

# Oconto County Lakes Project

**DRAFT 073024**

## HALFMOON LAKE MANAGEMENT PLAN

**2024**

### Oconto County Lakes Project Reports:

**State of the  
Oconto County  
Lakes**

**Lake Study  
Summary  
Reports**

**Operational Strategy and  
Plan for Surface Water  
Management and  
Protection**

**Lake  
Management  
Plans**

### VISION

*Halfmoon Lake will be the ideal Northwoods lake, where residents can balance time with one another, fishing, boating, swimming and exploring while immersing in the nature and wildlife that comprise this high-quality resource.*



# Halfmoon Lake Management Plan

The authors would like to acknowledge the commitment and enthusiasm of Oconto County Lakes & Waterways Association, Oconto County Land and Water Conservation Department, UW Extension – Oconto County, Wisconsin Department of Natural Resources, UW-Stevens Point Water and Environmental Analysis Laboratory, landowners in the Halfmoon Lake watershed, and participants in the Oconto County Lakes Project.

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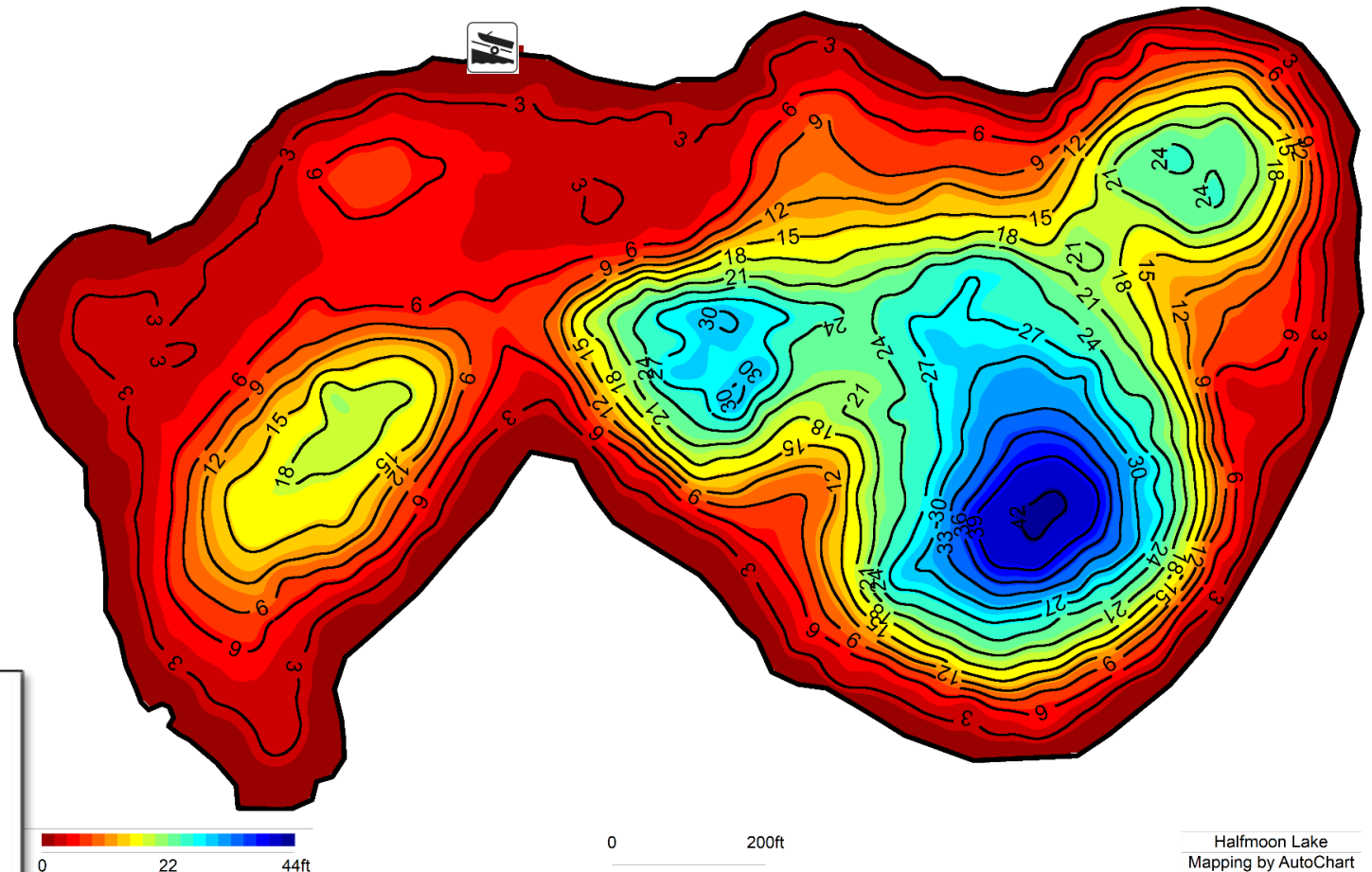
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Resource	Acronym or Truncated Name
Citizen Lake Monitoring Network	CLMN
Clean Boats Clean Waters	CBCW
Lumberjack Resource Conservation & Development Council	LRCD
Oconto County Land & Water Conservation Dept.	OC LCD
Oconto County Board of Supervisors	OC Board
Oconto County Lakes and Waterways Association	OCLAWA
Town of Brazeau	TOB
University of Wisconsin - Extension	UWEX
UWSP Water & Environmental Analysis Laboratory	WEAL
UWSP Center for Watershed Science and Education	CWSE
USDA Natural Resources Conservation Service	NRCS
Wisconsin Department of Natural Resources	WDNR
Wisconsin Department of Transportation	WDOT

# Background

## ABOUT HALFMOON LAKE

Halfmoon Lake is located in the Town of Brazeau in northeastern Wisconsin. This 28-acre seepage lake has a maximum depth of 38 feet with clear water. Its bottom sediments are primarily muck and sand. Visitors have access to the lake from one public boat landing on the north side of the lake, which is owned and maintained by the Town of Brazeau. Water enters and leaves Halfmoon Lake primarily through groundwater and surface runoff.



Halfmoon Lake  
Mapping by AutoChart

Map created by WDNR.

# What Is A Lake Management Plan?

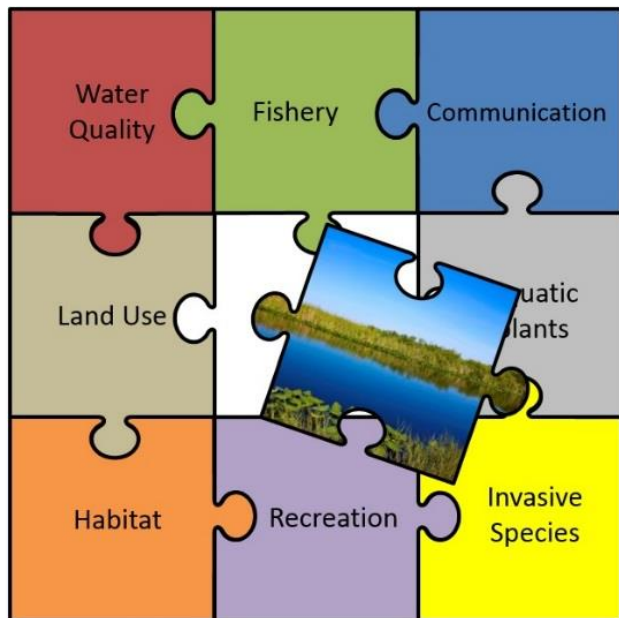
## LAKE MANAGEMENT PLANS (LMP)

### What is an LMP?

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. Although each lake is different, the WDNR requires that each comprehensive lake management plan addresses a specific list of topics affecting the character of the lake, whether each topic has been identified as a priority, or as simply something to consider. In this way, every LMP considers the many aspects associated with lakes.

### What is the purpose of this LMP?

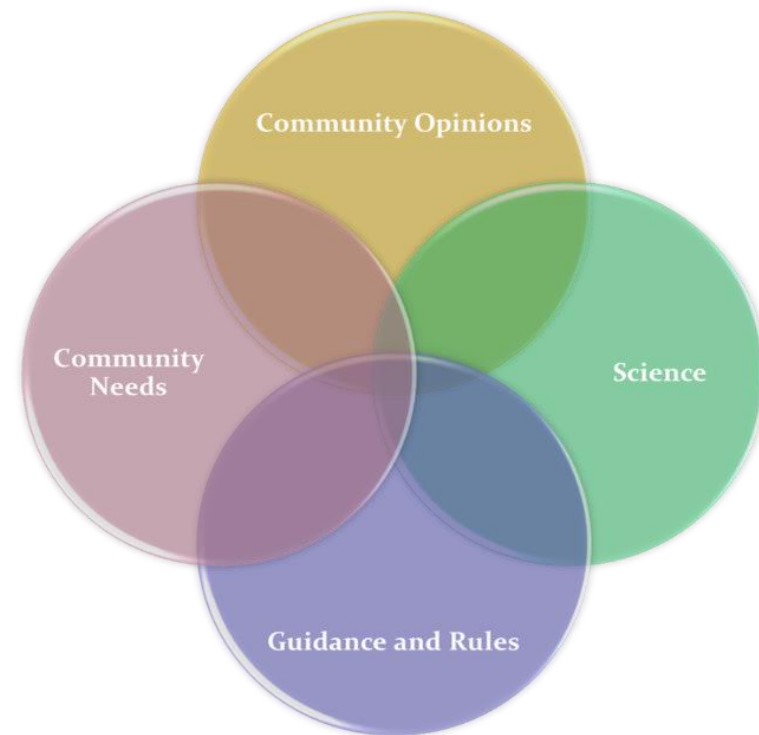
This plan was created to ensure that Halfmoon Lake is healthy now and for future generations. It was designed to learn about Halfmoon Lake and identify features important to the Halfmoon Lake community, in order to provide a framework for the protection and improvement of the lake.



Implementing the content of this LMP will enable citizens and others to work together to achieve the vision for Halfmoon Lake now and in the years to come. It is a dynamic document that identifies goals and action items for the purpose of

maintaining, protecting and/or creating desired conditions in the lake and identifies steps to correct past problems, improve on current conditions, and provide guidance for future boards, lake users, and technical experts.

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 key assistance exists. The actions identified in this LMP can serve as a gateway for obtaining grant funding and other resources to help implement activities outlined in the plan.



# How Was This Plan Created?

## ABOUT THIS PLAN

One of the first steps in creating this plan was to gather and compile data about the lake and its ecosystem to understand past and current conditions. This was done in 2021-2022 alongside 5 other lakes as part of the Oconto County Lakes Project. The project was initiated by citizens in the Oconto County Lakes and Waterways Association who encouraged Oconto County to prioritize lake interests. This effort led to funding from the WDNR Lake Protection Grant Program. There was insufficient data available for many of the lakes to evaluate current water quality, aquatic plant communities, invasive species, and shorelands. The data that were available had been collected at differing frequencies or periods of time, making it difficult to compare lake conditions. Professionals and students from UW-Stevens Point, Oconto County Land Conservation Department, UW Extension, Oconto County citizens and WDNR staff collected the data for use in the development of lake management plans. Sources of information used in the planning process are listed at the end of this document.

Reports from the Halfmoon Lake Study and the materials associated with the planning process and reports can be found on the Oconto County website: [www.co.oconto.wi.us](http://www.co.oconto.wi.us) and navigating to Departments>Land Conservation>County Waterways>County-wide Lake Study.

## THE PLANNING PROCESS

### Who created the strategic plan?

This plan is the result of a stakeholder-driven effort which involved many partners combining insight, knowledge, and expertise throughout the process. Area residents, lake users, and representatives of local municipalities gathered at public

meetings held on May 11, 2021 and March 12, 2024 via an online platform to learn from one another and make decisions about the fishery, water quality, habitat, and land management in the Halfmoon Lake watershed. Technical assistance during the planning process was provided by staff from OCLCD, UWEX, WDNR, and the CWSE.

