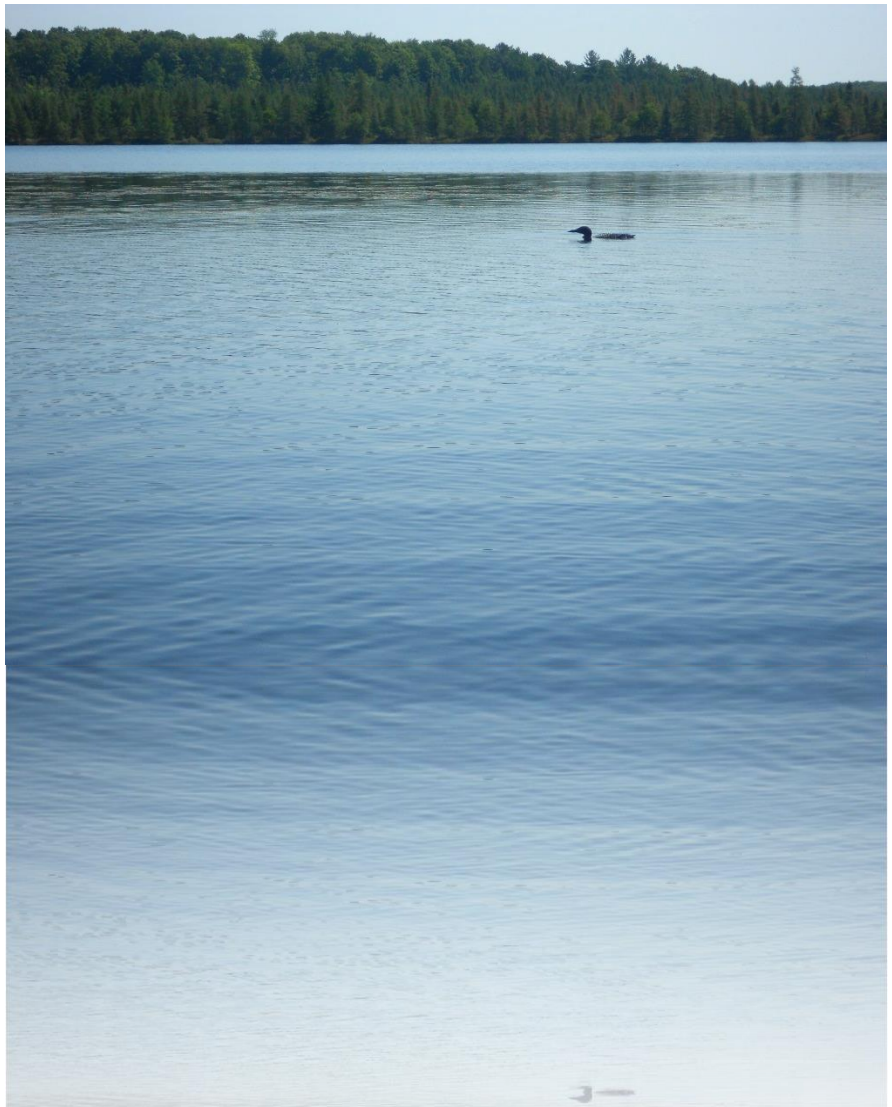
2015

Mud Lake Management Plan



Prepared by staff from the Center for Watershed Science and Education
University of Wisconsin-Stevens Point.

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Mud Lake Management Plan

The Mud Lake Management Plan was prepared after obtaining input from residents and lake users at a series of four public planning sessions held at the Norrie Town Hall in Birnamwood, Wisconsin in August, September, October, and November 2014. The inclusive community sessions were designed to learn about and identify key community opportunities, assets, concerns, and priorities. Representatives of state and local agencies, as well as nonprofit organizations, also attended the planning sessions to offer their assistance to the group in developing a strategic lake management plan (LMP).

The plan was adopted by the Town of Norrie on: July 13, 2015

The plan was adopted by Marathon County on: August 18, 2015

The plan was approved by the Wisconsin Department of Natural Resources on: _____

A special thanks to all who helped to create the Mud Lake Management Plan and provided guidance during the plan's development.

Mud Lake Management Planning Committee Members and Resources

Planning Committee

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We are grateful to many for providing insight, enthusiasm, and funding:

Marathon County Concerned Citizens and Property Owners
Mayflower Lake District, Pike Lake Sportsman Club, and Wadley Lake Sportsman Club
Marathon County Environmental Fund
Wisconsin Department of Natural Resources Lake Protection Grant

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Overarching Vision for Mud Lake

Mud Lake will always be the area's hidden jewel with a robust, well-balanced fishery, high quality wildlife habitat and, clean, clear water enjoyed by its visitors and the lucky few that reside there.

Mud Lake is a 70 acre seepage lake with a maximum depth of 15 feet located in eastern Marathon County. It is hydrologically connected to Mayflower Lake to the east via a large wetland complex. Surrounded by wetland and forest, Mud Lake is a largely undeveloped lake located in a quiet community of Marathon County. One public access point is located on the southeast end of the lake.

Based on discussions throughout the planning process, Mud Lake planning session participants identified that the key issue that they would like to focus on in upcoming years includes maintaining a healthy and sustainable fishery.

Introduction and Background

This lake management plan (LMP) and its planning process allow the community to guide the fate of its lake. The LMP is a dynamic document that identifies goals and action items for the purpose of maintaining, protecting and/or creating desired conditions in a lake for within given period of time. It can correct past problems, improve on current conditions, and provide guidance for future boards, lake users, and technical experts by identifying which issues have been addressed and how successful previous efforts were. Each plan is unique, dependent upon the conditions of the lake, its watershed, and the interests of the stakeholders involved. The actions identified in this LMP serve as a gateway for obtaining grant funding and other resources to help implement activities outlined in the plan. Because many entities are involved in lake and land management, it can be challenging to navigate the roles, partnerships, and resources that are available. The planning process and content of this plan have been designed to identify where some of the key assistance exists.

Many individuals and organizations are involved in assuring that the Mud Lake ecosystem is healthy. It is essential for key partners who are responsible for lake and land management work together to achieve this goal. The planning process and content of this plan have been designed to identify where some of the key assistance exists. Following is a list of key partners; this list is not all inclusive.

- **Individuals**: Individuals can use this plan to learn about the lake they love and their connection to it. People living near Mud Lake can have the greatest influence on the lake by understanding and choosing lake-friendly options to manage their land and the lake.
- **A future Mud Lake organization:** This plan could provide an organization with a well thought out plan for the whole lake and lists options that can easily be prioritized. Annual review of the plan will also help an organization to realize its accomplishments. Resources and funding opportunities for organizational management activities are made more available by placement of goals into the lake management plan, and the organization can identify partners to help achieve their goals for Mud Lake.
- **Neighboring lake groups, sporting and conservation clubs**: Neighboring groups with similar goals for lake stewardship can combine their efforts and provide each other with support, improve competitiveness for funding opportunities, and make efforts more fun.
- **The Town of Norrie**: The Town can utilize the visions, wishes, and goals documented in this lake management plan when considering town-level management planning or decisions within the watershed that may affect the lake.
- **Marathon County:** County professionals will better know how to identify needs, provide support, base decisions, and allocate resources to assist in lake-related efforts documented in this plan. This plan can also inform county board supervisors in decisions related to Eastern Marathon County lakes, streams, wetlands, and groundwater.
- **Wisconsin Department of Natural Resources**: Professionals working with lakes in Marathon County can use this plan as guidance for management activities and decisions related to the management of the resource, including the fishery, and invasive species. Lake management plans help the WDNR identify and prioritize needs within Wisconsin's lake community, and decide where to best apply resources and funding. A well thought out lake management plan increases an application's competitiveness for funding from the State – if multiple Marathon County lakes have similar goals in their lake management plans, they can join together when seeking grant support to increase competitiveness for statewide

resources. Information about WDNR grants is located on their website http://dnr.wi.gov/lakes/grants/. Grant contacts are also listed in the appendices.

One of the first steps in creating the Mud Lake management plan was to gather and compile data about the lake and its ecosystem to understand past and current lake conditions. The Eastern Marathon County Lakes Project was initiated by citizens who encouraged Marathon County to work in partnership with personnel from UW-Stevens Point to assess 11 lakes located in the eastern portion of the county. Finding for this effort was provided by the WDNR Lake Protection Grant program, the county's environmental fund, and monetary and in-kind contributions from citizens. One of the first steps of the project was the Eastern Marathon County Lakes Study (2010-12), which gathered and compiled data about the 11 lakes and their ecosystems in order to understand past and current lake conditions. Many of the lakes had insufficient data available to help evaluate current water quality concerns, aquatic plant communities, invasive species, or fisheries. Professionals and students from UW-Stevens Point conducted the study and interpreted the data for use in lake management planning. The results of this project (including this document) will assist citizens, municipalities, Marathon County, and State staff to efficiently manage their water resources and help make informed decisions and policies that affect their lakes.

In addition to the Eastern Marathon County Lakes Study, data collected by citizens, consultants, and professionals from the WDNR were incorporated into the planning process to provide a robust set of information from which informed decisions were made in this plan. Sources of information used in the planning process are listed at the end of this document for future reference.

Several reports from the Mud Lake Study and the materials associated with the planning process and reports can be found on the Marathon County website: http://www.co.marathon.wi.us/Departments/ConservationPlanningZoning/ConservationServices/LakePrograms.aspx.

The purpose of this plan is to learn about Mud Lake and identify features important to the Mud Lake community in order to provide a framework for the protection and improvement of the lake. This framework, or lake management plan, will enable citizens and other supporters to achieve the vision for Mud Lake now and in the years to come. The planning process included a series of four public planning sessions which were held at the Norrie Town Hall to assist area residents, lake users, and representatives of local municipalities with the development of the lake management plan. These meetings took place between August and November 2014.

Participation in the planning process was open to everyone and was encouraged by letters sent directly to Mud Lake waterfront property owners and by press releases in local newspapers. In addition, members of the planning committee were provided with emails about upcoming meetings which could be forwarded to others.

The purpose of this plan is to learn about Mud Lake, identify factors important to lake residents and users, and develop goals to protect and improve Mud Lake for future generations.

Guest experts and professionals were invited to attend the planning sessions. They presented information and participated in discussions with participants to provide context, insight and recommendations for the lake management plan, including environmental and regulatory considerations. Information provided by the professionals was organized with the survey results into discussion topics, which included: the fishery and recreation; the aquatic plant community; water quality and land use; shoreland health; and communication. After learning about the current conditions of each topic, participants identified goals, objectives, and actions for the lake management plan that were recorded by professionals from UW-Stevens Point. Planning session notes and presentations were posted to the Marathon County website.

The Mud Lake Planning Committee consisted of property owners and recreational users. Technical assistance during the planning process was provided by the Marathon County Conservation, Planning, and Zoning Department (CPZ) and professionals from the Wisconsin Department of Natural Resources (WDNR), Golden Sands Resource Conservation & Development, Inc. (RC&D), and the University of Wisconsin-Stevens Point Center for Watershed Science and Education (CWSE).

