Hurricane Creek

Watershed-based Plan

GREATER EGYPT REGIONAL PLANNING & DEVELOPMENT COMMISSION

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Pictured on cover: Herrin Old Lake (City of Herrin), Hurricane Creek, and USGS Topographic Map, Herrin, IL Quadrangle (1968)

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Acronyms and Abbreviations

ACS	American Community Survey
AISWCD	Association of Illinois Soil and Water Conservation Districts
ALMP	Ambient Lake Monitoring Program
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CWA	Clean Water Act
DOI	Department of the Interior
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives program
HUC	Hydrologic Unit Code
ICN	Illinois Climate Network
IDES	Internet Data Entry System
IDNR	Illinois Division of Natural Resources
IEPA	Illinois Environmental Protection Agency
ISGS	Illinois State Geological Survey
LAUS	Local Area Unemployment Statistics
LRR	Lateral Recession Rate
MCL	Maximum Contaminant Level
MLCG	Maximum Contaminant Level Goal
MRLC	Multi-Resolution Land Characteristics Consortium
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NOAA	National Oceanic and Atmospheric Agency
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NWI	National Wetland Inventory
PCB	Polychlorinated Biphenyl
RMMS	Resource Management Mapping Service
SMU	Sub-Watershed Management Unit
STEPL	Spreadsheet Tool for Estimating Pollutant Loads
SWCD	Soil and Water Conservation Districts
TSS	Total Suspended Solids
USACE	Unites State Army Corps of Engineers
USDA	Unites State Department of Agriculture
USFWS	Unites State Fish and Wildlife Service
USGS	Unites States Geological Survey
VLMP	Volunteer Lake Monitoring Program
WRP	Wetlands Preserve Program

Executive Summary

Beginning in 2015, the Greater Egypt Regional Planning and Development Commission (Greater Egypt) was contracted by the Illinois Environmental Protection Agency (IEPA) to develop a watershed-based plan for the Hurricane Creek Watershed (071401060705) under Clean Water Act Section 604(b) funding.

Two waterbodies in the watershed have been placed on the Environmental Protection Agency's (EPA) 303(d) List of Impaired Waters. This list is comprised of waterbodies that do not meet water quality standards. In particular, Hurricane Creek (IL_NF-01) has been placed on the list because of problems with lindane, sedimentation and siltation as seen in Figure 1. Herrin Old Lake (IL_RNZD) exhibits many other impairments including: mercury, polychlorinated biphenyls (PCBs), total suspended solids (TSS), phosphorus and algae.

Impaired designated uses of Herrin Old Lake are aesthetic quality and fish consumption. Hurricane Creek exhibits an impaired designated use of aquatic life. These impairments of designations are caused by the previously mentioned pollutants.

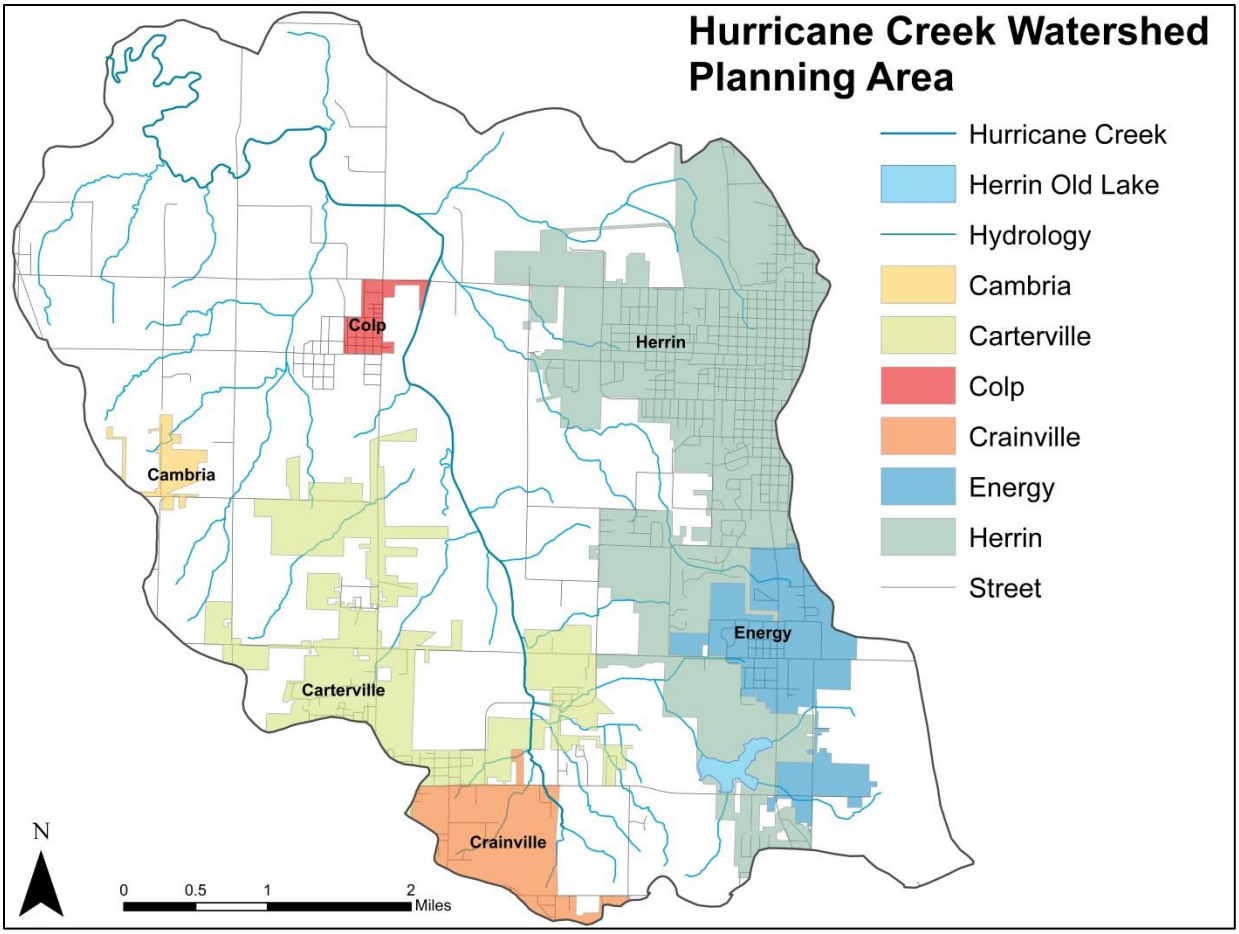
An initial stakeholder meeting was held in 2015 to gain awareness of planning efforts and to garner membership for the Hurricane Creek Watershed Council. The council usually met monthly and provided guidance throughout the plan. This included discussing existing knowledge of the watershed and suggesting BMPs for the plan. The continuation of Council activities will move forward following plan adoption. This includes overseeing implementation of the plan and monitoring progress.

The Hurricane Creek watershed encompasses 16,590 acres, or 26 square miles and is located entirely in Williamson County, Illinois. It is part of the larger Big Muddy River watershed. Six cities and villages make up the relatively small population of the watershed. The City of Herrin being the most populated, contributes the most urban runoff in the watershed.

Land use in the watershed is fairly balanced among agriculture, forested areas, and development. Agriculture in the watershed is composed of 21.8 percent of pasture and hay and 13 percent of cultivated crops. Woodland and grassland

comprise 29.3 and 2.3 percent of the watershed. The remaining land uses in the watershed are developed land (28.7 percent), wetlands (2.6 percent), and water (1.9 percent). With 34.8 percent of the watershed being classified as agriculture, there is a high potential for erosion. This is especially true for the areas of cropland that run along the Hurricane Creek

Figure 1- Hurricane Creek Watershed Planning Area



While impervious surfaces in the watershed are rather low, the City of Herrin constitutes a large portion of the watershed's impervious network. The watershed exhibits around four percent of imperviousness (50 percent or more impervious surface).

The Spreadsheet Tool for Estimating Pollutant Loads (STEPL) and the Region 5 Model were utilized to generate existing pollutant loads for the Hurricane Creek watershed and its sub-watersheds. While the program produces general

estimates, the baseline data was generated from multiple factors including: land use, climatic indicators, agriculture, septic rates, urban runoff, and streambank/shoreline impairments. Estimated pollutant loads are influenced heavily by urban areas and agriculture (see Table 1).

Table 1- Existing Pollutant Loads

Source	N Load (lb/yr)	Percent of Total Load	P Load (lb/yr)	Percent of Total Load	Sediment Load (tons/yr)	Percent of Total Load
Urban	42879.22	28.92%	6628.33	24.11%	984.24	6.23%
Cropland	30825.17	20.79%	8977.75	32.66%	5656.27	35.81%
Pastureland	44021.10	29.69%	5380.93	19.58%	2096.12	13.27%
Forest & Grassland	2548.54	1.72%	1198.67	4.36%	205.43	1.30%
Groundwater	16125.60	10.88%	728.70	2.65%	0.00	0.00%
Streambank/Shoreline	10052.71	6.78%	3870.29	14.08%	6283.00	39.78%
Other	1823.11	1.23%	701.90	2.55%	569.72	3.61%
Total	**148275.45**		**27486.57**		**15794.78**	

Pollutant load reduction targets were also generated for the major pollutants. A reduction of nitrogen at 15 percent, phosphorus at 40 percent, and sediment reduction of 45 percent were calculated for the plan. Target goals are consistent with the recommended best management practices (BMP) suggested in the plan.

BMPs were suggested in regards to two major impairments in the watershed: urban runoff and agricultural practices. While the plan addresses watershed-wide impairments, site-specific BMPs have also been established to manage agricultural pollutants and urban runoff.

These management efforts confront the impairments of Hurricane Creek (sedimentation/siltation) and Herrin Reservoir (phosphorus, TSS). Some of the measures include: streambank and shoreline stabilization, agricultural and vegetated filter strips, and grassed waterways. They have also been categorized by priority based on feasibility, cost, and pollutant load reductions.

The plan incorporates the nine minimum elements of any watershed-based plan. These elements include: a characterization of the watershed through a resource inventory and assessment to identify nonpoint source pollution, identification of

BMPs to address those pollutants, identifying funding and technical assistance, an educational component, and a monitoring and evaluation component to track progress and monitor accomplishments.

Funding will mainly come through EPA Clean Water Act Section 319 grants. Most of the BMPs in the plan can receive funding through these grants that are focused on reducing nonpoint source pollution.

Outreach and education of watershed-related activities are important in promoting awareness of the plan and progression of plan implementation. Some of the components of outreach include holding public meetings, distributing flyers on stormwater management, and hosting litter cleanup days around the watershed.

Implementation of the plan is divided into three phases. Phase I represents the first two years of the plan where most educational and outreach component are implemented along with selecting site-specific BMPs for grant funding. Phase II will require the watershed council to continue submitting grants and starting implementation of BMPs. Phase III represents the last four years of the planning period in which BMP implementation will continue and evaluating the plan will commence.

Interim measurable milestones, water quality benchmarks, and a monitoring component have also been established to track progress and evaluate the success of the plan. Table 2 represents the water quality benchmarks in the plan which focuses on nitrogen, phosphorus, and sediment.

Table 2- Water Quality Benchmarks

	Benchmark Reduction Target					
Benchmark Period	**Nitrogen (percent)**	**Nitrogen (lbs/ yr)**	**Phosphorus (percent)**	**Phosphorus (lbs/yr)**	**Sediment (percent)**	**Sediment (tons/yr)**
2 Year (Phase I)	-	-	-	-	-	-
6 Year (Phase II)	6	8897	20	5497	20	3159
10 Year (Phase III)	15	22241	40	10995	45	7108

The monitoring component of the plan features programs offered by IEPA and the Illinois Division of Natural Resources (IDNR). The Volunteer Lake Monitoring Program (VLMP) and the Ambient Lake Monitoring Program (ALMP) are both ways in which water quality can be tested. Results will be analyzed by the watershed action committee to determine success of BMP implementation and the plan itself.

1. Introduction

A watershed is a drainage basin where all water flows into from surrounding elevated lands. Precipitation and runoff drain to a waterbody, usually a lake or stream that centralizes all flow of the watershed. Watersheds can range from regional land areas that span states to smaller basins that are encompassed within counties. Watershed size is classified by Hydrologic Unit Codes (HUC) which range from 2 (regional) to 12 (sub-watershed).

Watershed-based Plans provide a framework for improving water quality in a specific watershed. They are often designed to reduce pollutants from nonpoint sources and identify other components that impair water quality. These plans include a characterization of the watershed through a resource inventory and assessment to identify nonpoint source pollution, identification of best management practices (BMP) to address those sources, and a monitoring and evaluation component to track progress and monitor accomplishments.

The selection of the Hurricane Creek Watershed for watershed planning was no coincidence. Two waterbodies in the watershed have been placed on IEPA's 303(d) List of Impaired Waters. This list is comprised of waterbodies that do not meet water quality standards. In particular, Hurricane Creek (IL_NF-01) has been placed on the list because of problems with lindane, sedimentation and siltation. Herrin Old Lake (IL_RNZD) exhibits many other impairments including: mercury, polychlorinated biphenyls (PCBs), total suspended solids (TSS), phosphorus and algae.

Watershed-based planning focuses on collaboration among stakeholders and local decision makers. Watershed-based plans must follow guidelines as set forth by the Environmental Protection Agency. To be successful, watershed-based plans should include the Nine Minimum Elements of a Watershed-based Plan[1]. The components and location within this plan are as follows:

[1] Environmental Protection Agency, "Appendix C- Minimum Elements of a Watershed-based Plan," in *Nonpoint Source Program and Grants Guidelines for States and Territories* (Washington D.C., 2013.), 63-68.

1. **Element A- Identify causes and sources of pollution.** This is completed through an inventory and assessment of the Hurricane Creek Watershed. The inventory should include a characterization of the watershed including details on: boundaries, geology and climate, soils, jurisdictions, demographics, and land use. It should also include an assessment of waterbodies and water quality which identifies sources of pollution in the watershed. (Chapter 2)

2. **Element B- Estimate load reductions expected from best management practices.** Pollutant load reduction targets were established to meet water quality goals. These targets were generated using the suggested BMPs in the plan found in Element C. (Chapter 2)

3. **Element C- Describe the nonpoint source best management practices that meet pollutant load reductions.** A description of each BMP type has been provided in the plan. Information for watershed-wide and site-specific BMPs has also been provided. This includes: location, load reductions, amount, unit, and priority. (Chapter 3)

4. **Element D- Identify the technical and financial assistance needed to implement the plan.** Costs associated with the technical and financial assistance have been calculated for each management measure in the plan. Grant opportunities for each BMP have also been identified. (Chapter 4)

5. **Element E- Develop an information and education component.** An outreach component should be created to gain public involvement which can promote the strategies and implementation measures in the plan. (Chapter 5)

6. **Element F- Develop a schedule for implementing the nonpoint source best management practices in the plan.** A schedule should be developed that outlines the best management practices, educational components, and other strategies in the plan. (Chapter 6.1)

7. **Element G- Describe interim measurable milestones to monitor management measures in the plan.** Milestones are to be addressed for each BMP in the plan. These milestones are also developed for the outreach components and other strategies. Milestones are separated by phases throughout the planning period. (Chapter 6.2)

8. **Element H- Develop criteria to measure progress of loading reductions through management measures.** These benchmarks signify whether BMPs and other management measures are successful in reducing pollutant loads and are leading to water quality standards. (Chapter 7.1)

9. **Element I- Develop a monitoring component that evaluates the efficacy of management measures.** Elements in the monitoring component should determine whether loading reductions are being met and water quality standards are being achieved. (Chapter 7.2)

The Hurricane Creek Watershed-based Plan incorporates all of these elements in an effort to reduce pollutant loads and improve water quality within the watershed. The success of the plan largely depends on the collaboration of stakeholders and local officials to implement and oversee the plan's development.

Figure 2- Hurricane Creek South Facing at Herrin Rd.

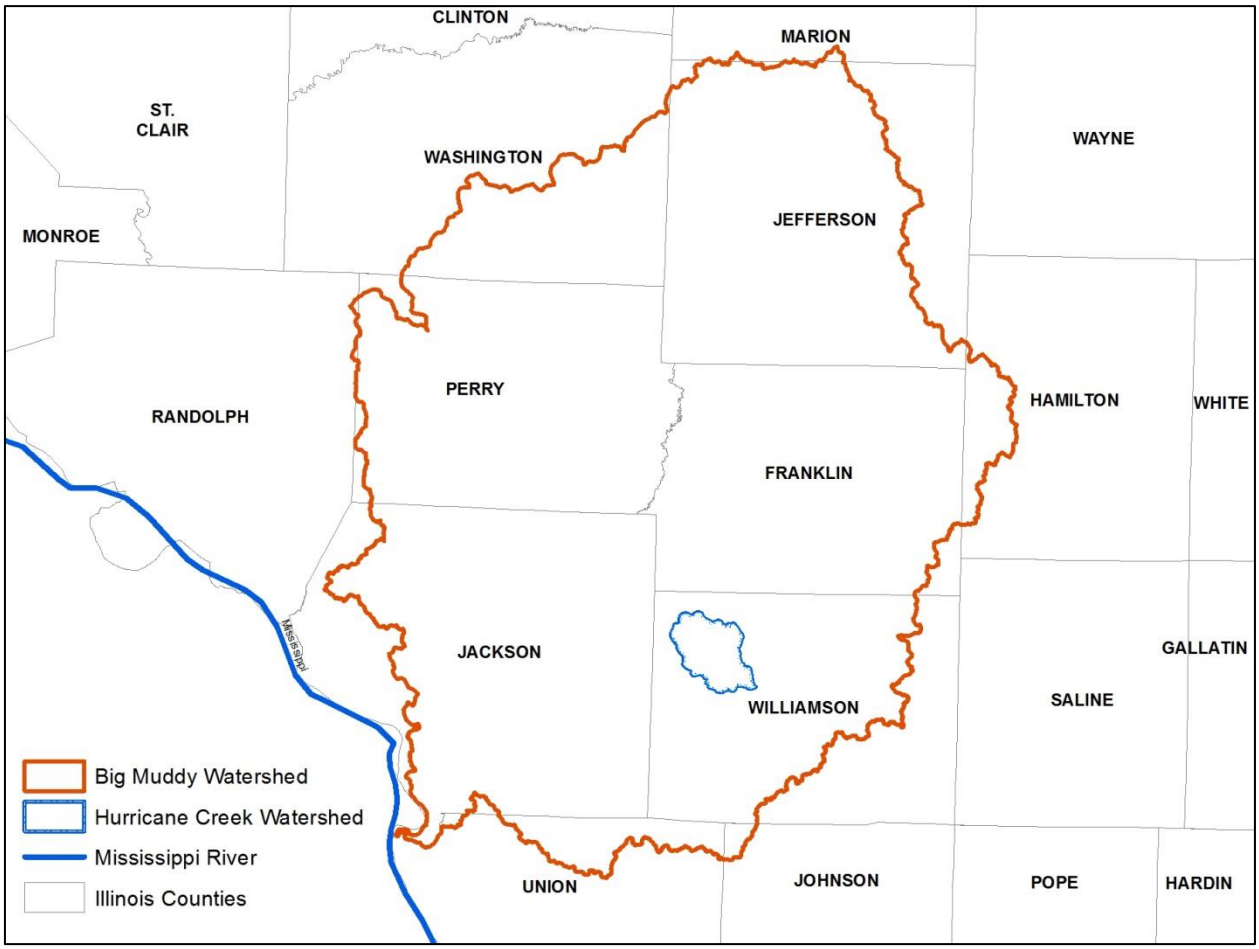
2. Hurricane Creek Watershed Inventory and Assessment

2.1 Watershed Boundaries

2.1.1 Geography

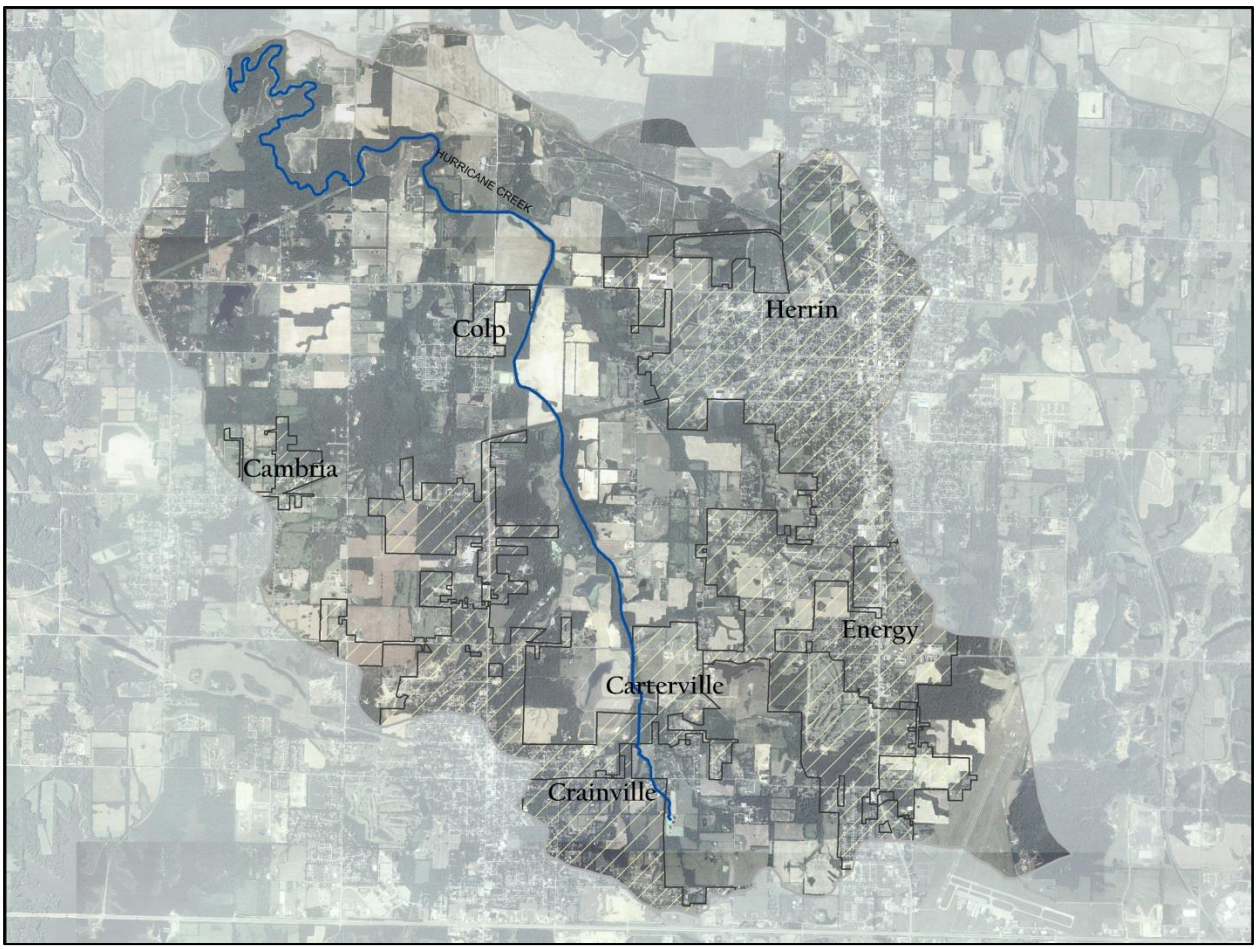
The Hurricane Creek watershed encompasses 16,590 acres, or 26 square miles, and has been assigned Hydrologic Unit Code (HUC) 071401060705. It is located in Williamson County, Illinois, and is part of the larger Big Muddy River watershed (Figure 3). The headwaters of Hurricane Creek originate north of Marion Street in Crainville, Illinois. Municipalities in the subject area are Cambria, Carterville, Colp, Crainville, Energy, and Herrin, all of which lie entirely in Williamson County, Illinois. The Hurricane Creek watershed is bound to the north by Big Muddy Road, to the east by the City of Herrin, to the west by the Village of Cambria, and to the south by the City of Carterville (Figure 4).

Figure 3 - Location of the Hurricane Creek Watershed



There are a number of communities partially or entirely within the Hurricane Creek watershed. With a population of 12,521, according to the 2010 Census, the largest city in the watershed is Herrin, Illinois. Other communities in the watershed such as Colp and Crainville sustain a much smaller amount of people. Few major roadways lie within the watershed. The most significant roadway rests just south of the subject area. Illinois Route 13 is traveled in an east-west direction.

Figure 4 - Municipalities



2.1.2 Location of Water Bodies

The Hurricane Creek watershed lies on the divide between the Ohio and Mississippi River basins. There are 56.6 stream miles in the Hurricane Creek watershed as identified in the National Hydrography Dataset (NHD). Two main creeks represent the Hurricane Creek watershed. Hurricane Creek runs 10.6 miles in a northwesterly direction through the center of the watershed before

discharging into the Big Muddy River. Little Hurricane Creek runs 3.43 miles in a northerly direction before discharging into the Hurricane Creek. Other smaller, unnamed streams run throughout the watershed in various directions.

Small ponds and lakes constitute a rather small area of the watershed, approximately 340.1 acres according to the NHD. Two lakes stand out as being the larger bodies of water. Madison Lake is approximately 25.4 acres in area and rests in the western portion of the watershed. The larger lake, Herrin Old Lake, or Herrin Reservoir, pools at the southern sub-watershed. It is 51.3 acres, and is on the Illinois Environmental Protection Agency's (IEPA) 303(d) list of impaired waters.

Wetlands are also a prominent feature throughout the target area. According to the U.S. Fish and Wildlife Service's National Wetlands Inventory, there are four classifications of wetlands identified in the Hurricane Creek watershed: freshwater emergent, freshwater forested/ shrub, freshwater ponds, and lakes. Table 3 contains information of the distribution of wetlands. Freshwater forested and shrub wetland is the most apparent wetland classification in the watershed consisting of 998 acres, or accounting for 6 percent of the watershed. Wetlands have also been spatially displayed in Figure 5.

Table 3 - Distribution of Wetlands

Wetland Type	Acres	Percent of Wetland Total	Percent of Watershed
Freshwater Emergent	141.38	9.63%	0.85%
Freshwater Forested/ Shrub	998.45	68.02%	6.02%
Freshwater Pond	230.93	15.73%	1.39%
Lake	97.2	6.62%	0.59%

Source: ISGS, US Fish and Wildlife Service National Wetlands Inventory

2.1.3 Topography

The Hurricane Creek watershed is located roughly nine miles north of the southern limit of the glacial till from the Illinoisan age. The watershed is generally flat, with gentle slopes near the headwaters and the southeasterly border. The topography is consistent with the surrounding watersheds of Southern Illinois. The lowest elevations in the watershed are found in the northwest section at the confluence of the Hurricane Creek and Big Muddy

River. The elevation is about 347 feet. The highest elevation in the watershed, around 536 feet, occurs at the southeasterly border near the Williamson County Airport. The watershed is somewhat oval-shaped with a dendritic drainage pattern.

2.1.4 Sub-Watershed Management

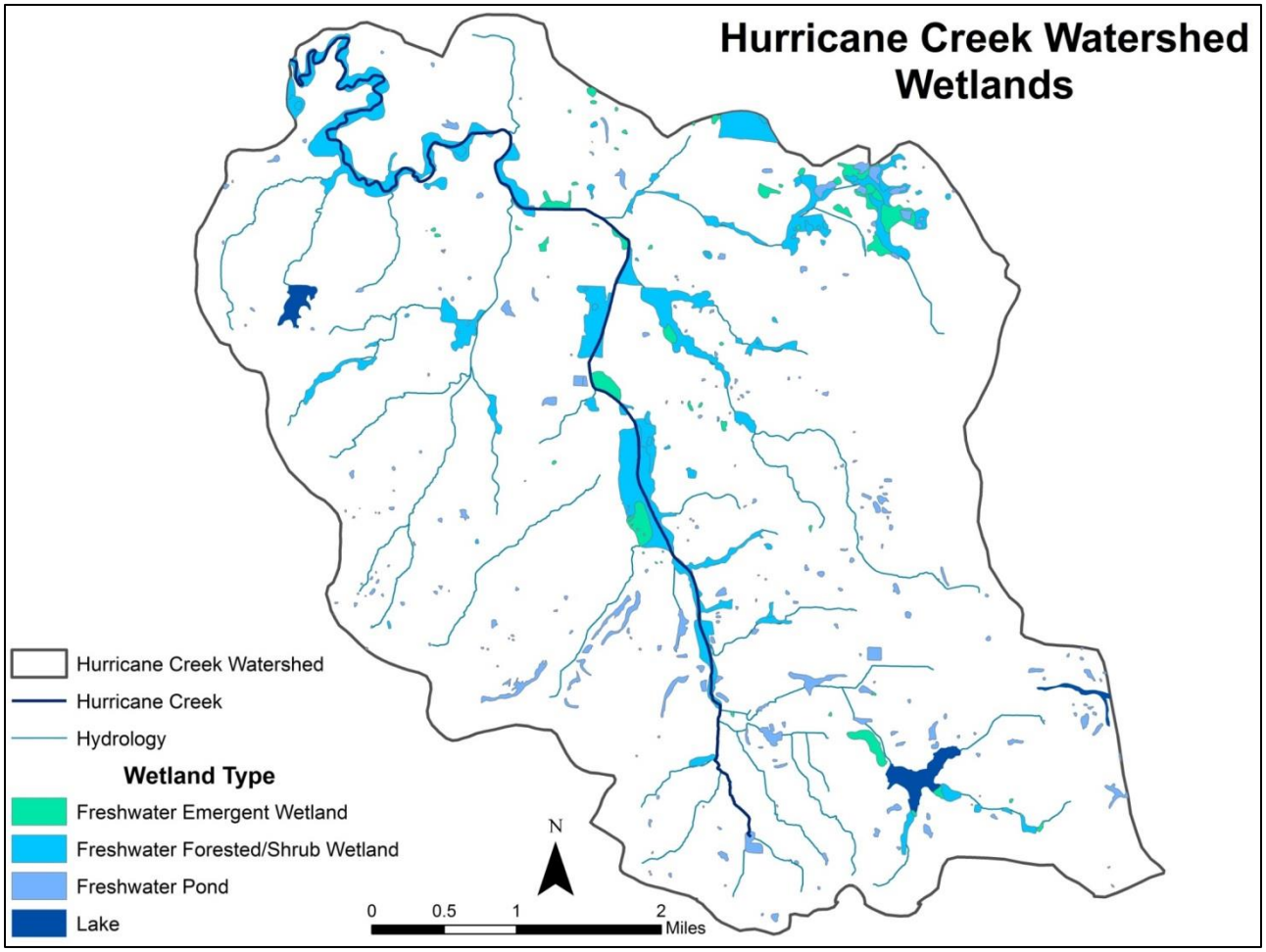
The Hurricane Creek watershed has been delineated further into four smaller sub-watershed management units (SMU). Along with Hurricane Creek, each SMU will be examined individually in this inventory. Each SMU was delineated based on the drainage patterns and the direction of flow of Hurricane Creek, the Little Hurricane Creek, and other un-named streams. A unique identifier was assigned to each SMU for classification. Each sub-watershed management unit was also given a name. The sub-watersheds are illustrated in Figure 6.

2.1.5 Characteristics of the SMUs

The Lower Hurricane Creek sub-watershed (SMU 1) is bound to the north by Big Muddy Road, to the east by Clifford Rd., to the west by Cambria Rd., and to the south by the ridgeline north of Little Hurricane Creek. It is comprised of 2,603 acres. There are very few roadways that pass through the Lower Hurricane Creek sub-watershed, and it is the only sub-watershed that is not represented by a municipality. SMU 1is comprised mainly of forest and cropland, however, Madison Lake rests in this sub-watershed. Hurricane Creek has its longest extension in this sub-watershed flowing 5.72 miles in a northwesterly direction.

The Little Hurricane Creek sub-watershed (SMU 2) encompasses 2,407 acres and represents the smallest sub-watershed in the Hurricane Creek watershed. SMU 2 is bound to the north by the division of SMU 1, to the east by the Village of Colp and the City of Carterville, to the west by the Village of Cambria, and to the south by Sycamore Road. As its name suggests, Little Hurricane Creek runs in a northern direction through the sub-watershed, eventually flowing into the Hurricane Creek 300 yards past the northern border. The Villages of Cambria and Colp and the City of Carterville are represented in this sub-watershed to some degree.

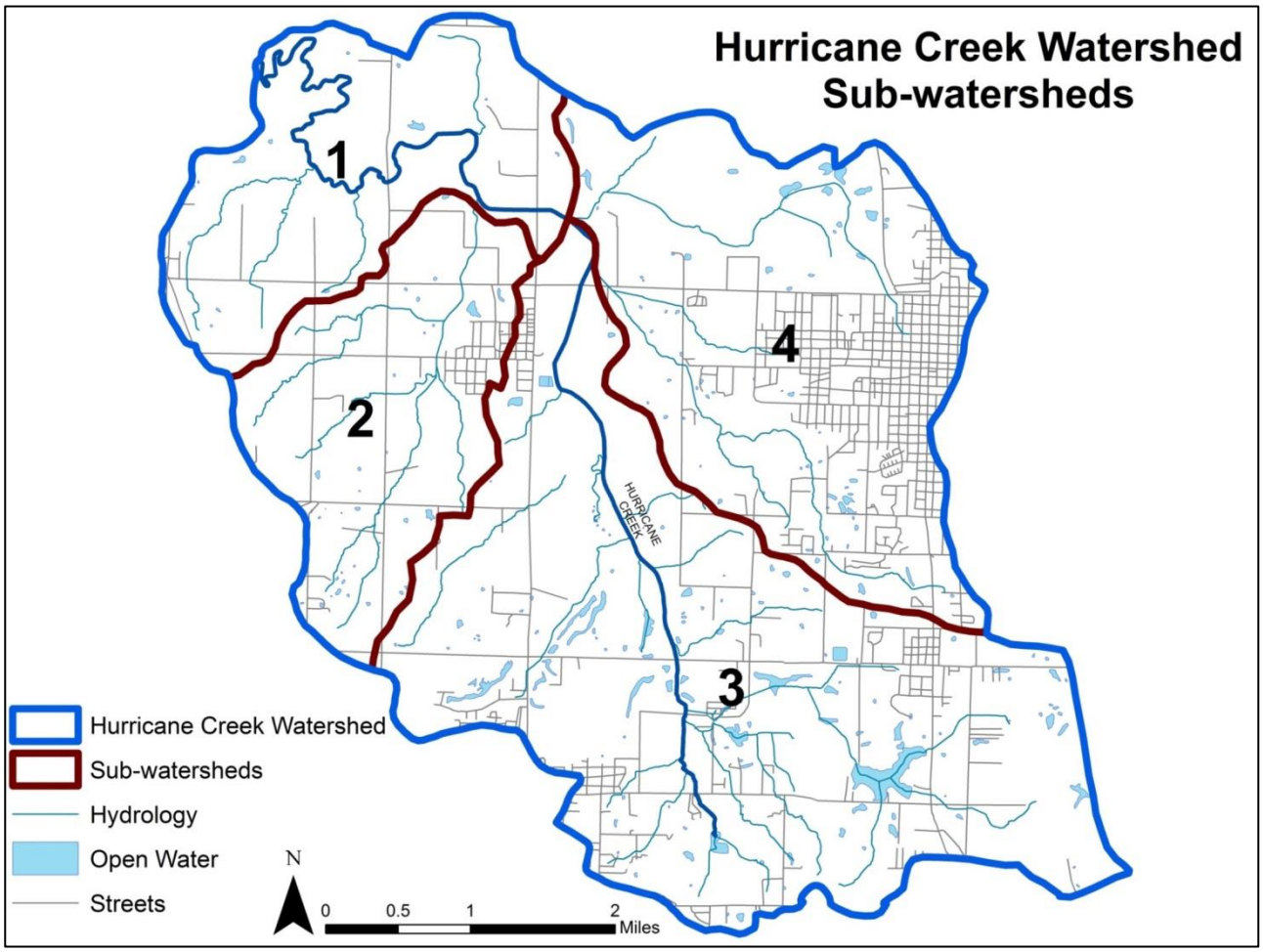
Figure 5 -Wetlands



The Upper Hurricane Creek sub-watershed (SMU 3) is the largest of the four sub-watersheds at 7,251 acres. SMU 3 is bound to the north by the confluence of Hurricane Creek and an unnamed stream that flows west from the City of Herrin, to the east by the Williamson County Airport, to the west by the City of Carterville, and to the south by Route 13. Every municipality in the Hurricane Creek watershed is represented in the Upper Hurricane Creek sub-watershed with the exception of the Village of Cambria. Notable bodies of water in SMU 3 include Herrin Reservoir and Hurricane Creek.

The Herrin sub-watershed (SMU 4) is the second largest SMU at 4,323 acres. It is delineated by the City of Herrin to the north, south and east, and to the west by the confluence of Hurricane Creek and an unnamed stream that flows west from the City of Herrin. The city limits for the City of Herrin account for more than half of the Herrin sub-watershed. This feature also relates to the Herrin sub-watershed having the highest percentage of developed land.

Figure 6 - Sub-Watershed Management Units



2.2 Geology and Climate

2.2.1 Geology

The Hurricane Creek watershed is located in the Central Lowland Province, Tills Plains Section. It is also in close proximity to the Interior Low Plateau to the south, and the Ozark Plateaus to the southwest. The physiographic provinces are further partitioned into divisions. The Hurricane Creek watershed rests just above the southern border of the Mt. Vernon Hill Country Division.[2]

In his report "Upper Crab Orchard Creek: A Watershed Inventory," David Muir discusses the geology and glaciation of the Mt. Vernon Hill County. He suggests that the, "Mt. Vernon Hill Country includes the southernmost area glaciated during Pleistocene times. The area was covered only by the Illinois glacial advance, and a fairly uniform layer of glacial till was deposited over the weak Pennsylvanian bedrock strata."[3]

Figure 7 shows the bedrock geology for the Hurricane Creek watershed and its surrounding area prior to the inception of the newly adopted Pennsylvanian Geologic Nomenclature for Illinois. The Pennsylvania System includes the uppermost bedrock in the Hurricane Creek watershed. It is overlain by relatively thin layers of glacial drift, loess, and alluvial deposits in river valleys. The Pennsylvanian surface is eroded by action of pre-glacial streams.

