

Oconto County Lakes Project

BOOT 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**

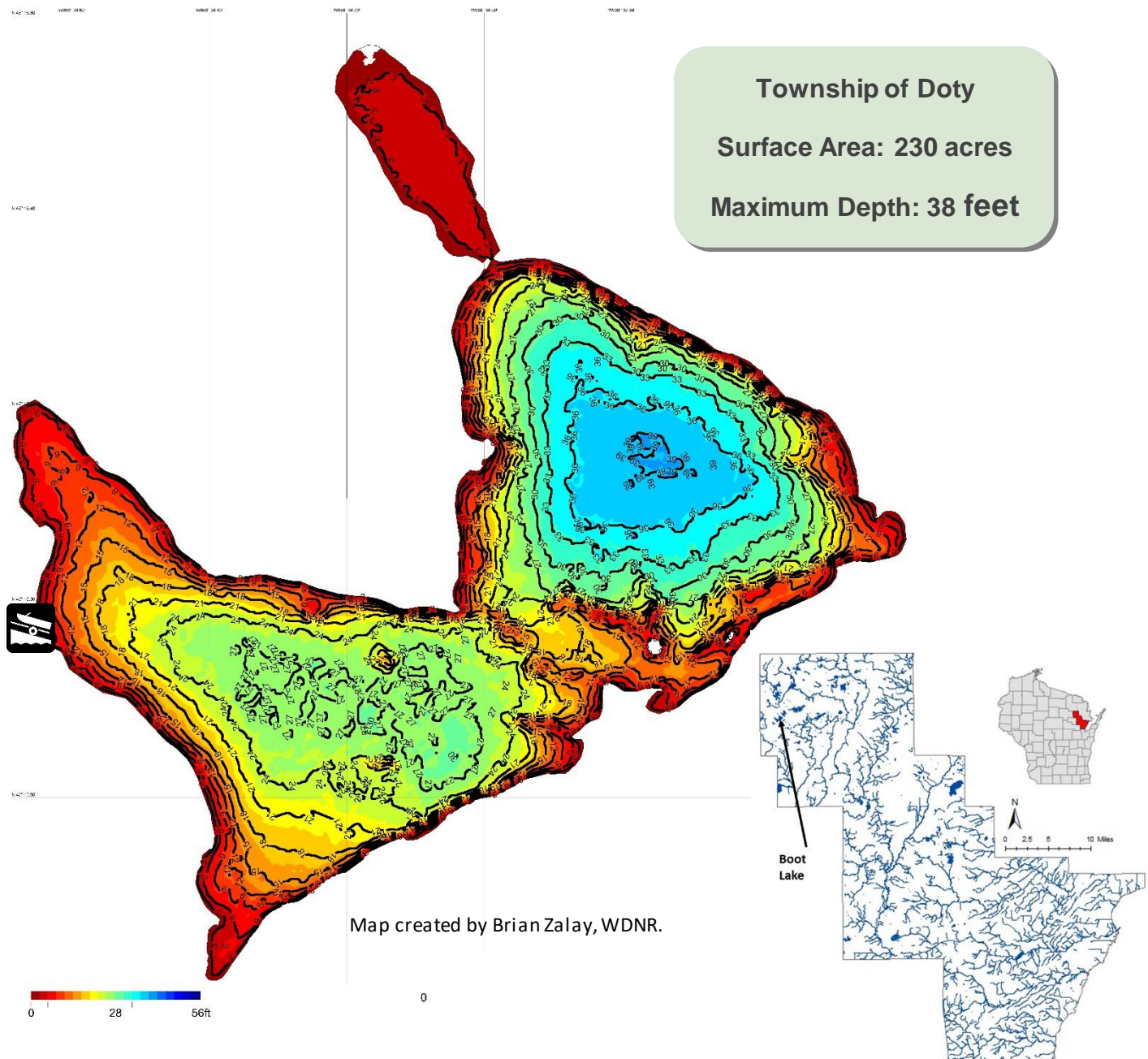
Lake
Management
Plans



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

Background

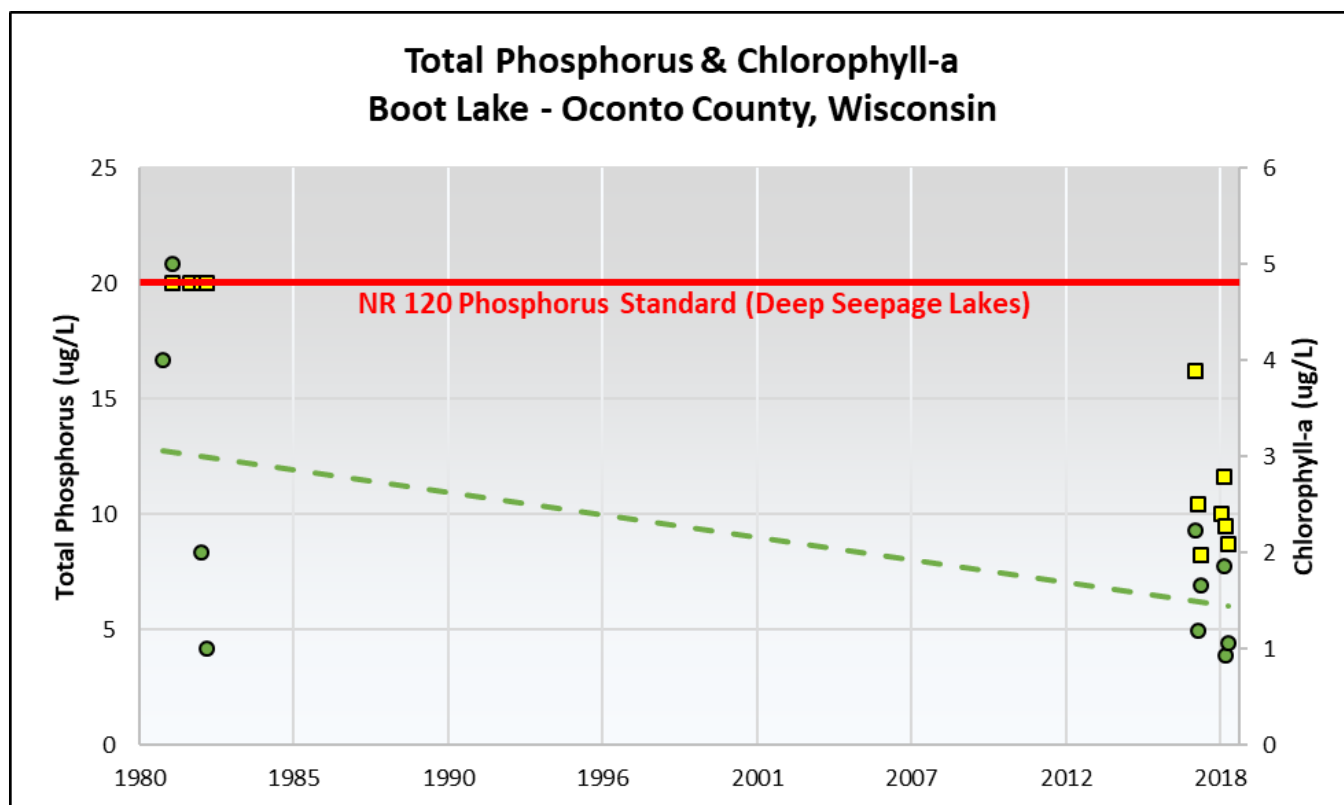
- ◆ Boot Lake is a 230-acre seepage lake in northern Oconto County with a maximum depth of 38 feet.
- ◆ Most water enters Boot Lake via groundwater. Surface water runoff and direct precipitation also contribute water.
- ◆ Visitors have access to the lake from one public boat landing located on the lake's west side.
