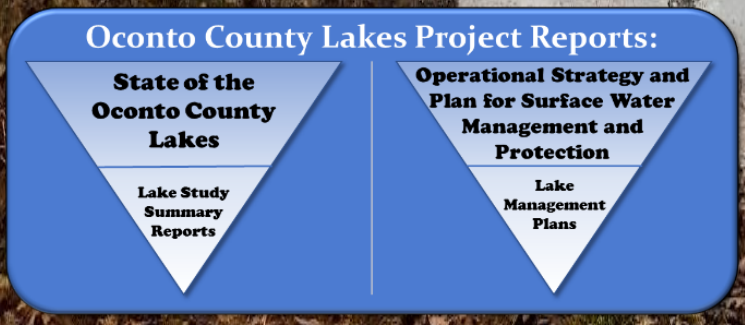
Oconto County Lakes Project

GREEN LAKE STUDY

SUMMARY REPORT

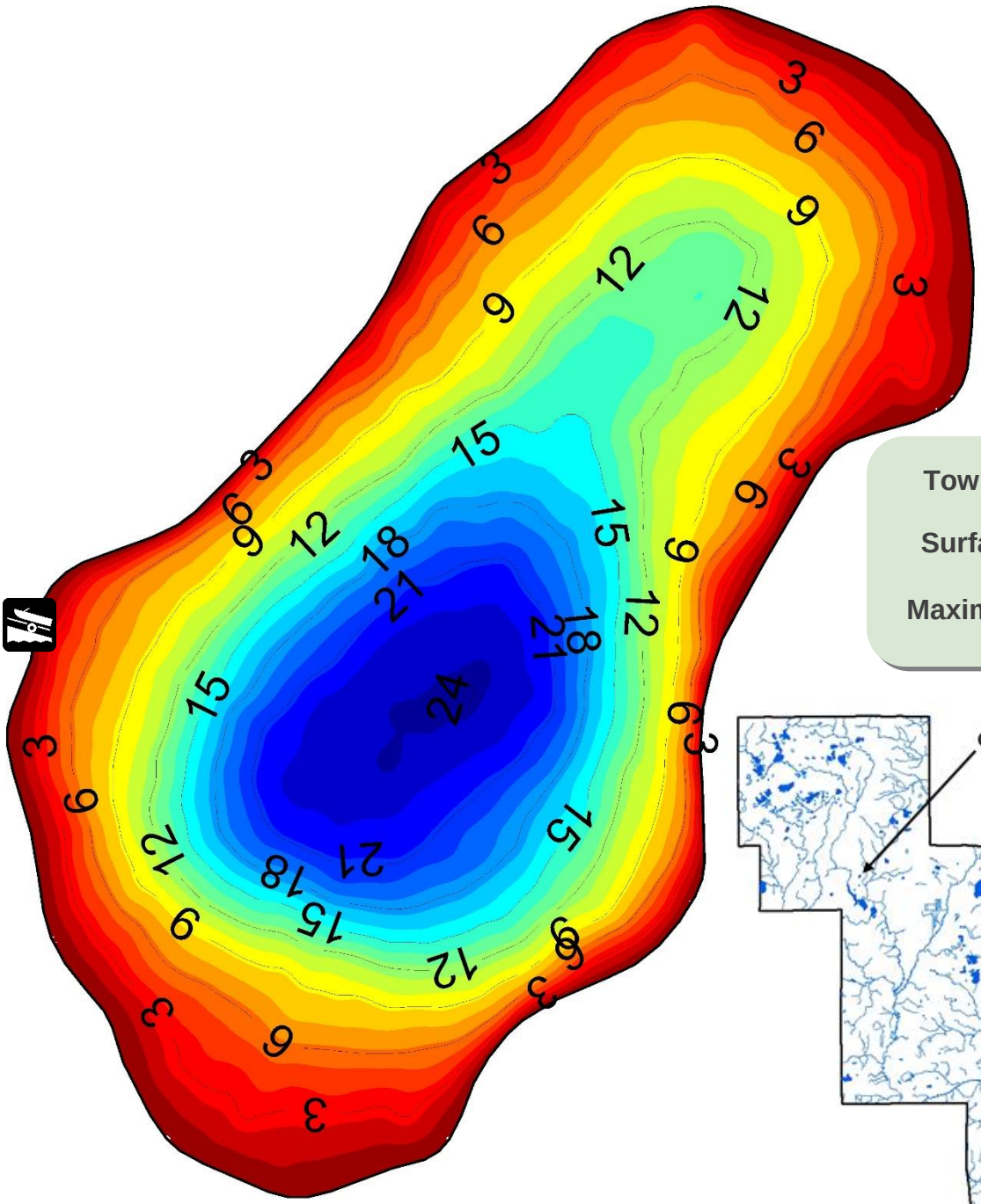
2020



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

Background

- Green Lake is a 21-acre seepage lake in northern Oconto County with a maximum depth of 25 feet.
- Most water enters Green Lake via groundwater with a retention time of around 6 months. 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 west side.
- This report summarizes data collected during the 2018-2019 lake study.

