

Oconto County Lakes Project

CHAIN LAKE STUDY

SUMMARY REPORT

2023

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**

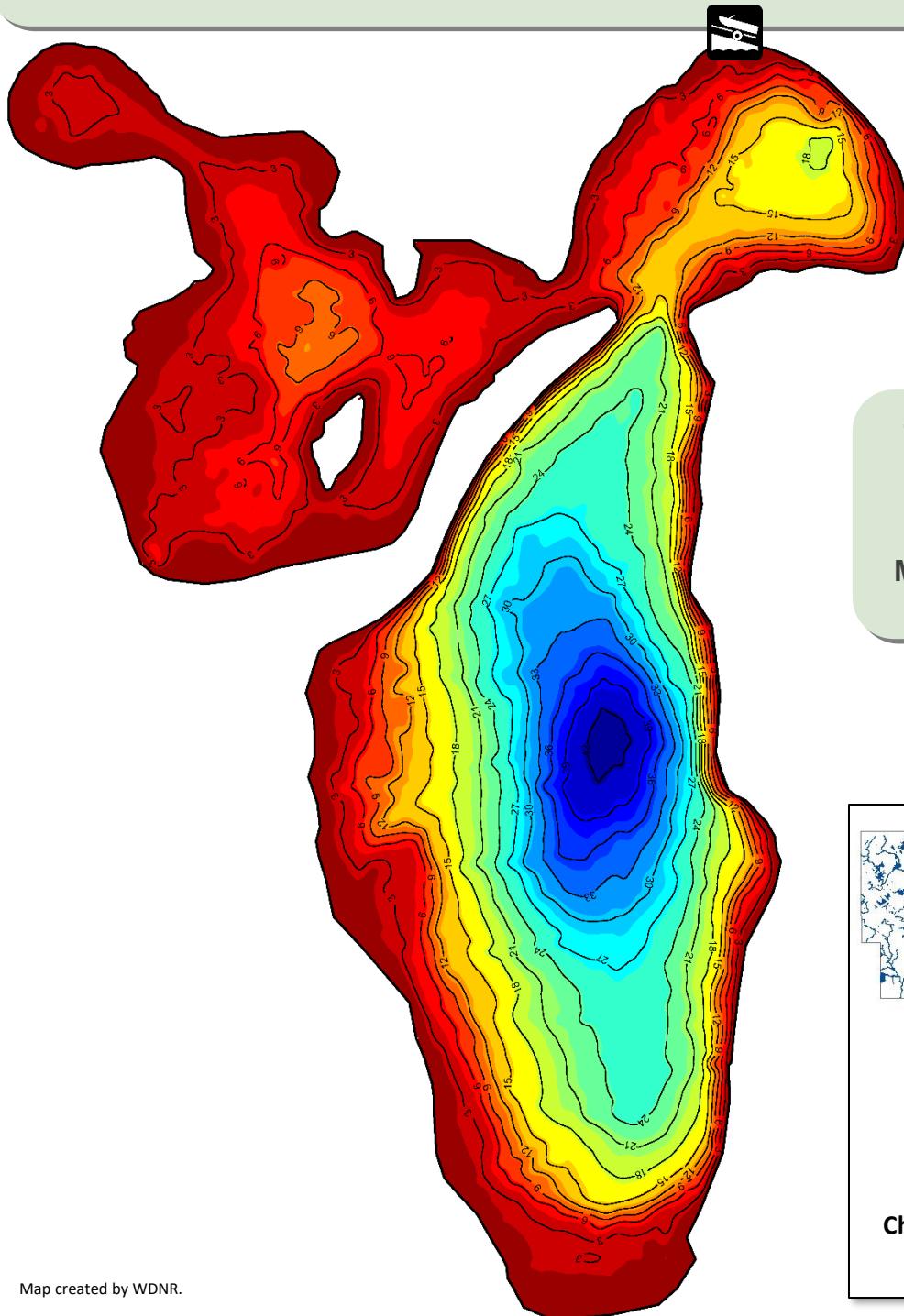
Lake
Management
Plans



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

Background

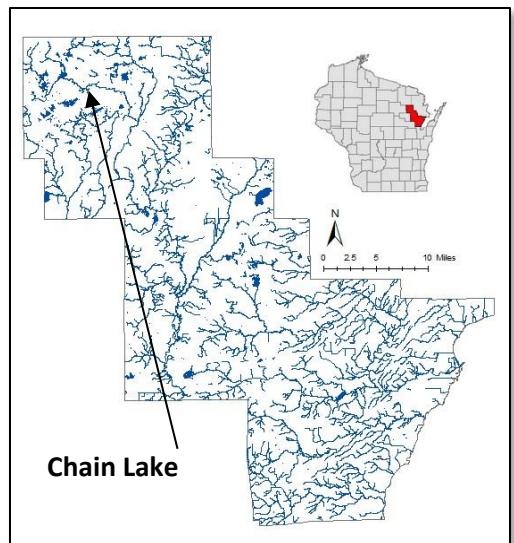
- Chain Lake is a 76-acre spring lake in northern Oconto County with a maximum depth of 42 feet.
- Most water enters Chain Lake via groundwater and leaves via a small drainage on the north side leading to McCaslin Brook. Surface water runoff and direct precipitation also contribute water.
- Visitors have access to the lake from one public boat launch located on the lake's north side.
- This report summarizes data collected during the 2021-2022 lake study.



