

# Oconto County Lakes Project

## MARY LAKE STUDY SUMMARY REPORT 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

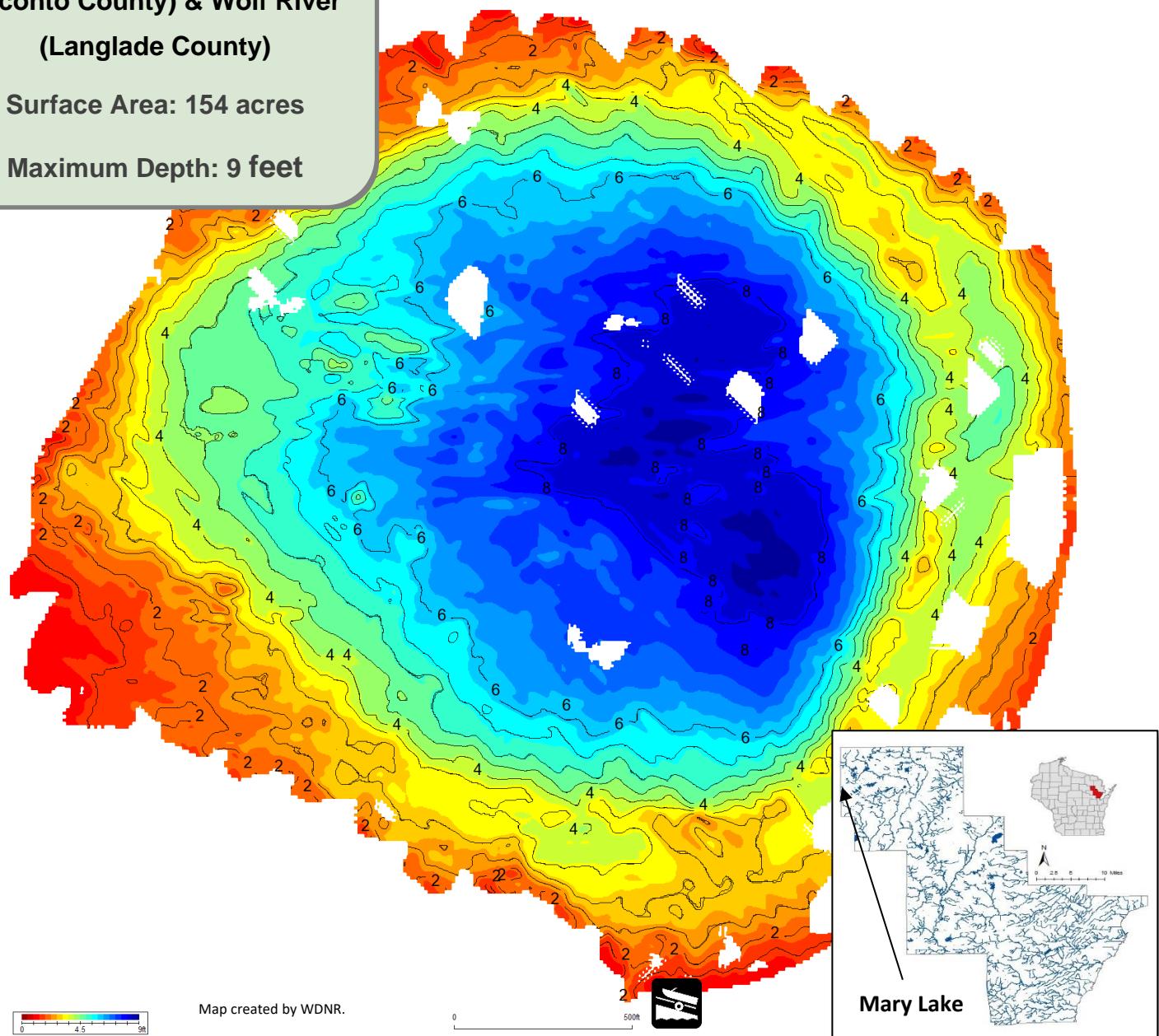


Center for Watershed Science and Education  
College of Natural Resources  
University of Wisconsin-Stevens Point

# Background

- Mary Lake is a 154-acre drainage lake in southwest Oconto County with a reported maximum depth of 20 feet (although 9 feet max is observed).
- Most water enters and leaves Mary Lake via Mary Creek which enters on the northwest side and leaves on the southwest side. Direct precipitation, groundwater and surface runoff also contribute water.
- Visitors have access to the lake from a carry-in access on the north side of the lake and a boat launch located on the lake's south side.
- This report summarizes data collected during the 2022-2023 lake study.

