

Oconto County Lakes Project

BEAR LAKE STUDY

SUMMARY REPORT

2018

*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**

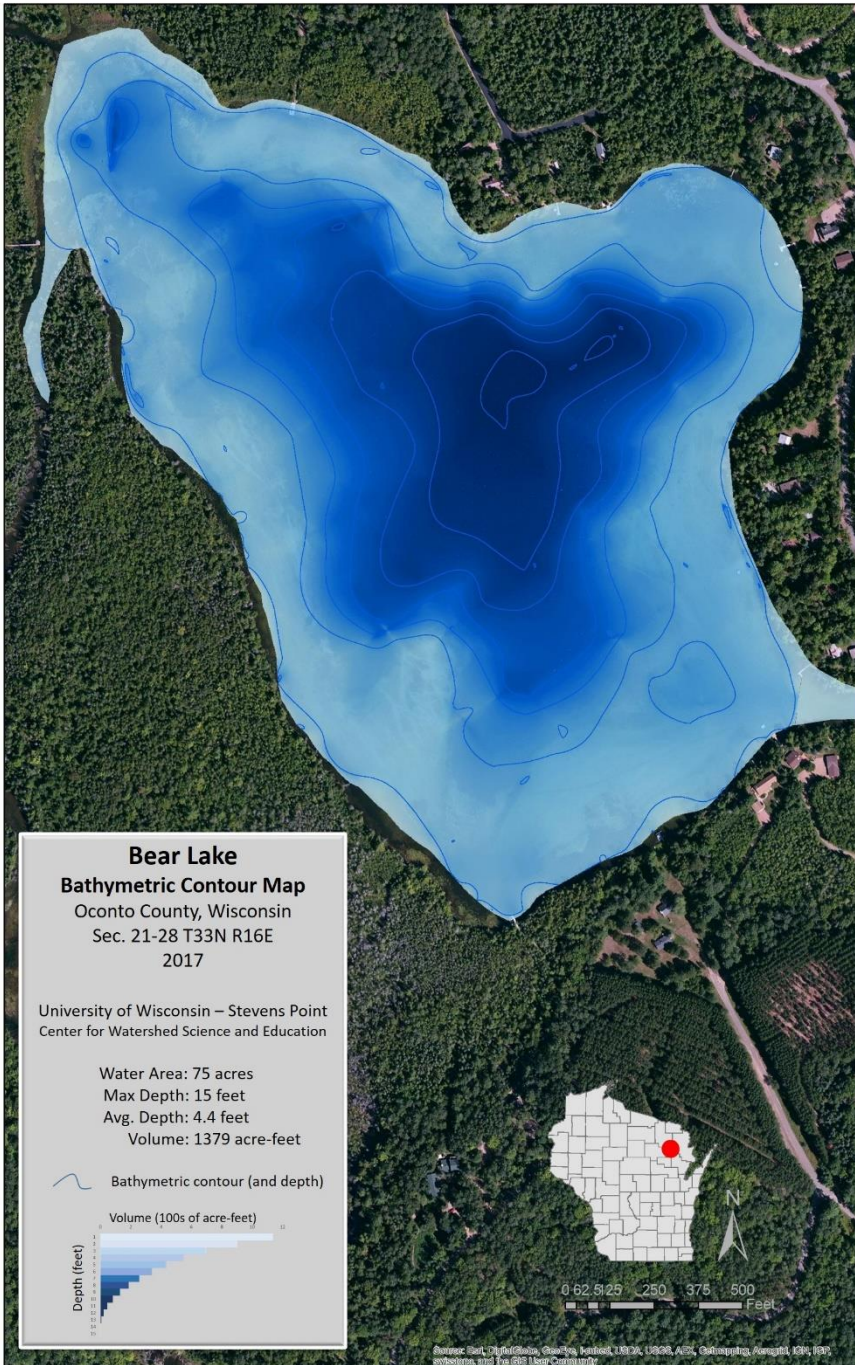
Lake
Management
Plans



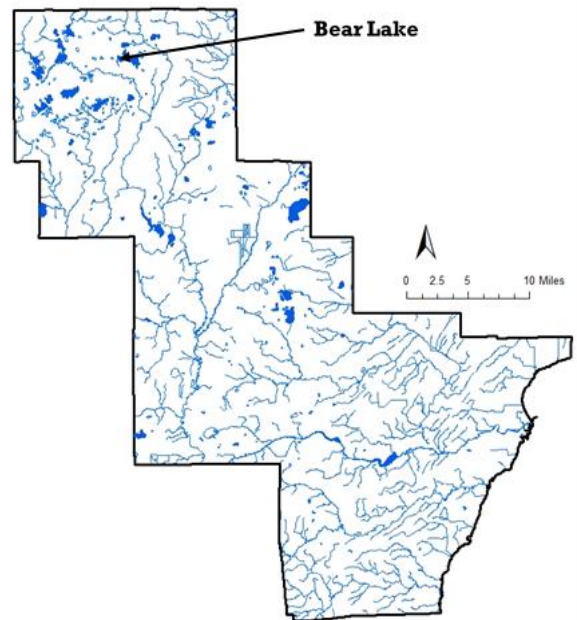
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Background

- ◆ Bear Lake is a 75-acre drainage lake in northern Oconto County with a maximum depth of 20 feet.
- ◆ Water enters Bear Lake from a tributary (and groundwater) on the northwest side of the lake and leaves via Munger Lake on the southeast side. Surface water runoff and direct precipitation also contribute water to the lake.
- ◆ Visitors have access to the lake from one public boat landing located on Munger Lake.
- ◆ This report summarizes data collected during the 2016-2017 lake study.



