KEWAUNEE COUNTY

LAND & WATER RESOURCE MANAGEMENT PLAN

2020-2029

KEWAUNEE COUNTY

2020-2029

Land & Water Resource Management Plan

Approved by the Wisconsin Land & Water Conservation Board on:
(DATE)

Approved by the Kewaunee County Board on:
(DATE)

Approved by Wisconsin Department of Agriculture, Trade & Consumer Protection:
(DATE)

Developed By:
Kewaunee County Land & Water Conservation Department

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

The Land & Water Resource Management Plan (LWRMP) outlines the local strategy for protecting surface and groundwater quality through implementation of the agricultural nonpoint source pollution control performance standards and prohibitions contained within Department of Natural Resources Chapter 151 (NR151) - Runoff Management, Wisconsin Administrative Code. Wisconsin adopted administrative rules in 2002 (NR151), with revisions effective in 2011 that set statewide performance standards and prohibitions for all Wisconsin farms. In 2018, Wisconsin established specific parameters for the Silurian Dolomite karst region, which included Kewaunee County.

The LWRMP's purpose is to fulfill the County's water management responsibilities under Wisconsin Statute and Rule.

The County developed this plan to provide:

1. A framework for land and water resource management planning
2. To avoid duplication of efforts by government agencies
3. To establish a framework for cooperation and coordination (and collaboration) of resource management efforts among all affected governments, agencies, and interested parties; and
4. To establish consistent land and water resource management goals, objectives, and standards for Kewaunee County.

While individual sources of pollution may appear insignificant, the cumulative effects of nonpoint source pollution can be devastating to local ecosystems and the economy. Through the year-long process, citizens input, local workgroups and the LWRMP advisory committee identified the top 3 resource concerns including Groundwater Quality, Surface Water Quality, and Soil Health & Quality. A course of action was developed for each of these resource concerns through a series of goals, objectives and partnerships.

Kewaunee County Land & Water Conservation Department (LWCD) expects this plan to be a guiding document in addressing the local concerns and priorities and in identifying annual work priorities. The LWRMP is a living document and will be updated as the effectiveness of action is documented and as new challenges arise. Kewaunee County LWCD will coordinate the implementation of projects with the many state, federal, academic, and nonprofit organizations that joined forces to focus on Kewaunee County. Ultimately, realizing the vision for a healthy and economically vibrant future will depend on this collaborative approach. Locally-led implementation of land and water conservation through consistent and precision efforts; will continue to be a priority for the citizens of Kewaunee County to protect and improve our natural, historical, and cultural resources.

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CHAPTER 1: INTRODUCTION

Through Wisconsin Act 27 (1997-1999 Biennial Budget Bill), Chapter 92.10 Wisconsin Statute was amended, creating the County Land and Water Conservation Planning program. The goal of the program is to foster and support a locally led process that improves decision-making, streamlines administrative and delivery mechanisms, and better utilizes local, state, and federal funds to protect Wisconsin's land and water resources.

LAND & WATER RESOURCE MANAGEMENT PLAN

The Legislature amended the statutes to allow County Conservation Committee's to develop and adopt standards and specifications for management practices to control erosion sedimentation and nonpoint source water pollution. Kewaunee County's Land and Water Resource Management Plan (LWRMP) was last approved in 2009, for implementation timeframe of January 1, 2010 through December 31, 2019.

The LWRMP is intended as a strategic planning process to assess local resource conditions and needs and decide the best approach to meet established goals. County LWRMPs are intended to develop a seamless approach for program integration; by addressing the conditions of local land and water resources, referencing available monitoring data, and applicable state and federal standards.

Required components:

- Soil erosion conditions
- Water quality conditions, including identification of the causes and sources of water quality impairments and pollutant sources
- Water quality objectives for each watershed based upon the resource assessment
- Pollutant load reduction targets
- A voluntary implementation strategy to encourage conservation practices
- State and local regulations used to implement the plan
- Compliance procedures
- Conservation practices to achieve compliance
- Monitoring system
- Expected costs of plan implementation including staff time and cost-share funding
- Develop an information and education strategy
- Education and outreach
- Partner with other agencies, municipalities, organizations, landowners, and other interested parties
- Track progress toward meeting the plan's goals, including compliance with state standards

WISCONSIN AGRICULTURAL PERFORMANCE STANDARDS & PROHIBITIONS

Consistent with state statutes, NR151 directs the Wisconsin Department of Natural Resources (DNR) to promulgate agricultural standards and prohibitions to control polluted runoff from all cropland and livestock operations while protecting Wisconsin's water resources. Conservation practices used to meet the performance standards are identified in Wisconsin Administrative Rule, Department of Agricultural, Trade and Consumer Protection (ATCP) Chapter 50 – Soil and Water Resource Management (SWRM) programs.

Wisconsin adopted NR151 administrative rules in 2002, with additional standards in 2011, which set statewide performance standards and prohibitions for all Wisconsin farms. On July 1, 2018, Wisconsin adopted standards and prohibitions specific to Silurian Dolomite bedrock, defined as "the area in Wisconsin where the bedrock consists of Silurian Dolomite with a depth of bedrock of 20 feet or less," which includes Kewanee County.

AGRICULTURAL PERFORMANCE STANDARDS & PROHIBITIONS

- All land where crops and feed are grown, including pastures, shall be managed to achieve a soil erosion rate equal to, or less than, the "tolerable" (T) rate established by the soil.
- No crop producer may conduct a tillage operation that negatively impacts streambank integrity and no tillage operations may be conducted within 5 feet of the top of the channel of surface waters.
- Croplands, pastures, and winter grazing areas shall average a phosphorus index (PI) of 6 or less over the accounting period and may not exceed a PI of 12.
- New or substantially altered manure storage facilities must be constructed, maintained or abandoned in accordance with accepted standards to minimize the risk of structural failure and minimize leakage in order to comply with groundwater standards. Closure of a manure storage facilities shall occur when an operation ceases operation, or manure has not been added or removed from the facility in a period of 24 months.
- There may be no significant discharge of process wastewater to waters of the state.
- Runoff shall be diverted away from contacting feedlot, manure storage areas and barnyard areas within Water Quality Management Areas (WQMA); defined as 1,000 feet of lakes/ponds or 300 feet of rivers.
- All crop producers and livestock producers that apply manure or other nutrients directly or through contract to agricultural fields shall comply with a nutrient management plan.

MANURE MANAGEMENT PROHIBITIONS

- No overflow of manure storage facilities.
- No unconfined manure pile in a WQMA.
- No direct runoff from a feedlot or stored manure into the waters of the state.

- No unlimited access by livestock to waters of the state in a location where high concentrations of animals prevent the maintenance of adequate sod or self-sustaining vegetative cover.

SILURIAN DOLOMITE STANDARDS & PROHIBITIONS

See Appendix 1: Summary of 2018 NR151 Silurian Dolomite Standards & Prohibitions

REVISION & UPDATE PROCESS

With the 2010-2019 LWRMP's goals and objectives specific to NR151 providing the foundation of the update, the revision process allows the LWCD to build off that groundwork to identify and assess current natural resource concerns and pinpoint all nonpoint pollution sources.

In 2018, LWCD staff along with DNR and Department of Agriculture Trade and Consumer Protection (DATCP) worked collaboratively for more than a year to review and update the resource assessment section of the LWRMP. This year-long process included: interpreting new data, identifying trends and resource concerns, incorporating priority watershed planning efforts, and partnerships established throughout the county.

PUBLIC HEARING & APPROVAL PROCESS

The completed draft plan was submitted to DNR and DATCP for review on December 11, 2018. The two agencies provided comments that were incorporated into the final draft. In addition, the draft plan was presented to the Land Conservation Committee (LCC) on December 11, 2018 with approval granted to seek public input. A LWRMP public hearing was administrated by the LCC on February 12, 2019 and comments received were incorporated as necessary.

Finally, the plan was presented to the State Land and Water Conservation Board on April 2, 2019. The Land & Water Conservation Board recommended approval of the plan at this meeting and the final plan was approved by DATCP on _____. The final draft was presented to and approved by the Kewaunee County Board on _____.

APPROVED PLAN

The approved plan is set to expire December 31, 2029. Subsequently, after five years of implementation, LWCD staff must return to the LCC and state Land & Water Conservation Board to present the County's progress and address any new initiatives or deviations needed to implement the remaining five years of the plan. Annual work-plans submitted to DATCP will include goals, objectives, and action items identified throughout this plan.

CHAPTER 2: KEWAUNEE COUNTY

Kewaunee County is located in Northeast Wisconsin and is bounded on the north by Door County, on the east by 26.9 miles of Lake Michigan shoreline, on the south by Manitowoc County, and on the west by Brown County that includes approximately 3 miles of Bay of Green Bay shoreline. Kewaunee County covers an area of 331 square miles, making it the 65th largest (or 7th smallest) out of 72 Wisconsin Counties. Kewaunee County is divided into 10 Townships, including 2 Cities (Algoma & Kewaunee) and 2 Villages (Luxemburg & Casco).

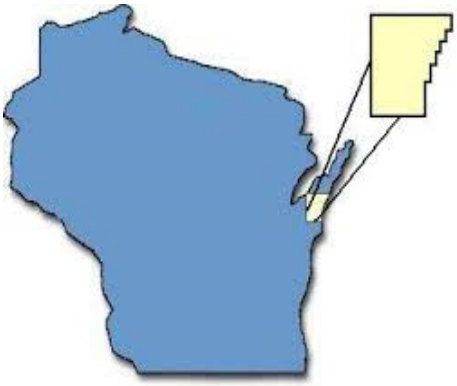
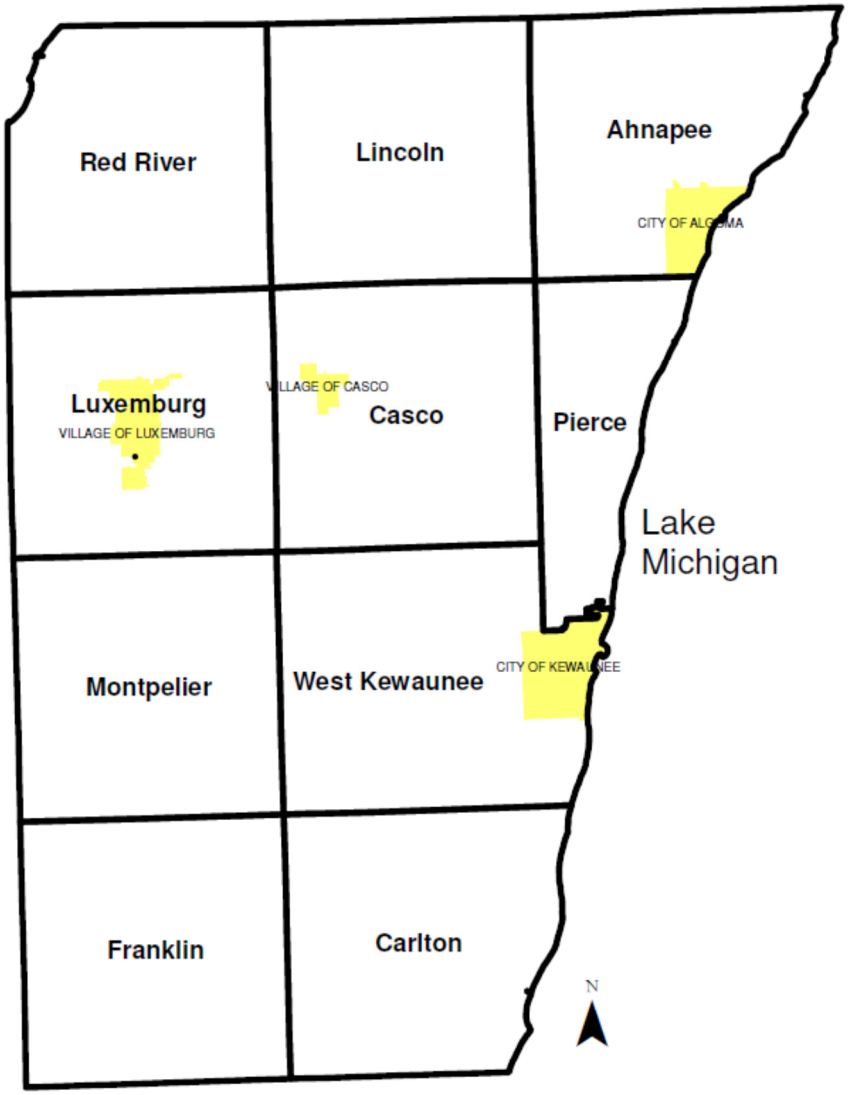


Figure 1: Kewaunee County, Wisconsin



Map 1: Kewaunee County Townships, Villages, & Cities

LAND-USE

Lumbering was the leading industry when the first settlement in the county was made in 1837, but around the 1850's agricultural development began. The forest land was cleared and wheat was the principal crop until around 1900. When wheat production steadily declined, a more diversified system of farming was developed with the combination of dairying. Dairying soon became the most important industry in Kewaunee County with cheese and butter being the chief products sold (Whitson et al, 1914). Today agriculture represents approximately 63% of the land-use in Kewaunee County (Table 1).

Agricultural Farmland, Kewaunee County.
Photo Credit: Aerica Bjurstrom, UW-Extension

Woodlands, which include wooded wetland complexes, represent 21% of the total acres and is the second largest land-use. Residential development has been increasing in Kewaunee County, even though it represents only 2.7% of the land-use. Landowners are moving farther into the country to build their homes over the past several decades.

Table 1. Kewaunee County Land-Use

Land-Use Type	Total Acres	Total Land Percentage
Developed		
Residential	5,903.1	2.68
Commercial	448.5	0.20
Industrial	339.5	0.15
Mining	713.4	0.32
Transportation	3,636.1	1.65
Communications/Utilities	211.2	0.10
Institutional/Governmental	386.2	0.18
Recreational	1,012.5	0.46
Agricultural Structures	3,533.6	1.61
Total Developed Acres	**16,184.1**	**7.36**
Undeveloped		
Croplands/Pastures	138,539.4	62.97
Woodlands	46,443.3	21.11
Other Natural Areas	17,816.5	8.10
Water Features	1,015.9	0.46
Total Undeveloped Acres	**203,815.1**	**92.64**
Total Land Area	219,999.2	100.00

Source: Kewaunee County 20-Year Comprehensive Plan Update, Bay-Lake Regional Planning Commission, 2016.

Recreational, natural areas, and water features comprise approximately 10% of the land-use type in the county (third largest). Although a smaller percentage, these areas encompass an extraordinary array of recreational resources along its 26.9 miles of Lake Michigan shoreline, picturesque rivers, lakes, parks, trails, and beaches. Kewaunee County provides a variety of outdoor recreational opportunities in 8 county parks, 5 inland lakes, navigable rivers, the Ahnapee State Trail and Ice Age Trail, a snow tubing hill, a small zoo and the county fairgrounds. Over 300 total miles of recreational trails exist in the county, which include 34 miles of the Ahnapee State Trail. In addition, Kewaunee County has over 3,250 acres of state-owned lands open for public hunting and outdoor recreation (Kewaunee County Economic Development Corporation, 2018).

Ice Age Trail, Kewaunee County
Photo Credit: Jennifer Gonzalez, KC Tourism Coordinator

Bruemmer Park Zoo (Left) and Ahnapee Trail (Right), Kewaunee County
Photo Credit: Jennifer Gonzalez, KC Tourism Coordinator

CLIMATE

Kewaunee County's climate is continental and considerably altered by Green Bay and Lake Michigan. The warm season typically starts from May 31 and extends to September 17, with an average daily high temperature above 69°F. The hottest day of the year is July 19, with an average high of 79°F and low of 62°F. The cold season typically lasts from December 1 to March 11, with an average daily high temperature below 37°F. The coldest day of the year is January 29, with an average low of 14°F and high of 27°F

Kewaunee County receives on average 31 inches of rain and 45 inches of snow per year. However, significant seasonal variation in monthly rainfall and snowfall exists. The most rain occurs during the 31 days centered on June 15, with an average total accumulation of 3.3 inches. The snowy period of the year lasts for 5.0 months, from November 11 to April 11, with the most snow falling during December, January and February.

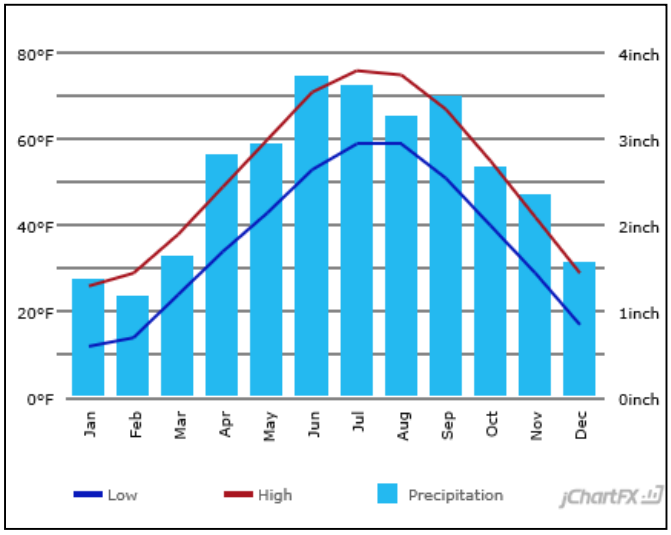


Figure 2: Weather Data, Kewaunee County

The growing season is the longest continuous period of non-freezing temperatures (≥ 32°F) in the year. In Kewaunee, the season typically lasts for 5.8 months (176 days), from around April 28 to around October 22, rarely starting before April 12 or after May 15, and rarely ending before October 1 or after November 13 (United States Climate Data, 2018).

GLACIAL INFLUENCES

Northeastern Wisconsin was glaciated several times. The Cary and Valders sub-stage of the Wisconsin glacial period are considered the main source of the drift mantle in Kewaunee County. Glacial ice scoured the bedrock in some places and deposited more than 100 feet of drift in other places.

Glacial ice of the Cary sub-stage entered northeastern Wisconsin in two lobes. One advanced in a southerly direction in the Fox River Valley; the other advanced in the Lake Michigan Basin. An extremely hilly and choppy area with numerous wet depressions was formed where the two lobes pushed against each other. This area is called the Kettle Moraine, which is the most pronounced topographic feature of the county. The main portion begins near the center of Casco Township and extends south, gradually becoming wider until it covers nearly half of West Kewaunee, half of Montpelier, half of Carlton, and the greater part of Franklin Townships. The region represents the medial moraine formed between the Green Bay and Lake Michigan glaciers. Its surface varies from level to rolling and hills. The topography of this section is truly glacial in character, and pot holes, small swampy areas, and stony and gravelly regions are common.

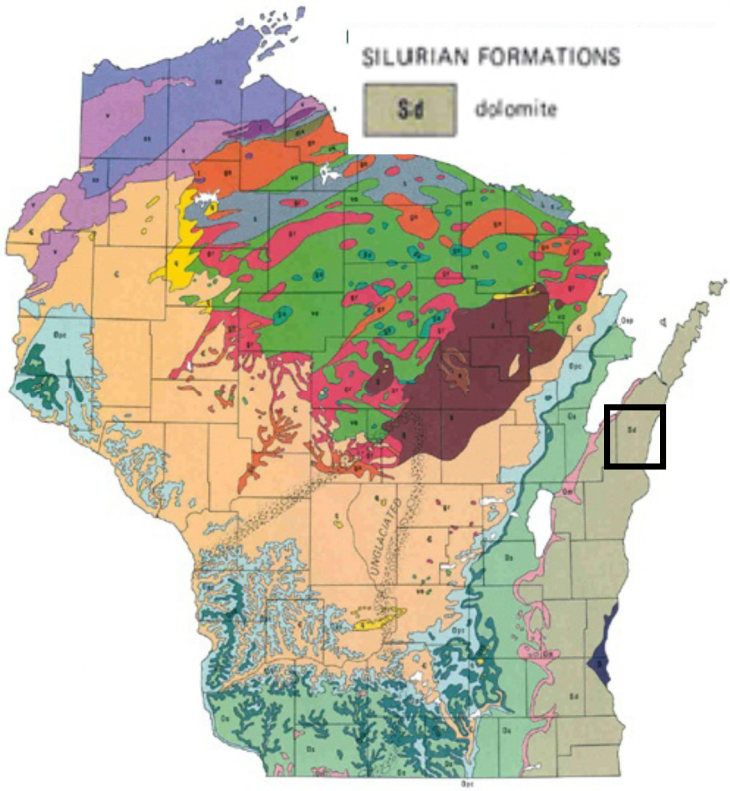
As retreating glaciers grew thin, the amount of meltwater decreased, often to the point that the water could not carry the huge quantities of drift that were melting out of the ice. The excess load was deposited in long sinuous ridges that look like inverted stream valleys. These ridges, or eskers, are a record of streams that flowed under the glacial ice. Eskers were formed in areas now located within Red River, Lincoln and Casco Townships.

A few drumlin fields can also be viewed in Lincoln, Ahnapee and Franklin Townships. Drumlin are long, narrow streamlined hills commonly formed behind the glacial ice front when the ice molds drift material that has already been deposited. The long axis indicates the direction in which the glacial ice was moving. The blunt tip at one end point toward the source of the ice. The long, pointed tip at the other end points to the end moraine. Some drumlins can be over 2 miles long and over 100 feet high. Glacial ice scoured the bedrock in some places and deposited more than 100 feet of drift in other places (Whitson et al, 1914).

BEDROCK GEOLOGY

The Eastern Dolomitic bedrock formation underlies all of Kewaunee County dropping sharply toward Green Bay while sloping gently across the county to Lake Michigan. This aquifer is also sometimes referred to as the Silurian aquifer formation (Map 2).

Topography is often characterized by shallow soil depth to the underlying Niagara Dolomite (limestone) bedrock. Karst bedrock is easily dissolved by water, and often displays large vertical and horizontal cracks and fissures. These features often become direct conduits for transporting unfiltered groundwater contaminants, such as sediment, chlorides, nitrates, bacteria and other microorganisms to local drinking water aquifers.



Map 2: Bedrock Geology of Wisconsin

The Eastern Dolomite aquifer is the most widely used source of groundwater supply in Kewaunee County. All private wells, including municipal water systems in the county, get their drinking water exclusively from groundwater. Streams, lakes, and wetlands are fed by groundwater; thus, fish and other wildlife are as dependent on abundant, clean groundwater as people. Development and land-use practices must be managed in a way that protects the county's valuable groundwater supply. In areas where the bedrock is at or very near the surface,

there can be a serious hazard of pollutants entering the ground water through fissures and crevices in the bedrock. Deeper soils overlying bedrock offer greater protection to the aquifer.

PHYSIOGRAPHY & RELIEF

The physiography of Kewaunee County is controlled largely by the Niagara Dolomite formation. Slopes are dominantly nearly level to sloping. Approximately 80% of the county has slopes of less than 6% and 12% has slopes of 6-12%. Generally, portions of the county occupied by Valders drift have the least relief. The steeper slopes of the county are valley sides and segments of the Kettle Moraine. These morainic deposits are extremely hilly and choppy areas with numerous depressions, some of which form small lakes. About 8% of the county has slopes of more than 12%. Lake Michigan, which borders the county on the east, has a mean lake elevation of 580 feet above sea level. The land elevation rises to about 900 feet in Lincoln and Montpelier Townships (Whitson et al, 1914).

Map 3: Shaded-Relief, Kewaunee County (Clayton, 2013).

NATURAL RESOURCES

Kewaunee County's unique geology and location on Lake Michigan provides an abundant amount of natural resources including vast shorelines, cold and warm water streams and rivers, beautiful wooded wetlands, and diverse habitat ecosystems.

COASTAL RESOURCES

The 26.9 miles of Lake Michigan shoreline bordering the county, comprise of bluffs, beaches and wetlands, providing a variety of natural features. In addition, living and cultural resources (history, recreation and agriculture) and unique habitats endemic to the region create valuable assets to the county. Protection is vital as development in coastal areas ultimately lead to greater land disturbance, runoff, and pollutants.

Coastal development can affect the profile and usage of the shoreline; which include; shoreline/bluff erosion, impact to coastal wetlands, fluctuating lake levels, increased nonpoint pollution, economic impacts, wildlife habitats, and the unique historic and archeological resources of the area. The preservation of coastal resources is integral to maintaining and improving community health and safety, aesthetics and economic viability (tourism, clean parks and beaches, recreational fishing) (Bay-Lake Regional Planning Commission, 2016).

Bay of Green Bay Shoreline, Kewaunee County.
Photo Credit: Engels, LWCD

ENVIRONMENTAL CORRIDORS

Environmental corridors are natural areas that contain and connect green space, and scenic, historic, scientific, recreational, and cultural resources. They often lie along waterways and other natural features and appear as long intertwining bands of natural vegetation and surface waters when looking at aerial photography (Bay-Lake Regional Planning Commission, 2001). These corridors are extremely important because they provide wildlife habitat, create an area that wildlife can use to move between habitats, keep green space on the landscape, and provide buffers for waterway complexes. In agricultural settings, these corridors are often wooded tree-lines adjacent to cropland.

The *Coastal Resource Identification for Kewaunee County Using Environmental Corridors Report* (Bay-Lake Regional Planning Commission, 2001) lists the following features as Environmental Corridors:

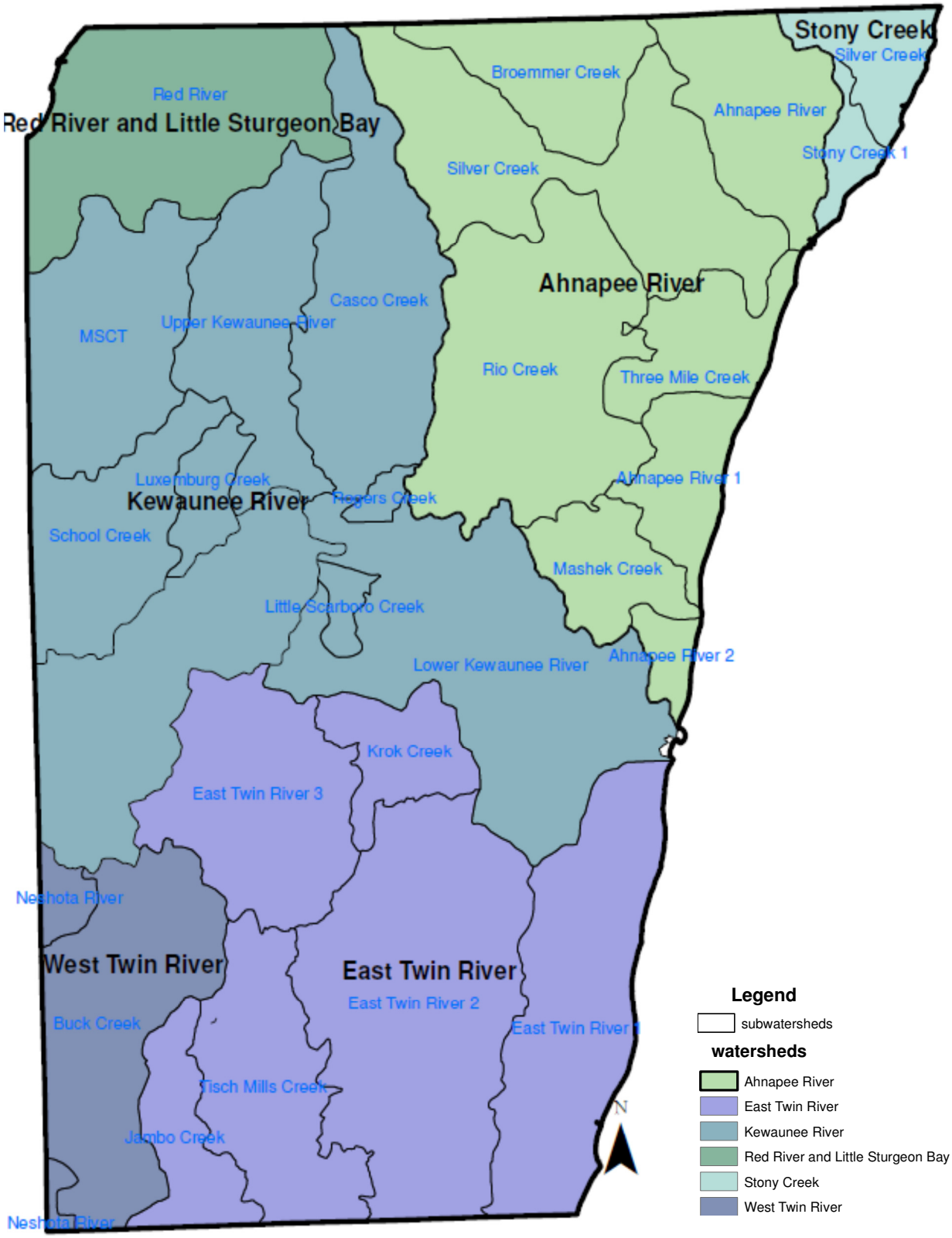
- Wetlands with 25-foot buffer

- Navigable waters with 75-foot setback
- 100-year floodplains
- Areas of steep slope (12% or greater)
- Other features that are part of the Kewaunee County environmental corridor definition include:
    - Designated scientific and natural areas
    - Unique and isolated woodland areas
    - Scenic views
    - Historic and archaeological sites
    - Unique geology
    - Wetland mitigation sites
    - Unique wildlife habitats
    - Parks and recreations areas
    - Other locally identified features

WATERSHEDS

Kewaunee County's water resources are abundant and unique. Kewaunee County lies within the Lake Michigan Watershed basin and consists of 6 watersheds including the Ahnapee River, East Twin River, Kewaunee River, Red River/Sturgeon Bay, Stony Creek and West Twin River. These watersheds are diverse with vast networks of intermittent and perennial streams. Each watershed comprises of many small unique ecosystems.

West Twin River (Left) and Tributary of Ahnapee River (Right), Kewaunee County
Photo Credit: Engels, LWCD



Map 4: Kewaunee County Watersheds & Sub-Watersheds

AHNAPEE RIVER

The Ahnapee River watershed covers 136 square miles in northeastern Kewaunee County and southern Door County. Approximately 55,890 acres (65%) of the watershed lie within the boundaries of Kewaunee County, including 41.2 miles of streams, creeks, and rivers. Silver Creek is the largest tributary to the Ahnapee River. Three Mile Creek is a small intermittent stream that drains from Krohns Lake to Lake Michigan and is the only creek in the watershed classified as a Class II Trout Water.

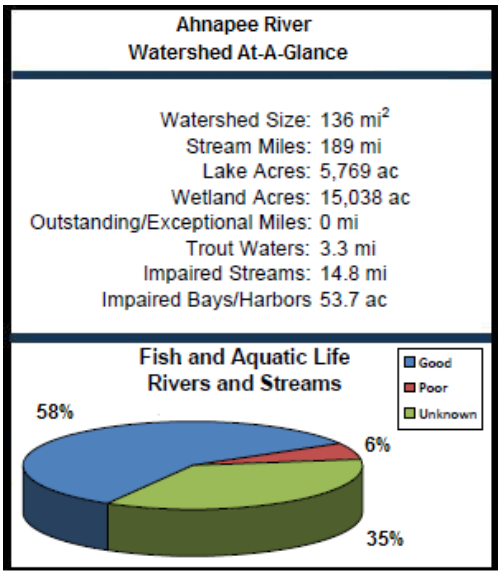


Figure 3: Ahnapee River Watershed At-A-Glance

The Ahnapee River watershed also contains several of Kewaunee County's largest lakes. East Alaska Lake is a 53-acre seepage/drainage lake up to 50-feet deep and fed by an intermittent inlet from West Alaska Lake with overall fair water quality. West Alaska Lake is a 20-acre seepage/drainage lake with a maximum depth of 41 feet. Little is known about the water quality of this lake but both East and West Alaska Lakes are possibly being enriched by polluted runoff. Krohns Lake is 21 acres and has a maximum depth of 38 feet. It is a spring-fed lake with fair to good water quality. Overall, fish and aquatic life in rivers and streams is good, but 35% is classified as unknown (Figure 3) (WDNR Watershed Ahnapee River, 2018).

EAST TWIN RIVER

The East Twin River watershed covers portions of southeastern Kewaunee County and northeastern Manitowoc County. Approximately 42,932 acres (42.5%) of the watershed lie within the boundaries of Kewaunee County. Much of the East Twin River watershed is agricultural with little natural buffer areas existing along the river.

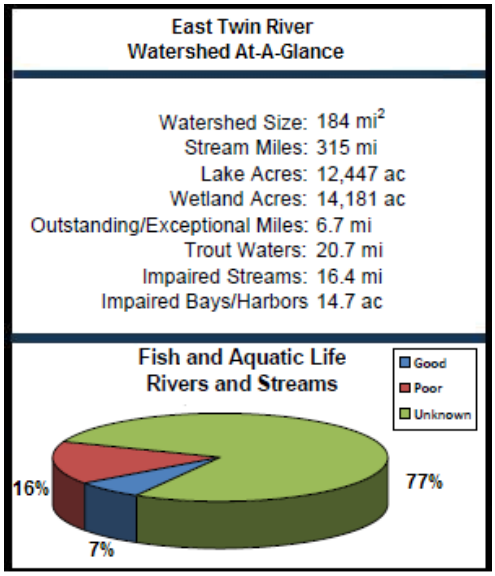


Figure 4: East Twin River Watershed At-A-Glance

The DNR has studied and classified the biological use of 67.9 of the 98.9 miles of streams in the East Twin River watershed that reside in Kewaunee County. Two and a half miles of streams are classified as trout waters, 26.9 miles are classed as warm water sport fisheries, 13.6 miles as warm water forage fisheries, 9.9 miles as limited forage fisheries and 5 miles of limited aquatic life. Krok Creek, a tributary of the East Twin River, is classified as an Exceptional Resource Water due to its designation as a Class I Trout Water (Figure 4).

Heidmann, Shea, and Englediner are the 3 larger lakes in this watershed and in Kewaunee County. Heidmann is a 24-acre seepage lake, 34 feet deep, and has fair water quality. Shea Lake is a 31-acre eutrophic seepage lake with a maximum depth of 24 feet and is extremely productive. Engledinger Lake is also a eutrophic seepage lake, 52-acres, with a depth of 20-feet (WDNR Watershed East Twin River, 2018).

Heidmann Lake, Kewaunee County
Photo Credit: Jennifer Gonzalez, Tourism Coordinator

KEWAUNEE RIVER

The Kewaunee River watershed crosses central Kewaunee County and eastern Brown County. Roughly 73,472 acres (83%) of the watershed lie within the boundaries of Kewaunee County, including 63.5 miles of streams/rivers. This watershed is approximately 79% agriculture and many of its streams and tributaries are receiving sediments and nutrients from agricultural runoff. Overall, 68% of this watershed's fish and aquatic life in the rivers and streams is unknown (Figure 5).

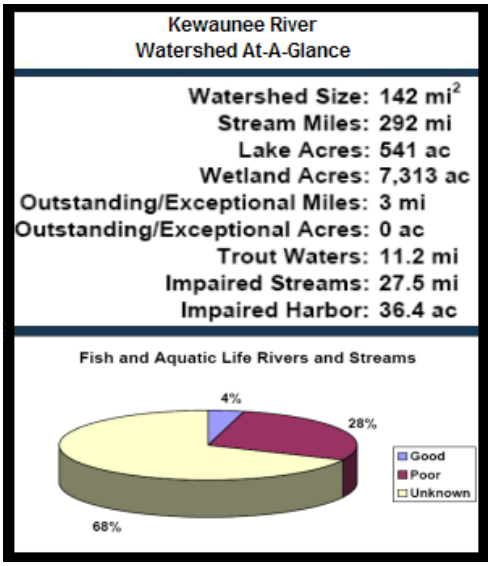


Figure 5: Kewaunee River Watershed At-A-Glance

The major tributaries include Casco, School, Scarboro and Little Scarboro Creeks. Little Scarboro Creek, a cold-water Class I Trout Stream tributary to the Kewaunee River, is the only designated "Outstanding Resource Water" (ORW) in Kewaunee County. An ORW is defined in NR102.10 of the Wisconsin Administrative Code, to include rivers designated as National Wild & Scenic Rivers and/or State Wild & Scenic Rivers, and some specially designated Class I Trout Waters. Little Scarboro Creek originates in the Lipsky Swamp and flows to the Kewaunee River and according to the DNR's 1995 Twin-Door-Kewaunee Report, "is the only Lake Michigan tributary in Wisconsin with significant natural reproduction of Coho Salmon and Rainbow Trout".

Roger's Creek and a portion of Casco Creek, also tributaries of the Kewaunee River, are classified in NR102.11 as "Exceptional Resource Waters" (ERW). ERW are defined in NR102.11 of the Wisconsin Administrative Code as surface waters which provide valuable fisheries, hydrologically or geologically unique features, outstanding recreational opportunities, or unique environmental settings, and which are not significantly impacted by human activities.

Seidl Lake is the only lake greater than 5 acres in size in the Kewaunee River watershed (WDNR, Watershed Kewaunee River, 2018).

RED RIVER/STURGEON BAY

Red River/Sturgeon Bay River watershed covers portions of northwestern Kewaunee County, southwestern Door County, and northeastern Brown County. Approximately 13,798 acres (22%) of the watershed lies within the boundaries of Kewaunee County. The watershed is dominated by agriculture (57%), wetlands (18%), and forest (14%). Two main rivers lie in the Kewaunee County portion of this watershed. The Red River is a 9-mile, warm water stream in northwestern Kewaunee County and Macco Creek is a high-gradient 1 mile long intermittent drainage ditch to Green Bay and is classified as a limited forage fishery. This watershed has approximately 60% of the fish and aquatic life identified as unknown (Figure 6) (WDNR Watershed Red River/Sturgeon Bay, 2018).

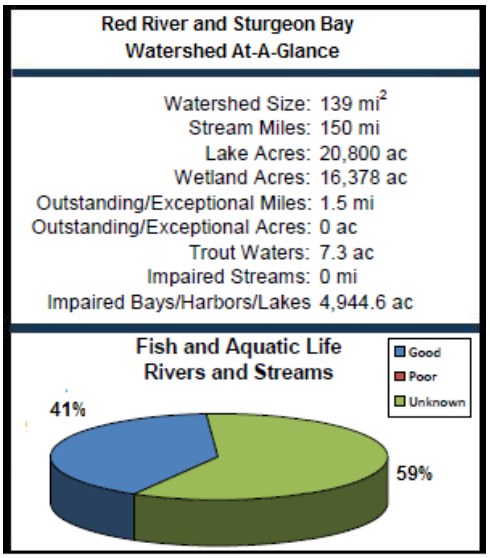


Figure 6: Red River/Sturgeon Bay River Watershed At-A-Glance

STONY CREEK

Stony Creek watershed covers portions of northeastern Kewaunee County and southeastern Door County. Approximately 4,431 acres (7%) of the watershed lie within the boundaries of Kewaunee County and only 21% of fish and aquatic life is categorized as good. Approximately 60% is still unknown (Figure 7).

Stony Creek, 13.6 miles long, begins northeast of Maplewood (Door County) and flows south-southeast into Lake Michigan. The lower 5 miles are not classified as trout stream, but DNR fisheries managers have found native brook trout in this reach. With habitat improvements, this reach could support a Class II Trout Fishery (WDNR Watershed Stony Creek, 2018).

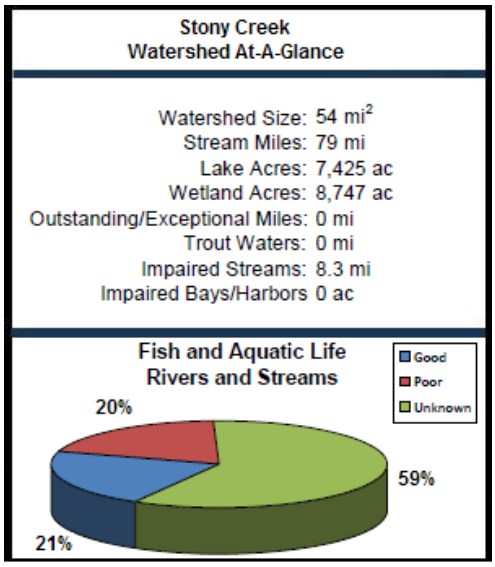


Figure 7: Stony Creek Watershed At-A-Glance

WEST TWIN RIVER

The West Twin River watershed covers portions of southwestern Kewaunee County, southeastern Brown County, and northwestern Manitowoc County. Approximately 13,346 acres (12%) of the watershed lie within the boundaries of Kewaunee County. Only 30% of the watershed is considered good for fish and aquatic life, with 56% still unknown (Figure 8).

The West Twin River watershed is 1 of 7 watersheds within the Twin-Door-Kewaunee River Basin and is located in north central Manitowoc and southeastern Brown Counties, with a small portion extending into southwestern Kewaunee County.

Portions of Black Creek and King Creek lie within Kewaunee County. Black Creek is a 10-mile long tributary of the West Twin River with lower sections of the river having a moderate gradient of 13.5 feet per mile and habitat ranking of fair.

King Creek is a 5-mile long tributary to the Neshota River and during dry years can be intermittent. This sub-watershed is highly agricultural and there is evidence that stream bank pasturing and row cropping contributes large qualities of sediment to the river creating turbid water conditions. Because the current status of the stream is unknown, it has the default classification of a warm-water sport fishery (WDNR Watershed West Twin River, 2018).

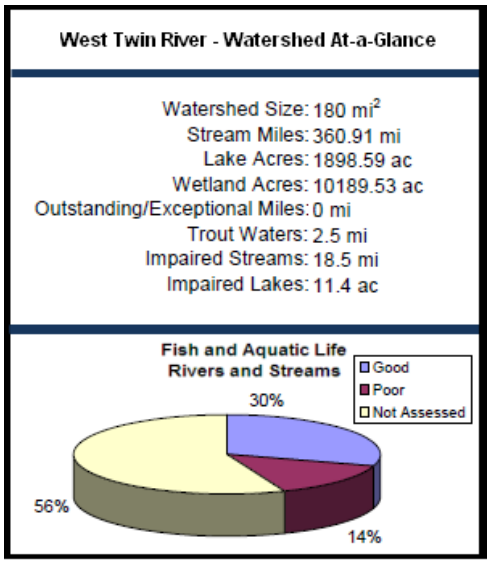
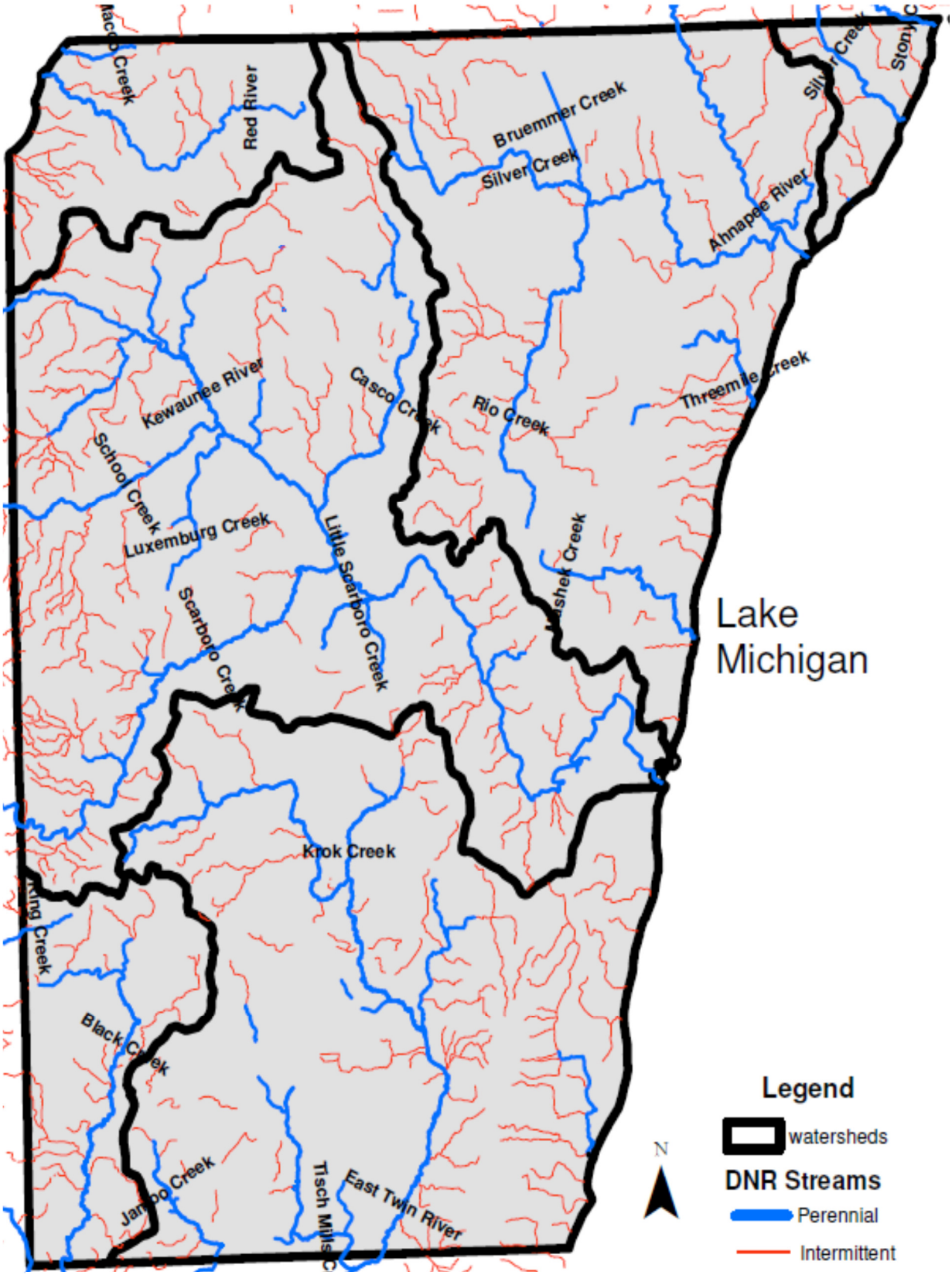


Figure 8: West Twin River Watershed At-A-Glance



Map 5: Kewaunee County Rivers & Streams

WETLANDS & WOODLANDS

The DNR has inventoried over 35,000 acres of wetlands, greater than 2 acres in size, in Kewaunee County, and the Wisconsin Wetland Association has identified an additional 10,447 acres of potentially restorable wetlands. Wetlands are vital natural resources and are critical to watershed health because they enhance water quality by absorbing excess nutrients and slow the flow of water and release settled pollutants; but also provide essential habitat for many types of wildlife and offer recreational, educational, and aesthetic opportunities to the county.

Kewaunee County's woodland resources date back before settlement when the county was predominately northern hardwood forest except for the Black Ash Swamp. Lumbering was once the leading industry until land was cleared for agricultural crops and now is rather small in economic importance. Currently, woodlands make up the second largest land-use covering 21% of the county although most of this percentage also includes the wooded wetland complexes.

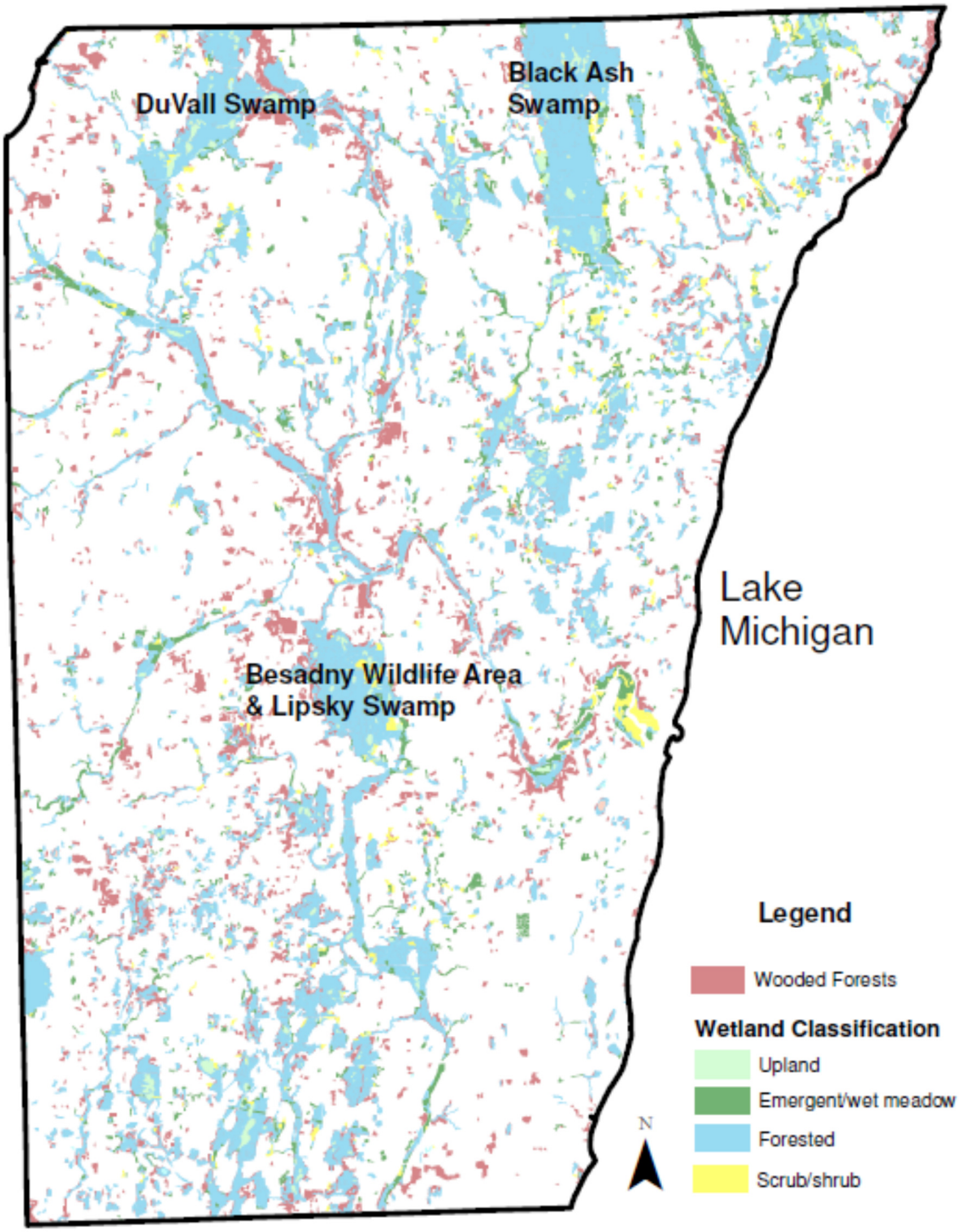
Three large DNR recognized wetland complexes located in Kewaunee County include the Black Ash Swamp in Lincoln Township, Lipsky Swamp in West Kewaunee Township, and the Duvall Swamp in Red River Township (Map 6).

The Black Ash Swamp is the largest wetland complex extending over 4,000 acres in size. The Black Ash Swamp is entirely privately owned, surrounded by agricultural land and contains 2 extensive forest community types featuring both northern and southern species as well as an undeveloped stretch of Silver Creek, a major tributary of the Ahnapee River. Woodlands in the northern portion of the Black Ash Swamp support second growth northern wet to wet-mesic forest of black ash, white cedar, and paper birch and the lowland areas consists of conifer stands of cedar and tamarack (WDNR, 2002).

One of the largest remaining blocks of forest in the county can be found in the C.D. (Buzz) Besadny Fish and Wildlife Area, which also contains the Lipsky Swamp. This area is a 2,632-acre property located in eastern Kewaunee County with lowland forest complexes consisting primarily of cedar and bottomland hardwood species. Other notable natural resources found in this wildlife area are grasslands, warm water rivers, and cold-water streams. This wildlife areas provides habitat for songbirds, waterfowl, water birds, and upland game.

Besadny Wildlife Area, Kewaunee County
Photo Credit: Engels, LWCD

The Besadny area also contains an Anadromous Fish Facility which is a Wisconsin DNR fish egg collection station near the city of Kewaunee. Trout and salmon migrating from Lake Michigan are moved from holding ponds into the processing building to be spawned and then sent to hatcheries where they are raised before being released into Lake Michigan's tributaries (WDNR C.D. Besadny, 2018).



Map 6: Kewaunee County Wetlands & Woodlands

SOILS

Kewaunee County is also abundant with rich soils that were formed in glacial till and outwash and are primarily clays and sandy loams. Based on the Natural Resources Conservation Service (NRCS) there are eight soil associations within the county (Table 2).