Goals, Objectives and Actions

The following goals, objectives, and associated actions were derived from the values and concerns of citizens and members of the Mud Lake Management Planning Committee, and the known science about Mud Lake, its ecosystem and the landscape within its watershed. Implementing and regularly updating the goals and actions in the Mud Lake Management Plan will ensure that the vision is supported and that changes or new challenges are incorporated into the plan. A management plan is a living document that changes over time to meet the current needs, challenges and desires of the lake and its community. **The goals, objectives and actions listed in this plan should be reviewed annually and updated with any necessary changes.**

Although each lake is different, to ensure a lake management plan considers the many aspects associated with a lake, the Wisconsin Department of Natural Resources requires that a comprehensive lake management plan address, at a minimum, a list of topics that affect the character of a lake, whether each topic has been identified as a priority or as simply something to preserve. These topics comprise the chapters in this plan. For the purposes of this plan, the chapters have been grouped as follows:

In-Lake Habitat and a Healthy Lake

Fish Community—fish species, abundance, size, important habitat and other needs
Aquatic Plant Community—habitat, food, health, native species, and invasive species
Critical Habitat—areas of special importance to the wildlife, fish, water quality, and aesthetics of the lake

Landscapes and the Lake

Water Quality and Quantity—water chemistry, clarity, contaminants, lake levels
Shorelands—habitat, erosion, contaminant filtering, water quality, vegetation, access
Watershed Land Use—land use, management practices, conservation programs

People and the Lake

Recreation—access, sharing the lake, informing lake users, rules
Communication and Organization—maintaining connections for partnerships, implementation, community involvement
Updates and Revisions—continuing the process
Governance—protection of the lake, constitution, state, county, local municipalities

Lead persons and resources are given under each objective of this plan. These individuals and organizations are able to provide information, suggestions, or services to accomplish objectives and achieve goals. The following table lists organization names and their common acronyms used in this plan. This list should not be considered all-inclusive – assistance may also be provided by other entities, consultants, and organizations.

Acronym	Organization/Resource
CBCW	Clean Boats Clean Waters
CLMN	Citizen Lake Monitoring Network
CWSE	UWSP Center for Watershed Science and Education
CPZ	Marathon County Planning and Zoning (includes Land Conservation Department)
MC	Marathon County
NCCT	North Central Conservancy Trust
NRCS	USDA Natural Resources Conservation Service
RC&D	Golden Sands Resource Conservation and Development Council, Inc.
UWSP	University of Wisconsin-Stevens Point
UWEX	UW-Extension
WEAL	UWSP Water and Environmental Analysis Lab
WDNR	Wisconsin Department of Natural Resources
WDOT	Wisconsin Department of Transportation

Contact information for organizations and individuals who support lake management in Marathon County can be found in Appendix A.

In-Lake Habitat and a Healthy Lake

Many lake users value Mud Lake for its fishing, wildlife, and good water quality. These attributes are all interrelated; the health of one part of the lake system affects the health of the rest of the plant and animal community, the experiences of the people seeking pleasure at the lake, and the quality and quantity of water in the lake. Habitat is the structure for a healthy fishery and wildlife community. It can provide shelter for some animals and food for others.

Lake habitat occurs within the lake, along all of its shorelands, and even extends into its watershed for some species. Many animals that live in and near the lake are only successful if their needs – food, a healthy environment, and shelter – are met. Native vegetation including wetlands along the shoreline and adjacent to the lake provides habitat for safety, reproduction, and food, and can improve water quality and balance water quantity. Some lake visitors such as birds, frogs, and turtles use limbs from trees that are sticking out of the water for perches or to warm themselves in the sun. Aquatic plants infuse oxygen into the water and provide food and shelter for waterfowl, small mammals, and people. The types and abundance of plants and animals that comprise the lake community also vary based on the water quality, and the health and characteristics of the shoreland and watershed. Healthy habitat in Mud Lake includes the aquatic plants, branches, and tree limbs above and below the water.

The Fish Community

A balanced fish community has a mix of predator and prey species, each having different food, habitat, nesting substrate and water quality needs in order to flourish. A sustainable fishery is one that seeks to be in balance with the lake's natural ability to support the fish community, and in which populations do not noticeably decline over time because of fishing practices or other human activity. Ultimately, the fish community is able to adapt to fishing without additional stocking or input because its reproductive and growth needs are met within the lake.

Mud Lake supports a warm water fish community. Fish diversity was low in Mud Lake compared to other lakes in the Eastern Marathon County Lakes Study. This may suggest fish kills during recent winters. Bluegill and largemouth bass were most abundant during the 2012 survey. Bluegill reached a maximum size of 10.1 inches. Only young-of-year largemouth bass were caught and did not exceed 2 inches in the 2012 sample. Black crappie were the largest fish caught in Mud Lake, with individuals reaching a maximum length of 12.8 inches. No new fish species were documented

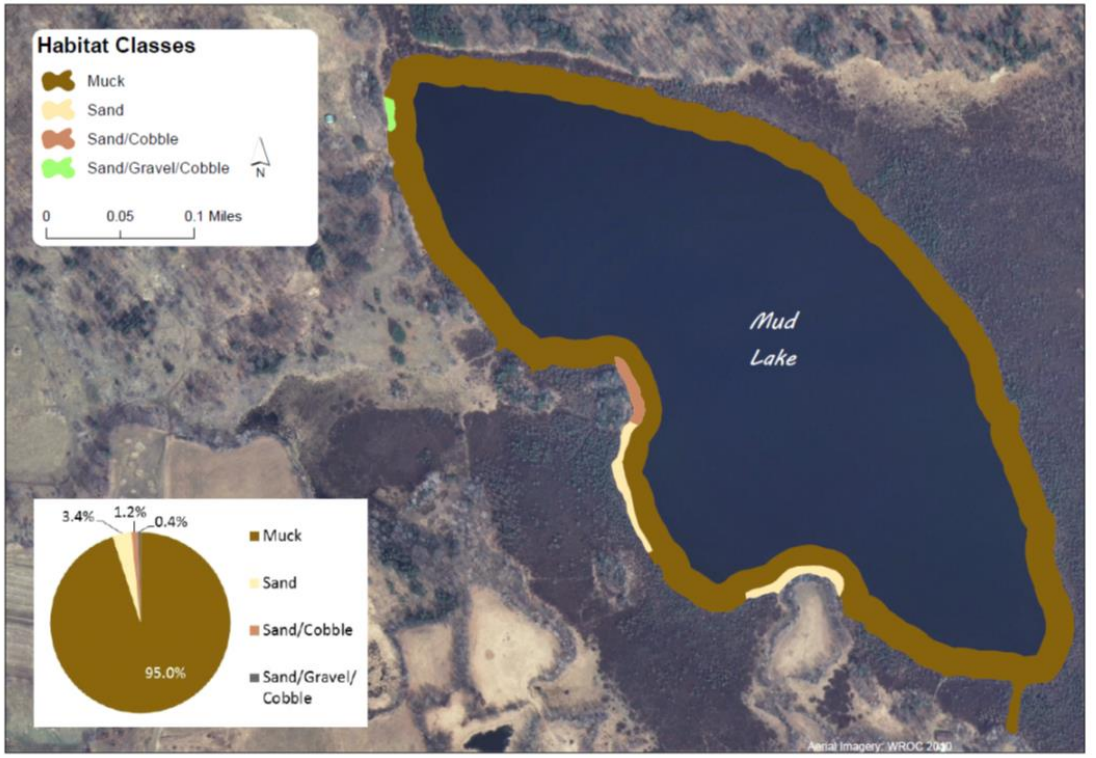
Table 1. Fish species in Mud Lake, 2012 survey and historical Wisconsin Department of Natural Resources records.

Species	1964	1971	1972	1975	1979	1980	1982	1985	2005	2008	2012
Black Bullhead	x	x	x	x	x						
Black Crappie								x	x	x	x
Bluegill	x					x	x	x		x	x
Common Shiner		x	x								
Golden Shiner				x							
Largemouth Bass						x	x	x	x		x
Mudminnow						x		x			
Northern Pike	x	x	x	x	x			x		x	
Pumpkinseed				x	x		x				
Yellow Perch	x	x	x	x	x						

during the 2012 sampling period. In 2012, three fish species were caught and identified out of the ten total species that have been recorded in surveys dating back to 1964 obtained from the Wisconsin Department of Natural Resources. The species documented previously but not detected during the 2012 survey were black bullhead, common shiner, golden shiner, mudminnow, northern pike, pumpkinseed, and yellow perch.

A variety of fish management techniques were attempted historically on Mud Lake. Due to winterkill events from low dissolved oxygen, a recommendation was made in 1958 to stock northern pike since they were more likely to survive low dissolved oxygen conditions. In the same year, yellow perch were noted to range in size from 3-11 inches. In 1964, yellow perch size was also noted as desirable, and a recommendation was made to develop public access to the lake, which was later constructed. Several years later (1972), yellow perch populations were severely stunted and a recommendation was made to poison the lake to eliminate yellow perch, northern pike, and black bullhead. In 1979, a chemical fish kill (known as the Mud Lake Fisheries Reclamation Project) was carried out with Rotenone; subsequent management was focused on producing desirable populations of largemouth bass, bluegill, and black crappie. Prior to the Rotenone treatment, the lake was shocked and 30 northern pike were transferred to nearby Norrie Lake. In 1980, Mud Lake was stocked with largemouth bass, bluegill, and minnows. Since the treatment, black bullhead and yellow perch have not been reported; northern pike were documented in 1985. Fish stocking records for Mud Lake date back to 1960 in Wisconsin Department of Natural Resources files.

Members of the Norrie Lake Sportsman's Club who were present at the October 8, 2014 planning meeting at the Norrie Town Hall stated that the Club would stock walleye in Mud Lake this year. Although reproduction is not expected, the addition of walleye may improve the size structure of the bluegill population. Tom Meronek, Fisheries Biologist with the Wisconsin Department of Natural Resources, stated that the WDNR will try to follow up the success of walleye stocking with electroshock surveys over the next few years (Meronek 2014). He also noted the generally small size of bluegill and largemouth bass in the 2012 survey, and explained that this could have been a function of the time of year. He also stated that overall, the fishery holds a good spread of sizes for these species. In response to a citizen comment that Mud Lake is "fished pretty hard" for crappie during the summer months, Meronek suggested the possibility of a reduction in bag limits as the DNR is currently in the process of revising regulations.



To successfully sustain a healthy fish population, a lake must have the habitat to support it. Habitat needs of fish include healthy aquatic plants and woody structure such as logs, fallen trees, and stumps. Woody structure provides places for fish to hide, as well as habitat for invertebrates that many fish species use as food sources. Many fish use lily pads and bulrushes, as well as gravel and cobble substrates, for spawning habitat.
Substrate distribution in Mud Lake primarily consisted of a soft bottom (95% muck) with mixtures of sand/gravel/cobble (1.6%) and sand (3.4%) on the southern shoreline. Gravel areas are utilized by many fish for spawning habitat, including sunfish (bluegill, pumpkinseed, black bass), where males will construct nests and guard their young. Sand can be important habitat for reproduction of non-game minnows.

The presence of young bass and sunfish sampling indicates successful reproduction of these species. Sparse areas of bulrush were present in Mud Lake. Northern pike, which do not offer parental care, utilize areas with emergent and floating-leaf vegetation in shallow or flooded areas for spawning. Black crappie utilize bulrush habitat on gravel or sand substrates where they construct nests and guard young.

Coarse woody habitat (CWH), including downed trees and logs, are present in Mud Lake. This structure is utilized by young prey fish and other aquatic organisms for spawning, foraging, and protective cover. The addition of CWH cover would benefit the fish community.

Guiding Vision for the Fish Community

Mud Lake will have a healthy, well-balanced fishery that provides great angling.

Goal 1. Support conditions that provide a healthy fishery.

Objective 1.1. Enhance and improve fish habitat.

Actions	Lead person/group	Resources	Timeline
Maintain woody structure already present in the lake, and inform residents and anglers of the importance of coarse woody habitat.	Shoreland property owners	WDNR Fisheries Biologist	Ongoing
Secure permit to enhance the variety and complexity of woody structure by adding tree drops or “fish sticks” placed offshore.	Mud Lake Committee	WDNR Fisheries Biologist	
Determine whether or not a permit would be necessary to install “Christmas tree bundles” near the shore.	WDNR Fisheries Biologist	WDNR Fisheries Biologist	
If necessary, secure permit and explore procurement of Christmas trees; determine who will install them and who will pull them at midsummer.	Norrie Lake Sportsman Club; Mud Lake Committee	WDNR Fisheries Biologist	

Objective 1.2 Supplement the fishery as needed.

