

# Oconto County Lakes Project

## GRINDLE LAKE STUDY SUMMARY REPORT 2019

*University of Wisconsin-Stevens Point and  
Oconto County Staff and Citizens*

### 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**

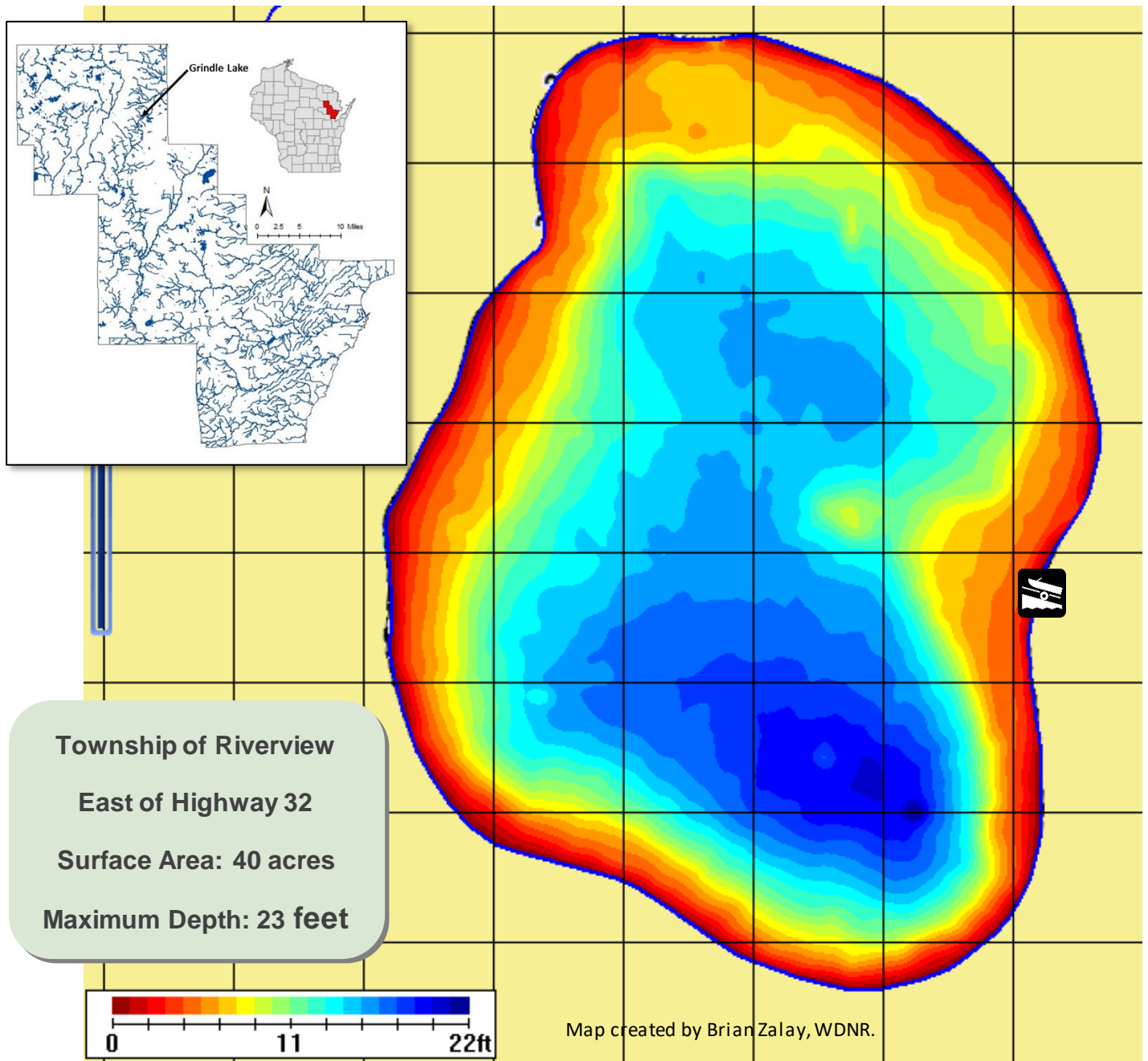
**Lake  
Management  
Plans**



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

# Background

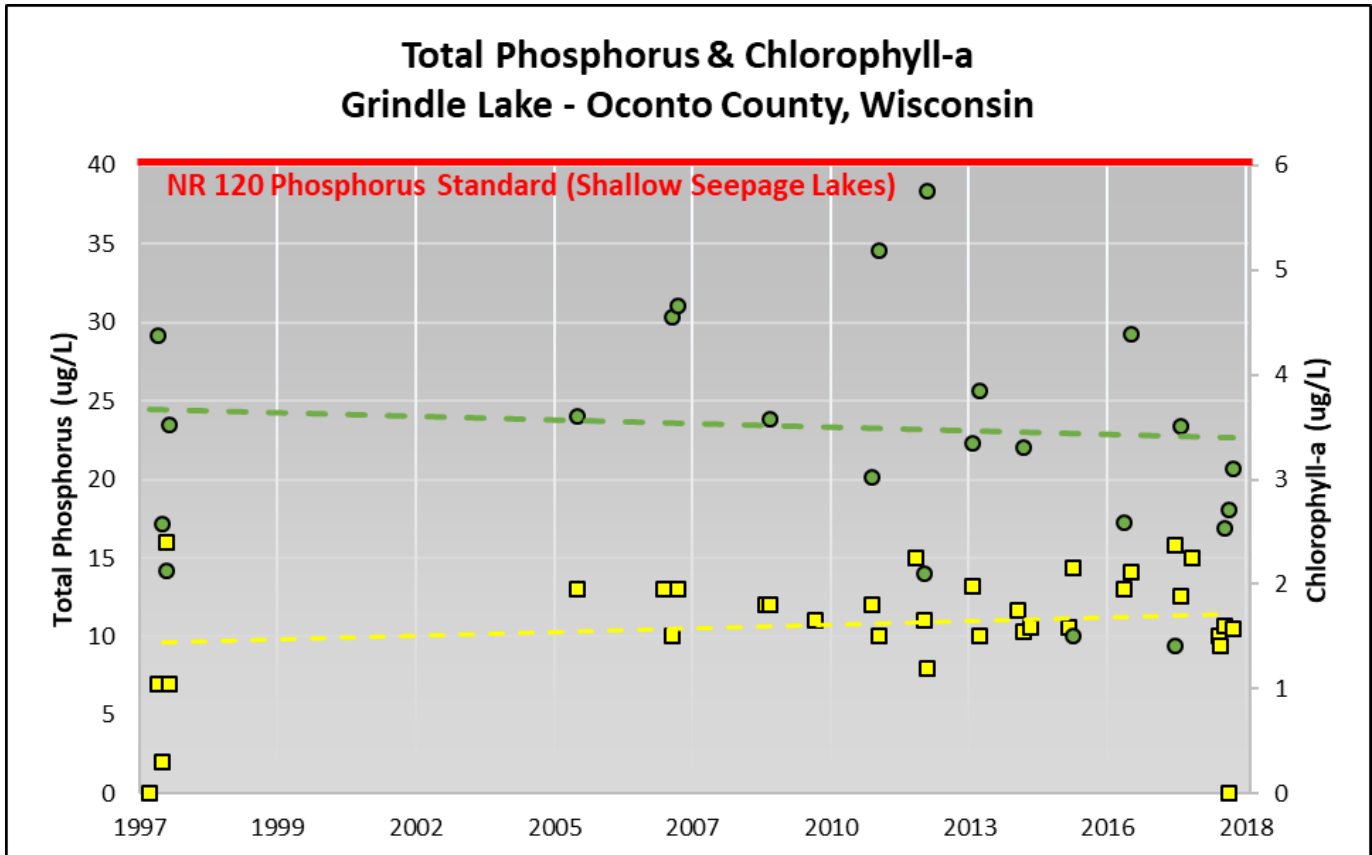
- ◆ Grindle Lake is a 40-acre seepage lake in northern Oconto County with a maximum depth of 23 feet.
- ◆ Most water enters Grindle Lake via groundwater. Surface water runoff and direct precipitation also contribute water.