Township of Townsend

Surface Area: 76 acres

Maximum Depth: 42 feet



Map created by WDNR.



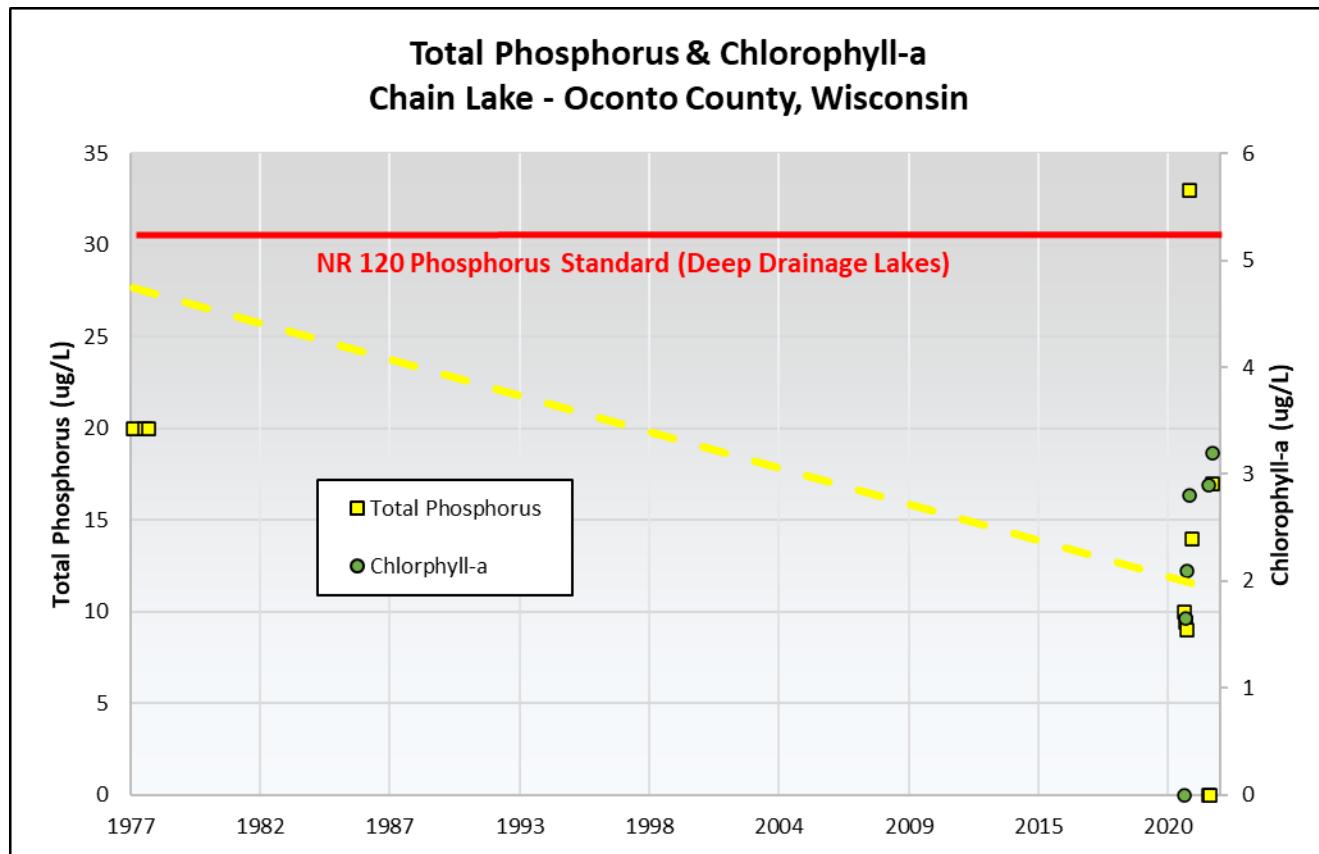
0 200ft

Chain Lake
Mapping by AutoChart

Water Quality

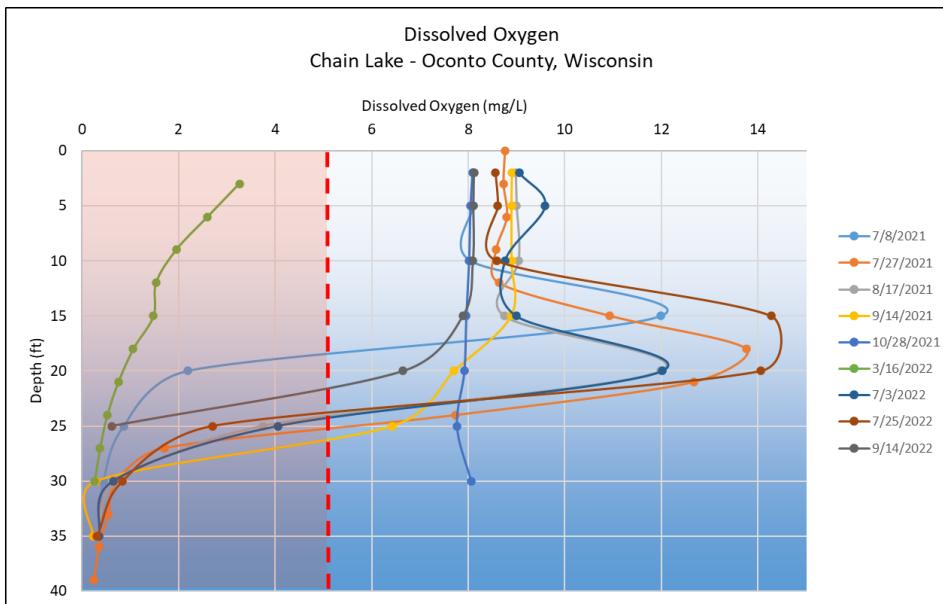
Nutrients such as phosphorus and nitrogen are what feed aquatic plants and algae in a lake. Excessive amounts of nutrients delivered to a lake will result in abundant plant and algae growth. Disturbance within a watershed combined with the landscape's inability to infiltrate and filter runoff is what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

