MARENGO RIVER WATERSHED PARTNERSHIP PROJECT
WATERSHED ACTION PLAN

Draft as of December 22, 2010

Bad River Watershed Association
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DRAFT

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PROJECT PARTNERS

Bad River Band of the Lake Superior Tribe of Chippewa Indians
Bayfield Regional Conservancy
Ashland County Land and Water Conservation Department
Northland College
Sigurd Olson Environmental Institute
Town of Ashland
Town of Gordon
Town of Grand View
Town of Kelly
Town of Lincoln
Town of Marengo
Town of Morse
Town of White River
Trout Unlimited – Wild Rivers Chapter
University of Wisconsin-Extension
University of Wisconsin- Madison
USDA Natural Resource Conservation Service
US Environmental Protection Agency
US Fish and Wildlife Service
US Forest Service
US Geological Survey
West Wisconsin Land Trust
Watershed Citizens

We would like to see a Marengo River Watershed that has clean, flowing water; supports healthy, diverse, and resilient plant and animal communities free of invasive species; and is a vital community of watershed stewards who take actions to care for the watershed, while enabling a productive livelihood.

EXECUTIVE SUMMARY

The Marengo River is truly a river of change. From its sleepy beginnings in the wetlands of the Penokee hills of northern Wisconsin, to its journey through a large valley that once formed the shoreline of glacial Lake Duluth, and its final leg through the flat, agricultural areas of the Lake Superior clay plain, this river and all the streams that flow into it are truly special.

However, the Marengo River is not unaffected by human activity. The Marengo River Watershed experienced extensive logging and farming activities around the turn of the 20th Century. The effects of this large-scale land cover conversion had tremendous impacts on streams and rivers that are still felt today.

The people that live, work, and play here recognize this and the Marengo River Watershed Partnership (MRWP) was formed as a way for watershed residents, local government leaders, and natural resource professionals to express things they value about the watershed, concerns they have about its health, and to identify actions needed to maintain and improve the health of the watershed for future generations.

The resulting Watershed Action Plan outlined in this document provides a tool for local governments, agencies, organizations, and watershed residents to carry out these actions and attract the resources needed to do it.

Vision and Watershed Goals

The MRWP developed a vision statement that reads:
"We would like to see a Marengo River Watershed that has clean, flowing water; supports healthy, diverse, and resilient plant and animal communities free of invasive species; and is a vital community of watershed stewards who take actions to care for the watershed, while enabling a productive livelihood."

To achieve this vision the Marengo River Watershed Action Plan provides a framework to accomplish the following goals:
Goal #1: The hydrologic system in the Marengo River Watershed is stable and resilient.
Goal #2: Safe water and healthy, productive soil are available and maintained for all human and wildlife uses.
Goal #3: The Marengo River Watershed has diverse, healthy, and resilient native communities of plants and animals and their habitats on land and in water.
Goal #4: Citizens of the Marengo River Watershed are active and engaged in maintaining the integrity of the watershed.

Watershed Challenges and Sources

Challenges are the existing stresses or issues and concerns that prevent watershed goals from being met. Challenges specific to the Marengo River Watershed and their sources, were identified and prioritized by the MRWP based on their "severity" and "scope." The challenges are: 1) Unstable hydrologic system; 2) excess sediment; 3) excess nutrients; 4) high bacteria

counts; 5) loss of aquatic habitat; 6) terrestrial habitat fragmentation and alteration. Sources of these challenges are generally from nonpoint source pollution.

The most widespread challenges facing the Marengo River Watershed (and many other watersheds in the Lake Superior Basin of Wisconsin) are related to the altered and unstable hydrologic system caused by past land uses. The sources of these challenges are part of a natural watershed response to disturbance, but in many cases are being exacerbated by current human activity. They prevent the watershed from achieving its full habitat potential and improving its resilience to climate change and other potential disturbances. Improving the unstable hydrologic system, reducing sediment loads, and establishing a more stable and resilient Marengo River Watershed will take time. While these challenges are widespread and require management responses on a watershed scale, the sources of other challenges such as pathogen and nutrient concerns are more localized. Better implementation of human and livestock waste management practices will be required to see improvement. Improvement for these localized concerns is more readily achievable in the short term and much good work has already been done. Success will be related to the willingness of the watershed community to embrace and implement solutions that meet these challenges.

Watershed Action Plan

In order to realize the vision and long-term goals for the Marengo River Watershed, a short term (10-year) Watershed Action Plan was developed. More than 120 recommendations and action items set the stage for work that is needed to prevent future impairments build upon and maintain the watershed's high quality features. From protection to restoration to outreach, the action steps are designed to reduce or prevent nonpoint source pollution and also to build a base of knowledge about the watershed that will allow future management efforts to adapt to changes in our understanding of watersheds and changes in human needs and pressures on watershed resources. For each action item, the partner organization(s) best suited to implement the task was identified, along with an estimated cost and potential funding source(s). A measure of success was also identified for each action item to assist in evaluation of plan progress. A timeframe of 10 years was used to determine the scope of activities.

Conclusion

Meeting the vision and goals for the Marengo River Watershed will ultimately require both the widespread and localized challenges to be met. Addressing these challenges will take time, resources, and a watershed community committed to its vision for a healthy watershed. The Marengo River Watershed community is up to the challenge.

GO MARENGO!

CHAPTER ONE: INTRODUCTION

1. WHY THE MARENGO?

Sediment is the most widespread nonpoint source pollution challenge in Wisconsin's Lake Superior Basin. The Marengo River is the largest contributor of sediment to the Bad River, the largest contributor of sediment to Lake Superior along the United States shoreline. While sediment pollution receives much attention, other challenges such as livestock and human waste management and land fragmentation and conversion affect both aquatic and terrestrial habitats in the Marengo River Watershed.

The cause of much of the sediment affecting the health of the Marengo River (and other watersheds of Wisconsin's Lake Superior Basin) can be traced back to extensive logging and farming activities around the turn of the 20th Century. This large-scale land cover conversion caused streams to become unstable, overloaded them with sediment, and reduced the quality of habitat for aquatic species such as trout and sturgeon. These impacts on the Marengo River Watershed are still being felt today. While they are part of a natural watershed response to disturbance, in many cases, they are being exacerbated by current human activity. This slows the pace of watershed recovery and limits the ability of watershed ecosystems to be resilient to future changes such as those from climate change and the potential for large-scale iron mining in the east-central portion of the watershed.

The Marengo River Watershed has become an important focus area for highlighting the key management strategy to reducing sedimentation in Wisconsin's Lake Superior Basin. This management strategy, called "slow the flow," recognizes that reducing the volume and velocity of runoff to streams is critical to improving watershed health. This strategy involves both restoration and protection activities. Because Wisconsin's Lake Superior Basin has not seen the level of significant degradation seen in other areas of the Great Lakes, restoration potential in in watersheds such as the Marengo is viewed by local resource managers to be very achievable and provides an opportunity for a quicker return on investment than restoring habitats in highly degraded ecosystems. Protection of high quality habitat areas provides an immediate return on investment and ensures valuable services such as clean water and healthy, diverse ecosystems will continue to endure.

The Marengo River Watershed Action Plan was created to provide opportunity to implement and apply the concepts of "slow the flow" and other watershed management activities to improve watershed resources for future generations. It was also created to engage and involve the local watershed community in taking care of its home watershed. While the plan is specific to the Marengo River Watershed, many of the management strategies and actions apply to improving watershed health in all of Wisconsin's Lake Superior Basin.

2. THE MARENGO RIVER WATERSHED PARTNERSHIP PROJECT

The Marengo River Watershed Partnership (MRWP) Project builds upon previous work by the Lake Superior Basin Partner Team (Partner Team), the United States Geological Survey (USGS), and the Bad River Band of the Lake Superior Tribe of Chippewa Indians (Bad River tribe).

A USGS summary of sediment and phosphorus loading data to Lakes Superior and Michigan identified the Bad River as the largest sediment contributor to Lake Superior along the United States shoreline (Robertson 1997). The vast majority of the sediment loading was due to episodic transport events, such as those associated with spring snowmelt and runoff. The report indicated the Bad River Watershed's geologic characteristics, particularly the combination of steep topography and highly erodible soils, made the watershed susceptible to significant sediment loads.

Subsequent geomorphic investigations by the USGS and Bad River tribe identified the Marengo River subwatershed as a likely key sediment contributor to the Bad River because of its geology and watershed position (Cahow and Fitzpatrick 2005).

In addition to these studies, work by the United States Forest Service showed that when the amount of open land and/or young forest (age class 0 to 15 years) in a watershed exceeds 60%, runoff rates increase and stream channels become unstable (Verry 2006). These conditions are of particular interest in Wisconsin's Lake Superior Basin because of steep topography, erodible soils, and land that was cleared for timber and agriculture around the turn of the 20th Century.

In an effort to begin applying this research and identify management priorities that could be implemented to improve the health of Lake Superior watersheds, the Partner Team selected the Marengo River Watershed as its test area to develop and demonstrate a process for assessing the hydrologic condition of Lake Superior watersheds. The Partner Team was originally formed in 1998 by the Wisconsin Department of Natural Resources (WDNR), to help implement the Lake Superior Bi-national Program and Lakewide Management Plan in Wisconsin. The Partner Team has since evolved into a unique blend of public, private and nonprofit organizations and individuals, whose mission today is to implement a watershed health initiative known as "slow the flow."

The result of Partner Team efforts was the *Marengo River Watershed Test Case: Assessing the Hydrologic Condition of the Marengo River Watershed, Wisconsin* (LSBPT, 2007). The Marengo Test Case, as it is known, laid the foundation for developing a watershed management plan. In 2008, the Bad River Watershed Association (BRWA) applied for funding from the National Fish and Wildlife Foundation, the Laura Jane Musser Fund, and the Wisconsin Department of Natural Resources (WDNR) to continue this work and develop a Watershed Action Plan through a collaborative process known as the Marengo River Watershed Partnership (MRWP).

3. FORMING THE MRWP

Community-based partnerships are essential to effective watershed planning and management. Through a partnership, different people and organizations work together to address common interests and concerns. Partnerships represent the easiest way to develop and implement a successful Watershed Action Plan because everyone is involved from the beginning. To garner information needed for the Watershed Action Plan, as well as cultivate the necessary buy-in to achieve plan implementation, the Marengo River Watershed Partnership (MRWP) was formed, with the goal to maintain and improve the health of the Marengo River Watershed by investing citizens, governments, and agencies to create a Watershed Action Plan.

Throughout the course of the project, BRWA sought input from both the watershed citizens who work and play in the watershed, and from the technical experts who study and work on natural resources issues in the watershed through the MRWP. The following teams were convened as part of the MRWP to help facilitate stakeholder involvement for the development of the Watershed Action Plan.

3.1 CITIZEN INVOLVEMENT TEAM

The Citizen Involvement Team (CI Team) was charged with identifying the concerns and interests of local citizens related to the land and water resources in our area. The goals of the CI Team were to:

1. Gather what is known about public interests and concerns, and summarize it for incorporation into the Watershed Action Plan.
2. Offer ideas on citizen involvement opportunities and assist in efforts to plan, recruit participants, and spread the word.
3. Develop an outreach and citizen involvement strategy for plan implementation.
4. Develop plan recommendations and project ideas.

Participants:

- Ruth Oppedahl, University of Wisconsin-Extension
- Pam Roberts, Bad River Natural Resources Department
- Valerie Damstra, Bad River Watershed Association
- Matt Hudson, Bad River Watershed Association
- Bill Heart, Bad River Watershed Association, watershed citizen
- George Einar Bussey, watershed citizen

3.2 TECHNICAL TEAM

The Technical Team was charged with providing technical expertise and guidance to support the development of the Watershed Action Plan. The goals of the Technical Team were to:

1. Draft watershed challenges and goals based on citizen and technical input.
2. Review available information and data on the Marengo River Watershed, prioritize challenges, and make specific recommendations on priority projects/actions that are likely to improve the health of the watershed in the short and long term.

3. Develop monitoring component to support Watershed Action Plan implementation.

Participants:

- Naomi Tillison, Bad River Natural Resources Department
- Faith Fitzpatrick, United States Geological Survey
- Dale Higgins, United States Forest Service
- John Jereczek, Wisconsin Department of Natural Resources
- Nancy Larson, Wisconsin Department of Natural Resources
- Scott Toshner, Wisconsin Department of Natural Resources
- Cordell Manz, Wisconsin Department of Natural Resources
- Carmen Wagner, Wisconsin Department of Natural Resources
- Ryan Magana, Wisconsin Department of Natural Resources
- Mike Gardner, Northland College, Sigurd Olson Environmental Institute
- Randy Lehr, Northland College, Sigurd Olson Environmental Institute
- Darienne McNamara, Northwoods Cooperative Weed Management Area
- Tom Fratt, Ashland County Land and Water Conservation Department
- Tom Hollenhorst, United States Environmental Protection Agency
- Michele Wheeler, Bad River Watershed Association
- Bill Heart, Bad River Watershed Association
- Kevin Brewster, Bad River Watershed Association
- Matt Hudson, Bad River Watershed Association
- Valerie Damstra, Bad River Watershed Association
- Ted Koehler, United States Fish and Wildlife Service
- Pam Dryer, United States Fish and Wildlife Service
- Gary Haughn, Natural Resources Conservation Service
- Jason Fischbach, University of Wisconsin-Extension
- Sue Reinecke, United States Forest Service
- Ellen Kwiatkowski, Bayfield Regional Conservancy
- Tracey Ledder, Red Cliff Environmental Department
- Ruth Oppedahl, University of Wisconsin-Extension

3.3 STEERING TEAM

The Steering Team was initially charged with taking recommendations from the CI and Technical Teams to draft and recommend a Watershed Action Plan. The goals of the Steering Team were revised during the course of the project to provide more specific tasks as follows:

1. Work closely with BRWA to provide review and comment during drafting of Watershed Action Plan.
2. Help build support and buy-in for plan among local government officials and heads of natural resource agencies.
3. Develop implementation strategy for plan.

Participants:

- Ruth Oppedahl, University of Wisconsin-Extension
- Naomi Tillison, Bad River Natural Resources Department
- Grant Herman, Northland College, Sigurd Olson Environmental Institute
- Randy Lehr, Northland College, Sigurd Olson Environmental Institute
- Valerie Damstra, Bad River Watershed Association
- Matt Hudson, Bad River Watershed Association
- Tom Fratt, Ashland County Land and Water Conservation Department

4. US EPA NINE ELEMENT WATERSHED MANAGEMENT PLANS

BRWA decided early on in the planning process to develop and seek formal approval of the Watershed Action Plan as a United States Environmental Protection Agency (EPA) nine-element watershed management plan, utilizing EPA's "Watershed Handbook for Developing Watershed Plans to Restore and Protect Our Waters" (EPA 2008).

While nine-element watershed management plans are typically developed as a tool to identify and prioritize management activities that will restore watersheds with listed 303(d) impairments, EPA recently launched a new program called the "Healthy Watersheds Initiative," which *"…encourages states, local governments, watershed organizations, and others to take a strategic, systems approach to conserve healthy components of watersheds, and, therefore, avoid additional water quality impairments in the future* (http://water.epa.gov/polwaste/nps/watershed/index.cfm)**."** In the spirit of the Healthy Watersheds Initiative, the focus of the Marengo River Watershed Action Plan is to identify management activities that will prevent future impaired listings and maximize its healthy ecosystem potential. Although the Marengo River Watershed has been altered by human activities, it has not been significantly degraded like many watersheds in the Great Lakes basin.

The watershed is unique in that its mouth and lower reaches are within the boundary of the Bad River Indian Reservation. Both the Bad River tribe and the State of Wisconsin have authority to set and enforce water quality standards. At the time of this plan approval, the Bad River tribe was in the process of developing and having its water quality standards approved by EPA. In addition, the State of Wisconsin is in the process of developing its approval process for EPA nine-element watershed plans. Recognizing this, EPA Region 5 staff agreed to approve both the on-reservation and off-reservation portions of the Marengo River Watershed Action Plan.

5. EXISTING RESOURCE MANAGEMENT AND COMPREHENSIVE PLANS

A significant amount of planning related to community growth, zoning, and natural resource management has occurred in recent years in the various management jurisdictions contained within the Marengo River Watershed. The intent of the Marengo River Watershed Action Plan is to coordinate these efforts, enhance their effectiveness by providing additional opportunities to apply for resources to implement them, and provide a clear path to turn these planning

objectives into actions that will maintain and improve the health of the Marengo River Watershed.

Here is a summary of relevant natural resource management and comprehensive planning documents that have been utilized and referenced for information to complete the Marengo River Watershed Action Plan:

Lake Superior Lakewide Management Plan (2008)
Wisconsin's Great Lakes Strategy (2009)
Wisconsin DNR Lake Superior Basin Water Quality Management Plan (1999)
Wisconsin Lake Superior Basin Brook Trout Plan (2005)
Ashland and Bayfield County Land and Water Resource Management Plans (2010)
Ashland County Comprehensive Plan (2006)
Bayfield County Comprehensive Plan (2010)
Watershed Town Comprehensive Plans (11 total, completed in various years)
Bayfield Regional Conservancy Strategic Conservation Plan for Lake Superior's Bayfield Peninsula (2009)
Wisconsin's Strategy for Wildlife Species of Greatest Conservation Need (2005)

CHAPTER TWO: CHARACTERIZING THE MARENGO RIVER WATERSHED

1. GENERAL DESCRIPTION AND ADMINISTRATIVE BOUNDARIES

The Marengo River Watershed is located in central Ashland and south central Bayfield counties in the Lake Superior Basin of northern Wisconsin. It is one of 334 level-five hydrologic unit code (HUC) watersheds in Wisconsin and one of six level-five HUC watersheds contained within the Bad–Montreal Watershed (HUC code: 04010302, Figure 2.1). It covers an area spanning 218 square miles or approximately 139,313 acres (NOAA 2010).

The western third of the Marengo watershed is located within Bayfield County and the eastern two thirds within Ashland County. Parts of ten townships, including: Ashland, Gordon, Grand View, Kelly, Lincoln, Marengo, Morse, Namakagon, Sanborn, and White River are located within the watershed. The northeast corner of the watershed, which includes the mouth of the Marengo River, is located within the reservation of the Bad River Band of the Lake Superior Tribe of Chippewa Indians.

There are no incorporated cities or villages within the watershed. Unincorporated villages include: Marengo, Highbridge, Sanborn, and North York (Figure 2.1).

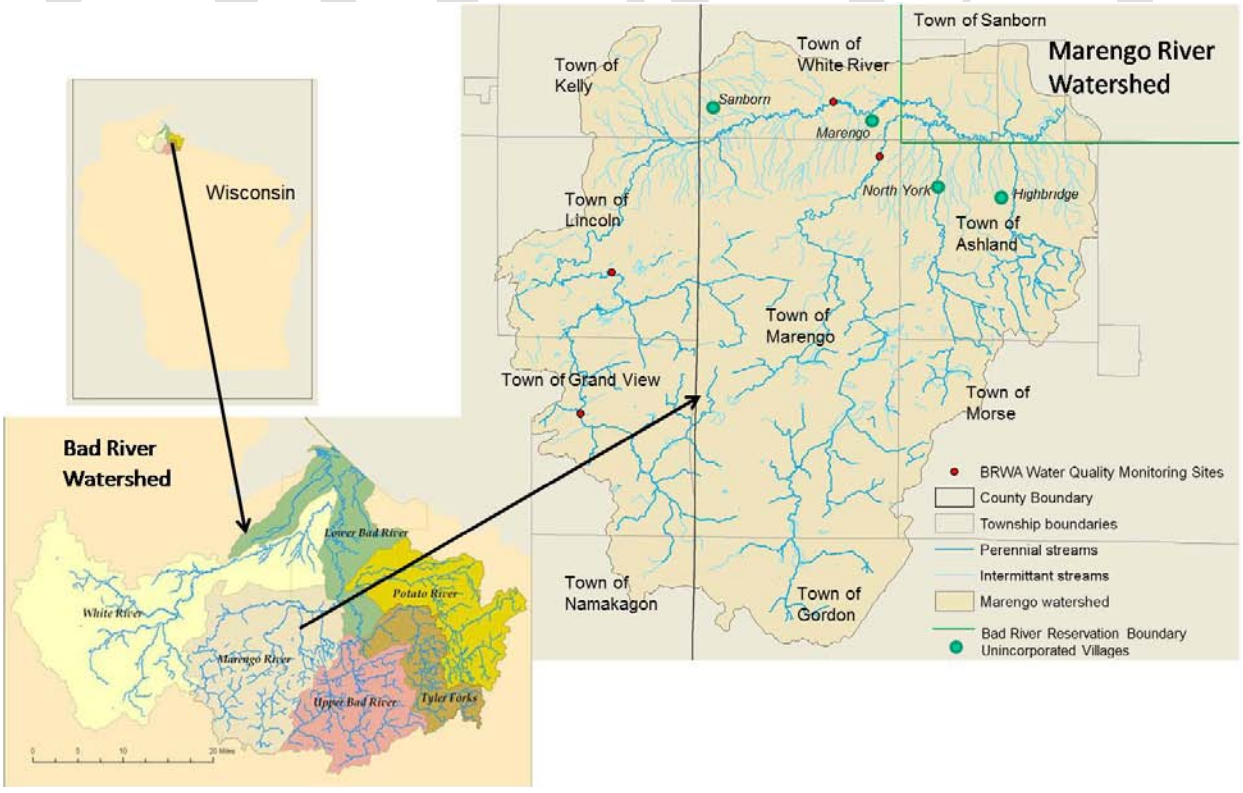


Figure 2.1. Location of the Marengo River Watershed and administrative boundaries.

1.1 COMMON WATERSHED FEATURES

Morgan Falls and Mineral Lake are examples of typical features found in the upper portion of the watershed, which is mostly contained within the Chequamegon-Nicolet National Forest (CNNF). The large, eroding sand bank is a common feature in the middle portion of the watershed. Agriculture and excess sand deposition are typical features of the lower portion of the watershed (Figure 2.2).

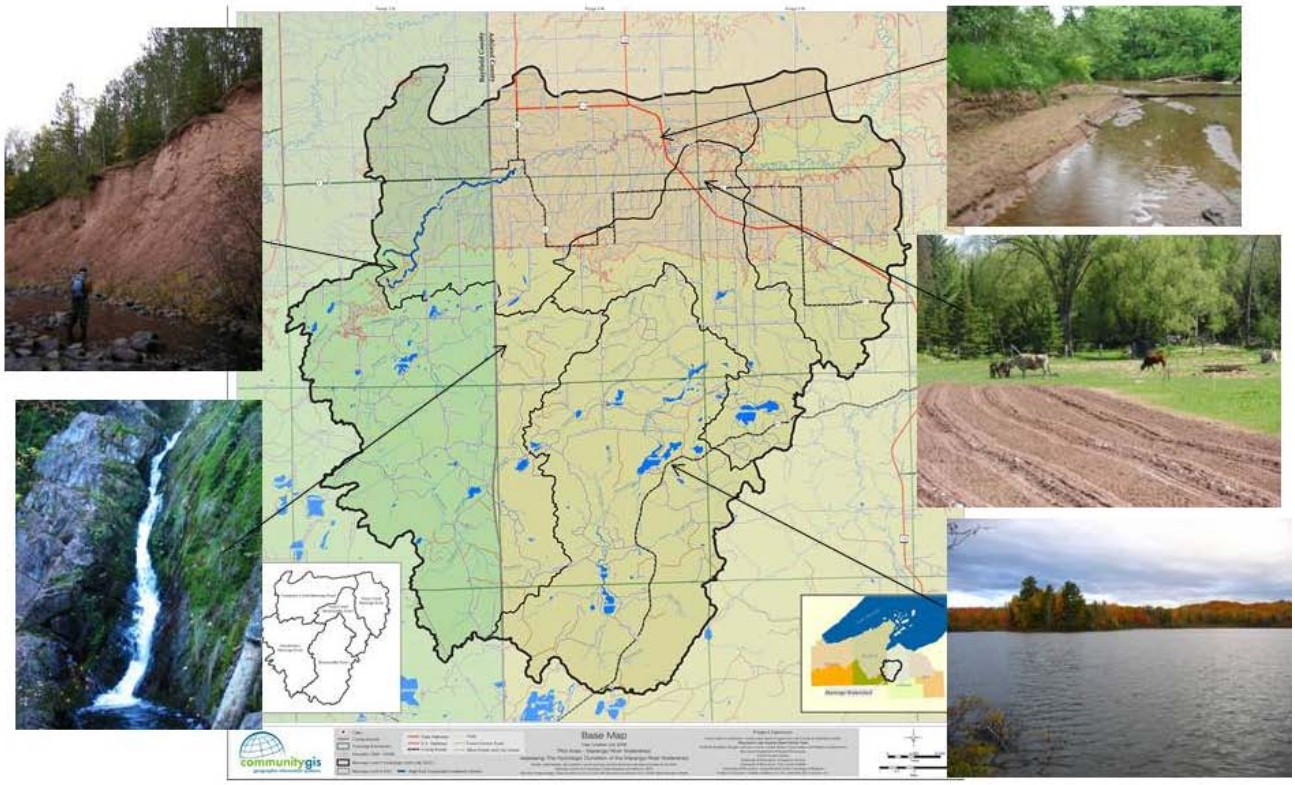


Figure 2.2. Map of the Marengo River Watershed (LSBPT 2007) and pictures of common features.

1.2 HISTORY

The landscape of northern Wisconsin and the Marengo River Watershed underwent significant change following European settlement of the region and exploitation of the region's rich natural resources in the late 1800s and early 1900s. Government Land Office survey notes indicate that the Marengo River Watershed was 100% forested in the 1850s. Original vegetation consisted primarily of mixed coniferous/deciduous forest (hemlock, sugar maple, yellow birch, white pine, red pine), boreal forest (white spruce, balsam fir, tamarack, white cedar, white birch), and wetland areas (Figure 2.3, Finley 1976).

Forests played a key role in slowing the rate of runoff to watershed streams from rain and snowmelt events, particularly in the northern, clay portion of the watershed where soil infiltration rates are naturally slower. The forests slowed the rate of snowmelt in spring and

provided abundant wood to streams that helped create excellent habitat for native aquatic species like brook trout (*Salvelinus fontinalis*, WDNR and USFWS 2007).

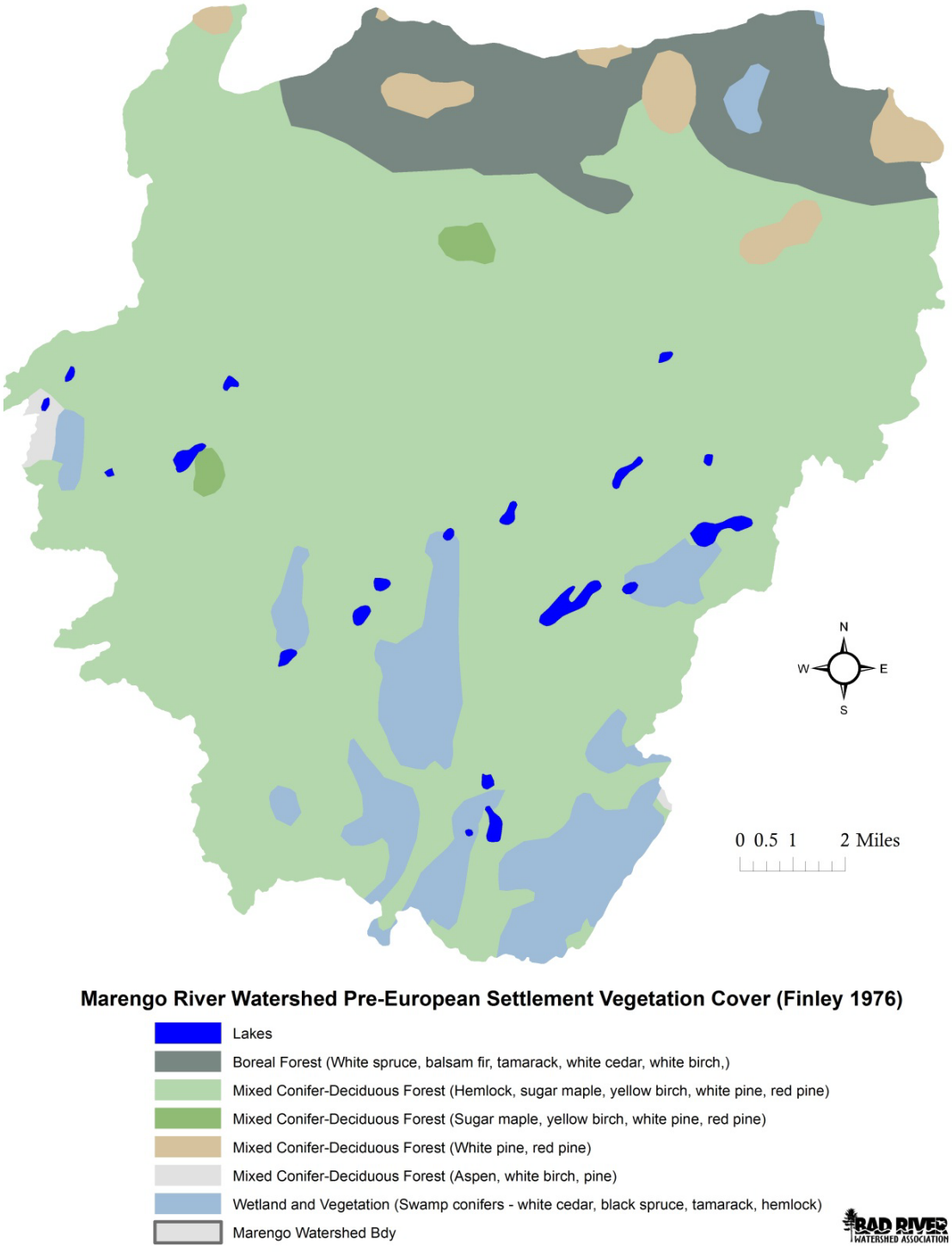


Figure 2.3. Original vegetation cover map of the Marengo River Watershed based on Finley's "Original Vegetation Cover of Wisconsin" map (Finley 1976). Data source: WDNR Public GIS FTP site: ftp://dnrftp01.wi.gov/geodata/, retrieved on 9/27/10.).

A comprehensive analysis of past land cover changes and their effects on erosion and sedimentation in the nearby North Fish Creek Watershed was conducted by the United States Geological Survey (USGS, Fitzpatrick *et al*. 1999). Similar land cover changes to those documented for North Fish Creek occurred throughout the Lake Superior Basin of Wisconsin, including the Marengo River Watershed. Removal of the forests began in in the late 1800s and continued through the early 1900s. Along with removing the forest, fires burned much of the organic layer that acted as a sponge, particularly on the clay soils. Streams were used to transport logs to area mills, which widened stream channels, scoured banks, and removed most of the woody material in streams that provided excellent aquatic habitat.

After the decline in logging, major agricultural development in the region occurred from 1895 to 1920 (Mahaffey and Bassuk, 1978). Agricultural activity peaked in the mid-1920's to mid-1930's, with much of the upland areas consisting of cropland (forage crops and some corn) and pasture for dairy cattle (Fitzpatrick *et al*. 1999). Field drainage networks helped to rapidly channel water off the land and into streams.

Logging and agriculture also led to an extensive transportation network in the Lake Superior region. Road and rail grades can damage watersheds by blocking passage for aquatic species, combining drainages, and accelerating surface runoff (WDNR & USFWS 2005).

The combination of forest removal and agricultural development had a tremendous effect on the landscape and stream channels of the Lake Superior Basin that is still being felt today. Evidence indicates that watersheds have recovered to some extent (Fitzpatrick *et al*. 1999). However, legacy effects from past land use, often exacerbated by current human activity, limits the terrestrial and aquatic habitat potential of these watersheds, including the Marengo. Despite this, the Marengo and other Lake Superior Basin watersheds in Wisconsin still retain many high quality habitats and areas of habitat potential.

1.3 DEMOGRAPHICS

The Marengo River Watershed is primarily rural and most of the human habitation is located in the northern third of the watershed. Bayfield and Ashland County Comprehensive Plan documents contain summary demographic information for each county and the jurisdictions within the county. Data from Towns were used to give a general summary of demographic information applicable to the Marengo River Watershed (Table 2.1).

General trends for the region are an increase in people age 35 and older and a decrease in people less than 35. In general, young people tend to leave the region in search of employment opportunities elsewhere and the resident population continues to age. A regional trend has been the sale of large tracts of industrial forest that are often broken up into smaller chunks of property bought by individuals for recreational purposes. The Marengo River Watershed has approximately 1,146 private landowners as of 2009 (BRWA data). Most of the private ownership is in the northern third of the watershed. Many of these are individuals who live outside the area and use the property for recreational opportunities such as hunting and fishing and may build a second home, particularly in waterfront areas.

Table 2.1. Population change for towns (excluding Namekagon and Sanborn) within the Marengo River Watershed, 1990-2000 (Ashland County 2006, Bayfield County 2010).		
	1990	**2000**
Ashland County Towns		
Ashland	567	603
Gordon	301	357
Marengo	284	362
Morse	481	515
White River	771	892
Bayfield County Towns		
Grand View	419	483
Kelly	383	377
Lincoln	294	293

1.4 ECONOMICS

Unemployment rates in Ashland and Bayfield Counties tend to be higher than the state average and median household incomes and property values lower than the state average (Ashland County 2006, Bayfield County 2010). Table 2.2 lists median household incomes for some of the townships in the Marengo River Watershed. They are among the poorest in the state of Wisconsin.

Table 2.2. Median household income for select Towns in the Marengo River Watershed. (Ashland County 2006, Bayfield County 2010).	
	Median Household Income - 2000
State of Wisconsin	$43,791
Town of Lincoln	$27,917
Town of Ashland	$34,063
Town of Marengo	$33,036
Town of Morse	$39,000
Town of White River	$38,250

Historically, farming and forestry have provided employment opportunity for watershed residents. While these sectors remain important in the watershed and the region, they have generally declined in recent decades, while occupations related to the tourism industry have increased. There are very few places of employment within the Marengo River Watershed aside from local governments themselves, a school, a sawmill, individual farms, and a few taverns. Most residents commute to work in local population centers such as Ashland and Mellen.

1.5 LOCAL COMMUNITY SURVEY SUMMARY

The CI Team reviewed survey results from subsequent community planning efforts as one tool to begin to assess some of the citizen interests and concerns related to land and water resources in the area. Community surveys were conducted in Ashland County (2003) and Bayfield County (2008) for the purposes of comprehensive plan development. A survey of woodland landowners in the Lake Superior Basin was conducted by University of Wisconsin and the Wisconsin Department of Natural Resources (2009) to learn more about their forest activities and effects on water quality in the Lake Superior Basin, of which the Marengo River Watershed is a part. A summary of these results, tailored to the Marengo River Watershed community when possible, are summarized here.

Ashland County Comprehensive Plan Survey (2003)

As part of the Ashland County and participating communities' Comprehensive Planning program(s) a random sample survey was designed and implemented in 2003. Ashland County has five townships (Ashland, Marengo, White River, Morse, and Gordon) that are completely within or part of the Marengo River Watershed. BRWA summarized the survey responses specific to those townships to tailor survey results for the purposes of the MRWP project.

Regulatory Environment

In Ashland County, existing county level regulatory controls include: 1) Private sewage system ordinance, 2) flood plain ordinance, 3) shoreland amendatory ordinance, 3) scenic ordinance, 4)subdivision control ordinance, 5) junkyard ordinance, 6) scenic ordinance, 7) zoning ordinance, 8) nonmetallic mining ordinance, and 9) fee schedule. In the towns of Morse, White River, Ashland, Marengo, and Gordon there is no local zoning, and so these towns are subject to county zoning regulations. Respondents were asked about their level of willingness to be additionally regulated to achieve individual visions of what the county should become. In the Marengo Watershed towns, over 50% of respondents felt that existing regulatory controls are sufficient (Figure 2.4).

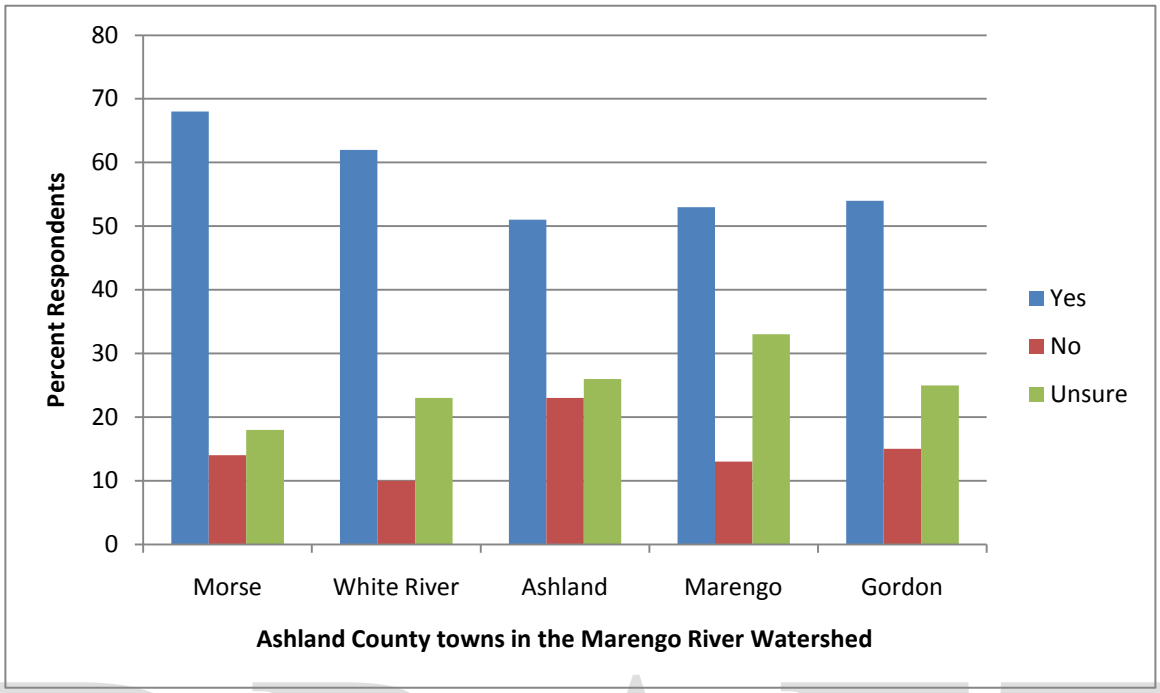


Figure 2.4 Marengo River watershed town resident responses to question 5 of Ashland County Comprehensive Plan Survey (2003): "Do you believe existing regulatory controls (i.e. zoning, subdivision, land division, sanitary permits, well permits) are sufficient to achieve your vision of your community's future?"

However, when asked if any additional regulations should be adopted to manage growth, the town of Marengo responded with a positive indication for stormwater and erosion control (57%), density standards (50%), local shoreland zoning control (50%), and local subdivision control (50%). The town of Gordon responded with a positive indication for local land division control (50%) and local subdivision control (54%).

These responses indicate that in general the residents feel that the existing regulatory environment is sufficient to meet the challenges of the next twenty years in these towns. However, there is also recognition that ordinance strengthening and some limited local ordinance adoption and local control may be needed to meet these challenges. Efforts to strengthen existing ordinances and their enforcement along with local efforts to adopt regulatory measures on perceived local need and issues should be successful and supported (Ashland County 2003).

About Ashland County

When asked to rank the importance of County level efforts and services, doing more to protect water quality and protect open space received a consensus of more than 60% support in the Marengo Watershed towns, while comparatively these efforts received a consensus of just over 30% county-wide (Figure 2.5). These results indicate that respondents from the Marengo Watershed highly value the natural resources of the watershed.

However, other Ashland County efforts and services that received a consensus of more than 60% were promoting industrial development, tourism, economic diversification, and enforcing existing ordinances. Continuing to promote industrial development was the effort that received the greatest consensus from all Ashland County respondents (54%). Promoting tourism and economic diversification received less support county-wide (36% each), and enforcing existing ordinances was not as well supported county-wide (15%).

The responses indicate that residents in these towns are supportive of industrial expansion and recruitment, building upon the existing economic base, continuing to grow the tourism market sector, and enforcing existing regulations. However, it is also evident that the area's natural resources are highly valued, and that part of preserving the quality of life in the Marengo Watershed portion of Ashland County includes protecting natural resources in addition to maintaining a good local economy.

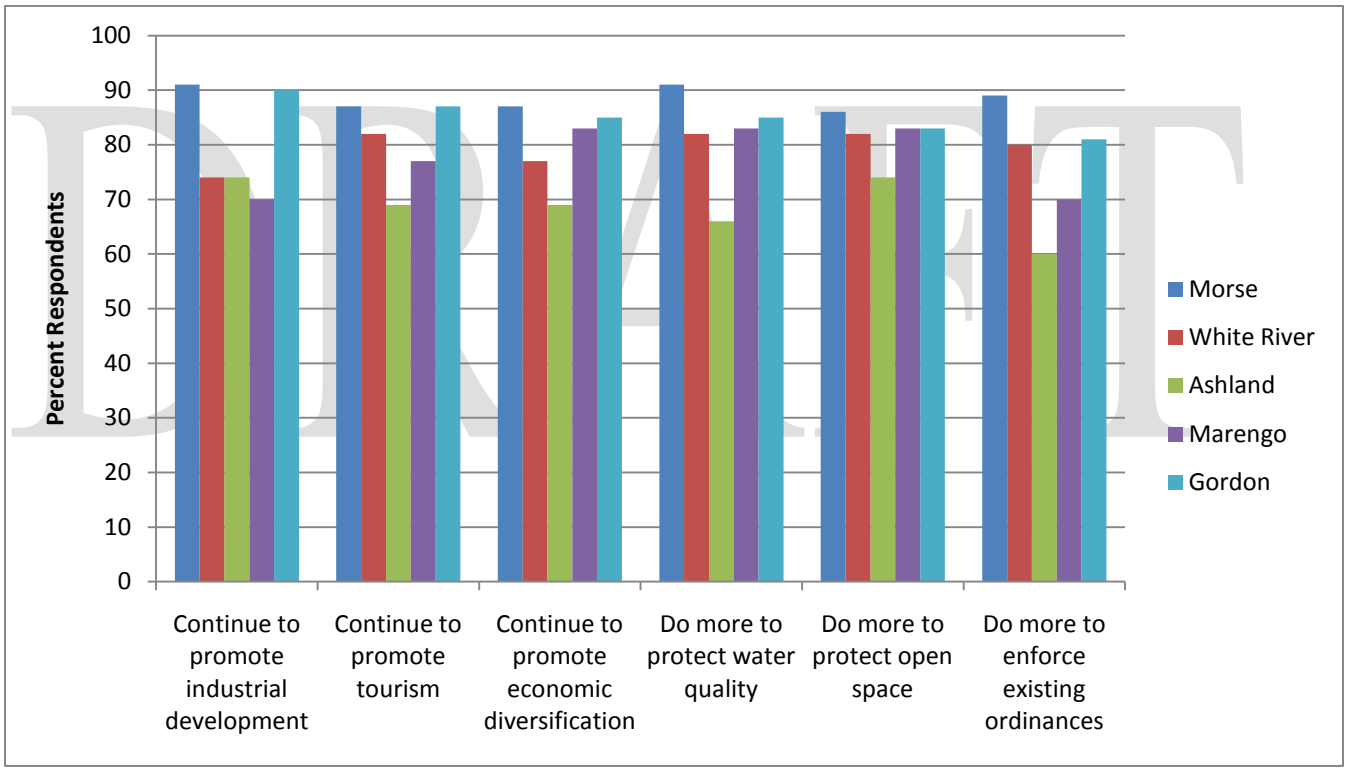


Figure 2.5 Marengo River watershed town resident responses to question 14 of Ashland County Comprehensive Plan Survey when asked to rank the importance of Ashland County efforts and services related to land and water resources.

Bayfield County Comprehensive Plan Survey (2008)

A county-wide survey was completed in Bayfield County in 2008 to determine issues and opportunities to address in the Bayfield County Comprehensive Plan Update. The survey data collected was broken down by town, age, and length of residence in Bayfield County. BRWA reviewed the data by town, to review the responses from residents of the four townships

(Lincoln, Kelly, Grand View, and Namakagon) that represent a portion of the Marengo River Watershed.

Natural Resources

In general, residents are passionate about maintaining the unique natural environment that Bayfield County has to offer. Accordingly, the majority of the respondents wanted greater protection and regulation of these natural resources. However, recreational enjoyment of the environment is a concern.

Over 80% of respondents from each of the four towns agreed or strongly agreed that Bayfield County should further ensure that its lakes, rivers, streams and wetlands are protected (Figure 2.6). Only 5% in Lincoln, Grand View, and Namakagon disagreed or strongly disagreed that Bayfield County should not further ensure its natural resources are protected from degradation; 15% disagreed or strongly disagreed in town of Kelly. However, given the larger percentage (60% +) of respondents strongly agreeing, natural resource protection is an important issue in maintaining these resources for future residents and tourists. The numerous natural resources are features of Bayfield County, and also the Marengo River Watershed, that make it a unique place to live and play.