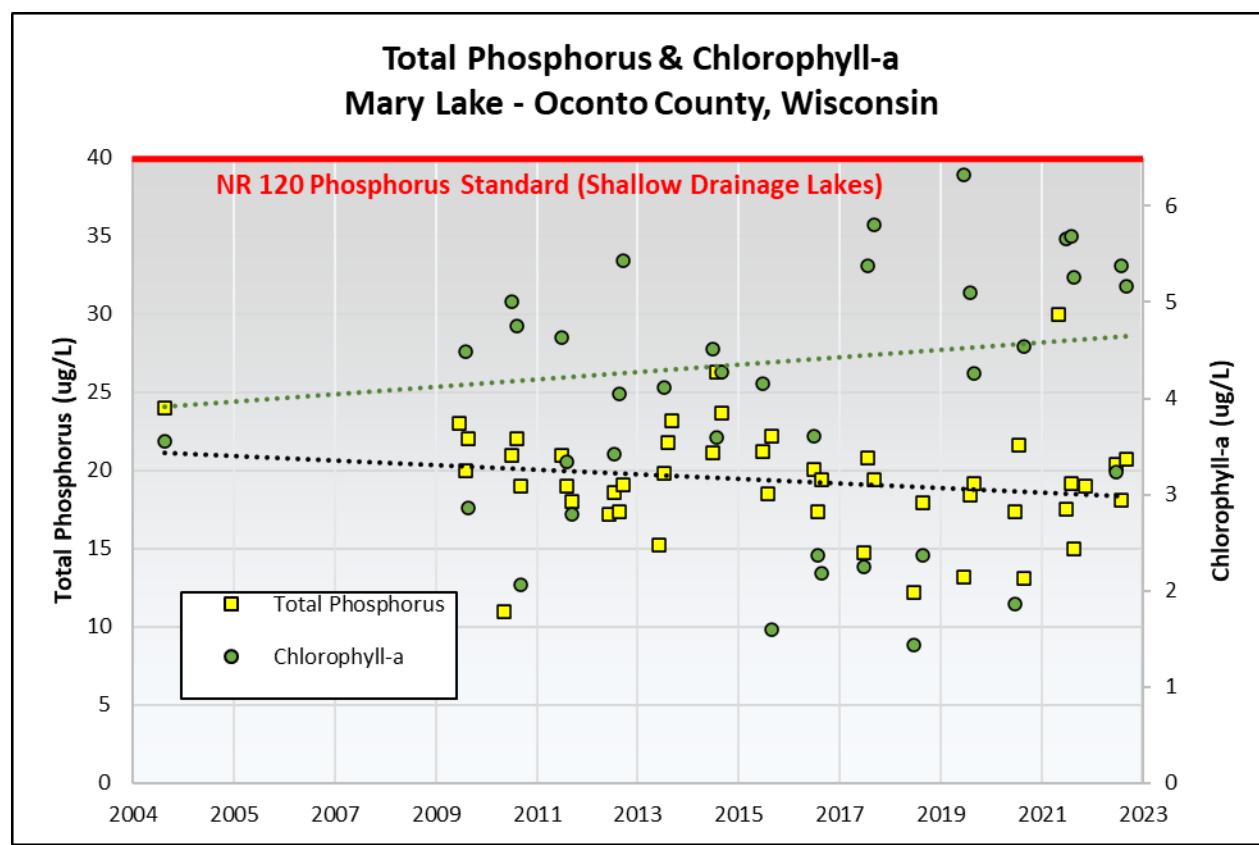
# Townships of Townsend (Oconto County) & Wolf River (Langlade County)



# Water Quality

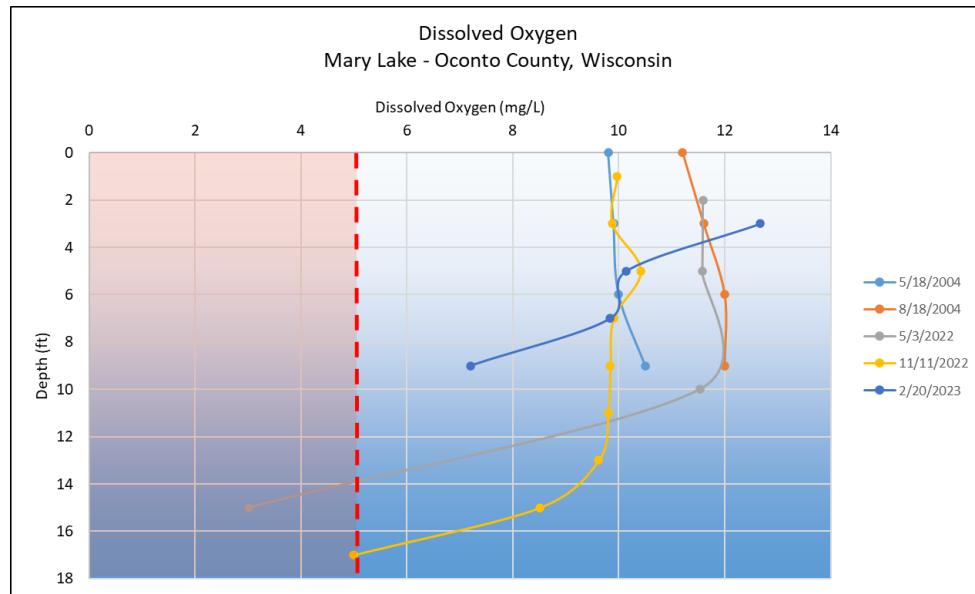
**Nutrients** such as phosphorus and nitrogen are what feed aquatic plants and algae in a lake. Excessive amounts of nutrients delivered to a lake will result in abundant plant and algae growth. Disturbance within a watershed combined with the landscape's inability to infiltrate and filter runoff is what primarily delivers nutrients to a lake.