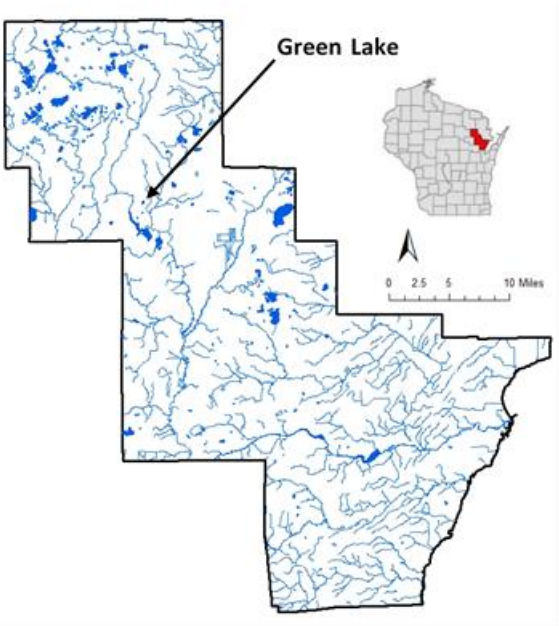


Map created by Brian Zaday, WDNR

Township of Mountain

Surface Area: 21 acres

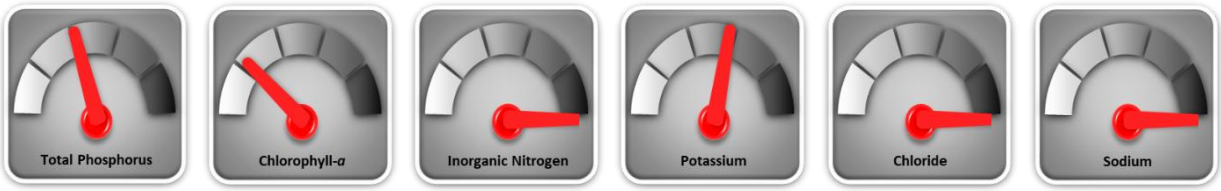
Maximum Depth: 25 feet

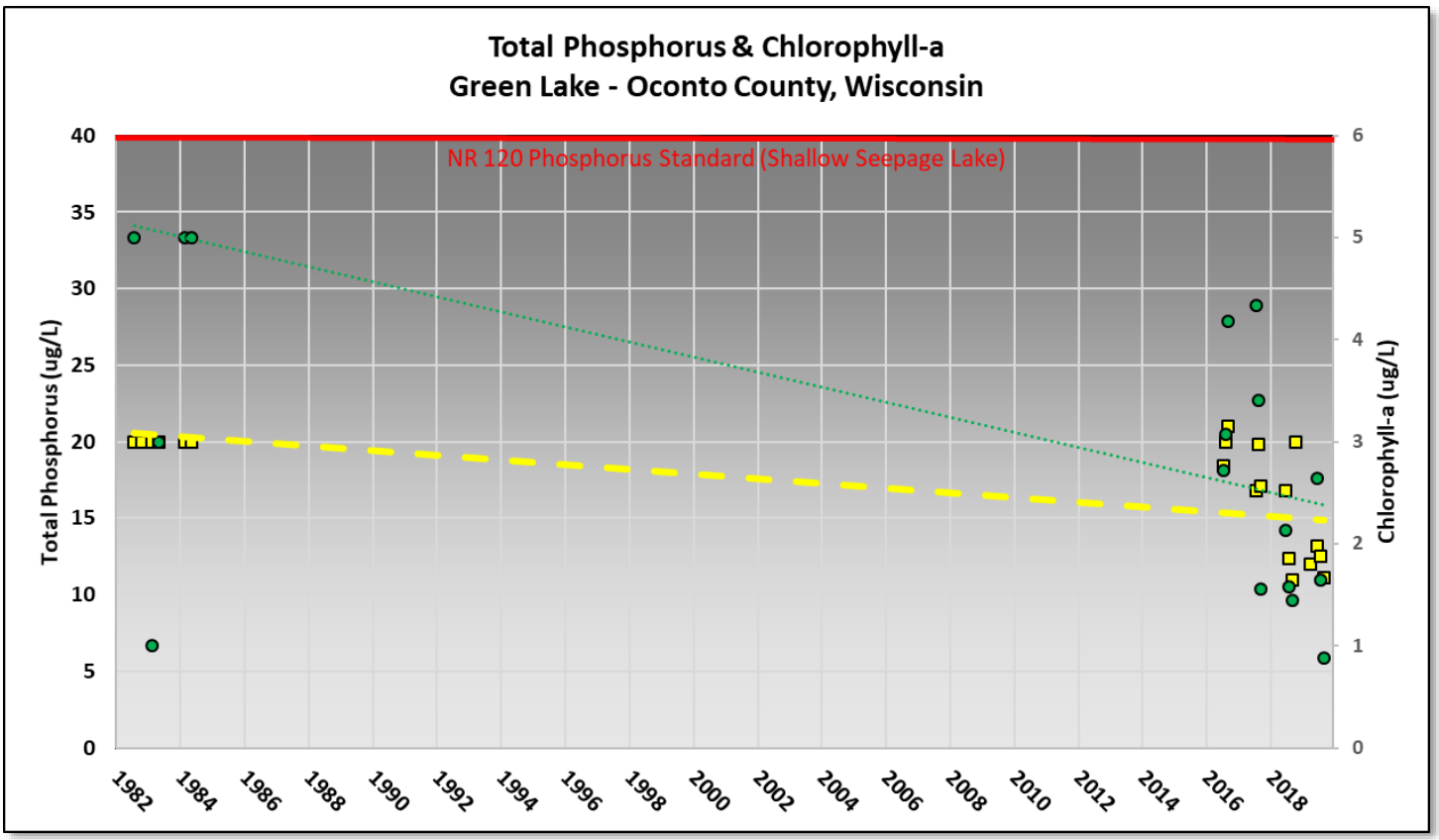


Water Quality

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.

