South Fork Kent Creek Watershed

Resource Inventory

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NAVIGATING THE WATERSHED RESOURCE INVENTORY

This Watershed Resource Inventory is a compilation of published maps and data, existing local information, and field surveys about the South Fork Kent Creek Watershed in north-central Illinois. Within the following pages, you will find detailed descriptions of this watershed's boundaries, drainage system, waterbodies, land uses and land cover, geology and climate, soils, and water quality. Part 1 discusses the watershed's boundaries including location and size, and it identifies the entities with jurisdiction over the land and waters within the watershed. Part 2 explains the drainage system's connectivity, spatial relationship, and flow and provides the locations of floodplain, wetlands, ponds, and basins that affect water filtration and storage during storms. Part 3 illustrates the people's demographics, explains how they use the land, and maps the type of cover such as cropland, pasture, forest, low density residential towns, and open spaces. Part 4 talks about the general geology, topography, and climate of the area. Part 5 details the types of soil found in the watershed and how they relate to erosion, groundwater storage and transmission, and agricultural production. Part 6 provides an assessment of water quality including concerns expressed by the Illinois Environmental Protection Agency (ILEPA), results of field surveys of streams and basins, and estimations of annual pollutant loading according to the types of land uses in the watershed. Together, this collection of facts provides insight about the watershed pertinent to making decisions about how to protect and improve the quality of the South Fork Kent Creek and its tributaries.

ACKNOWLEDGEMENTS

The Watershed Resource Inventory was initiated by efforts of the Rockford Park District (RPD) staff, who worked with consultants and watershed stakeholders to collect existing information about the watershed's current conditions. In 2019, they partnered with consultants from Olson Ecological Solutions (OES) and Tallgrass Restoration (TGR) to write the inventory.

The following individuals were instrumental in compiling this inventory:

Written by Kristin Adams, TGR with assistance from OES
Edited by Rebecca Olson, OES
Maps and Tables by Kristin Adams, TGR
Pollutant Load Reduction Modeling by Kristin Adams, TGR
Erosion and Riparian Condition Survey for Waterbodies and Streams by OES
Channelization Assessment by Kristin Adams, TGR

TABLE OF CONTENTS

FIGURES

TABLES

Abbreviations	
BASINS	Better Assessment Science Integrating Point and Non-Point Sources
BCC	Birds of Conservation Concern
BMP	Best Management Practices
DEM	Digital Elevation Model
EMCs	Event Mean Concentrations
FSA	Farm Service Agency
GIS	Geographic Information System
HEL	Highly Erodible Land
HSG	Hydrologic Soil Group
HUC	Hydrologic Unit Code
IDNR	Illinois Department of Natural Resources
ILEPA	Illinois Environmental Protection Agency
IPaC	Information for Planning and Consultation
LRR	Lateral Recession Rate
NHD	National Hydrography Dataset
NLCD	National Land Cover Database
NLRS	Nutrient Loss Reduction Strategy
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OES	Olson Ecological Solutions
PHEL	Potentially Highly Erodible Land
PLOAD	Pollutant Loading Estimator
R1PC	Region 1 Planning Council
RPD	Rockford Park District
RRWRD	Rock River Water Reclamation District
TGR	Tallgrass Restoration
TN	Total Nitrogen
TP	Total Phosphorous
TSS	Total Suspended Solids
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

PART 1: SOUTH FORK KENT CREEK WATERSHED BOUNDARIES

LOCATION OF WATERSHED

The South Fork Kent Creek Watershed is located in Winnebago County in north-central Illinois. The location can be observed in Figure 1 and the boundary can be seen in Figure 2. The watershed lies between Winnebago and Rockford (shown in Figure 3). Levings Lake is found on the east terminal of the watershed, and U.S. Route 20 runs the length of the watershed from northwest to southeast.

The Hydrologic Unit Code (HUC) system defines this watershed and the larger watersheds in which it is nested. The South Fork Kent Creek Watershed is mostly part of the Keith Creek – Rock River Watershed, with a small section to the southeast in the Stillman Creek – Rock River Watershed. These HUC-10 level watersheds are enveloped in even larger watersheds, including the Upper Mississippi Region (HUC 07), Rock (0709), and Lower Rock (07090005) watersheds.

WATERSHED SIZE

The South Fork Kent Creek Watershed is 7,760 acres in size, or 12.1 square miles, according to Geographic Information System (GIS) analysis. Figure 2 shows the boundaries and aerial imagery of the watershed footprint. The South Fork Kent Creek Watershed is comprised of two HUC-12 level watersheds. The largest is Kent Creek in the north, which accounts for 7,280 acres, or 93.8% of the watershed. The remainder is confined to the southeast corner and is part of the City of Rockford – Rock River, which covers 480 acres, or 6.2% of the watershed.

GEOGRAPHIC BOUNDARIES

Watershed boundaries for the South Fork Kent Creek and its tributaries culminate at the confluence of the Rock River. Our focus area and defined watershed includes Levings Lake and its upstream watershed only; it disregards the portion of the watershed between Levings Lake and the Rock River. We determined the watershed boundaries using the digital elevation model (DEM), which illustrated elevation and the direction of water flow through ArcMap software. Boundaries of subbasins within the watershed were determined by grouping together catchments from the national hydrography dataset (NHD) based on water flow and topography.

WATERSHED JURISDICTIONS

The South Fork Kent Creek Watershed lies entirely within Winnebago County. Townships within the watershed are Winnebago, Rockford, and Burritt (see Figure 4). Table 1 shows Winnebago Township as the largest, covering 60.7% of the watershed and 4,708 acres. Rockford Township is 38.7% of the watershed, spanning 3,000 acres. Burritt Township is 0.7% of the watershed, spanning 52 acres. Incorporated places in the watershed are the Village of Winnebago and City of Rockford (see Figure 3).

The South Fork Kent Creek Watershed is influenced by local and state governmental jurisdictions and organizations with missions focused on the environment and agricultural production. Each of these agencies is described below.

Local agencies:

- *Winnebago County* is responsible for governing zoning, storm water management, watershed planning, and surface water management. The storm water management ordinance for

Winnebago County applies to the unincorporated areas within the county. Currently, the county has watershed improvement plans for Buckbee Creek and Madigan Creek (Winnebago County).

- *Village of Winnebago* is responsible for zoning ordinances within their jurisdiction and satisfying water quality requirements. They have developed a Storm Water Management Program to help reduce pollutant discharges from the Village's Municipal Separate Storm Sewer System. The program aims to meet water quality requirements of the Illinois Pollution Control Board Rules, Clean Water Act, and National Pollutant Discharge Elimination System (Fehr-Graham & Associates LLC, 2011).
- *City of Rockford* is responsible for zoning ordinances and satisfying water quality requirements as they relate to their jurisdiction. Their Public Works Department includes the Water Division that manages water production, quality control, treatment, and distribution (The City of Rockford Illinois, USA).
- *Winnebago County Soil and Water Conservation District (SWCD)* is responsible for providing technical information for soil and water resources conservation and natural resource inventory (Winnebago County SWCD, 2019).
- *Winnebago County Highway Department* implements stormwater management to address issues caused by runoff from precipitation events within the unincorporated areas of Winnebago County, while incorporated areas are managed by city or village jurisdictions (Winnebago County, 2019).
- *Winnebago-Boone Farm Bureau* manages agricultural fields and provides farmers with opportunities to monitor their effects on the water quality, such as field tile testing for nitrates (Winnebago-Boone Farm Bureau, 2019).
- *Rock River Water Reclamation District (RRWRD)* manages the wastewater and solid waste within the Rockford area, and they are responsible for maintenance and installment of the sewer lines that run throughout the watershed. This agency helps protect the public health and environment within the watershed (RRWRD, 2019).
- *Winnebago County Health Department* contributes to water quality by overseeing well and septic programs. Licensed inspectors oversee installation of private sewage systems, respond to complaints, and evaluate well and septic fields on properties being sold (Winnebago County Health Department, 2019).
- *Natural Land Institute (NLI)* works on advocacy for land preservation and land use planning in the natural areas of northern Illinois, including the Rock River watersheds (NLI, 2019).
- *Forest Preserves of Winnebago County* manages the land, wildlife, and natural resources in their preserves, including the Rock River Watershed (FPWC, 2019).
- *Region 1 Planning Council (R1PC)* is a regional governmental agency in northern Illinois. They provide services including GIS, and they fund and program development services. The R1PC Environmental Committee is charged with how natural resources fit with the economic development plans of the region (R1PC, 2019).

At the state level, there are several governmental agencies that help to monitor and improve the water quality within South Fork Kent Creek Watershed including:

- Illinois Environmental Protection Agency (ILEPA) has awarded a grant to RPD for the development of this watershed resource inventory and a watershed-based plan to improve the water quality in South Fork Kent Creek Watershed. The grant aims to reduce stream impairments caused by nonpoint source pollution (RPD, 2019).

- Illinois Department of Natural Resources (IDNR) protects native wildlife, water resources, and natural areas and habitats. The IDNR Office of Water Resources focuses on water resources planning, navigation, floodplain management, water supply, and drought (IDNR, 2018).
- U.S. Army Corps of Engineers Rock Island District (USACE) addresses navigation and environmental protection and restoration, damage risk management, and regulation (USACE Rock Island, 2019).
- Illinois Department of Transportation (IDOT) is involved with the Village of Winnebago's Storm Water Management Plan by managing the pollutant levels in waterways and ground water (IDOT, 2019).
- Illinois Farm Bureau assists Illinois farmers in sustainability for agricultural practices. They educate their members to be leaders in environmental issues by protecting water quality and encouraging conservation of the natural resources within the state. They play a large role in the implementation of the Illinois Nutrient Loss Reduction Strategy (NLRS) and spearhead programs that encourage farmer involvement to improve water quality on their properties. The goals of NLRS are to achieve a 15% reduction of the nitrate nutrient losses and 25% reduction of phosphorus losses by the year 2025 (IFB, 2019).

TABLE 1: COUNTIES AND TOWNSHIPS

Counties and Townships			
County	**Township**	**% Watershed**	**Acres**
Winnebago	Winnebago Township	60.7%	4,708
	Rockford Township	38.7%	3,000
	Burritt Township	0.7%	52
	County Total:	**100.0%**	**7,760**

FIGURE 1: SOUTH FORK KENT CREEK WATERSHED LOCATION

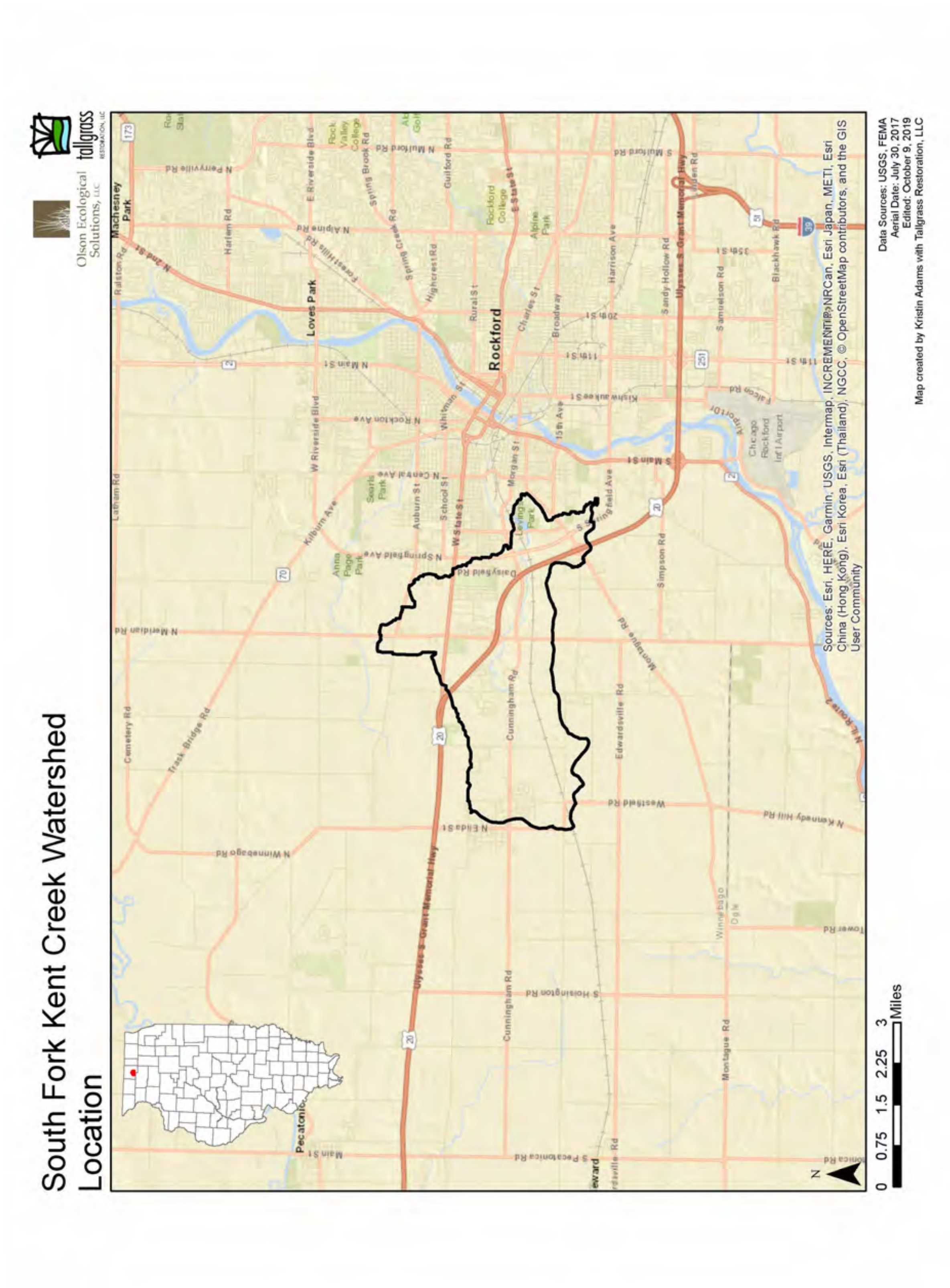


FIGURE 2: SOUTH FORK KENT CREEK WATERSHED AERIAL

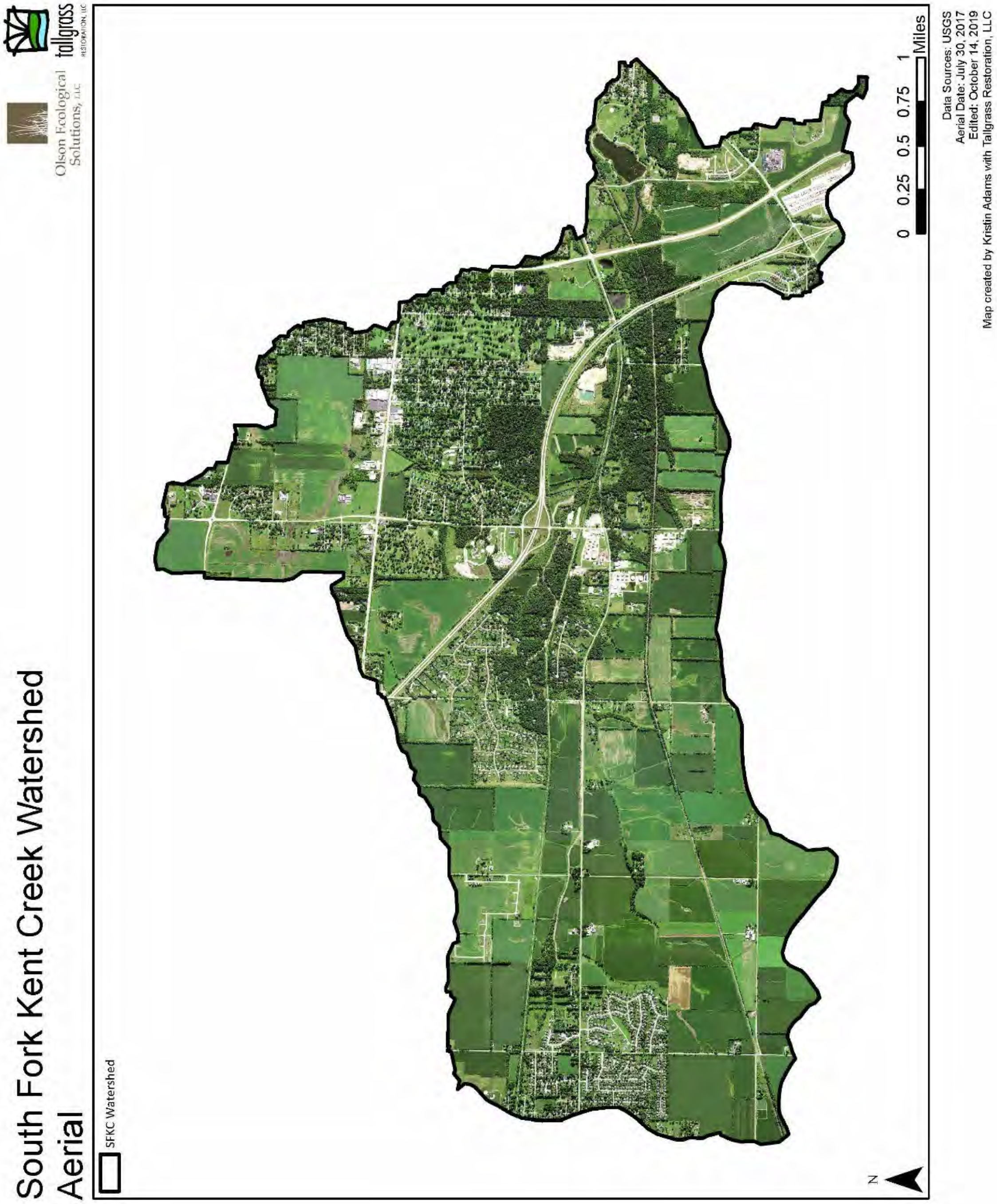


FIGURE 3: INCORPORATED PLACES

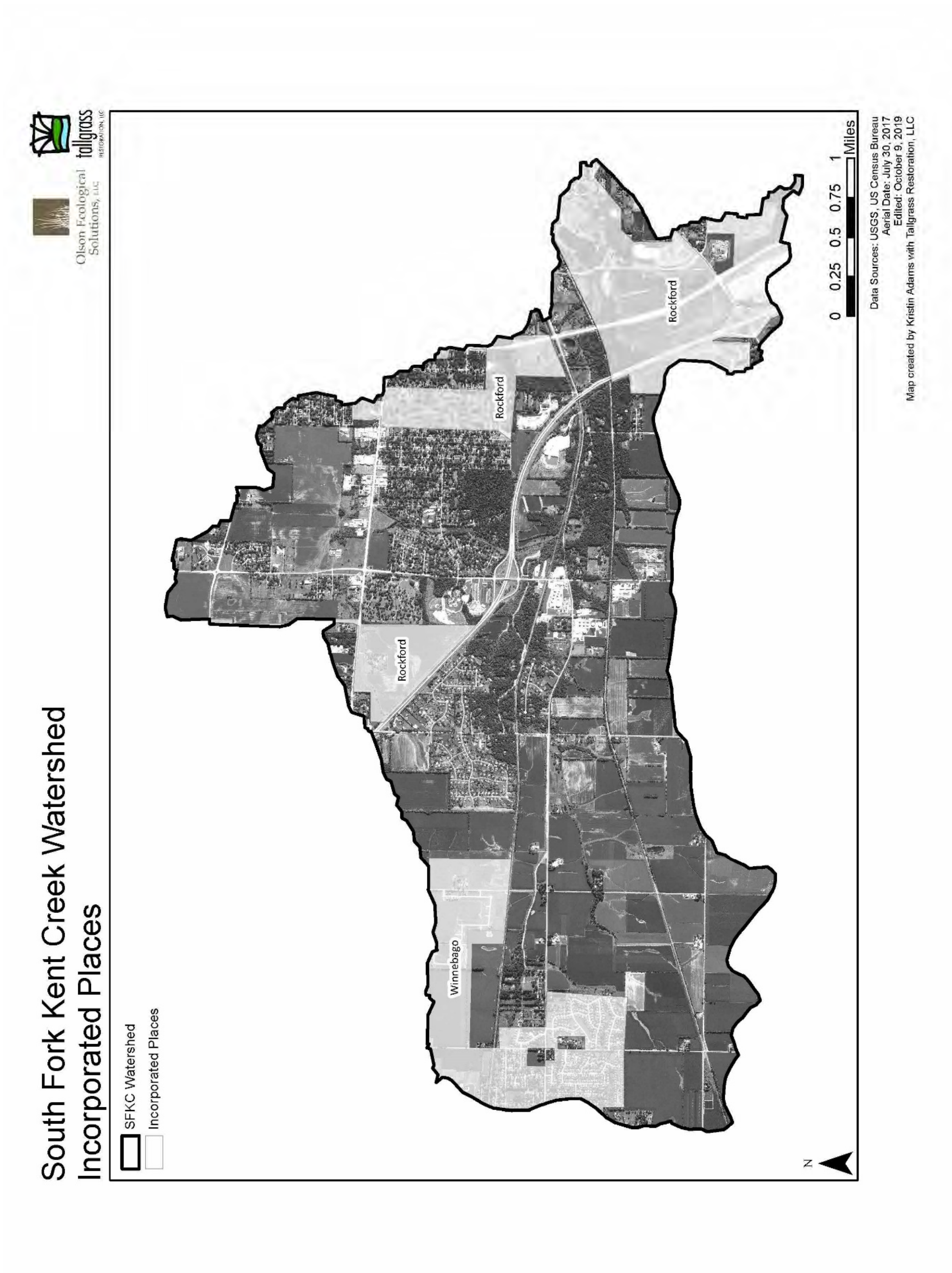
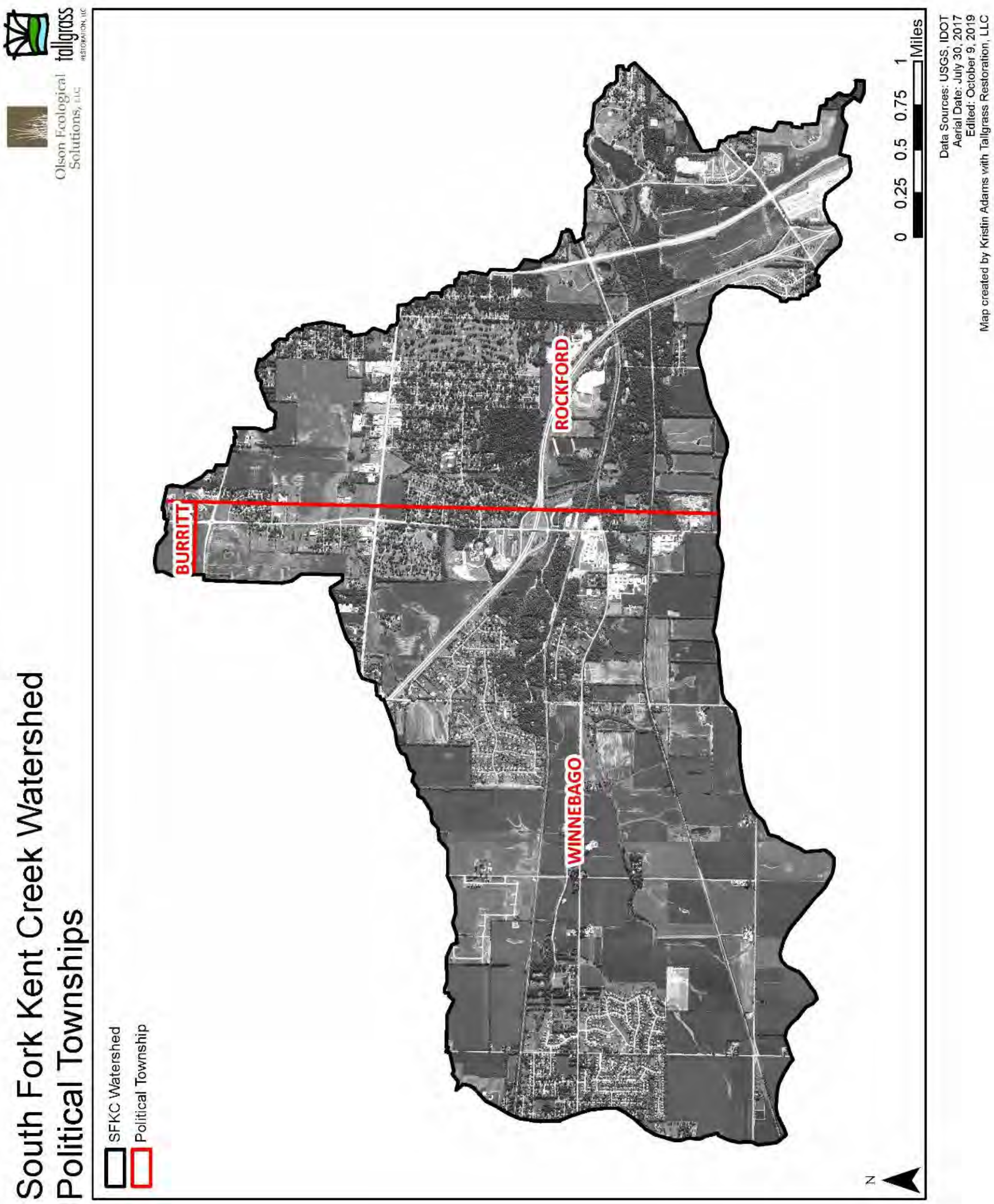


FIGURE 4: POLITICAL TOWNSHIPS



PART 2: WATERSHED DRAINAGE SYSTEM AND WATERBODIES

The drainage system of the South Fork Kent Creek Watershed is defined through connectivity and water flow from one watershed to another, from one stream to the next within the watershed, and through further dividing the watershed into smaller subbasins. The relationship of these watersheds and streams along with their lakes, ponds, detention basins, flood zones, and wetlands provide a full picture of water flow through the watershed and beyond.

CONNECTIVITY AND WATER FLOW OF WATERSHEDS

The connectivity of South Fork Kent Creek and its tributaries is understood within the larger context of water flow from its headwaters to the Gulf of Mexico. South Fork Kent Creek joins the North Fork of Kent Creek near the intersection of South Winnebago Street and Cunningham Street. After this conjunction, water enters into a short main stem of Kent Creek, which flows into the Rock River near the junction of Main Street and Morgan Street in Rockford. The Rock River joins the Mississippi River in Rock Island, Illinois. The Mississippi River travels south, emptying into the Gulf of Mexico through the state of Louisiana (USGS StreamStats, 2012). According to the HUC system, which organizationally divides larger drainage systems in the United States, the South Fork Kent Creek Watershed is nested within the larger watersheds named below as seen in Table 2 and Figure 5.

CONNECTIVITY AND WATER FLOW WITHIN SOUTH FORK KENT CREEK WATERSHED

Water flows through the South Fork Kent Creek Watershed primarily via a network of intermittent and perennial streams. These streams total 122,463 feet in length: 29,751 feet perennial and 92,712 feet intermittent. The streams generally flow from the west near the Village of Winnebago to the southeast into Levings Lake. Waterflow and stream data is a product of the NHD created by U.S. Geological Survey (USGS) using the DEM with assigned reach codes provided by the United States Environmental Protection Agency (USEPA).

The South Fork Kent Creek Watershed encompassed portions of two HUC-12 subwatersheds: Kent Creek and City of Rockford-Rock River. The majority of South Fork Kent Creek Watershed falls within Kent Creek Watershed. The southeast corner of the watershed is part of the City of Rockford-Rock River Watershed as shown in Figure 5. A breakdown of the HUC-12 watershed acreages can be found in Table 2.

SPATIAL RELATIONSHIP AND CONNECTIVITY OF PSEUDO-HUC-14 SYSTEM

There is no official assigned numbering system for watersheds smaller than the HUC-12 level. In order to illustrate the spatial relationship and connectivity within the South Fork Kent Creek Watershed, we determined boundaries for 15 subbasins, which can be observed in Figure 6 and Table 3. We used drainage basins defined by elevation as the principal factor in the breakdown into smaller watersheds, referred to as subbasins. To do so, first a computer-aided watershed generator called Better Assessment Science Integrating Point and Non-Point Sources Version 4.1 (BASINS) divided the entire South Fork Kent Creek Watershed into smaller subbasins. Then using aerial photography and topographic maps, we corrected the boundaries to create the final subbasin boundaries.

The resulting 15 subbasins are labeled in alphabetic order, starting at the southeastern-most corner. Subbasin A is part of the City of Rockford-Rock River Watershed. The remaining 14 subbasins are part of the Kent Creek Watershed. Intermittent, headwater streams travel through Subbasins A, F, G, H, I, J, K, L, and N and flow into the perennial stream. The perennial stream flows through Subbasins E, D, C, B, and M and deposits into Levings Lake in Subbasin M. Subbasin O, in the northern portion of the South Fork Kent Creek Watershed, does not have any apparent streams flowing through it.

LOCATIONS OF WATERBODIES

Within the South Fork Kent Creek Watershed, we identified 24 waterbodies using a combination of data from NHD, National Wetlands Inventory (NWI), and aerial imagery. Subbasins B and M have the highest concentration of waterbodies of all the subbasins, with six waterbodies in Subbasin B and four waterbodies in Subbasin M. Subbasins C, D, E, and L each hold two waterbodies. Subbasin K has one plus another partial waterbody, with the other half of the partial waterbody in Subbasin O. Subbasins A, F, H, and N each house one waterbody. Subbasins G, I, and J do not have any waterbodies. Most of these waterbodies are small ponds or basins located near the stream. Levings Lake, located in Subbasin M, is the largest waterbody in the watershed with 22.9 acres. The NWI lists 11 of the same waterbodies. There are 46.3 acres of ponds or basins within the watershed (see Figure 7).

BASINS

Basins are an important existing BMP as they help control and divert stormwater after rainfall events. Typically, they are installed in urban settings such as neighborhoods and businesses where impervious surfaces are found at a higher percentage, having higher potential for runoff issues. Two categories of basins are typically observed: detention and retention. Detention basins temporarily hold stormwater, allowing sediment to separate and not be carried downstream as well as preventing flooding and erosion. Retention basins also manage for runoff in a similar manner but typically hold water permanently. Detention basins are most commonly found in the South Fork of Kent Creek Watershed, with the only observed exception being the retention pond managed by Farm and Fleet.

Within this watershed, we performed a desktop analysis of basins to observe their functionality, ground cover, and connection (on-line or off-line) to the streams, shown in Figure 8 and Table 4. We gathered basin locations from the Winnebago County Highway Department based on development plans as well as from using aerial imagery and Google Street View. There are a total of 27 basins covering 47.1 acres spread throughout the watershed. The largest basin, accounting for 7 acres, is located adjacent to the Lowe's Distribution center in the southernmost tip of the watershed. Over half of the basins are covered in maintained turf grass. The other ground cover types are either forest, native plantings in the form of prairies or wetlands, predominately unmanaged weed cover, or some combination of the aforementioned. Five of the basins are considered on-line basins with a direct connection to the stream channel. On-line basins are effective in trapping urban pollutant run-off by allowing sediment to settle out in the widened channel and floodplain and preventing flooding (MPCA, 2000). The remaining 22 basins are considered off-line and eventually discharge to the streams but are not immediately draining into it. All of the basins seem to be functioning as intended.

WETLANDS

We collected wetland data from the NWI and in the form of color infrared imagery from 1980 using remote sensing technology mounted on aircraft to interpret soil moisture and saturation at a 1:58,000 scale. The NWI can be observed in Figure 9. This data refers to existing wetlands only. Areas that were historically wetlands and have wetland restoration potential are discussed below as hydric soils (see Part 5: Soils).

The NWI recognizes wetlands throughout the watershed, some of which are waterbodies and streams discussed above. There are 20 wetlands not considered waterbodies or streams within the South Fork Kent Creek Watershed: 18 located in the Kent Creek Subwatershed and two in the City of Rockford-Rock River Subwatershed. The NWI classifies wetlands by their moisture regime and vegetative cover. Twenty wetlands in the South Fork Kent Creek Watershed are considered palustrine (P) systems: 10 freshwater emergent wetlands and 10 freshwater forested/shrub wetlands.

All 10 of the freshwater emergent (EM) wetlands are in the "persistent" subclass (PEM1), which are further classified based on water regime: three temporary flooded (A), six seasonally flooded (C), and one semi-permanently flooded (F). All ten of the freshwater forested/shrub wetlands fall into the broadleaved deciduous subclass: nine forested class (PFO) temporary flooded (A) wetlands and one scrub-shrub class (PSS) seasonally flooded (C) wetland. The 20 palustrine wetlands have a mean size of 2.9 acres and total acreage of 57.6 acres. PFO1A is the most prevalent type of palustrine wetland in the watershed, which covers 33.1 acres. Table 5 shows a breakdown of the NWI wetland categories.

HISTORIC WETLAND LOSS

Wetland habitats were historically a significant community type found throughout the region. A combination of methods is used to quantify how many acres were historically present in the 18th century to compare to present day totals. These methods include land-use records, drainage pattern statistics, hydric soils, and known locations of wetlands from state records. The United States supported nearly 392 million acres of wetlands prior to the Revolution, while current day only 274 million acres remain, over 60% of which are found in either Alaska and Hawaii (Dahl, 1990b). Illinois wetland distribution across the United States historically was between 12-25% or about 8.2 million acres, while present day estimates 1.2 million acres currently exist. It was estimated to have lost 85% of more of the historical wetland acreage due to the introduction of agriculture (Dahl, 1990a). Winnebago County, where the South Fork Kent Creek Watershed is located, is estimated to have lost 70-79% of wetlands (Suloway, 1994).

The National Wetland Inventory lists known historic wetlands, however none were present within the watershed boundaries. To give a rough estimate of the quantity of historic wetlands, we assumed that the soils that were significantly hydric were originally wetland. In South Fork Kent Creek, there were 761.4 acres of hydric soils with a rating over 66% and the present-day wetland acreage is only 0.3 acres. This suggests that South Fork Kent Creek Watershed may have lost over 99.9% of the wetlands originally found within its boundary.

FLOODZONES AND FLOODING FREQUENCY

Floodzones and flooding frequency combine to explain flooding patterns within the South Fork Kent Creek Watershed. Floodzone boundaries according to FEMA are shown in Figure 10, including floodway, 100-year floodzone, 500-year floodzone, and minimal flood hazard. The floodway is the stream channel and its adjacent land that must remain free from obstruction to carry the deeper, faster moving water during a storm so that discharge of the base flood does not increase the water surface elevation more than a specified height (FEMA, 2019). Floodways are located along South Fork Kent Creek and branch slightly north into Subbasins L and K. They account for 2.1% of the watershed, or 165 acres (see Table 6).

The 100-year floodzones have one percent chance of flooding in a year. They are located along South Fork Kent Creek and branch slightly west into Subbasins E and I, then slightly north into Subbasins L, K, O, and N. They account for 4.8% of the entire watershed, or 375 acres. The 500-year floodzones are areas with 0.2 percent chance (or 1 in 500 chance) of flooding in a year. They are located along South Fork Kent Creek and branch west into Subbasins I, F, G, and H; north into Subbasins L, K, O and N; and south into Subbasin A. They account for 4.1% of the watershed, or 314 acres. The remaining 89% of the watershed, or 6,906 acres, falls into the minimal flood hazard category.

We used "Web Soil Survey" to assess flooding frequency of the watershed (2019). The results sometimes overlap floodzones but more often offer independent information. Web Soil Survey expresses flood frequency as either frequent or none, as displayed in Figure 11. In this watershed, 8.2% of the watershed, or 635 acres, is classified as a frequent flooding zone, described as more than 50% chance of flooding in any year, but less than 50% in all months within any year (see Table 7). This classification applies only on land near South Fork Kent Creek and extends slightly further to the west and further into the north. The remaining 91.8% of the land is considered to flood less than once in 500 years.

TABLE 2: HUC FOR SOUTH FORK KENT CREEK & ASSOCIATION WATERSHEDS

HUC for South Fork of Kent Creek & Associated Watersheds		
HUC Level	**HUC Code**	**Watershed Name**
HUC-02	"07"	Upper Mississippi Region
HUC-04	"0709"	Rock
HUC-08	"07090005"	Lower Rock
HUC-10	"0709000501"	Keith Creek - Rock River
	"0709000504"	Stillman Creek - Rock River
HUC-12	"070900050106"	Kent Creek
	"070900050401"	City of Rockford - Rock River

TABLE 3: SOUTH FORK KENT CREEK SUBBASINS

South Fork Kent Creek Subbasins			
City of Rockford-Rock River Subwatershed	**Subbasin**	**% SFKC Watershed**	**Acres**
HUC Code: 70900050401 **Total Acreage:** 13,480 **SFKC Acreage:** 580 **% HUC 12 Watershed:** 4.3%	A	7.5%	580
	Total:	**7.5%**	**580**
Kent Creek Subwatershed	**Subbasin**	**% SFKC Watershed**	**Acres**
HUC Code: 70900050106 **Total Acreage:** 29,458 **SFKC Acreage:** 7,180 **% HUC 12 Watershed:** 24.4%	B	6.5%	504
	C	6.8%	526
	D	8.6%	666
	E	7.1%	548
	F	8.5%	658
	G	6.2%	478
	H	5.9%	457
	I	5.8%	450
	J	4.5%	348
	K	4.5%	353
	L	6.2%	478
	M	8.7%	676
	N	6.9%	535
	O	6.5%	503
	Total:	**92.5%**	**7,180**

TABLE 4: BASINS

Basins					
Label	**Name**	**Acres**	**Ground Cover**	**Connection**	**Functioning**
1	Barrington on Weldon 1	0.5	turf	off-line	yes
2	Barrington on Weldon 2	0.6	turf	off-line	yes
3	Farm and Fleet	1.2	none - water	off-line	yes
4	Greenlee Estates 1	1.5	turf	**on-line**	yes
5	Greenlee Estates 2	0.3	turf	off-line	yes
6	Greenlee Estates 3	1.1	turf	off-line	yes
7	Kelley Meadows	2.1	turf	off-line	yes
8	Lowe's	7.0	turf	off-line	yes
9	Prairie Hill 1	0.3	turf	off-line	yes
10	Prairie Hill 2	2.1	turf	**on-line**	yes
11	Redenius Woods 1	4.9	forest, some turf	**on-line**	yes
12	Redenius Woods 2	0.6	forest, some turf	off-line	yes
13	Redenius Woods 3	5.9	forest and reed canary grass	**on-line**	yes
14	Resh Farm 1	2.9	turf	off-line	yes
15	Resh Farm 2	0.3	turf	off-line	yes
16	RPD 1	0.9	natives	off-line	yes
17	RPD 2	0.2	sparse trees and natives	off-line	yes
18	RPD 3	1.0	natives	off-line	yes
19	Slacks	0.5	turf	off-line	yes
20	Westridge 1	1.6	forest and reed canary grass	off-line	yes
21	Westridge 2	0.9	forest	**on-line**	yes
22	Westridge 3	1.7	turf	off-line	yes
23	Westridge 4	0.9	sparse trees and turf	off-line	yes
24	Willingham 1	1.9	weeds and mowed turf	off-line	yes
25	Willingham 2	6.4	weeds and mowed turf	off-line	yes
26	Woodsong Estates 1	1.1	turf	off-line	yes
27	Woodsong Estates 2	1.3	turf	off-line	yes

TABLE 5: NATIONAL WETLANDS INVENTORY

National Wetlands Inventory		
Description	**Code**	**Acres**
Freshwater Emergent Wetland	PEM1A	3.0
	PEM1C	20.4
	PEM1F	0.9
	Total:	**24.3**
Freshwater Forested/Shrub Wetland	PFO1A	33.1
	PSS1C	0.3
	Total:	**33.3**
Lake	L1UBHh	26.2
	Digitized/NHD	20.1
	Total:	**46.3**
Riverine	R2UBH	15.0
	R4SBC	38.0
	R5UBH	2.0
	Total:	**55.0**

TABLE 6: FEMA FLOOD HAZARD

FEMA Flood Hazard		
Flood Zone Type	**% Watershed**	**Acres**
1% Annual Chance Flood Hazard	4.8%	375
0.2% Annual Chance Flood Hazard	4.0%	314
Floodway	2.1%	165
Area of Minimal Flood Hazard	89.0%	6,906
Total:	**100%**	**7,760**

TABLE 7: FLOODING FREQUENCY CLASS

Flooding Frequency Class			
Description	**Chance of flooding**	**% Watershed**	**Acres**
Very frequent	More than 50% in all months in any year.	0.0%	0
Frequent	More than 50% any year, but less than 50% in all months in any year.	8.2%	635
Occasional	Between 5-50% in any year.	0.0%	0
Rare	Between 1-5% in any year.	0.0%	0
Very rare	Less than 1% in any year.	0.0%	0
None	Less than once in 500 years.	91.8%	7,125
	Total:	**100%**	**7,760**