- ◆ This report summarizes data collected during the 2017-2018 lake study.



Water Quality

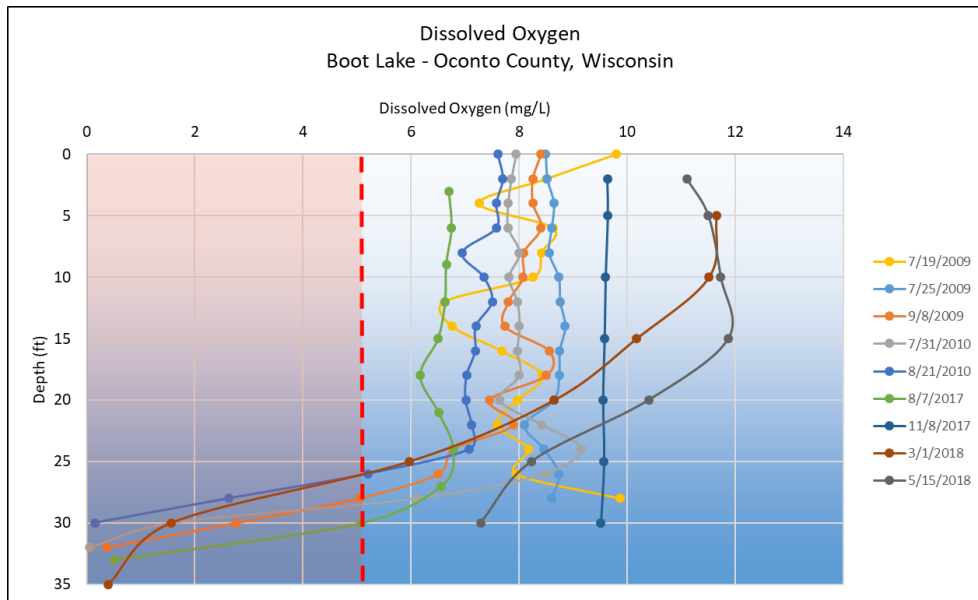
Nutrients such as phosphorus and nitrogen are what feed aquatic plants and algae in a lake. Excessive amounts of nutrients delivered to a lake will result in abundant plant and algae growth. Disturbance within a watershed combined with the landscape's inability to infiltrate and filter runoff is what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