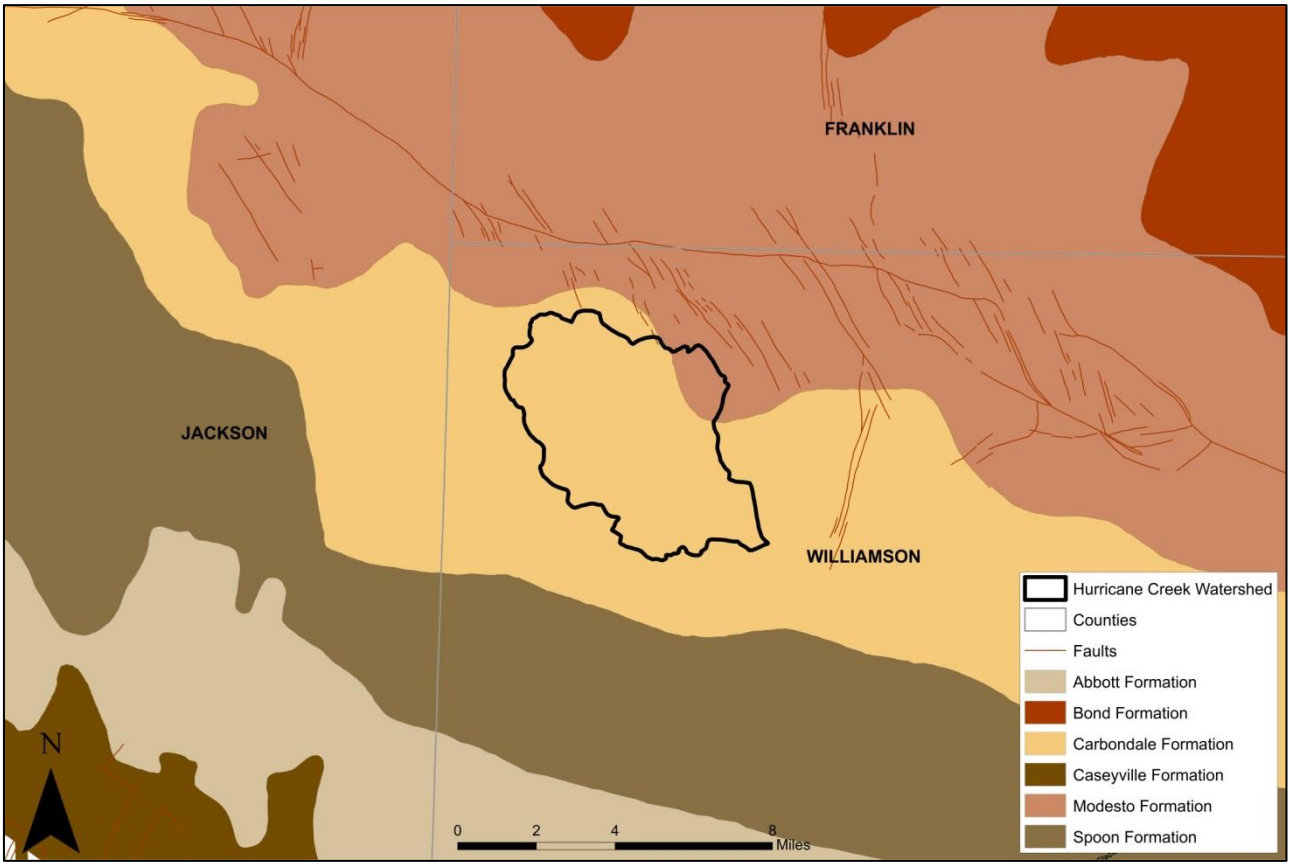
The Carbondale and Modesto formations are the uppermost bedrock layers underlying the Hurricane Creek watershed. The Modesto Formation is the uppermost bedrock layer in around 10 percent of the watershed. The formation consists primarily of shale. Sandstone and limestone are also heavily present throughout the formation. At 5 percent, coal is present, but is considerably thinner than the underlying Carbondale Formation. While the Modesto

[2] M.M. Leighton, George E. Elkblaw, Leland Horberg, "Physiographic Divisions of Illinois," *The Journal of Geology*: ISGS, 1948, 16-33.
[3] David Muir, et al., "Upper Crab Orchard Creek: A Watershed inventory," Greater Egypt Regional Planning and Development Commission, 1988, 6.

Formation is generally about 300 feet in thickness, it has a maximum thickness of 400 feet.[4]

The Carbondale Formation is the principle coal producing formation in the in the Hurricane Creek watershed. The formation consists of predominantly shale (40 percent) with heavy limestone, sandstone, and underclay deposits.[5]

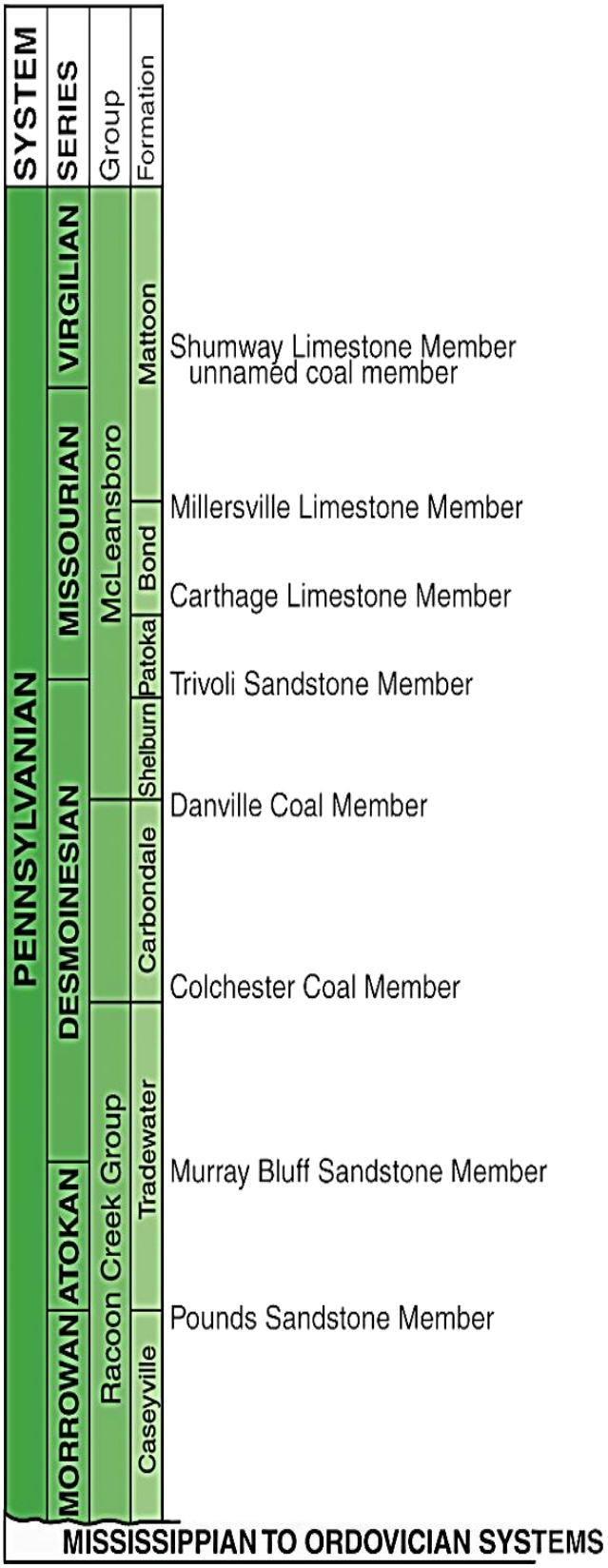
Figure 7 - Bedrock Geology



In the early 1980s, the Tri-State Committee on Correlation of the Pennsylvanian System in the Illinois Basin was formed to resolve problems from different jurisdictions, and to standardize stratigraphic terminology for the Pennsylvanian System. One of the results was the reclassification of the Modesto Formation which included the Shelburn and Patoka Formations.

[4] USGS, "Modesto Formation." http://mrdata.usgs.gov/geology/state/sgmc-unit.php?unit=ILPAm%3B0. Accessed 11 June 2015.
[5] USGS, "Carbondale Formation." http://mrdata.usgs.gov/geology/state/sgmc-unit.php?unit=ILPAc%3B0. Accessed 11 June 2015.

Figure 8- Generalized Stratigraphic Column of the Pennsylvanian in Illinois



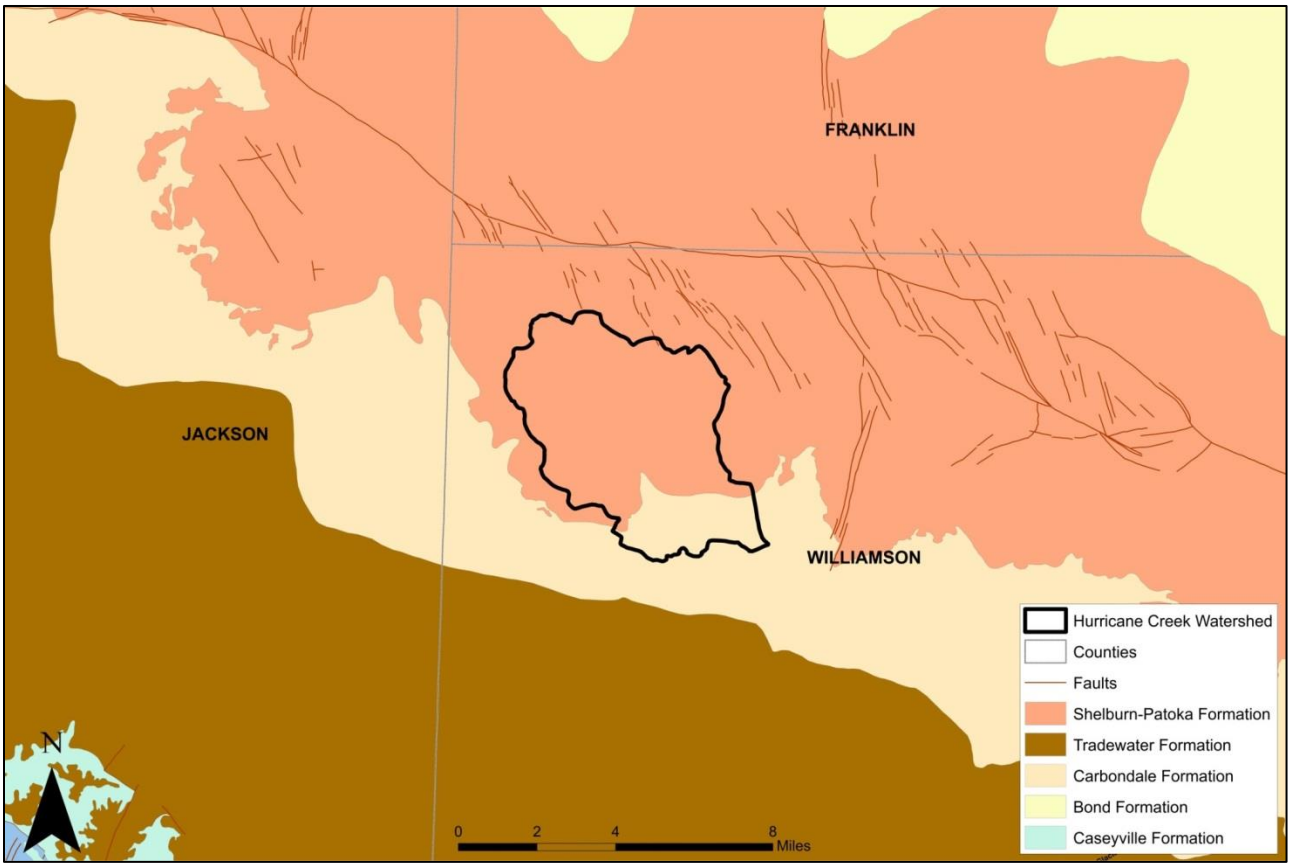
Source: ISGS

Sometimes paired as a single formation, the Shelburn-Patoka Formation primarily consists of shale and sandstone. Other deposits include coal and limestone. General thickness of the Shelburn Formation is 100 to 275 feet. While it is mainly comprised of sandstone, the Shelburn Formation also exhibited deposits of black shale, coal and limestone.[6]

The Patoka Formation reaches a thickness of around 300 feet. Shale and sandstone compose around 85 percent of the Patoka Formation. The Shelburn-Patoka Formation constitutes 82 percent of the uppermost bedrock layer in the Hurricane Creek watershed, while the other 18 percent belongs to the Carbondale Formation. The reclassified stratigraphic geology is represented in Figure 9.

[6] Tri-State Committee on Correlation of the Pennsylvanian System in the Illinois Basin, *Toward a More Uniform Stratigraphic Nomenclature for Rock Units of the Pennsylvanian System in the Illinois Basin.* (Bloomington: Illinois Basin Consortium, 2001), 16.

Figure 9 - Reclassification of Stratigraphy



2.2.2 Climate

The climate in the Hurricane Creek watershed borders the Humid Subtropical and Humid continental climates. Muir goes on to explain the climate in the area by stating, "The incursion of air masses from different directions results in quite variable weather patterns. Warm moist air from the gulf, cold dry air from Canada, and dry continental air from the southwest are the major influences on weather. Landform and topography have a negligible impact on climate in this area."[7]

Temperatures in the region can vary significantly due to the effects of warm gulf air from the south and cold Canadian air. Maximum and minimum temperatures recorded at Carbondale, Illinois were 97 degrees Fahrenheit and 1 degree

[7] Muir, et al., 1.

Fahrenheit in 2013. The range used by the NOAA National Climate Data Center from Carbondale, Illinois encompasses the Hurricane Creek watershed in its entirety[8]. The average temperature for 2013 was 53.9 degrees Fahrenheit. Table 5 summarizes temperature information for the area during 2013.

The Hurricane Creek watershed is subject to considerable rainfall throughout the year. The average annual precipitation in the Hurricane Creek watershed is 47.15 inches. The wettest months are typically from March to June. Average snowfall amounts in the region are around 14 inches. Table 5 displays the monthly precipitation distribution of the 2013.

During the summer months damaging storms and heavy rainfall can be expected. Heavy rainfall usually leads to flooding in certain areas. Like most areas in the Midwest, the watershed is susceptible to tornadoes. Winters can occasionally bring severe snow and ice.

Wind data was obtained from the Illinois Climate Network (ICN) Carbondale Station, located on a SIU farm[9]. Wind speed generally ranges from 6 to 17 miles per hour throughout the year with an average of six miles per hour. However, gusts can average 25 to 40 miles per hour in any certain month. There does not seem to be a prevalent pattern of wind direction in the region. Considering the region is fairly flat, wind direction is caused by incoming weather patterns.

[8] NOAA/National Climatic Data Search, "Climate Data Online Search," https://www.ncdc.noaa.gov/cdo-web/search. Accessed 16 April 2015.
[9] ICN, "Water and Atmospheric Resources Monitoring Program," http://www.isws.illinois.edu/warm/datatype.asp. Accessed 2015.

Table 4 - 2013 Monthly Average Temperatures

2013 MONTHLY AVERAGE TEMPERATURES (degrees Fahrenheit)													
	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Average High	45.3	46.7	48	66.5	77.5	85.7	84.9	84.5	83.4	68.3	52.8	41.8	65.5
Average	34.5	35.6	38.1	53.8	65	74.1	73.6	73.6	70.3	56	41.1	31.5	53.9
Average Low	23.8	24.4	28.2	41.1	52.6	62.4	62.2	62.7	57.2	43.6	29.5	21.3	42.4

Source: National Oceanic and Atmospheric Administration (NOAA)-National Climatic Data Center

Table 5 - 2013 Monthly Average Precipitation

2013 MONTHLY AVERAGE PRECIPITATION													
	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Average	3.06	3.08	4.15	4.44	5.37	4.5	3.66	3.26	3.14	3.81	4.63	4.05	47.15
Total	5.65	3.19	4.82	4.05	3.53	4.05	4.09	2.72	0.68	3.65	5.31	7.3	49.04

Source: NOAA- National Climatic Data Center

2.3 Soil Conditions

The United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) soils mapping data (Web Soil Survey) and the Soil Survey of Williamson County (USDA, NRCS) was utilized for the examination of soils within the Hurricane Creek watershed. This data was utilized to summarize the soil types, hydric soils, soil erodibility, and hydrologic soil groups.

2.3.1 Hydrologic Soil Groups

There are twenty-five dominant soil types within the Hurricane Creek watershed. Each soil is placed in a certain hydrologic group depending on the rate of water infiltration. These factors include whether the soil is protected by vegetation, consistently wet, or receives precipitation from storms[10]. The NRCS defines the hydrologic soil groups by the following:

> **Group A**: Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
>
> **Group B**: Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
>
> **Group C:** Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
>
> **Group D:** Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a

[10] USDA, NRCS. "Web Soil Survey." http://websoilsurvey.sc.egov.usda.gov/. Accessed Various Dates 2015.

claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.[11]

Soils can also be assigned to a dual hydrologic group (A/D, B/D, or C/D). The first letter represents drained areas while the represents undrained areas. Figure 6 displays the hydrologic soil groups and relative information.

Table 6 - Hydrologic Soil Groups

Hydrologic Group	Soil Texture	Drainage	Infiltration	Transmission Rate
A	Sand or Gravel	Deep, Well Drained to Excessivley Drained	High	High
B	Moderately Fine to Moderatley Coarse	Moderately Deep or Deep, Moderately Well Drained or Well Drained	Moderate	Moderate
C	Moderatley Fine to Fine	Layer that Impedes the Downward Movement of Water	Slow	Slow
D	Clays	High Shrink-Swell Potential, High Water Table, Claypan Layer Near Surface, Shallow Over Nearly Impervious Surfaces	Very Slow (High Runoff)	Very Slow

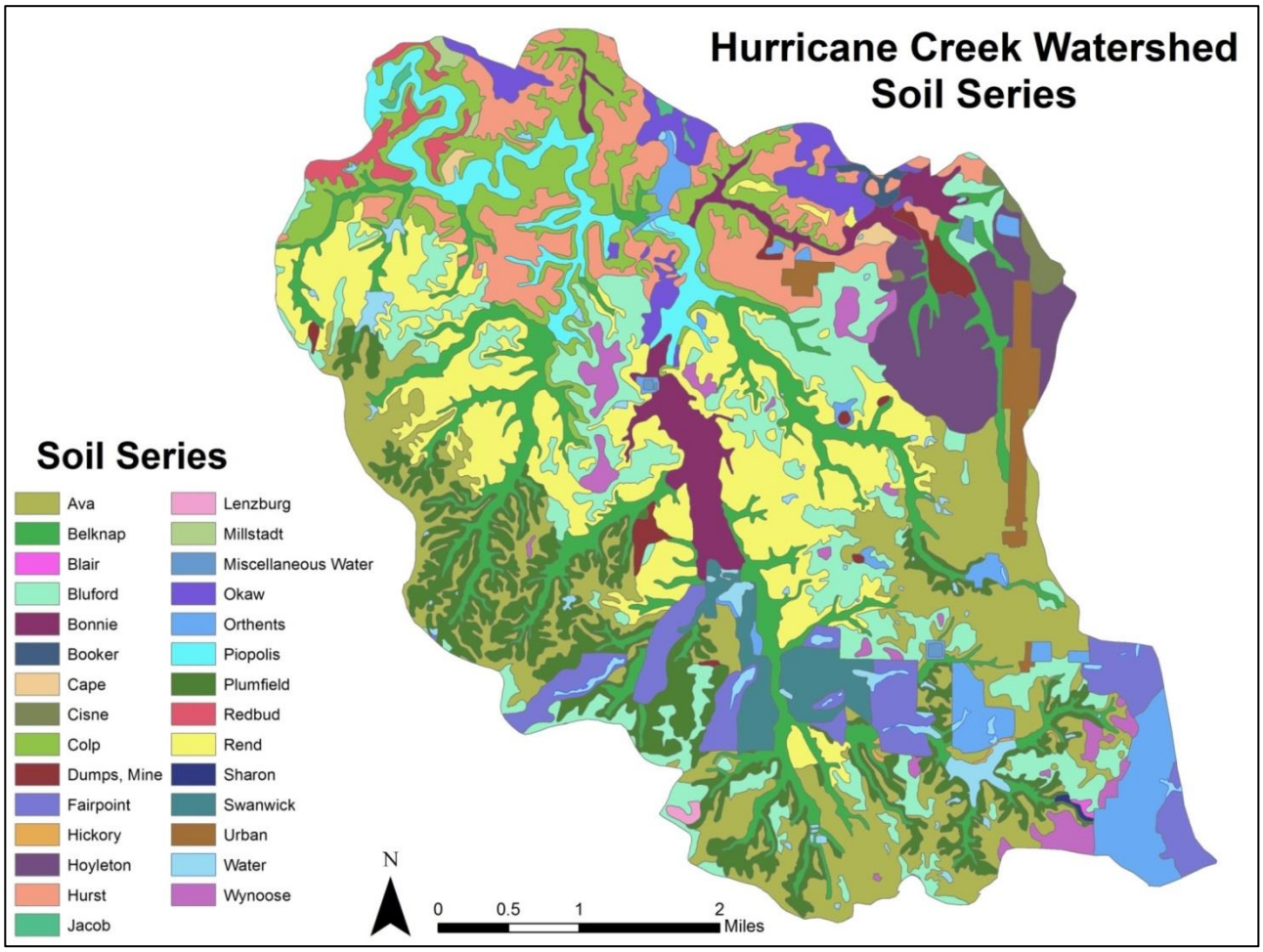
Source: USDA NRCS- Web Soil Survey

Covering approximately 2,500 acres in the Hurricane Creek watershed, Ava is the predominant soil series among the 25 soil types. This also accounts for fifteen percent of the watershed. The Rend soil type is the second most dominant soil type encompassing around 2,145 acres, or almost thirteen percent of the watershed. Information regarding the Hurricane Creek watershed soils can be found in Table 7.

Soils in the watershed vary within the hydrologic group classification. Only two soils fall under group B. These are the Hickory and Sharon soils. They account for less than one percent of the watershed. Group C contains seven soils: Ava, Fairpoint, Lenzburg, Orthents, Redbud, Rend, and Swanwick. These soils make

[11] Ibid.

Figure 10 - Soils and Classifications



up around 38.38 percent of the Hurricane Creek watershed. The Booker, Cape, Hoyleton, Hurst, Jacob, Okaw, and Plumfield soils are categorized as group D and account for 21.27 percent of the watershed.

Dual hydrologic soil groups account for over a third of the watershed. Group B/D has only one soil, Belknap, which is 9.68 percent of the entire watershed. The remaining eight soils are associated with soil group C/D. Soils are displayed in Table 7 with their respective hydrologic groups.

Together, these soils account for approximately 96 percent of the Hurricane Creek watershed. The remaining four percent belongs to dumps and mines (0.82 percent), miscellaneous water (0.13 percent), urban development (1.40 percent), and other water resources (1.56 percent).

Table 7- Soils and Classifications

Soil Series	Hydric Y/N	Erodibility (K Factor)	Hydrologic Soil Group	Acres	Percent of Watershed
Ava	N	.43	C	2503	15.09%
Belknap	N	.43	B/D	1606	9.68%
Blair	N	.43	C/D	6	0.04%
Bluford	N	.49	C/D	1851	11.16%
Bonnie	Y	.43	C/D	484	2.92%
Booker	Y	.24	D	32	0.19%
Cape	Y	.37	D	36	0.22%
Cisne	Y	.49	C/D	71	0.43%
Colp	N	.43	C/D	1179	7.11%
Dumps, Mine	N	-	-	136	0.82%
Fairpoint	N	.20	C	662	3.99%
Hickory	N	.32	B	9	0.05%
Hoyleton	N	.43	D	653	3.94%
Hurst	N	.43	D	1063	6.41%
Jacob	Y	.24	D	23	0.14%
Lenzburg	N	.20	C	15	0.09%
Millstadt	N	.43	C/D	25	0.15%
Miscellaneous Water	-	-	-	21	0.13%
Okaw	Y	.49	D	342	2.06%
Orthents	N	.43	C	576	3.47%
Piopolis	Y	.37	C/D	500	3.01%
Plumfield	N	.43	D	1380	8.32%
Redbud	N	.43	C	133	0.80%
Rend	N	.43	C	2145	12.93%
Sharon	N	.43	B	8	0.05%
Swanwick	N	.43	C	333	2.01%
Urban	N	-	-	233	1.40%
Water	-	-	-	259	1.56%
Wynoose	Y	.49	C/D	304	1.83%

Source: USDA NRCS

2.3.2 Hydric Soils

The NRCS defines hydric soils as a "soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to

develop anaerobic conditions in the upper part".[12] Of the twenty-five soils that comprise the Hurricane Creek watershed, only eight are defined as hydric soils. Table 8 contains the hydric soils with acreage and percent of watershed. These soils account for 1792 acres, or almost 11 percent of the watershed.

At 500 acres, the Piopolis soil series is the largest hydric soil in the watershed. This also covers just over three percent of the entire watershed. The Bonnie soil also covers around three percent at 484 acres. The Okaw and Wynoose soils make up around two percent, while all other soils combined comprise only one percent of the watershed. Hydric soils in the watershed are depicted in Figure 11.

Table 8- Hydric Soils

Hydric Soils	Acres	Percent of Watershed
Bonnie	484	2.92%
Booker	32	0.19%
Cape	36	0.22%
Cisne	71	0.43%
Jacob	23	0.14%
Okaw	342	2.06%
Piopolis	500	3.01%
Wynoose	304	1.83%
Totals	1792	10.80%

Source: USDA NRCS

2.3.3 Soil Erodibility

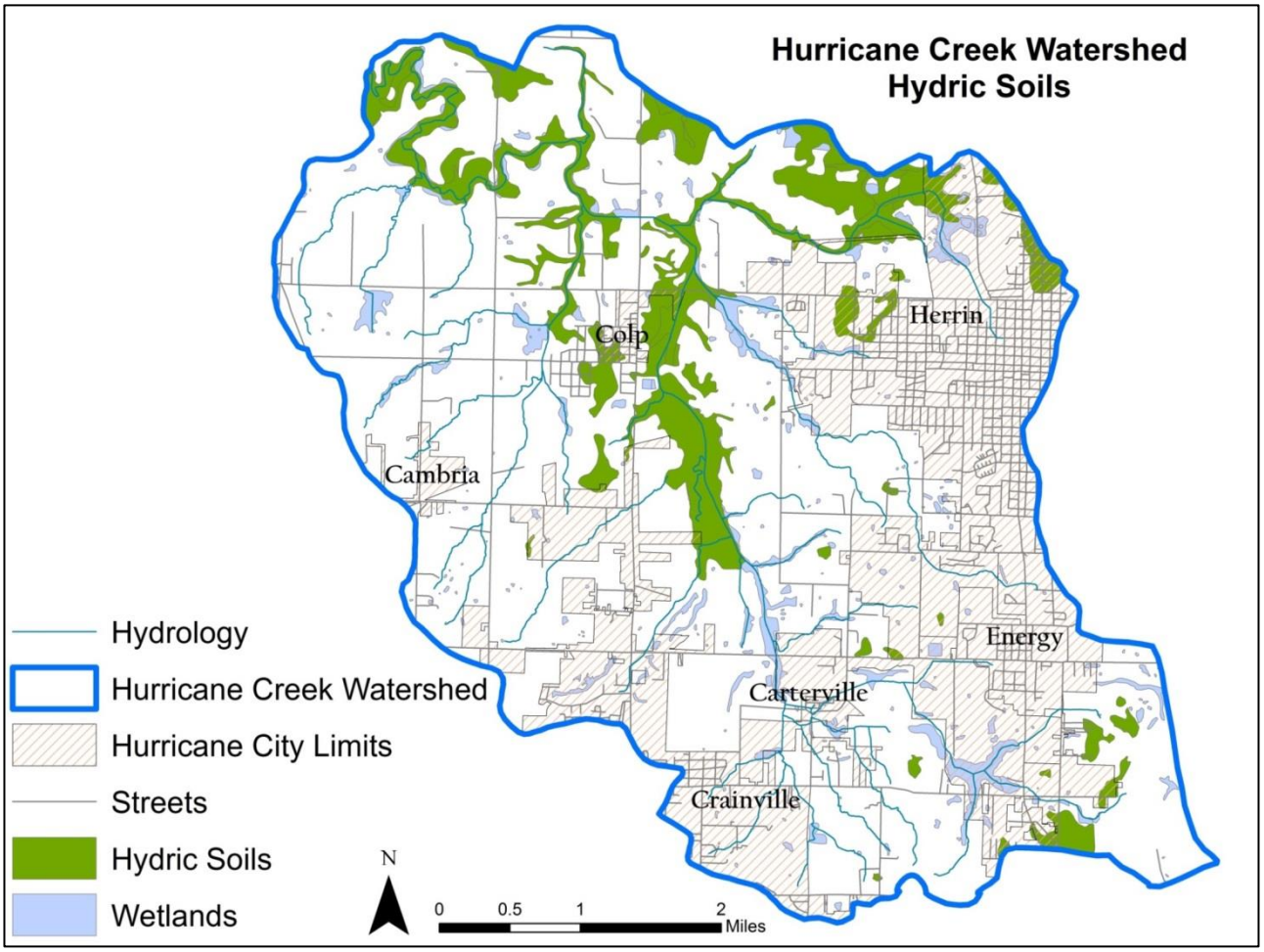
While no soils in the Hurricane Creek watershed can be considered highly erodible, erodibility is still examined for the soils of the watershed. The soil erodibility factor (K-factor) was utilized to delineate erodibility. The Pacific Northwest National Laboratory defines K-factor as the following:

> The soil erodibility factor (K-factor) is a quantitative description of the inherent erodibility of a particular soil; it is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. For a particular soil, the soil erodibility factor is the rate of erosion per unit erosion index from a standard plot. The factor reflects the fact that different soils erode at different rates when the other factors that affect erosion (e.g., infiltration rate, permeability, total water capacity, dispersion, rain splash, and abrasion) are the same. Texture is the principal factor affecting K fact, but structure, organic matter, and permeability also contribute. The soil erodibility factor ranges in value from 0.02 to 0.69.[13]

[12] Ibid.
[13] Pacific Northwest Laboratory. "5.3.2. Soil Erodibility Factor." http://mepas.pnnl.gov/mepas/formulations/source_term/5_0/5_32/5_32.html. Accessed 23 July, 2015.

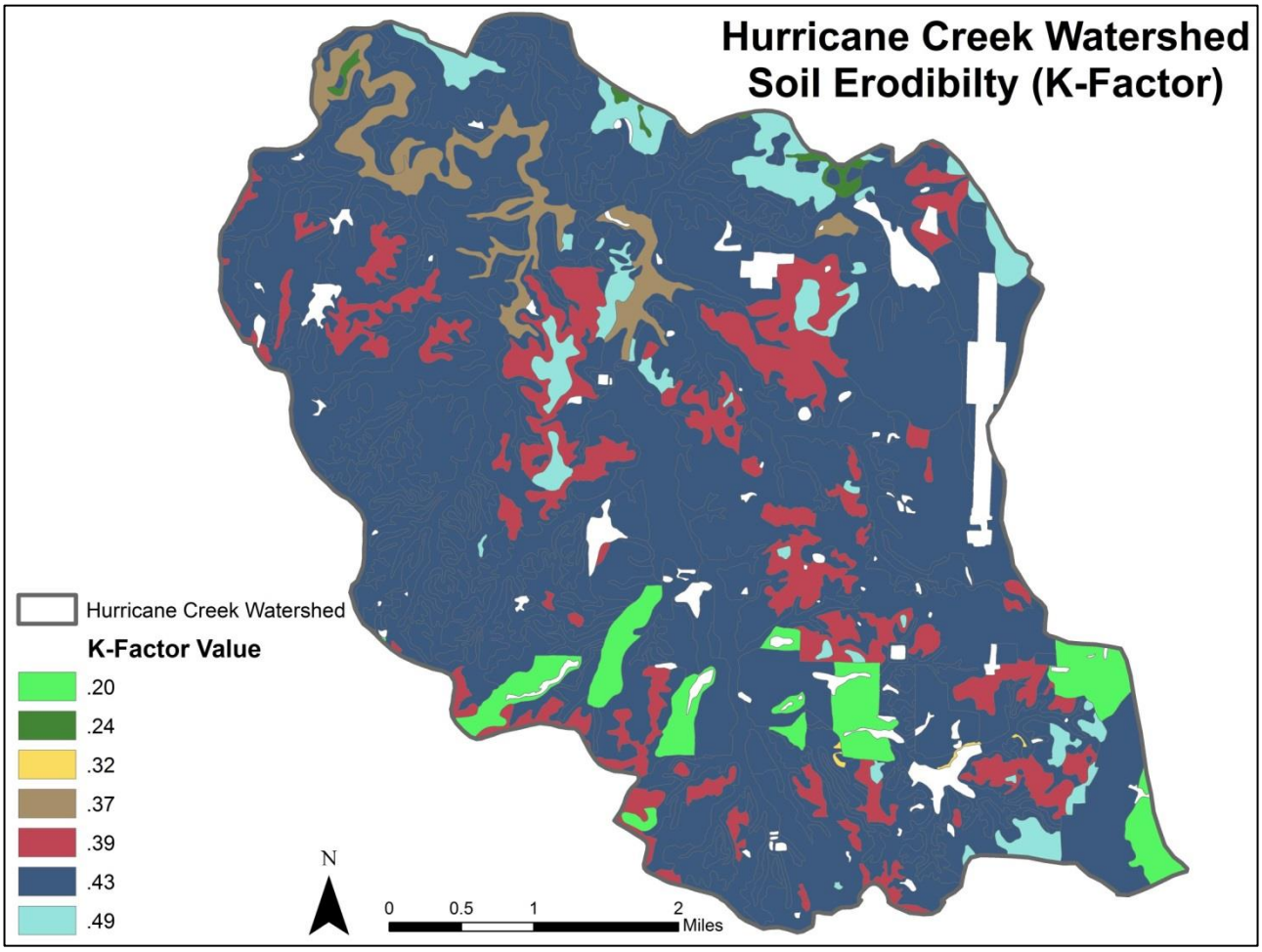
Erodibility correlates with the gradual increase in the K-factor value. The K-factor for soils in the Hurricane Creek watershed ranges from .20 to .49.

Figure 11 – Hydric Soils



K-factor values can be seen in Table 3.2. Soils with the lowest K-factor value are the Hoyleton and Lenzburg series at .20. While the majority of soils have a K-factor value of .43, four soils consist of a K-factor value of .49: Bluford, Cisne, Okaw, and Wynoose soil series. These represent the highest erodible soils in the Hurricane Creek watershed. Soils and their K-factor values are depicted in Figure 12.

Figure 12 – Soil Erodibility (K-Factor Value)



2.4 Watershed Jurisdictions

While the Hurricane Creek watershed rests entirely within Williamson County, there are several municipalities within its border. The Cities of Carterville and Herrin represent the larger cities in the watershed, and several villages are present including: Cambria, Colp, Crainville, and Energy. There are also two unincorporated communities; Dewmaine and Clifford. These jurisdictions represent a third of the watershed's area.

Although civil townships are absent in Williamson County, there is a presence of survey townships, or Congressional townships. These are also referred to as precincts. Table 9 displays the jurisdictions and their size relative to the watershed. Jurisdictions and precincts are also depicted in Figure 13.

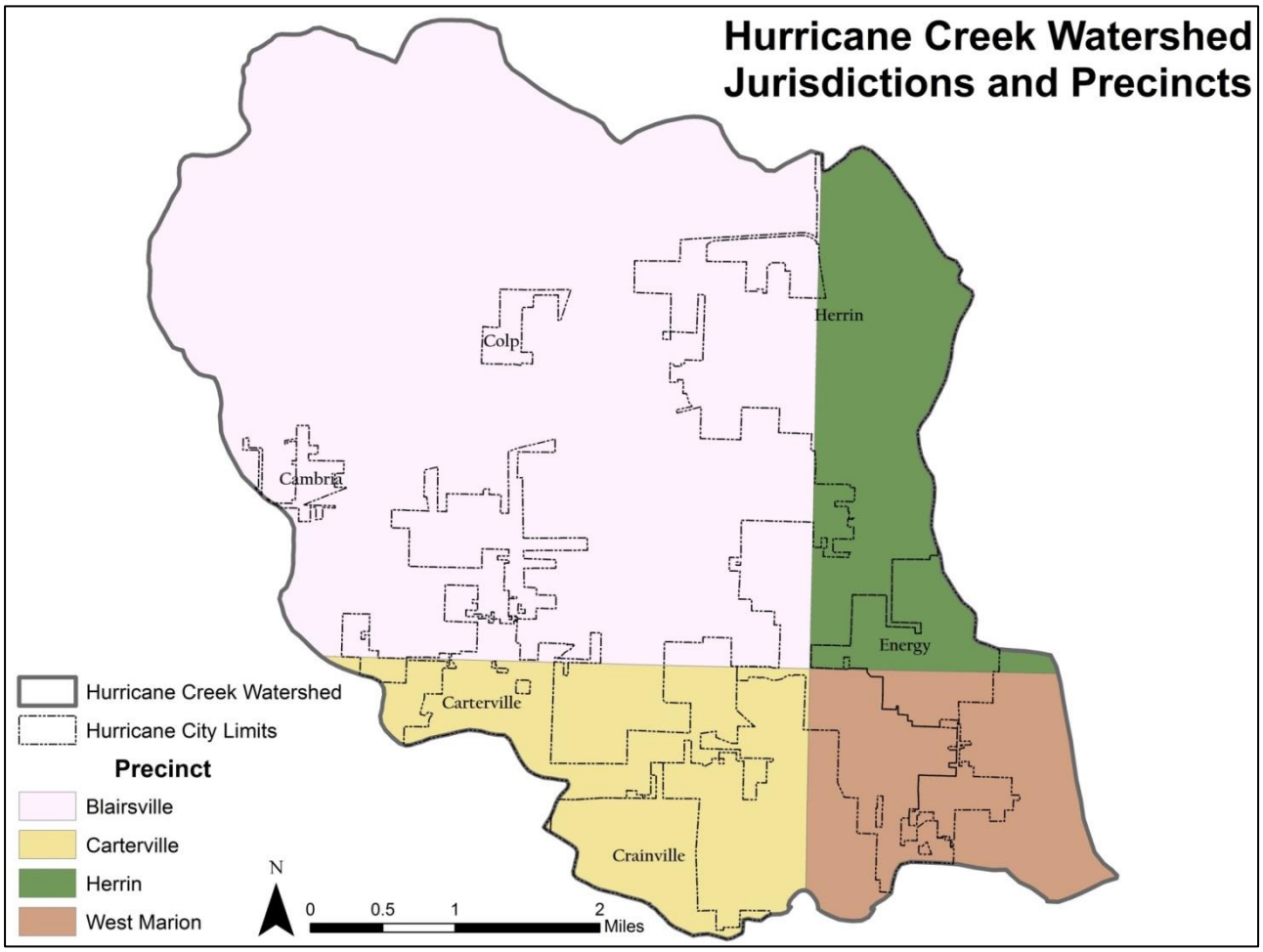
In Williamson County, municipalities generally operate wastewater treatment plants. Carterville, Crainville, Colp, and Energy operate their individual wastewater treatment plants within the Hurricane Creek watershed. Herrin operates a treatment plant, but the discharge is outside of the watershed. Currently, there are no existing watershed planning initiatives in the Hurricane Creek watershed, but a few institutions conduct programs related to water quality.

Table 9 - Jurisdictional Areas

Jurisdiction	Total Acres	Acres in Watershed	Percent of Watershed
County	**284,213**	**16,590**	**100%**
Williamson	284,213	16,590	100%
City	**8,148**	**4,260**	**25.70%**
Carterville	2,788	1,240	7.50%
Herrin	5,360	3,020	18.20%
Villages	**2,630**	**1,305**	**7.80%**
Cambria	880	89	<1%
Colp	91	91	<1%
Crainville	894	463	2.80%
Energy	765	662	4%
Unincorporated Areas	**<10**	**<10**	**<1%**
Dewmaine	<5	<5	<1%
Clifford	<5	<5	<1%

Sources: US Census Bureau

Figure 13 - Jurisdictions and Precincts



2.4.1. Municipal Ordinances

All municipalities in the Hurricane Creek watershed have implemented and adopted ordinances in regards to storm water management and erosion control. Information on these ordinances has been retrieved through the 2009 Williamson County Multi-Hazard Mitigation Plan. [14] The information has been verified by contacting each municipal water department. This insures that information has not been edited since the adoption of the 2009 Williamson County Multi-Hazard Mitigation Plan.

[14] Greater Egypt Regional Planning and Development Commission, et al. "Williamson County Multi-Hazard Mitigation Plan," Greater Egypt, 2009, 102-104.

Ordinance No. 08-70-31-05 is the Flood Damage Prevention Ordinance for Williamson County. In addition to many other purposes, it serves to preserve the natural characteristics and functions of watercourses and floodplains in order to moderate flood and stormwater impacts, improve water quality, reduce soil erosion, protect aquatic and riparian habitat, provide recreational opportunities, provide aesthetic benefits and enhance community and economic development[15] Under Ordinance 40-5-8 R-5 of the Village of Cambria's zoning codes labeled Planned Unit Development, subdividers are to construct a plan for storm water facilities.[16]

As an element of the Subdivision Code, Section 34-7-6, the City of Carterville has a storm water management plan. Under the code, subdividers are required to implement practices for the removal of storm runoff. This requires the subdivider to obtain an analysis of storm drainage facilities from a Registered Professional Engineer[17].

Subdivision Ordinance Code 34-2-11 is the City of Herrin's storm water management plan. The code informs the subdivider a list of requirements for storm water drainage such as storm water drainage shall be discharged to marshlands, swamps, retention basins, or other treatment facilities, and permission is needed from the city in order to widen ditches.[18]

As an element of the Subdivision Ordinance, Section 34-6-1, the Village of Energy has instituted some steps towards storm water management. Under the ordinance, the Village requires that detention storage is used if excess runoff occurs. The subdivider is not responsible for detention storage if the development consists of two acres with less than 30% of the area paved and developments that generate runoff less than one cubic foot per second. [19]

Municipalities have also implemented programs and policies that target erosion. There are erosion and sediment controls under Subdivision Ordinance, Section 7 for Williamson County. To prevent or reduce erosion, subdividers are required to sod or reseed turf of exposed areas.[20] Under the Village of Crainville's

[15] Williamson County, IL. "Flood Damage Prevention Ordinance," Williamson County, 2008, 2.
[16] Greater Egypt, et al., 102.
[17] Ibid., 102.
[18] Illinois Codification Services. "Revised Code of Ordinances of Herrin, Illinois," Illinois Codification Services, 2015, 837.
[19] Greater Egypt, et al., 102.
[20] Ibid., 104.