- Total Phosphorus was consistently below the Wisconsin state standard of 40 ug/L for shallow drainage lakes during the two-year study. The 20-year data trend suggests a slightly decreasing average concentration.
- Inorganic nitrogen remained below the threshold of 0.3 mg/L when algal blooms increase.
- Chlorophyll-a, an indirect measure of algae, was slightly elevated nearing the threshold of 6 ug/L when nuisance algae blooms typically occur. The 20-year trend suggests a slight increase in these concentrations.



# Water Quality

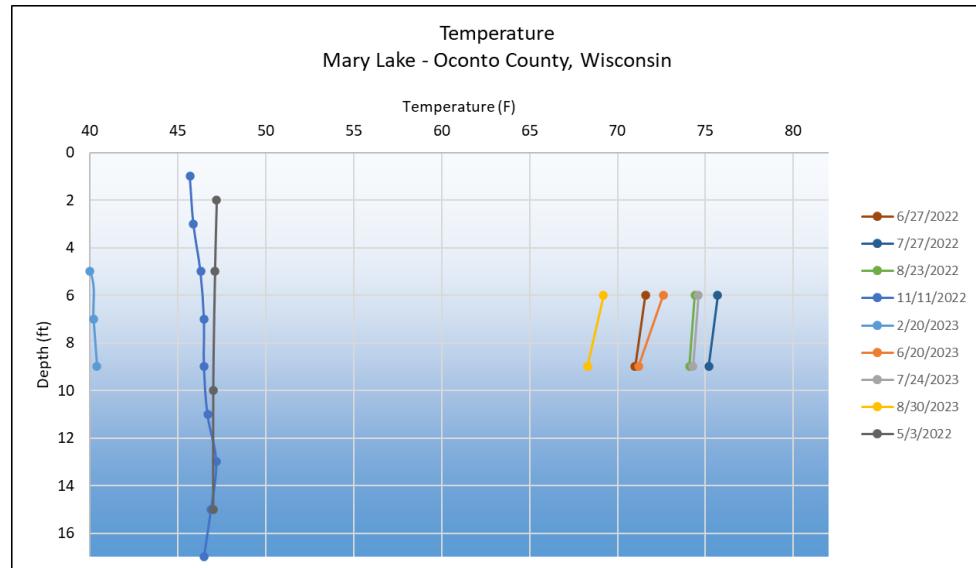
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature, and inputs of surface and groundwater. Generally, at least 5 mg/L oxygen is required for fish.



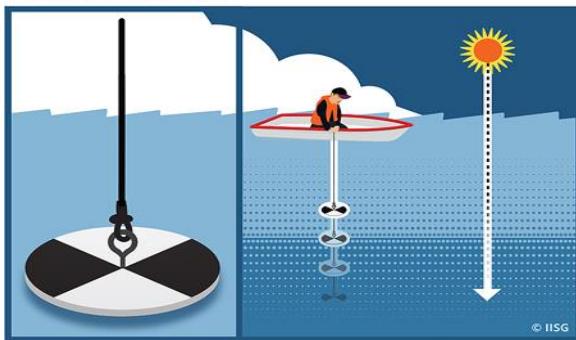
- Sufficient oxygen is available in the water column of Mary Lake throughout the year. Generally, the top 10-14 feet maintains enough oxygen to support most fish species, even in late winter.

Lake water **temperature** has a significant impact on water chemistry, spatial distribution of fish, microbial growth and oxygen content.

- Temperature profiles in Mary Lake show similar temperature with depth, typical of a shallow, mixed lake.

