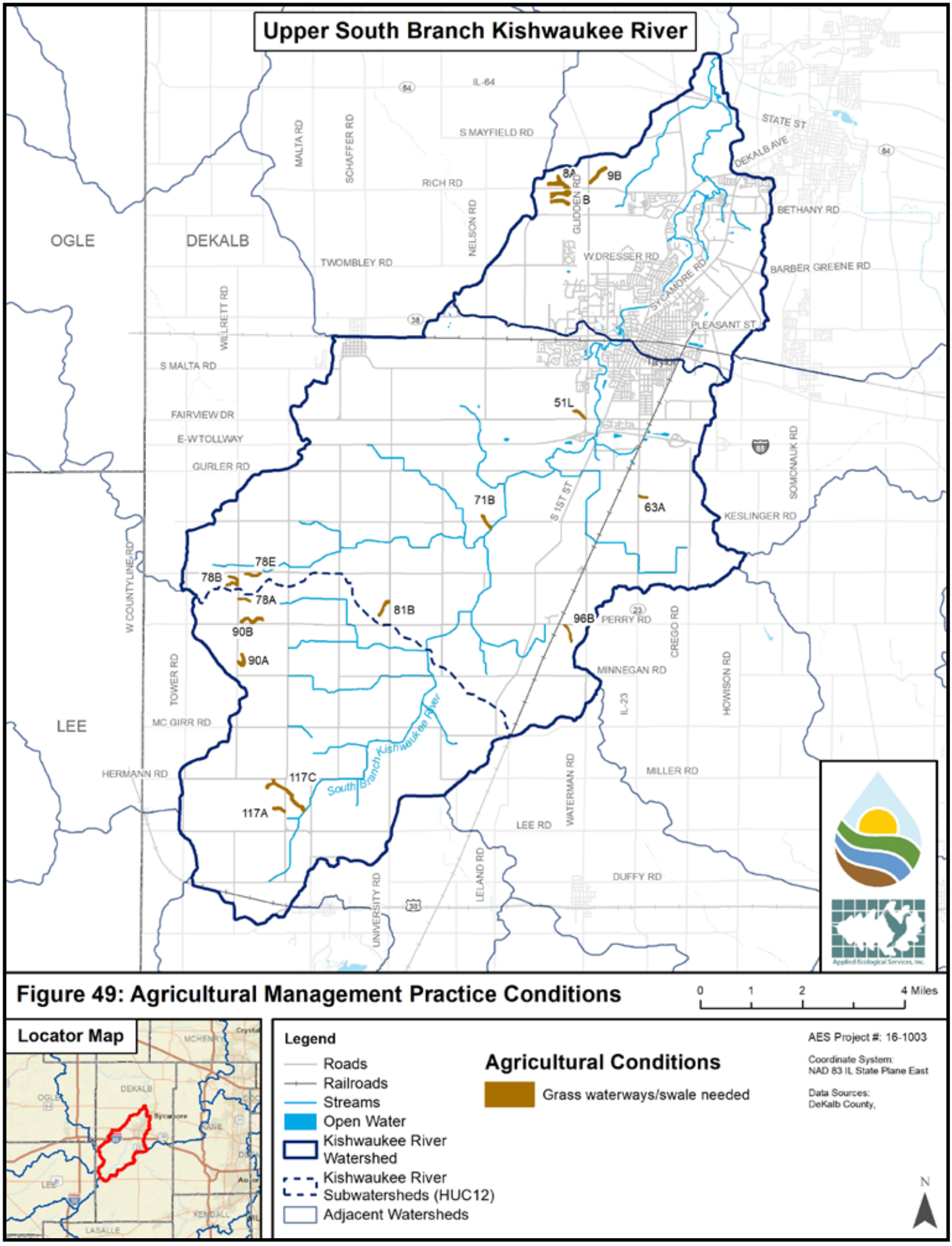


Figure 49: Agricultural Management Practice