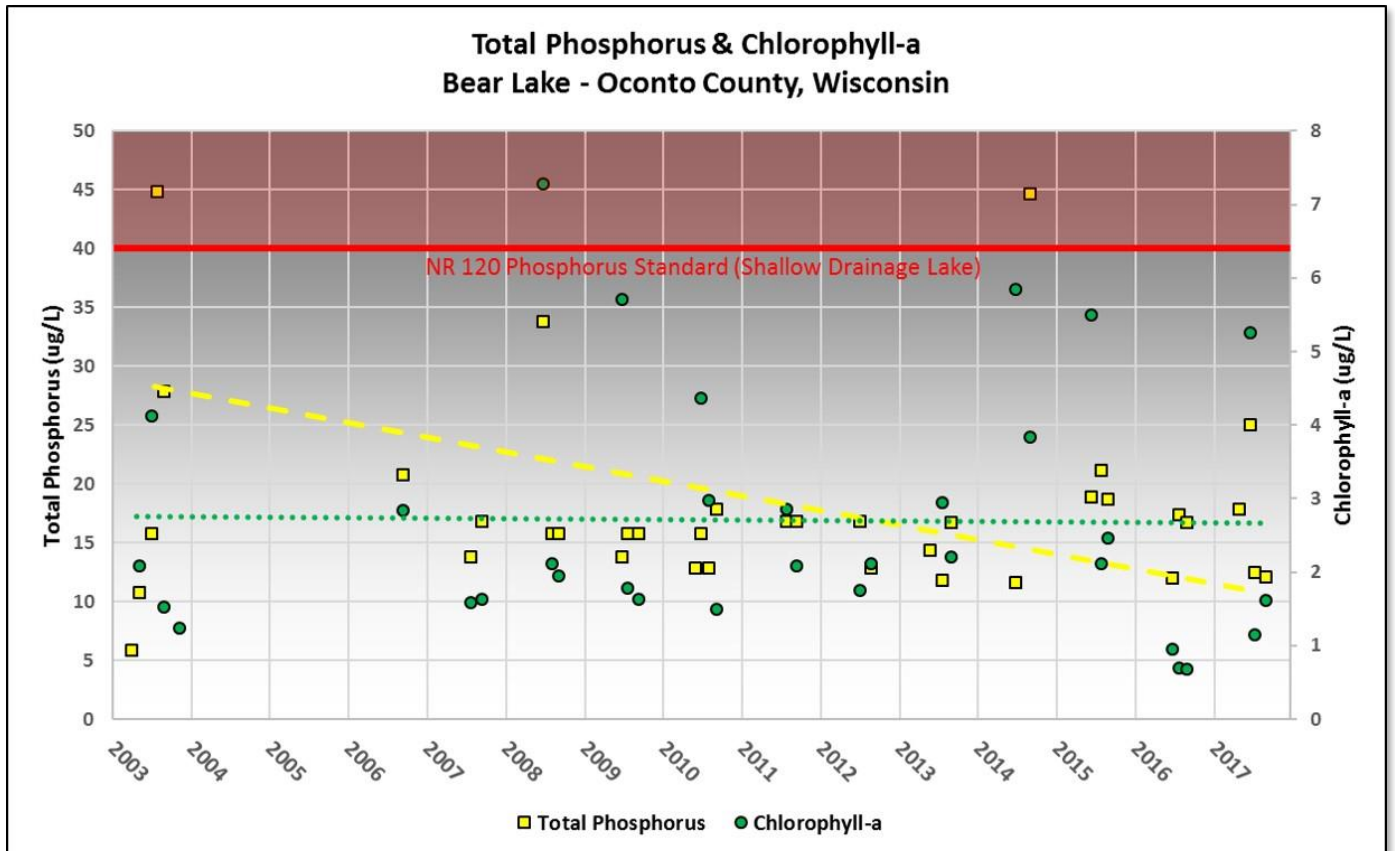
Township of Lakewood
Surface Area: 75 acres
Maximum Depth: 20 feet