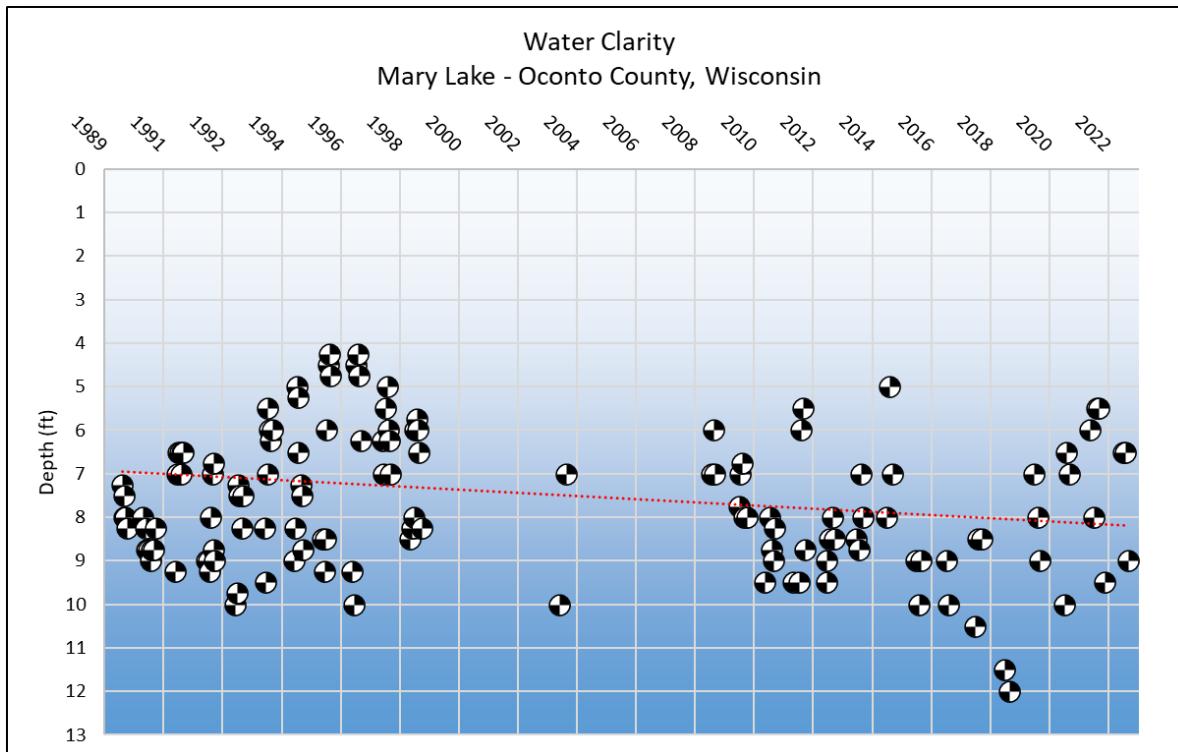
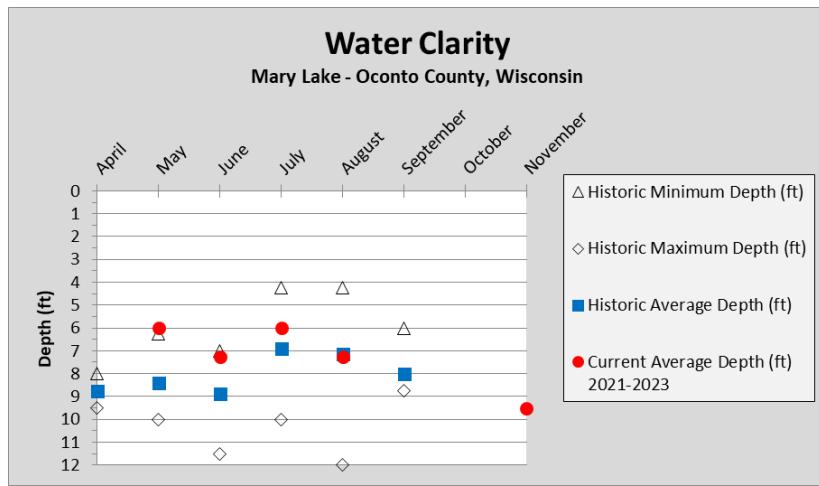


# Water Quality



**Water clarity** is a measure of how deep light can penetrate (Secchi depth). Clarity is affected by water color, turbidity (suspended sediment), and algae. Water clarity helps determine where rooted aquatic plants can grow. It is typical for water clarity to vary throughout the year.

- The graphs below show water clarity measurements taken between May and November.
- During 2022-23, water clarity was best in November and worst in July. The long-term trend suggests increasing average clarity.



# Water Quality

**Other chemistry** data was collected from lake water samples, such as basic cations, pollutants and acid rain input, and physical parameters. Results of such analyses can provide insights into a variety of other potential impacts to the lake. While concentrations of these compounds in lake water is usually low, higher concentrations can be indicators of other potential issues.

- Concentrations of potassium (0.74 mg/L), chloride (0 mg/L) and sodium (1.6 mg/L) were low. This suggests minimal impacts from human activity such as septic systems, road salt, animal waste and fertilizers.
- DACT, a screening tool to determine if your lake is being impacted by pesticides, was not detected.
- Water in Mary Lake is moderately hard (110 mg/L CaCO<sub>3</sub>), having a slightly elevated level of dissolved minerals. These minerals tend to bind with phosphorus making it unavailable to algae blooms.