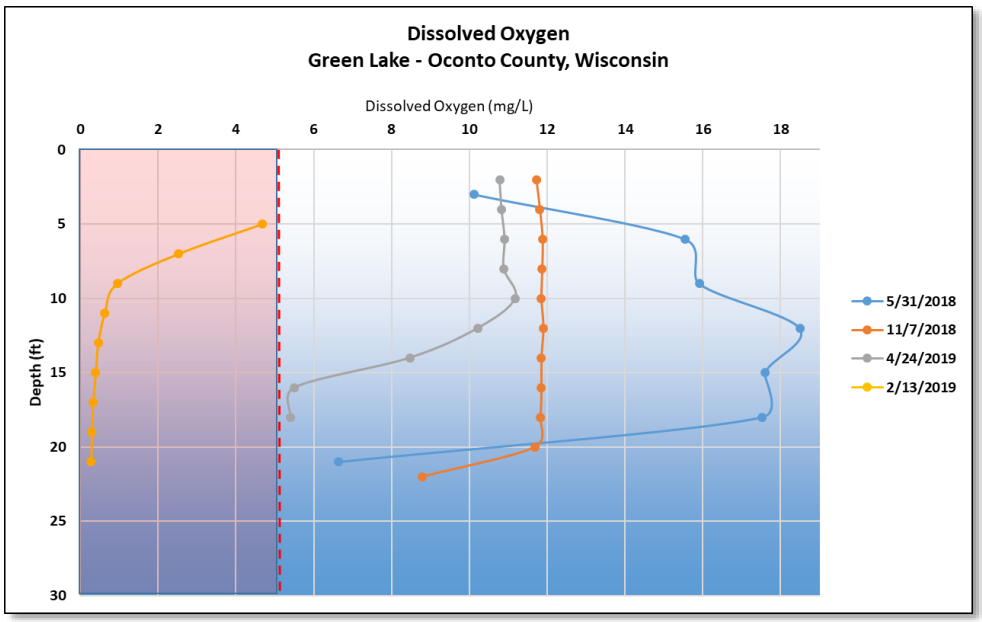
- Total Phosphorus was consistently **below** the Wisconsin state standard of 40 ug/L for shallow seepage lakes during the two-year study. The long-term trend (based on summer samples) suggests a slightly decreasing average concentration.
- Inorganic nitrogen remained below the threshold of 0.3 mg/L when algal blooms tend to increase.
- Chlorophyll-*a*, an indirect measure of algae, remained below the threshold of 6 ug/L when nuisance algae blooms become apparent and average concentrations appear to be decreasing over the long term.





Water Quality

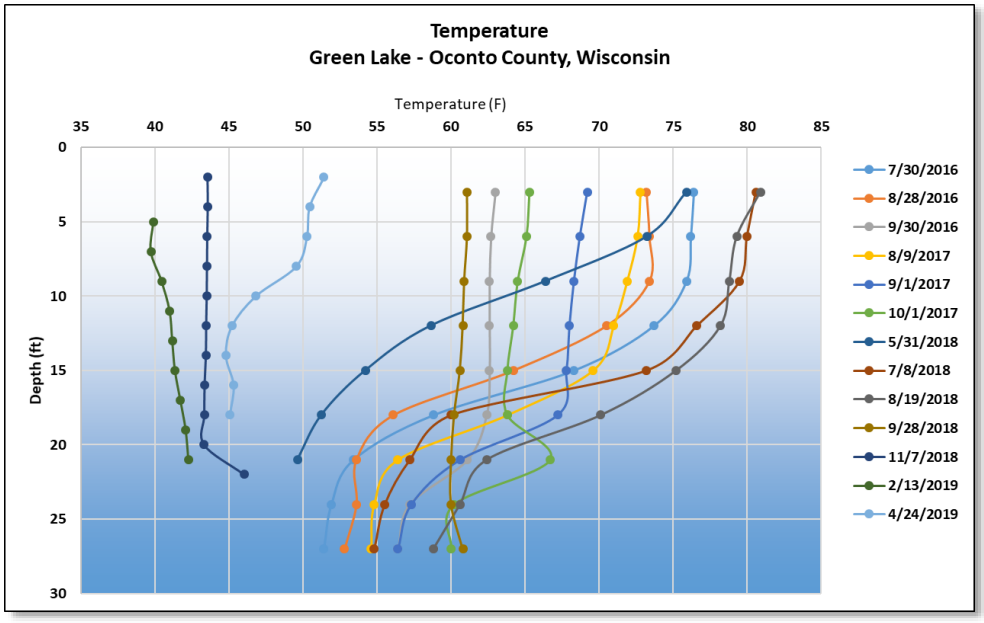
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature,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



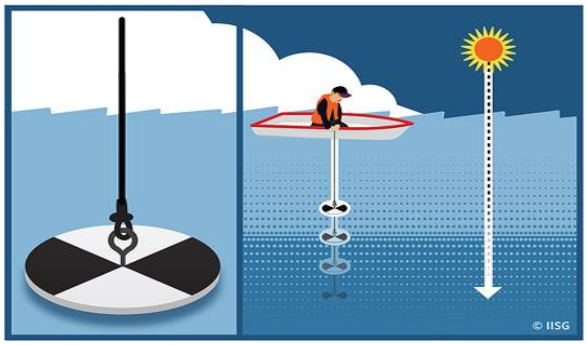
- Sufficient oxygen is available in the water column of Green Lake most of the year. The lowest concentrations were observed in late winter when only the top ~4 feet has enough oxygen to support most fish species.
- The late May profile, with elevated dissolved oxygen concentrations at depth (10-20 feet), is indicative of an algae bloom occurring.

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

- The temperature gradient in Green Lake exhibits a weak thermocline between 10 and 20 feet during the growing season that separates warmer oxygen-rich water at the top from colder oxygen-poor water below.

