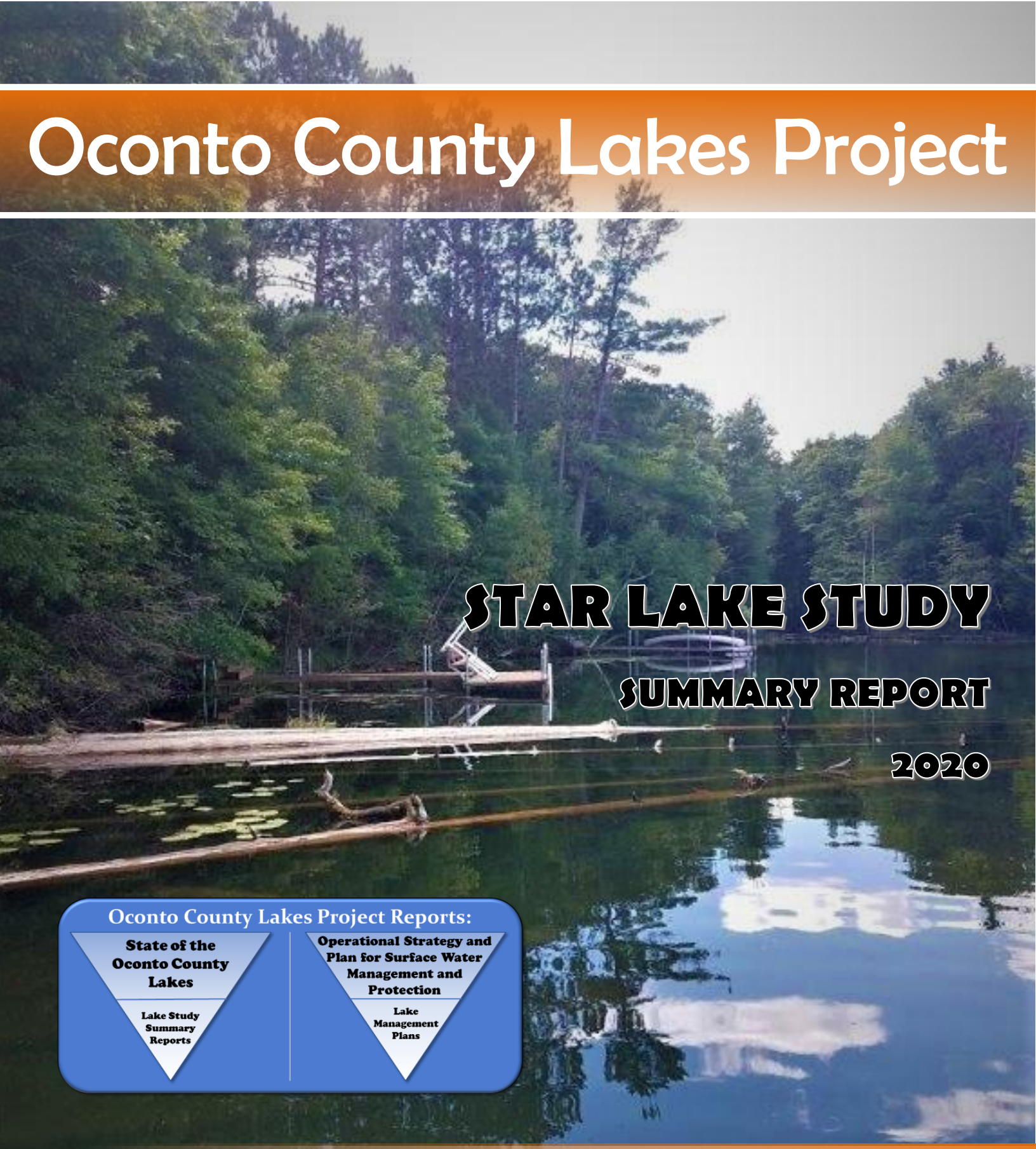
Oconto County Lakes Project



STAR LAKE STUDY

SUMMARY REPORT

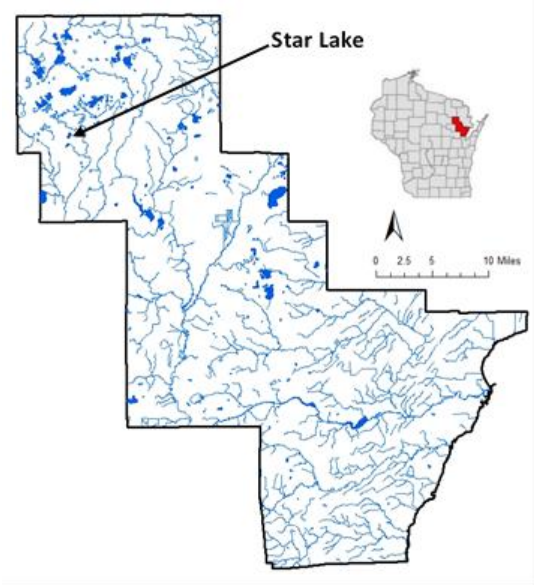
2020

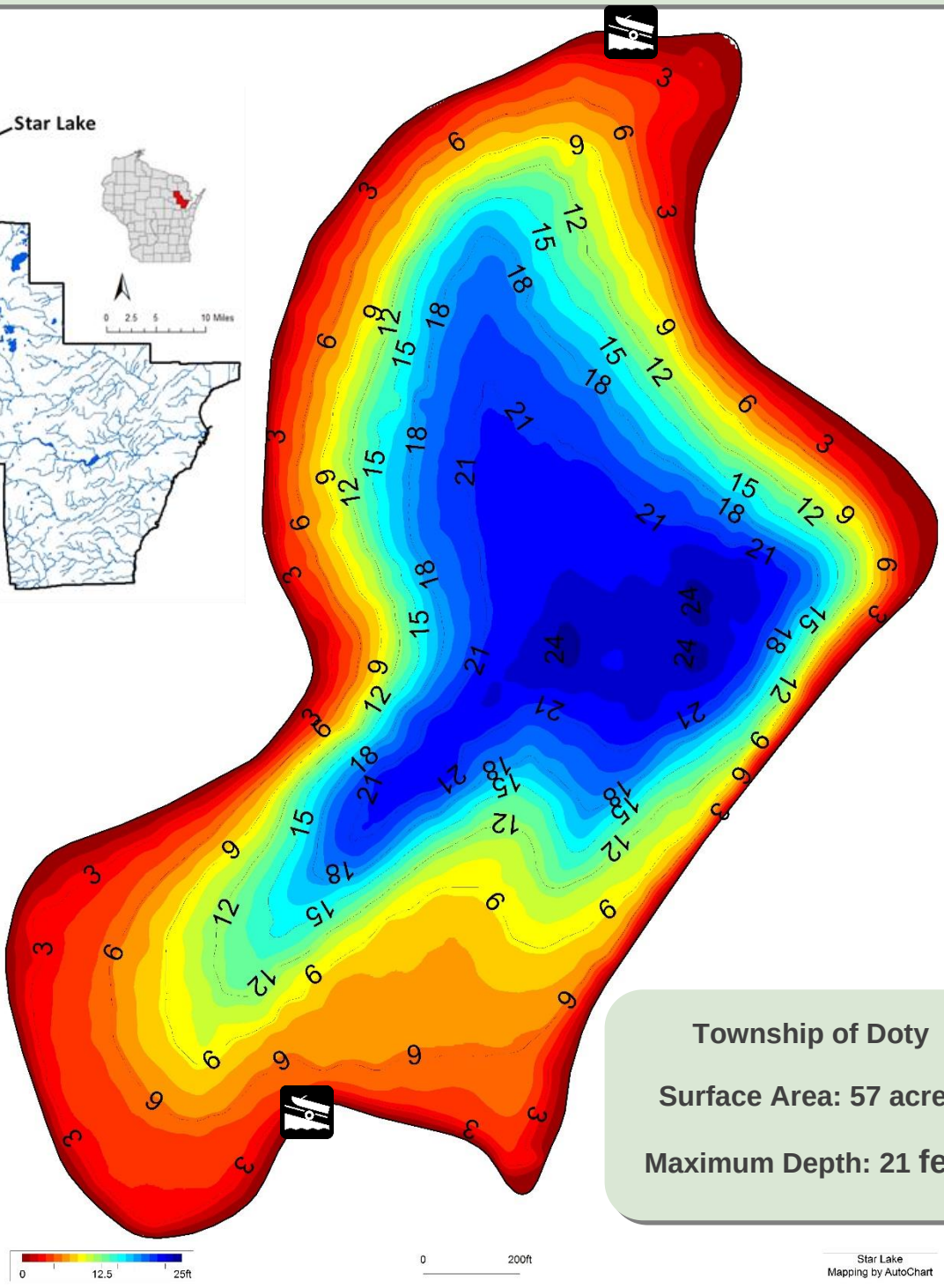
Oconto County Lakes Project Reports:

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

Background

- Star Lake is a 57-acre seepage lake in northern Oconto County with a maximum depth of 21 feet.
- Most water enters Star Lake via groundwater with a retention time of about 1 year. Surface water runoff and direct precipitation also contribute water.
- Visitors have access to the lake from two public boat landings located on the lake's north and south side.
- This report summarizes data collected during the 2018-2019 lake study.