- ◆ Total Phosphorus was consistently below the standard of 20 ug/L for deep seepage lakes during the two-year study.
- ◆ Inorganic nitrogen remained below the threshold of 0.3 ug/L when algal blooms increase.
- ◆ Chlorophyll-a remained well below 6 ug/L and appears to be decreasing over the long term.



Water Quality

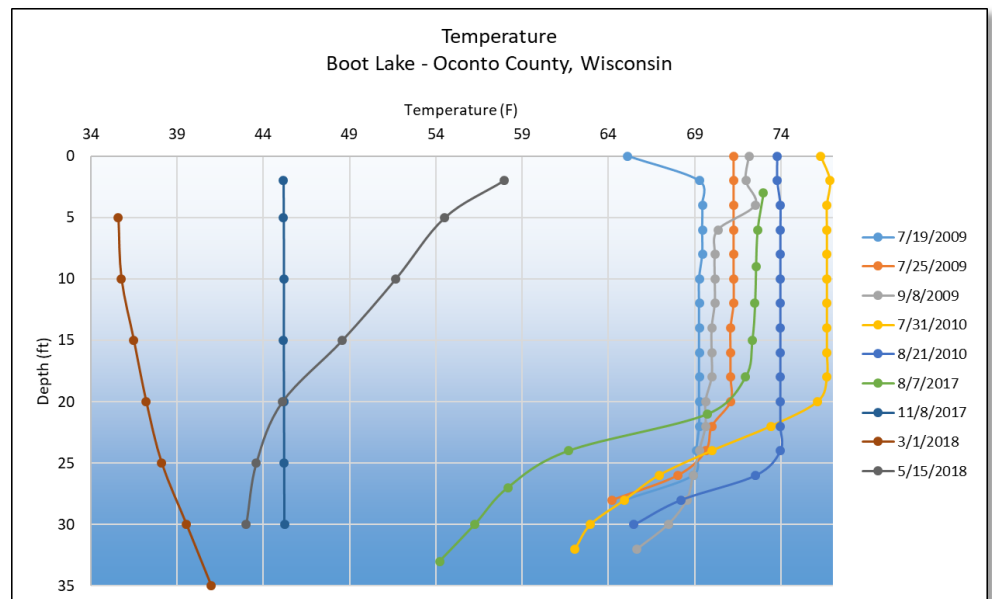
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature,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



- ◆ Sufficient oxygen is available in Boot Lake throughout the water column during all parts of the year. Oxygen concentrations remain low in the hypolimnion (below 25 feet) most of the year.

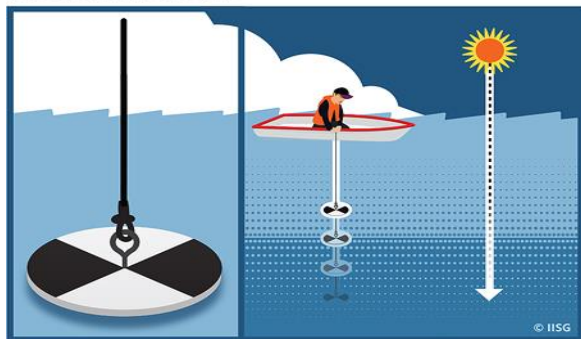
Lake water **temperature** has a significant impact on water chemistry, spatial distribution of fish, microbial growth and oxygen content.

- ◆ The temperature gradient in Boot Lake shows a clear thermocline between 20-30 feet during the growing season.



Water Quality

Secchi Disk

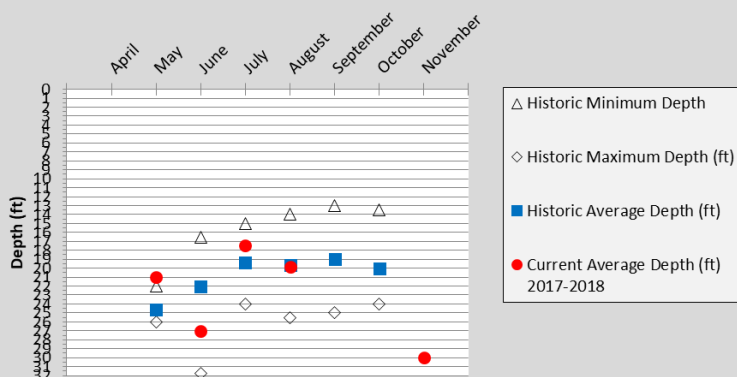


Water clarity is a measure of how deep light can penetrate (Secchi depth). Clarity is affected by water color, turbidity (suspended sediment), and algae. Water clarity helps determine where rooted aquatic plants can grow. It is typical for water clarity to vary throughout the year.