Water Quality

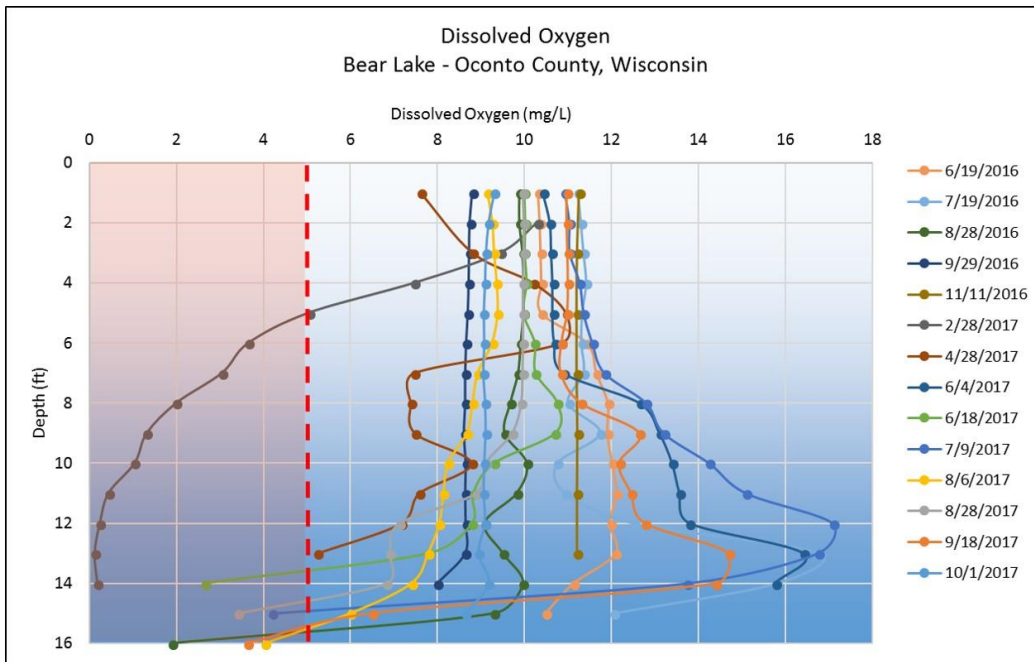
Nutrients such as phosphorus and nitrogen are what feed aquatic plants and algae in a lake. Excessive amounts of nutrients delivered to a lake will result in abundant plant and algae growth. Disturbance within a watershed combined with the landscape's inability to infiltrate and filter runoff is what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

- ◆ Total phosphorus was consistently below the Wisconsin State phosphorus standard of 40 ug/L for shallow drainage lakes during the two-year study. The 14-year trend is decreasing (based on July data).
- ◆ Inorganic nitrogen was very low (0.03 mg/L), well below the threshold of 0.3 mg/L when algal blooms increase.
- ◆ Chlorophyll-a, an indirect measure of algae, remained consistently below the threshold of 6 ug/L and appears stable over the long term.



Water Quality

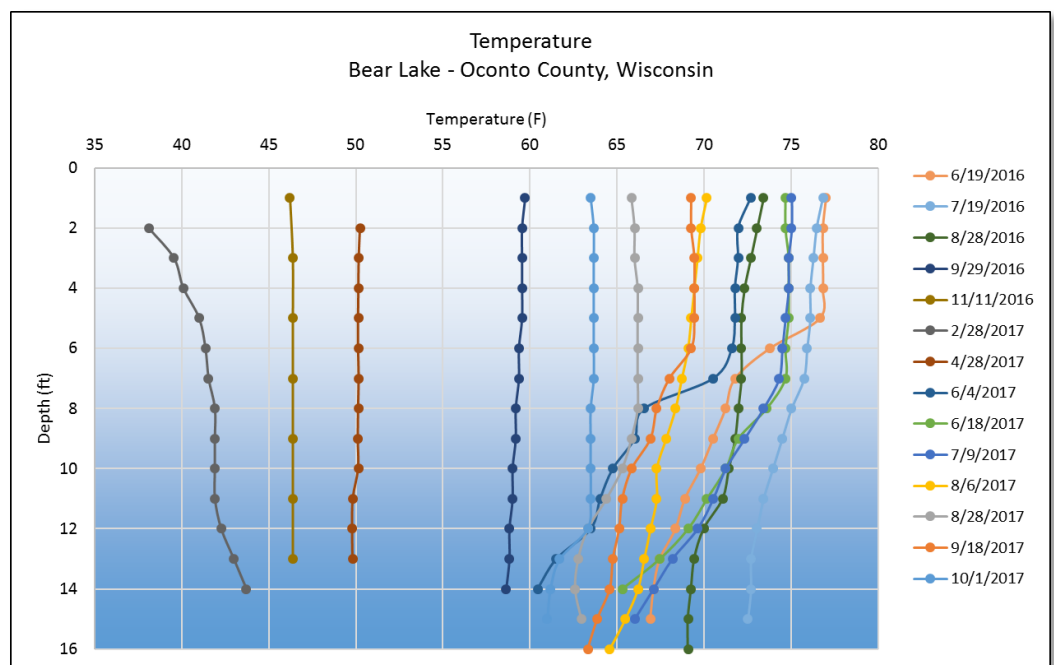
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature,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