### How were various opinions incorporated?

Participation in the planning process was open to everyone and was encouraged by letters mailed to Halfmoon Lake waterfront property owners and by press releases in local newspapers. In addition, those individuals and organizations who provided their information were provided with emails about upcoming meetings, which could be forwarded to additional contact lists. To involve and collect input from as many people as possible, including those who might not be able to attend the public meetings, an online survey was conducted. Property owners and interested lake users were notified about the survey and how to access it via direct mailings to waterfront property owners and associated lake organizations and press releases in local newspapers. The surveys could be filled out anonymously online, or paper copies were available upon request. Survey questions and responses were shared at the planning sessions and can be found in the Appendix.





# How Is This Management Plan Used?

## Who will use this plan?

- **Individuals:** Individuals can use this plan to learn about the lake they love and their connection to it. People living near the 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 lake association:** This plan provides an association with guidance for the whole lake and lists options that can easily be prioritized. Resources and funding opportunities for lake management activities are made more available by placement of goals into the lake management plan, and the association can identify partners to help achieve their goals for the lake.
- **Neighboring lake groups, sporting and conservation clubs:** 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 Brazeau:** Municipalities can utilize the visions, objectives, and goals documented in this lake management plan when considering town-level planning or decisions within the watershed that may affect the lake.
- **Oconto 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 Oconto County lakes, streams, wetlands, and groundwater.
- **Wisconsin Department of Natural Resources (WDNR):** Professionals working with lakes in Oconto 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. LMPs help them to identify and

prioritize needs, and where to apply resources. A well thought out lake management plan increases an application's competitiveness for funding from the State.

## Who can help implement this plan?

Lead persons and resources are identified under each action in this plan. These individuals and organizations are able to provide information, suggestions, or services to 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.



# Management Plan Structure

## GOALS FOR HALFMOON LAKE

The foundation of any effective strategic plan is clear identification of goals and the steps needed to achieve the goals. The selected goals should achieve the overall vision for Halfmoon Lake. This plan also identifies available resources within each objective.



The topics comprise the chapters in this plan and 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—water chemistry, clarity, contaminants, lake levels

Shorelands—habitat, erosion, contaminant filtering, water quality, vegetation, access

Watershed—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 & Revisions—plan for maintaining a living document



# Halfmoon Lake Management Plan Goals

## ***Goals for Halfmoon Lake***

The following goals and actions were derived from the values and concerns of citizens interested in Halfmoon Lake and members of the planning committee, as well as the known science about Halfmoon Lake, its ecosystem and the landscape within its watershed. Implementing and regularly updating the goals and actions in this plan will ensure that the vision is supported and that changes are incorporated into the plan.

## **LIST OF GOALS**

<b>Goal 1</b>	<b>Maintain a healthy and diverse fishery.</b>
<b>Goal 2</b>	<b>Halfmoon Lake will maintain a healthy and diverse aquatic plant community.</b>
<b>Goal 3</b>	<b>Sensitive areas in Halfmoon Lake, which provide essential habitat and/or water quality benefits, will be protected.</b>
<b>Goal 4</b>	<b>Property owners within Halfmoon Lake's watershed will understand their connection to the lake and will know about and utilize resources for healthy land management practices.</b>
<b>Goal 5</b>	<b>Halfmoon Lake will maintain healthy shorelands that protect water quality and provide essential habitat.</b>
<b>Goal 6</b>	<b>Maintain or improve water quality in Halfmoon Lake.</b>
<b>Goal 7</b>	<b>Lake users will be informed about and respectful of Halfmoon Lake.</b>
<b>Goal 8</b>	<b>Increase participation in lake stewardship.</b>
<b>Goal 9</b>	<b>Review plan annually and update as needed.</b>

# Fish Community

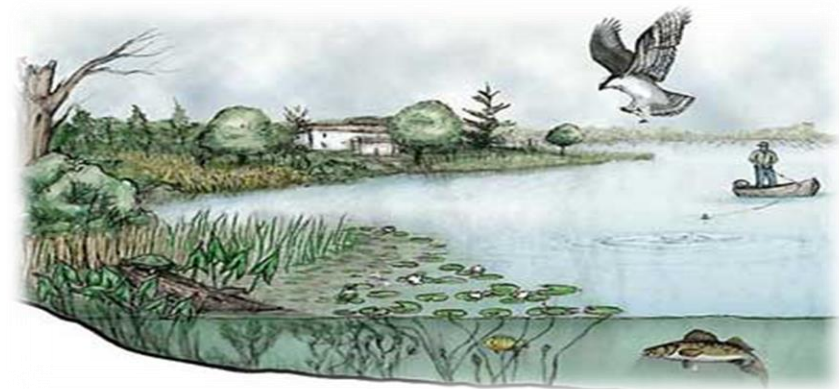
## IN-LAKE HABITAT AND A HEALTHY LAKE

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. Many animals that live in and near the lake are only successful if their habitat needs are met.

### What is lake-habitat?

Healthy lake-habitat in Halfmoon Lake includes native aquatic plants and shoreland vegetation, as well as tree branches/limbs above and below the water.

Habitat exists within the lake, along the shoreland, and even extends into its watershed for some wildlife species. Native vegetation (including wetlands) along the shoreline and connected to the lake provides shelter and food for waterfowl, small mammals, turtles, frogs, and fish. Native plants in and near the lake can also improve water quality and balance water quantity. Aquatic plants infuse oxygen into the water, which is essential for the fish community. 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. 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.



## The Fish Community

A balanced fish community has a mix of predator and prey species, each with different food, habitat, nesting substrate, and water quality needs to flourish.

### What can affect the fishery?

Activities in and around a lake that can affect a fishery include:

- disturbances to the native aquatic plant community or substrate,
- excessive additions of nutrients or harmful chemicals,
- removal of woody habitat,
- shoreline alterations,
- shoreland erosion can cause sediment to settle onto the substrate, causing the degradation of spawning habitat.

### What People Value about Halfmoon Lake

Fishing, swimming, time with family.  
Quiet, wildlife, water quality.  
Neighbors, clear water.



**Habitat provides shelter and food for fish and wildlife.**



# Fish Community



**Fish cribs are good cover for small fish, but near shore habitat is essential for reproduction of most species.**

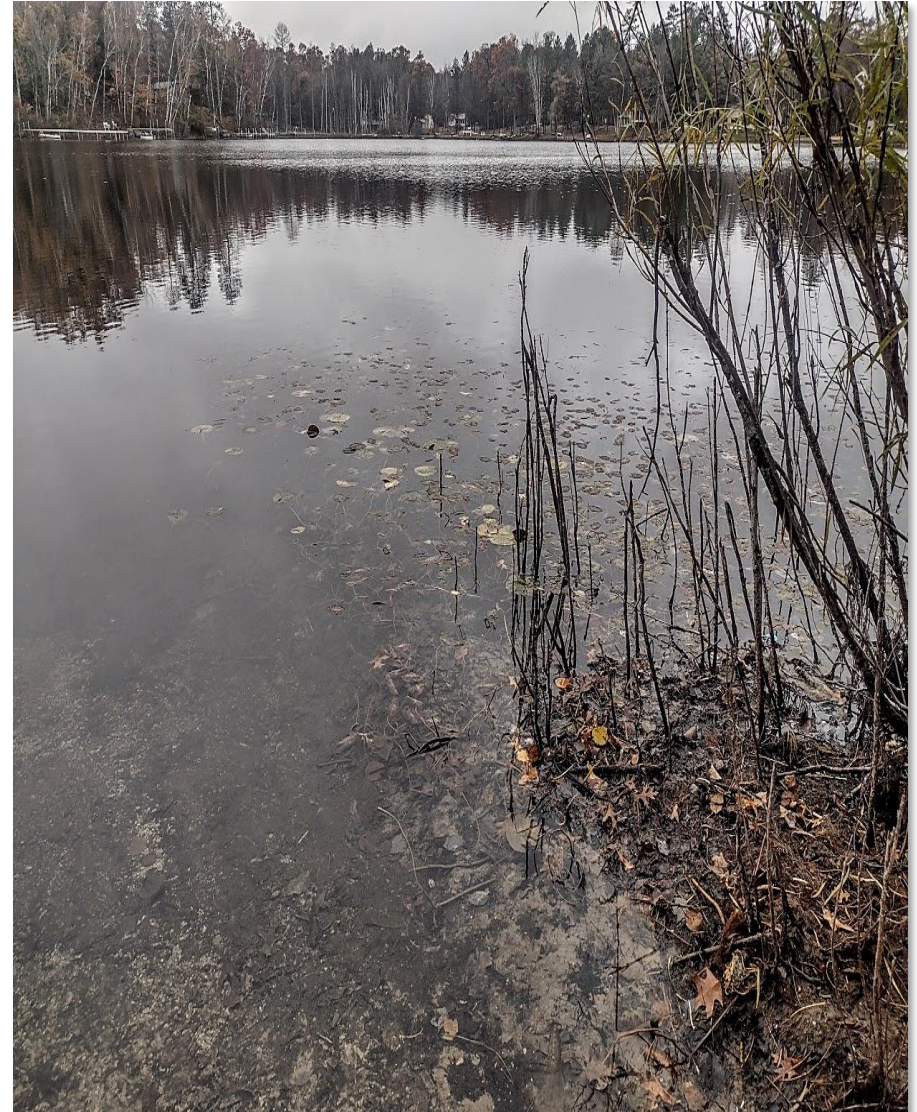
## **Can the fishery be improved?**

Managing a lake for a balanced fishery can result in fewer expenses to lake stewards and the public. While some efforts may be required to provide a more suitable environment to meet the needs of the fish, they usually do not have to be repeated on a frequent basis. Ideally, a lake contains the habitat, water quality, and food necessary to support the fish communities present within the lake and provide fishing opportunities for people without a lot of supplemental effort and associated expenses to maintain these conditions.

- Protecting existing habitat such as emergent, aquatic, and shoreland vegetation, and allowing trees that naturally fall into the lake to remain in the lake, are free of cost.
- Restoring habitat in and around a lake can have an up-front cost, but the effects will often continue for decades.
- Costs in time, travel, and other expenses are associated with routine efforts such as fish stocking and aeration.

### ***Halfmoon Lake Fish Management History***

- ✓ There is no history of stocking or active fishery management in Halfmoon Lake.
- ✓ Fish present include panfish and largemouth bass.
- ✓ Catch and release fishing for largemouth and smallmouth bass is open year-round unless otherwise posted.
- ✓ Motor trolling is allowed with up to 3 hooks, baits or lures per angler.