- 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 Boot Lake was in July and the best was in June and November. This is consistent with previous observations and demonstrates a slightly increasing trend over the past 30 years.

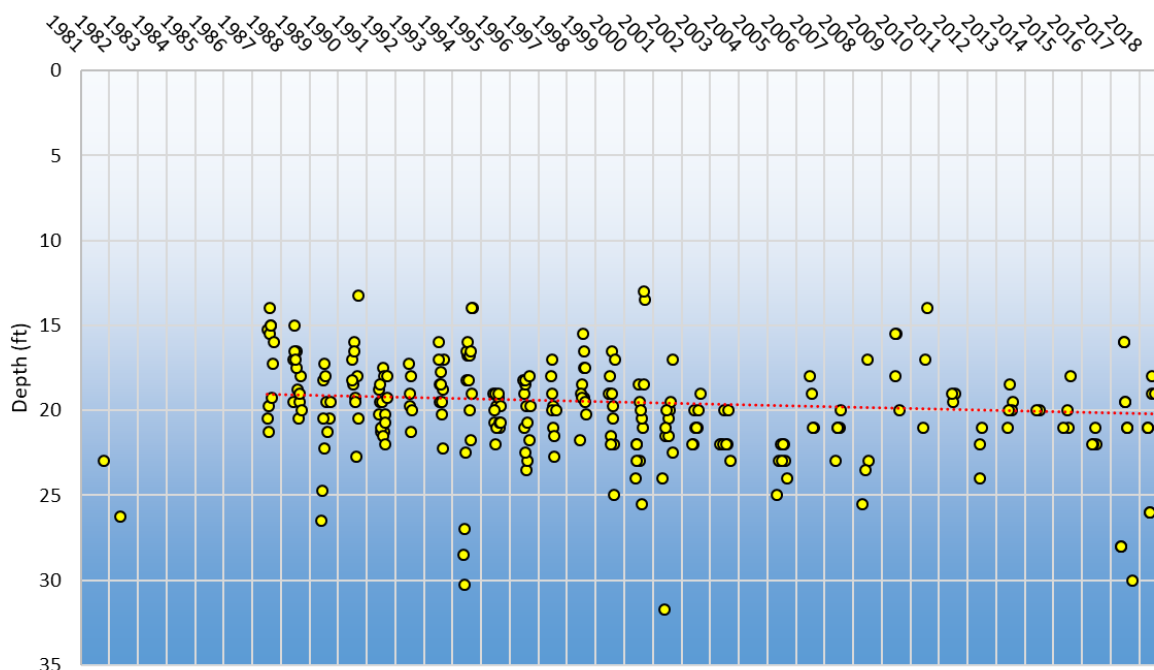
Water Clarity

Boot Lake - Oconto County, Wisconsin



Water Clarity

Boot 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.