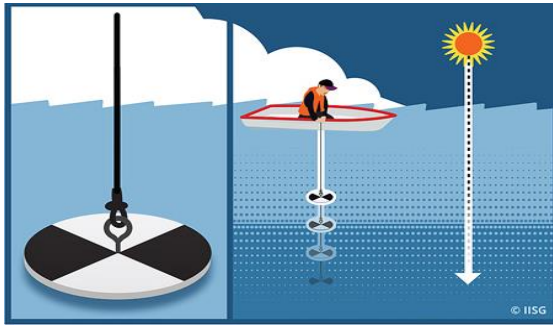
- During most of the year, sufficient oxygen is available in Bear Lake throughout the water column. Oxygen is depleted during the winter while the lake is ice covered, with only the upper 5 feet having enough to support fish.
- Bumps in dissolved oxygen concentrations at 5-10 feet suggest mild algal activity.

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

- The temperature gradient in Bear Lake is relatively uniform most of the year, typical of a shallow, mixed lake.

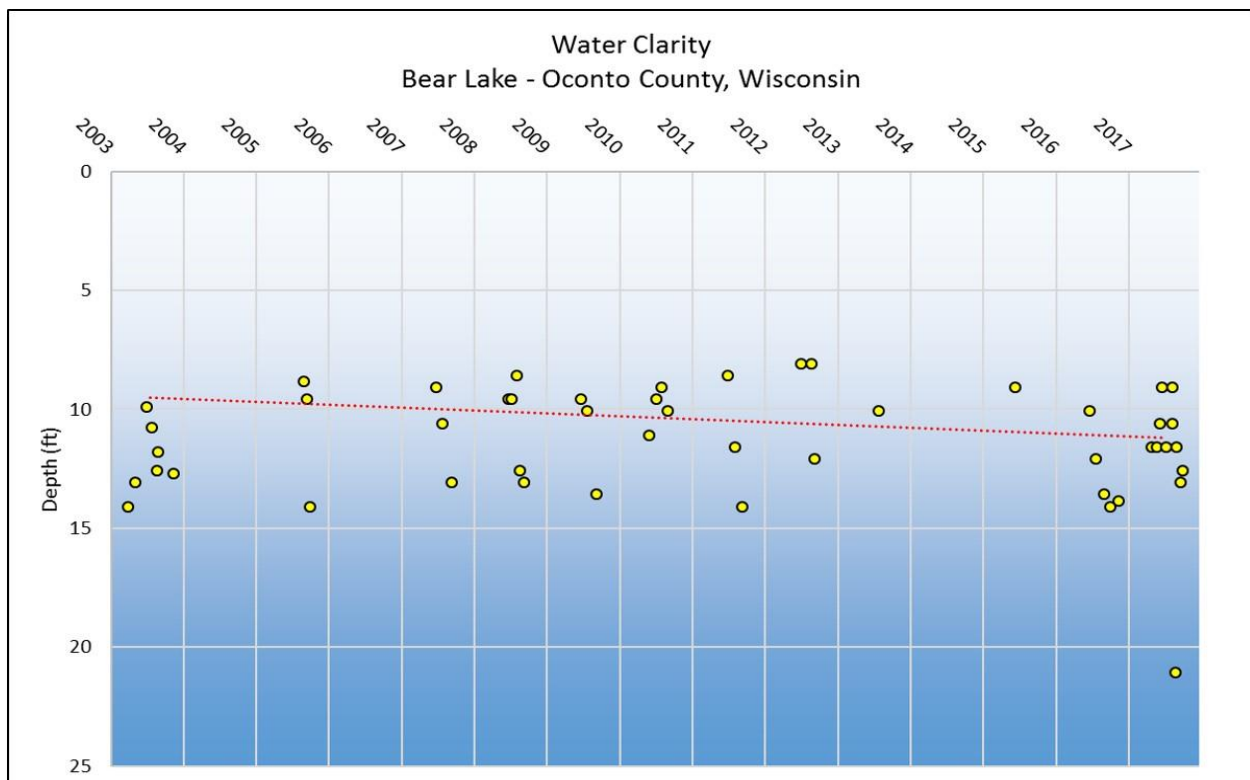
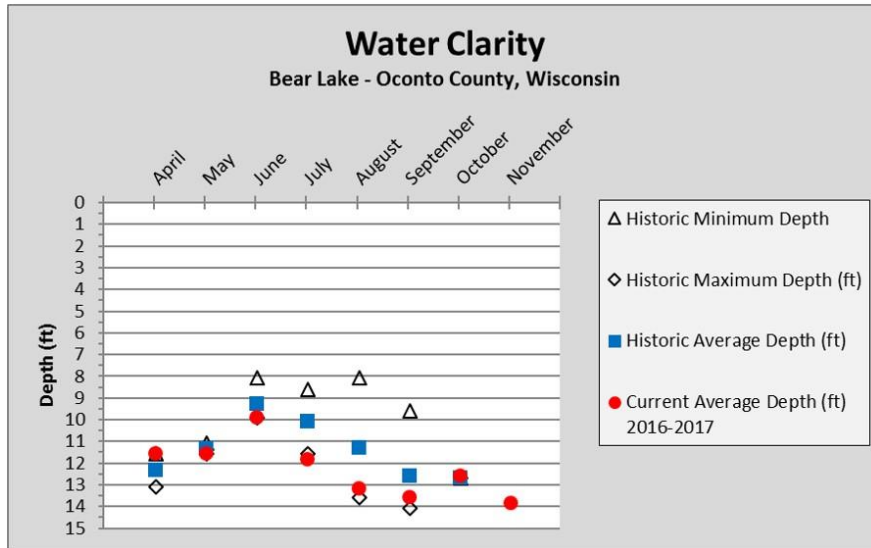


Water Quality



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.

