

# Oconto County Lakes Project

## **SURPRISE LAKE STUDY**

### **SUMMARY REPORT**

**2022**

#### 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**

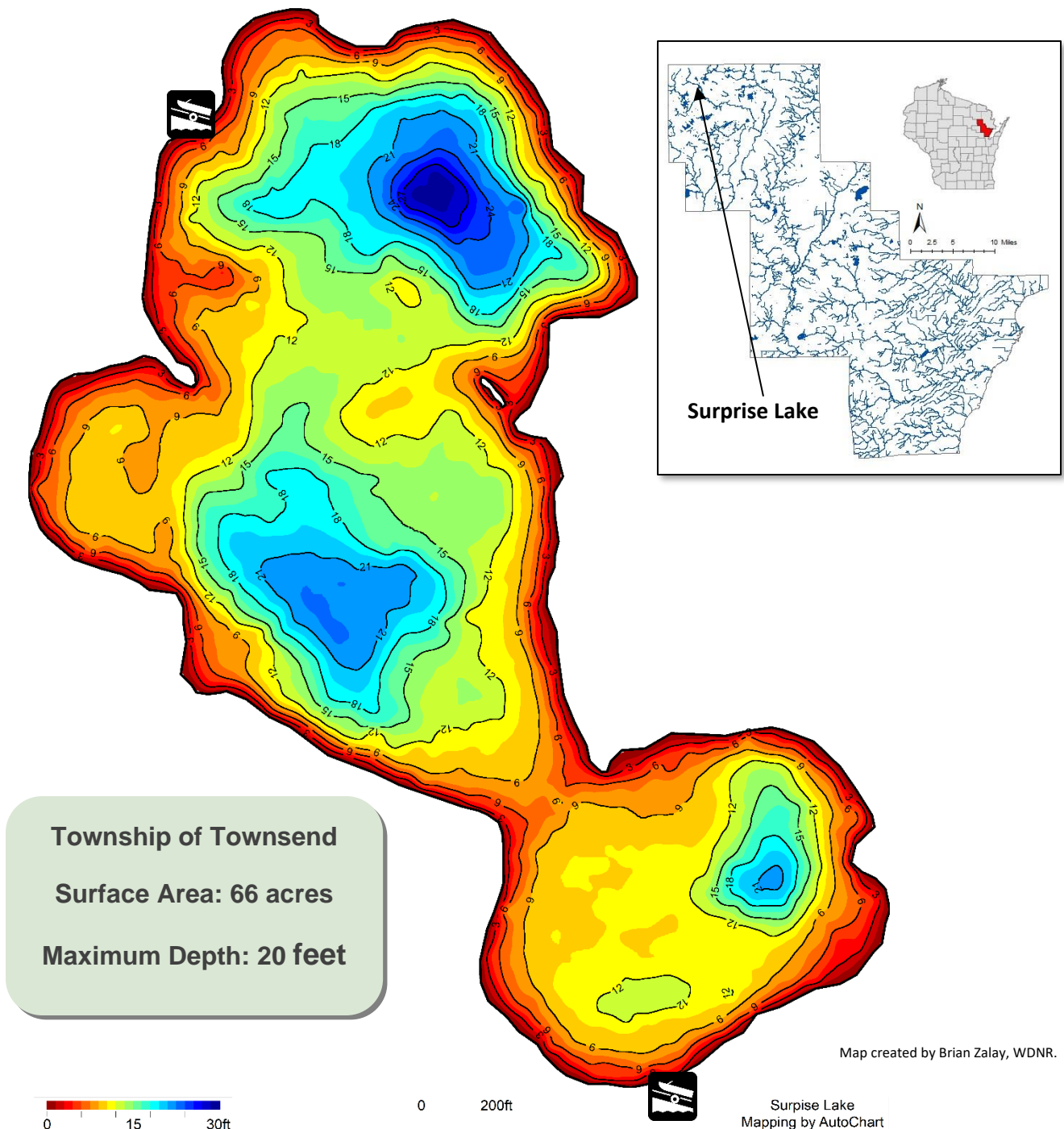
**Lake  
Management  
Plans**



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

# Background

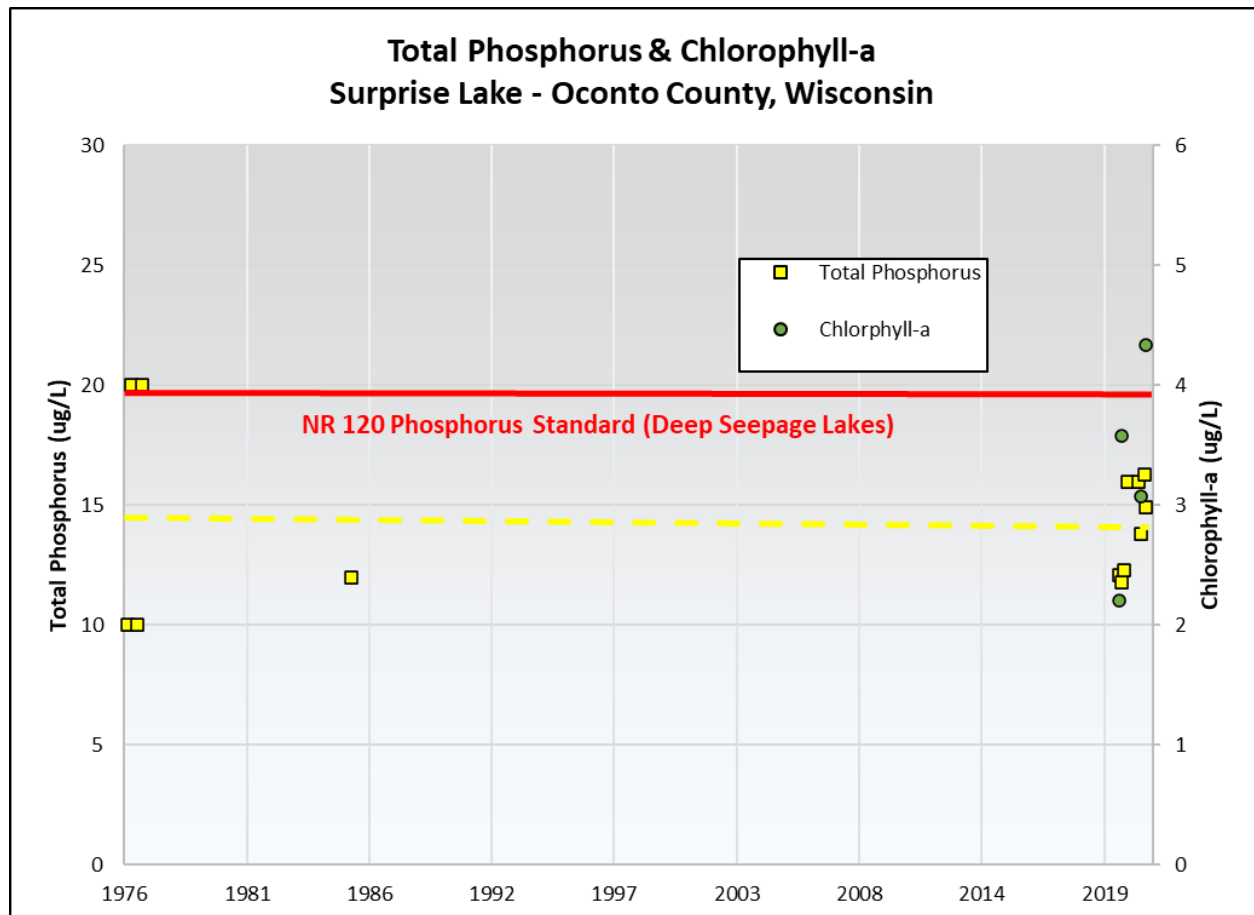
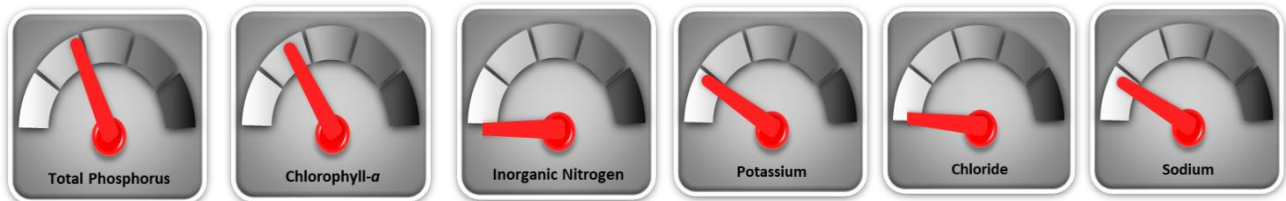
- Surprise Lake is a 66-acre seepage lake in northern Oconto County with a maximum depth of 20 feet.
- Most water enters and leaves Surprise Lake via groundwater. Surface water runoff and direct precipitation also contribute water.
- Visitors have access to the lake from two public boat launches located on the lake's north and south side.
- This report summarizes data collected during the 2020-2021 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.