Subdivision Ordinance, Section 3-16, subdividers are required to conform to the natural limitations presented by topography and soil so as to create the least potential for soil erosion.[21]

Under Subdivision Ordinance, Section 34-2-12, the City of Herrin requires that natural plant covering shall be retained and protected, and exposed areas during development should be covered with temporary vegetation, or mulch.[22]

Subdivision Ordinance, Section 34-6-12 (D) and (E) of the Village of Energy informs the subdivider of the proper calculations for a sediment storage facility design.[23]

2.4.2 Local, State and Federal Responsibilities

In the Hurricane Creek watershed, there are a few local, state and federal agencies that implement programs related to watershed planning, water quality, and nonpoint source pollution. While some of these agencies have applied programs that target water related resources specifically for the Hurricane Creek watershed, other agencies have programs designated for these purposes, but have not been established for Hurricane Creek watershed.

The following agencies have been described by their roles related to watershed planning, water quality, and nonpoint source pollution within and outside the Hurricane Creek watershed.

Franklin-Williamson Bi-County Health Department

Since Williamson County has a considerable municipal water program, the aim of the Franklin-Williamson Bi-County Health Department is to protect the water sources from private sources. According to their online information, the Health Department conducts inspections that follow the guidelines set by the Illinois

[21] Ibid., 104.
[22] Illinois Codification, 838.
[23] Greater Egypt, et al., 104.

Water Well Construction Code and the Illinois Water Well Pump Installation Code (Environmental Health). [24]

Greater Egypt Regional Planning and Development Commission

Since the 1960s, the Greater Egypt Regional Planning and Development Commission (Greater Egypt) has played an important role in regional water-related issues such as: watershed planning, water quality, and nonpoint source pollution. Greater Egypt has produced watershed inventories and plans for: Rend Lake, Cedar Lake, Atchison Creek, Pinckneyville Reservoir, Upper Crab Orchard, and the Upper Big Muddy watershed. These reports involved describing watershed characteristics and water quality in the particular watershed.

In 1981, the Illinois Environmental Protection Agency established the Volunteer Lake Monitoring Program. This program was established to gather fundamental information on Illinois inland lakes. Greater Egypt coordinates the program for Southern Illinois for the ten-county region. Volunteers gather the data on water transparency and water quality. Herrin Reservoir, located within the Hurricane Creek watershed, has been monitored since 2000.

Greater Egypt coordinated the Regional Water Quality Coordinating Council (RWQCC) which served as a public forum that reviewed facility plans and domestic wastewater National Pollutant Discharge Elimination System (NPDES) permits. The council covered the ten-county region until January of 2015.

Illinois Department of Natural Resources (IDNR)

The Illinois Department of Natural Resources is responsible for many programs related to water related activities. The IDNR Division of Resource Management is responsible for various activities such as: regulating public waters, regulating

[24] Franklin-Williamson Bi-County Health Department. "Private Water Supply Program," http://www.bicountyhealth.org/index.php/potable-water-program.html. Accessed Various Dates 2015.

construction and maintenance of dams, National Flood Insurance Program coordination, and Flood Mitigation Program (nonstructural) administration. [25]

The Division also has an extensive permitting program in which they are responsible for permits for work along Illinois waterbodies. The four main components of the permitting program are: Floodway/Floodplain Management, Public Water Management, Dam Safety, and Lake Michigan Management. [26]

Illinois Environmental Protection Agency (IEPA)

The IEPA oversees and implements many programs that target watershed planning, water quality, and nonpoint source pollution. Through the National Pollutant Discharge Elimination System (NPDES), the IEPA handles stormwater and wastewater discharges to waterbodies. NPDES permits are required for discharges of: treated municipal effluents, treated industrial effluents, and stormwater discharged through separate municipal storm sewer systems (MS4s) and construction sites. The IEPA Bureau of Water characterizes NPDES and other stormwater regulations by the following:

> Under Phase I of the NPDES Storm Water program, operators were required to obtain permit coverage for construction activity that resulted in a total land disturbance of 5 acres or more or less than 5 acres if they were part of a "larger common plan of development or sale" with a planned land disturbance of 5 acres or greater. Phase II reduced that project size to 1 acre or more.
>
> Phase I of the NPDES Storm Water program began in 1990 and required medium and large municipal separate storm sewer systems (MS4s) to obtain NPDES coverage. The expanded Phase II program began in March 2003 and required small MS4s in urbanized areas to obtain NPDES permits and implement six (6) minimum control measures. An urbanized area as delineated by the Bureau of Census is defined as a central place or places and the adjacent densely settled surrounding area that together have a residential population of at least 50,000 people and an overall population density of at least 500 people per square miles.[27]

[25] IDNR. "Division of Resource Management," https://www.dnr.illinois.gov/WaterResources/Pages/ResMan.aspx. Accessed 11 August 2015.
[26] Ibid.
[27] Scott Ristau, e-mail message to author, September 9, 2015.

In the Hurricane Creek watershed exists three permitted dischargers of wastewater. These are displayed in Table 10. The NPDES Facility locations are also depicted in Figure 14. More information on existing and discontinued NPDES facilities can be found in the Water Quality section of this report (Section 2.8).

Table 10 – NPDES Facilities

Facility	NPDES Permit Number
Colp STP	ILG580155
Crainville STP	ILG582002
Energy STP	ILG580117

Source: University of Illinois RMMS

United States Fish and Wildlife Service (USFWS)

The USFWS works with many facets of government to oversee projects in water resource development, conservation planning, and natural resource damage assessment. In coordination with the United States Army Corps of Engineers (USACE) and other state agencies, the USFWS assists in developing resource projects for federal waters. These projects consist of dams, harbor development, flood control, and water storage. Under a collection of policies, the USFWS and the USACE collaborate to conserve the habitats of fish and wildlife during resource development. [28]

Along with water resource development, the agency also collaborates with multiple agencies by providing conservation planning assistance. USFWS staff assists organizations with developing plans of conservation and restoration that accompany their specific objectives of development. [29]

United States Army Corps of Engineers (USACE)

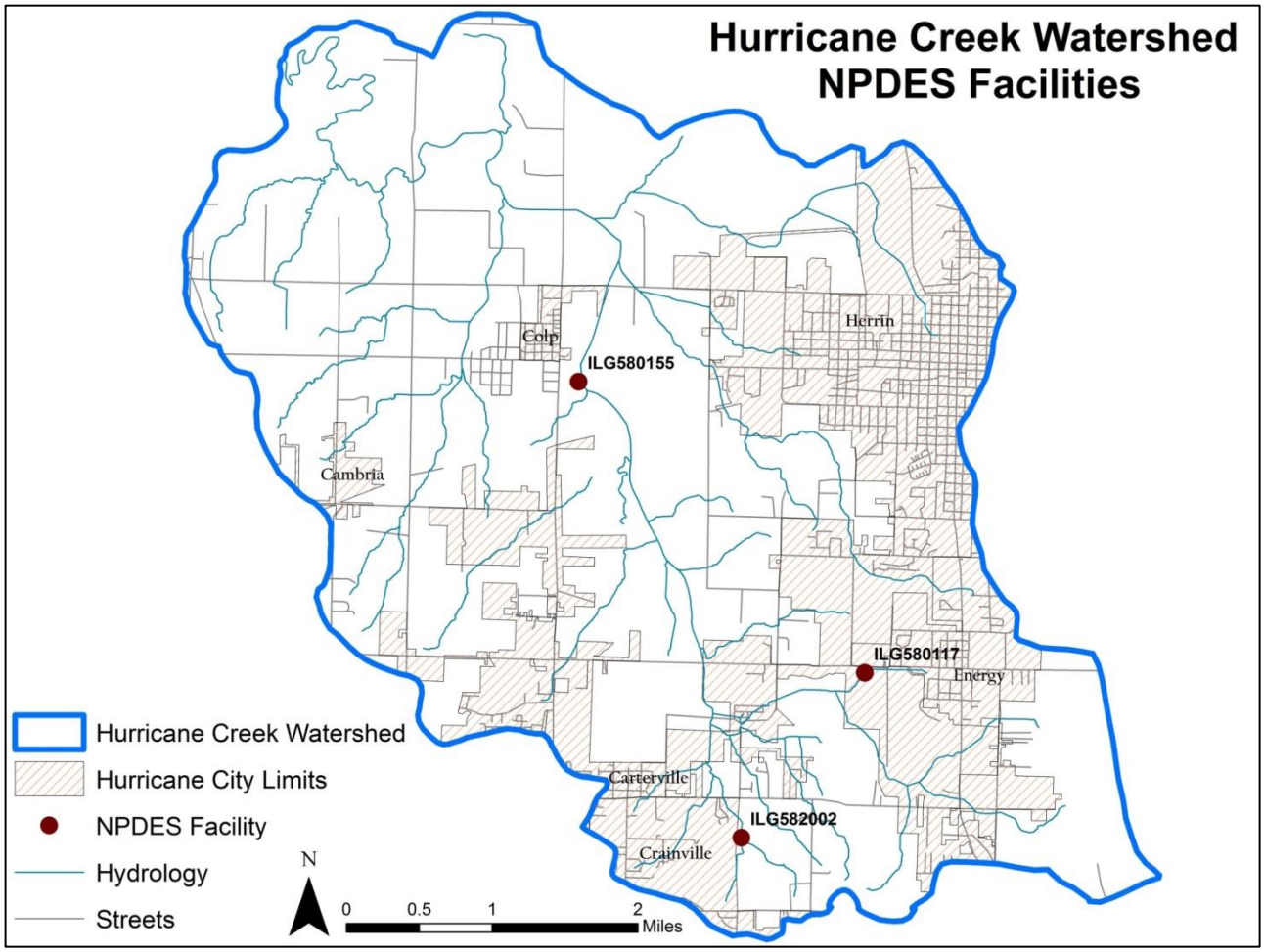
The United States Army Corps of Engineers St. Louis District is responsible for the preservation and maintenance of waterways within its jurisdiction. Their jurisdiction covers an area which covers eastern Missouri and southwestern Illinois. The Corps is responsible for maintaining the data associated with the waterbodies within its district. Stations in closest proximity to the Hurricane

[28] USFWS. "Overview- Ecological Services," https://www.fws.gov/ecological-services/. Accessed 11 August 2015.
[29] Ibid.

Creek watershed include Murphysboro and Plumfield which are located along the Big Muddy River. [30]

The Corps is also responsible for water control operations which consist of four Mississippi River navigation structures and five multi-purpose reservoirs within the district which include Rend Lake located north of the Hurricane Creek watershed. [31]

Figure 14 – NPDES Facilities



[30] USACE. "St. Louis District- Water Management USACE," http://mvs-wc.mvs.usace.army.mil/. Accessed 11 August 2015.
[31] Ibid.

Williamson County Soil & Water Conservation District (Williamson County SWCD)

The Williamson County Soil and Water Conservation District implements several programs in relation to conserving natural resources. Some of their programs include implementing conservation practices for farming that reduce soil loss, and environmental sustainability. [32] Duties related to water resources include the conservation and restoration of wetlands, the protection of groundwater resources, and the prevention of soil erosion.

[32] AISWCD. "Association of Illinois Soil and Water Conservation Districts AISWCD," http://www.aiswcd.org/. Accessed 14 July 2015.

2.5 Watershed Demographics

To better assess the demographics of the Hurricane Creek watershed, each village and city was individually examined. Data from the 2000 and 2010 Census and the 2013 American Community Survey (ACS) were utilized. Villages in the watershed tend to have smaller populations, but are consistent with other smaller towns and villages in Southern Illinois. Colp, which is the only village or town entirely within the watershed border, has a population of only 225. By contrast, the City of Herrin has 12,501 according to the 2010 Census. The population from the 2000 and 2010 Census are depicted in Table 11.

Table 11 - 2000 and 2010 Population Change

Municipality	Population 2000	Population 2010	Population Change	Population Change as %
Cambria	1,330	1,228	-102	-7.7%
Carterville	4,616	5,496	880	19.1%
Colp	224	225	1	0.0%
Crainville	992	1,254	262	26.4%
Energy	1,175	1,146	-29	-2.5%
Herrin	11,298	12,501	1,203	10.6%

Source: US Census Bureau

Table 12 - Growth Forecast

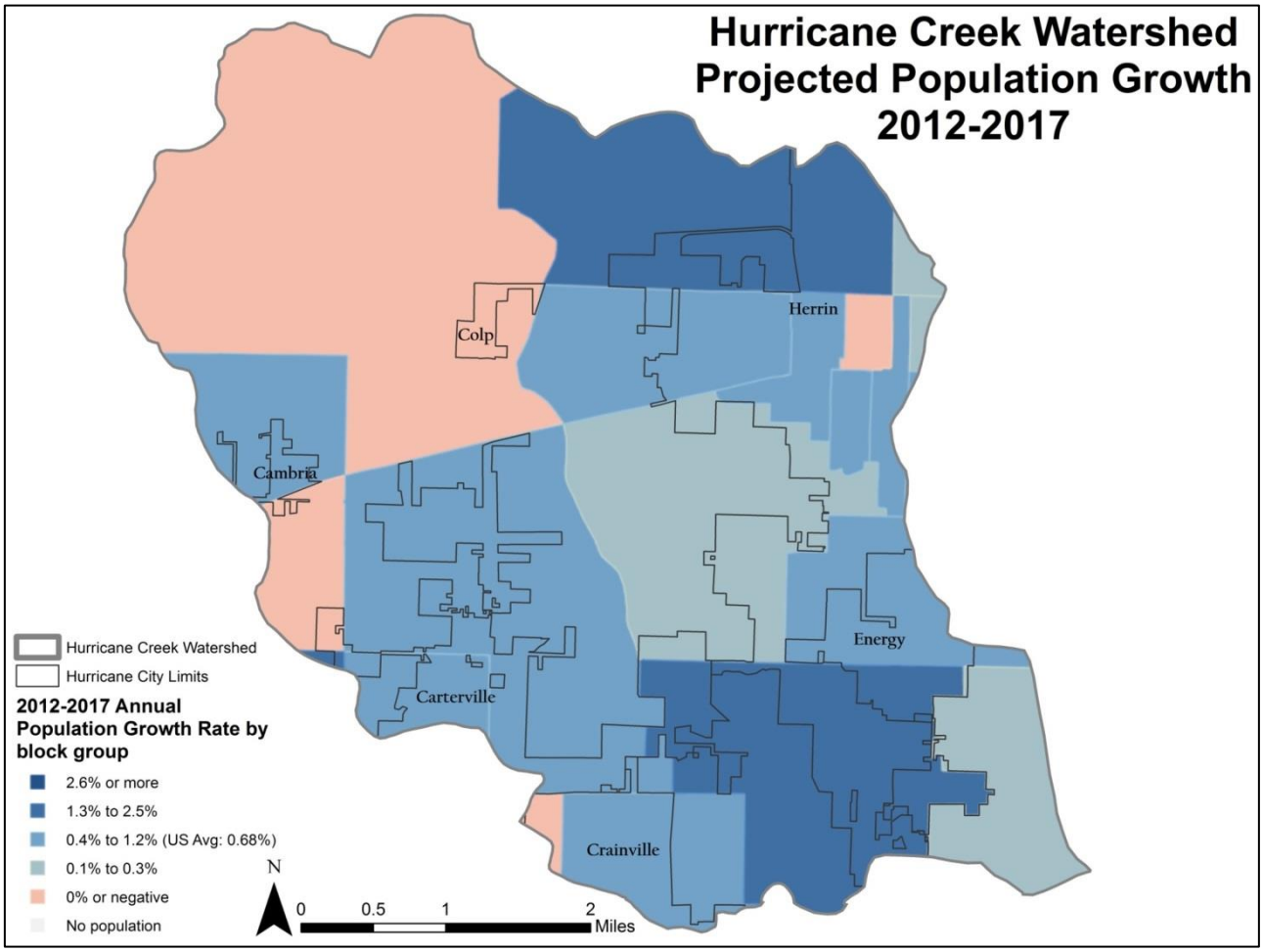
Municipality	Growth Forecasts (Total Pop.)	Population Growth Forecast as %
Cambria	1,260	2.6%
Carterville	5,770	5.0%
Colp	224	0.0%
Crainville	1,364	8.8%
Energy	1,145	0.0%
Herrin	12,852	2.8%

Source: US Census Bureau

Growth forecasts as total and percentage are also displayed in Table 12. While Colp and Energy have very little to no change, Cambria and Herrin show a growth of around 2.6 and 2.8 percent. Crainville depicts the largest growth at 8.8 percent growth. The data used in these tables reflect the villages as a whole and may not represent the sections of the villages and towns represented only in the Hurricane Creek watershed.

Along with these estimates, individual Census tracts have been analyzed to display the estimated population growth from the period of 2012 to 2017. This data was derived from the Environmental Systems Research Institute's (ESRI) online map database which utilizes previous Census data. Figure 15 displays the projected 2017 growth by Census tracts. This data shares the same characteristics as the previous growth forecast.

Figure 15 - 2012-2017 Projected Population Growth



The 2014 Illinois Department of Employment Security's Local Area Unemployment Statistics (IDES-LAUS) for Williamson County was at 7.4 percent. In 2015, this percentage dropped almost two points to 5.9 percent.

According to the 2010 Census, the median age for the villages and towns within the Hurricane Creek watershed differ slightly from around 24 to 45 years of age. The City of Carterville has the lowest median age at 34.6. The highest median age belongs to the Village of Energy with citizens being around 45.1 years of age. The median age and median income are displayed in Table 13.

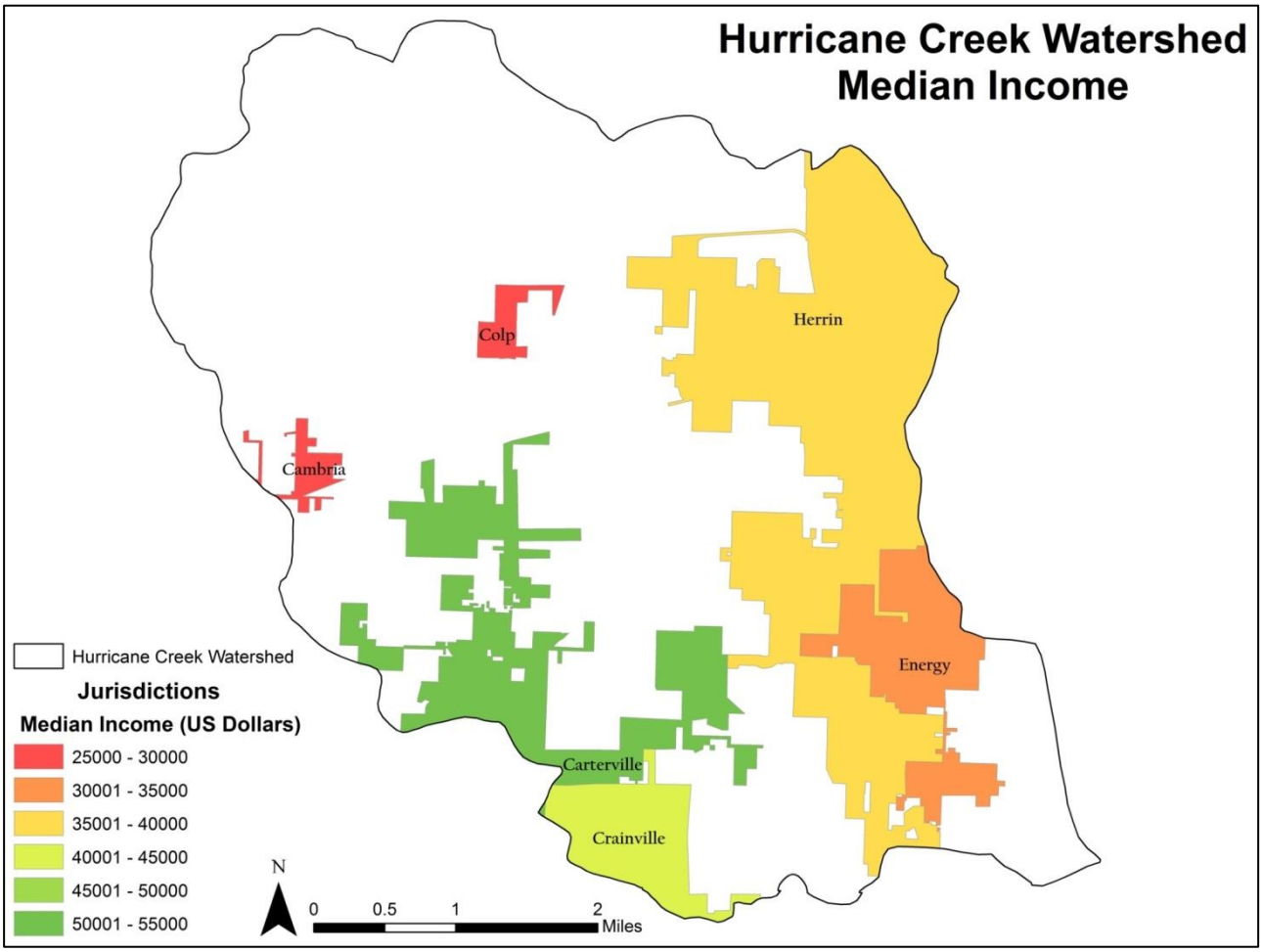
Median income in the Hurricane Creek watershed varies significantly. Corresponding to the numbers provided by the American Community Survey, the Village of Cambria and the City of Carterville display the most income disparity within the watershed. These results are also spatially depicted in Figure 16.

Table 13 - Median Age and income

Municipality	Median Age	Median Income
Cambria	35.8	$26,726
Carterville	34.6	$54,474
Colp	39.5	$27,875
Crainville	38.7	$44,950
Energy	45.1	$30,625
Herrin	37.9	$39,699

Source: US Census Bureau, ACS

Figure 16 - Median Income



2.6 Land Use

2.6.1 Existing Land Use

For the land use portion of this inventory, the USGS Multi-Resolution Land Characteristics Consortium (MLRC) land cover and impervious datasets were used to complete the analyses. The largest land use category in the Hurricane Creek watershed is agriculture. This is composed of 21.8 percent of pasture and hay and 13 percent of cultivated crops. The breakdown of classifications is seen in Table 14. Woodland and grassland comprise 29.3 and 2.3 percent of the watershed, respectively. The remaining land uses in the watershed are barren land (0.2 percent), developed (28.7 percent), wetlands (2.6 percent), and water (1.9 percent). Figure 17 shows the land use map of the watershed, based on 2011 data.

With 34.8 percent of the watershed being agricultural, there is a high potential for erosion. This is especially true for the areas of cropland that run along the Hurricane Creek.

Table 14 - Land Use Classifications

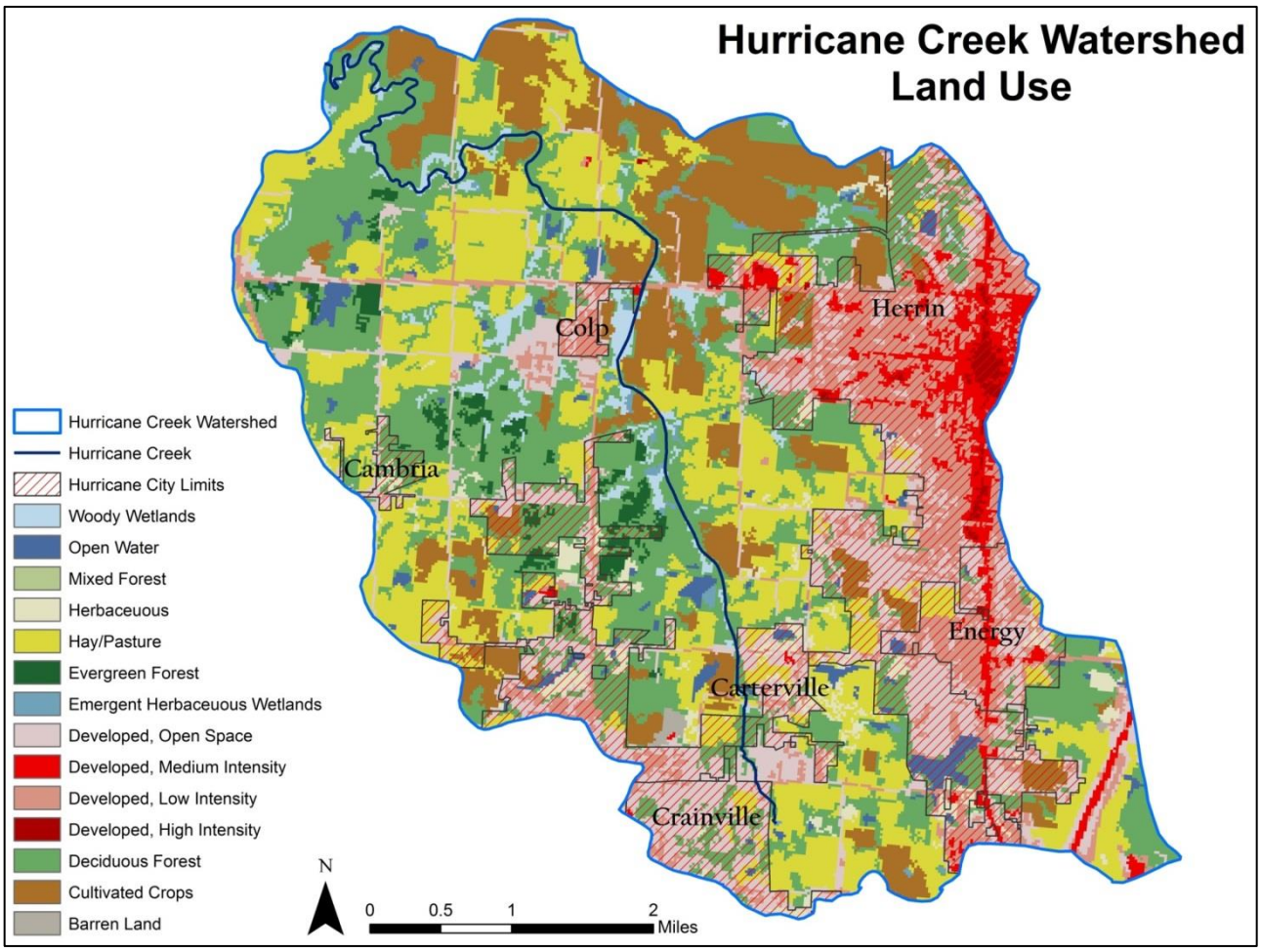
Classification	Acreage	% of Watershed
Open Water	314.2	1.9
Developed, Open Space	2322.6	14
Developed, Low Intensity	1825.3	11
Developed, Medium Intensity	535.1	3.2
Developed, High Intensity	87	0.5
Barren Land	26.2	0.2
Deciduous Forest	4594.5	27.69
Evergreen Forest	265.1	1.6
Mixed Forest	4.4	>.01
Grassland/Herbaceous	378.7	2.3
Hay/Pasture	3650.2	22
Cultivated Crops	2152	13
Woody Wetlands	363.2	2.2
Emergent Herbaceous Wetlands	70.7	0.4

Source: USGS Multi-Resolution Land Characteristics Consortium (MRLC)

According to the NRCS Soil Survey of Williamson County, "the main concerns affecting the management of cropland in Williamson County include crusting, flooding, ponding, poor tilth, water erosion, and wetness. Equipment limitations, high pH, limited available water capacity, limited rooting depth, low pH, and restricted permeability are additional concerns."[33]

Along with problems affecting cropland, there are also concerns regarding pastureland. These concerns are, "low pH, water erosion, and wetness. Additional management concerns include equipment limitations, flooding, high pH, limited available water capacity, ponding, and restricted trafficability."[34]

Figure 17 - Land Use of the Hurricane Creek Watershed



[33] USDA NRCS. "Soil Survey of Williamson County, Illinois," Published Soil Surveys for Illinois, 2006, 120.
[34] Ibid., 123.

According to the 2012 Census of Agriculture (USDA), farming in Williamson County consists mainly of soybeans, corn, and hay. Farmers in the county are predominantly white males, and are an average age of 59 years of age.[35] Cultivation within the Hurricane Creek watershed follows the same pattern

Based on the USDA's National Agriculture Statistics Service CropScape[36], the watershed contains approximately 6,130 acres of agricultural land. Table 15 displays the types of cultivation found within the watershed. Figure 18 shows the location of various crops. Accounting for 3,278 acres, grassland and pasture is the largest form of cultivation in the Hurricane Creek watershed. Soybeans are also heavily cultivated. Corn is the third most cultivated crop with a little over 440 acres.

Table 15 - Agricultural Diversity

Crop	Acreage
Alfalfa	0.4
Corn	443.9
Cucumbers	0.2
Winter Wheat/ Corn	5.8
Winter Wheat/ Soybeans	459.5
Fallow/Idle Cropland	70.3
Grass/Pasture	3277.9
Other Hay/Non Alfalfa	38
Pumpkins	0.2
Sorghum	0.4
Soybeans	1821.2
Winter Wheat	11.8

Source: USDA National Agricultural Statistics Service Cropland Data Layer

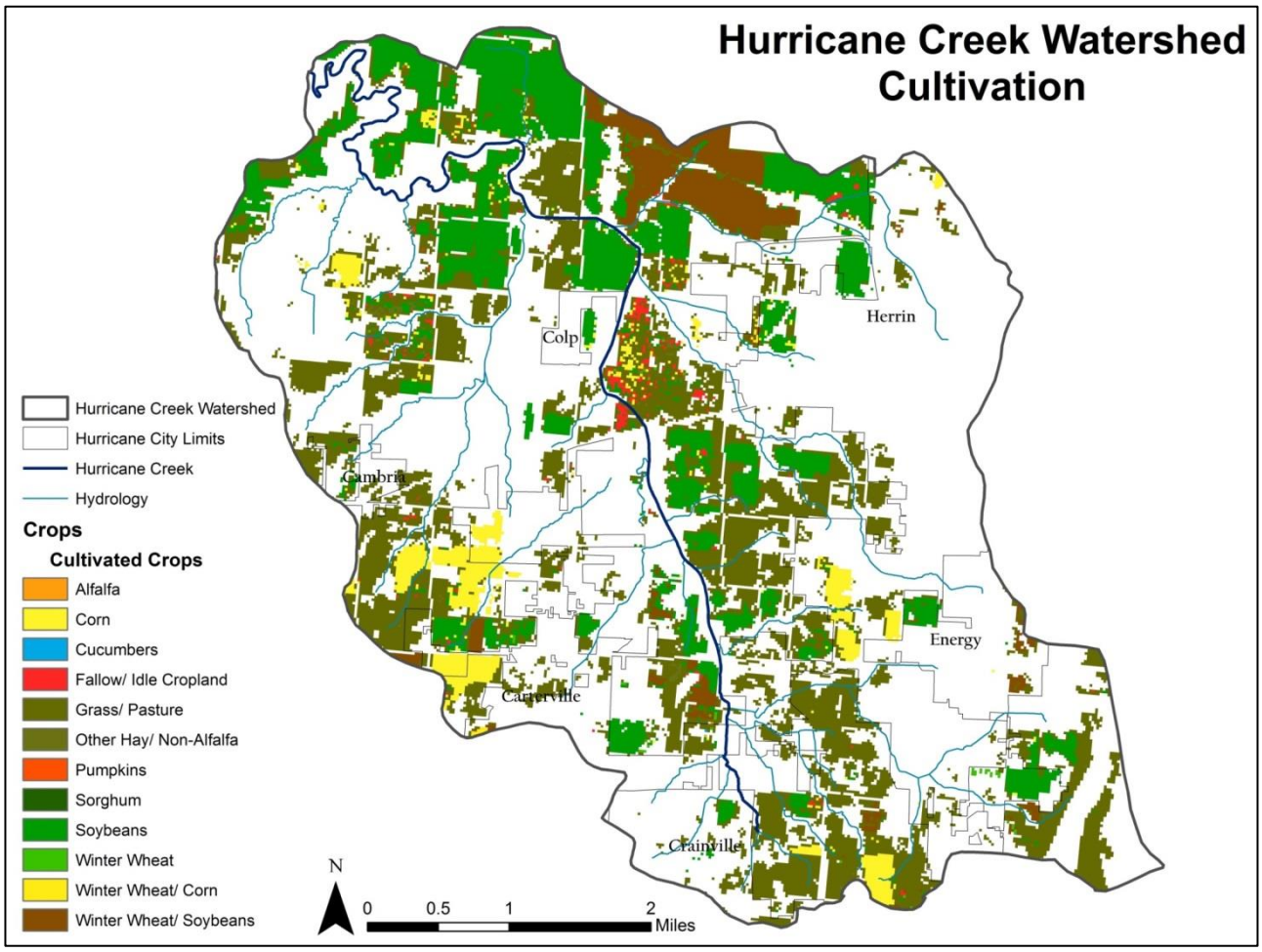
2.6.2 Predicted Future Land Use

To estimate the future land cover for the Hurricane Creek watershed, land cover from past and existing datasets has been analyzed. Land cover from 2001, 2006, and the existing 2011 dataset were used to compare past and present changes in land use. Because the classifications were not labeled consistently with the other years, and to prevent skewing of the data, the 1992 land cover dataset could not be utilized during this analysis.

The period from 2001 to 2011 is also a better representation of current land use change within the Hurricane Creek watershed. This is due to consistent farming practices and construction within the target area. Table 16 displays the acreage and percent of watershed of each land use classification for 2001 and 2011.

[35] Census of Agriculture. "2012 Census Publications," USDA, 2012, 1-2.
[36] *CropScape* (2015). USDA. National Agricultural Statistics Service, 2015.

Figure 18 - Hurricane Creek Cultivation



The percent of change from those years, predicted acreage, and percent change of each classification are also displayed.

Assuming development in the area will remain constant, the percent of change from 2001 to 2011 was used to calculate the predicted acreage and predicted percent change of each classification. The two striking contrasts in the predicted land use change occur with the grassland herbaceous and developed high intensity classifications.

The major increase from the study period is the grassland herbaceous land cover. The MRLC defines the grassland herbaceous land cover dataset as, "areas dominated by gramanoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. These areas are not subject to intensive management

such as tilling, but can be utilized for grazing."[37] The predicted increase is 5.67 percent. The land use with the highest decrease in percentage is the developed, high intensity classification. The MRLC defines this classification as "highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial sites. Impervious surfaces account for 80 percent to 100 percent of the total cover."[38] The predicted change of this land cover designation is a decrease of 16.37 percent.

2.6.3 Existing and Predicted Imperviousness

As a whole, the Hurricane Creek watershed has a rather low level of imperviousness. This is mainly due to low levels of commercialization and residences. Imperviousness in the watershed has been characterized by acreage and percent of the watershed by intervals of ten percent (See Table 17). These intervals have also been depicted spatially in Figure 19. Almost three quarters of the watershed consist of non-existing impervious cover (71.36 percent). This is a major contrast to the 90-100 percent impervious cover, which constitutes less than one percent (0.18 percent). The more impervious locations in the Hurricane Creek watershed occur in the eastern portion (SMU 5) around the City of Herrin.

Following the same method to predict future land use, impervious land cover from past and existing datasets has been analyzed. Impervious land cover from the 2001 and 2011datasets were utilized to compare past and present variations in imperviousness. Table 17 also displays the predicted percent of change and acreage to the year 2021.

[37] Department of Interior (DOI) and USGS. "National Land Cover Database 2011 Product Legend," http://www.mrlc.gov/nlcd11_leg.php. Accessed Various Dates 2015.
[38] Ibid.

Table 16 - Existing and Predicted Land Cover

Classification	2001		2011		2001-2006	2006-2011	2001-2011	2011-2021	
	Acreage	Percent of Watershed	Acreage	Percent of Watershed	Percent Change	Percent Change	Percent Change	Predicted Acreage (2021)	Predicted Percent Change
Open Water	307.35	1.85	316.2	1.9	-0.80	3.70	2.80	325.05	2.80
Developed, Open Space	2288.67	13.80	2311.1	14	2.37	-1.36	0.97	2333.53	0.97
Developed, Low Intensity	1753.14	10.57	1823.9	11	1.85	2.14	3.88	1894.66	3.88
Developed, Medium Intensity	527.97	3.18	542.2	3.2	1.94	0.74	2.63	556.43	2.63
Developed, High Intensity	102.52	0.62	88.1	0.5	1.74	-15.53	-16.37	73.68	-16.37
Barren Land	0.00	0.00	26.7	0.2	0.00	0.00	100.00	53.40	100.00
Deciduous Forest	4740.79	28.58	4598.2	27.69	-0.69	-2.33	-3.10	4455.61	-3.10
Evergreen Forest	280.00	1.69	265.5	1.6	-4.21	-1.01	-5.46	251.00	-5.46
Mixed Forest	4.45	0.03	4	>.01	0.00	-10.07	-11.20	3.55	-11.20
Grassland/Herbaceous	355.61	2.14	377	2.3	6.94	-0.87	5.67	398.39	5.67
Hay/Pasture	3661.07	22.07	3636.6	22	-0.91	0.25	-0.67	3612.13	-0.67
Cultivated Crops	2143.67	12.92	2166.1	13	-1.62	2.71	1.04	2188.53	1.04
Woody Wetlands	349.60	2.11	363.2	2.2	0.00	3.89	3.74	376.80	3.74
Emergent Herbaceous Wetlands	75.17	0.45	70.5	0.4	-10.95	5.32	-6.62	65.83	-6.62

Source: USGS, MRLC

According to the analysis, levels of imperviousness will continue to rise. However, these levels are hardly alarming. The only impervious level set to decline is at the zero percent level. It is only set to decline less than one percent over the ten year period. The largest increase in impervious cover is at the 60-70 percent range. This interval will see a rise at about 6.98 percent.

2.6.4 Land Cover and Imperviousness of the Sub-watersheds

Each sub-watershed management unit has been delineated by land cover and imperviousness. Table 18 displays both the acreage and percentage of each SMU by the land use classification. Tables 19 and 20 present the impervious cover and predicted impervious cover of each sub-watershed

The Lower Hurricane Creek (SMU 1) sub-watershed has the highest percentage of deciduous forest at 39.21 percent. It also has the lowest percentage of developed land (6.27 percent). The developed land that is present is mainly characterized by the roadways that bisect the sub-watershed. SMU 1 also has large areas of hay/pasture and cultivated crops. These land classifications account for 716.4 acres and 484.5 acres. Land use classifications can be seen in Figure 20.