Hortonville – Symco: consists of very deep, well drained soils formed primarily in calcareous loamy till on drumlins and ground moraines.

Kewaunee – Manawa: consists of very deep, well drained soils formed in clayey till, typically with a thin mantle of loess, on ground moraines, end moraines, and recessional moraines. Slope ranges from 0 to 45 percent.

Casco – Boyer: consists of very deep, somewhat excessively drained soils which are shallow to stratified calcareous sandy outwash.

Waymor – Lamartine – Pella: consists of very deep, well drained soils typically formed in a thin mantle of loess and in the underlying calcareous loamy till on ground moraines.

Onaway – Solona – Hortonville: consists of very deep, well drained or moderately well drained soils formed in loamy deposits on ground moraines, end moraines, and drumlins.

Carbondale – Cathro –Markey: consists of very deep, very poorly drained soils formed in organic deposits more than 51 inches thick on ground moraines, outwash plains and lake plains. These soils have moderately slow to moderately rapid permeability. Slopes range from 0 to 2 percent.

Kolberg – Namur – Longrie: consists of well drained soils that are moderately deep to a lithic contact with dolomite. These upland soils formed mostly in clayey till and, in many pedons, in a thin underlying layer of loamy till that is underlain in turn by dolomite. Slope ranges from 0 to 12 percent.

Wainola – Oakville: consists of very deep, somewhat poorly drained soils formed in fine sandy glaciofluvial deposits on outwash plains, lake plains, and glacial lake deltas. Slope ranges from 0 to 4 percent.

Table 2. Soil Mapping Units & Percentages

Soil Mapping Units	Percentage
Hortonville – Symco	34.8
Kewaunee – Manawa	18
Casco – Boyer	13
Waymor - Lamartine - Pella	11
Onaway - Solona – Hortonville	10
Carbondale - Cathro – Markey	7
Kolberg - Namur - Longrie	6
Wainola – Oakville	0.2

Source: NRCS Personal Communication, 2018

HYDROLOGIC SOIL GROUPS

Soils are further classified into four Hydrologic Soil Groups based on the soil's runoff potential. The four major Hydrologic Soil Groups are A, B, C and D (Map 7).

Group A: Sand, loamy sand, or sandy loam. Soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel.

Group B: Silt loam or loam. Soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures.

Group C: Sandy clay loam. Soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture.

Group D: Clay loam, silty clay loam, sandy clay, silty clay, or clay. Soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high-water table, soils with a clay-pan or clay layer at or near the surface, and shallow soils over nearly impervious material.

Table 3 & Figure 9 shows the acreage associated with the Hydrological Soil Groups. Group C soils are the dominate group representing 56% of Kewaunee County's acres (U.S. Department of Agricultural, 1980).

Table 3. Hydrologic Soil Group Acres

Soil Group	Acres
Not Rated	1,806
A	4,641
A/D	20,172
B	13,039
B/D	28,736
C	122,428
C/D	18,957
D	10,180

Source: NRCS Personal Communication, 2018

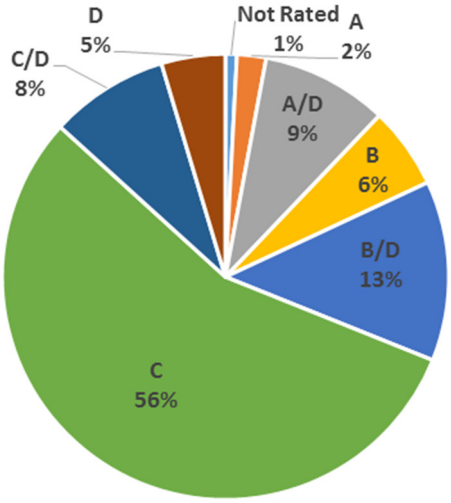
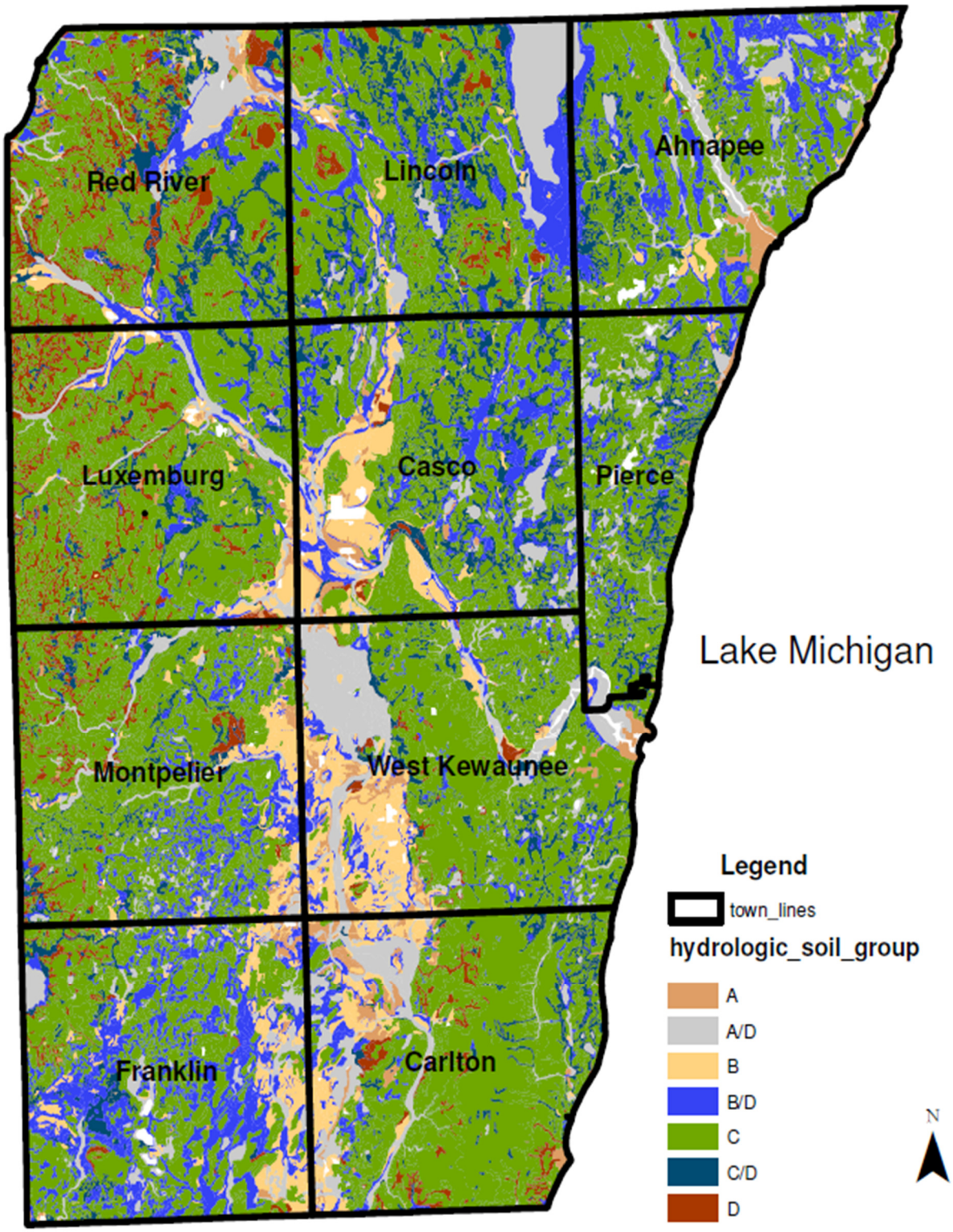


Figure 9: Hydrological Soil Group Percentages



Map 7: Kewaunee County Hydrologic Soil Groups

TOLERABLE SOIL LOSS

According to the NRCS, Tolerable Soil Loss, also known as "T" value, for a specific soil is the maximum average annual soil loss expressed as tons per acre per year (t/acre/yr.) that will permit current production levels to be maintained economically and indefinitely. Erosion is considered to be greater than T if either the water (sheet & rill) erosion or the wind erosion rate exceeds the soil loss tolerance rate (NPPH, 2014). Landowners must meet T on cropped fields and pastures to be following state standards and prohibitions.

In Kewaunee County, T values of 5 represent approximately 57% or 125,948 acres (Table 4 & Figure 10). Soils with a T of 5 can lose up to 5 t/acre/yr. T values of 3 is the next dominate classification with roughly 41,000 acres and lie more on the western side of the county. Map 8 indicates T values of 1 and 2 are typically found in the lower areas, like the Black Ash Swamp, located in Lincoln Township.

Table 4. Tolerable Soil Loss Acres

Soil T	Acres
0	1,806
1	13,198
2	32,050
3	41,089
4	5,866
5	125,948

Source: NRCS Personal Communication, 2018

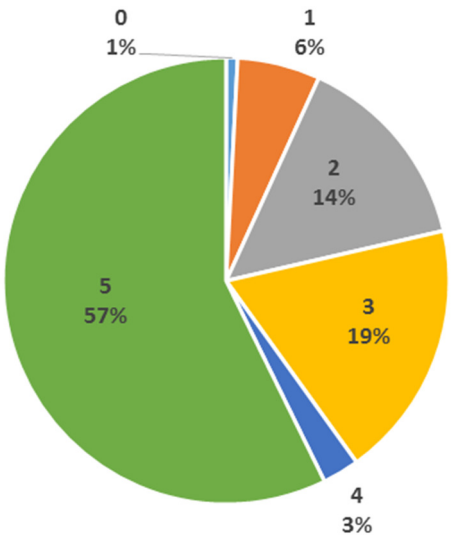
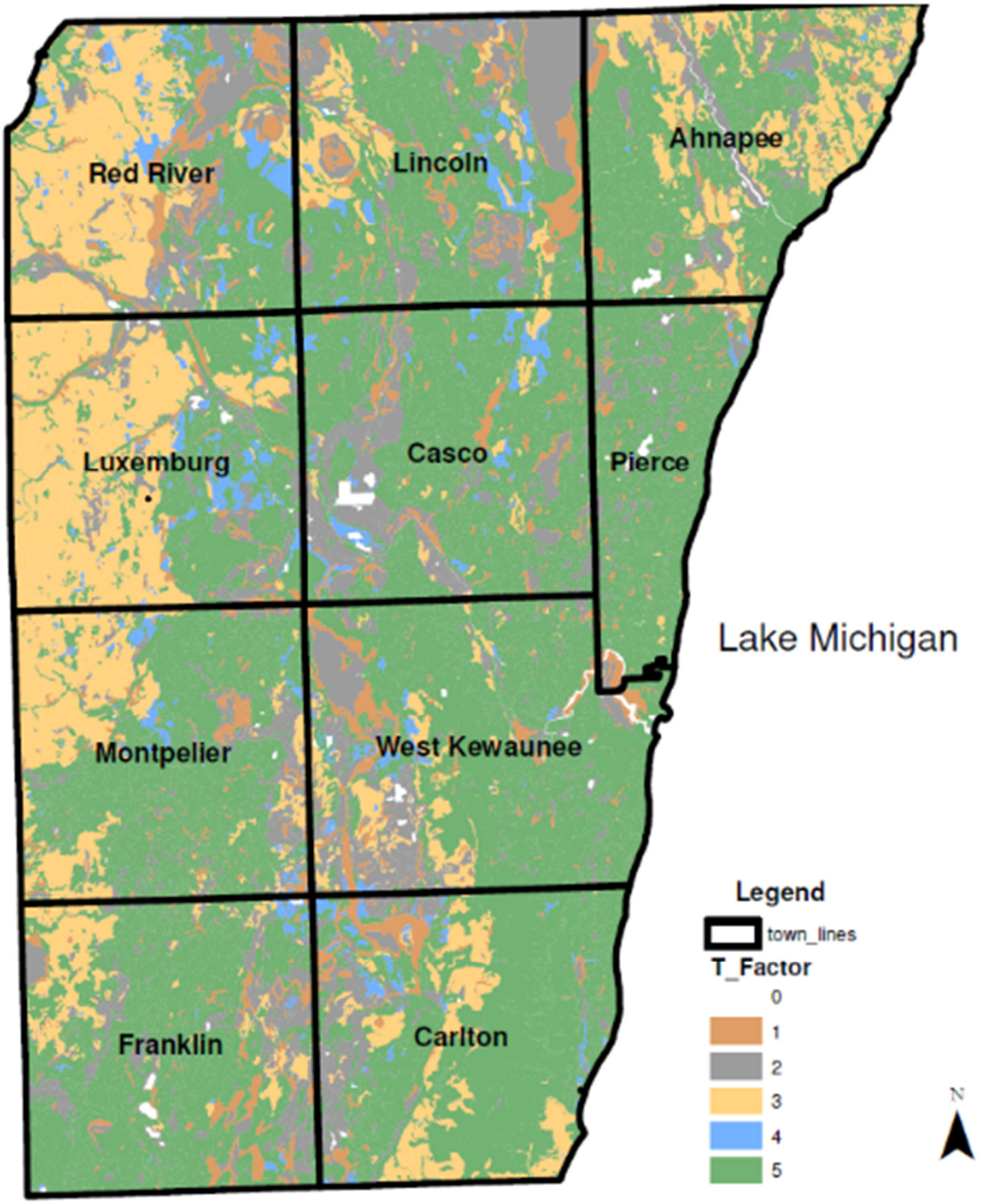


Figure 10: Tolerable Soil Loss Percentages



Map 8: Kewaunee County Tolerable Soil Loss "T" Factor

FARMLAND

The rich suitable farmland soils, water resources, and climate make Kewaunee County a prime place for the agricultural industry.

DATCP defines prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses.

Prime farmland has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding. Map 9 illustrates the large majority of Kewaunee County land is classified as "prime" farmland with almost 85,000 acres, or approximately 40%. An additional 24%, or 52,000 acres, are also considered prime farmland if drained, meaning the farmland was tiled to drain excess water from below the surface (Table 5 & Figure 11).

Land that does not meet the criteria for prime or unique farmland is considered to be farmland of statewide importance. Areas along rivers, streams, and wetlands that are too wet and natural areas, including wetlands and woodlands are designated as not prime farmland (NRCS Farmland Classification, 2018).

Table 5. Farmland Classification Acres

Classification	Acres
All areas are Prime Farmland	84,855
Prime Farmland if Drained	52,458
Not Prime Farmland	46,728
Farmland of Statewide Importance	35,917

Source: NRCS Personal Communication, 2018

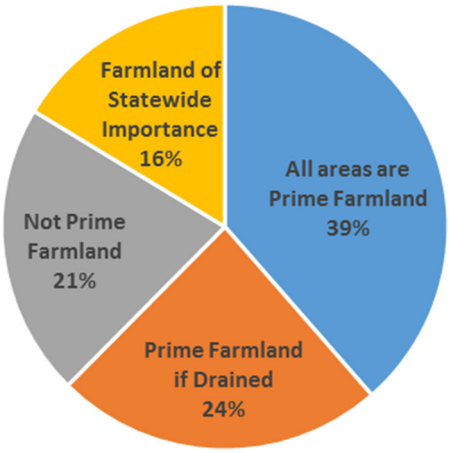
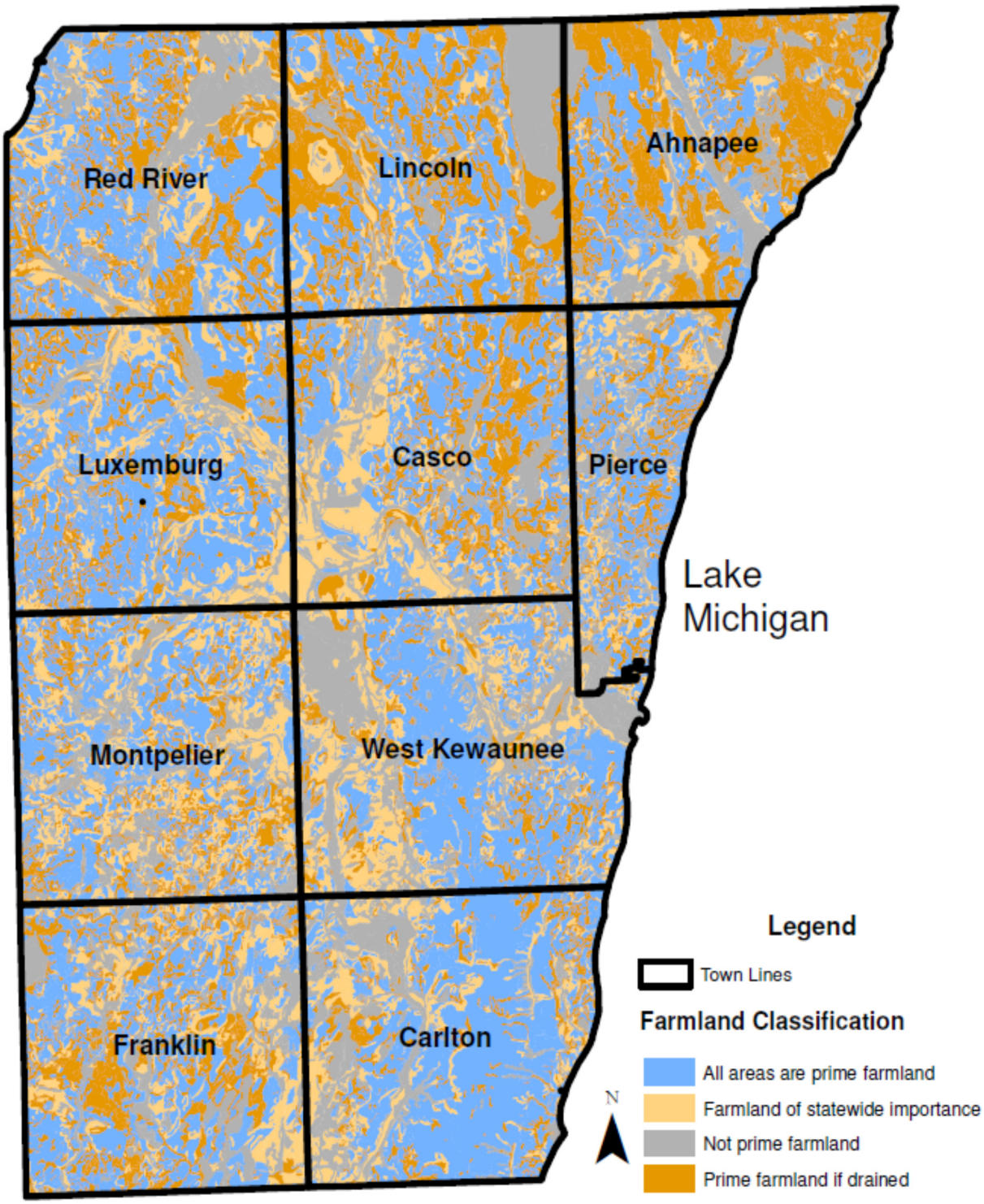


Figure 11: Farmland Classification Percentages



Map 9: Kewaunee County Farmland Classification

NONPOINT SOURCES

The underlying principal of the LWRMP and NR151 is addressing nonpoint source pollution. Nonpoint source water pollution can be defined as pollution from diffuse sources and can be caused by rainfall or snowmelt moving over, and percolating through the ground. Land-spreading of all wastes have been shown to impact our groundwater and surface water resources. Timing of applications, weather patterns, shallow soils, and application methods can all influence runoff.

AGRICULTURE

Today approximately 138,539 acres are cropped or used as pasture land in Kewaunee County (Bay-Lake Regional Planning Commission, 2016). In 2017, Wisconsin Agricultural Statistics reported 160 dairies, representing 99,000 total cattle and calves in the county.

Sixteen of the dairies in Kewaunee County are considered Concentrated Animal Feeding Operations or CAFOs, defined as Wisconsin animal feeding operations with 1,000 Animal Units (AU) or more. AUs measure equivalencies between animal types as established by NR243.05 Wis. Adm. Code. CAFOs are regulated under the DNR and are required to have a Wisconsin Pollutant Discharge Elimination System (WPDES) permit. According to the 2018 Nutrient Management Plans (NMP), these 16 CAFOs represent approximately 59,355 total animals or approximately 60% of the total cattle and calves in the County.

Table 6. Kewaunee County Cattle & Herd Numbers

Year	Total Herds	# Milk Cows	Total Cattle & Calves
2000	376	27,000	53,000
2005	276	30,000	66,000
2010	222	40,500	77,000
2015	173	45,500	98,000
2017	160	48,000 (2016#)	99,000

Source: Wisconsin Agricultural Statistics, 2000, 2005, 2010, 2015, 2017

The general agricultural trend in Kewaunee County from 2000 to 2017 is inversely proportional, indicating that one variable increases (total milk cows and total cattle) while the other decreases (total herds) as Figures 12 and 13 characterize. Overall, from 2000 to 2017, the county experienced a 57% reduction in total herd's numbers; while experiencing a 46.5% increase (46,000) of total cattle (including calves) population (Table 6).

The agricultural economic impact in Kewaunee County supports approximately 2,300 jobs and brings in over 80 million dollars annually, with approximately $65 million generated from dairy farms. Besides employment directly on farms, Kewaunee County's dairy industry supports a number of agri-business professionals including veterinarians, hoof trimmers, nutritionists, agronomists, crop consultants, milk haulers, cheese processors, breeding technicians, custom harvesters, custom heifer growers and farm management consultants (Kewaunee County Economic Development Corporation, 2018).

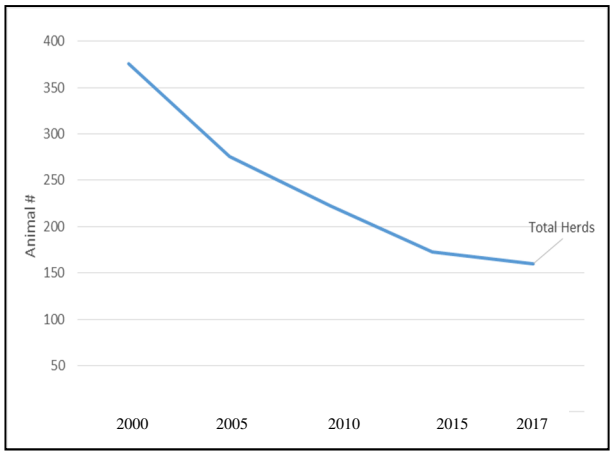


Figure 12: Kewaunee County Total Herd Numbers, 2000-2017

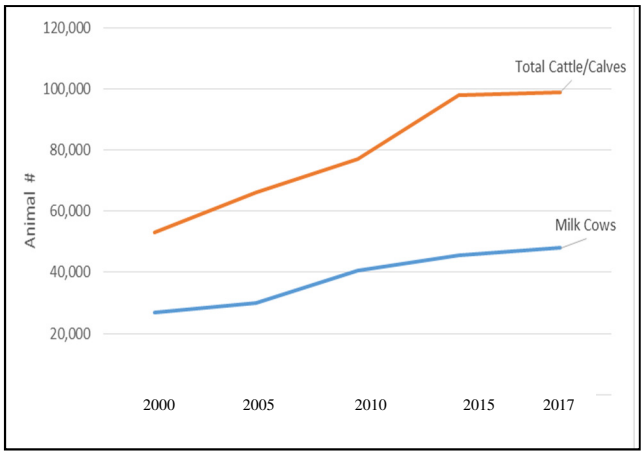


Figure 13: Kewaunee County Milk Cows & Total Cattle/Calves, 2000-2017

The primary crops grown and harvested in the county include corn grain, corn silage, alfalfa, soybeans, oats, and winter wheat. Although most farms grow these primary crops in Kewaunee County, a small number of farms also grow sunflowers, snap beans, beets, among other varieties. Sunflowers, for example, can be used as a double crop after early harvested small grains or vegetables, an emergency crop, or in areas with a season too short to produce mature corn for silage.

Sunflower Field (Left), Winter Wheat Field (Right), Kewaunee County
Photo Credit: Engels, LWCD

Table 7 and Figure 14 show the harvested acres for the primary crops. Inclement weather in spring and fall can adversely affect crop planting and ultimately acres harvested. Trends from 2000 indicate corn grain and corn silage represent the highest acres harvested in the county. With the exception of 2015, winter wheat has also shown an upward trend since 2000. Soybeans remained relatively steady with only a small decline in 2010. Harvested acres of oats continue to decline with only 2,230 acres in 2017. Alfalfa acres are also experiencing a steady decline; however, the county saw its first increase in 2016, which may be related to the increase in cover crops throughout the county.

Table 7. Kewaunee County Crop Acres Reported as Harvested

Crops	2000	2005	2010	2015	2016
Corn Grain	21,400	15,000	23,800	26,100	24,200
Corn Silage	16,300	33,000	23,000	29,700	26,500
Alfalfa (Dry Hay)	34,500	20,700	18,000	14,600	19,200
Soybeans	11,500	13,500	8,700	11,200	11,600
Oats	8,000	5,000	3,600	6,150	2,230
Winter Wheat	3,900	7,500	10,100	6,000	11,400

Source: Wisconsin Agricultural Statistics, 2001, 2006, 2011, 2016, 2017

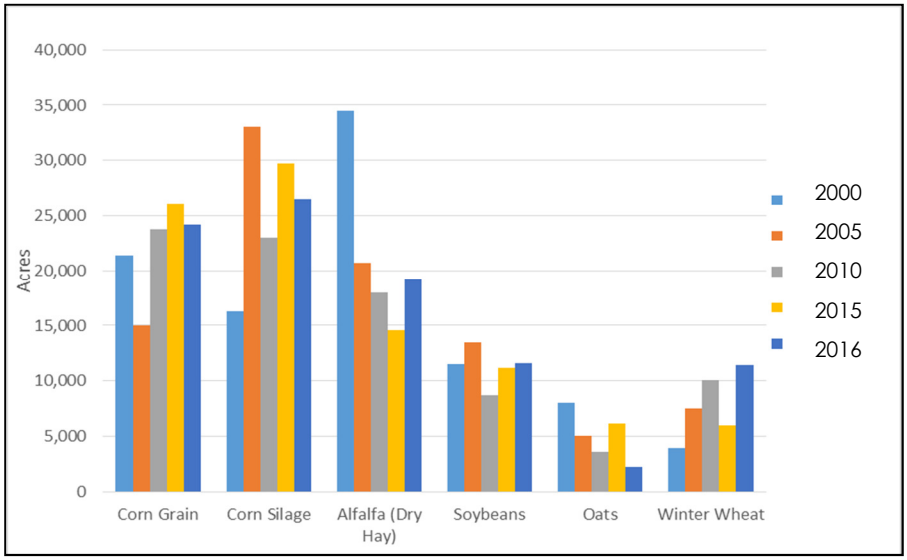


Figure 14: Kewaunee County Crops Harvested

Manure, an animal by-product of farms, is used as a form of fertilizer and land applied on the cropland. Whey from cheese plants is also spread on cropland throughout Kewaunee County. 2017 NMPs, report approximately 151,000 tons of manure solids and approximately 784 million gallons of liquid manure were generated and applied in Kewaunee County. Liquid manure figures include all manure with less than 25% solids, and liquids collected and stored in the manure storage including leachate from feed pads, runoff from production site, and milk-house waste.

Caveat – Approximately 80% of farms report manure generated or applied to cropland to the LWCD office; therefore, these numbers are not a full representation of manure spread.

RESIDENTIAL

Kewaunee County's population, according to the 2010 U.S. Census is 20,574. With the county's natural resources, scenic views, Lake Michigan and Bay of Green Bay shoreline, citizens are moving away from cities and villages and into the rural areas. One way to visualize this rural population is by the location of Private Onsite Wastewater Treatment Systems (POWTS), commonly known as septic systems outside the city and village limits.

Septic systems are required for homes who do not have sewer to properly treat and disperse wastewater from their homes. Septic systems, when properly sited, designed, constructed and maintained, pose a minimal threat to drinking water source, but can still leach approximately 20-25 pounds of nitrogen per year (EPA, 2002). If septic systems are improperly sited, constructed, or maintained, they can pose a significant threat to our groundwater.

Kewaunee County has 4,856 documented sanitary systems (Map 10), of which approximately 500 are holding tanks that are required to be pumped on a regular basis. Septage servicing businesses must register with the DNR and follow Wis. Admin. Codes NR113 and NR114. Septage haulers can land apply waste on DNR approved fields. In 2016, 652,920 gallons was land applied in Kewaunee County and 211,850 gallons was land applied in 2017 (Table 8).

Table 8. Land Applied Septage, Kewaunee County

Permitted Septage Hauler	**Gallons Land Applied in Kewaunee County**	
	2016	**2017**
Pelishek Sanitation	184,300	153,850
Renier	468,620	58,000
Total	**652,920**	**211,850**

Source: DNR Email, 2018

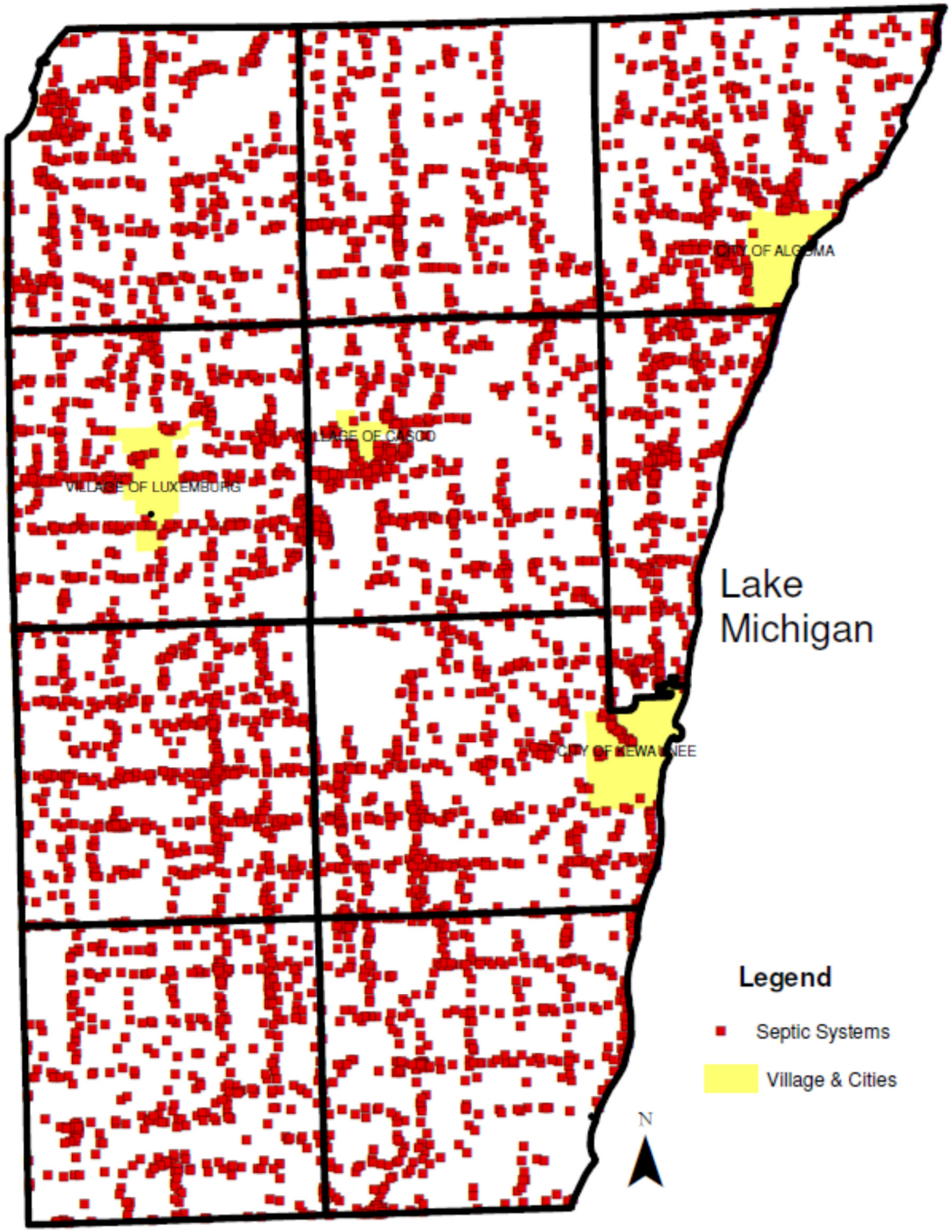
The DNR also regulates four municipal and industrial operations in Kewaunee County discharging wastewater to surface water or groundwater through the WPDES permit program. These operations are located in the Village of Luxemburg, Village of Casco, City of Kewaunee and the City of Algoma. Wastewater treatment plants also can land apply their treated waste on DNR approved fields. In 2016, Algoma, Casco, and Denmark (not located in Kewaunee County, but has fields approved for land-spreading in the county) land applied approximately 2.1 million gallons of treated wastewater plant sludge and 2.4 million gallons in 2017 (Table 9).

Table 9. Land Applied Wastewater Treatment Plant Sludge, Kewaunee County

Treatment Plant	**Gallons Land Applied in Kewaunee County**	
	2016	**2017**
Algoma	684,000	1,107,300
Casco	160,000	64,000
Denmark	1,290,800	1,279,20
Luxemburg	Spreads once every 10-15 years *per DNR email	
Kewaunee	All sludge to landfill *per DNR email	
Total	**2,134,800**	**2,450,500**

Source: DNR Email, 2018

Septic effluent and/or the land application of septage or industrial waste from the treatment plants are considered nonpoint sources of pollution and can contribute to groundwater and surface water pollution in Kewaunee County.



Map 10: Kewaunee County Septic System Locations

CHAPTER 3: NATURAL RESOURCE ASSESSMENTS

With a basic understanding of the Kewaunee County's natural resources and an assessment of nonpoint pollution sources, a thorough assessment of the current quality of these natural resources needs to be examined. This assessment is vital to determine the county's planning needs and to preserve our natural resource for future generations.

SURFACE WATER QUALITY

It has been widely documented that many of Kewaunee County's surface waters are impaired and have been directly impacted by nonpoint sources of pollution. Surface water quality is often tied to groundwater and soil quality and vice versa, especially in karst geology.

Although sedimentation is not ordinarily thought of as a pollutant, sediments increase turbidity, which leads to our lakes and rivers to turn brown. As shown in the adjacent photo (taken by a local citizen), Lake Michigan shoreline turns brown from the sedimentation leaving the fields after heavy rain events. Nutrients and other nonpoint pollutants are bound to sediments, so sediments can serve as a means for the transfer of nutrients and chemicals such as fertilizers and pesticides from adjacent lands within the watershed into the river. Sediment can also be harmful to fisheries because it kills small bottom dwelling stream animals and destroys fish habitat.

Sediment runoff also carries natural and man-made pollutants into local lakes, rivers, streams, wetlands and groundwater. Nutrients, specifically phosphorus, which can accumulate in soils from nutrient applications, in excess can trigger algal blooms and increase aquatic weed growth.

The picture to the right was taken by the Luxemburg NRCS office in 2015 at Selner Beach, located in the City of Kewaunee where reported incidences of nuisance algal blooms and larger quantities of decaying algae, called Cladophora are on the rise. Algal blooms can interfere with photosynthesis of submerged plants by blocking sunlight, causing aquatic plants to die. Excess plants and algae, dead or alive, clog up waterbodies, and cause odors hurting both recreational values of the waterbody and adjacent property values (WDNR Nuisance Algae, 2018).

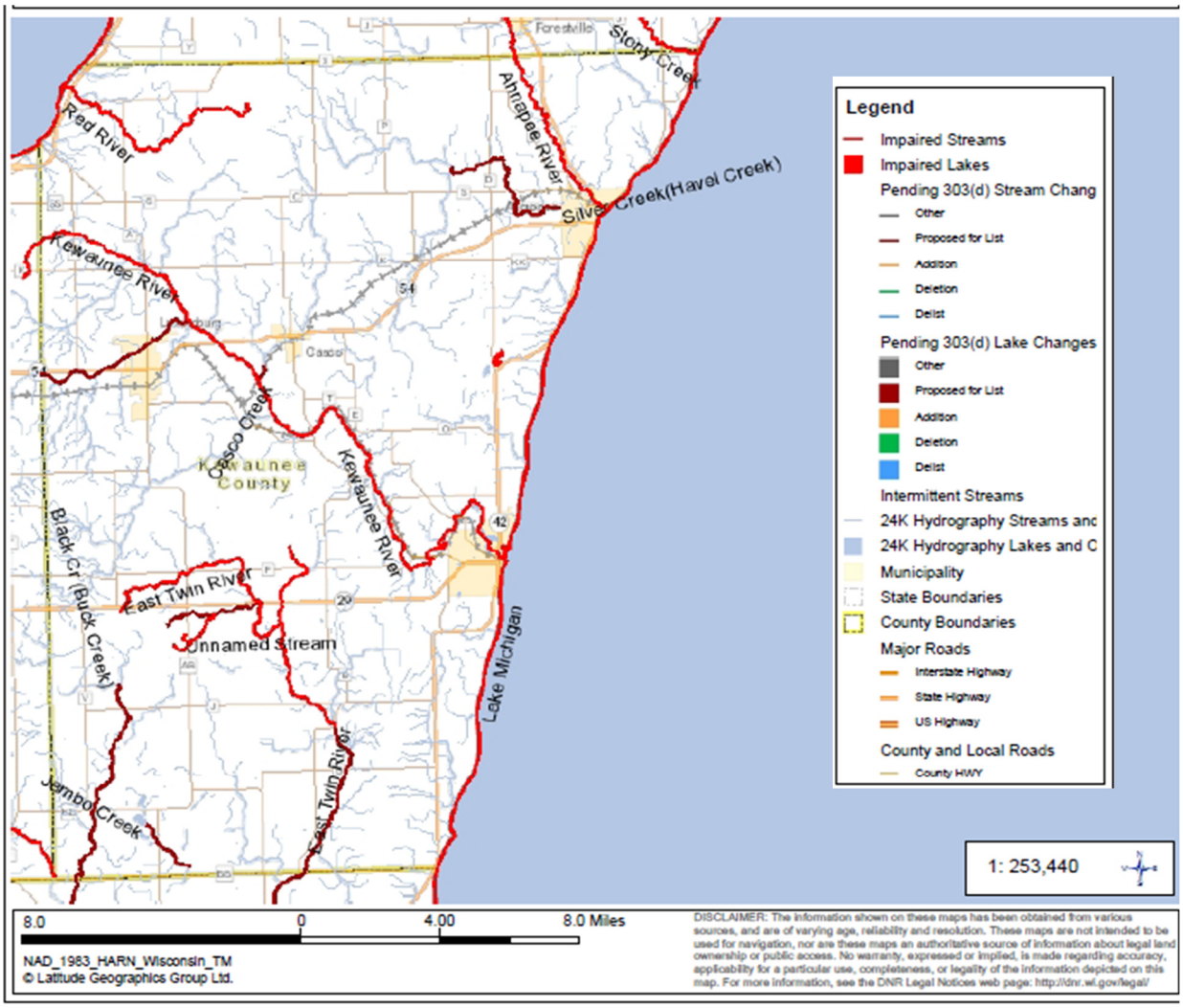
IMPAIRED WATERS

Every two years, Section 303(d) of the Clean Water Act, administered by the Environmental Protection Agency (EPA), requires states to publish a biannual Impaired Waters List that includes all waters that *do not meet* water quality standards, including both water quality criteria for specified substances or designated uses. The inclusion of a waterbody on the list is based on measured exceedances of water quality criteria or a determination that designated uses are not being met. Table 10 and Map 11 identifies the 303(d) impaired waters in Kewaunee County.

Table 10. DNR Listed Impaired Waters, Kewaunee County

Watershed	Waterbody Name	Pollutant	303(d) Listing Year	TMDL Priority
Ahnapee River (TK04)	Ahnapee River	Total Phosphorus	2014	Medium
		PCBs	1998	Low
	East Alaska Lake	Mercury	1998	Low
	Silver Creek (Havel Creek)	Total Phosphorus	2018	Medium
East Twin River (TK02)	East Twin	Total Phosphorus	2014 & 2018	Medium
	Jambo Creek	Total Phosphorus	2018	Medium
	Krok Creek	Total Phosphorus	2012	Medium
	Unnamed Stream	Unknown Pollutant	2016	Low
	Unnamed Stream	Total Phosphorus	2016	Medium
	Unnamed Stream	Total Phosphorus	2018	Medium
Kewaunee River (TK03)	Casco Creek	Total Phosphorus	2018	Medium
	Kewaunee Inner Harbor	Unspecified Metals & PCBs	1998	Low
	Kewaunee River & Marsh	Total Phosphorus	2016	Low
		PCBs & Unspecified Metals	1998 & 2006	
	School Creek	Total Phosphorus	2018	Medium
	Selner Park Beach (Lake Michigan)	E. coli	2006	Low
Red River (TK07)	Red River	Total Phosphorus	2014	Low
	Green Bay Shoreline	PCBs	1998	Low
Stony Creek (TK05)	Stony Creek	Sediment/Total Suspended Solids	1998	Medium
West Twin (TK01)	Black Creek (Buck Creek)	Total Phosphorus	2018	Medium
	Neshota River	Total Phosphorus	2012	Medium

Source: WDNR Impaired Waters, 2018



Map 11: Kewaunee County Impaired Waters

All five of Kewaunee County's major rivers including the Ahnapee River, Kewaunee River, East Twin River, West Twin River, and the Red River are listed for Total Phosphorus (TP) impairments. To examine these impairments further, a detailed analysis by watershed will follow.

AHNAPEE RIVER WATERSHED

The Ahnapee River watershed is dominated by agriculture (71%) and wetlands (17%) and is ranked high for nonpoint sources affecting streams and groundwater. According to the DNR, the watershed overall generally has good water quality, but the Ahnapee River was placed on the impaired waters list for TP in 2014. In 2016, the DNR reassessed the Ahnapee River, but continued to document phosphorus impairments (WDNR Watershed Ahnapee River, 2018).

Silver Creek, which outlets into Lake Michigan, has fair to poor water quality and Rio Creek has very poor water quality. Both creeks experience impacts from farmland erosion and other nonpoint sources throughout the watershed (WDNR, 1995).

In 2018, Silver Creek was added to the impaired water listing for TP impairments and Rio Creek has not yet been designated (WDNR Watershed Ahnapee River, 2018).

Silver Creek's Algal Blooms (2018), Kewaunee County
Photo Credit: Engels, LWCD

East Alaska, West Alaska, and Krohns Lakes (all located in the Ahnapee River Watershed) have generally fair water quality as determined by DNR monitoring in 2017 and 2018 for temperature, dissolved oxygen, TP, and chlorophyll around their deepest points (WDNR Lakes, 2018). A Trophic State Index (TSI), which is a classification system designed to rate bodies of water based on the amount of biological activity they sustain, was assigned to each waterbody.

The TSI of a body of water is rated on a scale from 0-100 and may be defined as:

- **Oligotrophic:** TSI 0–40, having the least amount of biological productivity, "good" water quality
- **Mesotrophic**: TSI 40–60, having a moderate level of biological activity, "fair" water quality)
- **Eutrophic** to **hypereutrophic**: TSI 60–100, having the highest amount of biological activity, "poor" water quality (Wikipedia, 2018).

DNR determined the TSI score for East Alaska Lake was 46 and Krohns Lake was 48 in 2018, and West Alaska Lake was 45 in 2017; therefore, all falling under mesotrophic.

Shae Lake and Heidmann Lake (located in the East Twin River Watershed) were also monitored by the DNR for the same parameters. Shae's Lake had a TSI of 62 in 2018 at its deepest area, placing it as eutrophic or "poor" water quality. Lakes that are considered eutrophic can see algae issues and extensive plant growth. Heidmann Lake (in 2017) at its deepest spot had a TSI score of 43, which is mesotrophic or "fair" water quality (WDNR Lakes, 2018).

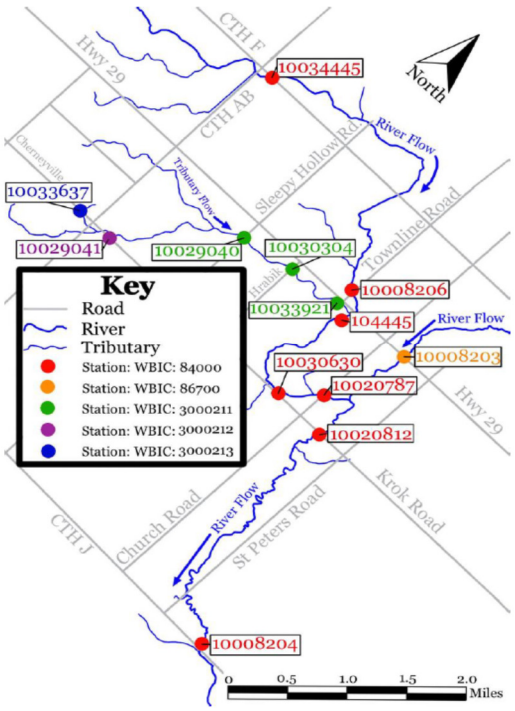
EAST TWIN WATERSHED

The East Twin River watershed is dominated by agriculture (75%) and wetlands (12%) and is also ranked high for nonpoint source issues affecting streams, lakes and groundwater. This watershed has had a number of biological and water quality studies conducted. Fish surveys have found a wide variety of gamefish which range from trout in upper reaches, to smallmouth bass and northern pike in middle reaches to Lake Michigan species in the areas nearest to the lake. Native warm water gamefish species are nearly absent or low in abundance in many surveyed sections and may be due to low flow conditions or habitat loss, in middle sections due to deep pool loss and in lower sections due to low dissolved oxygen (WDNR Watershed East Twin River, 2018).

In response to water quality concerns in the East Twin River and its tributaries, the Kewaunee County Board in October of 2016 approved a resolution requesting the DNR to "immediately initiate a water quality and aquatic life survey of the East Twin River in Kewaunee County."

The East Twin River and tributaries are high quality fisheries that have long-standing importance to both citizens and visitors of Kewaunee County. A 2011-2012 DNR survey, conducted by DNR, found that the "fish and aquatic life use of the upper reaches of the East Twin River and Unnamed Tributaries (UNT) are not meeting Phosphorus water quality standards;" and recommended "that the entire section of the East Twin River that is currently classified as Cold-Class II Trout Water be included on the 2014 impaired waters for Phosphorus." Furthermore, local officials and citizens voiced a strong concern of a point source facilities increased chloride discharge into an already impaired East Twin River watershed.

In response, the DNR initiated a 2017 Water Quality Study (WQS) and released the findings in the 2018 DNR report "Water Quality Surveys of the East Twin River (84000) and Unnamed Tributaries (3000211, 3000212, & 3000213) to the East Twin River, and Krok Creek (86700), Kewaunee County." This report documents the current status and recent changes in water quality, habitat, and the biological communities in the upper reaches of the East Twin River watershed (Map 12).



Map 12: Upper East Twin River Watershed & Sampling Stations IDs

The key conclusions and recommendations from the DNR East Twin WQS are as follows:

- All stream locations assessed exceed water quality criteria for phosphorus and should remain on the 303(d) impaired waters list.

- Chloride, ammonia, and chromium levels in the streams are below impaired thresholds.
- Water temperature in UNT 3000213 exceed water quality standards and should remain on the impaired waters list.
- Ambient chronic toxicity was observed in UNT 3000213 on two occasions in 2017 (July and October). Chronic toxicity was observed on the East Twin River below the confluence with the UNT 3000211 (Station ID 104445) in June but is likely unrelated to UNT 3000213 since no toxicity was found in UNT 3000211 in June.
- Macroinvertebrate monitoring confirmed fair to good water quality conditions in the East Twin River and UNTs with a slight improvement over the 2011 assessment.
- Qualitative habitat assessments found mostly good to fair fish and aquatic life habitat available in Krok Creek, the East Twin River and all three UNTs.
- Watershed-wide nonpoint sources of nutrient and sediment contributions likely impact the water quality and aquatic life habitat in Krok Creek, the East Twin River and all three UNTs and should be controlled to the extent possible.
- The overall fish community in the Upper East Twin River watershed is in good to excellent condition.
- The natural community of the East Twin River at CTH J (Station ID 10008204) should be updated to reflect the current fish community structure of cool-warm headwater.
- The natural community of the East Twin River at Krok Road Bridge (Station ID 10020812) should be updated to reflect the current fish community structure of cool-cold headwater.
- The natural community of the UNT 3000211 at Sleepy Hollow Road (Station ID 10029040) should be updated to reflect the current fish community structure of cool-warm headwater.

*Appendix 2: Kewaunee County LCC response to East Twin River WQS report

KEWAUNEE RIVER WATERSHED

The Kewaunee River watershed is dominated by agriculture (75%) and is ranked as a high priority overall for nonpoint source pollution and is similarly ranked for groundwater pollution. Soils in this watershed, which are moderately fine or fine textured, are more susceptible to erosion and groundwater contamination. In addition, significant erosion occurs on the steep bluffs located on the Lake Michigan shore-land from pounding waves and high winds. From School Creek downstream to the mouth of the Kewaunee River is only partially supporting its potential use due to both point and nonpoint pollution (WDNR, 1995).

In 2001, the DNR released a baseline water monitoring report for work conducted in the Kewaunee River watershed. Based on watershed models, the Kewaunee River delivers approximately 1,900 tons of sediment per year to the Kewaunee Harbor and Lake Michigan that transports both phosphorus and nitrogen. Because of high levels of point and nonpoint source pollution, the Kewaunee River was designated as a Priority Watershed in 1982 and ended in 1992. One project objective was to prevent the existing trout fishery from being lost due to water quality program from nonpoint sources of water pollution (WDNR, 1995). Overall, the priority watershed program participation was low, but some Best Management Practices (BMPs) were

installed. However, despite these efforts, in 2016, the Kewaunee River was added to the impaired water list and in 2018 both Casco Creek and School Creek were added for TP (WDNR Watershed Kewaunee River, 2018).

RED RIVER/STURGEON BAY WATERSHED

The Red River/Sturgeon Bay watershed is dominated by agriculture (57%), wetlands (18%) and forest (14%), and is ranked medium for nonpoint source issues affecting streams and high for nonpoint source issues affecting groundwater. The Red River watershed was designated a Priority Watershed in 1992, but continues to be ranked medium for nonpoint source issues affecting streams and high for nonpoint source issues affecting groundwater.

Red River, which flows through Kewaunee County and outlets in the Bay of Green Bay, was placed on the impaired waters list for TP in 2014. The DNR's 2016 assessments showed continued impairment by phosphorus and general conditions of this river remain poor (WDNR Watershed Red River, 2018).

WEST TWIN RIVER WATERSHED

As with the other watersheds, the West Twin also has agriculture as its primary land-use and, despite significant work to improve conditions, the West Twin runs clay brown for at least several days after rainfall events. Rural field runoff and erosion as well as wetland degradation remain to be major issues in this watershed. Black Creek is the largest creek located in Kewaunee County in this watershed and in 2018 was included on the state's 303(d) list of impaired surface waters for TP impairment (WDNR Watershed West Twin River, 2018).

WATERSHEDS: 2020-2029 WATER QUALITY OBJECTIVES

In conclusion, all five of Kewaunee County's major rivers and several large tributaries are listed by the DNR as impaired. The 2020-2029 LWRMP watershed goal is to focus efforts on reducing cropland erosion, controlling nutrient losses from sedimentation and the application of wastes, and increasing buffers along waterways to work towards meeting Wisconsin's Water Quality Standards for all waterbodies in Kewaunee County. This effort will be accomplished through the development of watershed-based plans and strategies and/or comprehensive lake management plans on both impaired and non-impaired waterbodies.

POLLUTANT REDUCTION TARGETS

In the next 2-4 years (2019-2022), DNR will work to complete the Northeast Lakeshore Total Maximum Daily Load (TMDL) report (details in next section), which will provide pollutant reduction target goals for streams and rivers within Kewaunee County that discharge to Lake Michigan (Map 13). In the meantime, Kewaunee County will work to implement practices

identified from the 9-key element planning process on the Ahnapee River to help restore impaired waters and/or prevent further impairments (refer to Table 26, page 100).

SPECIFIC WATERBODIES TO FOCUS ON FROM 2020-2029

1. Krohns Lake: is not on the impaired waters list, but recent DNR water quality data suggest water quality is declining.
    a. LWRMP priority recommendation for Krohns Lake is to partner with DNR to complete a watershed assessment to determine potential nonpoint impacts on the lake.

2. Shae Lake: is not on the impaired waters, but is eutrophic.
    a. LWRMP priority recommendation for Shae Lake is to develop a watershed-based plan and strategy and/or comprehensive lake management plan to reduce the frequency of eutrophic conditions.