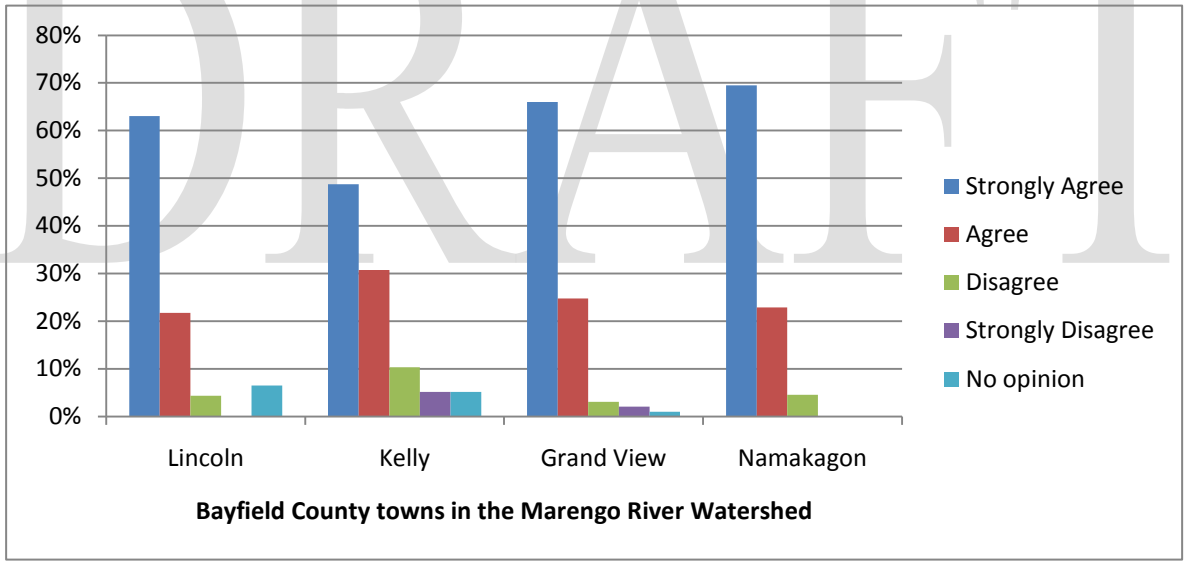


Figure 2.6 Marengo River watershed town resident responses to Natural Resources question 2 of the Bayfield County Comprehensive Plan Survey (2008): "Bayfield County should further ensure that its lakes, rivers, streams, and wetlands are protected from degradation."

Sixty-nine percent of respondents from the four towns agreed or strongly agreed that additional development restrictions should be put in place to protect the aesthetic beauty and ecological functioning of lake, river and stream shorelines (Figure 2.7). This response also shows support for protection of land and water resources in this portion of Bayfield County.

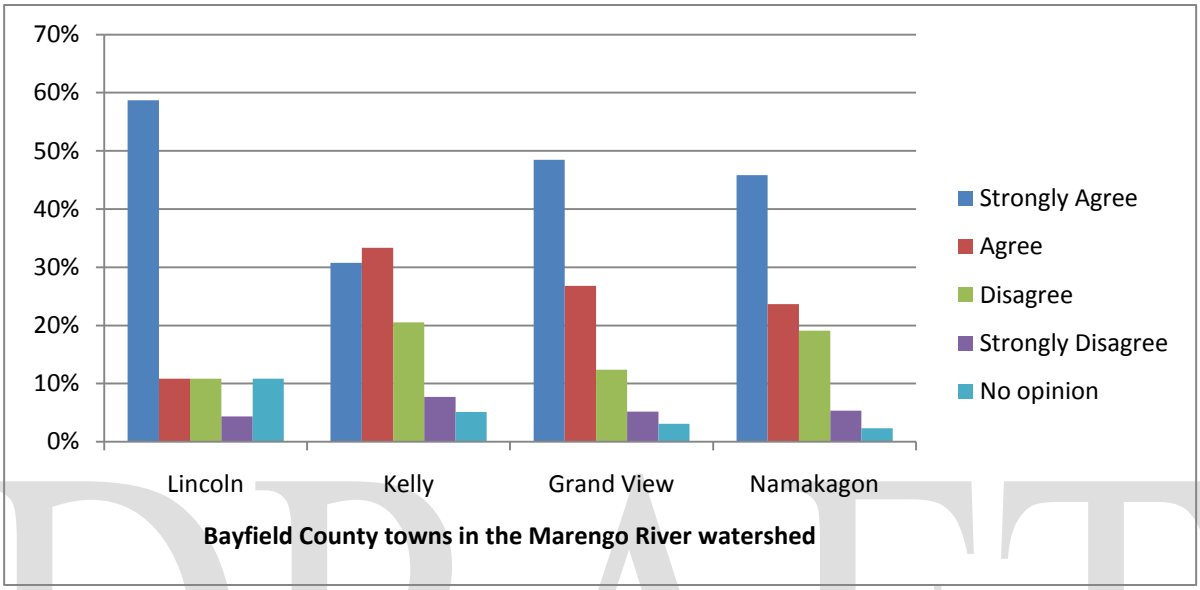


Figure 2.7 Marengo River watershed town resident responses to Natural Resources question 3 of the Bayfield County Comprehensive Plan Survey (2008): "Additional development restrictions should be put in place to protect the aesthetic beauty and ecological functioning of lake, river, and stream shorelines."

Agricultural Resources

Along with the lakes, rivers, and wetlands, agricultural lands are also an important attribute of Bayfield County, particularly in the town of Kelly, which is in the lower part of the watershed where more farming is occurring.

In the town of Kelly, 64% of respondents agreed or strongly agreed that agricultural lands should be preserved exclusively for farming use in Bayfield County. Respondents from Grand View, Lincoln, and Namakagon were lower, but still averaged at 48% agreeing or strongly agreeing. However, 52% of respondents agreed or strongly agreed that single-family residences should be allowed to be constructed on agricultural lands. These were contradictory answers found within the survey; however, the responses may relate to the importance of preserving natural resources.

Thirty-four percent of respondents in the four towns believed that the current residential density within agricultural area should remain the same, while 51% of respondents believed that the density should be lowered.

Land Use

Land uses in the four towns included private forest land, agricultural land, residential, commercial, industrial, rivers/inland lakes, and wetlands.

About 70 percent of respondents from all of Bayfield County agreed that the county should allow the option of clustering single-family residences on a large acreage. Since the residents are very concerned about preserving environmental resources, the findings are consistent with other environmental questions. However, other questions found that the majority of respondents wanted a minimum lot size. This is slightly inconsistent, but the awareness of preserving natural resources is still considered.

In the four towns, an average of 52% of respondents felt that private forest lands were most adequately regulated by County regulations out of all land uses. For water resources (rivers/ inland lakes and wetlands), there was mixed opinion on the adequacy of regulations on rivers/ inland lakes and wetlands.

The town of Kelly had the greatest percentage of respondents that felt regulations for water resources were excessive (23%), while the other three towns had higher percentages of respondents that said regulations for water resources was not adequate (Figure 2.8).

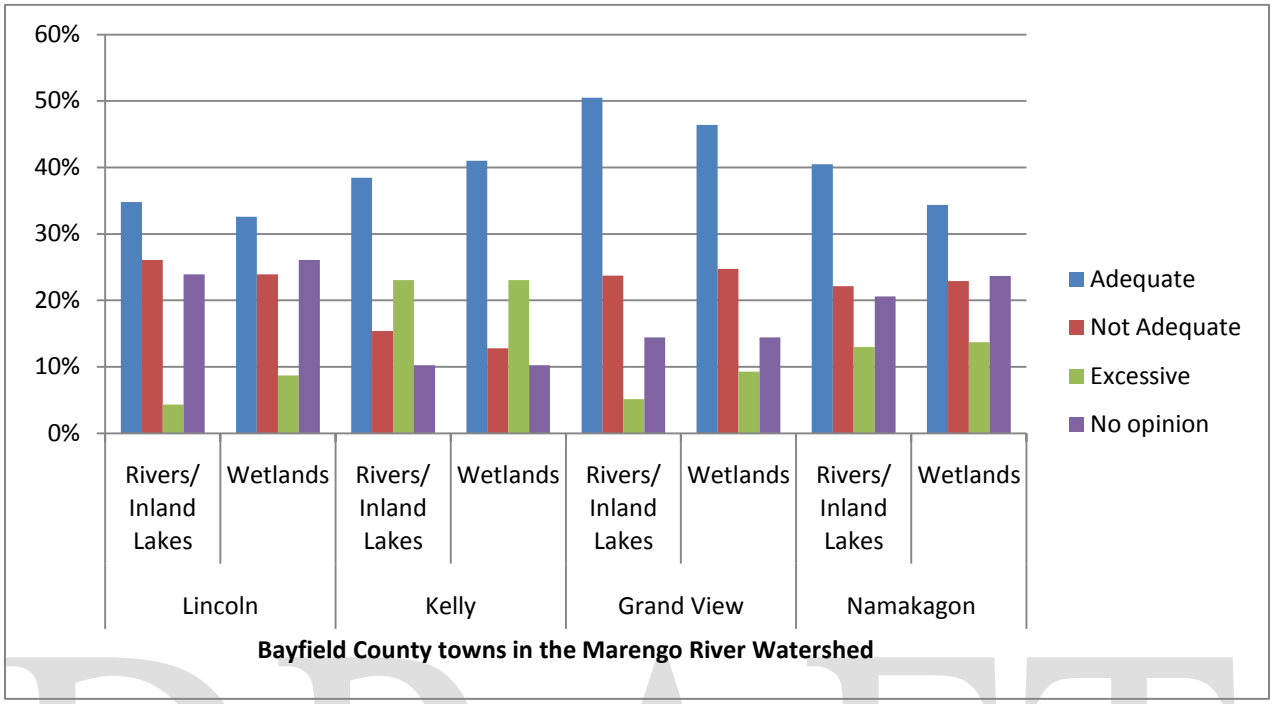


Figure 2.8 Marengo River watershed town resident responses to Land Use question 1 of the Bayfield County Comprehensive Plan Survey (2008): "Opinions on the existing Bayfield County regulations for rivers/ inland lakes and wetlands."

When asked about regulations for agricultural lands, respondents from the town of Kelly felt most strongly out of the four towns that regulations for agricultural lands were inadequate (18%), while the other three towns felt that agricultural lands were adequately regulated (47%). This could be a reflection of the higher value that town of Kelly respondents may place on agricultural lands, as it is more prevalent in that town and more important to livelihoods here than in the other towns.

It is worth noting that land use was indicated to be the most important element to the residents in the towns of Grand View, Lincoln, and Namakagon, with agricultural, natural, and cultural resources being second. In the town of Kelly, the importance of land use was second to agricultural, natural, and cultural resources. Economic development was the third most important element to all of these towns.

These results indicate that agricultural lands are valued more to respondents from the town of Kelly, where more farming is occurring in this area of the Marengo River watershed.

Lake Superior Basin Natural Resources Survey (2009)

A survey of Wisconsin landowners in the Lake Superior Basin was carried out in May-June 2009 by the University of Wisconsin and the Wisconsin Department of Natural Resources. The survey population of interest was private woodland landowners with ten acres or more, without forest

management plans, who own land in the Lake Superior Basin. 981 surveys were sent out with 478 being returned, for a return rate of 49%.

The results of this survey indicate that landowners in the Lake Superior Basin have the sense that our water resources are in pretty good shape. A high percentage of respondents rated the water quality okay or excellent for scenic beauty, swimming, catching, and eating fish. In the Lake Superior Basin, fish managers and hydrogeologists are very concerned about sand eroding from stream banks smothering gravel spawning beds and degrading fish habitat. This is an even larger concern in the Marengo River Watershed, as it is the largest contributor of sediment to the Bad River, and in turn the Bad River is the largest contributor of sediment to Lake Superior. However, this survey showed that most of the public surveyed (76%) doesn't believe the water quality is affecting fish, and another 20-21% did not know.

Respondents in this survey were less sure about the quality of their drinking water. One third (35%) of the respondents didn't know the quality of their drinking water, and more than half thought their drinking water was just okay or poor.

The strongest response in the survey came from questions about water quality and economic development. In general, respondents valued water quality over economic development. 20% of respondents strongly agreed and 55% agreed when asked generally "it is important to protect water quality even if it slows economic development." However, when asked specifically about themselves, if they would be willing pay more to protect water quality, then 6% strongly agreed and 43% agreed. As the question became more specific to the individual level, the willingness to pay for water protection decreased, but respondents still agreed it was important. When asked about the top considerations when making a decision to do a management activity on their land, the top consideration was the out-of-pocket expense, followed by their own views about effective woodland management, then the environmental benefits of the management activity and the environmental damage that may be caused by the management activity.

When asked about water pollutants of concern, 34% of respondents indicated that the biggest perceived pollutant is trash and litter. This may be because it's more visible than other pollutants, such as sand and clay. Interestingly, sand and clay were not identified as much of a problem by the respondents, but are indeed serious pollutants in streams like the Marengo River and the bays of Lake Superior. A large majority of the respondents did not perceive any problem, or perceived only a slight problem, with the sources listed in the survey as contributors to water quality problems, such as litter, septic systems, roads, slumping stream banks, parking lots, harvested areas, etc.

When asked about landowner's experience with forest management activities that affect water quality, there were high numbers of "does not apply" answers coupled with high numbers of willingness to try a practice. More than half of the landowners that responded didn't think practices like stream crossings, improving logging roads, relocating roads off steep slopes and delaying a harvest for 3-5 years applied to them. Yet, those same practices were identified by

slightly fewer landowners as ones they are willing to try. High levels of willingness to try some forest practices bode well for future efforts to get more landowners to implement forest management activities.

2. WATERSHED CHARACTERISTICS

The following summary of Marengo River Watershed characteristics involved reviewing available literature, reports, data, interviewing technical experts familiar with the watershed, and hosting a "MRWP Technical Team Workshop" where several technical experts were asked to present "what we know" about watershed along with strategies on "what we should do about it."

Chapter 2.2 is a summary of "what we know" about the Marengo River Watershed that forms the basis of the goals, objectives, and management actions that will help this watershed community achieve its vision.

2.1 ECOLOGICAL LANDSCAPES

The Wisconsin Department of Natural Resources (WDNR) has defined 23 different Ecological Landscapes within Wisconsin (WDNR 2010a). Ecological Landscapes are areas that differ from each other in ecological attributes and management opportunities. They have unique combinations of physical and biological characteristics that make up the ecosystem, such as climate, geology, soils, water, or vegetation. They differ in levels of biological productivity, habitat suitability for wildlife, presence of rare species and natural communities, and in many other ways that affect land use and management.

Two Ecological Landscapes occur within the Marengo River Watershed, the Superior Coastal Plain Landscape covering the northern third; and the North Central Forest Landscape covering the southern two thirds of the watershed (Figure 2.9).

The Superior Coastal Plain is Wisconsin's northernmost Ecological Landscape. Its major landform is a nearly level plain of lacustrine clays that slopes gently northward toward Lake Superior. Historically the Superior Coastal Plain was almost entirely forested and included a distinctive mixture of white pine, white spruce, balsam fir, paper birch, balsam poplar, trembling aspen, and white cedar (Figure 2.3).

The North Central Forest has landforms characterized by end and ground moraines with some pitted outwash and bedrock controlled areas. Kettle depressions and steep ridges are found in the northern portion. Soils consist of sandy loam, sand, and silts. The historic vegetation was primarily hemlock-hardwood forest dominated by hemlock, sugar maple, and yellow birch (Figure 2.3).

2.2 LAND COVER AND USES

Several sources for land cover data specific to the Marengo River Watershed are available. The Marengo Test Case study used a land cover analysis for Wisconsin called "WISCLAND," (Wisconsin Initiative for Statewide Cooperation on Landscape Analysis and Data) published in 1992. A more recent land cover analysis in the Great Lakes coastal region was conducted by the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center according to Coastal Change Analysis Program (C-CAP) standards (NOAA 2010). The land cover and land cover change analyses were conducted using Landsat Thematic Mapper and Landsat Enhanced Thematic Mapper satellite imagery for the years 1996, 2001, and 2006.

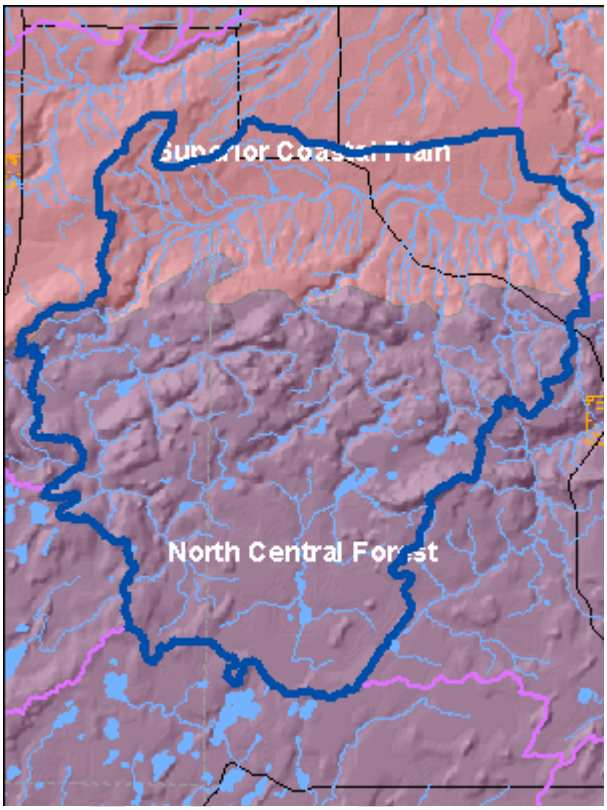


Figure 2.9. Ecological Landscapes in the Marengo River Watershed (WDNR 2010a).

In order to give the most recent picture of land cover in the Marengo River Watershed, data were extracted from the NOAA Great Lakes C-CAP dataset for 2006. Land cover data for the Marengo River Watershed indicate that it is almost 70% forested, 12% wetland, 13% actively cultivated or in pasture/hay or grassland, less than 1% developed, and about 5% water or other categories (Table 2.3). Details on land cover classification categories are available from the NOAA website (NOAA 2010).

Table 2.3. Land cover percentages for the Marengo River Watershed (2006) from National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center, Coastal Change Analysis Program (C-CAP).

Land Cover Category	Acres	Percent
Developed	718.6	0.5%
Cultivated	3,384.2	2.4%
Pasture/Hay	14,263.0	10.2%
Grassland	408.6	0.3%
Deciduous Forest	70,743.7	50.8%
Evergreen Forest	8,198.4	5.9%
Mixed Forest	17,555.2	12.6%
Scrub/Shrub	5,234.8	3.8%
Palustrine Scrub/Shrub Wetland	6,953.6	5.0%
Palustrine Emergent Wetland	99.3	0.1%
Palustrine Forested Wetland	9,771.2	7.0%

Table 2.3. Land cover percentages for the Marengo River Watershed (2006) from National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center, Coastal Change Analysis Program (C-CAP).		
Bare Land	2.2	0.0%
Water	1,980.5	1.4%
Total Watershed	139,313.3	100.0%

The majority of the forest and wetland area is located in the southern two thirds of the watershed. Much of this area is within the Chequamegon-Nicolet National Forest. The majority of the open land associated with agriculture (row crops, pasture/hay, or grassland) is located in the northern third of the watershed (Figure 2.10).

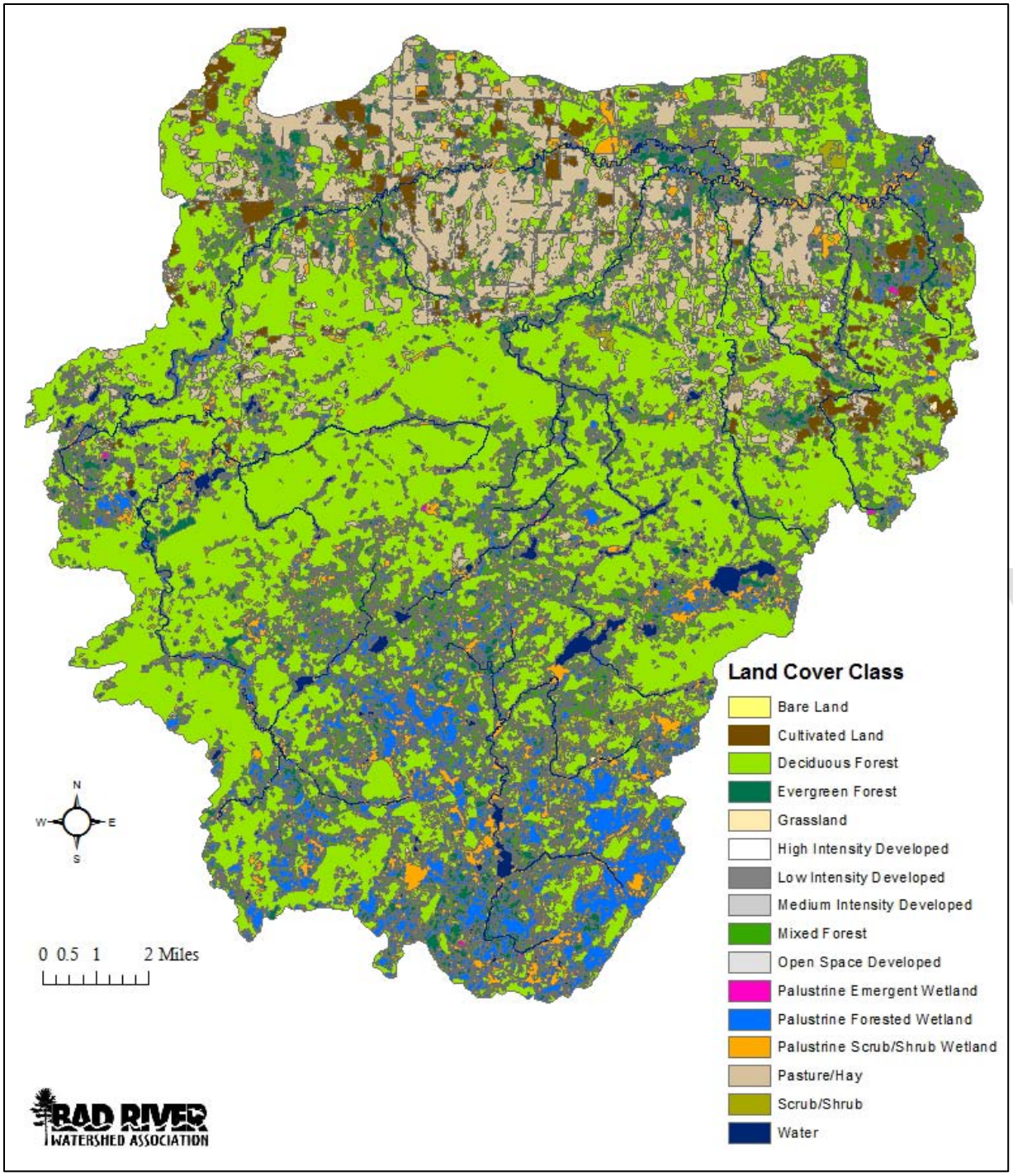


Figure 2.10. Land cover map for the Marengo River Watershed (2006) from National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center, Coastal Change Analysis Program (C-CAP).

2.3 HYDROLOGY AND GEOMORPHOLOGY

The Marengo River and its watershed have been the focus of several recent studies focused on characterizing its geomorphology and hydrologic condition (Fitzpatrick 2005, Cahow and Fitzpatrick 2005, LSBPT 2007, BRWA 2010). The focus on the Marengo River comes in large part because it is estimated to be the greatest contributor of sediment to the Bad River. The Bad River is the largest U.S. sediment contributor to Lake Superior (Robertson 1997). Sedimentation and its causes are perhaps the greatest issues facing the health of Wisconsin's Lake Superior basin streams.

These studies have revealed evidence of how historical land cover change created unstable stream channel conditions that the Marengo River and other, similar Lake Superior watersheds are still responding to about 100 years later. It is these unstable conditions and current human influences that exacerbate the conditions, which lead to many of the challenges discussed in this Watershed Action Plan. The following is a summary of key findings associated with these studies.

Streams in the Bad River Watershed tend to be characterized as "flashy," meaning high flows are intense but short in duration (Robertson 1997). The flashiness of these streams is a result of steep gradients, surficial deposits with high clay content, and land cover characteristics (Robertson 1997, Verry 2001). As a result, these streams are susceptible to erosion and sedimentation impacts.

The Marengo River Watershed begins at an elevation of approximately 1,443 ft. above sea level and ends where the Marengo River flows into the Bad River at an elevation of about 690 ft. above sea level. The main stem of the Marengo River is approximately 52 miles in length.

Elevations above 1,050 ft. are characterized by sandy glacial till with rock outcroppings frequent, a poorly developed stream network with no valleys, and relatively stable geomorphic conditions (Fitzpatrick 2005). Elevations below 750 ft. correspond to the Lake Superior clay plain, which is a relatively flat landscape except for frequent entrenched, alluvial valleys.

Between elevations of 1,050 to 750 feet above sea level, the Marengo River Watershed and other Lake Superior basin watersheds in Wisconsin are divided and defined, in part, by a post-glacial lake shoreline (glacial Lake Duluth) that is the boundary between the North Central Forest and Superior Coastal Plain Ecological Landscapes described in Chapter 2.2.1. The abandoned shoreline has wave-planed topography developed in sandy unconsolidated deposits. A combination of high relief, clay over sand, and clearing or road development in this area leads to high erosion rates (Fitzpatrick 2005).

A longitudinal profile of the mainstem of the Marengo River reveals the average slope of the stream channel below Marengo Lake, which is near the transition between the more stable upper and unstable middle portion of the watershed (Figure 2.11). The steep slope between 830ft and 1010ft of elevation corresponds to the soil transitional area (steep, wave-planed glacial topography) and unstable conditions characterized by severe valley and stream bank

erosion. Elevations below 750 ft. correspond to the clay plain with more gentle slopes and deposition of sand eroded from the soil transition zone.

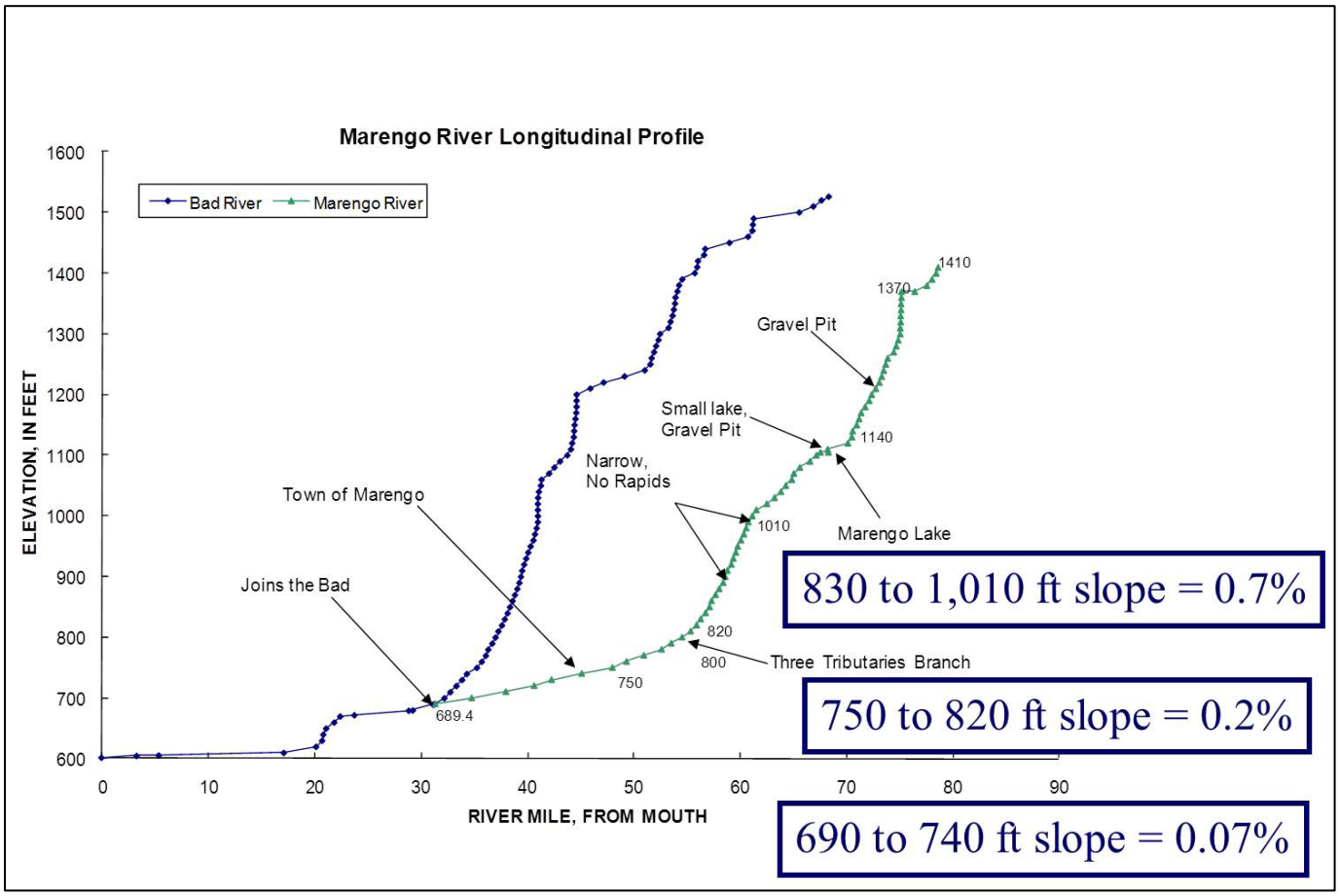


Figure 2.11. Longitudinal profile of the Marengo River compared to the Bad River. Average slopes are given for key erosional and depositional reaches of the Marengo River (Fitzpatrick 2010).

The lower portion of the Marengo River displays evidence of sediment overload, likely transported during episodic flood events. USGS developed stream channel cross sections as part of a geomorphic assessment of the Marengo River (Fitzpatrick 2005). The cross sections reveal evidence of historical channel incision upstream and sedimentation downstream near the river mouth (Figure 2.12). A cross section of the stream in the soil transition area reveals evidence of about 0.3 meters of historical incision compared to 1-2 meters of historical overbank deposition, natural levee formation, possibly 0.4 meters of channel aggradation based on a channel abandoned between 1870 and 1930 near the river mouth.

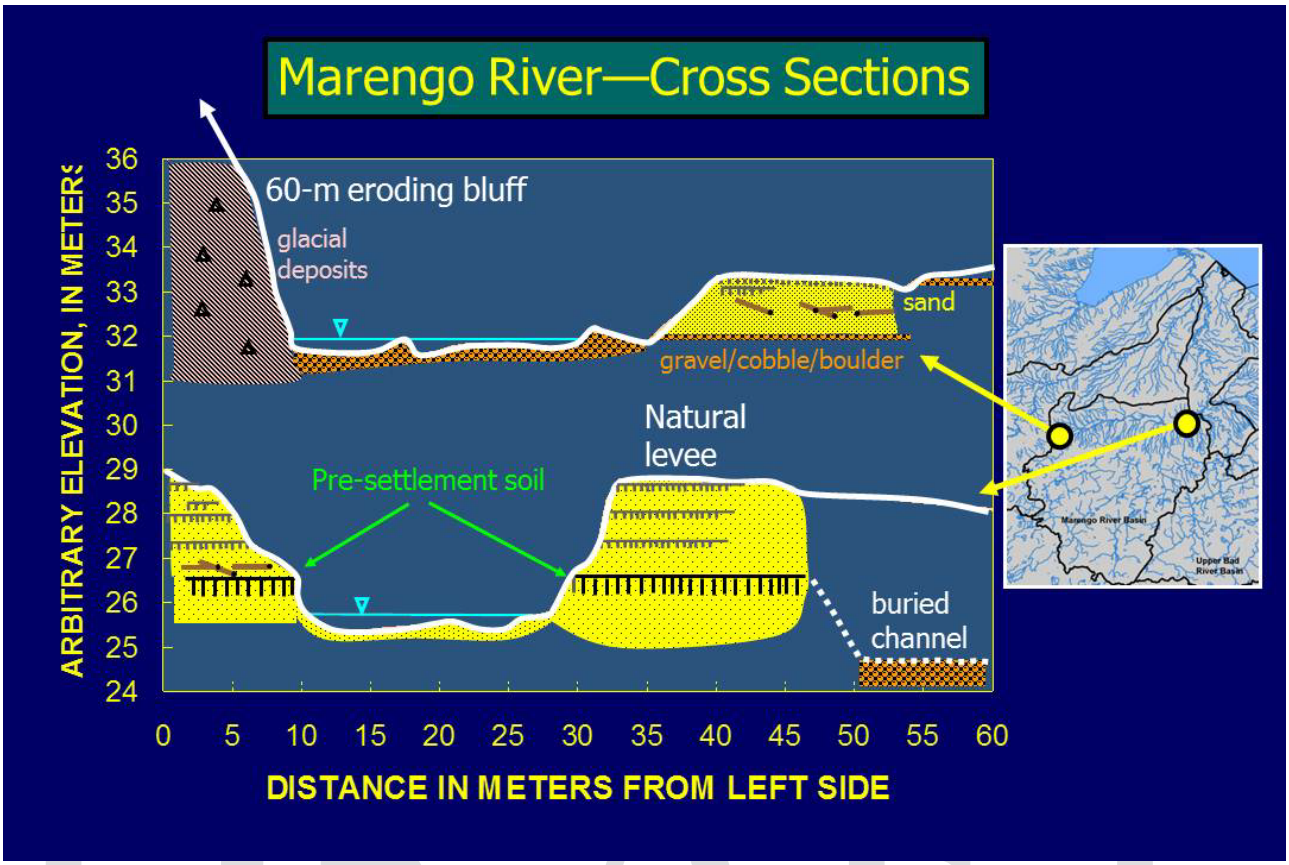


Figure 2.12. Stream channel cross sections as part of a geomorphic assessment of the Marengo River (Fitzpatrick 2005). The cross sections reveal evidence of historical channel incision upstream and sedimentation downstream near the river mouth (courtesy of F. Fitzpatrick).

Excessive lateral migration and channel instability exist at the confluence of the Marengo and Bad Rivers. Increased overbank sedimentation (levee building) disconnects the river from its floodplain and increases flood power to downstream reaches (Fitzpatrick 2005). The overbank sedimentation is primarily sand, presumably eroded from the wave-planed topography in the soil transition zone (Figure 2.13).

Figure 2.13. Levee building as a result of sand deposition near the mouth of the Marengo River (photo courtesy of Bad River Natural Resources Department).

Similar evidence of stream channel change following European settlement was documented as part of a more detailed geomorphic and sediment processes study conducted on the North Fish Creek watershed, just north of the Marengo River Watershed (Fitzpatrick et al. 1999, Figure 2.14). Like the Marengo River Watershed, North Fish Creek has a similar geologic setting, longitudinal profile, and historical land cover changes and provides a good proxy for ways in which historical land cover changes likely have affected flooding and sedimentation in the Marengo River Watershed.

Figure 2.15 shows how the amount of geomorphic change in North Fish Creek over the past 120 years (following European settlement of the area) is equal to that of the previous 2,000 years. In addition, peak flood flows are about twice as high and sediment loading about 2.5 times higher than pre-European settlement rates (Figure 2.16).

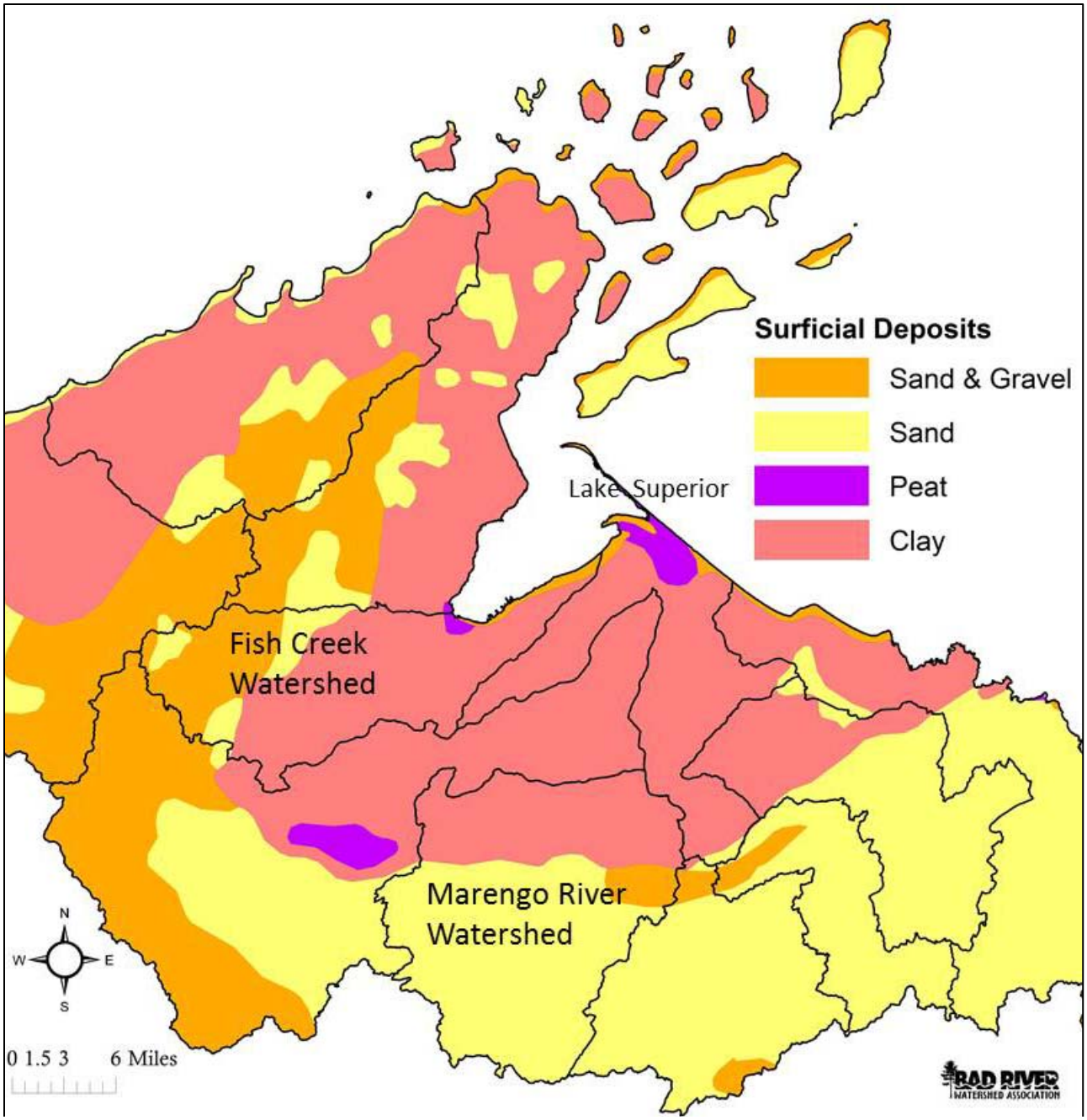


Figure 2.14. Location of Fish Creek watershed (includes North Fish Creek) relative to the Marengo River Watershed in the Lake Superior Basin of northern Wisconsin. Surficial deposits are shown to give an indication of the similar geologic setting of the two watersheds.

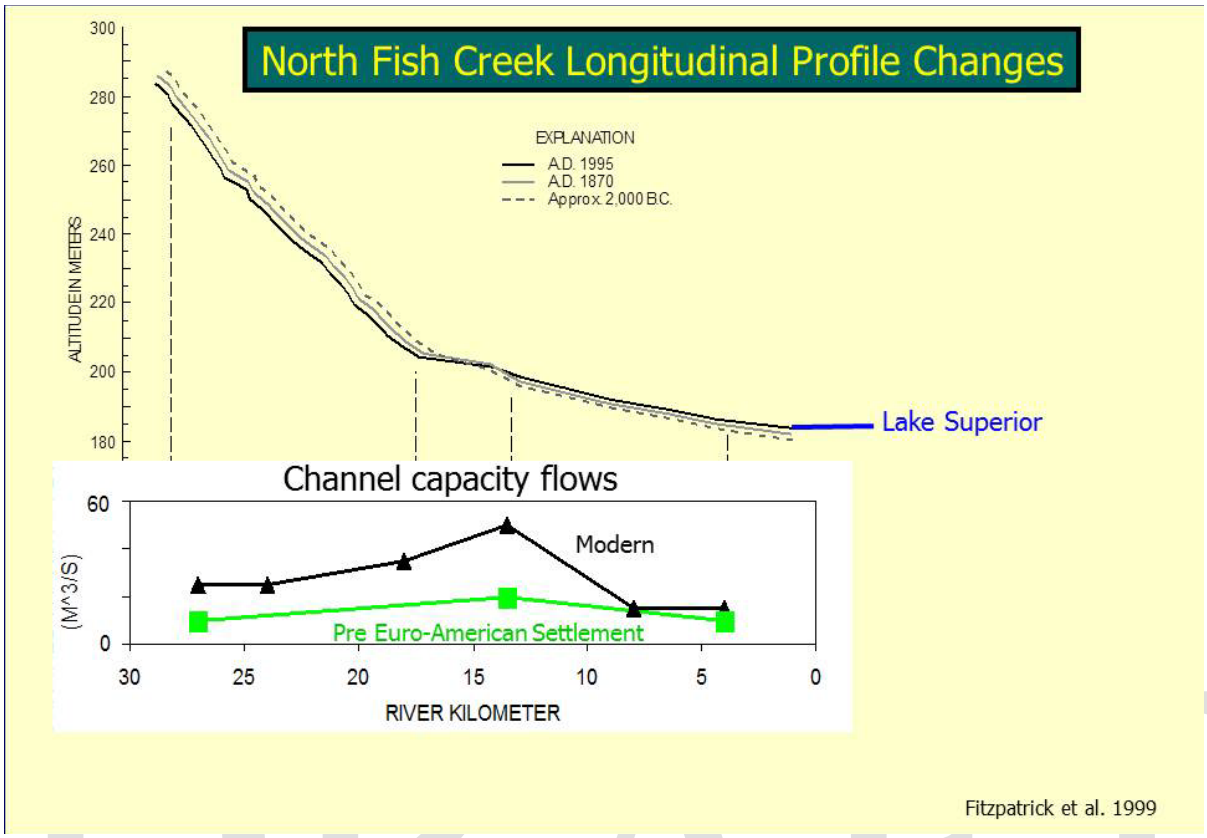


Figure 2.15. North Fish Creek longitudinal profile changes (Fitzpatrick et al. 1999).

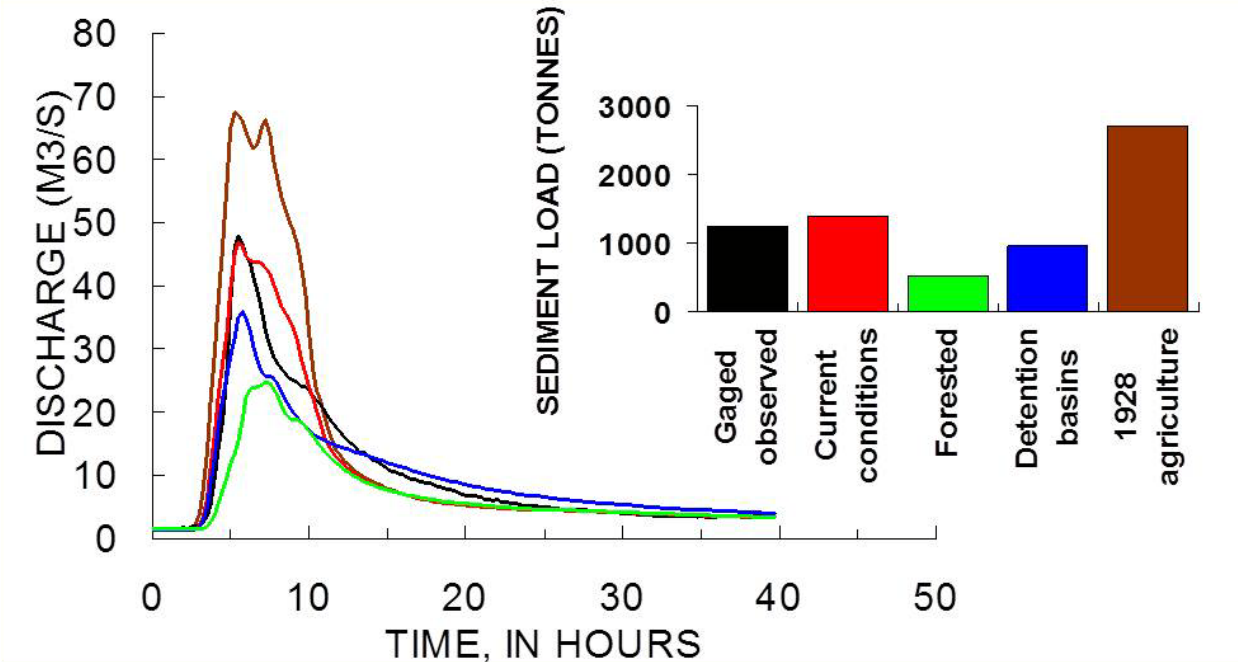


Figure 2.16. Storm hydrographs and sediment loads for North Fish Creek near Moquah, WI, for a historical storm on September 3, 1991, under four land-cover conditions (Fitzpatrick et al. 1999).