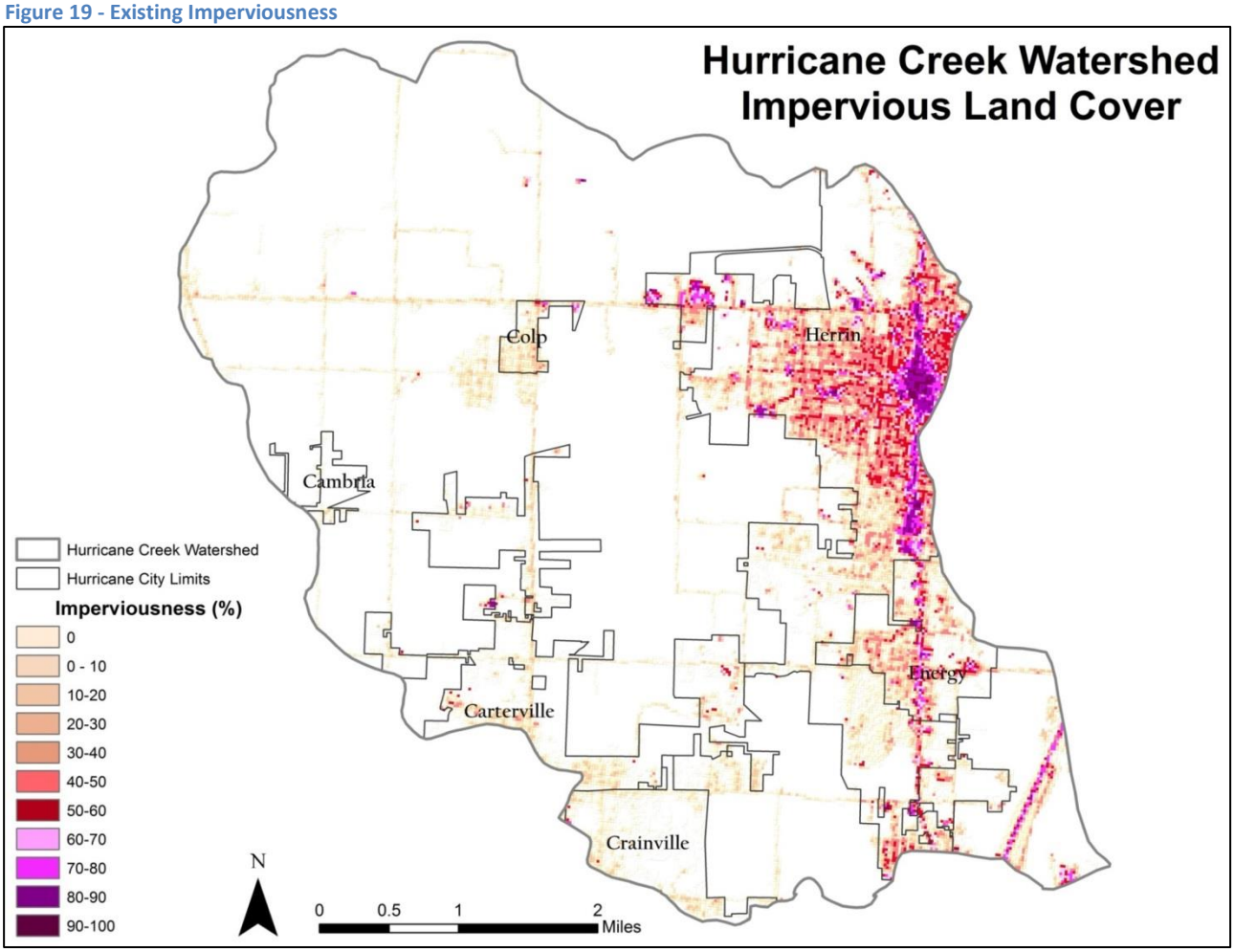
Being the smallest sub-watershed, Little Hurricane Creek (SMU 2) is defined by its large amount of deciduous forests and hay/pastureland. These both account for around 35 percent of the sub-watershed. While the Little Hurricane Creek sub-watershed characterized by a high level of deciduous forest, developed land starts to become apparent. Developed land makes up 359.3 acres. This is mainly due to the presence of the smaller villages. This trend continues the closer the SMUs get to the City of Herrin.

Table 17 - Existing and Estimated Imperviousness

Percent Imperviousness	2001		2011		2001-2011	2011-2021	
	Acreage	Percent of Watershed	Acreage	Percent of Watershed	Percent Change	Predicted Acreage (2021)	Predicted Percent Change
0%	11940.53	71.97%	11838.09	71.36%	-0.86	11736.52	-0.86
0-10%	1281.44	7.72%	1313.59	7.92%	2.51	1346.55	2.51
10-20%	987.41	5.95%	996.28	6.01%	0.90	1005.23	0.90
20-30%	734.18	4.43%	744.38	4.49%	1.39	754.73	1.39
30-40%	531.96	3.21%	542.60	3.27%	2.00	553.46	2.00
40-50%	482.29	2.91%	490.71	2.96%	1.75	499.29	1.75
50-60%	275.85	1.66%	285.60	1.72%	3.54	295.70	3.54
60-70%	149.23	0.90%	159.65	0.96%	6.98	170.80	6.98
70-80%	104.00	0.63%	111.09	0.67%	6.82	118.67	6.82
80-90%	74.50	0.45%	78.27	0.47%	5.06	82.23	5.06
90-100%	28.60	0.17%	29.71	0.18%	3.88	30.86	3.88

Source: USGS, MRLC

Figure 19 - Existing Imperviousness



Because of its size, every land use category is represented in the Upper Hurricane Creek sub-watershed (SMU 3). Like the other SMUs, Upper Hurricane Creek is heavily forested. Deciduous forest totals 1927.7 acres and represents 26.6 percent of the sub-watershed. Open space development also represents a large portion of the watershed at 19 percent. Every municipality except the Village of Cambria is represented in some scope in the Upper Hurricane Creek sub-watershed.

The Herrin sub-watershed (SMU 4) is characterized by its high levels of developed land. While almost half of the sub-watershed is developed (47.72 percent), 23.23 percent is represented by low intensity development which is defined as areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20 to 49 percent of total cover. These areas most

commonly include single-family housing units[39]. Though it is highly developed, the Herrin sub-watershed also has the highest percentage of cultivated crops at 19.96 percent, or 862.9 acres.

Imperviousness in the sub-watersheds follows the same characteristics as the Hurricane Creek watershed as a whole. The majority of the sub-watersheds are non-impervious. 93.60 percent of the Lower Hurricane Creek sub-watershed is comprised of completely non-impervious land cover. Following the high levels of development, the Herrin sub-watershed is the most impervious sub-watershed. Only 52.19 percent of the sub-watershed is identified by being zero percent impervious. It also has 28.54 acres of land that ranges from being 90 to 100 percent impervious.

According to the estimations (see Table 20), SMU 1 and 2 will see no, or insignificant change regarding future levels of imperviousness. Following the previous estimations, levels of imperviousness will continue to rise. This is notably observed in the Herrin sub-watershed where high levels of imperviousness already exist. The Upper Hurricane Creek sub-watershed will witness the most change in regards to levels of imperviousness. All categories except zero and 100 percent will see an increase in impervious levels. These increases range from 2.37 to 21.98 percent.

[39] DOI and USGS, MRLC, 2015.

Figure 20 - Sub-watershed Land Cover

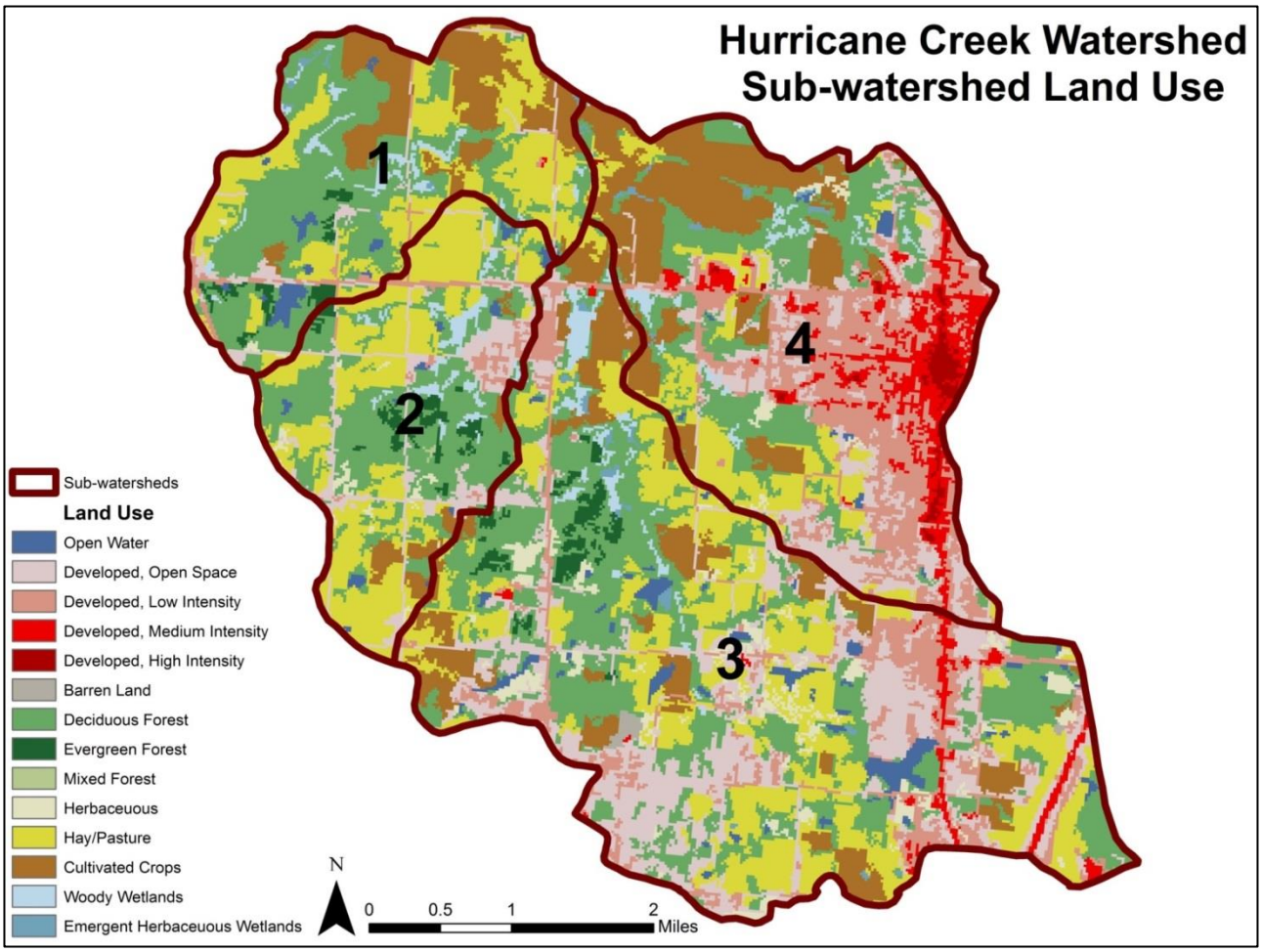


Table 18 - Sub-watershed Existing Land Cover

Source: USGS, MRLC

Land Use Classification	SMU 1		SMU 2		SMU 3		SMU 4	
	Acreage	% of SMU 1	Acreage	% of SMU 2	Acreage	% of SMU 3	Acreage	% of SMU 4
Open Water	56.7	2.17	38.5	1.6	194.6	2.68	24.2	0.56
Developed, Open Space	98.3	3.77	286.8	11.91	1375.2	18.97	568.1	13.14
Developed, Low Intensity	64.3	2.46	72.5	3.01	694.2	9.57	999.6	23.12
Developed, Medium Intensity	1.1	0.04	0	0	125.0	1.72	409.7	9.48
Developed, High Intensity	0	0	0	0	2.0	0.03	85.8	1.98
Barren Land	0	0	0	0	26.2	0.36	0	0
Deciduous Forest	1022.5	39.21	843.6	35.05	1927.7	26.59	798	18.46
Evergreen Forest	58.3	2.23	82.5	3.43	124.3	1.71	0	0
Mixed Forest	0	0	2.7	0.11	1.8	0.02	0	0
Herbaceous	7.1	0.27	35.6	1.48	299.2	4.13	38.2	0.88
Hay/Pasture	716.4	27.47	863.8	35.89	1626.1	22.43	449.4	10.4
Cultivated Crops	484.5	18.58	91.8	3.81	696.9	9.61	862.9	19.96
Woody Wetlands	83.9	3.22	89.4	3.71	122.8	1.69	66.7	1.54
Emergent Herbaceous Wetlands	14.9	0.57	0	0	34.9	0.48	20.5	0.47

Table 19 - Sub-watershed Existing Imperviousness

Source: USGS, MRLC

2011 Percent Imperviousness	SMU 1		SMU 2		SMU 3		SMU 4	
	Acreage	% of SMU 1	Acreage	% of SMU 2	Acreage	% of SMU 3	Acreage	% of SMU 4
0%	2441.06	93.60%	2052.83	85.29%	5061.14	69.80%	2256.05	52.19%
0-10%	48.14	1.85%	145.99	6.07%	822.09	11.34%	304.39	7.04%
10-20%	54.61	2.09%	119.47	4.96%	538.99	7.43%	288.78	6.68%
20-30%	49.04	1.88%	67.98	2.82%	367.35	5.07%	264.03	6.11%
30-40%	11.81	0.45%	18.05	0.75%	217.56	3.00%	298.15	6.90%
40-50%	1.56	0.06%	1.11	0.05%	112.12	1.55%	378.65	8.76%
50-60%	0.45	0.02%	0.67	0.03%	55.95	0.77%	230.13	5.32%
60-70%	0.89	0.03%	0.67	0.03%	39.68	0.55%	119.30	2.76%
70-80%	0.45	0.02%	0.22	0.01%	24.74	0.34%	86.30	2.00%
80-90%	0	0	0	0	10.03	0.14%	68.68	1.59%
90-100%	0	0	0	0	0.89	<.001%	28.54	0.66%

Table 20 - Sub-watershed Estimated Future Imperviousness

2011-2021 Percent Imperviousness	SMU 1		SMU 2		SMU 3		SMU 4	
	Predicted Acreage (2021)	Predicted Percent Change	Predicted Acreage (2021)	Predicted Percent Change	Predicted Acreage (2021)	Predicted Percent Change	Predicted Acreage (2021)	Predicted Percent Change
0%	2441.1	0.0	2052.8	0.00	4960.2	-1.99	2256.1	0.00
0-10%	48.1	0.0	144.9	-0.76	861.3	4.77	300.4	-1.30
10-20%	54.6	0.0	119.5	0.00	551.8	2.37	285.3	-1.22
20-30%	49.0	0.0	67.8	-0.33	383.2	4.30	259.4	-1.74
30-40%	11.8	0.0	18.1	0.00	231.1	6.20	296.2	-0.67
40-50%	1.6	0.0	2.8	150.00	119.5	6.57	379.5	0.24
50-60%	0.4	0.0	1.0	50.00	64.4	15.14	232.4	0.98
60-70%	0.9	0.0	1.0	50.00	46.2	16.34	124.2	4.09
70-80%	0.4	0.0	0.7	222.00	30.2	21.98	88.8	2.93
80-90%	0.0	0.0	0.0	0.00	11.0	9.76	71.7	4.41
90-100%	0.0	0.0	0.0	0.00	0.6	-33.33	29.7	4.07

Source: USGS, MRLC

2.7 Watershed Drainage

2.7.1 Stream Assessment

To further characterize the waterbodies in the Hurricane Creek watershed, an assessment has been included to identify certain components of streams and lakes. Components assessed are channelization, condition of riparian area, and degree of bank erosion for streams. For the lake assessment, a summary of the shoreline buffer zones and shoreline erosion were assessed.

Assessment methods included actual field evaluations, and comparisons of aerial photography from 1937 to 2014 along with other available GIS data layers.

For each component, the assessed streams were delineated by their individual reach code. These reach codes identify certain portions of the stream, and represent varying degrees of stream length. Table 21 depicts the stream name with its corresponding reach code.

Table 21 - Stream and Tributary Reach Codes

Stream or Tributary Name	Reach Code	Stream Length (ft.)
Hurricane Creek	07140106000093	14722
Hurricane Creek	07140106000094	11959
Hurricane Creek	07140106000095	3542
Hurricane Creek	07140106000096	1980
Hurricane Creek	07140106000097	11436
Hurricane Creek	07140106000098	12266
Hurricane Creek	07140106007352	3230
Little Hurricane Creek	07140106000660	5080
Little Hurricane Creek	07140106000661	13010
South Herrin Tributary	07140106001217	21583
North Herrin Tributary	07140106001218	18926
Herrin Reservoir Tributary	07140106007253	994
Herrin Reservoir Tributary	07140106007256	4198
Herrin Reservoir Tributary	07140106007278	3464

2.7.2 Streambank Erosion

> Streambank erosion is a natural process but it can be greatly accelerated by changes in land use and hydrology. Accelerated streambank erosion can negatively impact property, infrastructure, aquatic habitat, and overall stream health. Streambank erosion generally results from instability in flow rate or volume in the stream channel, human alteration such as channelization, or changes in streambank vegetation. The deposition of sediment and the transport of sediment downstream can be detrimental to water quality.[40]

Erosion was assessed as none, or low (0-33 percent of banks displaying erosion), moderate (33-66 percent), and high (66-100 percent). Results for streambank erosion by reaches are summarized in Table 22.

The majority of streams and tributaries in the Hurricane Creek watershed exhibit some degree of streambank erosion. While there are areas of high erosion, they may be classified as moderate because of other parts of that particular reach exhibiting less erosion. Areas of increased erosion occur near the confluence of Hurricane Creek and Little Hurricane Creek. Other areas that experience high rates of erosion are streambanks around culverts and areas of high channelization around the watershed. This is particularly evident near the overpass of the Herrin South stream at West Stotlar Road in Herrin.

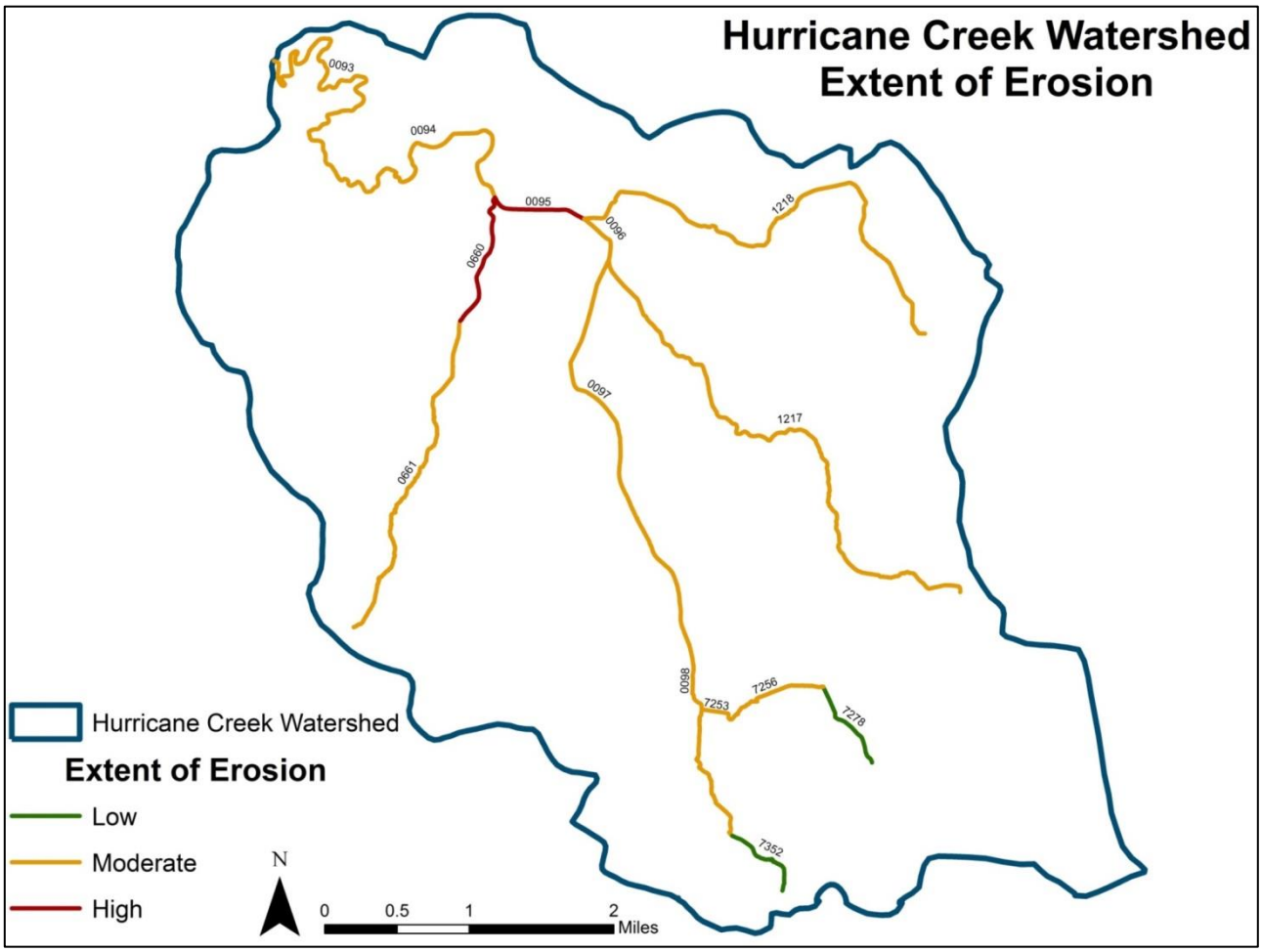
Table 22 - Extent of Streambank Erosion

Extent of Erosion	Hurricane Creek		Little Hurricane Creek		Herrin Reservoir Tributary		North Herrin		South Herrin		Watershed Total	
	Reaches	%	Reaches	%	Reaches	%	Reaches	%	Reaches	%	Reaches	%
None or Low	1	14.3%	0	0.0%	1	33.3%	0	0.0%	0	0.0%	2	14.3%
Moderate	5	71.4%	1	50.0%	2	66.7%	1	100.0%	1	100.0%	10	71.4%
High	1	14.3%	1	50.0%	0	0.0%	0	0.0%	0	0.0%	2	14.3%

These results are also presented in Figure 21. Reaches of the assessed streams are labeled with the last four digits of their particular reach code.

[40] Ristau, e-mail message, 2015.

Figure 21 - Extent of Streambank Erosion



2.7.3 Channelization

Channelization increases the slope and velocity of the altered stream, which increases its capacity to erode streambanks and transport sediment. Channelization typically creates straight channels of uniform depth, eliminating or reducing meanders and the natural pool and riffle areas.

Meanders provide a natural release for the stream's energy and a channelized stream may erode streambanks and bottoms in an alternating manner in an attempt to re-establish a sinuous course. Like meanders, pools and riffles also serve as naturally effective means of reducing the erosive energy of a stream.

Channelization reduces habitat diversity by creating a basically uniform stream water depth, velocity, and bottom type and by reducing stream

sinuosity and length channelization reduces the total quantity of aquatic habitat area. The hydraulic connection between a stream and its adjacent floodplain and wetland area is also reduced through channelization.[41]

The method of assessing erosion is also applied to the degree of channelization where less than 33 percent of the particular reach is characterized as having none, or low channelization, 33 to 66 percent of reach channelized is moderate, and a high degree of channelization is expressed as exhibiting 66 percent or more channelization features.

The Hurricane Creek watershed is prone to all degrees of channelization. With the exception of reaches at the confluence with the Big Muddy River, Hurricane Creek has been channelized at various locations. This is evident along the large expanses near pastures, farm land, and areas of urbanization. Table 23 and Figure 22 show the degree of channelization for the assessed streams and tributaries.

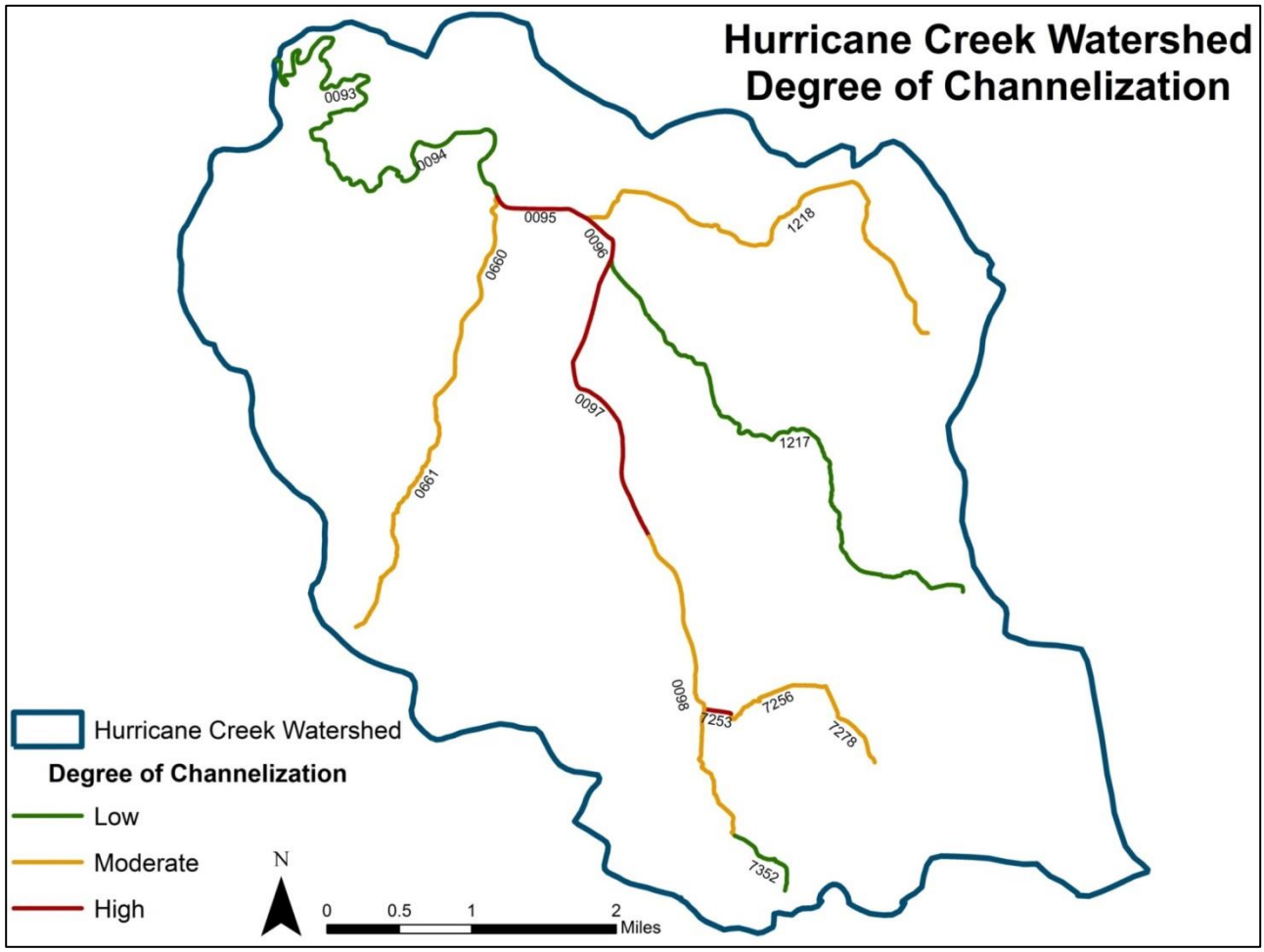
Table 23 - Degree of Channelization

Degree of Channelization	Hurricane Creek		Little Hurricane Creek		Herrin Reservoir Tributary		North Herrin		South Herrin		Watershed Total	
	Reaches	%	Reaches	%	Reaches	%	Reaches	%	Reaches	%	Reaches	%
None or Low	3	42.9%	0	0.0%	0	0.0%	0	0.0%	1	100.0%	4	28.6%
Moderate	1	14.3%	2	100.0%	2	66.7%	1	100.0%	0	0.0%	6	42.9%
High	3	42.9%	0	0.0%	1	33.3%	0	0.0%	0	0.0%	4	28.6%

Although reaches such as 0714016007352 (7352) have many areas of channelization, this still accounts for less than 33 percent of the entire reach, which is why it is categorized as having none, or low channelization as seen in Figure 22.

[41] Ibid.

Figure 22 - Degree of Channelization



2.7.4 Riparian Areas

Riparian corridors buffer streams and tributaries by filtering pollutants from runoff. Buffers also provide beneficial wildlife habitat. This assessment classifies riparian zones, or buffers, as 75-100 feet from the stream on either side. The one-third method from the previous components has also been utilized for riparian buffers. Stream reaches that have 33 percent, or fewer areas with degraded riparian areas have been classified as good, 33-66 percent as fair, and 66 percent or more as poor.

In general, development in riparian zones is minimal in the Hurricane Creek watershed. While most of the Hurricane Creek riparian area is forested, many

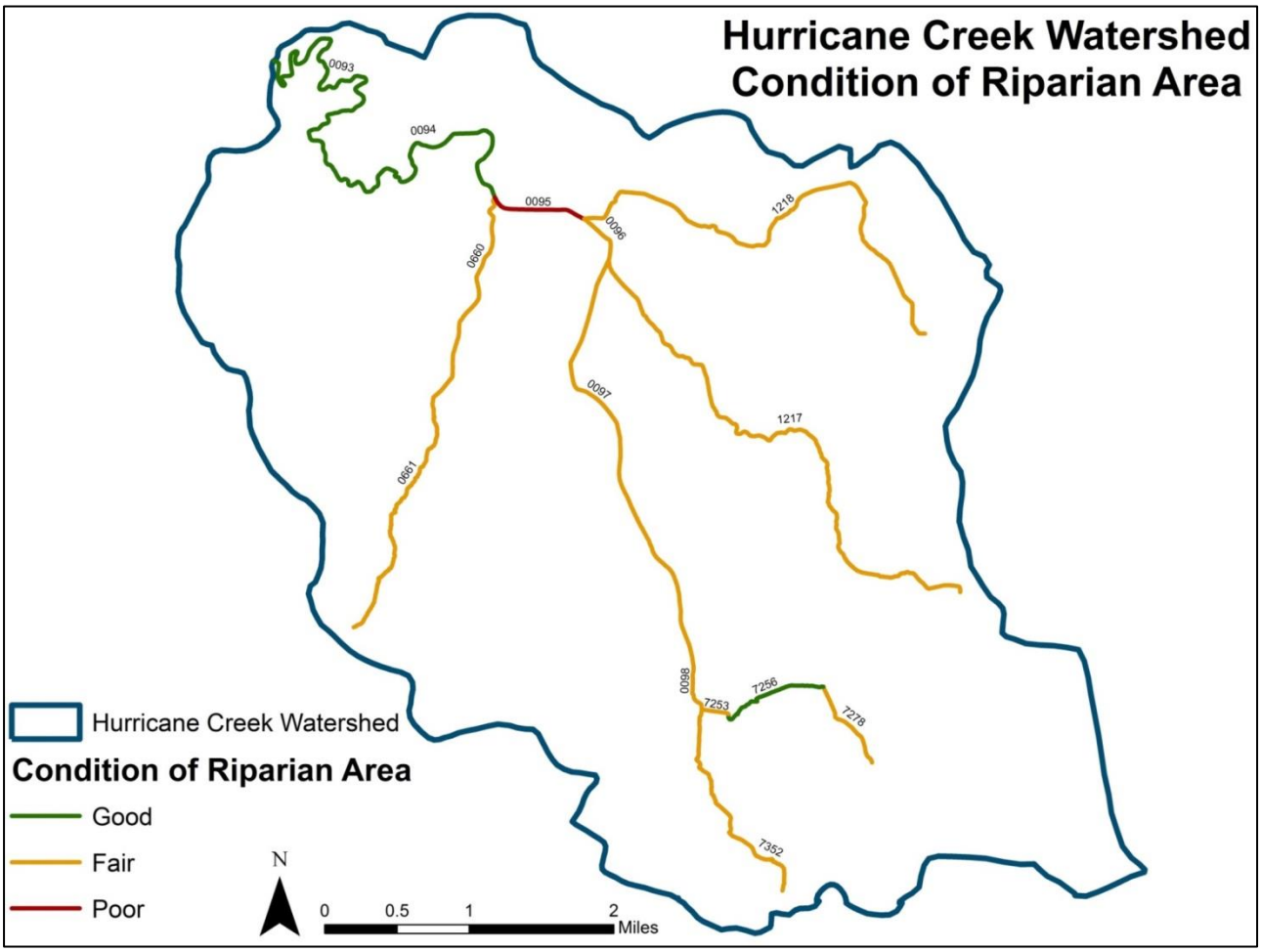
portions of the creek exhibit erosion, debris blockages, and areas of limited biodiversity. Table 24 displays the condition of riparian areas.

Table 24 - Condition of Riparian Area (Buffer)

Condition of Riparian Area	Hurricane Creek		Little Hurricane Creek		Herrin Reservoir Creek		North Herrin		South Herrin	
	Reaches	%	Reaches	%	Reaches	%	Reaches	%	Reaches	%
Good	2	28.6%	0	0.0%	1	33.0%	0	0.0%	0	0.0%
Fair	4	57.1%	2	100.0%	2	66.0%	1	100.0%	1	100.0%
Poor	1	14.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Although the Hurricane Creek is heavily forested, some parts of the stream's riparian area are breached by crops and areas of agricultural practices. Recommendations for improving the riparian buffers include the introduction of native flora, widening the buffer near areas of cultivation, and maintaining brush with areas of blockages. Locations of these areas can be seen in Figure 23. Riparian buffers that are considered to be in fair and especially poor condition will be considered those that will need to be improved.

Figure 23 - Condition of Riparian Area



2.7.5 Lake Assessment

Two lakes were assessed for this report. Madison Lake (IL_RNZT) is one of the larger lakes in the Hurricane Creek watershed. It is privately owned, and is used primarily for recreation. At approximately 27 acres, Madison Lake lies in the northwesterly portion of the Hurricane Creek watershed.

Herrin Old Lake (IL_RNZD), also referred as Herrin Reservoir, is the largest lake in the watershed at 50.5 acres. It is primarily used for recreation. Herrin Old Lake is on the Illinois Environmental Protection Agency's 303(d) list of Impaired Waters.

Each lake was given a shoreline code for documentation purposes (Table 25). Parameters assessed were condition of shoreline buffer zones (riparian conditions) and degree of shoreline erosion. This also includes an approximation of land cover types along the shoreline. Observations from various assessment points were used to assess the parameters previously stated.

Table 25 - Shoreline Lake Codes

Lake Name	Shoreline Code	Shoreline Length Assessed (ft)
Madison Lake	IL_RNZT_01	3801
Madison Lake	IL_RNZT_02	3283
Herrin Reservoir	IL_RNZD_01	2389
Herrin Reservoir	IL_RNZD_02	1112
Herrin Reservoir	IL_RNZD_03	2260
Herrin Reservoir	IL_RNZD_04	2513
Herrin Reservoir	IL_RNZD_05	1554
Herrin Reservoir	IL_RNZD_06	637
Herrin Reservoir	IL_RNZD_07	769

2.7.6 Madison Lake

Table 26 contains information regarding the shoreline buffer zones. For this assessment, the buffer zone included the area approximately 50 feet from the shoreline. Madison Lake was assigned two reach codes while Herrin reservoir was given seven. This is due to the size discrepancy between the two lakes. The riparian area around Madison Lake appears to be in good condition. Table 28 displays the approximate land cover of the riparian area.

Erosion does not appear to be a problem on the Madison Lake shoreline. The highest part of the shoreline is at the north bank at around 2 feet. What little areas did have issues with erosion (less than five percent), rip rap and other measures have been implemented. Table 27 depicts the erosion conditions for Madison Lake. Figure 24 spatially displays the conditions of the riparian area and degree of erosion for Madison Lake.

Table 26 - Condition of Lake Riparian Area

Lake Name	Shoreline Code	Shoreline Length Assessed (ft)	Good Condition (% of Buffer Area)	Fair Condition (% of Buffer Area)	Poor Condition (% of Buffer Area)
Madison Lake	IL_RNZT_01	3801	71.00%	29.00%	
Madison Lake	IL_RNZT_02	3283	89.00%	11.00%	
Herrin Reservoir	IL_RNZD_01	2389	74.00%	26.00%	
Herrin Reservoir	IL_RNZD_02	1112	75.00%	25.00%	
Herrin Reservoir	IL_RNZD_03	2260	90.00%	10.00%	
Herrin Reservoir	IL_RNZD_04	2513	77.00%	19.00%	4.00%
Herrin Reservoir	IL_RNZD_05	1554	55.00%	19.00%	26.00%
Herrin Reservoir	IL_RNZD_06	637	94.00%	6.00%	
Herrin Reservoir	IL_RNZD_07	769	82.00%	18.00%	

Table 27 - Percentage of Erosion along Lake Shoreline

Lake Name	Shoreline Code	Shoreline Length Assessed (ft)	None or Low Erosion	Moderate Erosion	High Erosion
Madison Lake	IL_RNZT_01	3801	100.00%		
Madison Lake	IL_RNZT_02	3283	100.00%		
Herrin Reservoir	IL_RNZD_01	2389	78.00%	22.00%	
Herrin Reservoir	IL_RNZD_02	1112	67.00%	29.00%	4.00%
Herrin Reservoir	IL_RNZD_03	2260	73.00%	27.00%	
Herrin Reservoir	IL_RNZD_04	2513	90.00%	10.00%	
Herrin Reservoir	IL_RNZD_05	1554	76.00%	20.00%	14.00%
Herrin Reservoir	IL_RNZD_06	637	85.00%	15.00%	
Herrin Reservoir	IL_RNZD_07	769	84.00%	16.00%	

2.7.7 Herrin Old Lake (Herrin Reservoir)

Unlike Madison Lake, Herrin Old Lake is publically owned by the City of Herrin. The assessed riparian area is in generally stable condition around Herrin Reservoir. There some are areas of heavy debris. One of these areas is near the boat ramp at the southeast portion of the lake. This is established as shoreline code four on Figure 25. The buffer zone around Herrin Reservoir is predominantly wooded. Others areas tend to be lawn and shrub/scrub land as seen in Table 28.

Herrin Reservoir has intermittent areas of erosion. The highest part of the shoreline is approximately eight feet at the western portion of shoreline code 5 as seen in Figure 25. This area also has the highest rate of erosion of Herrin Old Lake. Other areas of the lake have implemented rip rap to reduce what little erosion was taking effect. This is particularly evident around the shoreline of homeowners.