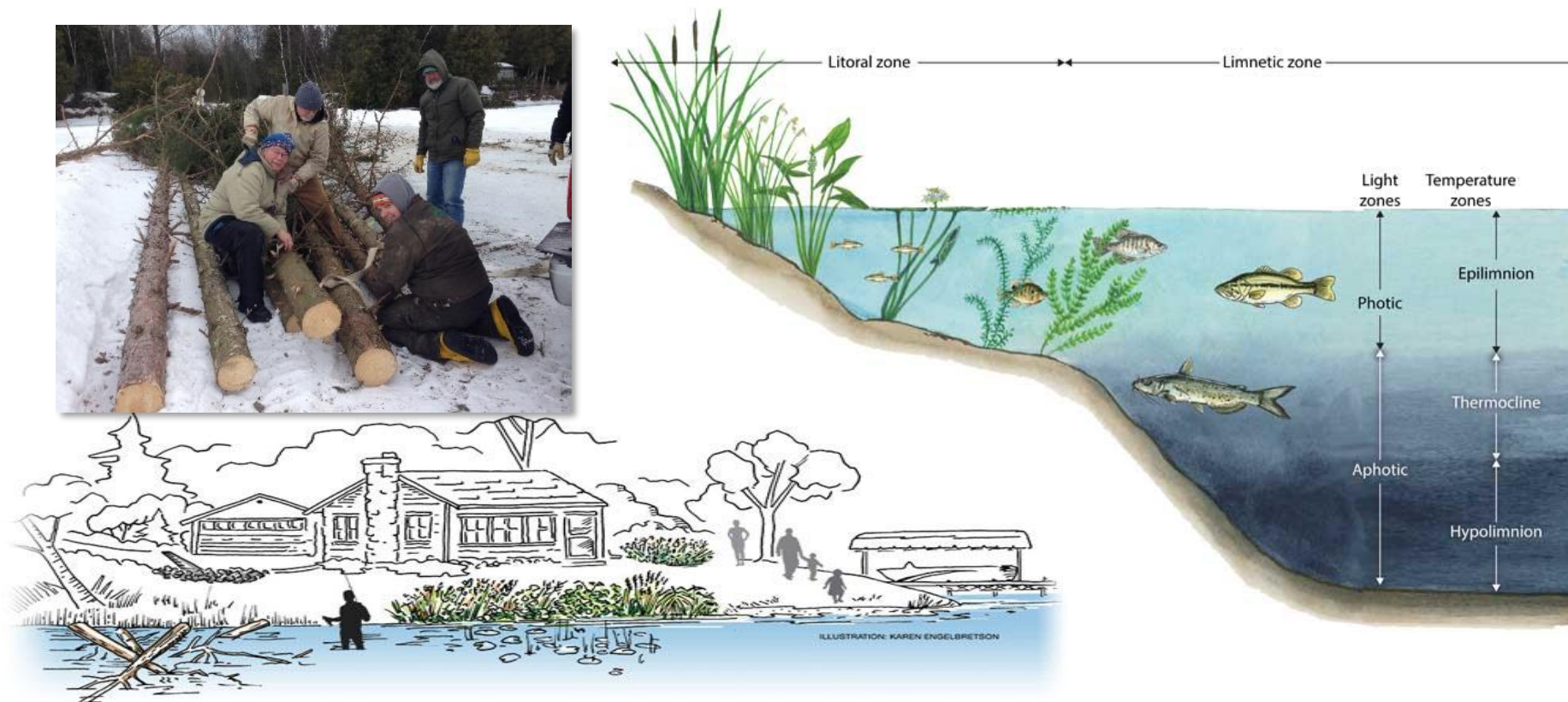


# Fish Community

## Goal 1. Maintain a healthy and diverse fishery.

### Objective 1.1

Actions	Lead person/group	Resources	Timeline
Identify landowners for fish stick installations (at least 10% of properties with fish sticks is recommended). Trees can be sourced by identifying other landowners who need a tree removed.		WDNR-Chip Long	
Educate and encourage landowners to leave logs, tree branches and limbs in place in the water, whenever possible.		WDNR-Chip Long UWEX-Pat Goggin	Ongoing
Continue to protect and restore shoreland areas and avoid shoreland alterations to improve fish habitat.		Shoreland property owners	Ongoing





# Aquatic Plant Community

## Aquatic Plants

Aquatic plants provide the forested landscape within Halfmoon 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 makes the aquatic plant community more resilient and can help to prevent the establishment of non-native aquatic species. Additionally, they stabilize the bottom sediment and help filter out the suspended sediment from the water column.

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. Aquatic plants also serve as indicator species for environmental stressors that could be occurring in a lake or river, such as a runoff event.

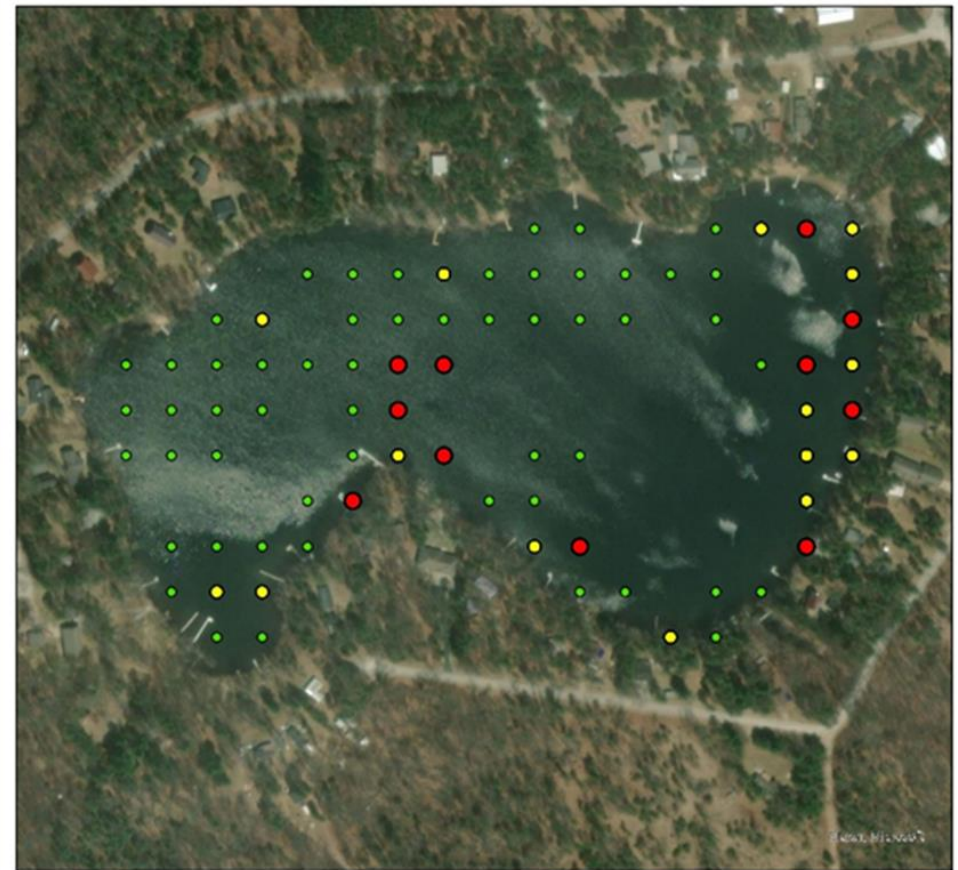
### ***Halfmoon Lake 2021 WDNR (Brenda Nordin) Aquatic Plant Survey Highlights***

- 20 species were identified in the 2021 survey, average diversity when compared to other lakes in the study.
- 82% of visited sites had vegetative growth. The maximum depth of vegetation was 18 feet and the Floristic Quality Assessment (FQI) was 29.3.
- The most frequently encountered plant species were southern naiad (28%), Leafy pondweed (28%) and chara (21%). All three are native to Wisconsin.
- No invasive species were observed.



Native plants provide essential food and habitat for fish and wildlife.

## Halfmoon Lake Aquatic Plant Survey 2021: Rake Fullness



0 125 250 500 750 1,000 Feet



Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point

### Rake Fullness

- 1
- 2
- 3



# Aquatic Plant Community

**Southern naiad**, also called bushy pondweed, is a primary food source for ducks and provides habitat for many invertebrates.



**Leafy pondweed**, a common linear-leaved species is very important to wildlife, offering habitat and food for many aquatic animals.



**Chara** is a type of macro algae that grows attached to muddy lake bottoms and has a musky odor. Muskgrass, as it is known, filters the lake water and is helpful in preventing the establishment of invasive species.



## Aquatic Invasive Species (AIS)

Aquatic invasive species are non-native aquatic plants and animals that are most often unintentionally introduced into lakes by lake users. This 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, DNR protocol is recommended every 5 years to detect changes in the plant community and monitor any AIS.

**Banded mystery snails** were first documented in Halfmoon Lake in 2015. Native to the southeast United States, they can compete with native snails for food and habitat, serve as a host for parasites, and are known to invade largemouth bass nests.



**Chinese mystery snails**, first documented in 2015, have the potential to be a vector for the transmission of parasites and disease and have also been known to clog the screens of water intake pipes.

**Phragmites**, a restricted species in Wisconsin, invades moist areas and can alter hydrology and choke out native species and wildlife habitat.





# Aquatic Plant Community

## **Aquatic Plant Management in Halfmoon Lake**

Management strategies in Halfmoon Lake were designed to achieve a balance between healthy aquatic habitat, good water quality, and eradication of invasive species.

### ***Management Options for Invasive Species or Nuisance Native Aquatic Plants***

Management options that offer the most practical and effective approaches for managing invasive species or nuisance native plants, while minimizing impacts to Halfmoon Lake as a whole, have been identified. Depending upon conditions, the following options may be used alone or in combination with others.

#### **Hand-pulling.** No permit required.

Hand-pulling is the preferred method for removing invasive species. Additionally, lakefront property owners are allowed to manually remove native aquatic plants from an area up to 30 feet wide without a permit for swimming and boat access (this does not include the excavation or removal of any bottom sediments). Any denuded lakebed is prime real estate for invasive species, however, and close monitoring is necessary to ensure no populations are established. EWM has most often been observed in Halfmoon Lake typically as a few isolated plants. Vigilance is required to address these populations while they are still small. Hand -pulling in these situations is the best approach (chemicals are reserved for large beds or lake-wide infestations). The plant spreads through fragmentation, so care to remove the entire plant, roots and all, is necessary. Dispose of away from the water's edge.

#### **Diver Assisted Suction Harvesting (DASH).** Permit required.

Some populations may be in areas of a lake (deep) that are problematic for hand pulling. DASH, a method where divers guide target plants into a suction device that is filtered on the other end, is an efficient way to access these areas while still thoroughly removing all plant fragments.

#### **Chemical Treatment: Spot** Permit required.

If EWM beds exceed a certain size (typically >1 acre), hand removal may not be practical. In this case, targeting specific beds with herbicide is an option. Though less destructive to the lake ecosystem than whole-lake treatment, the herbicide will dilute into a larger area given enough time, so potential collateral damage to native and sensitive species should be considered.

#### **Chemical Treatment: Whole-lake** Permit required.

Lake-wide treatment distributes herbicide throughout the entire lake. Water volume is calculated (while considering the thermocline) to achieve a target chemical concentration in lake water. Whole-lake treatment tends to reduce populations for a time (typically 4-6 years) resulting in less frequent applications. Because every lake responds a little differently, regular (perhaps annually) point intercept surveys are required to monitor the native plant community and measure efficacy of chemical applications.

### ***Aquatic Plant Management Plan Review***

A good aquatic plant management plan strategy should reduce the amount of management activity needed as time goes on. In Halfmoon Lake, a series of successful strategies (integrated plant management) should lead to a balance between healthy aquatic habitat, water quality, and recreation with minimal annual management.

# Aquatic Plant Community

## Goal 2. Halfmoon Lake will maintain a healthy and diverse aquatic plant community.

### Objective 2.1 Minimize disturbance to native aquatic plants while also reducing impacts to recreation.

Actions	Lead person/group	Resources	Timeline
Inform property owners of the importance of native aquatic vegetation to impede the establishment of additional AIS, provide food and habitat for wildlife, and protect the shoreline via educational materials provided at the annual meeting and in a newsletter.		WDNR-Brenda Nordin	Ongoing
Encourage landowners to limit plant removal to invasive species or skimming off those that have become unrooted and free-floating. If plants severely impede recreation, consider hand-pulling small areas around private docks (within WDNR guidelines). Cleared lakebed is ideal habitat for AIS to become established, so be vigilant about watching for AIS in these areas.		WDNR-Brenda Nordin	Ongoing
Regularly monitor aquatic plant community to detect any changes in lake conditions and ensure stable populations. A point-intercept survey is recommended.		WDNR-Brenda Nordin Consultants	Every 10 years if no active plant management taking place.
Reduce nutrient and sediment loading to lake (to limit abundance of plants and algae) by improving shoreland buffers (see <b>Shorelands</b> section) and implementing BMPs in the watershed (see <b>Watershed</b> section).		WDNR-Brenda Nordin OCLCD	Ongoing

### Objective 2.2 Protect against establishment of AIS.

Actions	Lead person/group	Resources	Timeline
Encourage or host training to identify and look for invasive species, particularly EWM.		WDNR-Brenda Nordin LRCD	Summer
Identify Clean Boats Clean Waters volunteers or hire someone to staff boat launch on busy days.		CBCW	Summers
Educate landowners on importance of native aquatic plants for preventing AIS. Bring in speaker for annual meeting, mail literature to property owners, etc.		WDNR-Brenda Nordin	Ongoing



# Aquatic Plant Community

Be vigilant about new reports of purple loosestrife. Quickly remove any new populations of purple loosestrife that are observed.