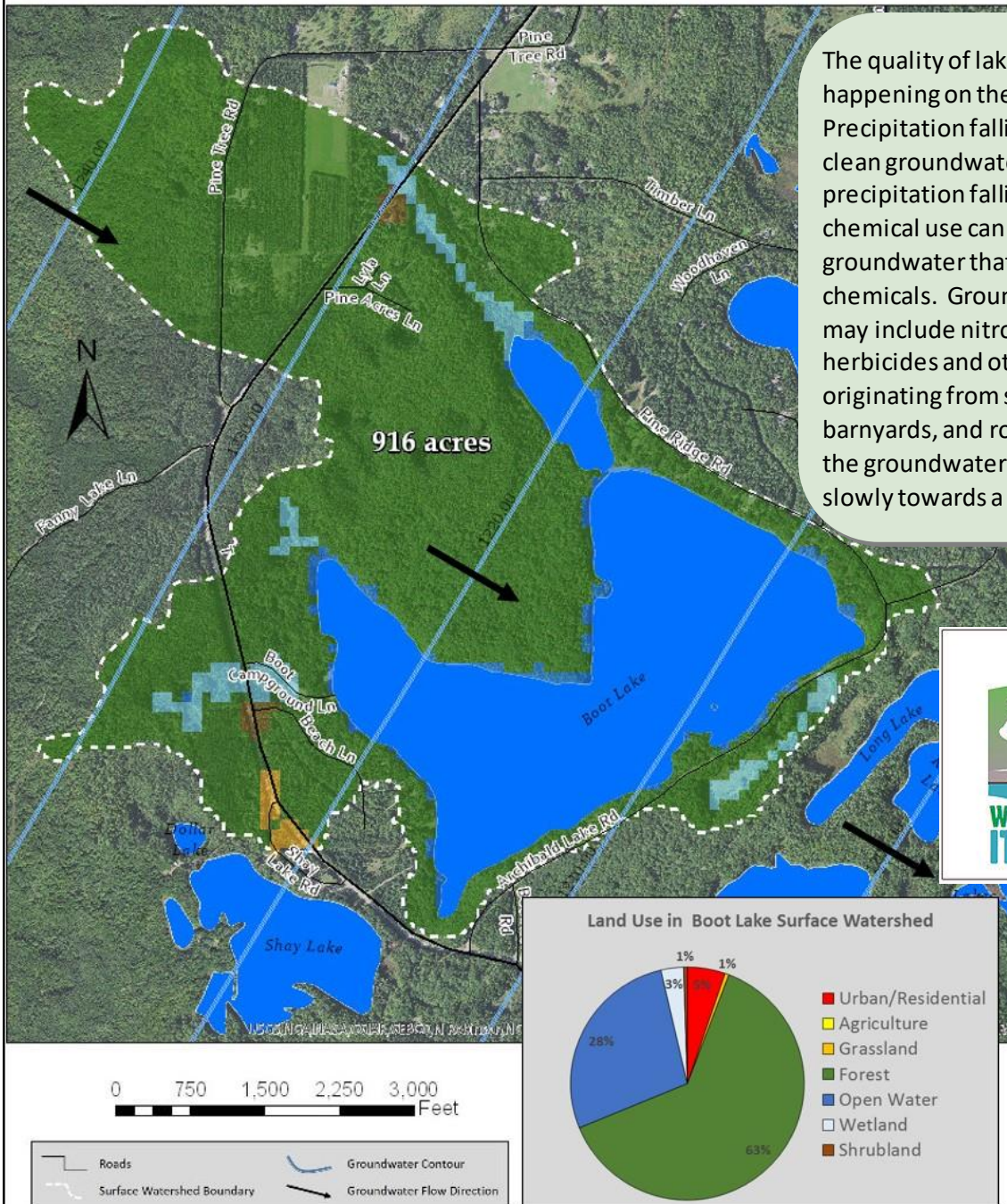
- ◆ Concentrations of potassium (0.623 mg/L), chloride (4.7 mg/L) and sodium (2.764 mg/L) were all low. This suggests minimal impact from septic systems, road salt, animal waste and fertilizers.
- ◆ DACT, a screening tool to determine if your lake is being impacted by pesticides, was not detected.
- ◆ Water in Boot Lake is moderately hard (79 mg/L CaCO_3), having an elevated 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.

Boot 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.

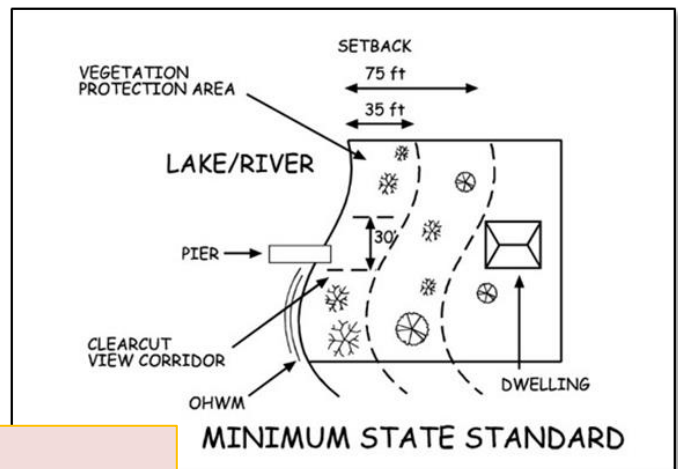


Shorelands

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 Boot Lake were surveyed in July 2017. Much of Boot 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-%
23,671	83	2,490	11%	4,302	18%