FIGURE 5: ASSOCIATED WATERSHEDS

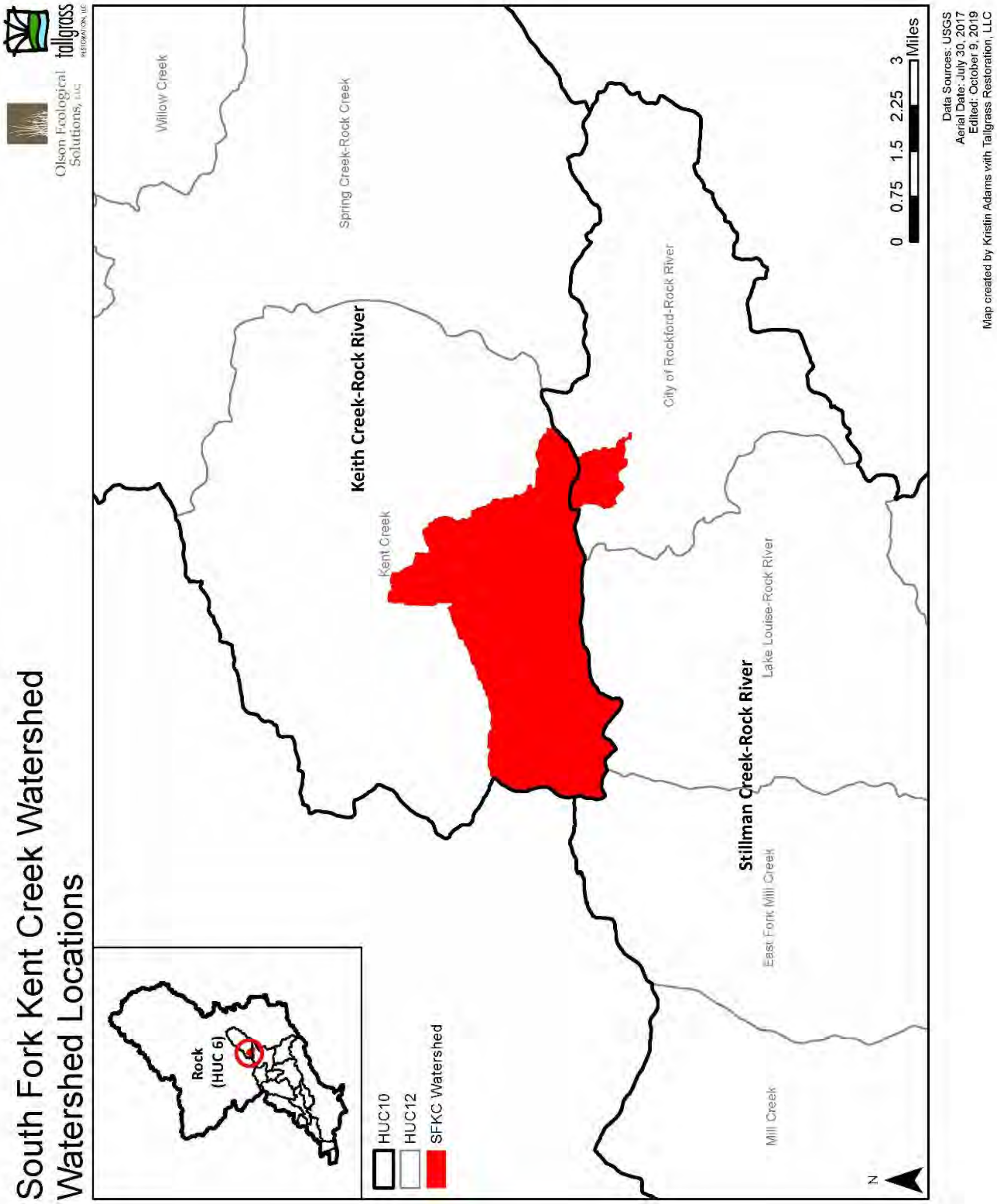


FIGURE 6: SUBBASIN BOUNDARIES

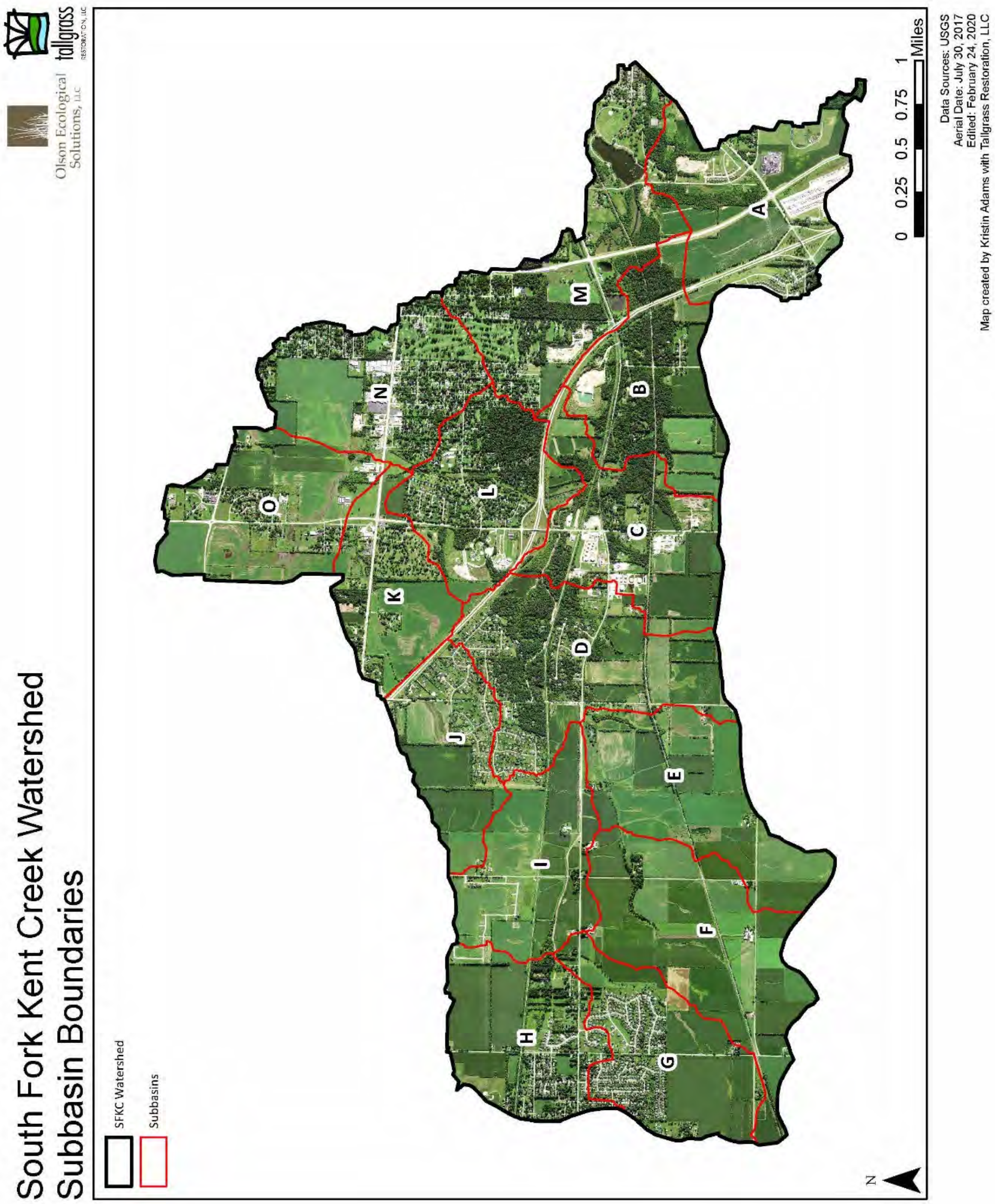


FIGURE 7: WATERBODY LOCATIONS

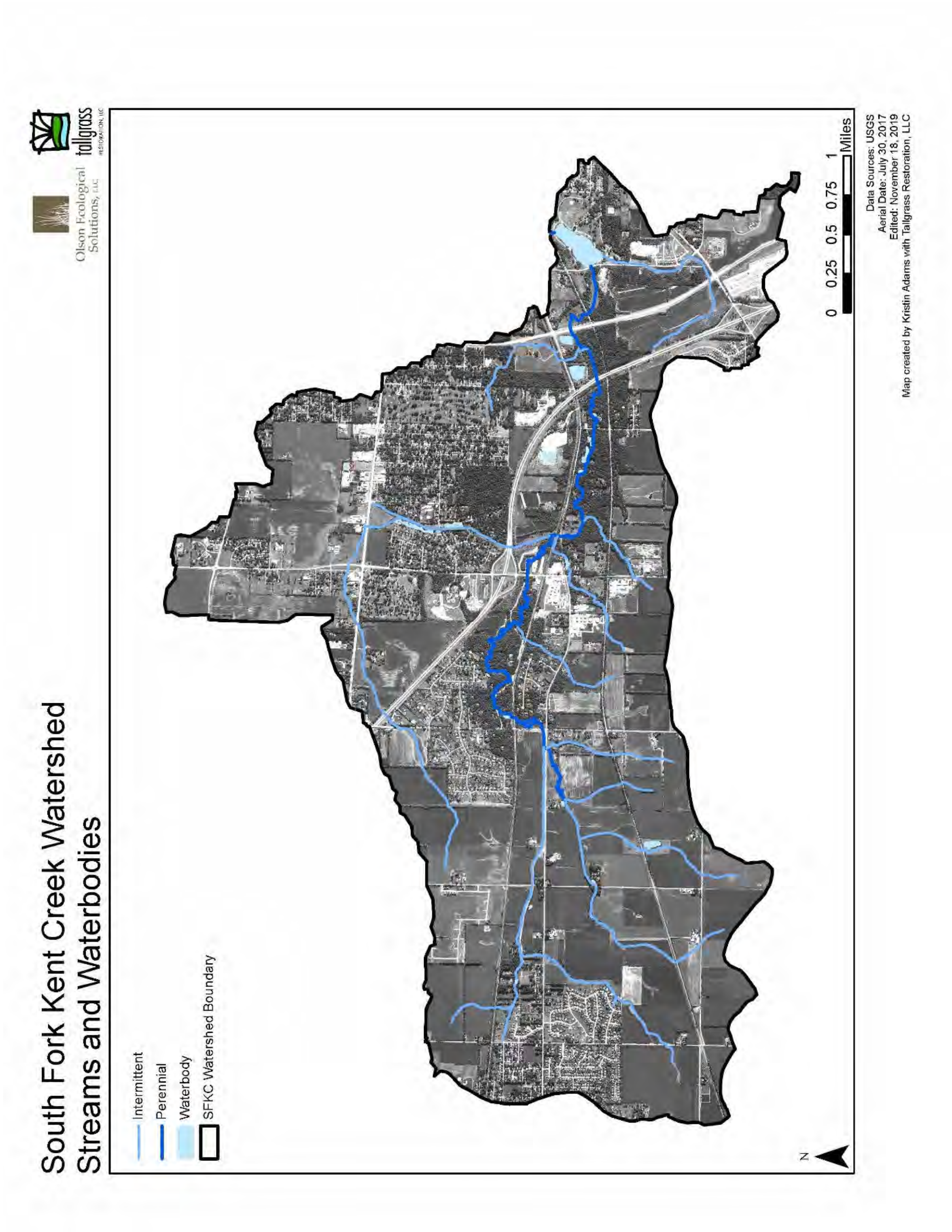


FIGURE 8: BASINS

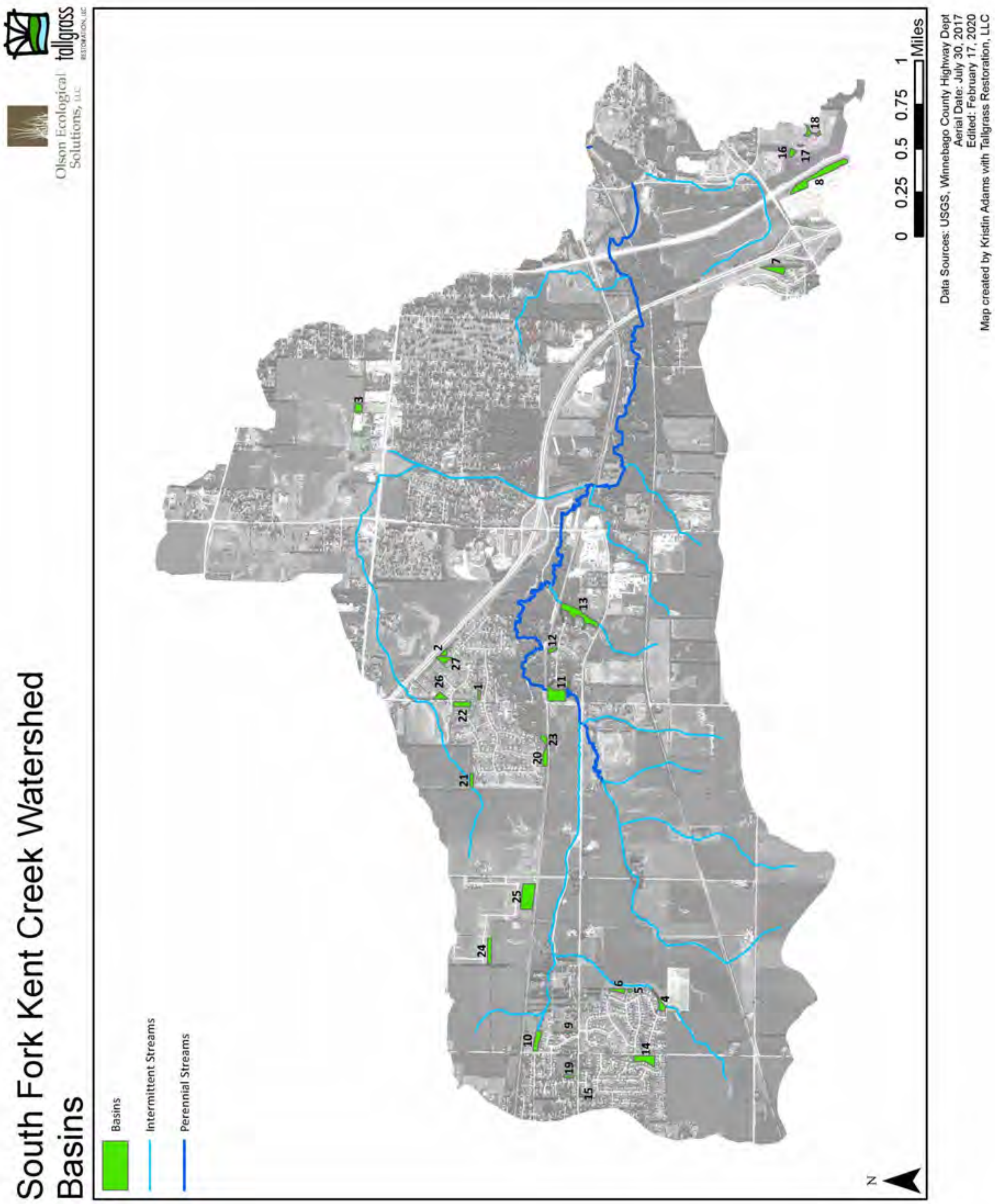


FIGURE 9: NATIONAL WETLANDS INVENTORY

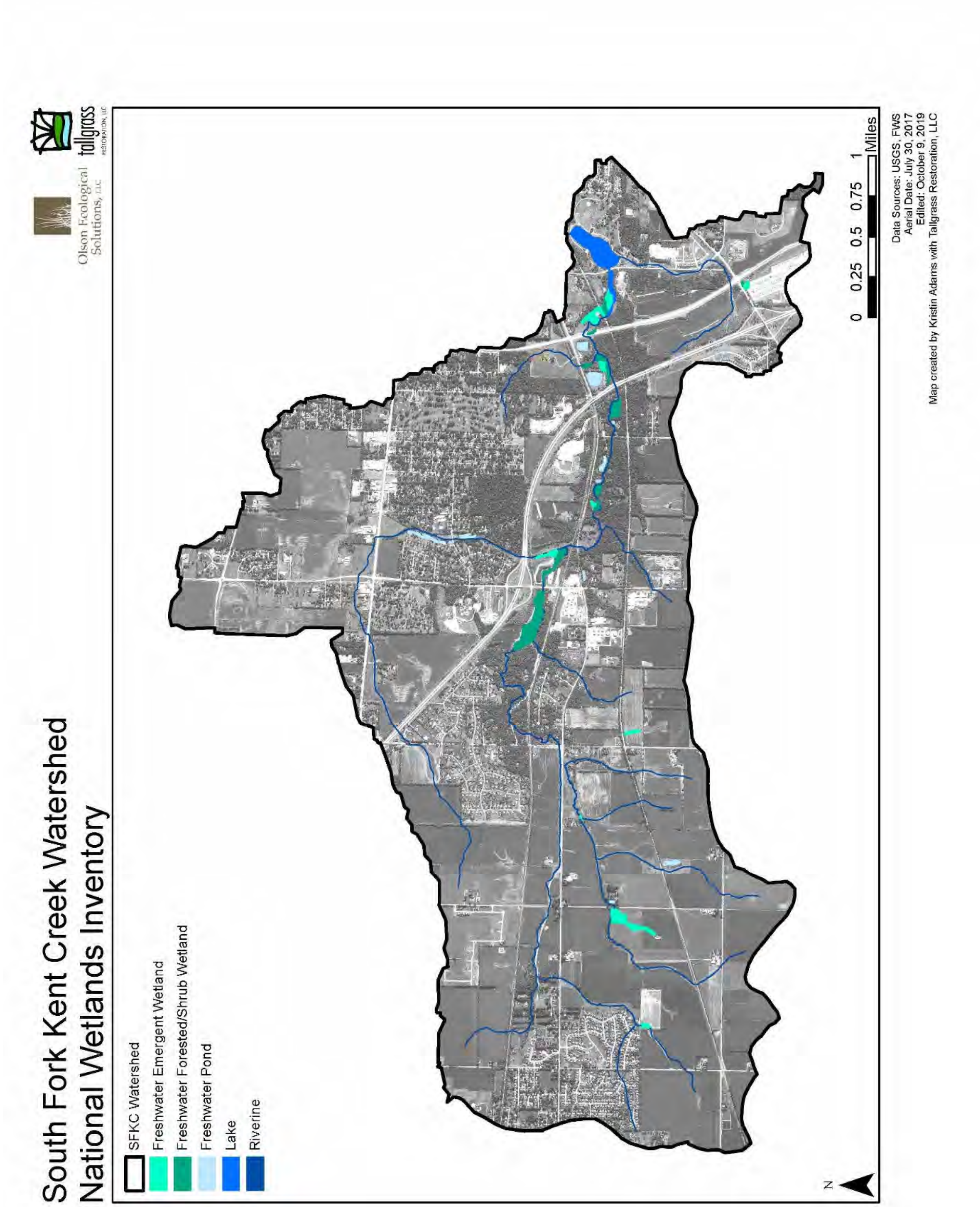


FIGURE 10: FLOOD HAZARD

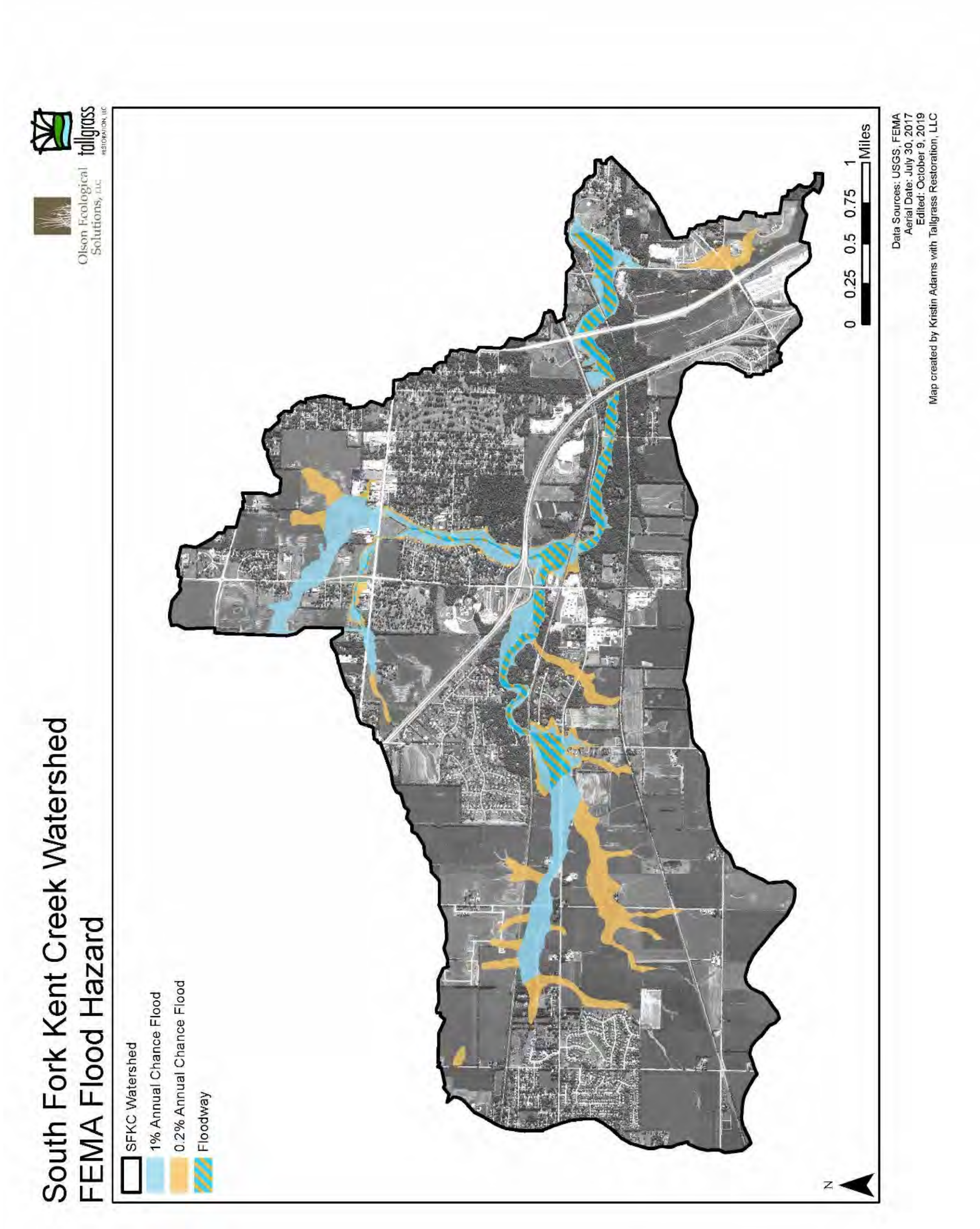
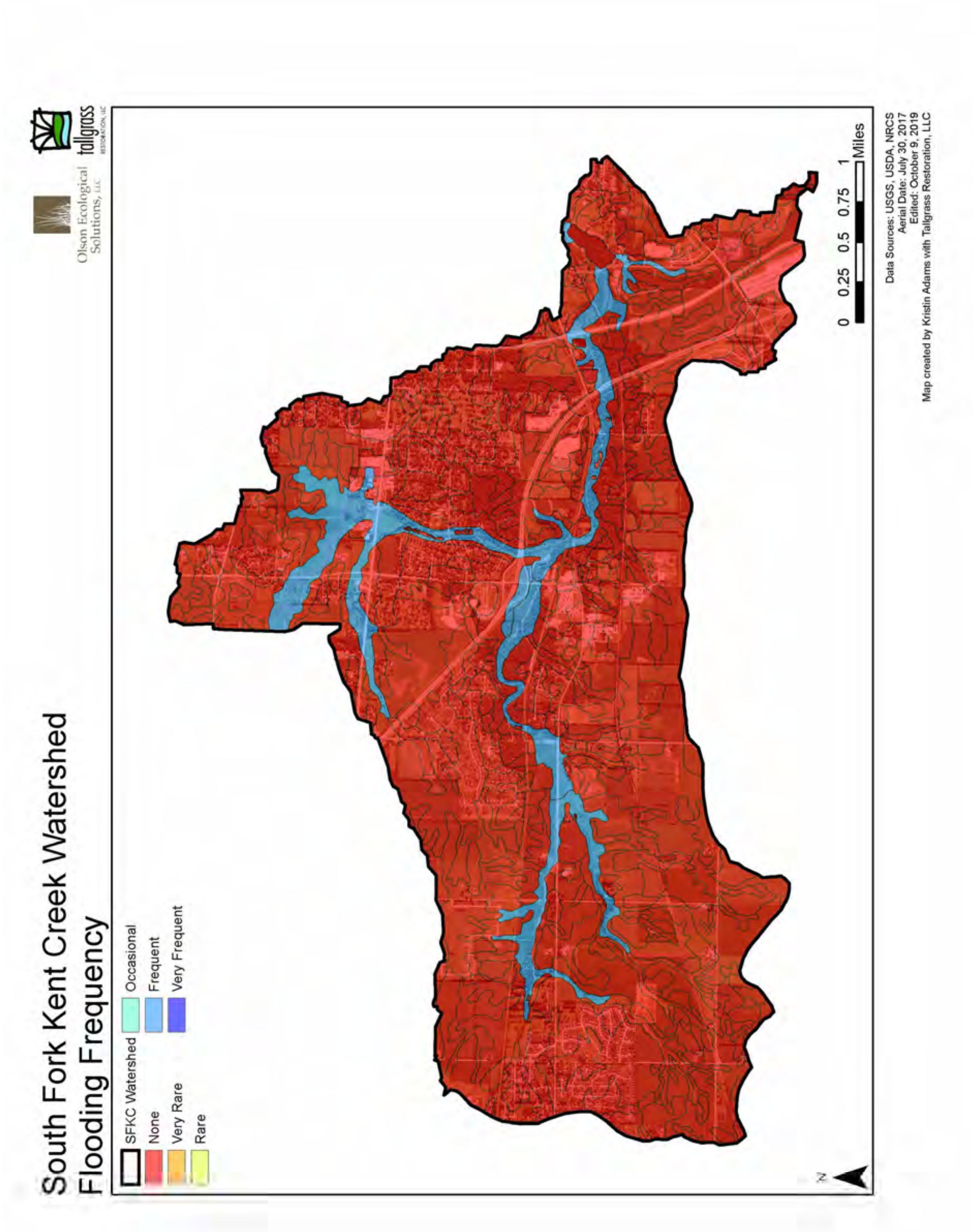


FIGURE 11: FLOODING FREQUENCY CLASS



PART 3: LAND USES

HISTORIC LAND USE

During the 1800s, the historic land cover of South Fork Kent Creek watershed consisted of prairie, timber, marsh, water, slough, and field. The most prevalent land cover in the watershed was prairie, which extended over 80% of the area. The next largest historical land cover was timber, covering 15.9%, or 1,233 acres. The remaining types of historic land covers accounted for less than 1% of the watershed, including water, marsh, slough, and cultural field (see Figure 11 and Table 7).

CURRENT LAND USES

Land use refers to how the landscape is used, whether for development, farming, conservation, or other various reasons. Land cover indicates the physical land type, such as forests, wetlands, and open water. We refer to land use and land cover interchangeably in this inventory because they play the same role in our analysis. We created a land use map of the South Fork Kent Creek Watershed in ArcMap based on recent aerial photography taken in June of 2017. The National Land Cover Database (NLCD) 2016 (Multi-Resolution Land Characteristics Consortium, 2016) provides information on a scale of 30-meter grids and provides the baseline data for determining the watershed's land use. We corrected this layer of information based on our more detailed analysis of aerial photography and site visits. Land cover for the entire South Fork Kent Creek Watershed can be observed in Figure 13 and Table 9. Land use is also broken down by each of the 15 subbasins and reported in Table 10.

There are 19 different land use types in the South Fork Kent Creek Watershed. The most abundant land use type is farmland classified as high residue till, which covers 35% of the watershed (2,726 acres). This land use represents any agricultural fields with more than 30% residue visible after the fall harvest based on observations from a site visit in November 2019. The next most abundant land use is low intensity developed land, representing just under 20% of the watershed (1,514 acres). This land use is comprised predominately of residential areas. Forests also have a large representation within the watershed, spanning 14% (1,090 acres). The other 16 land use types jointly represent about 30% of the entire watershed. They fall into categories of developed lands, transportation and utility features, and open space.

Developed lands are comprised of three ranks based on their impervious surfaces and types of structures. Commercial areas are considered high intensity while industrial sites are medium intensity. As previously mentioned, low intensity development represents residential areas. Residential areas are grouped together in Winnebago and Rockford incorporated areas, and some rural pockets represent farmhouses and barns.

Transportation features are separated into three categories: roads, railroads, and trails. Roads spread throughout all of the subbasins. There is one railroad line that runs from east to west, located south of Cunningham Road. The Pecatonica Prairie Path is the only trail system within the watershed. It runs north of Cunningham Road, and spans from the east to the west, similar to the railroad. RRWRD manages 193,854 feet of sewer lines within the watershed; 159,294 feet of gravity sewer; and 34,560 feet of forced mains. There are 1,510 feet of abandoned sewer pipe in the watershed. The sewer line follows the main stem of South Fork Kent Creek and U.S. Route 20 through the watershed from Winnebago to Rockford a shown in Figure 14.

Wetlands and grasslands are not particularly abundant but do have a scattered presence. We analyzed mowed turf grass separate from grasslands, as the level of maintenance and pollutant loading is greater for the managed areas. Forests are located throughout every subbasin. We assessed the quality of some of the woodlands during the field survey site visits. A summary of woodland survey procedure can be found in Part 6: Water Quality Assessment. Most of the woodlands throughout the watershed have issues with buckthorn and other invasive shrubs severe enough to impact the ground cover within the woodland. The resulting sparse ground cover allows greater runoff that is less filtered, which also contributes to bank erosion. According to our field survey, approximately 4% of woodlands are in very low-quality condition, with a thick layer of invasive shrubs that make the area impassable. Another 29% of woodlands are low quality with a thick density of invasive old growth woody species. Around 48% of the surveyed woodlands are of medium quality, which still have a thick density of invasive woody species, but the woodies are young growth and the area is passable. Only 19% are high quality with occasional invasive woody species present. None of the surveyed woodlands are of very high quality, categorized as areas relatively free of invasive shrubs. Of all the surveyed woodlands, the percentage of dead trees in the canopy is 6%, whereas the total herbaceous vegetation cover is 53%. Refer to Appendix A for a detailed summary of the woodland quality survey performed.

Most of the watershed's agriculture is practiced centrally within the watershed, with the exception of one orchard near the Village of Winnebago to the west. Low residue till is only noted in a few fields within the west-central region of the watershed, defined as less than 30% residue left on the field after fall tillage. There are a few pastures in the watershed that hold a variety of livestock including cows, sheep, horses, and even alpacas. Our tillage survey took place during a wet season when many farmers were not able to harvest their crops on time if at all, which may have affected our results. According to the SWCD county tillage survey, our resulting percentages of tillage types agreed with county averages (Dennis Anthony, personal communication, February 18, 2020) therefore, we consider them to accurately represent farming practices in the watershed.

Specific land use types in the watershed, such as a cemetery, a golf course, a few quarries, and one mulch yard were unique enough to be classified independently even thought their acreages are not prevalent.

PREDICTED FUTURE LAND USES

Development expansion for Rockford and Winnebago is reflected in the 2030 Land Resource Management Plan, Winnebago County, IL (Camiros and Nicolosi & Assoc., 2009), and critical areas for natural preservation are highlighted in the Boone and Winnebago Counties Greenways Plan (R1PC, 2015). The 2030 Plan intends to ensure that change in the region occurs according to the vision of area citizens and governing agencies while accommodating a population increase. It seeks to achieve "proportional economic development, preserve and enhance the urban and rural characters of the County, and minimize the impact of future development on natural resources, agriculture, and the environment" (Camiros and Nicolosi & Assoc., 2009).

Goals and objectives of the 2030 Plan that are applicable to this inventory are to:

- attract new industrial and commercial development,
- preserve prime farmland,
- protect environmentally sensitive areas,
- connect the county's greenway, and

- minimize water pollution and soil erosion.

The 2030 Plan directs residential development adjacent to municipal boundaries in areas with readily available sewer and water, and it reserves key transportation corridors for industrial and commercial growth. It restricts land use within the county greenway to agriculture and open spaces, and it buffers farmland from encroachment or incompatible land uses with large setbacks and planned open space.

To understand the expected changes to land use within the South Fork Kent Creek Watershed, OES compared the existing and future land use maps found within the 2030 Plan. Residential districts are likely to replace farmland along the boundaries of Rockford and Winnebago. Between Rockford and Meridian Road, we expect to see future light industrial replace farmland on either side of U.S. Route 20 extending all the way to the south boundary of the watershed, with some heavy commercial use north of U.S. Route 20. Land newly incorporated into Winnebago will stretch from the existing footprint of Winnebago east to the cemetery. Light industrial with possible heavy commercial will flank U.S. Route 20 to the north of Winnebago and the CC&P Railroad to the south. These potential future land uses would replace existing farmland. Figure 15 and Figure 16 illustrate these changes on the Future Land Use Map.

The 2030 Plan incorporates within its objectives the implementation of the Boone and Winnebago Counties Greenways Plan and Map (R1PC, 2015). This plan identifies features within the South Fork Kent Creek Watershed that are considered Critical/Sensitive Area Priority Acquisition following South Fork Kent Creek. The map shown in Figure 17 depicts the effect of the Greenways Plan within the watershed region. The identified area follows South Fork Kent Creek's floodplain and creates a 150-foot buffer around hydrology, steep slopes, and any special areas identified for priority acquisition (R1PC, 2015). Many of these areas overlap with features identified within this inventory.

In order to estimate the approximate change in future land use, we georeferenced the 2030 plan in ArcMap and digitized the expansions on development overtop the current land use. This map and the acreage breakdown per subbasin for future land use can be observed in Figure 18 and Table 11. Low intensity developed areas replaced high residue till as the most abundant land use, covering 2552.2 acres or 33% of the watershed. Most importantly, these changes in land use will introduce more impervious surfaces.

FUTURE AND CURRENT IMPERVIOUS SURFACES

Surfaces that are considered impervious do not allow for the natural infiltration of stormwater runoff into the ground after rainfall events. Typically, these areas have an impermeable layer such as concrete in developed areas. If not mitigated by best management practices, the increase in impervious surfaces will create more runoff that will flow faster and with more energy during storm events and carry more nonpoint source pollution into the streams. This can negatively impact associated problems of streambank erosion and water quality and amplify the frequency and severity of flood events (Capiella et al, 2012).

We estimated the amount of impervious surface within the South Fork Kent Creek Watershed by first assigning each land use type a coefficient that represents the percent imperviousness then calculating the acres of imperviousness within each land use type. We repeated this equation for current and future land uses and compared the results. We gave roads, railroads, and trails the same coefficient of being entirely impervious, based on the assumption that they are completely paved. We assigned developed areas, from residences to businesses, a coefficient based on the intensity of the developed area. High intensity areas, which we classified as being commercial businesses, have 85% impervious cover. Medium intensity areas include industrial land at 72% imperviousness. Low intensity development represents residences and has on average 38% impervious surfaces. Golf courses, cemeteries, and managed turf grass have a slight coefficient of 9% while the agricultural fields, pastures, and mulch yard only account for 2% imperviousness. Natural areas, yet unaffected by development have no presence of imperviousness. These land uses include forests, grasslands, wetlands, and water. We derived these impervious surface coefficient values from multiple sources. Values for high, medium, and low density developed areas agree with the Natural Resources Conservation Service (New York State, 2017), and we derived values for agricultural and open spaces like golf courses, cemeteries, and turf from U.S.Geological Survey (Capiella and Brown, 2001; Tilley and Slonecker, 2007).

The equation to determine the percent impervious cover within the watershed and each of the subbasins is straightforward. We multiplied the impervious surface coefficient by the amount of acreage in each individual land use type, current or future. The accumulation of all impervious areas by land use type results in the total impervious surface area, which we recorded in acres. We divided the total impervious area by the entire acreage, either at the watershed level or per subbasin. We used a tool called the "Impervious Surfaces Analysis Tool" in ArcMap to generate the total acreages of impervious surface and create a visualization of the status of imperviousness within the watershed by using land use formatted as a raster, the impervious surface coefficients, and the subbasin boundaries.

The current state of impervious surfaces within the South Fork Kent Creek Watershed can be seen in Figure 19, and the future prediction for impervious cover can be observed in Figure 20. Both figures illustrate three ranges of percent impervious cover are used to categorize each subbasin: 0%-10% (low imperviousness), 10%-25% (moderately impervious), and 25%-100% (highly impervious). Refer to Table 11 for a complete breakdown of imperviousness within the South Fork Kent Creek Watershed.

Currently, Subbasins E and F have the lowest percentage of impervious surfaces within the entire watershed (5.2% and 6.8%, respectively), while Subbasins L and N the highest (26.1% and 27.3%, respectively), just over the minimum threshold for the highly impervious category. The other 11 subbasins are moderately impervious, ranging from 10.3% to 25%.

Predictions of future imperviousness within the watershed show a stark contrast caused by projected development from the Winnebago County 2030 Plan. On average, imperviousness throughout the entire watershed will more than double, increasing from an average of 17.2% impervious cover to 37% impervious cover. Subbasin C would experience the most dramatic increase of 47.4% between now and the 2030 projections. Subbasins E, I, and M are predicted to experience minimal increases in percent imperviousness (3.1%, 2.9%, and 1.8% increase, respectively). Subbasin E is the only subbasin predicted to continue to have less than 10% imperviousness, while Subbasins I and M would remain in the 10% to 25% impervious range along with Subbasin H. The other 11 subbasins are predicted to be classified as having highly impervious coverage, ranging between 31.6% and 66.7% imperviousness.

WILDLIFE WITHIN THE WATERSHED

Wildlife living within the region of the South Fork Kent Creek Watershed is documented from national and local sources. We utilized the U.S. Fish and Wildlife Service (USFWS) tool called Information for Planning and Consultation (IPaC) to determine species of concern within the vicinity of the watershed (2019). A Bioblitz occurred in the Rockford Park District's nearby Anna R. Page Park in 2007 and a wildlife survey by the Forest Preserves of Winnebago County was completed in areas surrounding and including the South Fork Kent Creek Watershed in 2019.

The USFWS identified through IPaC the following threatened and endangered species found within the vicinity of the watershed:

- Indiana bat (*Myotis sodalis*) is endangered throughout its range. The critical habitat for this bat species, finalized in the Federal Register on September 22, 1977, is located outside of the watershed boundary.
- Northern long-eared bat (*Myotis septentrionalis*) is threatened due to white-nose syndrome, a fungal disease, which has not yet spread throughout its entire range.
- Hine's emerald dragonfly (*Somatochlora hineana*) is an endangered species. Critical habitat for this species, finalized in Federal Register on April 23, 2010, is located 90 miles east of the watershed in Will, Cook, and DuPage counties.
- Rusty patched bumble bee (*Bombus affinis*) is an endangered species that may be found within the watershed within a small area of "High Potential Zone" surrounding Levings Lake. It is not likely to be found in the remainder of the watershed, as indicated by a "Low Potential Zone" on the Rusty Patched Bumble Bee Map (USFWS, 2020). The species has declined by 87% in the last 20 years (USFWS, 2019b).

IPac also found the following bird species in the IPaC database, Birds of Conservation Concern (BCC) list, or protected by federal law. Bald eagle (*Haliaeetus leucocaphalus*) is not a BCC in the area but is listed here because it has a special attention due to Eagle Act or potential susceptibilities to developed areas. Three bird species are considered BCC in only particular locations of the Bird Conservation Regions (BCRs): dunlin (*Calidris alpina arcticola*), Smith's longspur (*Calcarius pictus*), and American bittern (*Botaurus lentiginosus*). Other bird species found in the area are considered BCC throughout their ranges in the continental United States and Alaska: American golden-plover (*Pluvialis dominica*), black-billed cuckoo (*Coccyzus erythropthalmus*), bobolink (*Dolichonyx oryzivorus*), cerulean warbler (*Dendroica cerulea*), eastern whip-poor-will (*Antrostomus vociferous*), Henslow's sparrow (*Ammodramus henslowii*), hudsonian godwit (*Limosa haemastica*), Kentucky warbler (*Oporornis formosus*), king rail (*Rallus elegans*), lesser yellowlegs (*Tringa flavipes*), prothonotary warbler (*Protonotaria citrea*), red-headed woodpecker (*Melanerpes erythrocephalus*), rusty blackbird (*Euphagus carolinus*), semipalmated sandpiper (*Calidris pusilla*), and wood thrush (*Hylocichla mustelina*). The breeding season for each BCC in the region is represented in Table 12.

A BioBlitz is a biological surveying event that includes participation of biologists, citizen scientists, naturalists, and local volunteers. BioBlitz is an attempt to identify and record as many species possible in a specific area and time (iNaturalist, 2019; National Geographic, 2019). Anne R. Page Park is a 300-acre park managed by the Rockford Park District located about one mile north of the South Fork Kent Creek watershed. Although Anna R. Page Forest Preserve is not within the watershed boundary, a BioBlitz conducted there on May 19, 2007 provides a good understanding of biodiversity of the region. Over 100 local citizens participated along with professional biologists specializing in their field of study. They found 306 species during the 8-hour Bioblitz. Some notable species found are: common burrowing mayfly (*Hexagenia spp*), pileated woodpecker (*Dryocopus pileatus*), yellow-throated warbler (*Setophaga dominica*), yellow breasted chat (Icteria virens), shells of the slipper shell mussel (*Alasmidonta viridis*), larvae of the Baltimore checker spot (*Euphydryas phaeton*), and scarlet tanager (*Piranga olivacea*). Slipper shell mussel is a state threatened species.

The Forest Preserves of Winnebago County have reported wildlife found within Winnebago County including birds, crayfish, fish, insects, mammals, mussels, reptiles, and amphibians. Over 320 species are documented in Winnebago County's four rivers, prairies, wetlands, and woodlands. More than 100 species of songbirds have been seen stopping by the Rock River basin as their migratory base. The county's four rivers and protected wetlands and marshes support many marsh birds. The threatened yellow-crowned night heron (*Nyctanassa violacea*) has been documented in the county along with other rare marsh bird species such as sora (*Porzana carolina*), black-crowned night heron (*Nycticorax nycticorax*), American bittern (*Botaurus lentiginosus*), least bittern (*Ixobrychus exilis*), great egret (*Ardea alba*), and pied-billed grebe (*Podilymbus podiceps*). About 35 species of waterfowl have been observed in large, restored wetland complexes such as Pecatonica Wetlands Forest Preserve, Pecatonica River Forest Preserve, and Nygren Wetland Preserve (Forest Preserves of Winnebago County, 2019).

Seven native species of crayfish are found in the county: devil (*Cambarus diogenes*), digger (*Fallicambarus fodiens*), calico (*Orconectes immunis*), northern clearwater (*Orconectes propinquus*), northern crayfish (*Orconectes virilis*), white river (*Procambarus acutus*), and prairie crawfish (*Procambarus gracilis*). There is at least one species of native freshwater shrimp, either the glass (*Palaemonetes paludosus*) or Mississippi grass shrimp (*Palaemonetes kadiakensis*) (Forest Preserves of Winnebago County, 2019).

There are about 20 game fish species living in Winnebago County: black bullhead (*Ameiurus melas*), black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), channel catfish (*Ictalurus punctatus*), common carp (*Cyprinus carpio*), flathead catfish (*Pylodictis olivaris*), gizzard shad (*Dorosoma cepedianum*), grass carp (*Ctenopharyngodon idella*), green sunfish (*Lepomis cyanellus*), largemouth bass (*Micropterus salmoides*), muskellunge (*Esox masquinongy*), northern pike (*Esox lucius*), quillback (*Carpiodes cyprinus*), redear sunfish (*Lepomis microlophus*), rock bass (*Ambloplites rupestris*), smallmouth bass (*Micropterus dolomieui*), walleye (*Sander vitreus*), white crappie (*Pomoxis annularis*), white sucker (*Catostomus commersoni*), yellow bullhead (*Ameiurus natalis*), and yellow perch (*Perca flavescens*) (Forest Preserves of Winnebago County, 2019).

Winnebago County has favorable insect habitat, including wet areas favorable for more than 20 species of dragonflies found in the county. There are 10 species of bumble bees and about 100 species of butterflies and moths identified in the county (Forest Preserves of Winnebago County, 2019).

There are 48 species of mammals found in the 10,000 acres of forest preserves. Some mammals that have been observed in the county are badgers, bats, beavers, chipmunks, ground squirrels, rabbits, foxes, coyotes, tree squirrels, skunks, deer, minks, weasels, muskrats, opossums, raccoons, river otters, mice, voles, shrews, and moles (Forest Preserves of Winnebago County, 2019).