If new AIS is suspected or observed, follow the guidance in **Appendix B.**

WDNR-Brenda Nordin

Ongoing

# Critical Habitat

## 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 WDNR 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.



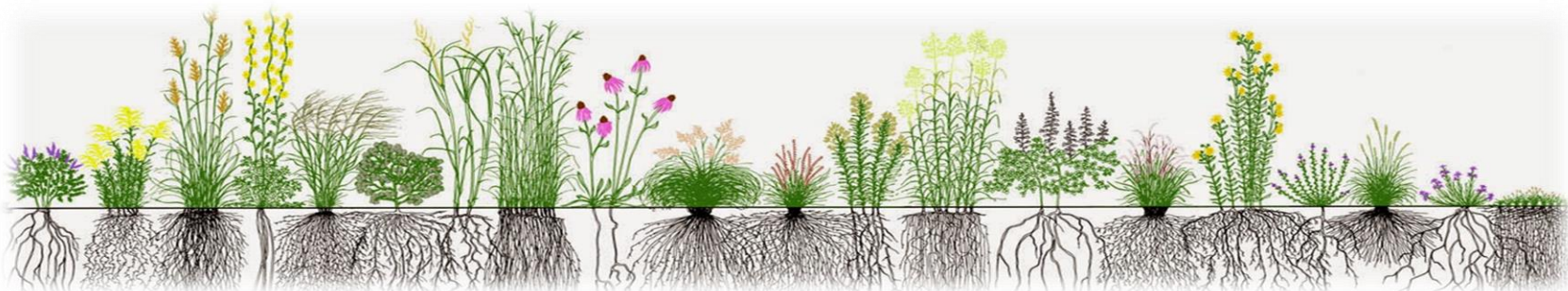
**Every waterbody has areas that are most important to the overall health of the lake.**

Although Halfmoon Lake does not have an official critical habitat area designation, there are areas within Halfmoon Lake that are important for fish and wildlife. 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. Identifying other important areas around the lake that are important habitat and informing lake users of their value can help raise awareness for the protection of these areas.

**Goal 3. Sensitive areas in Halfmoon Lake, which provide essential habitat and/or water quality benefits, will be protected.**

**Objective 3.1 Identify and inform others of quality habitat areas in and around Halfmoon Lake.**

Actions	Lead person/group	Resources	Timeline
Request a Critical Habitat Designation from WDNR.		WDNR-Brenda Nordin	
If critical habitat is identified, communicate to property owners, visitors, and Town Board as to why these areas are important. Look for opportunities to protect these areas.			TBD





# Watershed

## LANDSCAPES AND THE LAKE

### Halfmoon Lake Watershed

#### A Lake is a Reflection of its Watershed...

Understanding where Halfmoon Lake's water originates is important to understanding lake health. During snowmelt or rainstorms, water moves across the surface of the landscape (runoff) towards lower elevations such as lakes, streams, and wetlands. This area is called the watershed. Groundwater also feeds Halfmoon Lake; its land area may be slightly different than the surface watershed.

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. 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 the lake's water quality and quantity. Landscapes with greater capacities to hold water during rain events and snowmelt slow the delivery of the water to the lake.

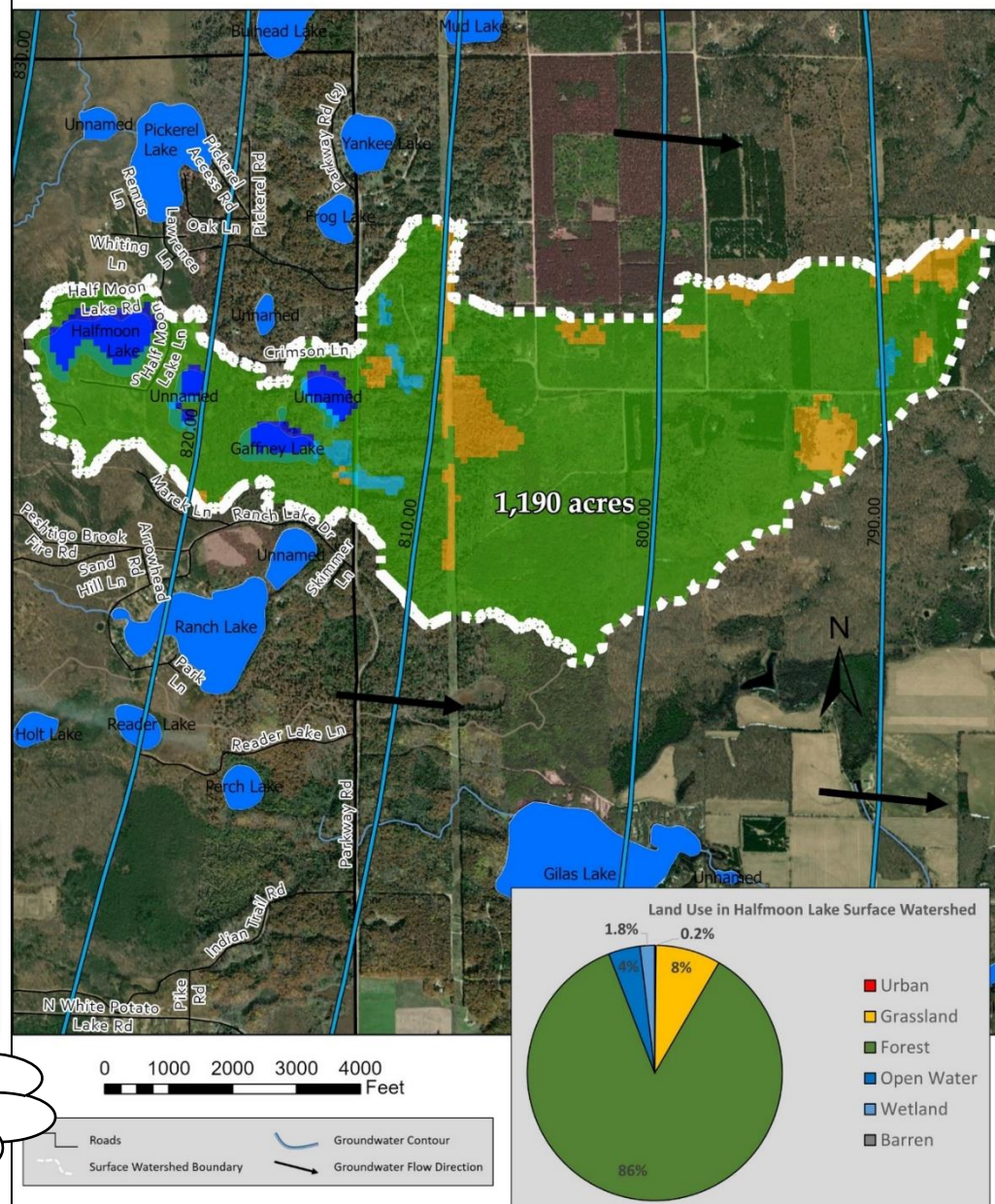
#### Halfmoon Lake's Watershed

The Halfmoon Lake watershed is 1,190 acres. Primary land use is forest, grassland and open water. The lake's shoreland is surrounded primarily by forest. In general, the land closest to the lake has the greatest immediate impact on water quality.



**Watershed: The area of land draining to a lake.**

### Halfmoon Lake Surface Watershed & Groundwater Flow



# Watershed

## Why does land matter?

Land use and land management practices within the 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.

### **Soil and Erosion**

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**

Development on the land may result in changes to natural drainage patterns, 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.

### **What can be done?**

Land management practices can be put into place that 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 and is often the easiest to manage (own property, no politics, etc.).

## ***Be Part of the Solution!***

Practices designed to reduce runoff include:

- protecting/restoring wetlands,
- installing rain gardens, swales, rain barrels, and other practices that increase infiltration
- routing drainage from pavement and roofs away from the lake
- meandering lake access paths to minimize direct flow to the lake.

Practices used to help reduce nutrients from moving across the landscape towards the lake include:

- 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,
- controlling erosion,
- manure management and cropping practices.



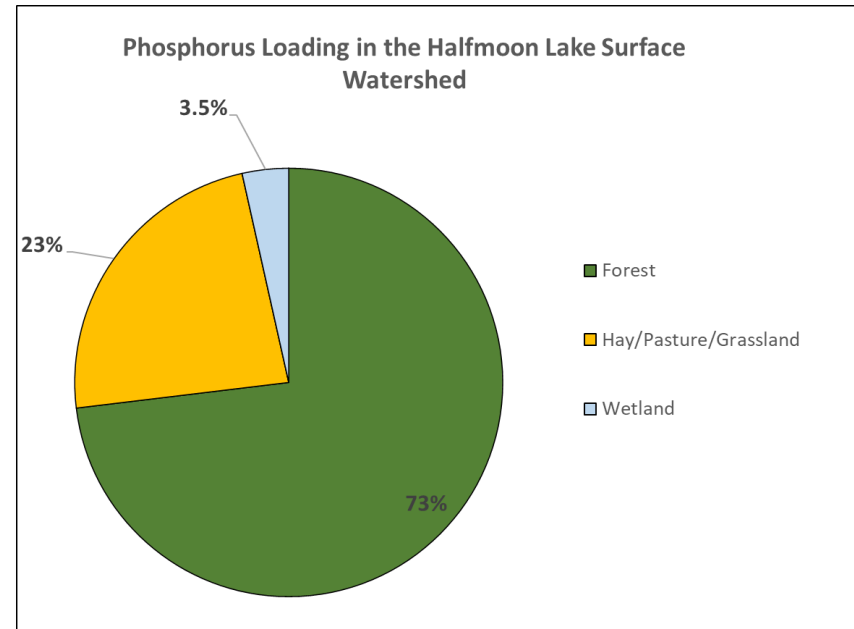
**Most of these activities  
are eligible for cost share  
and grant assistance!**



# Watershed

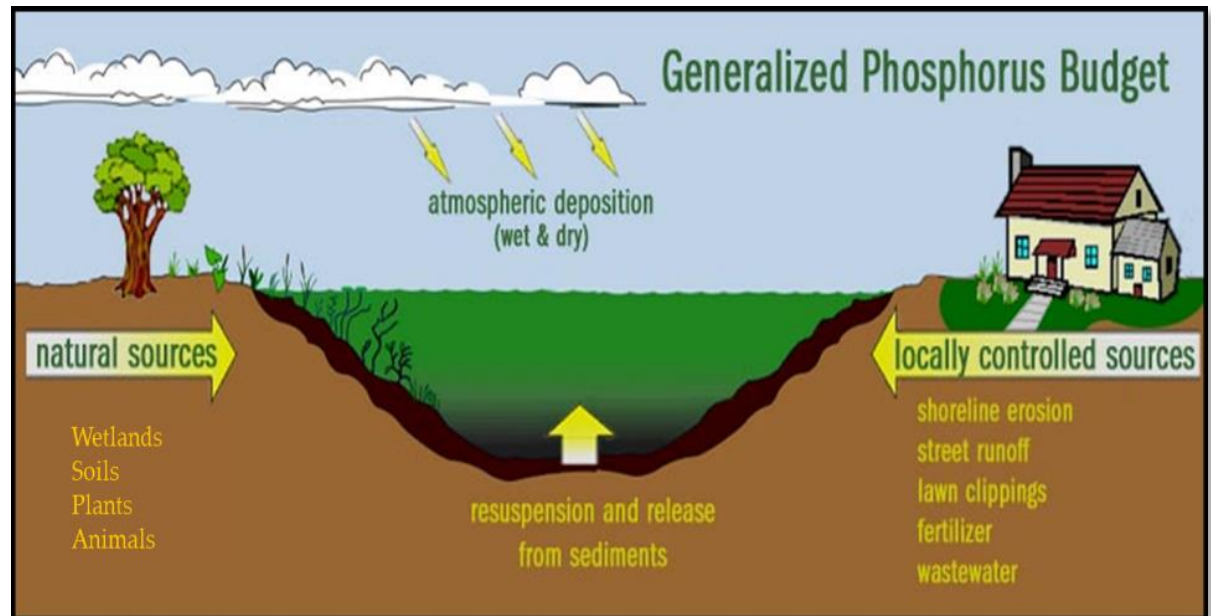
## ***Phosphorus Modeling***

Estimates of phosphorus from the landscape can help to understand the phosphorus sources to Halfmoon 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 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. The phosphorus contributions by land use category, called phosphorus export coefficients, have been obtained from studies throughout Wisconsin (Panuska and Lillie, 1995). In the Halfmoon Lake watershed, efforts should be directed at phosphorus sources that can be controlled.



