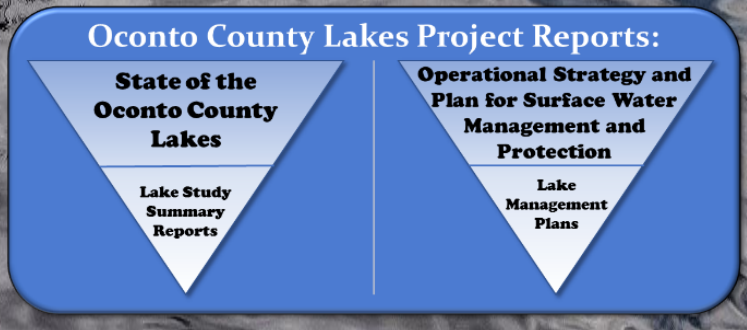
# Oconto County Lakes Project

# CHRISTIE LAKE STUDY

## SUMMARY REPORT

2024




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

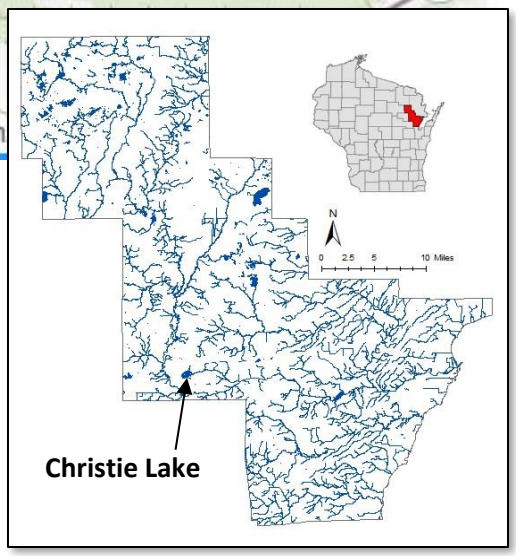
# Background

- Christie Lake is a 398-acre drainage lake in southwest Oconto County with a maximum depth of 10 feet.
- Most water enters Christie Lake through groundwater and surface water runoff and leaves via Christie Brook on the east side leading to the Oconto River southeast of Gillett. Direct precipitation also contributes 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 2022-2023 lake study.