Evidence for how land cover change causes geomorphic change to stream channels in the upper Midwest comes from the work of Dr. Elon S. Verry and others (i.e. Verry *et al*. 1983, Verry 2001). Dr. Verry researched the relationship of the amount of open land in a watershed to the change in channel-forming peak flows (1.5-year bankfull flow). The removal of forest cover corresponds to an increase in snowmelt and other surface runoff events. These effects are particularly prevalent in the upper Midwest where significant logging and farming activities took place around the turn of the 20th Century and in areas with soils high in clay content. Verry showed that young forests (0-15 year age class) affect runoff rates in the same way as open land. The threshold for these impacts occurs at about 60% open land or young forest in watersheds only 2.5 km^2 in size where hill slopes are 3 to 45%. In flat basins (<3% hillslopes) in channel erosion does not occur in basins smaller than 25 km^2 (Verry 2001, Figure 2.17).

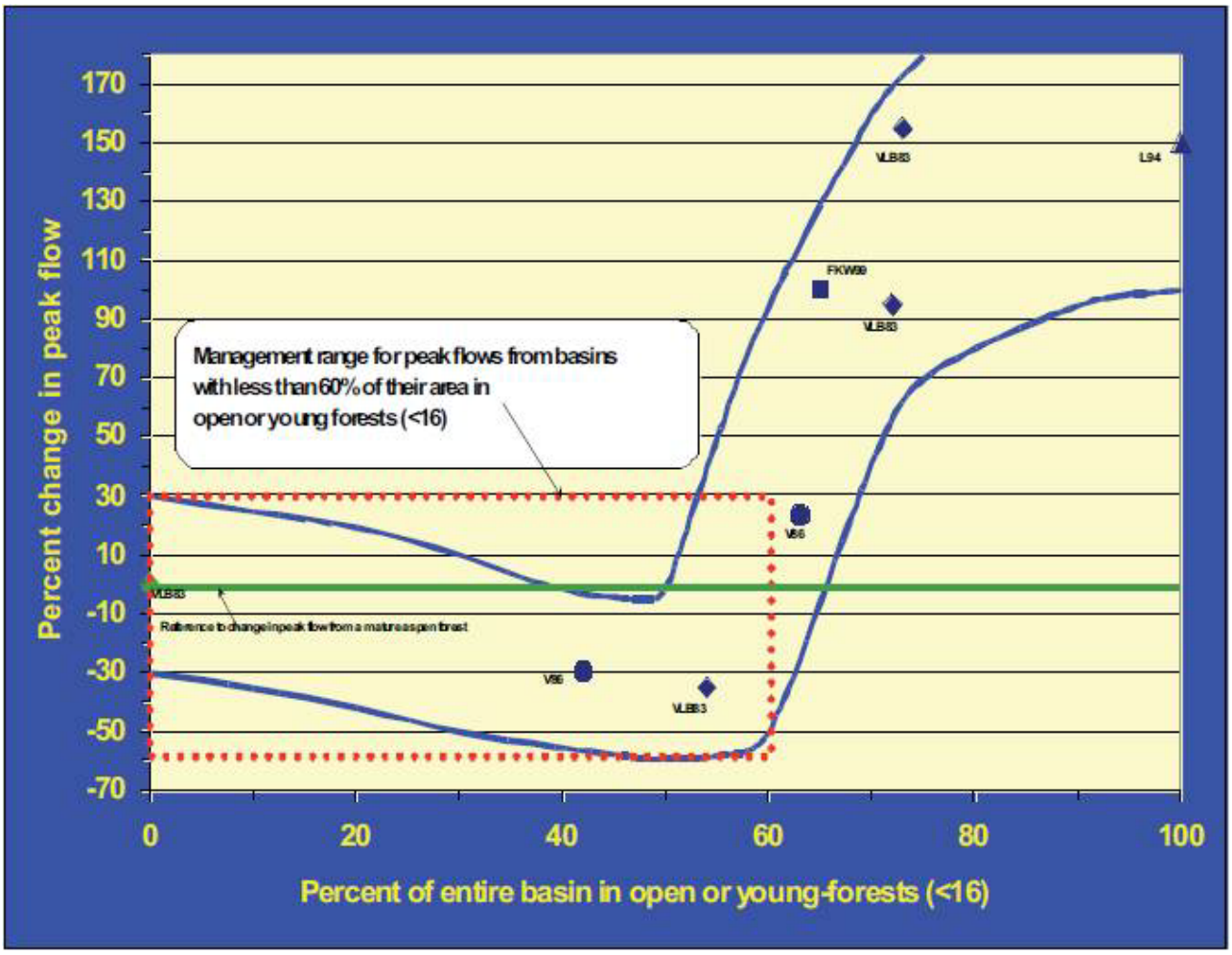


Figure 2.17. Relationship of the amount of open land in a subwatershed to the change in peak flow (Verry, 2001).

Other studies have shown that if forest vegetation is allowed to return, recovery to pre-logging hydrologic conditions may take from only a few years to several decades (Reinhart *et al*., 1963). However, in areas where natural vegetation is permanently converted to agriculture,

substantial long-term changes in flooding and sedimentation occur (Knox, 1977; Jacobson and Primm, 1997).

The Marengo River Watershed is of particular interest because of its geologic setting and past and present human activity that corresponds with the erosion-prone soil transition and clay plain areas. There are a high number of small tributaries flowing into the main stem of the Marengo River off the wave-planed topography in the soil transition zone from the south (Figure 2.18). These tributaries lie in the area of the watershed with the majority of farming activities, open land, clay soils, and an extensive road network. Because of these converging factors, the Marengo River was estimated to have the highest potential erosion problems of all the Bad River tributaries, and is likely to be the main contributor of sedimentation to the Bad River (Fitzpatrick 2005). Using the Bad River USGS stream gage sediment rating curve, it is estimated that more than a third of the annual suspended sediment load from the Bad River (~64,000 tons) comes from the Marengo River Watershed (Fitzpatrick 2010).

The Marengo River Watershed is prone to erosion and sedimentation because of its geology and landscape position, but geomorphic evidence suggests that these natural processes have been altered and increased due to past and current land use activities. The question exists as to how much human activity is affecting stream conditions and what can be done to improve those conditions and maximize ecosystem services the watershed is able to provide? In 2006, Wisconsin's Lake Superior Basin Partner Team set out to begin to tackle this question and learn which hydrologic factors had the most influence on the timing, quality and quantity of water in the Marengo River Watershed to help identify and prioritize projects in the watershed and lay the foundation for a watershed planning effort. The result was the *Marengo River Watershed Test Case: Assessing the Hydrologic Condition of the Marengo River Watershed, Wisconsin*.

The hydrologic assessment identified the following specific concerns or areas of concern in the Marengo River Watershed:

- areas with more than 50 or 60% open land or young forest;
- sand deposition in the lower reaches of the watershed and at the confluence with the Bad River, filling in and channelizing flow and restricting access to floodplains;
- cropland tillage, rotation and surface drainage;
- water channeled by road and ditch systems; and
- drained wetlands contributing to the overall volume and velocity of water added to the river system during major runoff events.

In addition, other ongoing projects in the Marengo River Watershed have identified the following specific areas of concern (Figure 2.18):

- The area within elevations 750–1,150 feet above sea level, known as the "soil transition zone" of the Lake Superior clay plain, is considered an erodible area. This band cuts across the entire Wisconsin portion of the Lake Superior Basin.

- A stretch of the Marengo River located between Kyster Road and County Highway C, has been identified, through a cooperative study by the US Geological Survey and the Bad River Natural Resources Department, as a high risk area for suspended sediment contributions.

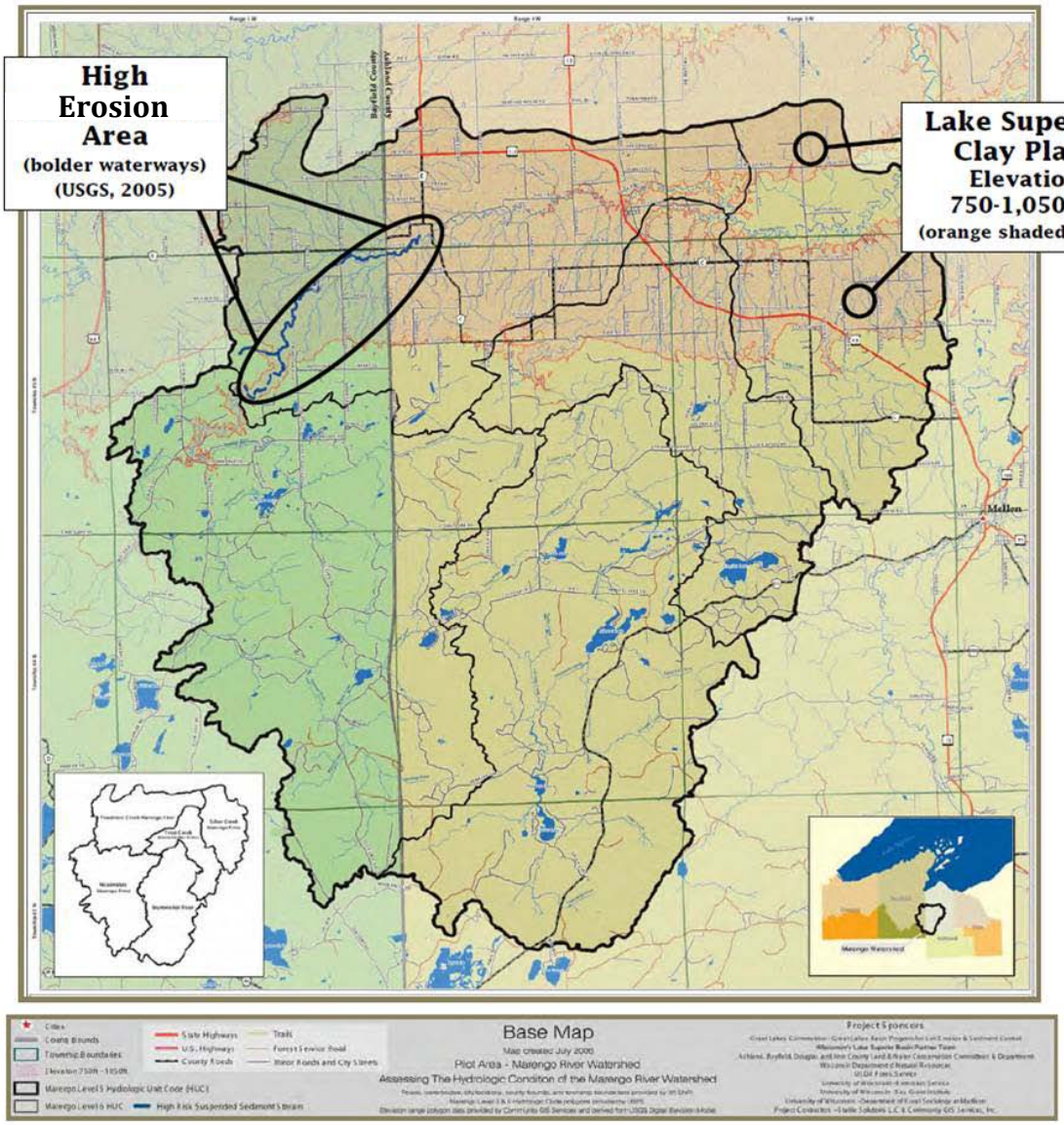


Figure 2.18. The Marengo River Watershed and specific areas of concern identified in the Marengo Test Case (LSBPT 2007).

2.3.1 BRWA "GET TO KNOW YOUR WATERSHED" STREAM ASSESSMENTS

During summer 2009, BRWA worked with staff at the Center for Watershed Protection (CWP) and hydrologists from the USGS and USFS, to modify existing stream assessment forms (Kitchell and Schueler 2005) to evaluate the severity of bluff and stream bank erosion and channel instability in the high risk area for suspended sediment contributions highlighted in the Marengo Test Case.

During fall 2009 and spring/summer 2010, BRWA staff, along with citizen and professional volunteers, surveyed approximately six miles of the Marengo River between Altamont Rd. and Ashland Bayfield Rd. and approximately one mile above Marengo Lake Rd (Figure 2.19). The program was called "Get to Know Your Watershed" and surveyors identified and assessed 97 stream bank erosion sites, 135 depositional bars, 16 log jams and 23 beaver dams. Figure 2.19 displays examples of some of the severe stream bank erosion surveyed as part of the program.

BRWA worked with WDNR staff to develop a Google Earth application to display the resulting data for stream bank erosion (Figure 2.19). The application provides a tool for citizens and resource managers to view photos and data collected from each of the stream bank erosion sites, as well as evaluate and prioritize potential sites for stabilization or remediation activities.

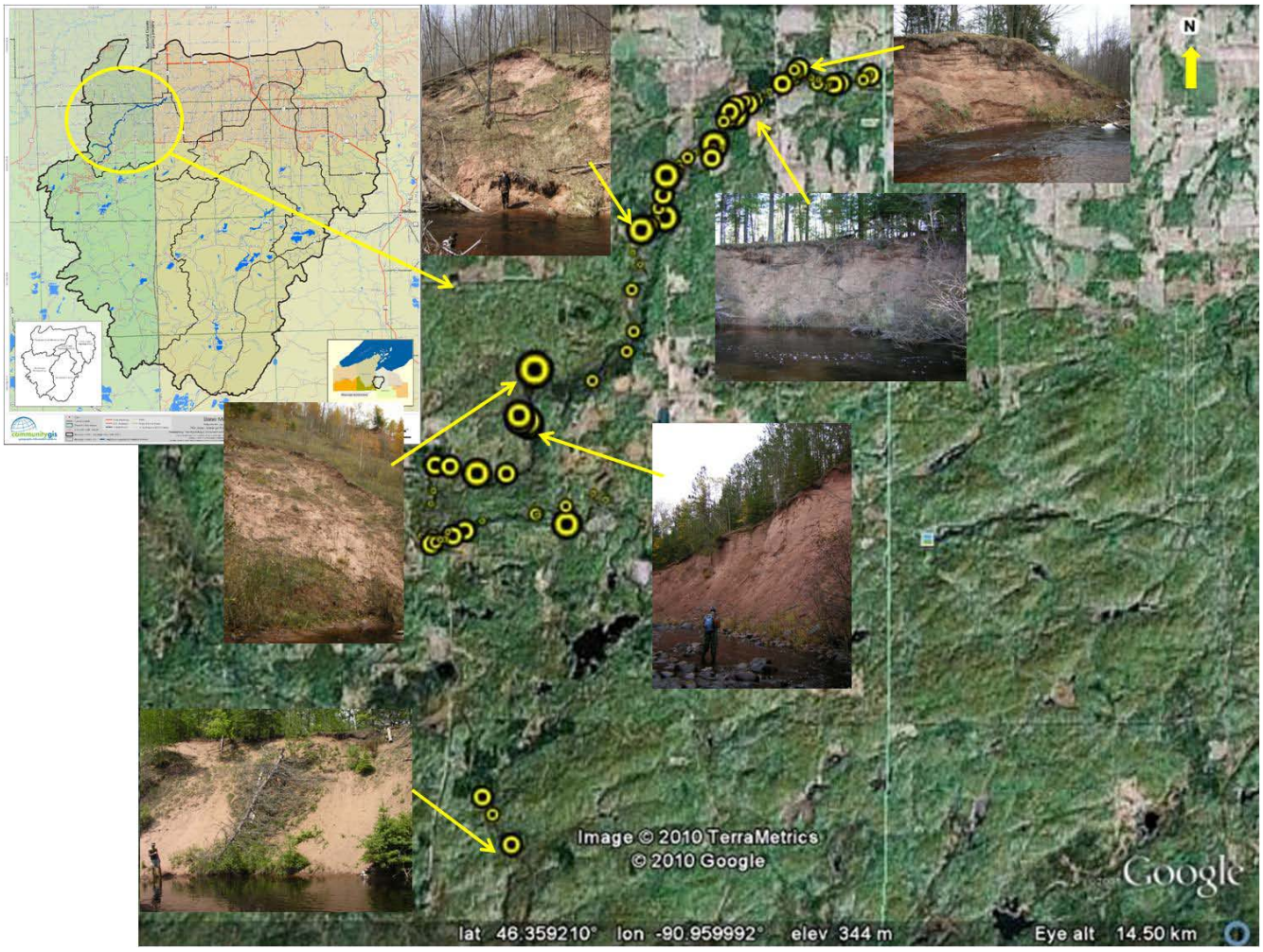


Figure 2.19. BRWA "Get to Know Your Watershed" survey stream bank erosion locations and example pictures of some erosion sites. The size of the dots is based on the area (in ft^2) of the eroding stream bank. The surveys were conducted in the high sedimentation area of concern identified in the Marengo Test Case (LSBPT 2007).

The BRWA surveys document the severity of bluff and stream bank erosion in the soil transition zone of the main stem of the Marengo River. Using the amount of bare, eroding area measured (270,000 ft^2), assuming a 1 ft/year retreat rate, and assuming 85 lbs/ft^3 volume/weight conversion, a rough estimate of annual sediment loading from the soil transition zone in the main stem of the Marengo River is about 11,000 tons (Fitzpatrick 2010). The suspended sediment loading estimate from the entire Marengo River Watershed based on the Bad River sediment rating curve is about 64,000 tons (Fitzpatrick 2010). These estimates suggest a significant amount of the sediment loading from the Marengo River Watershed could be coming from not only from the main stem but also from the tributaries. This would make sense given the geologic setting of the watershed and that many of the tributaries to the main stem flow north off the soil transition zone. While these estimates can provide preliminary clues to erosion and sedimentation problems in the Marengo River Watershed, a full sediment budget is needed to characterize these issues, direct management activities, and document future improvements.

2.3.2 "SLOW THE FLOW"

While erosion and sedimentation are important challenges to maintaining and improving the health of the Marengo River Watershed, as learned from the work of Verry and others, they are symptoms of watersheds responding to increased runoff rates largely from land cover changes. The Lake Superior Basin Partner Team has adopted a slogan called "slow the flow" to help draw attention to the key non-point source issue affecting the health of streams in the Lake Superior Basin of Wisconsin. The concept recognizes that holding water back on the landscape and delaying its delivery to streams, particularly in the soil transition zone and clay plain areas, will protect stream channels and improve habitat for aquatic species.

As part of the Marengo Test Case, the USGS National Flood Frequency Model (NFF) was used to estimate peak discharge rates from each of the 6^{th}-level hydrologic units in the Marengo River Watershed. The estimates were used to identify areas in the watershed that are likely to be more "flashy," unstable, prone to erosion, and susceptible to impacts from land cover changes.

As part of this watershed planning effort, staff at the US EPA Office of Research and Development laboratory in Duluth, MN modeled peak discharge for the same five subwatersheds as the Marengo Test Case and again for a higher resolution set of 30 subwatersheds using the National Streamflow Statistics Program (NSSP, a later version of the NFF model).

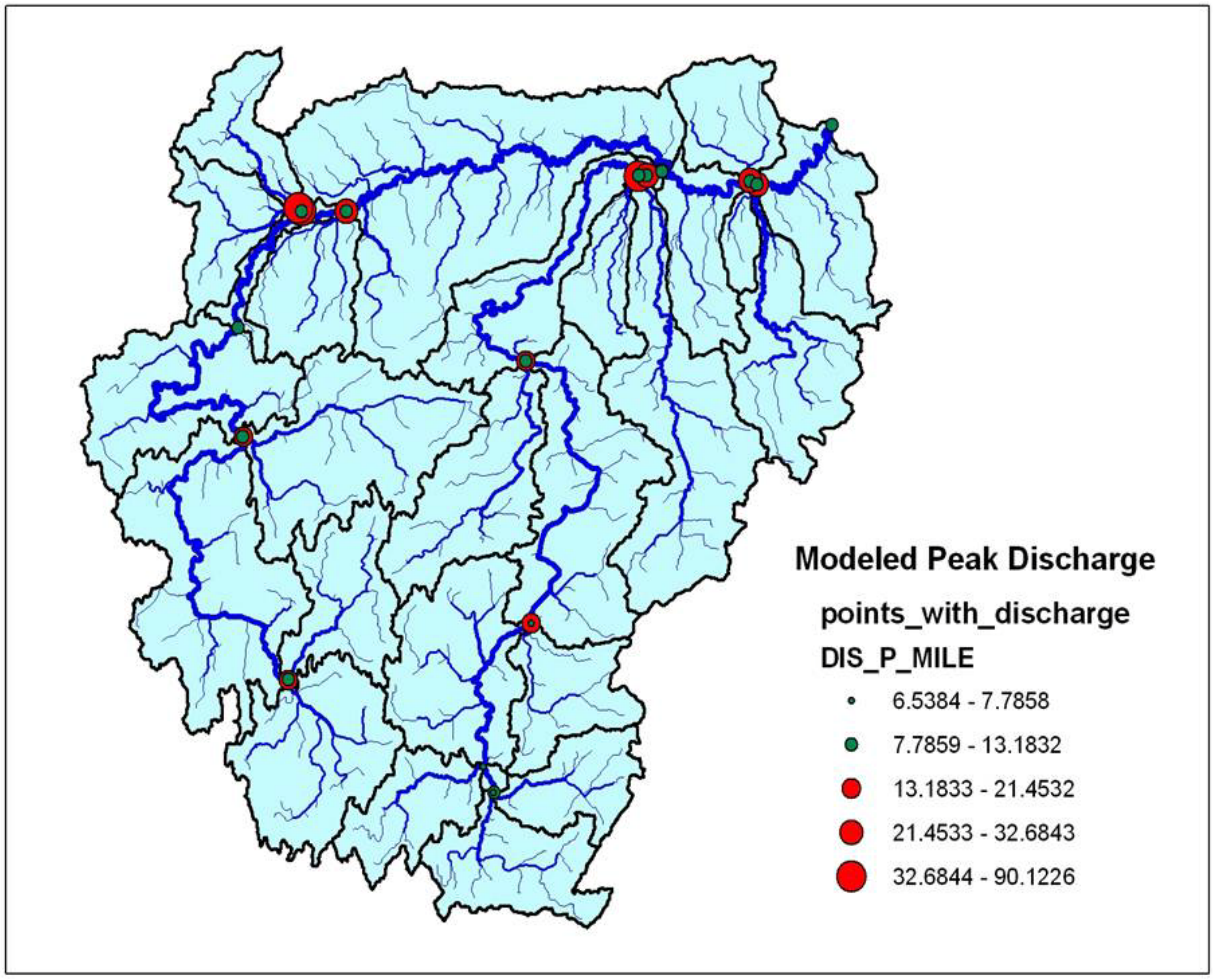


Figure 2.20. Results from National Flood Frequency modeling for 30 sub-watersheds in the Marengo River. The dots, or "pour points" (many of which overlap) for each watershed are sized by predicted 2-year peak discharge per square mile. Peak discharge per square mile was calculated for 30 nested subwatersheds in the Marengo River Watershed. Results were modeled using the USGS National Streamflow Statistics Program (USGS 2010). Analysis completed by Tom Hollenhorst, USEPA.

The results show how the areas of the watershed with the greatest modeled peak discharge per square mile correspond to the soil transition zone and clay plain area (Figure 2.20).

The Lake Superior Basin Partner Team and WDNR have also worked with Dr. Verry and Community GIS, Inc. over the past several years to apply the open lands concept developed by Dr. Verry to identify critical areas for management activities to slow the flow. Using 16 years of satellite imagery of the entire Lake Superior basin in Wisconsin and subdividing the watershed into smaller "hydrologic units" based on stream sinuosity, slope, and length, the percent open land and forest less than 16 years old was calculated for each of the hydrologic units. This process was completed using data through 2004 and repeated again using data through 2008 (Community GIS, Inc. 2006, 2009).

The open lands assessment is designed to determine what areas of the Lake Superior Basin currently exceed the 60% open land/young forest threshold in order to focus slow the flow efforts on the landscape that will eventually reduce 2-year peak flow volumes and improve stream health.

Figure 2.21 displays the 2008 open lands assessment for the Marengo River Watershed along with the modeled 2-year peak discharge for the pour points described in the USEPA NSSP analysis in Figure 2.20. The hydrologic units or subwatersheds used in each of the analyses are different, but what the figure shows is that the areas of the Marengo River Watershed with the greatest potential peak flows also correspond to the areas of the watershed with the greatest amount of open lands either above or near the 60% threshold. These areas also correspond to the soil transition zone and clay plain and the greatest concentration of agriculture and road density in the watershed.

The open lands assessment and modeled peak discharge estimates show which areas of the Marengo River Watershed are most susceptible to excessive peak flow volumes leading to erosion and sedimentation problems that in turn affect aquatic habitat and water quality.

In order to apply the open lands assessment to slow the flow management activities, a recommendation from the Nemadji River Basin Project Report (NRCS 1998) was to avoid exceeding 40% open land in a subwatershed to help control erosion and improve fish habitat. WDNR has recently proposed the following strategy related to open lands management in the Lake Superior basin that provides further detail (Wagner and Matula 2010):

- Priority for Restoration Efforts: Hydrologic units at 55% or more open lands
- Priority for Landowner Education Efforts: Hydrologic units at 40%-55% open lands
- Priority for Maintaining Working Forests: Hydrologic units at less than 40% open lands

For the purposes of identifying a management target for the Marengo River Watershed, the amount of open land needing re-forestation was calculated to achieve the 40% guideline within the hydrologic units delineated for WDNR's 2008 open lands assessment (Figure 2.22). The total amount of open land needing re-forestation to achieve 40% open land or less in all hydrologic units in the Marengo River Watershed is 7,643 acres.

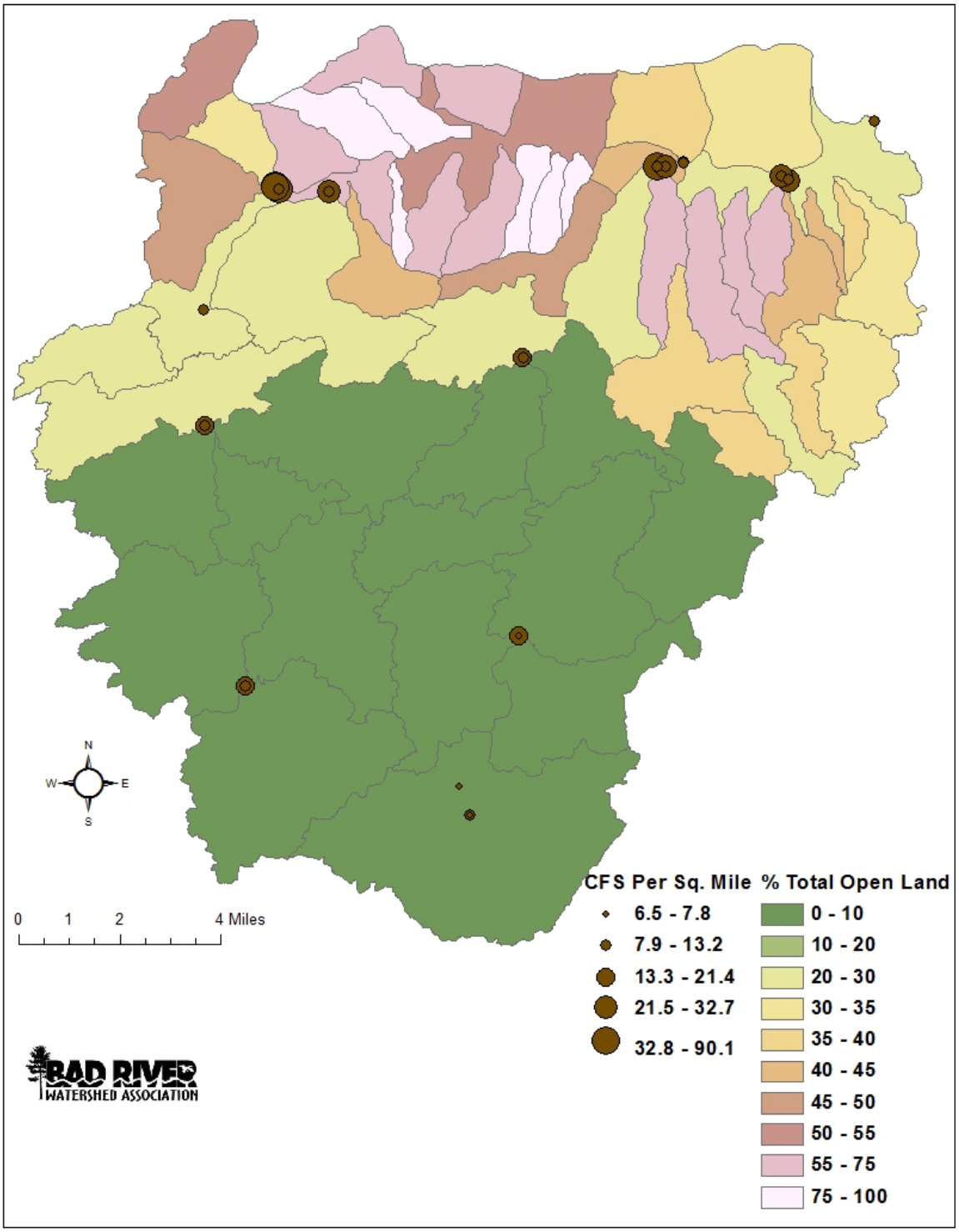


Figure 2.21. Wisconsin Department of Natural Resources 2008 open lands assessment data for Marengo River Watershed hydrologic units. Modeled peak discharge (in cubic feet per second) per square mile is also plotted to give a general representation of how peak discharge relates to percent open land in the Marengo River Watershed.

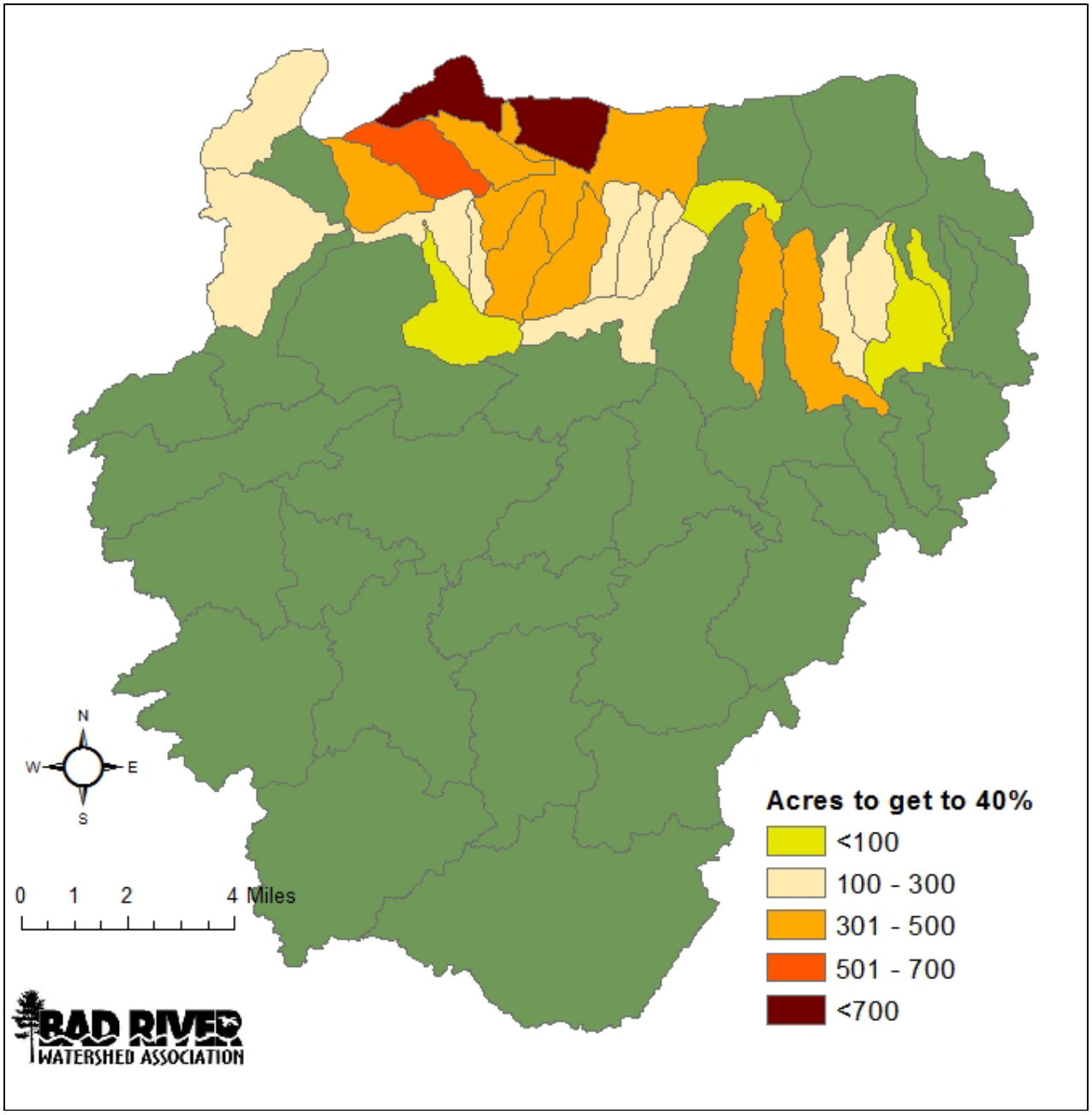


Figure 2.22. Acres of open land needing re-forestation to achieve 40% open land in Marengo River Watershed hydrologic units. Data from WDNR's 2008 open lands assessment (Community GIS 2009).

2.4 DRAINAGE: ROADS, CULVERTS, AND AGRICULTURE

When roads were first built, the focus was on getting vehicles across streams and draining water away from roads via ditches. Agricultural drainage systems are designed to channel water quickly off the land to facilitate the growth and maintenance of crops. Both of these types of drainage systems create hydrologic connectivity between uplands and river systems. Harr

(1975) showed that when the amount of total road right-of-way area exceeds 12% of a watershed area, peak flows increased significantly.

In addition to channelizing runoff faster to streams, road/stream interactions at crossings can also pose major problems for fish passage and sedimentation. Culverts can act as barriers to fish by blocking access to quality habitat upstream. There may be a drop at the outlet that prevents fish from getting into the pipe. Or the water velocity in the culvert may be too fast for fish to make it all the way through the pipe.

Road crossings can also cause sedimentation problems in streams. Extra sediment can come from a road failure, or from a regularly eroding stream crossing. This extra sediment covers the stream bottom, filling in spaces for insects which are the food for fish, and also limits spawning success.

Currently there are about 406 known crossings in the Marengo River Watershed. Of these:

- 326 have been inventoried.
- 47 are listed has having a steep embankment
- 117 are listed as being on perennial streams
- 165 are not embedded
- 61 have at least a 6" drop - 90% of these are on perennial streams, 59% occur within the soil transition zone (Figure 2.23).
- 7 sites have been or are scheduled to be restored.

Crossings associated with recreational trails such as those used by snowmobiles, all-terrain vehicles, hikers, etc. have generally not been inventoried and may pose fish passage and/or sedimentation problems as well.

In steep areas, when culverts are not embedded or aligned with the slope of the stream channel, erosion at the downstream end of the culvert gradually leads to a drop between the end of the culvert and the continuation of the stream channel (Figure 2.24). Sediment often accumulates at the upstream end of the culvert (Figure 2.25). Often these small tributaries start as springs or seeps coming out of the sand/clay transition area. Many aren't listed as perennial streams on current management maps, yet field work through the culvert program and conversations with local citizens reveals that many of these "intermittent" streams are actually perennial. Some may offer high-quality, cold water aquatic habitats or habitat potential that may often be inhibited by culvert crossings.

In addition to the fish passage issues that can occur more frequently in the steep, soil transition areas, these sites are also prone to erosion due to steep channel gradients. When culverts fail (Figure 2.26) or are replaced, if care is not taken to stabilize the stream channel grade, sediment that was held behind the upstream end of the culvert is released and incision caused by the downstream erosion migrates upstream, causing further channel and habitat degradation upstream of the culvert.

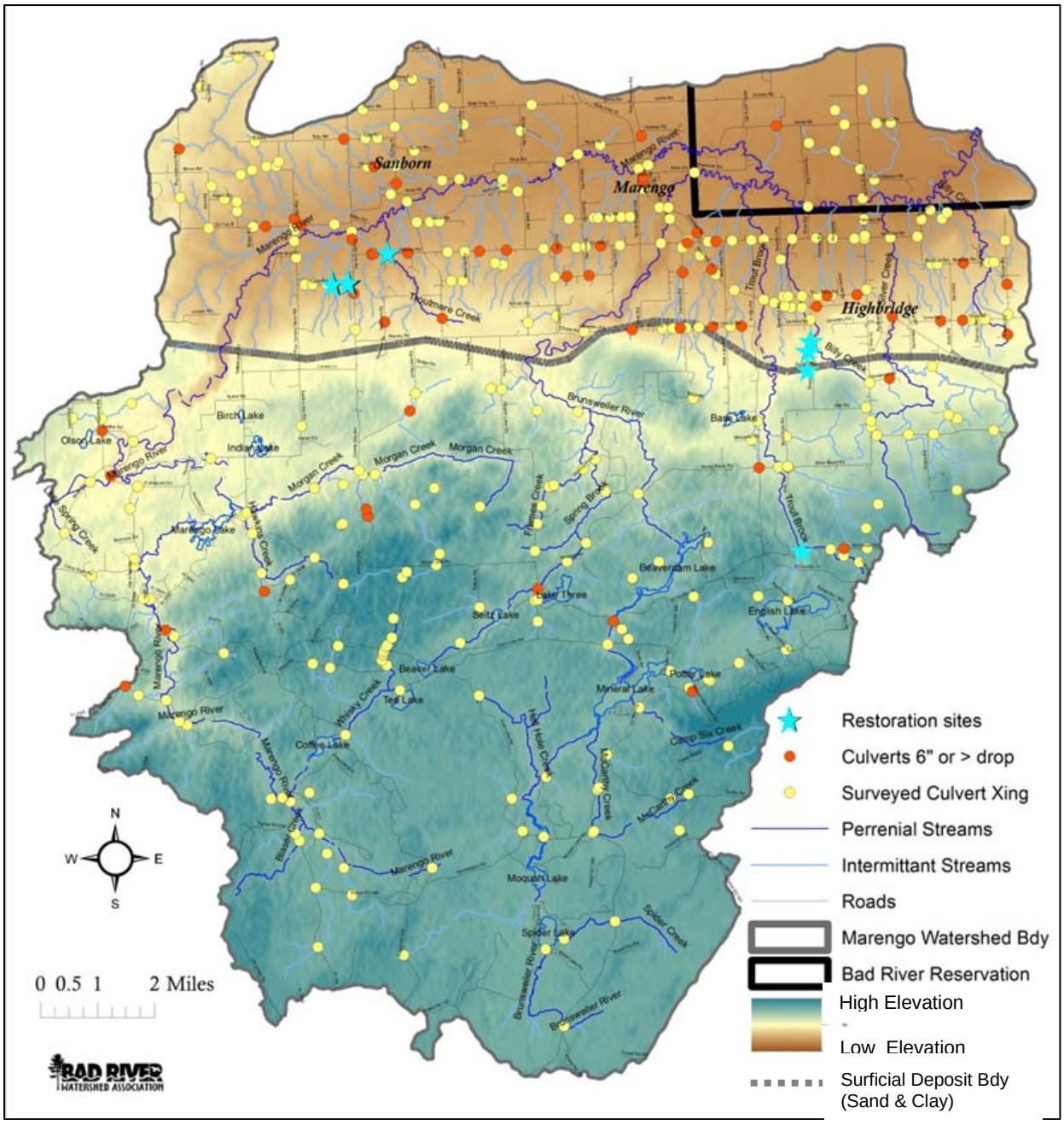


Figure 2.23. Marengo River Watershed road/stream crossings from the Bad River Watershed Association culvert inventory database. Red dots indicate culverts with a drop of 6 inches or greater at the downstream end. Blue stars indicate known restoration sites or planned restoration sites (as of 2010).

Figure 2.24. Example of a typical perched culvert in the Marengo River Watershed.

Figure 2.25. Examples of typical road/stream interaction at culverts in the soil transition zone of the Marengo River Watershed (courtesy of F. Fitzpatrick). Sediment accumulation upstream and erosion downstream.

Figure 2.26. Examples of failed culverts in the Marengo River Watershed.

Outside of road/stream crossings, very little is understood about the effect of roads, ditches, and agricultural drainage systems on hydrologic function in the Marengo River Watershed. The Marengo Test Case identifies the road system and agricultural surface drainage as "significant" factors in affecting the hydrology of the Marengo River Watershed and affecting the velocity and volume of water delivered to streams during runoff events. Recommendations include determining the percentage of road and road/ditch systems in the watershed to see how it relates to Harr's 12% threshold and identify target areas where management activities to slow the flow of runoff from the road system will have the greatest benefit. Particular focus should be on the soil transition zone and clay plain areas, but the road system in the headwaters area should also be evaluated both for existing roads and abandoned roads that may be increasing flow to the downstream soil transition and clay plain areas.

Most of the agricultural drainage exists in the northern portion of the watershed in the soil transition and clay plain areas (Figure 2.27). The drainage systems are designed to move water off the land as quickly as possible to facilitate farming activities. Breaking drainages on fallow lands, and creating temporary storage by restoring wetlands, and planting trees in marginal agricultural areas are ways that the rate of runoff can be slowed from agricultural land.

Figure 2.27. Aerial photo showing an example of an existing agricultural drainage network in the Marengo River Watershed (photo – USDA Farm Service Agency 2008, from Google Earth).

2.5 FOREST OWNERSHIP AND MANAGEMENT

The Marengo River Watershed contains approximately 97,000 acres of forest land cover or about 70% of its total land area (NOAA 2010). Therefore, the manner in which forests are managed plays a significant role in the quality of aquatic and terrestrial resources of the watershed.

Wisconsin's Forestry Best Management Practices (BMPs) for Water Quality were developed in 1995 (updated in 2010) in response to requirements of the Clean Water Act. Sec 319 of the 1987 Amendments to the Clean Water Act requiring states to develop a management program to control non-point sources of water pollution, including those from silvicultural activities, and to identify BMPs that would be undertaken to reduce such pollution (Shy and Wagner 2007a, WDNR 2010b). In 2003, WDNR published Wisconsin Forest Management Guidelines, designed to integrate multiple BMPs related to forest management to help landowners, resource managers, and loggers determine how to protect the functions and values of forest resources during forest management activities. In 2007, WDNR published forest management and harvest guidelines specific to the unique nature of the Lake Superior Basin red clay soils (Schultz 2003, Shy and Wagner 2007b, Shy and Wagner 2007c).

Approximately 71,000 or about 73% of the forest land in the Marengo River Watershed has a plan that includes some version of third party oversight in harvest and management activities

(Figure 2.28). In general, management activities on these lands follow or are similar to the recommendations in Wisconsin's Forest Management Guidelines. Table 2.4 details the acreage in each type of ownership/management category.

Table 2.4. Acres of forest land in the Marengo River Watershed known to have a forest management plan.

