Manitowoc County

Land and Water
Resource Management Plan
January 1, 2016 to December 31, 2025

As compiled by the Manitowoc County Soil and Water Conservation Department
4319 Expo Drive P.O. Box 935, Manitowoc, WI 54221-0935

Acknowledgements

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Table of Contents

Chapter 1

Introduction

Purpose

Mission Statement

Plan Development

History of the Conservation District

Manitowoc County Soil and Water Conservation Department

Purpose of the Land and Water Conservation Plan

Wisconsin Chapter 92 and Chapter ATCP 50.12 require counties to develop a Land and Water Resource Management Plan. The intent of this plan 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 the county's land and water resources.

Mission Statement for Manitowoc County Soil and Water Conservation Department

> "Protecting our environment to enhance the quality of life for all County citizens. The responsibilities of the Soil & Water Conservation Department include erosion, runoff and sedimentation control and the conservation of soil, water, and related resources in Manitowoc County."

The primary means of protecting our environment is by providing technical and financial assistance to landowners and land occupiers. The Department also assists town, city, and village governments with land use planning, standards, and technical assistance. The department is also responsible for enforcing county ordinances protecting soil and water resources.

Plan Development Process

The Soil and Water Conservation Department developed this 10-year land and water management plan by utilizing a three-phase planning process:

First Phase: **Public Involvement**

- Create a Local Advisory Committee (LAC) that includes a broad spectrum of public interest and perspectives:
  - Educate Local Advisory Committee members of current programs, achievements, and quality of Manitowoc County's Natural Resources
  - Identify, select, and analyze areas of concern
  - Develop a vision for protecting and enhancing Manitowoc County's Natural Resources
- Gather public opinion via community survey:
  - Distribute surveys to various members of the community to determine their concerns and values regarding Natural Resources in Manitowoc County

Second Phase**: Technical Involvement**

- Create a Technical Advisory Committee that includes professionals from University of Wisconsin Extension, Wisconsin Department of Natural Resources, Natural Resource Conservation Service, Department of Agriculture, Trade and Consumer Protection, other

county departments, Farm Service Agency and the Soil and Water Conservation Department:
  - Review Local Advisory Committee alternatives and best solutions
  - Determine what changes are necessary to implement alternatives and solutions

***Third Phase*: Completion and Adaptation of Plan**

- Local Advisory Committee reviews draft plan and offers suggestions for changes
- Draft plan goes to Wisconsin Department of Agriculture, Trade, and Consumer Protection, Wisconsin Department of Natural Resources, and the United States Department of Agriculture for review and comment
- Land Conservation Committee holds public hearing on plan
- Present plan to State Land and Water Conservation Board
- Wisconsin Department of Agriculture, Trade, and Consumer Protection approves or denies the plan
- Manitowoc County Board approval
- Implement plan
- Review and monitor success

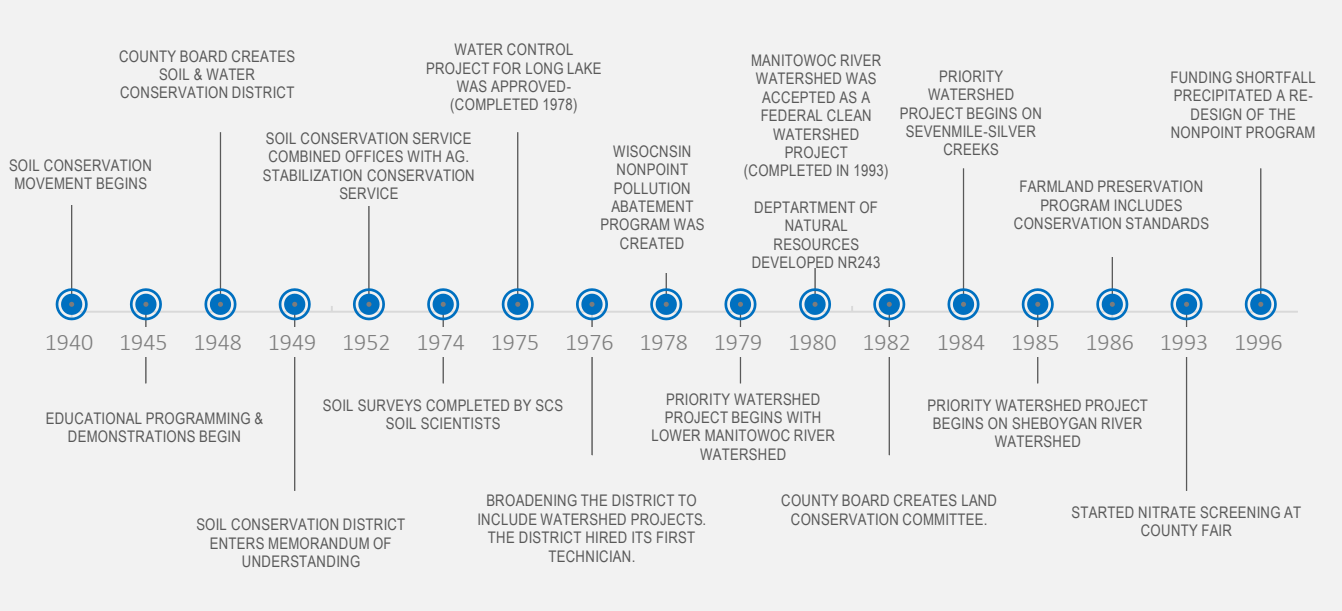
History of Manitowoc County

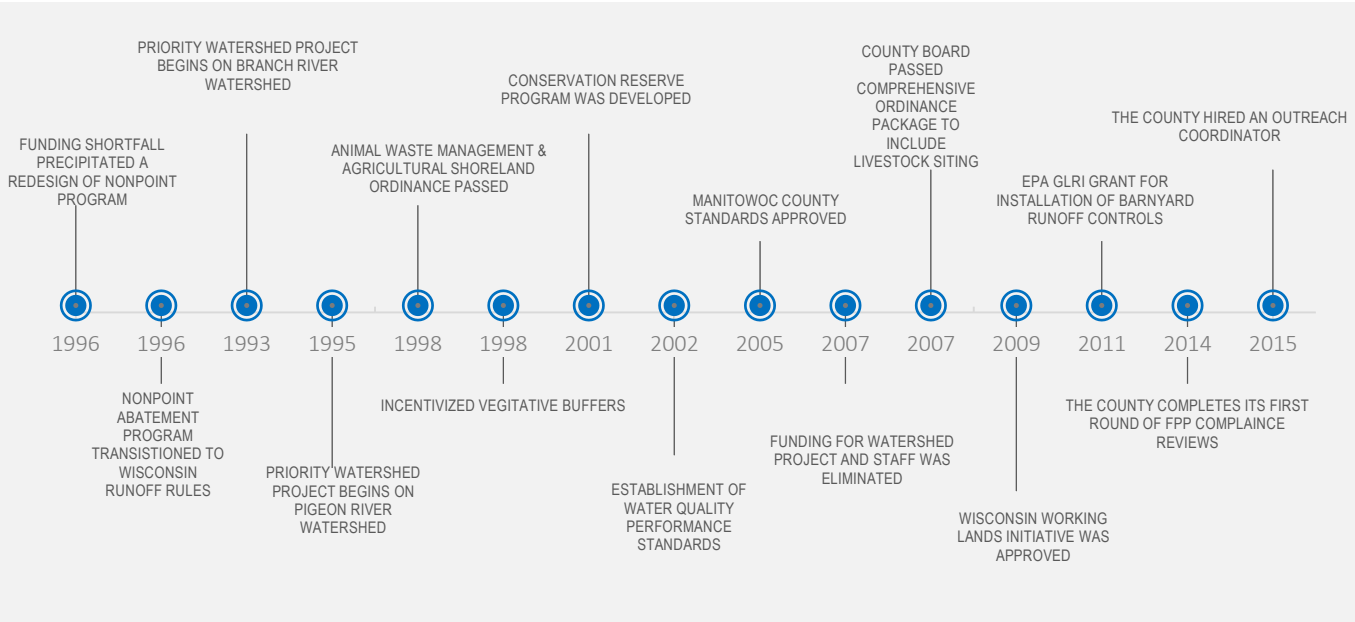
"Manitowoc" is Native American word translated as the habitation of the Good Spirit and the Devil's Den. The name resulted from a tradition among the Native Americans that a nondescript being was seen at various times at the mouth of the River. Different Native American tribes occupied the territory of Manitowoc at different times, though the Menominee were generally acknowledged as owners of the land. When European settlers arrived, the Native Americans did not resist their presence.

The first settlements were made in 1836 in Mishicot, Manitowoc, Two Rivers, Shoto, and Manitowoc Rapids. Numerous changes took place in the next decade as German, Norwegian, Irish, and Bohemian immigrants came to America in large numbers to create a new life in this area. Early settlements were primarily engaged in the lumber industry. Some efforts were also devoted to developing the waterpower that existed on the Manitowoc and Twin Rivers.

The fishing industry soon developed along the lakeshore. As the land was cleared, agricultural production expanded. In the 1850's, the European immigrants brought the skills and tradition to make farming a strong and stable base in the County. As the lumber industry was declining, the tanning and furniture industries grew, and they made use of the less valuable lumber and remaining hardwoods. During the same period, the shipbuilding, malting, and brewing industries began to grow.

History of Soil and Water Conservation in Manitowoc County*: 1940-2015





*Explanation of events below.

1940 Soil Conservation Movement Begins:

The soil conservation movement began after Manitowoc County's agriculture grew its Soil Fertility Program and increased its crop production without knowledge of soil conservation practices.

Upon request of farmers who farmed on sandier soils, the County Agent, Harvey Weaver, invited professor Otto Zeasman, from the University of Wisconsin Soils Department, to discuss wind erosion control practices. Zeasman has since been acclaimed as the Father of Soil Conservation in Wisconsin for the progress he made.

The Soil Fertility Program advanced and farm records were studied by Professor I.F. Hall of the University. He advised farmers on soil conserving rotations as part of their soil management program. For example, where the fields were hilly and soil more erosive, farmers were advised to crop only continuous hay.

1945 Educational Programing and Demonstrations:

The Agricultural Committee for the County Board gained support from the Wisconsin State Soil Conservation Committee to hire an employee who would be responsible for educational programs and demonstrations. Mr. Donald W. Niendorf, Erosion Control Agent for the Wisconsin State Soil Conservation Committee, was assigned to Manitowoc in 1947 to carry out educational and demonstrational work in soil conservation with interested farmers. During 1947 and 1948, soil-conserving practices were demonstrated on various farms and numerous meetings were held explaining a good land use program.

1948 County Board Creates Soil Conservation District:

The Manitowoc County Agricultural Committee presented a resolution to the Manitowoc County Board to formulate a Soil Conservation District. The County Board passed the resolution, thereby creating the Manitowoc County Soil Conservation District (later to be called Soil and Water Conservation Department). County Agent John Buchholz, 4-H Agent R.J. Rensink, Don Niendorf, and vocational agricultural teachers, were instrumental in conducting the educational program and creating an interest in the soil conservation movement.

1949 Soil Conservation District enters Memorandum of Understanding:

Following the organization of the District Board of Supervisors, the District entered into a Memorandum of Understanding with the United States Department of Agriculture on March 30, 1949. This memoranda, and revisions to follow, provided a basis upon which the agencies of the

Department cooperated with and furnished aid to the District. This enabled the District to obtain technical help in planning and application of conservation practices.

As a result of this agreement, the Soil Conservation Service (SCS) assigned Norman E. Schmeichel to Manitowoc on June 1, 1949, to aid the District in carrying out its program. District Conservationist Schmeichel made arrangements with the District to set up an office in the old Armory building on South 8th Street.

1952 Soil Conservation Service combined offices with Agriculture Stabilization Conservation Service:
Under orders from the Secretary of Agriculture, the SCS combined offices with the ASCS office to better accommodate farmers for a "one-stop service". The offices were located in the City Safety Building and later moved across from the Courthouse Annex.

1974 Soil Surveys Completed:
The thrust of the Agricultural Conservation Program (ACP) at that time was toward production-oriented practices, mainly drainage practices. This created an extra heavy workload for the SCS technical staff. Consequently, two Soil Conservation Service technicians were assigned to the Manitowoc Field Office.

Through a cost-sharing agreement between the District and the Soil Conservation Service, the County was soil surveyed by Soil Conservation Service soil scientists, headed up by party leader Augustine Otter. This accelerated soil survey program was completed in 1974. This was a milestone in the District's history of providing county soils information for both agricultural and urban land uses. The published soil survey was issued in February 1980.

1975 Water Control Project Approved:
The District program took on new dimensions in the early 70's when landowners in the Brillion area and around Long Lake in the Town of Rockland applied to both the Manitowoc and Calumet County Soil and Water Conservation Department for assistance in solving a flooding problem. Federal money was approved for a project in 1975. The Long Lake water control and outlet structure was completed in the spring of 1978.

1976 Broadening the District to Include Watershed Projects:
The broadening of the District Program to include watershed projects resulted in a need for more technical assistance. As a result of a Soil Conservation Service personnel ceiling limiting federal assistance, the District hired its first technician, Tom Ward, in March 1976; and followed with an additional technician, William Mrotek in 1978. With the additional assistance to coordinate and implement the many authorities of the District, a new District identity began to emerge.

1978 Wisconsin Nonpoint Pollution Abatement Program was Created:

Prior to the mid-1970's, the Soil and Water Conservation District primarily focused on erosion control management to improve soil productivity. Public awareness of degrading water quality and a better understanding of interrelated natural resource systems caused the legislators to take a broader approach with Conservation Programs. In 1972, Congress passed the Federal Pollution Control Act requiring the control of point and nonpoint pollution. Wisconsin followed and in 1978 created the Wisconsin Nonpoint Pollution Abatement program.

1979 Priority Watershed Projects Begin:

Five watersheds were treated for agricultural pollution due to animal waste and sediment that was reaching our streams and lakes:

1979: Manitowoc River Watershed Project Begins: In 1980 the Manitowoc River Watershed was accepted as a Federal Clean Watershed Project that was completed in 1993
1984: Seven Mile/Silver Creek Watershed Project Begins
1985: Sheboygan River Watershed Project Begins
1993: Branch River Watershed Project Begins
1995: Pigeon/Meeme River Watershed Project Begins

1980 Department of Natural Resources developed NR243:

Wisconsin Department of Natural Resources developed NR243 to regulate the discharge of animal waste to the waters of the State. This was the first time agriculture was regulated for natural resource protection. Manitowoc County chose to enter into an agreement with Wisconsin Department of Natural Resources and the Wisconsin Department of Agriculture, Trade, and Consumer Protection to assist the livestock community with technical assistance regarding compliance to the new regulation.

1982 The County Board creates a Land Conservation Committee:

On July 1, 1982, the legislature dissolved the Soil and Water Conservation District that had special powers separate from County government, and required the County Board to create a Land Conservation Committee. This established the program with County government and created the opportunity for locally designed and locally led conservation.

1986 Farmland Preservation Program includes Conservation Standards:

The Farmland Preservation Program was amended to require all farmland receiving tax credits would need to meet Soil Conservation Standards. This concept of requiring conservation with the acceptance of public dollars was also expanded by the Federal Government in the 1985 Farm

Bill. The Bill required farmers to have a Conservation Plan on highly erodible fields if they received commodity payments from public tax dollars. Landowners who chose not to adopt conservation practices would not be eligible for public dollars.

1993 Started Nitrate Screening at the County Fair:

Soil and Water Conservation Department started offering homeowners with private wells free well water screening for nitrates at the County Fair every year. The results continue to be logged into a database. A map is annually updated and used for identification of areas susceptible to groundwater contamination.

1996 Nonpoint Abatement Program Transitioned to Wisconsin Runoff Rules:

The Wisconsin Nonpoint Abatement Program changed the direction of soil conservation programming from improving productivity to water conservation. However, by 1996 a projected $18 million dollar funding shortfall in the program and a denial of increased bonding authority precipitated a re-design of the nonpoint program. By 1999, Legislative Act 9 started a formal phase out of the watershed Nonpoint Abatement Program. By 2002, the Wisconsin Runoff rules were passed to replace the Nonpoint Program. The Branch Watershed Project was completed at the end of 2007 and the Pigeon/Meeme project was completed by the end of 2009, under the Nonpoint Abatement Program.

1998 Animal Waste Management and Agricultural Shoreland Ordinance was Passed:

In November, 1998, Manitowoc County, by public referendum, passed an Animal Waste Management and Agricultural Shoreland Ordinance which was designed to protect surface and groundwater from animal waste contamination. The intent of the ordinance was to establish standards to prevent water pollution for all farm producers, regardless of their program involvement.

1998 Incentivized Vegetated Buffer Strips:

The Manitowoc County Fish & Game Protective Association partnered with the Soil and Water Department to provide local conservation dollars to private landowners to set aside a vegetated buffer of grass or trees adjacent to stream channels that would improve water quality and enhance wildlife habitat. This project was one of the first in the State to encourage demonstrations of buffer strips using non-government dollars.

2001 Conservation Reserve Enhancement Program (CREP) was Developed:

Wisconsin established a Conservation Reserve Enhancement Program called CREP, which provided $40 million State dollars to leverage $200 million Federal dollars to enroll a State goal of 100,000 acres of buffered stream areas. This was an opportunity to provide financial assistance

to landowners thru 15-year agreements or perpetual conservation easements that would offset the loss of cropland to vegetated buffer and improve water quality.

Manitowoc County entered into contract with the Wisconsin Department of Agriculture to provide cost-share assistance to county landowners. The contracts were later enhanced with Great Lakes Protection Funds thru Wisconsin Department of Agriculture, Trade and Consumer Protection to improve participation. By 2007, over 438 acres of buffers were installed, protecting an estimated 190,000 feet of streams.

2002 Establishment of Water Quality Performance Standards:

The Wisconsin Runoff Rules were passed on October 1, 2002. The Wisconsin Department of Natural Resources Rule NR 151 set water quality performance standards and prohibitions for farms and urban communities. The rules were a result of a process that identified basic performance objectives expected of farmers, transportation facilities and municipalities to meet water quality Standards. Prohibitions for agriculture included: prevention of direct runoff from feedlots or manure facilities, limited access of cattle to State waters, and no unconfined manure piles. They were also required to repair any failing or leaking manure storage structures that threaten health or ground water. Standards identified a requirement for farmers who grow crops to meet tolerable soil loss and follow a nutrient management plan designed to limit entry of nutrients into State waters.

The Wisconsin Department of Agriculture, Trade, and Consumer Protection established administrative rule ATCP 50 which identifies conservation practices that farmers must follow to meet performance standards. The County Soil & Water Conservation Department has the primary responsibility for implementing the Agricultural runoff Standards.

The concept of standards was also added to the Farmland Preservation Law Ch. 91, Statutes, requiring landowners claiming tax credits to comply with County Soil & Water Conservation Standards.

2005 Manitowoc County Standards Approved:

Manitowoc County's Standards were approved on June 7, 2005. Participants of the Farmland Preservation program were required to meet the State water quality performance standards and prohibitions. The Standards can be viewed on the County web site: www.co.manitowoc.wi.us.

2007 Funding for Watershed Project and Staff was Eliminated:

State revenues for County watershed project staff was eliminated at the end of 2007. Combined with tax levy caps on County government, the Soil and Water Conservation Department has seen

significant staff reductions. Soil and water conservation programming started to focus on bringing high priority landowners with critical sites into compliance with State Standards and Prohibitions through compliance with County ordinances.

2007 County Board passed Comprehensive Ordinance Package:

The majority of state prohibitions in NR 151 have been codified in Manitowoc County ordinances thru these changes.

Chapter 19: Animal Waste Management Ordinance Provisions

The provisions included a public referendum on Chapter 19, Animal Waste Management that added additional restrictions on field application of animal waste. The provisions included a prohibition of animal waste applied to within 100 feet of sinkholes, wells and exposed bedrock. It also established winter application standards for animal waste applied from December 1 and ending April 15. Ordinance revisions include new groundwater protection provisions that are also included in Northeast Wisconsin Karst Task Force Recommendations.

Chapter 26: Animal Waste Storage Ordinance

Regulates construction, operation and closure of animal waste storage facilities.

Chapter 27: Agricultural Shoreland Management Ordinance

Regulates agricultural activities within 300 feet of a stream or 1000 feet of a Lake.

Chapter 28: Livestock Facility Licensing Ordinance

This ordinance went into effect on January 1, 2007 as authorized by the Wisconsin Livestock Facility Siting Law s. 93.90 Stats. The ordinance requires any new livestock facility with over 750 animal units or an expanding facility that will exceed 750 animal units as a result of that expansion, to obtain a license that meets the standards established in Wis. Admin. Code Ch. ATCP 51. The process will require livestock operations with over 750 animal units to meet the State Performance Standards and Prohibitions without the need to provide cost sharing and require operations with more than 1000 animal units to meet State odor standards for their facilities.

2009 Wisconsin's Working Lands-Farmland Preservation Program Initiative Approved and Revised:

Farmland Preservation Program was revised to award participants using flat rates, increasing participation in Farmland Preservation Program. All participants are reviewed for compliance with State Conservation Standards. Participants in full compliance are issued a Certificate of

Compliance. Farms that do not meet Wisconsin State Conservation Standards are provided a Compliance Schedule to meet State Conservation Standards.

2011 EPA/GLRI Grant for Installation of Barnyard Runoff Control Systems:

From 2011 to the end of 2014, all active barnyards within 300 feet of streams with significant runoff ratings were corrected. The Manitowoc County Soil and Water Conservation Department utilized a GIS-based, barnyard inventory to prioritize sites to correct. The project goal was to correct a minimum of 20 barnyard sites. The project funded 15 barnyard sites, 6 sites were corrected by farmers without cost sharing, and 6 of the priority barnyards were abandoned during the project. Sites were systematically corrected starting with the highest pollution ratings in year one and ending with the lowest rated sites.

2015 Soil and Water Conservation Department Hires Outreach Coordinator/Administrative Assistant:

A new position was developed within the department to focus on public outreach and education. The person in this position is responsible for promoting various educational activities as well as providing daily administrative duties.

Future

The Soil and Water Conservation Department will need to be creative in working with citizen groups, other municipalities, private consultants, and State and federal agencies to carry out the work of protecting and improving our County's natural resources, which local budgets cannot provide.

Chapter 2

Public Participation

Introduction

Public Survey

Local Advisory Committee

Technical Advisory Committee

Manitowoc Soil and Water Conservation Department

Introduction:

In developing public input for the Land and Water Resource Plan, consideration was given to a variety of sources. Manitowoc County has always promoted the use of public involvement to help identify priorities. Many groups and individuals have provided public comment or input on topics related to natural resources. Data from this ongoing public involvement process is summarized below.

Public Survey

In 2014, The Soil and Water Conservation Department developed a survey for distribution to various members of the community with the purpose of gaining focus on what the public believes the greatest environmental concerns are. The following questions were asked:

1) Which resources are most important to protect and improve?
2) What concerns are most important to devote time to in order to improve resources?
3) What tools and strategies would have the greatest impact?

The department used their answers to help guide them during the planning and development of the 10 year Land and Water Plan.

Survey Demographics

250 Surveys completed by:

Farm organizations, Environmental Groups, UW Extension Contacts, and County Fair Attendees

Location of Residence:

80% Rural/20% Urban

Professions/organizations:

The following percentages are only approximations due to unanswered questions and multiple profession listings.

11% of survey takers work for government agencies (9 are on county board)

45% of survey takers in Ag Professions (30 respondents were in both professions listed)

- 25% AgriBusiness
- 32% Ag Producer

27% of survey takers were members of an environmental group

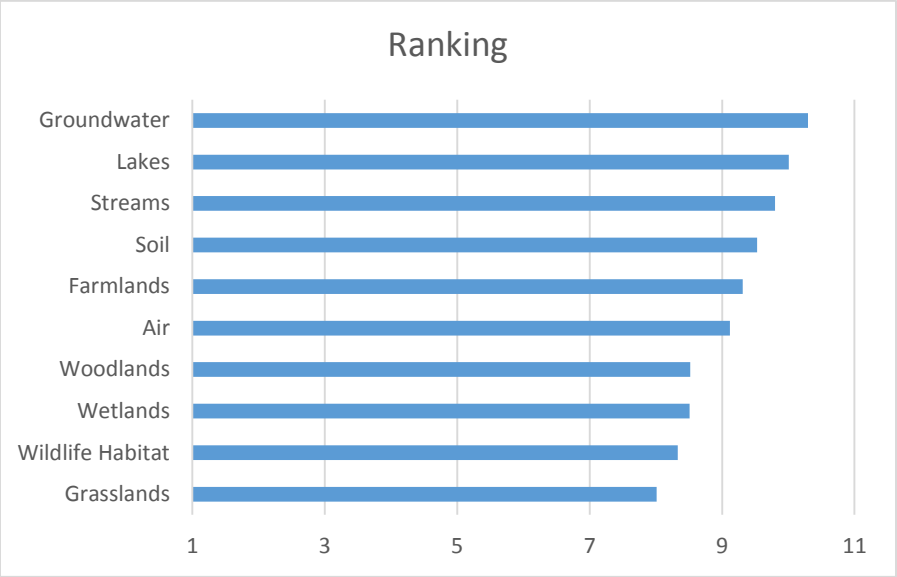
Age:

66% were 51 and over
26% were 31-50
8% were below 30

Survey Results

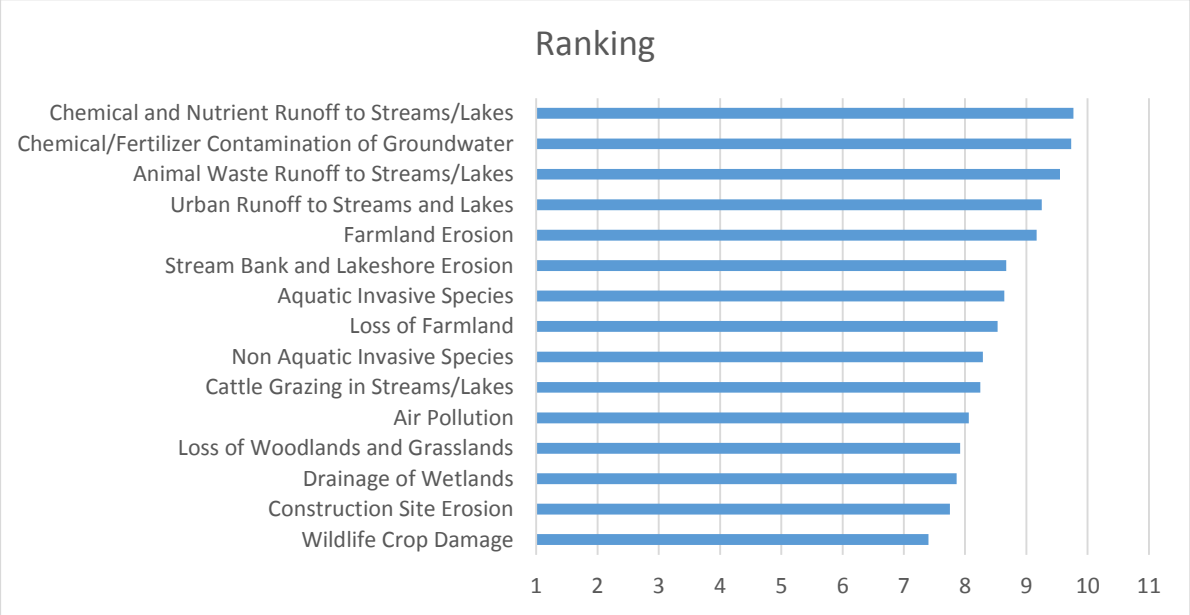
The survey was designed on a 0 to 10 scale: 0 being definitely not important and 10 being extremely important. In this case, the highest rating is 11 because zero was given a value.