Table 28 - Riparian Area Land Cover

Lake Name	Shoreline Code	Shoreline Length Assessed (ft)	Shrub/Scrub	Lawn	Wooded	Impervious
Madison Lake	IL_RNZT_01	3801	25.00%	25.00%	50.00%	
Madison Lake	IL_RNZT_02	3283	10.00%	20.00%	70.00%	
Herrin Reservoir	IL_RNZD_01	2389		50.00%	50.00%	
Herrin Reservoir	IL_RNZD_02	1112	20.00%	40.00%	40.00%	
Herrin Reservoir	IL_RNZD_03	2260		50.00%	50.00%	
Herrin Reservoir	IL_RNZD_04	2513	10.00%	30.00%	60.00%	
Herrin Reservoir	IL_RNZD_05	1554	30.00%	20.00%	10.00%	40.00%
Herrin Reservoir	IL_RNZD_06	637	10.00%	90.00%		
Herrin Reservoir	IL_RNZD_07	769		90.00%	10.00%	

Figure 24 - Madison Lake Erosion and Riparian Area

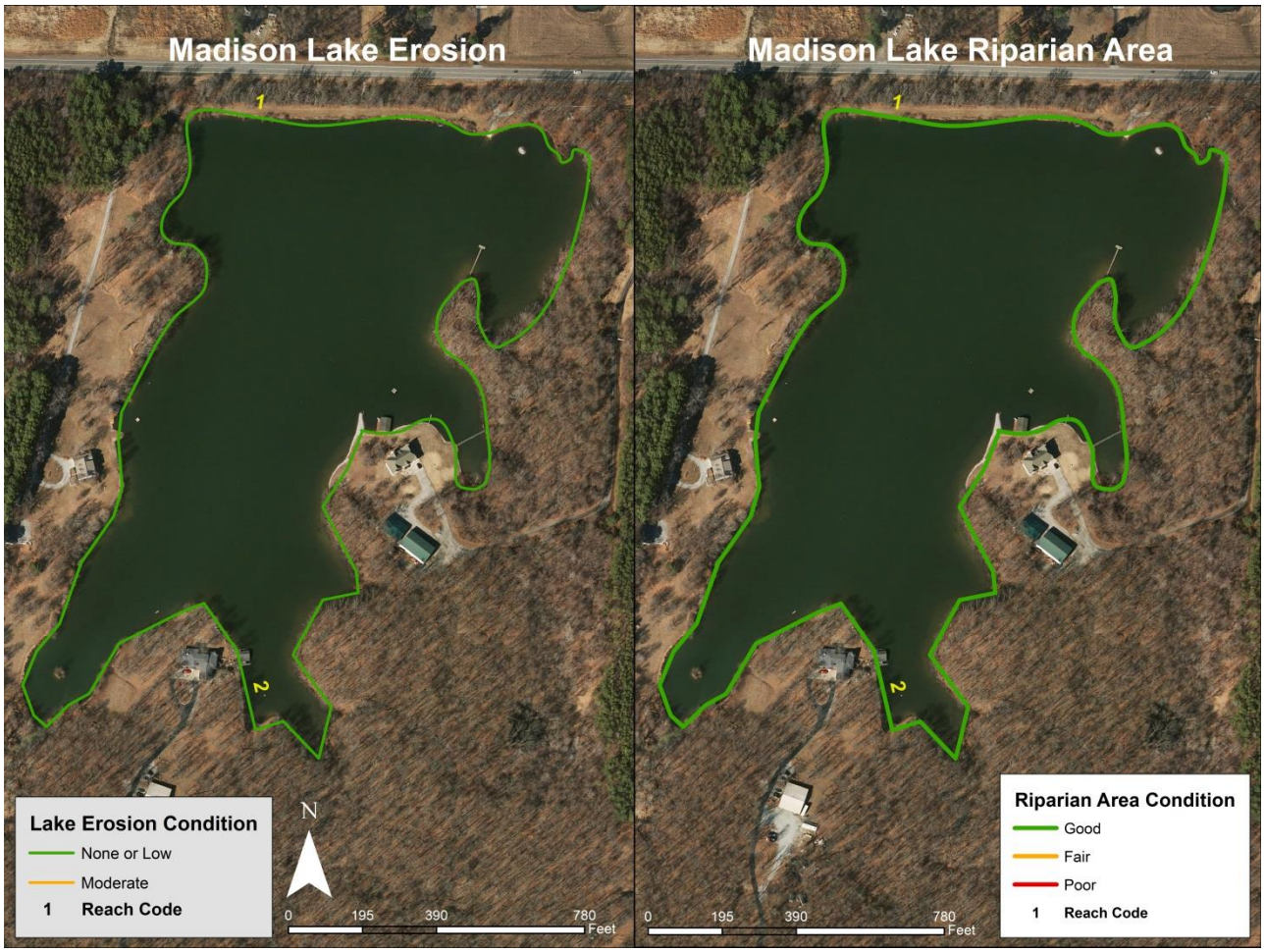
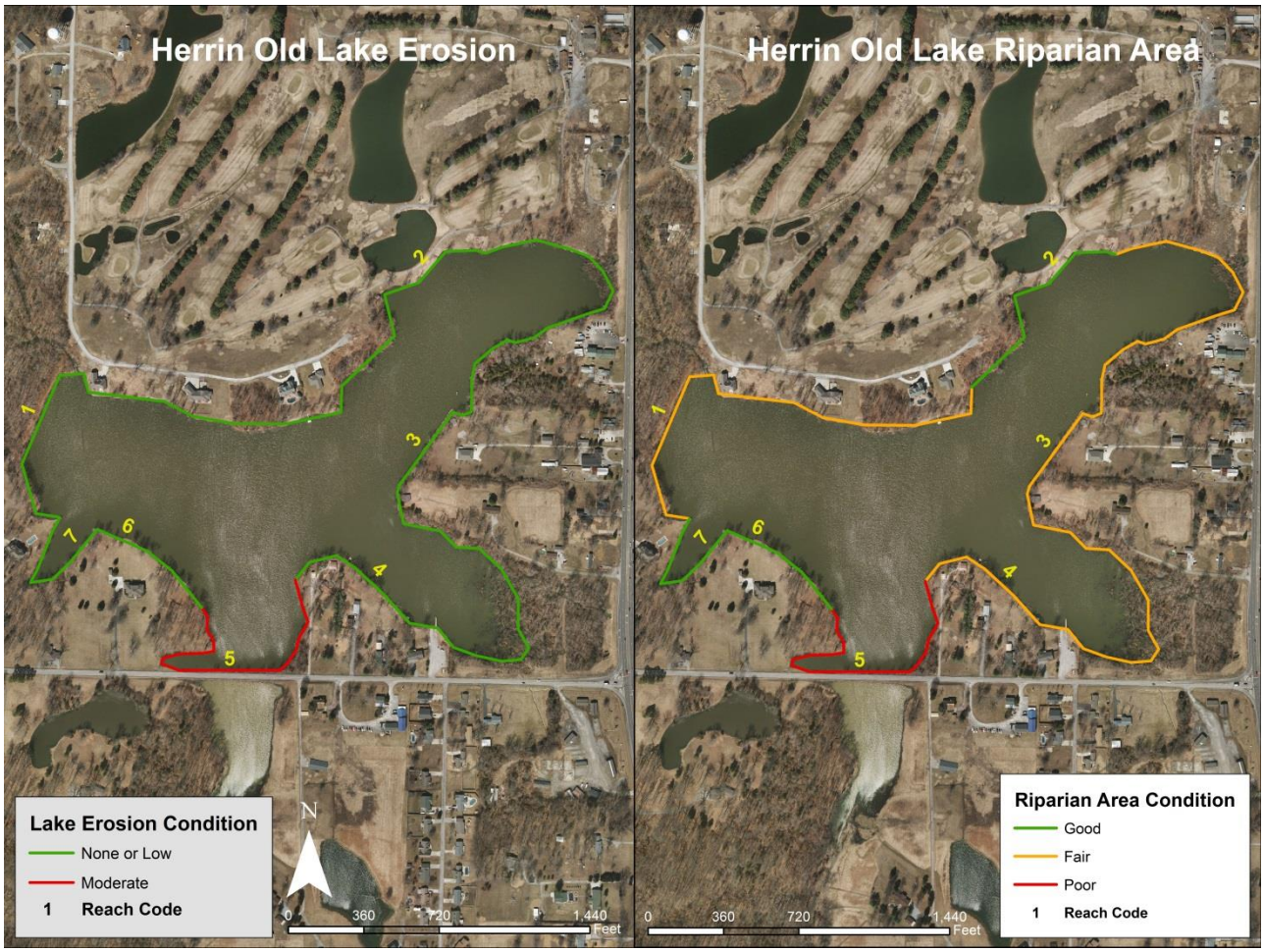


Figure 25 - Herrin Old Lake Erosion and Riparian Area



2.7.8 Detention and Retention Basins

> Detention basins, or dry basins, are structures built to temporarily store stormwater runoff and release stormwater at a controlled rate. If designed or retrofitted with the proper configuration, slopes, and water depths, and planted with native prairie and wetland vegetation, detention basins can also provide wildlife habitat and improve water quality.[42]

Retention basins, also known as wet basins, also serve to manage stormwater runoff, but hold water on a permanent basis. Like detention basins, retention areas can also reduce, or prevent flooding and improve water quality.

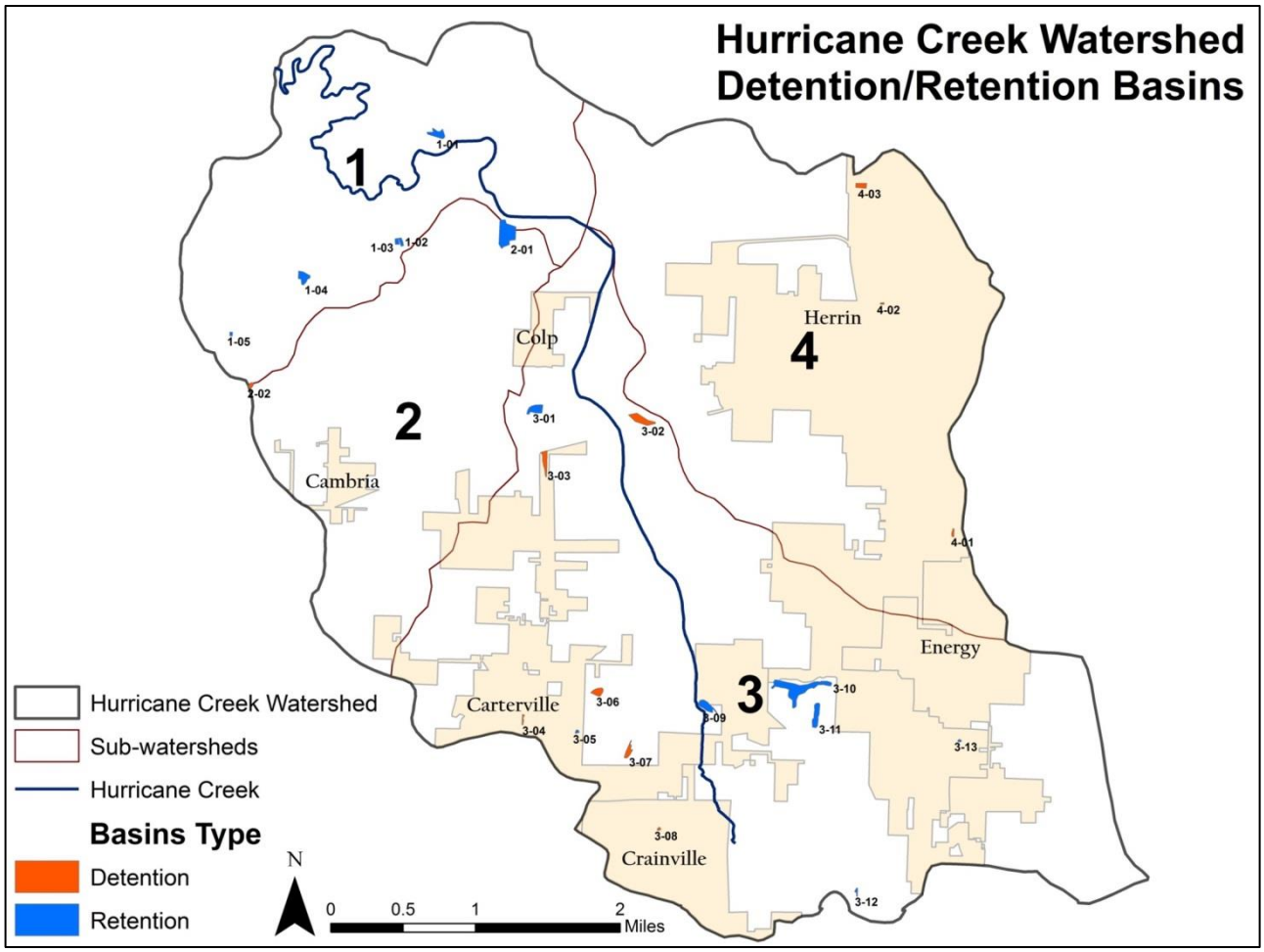
[42] Ibid.

Basins were located using aerial imagery, and Light Detection and Ranging (LIDAR) techniques. These techniques included using aerial photography from different periods to distinguish unnatural features, and locating man-made berms as means to store water temporarily, or permanently.

Both types of basins are prevalent in the Hurricane Creek watershed. Detention areas in the watershed tend to be in more urban environments, while retention basins occur mostly in more urban areas, specifically around developments. Basins in the Hurricane Creek watershed are displayed in Figure 25.

The following table (Table 29) summarizes the detention basins by type, size, jurisdiction, and location (latitude, longitude). Basins were assigned an identification number based on the SMU in which they were located. For example, if a basin is located in SMU 1 (Lower Hurricane Creek), the identification number would be 1 followed by the number in which they were labeled.

Figure 25 - Detention and Retention Basin Locations



The data suggests there are 10 detention basins and 13 retention basins in the Hurricane Creek watershed. Most of these features occur in SMU 3 (Upper Hurricane Creek), which encompasses 13 basin types. The largest feature is a 14 acre retention basin just south of Sycamore Road west of the Village of Energy. This basin was made to store water from surrounding new development.

Table 29 - Basin Information

Basin ID	Type	Acres	Jurisdiction	Latitude	Longitude
1-01	Retention	2.92	Williamson County	37.8268	-89.0927
1-02	Retention	0.69	Williamson County	37.8159	-89.0969
1-03	Retention	0.65	Williamson County	37.8159	-89.0975
1-04	Retention	2.98	Williamson County	37.8121	-89.1092
1-05	Retention	0.32	Williamson County	37.8063	-89.1182
2-01	Retention	10.43	Williamson County	37.817	-89.0837
2-02	Detention	0.61	Williamson County	37.8012	-89.1155
3-01	Retention	3.30	Williamson County	37.7994	-89.0795
3-02	Detention	4.42	Williamson County	37.7986	-89.0661
3-03	Detention	2.62	Carterville	37.7943	-89.0781
3-04	Detention	0.40	Carterville	37.7683	-89.0802
3-05	Retention	0.29	Carterville	37.7672	-89.0733
3-06	Detention	2.03	Williamson County	37.7712	-89.0708
3-07	Detention	1.82	Williamson County	37.7653	-89.0668
3-08	Detention	0.23	Crainville	37.7576	-89.0627
3-09	Retention	3.42	Williamson County	37.77	-89.0571
3-10	Retention	13.97	Williamson County	37.772	-89.0456
3-11	Retention	3.75	Williamson County	37.7693	-89.0432
3-12	Retention	0.40	Williamson County	37.7517	-89.0376
3-13	Retention	0.20	Herrin	37.7671	-89.025
4-01	Detention	0.47	Herrin	37.7879	-89.0264
4-02	Detention	0.18	Herrin	37.8108	-89.036
4-03	Detention	1.48	Herrin	37.8226	-89.039

2.8 Water Quality Assessment

For this assessment, water quality of Hurricane Creek and Herrin Old Lake has been analyzed. A water quality assessment has also been completed for local municipalities within the Hurricane Creek watershed.

> In accordance with Sections 305(b) and 303(d) of the federal Clean Water Act, the Illinois Environmental Protection Agency (IEPA) must report to the U.S. Environmental Protection Agency on the quality of Illinois surface water (e.g., lakes, streams, wetlands) and groundwater resources (Section 305(b)) and provide a list of those waters where their designated uses are deemed 'impaired' (Section 303(d)).
>
> There are seven designated uses in Illinois; however, only five of those uses apply within the Hurricane Creek planning area. These are Aquatic Life, Fish Consumption, Primary Contact, Secondary Contact, and Aesthetic Quality.[43]

2.8.1 Water Quality Impairments and Monitoring

Hurricane Creek (IL_NF-01) and Herrin Old Lake (IL_RNZD) have been assessed for water quality impairments. Monitoring station locations are displayed in Figure 26. Little Hurricane Creek (IL_NFA) has not been assessed by the IEPA.

Water quality in the Hurricane Creek watershed differs for each body of water. Location, uses, and drainage are factors that influence the water quality of each particular lake or stream. Water quality assessments for the Hurricane Creek and Herrin Reservoir (Old) have been detailed for this report. Data provided from the IEPA and 2014 Municipal Annual Drinking Water Quality Reports have been utilized for this assessment.

Tables 30 and 31 outline the designated uses, assessment status, and impairment status of Hurricane Creek (IL_NF-01) and Herrin Old Lake (IL_RNZD) as

[43] Ibid.

identified in the Illinois Integrated Water Quality Report and Section 303(d) List for 2014.

The Illinois Integrated Water Quality Report[44] categorizes Hurricane Creek as only having one desginated use, aquatic life, which is not supported. All other categories were not assessed for the water quality report. Herrin Old Lake, or Herrin Reservoir, has three desginated uses that were assesed for the report. While Herrin Old Lake fully supports aquatic life, fish consumption and aesthetic qaulity have been deemed not supporting.

Table 30 - Assessment Status of Hurricane Creek (IL_NF-01)

Designated Use	Use ID	Assessed in 2014 Integrated Report	Use Attainment
Aquatic Life	582	Yes	Not Supporting
Fish Consumption	583	No	Not Assessed
Primary Contact	585	No	Not Assessed
Secondary Contact	586	No	Not Assessed
Aesthetic Quality	590	No	Not Assessed

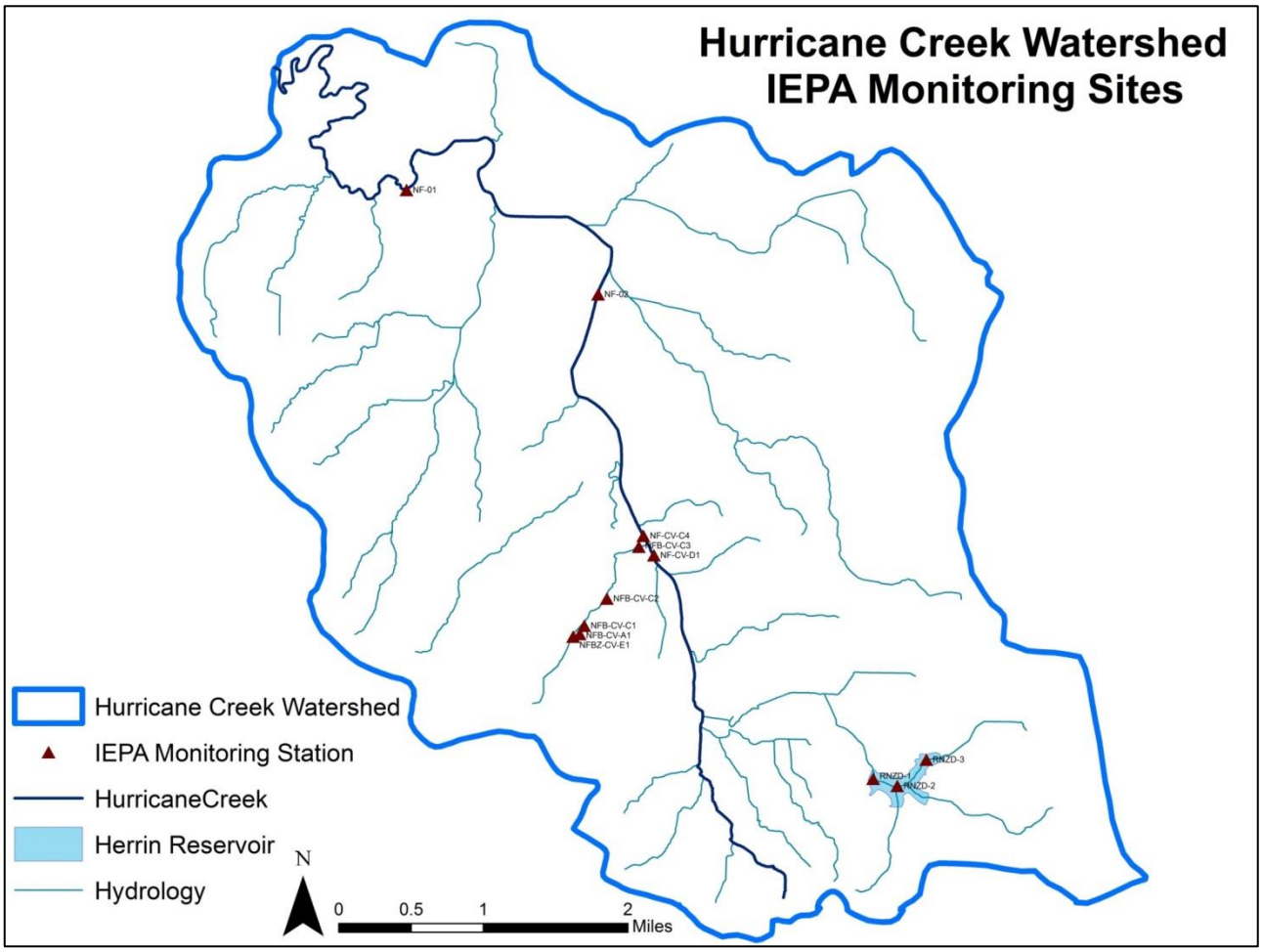
Source: IEPA Illinois Integrated Water Quality Report and 303(d) Lists

Table 31 - Assessment Status of Herrin Old Lake (IL_RNZD)

Designated Use	Use ID	Assessed in 2014 Integrated Report	Use Attainment
Aquatic Life	582	Yes	Fully Supporting
Fish Consumption	583	Yes	Not Supporting
Primary Contact	585	No	Not Assessed
Secondary Contact	586	No	Not Assessed
Aesthetic Quality	590	Yes	Not Supporting

[44] IEPA. *Integrated Water Quality Report and 303d Lists.* Springfield: IEPA, 2014.

Figure 26 -IEPA Monitoring Sites



The Illinois Integrated Water Quality Report categorizes Hurricane Creek as only having one desginated use, aquatic life, which is not supported. All other categories were not assessed for the water quality report. Herrin Old Lake, or Herrin Reservoir, has three desginated uses that were assesed for the report. While Herrin Old Lake fully supports aquatic life, fish consumption and aesthetic qaulity have been deemed not supporting.

Hurricane Creek and Herrin Old Lake have been placed on the IEPA's 303(d) list of impaired waters. This is due to several impairments to the water bodies. While Hurricane Creek only suffers from three impairments, Herrin Old Lake is marred by five different impariments. Table 8.3 summarizes the causes and sources of

impairment for Hurricane Creek and Herrin Old Lake as identified in Appendix B-2 and Appendix B-3 of the 2014 Integrated Report. Figure 27 figure identifies the waterbodies that the IEPA has listed as impaired in accordance with Section 303(d) of the Federal Clean Water Act (CWA).

Table 32 - Assessment Information for Hurricane Creek Watershed Waterbodies

Waterbody	Assessment Unit ID	Size	Causes of Impairment(s)	Sources of Impairment(s)
Hurricane Creek	IL_NF-01	10.6 miles	Lindane, Sedimentation / Siltation	Crop Production (Crop Land or Dry Land), Agriculture
Herrin Old Lake	IL_RNZD	51.3 acres	Mercury, Polychlorinated biphenyls, Total Suspended Solids (TSS), Phosphorus (Total), Aquatic Algae	Atmospheric Deposition - Toxics, Source Unknown, Contaminated Sediments, Urban Runoff / Storm Sewers, Other Recreational Pollution Sources

Source: IEPA Illinois Integrated Water Quality Report and 303(d) Lists

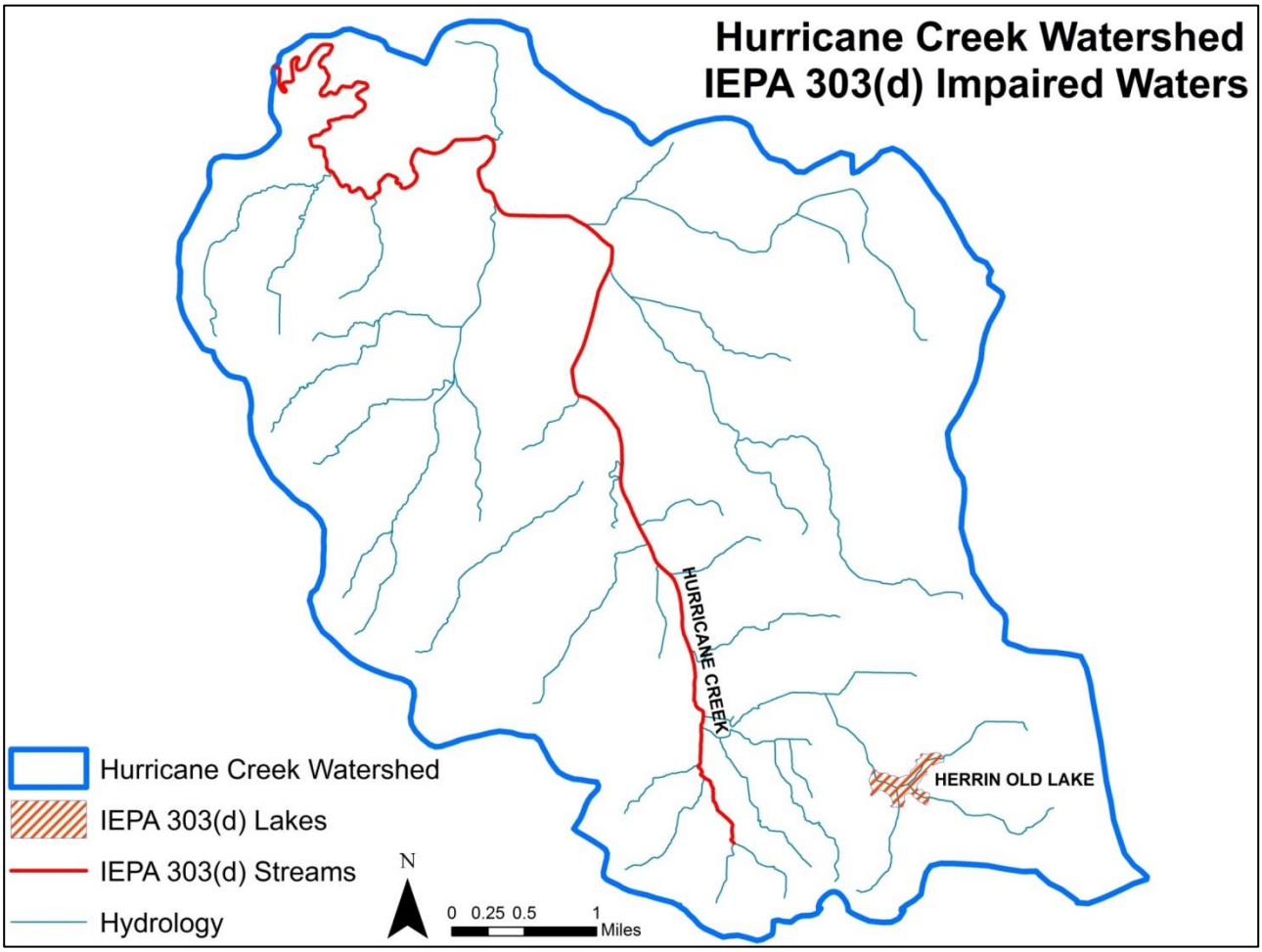
The following table summarizes the causes and sources of impairment for Hurricane Creek and Herrin Old Lake as identified in the 303(d) list (Appendix A-2) of the 2014 Integrated Report.

Table 33 - 303(d) Information for Hurricane Creek Watershed Waterbodies

Waterbody	Assessment Unit ID	Size	Impaired Designated Use	Causes of Impairment(s)
Hurricane Creek	IL_NF-01	10.6 miles	Aquatic Life	Lindane, Sedimentation / Siltation
Herrin Old Lake	IL_RNZD	51.3 acres	Aesthetic Quality	Total Suspended Solids (TSS), Phosphorus (Total)
Herrin Old Lake	IL_RNZD	51.3 acres	Fish Consumption	Mercury, Polychlorinated biphenyls

Source: IEPA Illinois Integrated Water Quality Report and 303(d) Lists

Figure 27 - IEPA 303(d) Impaired Waters



The CWA also requires that a Total Maximum Daily Load (TMDL) be developed for each pollutant of an impaired water body. The *Upper Big Muddy Watershed Total Maximum Daily Load Stage One Report* was completed January 31, 2014. This Stage 1 report was developed for the impaired waterbody segments located within the Upper Big Muddy Creek watershed, which includes Hurricane Creek (IL_NF-01) and Herrin Old Lake (IL_RNZD). Information in the Stage 1 report will be used to develop TMDLs and Load Reduction Strategies (LRS).

The *Illinois Nutrient Loss Reduction Strategy* prioritizes watersheds that are expected to have the greatest capacity to reduce high volumes of nutrient losses annually. The Hurricane Creek watershed is in the Big Muddy

River watershed (HUC 07140106), which is an IEPA priority watershed for addressing total phosphorus losses from nonpoint sources.[45]

2.8.2 Hurricane Creek Water Quality

The 2014 Illinois Integrated Water Quality Report states the designated use of Hurricane Creek as aquatic life (Illinois, 2014). Hurricane Creek is on the EPA's 303(d) list of impaired waters. Causes for impairments are lindane, sedimentation, and siltation. Possible sources of Lindane stem from crop production. Sources of sedimentation and siltation arise from agricultural practices and crop production (crop land or dry land).

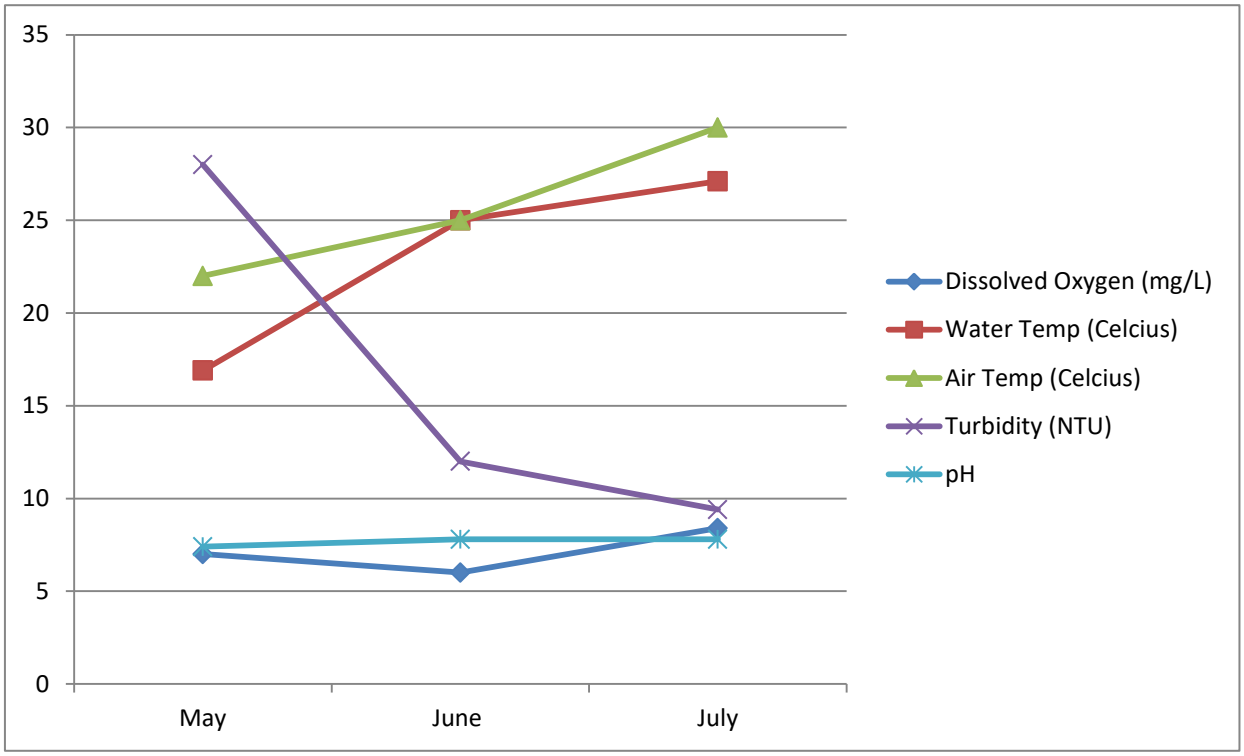
The IEPA has established four monitoring stations along the Hurricane Creek. EPA designated monitoring sites for waterbodies in the Hurricane Creek watershed are displayed in Figure 26. On a southward path, the first station (NF-01) is positioned between SMU 1 and SMU 2, nearly 1.2 miles southeast of the confluence with the Big Muddy River. NF-02, or the second station, rests between SMU 4 and 5 near the center of the watershed. Stations 3 (NF-CV-C4) and 4 (NF-CV-D1) are around 1.4 miles northeast of Carterville. They are stationed at the confluence with the Carterville Creek.

The most recent available data was taken from IEPA Station IL_NF-01 from May to July of 2008. Field assessment parameters included were Dissolved Oxygen, pH, air and water temperature, and turbidity. A variety of contaminants were listed in the report.

The field assessment parameters are displayed in Table 28. All parameters seem to be consistent through the testing period, with the exception of turbidity. May levels of turbidity are the highest at 28 NTUs. This could be a result of heavy rains usually experienced in late spring and early summer. Levels of pH seem to remain neutral at a range from 7.4 to 7.8. Dissolved Oxygen levels range from 6 to 8.4.

[45] Ibid.

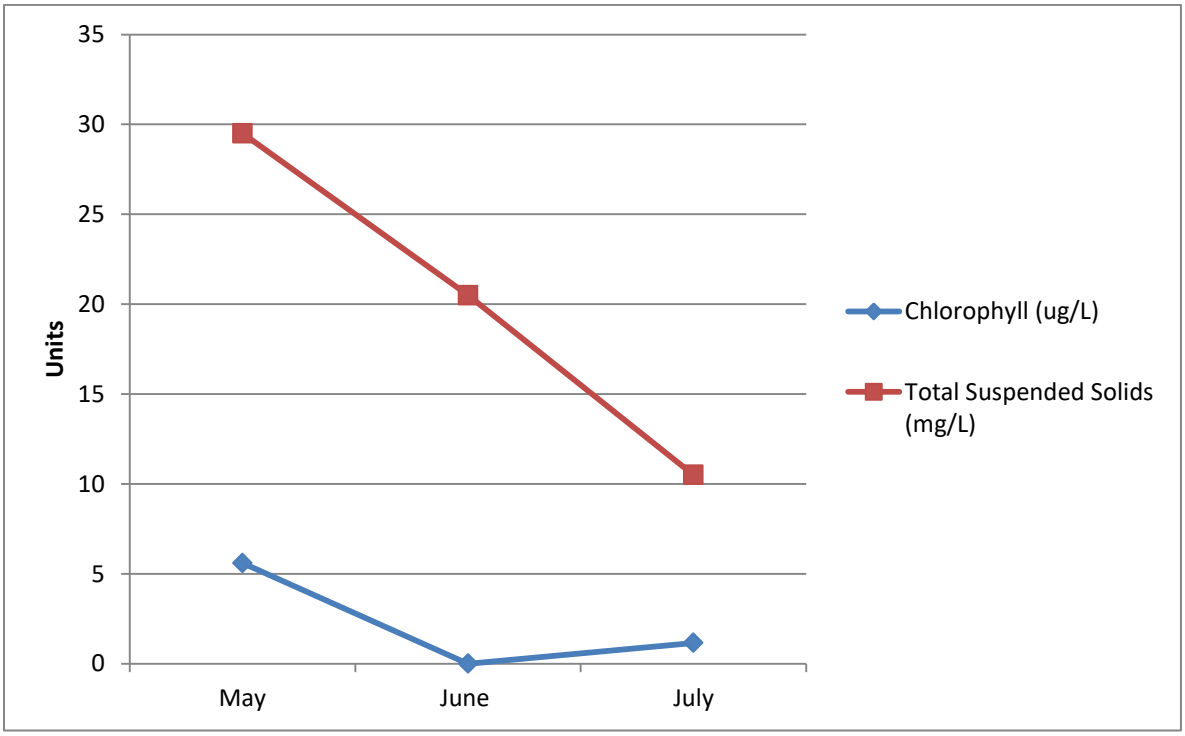
Figure 28 - Hurricane Creek Field Assessment Results (2008)



Source: IEPA, Surface Water Section

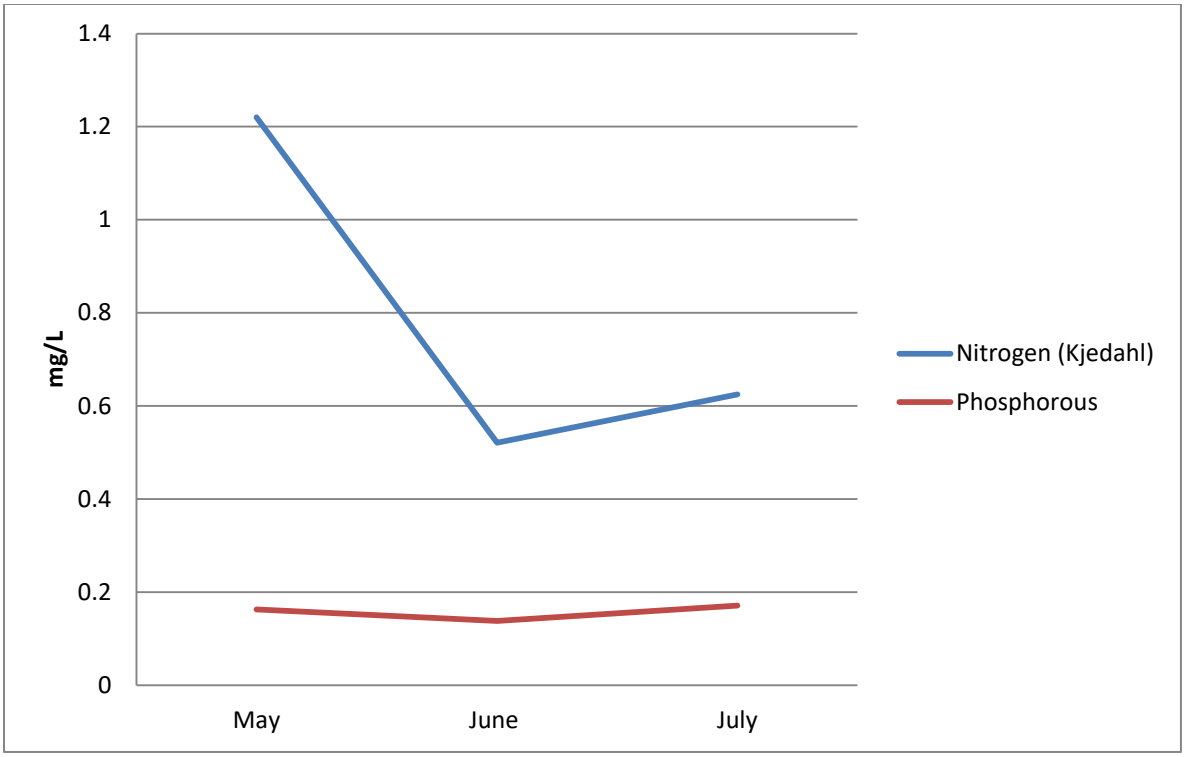
The following figures show the chloropyll,total suspended soilds (TSS), nitrogen, and phosphorus results from station IL_NF_01.

Figure 29 - Chlorophyll and TSS Results (2008)



Source: IEPA, Surface Water Section

Figure 30 - Nitrogen and Phosphorus Results (2008)



Source: IEPA, Surface Water Section

Table 34 - Hurricane Creek Analyte Data (2008)

Analyte	Units	May	June	July
Alkalinity	mg/l	112	178	208
Aluminum	ug/l	-	-	247
Barium	ug/l	34.7	34.4	35.7
Boron	ug/l	89.8	116	179
Cadmium	ug/l	1.23	0.53	-
Carbon, organic	mg/l	6.97	4.63	5.45
Chloride	mg/l	16.7	14.8	28.6
Chromium	ug/l	1.71	0.57	0.89
Cobalt	ug/l	1.51	-	-
Copper	ug/l	-	-	3.59
Fluorides	mg/l	0.215	0.338	0.37
Iron	ug/l	1330	-	379
Lead	ug/l	1.8	1.75	-
Magnesium	ug/l	-	-	45700
Manganese	ug/l	-	305	216
Nickel	ug/l	5.71	2.66	4.25
Phenols	ug/l	-	-	35
Potassium	ug/l	-	-	7320
Sodium	ug/l	28100	-	44500
Strontium	ug/l	200	328	442
Sulfate	mg/l	167	268	313

Table 8.7 –Hurricane Creek Analyte Data, IEPA (2008)

2.8.3 Herrin Old Lake (Herrin Reservoir)

As displayed in Figure 26, Herrin Old Lake has three designated monitoring locations assigned by IEPA. IL_RNZD-1, or RNZD-1, sits on the western part of Herrin Old Lake near the dam. While RNZD-2 rests in the middle of the lake,

RNZD-3 is located on the eastern portion of Herrin Old Lake near the shores of Pine Lakes Golf Course.

Sampling was completed for all three locations in 2014 from the months of April to October, excluding May and September. While many analytes were monitored, pollutants of importance are those that cause Herrin Old Lake to remain on the IEPA's 303(d) List of Impaired Waters. These pollutants include: Mercury, Polychlorinated Biphenyls (PCBs), Phosphorus, and Total Suspended Solids (TSS).

Mercury was measured at RNZD-1 and RNZD-3 in August of 2014. The mercury level at RNZD-1 was 0.07 mg/kg. The detected level at RNZD-3 was 0.08 mg/kg. According to the Environmental Protection Agency, the maximum contaminant level goal (MCLG) for mercury is 0.002 mg/L for safe drinking water.

PCBs were also measured at the same time as mercury. PCBs at RNZD-1were detected at 15 micrograms (ug/kg). Levels at RNZD-3 measured at7.4 ug/kg. The EPA's MCLG for polychlorinated biphenyls is 0.0005 mg/L. In the summer of 2015, the City of Herrin released a fish advisory warning stating that carp of all sizes should not be eaten because of contamination from PCBs. However, while contaminated by PCBs, channel catfish can be eaten once a month.