Forest Manager (Year of Data)	**Acres In Marengo River Watershed**
Bureau of Indian Affairs (2005)	654
MFL Program (WDNR, 2006)	11,959
FCL Program (WDNR, 2006)	1,441
Living Forest Cooperative, Inc. (2010)	1,530
U.S. Federal Government (2000)	55,285
Management Unknown	25,628 (estimate based on NOAA 2010 Land Cover)

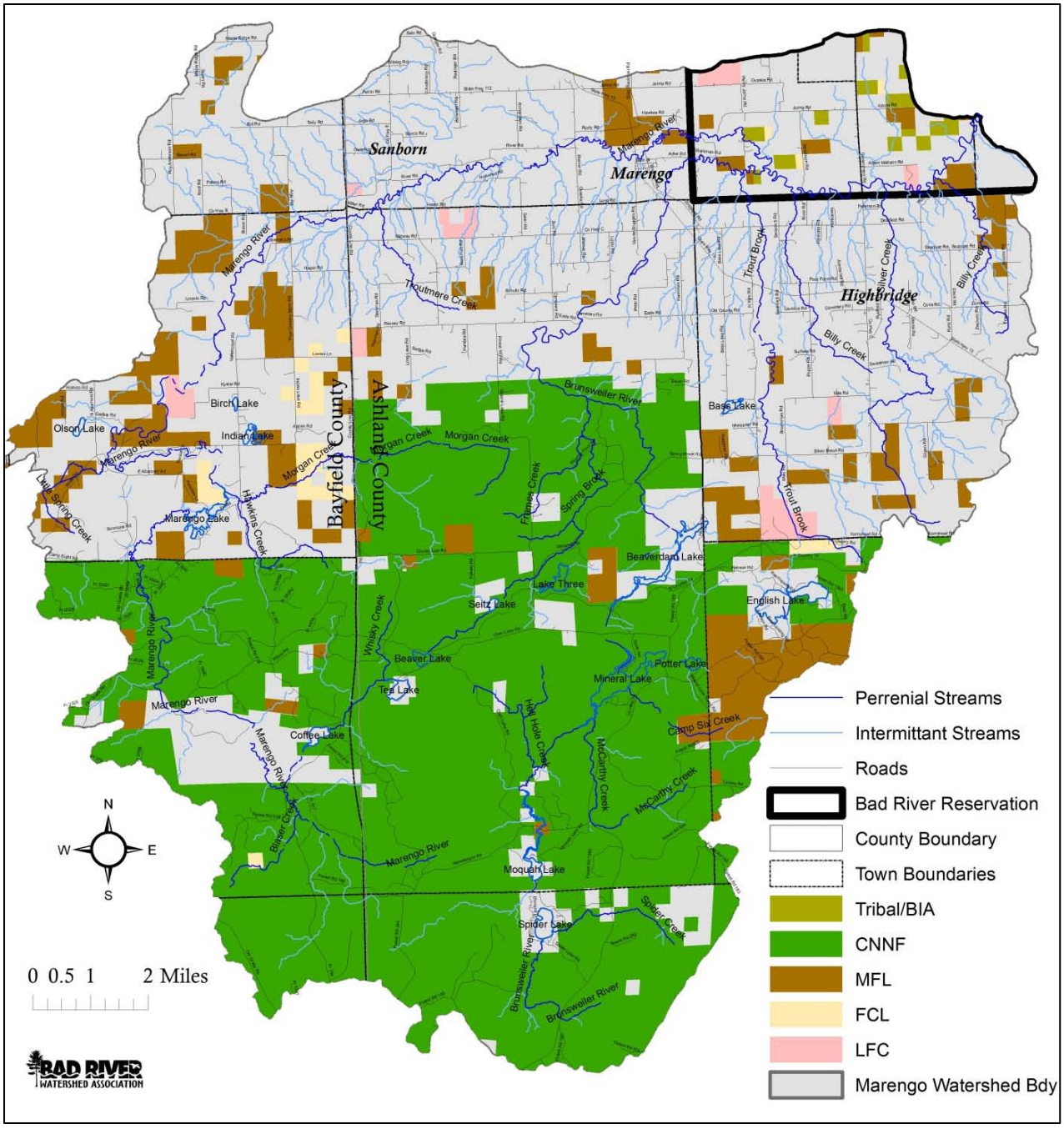


Figure 2.28. Forest land in the Marengo River Watershed known to have a forest management plan. CNNF (Chequamegon-Nicolet National Forest, MFL (Managed Forest Law), FCL (Forest Crop Land), LFC (Living Forest Cooperative, Inc.), Tribal/BIA (Bureau of Indian Affairs). Gray areas indicate non-forested land or areas where forest management status is unknown.

2.6 AGRICULTURE

Agriculture production in the Lake Superior Basin of Wisconsin has steadily declined since the 1920s and 1930s. The region's cool temperatures and relatively infertile and highly erodible clay soils limit agriculture activity mostly to dairy and beef operations. Ashland and Bayfield County rank near the bottom of Wisconsin counties for agricultural production and income from farming. The following narrative from the Ashland County Land and Water Conservation Plan (2010) describes the state of agriculture and trends that also apply to neighboring counties in the Lake Superior Basin of Wisconsin.

Trends in farm ownership are continuing to affect our area. Farms are being purchased as recreational properties and taken out of production or converted to "hobby farms", small family dairy operations are being replaced with larger multi-family operations with larger numbers of animals, and partnerships and family corporations are now in place. There continues to be a switch from dairy to beef production on some farms. Smaller organic farm operations are an emerging trend in Ashland and adjacent counties, providing low input produce, fruit and plants to the local communities. Within the last 3 years, production of crops for bio-diesel took a sharp rise, and then subsided in 2009 with diminished markets.

Although most farms in Ashland County are dairy and beef operations; other farming activities are increasing. They include organic truck-type farms, flower and landscape plant producers and small orchard fruit growers. These important industries provide valuable services by raising native and organic produce for local consumption. Crops produced in the county include sunflowers, oats, trefoil (forage and seed), turf grass seed, corn, legumes, grass hay, fruits, vegetable crops (cabbage, pumpkins and various other crops), and nursery stock.

Animal operations must address an increasingly difficult part of farming – manure management. Manure is generally stockpiled or stored and spread on fields when condition allow. Some producers still allow cattle unlimited access to streams, and in many cases this has contributed to streambank erosion, sedimentation, nutrient loading, and shoreland degradation. The Ashland County LWCD is actively encouraging the development of nutrient management plans by providing "farmer education" in coordination with UWEX and NRCS in DATCP-approved training courses. Over $50,000 in cost-share has been provided to Ashland County producers for development of nutrient management plans in 2008 and 2009, although the demand for this program greatly exceeds the available cost-share funds. Cropland soil erosion is not generally an issue due to long hay rotations and limited row crop production.

Although agriculture is a small portion of the land area in the Lake Superior Basin, the northern portion of the Marengo River Watershed is one of the areas where it is concentrated. The NOAA C-CAP land cover dataset indicates that about 13% of the land area (about 18,000 acres) in the Marengo River Watershed is actively cultivated or in pasture/hay or grassland (Table 2.3). The majority of the agriculture also occurs in the soil transition zone and clay plain areas, which are more susceptible to runoff, erosion, and sedimentation issues. Therefore, agriculture activities, while covering a small area of the watershed, play a very important, localized role in maintaining a healthy watershed. The most important effects agriculture operations currently

have on the health of Marengo River Watershed resources are related to drainage (concentrated flow areas, field drainage networks, etc.) and the management of dairy, beef, and other livestock (pasturing, water crossings, etc.) and their waste.

2.7 DAMS AND NATURAL BARRIERS

WDNR's webpage on Dam Safety (http://dnr.wi.gov/org/water/wm/dsfm/dams/) gives considerable information about the history of dam building and regulation in Wisconsin, along with considerations and procedures for maintaining and removing dams. Many dams in Wisconsin are aging and falling into disrepair and require decisions to be made whether to repair or remove them.

Removal of dams can have significant ecological benefits including, but not limited to: re-connection of important seasonal fish habitat, normalized water temperature regimes, and improved biological diversity (WDNR 2010c). While many benefits exist to removing dams, both human-made dams and natural barriers can prevent the upstream movement of undesirable invasive species such as sea lamprey and may provide opportunities for refugia for native species such as brook trout. Many considerations need to be weighed before decisions are made whether to maintain or remove existing dams.

According to Wisconsin's Dam Safety database, there are 12 dams within the Marengo River Watershed (WDNR 2010c, Figure 2.29). Three of these dams are listed as abandoned, one of which is confirmed as having been removed (Marengo Dam). It is not specified whether the other two have had the abandoned structure removed. Of the nine remaining dams, five are classified as "large" dams. Large dams are defined as "a dam with a structural height of over 6 feet and impounding 50 acre-feet or more, or having a structural height of 25 feet or more and impounding more than 15 acre-feet" (WDNR 2010c). WDNR is required to inspect "large" dams at least once every 10 years to ensure their safety. According to Wisconsin's Dam Safety Database, Only one of these five "large" dams has been inspected within the past 10 years (Figure 2.29). The remaining four dams are classified as "small." Three natural barriers occur at Marengo Falls, Morgan Falls, and Spring Brook Falls (Figure 2.29).

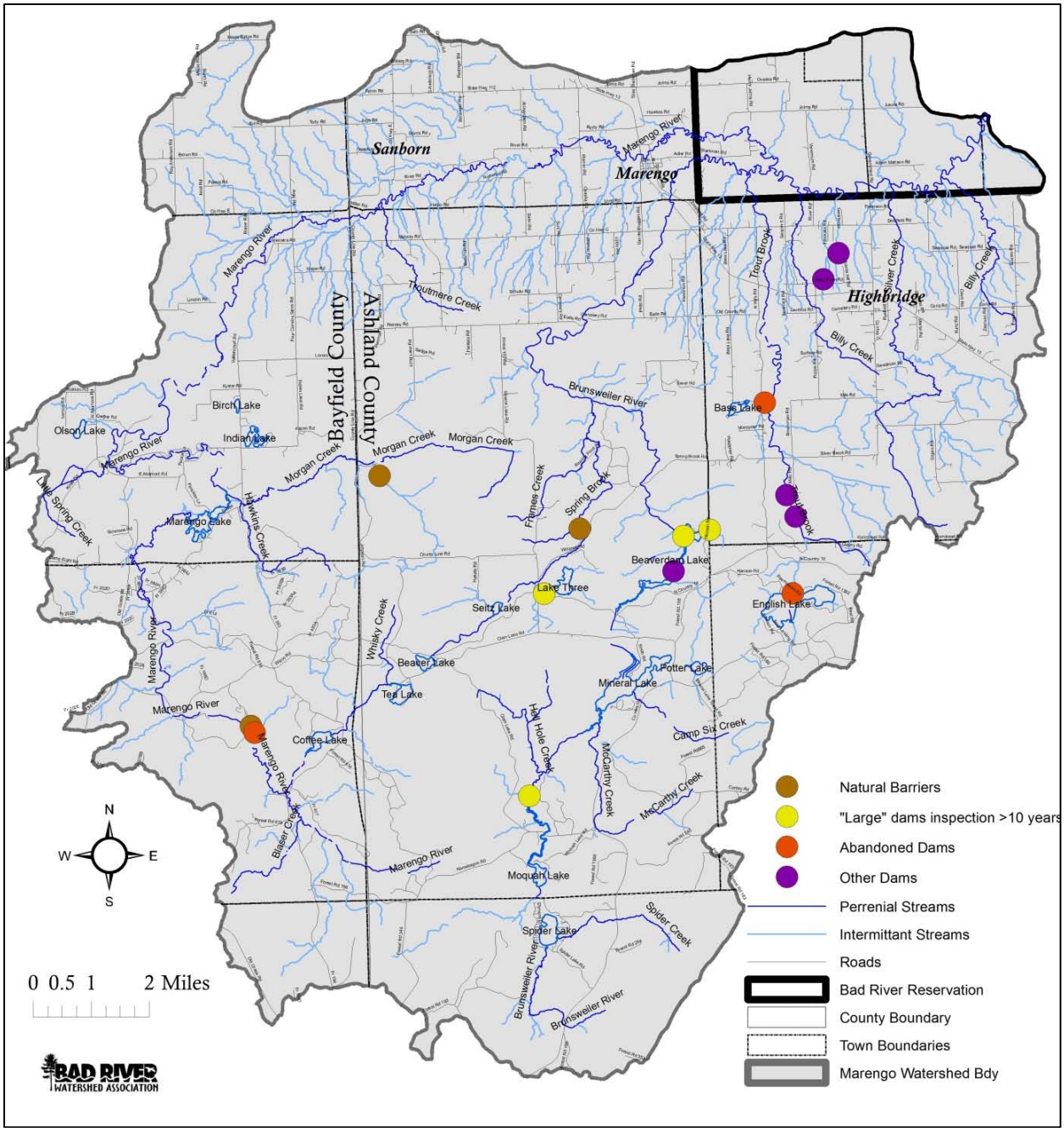


Figure 2.29. Location of natural barriers, dams identified as "abandoned," dams defined as "large" and not having been inspected in greater than 10 years, and other dams within the Marengo River Watershed. Data Source: WDNR's Dam Safety Database (WDNR 2010c).

2.8 LAKES

There are 20 named lakes or impoundments within the Marengo River Watershed and many other unnamed ponds and wetland areas. The lakes and impoundments all occur within the southern two-thirds of the watershed associated with the North Central Forest Ecological Landscape described in Chapter 2.2.1.

Loon populations are currently being monitored by volunteers in the following watershed lakes through Northland College's Loon Watch Program: Bass Lake, Beaver Lake, Beaverdam Lake, Coffee Lake, English Lake, Lake Three, Marengo Lake, Mineral Lake, Tea Lake (Northland College 2010).

Mineral Lake is one of WDNR's Citizen Lake Monitoring Network, Lakes Baseline and Trends Monitoring sites (WDNR 2010d).

Some of the lakes in the Marengo River Watershed are managed by WDNR for walleye or muskellunge (Table 2.5).

Table 2.5. Wisconsin Department of Natural Resources (WDNR) isheries management codes for Marengo River Watershed lakes. Data source: WDNR Surface Water Data Viewer, retrieved on 10/19/10.

Lake	Walleye Code		Muskellunge Code		
	NR	C-NR	Cat 1	Cat 2	Cat 0
Beaverdam					X
English				X	
John Frank					X
Marengo	X				
Mineral			X		
Moquah				X	
Potter			X		
Seitz					X
Spider				X	
Tea	X				

Codes: Walleye waters
NR - Natural reproduction only
C-NR - Stocking plus natural reproduction

Codes: Muskellunge waters
Natural reproduction only (Cat 1)
Natural reproduction plus stocking (Cat 2)
Reproduction unknown, stocking occurs (Cat 0)

2.9 GROUNDWATER

Groundwater is an important resource in the Marengo River Watershed that is not very well understood. Groundwater feeds many streams, seeps, wetlands, and lakes and is essential for supporting trout populations in over 130 miles of designated trout streams in the watershed. Understanding groundwater contributions to baseflow in streams is important to identifying and managing aquatic habitats.

Residents of the Marengo River Watershed rely on private wells for their drinking water needs. There are no municipal water systems currently within the watershed (UW-Extension and USGS 2008). Areas associated with clay surficial deposits in the northern third of the watershed tend to have low susceptibility to groundwater contamination, while areas in the southern two thirds (associated with sand and sand/gravel surficial deposits) tend to have higher susceptibility to groundwater contamination (Figure 2.30).

The UW-Extension Center for Land Use Education and the USGS Wisconsin Water Science Center have compiled extensive information about groundwater resources in Wisconsin through an online resource titled: Protecting Wisconsin's Groundwater through Comprehensive Planning (UW-Extension and USGS 2008, http://wi.water.usgs.gov/gwcomp/)**.** The resource provides information specific to each county and is intended to provide local communities information and suggestions on how to incorporate groundwater protection into their comprehensive planning processes. Some relevant points from the report include:

- 100% of 103 private well samples collected in Bayfield County and 56 in Ashland County from 1990-2006 met the health-based drinking water limit for nitrate-nitrogen.
- A 2002 study estimated that 25% of private drinking water wells in the region of Wisconsin that includes Bayfield County and 12% in the region that includes Ashland County contained a detectable level of an herbicide or herbicide metabolite. Pesticides occur in groundwater more commonly in agricultural regions, but can occur anywhere pesticides are stored or applied (Vanden Brook *et al.* 2002).
- Neither Ashland nor Bayfield County has adopted an animal waste management ordinance, generally designed to protect surface and groundwater resources.

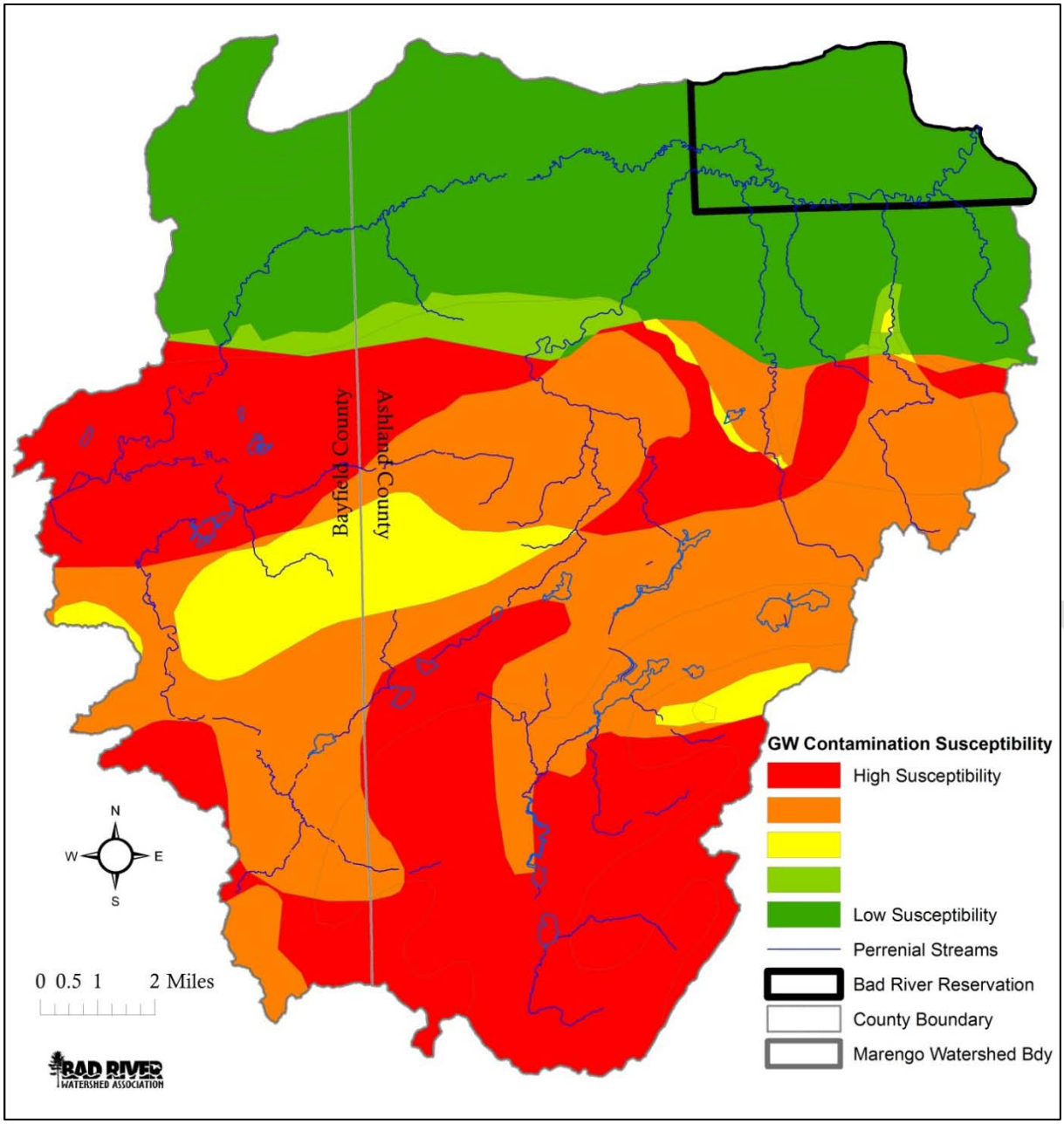


Figure 2.30. Groundwater contamination susceptibility in the Marengo River Watershed. Low scores represent areas that are more susceptible to contamination, and high scores represent areas that are less susceptible (Data source: WDNR *Surface Water Data Viewer,* retrieved on 11/17/10 *metadata: ftp://dnrftp01.wi.gov/geodata/gcsm/GCSM_data.pdf).*

2.9.1 CONTAMINATED SITES

WDNR's Remediation and Redevelopment (RR) Program oversees the investigation and cleanup of environmental contamination and the redevelopment of contaminated properties. The RR Program provides information about contaminated properties and other activities related to

the investigation and cleanup of contaminated soil or groundwater in Wisconsin through its Bureau for Remediation and Redevelopment Tracking System (BRRTS) database (WDNR 2010e).

The database lists one leaking underground storage tank (LUST) site in the Marengo River Watershed that is classified as "open," meaning "contamination has affected soil, groundwater, or more and the environmental investigation and cleanup need to begin or are underway." The other six sites are classified as "closed," meaning "contamination has affected soil, groundwater or more but the environmental cleanup has been completed and approved" (Figure 2.31).

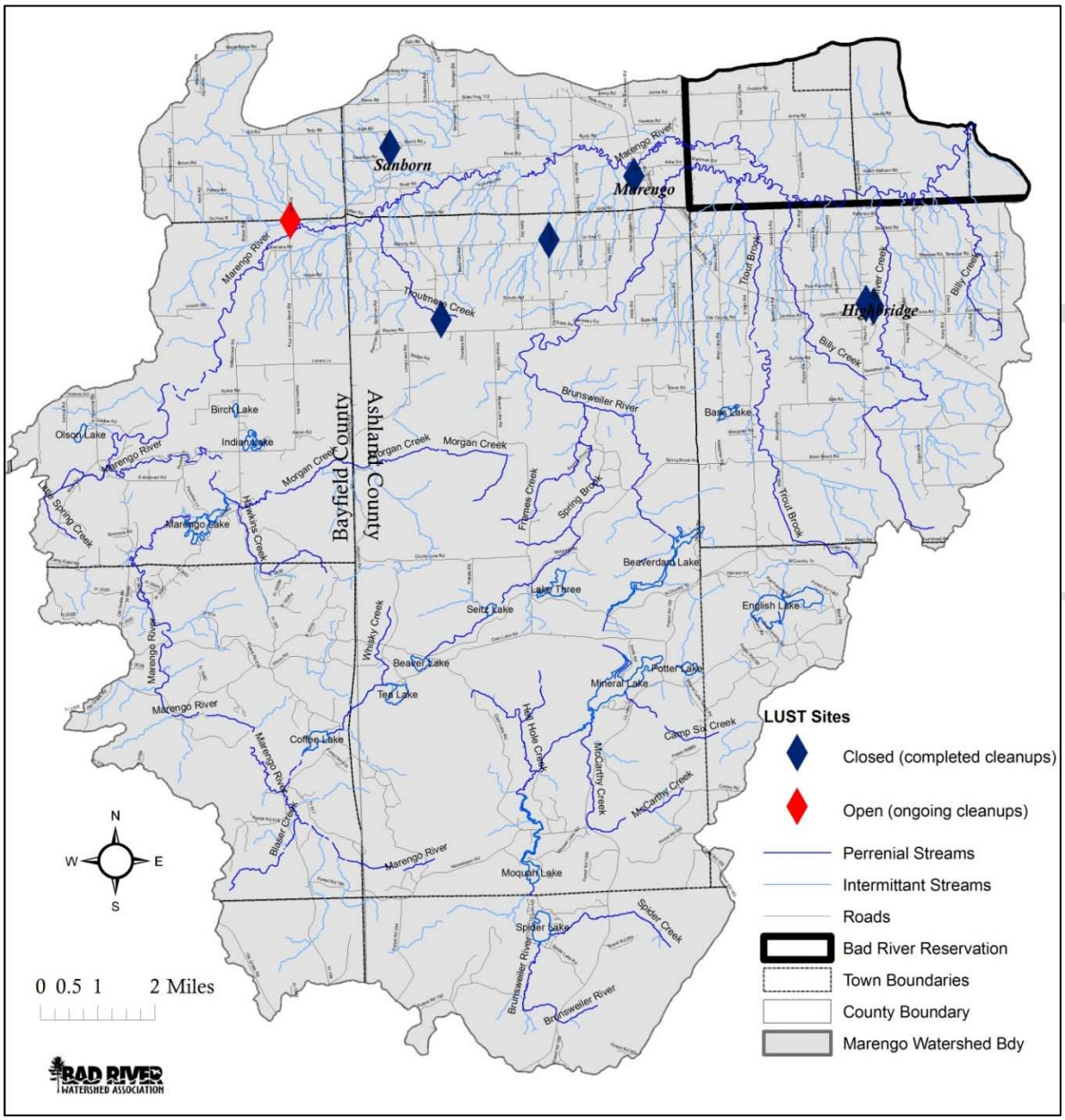


Figure 2.31. Location of contaminated (open) and previously contaminated (closed) sites in the Marengo River Watershed. These sites are all classified as "Leaking Underground Storage Tank" (LUST) sites. Data Source: WDNR Remediation and Redevelopment online sites map, retrieved on 11/17/10.

2.10 INVASIVE SPECIES

Invasive non-native plants and animals can have devastating impacts on native plant communities, fish and wildlife habitat and populations, agricultural yields, recreational and subsistence opportunities, and ultimately, local economies.

Chapter NR 40 is Wisconsin's Invasive Species Identification, Classification and Control Rule, which became effective on 9/1/09. The rule classifies invasive species into 2 categories: "Prohibited" and "Restricted". With certain exceptions, the transport, possession, transfer and introduction of Prohibited species is banned. Restricted species are also subject to a ban on transport, transfer and introduction, but possession is allowed, with the exception of fish and crayfish (WDNR 2010g).

Invasive species data in the Marengo River Watershed is sporadic and mostly available for terrestrial plant species along roadways. Currently, the Great Lakes Indian Fish & Wildlife Commission (GLIFWC) maintains an online database of invasive species (www.glifwc-maps.org), including those within the Marengo River Watershed. In the future, these data will be uploaded onto the Global Invasive Species Information Network (GISIN) website, www.gisin.org, where the information will be publicly accessible and searchable. Until the data are transferred, the GLIFWC website is the most useful for searching known infestations within the Marengo River Watershed.

Currently (as of July 2010), there are no known infestations of prohibited or restricted (Chapter NR 40) fish, algae or aquatic invertebrates invasive species within the Marengo River Watershed. Restricted aquatic species that have been documented within five miles of the watershed include the Chinese Mystery Snail (*Cipangopaludina chinensis*) and Ruffe (*Gymnocephalus cernuus*).

Table 2.6 lists known infestations (as of July 2010) of restricted terrestrial and wetland invasive plant species (Chapter NR 40) within a five mile radius of the Marengo River Watershed. There are currently no known infestations of prohibited species. A full list of known invasive species infestations (including species not listed as prohibited or restricted in Chapter NR 40) in the Marengo River Watershed is in Appendix B.

Even though invasive species survey data are limited, the Marengo River Watershed has generally not seen the level of infestation by terrestrial and aquatic invasive species as more populated areas of the Great Lakes region. Thus, focusing on prevention, education, and identification and treatment of new infestations can limit the effects of invasive species on native plant and animal communities and maintain high quality natural areas and productive forests and farms.

Table 2.6. Restricted (Wisconsin Administrative Code Chapter NR40) terrestrial and wetland invasive plant species documented within a five-mile radius of the Marengo River Watershed. Data source: Great Lakes Indian Fish and Wildlife Commission, retrieved 7/6/10.		
GENUS	**SPECIES**	**COMMON NAME**
Lonicera	*X bella*	Bell's honeysuckle
Cirsium	*arvense*	Canada thistle
Rhamnus	*cathartica*	common buckthorn
Tanacetum	*vulgare*	common tansy
Hesperis	*matronalis*	dame's rocket
Alliaria	*petiolata*	garlic mustard
Frangula	*alnus*	glossy buckthorn
Euphorbia	*esula*	leafy spurge
Lonicera	*morrowii*	Morrow's honeysuckle
Typha	*angustifolia*	narrow-leaved cattail
Lythrum	*salicaria*	purple loosestrife
Centaurea	*biebersteinii*	spotted knapweed
Pastinaca	*sativa*	wild parsnip

Currently, invasive species survey and management activities are coordinated in a four county area that includes the Marengo River Watershed (Ashland, Bayfield, Douglas, and Iron Counties) through the Northwoods Cooperative Weed Management Area (NCWMA, http://www.northwoodscwma.org/). Some of the activities the NCWMA has engaged in within the Marengo River Watershed include:

- Municipal officials and employees trained regarding invasive species best management practices (Ashland Co, Bayfield Co, Town of Lincoln).
- Limited surveys along roadsides.
- Limited treatment of isolated infestations.
- Introduction of biological control agents for purple loosestrife.

2.11 THREATENED AND ENDANGERED RESOURCES

2.11.1 WISCONSIN'S WILDLIFE ACTION PLAN

Also known as the comprehensive Wildlife Conservation Plan, plan is the result of a statewide effort to identify which native Wisconsin species are of greatest conservation need. The Action Plan presents priority conservation actions to protect the species and their habitats (WDNR 2010h).

Species of Greatest Conservation Need have low and/or declining populations that are in need of conservation action (WDNR 2010h). They include various birds, fish, mammals, reptiles, amphibians, and invertebrates (e.g. dragonflies, butterflies, and freshwater mussels) that are:

- Already listed as threatened or endangered;
- At risk because of threats to their life history needs or their habitats;
- Stable in number in Wisconsin, but declining in adjacent states or nationally.
- Of unknown status in Wisconsin and suspected to be vulnerable.

The Marengo River Watershed contains two Ecological Landscapes (see Chapter 2.2.1). Species of Greatest Conservation Need, management opportunities for natural communities, and more general management opportunities for each Ecological Landscape are available on WDNR's website (http://dnr.wi.gov/landscapes/index.asp).

WDNR's Natural Heritage Inventory Database indicates that the following water-dependent endangered, threatened or special concern species and/or communities have been sighted in the Marengo River Watershed within the last 20 years (Table 2.7).

Table 2.7. Known rare macroinvertebrate species present in the Marengo River Watershed (Epstein *et. al* 1997).

Common Name	Latin Name	Habitat
Ephemeroptera; Family Ephemerellidae	*Drunella cornutella*	Trout Brook
Odonata; Family Gomphidae	*Ophiogomphus carolus*	Brunsweiler River, Hawkins Creek, Marengo River

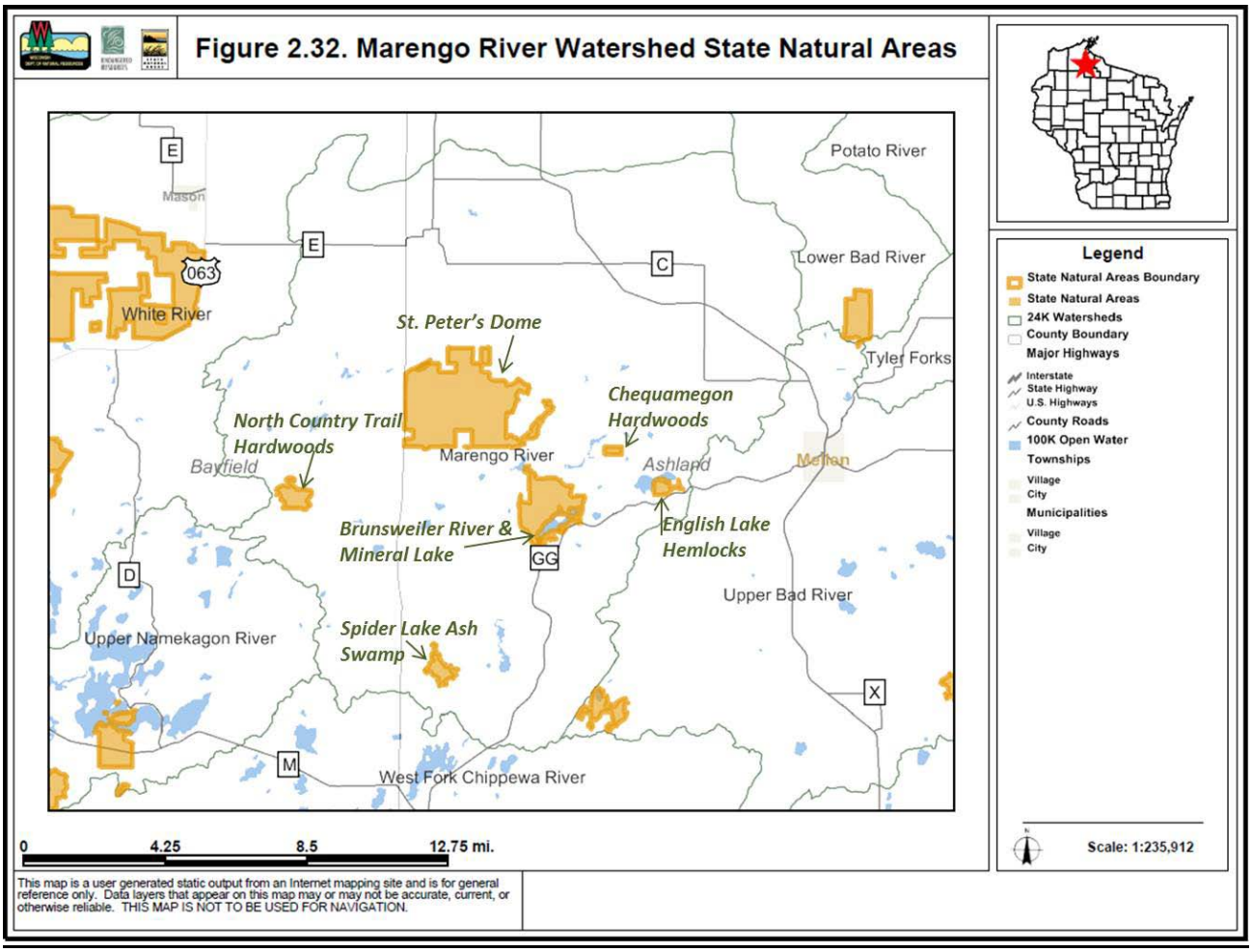
2.11.2 STATE NATURAL AREAS

Wisconsin's State Natural Areas (SNAs) protect outstanding examples of native natural communities, significant geological formations, and archaeological sites. They harbor natural features essentially unaltered by human-caused disturbances or that have substantially recovered from disturbance over time. SNAs also provide the last refuges in Wisconsin for rare plants and animals (WDNR 2010i).

The following State Natural Areas are designated within the Marengo River Watershed (Figure 2.32). All are located in the Chequamegon-Nicolet National Forest:

- St. Peter's Dome - A unique geologic feature in an exposed granite dome with shaded cliffs, deep stream gorges, older hemlock forest and several rare plant species.

- Brunsweiler River and Mineral Lake - Features a scenic, rocky river gorge incised in an upland of Keweenawan granite bedrock, and several high quality old growth hemlock-hardwood stands embedded in a large tract of maturing northern mesic hardwoods that includes some of the largest yellow birch on the forest.
- North Country Trail Hardwoods - Includes good examples of most of the major community types known from the Penokee/Gogebic Iron Range Landtype. In particular, there are several significant pockets of older sugar maple-basswood forest with a rich, mesic understory.
- Spider Lake Ash Swamp - A high quality stand of swamp hardwoods dominated by black ash of various age and size classes with canopy associates of red maple, paper birch, white cedar, and white spruce.
- Chequamegon Hardwoods - An old second-growth northern mesic hardwood forest with an undisturbed understory.
- English Lake Hemlocks - Contains an excellent example of upland and swamp hemlock and white cedar forest with an intact gradient from upland to lowland.
-



2.12 RECREATION

Recreation opportunities are abundant within the Marengo River Watershed. Fishing, hunting, hiking, ATV riding, snowmobiling, skiing, boating (motorized and canoeing/kayaking), biking, and bird watching are some examples of popular recreation activities enjoyed by watershed residents and visitors. Clean water, clean air, scenic beauty, and abundant fish and wildlife resources draw people to the area and provide economic opportunity to local businesses.

While recreation provides opportunities for residents and visitors to enjoy watershed resources, it can also lead to conflicts between user groups (such as motorized and non-motorized trail users) and cause damage to the resources people come to the watershed to enjoy (air and water pollution from motorboats, invasive species transported by all trail users, damage to wetlands and vegetation primarily from motorized recreation). In addition, trail networks often cross streams and the same erosion, sedimentation, and fish passage issues that occur with the road network can occur on trails.

Major concerns related to recreation in the Marengo River Watershed include: providing opportunities for access to watershed resources for all user groups, resolving conflicts between user groups (such as: motorized and non-motorized uses, management of habitat for game species and non-game species), aquatic and terrestrial invasive species transport from recreational activities, and trail/stream interactions that may cause erosion, sedimentation, and fish passage issues.

2.13 WATER QUALITY

The federal Clean Water Act (CWA) requires that states and federally recognized Indian tribes adopt water quality standards to protect waters from pollution. These standards set the water quality goals for a lake, river, or stream by stating the maximum amount of a pollutant that can be found in the water while still allowing it to be used for fishing, swimming, and allowing aquatic organisms and wildlife to thrive.

2.13.1 BAD RIVER TRIBE WATER QUALITY STANDARDS

Bad River was granted Treatment as a State status by the United States Environmental Protection Agency in 2008.

2.13.2 STATE OF WISCONSIN WATER QUALITY STANDARDS

(Taken from Wisconsin's 2010 Water Quality Report to Congress, *WDNR* 2010f*)*

Wisconsin Statutes provide WDNR with the authority to regulate and manage how waters are used to ensure the protection of water quality and the general public interest in Wisconsin's waters. Water Quality Standards define the goals for a waterbody by designating its uses, setting criteria to protect those uses, and establishing provisions to protect water quality from pollutants. A water quality standard consists of three basic elements:

- Designated uses of the water (e.g., fish and aquatic life, recreation, fish consumption, see below),

- Water quality criteria to protect designated uses (numeric pollutant concentrations and narrative requirements, described in Chapters NR 102-105 (Wis. Adm. Code), and
- An antidegradation policy to maintain and protect existing uses and high quality waters.

Water quality standards for surface waters are described in Chapters NR 102, 104, and 105 of the Wisconsin Administrative Code. These rules include general policies and detailed provisions describing implementation issues such as mixing zone provisions, variances, etc.

In Wisconsin, waterbodies fall into the following designated uses:

- **Fish and Aquatic Life:** All surface waters are considered appropriate for the protection of fish and other aquatic life. Surface waters vary naturally with respect to factors like temperature, flow, habitat, and water chemistry. This variation allows different types of fish and aquatic life communities to be supported. Currently, Wisconsin recognizes five subcategories of Fish and Aquatic Life Use Designations; these are described in detail in Table 11 in Section C2 of this report.
- **Recreational Use:** All surface waters are considered appropriate for recreational use unless a sanitary survey has been completed to show that humans are unlikely to participate in activities requiring full body immersion.
- **Public Health and Welfare:** All surface waters are considered appropriate to protect for incidental contact and ingestion by humans. All waters of the Great Lakes as well as a small number of inland water bodies are also identified as public water supplies and have associated water quality criteria to account for human consumption. *Fish Consumption Use* also falls under this category.
- **Wildlife:** All surface waters are considered appropriate for the protection of wildlife that relies directly on the water to exist or rely on it to provide food for existence. The Fish and Aquatic Life (FAL) use is further divided into several subcategories for Streams/Rivers and Lakes. Updates to the Streams/Rivers subcategories are being considered by WDNR.

In exercising this statutory authority, WDNR establishes water quality standards for individual surface waters based on the potential or attainable uses of the water. This mandate also clearly applies to all waters of the State whether they are natural or artificially created. In addition to state statutory requirements, WDNR is required by the Federal Clean Water Act (PL92-500) to "provide, wherever attainable, water quality for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water." Wisconsin has interpreted the wherever attainable clause to mean that all surface waters in the State shall meet the water quality standards associated with the proposed Diverse Fish and Aquatic Life (DFAL) use sub-category.

In practice, this means that all surface waters are designated DFAL until an evaluation of the surface water shows that either:

- A DFAL use is not attainable due to natural limitations that prevent the water from supporting a DFAL community, or
- The water segment is capable of supporting a Coldwater community, or
- Irreversible conditions exist in a water segment that prevents the DFAL use from being attained.

Assessing Wisconsin's Waterbodies

Wisconsin recently updated its methodology to conduct general and specific assessments for determining the attainment of designated uses. Wisconsin's Consolidated Assessment and Listing Methodology (WisCALM) provides guidance for conducting general and impaired water determinations and lists the assessment thresholds used to make these determinations (WDNR 2009).

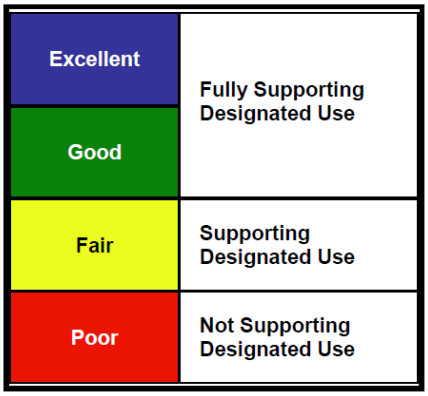


Figure 2.33. WDNR's General Water Condition Continuum.

The first level of evaluation is a *General Condition Assessment* that determine whether a waterbody is in Excellent, Good, Fair, or Poor condition (Figure 2.33). The second level of evaluation is an *Impairment Assessment*, to determine whether a waterbody should be included on the 303(d) Impaired Waters List. Additionally, waters in *Excellent* condition may be eligible for Outstanding or Exceptional Resource Water status.

Assessment thresholds are used to make determinations when placing waters on the Impaired Waters List. These thresholds are based on numeric water quality criteria included in Chapters NR 102-105 (Wis. Adm. Code), WDNR technical documents, and federal guidance. In some cases, qualitative thresholds based upon narrative standards may be used to make assessment decisions. In those cases, a thoroughly documented analysis of the contextual information should be used in conjunction with professional judgment to collectively support a decision.

Further details on assessing designated uses are available in the WisCALM document (WDNR 2009). Current designated uses and assessments identified for surface waters in the Marengo River Watershed are described below.

2.13.3 OUTSTANDING AND EXCEPTIONAL RESOURCE WATERS

Wisconsin has designated many of the state's highest quality waters as Outstanding Resource Waters (ORWs) or Exceptional Resource Waters (ERWs). Waters designated as ORW or ERW are surface waters which provide outstanding recreational opportunities, support valuable fisheries and wildlife habitat, have good water quality, and are not significantly impacted by human activities. ORW and ERW status identifies waters that the State of Wisconsin has determined warrant additional protection from the effects of pollution. These designations are intended to meet federal Clean Water Act obligations requiring Wisconsin to adopt an "antidegradation" policy that is designed to prevent any lowering of water quality – especially in those waters having significant ecological or cultural value.

The Marengo River Watershed contains 62.31 miles of waters defined as Outstanding Resource Waters and 27.02 miles defined as Exceptional Resource Waters (Figure 2.34, Table 2.8).

Table 2.8. Streams classified as Outstanding or Exceptional Resource Waters (ORW, ERW) in the Marengo River Watershed by the Wisconsin Department of Natural Resources. Data source: WDNR Public GIS FTP site: ftp://dnrftp01.wi.gov/geodata/**, retrieved on 9/24/10.**

Stream Name	ORW miles	ERW miles
Marengo River	40.77	
Brunsweiler River	21.54	
Hawkins Creek		3.64
Marengo River Trib (S20)		1.35
Marengo River Trib (S9)		3.65
Spring Brook		8.0
Troutmere Creek		3.0
Unnamed Trib To Marengo River T44n R5w S16 (Nwne)		2.0
Unnamed Trib To Marengo River T44n R5w S9		1.58
Unnamed Trib To Whisky Creek T44n R5w S13		2.26
Unnamed Trib. To Marengo River T44n R5w S15		1.54
Total for the Marengo River Watershed	**62.31**	**27.02**

Source: Wisconsin Department of Natural Resources

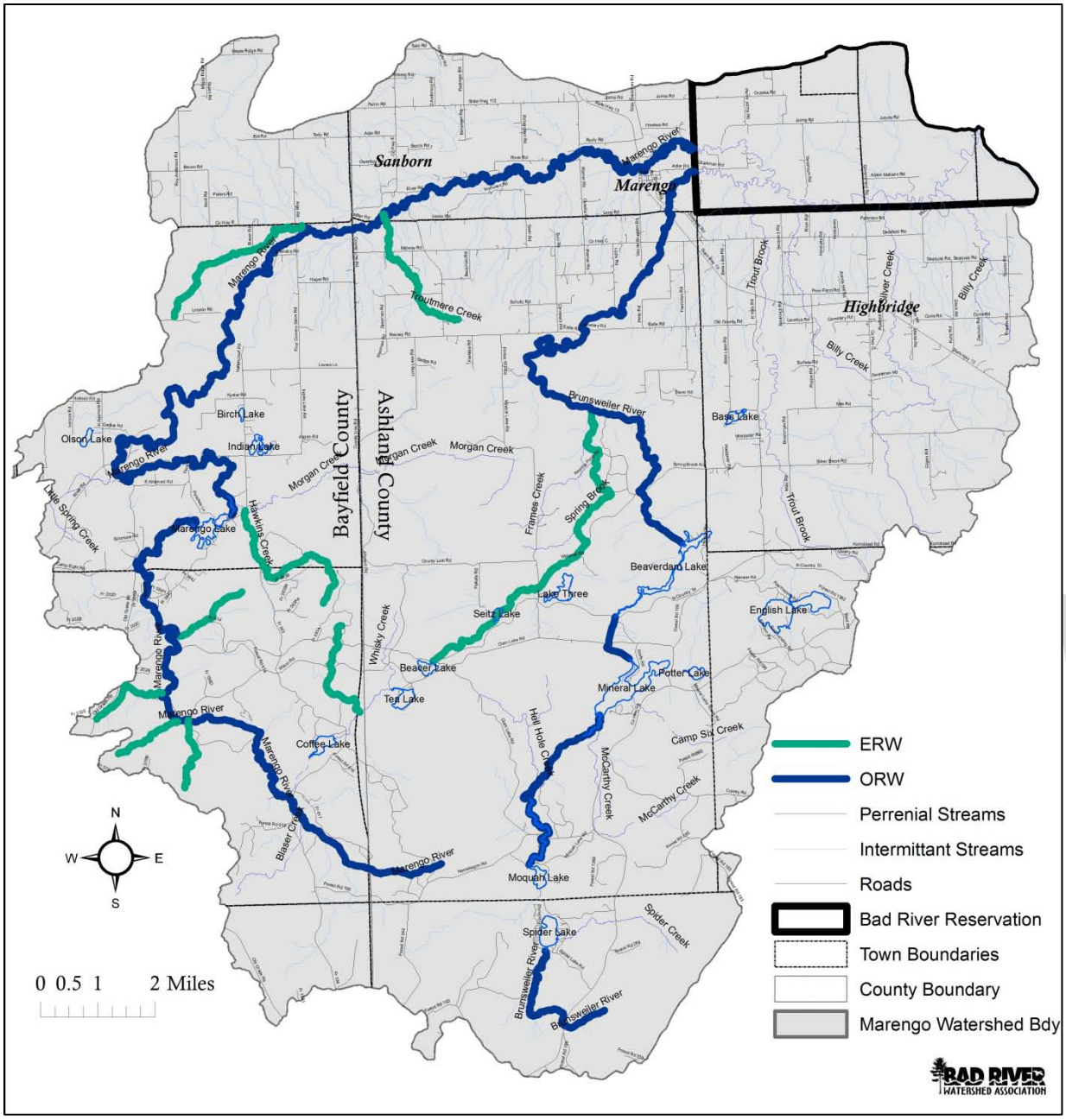


Figure 2.34. Streams classified as Outstanding or Exceptional Resource Waters (ORW, ERW) waters in the Marengo River Watershed. Data source: WDNR GIS FTP: ftp://dnrftp01.wi.gov/geodata/, retrieved on 9/24/10.