- During 2016-17, on average, the poorest water clarity in Bear Lake was in June and the best was in September. This is consistent with previous observations and demonstrates a slightly increasing trend over the past 14 years (based on July data).



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 (1.6 mg/L), chloride (4.6 mg/L) and sodium (3.1 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 Bear Lake is hard (142 mg/L CaCO₃), having a high level of dissolved minerals. Hard water lakes tend to produce more fish and aquatic plants than soft water lakes and have clearer water as the minerals tend to bind with phosphorus making it unavailable to algae blooms.

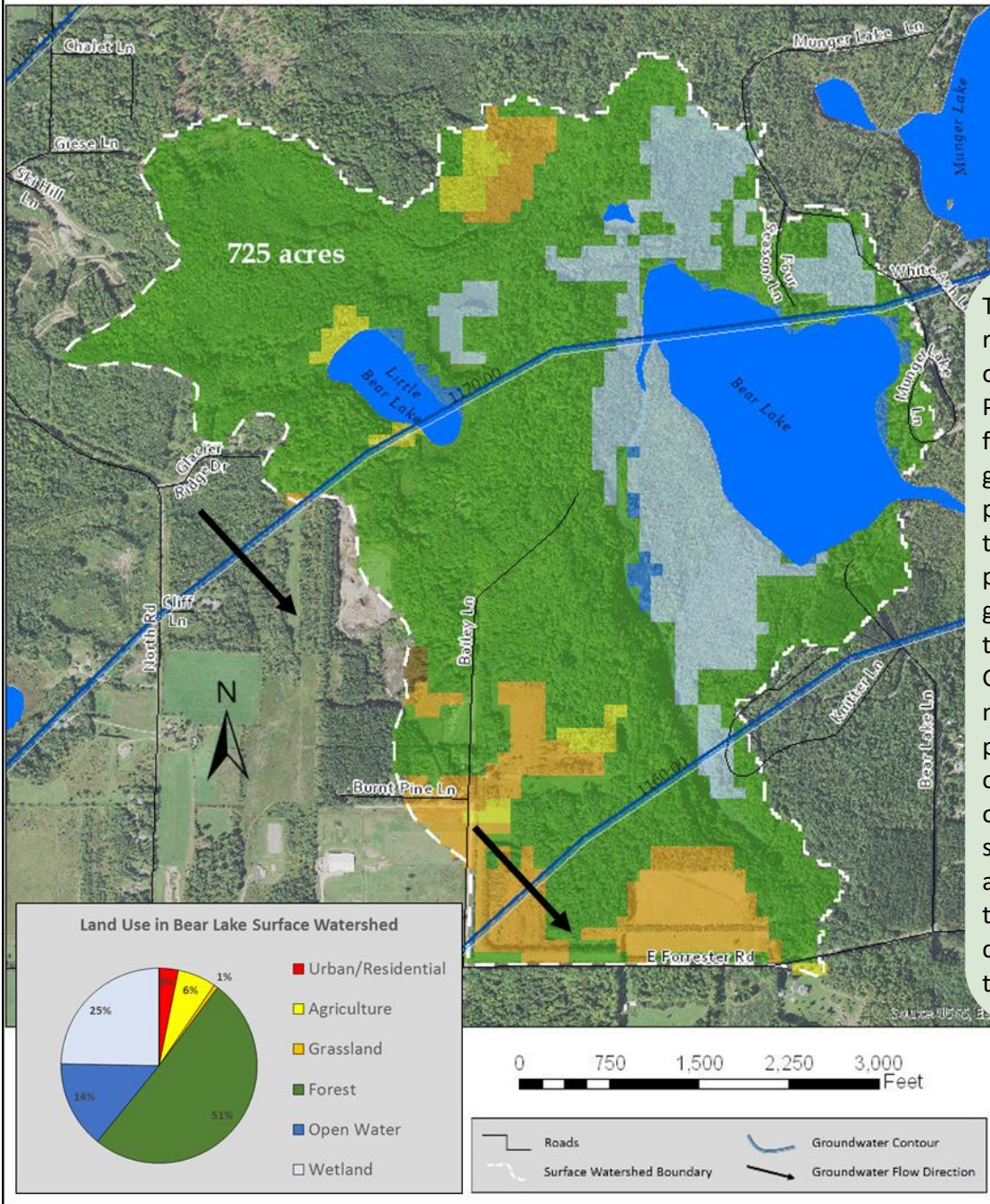


For more information on how to interpret your lake's water quality data, please refer to the "State of the Oconto County Lakes Report" that is on file with Oconto County.