**Township of Gillett**

**Surface Area: 398 acres**

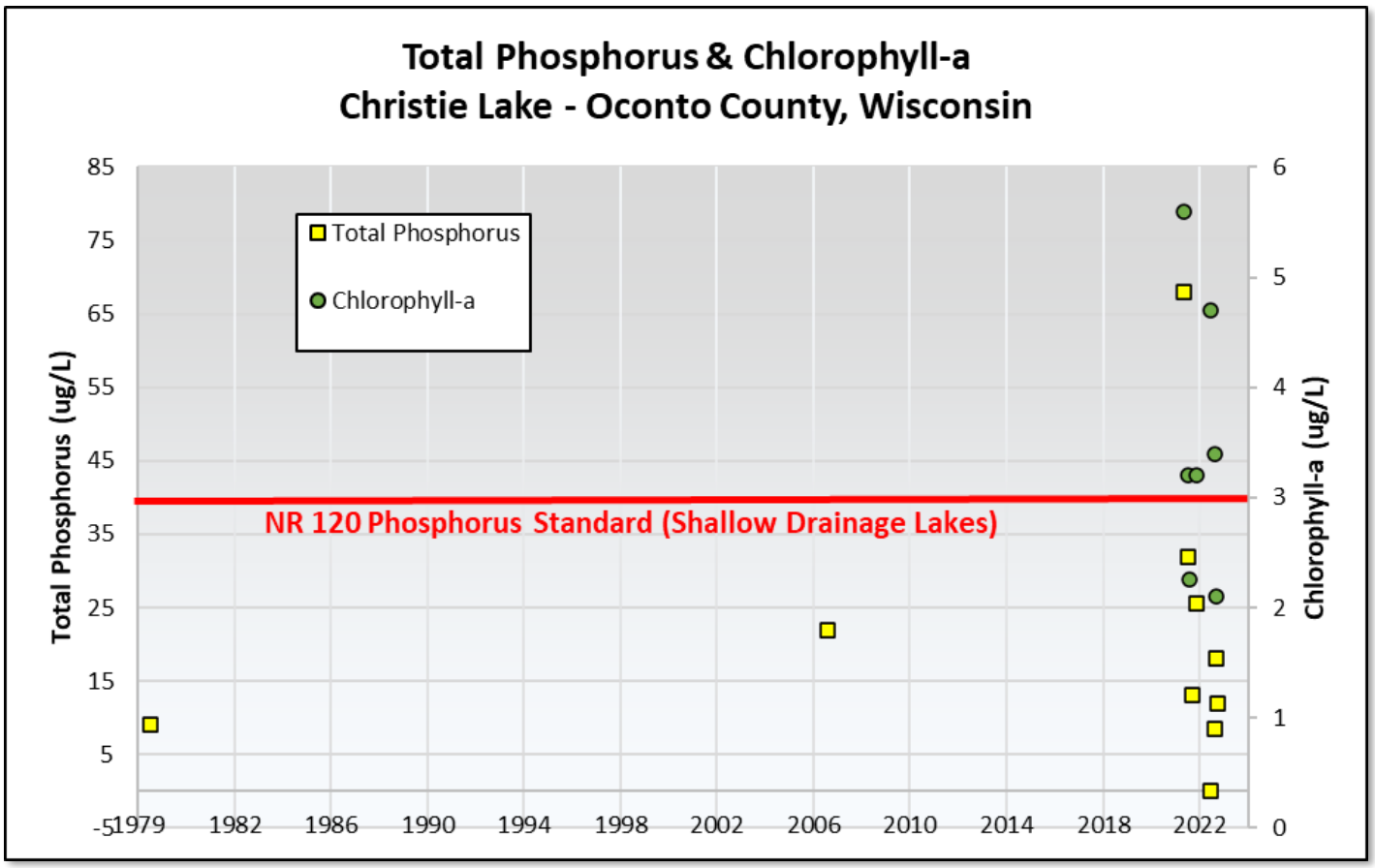
**Maximum Depth: 10 feet**

# Water Quality

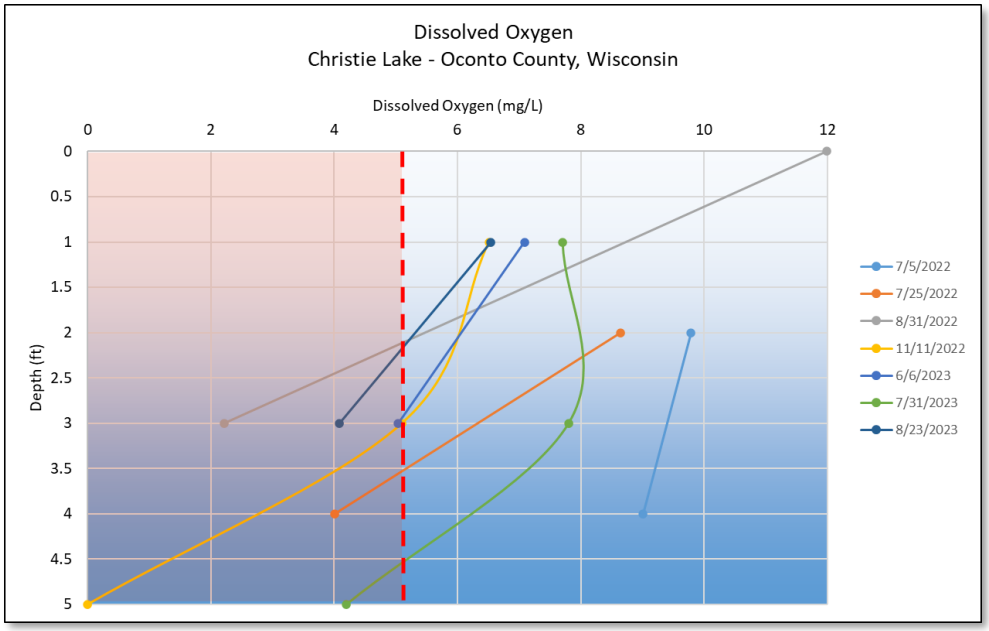
**Nutrients** such as phosphorus and nitrogen are what feed aquatic plants and algae in a lake. Excessive amounts of nutrients delivered to a lake will result in abundant plant and algae growth. Disturbance within a watershed combined with the landscape's inability to infiltrate and filter runoff