Question 1: Which resources are most important to protect and improve in Manitowoc County?



Resource	Ranking
Groundwater	10.30
Lakes	10.01
Streams	9.80
Soil	9.53
Farmlands	9.31
Air	9.12
Woodlands	8.52
Wetlands	8.51
Wildlife Habitat	8.33
Grasslands	8.01

Question 2: What concerns are most important to devote time to?

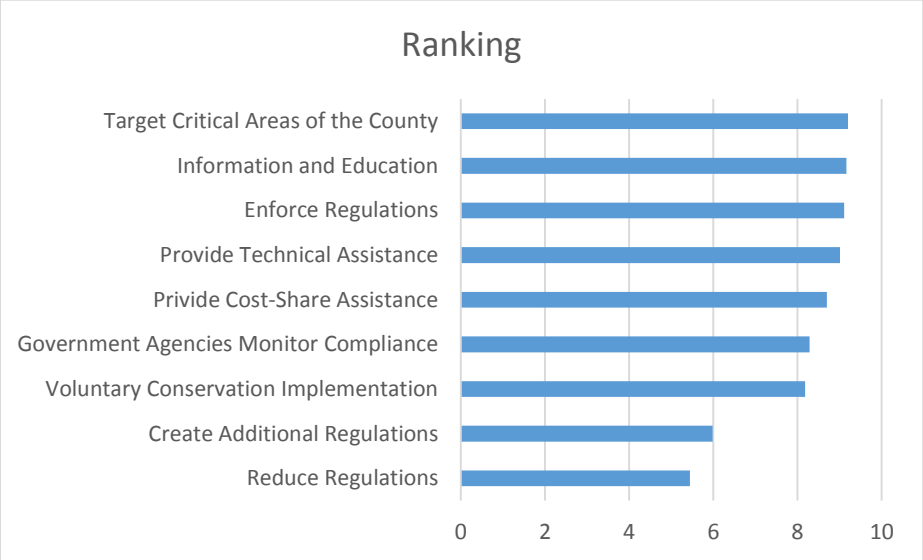


Concern	Ranking
Chemical and Nutrient Runoff to Streams/Lakes	9.77
Chemical/Fertilizer Contamination of Groundwater	9.73
Animal Waste Runoff to Streams/Lakes	9.55
Urban Runoff to Streams and Lakes	9.25
Farmland Erosion	9.17
Stream Bank and Lakeshore Erosion	8.67
Aquatic Invasive Species	8.64
Loss of Farmland	8.53
Non Aquatic Invasive Species	8.29
Cattle Grazing in Streams/Lakes	8.25
Air Pollution	8.06
Loss of Woodlands and Grasslands	7.92
Drainage of Wetlands	7.86
Construction Site Erosion	7.75
Wildlife Crop Damage	7.40

Additional **environmental concerns** according to respondents:

- Wildlife damage
- Outdoor wood burners causing air pollution
- Demise of river fishing
- Rapid increase in CAFOS and lack of staff to monitor their activities
- Grassland habitat protection and promotion is important to migrating bird species
- Manure spraying
- Private properties with extra unsanitary machinery

Question 3: What tools & strategies would have the greatest impact on improving our natural resources?



Strategy	Ranking
Target Critical Areas of the County	9.20
Information and Education	9.16
Enforce Regulations	9.11
Provide Technical Assistance	9.01
Provide Cost-Share Assistance	8.70
Government Agencies Monitor Compliance	8.29
Voluntary Conservation Implementation	8.18
Create Additional Regulations	5.98
Reduce Regulations	5.44

Additional **tools and strategies** according to participants:

- Review/Revise existing regulations
- Reduce paperwork
- Increase water testers
- Regulate lawn care companies
- Provide adequate staffing for departments
- Consistent and standardized regulation and enforcement
- Limit mining of sand
- Study urban runoff
- Free drinking water analysis on a regular basis.
- Incorporate environmental education into K-12 curriculum in age-appropriate ways: Project WET, Learning Tree
- Include education at the public school level. All children have to have the regular opportunity to be out in nature, in every way: Water, woodlands, farms, etc. This has already begun as "Forest Kindergarten" and "Experiential Science Teaching in upper grades. All science as all knowledge, is based on experience. Let's get us out there!
- Enforce regulations with stiff fines and education to abusers
- Elect a Green Representative
- Map invasive and runoff and provide mitigations for each
- Set goals, celebrate success
- Regulate farms that are less than 750 animal units

TOOLS AND STRATEGIES
According to Manitowoc County residents, targeting critical areas, information and education, and providing technical assistance would make the greatest impact in protecting our natural resources.

Additional suggestions from respondents:

- It is high time that this subject receives attention it deserves. We are asking more and more of our producers to increase production per acre. That acre needs to be well protected for there are very few left to be returned to production.
- Work together with LNRP, they are very active in Manitowoc with many topics mentioned in the survey.
- Large corporate farms, especially dairy are the biggest threat to our state. The number of heads per acre should be regulated and proper disposal of manure should be strictly enforced.
- We need rules and regulations that are practical and make sense, not just to improve someone's chances at re-election. They should not be onerous but fair to both sides making sure our water, air, ground, and animals are protected for the future.
- Controlling invasive species is important before they spread further. Do this through education and direct action. It is more effective and cheaper now than later.
- Use less road salt.
- Keep citizen advisory board to the DNR. Keep politics out of decision making. We are very concerned about budget cuts, staffing cuts, the moratorium on purchasing land for

conservation-naming rights to our parks. They are nuts. We could do more by eliminating their salaries and their justification for their own existence.

- Help small home owners who live in close proximity to large farms. Our well has 30ppm of nitrates.
- Limit fracking
- Reclaim old gravel pits by creating a very large tax breaks to anyone who restores the pits
- Use Renewable Energy, including wind
- Limit EPA input
- Soil and water should not be allowed to trespass on private property without consent of landowner or farm operator unless immediate danger to environment, complaint from resident who does not like the way something looks, sounds or smells is not excuse to trespass. Any time staff from soil and water visits fields or woodlands the owner/operator should be contacted immediately. It is a safety issue as well as private property rights.
- Hire private regulators
- Improve recycling
- Improve awareness
- Get concerns in media and news
- We need to have an invasive species program. I see so many new patches of invasive species starting along road sides - city, county, state properties. They eventually spill into private land.
- Land owner awareness
- Rural residential subdivisions should be expanded
- Illegal dumping of garbage and toxins in rural areas by both homes and urban residents. Many small farms had less issues. Anything large like CAFOs operate without whole picture in mind. Their soils are dead and eroding. It must be stopped

Results Summary

Top 3 resources to protect:

Groundwater, Lakes, Streams→ WATER

Top 3 concerns:

Chemical runoff into streams and lakes, chemical fertilizer contamination of groundwater, animal waste contamination of ground water→ WATER CONTAMINATION

Top 3 tools and strategies:

Target critical areas, information and education, enforce regulations

Local Advisory Committee

The Soil and Water Conservation Department assembled a Local Advisory Committee to identify and address environmental concerns of the community. The individuals on the committee represented a broad spectrum of public interest and perspectives:

Elmer Dvoracheck	Farm Owner; Manager
Dick Halverson	Dairy Farmer; Land Owner
James Lepich	Twin Cities Vue Dairy LLC
Diane Ott	Speedy Agronomic Consulting LLC
Terri Wilfert	Wilfert Farms LLC; FSA Representative
John Durbrow	Manitowoc County Lakes Association
Mike Glandt	Groundwater Advocate
Jim Kettler	LNRP Executive Director
Bryce Larson	Manitowoc County Fish and Game Association
Andy Dexheimmer	Miller Engineers & Scientists
Greg Minikel	City of Manitowoc; Engineering Division Manager
Peter Pittner	Miller Engineers & Scientists; Sheboygan River Partnership
Eric Cooley	UW Discovery Farms® Co-Director
Danielle Block	WDNR Agricultural Runoff Management Specialist
Mary Gansberg	WDNR Water Resource Biologist
Scott Gunderson	Manitowoc County UW-Extension Agricultural Agent
Andrew Noth	WDNR Forester
Matt Rataczak	USDA-NRCS District Conservationist
Tim Ryan	Planning & Zoning Department Director
Michaeleen Gerken Golay	PhD; Assistant Professor; Silver Lake College
Russ Tooley	Lake Michigan Property Owner
Gene Weyer	Lake Property Owner

Meeting Schedule:

Meeting 1 (4/29/2015): Review public survey results, review of current private and public programs working to improve and protect county natural resources.
Meeting 2 (5/15/2015): Review current status of natural resources including groundwater, surface water, forestry, beaches, and soil.
Meeting 3 (6/15/2015): Developed goals and solutions.
Meeting 4 (10/07/2015: Review draft of 10-Year Land and Water Plan.

LOCAL ADVISORY COMMITTEE RECOMMENDATIONS AND DISCUSSIONS:

Committee members determined which resources were most important to protect and conserve. Low number is least important, high number is most important. The highest possible score is 140 points.

Results:

Ground-water	Lakes	Streams	Soil	Wet-lands	Farm-lands	Air	Woodlands/ Grasslands	Wildlife Habitat
128	126	121	118	111	110	95	90	86

Groundwater, lakes and streams were the highest priorities therefore goals, problems, and solutions were identified for these resources.

GROUNDWATER DISCUSSION:

Goal: A goal was discussed and developed.

To improve quality of groundwater by decreasing nitrate levels by 20% in wells previously screened and above 10mg/L in the towns of Cato, Maple Grove, Franklin, Gibson, Cooperstown, Rockland, Schleswig and Kossuth.

Problems: Members identified causes of groundwater pollution in Manitowoc County.

- Lawn fertilizer*
- Agricultural runoff (manure management, Commercial nitrogen)*
- Tile Lines*
- Over application of manure*
- Soil (shallow soils)- Higher permeable soils
- Fractured bedrock (Karst)
- Discharge from municipalities*
- Septic systems*
- Timing of manure and waste application*
- Industrial waste leakage- brown fields
- Lack of knowledge about water systems and leaks*
- Lack of enforcement*
- Unidentified sinkholes
- Household chemical disposal
- Old wells not properly abandoned.

*Also listed as a reason for surface water problems

Prioritize Problems:
Members were asked to prioritize the problems listed above. (High number is high priority, low number is low priority).

Manure runoff, timing of application	Karst areas, shallow soils, unidentified sinkholes and groundwater conduits	Tile lines	Lack of Know-ledge	Human waste, septic systems, sewage plant discharge	Lack of enforce-ment	Industrial waste leakage, brown fields	Lawn Fertilizer
52	49	29	27	25	15	6	3

Solutions: Members identified solutions for the top problems.

Manure Runoff Solutions:

- Nitrogen Stabilizers
- Simplified Nutrient Management Plans that farmers can use (1-2 pages, summarized by field)
- 100% Nutrient Management Plans followed
- Improve restriction maps in Karst regions by identifying additional karst features and watershed area contributing to conduits to groundwater
- Buffer strips on every stream, near every sinkhole
- Barrier around sinkholes
- Variety of crops- lower nutrient needs
- Waterways
- Education: One-on-one with landowners and small group meetings
- Split or reduced application of manure
- Cover crops
- Grazing where appropriate
- Best Management Practices for higher yields since more nutrients removed
- Fix tile lines and blowouts
- Identify all sinkholes and groundwater conduits
- Export nutrients off farm
- Enforcement (bad actors) where appropriate
- Human health approach to protecting groundwater (health dept. and health officer involvement with solving the problem)

Karst/Shallow Soils Solutions:

- Workshops for Karst landowners
- 1 on 1 meetings with farmers located on karst regions
- See manure management solutions above
- Zoning ordinance to protect sensitive areas (eg. Forage only areas, Perennials)
- Contamination Susceptibility ranking by section
- More resources: partner with others

General solutions for groundwater improvement and protection:

- Analyze a certain number of well water tests by town
- POWTS program- sample of well water with septic inspection
- Utilize Natural Resource Conservation Service Conservation Practices
- Increase number of conservation practices installed: Work with nutritionists and agronomists on soil health
- Improve soil health: Cover crops, no till, strip till, residue management, contour strips etc.
- Reach rural non-farmers and hobby farmers with BMP that are available to them
- Workshop for rural landowners
- Work with co. highway department

Human Waste Solutions:

- The Soil and Water Conservation Department to coordinate with Wisconsin Department of Natural Resources
- regarding risk of groundwater pollution from fields receiving septage and industrial waste
- Enforce septage and industrial waste regulations

SURFACE WATER DISCUSSION

The members of the committee developed potential Surface Water goals:

Lakes:
Goal 1: To maintain phosphorus levels at or below current levels for lakes between 0-24 ppb (Horseshoe, Pigeon, Shoe, Spring, Cedar, Wilke, Tuma, English)

Goal 2: To decrease phosphorus levels by 10% in all inland lakes with average phosphorus levels above 24 ppb by 2026 (Bullhead, Silver, Weyers, Hartlaub, Long, Carstens, Gass, Harpt)

Streams:
To decrease phosphorus levels by 10% for streams identified in the Impaired Waters List above the water quality standard of 0.100 mg/L for rivers and 0.075 mg/L for streams, including stretches of the Manitowoc River, Meeme River, Molash Creek, Pigeon River, Pine Creek, Silver Creek, South Branch River and the West Twin River by 2026.

Problems: Members identified causes of stream and lake pollution in Manitowoc County

- Lake Phosphorus pollution and soil erosion
- Lawn fertilizer*
- Poor landscape management
- Soil erosion
- Management around rain events
- Not following/not having Nutrient Management Plans

- Lack of Biological Filters
- Failing production site structures
- Agricultural runoff (manure management, Commercial nitrogen)*
- Tile Lines*
- Over application of manure*
- Discharge from municipalities*
- Phosphorus stratification in soils
- Septic systems*
- Timing of manure and waste application*
- Lack of knowledge about water systems and leaks*
- Lack of enforcement*

*Also listed as groundwater problems

Prioritizing Problems: Members were asked to prioritize problems listed above (High number is high priority, low number is low priority)

Soil Erosion	Agricultural runoff	Poor cropland management	Not following NMPs	Manage around rain events	Lack of enforcement	Municipality discharge, industrial waste	Lack of Knowledge	Failing production site structures	Lack of biological filters
44	41	29	22	21	21	11	11	8	4

Solutions: Members were asked to identify solutions for surface water problems.

- Utilize Natural Resource Conservation Service Conservation Practices
- Increase number of conservation practices: Work with nutritionists, agronomists on soil health
- Improve soil health: Cover crops, no till, strip till, residue management, & contour strips
- Reach rural non-farmers and hobby farmers with Best Management Practices that are available to them
- Workshop for rural landowners
- Work with co. highway department
- Simplified Nutrient Management Plans that farmers can use (1-2 pages, summarized by field)
- Buffer strips on every stream
- Variety of crops- lower nutrient needs
- Waterways
- Education: One-on-one with landowners and small group meetings
- Split or reduced application of manure
- Cover crops
- Grazing where appropriate
- Best Management Practices for higher yields since more nutrients removed
- Fix tile lines and blowouts
- Export of nutrients off farm
- Enforcement (bad actors) where appropriate
- Human health approach to protecting surface water (health dept. and health officer involvement with solving the problem)

Human Waste Solutions:

- Soil and Water Conservation Department to coordinate with Wisconsin Department of Natural Resources regarding fields receiving septage and industrial waste
- Enforce septage and industrial waste regulations

Technical Advisory Committee

The Soil and Water Conservation Department assembled a Technical Advisory Committee to identify and address environmental concerns in the county:

Danielle Block	Wisconsin Dept. of Natural Resources Agricultural Runoff Management Specialist
Mary Gansberg	Wisconsin Dept. of Natural Resources Water Resource Biologist
Scott Gunderson	University of Wisconsin Extension Agriculture Agent
Jerry Halverson	Soil and Water Conservation Department Director
Erin Hanson	Wisconsin Dept. of Natural Resources Water Resource Management Specialist
Amanda Cordova	Soil and Water Conservation Department Public Relations and Administration
Matt Rataczak	Natural Resource Conservation Service District Conservationist
Bruce Riesterer	Soil and Water Conservation Department Conservationist
Tim Ryan	Planning and Zoning Department Director
Heidi Schmitt Marquez	Wisconsin Dept. of Natural Resources Wastewater Specialist
Thomas Schneider	Farm Service Agency County Executive Director
Titus Seilheimer	UW Manitowoc Sea Grant Fisheries Specialist
Tony Smith	Soil and Water Conservation Department Conservationist
Mike Wendt	Soil and Water Conservation Department Conservationist
Jessica Wanserski	Health Department Environmental Health Manager
Travis Buckley	Dept. of Agriculture, Trade and Consumer Protection Conservation Engineer

Meeting Schedule:

The Technical Advisory Committee meeting was held on 07/22/2015 to review the Assessment of the County's Natural Resources, the Public Survey Results, and the Local Advisory Committee recommendations.

TECHNICAL ADVISORY COMMITTEE RECOMMENDATIONS AND DISCUSSIONS:

Potential Funding for Installing Conservation Practices- Natural Resource Conservation Service (NRCS) Programs

Local NRCS work groups can tailor program and financial cost sharing according to conservation needs and public interest.

CRP can provide $250/acre plus incentive dollars. Create a brochure with 4 to 5 bullets on the benefits of CRP to give to interested people to help sell the program.
Safe Program: Part of the CRP program where local people can submit priorities to United States Department of Agriculture to address local concerns.

EQIP provides technical and planning assistance for various conservation efforts.

GROUNDWATER DISCUSSION

Problems:

- The majority of people do not know if their wells are contaminated.
- People are unaware of the health risks associated with contaminated wells.
- There is no efficient and affordable way to test wells.
- People don't know how to test their wells or where to get information.
- There's not enough data on groundwater to determine overall groundwater quality.
- Lack of funding to support testing, research and education.
- There is no lab in town that can provide easy-access testing.
- Data collected by Manitowoc County Health Department is not able to be sorted by land-use.
- The programs in place for surface water protection do not encompass groundwater priorities.

Note: The Health Department tests the same 95 wells every year through a Wisconsin Department of Natural Resources contract. These are only transient wells. The data collected are results only. There is no way to sort or emphasize land-use in the area.

Solution/Action Items:

- Target karst regions and sink holes.
- Use nitrate map from county fair screening to help target critical areas.
- Identify new sink holes and drainage areas using new elevation mapping program (LIDAR) available next year. Work with crop advisors to locate conduits to groundwater and provide that information to Soil and Water Conservation Department. Soil and Water Conservation Department will update maps accordingly.
- Update hazard maps with conduits to groundwater and disseminate to the community and land owners.
- Provide information and education to landowners, farmers, crop consultants and manure haulers:
    - Create contact group for all land owners near and around currently identified sinkholes- update contacts as new sinkholes are found.

  - Educate landowners about:
  - Groundwater geology/ water cycle, health hazards due to contamination of groundwater, incentives for conservation (soil health, yield, safety, etc), cost share programs available, technical support available, well water testing opportunities.
- Create packets of information including above for educators, crop advisors, custom manure applicators, and conservationists to give to landowners who live near sensitive areas.
- Use on-farm research to show farmers the benefits of cover crops
- Determine how to revise DATCP 51 policy to include locally identified issues: Manitowoc County is currently unable to use DATCP 51 for cover crops because the policy only addresses soil loss. Manitowoc county cropland currently meets soil loss standards.
- Partner with Wisconsin Department of Natural Resources on well abandonment.

LAKES DISCUSSION

Potential Funding:

Lakes Planning Grant Program: This grant is available to any interested organization. They can provide up to $25,000 for inventory, planning, data collection, and implementation. The deadline for the application is Dec 10th.

Lake Management Grant: This grant will allow up to $200,000 for a Lake Management Plan.

Problems:

- No inland lakes are tested by the Health Department for contamination- cost is $25. There is no funding or money for the testing.
- There is a lack of action/implementation after lake plans are completed.

Solution/Action Items:

- Take inventory of watersheds to determine what is needed and where
- All Lakes are eligible to apply for a lake study grant through the Wisconsin Department of Natural Resources.

INDUSTRIAL AND POWTS WASTE DISCUSSION

Solution/Action Items:

- Partner with Wisconsin Department of Natural Resources to review permits for waste spreading: Wisconsin Department of Natural Resources will forward waste spreading permit applications to The Soil and Water Conservation Department to review prior to approval. The Soil and Water Conservation Department will advise if the request is within a known sensitive area.

Other Discussion Topics:

- Share information with Wisconsin Department of Agriculture, Trade, and Consumer Protection and Wisconsin Department of Natural Resources on gully erosion problems.
- Contact Wisconsin Department of Natural Resources immediately following a complaint on Concentrated Animal Feeding Operation (CAFO) farms.
- Keep Wisconsin Department of Natural Resources and Natural Resource Conservation Service involved during Livestock Siting process.
- Attend Lake Michigan Areas meeting: Discuss options to allow Wisconsin Department of Natural Resources to administer penalties for CAFOs that are not in program compliance.
- Progress Tracking: The Technical Advisory Committee agreed that it would be beneficial to meet annually to share information and discuss progress with implementation of the Manitowoc County 10-Year Land and Water Plan.

Chapter 3

Resource Assessment

Part 1: Physical Geography & Climate

Part 2: Water Quality

Part 3: Soil Quality

Part 4: Agriculture

Part 5: Woodland

Manitowoc County Soil and Water Conservation Department

PART ONE: Physical Geography and Climate

Physical Geography

The topography of Manitowoc County is largely the result of glaciation. Beneath the glacial drift is the buried backslope of the Niagara Silurian Dolomite and limestone formation which tilts gently eastward towards Lake Michigan and is capable of topographic expression. The depth of glacial deposits varies widely, but averages 70-100 feet. Deposits are somewhat deeper in the southern and eastern parts of the county, but as shallow as one foot or less in the vicinity of Central Manitowoc County. Outcrops of the dolomitic lime rock gave rise to many quarries in the County, many of which are now closed. Major quarry operations are still active in the Valders and Rockwood areas.

The most conspicuous glacial physiographic feature in Manitowoc County is the Kettle Moraine, a belt of irregular hills, glacial lakes, and wet depressions formed along the junction of two glacial lobes. It extends from the Kiel area, in the southwest part of the County, to the towns of Cooperstown and Gibson in the north. Another conspicuous glacial feature, which shows up on the horizon just south of U.S. Highway 151 in Section 16 of the Town of Eaton, is a round cone-shaped hill called Moulin Kame.

The highest point in the County is 1047' above sea level which is in Section 27, Town of Schleswig. This is 567' above Lake Michigan.

Some prominent glacial ridges and eskers can also be found in sections of Maple Grove, north of Reedsville. A long narrow esker of more than four miles winds through the Maple Grove swamp, west of County Highway W.

In the northeastern part of the County in the Town of Two Creeks, a rare glacial feature is found along the wave-cut cliffs of Lake Michigan. An ancient forest was buried beneath red glacial till. Remnants of logs and branches of trees that grew during a frigid climate between the glacial periods has been uncovered at points along the lake bank and carbon-14 dated at about 11,000 years old.

The topography of the County can generally be described as gently rolling. Areas which deviate from this norm are the Collins, Killsnake, Hayton and Maple Grove marsh areas located in the western part of the County. An area of irregular hilly terrain occurs in a band running from the northwest corner of the County in the Town of Cooperstown down through the Town of

Schleswig in the southwest corner. Relief also occurs along major rivers and along Lake Michigan.

Manitowoc County Soils

The soils in Manitowoc County are formed mostly from the glacial drift of the Wisconsin Stage of Glaciation. They are generally level to gently sloping and have a medium natural fertility. The various advances of the ice masses deposited different types of till from which many of the soils developed.

The most common till in the county is the Valders till. It was deposited by the last major advance of the Ice Age glaciers, (fourth sub-stage of the Wisconsin glaciation). The Valders till is recognized by its red color and clayey texture. This so-called "red-drift" is the material from which 65 percent of the soils in the County are derived. Generally, these are the better agricultural soils in Manitowoc County. However, percolation rates are slow in many of these soils causing severe limitations for septic tank filter fields. Kewaunee loam and Manawa silt loam are the most prominent soils formed from this type of parent material.

The Cary till was deposited by an earlier ice advance, or the third sub-stage of Wisconsin glaciation. It underlies the Valders till in most of the County. Two lobes of the Cary till have had an influence in the formation of different soils. The most prominent lobe, which is in the southwestern part of Manitowoc County, is distinguished by the yellowish color, loam or sandy loam textures, and high calcium carbonate content.

The major soils in prominent lobe of the Cary till are Hochheim loam and Lamartine silt loam. These soils are of lower clay content and moisture holding capacity; consequently, they warm up sooner in spring for agricultural operations. The less prominent lobe of the Cary till is in the northwestern part of the County and is somewhat reddish in color, lower in calcium carbonate content, and has a loam texture throughout. The major soils in this lobe are Hortonville and Symco silt loams.

The Niagara dolomitic bedrock formation underlies all of Manitowoc County and slopes from west to east toward Lake Michigan. The major soils formed in the shallow drift over the dolomite limerock are Channahon, Whalon and Kolberg silt loams. These areas are a source of dolomite for construction purposes or agricultural lime.

Melt waters from the receding ice masses deposited sand and gravel on water courses, in the river beaches, eskers, kames and outwash plains. These areas are a source of sand and gravel for road construction. Sandy soils such as Boyer, Nichols and Oakville are prominent in a

narrow belt along Lake Michigan, along river terraces and glacial outwash plains. There are other sandy and gravelly soil inclusions within the finer textured soil areas throughout the County.

Manitowoc County Climate

The climate of Manitowoc County is continental, characterized by the marked changes in weather common to the latitude. A narrow belt adjacent to Lake Michigan has a modified continental climate. Lake Michigan's influence is strongest during spring, summer and fall. The lag in lake water temperature delays the coming of the spring and extends mild temperatures into late fall. Residents of this narrow belt enjoy relatively cool summers compared to the hot summer temperatures further inland.

The growing season of Manitowoc County varies from east to west reflecting the climatic influences of Lake Michigan. Along the lakeshore, the average growing season is over 160 days while it decreases to 140-160 days near the western border of the County. In the east, the last killing spring frost is likely to occur in late April and the first killing fall frost in mid-October. In the west, early May and early October are probable dates of the first and last killing frosts.

Precipitation varies from 31 inches near Lake Michigan to 27 inches in the northwest part of the County. June is the rainiest month, with the five months from May through September averaging about 55 percent of the annual normal. Most of the winter precipitation falls as snow with February on the average being the driest. Precipitation is normally adequate for agricultural purposes, although some degree of soil moisture deficiency occurs in July and August.

