

# Oconto County Lakes Project

## PINE RIDGE LAKE STUDY

### SUMMARY REPORT

2022

#### 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**

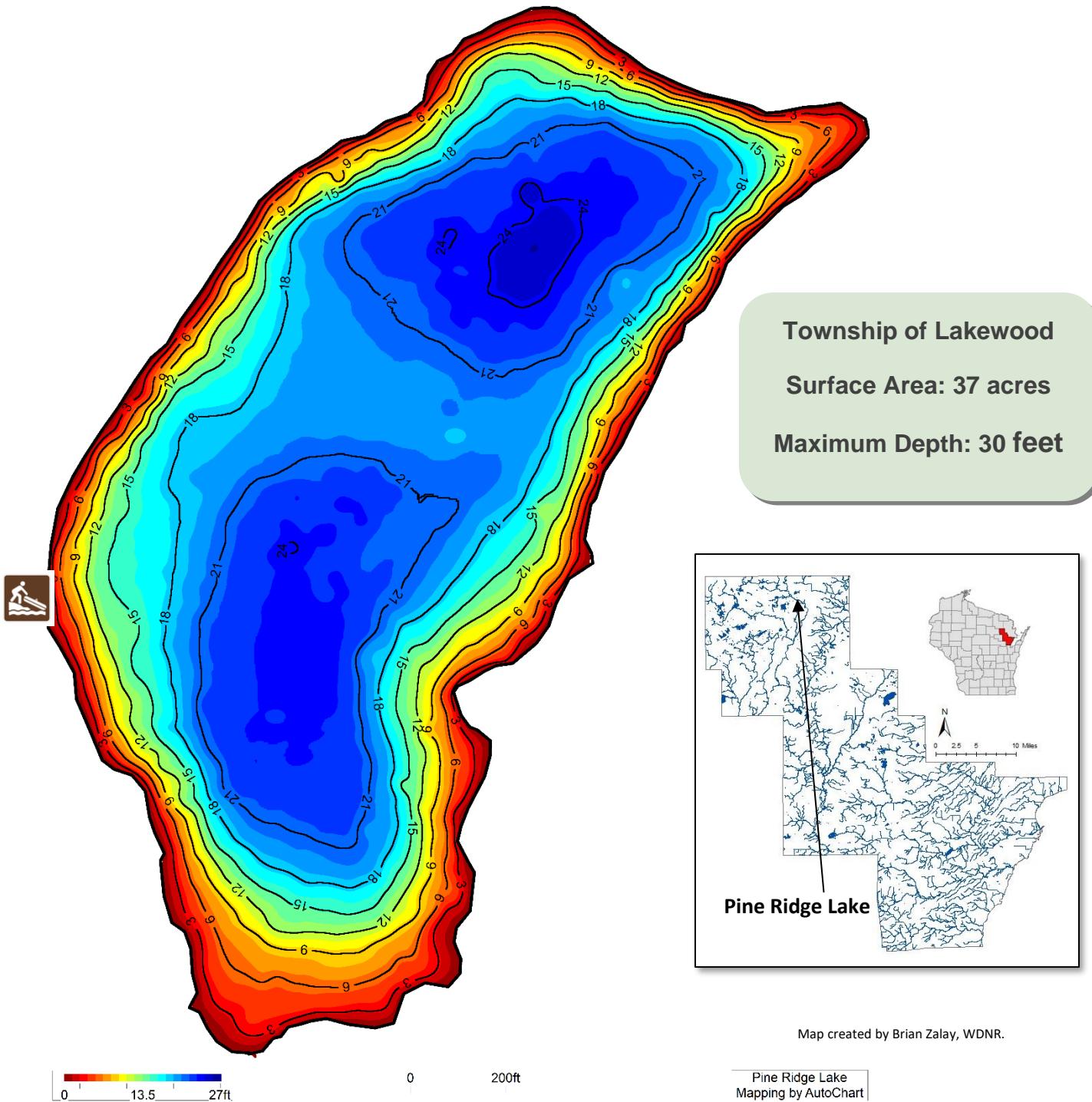
Lake  
Management  
Plans



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

# Background

- Pine Ridge Lake is a 37-acre seepage lake in northern Oconto County with a maximum depth of 30 feet.
- Most water enters and leaves Pine Ridge Lake via groundwater. Surface water runoff and direct precipitation also contribute water.
- Visitors have access to the lake from one public carry-in access located on the lake's west side.
- This report summarizes data collected during the 2020-2021 lake study.