Conditions

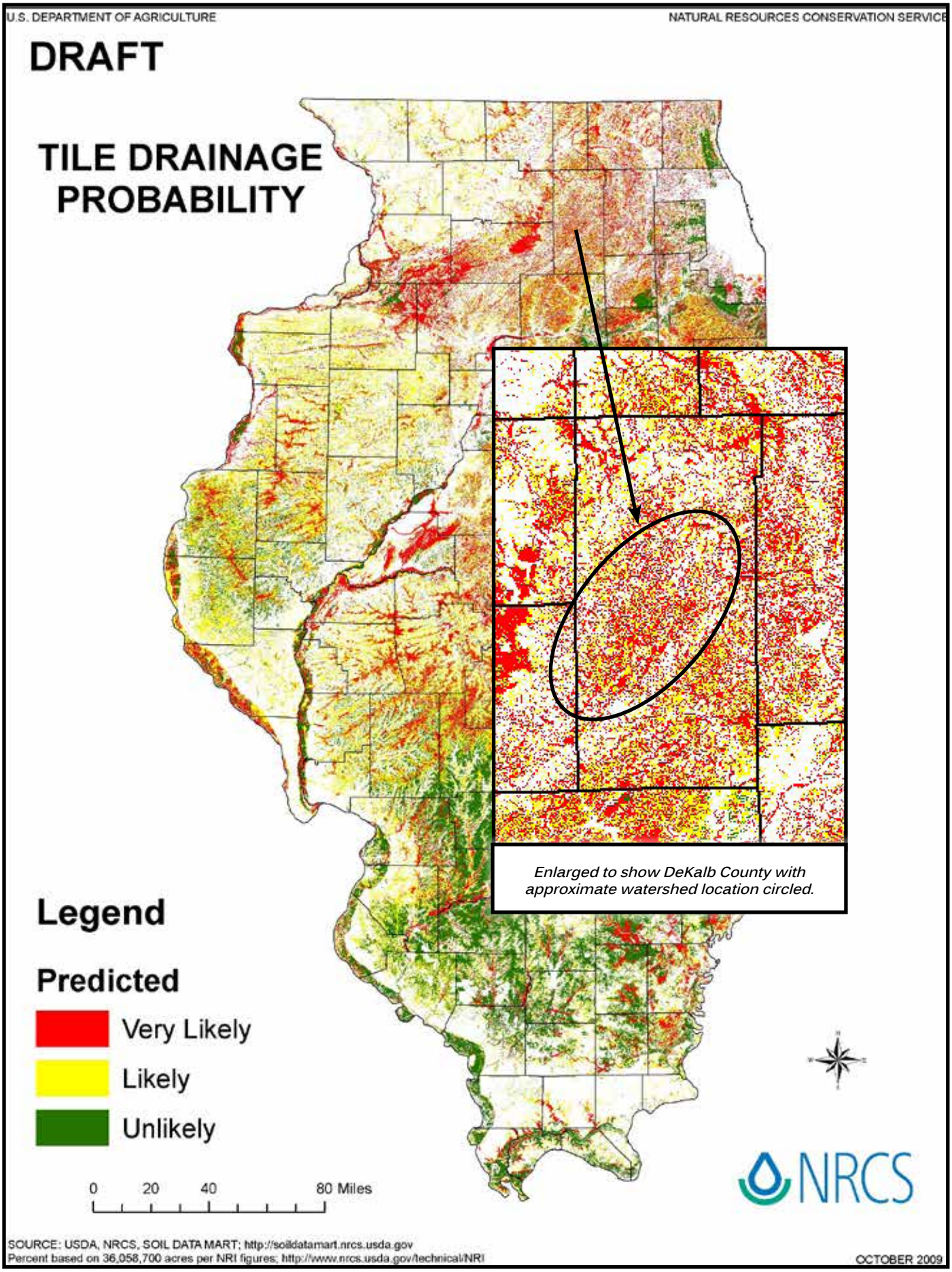


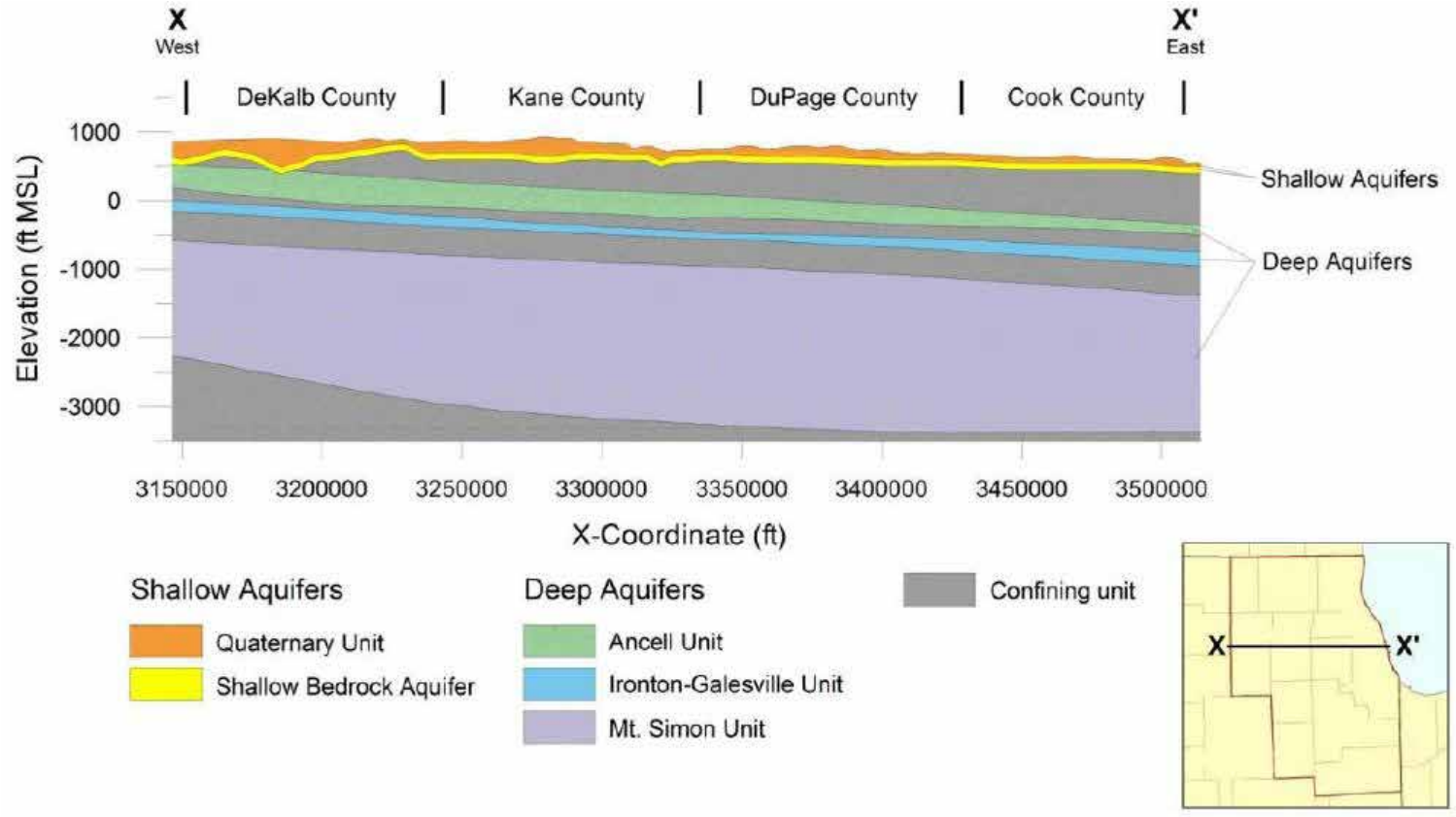
Figure 50. Tile drainage probability in Illinois (Source: NRCS, 2009).