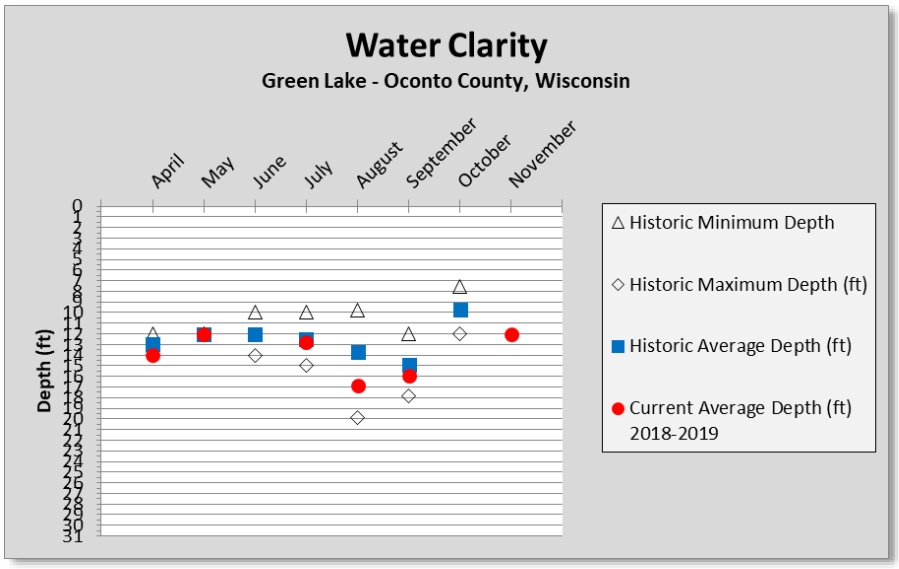


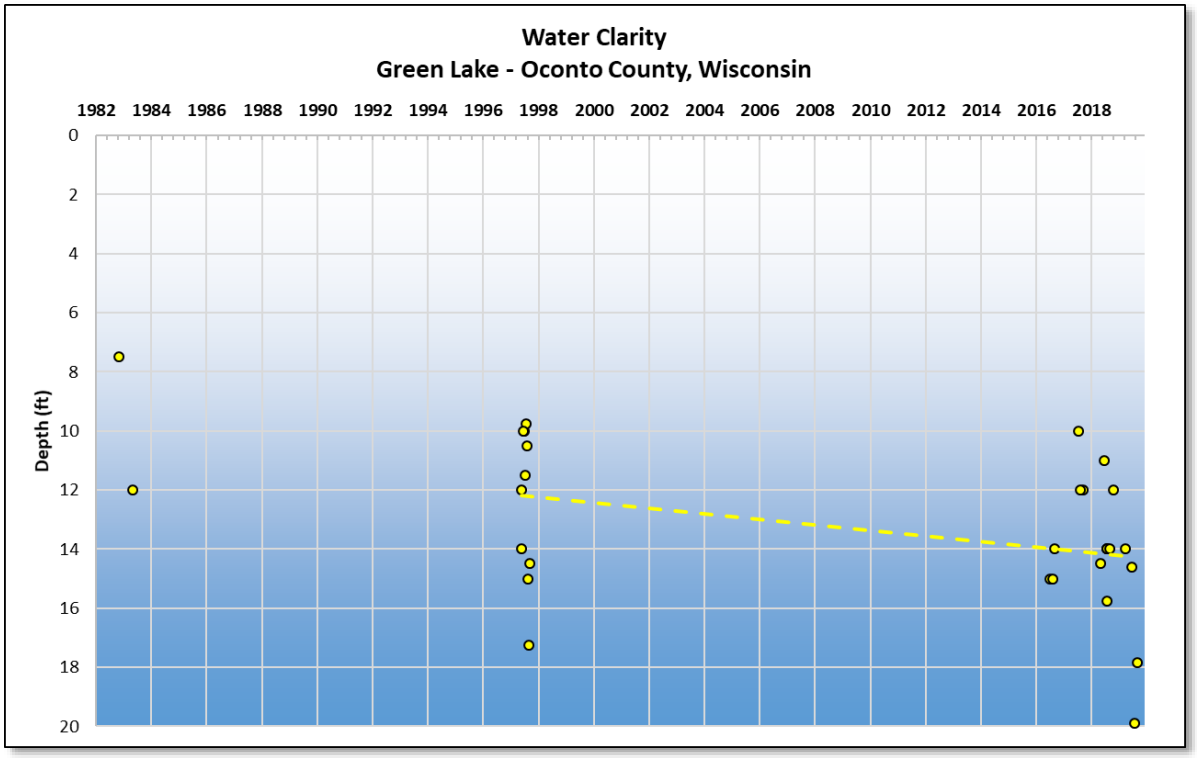
Water Quality



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 April and November.
- During 2018-19, on average, the poorest water clarity in Green Lake was in November and the best was in August. This is very consistent with previous observations and demonstrates a slightly increasing trend over the long term.