- ◆ Visitors have access to the lake from one public boat landing located on the lake's east side.
- ◆ This report summarizes data collected during the 2017-2018 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.

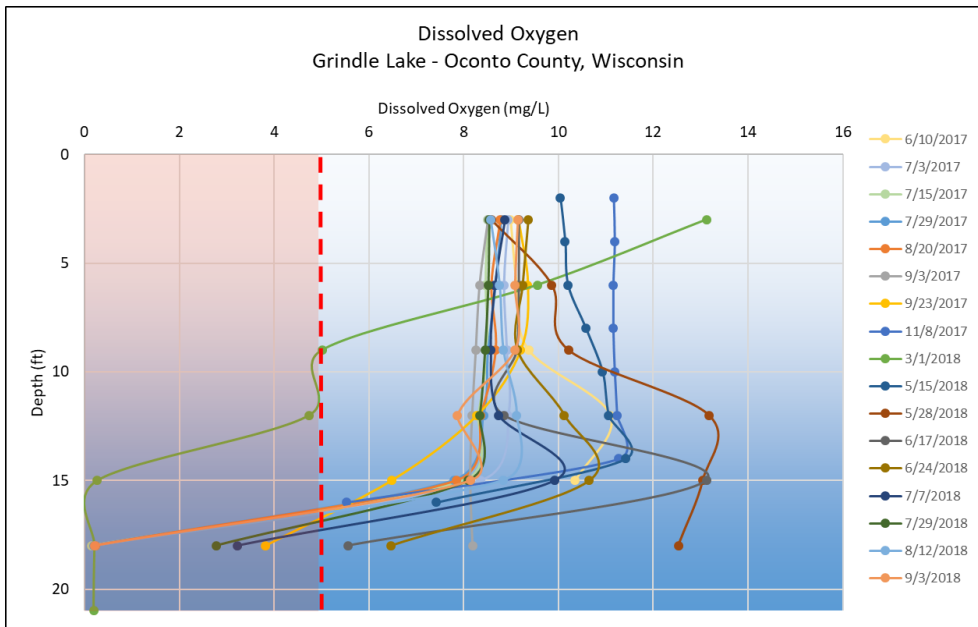
- ◆ Total Phosphorus was consistently **below** the standard of 40 ug/L for shallow seepage lakes during the two-year study. The 20-year trend is slightly increasing.
- ◆ Inorganic nitrogen remained below the threshold of 0.3 ug/L when algal blooms increase.
- ◆ Chlorophyll-a remained below 6 ug/L and appears stable over the long term.