is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

- Total Phosphorus was above the Wisconsin state standard of 40 ug/L for shallow drainage lakes during the two-year study. The limited dataset does not indicate a clear trend.
- 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 throughout the study.

# Water Quality

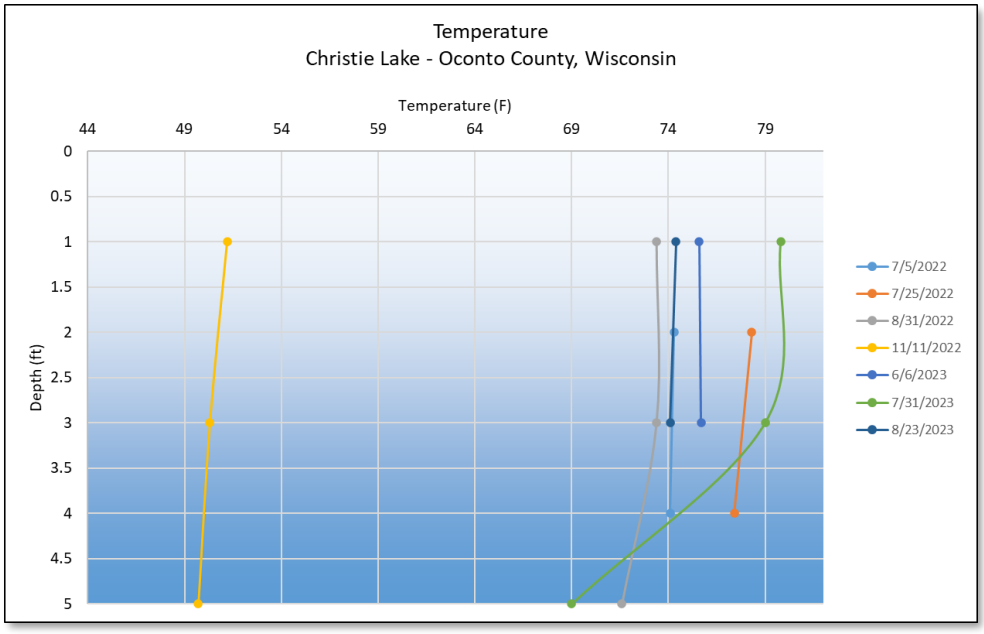
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature,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