Table 35 - Herrin Old Lake (IL_RNZD), RNZD-1 Sample Results

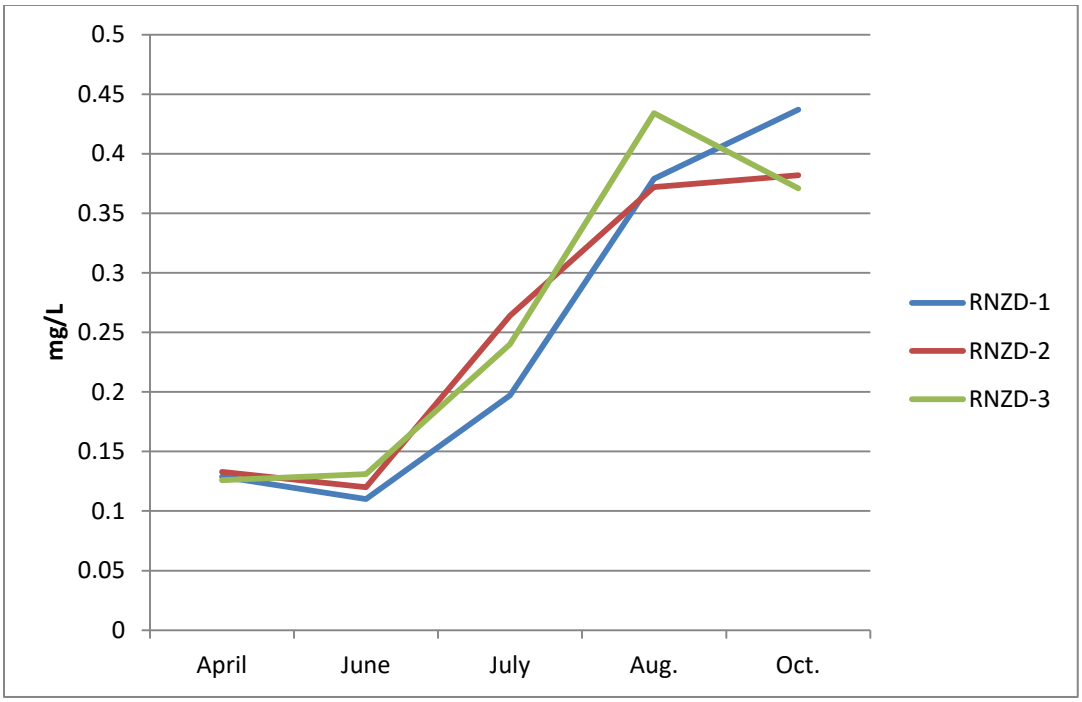
RNZD-1						
Analyte	Units	April	June	July	Aug.	Oct.
Phosphorus (1 ft. sample depth)	mg/L	0.129	0.11	0.197	0.379	0.437
Total Suspended Solids (TSS) (1 ft. sample depth)	mg/L	7	10	12	28	26
Phosphorus (10 ft. sample depth)	mg/L	0.195	0.865	0.434	2.08	-
Total Suspended Solids (TSS) (10 ft. sample depth)	mg/L	8	11	8	8	-

Source: IEPA, Surface Water Section

Phosphorus and Total Suspended Solids (TSS) were sampled at each site. Samples from RNZD-1 included two samples of each analyte at depths of one foot and ten feet. Samples from all other sites were measured at just one foot in depth. Table 36 displays the results from the 2014 samples taken from RNZD-1.

Phosphorus readings from all three sites are displayed in Figure 31. Results from all sites remain consistent. Levels of phosphorus tend to be lower in late spring and early summer, and gradually increase as summer extends into the autumn months. The October reading at RNZD-1 represents the highest level of phosphorus detected at Herrin Old Lake at 0.437 mg/L.

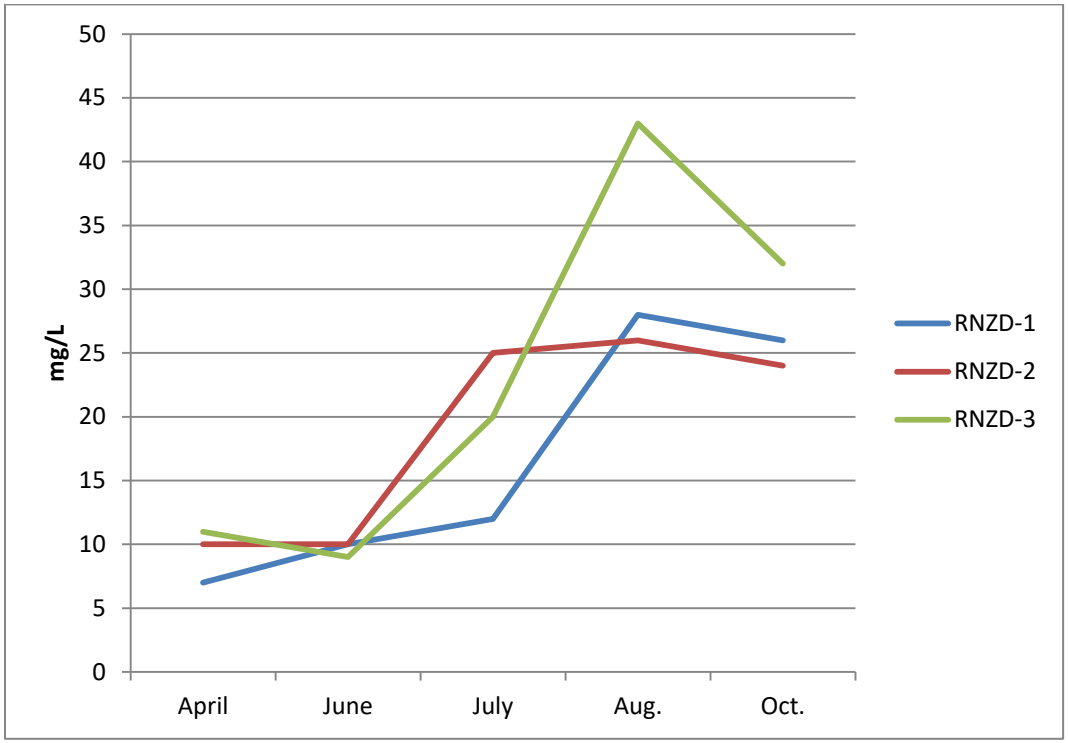
Figure 31 - Herrin Old Lake, RNZD-1 Phosphorus Sample Results



Source: IEPA, Surface Water Section

Total Suspended Solids also follow the same trend as phosphorus levels. However, they generally level off around mid-summer. The only exception is RNZD-3 which had a spike in TSS levels in August. This also represents the highest level of TSS at 43 mg/L. These results can be seen in Figure 32. Sample results for all sites and depths are displayed in tabular form in Table 36.

Figure 32 - Herrin Old Lake TSS Sample Results



Source: IEPA, Surface Water Section

Table 36 - Herrin Old Lake Sample Results

Analyte	RNZD-1						RNZD-2					RNZD-3				
	Units	April	June	July	Aug.	Oct.	April	June	July	Aug.	Oct.	April	June	July	Aug.	Oct.
Phosphorous (1 ft. sample depth)		0.129	0.11	0.197	0.379	0.437	0.133	0.12	0.264	0.372	0.382	0.126	0.131	0.24	0.434	0.371
Total Suspended Solids (TSS) (1 ft. sample depth)	mg/L	7	10	12	28	26	10	10	25	26	24	11	9	20	43	32
Phosphorous (10 ft. sample depth)	mg/L	0.195	0.865	0.434	2.08	-	-	-	-	-	-	-	-	-	-	-
Total Suspended Solids (TSS) (10 ft. sample depth)	mg/L	8	11	8	8	-	-	-	-	-	-	-	-	-	-	-

Source: IEPA, Surface Water Section

2.8.4 Local Water Quality Assessment

To address water quality at the local level, an assessment has been completed for the six villages and cities within the Hurricane Creek watershed. This assessment was designed to review the latest annual water quality reports submitted by the local municipalities. All jurisdictions purchase treated water through the Rend Lake Inter-City Water System. The Rend Lake report has also been utilized for this assessment.

Each municipality is required to test certain organic and inorganic contaminants. Regulated contaminants consist of: Lead, Copper, Chlormines, Halocetic Acids, and Total Trihalomethanes. The following key represents the factors used in each water quality report:

> **Action Level (AL):** The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
>
> **Maximum Contaminant Level Goal (MLCG)**: The level of a contaminant in drinking water below which there is no known or expected risk to health. MLCCGs allow for a margin of safety.
>
> **Maximum Contaminant Level (MCL):** The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MLCGs as feasible using the best available treatment technology.
>
> **ppb:** Micrograms per liter or parts per billion- or one ounce in 7,350,000 gallons of water.
>
> **ppm:** Milligrams per liter or parts per million- or one ounce in 7,350 gallons of water[46]

[46] Leonard Killman. *Rend Lake Inner-City Water System.* Rend Lake Conservancy District, 2014. PDF File.

Table 37 displays the 2014 water quality reports for lead and copper. The Villages of Colp and Energy test for lead and copper on a three-year cycle. They are absent from the 2014 data being presented for lead and copper because they were last tested in 2013. All municipalities have a MCLG of 1.3 ppm. Action Levels are also set at 1.3 ppm for each municipality. According to the water quality reports, no jurisdiction was in violation of lead or copper levels. Likely sources of lead consist of corrosion of household plumbing systems, and erosion of natural deposits. Sources of copper include erosion of natural deposits, leaching from wood preservatives, and corrosion of household plumbing materials.

Table 37 - Municipal Water Quality, Lead and Copper Information

Municipality	Contaminants	MCLG	Action Level (AL)	90th percentile	Sites Over Lead AL	Units	Violation	Likeley Source of Contamination
Cambria	Lead	0	15	0	0	ppb	N	Corrosion of Household plumbing systems
	Copper	1.3	1.3	0	0	ppm	N	Erosion of Natural Deposits
Carterville	Lead	0	15	3.9	1	ppb	N	Corrosion of Household plumbing systems, Erosion of natural deposits
	Copper	1.3	1.3	0.083	0	ppm	N	Erosion of Natural Deposits, Leaching from wood preservatives, corrosion of household plumbing materials
Crainville	Lead	0	15	1	0	ppb	N	Corrosion of Household plumbing systems, Erosion of natural deposits
	Copper	1.3	1.3	0.04	0	ppm	MN	Erosion of Natural Deposits, Leaching from wood preservatives, corrosion of household plumbing materials
Herrin	Lead	0	15	2.8	0	ppb	N	Corrosion of Household plumbing systems, Erosion of natural deposits
	Copper	1.3	1.3	0.047	0	ppm	N	Erosion of Natural Deposits, Leaching from wood preservatives, corrosion of household plumbing materials

Source: Villages of Cambria, Crainville, Cities of Carterville, Herrin

Along with lead and copper, other regulated contaminants that are reported are chloramines, halocetic acids and total trihalomethanes. The source of chloramines is likely a water additive used to control microbes. Halocetic acids and trihalomethanes seem to be by-products of drinking water disinfection. Information of these contaminants can be found in Table 38. All municipalities are within the limits for each contaminant, and no violations have occurred.

2.8.5 Herrin Water Quality Report

Complementing the standard regulated contaminant report is the Unregulated Contaminant Monitoring Rule for the City of Herrin. The City of Herrin defines unregulated contaminants as, "contaminants for which the EPA has not established drinking water standards. The purpose of unregulated contaminant monitoring is to assist EPA in determining the occurrence of unregulated contaminants in drinking water and whether future regulation is warranted. A maximum contaminant level (MCL) for these substances have not been established by either state or federal regulations, nor has mandatory health effects language."[47] The City of Herrin is the only municipality in the watershed that integrates this component into their annual reports. Figure 33 contains information on the contaminants, amounts, ranges, and typical sources.

[47] Stephen K. Phillips. *Herrin Annual Drinking Water Quality Report.* City of Herrin: Herrin Water Department, 2014. PDF File.

Figure 33 - City of Herrin Unregulated Contaminants

City of Herrin Unregulated Contaminant Monitoring Rule (UCMR3)[1]

Substance (units)	Year Sampled	Amount Detected (average)	Range of Detections (lowest – highest)	Typical Source
1,1-Dichloroethane	2014	0	0	Halogenated alkane, used as a solvent.
1,2,3-trichloropropane	2014	0	0	Halogenated alkane; used as an ingredient in paint, varnish remover, solvents and degreasing agents
1,3-butadiene	2014	0	0	Alkene; used in rubber manufacturing and occurs as a gas
1,4-Dioxane	2014	0	0	Cyclic aliphatic ether; used as a solvent or solvent stabilizer in manufacture and processing of paper, cotton, textile products, automotive coolant, cosmetics, and shampoos, cleaning agent, surface coating, and adhesive agent.
Bromochloromethane	2014	0	0	Used as a fire-extinguishing fluid, an explosive suppressant, and as a solvent in the manufacturing of pesticides.
Bromomethane	2014	0	0	Halogenated alkane; occurs as a gas, and used as a fumigant on soil before planting, on crops after harvest, on vehicles and buildings, and for other specialized purposes
Chlorate	2014	430 ppb	260 – 600 ppb	Agricultural defoliant or desiccant; disinfection byproduct; and used in production of chlorine dioxide.
Chlorodifluoromethane	2014	0	0	Chlorofluorocarbon; occurs as a gas, and used as a refrigerant, as a low-temperature solvent, and in fluorocarbon resins, especially tetrafluoroethylene
Chromium	2014	0.84	0.84	Naturally occurring element; used in making steel and other alloys; used for chrome plating, dyes, and pigments, leather tanning, and wood preservation
Chromium 6 (ppb)	2014	0.94	0.88 – 0.99 ppb	Naturally occurring element; used in making steel and other alloys; used for chrome plating, dyes, and pigments, leather tanning, and wood preservation.
Cobalt	2014	0	0	Naturally-occurring element found in the earth's crust and at low concentrations in seawater, and in some surface and ground water; cobaltous chloride was formerly used in medicine and as a germicide
Molybdenum	2014	1.5 ppb	1.4 – 1.6 ppb	Naturally-occurring element found in ores and present in plants, animals, and bacteria; commonly used form molybdenum trioxide used as a chemical reagent.
Perfluorobutanesulfonic acid (PFBS)	2014	0	0	Manmade chemical; used in products to make them stain, grease, heat and water resistant
Perfluoroheptanoic acid (PFHpA)	2014	0	0	Manmade chemical; used in products to make them stain, grease, heat and water resistant
Perfluorohexanesulfonic acid (PFHxS)	2014	0	0	Manmade chemical; used in products to make them stain, grease, heat and water resistant
Perfluorononanoic acid (PFNA)	2014	0	0	Manmade chemical; used in products to make them stain, grease, heat and water resistant
Perfluorooctanesulfonic acid (PFOS)	2014	0	0	Surfactant or emulsifier; used in fire-fighting foam, circuit board etching acids, alkaline cleaners, floor polish, and as a pesticide active ingredient for insect bait traps; U.S. manufacture of PFOS phased out in 2002; however, PFOS still generated incidentally
Perfluorooctanoic acid (PFOA)	2014	0	0	Perfluorinated aliphatic carboxylic acid; used for its emulsifier and surfactant properties in or as fluoropolymers (such as Teflon), fire-fighting foams, cleaners, cosmetics, greases and lubricants, paints, polishes, adhesives and photographic films
Strontium	2014	74 ppb	68 – 80 ppb	Naturally-occurring element; historically, commercial use of strontium has been in the faceplate glass of cathode-ray tube televisions to block x-ray emissions.
Vanadium	2014	0.69 ppb	0.58 - 0.77 ppb	Naturally-occurring elemental metal; used as vanadium pentoxide which is a chemical intermediate and a catalyst.

Source: City of Herrin

Table 38 - Municipal Water Quality, Other regulated Contaminants

Municipality	Contaminants	Highest Level Detected	Range of Levels Detected	MCLG	MCL	Units	Violation	Likeley Source of Contamination
Cambria	Chloramines	2.9	2.0-3.0	MRDLG=4	MRDL=4	ppm	N	Water additive used to control microbes
	Halocetic Acids	16	13.9-22.0	N/A	60	ppb	N	By-product of drinking water chlorination
	Chlorite	0.52	.24-.52	0.8	1	ppm	N	By-product of drinking water chlorination
	Total Trihalomethanes	36	24.1-51.8	N	80	ppb	N	By-product of drinking water chlorination
Carterville	Chloramines	3	1.2-2.9	MRDLG=4	MRDL=4	ppm	N	Water additive used to control microbes
	Halocetic Acids	21	14.8-26.5	No goal	60	ppb	N	By-product of drinking water disinfection
	Total Trihalomethanes	34	19.65-48	No goal	80	ppb	N	By-product of drinking water disinfection
Crainville	Chloramines	2.6	2.0-3.0	MRDLG=4	MRDL=4	ppm	N	Water additive used to control microbes
	Halocetic Acids	21	15-23.1	N/A	60	ppb	N	By-product of drinking water chlorination
	Total Trihalomethanes	40	22.6-64.52	N/A	80	ppb	N	By-product of drinking water chlorination
Colp	Chloramines	2.2	2.1-2.33	MRDLG=4	MRDL=4	ppm	N	Water additive used to control microbes
	Halocetic Acids	14	7.1-22.2	No goal	60	ppb	N	By-product of drinking water disinfection
	Total Trihalomethanes	36	24.5-52.5	No goal	80	ppb	N	By-product of drinking water disinfection
Energy	Chloramines	2	1.7-2.15	MRDLG=4	MRDL=4	ppm	N	Water additive used to control microbes
	Halocetic Acids	18	11.2-24.8	No goal	60	ppb	N	By-product of drinking water disinfection
	Total Trihalomethanes	34	22-44.4	No goal	80	ppb	N	By-product of drinking water disinfection
Herrin	Chloramines	3.4	1.0-3.4	MRDLG=4	MRDL=4	ppm	N	Water additive used to control microbes
	Halocetic Acids	24	6.7-30.2	No goal	60	ppb	N	By-product of drinking water disinfection
	Total Trihalomethanes	37	20.45-54.51	No goal	80	ppb`	N	By-product of drinking water disinfection

Source: Villages of Cambria, Colp, Crainville, Energy. Cities of Carterville, Herrin

2.8.6 Rend Lake Inter-City Water System

As stated previously, all municipalities within the Hurricane Creek watershed purchase water through the Rend Lake Inter-City Water System. According to the Source Water Assessment of the Rend Lake Annual Drinking Water Quality Report, "Rend Lake is utilized by the Rend lake Intercity Water System to provide water to 67 communities in Williamson, White, Saline, Perry, Jefferson, Jackson, Hamilton, and Franklin Counties. This facility draws water from Rend Lake through on surface water intake (IEPA #70290). The supply provides approximately 15 million gallons per day to 67 satellite supplies with an estimated population of 173,000 persons."[48]

The water report includes the parameters from the previous municipal water quality reports identified as regulated contaminants. In addition, inorganic contaminants were also reported. This category includes substances such as: barium, arsenic, fluoride, nitrate (measured as nitrogen), and sodium. Radioactive contaminants and synthetic organic contaminants are also measured. Elements tested in these categories are radium and atrazine, respectively. Results are displayed in Table 39.

The contaminants in all categories are within the regulated range designated by the EPA. Therefore, no violations have occurred. Similar to the municipal sources of contamination, the regulated contaminants are likely caused by by-products of drinking water chlorination and water additives used to control microbes.

The sources of contamination of the inorganic contaminants differ somewhat. Possible causes of barium include: discharge of drilling waste, discharge from metal refineries, and erosion of natural deposits. While arsenic, fluoride and sodium are also characterized by erosion of natural deposits, there are a few differences. Likely sources of arsenic also include runoff from orchards and runoff from electronics production waste. Possible sources of fluoride include leaching from septic tanks and sewage.

The presence of the synthetic organic substance atrazine is possibly due to runoff from fertilizer used on row crops.

[48] Killman, *Rend Lake,* 2014.

Table 39 - Rend Lake Inter-City Water System 2014 Water Quality Report

Regulated Contaminants	Highest Level Detected	Range of Levels Detected	MCLG	MCL	Units	Violation	Likeley Source of Contamination
Total Halocetic Acids	16	13.9-22.0	N/A	60	ppb	N	By-product of drinking water chlorination
Total Trihalomethanes	36	24.1-51.8	N/A	80	ppb	N	By-product of drinking water chlorination
Chlorite	0.52	.24-.52	0.8	1	ppm	N	By-product of drinking water chlorination
Chloramines	2.9	2.0-3.0	MRDLG=4	MRDL=4	ppm	N	Water additive used to control microbes
Inorganic Contaminants	-	-	-	-	-	-	-
Barium	0.0135	.0135-.0135	2	2	ppm	N	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Arsenic	1	1.12-1.12	0	10	ppb	N	Erosion of natural deposits; runoff from orchards; runoff from electronics production waste
Flouride	0.9	.876-.876	4	4	ppm	N	Erosion of natural deposits; water additive which promotes strong teeth; fertilizer discharge
Nitrate (measued as nitrogen)	0.113	0.113-0.113	10	10	ppm	N	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits
Sodium	21	20.6-20.6	-	-	ppm	N	Erosion from naturally occuring deposits
Radioactive Contaminants	-	-	-	-	-	-	-
Combined Radium 226/228	0.26	.26-.26	0	5	pCl/L	N	Erosion of naturally ocurring deposits
Synthetic Organic Contaminants	-	-	-	-	-	-	-
Atrazine	0.41	0-0.41	3	3	ppb	N	Runoff from fertilizer used on row crops

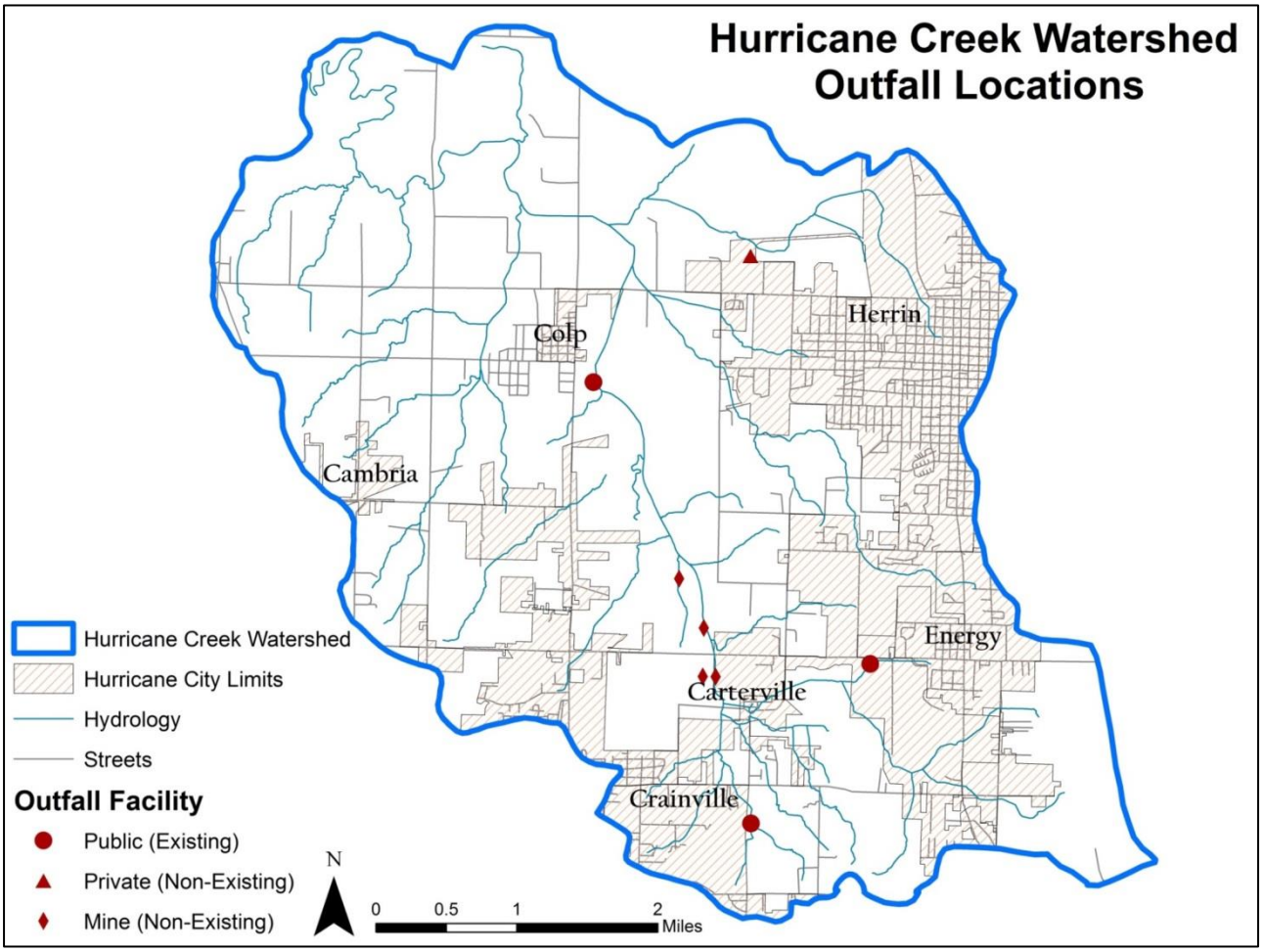
Source: Rend Lake Conservancy District

2.8.7 Outfall Locations

There are three existing outfall locations within the Hurricane Creek watershed. These are all outfalls from municipal sewage treatment plants. Outfalls for the Village of Colp and the City of Crainville rest along the Hurricane Creek. The Outfall for the Village of Energy lies a mile east of the Hurricane Creek. Locations of these outfalls are displayed in Figure 34. Outfalls for the other muncipalities within the Hurricane Creek watershed are outside the watershed jurisdiction.

Along with the municipal outfalls, private discharges and mine operated outfalls have occurred in the Hurricane Creek watershed recently, but have become non-operational. Private outfalls include United Tech Auto in the northeast portion of the watershed. This company has ceased operations.

Figure 34 - Hurricane Creek Watershed Outfall Locations



There are four non-operational mining outfalls. The Williamson Coal Company had three outfalls which were positioned along the Hurricane Creek west of the City of Carterville. These have been non-operational since the mine's closing in the early 2000s.

The remaining outfall was owned by a mining operation known as Jader Fuel Company- Ace Diggin Mine. This outfall discharged at an unnamed pond less than 250 yards west of the Hurricane Creek. These outfalls are also depicted in Figure 8.2. Discharges from mining operations may have contributed to the levels of arsenic, cadmium and nickel found in the Hurricane Creek.

2.8.8 Pollutant Load Analysis

The Spreadsheet Tool for Estimating Pollutant Load (STEPL) modeling tool developed by Tetra Tech, Incorporated for the U.S. Environmental Protection Agency Office of Water was used to estimate the existing nonpoint source nutrient loads (nitrogen & phosphorus) and sediment loads from Hurricane Creek watershed as a whole and by individual Subwatershed Management Units (SMU).

STEPL uses land cover category types, precipitation data, soils information, existing best management practices, and other data input. The following table identifies estimates of current pollutant loads by source and land use type for the Hurricane Creek watershed.

The STEPL model can also utilizes other available data through the online STEPL preparation webpage. This generates numbers for agricultural animal counts, and data associated with septic systems. Since these numbers can only be generated at the watershed level, and not the sub-watershed level, these were not utilized.

The model estimations suggest cropland and pastureland account for nearly 50 percent of the total nitrogen load, while pastureland individually constitutes the largest portion at approximately 30 percent. Groundwater has been added to the model and calculates to be almost 11 percent of the nitrogen load. The majority of phosphorus load stems from agriculture (cropland and pasture), accounting for

nearly 52 percent of the phosphorus load. Developed areas again contribute a large amount of the nutrient load at 24 percent. At 40 percent, streambank and shoreline is the main contributor to the total sediment load in the Hurricane Creek watershed. While urban development plays a small role (around 6 percent), cropland is the second highest land use category contributing to the total sediment load at 36 percent.

Table 40 - Hurricane Creek Watershed Estimated Pollutant Loads

Source	N Load (lb/yr)	Percent of Total Load	P Load (lb/yr)	Percent of Total Load	Sediment Load (tons/yr)	Percent of Total Load
Urban	42879.22	28.92%	6628.33	24.11%	984.24	6.23%
Cropland	30825.17	20.79%	8977.75	32.66%	5656.27	35.81%
Pastureland	44021.10	29.69%	5380.93	19.58%	2096.12	13.27%
Forest & Grassland	2548.54	1.72%	1198.67	4.36%	205.43	1.30%
Groundwater	16125.60	10.88%	728.70	2.65%	0.00	0.00%
Streambank/Shoreline	10052.71	6.78%	3870.29	14.08%	6283.00	39.78%
Other	1823.11	1.23%	701.90	2.55%	569.72	3.61%
Total	**148275.45**		**27486.57**		**15794.78**	

Source: EPA-STEPL

2.8.9 Sub-watershed Pollutant Loads

Sub-watersheds were also individually modeled in STEPL. Pollutant loads reflect the dominant land use categories and size of each sub-watershed. Results of the sub-watershed STEPL model can be seen in Table 41.

Because of its size, SMU 3 (Upper Hurricane Creek Sub-watershed) exhibits the most nutrient and sediment loads for the Hurricane Creek watershed. The nitrogen loads for SMU 3 account for 41 percent of the total loading. With 10,850 pounds of phosphorus loads per year, SMU 3 also makes up 39 percent of the total watershed phosphorus load. 36 percent of the sediment load is also made up from SMU 3. These high rates of nutrients and sediment are possibly contributed from the sub-watershed's high concentrations of urban areas, agriculture, and amount of stream networks including 28,912 feet of Hurricane Creek alone.

These numbers are also reflected by SMU 4 (Herrin sub-watershed), which also displays high rates of urbanization.

Table 41 - Sub-watershed Estimated Existing Pollutant Loads

Sub-watershed	Size (acres)	N Load (lb/yr)	N Load (lb/yr)/ Acre	P Load (lb/yr)	P Load (lb/yr)/ Acre	Sediment Load (t/yr)	Sediment Load (t/yr)/ Acre
SMU1	2608	23670	9.08	5247.4	2.01	4208.6	1.61
SMU2	2407	19556.2	8.12	3058.3	1.27	1667.2	0.69
SMU3	7251	61761.3	8.52	10850	1.50	5740.6	0.79
SMU4	4323	43288	10.01	8330.9	1.93	4178.2	0.97
Total	**16589**	**148275.5**	**35.73**	**27486.6**	**6.71**	**15794.6**	**4.06**

Source: EPA-STEPL

2.8.10 Pollutant Load Reduction Targets

According to the Illinois Integrated Water Quality Report, there are several known and potential causes and sources of water pollution in the Hurricane Creek watershed. The following table summarizes the causes and sources based on the Illinois Integrated Water Quality Report and other factors identified in this inventory and assessment.

Table 42 - Causes and Sources of Watershed Impairments

Causes of Impairment	Possible Sources of Impairment
Nutrients: (nitrogen and phosphorus)	Agricultural row-cop runoff
	Residential and commercial fertilizer use
	Failing septic systems
	Streambank erosion
	Urban runoff
Sediment	Crop production
	Streambank erosion
	Development sites
	Urban runoff/ Storm sewers
Low dissolved oxygen	Heated stormwater runoff from urban areas
	Lack of natural riffles in channelized stream reaches

Source: IEPA Illinois Integrated Water Quality Report and 303(d) Lists

Knowing agricultural practices and urban runoff contribute the majority of pollutant loads in the Hurricane Creek Watershed, BMPs should focus on addressing those issues. BMPs are further discussed in the following chapter. However, existing pollutant loads and BMP load reductions have been utilized to estimate annual pollutant load reduction targets, or needed load reductions for Hurricane Creek watershed and its sub-watersheds. Examples of recommended BMPs include streambank and shoreline stabilization, filter strips, and porous pavement. The summary of pollutant load reduction targets can be found in Table 43.

The summary suggests that nitrogen loading should be reduced by about 15 percent for the Hurricane Creek watershed. This accounts for a reduction of around 22,421 pounds of nitrogen per year. Other suggestions for the watershed-wide model include a reduction of phosphorus at 40 percent, and reduction of sediment at 45 percent.

Table 43 - Summary of Pollutant Load Reduction Targets

Watershed	Nitrogen Load Reduction Target (lbs)	Nitrogen (percent reduction)	Phosphorus Load Reduction Target (lbs)	Phosphorus (percent reduction)	Sediment Load Reduction Target (tons)	Sediment (percent reduction)
Hurricane Creek	22241	15.0%	10994	40.0%	7107	45.0%
Sub-watershed Load Reduction Targets						
SMU 1	4680	21.0%	2379	21.6%	1526	21.5%
SMU 2	4099	18.4%	2201	20.0%	1322	18.6%
SMU 3	7600	34.2%	3460	31.5%	2246	31.6%
SMU 4	5862	26.4%	2954	26.9%	2013	28.3%
Total	**22241**		**10994**		**7107**	

As mentioned previously, load reduction targets are measured by the individual load reductions from site-specific and watershed-wide BMPs suggested in this plan. Information on BMPs can be seen in Chapter 3.

The sediment reduction percentages for the sub-watersheds remain high, correlating with their individual stream network. This is particularly evident in SMU 1 and SMU 3 where Hurricane Creek is present. Suggested nitrogen reduction in SMU 3 is the largest at 34.2 percent. At 31.5 percent, SMU 3 also represents the largest reduction target for phosphorus. These large rates for reduction are needed considering agriculture and development accounts for over two thirds of the sub-watershed's land use.

3. Best Management Practices and Pollutant Load Reductions

3.1 Best Management Practices (BMPs)

For the Hurricane Creek Watershed-based Plan, BMPs have been separated into watershed-wide (WW) and site-specific classes. There are a variety of practices in the plan that address the issues of stormwater and agricultural practices in the watershed. BMPs were suggested based on several factors including: need, feasibility, cost, and labor.

Pollutant load reductions have been calculated for each site-specific practice by implementing the STEPL Region 5 Model. Reductions were also estimated for watershed-wide BMPs. However, estimations for site-specific BMPs may be more accurate considering the variables used for those calculations pertain to a particular area.

BMPs have been arranged by general area in the following section. Along with the general area, they have also been classified by sub-watershed management unit (SMU), amount, unit, and priority ranking.

3.2 BMP Descriptions and Methodology

Each BMP type suggested in the plan has been characterized and described further by the methodology. As previously stated, management measures address the major pollutants in the watershed derived from the original pollutant loads outlined in the watershed resource inventory. These are heavily geared towards pollutant load reductions in agriculture and urban stormwater runoff.

3.2.1 Agricultural BMPs

According to the existing pollutant loads derived from the STEPL model, agricultural practices (cropland/pastureland) account for 53.67 percent of the

total nitrogen load, 61.67 percent of the total phosphorus load, and 83.6 percent of the total sediment load in the watershed. With the agricultural pollutant loading being so substantial, there is little doubt on why so many of the BMPs are focused on addressing cropland and pastureland. Figure 3.1 displays various agricultural BMPs.

Agricultural Filter Strips

Agricultural filter strips protect water quality by naturally filtering nutrients and sediment. Since Hurricane Creek is impaired by sedimentation, this BMP is effective in reducing the pollutant loads into the waterbody. Nearly 50 percent of Hurricane Creek is within 300 yards of agricultural land alone. With the amount of agricultural runoff taking place at these specific locations, agricultural filter strips are particularly effective in reducing pollutant loads. Pollutant load reductions were generated in STEPL assuming BMP efficiencies of: 65 percent sediment reduction; 75 percent phosphorus reduction; and 70 percent nitrogen reduction. The model also takes Universal Soil Loss Equation (USLE) or the Revised USLE (RUSLE) parameters into consideration. These are specific for the geographic area. Unless otherwise noted, all agricultural BMPs follow the same BMP efficiency model.

Figure 35 - Example of Agricultural BMPs

Source: USDA NRCS, Ohio

Conservation Tillage

Conversation tillage can include mulch-till, no-till, or strip-till practices. These forms of conservation tillage usually leave a residual of the previous layer of

crops. Each method varies in practice, but the benefits are usually consistent with the others. Major benefits of implementing some form of conservation tillage include a reduction in soil erosion, and improved water quality.

Cover Crops

Cover crops provide benefits to agricultural land by improving water quality and reducing erosion. These are usually planted following seasonal harvests. The Hurricane Creek Watershed already exhibits some form of cover crops. They represent nearly eight percent of the 6,030 acres of agricultural land in the watershed; 11.7 acres of winter wheat, 5.7 acres of winter wheat/ corn, and 454.5 acres of winter wheat/ soybeans.

Grassed Waterways

Grassed waterways aid in preventing erosion in areas prone to consistent water flow. They can also serve as a filtering mechanism for nutrients. Compared to surrounding areas, the Hurricane Creek Watershed has very few areas that implement this practice. The parameters used in the STEPL model for grassed waterways include: soil type, top and bottom width of existing gully, depth, length, and number of years to form. Since grassed waterways are very effective in addressing erosion and nutrients, the BMP efficiency used in the pollutant load reduction models was set at 1 (100 percent efficiency). Implementation of grassed waterways is assuming at least a 25 foot width per gully.

No Mow Pastures

Low mow, or no mow pastures, can provide some benefits to water quality and the environment in general. These can potentially act as a natural filtering system for water runoff from pastures. A larger swath could at the very least slow the flow of stormwater. Since no mow pastures utilize the existing natural vegetation, costs are either low or non-existent.

Riparian Buffer

Riparian buffers are similar to filter strips, and have additional benefits. Like filter strips, buffers reduce sediment and nutrients by filtering the water that flows through it. Since buffers are generally larger than agricultural filters, they can reduce the flow of water at a higher pace. This is certainly beneficial for the riparian buffers along Hurricane Creek. Considering buffers can be more expensive than normal filter strips, they were suggested sparingly for the Hurricane Creek Watershed-based Plan.

3.2.2 Urban Stormwater BMPs

Urban stormwater contributes heavily to the pollutant loading in the Hurricane Creek Watershed. One third of the nitrogen load in the watershed is attributed to urban runoff. It is also responsible for nearly 30 percent of the phosphorus load, and 11 percent of the sediment load. As previously stated, BMPs were suggested based on need, feasibility, cost, and labor. Since most of the municipalities in the watershed are smaller in size and have a small population, costs for these management practices had to be considered.

The STEPL Region 5 Model considers the type and acreage of urban environment (commercial, transportation, residential, etc.) and whether the area is sewered, or unsewered. Since the municipalities in the watershed are considerably smaller than other cities in the region, the more nature-based solutions (bioswales, green roofs) are suggested sparingly. In most cases, these are considered pilot projects and the first of their kind for the municipalities.

Bioswale

Bioswales act as a filter for stormwater nutrients. Swales are effective in trapping sediment and other nutrients before releasing the water flow into other areas. Depending on the contributing area for the practice, bioswales are generally a suitable structure to reduce total suspended solids.

Detention/ Retention Basin

For the purpose of reducing flooding, detention basins have been proposed for the plan. While these already exist in some areas of the watershed, developing new basins will mitigate future flooding occurrences in areas prone to the back-up of water flow. Figure 36 displays a detention basin north of the City of Carterville, IL, located in the Hurricane Creek Watershed. This particular basin is adjacent to farmland which also utilizes grassed waterways.

Figure 36 - Detention Basin North of Carterville, IL

Green Roof

Along with providing reduced energy costs, green roofs can also provide some environmental benefits including a reduction of stormwater runoff. While the construction of a green roof might immediately be costly, improved energy efficiency would negate the cost over a period of time. For the Hurricane Creek Watershed, green roofs could also be used as an educational tool, providing a possible environment for sustainability and natural-based solutions to infrastructure.

No Spray Zone (NSZ)

As its name implies, these areas would implement a no spray, or reduced spray, approach to fertilizer use and other chemical use for a particular space. Among other nutrients, this would reduce the amount of nitrogen and phosphorus in

runoff. While this approach could be used at a residential and commercial level, golf courses could also implement the strategy considering they contribute massive amounts of nutrients from fertilizers and other chemicals. This is specifically evident at the Pine Lakes Golf Course adjacent to Herrin Old Lake in Herrin.

Porous/ Permeable Pavement

Considering nearly 30 percent of the Hurricane Creek Watershed exhibits 10 percent or more impervious surfaces, porous and permeable pavement has been suggested as an option to reduce nutrient loads from stormwater runoff. Unlike normal pavement, permeable surfaces act to reduce larger volumes of stormwater across a specific site, and subsequently, limit the advancement of nutrients. This is also helpful in limiting other contaminants from vehicles.

Rain Barrels/ Rain Gardens

Rain gardens and barrels are cost effective measures in reducing stormwater runoff, notably at the residential level. Rain barrels capture stormwater runoff from a downspout, usually storing water for later use. Rain gardens have the potential to store excess runoff from urban environments. While they can

Figure 37 - Rain Barrel

Source: Eliana Brown, Illinois Water Resources Center

provide environmental benefits, they can also have an aesthetic value. While load reductions were calculated using the STEPL model, it would be worth designing a better model to more accurately assess the effectiveness of these management measures.