There are 19 species of mussels found in Winnebago county: creek heel splitter (*Lasmigona compressa*), pimple back (*Quadrula pustulosa*), pistol grip (*Tritogonia verrucosa*), three ridge (*Amblema plicata*), wabash pig toe (*Fusconaia flava*), elk toe (*Alasmidonta marginata*), fluted shell (*Lasmigona costata*), giant floater (*Pyganodon grandis*), paper pondshell (*Utterbackia imbecillis*), white heel splitter (*Lasmigona complanata*), black sandshell (*Ligumia recta*), deer toe (*Truncilla truncata*), fat mucket (*Lampsilis siliquoidea*), pink heel splitter (*Potamilus alatus*), plain pocket book (*Lampsilis cardium*), creeper (*Strophitus undulates*), ellipse (*Venustaconcha ellipsiformis*), spike (*Elliptio dilatata*), and fawns foot (*Truncilla donaciformis*). Black sandshell and spike are mussel species that are threatened in the area (Forest Preserves of Winnebago County, 2019).

There are 21 reptile species found in the county. The snake species that can be found are: eastern plains garter snake (*Thamnophis radix radix*), common garter snake (*Thamnophis sirtalis*), midland brown snake (*Storeria dekayi wrightorum*), eastern hognose snake (*Heterodon platirhinos*), northern water snake (*Nerodia sipedon*), smooth green snake (*Opheodrys vernalis*), western fox snake (*Elaphe vulpine*), and eastern milk snake (*Lampropeltis triangulum triangulum*) (Forest Preserves of Winnebago County, 2019).

The native turtle species in the area are: blanding's turtle (*Emydoidea blandingii*), common map turtle (*Graptemys geographica*), common musk turtle (*Sternotherus odoratus*), eastern box turtle (*Terrapene carolina*), eastern spiny softshell turtle (*Apalone spinifera*), false map turtle (*Graptemys pseudogeographica*), midland painted turtle (*Chrysemys picta*), snapping turtle (*Chelydra serpentine*), and ornate box turtle (*Terrapene ornata*) (Forest Preserves of Winnebago County, 2019).

There are 15 species of amphibians. Frog species include the American toad (*Anaxyrus americanus*), bullfrog (*Lithobates catesbeiana*), eastern gray tree frog (*Hyla versicolor*), Cope's gray tree frog (*Hyla chrysoscelis*), green frog (*Lithobates clamitans*), northern leopard frog (*Lithobates pipiens*), spring peeper (*Pseudacris crucifer*), western chorus frog (*Pseudacris triseriata*), and wood frog (*Lithobates sylvaticus*). There are 5 native species from order Caudata found in the county: blue-spotted salamander (*Ambystoma laterale*), tiger salamander (*Ambystoma tigrinum*), spotted salamander (*Ambystoma maculatum*), mudpuppy (*Necturus maculosus*), and eastern newt (*Notophthalmus viridescens*) (Forest Preserves of Winnebago County, 2019).

DEMOGRAPHICS

We gleaned demographic information from block groups and census tracks within the South Fork Kent Creek Watershed. There are 14 block groups that fall within the watershed as shown in Figure 21. The data reported in 2017 for these block groups include a total population of 15,548 people with median age of 38.85 years and 6,366 housing units (U.S. Census Bureau, 2017). Although the block groups data is more specific to the watershed, the census tract data records give a broader understanding of the area's demographics. There are census tract records for total population, estimated growth rate, and median household income. Five census tracts fall within the watershed. The Illinois Tract 17201004200 covers the largest portion of the watershed. Total population for all census tracts is 22,792 people with a growth rate of -0.25% (Esri, 2019b). The median household income is estimated to be $48,656 (Esri, 2019a). Table 13 shows the census tracts data and block group data of the watersheds.

TABLE 8: 1800'S HISTORIC LAND COVER

1800's Historic Land Use			
Type	**Description**	**% Watershed**	**Acres**
Prairie	A large area of level or rolling grassland, generally treeless.	81.5%	6,322
Timber	A thick growth of trees, etc. covering a large tract of land.	15.9%	1,233
Water	Lake, low land, pond, river, wide river, spring.	0.79%	62
Marsh	A tract of low, poorly drained, soft land, permanently or semi-permanently water-covered, having aquatic and grass-like vegetation	0.71%	55
Slough	A place full of soft, muddy waterlogged ground; a marsh or shallow undrained depression	0.35%	27
Topo/Geo	Bluff, sand bluff, clifts, dry ground, glade, hills, sandy hill, mound, high mound, high ridge, sandy ridge, island, sandy island, ledge, licks, rough, rolling land, rocky, ravine, gully, valley, hollow, sandy ground, sinkhole.	0.001%	0.06
Cultural	A piece of land with houses, barns, etc., on which crops or animals are raised or grazed.	0.79%	61
	Total:	**100%**	**7,760**

TABLE 9: LAND USE

Land Use		
Land Use Type	**Acres**	**%**
High Intensity, Developed	85	1.1%
Medium Intensity, Developed	161	2.1%
Low Intensity, Developed	1,514	19.5%
Roads	367	4.7%
Railroad	42	0.54%
Trail	29	0.37%
Golf Course	123	1.6%
Cemetery	69	0.89%
Turf	373	4.8%
High Residue Till	2,726	35.1%
Low Residue Till	717	9.2%
Orchard	2	0.02%
Pasture	37	0.5%
Quarry	74	1.0%
Mulch Yard	23	0.30%
Forest	1,090	14.0%
Grassland	212	2.7%
Wetland	54	0.69%
Water	63	0.81%
Total:	**7,760**	**100%**

TABLE 10: LAND USE PER SUBBASINS

Land Use Per Subbasin - South Fork Kent Creek										
Land Use Type	A		B		C		D		E	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
High Intensity, Developed	6	1.0%	0	0.0%	38	7.3%	4	0.6%	0	0.0%
Medium Intensity, Developed	49	8.4%	0	0.0%	15	2.8%	2	0.2%	0	0.0%
Low Intensity, Developed	52	8.9%	28	5.5%	47	9.0%	172	25.9%	19	3.4%
Roads	72	12.5%	28	5.6%	25	4.8%	26	3.9%	4	0.7%
Railroad	0	0.0%	9	1.7%	6	1.1%	2	0.4%	8	1.4%
Trail	0	0.0%	0	0.0%	4	0.7%	14	2.1%	0	0.0%
Golf Course	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Cemetery	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Turf	98	17.0%	15	3.1%	18	3.4%	15	2.2%	4	0.8%
High Residue Till	100	17.2%	145	28.9%	179	33.9%	223	33.4%	313	57.2%
Low Residue Till	90	15.5%	13	2.7%	0	0.0%	7	1.0%	158	28.9%
Orchard	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Pasture	0	0.0%	0	0.0%	0	0.0%	2	0.3%	0	0.0%
Quarry	9	1.6%	32	6.4%	3	0.5%	0	0.0%	0	0.0%
Mulch Yard	0	0.0%	1	0.3%	22	4.2%	0	0.0%	0	0.0%
Forest	89	15.3%	211	41.9%	145	27.5%	187	28.0%	12	2.2%
Grassland	9	1.5%	0.4	0.1%	16	3.0%	5	0.8%	22	4.0%
Wetland	6	1.0%	14	2.7%	8	1.5%	7	1.0%	4	0.8%
Water	0.2	0.0%	6	1.2%	1	0.3%	0.7	0.1%	3	0.5%
Total:	**580**	**100%**	**504**	**100%**	**526**	**100%**	**666**	**100%**	**548**	**100%**

Land Use Per Subbasin - South Fork Kent Creek (Continued)										
Land Use Type	F		G		H		I		J	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
High Intensity, Developed	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Medium Intensity, Developed	0	0.0%	25	5.3%	13	2.8%	0.7	0.1%	1	0.3%
Low Intensity, Developed	12	1.7%	168	35.0%	154	33.7%	27	6.0%	125	35.9%
Roads	16	2.4%	11	2.2%	9	1.9%	24	5.4%	18	5.3%
Railroad	12	1.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Trail	0	0.0%	0	0.0%	5	1.1%	6	1.3%	0	0.0%
Golf Course	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Cemetery	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Turf	0	0.0%	16	3.2%	47	10.2%	10	2.2%	8	2.4%
High Residue Till	456	69.4%	250	52.2%	94	20.6%	128	28.4%	158	45.6%
Low Residue Till	147	22.3%	0	0.0%	77	16.9%	196	43.5%	28	7.9%
Orchard	0	0.0%	0	0.0%	2	0.4%	0	0.0%	0	0.0%
Pasture	0	0.0%	0	0.0%	0	0.0%	0	0.0%	5	1.5%
Quarry	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mulch Yard	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Forest	13	2.0%	6	1.3%	36	7.9%	10	2.3%	4	1.0%
Grassland	2	0.2%	3	0.7%	20	4.4%	37	8.1%	0	0.0%
Wetland	0	0.0%	0	0.0%	0	0.0%	11	2.5%	0	0.0%
Water	0.3	0.0%	0	0.0%	0.3	0.1%	0	0.0%	0	0.0%
Total:	**658**	**100%**	**478**	**100%**	**457**	**100%**	**450**	**100%**	**348**	**100%**

Land Use Per Subbasin - South Fork Kent Creek (Continued)										
Land Use Type	K		L		M		N		O	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
High Intensity, Developed	1	0.3%	0.4	0.1%	0.2	0.0%	24	4.5%	10	2.1%
Medium Intensity, Developed	4	1.2%	3	0.6%	9	1.3%	34	6.3%	6	1.2%
Low Intensity, Developed	44	12.5%	227	47.6%	142	21.1%	215	40.2%	82	16.3%
Roads	22	6.2%	32	6.8%	49	7.3%	10	1.9%	20	3.9%
Railroad	0	0.0%	0	0.0%	6	0.8%	0	0.0%	0	0.0%
Trail	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Golf Course	0	0.0%	0	0.0%	55	8.2%	68	12.7%	0	0.0%
Cemetery	58	16.6%	11	2.3%	0	0.0%	0	0.0%	0	0.0%
Turf	26	7.2%	17	3.5%	61	9.0%	9	1.6%	29	5.7%
High Residue Till	163	46.1%	43	8.9%	60	8.9%	132	24.7%	282	56.1%
Low Residue Till	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Orchard	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Pasture	0	0.0%	0	0.0%	14	2.0%	0	0.0%	16	3.3%
Quarry	0	0.0%	0	0.0%	30	4.4%	0	0.0%	0	0.0%
Mulch Yard	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Forest	23	6.6%	113	23.7%	182	26.9%	35	6.5%	24	4.7%
Grassland	11	3.2%	26	5.5%	19	2.9%	7	1.4%	33	6.6%
Wetland	0.3	0.1%	0	0.0%	13	1.9%	0	0.0%	0	0.0%
Water	0.3	0.1%	5	1.0%	36	5.3%	1	0.2%	0	0.0%
Total:	**353**	**100%**	**478**	**100%**	**676**	**100%**	**535**	**100%**	**503**	**100%**

TABLE 11: IMPERVIOUS SURFACE ANALYSIS FOR SOUTH FORK KENT CREEK

Impervious Surface Analysis for South Fork Kent Creek, Current and Future Estimates Based on Land Use Type																	
Land Use Type	Imp Surf	SFKC		SFKC FUTURE		A		A FUTURE		B		B FUTURE		C		C FUTURE	
	Coefficien	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf
High Intensity, Developed	0.85	84.7	72.0	423.5	360.0	6.0	5.1	24.5	20.8	0.0	0.0	0.0	0.0	38.3	32.6	38.3	32.6
Medium Intensity, Developed	0.72	160.7	115.7	1,395.0	1004.4	48.9	35.2	56.1	40.4	0.0	0.0	225.0	162.0	14.8	10.6	336.0	241.9
Low Intensity, Developed	0.38	1,514.1	575.3	2,552.2	969.8	51.6	19.6	107.8	41.0	27.6	10.5	100.4	38.2	47.4	18.0	104.5	39.7
Roads	1	367.3	367.3	366.1	366.1	72.5	72.5	72.5	72.5	28.0	28.0	26.8	26.8	25.3	25.3	25.3	25.3
Railroad	1	42.0	42.0	41.7	41.7	0.0	0.0	0.0	0.0	8.6	8.6	8.2	8.2	5.8	5.8	5.8	5.8
Trail	1	28.7	28.7	46.2	46.2	0.0	0.0	2.4	2.4	0.0	0.0	2.8	2.8	3.7	3.7	5.3	5.3
Golf Course	0.09	123.3	11.1	123.3	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cemetery	0.09	69.5	6.3	69.5	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turf	0.09	372.5	33.5	252.3	22.7	98.3	8.9	86.6	7.8	15.4	1.4	4.7	0.4	17.8	1.6	0.4	0.0
High Residue Till	0.02	2,726.3	54.5	1,010.5	20.2	99.5	2.0	78.1	1.6	145.4	2.9	19.8	0.4	178.6	3.6	2.6	0.1
Low Residue Till	0.02	716.7	14.3	649.3	13.0	90.1	1.8	90.1	1.8	13.4	0.3	13.4	0.3	0.0	0.0	0.0	0.0
Orchard	0.02	1.7	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasture	0.02	36.8	0.7	27.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Quarry	0	74.1	0.0	34.2	0.0	9.4	0.0	4.7	0.0	32.5	0.0	0.2	0.0	2.6	0.0	0.0	0.0
Mulch Yard	0.02	23.4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	22.1	0.4	0.0	0.0
Forest	0	1,089.6	0.0	535.5	0.0	88.6	0.0	50.0	0.0	211.4	0.0	87.6	0.0	144.8	0.0	6.2	0.0
Grassland	0	211.9	0.0	135.6	0.0	8.8	0.0	3.5	0.0	0.4	0.0	0.4	0.0	15.6	0.0	0.0	0.0
Wetland	0	53.8	0.0	42.3	0.0	6.1	0.0	3.6	0.0	13.8	0.0	8.4	0.0	7.8	0.0	0.0	0.0
Water	0	63.1	0.0	53.2	0.0	0.2	0.0	0.2	0.0	6.1	0.0	6.1	0.0	1.4	0.0	1.4	0.0
Total Area (Acres)		**7,760**	**1322**	**7,760**	**2,862**	**580**	**145**	**580**	**188**	**504**	**52**	**504**	**239**	**526**	**102**	**526**	**351**
% Impervious Surface		**17.0%**		**36.9%**		**25.0%**		**32.4%**		**10.3%**		**47.4%**		**19.3%**		**66.7%**	

Impervious Surface Analysis for South Fork Kent Creek, Current and Future Estimates Based on Land Use Type (Continued)																	
Land Use Type	Imp Surf	D		D FUTURE		E		E FUTURE		F		F FUTURE		G		G FUTURE	
	Coefficien	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf
High Intensity, Developed	0.85	4.3	3.6	4.3	3.6	0.0	0.0	17.0	14.5	0.0	0.0	70.5	60.0	0.0	0.0	0.0	0.0
Medium Intensity, Developed	0.72	1.6	1.1	199.7	143.8	0.0	0.0	3.5	2.5	0.0	0.0	153.5	110.5	25.2	18.1	30.5	21.9
Low Intensity, Developed	0.38	172.4	65.5	344.8	131.0	18.7	7.1	18.7	7.1	11.5	4.4	87.0	33.1	167.6	63.7	394.6	150.0
Roads	1	26.2	26.2	26.2	26.2	4.1	4.1	4.1	4.1	16.0	16.0	16.0	16.0	10.5	10.5	10.5	10.5
Railroad	1	2.4	2.4	2.4	2.4	7.6	7.6	7.6	7.6	12.1	12.1	12.1	12.1	0.0	0.0	0.0	0.0
Trail	1	13.9	13.9	10.3	10.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Golf Course	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cemetery	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turf	0.09	14.8	1.3	1.9	0.2	4.5	0.4	4.5	0.4	0.0	0.0	0.0	0.0	15.5	1.4	15.5	1.4
High Residue Till	0.02	222.6	4.5	49.6	1.0	313.3	6.3	309.4	6.2	456.3	9.1	209.1	4.2	249.9	5.0	21.1	0.4
Low Residue Till	0.02	6.9	0.1	6.9	0.1	158.3	3.2	141.9	2.8	147.0	2.9	96.0	1.9	0.0	0.0	0.0	0.0
Orchard	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasture	0.02	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Quarry	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mulch Yard	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forest	0	186.6	0.0	17.9	0.0	12.2	0.0	12.2	0.0	13.0	0.0	13.0	0.0	6.1	0.0	6.1	0.0
Grassland	0	5.2	0.0	0.0	0.0	22.0	0.0	21.8	0.0	1.6	0.0	0.4	0.0	3.5	0.0	0.0	0.0
Wetland	0	6.6	0.0	1.7	0.0	4.5	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water	0	0.7	0.0	0.1	0.0	2.7	0.0	2.7	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Total Area (Acres)		**666**	**119**	**666**	**319**	**548**	**29**	**548**	**45**	**658**	**45**	**658**	**238**	**478**	**99**	**478**	**184**
% Impervious Surface		**17.8%**		**47.9%**		**5.2%**		**8.3%**		**6.8%**		**36.1%**		**20.6%**		**38.5%**	

Impervious Surface Analysis for South Fork Kent Creek, Current and Future Estimates Based on Land Use Type (Continued)																	
Land Use Type	Imp Surf	H		H FUTURE		I		I FUTURE		J		J FUTURE		K		K FUTURE	
	Coefficien	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf
High Intensity, Developed	0.85	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.0	99.4	84.5
Medium Intensity, Developed	0.72	12.7	9.2	12.7	9.2	0.7	0.5	0.7	0.5	1.1	0.8	1.1	0.8	4.1	3.0	3.6	2.6
Low Intensity, Developed	0.38	154.1	58.6	219.9	83.6	27.1	10.3	65.1	24.7	124.9	47.5	233.7	88.8	44.1	16.7	158.2	60.1
Roads	1	8.5	8.5	8.5	8.5	24.3	24.3	24.3	24.3	18.4	18.4	18.4	18.4	21.7	21.7	21.7	21.7
Railroad	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trail	1	5.2	5.2	5.2	5.2	5.9	5.9	5.9	5.9	0.0	0.0	0.0	0.0	0.0	0.0	3.2	3.2
Golf Course	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cemetery	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.4	5.3	58.4	5.3
Turf	0.09	46.6	4.2	46.6	4.2	10.0	0.9	2.3	0.2	8.5	0.8	1.0	0.1	25.6	2.3	0.3	0.0
High Residue Till	0.02	94.1	1.9	28.3	0.6	127.7	2.6	97.5	1.9	158.5	3.2	65.8	1.3	162.7	3.3	0.0	0.0
Low Residue Till	0.02	77.5	1.5	77.5	1.5	195.8	3.9	195.8	3.9	27.6	0.6	27.6	0.6	0.0	0.0	0.0	0.0
Orchard	0.02	1.7	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasture	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Quarry	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mulch Yard	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forest	0	36.4	0.0	36.4	0.0	10.4	0.0	10.4	0.0	3.5	0.0	0.0	0.0	23.4	0.0	7.1	0.0
Grassland	0	20.3	0.0	20.3	0.0	36.6	0.0	36.6	0.0	0.0	0.0	0.0	0.0	11.4	0.0	1.0	0.0
Wetland	0	0.0	0.0	0.0	0.0	11.2	0.0	11.2	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
Water	0	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.0
Total Area (Acres)		**457**	**89**	**458**	**113**	**450**	**48**	**450**	**62**	**348**	**71**	**348**	**110**	**353**	**53**	**353**	**177**
% Impervious Surface		**19.5%**		**24.7%**		**10.8%**		**13.7%**		**20.5%**		**31.6%**		**15.1%**		**50.2%**	

Impervious Surface Analysis for South Fork Kent Creek, Current and Future Estimates Based on Land Use Type (Continued)																	
Land Use Type	Imp Surf	L		L FUTURE		M		M FUTURE		N		N FUTURE		O		O FUTURE	
	Coefficien	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf	Acres	Imp Surf
High Intensity, Developed	0.85	0.4	0.4	19.4	16.5	0.2	0.1	0.2	0.1	23.9	20.4	54.4	46.3	10.4	8.8	95.6	81.3
Medium Intensity, Developed	0.72	3.0	2.1	32.9	23.7	9.0	6.5	9.0	6.5	33.7	24.2	162.8	117.2	6.1	4.4	167.9	120.9
Low Intensity, Developed	0.38	227.4	86.4	239.2	90.9	142.4	54.1	168.0	63.8	215.1	81.7	214.4	81.5	82.1	31.2	95.9	36.4
Roads	1	32.5	32.5	32.5	32.5	49.2	49.2	49.2	49.2	10.2	10.2	10.2	10.2	19.8	19.8	19.8	19.8
Railroad	1	0.0	0.0	0.0	0.0	5.5	5.5	5.5	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trail	1	0.0	0.0	3.5	3.5	0.0	0.0	3.1	3.1	0.0	0.0	2.8	2.8	0.0	0.0	1.7	1.7
Golf Course	0.09	0.0	0.0	0.0	0.0	55.2	5.0	55.2	5.0	68.1	6.1	68.1	6.1	0.0	0.0	0.0	0.0
Cemetery	0.09	11.0	1.0	11.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turf	0.09	16.9	1.5	15.2	1.4	61.0	5.5	56.1	5.1	8.6	0.8	0.0	0.0	28.8	2.6	17.0	1.5
High Residue Till	0.02	42.5	0.9	0.0	0.0	60.5	1.2	60.3	1.2	132.2	2.6	1.2	0.0	282.3	5.6	67.8	1.4
Low Residue Till	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Orchard	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasture	0.02	0.0	0.0	0.0	0.0	13.5	0.3	11.3	0.2	0.0	0.0	0.0	0.0	16.4	0.3	16.4	0.3
Quarry	0	0.0	0.0	0.0	0.0	29.5	0.0	29.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mulch Yard	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forest	0	113.2	0.0	102.9	0.0	181.5	0.0	161.1	0.0	34.7	0.0	19.9	0.0	23.9	0.0	4.7	0.0
Grassland	0	26.4	0.0	16.8	0.0	19.4	0.0	18.7	0.0	7.3	0.0	0.0	0.0	33.2	0.0	16.2	0.0
Wetland	0	0.0	0.0	0.0	0.0	12.9	0.0	12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water	0	4.8	0.0	4.8	0.0	35.8	0.0	35.8	0.0	1.1	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Total Area (Acres)		**478**	**125**	**478**	**169**	**676**	**127**	**676**	**140**	**535**	**146**	**535**	**264**	**503**	**73**	**503**	**263**
% Impervious Surface		**26.1%**		**35.4%**		**18.9%**		**20.7%**		**27.3%**		**49.4%**		**14.5%**		**52.3%**	

Table 12: Bird of Conservation Concern and Breeding Season

Birds of Conservation Concern and Breeding Season	
Bird Species	**Breeding Season**
American bittern	April to August
Black-billed cuckoo	May to October
Bobolink	May to July
Cerulean warbler	April to July
Eastern whip-poor-will	May to August
Henslow's sparrow	May to August
Kentucky warbler	April to August
King rail	May to September
Prothonotary warbler	April to July
Red-headed woodpecker	May to September
Wood thrush	May to August

Table 13: Demographics

Tract 1720100-	Block Group	Current Population (2019)	Estimated Population (2024)	Average Household Income	Township	Total Housing Units	Total Population	Male	Female	Median Age
2200	1	1,232	1,182	$43,032.00	Rockford	414	1,150	597	553	37.6
	2	1,316	1,277	$58,856.00	Rockford	543	1,430	779	651	39.5
	4	664	646	$60,442.00	Rockford	271	649	306	343	37.1
2301	1	989	933	$47,668.00	Rockford	424	800	427	373	44.6
2302	1	722	688	$42,503.00	Rockford	318	665	295	370	38.2
	2	651	633	$74,858.00	Rockford	287	587	275	312	52.4
2400	1	1,159	1,091	$22,845.00	Rockford	483	995	407	588	24.3
	3	727	692	$32,502.00	Rockford	314	849	347	502	26.9
3601	2	766	896	$84,236.00	Rockford	273	604	288	316	52.4
3711	1	1,432	1,456	$98,548.00	Burritt/Winnebago	580	1,585	778	807	37.11
4200	1	1,097	1,064	$117,855.00	Winnebago	482	1,156	668	488	41.3
	2	2,513	2,399	$89,695.00	Winnebago	1,138	2,809	1,409	1,400	45.7
	3	1,779	2,247	$107,023.00	Winnebago	577	1,636	883	753	48.5
	4	687	781	$97,250.00	Winnebago	262	633	401	232	36.9
Totals and Averages:		**15,734**	**15,985**	**$69,808.07**		**6,366**	**15,548**	**7,860**	**7,688**	**38.85**