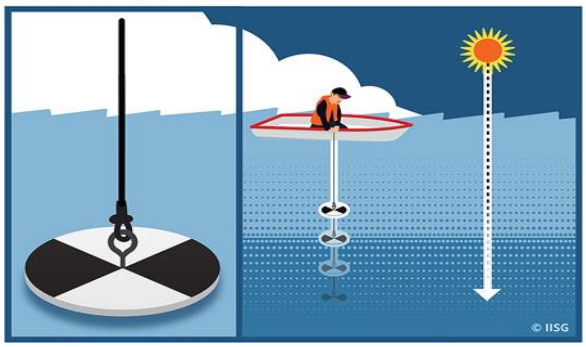

- Sufficient oxygen is available in the water column of Christie Lake through most of the year but may become anoxic in late winter. Generally, the top 2 feet maintains enough oxygen to support most fish species.

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

- Temperature profiles in Christie Lake show similar temperature with depth at each sampling, typical of a shallow, mixed lake.

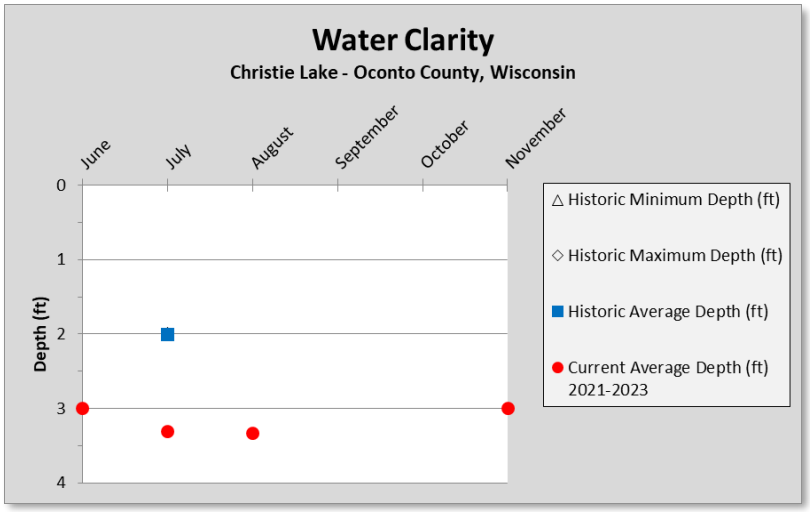


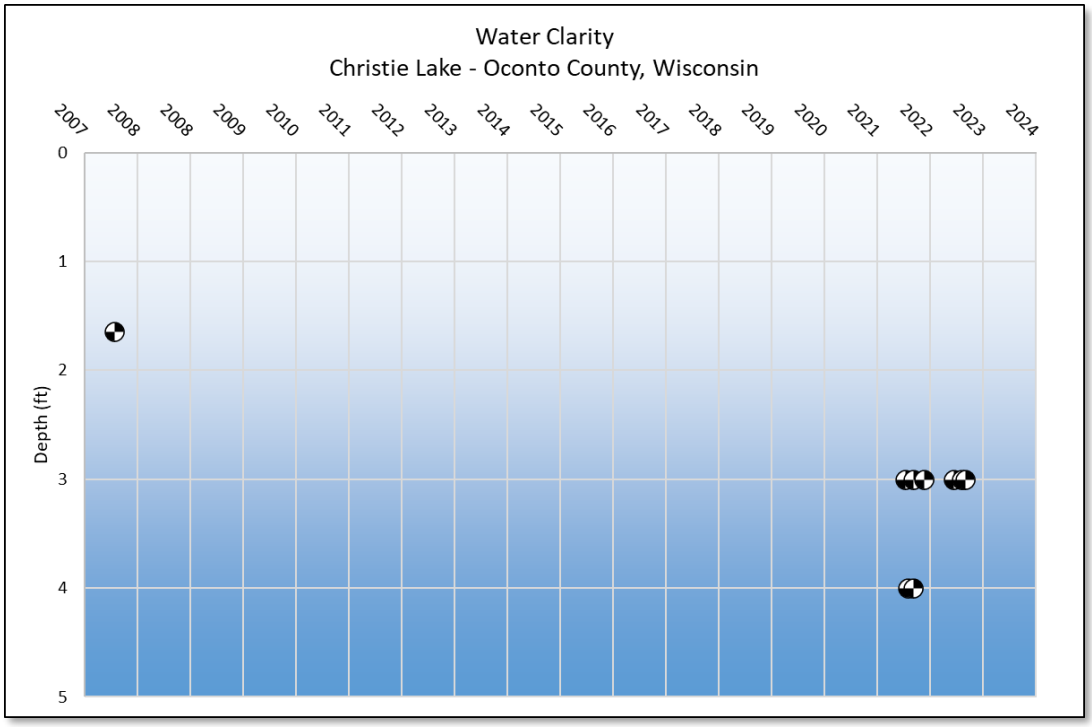
# Water Quality




**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.

- The graphs below show water clarity measurements taken between May and November.