Runoff Filtration System

Along with filter strips and no spray zones, a filtering device could be implemented in reducing runoff to Herrin Old Lake from Pine Lakes Golf Course. The device would likely use steel slag to absorb excess phosphorus. This approach is based on a design constructed at the Stillwater Country Club in Stillwater, OK.[49] The device led to a 25 percent reduction of phosphorus over an 8 month period. A reduction of nutrients in Herrin Old Lake is important because of the increased levels of phosphorus which have led to multiple harmful algal blooms (HAB) in the previous years.

Vegetated Filter Strip

Vegetated filter strips act much like an agricultural filter strip, but for more urban areas. As its name implies, these BMPs filter nutrients and sediment in stormwater runoff. If using natural vegetation, filter strips can be a cost-effective strategy in reducing nutrient loads.

3.2.3 Waterbody BMPS

While other BMPs previously suggested have focused on agriculture and urban areas, it is important to recommend management measures that can immediately affect waterbodies. These management practices deal with both agriculture and urban environments.

[49] Penn et al., *Designing Structures to Remove Phosphorus from Drainage Waters.* Stillwater, OK: OSU, November, 2013. http://articles.extension.org/pages/67669/designing-structures-to-remove-phosphorus-from-drainage-waters (accessed January-August 2016)

Debris Removal

Many areas in the Hurricane Creek Watershed exhibit some form of blockages. This is certainly evident in some segments of Hurricane Creek. While this is sometimes overlooked, it can be detrimental to the health of a stream or lake. Depending on the flow, a blockage can alter the stream channel and cause erosion on the streambank. Areas with major blockages can also exhibit flooding.

Figure 38 - Minor Debris Along Hurricane Creek

Shoreline and Streambank Stabilization

Varying degrees of erosion occur on all waterbodies. This is particularly evident in Hurricane Creek and Herrin Old Lake. Stabilization of shorelines and streambanks is important to reduce the progress of erosion and mitigate any future occurrences. Stabilization measures can also reduce nutrient loads from runoff.

Figure 39 – Streambank Stabilization Technique (Before and After)

Source: Delta Conservation District

The Region 5 Model uses various parameters to estimate load reductions for shoreline and streambank stabilization. Soil, length and height are components included in the model. Lateral recession rates (LRR) are also used in determining the effectiveness of stabilization. Table 44 displays the modified LRR characterization used in the STEPL Region 5 Model.

Table 44 - Modified Lateral Recession Rate Diagram in STEPL Region 5 Model

LRR (ft/yr)	Category	Description
0.01 - 0.05	Slight	Some bare bank but active erosion not readily apparent
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
0.5+	Very Severe	Bank is bare with gullies and severe vegetative overhang

Source: EPA, IEPA

For consistency, LRRs used for streambank and shoreline stabilization were set at: Slight (0.05), Moderate (0.2), Severe (0.5), and Very Severe (0.8). Efficiency parameters were set at 1 (100 percent efficiency). In most cases, this strategy was used for both banks of a reach unless otherwise noted.

Sediment Reduction Channels

These would serve to temporarily slow the flow of streams and allow sediment to drop more easily. Stone would be placed in specific reaches to allow sediment to be retained. Sites would likely be chosen by rate of flow.

For more information regarding best management practices, the Illinois Urban Manual[50] and NRCS Field Office Technical Guides[51] can be consulted. The Illinois Urban Manual is provided by the Association of Illinois Soil and Water Conservation Districts (AISWCD). It details BMPs, specifically in relation to soil erosion and sediment control, and stormwater management. The NRCS Field Office Technical Guides offer information on BMPs and conservation efforts in particular areas state-wide and at the county level.

3.3 BMP Recommendations

3.3.1 Watershed-wide BMPs

As previously stated, BMPs suggested in the plan are separated into watershed-wide and site-specific categories. Table 45 displays the watershed-wide BMPs, amount, and their estimated load reductions. Proposed ordinances are also found in this table. While ordinances can certainly have a positive effect on stormwater runoff and other watershed issues, estimating their effectiveness is not possible for this plan.

Watershed-wide BMPs include: bioswales, conservation tillage, cover crops, green roofs, no mow pastures, porous pavement, rain barrels, rain gardens, and streambank stabilization. Load reductions are symbolized by N (Nitrogen), P (Phosphorus), TSS (Total Suspended Solids), BOD (Biological Oxygen Demand), and COD (Chemical Oxygen Demand).

For the agricultural watershed-wide BMPs, a suggestion of a five percent of land to implement conservation tillage, cover crops, and no mow pastures has been

[50] For more information regarding the Illinois Urban Manual please contact your local Soil and Water Conservation office, or visit http://www.aiswcd.org/illinois-urban-manual/.
[51] For more information regarding the NRCS Technical Guide please contact your local NRCS office, or visit http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/fotg/.

suggested. The five percent constitutes 306.5 acres of agricultural land. In regards to nutrient load reductions, these practices seem to provide the most benefits considering the small application size.

Watershed-wide streambank stabilization was based on the extent of erosion and feasibility of the projects. The percent of streambank stabilization per reach is displayed in Table 46. Low extent of erosion leads to 15 percent of the reach becoming eligible for stabilization, moderate at 33 percent, and high being 66 percent of the reach.

Porous and permeable pavement has also been suggested as a watershed-wide BMP. A five percent reduction or conversion of impervious surfaces has been suggested. This composes around 238 acres of impervious surfaces. These would likely consist of parking areas with poor runoff and sidewalks.

With these measures, estimations for nutrient load reductions account for: nitrogen (11,837.6 lbs/yr), phosphorus (5,328.8 lbs/yr), and sediment (4,624.8 tons/yr). Other load reductions have been calculated for TSS, BOD, and COD.

Table 45 - Watershed-Wide BMPs and Load Reductions

BMP	Amount	Unit	Load Reductions- lbs/ yr (N,P, TSS, BOD, COD), ton/yr- (Sediment)					
			N	P	Sediment	TSS	BOD	COD
Bioswale	43,560	sq. feet	60	18	-	50606	695	7294
Conservation Tillage	306.5	acres	1467	786	671	-	-	-
Cover Crops	306.5	acres	1467	786	671	-	-	-
Green Roof	2	acres	17	1	-	1723	86	471
No Mow Pastures	600	acres	2377	1274	1072	-	-	-
Porous Pavement	20	acres	784	59	-	92934	-	34608
Rain Barrel	100	unit	897	163	-	40777	4077	-
Rain Garden	50	number	359	33	-	32621	-	-
Streambank Stabilization	43,349	feet	4421.6	2210.8	2210.8	-	-	-
		TOTALS:	**11849.6**	**5330.8**	**4624.8**	**218661**	**4858**	**42373**
			N	P	Sediment	TSS	BOD	COD

BOD	**BIOCHEMICAL OXYGEN DEMAND**
COD	**CHEMICAL OXYGEN DEMAND**
TSS	**TOTAL SUSPENDED SOLIDS**
TN	**TOTAL NITROGEN**
TP	**TOTAL PHOSPHORUS**

Table 46 - Watershed-wide Streambank Stabilization by Reach

Stream or Tributary Name	Reach Code	Stream Length (ft.)	Proposed Streambank Stabilization	Percent of Reach
Hurricane Creek	7140106000093	14722	4858.26	33%
Hurricane Creek	7140106000094	11959	3946.47	33%
Hurricane Creek	7140106000095	3542	2337.72	66%
Hurricane Creek	7140106000096	1980	653.4	33%
Hurricane Creek	7140106000097	11436	3773.88	33%
Hurricane Creek	7140106000098	12266	4047.78	33%
Hurricane Creek	7140106007352	3230	484.5	15%
Little Hurricane Creek	7140106000660	5080	3352.8	66%
Little Hurricane Creek	7140106000661	13010	4293.3	33%
South Herrin Tributary	7140106001217	21583	7122.39	33%
North Herrin Tributary	7140106001218	18926	6245.58	33%
Herrin Reservoir Tributary	7140106007253	994	328.02	33%
Herrin Reservoir Tributary	7140106007256	4198	1385.34	33%
Herrin Reservoir Tributary	7140106007278	3464	519.6	15%
	Totals:	**126390**	**43349**	

3.3.2 Watershed-Wide Ordinances

Though they are not necessarily deemed BMPs, watershed-wide ordinances have also been suggested as part of the plan. Since they are only suggestions, municipalities would have the opportunity to adopt, or pass their own version of each ordinance. In some cases, municipalities have already adopted something similar to the suggested ordinances. In these cases, municipalities could choose to review their current ordinance and make any improvements. The *Municipal Ordinances* subsection of this plan covers some existing ordinances in each municipality (Section 2.4.1). Suggested ordinances are available in Table 47.

Since most municipalities are only partially represented in the watershed, passing an ordinance for the entire municipality would benefit areas outside of the watershed as well. Places such as Carterville and Crainville only represent a small portion of the

watershed compared to the other percent of their municipalities excluded from the border.

Table 47 - Watershed-wide Ordinances

Ordinance	Description
Animal Waste	Owners would be responsible for proper disposal of animal waste and remains; parks would set up dog waste stations
Fertilizer Control	Fertilizer application would be used sparingly; education on fertilizer use and disposal
Stormwater Detention	Prevention of flood occurrences and hazards; prevent possible erosion; detention and retention of stormwater
Wetland Protection Areas	Development would consider designated wetland areas; existing wetlands would remain in a state of perpetuity

As previously stated, some forms of these ordinances are already in place for some of the watershed municipalities. More recently, the City of Herrin passed its own stormwater detention ordinance in the spring of 2016. It was modeled heavily after the City of Marion's stormwater ordinance. For those municipalities without a stormwater ordinance, they could either adopt something similar to this ordinance, or implement the newly created *Model Stormwater Management Ordinance*. This model was created by the Illinois Department of Natural Resources and issued in September of 2015.

While wetland protection areas are already mostly covered in the National Environmental Policy Act (NEPA) and the Clean Water Act (CWA), other wetland ordinances could offer protection for the nearly 1,468 acres of wetland in the watershed. These would likely contain a permitting, penalty, and enforcement component.

Adoptions of the various ordinances would depend on each particular municipality. The adoption phases can be viewed in Chapter 6, Implementation Schedule and Interim Milestones.

3.3.3 Site-specific BMPs

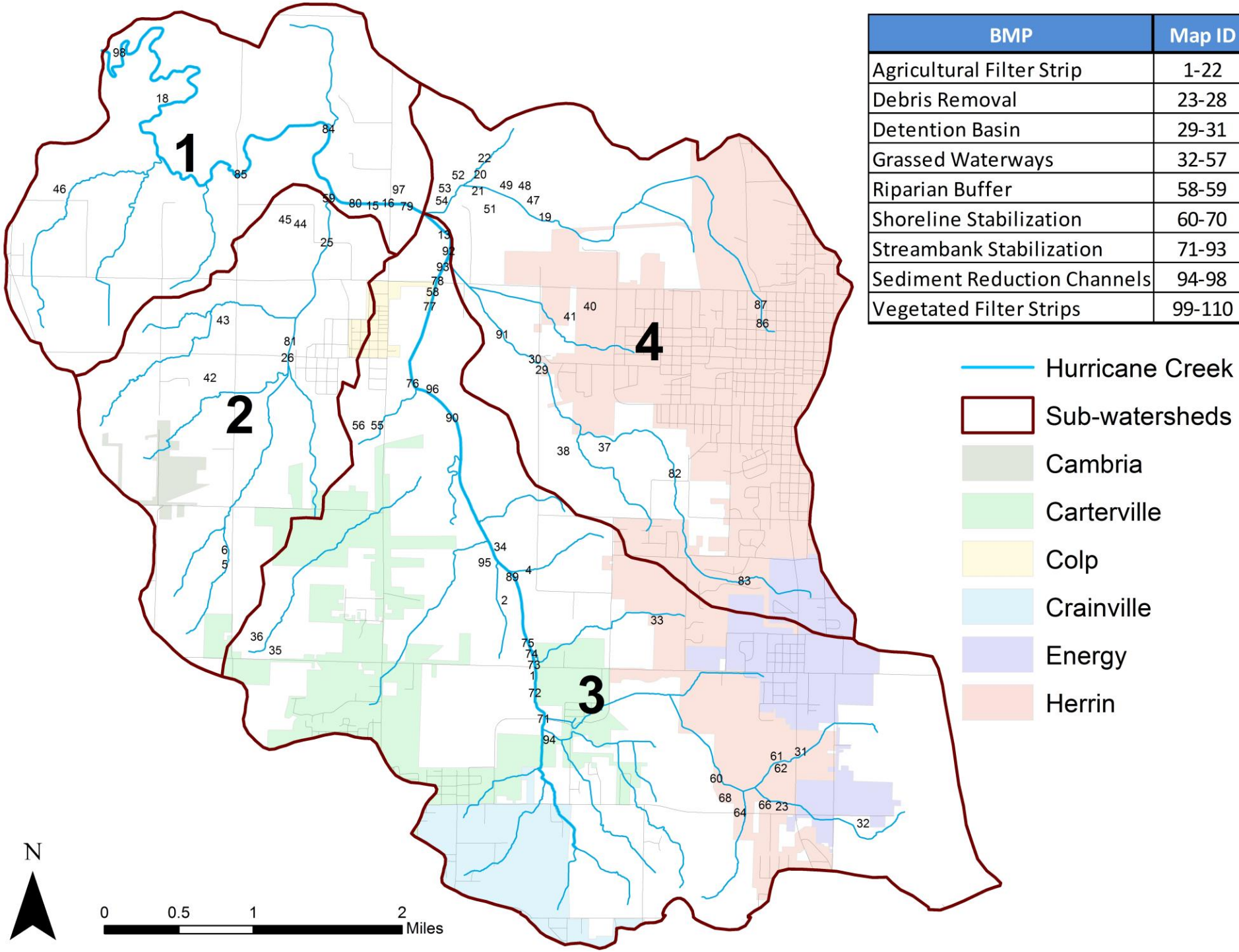
Many of the watershed-wide BMPs have also been suggested at site-specific areas. Other BMPs such as shoreline stabilization, grassed waterways, and agricultural filter strips have been recommended. Figure 38 illustrates the locations of site-specific BMPs for the Hurricane Creek Watershed by map code. Map codes are also available on the site-specific BMP load reductions in the following section.

Site-specific BMPs and load reductions are displayed by SMUs. Load reductions follow the same layout as the watershed-wide diagram. A priority ranking has also been established for each BMP. Rankings were based on various factors including factors that were previously used in establishing BMPS: need, feasibility, cost, labor, and load reductions and other benefits from the BMP. Table 48 illustrates the priority ranking IDs. These are congruent with the phases outlined in Element F of the plan (schedule for implementing nonpoint source management measures).

Table 48 - BMP Priority Index

Priority	Description
L	Low Priority
M	Medium Priority
H	High Priority

An alternate map and map codes were created for the Pine Lakes Golf Course in the City of Herrin. A detailed nutrient reduction strategy was designed for the course. Load reductions are part of the Upper Hurricane Creek (SMU 3) BMPs and Load Reductions diagram in Table 51. The map and separate load reduction table can be found in Appendix A.



BMP	Map ID
Agricultural Filter Strip	1-22
Debris Removal	23-28
Detention Basin	29-31
Grassed Waterways	32-57
Riparian Buffer	58-59
Shoreline Stabilization	60-70
Streambank Stabilization	71-93
Sediment Reduction Channels	94-98
Vegetated Filter Strips	99-110

Figure 40 - Hurricane Creek Site-specific BMPs by Map ID

Table 49 - Lower Hurricane Creek SMU (SMU 1) BMPs and Load Reductions

General Area (Contributing Area)	BMP	Map ID	Target Area (Reach Code)	Amount	Unit	Load Reductions- lbs/ yr (N,P, TSS, BOD, COD), ton/yr- (Sediment)							
						N	P	Sediment	TSS	BOD	COD	K	Priority
Hurricane Creek	Grassed Waterways	46	7140106001214	0.24	acre	26.5	13.3	13.3	-	-	-	-	M
	Agricultural Filter Strip	14	7140106000095	1.53	acre	76	41	38	-	-	-	-	L
		15	7140106000095	2.73	acre	251	134	120	-	-	-	-	M
		16	7140106000095	0.35	acre	158	85	77	-	-	-	-	M
		17	7140106000094	0.55	acre	93	50	46	-	-	-	-	L
		18	7140106000093	0.72	acre	22	12	11	-	-	-	-	L
	Streambank Stabilization	79	7140106000095	793	feet	472	236	236	-	-	-	-	H
		80	7140106000095	1682	feet	1000.8	500.4	500.4	-	-	-	-	H
		84	7140106000094	218	feet	22.4	11.2	11.2	-	-	-	-	M
		85	7140106000094	631	feet	10.8	5.4	5.4	-	-	-	-	M
		88	7140106000660	522	feet	88.8	44.4	44.4	-	-	-	-	H
	Riparian Buffer	59	7140106000660	532	acre	177	89	93	-	-	-	-	L
	Stream Channel Sediment Reduction	97	7140106000095	1	site	-	-	-	-	-	-	-	M
		98	7140106000093	1	site	-	-	-	-	-	-	-	M
					TOTALS:	**2398.3**	**1221.7**	**1195.7**	**0**	**0**	**0**	**0**	
						N	P	Sediment	TSS	BOD	COD	K	

Table 50 - Little Hurricane Creek SMU (SMU 2) BMPs and Load Reductions

General Area (Contributing Area)	BMP	Map ID	Target Area (Reach Code)	Amount	Unit	Load Reductions- lbs/ yr (N,P, TSS, BOD, COD), ton/yr- (Sediment)							
						N	P	Sediment	TSS	BOD	COD	K	Priority
Little Hurricane Creek	Streambank Stabilization	81	7140106000661	1656	feet	563.2	281.6	281.6	-	-	-	-	H
	Debris Removal	25	7140106000660	567	feet	-	-	-	-	-	-	-	L
		26	7140106000660	615	feet	-	-	-	-	-	-	-	L
	Grassed Waterways	42	7140106007134	0.46	acres	273.2	136.6	136.6	-	-	-	-	H
		43	7140106001215	0.37	acres	160	80	80	-	-	-	-	L
		44	7140106000660	0.3	acres	228.5	114.3	114.3	-	-	-	-	M
		45	7140106000660	0.6	acres	151.9	75.9	75.9	-	-	-	-	M
	Agricultural Filter Strip	5	7140106000661	1.27	acres	266	142	127	-	-	-	-	L
		6	7140106000661	2.33	acres	174	214	177	-	-	-	-	L
					TOTALS:	**1816.8**	**1044.4**	**992.4**	**0**	**0**	**0**	**0**	
						N	P	Sediment	TSS	BOD	COD	K	

Table 51 - Upper Hurricane Creek SMU (SMU 3) BMPs and Load Reductions

General Area (Contributing Area)	BMP	Map ID	Target Area (Reach Code)	Amount	Unit	Load Reductions- lbs/ yr (N,P, TSS, BOD, COD), ton/yr- (Sediment)							
						N	P	Sediment	TSS	BOD	COD	K	Priority
Herrin Reservoir	Vegetative Filter Strip	101	IL_RNZD_04	0.13	acre	3	1	-	292	12	84	-	L
		104	IL_RNZD_07	0.5	acre	5	2	-	551	15	190	-	L
		103	IL_RNZD_06	0.2	acre	4	1	-	377	13	119	-	L
		102	IL_RNZD_05	0.27	acre	3	1	-	544	7	159	-	L
		100	IL_RNZD_02	0.22	acre	36	3	-	3671	183	998	-	L
		99	IL_RNZD_03	0.58	acre	17	7	-	1846	21	763	-	H
		105	7140106007296	0.32	acre	1	0	-	102	2	36	-	L
	Debris Removal	23	IL_RNZD_04	819	feet	-	-	-	-	-	-	-	L
		24	IL_RNZD_02	333	feet	-	-	-	-	-	-	-	L
	Detention Basin	31	7140106007261	36544.92	Cu. Ft.	21	2		2381	37	210		M
	Shoreline Stabilization	60	IL_RNZD_01	434	feet	18.4	9.2	9.2	-	-	-	-	H
		62	IL_RNZD_02	360	feet	18.4	9.2	9.2	-	-	-	-	M
		61	IL_RNZD_02, 03	972	feet	9.9	5	5	-	-	-	-	H
		69	IL_RNZD_05	503	feet	8.6	4.3	4.3	-	-	-	-	H
		64	IL_RNZD_05	550	feet	28.1	14	14	-	-	-	-	H
		65	IL_RNZD_05	231	feet	98.2	49.1	49.1	-	-	-	-	H
		63	IL_RNZD_06	316	feet	64.5	32.2	32.2	-	-	-	-	H
		66	IL_RNZD_04	434	feet	4.4	2.2	2.2	-	-	-	-	M
		67	IL_RNZD_05	288	feet	2.9	1.5	1.5	-	-	-	-	M
		68	IL_RNZD_06, 07	766	feet	19.5	9.8	9.8	-	-	-	-	H
		70	IL_RNZD_07	315	feet	4.3	2.1	2.1	-	-	-	-	M
Hurricane Creek	Debris Removal	27	7140106000098	277	feet	-	-	-	-	-	-	-	L
		28	7140106000098	339	feet	-	-	-	-	-	-	-	L
	Grassed Waterways	33	7140106007224	0.31	acre	44.1	22	22	-	-	-	-	L
		34	7140106000098	0.13	acre	14.4	7.2	7.2	-	-	-	-	M
		55	7140106007120	0.56	acre	572.2	286.1	286.1	-	-	-	-	L
		56	7140106007120	0.16	acre	17.7	8.8	8.8	-	-	-	-	M
		57	7140106000096	0.35	acre	7.9	3.9	3.9	-	-	-	-	L
	Riparian Buffer	58	7140106000097	4.8	acre	155	83	75	-	-	-	-	L
	Agricultural Filter Strip	1	7140106000098	1.25	acre	220	118	106	-	-	-	-	M
		2	7140106000098	2.1	acre	142	76	69	-	-	-	-	M
		3	7140106000098	1.33	acre	59	32	29	-	-	-	-	L
		4	7140106007179	2.03	acre	220	118	106	-	-	-	-	M
		7	7140106000097	0.96	acre	76	41	38	-	-	-	-	L
		10	7140106000097	1.12	acre	41	22	21	-	-	-	-	L
		11	7140106000097	0.5	acre	93	50	46	-	-	-	-	M
		12	7140106000096	0.97	acre	41	22	21	-	-	-	-	L
		13	7140106000096	0.69	acre	76	41	38	-	-	-	-	L
					TOTALS:	**2146.5**	**1086.6**	**1015.6**	**9764**	**290**	**2559**	**0**	
						N	P	Sediment	TSS	BOD	COD	K	

Table 51 - Upper Hurricane Creek SMU (SMU 3) BMPs and Load Reductions (Cont'd)

General Area (Contributing Area)	BMP	Map ID	Target Area (Reach Code)	Amount	Unit	Load Reductions- lbs/ yr (N,P, TSS, BOD, COD), ton/yr- (Sediment)							
						N	P	Sediment	TSS	BOD	COD	K	Priority
Hurricane Creek	Streambank Stabilization	71	7140106000098	372	feet	38	19	19	-	-	-	-	M
		72	7140106000098	1224	feet	124.8	62.4	62.4	-	-	-	-	H
		73	7140106000098	631	feet	214.6	107.3	107.3	-	-	-	-	H
		74	7140106000098	376	feet	128	64	64	-	-	-	-	H
		75	7140106000098	401	feet	54.6	27.3	27.3	-	-	-	-	M
		76	7140106000097	751	feet	25.6	12.8	12.8	-	-	-	-	M
		77	7140106000097	665	feet	56.5	28.3	28.3	-	-	-	-	M
		78	7140106000097	809	feet	110	55	55	-	-	-	-	H
		89	7140106000098	716	feet	182.6	91.3	91.3	-	-	-	-	H
		90	7140106000097	328	feet	83.6	41.8	41.8	-	-	-	-	M
		92	7140106000096	980	feet	333.2	166.6	166.6	-	-	-	-	H
		93	7140106000097	601	feet	204.4	102.2	102.2	-	-	-	-	H
	Stream Channel Sediment Reduction	94	7140106000098	1	site	-	-	-	-	-	-	-	L
		95	7140106000098	1	site	-	-	-	-	-	-	-	L
		96	7140106000097	1	site	-	-	-	-	-	-	-	L
Other	Grassed Waterways	32	7140106007296	0.21	acre	88.2	44.1	44.1	-	-	-	-	M
		35	7140106007231	0.73	acre	67.5	33.8	33.8	-	-	-	-	L
		36	7140106007231	0.48	acre	89	44.5	44.5	-	-	-	-	L
	Vegetative Filter Strip	108	7140106007261	0.53	acre	7	1	-	1447	22	262	-	L
		107	7140106007261	0.56	acre	41	5	-	6615	167	1015	-	M
Pine Lakes Golf Course	Vegetative Filter Strip	ALT	Pine Lakes Golf Course	6.14	acre	870	65	-	91615	4570	25098	-	L
	No Spray Zone (NSZ)	ALT	Pine Lakes Golf Course	11.76	acre	452.606	191.035	-	-	-	-	461.423	L
	Runoff Filtration System	ALT	Pine Lakes Golf Course	1	unit		54	-	103538	3620	-	-	M
					TOTALS:	**3171.206**	**1216.435**	**900.4**	**203215**	**8379**	**26375**	**461.423**	
						N	P	Sediment	TSS	BOD	COD	K	

Table 52 - Herrin SMU (SMU 4) BMPs and Load Reductions

General Area (Contributing Area)	BMP	Map ID	Target Area (Reach Code)	Amount	Unit	Load Reductions- lbs/ yr (N,P, TSS, BOD, COD), ton/yr- (Sediment)							
						N	P	Sediment	TSS	BOD	COD	K	Priority
North Herrin Tributary	Agricultural Filter Strip	19	7140106001218	0.63	acre	59	32	29	-	-	-	-	L
		20	7140106001218	8.3	acre	873	468	405	-	-	-	-	H
		21	7140106001218	3.25	acre	383	205	182	-	-	-	-	H
		22	7140106006989	1.34	acre	59	32	29	-	-	-	-	L
	Grassed Waterways	47	7140106001218	0.35	acre	40.9	20.5	20.5	-	-	-	-	L
		48	7140106001218	0.53	acre	62.5	31.3	31.3	-	-	-	-	L
		49	7140106001218	0.42	acre	277.3	138.6	138.6	-	-	-	-	L
		50	7140106001218	0.32	acre	72.1	36	36	-	-	-	-	L
		51	7140106001218	0.65	acre	136	68	68	-	-	-	-	L
		52	7140106001218	0.24	acre	17.6	8.8	8.8	-	-	-	-	L
		53	7140106001218	0.16	acre	16.1	8	8	-	-	-	-	M
		54	7140106001218	0.23	acre	37.3	18.7	18.7	-	-	-	-	M
	Streambank Stabilization	86	7140106001218	206	feet	7	3.5	3.5	-	-	-	-	L
		87	7140106001218	1052	feet	36	18	18	-	-	-	-	M
	Vegetative Filter Strip	106	7140106001218	0.76	acre	79	10	-	7773	375	2061	-	M
		109	7140106001218	0.12	acre	3	0	-	825	13	176	-	L
		110	7140106001218	0.63	acre	13	2	0	1196	59	297	-	L
South Herrin Tributary	Agricultural Filter Strip	8	7140106001217	1.19	acre	22	12	11	-	-	-	-	L
		9	7140106001217	1.31	acre	110	59	54	-	-	-	-	L
	Grassed Waterways	37	7140106001217	0.21	acre	76.9	38.5	38.5	-	-	-	-	M
		38	7140106001217	0.47	acre	108.7	54.3	54.3	-	-	-	-	M
		39	7140106007055	0.31	acre	62	31	31	-	-	-	-	L
		40	7140106007055	0.49	acre	98.7	49.3	49.3	-	-	-	-	L
		41	7140106007055	0.22	acre	32.1	16.1	16.1	-	-	-	-	L
	Detention Basin	29	7140106001217	50,555	Cu. Ft.	18	2	-	3564	61	290	-	M
		30	7140106001217	18750.16	Cu. Ft.	14	2	-	2398	36	184	-	M
	Streambank Stabilization	82	7140106001217	520	feet	265.2	132.6	132.6	-	-	-	-	H
		83	7140106001217	955	feet	568.4	284.2	284.2	-	-	-	-	H
		91	7140106001217	473	feet	32	16	16	-	-	-	-	M
					TOTALS:	**3579.8**	**1797.4**	**1683.4**	**15756**	**544**	**3008**	**0**	
						N	P	Sediment	TSS	BOD	COD	K	

Total load reductions are consistent with the load reduction targets found in Section 2.8.10. Pollutant load reduction totals are displayed in Table 53.

Table 53 - Total BMP Load Reductions

	N	P	Sediment	TSS	BOD	COD	K
Total Load Reduction:	**24950**	**11695**	**10412**	**438536**	**13916**	**112527**	**461.42**
Percent of Pollutant Load:	**17.60%**	**44.54%**	**69.00%**	-	**3.70%**	-	-

Implementation of every BMP in the plan would result in a nearly 18 percent reduction in nitrogen; 45 percent reduction in phosphorus; 69 percent reduction in sediment; and almost 4 percent reduction in BOD. Since total suspended solids (TSS), chemical oxygen demand (COD), and potassium (K) were not calculated in the watershed pollutant loading, total BMP load reductions could not be calculated.

The reductions in nitrogen and phosphorus are also consistent with the *Illinois Nutrient Loss Reduction Strategy* (Illinois NLRS). The Illinois NLRS was designed to curb runoff and nutrient loss by implementing state-wide best management practices. The strategy is a collaborative effort between multiple state agencies in Illinois. Short-term milestones of the strategy include a reduction of nitrate-nitrogen by 15 percent, and a 25 percent reduction in phosphorus by 2025. A long-term milestone of phosphorus reduction is 45 percent.[52]

[52] IEPA. *Illinois Nutrient Loss Reduction Strategy*. Springfield, IL: IEPA, August 2015. http://www.epa.illinois.gov/Assets/iepa/water-quality/watershed-management/nlrs/nlrs-final-revised-083115.pdf (accessed July 13, 2016)

4. Summary of Technical and Financial Assistance

Each BMP in the plan has also been described by the technical and financial assistance needed to implement each measure. While technical assistance comes from a few select groups, the financial assistance for management measures comes from a variety of different sources. Table 54 summarizes the cost, technical assistance, and possible funding source for each BMP. The diagram also characterizes the suggested ordinances in Chapter 3 and elements associated with the educational component that will be discussed in Chapter 5.

4.1 Technical Assistance

The labor to execute the BMPs will largely come from local municipalities, public works, landowners, the planning commission, and state and federal agencies such as the USDA/NRCS and the Williamson County Soil and Water Conservation District.

The type of technical assistance largely depends on which type of BMP is being implemented. For agricultural BMPs, the USDA and Soil and Conservation Districts will be able to provide their services. If the BMP is municipal, local public works can offer their support. However, for most management measures, drawings and surveys will likely be required by an engineer.

The Greater Egypt Regional Planning and Development Commission could also provide technical assistance for some of the BMPs. This includes: GIS services, site plans and drawings, and grant writing and administration.

4.2 Funding Sources

A majority of the management measures described in Chapter 3 will require funding. A major source of funding would be through the Clean Water Act Section 319 Grant Program. This would be administered through the IEPA. Section 319 grants can cover up to 60 percent of the costs. The other 40 percent would be met through a local match (municipal, landowner, etc.)

While 319 funding covers most BMPs in the plan, other funding sources have to be considered for others. The USDA offers many funding opportunities through programs such as: Environmental Quality Incentives Program (EQIP), Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), and Wetland Reserve Program (WRP).

Table 54 - Technical and Financial Assistance for BMPs

BMP	Cost	Unit	Technical Assistance	Funding Source(s)
Agricultural Filter Strip	$0.00-$300	acre	Landowner, public works, NRCS	IEPA 319 Grant, FSA CRP (No cost assumes using existing vegetation, if any)
Animal Waste Control (Ordinance)	$0.00*	site	Public Works Departments	Municipality
Bioswale	$42.00	foot	IDOT, contractor, municipality, public works	IEPA 319 Grant
Conservation Tillage	$33.33	acre	Landowner, public works, NRCS	NRCS EQIP, FSA CRP
Cover Crops	$66.67	acre	Landowner, public works, NRCS	NRCS EQIP, FSA CRP
Debris Removal	$486.00	site	Volunteers, landowners, public works, contractor	Volunteers, landowners, public works, contractor
Detention Basin	$0.74	cubic foot	Landowner, IDOT, contractor, municipality, public works	Landowners, municipality
Fertilizer Control (Ordinance)	$0.00*	-	Municipality	Municipality
Grassed Waterways	$3,250.00	acre	Landowner, public works, NRCS	IEPA 319 Grant, FSA CRP
Green Roof	$15.00	square foot	Landowner, public works, business	IEPA 319 Grant
Litter Cleanup	$0.00	acre	Volunteers	-
No Mow Pasture	$0.00	acres	Landowner	Landowners, municipality
No Spray Zone (fertilizer)	$0.00	acre	Landowner, public works, businesses	-
Porous/ Permeable Pavement	$150.00	cubic yard	Contractor, volunteer	IEPA 319 Grant
Public Education on Fertilizer Use	$0.50 each / $150.00 per 300	flyer/brochure	Planning Commission	IEPA 319 Grant, Planning Commission
Public Education on Stormwater Management	$0.50 each / $150.00 per 300	flyer/brochure	Planning Commission	IEPA 319 Grant, Planning Commission
Rain Barrels	$60.00-$150.00	unit	Landowner, businesses, school district	IEPA 319 Grant
Rain Gardens	$3.00-$15.00	square foot	Landowner, public works, businesses, school district	IEPA 319 Grant
Riparian Buffer	$500.00	acre	Landowner, public works, NRCS	IEPA 319 Grant, FSA CRP
Runoff Filtration System	$2,200.00	unit	Landowner, public works, businesses	Landowner, public works, business
Shoreline Stabilization	$96.00	feet	Landowner, volunteer, contractor	IEPA 319 Grant
Stormwater Detention (Ordinance)	$0.00*	-	Municipality	Municipality
Stormwater Management Workshop	$1,000.00	workshop	Planning Commission, Various Experts	IEPA 319 Grant
Stream Channel Sediment Reduction	$486.00	site	Volunteers, landowners, public works, contractor	IEPA 319 Grant
Streambank Stabilization	$80.00	foot	Landowner, volunteer, contractor	IEPA 319 Grant
Vegetated Filter Strip	$0.00-$300	acre	Landowner, volunteer, contractor	IEPA 319 Grant (No cost assumes using existing vegetation)
Wetland Protection (Ordinance)	$0.00*	acre	Landowner, public works, business	IEPA 319 Grant , NRCS Wetland Reserve Program, FSA FWP, FSA CRP

***Costs would be associated with enforcement and fines**

In most cases, these programs will not cover the entire cost of the selected BMP. The remaining costs would have to be funded by landowners, municipalities, businesses, and other entities.

4.3 Implementation Costs

Costs largely depend on which BMP is being implemented. Table 55 illustrates the total amounts and costs of each BMP, suggested ordinance, and educational component. Identification of site-specific costs can be viewed in Appendix B.

To implement all BMPs suggested in the plan, the total is $13,072,229.46. Costs generally take into account the technical and financial assistance needed along with the maintenance following implementation. The majority of the costs come from the implementation of green roofs, porous and permeable pavement, and shoreline and streambank stabilization.

The cost for filter strips (agricultural, urban vegetated) is dependent on whether the entity is using existing or natural vegetation compared to planting new vegetation.

Table 55 - Implementation Costs

BMP	Cost	Unit	Total Units	Total Cost
Agricultural Filter Strip	$0.00-$300	acre	36.5	$10,950.00
Animal Waste Control (Ordinance)	$0.00*	-	-	-
Bioswale	$42.00	square foot	43560	$1,829,520.00
Conservation Tillage	$33.33	acre	306.5	$10,215.65
Cover Crops	$66.67	acre	306.5	$20,434.36
Debris Removal	$486.00	site	6	$2,916.00
Detention Basin	$0.74	cubic foot	105850.62	$78,329.46
Fertilizer Control (Ordinance)	$0.00*	-	-	-
Grassed Waterways	$3,250.00	acre	9.5	$30,875.00
Green Roof	$15.00	square foot	87120	$1,306,800.00
Litter Cleanup	$0.00	acre	-	-
No Mow Pasture	$0.00	acres	-	-
No Spray Zone (fertilizer)	$0.00	acre	-	-
Porous/ Permeable Pavement	$150.00	cubic yard	32267	$4,840,050.00
Public Education on Fertilizer Use	$0.50 each / $150.00 per 300	flyer/brochure	1500	$750.00
Public Education on Stormwater Management	$0.50 each / $150.00 per 300	flyer/brochure	1500	$750.00
Rain Barrels	$60.00-$150.00	unit	100	$10,500.00
Rain Gardens	$3.00-$15.00	square foot	50	$90,000.00
Riparian Buffer	$500.00	acre	7.05	$3,525.00
Runoff Filtration System	$2,200.00	unit	1	$2,200.00
Shoreline Stabilization	$96.00	feet	5169	$496,224.00
Stormwater Detention (Ordinance)	$0.00*	-	-	-
Stormwater Management Workshop	$1,000.00	workshop	6	$6,000.00
Stream Channel Sediment Reduction	$486.00	site	5	$2,430.00
Streambank Stabilization	$80.00	foot	76469	$6,117,520.00
Vegetated Filter Strip	$0.00-$300	acre	4.8	$1,440.00
Wetland Protection (Ordinance)	$0.00*	-	-	-
			Total:	**$14,861,429.46**

5. Public Outreach and Education

The success of the Hurricane Creek Watershed-based Plan is largely dependent on public outreach and educational measures. During the planning phase, public meetings, Watershed Council meetings, and other events were held to provide guidance and raise awareness of the plan. These activities will continue after the plan is approved and will support the success of the plan.

Early in the planning phase, an initial stakeholders meeting was held to gather local knowledge of the watershed and define preliminary goals including identifying key areas of watershed impairments. From the initial meeting came the formation of the Hurricane Creek Watershed Planning Council. Meetings were usually held monthly, and were designed to provide guidance for the plan. Council members provided local knowledge of water-related activities and identified BMPs that were suggested in the plan.

5.1 Outreach and Educational Components

The Hurricane Creek Watershed-based Plan has several public awareness and educational components. The recommendations are as follows:

1. **Hold public meetings.** An initial public meeting would serve to inform the public on implementation of the plan and garner membership for the steering committee. Like the public meetings during the planning phase, flyers, newspaper ads, and PSAs could be used to inform the public of meeting dates.

2. **Establish a Hurricane Creek Watershed Action committee.** This assembly would serve much like the planning council during the development of the plan. The goal of a steering committee would be to promote awareness of the watershed and monitor the progress of implementation.

3. **Post Hurricane Creek Watershed signs.** Signs will be posted informing the public about the watershed and activities. Placement of the signs

would be in areas most visible to the public: parks, schools, libraries, or even government buildings. Signs for best management practices will also be posted at BMP implementation sites.

4. **Create a website for watershed activities.** This would include posting key dates for meetings, events, and other watershed-related activities.

5. **Enlist volunteers for litter cleanup days.** Local volunteer groups were contacted throughout the planning phase to gain interest in these events. Groups such as 4H, Boy Scouts of America, Girl Scouts of USA, and other local volunteers groups would likely be implemented in these events. Beautify Southern Illinois, a student volunteer group at Southern Illinois University, was also contacted to provide services. Volunteers in this group receive a notation on their transcripts for volunteering efforts.

6. **Create and distribute flyers and brochures for stormwater management and similar topics.** Along with the stormwater management and similar workshops, distributing flyers on the importance of residential measures to limit stormwater runoff would be critical in lowering nutrient runoff.

7. **Hold public Stormwater Management Workshops and similar events to promote the best management practices in the plan.** These workshops would also raise awareness for stormwater runoff and erosion control measures at a residential level. Other topics would include agricultural practices. This would likely be in cooperation with the local USDA NRCS Office.

The schedule for implementing the educational and informational components of the plan is further detailed in the following chapter.