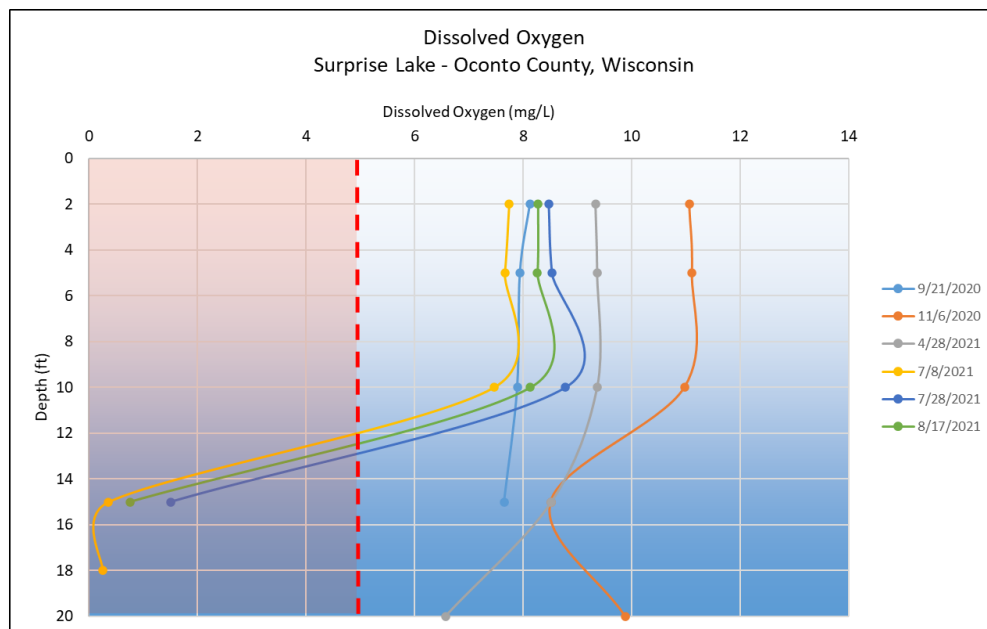
- Total Phosphorus was consistently below the Wisconsin state standard of 20 ug/L for deep seepage lakes during the two-year study. The long-term trend (based on summer samples) suggests very stable concentrations.
- Inorganic nitrogen remained below the threshold of 0.3 mg/L when algal blooms increase.
- Chlorophyll-a, an indirect measure of algae, remained below the threshold of 6 ug/L. Not enough data exists to determine a trend.





# Water Quality

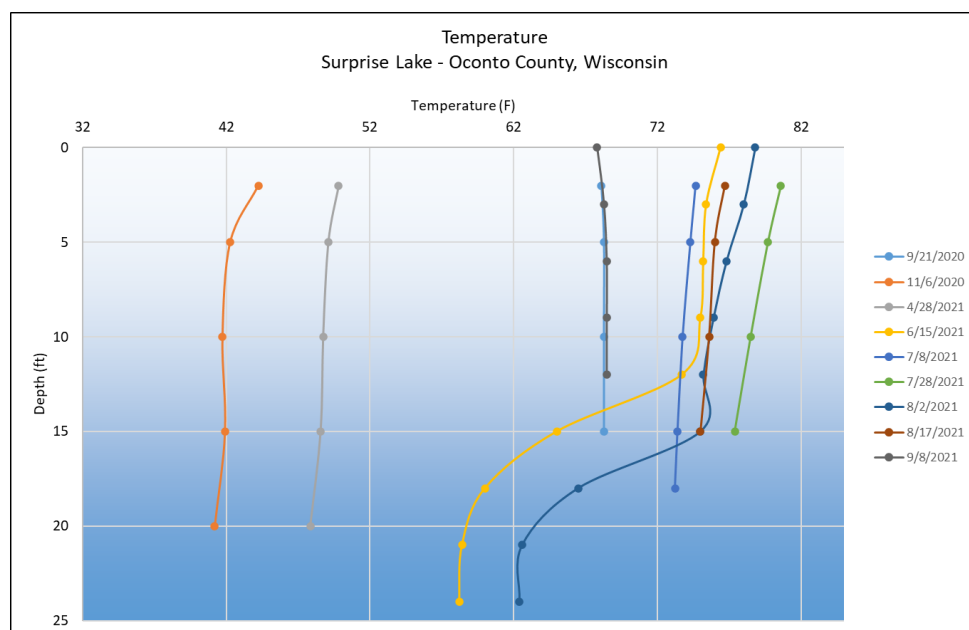
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature,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