## ***Phosphorus Loading in Halfmoon Lake Watershed***

Based on modeling results, forest had the greatest percentage of phosphorus contributions from the watershed. Efforts to reduce nutrient inputs to the lake must be focused on land uses that we have some control over such as production and developed areas.



# Watershed

**Goal 4. Property owners within Halfmoon Lake's watershed will understand their connection to the lake and will know about and utilize resources for healthy land management practices.**

***Objective 4.1 Support healthy land management practices in the Halfmoon Lake watershed to reduce sediment and nutrient loading.***

<b>Actions</b>	<b>Lead person/group</b>	<b>Resources</b>	<b>Timeline</b>
Encourage the County to support and follow-up with water quality-based best management practices (BMPs) within the watershed.		OCLCD County Board Supervisors	Ongoing
Support landowners (consider financial support) interested in the protection of their land via a land conservation program (i.e. Conservation Easement, Purchase of Development Rights, or sale of land for protection).		WDNR Lake Protection Grants Knowles-Nelson Stewardship Fund Northeast WI Land Trust	As needed
Encourage any new developments to manage runoff on site and consider ways to minimize impacts from septic systems.		Town of Brazeau Developers/Builders	As needed
Protect wetlands to maintain the water budget of Halfmoon Lake. Any altered wetlands should be mitigated within the lake's watershed.	Oconto County	WDNR	As needed
Encourage design of road and construction projects that will minimize impacts to the lakes.		Town of Brazeau OC Highway Department/WDOT	As needed

# Shorelands

## Shorelands

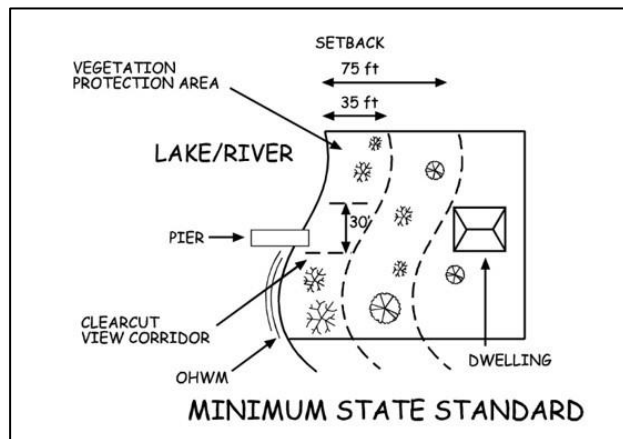
Shoreland vegetation is critical to a healthy lake ecosystem. It provides habitat for many aquatic and terrestrial animals including birds, frogs, turtles, and small and large mammals. It also helps to improve the quality of the runoff that is flowing across the landscape towards the lake.

**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.

Shoreland ordinances have been in place since 1964 to improve water quality and habitat, and to protect our lakes. To protect our lakes, county and state (NR 115) shoreland ordinances state that vegetation should extend at least 35 feet inland from the water's edge, with the exception of an optional view corridor (30% of frontage, 200 foot max) for each shoreland lot. Although some properties were grandfathered in when the ordinance was initiated in 1966, following this guidance will benefit the health of the lake and its inhabitants.

Disturbed shoreland is measured as any shoreline without a shrub

or herbaceous layer at the water's edge, regardless of buffer thickness. This may be a result of mowed lawn, artificial beach, etc.



**90% of lake life spends all or part of their life in the near shore zone.**

## ***Be Part of the Solution!***

### ***Follow Healthy Shoreland Practices***

- **Mow Less:** The simplest, most affordable way to improve your shoreland is to reduce mowing near shore. Native vegetation will re-establish itself over time.
- Leave natural shoreland vegetation in place.
- Restore native shoreland vegetation where it is lacking.
- Plant attractive native species of grasses/flowers, shrubs and trees that will add interest and beauty to your property.
- Don't use fertilizers or herbicides, they may run into the lake. Test your soil to determine if fertilizer is warranted.
- Add or leave woody habitat near the shore. Turtles, birds, and fish love it!
- Never transplant water garden plants or aquarium plants into lakes, streams, or wetlands.
- Visit [www.healthylakeswi.com](http://www.healthylakeswi.com) for additional resources.

### **State Shoreland Zoning Ordinance**

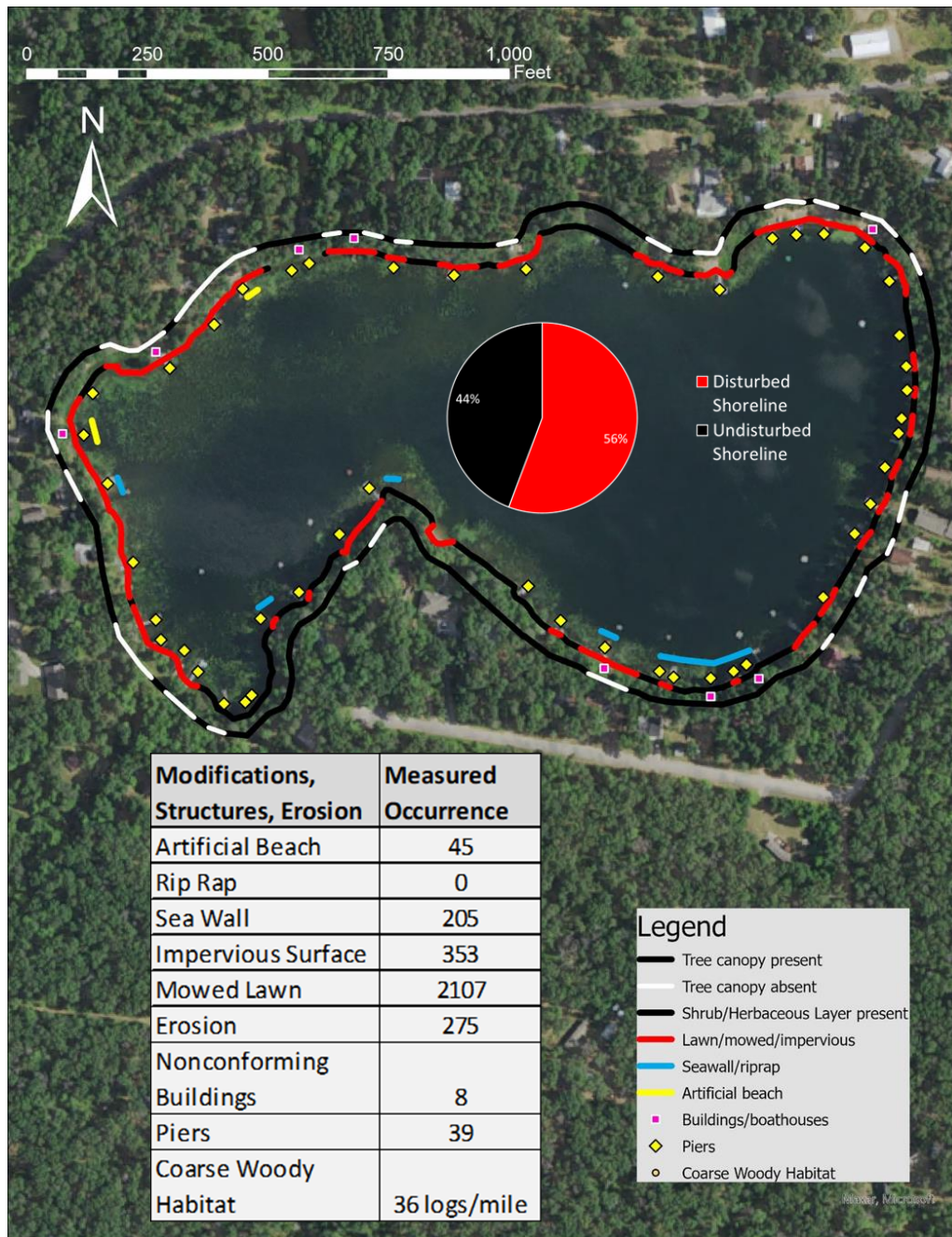
#### **NR 115 Wisc. Adm. Code for Unincorporated Municipalities**

No vegetation within 35 feet of the lake's edge shall be removed except for:

- Up to 30% of shoreline may be removed of shrubs and trees for a view corridor
- A mowed or constructed pedestrian path up to 5 feet wide to access lake



# Shorelands



## Halfmoon Lake's Shorelands

To better understand the health of Halfmoon Lake, shorelands were evaluated by WDNR (Brenda Nordin) in 2021. The survey inventoried shoreland vegetation, erosion, riprap, barren ground, seawalls, structures, and docks. Over half of the 1-mile shoreline is considered disturbed. A total of 39 piers were counted during the survey (1/132 ft).

- With 49 lakefront lots, 1,470 feet (29%) of disturbed shoreland is permitted under NR115. Based on the 2021 shoreland inventory, 56% of Halfmoon Lake's shoreland was disturbed. Coarse woody habitat was measured at 36 logs/mile (250 logs/mile recommended.)
- Halfmoon Lake had above average shoreland health compared to other lakes in the study. Several areas have been identified for restoration.





# Shorelands

## Coarse Woody Habitat (CWH)

Woody debris (i.e., branches, limbs, trees) that falls into the lake forms critical habitat for tiny aquatic organisms that feed bluegills, turtles, crayfish and other critters. Water insects such as mayflies graze on the algae that grow on decomposing wood. Dragonfly nymphs hunt for prey among the stems and branches. Largemouth and smallmouth bass often find food, shelter, or nesting habitat among these fallen trees.

Above water, a fallen tree is like a dock for wildlife. Ducks and turtles sun themselves on the trunk, muskrats use the tree as a feeding platform, predators such as mink and otter hunt for prey in the vicinity of fallen wood, and dead trees that remain along the shoreline are used as perches by belted kingfishers, ospreys and songbirds.

Undeveloped lakes typically contain hundreds of 'logs per mile' while they may completely disappear on developed lakes. Unless it is a hazard to navigation or swimming, consider leaving woody debris in the water.

## HOW WILL YOU IMPROVE YOUR LAKE?



ILLUSTRATION: KAREN ENGELBRETON

**1 FISH STICKS**  
**CREATE FISH AND WILDLIFE HABITAT.**  
Fish Sticks are feeding, breeding, and nesting areas for all sorts of critters – from fish to song birds. They can also prevent bank erosion – protecting lakeshore properties and your lake.



**2 NATIVE PLANTINGS**  
**IMPROVE WILDLIFE HABITAT, NATURAL BEAUTY AND PRIVACY, AND SLOW RUNOFF.**  
Native Plantings include grasses and wildflowers with shrubs and trees. Choose a template based on your property and interests – from bird/butterfly habitat to a low-growing garden showcasing your lake view.



**3 DIVERSION**  
**PREVENT RUNOFF FROM GETTING INTO YOUR LAKE.**  
Diversion Practices move water to areas where it can soak into the ground instead. Depending on your property, multiple diversions may be necessary.



**4 ROCK INFILTRATION**  
**CAPTURE AND CLEAN RUNOFF.**  
Rock Infiltration practices fit in nicely along roof drip lines and driveways and provide space for runoff to filter itself. They work best if your soil is sandy or loamy.



**5 RAIN GARDEN**  
**CREATE WILDLIFE HABITAT AND NATURAL BEAUTY WHILE CAPTURING AND CLEANING RUNOFF.**  
Rain Gardens multi-task - they improve habitat and filter runoff while providing a naturally beautiful view.