FIGURE 12: 1800'S LAND COVER

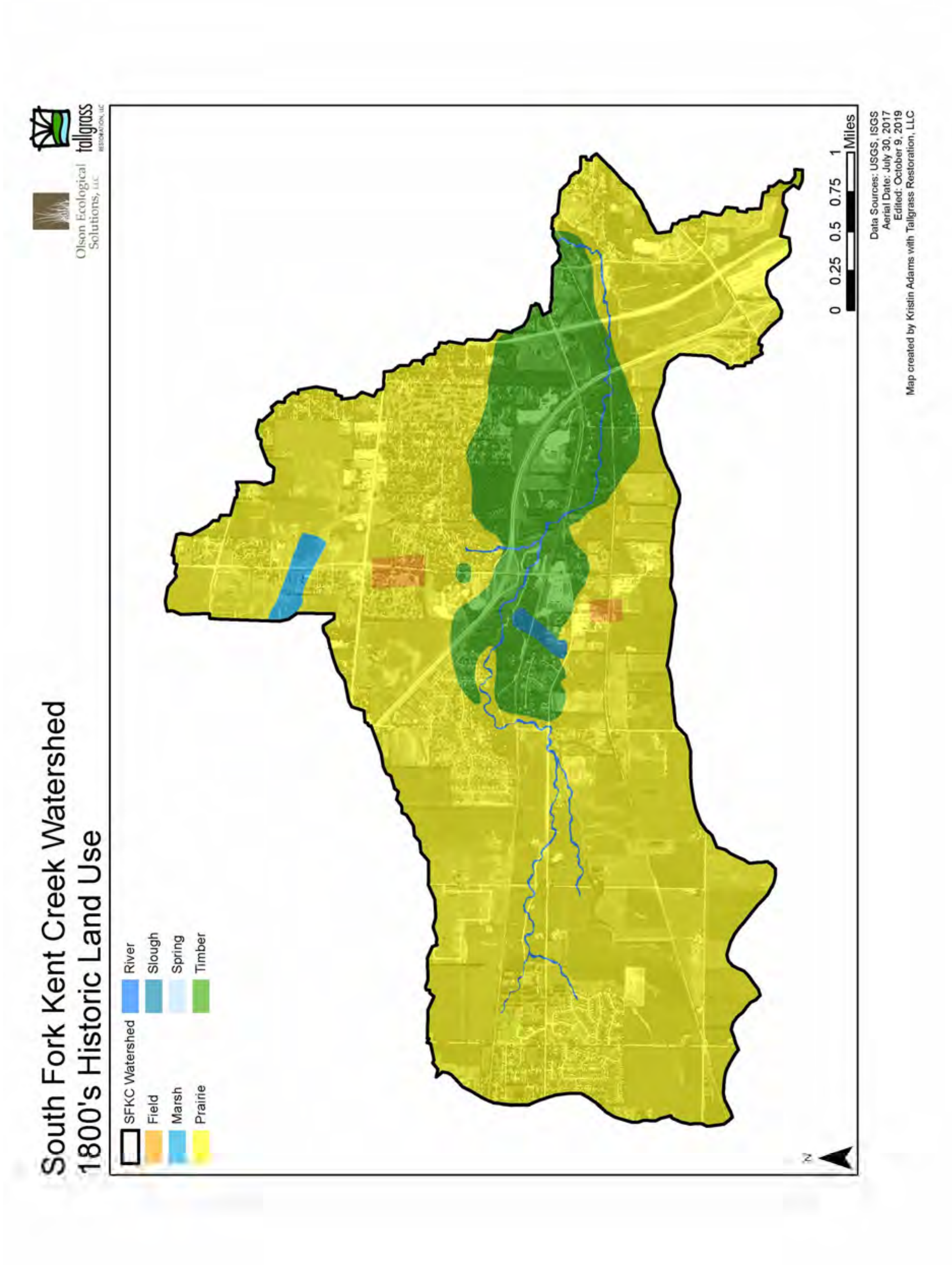


FIGURE 13: LAND COVER

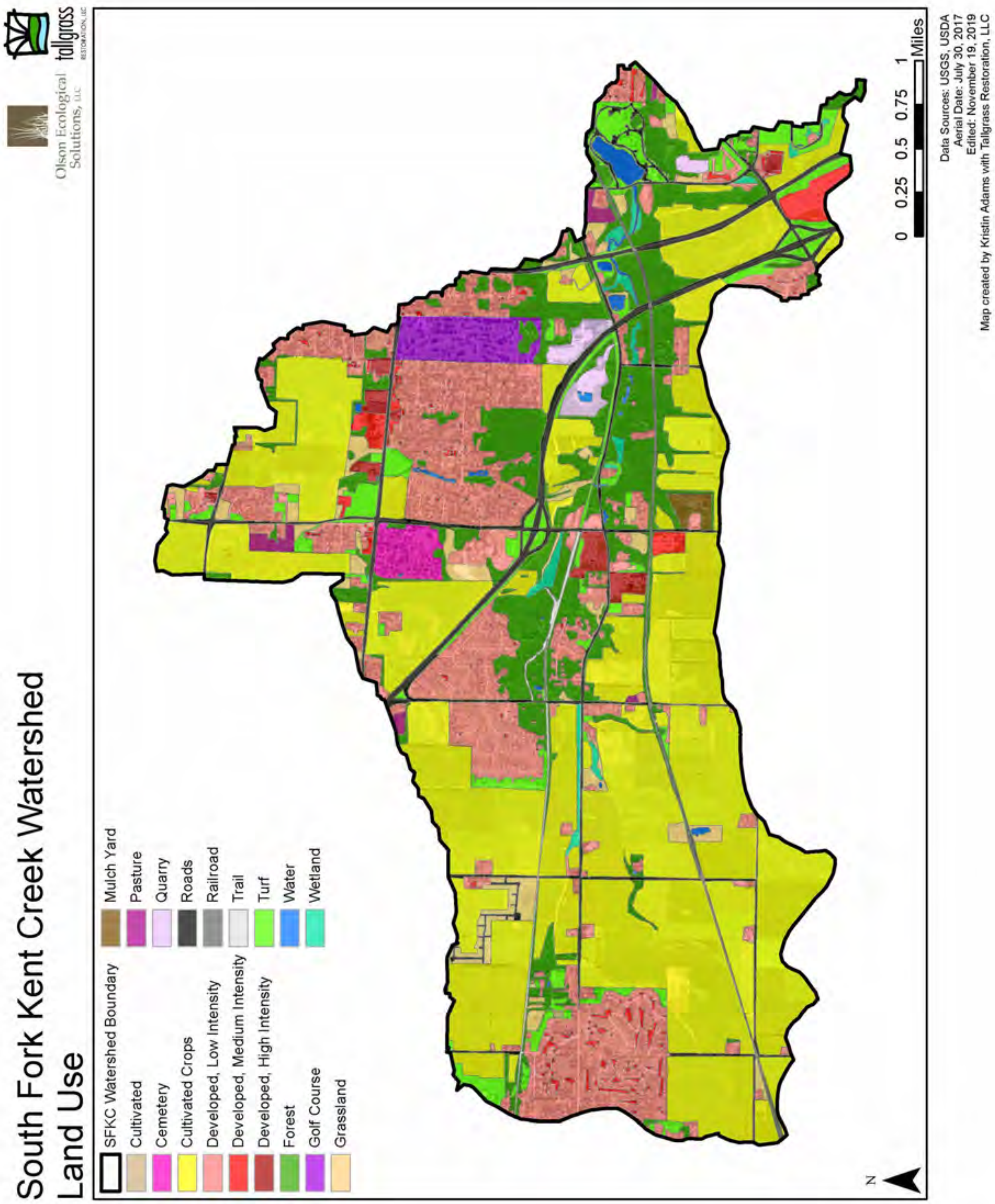


FIGURE 14: SEWER LINE MAP

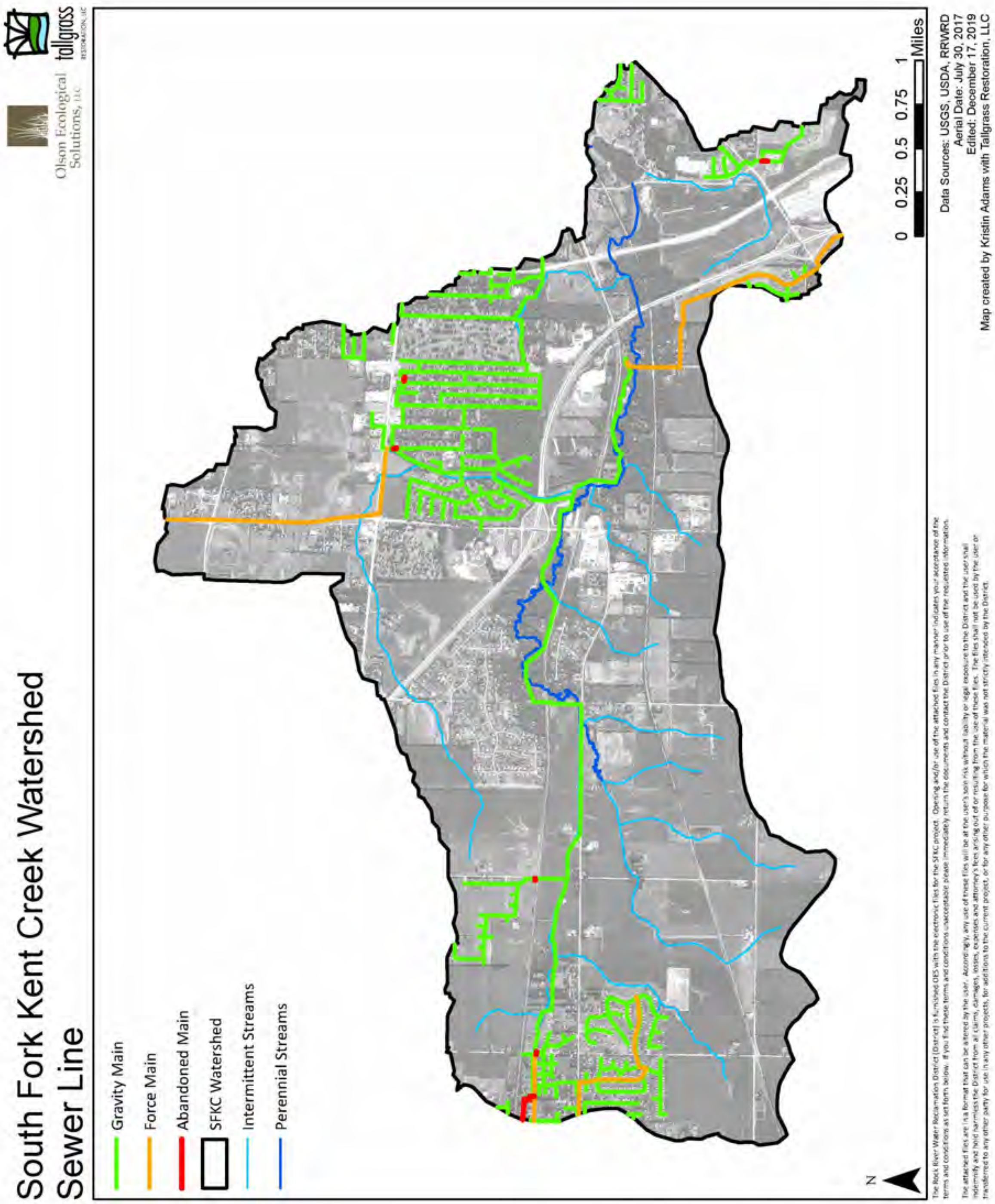


FIGURE 15: WINNEBAGO - 2030 PLAN

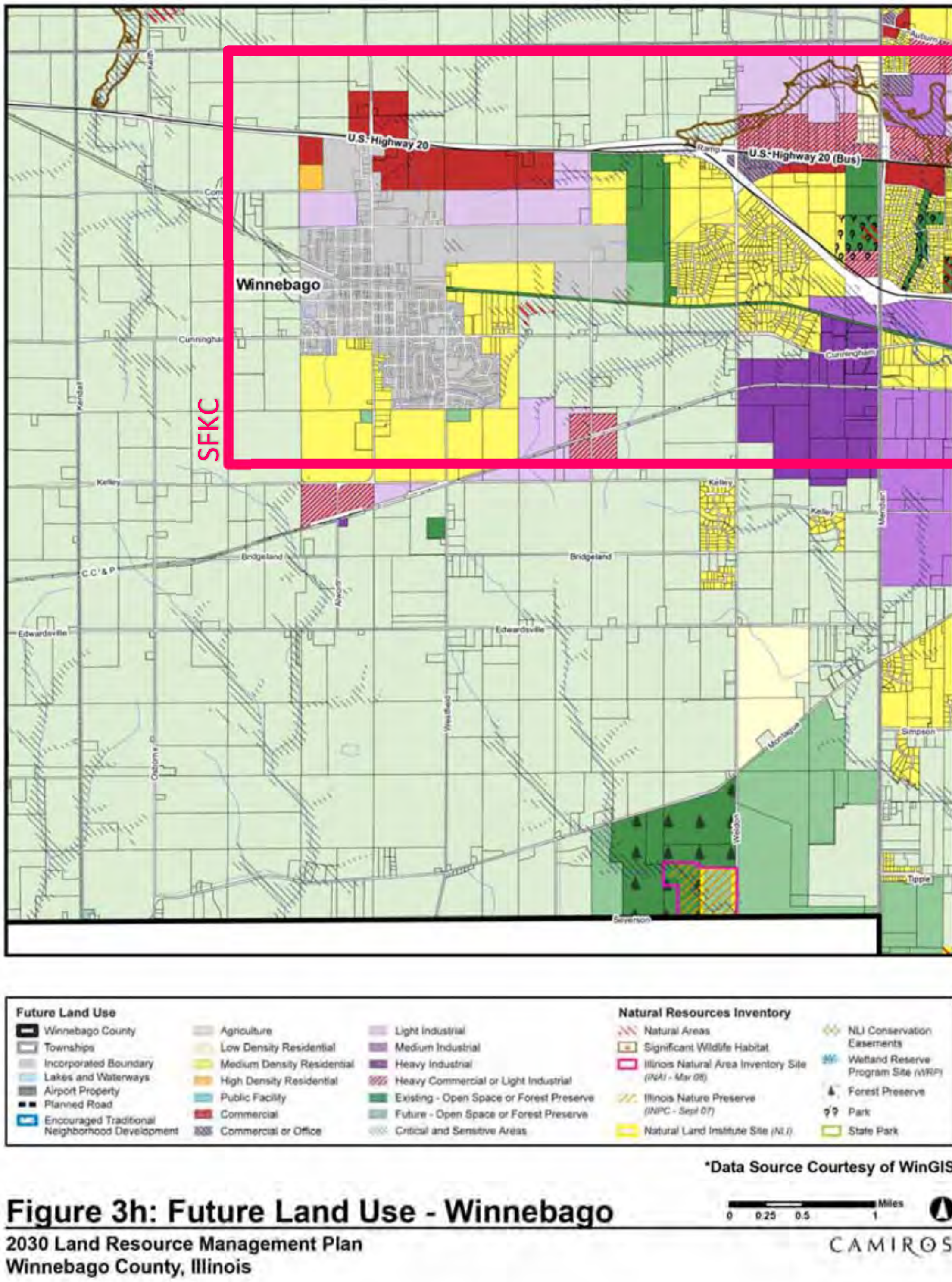


FIGURE 16: ROCKFORD - 2030 PLAN

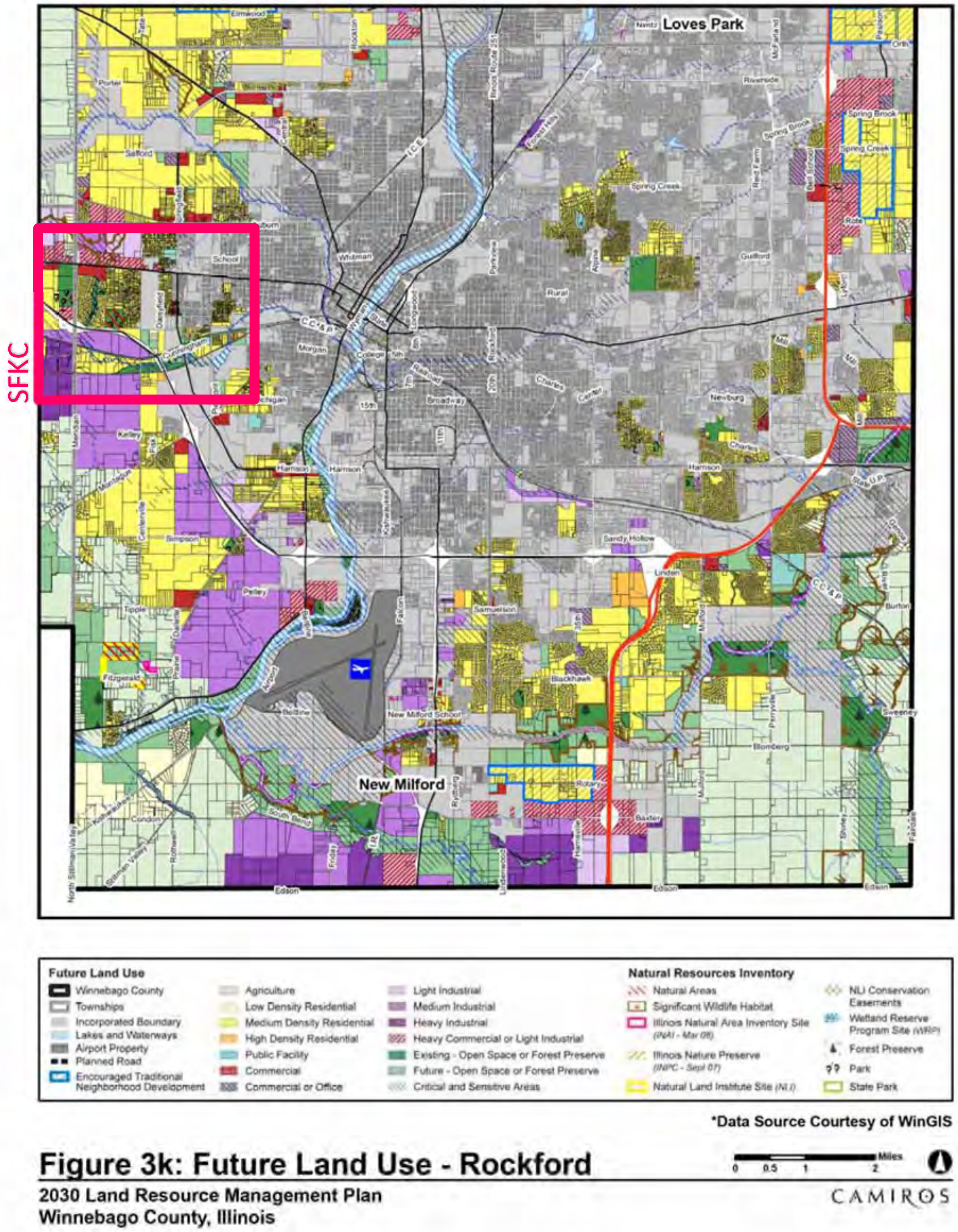


FIGURE 17: GREENWAYS TRAIL - 2030 PLAN

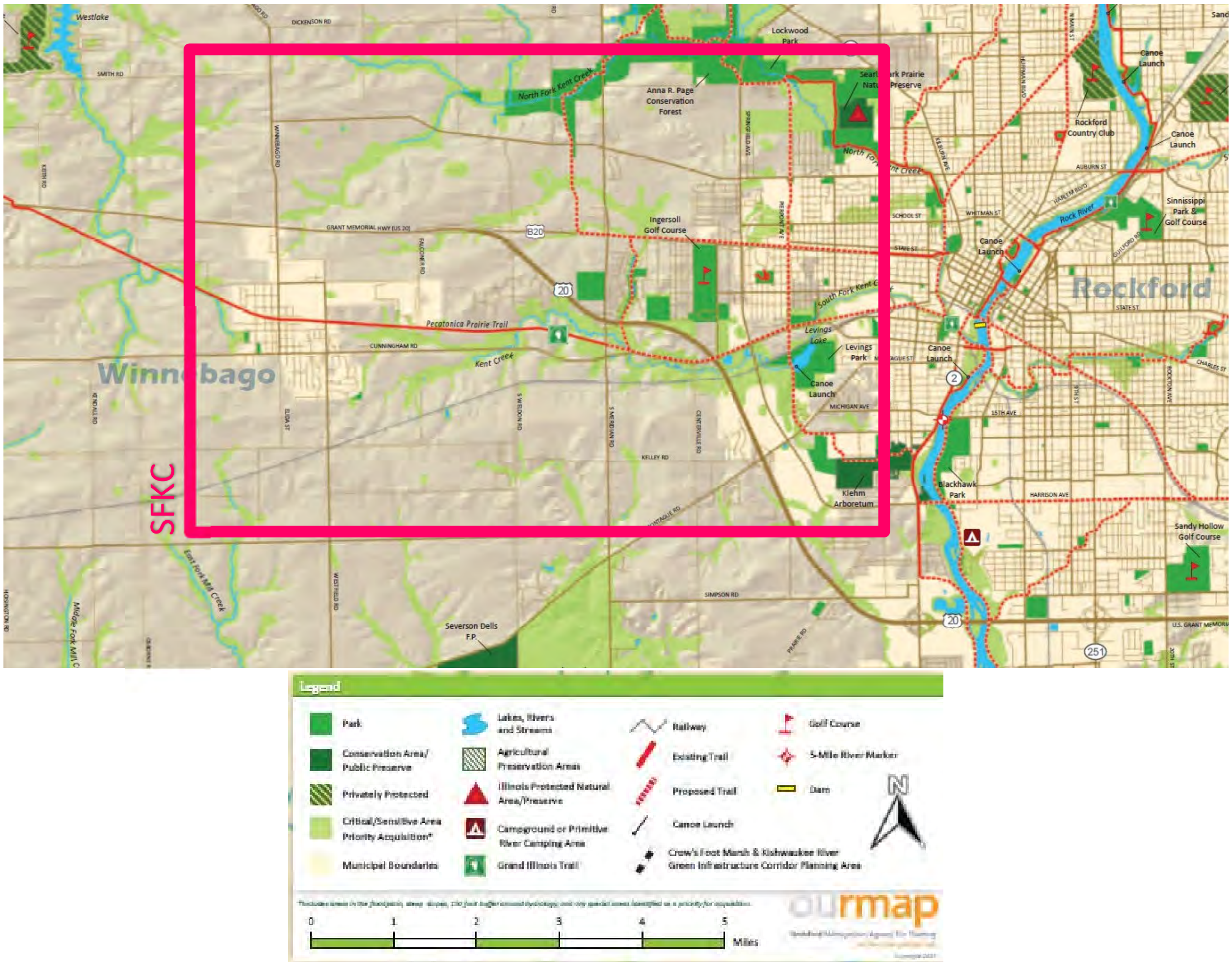


FIGURE 18: FUTURE LAND USE

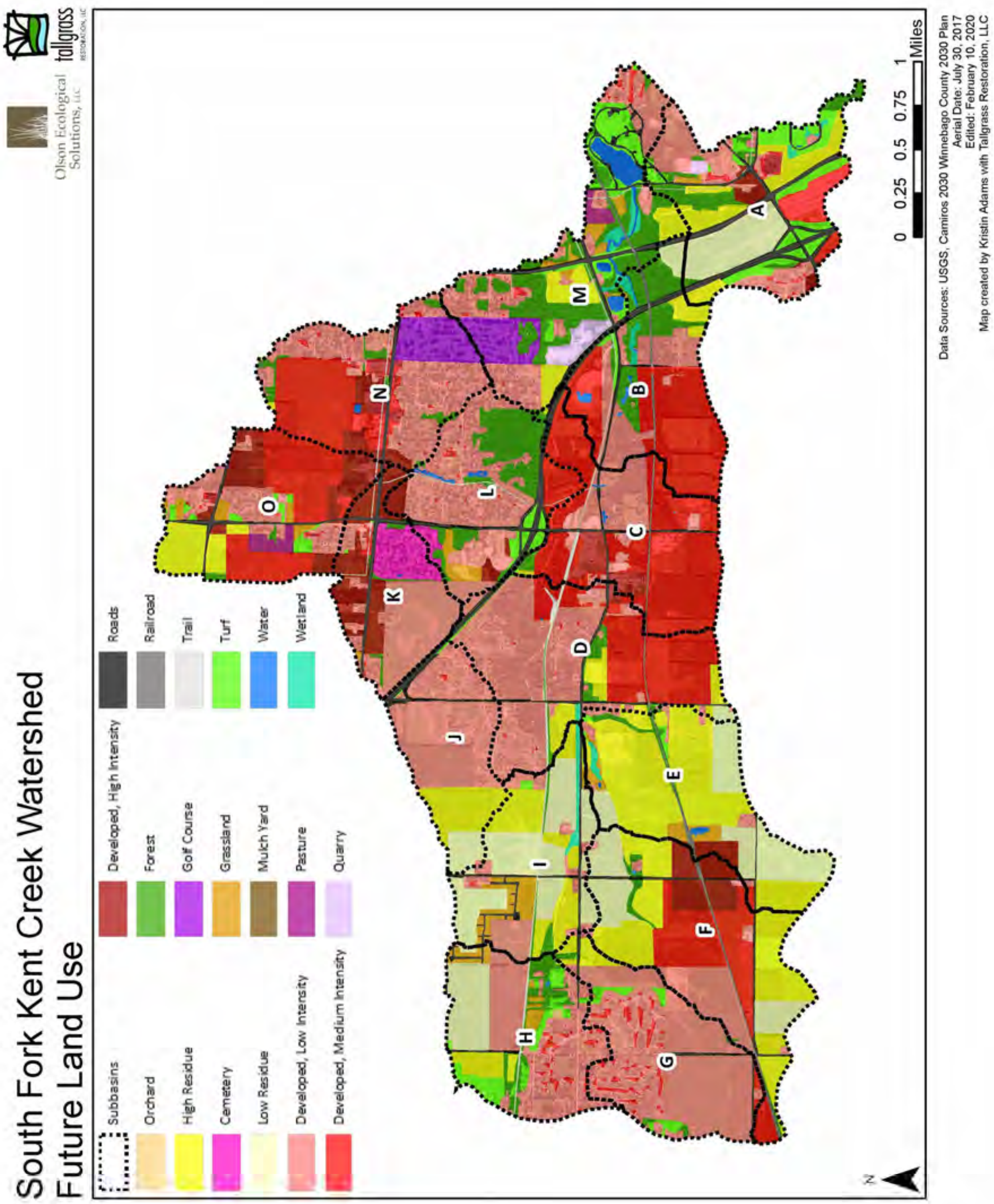


FIGURE 19: ESTIMATED IMPERVIOUS SURFACE

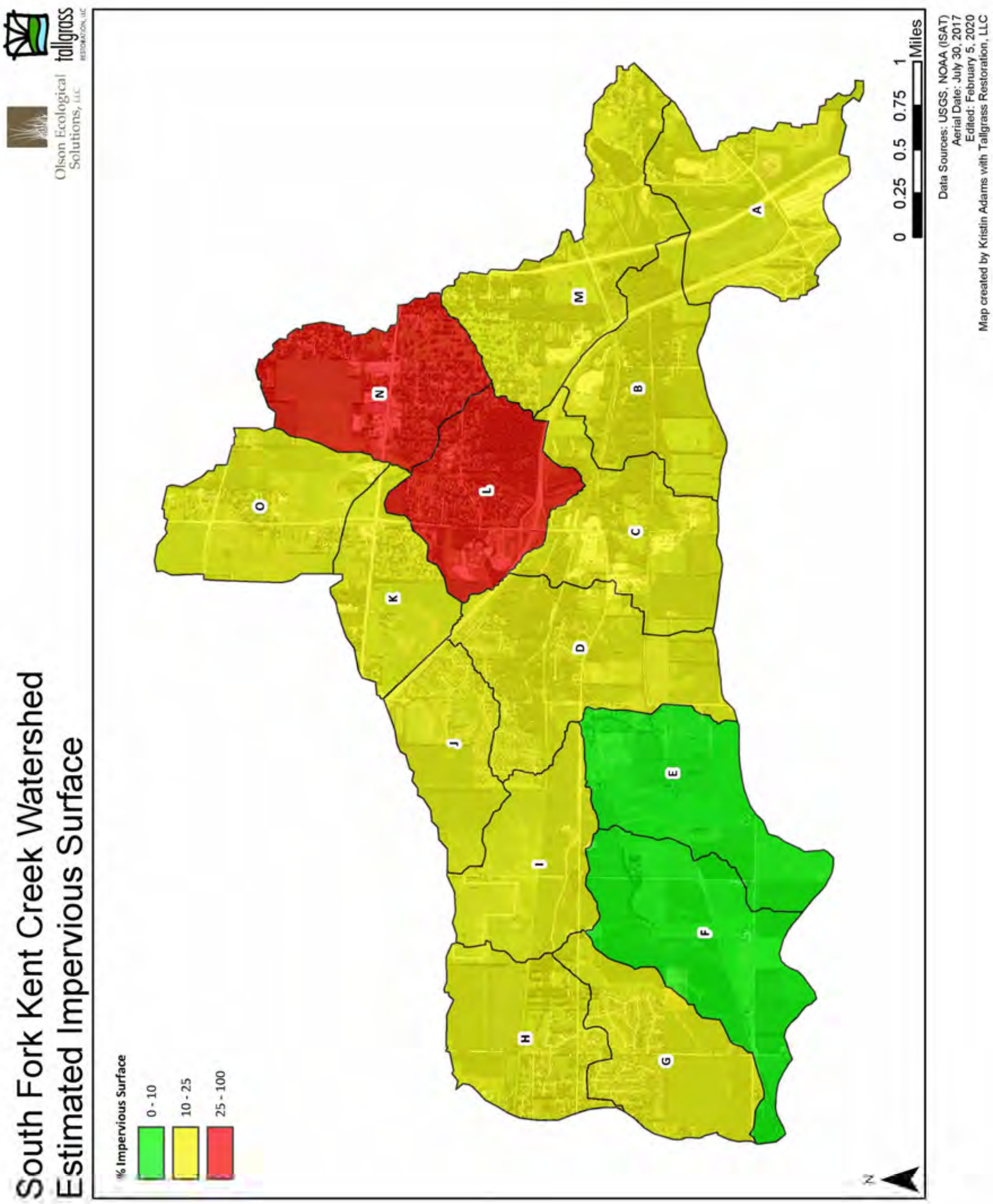


FIGURE 20: ESTIMATED FUTURE IMPERVIOUS SURFACE

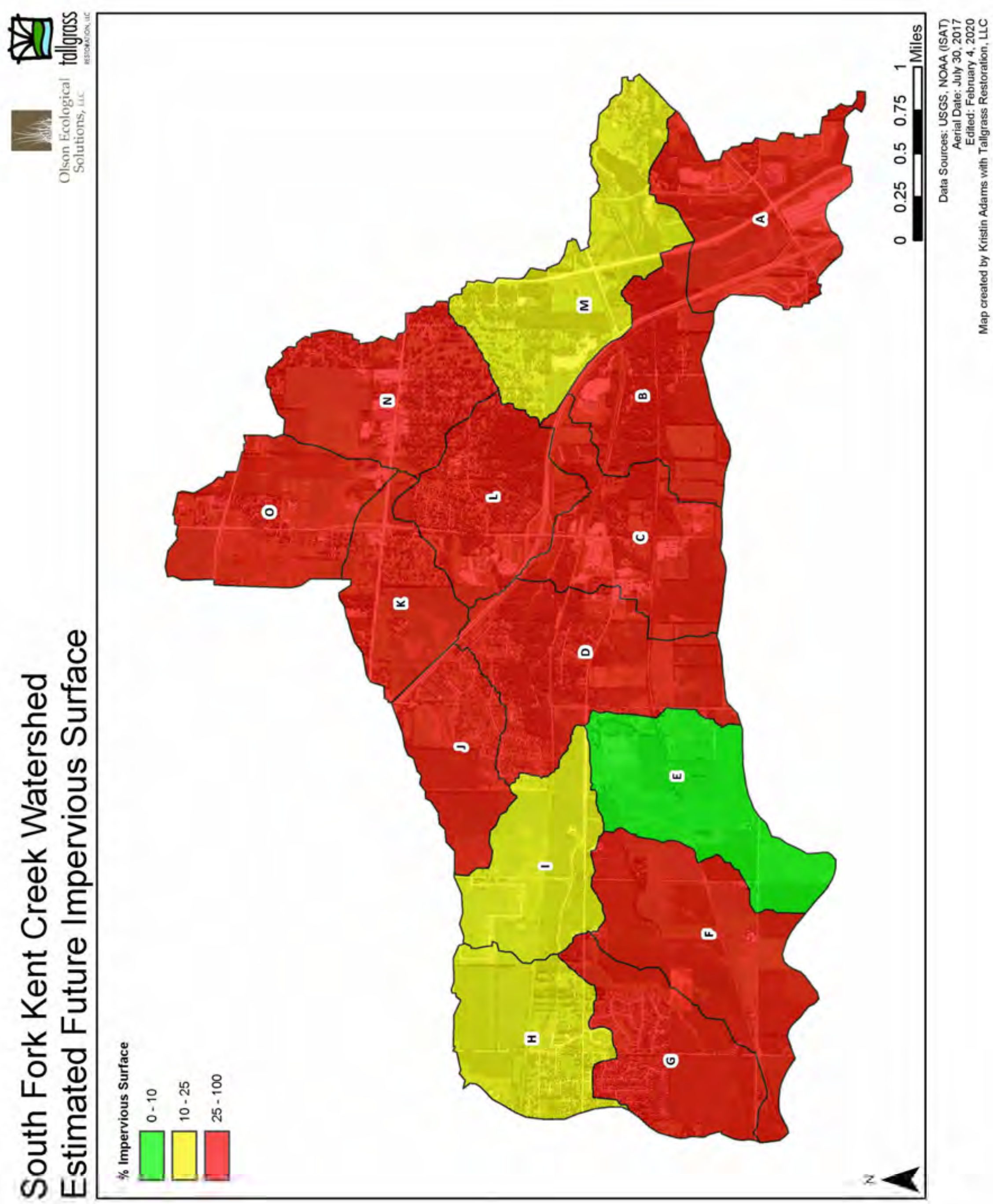
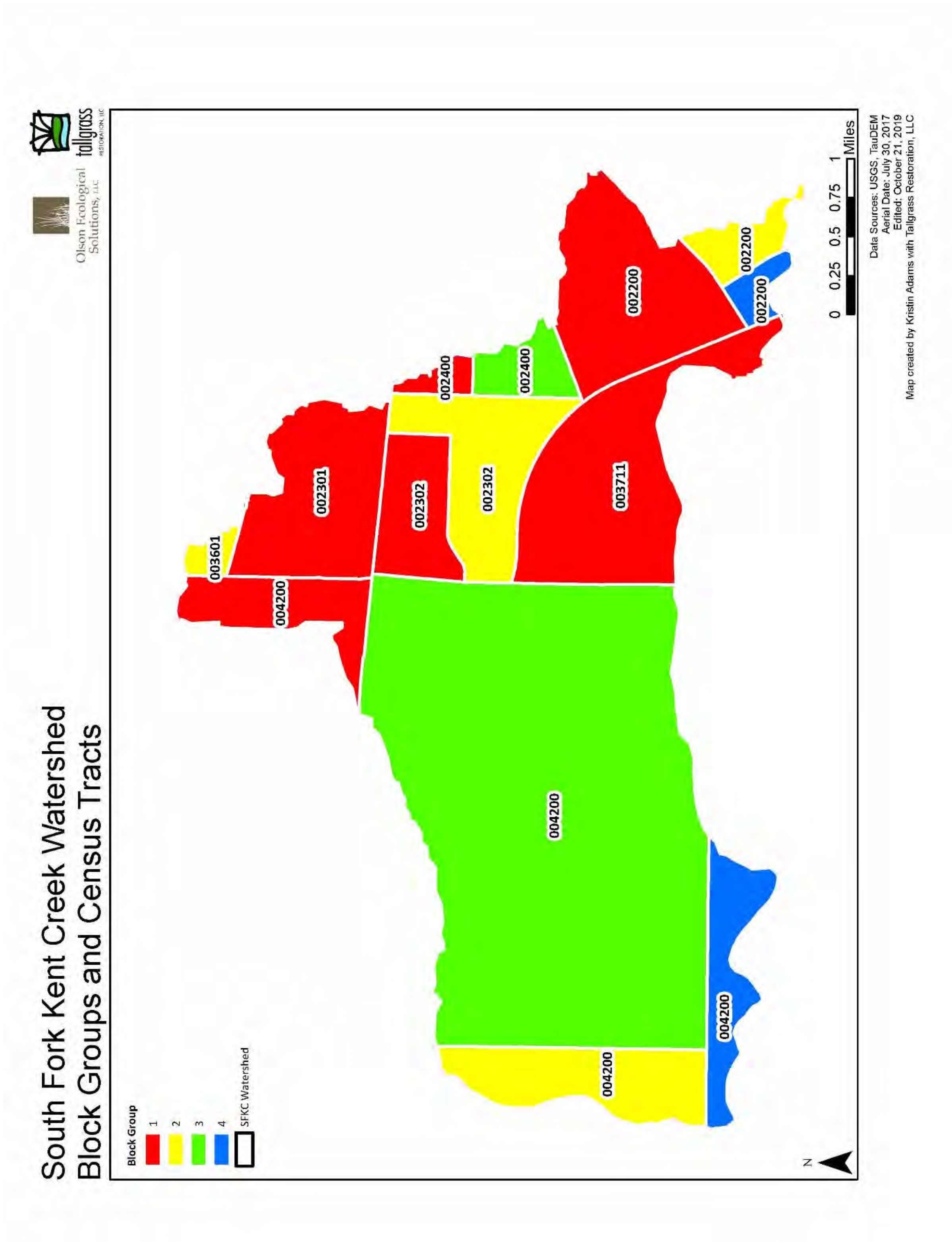


FIGURE 21: CENSUS TRACTS AND BLOCKS



PART 4: GEOLOGY AND CLIMATE

GEOLOGY

The geology of the South Fork Kent Creek watershed was constructed from glaciation and bedrock formations. The Illinois landscapes were mostly formed by glacial ice known as the Illinois Episode, which covered 90% of the state of Illinois. The Illinois Episode occurred during the Quaternary period, the most recent period in geological time, approximately 2.6 million years ago (Kolata and Nimz, 2010).

Quaternary deposits in the area can be reviewed in Figure 22 and Table 14. The Winnebago Formation, within the Illinois Episode, covers 78.6% of the watershed. The remaining 21.4% of the watershed is made up of the Cahokia and/or Henry Formation, from the Wisconsin Episode.

Bedrock formations, the underlying topography upon which the landscape formed, are named for the period in which they formed. Most of the bedrock formation is from the Galena Group, which encompasses about 99% of the watershed (see Figure 23 and Table 15). The Galena Group's materials are lime mudstone-wackestone and pure lime packstone-grainstone. The remaining area is made up of the Platteville Group. The Platteville Group consists of lime mudstone, wackestone, ooids, and coated grains (Kolata and Nimz, 2010).

TOPOGRAPHY

The landscape has slight variation in elevation within the South Fork Kent Creek watershed. Topography and 1-meter elevations along the creek have some undulation along the South Fork Kent Creek and Levings Lake (see Figure 24 and Figure 25) ranging from 223 to 281 meters above mean sea level. Hence, erosion hazards might be focused along the creek and the lake for this watershed.

CLIMATE

It is important to understand climate's environmental effect on water quality, which impacts the soils and wildlife within the watershed. The amount of rainfall received in the region causes mineral weathering and sediment transportation into the watershed. Weather patterns affect the ecological relationship of plant and animal species such as resource availability for seasonal migration, timing of dormant stage, and overall fitness of population. The climate of this region has four distinct seasons and is an especially important factor to the crop producers in the area. We collected weather-related data from the Greater Rockford Airport in Rockford, Illinois weather station, accessed through the National Oceanic and Atmospheric Administration. We averaged climate data from 1981 through 2010 to determine a normal climate pattern for the region (see Table 16).

Climate in the South Fork Kent Creek watershed is temperate and humid with an average annual precipitation of 35.36 inches. In 2019, the annual average high temperature was 55.6°F while the low average temperature was 41.2°F. The mean temperature from 2019 overall was 48.4°F, varying less than one degree from normal patterns. 2019 was an exceptionally wet year, with 50.59 inches of precipitation falling from November 2018 through October 2019. This measured over 15 inches above the normal amount of rainfall, 43% higher than average. Every season experienced more rainfall than normal in 2019. The wettest season was the spring of 2019, which saw 5.6 inches above the normal precipitation levels. On January 31, 2019, Rockford Airport had the coldest day of the year, with a low temperature of -31°F, which broke the previous record of -27°F from 1982 (NOAA, 2019b). On July 19, 2019, Rockford had a high minimum temperature of 80°F, which tied the high minimum temperature recorded on August 6, 1918 (NOAA, 2019c).

From November 2018 to October 2019, there were 6,852 heating degree days and 927 cooling degree days. Degree days are any daily temperature where the mean is either above or below 65°F (USGCRP, 2020). The heating and cooling degree days may impact residents' use of air conditioning or heating. Hence, examining degree days help understand the region's energy consumption. The local energy consumption could potentially affect the water and air quality of the watershed.

TABLE 14: QUATERNARY DEPOSITS

Quaternary Deposits				
Event	**Stratigraphic Class**	**Material of geologic deposits**	**% Watershed**	**Acreage**
Wisconsin glaciation (100)	Cahokia and/or Henry Formation (10)	C1: waterlain river sediment and wind-blown beach sand	21.4%	1,664
Illinois glaciation (200)	Winnebago formation (50)	I1: diamicton deposited as till and ice-marginal sediment (Illinois Episode)	78.6%	6,096
		Total:	**100%**	**7,760**

TABLE 15: BEDROCK GEOLOGY

Bedrock Geology			
Abbreviation	**Geological Formation**	**% Watershed**	**Acres**
Og	Galena Group	99.3%	7,702
Op	Platteville Group	0.74%	58
	Total:	**100%**	**7,760**

TABLE 16: PRECIPITATION AND TEMPERATURE MONTHLY AVERAGES FOR 2018

Precipitation & Temperature Monthly Averages for 2019						
Month/Season	Total Precipitation (inches)	Temperature (F)			Degree Days	
		Mean	Max Avg.	Min Avg.	Heating	Cooling
November	2.06	32.4	38.4	26.4	977	0
Fall 2018:	-	-	-	-	-	-
December	2.66	30.8	38.1	23.5	1,053	0
January	2.27	18.1	25.4	10.7	1,449	0
Febuary	4.04	22.1	29.8	14.3	1,197	0
Winter 2018-19:	**8.97**	**23.7**	**31.1**	**16.2**	**3,699**	**0**
March	2.09	33.7	42.8	24.6	962	0
April	4.26	49.3	59.7	38.8	468	2
May	8.93	58.2	68.3	48.1	226	23
Spring 2019:	**15.28**	**47.1**	**56.9**	**37.2**	**1,656**	**25**
June	3.21	69.3	79.7	59.0	18	156
July	2.80	77.5	67.1	87.9	0	395
August	5.55	71.5	82.0	60.9	1	207
Summer 2019:	**11.56**	**72.8**	**76.3**	**69.3**	**19**	**758**
September	9.09	68.5	76.8	60.2	20	132
October	3.63	49.9	59.3	40.5	481	12
Fall 2018/19:	**14.78**	**50.3**	**58.2**	**42.4**	**1,478**	**144**
Annual (Nov 18-Oct 19):	**50.59**	**48.4**	**55.6**	**41.2**	**6,852**	**927**
Normal Weather Patterns (1981-2010) - **Higher** or **Lower** than Normal						
Winter (Dec-Feb)	4.76	24.3	32.3	16.3	3,667	0
Spring (Mar-May)	9.69	48.9	59.8	38.0	1,538	56
Summer (Jun-Aug)	13.19	71.8	82.7	60.9	45	672
Fall (Sept-Nov)	7.72	51.5	61.9	41.1	1,321	93
Annual	35.36	49.1	59.2	39.1	6,571	821
Station: Greater Rockford Airport, IL. NOAA - www.ncdc.noaa.gov. Accessed 10/24/2019						

FIGURE 22: QUATERNARY DEPOSITS

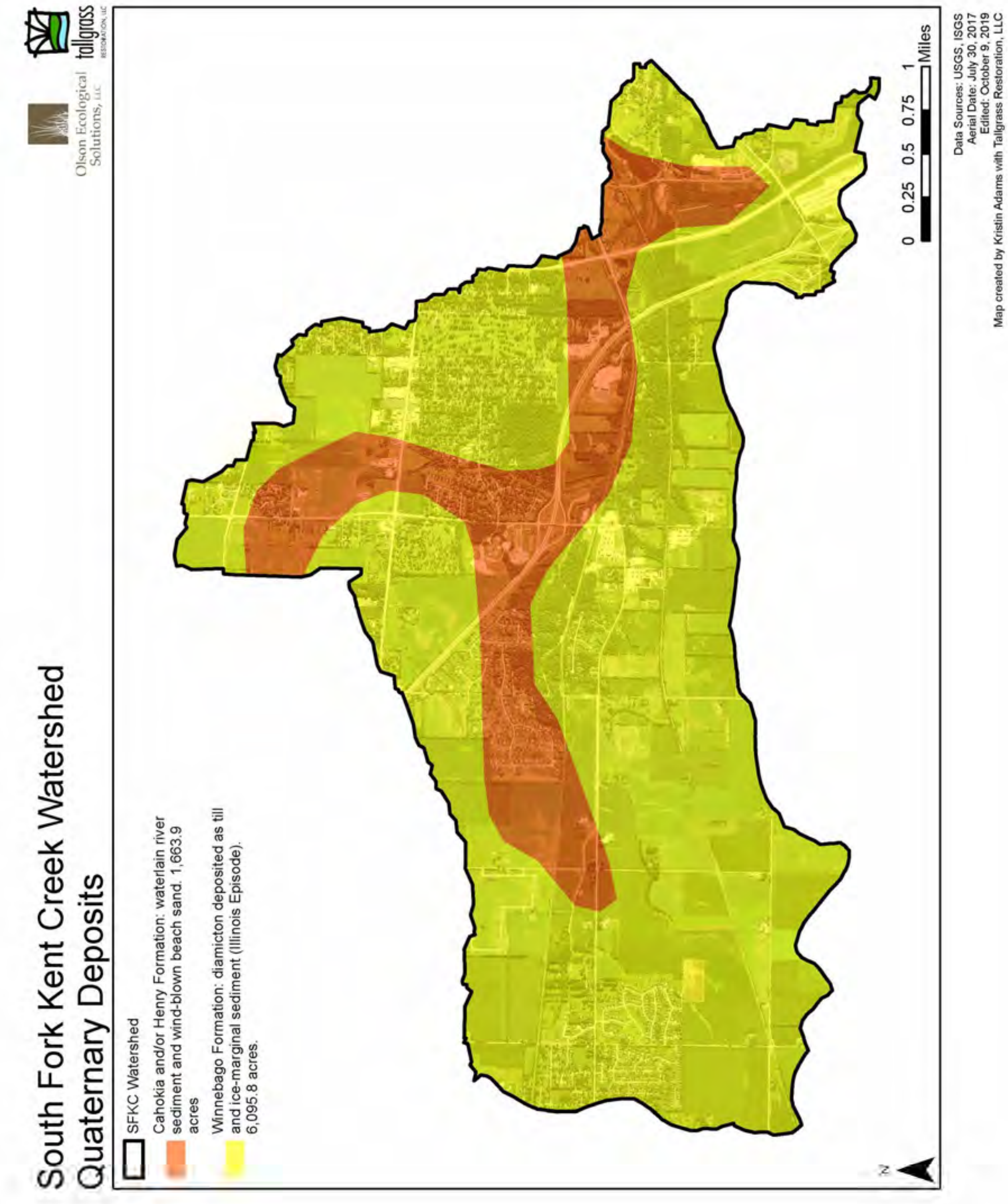


FIGURE 23: BEDROCK GEOLOGY

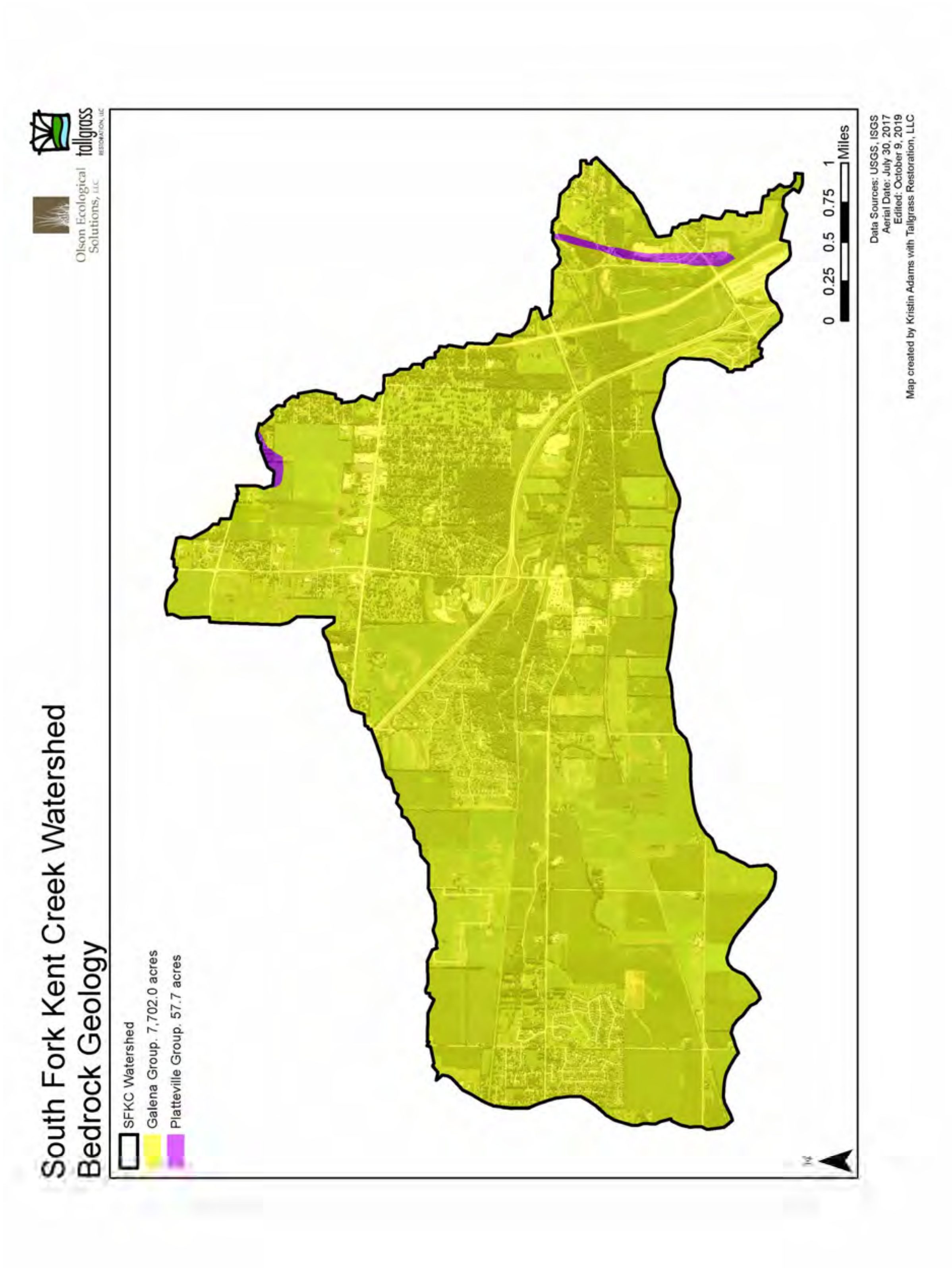


FIGURE 24: TOPOGRAPHY

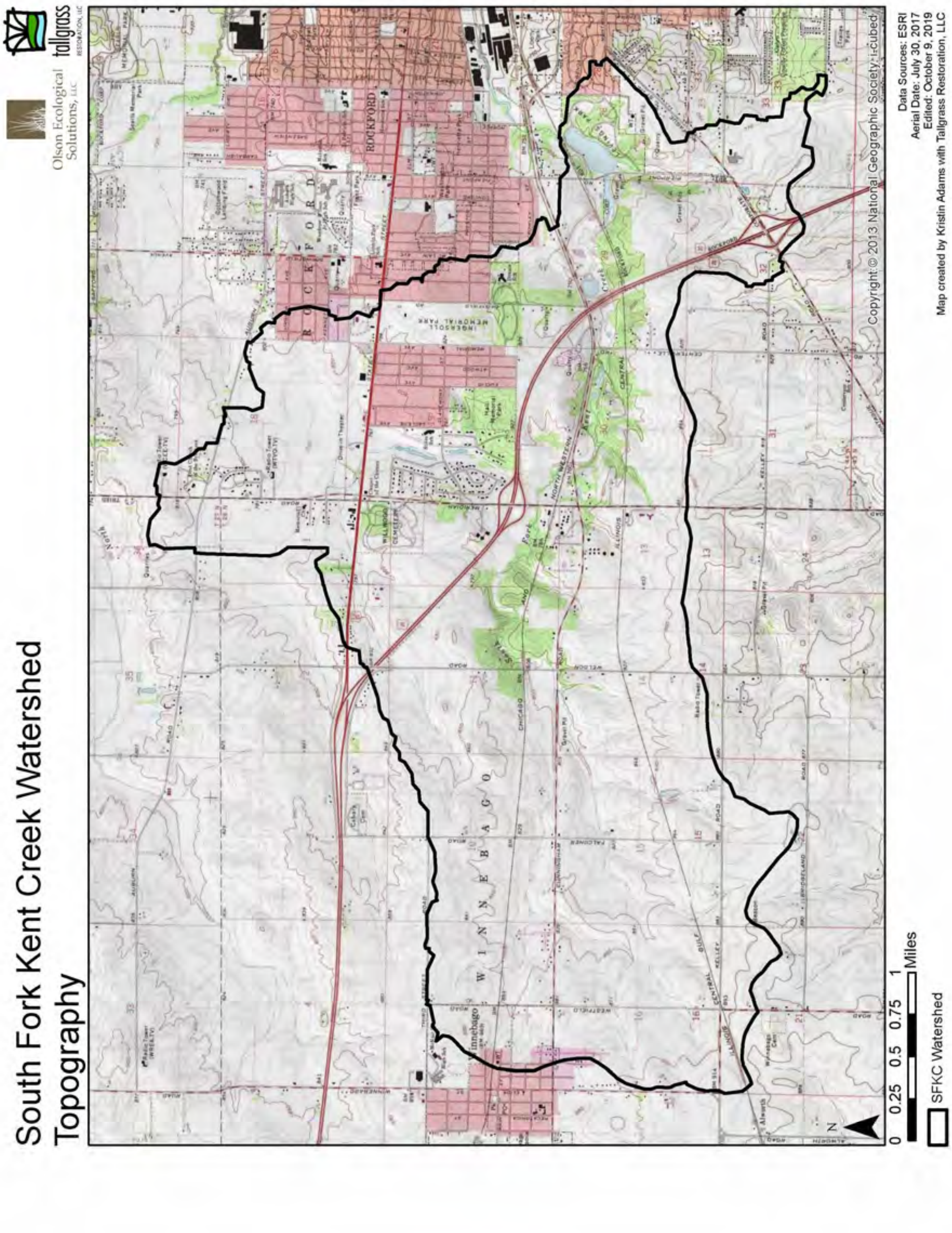
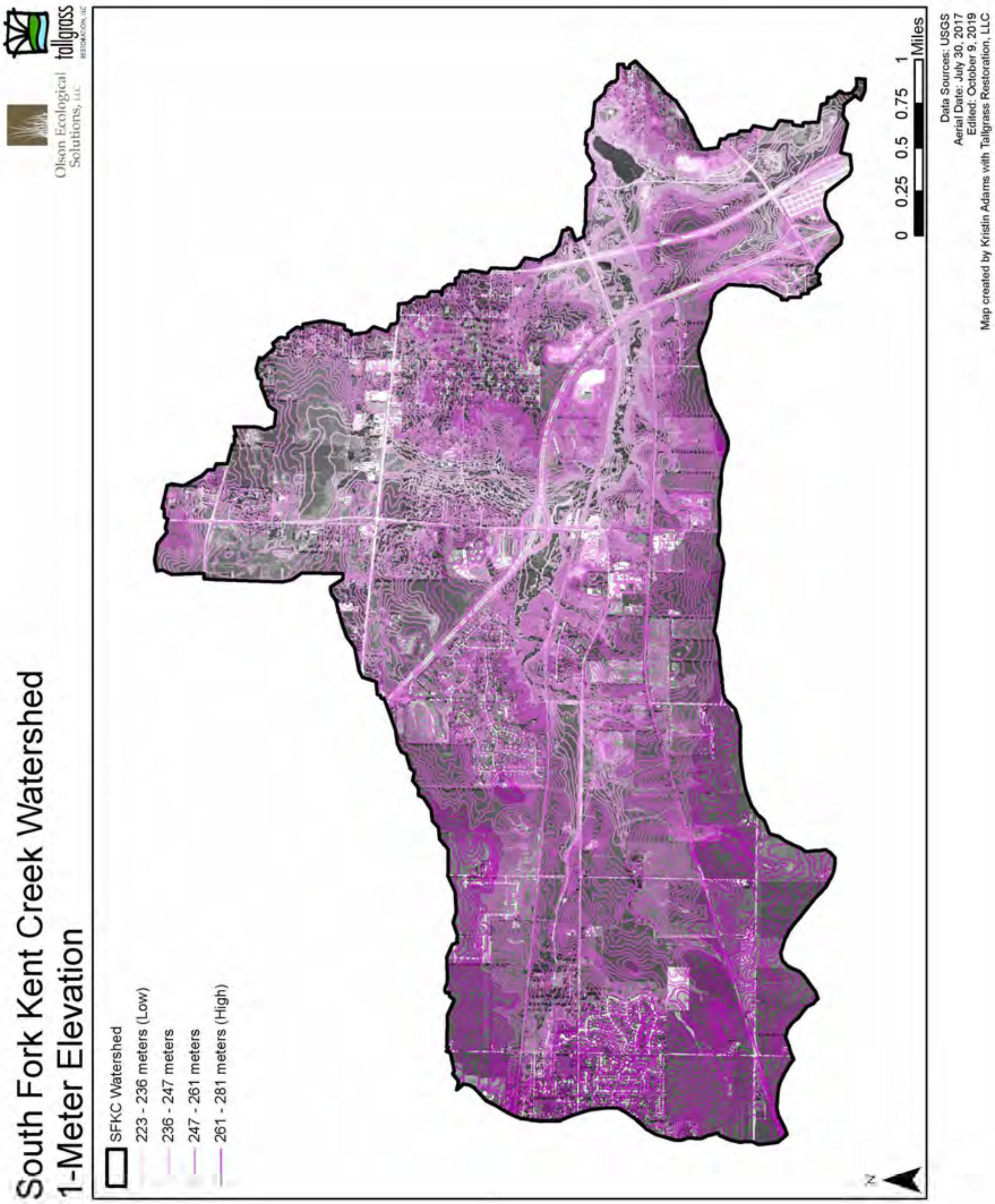


FIGURE 25: 1-METER ELEVATION



PART 5: SOILS

To understand soils in the South Fork Kent Creek Watershed and the role they play in water quality, we look at soil texture, soil types, farmland quality, hydric soils, hydrological groups and water transmission, drainage class, and erodibility.

SOIL TEXTURE

Most of the soil surface texture spanning throughout the watershed is silt loam, which constitutes 77.3% of the watershed or 5,998 acres. The next highest coverage of soil texture is loam at 14.8% of the watershed or 1,149 acres, mostly located in the central part of the watershed. The soil textures covering less than 5% but more than 1% of the watershed are fine sandy loam (3.4%) and silty clay loam (2.0%). The fine sandy loam and silty clay loam are scattered throughout the watershed. The remaining soil textures that cover less than 1% of the watershed are muck (0.2%) and sandy loam (0.9%). The remaining 1.6% of the watershed soil surface texture is not specified (see Figure 26 and Table 17).

MAJOR SOIL TYPES

There are 79 different soil types in the watershed, and most of them are silt loams. The most prevalent soil type is Osco silt loam, covering 22.7% of the watershed. The next prevalent is Ogle silt loam, which covers 10.9% of the watershed. Comfrey loam covers 6.8% of the watershed, and the rest of the 76 soil types make up less than 5% of the watershed (see Figure 27 and Table 18).