Township of Doty

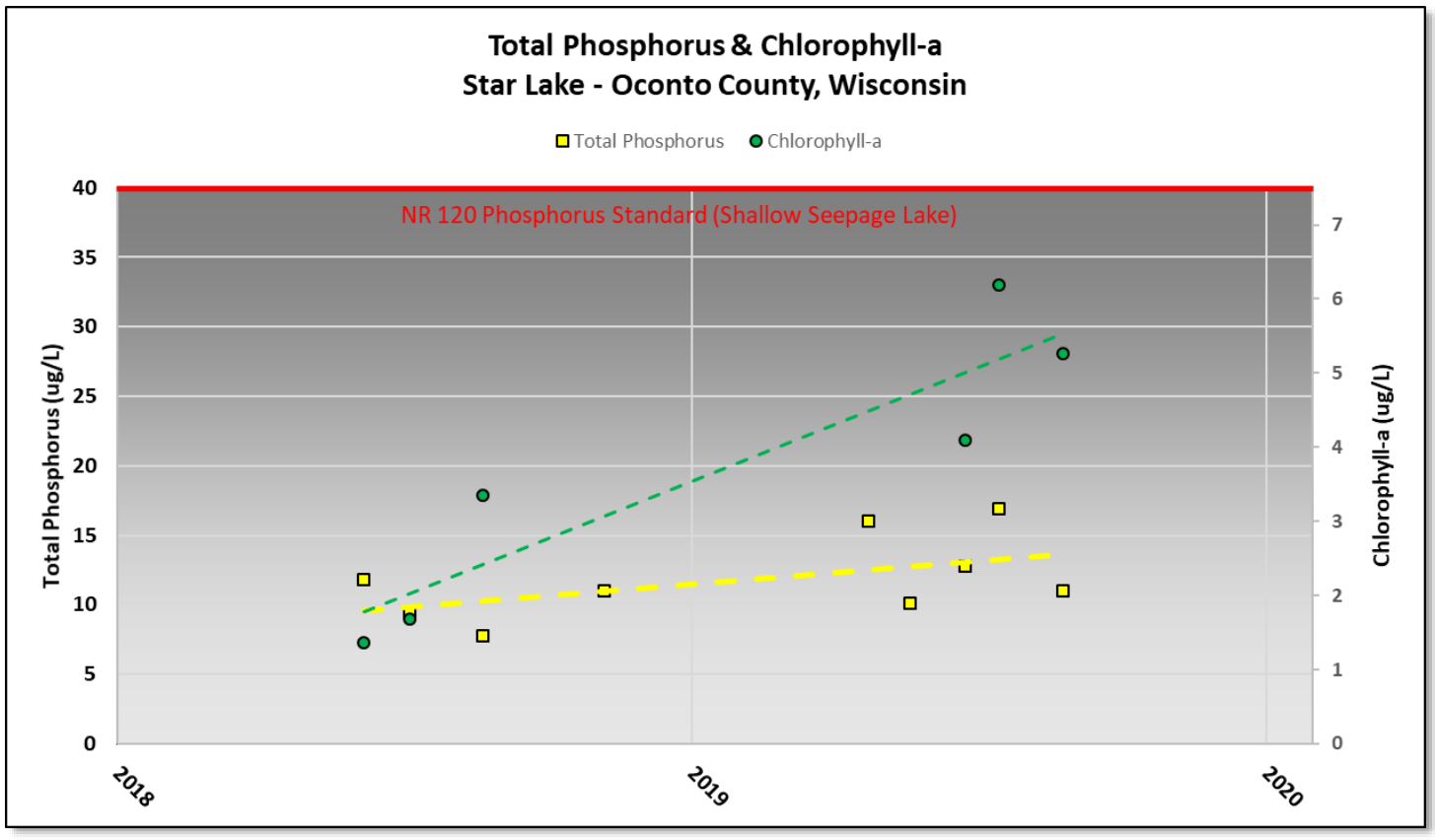
Surface Area: 57 acres

Maximum Depth: 21 feet

Water Quality

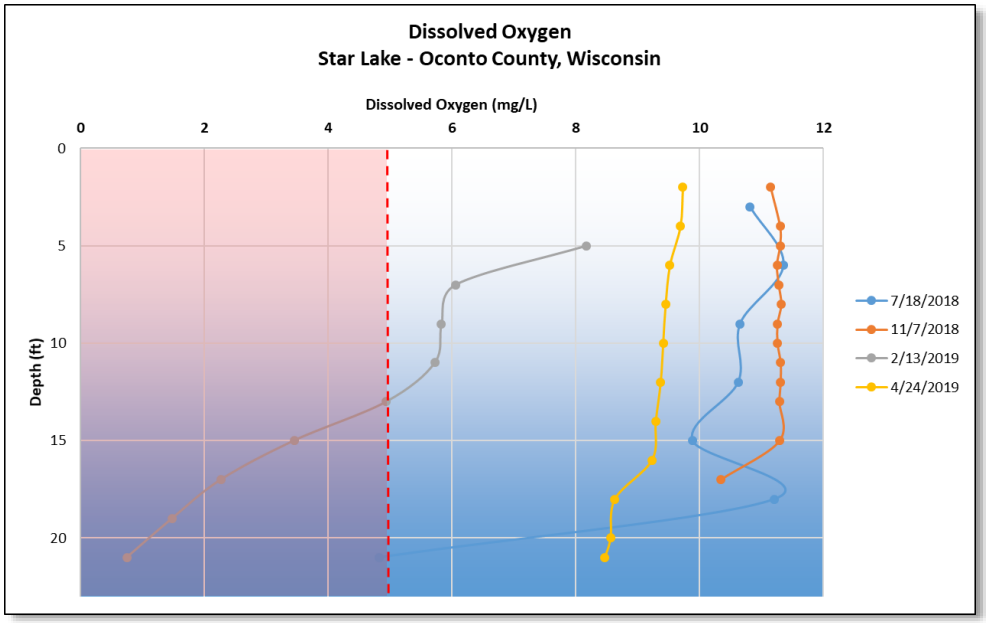
Nutrients such as phosphorus and nitrogen are what feed aquatic plants and algae in a lake. Excessive amounts of nutrients delivered to a lake will result in abundant plant and algae growth. Disturbance within a watershed combined with the landscape's inability to infiltrate and filter runoff is what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

- Total Phosphorus was consistently **below** the Wisconsin state standard of 40 ug/L for shallow seepage lakes during the two-year study. The study period trend (based on summer samples) suggests a slightly increasing average concentration. Additional monitoring is needed to establish a trend.