# Water Quality

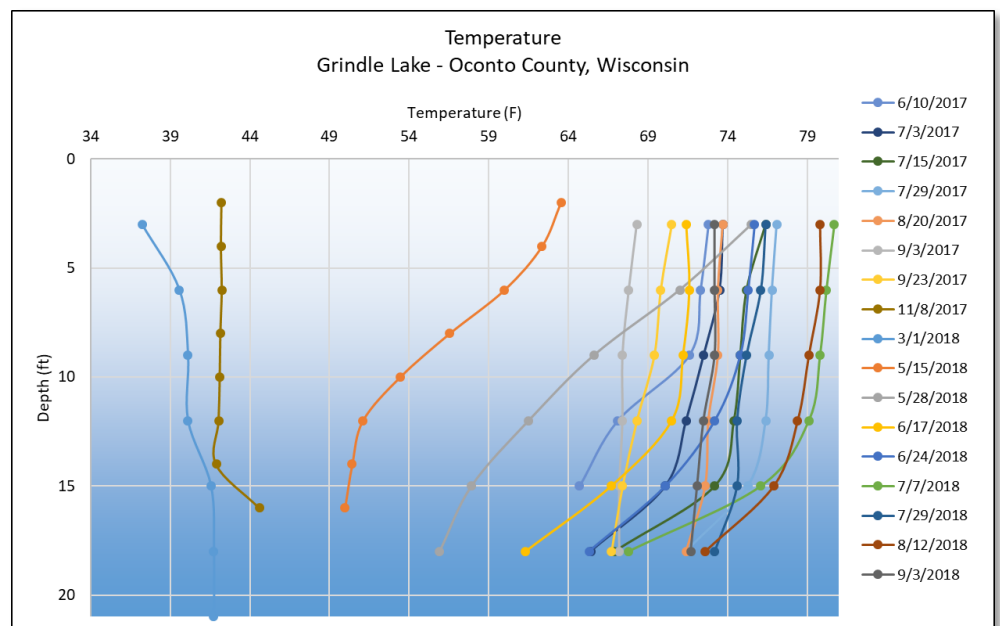
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature,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



- During most of the year, sufficient oxygen is available in Grindle Lake throughout the water column. Oxygen is depleted during the winter while the lake is ice covered, however, with the only the upper 9 feet having enough to support fish.
- Bumps in dissolved oxygen concentrations at 10-15 feet suggest mild algal activity.

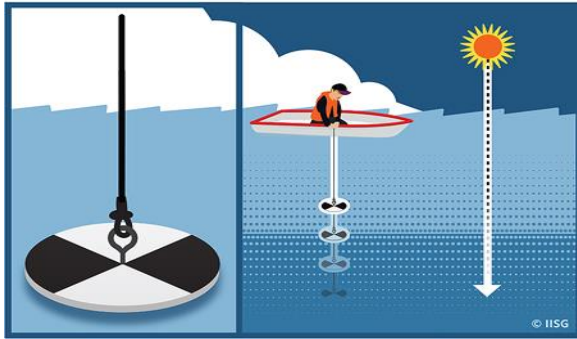
Lake water **temperature** has a significant impact on water chemistry, spatial distribution of fish, microbial growth and oxygen content.

- The temperature gradient in Grindle Lake is relatively uniform from top to bottom most of the year, typical of a shallow, mixed lake.