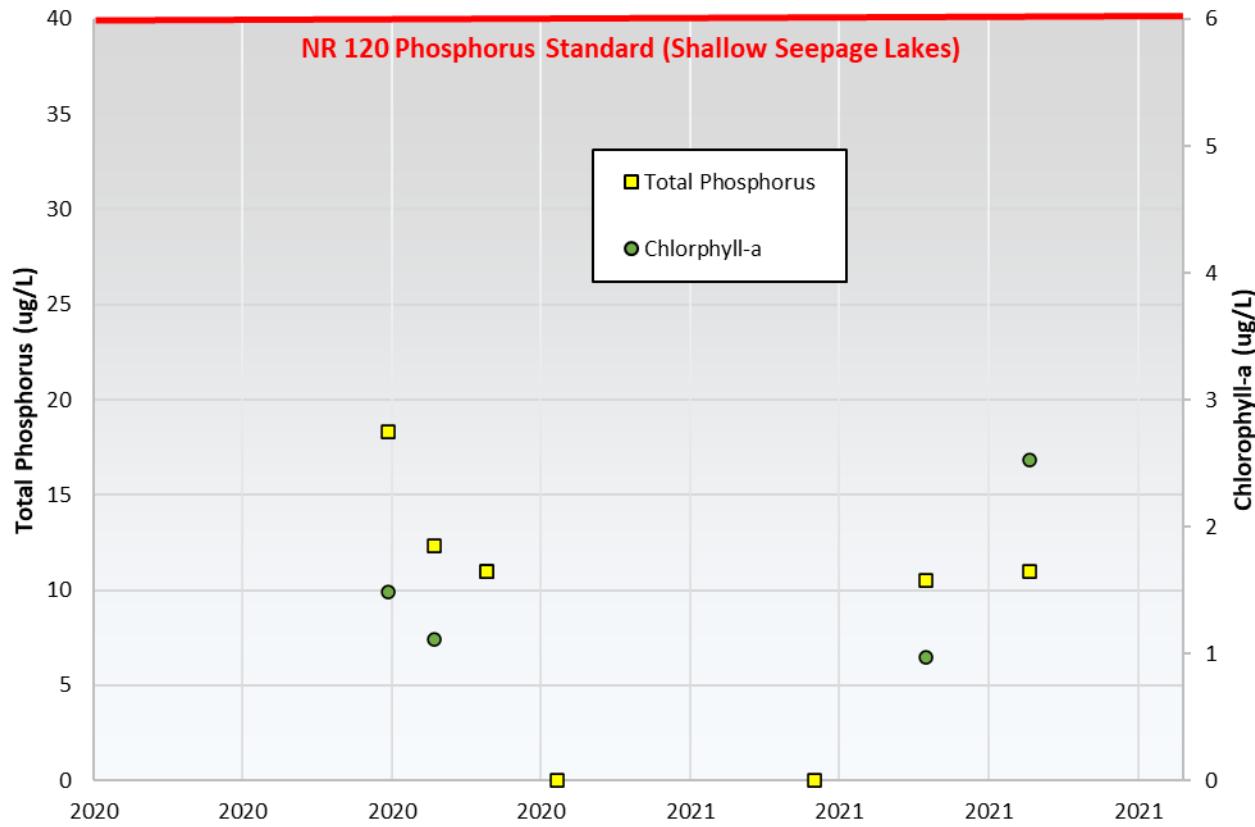
# Water Quality

**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 seepage lakes during the two-year study. A trend cannot be established from limited data. Continued monitoring is recommended.
- Inorganic nitrogen remained below the threshold of 0.3 mg/L when algal blooms increase.
- Chlorophyll-a, an indirect measure of algae, remained below the threshold of 6 ug/L.