Water Quality

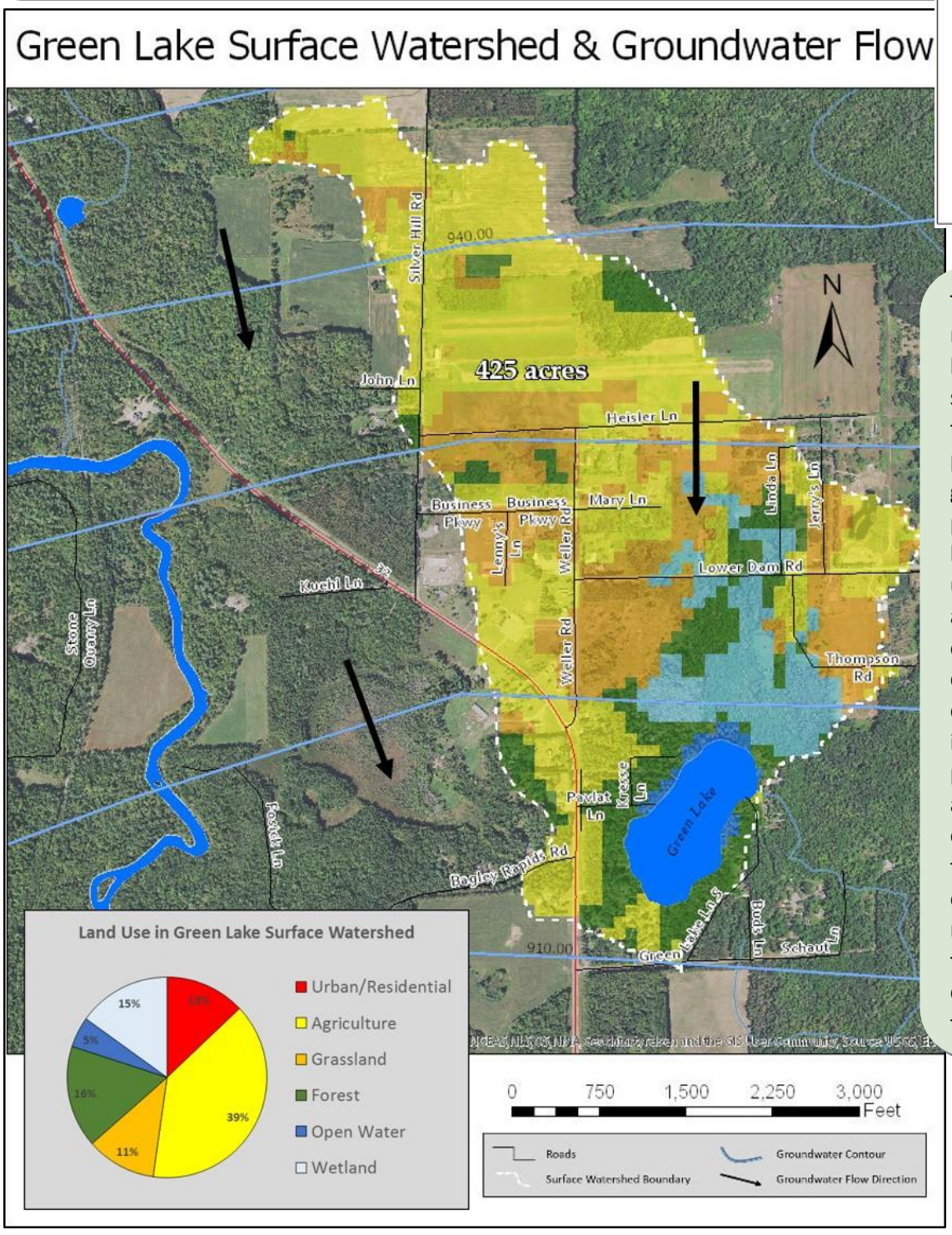
Other chemistry data was collected from lake water samples, such as basic cations, pollutants and acid rain input, and physical parameters. Results of such analyses can provide insights into a variety of other potential impacts to the lake. While concentrations of these compounds in lake water is usually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

- Concentrations of potassium (1.28 mg/L) were low, but chloride (35.8 mg/L) and sodium (19.44 mg/L) had elevated concentrations suggesting impact to the lake from septic systems, road salt, animal waste and/or fertilizers.
- DACT, a screening tool to determine if your lake is being impacted by pesticides, was not detected.
- Water in Green Lake is hard (145 mg/L CaCO3), 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.



WHEN IT RAINS IT DRAINS

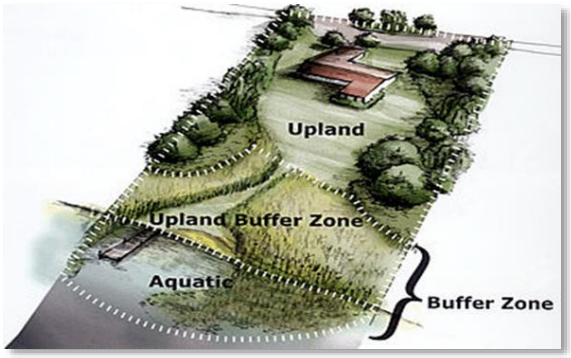
The quality of lake water reflects what is happening on the land surface. Precipitation falling on forests produces clean groundwater, whereas precipitation falling on land that has chemical use can produce runoff and groundwater that contains these chemicals. Groundwater contamination may include nitrogen, 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 Green Lake were surveyed in May 2018. Some of Green Lake's shoreland is healthy, but many stretches are in need of restoration.

Total lakefront footage	No. Riparian lots	Measured shoreland disturbance (feet)	Measured shoreland disturbance (%)
3,933	36	1,787	45%