- Total Phosphorus remained below the Wisconsin state standard of 30 ug/L for deep drainage lakes for all but one sample during the two-year study. The long-term trend based on limited historic data suggests decreasing average concentrations.
- Inorganic nitrogen (0.55 mg/L) was above 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 throughout the study.



Water Quality

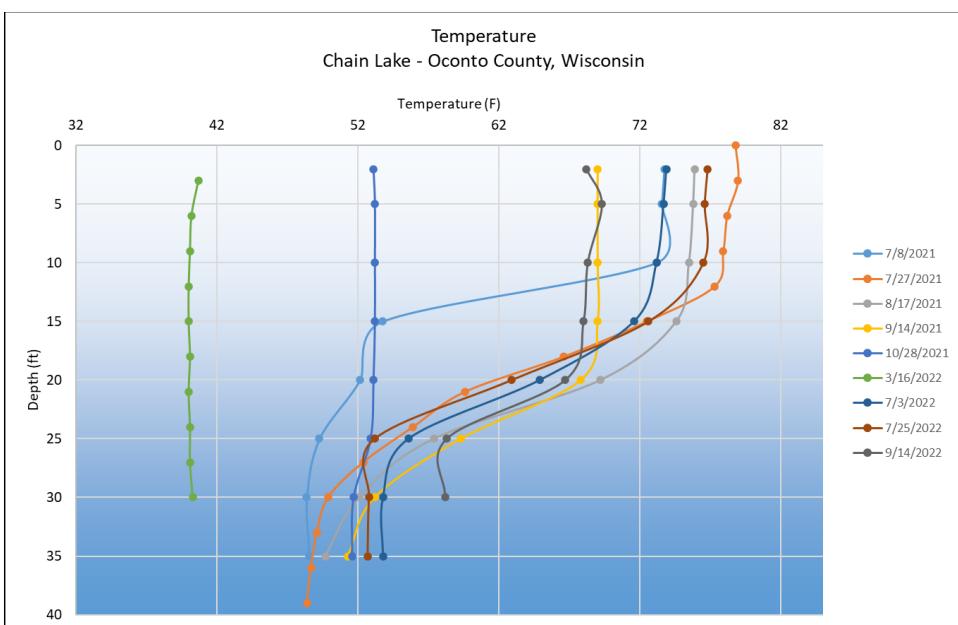
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature,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



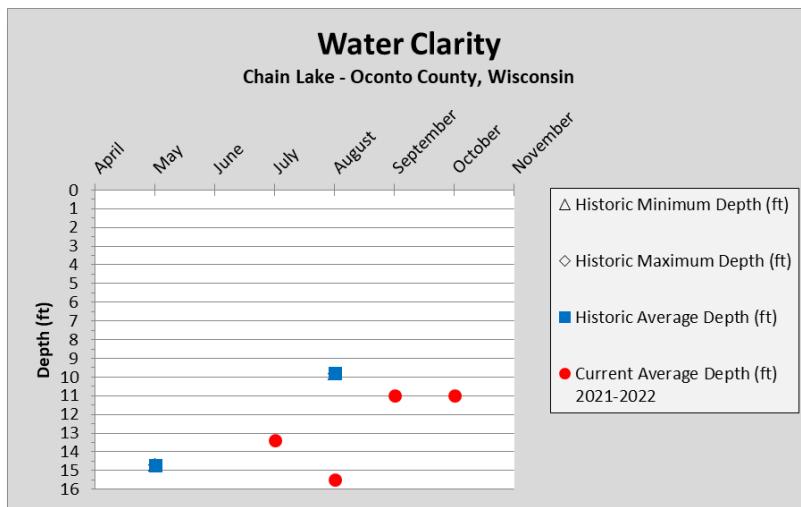
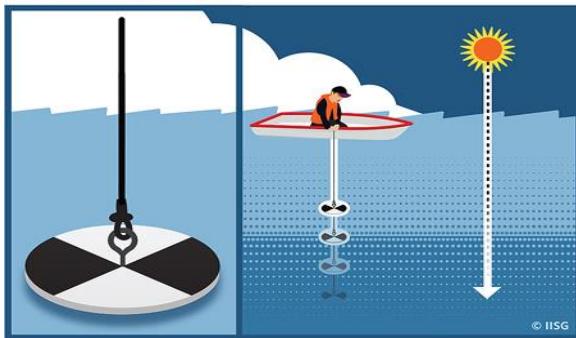
➤ Sufficient oxygen is available in the water column of Chain Lake through most of the year but may become anoxic in late winter. Generally, the top 20 feet of water column maintains enough oxygen to support most fish species. Algae blooms at depth are common just above the thermocline as shown by increases in dissolved oxygen.