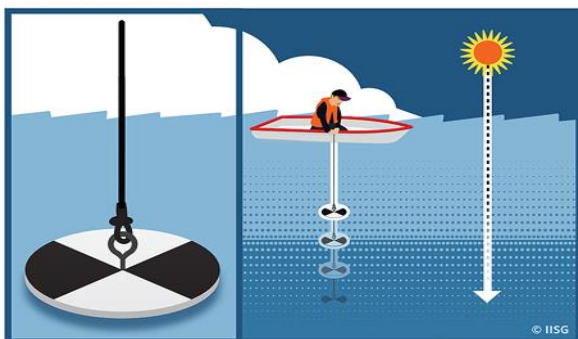
➤ Sufficient **dissolved oxygen** is available in the water column of Surprise Lake throughout the year. The lowest concentrations were observed in late summer when only the top 12 feet has enough oxygen to support most fish species.

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

➤ The temperature gradient in Surprise Lake is typical of a shallow, mixed lake showing consistent temperatures with depth at each sampling event.

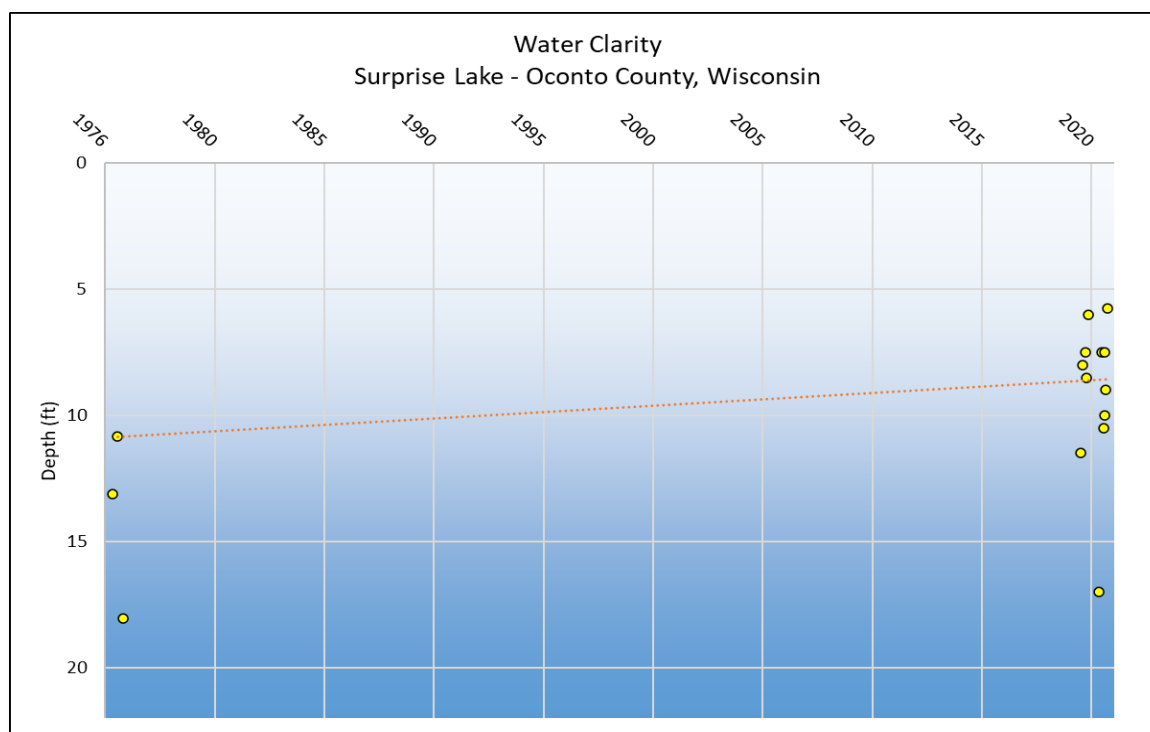
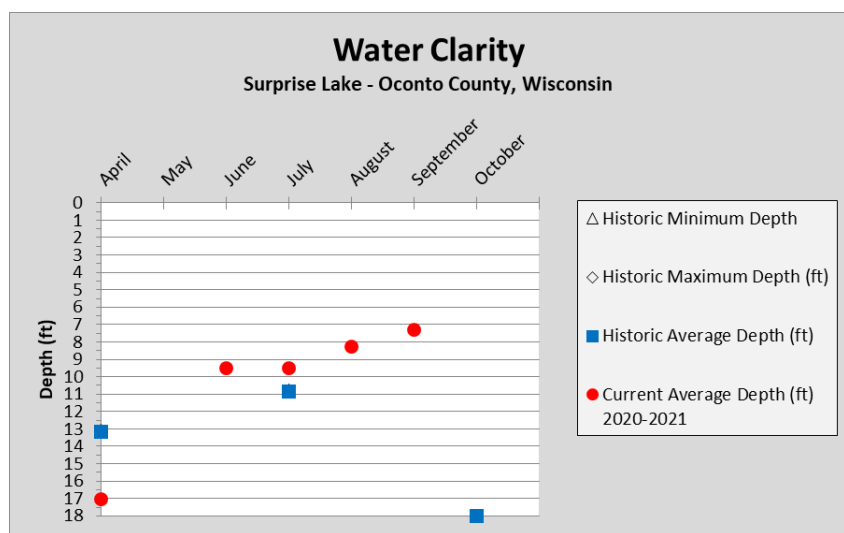