Manitowoc County Surface Water

Manitowoc County has an abundance of surface water that provides quality habitat for wildlife as well as exceptional recreational opportunities:

- 10 Major Watersheds
- 927 miles of streams and rivers
- 355 miles of perennial flow
- 572 miles of intermittent flow
- 109 lakes

Watersheds

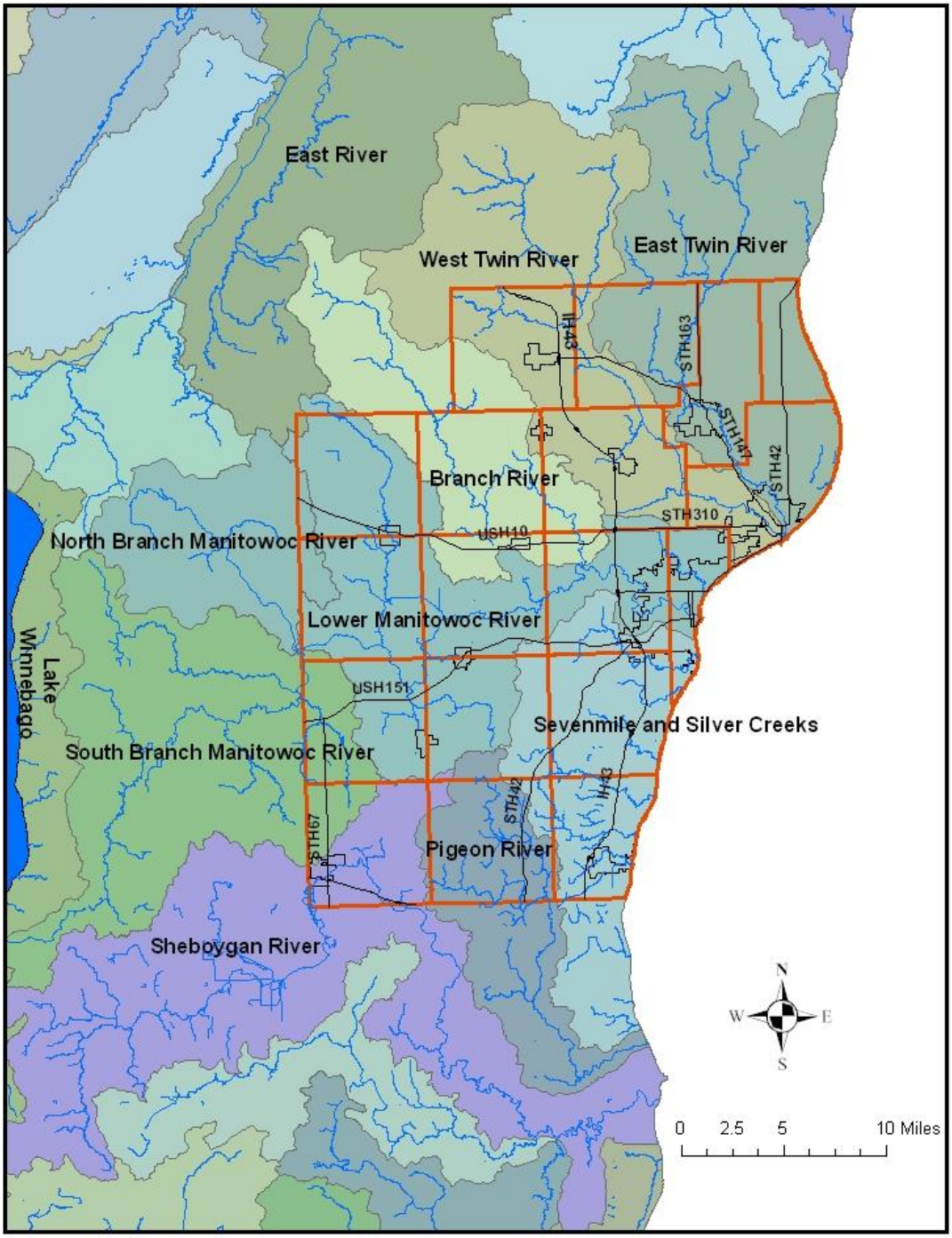
Manitowoc County consists of ten major watersheds that drain into Lake Michigan (Map 3.1).

Watersheds in Manitowoc County				
Watershed Name	**Size (mi^2)**	**Counties**	**Water Management Unit**	**Drainage System**
Branch River	108.49	Manitowoc, Brown	Manitowoc	Lake Michigan
East River	206.32	Manitowoc, Brown, Calumet	Lower Fox	Lake Michigan
East Twin River	183.58	Kewaunee, Manitowoc	Twin - Door - Kewaunee	Lake Michigan
Lower Manitowoc River	168.33	Manitowoc, Brown, Calumet	Manitowoc	Lake Michigan
North Branch Manitowoc River	76.97	Manitowoc, Calumet	Manitowoc	Lake Michigan
Pigeon River	78.87	Manitowoc, Sheboygan	Sheboygan	Lake Michigan
Sevenmile and Silver Creeks	112.90	Manitowoc, Sheboygan	Manitowoc	Lake Michigan
Sheboygan River	260.12	Fond du Lac, Manitowoc, Sheboygan, Calumet	Sheboygan	Lake Michigan
South Branch Manitowoc River	189.10	Fond du Lac, Manitowoc, Calumet	Manitowoc	Lake Michigan
West Twin River	180.11	Kewaunee, Manitowoc, Brown	Twin - Door - Kewaunee	Lake Michigan

Table 3.1: Watersheds and Sizes

Source: Wisconsin Department of Natural Resources, 2015

Manitowoc County Watersheds



Map 3.1: Manitowoc County Watersheds
Source: SWCD

Rivers

There are a total of 927 miles of streams and rivers located in Manitowoc County. The major rivers and streams are: Manitowoc River, Branch River, Meeme River, West Twin River, East Twin River, Pigeon River, Little Manitowoc River, Sheboygan River, Devils River, Silver Creek, Fischer Creek, Point Creek, and Mud Creek (Table 3.2).

Rivers in Manitowoc County		
Official Name	Water Size (miles)	County
Black Creek	9.5	Kewaunee, Manitowoc
Branch River	36.8	Brown, Manitowoc
Calvin Creek	6.0	Manitowoc
Cedar Creek	9.0	Calumet, Manitowoc
Centerville Creek	5.5	Manitowoc
Devils River	15.8	Brown, Manitowoc
East Twin River	26.4	Kewaunee, Manitowoc
Fischer Creek	8.8	Manitowoc
Francis Creek	6.8	Manitowoc
Hayton Creek	6.0	Calumet, Manitowoc
Jambo Creek	8.0	Kewaunee, Manitowoc
Johnson Creek	7.0	Manitowoc
Kriwanek Creek	6.0	Manitowoc
Little Manitowoc River	7.0	Manitowoc
Manitowoc River	35.8	Calumet, Manitowoc
Meeme River	12.0	Manitowoc
Millhome Creek	2.0	Manitowoc, Sheboygan
Molash Creek	7.8	Manitowoc
Mud Creek	10.0	Manitowoc
Mud Creek	10.4	Brown, Manitowoc
Neshota River	3.0	Brown, Kewaunee, Manitowoc
Pigeon River	30.0	Manitowoc, Sheboygan
Pine Creek	6.0	Manitowoc
Point Creek	12.0	Manitowoc
Sheboygan River	42.0	Calumet, Fond Du Lac, Manitowoc, Sheboygan
Silver Creek	15.0	Manitowoc
South Branch Manitowoc River	12.6	Calumet, Fond Du Lac, Manitowoc
Tisch Mills Creek	2.3	Kewaunee, Manitowoc
West Twin River	15.6	Manitowoc

Table 3.2: Rivers of Manitowoc County-This does not include 134 unnamed rivers
Source: Wisconsin Department of Natural Resources, 2015

Lakes

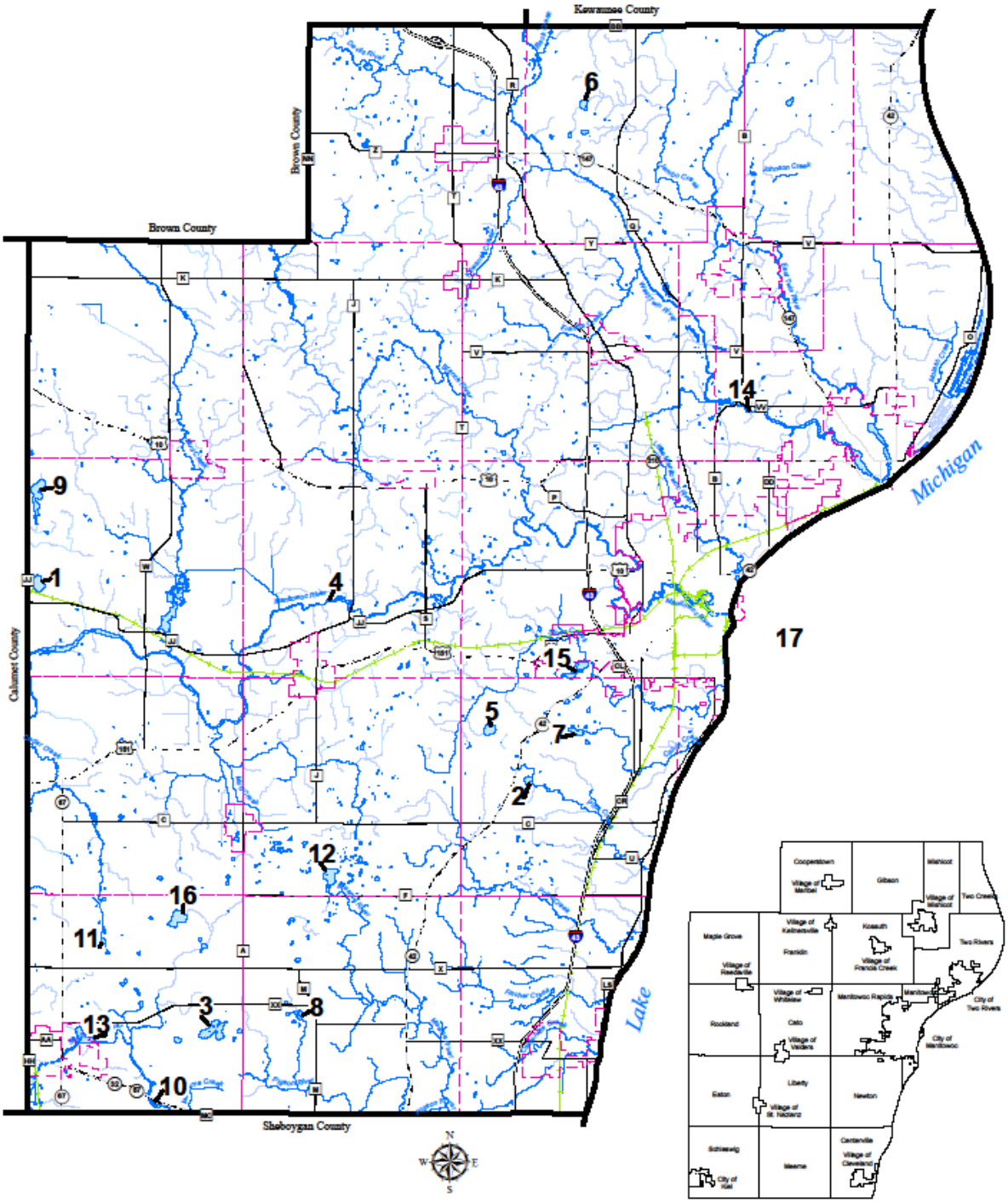
There are a total of 109 inland lakes in Manitowoc County (Table 3.3). These lakes provide fishing opportunities as well as recreational activities. Reference Map 3.3 for locations of lakes greater than 20 Acres. For more information on these maps, reference the DNR webpage.

Lakes Greater than 20 Acres		
Map Number	Name of Lake	Acres
1	Bullhead Lake	70
2	Carstens Lake	22
3	Cedar Lake	137
4	Clarks Mills Pond	
5	English Lake	48
6	Harpt Lake	32
7	Hartlaub Lake	37
8	Horseshoe Lake	21
9	Long Lake	127
10	Millhome Flowage	
11	Mud Lake North	62
12	Pigeon Lake	80
13	Rockville Flowage	76
14	Shoto Lake	12
15	Silver Lake	73
16	Wilke Lake	93

Table 3.3: Lakes Greater than 20 Acres
Source: Wisconsin Department of Natural Resources, 2015; Bay-Lake Regional Planning Commission

Surface Water Features

Manitowoc County, Wisconsin



DISCLAIMER: This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. Bay-Lake RPC is not responsible for any inaccuracies herein contained.

Surface Water Features
Major Surface Water Features
Minor Surface Water Features

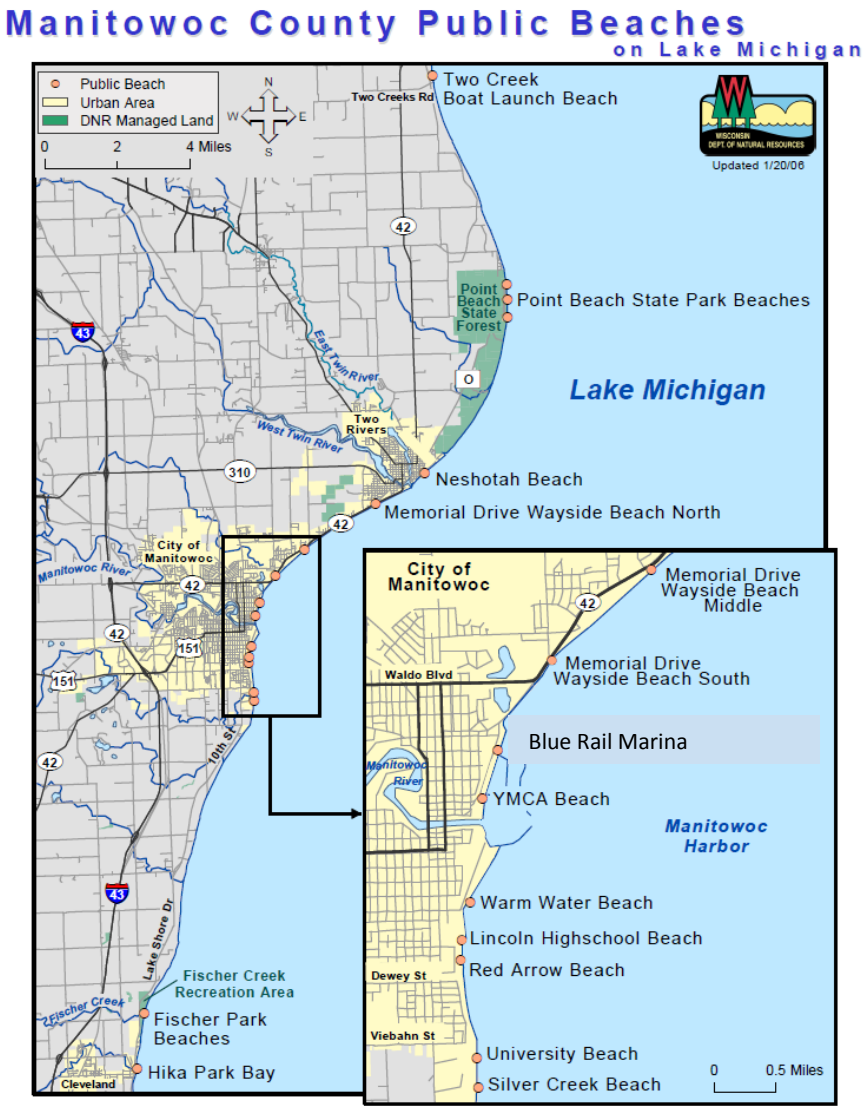
Base Map Features
- County Boundary
- Community Boundary
- Interstate Highway
- U.S. Highway
- State Highway
- County Highway
- Railroad
- Major Surface Water

Source: WNDR, 2005; WisDOT, 2007, 2008; Manitowoc County, 2008; Bay-Lake Regional Planning Commission, 2009. Q:\myfiles\manitowo\County\Comp2007\

Beaches

Major beaches in Manitowoc County include:

- Red Arrow Park
- Point Beach State Park
- YMCA
- Neshotah Park
- Blue Rail Marina Beach
- Two Creeks Boat Launch
- Fischer Park Beaches
- Warm Water Beach
- Lincoln High School Beach
- Hika Park Bay
- Maritime Drive Boat Launch
- Maritime Drive Wayside Beach (Middle and South)



Map 3.3: Manitowoc County Public Beaches
Source: Wisconsin Department of Natural Resources

PART TWO: Water Quality Assessment

Introduction:

Manitowoc County water bodies are subject to impairments from a variety of sources. The Water Quality Assessments section is primarily concerned with surface water and groundwater quality. While point source pollution can be as bad as non-point pollution, it relies on different sets of standards and guidelines and is beyond the scope of this document.

Major nonpoint problems impacting Manitowoc County water bodies and groundwater include the following:

1. Sediment from soil erosion (primarily agricultural)
2. Animal Waste (ammonia, toxicity, high biochemical oxygen demand, e-coli, bacteria and nitrate)
3. Nutrient enrichment (primarily phosphorus)
4. Milking center wastes
5. Barnyard runoffs and feed storages

Sediment

Sediment from soil erosion is usually considered the number one problem to water in the county. When soil erodes, some or most of it, eventually reaches a water body. Once in the water, the sediment increases the turbidity of the water (the water looks muddy) and this turbidity can have adverse effects on fish and other aquatic organisms.

Sediment is also a primary carrier of phosphorus. Phosphorus readily attaches to soil particles and is transported to the water body through the erosion process. Excess phosphorus can cause nutrient enrichment, as defined below.

In rapidly flowing rivers and streams, the sediment remains suspended. When the water velocity decreases, such as in a pool in the stream or when it reaches a lake, the sediment is often deposited in the stream or lakebed. This deposited sediment can kill aquatic organisms and create a bottom unsuitable for spawning fish.

Animal Waste and Nutrient Enrichment

Nutrient enrichment, primarily from animal waste and commercial fertilizer, is detrimental to surface and groundwater quality. Surface water and groundwater contaminated by animal waste can cause serious illnesses if consumed by humans. Animal waste can also be hazardous to aquatic life. High Biologic Oxygen Demand (BOD) consumes all oxygen in lakes and streams, causing fish kills. Ammonia in manure is toxic and will kill aquatic life. Phosphorus in manure causes eutrophication in lakes and streams. Eutrophication is the enrichment of an ecosystem

with nutrients, causing excessive plant growth and decay. As plants decomposes, oxygen is depleted and water quality is severely degraded. Eutrophication often causes fish kills.

Perhaps the most pertinent source of phosphorus is runoff from dissolved nutrients picked up in rainwater and snowmelt. Phosphorus from manure or chemical fertilizers, if not incorporated into the soil, quickly dissolves and can be removed by excess precipitation or runoff. A critical factor in phosphorus runoff is the level of phosphorus in the soil. When phosphorus levels in the soil are high, the element is easily dissolved by rainwater and removed from the land by runoff. Once in the runoff, it easily enters streams and lakes causing algae blooms and eutrophication.

Manure Spreading on Frozen Ground:

In Manitowoc County, the ground freezes in early December and will stay frozen until the end of March. Discovery Farms research indicated the highest runoff percentage was in the months of February and March, totaling 53% of the annual runoff. Discovery Farms data has shown that the early frozen ground period will often have a low potential for loss if there is adequate contact of the applied manure to the soil surface and sufficient pore space in the surface of the soil for nutrients to infiltrate.

February and March account for 53% of the annual runoff.

Manure Spreading on Non-frozen Ground:

Discovery Farms research also indicated that another critical runoff period occurs on non-frozen ground that is strongly influenced by antecedent soil moisture content, or moisture content before a rain event. This critical period typically occurs in the spring during, April, May and June. 30% of the annual runoff occurs during this time when soils are characteristically at high moisture contents from snowmelt and spring rains. Large volume and/or intense precipitation events, especially during these spring months, can result in the majority of the annual sediment and nutrient loss in one or two storms.

April, May and June account for 30% of the annual runoff.

Milking Center Waste

"The wastewater from washing dairy milking equipment and the milking parlor after each milking contains milk waste, animal waste and cleaning products. This water can be a problem for dairy farmers without a suitable method of disposal. The high oxygen demand and large amounts of nutrients, fats, and detergents can pose an environmental risk if not taken care of properly. Wastewater needs to be properly managed to ensure not only the health of the environment, but also of the farmer and the livestock. Collection and treatment systems need

to be adequate to handle the amount of waste water being processed and treated by each particular operation." (Cortland SWCD)

Treating milk house wastewater protects water quality by reducing the amount of pollutants (tss, phosphorus, nitrogen and fats, oils, and grease) that enters nearby surface and groundwater.

Barnyard and Feed Storage Runoffs

Barnyard and feed storage runoff can be a significant source of pollution entering streams. When compared to liquid manure, runoff from feed storage areas contain higher levels of biochemical oxygen demand, phosphorous, and ammonia.

Quality of Surface Waters

To assess the current state of surface water quality in the county, the most recent data on the following topics were reviewed:

1. Wisconsin Water Quality Standards
2. Fish and Aquatic Life Condition of Streams and Rivers
3. Impaired Waters List
4. Exceptional Water Resource or Outstanding Water Resource
5. Beach Advisories and Closures due to E.coli
6. Phosphorus Levels in Lakes

1. Wisconsin Water Quality Standards

Wisconsin Water Quality Standards are administered through the Department of Natural Resources. Water quality is constantly threatened by many different sources and types of pollution. Under the Clean Water Act, every state must adopt water quality standards to protect, maintain and improve the quality of our nation's surface waters. These standards set the appropriate level of protection by:

- Determining the types of activities the water should support
- Developing water quality criteria to protect these uses from excess pollution
- Establishing an antidegradation policy to maintain and protect existing uses
- Identifying general policies to implement these protection levels in point source discharge permits

Water Quality Standards are important because they help water quality managers protect and restore the quality of Wisconsin´s surface waters. Standards also support efforts to achieve and maintain protective water quality conditions. Any interested individual can have a role in the process of developing water quality standards. Wisconsin Department of Natural Resources

reviews and, as appropriate, revises water quality standards at least once every three years. When water quality standard revisions are proposed, the public is notified of these revisions and a public hearing is held to gather input and comments.

Source: Wisconsin Department of Natural Resources Surface Water Standards Website

2. Fish and Aquatic Life Condition of Streams and Rivers

The Wisconsin Department of Natural Resources uses four levels of conditions in describing a waterbody's current status within the overall water quality continuum. Waters considered "Excellent" are considered to be attaining applicable Water Quality Standards and fully supporting their assessed designated uses. Waters assigned with the condition category of "Good" or "Fair" are also considered to be attaining applicable Water Quality Standards and supporting their assessed designated uses. Waters determined to be in "Poor" condition are further evaluated and may be selected for additional monitoring or, if the limited dataset includes overwhelming evidence of impairment (e.g. Large magnitude of exceedance), considered "impaired" and added to Wisconsin's Impaired Waters List." (Wisconsin Department of Natural Resources; Wisconsin's 2014 Water Quality Report to Congress). Wisconsin Department of Natural Resources Wisconsin Water Search Database reports the following river conditions:

EXCELLENT: 0 Miles of river water is in "excellent" Fish and Aquatic Life Condition
GOOD: 107.9 miles of river water is in "good" Fish and Aquatic Life Condition
POOR: 125 miles of river water is in "poor" Fish and Aquatic Life Condition
UNKNOWN: 360 miles of river water is "unknown" Fish and Aquatic Life Condition

3. Impaired Surface Waters

Section 303 (d) of the Federal Clean Water Act requires each state to periodically submit to the U.S. Environmental Protection Agency a list of impaired waters. Impaired waters are those that are not meeting the state's water quality standards.

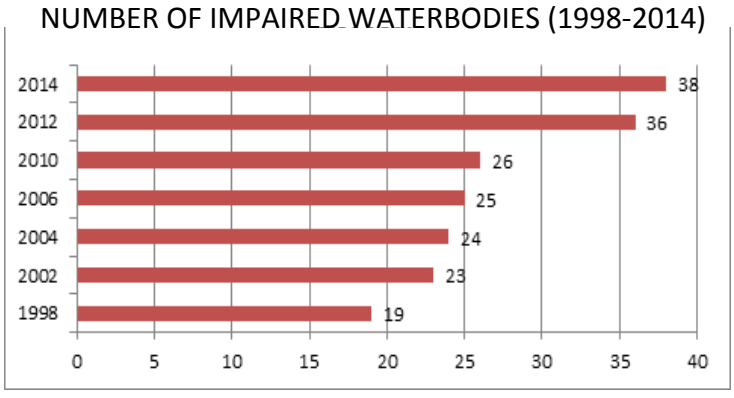


Figure 3.1: Number of Waterbodies on the Impaired Waters List (1998-2014)
Source: Wisconsin Department of Natural Resources Impaired Waters Coordinator

The number of waterbodies on the impaired waters list has increased since 1998 (Figure 3.1). "The impaired waters list is used by Wisconsin Department of Natural Resources to track water quality status and restoration planning for monitored and assessed waterbodies. The impaired waters list is not a good measure of statewide (or countywide) water quality trends. When a waterbody is added to the list, it does not necessarily mean the condition of the waterbody has recently gotten worse. Changes in the number of listed waters can be driven by several factors, including changes in water quality standards, assessment methods and monitoring strategies. Water quality standards are reviewed and may be updated every three years; assessment methods are reviewed and may be updated every two years. These updates can result in listing changes. The current phosphorus water quality standards were adopted in 2010 and were first assessed for the 2012 impaired waters list, which is a primary factor causing the increase in listings in 2012".

Source: Aaron Larson, Wisconsin Department of Natural Resources Impaired Waters Coordinator

Impaired Waters in 2016:
With the approval of the 2016 Impaired Waters List, there will be 10 lakes, 15 rivers, 6 beaches and 1 harbor listed under the impaired waters in Manitowoc County.

Impaired Waters in Manitowoc County:
10 lakes
15 rivers
6 beaches
1 harbor

2016 Impaired Surface Waters by Pollutant:

PCBs:

Contaminated Rivers: Branch River, East Twin River, Manitowoc River, South Branch River, West Twin River.

Phosphorus:

Contaminated Rivers: Manitowoc River, Meeme River, Molash Creek, Pigeon River, Pine Creek, Silver Creek, South Branch Manitowoc River, West Twin River, Osman Tribute to Meeme, unnamed stream, unnamed stream.

Contaminated Lakes: Bullhead Lake, Carstens Lake, Silver Lake, Long Lake, Harpt Lake, Hartlaub Lake, Boot Lake.

Contaminated Harbors: Two Rivers Harbor

E.Coli:

Contaminated Lake Michigan Beaches: Hika Park Bay Beach, Red Arrow Park, Memorial Drive Wayside Beach, YMCA Beach, Warm Water Beach, Fischer Park Beach.

Mercury:

Contaminated Rivers: East Twin River

Contaminated Lakes: Bullhead Lake, Pigeon Lake

Sediment:

Contaminated Rivers: Osman Tributary to Meeme River

PAH:

Contaminated Rivers: Manitowoc River

Unknown Pollutant:

Contaminated Rivers: Mud Creek, unnamed tributary to St. Nazianz, Two Rivers Habor.

4. Exceptional Resource Waters (ERWs) Outstanding Resource Waters (ORWs)

According to the Wisconsin Department of Natural Resources, for a river to be considered an Exceptional Resource Water or an Outstanding Resource Water it must provide great recreational opportunities, ample aquatic life habitat, and a healthy fish community. The water shall not be dramatically impacted by human activity. The state administers increased regulations to protect rivers under this classification.

Manitowoc County does not have any rivers that are classified by the Wisconsin Department of Natural Resources as an Outstanding Resource Water (ORW). However, there are two rivers (a total of 22.13 miles), classified as an Exceptional Resource located in Manitowoc County: **The Branch River and Millhome Creek warrant extra protection from the effects of pollution.**

5. Beach Closures and Warnings due to E.coli

Beach advisories and closures protect the health and safety of the community. Closures and advisories indicate that swimming in posted areas may be unsafe. There are a number of reasons for beach closures or advisories including: Sewage discharge/spill, elevated bacteria (E.coli), model predictions, increased rainfall and chemical discharges/spills. Storm water, in particular, greatly affects the quality of Manitowoc County beaches. Storm water runoff flushes chemicals and debris from streets, parking lots, and storm sewers into rivers and lakes causing contamination. Bacterial contamination can be correlated to rainfall, beaches physical features, bird populations, air temperature, water temperature, wind direction, wave height

and turbidity. Flat surfaces that don't drain properly can create wet environments for harboring bacteria as well.