3. Upper reaches of East Twin River: these stream reaches are impaired and are Class I Trout Waters.
    a. LWRMP priority recommendation for the East Twin River (specifically the upper reaches) is to work on developing a watershed-based plan and strategy that focuses on implementing BMPs in the upper watershed to reduce pollutant sources that are causing or contributing to the impairments.

4. School Creek: was added to the impaired list in 2018 for phosphorus.
    a. LWRMP priority recommendation for School Creek is to work on developing a watershed-based plan or watershed assessment to determine the nonpoint sources of pollution that are causing or contributing to the impairments.

5. Luxemburg Creek: is not on the impaired waters list, but recent fish and macroinvertebrate data indicate the stream is impacted by nonpoint sources of pollution.
    a. LWRMP priority recommendation is to work on developing a watershed-based plan or watershed assessment to determine the nonpoint sources of pollution that are causing or contributing to the impairments.

As future watershed-based plans and strategies are developed and become available within the LWRMP's 2020-2029 timeframe, pollutant reduction targets will be evaluated and incorporated under the specified watershed's goals and objectives. Kewaunee County's overall watershed goals are to remove all waterbodies from the DNR's impaired listing and to protect those waterbodies that are not currently considered impaired from becoming impaired.

NORTHEAST LAKESHORE TMDL

As referenced above, after states establish priority rankings for their impaired waters, the next step is to develop a TMDL. A TMDL establishes the maximum amount of a pollutant allowed in a waterbody and serves as the starting point or planning tool for restoring water quality. A waterway that exceeds water quality standards is often no longer suitable for its designated uses, such as wildlife habitat, fishing, or other recreational activities. The ultimate goal of the TMDL is to improve water quality by reducing pollutants, such as phosphorus and sediment (EPA, 2018). In order to develop the TMDL, the watershed is studied to determine the amount of pollution currently entering the waterway.

In 2018, the Wisconsin Legislature 281.145, passed the Northeast Lakeshore TMDL study (Map 13). The DNR "shall conduct a program to monitor and study the introduction of nutrients from point sources and nonpoint sources into the East and West Twin Rivers, the Manitowoc River, the Sheboygan River, and the streams that outlet to Lake Michigan and that lie in and between the Ahnapee River watershed and the Sauk Creek watershed." Kewaunee County watersheds included in this TMDL are Stony Creek, Ahnapee River, Kewaunee River, and the Twin Rivers (East & West).

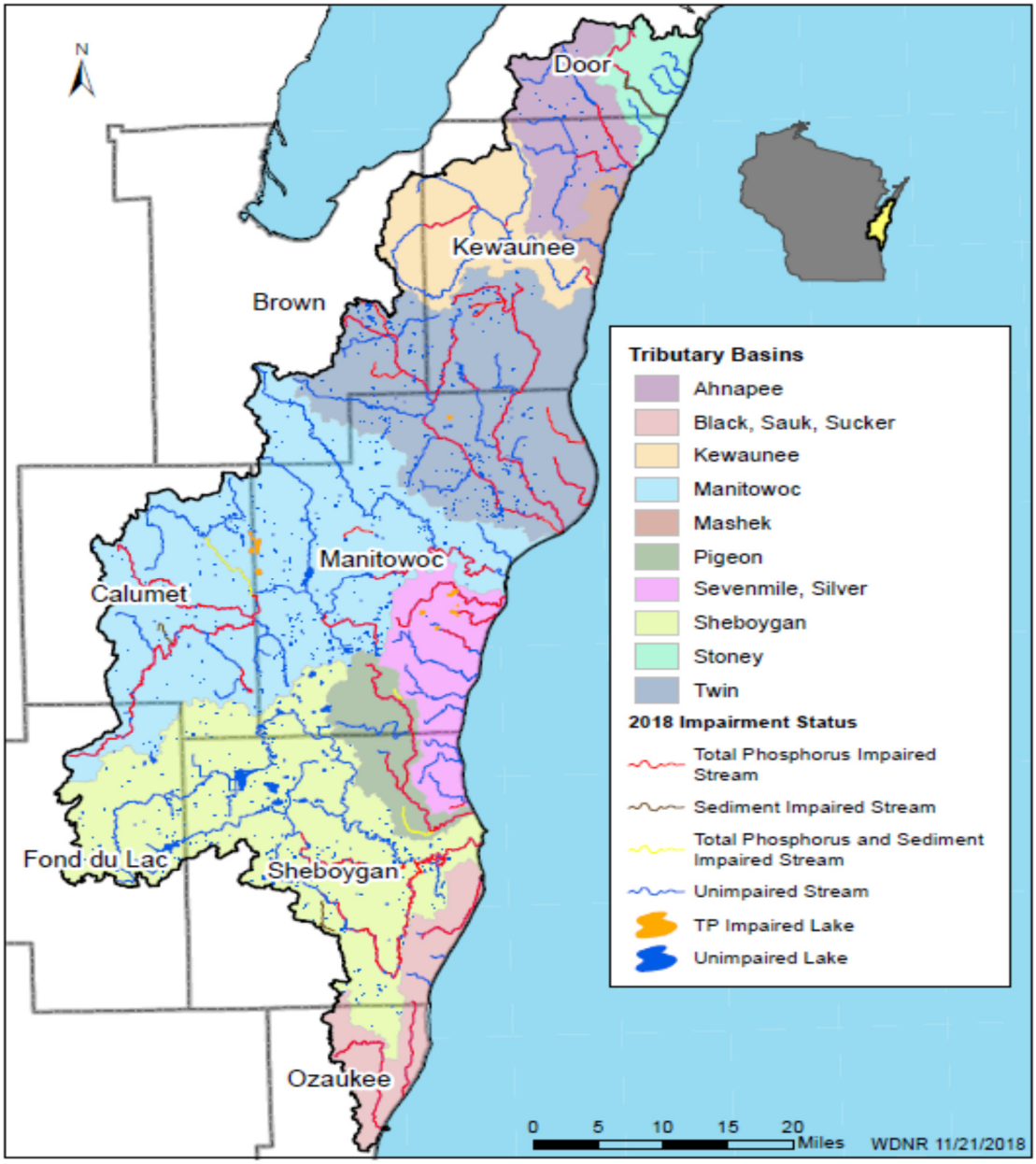
DNR shall seek to do all of the following under this subsection:

- Identify the amounts of nutrients being introduced into these waters.
- Characterize and quantify the nutrients, in particular nitrogen and phosphorus, introduced into these waters from nonpoint sources relative to climate, land-use, soil type, elevation, and drainage.
- Collect water quality information from locations on these waters and from major tributaries and major impoundments to use in evaluating the biological, physical, and chemical properties of the water and to use as data in watershed and river models.
- Use watershed and river models and the information collected under this subsection and from other sources to forecast the effect on water quality of different methods of reducing the amounts of nutrients introduced into these waters.
- Develop tools to use in selecting and implementing methods of reducing the amounts of nutrients introduced into these waters.

The Northeast Lakeshore TMDL is in the initial development phase and is the first TMDL located in Kewaunee County. DNR began surface water monitoring in 2016 and estimate the entire TMDL process to be completed in 2022.

Northeast Lakeshore TMDL anticipated project milestones are:

- November 2019: All stream monitoring to be completed
- Fall 2020: DNR to present initial watershed model results to stakeholders
- Winter 2021: DNR to present draft allocations to stakeholders
- Summer 2021: DNR to conduct TMDL public hearing
- 2022: DNR to submit TMDL to EPA



Map 13: Northeast Lakeshore TMDL

BEACH TESTING

Beach testing also measures surface water quality along Lake Michigan from Memorial Day to Labor Day. Kewaunee County has two beaches, Crescent Beach, located in the City of Algoma, and Selner Beach, located in the City of Kewaunee. The EPA requires that beaches post an "advisory" sign informing the public of increased health risk when a water sample exceeds 235 colony-forming units (CFU) of *E. coli* per 100 milliliters of water and a "closed" sign when a water sample shows more than 1000 CFU of *E. coli* per 100 mL are present (Wisconsin Beach Health, 2018). Kewaunee County uses a system of red (warning), yellow (advisory), and green (safe) flags for our advisory system, as shown in the picture to the right.

Water Quality Notice, Crescent Beach, Algoma. Photo Credit: LWCD

Table 11 displays the past nine years of closings and advisories for both Crescent and Selner beaches. Closing and warnings can be directly related to the weather patterns and land-use activities. The more rain events during the testing dates can move nutrients from the landscape into surface waters; therefore, causing additional beach closing and warnings. In 2011 and 2014, Kewaunee County saw the highest number of closings and advisories, but then experienced a significant drop in 2015 through 2017. In 2018, Kewaunee County had the first year since 2010 where no advisories or warnings were posted.

Table 11. Kewaunee County Beach Closings & Advisories

Year	**Kewaunee County Crescent & Selner Beaches**		
	Beach Closings > 1000 CFU/100mL	**Warning Advisories** > 235 CFU/100mL	**Total Warnings & Closings**
2010	7	6	13
2011	12	17	29
2012	2	3	5
2013	3	3	6
2014	11	15	26
2015	6	8	14
2016	1	5	6
2017	1	3	4
2018	0	0	0

Source: Wisconsin Beach Health, 2018

MANURE SPILLS

With the land-spreading of agricultural waste, manure spills often transpire and may pose a significant threat to aquatic ecosystems, and excessive nutrients may cause eutrophication in freshwater ecosystems. Furthermore, in karst regions, manure spills can directly impact our groundwater in which residents rely on for their drinking water.

Table 12 breaks down the number of manure spills per year in Kewaunee County. Since 2010, 76 spills have occurred with a high of 14 spills in 2016. In 2017, manure spills directly entered tributaries to the Kewaunee and East Twin Rivers, which are both designated as impaired waters. In 2018, 9 of the 13 manure spills occurred in the months of November and December. A wet fall and early snow/cold temperatures impacted harvest and timing of manure applications.

All spills must be reported to the DNR spills hotline and require mitigation to clean up any impacted waters. Operator or human error, broken or unknown tile lines, equipment failures, over-applications of manure resulting in surface runoff and weather are all documented reasons for manure spills.

Table 12. Kewaunee County Manure Spills

Year	Number of Manure Spills
2010	11
2011	5
2012	6
2013	3
2014	7
2015	8
2016	14
2017	9
2018	13

Source: WDNR & LWCD, 2018

Hose break causing discharge of manure, Kewaunee County
Photo Credit: Engels, LWCD

Field application of manure entered a tile line and outlet into a navigable stream, Kewaunee County
Photo Credit: Bonness, LWCD

GROUNDWATER QUALITY

Surface water and groundwater are often directly connected in karst geology. Roughly 70% of the County's citizens rely on the Eastern Dolomite aquifer for their drinking water; however, in this "karst" geology, surface water and groundwater can be directly connected. Fracture traces, sinkholes, and other direct conduits commonly found in karst settings can provide surface water and any associated nutrients or pathogens direct pathways to groundwater.

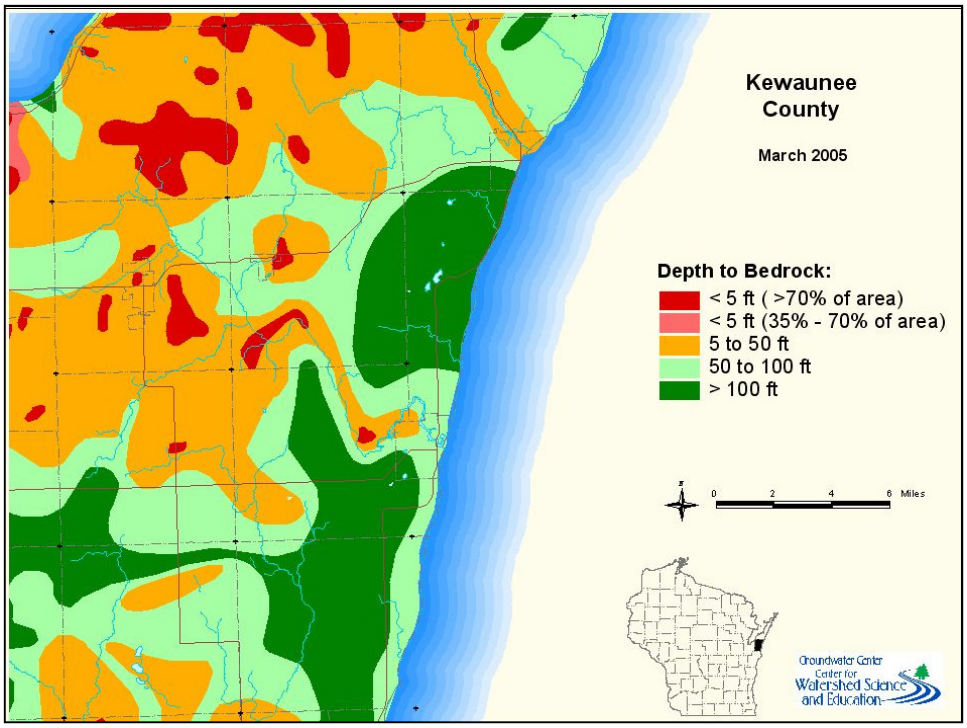
Karst features, including fracture traces and sinkholes (pictured below) often become direct conduits for transporting unfiltered groundwater contaminants, such as sediment, chlorides, nitrates, bacteria and other microorganisms to local drinking water aquifers. In dry times of the year, fracture traces can be visible on the surface, especially in alfalfa fields where deep taproots grow along the fractures to seek water.

Fracture Traces in an Alfalfa Field, Kewaunee County. Photo Credit: Engels, LWCD

Sinkhole in an Alfalfa Field, Kewaunee County Photo Credit: Bonness, LWCD

Map 14 displays shallow soil depth in Kewaunee County. The red areas indicate less than 5 feet of soil over the Niagara Dolomite (limestone) bedrock, the orange represents 5 to 50 feet and green areas have greater than 50 feet of soil.

The 2007 Northeast Wisconsin Karst Task Force Final Report identified that less than 5 to carbonate bedrock, and or closed depressions or any drainage areas that contribute water to sinkholes/bedrock openings as an "extreme" relative vulnerability to contamination; 5-15 feet to carbonate bedrock as "high"; 15-50 as "significant"; and greater than 50 feet to carbonate bedrock as a "moderate" vulnerability.



Map 14: Kewaunee County Depth to Bedrock

WELL TESTING

Local citizens often talk about their drinking water turning brown in the spring and fall seasons, directly correlating to groundwater recharge. Kewaunee County has worked very hard to document the level of groundwater contamination from coliform bacteria, e-coli bacteria, and nitrates.

Water collected from a Home in Kewaunee County (2016) testing positive for *E.coli* (bovine source) following a surface application of manure and 1 inch rain event. Photo Credit: Bonness, LWCD

Coliform bacteria are present in the environment and feces of all warm-blooded animals and humans, but unlikely to cause illness. However, their presence in drinking water indicates that disease-causing organisms (pathogens) could be in the water supply. Fecal coliform bacteria are a subgroup of total coliform bacteria and exist in the intestines and feces of people and animals. The presence of fecal coliform in a drinking water sample often indicates recent fecal contamination and means there is a greater risk that pathogens are present. *E. coli* is a subgroup of the fecal coliform group. Most *E. coli* bacteria are harmless and exist in the intestines of people and warm-blooded animals. However, some

strains can cause illness. The presence of *E. coli* in a drinking water sample usually indicates recent fecal contamination (WDNR Bacterial Contamination, 2017).

Nitrate-nitrogen is the most widespread groundwater contaminant in Wisconsin and because of its mobility through soils and groundwater, is generally considered to be a good indicator of groundwater susceptibility and land-use impacts. Background or natural levels of nitrate-nitrogen in groundwater are generally less than 1 mg/L (milligrams per liter) or 1 ppm (parts per million). Concentrations above 1 mg/L indicate influence by one or more of the following sources: nitrogen fertilizers, manure or other bio-solids (both application to land-surface or leakage from storage), land application of septage, or septic system drain fields. Nitrate-nitrogen concentrations above the drinking water standard of 10 mg/L should not be consumed by infants or women who are pregnant or expecting to become pregnant, all other persons are encourage to avoid long-term consumption of water greater than 10 mg/L (WDNR, 2014).

In 2004, Kewaunee County LWCD began a voluntary well testing program to educate landowners as well as the county on groundwater quality. Table 13 shows the cumulative well testing results from 2004 to 2018 for landowners who voluntarily tested their well. The number represents different wells tested in the County, and the overall percentage unsafe (bacteria positive and/or nitrates greater than 10 ppm) at 30.17%, of those who tested. Percentages of unsafe "tested" wells do increase in Townships that have a higher amount of shallow karst soils, including Lincoln, Luxemburg, and Red River, who has the highest percentage of 41.2% of tested wells unsafe.

Table 13. Kewaunee County Cumulative Well Testing Data (2004-2018)

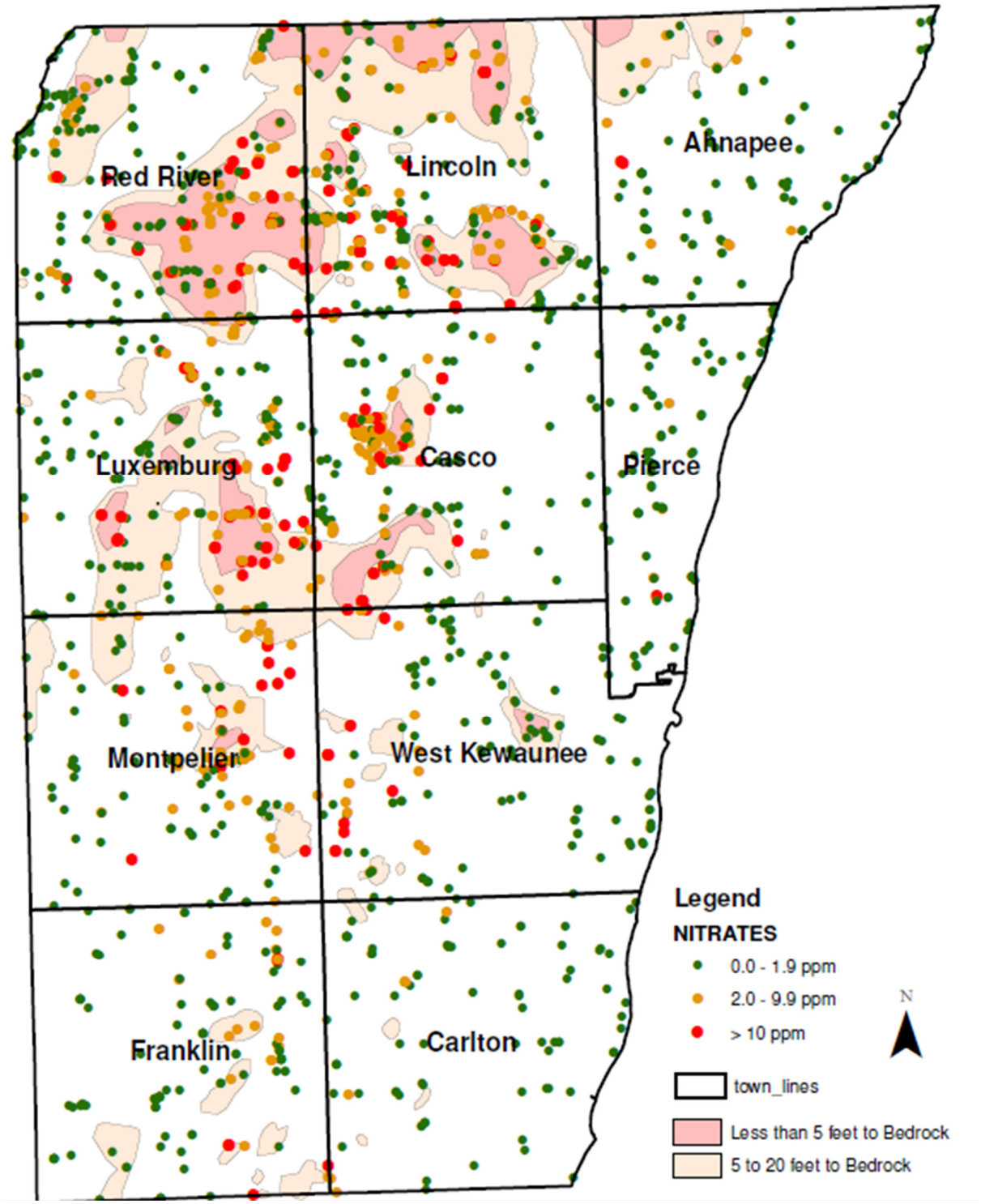
Township	**Total Number of Tested Wells**	**Total Unsafe Wells** *Bacteria Present and/or Nitrates > 10 ppm*	
		Number	**Percent**
Ahnapee	85	22	25.9%
Carlton	84	18	21.4%
Casco & Village of Casco	191	50	26.2%
Franklin	89	18	20.2%
Lincoln	208	69	33.2%
Luxemburg	175	63	36.0%
Montpelier	114	39	34.2%
Pierce	84	17	20.2%
Red River	216	89	41.2%
West Kewaunee	123	28	22.8%
Kewaunee County Totals:	**1369**	**413**	**30.17%**

Source: Kewaunee County LWCD

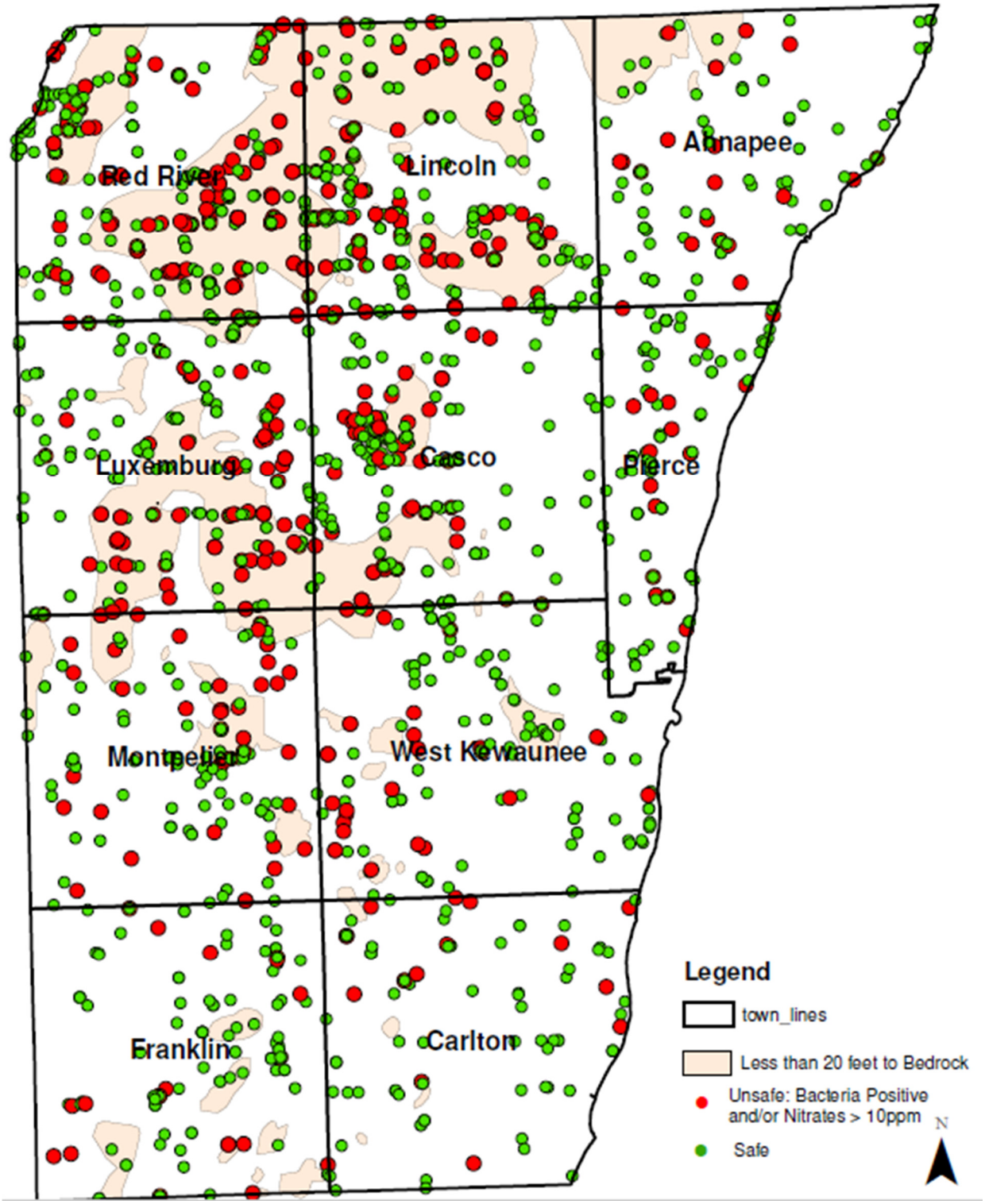
Map 15 breaks down the nitrate concentrations of tested wells and Map 16 indicates locations of safe wells (green dots) or unsafe wells (red dots). Unsafe wells are defined as having bacteria present and/or nitrates greater than 10 ppm. In Map 15, red dots are nitrate concentrations greater than 10 ppm and the orange dots are greater than 2.0 ppm, both indicating some sort of human influence.

When overlaying the nitrate data and the safe/unsafe well locations with the depth of bedrock layers (red less than 5 feet; orange less than 20 feet), the impacted or unsafe wells often correlate

to areas with shallow soils. The green dots (safe wells or nitrates less than 2.0 ppm), often are located along Lake Michigan and in the southern townships where deeper clay soils offer better protection for the aquifer.



Map 15: Kewaunee County Well Testing Nitrate Results (2004-2018) & Bedrock Depth



Map 16: Kewaunee County Well Testing Results Safe / Unsafe (2004-2018) & Bedrock Depth

GROUNDWATER RESEARCH

Previous groundwater research by Muldoon & Bradbury (2010) indicates contamination in the Silurian dolomite aquifer is often a function of the depth of the overlying glacial materials (or soil). Generally, thicker soil provides greater protection and increases the filtration of contaminants before entering the aquifer which is what we see in the voluntary testing results.

Testing private wells provides valuable data on groundwater quality; however, does not analyze or identify the specific source of contamination if a well is unsafe due to bacteria or nitrates greater than 10ppm. Therefore, to answer this question, in 2015, the DNR funded a research study to evaluate the level of groundwater contamination as it correlates to depth of bedrock, virus contamination, and source of that contamination in Kewaunee County.

The research study conducted under Dr. Mark Borchardt et al had two main objectives: (1) design a county-wide randomized sampling plan, stratified by depth-to-bedrock, for nitrate and indicator bacteria and (2) sample once per season a subset of wells for viruses and fecal markers capable of distinguishing septic versus bovine sources of contamination.

Objective 1: A county-wide randomized sampling of private wells stratified by depth-to-bedrock was done in November of 2015 when groundwater recharge was occurring and again in July 2016 when there was no recharge. Results found were similar to the Kewaunee County voluntary well testing program. The overall percentage of tested wells contaminated by total coliform, e-coli or high nitrate (>10 ppm) was 26.4% in November 2015 during recharge event and 27.6% during the July 2016 non-recharge event.

To correlate contamination to depth of bedrock, Figure 15 breaks down the well results by 0-5 feet to bedrock, 5-20 feet to bedrock and 20 feet or greater to bedrock and then by recharge and no recharge events.

In tested wells located in areas with less than 5 feet to bedrock, 50% were unsafe for either total coliform, e-coli or high nitrates during the recharge period and 33% during no recharge. In 5-20 feet, 42% of the tested wells were unsafe during recharge and 40% during no recharge. And finally, wells with 20 feet and greater of soil over bedrock still had 23-26% of the tested wells found to be unsafe.

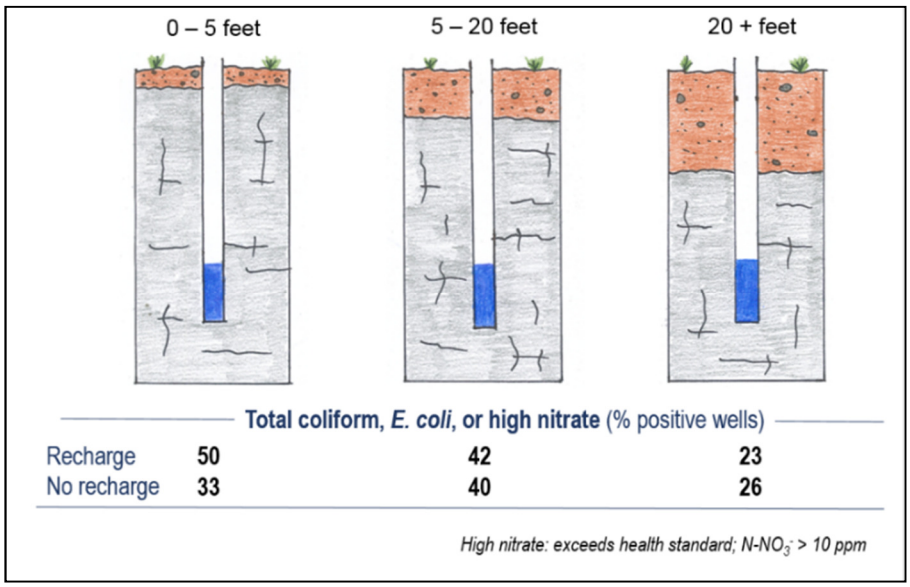


Figure 15: Total Coliform, *E-Coli*, or High Nitrates in Private Wells by Depth of Bedrock, Borchardt et al, 2018

The second objective was to determine the source of fecal contamination, Borchardt et al completed a randomized stratified sampling of the 234 wells positive for total coliform, *E. coli*, or high nitrate (greater than 10 ppm) found in Objective 1. Five rounds of sampling were completed in April, August and November of 2016; and January and March, 2017 to determine host-specific and host non-specific microbes detected in private household wells. Human specific microbes were detected in 33 wells; bovine or ruminant specific microbes were detected in 44 wells; and no host specificity were detected in 37 wells.

As found, agricultural contamination is not the only source of nitrates, bacteria, or pathogens in Kewaunee County groundwater. Human waste from septic systems and/or the spreading of septage can also contribute to groundwater contamination.

SOIL QUALITY

Over the last century, Kewaunee County farms have used conventional tillage and corn silage rotations resulting in fields with low soil organic matter, disrupted soil structure, and a compacted plow pan layer at 8-10 inches below the soil's surface. Consequently, poor soil quality, impedes retention of nitrates and phosphorus within the soil profile. This results in increased leaching of pollutants to our groundwater and surface water. Bare fields remaining after conventional tillage in fall are vulnerable to wind and water erosion which leads to nutrient and soil particle loss, further contributing to poor ground and surface water quality. The photo exhibits soil erosion in an unvegetated concentrated flow channel following a heavy rainfall event.

Soil Erosion after a heavy rainfall, Kewaunee County.
Photo Credit: Engels, LWCD

As farmers become increasingly aware of the benefits associated with conservation practices, including building soil holding capacity and soil health, more and more acres are being planned with conservation in mind.

Cover crops, for example, have been growing in popularity throughout Kewaunee County. Kewaunee County does not have a good baseline of cover crop acres due to the only acres that are reported are those that are cost-shared. However, winter wheat and alfalfa also serve as cover crops. In Table 14, data was taken from the Wisconsin Agricultural Statistics for various crops grown in Kewaunee County. From 2015 to 2016, Kewaunee County farms reported an additional 10,000 acres of alfalfa and winter wheat, which both provide cover on fields during the winter months. *2017 harvested crops have not been reported yet.

Table 14. Kewaunee County Alfalfa & Winter Wheat Crops

Crops	2000	2005	2010	2015	2016
Alfalfa (Dry Hay)	34,500	20,700	18,000	14,600	19,200
Winter Wheat	3,900	7,500	10,100	6,000	11,400
Total	**38,400**	**28,200**	**28,100**	**20,600**	**30,600**

Source: Wisconsin Agricultural Statistics, 2001, 2006, 2011, 2016, 2017

Cover crops are important for various reasons. Research conducted by Kris R. Ethridge, NRCS Resource Conservationist, shows that soil organic matter can increase significantly within a short time frame with the use of cover crops in conjunction with a no-till system. Soil organic matter content is a valuable analysis to help determine is soil health and how efficiently it will be able to use available water.

Soils across Kewaunee County are identified as Alfisols which formed under forested conditions. A NRCS Soil Scientist conducted a study in 2016 to determine the organic matter content of undisturbed (not farmed) soils formed in these conditions. This information provided baseline data from soil samples collected from mature woodlands. Three sites were sampled for each soil series; 3 soil cores in each sample, therefore 9 samples per series. The sites were located in Brown, Outagamie, Kewaunee and Shawano County.

Under historic forested conditions, study results shown in Table 15 indicate Kewaunee County (Hortonville and Symco) soils had a mean of 7.6 to 13.2% organic matter content. However, soil test organic matter from 1974-2009 shows Kewaunee County cropland is only around 2 to 3% (UW-Madison, 2009) organic matter, which is a significant decrease from historical conditions. Therefore, increasing organic matter of soils, a goal of soil health and quality, under annual row crops can use these study results to identify a resource concern and provide a level to strive for.

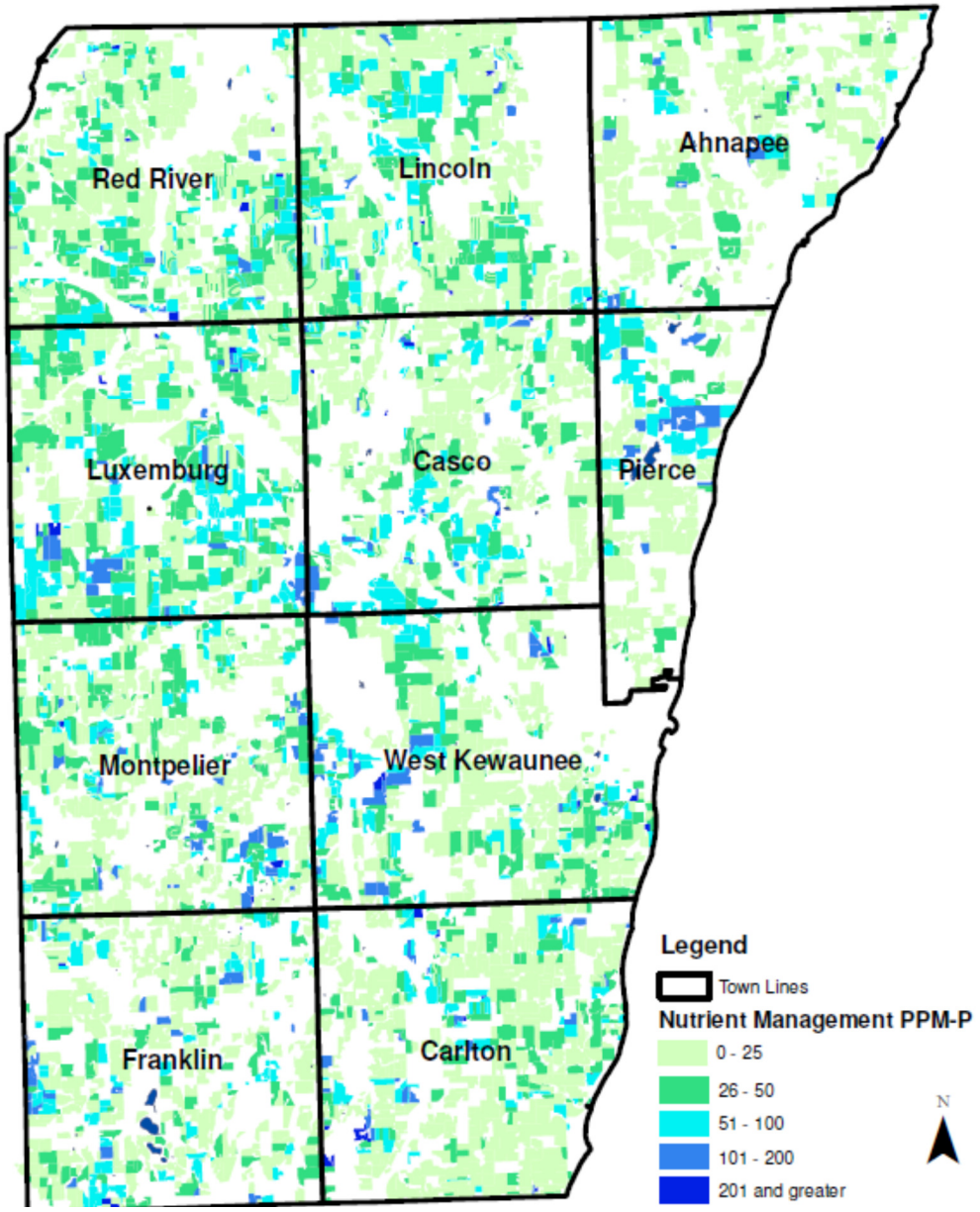
Table 15. 2016 Organic Matter Study Results

Soil	Texture	County	Soil Organic Matter (%)	
			Mean	St. Dev
Kewaunee	Silt Loam	Brown	6.7	1.3
Manawa	Silty Clay Loam	Brown	10.8	2.0
Oshkosh	Silt Loam	Brown	5.7	1.0
Poygan	Silty Clay Loam	Brown	10.6	1.0
Waymor	Silt Loam	Brown	7.2	1.2
Hortonville	Silt Loam	Kewaunee	7.6	0.8
Symco	Silt Loam	Kewaunee	13.2	4.7
Shiocton	Silt Loam	Outagamie	9.5	5.0
Onaway	Fine Sandy Loam	Shawano	5.9	0.9
Rosholt	Fine Sandy Loam	Shawano	6.5	1.5
Solona	Loam	Shawano	5.9	2.9
Tilleda	Fine Sandy Loam	Shawano	4.7	1.0

Source: NRCS Appleton WI Office

Another tool used to examine soil quality is directly related to NRCS 590 Nutrient Management Standard, which requires operators to soil sample their cropland every 4 years for nutrients. Map 17 shows soil phosphorus levels in ppm in NMP fields. Blue indicates high levels (100+ ppm) of phosphorus in the soil. If soil erosion occurs, the phosphorus attached to the soil participles can significantly impact surface water. These blue areas are high priority areas for the adoption of conservation practices including cover crops and crop rotations are managed to slowly reduce phosphorus in the soil.

Kewaunee County's clay soil can be highly erodible if left open and bare. When clay soils erode, nutrients are transported to our surface water and after heavy rain events, turn streams and rivers brown from the excessive sedimentation. These areas will be focused on in the next 10 years for improvements including cover crops and buffers.



Map 17: Kewaunee County Nutrient Management Field Phosphorus Levels

INVASIVE SPECIES

Kewaunee County, in the past, has been inactive in managing invasive species. Currently, there is no county inventory or early detection and monitoring. Giant Reed Grass (*Phragmities australis*) can be found in nearly every wetland and shoreland area in the county, wild parsnip (*Pastinaca sativa*) has spread through the ditches and along the Ahnapee State Trail, Japanese knotweed (*Fallopia japonica*) and Teasel (*Dipsacus fullonum*) are spreading unchecked.

Thick stand of Phragmities along a road ditch, Kewaunee County
Photo Credit: Engels, LWCD

Invasive species are a growing environmental and economic threat to Kewaunee County and coastal resources. The current threats posed by invasive species are significant. Invasive species are degrading the county's forests, grasslands, waterways, and beaches, impacting agriculture, and reducing the enjoyment of recreation areas and trails. In Kewaunee County, as many other counties, it is clear that transportation corridors and right-of-ways are providing pathways for the spread of invasive species throughout the county.

The biggest threats and highest priorities include the following: (some present/abundant, while others have not yet been found in the county, but their detection is a priority under NR-40): Phragmities, Chinese Yam, Marsh Thistle, Flowering Rush, Japanese knotweed, Leafy Spurge, Oriental bittersweet, Purple loosestrife, Swallow-wort, Tall manna grass, Wild parsnip, Teasel, Curly-Leaf Pondweed, Rusty Crayfish, Eurasian Water-Milfoil, Zebra mussel, Starry Stonewort, Yellow Iris, Aquatic forget-me-not, and narrow-leaf cattail.

In 2018 and 2019, with funding from the EPA Great Lakes Restoration Initiative (GLRI), the Bay-Lake Regional Planning Commission facilitated the first initiative in Kewaunee County to strategically manage at least 1,000 acres of invasive Phragmities, Wild parsnip, and Japanese knotweed.

To build off this 2-year initiative, in 2018, Kewaunee County LWCD partnered with the Bay-Lake Regional Planning Commission to pursue grant funding to develop a county-wide invasive species management plan addressing both terrestrial and aquatic invasive species. Provided available funding, LWCD plans on gathering spatial data (into a Geographic Information System (GIS) database) on invasive species locations and documenting previous management activities. Field inventories would be conducted to fill existing data gaps and to document any emerging invasive species threats. In addition, an online reporting mapping program would be created to collect inventory data through citizen reporting.

Kewaunee County plans to analyze needs and desires for invasive species management and develop a prioritized action plan for addressing current and emerging invasive species. The action plan will outline the efforts that are needed in the county, who will implement it, the priority of the action and when it needs to be done, the estimated cost to implement the action, how to measure success, and potential funding sources. As the plan is being developed, the LWCD will undertake education and outreach activities that will focus on providing information and education to landowners while gathering data on the locations of invasive species on private property. Educational activities will also include presentations and youth programming at schools, and presentations to the LCC, civic organizations, towns associations, city and village councils, and town boards.

This strategic planning project would address many of the priority issues identified in the State of the Lakeshore Basin report (WDNR, 2001), the Lake Michigan Lake-wide Management Plan (LAMP) (EPA, 2008), and the GLRI. The DNR Lakeshore Basin report identifies both terrestrial and aquatic invasive species as concerns and identifies tactics to address the issue including educating the public, treatment/removal of invasive species and monitoring invasive species. The Lake Michigan LAMP identifies invasive species as a concern in 6 of the 12 sub-goals in the plan. The GLRI identifies "existing invasive species controlled" and "no new self-sustaining invasive species" as two of its eight long-term goals. The GLRI Action Plan II identified invasive species as 1 of 5 focus areas for Fiscal Year 2015-2019.

Overall, this project will result in an adopted invasive species management plan for Kewaunee County, county-wide invasive species data in GIS, and public education and outreach on invasive species to all ages throughout the county. But more importantly, this project will set a solid program in motion to manage invasive species throughout a coastal county in a sustainable manner.

Phragmities within a Small Tributary, Kewaunee County. Photo Credit: Engels, LWCD

CHAPTER 4: ACCOMPLISHMENTS & INITIATIVES FROM 2010 – 2019

In the past 10 years, Kewaunee County local officials have worked hard to locally address our soil and water quality concerns, along with State and Federal partners, including EPA, DNR, DATCP, and NRCS.

The 2010-2019 LWRMP outlined one overarching goal to "locally implement and enforce NR151 agricultural nonpoint source pollution control standards and prohibitions in order to protect local surface and groundwater quality." This goal was implemented through the following 8 key objectives:

1. Develop a Memorandum of Understanding (MOU) with DNR covering a local compliance and enforcement strategy for NR151 agricultural nonpoint source pollution control standards.
2. Determine current landowner compliance with NR151 agricultural nonpoint source pollution control standards and prohibitions.
3. Prepare NR151 status reports and notify landowners of compliance status.
4. Secure funding and technical assistance for compliance with NR151 agricultural nonpoint source pollution control standards and prohibitions.
5. Administer funding and technical assistance for compliance with NR151 agricultural nonpoint source pollution control standards and prohibitions.
6. Enforce NR151 agricultural nonpoint source pollution control standards and prohibitions through MOU with the DNR.
7. Conduct ongoing NR151 agricultural nonpoint source pollution control standards and prohibitions compliance monitoring.
8. Provide annual NR151 agricultural nonpoint source pollution control standards and prohibitions reporting information to DATCP and DNR.

The following initiatives and accomplishments established between 2010 and 2019 in Kewaunee County will be the fundamental building blocks for the next 10 years.

NR151 IMPLEMENTATION

The overall goal of the 2010-2019 LWRMP update was to "locally implement and enforce NR151 Agricultural Performance Standards and Prohibitions to protect local surface and groundwater quality."

In 2010, the Kewaunee County LWCD began NR151 and Farmland Preservation Program (FPP) walkovers in conjunction to determine compliance with cropland and livestock facilities (Map 18). Landowners who claim the Working Lands Initiative (formally known as Farmland Preservation) tax credit must have their cropland and livestock facilities inspected for compliance every 4 years.

Year 1 (2010): 251 walkovers were completed in 303d listed watersheds (West Twin River and Stony Creek) & Outstanding and Exceptional Resource Waters (Little Scarboro Creek, Casco Creek, Krok Creek and Rogers Creek Sub-Watersheds).

Year 2 (2011): 163 walkovers were completed in Lincoln, Red River & Casco Townships because of the shallow bedrock areas and higher well contamination percentages.

Year 3 & 4 (2012 & 2013): 312 walkovers were completed in the Townships of West Kewaunee, Carlton, Pierce and Franklin to complete the first round of walkovers. Every participant in FPP received a walkover by 2013.

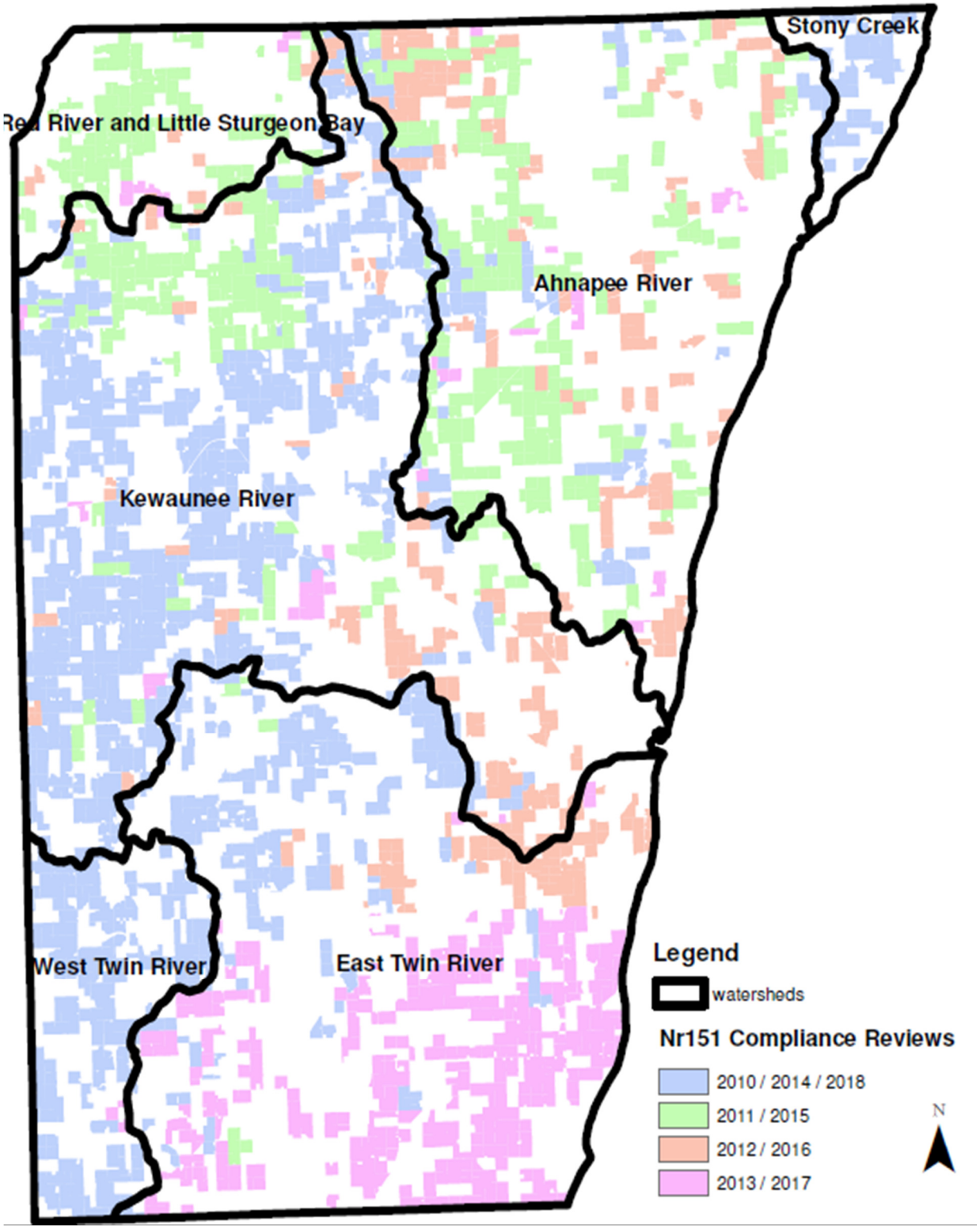
Table 16 specifies the number of NR151 evaluations completed yearly since the program was initiated in 2010. Altogether, Kewaunee County has approximately 600 landowners who claim the tax credit, representing approximately 80% of our cropland acres.

A caveat to 100% participation is that to be eligible for the Farmland Preservation Tax credit, a landowner must have been a resident of Wisconsin for the entire taxable year and the farmland on which the claim is based must have produced at least $6,000 of gross farm profits or at least a total of $18,000 in gross farm profits for the past 3 years combined. Therefore, if landowners do not qualify for Farmland Preservation, then the LWCD is not required to walk their land for compliance; however, if issues are noticed or complaints are received, LWCD does perform inspections on those parcels.

Table 16. Kewaunee County NR151 Farm Compliance Walkovers by Year

Year	NR151 Evaluation Completed	Status
2010	251	1st Round Starts
2011	163	
2012	198	
2013	114	1st Round Complete
2014	204	2nd Round Starts
2015	85	
2016	177	
2017	183	2nd Round Complete
2018	167	3rd Round Starts

Source: Kewaunee County LWCD



Map 18: Kewaunee County NR151 Compliance Walkover Schedule

During walkovers, LWCD staff inspect the livestock facilities and agricultural cropland to identify compliance with Wisconsin's NR151 Standards and Prohibitions and FPP. Walkover findings for both programs (NR151 and FPP) are documented and entered into a comprehensive excel database used to track compliance by landowner and tax parcel. Landowners in full compliance received a full compliance letter and are assigned a Certificate of Compliance Number, which are provided to DATCP so landowners can receive their Working Lands Initiative tax credit. Landowners who are not in full compliance are provided either a schedule of compliance or notice of non-compliance (NONC) depending on the findings, as well as, depending on funding sources and applicability, offers of cost-sharing. NR151 monthly updates are provided at the LCC meetings to discuss findings.

Commonly noticed issues in cropland fields are farming too close to stream corridors, eroding grassed waterways, un-vegetated concentrated flow channels, and sheet/wind erosion. Manure management concerns noticed include direct runoff from feedlots and stored manure into waters of the state, process wastewater or leachate discharge, unlimited access of livestock to waters of the state, overflowing manure storages, and unconfined manure in WQMAs. These prohibitions reduce soil quality, soil health and can impact our groundwater and surface water resources.