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

➤ Temperature profiles in Chain Lake are typical of a deep, stratified lake with a clear thermocline from 15-25 feet during the growing season. This stratification isolates deeper, cooler water from more oxygen-rich warmer water above.

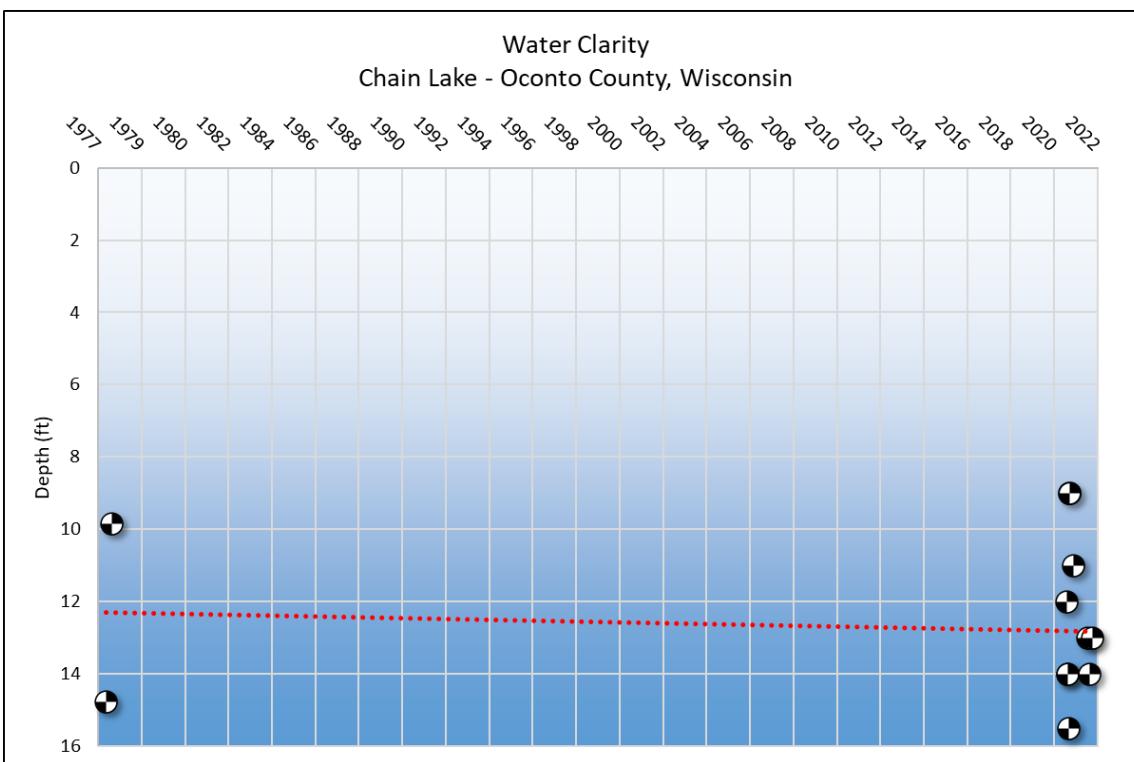


Water Quality



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 graphs below show water clarity measurements taken between May and November.
- During 2021-22, the poorest average water clarity was in September-October and best was in August. Comparison to previous data suggests a stable 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 (1.92 mg/L), chloride (1.7 mg/L) and sodium (2.43 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 Chain Lake is hard (152 mg/L CaCO₃), having an elevated level of dissolved minerals. These minerals tend to bind with phosphorus making it unavailable to algae blooms.