**IMPROVE 🐟 HABITAT AND 🌿 NATURAL BEAUTY ~ ⚠️ SLOW, 🔄 DIVERT, 🧼 CLEAN AND 🌊 FILTER RUNOFF**

# Shorelands

Halfmoon Lake 2021 Shoreland Survey Results			
Total lakefront footage	# Riparian lots	Total allowable (NR115) disturbed shoreland	Measured disturbed shoreland
5,130	49	1,470 feet (29%)	2,860 feet (56%)

**Goal 5. Halfmoon Lake will maintain healthy shorelands that protect water quality and provide essential habitat.**

**Objective 5.1 Shoreland property owners will be knowledgeable about and make good decisions regarding their shoreland practices that result in good water quality and habitat. At least 2 properties/year will implement restoration over the next 5 years. At least 2 properties/year will install fish stick clusters over the next 5 years.**

Actions	Lead person/group	Resources	Timeline
Provide informational materials to all shoreland property owners about basic lake stewardship including healthy shorelands and their composition (wildflowers, shrubs, trees, etc.). Include information on cost share programs.		OCLWA UWEX Lakes WDNR Healthy Lakes grants	Ongoing
Identify willing properties and install fish sticks to improve fish habitat (see <b>Fish Community</b> section).		OCLCD WDNR	Ongoing
Encourage and support shoreland owners interested in shoreland restoration (including rain gardens, diversion practices, infiltration practices, native plantings, no mow, or fish sticks). Include information on how and why to create healthy shorelands in a welcome packet to new property owners.		UWEX Lakes OCLCD WDNR Healthy Lakes Grants	Ongoing
Encourage those interested in shoreland restorations to contact the OCLCD for available resources.		OCLCD WDNR Healthy Lakes Grants	Ongoing
Host a speaker/demonstration: "How to restore your shoreline."		UWEX Lakes-Pat Goggin	
Explore purchase of undeveloped shoreland property.		UWEX Lakes Knowles-Nelson Stewardship Fund	As available



# Water Quality

## Water Quality

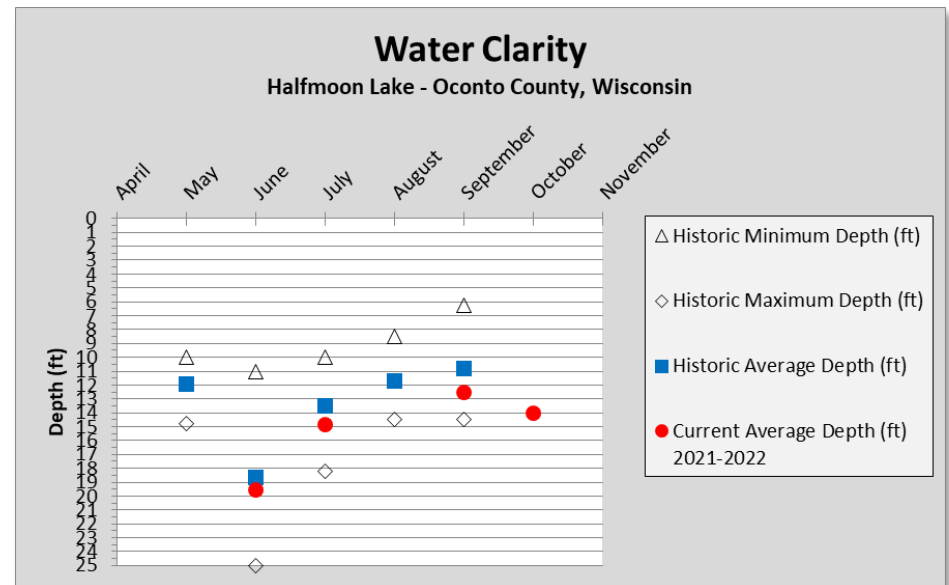
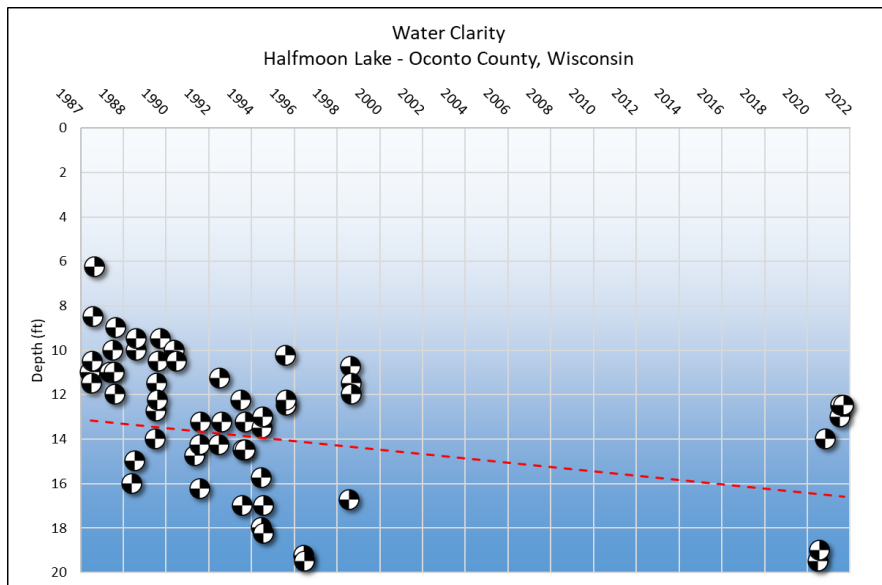
A variety of water chemistry measurements were used to characterize the water quality in Halfmoon Lake. Water quality was assessed during the 2021-2022 lake study and involved a number of measures including temperature, dissolved oxygen, water chemistry, and nutrients (phosphorus and nitrogen). Nutrients are important measures of water quality in lakes because they contribute to algae and aquatic plant growth. Each of these interrelated measures plays a part in the lake's overall water quality. In addition, water quality data collected in past years was also reviewed to determine trends in Halfmoon Lake's water quality.

## Water Clarity

Water clarity is a measure of how deep light can penetrate (Secchi depth). Clarity is affected by water color, turbidity, and algae and helps determine where rooted aquatic plants grow.

### Halfmoon Lake's Water Quality Summary

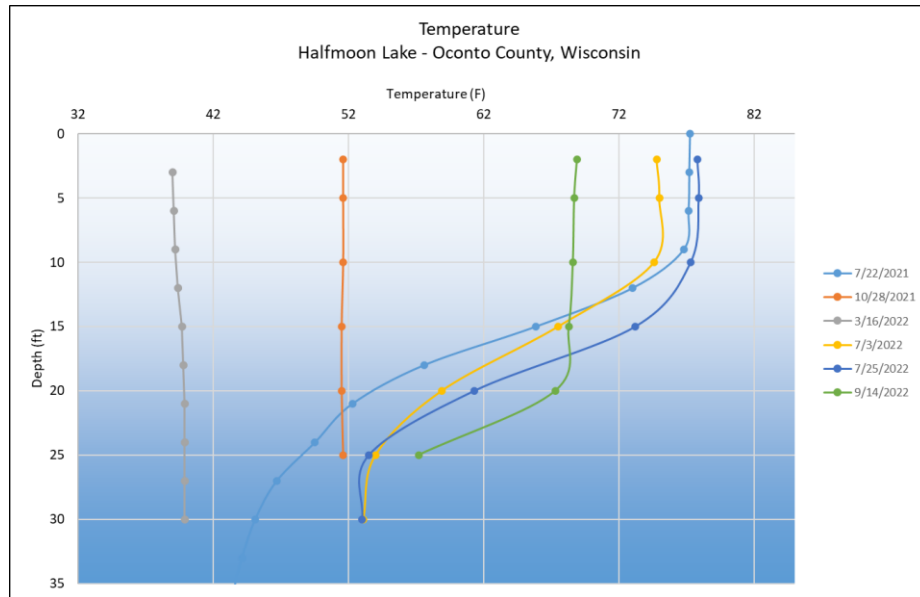
- ✓ **Water clarity** ranged from 12.5-19.5 feet (considered good). The long-term trend suggests increasing clarity.
- ✓ **Dissolved oxygen** was sufficient most of the year, but may become anoxic in late winter.
- ✓ Concentrations of **contaminants** were 'low' during the study. Atrazine was not detected.
- ✓ **Phosphorus** concentrations were consistently below the standard of 30 ug/L during the study. **Inorganic nitrogen** remained below concentrations that spur algal blooms.



# Water Quality

## Temperature and Dissolved Oxygen

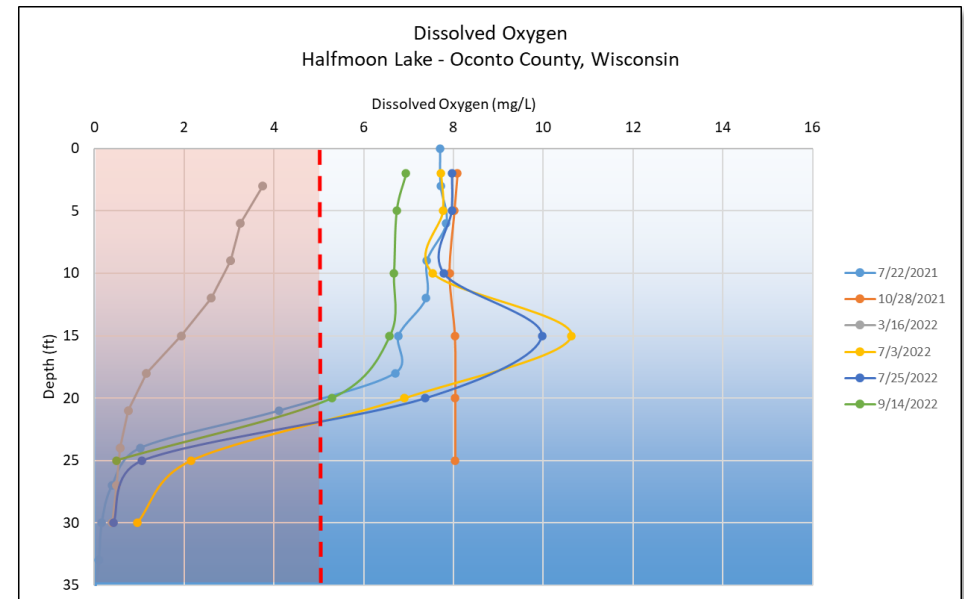
Temperature profiles for Halfmoon Lake illustrate a typical deep lake that stratifies during the growing season with a clear thermocline between 10 and 20 feet separating cooler water at



depth from more buoyant warmer water near the surface. Each spring and fall, temperatures become similar with depth as the seasons change and the lake experiences an overturn event.

Dissolved oxygen is an important measure in Halfmoon 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.

Dissolved oxygen concentrations generally decline with depth as access to sources such as the atmosphere and growing plants is



decreased. In Halfmoon Lake, oxygen levels are similar at shallow depths as the surface is mixed then drop significantly once depths below the thermocline are reached. Midsummer bumps in oxygen in the thermocline are indicative of algae blooms at depth.