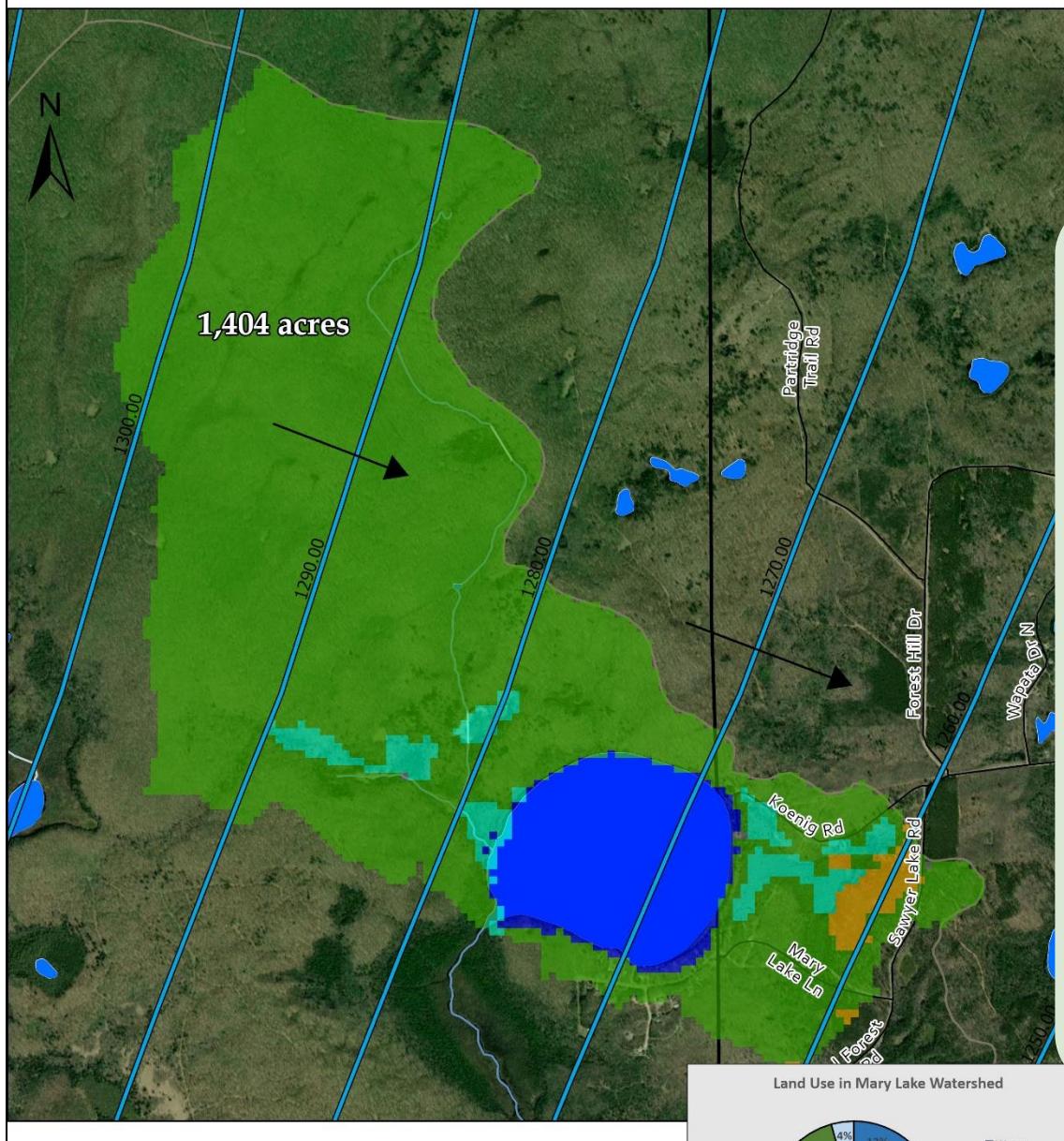


*For more information on how to interpret  
your lake's water quality data, please refer to  
the "State of the Oconto County Lakes  
Report" that is on file with Oconto County.*

# Watershed

**Groundwater** provides water to lakes in Oconto County throughout the entire year. Hard surfaces on the landscape prevent water from soaking into the ground and becoming groundwater. This results in less water flowing to the lake during snowmelt and rain events. Water that does not infiltrate to groundwater becomes **surface runoff** flowing across the surface of the landscape where it can move sediment and contaminants to the lake from within its watershed.

## Mary Lake Surface Watershed & Groundwater Flow



The quality of lake water reflects what is happening on the land surface. Precipitation falling on forests produces clean groundwater, whereas precipitation falling on land that has chemical use can produce runoff and groundwater that contains these chemicals. Groundwater contamination may include nitrogen, pesticides, herbicides and other soluble chemicals originating from septic systems, crops, barnyards, and road de-icing. Once in the groundwater, these chemicals move slowly towards a lake or river.

# Shorelands

**Shoreland vegetation** is critical to a healthy lake's ecosystem. It provides habitat for many aquatic and terrestrial animals including birds, frogs, turtles, and many small and large mammals. It also helps to improve the quality and quantity of the runoff that flows across the landscape towards the lake. Healthy shoreland vegetation includes a mix of tall, native grasses/flowers, shrubs and trees.

- Shorelands around Mary Lake were surveyed in August 2022. Most of Mary Lake's shoreland is healthy, but some sections are in need of restoration.

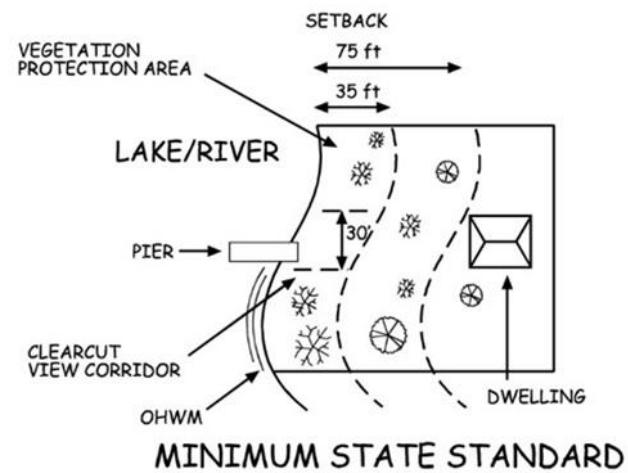
Total lakefront footage	No. Riparian lots	Measured shoreland disturbance (feet)	Measured shoreland disturbance (%)
3,094	29	615	20%