Many of the beach closures and advisories in Manitowoc County are caused by high E.coli levels, making beaches unsafe for swimming:

> *The strain of E. coli being tested at coastal beaches in itself poses a low probability of making swimmers ill. This strain is used as an indicator: High levels of E. coli indicates a high chance of fecal matter being in the water.*
> *The standard of 235 CFU/100 mL (E. coli in water) was adopted based upon data from three USEPA studies. The studies determine E.coli as the best indicator to assess risk of swimming. The risk assessment comes from the probability of acquiring gastrointestinal illness. The "Closure" level of 1000 CFU E. coli/100 mL was adopted by the WDNR based upon data from the studies and represent a risk of approximately 14 cases of gastrointestinal illness per 1000 recreational water users.*
>
> *Illnesses that can occur during an E. coli advisory/beach closure include: gastroenteritis (includes diarrhea and abdominal pain), salmonellosis (food poisoning), cholera, fever, common colds, gastroenteritis, diarrhea, respiratory infections, hepatitis.*
>
> *Source: Wisconsin Beach Health*

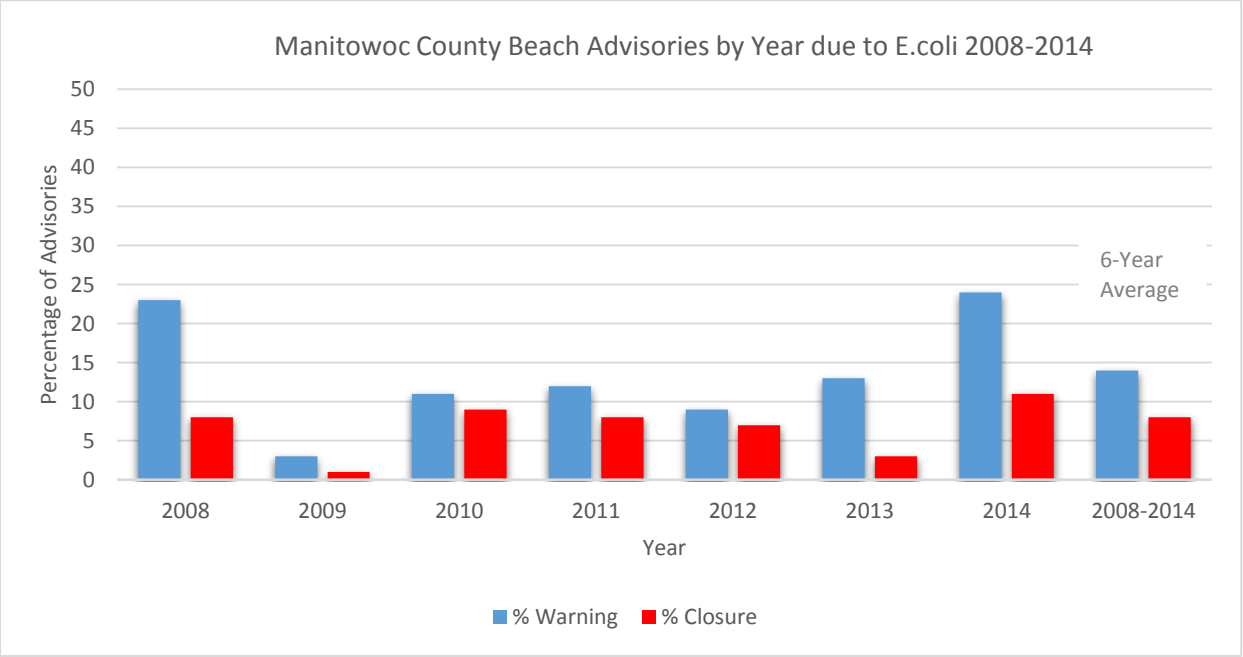


Figure 3.2: Manitowoc County Beach Advisories and Closures due to E.coli 2008-2014
Source: Wisconsin Beach Health Website

There have been several advisories and warnings between 2008 and 2014 (Figure 3.2). In 2009, the percentages of closures and warnings in Manitowoc County were lowest. In 2014, the beach warning and closure percentages were highest.

Within six years, E.coli levels exceeded 235 colonies/100ml 22% of the time (8% were at closure levels and 14% were at warning levels).

Beach Warnings and Closures due to high E.coli Levels 2008-2015:

Beaches of higher concern include those that were issued the most advisories between 2008 and 2015 (Table 3.4 and Figure 3.3).

The beach with the **highest** percentage of **warnings** due to E.coli was Blue Rail (23%).
The beach with the **highest** percentage of **closures** due to E.coli was YMCA (16%)
The beach with the **highest** percentage of **closures and warnings** combined was the YMCA (38%).

Beach	Date Range	Percent of Warnings	Percent of Closures	Total Percentage
Point Beach State Forest Concession	2008-2015	10	4	14
Point Beach State Forest Lakeshore	2008-2015	10	4	14
Warm Water	2011-2012	9	5	14
Memorial Drive Parkway	2008-2015	11	4	15
Neshotah	2008-2015	14	2	16
Point Beach State Forest Lighthouse	2008-2015	12	5	17
Memorial Drive Mariners	2008-2015	11	6	17
Fischer Park	2008-2015	12	13	25
Hika Park	2008-2015	15	11	26
Blue Rail	**2008-2011**	**23**	**8**	**31**
Red Arrow	**2008-2015**	**17**	**14**	**31**
YMCA	**2011-2015**	**22**	**16**	**38**

Table 3.4: Manitowoc County Beach Advisories from E.coli 2008-2015
Source: Wisconsin Beach Health Website

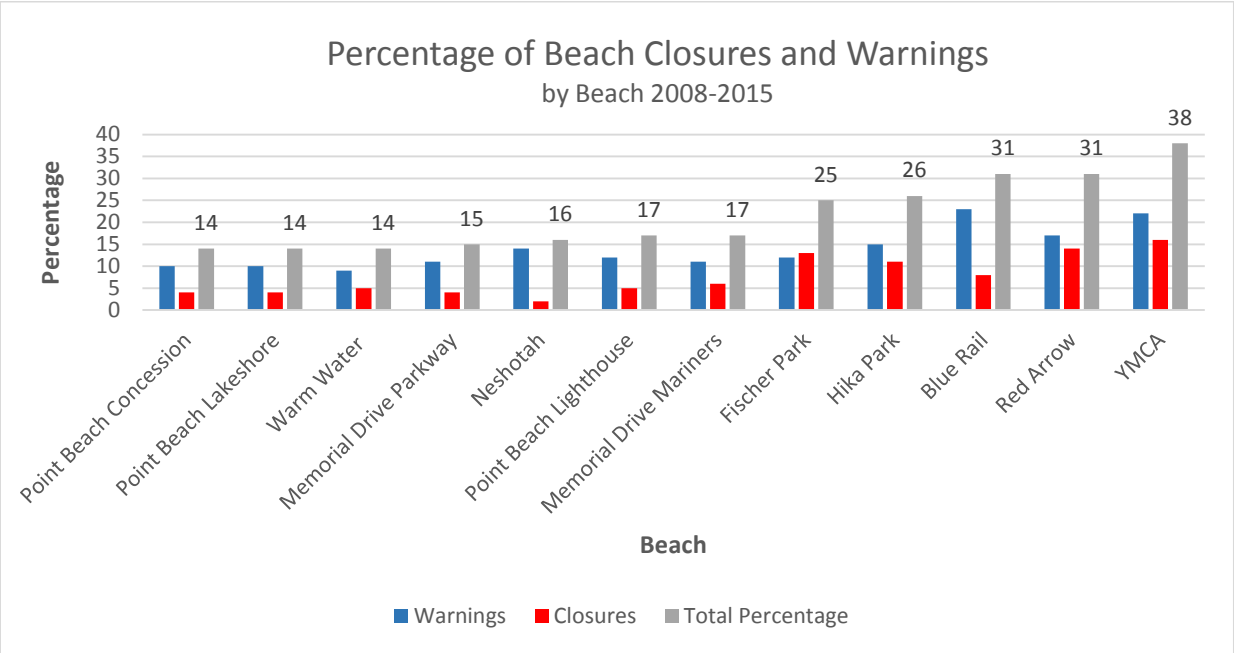


Figure 3.3: Percentage of Beach Closures and Warnings by Beach
Source: Wisconsin Beach Health Website

6. Phosphorus in Lakes

A three-year study, conducted by Manitowoc County Lakes Association, indicated various levels of phosphorus in 16 lakes located in Manitowoc County. The lakes below were tested by volunteers using Wisconsin Department of Natural Resources protocol and consist of 4 samples each year. Manitowoc County Lakes with phosphorus levels above 40ppb include: Harpt, Gass, Carstens, and Long Lake. Lakes between 25-39.9ppb include: Hartlaub, Weyer, Bullhead, and Silver (Figure 3.4).

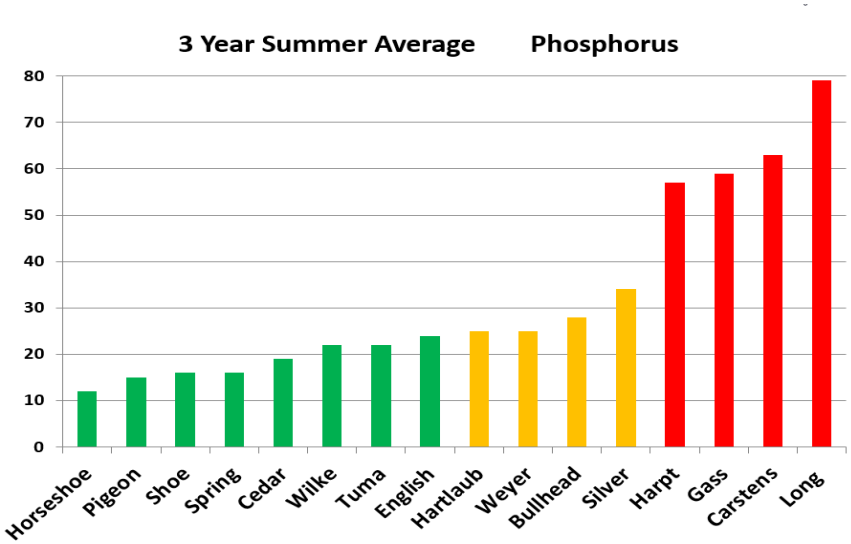


Figure 3.4: Phosphorus Levels in Lakes 2012-2014
Source: Manitowoc County Lakes Association

Surface Water Standards for Lakes:

Deep seepage lakes standard is 20 ppb:

Bullhead
Carstens
English
Harpts
Hartlaub
Long
Pigeon
Silver
Tuma
Wilke
Weyer
Spring
Shoe
Gass

Shallow seepage lakes standard is 40 ppb:

Cedar

Stratified two-story lake standard is 15 ppb:

Horseshoe

Groundwater Assessment

Groundwater is water that fills spaces between soil particles and fractured rocks located below the earth's surface. It is stored and moves through geologic formations called aquifers. In Manitowoc County, the groundwater is stored in three aquifers: Consolidated Sand and Gravel Aquifer, Niagra Dolomite Aquifer and Sandstone Aquifer.

This section will cover the following groundwater topics:

1. Public opinion on groundwater
2. Groundwater usage
3. Groundwater susceptibility to contamination study
4. Groundwater assessment using well water test results:
    A. Soil and Water Conservation Department Nitrate Screening
    B. University of Wisconsin Steven's Point Well Water Viewer

1. Public Opinion on Groundwater

Manitowoc County Soil and Water Conservation Department distributed a public survey to county residents with the intention of determining resources of greatest interest and concern. The survey was filled out by 250 residents. Groundwater was ranked the most important resource to protect and conserve.

Residents in Manitowoc County and the Local Advisory Committee indicated that they are most concerned with Groundwater Contamination.

2. Groundwater Usage

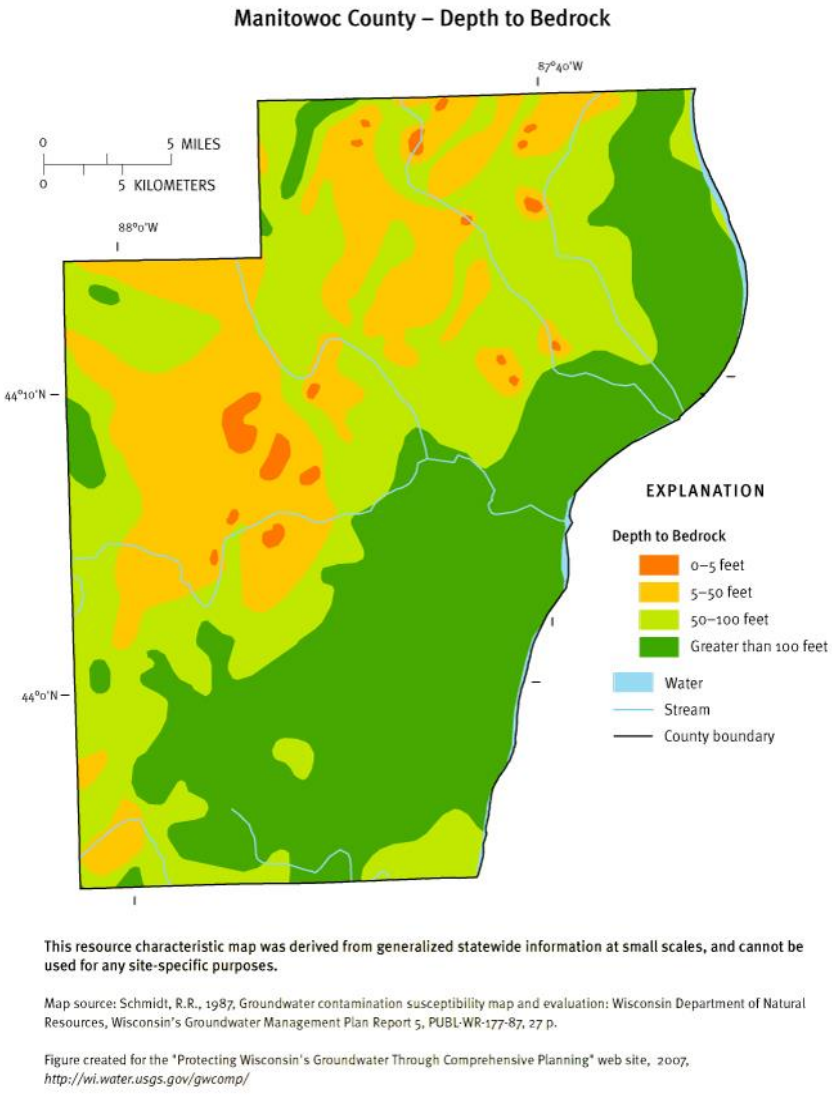
There are several ways that groundwater is used by residents of Manitowoc County including: Domestic, livestock, aquaculture, irrigation, industrial, commercial, and public use. Approximately 20 million gallons of groundwater are used daily in Manitowoc County (Source: USGS: Protecting Wisconsin's Groundwater Through Comprehensive Planning Manitowoc County).

According to the Wisconsin Department of Natural Resources Groundwater Retrieval Network, it is estimated that Manitowoc County has a **total of 5,401 active wells**. **Nine of the public water systems are supplied from groundwater** through community wells including Cleveland, Kellnersville, Maribel, Mishicot, Reedsville, St. Nazianz, Valders, Whitelaw and Kiel. The villages of Francis Creek and 18 towns within the county not serviced by public systems have individual

or shared wells that are owned and maintained by the property owners (Manitowoc 20-year Comprehensive Plan).

3. Groundwater Susceptibility to Contamination Study

There are multiple variables that increase or decrease groundwater vulnerability to contamination. Depth to bedrock and bedrock type, karst features, soil characteristics, and surficial deposits are all variables that must be evaluated to determine groundwater contamination susceptibility.



Map 3.4: Manitowoc County Depth to Bedrock

Groundwater Susceptibility: Depth to Bedrock and Bedrock Type

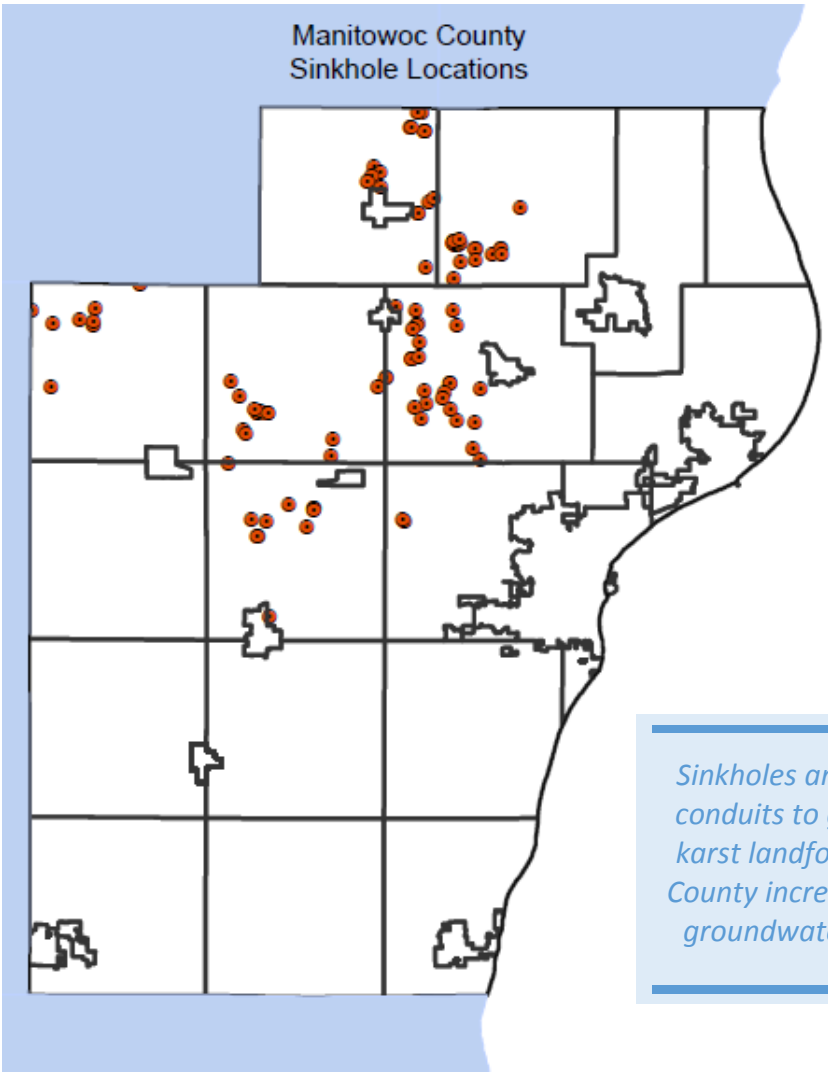
Manitowoc County has several areas where depth to bedrock is less than 50 feet, primarily located in the northern and western portions of the county (Map 3.4).

Silurian Dolomite bedrock is the dominant bedrock type in Manitowoc County. This type of bedrock has higher potential for contaminates to enter groundwater because surface water can pass through this particular bedrock type quickly.

Groundwater Susceptibility: Karst Features

Water that seeps into bedrock fractures can increase fracture sizes and allow for karst landforms, such as sinkholes and caves, to develop. A good example of this is in *Maribel Caves County Park.* Sinkholes and caves found in a karst region are direct conduits to groundwater, increasing vulnerability of groundwater contamination.

In Manitowoc County, there are 101 mapped sinkholes; 3,764 acres of land drain into those sinkholes (Map 3.5). Numerous others are currently unidentified.



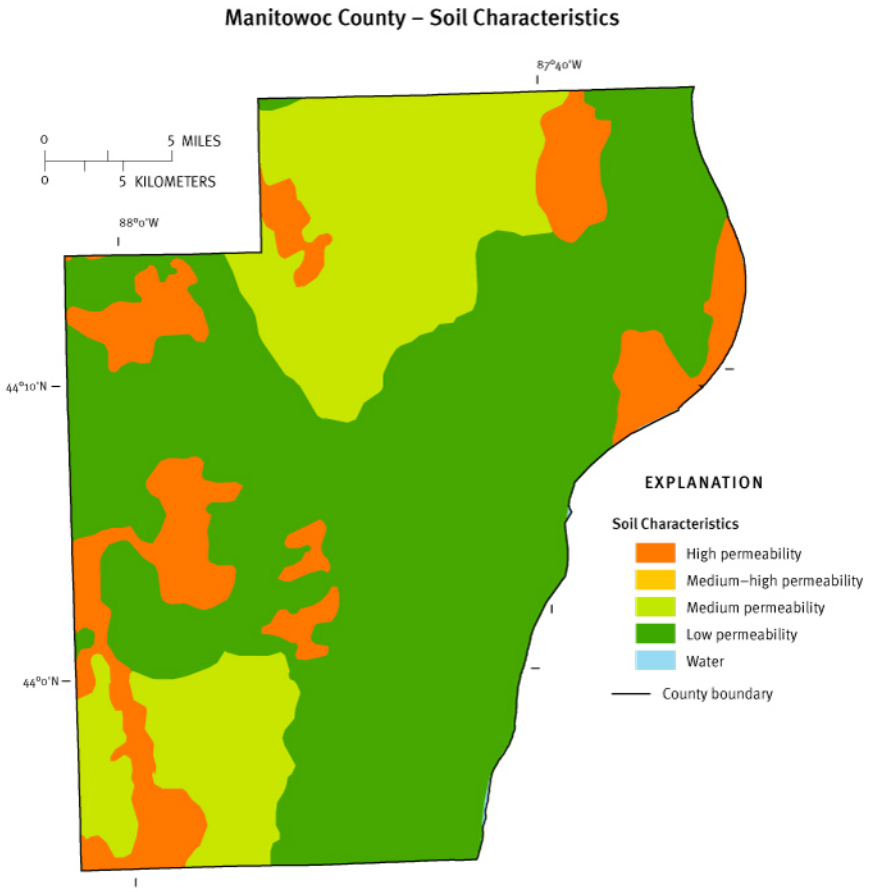
Sinkholes and caves are direct conduits to groundwater. The karst landforms in Manitowoc County increase vulnerability of groundwater contamination.

Map 3.5: Manitowoc County Sinkholes
Source: Manitowoc County Soil and Water Conservation Department

Groundwater Susceptibility: Soil Characteristics

The characteristics of soil in the first five feet of the surface plays an important role in determining how quickly surface water reaches the groundwater. For example, low permeability soils, such as clay soils, do not allow water to rapidly percolate through, *reducing* groundwater contamination but *increasing* surface runoff. Highly permeable soils, such as gravel and sand, allow water to percolate rapidly, causing *increased* vulnerability to groundwater contamination but *reducing* vulnerability to surface runoff.

Manitowoc County has highly permeable soils in nine towns: Gibson, Cooperstown, Maple Grove, Rockland, Cato, Liberty, Eaton, Schleswig, and Two Rivers (Map 3.6).



This resource characteristic map was derived from generalized statewide information at small scales, and cannot be used for any site-specific purposes.

Map source: Schmidt, R.R., 1987, Groundwater contamination susceptibility map and evaluation: Wisconsin Department of Natural Resources, Wisconsin's Groundwater Management Plan Report 5, PUBL-WR-177-87, 27 p.

Figure created for the "Protecting Wisconsin's Groundwater Through Comprehensive Planning" web site, 2007, *http://wi.water.usgs.gov/gwcomp/*

Map 3.6: Manitowoc County Soil Characteristics

Groundwater Susceptibility: Depth to Water Table

The closer the water table is to the surface, the less opportunity water has to filter out before entering the water table. Over 50% of the county's water table lies within 50 feet or less of the surface (Map 3.7).