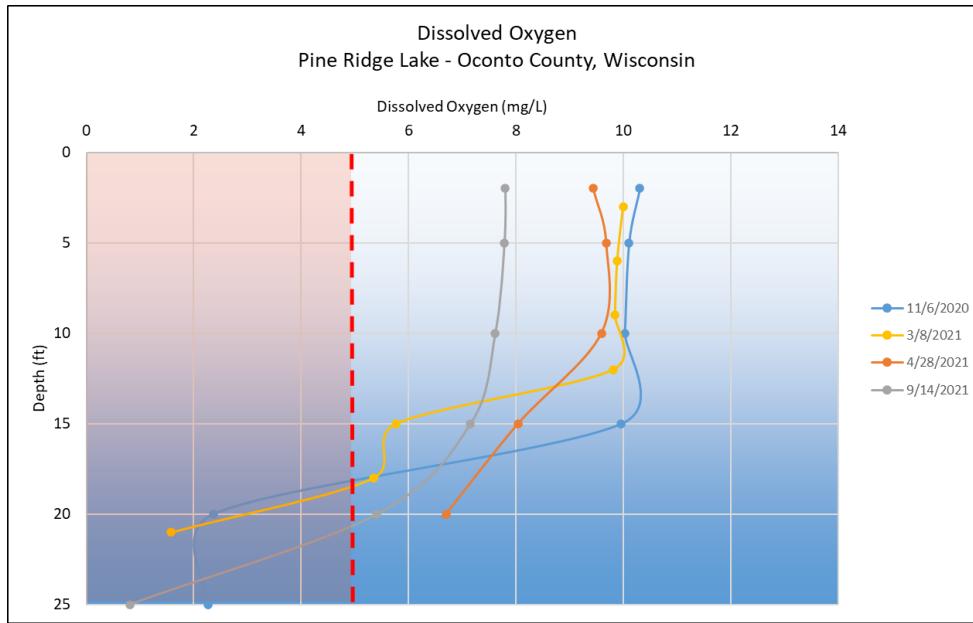


**Total Phosphorus & Chlorophyll-a**  
**Pine Ridge Lake - Oconto County, Wisconsin**



# Water Quality

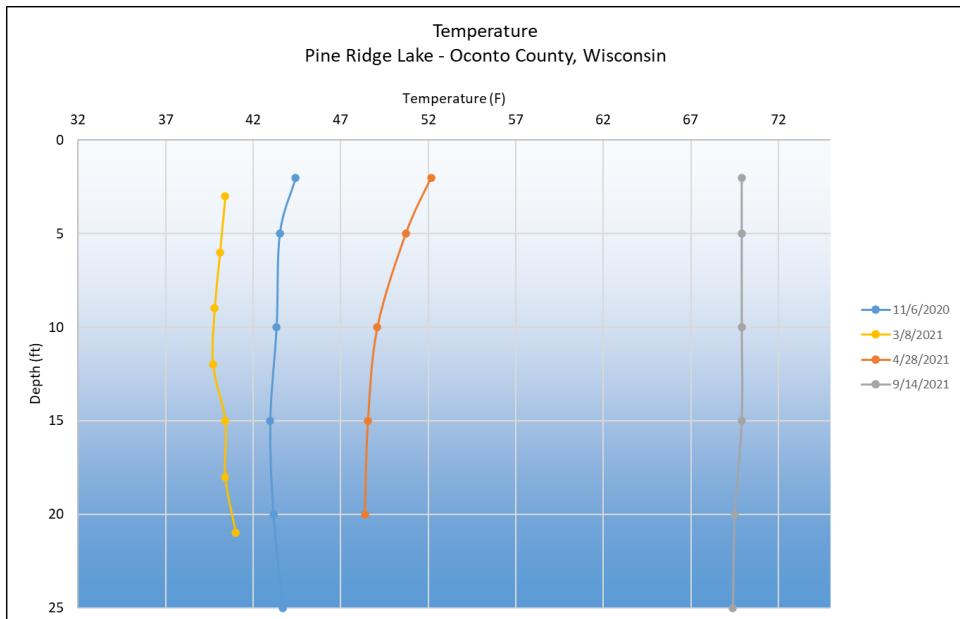
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature,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



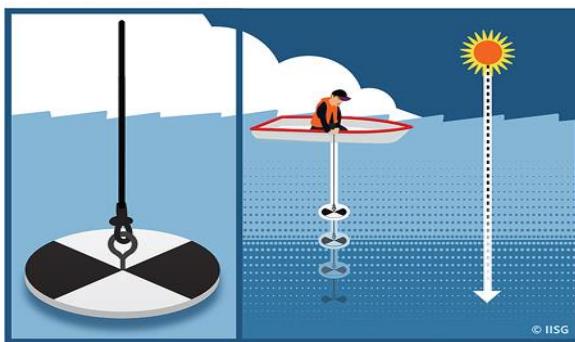
➤ Sufficient oxygen is available in the water column of Pine Ridge Lake throughout the year. The lowest concentrations were observed in late winter when only the top 17 feet has enough oxygen to support most fish species.

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

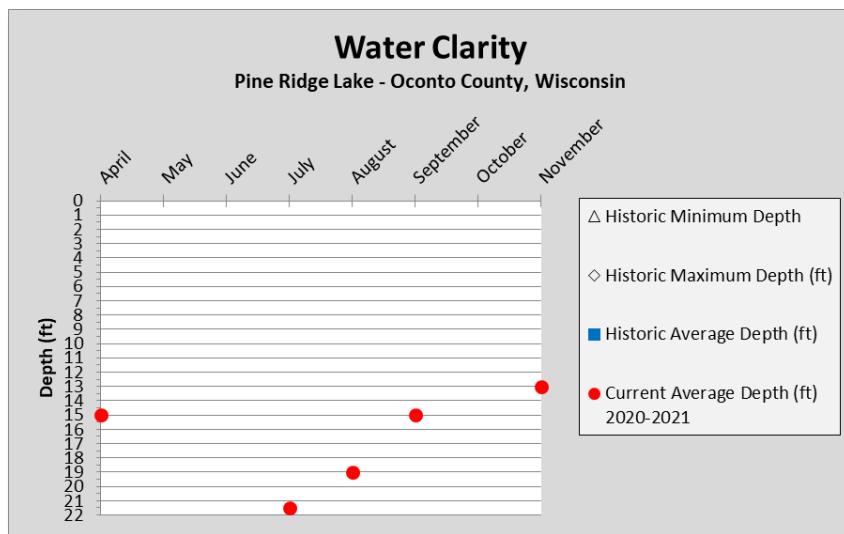
➤ The temperature gradient in Pine Ridge Lake shows consistent temperatures with depth throughout the season, typical of a shallow lake.