## 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:

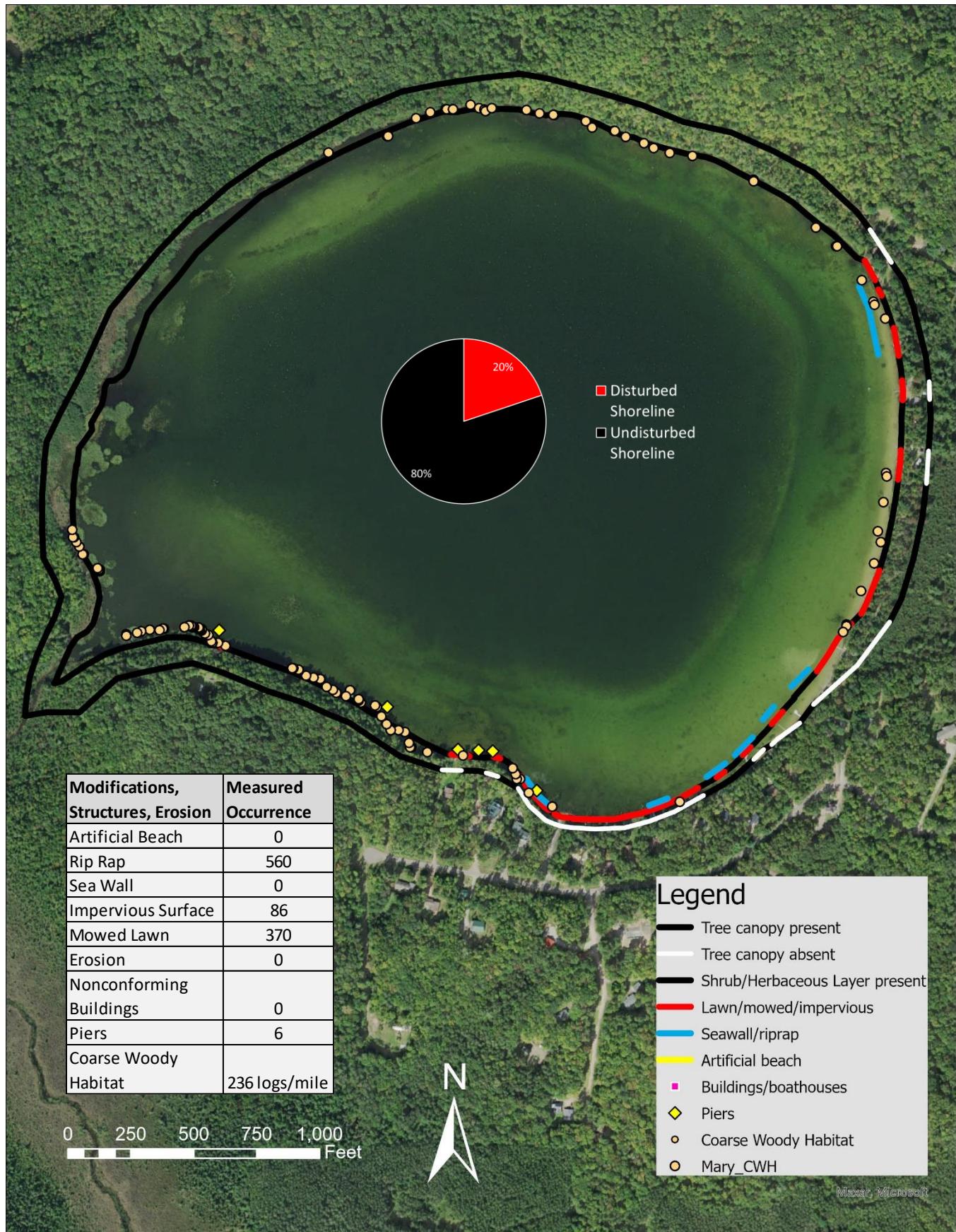
- Up to 30% of shoreline may be removed of shrubs and trees for a view corridor
- A mowed or constructed pedestrian path up to 5 feet wide to access lake



## What Can You Do To Help Mary Lake?

- ✓ Leave natural shoreland vegetation in place or restore if it has been removed.
- ✓ Learn to identify and look for invasive plants and animals and know who to contact if found.
- ✓ Do not purchase prohibited and restricted species. Purchase native plants when possible.
- ✓ Never transplant water garden or aquarium plants into lakes, streams or wetlands. Properly dispose of them.
- ✓ Remove invasive exotic plants from your landscape and replace them with native plants or non-invasive exotics. Scout regularly for new invasive plants.
- ✓ Avoid using garden plants from other regions whose invasive potential is poorly understood.