Actions	Lead person/group	Resources	Timeline
Continue stocking crappie as approved by WDNR Fishery Biologist.		Norrie Lake Sportsman Club WDNR Fisheries Biologist	
Explore the potential and pros/cons of a regulation change to decrease the bag limit for crappie.		WDNR Fisheries Biologist	
Attend Conservation Congress spring meeting to vote to support (or not support) a regulation change.		WDNR Fisheries Biologist	
If the bag limit is decreased, determine if restocking should take place or should be delayed until the effect of lower bag limit is understood.		WDNR Fisheries Biologist	
Monitor dissolved oxygen (DO) during the winter months. Ask MC to purchase a DO meter that can be loaned out, or seek WDNR small-scale lake planning grant to purchase one.	Interested citizen	CPZ	
If DO measurements indicate low DO levels during winter, or if a fish kill occurs, explore purchase of aerator.		WDNR Fisheries Biologist	

Aquatic Plants

Aquatic plants provide the forested landscape within Mud Lake. They provide food and habitat for spawning, breeding, and survival for a wide range of inhabitants and lake visitors including fish, waterfowl, turtles, amphibians, as well as invertebrates and other animals. They improve water quality by releasing oxygen into the water and utilizing nutrients that would otherwise be used by algae. A healthy lake typically has a variety of aquatic plant species which creates diversity that makes the aquatic plant community more resilient and can help to prevent the establishment of non-native aquatic species.

Aquatic plants near shore and in shallows provide food, shelter and nesting material for shoreland mammals, shorebirds and waterfowl. It is not unusual for otters, beavers, muskrats, weasels, and deer to be seen along a shoreline in their search for food, water, or nesting material.

During the 2012 aquatic plant survey of Mud Lake, 19 species of aquatic plants were observed, with the greatest diversity located on the northwestern shore of the lake. The nineteen total species within Mud Lake were low compared with the other lakes in the Eastern Marathon County Lakes Study. Eighty-nine percent (171 of 193) of the sampled sites had vegetative growth.

The dominant plant species in the survey were large purple bladderwort (*Utricularia purpea*), small purple bladderwort (*Utricularia resupinata*) and arrowheads (*Sagittaria* spp.). Both large and small purple bladderwort are species of special concern in Wisconsin and offer invertebrate habitat as well as foraging sites for fish. Bladderworts are carnivorous plants, using vacuums in their bladders to catch tiny insects. Arrowhead is one of the highest valued aquatic plants for wildlife. Waterfowl depend on the high-energy tubers during migration. Beds of arrowhead offer shade and shelter for young fish (Borman et al., 2001).

Overall, the aquatic plant community in Mud Lake can be characterized as having excellent quality species with a number of relatively uncommon species for central Wisconsin. The habitat, food source, and water quality benefits of this diverse plant community should be focal points in future lake management strategies.

More detailed information can be found in the Mud Lake Aquatic Plant Report or the Mud Lake 2010-2012 Lake Study Report.

Guiding Vision for Aquatic Plants in Mud Lake

Mud Lake will have a diversity of high quality native aquatic plants that support a thriving fishery and excellent water quality.

Goal 2. Maintain the healthy native aquatic plant community in Mud Lake.

Objective 2.1. Preserve/protect the high quality plant community in Mud Lake that was observed in the 2012 aquatic plant survey, and minimize the chance for AIS to become established.

Actions	Lead person/group	Resources	Timeline
Inform visitors about Mud Lake's unique and vibrant native aquatic plant community with a brochure or signage that includes interesting facts and information about species of special concern in the lake.	Mud Lake Committee	UWSP Environmental Education faculty RC&D* MC Visitor Center or CPZ	
Inform visitors and existing and new lakeshore property owners about protection of the native aquatic plant community through brochure, boating excursions focused on aquatic plant identification, or other creative means.	Mud Lake Committee	UWSP Environmental Education faculty (brochure) RC&D* (plant identification event)	

Explore ways to preserve the undisturbed shoreland by working with the Town/County to establish conservancy zoning (either setback or overlay).	Mud Lake Committee	Town of Norrie CPZ	
Explore ways to preserve the undisturbed shoreland by identifying land for conservation easements/land purchase/deed restriction.		NCCT WI Stewardship funds WDNR Lake Protection Grants	
Minimize removal of native aquatic plants, particularly near the boat launch, by informing residents and visitors via signage, brochure, or other methods. This reduces that potential for establishment of invasive species.		UWEX Lakes (educational materials)	

***** Note: Services offered by RC&D are dependent on available funds through grants or lake groups.

Aquatic Invasive Species (AIS)

Aquatic invasives species are non-native aquatic plants and animals that are most often unintentionally introduced into a lake by lake users. This most commonly occurs on trailers, boats, equipment, and from the release of bait. In some lakes, aquatic invasive plant species can exist as a part of the plant community, while in other lakes populations explode, creating dense beds that can damage boat motors, make areas non-navigable, inhibit activities like swimming and fishing, and disrupt the lakes' ecosystems.

During the aquatic plant survey of Mud Lake, no non-native species were observed. However, a follow up survey of the lake in 2014 By Golden Sands RC&D, Inc. indicated the presence of non-native purple loosestrife (*Lythrum salicaria*) on shore. Two plants were observed near the water's edge on the east-northeast side of the lake in the edge of the bog (near a duck blind).

Guiding Vision for Aquatic Invasive Species

Mud Lake will not be adversely impacted by aquatic invasive species.

Goal 3. Existing AIS in Mud Lake will be eradicated.

Objective 3.1. Reduce or eliminate purple loosestrife, an aquatic invasive species on Mud Lake's shoreland.

Actions	Lead person/group	Resources	Timeline
Conduct training for interested residents on the identification and proper removal techniques for purple loosestrife.	ML Committee members	RC&D*	2015

Goal 4. AIS will be prevented from entering Mud Lake.

Objective 4.1. People recreating on Mud Lake will be informed about controlling the transport of aquatic invasive species between water bodies and will take appropriate action to clean boats, trailers, and other equipment used in the lake.

Actions	Lead person/group	Resources	Timeline
Include information about the threat of AIS in a welcome packet or newsletter to shoreland property owners.		CPZ	
Remind lake users to clean plants off trailers, drain motors and live wells, and wash boats before and after entering/leaving the lake.	Interested citizen	RC&D* CBCW interns/volunteers	
Provide signage at the boat landing to inform users about aquatic invasive species and the importance of proper hygiene for boats, trailers, and equipment.		RC&D*; UWEX Lakes	

Objective 4.2. Be proactive in preventing establishment of new AIS in Mud Lake.

Actions	Lead person/group	Resources	Timeline
Minimize the disturbance of native aquatic vegetation.	Shoreland property owners		
Learn to identify and closely monitor for AIS and take immediate action if new AIS is observed in the lake (see Rapid Response plan in Appendix).	Citizens; Mud Lake committee members	RC&D* Rapid Response Plan WDNR Aquatic Plant Specialist	
Provide letter to RC&D* in support of their work to assist communities in AIS identification, monitoring and eradication.	Interested citizen	RC&D*	

***** Note: Services offered by RC&D are dependent on available funds through grants or lake groups.

Critical Habitat

Special areas harbor habitat that is essential to the health of a lake and its inhabitants. In Wisconsin, critical habitat areas are identified by biologists and other lake professionals from the Wisconsin Department of Natural Resources in order to protect features that are important to the overall health and integrity of the lake, including aquatic plants and animals. While every lake contains important natural features, not all lakes have official critical habitat designations. Designating areas of the lake as critical habitat enables these areas to be located on maps and information about their importance to be shared. Having a critical habitat designation on a lake can help lake groups and landowners plan waterfront projects that will minimize impact to important habitat, ultimately helping to ensure the long-term health of the lake.

Although Mud Lake does not have an official critical habitat area designation, many areas within Mud Lake are in excellent condition for wildlife and amphibian habitat. Natural, minimally impacted areas with woody habitat such as logs, branches, and stumps; areas with emergent and other forms of aquatic vegetation; areas with overhanging vegetation; and wetlands are elements of good quality habitat. Informing lake users of the value of such areas can help raise awareness for their protection.

Guiding Vision for Mud Lake's Critical Habitat

Sensitive areas on Mud Lake will be enhanced and protected from degradation.

Goal 4. Preserve high quality habitat for fish and wildlife.

Objective 4.1. Identify potentially critical habitat on Mud Lake.

Actions	Lead person/group	Resources	Timeline
Request Critical Habitat Designation from WI-DNR	Interested citizen	WDNR Aquatic Biologist and Lake Managers	
Once identified, help others understand the value of these areas.	Interested citizen	UWEX Lakes (educational materials) WDNR Aquatic Biologist and Lake Managers	

Landscapes and the Lake

Land use and land management practices within a lake's watershed can affect both its water quantity and quality. While forests, grasslands, and wetlands allow a fair amount of precipitation to soak into the ground, resulting in more groundwater and good water quality, other types of land uses may result in increased runoff and less groundwater recharge, and may also be sources of pollutants that can impact the lake and its inhabitants. Areas of land with exposed soil can produce soil erosion. Soil entering the lake can make the water cloudy and cover fish spawning beds. Soil also contains nutrients that increase the growth of algae and aquatic plants. Development on the land may result in changes to natural drainage patterns and alterations to vegetation on the landscape, and may be a source of pollutants. Impervious (hard) surfaces such as roads, rooftops, and compacted soil prevent rainfall from soaking into the ground, which may result in more runoff that carries pollutants to the lake. Wastewater, animal waste, and fertilizers used on lawns, gardens and crops can contribute nutrients that enhance the growth of algae and aquatic plants in our lakes. Land management practices can be put into place that better mimic some of the natural processes, and reduction or elimination of nutrients added to the landscape will help prevent the nutrients from reaching the water. In general, the land nearest the lake has the greatest impact on the lake water quality and habitat.

Shoreland vegetation is critical to a healthy lake's ecosystem. It helps improve the quality of the runoff that is flowing across the landscape towards the lake. It also provides habitat for many aquatic and terrestrial animals including birds, frogs, turtles, and many small and large mammals. Healthy shoreland vegetation includes a mix of tall grasses/flowers, shrubs, and trees which extend at least 35 feet landward from the water's edge. Shorelands include adjacent wetlands, which also serve the lake by allowing contaminants to settle out, providing shelter for fish and wildlife, and decreasing the hazard of shoreline erosion by providing a shoreland barrier from waves and wind.

The water quality in Mud Lake is the result of many factors, including the underlying geology, the climate, and land management practices. Since we have little control over the climate and cannot change the geology, changes to land management practices are the primary actions that can have positive impacts on the lake's water quality. The water quality in Mud Lake was assessed by measuring different characteristics including temperature, dissolved oxygen, water clarity, water chemistry, and algae. All of these factors were taken into consideration when management planning decisions were made.

Water Quality

Water quality was assessed during the 2010-2012 lake study, and past water quality data were acquired and reviewed to determine trends in Mud Lake's water quality. These data included a number of measures such as temperature, dissolved oxygen, water chemistry, and phosphorus. Each of these interrelated measures plays a part in the lake's overall water quality. Overall, many of the measures indicated that Mud Lake had good water quality; however, inorganic nitrogen was elevated and the dominance of blue-green algae suggested some problems. Mud Lake has a history of low dissolved oxygen and winter fish kills. The lake appears to be transitioning towards more nutrient-rich conditions, so efforts should be made to prevent additional inputs from reaching the lake.