# Water Quality



**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 May and November.
- During 2020-21, the poorest average water clarity was in September and best was in April. Limited historic data suggests a decreasing 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 (0.80 mg/L), chloride (0.53 mg/L) and sodium (1.02 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 Surprise Lake is soft (10 mg/L  $\text{CaCO}_3$ ), having a low level of dissolved minerals. Soft water has less ability to buffer inputs such as acid rain or phosphorus.

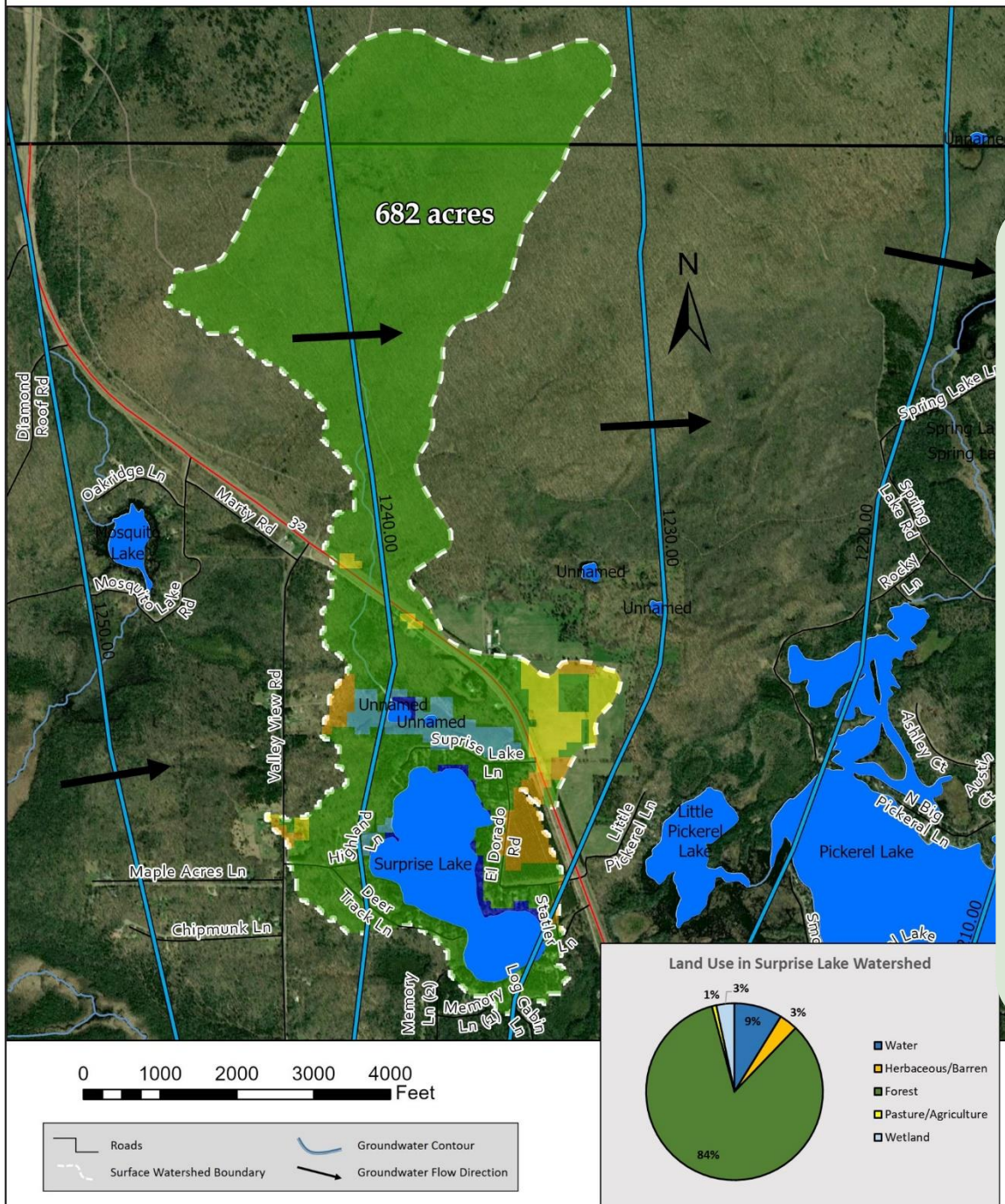


*For more information on how to interpret your lake's water quality data, please refer to the "State of the Oconto County Lakes Report" that is on file with Oconto County.*

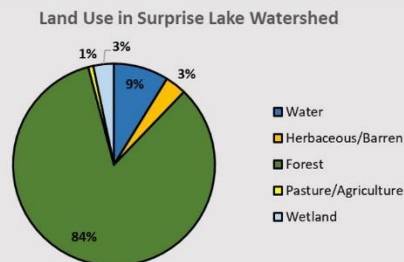