2.13.4 TROUT STREAMS

The Marengo River Watershed contains a total of 134.7 miles of WDNR designated trout waters*, (Table 2.9, Figure 2.35).

***Trout Stream Classification (State of Wisconsin)**

Class I: Highest quality trout waters. No stocking needed to maintain populations.
Class II: Some natural reproduction, but stocking is needed to maintain a desirable sport fishery.
Class III: No natural reproduction. Populations maintained by stocking.

Brook Trout
Salvelinus fontinalis

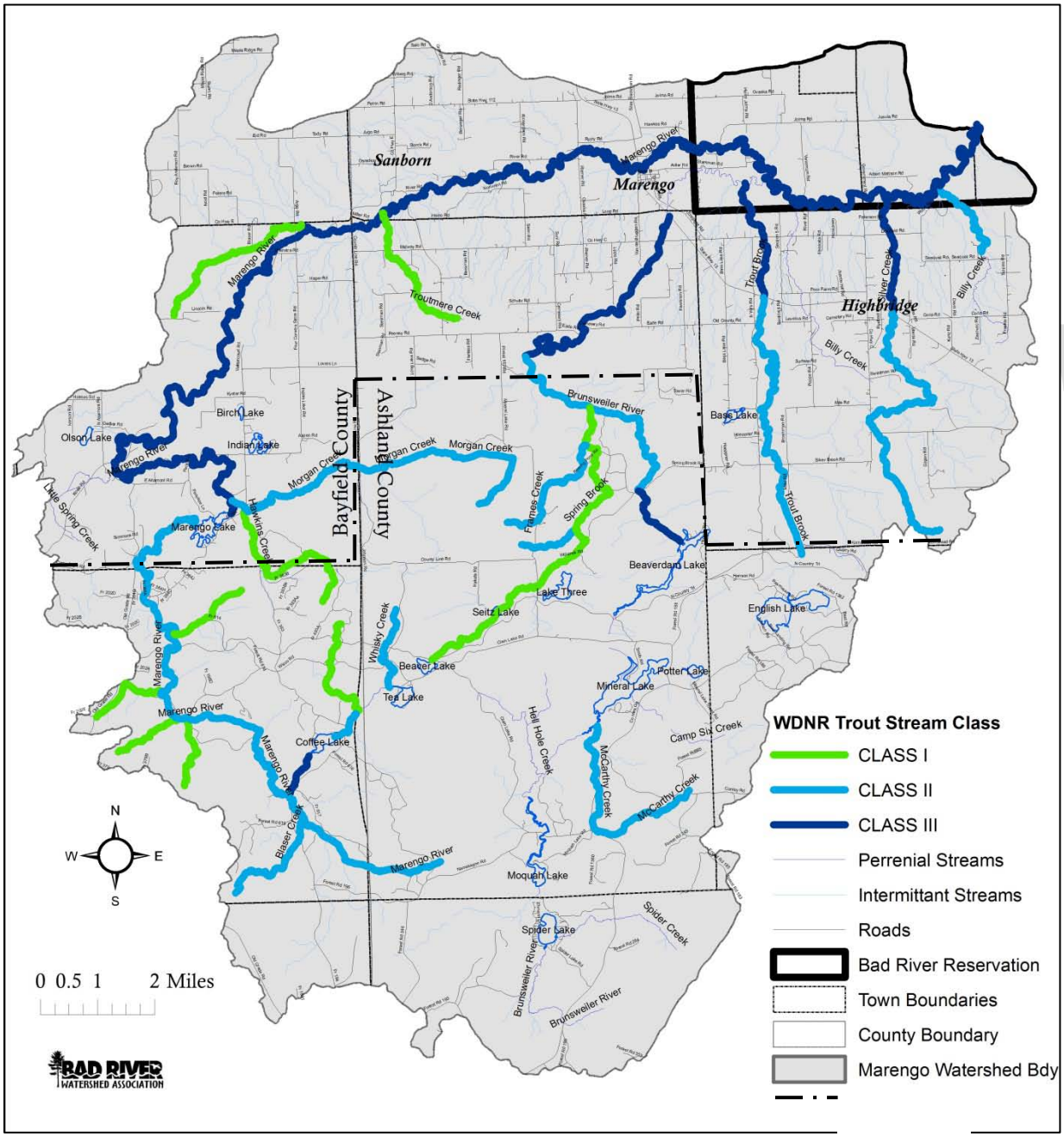


Figure 2.35. Streams classified as Trout Water in the Marengo River Watershed by Department of Natural Resources. Data source: WDNR 2002 Blue Book of Trout St

Table 2.9. Streams classified as trout waters in the Marengo River Watershed by the Wisconsin Department of Natural Resources. Data source: WDNR 2002 Blue Book of Trout Streams.				
Stream Name	**Class I miles**	**Class II miles**	**Class III miles**	**Total miles**
Billy Creek		2.0		2.0
Blaser Creek		3.0		3.0
Brunsweiler River		4.47	6.7	11.17
Frames Creek		2.66		2.66
Hawkins Creek	3.64			3.64
Marengo River		14.0	38.51	52.51
Marengo River Trib (S20)	1.35			1.35
Marengo River Trib (S9)	3.65			3.65
McCarthy Creek		5.0		5.0
Morgan Creek		8.0		8.0
Silver Creek		7.01	2.43	9.44
Spring Brook	8.0			8.0
Trout Brook		6.16	3.25	9.41
Troutmere Creek	3.0			3.0
Unnamed Trib To Marengo River T44n R5w S16	2.0			2.0
Unnamed Trib To Marengo River T44n R5w S9	1.58			1.58
Unnamed Trib To Whisky Creek T44n R5w S13	2.26			2.26
Unnamed Trib. To Marengo River T44n R5w S15	1.54			1.54
Waboo Creek		1.16		1.16
Whiskey Creek		2.51	0.84	3.35
Total Marengo Watershed	**27.0**	**56.0**	**51.7**	**134.7**

Data Source: Wisconsin Department of Natural Resources 2002 Blue Book of Trout Streams.

2.13.5 STATE WILD RIVERS

The Wisconsin Legislature established the Wild Rivers Program in 1965. The intent of the program is to "preserve some rivers in a free flowing condition and to protect them from development." To protect these rivers, Chapter NR 302, Wis. Admin. Code (NR 302), places restrictions on certain activities and structures along Wild Rivers. The intent is to protect and preserve public rights features, including maintenance of a natural condition, scenic beauty and rights incident to navigation.

Martin Hanson, one of Wisconsin's most important environmental leaders of the last century, campaigned for the designation of the Brunsweiler River (a main tributary to the Marengo

River) as a State Wild River. Mr. Hanson passed away in 2008 and to honor both him and his contributions to conservation, a 10-mile segment of the Brunsweiler River was designated by the Wisconsin State Legislature as the “Martin Hanson Wild River” in the spring of 2009 (Figure 2.36). Mr. Hanson originally owned much of the land surrounding the river in the lower reaches of the Wild River segment. Through his donations, it is now public land. Further details on what the Martin Hanson Wild River designation means for this segment of the Brunsweiler River is available online at: http://basineducation.uwex.edu/lakesuperior/Brunsweiler.htm**.**

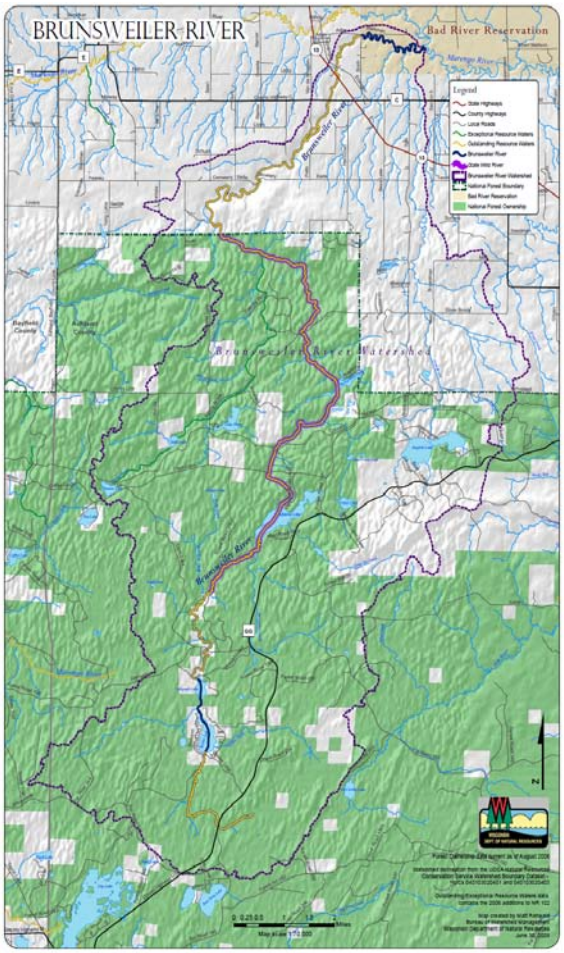


Figure 2.36. Map produced by the Wisconsin Department of Natural Resources displaying the segment of the Brunsweiler River designated as the Martin Hanson Wild River in 2009.

2.13.6 POINT SOURCES

Currently there are no regulated point-source discharges to water or air in the Marengo Watershed. There are four air permits issued in Mellen, just east of the watershed (Source: WDNR Surface Water Data Viewer).

2.13.7 IMPAIRED WATERS (303d)

A waterbody is polluted or "impaired" if it does not support full use by humans, wildlife, fish and other aquatic life and it is shown that one or more of the pollutant criteria are not met.

WDNR recently updated its list of impaired waters as part of its 2010 Water Quality Report to Congress (WDNR 2010f). There are currently four waterbodies listed as impaired within the Marengo River Watershed. All are listed for containing fish with mercury concentrations greater than state standards (Table 2.10).

Table 2.10. Waterbodies lists as impaired within the Marengo River Watershed.

Waterbody	Impairment
Mineral Lake	Mercury in fish tissue
English Lake	Mercury in fish tissue
Lake Three	Mercury in fish tissue
Beaver Lake	Mercury in fish tissue

In 2001, Wisconsin began to provide consumption advice on eating fish caught from all Wisconsin waters. More information of fish consumption advisories can be found on the WDNR website at: http://www.dnr.wi.gov/fish/consumption/.

2.13.8 DESIGNATED USES EVALUATION

The streams of the Marengo River Watershed are flashy, particularly in the soil transition and clay plain areas where more open land, agriculture and road drainage systems create conditions where surface water is rapidly transported to streams. Streams that appear clear most of the time will turn turbid during and following rain and snowmelt events. In addition, intermittent streams and drainages may only have flow in them during and following rain events, carrying surface runoff to the Marengo River and perennial tributaries.

These episodic runoff events play a major role in determining when sediment, nutrients, pathogens, and other materials are delivered to and transported in Marengo River Watershed streams, but these events are poorly understood. Pollutants from poorly managed livestock and/or human waste disposal can sit on the landscape or in stagnant drainages during dry times and then be flushed into streams during rain or snowmelt events. Water samples collected during dry times may miss the majority of these pollutants and sampling during runoff events can be difficult and costly. Existing sampling programs are generally set up to collect samples on a scheduled basis that may or may not coincide with runoff events. As a result, it is difficult to quantify potential beneficial use impairments without flow and event-based monitoring data. The following designated uses evaluation utilizes available water quality data compared to WDNR water quality criteria.

Fish and Aquatic Life

WDNR has identified five different types of stream classes based upon the water temperature and the capacity of the stream or river to support a diverse and healthy fish community (WDNR 2009). With 134.7 miles of trout water designated in the Marengo River Watershed, the two stream classes applicable to evaluating these streams are:

A. *Coldwater Community:* Streams capable of supporting a cold water sport fishery, or serving as a spawning area for salmonids and other cold water fish species. Representative aquatic life communities associated with these waters generally require cold temperatures and concentrations of dissolved oxygen that remain above 6 mg/L. Since these waters are capable of supporting natural reproduction, a minimum dissolved oxygen concentration of 7 mg/L is required during times of active spawning and support of early life stages of newly-hatched fish. This includes waters designated as Class I and II trout streams.

B. Warmwater Sport Fish Community: Streams capable of supporting a warm water-dependent sport fishery. Representative aquatic life communities associated with these waters generally require cool or warm temperatures and concentrations of dissolved oxygen that do not drop below 5 mg/L. This includes waters designated as Class III trout streams.

Outside of the Chequamegon-Nicolet National Forest, little recent data (<15 years) exists to evaluate the Fish and Aquatic Life designated use in Marengo River Watershed streams. In 2010, BRWA completed a "Baseline Monitoring Report" for three of its volunteer monitoring sites in the Marengo River Watershed (Figure 2.37) with at least four years of data (BRWA 2010a). The report includes a summary of dissolved oxygen data collected from the three sites (Figure 2.38). The river segments represented by these sites are all Class III trout streams, meaning they need to meet the dissolved oxygen criteria for a warmwater sport fish community. These data indicate the dissolved oxygen criteria for a warmwater sport fish community is currently being met at these sites.

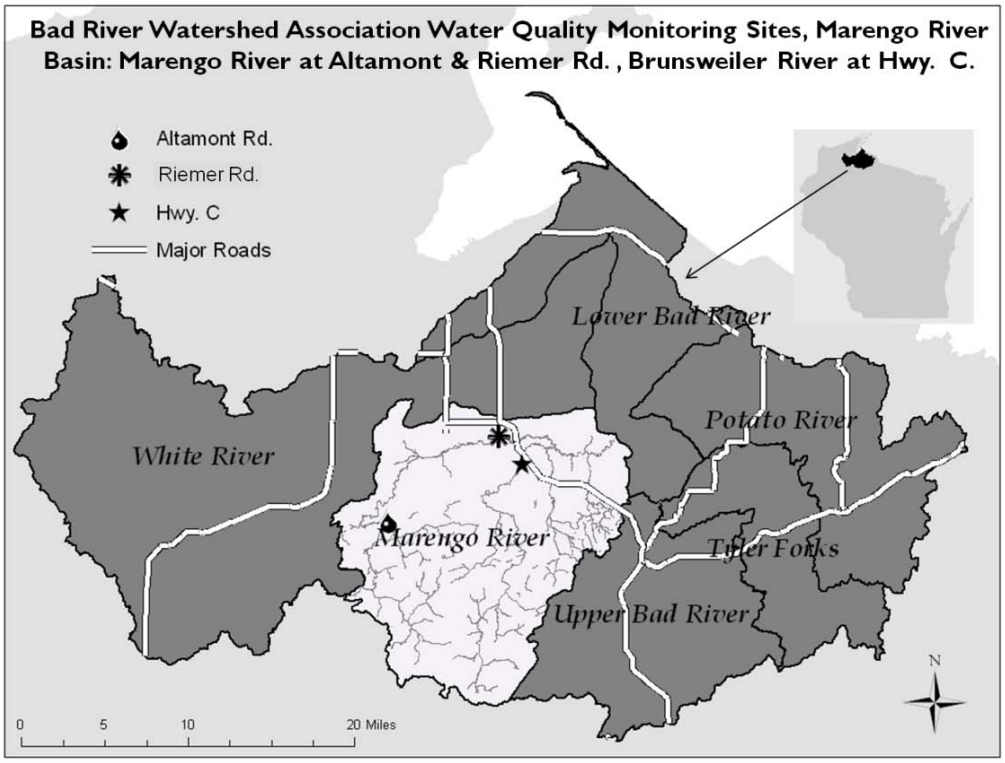


Figure 2.37. Bad River Watershed Association volunteer monitoring sites with at least four years of data, summarized in a Baseline Monitoring Report (BRWA 2010a).

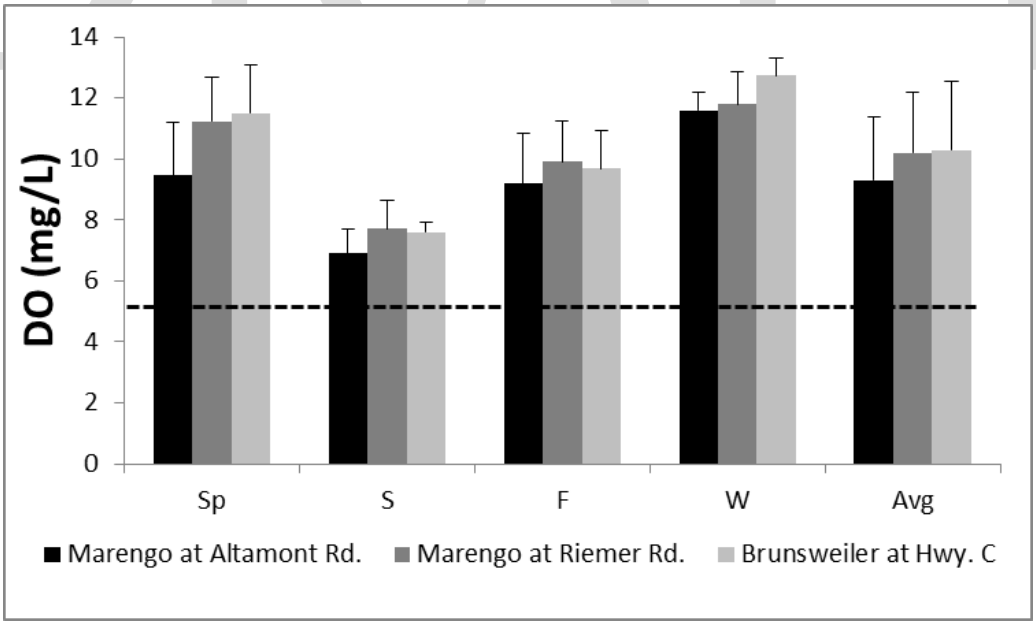


Figure 2.38. Seasonal and overall average DO concentrations at Marengo River Watershed sites monitored by Bad River Watershed Association volunteers (BRWA 2010a). Dashed bar indicates State of Wisconsin criteria for a warmwater sport fish community (5.0 mg/L).

In addition to dissolved oxygen data, BRWA volunteers collect macroinvertebrates from these same sites. Macroinvertebrates provide important long term information about water quality in a stream because they typically spend a large part of their lives in the water and differ in their tolerance to pollution. BRWA evaluates macroinvertebrates using the Hilsenhoff Family Biotic Index (FBI, Hilsenhoff 1988). In general, the lower the FBI score, the better the water quality at a site. FBI values for Marengo River Watershed sites indicate “Excellent” to “Very Good” water quality (Figure 2.39).

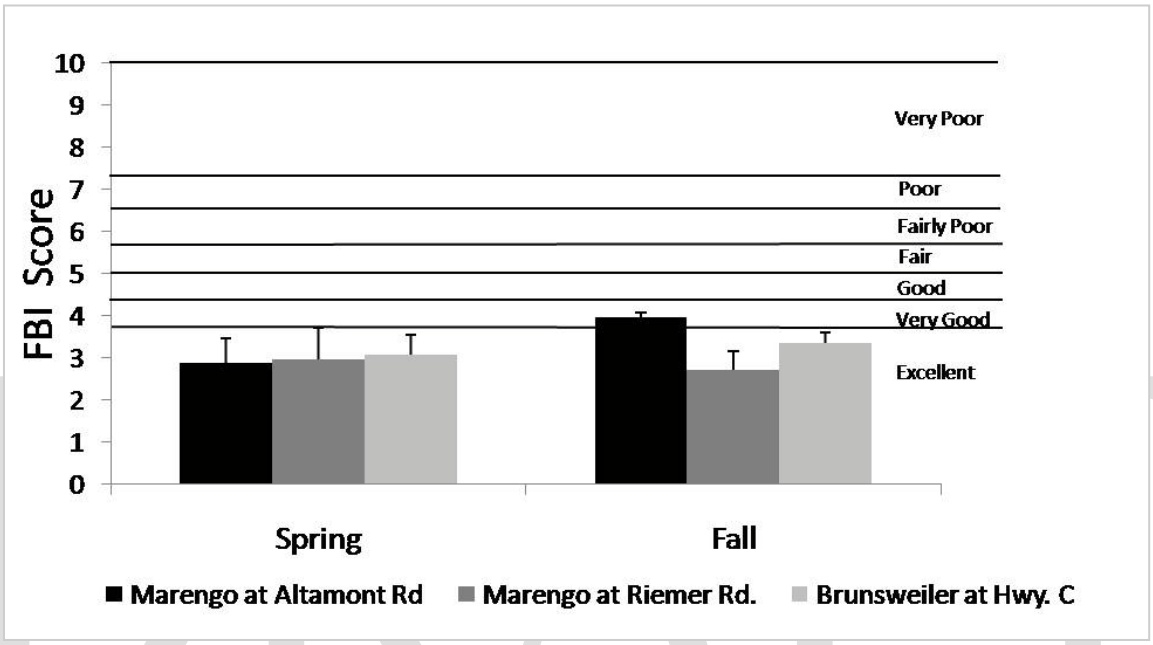


Figure 2.39. Average spring & fall FBI values at Altamont Rd. (total spring samples = 3, fall = 2), Riemer Rd. (total spring samples = 3, fall = 3) & Hwy. C (total spring samples = 3, fall = 3).

Good aquatic habitat assessment data exists for Marengo River Watershed streams within the boundary of the Chequamegon-Nicolet National Forest (CNNF) and for the main stem Marengo River and some of the larger tributaries north of the CNNF (Figure). The CNNF has identified warm and cold water streams, habitat issues affecting the streams, and has been implementing stream habitat improvement projects based on this information.

WDNR conducted a few, limited fisheries surveys of the main stem Marengo River and six tributaries in the 1960s. A coastal wetlands evaluation conducted by WDNR in 1995 and 1996 identified a number of species and habitats described in a comprehensive report, Wisconsin's Lake Superior Coastal Wetlands Evaluation / Including Other Selected Natural Features of the Lake Superior Basin (Epstein *et. al* 1997). The report describes macroinvertebrate collections and gives a general habitat assessment from each of the trout streams in the Marengo River Watershed listed in Table 2.40. The report also gives the following recommendations relevant to evaluating fish and aquatic habitat designated uses:

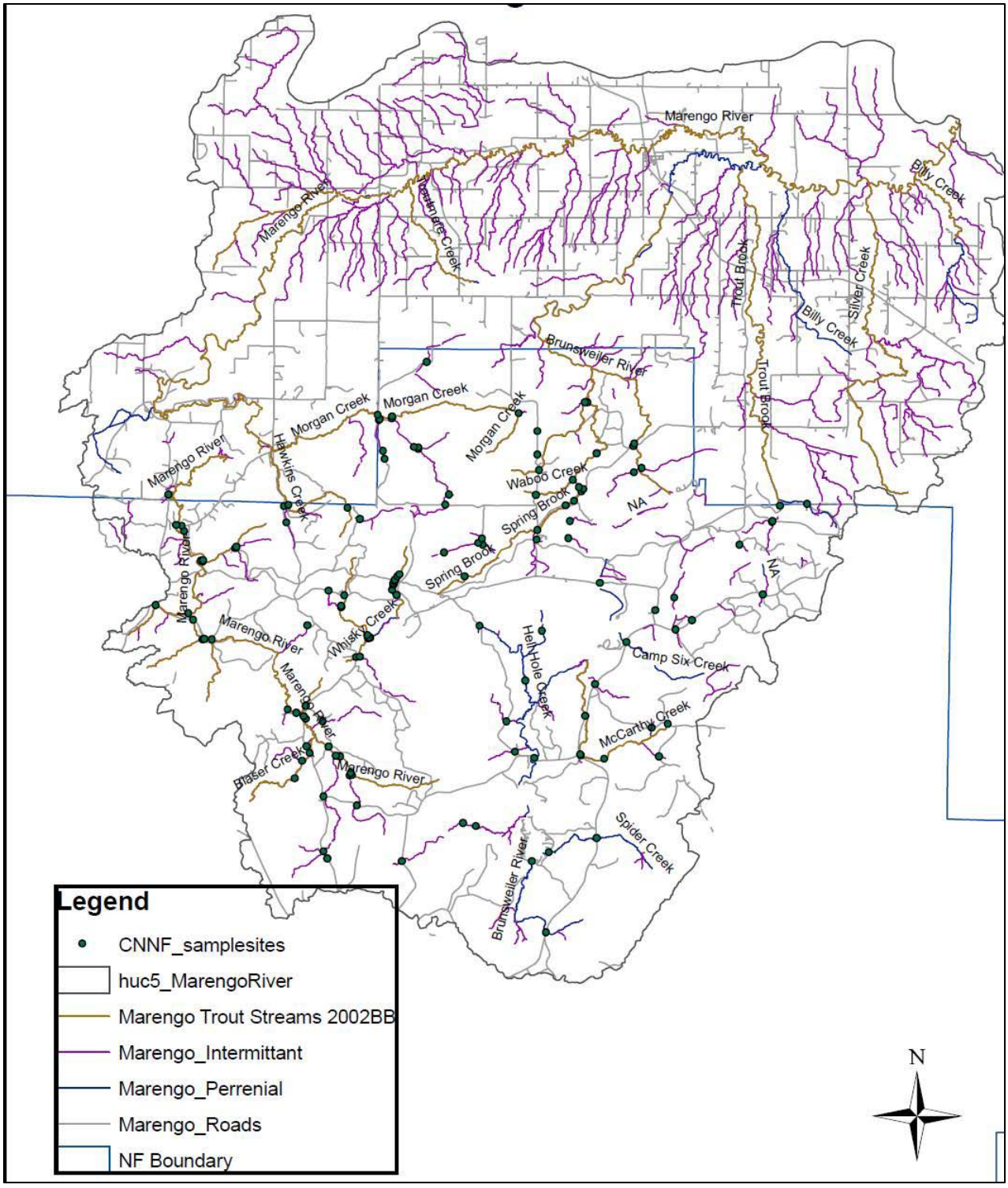


Figure 2.40. Marengo River Watershed fisheries and aquatic habitat sample sites, United States Forest Service (USFS). Courtesy of Sue Reinecke, USFS.

1. Regional basin management team staff should conduct a review of the effluent ditch to the Marengo River at Marengo to determine if untreated waste effluent poses a public health hazard or is having any effect on Marengo River water quality.
2. Regional fish management staff should evaluate whether opportunities exist for improving streambed and spawning habitat for trout by controlling bed loads and erosion to the Marengo and Brunsweiler Rivers.
3. Regional basin management team staff should assess water quality in the Marengo and Brunsweiler Rivers.
4. Regional basin management team staff should collect data on the Marengo and Brunsweiler Rivers to support ranking the watersheds for potential polluted runoff abatement projects.

Dissolved oxygen and temperature data are lacking from other designated trout streams north of the CNNF border. Recent (2008-2010) fisheries surveys conducted by BRWA and the United States Fish and Wildlife Service (USFWS) at sites on Trout Brook (Class III), Troutmere Creek (Class I), two unnamed tributaries to the Marengo River in T45N R5W S1 (no trout designation), one unnamed tributary to the Marengo River in T45N R4W S6 (no trout designation), and by WDNR on Silver Creek (Class III) confirm the presence of brook trout in these streams, and suggest these streams may be meeting or exceeding their fish and aquatic life designations and could be considered for future ORW/ERW designation (except Troutmere Creek, which is already an ERW).

Geomorphic assessment and stream bank erosion survey data described in Chapter 2.2.3 indicate evidence of sediment overload in the main stem of the Marengo River. The watershed is likely the largest contributor of sediment to the Bad River. Sediment is undoubtedly having an impact on habitat availability and habitat potential in the Marengo River Watershed, particularly in areas north of the CNNF. However, data to quantify the effects of excess sediment in the Marengo River Watershed on fish and aquatic life designated uses are limited. Wisconsin currently does not have criteria to directly evaluate sediment pollution to streams and rivers, instead using a macroinvertebrate Index of Biotic Integrity (M-IBI) developed by Weigel (2003). The M-IBI metric responds to the watershed scale impacts of agricultural and urban land uses, riparian habitat degradation, sedimentation problems, and scouring. Collecting the necessary M-IBI and other data needed to quantify the effects of sediment on fish and aquatic life is needed to complete a full evaluation of this designated use.

Overall, aquatic habitat and fisheries assessments and general understanding of available and potential aquatic habitat in the Marengo River Watershed has mostly been confined to areas within the CNNF and the larger streams north of the CNNF. Currently there is a very poor understanding of where perennial water is and what type of aquatic habitat exists or could exist within these streams. Because areas north of the CNNF lie along the soil transition zone, many seeps and springs exist that hold the potential for high quality, cold water aquatic systems. This area is also largely in private ownership and is within areas used for agriculture. A better understanding of aquatic habitat, particularly north of the CNNF, is needed to evaluate whether additional streams and stream segments deserve consideration for designation as ORW/ERW,

assessing whether streams that are currently designated as trout and/or ORW/ERW waters (Marengo River Trib (S20), Troutmere Creek, Trout Brook, Silver Creek, Billy Creek west and Billy Creek east) are meeting those uses, and to help guide management decisions (such as which culverts to target for restoration, which riparian areas to target for protection/restoration, etc.).

Recreational Use and Public Health and Welfare

The *Recreational Use* category applies to all surface waters and is considered appropriate for recreational use unless a sanitary survey has been completed to show that humans are unlikely to participate in activities requiring full body immersion. *Public Health and Welfare* applies to all surface waters and they are considered appropriate to protect for incidental contact and ingestion by human (WDNR 2009).

No sanitary survey information was found for the Marengo River Watershed and it is unlikely a recent survey has been conducted since there are no public water systems in the watershed. Therefore, it is assumed that humans are likely to participate in activities requiring incidental contact and full body immersion in the Marengo River Watershed.

The BRWA and Bad River tribe have collected *Escherichia coli* (*E. coli*) samples from streams and rivers in the Marengo River Watershed over the past several years to evaluate the potential health risk of contact with water through recreational activities. Both use the Coliscan EasyGel Method (Micrology Laboratories, Inc. 2010). USEPA currently recommends using *E. coli* data to evaluate the health risk from recreational water contact. For flowing rivers and streams, WDNR currently uses the membrane filter fecal coliform count to evaluate recreational use. The guidelines in Chapter NR 102.04(5) of the Wisconsin Administrative Code state that: *… the membrane filter fecal coliform count may not exceed 200 per 100 ml as a geometric mean based on not less than 5 samples per month, nor exceed 400 per 100 ml in more than 10% of all samples during any month.*

In the absence of membrane filter fecal coliform data for the Marengo River Watershed, *E. coli* data were evaluated using the criteria of 400 colony forming units per 100mL (CFU/mL).

General E. coli Monitoring

BRWA volunteers have collected 157 *E. coli* samples from Marengo River Watershed sites since 2007. Samples are generally collected once per month from May through October and during or following rain events. More frequent sampling (bi-weekly) occurred during May 2009 and from May-July 2010 at several locations as part of a class with Northland College. Table 2.11 shows a summary of results. Some general patterns emerge from the data (Figure 2.41):

- Sites in the lower watershed often have *E. coli* counts exceeding 400 CFU/100mL. These sites correspond to areas of agriculture land use and human population.
- Samples from sites draining areas with little or no agriculture land use and human population have low *E. coli* counts.

- *E. coli* counts in the lower watershed are highly variable and tend to increase when associated with runoff events.
- Site specific evaluations reveal the source or potential source of high *E. coli* counts to the lower main stem of the Marengo River associated with runoff events.

Table 2.11. Summary of BRWA *E. coli* data collected from Marengo River Watershed sites. Average and standard deviation is given for samples collected associated with runoff events and non-runoff events. A ratio of the total number of samples collected at each site and the total number of samples that exceeded the WDNR criteria for fecal coliform bacteria (400 CFU/100mL) is also given.

River	Site	Avg Runoff Event	St Dev Runoff Event	# above standard /# total samples	Avg Non-Runoff Event	St Dev Non-Runoff Event	# above standard/ # total samples
Brunsweiler River	County Hwy C	35	35	0/2	15	21	0/2
Marengo Lake	Marengo Lake Cottages	0	0	0/0	20	28	0/2
Marengo River	Altamont Road	0	0	0/0	44	57	0/5
Marengo River	Four Corner Store Road	0	0	0/0	0	0	0/1
Marengo River	County Hwy C	0	0	0/0	20	0	0/1
Marengo River	Marengo River Road	0	0	0/0	80	0	0/1
Marengo River	Riemer Road	225	110	1/5	73	61	0/6
Marengo River	Hwy 13	0	0	0/0	60	28	0/2
Marengo River	Upstream livestock impact	323	360	1/4	38	27	0/8
Unnamed Marengo Trib	Upstream livestock impact	388	111	1/2	93	146	0/4
Unnamed Marengo Trib	Downstream livestock impact	2690	3312	4/5	1385	1521	2/4
Unnamed Marengo Trib	Upstream Village of Marengo	62	98	0/3	0	0	0/0
Unnamed Marengo Trib	Downstream Village of Marengo	1437	1761	2/5	55	7	0/2
Marengo River	Upstream of Trib Mouth	675	1120	2/7	20	20	0/3
Marengo River	Downstream of Trib Mouth	793	1220	1/3	20	28	0/2
Billy Creek	County Hwy C	1700	0	1/1	145	189	1/11
NC 1 Unnamed Trib	County Hwy C	0	0	0/0	147	137	1/11
NC2 Unnamed Trib	County Hwy C	933	0	1/1	101	84	0/10
NC3 Unnamed Trib	County Hwy C	0	0	0/0	181	97	0/8
NC4Unnamed Trib	County Hwy C	1375	0	1/1	419	421	4/10
Silver Creek	Delafield Road	1675	0	1/1	40	32	0/11
Trout Brook	County Hwy C	2050	0	1/1	92	76	0/10

"Background" Sites

Site assessment - Livestock

Site assessment - Village of Marengo

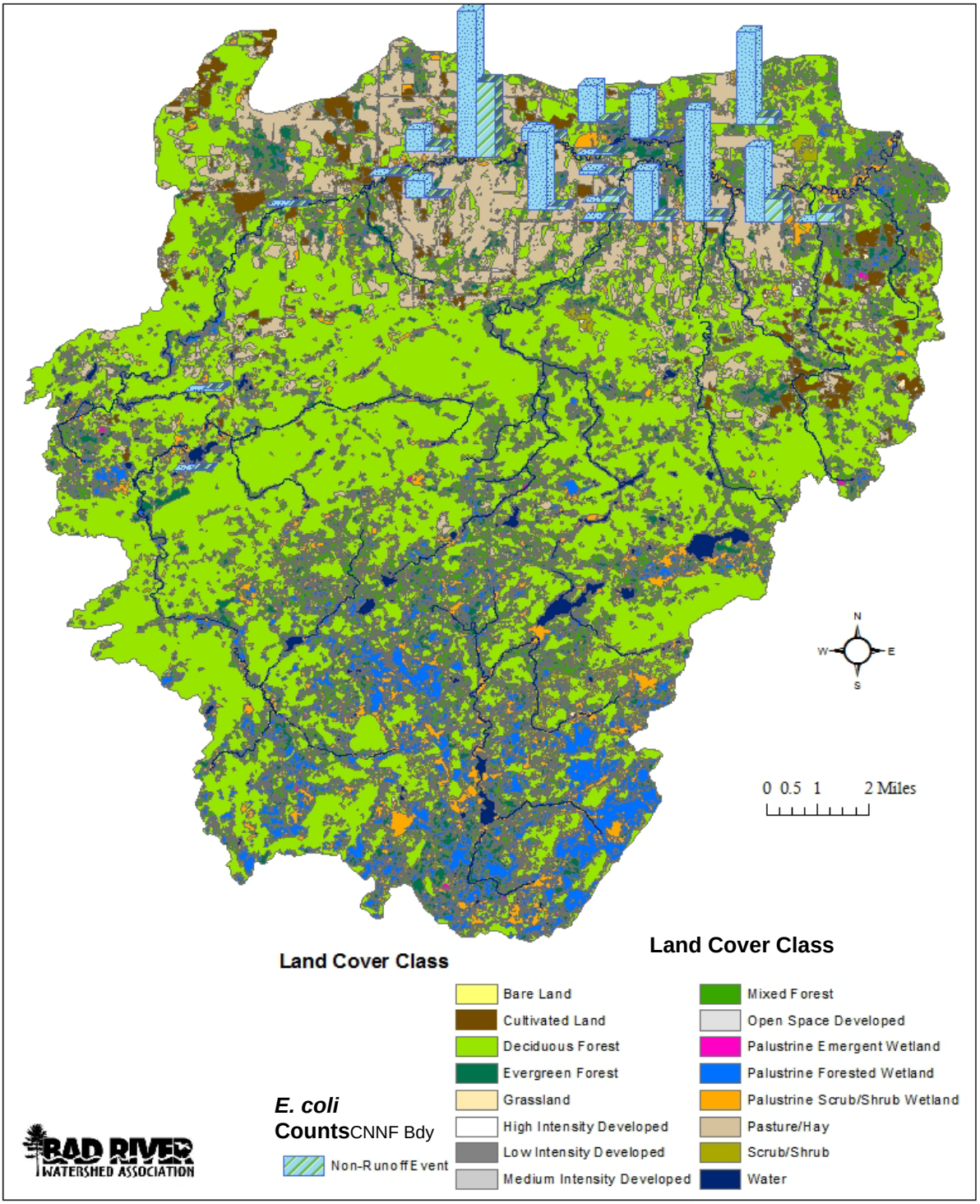


Figure 2.41. Land cover map of the Marengo River Watershed (NOAA 2010) and Bad River Watershed Association average E. coli counts (CFU/100mL) for sites in the Marengo River Watershed. Results are given for samples taken during or within 48 hours of a rain event and non-rain events. The size of the bars

In 2009 BRWA completed a watershed assessment of the Marengo River Watershed with the help of the Center for Watershed Protection (BRWA 2010b). Using the Unified Stream Assessment (USA, Kitchell and Schueler 2005) protocol for assessing stream health, BRWA and CWP assessed several sites that could be improved with implementation of best management practices or need further investigation to determine the source and cause of suspected impairments (Figure 2.42).

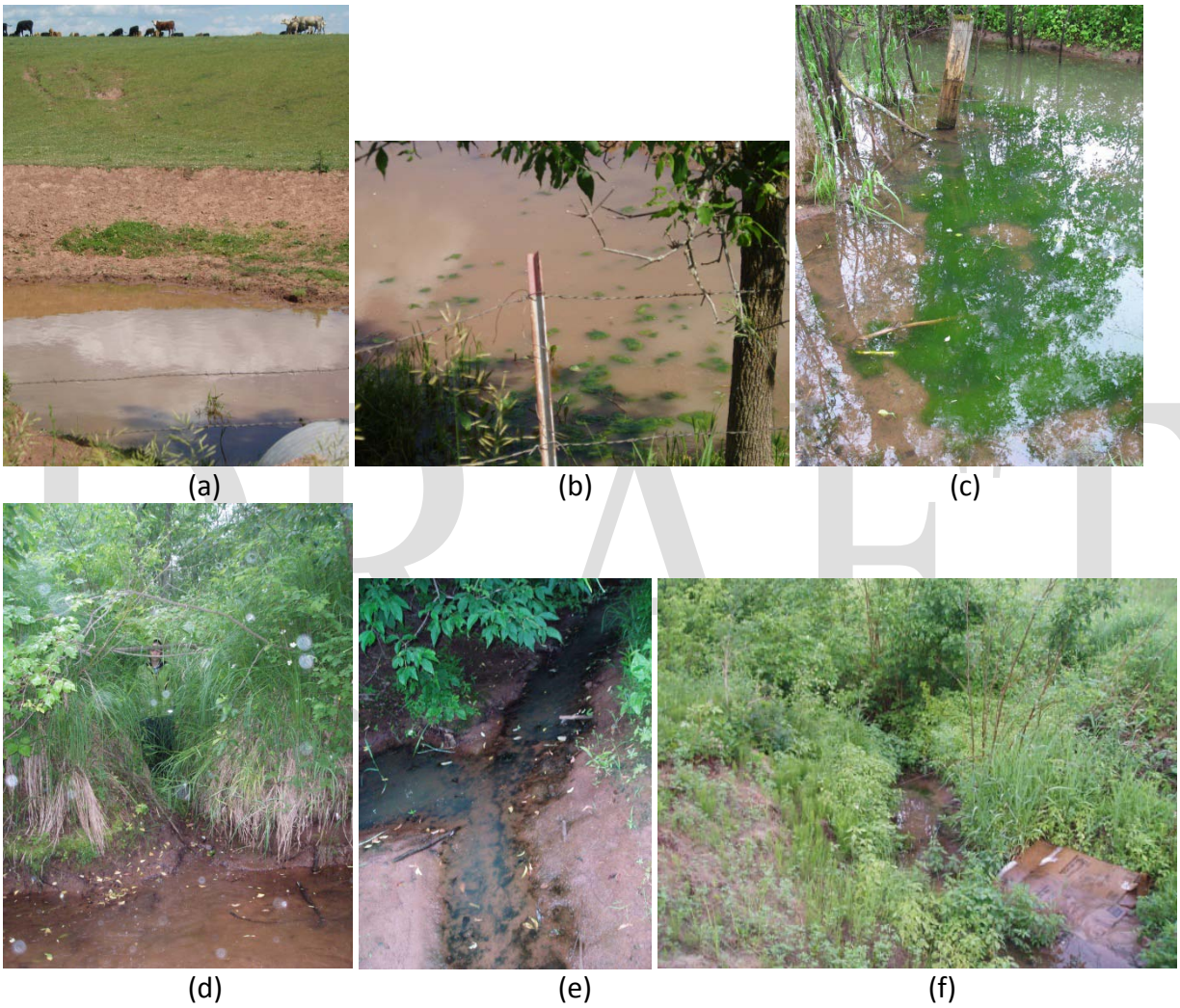


Figure 2.42. Marengo River Watershed sites evaluated by the Bad River Watershed Association and Center for Watershed Protection (BRWA 2010b) in 2009. (a & b) Cattle access contributes excess sediment and nutrients to the stream as evidenced by turbid water and excessive algae growth; (c) Excessive algal growth and stagnant turbid water behind a beaver dam indicate a potential illicit discharge or connection upstream; (d, e, f) Small tributary in the Village of Marengo with potential illicit discharge.

The site depicted in Figure 2.42 d, e, and f is the same location as the "effluent ditch" in recommendation #1 on page 74 (Epstein *et. al* 1997).

BRWA conducted follow-up volunteer monitoring for *E. coli* upstream and downstream of the two sites depicted in Figure 2.42 a, b and Figure 2.42 d, e, f in 2009 and 2010. Efforts were made to sample during or following rain events, along with sampling once per month from May through October.

Results from the site in Figure 2.42 a, b show six of the nine samples collected downstream of the site exceeded WDNR's guideline of 400 colony forming units (CFU) per 100 mL. Five of these samples were greater than 1000 CFU/mL and four of them were marked as "rain event" samples. *E. coli* counts were consistently greater from samples collected downstream of the impacted site (Table 2.11).