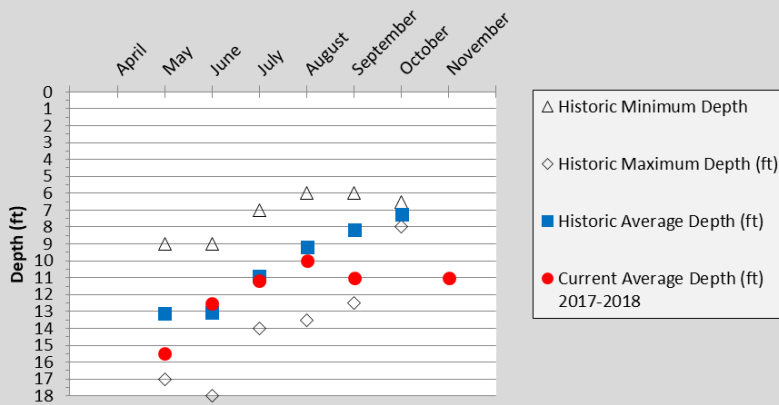
# Water Quality

## Secchi Disk



## Water Clarity

Grindle Lake - Oconto County, Wisconsin

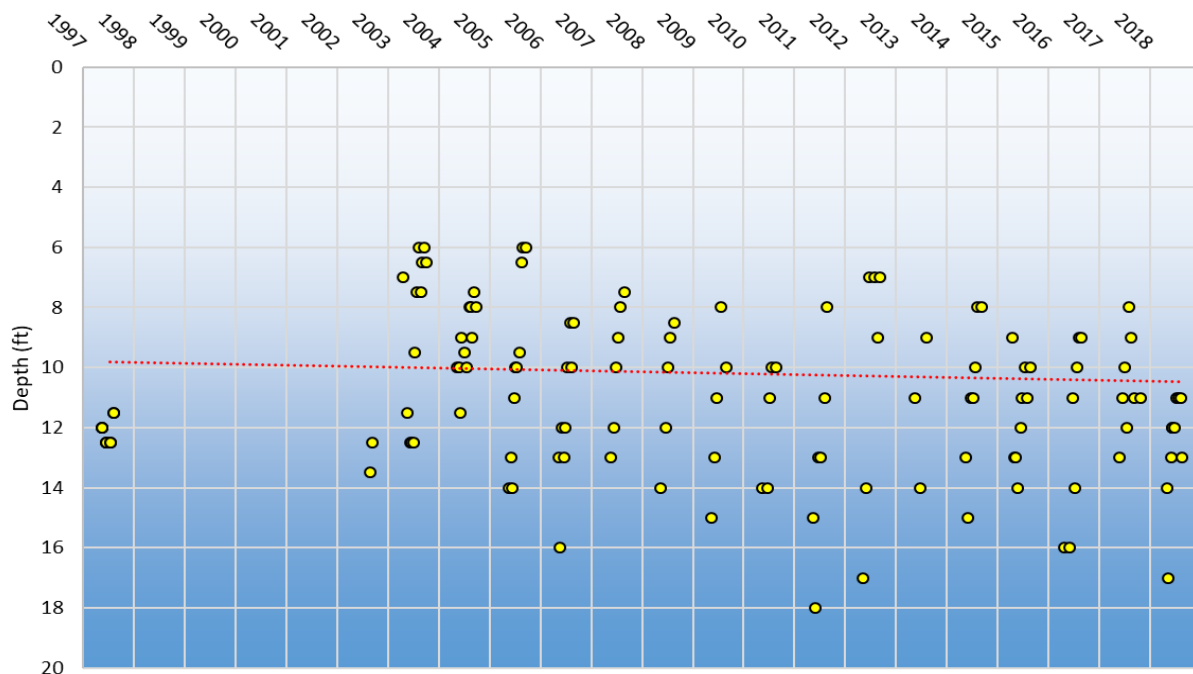


**Water clarity** is a measure of how deep light can penetrate (Secchi depth). Clarity is affected by water color, turbidity (suspended sediment), and algae. Water clarity helps determine where rooted aquatic plants can grow. It is typical for water clarity to vary throughout the year.

- The graph below shows water clarity measurements taken between April and November. It is typical for water clarity to vary throughout the year.
- During 2017-18, on average, the poorest water clarity in Grindle Lake was in August and the best was in May. This is consistent with previous observations and demonstrates a slightly increasing trend over the past 20 years.

## Water Clarity

Grindle Lake - Oconto County, Wisconsin



# 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 (0.63 mg/L), sodium (0.601 mg/L) and chloride (not detected) 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 Grindle Lake is soft (14 mg/L CaCO<sub>3</sub>), having a low level of dissolved minerals. Soft water lakes tend to have a higher pH and are limited in their ability to buffer the effects of acid rain and results in reduced productivity compared to similar lakes with harder water and plays a role in the type of aquatic plants that are found.