5.2 Stormwater Management Workshop (2016)

Figure 41 - Stormwater Management Workshop Presenter

During plan development, the Greater Egypt Regional Planning and Development Commission hosted the first Stormwater Management Workshop. Local decision makers, stakeholders, and other groups were invited to the event. The goal was to not only provide information on stormwater management and urban best management practices, but more importantly to raise awareness of the Hurricane Creek Watershed-based Plan. All of the topics presented are BMPs suggested in the Hurricane Creek Watershed-based Plan.

Presentations included:

1. An overview of the Hurricane Creek Watershed-based Plan and planning elements (Greater Egypt)
2. Efficacy, design, and benefits of rain gardens and rain barrels (Illinois Water Resources Center)
3. Construction and implementation of porous and permeable pavement (E.T. Simonds Construction Company)
4. A panel discussion on stormwater ordinances and design from local municipalities (Cities of Carbondale, Herrin, and Marion)
5. An examination of stormwater regulations and permitting in Illinois (IEPA)

The workshop was considered very successful. While this event focused on the urban BMPs in the plan, future events could center on the agricultural BMPs in the plan. Groups such as farmers and other large landowners would likely be the target audience. Partners for the workshop would likely be the local Soil and Water Conservation Districts (SWCD) and the local USDA Natural Resources Conservation Service (NRCS) offices.

6. Implementation Schedule and Interim Milestones

To be successful, watershed-based plans require designing a thorough monitoring and evaluation component. These elements include: an implementation schedule which identifies key intervals for management measures (Element F), a description of interim measurable milestones for nonpoint source management (Element G), benchmarks to monitor the effectiveness of BMP load reductions (Element H), and the overall monitoring component to evaluate the progress of implementation (Element I). Elements H and I will be discussed in Chapter 7 of this plan.

6.1 Implementation Schedule

The implementation schedule reflects the general goals in the Hurricane Creek Watershed-based plan. Components of the schedule have been classified into three separate phases as seen in Table 56.

Phase I signifies the short-term actions to be taken in the first two years of the plan. These goals include establishing a watershed action council which would serve to implement the plan and track progress. The other educational and informational components of the plan largely fall under this phase.

Phase II constitutes the mid-term implementation of the plan. Components in this phase should be completed within the sixth year of plan implementation. Key elements of this phase include the continuation of public involvement, and submitting grant applications for BMPs suggested in the plan. The implementation and execution of BMPs will also fall under this segment of the plan.

Phase III indicates the final stage of the plan. This is characterized by continuing efforts in BMP implementation and evaluating accomplishments throughout the plan.

Site-specific BMPs have been characterized by a priority ranking in Chapter 3. These priority rankings follow the phases of the implementation schedule. Generally, BMPs with a high priority ranking will be the first to have grant

submissions written for them. Grant submissions, implementation, and execution of high priority BMPs will be considered mainly Phase II components. Subsequently, medium and low priority BMPs will be implemented in the latter part of Phase II and beginning of Phase III depending on available funding.

Table 56 - Implementation Schedule

Target	Phase I		Phase II				Phase III			
	Short-term (2 yr)		Mid-term (3-6 yr)				Long-term (7-10 yr)			
	1	2	3	4	5	6	7	8	9	10
Establish watershed action committee	X									
Hold public meetings to gain input	X	X	X	X	X	X				
Post watersheds sign for public awareness and BMP implementation	X	X	X	X	X	X	X	X	X	X
Create a website for watershed activities and key dates		X								
Enlist volunteers for litter cleanup days	X	X	X	X	X	X	X	X	X	X
Distribute flyers for stormwater management and similar topics	X		X		X		X		X	
Hold workshops to inform public on stormwater management		X		X		X		X		
Continue researching funding and technical assistance	X	X	X							
Select site-specific BMPs for preliminary designs	X	X	X							
Submit grant applications based on BMPs in plan		X	X	X	X	X	X	X		
Meet with landowners to review BMPs in plan		X	X	X	X	X	X	X		
Implement and execute BMPs			X	X	X	X	X	X	X	X
Monitor BMP implementation				X	X	X	X	X	X	X
Announce success of plan implementation					X	X	X	X	X	X

6.2 Interim Measurable Milestones

To determine whether nonpoint source best management practices are being implemented, interim measurable milestones have been designed to monitor success. The educational and outreach components have also utilized the milestone matrix. These milestones follow the same phases as the implementation schedule with three phases distinguishing varying degrees of BMP implementation. Interim measurable milestones are displayed in Table 57.

Table 57 - Interim Measurable Milestones

Interim Measurable Milestones				
Goal	**Indicator**	**Short (2-year)**	**Mid (6-yr)**	**Long (10-yr)**
Address Impairments from Agricultural Practices/ Improve Water Quality	Linear Feet of Streambank Stabilized	-	7,000	14,000
	Agricultural Strips Created	-	6	12
	Acres Converting to Conservation Tillage	-	70	140
	Acres to Implement Cover Crops	-	70	140
	Grassed Waterways Created	-	5	10
	Acres of No Mow Pastures	150	300	600
	Riparian Buffers Created	-	1	2
	Stream Channel Sediment Reduction Channels Created	-	2	5
Improve Recreational Opportunities	Improve Ramp and Dock at Herrin Reservoir	-	-	1
Ordinances to Protect/ Improve Water Quality	Animal Waste Control Ordinances Passed	2	4	6
	Fertilizer Control Ordinances Passed	2	4	6
	Stormwater Detention Ordinances Passed	2	4	6
	Wetland Protection Ordinances Passed	2	4	6

Table 57- Interim Measurable Milestones (Cont'd)

Interim Measurable Milestones				
Goal	**Indicator**	**Short (2-year)**	**Mid (6-yr)**	**Long (10-yr)**
Outreach and Education	Educational Brochures for Fertilizer Use	500	1000	1500
	Educational Brochures for Stormwater Management	500	1000	1500
	Lakes in Volunteer Lake Monitoring Program	1	3	-
	Number of Litter Cleanup Days	3	6	9
	Public Meetings Held	4	10	14
	Stormwater Management Workshops Held	1	3	5
Reduce/Mitigate Flooding	Detention Basins Installed	-	1	2
	Linear Feet of Stream Channel Debris Removal	150	300	600
Reduce Stormwater Runoff/ Mitigate Urban Impact/ Improve Water Quality	Acres Implementing Fertilizer No Spray Zones	-	3	6
	Bioswales Installed	-	3	6
	Green Roofs Installed	-	-	1
	Linear Feet of Shoreline Stabilized	-	600	1200
	Porous/ Permeable Pavement Installed (cubic yards)	-	2	4
	Rain Barrels Installed	5	20	50
	Rain Gardens Created	3	10	25
	Runoff Filtration System Installed	-	-	1
	Vegetated Filter Strips Installed	2	4	8

Understanding that every BMP in the plan may not be implemented is important in identifying the measurable milestones. Feasibility of each BMP has to be considered when distinguishing milestones. If BMP implementation is progressive throughout the plan, the interim measurable milestones in this plan are attainable over a ten-year implementation period.

Progress in achieving the milestone goals will be evaluated periodically by the Hurricane Creek Watershed Action Committee. If milestones are not being met, there may be need for adjustments. Adjustments may come in the form of establishing new BMPs, or adjusting the interim measurable milestones to adhere to current progress. Since these milestones are originally established to document progress, any changes should not be significant.

7. Evaluation Criteria and Monitoring Component

Along with the implementation schedule and interim measurable milestones, water quality benchmarks (Element H) and a monitoring component (Element I) are required to evaluate the implementation and the overall success of the plan.

7.1 Evaluation Criteria (Water Quality Benchmarks)

The benchmarks provided in Table 58 are based on the implementation of all BMPs in the plan. BMPs that were ranked as high priority, as seen in Chapter 3, will be completed by the sixth year, Phase II of the planning period. Those with a medium or low priority ranking will be implemented in by the tenth year, Phase III. Determining success and achieving these benchmarks will be dependent on the number of BMPs that are actually implemented in the planning period.

Benchmarks in this plan target nitrogen, phosphorus, and sediment. This is largely due to the availability of data from models and nutrient loading information, and the impairments from the 303(d) waters in the Hurricane Creek Watershed.

Since Phase I of the plan is up to the end of the second year, benchmarks have not been assigned. This is due partly to the activities in that phase not having an immediate impact on nutrient load reductions (ordinances, workshops, flyers, etc.). Whatever load reductions do occur will be minimal.

Table 58 - Benchmarks for Determining Progress

	Benchmark Reduction Target					
Benchmark Period	**Nitrogen (percent)**	**Nitrogen (lbs/ yr)**	**Phosphorus (percent)**	**Phosphorus (lbs/yr)**	**Sediment (percent)**	**Sediment (tons/yr)**
2 Year (Phase I)	-	-	-	-	-	-
6 Year (Phase II)	6	8897	20	5497	20	3159
10 Year (Phase III)	15	22241	40	10995	45	7108

While many of the high-priority BMPs will be implemented in Phase II, benchmarks have been set to around half of the overall nutrient load reduction targets. Considering Phase II ends at the sixth year of the planning period, effects of some BMP implementation may not be apparent until Phase III of the plan.

Phase III benchmarks account for the total reductions in nutrients in the plan. Phase III BMPs should be implemented by the tenth year of the plan. These include any remaining high-priority BMPs and the medium and low BMPs according to the priority index.

7.2 Monitoring Component

Because Hurricane Creek (IL_NF-01) and Herrin Old Lake (IL_RNZD) were placed on the IEPA's 303(d) list of Impaired Waters, the focus of this plan has been to address the issues pertaining to those particular waterbodies. A monitoring component is essential to a watershed-based plan in order to determine progress in achieving water quality.

Several elements represent the monitoring component for the plan. These elements will provide water quality data that can be used to assess the efficacy of the Hurricane Creek Watershed-based Plan. The monitoring strategy components are as follows:

1. **Volunteer Lake Monitoring Program (VLMP) –** Volunteers are recruited and trained to monitor the health of their lakes by taking various measurements of water quality. The program is structured by a tiered approach[53]. Table 59 displays each tier and corresponding responsibilities. A brief history can be viewed in Watershed Jurisdictions section of the Hurricane Creek Watershed Resource Inventory (Section 2.4.2)
   Since the VLMP uses a tiered approach, volunteers wishing to graduate to the next tier must first spend one year in each previous tier. Herrin Old Lake (Herrin Reservoir) has been monitored sporadically since 2000. Since

[53] IEPA. *Tiered Approach.* Springfield, IL: IEPA. http://www.epa.illinois.gov/topics/water-quality/monitoring/vlmp/tiered-approach/index (accessed: July, 2016)

this waterbody has been placed on the 303(d) list, it is important to have the lake in the program and be consistently monitored.

Because Herrin Old is impaired by phosphorus, it is especially important for the lake to have a Tier II volunteer who can take water samples. This nutrient data will be invaluable in determining the success of the watershed plan.

Table 59 - VLMP Duties

Tier	Volunteer Responsibilities	Testing Intervals
I	Secchi disk transparency monitoring and field observations.	Twice per month from May to October
II	Tier I duties and collection of water samples at Site one which test for nutrients, suspended solids, and chlorophyll	Once per month from May to August
III	Tier I & II duties (all sites). Volunteers may also choose to take dissolved oxygen/ temperature profiles	Once per month from May to August and October

Other lakes will also be introduced to the program. These include Madison Lake and Lake Sycamore. Since Sycamore Estates has become a highly developed subdivision, runoff will become an increasing problem in the future.

2. **Ambient Lakes Monitoring Program (ALMP) –** 50 inland lakes are monitored on a routine basis through field agents of the IEPA[54]. Priority is given to public water sources. However, other lakes are monitored such as Herrin Old Lake. Since monitoring in this program is cyclical, having baseline data for Herrin Old Lake would be a priority. This would be done at the start of the plan in 2017. Monitoring would also occur at five-year intervals.

[54] Norris, Tara. IEPA. Personal Correspondence to the Author (phone). August 9, 2016.

3. **Watershed Basin Surveys-** Every five years IEPA and IDNR conduct intensive basin surveys of various watersheds in Illinois[55]. IDNR completes testing of aquatic species while the IEPA monitors instream habitats and water quality. The last basin survey for the Big Muddy Watershed was in 2013, so the next study should be in 2018.

4. **Sediment Deposition Monitoring-** Because Hurricane Creek is impaired by sedimentation and siltation, monitoring the amount of sediment deposition is crucial in evaluating the effectiveness of the plan. Sediment monitoring would likely come from IEPA, the Illinois Water Survey, or Southern Illinois University.

These monitoring components will be utilized throughout the ten-year planning period. The schedule for monitoring is displayed in Table 60. The information from these components will have to be reviewed by the Hurricane Creek Watershed Action Committee to measure the effectiveness of plan implementation.

Table 60 - Schedule for Monitoring Components

Monitoring Component	Phase I		Phase II				Phase III			
	1	2	3	4	5	6	7	8	9	10
Ambient Lakes Monitoring Program	X					X				
Sediment Monitoring	X		X		X		X		X	
Volunteer Lake Monitoring Program	X	X	X	X	X	X	X	X	X	X
Watershed Basin Surveys		X					X			

[55] Hirst and Holtrop. IDNR. Personal Correspondence to the Author (electronic mail). August, 2016.

Appendix A- Pine Lakes Nutrient Reduction Strategy

Pine Lakes Nutrient Reduction Strategy

Vegetated Filter Strips	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)	Percent Reduction
BOD	9,050		4,480		4,570	49.50%
COD	62,745		37,647		25,098	60.00%
TSS	125,500		33,885		91,615	27.00%
LEAD	109		60		49	55.00%
COPPER	22		U		U	U
ZINC	169		68		101	40.00%
TDS	301,650		U		U	U
TN	2,175		1,305		870	60.00%
TKN	736		U		U	U
DP	74		U		U	U
TP	145		79		65	54.75%
CADMIUM	1		U		U	U

Runoff Filter	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)	Percent Reduction
BOD	9,050		5,430		3,620	60.00%
COD	62,745		U		U	U
TSS	125,500		21,963		103,538	17.50%
LEAD	109		U		U	U
COPPER	22		U		U	U
ZINC	169		U		U	U
TDS	301,650		U		U	U
TN	2,175		U		U	U
TKN	736		U		U	U
DP	74		U		U	U
TP	145		90		54	62.50%
CADMIUM	1		U		U	U

No Spray Zones (NSZ)	Acres	Application Reduction- N (lbs/yr)*	Application Reduction- P (lbs/yr)*	Application Reduction- K (lbs/yr)*	Total
10 foot NSZ	0.693	26.681	11.261	27.200	65.142
50 foot NSZ	11.063	425.926	179.774	434.223	1039.922
Total	11.756	452.606	191.035	461.423	1105.064

* Average pounds per acre (APA) based on a 2006 report by the Golf Course Superintendents Association of America (GCSAA). APA was reduced by 75% because of Pine Lakes' limited application use.

Pine Lakes Golf Course Nutrient Reduction Strategy

Pine Lakes Golf Course rests on nearly 120 acres within the City of Herrin. The course contains several ponds varying in size. Those ponds located on the first and eighteenth holes retain water that eventually flows into Herrin Old Lake (Herrin Reservoir). Herrin Old Lake is on the Illinois Environmental Protection Agency's 303(d) List of Impaired Waters. These impairments include: aquatic algae, mercury, phosphorus, polychlorinated biphenyls (PCBs), and total suspended solids (TSS).

Pine Lakes Golf Course contains nearly 1,000 feet of shoreline of Herrin Old Lake. The use of turf applications normally used on golf courses could have contributed to the impairments in Herrin Old Lake. This nutrient reduction strategy (NRS) targets the previous impairments through various Best Management Practices (BMPs). Below is a list of each BMP and how it can be applied to Pine Lakes Golf Course.

Conservation Buffer/ Vegetated Filter - Conservation buffers between the golf course and Herrin Old Lake would act to prevent sediment, nutrients, and turf applications from entering the surface water. According to the Audubon International's Fact Sheet for Environmental Management Practices for Golf Courses, raising mowing heights to three or more inches with a 25 foot buffer can provide filtering benefits. This would be a cost-effective solution for runoff that would take little effort in implementing. A 25 foot riparian buffer of each waterbody has been applied. For those areas that rest within close proximity to fairways or greens, the buffer has been reduced to five feet to allow continued playability.

No Spray Zone (NSZ) - No Spray Zones would diminish the runoff of turf applications and pesticides to waterbodies on the course. The proposed NSZ would act as a 50 foot buffer around waterbodies much like the riparian buffer. This land would continue to be mowed; however, not applying chemicals or pesticides to the buffer would also limit the runoff entering the riparian buffer. NSZs would be cost-effective as they would reduce the amount of chemicals needed to be applied. If there are areas in the NSZ that need to be handled individually, spot treatments could be applied. Like the riparian buffer, areas that are adjacent to fairways and greens would be limited to ten feet to not disturb playability. This buffer also assists in keeping chemicals on the playable surface and out of surface water.

Runoff Filter - The flow of waterbodies adjacent to Herrin Old Lake are all interconnected, eventually discharging into the lake. Since the application of chemicals and pesticides on the course could possibly be attributed to the phosphorus loads in Herrin Old Lake, a filtering system arranged near the discharge to Herrin Old Lake could reduce the amount of nutrients from entering the waterbody. Among other uses, the filtering system would implement a phosphorus absorbing material such as steel slag. This technique has proven to be successful at other golf courses such as the Stillwater Country Club in Stillwater, Oklahoma. This could also reduce the levels of TSS associated with Herrin Old Lake.

With these combined efforts, a reduction of nutrients and sediment could be achieved. These options provide a cost effective way to combat pollutants in the Herrin Old Lake and provide a low-maintenance strategy that will not hinder the experience of the golf course design.

- Herrin Old Lake
- Pine Lakes Property
- Runoff Filter
- Conservation Buffer
- No Spray Zone (NSZ)

Data Sources: Williamson County Supervisor of Assessments, RMMS (IEPA), Audubon International
Drawn by: Tyler Carpenter
Produced by: Greater Egypt Regional Planning and Development Commission

Appendix B- Site-Specific BMP Costs

Lower Hurricane Creek SMU Site-Specific BMP Costs

General Area (Contributing Area)	BMP	Map ID	Target Area (Reach Code)	Amount	Unit	Cost
Hurricane Creek	Grassed Waterways	46	7140106001214	0.24	acre	$772.88
	Agricultural Filter Strip	14	7140106000095	1.53	acre	$460.25
		15	7140106000095	2.73	acre	$817.90
		16	7140106000095	0.35	acre	$105.88
		17	7140106000094	0.55	acre	$165.69
		18	7140106000093	0.72	acre	$216.66
	Streambank Stabilization	79	7140106000095	793	feet	$126,880.00
		80	7140106000095	1682	feet	$269,120.00
		84	7140106000094	218	feet	$34,880.00
		85	7140106000094	631	feet	$100,960.00
		88	7140106000660	522	feet	$83,520.00
	Riparian Buffer	59	7140106000660	532	acre	$1,114.54
	Stream Channel Sediment Reduction	97	7140106000095	1	site	$486.00
		98	7140106000093	1	site	$486.00
					TOTALS:	**$619,985.80**

Little Hurricane Creek SMU Site-Specific BMP Costs

General Area (Contributing Area)	BMP	Map ID	Target Area (Reach Code)	Amount	Unit	Costs
Little Hurricane Creek	Streambank Stabilization	81	7140106000661	1656	feet	$264,960.00
	Debris Removal	25	7140106000660	567	feet	$486.00
		26	7140106000660	615	feet	$486.00
	Grassed Waterways	42	7140106007134	0.46	acres	$1,497.92
		43	7140106001215	0.37	acres	$1,186.92
		44	7140106000660	0.3	acres	$979.42
		45	7140106000660	0.6	acres	$1,965.28
	Agricultural Filter Strip	5	7140106000661	1.27	acres	$380.84
		6	7140106000661	2.33	acres	$701.29
					TOTALS:	**$272,643.67**

Upper Hurricane Creek SMU Site-Specific BMP Costs

General Area (Contributing Area)	BMP	Map ID	Target Area (Reach Code)	Amount	Unit	Cost
Herrin Reservoir	Vegetative Filter Strip	101	071401060705-06	0.13	acre	$39.74
		104	071401060705-09	0.5	acre	$150.07
		103	071401060705-08	0.2	acre	$61.48
		102	071401060705-07	0.27	acre	$79.89
		100	071401060705-04	0.22	acre	$65.27
		99	071401060705-05	0.58	acre	$173.23
		105	7140106007296	0.32	acre	$95.82
	Debris Removal	23	071401060705-06	819	feet	$486.00
		24	071401060705-04	333	feet	$486.00
	Detention Basin	31	7140106007261	36544.92	Cu. Ft.	$27,043.25
	Shoreline Stabilization	60	071401060705-03	434	feet	$41,664.00
		62	071401060705-04	360	feet	$34,560.00
		61	071401060705-04, 05	972	feet	$93,312.00
		69	071401060705-07	503	feet	$48,288.00
		64	071401060705-07	550	feet	$52,800.00
		65	071401060705-07	231	feet	$22,176.00
		63	071401060705-08	316	feet	$30,336.00
		66	071401060705-06	434	feet	$41,664.00
		67	071401060705-07	288	feet	$27,648.00
		68	071401060705-08, 09	766	feet	$73,536.00
		70	071401060705-09	315	feet	$30,240.00
Hurricane Creek	Debris Removal	27	7140106000098	277	feet	$486.00
		28	7140106000098	339	feet	$486.00
	Grassed Waterways	33	7140106007224	0.31	acre	$992.31
		34	7140106000098	0.13	acre	$426.21
		55	7140106007120	0.56	acre	$1,828.43
		56	7140106007120	0.16	acre	$536.14
		57	7140106000096	0.35	acre	$1,147.86
	Riparian Buffer	58	7140106000097	4.8	acre	$2,411.25
	Agricultural Filter Strip	1	7140106000098	1.25	acre	$375.20
		2	7140106000098	2.1	acre	$628.10
		3	7140106000098	1.33	acre	$398.79
		4	7140106007179	2.03	acre	$611.98
		7	7140106000097	0.96	acre	$288.06
		10	7140106000097	1.12	acre	$337.09
		11	7140106000097	0.5	acre	$149.46
		12	7140106000096	0.97	acre	$289.51
		13	7140106000096	0.69	acre	$208.22
					TOTALS:	**$536,505.36**

Upper Hurricane Creek SMU Site-Specific BMP Costs (Cont'd)

General Area (Contributing Area)	BMP	Map ID	Target Area (Reach Code)	Amount	Unit	Cost
Hurricane Creek	Streambank Stabilization	71	7140106000098	372	feet	$59,520.00
		72	7140106000098	1224	feet	$195,840.00
		73	7140106000098	631	feet	$100,960.00
		74	7140106000098	376	feet	$60,160.00
		75	7140106000098	401	feet	$64,160.00
		76	7140106000097	751	feet	$120,160.00
		77	7140106000097	665	feet	$106,400.00
		78	7140106000097	809	feet	$129,440.00
		89	7140106000098	716	feet	$114,560.00
		90	7140106000097	328	feet	$52,480.00
		92	7140106000096	980	feet	$156,800.00
		93	7140106000097	601	feet	$96,160.00
	Stream Channel Sediment Reduction	94	7140106000098	1	site	$486.00
		95	7140106000098	1	site	$486.00
		96	7140106000097	1	site	$486.00
Other	Grassed Waterways	32	7140106007296	0.21	acre	$682.03
		35	7140106007231	0.73	acre	$2,358.07
		36	7140106007231	0.48	acre	$1,567.60
	Vegetative Filter Strip	108	7140106007261	0.53	acre	$159.61
		107	7140106007261	0.56	acre	$167.11
Pine Lakes Golf Course	Vegetative Filter Strip	ALT	Pine Lakes Golf Course	6.14	acre	$1,842.00
	No Spray Zone (NSZ)	ALT	Pine Lakes Golf Course	11.76	acre	$0.00
	Runoff Filtration System	ALT	Pine Lakes Golf Course	1	unit	$2,200.00
					TOTALS:	**$1,267,074.42**

Herrin SMU Site-Specific BMP Costs

General Area (Contributing Area)	BMP	Map ID	Target Area (Reach Code)	Amount	Unit	Cost
North Herrin Tributary	Agricultural Filter Strip	19	7140106001218	0.63	acre	$188.99
		20	7140106001218	8.3	acre	$2,493.38
		21	7140106001218	3.25	acre	$976.06
		22	7140106006989	1.34	acre	$399.59
	Grassed Waterways	47	7140106001218	0.35	acre	$1,130.39
		48	7140106001218	0.53	acre	$1,709.03
		49	7140106001218	0.42	acre	$1,366.87
		50	7140106001218	0.32	acre	$1,056.08
		51	7140106001218	0.65	acre	$2,107.52
		52	7140106001218	0.24	acre	$788.64
		53	7140106001218	0.16	acre	$507.18
		54	7140106001218	0.23	acre	$736.49
	Streambank Stabilization	86	7140106001218	206	feet	$32,960.00
		87	7140106001218	1052	feet	$168,320.00
	Vegetative Filter Strip	106	7140106001218	0.76	acre	$227.83
		109	7140106001218	0.12	acre	$36.79
		110	7140106001218	0.63	acre	$190.45
South Herrin Tributary	Agricultural Filter Strip	8	7140106001217	1.19	acre	$357.14
		9	7140106001217	1.31	acre	$392.59
	Grassed Waterways	37	7140106001217	0.21	acre	$685.43
		38	7140106001217	0.47	acre	$1,526.35
		39	7140106007055	0.31	acre	$1,007.29
		40	7140106007055	0.49	acre	$1,582.59
		41	7140106007055	0.22	acre	$707.37
	Detention Basin	29	7140106001217	50,555	Cu. Ft.	$37,411.00
		30	7140106001217	18750.16	Cu. Ft.	$13,875.12
	Streambank Stabilization	82	7140106001217	520	feet	$83,200.00
		83	7140106001217	955	feet	$152,800.00
		91	7140106001217	473	feet	$75,680.00
					TOTALS:	**$584,420.17**

Appendix C- Meetings and Planning Correspondence

April 23, 2015

The Greater Egypt Regional Planning and Development Commission has been contracted by the Illinois Environmental Protection Agency to develop a Watershed-based Plan for the Hurricane Creek Watershed in Williamson County. The plan will consist of a comprehensive watershed inventory which will define the physical components of the watershed. This will be used to complement the watershed-based plan which will address water quality issues within the watershed.

The Hurricane Creek Watershed Plan will channel the concerns of the public and local officials to improve and protect the water bodies within the watershed. This will be completed by developing goals through the course of the plan, and administering those objectives through the leadership of the planning committee.

The development of a watershed plan is important as it can help sustain the appropriate uses for that body of water which range from safe drinking water to supporting an effective ecosystem. Involvement in the watershed plan means expressing concerns and developing goals to be implemented.

As a potential stakeholder we respectfully ask you to be a part of the planning process. Greater Egypt will be hosting the initial planning meeting on June 15, 2015 at the Greater Egypt office. The address is 3000 West DeYoung St Suite 800B-3, Marion, IL. If you plan on attending, please RSVP no later than May 22, 2015.

Sincerely,

Cary Minnis
Executive Director
Greater Egypt

3000 West DeYoung Street · Suite 800B-3 · Marion, IL 62959 · Phone: 618.997.9351 · Fax: 618.997.9354 · www.greateregypt.org

Hurricane Creek
Watershed Council

Greater Egypt Regional Planning and Development Commission
3000 West Deyoung Street, Suite 800B-3
Marion, IL 62959 (618)997-9351

AGENDA

August 7, 2015

10:00 AM

Greater Egypt Office

1.) Welcome and Introductions

2.) Introduction of the Watershed-based Plan

3.) Synopsis of the Hurricane Creek Watershed

4.) Concerns within the watershed

5.) Preliminary Goals

6.) Adjourn

Hurricane Creek
Watershed Council

Greater Egypt Regional Planning and Development Commission
3000 West Deyoung Street, Suite 800B-3
Marion, IL 62959 (618)997-9351

AGENDA

September 29, 2015

10:00 AM

Greater Egypt Office

1.) Welcome and Introductions

2.) Recap of Previous Meeting

3.) Update of the Watershed Inventory

a. Items Needed to be Addressed

4.) In Depth Discussion of Nine Elements of the Plan

a. Public Outreach Component

b. Possible Roles of Council

5.) Adjourn

Hurricane Creek Watershed Council

Greater Egypt Regional Planning and Development Commission
3000 West Deyoung Street, Suite 800B-3
Marion, IL 62959 (618)997-8551

AGENDA

November 12, 2015

10:00 AM

Greater Egypt Office

1.) Welcome and Introductions

2.) Summary of Previous Meeting

3.) Update of the Watershed Inventory

4.) Status of Nine Elements

a. Estimation of pollutant loads

b. Load reduction targets

c. Educational component ideas

5.) BMP Priority Area Exercise

a. Build on areas from previous meeting

b. Create new areas for BMP implementation

6.) Adjourn

Hurricane Creek Watershed Council

Greater Egypt Regional Planning and Development Commission
3000 West Deyoung Street, Suite 800B-3
Marion, IL 62959 (618)997-9351

AGENDA

January 12, 2016

10:00 AM

Greater Egypt Office

1.) Welcome and Introductions

2.) Summary of Previous Meeting

3.) Overview of Best Management Practices

a. Types of BMPs

b. BMP Locations

c. Pollutant Load Reductions

4.) Status of Nine Elements

a. Technical and Financial Assistance (element d)

b. Schedule for Implementing BMPs (element f)

c. Interim Measurable Milestones (element g)

d. Interim Benchmarks (element h)

e. Monitoring Component (element i)

5.) Adjourn

Hurricane Creek Watershed Council

Greater Egypt Regional Planning and Development Commission
3000 West Deyoung Street, Suite 800B-3
Marion, IL 62959 (618)997-9351

AGENDA

February 25, 2016

10:00 AM

Greater Egypt Office

1.) Welcome and Introductions

2.) Summary of Previous Meeting

3.) Best Management Practices

a. Need for Urban BMPs (Specifically around Herrin Old Lake)

4.) Educational Component

a. Discussion of Stormwater Management Workshop

5.) Status of Nine Elements

a. Technical and Financial Assistance (element d)

b. Schedule for Implementing BMPs (element f)

c. Interim Measurable Milestones (element g)

d. Interim Benchmarks (element h)

e. Monitoring Component (element i)

5.) Adjourn

Hurricane Creek
Watershed Council

Greater Egypt Regional Planning and Development Commission
3000 West Deyoung Street, Suite 800B-3
Marion, IL 62959 (618)997-9351

AGENDA

April 21, 2016

10:00 AM

Greater Egypt Office

1.) Welcome and Introductions

2.) Summary of Previous Meeting

3.) Update of the Plan

a. Pollutant Load Reductions

4.) Overview of Best Management Practices

a. Technical and Financial Assistance (element d)
b. Changes to document
c. Additional BMPs

5.) Educational Component

a. Discussion of Stormwater Management Workshop
b. Committed Speakers for Workshop
c. Additional Public Meeting
d. Flyers

6.) Status of Nine Elements

a. Schedule for Implementing BMPs (element f)
b. Interim Measurable Milestones (element g)
c. Interim Benchmarks (element h)
d. Monitoring Component (element i)

7.) Adjourn

Hurricane Creek
Watershed Council

Greater Egypt Regional Planning and Development Commission
3000 West Deyoung Street, Suite 800B-3
Marion, IL 62959 (618)997-9351

AGENDA

May 26, 2016

10:00 AM

Greater Egypt Office

1.) Welcome and Introductions

2.) Summary of Previous Meeting

3.) Update of the Plan

a. Schedule for Implementing BMPs (element f)
b. Discussion of Schedule

4.) Review of Interim Measurable Milestones (element g)

a. Interim Measurable Milestone worksheet
b. Discussion of Milestones

5.) Educational Component (element e)

a. Stormwater Management Workshop
b. Committed Speakers for Workshop
c. Additional Public Meeting
-June 15, 2016- 6:00 PM, Herrin City Hall

6.) Status of Nine Elements

a. Interim Benchmarks (element h)
b. Monitoring Component (element i)

7.) Adjourn

Hurricane Creek Watershed Council

Greater Egypt Regional Planning and Development Commission
3000 West Deyoung Street, Suite 800B-3
Marion, IL 62959 (618)997-9351

AGENDA

July 27, 2016

10:00 AM

Greater Egypt Office

1.) Summary of Previous Meeting

2.) Update of Plan Elements and Discussion

a. Identification of Causes of Impairments and Pollutant Sources (Element A)

b. Estimation of Load Reductions from BMPs (Element B)

c. Description of Nonpoint Source Measures (Element C)

d. Estimation of Technical and Financial Assistance and Costs (Element D)

e. Information and Education Component (Element E)

f. Schedule for Implementing BMPs (Element F)

g. Interim Measurable Milestones (Element G)

h. Benchmarks to Track Progress (Element H)

i. Monitoring Component (Element I)

3.) Public Involvement

a. Overview of Public Meeting
-June 15, 2016- 6:00 PM, Herrin City Hall

b. Overview of Stormwater Management Workshop
-July 20, 2016

4.) Adjourn

WATERSHED PLANNING WORKSHOP

The Greater Egypt Regional Planning and Development Commission will be holding a public information meeting for the Hurricane Creek Watershed-based Plan.

This workshop will help to address the community's concerns regarding water quality issues in the watershed. The purpose of the workshop is to determine approaches that encourage sustainability of water resources.

Citizens of **Cambria, Carterville, Colp, Crainville, Energy and Herrin** are encouraged to attend the meeting and provide comments about their experiences involving water quality and other issues regarding water resources.

The meeting will be held on **Thursday, October 22, 2015** at **6:00 PM**.

GREATER EGYPT OFFICE

3000 West DeYoung St.
Suite 800B-3
Marion, IL 62959

(Left of Pirate Pete's at the Illinois Star Centre Mall)

If you have any questions or comments, please contact the Greater Egypt office at 618-997-9351

WATERSHED PLANNING MEETING

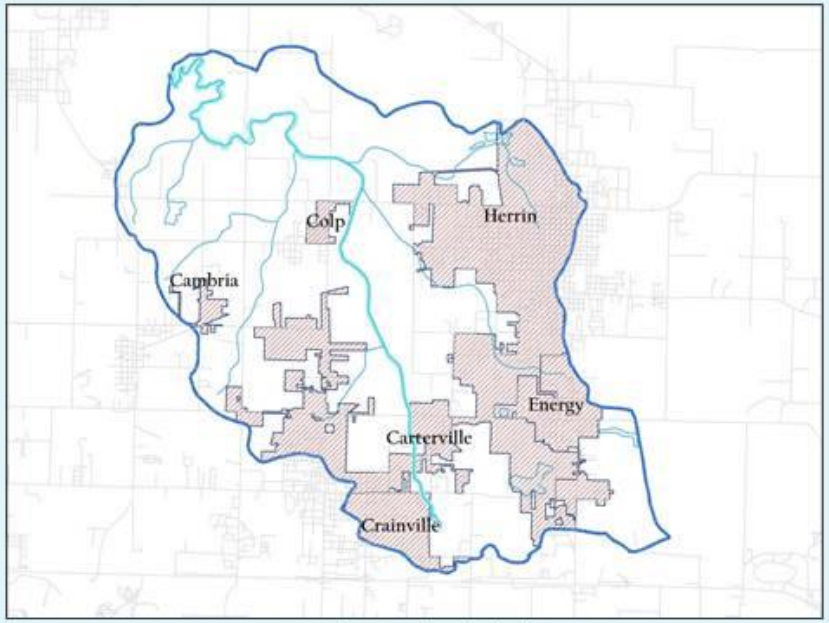
HERRIN CITY HALL
June 15, 2016- 6:00PM
300 N. Park Avenue
Herrin, IL 62948

The Greater Egypt Regional Planning and Development Commission will be holding a public information meeting for the Hurricane Creek Watershed-based Plan.

This meeting will help to address the community's concerns regarding water quality issues in the watershed. The purpose of the workshop is to determine approaches that encourage sustainability of water resources.

Citizens of **Cambria, Carterville, Colp, Crainville, Energy and Herrin** are encouraged to attend the meeting and provide comments about their experiences involving water quality and other issues regarding water resources.

The meeting will be held on **Wednesday, June 15, 2016** at **6:00 PM**. The location is Herrin City Hall. If you have questions or Comments, please contact the Greater Egypt Office at **618-997-9351**.



Hurricane Creek Watershed

Stormwater Management Workshop

Hosted by Greater Egypt Regional Planning and Development Commission

John A Logan College
Room H127 (see attached map)
July 20, 2016

09:00-09:30	Registration and Refreshments
09:30-09:45	Welcome and Introductions- Cary Minnis, Greater Egypt
09:45-10:15	Hurricane Creek Watershed-based Plan- Tyler Carpenter, Greater Egypt
10:15-10:45	Rain Gardens/ Rain Barrels- Eliana Brown, Illinois Water Resources Center
10:45-11:00	Coffee Break
11:00-11:30	Porous/ Permeable Pavement- Joe Lenzini, ET Simonds
11:30-12:15	Stormwater Ordinances and Design- Panel Discussion- Robert Hardin, City of Carbondale; Tom Somers, City of Herrin; Brian Ziegler, Clarida & Ziegler Engineering Co., City of Marion
12:15-13:00	Lunch (provided)
13:00-14:00	IEPA Stormwater Regulations- Wayne Caughman, IEPA
14:00-14:15	Q&A
14:15-14:30	Closing Remarks

Please RSVP by July 12. Contact Tyler Carpenter at Greater Egypt: 618-997-9351, or tylercarpenter@greateregypt.org

Professional Development Hours *(PDH) and Water Operator Credits will be awarded following the workshop

*Workshop may meet the requirements of Professional Engineer Professional Development per Title 68, Chapter VII, Subchapter b, Section 1380.325 of the Joint Committee on Administrative Rule Administrative Codes

Photo Source: toledo.oh.gov

February 9, 2016

Dear Watershed Stakeholder:

Under Section 319(h) of the federal Clean Water Act, the Illinois Environmental Protection Agency (Illinois EPA) receives **federal funds** to implement nonpoint source (NPS) pollution control projects in cooperation with local units of government and other organizations. NPS pollution is caused by rainfall or snowmelt moving over and through the ground and carrying natural and manmade pollutants into lakes, rivers, streams, wetlands, and groundwater. Major sources of NPS pollution in Illinois include agriculture, urban runoff, and streambank and shoreline erosion. State and local governmental units, citizen and environment groups, individuals, and businesses are eligible to receive Section 319(h) funds to carry out approved NPS management projects that implement appropriate NPS pollution control best management practices (BMPs) or enhance the public's awareness of NPS pollution.

The Hurricane Creek watershed is located within an Illinois EPA priority watershed (Hydrologic Unit Code 07140106 - Big Muddy River) for NPS pollution control implementation activities in Federal fiscal year (FFY) 2017. Furthermore, Clean Water Act Section 319 grant guidelines require that most of the available **grant funds** go toward restoring impaired waters through the implementation of watershed-based plans. The Illinois Nutrient Loss Reduction Strategy has also identified the Hurricane Creek watershed as a priority watershed to reduce nutrient loss (Non-point Sources - Phosphorus).

That being the case, you might want to consider investigating whether or not some of the BMP recommendations proposed for inclusion in the draft Hurricane Creek Watershed-based Plan could be developed into one or more Section 319 grant applications for submittal to Illinois EPA in calendar year 2016 for the FFY2017 funding cycle.

The submittal period for Section 319(h) financial assistance applications to the Illinois EPA is **May 1st to August 1st.** Submittals must include a completed Section 319(h) Financial Assistance Application Package. Copies of the application package can be obtained from the Illinois EPA's web page.

Some types of activities that can be funded under Section 319 include: **streambank and shoreline stabilization, wetland restoration, bio-retention facilities, bio-swales, permeable pavement, green roofs, agricultural terraces, water and sediment control basins, grassed waterways, and education programs**.

Feel free to contact us if you would like more information about Section 319 grant funding or the Hurricane Watershed-based Plan.

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Bureau of Water, Nonpoint Source Unit
1021 North Grand Ave. East, PO Box 19276
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Maps throughout this report were created using ArcGIS® software by Esri. ArcGIS® and ArcMap™ are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved. For more information about Esri® software, please visit www.esri.com.

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