Resource Concern: Leachate Runoff from Feed Bags (Left), Unconfined Manure Stack in a Water Quality Management Area (Right). Photo Credit: Engels, LWCD

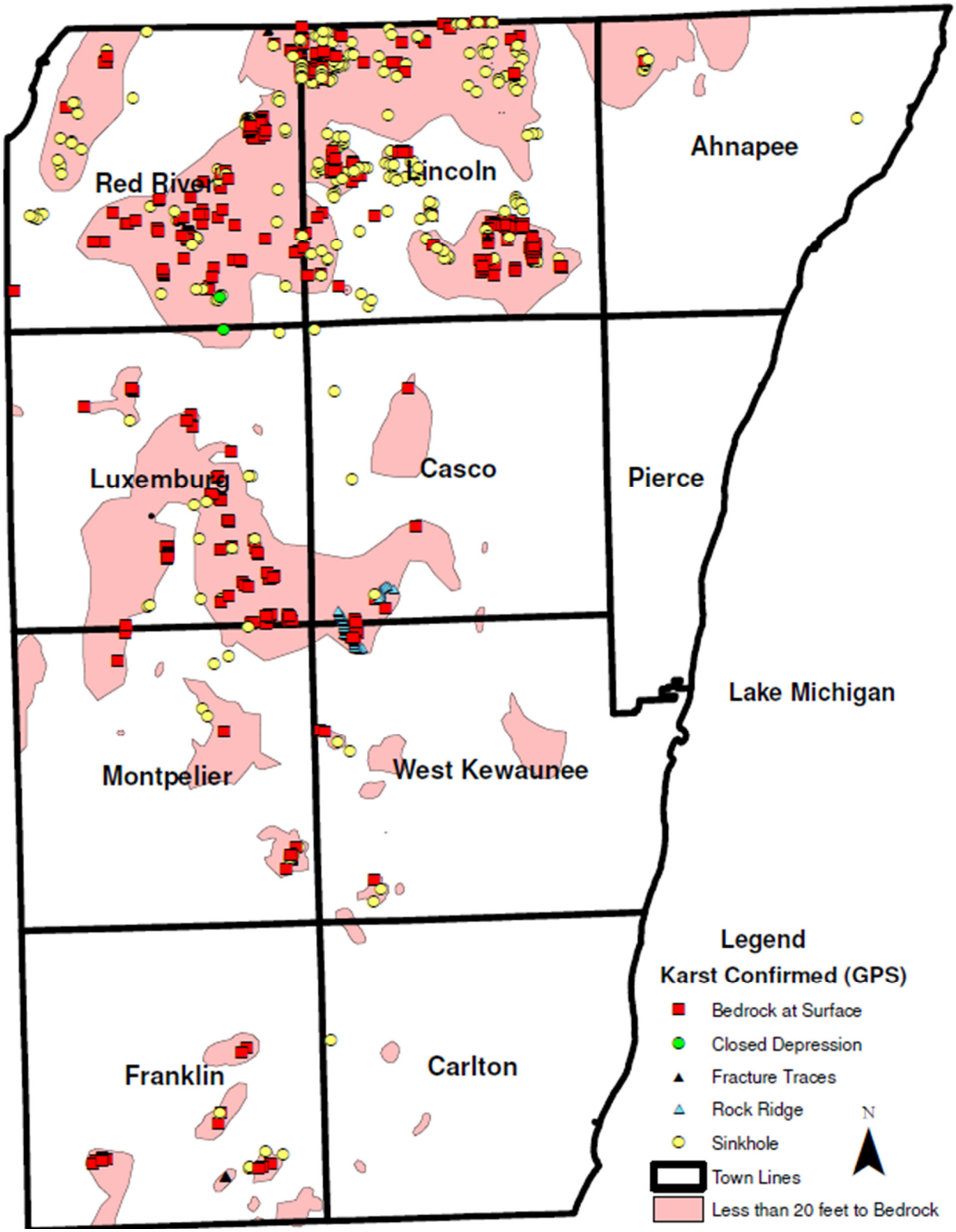
Not all NR151 walkover findings are non-compliant. LWCD commonly documents conservation practices farmers are implementing to keep soil on their land and nutrients properly stored to protect groundwater, surface water, and soil quality. In the top two pictures on page 59, grassed waterways are well vegetated and roughly 20 feet wide. The third picture is a concrete lined manure storage funded through a DNR Targeted Runoff Management (TRM) grant. Manure storages provide farms the ability to property store manure during times when the ground is frozen, saturated, or snow covered.

Pictured Above: Grassed Waterways, well vegetated, no erosion, and 20' wide.
Photo Credit: Bonness/Engels, LWCD

Picture to the right: Properly Constructed Manure Storage.
Photo Credit: LWCD

A local priority while conducting NR151 walkovers is to map karst features found on the landscape. Since 2010, LWCD staff has identified more than 800 new karst features, including sinkholes, bedrock at the surface, karst ledges, fracture traces, and closed depressions (Map 19). All karst features are added to the County's ArcGIS database. Since karst features are direct conduits to groundwater, they have certain setback requirements when spreading manure and therefore must be added to operator's NMP. The LWCD provides updated karst features and/or maps to Certified Crop Advisors (CCA) as well as DATCP and DNR.

This four-year NR151 walkover implementation strategy followed the 2010-2019 LWRMP and accomplished objectives 2, 3, 4, 6, 7, and 8. <u>These objectives are ongoing and will continue in the 2020-2029 LWRMP.</u>



Map 19: Kewaunee County Karst Features

NUTRIENT MANAGEMENT (590)

Nutrient management refers to the use of manure and other fertilizers to meet crop nutrient needs, while reducing the potential for them to run off fields to lakes, streams and groundwater. In Wisconsin, all farms should have a Nutrient Management Plan (NMP).

In 2004, the LWCD began pursuing nutrient management on landowners who were regulated under the Kewaunee County Animal Waste Storage Ordinance or hold a WPDES permit. In 2010, in conjunction with implementing NR151 and FPP, LWCD started to verify that all participating landowners had an approved NMP for their owned and operated cropland.

Kewaunee County has steadily increased cropland acres under a certified NMP (Figure 16) through the implementation of FPP and enforcement of manures storage permits and WPDES permitted farms. In 2018, NMP acres slightly decreased for the first time since 2005 due to low milk prices and an overall low farm economy.

Overall, from 2004 to 2017, an additional 66,000 acres of cropland were submitted to the LWCD. Kewaunee County continues to remain in the top 5 in Wisconsin with approximately 80% of the county's cropland in plans for 2017 (Table 17).

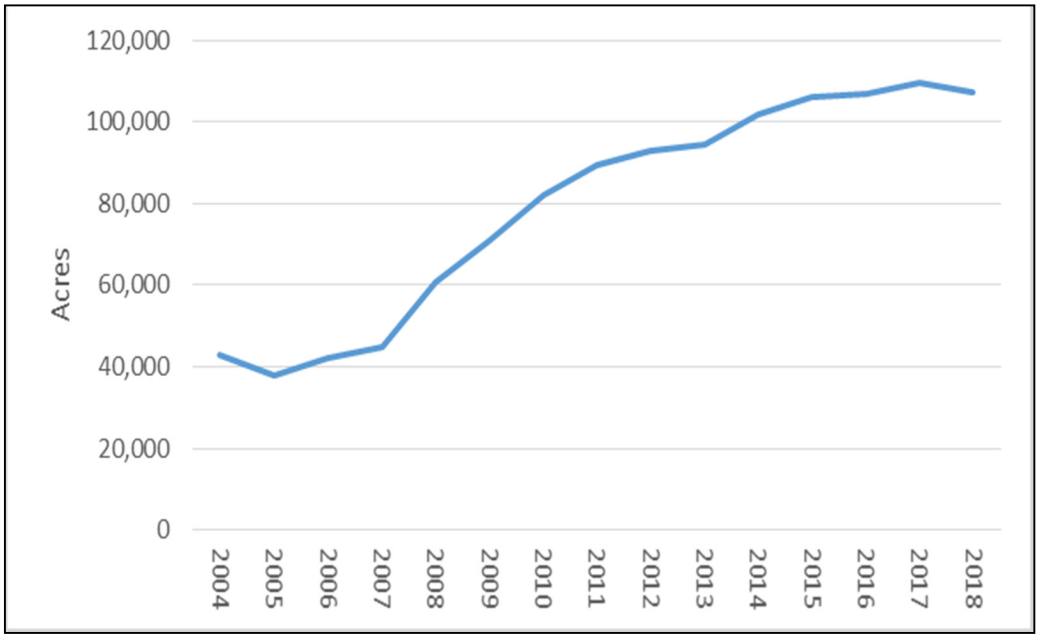


Figure 16: Kewaunee County Nutrient Management Acres, 2004-2018

NMPs are submitted annually to the LWCD and are mapped and inventoried into ArcGIS by field name and operator. Soil phosphorus levels, tolerable soil loss, rotational soil loss, pH, soil tests, crop rotations, organic matter, soil year sampled, and critical and predominate soil types are also recorded. Associated tax parcels are cross referenced to verify landowners have a

compliant plan on all acres owned. The NMP information is then documented by tax parcel in the NR151 comprehensive database.

Table 17. Kewaunee County Nutrient Management Plan Acres, 2004-2018

Year	Total Acres in NMP	Total Number of Plans	Percent of Ag Acres under NMP
2004	42,991	80	31
2005	37,718	76	27
2006	42,195	92	30
2007	44,766	89	32
2008	60,853	113	44
2009	70,720	144	51
2010	81,947	164	59
2011	89,458	187	65
2012	93,049	202	67
2013	94,507	229	68
2014	101,820	267	73
2015	106,189	273	77
2016	106,900	276	77
2017	109,493	278	79
2018	107,140	275	77

Source: Kewaunee County LWCD

In the effort to address the question of whether NMP are being "implemented" or only used as a "plan" on the landscape and to help assist with complaint follow up, the Land Conservation Committee passed the **"Kewaunee County Records Recording Policy for Manure Hauling Applicators"** on November 2, 2017.

This policy requires two things:

1. CCAs or farmers shall provide a manure spreading plan for a Spring-Spring crop season in a NMP, SNAP (Soil Nutrient Application Planner) Plus data file, or a method reviewed and accepted by the LWCD. NMPs are due by April 15th every year.

2. Haulers or farmers shall provide "actual" manure spreading applications to include: date of application, time, total amount (gallons), field number, planned rate, actual rate, and source of manure. Spreading records for all liquid manure applications must be provided to the LWCD as indicated in Table 18. This policy was revised by the LCC on October 9, 2018 to include all manure applications with less than 25% dry matter.

Table 18. Kewaunee County Manure Hauling Records Policy Reporting Dates

Season	Applicable Months	Deadline for Records Submittal to LWCD
Fall	September-October-November	January 31st
Winter	December-January-February	March 31st
Spring	March-April-May	July 31st
Summer	June-July-August	October 31st

CONSERVATION PLANNING & MANAGEMENT PRACTICES

According to the NRCS, a Conservation Plan is the record of decisions and supporting information for treatment of a unit of land meeting planning criteria for one or more identified natural resource concerns as a result of the planning process. The plan describes the schedule of implementation for practices and activities needed to solve identified natural resource concerns and takes advantage of opportunities. Conservation plans are developed and implemented to protect, conserve, and/or enhance natural resources within the client's social and economic interests and abilities.

Conservation plans are regularly a basis for NMP and are updated in the LWCD through Tool-Kit software. Conservation initiatives, cost-sharing projects, conservation crop rotations, and change in ownership are examples of measures updated in the plans. Currently 633 conservation plans are at the LWCD office. Approximately 100 plans are updated annually, with 20-30 new plans established annually.

To initiate Objective 5 (administer funding & technical assistance), LWCD staff continues to provide conservation plan assistance, engineering design assistance, and construction oversight. Findings from walkovers allow LWCD staff to apply for cost-sharing through DNR-TRM grants and DATCP-SWRM funding. Table 19 identifies the conservation practices installed in Kewaunee County from 2010-2018 with the assistance of the LWCD and NRCS and establishes a baseline to increase the adoption of practices throughout the county. However, Table 19 is not a comprehensive list of all installed practices, but includes practices that were cost-shared or landowners who received technical assistance.

Agricultural field planted along the contour of the land and in conservation strips, Kewaunee County. Photo Credit: Engels, LWCD

Table 19. Kewaunee County LWCD & NRCS Conservation Practices, 2010-2018

Conservation Practices Installed	**2010**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Reported by Number								
Animal Waste Storage Facilities	1	2	3	3	5	3	5	1
Animal Waste Storage Facilities Closure		6			1		4	1
Approved (new) Conservation Plans	25	19	51	18	24	23	38	13
Comprehensive Nutrient Management Plans	7	3		3	1	2	3	3
Roof Runoff Structure Systems	3	1	2	1	2	3	3	
Waste Transfer	4	4	5	7		6	3	
Well Decommissioning	7	1	1			6		
Reported by Acres								
Conservation Cover	105.5	84	1,003	2.3	1.9	4.9	0.5	
Conservation Crop Rotation	3,043	2,645	3,182	1,786	2,225	8,645	2,548	854
Contour Farming						100	288.4	164
Cover Crop				871.2	1,055	1,811	1,192	3,115
Critical Area Planting					1.5	4.6	0.9	
Forage and Biomass Planting	37.3			91.5	43	32	17.7	90.7
Grassed Waterways	1.25	2.25	2.8	4.4	1.8	13.7	4.8	47.1
Heavy Use Area Protection	1		9	6.4	0.1	0.3	0.2	0.2
Integrated Pest Management	428.3	2,788	1,064	449.5	220			
Nutrient Management Planning (new)	1,037	4,180	4,006	5,001	1,425	2,349	475.6	249
Prescribed Grazing	78.2	70	70	4.6	17	32	82.3	208
Residue & Tillage Management		105			334	7,160	256.3	1,009
Tree/Shrub Establishment	122.5	9	14	0.5	0.5			

Source: Kewaunee County LWCD

*2011 PRACTICES WERE NOT REPORTED

KEWAUNEE COUNTY ORDINANCES

Over the past 10 years, four ordinances were passed or updated to further assist Kewaunee County in the implementation of conservation practices and to better protect our natural resources.

CHAPTER 18: ANIMAL WASTE STORAGE FACILITY

The Animal Waste Storage Facility Ordinance was written in the early 1980s and amended in 2010. The intent of this ordinance is to regulate the location, construction, installation, alteration, design and use of animal waste storage facilities so as to protect the health and safety of residents and transients; prevent the spread of disease and promote the prosperity and general welfare of the citizens of Kewaunee County. It is also intended to provide for the administration and enforcement of the ordinance and to provide penalties for its violation.

No animal waste storage facility, manure transfer system, or parts thereof may be located, installed, moved, extended, enlarge, converted, substantially altered or its use changed, including animals waste with "other waste, without an animal waste permit and without compliance with the provisions of ordinance, and without compliance with NRCS Technical Standards as adopted by the Kewaunee County LCC.

CHAPTER 30: PUBLIC HEALTH & GROUNDWATER PROTECTION

Kewaunee County's LCC and County Board have also taken a strong initiative to protect our groundwater. In 2014, the Public Health & Groundwater Protection Ordinance was drafted to "Promote the public health, safety and general welfare of the citizens of Kewaunee County through proper land-use and management on geographically vulnerable areas". In September 2014, the County Board unanimously passed the Ordinance and County residents voted to approve on the April 2015 ballot by an overwhelming 83%.

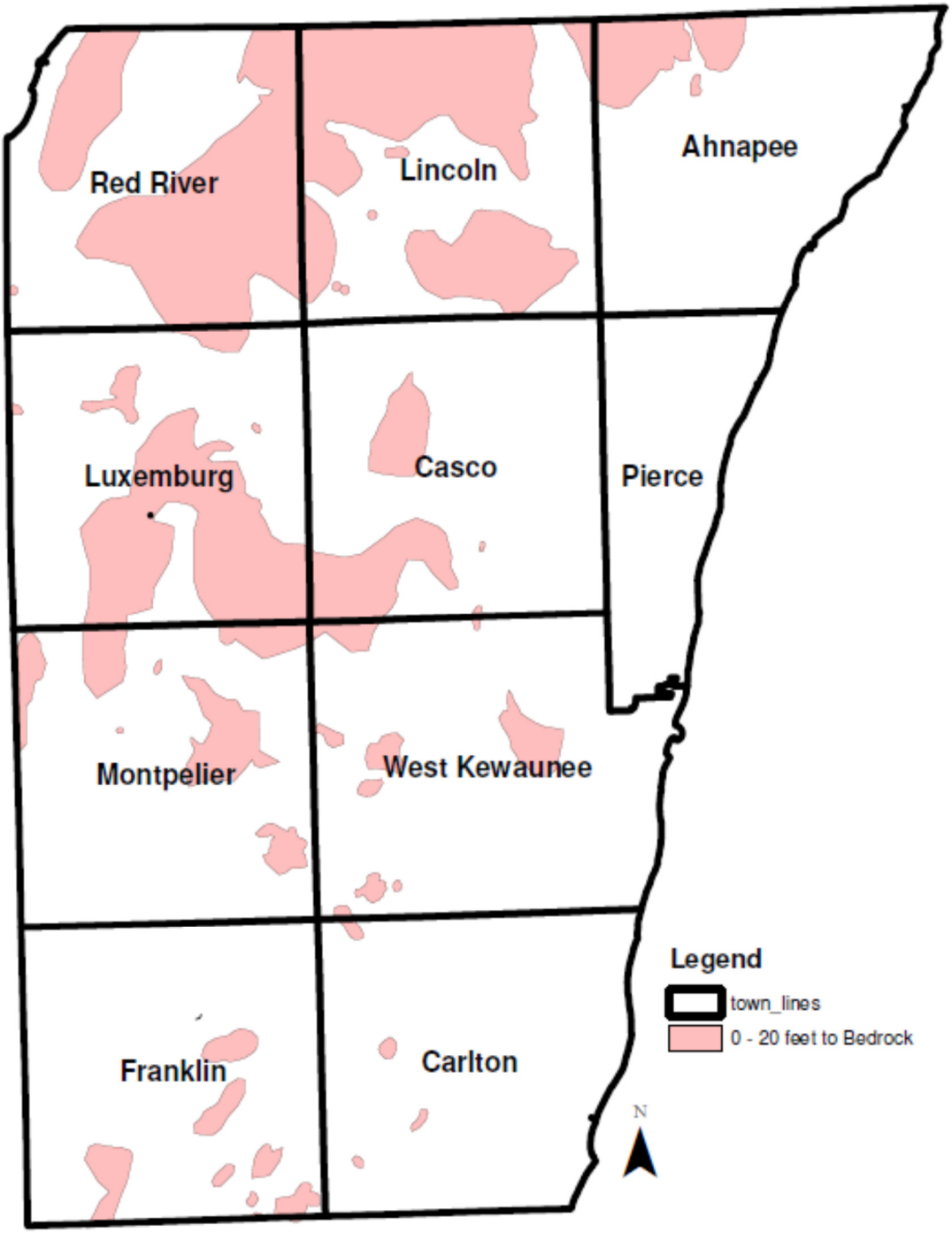
This Ordinance places the following Land-Use and Management Restrictions:

a. Waste shall not be mechanically applied to land, or allowed to directly drain to, landscapes likely having areas twenty (20) feet or less in soil depth to carbonate bedrock during the time period of January 1st through April 15th.

b. Waste shall not be mechanically applied to landscapes likely having areas of twenty (20) feet or less in soil depth to carbonate bedrock when the soil is frozen, snow-covered or saturated; when snow is actively melting such that water is flowing off the field; or precipitation capable of producing runoff is forecast within twenty-four (24) hours of application.

c. Wastes shall not be mechanically applied to direct conduits to groundwater, or allowed to directly drain to direct conduits of groundwater.

d. Temporarily stockpiling or stacking of waste on landscapes likely having areas twenty (20) feet or less in soil depth to carbonate bedrock shall not occur during the time period of January 1st through April 15th. Map 20 displays the impacted area in the county defined as less than 20 feet to bedrock.



Map 20: Kewaunee County Public Health & Groundwater Protection Ordinance, 0-20 feet

CHAPTER 37: AGRICULTURAL WASTE & PROCESS WASTEWATER IRRIGATION

To try and minimize the amount of manure and other waste being land-spread in spring and fall months of the year, which also coincide with groundwater recharge and unsafe wells with bovine manure (Borchardt et al, 2018), Kewaunee County drafted and passed Chapter 37 "Agricultural Waste & Process Wastewater Irrigation Ordinance" (passed on November 17, 2017).

This Ordinance was the first in Wisconsin to **allow** for the application of agricultural manure and other waste through the use of a low-pressure drip irrigation system at an average height no greater than 18" to efficiently apply nutrients during the growing season when plants are on the cropland and able to uptake and use the nutrients.

CHAPTER 39: AGRICULTURAL PERFORMANCE STANDARDS

On September 18, 2018, Kewaunee County locally adopted the Wisconsin Department of Natural Resources' NR151 Agricultural Performance Standards and Prohibitions as Chapter 39. The "Agricultural Performance Standards" Ordinance, which includes the recently adopted Silurian Dolomite rules that address land application of manure on 20 feet or less to bedrock, allows Kewaunee County to enforce the standards and prohibitions.

DEPARTMENT OF NATURAL RESOURCES – KEWAUNEE COUNTY WORKGROUPS

In October 2014, local citizens and environmental groups petitioned the Environmental Protection Agency to request that EPA invoke its emergency authority under section 1431 of the Safe Drinking Water Act, 42 U.S.C. § 300i, as well as to address the imminent and substantial endangerment to public health in Kewaunee County, Wisconsin from widespread and pervasive groundwater contamination from nitrate and bacteria. In response, the DNR implemented 5 workgroups with a diversity of organizations, citizens, and governmental officials to discuss the vulnerability of this Silurian Dolomite aquifer and the residents impacted by unsafe drinking water.

Stakeholder and public participation throughout these workgroups were extensive and included the U.S. EPA, farmers, citizens, local officials, agricultural and environmental groups, soil and water conservation and other state/federal agencies.

This work was crucial to the development of important recommendations and public input moving Kewaunee County forward, and therefore, is a crucial part of the LWRMP. The full report can be found at: https://dnr.wi.gov/topic/Groundwater/CollaborationWorkgroup.html

SHORT-TERM SOLUTIONS

The Short-Term Solutions Workgroup's purpose was to review and define issues faced by individuals in Kewaunee County who have wells which are contaminated by bacteria and/or nitrate. The scope of the workgroup activities will address concerns from these and other concerned citizens and seek avenues to provide clear information for those with contaminated drinking water to quickly and efficiently obtain a safe drinking water source.

WORKGROUP MEMBERS

Kyle Burton	DNR Drinking Water and Groundwater (chair)
Davina Bonness	Kewaunee County Conservationist
Tom Davenport	US Environmental Protection Agency
Ron Heuer	Kewaunee County Supervisor
Cindy Kinnard	Kewaunee County Health Department
Dale Konkol	Door County Soil Conservation
Marty Nessman	DNR Drinking Water and Groundwater
John Pagel	Agricultural Representative
Jodi Parins	Kewaunee County Citizen
Russ Rasmussen	DNR Division of Water, Policy Advisor
Dick Swanson	Kewaunee County Citizen
Lynn Utesch	Kewaunee Cares / Agriculture Producer
Sara Williams	Midwest Environmental Advocates

This group met 5 times from August to December 2015. The recommendations in the final report were grouped by particular stakeholder or stakeholders that may be involved in implementation (e.g. Wisconsin Department of Natural Resources, Kewaunee County, local citizen/farmer groups, etc.). For planning purposes, the recommendations targeted for Kewaunee County are listed below.

SHORT-TERM RECOMMENDATIONS

- Develop clear guidance at the county and DNR level regarding respective processes for responding to a contamination event.
- Develop a protocol to immediately provide an emergency supply of drinking water for owners of wells impacted by offsite contamination until another source of safe drinking water can be provided or a long-term solution is in place.
- Consider annually making $10,000 and staff available to provide emergency water supplies free of charge to those households with wells impacted by offsite livestock contamination.
- County actively seek and obtain grants and other programs whose funds would be appropriated to paying for a semi-annual well testing program, emergency water supplies, and potential remediation of contaminated wells.
- The Kewaunee County Health Department work with DNR to create and distribute a letter to all county well owners detailing the importance of private well sampling. This letter should include information about obtaining sample kits, contaminants to sample for, follow up to results, and specific contact information for DNR and Kewaunee Co.
- Provide informational materials to county well owners that include easy to use contact information lists (i.e. refrigerator magnets) and up to date well safety and maintenance checklists.

COMPLIANCE

The Compliance Workgroup's purpose was to review and evaluate the current compliance structure regarding currently regulated activities that may affect groundwater. This includes activities regarding well installation/compliance, septic system compliance, municipal and industrial land application, septage waste land application and farm generated manure and process wastewater land application.

WORKGROUP MEMBERS

Casey Jones	DNR Runoff Management (chair)
Davina Bonness	Kewaunee County Conservationist
Cheryl Burdett	US Environmental Protection Agency
Kyle Burton	DNR Drinking Water and Groundwater
Paul Cornette	Kewaunee County Dairy Farmer
Ryan Debroux	Debroux Custom, Manure Applicator

Sara Geers	Midwest Environmental Advocates
Nick Guilette	Certified Crop Advisors
Dean Hoegger	Clean Water Action Council
Mark Jenks	Department of Agricultural Trade & Consumer Protection
Joe Johnson	USDA Natural Resources Conservation Service
Tressie Kemp	Midwest Environmental Advocates
Dale Konkol	Door County Soil Conservation
Mary Ann Lowndes	DNR Runoff Management
Lee Luft	Kewaunee County Resident, County Supervisor
Dean Maraldo	US Environmental Protection Agency
Martin Nessman	DNR Drinking Water and Groundwater
Jodi Parins	Kewaunee County Citizen
Bill Phelps	DNR Groundwater
Judy Polczinski	DNR Environmental Enforcement
Russ Rasmussen	DNR Division of Water, Policy Advisor
Heidi Schmitt-Marquez	DNR Industrial Wastewater
Glenn Selner	Kewaunee County Zoning Department
Sara Walling	Department of Agricultural Trade & Consumer Protection

This group met 5 times between September and December 2015. There were 14 recommendations that reached consensus/near consensus (11 total) or had 2/3 majority in agreement (3 total). The lead stakeholders that may be implementing the recommendations are listed in bold at the end of each recommendation.

COMPLIANCE RECOMMENDATIONS

- Conduct more land application hauling audits/oversight in sensitive areas. [DNR and County]
- Staffing - Add compliance staff position(s) to conduct improved compliance oversight (examples listed below) of existing regulations regarding agriculture in sensitive areas [DNR]. Fill vacancies in a timelier manner. Additional EPA, DATCP, County, NRCS staff may also be relevant to fulfilling some of the duties below.
- Voluntary training and outreach/education for farmers, citizens, haulers, crop consultants, landowners, etc.
- Joint-agency training (EPA, DNR, NRCS, DATCP, County) for consistency and efficiency
- Review nutrient management plans (CAFO)
- More frequent inspections of land application sites
- More frequent production site inspections of CAFO farms (1/year) by DNR.
- More thorough review of permit-required record-keeping regarding CAFO production sites by DNR (annual reports, spill response plans, evaluations, etc.)
- Inspection of medium sized livestock production sites not yet inspected by County LWCD.
- More stringent review of CAFO emergency land spreading variances. [DNR]

- Require that all land applicators have, at minimum, one set of spreading restriction maps and written instructions present for land application sites where manure is actively being applied. [DNR & County]
- Targeted focus on proper well abandonment of non-compliant wells or wells no longer used. [DNR]
- Further evaluation and review of existing enforcement processes. [DNR, County, EPA]
- Fill currently vacant DNR conservation warden position in Kewaunee County. [DNR]
- Continue and improve communications and outreach to farmers/landowners from agencies (DATCP, NRCS, County LWCD) regarding:
- Winter (frozen or snow-covered ground) spreading
- General cropland best management practices
- Develop guidance that defines and explains "substantial compliance" requirement for CAFO permit reissuance. May include: inspection checklist updates; staff training, template reporting resources, and clearer permit conditions. [DNR, EPA]
- Resources/Technology for agricultural compliance staff use and efficiency (internal/non-public) – database of information electronically accessible for multiple compliance agencies. [EPA, DNR, County]
- Nutrient management plan information
- Pending compliance/complaint response status
- During land application complaint response, DNR and County shall encourage having all associated parties present (e.g. farmer, hauler, crop consultant, complainant) during complaint inspection. [DNR, County]
- Develop communication plan for all landowners who rent land for application of wastes. [County/Local groups]
- Improve review and approval process of offsite waste distribution by non-agricultural waste generators into agricultural waste storages. [DNR & County LWCD]
- Develop communication plan for public regarding compliance and enforcement activities (e.g. agricultural, industrial and septage) being conducted by DNR. [DNR]

COMMUNICATIONS

The Communications Workgroup's purpose was to discuss how to take the recommendations/items from the workgroups and determine how best to communicate/reach out to key stakeholders, audiences, etc., so they receive the information in an understandable and accessible way.

WORKGROUP MEMBERS

Andrew Savagian	DNR Office of Communication (chair)
Tom Bauman	DNR Runoff Management
Davina Bonness	Kewaunee County Conservationist
Kyle Burton	DNR Runoff Management
Andrew Craig	DNR Runoff Management
Tom Davenport	US Environmental Protection Agency
Sara Geers	Midwest Environmental Advocates
Callie Herron	UW Discovery Farms
Casey Jones	DNR Runoff Management
MaryAnne Lowndes	DNR Runoff Management
Jodi Parins	Kewaunee County Citizen
Russ Rasmussen	DNR Division of Water, Policy Advisor
Tony Reali	Calumet County

This group met 3 times between December 2015 and February 2016. The main purpose of the Communications Workgroup was to provide a plan and strategy to help with outreach and dissemination of the recommendations in the final report.

COMMUNICATION GOALS

- Get the word out. To communicate/reach out to key stakeholders, audiences, etc. about the proposed recommendations of the workgroup.
- Increase Awareness. To increase public's awareness and understanding of the workgroup and the proposed recommendations as they affect the various stakeholders through potential legislative, administrative and/or voluntary changes.
- Improve Information Access. Provide the public and media better access to information about the workgroup's process and the final report/proposed recommendations

COMMUNICATION OBJECTIVES

- Develop communication plan.
- Develop process to complete final report.
- Release final report and possible news release, post web content, etc.
- Reach out to key stakeholders with final report via key communication tools.
- Follow up, evaluate implementation.

BEST MANAGEMENT PRACTICES & SENSITIVE AREAS

The Best Management Practices & Sensitive Areas Workgroup's purpose was to define sensitive areas that are high risk for groundwater pollution and to recommend management practices that may help reduce or eliminate groundwater pollution and the associated public health risk within these sensitive areas.

WORKGROUP MEMBERS

Andrew Craig	DNR Runoff Management Section (chair)
Joe Baeten	DNR Runoff Management
Davina Bonness	Kewaunee County Conservationist
Kyle Burton	DNR Drinking Water and Groundwater
Tom Davenport	US Environmental Protection Agency
Ryan Debroux	Custom Manure Hauler
Betsy Doolittle	Natural Resource Conservation Service
Kevin Erb	UW-Extension
Sara Geers	Midwest Environmental Advocates
Brad Holtz	DNR Runoff Management
Mark Jenks	Department of Agricultural Trade & Consumer Protection
Joe Johnson	USDA Natural Resources Conservation Service
Dale Konkol	Door County Soil Conservation
Mary Ann Lowndes	DNR Runoff Management
Kevin Masarik	UWSP-UWEX – Groundwater
Don Niles	Agricultural Representative
Nathan Nysse	Certified Crop Advisor
Jodi Parins	Kewaunee County Citizen
Bill Phelps	DNR Groundwater
Jeff Polenske	Certified Crop Advisor
Russ Rasmussen	DNR Division of Water, Policy Advisor
Mick Sagrillo	Kewaunee County Citizen
Bill Schuster	Door County Conservationist
Lynn Utesch	Kewaunee Cares Representative
Sara Walling	Department of Agricultural Trade & Consumer Protection

This group met 9 times between August 2015 and March 2016.

CONSENSUS RECOMMENDATIONS

- No mechanical applications of manure on soils with a soil depth less than 12 inches to bedrock.
- The next three recommendations received the same ranking score from the workgroup; therefore, all have the same priority 2 ranking.

- Inspect fields according to a., b., and c. below for depth to bedrock, groundwater conduits, contributing channels or areas that drain to groundwater conduits, drain tiles that may drain/discharge to groundwater conduits and evidence of fracture traces; keep inspection logs and update NMP maps with identified features.
- Inspect annual cropped fields in spring before manure application, tillage, or planting or in late summer/fall after crop harvest and before manure application, tillage, or planting.
- Inspect alfalfa and perennial cropped fields in spring and summer before or 7-10 days after cutting – look for uneven crop growth that follows distinct lines.
- Use direct measurements (backhoe, probe, test pits, etc.) to verify depth to bedrock and groundwater.
- On soils with less than 24" to bedrock, no manure applications of liquid manure are allowed. Liquid manure is defined as having less than 12% solids content.
- Depth to Bedrock Recommendations – *Refer to Final Report page 39-45*
- Direct Conduits to Groundwater Recommendations – *Refer to Final Report page 45*
- All nutrient sources and not just manure should be considered.
- All livestock operations that apply manure prepare and implement a NMP that reflects, at a minimum, the proposed 2015 NRCS 590 standard.
- Analyze low solids content manure for ammonia and adjust the first-year available nitrogen based on the results, per UW A2809, Nutrient Application Guidelines, Chapter 9, and page 73, Table 9.1.
- Depressional groundwater recharge areas over shallow bedrock needs a clear definition; specifically, the workgroup needs to define the term 'shallow.'
- Practices need to reflect manure type and not farm size. Manure characteristics (e.g., solids, nutrient and pathogen content) help better define groundwater contamination risk(s) and should be a primary criterion for practice recommendations.
- On soils with less than 12" to bedrock, livestock may be pastured as long as the following items are met:
    - Pasture is maintained in adequate, perennial vegetation
    - Vegetation is maintained year round
    - Producer develops and maintains a grazing plan
    - The grazing plan, at a minimum, meets both NRCS Standard 590, Nutrient Management and 528, Prescribed Grazing.
- The workgroup needs to focus on winter spreading plan requirements to address manure applications on soils > 20 feet to rock during winter – frozen or snow-covered soils
- For manure mixed with industrial waste, require chloride sampling and other applicable WPDES permit sampling requirements, as authorized under NR 214.17, Wis. Adm. Code, in addition to Nitrogen, Phosphorus, and Potassium.

The Best Management Practices recommendations found in the June 2016 Groundwater Collaboration Workgroup final report, provided the foundation for the NR151 Silurian Dolomite Standards & Prohibitions promulgated by the DNR on July 1, 2018.

** Additional information on the NR151 process can be found at:*
https://dnr.wi.gov/topic/nonpoint/nr151Strategy.html

ALTERNATIVE TECHNOLOGY

The Alternative Technology Workgroup's purpose is to: Identify and investigate alternative technologies and practices that may be applied to further reduce the risk of groundwater contamination in sensitive areas of Kewaunee county and the state – focusing on karst geology overlain by shallow soils; continue discussions regarding issues raised in the Sensitive Areas / Best Management Practices Work Group that were not resolved; evaluate the effectiveness of practices being applied in sensitive areas and suggest alternatives if necessary; and evaluate and suggest additional research that may be warranted to better derive effective solutions to reduce the risk of groundwater contamination in sensitive areas.

WORKGROUP MEMBERS

Russ Rasmussen	DNR Division of Water, Policy Advisor (Chair)
Aaron Augustian	Dairy Producer
Tom Bauman	DNR Runoff Management
Davina Bonness	Kewaunee County Conservationist
Kevin Erb	UW-Extension
Colin Geisenhoffer	Environmental Protection Agency
Erin Hanson	Door County Conservationist
Krassimira Hristova	Marquette University
Scott Laeser	Clean Wisconsin
Lee Luft	Kewaunee County Board of Supervisors
Maureen Muldoon	UW Oshkosh
Lynn Utesch	Kewaunee Cares / Agriculture Producer
Matt Woodrow	Department of Agricultural Trade & Consumer Protection

This group started meeting in 2016 after the Best Management Practices group ended and continues to meet monthly.

NRCS AHNAPEE & KEWAUNEE RIVER WATERSHED CONSERVATION PLAN

On May 1, 2015 Kewaunee County LWCD submitted a request for assistance to the United States Department of Agriculture (USDA) NRCS for technical and financial assistance to address Soil Quality and Erosion, Surface Water Quality, and Groundwater Quality resource concerns in Kewaunee County.

NRCS follows a 3-phase, 9-step planning process (Figure 17). Although the 9-steps are shown in sequence, the process is very dynamic and could start within any of the 9-steps. Cycling back to previous steps is often necessary as part of the planning process.

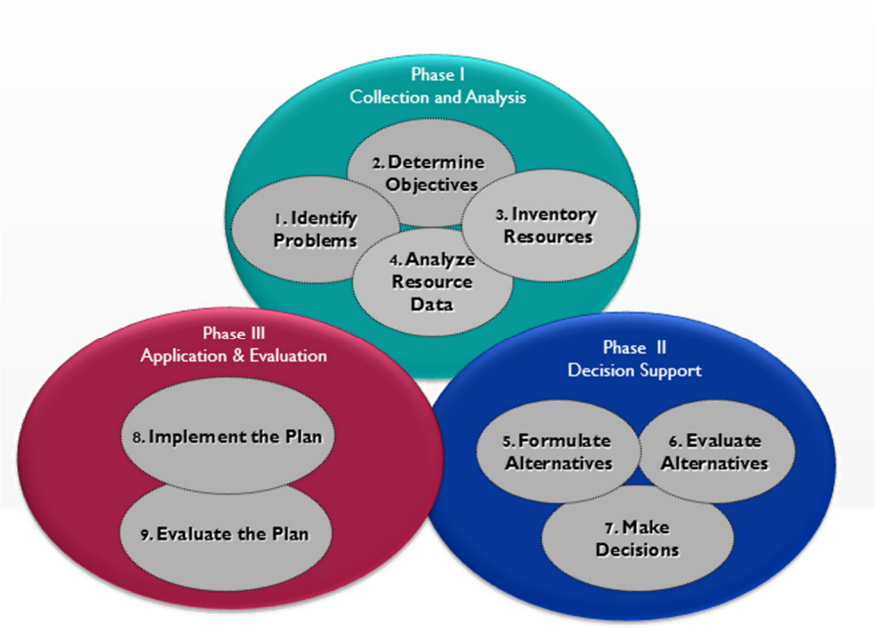
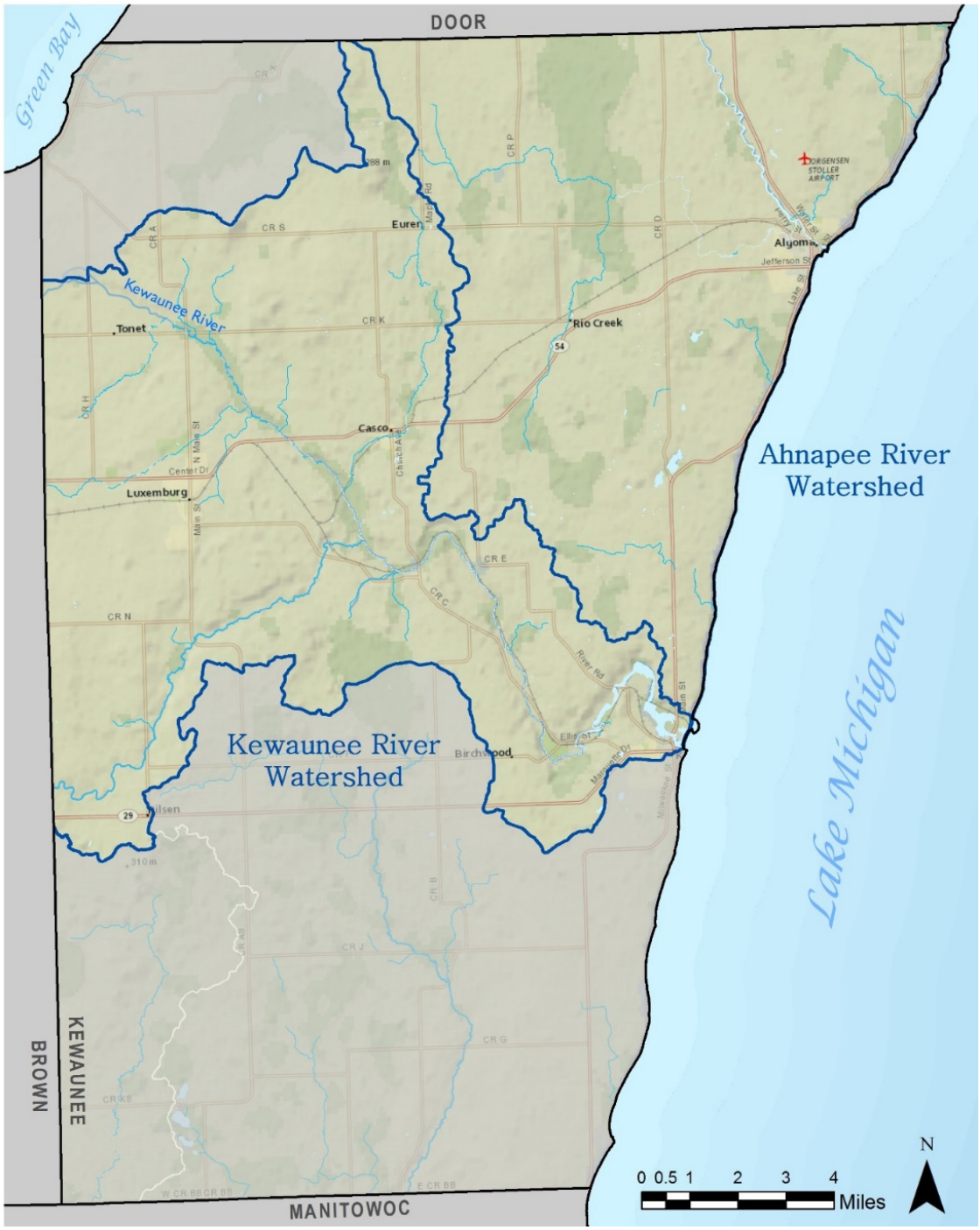


Figure 17: NRCS 9-Step Planning Process (Source: NRCS)

Area-wide conservation plans, such as the Ahnapee & Kewaunee River Watershed Conservation Plan, consider all the natural resources in the planning area as well as relevant social and economic considerations. The plan development follows the 9-step planning process to assist local people, through a voluntary locally led effort; to assess their natural resource conditions and needs, set goals, identify programs and other resources to achieve those goals, develop proposals and recommendations, implement solutions, and measure their success.

The Kewaunee and Ahnapee River Watersheds (Map 21) were selected because they border the county's Lake Michigan shoreline, contain a high percentage of shallow karst soils, and represent a large number of animal dairies in Kewaunee County.



Map 21: NRCS Watershed Planning Area

PLANNING TEAM

Davina Bonness	Kewaunee County Land & Water Conservation Department
Eric Allness	USDA Natural Resources Conservation Service
Jimmy Bramblett	USDA Natural Resources Conservation Service
Betsy Doolittle	USDA Natural Resources Conservation Service
Joe Johnson	USDA Natural Resources Conservation Service
Tom Krapf	USDA Natural Resources Conservation Service

To obtain public input for the development of the plan, a Technical Advisory Group (TAG) was established in July/August 2015 that comprised of a diverse assemblage of governmental and non-governmental representatives. The first TAG meeting was September 3, 2015 and the final TAG meeting was June 7, 2017.

TECHNICAL ADVISORY GROUP

Robert Atwell	Nicolet Bank
Andy Barta	Rio Creek Feed mill
Aerica Bjurstrom	University of Wisconsin-Extension
Mark Borchardt	USDA-Agricultural Research Service
Travis Buckley	Wisconsin DATCP
Nic Cochart	Kewaunee County Groundwater Task Force
Andrew Craig	Wisconsin Department of Natural Resources
Tom Davenport	Environmental Protection Agency
Ryan DeBroux	DeBroux Hauling
Judy Derricks	USDA Natural Resource Conservation Service
Scott Feldt	Kewaunee County Administrator
Randy Hallet	Kewaunee County Farmer
Steve Hogler	Wisconsin Department of Natural Resources
Brad Holtz	Wisconsin Department of Natural Resources
John Katers	University of Wisconsin – Green Bay
Jessica Kempke	US Army Corp of Engineers
Cindy Kinnard	Kewaunee County Public Health Department
Joel Kitchens	State Representative
Lee Luft	Kewaunee County Land & Water Conservation Committee
Don Niles	Peninsula Pride Farms & Farmer
John Pagel	Kewaunee County Land & Water Conservation Committee
Mike Parsen	Wisconsin Geological & Natural History Service
Pat Robinson	University of Wisconsin – Green Bay
Brian Rueckl	USDA Farm Service Agency
Joe VanHulle	USDA Natural Resource Conservation Service
Gary VanVreede	U.S. Fish & Wildlife Service
Sara Walling	Department of Agricultural Trade & Consumer Protection

Prior to the first TAG meeting, the Planning Team identified 10 resource concerns as defined by the National Planning Procedures Handbook (NPPH). These resource concerns were selected

based on Kewaunee County's sensitive landscape, history of groundwater and surface water contamination, concerns voiced by the public and the nature of the local agricultural community.

IDENTIFIED RESOURCE CONCERNS & DEFINITIONS

Air Quality - Objectionable Odors – Emissions of odorous compounds which cause nuisance conditions.

Excess Water - Flooding, Ponding & Seasonal High-Water Table – Surface water or poor subsurface drainage restricts land-use and management goals.

Inadequate Habitat for Fish & Wildlife - Habitat Degradation – Quantity, quality or connectivity of food, cover, space, shelter and/or water is inadequate to meet requirements for fish or wildlife species.

Soil Erosion - Concentrated Flow – Untreated classic gullies may enlarge or occur in the same flow area every year runoff from rainfall, snowmelt, or irrigation water.

Soil Erosion - Sheet, Rill & Wind – Detachment and transportation of soil particles caused by wind or rain that degrades soil quality.

Soil Quality Degradation – Compaction – Management induced soil compaction resulting in decreased rooting depth that reduces plant growth, animal habitat and soil biological activity.

Soil Quality Degradation - Organic Matter Depletion – Soil organic matter is not adequate to provide a suitable medium for plant growth, animal habitat, and soil biological activity.

Water Quality Degradation - Excess Nutrients in Surface & Groundwater – Nutrients (organics and inorganics) are transported to receiving waters through surface runoff and/or leaching into shallow ground waters in quantities that degrade water quality and limit use for intended purposes.

Water Quality Degradation - Excessive Sediment in Surface Waters – Off-site transport of sediment from sheet, rill, and wind erosion that threatens to degrade surface water quality and limit use for intended purposes.

Water Quality Degradation - Excess Pathogens & Chemicals from Manure, Bio-Solids or Compost Applications – Pathogens, pharmaceuticals, and other chemicals are carried by soil amendments that are applied to the land and are subsequently transported to receiving waters in quantities that degrade water quality and limit use for intended purposes.

TECHNICAL ADVISORY GROUP & PUBLIC PARTICIPATION:

At the initial TAG meeting on September 3, 2015, the TAG was given a Voting Sheet (Appendix 3) and were asked to rank the resource concerns on whether they were a high, medium or low priority to them. Then, on September 22, a public meeting was held in which approximately 100 Stakeholders were in attendance. The Public Stakeholders were given the same Resource Concern Voting Sheet as the TAG and asked to rank the resource concerns on whether they were a high, medium or low priority to them.

SUMMARY OF RANKING RESULTS

Following the September preliminary meetings, the Planning Team combined the Stakeholder's & TAG's Resource Concern voting results to prioritize the 10 resource concerns to develop a targeted planning process. Table 20 indicates the priority ranking order, with one being the highest priority and ten being the lowest.

Table 20. NRCS Watershed Plan - Priority Ranking of Resource Concerns

Priority Ranking Order	Resource Concerns
1	Water Quality Degradation – Excess Nutrients in Surface & Groundwater
2	Water Quality Degradation – Excess Pathogens and Chemicals from Manure, Bio-solids or Compost Applications
3	Water Quality Degradation – Excessive Sediment in Surface Waters
4	Soil Erosion – Concentrated Flow
5	Soil Erosion – Sheet, Rill & Wind
6	Inadequate Habitat for Fish & Wildlife – Habitat Degradation
7	Soil Quality Degradation –Compaction
8	Soil Quality Degradation – Organic Matter Depletion
9	Air Quality – Objectionable Odors
10	Excess Water – Flooding, Ponding & Seasonal High-Water Table

The three highest ranked resource concerns were concerning Water Quality Degradation, with the top concern being excess nutrients in surface and groundwater. The fourth and fifth ranked resource concerns dealt with Soil Erosion issues including concentrated flow channels and sheet, wind, and rill erosion. The seventh and eighth resource concerns were Soil Quality Degradation. Ninth was Air Quality and the tenth was Excess Water with regards to flooding and seasonal high-water table. In the Planning Team's discussion, resource concerns are often connected. When a landowner works to improve one, often times, they end up positively affecting resource concerns further down the list.

The Ahnapee & Kewaunee River Watershed Conservation Plan was approved in September 2018 and available at the LWCD office. Next steps including goals, objectives and action items, can be found in Chapter 5.

CHAPTER 5: RESOURCE IDENTIFICATION, PRIORITIZATION & PUBLIC PARTICIPATION

Public participation is a vital component in prioritizing natural resource needs in the County. Several methods were used to incorporate public input and to identify County needs including the DNR Workgroups, the NRCS Watershed Planning project, and the LWRMP public survey. All of these initiatives prioritized, ranked and incorporated public involvement; therefore, were included to move Kewaunee County forward in the next 10-year planning process.

NRCS AHNAPEE & KEWAUNEE RIVER WATERSHED CONSERVATION PLAN

As indicated in Chapter 4, the NRCS Watershed Planning process identified and ranked 10 resource concerns. The top 5 resource concerns identified (Table 21) were associated with water quality (both surface and groundwater) and soil erosion, which mimic the results of the public survey for this LWRMP update.

Table 21. NRCS Watershed Plan - Top 5 Priority Resource Concerns

Priority Ranking Order	Resource Concerns
1	Water Quality Degradation – Excess Nutrients in Surface & Groundwater
2	Water Quality Degradation – Excess Pathogens and Chemicals from Manure, Bio-solids or Compost Applications
3	Water Quality Degradation – Excessive Sediment in Surface Waters
4	Soil Erosion – Concentrated Flow
5	Soil Erosion – Sheet, Rill & Wind

The Planning Team then established Desired Future Conditions (DFC) and Action Items based off practices commonly used throughout NRCS and LWCD that are associated with the top 5 resource concerns. These practices include: Nutrient Management, Conservation Planning, Soil Quality, NR151 Standards & Prohibitions, Surface Water and Groundwater. The following DFC and Action Items were approved in September 2018.

*Caveat, the following DFC & Action Items under this planning effort were only set for the Kewaunee and Ahnapee River Watersheds. However, they were included and discussed by the LWRMP Local Advisory Committee because they could be representative of Kewaunee County as a whole.

NUTRIENT MANAGEMENT

Resource Concerns that can be addressed include: Groundwater and Surface Water Quality; Cropland Erosion; Soil Quality Degradation; as well as the overall Soil Health and Quality.

Desired Future Conditions:

1. All NMPs currently submitted to the LWCD are to follow the NRCS 2015 Standard by 2019. Note: Counties could not require landowners to follow the 2015 updated NMP standard until ATCP 50 passed in February 2018.

2. By 2018, have 91% of all watershed acres under an NMP; 2019 – 94%; 2020 – 97% and 2021 – 100%. Note: This will require landowner participation and cost-sharing dollars

3. Reduce Soil phosphorus (P) ppm by 10ppm over 10 years
   Current Conditions (Ahnapee): Average 28 ppm P
   Current Conditions (Kewaunee): Average 36 ppm P

4. Have all fields under NMP to have a Phosphorus Index (PI) of 2 or less
   Current Conditions (Ahnapee): 75% of fields < 2
   Current Conditions (Kewaunee): 74% of fields < 2

** 3 & 4 are based on 2016 NMPs submitted to LWCD93*

Action Items:

1. Confirm that NMP are not only planned but implemented by field verifying the following:
   a. Planned crop rotations match what is being planted
   b. Farming on contour or on strips to meet field T
   c. Setbacks
   d. Cover crops
   e. Manure hauling gallons/fields/analysis matches NMP
   f. Concentrated flow channels are all vegetated

2. Promote outreach and education through farmer led workgroups and agencies

CONSERVATION PLANNING

Resource Concerns that can be addressed include: Groundwater and Surface Water Quality; Cropland Erosion; Wildlife Habitat Fragmentation; Soil Quality Degradation; Air Quality; and Excess Water.

Desired Future Conditions:

1. By 2018 – 85% of all watershed acres under a Conservation Plan; 2019 – 90%; 2020 – 95% and 2021 – 100%. Note: This will require landowner participation

2. A 10% reduction in soil loss in 5 years; 20% reduction in 10 years
   Current Conditions (Ahnapee): 73% of fields < 2.0
   Current Conditions (Kewaunee): 71% of fields < 2.0
   Note: Current Conditions are based on 2016 NMPs submitted to LWCD

3. Address odor issues to meet the National Air Quality Site Assessment Tool

Action Items:

1. Conservation plan is truly implemented and matches the landowner/operators Nutrient Management Plan (i.e. crop rotations, tillage, buffers, management & structural practices)

2. Promote outreach and education through farmer led workgroups and agencies

3. Work with farms on adopting a Conservation System Approach suitable to their farming needs

SOIL QUALITY & CONSERVATION MANAGEMENT PRACTICES

Resource concerns that can be addressed include: Groundwater and Surface Water Quality; Cropland Erosion; Soil Quality Degradation; and Excess Water.