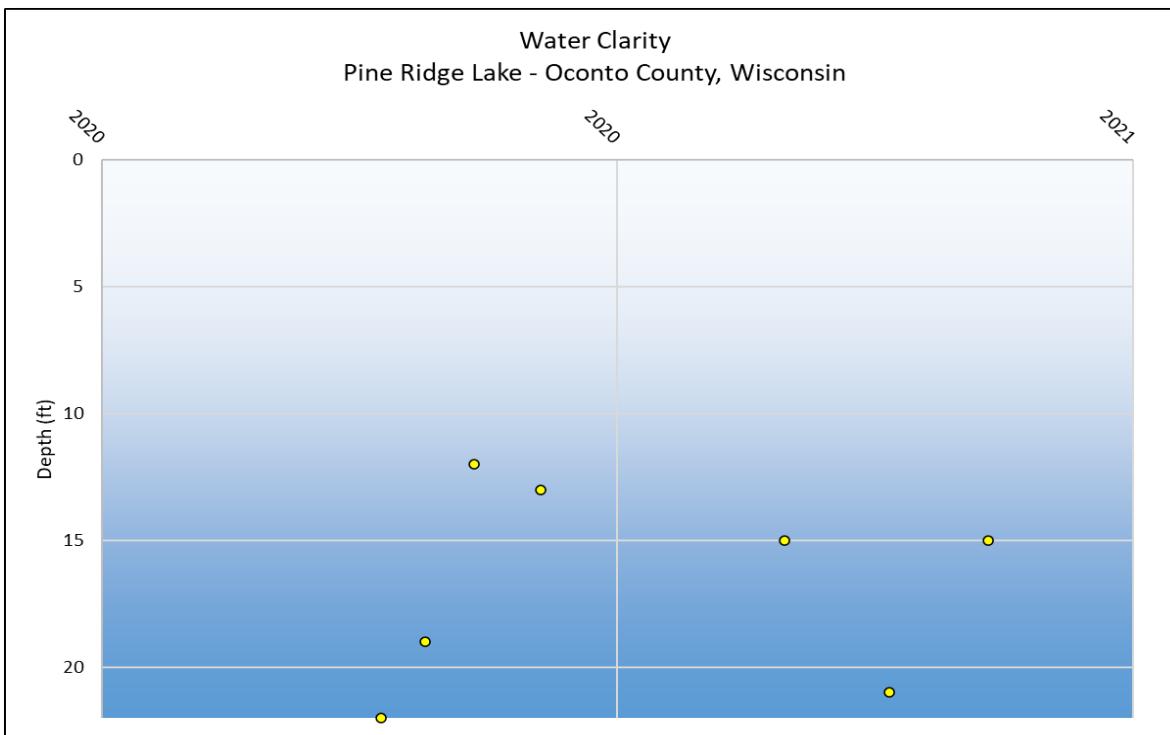
# Water Quality



**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 graph below shows water clarity measurements taken between May and November.
- During 2019-20, the poorest average water clarity was in May and best was in August. Limited historic data suggests a decreasing trend.



# 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 (1.07 mg/L), chloride (5.7 mg/L) and sodium (3.3 mg/L) were all low. This suggests minimal impact from 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 White Lake is hard (153 mg/L CaCO<sub>3</sub>), having an elevated level of dissolved minerals. These minerals tend to bind with phosphorus making it unavailable to algae blooms.