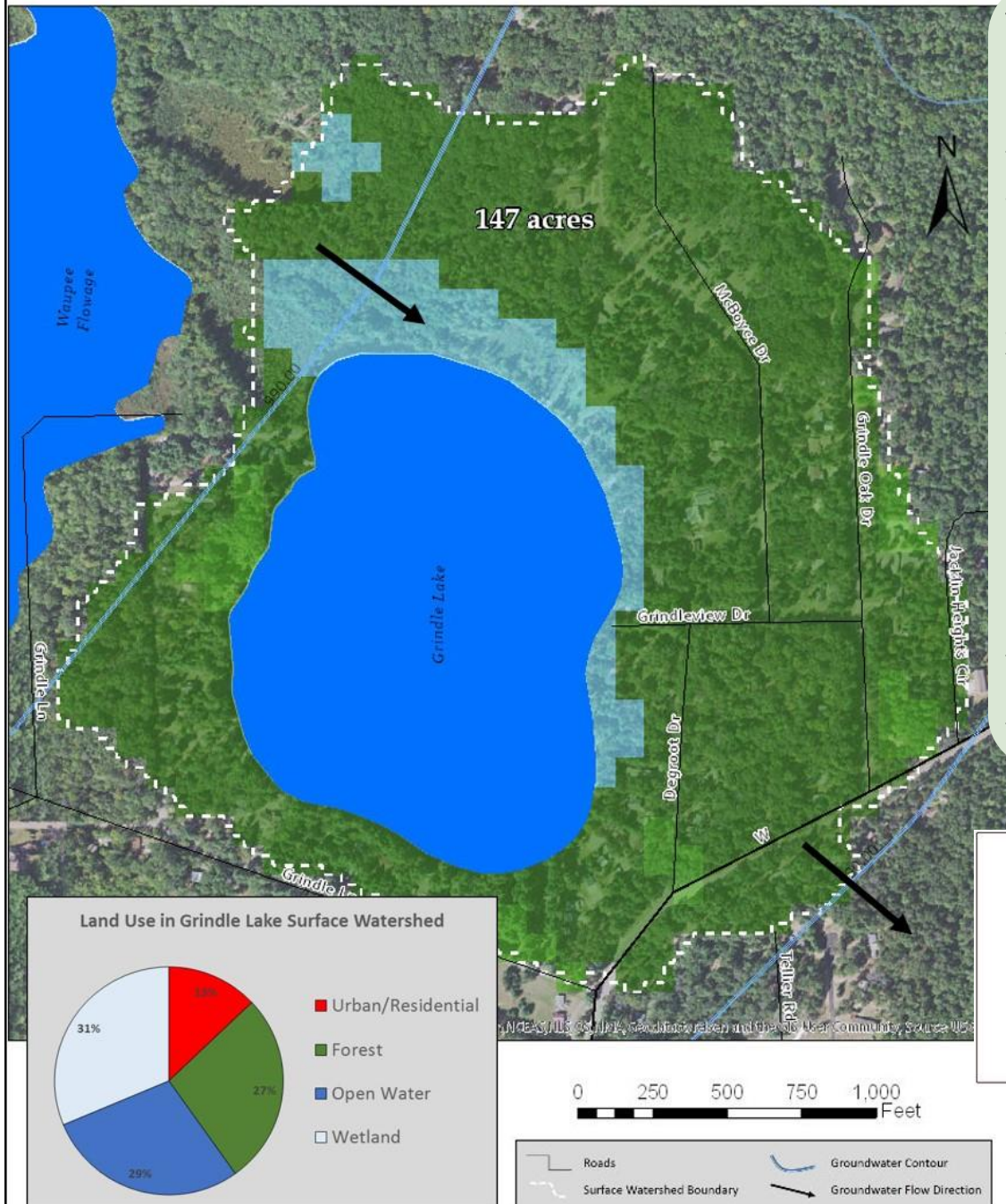


*For more information on how to interpret your lake's water quality data, please refer to the "State of the Oconto County Lakes Report" that is on file with Oconto County.*



**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 r 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.

## Grindle 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.

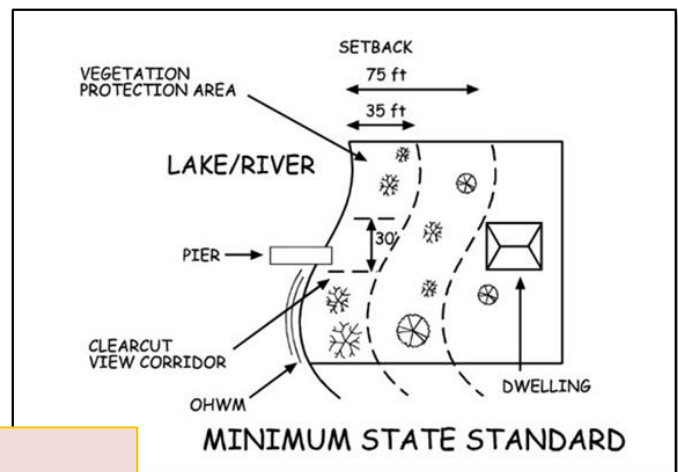


# Shorelands

**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 Grindle Lake were surveyed in August 2017. Much of Grindle Lake's shoreland is healthy, but some stretches are in need of restoration. Restoration would benefit the lake.

Total lakefront footage	No. Riparian lots	Total allowable (NR115) disturbed shoreland-feet	Total allowable (NR115) disturbed shoreland-%	Measured shoreland disturbance-feet	Measured shoreland disturbance-%
5,197	50	1,500	29%	2,870	55%