Desired Future Conditions:

1. Increase percent of Cover Crops on Soybean and Corn Silage acres

2. Decrease the percent of Fall Conventional tillage (use transect survey to record data)

3. Increase farming operations that adopt the "voluntary" recommendations outlined in the Best Management Practices DNR workgroup

4. Decrease the compaction in the plow pan layer

5. Improve overall soil health, soil structure, and soil organic matter

Action Items:

1. Continue to increase adoption of cover crops / no-till practices

2. Continue to partner with the Peninsula Pride Farms (PPF) and the three established NRCS funded demonstration farms, which have launched initiatives and field days to educate farmers/landowners about soil health and cover crops.

3. Educate the use of manure irrigation and composting to reduce compaction and increase soil health and track the number of farms using composting and irrigation

4. Partner with NRCS & PPF to establish a way to document acres of Cover Crops

5. Identify framework to establish baseline data for bulk density and organic matter

WISCONSIN NR151 AGRICULTURAL COMPLIANCE STANDARDS AND PROHIBITIONS

Resource concerns that can be addressed include: Groundwater and Surface Water Quality; Cropland Erosion; Wildlife Habitat Fragmentation; and Soil Quality Degradation.

Desired Future Conditions:

1. All farms that currently take FPP credits to be in full compliance with NR151 Standards and Prohibitions by 2021

2. Determine which farms are eligible, but currently not taking the FPP credit, and work with them towards compliance

3. No unvegetated concentrated flow channels, which will reduce nutrients and sedimentation into our Groundwater and Surface Water

4. Have all farms/operations in both watersheds meeting NR151 Performance Standards on their facilities and cropland

5. Increase adoption of buffers to provide connectivity for wildlife

Action Items:

1. Increase the number of eligible participants claiming FPP and complete a NR151 walkover

2. Research alternatives to Manure Management (technologies like separation, reverse osmosis, etc.)

SURFACE WATER

Resource concerns that can be addressed include: Surface Water Quality and Groundwater Quality

Desired Future Conditions:

1. No Impaired Rivers for Total Phosphorus (on DNR/EPA list)
2. Restore Trout Streams & Fish Habitats
3. Zero Beach Closings
4. Zero Manure Spills
5. Decrease the intensity and number of algal blooms on Lake Michigan and inland lakes
6. Zero fish kills from high nutrient loads or manure spills
7. Reduce sedimentation transport from farm fields
8. Reduce transport of Nitrogen (N) & Phosphorus (P) to surface waters from tiles

Action Items:

1. Promote education to manure haulers about spreading and manure transport to reduce the number of spills in the county
2. Use Irrigation as a tool to spread nutrients (manure, leachate) during the growing season
3. Investigate new technology on Phosphorus removal systems in tile lines
4. Establish Total Maximum Daily Loads on the Kewaunee River and Ahnapee River
5. Identify the framework to establish baseline data for Total Suspended Solids (TSS), Total Phosphorus (TP), and Total Nitrogen (TN) for all waterbodies in both Watersheds
6. Increase the implementation of buffers

GROUNDWATER

Resource concerns that can be addressed include: Groundwater Quality & Surface Water Quality

Desired Future Conditions:

1. All wells that provide drinking water to be bacteria (total coliform and e-coli) absent and nitrates less than the state standard of 10 ppm

2. All wells that provide drinking water to be free of microbes and viruses

Action Items:

1. Properly abandon all unused wells in the County

2. Update all existing septic systems to current standards

9-KEY ELEMENT PLAN - AHNAPEE RIVER WATERSHED

Following the NRCS Watershed planning process, the LWCD and DNR began a 9-key element plan for the Ahnapee River Watershed, located in northeast Kewaunee County encompassing portions of Lincoln, Ahnapee, Casco, and Pierce Townships. 9-key element plans fall under the EPA Nonpoint Source (Section 319) Program and help to determine the contributing causes and sources of nonpoint sources of pollution, while creating partnerships with all stakeholders to address water quality problems in the county (Figure 18).

For planning purposes, 9-key element plans are based off HUC (Hydrologic Unit Code) 12 sub-watersheds, (defined as 35 acres in size). HUC-12 watershed planning helps assess the contributing causes and sources of nonpoint source pollution. This involves key stakeholders, prioritizing restoration and protection strategies to address water quality problems, which is the main objective in the LWRMP update. The 9-key element plan was written to coincide with the 10-year (2020-2029) LWRMP update.

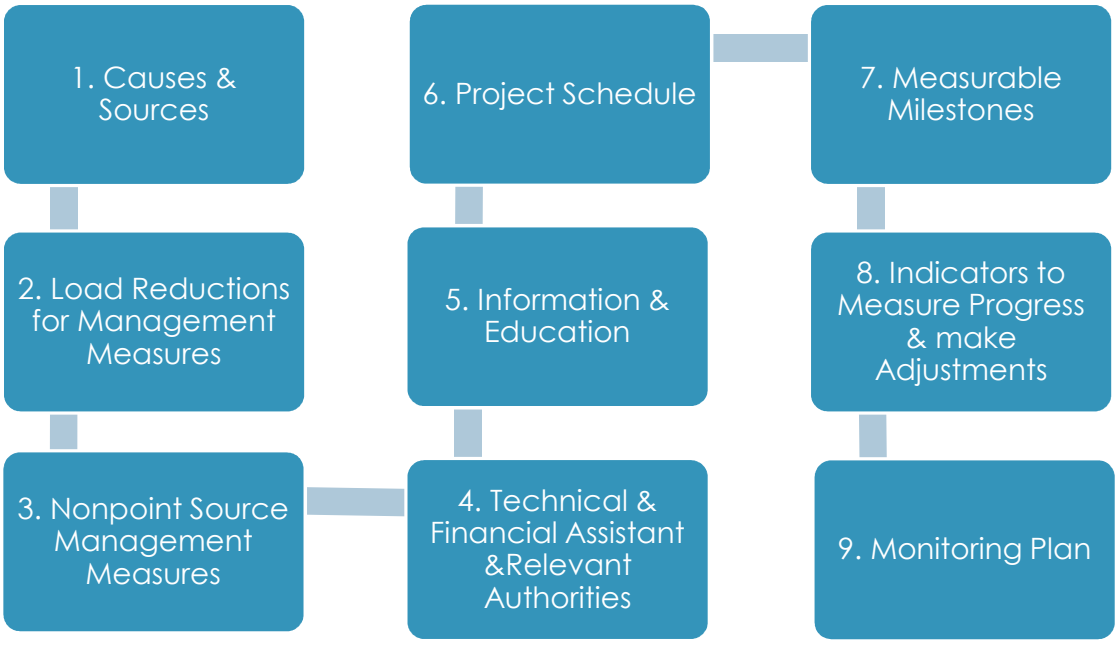
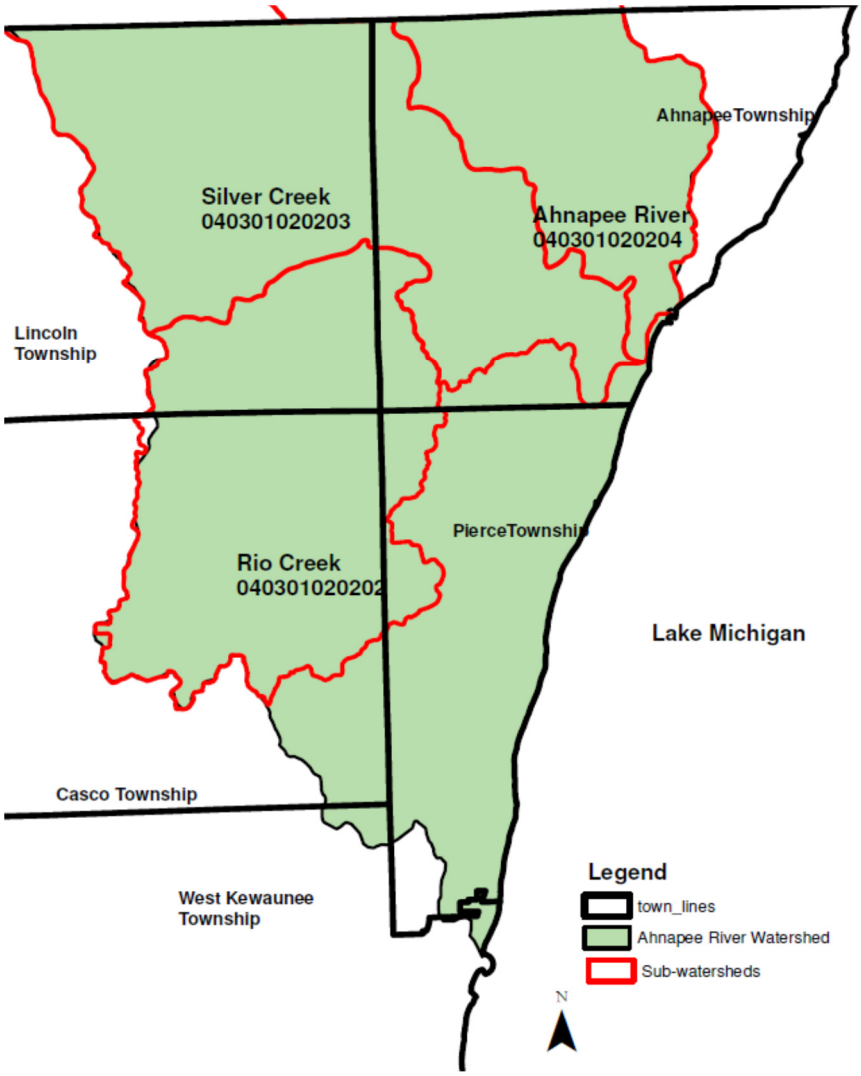


Figure 18: 9-Key Elements for Watershed-Based Plans

Within the Ahnapee River Watershed, DNR and LWCD selected Silver Creek (HUC code 040301020203), Ahnapee River (HUC code 040301020204) and the Rio Creek (HUC code 040301020202) sub-watersheds (Map 22).



Map 22: 9-Key Element Plan Area - Ahnapee River HUC-12 Watersheds

STEP 1: IDENTIFY THE CAUSES & SOURCES

To identify the causes and sources of nonpoint pollution that need to be controlled to achieve the load reductions, LWCD and DNR staff worked in a collaborative effort.

To select significant pollutant sources and estimate number and location of sources and background levels; DNR and LWCD staff referenced annual NMPs, NR151 walkover data, conservation planning efforts and analyzed current crop rotations within the 3 sub-watersheds. Information pulled from 2017 NMPs and NR151 walkover data included: cropland acres with NMPs, Conservation Plans and NR151 walkover in each HUC-12 as well as acres without a NMP or a conservation plan, acres never verified for NR151 compliance, number of operations needing manure storage, barnyards, and waste collection, and the total operations/animal units within each sub-watershed.

Table 22 outlines the input data requirements for each HUC-12 watershed. An average of 79% of the cropland acres have a NMP and 90% have a conservation plan. Thirty-four percent (34%) of the cropland acres need a NR151 walkover, with the Ahnapee River sub-watershed with the highest at 49% or almost half the cropland acres needing a NR151 walkover to determine compliance status.

Table 22. 9-Key Element Plan - STEPL HUC-12 Watershed Inputs

Input Data Requirements	**Rio Creek 40301020202**	**Ahnapee River 40301020204**	**Silver Creek 40301020203**
Acres without NMP	1056 (13%)	1348 (33%)	1520 (17%)
Acres with NMP	6914 (87%)	2737 (67%)	7421 (83%)
Acres without Conservation Plan	243 (2%)	809 (17%)	1141 (11%)
Acres with Conservation Plan	98%	83%	89%
Acres WITHOUT NR151 walkover	2356 (24%)	2308 (49%)	2988 (30%)
Acres in compliance with NR 151	76%	51%	70%
# Animal Feeding Operations that NEED manure storage, barnyard, milk-house collection and or leachate	No data	5 farms	4 farms
Acres of bare-lot (feedlot/exercise lot)	17.09 acres	12.3 acres	6.4 acres
Average # of months manure is applied	8	11	9
Agricultural Animal Units * Population	4611	200-400	9063

Source: LWCD & WDNR Communication, 2018. Also, see Appendix 4

Figures 19-21 display the PRESTO (Pollutant Load Ratio Estimation Tool) outputs for the 3 HUC-12 sub-watersheds, including the delineated watershed, land-cover types and percentages, and the estimated average annual phosphorus load.

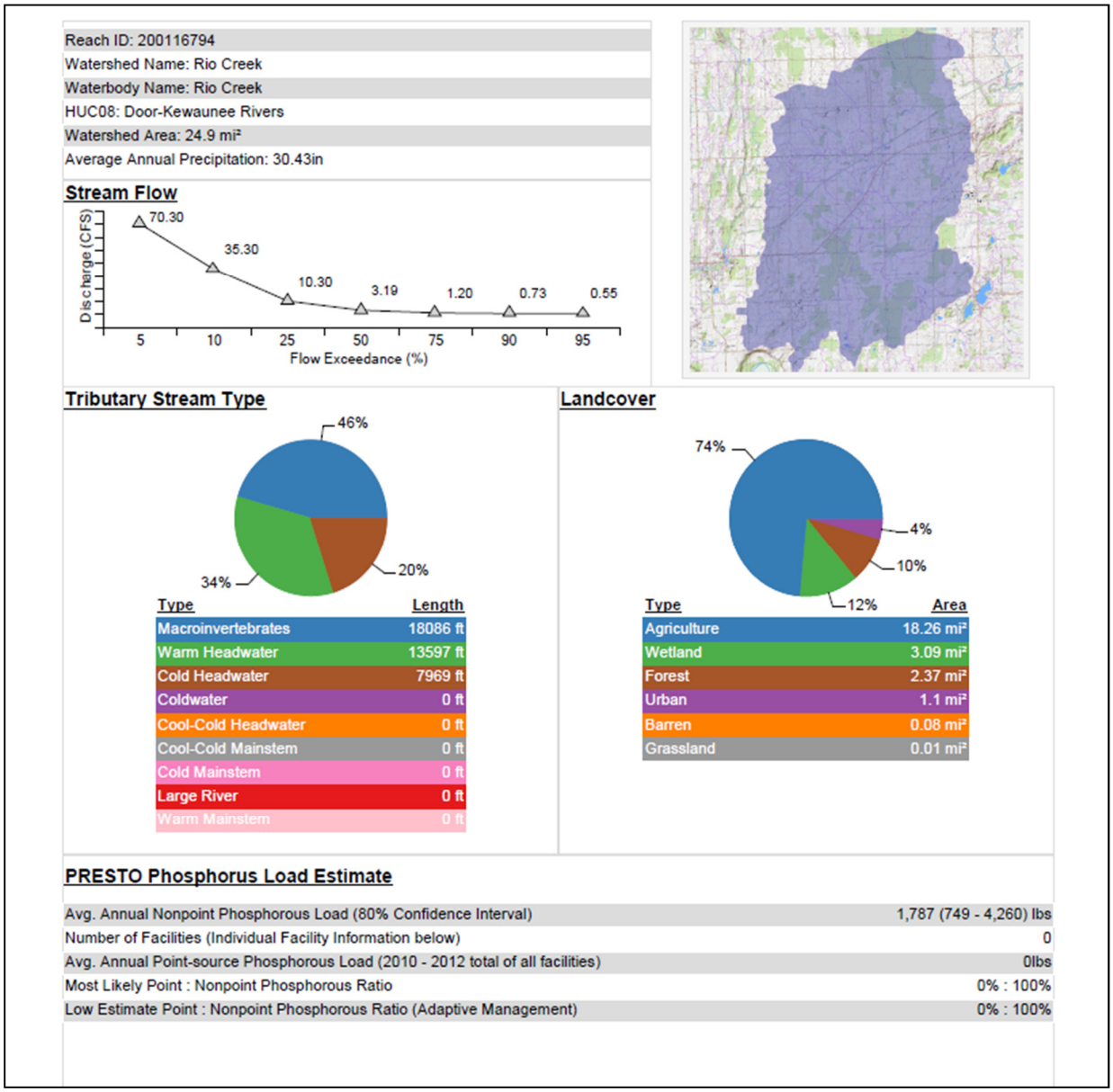


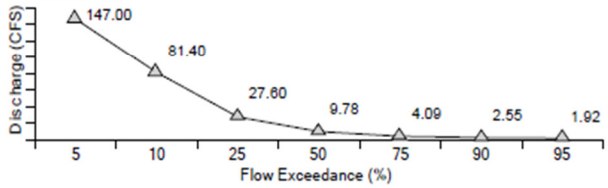
Figure 19: Rio Creek PRESTO-Lite Watershed Delineation Report, DNR 2018

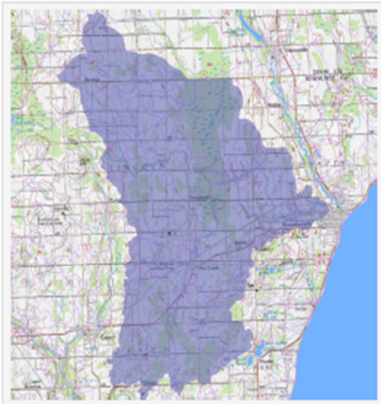
Rio Creek
HUC 040301020202

- ► 74% Agriculture
- ► 1,787 pounds on average annual nonpoint phosphorus load
- ►100% located in Kewaunee County

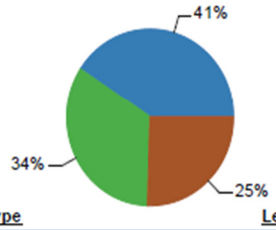
Reach ID: 200116094
Watershed Name: Silver Creek
Waterbody Name: Silver Creek
HUC08: Door-Kewaunee Rivers
Watershed Area: 56.77 mi²
Average Annual Precipitation: 30.55in

Stream Flow



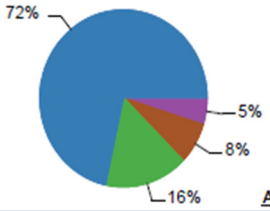


Tributary Stream Type



Type	Length
Warm Headwater	45183 ft
Macroinvertebrates	37458 ft
Cold Headwater	28250 ft
Coldwater	0 ft
Cool-Cold Headwater	0 ft
Cool-Cold Mainstem	0 ft
Cold Mainstem	0 ft
Large River	0 ft
Warm Mainstem	0 ft

Landcover



Type	Area
Agriculture	40.44 mi²
Wetland	9.07 mi²
Forest	4.27 mi²
Urban	2.73 mi²
Barren	0.24 mi²
Grassland	0.02 mi²

PRESTO Phosphorus Load Estimate

Avg. Annual Nonpoint Phosphorous Load (80% Confidence Interval)	6,341 (2,516 - 15,982) lbs
Number of Facilities (Individual Facility Information below)	0
Avg. Annual Point-source Phosphorous Load (2010 - 2012 total of all facilities)	0lbs
Most Likely Point : Nonpoint Phosphorous Ratio	0% : 100%

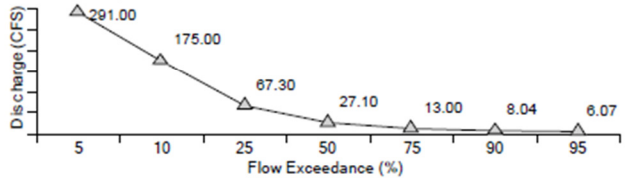
Figure 20: Silver Creek PRESTO-Lite Watershed Delineation Report, DNR 2018

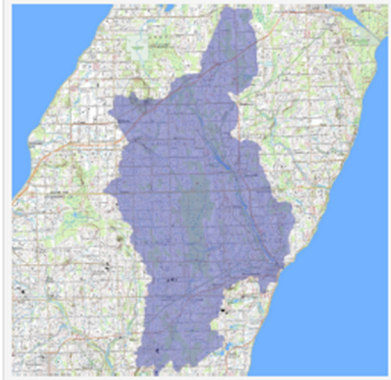
Silver Creek
HUC 040301020203

- ► 72% Agriculture
- ► 6,341 pounds on average annual nonpoint phosphorus load
- ► 80% located in Kewaunee County

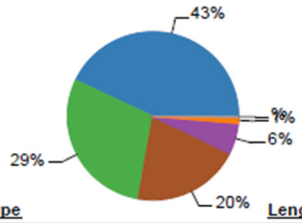
Reach ID: 200116278
Watershed Name: Ahnapee River
Waterbody Name: Ahnapee River
HUC08: Door-Kewaunee Rivers
Watershed Area: 121.2 mi²
Average Annual Precipitation: 30.59in

Stream Flow



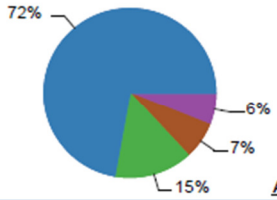


Tributary Stream Type



Type	Length
Warm Headwater	87016 ft
Macroinvertebrates	59323 ft
Cold Headwater	41114 ft
Warm Mainstem	12392 ft
Cool-Cold Headwater	2336 ft
Coldwater	333 ft
Cool-Cold Mainstem	0 ft
Cold Mainstem	0 ft
Large River	0 ft

Landcover



Type	Area
Agriculture	86.49 mi²
Wetland	17.59 mi²
Forest	8.39 mi²
Urban	7.38 mi²
Barren	0.92 mi²
Grassland	0.11 mi²

PRESTO Phosphorus Load Estimate

Avg. Annual Nonpoint Phosphorous Load (80% Confidence Interval)	11,943 (4,705 - 30,316) lbs
Number of Facilities (Individual Facility Information below)	2
Avg. Annual Point-source Phosphorous Load (2010 - 2012 total of all facilities)	909lbs
Most Likely Point : Nonpoint Phosphorous Ratio	7% : 93%
Low Estimate Point : Nonpoint Phosphorous Ratio (Adaptive Management)	3% : 97%

Figure 21: Ahnapee River PRESTO-Lite Watershed Delineation Report, WDNR 2018

Ahnapee River
HUC 040301020204

- ► 72% Agriculture
- ► 11,943 pounds on average annual nonpoint phosphorus load PRESTO included entire watershed (going into Door County)
- ► 25% located in Kewaunee County

Water quality data collected from 2016 to 2018 by DNR and Water Action Volunteers (WAV) for TP and total suspended solids (TSS) on the Ahnapee River and Silver Creek was incorporated into Step 1 (Figures 22 and 23). Testing in Rio Creek began in May of 2018.

From the 2016-2018 data, the median TP concentration for Silver Creek is 0.097 mg/L and median for Ahnapee River is 0.0549 mg/L. Silver creek does not meet TP criterion (0.075 mg/L) and Ahnapee River meets TP criterion. The median TP concentration from 2018's data on the Rio Creek is 0.196 mg/L, which also does not meet TP criterion.

DNR along with WAV continue to collect adequate water quality and flow data to be used to calculate nutrient loading in the Ahnapee River watershed. Data collection and pollutant load estimates for the Ahnapee River watershed should be finished in 2019 and the 9-key element plan will be modified to reflect those pollutant load reductions.

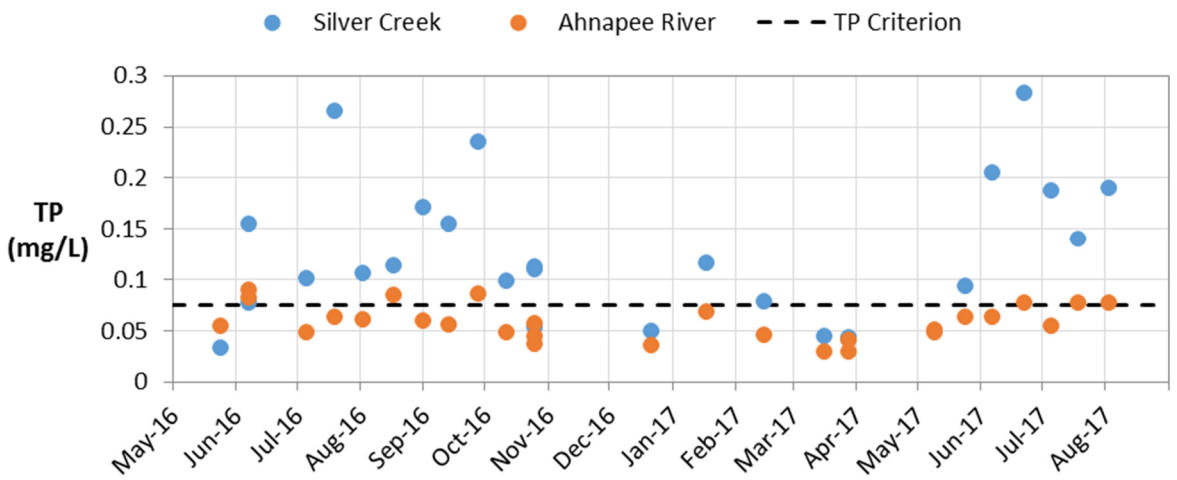


Figure 22: Total Phosphorus - Silver Creek & Ahnapee River (2016-2017)

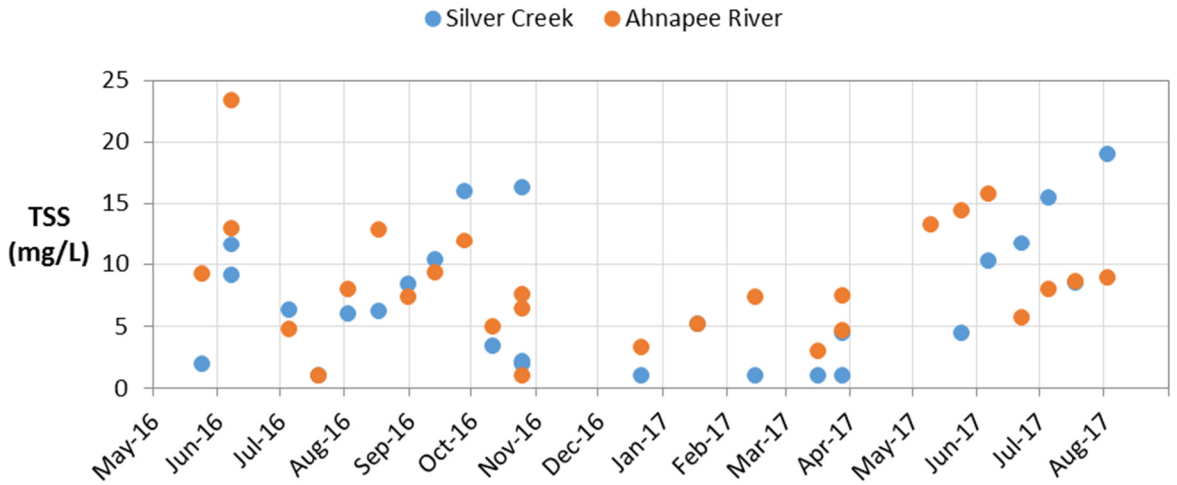
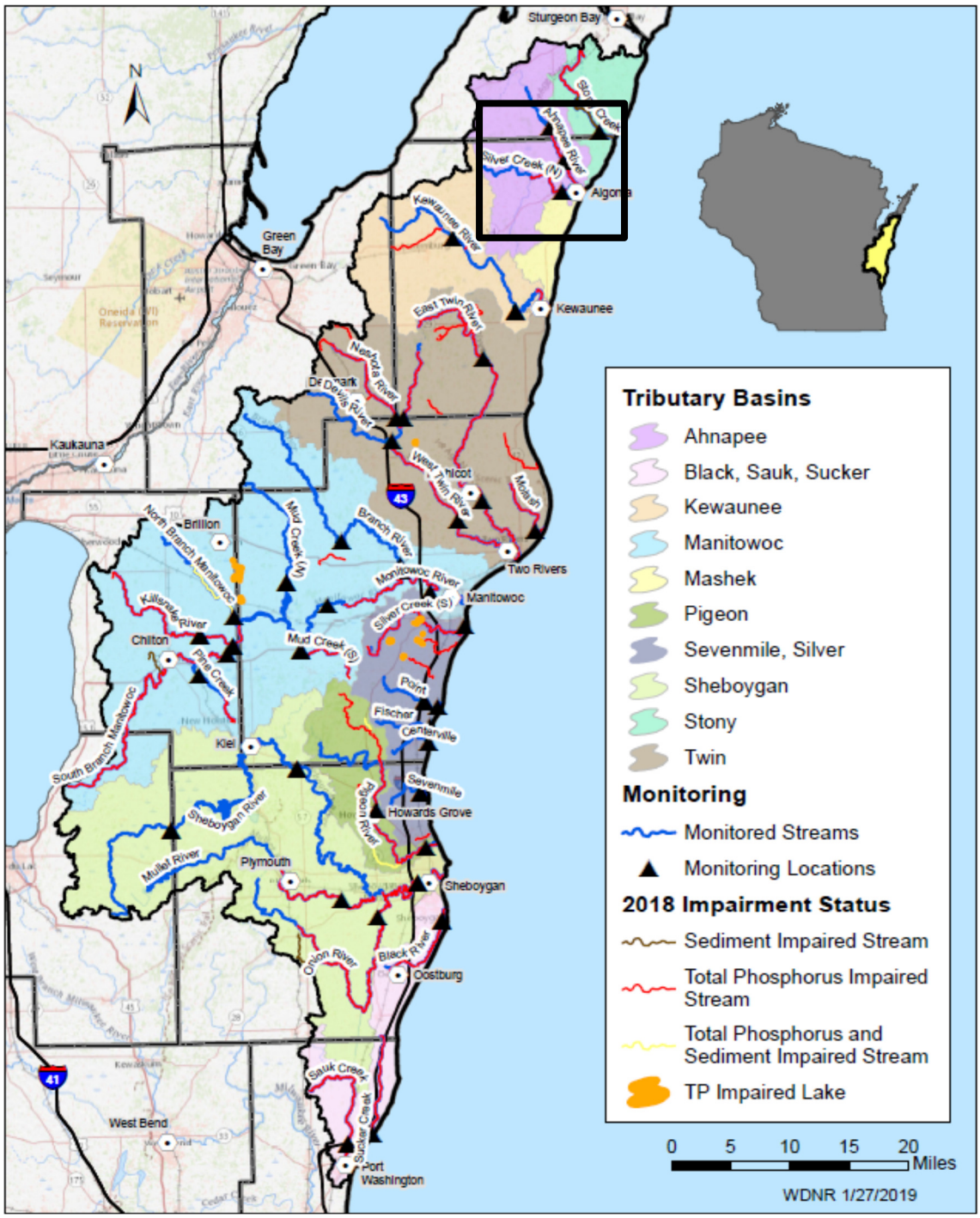


Figure 23: Total Suspended Solids - Silver Creek & Ahnapee River (2016-2017)

Monitoring locations for the Ahnapee River and Silver Creek are shown as black triangles in the Ahnapee River displayed in the black square on Map 23.



Map 23: Monitoring Locations in Northeast Wisconsin TMDL

STEP 2: ESTIMATE POLLUTANT LOADING & EXPECTED LOAD REDUCTIONS

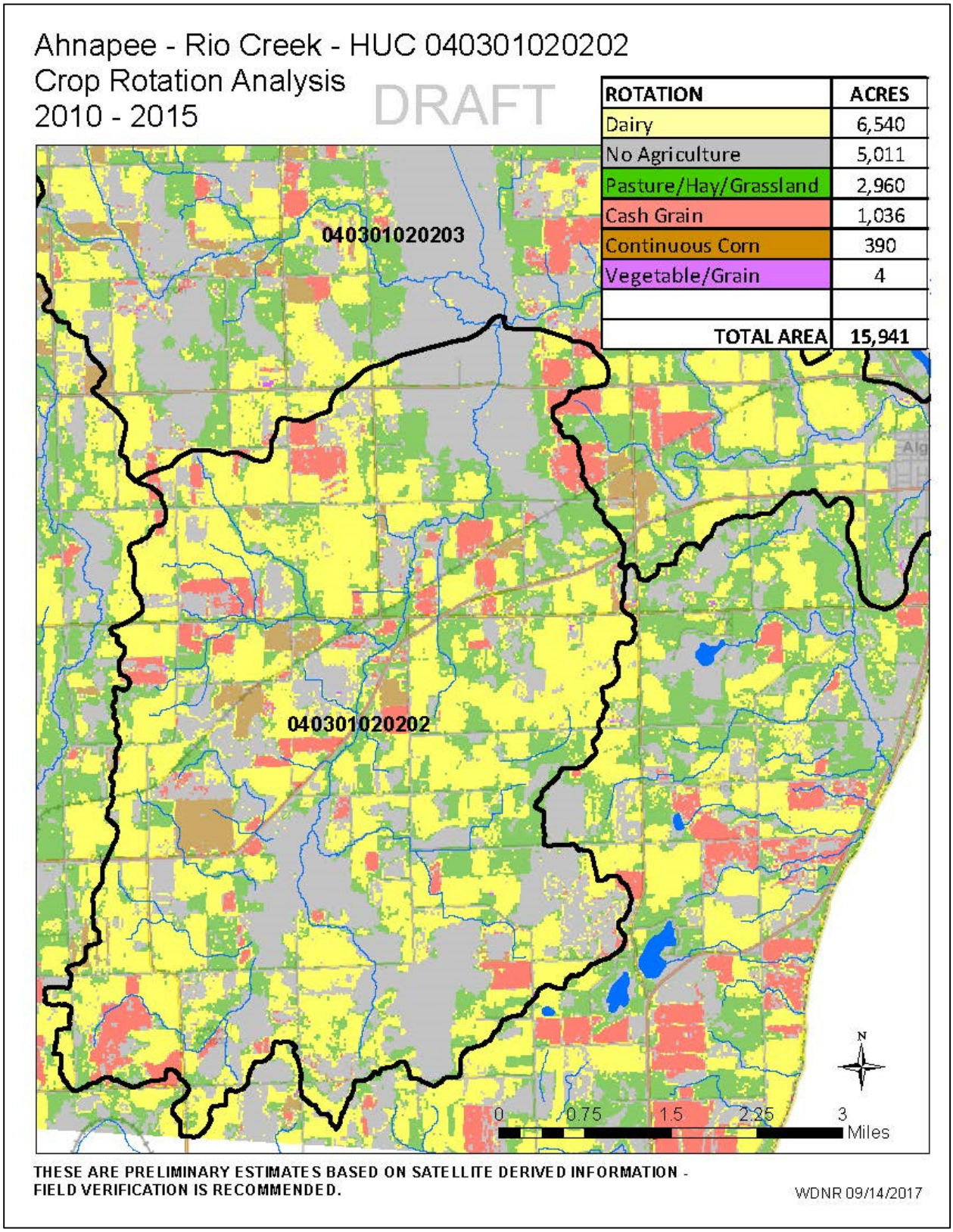
PRESTO reports identified each selected HUC-12 contains greater than 72% of land assessed as cropland. DNR staff created crop rotation history Maps (24-26) for each HUC-12 that further identify causes and sources of pollution and the maps were also used, in part, for STEPL (Spreadsheet Tool for Estimating Pollutant Loads) input modeling to set baseline/current conditions and set to set milestones for future practices. These maps display each HUC-12s acres according to no agriculture, dairy, pasture/hay/grassland, cash grain, vegetable grain, and continuous corn.

Therefore, to accurately estimate pollutant loading, LWCD staff calculated the percent of cropland using different tillage (conventional, no-till, chisel) and conservation practices (cover crops, edge filters, farming on contour, and strip cropping) currently being applied to the cropland within the HUC-12s.

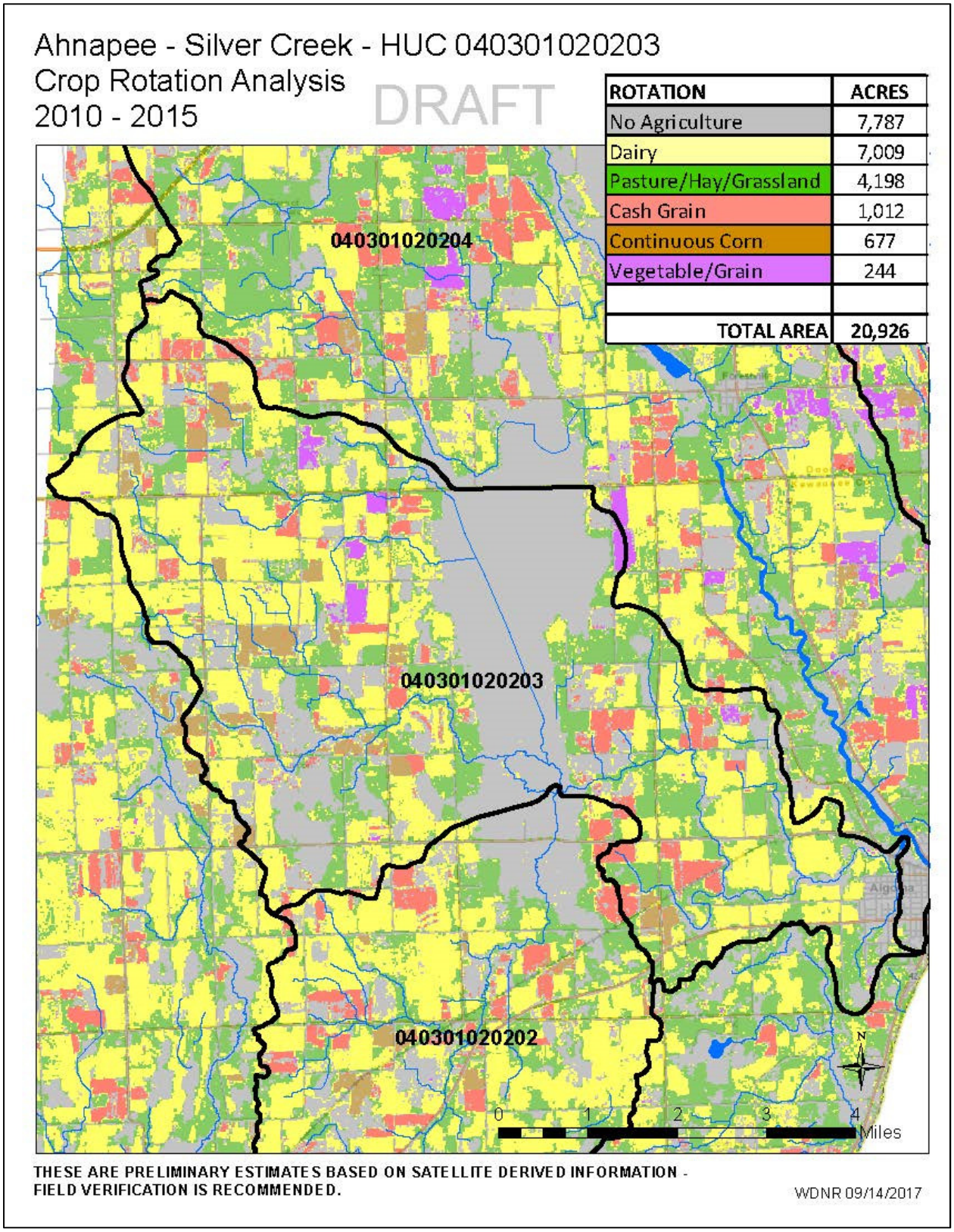
Throughout the LWRMP, there are several areas that are applicable to this 9-key element plan and need to be crossed referenced to further define causes and sources of pollution within these three HUC-12s. Table 23 identifies these areas and the associated page numbers.

Table 23: Applicable Cross References Areas for the Ahnapee River Watershed

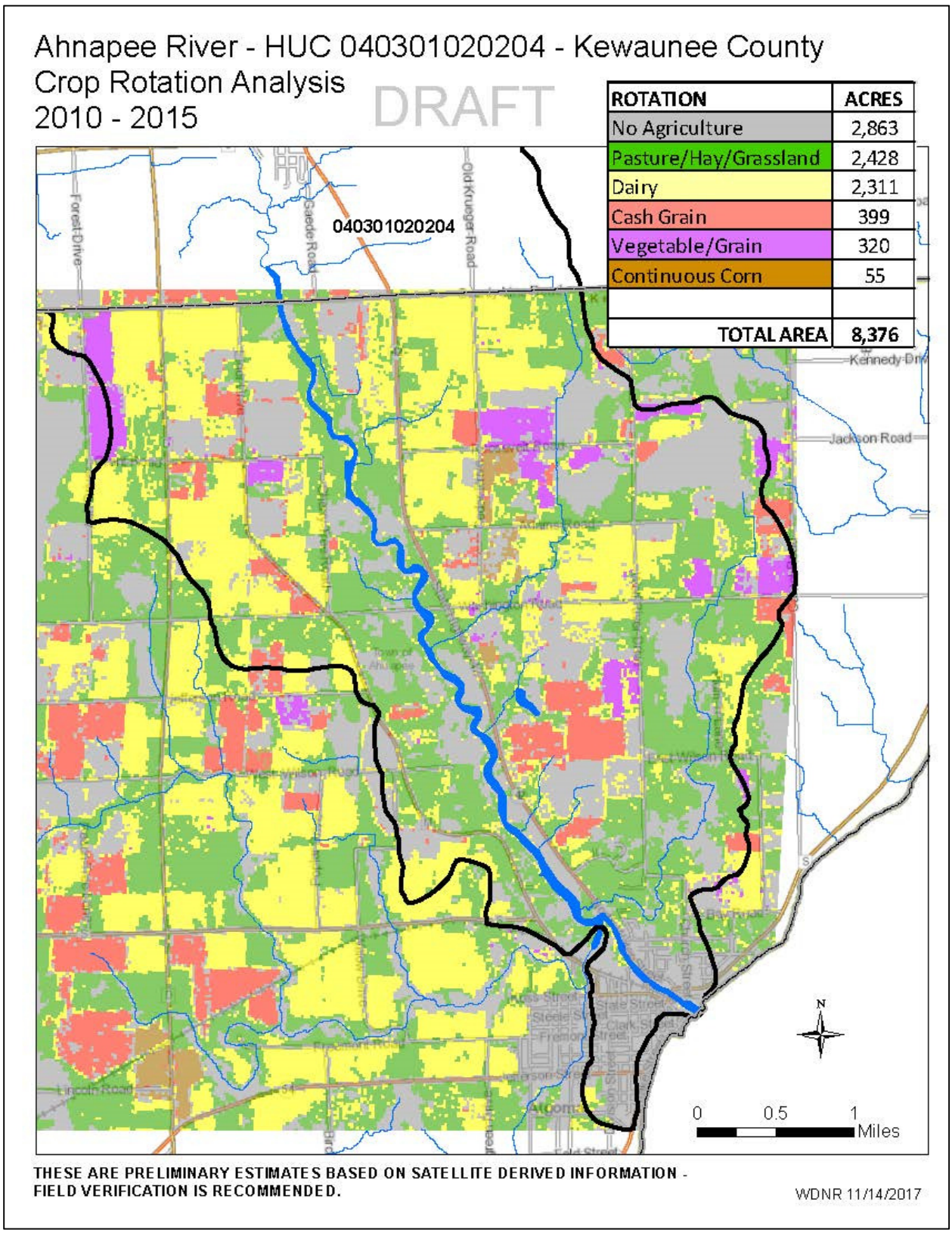
Reference:	**Page Number(s)**
Tolerable Soil Loss T	23, 103
Hydrologic Soil Groups	21, 104
NR151 Compliance Walkovers	55-56, 107
Soil Phosphorus ppm	52, 106
NRCS Watershed Plan (includes entire Ahnapee River Watershed (Surface Water and Soil Health)	79
DFC / Goals / Action Items	82-86
Local Advisory Goals & Objectives (includes entire County)	
Surface Water	128-130
Soil Health & Quality	131-132



Map 24: Rio Creek Crop Rotation Analysis (2010-2015)



Map 25: Silver Creek Crop Rotation Analysis (2010-2015)



Map 26: Ahnapee River Crop Rotation Analysis (2010-2015)

From these data inputs, DNR ran STEPL modeling (Figure 24) to calculate the current loading of Nitrogen (N), Phosphorus (P), Biological Oxygen Demand (BOD), and sediment.

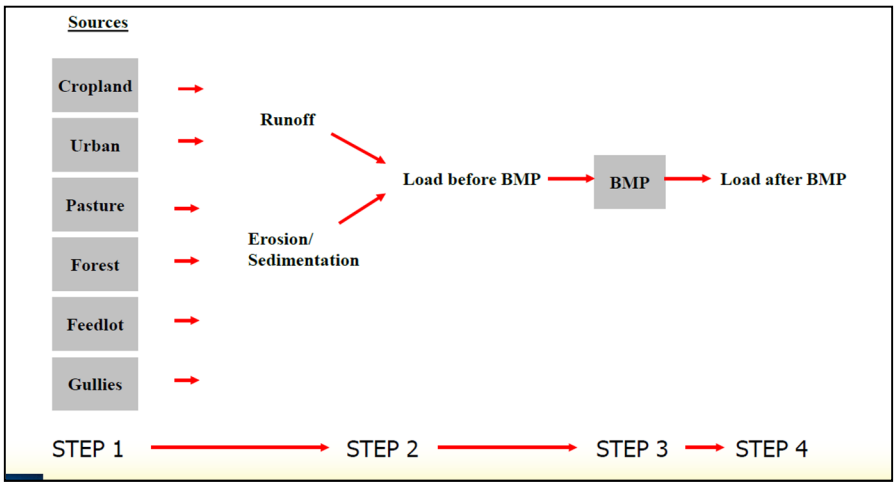


Figure 24: 9-Key Element Plan STEPL Model

STEPL's first step is to input the contributing sources (urban, cropland, pastureland, forest, feedlots, septic, gully, streambank and groundwater) with their relative loading equivalents. For each HUC-12, the annual nutrient loadings were calculated using STEPL model derived values for runoff volume and pollutant concentrations in runoff water – which are based upon STEPL inputs that capture watershed conditions. The annual sediment load from sheet and rill erosion was calculated based off USLE (Universal Soil Loss Equation) and the sediment delivery ratio. The sediment and pollutant load reductions were generated from adoption of new or additional BMPs using STEPL derived BMP efficiencies (EPA, 2018).

Table 24 identifies the current sources STEPL analyzed and the corresponding N, P, BOD, and sediment loadings. Total current loadings are approximately 206,000 pounds of N; 46,000 pounds of P; 451,000 pounds of BOD; and 6,000 tons of sediment every year. Table 25 separates the total loadings in Table 24 per their HUC-12 watershed.

Table 24. 9-Key Element Plan – Current Total Load by Land-Use (with BMP)

Sources	**N Load (with BMP)**	**P Load (with BMP)**	**BOD (with BMP)**	**Sediment Load (with BMP)**
	lbs./year	lbs./year	lbs./year	tons/year
Urban	1693.85	261.21	6669.12	38.69
Cropland	138453.62	36869.61	267418.24	5338.27
Pastureland	45455.92	4317.62	146217.71	378.51
Forest	2958.24	1576.8	7245.32	93.93
Feedlots	16982.44	2915.32	21699.78	0.00
Septic	435.24	170.47	1777.21	0.00
Gully	116.88	96.42	233.75	73.05
Streambank	0.00	0.00	0.00	0.00
Groundwater	0.00	0.00	0.00	0.00
Totals:	**206,096.18**	**46,207.45**	**451,261.12**	**5,922.44**

Source: WDNR Communication, 2018

Table 25. 9-Key Element Plan - Current Loading by HUC-12 Watershed

HUC-12 Watersheds	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)
	lbs./year	lbs./year	lbs./year	tons/year
Silver Creek	90368.4	20278.5	197291.5	2378.8
Rio Creek	74673.1	17267.4	160797.2	2201.3
Ahnapee	41054.7	8661.6	93172.4	1342.3
Totals:	**206,096.2**	**46,207.5**	**451,261.1**	**5,922.4**

Source: WDNR Communication, 2018

STEP 3: IDENTIFY REASONABLE GOAL ADOPTION OF FUTURE CROPLAND PRACTICES FOR THE NEXT 10 YEARS

Cropland practices that participating agencies have the ability to cost-share and implement through state, federal, and local programs will be used to reduce N, P, BOD, and sediment loads. Common practices used within STEPL modeling included cover crops, residue management, no-till, grass buffers and filters, grassed waterways to fix gully erosion, waste management collection, nutrient management plans, and conservation plans.

Table 26 identifies the 10-year implementation goals (2020-2029) per BMP and HUC-12 watershed. Overall, this plan will focus upon reducing current causes and sources of pollutants within each HUC-12 to improve water quality by increasing the number of acres with cover crops, cropland residue management (residue1), grass filter strips and/or buffers and grassed waterways and achieve 75% implementation of the NMPs. Implementation of NMPs refers to verifying the planned crops, manure applications, and tillage to reduce soil erosion and phosphorus losses is actually being implemented consistently on existing cropland. For livestock facilities, the goal is to properly manage and/or collect feedlot, manure, and wastewater runoff from entering waters of the state or groundwater resources.

Table 26. 9-Key Element Plan - 10-year BMP Implementation Goals

Best Management Practices (BMPs)	HUC-12 watersheds of the Ahnapee River Watershed		
	Silver Creek	**Rio Creek**	**Ahnapee**
Cover Crops + NMP	500 acres	500 acres	500 acres
Residue1 + NMP	1000 acres	1000 acres	1000 acres
Grass Filter + NMP	200 acres	200 acres	200 acres
75% NMP Implementation	All NMP acres	All NMP acres	All NMP acres
Feedlots with Waste Management System	2 acres	2 acres	2 acres
Grassed Waterways (GWW)	1000 feet	1000 feet	1000 feet

Source: WDNR Communication, 2018. Also see Appendix 5.

Table 27 takes the 10-year BMP overall goals from Table 26 and outlines an implementation strategy by milestones (0-3 years, 3-7 years and 7-10 years) with applicable funding sources and the agency to oversee implementation.

Table 27. 10-year Implementation Strategy of BMPs

Recommendations	Indicators	Milestones (in years)			Funding Sources	Implement
		0-3	3-7	7-10		
Conservation practices to cropland: including cover crops, no-till, residue management in priority areas	# of acres cropland with conservation practices applied	150 acres Cover Crops + NMP 300 acres residue + NMP	150 acres Cover Crops + NMP 400 acres residue + NMP	200 acres Cover Crops + NMP 300 acres residue + NMP	EQIP, TRM, SWRM, CSP, GLRI	LWCD, NRCS
Installation of GWW in priority areas	# of linear feet installed	250 feet	500 feet	250 feet	EQIP, SWRM, CREP, GLRI	LWCD, NRCS
Installation of grass filter strips + NMP along perennial and intermittent streams	# acres of buffers installed	50 acres	75 acres	75 acres	CREP, CRP, EQIP	LWCD, NRCS
Nutrient Management - 75% Implementation	Verify NMP Implemented	30% NMP acres verified	50% NMP acres verified	75% NMP acres verified	EQIP, CREP, GLRI SWRM	LWCD, NRCS
Feedlots with Waste Management System	Feedlot runoff collected to prevent discharge to surface water	0.5 acres	1.0 acres	0.5 acres	EQIP, SWRM, TRM, GLRI, CREP	LWCD, NRCS
Enforcement of NR 151.03 standard for tillage setbacks from surface waters where necessary	% of fields meeting standard tillage setback	25%	50%	75%	N/A	LWCD

If the BMPs in Table 26 are implemented and maintained within each HUC-12 over the plan's 10-year schedule (Table 27), STEPL analyzes the future reduction in N, P, BOD and sediments per sources outlined in Table 28 and by HUC-12s in Table 29. Total future loading reductions are approximately 180,693 pounds of N; 36,795 pounds of P; 447,630 pounds of BOD; and 5351 tons of sediment every year. This equates to a 12% reduction in N, a 20% reduction of P, a 1% reduction in BOD and a 10% reduction in sediment loading (Table 30). These reductions will assist in making progress towards, or attaining, water quality standards in Silver Creek, Rio Creek and the Ahnapee River.