# Shorelands

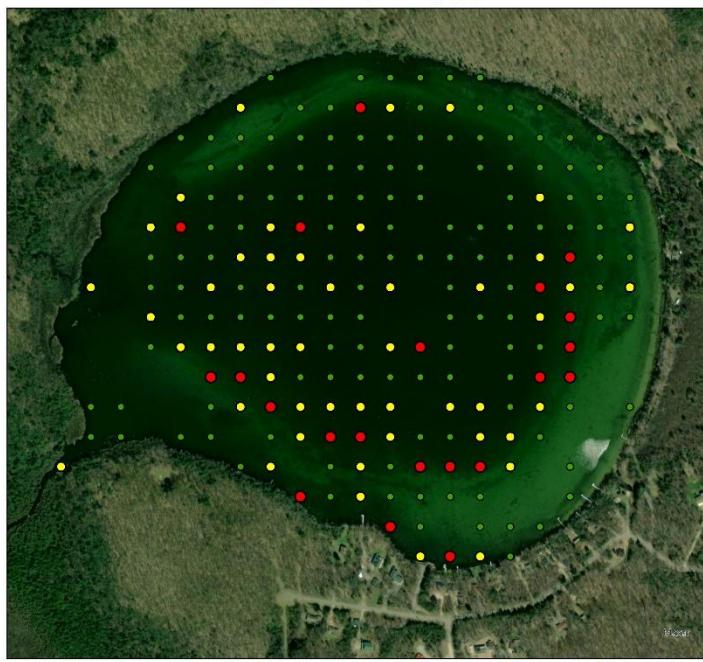


# Aquatic Plants

**Aquatic plants** are the forest landscape within a lake. They provide food and habitat for terrestrial and aquatic creatures such as fish, ducks, turtles, invertebrates and other animals. They increase oxygen levels in the water and utilize nutrients that would otherwise be used by algae. A healthy lake typically has a variety of aquatic plant species creating diversity that can help to prevent the establishment of aquatic invasive species.

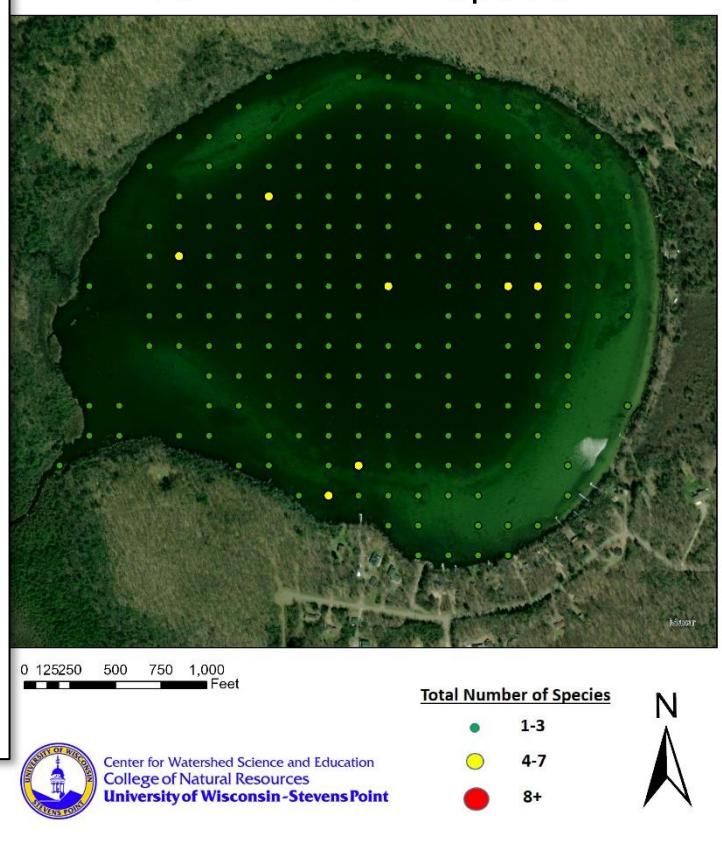
- The aquatic plant community in Mary Lake is characterized by slightly average diversity of plant species when compared to other lakes in the Oconto County Lakes Project, with a total of 22 species in the 2022 survey.
- During the 2022 aquatic plant survey of Mary Lake, 81% of visited sites had vegetative growth. The maximum depth of vegetation was 13 feet and the Floristic Quality Assessment (FQI) was 24.5.
- The most frequently encountered plant species were slender naiad (65%), chara (50%), and flat-stem pondweed (11%).
- No invasive species were observed.

## Mary Lake Aquatic Plant Survey 2022: Rake Fullness



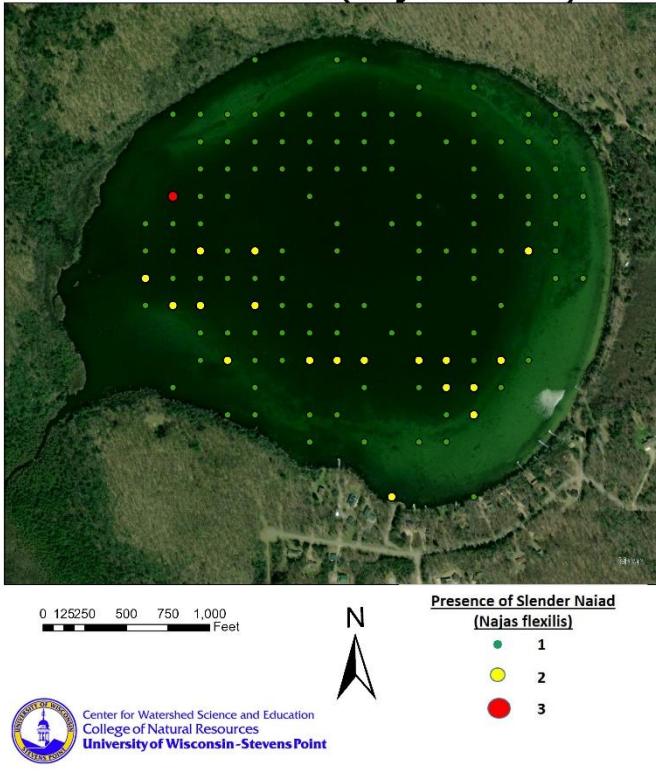
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## Mary Lake Aquatic Plant Survey 2022: Total Number of Species