- During 2022-23, water clarity remained similar throughout the season. Very limited data does not allow us to establish a 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.

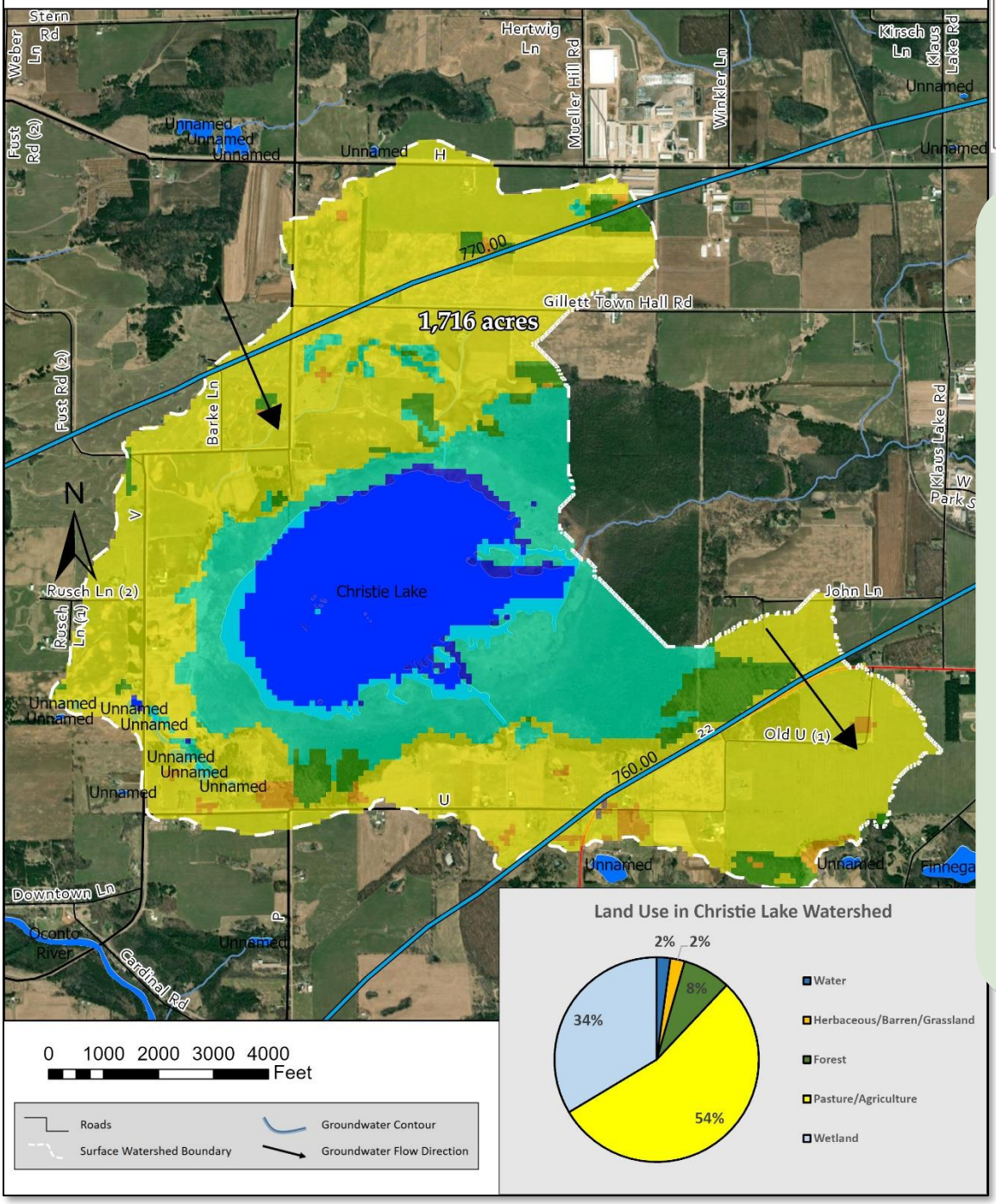
- Concentrations of potassium (5.4 mg/L), chloride (34 mg/L) and sodium (13.8 mg/L) were all high. This suggests impacts from human activity such as septic systems, road salt, animal waste and fertilizers.
- DACT, a screening tool to determine if your lake is being impacted by pesticides, was not detected.
- Water in Christie Lake is hard (178 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.