Table 28. Future Total Load by Land-Use (with 10-year installed BMPs)

Sources	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)
	lbs./year	lbs./year	lbs./year	tons/year
Urban	1693.85	261.21	6669.12	38.69
Cropland	119820.83	28750.36	263740.98	4763.69
Pastureland	45455.92	4317.62	146217.71	378.51
Forest	2958.24	1576.8	7245.32	93.93
Feedlots	20289.46	1603.42	21699.78	0.00
Septic	435.24	170.47	1777.21	0.00
Gully	140.24	115.63	280.31	76.17
Streambank	0.00	0.00	0.00	0.00
Groundwater	0.00	0.00	0.00	0.00
Totals:	**180693.70**	**39795.52**	**447630.43**	**5351.00**

Source: WDNR Communication, 2018

Table 29. Future Total Load by Land-Use (with 10-year installed BMPs) by HUC-12

HUC-12 Watersheds	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)
	lbs./year	lbs./year	lbs./year	tons/year
Silver Creek	80164.1	16239.2	196186.9	2203.7
Rio Creek	66453.9	14040.4	159724.8	2032.1
Ahnapee	34075.7	6515.9	9,718.8	1115.2
Totals:	**180693.7**	**36795.5**	**447630.4**	**5,351.0**

Source: WDNR Communication, 2018

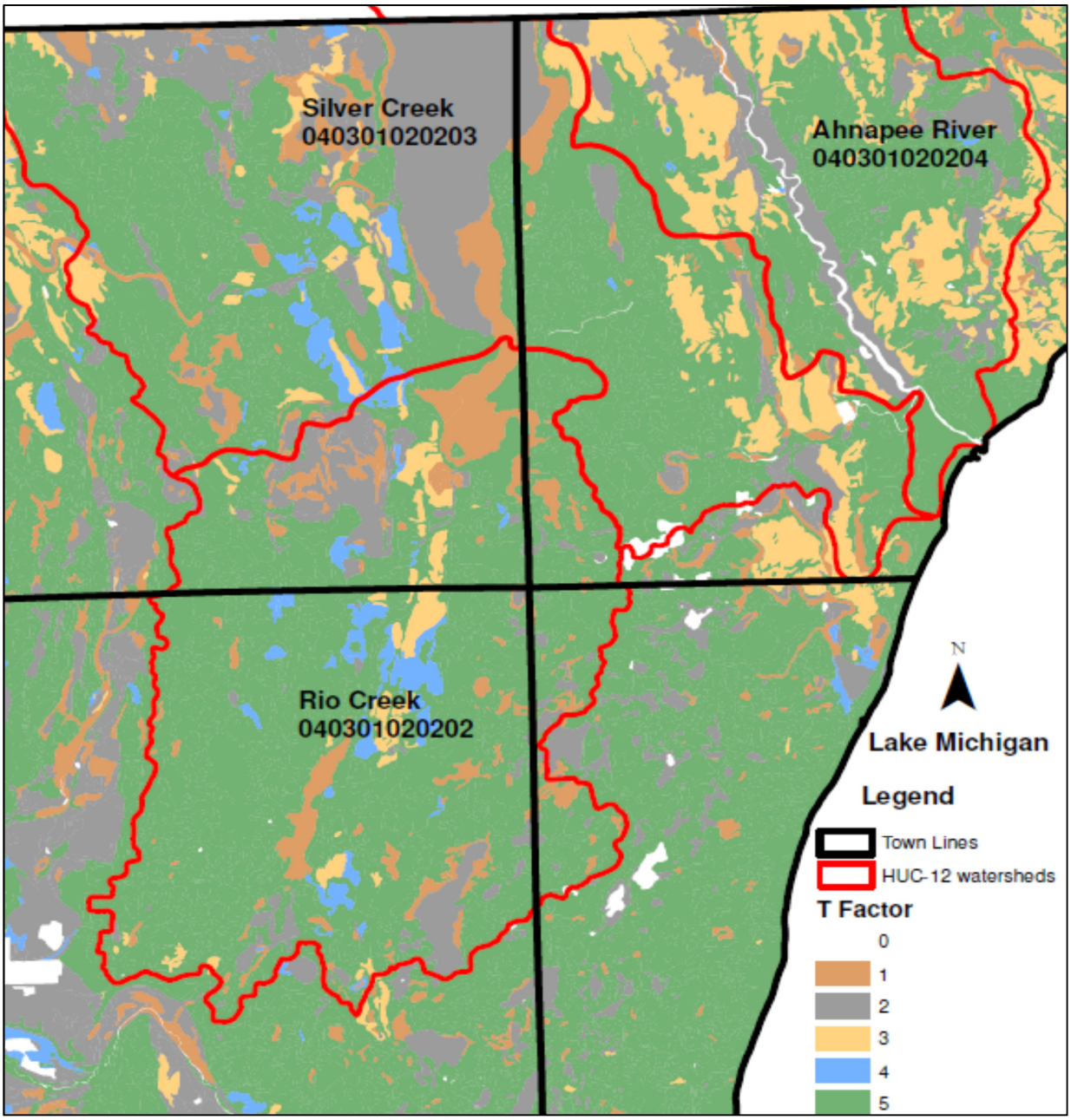
Table 30. 10-year STEPL Reductions

Sub-Watersheds	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)
	lbs./year	lbs./year	lbs./year	tons/year
Silver Creek	10204.3	4039.4	1104.7	175.1
Rio Creek	8219.2	3226.9	1072.5	169.2
Ahnapee	6978.9	2145.6	1453.6	227.1
Totals:	**25402.5**	**9411.9**	**3630.7**	**571.4**
Total Reduction	**12.3%**	**20.4%**	**0.8%**	**9.6%**

Source: WDNR Communication, 2018

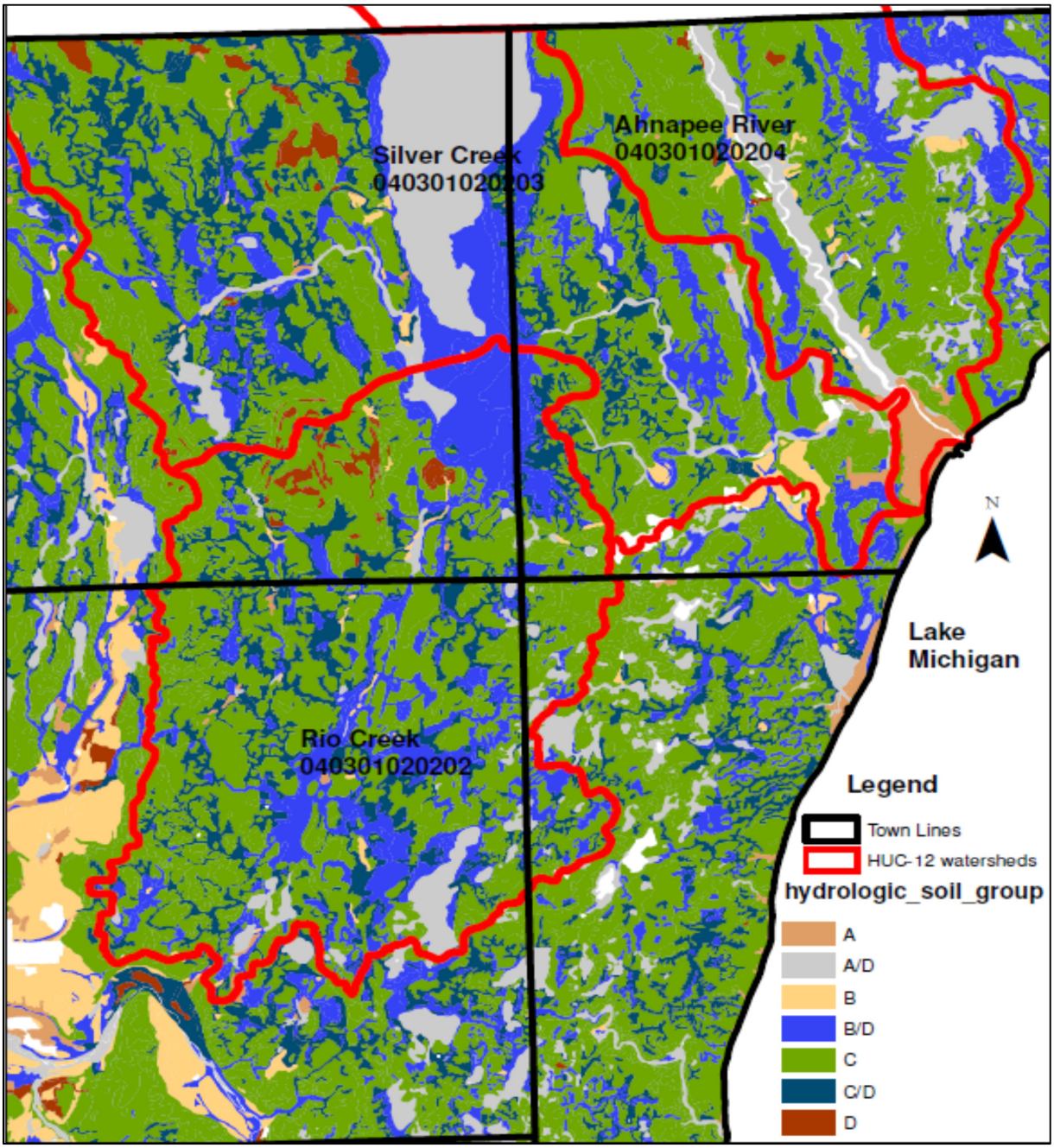
CRITICAL AREAS

The following maps display the HUC-12 watershed boundaries for the Silver Creek, Rio Creek and Ahnapee River and reflect critical areas for the adoption of practices in Table 26 and Table 27. Map 27 displays the Tolerable Soil Loss, or T value. Refer to pages 50-52 for description of T values.



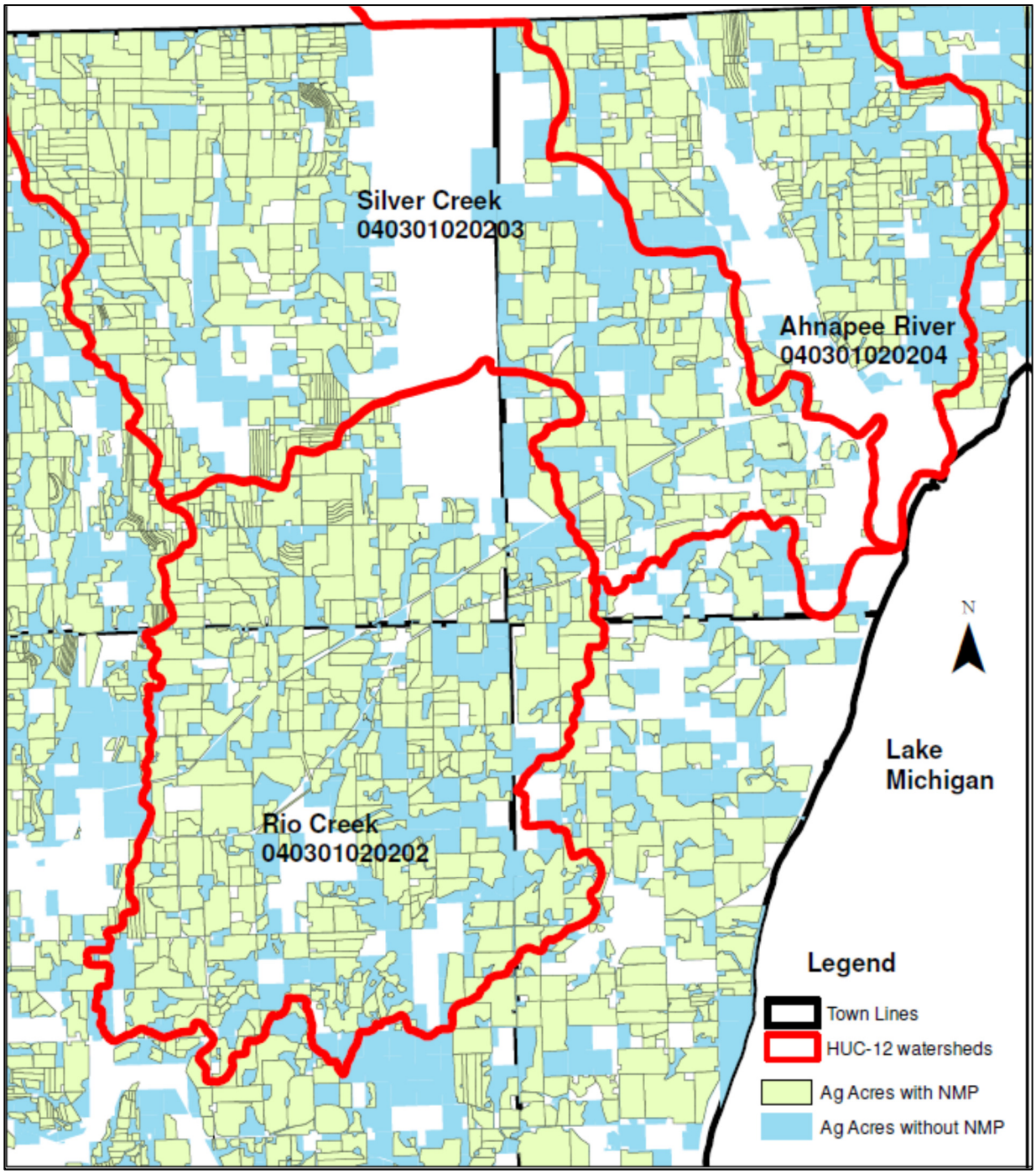
Map 27: HUC-12 Tolerable Soil Loss "T" Factor

Map 28 displays the Hydrologic Soil Groups per HUC-12 watershed. The majority of soils are considered to be Group C, which have a low infiltration rates when thoroughly wetted. Refer to pages 50-52 for a description of Hydrologic Soil Groups.



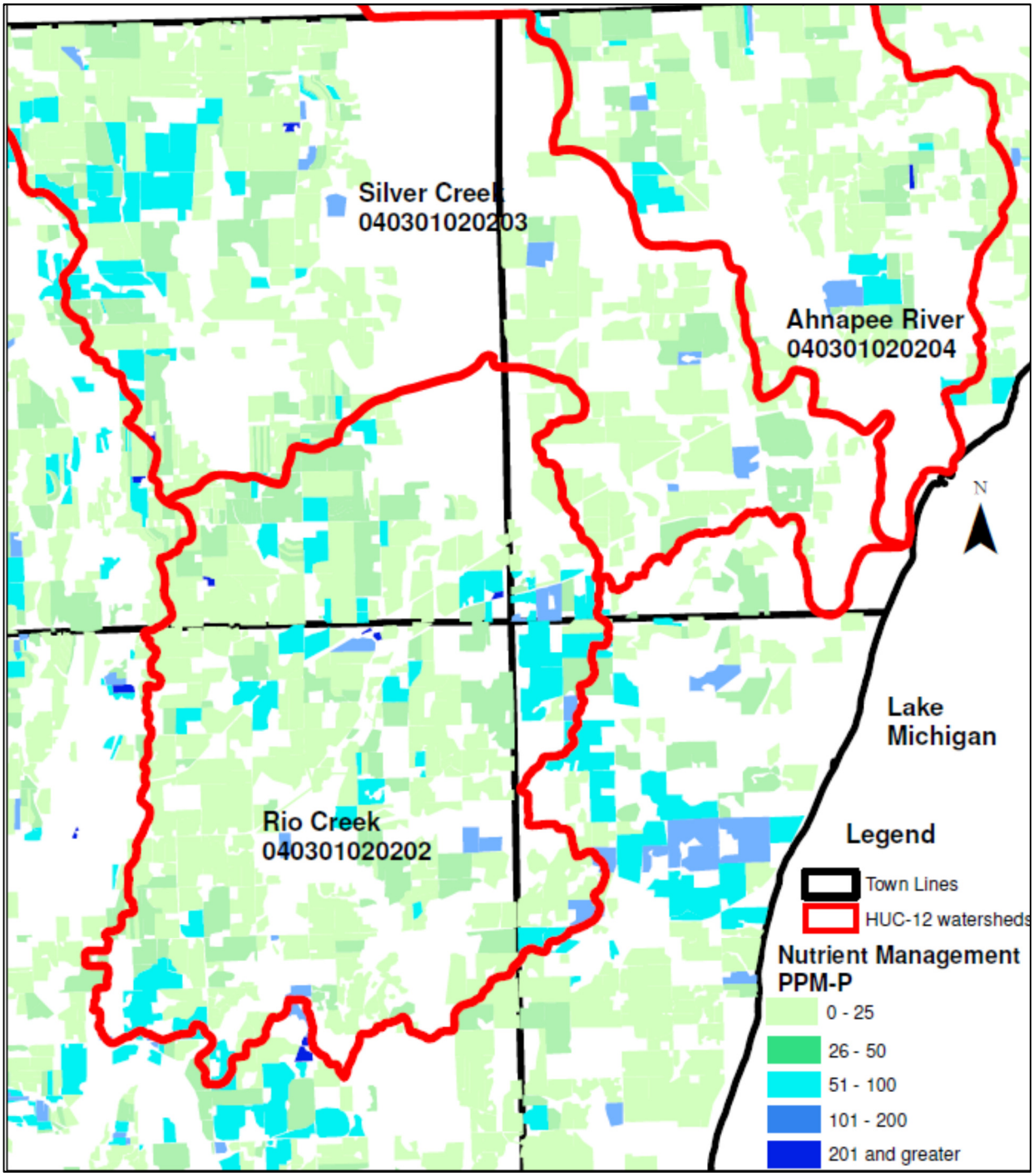
Map 28: HUC-12 Hydrologic Soil Groups

Map 29 displays Nutrient Management on the landscape within the HUC-12 watersheds. Yellow indicates the LWCD has a current NMP in the office for that parcel and the blue does not have a current NMP. Therefore, the blue areas are critical areas for the implementation of NMP.



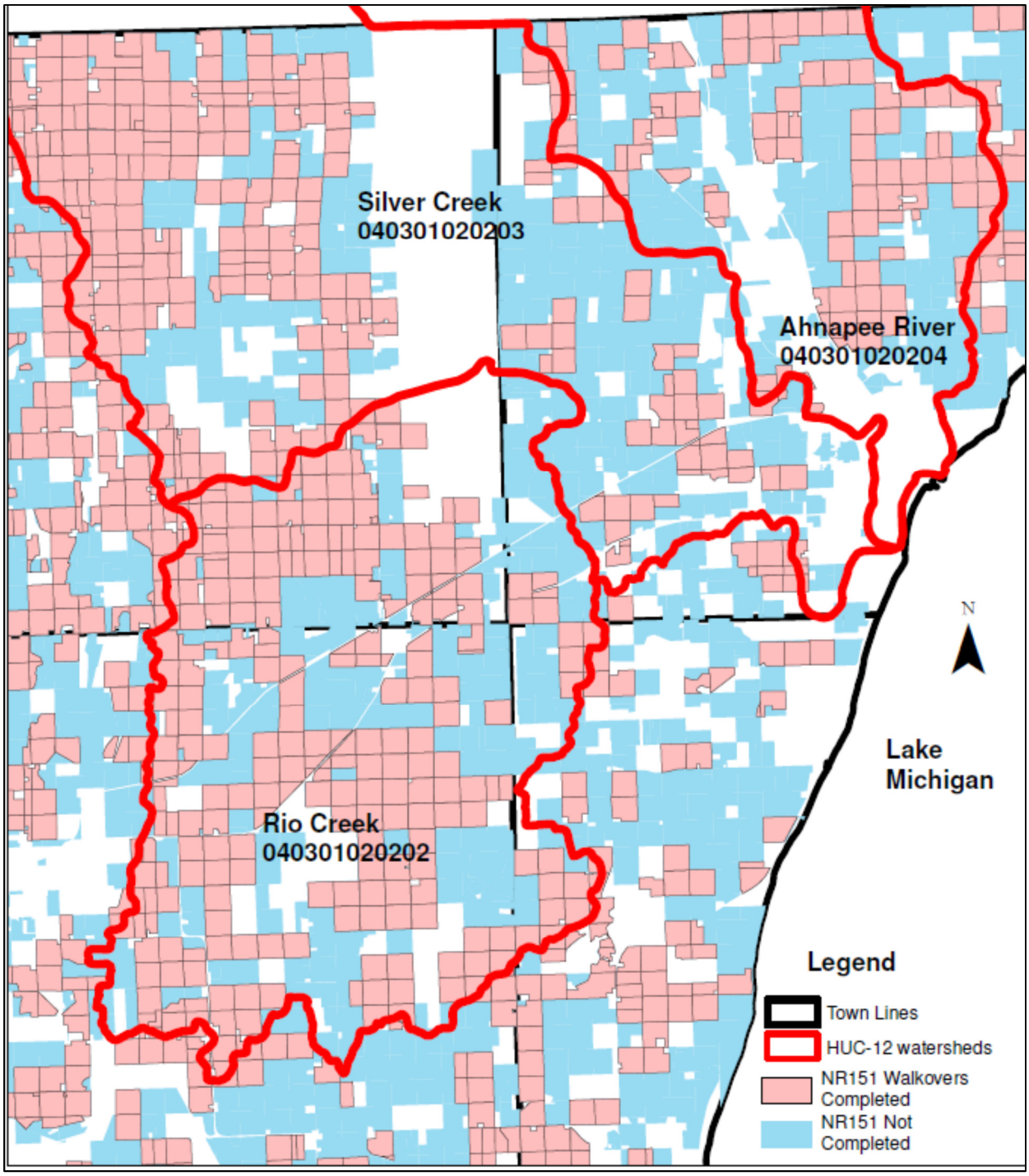
Map 29: HUC-12 Acres with and without Nutrient Management (NMP)

Map 30 displays the areas under NMP and the associated phosphorus levels according to soil samples. The blue areas are critical areas and indicates higher levels of phosphorus in the soil. If erosion occurs in the blue areas, the phosphorus attached can significantly impact surface water. These areas will be targeted for crop rotations to drawn down phosphorus levels and the implementation of other conservation practices.



Map 30: HUC-12 Nutrient Management Phosphorus Levels

Map 31 displays where Kewaunee County LWCD has conducted NR151 walkovers within the 3 HUC-12 watersheds. Pink indicates the LWCD has conducted a compliance walkover for that parcel and the blue indicates agricultural land that has not been walked for NR151 compliance. The blue areas are critical areas for determining compliance status.



Map 31: HUC-12 Acres with and without a NR151 Walkover

TILE DRAINAGE

Kewaunee County recognizes that tile lines do exist within the Ahnapee River watershed, however, currently there has been no initiative to map or locate these tile lines. By year 2-3, a milestone is to access tile line locations and their functionality. Then, an update to the 9-key element will be provided.

Tile drains in fields can act as a conduit for nutrient transport to streams if not managed properly. An average of 0.9 lbs. P/acre/yr. and 240 lbs. sediment/acre/yr. was found to be leaving via tile drainage on a UW-Discovery Farm study in Kewaunee County, Wisconsin (Cooley et al, 2010). The UW-Discovery Farm study compared surface phosphorus loss to tile phosphorus loss and found that the tile drainage was 34% of the total phosphorus lost (Cooley et al, 2010). Treating tile drainage at the outlet and better management of nutrient/manure applications on fields can reduce the amount of phosphorus reaching rivers and streams. Additional options for treating tile drainage at the outlet include constructing a treatment wetland, saturated buffers, phosphorus removal structures, and installation of water control structures to stop the flow of drainage water during poor conditions.

There are many alternative and new conservation technologies and methods currently being developed and evaluated to reduce agricultural nonpoint source pollutant loads (which include, but are not limited to drain tile losses and treating manure using digesters and or other nutrient treatment systems). If planned management measures are not implemented or as effective as expected, incorporation of new and alternative technologies and management methods into this plan may be necessary to achieve this plan's water quality reduction targets. New conservation technologies and practices may also prove be more cost effective than current recommended BMPs. During this plan's 10-year schedule, newer practices will need to be evaluated for effectiveness and feasibility before incorporation into the plan.

STEP 4: TECHNICAL & FINANCIAL ASSISTANCE AND AUTHORITIES

FINANCIAL ASSISTANCE

Financial assistance to implement the necessary BMPs are broken down in Table 31. Each BMP quantity to carry out the 9-key element plan is listed with its associated unit cost that was based on current NRCS-EQIP (Environmental Quality Incentive Program) cost-share rates, incentives payments, and current conservation project installation rates to determine total costs.

Landowners will be responsible for their percentage of installation and any/all maintenance and operation costs associated with installed practices. The total cost to implement the BMP over the 10-year period is estimated between $2,051,262 and $2,060,367.

Table 31. Cost-Estimates for Implementing BMPs

BMP	Quantity	Cost/Units	Total Cost
Conservation Practices including: no-till, residue management	3000 acres	No-Till ($16.66/acre)	$49,980
Cover Crops + NMP	1500 acres	1-species - $51.18 / acre Multi-species - $57.25 / acre	$76,770[1] $85,875[2]
Grassed waterways	3000 feet	$5.00 / foot	$15,000
Grass Filter + NMP	600 acres	$117.12 / acre	$70,272
Nutrient Management	3924 acres	$10.00 / acre	$39,240
Feedlots with Waste Management System	9 Farms	$200,000 / each	$1,800,000
Total Costs for Implementing BMPs:			**$2,051,262[1]** **$2,060,367[2]**

TECHNICAL ASSISTANCE

Technical assistance for practice implementation will be a combination of Kewaunee County LWCD and NRCS. The NRCS staff availability will coincide with the implementation of the NRCS Watershed Plan. To implement the necessary BMPs, Table 32 estimates that two staff members will be needed (Conservation Technician/Specialist and an Agronomist) with a total cost-estimate over the 10-year plan of $1,920,000.

Table 32. Cost-Estimates for Technical Assistance for Implementation

Technical Assistance	Quantity	Cost/Year	Total Cost (10-years)
Conservation Technician/Specialist	1	$96,000	$960,000
Agronomist	1	$96,000	$960,000

WATER QUALITY MONITORING COSTS

Table 33 lays out the cost-estimates for the water quality monitoring that will continue throughout the life span of this 9-key element plan. DNR suggests monitoring monthly from May-October on an annual basis for TP, TSS, and TN; 6 monthly samples per stream site. DNR also suggests sampling for macroinvertebrates in Silver Creek and Rio Creek (one location in each stream) in years 3, 7 and 10. Total cost of water quality monitoring is approximately $14,070.

Table: 33. Cost-Estimate for Water Quality Monitoring

HUC-12s and Sampling Parameters / Duration		Total Cost
Rio Creek:	TP, TN, TSS: 6 months/annually for 10 years	$4560
	Macroinvertebrate: 3x/10 years	$195
Silver Creek:	TP, TN, TSS: 6 months/annually for 10 years	$4560
	Macroinvertebrate: 3x/10 years	$195
Ahnapee River:	TP, N, TSS: 6 months/annually for 10 years	$4560

SUMMARY OF COSTS

Summary of costs for the Ahnapee River 9-key element plan are itemized in Table 34 and total approximately $4,000,000.

Table 34: Summary of Total Costs to Implement 9-Key Element Plan

Cost Category:	**Costs:**
BMP Implementation	$2,051,262[1] $2,060,367[2]
Technical Assistance	$1,920,000
Water Quality Monitoring	$14,070
Education & Information	$36,800
Legacy Phosphorus	TBD
Total Costs:	**$4,022,132-$4,031,237**

OPERATION & MAINTENANCE

The 9-key element plan will require a landowner to agree to a 10-year operation and maintenance agreement for installed practices, including grassed waterways (GWW) and feedlots with waste management systems. For annual practices that require re-installation of management each year such as conservation tillage, cover crops, and nutrient management, landowners are required to maintain the practice for each period that cost-sharing is available. Therefore, annual assistance may be required for certain practices.

RELEVANT AUTHORITIES

NR151 provides the guidelines and foundation for implementing and enforcement the agricultural runoff management standards and prohibitions. This 9-key element plan recommends enforcement of the state standards when implementing the plan. NR151.005 (performance standard for TMDLs) states that a crop producer or livestock producer subject to this chapter shall reduce discharges of pollutants from a livestock facility or cropland to surface waters if necessary to meet a load allocation in a US EPA and state approved TMDL.

Local ordinances, including Chapter 18 and Chapter 39 (refer to pages 65 & 67) will be used to implement conservation practices and enforce compliance. Kewaunee County LWCD and NRCS will work with landowners to implement conservation practices. Landowners will be educated on programs and funding available to them as well as current state and local agricultural regulations.

STEP 5: INFORMATION/EDUCATION

The information and education strategy of the Ahnapee River 9-key element plan will follow Table 35.

Table 35. 9-Key Element Plan: Information & Education Implementation Activities

Activity	Timeline (in years)			Cost	Implementation
	0-3	3-7	7-10		
Conduct a Ahnapee River Watershed Survey	1 survey	1 survey	1 survey	$800	LWCD
Issue a post-project survey to measure project success			75 surveys	$4500	LWCD, DNR
Develop project wide newsletter	2 newsletters	2 newsletters	2 newsletters	$6000	LWCD, DNR
Distribute Fact sheets for NR151	100	100	100	$3000	LWCD
Project kick-off meeting to introduce project	1 meeting			$500	LWCD, DNR
Distribute Fact sheets for BMPs	100	100	100	$3000	LWCD
Annual "Progress to Date" meeting	1 meeting	3 meetings	3 meetings	$3500	LWCD, DNR
Project wrap up meeting			1 meeting	$500	LWCD, DNR
Plan &/or partner to hold Field Days for soil health with farmers in this watershed	2 field days	2 field days	2 field days	$10000	NRCS, Demo-Farms, PPF, LWCD, UW-EX
Conduct one-on-one landowner meetings to encourage soil and water conservation practices	50 meetings	50 meetings	50 meetings	$5000	LWCD - during & following NR151 walkovers

STEP 6: PROJECT SCHEDULE

The project schedule for the Ahnapee River 9-key element plan is 10-years, see Table 27 and 35 for interim milestones.

STEP 7: INTERIM, MEASURABLE MILESTONES

Table 36 reflects the 3 water quality monitoring stations (ID 10020779, ID 10044953 & ID 10011683) in the Ahnapee River Watershed that are currently being tested. Each monitoring station results (2016-2018) were summarized to determine the median TP and TSS values.

Target values and interim milestones were established by DNR. Macro-invertebrate Index of Biological Integrity (IBI) was also included, although testing will not begin until year 3.

Table 36 will be updated periodically after additional sampling is completed in the watershed over the plan's 10-year schedule. This plan recognizes that current data may not be available for all water quality monitoring stations and therefore, this plan has milestones to collect and include information as data becomes available.

Table 36. Water Quality Monitoring Indicators & Interim Milestones

Monitoring recommendations	Indicators	Current Value Median	Target Value	Interim Milestones		
				Short Term (3 yrs.)	Medium Term (7 yrs.)	Long Term (10 yrs.)
Silver Creek at Brumerville Park off Willow Dr. Station ID: 10020779	2016-2018 Median TP (mg/L)	0.097	0.075	0.09	0.085	0.075
Ahnapee River at Washington Road Station ID: 10044953	2016-2018 Median TP (mg/L)	0.0549	0.075	0.05	0.05	0.05
Rio Creek at Hwy S Station ID: 10011683	2018 Median TP (mg/L)	0.196	0.075	0.156	0.116	0.075
Silver Creek at Brumerville Park off Willow Dr. Station ID: 10020779	2016-2018 Median TSS (mg/L)	6.0	TBD	TBD	TBD	TBD
Ahnapee River at Washington Road Station ID: 10044953	2016-2018 Median TSS (mg/L)	7.33	TBD	TBD	TBD	TBD
Rio Creek at Hwy S Station ID: 10011683	2018 Median TSS (mg/L)	5.67	TBD	TBD	TBD	TBD
Silver Creek at Brumerville Park off Willow Dr. Station ID: 10020779	Macro-invertebrate IBI	N/A	Good	TBD	TBD	TBD
Ahnapee River at Washington Road Station ID: 10044953	Macro-invertebrate IBI	N/A	Good	TBD	TBD	TBD
Rio Creek at Hwy S Station ID: 10011683	Macro-invertebrate IBI	N/A	Good	TBD	TBD	TBD

Funding for monitoring recommendations in Table 36 would potentially come from DNR and GLRI sources and all implementation would be done in correlation with DNR, WAV and Kewaunee County LWCD.

STEP 8: INDICATORS TO MEASURE PROGRESS

The indicators that will be used to measure progress are documented in the interim milestones discussed in Step 7, Table 36. Kewaunee County LWCD will be responsible for tracking progress of the plan and will work with NRCS staff to track progress and implement projects.

To evaluate the progress and success of the Ahnapee River 9-key element plan, the Kewaunee County LWCD will annually complete the following 5 reports: Information and Education; Tracking installed BMPs, Pollutant Reduction Evaluation for BMPs installed, Water Quality Monitoring, and an Administrative Review.

INFORMATION AND EDUCATION

Report to Include:

1. Number of landowners/operators in the watershed plan area
2. Number of eligible landowners/operators in the watershed plan area
3. Number of landowners/operators contacted
4. Number of cost-share agreements signed
5. Number and type of information and education activities held
    a. Agency/agencies involved in activity
    b. Number of individuals invited
    c. Number of attendees
    d. Measurable results
6. Number of informational flyers/brochures distributed
7. Number of one-on-one contacts made with landowners
8. Number of radio broadcasts and newspaper articles
9. Percent change in attendance at information and education activities held
10. Comments or suggestions for future activities

TRACKING INSTALLED BEST MANAGEMENT PRACTICES

Report to Include:

1. BMPs mapped in ArcGIS and in landowners Conservation Plans through Took-kit
2. Pollution reductions will be evaluated using STEPL and Snap-Plus for upland practices and the BARNY (Wisconsin Barnyard Runoff Model) for barnyard practices
3. Installation dates, design specifications, operation and maintenance periods, practice inspections, estimated load reductions and cost-share sources/amounts will also be tracked in a GIS and/or Excel database
4. All implemented practices and corresponding reductions will be referenced back to the Northeast Lakeshore TMDL

The methods outlined in the US EPA technical memo, “Adjusting for Depreciation of Land Treatment When Planning Watershed Projects” will be used when evaluating BMP effectiveness

and identifying factors that may affect BMP performance levels and implementation. For additional information on BMP deprecation see https://www.epa.gov/sites/production/files/2015-10/documents/tech_memo_1_oct15.pdf

POLLUTANT REDUCTION EVALUATION FOR BMPS INSTALLED

Report to Include:

1. Planned and completed BMPs
2. Pollutant load reductions and percent of goal planned and achieved
3. Cost-share funding source of planned and installed BMPs
4. Number of compliance checks for management plans
5. Number of compliance checks for practices that include operation and maintenance plans
6. Number of new and alternative technologies and management measures assessed for feasibility, used, and incorporated into plan
7. Changes in land-use or land management in watershed that may impact BMP effectiveness
8. Variations in weather that may have influenced implementation of BMPs or effectiveness of installed BMPs

WATER QUALITY MONITORING

Report to Include:

1. TP, TSS, and TN monitoring results (as they become available through either DNR and/or WAV) from all 3 sampling locations within the HUC-12s
2. Macroinvertebrate IBI monitoring results

ADMINISTRATIVE REVIEW

Report to Include:

1. Status of grants
2. Status of project administration including data management, staff training, and BMP monitoring
3. Status of NMPs
4. Number of cost-share agreements
5. Total amount ($) on cost-share agreements
6. Total amount reimbursed to landowner(s)
7. Staff salary and fringe benefits expenditures
8. Staff travel expenditures
9. Information and education expenditures
10. Equipment, materials, and supply expenses
11. Professional services and staff support costs

12. Total expenditures for the county
13. Total amount paid for installation of BMP's and amount encumbered for cost-share agreements

MINIMUM PROGRESS CRITERIA FOR REVISITING PLAN MILESTONES

This plan contains several milestones that will be carefully tracked and monitored to determine if sufficient progress is being made to meet plan goals/pollutant reductions.

The following criteria will be used to determine when plan milestones and reduction goals should be revised due to minimal progress achieved:

1. Less than 20% of planned landowner participation is achieved by year 3
2. Less than 25% of planned cropland practices or estimated load reductions are met by year 3
3. Less than 25% of funding is available/awarded to implement plan by year 3
4. Less than 25% of funding for conservation staff is awarded/available by year 3
5. Conservation staff shortages occur and technical assistance resources are limited for two years between years 1-5

LEGACY PHOSPHORUS AND SEDIMENT

A challenge that presents itself in restoring TP impaired waters is legacy phosphorus in the soil and in stream. In recent years, scientists and watershed managers are finding that water quality is not responding as well as expected to implemented conservation practices (Sharpley et al 2013). They are attributing this slower and smaller response to legacy phosphorus. Legacy phosphorus is used to describe the accumulated phosphorus that can serve as a long-term source of P to surface waters. Legacy phosphorus in a soil occurs when phosphorus in soils builds up much more rapidly than the decline due to crop uptake. In stream channels, legacy phosphorus can result from sediment deposition of particulate phosphorus, sorption of dissolved phosphorus onto riverbed sediments or suspended sediments, or by incorporation into the water column (Sharpley et al 2013).

Legacy instream sediment may need to be evaluated as a significant source of phosphorus. In 2014, Dane County partnered with WDNR to research legacy phosphorus and sediment in Dorn Creek after improvement in water quality in the Yahara Chain of Lakes was not occurring after years of working with producers on conservation practice implementation.8 The study found that phosphorus concentrations in the stream sediment of Dorn Creek was seven times greater than that of nearby crop fields and it was estimated that it would take almost 100 years to see a 50 percent reduction in phosphorus if the sediments remained. The county has since started a $12 million initiative to remove sediment from 33 miles of streams in the Yahara River Watershed that is expected to remove 870,000 pounds of phosphorus. An analysis of legacy sediment and phosphorus, like the Dane County study, may be necessary within this watershed if management goals are being met but improvements in water quality are not occurring.

STEP 9: MONITORING

WATER QUALITY MONITORING PROGRESS EVALUATION

This implementation plan recognizes that estimated pollutant load reductions and expected improvement in water quality or aquatic habitat may not occur immediately following implementation of practices due to several factors (described below) that will need to be taken into consideration when evaluating water quality data. These factors can affect or mask progress that plan implementation has made elsewhere. Consultation with the DNR and Water Quality biologists will be critical when evaluating water quality or aquatic habitat monitoring results.

If the reduction target values/goals in this plan are not being achieved, the water quality targets or timetable for pollutant reduction will need to evaluated and adjusted as necessary.

The following criteria will be evaluated when water quality and aquatic habitat monitoring is completed after implementation of practices:

1. Changes in land-use or crop rotations within the same watershed where practices are implemented.
    a. Increase in cattle numbers, corn silage acres, and/or urban areas can negatively impact stream quality and water quality efforts
2. Location in watershed where land-use changes or crop rotations occur.
    a. Where are these changes occurring in relation to implemented practices?
3. Watershed size, location where practices are implemented and location of monitoring sites.
4. Climate, precipitation and soil conditions that occurred before and during monitoring periods.
    a. Climate and weather patterns can significantly affect growing season, soil conditions, and water quality.
5. Frequency and timing of monitoring.
6. Percent of watershed area (acres) or facilities (number) meeting NR151 performance standards and prohibitions.
7. Percent of watershed area (acres) or facilities (number) that maintain implemented practices over time.
8. Extent of gully erosion on crop fields within watershed over time.
    a. How many are maintained in perennial vegetation versus plowed under each year?
9. Stability of bank sediments and how much this sediment may be contributing P and TSS to the stream.
10. How “Legacy’ sediments already within the stream and watershed may be contributing P and sediment loads to stream?
11. Presence and extent of drain tiles in watershed area in relation to monitoring locations.
    a. Do these drainage systems contribute significant P and sediment loads to receiving streams?

12. Does monitored stream meet IBI and habitat criteria, but does not meet TMDL water quality criteria?
13. Are targets reasonable?
    a. Load reductions predicted by models could be overly optimistic.

*This 9-key element plan for the Ahnapee River Watershed has **NOT** yet been approved. LWCD is working with DNR for approval in 2019.

LWRM PUBLIC POLL

An online survey was conducted between June 13 and July 13, 2018 to identify the resource concerns and priorities of Kewaunee County citizens. The purpose was to gain focus on what the public believes the greatest environmental concerns are and the tools and strategies that could be used to have the greatest impact on these concerns. The aggregated poll results guided the planning and development of the 10-year LWRMP update, represented the voices of the county's citizens and provided the foundation from where the Advisory Committee will start.

Participants were asked to rank the following questions on a 0-10 scale: 0 being defined as "no importance" and 10 being the "highest importance."

1. Rank the importance of the natural resource issues facing Kewaunee County within the next five years.
2. What concerns are the most important to devote time to in order to improve resources in the next 5 years?
3. What tools and strategies can the LWCD provide in the next 5 years that would have the greatest impact?

The LWCD received 257 responses. As part of the survey, demographics collected indicated the majority of those who responded were Kewaunee County citizens (69%) (Figure 25). Furthermore, 71% of respondents reside in rural communities (Figure 26) and 57% are over the age of 51 and 94% are over the age of 30 (Figure 27).

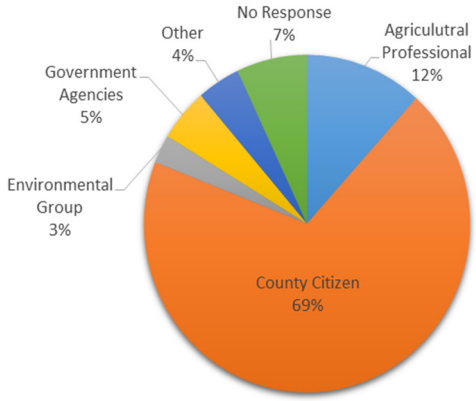


Figure 25: Public Poll - Profession / Organization

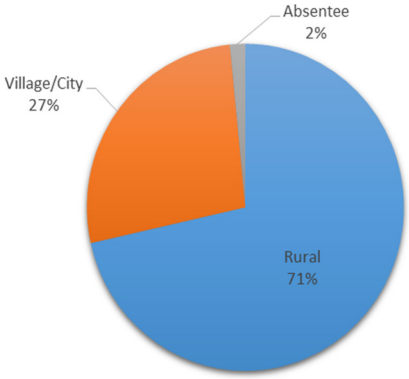


Figure 26: Public Poll - Location of Residence

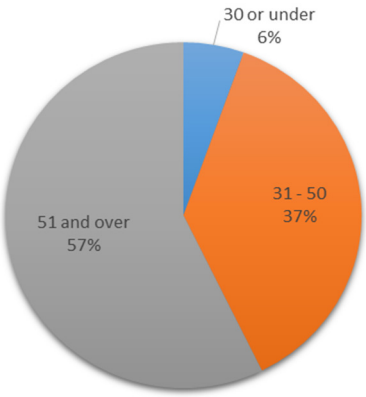


Figure 27: Public Poll - Age Demographics

Question 1 Results: Rank the importance of the natural resource issues facing Kewaunee County within the next 5 years.

Table 37 and Figure 28 indicate that public survey participants ranked groundwater quality as the #1 natural resource concern in the county with a score of 9.05; surface water quality at #2 at 8.66 and rounding up the top three was animal waste management at 8.65. These top 3 ranked natural resources mimic the top 3 NRCS resource concerns. Middle range issues include farmlands, nutrient management, soil quality, and soil erosion, urban sprawl, grasslands, and woodlands were the lowest importance.

Table 37. Public Survey Natural Resources Ranking

Natural Resource	Average Score	Rank
Groundwater Quality	9.05	1
Surface Water Quality	8.66	2
Animal Waste Management	8.65	3
Farmlands	7.37	4
Nutrient Management	7.29	5
Soil Quality	7.08	6
Soil Erosion	7.00	7
Air Quality	6.83	8
Wetlands	6.56	9
Wildlife Habitat	6.54	10
Invasive Species	6.34	11
Woodlands	6.17	12
Grasslands	6.07	13
Urban Sprawl	5.22	14

Top 3 Natural Resources

1. Groundwater Quality
2. Surface Water Quality
3. Animal Waste Management

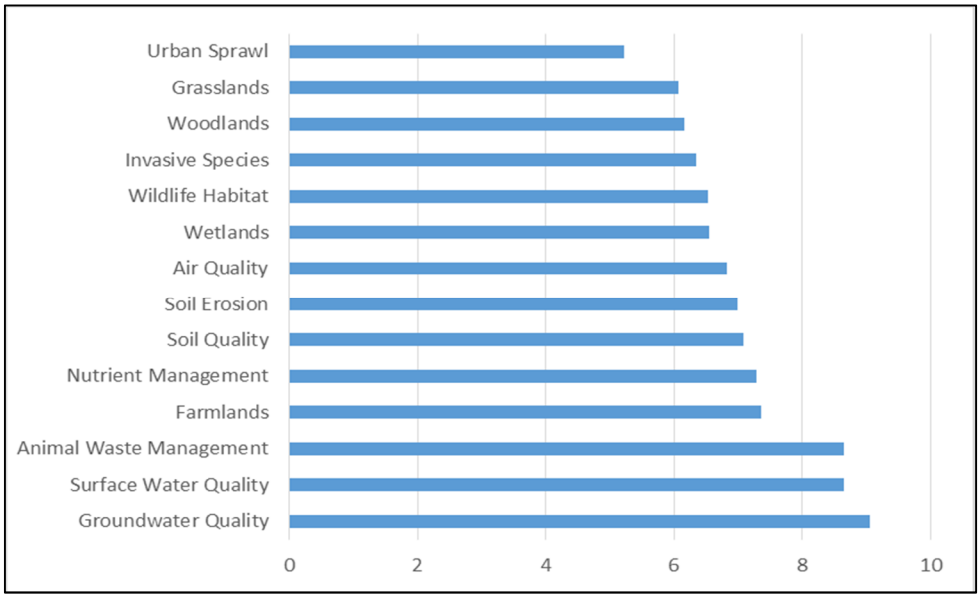


Figure 28: Public Survey Natural Resources Ranking

Question 2 Results: What concerns are the most important to devote time to in order to improve resources in the next 5 years?

Table 38 and Figure 29 identifies and ranks the most important concerns to the public where LWCD and LCC should focus and devote time to improving. Replicating the results from question 1, animal waste runoff to streams/lakes was the #1 public concern (8.81), closely followed by nutrient-pathogen contamination to groundwater (8.80) and nutrient/sediment contamination to surface water (8.48). After the top 3, the next 7 were relatively close in ranking, including nutrient management, cattle grazing in streams, cropland erosion, well abandonment, loss of wetlands, streambank erosion, loss of woodlands/grasslands, and invasive species.

Table 38. Public Survey Concerns Ranking

Concerns	Average Score	Rank
Animal Waste Runoff to Streams/Lakes	8.81	1
Nutrient/Pathogen Contamination to Groundwater	8.80	2
Nutrient/Sediment Contamination to Surface Water	8.48	3
Nutrient Management	6.87	4
Cattle Grazing in Streams/Lakes	6.74	5
Cropland Erosion (Sheet, Rill, Wind)	6.44	6
Well Abandonment	6.44	7
Loss of Wetlands	6.38	8
Streambank and Lakeshore Erosion	6.37	9
Loss of Woodlands/Grasslands	6.27	10
Aquatic Invasive Species	6.20	11
Air Pollution	5.94	12
Non-Aquatic Invasive Species	5.74	13
Loss of Farmland	5.64	14

Top 3 Public Concerns

1. Animal Waste Runoff into Streams/Lakes
2. Nutrient/Pathogen to Groundwater
3. Nutrient/Sediment to Surface Water

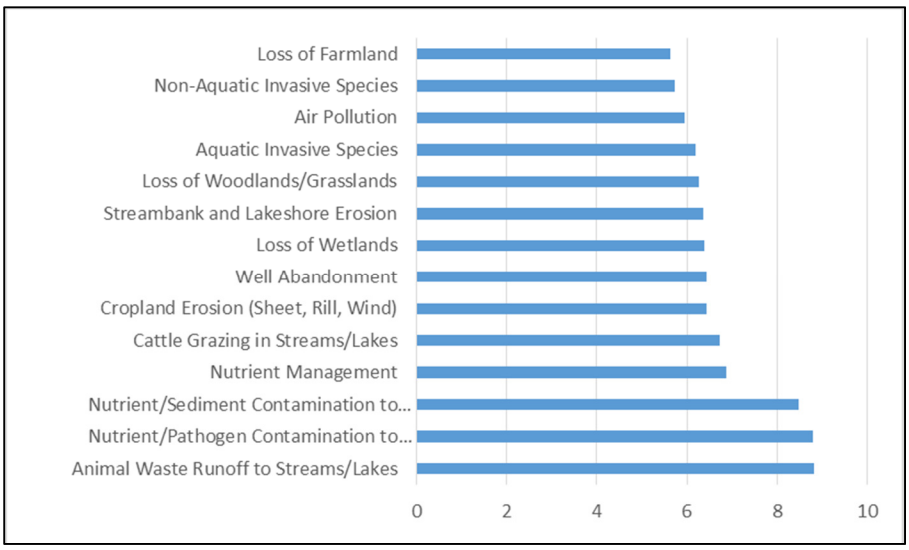


Figure 29: Public Survey Concerns Ranking

Question 3 Results: What tools and strategies can the LWCD provide in the next 5 years that would have the greatest impact?

The last question was to gather the public's viewpoint on implementation priority tools or strategies the LWCD should employ. Table 39 outline survey participant's top 3 tools and strategies which included agricultural waste management (8.77), monitoring compliance (8.46), and enforcing the current standards (8.39). Middle range issues include conservation planning, information and education, creating additional regulations, and erosion & sediment control.

Table 39. Public Survey Tools/Strategies Ranking

Tools / Strategies	Average Score	Rank
Agricultural Waste Management	8.77	1
Monitor Compliance	8.46	2
Enforce Current Regulations	8.39	3
Conservation Planning	7.13	4
Information & Education	7.10	5
Create Additional Regulations	7.07	6
Erosion & Sediment Control	6.87	7
NR151	6.81	8
Provide Technical Support	6.66	9
Voluntary Conservation Implementation	5.98	10
Demonstration Farms	5.78	11
Provide Cost-Share Assistance	5.54	12
Wildlife Management Assistance	5.40	13
Forestry Management Assistance	5.41	14
Partner with Peninsula Pride Farms	5.20	15

Top 3 Tools/Strategies

1. Agricultural Waste Management
2. Monitor Compliance
3. Enforce Current Regulations

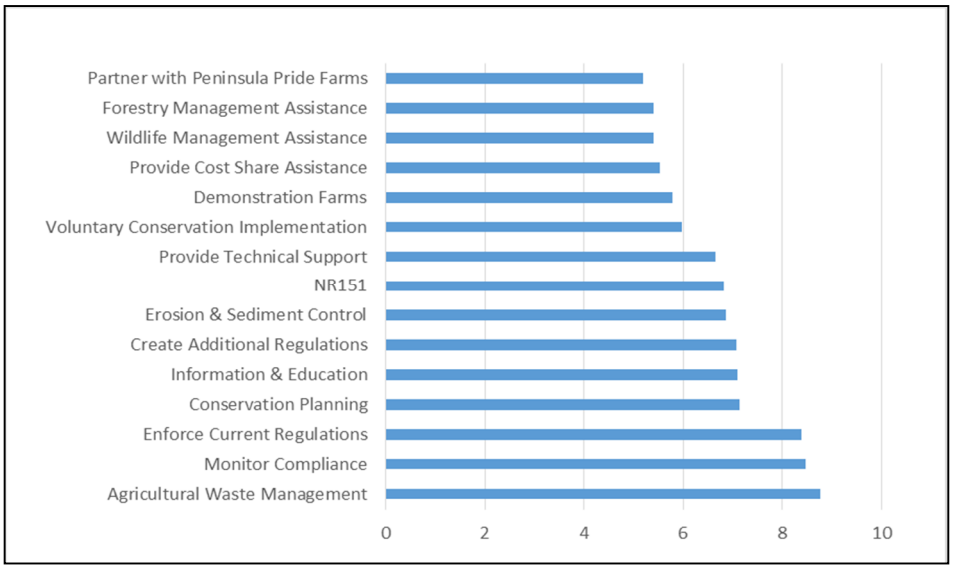


Figure 30: Public Survey Tools/Strategies Ranking

*For additional responses, see Appendix 6

CHAPTER 6: LWRMP 2020-2029 GOALS & OBJECTIVES

The **overall goal** and the objectives of the **2010-2019 LWRMP** update are an **ongoing** process and will continue throughout the 2020-2029 LWRMP update.