- Inorganic nitrogen was right around (0.29 mg/L and 0.45 mg/L) the threshold of 0.3 mg/L when algal blooms increase.
- Chlorophyll-a, an indirect measure of algae, periodically exceeds the threshold of 6 ug/L and appears to be increasing over the two-year study period.



Water Quality

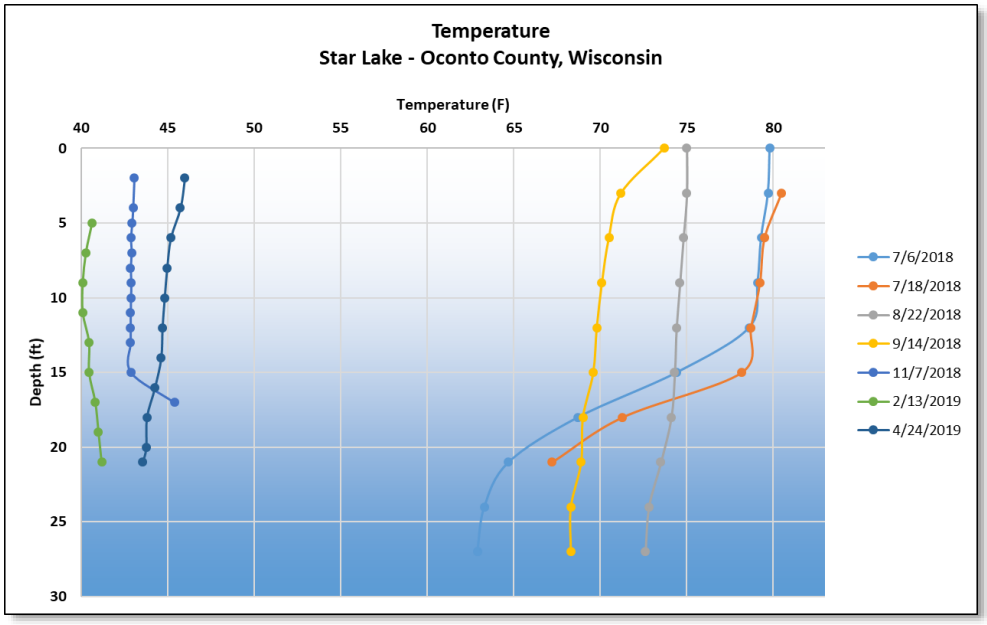
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature,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



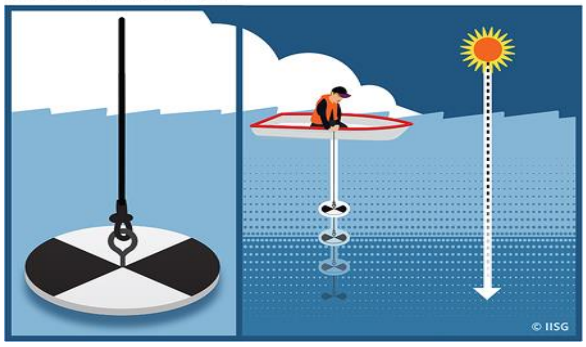
- Sufficient oxygen is available in the water column of Star Lake throughout the year. The lowest concentrations were observed in late winter when only the top 12 feet has enough oxygen to support most fish species.
- An algae bloom is evidenced by increased dissolved oxygen concentrations at depth (15-17 ft) in July.