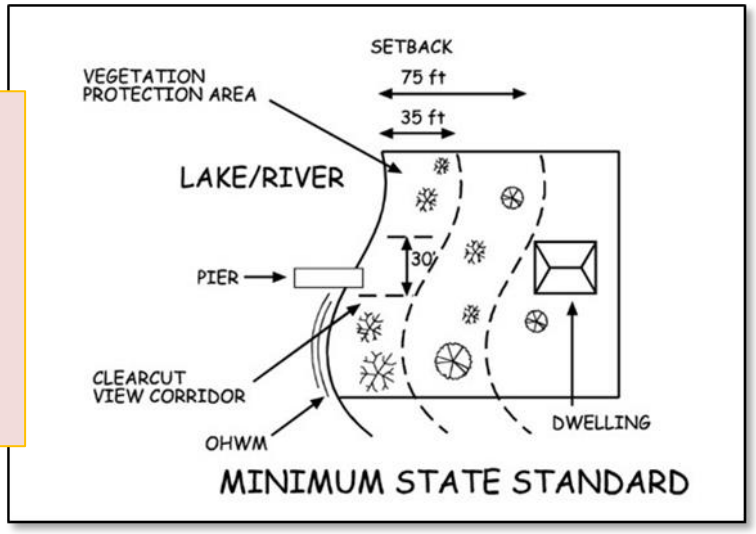


State Shoreland Zoning Ordinance

NR 115 Wisc. Adm. Code for Unincorporated Municipalities

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

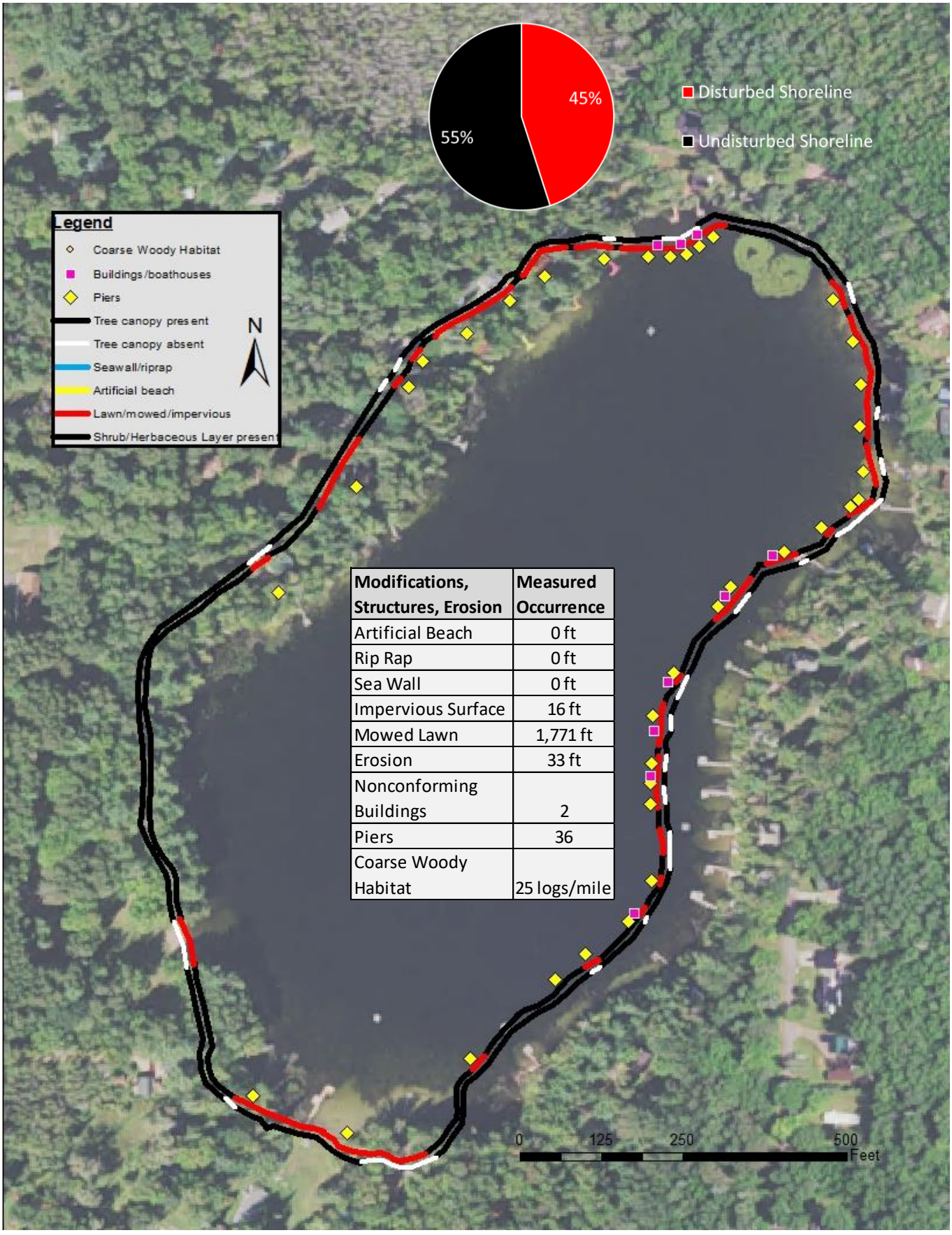
- Up to 30% of shoreline may be removed of shrubs and trees for a view corridor
- A mowed or constructed pedestrian path up to 5 feet wide to access lake



What Can You Do to Help Green 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