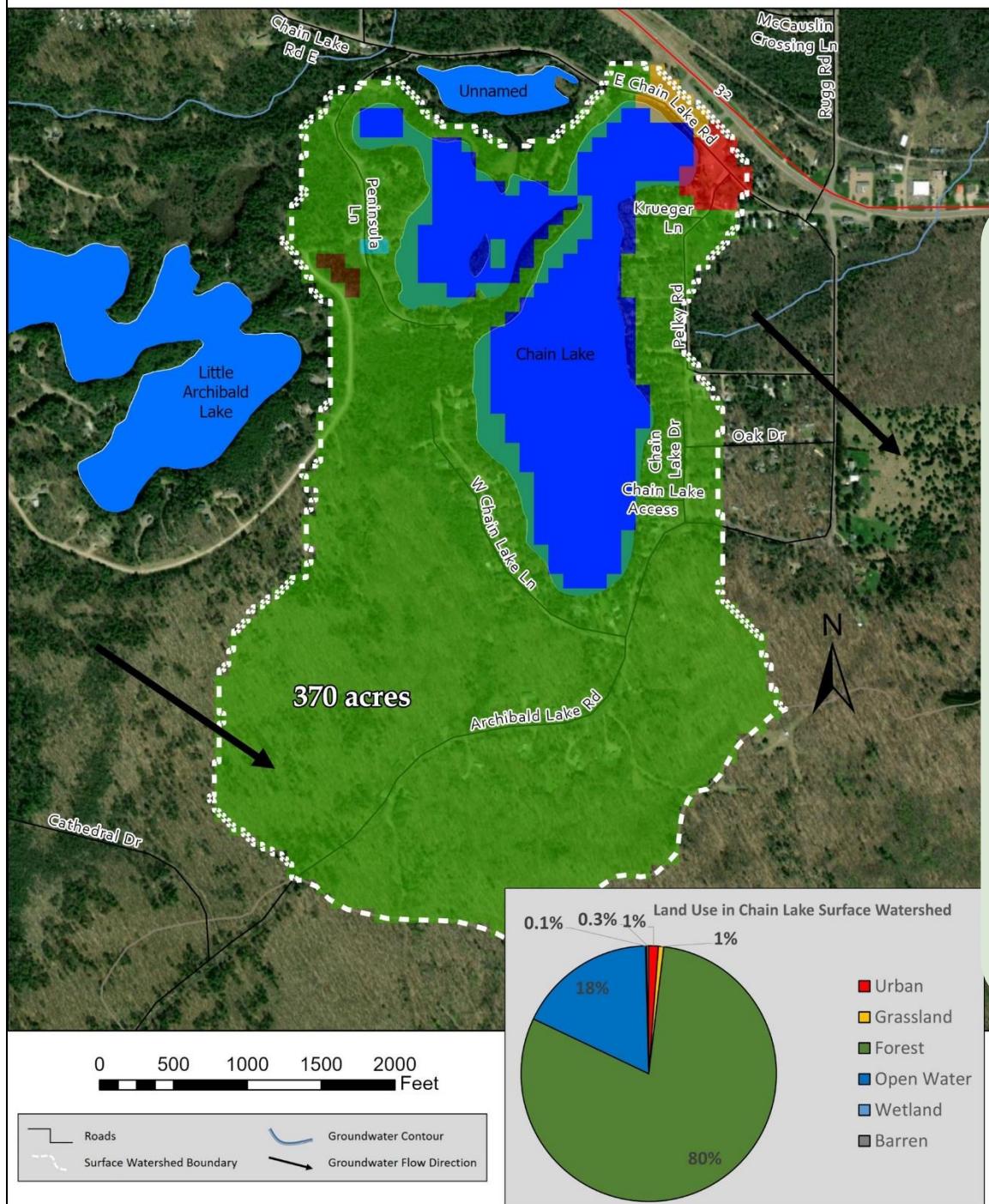


*For more information on how to interpret
your lake's water quality data, please refer to
the "State of the Oconto County Lakes
Report" that is on file with Oconto County.*

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.

Chain 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 Chain Lake were surveyed in July 2021. Many shoreland areas are healthy, but some stretches are in need of restoration.

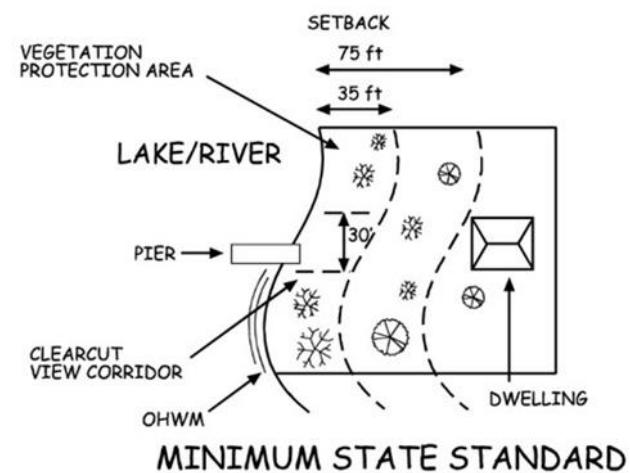
Total lakefront footage (feet)	No. Riparian lots	Measured shoreland disturbance (feet)	Measured shoreland disturbance (%)
9,196	83	1,721	19%



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:

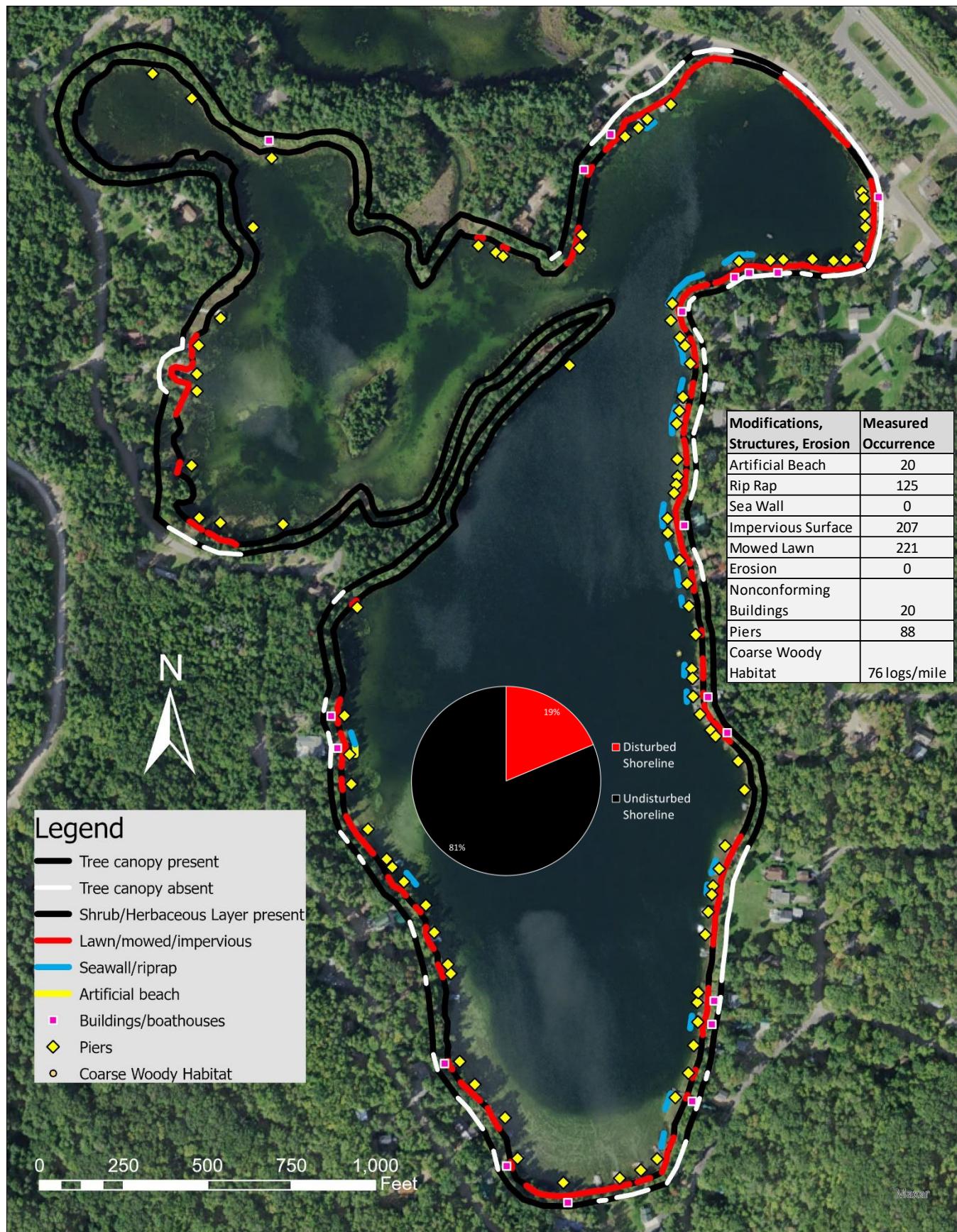
- Up to 30% of shoreline may be removed of shrubs and trees for a view corridor
- A mowed or constructed pedestrian path up to 5 feet wide to access lake



What Can You Do To Help Chain 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

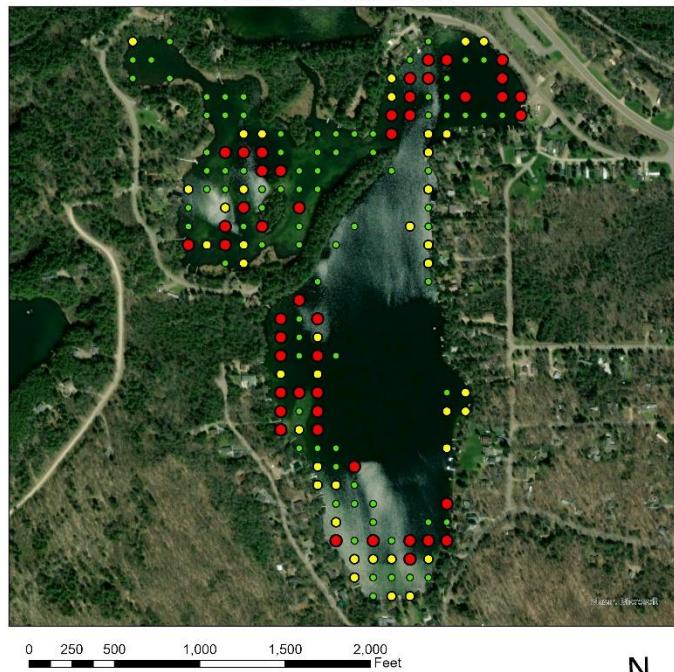


Aquatic Plants

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.