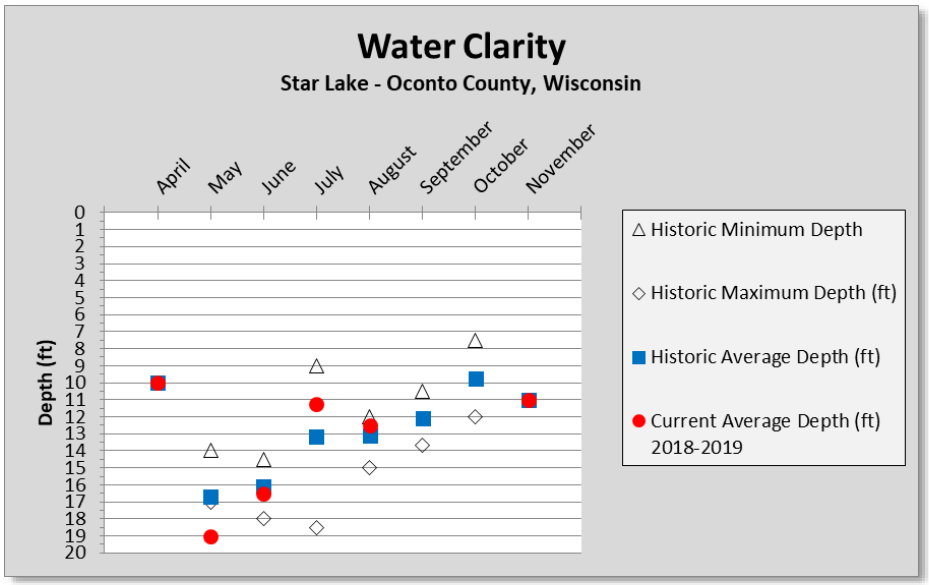
Lake water **temperature** has a significant impact on water chemistry, spatial distribution of fish, microbial growth and oxygen content.

- The temperature gradient in Star Lake is typical of a shallow, mixed lake most of the year with a weak thermocline developing between 15-20 feet in the hottest months (late July).