## State Shoreland Zoning Ordinance

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

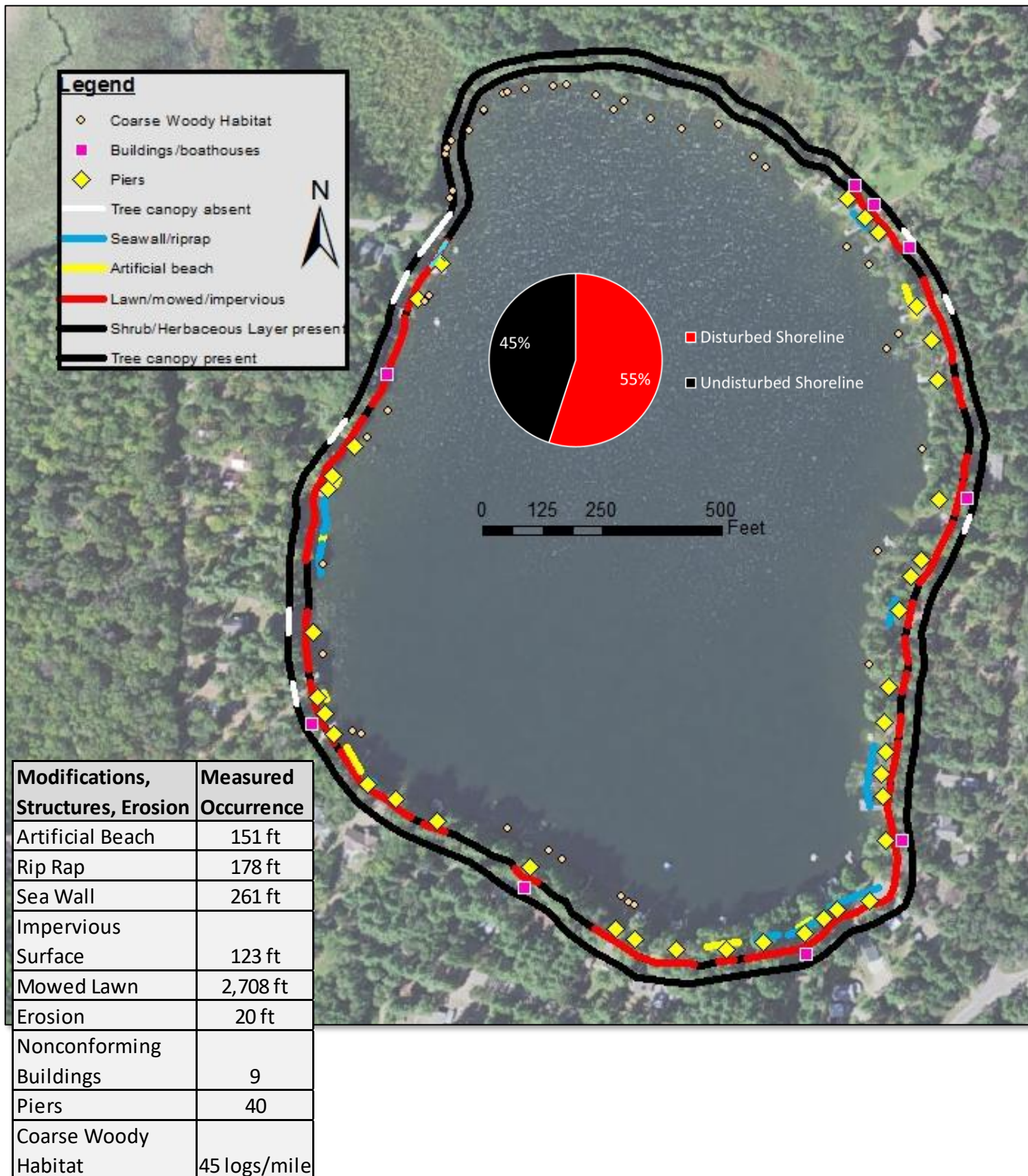
No vegetation within 35 feet of the lake's edge shall be removed except for:

- 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 Grindle 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.