FARMLAND QUALITY

Soils are typically evaluated for their abilities in agricultural use such as producing feed, forage, fiber, and oilseed crop. Illinois soils fall into categories of prime farmland, farmland of statewide importance, prime farmlands with alteration, or not prime farmland. Prime farmland produces the highest yield with lowest cost of energy and economic resources and least environmental damage. Statewide important farmlands are generally less productive compared to prime farmland due to more restrictions. Not prime farmlands could potentially be used as farmland but may have some restrictions (Illinois Dept. of Agriculture, 2001).

More than half of the South Fork Kent Creek watershed (59.7%) is categorized as prime farmland. Prime farmland meets the standard quality without any alteration. The next prevalent class is farmland of statewide importance, covering 24.5% of the watershed. The remaining farmland classifications make up less than 10% of the watershed and are classified as not prime farmland (5.1%), prime farmland if drained (2.5%), prime farmland if drained and protected from flooding or not frequently flooded (7.9%), and prime farmland if protected from flooding or not frequently flooding (0.2%) (see Figure 28 and Table 19).

HYDRIC SOILS

Hydric soils are soils formed under conditions of saturation, flooding, or ponding during the growing seasons. The upper part of the soil is in an anaerobic condition, or a low oxygen state. Hydric soils are often associated with wet prairies, forest floodplains, and wetlands. This soil type supports the growth and the regeneration of hydrophytic, wetland vegetation that can withstand the low oxygen conditions (Soil Survey, 2019d). Even if these soils are drained, their hydric characteristics can still be seen, and they are often used to indicate areas of wetland restoration potential. There are four established ranges of hydric soils: low (1 to 32%), moderate (33 to 65%), high (66 to 99%), and entirely hydric (100%).

Within the South Fork Kent Creek Watershed, non-hydric soils were the most frequent soils found, covering 51% of the watershed. This suggests that about half of the soils in the watershed were formed under dry conditions. The next frequent soil type is in the low range of hydric soil, covering 39.2% of the watershed. Less than 10% of the watershed's soils are classified as high hydric soil (9.3% of the watershed or 724 acres) or entirely hydric soil (0.5% of the watershed or 38 acres). There are no soils in the watershed classified in the moderate range. Entirely and high hydric soils present in the watershed are mostly located near the creek (see Figure 29 and Table 20).

HYDROLOGIC SOIL GROUPS AND WATER TRANSMISSION

Hydrologic Soil Groups (HSG) explain the runoff response potential of soils based on transmission rate of water; depth to water table or restrictive layer; and soil texture, structure, and degree of swelling when saturated. Soils are assigned into four groups: A, B, C, or D. Water transfers freely through HSG A soils, so they have low runoff potential when thoroughly wet. Most of the HSG A soils have a soil texture of sand or gravel. HSG B includes soils with moderately low runoff potential and mostly have loamy sand or sandy loam texture. HSG C includes soils with moderately high runoff potential and usually are a mixture of sand, clay, and loam. HSG D includes soils with high runoff potential and have more than 40% of clay and less than 50% of sand and loam. Furthermore, if a soil in HSG D is adequately drained, it is assigned a dual class as HSG A/D, B/D, or C/D based on saturated hydraulic conductivity and the water table depth. The first letter indicates the characteristic of the soil once it is drained, while the second letter indicates the characteristic of the soil in its undrained condition (Soil Survey Staff, 2007 and 2019f)

Most of the soils in the watershed are assigned to HSG B, which covers 76% of the watershed or 5,894 acres. The soils in HSG B have a moderate infiltration rate when thoroughly wet. The next frequent soil group is HSG B/D, covering 14.5% of the watershed or 1,123 acres. The dual class HSG B/D is located primarily along the streams. Soils in the remaining groups cover less than 5% and are scattered throughout the watershed (see Figure 30 and Table 21).

SOIL DRAINAGE CLASS

Soil drainage class refers to the frequency and duration of wet periods for soils in their natural condition, similar to the conditions in which they formed and without artificial drainage (Soil Survey Staff, 2019b). Nearly 80% of the soils in the watershed are well drained. The next prevalent soil drainage class is poorly drained, covering about 10% of the watershed along the streams (see Figure 31 and Table 22).

SOIL ERODIBILITY

Soil erosion, defined as the breakdown, detachment, transport, and redistribution of soil particles caused by water and wind combined with gravity, is of particular interest for the watershed due to its impacts to water quality. Soil erodibility is based on slope and soil erosion factor (K). Expected erosion rates of soil are a factor of long-term climate data, inherent soil and site characteristics, and cropping and management practices. Soil loss in the form of either rill or sheet erosion is predicted in areas where 50 to 75% of the soil surface is exposed (Soil Survey Staff, 2019c).

Throughout the nation, soil erosion on cropland has been on a downward trend, decreasing by 43% between 1982 and 2007. Geographically, 54% of soil erosion from water occurs in two of ten farm production regions in the United States, including Illinois, which emphasizes the national importance of reducing erosion in Northern Illinois and this watershed (Soil Survey Staff, 2019c).

For the South Fork Kent Creek watershed, 94.8% of the entire watershed (7,355 acres) is classified as having a slight erosion hazard. 280 acres are considered to have a moderate erosion hazard (3.6%), and 124 acres are not rated due to being classified as water. There are no severe or very severe erosion hazards in the watershed (see Figure 32 and Table 23).

HIGHLY ERODIBLE LAND

Highly erodible land (HEL) is characterized by soil map units that have an erodibility index (EI) of eight or greater, as determined by the Revised Universal Soil Loss Equation (RUSLE). HEL status has been recorded by Farm Service Agency (FSA) in 1990 in their Common Land Unit database (CLU). The 1985 Food Security Act Farm Bill has dictated compliance requirements related to HEL for agricultural producers who utilize programs offered by U.S. Department of Agriculture (USDA) with a purpose to minimize soil erosion, preserve land fertility of farmland, and protect water quality along with the nation's wetlands (Soil Survey Staff, 2019a and 2019e). This database used by the Natural Resources Conservation Service (NRCS) and FSA for HEL status determination has not been updated since 1990; therefore, it does not include the current erodibility indexes.

According to the 1990 database, Figure 33 and Table 24 show soils classified as either HEL or Potentially HEL (PHEL) based on the frozen soil lists from 1990. About 1.7% the soil map units in the South Fork Kent Creek watershed are characterized as HEL (134 acres). The HEL is located mainly along the South Fork Kent Creek stream and its tributaries. PHEL soils are slightly more abundant at 1.9% of the watershed, with 149 acres scattered throughout the watershed.

TABLE 17: SOIL SURFACE TEXTURE

Soil Surface Texture		
Rating	**% Watershed**	**Acres**
Fine sandy loam	3.4%	264
Loam	14.8%	1,149
Muck	0.02%	1.8
Sandy loam	0.92%	71
Silt loam	77.3%	5,998
Silty clay loam	1.9%	151
Not specified - water or other	1.6%	124
Total:	**100%**	**7,760**

TABLE 18: SOIL MAP UNITS

Soil Map Units (listed from most frequent to least)			
Symbol	Name and description	% Watershed	Acreage
86B	Osco silt loam, 2 to 5 percent slopes	22.7%	1,761
412B	Ogle silt loam, 2 to 5 percent slopes	10.9%	846
3776A	Comfrey loam, 0 to 2 percent slopes, frequently flooded	6.8%	529
280gC2	Fayette silt loam, glaciated, 5 to 10 percent slopes, eroded	4.8%	369
675B	Greenbush silt loam, 2 to 5 percent slopes	4.1%	318
86C2	Osco silt loam, 5 to 10 percent slopes, eroded	3.8%	295
728C2	Winnebago silt loam, 5 to 10 percent slopes, eroded	3.4%	265
86A	Osco silt loam, 0 to 2 percent slopes	2.8%	215
781B	Friesland fine sandy loam, 2 to 5 percent slopes	2.6%	202
728B	Winnebago silt loam, 2 to 5 percent slopes	2.4%	183
361D2	Kidder loam, 6 to 12 percent slopes, eroded	2.2%	175
21C2	Pecatonica silt loam, 5 to 10 percent slopes, eroded	2.2%	171
51A	Muscatune silt loam, 0 to 2 percent slopes	2.0%	159
197A	Troxel silt loam, 0 to 2 percent slopes	2.0%	158
403E	Elizabeth silt loam, 12 to 35 percent slopes	1.9%	145
419C2	Flagg silt loam, 5 to 10 percent slopes, eroded	1.9%	145
280B	Fayette silt loam, glaciated, 2 to 5 percent slopes	1.4%	112
363D2	Griswold loam, 6 to 12 percent slopes, eroded	1.3%	103
528A	Lahoguess loam, 0 to 2 percent slopes	1.2%	93
199B	Plano silt loam, 2 to 5 percent slopes	1.2%	92
3107A	Sawmill silty clay loam, 0 to 2 percent slopes, frequently flooded	1.1%	87
529A	Selmass loam, 0 to 2 percent slopes	1.0%	79
802B	Orthents, loamy, undulating	1.0%	79
419B	Flagg silt loam, 2 to 5 percent slopes	0.89%	69
561D2	Whalan and NewGlarus silt loams, 10 to 15 percent slopes, eroded	0.83%	64
259B2	Assumption silt loam, 2 to 5 percent slopes, eroded	0.69%	53
783B	Flagler sandy loam, 2 to 6 percent slopes	0.64%	49
533	Urban land	0.56%	43
561C2	Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded	0.55%	43
780C2	Grellton fine sandy loam, 5 to 10 percent slopes, eroded	0.54%	42
W	Water	0.53%	41
279A	Rozetta silt loam, 0 to 2 percent slopes	0.51%	40
864	Pits, quarries	0.51%	40
9051A	Muscatune silt loam, terrace, 0 to 2 percent slopes	0.50%	39
440B	Jasper silt loam, 2 to 5 percent slopes	0.47%	36
152A	Drummer silty clay loam, 0 to 2 percent slopes	0.46%	36
675A	Greenbush silt loam, 0 to 2 percent slopes	0.43%	33
728D2	Winnebago silt loam, 10 to 18 percent slopes, eroded	0.40%	31
259C2	Assumption silt loam, 5 to 10 percent slopes, eroded	0.40%	31
			Totals on next page

Soil Map Units (listed from most frequent to least, continued)			
Symbol	**Name and description**	**% Watershed**	**Acreage**
22D2	Westville silt loam, 10 to 18 percent slopes, eroded	0.39%	30
411B	Ashdale silt loam, 2 to 5 percent slopes	0.38%	30
297D2	Ringwood silt loam, 6 to 12 percent slopes, eroded	0.36%	28
566D2	Rockton and Dodgeville soils, 10 to 15 percent slopes, eroded	0.34%	26
566C2	Rockton and Dodgeville soils, 5 to 10 percent slopes, eroded	0.32%	25
9061A	Atterberry silt loam, terrace, 0 to 2 percent slopes	0.32%	25
440C2	Jasper silt loam, 5 to 10 percent slopes, eroded	0.29%	22
781A	Friesland fine sandy loam, 0 to 2 percent slopes	0.26%	20
3415A	Orion silt loam, 0 to 2 percent slopes, frequently flooded	0.24%	19
429C2	Palsgrove silt loam, 5 to 10 percent slopes, moderately eroded	0.23%	18
566B	Rockton and Dodgeville soils, 2 to 5 percent slopes	0.23%	18
505D2	Dunbarton silt loam, 6 to 12 percent slopes, eroded	0.21%	17
9068A	Sable silty clay loam, terrace, 0 to 2 percent slopes	0.21%	16
188A	Beardstown loam, 0 to 2 percent slopes	0.20%	16
198A	Elburn silt loam, cool, 0 to 2 percent slopes	0.17%	13
68A	Sable silty clay loam, 0 to 2 percent slopes	0.16%	12
61A	Atterberry silt loam, 0 to 2 percent slopes	0.15%	12
227B	Argyle silt loam, 2 to 5 percent slopes	0.15%	11
9675A	Greenbush silt loam, terrace, 0 to 2 percent slopes	0.14%	11
332B	Billett sandy loam, 2 to 5 percent slopes	0.13%	10
243C2	St. Charles silt loam, 5 to 10 percent slopes, eroded	0.12%	9
506B	Hitt silt loam, 2 to 5 percent slopes	0.12%	9
297B	Ringwood silt loam, 2 to 4 percent slopes	0.12%	9
506C2	Hitt silt loam, 5 to 10 percent slopes, eroded	0.12%	9
199C2	Plano silt loam, 5 to 10 percent slopes, eroded	0.09%	7
172A	Hoopeston sandy loam, 0 to 2 percent slopes	0.08%	6
361B	Kidder loam, 2 to 4 percent slopes	0.08%	6
783A	Flagler sandy loam, 0 to 2 percent slopes	0.07%	5
769E2	Edmund silt loam, 12 to 20 percent slopes, eroded	0.07%	5
243B	St. Charles silt loam, 2 to 5 percent slopes	0.07%	5
429B2	Palsgrove silt loam, 2 to 6 percent slopes, moderately eroded	0.07%	5
570D2	Martinsville silt loam, 6 to 12 percent slopes, eroded	0.06%	5
505C2	Dunbarton silt loam, 4 to 6 percent slopes, eroded	0.06%	5
403C	Elizabeth silt loam, 5 to 10 percent slopes	0.06%	5
505E2	Dunbarton silt loam, 12 to 20 percent slopes, eroded	0.05%	4
119B	Elco silt loam, 2 to 5 percent slopes	0.05%	4
199A	Plano silt loam, 0 to 2 percent slopes	0.04%	3
21B	Pecatonica silt loam, 2 to 5 percent slopes	0.04%	3
100A	Palms muck, 0 to 2 percent slopes	0.02%	2
769B	Edmund silt loam, 2 to 4 percent slopes	0.004%	0.28
	Total:	**100%**	**7,760**

TABLE 19: FARMLAND CLASSIFICATION

Farmland Classification		
Description	**% Watershed**	**Acres**
All areas are prime farmland	59.7%	4,629
Farmland of statewide importance	24.5%	1,902
Not prime farmland	5.1%	398
Prime farmland if drained	2.5%	196
Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	7.9%	616
Prime farmland if protected from flooding or not frequently flooded during the growing season	0.2%	19
Total:	**100%**	**7,760**

TABLE 20: HYDRIC RATING

Hydric Rating			
Rating	**Range**	**% Watershed**	**Acres**
Not Hydric	0%	51.0%	3,958
Hydric	1 to 32%	39.2%	3,041
	33 to 65%	0.0%	0
	66 to 99%	9.3%	724
	100%	0.49%	38
	Total:	**100%**	**7,760**

TABLE 21: HYDROLOGIC SOIL GROUP

Hydrologic Soil Group			
Group	**Description**	**% Watershed**	**Acreage**
N/A	Not applicable, pits or water.	1.6%	124
A	High infiltration rate when thoroughly wet, low runoff potential.	0.8%	65
A/D	Dual Class: drained areas show characteristics of Group A, undrained areas show characteristics of Group D.	0.08%	6
B	Moderate infiltration rate when thoroughly wet.	76.0%	5,894
B/D	Dual Class: drained areas show characteristics of Group B, undrained areas show characteristics of Group D.	14.5%	1,123
C	Slow infiltration rate when thoroughly wet.	4.7%	365
C/D	Dual Class: drained areas show characteristics of Group C, Undrained areas show characteristics of Group D.	0.0%	0
D	Very slow infiltration rate when thoroughly wet, high runoff potential.	2.3%	181
	Total:	**100%**	**7,760**

TABLE 22: SOIL DRAINAGE CLASS

Soil Drainage Class		
Rating	**% Watershed**	**Acres**
Not rated or not available	1.6%	124
Subaqueous	0.0%	0
Very poorly drained	0.02%	1.8
Poorly drained	9.8%	760
Somewhat poorly drained	4.9%	381
Moderately well drained	1.1%	88
Well drained	79.9%	6,200
Somewhat excessively drained	2.6%	204
Excessively drained	0.0%	0
Total:	**100%**	**7,760**

TABLE 23: EROSION HAZARD

Erosion Hazard		
Rating	**% Watershed**	**Acres**
Not rated	1.6%	124
Slight	94.8%	7,355
Moderate	3.6%	280
Severe	0.0%	0
Very Severe	0.0%	0
Total:	**100%**	**7,760**

TABLE 24: ERODIBILITY CLASSES

Erodibility Classes								
Highly Erodible Lands (HEL)					RUSLE Components*			
Map Unit	Soil name	Slope (%)	Characteristic	Acres	R-value*	K-Factor*	T-Factor*	Length/Slope*
728D2	Winnebago Silt Loam	9-15	Eroded	24	180	0.32	5	0.694
21C2	Pecatonica Silt Loam	5-9	Eroded	22		0.37	5	0.601
561D2	Whalan And Newglarus Silt Loam	9-15	Eroded	10		0.35	4	0.518
361D2	Kidder Loam	9-15	Eroded	10		0.32	5	0.694
243C2	St.Charles Silt Loam	5-9	Eroded	9		0.37	5	0.601
505D2	Dunbarton Silt Loam	7-12	Eroded	8		0.37	2	0.24
429C2	Palsgrove Silt Loam	5-9	Eroded	8		0	0	0
199C2	Plano Silt Loam	5-9	Eroded	7		0.32	5	0.694
506C2	Hitt Silt Loam	5-9	Eroded	5		0.32	5	0.694
505C2	Dunbarton Silt Loam	4-7	Eroded	5		0.37	2	0.24
363D2	Griswold Sandy Loam	9-15	Eroded	4		0.32	4	0.694
505E2	Dunbarton Silt Loam	12-20	Eroded	4		0.37	2	0.24
22D2	Westville Silt Loam	9-15	Eroded	4		0.37	5	0.601
561C2	Whalan And Newglarus Silt Loam	5-9	Eroded	3		0.35	4	0.518
728C2	Winnebago Silt Loam	5-9	Eroded	3		0.32	5	0.694
419C2	Flagg Silt Loam	5-9	Eroded	3		0.37	5	0.601
566D2	Rockton and Dodgeville Soils	9-15	Eroded	2		0.3	4	0.596
566C2	Rockton and Dodgeville Soils	5-9	Eroded	2		0.3	4	0.596
769B	Edmund Silt Loam	2-5		0.3		0.37	2	0.24
			Total:	134	% Watershed:	1.73%		
Potentially Highly Erodible Lands (PHEL)					RUSLE Components*			
Map Unit	Soil name	Slope (%)	Characteristic	Acres	R-value*	K-Factor*	T-Factor*	Length/Slope*
780C2	Grellton Sandy Loam	5-9	Eroded	42	180	0.24	5	0.925
419B	Flagg Silt Loam	2-5		20		0.37	5	0.601
259B2	Assumption Silt Loam	2-5	Eroded	17		0.32	4	0.556
332B	Billett Sandy Loam	2-6		10		0.2	5	1.11
506B	Hitt Silt Loam	2-5		9		0.32	5	0.694
783B	Flagler Sandy Loam	3-7		9		0.2	4	0.889
280B	Fayette Silt Loam	2-5		8		0.37	5	0.601
361B	Kidder Loam	2-5		6		0.32	5	0.694
297B	Ringwood Silt Loam	2-5		5		0.28	5	0.794
243B	St.Charles Silt Loam	2-5		5		0.37	5	0.601
119B	Elco Silt Loam	2-6		4		0.37	4	0.48
21B	Pecatonica Silt Loam	2-5		3		0.37	5	0.601
199B	Plano Silt Loam	2-5		3		0.32	5	0.694
440C2	Jasper Silt Loam	5-9	Eroded	2		0.28	5	0.794
227B	Argyle Silt Loam	2-6		2		0.32	4	0.556
728B	Winnebago Silt Loam	2-5		1		0.32	5	0.694
566B	Rockton and Dodgeville Soils	1-5		1		0.3	4	0.596
411B	Ashdale Silt Loam	2-5		1		0.32	5	0.694
412B	Ogle Silt Loam	2-5		0		0.32	5	0.694
			Total:	149	% Watershed:	1.92%		

FIGURE 26: SURFACE TEXTURE

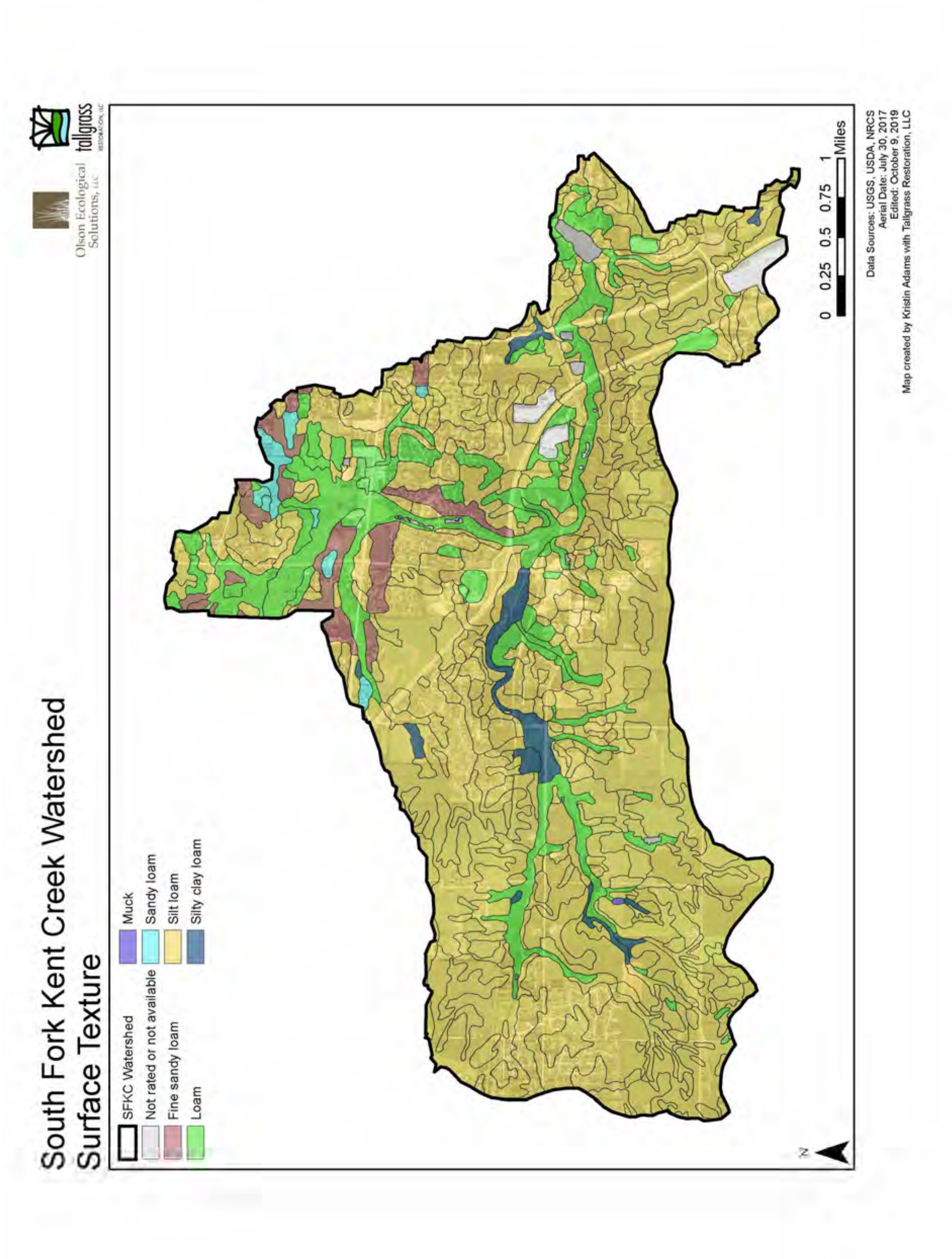
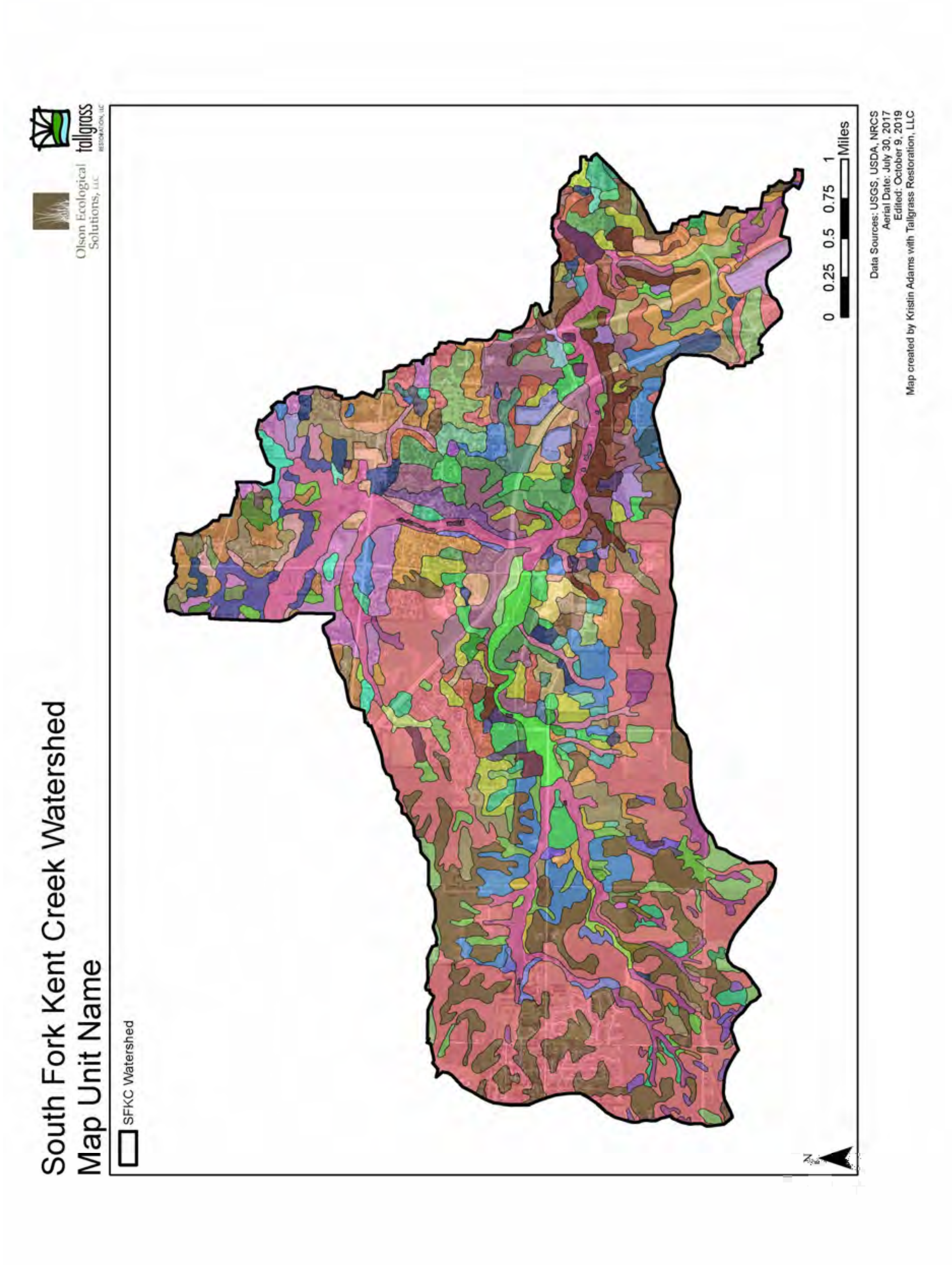


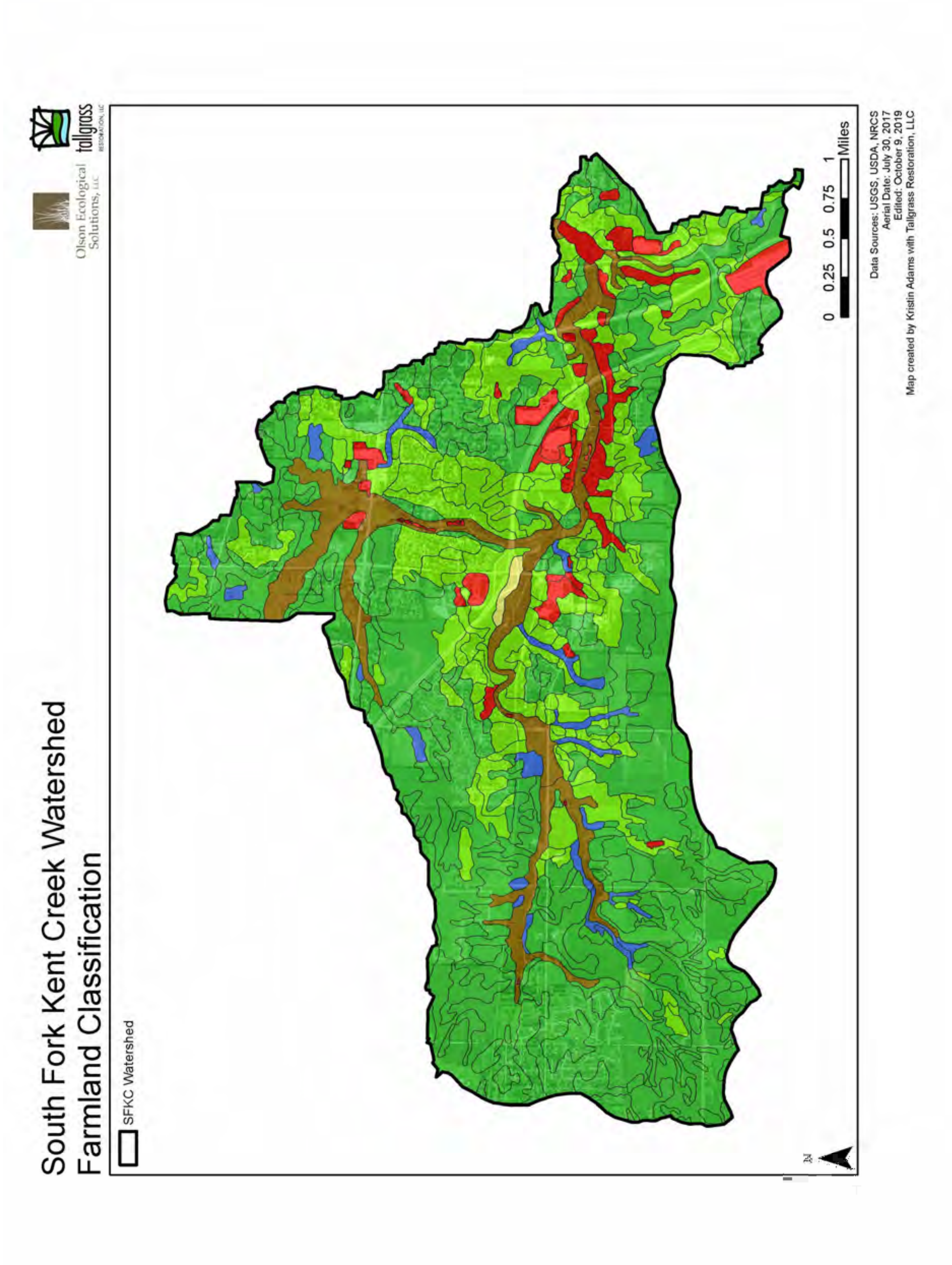
FIGURE 27: SOIL MAP UNIT



South Fork Kent Creek Watershed Map Unit Key

- Not rated or not available
- Argyle silt loam, 2 to 5 percent slopes
- Ashdale silt loam, 2 to 5 percent slopes
- Assumption silt loam, 2 to 5 percent slopes, eroded
- Assumption silt loam, 5 to 10 percent slopes, eroded
- Atterberry silt loam, 0 to 2 percent slopes
- Atterberry silt loam, terrace, 0 to 2 percent slopes
- Beardstown loam, 0 to 2 percent slopes
- Billett sandy loam, 2 to 5 percent slopes
- Comfrey loam, 0 to 2 percent slopes, frequently flooded
- Drummer silty clay loam, 0 to 2 percent slopes
- Dunbarton silt loam, 12 to 20 percent slopes, eroded
- Dunbarton silt loam, 4 to 6 percent slopes, eroded
- Dunbarton silt loam, 6 to 12 percent slopes, eroded
- Edmund silt loam, 12 to 20 percent slopes, eroded
- Edmund silt loam, 2 to 4 percent slopes
- Elburn silt loam, cool, 0 to 2 percent slopes
- Elco silt loam, 2 to 5 percent slopes
- Elizabeth silt loam, 12 to 35 percent slopes
- Elizabeth silt loam, 5 to 10 percent slopes
- Fayette silt loam, glaciated, 2 to 5 percent slopes
- Fayette silt loam, glaciated, 5 to 10 percent slopes, eroded
- Flagg silt loam, 2 to 5 percent slopes
- Flagg silt loam, 5 to 10 percent slopes, eroded
- Flagler sandy loam, 0 to 2 percent slopes
- Flagler sandy loam, 2 to 6 percent slopes
- Friesland fine sandy loam, 0 to 2 percent slopes
- Friesland fine sandy loam, 2 to 5 percent slopes
- Greenbush silt loam, 0 to 2 percent slopes
- Greenbush silt loam, 2 to 5 percent slopes
- Greenbush silt loam, terrace, 0 to 2 percent slopes
- Grellton fine sandy loam, 5 to 10 percent slopes, eroded
- Griswold loam, 6 to 12 percent slopes, eroded
- Hitt silt loam, 2 to 5 percent slopes
- Hitt silt loam, 5 to 10 percent slopes, eroded
- Hoopeston sandy loam, 0 to 2 percent slopes
- Jasper silt loam, 2 to 5 percent slopes
- Jasper silt loam, 5 to 10 percent slopes, eroded
- Kidder loam, 2 to 4 percent slopes
- Kidder loam, 6 to 12 percent slopes, eroded
- Lahoguess loam, 0 to 2 percent slopes
- Martinsville silt loam, 6 to 12 percent slopes, eroded
- Muscatune silt loam, 0 to 2 percent slopes
- Muscatune silt loam, terrace, 0 to 2 percent slopes
- Ogle silt loam, 2 to 5 percent slopes
- Orion silt loam, 0 to 2 percent slopes, frequently flooded
- Orthents, loamy, undulating
- Osco silt loam, 0 to 2 percent slopes
- Osco silt loam, 2 to 5 percent slopes
- Osco silt loam, 5 to 10 percent slopes, eroded
- Palms muck, 0 to 2 percent slopes
- Palsgrove silt loam, 2 to 6 percent slopes, moderately eroded
- Palsgrove silt loam, 5 to 10 percent slopes, moderately eroded
- Pecatonica silt loam, 2 to 5 percent slopes
- Pecatonica silt loam, 5 to 10 percent slopes, eroded
- Pits, quarries
- Plano silt loam, 0 to 2 percent slopes
- Plano silt loam, 2 to 5 percent slopes
- Plano silt loam, 5 to 10 percent slopes, eroded
- Ringwood silt loam, 2 to 4 percent slopes
- Ringwood silt loam, 6 to 12 percent slopes, eroded
- Rockton and Dodgeville soils, 10 to 15 percent slopes, eroded
- Rockton and Dodgeville soils, 2 to 5 percent slopes
- Rockton and Dodgeville soils, 5 to 10 percent slopes, eroded
- Rozetta silt loam, 0 to 2 percent slopes
- Sable silty clay loam, 0 to 2 percent slopes
- Sable silty clay loam, terrace, 0 to 2 percent slopes
- Sawmill silty clay loam, 0 to 2 percent slopes, frequently flooded
- Selmass loam, 0 to 2 percent slopes
- St. Charles silt loam, 2 to 5 percent slopes
- St. Charles silt loam, 5 to 10 percent slopes, eroded
- Troxel silt loam, 0 to 2 percent slopes
- Urban land
- Water
- Westville silt loam, 10 to 18 percent slopes, eroded
- Whalan and NewGlarus silt loams, 10 to 15 percent slopes, eroded
- Whalan and NewGlarus silt loams, 5 to 10 percent slopes, eroded
- Winnebago silt loam, 10 to 18 percent slopes, eroded
- Winnebago silt loam, 2 to 5 percent slopes
- Winnebago silt loam, 5 to 10 percent slopes, eroded