**Groundwater** provides water to lakes in Oconto County throughout the entire year. Hard surfaces on the landscape prevent water from soaking into the ground and becoming groundwater. This results in less water flowing to the lake during snowmelt and rain events. Water that does not infiltrate to groundwater becomes **surface runoff** flowing across the surface of the landscape where it can move sediment and contaminants to the lake from within its watershed.

## Surprise 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.

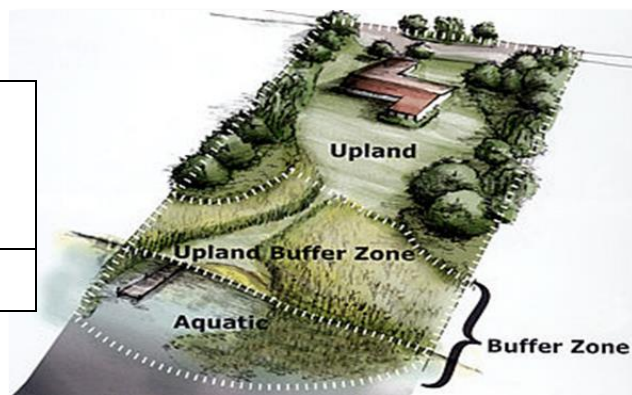


# Shorelands

**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 Surprise Lake were surveyed in August 2020. Some of Surprise Lake's shoreland is healthy, but many stretches are in need of restoration.

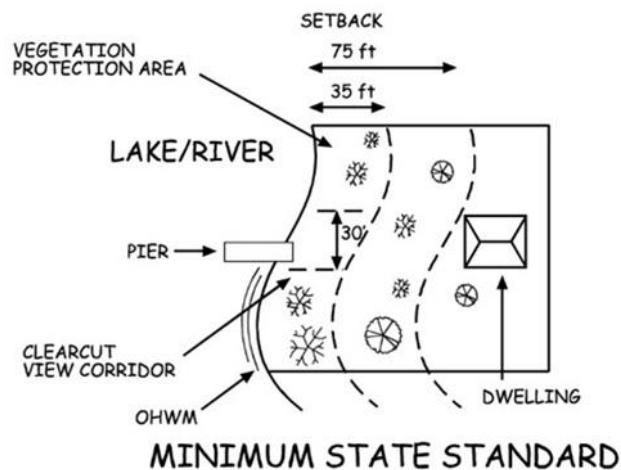
Total lakefront footage	No. Riparian lots	Measured shoreland disturbance (feet)	Measured shoreland disturbance (%)
9,863	65	6,481	66%