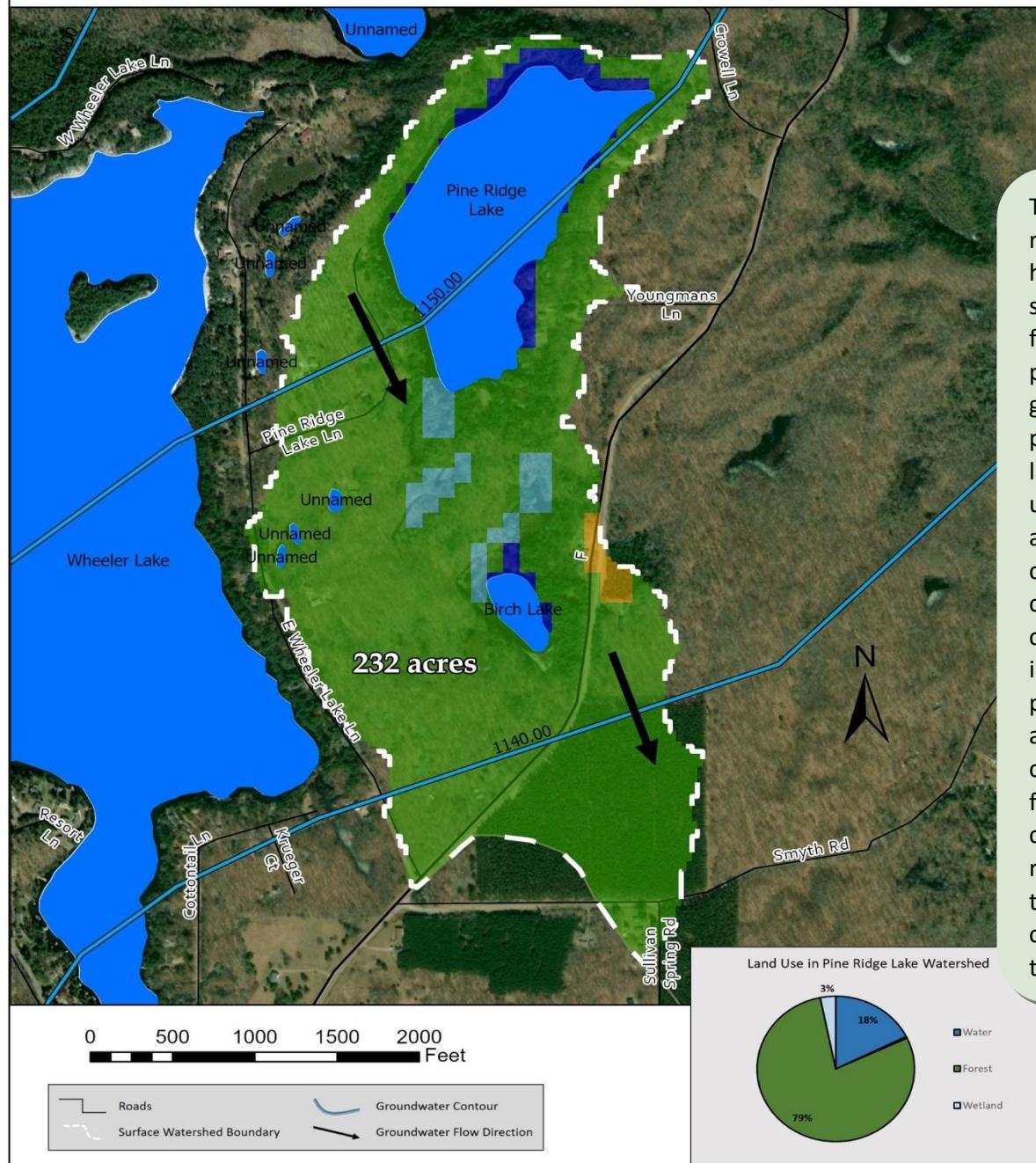


*For more information on how to interpret  
your lake's water quality data, please refer to  
the "State of the Oconto County Lakes  
Report" that is on file with Oconto County.*

# 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.

## Pine Ridge 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 Pine Ridge Lake were surveyed in July 2020. Though very little was considered disturbed, the lack of ground vegetation can lead to erosion issues. Where appropriate, strategies to reduce/divert runoff should be used.

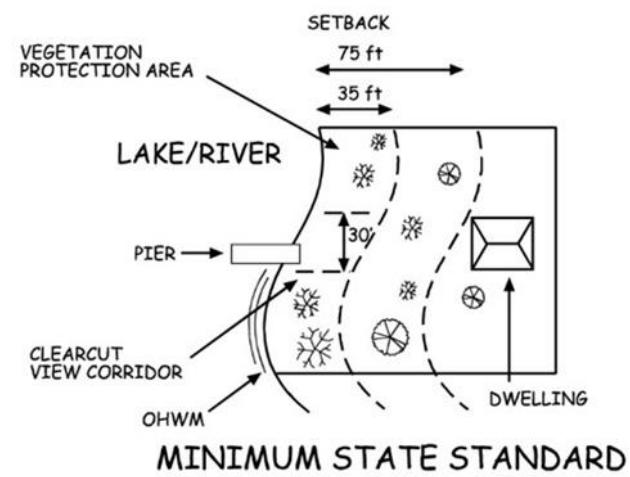
Total lakefront footage	No. Riparian lots	Measured shoreland disturbance (feet)	Measured shoreland disturbance (%)
6,333	13	30	0.5%