FIGURE 28: FARMLAND CLASSIFICATION



Farmland Classification Key

- Friends Creek Watershed
- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

FIGURE 29: HYDRIC RATING

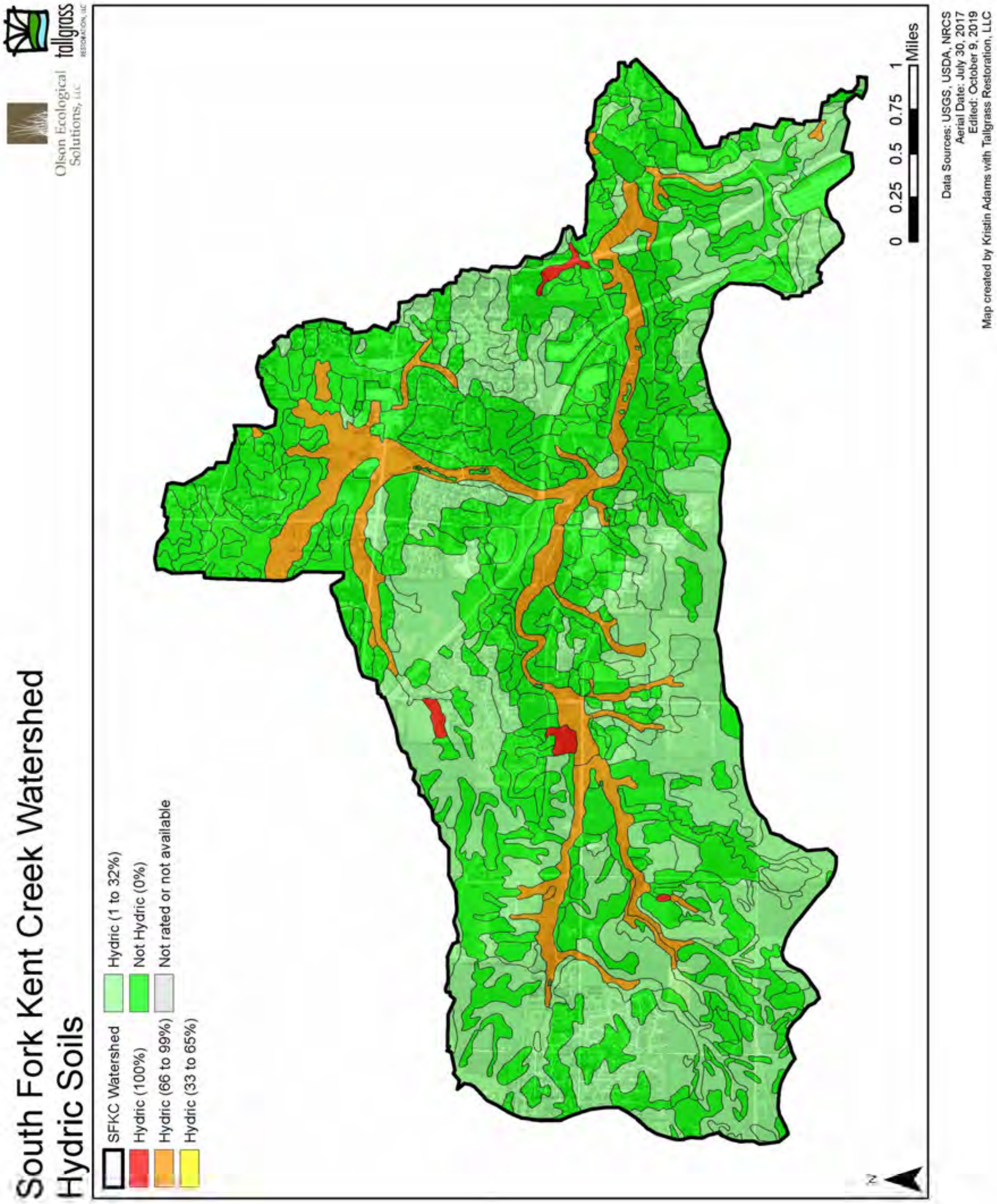


FIGURE 30: HYDROLOGIC SOIL GROUP

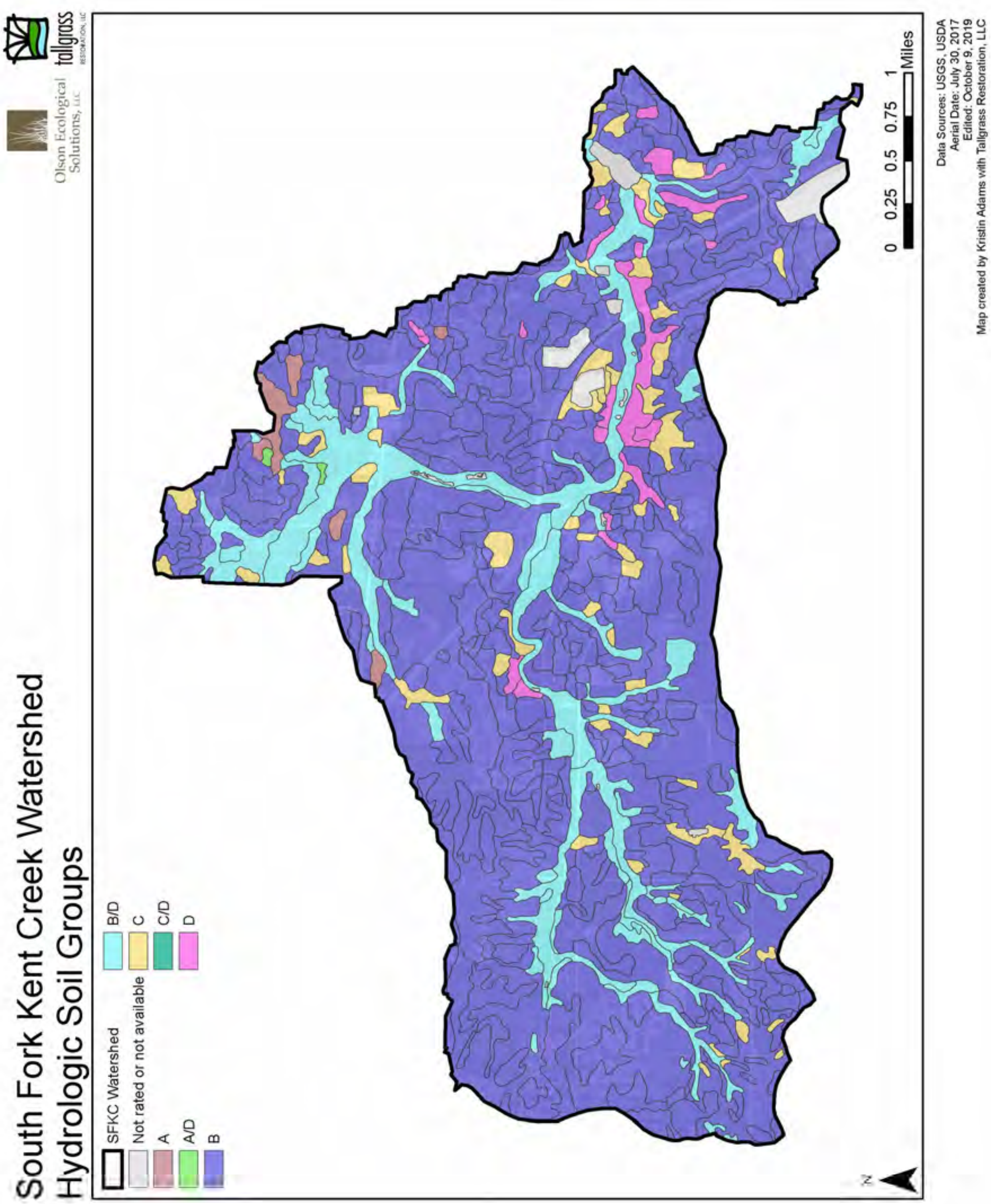


FIGURE 31: SOIL DRAINAGE CLASS

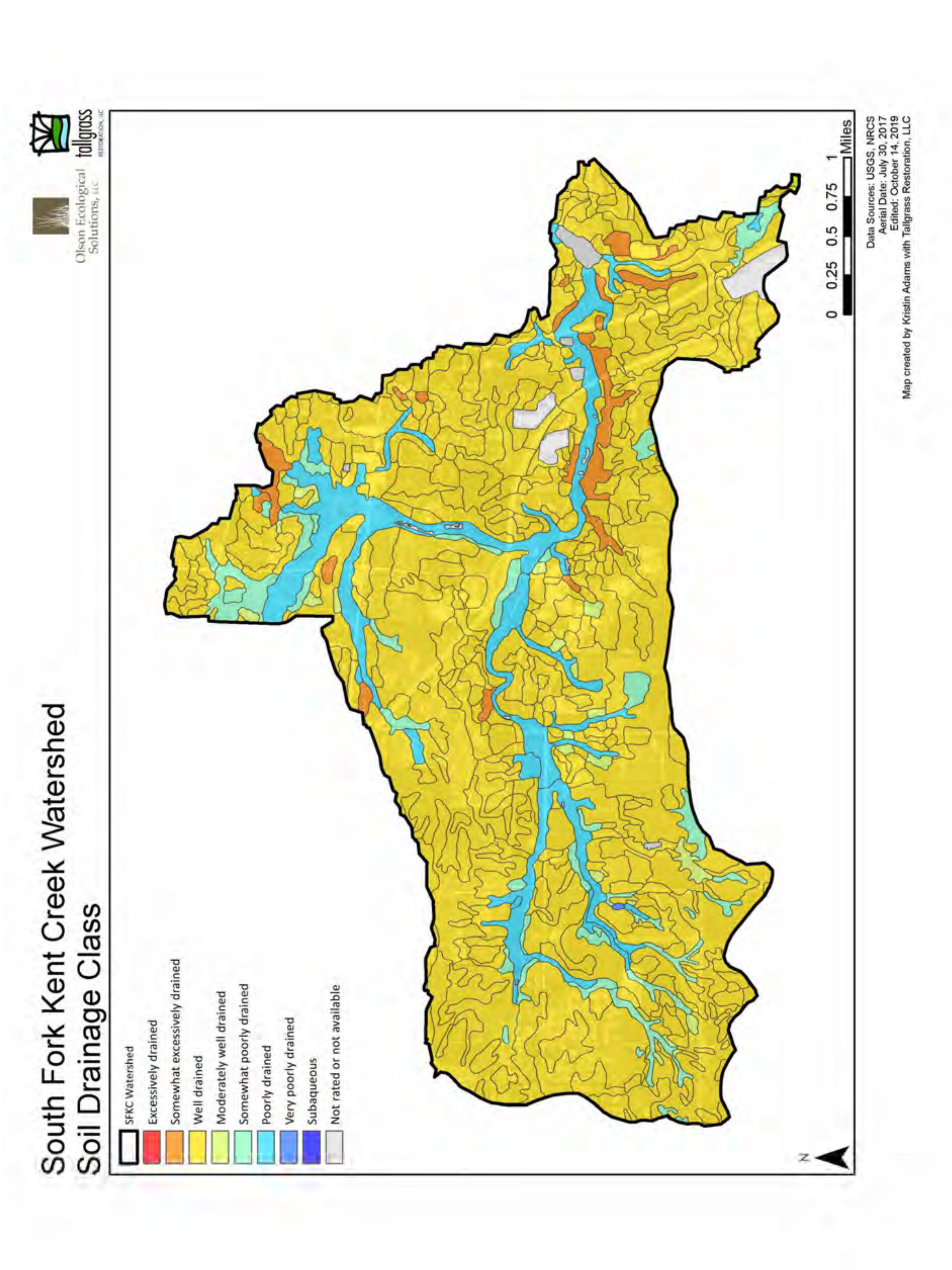


FIGURE 32: EROSION HAZARD

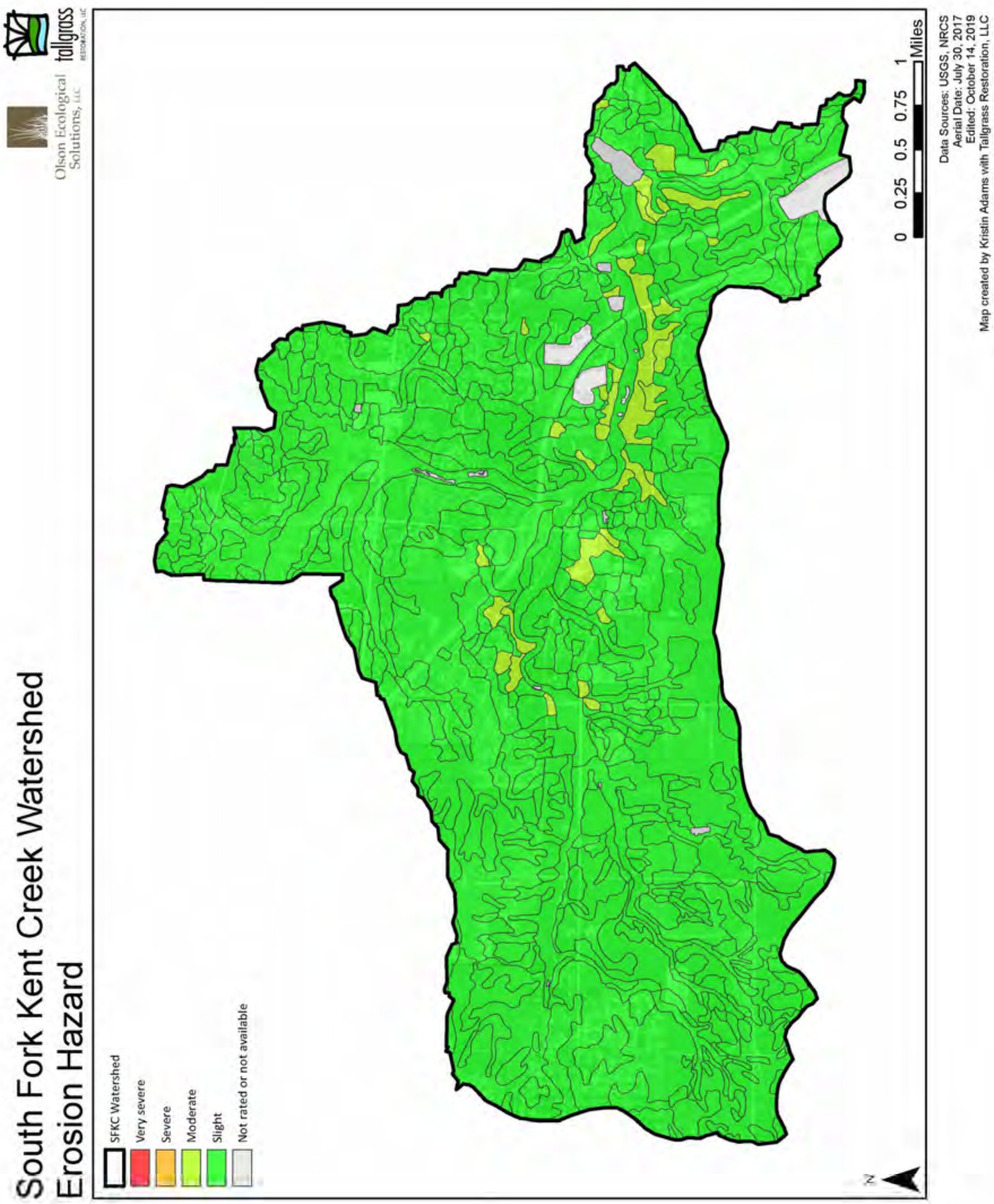
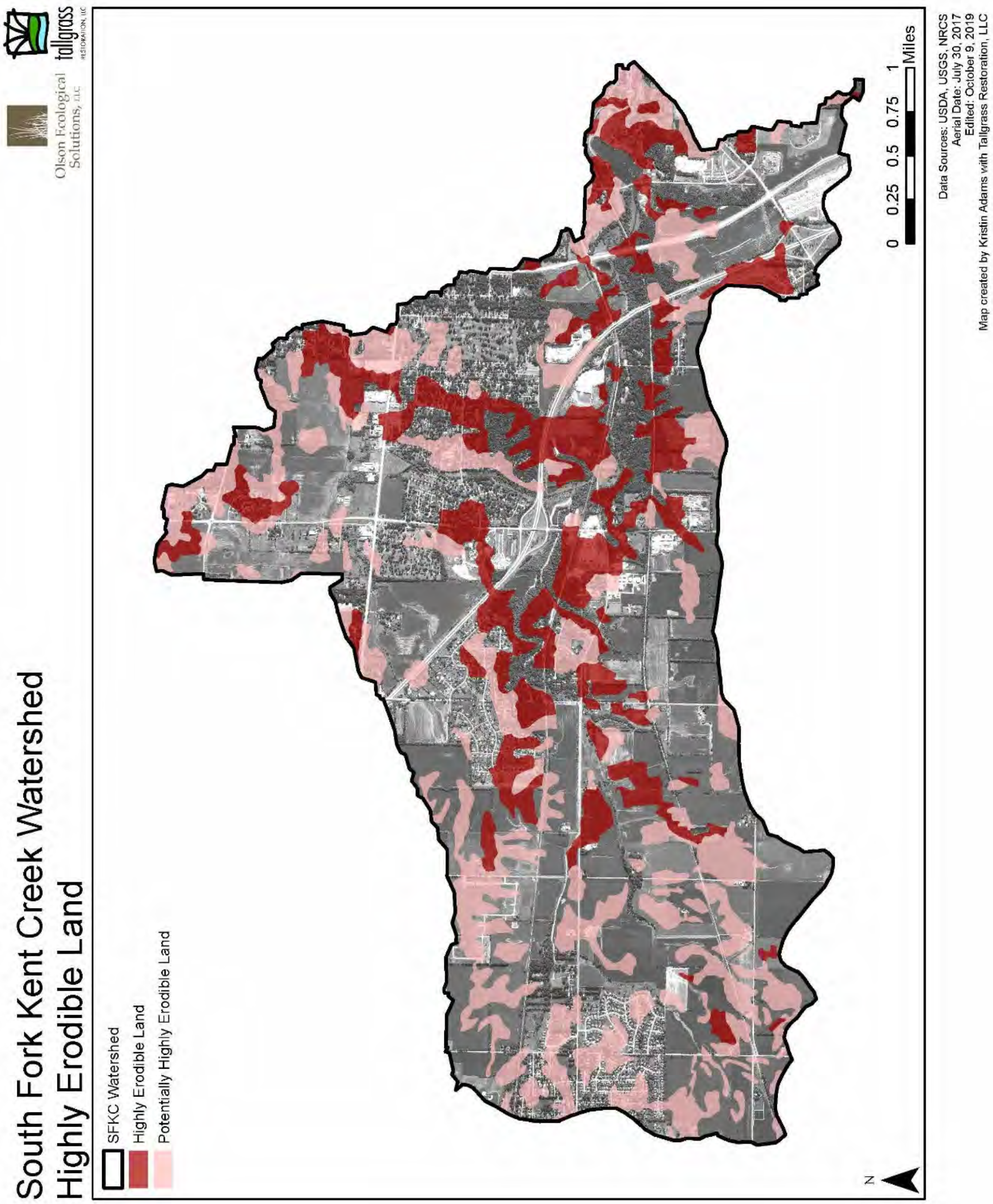


FIGURE 33: HIGHLY ERODIBLE LAND



PART 6: WATER QUALITY ASSESSMENT

ILLINOIS INTEGRATED WATER QUALITY AND SECTION 303(D) LIST

The information for the water quality assessment of the watershed is sourced from the *Illinois Integrated Water Quality Report and Section 303(d) List - Volume 1: Surface Water* (ILEPA, 2018). This report informs the federal government and citizens about the surface water quality of particular streams pertaining to their designated uses, categorized as primary or secondary contact recreation, aesthetic quality, aquatic life, fish consumption, and public and food processing water supply. The streams that do not meet the standard for one or more of the designated uses are referred to as "impaired." According to the ILEPA's 303(d) list, South Fork Kent Creek is documented as an impaired stream because it does not support primary contact recreation (see Table 25). The cause of impairment for South Fork Kent Creek is fecal coliform originating from unknown sources. Other designated use categories were not assessed: aquatic life, fish consumption, secondary contact recreation, and aesthetic quality.

The streams downstream of South Fork Kent Creek are also listed on the ILEPA's 303(d) list as impaired (see Table 26). South Fork Kent Creek channels into Kent Creek, which is impaired due to fecal coliform. Kent Creek is assessed as fully supporting aquatic life yet not supporting primary contact recreation. Fish consumption, secondary contact recreation, and aesthetic quality uses were not assessed. Kent Creek empties into the Rock River, also impaired. The causes of the impairment for the Rock River are mercury and polychlorinated biphenyls. The source of the impairment is reported as toxic atmospheric depositions and other possibly unknown sources. Rock River does not support fish consumption. On the other hand, Rock River fully supports aquatic life, primary and secondary contact recreation, and aesthetic quality. Reducing the fecal coliform in the South Fork Kent Creek is important for minimizing its potential effects on the downstream water quality.

LOCAL WATER QUALITY TESTING

Water samples were taken at Levings Lake within the watershed on August 5, 2016 by JadEco Natural Resources Consulting and on July 10, 2019 and August 12, 2019 by Lake & Pond Solutions. All of these samples measured phosphorus and nitrogen in the lake, and the 2016 measurements also measured total suspended solids (TSS). Between sampling years, phosphorus demonstrated a possible decrease and nitrogen levels were similar. Total phosphorus (TP) levels were 0.027 mg/L, 0.020 mg/L, and 0.019 mg/L on the consecutive sampling dates, and total nitrogen (TN) levels were 4.79 mg/L, 5.51 mg/L, and 4.82 mg/L. TSS was 25 mg/L in 2016; it was not sampled in 2019. TP levels were consistently less than the State of Illinois' General Water Use Quality Standard of 0.05 mg/L and the USEPA's suggestion of 0.038 mg/L. Orthophosphorus, the form of phosphorus available for uptake by plants and algae, had levels of 0.018 mg/L, 0.036 mg/L, and 0.027 mg/L during the three consecutive sampling dates, all of which were above the level of 0.01 mg/L that can cause nuisance algae blooms. TN levels fell within the acceptable range of 2 mg/L and 6 mg/L set by the USEPA. There are no state standards for TSS.

As of 2019, the depth of Levings Lake is on average 4 feet, as measured in the sediment survey conducted during the spring and fall of 2019. Historically the depth was 6 feet. In 2019, RPD experimented with muck pellet treatment to see if that improves lake depth. Muck pellets contain natural beneficial bacteria and enzymes that feed on the organic sediment, or muck, at the lake bottom, thus reducing the sediment levels in localized areas. The average sediment depth in the spring of 2019 was 24.6 inches. After four muck pellet treatments, once per month, the average sediment depth was 13.8 inches. Muck pellet treatment resulted in a sediment reduction of 10.8 inches. Because this sediment reduction seemed high, consultants researched muck pellet case studies and found that it was not out of line with what other case studies found. Some case studies with a relatively similar number of treatments and similar application rate found similar depth reductions.

Lake & Pond Solutions also conducted measurements of dissolved oxygen (DO) throughout the summers of 2018 and 2019. DO is the measurement of how much oxygen is dissolved in the water, which correlates to the amount of oxygen that is available to living aquatic organisms. Since all forms of aquatic life utilize the DO in surface waters, the value of DO and whether or not there is enough to support aquatic life is frequently used to assess the health of a stream or lake (USGS). DO in Levings Lake was measured at multiple sample sites in August of 2018, June of 2019, July of 2019 and August of 2019. At each sample site, DO and temperature was measured at four different depths. The value of DO at the lowest depth, or the depth right at sediment level, is the most important value to consider since that value is likely to have the lowest amount of DO. DO is measured in order to ensure the lake water will support basic aquatic life. Any DO value above five parts per million (ppm) will support basic aquatic life. DO ranged from 5.17 ppm to 11.39 ppm for all sample sites at all depths. For the depths at sediment level, DO ranged from 5.15 ppm to 11.11 ppm. These ranges show that even during the summer, when DO levels are expected to lower, DO remains above 5 ppm.

STREAM SURVEY

We performed a thorough evaluation of stream riparian buffer conditions, erosion rates, and channelization throughout the South Fork Kent Creek Watershed. To assess riparian buffer conditions and erosion rates, we surveyed stream segments throughout the watershed. See Appendix A for a map depicting the location of each stream segment as well as a breakdown of the analysis for each stream segment sampled. We determined the extent of channelization for all streams visible via aerial imagery.

In order to assess stream riparian condition and streambank erosion, we performed site surveys in late October and early November of 2019. We surveyed 31,793 feet of stream segments throughout the entire watershed. Several key factors determined which streams were surveyed: landowner permission, accessibility, and the desire to best represent the entire watershed. Subbasins with no surveyed stream segments are A, F, J, N, and O. Surveyed stream segments are labeled by the subbasin in which they fall and then are further broken down numerically. For instance, three stream segments surveyed in Subbasin B are labeled B1, B2, and B3. The stream segment labeled B1 is further divided into three sections (B1.1, B1.2, B1.3) because of the varying erosion rates or riparian conditions within the B1 stream segment. We inventoried 20 stream segments along the main stem of South Fork Kent Creek and along unnamed tributaries for the riparian condition and streambank erosion. For each stream segment surveyed, OES determined if the riparian buffer was in good, fair, or poor condition using the standards listed in Table 27.

From our survey, we found that approximately 55% of the surveyed streambanks in the watershed have poor riparian condition resulting from little to no vegetation surrounding the streams. About 41% of streambanks appear to be in good condition with naturalized vegetation within 50 feet of the streambank, even though many contain invasive herbaceous and woody species. The remaining 3% of surveyed streambanks have riparian buffer in fair condition.

For each stream segment surveyed, we measured streambank heights, estimated the streambank's lateral recession rate (LRR) using the standards listed in Table 28, and specified the streambed erosion stage by the standards in Table 29 and Figure 34. LRR is the thickness of soil eroded from a bank surface.

LRR is typically measured in feet per year and ranges from zero feet per year, which indicates no erosion occurring, to greater than 0.5 feet per year, which indicates very severe erosion. Of the surveyed streambanks, 38% are categorized as having slight erosion, 26% as moderate, 27% as severe, and 9% as very severe. Subbasin C has the highest amount (2,296 feet) of surveyed streambank with severe LRR, with Subbasin B following closely behind (2,076 feet). Subbasin B also has the highest amount (1,284 feet) of surveyed streambank with very severe LRR, followed by Subbasin C (1,257 feet). If we assume that our sample is representative of the watershed and apply the percentages accordingly, then the watershed has estimates of streambank erosion as follows: 22,043 feet very severely eroding, 66,129 feet severely eroding, 63,680 feet moderately eroding, and 93,071 feet of slight to no erosion.

Streambed erosion stages and other observations, e.g. debris blockages, also help give an idea of the type and degree of streambed erosion and other potential factors contributing to erosion or sedimentation in surveyed streams. Surveyors utilized the channel evolution model (Figure 34) to determine which erosive stage the streambed demonstrated (Hupp, 1992). Some streams have dead trees or active beaver dams causing debris blockages in parts of the streams. Out of 20 stream segments surveyed, we recorded debris jams on 12 of them. Streams B1.2 and B1.3 have major slumping of sediment throughout the stream as well as dead tree blockages. Portions of Stream C2 has debris jams and some head cutting. Other surveyed streams have evidence of rip rap or rock placement in order to reduce the erosive force of water flow and stabilize the streambanks. Stream D2 has rip rap on both sides of the bank at some of the more severe curves of the stream or where there had been more streambank erosion. Stream H1 has some angular concrete rocks placed on both sides of bank at sharp curves.

In October of 2019, we conducted a desktop analysis of stream channelization of all intermittent and perennial streams visible via aerial imagery. The criteria used to classify the stream channelization as low, moderate, or high can be found in Table 30. Table 31 depicts the length and severity of stream channelization per subbasin. Of the 122,462 feet of stream assessed 73,255 feet (60%) have little to no channelization; 23,593 feet (19%) have moderate channelization; and 25,614 feet (21%) have high channelization. Figure 35 depicts the high and moderate channelization found in the watershed during this desktop analysis.

WATERBODY SURVEY

In addition to performing streambank surveys, we evaluated waterbody riparian buffer conditions and shoreline erosion rates throughout the South Fork Kent Creek Watershed. See Appendix A for a map depicting the location of each waterbody as well as a breakdown of the analysis found at each waterbody surveyed.

We performed waterbody site surveys in late October and early November of 2019. We surveyed 18,318 feet of waterbody shoreline throughout the entire watershed. Factors that determined which waterbodies were surveyed were the same that dictated which streams were surveyed: landowner permission, accessibility, and the desire to best represent the entire watershed. Subbasins that have no surveyed waterbodies are G, I, J, N, and O. Surveyed waterbodies are labeled by the subbasin in which they fall and then are further broken down numerically. We inventoried the riparian condition and shoreline bank erosion of 15 waterbodies.

For each waterbody surveyed, we determined if the riparian buffer was in good, fair, or poor condition using the standards listed in Table 27. Approximately 66% of the surveyed waterbodies in the watershed appear to have poor riparian condition resulting from little to no vegetation surrounding the waterbodies. About 18% of the waterbodies appear to be in fair condition. The remaining 16% of surveyed waterbodies have a riparian buffer in good condition.

For each waterbody surveyed, we also measured shoreline heights and estimated the LRR by using the standards listed in Table 28. Of the surveyed shoreline, 49% are categorized as having slight erosion, 39% as moderate, 12% as severe, and 0% as very severe. Extrapolating our results to the entire watershed, we assume that of the 29,063 feet of total waterbody shoreline, the following erosion rates apply: 14,241 feet have little to no erosion; 11,335 feet are moderately eroding; 3,487 feet are severely eroding; and; and none of the shorelines are considered to be very severely eroding.

WOODLAND SURVEY

During the survey site visits, we also surveyed the woodlands surrounding the surveyed stream segments and waterbodies. See Appendix A for a chart depicting the findings at each woodland surveyed. We surveyed 17.65 acres (768,725 square feet)within 15 woodlands for quality (measured by the presence or absence of invasive woodies), percent cover of dead canopy trees, and percent of herbaceous vegetation groundcover. See Table 32 for the criteria for categorizing the quality of surveyed woodlands. A summary of these findings can be found in Part 3: Land Uses.

POLLUTANT MODELLING

Considering the land cover of the South Fork Kent Creek Watershed, we estimated the amount of nonpoint source pollutants entering South Fork Kent Creek and its tributaries. We analyzed excess nutrients (TN and TP), sediment (TSS), and bacteria that commonly result from agricultural and developed lands like those found in the South Fork Kent Creek Watershed. We assessed each pollutant within each of the 15 subbasins to determine a baseline pollutant loading rate and identified specific areas of concern or opportunity within the South Fork Kent Creek Watershed. We then estimated the pollutant loading rate resulting from streambank erosion throughout the watershed. This baseline can be compared to the future effects of implementing Best Management Practices (BMPs) within the watershed proposed by the South Fork Kent Creek Watershed Plan.

METHODS

We analyzed the 15 subbasins of the watershed for pollutant loading into their respective tributaries and sections of South Fork Kent Creek using the BASINS Pollutant Loading Estimator (PLOAD) software package (Hill, 2001). We repeated this modelling exercise for the entire watershed to identify where various concentrations of the four target nonpoint source pollutants were originating throughout the watershed based on land cover. Estimating pollutant loading using BASINS in the manner described below is generally used for planning at a subbasin and watershed scale but is not intended to include the level of detail needed for site planning (New York State, 2017).

BASINS is a multi-purpose environmental analysis system that integrates GIS, watershed data, and modelling tools supported by the USEPA (USEPA, 2017). This software analyzes watershed and water quality using both user input data and data downloaded from the internet. Within this software is the PLOAD model, a simplified, GIS-based model which calculates the pollutant load amounts within a watershed. To make sure that PLOAD accurately reflects the South Fork Kent Creek Watershed, we determined annual rainfall within the area and researched local values for impervious cover and event mean concentrations (EMCs) of pollutants for each of the 19 land use types found within the watershed. We used the local data reported below in our calculations.

•Annual Rainfall: We used the normal rate of annual precipitation data from NOAA using the Greater Rockford Airport, IL station data averaged from 1981 through 2010, which resulted in a value of 35.36 inches per year.

•Impervious Cover: Local values of impervious cover for urban land uses used by the City of Peoria in their Code of Ordinances (n.d.) mirrored averages reported by the NRCS (USDA, 1986 *in* New York State, 2017). We derived impervious surface of agricultural land and various open space uses from U.S. Geological Survey (USGS) (Capiella and Brown, 2001; Tilley and Slonecker, 2007). We used the following:

- 100% impervious: Roads, Railroad, Trail
- 85% impervious: High Density Developed
- 72% impervious: Medium Density Developed
- 38% impervious: Low Density Developed
- 9% impervious: Golf Course, Cemetery, Turf
- 2% impervious: High and Low Residue Till, Orchard, Pasture, Mulch Yard
- 0% impervious: Wetland, Forest, Water, Grassland, Quarry

•Pollutant EMCs: We used the most current EMC data from February 2018 created for the Des Plaines River Watershed Plan by Northwater Consulting. These values can be observed in Table 33. We prefer local values to determine pollutant load rates compared to the 2016 NLCD national averages. This resource did not report TSS by row crop production, so we alternatively used the Urban Runoff Loading Rate from the USEPA Region 5 Model for Estimating Pollutant Load Reductions (NIPC, 1193 in USEPA, 2018) for Low Residue Till. Furthermore, we reduced this amount for High Residue Till following reductions noted in the Illinois NLRS (Illinois Dept. of Ag., 2015). We did not use the Simple Method to determine cropland values, as they were already reported as pollutant loading rates (lbs/ac-yr).

We provided PLOAD with local pollutant loading rates (lbs/ac-yr) derived from local rainfall (in/yr), impervious surface per land use type (%), and pollutant concentrations (mg/L) using the Simple Method (USEPA, 2001; Shueler, 1987; New York State, 2017). These values can be seen in Table 34. We then calculated pollution loads within PLOAD using the Export Coefficient Method (Hill, 2001), which uses the area (ac) and pollutant loading rates (lbs/ac-yr) of each land use type. This process resulted in estimated annual pollutant loading per subbasin and per land use type (lb/yr). The Simple Method and Export Coefficient Method are sometimes presented as one equation, but we utilized them separately in order to provide BASINS with the needed inputs to the model and to better understand the pollutant loading rates per land use.

SIMPLE METHOD

Estimating the nutrient and sediment loading from each land use type involves three Simple Method calculations as follows:

EQUATION 1: RV = 0.05 + (0.9 * I)

- Rv Runoff Coefficient (no unit)
- I Imperviousness (decimal %)

Equation 2: R = Rv * P * CF

- R Annual Runoff (in/yr)
- Rv Runoff Coefficient (no unit)
- P Annual Precipitation (35.36 in/yr)
- CF Correction Factor (0.9 for storms with no runoff, no unit)

Equation 3: EC = R * C * 1 Ac * 0.226

- EC Export Coefficient (lb/ac-yr)
- R Annual Runoff (in/yr)
- C Event Mean Coefficient (mg/L)
- 0.226 Unit Conversion Factor (2.716 L-lb/mg-ac-ft / 12 in/ft)

Estimating the bacteria loading from each land use type involves a different conversion factor to account for the differences in units. This equation is:

Equation 4: EC = R * C * 1 Ac * 1.03 * 10-3

- EC Export Coefficient (billion counts/ac-yr)
- R Annual Runoff (in/yr)
- C Event Mean Coefficient (counts/100 ml)
- 1.03 * 10-3 Unit Conversion Factor

The Simple Method explains in mathematical terms that the annual pollutant loading is based on the amount of annual runoff (R) caused by impervious surface (I) and rainfall (P) combined with the concentration of pollutants (C) within the runoff. More impervious surface will equate to more runoff leaving the site and entering the stream or waterbody. As a result, the pollutant load from an acre of land use with high impervious surface and low pollutant concentration may be greater than an acre of a land use that has higher pollutant concentrations but less impervious surface. For example, Low Intensity Development like a residential subdivision has an average phosphorus concentration (C) of 0.3 mg/L and average of 38% impervious surface (I) while Low Residue Till farmland has an average phosphorus concentration (C) of 0.6 mg/L yet virtually no impervious area (I), 2%. When the Simple Method equation is used, we see that the pollutant loading (EC) of these land uses is 0.85 lb/ac-yr for Low Intensity Development and 0.29 lb/ac-yr for Low Residue Till. Even though Low Residue Till had twice the pollutant concentration in its runoff, it had significantly less runoff due to its lack of impervious surface; therefore, it contributed less pollution loading to the stream than Low Intensity Development.

It is important to note that we did not consider other variables that affect the amount of runoff coming from a particular land use in the Simple Method such as slope, soil type, and fertilizer applications. Therefore, our comparison of subbasins within the watershed consider land use type only. By limitation of the equations and model on a watershed scale, we considered a land use on a flatter slope to have the same amount of runoff as the same land use type on a steeper slope, and we considered a land use type on more compact soil to have the same runoff as the same land use on soil with more infiltration capacity. We assumed fertilizer applications to be the same on each property within the same land use type. In reality, pollutant loads in stormwater runoff would be different given these variables within similar land uses. Some of the variables will be considered when prioritizing focus areas for BMPs.

EXPORT COEFFICIENT METHOD

Once we generated the pollutant loading per acre using the Simple Method, we provided the results to BASINS. This software program then used the Export Coefficient Method to multiply the pollutant loading per acre by the number of acres for each land use in each subbasin to estimate the total pollutant loading from each subbasin and the entire watershed. The equation has different units for nutrients and sediment than for bacteria:

EQUATION 5: L = EC * A

Where for nutrients and sediment:

- L Pollutant Load (lb/yr)
- EC Export Coefficient (lb/ac-yr)
- A Area (ac)

Where for bacteria:

- L Pollutant Load (billion counts/yr)
- EC Export Coefficient (billion counts/ac-yr)
- A Area (ac)

The BASINS results reflect pollutant loading within the watershed by subbasin and land use type as discussed below.

In addition to land use pollutant loading calculated by the process above and BASINS, we also considered if bank erosion significantly contributes nutrients and sediment to the stream. We used the USEPA's Region 5 Model for Estimating Pollutant Load Reductions to determine the pollutant load reduction estimates for each sampled bank and added them together for an estimate of total reduction for each pollutant. This model estimates that stabilizing the banks reduce pollutant loading to the stream by 95%. From there, we extrapolated 100% of the estimated pollutant loading of each pollutant by adding 5% to give us the baseline pollutant loading from sampled eroding streambanks. We used our sample of 31,793feet of streambank to represent the entire watershed by extrapolating the results to the watershed's 59,502 feet of streambanks along perennial streams. We did not consider intermittent streambanks during this preliminary analysis; therefore, our sample represented 53% of perennial streambanks.

RESULTS

The mapping and modeling exercise resulted in a screening of land cover and estimated pollutant loading into South Fork Kent Creek and its tributaries. Land cover data, presented below, gives an overarching look at the South Fork Kent Creek Watershed. A land cover breakdown amongst 15 subbasins further assists data analysis. We estimate pollution loading for each of the 15 subbasins and report a range. These results are explored in greater depth in the following sections.

From the mapping and modeling exercise, land cover is identified and each of the 15 subbasins are highlighted for their contributing amounts of the four target pollutants to the stream, taking into consideration the percentage of impervious surfaces per land use type. Subbasins colored in different hues represent the pollutant loading range in which they fall for each of the four target pollutants. Variations in color allow a quick reference of the subbasins with the largest pollutant loads to the stream and therefore the greatest opportunity for change.

POLLUTANT LOADING BY LAND USE

Pollutant loading by land use throughout South Fork Kent Creek Watershed gives an interesting comparison which can be observed in Table 35. Although 19 different land use types are observed, we only discuss a few that offer more significant results. The majority of the landscape, 2,726 acres of high residue tilled agricultural land, contributes nearly 17.5% (667.6 lbs/yr) of the TP loading into South Fork Kent Creek and its tributaries. This estimated load can be compared to the roads within the watershed, which cover only 367 acres but account for about 22.3% (853.8 lbs/yr) of TP loading, a much more intense concentration. On the other end of the spectrum, forests span 1,090 acres of the watershed, nearly three times the overall acreage of the roads, yet they contribute only about 1.5% (58.9 lbs/yr) of the TP loading. Low intensity developed areas contribute the most phosphorous to the watershed at 33.5% (1,282 lbs/yr).

A similar comparison for TN results in about 17.4% (8,011 lbs/yr) loading from high residue tilled agricultural land, while forests still only account for 1.5% (550 lbs/yr). Roads, similar to the phosphorous load, have a relatively large nitrogen load, at 15.9% (5,776 lbs/yr) despite the low representative acreage of the land use within the watershed. Low intensity developed areas span 1,514 acres and also have the largest nitrogen load at 37.7% (13,679 lbs/yr).

The suspended solids have a slightly different ratio of the estimated load. In this case, roads result in the highest rate of 27.0% (384,224 lbs/yr) despite covering less than 5% of the entire watershed. The sediment runoff from the high residue agricultural lands accounts for 22.1% (291,955 lbs/yr) while forests have an impact of less than 1% (1,145 lbs/yr).

Compared to the other pollutants, bacteria show low intensity developed areas as an obvious outlier. These residential lands account for an impressive 73.7% (161,466 counts/yr) of bacteria loading into streams and waterbodies. No other land use type exceeds 10%. Roads account for 8.9% (19,428 counts/yr) while forests represent 0.82% (1,786) of the bacteria load.

POLLUTANT LOADING BY SUBBASIN FOR HISTORIC LAND USE

To initiate a comparison for what the ideal pollutant load by subbasin should reflect, we ran the PLOAD model using the historic land use as the data. This allows us to observe what the water quality in the watershed would have been like in the 1800s when most of the land was prairie, and it helps us to understand natural levels nutrient, sediment, and bacteria loading into the South Fork Kent Creek and its associated tributaries and waterbodies. Sloughs, springs, and marshes were classified as wetland, while the small section denoted as field was considered high residue tillage. The results can be viewed and compared to the pollutant load outcomes from today's land use in Table 36 through Table 43.

Across the watershed as a whole, nutrients and sediment loads of today are dramatically higher than the natural levels of the pre-developed watershed in the 1800s. The loading rates of all four target pollutants have increased 10 to 26 times their historic loading rates based on land use changes. Historically, the pollutant loading was a fraction of what it is today: TP loading into streams was one-tenth the current rate, TN was 7%, TSS was 4%, and Bacteria was 6%.Subbasin N saw the greatest percent change for TN, TP, and bacteria. The entirety of this subbasin was originally prairie, while as of current day land use, it is predominantly developed. Subbasin B had the least percent change for TP and TN. This subbasin still has over 200 acres of forested land, significantly more than any other subbasin. TSS is unique in its percent change from current from historic land use, seeing the most change in Subbasin A and the least in Subbasin K, possibly due to the amount of area used in road development which has one of the higher sediment loading rates. Bacteria showed the least percent change in Subbasin F, which currently only holds about 11 acres of developed land while the majority is in agricultural fields.

POLLUTANT LOADING BY SUBBASIN

By applying the pollutant loading analysis, trends show which regions within the South Fork Kent Creek should be prioritized based on their estimated pollutant loads (see Figure 36 through Figure 43, and Table 36 through Table 43). Since the subbasins vary in size, we consider the results shown by comparing the annual load in pounds per year secondary to the per-acre approach. Overwhelmingly, Subbasin N, located along the eastern edge of the watershed, contributes more phosphorous, nitrogen, and bacteria than all of the other subbasins in the total load per year. However, Subbasin A in the southeastern corner, has the most suspended solids present in pounds per year, followed closely by Subbasin N. Other significantly high contributors are Subbasin D, which has the second highest nitrogen load, and Subbasin L which has the second highest bacteria load. Subbasin B is of least concern overall, however the loads are still significant.

The picture varies slightly when analyzing pollutant loading into South Fork Kent Creek per year on a per-acre basis. Annual TSS contributions per acre are high in all 15 subbasins. Each subbasin contributes between 142 and 275 pounds per acre of TSS annually, with Subbasin A accounting for the highest quantities. TN and TP loading per acre are highest in Subbasin N, with nitrogen at a rate of 6.53 pounds per acre and phosphorous at 0.72 pounds per acre each year. Annual bacteria counts per acre are the highest in Subbasin L, which is located centrally within the watershed, at a rate of 55.8 billion counts per acre per year.

The high pollutant loading of the four most contributing subbasins seems to be related to land cover. Subbasins that have a higher coverage of low intensity developed areas are typically higher in nitrogen, phosphorous, and bacteria loading to the stream. This is the case with Subbasin N, since it hosts a significant portion of the Parker Woods Neighborhood. Subbasin A, however, does not fit this description. It represents the highest suspended solid load due to hosting a significant amount of acreage in roads, the land use with the highest sediment loading rate. About 72.5 acres of roads are present in Subbasin A, after which the next highest acreage of roads is only 49.2 acres in Subbasin M, even though Subbasin M is larger than Subbasin A by almost 100 acres. Subbasins with the highest amount of total pollutant loading detected are shaded darker on maps for comparison.

POLLUTANT LOADING BY BANK EROSION

The 31,793 feet of sampled streambanks contribute an estimated 978 tons/yr of sediment, 874 lb/yr of TP, and 1,747 lb/yr of TN to the stream. Since sampled streambanks represent 53% of the 59,502 feet of perennial streambanks throughout the watershed, we assume that all perennial streambanks contribute 1845 ton/yr of sediment, 1,650 lb/yr of TP, and 3,300 lb/yr of TN in addition to contributions by the watershed's land uses. Please note that the Region 5 model didn't address bacteria, and it expresses tons of sediment loss per year while BASINS presents pounds of TSS loss per year from land uses.

TABLE 25: ILEPA WATER QUALITY DATA WITHIN SOUTH FORK KENT CREEK WATERSHED

ILEPA Water Quality Data Within South Fork of Kent Creek Watershed		
South Fork Kent Creek	**AUID:**	IL_PSA
	Basin:	6, Rock River
	Category:	5
	Stream Length:	9.6 Miles
	TMDL:	No ongoing or approved TMDLs
	Status of Use Attainments:	Aquatic Life Not Assessed (X582) Fish Consumption Not Assessed (X583) Not Supporting Primary Contact (N585) Secondary Contact Not Assessed (X586) Aesthetic Quality Not Assessed (X590)
	Causes of Impairment:	Fecal coliform (400)
	Sources of Impairment:	Source Unknown (140)
	Priority:	Medium

TABLE 26: ILEPA WATER QUALITY DATA FOR DOWNSTREAM AFFECTED WATERS

ILEPA Water Quality Data for Downstream Affected Waters		
Kent Creek	AUID:	IL_PS
	Basin:	6, Rock River
	Category:	5
	Stream Length:	0.5 Miles
	TMDL:	No ongoing or approved TMDLs
	Status of Use Attainments:	Fully Supporting Aquatic Life (F582) Fish Consumption Not Assessed (X583) Not Supporting Primary Contact (N585) Secondary Contact Not Assessed (X586) Aesthetic Quality Not Assessed (X590)
	Causes of Impairment:	Fecal Coliform (400)
	Sources of Impairment:	Source Unknown (140)
	Priority:	Medium
Rock River	AUID:	IL_P-23
	Basin:	6, Rock River
	Category:	5
	Stream Length:	7.5 Miles
	TMDL:	No ongoing or approved TMDLs
	Status of Use Attainments:	Fully Supporting Aquatic Life (F582) Not Supporting Fish Consumption (N583) Fully Supporting Primary Contact (F585) Fully Supporting Secondary Contact (F586) Aesthetic Quality Not Assessed (X590)
	Causes of Impairment:	Mercury (274) Polychlorinated biphenyls (348)
	Sources of Impairment:	Atmospheric Deposition - Toxics (10) Source Unknown (140)
	Priority:	Medium
Rock River	AUID:	IL_P-14
	Basin:	6, Rock River
	Category:	5
	Stream Length:	11.01 Miles
	TMDL:	No ongoing or approved TMDLs
	Status of Use Attainments:	Fully Supporting Aquatic Life (F582) Not Supporting Fish Consumption (N583) Fully Supporting Primary Contact (F585) Fully Supporting Secondary Contact (F586) Fully Supporting Aesthetic Quality (F590)
	Causes of Impairment:	Mercury (274) Polychlorinated biphenyls (348)
	Sources of Impairment:	Atmospheric Deposition - Toxics (10) Source Unknown (140)
	Priority:	Medium

TABLE 27: RIPARIAN CRITERIA (CONDITION)

Riparian Criteria (Condition)			
Category	**Vegetation Width**	**% Area Vegetated**	**Vegetation Height**
Good	≥ 50 feet	≥ 55%	≥ 12 inches
	≥ 25 feet	≥ 70%	≥ 12 inches
	≥ 25 feet	≥ 55% and sandy/sandy loam	≥ 12 inches
Fair	≥ 15 feet but ≤ 25 feet	≥ 55%	≥ 12 inches
Poor	< 15 feet	-	-
	Or doesn't meet qualifications listed above		

TABLE 28: LATERAL RECESSION RATE CRITERIA (EROSION)

Lateral Recession Rate Criteria (Erosion)		
LRR (ft/yr)	**Category**	**Description**
0.01 - 0.05	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang. No exposed tree roots.
0.06 - 0.2	Moderate	Bank is predominantly bare with some rills and vegetative overhang.
0.3 - 0.5	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped.
0.5+	Very Severe	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains and culverts eroding out and changes in cultural features as above. Massive slips or and culverts eroding out and changes in cultural features as above. Massive slips or eroding out and changes in cultural features as above. Massive slips or washouts common. Channel cross-section is U-shaped and streamcourse or gully may be meandering.