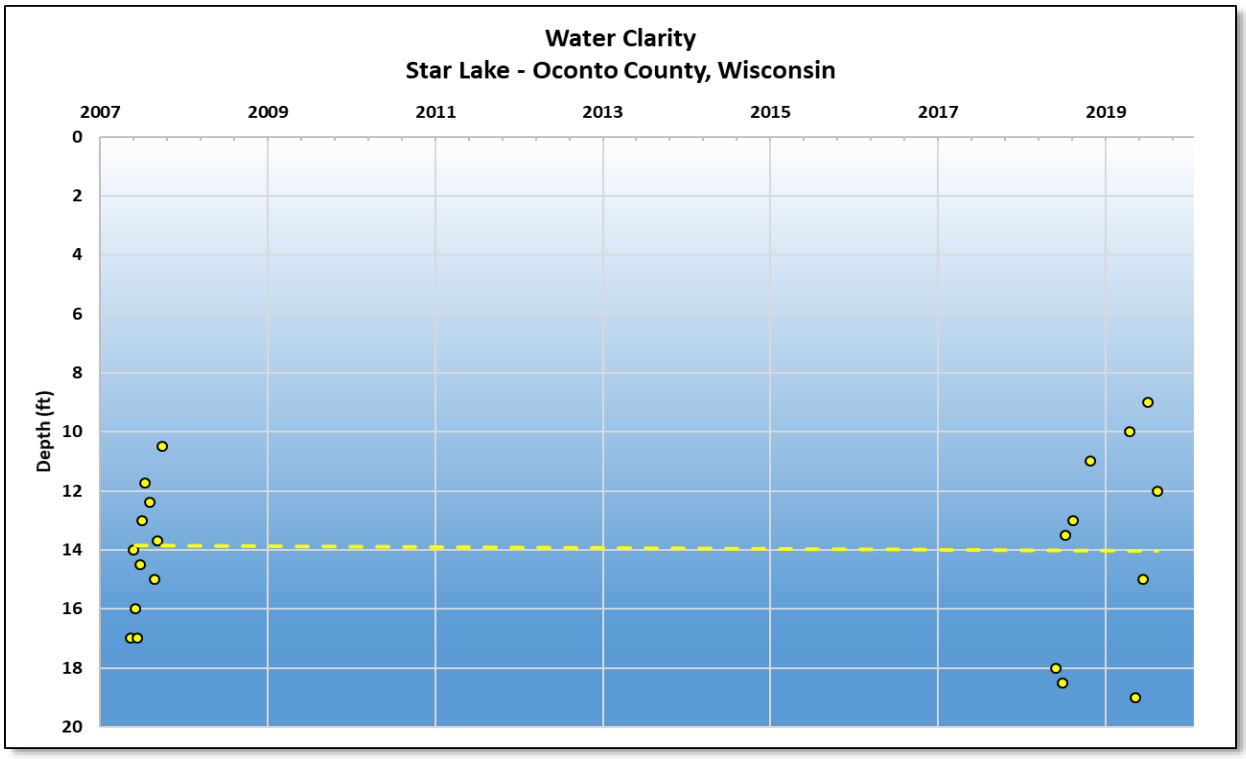
Water Quality





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 April and November.
- During 2018-19, on average, the poorest water clarity in Star Lake was in July and the best was in May. This is somewhat consistent with previous observations and demonstrates a very flat, stable trend over the past 12 years.



Water Quality

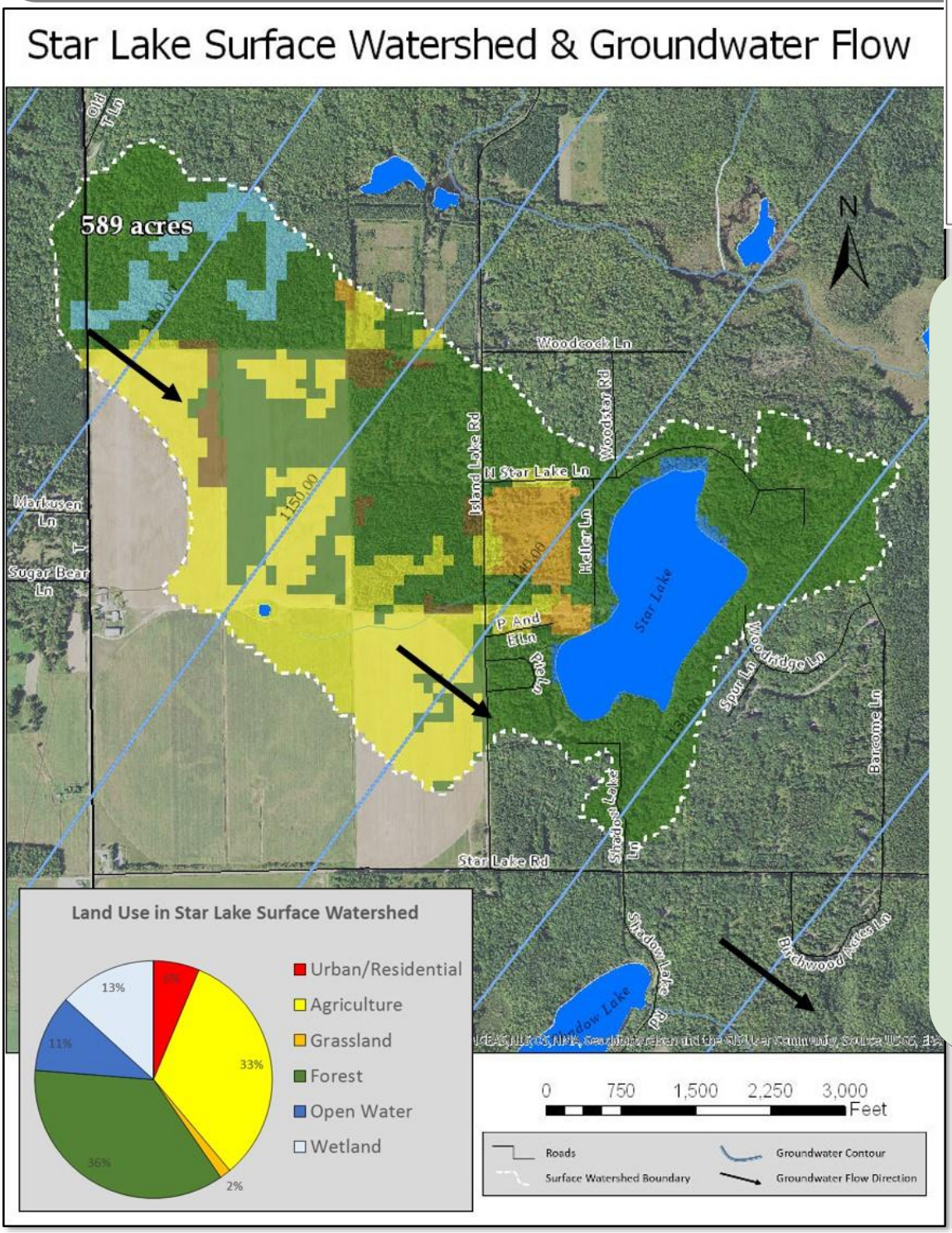
Other chemistry data was collected from lake water samples, such as basic cations, pollutants and acid rain input, and physical parameters. Results of such analyses can provide insights into a variety of other potential impacts to the lake. While concentrations of these compounds in lake water is usually low, higher concentrations can be indicators of other potential issues.