Dissolved oxygen is an important measure in Mud Lake because a majority of organisms in the water depend on oxygen to survive. Oxygen is dissolved into the water from contact with air, which is increased by wind and wave action. Algae and aquatic plants also produce oxygen when sunlight enters the water, but the decomposition of dead plants and algae reduces oxygen in the lake. During the study period, dissolved oxygen concentrations in Mud Lake

ranged from plentiful to limited depending upon depth and time of year. During the winter of both years, the dissolved oxygen fell below concentrations needed to support many fish species. At times, only the upper 2 feet of water had concentrations above 5 mg/L. During summer months, algae blooms produced periodic spikes in dissolved oxygen concentrations at depths typically between 6 and 8 feet.

The water clarity in Mud Lake is considered fair. The average water clarity measurements in Mud Lake during the study were poorest in June and best in September. When compared with limited past data (1999-2010), the average water clarity measured during the study was better in August and poorer in July and September.

Chloride, sodium and potassium concentrations are commonly used as indicators of how a lake is being impacted by human activity. Over the monitoring period, concentrations of chloride, sodium and potassium were low in Mud Lake. Atrazine (DACT), an herbicide commonly used on corn, was below the detection limit in the samples that were analyzed from Mud Lake.

Phosphorus is an element that is essential in trace amounts to most living organisms, including aquatic plants and algae. Sources of phosphorus can include naturally-occurring phosphorus in soils and wetlands, and groundwater. Common sources from human activities include soil erosion, animal waste, fertilizers, and septic systems. Although a variety of compounds are important to biological growth, phosphorus receives so much attention because it is commonly the "limiting nutrient" in many Wisconsin lakes. Due to its relatively short supply compared to other substances necessary for growth, relatively small increases in phosphorus result in significant increases in aquatic plants and algae.

Total phosphorus concentrations in Mud Lake ranged from a high of 44 µg/L in June 2011 to a low of 12 µg/L in February 2011 and June 2012. Summer median total phosphorus was 20.5 µg/L and 16.5 µg/L in 2011 and 2012, respectively. This is below Wisconsin's phosphorus standard of 40 µg/L for shallow seepage lakes, but above the proposed flag value of 15 µg/L.

During the study, inorganic nitrogen concentrations in samples collected from Mud Lake during the spring averaged 0.72 mg/L. Concentrations above 0.3 mg/L are sufficient to enhance algal blooms throughout the summer (Shaw et al., 2000). Inorganic nitrogen typically moves to lakes with groundwater. Common sources of inorganic nitrogen include fertilizers, animal waste, and septic systems.

Managing nitrogen, phosphorus and soil erosion throughout the Mud Lake watershed is one of the keys to protecting the lake itself. Near shore activities that may increase the input of phosphorus and nitrogen to the lake include applying fertilizer, removing native vegetation (trees, bushes and grasses), mowing vegetation, and increasing the amount of exposed soil. Nitrogen inputs to Mud Lake can be reduced by using lake-friendly land management decisions throughout, such as the reduction of fertilizer use in the watershed, proper management of animal waste and septic systems, and the use of water quality-based management practices.

One pound of phosphorus entering a lake can result in up to 500 pounds of algal growth!
(Vallentyne, 1974)

Guiding Vision for Water Quality in Mud Lake

Mud Lake will maintain excellent water quality for its fish, wildlife and human visitors to enjoy and thrive.

Goal 5. Maintain or decrease nutrient concentrations appropriate for shallow seepage lakes.

Objective 5.1. Decrease watershed inputs of inorganic nitrogen and phosphorus over the next 5 years.

Actions	Lead person/group	Coordinator	Timeline
Establish a water quality monitoring program to include regular water clarity measurements and analysis of phosphorus and chlorophyll-*a* to evaluate changes over time. Phosphorus samples need to be collected according to WisCALM guidance to compare to the State's phosphorus rule.	Interested citizen	Coordinator	
Monitor dates of ice on/ice off and submit the information to the state database.	Interested citizen	WDNR	
If indicated by changes in summer sampling results, consider adding overturn sample for additional water quality data.	Interested citizen	Coordinator	
Inform others in the watershed about the impacts of nutrients and land management on water quality through the distribution of a Town newsletter and neighborly discussions. Consider including information on a lake sign.	Interested citizen	UWEX Lakes (educational materials)	
Refrain from the use of fertilizers on shoreland properties (see Shorelands section). Consider distributing educational materials around the lake.	Shoreland property owners	UWEX Lakes (educational materials)	

Shorelands

Shoreland vegetation is critical to a healthy lake ecosystem. It provides habitat for many aquatic and terrestrial animals including birds, frogs, turtles, and small and large mammals. It also helps to improve the quality of the runoff that is flowing across the landscape towards the lake. Healthy shoreland vegetation includes a mix of unmowed grasses/flowers, shrubs, trees, and wetlands which extends at least 35 feet landward from the water's edge.

Mud Lake's shoreland was assessed for the extent of vegetation and disturbances. Mud Lake has 1.5 miles of shoreline. During the 2011 survey, the lake's shoreland vegetation was primarily in a natural state. The overall findings showed that shorter vegetation is the most prominent vegetative layer near the water's edge. Much of this is due to the abundance of wetlands adjacent to Mud Lake, but also may be a result of lower than normal lake levels in 2011. Although Mud Lake's shoreland is in a natural condition right now, changes can easily occur as development takes place. Minimizing impacts to Mud Lake from future development should include planning to ensure that perspective developers have the right information to make informed decisions and that zoning is in place to achieve habitat, water quality, and aesthetic goals. Distributing information about the importance of healthy shorelands to property owners is a good first step.

Guiding Vision for Mud Lake's Shorelands

Mud Lake's shorelands will remain natural and undisturbed.

Goal 6. Maintain natural shoreland around Mud Lake.

Objective 6.1. Protect healthy, stable shoreland habitat near and around Mud Lake.

Actions	Lead person/group	Resources	Timeline
Explore strengthening buffer language in zoning regulations around Mud Lake.		CPZ Wisconsin Lakes	
Participate in Marathon County Comprehensive Planning process especially as related to updating shoreland zoning ordinances.	Interested citizen	CPZ	
Provide information packets regarding shoreland regulations and shoreland management practices to existing lakefront property owners .		CPZ	

Watershed Land Use

It is important to understand where Mud Lake's water originates in order to understand the lake's health. During snowmelt or rainstorms, water moves across the surface of the landscape (runoff) towards lower elevations such as lakes, streams, and wetlands. The land area that contributes runoff to a lake is called the surface watershed. Groundwater also feeds Mud Lake; its land area may be slightly different than the surface watershed.

The capacity of the landscape to shed or hold water and contribute or filter particles determines the amount of erosion that may occur, the amount of groundwater feeding a lake, and ultimately, the lake's water quality and quantity. Essentially, landscapes with greater capacities to hold water during rain events and snowmelt slow the delivery of the water to the lake. Less runoff is desirable because it allows more water to recharge the groundwater, which feeds the lake year-round - even during dry periods or when the lake is covered with ice. A variety of land management practices can be put in place to help reduce impacts to our lakes. Some practices are designed to reduce runoff. These include protecting/restoring wetlands, installing rain gardens, swales, rain barrels, and routing drainage from pavement and roofs away from the lake. Some practices are used to help reduce nutrients from moving across the landscape towards the lake. Examples include manure management practices, eliminating/reducing the use of fertilizers, increasing the distance between the lake and a septic drainfield, protecting/restoring wetlands and native vegetation in the shoreland, and using erosion control practices.

The surface watershed for Mud Lake is 1,902 acres. The primary land use is forests and agriculture (Figure 1). The lake's shoreland is surrounded primarily by wetlands and forest. In general, the land closest to the lake has the greatest immediate impact on water quality. Mud Lake's groundwater watershed extends north and slightly east (Figure 2). The groundwater watershed is approximately 339 acres and contains predominantly agricultural and forested land.

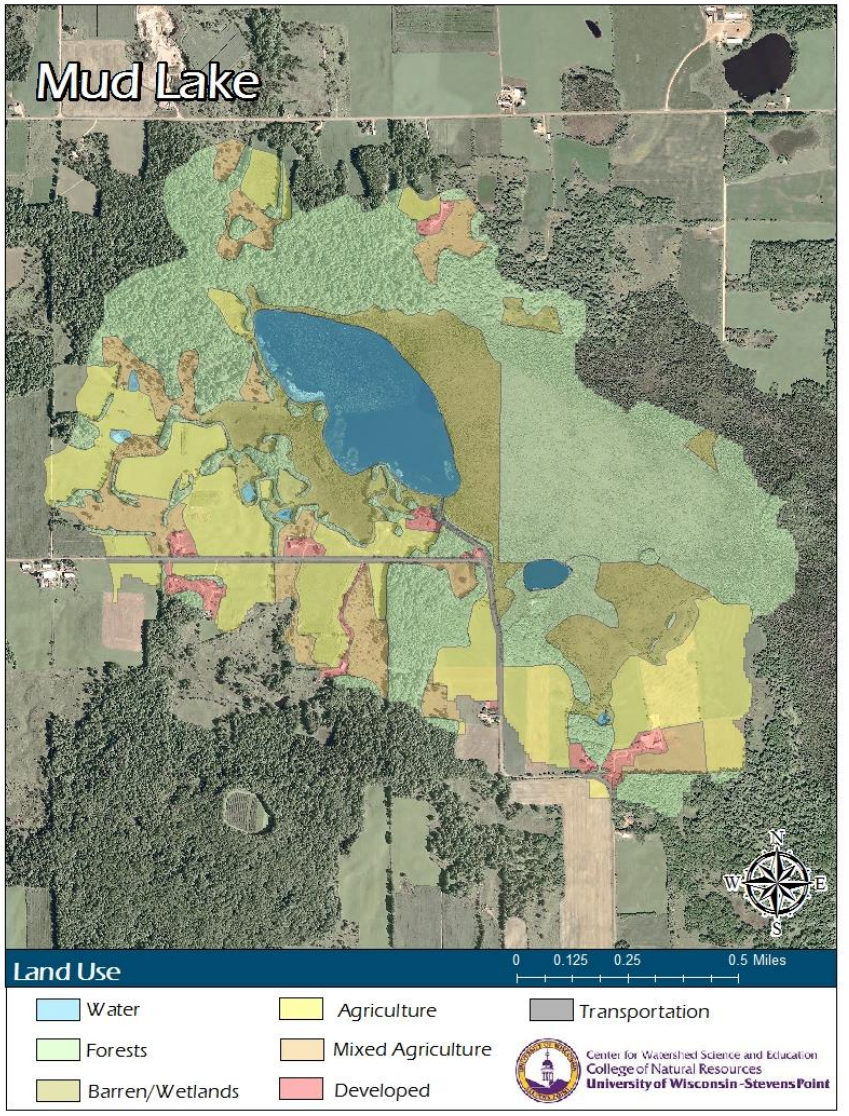
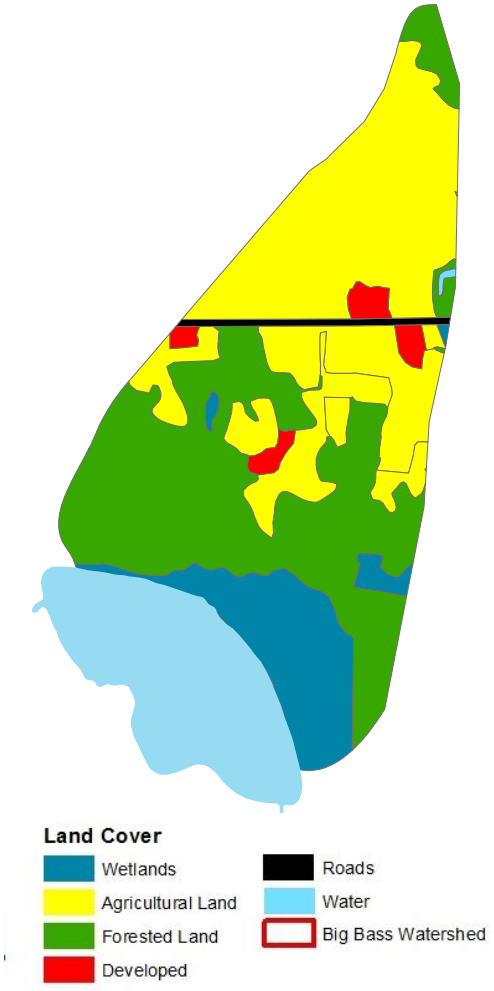


Figure 1. Surface watershed of Mud Lake.