State Shoreland Zoning Ordinance

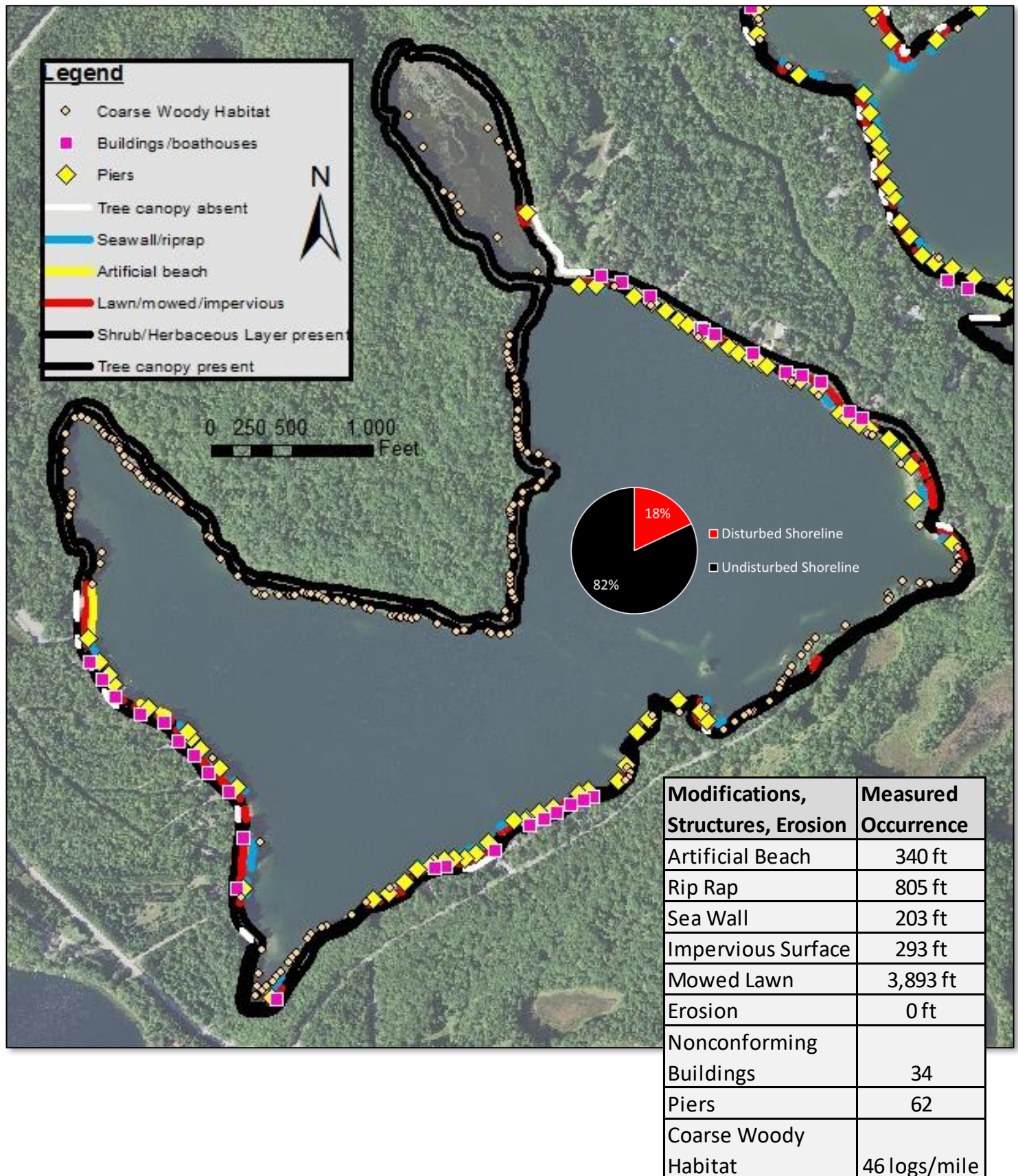
NR 115 Wisc. Adm. Code for Unincorporated Municipalities

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 Boot 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.