- Concentrations of potassium (1.21 mg/L), chloride (4.1 mg/L) and sodium (1.87 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 Star Lake is moderately hard (73 mg/L CaCO3), having a slightly elevated level of dissolved minerals. These minerals tend to bind with phosphorus reducing their availability 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.



WHEN IT RAINS IT DRAINS

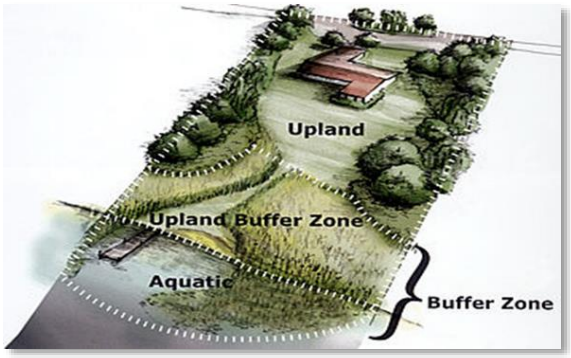
The quality of lake water reflects what is happening on the land surface. Precipitation falling on forests produces clean groundwater, whereas precipitation falling on land that has chemical use can produce runoff and groundwater that contains these chemicals. Groundwater contamination may include nitrogen, 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 Shay Lake were surveyed in July 2018. Some of Star 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 (%)
8,365	53	4,712	56%