## Christie Lake Surface Watershed & Groundwater Flow




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.

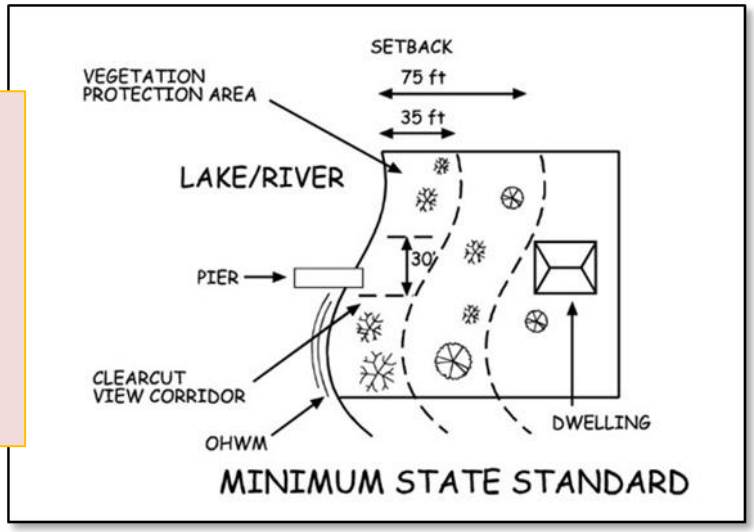
- Shorelands around Christie Lake were surveyed in August 2022. All shoreland areas are undisturbed.

| Total lakefront footage | No. Riparian lots | Measured shoreland disturbance (feet) | Measured shoreland disturbance (%) |
|---|---|---|---|
| 8,721 | 10 | 0 | 0% |


**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:

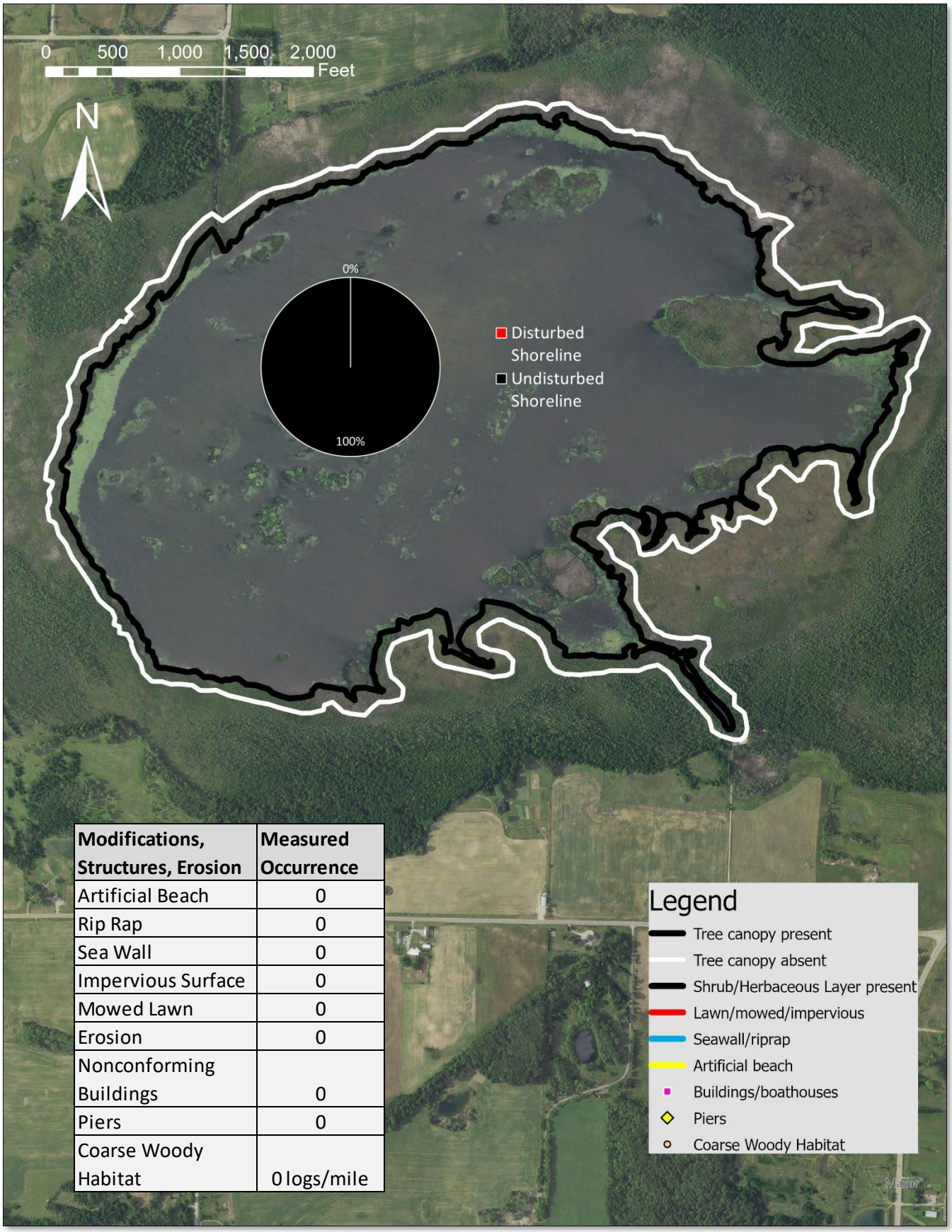
- Up to 30% of shoreline may be removed of shrubs and trees for a view corridor
- A mowed or constructed pedestrian path up to 5 feet wide to access lake