Estimates of phosphorus from the landscape can help to understand the phosphorus sources to Mud Lake. Land use in the surface watershed was evaluated and used to populate the Wisconsin Lakes Modeling Suite (WILMS) model. In general, each type of land use contributes different amounts of phosphorus in runoff and through groundwater. The types of land management practices that are used and their distances from the lake also affect the contributions to the lake from a parcel of land. While forests comprised the greatest amount of land in the watershed, modeling results indicated that agriculture had the greatest percentage of phosphorus contributions from the watershed to Mud Lake (



).

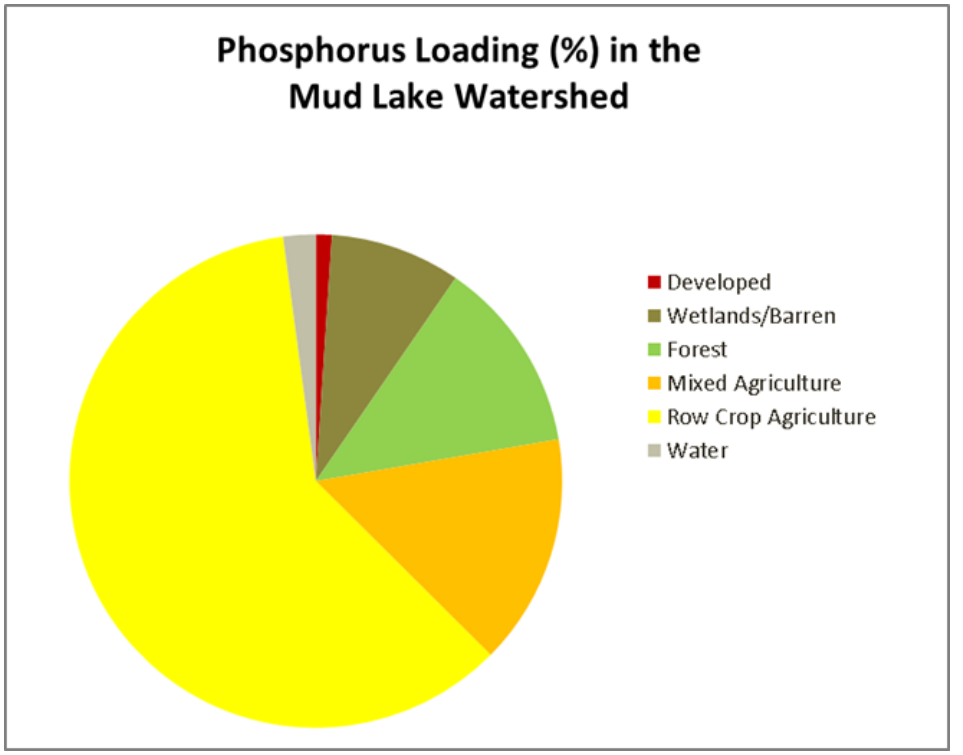


Figure 2. Land use in the Mud Lake groundwater watershed.

Figure 3. Estimated phosphorus loads from land uses in the Mud Lake watershed.

Guiding Vision for Mud Lake's Watershed

Mud Lake will be protected into the future by informed planning and land use decisions.

Goal 7. Land use practices in the watershed will not adversely impact the lake.

Objective 7.1. Protect important habitat around Mud Lake and within its watershed by informing landowners of options and opportunities.

Actions	Lead person/group	Resources	Timeline
Support those interested in creating conservation easements to restrict development or land uses that might harm critical habitat or natural features.		NCCT	
Support those interested in the purchase of development rights that permanently protect the landscape while retaining private ownership.		CPZ	

Objective 7.2. Reduce runoff in the Mud Lake watershed by working with landowners to design landscapes and management practices that enhance infiltration and filter runoff.

Actions	Lead person/group	Resources	Timeline
Encourage Marathon County to work with watershed property owners to develop water quality-based nutrient management plans for reducing inorganic nitrogen.		CPZ	

People and the Lake

The people that interact with the lake are a key component of the lake and its management. In essence, a lake management plan is a venue by which people decide how they would like people to positively impact the lake. The plan summarizes the decisions of the people to take proactive steps to improve their lake and their community. Individual decisions by lake residents and visitors can have a positive impact on the lake and on those who enjoy this common resource. Collaborative efforts may have a bigger positive impact; therefore, communication and cooperation between a lake district, community, and suite of lake users are essential to maximize the effects of plan implementation.

Boating hours, regulations, and fishing limits are examples of principles that are put into place to minimize conflicts between lake users and balance human activities with environmental considerations for the lake.

Recreation

Mud Lake has one public boat landing on the south east end of the lake. At the time of plan formation, there were no signs posted at the boat launch aside from a general aquatic invasive species sign.

Guiding Vision for Recreation

Mud Lake will be a place for swimming, fishing, or hunting in a place of serenity.

Goal 8. Preserve the solitude found at Mud Lake.

Objective 8.1. Work with municipality and County to protect the lake.

Actions	Lead person/group	Resources	Timeline
Install signs (no wake, etc.)		Town of Norrie	
Install signage to redirect parking away from the boat launch.		Town of Norrie	

Communication and Organization

Many of the goals outlined in this plan focus on distributing information to lake and watershed residents and lake users in order to help them make informed decisions that will result in a healthy ecosystem in Mud Lake enjoyed by many people. Working together on common values will help to achieve the goals that are outlined in this plan.

Guiding Vision for Communication

Updates to the Mud Lake management plan will be communicated to those that live near the lake, townships and lake users.

Goal 9. Develop a core group of people interested in the health and well-being of the Bass Lake ecosystem, and continue activities that develop knowledge.

Objective 9.1. Communicate important lake information in a variety of venues.

Actions	Lead person/group	Resources	Timeline
Work with County to ensure the distribution of welcome packets to new residents. Consider a Lake District or watershed welcome packet.		CPZ	
Explore the formation of a lakes subcommittee on the town board, and/or a county-wide lake group.	Interested citizen	Town of Norrie	
Encourage attendance at the Lakes Convention and Lake Leaders Institute, and announce educational events such as these.	Interested citizen		
Inform the County about issues that may lead to problems within the lake community, i.e. activities that may lead to erosion like residents clear cutting shorelines, dumping sand on shorelines or other shoreline disturbance; septic failures; non-compliance with setbacks; new construction, and/or new irrigation wells. Encourage lake residents to call in concerns to the County to provide “extra eyes” on the landscape.	Interested citizen		

Updates and Revisions

A management plan is a living document that changes over time to meet the current needs, challenges and desires of the lake and its community. The goals, objectives and actions listed in this plan should be reviewed annually and updated with any necessary changes.

Guiding Vision for Updates and Revisions

Mud Lake will have an up-to-date, accurate and comprehensive lake management plan that is reviewed regularly and documents all management activities and results.

Goal 10. Review plan annually and update as needed.

Objective 10.1. Communicate updates with the community and those that live around the lake.

Actions	Lead person/group	Resources	Timeline
Meet annually (as Town subcommittee or 'Friends' group) to update the plan through discussion and evaluation of available surveys and data. Invite county staff to help review and provide guidance.	Mud Lake Committee	CPZ	
Notify the town, county, and WDNR of any potential changes in the management plan.		Town of Norrie CPZ	

Governance

This section will identify plans, ordinances, and regulations that affect the lake and responsible authorities including the local municipalities, state, and federal agencies.

Marathon County Strategic Plan: Marathon County's strategic plan states a clear intent to provide leadership and services focusing on improving land use and resource planning. This will assure the orderly development of retail and manufacturing business, agriculture/agribusiness, and residential growth while retaining the rural character of Marathon County. Specific objectives to support this leadership role are as follows:

Develop comprehensive planning and zoning ordinances that provide towns with value so that 100% request participation in county planning and zoning.

Improve water quality and residential, commercial, and industrial waste management resulting in 100% of all households, businesses, and industry sites meeting water quality standards.

Inventory water resources, determine where we have adequate supplies, and encourage development in those areas.

Develop an educational program on the quantity and quality of water supplies for local and state policy makers.

Comprehensive Plans – Marathon County and the Town of Norrie: Marathon County as well as the Town of Norrie adopted Comprehensive Plans in 2006. These plans outline the direction of future growth within the County and Town.

During the planning process, a set of guiding principles that describe broad characteristics of a desired future for local communities and Marathon County were developed. These guiding principles were used to provide a general framework for developing local and countywide goals and objectives. The guiding principles outlined in the Marathon County Comprehensive Plan are:

Respect Local Governance - Planning in Marathon County should build on local town, village and city government as a system that is unique, has served residents well, and is a strong component of local identity.

2. Preserve Working Agriculture - Agriculture has been central to the culture and economy of Marathon County for over 100 years. Farming has been a way of life for generations of county residents and is fundamental to both community and individual identity. Efforts such as protecting prime farmland from development, exploring niche markets, and supporting cooperative practices can be implemented at the local level to help maintain and preserve working agriculture.

3. Maintain a Sense of Place - As Marathon County's population grows and changes, communities will need to ensure that important physical features, buildings, and landscapes that exemplify their local identity are retained. These features provide a sense of heritage and continuity that contribute to a community's identity and sense of place.

4. Preserve Rural Character - Shifts in the farm economy and urban expansion are altering the County's rural landscape characterized by working farms, woodlands, rolling hills, marsh areas, and plentiful water bodies. As open spaces, farms, and woodlands are being lost or fragmented by development, Marathon County communities will need to make some important choices in order to preserve the qualities and character of the rural landscape.
5. Safeguard Natural Resources - Marathon County is graced with abundant natural resources including numerous rivers, wetlands, forests, and wildlife. Careful stewardship of natural resources is essential to protect against fragmentation and degradation and ensure these resources continue to contribute to the ecology, character, quality of life, and economy of Marathon County into the future.
6. Foster Managed Growth and Coordinated Development - Managing growth is important to ensure that no area is overwhelmed by development, land use conflicts are minimized, and development occurs in a quality manner that minimizes impacts on natural resources. Managing growth requires coordination of land uses and infrastructure, within and between communities,

From these Guiding Principles, the following goals were developed that are directly related to lake management planning and protection:

Goal 1: Enhance the natural character of Marathon County.

Objective: To encourage establishment of an open space network connecting woodlands, wetlands, shorelands, grasslands, and other natural areas.

Goal 2: Protect and enhance surface water resources and natural habitat areas.

Objective: To minimize development impacts that could affect the water quality and habitat of rivers, floodplains, and wetlands.

Objective: To provide leadership in disseminating information about shoreland, floodplain, and wetland preservation and management to County residents.

Goal 3: Protect and enhance the quantity and quality of potable groundwater and potable surface water supplies.

Objective: To continue to enforce, and update as necessary, ordinances and development standards to protect the quantity and quality of groundwater resources.

Objective: To continue to encourage local municipalities to protect groundwater quality and quantity.

Objective: To continue to work with the WDNR and others to address known contamination problems and ensure that sufficient measures are taken to prevent additional groundwater contamination.

Goal 7: Improve coordination regarding natural resource protection.

Objective: To foster coordinated and effective enforcement of the various regulations aimed at protecting natural resources.