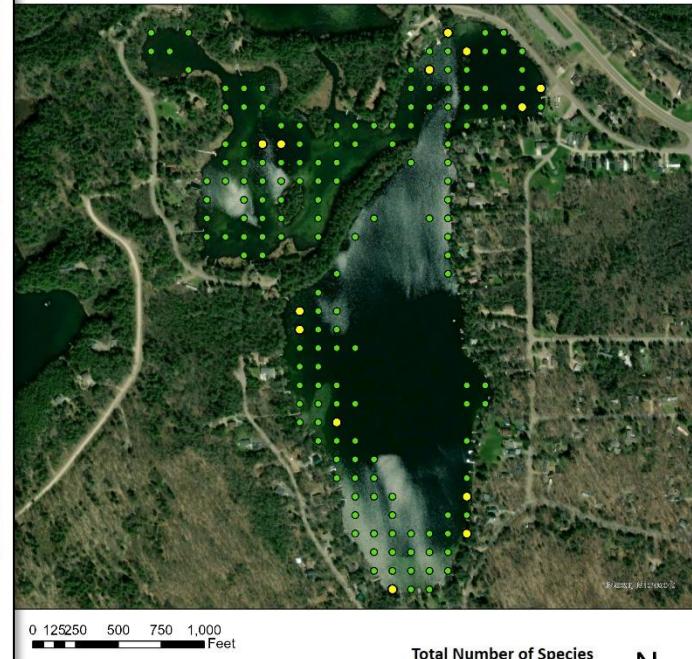
- The aquatic plant community in Chain Lake is characterized by above average diversity of plant species when compared to other lakes in the Oconto County Lakes Project, with a total of 23 species in the 2021 survey.
- During the 2021 aquatic plant survey of Long Lake, 76% of visited sites had vegetative growth. The maximum depth of vegetation was 23 feet and the Floristic Quality Assessment (FQI) was 30.7.
- The most frequently encountered plant species were Northern water-milfoil (27%), Slender naiad (25%), Fern pondweed (21%), and Flat-stem pondweed (21%).
- No invasive species were observed.

Chain Lake Aquatic Plant Survey 2021:
Rake Fullness



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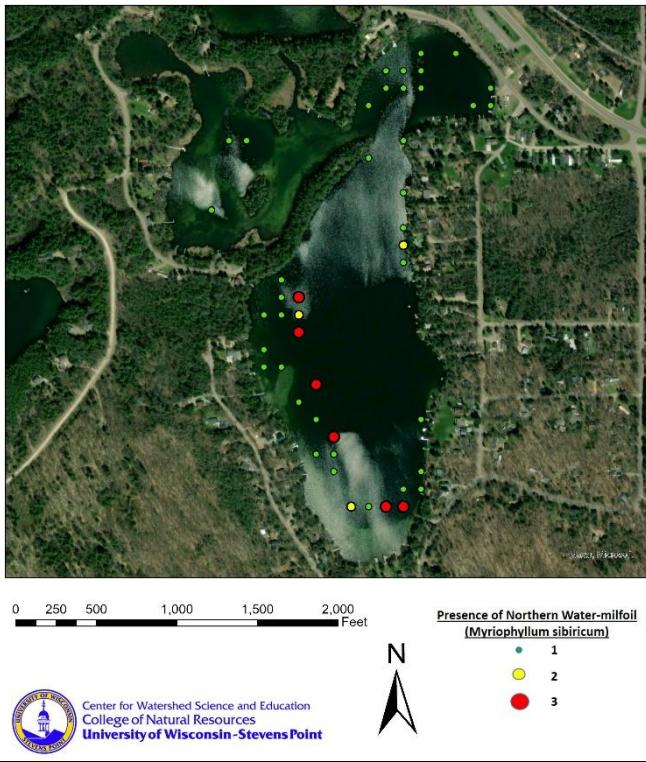
Chain Lake Aquatic Plant Survey 2020:
Total Number of Species



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Aquatic Plants

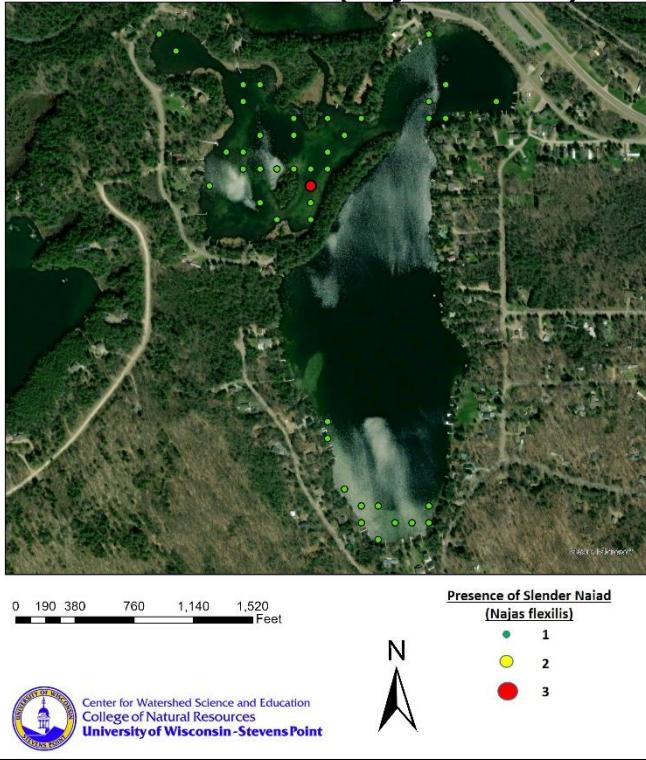
Chain Lake Aquatic Plant Survey 2021: Northern water-milfoil (*Myriophyllum sibiricum*)



Northern watermilfoil is important forage and cover for aquatic animals and an important food source for waterfowl.