**What Can You Do To Help Christie 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

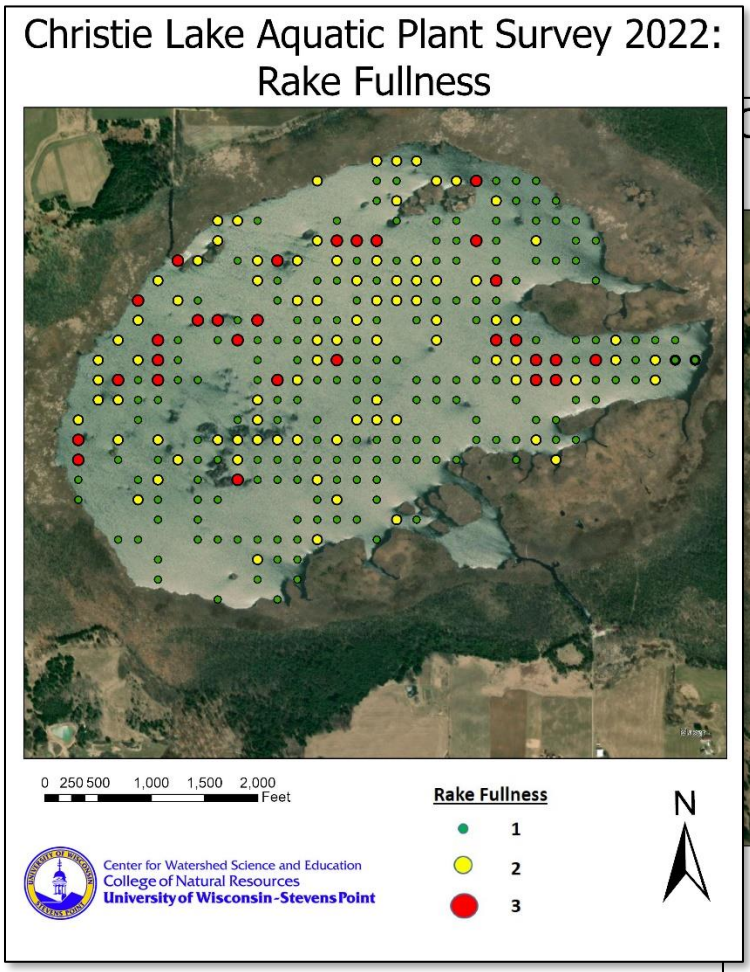


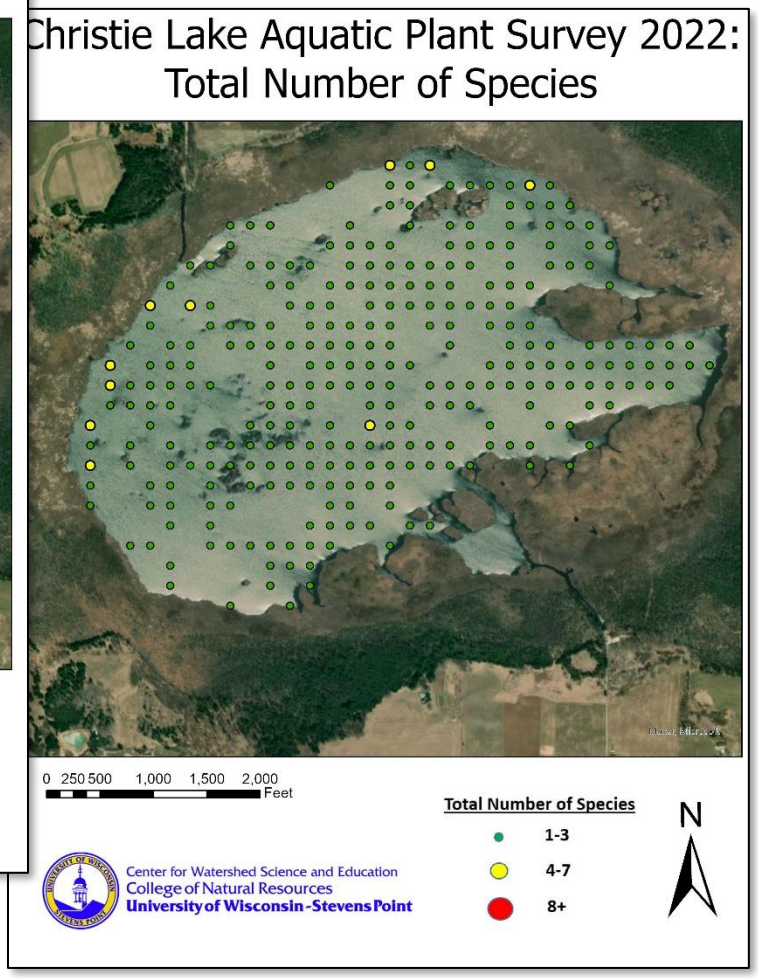

| Modifications, Structures, Erosion | Measured Occurrence |
|---|---|
| Artificial Beach | 0 |
| Rip Rap | 0 |
| Sea Wall | 0 |
| Impervious Surface | 0 |
| Mowed Lawn | 0 |
| Erosion | 0 |
| Nonconforming Buildings | 0 |
| Piers | 0 |
| Coarse Woody Habitat | 0 logs/mile |

# Aquatic Plants

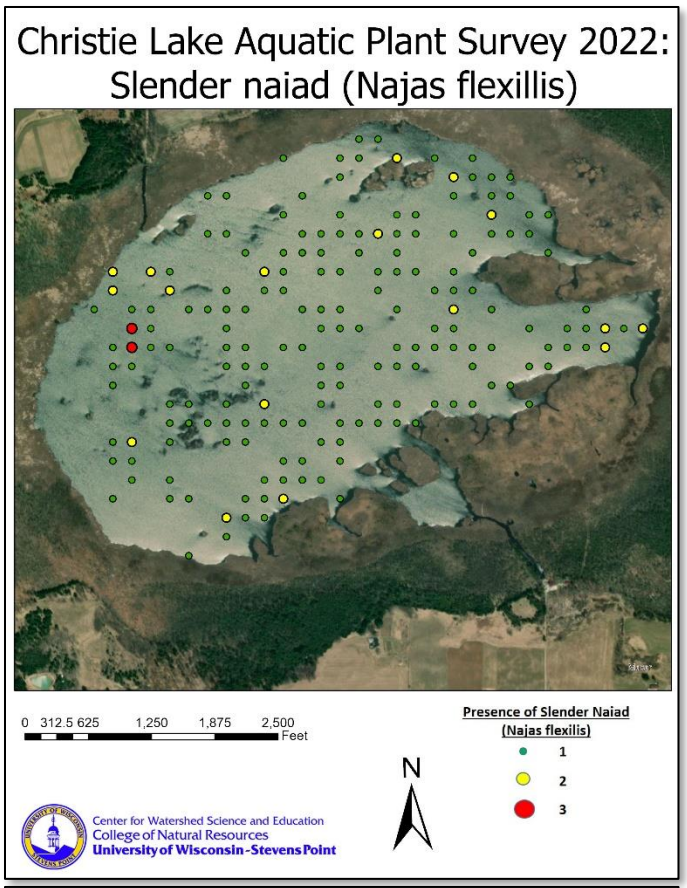
**Aquatic plants** are the forest landscape within a lake. They provide food and habitat for terrestrial and aquatic creatures such as fish, ducks, turtles, invertebrates and other animals. They increase oxygen levels in the water and utilize nutrients that would otherwise be used by algae. A healthy 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 Christie 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 19 species in the 2022 survey.
- During the 2022 aquatic plant survey of Christie Lake, 69% of visited sites had vegetative growth. The maximum depth of vegetation was 5 feet and the Floristic Quality Assessment (FQI) was 22.5.
- The most frequently encountered plant species were slender naiad (65%), chara (39%), white water lily (25%).
- No invasive species were observed.