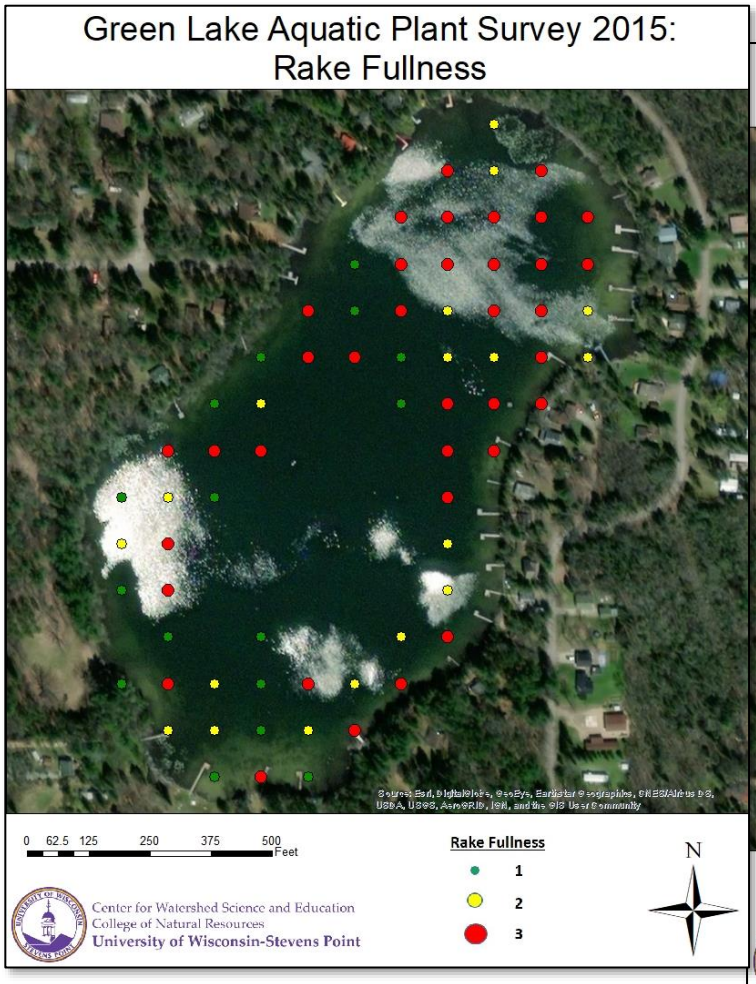


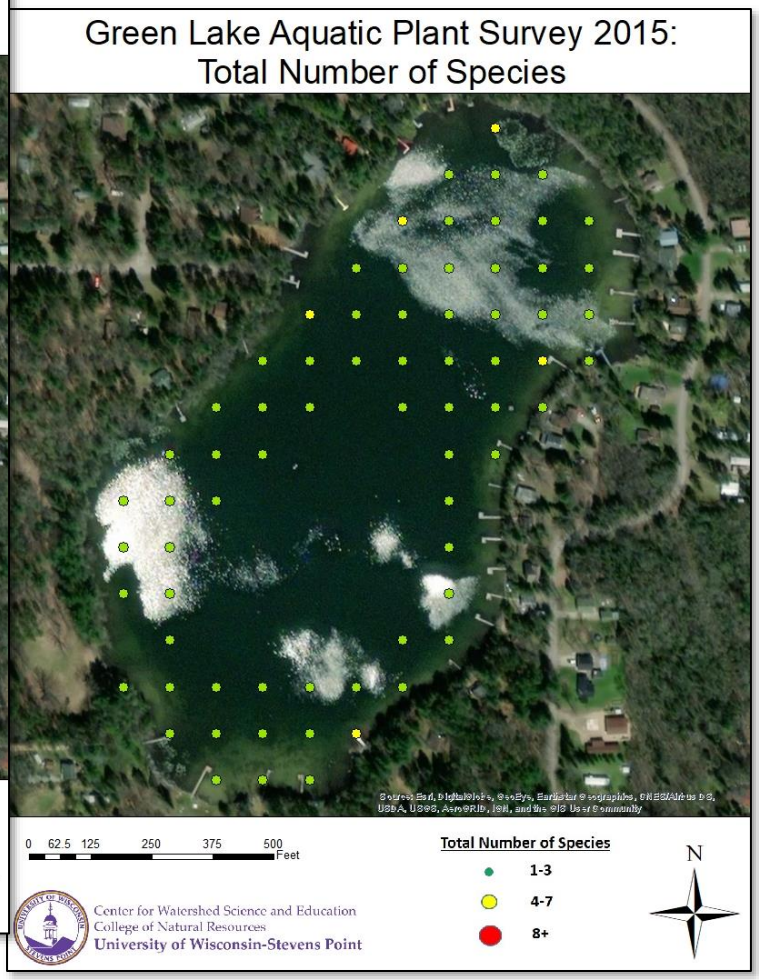
Modifications, Structures, Erosion	Measured Occurrence
Artificial Beach	0 ft
Rip Rap	0 ft
Sea Wall	0 ft
Impervious Surface	16 ft
Mowed Lawn	1,771 ft
Erosion	33 ft
Nonconforming Buildings	2
Piers	36
Coarse Woody Habitat	25 logs/mile

Aquatic Plants

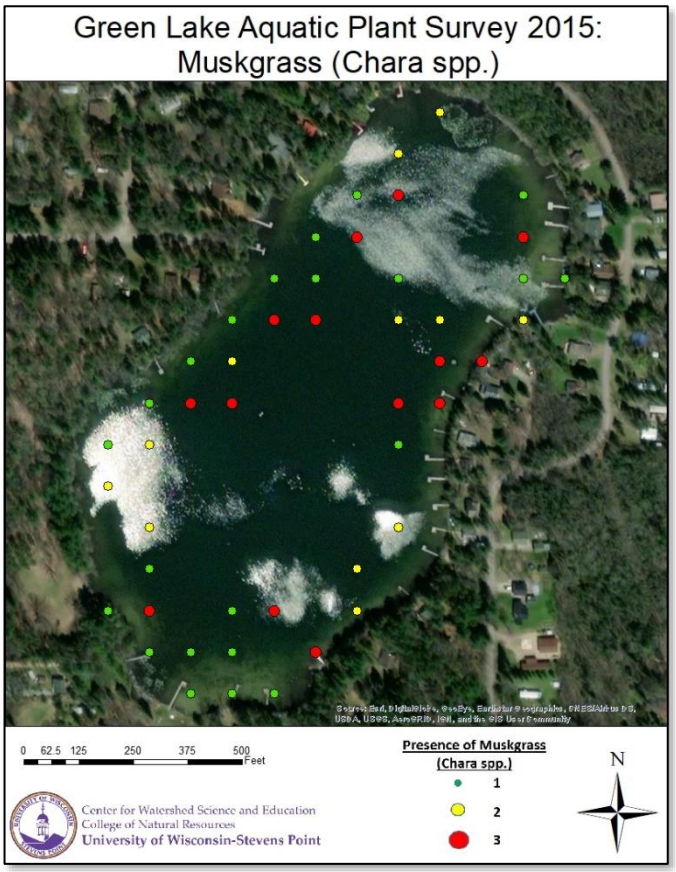
Aquatic plants are the forest landscape within a lake. They provide food and habitat for terrestrial and aquatic creatures such as fish, ducks, turtles, invertebrates and other animals. They increase oxygen levels in the water and utilize nutrients that would otherwise be used by algae. A healthy lake 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 Green 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 14 species in the 2015 survey.
- During the 2015 aquatic plant survey of Green Lake, 71% of the sites (88% of littoral area) had vegetative growth. The maximum depth of vegetation was 16 feet.
- The most frequently encountered plant species were chara (67%), wild celery (46%) and southern naiad (44%). All three species are native to Wisconsin.
- No invasive species were observed.