## 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:

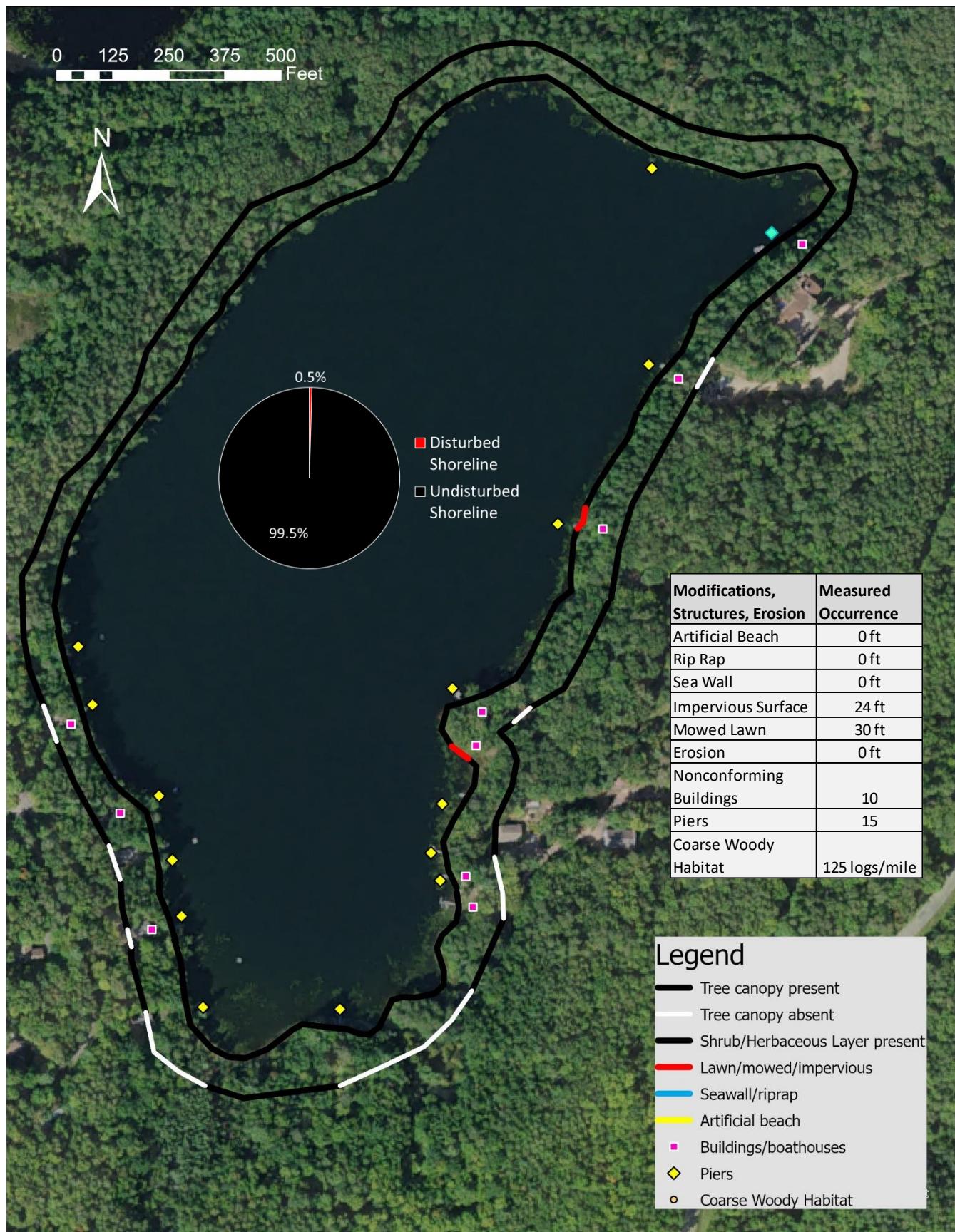
- Up to 30% of shoreline may be removed of shrubs and trees for a view corridor
- A mowed or constructed pedestrian path up to 5 feet wide to access lake