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.



Bear 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 Bear Lake were surveyed in July 2017. Much of Bear Lake's shoreland is healthy, but some stretches are in need of restoration.

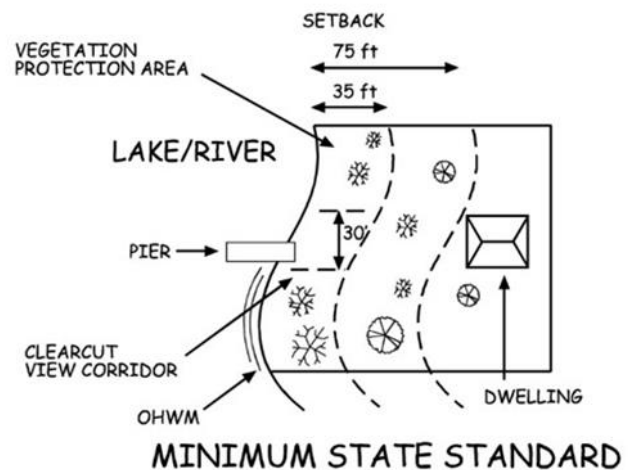
Total lakefront footage	No. Riparian lots	Measured shoreland disturbance (feet)	Measured shoreland disturbance (%)
7,786	30	1,141	15%



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:

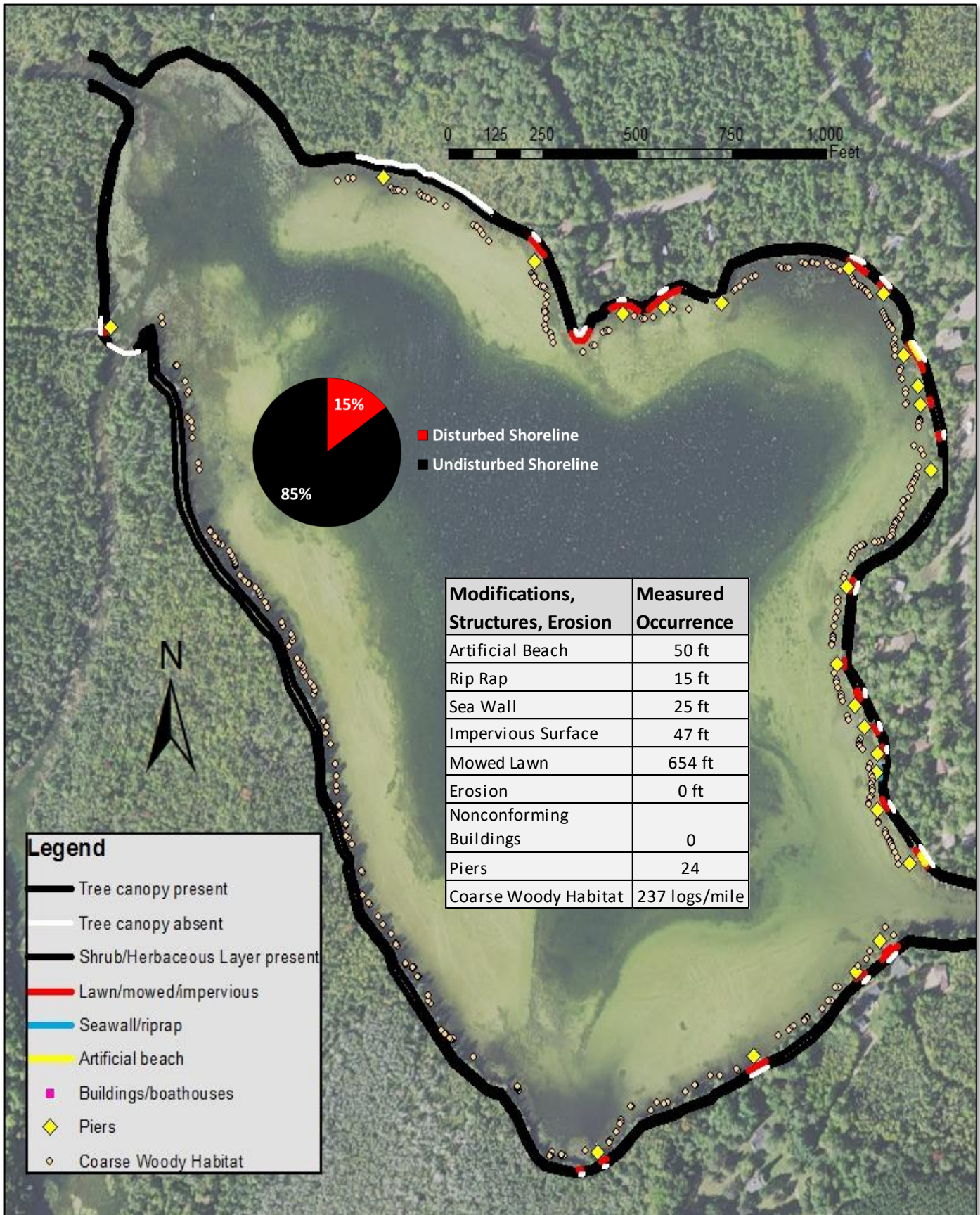
- Up to 30% of shoreline may be removed of shrubs and trees for a view corridor
- A mowed or constructed pedestrian path up to 5 feet wide to access lake