# Aquatic Plants

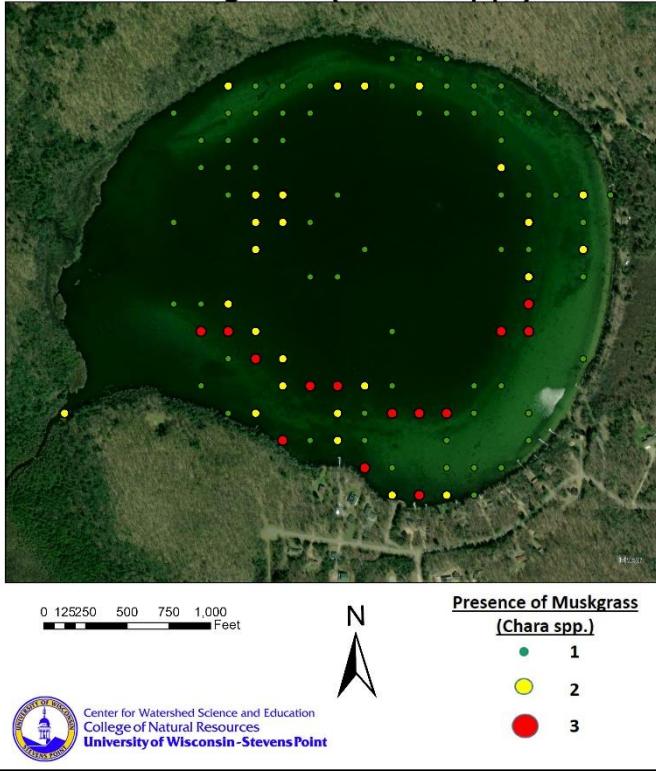
## Mary Lake Aquatic Plant Survey 2022: Slender naiad (*Najas flexilis*)



**Slender naiad** has glossy, finely toothed leaves appearing as whorls near the end of stems. Also known as the water-nymph, the whole plant is eaten by waterfowl and provides shelter for small fish and insects.



## Mary Lake Aquatic Plant Survey 2022: Muskgrass (*Chara* spp.)

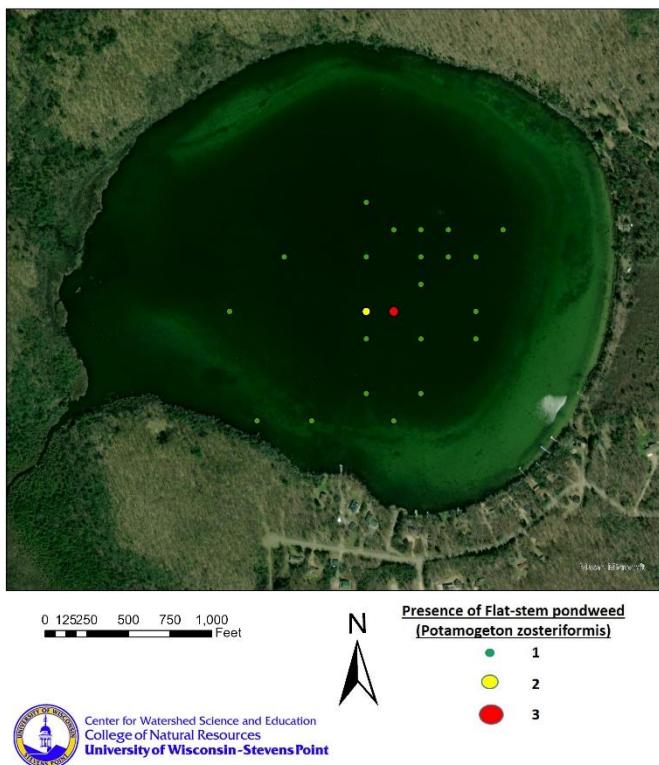


**Chara** is a type of macro algae that grows attached to muddy lake bottoms and has a musky odor. Muskgrass, as it is known, filters the lake water and is helpful in preventing the establishment of invasive species.



# Aquatic Plants

Mary Lake Aquatic Plant Survey 2022:  
Flat-stem pondweed (*Potamogeton zosteriformis*)



**Flat-stem pondweed**, usually found in soft sediment, is a food source for geese and ducks and some mammals. It provides food and cover for fish and invertebrates.



Aquatic **invasive species** are non-native aquatic plants and animals that are most often unintentionally introduced into lakes by lake users. 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.

- No invasive species were observed during the 2022 survey.
- Banded mystery snails (2009) and phragmites (2015) have previously been documented in Mary Lake.

**Banded mystery snails** are born as fully formed snails that seem to appear from nowhere. Native to southeast US, they have the potential to serve as hosts for parasites and outcompete native snails



**Phragmites**, or common reed grass, creates tall, dense stands that crowd out native plants, degrades wildlife habitat and reduces access. It spreads through underground growth and takes aggressive treatment to control.

# Acknowledgments

This report was prepared as an appendix to the *Oconto County State of the Lakes Report*, which is on file with the Oconto County Land Conservation Department.

Written and prepared by the Center for Watershed Science and Education at the University of Wisconsin-Stevens Point.

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## Acknowledgments

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