These results clearly show pasturing cattle in this tributary are contributing high *E. coli* counts to the tributary and to the Marengo River just downstream. Contributions are typically greatest associated with runoff events. Implementation of best management practices is needed at this site.

Results from the site in Figure 2.42 d, e, f show two of seven samples collected downstream from the Village of Marengo with *E. coli* counts greater than 400 CFU per 100mL. Both of these samples exceeded 3000 CFU per 100mL. All samples collected upstream of the Village of Marengo were below 400 CFU per 100 mL. Very high *E. coli* counts and reports of milky, turbid water in the tributary provide evidence that an illicit connection delivering septage may be present and human or animal contact with the water in the tributary may be a health hazard. Farm runoff is not a likely source of the *E. coli* here because of low *E. coli* counts found upstream of the village and the lack of pastured cattle or feedlots/barnyards in the vicinity of the tributary.

Identifying sources of the *E. coli* within the Village of Marengo and finding solutions to remediate them is a priority to reducing this potential health hazard and reducing *E. coli* counts in the Marengo River.

E. coli monitoring reveals that the lower Marengo River is receiving non-point sources of pollution from livestock and/or human waste and therefore may not be meeting its designation as an Outstanding Resource Water. The high *E. coli* counts tend to be associated with runoff events. Site-specific monitoring has revealed need for implementation of agriculture best management practices for livestock and evaluation and updating where needed of private onsite wastewater treatment systems (POWTS).

CHAPTER THREE: BEST MANAGEMENT PRACTICES AND SELECTED MANAGEMENT ALTERNATIVES

To address the challenges in the Marengo River Watershed, a series of management alternatives will be implemented, which includes a variety of best management practices, landowner incentive programs, invasive species management and a land protection program. This also includes continuing implementation of BRWA's Culvert Restoration Program and other approaches Innovative APPROACHES?. The following is a description of these different categories of management alternatives.

1. FOREST AND AGRICULTURAL BEST MANAGEMENT PRACTICES

Best management practices, or BMPs, are techniques, measures, or structural controls that are designed to eliminate surface runoff and pollutants from entering surface and ground waters. BMPs can include preventative actions that involve management and source controls. This includes policies and ordinances that provide requirements and standards to direct growth of identified areas, protection of sensitive areas such as wetlands and riparian areas, and maintaining and/or increasing open space. Other examples are providing buffers along sensitive water bodies or minimizing disturbance of soils and vegetation. Additional nonstructural BMPs can be education programs for landowners, businesses, developers, and local officials about project designs and everyday actions that minimize water quality impacts.

Since watershed challenges and priority causes have been identified in the Marengo River Watershed, we can determine which BMPs can be used to address these water quality issues. Different types of BMPs will be used in combination in the watershed to obtain the maximum reduction or elimination of a pollutant or pollutants. In addition, as more is learned about the watershed as the Action Plan is implemented; new BMPs and innovative approaches will be considered as part of an adaptive management approach to meeting watershed goals. Recommendations for BMPs as management alternatives are located in the Action Plan table in Chapter Five.

1.1 AGRICULTURE

NR 151 of Wisconsin Administrative Code defines the minimum performance standards and prohibitions for farms, rural development, and urban areas needed to achieve water quality standards by limiting nonpoint source pollution. Implementation of the standards is the responsibility of landowners and is done with technical and cost-share assistance from County Land and Water Conservation Departments, UW-Extension, USDA Farm Service Agency and the Natural Resources Conservation Service. Enforcement of NR 151 occurs through WDNR.

The predominant forms of agriculture in Wisconsin's Lake Superior Basin (including the Marengo River watershed) are dairy and beef operations. As a result, managing livestock and livestock waste in ways that reduce impacts to streams are key to meeting NR 151 standards and ensuring Marengo River watershed streams meet their ORW/ERW classifications. Both

Ashland and Bayfield County rely on voluntary compliance and providing technical assistance and cost-sharing of best management practice installation to meet NR 151 standards. Neither county currently has adopted an ordinance regulating animal waste management. Both Ashland and Bayfield County have described strategies for implementing NR 151 in their 2010 Land and Water Resource Management Plans.

Overall, the number of farms and the footprint of agriculture in the Marengo River watershed is confined to a relatively small area and is much less than watersheds of similar size in other parts of Wisconsin. Therefore, the ability to reduce nonpoint source pollution and ensure the Marengo River meets its designation as an ORW is achievable in the short term, particularly if limited resources are devoted to improving sites most in need of best management practices. While this may provide more immediate improvements to watershed resources, efforts to research and encourage longer term solutions to producing agricultural products that enhance ecosystem services and provide greater opportunity for farmers to make a living should be explored and encouraged. Reducing impacts from livestock and livestock waste management will reduce high bacteria counts, nutrients associated with animal waste, sediment runoff, and will help slow the flow of runoff to watershed streams.

Trends in agriculture continue to force farmers into planting more crops and having more livestock to keep up with stagnant prices and dwindling profit margins. These financial pressures continue to put additional pressure on land and water resources to handle more crop production, more animals, and more waste. Traditional Farm Bill programs are designed to reduce impacts to land and water resources from these activities. An alternative is to find agricultural products that take advantage of emerging markets, offer better and more diverse revenue streams for farmers, and reduce impacts from agriculture on water quality and wildlife habitat. Changing traditional thinking about agriculture production will take time, but has the potential to provide economic opportunity for watershed residents while enhancing watershed health and other ecosystem services.

One example that is already being implemented by at least one beef farm in the Marengo River watershed is managed intensive grazing. Managed intensive grazing involves frequently moving cattle to new pasture. The system has many benefits such as fewer inputs from farm machinery (i.e. fertilizing fields, harvesting and transporting forage), manure is delivered directly to fields as they are grazed, reduced exposure to disease that can occur with animals raised in confinement, improvements in soil and forage quality, and higher prices for meat produced in this fashion.

Another example being explored locally (Ashland/Bayfield County UW-Extension) is producing woody biomass for emerging biofuels markets. Experiments are underway to determine what species and strains of various rapidly growing woody plants (such as hybrid poplar and willow) grow well in the climate and soils of the Lake Superior Basin and may provide alternative crops that feed increased local demand for woody biomass, provide income streams for local farmers and other landowners, and provide “slow the flow” benefits to Lake Superior watersheds.

Further exploration and development of pilot and demonstration projects of alternative agriculture production that provide market-based solutions to enhancing ecosystem services should be a priority for the Marengo River watershed and other areas in the Lake Superior Basin.

1.2 FORESTRY

WDNR has been monitoring the implementation and effectiveness of its forestry best management practices since 1995 and recently reported results on monitoring 521 federal, state, county, private, and industrial timber harvests between 1995 and 2006 (Shy and Wagner 2007). These results were further broken down into two of the ecological landscapes represented in Wisconsin's Lake Superior basin (Bayfield Sand-Plains and Superior-Ashland Clay Plain). Results indicate that forestry BMPs are generally being applied correctly both statewide and in the Lake Superior basin. However, application of timber harvesting, Riparian Management Zone (RMZ), and especially forest road BMPs could be improved in Superior-Ashland Clay Plain (Figure 3.1). Impacts to water quality were generally not observed during timber harvest monitoring when BMPs were correctly applied.

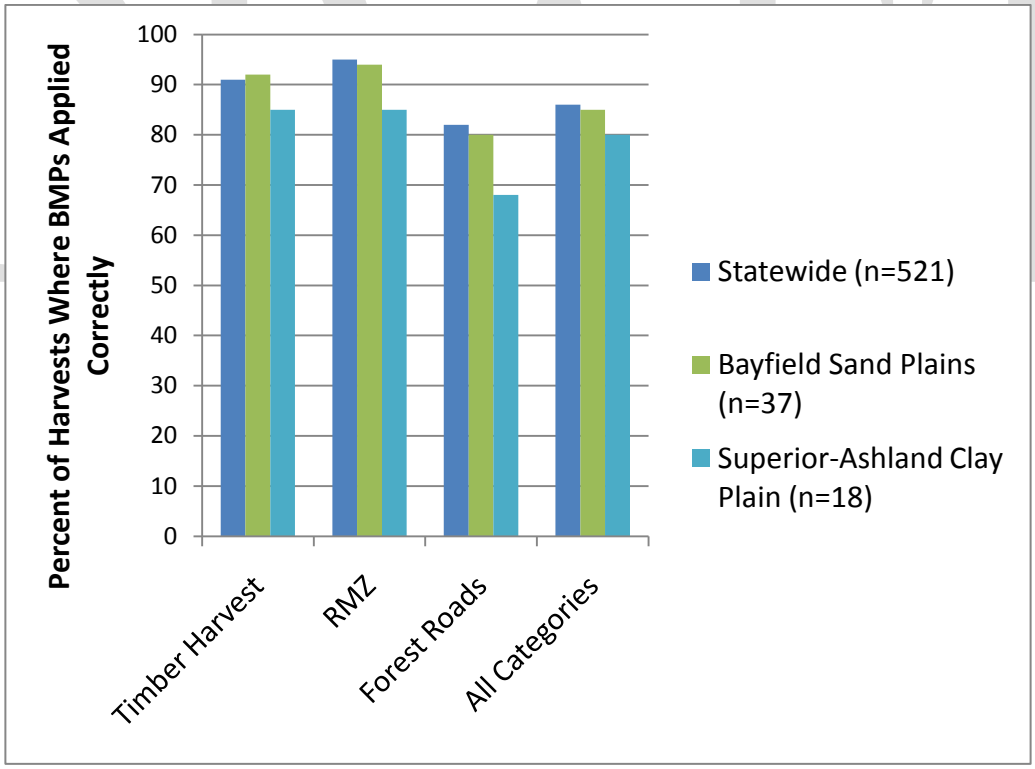


Figure 3.1. Percent of monitored timber harvests where Wisconsin Department of Natural Resources forestry best management practices (BMPs) for timber harvest, RMZ (riparian management zone), forest roads, and all BMP categories combined were applied correctly.

It is not currently known or being tracked what type of harvest and management techniques are being used (or not being used) on the approximately 27% of forest land in the Marengo River Watershed without a known forest management plan (see Chapter 2.2.5). There are approximately 1,146 private landowners in the watershed. Most of the private forest land is located in the soil transition zone and clay plain areas.

Recognizing the importance of forest management on private lands to achieving slow the flow and other natural resource management objectives unique to the Lake Superior Basin, WDNR recently completed an outreach and education project targeted at private woodland landowners in the Lake Superior basin. The project was part of WDNR's 2008 update to its open lands assessment data. The project included a survey of woodland landowners with greater than 10 acres. See Chapter 2.1.5 for a description of survey results. It also included a series of workshops targeted at private woodland landowners during spring 2010 and a workshop targeted at natural resource managers in September 2010. Funding has recently been made available for private woodland landowners to help defer the costs of developing a management plan for their woodlands.

Efforts to reach out to private woodland landowners and encourage the development of management plans that consider things like water quality and wildlife habitat need to continue, particularly as land is parcelized into smaller pieces and more individual landowners. Monitoring of BMP effectiveness has shown that, in general, BMPs are being followed during harvest management activities on lands with third-party oversight of harvest activities. Areas for improvement have been noted and education, outreach and monitoring must continue to ensure that strides that have been made in forest management and harvest continue. Providing additional and more diverse management opportunities and incentives that meet the needs of individual land owners are also needed.

2. LANDOWNER INCENTIVE PROGRAMS

Conservation programs are already available to help implement best management practices needed to reduce nonpoint source pollution to Marengo River Watershed streams from agriculture and forest management activities on private lands. Some of these practices include: nutrient management, management of concentrated flow areas, waterway crossings for farm machinery and cattle, livestock fencing, riparian buffers, streambank protection, conservation tillage, managed-intensive grazing, wetland restoration, and wildlife habitat enhancement. In 2010 the Bayfield Regional Conservancy and the Living Forest Cooperative summarized available landowner conservation incentive programs. The program summaries from the toolkit are listed below, along with a few additional programs. For more information or a full version of the toolkit visit: www.livingforestcoop.com. Complete information on these programs can be obtained by contacting the administering agency.

Conservation Reserve Enhancement Program (CREP): Land retirement program that provides

technical and financial assistance to eligible farmers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. In the Marengo River watershed, the Lake Superior Conservation Reserve Enhancement Program is a modification of the CREP program available in other parts of Wisconsin and is designed to help achieve "slow the flow" objectives specific to the Lake Superior basin. There are currently two landowners in the Marengo River watershed that make a total of 33.1 acres in the program.

Contact: USDA Farm Service Agency- Ashland Service Center (715) 682-9117
Ashland County Land and Water Conservation Department (715) 682-7187
Bayfield County Land and Water Conservation Department (715) 373-6167

Conservation Stewardship Program (CSP): Cost-share conservation program that encourages producers to address resource concerns in a comprehensive manner by undertaking additional conservation activities; and improving, maintaining, and managing existing conservation activities.

Contact: USDA-Natural Resources Conservation Service (NRCS)
Ashland Service Center (715) 682-9117

Environmental Quality Incentives Program (EQIP): Cost-share program that provides technical and financial help to landowners for conservation practices that protect soil and water quality.

Contact: USDA-NRCS Ashland Service Center (715) 682-9117

Managed Forest Law (MFL): Land management incentive program that encourages sustainable forestry on private woodlands by reducing and/or deferring property taxes.

Contact: Wisconsin Department of Natural Resources
Ashland and Bayfield County DNR (715) 685-2900

Wetland Reserve Program (WRP): Land retirement program to restore and protect wetlands on private property.

Contact: USDA-NRCS Ashland Service Center (715) 682-9117

Wildlife Habitat Incentive Program (WHIP): Cost-share program to develop and improve wildlife habitat on agricultural land and nonindustrial private forest land.

Contact: USDA-NRCS Ashland Service Center (715) 682-9117

Wisconsin Forest Landowner Grant Program (WFLGP): Cost-share program that provides assistance to protect and enhance their forested lands, prairies, and waters.

Contact: Wisconsin Department of Natural Resources
Ashland and Bayfield County DNR (715) 685-2900

Partners for Fish and Wildlife: Provides technical and cost-share funding assistance to landowners to restore wetland and other wildlife habitats on their property. From 2001 to the present, eight wetland restoration projects in the Marengo River watershed have been completed through this program, for a total of 38 wetland acres to date. 76 upland acres have

been enhanced for migratory bird nesting in the watershed. One additional project is scheduled for 2011 with the potential to restore 4 acres of wetland and enhance 15 upland acres.

Contact: US Fish and Wildlife Service- Ashland Conservation Office (715) 682-6185

Coastal Program- Great Lakes: Provides technical and cost-share funding assistance to private landowners in the planning, design, and construction phases of wetland restoration and other wildlife habitat activities. This multi-agency wetland restoration program exists between the USFWS and the local county land and water conservation departments.

Contact: US Fish and Wildlife Service- Ashland Conservation Office (715) 682-6185

South Shore Nutrient Management Farmer Education Program: Cost-share and technical assistance program for developing and implementing nutrient management plans that help livestock producers comply with NR 151 Standards and Prohibitions. The program applies to the four counties in the Lake Superior Basin (Ashland, Bayfield, Douglas, Iron). Currently, there are at least nine farms in the Marengo River Watershed that have completed the training program and have nutrient management plans.

Contact: USDA Farm Service Agency- Ashland Service Center (715) 682-9117
Ashland County Land and Water Conservation Department (715) 682-7187
Bayfield County Land and Water Conservation Department (715) 373-6167
UW-Extension, Ashland and Bayfield County (715) 373-6104

Lake Superior Grazing Specialist: The Specialist is available through the Pri-Ru-Ta Resource Conservation & Development Council to provide technical assistance for developing and implementing managed-intensive grazing plans for livestock producers.

Contact: USDA Farm Service Agency- Ashland Service Center (715) 682-9117

Implementation of these programs is limited only by resources and staffing. The Marengo River is an Outstanding Resource Water (ORW), making it a priority for reducing and eliminating nonpoint pollution runoff. The programs are in place to make this happen. Currently, priority is given to voluntary requests and these requests regularly are greater than the available funding and staff availability. As a result, areas most in need of implementation of conservation practices that may most benefit water quality may not be addressed. Water quality monitoring in the Marengo River watershed has shown at least two of these sites. Targeting these locations for priority implementation of limited cost share funding and enforcement of NR151 where necessary is likely to have the greatest benefit for reducing high *E. coli* counts, particularly where associated with poor livestock management practices in the Marengo River watershed.

3. SLOW THE FLOW/SEDIMENT REDUCTION

Reducing the volume and rate of surface runoff to Marengo River Watershed streams is the most important activity that will ultimately help reduce erosion and improve aquatic habitat.

- Complete a "Flood Flow Reduction Model" similar to Blodgett (2009) to identify priority areas and best management practices in the Marengo River Watershed to increase surface runoff attenuation, reduce peak flows, and reduce sediment erosion.
- Most of the Landowner Incentive Programs described in Chapter 3.2 will help "slow the flow" of surface runoff to streams when implemented properly. In particular, the CREP Program (riparian buffer planting) and the Partners for Fish and Wildlife/Coastal Program-Great Lakes (wetland restoration and creation) are important management alternatives to "slowing the flow" of surface runoff in the Marengo River Watershed.
- CREP applies only to perennial stream, so concentrated flow areas and other drainages that may only carry runoff during snowmelt and storm events are not adequately addressed through this program. In addition CREP requirements and restrictions may not meet the needs of all landowners who qualify for the program. Further expanding or enhancing CREP to address these issues or developing an innovative native-tree planting program that leverages methods utilized in CREP will help reduce the amount of open land in priority areas (see Chapter 2.3.2).
- Install flow-deflecting vanes and stream bank stabilization materials at priority eroding valley walls and banks (see Chapter 2.3.1 for survey map) in the Marengo River and tributaries. Use methods described in Fitzpatrick *et al.* (2005).
- Prioritize watershed streams for application of selective wood removal (such as in Dumke 2009) as a technique to induce scour of the stream bed and exposing underlying coarse substrates for aquatic habitat improvement.
- Utilize "slow the flow" techniques that have been used in Stepped grade control "hold the sand" in ephemeral channels
- Utilizing ditch plugging in agricultural fields no longer in production.
- Floodplain re-connection by scraping off levees formed by excess sand deposition.

4. POWTS

In addition to managing livestock waste, human waste management through update and maintenance of private on-site sewage treatment systems (POWTS) is needed to reduce high bacteria counts in the Marengo River.

Regulation of POWTS in Wisconsin is described in Chapter Comm 83 of Wisconsin Administrative Code. Counties Zoning Departments typically act as the administrative agents for enforcing Comm 83 and other related code chapters relative to POWTS. Funding for developing and maintaining POWTS programs is not currently available from the State and counties use various mechanisms to implement their programs through taxes and fees.

Bayfield and Ashland County currently have different approaches to implementing Comm 83. These approaches and hindrances to implementing Comm 83 need to be further explored in order to identify specific needs each county has to ensure POWTS are adequately updated and maintained and to ensure that water quality in the Marengo River Watershed meets appropriate recreational use standards and its ORW designation.

5. BRWA CULVERT PROGRAM

Problems at road crossings are currently being addressed in the Bad River Watershed (including the Marengo) through a cooperative partnership initiated by BRWA and involving USFWS, local towns, counties, USFS, Bad River tribe, Northland College, and others. BRWA's Culvert Program aims to:

- Educate watershed citizens about the environmental and fiscal costs of improperly designed and/or installed culverts
- Identify and inventory all stream/road crossings in the Bad River Watershed
- Prioritize crossings in need of repair with respect to fish passage barriers and sedimentation, and
- Search for funding to help pay for new installations.

A priority list of culverts is presented in the BRWA Culvert Program Strategic Plan (2008). The list of culverts was developed by applying critical criteria to the culvert inventory data. As additional inventory data becomes available the priority list may be amended. Recommendations from town or county road crews are also taken into consideration and can change the priority ranking for a site. Program partners meet on an annual basis to revise the priority project list. To date, five culverts have been replaced in the Marengo River Watershed through the BRWA-led program, with another scheduled for completion in 2011. When project sites are chosen, all culvert remediation projects go through the following series of steps to ensure success:

Engineering: The engineering work to design the new crossing is typically completed by a county, state, federal or other engineer with training in fish friendly design. The engineer is selected on a site-to-site basis depending on the location of the crossing site.

Permitting: All permitting is the responsibility of the appropriate jurisdiction. Engineers that design fish friendly crossings in this plan work with those jurisdictions to complete required permits.

Funding: The BRWA Culvert Program is often involved with locating and providing funding for the pipe, with match for the project contributed by local townships or counties to install the pipe.

Installation: The installation is carried out by state, county, township, or tribal county road crews or by a contractor of their choosing. Installers for BRWA's Culvert Program must be willing to work with all participating partners and install new structures according to design plans.

Monitoring: Monitoring is conducted to assess the effects of culvert replacement on fish and sediment delivery at the remediation sites. BRWA and partners coordinate and conduct this monitoring. The monitoring includes fish population assessments and habitat assessments.

5. INVASIVE SPECIES MANAGEMENT

The Northwoods Cooperative Weed Management Area (NCWMA) is a collective group of federal, state, municipal, and tribal agencies, as well as nonprofit organizations and community groups working together to reduce the impacts of invasive species in the northern four counties of Wisconsin, which encompass the Marengo River Watershed. For the past five years, the NCWMA has met monthly to exchange information, collaborate on projects, and coordinate regional invasive species efforts. The NCWMA provides a great resource for invasive species efforts in the Marengo River Watershed by conducting outreach with the public; training professionals whose work is affected by invasive species; providing expertise in species identification, biology, and control methods; coordinating survey and control efforts; and obtaining additional funding for future projects.

More surveys need to be conducted (in high-quality and highly disturbed areas) to determine presence and absence of aquatic and terrestrial invasive species, particularly those listed as "prohibited" and "restricted" in Chapter NR 40 of Wisconsin Administrative Code. This could be accomplished through the NCWMA.

Keeping high quality areas uninfested is a high priority. High quality areas could include high-quality wildlife habitat, but may also include highly productive farmlands in the Marengo River watershed. New populations of invasive species that show up in relatively uninfested areas need to be dealt with quickly. "New populations" are defined as existing for approximately five years or less.

Many species will infest disturbed areas (roadsides, gravel yards, etc.) but may not readily spread into natural areas (forests, wetlands, etc.). These species, such as bull thistle or common mullein, are a lower priority than other species that are capable of spreading into uninfested natural areas. Species that would fall into this category would be *garlic mustard, leafy spurge, Japanese knotweed, Japanese barberry*, and possibly others.

To date, the NCWMA has worked to manage invasive species in the Marengo River Watershed by coordinating agencies working on invasive species; training municipal officials and employees on invasive species best management practices (Ashland Co, Bayfield Co, Town of Lincoln); conducting limited surveys along roadsides; conducting limited treatment of isolated infestations; and introducing biological control agents for purple loosestrife. These activities and more are addressed as actions in the Action Plan.

An invasive species treatment protocol has been recommended by the NCWMA for the Marengo River Watershed. The treatment protocol includes:

1) That treatment methods be chosen based on recommendations from:
    a. Local experts with experience doing control work in the region, such as agency staff and certified contractors

b. Wisconsin DNR invasive species website – www.dnr.wi.gov/invasives/plants.asp
c. "Invasive Plants of the Upper Midwest" by Elizabeth Czarapata, which outlines detailed options for controlling invasive plants in Wisconsin.

2) That integrated pest management (IPM) will be applied, utilizing manual, mechanical, and biological control methods whenever possible to minimize the impacts of pesticides in the watershed.
3) That landowners should receive financial assistance to control large-scale infestations (1 acre or more of an infested area.)

Treatment not only refers to invasive species that are already known to be in the watershed, but also refers to the control of new and potentially harmful species. "New species" could be defined as those that have only been known to occur in the area for five years or less. "Potentially harmful species" are those that will cause the most harm to the environment, economy, or human health. In the Marengo River watershed, this may include species that would impact crop production (hay, corn, etc.), timber production, forest habitat, riparian habitat, open field habitat, and human health.

6. LAND PROTECTION PROGRAM

One of the most effective tools for long-term water quality protection is permanent protection of sensitive lands. Permanent protection is best achieved through purchase, donation, or conservation easement. Permanent protection of high priority areas will help maintain the ecological integrity of the most sensitive areas.

There are two local land trusts that work to protect land in the Watershed: Bayfield Regional Conservancy and West Wisconsin Land Trust. Local governments also participate in land protection efforts. The Bayfield Regional Conservancy, a local land trust located in Bayfield, Wisconsin (www.brcland.org) has identified the Marengo River watershed as a Priority Conservation Area (PCA) in its "Strategic Conservation Plan for Lake Superior's Bayfield Peninsula" (2009). PCAs are defined as areas where several high quality conservation values (e.g. wildlife habitat, water quality, rare species, scenic features, and wetlands) overlap, creating a "hot spot" for conservation. The Marengo River Watershed was identified as a PCA primarily due to the high water quality of its rivers and streams, and the landscape context that provides important habitat areas. It should be noted that this Strategic Conservation Plan only covers the Bayfield County portion of the watershed. An Ashland County Strategic Conservation Plan for BRC will be completed at a later date, and the completion of this plan is a recommended action in the Action Table in Chapter Five. The area of the PCA is 44,878.41 acres and includes the following conservation targets (Table 3.1, Figure 3.2).

Table 3.1. Conservation Target Acreages identified by Bayfield Regional Conservancy for the Marengo River Watershed.

High Priority	**Medium Priority**
Public: 11, 720 acres	*Public:* 82 acres

Private: 8,653 acres	*Private:* 1,321 acres

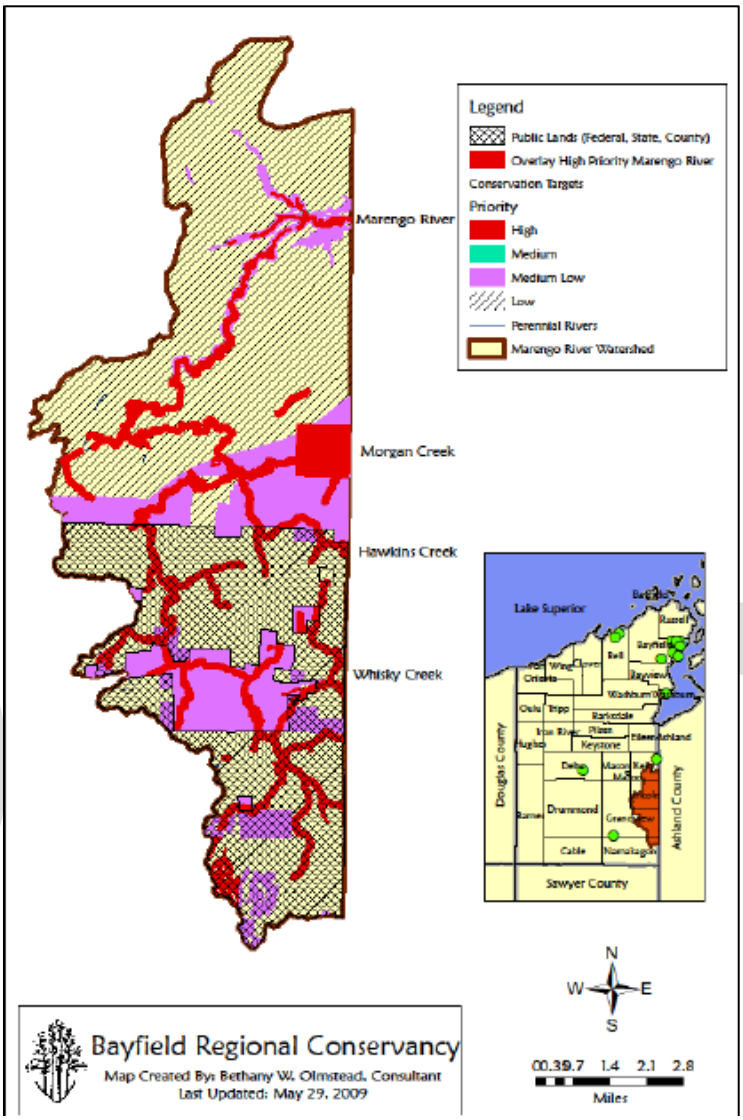


Figure 3.2 . The Bayfield Regional Conservancy's Marengo River Watershed Priority Conservation Area.

BRC also identified key conservation strategies for implementing an effective and efficient pro-active land protection program for continued conservation success. An effective land protection program is comprised of the following components: outreach and education, land protection, natural resource conservation, and funding. Conservation significance, population and land use trends, and threats, of the Marengo River watershed Priority Conservation Area was considered in order to develop key conservation strategies and their associated tools, partners, funders, and target areas. A list of the recommended tools and activities are listed below, and captured as recommended actions in the Action Table:

Recommended Tools/ Activities for Land Protection Program

- Conservation Easements (permanent and term) – Donated, Purchased, and Bargain Sale

- Land Acquisition – Donated, Purchased, and Bargain Sale
- Best Management Practice Implementation
- Landowner Management Agreements
- Active Land Management
- Direct mailings to landowners in high and medium priority areas within the Marengo River watershed Priority Conservation Areas
- Implement targeted workshops (e.g., forestry BMP workshop, conservation easement workshop, agricultural cost-share programs, wildlife habitat enhancement) held in target areas to address specific resource and landowner concerns
- Host informal special events such as hikes, canoe trips, or others as appropriate, inviting not only members but landowners in targeted areas as well
- Encourage the establishment of local farmland preservation programs with sustainable funding mechanisms (e.g., Agricultural Mitigation Banking)
- Encourage coordination between long-term land use planning and agricultural preservation planning
- Encourage the inclusion of forest lands in Wisconsin Working Lands Initiative (PACE)
- Conduct outreach to key decision makers such as Town Boards and Comprehensive Planning Committees to raise awareness of BRC and to convey findings of this Plan
- Hold public meetings to share results of this Plan with interested parties.
- Engage in the ongoing Comprehensive County Land Use Planning process.
- Engage with potential partners on a semi-regular basis to gain a better understanding of each other's priorities and to share technical expertise (e.g., establish a listserv, semi-annual lunch, conservation outings)
- Collaborate with agencies that complement land protection (e.g., partnering with agency suited to implementation of best management practices such as fencing livestock out of streams, planting riparian buffers, stream restoration)
- Promote responsible conservation design for development – identify developers interested and develop pilot project.

CHAPTER FOUR: PRIORITIZING CHALLENGES AND CAUSES

1. IDENTIFYING CHALLENGES AND CAUSES

Identifying Marengo watershed issues and concerns or "challenges," was one of the first steps undertaken through the Marengo River Watershed Partnership (MRWP). At the first MRWP meeting on 12/16/09, watershed residents, technical experts, and other meeting participants were asked to identify issues and concerns they felt were important to maintaining and improving the health of the Marengo River Watershed. The ideas expressed at this meeting, along with reviewing available literature about the watershed, asking for feedback from MRWP Technical Team members, and reviewing available water quality standards resulted in the following six challenges to achieving the vision and goals (see Chapter 5) for the Marengo River Watershed. A full list of issues and concerns expressed at the 12/16 MRWP meeting and how they were used to derive the challenges described here is displayed in Appendix.

Marengo River Watershed challenges:

1. Unstable hydrologic system
2. Excess sediment
3. Terrestrial habitat fragmentation and alteration
4. Loss of aquatic habitat
5. Excess nutrients
6. High bacteria counts

2. TECHNICAL TEAM SURVEY

In order to prioritize the challenges and identify the most important sources of the challenges, the MRWP Technical Team was asked to complete an online survey. The prioritization exercise was done to provide a guide in focusing management actions that will have the greatest benefit to achieving the watershed vision and goals. While the prioritization is key to focusing management efforts, all of the challenges are considered important to achieving the vision and goals and will ultimately be implemented as resources and partner ambitions allow.

The survey was conducted September 20-27, 2010 and 27 MRWP Technical Team participants responded. Survey participants were asked to identify which of four focus areas they had the most interest in. Results indicate a good representation of input from each group (Figure 4.1).

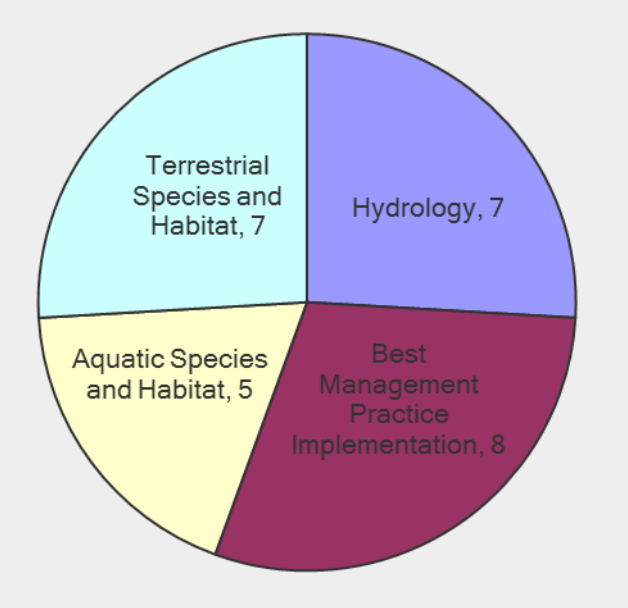


Figure 4.1. Marengo River Watershed Partnership Technical Team survey respondents grouped by technical interest area.

Survey participants were first asked to judge the "severity" and "scope" of the challenges compared to each other. They were asked to judge "severity" by considering how great the overall effect of each challenge has now or in the future on meeting the draft vision and goals for the watershed and its effect compared to the other challenges. The most "severe" challenge was given a ranking of 1 and the least "severe" a ranking of 6. The "scope" ranking was done in the same way and was designed to differentiate which challenges were most widespread and which were most localized in the watershed. A challenge ranked as being widespread was considered an overall higher priority than a localized one.

Ranking watershed challenges by priority was achieved by calculating a "weighted total score" for both the severity and the scope ranking for each challenge. The weighted total score is a method used to give greater weight to responses indicating greater severity and scope compared to those rated as having a low severity and scope. The challenge with the greatest total severity and scope score was considered the top priority and the least score the lowest priority for achieving the watershed vision and goals (Table 4.1).

Results indicate that an unstable hydrologic system is the challenge having the greatest effect and is most widespread in the Marengo River Watershed. Several comments were given by survey participants noting how interrelated some of the challenges are. For instance, an unstable hydrologic system has led to many of the issues with excess sediment, which also leads to loss of aquatic habitat. Excess nutrients and high bacteria counts ranked as having the least overall effect on the watershed and are least widespread compared to the others.

Table 4.1. Marengo River Watershed Partnership Technical Team survey results for severity and scope ranking of watershed challenges.				
Challenge	**Severity Weighted Score**	**Scope Weighted Score**	**Total Weighted Score**	**Priority Rank**
Unstable hydrologic system	226 (n=24)	215 (n=24)	441	1
Excess sediment	220 (n=24)	205 (n=24)	425	2
Terrestrial habitat fragmentation and alteration	194 (n=24)	202 (n=24)	396	3
Loss of aquatic habitat	198 (n=24)	188 (n=23)	386	4
Excess nutrients	172 (n=24)	159 (n=23)	331	5
High bacteria counts	166 (n=24)	152 (n=23)	318	6

Survey participants were then asked to evaluate the ten most important sources for each of the challenges and to evaluate the "recovery potential" or the ability of management actions to mitigate the source. Ranking sources and recovery potential provides a guide to selecting and prioritizing management objectives and actions that will be most effective at meeting the watershed challenges. It also provides a way to look at which sources may be similar across one or more of the other challenges and would achieve multiple benefits if mitigated.

Two methods were used to evaluate the source rankings. The first generated a list of top ten sources for each challenge by weighting the ranking given to each source by each survey respondent and summing the total weighted score for each source. The totals were ranked highest to lowest (Table 4.2). This method considered sources for each challenge separately from the others and gave greater importance to sources for the top priority challenges.

The second method looked at survey results based on frequency and rankings of a source appearing under multiple challenges. In this way, sources for multiple challenges are factored into evaluating top overall sources. This was done by weighting source rankings under the top priority challenges higher than those under the lowest ranked challenge (for instance, the #1 ranked source for the #1 challenge was given a score of 10*6 = 60, the #1 source for the #2 challenge was given a score of 10*5 = 50, the #2 ranked source for the #3 ranked challenge was given a score of 9*4 = 36). The weighed rankings were added together for each source and ranked by total weighted score. The results from this analysis are shown in Table 4.3.

Evaluating sources using both methods resulted in sources affecting runoff and erosion ranking highest (i.e. Hydrologic units with >60% open land/<16 year forests, Roads & road/stream crossings, Surface drainage from agricultural areas, Bluff/Streambank erosion).

Table 4.2. Marengo River Watershed Partnership Technical Team survey weighted ranking results for sources of each watershed challenge.		
Challenge	**Source**	**Score**
1. Unstable hydrologic system	Hydrologic units with >60% open land/<16 year forests	164
	Surface drainage from agricultural areas	133
	Roads & road/stream crossings	131
	Drained wetlands	116
	Stream channelization/incision	101
	Bluff/Streambank erosion	99
	Poor forest management and harvest	86
	Development (converting land use)	66
	Overbank sedimentation	42
	Climate change	32
2. Excess sediment	Bluff/Streambank erosion	176
	Roads & road/stream crossings	157
	Hydrologic units with >60% open land/<16 year forests	154
	Surface drainage from agricultural areas	116
	Stream channelization/incision	112
	Drained wetlands	87
	Poor forest management and harvest	73
	Overbank sedimentation	65
	Development (converting land use)	58
	Untreated storm water runoff	24
3. Terrestrial habitat fragmentation and alteration	Development (converting land use)	177
	Poor forest management and harvest	122
	Inconsistent/inadequate zoning	91
	Conflicting objectives in wildlife management	78
	Roads & road/stream crossings	68
	Invasive species	64
	Hydrologic units with >60% open land/<16 year forests	63
	Drained wetlands	61
	Climate change	32
	Bluff/Streambank erosion	22
4. Loss of aquatic habitat	Bluff/Streambank erosion	138
	Roads & road/stream crossings	115
	Drained wetlands	107
	Stream channelization/incision	97
	Elevated water temperatures	68
	Overbank sedimentation	62
	Poor forest management and harvest	51
	Surface drainage from agricultural areas	50
	Hydrologic units with >60% open land/<16 year forests	47
	Dams	45

Table 4.2. Marengo River Watershed Partnership Technical Team survey weighted ranking results for sources of each watershed challenge.		
Challenge	**Source**	**Score**
5. Excess nutrients	Surface drainage from agricultural areas	168
	Poorly designed/functioning septic systems	167
	Improperly applied/managed livestock waste	159
	Untreated storm water runoff	111
	Development (converting land use)	102
	Drained wetlands	68
	Hydrologic units with >60% open land/<16 year forests	49
	Inconsistent/inadequate zoning	37
	Roads & road/stream crossings	32
	Poor forest management and harvest	18
6. High bacteria counts	Improperly applied/managed livestock waste	171
	Poorly designed/functioning septic systems	155
	Surface drainage from agricultural areas	120
	Untreated storm water runoff	91
	Development (converting land use)	46
	Elevated water temperatures	42
	Inconsistent/inadequate zoning	32
	Drained wetlands	22
	Bluff/Streambank erosion	15
	Stream channelization/incision	11

Table 4.3. Marengo River Watershed Partnership Technical Team survey results for sources weighted based on priority watershed challenges and frequency of listing under multiple challenges.	
Source	**Weighted Score**
Roads & road/stream crossings	148
Hydrologic units with >60% open land/<16 year forests	130
Surface drainage from agricultural areas	126
Drained wetlands	116
Bluff/Streambank erosion	116
Poor forest management and harvest	94
Stream channelization/incision	88
Development (converting land use)	86
Overbank sedimentation	42
Inconsistent/inadequate zoning	42
Conflicting objectives in wildlife management	28
Poorly designed/functioning septic systems	27
Untreated storm water runoff	26
Improperly applied/managed livestock waste	26
Elevated water temperatures	23
Invasive species	20
Climate change	14
Dams	3
Mining (i.e. iron ore, gravel pits)	0

Finally, survey participants were asked to rate the recovery potential, or the ability of a source to be mitigated through management actions. The recovery potential was rated on the following scale:

- **Very High**: The potential for the source to be mitigated through management actions is very likely (4 points).
- **High**: The potential for the source to be mitigated through management actions is likely (3 points).
- **Medium**: The potential for the source to be mitigated through management actions might be likely (2 points).
- **Low**: The potential for the source to be mitigated through management actions is unlikely (1 point).
- **Don't Know**: I don't know or feel comfortable rating the potential of the source to be mitigated through management actions (no score).

Results are displayed in Table 4.4. In general, the MRWP Technical Team felt that the recovery potential for many of the sources was greatest for those activities that human behavior can directly impact and lesser for those due to natural watershed response. For instance, reducing impacts to watershed health from agricultural runoff was seen as something that could be directly improved by management activity in the short term, while reducing the impacts of from streambank erosion is an issue much larger in scope and something humans have less immediate control over.

Overall, results from the survey indicate the unstable hydrologic system is the greatest challenge facing the Marengo River Watershed and the main sources of this challenge are related to surface runoff. Addressing these sources will help to meet other watershed challenges. Although, the scope and severity of the "excess nutrients" and "high bacteria counts" challenges were less on a watershed scale, recovery potential of their main sources is seen as greater than some of the sources for the "unstable hydrologic system" and "excess sediment." These factors were all considered together to come up with a prioritization of sources that was used to form the basis of the targeted objectives and management actions described in Chapter Five (Table 4.5).

Table 4.4. Marengo River Watershed Partnership Technical Team survey average recovery potential for each source.	
Source	**Average Recovery Potential**
Poorly designed/functioning septic systems	3.1
Roads & road/stream crossings	3.0
Improperly applied/managed livestock waste	3.0
Surface drainage from agricultural areas	2.9
Inconsistent/inadequate zoning	2.8
Poor forest management and harvest	2.8
Untreated storm water runoff	2.8
Hydrologic units with >60% open land/<16 year forests	2.7
Drained wetlands	2.5
Dams	2.4
Conflicting objectives in wildlife management	2.4
Mining (i.e. iron ore, gravel pits)	2.3
Bluff/Streambank erosion	2.2
Overbank sedimentation	2.1
Stream channelization/incision	2.1
Development (converting land use)	2.1
Invasive species	1.9
Elevated water temperatures	1.8
Climate change	1.3

Table 4.5. Prioritization of sources (left column) for each of the watershed challenges for the Marengo River Watershed based on results from the Marengo River Watershed Partnership Technical Team survey. Watershed challenges are listed in priority order. The numbers under each challenge correspond to the ranking of each source for that challenge (for instance, "Drained wetlands" were the #4 source for the "unstable hydrologic system" and the #6 source for "excess sediment" challenge. Average recovery potential for each source is also given.

SOURCE (known or suspected)	CHALLENGE						RECOVERY POTENTIAL Very High=4, High=3, Medium=2, Low=1	
	1. Unstable hydrologic system	2. Excess Sediment	3. Terrestrial habitat fragmentation and alteration	4. Loss of aquatic habitat	5. Excess Nutrients	6. High Bacteria counts	Average Score	Likelihood* Ranking
1. Hydrologic units with >60% open land/<16 year forests	1	3	7	9	7		2.7	High/Medium
2. Surface drainage from agricultural areas	2	4		8	1	3	2.9	High
3. Roads & road/stream crossings	3	2	5	2	9		3.0	High
4. Drained wetlands	4	6	8	3	6	8	2.5	High/Medium
5. Bluff/Streambank erosion	6	1	10	1		9	2.2	Medium
6. Poor forest management and harvest	7	7	2	7	10		2.8	High
7. Improperly applied/managed livestock waste					3	1	3.0	High
8. Poorly designed/functioning septic systems					2	2	3.1	High
9. Stream channelization/ incision	5	5		4		10	2.1	Medium
10. Inconsistent/ inadequate zoning			3		8	7	2.8	High
11. Development (converting land use)	8	9	1		5	5	2.1	Medium
12. Overbank sedimentation	9	8		6			2.1	Medium
13. Untreated storm water runoff		10			4	4	2.8	High
14. Invasive species			6				1.9	Medium
15. Elevated water temperatures				5		6	1.8	Medium
16. Dams				10			2.4	Medium/High
17. Conflicting objectives in wildlife management			4				2.4	Medium/High
18. Climate change	10		9				1.3	Low/Medium
19. Mining (i.e. iron ore, gravel pits)							2.3	Medium/High

*Likelihood Ranking – 4.0-3.8=Very High, 3.8-3.5=Very High/High, 3.4-3.3=High/Very High, 3.2-2.8=High, etc.