What Can You Do To Help Bear 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 Bear Lake is characterized by high quality vegetation with a Floristic Quality Index of 23.5, which is above the regional average. There were a total of 18 species found in the 2017 survey.
- During the 2017 aquatic plant survey of Bear Lake, 88% of the sites had vegetative growth. The maximum depth of vegetation was 15.5 feet.
- The most frequently encountered plant species were chara (92%), wild celery (15%), northern water-milfoil (14%) and Illinois pondweed (14%). All four species are native to Wisconsin.

Bear Lake Aquatic Plant Survey 2017:
Rake Fullness



0 125 250 500 750 1,000 Feet

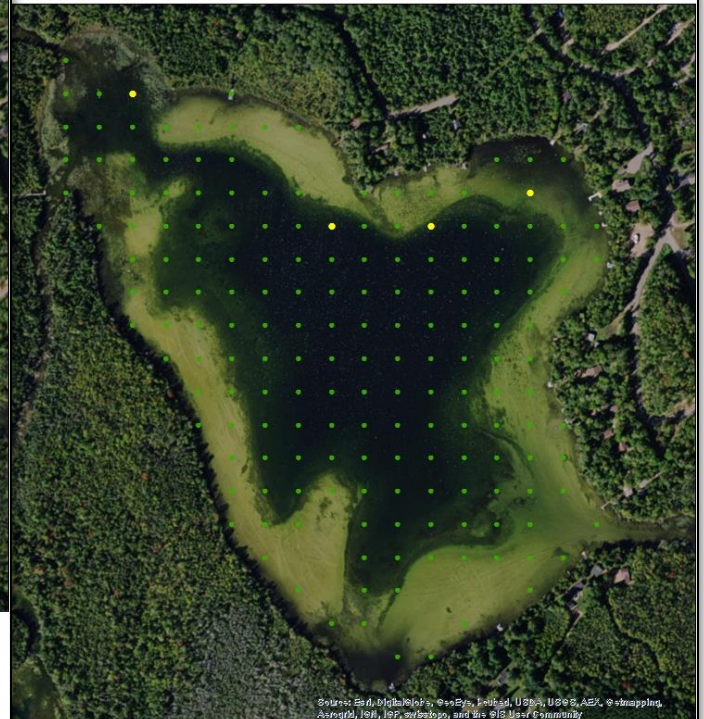
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Rake Fullness

● 1
● 2
● 3



Bear Lake Aquatic Plant Survey 2017:
Total Number of Species



250 500 750 1,000 Feet

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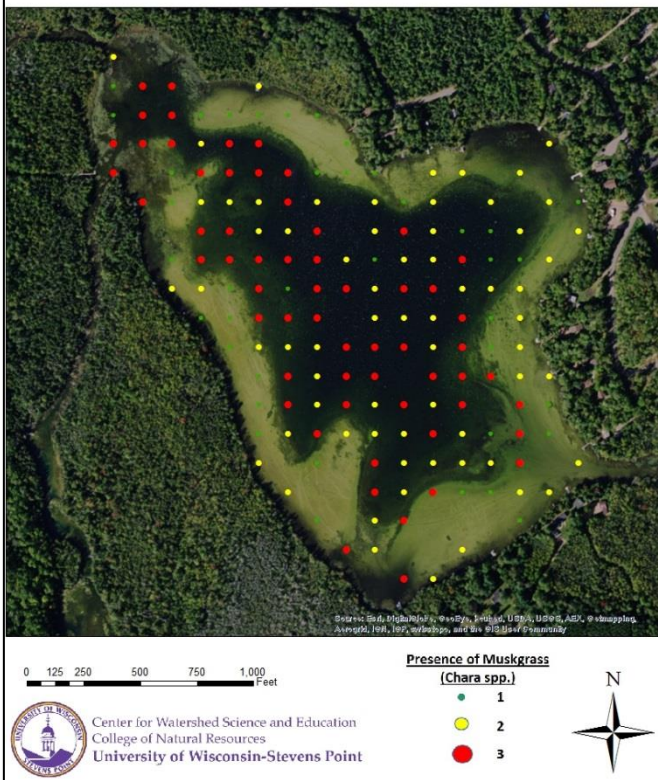
Total Number of Species