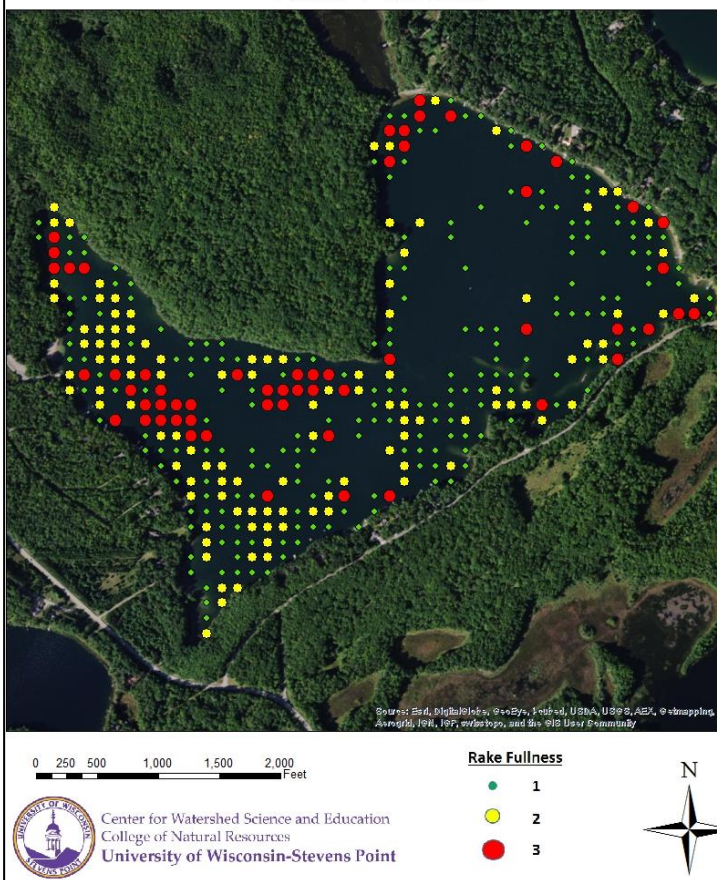


Aquatic Plants

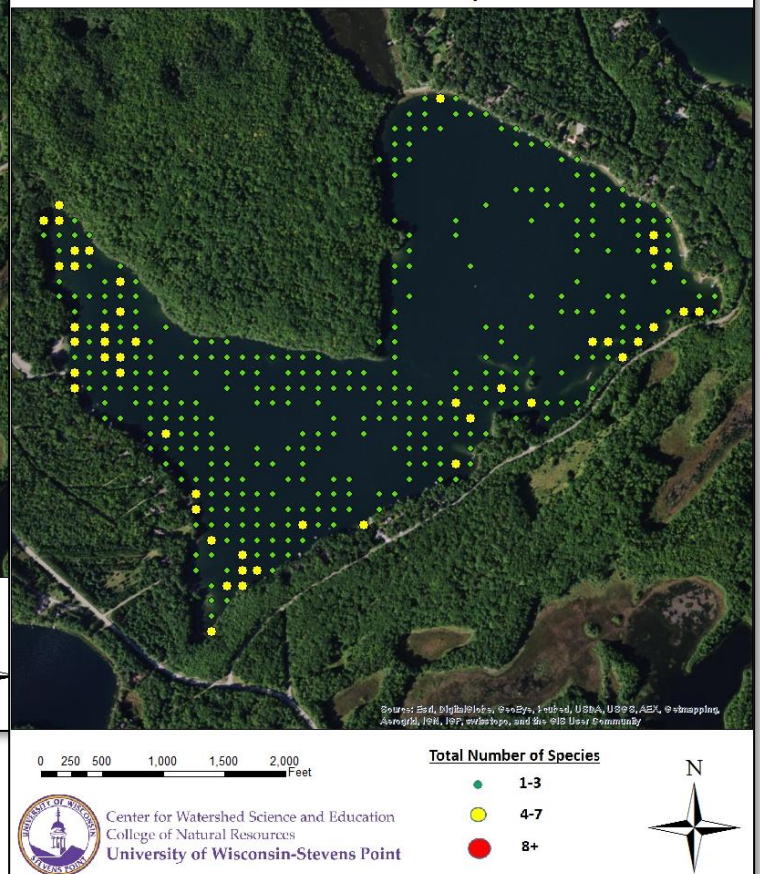
Aquatic plants are the forest landscape within a lake. They provide food and habitat for terrestrial and aquatic creatures such as fish, ducks, turtles, invertebrates and other animals. They increase oxygen levels in the water and utilize nutrients that would otherwise be used by algae. A healthy lake 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 Boot Lake is characterized by above-average diversity of plant species when compared to other lakes in the Oconto County Lakes Project, with a total of 31 species in the 2017 survey.
- During the 2017 aquatic plant survey of Boot Lake, 57% of the sites had vegetative growth. The maximum depth of vegetation was 37 feet.
- The most frequently encountered plant species were nitella (40%), fern pondweed (29%), and chara (27%). All three species are native to Wisconsin.
- No invasive species were observed.