## 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:

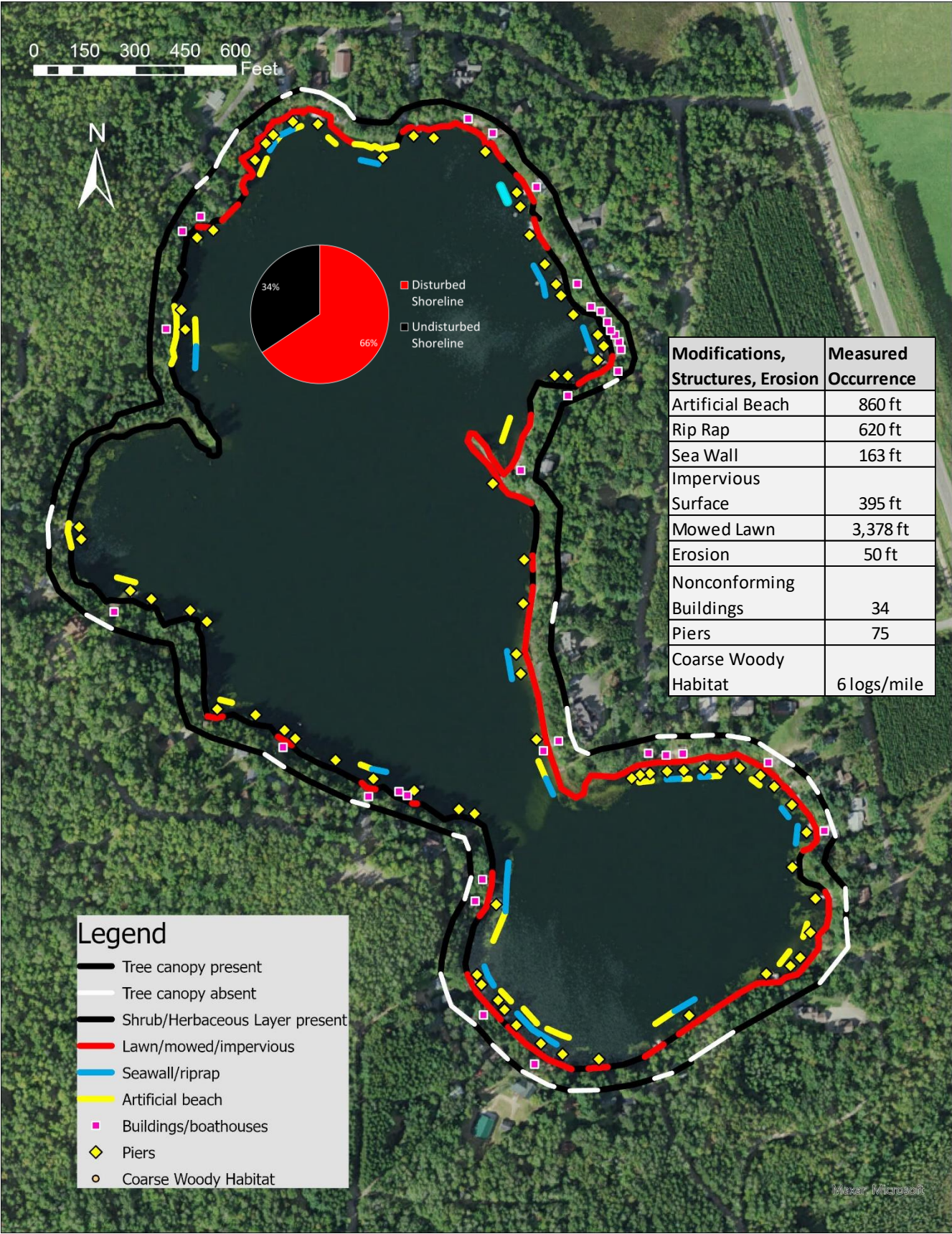
- Up to 30% of shoreline may be removed of shrubs and trees for a view corridor
- A mowed or constructed pedestrian path up to 5 feet wide to access lake