CHAPTER FIVE: GOALS, OBJECTIVES, AND THE WATERSHED ACTION PLAN

1. VISION AND WATERSHED GOALS

Identifying a vision for the Marengo watershed, issues and concerns or "challenges," and goals to address those challenges, were three of the first steps undertaken through the Marengo River Watershed Partnership (MRWP). At the first MRWP meeting on 12/16/09, watershed residents, technical experts, and other meeting participants were asked to identify what words they would use to describe their vision for a Marengo River Watershed in the future. The draft watershed vision statement is a combination of those words.

Meeting participants were then asked to identify challenges they felt were important to maintaining and improving the health of the Marengo River Watershed. The ideas expressed at this meeting, along with reviewing available literature about the watershed, asking for feedback from MRWP Technical Team members, and reviewing available water quality standards resulted in the first three watershed goals, which focused on addressing six challenges to achieving the vision for the Marengo River Watershed. A fourth goal was added with feedback from other members of the Partnership and Citizen Involvement Team to address watershed citizen engagement. The vision and goals are long-term; the action plan will be focused on what can be achieved in a 10-year time span.

Vision Statement
"We would like to see a Marengo River Watershed that has clean, flowing water; supports healthy, diverse, and resilient plant and animal communities free of invasive species; and is a vital community of watershed stewards who take actions to care for the watershed, while enabling a productive livelihood"

Watershed Goals
Goal #1: The hydrologic system in the Marengo River Watershed is stable and resilient.
Goal #2: Safe water and healthy, productive soil are available and maintained for all human and wildlife uses.
Goal #3: The Marengo River Watershed has diverse, healthy, and resilient native communities of plants and animals and their habitats on land and in water.
Goal #4: Citizens of the Marengo River Watershed are active and engaged in maintaining the integrity of the watershed.

2. MANAGEMENT AREAS

The Marengo River Watershed has two distinct areas that provide a logical break for prioritizing management actions to improve watershed health. These two areas are roughly defined by the boundary between sand and sand/gravel surficial deposits and clay surficial deposits and an elevation of approximately 1,050 feet above sea level (Figure 5.1, also see Chapter 2.2.3).

2.1 SOIL TRANSITION AND CLAY PLAIN

The lower, northern third of the watershed (approximate elevations 1,050 feet to 711 feet above sea level) is where most of the human activity is located. It is characterized by mostly private land ownership, agricultural land use, erodible sand over clay and clayey soils, and unstable hydrologic conditions. Current human activity has its greatest impact on this part of the Marengo River Watershed and thus is the priority focus area for management activities to improve watershed health. The Marengo Test Case study (LSBPT 2007) identified this area of the watershed as key to affecting its hydrologic condition. The MRWP Technical Team identified unstable hydrology and excess sediment as the top two challenges having the greatest overall effect and the most widespread effect. The top sources of these challenges were hydrologic units with greater than 60% open land and/or less than 16 year-old forests, surface drainage from agricultural areas, roads, road/stream crossings, and bluff/streambank erosion. Two of the three sources with the greatest recovery potential were related to human or livestock waste management. The following action plan for the soil transition and clay plain management area represents short term management actions that will help ensure water quality standards are met and important groundwork towards achieving a more stable hydrologic system is completed.

2.2 UPPER MARENGO RIVER WATERSHED

The southern, forested two-thirds of the watershed (approximate elevations 1,443 feet to 1,050 feet above sea level) is primarily in federal ownership as part of the Chequamegon-Nicolet National Forest (CNNF), has a relatively stable hydrologic system, and is characterized by sandy, glacial till soils, rock outcroppings, and a significant amount of the watershed's wetland acreage. Because it contains the headwaters this is the most critical portion of the watershed to protect. This part of the watershed is vulnerable to the potential impacts of large-scale iron mining and will also serve as an important area to build and expand watershed resilience to impacts of climate change. In these areas, the focus should be on continuing to identify and improve road and stream interactions, identifying and removing stream barriers and old ditching or drainage systems that contribute increased runoff and stream power to lower watershed reaches, monitoring and removing populations of priority terrestrial and aquatic invasive species, protecting and restoring wetlands, and stabilizing streambank erosion sites.

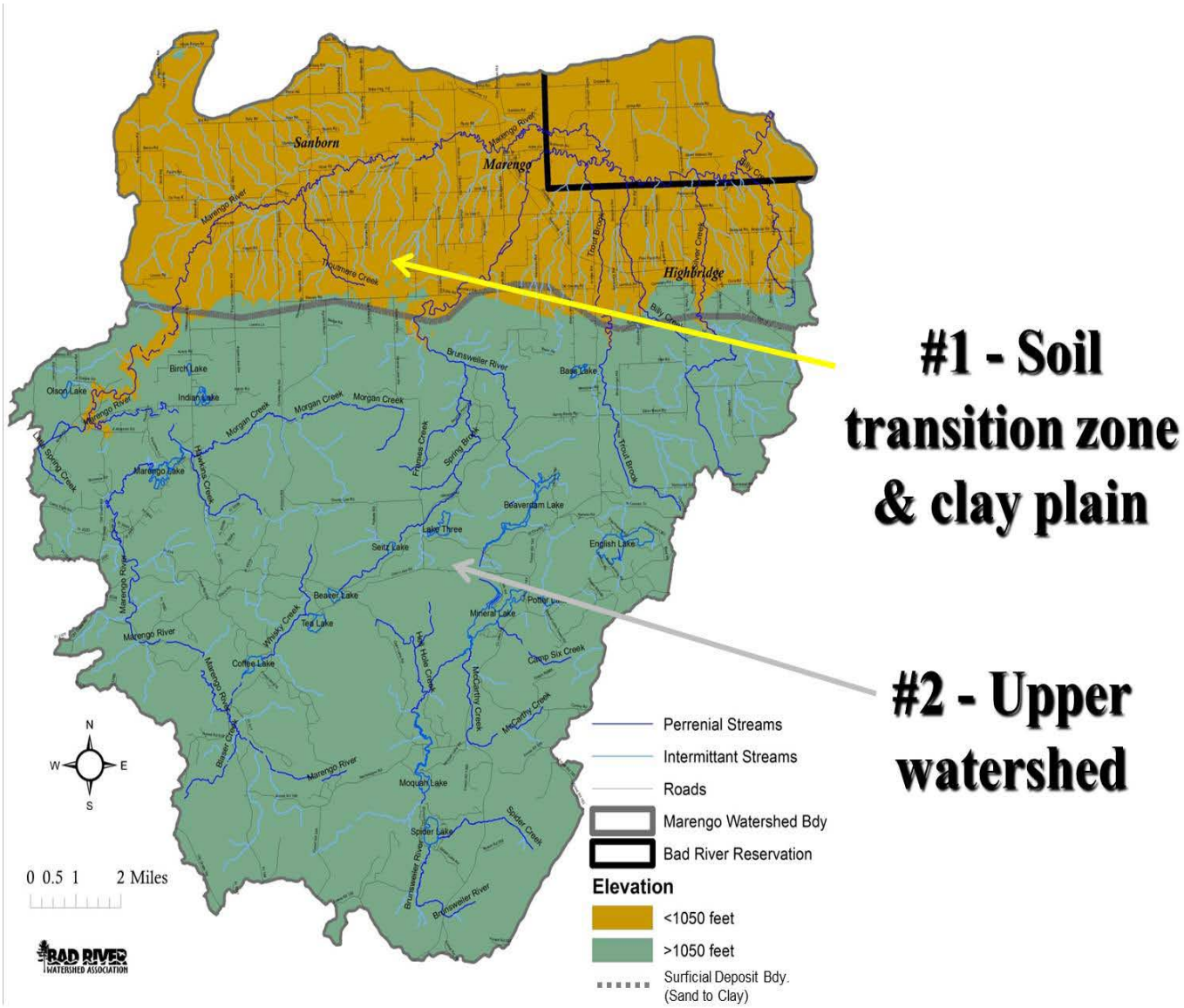


Figure 5.1. Management areas for the Marengo River Watershed Action Plan.

3. LONG TERM AND TARGETED OBJECTIVES

The long-term goals for the watershed describe a future state. In order to meet these goals, a series of long-term objectives are described in Table 5.1. Accompanying each long-term objective are a series of targeted objectives that provide more specific direction on the programs and targets needed to meet long-term objectives. These are specific or quantitative where possible and reflect current knowledge about the watershed and management activities needed to meet the long-term objectives. The targeted objectives for the first three goals are prioritized in the Watershed Action Plan table in based on feedback from the MRWP Technical Team (see Table 4.5). Targeted objectives related to Goal #4 are listed at the end of the action plan table. Some actions pertaining to the targeted objectives of Goal #4 are interspersed

within the action plan, as they also help to achieve targeted objectives of the other long-term watershed goals.

Table 5.1. Marengo River Watershed long-term goals, long-term objectives, and targeted objectives.

#	Long Term Watershed Goal	Long Term Objectives	Targeted Objectives
1	The hydrologic system in the Marengo River Watershed is stable and resilient.	Reduce peak flows by 50% from current levels.	• Reduce amount of open land by 7,600 acres, focusing in hydrologic units with 40% or more open lands (2008 baseline). • Slow the flow of runoff from upland areas to watershed streams. • Reduce hydrologic connectivity of road and recreational trail system to less than 15% of the surface area of the watershed. • Increase watershed storage capacity. • Break agricultural drainage systems no longer in use. • Improve coordination of forest harvest activity to maintain less than 40% open land in watershed hydrologic units. • Reduce adverse effects on watershed from forest harvest and management activities. • Restore floodplain connectivity in incised reaches and reaches with excessive overbank sedimentation. • Increase channel roughness.
		Reduce sources of sediment to watershed streams by 50% from current levels.	• Reduce sediment contributions from roads, recreational trail systems, and all waterway crossings. • Reduce bluff/stream bank erosion.
		Understand groundwater contribution to baseflow and water supply.	• Conduct baseflow stream survey. • Map groundwater recharge areas.

Table 5.1. Marengo River Watershed long-term goals, long-term objectives, and targeted objectives.			
#	**Long Term Watershed Goal**	**Long Term Objectives**	**Targeted Objectives**
2	Safe water and healthy, productive soil are available and maintained for all human and wildlife uses.	Surface and groundwater meet appropriate state and tribal criteria for pathogens, nutrients, and other contaminants.	• Implement agriculture conservation practices that improve manure storage and management. • Inventory and replace failing, poorly designed, and poorly functioning private on-site sewage treatment systems (POWTS). • Insure POWTS are maintained on a regular basis. • Develop and encourage market-driven solutions to conservation on agricultural and forest land. • Strengthen local zoning ordinances and encourage practices that protect watershed health while meeting development needs. • Coordinate and increase opportunities for proper household hazardous waste, pesticides, white goods, and tire disposal. • Remediate existing brownfield sites and leaking underground storage tanks. • Identify and close abandoned wells. • Develop private well monitoring program.
		Maintain and/or identify and designate waters meeting special designation criteria.	• Identify and designate stream segments with priority cold or warm water communities, potential ORW/ERW, State Wild and Scenic River, or other state or tribal special designation. • Develop monitoring strategy to evaluate and ensure special designations are being met in these streams.
3	The Marengo River Watershed supports diverse, healthy, and resilient native communities of plants and animals and their habitats on land and in water.	Identify, restore, and maintain ecological processes and priority habitats for native communities of plants and	• Secure protection of existing priority riparian, aquatic, and terrestrial conservation areas and habitats. • Inventory and control invasive

Table 5.1. Marengo River Watershed long-term goals, long-term objectives, and targeted objectives.			
#	**Long Term Watershed Goal**	**Long Term Objectives**	**Targeted Objectives**
		animals.	species • Identify presence and extent of terrestrial habitat types present in the watershed. • Identify presence and extent of aquatic habitat types present in the watershed. • Restore and improve priority aquatic and terrestrial habitats.
4	Citizens of the Marengo River Watershed are active and engaged in maintaining the integrity of the watershed.	Establish outreach and citizen involvement efforts to reduce pollution that impacts the Marengo River Watershed.	• Increase general public's awareness and knowledge of water quality issues and watershed health. • Increase public participation in watershed stewardship activities. • Reduce pollution that impacts the watershed by providing practical knowledge to key watershed audiences. • Increase citizen involvement opportunities that results in restoration, preservation, and protection of watershed health.
		Develop and improve recreational activities for watershed residents and visitors.	• Develop and improve recreational opportunities for all types of users. • Resolve conflicts related to wildlife management

4. MARENGO RIVER WATERSHED 10-YEAR ACTION PLAN

The Marengo River Watershed Partnership presents the following plan of actions needed over the next 10 years to achieve long-term objectives and ultimately the long-term goals and vision for the Marengo River Watershed. The first column of "recommendations" includes prioritized targeted objectives, management alternatives selected to help meet the targeted objectives, and specific actions needed to implement the management alternatives.

These are color-coded as follows:

Targeted Objectives
Management Alternatives (* refer to project map in Appendix for potential locations for implementing alternative
Actions

Each targeted objective, management alternative, and action is marked with an "X" by each of the long-term objectives (Columns 2-9) it helps to meet. The remaining columns describe additional information about each of the actions as follows:

Location: (also see map in Figure 5.1).
ST/CP = Soil Transition and Clay Plain Management Area
UW = Upper Watershed Management Area

Time Frame:
S = within 5 years
M = within 10 years
L = >10 years

Measure of Success: Within the time frame specified, what measure will indicate the action is being met.

Cost Estimate: An estimated cost of implementing the action.

Funding: Potential funding sources to implement the action.

Implementation: List of potential partners who would be likely to implement the action.

Blank boxes are "unknown" at this point or "not applicable."

Table 5.2. Marengo River Watershed 10 Year Action Plan														
Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
1. Reduce amount of open land by 7,600 acres, focusing in hydrologic units with 40% or more open lands	X	X			X			X						
A. Riparian and native upland tree planting*	X	X			X			X						
1. Increase capacity to implement Lake Superior Conservation Reserve Enhancement and Partners in Fish and Wildlife Programs.	X	X			X		X	X	ST/CP	S	200 acres in 5 years. 50% tree survival.	$800-$1600 per acre	Farm Bill, GLRI	NRCS, County LWCDs, USFWS, Pri-Ru-Ta, landowners
2. Explore and develop market-driven or other innovative program.	X	X			X		X	X	ST/CP	M	Pilot project developed & funded			NRCS, County LWCDs, USFWS, UWEX CBAP
B. Coordinate & schedule timber harvests to maintain <40% open land in WDNR hydrologic units.	X	X			X		X		ST/CP, UW	S				WDNR, UWEX, BRWA
1. Continue outreach and education efforts to watershed managers, timber harvesters, landowners.	X	X			X		X		ST/CP, UW	S	One training workshop per year	$2,000-4,000/ wkshop	WCMP, USFS	WDNR, UWEX
2. Slow the flow of runoff from upland areas to watershed streams.	X	X		X	X			X						

Table 5.2. Marengo River Watershed 10 Year Action Plan														
Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
A. Increase upland flood flow storage.	X	X			X									
1. Develop flood flow reduction model to identify priority areas for upland water attenuation. See Blodgett (2009) for example.	X	X			X				ST/CP, UW	S	Completed model & implementation recommendations	$30,000-$50,000	GLRI, GLC	Universities, USGS
2. Implement pilot project based on model results.	X	X			X					M	1 project completed		Depends on model results	Depends on model results
3. Distribute information to landowners about "slow the flow" concept and the impact of runoff to rivers and lakes.	X	X			X		X			S	One Learn About Your Land series or similar per year	$4,000/ series + staff time	WCMP, USFS	WDNR, UWEX, LFC, Land Trusts, BRWA
B. Restore and protect wetlands.*	X	X		X	X			X						
1. Implement Partners in Fish and Wildlife and Wetland Reserve Programs.									ST/CP	S	Work with 5 landowners to restore/enhance 5 wetlands in 5 years	$3000-$7000 per project	Farm Bill	USFWS, County LWCDs, NRCS
C. Implement managed intensive grazing for livestock producers.	X	X		X	X		X							

Table 5.2. Marengo River Watershed 10 Year Action Plan														
Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
1. Develop and implement grazing plans, demonstration sites.	X	X		X	X		X		ST/CP	S	5 new grazing plans developed & implemented in 5 years	$90,000/ yr, FTE Grazing Specialist	DATCP	Pri-Ru-Ta, NRCS, County LWCDs, farmers
2. Establish equipment rental/marketing coop.	X	X		X	X		X		ST/CP	M				Pri-Ru-Ta, UWEX, farmers
D. Increase acreage using conservation tillage.	X	X		X	X		X							
1. Promote conservation tillage through field demonstrations and rental of no-till and reduced-till technologies.	X	X		X	X		X		ST/CP	S	500 acres/year using conservation tillage in 5 years	$10,000 (purchase rental drill)	Farm Bill, DATCP	NRCS, County LWCDs, UWEX, Pri-Ru-Ta, farmers
E. Plug/break agricultural drainage systems no longer in use.	X	X					X		ST/CP, UW	M	Complete flow reduction model in 2.A.1 above	See 2.A.1 above	See 2.A.1 above	See 2.A.1 above
F. Continue implementation and monitoring of forest harvest best management practices.		X		X	X		X		ST/CP, UW	S			WDNR	WDNR

Table 5.2. Marengo River Watershed 10 Year Action Plan														
Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
3. Reduce hydrologic connection between road and recreational trail system and watershed streams.	X	X			X									
A. Replace or re-design poorly functioning road crossings.*	X	X			X									
1. Implement BRWA Culvert Program Partnership.	X	X			X			X	ST/CP, UW (Map)	S	10 priority sites remediated and monitored for improvement in 5 years	$10,000 - $50,000 per site	GLRI, USFWS, NFWF, Towns, Counties, NOAA	BRWA Culvert Program Partnership
2. Recruit volunteers to conduct additional culvert inventories or assist with fisheries monitoring efforts.					X		X		ST/CP, UW (Map)	S			GLRI, USFWS, NFWF, Towns, Counties, NOAA	BRWA Culvert Program Partnership
B. Implement conservation practices associated with waterway crossings.		X		X	X									
1. Implement current programs.									ST/CP, UW	S	Improve 2-5 waterway crossings per year	$10,000-$50,000 per year	Farm Bill, DATCP	NRCS, County LWCDs, UWEX, farmers

Table 5.2. Marengo River Watershed 10 Year Action Plan														
Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
C. Evaluate upland flow attenuation for road system.	X	X			X									
1. Evaluate road and trail drainage systems and their impact on peak flows as part of modeling analysis in action 2.A.1.	X	X			X				ST/CP, UW	S	See action 2.A.1	See action 2.A.1	See action 2.A.1	See action 2.A.1
4. Reduce bluff/streambank erosion.		X		X	X			X						
A. Stabilize eroding bluffs/streambanks.*		X		X	X			X						
1. Restore priority sites using BRWA survey.		X			X		X	X	ST/CP, UW	S	2 priority bluffs stabilized in 5 years.	$30,000 - $100,000 per site	GLRI, GLC, USFWS, NFWF	USGS, universities, County LWCDs, BRWA
2. Quantify sediment loading from key areas of watershed.		X			X		X		ST/CP	S	USGS stream gage near watershed outlet in 5 years.	$15,000/ year	USGS, GLC	USGS, universities, BRWA, Bad River
3. Survey additional streams with erosion issues.		X			X		X		ST/CP	S	Survey other major tribs. In 5 years.	$5,000	Fndations, NFWF	BRWA

Table 5.2. Marengo River Watershed 10 Year Action Plan														
Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
4. Educate landowners, developers, and contractors about proper streambank and shoreline erosion control techniques to protect water quality.		X			X		X			M				BRWA, UWEX, County LWCDs
5. Implement agriculture conservation practices that improve manure storage and management.				X			X	X						
A. Implement South Shore Nutrient Management Farmer Education Program				X			X	X	ST/CP	S				
1. Increase local capacity to implement program.				X			X	X	ST/CP	S	2 new nutrient management plans completed per year.	$28/acre + staff time	Farm Bill, DATCP	NRCS, County LWCDs, UWEX, farmers
2. Conduct survey to determine compliance. and implementation				X			X	X	ST/CP	S	All completed plans are implemented.		Farm Bill, DATCP	NRCS, County LWCDs, UWEX
B. Implement current programs to increase manure storage.														
1. Increase local capacity to implement program.				X			X	X	ST/CP	S	5 new or updated manure storage structures.	$28/acre + staff time	Farm Bill, DATCP	NRCS, County LWCDs, UWEX, farmers

Table 5.2. Marengo River Watershed 10 Year Action Plan														
Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
6. Inventory and replace failing, poorly designed, and poorly functioning private on-site sewage treatment systems (POWTS).				X				X						
1. Complete state mandated POWTS inventory.				X				X	ST/CP, UW	S	Completed inventory.	$15000-$25000		County Zoning, LWCDs
2. Replace/update priority sites.				X				X	ST/CP, UW	S	1 priority site updated per year.	$10000-$15000		County Zoning Depts., WDNR, Bad River, Towns, private landowners
3. Develop electronic database and tracking capability for POWTS in Ashland Co.				X				X	ST/CP, UW	M	System completed and operational.			Ashland Co. Zoning
4. Continue to implement Bad River and Bayfield Co. POWTS update and maintenance programs.				X				X	ST/CP, UW	S	Continued support and implementation of program.			Bayfield Co. Zoning
7. Ensure POWTS are maintained on a regular basis.				X				X						

Table 5.2. Marengo River Watershed 10 Year Action Plan														
Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
1. Continue to implement Bad River and Bayfield Co. POWTS update and maintenance programs.				X				X	ST/CP, UW	S	See Action 4 in previous			
2. Develop program in Ashland Co.				X				X	ST/CP, UW	M	County Board support for funding program.			
8. Restore floodplain connectivity in incised reaches and reaches with excessive overbank sedimentation.	X	X			X			X						
A. Legacy sediment/levee scrapes.		X			X			X						
1. Identify and map key areas of overbank sedimentation.		X			X			X	ST/CP	M	Map of priority areas completed.	~$10,000 - $15,000		USGS, universities, County LWCDs, BRWA
B. Grade control/stabilization		X			X			X						
1. Identify and map key areas of channel incision.		X			X			X	ST/CP	M	Map of priority areas completed.	~$10,000 - $15,000		USGS, universities, County LWCDs, BRWA
C. Raise stream bed.		X			X			X						

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Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
1. Identify locations using stream channel surveys.		X			X			X	ST/CP	M	Map of priority areas completed.	~$10,000 - $15,000		USGS, universities, County LWCDs, BRWA
9. Increase stream channel roughness.														
A. Add natural material such as coarse woody debris, rock					X			X						
1. Develop map of priority areas. Utilize Dumke (2009) study for guidance.					X			X	ST/CP, UW	M	Map of priority areas completed.	~$10,000 - $15,000		USGS, universities, County LWCDs, BRWA
10. Strengthen local zoning ordinances and encourage practices that protect watershed health while meeting development needs.				X	X		X	X						
1. Review current ordinances and identify gaps in water resource protection.				X	X		X	X	ST/CP, UW	S	Complete NR 115 update		Local govts.	Bad River, County Zoning, UWEX
2. Develop model ordinances that protect water quality where they do not exist.				X	X		X	X	ST/CP, UW	M			Local govts.	Bad River, County Boards, UWEX

Table 5.2. Marengo River Watershed 10 Year Action Plan														
Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
3. Work with local governments to amend current ordinances or adopt new ordinances to protect water quality.				X	X		X	X	ST/CP, UW	L				Bad River, County Boards, UWEX
4. Educate landowners and developers about good riparian and shoreline property management.				X	X		X	X	ST/CP, UW	S				UWEX, Bad River, County Zoning/ LWCDs, BRWA
5. Provide water quality information to local decision makers to promote responsible and effective decision-making on watershed issues.				X	X		X		ST/CP, UW	S			Local govts.	UWEX, Bad River, County Zoning/ LWCDs, BRWA
11. Identify available and potential habitat for terrestrial and riparian species of conservation interest.					X	X	X							
A. Riparian and upland habitat assessments.*					X	X	X							
1. Conduct terrestrial habitat surveys.					X	X	X		ST/CP	S	Completed report & recommendations for actions.		WDNR State Wildlife Grant	Conservation groups, universities, WDNR, Bad River

Table 5.2. Marengo River Watershed 10 Year Action Plan														
Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
2. Identify and monitor species of conservation interest.					X	X	X		ST/CP, UW	M	Monitoring program fully funded.		WDNR State Wildlife Grant	Conservation groups, universities, WDNR, Bad River
3. Develop or update strategic conservation plan using habitat assessment data.					X	X	X		ST/CP, UW	M	Data used for protection of critical habitats & species.	$5,000	WDNR State Wildlife Grant	Land trusts, WDNR
12. Identify available and potential habitat for aquatic species of conservation interest.			X		X	X	X							
A. Identify perennial streams.			X		X	X	X							
1. Conduct baseflow survey.			X		X	X	X		ST/CP	S	100% of perennial streams surveyed.	$5,000	Fndations, cons. groups	BRWA, USGS, universities, Bad River
2. Collect water temperature data to identify cold, cool, and warm water habitat.			X		X	X	X		ST/CP	S	100% of perennial streams surveyed.	$15,000-$20,000	Fndations cons. groups, WDNR	BRWA, USFWS, universities, Bad River
B. Conduct aquatic habitat assessments.*					X	X	X							

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Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
1. Identify and survey species of conservation interest & habitats.					X	X	X		ST/CP, UW	S	Monitoring program fully funded.	$25,000-$50,000/ yr	WDNR Wildlife Grant, USFWS	BRWA, USFWS, universities
2. Develop or update strategic conservation plan using habitat assessment data.					X	X	X		ST/CP, UW	M	Data used for protection of critical habitats & species.	$5,000	WDNR Wildlife Grant, USFWS	Land trusts, WDNR
13. Secure protection of priority riparian, aquatic, and terrestrial conservation areas and habitats.				X	X	X	X	X						
A. Special Designations				X	X	X	X							
1. Establish clear protocol for utilizing volunteer and other aquatic and terrestrial habitat data for state and/or tribal special use designations (sucha s ORW/ERW).				X	X	X	X		ST/CP, UW	S	BRWA programs updated & data used for designated use evaluations.	$5,000	WDNR, Fndations	WDNR, Bad River, BRWA
2. Collect water quality and habitat assessment data and evaluate data for special use designations.				X	X	X	X		ST/CP, UW	S	Assessment report & designated use recommendations	$50,000	WDNR, Fndations	WDNR, Bad River, BRWA

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Recommendations	**Reduce peak flows by 50%**	**Reduce sediment by 50%**	**Understand groundwater**	**Water meets criteria**	**Improve, maintain habitats**	**Special designations**	**Outreach/ Citizen Involvement**	**Recreation**	**Location**	**Time Frame**	**Measure of Success**	**Cost Estimate**	**Funding**	**Implementation**
3. Recommend and encourage water bodies or terrestrial areas for state and or tribal special designation status.				X	X	X	X		ST/CP, UW	S	List submitted to NR Board, Tribal Council.	$5,000	WDNR, Fndations	WDNR, Bad River, BRWA
4. Evaluate special designation status on a regular basis.				X	X	X	X		ST/CP, UW	M	Monitoring programs fully funded.	$30,000/ yr	WDNR, Fndations	WDNR, Bad River, BRWA
5. Continue to improve and implement BRWA Volunteer Water Quality Monitoring Program: Recruit and train additional volunteers, support new and current volunteers, improve communication with volunteers to ensure long-term viability of the program.				X	X	X	X		ST/CP, UW	S	Recruit 10 new volunteers per year	See 13.A.4	Fndations, local contributi ons	BRWA, WDNR, Bad River
B. Land acquisition/Conservation easements					X	X	X	X						
1. Complete strategic conservation plan for Ashland Co.					X	X	X	X		S	Completed plan	$10,000-$15,000	Fndations, WDNR	Land trusts
2. Increase outreach and opportunities for landowners to learn about and implement land protection options.					X	X	X	X	ST/CP, UW	S	5 Conservation easements, other land management agreements completed per year.	$30,000/ yr	Fndations, USFWS	UWEX, Land trusts, WDNR, private landowners

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C. Tax incentives to maintain ecosystem services.				X	X	X	X	X						
1. Complete value assessment of watershed ecosystem services.	X	X	X	X	X	X	X	X	ST/CP, UW	L	Completed value assessment			USEPA ORD, universities
2. Integrate ecosystem valuation into local tax code.	X	X	X	X	X	X	X	X	ST/CP, UW	L	1 local govt. conducts pilot project.			UWEX, Bad River, Towns, Counties
14. Restore and improve priority aquatic and terrestrial habitats.					X			X						
A. Dam inspections/removals.*					X			X						
1. Utilize WDNR decision-making process outlined at: http://dnr.wi.gov/org/water/wm/dsfm/dams/removal.html					X			X	ST/CP, UW	M	All large dams inspected, recommendations on repair/ removal	Staff time		WDNR
15. Inventory and control invasive species.					X		X							
A. Increase and improve surveys and monitoring.					X		X							

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1. Continue coordination among agencies and capacity support for working on invasive species through the Northwoods Cooperative Weed Management Area (NCWMA).					X		X		ST/CP, UW	S	1. Full-time NCWMA coordinator. 2. Ashland Co. Invasive Species Coordinator.	1. $45,000-$50,000 2.	NFWF, USFS, GLRI	NCWMA
2. Continue to implement and improve training and education opportunities for right-of-way managers, land managers, and landowners on invasive species identification, prevention, and treatment options.					X		X		ST/CP, UW	S	Each watershed Town has invasive species management plan	$25,000	NFWF, WCMP, USFS	NCWMA
B. Control terrestrial and aquatic infestations with established control methods.*					X		X							
1. Develop SWAT teams or other dedicated capacity to conduct treatments.					X		X		ST/CP, UW	S	Annual seasonal full crew, project manger, vehicle, supplies	$200,000 - $300,000	GLRI	NCWMA

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2. Treat invasives based on risk, cost, and opportunities.					X		X		ST/CP, UW	S	1. No prohibited species in watershed. 2. No new species introduced to watershed.	Included in 15.B.1	Included in 15.B.1	NCWMA
3. Identify use for invasive woody biomass removed through treatment.					X		X			M	Use identified and promoted by NCWMA	Included in 15.A.1	Included in 15.A.1	NCWMA, UWEX
16. Develop and encourage market-driven solutions to conservation on agriculture and forest land.				X	X		X							
A. Explore upland agroforestry options.				X	X		X							
1. Expand research test trials.				X	X		X		ST/CP	S	Develop plan to implement field trials based on research results		Private companies, GLRI, WDNR	UWEX, universities, County LWCDs, AERC, farmers
2. Develop Discovery Farms or willing farmers and landowners to provide research and demonstration sites.				X	X		X		ST/CP	L	Establish research trial at 1 watershed farm.			County LWCDs, Land Trusts

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B. Explore opportunities under Wisconsin's Working Lands Initiative.							X		ST/CP	L	Farmland preservation agreements or easements with landowners	$20,000	Fndations, private donations	County LWCDs, Land Trusts, UWEX
17. Coordinate and increase opportunities for proper household hazardous waste, pesticides, pharmaceuticals, white goods (stoves, refrigerators, etc.), and tire disposal.				X			X							
1. Scope interest and set up meeting to discuss possibilities.				X			X		ST/CP, UW	S	Host one meeting		NWRPC, WDNR	Towns, Counties, UWEX, NWRPC
2. Hold household hazardous waste disposal event.				X			X		ST/CP, UW	S	One HHW within 2 years; then annually			Towns, Counties, UWEX, NWRPC
18. Remediate existing brownfield sites and leaking underground storage tanks.				X										
1. Complete cleanup at Four Corners site.				X					Site specifi c	S	Cleanup completed within 5 years.		WDNR	WDNR
19. Identify and close abandoned wells.			X	X										

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1. Implement current programs.				X					ST/CP, UW	S	Close 1-5 abandoned wells in 5 years			County LWCDs, WDNR, NRCS
20. Map groundwater flow, quantity, and recharge areas.			X											
1. Identify project lead, submit proposal, focus in areas with potential mining impacts.			X						UW	M	Completed map			USGS, UWSP Groundwater Center
21. Develop drinking water and private well monitoring program.			X	X			X							
1. Coordination meeting among partners to discuss options, develop proposal.			X	X			X		ST/CP, UW	M	Pilot project implemented			County LWCDs, UWSP Groundwater Center, BRWA
22. Increase general public's awareness and knowledge of water quality and watershed health.														

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1. Continue to develop and distribute the "Marengo Riffles" newsletter to keep public informed re: the Partnership, updates related to plan implementation, and opportunities for involvement.							X			S	2-3 times per year	$600/ issue		BRWA, UWEX
2. Hold watershed tours and/or field trips							X			S	1 annually			BRWA, UWEX, SIGO, Project Partners
3. Present at community events or host additional informational events at local establishments in the watershed.										S	Attend one established event/ yr; host one additional event/ yr	$300 per event hosted	Fndations, local contributi ons	BRWA, Project Partners
4. Increase general publicity about implementation projects i.e. press releases in Daily Press or partner organization newsletters; BRWA website; LSBPT website							X			S	Distribute 2 press releases annually			BRWA, UWEX
5. Improve and maintain MRWP Project website for outreach and information on citizen involvement activities; link to LSBPT website.							X			S	Update website quarterly	$1500/ yr		BRWA, UWEX

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6. Develop and distribute information on water quality threats to fish and fishing.							X	X		S				UWEX, WDNR, BRWA
23. Increase public participation in general watershed stewardship activities.							X							
1. Host river clean-up in the Marengo River or other tributaries.							X			M		$2,500		
2. Work with Marengo Valley School to engage students and families in water resource activities.							X			S		$5,000		BRWA, UWEX, TU
24. Reduce pollution that impacts the watershed by providing practical knowledge to key watershed audiences.														
1. Host "Learn from your Neighbor" informational gatherings to learn what citizens are doing on their land to protect land and water (i.e. conservation easement, BMP implementation, participation in landowner incentive program, etc.)							X			S	First event in year 1; then at least 1 annually			BRWA, UWEX, County LWCDs
25. Develop and improve recreational opportunities for all types of users. for all types of users.*							X	X						

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1. Meet with local user groups to identify needs and project interests.							X	X		M	Hold meeting, identify list of needs	Volunteer		Local user groups, cons. groups, WDNR, USFS
2. Develop informational brochures or similar to promote recreation (i.e. canoeing fact sheets, locations of access points, etc.)							X	X		M				WDNR, TU, Local user groups
3. Organize fishing and hunting events.							X	X		S	1 scheduled event per year	Volunteer		Local user groups, Cons. groups
26. Resolve conflicts related to wildlife management.					X			X						
1. Hold annual event reporting on state of deer, turkey, fish, and other game populations and habitats to encourage discussion on management issues and concerns.					X			X		L	1 scheduled event per year	Volunteer		Cons. groups, WDNR

5. WATERSHED OUTREACH AND CITIZEN INVOLVEMENT

5.1 OUTREACH AND CITIZEN INVOLVEMENT IN THE PLANNING PHASE

Involving watershed citizens in the planning process to develop the Marengo River Watershed Action Plan was a very important part of the MRWP Project. Efforts were made to engage watershed stakeholders in the process of creating the Watershed Action Plan, and to foster water and natural resource stewardship in watershed citizens through project outreach. A Citizen Involvement Team (CIT) was formed to identify the concerns and interests of local citizens related to the land and water resources in the watershed, and identify outreach and citizen involvement opportunities for watershed citizens (a more complete description of the CIT is in Chapter One).

Various opportunities for citizen involvement were created to appeal to different levels of interest. Through the outreach and citizen involvement activities, citizens contributed either water quality data, their vision for the future of the watershed, issues and concerns about the watershed, as well as identifying specific project ideas and their locations in the watershed. The following is a summary of the outreach and citizen involvement activities that were conducted for the MRWP Project. The citizen input received was translated into action items and incorporated into the Watershed Action Plan.

"Marengo Riffles" Newsletter

The CIT with input from citizens at the December 2009 MRWP Project Partners meeting collaborated to create a newsletter specific to the MRWP Project. In a rural community where its residents are widespread, or absentee, it was recommended by some local residents that a mailing piece was needed to keep landowners informed of project happenings. Two editions of the "Marengo Riffles" newsletter were distributed, one in February 2010 and another in September 2010. The newsletter was mailed to over 1,100 property owners that own land within the Marengo River Watershed. Many positive comments were received from residents that they would like to see the newsletter continue as the Watershed Action Plan continues into the implementation phase.

Community Events

BRWA staff attended several community events to present a display on the MRWP Project and talk with citizens about their issues and concerns for the watershed. Certain events were also attended to learn more about land use and water quality issues in the Lake Superior Basin. Events attended were:

- "Coffee and Conversation" at Four Corners Saloon
- Bay Area Farm and Garden Show
- Wild Rivers Chapter of Trout Unlimited fundraiser
- "Learn About Your Land" Woodland Owner Class Series
- "Critical Issues in the Forest Industry" Conference and Workshop
- Bayfield Regional Conservancy and Living Forest Cooperative Forest Landowner Workshop

- “Slow the Flow: Forests, Water Quality, and Land Management in the Lake Superior Basin” Workshop

“Make Your Mark on the Marengo” Watershed Map and Project Ideas

BRWA staff developed a traveling watershed map display to take to community events as a visual aide to help citizens think of projects they would like to see occur in the watershed. Sticker “dots” were provided for citizens to mark their project location in the watershed. The “dots” were numbered and a corresponding numbered card was filled out to give more detail on the location of the project and a project description. The contributors contact information was also included so that they could be contacted at a later date if BRWA staff had questions about their idea. Nearly 140 projects were submitted, and fit into one of the following categories: 1) streambank erosion, 2) road/culverts, 3) habitat, 4) education & outreach, 5) waste disposal, 6) economy, 7) invasive species, 8) monitoring, 9) recreation, 10) streamside buffers, and 11) special designation (Figure 5.2).

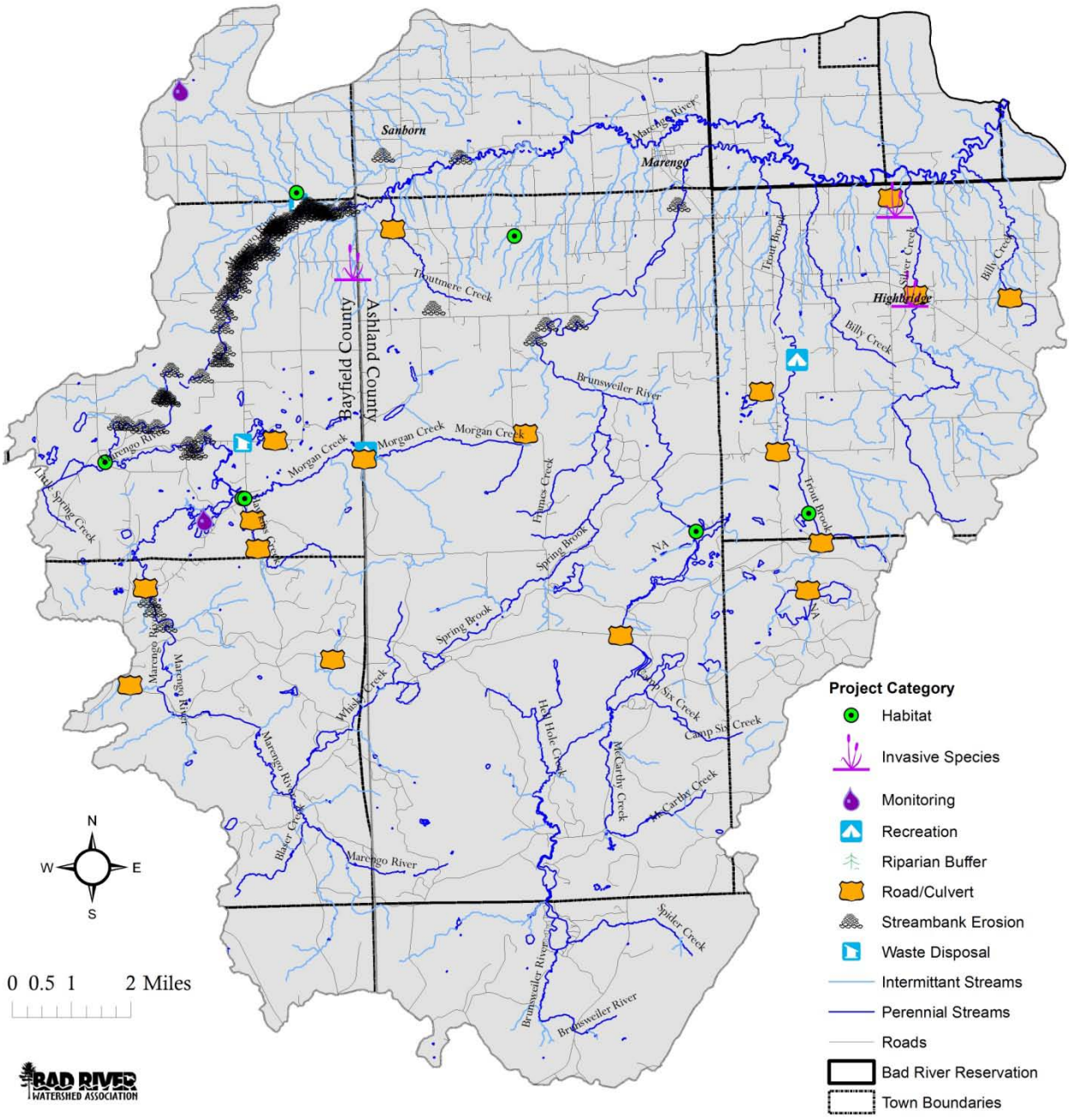

Figure 5.2. "Make Your Mark on the Marengo" Watershed Map with project ideas gathered via citizen input. Project ideas are incorporated within the actions of the Action Plan table.

Project Website

In the winter of 2010, project webpages were created on BRWA's website to provide information to the public during the development of the Watershed Action Plan for the Marengo River Watershed. Topics covered on the website include:

- A general description of the watershed and the MRWP Project
- MRWP Project meeting announcements, notes, and presentations
- The draft Marengo River Watershed Action Plan
- Events and participation opportunities related to the MRWP Project
- Links of interest related to the Marengo River Watershed

The website is located at www.badriverwatershed.org.

Project Partner Community Meetings

The MRWP Project Partner Community meetings were convened to work on parts of the Watershed Action Plan, and to inform the public of the status of the project. Six community meetings were held in different locations in the watershed (August, December 2009; March, June, October, December 2010). Over 150 people attended the MRWP Project Partner Community Meetings.

At the MRWP Project Partner community meeting held in December 2009, agency representatives and interested citizens came together to learn about the project and the process of action plan development. The first contributions of citizen input were gathered at this meeting through a visioning exercise facilitated by Ruth Oppedahl, Lake Superior Basin Educator with the UW-Extension. Notes from the Vision Statement exercise can be found in Appendix A. The CIT developed drafts of a vision statement and presented these at the MRWP Project Partners meeting in March 2010 for comment. The vision statement appears in several locations throughout the Watershed Action Plan.

Volunteer Water Quality Monitoring and Stream Assessments

Water quality monitoring is the flagship program of BRWA, and one of the ways the organization has involved citizens in protecting and caring for their home watershed. As part of the MRWP Project, water quality monitoring in the Marengo River Watershed was continued with the work of water quality volunteers. Ten sites were monitored on the Marengo River and its tributaries. Data was collected by citizens for water chemistry, bacteria, and macroinvertebrates.

Additional sites on Marengo River tributaries were monitored by Sharon Anthony's May 2009 and 2010 term Ecological Chemistry classes at Northland College. Students from this class were able to sample seven additional sites and collect data on water chemistry and bacteria. Additionally, a new citizen involvement field activity was initiated with the MRWP Project. Volunteers helped conduct stream assessments during "Get to Know Your Watershed" field days on the Marengo River to identify eroding banks, depositional areas, and beaver dams and/or log jams that are impeding flow on the river. Nineteen volunteers spent 12 days in the field collecting data that is used in the Watershed Action Plan to identify sites in need of restoration.

Local Community Survey Review and Summary

One tool that BRWA used to assess the interests and concerns of watershed citizens are the

local community surveys that have been conducted over the last few years. Community surveys have been conducted in Ashland County (2003) and Bayfield County (2008) for the purposes of comprehensive plan development. A survey of woodland landowners in the Lake Superior Basin was conducted by UW-Extension and WDNR (2009) to learn more about their forest activities and effects on water quality in the Lake Superior Basin, of which the Marengo River Watershed is a part. Information that was relevant to towns within the Marengo River Watershed was selected out, and reviewed and summarized to capture thoughts related to land and water resource protection.

General themes that emerged from this review include:

- Local citizens recognize the importance of and care about protecting land and water resources in the area.
- Keeping the watershed natural, preserving wild and scenic characteristics, and maintaining rural character of the area are very important.
- Many citizens feel that water resources are currently in pretty good shape, but are concerned about more visible pollutants such as trash and litter, rather than sediment and nutrients that are less visible.
- Preserving or improving water quality is important to local citizens. In general, water quality was valued more than economic development. However, willingness to pay as an individual for water protection is of concern even though citizens agree it is important.
- Agricultural lands are favored just as much as lakes, rivers, and wetlands to local citizens.
- Land use and agricultural, natural, and cultural resources ranked of higher importance than economic development (at least, in the Bayfield County towns).