Locally Implement & Enforce NR151 Agricultural Performance Standards & Prohibitions to Protect Local Surface & Groundwater Quality

Goal 1: 2010-2019 LWRMP

2010-2019 LWRMP OBJECTIVES (TO CONTINUE INTO 2020-2029)

1. Continue to determine current landowner compliance
2. Prepare NR151 Status Reports and notify landowners of compliance status
3. Secure funding and technical assistance for compliance with NR151 agricultural nonpoint source pollution control standards and prohibitions
4. Administer funding and technical assistance for compliance with NR151 agricultural nonpoint source pollution control standards and prohibitions
5. Enforce NR151 agricultural nonpoint source pollution control standards and prohibitions through the MOU with the DNR.
6. Conduct ongoing NR151 agricultural nonpoint source pollution control standards and prohibitions compliance monitoring
7. Provide annual NR151 agricultural nonpoint source pollution control standards and prohibitions reporting information to DATCP & DNR

2020-2029 LOCAL ADVISORY COMMITTEE

The overarching goal to locally implement and enforce NR151 Standards & Prohibitions will continue to guide the county in the implementation of the Agricultural Performance Standards. To build upon this guiding principal, a Local Advisory Committee (LAC) was established in 2018 to create additional goals and objectives for the 2020-2029 plan update.

Membership (identified in Table 40) included LWCD employees, LCC members, and individuals involved with the NRCS Watershed planning process or the DNR Kewaunee County Workgroups. LAC members all have background knowledge of the groundwater, surface water, and natural resource issues in the county.

Table 40. 2020-2029 LWRMP – Local Advisory Committee

Name	Affiliation(s) / Title
Chuck Wagner	Land Conservation Committee Chair
Gary Paape	Land Conservation Committee Vice Chair
Lee Luft	Land Conservation Committee
Aaron Augustian	Land Conservation Committee / CAFO owner / Demonstration Farm
Clark Riemer	Land Conservation Committee Farm Service Agency
Mary Ellen Dobbins	Kewaunee County Board
Scott Feldt	Kewaunee County Administrator
Davina Bonness	LWCD - County Conservationist
Paul Fredrich	LWCD - Conservation Technician
Travis Engels	LWCD - Conservation Specialist II
Kate Hau	LWCD - Conservation Specialist I
Joe Johnson	Natural Resources Conservation Service - District Conservationist
Erin Carviou	DNR - Nonpoint Source Coordinator - Northeast Region
Sara Fry	DNR - Water Supply Specialist - Drinking Water & Groundwater
Joel Kitchen	State of Wisconsin Assembly Representative
Travis Buckley	DATCP
Cindy Kinnard	Kewaunee County Public Health – Health Officer / Health Director
Aerica Bjurstrom	UW-Extension - Agriculture Agent
Mike Parsen	WI Geological & Natural History Survey - Hydrogeologist
Tom Konop	Citizen / Farmer
Dennis Frame	Timber Ridge Consulting
Nathan Nysse	Certified Crop Advisor
Nick Guilette	Ag Source - Certified Crop Advisor
Don Niles	Citizen / Peninsula Pride Farms / CAFO owner
Laura Vlies Wotachek	Farmer
Frank Madzarevic	Citizen
Lynn Utesch	Citizen / Farmer
Jodi Parins	Citizen
Dick Swanson	Citizen

The LAC met on September 11, 2018 and members were tasked with completing the following 6 objectives:

1. Reviewing the identified natural resource concerns prior to attending the first meeting including the priority rankings from the public poll, DNR workgroups, and the NRCS watershed planning process to develop the LWRMP goals and objectives for 2020-2029.
2. Identify the top resource concerns
3. Identify issues associated with the top resource concerns
4. Identify goals or desired future conditions
5. Identify objectives or action items to reach those goals
6. Identify tools/strategies to implement the objectives to reach the goals.

Prior to the September 11th meeting, LAC members were provided the NRCS watershed ranking with the approved desired future conditions and action items; the public online poll results; and the DNR workgroup recommendations to review.

The first and second natural resource concerns correlated directly with the public and prior workgroups, but after discussion, the 3rd ranked public poll natural resource "Animal Waste Management" is not necessarily a natural resource but directly impacts both groundwater and surface water quality; therefore, was addressed under specific goals and objectives.

Continuing to follow the public ranking of natural resources, Farmlands (#4), Nutrient Management (#5), Soil Quality (#6) and Soil Erosion (#7) were aggregated to represent the County's third resource concern - Soil Quality & Soil Health. The LAC's top 3 resource concerns directly mirrored the final ranking in the NRCS watershed planning process.

For the Top 3 Resource Concerns, the LAC

1. Developed a list of concerns/issues

2. Developed a list of goals

3. Ranked the goals
    a. Each LAC member was given 6 dots to put on one goal or multiple goals
    b. Dots were tallied and ranked

4. Determined objectives for the top 4 goals per resource concern

Overall, the goals identified by the LAC will be in addition to the NRCS watershed planning goals and the 9-key element plan goals for the Ahnapee River Watershed Plan.

Local Advisory Committee's 2018 Top 3 Resource Concerns

1. Groundwater Quality

2. Surface Water Quality

3. Soil Quality & Soil Health

RESOURCE CONCERN #1 – GROUNDWATER QUALITY
PRIMARY FOCUS: NUTRIENTS & PATHOGENS

ISSUES/CONCERNS IDENTIFIED *(NO SPECIFIC ORDER)*

- Nonpoint sources
- Unidentified conduits to groundwater
- Increased volume of manure
- Septic Systems
- Mapping (i.e. soil, bedrock, water table)
- Shallow water tables
- Information and education
- Nutrient management plans
- Wells that need to be abandoned
- Geology
- Well Head Protection
- Soil health
- Surface water
- Point sources
- Tile lines
- Nutrients (nitrogen)
- Pathogens (animal/human)
- Complex nitrogen management
- Animal/human waste management
- Non-compliance with NR151 & Nutrient Management Plans
- Land-use

From these concerns, the LAC identified 15 goals. The dots placed and counted resulted in the 15 following ranked goals.

LAC GROUNDWATER QUALITY GOALS (THREE #2'S DUE TO TIE)

1. Decrease the percentage of "unsafe" tested wells (currently 30%) – Goal is to have a lower percentage than the surrounding counties (19 dots)
2. Implement New NR151 Silurian Dolomite Standards & Prohibitions (16 dots)
2. Map depth to bedrock and water table elevations (16 dots)
2. Inspect all wells for construction conditions (16 dots)
3. Identify and decrease by 50% non-compliant wells (15 dots)
4. Work with state agencies to develop a better model than SNAP-PLUS for Groundwater protection (14 dots)
5. Bring all septic systems up to code (13 dots)
6. Identify approved manure alternative programs– grazing, composting, and provide these options to farmers (12 dots)
7. Have 25-70% of manure go through an advance manure treatment system (12 dots)
8. Have all wells nitrate levels below 2 ppm (10 dots)
9. Increase by 10 times the amount of cost-sharing dollars for protective practices (10 dots)
10. Increase number of wells tested in Kewaunee County, specific goal of 25% increase of wells per year per township (3 dots)
11. Decrease the current nutrient load in the County by 50% (3 dots)
12. Identify sites and eliminate spreading of untreated human septic (2 dots)
13. Educate and/or locally adopt the DATCP advisory system (0 dots)

Then, the LAC took the top 4 goals and identified objectives, tools, or strategies. Objectives listed under each goal were not ranked and are listed in no specific order.

GOAL 1: GROUNDWATER
DECREASE THE PERCENTAGE OF "UNSAFE" TESTED WELLS

OBJECTIVES

- Locate and buffer sinkholes & conduits to groundwater
- Monitor & map tile lines
- Identify alternative crops to be planted (other than corn, soybeans, oats, peas, wheat) – to increase diversity
- Increase number of wells sampled
- Identify and implement manure treatment alternatives
- Inform and educate well owners about testing, well construction and yearly maintenance (example - loose well caps can cause coliform bacteria positive results)
- 100% compliance of NMPs
- Increase soil health and filtering capacity
- Increase septic system compliance
- Decrease acres used & conduct site analysis of acres used for spreading of treated & untreated human septage
- Compliance with human waste and/or other waste documented in NMP

GOAL 2: GROUNDWATER
IMPLEMENT NEW NR151 SILURIAN DOLOMITE STANDARDS & PROHIBITIONS

OBJECTIVES

- Implement Chapter 39
- Inform & educate public/farmers/landowners on new rules
- Document & report non-compliance and compliance with new standards
- Identify impacted farms
- Partner with DATCP and DNR for rules, regulations, and accepted methodologies for verifying depth of bedrock
- Partner with other counties to adopt similar protocols

GOAL 3: GROUNDWATER
MAP DEPTH TO BEDROCK AND WATER TABLE ELEVATIONS

OBJECTIVES

- Partner & prioritize mapping in townships with high percentages of unsafe wells and located in highly susceptible areas.
- Partner with farms, crop advisors, townships
- Seek a county program to match Peninsula Pride Farms (PPF) cost-sharing program
- Seek DATCP & DNR funds to assist in mapping verification
- Use Lidar as a tool for mapping bedrock and closed depressions
- Increase staff with GIS capabilities
- Send all findings of bedrock mapping to DATCP to update SNAP maps as soon as possible

GOAL 4: GROUNDWATER
INSPECT ALL WELLS FOR CONSTRUCTION CONDITIONS

OBJECTIVES

- Information & education
- Decrease the number of non-compliant wells by 50%
- Inventory and properly abandon wells in cropland, ditches, and no longer used
- Partner with DNR Water Specialist

RESOURCE CONCERN #2 – SURFACE WATER QUALITY
PRIMARY FOCUS: NUTRIENTS & SEDIMENTS

ISSUES/CONCERNS IDENTIFIED *(NO SPECIFIC ORDER)*

- Invasive Species (information, education, identify, eradication)
- Erosion of farmland – carries sediments and nutrients
- Farm-site discharge (wastewater, leachate, barnyard runoff, manure)
- Tile Lines (inlet and outlet)
- Nutrients: Nitrogen & Phosphorus
- Algal blooms
- Reduced fish population
- Land application of manure (spring/fall) timing
- Lawn fertilizer
- Lack of soil health / quality
- Fall tillage (with erosion)
- Not following NMP or NR151
- Lack of enforcement
- Impaired waters
- Animal waste runoff
- Animal/human waste management

From these concerns, the LAC identified 8 goals. The dots placed and counted resulted in the 8 following ranked goals.

LAC SURFACE WATER QUALITY GOALS

1. Increase harvestable buffer acres (34 dots)
2. Prioritize fields in highly sensitive watersheds for additional conservation practices to prevent surface water contamination (25 dots)
3. No waterways on impaired waters list for any contaminant (23 dots)
4. Develop & implement TMDL recommendations from DNR (22 dots)
5. Increase grass buffers and grazing in the county (20 dots)
6. Restore Kewaunee County waterways to Class A fisheries (14 dots)
7. Develop 9 key element plans (11 dots)
8. Partner with agencies to establish baseline information on antibiotic resistant sludge in streams (0 dots)

Again, LAC took the top 4 goals and identified objectives, tools, or strategies and developed objectives. However, during this discussion, many of the objectives/tools/strategies identified were not specific to 1 goal, but to all 4 goals. Therefore, there is some overlap of the objectives identified.

GOAL 1: SURFACE WATER
INCREASE HARVESTABLE BUFFER ACRES

OBJECTIVES

- Create a county buffer program
- Reach out to State & Federal agencies to allow Conservation Reserve Enhancement Program (CREP) buffers to be harvested
- Create buffer programs for harvestable buffers along impaired waterways
- Partner with Dairy Business Association (DBA), Door/Kewaunee Demonstration Farms, PPF, and other farm groups and organizations

GOAL 2: SURFACE WATER
PRIORITIZE FIELDS IN HIGHLY SENSITIVE WATERSHEDS FOR ADDITIONAL CONSERVATION PRACTICES

OBJECTIVES

- Through NR151 walkovers and/or complaints, prioritize fields in sensitive watersheds or in close vicinity to impaired waters
- Locate areas to promote CREP & CRP (Conservation Reserve Program) buffers along waterways

GOAL 3: SURFACE WATER
NO WATERWAY ON IMPAIRED WATERS LIST FOR ANY CONTAMINANT

OBJECTIVES

- Buffer adjacent impaired waterways (examples: CREP, CRP)
- Reduce fall tillage
- Increase cover crops and no-till acres
- Improve soil health
- Increase year-round coverage on fields
- Make sure grassed waterways are vegetated 20-feet wide
- Map tile line outlets to waters of the state
- Eliminate erosion in grass waterways and concentrated flow channels
- Use irrigation during growing season
- Information and education to all haulers about rules and regulations
- Partner with citizens, townships, non-profits, farm groups and other state, federal or county organization

GOAL 4: SURFACE WATER
DEVELOP AND IMPLEMENT TMDL RECOMMENDATIONS

OBJECTIVES

- Partner with DNR during data collection and TMDL development
- Partner with DNR, DATCP, and other state agencies to implement TMDL recommendations

Much of this discussion tied directly into the 3rd goal of Soil Health & Soil Quality. As discussed in some length during the NRCS watershed process, when increasing cropland soil health and quality; erosion, sediment loss, and nutrient losses to surface water will decrease.

RESOURCE CONCERN #3 – SOIL QUALITY & HEALTH
PRIMARY FOCUS: EROSION, SEDIMENT LOSS, QUALITY, HEALTH

ISSUES/CONCERNS IDENTIFIED *(NO SPECIFIC ORDER)*

- Erosion (wind, sheet, rill)
- Not following a NMP
- Compaction
- Fields not meeting T
- Low organic matter
- Low bacteria (biology)
- Grassed waterway erosion
- Tillage
- Bare fields in winter, spring, fall

From these concerns, the LAC identified 6 goals. The dots placed and counted resulted in the 6 following ranked goals.

LAC SOIL QUAITY & HEALTH GOALS

1. Increase no-till acres and decrease tillage acres on fields not meeting T (38 dots)
2. Increase covered acres by 25% from the 11,000 reported in spring/fall (34 dots)
3. Increase awareness of manure leachate irrigation (23 dots)
4. Increase cover crops on fields not meeting T (23 dots)
5. Increase diversity of crops planted with alfalfa and in cover crop mixes (21 dots)
6. Decrease harmful chemical inputs that decrease soil biology (7 dots)

Again, LAC took the top 4 goals and identified objectives, tools, or strategies. However, during this discussion, many of the objectives/tools/strategies identified were not specific to 1 goal, but to all 4 goals. Therefore, there will be some overlap of the objectives identified.

GOAL 1: SOIL QUALITY & HEALTH
INCREASE NO-TILL ACRES AND DECREASE TILLAGE ACRES ON FIELDS NOT MEETING T

OBJECTIVES

- Increase no-till and reduce tillage, specifically fall tillage
- Make sure grassed waterways are vegetated 20-feet wide
- Education & information
- Collaborate with NRCS on cost-sharing opportunities
- Partner with DBA, Door/Kewaunee Demonstration Farms, PPF, and other farm groups and organizations
- Increase grazing and composting of manure (education & information)
- Partner with canning companies who are moving into the county

GOAL 2: SOIL QUALITY & HEALTH
INCREASE COVERED ACRES BY 25%*

OBJECTIVES

- Increase no-till & cover crops
- Reduce tillage (specifically fall tillage)
- Increase organic matter
- Test & tract soil health
- Education & information on no-till, reduced tillage, and cover crops
- Collaborate with NRCS on cost-sharing opportunities
- Partner with DBA, Door/Kewaunee Demonstration Farms, PPF, and other farm groups and organizations
- Increase grazing (education & information)
- Increase composting of manure (education & information)
- Partner with canning companies who are moving into the county

** Increase by 25% from the 11,000 reported in spring/fall 2017*

GOAL 3: SOIL QUALITY & HEALTH
INCREASE AWARENESS OF MANURE LEACHATE IRRIGATION

OBJECTIVES

- Education & information
- Partner with DBA, Door/Kewaunee Demonstration Farms, PPF and other farm groups and organizations

GOAL 4: SOIL QUALITY & HEALTH
INCREASE COVER CROPS ON FIELDS NOT MEETING T

OBJECTIVES

- Increase cover crops & organic matter
- Test & tract soil health
- Education & information on cover crops
- Use Conservation Planning & NMP
- Collaborate with NRCS on cost-sharing opportunities
- Partner with Door/Kewaunee Demonstration Farms, PPF, canning companies and all farm groups and organizations

CHAPTER 7: 2020-2029 IMPLEMENTATION, EVALUATION & MONITORING STRATEGIES

Kewaunee County will use three main strategies to guide the implementation of the 2020-2029 goals and objectives outlined in Chapter 6. The monitoring and evaluation components of each strategy and program are vital to determining if the goals, objectives, and performance standards are being met. This strategic approach has a multitude of implementation measures to work towards land and water resource management and preservation in the next 10 years.

The first strategy is the implementation of the State Performance Standards and Prohibitions, which is the main catalyst to drive this plan forward and provides the foundation to build upon NR151. The second strategy represents implementing state and federal local priority planning efforts. The final strategy represents the implementation of county ordinances and programs, both regulatory and voluntary. All three of these strategies represent collaborative partnerships and programs that overlap and simultaneously work and build off upon each other in both a regulatory and voluntary process. Together, this strategic approach will push Kewaunee County forward in achieving the LWRMP goals and objectives.

STRATEGY 1 - STATE PERFORMANCE STANDARDS & PROHIBITIONS

The regulatory driver for the implementation of the State Performance Standards and Prohibitions is NR151, which was locally adopted as Chapter 39 and the County's Animal Waste Storage Facility Ordinance. The Working Lands Initiative (Farmland Preservation) is the incentive-based program used to achieve full compliance because of the state tax credit participating landowners receive. Continued compliance directly relates to groundwater, surface water and soil quality.

NR151

IMPLEMENTATION & MONITORING STRATEGY

- Continue 4-year walkover rotation implemented in 2010 (Refer to Map 18, page 57).
    - **Year 1**: 303d listed watersheds (West Twin River and Stony Creek) & Outstanding and Exceptional Resource Waters (Little Scarboro Creek, Casco Creek, Krok Creek and Rogers Creek Sub-Watersheds).
    - **Year 2**: Ahnapee, Lincoln, Red River & Casco Townships
    - **Year 3:** Pierce & West Kewaunee Townships
    - **Year 4:** Carlton & Franklin Townships
- Full compliance landowners receive a NR151 full compliance status letter and a certificate of compliance number (if they do not already have one). Those numbers are currently tracked by landowner and associated parcel numbers in an excel database and provided to DATCP on an annual basis.

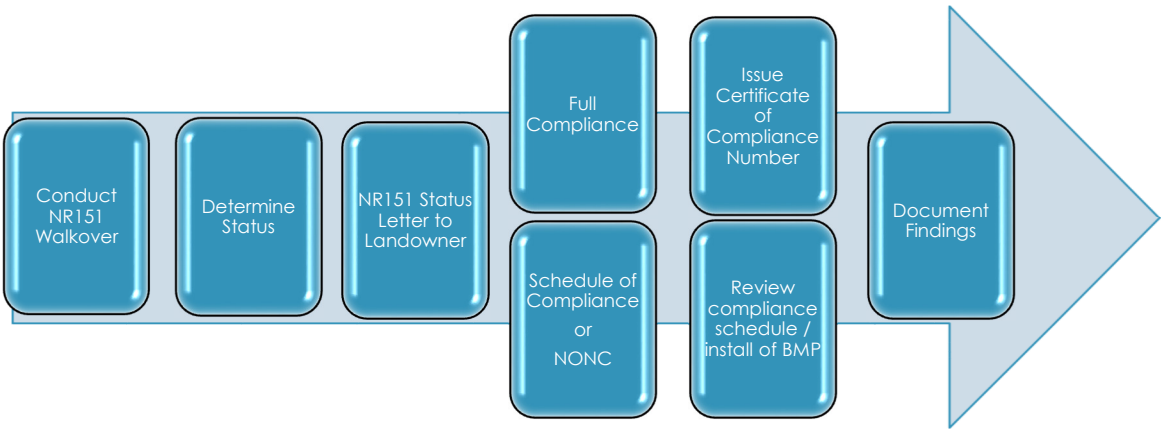


Figure 31: NR151 Implementation Process

- Landowners **not** in full compliance will be notified following the NR151 notification process (next page)
    - If eligible, landowners will receive a schedule of compliance, technical assistance and potential cost-share opportunities
- All findings will be documented in the NR151/FPP master excel database and GIS.
- Progress of landowner's schedule of compliances timelines will be monitored and reviewed; and as cost-sharing opportunities arise, grants will be submitted and technical assistance offered.

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

- One-on-one onsite NR151/FPP walkovers with landowners present (if they choose)
- Monthly updates at the LCC meetings
- LWCD annually holds a spring and fall meeting for landowners, farms, haulers, and CCAs to review NMP, policy changes (if necessary) and/or updates to NR151/FPP
- Partnerships: DNR, NRCS, DATCP, LCC, all farms, citizens and landowners

NR151-SILURIAN DOLOMITE STANDARDS & PROHIBITIONS

- Continue to educate landowners, operators, haulers, CCAs and public on the new 2018 Silurian Dolomite Standards and Prohibitions
- Continue to inventory and verify depth of bedrock
    - Refer to Appendix 7 - Kewaunee County's Bedrock Verification Policy
- Follow NRCS soil survey soils mapped as "20-40" and probe fields to identify areas less than 24 inches and greater than 24 inches
- Identify the 3-foot and 5-foot bedrock layers
- Global Positioning System (GPS) and upload all probe points into ArcGIS database

- Provide all points to DATCP, DNR, operators, landowners, farmers, and/or CCAs

NR151 NOTIFICATION PROCESS

Once a landowner is determined to be in compliance or not in compliance and the determination of whether the cropland and/or livestock facilities are existing or new and whether cost-sharing is required and made available to the landowner or operator, the following process is followed (as detailed in NR151 and Chapter 39).

1. The County shall notify a landowner or operator in writing of the compliance determinations
2. The notice shall be sent certified mail, return receipt requested or personal delivery
3. The following information shall be included in the notice:
    a. Description of the performance standard(s) or prohibition(s) in compliance or being violated
    b. Cropland or livestock facility status of existing or new operation
    c. Determination as to which best management practices or other corrective measures that are needed to comply with performance standard(s) or prohibition(s)
    d. Determination as to eligibility of cost-sharing

A. IF COST-SHARING IS AVAILABLE FOR ELIGIBLE COSTS

1. A written offer of cost-sharing
2. An offer to provide or coordinate the provision of technical assistance
3. A compliance period for meeting the performance standard(s) or prohibition(s)
4. An explanation of the possible consequences if the landowner or operator fails to comply with provisions of the notice, including enforcement or loss of cost-sharing, or both.

B. IF NO ELIGIBLE COSTS ARE INVOLVED

1. A compliance period for achieving the performance standard(s) or prohibition(s)
2. An explanation of consequences if the landowner or operator fails to comply with the provisions of the notice

COMPLIANCE PERIOD

1. Shall begin on the postmark date of the notice or the date of personal delivery.
2. Shall be not less than 60 days nor more than 3 years unless otherwise provided for in this subdivision.
3. May be less than 60 days if the site is an imminent threat to public health, fish and aquatic life.
4. Once a landowner or operator achieves compliance with a performance standard(s) or prohibition(s), compliance shall be maintained by the existing landowner or operator heirs or subsequent owners, regardless of cost-sharing.

TECHNICAL ASSISTANCE AND/OR COST-SHARE OPPORTUNITIES

Provide technical assistance to implement and construct BMPs and (if eligible) provide financial assistance through DATCP, DNR, and/or NRCS.

1. Cropland: Cost-sharing or voluntary practices could include grassed waterways, cover crops, residue management, and/or buffers. Voluntary measures could include tillage or management changes
2. Livestock Facilities: Cost-sharing practice could include manure storages, barnyards, roof gutters, leachate, compositing, and/or wastewater collection

* Funding Program Opportunities see Appendix 8
* Cost-share Practices: DATCP-SWRM in Appendix 9 and DNR-TRM in Appendix 10
* NRCS Conservation Practices see Appendix 11

NR151/FPP ENFORCEMENT & VIOLATIONS

If any livestock facility is meeting a livestock performance standards or prohibitions on or after the effective date of the standards or prohibitions, the livestock performance standard or prohibition shall continue to be met by the existing owner or operator, heirs or subsequent owners or operators of the facility. In addition, if any cropland is meeting a cropland performance standard on or the effective date of the standards or prohibitions, the cropland performance standard or prohibition shall continue to be met by the existing owner or operator, heirs or subsequent owners or operators of the facility. If a landowner or operator alter or changes the management of the cropland or the livestock facility, in a manner that results in noncompliance with the performance standard, the landowner or operator shall bring the cropland or livestock facility back into compliance, regardless of whether cost-sharing is available.

PRIORITY FARMS (REGARDLESS OF 4-YEAR WALKOVER ROTATION)

1. Any farm receiving a DNR Notice of Intent (NOI) or Notice of Discharge (NOD)
2. Any farm located within the new Silurian Dolomite Performance Standards
3. Any farm with significant discharge of waste to waters of the state
4. Any farm with excessive cropland erosion

AGRICULTURAL PERFORMANCE STANDARDS ORDINANCE (CHAPTER 39)

Enforcement of NR151 violations will be carried out through Kewaunee County's Chapter 39. Any person who violates, neglects, or refuses to comply with or resists the enforcement of any provision of this ordinance shall be subject to a forfeiture of not less than $10 nor more than $5,000 plus costs of prosecution of each violation. An unlawful violation includes failure to comply with any standard of this ordinance or with any condition or qualification attached to any permit or variance. The County may enforce the provision of this ordinance through the issuance of a citation in accordance with Wis. Stat. §66.0113.

ANIMAL WASTE STORAGE FACILITY ORDINANCE (CHAPTER 18)

To regulate any construction, reconstruction, enlargement, abandonment or substantial altering of manure storage facilities, Kewaunee County follows their Animal Waste Management Ordinance. A permit must be secured to proceed and the County must review and approved site plans before such a permit is issued. Any permitted projects must meet NRCS 313 (Waste Storage Facility) and 634 (Waste Transfer) technical standards for construction. Facilities for which permits are issued shall also be operated and managed in accordance with NRCS technical standards specified in the 590 NMP standard.

A permit must be obtained for:

- New animal waste storage facility or altering an existing animal waste storage facility
- Abandonment of a waste storage facility
- All agriculture operations are required to have a Nutrient Management Plan according to USDA-NRCS Technical Standard 590
- Properly abandon animal waste storage facilities that have not been utilized for a period of 24 months

Any person who violates, neglects, or refuses to comply with or resists the enforcement of any provision of this ordinance shall be subject to a forfeiture of not less than $50 plus costs of prosecution of each violation.

STRATEGY 2 - PRIORITY PLANNING EFFORTS

In addition to the implementation of NR151 State Standards and Prohibitions, Kewaunee County has been working on State and Federal priority planning efforts to assist groundwater, surface water, and soil health initiatives. Each planning effort brings along diverse opportunities for collaboration, partnerships, and cost-sharing opportunities.

NORTHEAST LAKESHORE TMDL

As discussed in Chapter 3, a TMDL establishes pollutant load allocations to both point and nonpoint sources in order to achieve pollutant load reductions needed to meet water quality goals. Once a TMDL is developed and approved, it must be implemented to reduce the amount of pollutants entering the water. The Northeast Lakeshore TMDL project entails two years of monitoring and data collection that began in 2017, followed by data assessment and computer modeling. The final TMDL report will be completed around 2021.

IMPLEMENTATION & MONITORING STRATEGY (FOLLOWING THE COMPLETED STUDY)

- Kewaunee County will use established regulations and programs including NR151, County Ordinances, FPP and 9-key element plans to implement the findings
- Use NR151 walkover database and inventory of livestock facilities and cropland to target area needing additional conservation practices
- Inventory streambank integrity
- Inventory location of tile lines, tile outlets and inlets and culverts
- Use EVAAL (Erosion Vulnerability Assessment for Agricultural Lands) / STEPL (or similar model) to determine highest loading farm sites within these priority areas
- Prioritize cropland and facilities that are enrolled in conservation programs such as the Farmland Preservation Program or sites that are eligible for cost-share assistance
- Develop and secure funding for additional 9-key element plans in the Kewaunee River, Stony Creek, and Twin River Watersheds
- Implement 9-key element plans as they are approved on a sub-watershed scale (HUC 12)
- Target & implement BMPs based off highest phosphorus & nitrogen loading sub-watershed (determined by the TMDL) and continue in descending order
- Provide technical assistance to implement and construct BMPs and (if eligible) financial assistance through NRCS, DNR, and/or DATCP to cost-share BMP that reduce P, N and TSS
- Upon TMDL plan approval, apply for additional funding to implement the approved plan as necessary
- Monitoring & Evaluation:
    - Use STEPL to quantify P, N and TSS reductions from installed BMPs
    - Use 9-key element plans to implement findings of TMDL
    - Document if any waterways come off the DNR impaired listing

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

- TMDL mailings to landowners
- One-on-one onsite visits with landowners
- Updates through the LCC meetings
- Partnerships: DNR, DATCP, LCC, water action volunteers, all farms, citizens and landowners, civic organizations, towns associations, city and village councils, town boards
- Engagement with stakeholders through local work groups, county boards and subcommittees, and ad-hoc meetings shall be important for education, outreach, and obtaining input and recommendations on conservation technical assistance delivery and prioritization of financial assistance funding and conservation efforts

9-KEY ELEMENT PLANS

See pages: 87-117

NRCS WATERSHED PLAN

Kewaunee County LWCD and NRCS (collectively referred to as the "Parties") will collaborate to address the action items as stated in the watershed plan.

IMPLEMENTATION & MONITORING STRATEGY

- On an annual basis the Parties shall meet to discuss the progress made during the preceding year and to identify potential collaborations for the upcoming year. Annual performance shall be recorded and provided to partners and stakeholders. Updates to the plan shall also be made when appropriate, as determined by the Parties.
- Acquiring additional funding for staff support and conservation practice cost-share assistance shall be pursued to the extent possible within the authorities of the Parties. Appendix 11 provides a listing of the current program opportunities available to agricultural producers for obtaining financial and technical assistance to address natural resource concerns on their property. Additional planning efforts such as the Kewaunee County LWRMP, and development of EPA 9-key element plans shall also be developed; which may result in additional funding opportunities becoming available as a result of the creation of these plans.
- Water quality monitoring efforts shall be promoted and conducted to the extent possible as a means for tracking environmental improvements in the watersheds.
- New and innovate conservation activities and practices shall be investigated and considered for trial implementation as a means to address the natural resources concerns.

EDUCATION & OUTREACH STRATEGY

- Education, outreach and promotion activities shall be coordinated and conducted between the Parties to the extent allowable.
- Collaboration with partners shall help to support the missions of the Parties and aid with accomplishing the goals and objectives of this plan.
- Field day events, tours, workshops; including print, video, and social media shall be tools used for engaging landowners and agricultural producers.
- Demonstration Farm Networks (e.g. Door-Kewaunee Demonstration Farm Network) and producer-led watershed groups (e.g. Peninsula Pride Farms (PPF)) shall be important avenues for engaging agricultural producers and for promoting implementation of priority conservation activities on agricultural lands.

PARTNERSHIPS

- Collaboration with partners for surface and groundwater monitoring shall be import for measurement of progress and to help inform future conservation planning decisions.
- Engagement with stakeholders through local work groups, county boards and subcommittees, and ad-hoc meetings shall be important for education, outreach, and obtaining input and recommendations on conservation technical assistance delivery and prioritization of financial assistance funding and conservation efforts.
- Cooperative agreements between the Parties and collaborating partners shall be pursued when appropriate and funding availability exists; for the purpose of leveraging federal, state, county and non-governmental financial resources to address priority natural resources, complete action items, and help achieve the goals and objectives of this plan.

DNR WORKGROUPS

IMPLEMENTATION & MONITORING STRATEGY

- Continue to work on implementing the recommendations found on worksheet
- Continue to reconvene workgroups to discuss recommendations and the status or success/non-success of implementation
- Monitoring & Evaluation:
    - Workgroup members will continue to meet in 2019 to evaluate and monitor the progress of implementing the DNR Workgroup Recommendations.

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

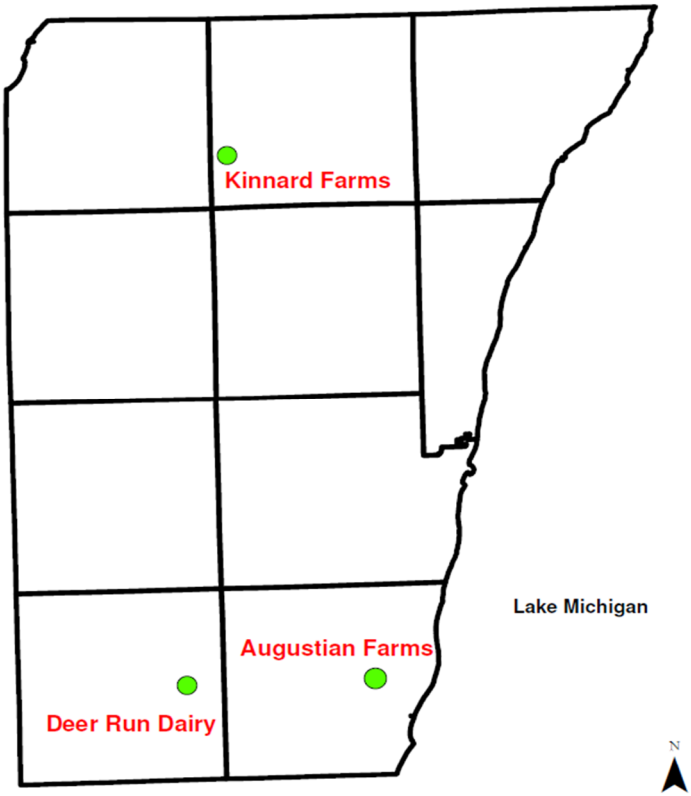
- Partnerships/Updates: DNR, EPA, LCC, petitioning organizations, county board, citizens and landowners, civic organizations, towns associations, city and village councils, town boards
- Engagement with stakeholders through local work groups, county boards and subcommittees, and ad-hoc meetings shall be important for education, outreach, and obtaining input and

recommendations on conservation technical assistance delivery and prioritization of financial assistance funding and conservation efforts.

DEMONSTRATION FARMS

Northeastern Wisconsin's Door-Kewaunee Watershed is now home to a network of 4 farms that will demonstrate the best conservation practices to protect the Great Lakes. Three farms are located in Kewaunee County including Kinnard Farms, Deer Run Dairy and Augustian Farms (Map 32). DATCP and the NRCS are tackling this effort in cooperation with PPF, a farmer-led organization.

The top priorities for the farmers of the Door-Kewaunee Watershed Demonstration Farm Network, who contend with shallow, fractured bedrock that can provide a direct path for contaminants are groundwater and surface water quality.



Map 32: Kewaunee County Demonstration Farm Locations

IMPLEMENTATION & MONITORING STRATEGY

- Test how well specific conservation practice systems reduce erosion and sedimentation, control phosphorus runoff, increase organic matter, and improve soil health conditions.
- Test the effectiveness of current and innovative conservation systems for controlling runoff
- Establish a mechanism to transfer technology and provide information on effective conservation systems to farmers, land management agencies, agribusiness and the general public
- Create opportunities for environmental research agencies and agribusiness to test research, provide technical assistance, and show conservation practices and technologies on the demonstration farm sites
- Host field days, farm tours, workshops, and provide additional outreach to share information and lessons learned to other natural resource managers, researchers, and stakeholders throughout the Great Lakes basin

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

- Farm tours 7-9 per year
- Field day events 3-5 per year
- Conservation equipment demonstrations 2-3 per year
- Local media interviews and education
- State farm paper interviews
- Local, State and Federal officials' tours
- Partnerships: LCC, DATCP, NRCS, LWCD, PPF, Door County Soil and Water Conservation Department, Demonstration Farm network in Brown County, citizens and landowners, civic organizations, towns associations, city and village councils, town boards
- Engagement with stakeholders through local work groups, county boards and subcommittees, and ad-hoc meetings shall be important for education, outreach, and obtaining input and recommendations on conservation technical assistance delivery and prioritization of financial assistance funding and conservation efforts.

SAVE THE BAY

In 2015, then Congressman Reid Ribble (WI-08) hosted a summit on phosphorus in the waters of Green Bay, which began conversations on reducing the levels of phosphorous in the bay. Congressman Mike Gallagher is continuing the initiative and hosted his first Save the Bay meeting in February 2017. Save the Bay is a Northeast Wisconsin collaborative initiative in which agriculture, academia, industry, government and nonprofit leaders identify, share and promote conservation practices to reduce phosphorus, nitrogen and sediment flowing into the waters of Green Bay and Lake Michigan (https://gallagher.house.gov/issues/save-bay).

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

- Save the Bay meetings provide opportunities for producers, scientists and other experts actively engaged in agriculture, soil health and water quality to collaborate on practices to reduce phosphorus leaving farm fields and entering waterways.
- Continue to be actively involved in the Door/Kewaunee Watershed subgroup
- Continue to attend/host field days and tours
- Partnerships & Door/Kewaunee Watershed Workgroup Priorities see Appendix 12

STRATEGY 3 - COUNTY ORDINANCES & PRIORITY PROGRAMS

The final strategy encompasses the implementation of county ordinances and programs, both regulatory and voluntary.

NON-METALLIC MINING RECLAMATION (CHAPTER 17)

IMPLEMENTATION & MONITORING STRATEGY

- Review plans yearly to document reclamation activities
- Review newly submitted plans
- Review financial assurance and annual reports
- Monitoring & Evaluation:
    - Complete on-site compliance walkovers annually on all non-metallic mines
    - Monitor all reclamation activities annually
    - Evaluate program through the DNR Non-Metallic Mining annual report

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

- Continue to work with Townships and Non-Metallic Mining operations on reclamation activities
- Partnerships: LCC, DNR, Non-Metallic Mining operators, landowners

PUBLIC HEALTH & GROUNDWATER PROTECTION (CHAPTER 30)

IMPLEMENTATION & MONITORING STRATEGY

- Continue strategy used when Ordinance passed in 2015 to identify and work with all farms in less than 20 feet to bedrock
- Monitoring & Evaluation:
    - Manure spreading and stacking activities in impacted area
    - Number of farms needing variances
    - Evaluate well testing results during January 1st – April 15th
- Evaluate Lincoln Well Testing Study Research Project by Bonness-Masarik, for trend analysis

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

- Continue to educate landowners and operators of the spreading and stacking prohibitions from January 1st – April 15th annually

- Educate operators as they add land (less than 20 feet to bedrock) to their NMPs and the setbacks, rates, and prohibitions
- Partnerships: CCAs, farms, LCC, NRCS, operators, haulers, citizens and landowners, civic organizations, towns associations, city and village councils, town boards

AGRICULTURAL WASTE & PROCESS WASTEWATER IRRIGATION (CHAPTER 37)

IMPLEMENTATION & MONITORING STRATEGY

- Work with farms interested in irrigation
- Seek cost-sharing opportunities and provide technical support
- Monitor & Evaluation:
    - Once installed on a farm:
        - Monitor irrigation applications
        - Monitor amounts of wastes with NMPs
        - Monitor wells in area for bacteria and nitrates
        - Monitor drift (if any)
        - Monitor any other potential issues that arise
    - Evaluate the amount of waste going out in "other" months, as opposed to spring and fall months
    - Evaluate benefits of irrigation of wastes on growing crops during the cropping season
    - Evaluate Ordinance for potential changes and/or updates

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

- Educate landowners on low pressure drop nozzle irrigation
- Educate farms on benefits
- Demonstrate at field days and tours using the Demonstration Farm networks throughout Wisconsin or any farm currently using the technology
- Partnerships: LCC, DNR, NRCS, farms interested in irrigations, citizens and landowners, civic organizations, towns associations, city and village councils, town boards
- Engagement with stakeholders through local work groups, county boards and subcommittees, and ad-hoc meetings shall be important for education, outreach, and obtaining input and recommendations on conservation technical assistance delivery and prioritization of financial assistance funding and conservation efforts.

NUTRIENT MANAGEMENT & CONSERVATION PLANNING

IMPLEMENTATION & MONITORING STRATEGY

- Continue to annually map all NMP in ArcGIS and cross reference parcels with NR151 for compliance checks
- Verify planned crops with planted crops in field
- Increase cover crops and reduced tillage on fields not meeting T
- Conduct hauling audits to verify manure land-spreading activities
- Conduct hauling audits to verify septage and industrial land-spreading activities and verify the applications are included in the NMP
- Monitoring & Evaluation:
    - Monitor NMP implementation and acres planned
    - Analyze T-values for soil health
    - Evaluate trends of acres under NMPs and in compliance with NR151
    - Evaluate percentage of cover crops and tillage trends
    - Evaluate NMPs submitted to LWCD to what is being done in the field

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

- Farmer NMP classes being held by LWCD in partnership with DATCP
- LWCD offers spring and fall meetings to discuss manure hauling, nutrient management applications, setbacks, and new regulations
- Continue to partner with CCAs, haulers, operators, and landowners
- Continue to educate operators and landowners on the components of their NMP
- Continue to educate operations and landowners on karst features, setbacks, rate restrictions
- Partnerships: LCC, DATCP, DNR, NRCS, CCA, all farms, landowners, haulers, citizens, civic organizations, towns associations, city and village councils, town boards

CONSERVATION RESERVE ENHANCEMENT PROGRAM (CREP)

IMPLEMENTATION & MONITORING STRATEGY

- Work with NRCS and FSA (Farm Service Agency) to locate eligible buffer locations
- First target areas in the East Twin River (following the DNR 2018 report) and Ahnapee River (9-key element plan)
- Second target areas identified when the Northeast WI TMDL is completed
- Provide technical assistance including design, preparation and construction oversight of CREP agreements and installation of buffers
- Monitoring & Evaluation:
    - Monitor current CREP maintenance agreements and established buffered areas
    - Monitor amounts of P, N, TSS reduced from the establishments of CREP buffers

    - Evaluate and document reductions in respect to TMDLs and 9-key element plans

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

- Direct mailings to landowners
- Field days to visit established CREP buffers
- One-on-one site visits with landowners
- County seminars and education/information
- Partnerships: LCC, FSA, NRCS, landowners, non-profit groups and/or lakes associations, civic organizations, towns associations, city and village councils, town boards and citizens

WELL TESTING / GROUNDWATER RESEARCH

IMPLEMENTATION & MONITORING STRATEGY

- Continue Annual Voluntary Well Testing program through LWCD in partnership with University of Wisconsin-Stevens Point
    - Update database with new percentages and monitor wells and assist landowners with unsafe levels of nitrates and/or bacteria present
- Continue to offer Year-Round well testing bottles in LWCD
- Seek funding to re-test wells for bovine/human viruses and microbes through the Borchardt study around 2023 to monitor (5 years after implementing) implementation of new NR151 Silurian Dolomite Standards
- Continue Lincoln Well Testing Research Project by Bonness-Masarik
    - Monitor results that are taken in January & June
    - Continue to update results and Lincoln Town Board as well as participating landowners

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

- Direct mailings to landowners
- Educate entire county on well testing results through LCC meetings, mailings, news releases, education seminars
- Partnerships & educational opportunities: LWCD, LCC, UW-Stevens Point, UW-Extension, citizens and landowners, non-profits, civic organizations, towns associations, city and village councils, town boards

INVASIVE SPECIES

IMPLEMENTATION & MONITORING STRATEGY

- Seek funding for Management Plan
- Continue in monitor the work completed in 2018 and 2019 under the GLRI/Bay-Lake Regional Planning Commission initiative to manage Phragmities, Wild parsnip, and Japanese knotweed
- Continue to seek funding for a Kewaunee County Invasive Species Management Plan
- Continue to document with GPS and record on GIS the locations of any/all invasive species in the county

EDUCATION/OUTREACH STRATEGY & PARTNERSHIPS

- Partner with and educate landowners who own private property with invasive species
- One-on-one meetings
- Direct mailings
- Partnerships & education activities: presentations and youth programming at schools, presentations to LCC, civic organizations, towns associations, city and village councils, town boards and citizens

CHAPTER 8: LWRMP 2020-2029 REPORTING & WORK-PLAN

In addition to the monitoring and evaluation done within the three implementation strategies discussed in Chapter 7, LWCD staff also uses DATCP reporting and work-plans to document, summarize, and evaluate work performed annually.

DATCP ANNUAL WORK-PLANS

DATCP work-plans are required to be submitted annually and include County goals and objectives, planned activities with benchmarks, estimated staff costs and cost-sharing, and performance measurements to determine success. The annual work-plan follows the County's LWRMP priorities as well as county and watershed initiatives.

DATCP ANNUAL REPORTS

DATCP also requires annual reporting of activities and implemented performance measures through an online survey for all counties to complete in Wisconsin. Kewaunee County will continue to provide answers to all questions following this DATCP format.

Summary of 2018 NR 151

****Table is a summary ONLY, please see WDNR for full details and definitions of terms****

Silurian Bedrock Performance Standards
Mechanical application shall not cause fecal contamination of water in a well
No mechanical application of manure where 24 inches or less of separation between the ground surface and apparent water table
Manure shall be applied in conformance with a NMP that is: consistent with NR 151.07, NRCS 590 (2015), consistent with targeted performance standards, identifies Silurian bedrock within or adjacent to cropland and pastures
Prior to mechanical manure applications use infield bedrock verification to locate Silurian bedrock having soil depths less than 5 feet

Definitions
Direct Conduits to Groundwater: wells, sinkholes, swallets, fractured bedrock at the surace, mineshafts, non-metalic mines, tile inlets discharging to groundwater, quarries or depressional groundwater recharge areas over shallow fractured bedrock.
Concentrated flow channel: natural channel or constructed channel that has been shaped or graded to required dimensions and established in perennial vegetations for the stacle conveyance of runoff. Concentrated flow channel may also include non-vegetated chennels caused by ephemeral erosion, intermittent streams, dreainage ditches, and drainage ends indentified on the NRCS soil survey and my be identified as contiguous up-gradient deflections of contour lines on the USGS 1:24,000 scale topographic map.
Long term no-till: no-till farming that has been implemented a minimum of 3 consecutive years.
Pre-tillage: using mechanical equipment to reduce soil preferential flow paths, worm holes, root holes, and cracks by turning and mixing the soil prior to and at least 2 inches below the depth of manure application.
Sites that is susceptible to goundwater:
a) An area 250 feet of a private well
b) An area 1000 feet of a community well
c) An area 300 feet upslope or 100 feet downslope of a direct conduit to groundwater
d) A channel that flows to a direct conduit to groundwater (road ditch, concentrated flow channel tile ect.)
e) An area where the soil depth to groundwater or bedrock is less than 2 feet
f) An area where the soil layer does not exhibit one of the following soil characteristics:
1. At least a 2-foot soil layer with 40% fines or greater above groundwater or bedrock
2. At least a 3-foot soil layer with 20% fines or greater above groundwater or bedrock
3. At least a 5-foot soil layer with 10% fines or greater above groundwater or bedrock

Water quality management area: "WQMA" area within 1,000 feet from the ordinary high water mark of a navigable waters (lake, pond or flowage), 300 feet from the ordinary high water mark of navigable waters that consist of a river or stream; and a site that is susceptible to groundwater contamination, or that has the potential to be a direct conduit for contamination to reach groundwater.

Setbacks
a) 250 feet of a private well
b) 1000 feet of a community well
c) 300 feet upslope or 100 feet downslope of a direct conduit to groundwater
d) 100 feet of defined channels that lead to a, b or c

Depth to Silurian Bedrock

< 5 feet		- Evaluate and rank fields for risk of pathogen delivery to groudwater pior to mechanically applying manure. High risk areas shall be avoided or be lowest priority for manure application.
		- Mechanical application of manure is prohibited when rainfall greater than one inch is forecast within 24 hours of planned application

0-2 feet	Solid Manure	Liquid Manure
	(12% or greater solid material by volume)	
	Mechanical manure application is prohibited	**Mechanical manure application is prohibited**

2- 3 feet	Solid Manure	Liquid Manure
	No mechanical application unless both:	**No mechanical application unless meets all:**
	1) Incorporated within 72 hrs to no more than 4 inches below ground (unless long-term no-till or have perennial or established crop)	1) Pre-tillage completed (except if long term no-till or has perennial or established crops) Surface application on no-till, perenial or established crop may not exceed 6,750 gal/ac per application
	2) And at least one of:	2) Injected or incorporated within 24 hrs to no more than 4 inches below ground
	a) Rate is 15 t/acre/yr or UW A2809 annual application rate, whichever is less	3) And at least one of:
	b) Applied within 10 days of planting date or on perennial or other established crop	a) Rate limited to Table 1. in rule or UW A2809 annual application rate, whichever is less
	c) Manure is composted or treated to reduce pathogen levels to a fecal coliform bacteria density of 500,000 colony- forming units, or most probable number per gram total solids on a dry weight basis	b) Applied within 10 d of planting date or on perennial or other established crop
		c) Treated to substantially reduce pathogen levels via practices to a fecal coliform bateria density of less than 500,000 most probable number or colony-

Table 1. Silurian Bedrock Maximum Liquid Manure Application Rates

Soil Texture	2 to 3 Feet Depth (gal/ac/yr)	3 to 5 Feet Depth (gal/ac/wk	5 to 20 Feet Depth (gal/ac/wk
Sand	6,750	6,750	13,500
Sandy Loam	13,500	13,500	27,000*
Loam	13,500	13,500	27,000*
Silt Loam	13,500	13,500	27,000*
Clay Loam	13,500	13,500	20,000*
Clay	6,750	6,750	13,500

* It is anticipated that this rate would exceeed the UW A2809 annual (crop year) application rate.

3-5 feet	Solid Manure	Liquid Manure
	No mechanical application unless both:	No mechanical application unless meets all:
	1) Incorporated within 72 hrs to no more than 6 inches below ground (except if long term no-till or has perennial or established crops)	1) Pre-tillage completed (except if long term no-till or has perennial or established crops) Surface application on no-till, perenial or established crop may not exceed 6,750 gal/ac per application
	2) And at least one of:	2) Injected or incorporated within 24 hrs to no more than 6 inches below ground
	a) Rate is 15 t/acre/yr or UW A2809 annual application rate, whichever is less	3) And at least one of:
	b) Applied within 10 days of planting date or on perennial or other established crop	a) Rate limited to Table 1. in rule or UW A2809 annual application rate, whichever is less
	c) Manure is composted or treated to reduce pathogen levels to a fecal coliform bacteria density of 500,000 colony- forming units, or most probable	b) Applied within 10 d of planting date or on perennial or other established crop
		c) Treated to substantially reduce pathogen levels via practices to a fecal coliform bateria density of less than 500,000 most probable number or colony-forming units per 100 milliliter sample.

5-20 feet	Solid Manure	Liquid Manure
		No mechanical application unless meets all:
		1) Pre-tillage completed (except if long term no-till or has perennial or established crops) Surface application on no-till, perenial or established crop may not exceed 10,000 gal/ac per application
		2) Injected or incorporated within 24 hrs to no more than 6 inches below ground
		2) And at least one of:
		a) Rate limited to Table 1. in rule or UW A2809 annual application rate, whichever is less
		b) Applied within 10 d of planting date or on perennial or other established crop
		c) Treated to substantially reduce pathogen levels via practices to a fecal coliform bateria density of less than 500,000 most probable number or colony-forming units per 100 milliliter sample.

Table 1. Silurian Bedrock Maximum Liquid Manure Application Rates

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Sandy Loam	13,500	13,500	27,000*
Loam	13,500	13,500	27,000*
Silt Loam	13,500	13,500	27,000*
Clay Loam	13,500	13,500	20,000*
Clay	6,750	6,750	13,500

* It is anticipated that this rate would exceeed the UW A2809 annual (crop year) application rate.

APPENDIX 2: KEWAUNEE COUNTY LCC RESPONSE TO EAST TWIN RIVER WQS REPORT

1. The East Twin WQS indicates that the East Twin River, Krok Creek, and the UNT (3000213 and 3000212) "clearly exceed" water quality standards for phosphorus and should remain on the impaired waters list. UNT 3000211 is not meeting water quality standards for phosphorus and DNR is proposing that it be added to the impaired list. UNT 3000213 is proposed to be added to the impaired listing for water temperatures exceeding standards.

2. The DNR report confirms that the East Twin River is not devoid of aquatic life and that aquatic organisms can be found in all tested areas of the East Twin River and the UNTs. The overall fish community in the *Upper* East Twin River watershed is in good to excellent condition.