Objective: To continue to serve as a liaison between State and Federal agencies and local municipalities regarding natural resource regulations and permitting procedures.

Objective: To ensure timely and effective communication of changes to natural resource regulations and permitting procedures.

The Town of Norrie adopted a Comprehensive Plan to guide the community's physical, social, and economic development. The Comprehensive Plan also serves to identify important physical and cultural resources that need to be protected and enhanced to maintain a desired quality of life. Comprehensive plans are not meant to serve as land use regulations in themselves; instead, they provide a rational basis for local land use decisions with a twenty-year vision for future planning and community decisions.

Town of Norrie residents are very concerned about preservation of natural resources in light of increased development pressure. Residents are particularly concerned with water bodies in the Town of Norrie, including the Plover River and numerous lakes. The Town of Norrie has developed the following goal, objectives, and policy recommendations to demonstrate its support:

Goal: Protect the aesthetic and environmental qualities of the Town of Norrie's many lakes.

- Objective: To minimize intensive development around the Town of Norrie's lakes in order to protect views, water and shoreline quality, habitat or natural vegetation on the lakes.

The lake management plan, along with any proposed changes to the comprehensive plan, will be presented to the local municipality for review and possible incorporation into their comprehensive plans. Zoning, subdivision, and official mapping decisions must be consistent with the comprehensive plan.

Marathon County Land & Water Resource Management Plan

The Conservation, Planning and Zoning Department's mission is to create, advocate, and implement strategies to conserve natural and community resources. The department administers programs to implement the Land and Water Resource Management Plan which includes the Farmland Preservation Program, Managed Intensive Grazing, Lake Districts, Wildlife Damage and Abatement, as well as regulatory activities associated with the Waste Storage Facility and Nutrient Management Ordinance and the Livestock Facilities Licensing Ordinance.

The Land & Water Resource Management Plan outlines the following goals, objectives, programs, and regulations to support the implementation of the Lake Management Plan:

A. Goals and Objectives

1. **Reduce Agricultural Nonpoint Runoff**. Reduce the discharge of soil sediment, organic materials, pesticides and nutrients into surface and ground waters.
2. **Groundwater Protection.** Educate the public and users about groundwater use and resource management challenges. In April 2001, the Marathon County Groundwater Guide was updated to reflect the changing programs and policies within the county as well as to acknowledge the increased level of regulation by state agencies to protect the groundwater resources of Marathon County.
3. **Forestry.** Sustain private and public forests. The Marathon County Forest Comprehensive Land Use Plan (2006-2020) includes recommendations to guide management of forest land in Marathon County in accordance with the Parks, Recreation and Forestry Department's mission to manage and protect the county forest on a sustainable basis for ecological, economic, educational, recreational, and research needs of present and future generations.
4. **Land Conversion.** Minimize the conversion of prime agricultural lands and forests to other land uses to support watershed management and to maintain economic value of the working lands.
5. **Lake and Reservoir Management.** Support local communities to understand the environmental opportunities and challenges facing lakes. This resource concern encompasses the areas of wetland management and aquatic invasive species. There is a great participation by local landowners in securing information and resources to better protect our water resources.

B. Conservation Programs and Partnerships

1. **Aquatic Invasive Species.** In 2010, Marathon County has entered into a working relationship with the Golden Sands Resource Conservation & Development agency to conduct an inventory of lakes and flowages unassociated with the Wisconsin River for aquatic species. The inventory efforts involve educational outreach efforts to Park Department employees and students.
2. **Managed Grazing Project.** Marathon County Conservation, Planning and Zoning Department, UW-Extension, and the Natural Resources Conservation Service have joined forces to support the Central Wisconsin River Graziers Network. The Network promotes the feasibility of grazing-based farming as a profitable way of farming that enhances lifestyles and protects and improves the environment.
3. **Managed Forest Law (MFL) Program.** The MFL program provides incentives to protect privately owned woodlands from destructive timber cutting practices and over-harvesting and prevents land from becoming developed and/or converted to agricultural land use.
4. **Farmland Preservation Program.** Marathon County adopted its Farmland Preservation Plan in 2013. The goals of the program are twofold: to preserve Wisconsin farmland for production of commodities by means of local land use planning and soil conservation practices, and; to provide

tax relief to landowners. For the landowner to receive tax credits they must be in compliance with current and applicable State Agricultural Performance Standards.

5. **Nutrient Management Program.** Nutrient management is defined as managing the amount, form, placement, and timing of applications of plant nutrients. The purpose of this program is to ensure a proper supply of plant nutrients for crop production while minimizing the entry of nutrients to surface water and groundwater. Marathon County requires nutrient management plans for landowners constructing and operating waste storage facilities.
6. **Federal Soil and Water Conservation Programs.** The Conservation, Planning and Zoning (CPZ) Department works closely with the United States Department of Agriculture through the Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA). The NRCS, FSA, UW-Extension and CPZ staffs work together in the Local Work Group to identify program and funding priorities for federal and local conservation programs such as the Environmental Quality Incentive Program, Comprehensive Nutrient Management Planning, Conservation Reserve Enhancement Program and grazing initiatives.

C. Regulations: The lake management plan is superseded by federal, state, county, and municipal laws and court rulings; however, the plan may influence county and municipal ordinances and enforcement. Federal laws contain regulations related to water quality, wetlands, dredging, and filling. State laws contain regulations related to water quality, water and lake use, aquatic plants and animals, shoreline vegetation, safety, and development. County laws contain regulations related to development, safety, use, and aquatic plants and animals. Municipal laws contain regulation of use and safety. The rules and regulations are primarily enforced by the US Army Corps of Engineers, the Wisconsin Department of Natural Resources, the Marathon County Sheriff's Department, and the Marathon County Conservation, Planning and Zoning (CPZ) Department. If considering development near or on a lake, addressing problem plants or animals, or altering the lake bottom contacts the Marathon County CPZ Department and/or the Wisconsin Department of Natural Resources.

1. Waste Storage Facility and Nutrient Management Ordinance. Dairy cattle in the county produce over 4,000,000 gallons of manure per day. To assure that this organic matter and nutrient source is contained and managed with sound practices, Marathon County has regulated these activities since 1985.

2. Marathon County Livestock Siting Ordinance. In October 2006, Marathon County adopted the General Code of Ordinances for Marathon County Chapter 13.01 Livestock Facilities Licensing Ordinance. The purpose of the ordinance is to establish the authority, technical standards, performance standards, and monitoring protocols necessary to protect public health, safety, and the environmental resources in Marathon County.

3. Marathon County Zoning Ordinance (Chapter 17) and Land Division and Surveying Regulations (Chapter 18). The Marathon County Zoning Ordinance (Chapter 17) is adopted to promote and protect public health, safety, comfort, convenience, aesthetics and other aspects of the general welfare of the population. More specifically, the ordinance establishes standards for buildings, structures, setbacks, lot coverage, land uses, streets and highways and other land use aspects. These regulations apply to all unincorporated areas that have adopted Marathon County Zoning. However, where a town has not adopted Marathon County Zoning but has adopted local regulations, the local regulations apply. In addition, the County regulates the division of land in accordance with Chapter 18 Land Division and Surveying Regulations. The County's land division regulations apply in all unincorporated areas of the County. However, where a town has land division regulations that are more restrictive than the County's, the local regulations apply.

4. **Floodplain and Shoreland Ordinance.** Shoreland, wetland, and floodplain regulations are applicable in all unincorporated areas of the County. Wisconsin law mandates counties to adopt and administer a zoning ordinance that regulates land use in shoreland/wetland and floodplain areas for the entire area of the county outside of villages and cities.

5. **Nonmetallic Mining Reclamation Ordinance.** Marathon County adopted the General Code of Ordinances for Marathon County Chapter 21 Nonmetallic Mining Reclamation Code in 1989. The ordinance applies to approximately 400 operating or abandoned excavations of sand, gravel, decomposed granite and stone. The ordinance requires restoration of the site to a purposeful and acceptable landscape appearance and use.

6. **Private Sewage System Ordinance**. Marathon County adopted Marathon County General Code of Ordinances Chapter 15 Private Sewage Systems in 1968. This ordinance is adopted to promote and protect public health and safety by assuring the proper siting, design, installation, inspection, and management of private sewage systems and non-plumbing sanitation systems, and to assure the timely repair or replacement of failing private sewage systems. All structures or premises in the County that are permanently or intermittently intended for human habitation or occupancy, which are not serviced by a public sewer or a privately owned wastewater treatment facility regulated by the Department of Natural Resources, shall have a system for holding or treatment and dispersal of sewage and wastewater which complies with the provisions of this ordinance.

7. **Construction Site Erosion – WI Administrative Code NR 216.** Construction site erosion and uncontrolled storm water runoff from land disturbing activities can have significant adverse impacts upon local water resources. Under subchapter III of NR 216, Wis. Adm. Code, a notice of intent shall be filed with the DNR by any landowner who disturbs one or more acres of land.

Lake Management Plan Approval

The final draft of the lake management plan will be approved through a vote of the Town Board. The final draft will be approved by the Wisconsin Department of Natural Resources (DNR) to ensure compliance lake management plan requirements and grant requirements. The completed plan that has been approved by the DNR will be presented to the municipalities containing the lake and Marathon County. The municipality may reference the lake management plan or parts of the plan in their comprehensive plan to guide municipal or county decisions.

Lake Assistance

The lake management plan will enhance the ability of the lake to apply for financial assistance. The lake management plan will be considered as part of the application for grants through the Wisconsin Department of Natural Resources. Current listings of grants available from the DNR can be found at http://dnr.wi.gov/aid/. Marathon County offers technical and financial assistance through the Conservation, Planning and Zoning Department and University of Wisconsin-Extension Department. Additional assistance may be available from other agencies and organizations, including DNR, UW-Extension Lakes Program, Golden Sands RC&D, Wisconsin Wetlands Association, and Wisconsin Trout Unlimited. Etc.

References

Boat Ed, 2013. The Handbook of Wisconsin Boating Laws and Responsibilities. Approved by Wisconsin Department of Natural Resources. www.boat-ed.com

Borman, Susan, Robert Korth, and Jo Temte, 2001. Through the looking glass, a field guide to aquatic plants. Reindl Printing, Inc. Merrill, Wisconsin.

Haney, R. 2014. Water Quality in Bass, Mud and Norrie Lakes. Presentation given November 5, 2014.

Meronek, Tom. 2014. The Fishery in Bass, Mud and Norrie Lakes. Presentation. Given October 8, 2014.

Panuska and Lillie, 1995. Phosphorus Loadings from Wisconsin Watershed: Recommended Phosphorus Export Coefficients for Agricultural and Forested Watersheds. Bulletin Number 38, Bureau of Research, Wisconsin Department of Natural Resources.

Shaw, B., C. Mechenich, and L. Klessig, 2000. *Understanding Lake Data*. University of Wisconsin-Extension, Stevens Point. 20 pp.

Skawinski, Paul, Kaitlin Kernosky, Shawn Esser, 2010. Norrie Lake—Marathon County AIS survey results. Golden Sands RC&D, Wisconsin Department of Natural Resources, Marathon County CPZ. Date of surveys August 24 and September 9 2010.

Turyk, N. 2014. Aquatic Plants of Bass, Mud and Norrie Lakes. Presentation given September 10, 2014.

Turyk, N. 2014. Healthy Shorelands. Presentation given October 8, 2014.

Turyk, N. 2014. Land Management Practices to Improve Water Quality. Presentation given November 5, 2014.

UW-Stevens Point Center for Watershed Science and Education, 2014. Eastern Marathon County Lake Study - Norrie Lake 2010-2012. Final Report to Marathon County and Wisconsin Department of Natural Resources.