## What Can You Do To Help Surprise 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.





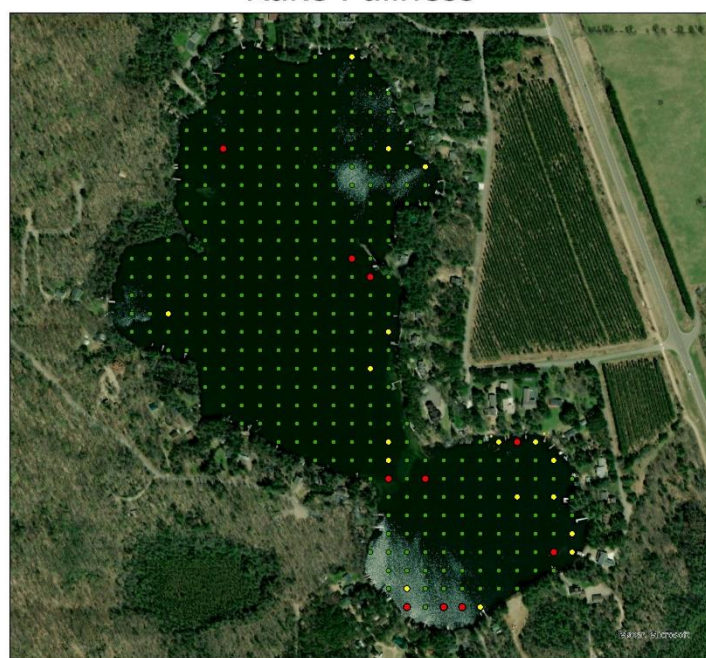


# Aquatic Plants

**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 Surprise Lake is characterized by average diversity of plant species when compared to other lakes in the Oconto County Lakes Project, with a total of 16 species in the 2020 survey.
- During the 2020 aquatic plant survey of Surprise Lake, 82% of visited sites had vegetative growth. The maximum depth of vegetation was 23 feet and the Floristic Quality Assessment (FQI) was 27.
- The most frequently encountered plant species were creeping bladderwort (41%), blunt-leaf pondweed (37%) and nitella (36%). All three species are native to Wisconsin.
- No invasive species were observed.

Surprise Lake Aquatic Plant Survey 2020:  
Rake Fullness



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

Rake Fullness

- 1
- 2
- 3



Surprise Lake Aquatic Plant Survey 2020:  
Total Number of Species



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

Total Number of Species

- 1-3
- 4-7
- 8+





# Aquatic Plants

## Surprise Lake Aquatic Plant Survey 2020: Creeping Bladderwort (*Utricularia gibba*)



0 125 250 500 750 1,000  
Feet

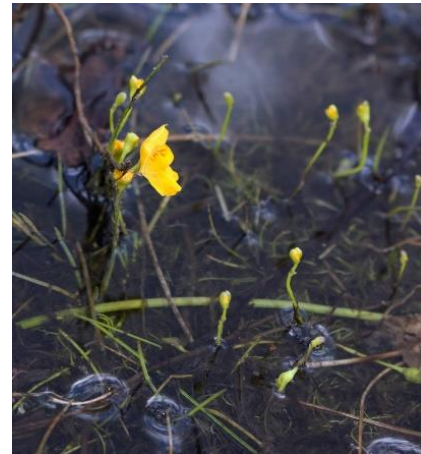
Presence of Creeping bladderwort  
(*Utricularia gibba*)

- 1
- 2
- 3



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

**Creeping bladderwort** is a carnivorous plant with underwater 'sacs' that trap insects and other small animals. Without roots, it has slender stems which may be floating, submerged or creeping along the substrate.



## Surprise Lake Aquatic Plant Survey 2020: Blunt-leaf pondweed (*Potamogeton obtusifolius*)



0 125 250 500 750 1,000  
Feet

Presence of Blunt-leaved pondweed  
(*Potamogeton obtusifolius*)

- 1
- 2
- 3



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

**Blunt-leaf pondweed** is usually found in quiet or slow-flowing waters. With no floating leaves, the dry seed fruit (achene) is eaten by foraging wildlife.



©2005 Gary Fewless



# Aquatic Plants

## Surprise Lake Aquatic Plant Survey 2020: *Nitella* (*Nitella*, sp.)



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

Like chara, **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.



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 2020 aquatic plant survey.



**STOP AQUATIC  
HITCHHIKERS!™**

Prevent the transport of nuisance species.  
Clean all recreational equipment.  
[www.ProtectYourWaters.net](http://www.ProtectYourWaters.net)

# 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

## Acknowledgments

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

*Oconto County Lakes and Waterways Association*

*Oconto County Land Conservation Department – Ken Dolata*

*Oconto County Staff and Citizens*

*UW Extension-Oconto County – Dale Mohr*

*Wisconsin Department of Natural Resources – Brenda Nordin & Brian Zalay*

*Wisconsin Department of Natural Resources Lake Protection Grant Program*

*UW-Stevens Point Water and Environmental Analysis Lab*



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