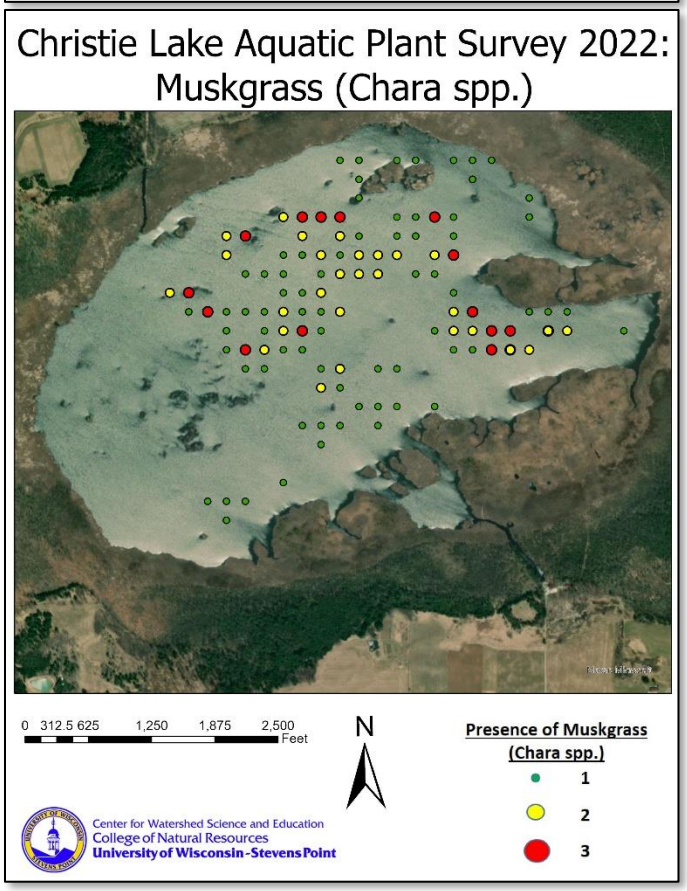


# Aquatic Plants

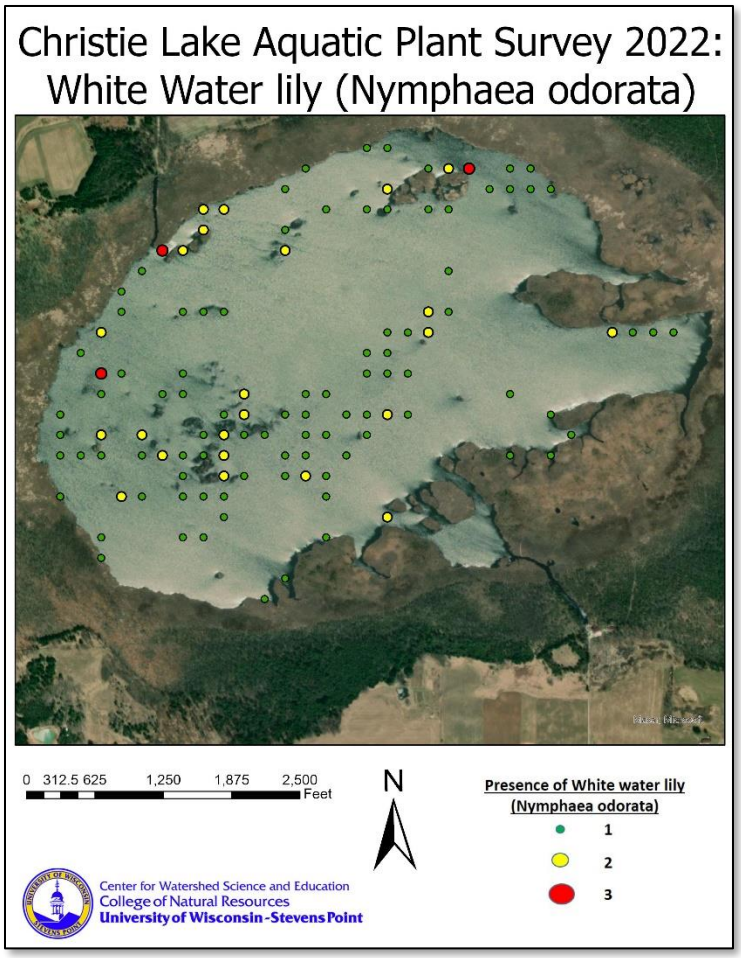



**Slender naiad,** also called nodding water-nymph, is a primary food source for waterfowl and provides habitat for many invertebrates.


**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.

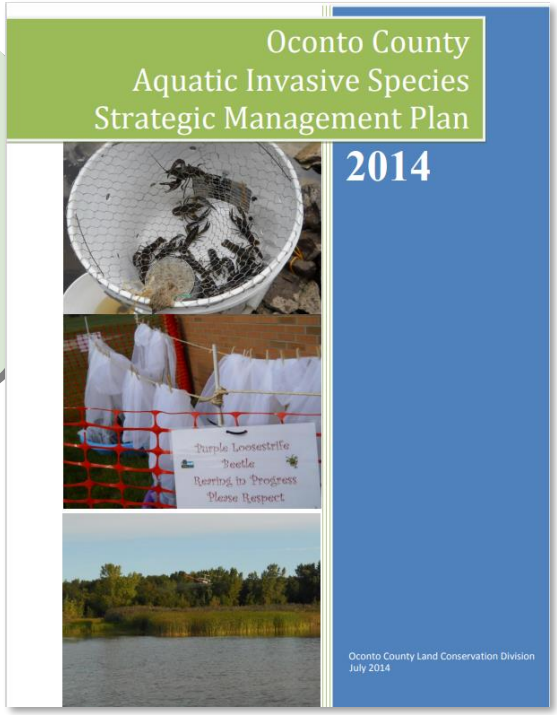
# Aquatic Plants




**White water lily** has round stalks that grow up from a rhizome in the sediment connecting to large round floating leaves. By mid-summer, white flowers also float at the surface. Lilies are important cover for fish, are food by many species, and help prevent erosion by slowing wave action.


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 have been documented in Christie Lake.

# 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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