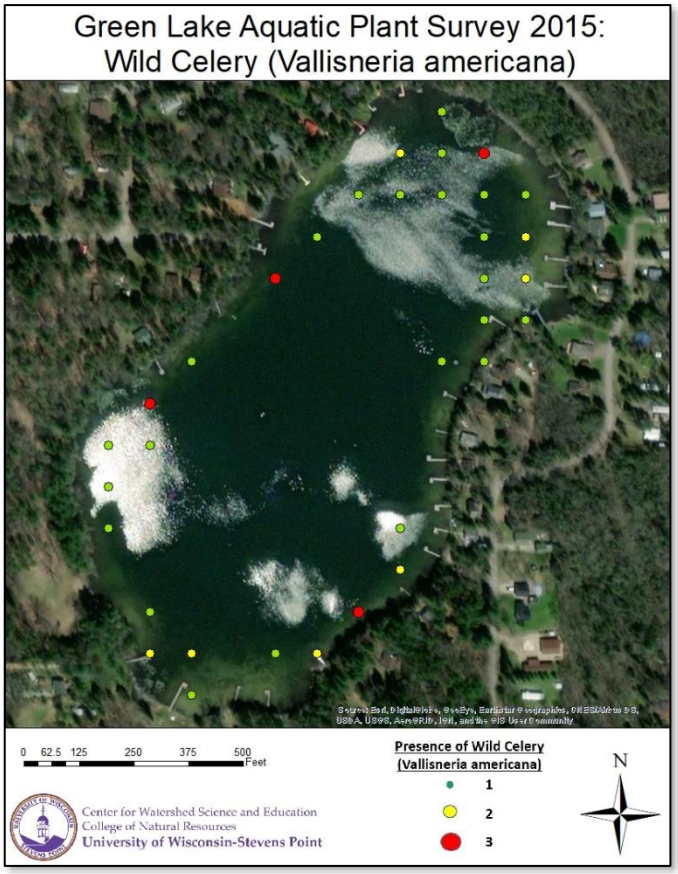




Aquatic Plants

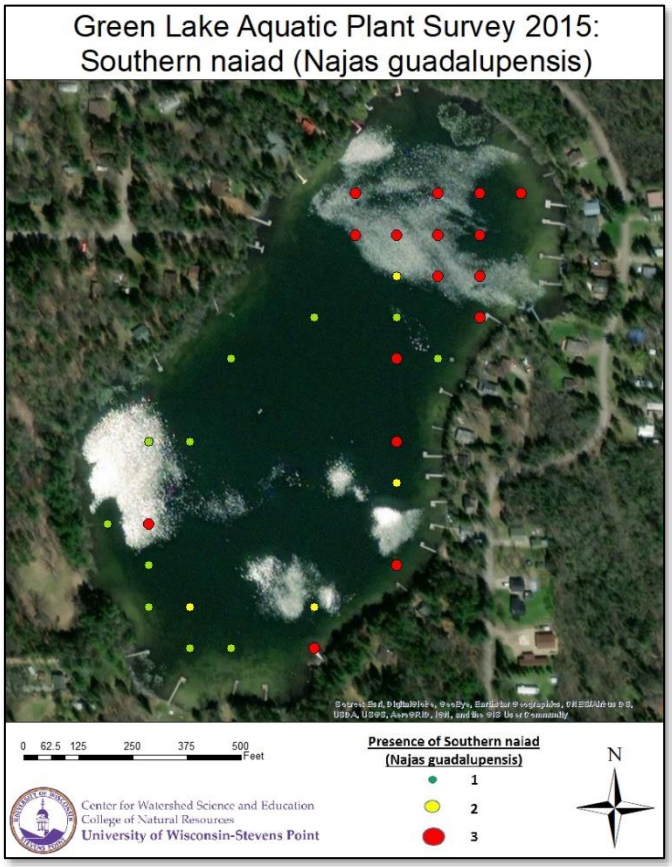


Chara is a type of macro algae that grows attached to muddy lake bottoms and has a musky odor. Muskgrass, as it is known, filters the lake water and is helpful in preventing the establishment of invasive species.



Wild celery has long, thin, ribbon-like leaves that are commonly up to four feet long. The seeds, roots and leaves are consumed by ducks and other waterfowl. Water celery provides excellent habitat for fish.

Aquatic Plants



Southern naiad, also called bushy pondweed, is a primary food source for ducks and provides habitat for many 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 2015 survey.
- ✓ Banded mystery snail (2016), Chinese mystery snail (2016) have been documented in Green Lake.

Banded mystery snails compete with native snails for food and habitat, can serve as a host for parasites and may invade largemouth bass nests.

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.

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