A more detailed report of the findings of this local community survey review and summary can be found in Chapter One of the Watershed Action Plan.

MRWP Project Survey

BRWA developed a simple questionnaire to learn more from Marengo River Watershed landowners how they use the watershed and what their concerns might be for watershed health. The questionnaire was mailed to 1,100 Marengo River Watershed landowners in the spring 2010 issue of the Marengo Riffles, a newsletter developed to inform the public about the MRWP Project. The questionnaire was also made available on BRWA's website to respond online, and was made available at events that BRWA attended to promote the MRWP project. We received 18 responses to the questionnaire (n=13 mail or event responses, n= 5 online responses).

The first question in the MRWP Project Survey asked respondents about what types of things they do in the watershed. Fishing was the most common response for what people do in the watershed (22%), followed by hiking (18%) and hunting (15%) and canoeing (15%) (Figure 5.3).

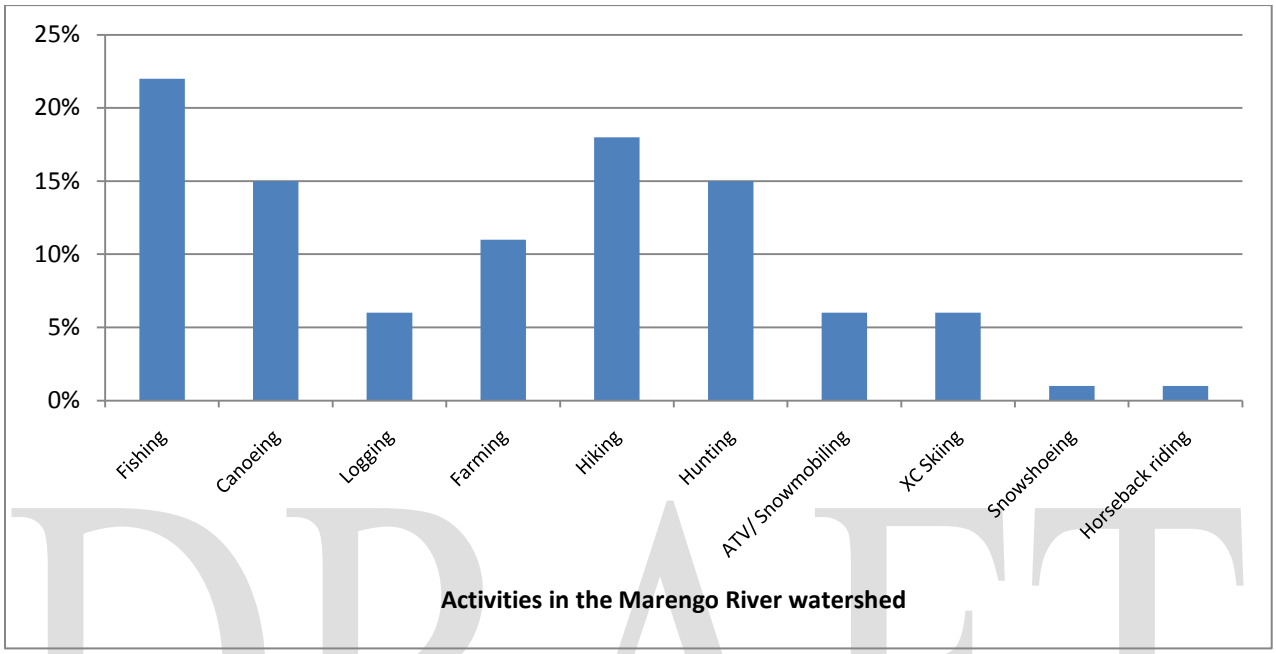

Figure 5.3 Responses to the BRWA MRWP Project Survey when asked "indicate the types of things you do in the watershed."

When asked about the most common water quality concerns in the watershed, bank erosion (19%) was the most common concern (Figure 5.4). Other important concerns were invasive species (14%) and bacteria contamination (14%), as well as degraded fish habitat (13%), development (13%), and poor water quality (13%). Drained wetlands were also of concern (8%), and some indicated flooding, deforestation, and drought.

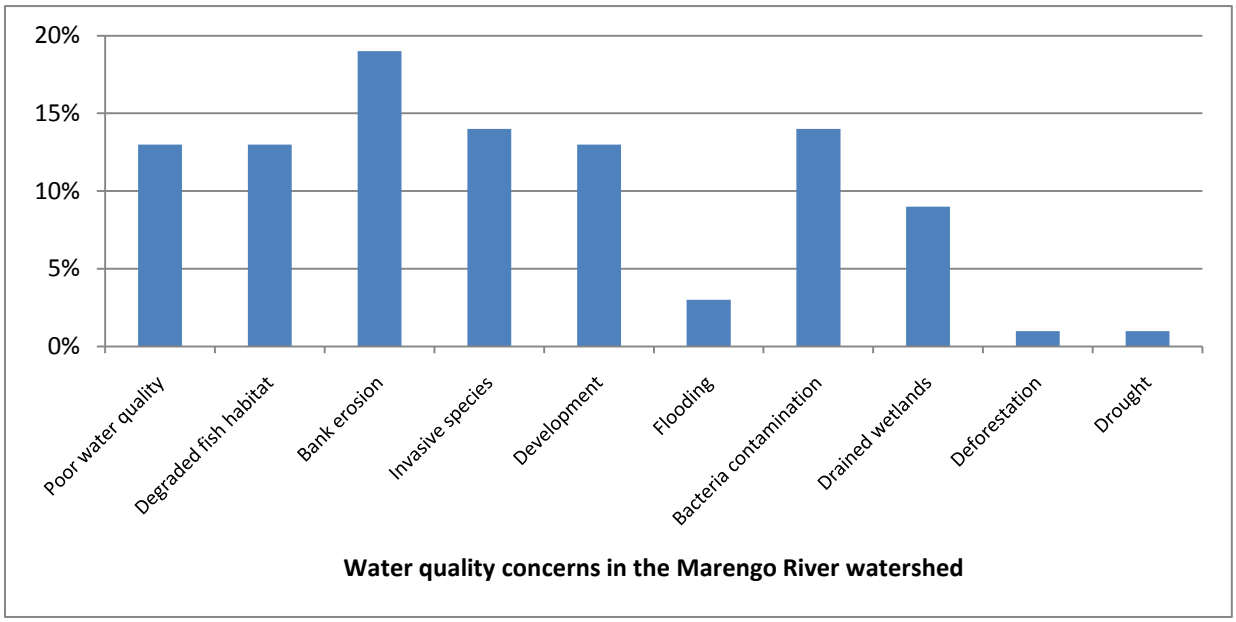

Figure 5.4 Responses to the MWRP Project Survey when asked "indicate what your concerns are about the quality of the watershed."

When asked about hopes for the watershed into the future, responses were consistent with other area community surveys, and input we have received to date for developing the vision statement for the Watershed Action Plan. Themes emerged of maintaining rural character, keeping the watershed natural and wild, preserving scenic qualities, limited and careful development, and preserving or improving water quality.

Respondents were also asked to submit ideas for projects that would protect the health of the watershed. Most responses were general and did not indicate real specifics or project locations in the watershed. However, suggestions indicate support for projects such as:

- Educational opportunities or programs for farmers to help reduce chemical use on farms; also conservation programs for farmers to help keep cattle out of creeks or improve manure management
- Working with local government and agencies for stronger enforcement of ordinances, rules and regulations
- Improved help for landowners to protect stream banks and control erosion
- Invasive species control or eradication
- Nonpoint source pollution control
- Drinking water testing

An additional comment was the importance of partnering with the US Forest Service, particularly in relation to issues in the headwaters of the watershed, of which the majority is a portion of the Chequamegon-Nicolet National Forest.

Site visits and one-on-one interviews

Town leaders and road crews: One of BRWA's most well-known programs, particularly in working with local towns, is the Culvert Inventory and Restoration Program. BRWA has worked to inventory and restore problem culverts that were having a negative impact on fish passage and contributing sediment to streams at road/stream crossings. This program has provided a benefit not only to water resources, but also to towns with limited budgets that have roads and culverts to maintain. BRWA staff visited with town leaders from six towns in the Marengo River Watershed and talked to 23 people, including representatives from the town boards and road crews. These meetings were held to identify town concerns with culverts or road maintenance that could be addressed in the Marengo River Watershed Action Plan.

At these meetings, priority culverts were identified based on inventory data and the on-the-ground knowledge of the road crews, as well as road maintenance schedules and what the towns have planned for maintenance in the upcoming years. Issues with road shoulder erosion were also discussed and areas in need of help were identified. Another topic of discussion for towns was waste disposal. Garbage and recycling options are typically good, but tire disposal is an issue for many towns. Since this seemed to be a common issue, there is great potential for towns to partner together to resolve this and conserve resources and cost. Another potential area for towns to partner together and should be explored through the Watershed Action Plan is landowner education and assistance with septic system maintenance. Support for this at the county level differs between Ashland and Bayfield County, and so more proactive measures taken by the towns could help with this issue.

Farmers: Agricultural use in the Marengo River Watershed accounts for 2% of the land use, however, many of the watershed residents' livelihoods depends on agricultural uses. Farming in the watershed includes primarily beef and dairy farming, although there are some vegetable crops farmed as well. A selection of farms was visited in the watershed to identify common issues and concerns related to farming in the watershed, and to see their farming operations firsthand. BRWA staff visited seven farms (3 conventional beef farms, 3 conventional dairy farms, and one USDA certified organic vegetable and fruit farm). Detailed notes from individual farm visits are included in Appendix C.

Generally, there is a great effort being made by local farmers to be good stewards of the land. One example noted by farmers is that many are now keeping their cattle out of ravines, unless there is a pressing need to do otherwise. Some of the farmers visited said that the ravines are in better shape than they used to be because people are more aware. Farmers all want to do the right thing, and keep a good image and be good neighbors. Nutrient management, such as manure spreading and storage is an issue. Many farmers have nutrient management plans, but actually implementing them and getting assistance from UWEX or other government agencies is

where the plans fall short due to limited staffing and budgets. In fact, participation by farmers in government conservation programs is virtually none in this watershed. There are only two farms that are enrolled in CREP (Conservation Reserve Enhancement Program). The general feeling by the farmers we talked to is that they do not have enough time to learn about available programs, that the financial incentives are not enough to make it worthwhile, and there is too much red tape and restriction to get through. There is interest though by farmers in the Marengo to do conservation practices, such as restoring wetlands on their property where they are no longer farming, but perhaps other means besides government programs should be explored to provide additional options and alternatives.

The economics of farming is an issue in the Marengo River Watershed, as it is across the country. In the Marengo, economics are driving farms to change from dairy to beef. Or in the case of dairy farming, there is pressure to increase the number of cows to keep up with competition, even though there is no profit increase from doing so because milk prices are down. Also as farmers increase in age, not many children are taking over because farming is not economically viable. There is concern about what the future of farming may be in the Marengo if there are no young farmers to take over. An alternative to the more conventional farms in the watershed is the USDA certified organic farm that is operating with a CSA (community supported agriculture) model. We discussed if the CSA model would work well for other small farms in this area. This may not be a viable option for many farms, in that currently there is not enough demand for the food products. The one CSA has difficulty selling all of its shares for a year, and with multiple farms there may not be enough demand to support all of them. However, a more cooperative model (i.e. South Shore Meats, Pasture Perfect Poultry) is something that could work well for small farms in the watershed, and is something that is currently being implemented by some farms in the area.

Educators: The watershed has one public school, and several groups of rural home-school families. The Marengo Valley Elementary School is part of the Ashland Public School system and is a K-5 school that has about 180 students that live throughout the watershed. The MVS also has an active Home and School Association that brings together MVS staff and parents to discuss school activities. BRWA staff met with the co-principals of the MVS to discuss the MRWP Project and learn more about how watershed concepts are incorporated into the curriculum. Watersheds and water quality concepts are currently not covered specifically in a "water unit", but the school is receptive to working with a group like BRWA or partner organizations to make the watershed connection, particularly as it can relate to multiple disciplines (English, art, etc. in addition to science). Opportunities to engage the students (and families through the Home and School Association) in water quality monitoring or other water resource activities should be explored.

Foresters and Loggers: Forests are a major land use in the Marengo River Watershed (cover ~75% of the basin) and thus, the management of forests plays a critical role in water quality. In developing the Watershed Action Plan, we have the goal to maintain a healthy watershed, while recognizing that people utilize forest products to make a living. As part of this, we worked to capture ideas, concerns, tools, and projects related to forestry. BRWA staff talked with local

foresters and a small, private logger, as well as attended and received information at a conference in Ashland that addressed "Critical Issues in the Forest Industry" in Wisconsin.

In northern Wisconsin, the forest industry has suffered the effects of the economic downturn, leading to a number of paper and sawmill closures. The number employed in the industry has dropped from about 100,000 in 1996 to about 66,000 today. The "big players" in the local market for timber (such as Flambeau Paper, Xcel Energy, Sappi, etc.) seek to ensure they have enough raw materials to meet the demands for their industry. Because of their size, they can bid higher on area timber sales, which puts small loggers at a huge disadvantage because the larger companies have the market control.

The private logger we talked to discussed the low-impact logging services he provides to Ashland and Bayfield county clients. Despite having to compete with larger companies for work, He has strived to reduce negative impacts of his operation through close adherence to the Wisconsin DNR's Best Management Practices (BMPs). This is a set of voluntary guidelines that have been developed to lessen environmental damage associated with logging, including soil compaction, non-harvested tree damage, and erosion. He also described his struggles to make ends meet as a "small guy" who is competing against big economic forces. For an independent logger, he has lots of overhead to cover, such as the cost of owning his own equipment. To keep up with the larger businesses he has to own comparable equipment, and with increasing fuel costs, it is difficult to cover costs and come out ahead to make a living. A niche he can fill as a private logger is small firewood cuts. He is often is looking for small sales that the bigger companies won't consider, which helps with getting some work.

In general, it seems like the industry has accepted some level of "sustainable" harvest and third party certifications, such as FSC (Forest Stewardship Council) or SFI (Sustainable Forest Initiative). While these often can be cumbersome and time intensive, they do provide a baseline for timber harvest practices. According to one forester we talked to, probably the worst forest management practices are typically happening on lands that are not federal or state forest, not in an MFL program, or not subject to third-party certifications. In the Marengo, there is very little forest land that does not fit in one of these categories, therefore the feeling is that forest management is done pretty well in the watershed.

Biomass production for fuel is often discussed and looked to as a way to revive the forest industry and contribute to more use of renewable energy. However, the current information states that biomass production produces a fraction of the amount of jobs as does a paper mill. One representative from Flambeau Paper talked about how at their mills they are developing on-site biorefineries that can produce fuel for the operations, which may be one way that may ensure the viability of paper mills into the future. WDNR has developed biomass guidelines that recommend you need to leave about 30% of the biomass on the land to not degrade soil quality, however this varies depending on soil type. In Wisconsin, there currently appears to be enough biomass availability to support the major industries that are currently vying for raw material, such as Xcel Energy, Flambeau Paper, and wood pellet mills. It was concluded though from the remarks at the conference that using woody biomass will only be a small part of the

renewable fuel solution, and that there just isn't enough available in Wisconsin for significant fuel production on a larger scale.

Public Comment Period on Watershed Action Plan
The public was invited to review and provide comment on the draft Watershed Action Plan. The review and comment period was announced in the fall issue of the "Marengo Riffles" project newsletter, BRWA's fall newsletter, on the BRWA website, as well as announced at the MRWP Project community meeting on October 7, 2010. The announcements described how and when the draft plan could be accessed and how comments could be submitted. After the comment period ended (November 12, 2010), the Watershed Action Plan was revised according to the comments received during this period. A final draft of the plan was presented to the public at the MRWP Project Partners Community Meeting on December 16, 2010.

5.2 COMMUNICATIONS PLAN

A communications plan for the Marengo River Watershed was initially developed as part of the MRWP Project for the planning phase of the project, and later adapted for the implementation phase. A goal, objectives, target audiences, and messages for the watershed were developed as well as a strategy to implement the communications plan. Pieces of the plan were developed by the citizen involvement coordinator and discussed and reviewed by members of the Citizen Involvement Team and BRWA staff.

5.2.1. GOAL AND OBJECTIVES OF THE COMMUNICATIONS PLAN

The goal of the communications plan is to ensure that citizens of the Marengo River Watershed are active and engaged in maintaining the integrity of the watershed.
The objectives of the plan are to:

1. Establish outreach and citizen involvement efforts to reduce pollution that impacts the Marengo River Watershed;
2. Increase general public's awareness and knowledge of water quality issues and watershed health;
3. Increase public participation in watershed stewardship activities;
4. Reduce pollution that impacts the watershed by providing practical knowledge to key watershed audiences; and
5. Increase citizen involvement opportunities that results in restoration, preservation, and protection of watershed health.

5.2.2 TARGET AUDIENCES AND MESSAGES

After developing a goal and objectives for the communications plan, the CIT discussed key audiences in the watershed. Based on the current knowledge of audiences in the watershed and their behaviors, outreach messages were developed. The target audiences and messages are listed here:

Households/ General Watershed Citizens

1. Watershed awareness: preserving sense of place and rural character of the watershed
2. Responsibility to care for the watershed: the water cycle, our land and water resources, and how we impact them
3. Healthy watershed for our children and future generations
4. Help protect water quality and your investment
5. Septic system maintenance

Private Woodland Landowners

1. Watershed awareness: preserving sense of place and rural character of the watershed
2. Responsibility to care for the watershed: the water cycle, our land and water resources, and how we impact them
3. Healthy watershed for our children and future generations
4. Good forestry practices means good hunting and fishing
5. Controlling spread of invasive species and invasive species management

Local Officials

1. Good land use decisions protect quality of life (rural character), property values, and water quality
2. Participation in Watershed Action Plan network (the MRWP)
3. Coordinate comprehensive plans and planning issues with neighboring towns
4. Identification and protection of key features and habitats: aquatic buffers, woodlands, wetlands, steep slopes, etc.

Farmers/ Agricultural Community

1. Watershed awareness: preserving sense of place and rural character of the watershed
2. Impacts of livestock in streams, livestock waste, and mitigation options
3. Advantages of and opportunities for vegetated buffer and filter strips
4. Impact of tillage methods/Importance of agricultural soil erosion and sedimentation control practices
5. Opportunities for market-driven solutions to conservation on agricultural and forest lands

River Riparian and Lakeshore Landowners

1. Watershed awareness: preserving sense of place and rural character of the watershed

2. Responsibility to care for the watershed: the water cycle, our land and water resources, and how we impact it
3. Riparian/ shoreline land management and importance of vegetated buffers
4. Septic system maintenance
5. Water-friendly lawn and garden practices: mowing habits, fertilizer/pesticide use, yard waste disposal, erosion control, landscaping with native plants, controlling spread of invasive species

Recreational Users

1. Watershed awareness: preserving sense of place and rural character of the watershed
2. Responsibility to care for the watershed: the water cycle, our land and water resources, and how we impact it
3. Protecting water quality preserves recreational opportunities
4. Controlling the spread of invasive species (waders, kayaks/ canoes)

Educators

1. Incorporating water quality and watershed concepts into curriculum
2. Watershed awareness: preserving sense of place and rural character of the watershed
3. Active participation in watershed activities and stewardship projects
4. Partnerships with community organizations or private sector

Tribal Members

1. Watershed awareness: preserving sense of place and cultural significance of the watershed
2. Healthy watershed for our children and future generations
3. Participate in Watershed Action Plan network (the MRWP)

Partner Organizations

1. Watershed awareness: preserving sense of place and rural character of the watershed
2. Active participation in watershed activities and stewardship projects
3. Communicate watershed issues to members and residents
4. Participate in Watershed Action Plan network (the MRWP)

5.3 OUTREACH AND CITIZEN INVOLVEMENT STRATEGY

An Outreach and Citizen Involvement Strategy was developed and projected for 10 years, which is the same timeframe projected for the Action Plan. Effectiveness of the outreach and citizen

involvement strategy should be evaluated annually through an annual survey of the Partnership and relevant education and natural resource partner agencies. Results from the evaluation should be used to assess the previous year's efforts and be a guide to shape the work in the coming year. The level of effort is expected to change as outreach and citizen involvement activities are achieved and behavioral changes are seen to occur. A full review of the communications plan and outreach strategy should be conducted upon completion of the third and fifth years of the implementation phase.

The Outreach and Citizen Involvement Strategy is a two-pronged approach. The "outreach" part of the strategy is focused on education and distributing information, where mechanisms will be developed and implemented to educate and inform watershed citizens. The "citizen involvement" part of the strategy takes the next step, by developing and providing opportunity for citizens to participate in watershed stewardship and put into practice a stewardship ethic. While these two parts of the strategy are certainly interlinked, we wanted to differentiate the two parts of the strategy- education and information activities versus involvement activities that engage citizens in taking care of their home watershed.

The Outreach Strategy will involve passive mechanisms to reach target audiences via multiple mass media outlets. This part of the strategy can include printed materials distributed via direct mail, such as the "Marengo Riffles" newsletter and articles in BRWA's organizational newsletter and partner organization newsletters; press releases in local papers; and a website. This broader approach will focus on larger audiences in the watershed, such as households/ general watershed citizens throughout the watershed. For some audiences, such as local officials and farmers, a more personal communication style is likely to be more effective, as we learned in the planning phase of the project.

The Citizen Involvement Strategy will involve creating active opportunities for watershed citizens to engage in stewardship activities in the watershed. This could include participation in the Volunteer Water Quality Monitoring Program, data collection and assisting with the Culvert Program, hands-on workshops, river clean-ups, invasive species workdays, citizen participation in the Marengo River Watershed Partnership, or other similar volunteer opportunities.
The groundwork of raising awareness about watershed issues was laid during the planning phase of the project, but communication with households and landowners in the watershed will continue into the first year of the implementation phase. The primary goal of the first and second years will be to continue to develop awareness within the watershed of the water cycle and watershed health, and how we impact it, including key pollutant sources, and reinforcing a sense of place within the watershed. Educating citizens on practices and behaviors they can implement in their lives which will result in improvement and protection of the watershed will be an emphasis as well. Additionally, we hope this will also reinforce watershed citizen support for implementation of the Action Plan.

The Watershed Action Plan table (Table 5.2) presents recommended outreach and citizen involvement activities with details about frequency, costs, potential partners, timeframe, milestones, and so on.

6. MONITORING AND EVALUATION STRATEGY

The actions proposed in this plan differ both in scale and in scope. While some of the challenges are likely to exhibit a shorter lag time between implementation of management actions and measured improvement (such as reducing high bacteria counts), others are large, watershed-scale issues that will require more time to observe change (such as reducing peak flows). The monitoring strategy for the Marengo River Watershed attempts to recognize this and is intended to support the concept of adaptive management (or "learning by doing").

The monitoring strategy for this plan uses components discussed in Monitoring Stream and Watershed Restoration, edited by Philip Roni (2005). The strategy is designed to provide information to fill in gaps in our knowledge of existing conditions (baseline monitoring), to help show whether short-term goals of an implementation project are met (implementation monitoring), determine if management actions are having an effect on meeting targeted and long-term objectives (effectiveness monitoring) and to evaluate whether management actions have led to meeting long-term watershed goals (validation monitoring).

Many of the components of this monitoring strategy are embedded within the Watershed Action Plan. In order to meet many of the long-term objectives stated in the plan, a better understanding of baseline conditions is needed to support implementation efforts, to show improvements over time, and to build a basis for an adaptive management strategy. These include things like quantifying peak flows and sediment loading and assessments of priority aquatic and terrestrial species and their habitats. Baseline monitoring for aquatic and terrestrial habitats and understanding groundwater quantity and quality are of particular interest in the short term given the potential for large-scale iron mining in the east-central portion of the watershed.

Table 5.3 identifies components of the monitoring strategy (baseline, implementation, and effectiveness monitoring) and how they relate to the long-term objectives for the Marengo River Watershed Action Plan. Table 5.4 identifies validation monitoring to support meeting long-term watershed goals. Some of the components overlap and ones that are embedded within the Watershed Action Plan itself are identified. As the plan is implemented and to support adaptive management, the Marengo River Watershed Partnership should review the monitoring strategy on a biennial basis to determine if the monitoring strategy is producing the kind of information needed to support plan implementation and if adaptations should be made. This will be particularly true for validation monitoring.

Table 5.3 Monitoring Strategy for the Marengo River Watershed Action Plan.			
Long Term Objective	**Baseline Monitoring**	**Implementation Monitoring**	**Effectiveness Monitoring**
Reduce peak flows by 50% from current levels.	• Establish USGS stream gage near Marengo River Watershed mouth to measure peak flows. • Monitor/model peak flows at priority tributaries.	• Acres of open land reduced compared to goal for each hydrologic unit (Action 1.A.1). • Survival rate of tree planting exceeds 50% (Action 1.A.1). • Number of wetlands restored or enhanced (Action 1.B.1). • Number of managed intensive grazing plans developed and implemented (Action 2.C.1). • Acres of forest land with a third party management plan.	• Complete flood flow reduction model (uses available monitoring data to help focus effectiveness monitoring efforts, Action 2.A.1). • Develop volunteer or other program to monitor channel morphology at priority tributary locations, particularly in the soil transition zone and in subwatersheds where restoration activities occur. • Monitor/model peak flows at priority tributaries. • Monitor forestry BMP implementation.
Reduce sources of sediment to watershed streams by 50% from current levels.	• Establish USGS stream gage near Marengo River Watershed mouth to monitor suspended sediment load. • Conduct bedload sampling. • Conduct BRWA “Get to Know Your Watershed” or	• Tons of annual sediment reduced by stabilizing eroding bluffs/streambanks. • Number of acres per year using conservation tillage. • Number of waterway crossings improved per year.	• Inventory and monitor sand deposition in Marengo River with slope between 0.2 and 0.4%, conduct sedimentation mapping, habitat surveys, and pebble counts. • Conduct geomorphic study

Table 5.3 Monitoring Strategy for the Marengo River Watershed Action Plan.			
Long Term Objective	**Baseline Monitoring**	**Implementation Monitoring**	**Effectiveness Monitoring**
	other stream assessment to identify areas of streambank erosion and other stream channel alterations in watershed streams (Action 4.A.3). • Complete sediment budget for Marengo River Watershed.		to monitor changes in channel morphology and sedimentation in high erosion area of Marengo River.
Understand groundwater contribution to baseflow and water supply.	• Conduct baseflow stream survey (Action 12.A.1). • Model groundwater flow and map groundwater recharge areas.		
Surface and groundwater meet appropriate state and tribal criteria for pathogens, nutrients, and other contaminants.	• Develop private well monitoring program. • Pathogen monitoring to identify areas in need of BMP implementation.	• Number of watershed livestock farms with a nutrient management plan. • Percentage of nutrient management plans implemented (Action 5.A.2). • Number of new manure storage facilities constructed or updated (Action 5.B.1). • Number of POWTS inventories completed.	• Monitor bacteria counts at BMP implementation sites and in watershed streams and lakes. • Monitor nutrients in watershed streams and lakes.

Table 5.3 Monitoring Strategy for the Marengo River Watershed Action Plan.			
Long Term Objective	**Baseline Monitoring**	**Implementation Monitoring**	**Effectiveness Monitoring**
		• Number of POWTS updated or replaced per year.	
Maintain and/or identify and designate waters meeting special designation criteria.	• Establish clear protocol for utilizing volunteer and other aquatic and terrestrial habitat and water quality data for ORW/ERW or other state and/or tribal special use designations (Action 13.A.1).	• Collect water quality and habitat assessment data and evaluate data for special use designations (Action 13.A.2).	• Evaluate special designation status on a regular basis (Action 13.A.4).
Identify, restore, and maintain ecological processes and priority habitats for native communities of plants and animals.	• Collect water temperature data to identify cold, cool, and warm water habitat (Action 12.A.2). • Complete aquatic habitat connectivity analysis to focus culvert restorations for fish passage. • Identify and survey aquatic and terrestrial species of conservation interest & habitats (Action 12.B.1). • Identify and survey	• Miles of aquatic habitat re-connected by replacing culverts. • Acres of invasive species removed or treated per year.	• Continue BRWA Culvert Program habitat monitoring. • Continue BRWA macroinvertebrate monitoring program.

Table 5.3 Monitoring Strategy for the Marengo River Watershed Action Plan.			
Long Term Objective	**Baseline Monitoring**	**Implementation Monitoring**	**Effectiveness Monitoring**
	terrestrial and aquatic invasive species. • Complete valuation of watershed ecosystem services.		
Establish outreach and citizen involvement efforts to reduce pollution that impacts the Marengo River Watershed.		• Number of "Learn About Your Land" series or similar per year (Action 2.A.3) • Number of new WQ volunteers per year (Action 13.A.5). • Number of watershed clean-up events per year (i.e. trash pick-ups, HHW collections, etc.) • Number of outreach materials distributed per year (i.e. newsletters, press releases, website updates, etc.)	• Number of conservation easements, other land management agreements completed per year (Action 13.B.2). • Attendance at MRWP meetings and events.
Develop and improve recreational activities for watershed residents and visitors.		• Number of fishing or hunting events organized per year.	

Table 5.4 Validation monitoring to support meeting Marengo River Watershed Action Plan long-term goals.	
Long Term Watershed Goal	**Validation Monitoring**
The hydrologic system in the Marengo River Watershed is stable and resilient.	• Establish and maintain USGS stream gage near Marengo River Watershed mouth to measure peak flows, sediment loading, and nutrients. • Identify other validation monitoring as plan is implemented and evaluated.
Safe water and healthy, productive soil are available and maintained for all uses by humans and wildlife.	• Long-term water quality monitoring programs (i.e. Bad River tribe, WDNR, BRWA) are maintained to support and assist biennial designated use evaluations of Marengo River Watershed streams and lakes. • Establish metric for evaluating long-term soil productivity.
The Marengo River Watershed supports diverse, healthy, and resilient native communities of plants and animals and their habitats on land and in water.	• Conduct valuation of watershed ecosystem services every 5 years.
Citizens of the Marengo River Watershed are active and engaged in maintaining the integrity of the watershed.	• Marengo River Watershed Partnership is active and supported financially by the watershed community. • 100% of 10-year Watershed Action Plan “actions” are completed by 2021.

7. IMPLEMENTATION STRATEGY

Success of the Marengo River Watershed Action Plan (WAP) depends on consistent involvement and support from watershed stakeholders, such as citizens, local, county, state, federal, and tribal governments, agencies, and institutions. This involvement depends on having an established forum for implementation and an organization to coordinate implementation. The Bad River Watershed Association is in a unique position to coordinate WAP implementation because of the connections it has with the Marengo River Watershed community, local governments, and agencies, along with its ability to work across jurisdictional boundaries to achieve management at the watershed scale.

Implementation of the WAP is likely to occur through the following means:

A) Marengo River Watershed Partnership - Continuation of the Partnership would ensure plan implementation, coordination, evaluation, and revision. The MRWP would be coordinated by the Bad River Watershed Association and would serve as a forum for discussing Marengo River Watershed issues and generating support for plan implementation and improved watershed planning. More specifically, the purpose of the Partnership would be to:

1) Provide a forum for learning about and discussing watershed challenges.
2) Exchange information on what is happening in the watershed and what watershed partners are doing to implement the plan.
3) Coordinate activities, discuss project ideas, and identify funding sources to further watershed plan implementation.
4) Provide a forum for developing collaborative proposals and applying for funding to implement plan.
5) Identify accomplishments and review/update plan actions/recommendations.

The MRWP may meet on a quarterly basis to accomplish these objectives, or as often as identified by the Partnership. One of these meetings could be an annual project scoping meeting, where partners submit project ideas and opportunities for the upcoming year are identified (Figure 5.5).

B) Partner Organizations and Agencies – Ongoing program work from partner organizations and agencies will further the goals and objectives of the WAP and sustain implementation efforts. With BRWA as the coordinator, the MRWP Project and the Partnership will be connected to and integrated into other local and regional partnerships such as the Chequamegon Bay Area Partnership, Lake Superior Basin Partner Team, and the Lake Superior Binational Program. Participation in the Partnership will help ensure that program work and implementation activities are coordinated and working to achieve watershed-based goals and objectives.

C) Tribal and Local Governments - Comprehensive plans that have recently been completed by local towns and counties in the Marengo River Watershed and tribal integrated resource management plans will further the goals and objectives of the WAP and sustain implementation efforts. Active involvement by tribal and local governments as watershed stakeholders in the Partnership may help to further the goals of these comprehensive plans while also implementing actions in the WAP.

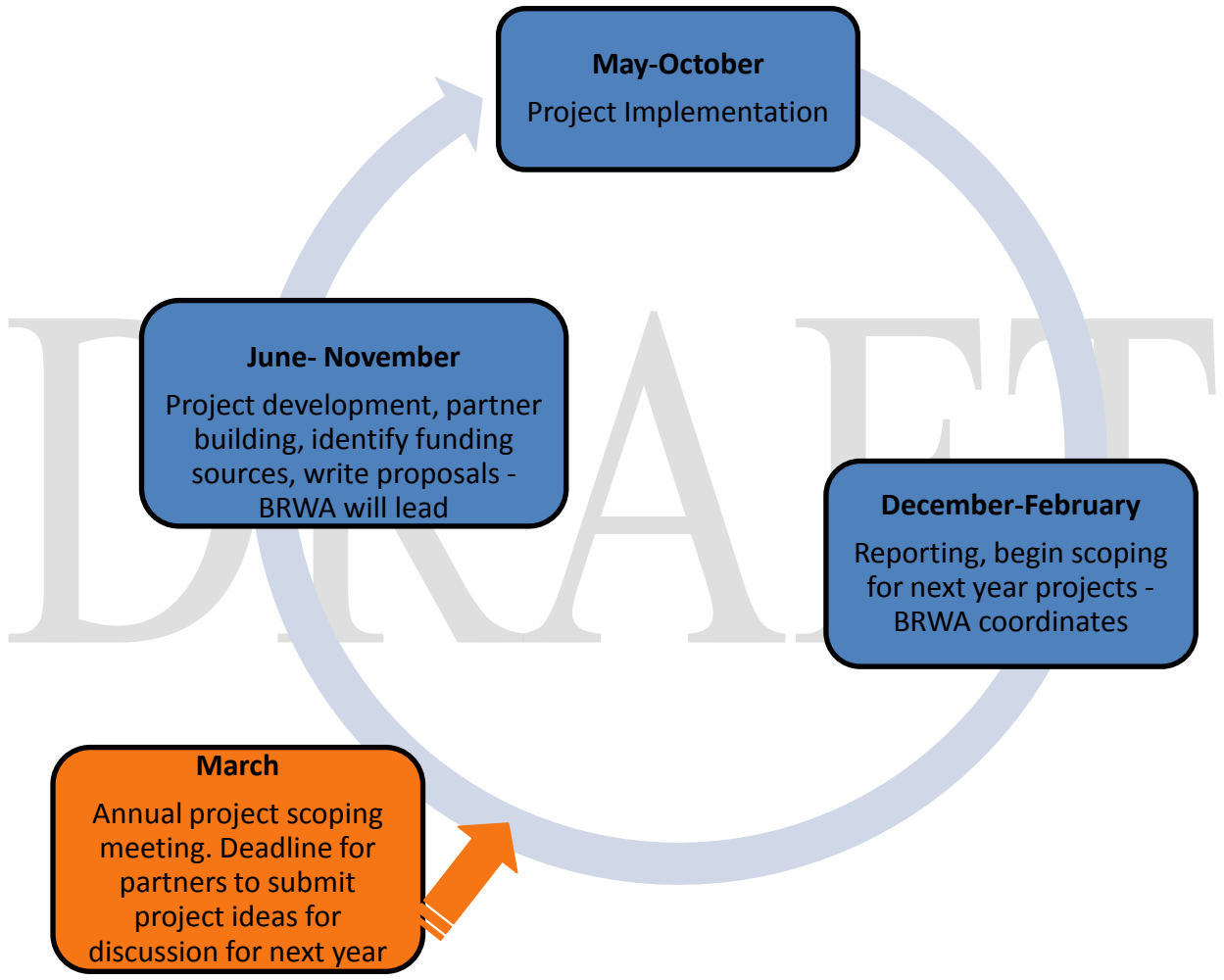

Figure 5.5 Potential Watershed Action Plan implementation annual cycle as carried out by the Marengo River Watershed Partnership.

8. CAPACITY BUILDING STRATEGY

An ongoing problem to implementing natural resources management actions is the number of projects almost always outweighs the available staff and resources devoted to completing them. The actions described in this project are ambitious and achieving full plan implementation will require additional local capacity in the form of staff at agencies and organizations and capacity to help facilitate and coordinate local partnerships that already exist in Wisconsin's Lake Superior Basin.

Due to the small nature of most natural resource organizations and agencies in the area, a strong network of partnerships has historically and continues to bring more efficient use of limited resources and assures that management activities are coordinated across jurisdictional boundaries. Examples include the Lake Superior Basin Partner Team, Chequamegon Bay Area Partnership, Bad River Watershed Association Culvert Program, and partnerships between County Land and Water Conservation Departments, USFWS, and USDA Farm Service Agency and NRCS to implement agriculture and other best management practices. Ensuring the resources are available to invest in the continuation and building the functional capacity of these partnerships is a top priority to take full advantage of current resources to implement the Marengo River Watershed Action Plan and other local natural resource management initiatives. Adding new capacity in the form of full or part time positions to implement specific projects and to ensure the long-term stability of partnerships will need to be continually explored.

Following is a list of specific local capacity needed to implement some of the actions described in the Marengo River Watershed Action Plan. This list will be updated and revised as projects are completed and as new priorities emerge.

- Continue current staffing levels devoted to implementing natural resources programs at the federal, tribal, state, and county agencies and at institutions and non-profit organizations. In order to achieve the Marengo River Watershed Action Plan implementation strategy (described in Chapter 7), the following positions are needed:

    - ✓ Watershed Action Director, Bad River Watershed Association: Coordination of plan implementation, project scoping and connection to local governments and local and regional agencies and partnerships, grant writing support, assist with Marengo River Watershed Partnership events, plan updating and reporting.
    - ✓ Citizen Involvement Coordinator, Bad River Watershed Association: Coordination of outreach and education component of plan, connecting citizen interests to agency programs through Watershed Action Director, coordinating Marengo River Watershed Partnership events.
    - ✓ Lake Superior Basin Educator, University of Wisconsin-Extension: Technical expertise related to outreach and education component, Connection to Lake Superior Basin Partner Team, grant writing support.

- Additional support needed to ensure plan implementation

  - ✓ Chequamegon Bay Area Partnership Coordinator: Coordinate regional partnership projects, Connect watershed planning efforts (including Marengo River Watershed Action Plan) to larger, regional efforts, define partnership roles, support for planning and grant writing, connection to statewide and Great Lakes regional programs and funding opportunities.
  - ✓ Conservation First Responder Specialist: (http://www.huronpines.org/project/75). One-on-one visits to landowners to match their natural resource interests to available programs (such as CREP, Partners for Fish and Wildlife, forest management planning, etc.) Could be tied in with BRWA Citizen Involvement Coordinator. This type of position was seen as a need because often citizens are not aware of available technical and financial assistance available to them to help meet their conservation goals along with broader agency goals.
  - ✓ Invasive species SWAT Teams: These teams would be deployed to treat and/or remove priority invasive species at locations identified by the Northwoods Cooperative Weed Management Area. Summer internship opportunity for Northland College or other interested students/citizens.
  - ✓ Invasive Species Coordinator for Ashland County: Coordinate trainings, inventory, control, education/outreach with landowners and community groups.

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APPENDIX A.

Marengo River Watershed Action Plan
Implementation Resolution

We, the supporters of the Marengo River Watershed Partnership, would like to see a Marengo River Watershed that has clean, flowing water; supports healthy, diverse, and resilient plant and animal communities free of invasive species; and is a vital community of watershed stewards who take actions to care for the watershed, while enabling a productive livelihood. Moreover, we recognize that achieving this vision for the watershed can be accomplished by implementing the Marengo River Watershed Action Plan. Therefore, we approve of and we shall implement, where feasible, the recommendations contained in the Watershed Action Plan to maintain and improve the health of the Marengo River Watershed. We understand that this agreement is voluntary and non-binding.

APPENDIX B.

Invasive species identified within the Marengo River Watershed and a 5-mile buffer around the watershed boundary. Database maintained by the Great Lakes Indian Fish and Wildlife Commission. Data retrieved on 7/6/10.

GENUS	SPECIES	COMMON NAME
Miscanthus	*sacchariflorus*	Amur silver grass
Elaeagnus	*umbellata*	autumn olive
Campanula	*trachelium*	bat in the belfry
Lonicera	*X bella*	Bell's honeysuckle
Lupinus	*polyphyllus*	bigleaf lupine
Aegopodium	*podagraria*	bishop's goutweed
Solanum	*dulcamara*	bittersweet nightshade
Robinia	*pseudoacacia*	black locust
Knautia	*arvensis*	blue buttons
Saponaria	*officinalis*	bouncing bet
Cirsium	*vulgare*	bull thistle
Linaria	*vulgaris*	butter and eggs
Cirsium	*arvense*	Canada thistle
Cipangopaludina	*chinensis*	Chinese mystery snail
Rhamnus	*cathartica*	common buckthorn
Veronica	*officinalis*	common gypsyweed
Leonurus	*cardiaca*	common motherwort
Verbascum	*thapsus*	common mullein
Vinca	*minor*	common periwinkle
Phragmites	*australis*	common reed
Veronica	*arvensis*	common speedwell
Hypericum	*perforatum*	common St. John's wort
Tanacetum	*vulgare*	common tansy
Salix	*fragilis*	crack willow
Campanula	*rapunculoides*	creeping bellflower
Glechoma	*hederacea*	creeping Charlie
Coronilla	*varia*	crown vetch
Euphorbia	*cyparissias*	cypress spurge
Hesperis	*matronalis*	dame's rocket
Rosa	*majalis*	double cinnamon rose
Helictotrichon	*pubescens*	downy alpineoatgrass
Hedera	*helix*	English ivy
Convallaria	*majalis*	European lily-of-the-valley
Sorbus	*aucuparia*	European mountain ash

GENUS	SPECIES	COMMON NAME
Phlox	*paniculata*	fall phlox
Lathyrus	*sylvestris*	flat pea
Rumex	*acetosa*	garden sorrel
Valeriana	*officinalis*	garden valerian
Alliaria	*petiolata*	garlic mustard
Myosoton	*aquaticum*	giant chickweed
Frangula	*alnus*	glossy buckthorn
Lonicera		honeysuckle
Typha	*X glauca*	hybrid cattail
Salix	*X rubens*	hybrid crack willow
Berberis	*thunbergii*	Japanese barberry
Pachysandra	*terminalis*	Japanese pachysandra
Petasites	*japonicus*	Japanese sweet coltsfoot
Euphorbia	*esula*	leafy spurge
Mentha		mint
Lysimachia	*nummularia*	moneywort
Lonicera	*morrowii*	Morrow's honeysuckle
Typha	*angustifolia*	narrow-leaved cattail
Lapsana	*communis*	nipplewort
Picea	*abies*	Norway spruce
Hemerocallis	*fulva*	orange daylily
Lythrum	*salicaria*	purple loosestrife
Mentha	*X gracilis*	red mint
Phalaris	*arundinacea*	reed canary grass
Juncus	*compressus*	roundfruit rush
Gymnocephalus	*cernuus*	ruffe
Ulmus	*pumila*	Siberian elm
Caragana	*arborescens*	Siberian pea-shrub
Bromus	*inermis*	smooth brome
Achillea	*ptarmica*	sneezeweed
Centaurea	*biebersteinii*	spotted knapweed
Draba	*verna*	spring Whitlow-grass
Anthoxanthum	*odoratum*	sweet vernal grass
Dianthus	*barbatus*	sweet William
Juncus	*ensifolius*	sword-leaved rush
Lonicera	*tatarica*	Tartarian honeysuckle
Deschampsia	*cespitosa ssp. cespitosa*	tufted hairgrass
Campanula	*carpatica*	tussock bellflower
Myosotis	*scorpioides*	water forget-me-not

GENUS	SPECIES	COMMON NAME
Viburnum	*lantana*	wayfaring tree
Salix	*alba*	white willow
Pastinaca	*sativa*	wild parsnip
Hylotelephium	*telephium ssp. telephium*	witch's moneybags
Poa	*nemoralis*	wood bluegrass
Myosotis	*sylvatica*	woodland forget-me-not
Hemerocallis	*lilioasphodelus*	yellow daylily
Iris	*pseudacorus*	yellow flag iris
Galium	*verum*	yellow spring bedstraw