● 1-3
● 4-7
● 8+



Aquatic Plants

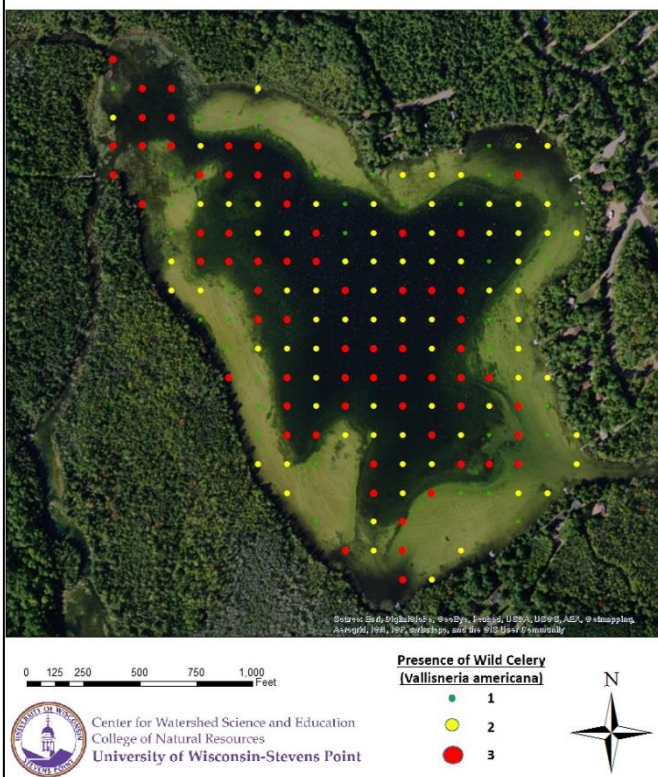
Bear Lake Aquatic Plant Survey 2017:
Muskgrass (*Chara* spp.)



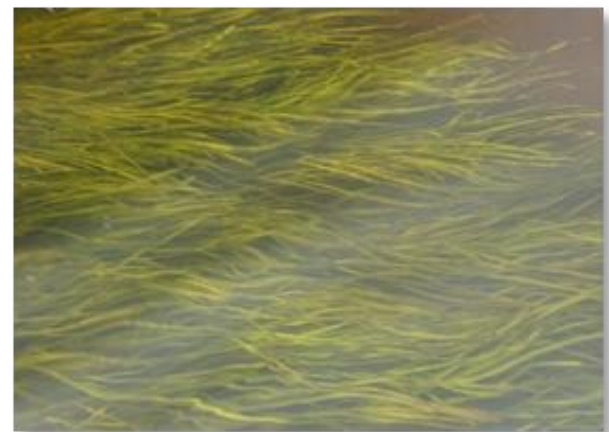
Chara is a type of macro algae that grows attached to muddy lake bottoms and has a musky odor. Muskgrass, as it is known, filters the lake water and is helpful in preventing the establishment of invasive species.



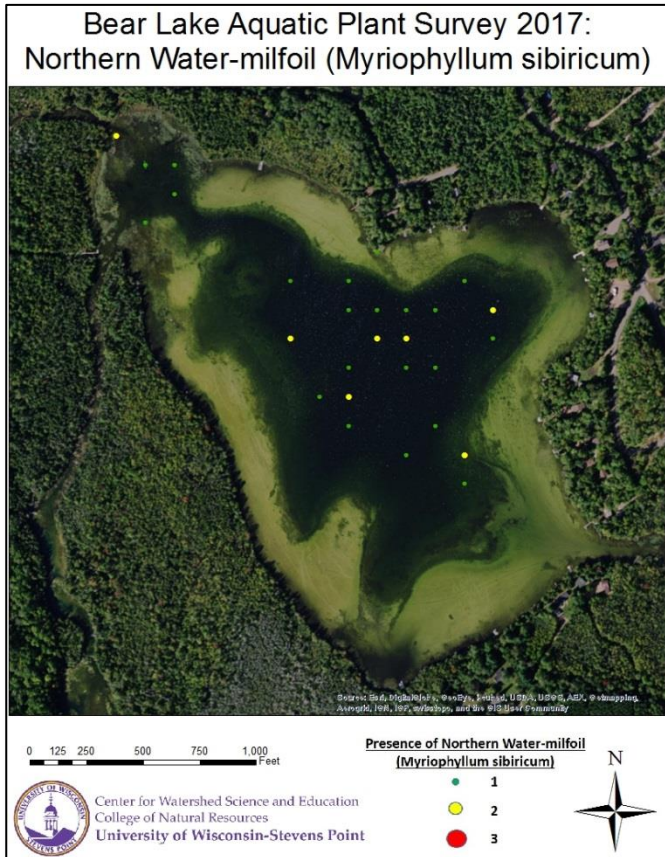
Bear Lake Aquatic Plant Survey 2017:
Wild Celery (*Vallisneria americana*)



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



Northern water-milfoil is important forage and cover for aquatic animals, and an important food source for waterfowl.



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 lake ecosystem.

- ◆ No invasive species were observed during the 2017 aquatic plant survey.
- ◆ Banded mystery snail has previously been documented in Bear Lake.

Banded mystery snail, native to the southeast United States, can compete with native snails for food and habitat, serve as a host for parasites, and are known to invade largemouth bass nests.



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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