UW-Stevens Point Center for Watershed Science and Education, 2013. Eastern Marathon County Lake Study - Norrie Lake 2010-2012 Mini-Report. Report to Marathon County and Wisconsin Department of Natural Resources. Planning Meeting Presentations

Vallentyne, J.R., 1974. The Algal Bowl-Lakes and Man. Ottawa Department of the Environment.

Wetzel, R.G., 2001. Limnology, Lake and River Ecosystems, Third Edition. Academic Press. San Diego, California.

Appendices

Appendix A: Marathon County Lake Information Directory

Algae - Blue-Green
Contact: Scott Provost, WI Dept. of Natural Resources
Phone: 715-421-7881
Address: 473 Griffith Ave., Wisconsin Rapids, WI 54494
E-mail: scott.provost@wisconsin.gov
Website: http://dnr.wi.gov/lakes/bluegreenalgae/

Contact: Wisconsin Department of Health Services
Phone: 608-267-3242
Address: PO Box 2659, Madison, WI 53701
E-mail: dhswebmaster@dhs.wisconsin.gov
Website:
www.dhs.wisconsin.gov/eh/bluegreenalgae/index.htm

Aquatic Invasive Species /Clean Boats Clean Water
Contact: Golden Sands RC&D
Phone: 715-343-6215
E-mail: info@goldensandsrcd.org
Address: 1100 Main Street, Suite #150, Stevens Point, WI 54481
Websites:
http://www.goldensandsrcd.org/
http://dnr.wi.gov/invasives/

Aquatic Plant Management
(Native and Invasive)
Contact: Scott Provost, WI Dept. of Natural Resources
Phone: 715-421-7881
Address: 473 Griffith Ave,. Wisconsin Rapids, WI 54494
E-mail: scott.provost@wisconsin.gov
Website: http://dnr.wi.gov/lakes/plants/

Aquatic Plant Identification
Contact: Golden Sands RC&D
Phone: 715-343-6215
E-mail: info@goldensandsrcd.org
Address: 1100 Main Street, Suite #150, Stevens Point, WI 54481
Website: http://www.goldensandsrcd.org/

Contact: Scott Provost, WI Dept. of Natural Resources
Phone: 715-421-7881
Address: 473 Griffith Ave., Wisconsin Rapids, WI 54494
E-mail: scott.provost@wisconsin.gov
Website: http://dnr.wi.gov/lakes/plants/

Aquatic Plant Management
Contact: Scott Provost, WI Dept. of Natural Resources
Phone: 715-421-7881
Address: 473 Griffith Ave., Wisconsin Rapids, WI 54494
E-mail: scott.provost@wisconsin.gov
Website: http://dnr.wi.gov/lakes/plants/

Best Management Practices (Rain gardens, shoreland buffers, agricultural practices, runoff controls)
Contact: Marathon County CPZ
Phone: 715-261-6000
Address: 210 River Dr., Wausau, WI 54403
E-mail: cpz@co.marathon.wi.us
Website:
http://www.co.marathon.wi.us/Departments/ConservationPlanningZoning.aspx

Boat Landings (County)
(Signage, permissions, etc.)
Contact: William Duncanson
Phone: 715-261-1550
Address: 212 River Dr., Suite 2, Wausau, WI 54403
E-mail: parkforestry@co.marathon.wi.us
Website:
http://www.co.marathon.wi.us/Departments/ParksRecreationForestry.aspx

Boat Landings (State)
Contact: Tom Meronek, WI Dept. of Natural Resources
Phone: 715-359-7582
Address: 5103 Rib Mt. Dr., Wausau, WI 54401
E-mail: Thomas.Meronek@wisconsin.gov
Website:
http://dnr.wi.gov/org/land/facilities/boataccess/

Boat Landings (Town)
Contact the clerk for the specific town/village in which the boat landing is located.

Conservation Easements
Contact: Gathering Waters Conservancy
Phone: 608-251-9131
Address: 211 S. Paterson St., Suite 270, Madison, WI 53703
E-mail: info@gatheringwaters.org
Website: http://gatheringwaters.org/

Contact: Buzz Sorge, WI Dept. of Natural Resources
Phone: 715-839-3794
Address: PO Box 4001, Eau Claire, WI 54702
E-mail: Patrick.Sorge@wisconsin.gov
Website: http://dnr.wi.gov/aid/easements.html

Contact: North Central Conservancy Trust
Phone: 715-341-7741
Address: PO Box 124, Stevens Point, WI 54481
E-mail: info@ncctwi.org
Website: http://www.ncctwi.org/

Contact: NRCS Wausau Service Center
Phone: 715-848-2330
Address: 326 River Dr. Wausau, WI 54403

Critical Habitat and Sensitive Areas
Contact: Buzz Sorge, WI Dept. of Natural Resources
Phone: 715-839-3794
Address: PO Box 4001, Eau Claire, WI 54702
E-mail: Patrick.Sorge@wisconsin.gov
Website: http://dnr.wi.gov/lakes/criticalhabitat/

Dams (Pike Lake) Town of Reid and Elderon
Contact: Town of Reid (Kittie Milanowski, Clerk)
Phone: 715-446-3767
Address: 7089 Plover River Rd., Hatley, WI 54440
E-mail: kitmil46@yahoo.com
Website:
http://www.co.marathon.wi.us/Home/AboutMarathonCounty/Municipalities/Towns.aspx

Contact: Town of Elderon (Mary Ostrowski, Clerk)
Phone: 715-454-6845
Address: 2021 Cherry Dr., Eland, WI 54427
E-mail: tnelderon@aol.com
Website:
http://www.co.marathon.wi.us/Home/AboutMarathonCounty/Municipalities/Towns.aspx

Fertilizers/Soil Testing
Contact: Marathon County UW Extension
Phone: 715-261-1230
Address: 212 River Drive, Suite 3, Wausau, WI 54403-5476
Website:
http://marathon.uwex.edu/agriculture/agriculture-news-in-marathon-county/

Contact: NRCS Wausau Service Center
Phone: 715-848-2330
Address: 326 River Dr., Wausau, WI 54403

Fisheries Biologist (management, habitat)
Contact: Tom Meronek, WI Dept. of Natural Resources
Phone: 715-359-7582
Address: 5103 Rib Mt. Drive, Wausau, WI 54401
E-mail: Thomas.Meronek@wisconsin.gov
Website: http://dnr.wi.gov/fish/

Frog Monitoring—Citizen Based
Contact: Andrew Badje, WI Dept. of Natural Resources
Phone: 608-266-3336
E-mail: Andrew.badje@wisconsin.gov
E-mail: WFTS@wisconsin.gov

Grants
Contact: Buzz Sorge, WI Dept. of Natural Resources
Phone: 715-839-3794
Address: PO Box 4001, Eau Claire, WI 54702
E-mail: Patrick.Sorge@wisconsin.gov

Contact: Marathon County CPZ
Phone: 715-261-6000
Address: 210 River Dr., Wausau, WI 54403
E-mail: cpz@co.marathon.wi.us
Website:
http://www.co.marathon.wi.us/Departments/ConservationPlanningZoning.aspx

Groundwater Quality
Contact: Kevin Masarik, UWSP Center for Watershed Science and Education
Phone: 715-346-4276
Address: 224 TNR, 800 Reserve St., Stevens Point, WI 54481
E-mail: kmasarik@uwsp.edu
Website: http://www.uwsp.edu/cnr/watersheds/

Groundwater Quantity
Contact: George Kraft, UW-Stevens Point
Phone: 715-346-2984
Address: TNR 224C, 800 Reserve St., Stevens Point, WI 54481
E-mail: George.kraft@uwsp.edu

Contact: Scott Provost, WI Dept. of Natural Resources
Phone: 715-421-7881
Address: 473 Griffith Ave., Wisconsin Rapids, WI 54494
E-mail: scott.provost@wisconsin.gov
Website:
http://prodoasext.dnr.wi.gov/inter1/hicap$.startup

Informational Packets
Contact: Ryan Haney, UWSP Center for Watershed Science and Education
Phone: 715-346-2497
Address: 224A TNR, 800 Reserve St., Stevens Point, WI 54481
E-mail: mclakes@uwsp.edu

Lake Groups – Friends, Associations, Districts
Contact: Patrick Goggin, UWEX Lakes
Phone: 715-365-8943
Address: 107 Sutliff Ave., Rhinelander, WI 54501
E-mail: pgoggin@uwsp.edu
Website:
http://www.uwsp.edu/cnr/uwexlakes/

Contact: Eric Olson, UWEX Lakes
Phone: 715-346-2192
Address: 800 Reserve St., Stevens Point, WI 54481
E-mail: eolson@uwsp.edu
Website: http://www.uwsp.edu/cnr/uwexlakes/

Contact: Susan Tesarik, Wisconsin Lakes
Phone: 1-800-542-5253
Address: 4513 Vernon Blvd., Suite 101, Madison, WI 53705
E-mail: lakeinfo@wisconsinlakes.org
Website: http://wisconsinlakes.org/

Lake Levels
See: Groundwater

Lake Related Law Enforcement (No-wake, transporting invasives, etc.)
Contact: Ben Harzfeldt or Paul Leezer, WI Dept. of Natural Resources State Conservation Wardens
Phone: 715-359-1030 or 715-401-0644
Website: http://dnr.wi.gov/org/es/enforcement/

Land Use Planning and Shoreland Zoning
Contact: Dean Johnson, Marathon County CPZ
Phone: 715-261-6000
Address: 210 River Dr., Wausau, WI 54403
E-mail: dean.johnson@co.marathon.wi.us
Website:
http://www.co.marathon.wi.us/Departments/ConservationPlanningZoning.aspx

Contact: Marathon County CPZ
Phone: 715-261-6000
Address: 210 River Dr., Wausau, WI 54403
Website:
http://www.co.marathon.wi.us/Departments/ConservationPlanningZoning.aspx

Contact: UWSP Center for Land Use Education
Phone: 715-346-3783
Address: TNR 208, 800 Reserve St., Stevens Point, WI 54481
E-mail: Center.for.Land.Use.Education@uwsp.edu
Website: http://www.uwsp.edu/cnr/landcenter/

Nutrient Management Plans
Marathon County Conservation, Planning, and Zoning
Contact: Kirk Langfoss
Phone: 715-261-6008
Address: 210 River Dr., Wausau, WI 54403
E-mail: kirk.langfoss@co.marathon.wi.us
Website:
http://www.co.marathon.wi.us/Departments/ConservationPlanningZoning.aspx
http://dnr.wi.gov/runoff/ag/manure.html

Parks (County)
Contact: William Duncanson
Phone: 715-261-1550
Address: 212 River Dr., Suite #2, Wausau, WI 54403
E-mail: parkforestry@co.marathon.wi.us
Website:
http://www.co.marathon.wi.us/Departments/ParksRecreationForestry.aspx

Purchase of Development Rights
Contact: North Central Conservancy Trust
Phone: 715-341-7741
Address: PO Box 124, Stevens Point, WI 54481
E-mail: info@ncctwi.org
Website: http://www.ncctwi.org/

Purchase of Land
Contact: Buzz Sorge, WI Dept. of Natural Resources
Phone: 715-839-3794
Address: PO Box 4001, Eau Claire, WI 54702
E-mail: Patrick.Sorge@wisconsin.gov
Website:
http://dnr.wi.gov/org/land/facilities/realestate/acquire.html

Rain Barrels – Order
Contact: Golden Sands RC&D
Phone: 715-343-6215
Address: 1462 Strongs Ave., Stevens Point, WI 54481
Website:
http://www.goldensandsrcd.org/downloads/rain_barrel_order_form.pdf

Rain Gardens and Runoff
Marathon County Conservation, Planning, and Zoning
Phone: 715-261-6000
Address: 210 River Dr., Wausau, WI 54403
E-mail: cpz@co.marathon.wi.us
Website:
http://www.co.marathon.wi.us/Departments/ConservationPlanningZoning.aspx