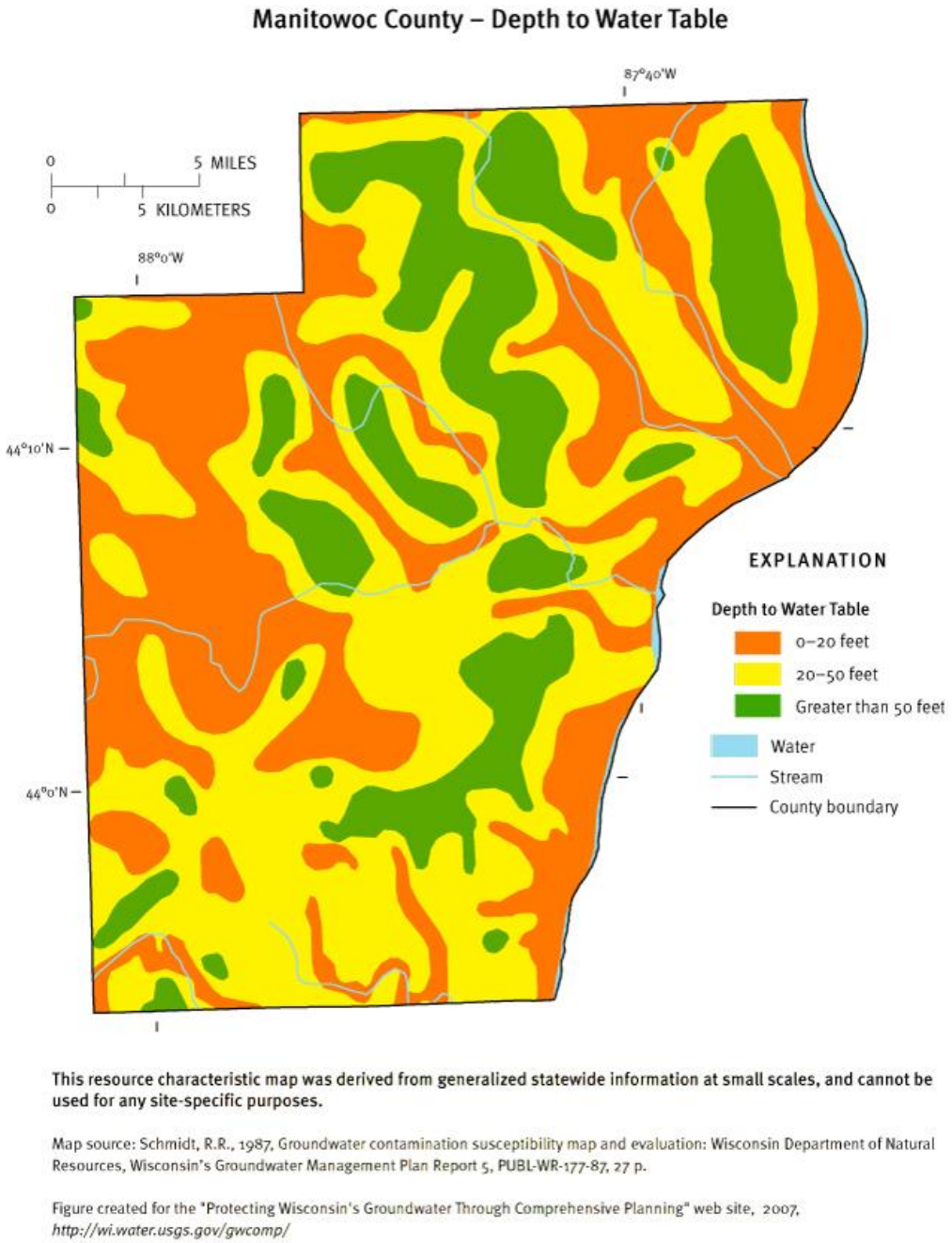


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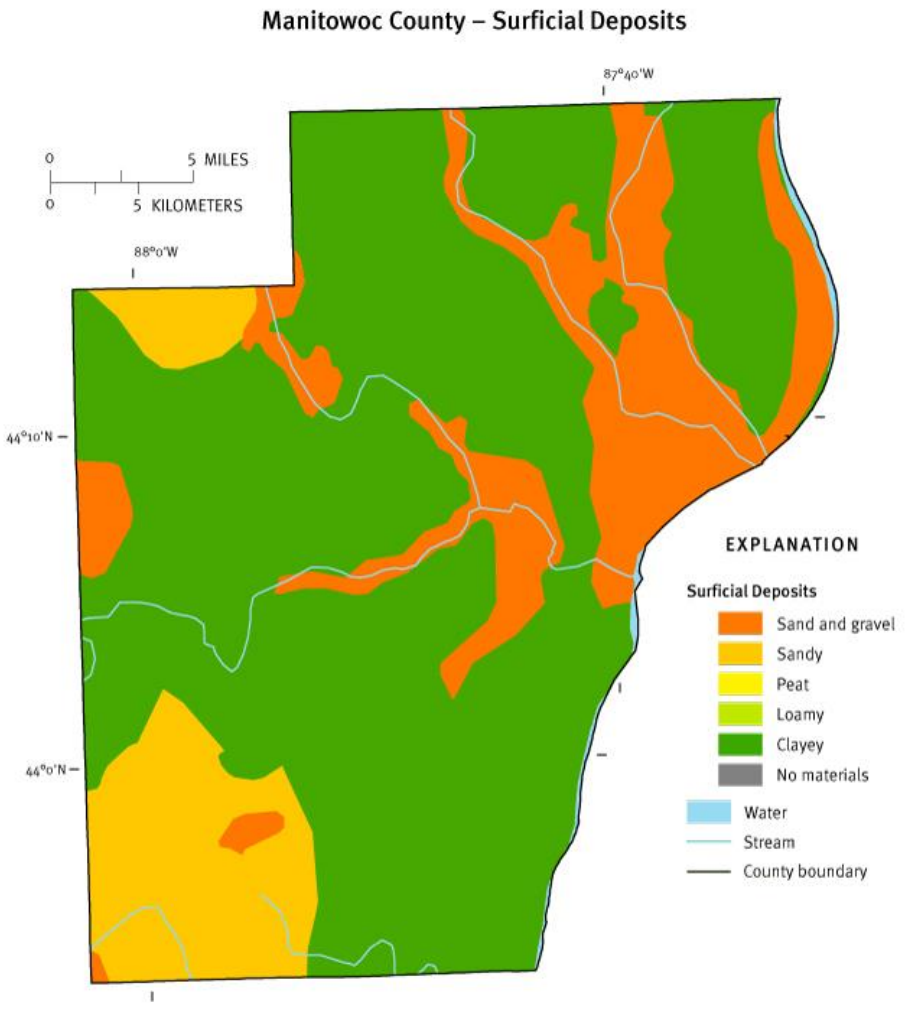
Figure created for the "Protecting Wisconsin's Groundwater Through Comprehensive Planning" web site, 2007, *http://wi.water.usgs.gov/gwcomp/*

Map 3.7: Manitowoc County Depth to Water Table

Groundwater Susceptibility: Surficial Deposits

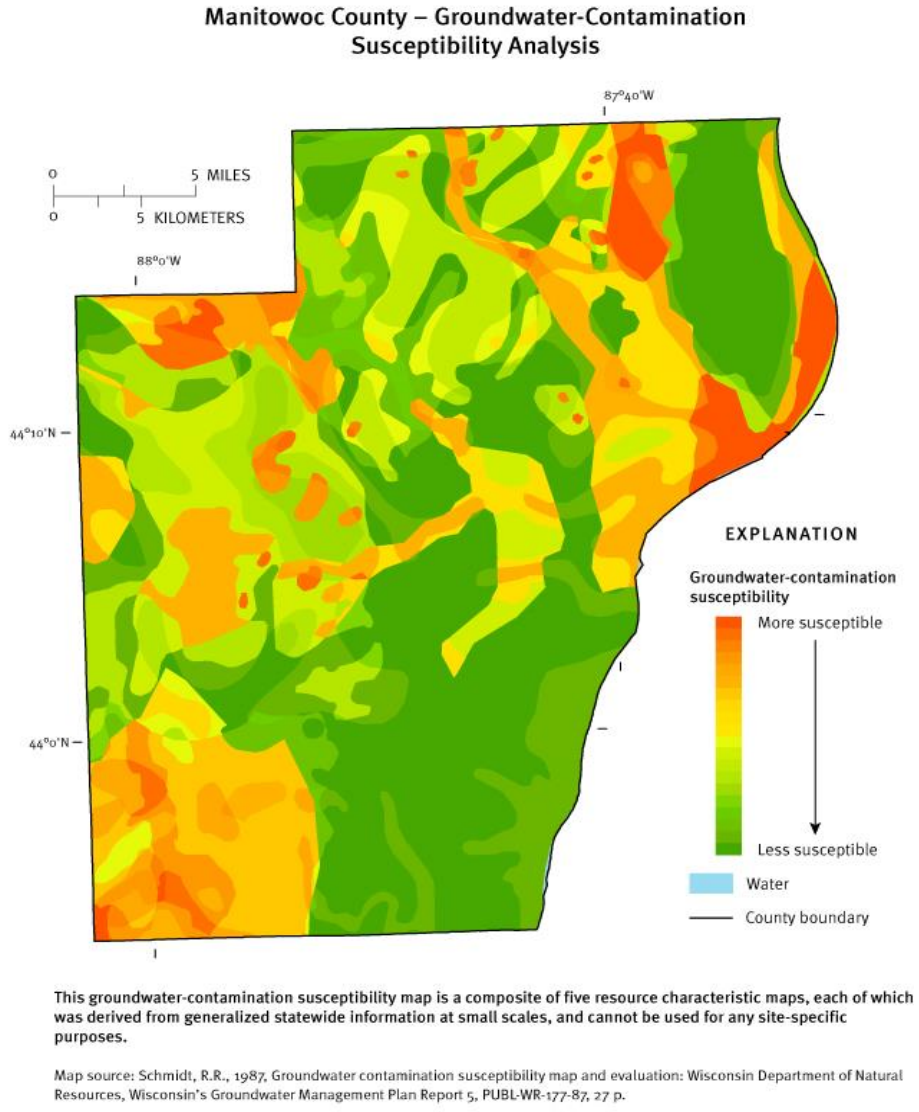
Surficial deposit is an important factor in determining groundwater susceptibility. This is the deposit that covers the bedrock and is considered the most important variable, with the exception of depth to bedrock, in determining contamination susceptibility. Sand and gravel, sandy and peat are most vulnerable to groundwater contamination due to their permeability. In Manitowoc County, about 25% of the surficial deposits are made of sand and gravel (Map 3.8).



Map 3.8: Manitowoc County Surficial Deposits

Groundwater Susceptibility: Analysis

This analysis, completed in cooperation by United States Geological Survey, UW Extension, Wisconsin Department of Natural Resources, and Wisconsin Geological and Natural History Survey, is a compilation of the five key players in susceptibility: Soil texture, depth to bedrock, surficial deposits, depth to water table, and bedrock type. Areas with most susceptibility are areas where depth to bedrock is less than 50 feet, surficial deposits are sand and gravel, the water table is 0-20 feet below the surface, soil characteristic has high permeability, and locations where karst landforms exist (Figure 3.10).



Map 3.9: Manitowoc County Groundwater Contamination Susceptibility

4. Groundwater Assessment using Well Water Test Results

General trends in groundwater quality was determined by analyzing levels of nitrates and bacteria in private wells around Manitowoc County. The Manitowoc County Soil and Water Conservation Department has collected well water data from two sources:

A. Soil and Water Conservation Department Nitrate Screening
B. University of Wisconsin Steven's Point Well Water Viewer

Soil and Water Conservation Department Nitrate Screening

Every year, the Manitowoc County Soil and Water Department offers a free Nitrate Screening at the Manitowoc County Fair. This gives landowners an idea of the quality of their drinking water.

Nitrogen is a chemical found in fertilizer and is also a result of decomposition of waste materials (manure and septic effluent). Nitrogen and especially bacteria, viruses, and pharmaceuticals can also come from failing septic systems. Nitrate contamination is a good indication that the water is susceptible to other contaminants as well. Nitrate contamination can also represent economic loss to farmer. Nitrogen found in groundwater indicates that there may be fertilizer that has not been used on the surface.

Reading Nitrate Results:

SAFE:

0mg/L to 2.0 mg/L: *Natural or background level*

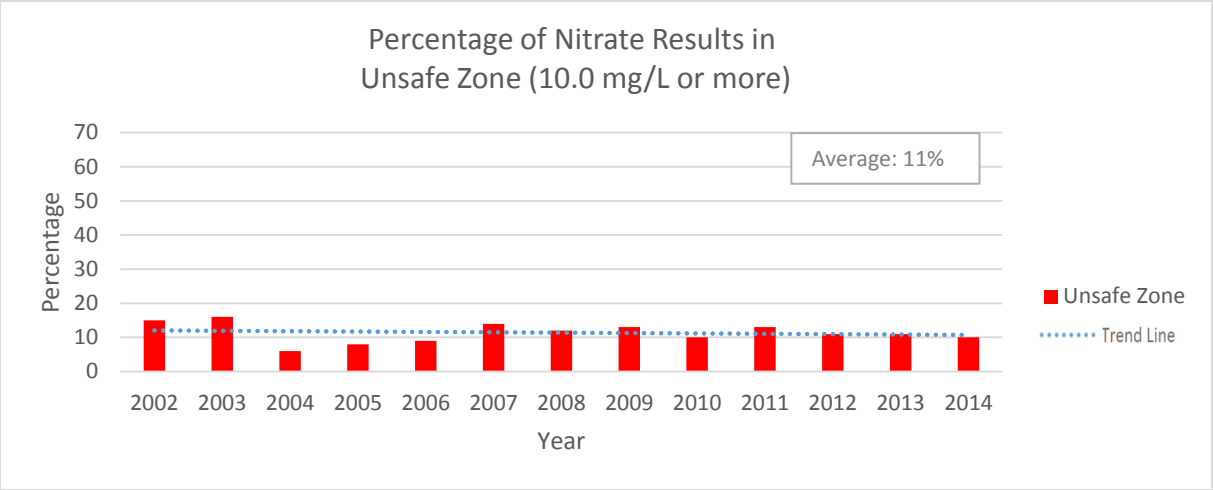
CAUTION:

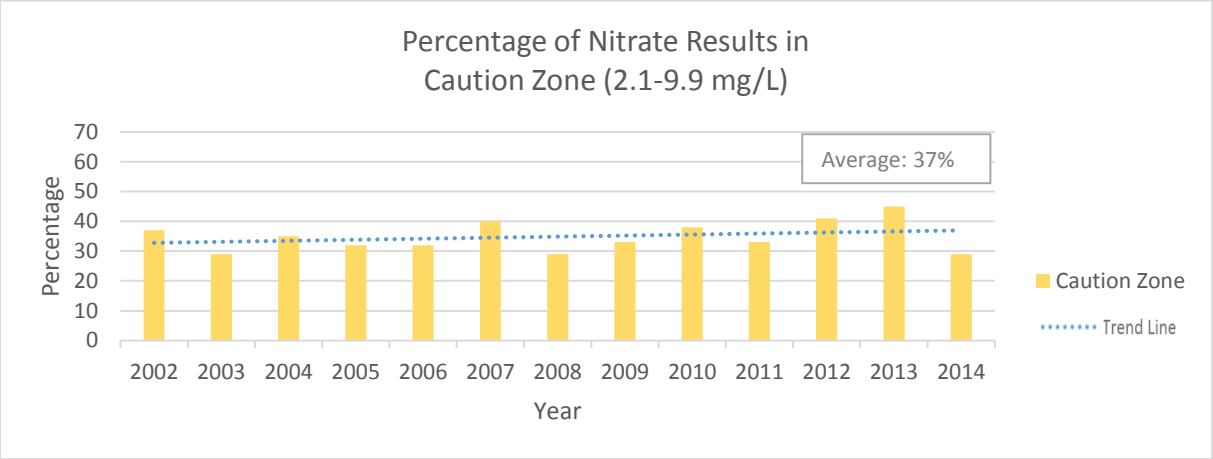
2.1-9.9 mg/L: Some human influence but meets drinking water standard.

UNSAFE:

10.0 mg/L or greater: Exceeds drinking water standard.
Water greater than 10mg/L should not be consumed by infants less than 6 months of age or pregnant women. All persons should avoid long term consumption of water above 10mg/L.

Since 2002, there has been a slight downward trend for readings in the Unsafe Zone; a slight upward trend for readings in the Caution Zone, and a slight downward trend for results in the Safe Zone (Figure 3.5).





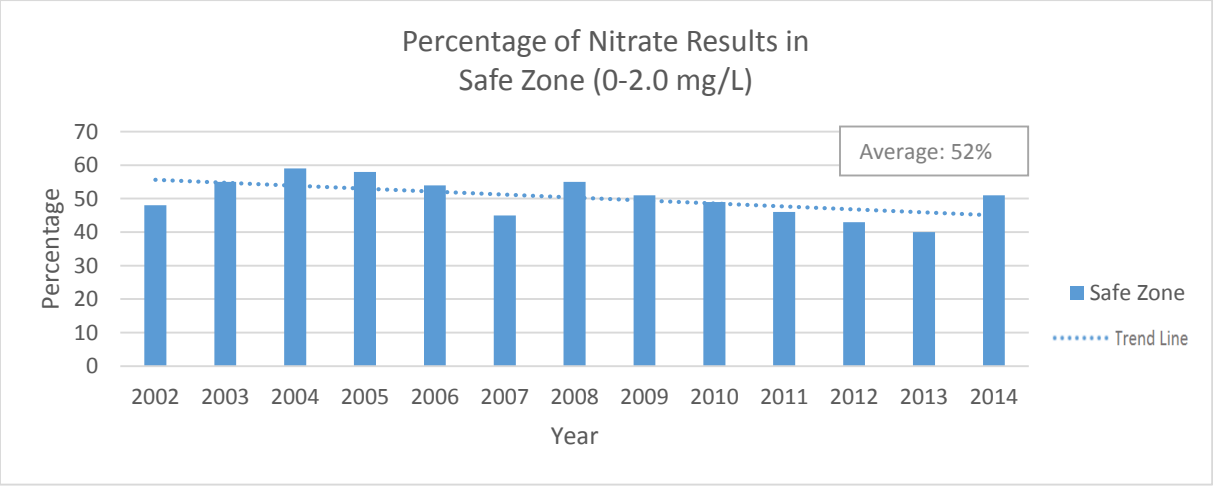


Figure 3.5: Nitrate Result Trends

B. *University of Wisconsin Steven's Point: Well Water Viewer*

The University of Wisconsin Steven's Point Well Water Viewer allows the public to view all known private well water test results since 1988. This viewer was used to research the *general* quality of the county's groundwater.

Well Water Viewer Disclaimer: This map viewer displays groundwater quality information from private wells around the state. This information is limited for some areas and is not a statistical design and therefore may not be representative of groundwater quality in some areas. Depending on the area, groundwater quality may also be changing in response to land use and climatic events. DO NOT extrapolate this information to a specific well, but rather use the maps to visualize regional trends and as a basis for laboratory testing of your well water to ensure a safe water supply. This data is provided "as is" and the Groundwater Center assumes no liability for accuracy or representativeness; conclusions drawn from the information are solely the responsibility of the user. Sources for Well Water Viewer include: Groundwater Retrieval Network GRN found on DNR website: Data extracted from various sources such as Public/Private Water Supply, Priority watershed projects, groundwater studies, Bureau of Waste's Groundwater and Environmental Monitoring Systems (GEMS) and Bureau of Watershed Management Systems (SWAMPS)

Manitowoc County Statistics
(1988-Present)

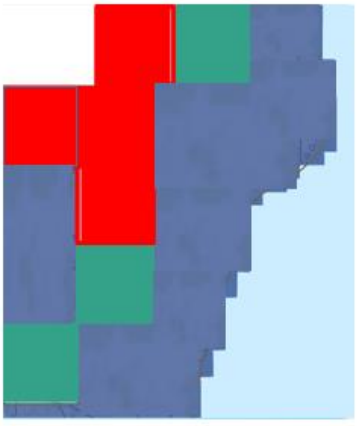
Range	Number	Percent	Summary
None Detected	428	46%	Minimum: No Detect
... 2.0	178	19%	
2.1 - 5.0	123	13%	Median: 0.2
5.1 - 10.0	104	11%	Average: 3.2
10.1 - 20.0	89	9%	
20.1 ...	16	2%	Maximum: 42.6
Total	938		
> 10mg/l N	105	11%	Exceeds Health Standard

Table 3.5: Manitowoc County Nitrate Levels
Source: UWSP Well Water Viewer

Of the wells tested for Nitrates since 1988, 11% exceeded the drinking water standard (Table 3.5).

Towns of high concerns are based on percentage of test results exceeding 10mg/L. Manitowoc County has four towns that are of high concern due to Nitrate exceedances: Cooperstown, Franklin, Cato, and Maple Grove (Map 3.10).

Concern Levels for Nitrates



Legend	
	High concern based on percentage of results exceeding 10mg/L
	Medium concern based on percentage of results exceeding 10mg/L
	Low concern based on percentage of results exceeding 10mg/L

Map 3.10: Manitowoc County Nitrate Exceedance
Source: UW Steven's Point Well Water Viewer/Soil and Water Conservation Department

Coliform Bacteria in Manitowoc County Private Wells:

Coliform Bacteria is found in surface water, soil, human and animal waste. This bacteria is a common indicator of **sanitary quality** of groundwater. They do not cause serious illnesses but their presence can help indicate other contaminants that may cause illness such as E.coli. This is the most valuable test that can be performed on well water samples if the owner is concerned about health hazards in their drinking water.

E.coli are almost exclusively found in fecal matter. Serious illnesses can occur if certain strains of E.coli is ingested: Gastroenteritis, salmonellosis, fever, common cold, diarrhea, respiratory infection, hepatitis, digestive disturbances, vomiting, restlessness, coughing, and chest pain.

Coliform Bacteria Well Water Results (Table 3.5):

Manitowoc County Statistics		
Range	Number	Percent
Coliform Positive	142	18%
Negative	632	82%
Total	774	
E. coli Positive	10	8%
Negative	123	92%
Total	133	

Presence of coliform bacteria in wells indicates that surface water is directly mixing with groundwater. Since 1988, there were 774 wells in Manitowoc County that were tested for Coliform Bacteria. 18% of those wells tested positive for Coliform Bacteria.

133 of those samples were also tested for E.coli; 8% of which tested positive for E.coli (Table 3.6).

Table 3.6: Manitowoc County Coliform Bacteria
Source: UW Steven's Point Well Water Viewer

Coliform Bacteria by Town:

Wells tested positive for Coliform Bacteria more than 25% of the time in the following towns:

- Franklin
- Maple Grove
- Rockland
- Eaton

PART THREE: Soil Quality Assessment

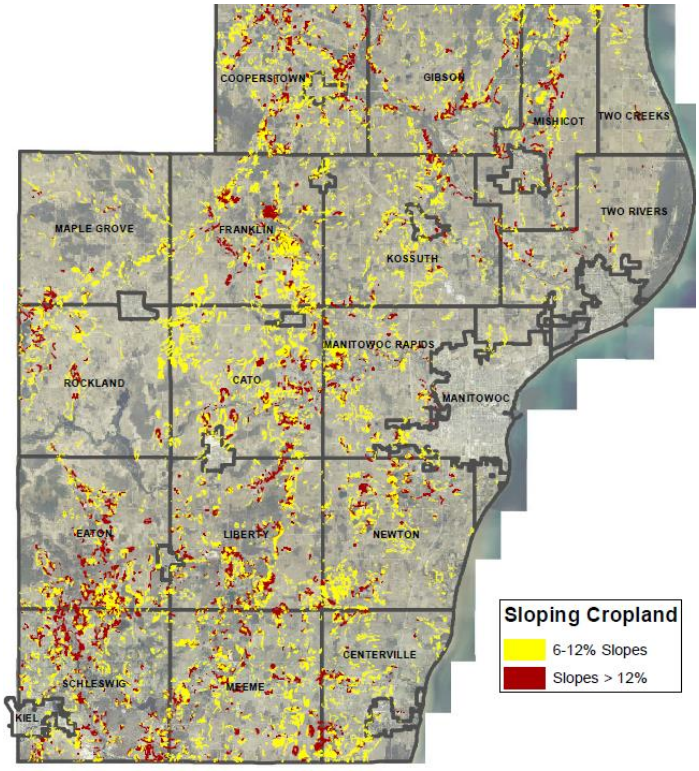
Evaluating soil types, slopes and vulnerability to erosion is essential when discussing soil quality. This section will discuss soil vulnerabilities and research as it pertains to Manitowoc County soil quality.

Manitowoc County Soil Erosion Vulnerability

Areas with high erosion correlate to poor soil quality and soil health. High erosion rates causes loss of topsoil and healthy organic matter. Organic matter is important because it supports soil microbial activity and nutrients for plants and microbes. Eroded clay soils will have greater soil density, less soil air, less nutrients, and overall lower soil health.

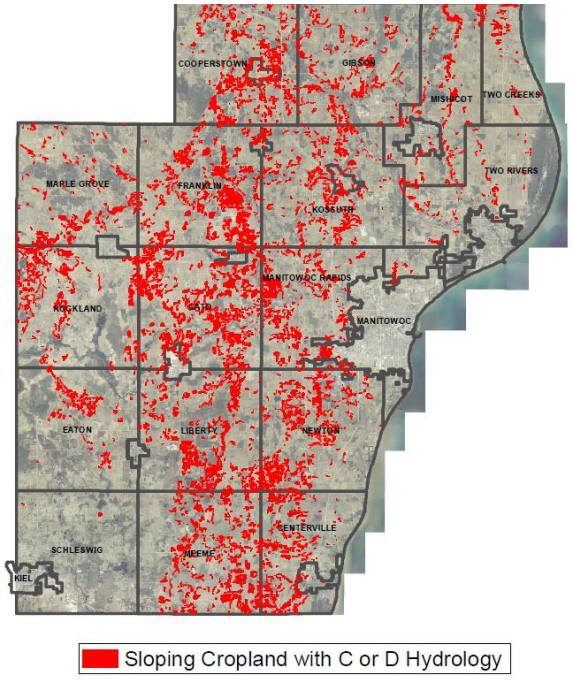
Sediment and erosion susceptibility are greatly affected by soil type and slope. Manitowoc County has 76 soil type and slope combinations (Soil Survey of Calumet and Manitowoc Counties, Wisconsin- USDA 1980). The most critical erosion sites are those with steep slopes and close proximity to streams, lakes and karst features. **Soil erosion management challenge is greatest on 27%, or 57,754 acres of cropland. These areas have 6% or greater slope and 1/3 of the topsoil is already gone** (Map 3.11). Much of the cropland has gentle slopes but still contribute to sediment runoff. Water resources in Manitowoc County suffer from cumulative effects of lower rates of erosion over many acres.

Sloping Cropland in Manitowoc County



Map 3.11: Sloping Cropland in Manitowoc County
Source: Soil and Water Conservation Department

Sloping Cropland with C or D Hydrology



Map 3.12: Sloping Cropland C/D Hydrology
Source: Soil and Water Conservation Department

C and D Hydrology are generally dense subsoils. The areas in red indicate lands that are most susceptible to erosion due to hydrology and slope (Map 3.12).

Soil Erosion Averages for Manitowoc County

Soil erosion averages are relatively low: about 2ton/ac/year as computed by RUSLE2 in SNAP+.

Nutrient and Sediment Loss: Discovery Farms Findings

Discovery Farms® performs research regarding quantity and quality of water leaving agricultural watersheds including: streams, edge-of-field, and subsurface tiles. The locations vary throughout the state to assess Wisconsin's diverse farming systems and varied landscapes. It includes eleven core farm studies (two of the eleven are located in Manitowoc County), six special projects, and two watershed studies. Discovery Farms® research has identified critical time periods and conditions when the risk of soil loss and runoff is high. Snowmelt, rain on snow, concrete frost, and non-frozen soils that are close to saturation are all conditions that increase runoff risk.

Edge-of Field Loss:

The timing and mechanisms of loss vary greatly not only between farms, but also between years and individual fields on a single farm. Discovery Farms data collected as of 2014 showed average **edge-of-field losses of 590 pounds per acre of sediment, 2.0 pounds per acre of phosphorus and 7.5 pounds per acre of nitrogen.**

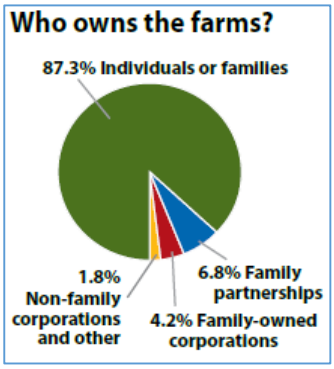
PART FOUR: Agriculture

Agriculture has a large impact on the local environment and economy in Manitowoc County. This section will provide an assessment of the county's agricultural demographics, economic influence, and environmental impact.

Manitowoc County Agriculture Demographics:

Source: Information in this section comes from 2014 Manitowoc County Agriculture: Value and Economic Impact Brochure- UW-Extension

Manitowoc County has 215,000 acres of land designated as cropland. This is 57% of the county's total land base. Manitowoc County also has approximately **110,000 dairy cattle** and **5,000 beef cattle**. The county ranks in the top five in Wisconsin counties for dairy production and in the top twenty-five U.S counties, making Manitowoc County a leader in dairy production.



87 percent of farms are owned by individuals or families. Seven percent of owners are family partnerships. Four percent are family-owned corporations, while less than two percent are owned by non-family corporations (Figure 3.6).

Figure 3.6: Farm Ownership
Source: UW-Extension

Farmers utilize 61 percent of the county's land

Manitowoc County farmers own and manage 230,735 acres, or 61 percent, of the county's land. This includes cropland, rangeland, pasture, tree farms and farm forests. As stewards of the land, farmers use conservation practices, such as crop rotation, nutrient management and integrated pest management to protect environmental resources and provide habitat for wildlife.

Farmers utilize 61 percent of the county's land

Nutrient Management Plans

A Nutrient Management Plan (NMP) is part of a good conservation plan for livestock operations. It's a plan to protect water quality and soil health by managing manure and the

nutrients in it. The goal of this plan is to set forth a range of flexible common-sense actions to minimize water quality and public health impacts of cropping activities, while ensuring the long-term sustainability of agriculture production.