## What Can You Do To Help Pine Ridge 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

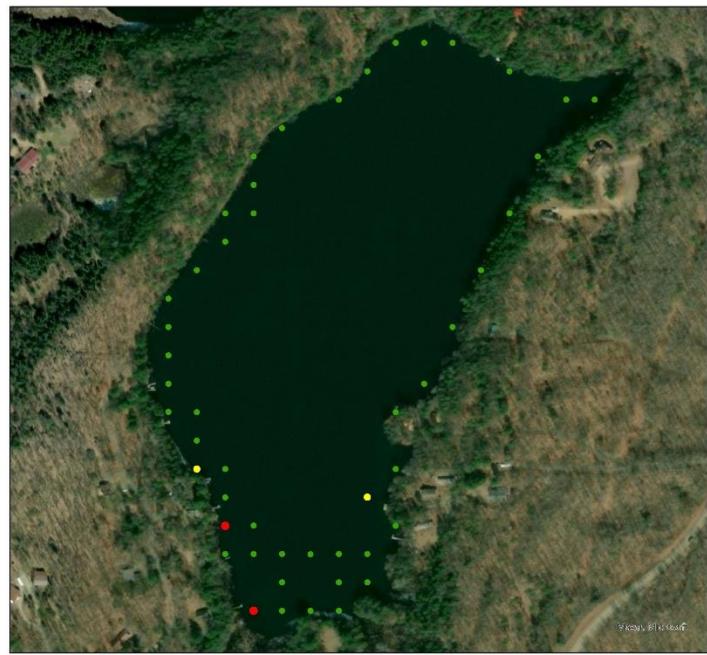


# Aquatic Plants

**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.

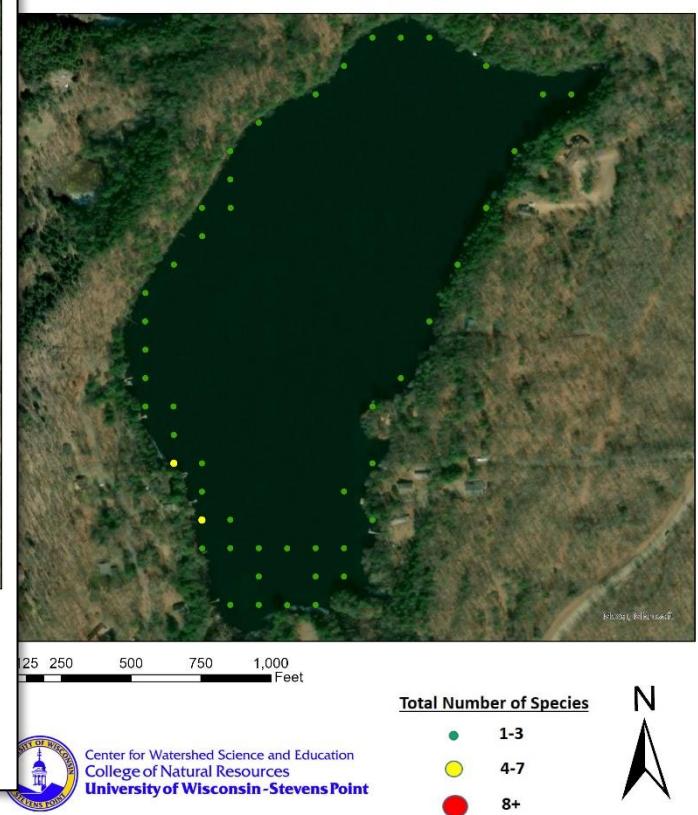
- The aquatic plant community in Pine Ridge Lake is characterized by below average diversity of plant species when compared to other lakes in the Oconto County Lakes Project, with a total of 13 species in the 2020 survey.
- During the 2020 aquatic plant survey of Pine Ridge Lake, 28% of visited sites had vegetative growth. The maximum depth of vegetation was 16 feet and the Floristic Quality Assessment (FQI) was 22.
- The most frequently encountered plant species were variable pondweed (43%), chara (36%) and slender naiad (30%). All three species are native to Wisconsin.
- The invasive species Eurasian watermilfoil was observed at one location.

Pine Ridge Lake Aquatic Plant Survey 2020:  
Rake Fullness



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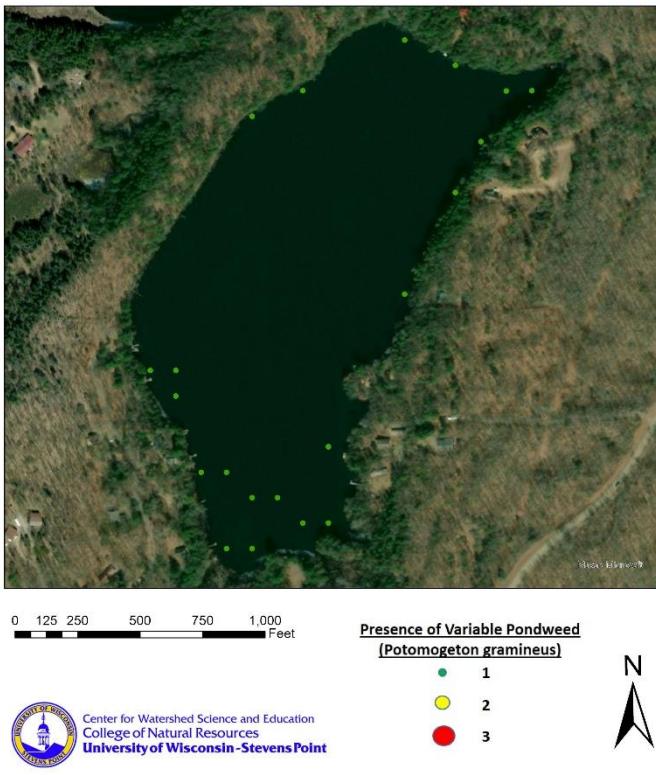
Pine Ridge Lake Aquatic Plant Survey 2020:  
Total Number of Species



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# Aquatic Plants

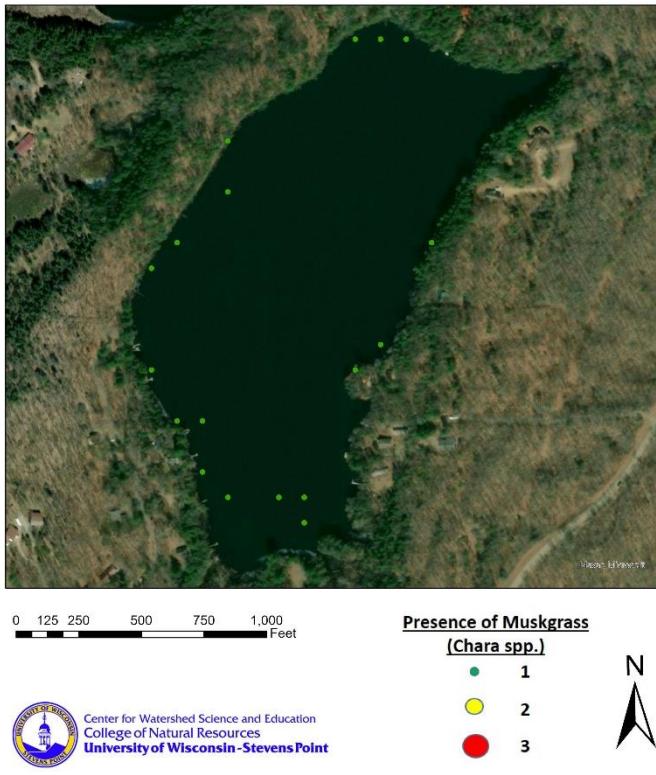
## Pine Ridge Lake Aquatic Plant Survey 2020: Variable pondweed (Potamogeton gramineus)