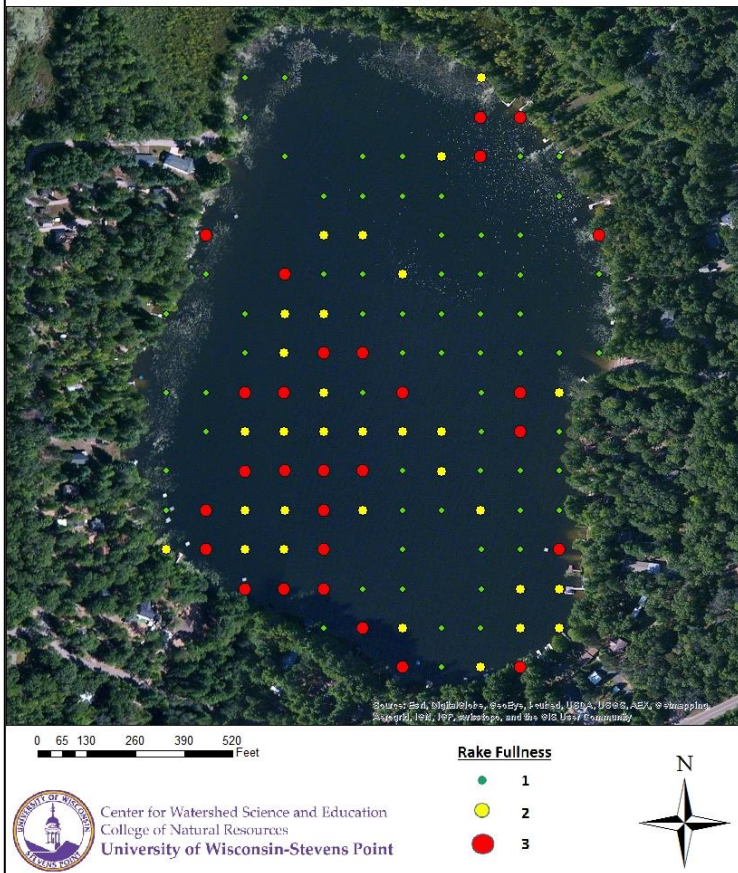


# Aquatic Plants

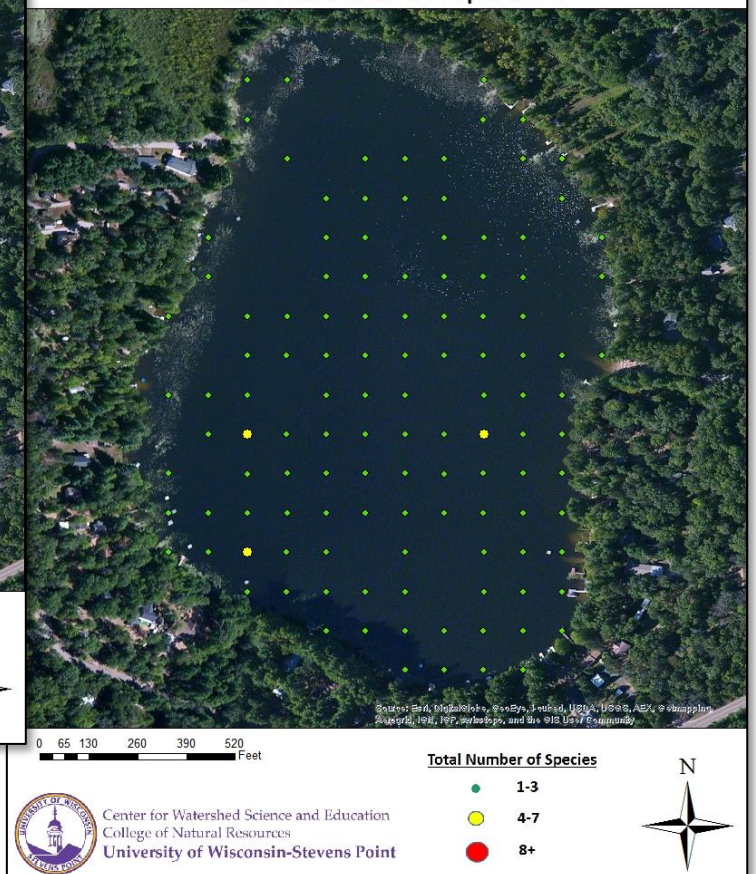
**Aquatic plants** are the forest landscape within a lake. They provide food and habitat for terrestrial and aquatic creatures such as fish, ducks, turtles, invertebrates and other animals. They increase oxygen levels in the water and utilize nutrients that would otherwise be used by algae. A healthy 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 Grindle 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 15 species in the 2017 survey.
- ◆ During the 2017 aquatic plant survey of Grindle Lake, 77% of the sites had vegetative growth. The maximum depth of vegetation was 19 feet.
- ◆ The most frequently encountered plant species were nitella (40%), chara (35%), and dwarf water-milfoil (21%). All three species are native to Wisconsin.
- ◆ No invasive species were observed.

Grindle Lake Aquatic Plant Survey 2017:  
Rake Fullness



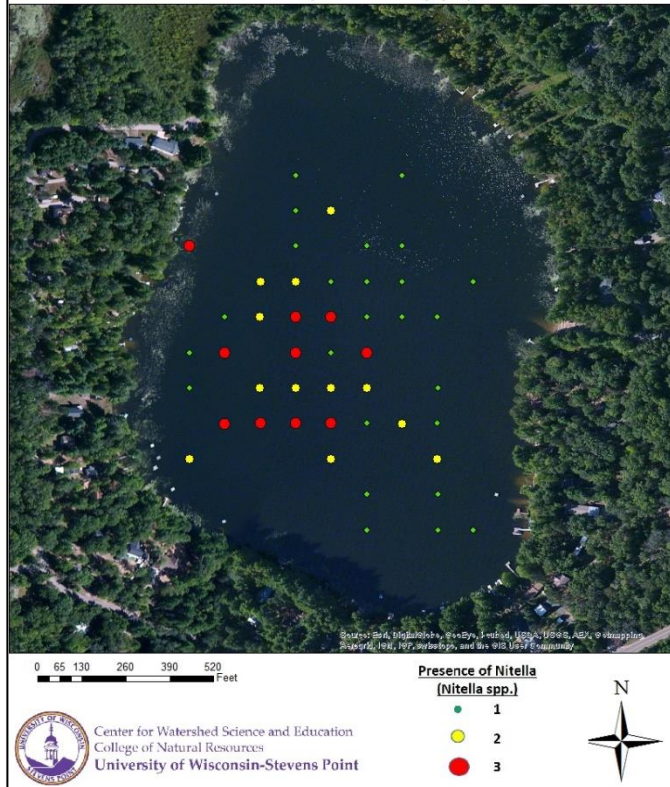
Grindle Lake Aquatic Plant Survey 2017:  
Total Number of Species