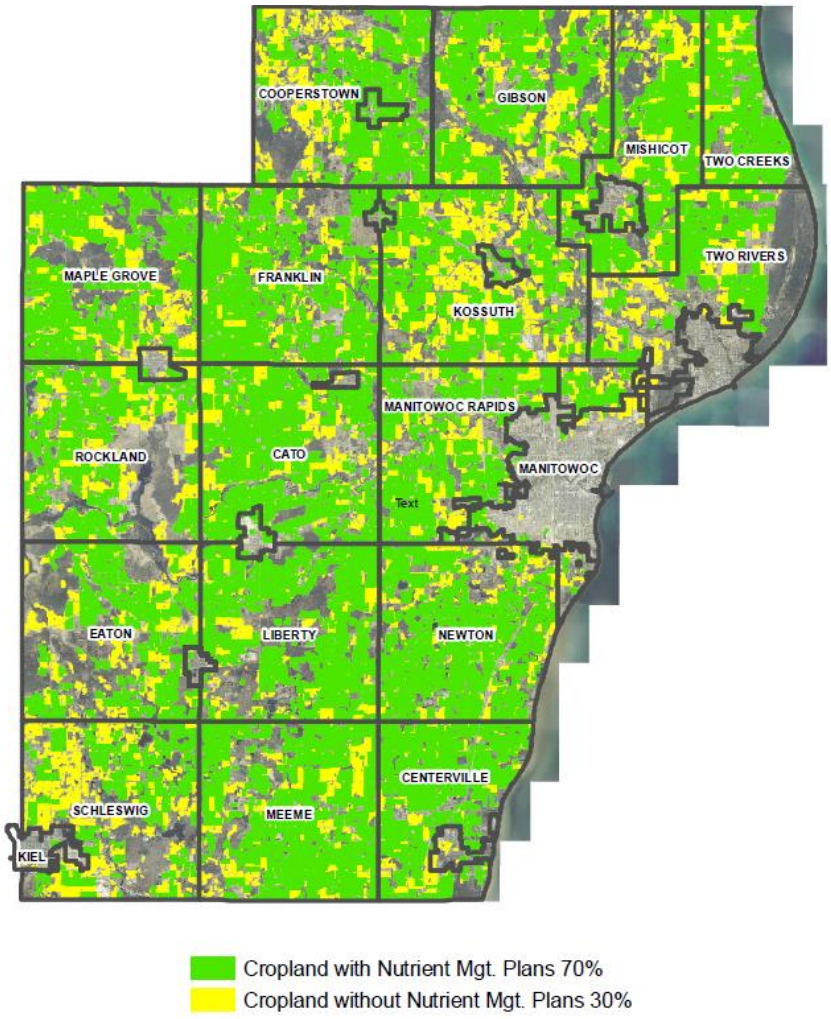
There are five components to the plan:

1) Use of manure and fertilizers on cropland
    - Develop a phosphorus based nutrient management plan- test soil and manure for nutrient content, follow a spreading plan to reduce overloading, minimize runoff to land applied manure through conservation planning. Adjust fertilizer applications to credit natural fertilizer sources like manure and legumes.
    - Proper application of manure to maximize nutrient uptake by plants and minimize odors.
2) Land management
    - Prevent soil erosion by using conservation practices like conservation tillage, contour strips, crop rotations and grassed waterways
    - Protect water quality by installing riparian buffers, filter strips, field borders, contour buffer strips and cover crops.
3) Keeping good records
    - Keeping track of how much manure is produced, record location, date, and rate of application, keep records of soil and manure testing, and record applications of commercial fertilizers and track crop yields.
4) Feed management
    - Manure is influenced by the feed ration. Feed additives can increase the nutrients in manure, especially phosphorous. The more phosphorous in the manure, the more acres are needed to spread.
5) Other options
    - If land is limited for manure application farmers may change characteristics of manure to allow for composting. They can also consider irrigating liquids after treatment or removing manure solids to use in fields that are greater distances from livestock facilities.

The Soil and Water Conservation Department has record of 70% (150,000 Acres) of cropland following a NRCS 590 Nutrient Management Plan.

Soil and Water Conservation Department does not have record of 30% (64,500 Acres) of cropland following a NRCS 590 Nutrient Management Plan (Map 3.13).

Nutrient Management Plans in Manitowoc County



Map 3.13: Nutrient Management Plans in Manitowoc County
Source: Soil and Water Conservation Department

Value and Economic Impact

Manitowoc County agriculture provides over 5,100 jobs, or about 11.5 percent of the county's workforce of 44,370. Production jobs include farm owners and managers and farm employees.

Agricultural service jobs include veterinarians, crop and livestock consultants, feed, fuel and other crop input suppliers, farm machinery dealers, barn builders and agricultural lenders, to name a few. Processing jobs include those employed in food processing and other value-added

industries that support food processors. Every job in agriculture generates an additional 0.48 jobs in the county.

Based on the latest UW-Extension analysis, Manitowoc County agriculture accounts for $360.4 million, or 10 percent, of the county's total annual income. This includes wages, salaries, benefits and profits of farmers and workers in agriculture-related businesses. Every dollar of agricultural income generates an additional $0.49 of county income.

Manitowoc County Agriculture

-Provides 5,105 jobs for Manitowoc County Residents
-Accounts for $1.5 billion in economic activity annually
-Contributes $360 million to the county's total income annually
-Pays $16.3 million in taxes annually

Source: UW-Extension

Each year, Manitowoc County agriculture generates $1.5 billion in economic activity, about 17 percent, of the county's total economic activity. Every dollar of sales from agricultural products generates an additional $0.16 of economic activity in other parts of the county's economy.

Agriculture stimulates economic activity:

- The direct effect of agriculture equals $1.3 billion each year and includes the sale of farm products and value-added products.
- Purchases of agricultural and food processing inputs, services and equipment add another $129 million in economic activity annually. For example, this includes business-to-business purchases of fuel, seed, fertilizer, feed and farm machinery, as well as veterinary services, crop and livestock consultants, and equipment leasing.
- This business-to-business activity then generates another $75.6 million annually in economic activity when people who work in agriculture-related businesses spend their earnings in the local economy.

Economic activity associated with Manitowoc County farms and agriculture related businesses generates $16.3 million in local and state taxes each year. This figure does not include all property taxes paid to support local schools. If it did, the number would increase dramatically.

Horticulture contributes to Manitowoc County's diversity. Manitowoc County sales of Christmas trees, fruits and vegetables, greenhouse, nursery, and floriculture products total $8.9 million per year. Landscape and grounds maintenance businesses create additional full-time jobs and many seasonal jobs.

More and more Manitowoc County farmers sell directly to consumers from roadside stands, farmers' markets, auctions and pick-your-own operations, with 97 farms generating $624,000 in local food sales each year.

Trends in Manitowoc County Farmland Demographics

Between 2007 and 2012 there has been farmland loss, farm loss, farm size increase and animal unit increase:

- Loss of Farmland Acreage:

  There has been a 7.1% decrease in farmland acres for a total loss of 17,503 acres.

  Source: USDA NASS Annual Wisconsin Agricultural Statistics Bulletin
- Loss of Farms:

  There has been a 15.2% decrease in the number of farms for a total loss of 220 farms.

  Source: USDA NASS Annual Wisconsin Agricultural Statistics Bulletin
- Increase in Farm Size:

  There has been a 9.9% increase in farm size for an average increase of 17 acres per farm.

  Source: USDA NASS Annual Wisconsin Agricultural Statistics Bulletin
- Increase in number of cows:

  The number of cows has increased by a total of 7,239 cows between 2007 and 2012. This equates to an approximate increase of 1,500 cows per year and results in increased feed requirements and manure generation.

  Source: 2012 Cow Inventory from Agricultural Census Data

Projected Growth for Cows, Feed and Required Land:

The following calculations on projected growth are based on current trends. The numbers should only be used as a generalization of what *could* be expected if agriculture continues the current trend. Estimates are from Manitowoc County UW-Extension and Soil and Water Conservation Department.

Dairy Cows:

Currently, Manitowoc County has about 55,000 dairy cows and approximately as many calves and heifers. It is expected that the number of cows and generated manure in Manitowoc County will increase by approximately 27 percent by 2026:

Population:
Between 2007 and 2012, the dairy cow population has increased by a total of 7,239 or an increase of approximately 1,500 cows per year. If this population trend continues, as it did between 2007 and 2012, the county can expect an addition of about 15,000 cows for a county-wide total of 70,000 cows by 2026.

Manure, Urine, and Waste:
A dairy cow and replacement will generate 35 gallons of manure, urine, and waste water each day, or 12,775 gallons a year. With the addition of 15,000 more cows, there is an estimated 192 million gallons of additional manure, urine, and waste that will be generated each year.

Dairy Cow Trend
Increased cow population and manure generation by 27 percent in 2026

In 2026, the estimated 70,000 cows and replacements will generate 894 million gallons of manure.

Beef Cows:
Currently, Manitowoc County has about 2,300 beef cows and approximately as many replacements. It is expected that the number of beef cows and generated manure, urine, and waste in Manitowoc County will increase by approximately 43 percent by 2026.

Population:
Between 2007 and 2012, the beef cow population has increased by a total of 500 cows or an increase of approximately 100 cows per year. If this population trend continues, as it did between 2007 and 2012, the county can expect an addition of about 1,000 cows for a county-wide total of 3,300 cows by 2026.

Manure, Urine, and Waste:
A beef cow and replacement will generate 15 gallons of manure, urine and waste water per day, or 5,475 gallons a year. The current 2,300 cows generate 12.6 million gallons of waste a year. With the addition of 1,000 cows, there will be an estimated 5.5 million gallons of additional manure, urine, and waste generated per year.

Beef Cow Trend
Increased cow population and waste generation by 43% in 2026

In 2026, the estimated 3,300 beef cows and replacements will generate 18 million gallons of manure. The generation of waste from dairy **and** beef cows is projected to **increase by 197.5 million gallons** by 2026.

Feed:

The amount of milk a cow produces will affect how much it eats. In Manitowoc County, the average milk production is approximately 70 pounds per cow per day. In the next 10 years, that level is expected to increase 2-3 percent per year due to genetic advancements, as well as improvements in housing, nutrition and management. The more a cow eats, the more milk it will produce. A general rule of thumb is that each pound of increased dry matter intake, or DMI, will result in 2-3 more pounds of milk per cow per day. In 10 years, the average cow in Manitowoc County will likely produce over 85 pounds of milk per day (a 21 percent increase).

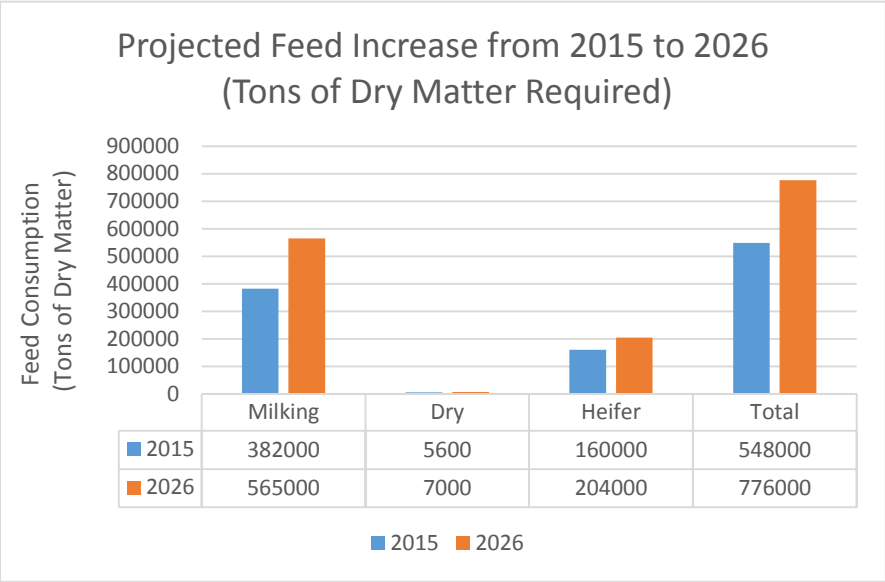
With an estimated 21 percent increase in milk production by 2026, comes an increase in feed intake; meaning the cow will need to consume about eight pounds more dry matter per day than today's average. The previous section projected a total dairy cow population to be 70,000 cows by 2026. Statistically, 15 percent of those cows will be dry cows and the remaining 85 percent will be milking. This is important because the amount of feed consumption decreases when cows are dry.

2026 Estimates

Milking Cows:	Dry Cows:
Population:	Population:
60,000 (85 percent of total dairy cow population)	10,000 (15 percent of total dairy cow population)
Consumption (DMI):	Consumption (DMI):
58 pounds per day per cow	28 pounds per day per cow

Feed consumption for all types of cows is anticipated to increase by 2026 due to the increase in milk production along with the increase in total dairy cow numbers (Figure 3.7).

Milking Cows: Increase by 48 percent
(A combination of increased cow numbers and increased dry matter intake per cow)
Heifers: Increase by 27 percent
Dry Cows: Increase by 25 percent



	Projected Feed Increase by 2026 (Tons of Dry Matter)
Milking	183,000
Dry	1,400
Heifers	44,000
Total	228,400

Figure 3.7: Projected Feed Increase 2015-2026
Source: UW Extension- Manitowoc

Projected Land Use Requirements:

Environmental standards limit the amount of manure that can be applied to cropland. To accommodate the anticipated increase in cow populations by 2026, the county will need an additional 20,000 acres of land for a total of 91,000 acres of cropland for spreading. Manitowoc County currently has a total of 215,000 acres of cropland, so by 2026, about half of it will be required for spreading.

This addition of cows and manure will create new challenges for farmers including transportation issues and land requirements. Some farmers will be required to transport manure offsite due to lack of acres owned and spreading regulations. Transportation of manure to the fields that need it can pose a unique challenges for farmers and manure haulers including increased cost, unpleasant odor on public streets, and increased risk of spilling or leaking during the process.

In 2026, Manitowoc County will require an additional 20,000 acres of cropland for spreading manure to sustain cow population growth

Challenges Facing Agriculture and Conservation

It is important to recognize challenges that farmers and the environment are facing in Manitowoc County in order to mitigate some of the issues. Challenges include: nutrient management,

increasing reliance on consultants due to operators specializing in dairy vs. crops, changes in farming demographics, meeting increased food demand, and lack of public knowledge and acceptance.

Environmental Degradation and Runoff:

Managing nutrients and reducing runoff will continue to be a growing challenge as the number of cows increase and farms become more concentrated. The trends in agriculture, without implementing appropriate conservation measures, will increase risk of surface water, groundwater, and wetland contamination. The information below comes from WDNR website, Ag Environmental Impact

Surface water: Too much manure, fertilizers or sediment may pollute lakes, streams and rivers. Improper use or disposal of pesticides, herbicides or medicines (for humans or animals) may also cause water quality problems. Excess nutrients from manure or other agricultural runoff raise the amount of nitrogen and phosphorus in the water. These increases cause algae bloom and lower oxygen levels in the water. It also harms water habitats, ruins the natural beauty, and can prevent recreational use of lakes, streams and rivers.

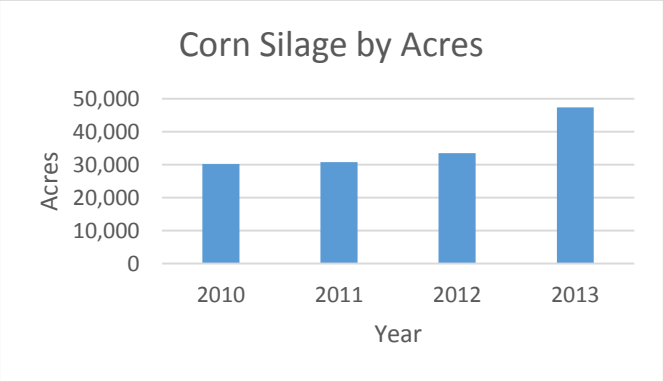
Groundwater: Many cities and towns, homes, businesses and farms rely on groundwater for clean drinking water. Manure, fertilizers, pesticides, herbicides and pharmaceuticals may pollute groundwater. Once in the groundwater, these pollutants are very difficult to remove. Nitrogen and bacteria are two of the main pollutants from farms and livestock operations. They can have immediate and severe public health affects in groundwater. Other pollutants such as pesticides, herbicides and pharmaceuticals may have unknown long term health effects. For more information about public health concerns related to drinking water, your local health department or the Centers for Disease Control and Prevention can provide more information about drinking water quality.

Wetlands: Wetlands are important water sources for fish and wildlife. They also provide natural flood control and improve water quality. Excessive nutrients and sediment from agriculture and construction (along with improper drainage or filling) change the natural function of wetlands and harm wetland plant communities. Agricultural pollutants, construction and wetlands drainage or filling can lead to habitat loss for wildlife.

Increased Corn Silage Production and Stress on the Environment:

Corn silage is an excellent source of feed for cattle but there can be negative environmental impacts from continuous corn silage production without conservation efforts. Harvesting corn silage leaves little residue, resulting in increased erosion and nutrient runoff. Continuous cropping of corn silage can reduce organic matter and soil structure.

Corn silage production is increasing because of the demand to feed an increasing number of livestock. Corn silage typically out yields other crops, making it a prized feed for farmers. In Manitowoc County, there was a 17,200 acre increase in acres used for corn silage between 2010 and 2013 (Figure 3.8).



Corn for Silage	
Year	Harvested Acres
2010	30,200
2011	30,800
2012	33,500
2013	47,400

Figure 3.8: Corn for Silage by Acres
Source: National Agriculture Statistics Service

Increasing reliance on consultants and service providers:

According to some farmers and the Local Advisory Committee, Nutrient Management plans, ordinances, and requirements are becoming more complex. This is causing increased demand for consultants and service providers to assist with farm management. Specialization has also increased use of custom field work for planting, manure spreading with operators less familiar with individual farms and farm systems. This is causing a growing disconnect between the farmer and their conservation plans.

Changes in Farming Demographics:

There has been a loss of farmland acreage, loss of number of farms, and increase in farm size and number of animals thus causing stress to environmental systems.

Farmers must meet increasing food demand:

According to the US Census Bureau, the population has increased in the state of Wisconsin, in the United States, and Worldwide:

- Wisconsin: 5.6 million in 2008 to 5.7 million in 2015.

- United States: 304 million in 2008 to an estimated 321 million in 2015.
- World: 6.7 billion in 2008 to 7.3 billion in 2015.
- World: 8.0 Billion by 2025

Worldwide population increases will drive farms to produce more food per acre, and to possibly use "marginal" cropland prone to environmental degradation. Shifts in livestock production and crop production techniques are anticipated.

Challenges in Agriculture & Conservation

-Nutrient management and the environmental impacts
-Increased corn silage production
-Increased reliance on consultants
-Changes in farming demographics
-Increased food demands
-Lack of public knowledge

Lack of Knowledge:

It is becoming more difficult to see the connection between the local farmer and the community due to massive grocery chains. In many cases, the community does not see where or how their food is grown, resulting in misunderstanding of food production systems. Farm operators are also more specialized and may be unaware of their actions on the environment and quality of life for their communities.

Agricultural Assessment Summary

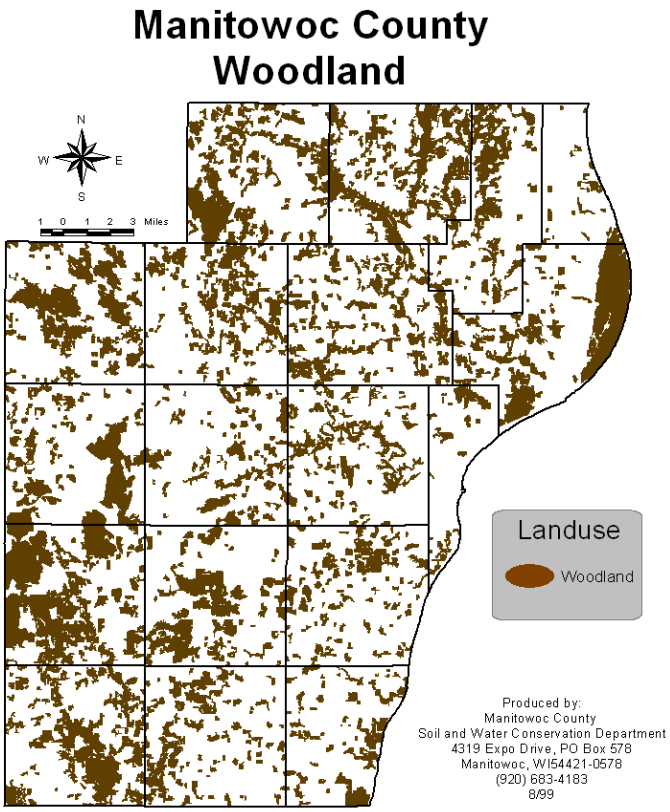
Agriculture has an important role in conservation efforts in Manitowoc County. Farmers account for over half of the land owners in Manitowoc County and the majority of land use. **Working with farmers to assist them with conservation efforts is vital to protect and improve the natural resources of Manitowoc County.**

PART FIVE: WOODLANDS

Upland hardwood is the most common forest type in Manitowoc County. These are mostly forests of sugar maple, beech, oak, ash and other mixed hardwoods. The swamp hardwood forest is also widespread. Many of these are high value soft maple stands.

Public Land

Point Beach State Forest is an important public property. Located along the banks of Lake Michigan, it contains a substantial acreage of northern forest and large plantations of pine trees. While recreation is a primary use, timber production is still ongoing. Walla Hi Park near Kiel and Collins Marsh Wildlife Area also contain some fairly substantial forest acreage.



Map 3.14: Manitowoc County Woodland
Source: SWCD

Large Blocks of Forest

At the time of the first European settlement, Manitowoc County was essentially a forested landscape. Original vegetation maps prepared from survey notes indicate that Manitowoc County was primarily a forest of beech, sugar maple and basswood. Parts of the County (especially near Point Beach State forest) had a higher percentage of conifers including hemlock and pine. Most of the swamps were conifers, probably cedar and tamarack.

Today's landscape, by contrast, is essentially agricultural. As is common throughout southern Wisconsin, the current forested acres are highly fragmented, with most woods in parcels of 40 acres or less. There are a few larger parcels, but there is a continuing trend to subdivide these woodlands and sell them as exclusive wooded lots, to build golf courses, or otherwise remove them from forestry or wildlife use.

Production of timber is still an important economic activity in the county with several operating sawmills. Forestland is also critical for maintaining the habitat of many game animals such as deer and turkey. Maintenance of a substantial block of forested lands in the county is necessary to maintain these activities.

Large parcels of land ranging in size from 500 to 1000 acres are of particular value because they can attract a much wider range of wildlife species than is possible in small woodlots. Woodland birds, such as warblers are especially vulnerable to predators if they are located along forest edges. The large woodlands provide a much safer haven for these forest birds.

Stresses on forest areas in Manitowoc County include:

- Housing development and fragmentation of remaining woodland areas
- Invasive species impacts from plant species and insect damage from Emerald Ash Bore and Gypsy Moth
- High value of cropland resulting in clearing of remaining upland woods for use as higher valued cropland

Chapter 4

Accomplishments
Priorities and Plan Implementation

A. Local Conservation Ordinances
B. State Agricultural Performance Standards and Prohibitions
C. Working Lands Initiative
D. Groundwater Protection Programming
E. Surface Water Protection Programming
F. Soil Health Programming
G. Best Management Practices
H. Education Programming for Conservation Practices
I. Office Administration and Professional Development

Partnerships
Monitoring and Evaluation

Manitowoc County Soil and Water Conservation Department

Soil and Water Conservation Department Accomplishments

County Animal Waste Management Ordinance Permits:

Since 2008, Manitowoc County has issued 63 Animal Waste Permits.

Since 1999, Manitowoc County has issued 162 Animal Waste Permits.

Since 2008, Manitowoc County has issued 49 Abandonment Permits.

Since 2007, Manitowoc County has issued 23 Livestock Facility Siting Licenses to 22 dairies.

Violations:

Since 1999:

350 Investigations (an average of 23.3 per year)/131 Ordinance Violations (37% of investigations)/18 County Citations Issued (14% of violations)

Farmland Preservation Program Administration:

Participation:

725 participants on average
Distributes $877,000 annually in tax credits
On average, The Soil and Water Conservation Department performs 180 annual farm compliance reviews each year
Approximately 70% of Agricultural Land participating in the program
595 farms, 153,900 acres, in full compliance
130 farms have conservation compliance schedules

Education Program Administration:

The Soil and Water Conservation Department has held Nutrient Management Farmer Education training since 2008. There are approximately 15 participants each year.

Free drinking water screening at the county fair held annually. The Soil and Water Conservation Department screens approximately 200 wells each year for nitrates.

Conservation Education Incorporated: Manitowoc County has provided environmental training to county educators yearly since 2005.

Breakfast on the Farm Display: One display in 2015 and plans to continue every year.

In 2015, The Soil and Water Conservation Department created a part-time position to fill the role of public relations, outreach educator coordinator and administration.

Agronomy/manure hauler update meetings have been held every other year since 2008.

Since 1976 the following Best Management Practices have been installed in Manitowoc County:

Over 350 manure storage facilities have been constructed.

Over 300 barnyard runoff control systems installed.

200 miles of grassed waterways installed.

1007 wetland restorations, over 1,500 acres of shallow water constructed.

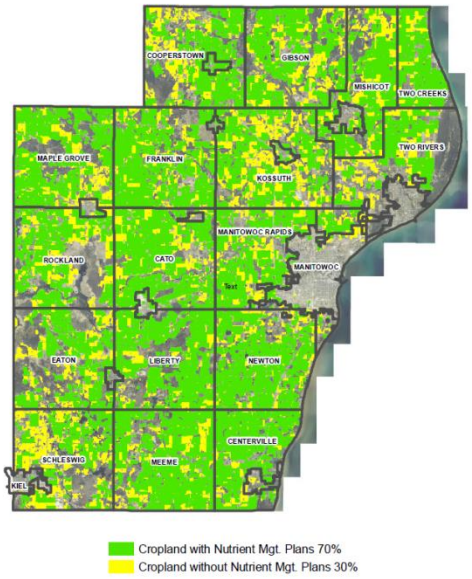
45 miles of buffers installed on 560 former cropland acres.

87 perpetual conservation easements on 1,968 acres.

40 Vegetated Treatment Areas constructed.

153,760 Acres (70% of cropland) with a Nutrient Management Plan.
Plans include crop rotations on this land.

Nutrient Management Plans in Manitowoc County



Manitowoc County currently has 70% of cropland enrolled in a Nutrient Management Plan

Natural Resource Conservation Service (NRCS) Programs:
The Soil and Water Conservation Department provides referrals and administrative or technical support for the following programs:

Environmental Quality Incentive Program (EQIP)
Since 2008, NRCS has provided 206 EQIP contracts.

Conservation Stewardship Program (CSP)
Since 2008, NRCS has provided 49 CSP Contracts.

Conservation Reserve Program (CRP)
Since 2008, the county has approved 146 CRP contracts.

Conservation Reserve Enhancement Program (CREP)
Since 2008, the county has approved 22 CREP Contracts.

Department of Natural Resources Programs and Permits:
The Soil and Water Conservation Department provides referrals and administrative or technical support for *Wisconsin Pollutant Discharge Elimination System Permitting (WPDES).* Manitowoc County has 18 WPDES Permitted Facilities.

Introduction to Program Priorities and Plan Implementation

Conservation programs offered by Manitowoc County are a blend of voluntary programming, state mandate administration, and local mandate administration.

The Soil and Water Conservation Department will continue current practice of not only identifying problems and enforcing violations, but also working with the landowner to find solutions and providing assistance when implementing them.

The philosophy guiding program implementation is to achieve multiple goals through administration of voluntary conservation programming and mandates.

The Soil and Water Conservation Department has developed nine priority items based off of past experience, current resource assessment, public input, local advisory committee recommendations, and technical advisory committee recommendations:

PRIORITY ITEMS

A. Local Conservation Ordinances
B. State Agricultural Performance Standards and Prohibitions
C. Working Lands Initiative
D. Groundwater Protection Programming
E. Surface water Protection Programming
F. Soil Health Programming
G. Best Management Practices
H. Education Programming for Conservation
I. Office Administration and Professional Development

PRIORITY A: Implement and Enforce Local Conservation Ordinances

County ordinances were developed to promote public health and welfare by protecting soil quality, surface water quality and groundwater quality in Manitowoc County. Implementation and enforcement of local conservation ordinances is viewed as a top priority for The Soil and Water Conservation Department staff. In instances where various State regulations overlap Manitowoc County ordinances, the enforcement is coordinated with the state agency representatives.

Education of County farm operators and their consultants is considered the primary tool to achieve compliance with County ordinances. Substantial compliance is accomplished using voluntary compliance and education.