Chain Lake Aquatic Plant Survey 2021: Slender naiad (*Najas flexillis*)

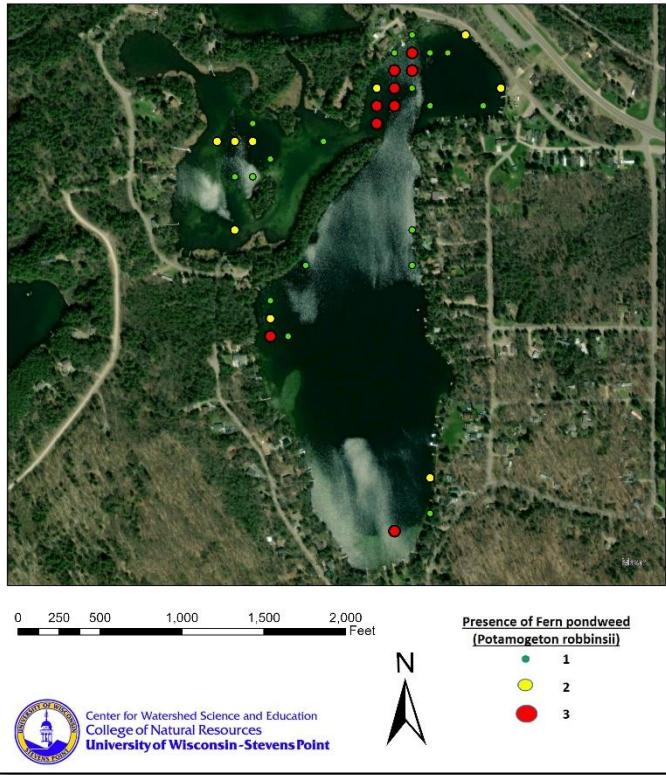


Slender naiad, also called nodding water-nymph, is a primary food source for waterfowl and provides habitat for many invertebrates.



Aquatic Plants

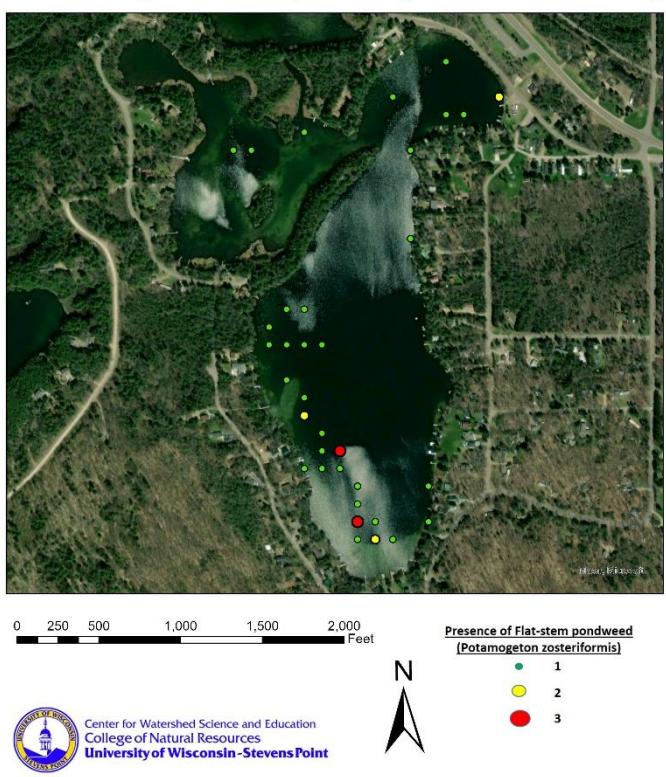
Chain Lake Aquatic Plant Survey 2021: Fern pondweed (*Potamogeton robbinsii*)



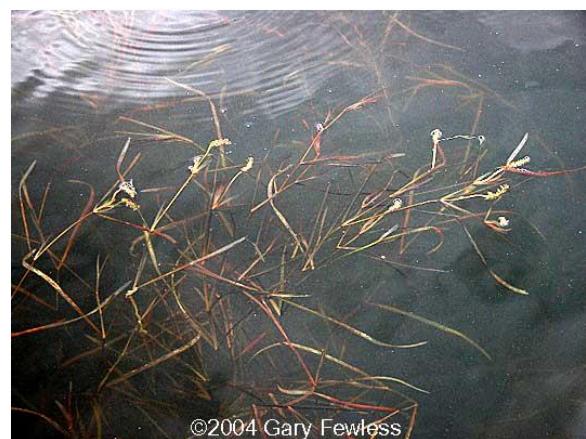
Fern pondweed, forms large colonies in deep water. It rarely flowers, but when it does, it is distinctive for its branched inflorescence. Its fruit is foraged by waterfowl.



Chain Lake Aquatic Plant Survey 2021: Flat-stem pondweed (*Potamogeton zosteriformis*)



Flat-stem pondweed, usually found in soft sediment, is a food source for geese and ducks and some mammals. It provides food and cover for fish and invertebrates.



Aquatic Plants

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 2021 survey.
- Banded mystery snail (2013) and Rusty crayfish have been previously documented in Chain 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.



Rusty crayfish displace native crayfish and reduce aquatic plant abundance leading to decreased water clarity and loss of habitat.



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

Ryan Haney and Paul McGinley

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