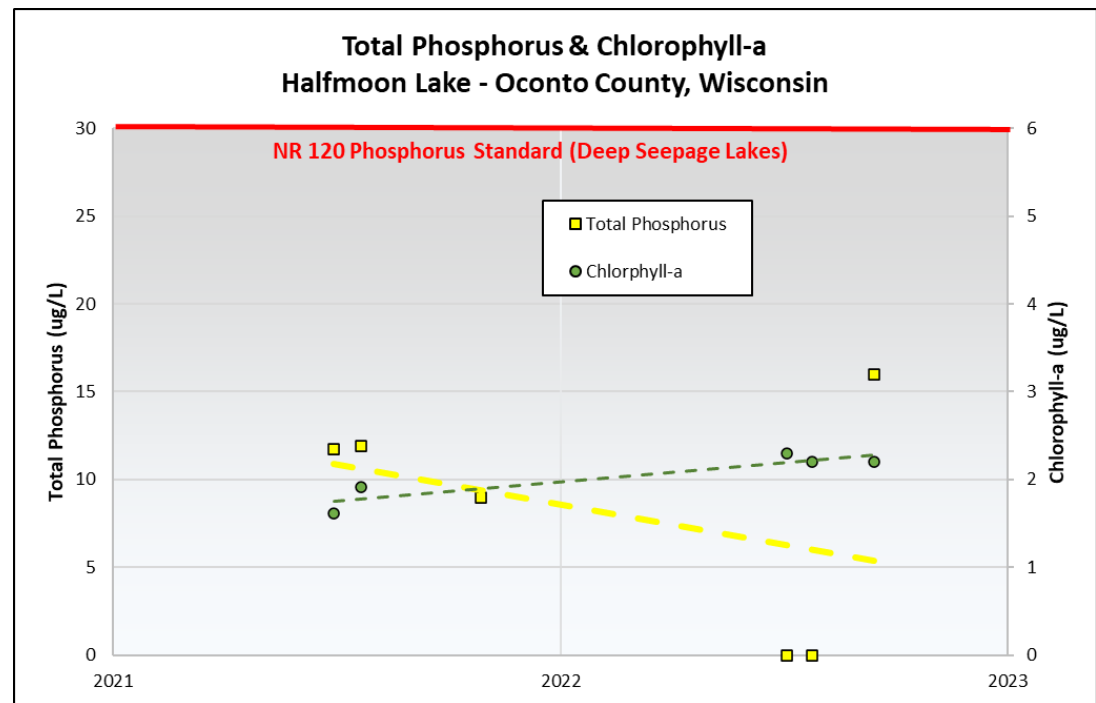
## Contaminants

Chloride, sodium and potassium concentrations are commonly used as indicators of how a lake is being impacted by human activity. The presence of these compounds where they do not naturally occur indicates sources of water contaminants. Although these elements are not detrimental to the aquatic ecosystem, they indicate that sources of contaminants such as road salt, fertilizer, animal waste and/or septic system effluent may be entering the lake from either surface runoff or via groundwater. Measurements of these compounds was low.

# Water Quality

## Nutrients

Phosphorus is an element that is essential in trace amounts to most living organisms, including aquatic plants and algae. Naturally-occurring sources of phosphorus include 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. NR 120, Wisconsin Administrative Code lists phosphorus limits for different lake types. Deep seepage lakes such as Halfmoon have a standard of 30 ug/L they must stay below to remain healthy. Data from this study show concentrations in Halfmoon to be consistently below this standard.



## *Be part of the solution!*

Managing nitrogen, phosphorus and soil erosion throughout the Halfmoon Lake watershed is one of the keys to protecting the lake itself. Near shore activities that may increase the input of phosphorus 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 a lake can be controlled by using lake-friendly land management decisions, such as the restoration of shoreland vegetation, elimination/reduction of fertilizers, proper management of animal waste and septic systems, and the use of water quality-based management practices.



# Water Quality

## Goal 6. Maintain or improve water quality in Halfmoon Lake.

**Objective 6.1** Maintain median summer total phosphorus concentrations below 30 ug/L and fall inorganic nitrogen concentrations below 0.3 mg/L.

Actions	Lead person/group	Resources	Timeline
Inform others around the lake about the impact of nutrients and land management on water quality through the distribution of an Association newsletter and/or hosting a guest speaker at the annual meeting.		OCLWA WDNR UWEX Lakes	Ongoing
Refrain from the use of fertilizers. Encourage soil testing to determine if fertilizer is necessary.		OC UWEX	Ongoing

**Objective 6.2** Continue to develop a good water quality dataset for Halfmoon Lake to monitor trends, declines and improvements over time.

Actions	Lead person/group	Resources	Timeline
Participate in CLMN and support volunteers collecting total phosphorus and chlorophyll-a data.	Trained volunteer	CLMN	3+ times annually-summer
Submit all collected data to WDNR for archival and use by scientists and resource managers.	Trained volunteer	WDNR	Ongoing





Wisconsin has more than 500,000 registered boats-one for every 10 residents.

## PEOPLE AND THE LAKE

The people who 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 positive impacts on the lake and on those who enjoy this common resource. Collaborative efforts may have bigger positive impacts; therefore, communication and cooperation between the 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

According to survey responses, the lake is enjoyed for its scenery and fishing. There is one public boat launch located on the north side of the lake which is owned and maintained by the Town of Brazeau. No Wake is allowed anytime.

### Goal 7. Lake users will be informed about and respectful of Halfmoon Lake.

#### Objective 7.1 Cultivate an environment of compliance amongst lake users.

Actions	Lead person/group	Resources	Timeline
Work with other lake groups and towns to support a recreational officer and municipal court for enforcement of regulations, including 'No Wake' and safe boat operation.		TOB OCLWA OC UWEX	Ongoing
Inform residents and consider posting signage of "DNR Hotline" to report unlawful behavior. (1-800-TIP-WDNR)		WDNR	Ongoing

# Communication & Organization

## Communication and Organization

Working together on common values will help to achieve the goals outlined in this plan. This will involve communication between individuals, the Town of Brazeau, Oconto County, resource managers, and elected officials. In addition, staying informed about lake- and groundwater-related topics will be essential to achieving the goals laid out in this plan. See the Oconto County Lake Information Directory in the Appendices for contact information.



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 Halfmoon Lake ecosystem that is enjoyed by many people. Working together on common values will help to achieve the goals that are outlined in this plan.

## Goal 8. Increase participation in lake stewardship.

*Objective 8.1 Develop opportunities and incentives for active participation in the management of Halfmoon Lake.*

Actions	Lead person/group	Resources	Timeline
Maintain a website or Facebook page:			Ongoing
Maintain an email list of shoreland property owners and others interested in Halfmoon Lake.		OC UWEX	Ongoing
Communicate updates to lake management plan and management activities to residents and users of the lake and WDNR via meetings, email list and/or newsletter.			Ongoing
Host an annual meeting to discuss lake management and opportunities for shoreland property owners.			Annually
Host gatherings to learn about topics identified in this plan. Invite speakers or conduct demonstrations.		UWEX Lakes WDNR OCLCD	As needed
Identify ways to recruit 'next generation' of water quality monitors and AIS removers. Support interested persons in Lake Leaders Institute and/or Wisconsin Lakes Convention.		UWEX Lakes Lake Leaders	Ongoing



# Communication & Organization

**Objective 8.2 Maintain good, clear communication between lake association, its residents, clubs, municipalities, agency staff, elected officials and organizations interested in Halfmoon Lake.**

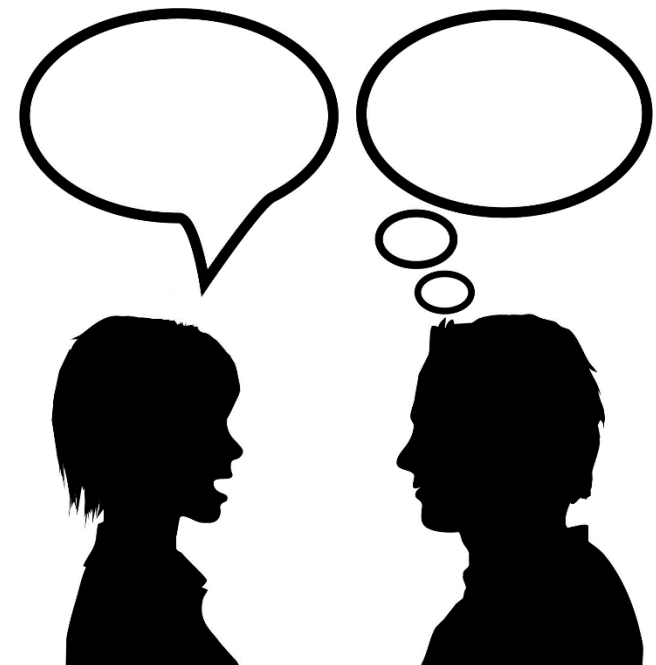
Actions	Lead person/group	Resources	Timeline
Network with other lake groups in Oconto County by having Halfmoon Lake represented at OCLWA.		OC UWEX	Ongoing
Network with other lakes in the state to learn lake management strategies, etc. by having a representative attend the Wisconsin Lakes Convention.		UWEX Lakes	Annually in April
Consider nominating an individual from Halfmoon Lake for the Lake Leaders Institute.		UWEX Lakes	Ongoing

**LEARN** from respected experts, grassroots organizers, and passionate water advocates.

**ENGAGE** in the workshops and interactive discussion sessions.

**ENHANCE** your network of water-focused professionals.

at the Wisconsin Lakes & Rivers Convention



# Updates and Revisions

## 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. Partners listed in the plan should be contacted annually, and updated information complied. A list of changes/updates to the plan should be documented. To ensure that everyone is informed about changes, appropriate approval for changes should be acquired by all partners signing on to this plan.

## Goal 9. Review plan annually and update as needed.

### *Objective 9.1 Communicate updates with lake community, Oconto County and WDNR.*

Actions	Lead person/group	Resources	Timeline
Review plan annually and discuss accomplishments and identification of goals/objectives for coming year.			Annually
Formally update this plan every 5 years.		OC UWEX WDNR	



# References

## **REFERENCES**

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

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# Appendices

## **APPENDICES**

# Appendix A

## Appendix A. Oconto County Lake Information Directory

### Algae - Blue-Green

Contact: Brenda Nordin

Wisconsin Department of Natural Resources

Phone: 920-360-3167

E-mail: [brenda.nordin@wisconsin.gov](mailto:brenda.nordin@wisconsin.gov)

Website: <http://dnr.wi.gov/lakes/bluegreenalgae>

Contact: Wisconsin Department of Health Services

1 West Wilson Street, Madison, WI 53703

Phone: 608-267-3242

Website:

[www.dhs.wisconsin.gov/eh/bluegreenalgae/contactus.htm](http://www.dhs.wisconsin.gov/eh/bluegreenalgae/contactus.htm)

### Aquatic Invasive Species/Clean Boats Clean Water

Contact: Brenda Nordin

Wisconsin Department of Natural Resources

Phone: 920-360-3167

E-mail: [brenda.nordin@wisconsin.gov](mailto:brenda.nordin@wisconsin.gov)

Website: <http://dnr.wi.gov/topic/Invasives/>

### Aquatic Plant Management

(Native and Invasive)

Contact: Brenda Nordin

Wisconsin Department of Natural Resources

Phone: 920-360-3167

E-mail: [brenda.nordin@wisconsin.gov](mailto:brenda.nordin@wisconsin.gov)

Website: <http://dnr.wi.gov/lakes/plants/>

### Aquatic Plant Identification

Contact: Dr. Emmet Judziewicz

UWSP Freckmann Herbarium

TNR 301, 800 Reserve St., Stevens Point, WI 54481

Phone: 715-346-4248

E-mail: [ejudziew@uwsp.edu](mailto:ejudziew@uwsp.edu)

Contact: Brenda Nordin

Wisconsin Department of Natural Resources

Phone: 920-360-3167

E-mail: [brenda.nordin@wisconsin.gov](mailto:brenda.nordin@wisconsin.gov)

### Aquatic Plant Surveys/Management

Contact: Brenda Nordin

Wisconsin Department of Natural Resources

Phone: 920-360-3167

E-mail: [brenda.nordin@wisconsin.gov](mailto:brenda.nordin@wisconsin.gov)

Website: <http://dnr.wi.gov/lakes/plants/>

Best Management Practices (rain gardens, shoreland buffers, agricultural practices, runoff controls)

Contact: Ken Dolata

Oconto County Land & Water Conservation Department

410 ½ East Main Street, Lena, WI 54139

Phone: 920-834-7152

E-mail: [ken.dolata@co.oconto.wi.us](mailto:ken.dolata@co.oconto.wi.us)

Website: <http://www.co.oconto.wi.us/departments/>

### Boat Landings, Signage, Permissions (County)

Contact: Monty Brink

Oconto County Forestry/Park/Recreation

301 Washington Street, Oconto, WI 54153

Phone: 920-834-6995

E-mail: [monty.brink@co.oconto.wi.us](mailto:monty.brink@co.oconto.wi.us)

Website: <http://www.co.oconto.wi.us/departments/>

### Boat Landings (State)

Contact: Tammie Paoli

Wisconsin Department of Natural Resources

101 N. Ogden Road, Peshtigo, WI 54157

Phone: 715-582-5052

E-mail: [Tammie.Paoli@wisconsin.gov](mailto:Tammie.Paoli@wisconsin.gov)

Website: <http://dnr.wi.gov/org/land/facilities/boataccess/>

# Appendix A

## Boat Landings (Town)

Contact the clerk for the specific town/village in which the boat landing is located.