# Aquatic Plants

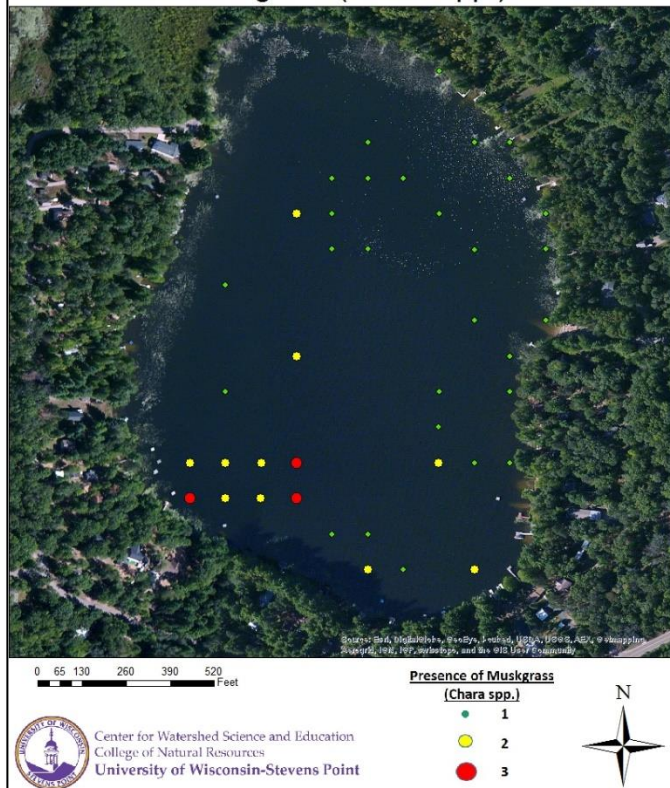
Grindle Lake Aquatic Plant Survey 2017:  
Nitella (Nitella spp.)



**Nitella** is a macroalgae that similarly grows along lake bottoms and can benefit a lake by filtering nutrients from water and preventing establishment of invasive species.



Grindle Lake Aquatic Plant Survey 2017:  
Muskgrass (*Chara* spp.)



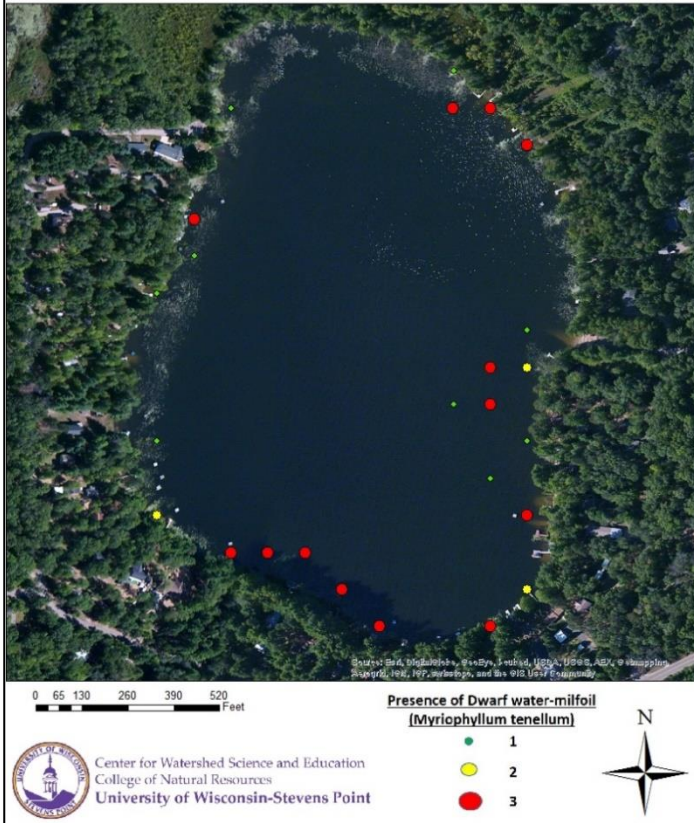
Like nitella, **Chara** is a type of macro algae that grows attached to muddy lake bottoms and has a musky odor. Muskgrass, as it is known, filters the lake water and is helpful in preventing the establishment of invasive species.





# Aquatic Plants

Grindle Lake Aquatic Plant Survey 2017:  
Dwarf water-milfoil (*Myriophyllum tenellum*)



**Dwarf water-milfoil** is a very sensitive species with little tolerance for disturbance and, thus, is an indicator of a high-quality, natural environment. It grows in dense clusters of thin, unbranched stems from rhizomes in sandy soil. The fruit is eaten by waterfowl that often rises above the water surface in shallow areas.



**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 2017 aquatic plant survey.
- ✓ Chinese mystery snail (2008) has been previously documented in Grindle Lake.



**Chinese mystery snails** 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.

# 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.*

**Primary Authors**

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## Acknowledgments

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

*Grindle Lake Area Landowners Association*

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*UW-Stevens Point Water and Environmental Analysis Lab*



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