Septic Systems
Marathon County Conservation, Planning, and Zoning
Contact: Dale Dimond
Phone: 715-261-6028
Address: 210 River Dr., Wausau, WI 54403
E-mail: dale.dimond@co.marathon.wi.us
Website:
http://www.co.marathon.wi.us/Departments/ConservationPlanningZoning.aspx

Shoreland Management
Marathon County Conservation, Planning, and Zoning
Phone: 715-261-6000
Address: 210 River Dr., Wausau, WI 54403
E-mail: cpz@co.marathon.wi.us
Website:
http://www.co.marathon.wi.us/Departments/ConservationPlanningZoning.aspx
http://www.uwsp.edu/cnr/uwexlakes/ecology/shorelands/default.asp

Shoreland Zoning Ordinances
See: Land Use Planning and Shoreland Zoning Ordinances

Soil Fertility Testing
See Fertilizers/Soil Testing

Water Quality Monitoring
Contact: Buzz Sorge, WI Dept. of Natural Resources
Phone: 715-839-3794
Address: PO Box 4001, Eau Claire, WI 54702
E-mail: Patrick.Sorge@wisconsin.gov
Website:
http://dnr.wi.gov/environmentprotect/water.html
http://watermonitoring.uwex.edu/index.html

Water Quality Problems
Contact: Buzz Sorge, WI Dept. of Natural Resources
Phone: 715-839-3794
Address: PO Box 4001, Eau Claire, WI 54702
E-mail: Patrick.Sorge@wisconsin.gov
Website:
http://dnr.wi.gov/environmentprotect/water.html

Contact: Nancy Turyk, UWSP Center for Watershed Science and Education
Phone: 715-346-4155
Address: 216 TNR, 800 Reserve St., Stevens Point, WI 54481
E-mail: nturyk@uwsp.edu

Wetlands
Contact: Wisconsin Wetland Association
Phone: 608-250-9971
Address: 214 N. Hamilton St., #201, Madison, WI 53703
E-mail: info@wisconsinwetlands.org
Website: www.wisconsinwetlands.org
http://dnr.wi.gov/wetlands/

Wetland Inventory
Contact: Emmet Judziewicz, UWSP Freckmann Herbarium
Address: 310 TNR, 800 Reserve St., Stevens Point, WI 54481
E-mail: ejudziewica@uwsp.edu

Woody Habitat
Contact: Tom Meronek, WI Dept. of Natural Resources
Phone: 715-359-7582
Address: 5103 Rib Mt. Drive, Wausau, WI 54401
E-mail: Thomas.Meronek@wisconsin.gov

If you are looking for any information that is not listed in this directory please contact:

Ryan Haney, **UWSP Center for Watershed Science and Education**
224 TNR, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-2497
E-mail: mclakes@uwsp.edu

Or **Marathon County Conservation, Planning and Zoning**
210 River Dr., Wausau, WI 54403
Phone: 715-261-6000
E-mail: cpz@co.marathon.wi.us

Appendix B: Invasive Species Rapid Response Plan 2014

SURVEY/MONITOR

1. Learn how to survey/monitor the lake.	**Contacts:** **Water Resources Management Specialist** Wisconsin Department of Natural Resources Scott Provost 473 Griffith Ave. Wisconsin Rapids, WI, 54494 Phone: 715-421-7881 E-Mail: Scott.provost@wisconsin.gov **Marathon County Aquatic Invasive Species (AIS) Coordinator** Golden Sands RC&D 1100 Main St., Suite #150 Stevens Point, WI 54481 Phone: 715-343-6278 E-Mail: info@goldensandsrcd.org
2. Survey/monitor the lake monthly/seasonally/annually.	If you find a suspected invasive species, report it as soon as possible using the procedure below.

REPORTING A SUSPECTED INVASIVE SPECIES

1. Collect specimens or take photos. Regardless of the method used, provide as much information as possible. Try to include flowers, seeds or fruit, buds, full leaves, stems, roots and other distinctive features. In photos, place a coin, pencil or ruler for scale. Deliver or send specimen ASAP.	Collect, press and dry a complete sample. This method is best because a plant expert can then examine the specimen. **-OR-** Collect a fresh sample. Enclose in a plastic bag with a moist paper towel and refrigerate. **-OR-** Take detailed photos (digital or film).
2. Note the location where the specimen was found. If possible, give the exact geographic location using a GPS (global positioning system) unit, topographic map, or the Wisconsin Gazetteer map book. If using a map, include a photocopy with a dot showing the plant's location. You can use TopoZone.com to find the precise location on a digital topographic map. Click the cursor on the exact collection site and note the coordinates (choose UTM or Latitude/Longitude).	Provide one or more of the following: • Latitude & Longitude • UTM (Universal Transverse Mercator) coordinates • County, Township, Range, Section, Part-section • Precise written site description, noting nearest city & road names, landmarks, local topography

3. Gather information to aid in positive species identification.	• Collection date and county • Your name, address, phone, email • Exact location (Latitude/Longitude or UTM preferred, or Township/Range/Section) • Plant name (common or scientific) • Land ownership (if known) • Population description (estimated number of plants and area covered) • Habitat type(s) where found (forest, field, prairie, wetland, open water)
4. Mail or bring specimens and information to any of the following locations: Digital photos may be emailed.	**Wisconsin Dept. Natural Resources** Scott Provost Water Resources Management Specialist 473 Griffith Ave. Wisconsin Rapids, WI 54494 Phone: (715) 421-7800 E-Mail: scott.provost@wisconsin.gov **Marathon County AIS Coordinator** Golden Sands RC&D 1100 Main St., Suite #150 Stevens Point, WI 54481 Phone: 715-343-6214 E-Mail : info@goldensandsrcd.org **UW-Stevens Point Herbarium** 301 Trainer Natural Resources Building 800 Reserve Street Stevens Point, WI 54481 Phone: 715-346-4248 E-Mail: ejudziew@uwsp.edu **Wisconsin Invasive Plants Reporting & Prevention Project** Herbarium-UW-Madison 430 Lincoln Drive Madison, WI 53706 Phone: (608) 267-7612 E-Mail: invasiveplants@mailplus.wisc.edu
5. Once the specimen is dropped off or sent for positive identification, be sure to contact:	**Marathon County AIS Coordinator** Golden Sands RC&D 1100 Main St., Suite #150 Stevens Point, WI 54481 Phone: 715-343-6214 E-Mail : info@goldensandsrcd.org

If an invasive species is confirmed, the Marathon County AIS Coordinator will make the following public information contacts:

- **Wisconsin Department of Natural Resources**
  Water Resources Management Specialist
  Scott Provost
  473 Griffith Ave.
  Wisconsin Rapids, WI, 54494
  Phone: 715-421-7881
  E-Mail: Scott.provost@wisconsin.gov

- **The town** in which the water body is located.
  Town of: Norrie
  Contact Name: Alfred King, Town Board Chair
  Contact Phone: (715) 446-3739

- **University of Wisconsin-Stevens Point**
  Water Resource Scientist
  Nancy Turyk
  Trainer Natural Resources Building
  800 Reserve Street
  Stevens Point, WI 54481Telephone: 715-346-4155
  E-mail: nturyk@uwsp.edu

- **Local Residents**

- **Norrie Lake Sportsmans Club**

If an invasive species is confirmed, the Norrie Lake Sportsmans Club and/or Marathon County Land Conservation will make the following public information contacts:

- **Newspapers**: Wausau Daily Herald, Wittenberg Birnamwood Enterprise

Contact the WDNR to post notice(s) at the access point(s) to the water body.

Appendix C: Aquatic Plant Management Strategies

General recommendations:

- Reduce nutrients traveling to the lake from the landscape.
- Avoid increasing algal blooms by maintaining a healthy amount of aquatic plants.
- Don't denude the lakebed.
    - Increases potential for aquatic invasive species establishment.
    - Sediments can add phosphorus to the water which may lead to increased algal growth.
- Choose options that are appropriate for your lake's situation.
- Monitor and adjust your strategies if you are not making headway!

List of Aquatic Plant Management Options (selection of options varies with situation):

No Action

ADVANTAGES	LIMITATIONS
∗ No associated cost. ∗ Least disruptive to lake ecosystem.	∗ May not be effective in achieving aquatic plant management objectives.

Hand Pulling

ADVANTAGES	LIMITATIONS
∗ Can be used for thinning aquatic plants around docks. ∗ Can target specific plants - with proper training. ∗ Can be effective in controlling small infestations of aquatic invasive species. ∗ No associated cost.	∗ Removes near-shore wildlife and fish habitat. ∗ Opens up areas where invasives to become established. ∗ If aquatic invasive species are not pulled properly, could worsen the problem.

Hand Pulling Using Suction

ADVANTAGES	LIMITATIONS
∗ Can be used for thinning plants around docks. ∗ Can be used in deeper areas (with divers). ∗ Can target specific plants with proper training. ∗ Can be effective in controlling small infestations of aquatic invasive species. ∗ May be useful in helping to remove upper root mass of aquatic invasive species.	∗ Costs associated with hiring a diver may be comparable to chemical treatment expenses. ∗ Currently an experimental treatment – not readily available. ∗ If aquatic invasive species are not pulled properly, could worsen the problem.

Mechanical Harvesting

ADVANTAGES	LIMITATIONS
∗ Removes plant material and nutrients. ∗ Can target specific locations. ∗ Used to manage larger areas for recreational access or fishery management.	∗ Not used in water depths less than 3 feet. ∗ Some harm to aquatic organisms. ∗ Is a temporary control. ∗ Risk of introduction of new aquatic invasive species (on a hired harvester) or spread of some existing invasive species. ∗ Hired cost at least $150/hr.

Water Level Manipulation

ADVANTAGES	LIMITATIONS
∗ Controls aquatic plants in shallower, near-shore areas. ∗ Can be low cost.	∗ Requires a controlling structure on the lake. ∗ May cause undesired stress on ecosystem. ∗ Cannot be used frequently.

Milfoil Weevils

ADVANTAGES	LIMITATIONS
∗ Natural, native maintenance of native and exotic milfoils. ∗ Prefers the aquatic invasive Eurasian Watermilfoil. ∗ Some lakes may already have a native populations; need a professional stem count and assessment of shoreland health, structure of fishery, etc. ∗ Doesn't harm lake ecosystem.	∗ Require healthy shoreline habitat for overwintering. ∗ Cannot survive in areas of mechanical harvesting or herbicide application. ∗ Effectiveness highly variable between lakes (only works well for some lakes). ∗ Limited access to weevils for purchase in WI. ∗ Still considered experimental.

Chemical Treatment: Spot

ADVANTAGES	LIMITATIONS
∗ May be less destructive to lake ecosystem than lake-wide treatment.	∗ Only considered in lakes with aquatic invasive plants. ∗ Usually not fully effective in eradicating target species. ∗ Contaminants may remain in sediment. ∗ Effects on lake ecosystem not fully understood. ∗ Does not remove dead vegetation, which depletes oxygen and releases nutrients, adds to build-up of muck. ∗ Extra nutrients may spur additional aquatic plant and algae growth.

Chemical Treatment: Lake-wide

ADVANTAGES	LIMITATIONS
∗ May reduce aquatic invasives for a time. ∗ Treatment not needed as frequently.	∗ Only considered in lakes with aquatic invasive plants. ∗ Usually not fully effective in eradicating target species. ∗ Contaminants may remain in sediment. ∗ Does not remove dead vegetation, which depletes oxygen and releases nutrients, adds to build-up of muck. ∗ Extra nutrients may spur additional aquatic plant and algae growth. ∗ Negatively affects native vegetation. ∗ Effects on lake ecosystem not fully understood. ∗ Opens up space once taken up by natives for invasive species to colonize once again. ∗ ~$4000 per 5 acres.