## Conservation Easements

Contact: Gathering Waters Conservancy  
211 S. Paterson St., Suite 270, Madison, WI 53703  
Phone: 608-251-9131  
E-mail: [info@gatheringwaters.org](mailto:info@gatheringwaters.org)  
Website: <http://gatheringwaters.org/>

Contact: Brenda Nordin  
Wisconsin Department of Natural Resources  
Phone: 920-360-3167  
E-mail: [brenda.nordin@wisconsin.gov](mailto:brenda.nordin@wisconsin.gov)

Contact: Northeast Wisconsin Land Trust  
14 Tri-Park Way, Suite 1, Appleton, WI 54914  
Phone: 920-738-7265  
E-mail: [newlt@newlt.org](mailto:newlt@newlt.org)  
Website: [www.newlt.org](http://www.newlt.org)

Contact: NRCS Lena Service Center  
410 ½ East Main Street, Lena, WI 54139  
Phone: 920-829-5406

## Critical Habitat and Sensitive Areas

Contact: Brenda Nordin  
Wisconsin Department of Natural Resources  
Phone: 920-360-3167  
E-mail: [brenda.nordin@wisconsin.gov](mailto:brenda.nordin@wisconsin.gov)  
Website: <http://dnr.wi.gov/lakes/criticalhabitat/>

## Dams

Contact: Meg Galloway  
Wisconsin Department of Natural Resources  
PO Box 7921, Madison, WI 53707

Phone: 608-266-7014

E-mail: [meg.galloway@wisconsin.gov](mailto:meg.galloway@wisconsin.gov)

Website: <http://dnr.wi.gov/org/water/wm/dsfm/dams/>

## Fertilizers/Soil Testing

Contact: Dale Mohr  
Oconto County UW- Extension  
301 Washington Street, Oconto, WI 54153  
Phone: 920-835-6845  
E-mail: [dale.mohr@wisc.edu](mailto:dale.mohr@wisc.edu)  
Website: <http://oconto.uwex.edu>

## Fisheries Biologist (management, habitat)

Contact: Tammie Paoli  
Wisconsin Department of Natural Resources  
101 N. Ogden Road, Peshtigo, WI 54157  
Phone: 715-582-5052  
E-mail: [Tammie.Paoli@wisconsin.gov](mailto:Tammie.Paoli@wisconsin.gov)  
Website: <http://dnr.wi.gov/fish/>

## Frog Monitoring—Citizen Based

Contact: Andrew Badje  
Wisconsin Department of Natural Resources  
Phone: 608-785-9472  
E-mail: [Andrew.badje@wisconsin.gov](mailto:Andrew.badje@wisconsin.gov)  
Website: [WFTS@wisconsin.gov](mailto:WFTS@wisconsin.gov)

## Grants

Contact: Brenda Nordin  
Wisconsin Department of Natural Resources  
Phone: 920-360-3167  
E-mail: [brenda.nordin@wisconsin.gov](mailto:brenda.nordin@wisconsin.gov)  
Website: <http://dnr.wi.gov/Aid/Grants.html>



# Appendix A

Contact: Ken Dolata  
Oconto County Land & Water Conservation Department  
410 ½ East Main Street, Lena, WI 54139  
Phone: 920-834-7152  
E-mail: [ken.dolata@co.oconto.wi.us](mailto:ken.dolata@co.oconto.wi.us)  
Website: <http://www.co.oconto.wi.us/departments/>

## Groundwater Quality

Contact: Kevin Masarik  
UWSP Center for Watershed Science & Education  
TNR 224, 800 Reserve St., Stevens Point, WI 54481  
Phone: 715-346-4276  
E-mail: [kmasarik@uwsp.edu](mailto:kmasarik@uwsp.edu)  
Website: <http://www.uwsp.edu/cnr/watersheds/>

## Groundwater Levels/Quantity

Contact: Ken Dolata  
Oconto County Land & Water Conservation Department  
410 ½ East Main Street, Lena, WI 54139  
Phone: 920-834-7152  
E-mail: [ken.dolata@co.oconto.wi.us](mailto:ken.dolata@co.oconto.wi.us)  
Website: <http://www.co.oconto.wi.us/departments/>

Contact: George Kraft  
UWSP Center for Watershed Science & Education  
TNR 224, 800 Reserve St., Stevens Point, WI 54481  
Phone: 715-346-2984  
E-mail: [george.kraft@uwsp.edu](mailto:george.kraft@uwsp.edu)

## Informational Packets

Contact: UW Extension - Lakes  
TNR 224, 800 Reserve St. Stevens Point, WI 54481  
Phone: 715-346-2116  
E-mail: [uwexlakes@uwsp.edu](mailto:uwexlakes@uwsp.edu)

## Lake Groups – Friends, Associations, Districts

Contact: Dale Mohr  
Oconto County UW- Extension  
301 Washington Street, Oconto, WI 54153

Phone: 920-835-6845  
E-mail: [dale.mohr@wisc.edu](mailto:dale.mohr@wisc.edu)  
Website: <http://oconto.uwex.edu>

Contact: Patrick Goggin  
UWEX Lakes  
TNR 203, 800 Reserve St., Stevens Point, WI 54481  
Phone: 715-365-8943  
E-mail: [pgoggin@uwsp.edu](mailto:pgoggin@uwsp.edu)  
Website: <http://www.uwsp.edu/cnr/uwexlakes/organizations/>

Contact: Eric Olson  
UWEX Lakes  
TNR 206, 800 Reserve St., Stevens Point, WI 54481  
Phone: 715-346-2192  
E-mail: [eolson@uwsp.edu](mailto:eolson@uwsp.edu)  
Website: <http://www.uwsp.edu/cnr/uwexlakes/organizations/>

Contact: Susan Tesarik  
Wisconsin Lakes  
4513 Vernon Blvd., Suite 101, Madison, WI 53705  
Phone: 1-800-542-5253  
E-mail: [lakeinfo@wisconsinlakes.org](mailto:lakeinfo@wisconsinlakes.org)  
Website: <http://wisconsinlakes.org/>

Lake Levels  
See: Groundwater

Lake-Related Law Enforcement (no-wake, transporting invasives, etc.)

Contact: Ben Mott  
State Conservation Warden  
Wisconsin Department of Natural Resources  
427 E. Tower Drive, Suite 100, Wautoma, WI 54982  
Phone: 920-896-3383  
Website: <http://www.wigamewarden.com/>

# Appendix A

## Land Use Plans and Zoning Ordinances

Contact: Patrick Virtues  
Oconto County Planning/Zoning/Solid Waste  
301 Washington Street, Oconto, WI 54153  
Phone: 920-834-6827  
E-mail: [Patrick.virtues@co.oconto.wi.us](mailto:Patrick.virtues@co.oconto.wi.us)  
Website: <http://www.co.waushara.wi.us/zoning.htm>

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

## Nutrient Management Plans

Contact: Ken Dolata  
Oconto County Land & Water Conservation Department  
410 ½ East Main Street, Lena, WI 54139  
Phone: 920-834-7152  
E-mail: [ken.dolata@co.oconto.wi.us](mailto:ken.dolata@co.oconto.wi.us)  
Website: <http://www.co.oconto.wi.us/departments/>

Contact: NRCS Lena Service Center  
410 ½ East Main Street, Lena, WI 54139  
Phone: 920-829-5406

## Parks (County)

Contact: Monty Brink  
Oconto County Forestry/Park/Recreation  
301 Washington Street, Oconto, WI 54153  
Phone: 920-834-6995  
E-mail: [monty.brink@co.oconto.wi.us](mailto:monty.brink@co.oconto.wi.us)  
Website: <http://www.co.oconto.wi.us/departments/>

## Purchase of Development Rights

Contact: Northeast Wisconsin Land Trust  
14 Tri-Park Way, Suite 1, Appleton, WI 54914  
Phone: 920-738-7265  
E-mail: [newlt@newlt.org](mailto:newlt@newlt.org)  
Website: [www.newlt.org](http://www.newlt.org)

## Purchase of Land

Contact: Brenda Nordin  
Wisconsin Department of Natural Resources  
Phone: 920-360-3167  
E-mail: [brenda.nordin@wisconsin.gov](mailto:brenda.nordin@wisconsin.gov)  
Website: <http://dnr.wi.gov/topic/stewardship/>

## Rain Gardens and Stormwater Runoff

Contact: Ken Dolata  
Oconto County Land & Water Conservation Department  
410 ½ East Main Street, Lena, WI 54139  
Phone: 920-834-7152  
E-mail: [ken.dolata@co.oconto.wi.us](mailto:ken.dolata@co.oconto.wi.us)  
Website: <http://www.co.oconto.wi.us/departments/>

## Septic Systems/Onsite Waste

Contact: Patrick Virtues  
Oconto County Planning/Zoning/Solid Waste  
301 Washington Street, Oconto, WI 54153  
Phone: 920-834-6827  
E-mail: [Patrick.virtues@co.oconto.wi.us](mailto:Patrick.virtues@co.oconto.wi.us)  
Website: <http://www.co.waushara.wi.us/zoning.htm>

## Shoreland Management

Contact: Ken Dolata  
Oconto County Land & Water Conservation Department  
410 ½ East Main Street, Lena, WI 54139  
Phone: 920-834-7152  
E-mail: [ken.dolata@co.oconto.wi.us](mailto:ken.dolata@co.oconto.wi.us)  
Website: <http://www.co.oconto.wi.us/departments/>

## Shoreland Vegetation

<http://dnr.wi.gov/topic/ShorelandZoning/>

## Shoreland Zoning Ordinances

See: Land Use Plans and Zoning Ordinances

# Appendix A

## Soil Fertility Testing

Contact: Dale Mohr

Oconto County UW- Extension

301 Washington Street, Oconto, WI 54153

Phone: 920-835-6845

E-mail: [dale.mohr@wisc.edu](mailto:dale.mohr@wisc.edu)

Website: <http://oconto.uwex.edu>

## Water Quality Monitoring

Contact: Brenda Nordin

Wisconsin Department of Natural Resources

Phone: 920-360-3167

E-mail: [brenda.nordin@wisconsin.gov](mailto:brenda.nordin@wisconsin.gov)

## Water Quality Problems

Contact: Brenda Nordin

Wisconsin Department of Natural Resources

Phone: 920-360-3167

E-mail: [brenda.nordin@wisconsin.gov](mailto:brenda.nordin@wisconsin.gov)

## Wetlands

Contact: Jason Fleener

Wisconsin Department of Natural Resources

GEF2 DNR Central Office, Madison, WI 53707

Phone: 608-266-7408

E-mail: [Jason.fleener@wisconsin.gov](mailto:Jason.fleener@wisconsin.gov)

Website: <http://dnr.wi.gov/wetlands/>

Contact: Wisconsin Wetlands Association

214 N. Hamilton Street, #201, Madison, WI 53703

Phone: 608-250-9971

Email: [info@wisconsinwetlands.org](mailto:info@wisconsinwetlands.org)

## Wetland Inventory

Contact: Dr. Emmet Judziewicz

UWSP Freckmann Herbarium

TNR 301, 800 Reserve St., Stevens Point, WI 54481

Phone: 715-346-4248

E-mail: [ejudziew@uwsp.edu](mailto:ejudziew@uwsp.edu)

## Woody Habitat

Contact: Tammie Paoli

Wisconsin Department of Natural Resources

101 N. Ogden Road, Peshtigo, WI 54157

Phone: 715-582-5052

E-mail: [Tammie.Paoli@wisconsin.gov](mailto:Tammie.Paoli@wisconsin.gov)

Website: <http://dnr.wi.gov/fish/>



## Appendix B. Rapid Response Plan

### 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.

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 (lat/long or UTM, Township/Range)
- Plant name
- Land ownership (if known/applicable)
- Population description (estimated # plants, area covered)
- Habitat type 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**

2984 Shawano Avenue,  
Green Bay, WI 54313  
Phone: (920) 662-5100

**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](mailto: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](mailto:invasiveplants@mailplus.wisc.edu)

# Appendix C

## **Appendix C. Lake User Survey Results**