The following procedure, per Manitowoc County Ordinances, is followed for noncompliance:
"If voluntary compliance is not achieved, the Department Director will mail a notice of the problem to the landowner or operator stating that the requirements of the ordinance have not been met; describing the nature of the problem; listing relevant best management practices and associated average costs; describing the action necessary to correct the problem; stating that the Soil and Water Conservation Department will provide a conservation plan, including a schedule of implementation, upon request; and provide notice of the availability of cost-share funds required under Wis. Stat. Sec. 92.14 to address the problem. The notice will also inform the owner or operator of the right to appeal and the appeal procedure. The Director is authorized to post an order stopping work, may issue an order to abate any violation, may issue a citation for any violation or may refer a violation to Corporation Counsel for legal action."

Manitowoc County Ordinances:

- Manitowoc County Chapter 19 – Animal Waste Management Ordinance
- Manitowoc County Chapter 26 – Animal Waste Storage Ordinance
- Manitowoc County Chapter 27 – Agricultural Shoreland Management Ordinance
- Manitowoc County Chapter 28 – Livestock Siting License

Manitowoc County Chapter 19 Animal Waste Management Ordinance –

Animal waste and land application related activities other than storage are covered by Chapter 19 of the Manitowoc County Ordinance. The ordinance cites specific manure management restrictions and requirements outside the structure of the 590 plan. Restrictions include manure spreading activities in proximity to lakes, streams, wells, sinkholes and tile surface inlets along with winter manure spreading criteria relative to manure type and land slope.

Manure Application Restrictions Based on Various Environmental Hazards

Hazard	Prohibition	Exception
Channels that flow to an intermittent or perennial stream, lake, pond or sinkhole	Do not apply within 50 feet of channel	Unless incorporated within 48 hours
Exposed bedrock and wells	Do not apply within 100 feet of exposed bedrock and wells	None
Exposed bedrock and wells	Do not apply within 100 to 300 feet of exposed bedrock and wells	* Unless incorporated within 48 hours * Land does not drain to hazard
Sinkhole	Do not apply within 100 feet of a sinkhole	None
Sinkhole	Do not apply within 100 to 300 feet of a sinkhole or within its drainage area	* Unless incorporated within 48 hours
Surface inlet or drainage tile, intermittent/perennial streams or pond	Do not apply within 300 feet of hazard	* Unless incorporated within 48 hours * Land does not drain to hazard
Lake	Do not apply within 1000 feet of a lake	* Unless incorporated within 48 hours * Land does not drain to hazard
* It is unlawful for any person to permit runoff of mechanically applied manure to enter land within 20' of a sinkhole, within 20' from the centerline of an intermittent stream, within 20' from the bank of a perennial stream or river, or the ordinary high-water mark of any pond or lake.		
* Application of manure must stop whenever there is ponding or runoff, including runoff through a drain tile.		

Figure 4.1: Manure Application Restrictions Based on Various Environmental Hazards
Source: The Soil and Water Conservation Department and Manitowoc County UW-Extension

Spreading Requirements Based on Season of the Year, Consistency of the Manure and Slope of the Field

Season	Consistency of Manure to be Spread	Field Slope	Action Needed	Exceptions
Winter	Liquid	6% +	Incorporate within 48 hours	None
Winter	Solid	6 to 12%	Incorporate within 48 hours	Contour strips, hay, or 40% crop residue
Winter	Solid	12% +	Incorporate within 48 hours	None
Spring, Summer and Fall	Both Liquid and Solid	6 to 12%	Incorporate within 48 hours	Contour strips, hay, or 40% crop residue
Spring, Summer and Fall	Both Liquid and Solid	12% +	Incorporate within 48 hours	None

Figure 4.2: Spreading Requirements
Source: The Soil and Water Conservation Department and Manitowoc County UW-Extension

Manitowoc County Chapter 19 Continued – Livestock and Grazing Permitting
Livestock are not permitted to access an intermittent stream, perennial stream, or lake except as authorized in a grazing permit issued by Soil and Water Conservation Department. The Land Conservation Committee is authorized to adopt procedures and standards for any grazing permit.

Manitowoc County Chapter 26 Animal Waste Storage Permit –
Permits to construct manure storage structures greater than 500 cubic feet are required to meet Natural Resource Conservation Service Standard 313 Waste Storage Facility and 634 Waste Transfer Criteria. Permits are required for all new construction, substantial alteration of existing structures, and manure transfer systems. Permitees are required to develop and maintain annual nutrient management plans that meet NRCS 590 Nutrient Management Standard, including soil erosion management criteria utilizing RUSLE II. The Soil and Water Conservation Department requires a Manure Storage Facility Abandonment Permit if storage is unused for a period of two years. A permit is also required for conversions of manure storage structures to other uses.

Manitowoc County Chapter 27 Agricultural Shoreland Management Ordinance –
Runoff of manure bearing water from barnyards; manure storage (stacked or constructed) or field application is prohibited from reaching the agricultural shoreline corridor.

Agricultural shoreland corridor: The land that is within 20 feet of the edge of a sinkhole, the centerline of an intermittent stream, the top of either bank of a perennial stream or river, or the ordinary high-water mark of any pond or lake as shown on a United States Geological Survey 1:24,000 quadrangle map or the Chapter 19 Map.

Agricultural activity: Any person who causes or conducts agricultural activity within the agricultural shoreland management area must do so in a manner that minimizes soil erosion and the movement of suspended solids into surface water.

Agricultural shoreland management area: Any land that drains to, and is within 1,000 feet of the ordinary high-water mark of a lake or pond, and any land that is within 300 feet of the edge of a sinkhole, the centerline of an intermittent stream, or the top of either bank of a perennial stream or river, as shown on a United States Geological Survey 1:24,000 quadrangle map or the Chapter 19 Map. Agricultural shoreland management area does not include any land that is within a drainage district.

Cropland areas: Erosion on a cropland that is within the agricultural shoreland management area and that contains a tilled annual crop must not exceed the tolerable rate specified in the Technical Standards for the predominant soil in the field.

Pastures: A pasture or other land with a permanent uniform cover of grasses or legumes used as forage for livestock that is within the agricultural shoreland management area must comply with Technical Standard 512.

Application of Animal Waste, Manure, and other Nutrients: The mechanical application of animal waste, manure, and other nutrients to any land within the agricultural shoreland management area must comply with the requirements of Chapter 27 and be in accordance with a nutrient management plan that complies with Technical Standard 590. Application of animal waste or manure must stop whenever there is ponding or runoff. Immediate remedial action must be taken to contain any ponding or runoff that occurs during or following the application.

Unconfined Piles and Stacks: Unconfined animal waste and manure piles are prohibited within the agricultural shoreland management area.

<u>Manitowoc County Chapter 28 Livestock Siting License –</u>
Chapter 28 adopts ATCP51 livestock siting criteria for livestock farms. Siting is administered by Manitowoc County Soil and Water Conservation Department using licensing. To obtain a license, applicants must utilize the ATCP51 application worksheets. Manitowoc County Livestock Siting Ordinance was effective Jan 1, 2007.

About the License:
A license is required for any new livestock facility with 750 or more animal units. A license is required for an expanded livestock facility if the number of animal units at the expanded livestock facility will exceed 750 and the number of animal units will exceed the maximum number of

previously approved or, if no maximum number was previously approved, will exceed a number that is 20% higher than the number kept on January 1, 2007.

Standards that must be met prior to the county granting a license include:

- Total animal units (maximum allowable after license granted)
- Setbacks from proposed livestock structures to property lines and road right-of-ways. Livestock structures include: barn, milking parlor, feed storage facility, feeding facility, animal lot, or waste storage structure
- Employee Training Plan
- Environmental Incident Response Plan
- Waste and Nutrient Management
- Waste storage facilities: existing and proposed meet specified criteria
- Runoff management from animal lot and feed storage areas
- Nonpoint pollution standards
- Odor management if applying for 1,000 or more animal units
- Odor score of 500 or more points to meet requirement

PRIORITY B: Implement and Enforce State Agricultural Performance Standards and Prohibitions

The Soil and Water Conservation Department will continue to integrate State Agricultural Performance Standards and Prohibitions into ongoing Soil and Water Conservation Department programs. These programs include:

- County Ordinances
- Farmland Preservation Program participation
- Animal Waste Storage cost – share compliance criteria
- Land and Water SEG funds – cost-sharing

State Agricultural Performance Standards and Prohibitions can be found in NR 151 and ATCP 50 and include the following requirements:

- Maintain a minimum 5 foot tillage setback from surface water bodies
- Prevent significant discharge of process wastewater (e.g. feed leachate, milk house waste) to waters of the state
- Meet tolerable soil loss (T) on cropped and pastured fields
- Follow a 590 Nutrient Management Plan on cropland and pastures
    - Fields must have initial soil tests conducted by 2016 and follow crop management practices that are planned to comply with the 590 standard across the crop rotation
- Calculate and follow the Phosphorus Index >6 average where it applies on cropland, pasture, and winter grazing areas
- Limit livestock access along waters to maintain vegetative cover
- Maintain manure storage structures to prevent leaking and overflow
- Follow manure storage technical standards for construction and abandonment
- Prevent direct runoff from feedlots or stored manure to waters of the state

- Near surface water or areas susceptible to groundwater contamination do not stack manure in an unconfined pile and divert clean water away from feedlots, manure storage and barnyards
    - Livestock operators must prevent a "significant" discharge from manure and feed storage, feedlots, and process wastewater. Consider low cost options for removing "significant" direct feedlot runoff such as: 1. Grazing cattle on nearby fields. 2. Collecting lot manure on a consistent basis and field applying in accordance with a nutrient management plan. 3. Removing channels with roof gutters, clean water diversions, or rock spreader diversions with harvested vegetative runoff filters.

Compliance procedures for failure to implement ATCP 50 and NR151

The Soil and Water Conservation Department will coordinate implementation and enforcement with Department of Agriculture, Trade, and Consumer Protection and Wisconsin Department of Natural Resources to achieve compliance with performance standards and prohibitions. The Soil and Water Conservation Department will seek voluntary compliance and offer information, cost sharing to comply with requirements under s. ATCP 50.08, and technical assistance to help landowners comply. The Soil and Water Conservation Department will discuss and investigate non-compliance issues with Wisconsin Department of Natural Resources to determine which agency will initiate enforcement action against a landowner who refuses to implement required conservation practices. Noncompliance is identified through complaints and program participant compliance reviews.

Priority Farms

The Soil and Water Conservation Department will assist all landowners to achieve compliance with performance standards and prohibitions, but will focus efforts on the following priority farms:

- Farms subject to a Wisconsin Department of Natural Resources notice of intent or notice of discharge
- Farms that have, or plan to have large numbers of livestock or significant problems with manure management
- Farms participating in the Farmland Preservation Program
- Farms in areas sensitive to groundwater contamination
- Farms with excessive rates of cropland erosion
- Farms within a watershed draining to inland lakes
- Farms located in watersheds draining to waters are listed on DNR 303(d) list of impaired waters for phosphorus and sediment.

PRIORITY C: Administer Working Lands Initiative

Farmland Preservation Program: The Soil and Water Conservation Department cooperates with the Manitowoc County Planning and Zoning to implement the Working Lands Initiative. For a county to be eligible for Farmland Preservation tax credits, Planning and Zoning must first zone a county as Exclusive Ag and obtain an Agriculture Preservation Plan for the county. After these two requirements have been met, farmers in those counties can become eligible for the Farmland Preservation tax credit which is administered by the Soil and Water Conservation Department.

The Farmland Preservation Program is designed to promote farmland conservation practices by providing tax credits to farmers who maintain a robust conservation plan and meet zoning and state conservation standards. All towns in Manitowoc County, with the exception of Schleswig, are participating in exclusive agriculture zoning and are eligible for Farmland Preservation Plan tax credit.

Wisconsin Farmland Preservation Program Monitoring and Compliance Strategy

Monitoring compliance of farm participants in the Farmland Preservation Plan is a combination of program specific farm visits to check compliance of farms meeting Wisconsin State Agricultural Performance Standards and Prohibitions, farm compliance checks that are subject to WPDES permit, inclusion of farms required to meet Manitowoc County Chapter 28 (ATCP51 criteria), and other farms that are investigated relative to Manitowoc County Chapters 19 and 27.

Farmland Preservation Program participants were identified in 2009 and 2010 in eligible exclusive agriculture zoned areas. Excluded areas are the towns of Schleswig and Kossuth. Approximately 750 participants collect credits through the program. Farms were assigned random priority values to evenly distribute "first" contacts with farms from 2010 through 2013, roughly dividing the participants into 4-year contact groups. Participant farms are inspected/checked every four years in rotation based on the last contact for compliance review. Reviews of farms are conducted with the aid of a farm inspection form that includes check off of all NR151 conservation standard items. In cases where deficiencies in compliance are identified, a compliance schedule is developed.

Waterway needs, where reoccurring channelized erosion occurs, are identified as a deficiency of meeting the nutrient management standard. Owners are required to repair or schedule repairs to waterway vegetation along with other needed Best Management Practices. Needed conservation practices are tracked/per owner/operator to check on implementation of Best Management Practices, as well as identification of technical assistance needs.

When full compliance with state conservation standards is identified, a certificate of compliance is issued to the owner for future Farmland Preservation Program claims. Certificates are by individual owner and will list all eligible parcels. Farms with signed compliance schedules that actively implement schedules will also be considered in compliance, and will receive compliance certification.

New participants to the Farmland Preservation Program must meet all NR151 standards prior to certification and participation. Farmland Preservation Program compliance is also checked and verified when a farm is reviewed for compliance with ATCP51 ordinance and when farms apply for manure storage permits. Other local conservation priorities are incorporated into Farmland Preservation Program visits such as Manitowoc County manure spreading restrictions and conservation program availability.

Failure of participants to meet compliance can result in an Issue of Noncompliance and forfeiture of tax credits.

PRIORITY D: Implement Groundwater Protection Programming

Protection of groundwater will be emphasized within ongoing programs. *Local priority will be given to areas sensitive to groundwater contamination including towns of: Cooperstown, Gibson, Maple Grove, Franklin, Kossuth, Rockland, Cato and Schleswig.*

GROUNDWATER GOAL

To improve quality of groundwater by decreasing nitrate levels by 20% in wells previously screened and above 10mg/L in the towns of Cato, Maple Grove, Franklin, Gibson, Cooperstown, Rockland and Kossuth.

Critical areas for Groundwater protection will be defined as:

- Geographic areas with less than 60" of soil over bedrock using current technology to determine. Soil types include: CnB, CnC, KrB, KrC, & WpB.
- Sinkholes and conduits to groundwater and all land that drains to those features.

Management to Protect Groundwater:

Groundwater Management can be accomplished by:

- Improving groundwater data
- Developing an educational program
- Installing Best Management Practices
- Administering/enforcing State Conservation Standards and County Ordinances

Improve Groundwater Data:

The department will focus on improving current groundwater data for the county. The Soil and Water Conservation Department will continue using nitrate screening results from County Fair and data from Stevens Point Environmental Lab to help target critical areas.

Identification of Conduits to Groundwater

The Soil and Water Conservation Department will identify new sink holes and groundwater conduits along with watersheds draining to those features. LIDAR elevation maps will be available in 2016 and will greatly assist with this effort. Upon identification of sinkholes using LIDAR, The Soil and Water Conservation Department will verify locations with onsite evaluation. Towns classified to be in a region sensitive to groundwater contamination will be first priority. The Department will also work with crop advisors, landowners, Natural Resource Conservation Service, UW Extension, and farm service suppliers to help locate conduits to groundwater and ask them to provide that information to The Soil and Water Conservation Department.

Updating and Distribution of Hazard Maps

Hazard maps will be updated and distributed as new information is gathered. Map layers will include shallow soil, sink holes, depressions, exposed bedrock, and restrictions zones based on land features. This information will be distributed to farmers, landowners, manure haulers, crop consultants and the public. The Soil and Water Conservation Department will share information with Department of Agriculture, Trade, and Consumer Protection to standardize map sets that includes Manitowoc County ordinance features and restrictions.

Well Water Screening for Farmland Preservation Program Participants

The Soil and Water Conservation Department will make well water screening a voluntary part of the Farmland Preservation Program. When doing the 4-year visit, the department will offer the opportunity for farmers to perform a screening for nitrates on their well to provide important information to the farmer and enhance our database.

Well Water Study

The Soil and Water Conservation Department will ask for volunteers from Cato, Maple Grove, Franklin, Gibson, Cooperstown, Rockland and Kossuth to be in a well water study. The department will gather nitrate levels from 3-4 wells from each of the aforementioned Towns. The goal is to obtain baseline data to monitor progress toward reducing nitrate levels after farmers implement Best Management Practices.

Develop a Groundwater Education Program:

See PRIORITY Education Programming.

Installation and Application of the Following Conservation Practices:

- Buffers along streams, around sinkholes, and near sensitive areas
- Diversions around sinkholes
- Nitrogen preservation techniques
- Export nutrients away from regions sensitive to groundwater contamination to lower risk
- 2016 NRCS 590 Standard
- Repair failed tile lines and blow-outs and remove drainage tile flowing to sinkholes
- Partner with WDNR on well abandonment for potential funding
- Cover crops and grass-based crop rotations

Administer and Enforce Current Standards and Ordinances

- Revise county ordinance to adopt 2016 NM 590 standard and 2012 Manure Storage and Transfer 313 and 634
- ATCP 50 and 51 are being revised to incorporate new 590 standard. Implement and track use of new standard

PRIORITY E: Implement Surface Water Protection Programming

Protection of surface water will be emphasized within ongoing programs.

SURFACE WATER GOALS

Lakes:
Goal 1: To maintain phosphorus levels at or below current levels for lakes between 0-24 ppb (Horseshoe, Pigeon, Shoe, Spring, Cedar, Wilke, Tuma, English)

Goal 2: To decrease phosphorus levels by 10% in all inland lakes with average phosphorus levels above 24 ppb by 2026 (Bullhead, Silver, Weyers, Hartlaub, Long, Carstens, Gass, Harpt)

Streams:
To decrease phosphorus levels by 10% for streams identified in the Impaired Waters List above the water quality standard of 0.100 mg/L for rivers and 0.075 mg/L for streams, including stretches of the Manitowoc River, Meeme River, Molash Creek, Pigeon River, Pine Creek, Silver Creek, South Branch River and the West Twin River by 2026.

Critical Area for Implementation of Water Quality Performance Standards will be defined as:

- Rivers and lakes listed on the Wisconsin Department of Natural Resources Impaired Waters List
- All land that is cropland in the Water Quality Management Area (WQMA), as defined by Manitowoc County Animal Waste Ordinance, Chapter 19, which is 300 feet from a stream or 1000 feet from a lake
- And if 1/3 of a cropland field has 'C' or 'D' slope AND hydrologic 'C' or 'D' in areas between 300 - 1000 feet of a stream or 1000 -2000 feet of a lake will be included as a critical area
- Active feed storage bunkers and barnyards within 1000' of a stream and 2000' of a lake, or if the barnyard or feed storage bunker has direct runoff to waters of the state
- Lakes with phosphorus levels above 40ppb: Long Lake, Carstens Lake, Gass Lake, Harpt Lake

Management to Protect Surface Water:

Surface Water Management can be accomplished by:

- Installation and Application of Best Management Practices
- Administering/enforcing State Conservation Standards and County Ordinances
- Developing an educational program

Installation and Application of the Following Conservation Practices:

- Buffers along streams, and around sinkholes and lakes
- Waterways
- Nitrogen preservation techniques
- Export nutrients away from critical areas
- 2016 NRCS 590 Standard
- Repair failed tile lines and blow-outs
- Cropping: cover crops, no till, strip till, residue management, contour strips
- Grass-based crop rotations; plant variety of crops with lower nutrient needs
- Communicate with landlords and hobby farmers to discuss BMPs that are available to them

Administer and Enforce Current Standards and Ordinances

- Revise county ordinance to adopt 2016 NM 590 standard and 2012 Manure Storage and Transfer 313 and 634
- ATCP 50 and 51 are being revised to incorporate new 590 standard. Implement and track use of new standard

The Soil and Water Conservation Department will work with Wisconsin Department of Natural Resources and community stakeholders to determine if implementing a Total Maximum Daily Load (TMDL) for Impaired Waters will meet the county's soil and water conservation needs.

Develop a Surface Water Education Program:

See PRIORITY H- Educational Programming.

PRIORITY F: Implement Soil Health Programming

Soil health will be emphasized within ongoing programs. The Soil and Water Conservation Department will promote Best Management Practices to improve soil health and increase productivity and profitability.

"As world population and food production demands rise, keeping our soil healthy and productive is of paramount importance. So much that we believe improving the health of our Nation's Soil is one of the most important conservation endeavors for our time".

Natural Resources Conservation Service

Manitowoc County is an agricultural powerhouse. Farmers depend on healthy soils to produce feed for dairy cattle and food for human consumption.

Healthy Soil is Important:

- It determines if rain and snowmelt water flows off the surface as runoff or infiltrates into the soil.
- It sustains plant and animal life by providing nutrients, oxygen and water. It filters and buffers potential pollutants.
- It cycles nutrients including carbon, nitrogen, phosphorus, and many other nutrients.
- It provides a medium for plant roots.

Management to Protect Soil Health:

Soil quality changes depending on how it is managed. Management choices affect the amount of soil organic matter, soil structure, soil depth, water and nutrient holding capacity, and erodability. Managing soil to promote an abundant number of soil flora and fauna, bacteria and fungi improves soil structure and therefore soil erosion and water availability. Soil life is essential to decomposition and nutrient cycling.

Improving Soil Health is Accomplished by:

- Decreasing soil disturbances
- Increasing crop diversity
- Maintaining living roots in the soil
- Keeping the soil covered with residue
- Preventing compaction

Decreasing Soil Disturbances: To limit destruction and disruption to soil microbes.

Best Management Practices that promote decreased soil disturbance include: reduced tillage, alfalfa and grasses in the crop rotation, and proper use of fertilizers and pesticides.

Increasing Plant Diversity: To achieve a diversity of plant carbohydrates to support the diversity of soil microorganisms necessary in the soil. Best Management Practices that promote plant diversity include: crop rotations, residue management, cover crops and pasture.

Maintaining Living Roots: To provide the easiest source of food for soil microbes so they can efficiently cycle nutrients that plants need to grow.

Best Management Practices that promote living roots include: growing long season crops or planting a cover crop following a short-season crop.

Keeping the Soil Covered: To conserve moisture, reduce temperature, intercept raindrops, suppress weed growth, and provide habitat for food web organisms.

Best Management Practices that promote soil cover include: reduced tillage, cover crops, alfalfa and grasses, pasture and residue management.

Preventing compaction: It is easier to avoid compaction than it is to correct compaction. This is accomplished by:

1. Avoiding field operations when the soil is saturated
2. Avoiding excessive heavy field machinery
3. Avoiding overloading and extreme farm equipment
4. Avoiding field operations that create compaction such as dishing or modern plowing
5. Using deep rooted crops like alfalfa
6. Using traffic management so compaction only occurs in limited areas

PRIORITY G: Implementation of Best Management Practices

The Soil and Water Conservation Department will continue to design and install various types of best management practices to protect groundwater, and surface water. Priority practices include:

Priority Practice	Purpose
Manure Storage Facilities	Allows farmers to store manure until optimum spreading times. This facilitates application of animal waste during seasons when there is increased runoff vulnerability.
Barnyard Runoff Control Systems	Diverts clean water away from barnyards. Runoff is either collected or filtered to reduce or eliminate discharge. Types include: containments, collection devices, clean water diversions, roofs, grass filters, settling basins, and fencing.
Grassed Waterways	Prevents gully erosion, reduces nutrient and sediment runoff and protects water quality.
Wetland Restorations & Sediment Retention Basins	Traps and treats sediment and nutrients, reduces flooding and provides wildlife habitat.
Conservation Buffers	Traps sediment and nutrients from cropland runoff, provides setback area between cropland application of fertilizer and pesticide applications, and provides wildlife habitat.
Conservation Easements	Permanent protection of restored wetlands or stream corridor areas.
Nutrient Management Plans	Intended to minimize nutrient entry into surface water, groundwater, and atmospheric resources while maintaining and improving the physical, chemical, and biological condition of the soil. (30% of cropland is NOT certified in NMP)

Priority Practice	Purpose
Conservation Crop Rotations	Reduces sheet, rill and wind erosion, manages balance of plant nutrients, manages plant pests, and improves soil organic matter content.
Vegetated Treatment Areas	Absorb nutrients, organics, pathogens, and other contaminants associated with livestock, poultry and other agricultural operations.
Feed leachate and milkhouse waste control systems	Reduce or eliminates milking center waste water discharge and discharge from field storage structures.
Cover Crops	Improve soil health, improve soil structure, increase organic matter, manage excess nutrients in the soil, minimize soil compaction, promote nitrogen fixation, and reduce erosion.
Reduced Tillage	Reduce erosion, improve soil condition, reduce energy use, provide food and escape cover for wildlife.
Subsurface Drainage	Repair tile blowouts to eliminate transfer of manure and nutrients to surface water.

Figure 4.3: Best Management Practices and their Purpose

Funding Sources for Best Management Practices:

Wisconsin Department of Agricultural, Trade, and Consumer Protection (DATCP)

Soil and Water Resource Management Cost-Share Funds:

DATCP allocates cost-share dollars for conservation practices in Manitowoc County. The Soil and Water Conservation Department administers cost sharing for applicants and helps farmers implement conservation practices. Reference ATCP 50 for specific regulations regarding cost-sharing.

Conservation Reserve Enhancement Program (CREP):

The Soil and Water Conservation Department administers state incentives and cost share funds. The Conservation Reserve Enhancement Program (CREP) is an offshoot of the Conservation Reserve Program, the country's largest private-land conservation program. CREP targets high-priority conservation issues identified by local, state or tribal governments or non-governmental organizations. In exchange for removing environmentally sensitive land from production and introducing conservation practices, farmers, ranchers and agricultural land owners are paid an annual rental rate, along with other federal and state incentives as applicable per each CREP agreement. Participation is voluntary and the contract period is typically 10-15 years. Typical practices include filter strips and riparian buffers.

Wisconsin Department of Natural Resources

Targeted Runoff Management Grant: The runoff management grant provides funding, and authorizes cost-share reimbursement for practices installed to cure a notice of discharge violation.

The Soil and Water Conservation Department administers grants and provides technical assistance under the runoff management grant program.

United States Fish and Wildlife Services

Partners for Wildlife Program: The U.S. Fish and Wildlife Services provides technical and financial assistance to private landowners with a desire to provide suitable habitat for wildlife on their property.

United States Department of Agriculture: Natural Resource Conservation Services (NRCS)

Conservation Technical Assistance: NRCS assists land-users, communities, units of state and local government, and other Federal agencies in planning and implementing conservation systems. These conservation systems reduce erosion, improve soil and water quality, improve and conserve wetlands, enhance fish and wildlife habitat, improve air quality, improve pasture and range condition, reduce upstream flooding, and improve woodlands. NRCS provides conservation planning to landowners.

Environmental Quality Incentive Program (EQIP): EQIP provides technical and financial help to farm and forest landowners for conservation practices that protect soil and water quality. Grassed waterways, stream fencing, critical area planting, manure management systems including storage structures and barnyard runoff protection, and many other conservation practices are eligible.

Great Lakes Restoration Initiative (EQIP-GLRI): To improve the health of the Great Lakes, the Natural Resource Conservation Service provides financial and technical resources to Manitowoc County landowners to improve water quality in the region. Through this Initiative, the Natural Resource Conservation Service focuses on helping farmers implement conservation practices that reduce erosion, improve water quality, and maintain agricultural productivity in selected watersheds.

Conservation Stewardship Program (CSP): CSP is a voluntary conservation program that encourages producers to continue to improve and maintain existing conservation activities as well as undertake additional conservation activities.