TABLE 29: STREAMBED EROSION STAGE CRITERIA

Streambed Erosion Stage Criteria	
Stage	**Label**
Stage 1	Premodified
Stage 2	Constructed
Stage3	Degradation
Stage 4	Degradation and widening
Stage 5	Aggradation and widening
Stage 6	Quasi equilibrium

FIGURE 34: STREAMBED EROSION STAGE DIAGRAM

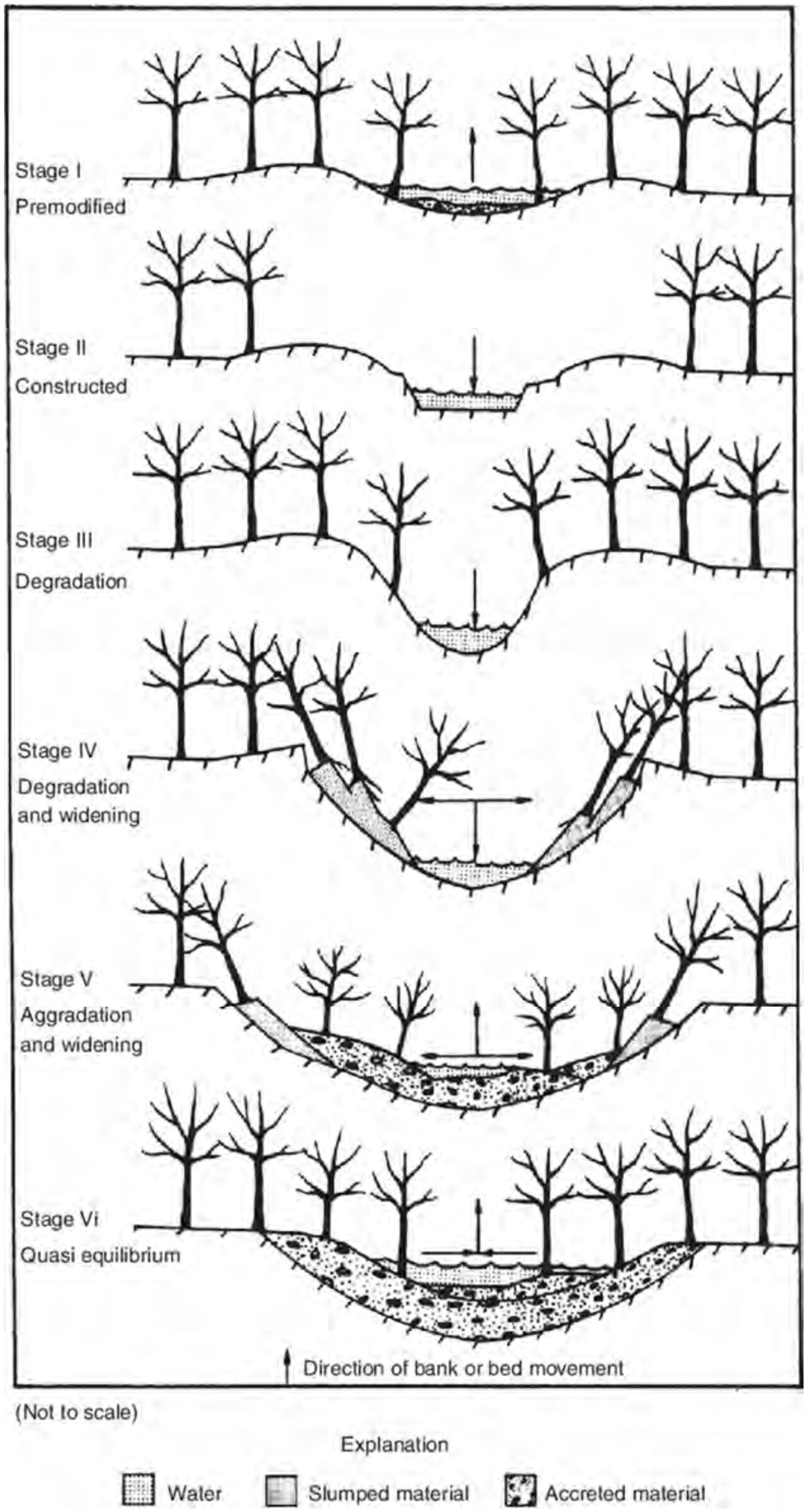


TABLE 30: CHANNELIZATION CRITERIA

Channelization Criteria	
Channelization	**Description**
Low	Areas with evidence of sinuosity and a clearly lacking any historical straightening.
Medium	Areas of either primarily straight paths with much less sinuosity than low channelization or paths with straight channels, non sinuosity, and evidence of natural correction developing meandering in the channel.
High	Areas with straight line channels, evidence of historical or recent dredging, and no sinuosity.

TABLE 31: CHANNELIZATION WITHIN SUBBASINS

Channelization within Subbasins				
Subbasin	**Total Stream Length (ft)**	**Channelization (ft)**		
		None/Low	**Moderate**	**High**
A	7,782	7,782	0	0
B	7,592	2,763	3,199	1,630
C	15,179	11,469	1,528	2,182
D	13,778	10,659	1,482	1,637
E	18,208	15,572	1,939	696
F	8,396	4,742	3,653	0
G	8,066	3,196	3,781	1,089
H	5,423	4,204	1,096	123
I	7,459	840	5,224	1,395
J	6,471	5,899	0	571
K	7,856	1,275	0	6,580
L	5,550	292	0	5,258
M	9,337	4,561	1,690	3,086
N	1,289	0	0	1,289
O	78	0	0	78
Total:	**122,462**	**73,255**	**23,593**	**25,614**
	Percent:	**59.8%**	**19.3%**	**20.9%**

FIGURE 35: STREAM CHANNELIZATION

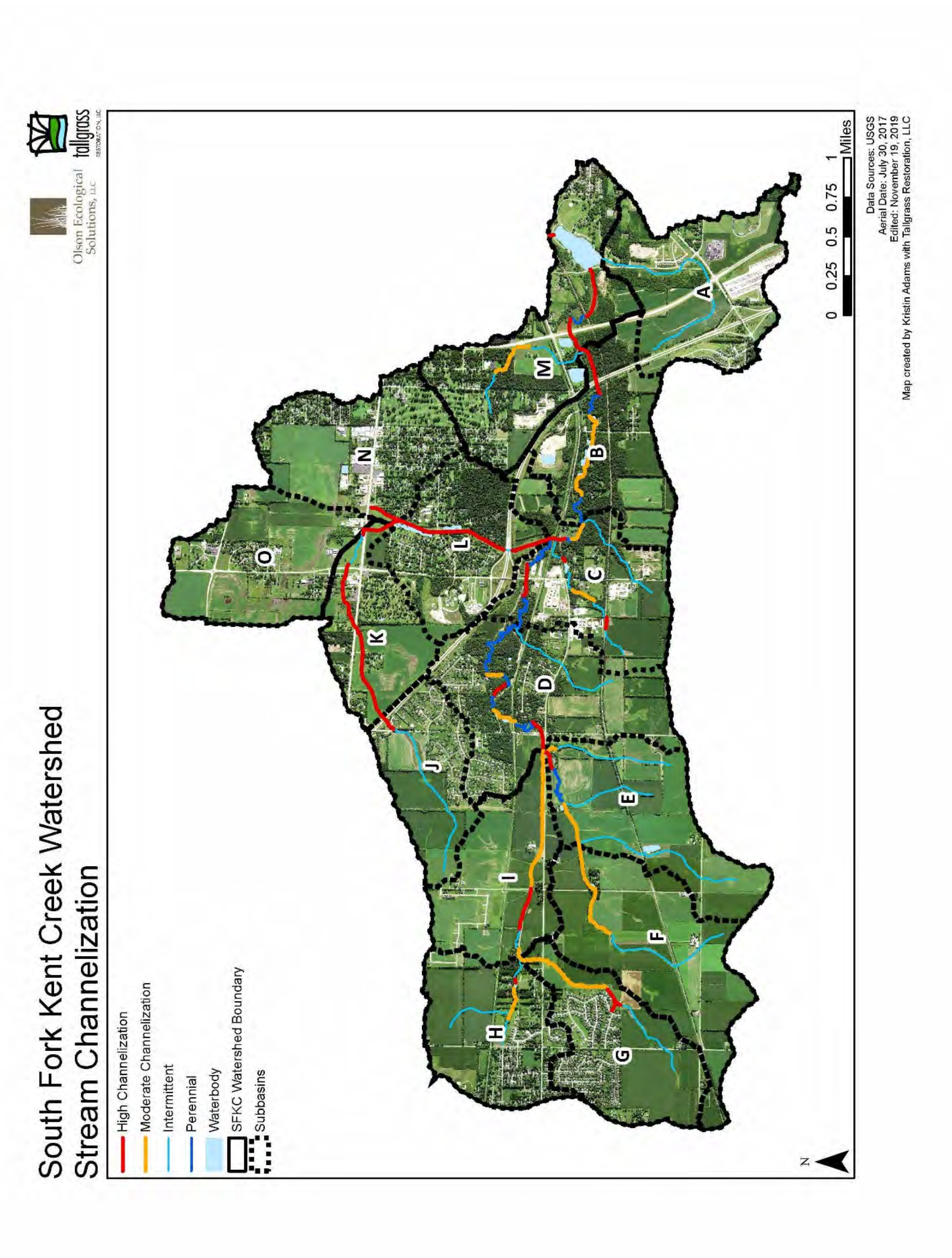


TABLE 32: WOODLAND CRITERIA

Woodland Quality Criteria	
Quality Category	**Description**
Very High	Little to no invasive woody species present.
High	Occasional invasive woody species present.
Medium	Thick density of invasive young growth woody species present. Able to walk through area.
Low	Thick density of invasive old growth woody species present.
Very Low	Area impassaable due to invasive woody species growth.

TABLE 33: EVENT MEAN CONCENTRATION BY LAND USE

Event Mean Concentration by Land Use					
Land Use	**Impervious Area (%)**	**Event Mean Concentration Values (EMC)**			
		Bacteria (Counts/ 100mL)	**TSS (mg/L)**	**TN (mg/L)**	**TP (mg/L)**
High Intensity Dev.	85%	1,400	153	2.8	0.40
Medium Intensity Dev.	72%	1,400	153	2.0	0.29
Low Intensity Dev.	38%	8,300	73	3.2	0.30
Roads	100%	1,700	153	2.3	0.34
Railroad	100%	1,700	240	2.0	0.34
Trail	100%	1,000	72	2.5	0.15
Golf Course	9%	2,600	84	3.6	0.60
Cemetery	9%	1,400	84	3.1	0.46
Turf	9%	1,000	30	2.5	0.20
High Residue Till	2%	2,600	-	6.0	0.50
Low Residue Till	2%	2,600	-	7.1	0.60
Orchard	2%	5,200	160	6.8	0.42
Pasture	2%	10,500	70	3.6	0.36
Quarry	0%	276	1.5	0.375	0.025
Mulch Yard/Landfill	2%	2,500	230	2.6	0.31
Forest	0%	1,000	30	1.4	0.15
Grassland/Herbaceous	0%	1,000	15	0.7	0.13
Wetland	0%	500	10.2	0.7	0.19
Water	0%	276	1.5	0.375	0.025

TABLE 34: EXPORT COEFFICIENT VALUES BY LAND USE

Export Coefficient Values by Land Use						
Land Use	**Impervious Area (%)**	**Export Coefficient Values (EC)**				
		Bacteria (billion counts/ ac-yr)	**TSS (lb/ac-yr)**	**TN (lb/ac-yr)**	**TP (lb/ac-yr)**	
High Intensity Dev.	85%	37.40	898.16	16.44	2.35	
Medium Intensity Dev.	72%	32.03	769.22	10.06	1.46	
Low Intensity Dev.	38%	106.65	206.12	9.04	0.85	
Roads	100%	52.94	1,046.93	15.74	2.33	
Railroad	100%	52.94	1,642.25	13.69	2.33	
Trail	100%	31.14	492.67	17.11	1.03	
Golf Course	9%	11.16	79.26	3.40	0.57	
Cemetery	9%	6.01	79.26	2.93	0.43	
Turf	9%	4.29	28.31	2.36	0.19	
High Residue Till	2%	5.80	107.10	2.94	0.24	
Low Residue Till	2%	5.80	153.00	3.48	0.29	
Orchard	2%	11.59	78.37	3.33	0.21	
Pasture	2%	23.40	34.29	1.76	0.18	
Quarry	0%	0.45	0.54	0.14	0.01	
Mulch Yard/Landfill	2%	5.57	112.65	1.27	0.15	
Forest	0%	1.64	10.80	0.50	0.05	
Grassland/Herbaceous	0%	1.64	5.40	0.25	0.05	
Wetland	0%	0.82	3.67	0.25	0.07	
Water	0%	0.45	0.54	0.14	0.01	

TABLE 35: POLLUTANT LOADING BY LAND USE TYPE

Pollutant Loading by Land Use Type										
Land Use Type	Land Use (Acres, %)		Pollutant Load (Acres, %)							
			TP (lbs/yr)		TN (lbs/yr)		TSS (lbs/yr)		Bacteria (counts/yr)	
High Intensity, Developed	85	1.1%	200	5.2%	1,397	3.9%	76,343	5.4%	3,179	1.5%
Medium Intensity, Developed	161	2.1%	235	6.1%	1,619	4.5%	123,844	8.7%	5,157	2.4%
Low Intensity, Developed	1,514	19.5%	1,282	33.5%	13,679	37.7%	312,060	21.9%	161,466	73.7%
Roads	367	4.7%	854	22.3%	5,776	15.9%	384,224	27.0%	19,428	8.9%
Railroad	42	0.54%	98	2.6%	575	1.6%	68,974	4.8%	2,223	1.0%
Trail	29	0.37%	30	0.78%	496	1.4%	14,288	1.0%	903	0.41%
Golf Course	123	1.6%	70	1.8%	418	1.2%	9,749	0.68%	1,373	0.63%
Cemetery	69	0.89%	30	0.78%	202	0.56%	5,469	0.38%	415	0.19%
Turf	373	4.8%	70	1.8%	880	2.4%	10,559	0.74%	1,602	0.73%
High Residue Till	2,726	35.1%	668	17.4%	8,011	22.1%	291,955	20.5%	15,798	7.2%
Low Residue Till	717	9.2%	211	5.5%	2,493	6.9%	109,701	7.7%	4,155	1.9%
Orchard	2	0.02%	0.4	0.01%	7	0.02%	157	0.01%	23	0.01%
Pasture	37	0.47%	7	0.17%	65	0.18%	1,269	0.09%	866	0.40%
Quarry	74	1.0%	0.7	0.02%	10	0.03%	40	0.00%	33	0.02%
Mulch Yard	23	0.30%	3	0.09%	29	0.08%	2,591	0.18%	128	0.06%
Forest	1,090	14.0%	59	1.5%	550	1.5%	11,777	0.83%	1,786	0.82%
Grassland	212	2.7%	10	0.26%	53	0.15%	1,145	0.08%	347	0.16%
Wetland	54	0.69%	4	0.10%	14	0.04%	198	0.01%	44	0.02%
Water	63	0.81%	0.6	0.01%	9	0.02%	34	0.00%	28	0.01%
Total:	**7,760**	**100%**	**3,830**	**100%**	**36,300**	**100%**	**1,420,000**	**100%**	**219,000**	**100%**

TABLE 36: ESTIMATED TOTAL PHOSPHOROUS LOADS FROM HISTORIC LAND USE

Estimated Annual Total Phosphorous Loads Historic Land Use		
Subbasin	(lbs/ac-yr)	(total lbs/yr)
A	0.047	27
B	0.050	25
C	0.056	29
D	0.049	31
E	0.046	25
F	0.047	31
G	0.047	22
H	0.047	21
I	0.046	21
J	0.047	16
K	0.058	21
L	0.058	28
M	0.051	34
N	0.047	25
O	0.047	21
Total (Entire Watershed):		**378**

TABLE 37: ESTIMATED ANNUAL TOTAL PHOSPHOROUS LOADS FROM CURRENT LAND USE

Estimated Annual Total Phosphorous Loads		
Subbasin	(lbs/ac-yr)	(total lbs/yr)
A	0.65	372
B	0.33	163
C	0.55	287
D	0.47	309
E	0.31	169
F	0.35	231
G	0.56	268
H	0.51	232
I	0.41	180
J	0.57	200
K	0.48	168
L	0.63	299
M	0.50	333
N	0.72	386
O	0.46	229
Total (Entire Watershed):		**3,826**

FIGURE 36: ESTIMATED ANNUAL TOTAL PHOSPHOROUS LOADS IN POUNDS PER ACRE PER YEAR

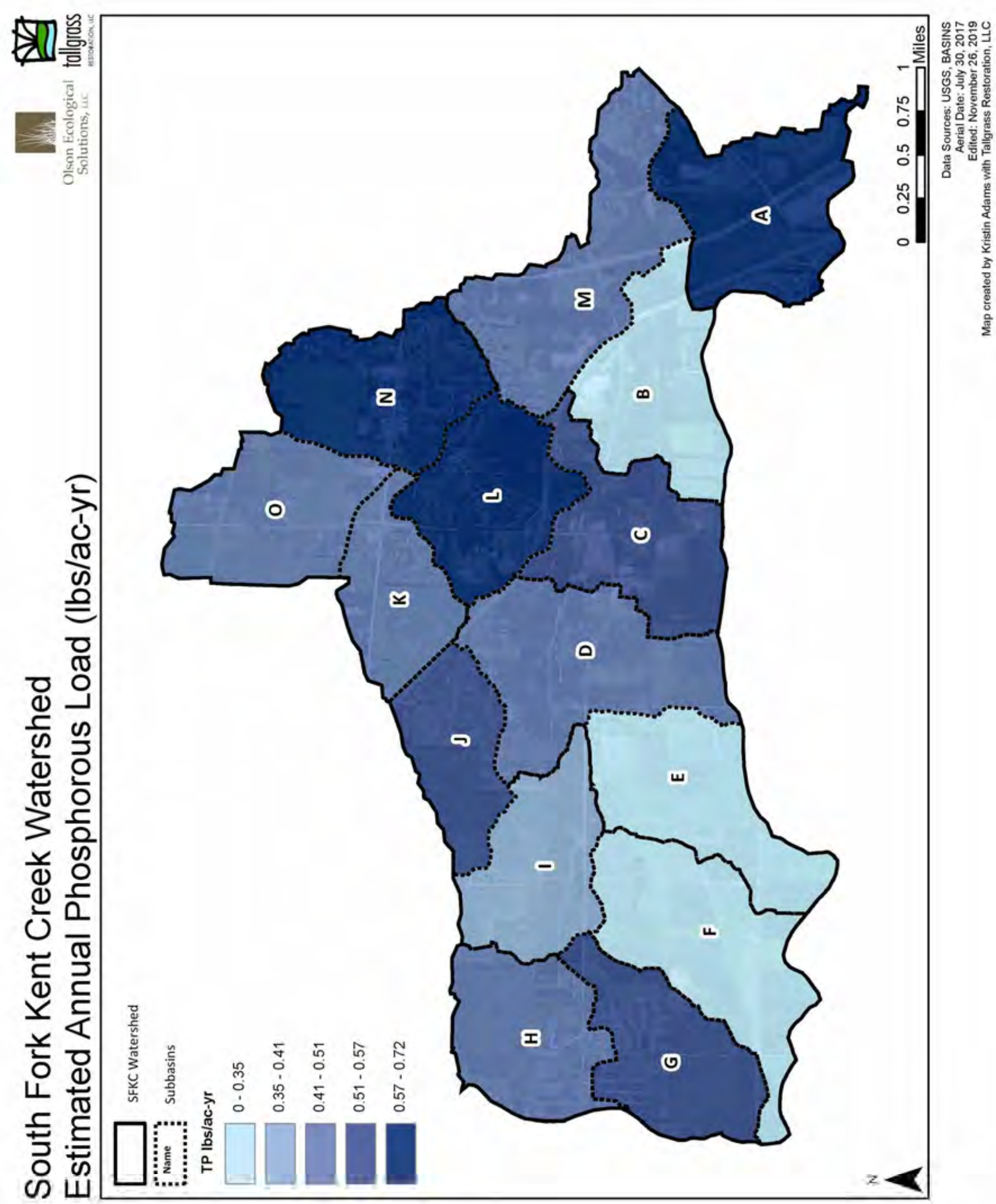


FIGURE 37: ESTIMATED ANNUAL TOTAL PHOSPHOROUS IN POUNDS PER YEAR

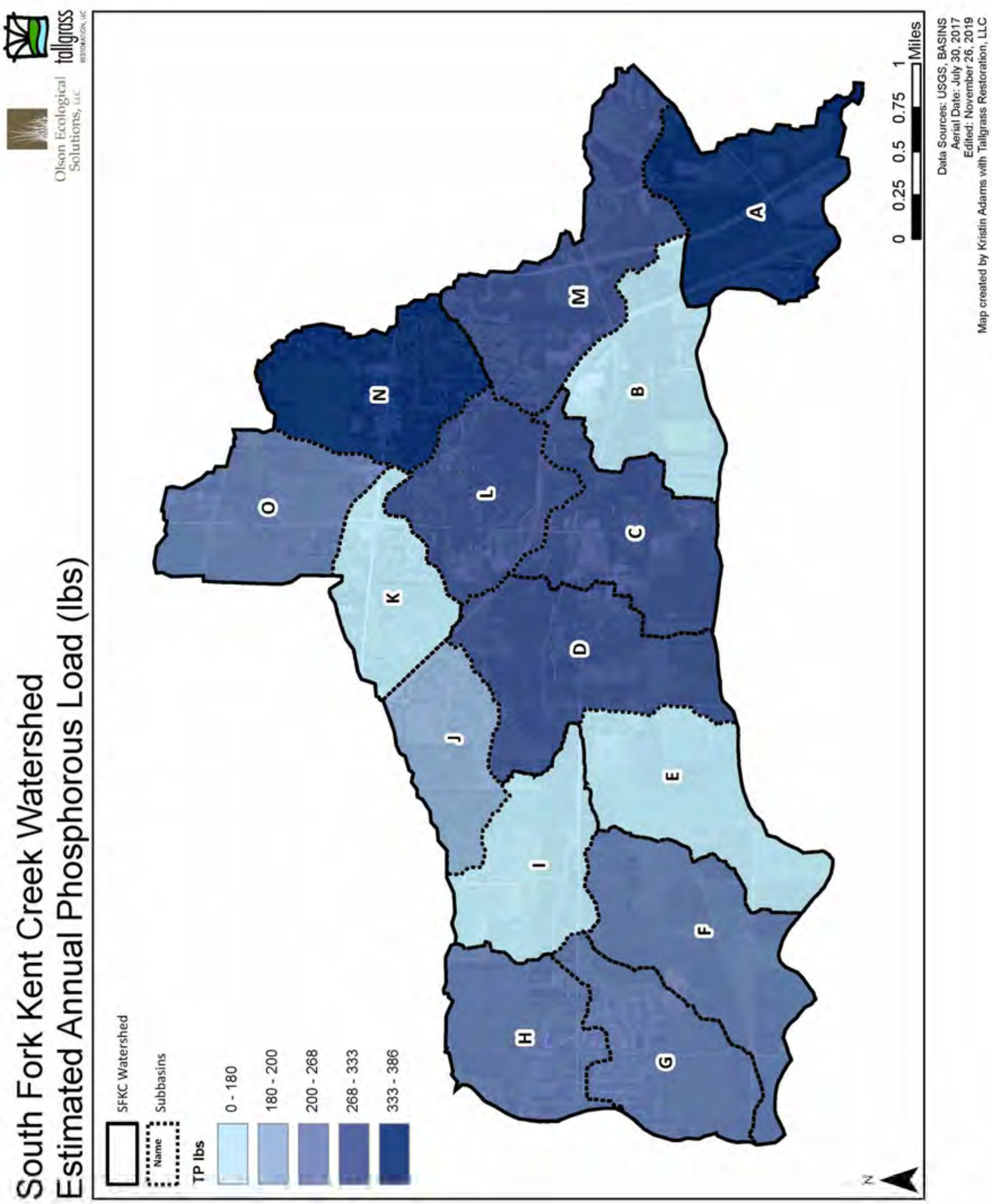


TABLE 38: ESTIMATED ANNUAL TOTAL NITROGEN LOADS FROM HISTORIC LAND USE

Estimated Annual Total Nitrogen Loads Historic Land Use		
Subbasin	**(lbs/ac-yr)**	**(total lbs/yr)**
A	0.25	146
B	0.39	197
C	0.44	232
D	0.33	212
E	0.25	137
F	0.25	166
G	0.25	120
H	0.25	115
I	0.25	112
J	0.25	88
K	0.41	144
L	0.46	220
M	0.39	266
N	0.25	135
O	0.25	113
Total (Entire Watershed):		**2,403**

TABLE 39: ESTIMATED ANNUAL TOTAL NITROGEN LOADS FROM CURRENT LAND USE

Estimated Annual Total Nitrogen Loads		
Subbasin	**(lbs/ac-yr)**	**(total lbs/yr)**
A	5.4	3,080
B	2.9	1,430
C	4.7	2,420
D	4.8	3,140
E	3.4	1,830
F	3.6	2,380
G	5.7	2,710
H	5.3	2,430
I	4.2	1,830
J	5.8	2,020
K	4.3	1,530
L	6.0	2,860
M	4.3	2,870
N	6.5	3,490
O	4.4	2,230
Total (Entire Watershed):		**36,250**

FIGURE 38: ESTIMATED ANNUAL TOTAL NITROGEN LOADS IN POUNDS PER ACRE PER YEAR

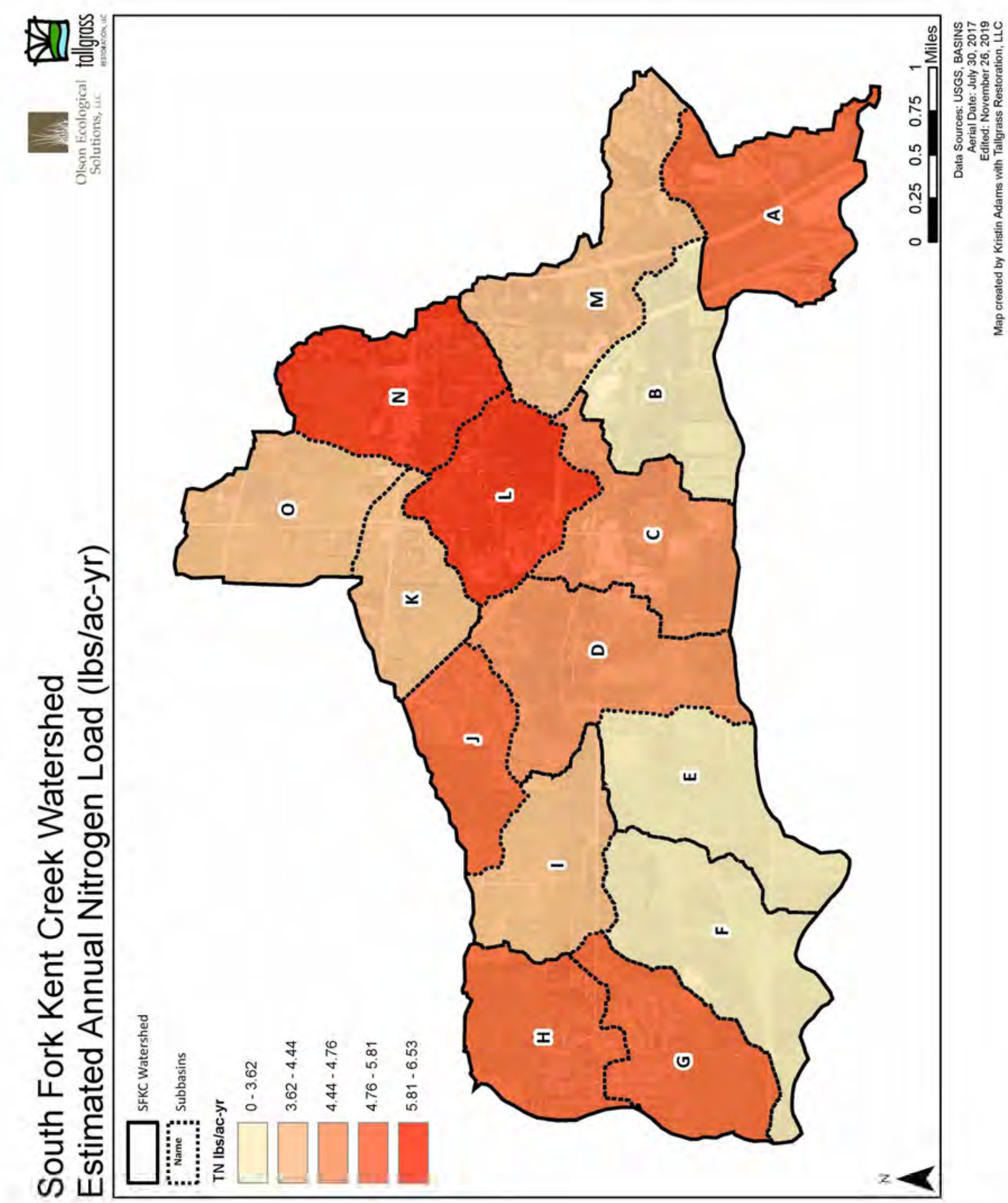


FIGURE 39: ESTIMATED ANNUAL TOTAL NITROGEN LOADS IN POUNDS PER YEAR

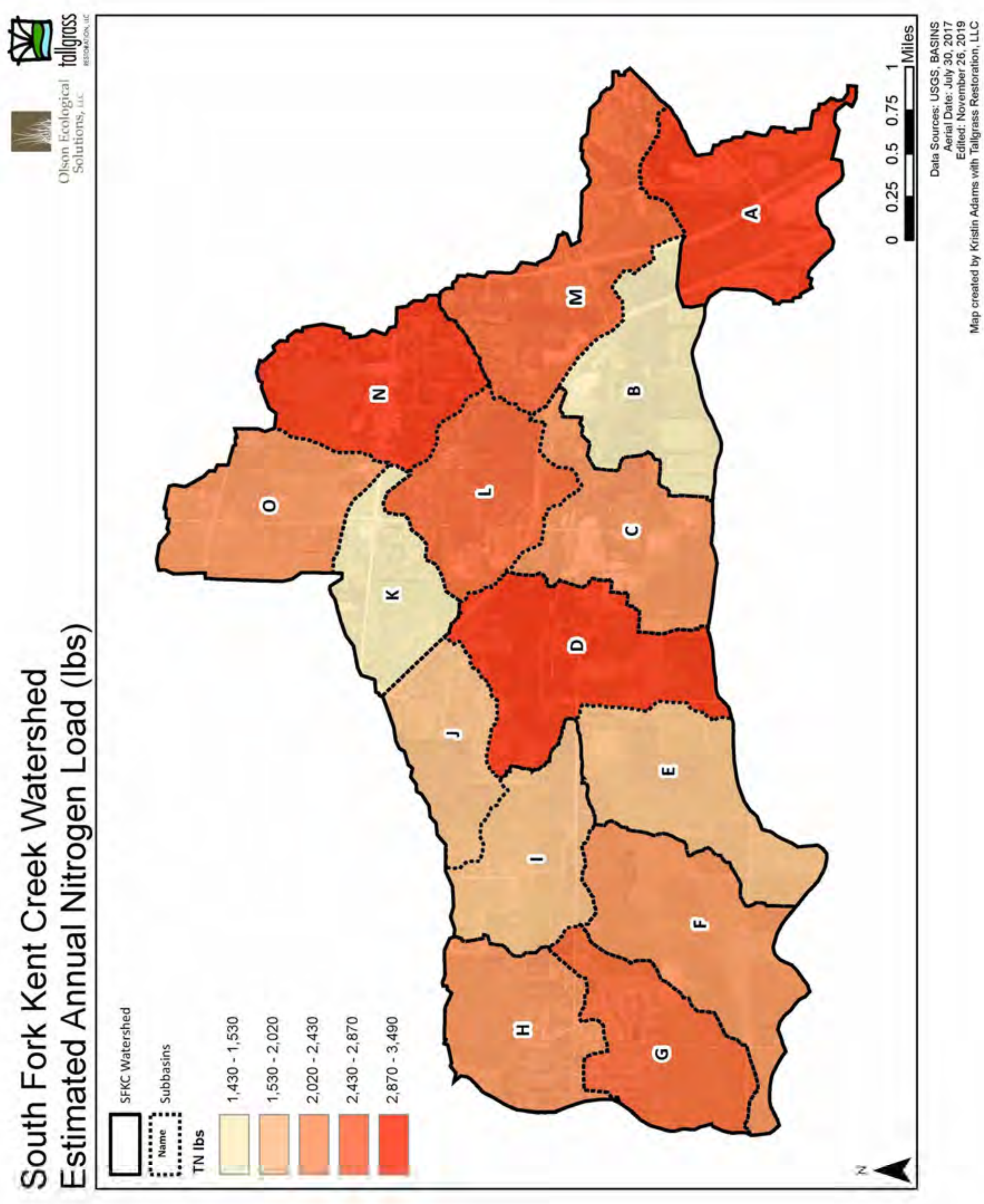


TABLE 40: ESTIMATED TOTAL SUSPENDED SOLIDS LOADS FROM HISTORIC LAND USE

Estimated Annual Total Suspended Solids Loads Historic Land Use		
Subbasin	**(lbs/ac-yr)**	**(total lbs/yr)**
A	5.4	3,130
B	8.3	4,200
C	11.1	5,780
D	7.0	4,520
E	5.3	2,930
F	5.4	3,540
G	5.4	2,570
H	5.4	2,460
I	5.3	2,390
J	5.4	1,880
K	11.3	3,980
L	11.9	5,670
M	8.4	5,680
N	5.4	2,890
O	5.4	2,420
Total (Entire Watershed):		**54,040**

TABLE 41: ESTIMATED ANNUAL SUSPENDED SOLID LOADS FROM CURRENT LAND USE

Estimated Annual Total Suspended Solids Loads		
Subbasin	**(lbs/ac-yr)**	**(total lbs/yr)**
A	275	158,000
B	142	69,600
C	226	117,000
D	161	106,000
E	145	78,800
F	168	111,000
G	193	92,300
H	168	76,800
I	179	78,700
J	194	67,400
K	168	59,200
L	190	90,800
M	169	112,000
N	229	123,000
O	166	83,700
Total (Entire Watershed):		**1,424,300**

FIGURE 40: ESTIMATED ANNUAL TOTAL SUSPENDED SOLID LOADS IN POUNDS PER ACRE PER YEAR

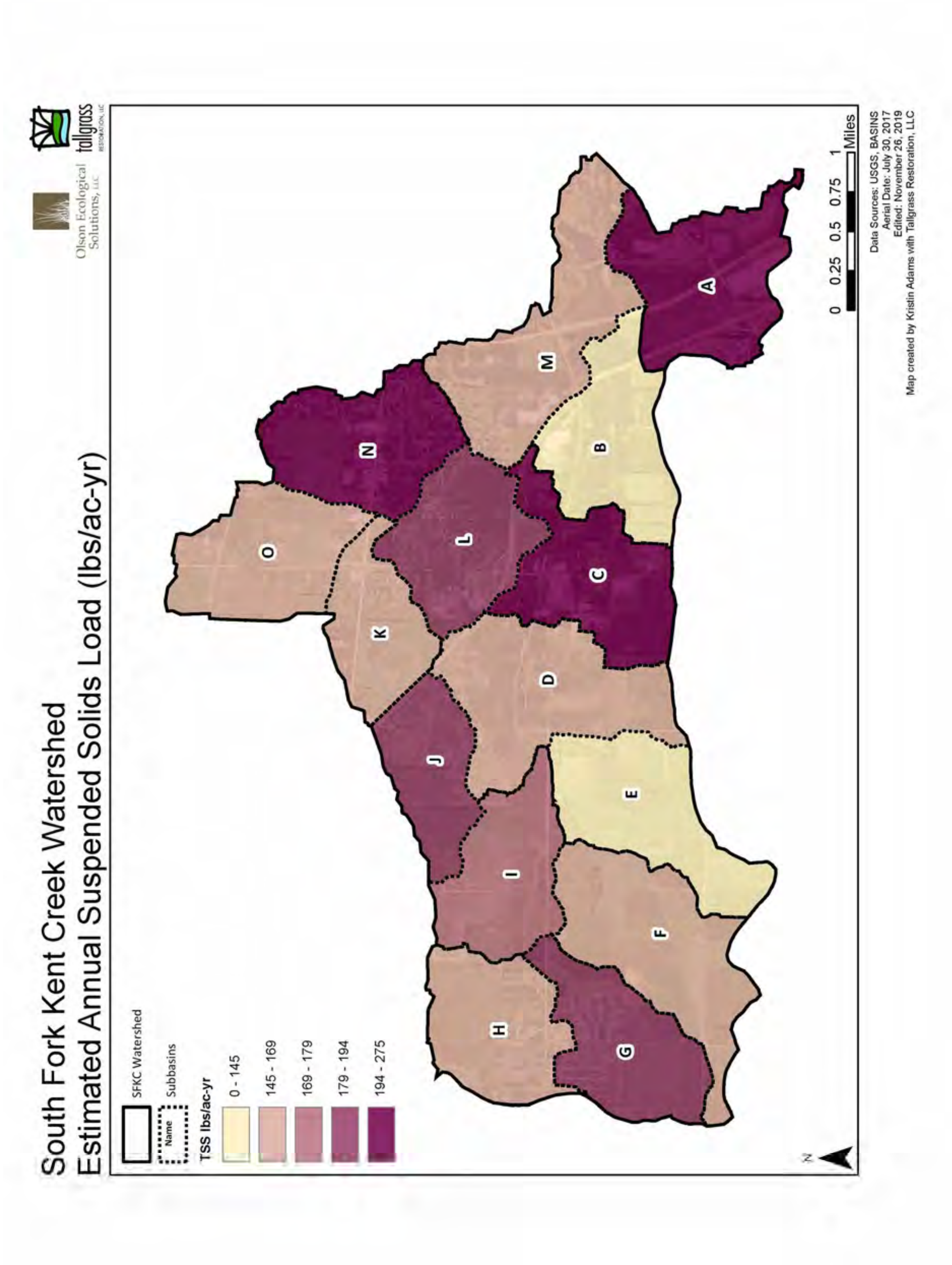


FIGURE 41: ESTIMATED ANNUAL TOTAL SUSPENDED SOLID LOADS IN POUNDS PER YEAR

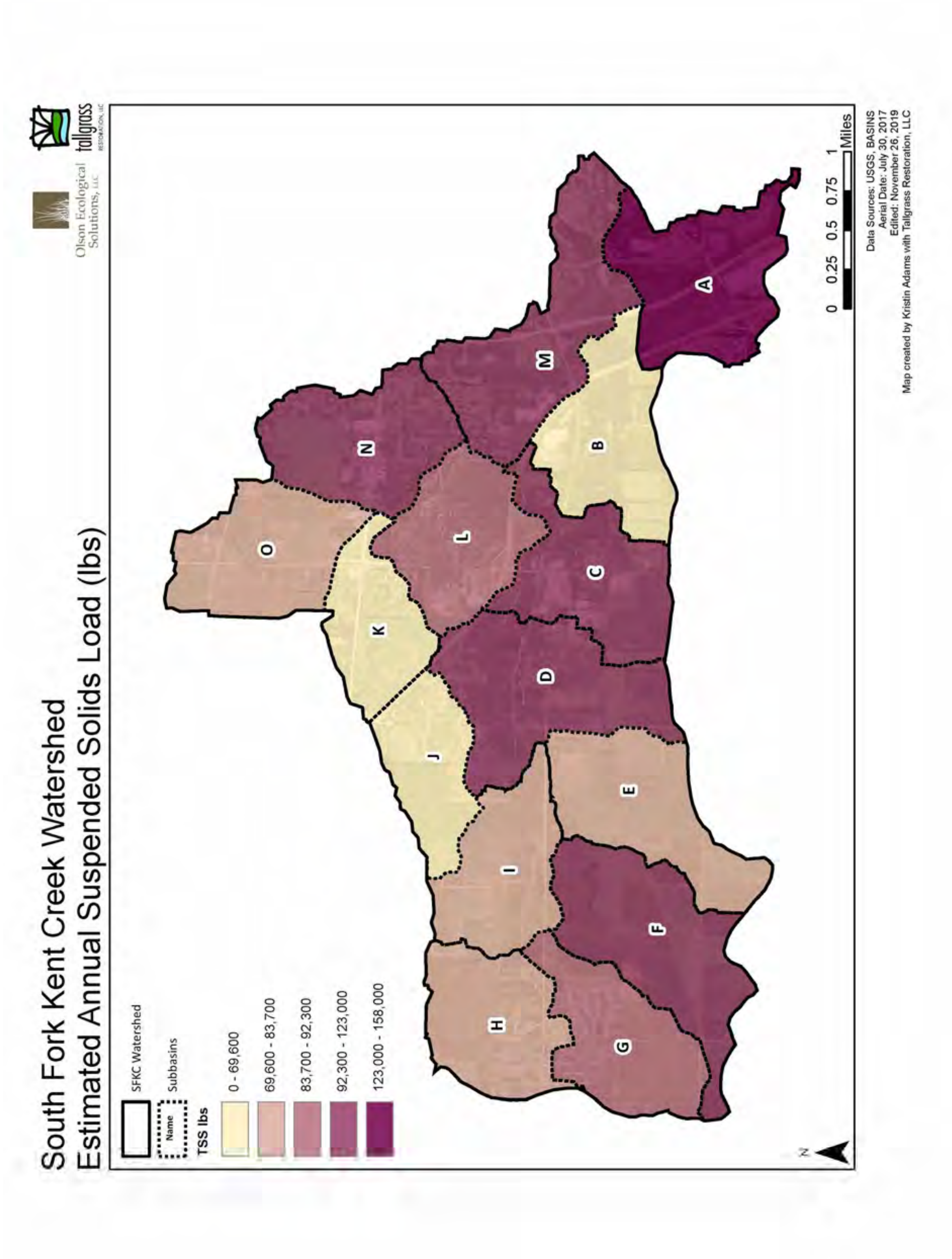


TABLE 42: ESTIMATED ANNUAL TOTAL BACTERIA LOADS FROM HISTORIC LAND USE

Estimated Annual Total Bacteria Loads Historic Land Use		
Subbasin	**(billion counts/ac-yr)**	**(total billion counts/yr)**
A	1.6	951
B	1.6	814
C	1.8	924
D	1.6	1,040
E	1.6	890
F	1.6	1,070
G	1.6	779
H	1.6	748
I	1.6	728
J	1.6	570
K	1.9	664
L	1.8	868
M	1.6	1,100
N	1.6	877
O	1.6	735
Total (Entire Watershed):		**12,758**