3.16 Groundwater Aquifers & Community Water Supply

Groundwater Aquifers

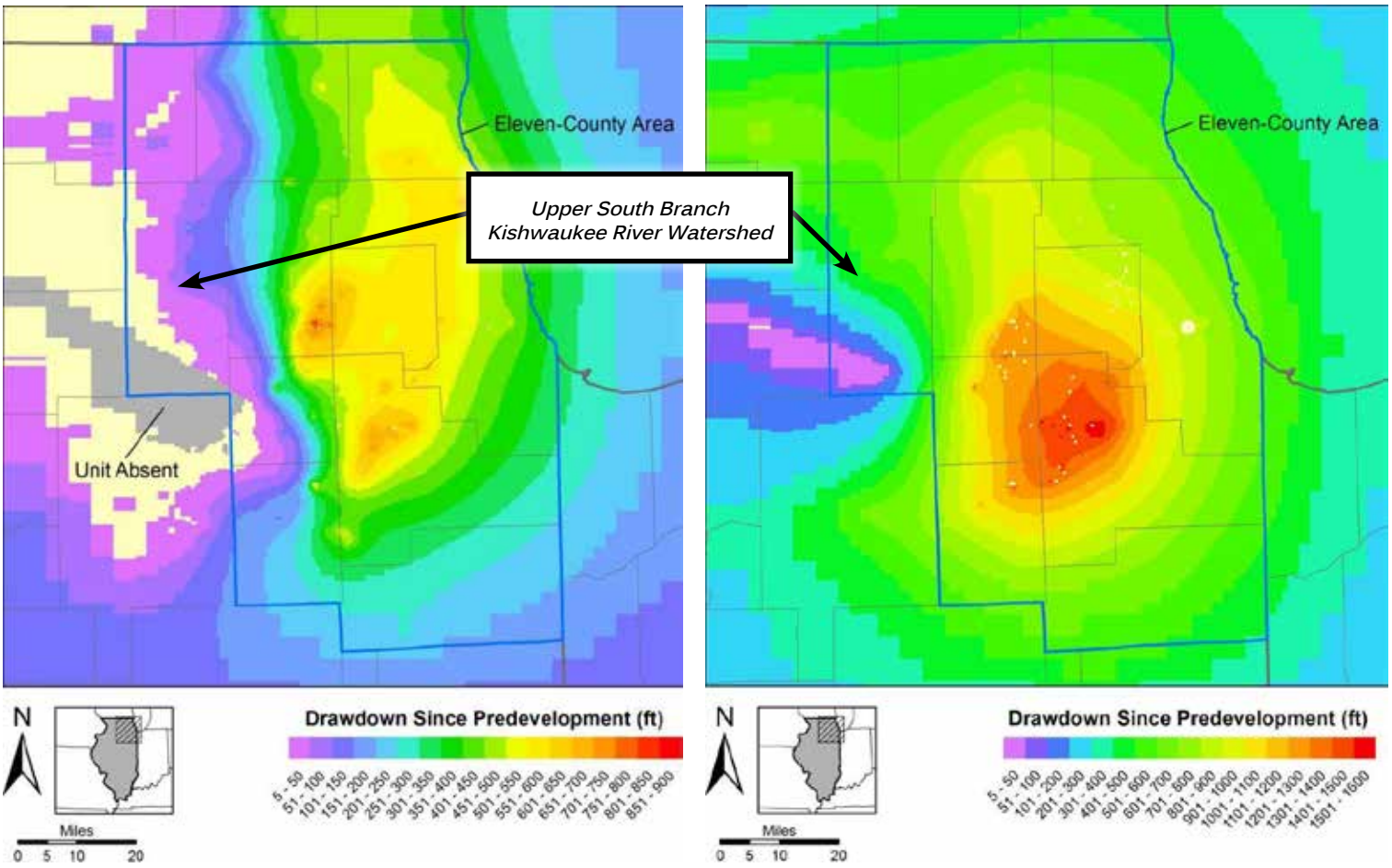
Groundwater is water that saturates small spaces between sand, gravel, silt, clay particles, or crevices in underground rocks. Groundwater is found in aquifers or underground formations that provide readily available quantities of water to wells, springs, or streams. Groundwater sources available to Northeastern Illinois are found in shallow aquifer units and deep aquifer units (Figure 51). 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.

Figure 51. Cross section of the Northeastern Illinois deep and shallow aquifer units.



Groundwater modeling studies conducted for the 11-county Northeastern Illinois Regional Water Supply Planning area by the Illinois State Water Survey (ISWS) (ISWS, 2012) suggests 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 Upper South Branch Kishwaukee River 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 52). 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).

Figure 52. Year 2050 modeled groundwater drawdown in the Ancell Unit (left) and Ironton-Galesville Unit (right).