Conservation Reserve Program (CRP): CRP can reduce erosion, increase wildlife habitat, improve water quality, and increase forestland. Landowners set aside cropland with annual rental payments based on a bid. Tree planting, wildlife ponds, grass cover, and other environmental practices are eligible practices.

Conservation Reserve Enhancement Program (CREP): The Conservation Reserve Enhancement Program is an offshoot of the Conservation Reserve Program, the country's largest private-land conservation program. CREP targets high-priority conservation issues identified by local, state or tribal governments or non-governmental organizations. In exchange for removing environmentally sensitive land from production and introducing conservation practices, land owners are paid an annual rental rate, along with other federal and state incentives as applicable per each CREP

agreement. Participation is voluntary and the contract period is typically 10-15 years. Typical practices include filter strips and riparian buffers.

Agricultural Conservation Easement Program (ACEP): ACEP provides financial and technical assistance to help conserve agricultural lands and restore wetlands. Under the Agricultural Land Easements component, the Natural Resource Conservation Service helps state and local governments, Native American tribes, and non-governmental organizations protect working agricultural lands and limit non-agricultural uses of the land. Under the Wetlands Reserve Easements component, NRCS helps to restore, protect and enhance wetlands that have been altered for agriculture.

PRIORITY H: Implement Education Programming for Conservation

Education creates an awareness and leads to voluntary compliance of County and State ordinances and requirements. Knowledge empowers County citizens to make good conservation decisions.

Public Opinion Validates Need for Education:

Community Survey (in 2015): 250 respondents ranked Information and Education as one of the most impactful tool/strategy for improving and protecting our natural resources.

The Local and Technical Advisory Committees that assisted with development of this 10-Year Land and Water Management Plan concur that one of the best methods to improve mis-management and pollution of our resources is to educate the public.

Current Education and Outreach Projects:

The Soil and Water Conservation Department will continue to provide the current education and outreach projects that are in place:

Nutrient Management Farmer Education Grant

This grant is provided by the Department of Agriculture, Trade and Consumer Protection with the purpose of providing farmers educational opportunities regarding nutrient management. The program is co-conducted by The Soil and Water Conservation Department staff, UW Extension, Discovery Farms and Natural Resource Conservation Services. The curriculum is state-approved for nutrient management training and consists of two or more classroom sessions, farm visits, and on farm manure spreader calibrations. Participants are qualified to prepare their own farm nutrient plan upon completion.

Fair Participation

Nitrate Screening: The Soil and Water Conservation Department performs a well water screening for nitrates jointly with Manitowoc County HCE. This provides information on individual wells and education on groundwater and contamination issues.

Ag Adventure Land: The Soil and Water Conservation Department will provide an educational display each year for the tent.

Conservation Education Incorporated
The Soil and Water Conservation Department provides environmental education for area educators. The Soil and Water Conservation Department staff offer classes on soils and resource conservation.

Breakfast on the Farm
The Soil and Water Conservation Department provides an educational display describing conservation efforts installed and implemented on the host farm.

Presentations and Field Days
Several presentations and Field Days are held every year to encourage conservation practices among farmers and the general community.

NEW Education and Outreach Opportunities

Create/Update Education Program Work Plan
The first step in developing an Education Program is to create both a long-range and annual work plan. The audience for educational programming will consist of landowners, farmers, agri –business professionals and the general public.

Focus of Education Program
Educational efforts will focus on supporting The Soil and Water Conservation Department priorities and goals: Improving groundwater and surface water quality, creating awareness of conservation stewardship efforts being implemented, County Ordinance requirements, State Standards for compliance of Farmland Preservation Program income tax credit, incentives and cost share availability for installation of conservation practices and many other environmental topics to enhance the quality of our natural resources.

Manitowoc County Soil and Water Conservation Department, in partnership with Natural Resources Conservation Service and University of Wisconsin Extension, will educate farmers on the importance of healthy soil and promote the implementation of best management practices to improve soil health and increase productivity and profitability.

Program Methodology
Creation of Educational Materials: The Education Program will include the creation of educational materials. Packets of information regarding program-specific topics will be written and distributed.

Communication and Outreach: Contact lists will be created to better distribute information to targeted audiences. Media will be used to distribute information: newsletters, radio, newspapers, magazines…etc. Educational programming will include workshops, group meetings, field days, well

water screening, on-farm research, and one-on-one meetings with various members of the community.

Agriculture Education Center:
The Agriculture Education Center is in the preliminary stages of development. Their main focus is education through discovery. The Soil and Water Conservation Department will work with the committee and director to develop a conservation display for the proposed agriculture center.

Promotion of Conservation through National/World Awareness Days:
There are several opportunities to become part of nation and world-wide movements in conservation throughout the year such as Earth Day or National Drinking Water Week.

Monthly News Letter:
Provide UW Extension a monthly newsletter for the Eastern WI DHIC (Wisconsin Dairy Herd Improvement Cooperative) Newsletter. This newsletter reaches EWDHIC, Field technicians, lab technicians, and Manitowoc Dairy Producers. The intentions of these articles should be geared towards stewardship of land and water.

Partnership Programs

INTRODUCTION:

Many agencies and organizations are involved in protecting the natural resources in Manitowoc County. Although each agency and group has its own individual mission, all are united in their goal to preserve the environment for future generations.

PARTNERSHIPS- ROLES AND RESPONSIBILITIES:

State:

1. UW Extension-Manitowoc
   - Together with dairy agent plan and implement an education program for ag producers
   - Utilize newsletters to distribute information
   - HCE members assist with water testing at County fair
   - Discovery Farms Director is a member of The Soil and Water Conservation Department Local Advisory Committee
   - County provides office space for Discovery Farm Coordinator
   - Joint farm and office visits with dairy agent to discuss environmental concerns with agricultural producers

2. Wisconsin Department of Natural Resources (WDNR)
   - Jointly investigate spills involving waters of the State with wardens, spills coordinator and fish manager
   - Coordinate with regional staff such as resource specialists and regulatory staff

- Participate in the Wildlife Damage Program
- DNR provides funding to landowners for wetland restoration and native grass plantings
- Coordinate easements with DNR real estate staff
- DNR provides cost sharing to landowners for Best Management Practices installation through Targeted Runoff Management program

3. Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP):
    - The Soil and Water Conservation Department implements requirements in ATCP 50 and 51 and other State programs
    - Department of Agriculture, Trade, and Consumer Protection provides training on State programs
    - CREP partnership
    - Provides funding for staff and Best Management Practices installation for local program
    - Provides engineering training and assistance to County staff and landowners
    - Issues job approval for County staff
    - Oversees Land and Water Resource Management Plan
    - The Soil and Water Conservation Department submits annual progress report to Department of Agriculture, Trade, and Consumer Protection
    - Programming for Nutrient Management software and tools like SNAP+ and MMAP

Federal:

1. NRCS
    - Share and coordinate programming
    - The Soil and Water Conservation Department staff attends EQIP local advisory work group meetings
    - The Soil and Water Conservation Department assists with EQIP implementation
    - Share files and database
    - Natural Resource Conservation Services provides training, technical assistance, engineering, and conservation planning certification and job approval to The Soil and Water Conservation Department
    - Share administrative assistant staff
    - Land Conservation Committee approves conservation plans and contracts
    - District Conservationist attends Land Conservation Committee meetings

2. FSA
    - The Soil and Water Conservation Department provides technical assistance
    - The Soil and Water Conservation Department assists with CREP implementation
    - Farm Service Agency representative serves on Land Conservation Committee

3. U.S. Fish & Wildlife
    - Designs and funds wetlands, stream restorations and native grass plantings

Local:

1. County Executive, County Board and Land Conservation Committee
    - Support
    - Policy decisions
    - Appeals, hearings

2. Planning and Zoning
    - The Soil and Water Conservation Department provides technical assistance for erosion control and well abandonment
    - Share mapping information
    - Coordination with The Soil and Water Conservation Department: Working Lands Initiative

3. Health Department
    - Water testing at beaches
    - Provides leadership when health issues are involved

4. Highway Department
    - Assists with spill cleanup
    - The Soil and Water Conservation Department provides technical assistance
    - Reduce invasives by spraying or cutting

5. Public Works Department
    - Coordinates recycling program and hazardous material collection

Environmental Advocate Organizations, Associations, and Friends:

There are many environmental advocate organizations, associations, and Friends who perform valuable services in support of natural resources in the County. These groups are largely self-directed. This grass roots hands-on approach will continue to play a major role in protecting and enhancing the natural resources in Manitowoc County. Some of the groups include:

- Manitowoc County Lakes Association
- Lakeshore Natural Resource Partnership
- Manitowoc County Forage Council
- Friends of the Branch River
- Friends of Hika Bay
- Friends of the Manitowoc River Watershed
- Friends of the Twin Rivers
- Manitowoc County Fish and Game Association
- Lake Michigan Advocates of Manitowoc County
- Maritime Museum
- Woodland Dunes
- Glacial Lakes Conservancy

Monitoring and Evaluating

The purpose of monitoring and evaluating is to ensure the actions are on schedule, and to assess the quality and effectiveness of those actions. A further goal of monitoring and evaluation is to determine the need for deviation if planned actions are not yielding the desired results.

Monitoring:
The Manitowoc County Soil and Water Conservation Department (SWCD) utilizes a geographical information system (GIS) to monitor locations and data for numerous farm features. Features in the SWCD GIS include: soil erosion compliance of cropland fields, nutrient management of cropland fields, barnyards, manure storage facilities, sinkholes, grassed waterways, stream buffers, conservation easements and tile surface inlets. Manitowoc County's GIS Office provides base layer information and enables data sharing between The Soil and Water Conservation Department and other county departments using land information.

In addition to GIS, The Soil and Water Conservation Department uses excel workbooks to track participation and compliance for the Farmland Preservation Program, Livestock Siting Licenses, the Soil and Water Resource Management Program, the Conservation Reserve Enhancement Program, nutrient management plans, local ordinance complaints and violations, and manure storage permits.

Environmental monitoring of streams and lakes in Manitowoc County is primarily carried out by the Wisconsin Department of Natural Resources (WDNR). WDNR conducts baseline surveys including water chemistry, survey of fisheries and habitat assessment. WDNR determines if a waterbody should be placed on the 303(d) list of impaired waters. The United States Geological Survey operates a gauging station on the Manitowoc River. The Soil and Water Conservation Department provides nitrate screening of rural wells at the county fair each year. The department partners with UW Stevens Point Water and Environmental Analysis Lab, providing water sampling bottles and collection information for private well testing. The Manitowoc County Health Department collects samples for bacteria in transient wells and public beaches.

Volunteer monitoring is conducted on various waterbodies by the Manitowoc County Lakes Association, Lakeshore Natural Resources Partnership and the University of Wisconsin, Manitowoc.

Evaluating:
The Soil and Water Conservation Department frequently evaluates farm practices and structures. Some examples include: Barnyard runoff ratings, RUSLE2 cropland erosion calculations, gully erosion, silage leachate discharges, setbacks, odor scores, manure spreading acreage requirements, manure incorporation and residue cover.

The Soil and Water Conservation Department reports progress to Department of Agriculture, Trade and Consumer Protection and Wisconsin Department of Natural Resources through the Annual Survey of County Land and Water Conservation Programs. Local administration of the Farmland Preservation Program is reviewed periodically by Department of Agriculture, Trade and Consumer Protection. All nutrient management plans are reported to Department of Agriculture, Trade and Consumer Protection annually. Engineering practices are reported annually to the Natural Resource Conservation Services and Department of Agriculture, Trade and Consumer Protection. An

annual engineering spot check is conducted by the Natural Resource Conservation Services and Department of Agriculture, Trade and Consumer Protection for conservation practices approved by The Soil and Water Conservation Department engineering practitioners.

The Soil and Water Conservation Department reports progress to the Manitowoc County Board though the Land Conservation Committee. Employees of Manitowoc County are evaluated annually through a process called PerformSmart. The process includes ratings of job duties, goals and performance competencies. Financial audits of The Soil and Water Conservation Department are conducted periodically by the State and Manitowoc County.

Land and Water Plan Review and Progress Reporting

The Technical Advisory Committee, the Local Advisory Committee, and The Soil and Water Conservation Department staff will meet annually to report on the following topics to determine if we are meeting goals and priorities. After progress has been reviewed, the meeting attendees will determine if changes must be made to the current 10-Year Land and Water Plan.

The Soil and Water Conservation Department Reporting:

- Results from fair screening
- Results from Farmland Preservation Program voluntary nitrate screening
- Results from well water study
- Farmland Preservation Program Compliance/Non-Compliance
- Total Best Management Practices installed
- Educational programming progress: Number of people reached and number of programs and events

Wisconsin Department of Natural Resources Reporting:

- Concentrated Animal Feeding Operations status/Compliance
- Impaired Waters status

Health Department Reporting:

- Beach advisories/Closures

Lakes Association Reporting:

- Phosphorus results in lakes

Chapter 5

Priorities, Goals, Activities, and Staffing for 10-Year Land and Water Management Plan

Manitowoc County Land and Water Conservation Department

CHAPTER 5- PRIORITIES, GOALS, ACTIVITIES, AND STAFFING FOR 10-YEAR LAND AND WATER RESOURCE MANAGEMENT PLAN

PRIORITY A: Implement Local Conservation Ordinances – Manitowoc County Chapters 19,26,27, & 28

GOALS: Control and reduce delivery of sediment, nutrients and other pollutants to surface and groundwater from agricultural cropland and production sites.
Sustain healthy productive soil by minimizing soil loss on cropland.
Minimize the risk and impact of animal waste in surface and groundwater.
Reduce conflict resulting from evolving farm and waste management practices and farm expansions.

Priority Zone	*Activity*	*Staff*	*Annual Hours*	*When*	*Expected Outcomes (Annual)*
Countywide	**Permit/License Administration** -- Meetings with applicants and consultants --Review applications	Department Director Resource Conservationist	150 75	Annually	5 AWO permits, 3 Facility Siting Licenses and 3 Facility Siting License modifications
	Investigation/Enforcement	Department Director Resource Conservationist	50 100	Annually	10 investigations 4 violation enforcements
	Construction Inspection/Compliance Follow-up/Monitoring	Department Director Resource Conservationist	100 250	Annually	12 Facility Siting compliance reviews. 2 year cycle Review 10 construction as-built
	***Bold indicates high priority**				
TOTAL		Department Director Resource Conservationist	300 425		

Estimated annual cost to meet this goal: $46,500 (725 hours)

PRIORITY B: Implement and Enforce State Agricultural Performance Standards and Prohibitions

GOALS: Control and reduce delivery of sediment, nutrients, manure, wastewater and other pollutants to surface and groundwater from agricultural cropland and production sites.
Sustain healthy productive soil by minimizing soil loss on cropland.

Priority Zone	***Activity***	***Staff***	***Annual Hours***	***When***	***Expected Outcomes (Annual)***
Countywide	**Allocate Soil and Water Resource Management Grant Dollars to Implement BMPs for State Standard Compliance**	Resource Conservationist	Included in Priority G	Annually	$60,000 Bond Fund $50,000 SEG Fund 3 miles of gully erosion control 2,000 acres of new nutrient Management and soil erosion control plans
	Investigation/Enforcement	Department Director Resource Conservationist	Included in Priority A & C	Annually	
	Conservation Planning	Resource Conservationists	240	Annually	12 new plans 10 referrals to NRCS for conservation practice funding
	One-on-one contacts with landowners -- Plan implementation --Monitor compliance	Resource Conservationist	Included in Priority A & C	Annually	200 Farmland Preservation Program Participants, 12 Facility Siting Farms
	***Bold indicates high priority**				
TOTAL		Resource Conservationist	240		

Estimated annual cost to meet this goal: $14,500 (240 hours)

PRIORITY C: Administer Working Lands Initiative- Farmland Preservation Program

GOALS: Control and reduce delivery of sediment, nutrients, manure, wastewater and other pollutants to surface and groundwater from agricultural cropland and production sites.
Sustain healthy productive soil by minimizing soil loss on cropland.
Minimize the risk and impact of animal waste in surface and groundwater.
Assist landowners so that they can become or remain in compliance of required standards in order to receive income tax credit benefit.

Priority Zone	***Activity***	***Staff***	***Annual Hours***	***When***	***Expected Outcomes (Annual)***
Countywide except Town of Schleswig	**Write and review conservation plans**	Resource Conservationist	1,600	Annually	10 new participants 200 plan reviews
	Monitor State Standard implementation and Compliance	Resource Conservationist	400	Annually	
	Data entry of conservation performance	Resource Conservationist	400	Annually	
	Administration of Program	Resource Conservationist	100	Annually	
	***Bold indicates high priority**				
TOTAL		Resource Conservationist	2,500		

Estimated annual cost to meet this goal: $150,000 (2,500 hours)

PRIORITY D: Implement Groundwater Protection Programming

GOALS**:** To improve quality of groundwater by decreasing nitrate levels by 20% in wells previously screened and above 10 mg/L in the towns of Cato, Maple Grove, Franklin, Gibson, Cooperstown, Rockland, Schleswig and Kossuth.

Priority Zone	***Activity***	***Staff***	***Annual Hours***	***When***	***Expected Outcomes (Annual)***
Areas less than 60" of soil over bedrock Soil types CnB, CnC, Krb, KrC & WpB Sinkholes, conduits to ground-water and all the land that drains to those features Towns with nitrates readings above 10mg/L **TOTAL**	<u>Improve Groundwater Data</u> **-Identify conduits to groundwater along with watersheds draining to conduits. Update and distribute hazard maps** -Well water screening for FPP participants -Well water study -Nitrate Screening at the Fair One-on-one meeting with landowners not in current programs with land vulnerable to groundwater contamination. **Install Best Management Practices:** Well abandonment, buffer and sinkhole treatment ***Bold indicates high priority**	Resource Conservationist Education Coordinator Resource Conservationist Education Coordinator Resource Conservationist Education Coordinator Department Director Resource Conservationist Education Coordinator Department Director Resource Conservationist Resource Conservationist Department Director Resource Conservationist Education Coordinator	200 250 15 20 10 80 20 40 30 60 120 Included in Priority G 80 385 380	2016-2020 Annually Annually Annually Annually	Use new LIDAR information and 2015 NRCS 590 Standard to revise hazard maps and distribute as needed 25% of FPP participants request voluntary nitrate screening during review (45 tests/year) 3-4 wells in each 'critical' town become part of an annual study to monitor groundwater (32 wells) 160 screenings 15 landowners

Estimated annual cost to meet this goal: $40,000 (845 hours)

PRIORITY E: Implement Surface Water Programming

Lakes Goals:

Goal 1. Maintain phosphorus levels at or below current levels for lakes between 0-24 ppb (Horseshoe, Pigeon, Shoe, Spring, Cedar, Wilke, Tuma, English)

Goal 2: To decrease phosphorus levels by 10% in all inland lakes with average phosphorus levels above 24 ppb by 2026 (Bullhead, Silver, Weyers, Hartlaub, Long, Carstens, Gass, Harpt)

Streams Goal: To decrease phosphorus levels by 10% for streams identified in the Impaired Waters List above the water quality standard of 0.100 mg/L for rivers and 0.075 mg/L for streams, including stretches of the Manitowoc River, Meeme River, Molash Creek, Pigeon River, Pine Creek, Silver Creek, South Branch River and the West Twin River by 2026.

Priority Zone	***Activity***	***Staff***	***Annual Hours***	***When***	***Expected Outcomes (Annual)***
Lakes identified in goals above **Streams** identified in Impaired Waters List	**Lakes Associations: Meet with board members. Review Lake Management Plans if available to identify pollution sources. Develop goals and strategies with lake members.**	Department Director Resource Conservationist	120 80	2016 2017 2020 2022	Carstens Lake Long Lake Harpt Lake Gass Lake
	Lake and Stream Watershed Land-owners: Meet with landowners. Discuss, promote, and implement BMPs that will reduce sediment, phosphorus and other pollutant loading to streams and lakes. Priority BMPs Include: buffers, waterways, nutrient management, manure management, failed tile line repair, cover crops, reduced tillage, grasses, barnyard and feed storage runoff systems, proper milking center waste handling, working septic systems.	Department Director Resource Conservationist	150 400	If time becomes available Annually	Bullhead Lake Hartlaub Lake Silver Lake Weyers Lake Install BMPs to reduce sediment and phosphorus levels to meet goals by 2026
	Watershed Model assessment	Resource Conservationist	300	Annually	Determine critical areas to apply BMPs
	Enforce State Conservation Standards and County Ordinances		Included in Priority A,B,C		
TOTAL	***Bold indicates high priority**	Department Director Resource Conservationist	270 780		

Estimated annual cost to meet this goal: $66,000 (1,050 hours)

PRIORITY F: Promote Best Management Practices that Improve Soil Health

GOALS**:** Improve crop production and increase profitability.
Minimize soil loss on cropland.
Control and reduce delivery of sediment, nutrients, and other pollutants to surface and groundwater from agricultural cropland.

Priority Zone	***Activity***	***Staff***	***Annual Hours***	***When***	***Expected Outcomes (Annual)***
Countywide	**Promote and encourage farmers to apply the following best management practices to cropland: reduced tillage, alfalfa and grasses in crop rotation, proper use of fertilizer and pesticide, residue management and cover crops.**	Resource Conservationists	Within ongoing programs	Annually	200 landowner/operator contacts per year
	Promote soil health through demonstrations and distribution of soil health information.	Education Coordinator Resource Conservationist	60 50	Annually	1 Field Day 5 additional landowners applying BMPs to improve soil health
	***Bold indicates high priority**				
TOTAL		Resource Conservationist Education Coordinator	50 60		

Estimated annual cost to meet this goal: $5,000 (110 hours)

PRIORITY G: Implement Best Management Practices

GOALS: Improve crop production and increase profitability.
Minimize soil loss on cropland.
Control and reduce delivery of sediment, nutrients, manure, wastewater and other pollutants to surface and groundwater from agricultural cropland and production sites.

Priority Zone	*Activity*	*Staff*	*Annual Hours*	*When*	*Expected Outcomes (Annual)*
Countywide	**Work with landowners/operators, consultants, and engineers to design and apply BMPs identified in Appendix A WI-NRCS Conservation Practice Standards**	Department Director Resource Conservationist	600 1200	Annually	-3 miles of gully erosion control practices installed -Nutrient management and sheet and rill erosion control plans on 3,000 additional acres -3 manure and wastewater storage facilities installed
	Develop and administer cost-share contracts with landowners and operators to help defray landowner cost for practice installation.	Department Director Resource Conservationist	20 50	Annually	-2 feed storage runoff collection and treatment systems installed -3 well abandonments -3 sinkhole treatments, diversions, or buffers -3 stream buffers Approximately $110,000 annual allocation from WI Dept. of Agriculture, Trade and Consumer Protection- Soil and Water Resource Management Grant
	***Bold indicates high priority**				
TOTAL		Department Director Resource Conservationist	620 1,250		

Estimated annual cost to meet this goal: $118,500 (1,870 hours)
Cost Share dollars from state and federal agencies: $550,000
***If all expected annual best management practices were cost shared at 70% of the actual or estimated cost**

PRIORITY H: Implement Educational Programming

GOAL**:** To provide quality educational programming for farmers, agribusinesses, landowners, professionals, and the general public so that they can make informed conservation decisions.

Priority Zone	***Activity***	***Staff***	***Annual Hours***	***When***	***Expected Outcomes (Annual)***
Countywide: Focus will be geared towards areas defined as "critical" for surface water and ground-water protection	**One-on-one contacts**	Resource Conservationist	Included in all Priorities	Annually	500 landowners/farm operators, public
	Nutrient Management Farmer Education	Resource Conservationist	170	Annually	12 nutrient management and conservation plans
	Crop Advisor /Custom Manure hauler meeting	Department Director Resource Conservationist	30 10	Every other year starting in 2016	25 participants
	Media releases	Department Director	25	Annually	2 per year
	Present at farm education opportunities	Department Director Education Coordinator	15 20	Annually	2 per year
	Creation/update Contact Lists	Education Coordinator	30	Annually	Create contact lists for crop advisors, farmers, landlords, custom manure haulers and other farm consultants
	Fair Participation -Demonstration in Ag Adventure Land Tent -Nitrate Screening (See Priority D)	Education Coordinator All SWCD staff	20 -Included in Priority D	Annually	Present conservation demonstrations throughout the day
	Conservation Education Incorporated. Area teacher training	Resource Conservationist	20	Annually	25 teachers

	Breakfast on the Farm	Education Coordinator	20	Annually	Booth highlighting conservation practices installed on host farm
	Agriculture Education Center Display	Education Coordinator	35	Annually	Highlight natural resources and conservation practices
	Promotion of Conservation through National/World Awareness Days	Education Coordinator	30	Annually	6 promotions or events
	***Bold indicates high priority**				
TOTAL		Education Coordinator Department Director Resource Conservationist	155 70 200		

Estimated annual cost to meet this goal: $22,000 (425 hours)

PRIORITY I: Office Administration/Professional Development

GOALS**:** Administer and manage department functions
Continuous improvement through staff training and meetings

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Priority Zone	***Activity***	***Staff***	***Annual Hours***	***When***	***Expected Outcomes (Annual)***
Countywide	Department Administration & Management	Department Director	400	Annually	
	Office and Administrative Support	Education Coordinator	400	Annually	
	Meetings/Training	**Department Director** **Resource Conservationist** **Education Coordinator**	80 120 40	Annually	
	Other Locally Identified Priorities ie: drainage, wildlife damage program, neighbor/community conflict issues	**Department Director**	200	Annually	
	***Bold indicates high priority**				
TOTAL		**Department Director** **Resource Conservationist** **Education Coordinator**	**680** **120** **440**		

Estimated annual cost to meet this goal: $68,000 (1,240 hours)
Operation, Maintenance and Fixed Costs: $40,000

Staff Hours Needed to Accomplish Priorities						
Priority		**Director**	**Resource Conservationist**	**Education Coordinator**	**Total Hours**	**% of Total Hours Available (7,400)**
A	**Local Conservation Ordinances**	300	425	0	725	**10**
B	**State Agricultural Performance Standards and Prohibitions**	0	240	0	240	**3**
C	**Working Lands Initiative**	0	2500	0	2500	**34**
D	**Groundwater Protection Programming**	80	385	380	845	**11**
E	**Surface Water Protection Programming**	270	780	0	1050	**14**
F	**Soil Health Programming**	0	50	60	110	**1.5**
G	**Best Management Practices**	620	1250	0	1870	**25**
H	**Education Programming**	70	220	135	425	**6**
I	**Office Administration**	680	120	440	1240	**16.5**
Total		2020	5970	1015	9005	**121%**

Tables, Maps and Figures

Sources

2012 Cow Inventory from Agricultural Census Data
2012 Manure Storage and Transfer 313 and 634
Aaron Larson, WDNR Impaired Waters Coordinator
Bay-Lakes Manitowoc county 20-Year Comprehensive Plan
Discovery Farms
Manitowoc County Lakes Association
Manitowoc County Ordinance Chapters 19, 26, 27, 28
Natural Resources Conservation Services
Section 303 (d) of the Federal Clean Water Act
State Conservation Standard ATCP 50 and 51
State Conservation Standard NR 151
United States Census Bureau
USDA NASS Annual Wisconsin Agricultural Statistics Bulletin
USGS: Protecting Wisconsin's Groundwater Through Comprehensive Planning Manitowoc County
WDNR Groundwater Retrieval Network
WDNR Impaired Waters List
WDNR Surface Water Standards Website
WDNR Watersheds and Sizes
WDNR; Wisconsin's 2014 Water Quality Report to Congress
Wisconsin Beach Health
Wisconsin Chapter 92