TABLE 43: ESTIMATED ANNUAL TOTAL BACTERIA LOADS FROM CURRENT LAND USE

Estimated Annual Total Bacteria Loads		
Subbasin	**(billion counts/ac-yr)**	**(total billion counts/yr)**
A	22.3	12,800
B	12.7	6,240
C	19.7	10,200
D	33.8	22,300
E	10.0	5,430
F	9.5	6,240
G	43.4	20,800
H	41.0	18,800
I	14.6	6,380
J	44.8	15,600
K	21.2	7,490
L	55.8	26,700
M	30.6	20,300
N	50.6	27,100
O	25.1	12,600
Total (Entire Watershed):		**218,980**

FIGURE 42: ESTIMATED ANNUAL BACTERIA LOADS IN POUNDS PER ACRE PER YEAR

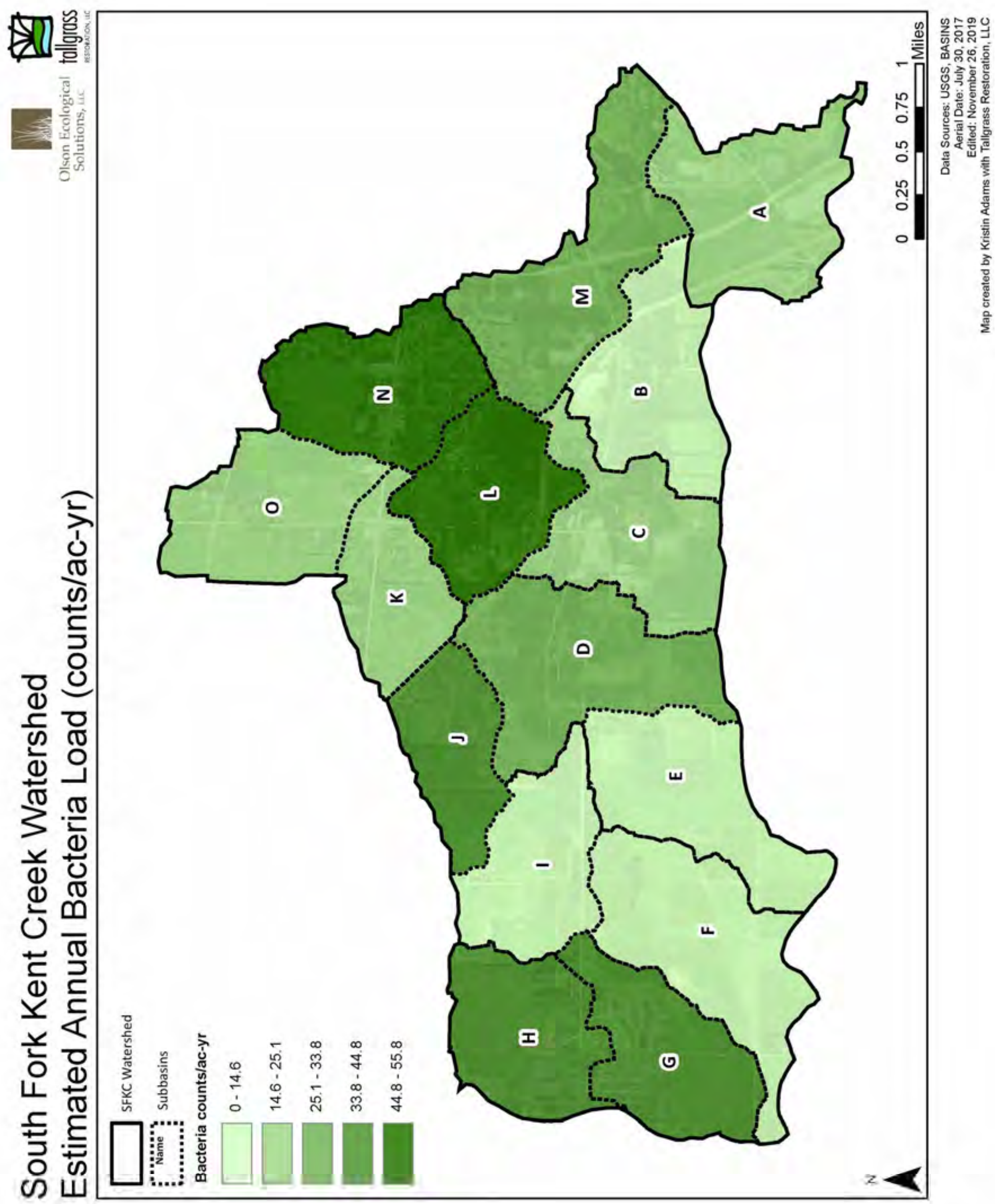
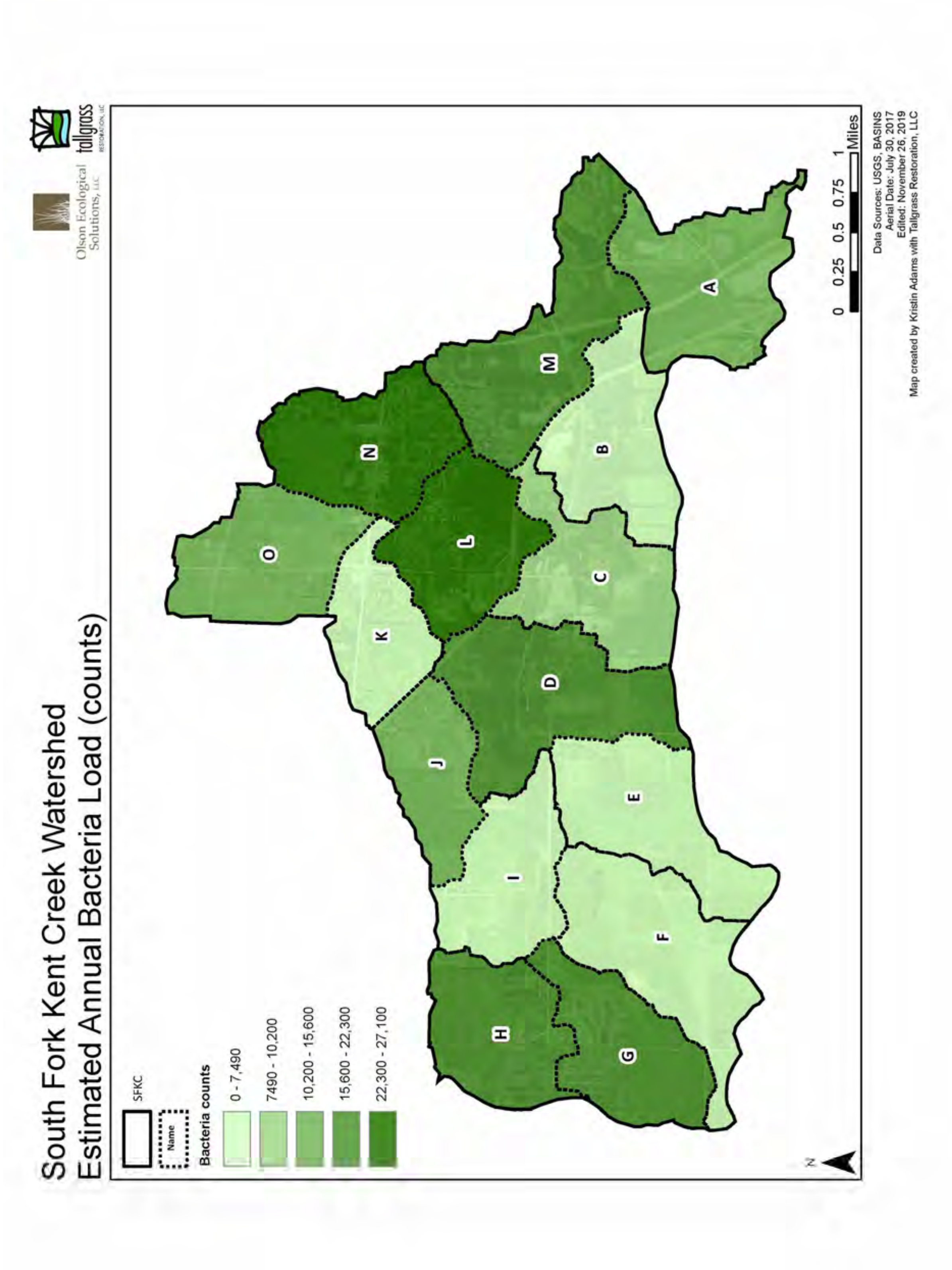


FIGURE 43: ESTIMATED ANNUAL BACTERIA LOADS IN POUNDS PER ACRE



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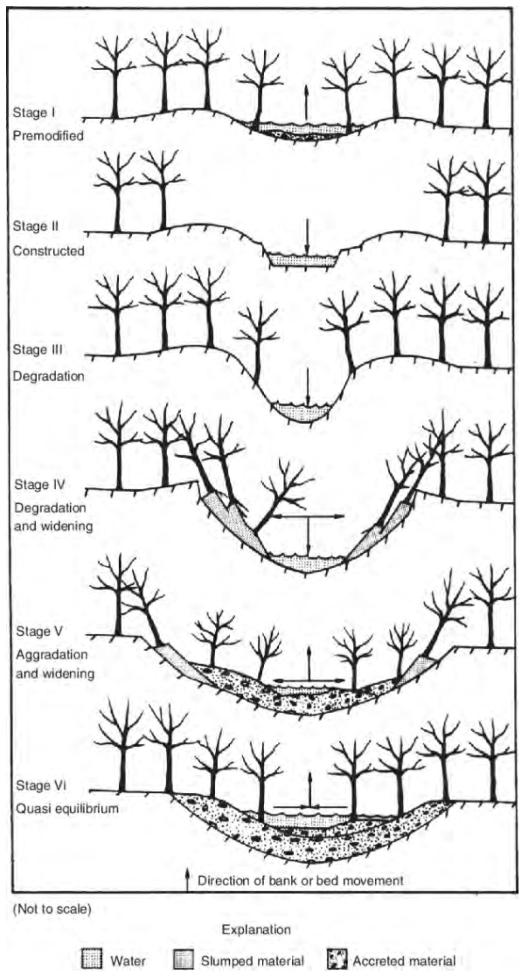
APPENDIX A:
FIELD SURVEY CRITERIA AND RESULTS

CRITERIA

Lateral Recession Rate (Erosion)		
LRR (ft/yr)	**Category**	**Description**
0.01 - 0.05	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang. No exposed tree roots.
0.06 - 0.2	Moderate	Bank is predominantly bare with some rills and vegetative overhang.
0.3 - 0.5	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped.
0.5+	Very Severe	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains and culverts eroding out and changes in cultural features as above. Massive slips or and culverts eroding out and changes in cultural features as above. Massive slips or eroding out and changes in cultural features as above. Massive slips or washouts common. Channel cross-section is U-shaped and streamcourse or gully may be meandering.

Riparian Criteria (Condition)			
Category	**Vegetation Width**	**% Area Vegetated**	**Vegetation Height**
Good	≥ 50 feet	≥ 55%	≥ 12 inches
	≥ 25 feet	≥ 70%	≥ 12 inches
	≥ 25 feet	≥ 55% and sandy/sandy loam	≥ 12 inches
Fair	≥ 15 feet but ≤ 25 feet	≥ 55%	≥ 12 inches
Poor	< 15 feet	-	-
	Or doesn't meet qualifications listed above		

Streambed Erosion Stage Criteria	
Stage	**Label**
Stage 1	Premodified
Stage 2	Constructed
Stage3	Degradation
Stage 4	Degradation and widening
Stage 5	Aggradation and widening
Stage 6	Quasi equilibrium



Woodland Quality Criteria	
Quality Category	**Description**
Very High	Little to no invasive woody species present.
High	Occasional invasive woody species present.
Medium	Thick density of invasive young growth woody species present. Able to walk through area.
Low	Thick density of invasive old growth woody species present.
Very Low	Area impassable due to invasive woody species growth.

South Fork Kent Creek - Stream Erosion Survey

Subbasin	Stream Name	Reach Code (709000500-)	Waypoint	Streambed Stage	Total Shoreline Length Assessed (ft)	Bank Height Assessed (ft)	LRR	Bank Erosion (ft)			
								Slight	Moderate	Severe	Very Severe
B	B1.1	-556	BA-BB Bank 1	Stage 3	213.3	4	0.40			71.1	
						2	0.06		71.1		
						4	0.30	71.1			
			BA-BB Bank 2		213.3	4	0.60				71.1
						3	0.40		71.1		
						1.5	0.06	71.1			
	B1.2		BC-BD Bank 1	Stage 5 (Debris jam)	200.6	4.5	0.10		30.1		
						2.5	0.10		20.1		
						7.5	0.50			150.5	
			BC-BD Bank 2		200.6	5.5	0.50				90.3
						3	0.40			70.2	
						2	0.05	40.1			
	B1.3		BE-BF Bank 1	Stage 5 (Debris jam)	134.4	2	0.07		107.5		
						4	0.09		26.9		
			BE-BF Bank 2		134.4	5.5	0.50				134.4
	B2		BG-BH Bank 1	Stage 4	988.7	2	0.06		148.3		
						4	0.30			840.4	
			BG-BH Bank 2		988.7	4	0.60				988.7
	B3		BI-BJ Bank 1	Stage 4	650.9	3.5	0.30			227.8	
						2.5	0.50			390.5	
						1.5	0.05	32.5			
			BI-BJ Bank 2		650.9	3.5	0.50			325.5	
						2.5	0.20		325.5		
C	C1.1	-555	CA-CB Bank 1	Stage 4	453.7	4.5	0.60				90.7
						3.5	0.50			363.0	
			CA-CB Bank 2		453.7	1.5	0.50			90.7	
						3.5	0.50			363.0	
	C1.2		CB-CC Bank 1	Stage 4	669.3	3.5	0.50			301.2	
						0.5	0.01	33.5			
						4	0.60				334.7
			CB-CC Bank 2		669.3	3.5	0.50			301.2	
						1	0.05	33.5			
						3	0.50				334.7
	C2.1	-554	CD-CE Bank 1	Stage 2	129.8	1.5	0.20		64.9		
						1	0.01	64.9			
			CD-CE Bank 2		129.8	1	0.01	64.9			
						1.5	0.20		64.9		
	C2.2		CE-CF Bank 1	Stage 3 (Debris jam)	320.5	2.5	0.20		96.2		
						1.5	0.06		224.4		
			CE-CF Bank 2		320.5	3	0.50			96.2	
						1.5	0.06		224.4		
	C2.3		CF-CG Bank 1	Stage 3	35.2	0.5	0.01	3.5			
						3	0.06		15.8		
						4.5	0.50			15.8	
			CF-CG Bank 2		35.2	4	0.06		35.2		
	C2.4		CG-CH Bank 1	Stage 4 (Debris jam)	496.5	0.5	0.01	49.7			
						3	0.50			446.9	
			CG-CH Bank 2		496.5	4	0.60				496.5
	C2.5		CH-CI Bank 1	Stage 3	159.1	3	0.50			159.1	
			CH-CI Bank 2		159.1	4	0.50			159.1	
D	D1.1	N/A	DA-DB Bank 1	Stage 3	148.6	2	0.08		22.3		
						0.5	0.03	22.3			
						1.5	0.03	104.0			
			DA-DB Bank 2		148.6	2	0.08		22.3		
						0.5	0.03	22.3			
						1.5	0.03	104.0			
	D1.2		DB-DC Bank 1	Stage 2	65.6	1.5	0.05	21.9			
						1.75	0.06		21.9		
						2	0.07		21.9		
			DB-DC Bank 2		65.6	1.5	0.05	21.9			
						1.75	0.06		21.9		
						2	0.07		21.9		
	D2	-051	DD-DE Bank 1	Stage 4	254.9	5	0.40			102.0	
						2	0.02	76.5			
						2	0.05	76.5			
			DD-DE Bank 2		254.9	4	0.30			152.9	
						4	0.09		25.5		
						3	0.30			76.5	
	D3.1		DH-DG Bank 1	Stage 5	91.4	4.5	0.30			36.6	
						3	0.10		36.6		
						1.75	0.10		18.3		
			DH-DG Bank 2		91.4	3.5	0.20		18.3		
						5	0.40			36.6	
						2	0.40			36.6	
	D3.2		DF-DG Bank 1	Stage 4	44	3.75	0.40			44.0	
			DF-DG Bank 2		44	2.5	0.07		44.0		

South Fork Kent Creek - Stream Erosion Survey

Subbasin	Stream Name	Reach Code (709000500-)	Waypoint	Streambed Stage	Total Shoreline Length Assessed (ft)	Bank Height Assessed (ft)	LRR	Bank Erosion (ft)			
								Slight	Moderate	Severe	Very Severe
D/I	D4	-051	DI-IA Bank 1	Stage 3	1552	4	0.04	517.3			
						3	0.10		517.3		
						2	0.03	517.3			
			DI-IA Bank 2		1552	3	0.03	465.6			
						3.5	0.30			543.2	
						4	0.40			77.6	
						2	0.04	465.6			
E	E1.1	-532	EA-EB Bank 1	Stage 1	50.4	0.25	0.05	7.6			
						2	0.20		35.3		
						0.5	0.04	7.6			
			EA-EB Bank 2		50.4	1.5	0.20		16.8		
						0.25	0.01	16.8			
						1	0.09		16.8		
E	E1.2	-184	EC-ED Bank 1	Stage 4	73.5	2	0.30		73.5		
			EC-ED Bank 2		73.5	2	0.50			18.4	
						5	0.50			18.4	
						1.5	0.30			36.8	
	E1.3		EE-EF Bank 1	Stage 3	103.5	1.5	0.08		103.5		
			EE-EF Bank 2		103.5	1.5	0.20		88.0		
						3	0.40			15.5	
G	G1.1	-051	GA-GB Bank 1	Stage 2	460.5	1	0.02	115.1			
						3.5	0.40			345.3	
			GA-GB Bank 2		460.5	2	0.30			115.1	
						4	0.40			184.2	
						5	0.50			23.0	
						2	0.40			138.1	
G	G1.2	-051 and -512	GB-GC Bank 1	Stage 1 (Debris jam)	248.2	0.5	0.01	173.7			
						1.5	0.02	74.5			
			GB-GC Bank 2		248.2	0.5	0.03	148.9			
						5	0.04	86.9			
						2	0.05	12.4			
H	H1	-507	HA-HB Bank 1	Stage 4	235.5	2	0.06		70.7		
						3.5	0.05	94.2			
						4	0.30			70.7	
			HA-HB Bank 2		235.5	2.5	0.08		94.2		
						3.5	0.30			141.3	
M	H2	N/A	HC-HD Bank 1	Stage 2	701.0	0.5	0.01	70.1			
						1.5	0.20		210.3		
						0	0.01	350.5			
						1	0.20		35.0		
						2	0.20		35.0		
			HC-HD Bank 2		701.0	0.5	0.01	70.1			
						1.5	0.20		210.3		
						0	0.01	350.5			
						1	0.20		35.0		
						2	0.20		35.0		
I	I1.1	-051	IA-IB Bank 1	Stage 1	1229.3	0.5	0.01	799.0			
						1.5	0.01	307.3			
						3	0.04	122.9			
			IA-IB Bank 2		1229.3	1.5	0.01	860.5			
						4	0.06		245.9		
						5	0.20		122.9		
	I1.2		IB-IC Bank 1	Stage 3	1249.2	2.5	0.06		874.4		
						1	0.03	374.8			
			IB-IC Bank 2		1249.2	4	0.40			374.8	
						2.5	0.06		437.2		
						1	0.03	437.2			
K	K1.1	-183	KA-KB Bank 1	Stage 2	233.6	2	0.30			233.6	
			KA-KB Bank 2		233.6	1	0.01	233.6			
	K1.2		KB-KC Bank 1	Stage 2	84.2	3.5	0.20		84.2		
			KB-KC Bank 2		84.2	2	0.05	84.2			
	K2		Wetland - No Banks	N/A	213.3	0.5	0.01	213.3			

South Fork Kent Creek - Stream Erosion Survey

Subbasin	Stream Name	Reach Code (709000500-)	Waypoint	Streambed Stage	Total Shoreline Length Assessed (ft)	Bank Height Assessed (ft)	LRR	Bank Erosion (ft)			
								Slight	Moderate	Severe	Very Severe
L	L1.1	-183	LA-LB Bank 1	Stage 4	179.7	1	0.02	44.9			
						2	0.30			134.8	
			LA-LB Bank 2		179.7	2	0.03	9.0			
						3	0.30			170.7	
	L1.2		LB-LC Bank 1	Stage 4	270	4.5	0.40			67.5	
						5.5	0.50			202.5	
			LB-LC Bank 2		270	3	0.40			135.0	
						3.5	0.30			67.5	
						2.5	0.20			67.5	
	L1.3		LC-LD Bank 1	Stage 5	481.3	5	0.40			240.7	
						5.5	.5+			24.1	
						5	0.40			216.6	
			LC-LD Bank 2		481.3	2.5	0.20		48.1		
						3	0.20		48.1		
						2.5	0.10		385.0		
	L1.4		LD-LE Bank 1	Stage 4	278.5	1.5	0.06		278.5		
			LD-LE Bank 2		278.5	2	0.10		278.5		
	L1.5		LE-LF Bank 1	Stage 4	119.8	2	0.07		59.9		
						2.5	0.07		59.9		
			LE-LF Bank 2		119.8	2.5	0.06		59.9		
						3	0.07		59.9		
L	L1.6	-183	LF-LG Bank 1	Stage 4	509.4	1.5	0.05	101.9			
						2	0.06		407.5		
			LF-LG Bank 2		509.4	3.5	0.05	305.6			
						2.5	0.05	203.8			
	L1.7		LG-LH Bank 1	Stage 4	266.4	2.5	0.05	93.2			
						3	0.05	93.2			
						2.5	0.05	79.9			
			LG-LH Bank 2		266.4	3.5	0.06		239.8		
						4	0.05	26.6			
	L1.8		LH-LI Bank 1	Stage 5 (Debris jam)	261.7	2	0.06		130.9		
						2.5	0.06		130.9		
			LH-LI Bank 2		261.7	2.5	0.05		261.7		
M	M1	N/A	Bank 1 (No Waypoint)		385.7	1.5	0.05	327.8			
						1	0.06		57.9		
			Bank 2 (No Waypoint)		385.7	0.5	0.01	385.7			
	M2	-569	MA-MB Bank 1	Stage 6	278.9	1.25	0.10	69.7			
						3	0.07		209.2		
			MA-MB Bank 2		278.9	1.25	0.01	69.7			
						3	0.07		125.5		
						4	0.30			83.7	
	M3.1	-562	MC-MD Bank 1	Stage 1,2,3 (Debris jam)	182.9	1	0.01	36.6			
						5	0.50				146.3
			MC-MD Bank 2	Stage 2 (Debris jam)	182.9	1	0.03			91.5	
						1	0.01	91.5			
	M3.2		MD-ME Bank 1	Stage 2 (Debris jam)	330.5	1	0.01	132.2			
						4	0.30		132.2		
						2	0.30		66.1		
			MD-ME Bank 2	Stage 1,2,3 (Debris jam)	330.5	5	0.60				231.4
						2.5	0.30			33.1	
						1	0.01	66.1			
	M3.3		ME-MF Bank 1	Stage 1,2 (Debris jam)	967.8	1	0.01	580.7			
						3	0.03	387.1			
			ME-MF Bank 2	Stage 1,2 (Debris jam)	967.8	3	0.03	387.1			
						1	0.01	580.7			

South Fork Kent Creek - Stream Riparian Buffer Survey

Subbasin	Stream Name	Reach Code (709000500-)	Waypoint	Total Shoreline Length Assessed (ft)	Riparian Condition (ft)		
					Good	Fair	Poor
B	B1.1	-556	BA-BB Bank 1	213.3	213.3		
			BA-BB Bank 2	213.3		160.0	53.3
	B1.2		BC-BD Bank 1	200.6			200.6
			BC-BD Bank 2	200.6	200.6		
	B1.3		BE-BF Bank 1	134.4			134.4
			BE-BF Bank 2	134.4			134.4
	B2		BG-BH Bank 1	988.7	988.7		
			BG-BH Bank 2	988.7	988.7		
	B3		BH-BI Bank 1	650.9	650.9		
			BH-BI Bank 2	650.9	650.9		
C	C1.1	-555	CA-CB Bank 1	453.7			453.7
			CA-CB Bank 2	453.7	340.3	113.4	
	C1.2		CB-CC Bank 1	669.3			669.3
			CB-CC Bank 2	669.3	502.0		167.3
	C2.1	-554	CD-CE Bank 1	129.8	129.8		
			CD-CE Bank 2	129.8	129.8		
	C2.2		CE-CF Bank 1	320.5	320.5		
			CE-CF Bank 2	320.5	320.5		
	C2.3		CF-CG Bank 1	35.2	35.2		
			CF-CG Bank 2	35.2	35.2		
	C2.4		CG-CH Bank 1	496.5			496.5
			CG-CH Bank 2	496.5			496.5
	C2.5		CH-CI Bank 1	159.1			159.1
			CH-CI Bank 2	159.1			159.1
D	D1.1	N/A	DA-DB Bank 1	148.6		89.1	59.4
			DA-DB Bank 2	148.6		89.1	59.4
	D1.2		DB-DC Bank 1	65.6		39.4	26.3
			DB-DC Bank 2	65.6		39.4	26.3
	D2	-051	DD-DE Bank 1	254.9	191.2		63.7
			DD-DE Bank 2	254.9			254.9
	D3.1-D3.2		DF-DH Bank 1	135.4		33.9	101.6
			DF-DH Bank 2	135.4			135.4
D/I	D4	-051	DI-IA Bank 1	1,552.0	1,552.0		
			DI-IA Bank 2	1,552.0			1,552.0
E	E1.1	-532	EA-EB Bank 1	50.4			50.4
			EA-EB Bank 2	50.4			50.4
	E1.2	-184	EC-ED Bank 1	73.5			73.5
			EC-ED Bank 2	73.5			73.5
	E1.3		EE-EF Bank 1	103.5			103.5
			EE-EF Bank 2	103.5	82.8		20.7
G	G1.1-G1.2	-051 and -512	GA-GC Bank 1	708.7			708.7
			GA-GC Bank 1	708.7			708.7
H	H1	-507	HA-HB Bank 1	235.5			235.5
			HA-HB Bank 2	235.5			235.5
	H2	N/A	HC-HD Bank 1	701.0	701.0		
			HC-HD Bank 2	701.0	701.0		
I	I1.1	-051	IA-IB Bank 1	1,229.3	614.7		614.7
			IA-IB Bank 2	1,229.3			1,229.3
	I1.2		IB-IC Bank 1	1,249.2			1,249.2
			IB-IC Bank 2	1,249.2			1,249.2

South Fork Kent Creek - Stream Riparian Buffer Survey							
Subbasin	**Stream Name**	**Reach Code (709000500-)**	**Waypoint**	**Total Shoreline Length Assessed (ft)**	**Riparian Condition (ft)**		
					Good	**Fair**	**Poor**
K	K1.1	-183	KA-KB Bank 1	233.6			233.6
			KA-KB Bank 2	233.6		233.6	
	K1.2		KB-KC Bank 1	84.2			84.2
			KB-KC Bank 2	84.2		84.2	
	K2		Wetland - No Banks	213.3			213.3
L	L1.1-L1.8	-183	LA-LI Bank 1	2,366.8			2,366.8
			LA-LI Bank 2	2,366.8			2,366.8
M	M1	N/A	Bank 1 (No Waypoint)	385.7	308.6		77.1
			Bank 2 (No Waypoint)	385.7		154.3	231.4
	M2	-569	MA-MB Bank 1	278.9	278.9		
			MA-MB Bank 2	278.9	278.9		
M	M3.1	-562	MC-MD Bank 1	182.9	182.9		
			MC-MD Bank 2	182.9	182.9		
	M3.2		MD-ME Bank 1	330.5	330.5		
			MD-ME Bank 2	330.5	330.5		
	M3.3		ME-MF Bank 1	967.8	967.8		
			ME-MF Bank 2	967.8	967.8		

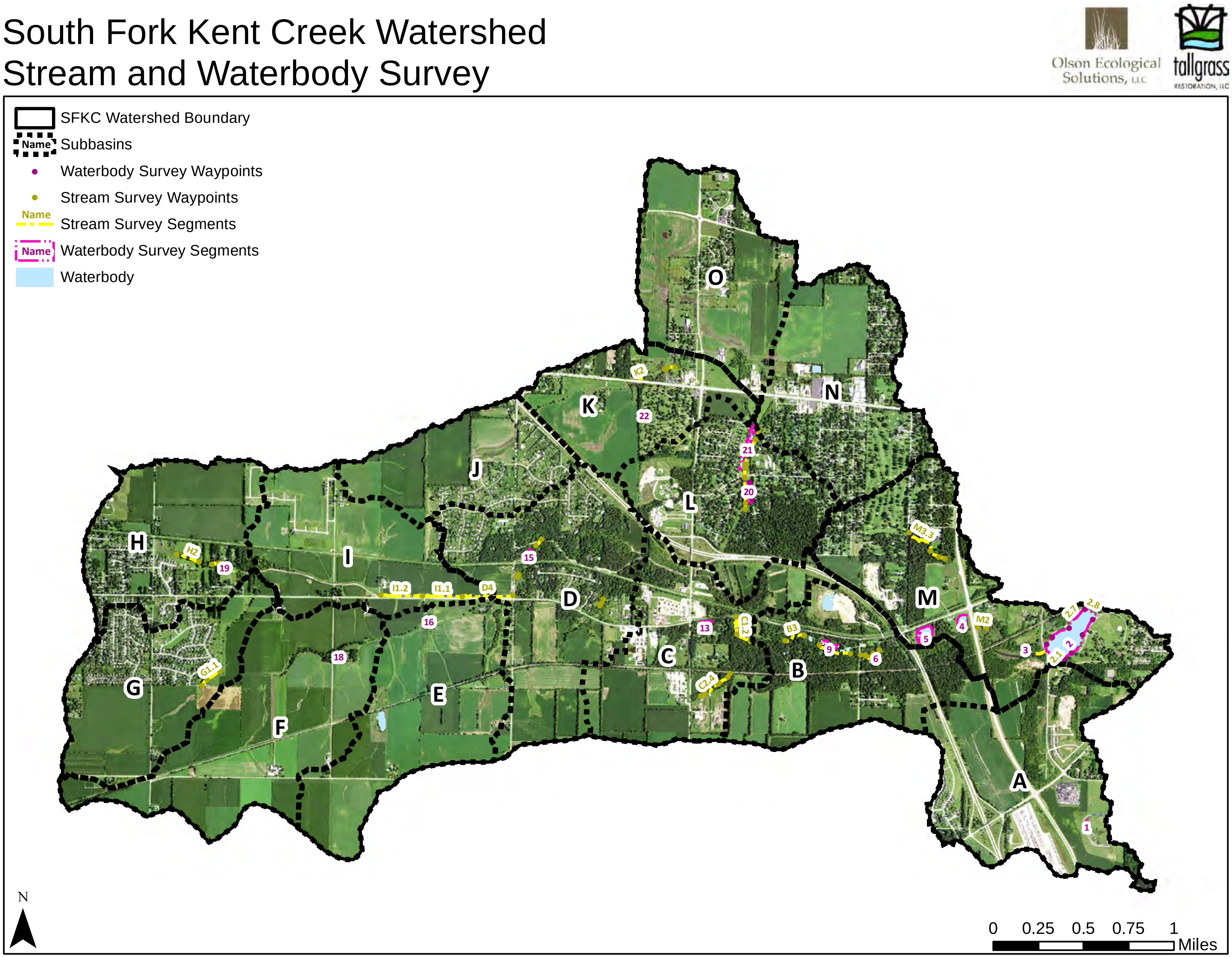
South Fork Kent Creek - Waterbody Erosion Survey

Subbasin	Waterbody Name	Type	Reach Code (709000500-)	Waypoint	Total Shoreline Length Assessed (ft)	Bank Height Assessed (ft)	LRR	Bank Erosion (ft/%)			
								Slight	Moderate	Severe	Very Severe
A	1	Wet Basin	N/A	N/A	450.0	0.00	0.10	450.00			
B	6	Pond	-6871	N/A	405.6	3.00	0.07		304.20		
				N/A		1.00	0.03	101.40			
	9	Pond	-6870	N/A	1,388.6	2.00	0.30			1388.60	
C	13	Pond	-6868	N/A	1,007.2	0.50	0.04	201.44			
				N/A		1.00	0.06		503.60		
				N/A		0.50	0.01		302.16		
D	15	Pond	N/A	N/A	657.2	1.00	0.02	328.60			
				N/A		0.50	0.02	328.60			
E	16	Pond	N/A	N/A	463.3	0.50	0.01	463.30			
F	18	Pond	-6872	N/A	404.4	1.00	0.03	404.40			
H	19	Pond	N/A	N/A	520.3	2.00	0.06	520.30			
K	22	Pond	N/A	N/A	500.2	4.00	0.01	500.20			
L	20.1	Pond	-6864	20A-20B	437.8	1.5	0.06		328.35		
						3.0	0.06		109.45		
	20.2			20B-20C	269.0	3.0	0.01	67.25			
						2.5	0.04	201.75			
	20.3			20C-20D	239.1	2.5	0.02	239.10			
	20.4			20D-20E	267.9	2.5	0.01	267.90			
	20.5			20E-20F	211.9	2.5	0.01	127.14			
						2.0	0.01	84.76			
	20.6			20F-20G	167.6	3.5	0.04	50.28			
						3.0	0.02	117.32			
	20.7			20G-20A	363.7	1.0	0.01	327.33			
						2.5	0.03	36.37			
	21	Pond	-6863	N/A	3,523.8	1.00	0.10		1585.71		
				N/A		1.00	0.01	176.19			
				N/A		2.00	0.10		1761.90		
M	2.1	Pond	-2726	2A-2B	344.4	1	0.04	68.88			
						1.5	0.05	68.88			
						2	0.07		103.32		
						1	0.02	103.32			
	2.2			2B-2C	275.1	0.5	0.02	68.78			
						1.25	0.09		68.78		
						1.5	0.10		68.78		
						2.5	0.30			68.78	
	2.3			2C-2D	674.5	2	0.30			67.45	
						1.25	0.09		101.18		
						3	0.30			101.18	
						1	0.06		67.45		
						1.5	0.30			134.90	
						0.25	0.01	67.45			
						1.5	0.09		101.18		
						2	0.40			33.73	
	2.4			2D-2E	547.4	2.5	0.01	136.85			
						3	0.1		54.74		
						1.5	0.1		355.81		
	2.5			2E-2F	568.7	2	0.02	227.48			
						1.5	0.02	341.22			
	2.6			2F-2G	749.4	1	0.03	37.47			
						2.5	0.4			187.35	
						2	0.01	524.58			
	2.7			2G-2H	593.6	2	0.10		118.72		
						4.5	0.03	89.04			
						2.5	0.06		148.40		
						1.5	0.01	89.04			
						2	0.06		148.40		
	2.8		-2726	2H-2I	264.4	1	0.01	198.30			
						2	0.01	66.10			
	2.9			2I-2J	565.5	1	0.05	141.38			
						2	0.30			141.38	
						1	0.01	141.38			
						2	0.40			141.38	
	3	Pond	-6867	N/A	246.1	0.00	0.01	246.10			
	4	Pond	-6865	N/A	1,286.5	1.00	0.02	514.60			
				N/A		2.00	0.10		128.65		
				N/A		1.00	0.05	643.25			
	5	Pond	-2728	N/A	925.7	1.50	0.08		740.56		
				N/A		0.50	0.01	185.14			

South Fork Kent Creek - Waterbody Riparian Condition Survey

Subbasin	Waterbody Name	Type	Reach Code (709000500-)	Waypoint	Total Shoreline Length Assessed (ft)	Riparian Condition (ft)		
						Good	Fair	Poor
A	1	Wet Basin	N/A	N/A	450.0	0.0	180.0	270.0
B	6	Pond	-6871	N/A	405.6	0.0	0.0	405.6
	9	Pond	-6870	N/A	1,388.6	0.0	1,388.6	0.0
C	13	Pond	-6868	N/A	1,007.2	0.0	302.2	705.0
D	15	Pond	-6864	N/A	657.2	0.0	0.0	657.2
E	16	Pond	-6863	N/A	463.3	393.8	69.5	0.0
F	18	Pond	-6872	N/A	404.4	0.0	161.8	242.6
H	19	Pond	N/A	N/A	520.3	0.0	0.0	520.3
K	22	Pond	N/A	N/A	500.2	0.0	0.0	500.2
L	20.1-20.7	Pond	-6864	20A-20G	1,956.9	0.0	0.0	1,956.9
	21	Pond	-6863	N/A	3,523.8	1,761.9	0.0	1,761.9
M	2.1	Pond	-2726	2A-2B	344.4	0.0	0.0	344.4
	2.2			2B-2C	275.1	0.0	27.5	247.6
	2.3			2C-2D	674.5	0.0	472.1	202.3
	2.4			2D-2E	547.4	0.0	136.9	410.6
	2.5			2E-2F	568.7	0.0	113.7	455.0
	2.6			2F-2G	749.4	0.0	0.0	749.4
	2.7			2G-2H	593.6	0.0	296.8	296.8
	2.8			2H-2I	264.4	0.0	0.0	264.4
	2.9			2I-2J	565.5	0.0	0.0	565.5
	3	Pond	-6867	N/A	246.1	246.1	0.0	0.0
	4	Pond	-6865	N/A	1,286.5	0.0	193.0	1,093.5
	5	Pond	-2728	N/A	925.7	555.4	0.0	370.3

South Fork Kent Creek Watershed
Stream and Waterbody Survey



Data Sources: USGS
Aerial Date: July 30, 2017
Edited: November 19, 2019
Map created by Kristin Adams with Tallgrass Restoration, LLC

South Fork Kent Creek - Woodland Density Survey					
Woodland Name	Subbasin	Total Woodline Area Assessed (ft by ft)	Notes	Area Dead Trees in Canopy (ft^2)	Area Herbaceous Vegetation Cover (ft^2)
W1	B	500x300	oak dominated canopy	15,000	135,000
W2	B	175x175	oak dominated	3,063	27,563
W3	B	40x70		280	2,520
W4	B	45x60		405	945
W5	C	1260x175		11,025	44,100
W6	C	720x50		0	32,400
W7	D	60x60	mostly buckthorn and honeysucke	0	2,160
W8	D	30x50		300	150
W9	D	50x200	honeysuckle, burning bush, buckthorn, cherry, maple	1,000	2,000
W10	E	50x50	not a lot of invasive woodies, but nothing high-quality	250	2,000
W11	L	2100x50		0	21,000
W12	M	400x40		800	0
W13	M	150x50		1,500	4,875
W14	M	200x150	open canopy, oak dominated	1,500	22,500
W15	M	1000x150	open canopy, oak dominated	7,500	112,500
Total Area:		**768,725**		**6%**	**53%**
				% Dead Trees in Canopy	**% Herbaceous Vegetation Cover**

South Fork Kent Creek - Woodland Quality Survey							
Woodland Name	Subbasin	Total Woodline Area Assessed (ft by ft)	Woodland Quality (ft^2)				
			Very High	High	Medium	Low	Very Low
W1	B	500x300		120,000	15,000	15,000	
W2	B	175x175		24,500	3,063	3,063	
W3	B	40x70				2,800	
W4	B	45x60			2,700		
W5	C	1260x175			209,475		11,025
W6	C	720x50			32,400		3,600
W7	D	200x40			8,000		
W8	D	30x50					1,500
W9	D	50x200				10,000	
W10	E	50x50			2,500		
W11	L	2100x50			26,250	78,750	
W12	M	400x40			16,000		
W13	M	150x50			3,750	3,750	
W14	M	200x150			9,000	18,000	3,000
W15	M	1000x150			45,000	90,000	15,000
Total Area:		**768,725**	**0%**	**19%**	**48%**	**29%**	**4%**
			Very High	High	Medium	Low	Very Low

FIELD SURVEY PICTURES

LATERAL RECCESSION RATE (LRR) OF SURVEYED STREAMS AND WATERBODIES

This photo was from stream segment E1.2 and depicted a lateral recession rate estimation of 0.2, which is categorized as the higher end of moderate.

This photo was from stream segment E1.2 and depicted a lateral recession rate estimation of 0.3, which is categorized as the lower end of severe.

This photo was from stream segment E1.3 and depicted lateral recession rates ranging between 0.01-0.09, which is categorized as the lower end of slight up to the middle of moderate.

This photo was taken at stream segment B1.1 and depicted a lateral recession rate estimation of 0.6, which is categorized as very severe.

This photo was taken at stream segment B1.3 and depicted a lateral recession rate estimation of 0.5, which is categorized as the higher end of severe.

RIPARIAN BUFFER CONDITION OF SURVEYED STREAMS AND WATERBODIES

This photo was taken at waterbody 16 in subbasin E. It depicted a riparian buffer in good condition because it had more than a 25-foot vegetation buffer width and more than 70% of the area vegetated with plants that were 12 inches or taller. Although there was a mowed path within the buffer, the overall buffer area still qualified the criteria for good condition.

This photo was taken at stream segment E1.2 and depicted a riparian buffer in poor condition. Although the buffer was more than 70% vegetated with plants taller than 12 inches, the buffer width was less than 15 feet.

This photo was taken at waterbody 2 (Levings Lake) and depicted a riparian buffer in poor condition because the buffer width was less than 15 feet.

This photo was taken at stream segment C1.1-C1.2 and depicted a riparian buffer in poor condition because the vegetated buffer width was less than 15 feet.

This photo was taken at stream segment D4 and depicted a riparian buffer in poor condition for bank 1 (near roadside), whereas bank 2 (near agricultural field) had a riparian buffer in good condition.

DEBRIS BLOCKAGES IN SURVEYED STREAMS AND WATERBODIES

This photo was taken at stream segment E1.3 and depicted a debris blockage from overgrown dead vegetation and dead woody limbs.

These two photos were taken at stream segment B1.2. Litter, a plastic trash receptacle, and large dead tree limbs were found in this stream segment. Large dead tree limbs were also found in stream segment B1.3 just downstream of B1.2.