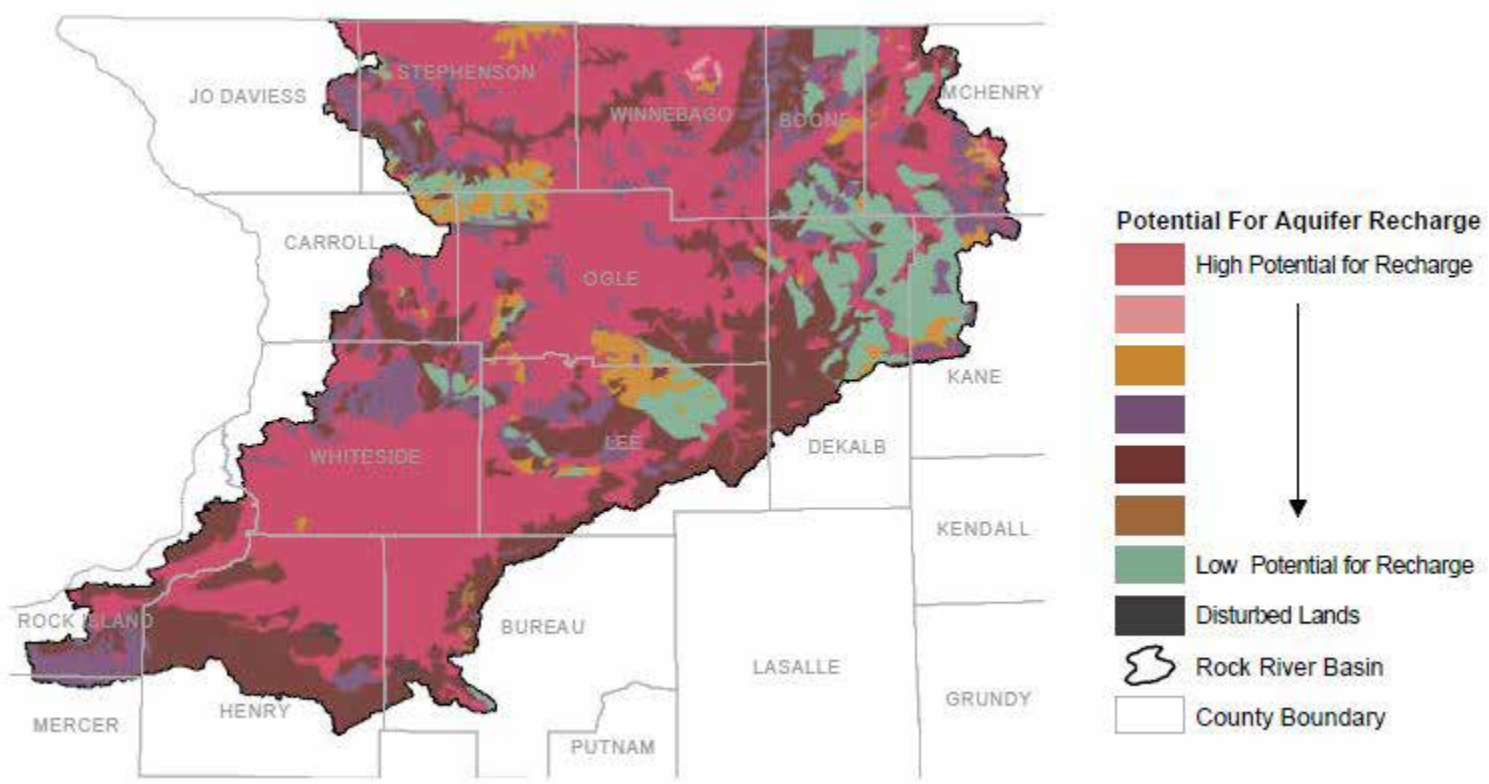


Groundwater Recharge

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 a number of 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 Upper South Branch Kishwaukee River watershed area generally has a moderate potential for groundwater recharge (Figure 53). Additional recharge in the area may also be occurring from outside of the watershed (IEPA, 2006).

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

Figure 53. Aquifer recharge potential in the Rock River Basin (Source: IEPA, 2006).



Community Water Supply

Groundwater is an essential resource within the Upper South Branch Kishwaukee River 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 the majority of the watershed. Twenty-four (24) community water supply wells are located within Upper South Branch Kishwaukee River watershed, but only 19 are active (Table 25). One additional well is proposed in Shabbona but is not yet constructed. Most shallow wells are drilled into the Quantenary Unit aquifer systems and are located in Shabonna. Most deeper wells, drilled into the Ordovician System, are located in Dekalb. 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 Upper South Branch Kishwaukee River watershed. The first was decommissioned in 2006 (application number 037-00041) and the second was decommissioned in 2009 (application number 037-00075) and both were handled by the DeKalb County Soil and Water Conservation District.

Table 25. Community water supply wells within the watershed (Source: IEPA Source Water Protection Program).