Boot Lake Aquatic Plant Survey 2017:
Rake Fullness

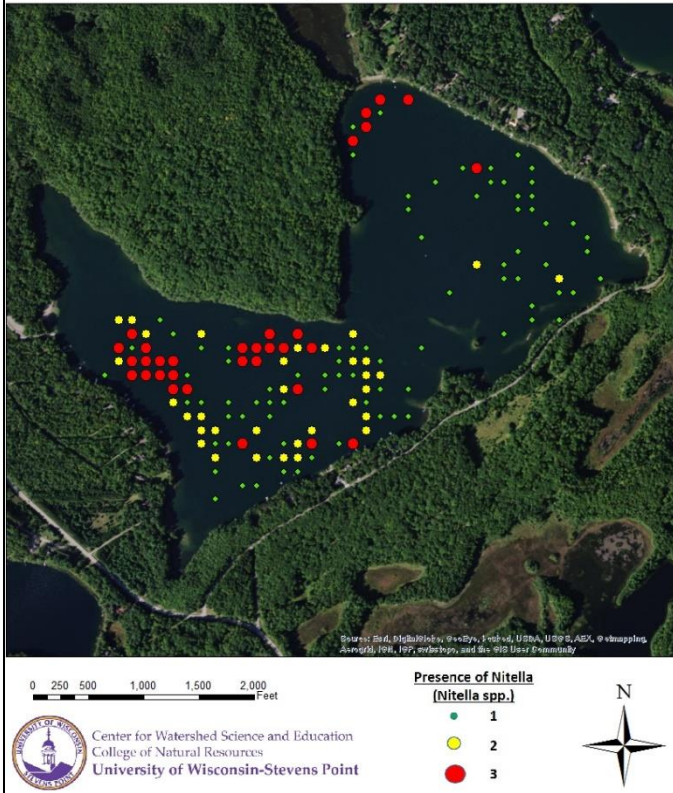


Boot Lake Aquatic Plant Survey 2017:
Total Number of Species



Aquatic Plants

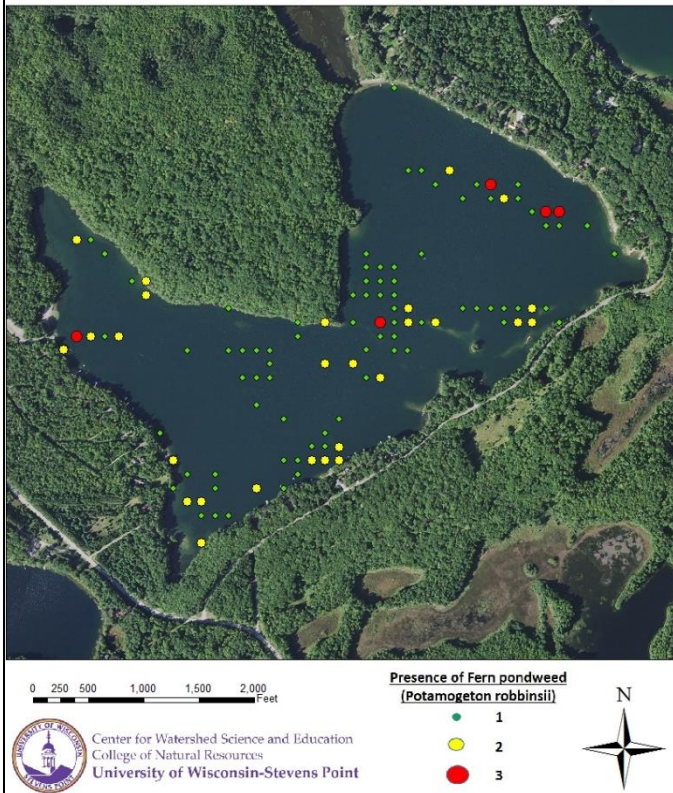
Boot Lake Aquatic Plant Survey 2017:
Nitella (Nitella spp.)



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.



Boot Lake Aquatic Plant Survey 2017:
Fern pondweed (Potamogeton robbinsii)

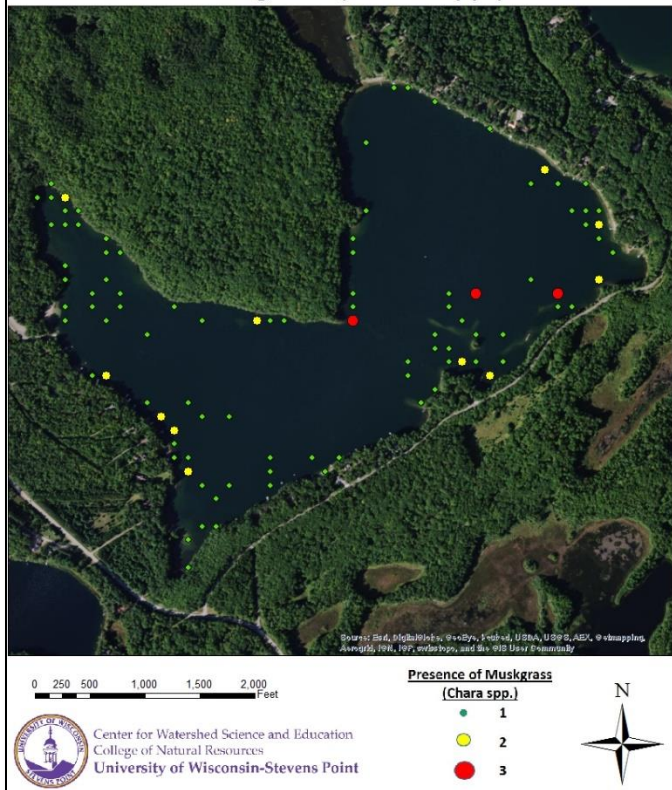


Fern pondweed, or Robbins pondweed, has glossy, finely toothed leaves appearing as whorls near the end of stems. Also known as the water-nymph, the whole plant is eaten by waterfowl and provides shelter for small fish and insects.



Aquatic Plants

Boot 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 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.
- ✓ Banded mystery snail (2008) and rusty crayfish (2008) have been previously documented in Boot 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.



Rusty crayfish displace native crayfish and reduce aquatic plant diversity and abundance.

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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Oconto County Staff and Citizens

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