3. Of significant concern to county residents who have reviewed the East Twin WQS are statements that can be found on page four of the WQS. DNR states that the data in this 2017 East Twin WQS were assessed against a "new Wisconsin 2018 Consolidated Assessment and Listing Methodology" to determine if a waterway is meeting water quality standards for critical factors such as dissolved oxygen, water temperature, chloride and phosphorus contamination.
   a. A potential concern of Kewaunee County is that it may now be easier for an impaired waterway to be considered *within standards* under these newly revised criteria. In addition, streams and rivers in Wisconsin are now being considered for placement in a "revised" aquatic life use classification system in which the new fish and aquatic life subclasses are referred to as "Natural Communities." Changing the fish community structure from say cool-cold headwater to cool-warm headwater will result in changes to the impairment criteria.
   b. DNR's 2017 testing of the East Twin River points to the fact that many of the aquatic species that were once present in the East Twin fishery are now absent. The species found in earlier surveys have given way to aquatic species that appear to be more resistant to the kinds of temperatures and contaminants now present in the East Twin waterway.

4. The 2017 DNR East Twin WQS indicates that all Chloride test levels were higher than in previous year studies but that the Chloride concentrations were not at Chronic Toxicity levels.
   a. DNR test results **did not** confirm prior Water Action Volunteer (WAV) testing results that indicated numerous instances of Chronic Chloride toxicity and even some Acute Chloride toxicity.
   b. Different Chloride test results could be due to the timing of the tests and weather events. Strong water flows from recent rains can dilute Chloride effluents and there are likely times when the amount of Chloride effluent being released from point sources may vary considerably.

5. The 2017 DNR East Twin WQS indicates that East Twin River met the cold-water quality criteria at all but one testing station. However, water temperatures are warmer now than in previous year's testing of all the UNT.

6. Ambient Toxicity for key species as reported in the East Twin WQS:
   a. Fathead Minnow: No chronic toxicity but two instances of lower survival and growth than in control treatments in the Fathead Minnow toxicity test.
   b. Water Flea: Chronic toxicity was found in two samples collected during the field season. Reproduction was found to be significantly lower in June below the confluence of UNT 3000211 and at the UNT 3000213 in October.
   c. UNT 3000213 showed noticeably lower green algae growth in July and August samples.

7. The 2017 DNR East Twin WQS indicates that under the new 2018 DNR assessment protocol, macroinvertebrate integrity and condition ranged from fair to good in the areas tested. All test results from the tributaries were listed as "fair." The macroinvertebrate communities are fair to poor in the upper reaches of the UNT 3000213 and fair conditions are found at two sites on UNT 3000211. The DNR attributes these lower macroinvertebrate water quality results to nonpoint sources of nutrients.

8. The 2017 DNR East Twin WQS assessed the condition of the aquatic habitat in the East Twin River, Krok Creek, and all three tributaries. The 2017 habitat condition score was lower in every location tested than in 2011.
   a. Declining conditions of the waterway's habitat could be due to runoff from nearby fields.

9. Of importance to local-residents and visitors is the fishery inventory and within that inventory the most valued fish is the brook trout. In confirmation of some anecdotal reports from residents, the brook trout inventory declined very significantly from earlier inventories in 2009, 2011, and 2015 when 20, 18, and 16 brood trout were cataloged to just 5 in 2017. The DNR report goes on to indicate that "large river fish" such as trout range from absent to uncommon in the East Twin River.

10. Key takeaways from this 2017 DNR East Twin WQS include:
    a. Good fish conditions in the upper river.
    b. Declining fish habitat in all areas tested likely due to runoff.
    c. Significant changes in the aquatic species now found in the East Twin (fewer species that are intolerant to contaminants).
    d. Increases in Chloride to levels that under the right conditions could be toxic.
    e. Significant reductions in trout inventory.
    f. The need for the East Twin and tributaries to remain on the impaired waters listing for high phosphorus levels and high-water temperature.

In summary, aquatic life conditions on the East Twin River and its tributaries are NOT improving under the current DNR management plans and in fact some conditions, especially those in the lower river, are deteriorating. Current efforts do not appear to be adequate to maintain a marginal fishery and it is difficult to see that without further efforts, there is little hope for to return the East Twin River and its tributaries to the robust sport fishery long-term residents have reported to the Kewaunee County LCC.

APPENDIX 3: NRCS RESOURCE CONCERN VOTING SHEET

	RESOURCE CONCERN	DEFINITION	YOUR RATING
1	**Air Quality - Objectionable Odors**	*Emissions of odorous compounds cause nuisance conditions*	HIGH MEDIUM LOW
2	**Excess Water - Flooding, Ponding & Seasonal High Water Table**	*Surface water or poor subsurface drainage restricts land use and management goals*	HIGH MEDIUM LOW
3	**Inadequate Habitat for Fish & Wildlife - Habitat Degradation**	*Quantity, quality or connectivity of food, cover, space, shelter and/or water is inadequate to meet requirements for fish & wildlife species*	HIGH MEDIUM LOW
4	**Water Quality Degradation - Excess Nutrients in Surface & Groundwaters**	*Nutrients-organic & inorganic are transported to receiving waters through surface runoff and/or leaching into shallow groundwaters in quantities that degrade water quality and limit use for intended purpose*	HIGH MEDIUM LOW
5	**Water Quality Degradation - Excess Pathogens & Chemicals from Manure, Bio-Solids or Compost Applications**	*Pathogens, pharmaceuticals and other chemicals carried by land applied soil amendments are transported to receiving waters in quantities that degrade water quality and limit use for intended purposes*	HIGH MEDIUM LOW
6	**Soil Erosion - Sheet, Rill & Wind**	*Detachment and transportation of soil particles caused by wind or rain that degrades soil quality*	HIGH MEDIUM LOW
7	**Soil Erosion - Concentrated Flow**	*Untreated gullies may enlarge or occur in the same flow area every year from rainfall, snowmelt or irrigation*	HIGH MEDIUM LOW
8	**Water Quality Degradation - Excessive Sediment in Surface Waters**	*Offsite movement of sediment from sheet, rill and wind erosion that threatens to degrade surface water quality and limit use for intended purposes*	HIGH MEDIUM LOW
9	**Soil Quality Degradation - Compaction**	*Management induced soil compaction resulting in decreased rooting depth that reduces plant growth, animal habitat and soil biological activity*	HIGH MEDIUM LOW
10	**Soil Quality Degradation – Organic Matter Depletion**	*Soil organic matter is not adequate to provide a suitable medium for plant growth, animal habitat and soil biological activity*	HIGH MEDIUM LOW

Silver Creek – Current BMPs, Efficiencies and Manure Spreading Frequency

Estimate an area-weighted combined efficiency of multiple BMPs (in parallel) across a watershed

Enter total treated land use area (acre) 8941.00 Cropland

Update BMP List

Enter the subarea treated by each selected BMP type (upto 20 varying frequency of treatment allowed)

Treatment	Area (ac)	Select a BMP Type	N	P	BOD	Sediment	E. coli
combo - Contour+NMP2	616.00	Combined BMPs-Calculated	0.460	0.740	0.000	0.340	0.000
2	5873.00	Nutrient Management 2 (Determined Rate Plus Additional Considerations)	0.247	0.560	0.000	0.000	0.000
combo - NMP2+ Residue1	627.00	Combined BMPs-Calculated	0.360	0.717	0.000	0.403	0.000
combo - Grass Filter + NMP 2	100.00	Combined BMPs-Calculated	0.502	0.751	0.000	0.533	0.000
Combo - NMP2+Cover2	205.00	Combined BMPs-Calculated	0.395	0.591	0.000	0.100	0.000
6		0 No BMP	0.000	0.000	0.000	0.000	0.000
7		0 No BMP	0.000	0.000	0.000	0.000	0.000
8		0 No BMP	0.000	0.000	0.000	0.000	0.000
9		0 No BMP	0.000	0.000	0.000	0.000	0.000
10		0 No BMP	0.000	0.000	0.000	0.000	0.000
11		0 No BMP	0.000	0.000	0.000	0.000	0.000
12		0 No BMP	0.000	0.000	0.000	0.000	0.000
13		0 No BMP	0.000	0.000	0.000	0.000	0.000
14		0 No BMP	0.000	0.000	0.000	0.000	0.000
15		0 No BMP	0.000	0.000	0.000	0.000	0.000
16		0 No BMP	0.000	0.000	0.000	0.000	0.000
17		0 No BMP	0.000	0.000	0.000	0.000	0.000
18		0 No BMP	0.000	0.000	0.000	0.000	0.000
19		0 No BMP	0.000	0.000	0.000	0.000	0.000
20		0 No BMP	0.000	0.000	0.000	0.000	0.000
Total Land Use Area	7421.00	Enter the calculated value in Table 7. located in "BMPs" tab, under the appropriate watershed -->	0.282	0.592	0.000	0.072	0.000

Estimate an area-weighted frequency of application based on varying manure application across a watershed

Enter total land use area 8,941.00 acres

Enter the subarea and its corresponding number of months of manure application below (upto 20 varying frequency of treatment allo

Treatment	Area (ac)	# of Months Manure Applied in a Year
1	5,364.00	9
2	3,576.00	0
3	-	0
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Total Land Use Area	8,940.00	5

<--- Enter the calculated value in Table 2. located in "Input" tab, uno

Total Area check: Check to ensure total treatment area matches the total land use area

Rio Creek – Current BMPs, Efficiencies and Manure Spreading Frequency

Estimate an area-weighted combined efficiency of multiple BMPs (in parallel) across a watershed

Enter total treated land use area (acre) 7970.00 Cropland

Update BMP List

Enter the subarea treated by each selected BMP type (upto 20 varying frequency of treatment allowed)

Treatment	Area (ac)	Select a BMP Type	N	P	BOD	Sediment	E. coli
combo - Contour+NMP2	1059.00	Combined BMPs-Calculated	0.460	0.740	0.000	0.340	0.000
2	5490.00	Nutrient Management 2 (Determined Rate Plus Additional Considerations)	0.247	0.560	0.000	0.000	0.000
combo - NMP2+ Residue1	265.00	Combined BMPs-Calculated	0.360	0.717	0.000	0.403	0.000
combo - Grass Filter + NMP 2	100.00	Combined BMPs-Calculated	0.502	0.751	0.000	0.533	0.000
5		0 No BMP	0.000	0.000	0.000	0.000	0.000
6		0 No BMP	0.000	0.000	0.000	0.000	0.000
7		0 No BMP	0.000	0.000	0.000	0.000	0.000
8		0 No BMP	0.000	0.000	0.000	0.000	0.000
9		0 No BMP	0.000	0.000	0.000	0.000	0.000
10		0 No BMP	0.000	0.000	0.000	0.000	0.000
11		0 No BMP	0.000	0.000	0.000	0.000	0.000
12		0 No BMP	0.000	0.000	0.000	0.000	0.000
13		0 No BMP	0.000	0.000	0.000	0.000	0.000
14		0 No BMP	0.000	0.000	0.000	0.000	0.000
15		0 No BMP	0.000	0.000	0.000	0.000	0.000
16		0 No BMP	0.000	0.000	0.000	0.000	0.000
17		0 No BMP	0.000	0.000	0.000	0.000	0.000
18		0 No BMP	0.000	0.000	0.000	0.000	0.000
19		0 No BMP	0.000	0.000	0.000	0.000	0.000
20		0 No BMP	0.000	0.000	0.000	0.000	0.000
Total Land Use Area	6914.00	Enter the calculated value in Table 7. located in "BMPs" tab, under the appropriate watershed -->	0.288	0.596	0.000	0.075	0.000

Estimate an area-weighted frequency of application based on varying manure application across a watershed

Enter total land use area 7,970.00 acres

Enter the subarea and its corresponding number of months of manure application below (upto 20 varying frequency of treatment allowed)

Treatment	Area (ac)	# of Months Manure Applied in a Year
1	4,782.00	9
2	3,188.00	0
3	-	0
4		
5		
6		
7		
8		
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20		
Total Land Use Area	7,970.00	5

<--- Enter the calculated value in Table 2. located in "Input" tab, under the appropriate

Total Area check: OK

... Gully&Streambank | Total Load | Graphs | ManureApplication

Ahnapee - – Current BMPs, Efficiencies and Manure Spreading Frequency

Estimate an area-weighted combined efficiency of multiple BMPs (in parallel) across a watershed

Enter total treated land use area (acre) 4085.00 Cropland

Update BMP List

Enter the subarea treated by each selected BMP type (upto 20 varying frequency of treatment allowed)

Treatment	Area (ac)	Select a BMP Type	N	P	BOD	Sediment	E. coli
combo - Contour+NMP2	110.00	Combined BMPs-Calculated	0.460	0.740	0.000	0.340	0.000
2	2269.00	Nutrient Management 2 (Determined Rate Plus Additional Considerations)	0.247	0.560	0.000	0.000	0.000
combo - NMP2+ Residue1	110.00	Combined BMPs-Calculated	0.360	0.717	0.000	0.403	0.000
combo - Grass Filter + NMP 2	248.00	Combined BMPs-Calculated	0.502	0.751	0.000	0.533	0.000
5		0 No BMP	0.000	0.000	0.000	0.000	0.000
6		0 No BMP	0.000	0.000	0.000	0.000	0.000
7		0 No BMP	0.000	0.000	0.000	0.000	0.000
8		0 No BMP	0.000	0.000	0.000	0.000	0.000
9		0 No BMP	0.000	0.000	0.000	0.000	0.000
10		0 No BMP	0.000	0.000	0.000	0.000	0.000
11		0 No BMP	0.000	0.000	0.000	0.000	0.000
12		0 No BMP	0.000	0.000	0.000	0.000	0.000
13		0 No BMP	0.000	0.000	0.000	0.000	0.000
14		0 No BMP	0.000	0.000	0.000	0.000	0.000
15		0 No BMP	0.000	0.000	0.000	0.000	0.000
16		0 No BMP	0.000	0.000	0.000	0.000	0.000
17		0 No BMP	0.000	0.000	0.000	0.000	0.000
18		0 No BMP	0.000	0.000	0.000	0.000	0.000
19		0 No BMP	0.000	0.000	0.000	0.000	0.000
20		0 No BMP	0.000	0.000	0.000	0.000	0.000
Total Land Use Area	2737.00	Enter the calculated value in Table 7. located in "BMPs" tab, under the appropriate watershed -->	0.283	0.591	0.000	0.078	0.000

Estimate an area-weighted frequency of application based on varying manure application across a watershed

Enter total land use area 4,085.00 acres

Enter the subarea and its corresponding number of months of manure application below (upto 20 varying frequency of treatment allowed)

Treatment	Area (ac)	# of Months Manure Applied in a Year
1	750.00	11
2	3,250.00	0
3	-	0
4		
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Total Land Use Area	4,000.00	2

<--- *Enter the calculated value in Table 2. located in "Input" tab, under the*

Total Area check: Check to ensure total treatment area matches the total land use area

... | Gully&Streambank | Total Load | Graphs | ManureApplication | C ...

Silver Creek – Future BMPs, Efficiencies and Manure Spreading Frequency

Estimate an area-weighted combined efficiency of multiple BMPs (in parallel) across a watershed

Enter total treated land use area (acre) 8941.00 Cropland

Update BMP List

Enter the subarea treated by each selected BMP type (upto 20 varying frequency of treatment allowed)

Treatment	Area (ac)	Select a BMP Type	N	P	BOD	Sediment	E. coli
combo - Contour+NMP2	616.00	Combined BMPs-Calculated	0.460	0.740	0.000	0.340	0.000
2	4173.00	Nutrient Management 2 (Determined Rate Plus Additional Considerations)	0.247	0.560	0.000	0.000	0.000
combo - NMP2+ Residue1	1627.00	Combined BMPs-Calculated	0.360	0.717	0.000	0.403	0.000
combo - Grass Filter + NMP 2	300.00	Combined BMPs-Calculated	0.502	0.751	0.000	0.533	0.000
combo - NMP2+CoverCrop2	705.00	Combined BMPs-Calculated	0.395	0.591	0.000	0.100	0.000
6		0 No BMP	0.000	0.000	0.000	0.000	0.000
7		0 No BMP	0.000	0.000	0.000	0.000	0.000
8		0 No BMP	0.000	0.000	0.000	0.000	0.000
9		0 No BMP	0.000	0.000	0.000	0.000	0.000
10		0 No BMP	0.000	0.000	0.000	0.000	0.000
11		0 No BMP	0.000	0.000	0.000	0.000	0.000
12		0 No BMP	0.000	0.000	0.000	0.000	0.000
13		0 No BMP	0.000	0.000	0.000	0.000	0.000
14		0 No BMP	0.000	0.000	0.000	0.000	0.000
15		0 No BMP	0.000	0.000	0.000	0.000	0.000
16		0 No BMP	0.000	0.000	0.000	0.000	0.000
17		0 No BMP	0.000	0.000	0.000	0.000	0.000
18		0 No BMP	0.000	0.000	0.000	0.000	0.000
19		0 No BMP	0.000	0.000	0.000	0.000	0.000
20		0 No BMP	0.000	0.000	0.000	0.000	0.000
Total Land Use Area	7421.00	Enter the calculated value in Table 7. located in "BMPs" tab, under the appropriate watershed -->	0.314	0.620	0.000	0.148	0.000

Total Area check: Check to ensure total treatment area matches the total land use area

10 year Practice Goals	Additional Amt
Cover Crops + NMP	500 ac
Residue1+NMP	1000 ac
Grass Filter+NMP	200 ac
75% NMP Implementation	all NMP acres
edlots - 50% with waste manag system	2 ac
Grassed Waterways	1000 ft

Estimate an area-weighted frequency of application based on varying manure application across a watershed

Enter total land use area 8,941.00 acres

Enter the subarea and its corresponding number of months of manure application below (upto 20 varying frequency of treatment all

Treatment	Area (ac)	# of Months Manure Applied in a Year	
1	5,364.00	9	
2	3,576.00	0	
3	-	0	
4			
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Total Land Use Area	8,940.00	5	<--- *Enter the calculated value in Table 2. located in "Input" tab, und*

Total Area check: Check to ensure total treatment area matches the total land use area

Rio Creek – Future BMPs, Efficiencies and Manure Spreading Frequency

Estimate an area-weighted combined efficiency of multiple BMPs (in parallel) across a watershed

Enter total treated land use area (acre) 7970.00 Cropland

Update BMP List

Enter the subarea treated by each selected BMP type (upto 20 varying frequency of treatment allowed)

Treatment	Area (ac)	Select a BMP Type	N	P	BOD	Sediment	E. coli
combo - Contour+NMP2	1059.00	Combined BMPs-Calculated	0.460	0.740	0.000	0.340	0.000
2	3790.00	Nutrient Management 2 (Determined Rate Plus Additional Considerations)	0.247	0.560	0.000	0.000	0.000
combo - NMP2+ Residue1	1265.00	Combined BMPs-Calculated	0.360	0.717	0.000	0.403	0.000
combo - Grass Filter + NMP 2	300.00	Combined BMPs-Calculated	0.502	0.751	0.000	0.533	0.000
combo - NMP2+CoverCrop2	500.00	Combined BMPs-Calculated	0.395	0.591	0.000	0.100	0.000
6		0 No BMP	0.000	0.000	0.000	0.000	0.000
7		0 No BMP	0.000	0.000	0.000	0.000	0.000
8		0 No BMP	0.000	0.000	0.000	0.000	0.000
9		0 No BMP	0.000	0.000	0.000	0.000	0.000
10		0 No BMP	0.000	0.000	0.000	0.000	0.000
11		0 No BMP	0.000	0.000	0.000	0.000	0.000
12		0 No BMP	0.000	0.000	0.000	0.000	0.000
13		0 No BMP	0.000	0.000	0.000	0.000	0.000
14		0 No BMP	0.000	0.000	0.000	0.000	0.000
15		0 No BMP	0.000	0.000	0.000	0.000	0.000
16		0 No BMP	0.000	0.000	0.000	0.000	0.000
17		0 No BMP	0.000	0.000	0.000	0.000	0.000
18		0 No BMP	0.000	0.000	0.000	0.000	0.000
19		0 No BMP	0.000	0.000	0.000	0.000	0.000
20		0 No BMP	0.000	0.000	0.000	0.000	0.000
Total Land Use Area	6914.00	Enter the calculated value in Table 7. located in "BMPs" tab, under the appropriate watershed -->	0.322	0.627	0.000	0.156	0.000

Total Area check: Check to ensure total treatment area matches the total land use area

10 year Practice Goals	Additional Amt
Cover Crops + NMP	500 ac
Residue1+NMP	1000 ac
Grass Filter+NMP	200 ac
75% NMP Implementation	all NMP acres
edlots - 50% with waste manag system	2 ac
Grassed Waterways	1000 ft

Estimate an area-weighted frequency of application based on varying manure application across a watershed

Enter total land use area 7,970.00 acres

Enter the subarea and its corresponding number of months of manure application below (upto 20 varying frequency of treatment allowed)

Treatment	Area (ac)	# of Months Manure Applied in a Year
1	4,782.00	9
2	3,188.00	0
3	-	0
4		
5		
6		
7		
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20		
Total Land Use Area	7,970.00	5

<— *Enter the calculated value in Table 2 located in "Input" tab, under the appropriate*

Total Area check: OK

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Ahnapee - Future BMPs, Efficiencies and Manure Spreading Frequency

Estimate an area-weighted combined efficiency of multiple BMPs (in parallel) across a watershed

Enter total treated land use area (acre) 4085.00 Cropland

Update BMP List

Enter the subarea treated by each selected BMP type (upto 20 varying frequency of treatment allowed)

Treatment	Area (ac)	Select a BMP Type	N	P	BOD	Sediment	E. coli
combo - Contour+NMP2	110.00	Combined BMPs-Calculated	0.460	0.740	0.000	0.340	0.000
2	569.00	Nutrient Management 2 (Determined Rate Plus Additional Considerations)	0.247	0.560	0.000	0.000	0.000
combo - NMP2+ Residue1	1110.00	Combined BMPs-Calculated	0.360	0.717	0.000	0.403	0.000
combo - Grass Filter + NMP 2	448.00	Combined BMPs-Calculated	0.502	0.751	0.000	0.533	0.000
combo - NMP2+CoverCrop2	500.00	Combined BMPs-Calculated	0.395	0.591	0.000	0.100	0.000
6		0 No BMP	0.000	0.000	0.000	0.000	0.000
7		0 No BMP	0.000	0.000	0.000	0.000	0.000
8		0 No BMP	0.000	0.000	0.000	0.000	0.000
9		0 No BMP	0.000	0.000	0.000	0.000	0.000
10		0 No BMP	0.000	0.000	0.000	0.000	0.000
11		0 No BMP	0.000	0.000	0.000	0.000	0.000
12		0 No BMP	0.000	0.000	0.000	0.000	0.000
13		0 No BMP	0.000	0.000	0.000	0.000	0.000
14		0 No BMP	0.000	0.000	0.000	0.000	0.000
15		0 No BMP	0.000	0.000	0.000	0.000	0.000
16		0 No BMP	0.000	0.000	0.000	0.000	0.000
17		0 No BMP	0.000	0.000	0.000	0.000	0.000
18		0 No BMP	0.000	0.000	0.000	0.000	0.000
19		0 No BMP	0.000	0.000	0.000	0.000	0.000
20		0 No BMP	0.000	0.000	0.000	0.000	0.000
Total Land Use Area	2737.00	Enter the calculated value in Table 7. located in "BMPs" tab, under the appropriate watershed -->	0.370	0.668	0.000	0.283	0.000

Total Area check: Check to ensure total treatment area matches the total land use area

10 year Practice Goals	Additional Amt
Cover Crops + NMP	500 ac
Residue1+NMP	1000 ac
Grass Filter+NMP	200 ac
75% NMP Implementation	all NMP acres
eedlots - 50% with waste manag system	2 ac
Grassed Waterways	0 ft

Estimate an area-weighted frequency of application based on varying manure application across a watershed

Enter total land use area 4,085.00 acres

Enter the subarea and its corresponding number of months of manure application below (upto 20 varying frequency of treatment allowed)

Treatment	Area (ac)	# of Months Manure Applied in a Year
1	750.00	11
2	3,250.00	0
3	-	0
4		
5		
6		
7		
8		
9		
10		
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12		
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18		
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20		
Total Land Use Area	4,000.00	2

<--- *Enter the calculated value in Table 2. located in "Input" tab, under the*

Total Area check: Check to ensure total treatment area matches the total land use area

... | Gully&Streambank | Total Load | Graphs | ManureApplication | C ...

APPENDIX 6: ADDITIONAL RESPONSES TO LWRMP PUBLIC POLL

Question 1: Additional natural resources issues that were identified from the survey included:

- Lake Michigan Water Quality
- Beach Erosion
- Grassed Waterways
- Deer Population
- Land Value Concerns
- Beach Preservation
- Prairies & Restoration

Question 2: Additional concerns that were identified from the survey included:

- CAFO monitoring
- Grassed Waterways
- Pesticide & Herbicide
- Permits too easy for CAFOs
- Manage Industrial Waste
- Proper well depth and Septic System Quality
- Plastics going into Lake Michigan
- Illegal Manure Spreading
- Urban Storm-water Runoff
- Well Water Safety
- Cap wells that are condemned
- Proper well installation to rock

Question 3: Additional tools and strategies that were identified from the survey included:

- Limit Animals per amount of land owned
- Reduce number of cattle
- Promote Permaculture / Silvopasturing
- Get a Warden
- More Employees
- Conserve good farmland
- Partner with Sustainable farming organizations
- Composting
- Urban development regulations & enforcement
- Positive Press Release
- Strengthen scientific oversight
- Organic Farming

Kewaunee County's Bedrock Verification Policy - 2018

1. Start by asking the farm and their agronomist how much manure they have, how many spreadable acres they currently have, how many gallons per acre they typically apply and which criteria they wish to verify to. If the farm only applies manure 1x per year and under 13,500 gallons per acre they may have no need to verify 3 ft- 5 ft or 5ft - 20 ft soils depths.

2. Once the farms needs or intent is defined, use the 0-40 inch soil map to narrow down which areas of field will need the most attention and where the 24 inch boundary may be. The soil maps, historical photos, field characteristics, tillage knowledge gained by the land operator will tell us were to look and hand probing clearly defines where the 0-24in boundary truly is. After the 0-24 inch boundary is mapped via GPS, increase probe intervals to find the next target depth boundary.

Depth to bedrock verification methods by target soil depth

0 inches-2 feet
- Soil Map, field characteristics, farm knowledge, air photos, soil probe (48inch) and Trimble GPS/ ESRI Collector
- Probe interval of 25 feet- 50 feet depending on other field specific characteristics
- Boundary line- Find where soils change from 20- 30 inches, probe until consistent results of 24 inches, GPS and repeat until a boundary line can be drawn on ArcGIS.
Other options: Varis or other comparable device with verification

1 feet- 3 feet

- Soil Map, field characteristics, farm knowledge, air photos, soil probe (48inch) and Trimble GPS/ ESRI Collector
- Probe interval of 25 feet- 50 feet depending on other field specific characteristics
Depending on farm's intent
- Boundary line- Find where soils change from 30- 40 inches, probe until consistent results of 36 inches, GPS and repeat until a boundary line can be drawn on ArcGIS.
Other options: Varis or other comparable device with verification

3 feet- 5 feet

- Soil Map/ 5ft layer, field characteristics, farm knowledge, air photos, soil probe (48inch and 60 inch) and Trimble GPS/ ESRI Collector
- Probe interval of 100 feet- 200 feet depending on other field specific characteristics
Depending on farm's intent
- Boundary line- Find where soils change from 48 inches, probe until consistent results of 60 inches, GPS and repeat until a boundary line can be drawn on ArcGIS.

Other options: Varis or other comparable device with verification

5 feet- 20 feet (NRCS Standard of 1 hole every 200 feet)

- Start with DNR and County 20 feet layer
- Mechanical excavation
- Soil probe with 20 feet extensions and Post Driver
- Hydraulic probe

****All holes larger than 1 inch must be filled in with Bentonite Slurry****

Note
A GPS point must be collected every probe point unless it is inconsistent with surrounding points. If rejection occurs at an inconsistent depth, probe in a 3 feet triangular pattern around the original point. When bedrock is reached you will feel it and will have a defined sound, different from a stone or boulder.

Field Characteristics
- Fracture traces
- Bedrock at the surface
- Escarpments
- Surface features (hills and depressions)
- Unfarmed areas

APPENDIX 8: FUNDING PROGRAM OPPORTUNITIES

The following is a listing of federal, state, and local conservation programs available to assist private landowners and agricultural operators to address resource concerns on their property. Utilization of conservation programs by private citizens will provide action necessary to meet the watershed conservation plan goals.

DATCP: Soil and Water Resource Management Program (SWRM)

The Department of Agriculture, Trade and Consumer Protection administers Wisconsin's SWRM program under the provisions of Chapter 92 Wisconsin Statutes and ATCP 50 Wisconsin Administrative Code. The Department assists the county land conservation committees by distributing funds through the SWRM grant program. These grant funds are used to help fund county soil and water conservation staff and support expenditures, as well as landowner conservation projects. These funds also can be used to support cooperators and other contracts to carry out special statewide activities.

USDA-FSA: Conservation Reserve Program (CRP)

CRP is a land conservation program administered by the Farm Service Agency (FSA). In exchange for a yearly rental payment, farmers enrolled in the program agree to remove environmentally sensitive land from agricultural production and plant species that will improve environmental health and quality. Contracts for land enrolled in CRP are 10-15 years in length. The long-term goal of the program is to re-establish valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat.

USDA-NRCS: Agricultural Conservation Easement Program (ACEP)

ACEP consists of two components: 1) an agricultural land easement component under which NRCS assists eligible entities to protect agricultural land by limiting nonagricultural uses of that land through the purchase of agricultural land easements and 2) a wetland reserve easement component under which NRCS provides financial and technical assistance directly to landowners to restore, protect and enhance wetlands through the purchase of wetlands reserve easements. Through the agricultural land easement component, ACEP helps farmers and ranchers keep their land in agriculture. The program also protects grazing uses and related conservation values by conserving grassland, including rangeland, pastureland and shrubland. Through the wetland reserve easement component, ACEP provides technical and financial assistance directly to private landowners and Indian tribes to restore, protect, and enhance wetlands through the purchase of a wetlands reserve easement or 30-year contract. Wetlands provide habitat for fish and wildlife, including threatened and endangered species, improve water quality by filtering sediments and chemicals, reduce flooding, recharge groundwater, protect biological diversity, and provide opportunities for educational, scientific and limited recreational activities.

USDA-NRCS: Conservation Technical Assistance Program (CTA)

The CTA program helps to develop and deliver conservation technologies and practices to private landowners, conservation districts, tribal, and other organizations. Through the CTA program, NRCS helps land managers develop comprehensive conservation plans that include activities which: reduce soil loss from erosion; address soil, water quality, water conservation, air quality, and agricultural waste management concerns; reduce potential damage caused by excess water and sedimentation or drought; enhance the quality of fish and wildlife habitat; improve the long-term sustainability of all lands, including cropland, forestland, grazing lands, coastal lands, and developed or developing lands; and facilitate changes in land-use as needed for natural resource protection and sustainability.

USDA-NRCS: Conservation Stewardship Program (CSP)

The purpose of CSP is to encourage producers to address resource concerns in a comprehensive manner by undertaking additional conservation activities and improving, maintaining, and managing existing conservation activities. CSP encourages agricultural and forestry producers to maintain existing conservation activities and to adopt additional ones on their operations. CSP provides opportunities to both recognize excellent stewards and deliver valuable new conservation. The program helps producers identify natural resource problems in their operation and provides technical and financial assistance to solve those problems in an environmentally beneficial and cost effective manner. CSP addresses seven natural resource concerns (soil quality, soil erosion, water quantity, water quality, air quality, plant resources, and animal resources) as well as energy. CSP is a voluntary program available through a continuous sign-up process, with announced cut-off dates for ranking and funding applications. This allows producers to submit their applications at any time. Applications are evaluated relative to other applications within similar geographic areas to facilitate a competitive ranking process among applications that face similar resource challenges.

USDA-NRCS: Environmental Quality Incentives Program (EQIP)

EQIP advances the voluntary application of conservation practices to promote agricultural production, forest management, and environmental quality as compatible uses. Conservation practices funded through EQIP help producers improve the condition of soil, water, air, and other natural resources. The program assists owners and operators of agricultural and forest land with the identification of natural resource problems and opportunities in their operation and provides assistance to solve identified problems in an environmentally beneficial and cost-effective manner. Although EQIP specifically addresses resource concerns on working farms and ranches, implementation of the program can create benefits that extend well beyond the farm. Conservation practices funded through EQIP contracts accrue significant environmental benefits, including improved grazing lands, improved air quality, enhanced fish and wildlife habitat, sustainable plant and soil conditions, improved water quality and quantity, reduced soil erosion, and energy conservation that provide important ancillary economic and social benefits. EQIP implementation is targeted to acres with the highest conservation benefit.

USDA-NRCS: Regional Conservation Partnership Program (RCPP)

Producers receive technical and financial assistance through RCPP while NRCS and its partners help producers install and maintain conservation activities. These projects may focus on water quality and quantity, soil erosion, wildlife habitat, drought mitigation, flood control, and other regional priorities. Partners include producer associations, State or local governments, Indian Tribes, non-governmental organizations, and institutions of higher education. RCPP contracts with producers are implemented through the Agricultural Conservation Easement Program, the Environmental Quality Incentives Program, the Conservation Stewardship Program, or the Healthy Forests Reserve Program, and through the Watershed and Flood Prevention Program in critical conservation areas. RCPP is designed to increase the restoration and sustainable use of soil, water, wildlife and related natural resources on regional or watershed scales by encouraging partners to cooperate with producers. Producers receive technical and financial assistance through RCPP while NRCS and its partners help producers install and maintain conservation activities. Partners contribute and leverage funding for partnership projects and are required to develop performance metrics and plans and report on the results.

USDA-NRCS: Conservation Activity Grants (CIG)

CIG are competitive grants that drive public and private sector innovation in resource conservation. CIG uses EQIP funds to award competitive grants to non-Federal governmental or nongovernmental organizations, American Indian Tribes, or individuals. Producers involved in CIG funded projects must be EQIP eligible. Through the NRCS CIG program, public and private grantees develop the tools, technologies, and strategies to support next-generation conservation efforts on working lands and develop market-based solutions to resource challenges. Grantees leverage the federal investment by at least matching it. CIG projects inspire creative problem-solving that boosts production on farms, ranches, and private forests - ultimately they improve water quality, soil health, and wildlife habitat.

DNR: Targeted Runoff Management Grant Program (TRM)

The TRM Grant Program offers competitive grants for local governments for the control of pollution that comes from diffuse sources, also called "nonpoint source (NPS)" pollution. Grants from the TRM Program reimburse costs for agricultural or urban runoff management practices in targeted, critical geographic areas with surface water or groundwater quality concerns.

APPENDIX 9: DATCP-SWRM COST-SHARE PRACTICES

Practice or Activity	ATCP 50 Reference	Fund Source
Manure Storage Systems	50.62	Bond
Manure Storage Closure	50.63	Bond
Barnyard Runoff Control Systems	50.64	Bond
Access Road	50.65	Bond
Trails and Walkways	50.66	Bond
Contour Farming	50.67	SEG
Cover and Green Manure Crop	50.68	SEG
Critical Area Stabilization	50.69	Bond
Diversions	50.70	Bond
Field Windbreaks	50.71	Bond
Filter Strips	50.72	Bond
Feed Storage Runoff Control Systems	50.705	Bond
Grade Stabilization Structures	50.73	Bond
Livestock Fencing	50.75	Bond
Livestock Watering Facilities	50.76	Bond
Milking Center Waste Control Systems	50.77	Bond
Nutrient Management for Cropland or Pasture	50.78	SEG
Pesticide Management Plans	50.79	Bond
Prescribed Grazing	50.80	Bond
Relocating or Abandoning Animals Feeding Operations	50.81	Bond
Residue Management	50.82	SEG
Riparian Buffers	50.83	Bond
Roofs	50.84	Bond
Roof Runoff Systems	50.85	Bond
Sediment Basins	50.86	Bond
Sinkhole Treatment	50.87	Bond
Streambank & Shoreline Protection	50.88	Bond
Stream Crossing	50.885	Bond
Strip-Cropping	50.89	SEG
Subsurface Drains	50.90	Bond
Terrace Systems	50.91	Bond
Underground Outlet	50.92	Bond
Waste Transfer System	50.93	Bond
Wastewater Treatment Strips	50.94	Bond
Water and Sediment Control Basins	50.95	Bond
Waterway Systems	50.96	Bond
Well Decommissioning	50.97	Bond
Wetland Restoration	50.98	Bond

APPENDIX 10: WDNR-TRM COST-SHARE PRACTICES

Practice or Activity	BMP Code
Access Roads and Cattle Crossing	R1
Animal Trails and Walkways	R2
Barnyard Runoff Control Systems	R3
Contour Farming	R4
Cover and Green Manure Crop	R5
Critical Area Stabilization	R6
Diversions	R7
Field Windbreaks	R8
Filter Strips	R9
Grade Stabilization	R10
Heavy Use Area Protection	R11
Lake Sediment Treatment	R12
Livestock Fencing	R13
Livestock Watering Facilities	R14
Manure Storage System Closure	R15
Manure Storage Systems	R16
Milking Center Waste Control Systems	R17
Nutrient Management	R18
Pesticide Management	R19
Prescribed Grazing	R20
Relocating or Abandoning Animal Feeding Operations	R21
Residue Management	R22
Riparian Buffers	R23
Roof Runoff Systems	R24
Roofs	R25
Sediment Basins	R26
Shoreline Habitat Restoration for Developed Areas	R27
Sinkhole Treatment	R28
Strip-Cropping	R29
Subsurface Drains	R30
Terrace Systems	R31
Underground Outlets	R32
Waste Transfer Systems	R33
Wastewater Treatment Strips	R34
Water and Sediment Control Basins	R35
Waterway Systems	R36
Well Decommissioning	R37
Wetland Development or Restoration	R38

APPENDIX 11: NRCS CONSERVATION PRACTICES

Practice & Code	Definition	Purpose
Conservation Cover (327)	Establishing and maintaining permanent vegetative cover.	Reduce soil erosion and sedimentation Improve water quality Improve air quality Enhance wildlife habitat Improve soil quality Manage plant pests Promote habitat for native pollinators
Conservation Crop Rotation (328)	A planned sequence of crops grown on the same ground over a period of time known as the rotation cycle.	Reduce sheet, rill & wind erosion, Maintain or increase soil health and organic matter content Reduce water quality degradation due to excess nutrients Improve soil moisture efficiency Reduce plant pest pressures Provide feed & forage for domestic livestock Provide food & cover habitat for wildlife, including pollinator forage, and nesting
Contour Buffer Strips (332)	Narrow strips of permanent, herbaceous vegetative cover established perpendicular to the hill slope and alternated with wider cropped strips that are also farmed on the contour.	Reduce sheet & rill erosion Reduce onsite or offsite transport of sediment and other waterborne contaminants downslope Increase water infiltration Enhance pollinator habitat
Contour Farming (330)	Aligning ridges, furrows and roughness formed by tillage, planting and other operations to reduce the velocity and direction of water flow to around the hillslope.	Reduce sheet & rill erosion Reduce transport of sediment, other solids and the contaminants attached to them Reduce transport of contaminants found in solution runoff Increase infiltration
Cover Crop (340)	Grasses, small grains, legumes, forbs and/or other herbaceous plants established for seasonal cover and conservation purposes.	Improve soil health & condition Improve soil structure/biodiversity Increase soil organic matter Manage excess nutrients in the soil Minimize and reduce soil compaction Promote biological nitrogen fixation Reduce wind abrasion damage Provide supplemental forage Reduce particle emissions Reduce water and wind erosion Soil moisture management Suppress weeds and break pest cycles

Critical Area Planting (342)	Establishing permanent vegetation on sites that have or are expected to have high erosion rates and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices.	Stabilize and restore riparian areas Stabilize stream and channel banks and shorelines Stabilize areas with existing or expected high rates of soil erosion by water or wind Rehabilitate and revegetate degraded sites that cannot be stabilized using normal establishment techniques
Field Border (386)	A strip of permanent vegetation established at the edge or around the perimeter of a field.	Reduce erosion from wind & water Protect soil & water quality Provide pollinator food & cover Provide wildlife food & cover Increase carbon sequestration Improve air quality
Filter Strip (393)	A strip or area of herbaceous vegetation that removes contaminants from overland flow.	Reduce suspended solids and associated contaminants in runoff Reduce dissolved contaminant loading in runoff
Forage & Biomass Planting (512)	Establishing adapted and/or compatible species, varieties or cultivars of herbaceous suitable for pasture, hay or biomass production.	Improve yield and plant longevity by providing guidance for selection and establishment of adapted and compatible plant varieties, species and cultivars Improve or maintain livestock nutrition and/or health Provide or increase forage supply during periods of low forage production Reduce soil erosion Improve soil and water quality Produce feedstock for biofuel or energy production
Grassed Waterway (412)	A shaped or graded channel that is established with suitable vegetation to convey surface water at non-erosive velocity using a broad and shallow cross section to a stable outlet.	Convey runoff from terraces, diversions or other water concentrations without causing erosion or flooding Prevent gully formation Protect/improve water quality
Karst Sinkhole Treatment (527)	Treatment of sinkholes in karst areas to reduce contamination of groundwater resources and to improve farm safety.	Improve ground and surface water quality Conserve soil and surface water resources Improve farm safety
Nutrient Management (590)	Managing the amount (rate), source, placement (method of application) and timing of plant nutrients and soil amendments.	Budget, supply and conserve nutrients for plant production Minimize the risk of agricultural nonpoint source pollution of surface and groundwater resources Properly utilize manure or organic by-products as a plant nutrient source Protect air quality by reducing odors and reactive nitrogen emissions (ammonia, inorganic oxidized forms and organic compounds) Maintain or improve the physical, chemical and biological condition of the land

Prescribed Grazing (528)	Manage the harvest of vegetation with grazing and/or browsing animals.	Improve the quality and quantity of forages for the benefit of the producer, livestock, wildlife and environment Protecting water quality Improving and maintaining the health of livestock plants and soil Reducing soil erosion Improving or maintaining riparian and watershed function
Residue & Tillage Management, No-Till (329)	Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round while limiting soil-disturbing activities to only those necessary to plant nutrients, condition residue and plant crops	Reduce sheet & rill erosion Reduce wind erosion Improve soil organic matter content Reduce CO2 losses from the soil Reduce soil particulate emissions Increase plant available moisture Provide food and escape cover for wildlife Reduce energy use
Residue & Tillage Management, Reduced Till (345)	Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round while limiting soil-disturbing activities used to grow crops in systems where the entire field surface is tilled prior to planting.	Reduce sheet, rill and wind erosion by keeping residue on the soil surface during environmentally sensitive times Reduce soil particulate emissions Maintain or improve soil condition Increase plant available moisture Provide food and escape cover for wildlife Reduce CO2 losses from the soil Reduce energy use
Stripcropping (585)	Growing planned rotations of crops or fallow land with strips of forages or small grains in a systematic arrangement of equal width strips across a field.	Reduce soil erosion from water and transport of sediment and other waterborne contaminants Reduce soil erosion from wind Protect growing crops from damage by wind-borne soil particles Enhance wildlife and pollinator habitat
Fence (382)	A constructed barrier to animals or people	Exclude livestock or wildlife from sensitive areas Confine livestock Regulate livestock access while permitting wildlife movement Subdivide grazing land to permit use of managed grazing systems Regulate access to areas by people, including vehicles and/or prevent trespass for safety purposes
Livestock Pipeline (516)	A pipeline and appurtenances installed to convey water for livestock or wildlife	Convey water to points of use for livestock or wildlife Reduce energy use Develop renewable energy systems
Watering Facility (614)	Providing drinking water to livestock or wildlife	Supply daily water requirements Improve animal distribution Provide a water source that is an alternative to a sensitive resource

Sprinkler System (442)	Distribution system that applies water by means of nozzles operated under pressure	Efficient and uniform application of water on irrigated lands Improve plant condition, productivity, health & vigor Prevent the entry of excessive nutrients, organics and other chemicals in surface and groundwater Improve condition of soil contaminate with salts and other chemicals Reduce particulate matter emissions to improve air quality Reduce energy use
Irrigation Pipeline (430)	Pipeline and appurtenances unsalted to convey water for storage or application as part of an irrigation water system	Conveyance of water from a source of supply to an irrigation system Reduce energy use Develop renewable energy systems
Irrigation Water Management (449)	Determining and controlling the volume, frequency and application rate of irrigation water	Improve irrigation water use efficiency Minimize irrigation induced soil erosion Degrease degradation of surface and groundwater resources Manage salts in the crop root zone Manage air, soil or plant micro-climate Reduce energy use
Waste Storage Facility (313)	Waste storage impoundment made by constructing an embankment and/or excavating a pit or dugout, or by fabricating a structure	Temporarily store waste
Waste Treatment (629)	Mechanical, chemical or biological treatment of agricultural waste	Improve ground and surface water quality by reducing the nutrient content, organic strength, and/or pathogen levels of agricultural waste Improve air quality by reducing odors & emissions Produce value added byproducts Facilitate desirable waste handing, storage or land application alternative Manage leachate and contaminated runoff emanating from livestock feed storage areas
Waste Transfer (634)	System using structures, conduits or equipment to convey byproducts (wastes) from agricultural operations to point of usage	Transfer waste (manure, manure processing derivatives, contaminated runoff and wastewater which includes milking center waste, leachate from feed holding areas and similar waste material) in a manner which safeguards the environment

APPENDIX 12: SAVE THE BAY-DOOR/KEWAUNEE WATERSHED WORKGROUP PRIORITIES

Door/Kewaunee Watershed Workgroup Priorities

11/16/2018

Note: Bold, blue font reflects actions from Nov. 29, 2017 meeting.

Topic	Cover Crops and Soil Health	Manure/Nutrient Management
Primary Objective	*Expand reach and access to information on new equipment and practices for cover crops and tillage options.*	*Expand reach and access to information on new equipment and practices/options for manure and nutrient management.*
Action	Share information, producer to producer, on experiences with cover crops and no till. Provide as many opportunities as possible (meetings, field days, social media, etc.) to share successes and setbacks. Encourage new adopters to start modestly, planting cover crops in plots side by side to compare results. Audience: Producers Timeline Status	Share information on management systems: treatment options, covered storage areas, irrigation, composting, grazing. Plans for each producer must be site specific; system will vary according to producer's needs and geology. Fiscal impact must be considered and evaluated. Audience: Producers Timeline: Status
Action	Facilitate meetings with farmers, nutritionists and agronomists to accelerate the learning curve Audience: producers, agronomists, nutritionists Status **PPF, Extension and Demo Farms currently hosting a number of field days and programs.**	Facilitate conversations on nutrient management re: safety, application on a growing crop, economics, agronomics, soil health Audience: Producers, agronomists Timeline: Status:
Action	Contact Kevin Kimberley, Kimberley AG Consulting (Maxwell, IA) for possible presentation on tillage practices. ✓ Status: Emailed Kimberley AG Consulting; awaiting response. (515.967.2583) brock@kimberleyagconsulting.com	Share information gleaned from Fair Oaks Dairy (Indiana) regarding its manure management program and systems. Audience: producers, stakeholders, agencies, PDPW Timeline: Status:
Action	Pin cover crop locations on Google Maps with photos and short descriptions. Posts could be referenced via other web pages and sites and/or through text messaging. Audience: Producers, agronomists, public **Pins and virtual tours of cover crops could best be done by PPF, Demo Farms, counties, etc. Important to encourage agronomists to get to fields with cover crops.**	As Rep. Gallagher to Consider federal biogas legislation, which allows for a 30% tax credit on equipment if producer captures 50% of N or P. Audience: legislators ✓ Status: H.R.2853 - Agriculture Environmental Stewardship Act of 2017 is in the Science, Space and Technology Committee for review; Rep. Gallagher is a cosponsor.
Action	Survey producers regarding interest in sharing equipment over a longer term; investigate feasibility of shared equipment. Audience: producers, custom contractors Timeline: Status:	Survey producers regarding interest in sharing equipment over a longer term; investigate feasibility of shared equipment. Audience: producers, custom haulers Timeline: Status:
Action	Post field days, presentations, etc., on *Save the Bay* shared Google calendar Audience: agencies, STB participants; Timeline: ongoing ✓ Status: completed **Extension, PPF, Demo Farms and other agencies are effective in promoting events and field days.**	

Acronyms	
ACEP	Agricultural Conservation Easement Program
AU	Animal Units
ATCP	Agriculture, Trade and Consumer Protection
BMP	Best Management Practice
BOD	Biological Oxygen Demand
CAFO	Concentrated Animal Feeding Operation
CCA	Certified Crop Advisors
CFU	Colony-forming units
CIG	Conservation Activity Grants
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CSP	Conservation Stewardship Program
CTA	Conservation Technical Assistance Program
DATCP	Department of Agriculture, Trade and Consumer Protection (Wisconsin)
DBA	Dairy Business Association
DFC	Desired Future Conditions
DNR	Department of Natural Resources (Wisconsin)
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
ERW	Exceptional Resource Water
EVAAL	Erosion Vulnerability Assessment for Agricultural Lands
FPP	Farmland Preservation Program
FSA	Farm Service Agency
GIS	Geographic Information System
GLRI	Great Lakes Restoration Initiative
GPS	Global Positioning System
HUC	Hydrologic Unit Code
IBI	Index of Biological Integrity
LAC	Local Advisory Committee
LAMP	Lake-wide Management Plan
LCC	Land Conservation Committee (Kewaunee County)
Lbs/year	Pounds per year
LWCD	Land & Water Conservation Department (Kewaunee County)
LWRMP	Land & Water Resource Management Plan
Mg/L	Milligram per liter
N	Nitrogen
NMP	Nutrient Management Plans
NOD	Notice of Discharge
NOI	Notice of Intent
NONC	Notice of Non-Compliance
NPPH	National Planning Procedures Handbook
NRCS	Natural Resources Conservation Service
ORW	Outstanding Resource Water
P	Phosphorus
PI	Phosphorus Index
POWTS	Private Onsite Wastewater Treatment Systems
PPF	Peninsula Pride Farms

PPM	Parts per million
PRESTO	Pollutant Load Ration Estimation Tool
RCPP	Regional Conservation Partnership Program
SNAP	Soil Nutrient Application Planner
STEPL	Spreadsheet Tool for Estimating Pollutant Loads
SWRM	Soil and Water Resource Management
TAG	Technical Advisory Group
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
T Value	Tolerable Soil Loss
t/ac/yr	Tons/acre/year
TRM	Targeted Runoff Management
TSI	Trophic State Index
TSS	Total Suspended Solids
UNT	Unnamed Tributary
USDA	United States Department of Agriculture
USGS	United States Geological Service
USLE	Universal Soil Loss Equation
UWEX	University of Wisconsin Extension
WAV	Water Action Volunteers
WPDES	Wisconsin Pollutant Discharge Elimination System
WQMA	Water Quality Management Area
WQS	Water Quality Survey

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Being duly sworn, doth depose and say that she/he is an authorized representative of the Green Bay Press Gazette, a newspaper published in Green Bay, Wisconsin, and that an advertisement of which the annexed is a true copy, taken from said paper, which was published therein on:

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Published Dates:	01/25/19, 02/01/19

(Signed) Kevin Yang **(Date)** 2-4-19

Legal Clerk

KAZOUA YANG NOTARY PUBLIC STATE OF WISCONSIN

Signed and sworn before me

Kazoua Yang

My commission expires 11/9/22

Public Notice

A public scoping hearing regarding the 2020 through 2029 Kewaunee County Land & Water Resource Management Plan will be held on Tuesday, February 12th, 2019. The hearing will begin at 10:00 A.M. and close at 12:00 P.M. The hearing will be held at the Kewaunee County Land & Water Conservation Department, located at the Luxemburg Fairgrounds, 688 Third Street in Luxemburg, Wisconsin 54217.

The Land & Water Resource Management Plan outlines the implementation and enforcement strategy that the Kewaunee County Land & Water Conservation Committee and Department will follow in local administration of chapter NR 151, Wis. Adm. Code, (i.e. Wisconsin's Runoff Management Standards and Prohibitions).

Copies of the Plan and/or Plan Executive Summary can be obtained at the Land & Water Conservation Department (920-845-9299). A copy can also be viewed at http://www.kewauneecounty.org/

Public comment on the Plan may be given in person at the public hearing. Written comments can also be sent to Donna Sievers (donna.sievers@kewaunee-lcd.org) or mailed to the Land & Water Conservation Department. All written comments must be received by 4:30 P.M. on February 12th, 2019.

Pub: Jan. 25 Feb. 1, 2019 WBAULP

KEW CO ZONING DEPT

Re. Feb. 12th

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