Well ID	CWS Name	Depth (ft)	Status	Aquifer Depth	Year Drilled
01090	Shabbona	412	Active	Shallow	1995
11435	Shabbona	158	Active	Shallow	1972
11434	Shabbona	149	Active	Shallow	1959
02066	Shabbona	407	Proposed	Shallow	N/A
00274	Dekalb	1,222	Active	Deep	1986
11408	Dekalb	1,191	Active	Deep	1972
11403	Dekalb	1,309	Active	Deep	1954
11404	Dekalb	940	Inactive	Deep	1921
11427	Malta	853	Active	Deep	1915
11428	Malta	1254	Active	Deep	1952
11453	Donny Brook Estates Subdivision	630	Active	Deep	1976
01235	Dekalb	360	Active	Shallow	1998
11406	Dekalb	1,307	Active	Deep	1966
11404	Dekalb	940	Inactive	Deep	1921
11401	Dekalb	1,283	Inactive	Deep	1995
11405	Dekalb	1,331	Inactive	Deep	1918
11402	Dekalb	1,284	Inactive	Deep	1951
11019	Suburban Apartments (Dekalb Univ Dvl)	970	Active	Deep	1963
11018	Suburban Apartments (Dekalb Univ Dvl)	805	Active	Deep	1963
00275	Dekalb	1,313	Active	Deep	1986
01313	Dekalb	0	Active	Unknown	1999
01247	Dekalb	266	Active	Shallow	1998
11407	Dekalb	1,310	Active	Deep	1968
00173	Sycamore	1,300	Active	Deep	1987
11444	Sycamore	246	Active	Shallow	1978

3.17 Wastewater Treatment Plant & Septic Systems

Wastewater Treatment Plant

There is one National Pollution Discharge Elimination System (NPDES) permitted wastewater treatment plant (WWTP) discharge to Upper South Branch Kishwaukee River (AUID Code: IL_PQC-02). Kishwaukee Water Reclamation District (KWRD) discharges under NPDES Permit No. IL0023027 and is located near downtown DeKalb. Under its permit, KWRD is required to stay within established discharge rates for chlorine residual, biological oxygen demand, fecal coliform, ammonia nitrogen, suspended solids, pH, and dissolved oxygen. The plant is only required to monitor total nitrogen as it is not regulated. It currently has a designed average flow of 8.63 million gallons per day (MGD) and design maximum flow of 18.13 MGD. KWRD does an excellent job of staying within its permitted discharge limits and has recently upgraded its entire facility. From late 2017 through 2019, KWRD 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)."

KWRDs NPDES permit standards are included in Table 26.

Above: Part of the Kishwaukee Water Reclamation District (Source: KWRD). Below: Guided tour of the KWRD facility as part of a 2017 watershed bus tour.

Table 26. KWRD NPDES permit requirements.

Parameter	Load Limits - lbs/day DAF (DMF)		Concentration Limits - mg/L	
	Monthly Ave. (lbs/day)	Daily Max. (lbs/day)	Monthly Ave. (mg/L)	Daily Max. (mg/L)
Flow: 8.63 MGD ave. & 18.13 MGD max.				
CBOD	720 (1512)	1439 (3024)	10	20
Suspended Solids	864 (1814)	1727 (3629)	12	24
pH	Shall be in the range of 6 to 9 Standard Units			
Fecal Coliform	Monthly mean ≤ 200 per 100 mL and no more than 10% of samples shall exceed 400 per 100mL (May through October)			
Chlorine Residual	-	-	-	0.05
Ammonia Nitrogen				
Mar-May/Sept-Oct	108 (227)	1,335		17,224
June-August	72 (151)	9,669		27,099
Nov-Feb	259 (544)	432 (907)		15,221
Total Phosphorus	72 (151)	-	1.0	-
Total Nitrogen	Monitor only			
Dissolved Oxygen			Not less than	Daily Minimum
March-July				5.0
August- February	-	-	6.0	4.0

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, AES was able to estimate that based on the 2010 census data, there are approximately 1,232 septic systems in the watershed. This number was calculated based on the assumption that each household outside of a municipal boundary is likely to have a septic system. AES carefully reviewed and verified the validity of this estimating method and is confident it is a reasonably accurate estimate and also used these estimates as part of the STEPL modeling (see Section 4.0). Table 27 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 the 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 27. Estimated number of rural households/septic systems by SMU.

SMU #	Estimated Number of Rural Households (based on 2010 Census)
1	9
2	7
3	2
4	5
5	18
6	5
7	5
8	8
9	23
10	5
11	8
12	11
13	13
14	12
15	17
16	36
17	81
18	5
19	21
20	9
21	17
22	24
23	20
24	16
25	27
26	1
27	1
28	481
29	56
30	2
31	6
32	130
33	32
34	119
TOTAL	1,232

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