**Variable pondweed** has both floating and submersed leaves which provide food and habitat for fish.



## Pine Ridge Lake Aquatic Plant Survey 2020: Muskgass (Chara sp.)

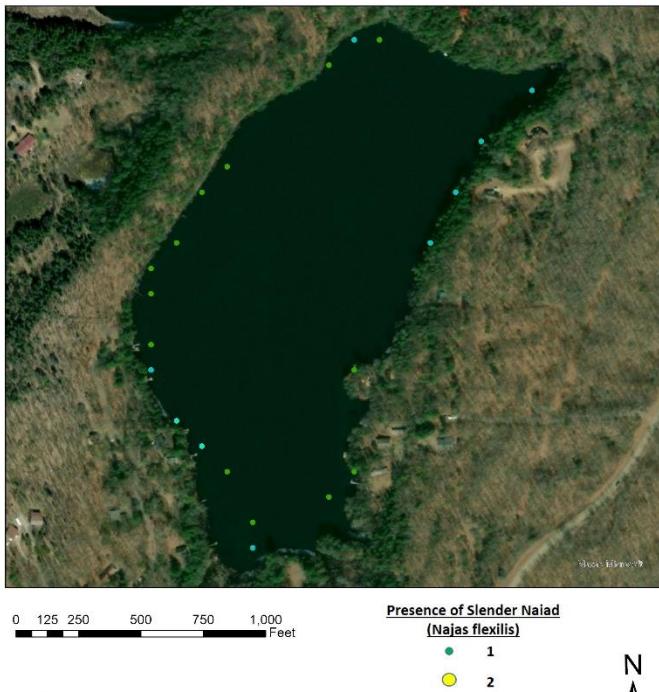


**Chara** is a type of macro algae that grows attached to muddy lake bottoms and has a musky odor. Muskgass, as it is known, filters the lake water and is helpful in preventing the establishment of invasive species.



# Aquatic Plants

## Pine Ridge Lake Aquatic Plant Survey 2020: Slender naiad (*Najas flexilis*)



**Slender naiad**, also called nodding water-nymph, is a primary food source for waterfowl and provides habitat for many invertebrates.

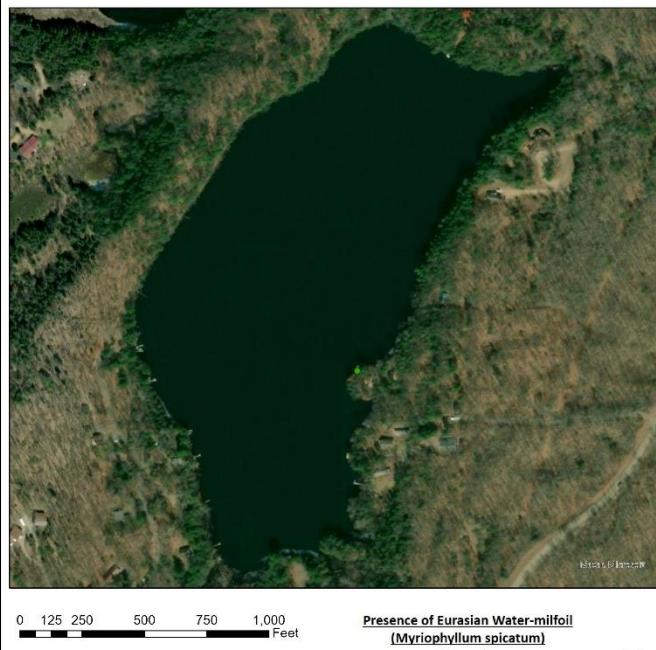


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Aquatic **invasive species** are non-native aquatic plants and animals that are most often unintentionally introduced into lakes by lake users. In some lakes, aquatic invasive plant species can exist as a part of the plant community, while in other 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.

- Eurasian watermilfoil was observed in one location during the 2020 aquatic plant survey.

## Pine Ridge Lake Aquatic Plant Survey 2020: Eurasian watermilfoil (*Myriophyllum spicatum*)



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# 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

We are grateful to our project partners for supporting this project by providing insight, enthusiasm, and funding:

Oconto County Lakes and Waterways Association

Oconto County Land Conservation Department – Ken Dolata

Oconto County Staff and Citizens

UW Extension-Oconto County – Dale Mohr

Wisconsin Department of Natural Resources – Brenda Nordin & Brian Zalay

Wisconsin Department of Natural Resources Lake Protection Grant Program

UW-Stevens Point Water and Environmental Analysis Lab



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