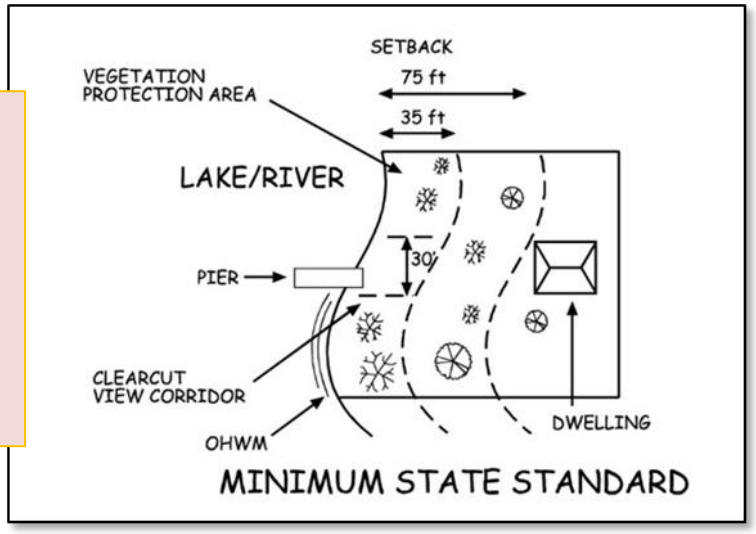


State Shoreland Zoning Ordinance

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

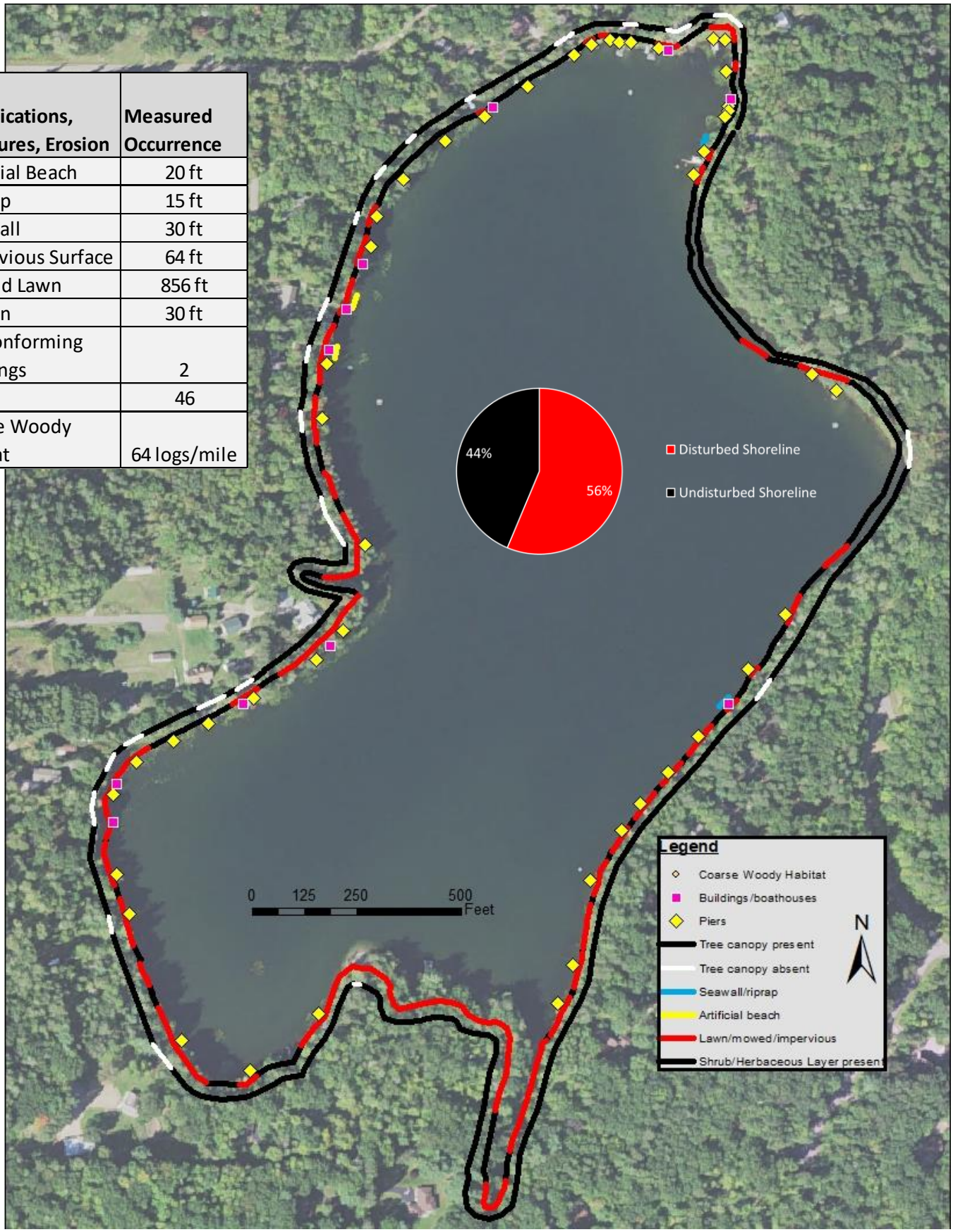


What Can You Do To Help Star Lake?

- ✓ 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

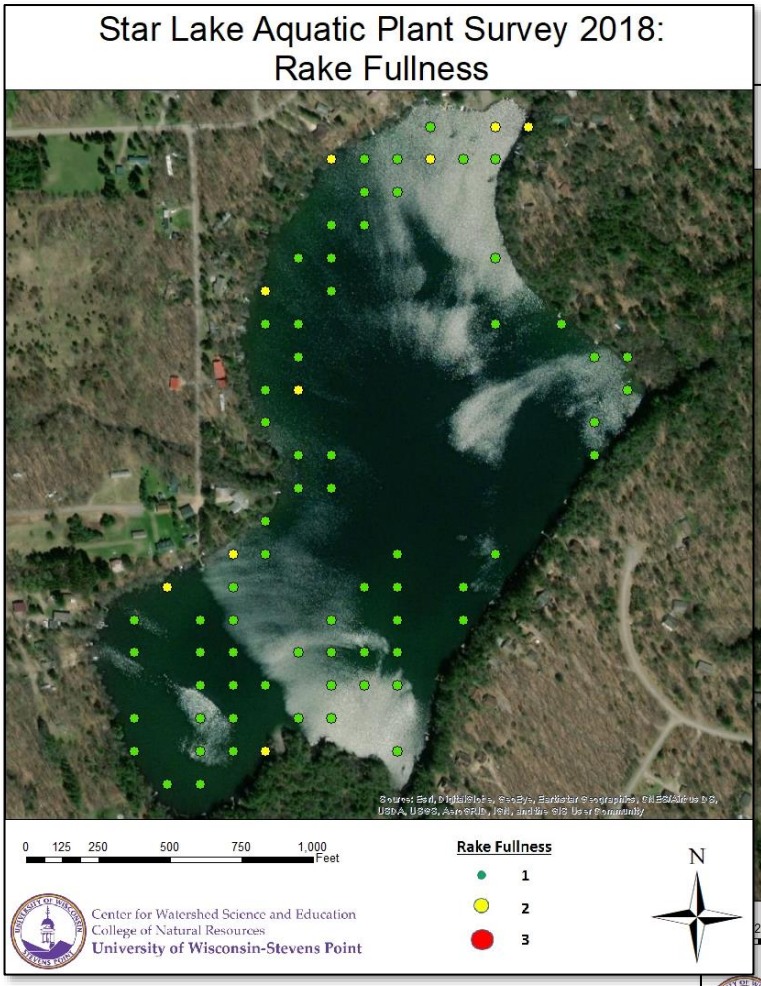
Modifications, Structures, Erosion	Measured Occurrence
Artificial Beach	20 ft
Rip Rap	15 ft
Sea Wall	30 ft
Impervious Surface	64 ft
Mowed Lawn	856 ft
Erosion	30 ft
Nonconforming Buildings	2
Piers	46
Coarse Woody Habitat	64 logs/mile

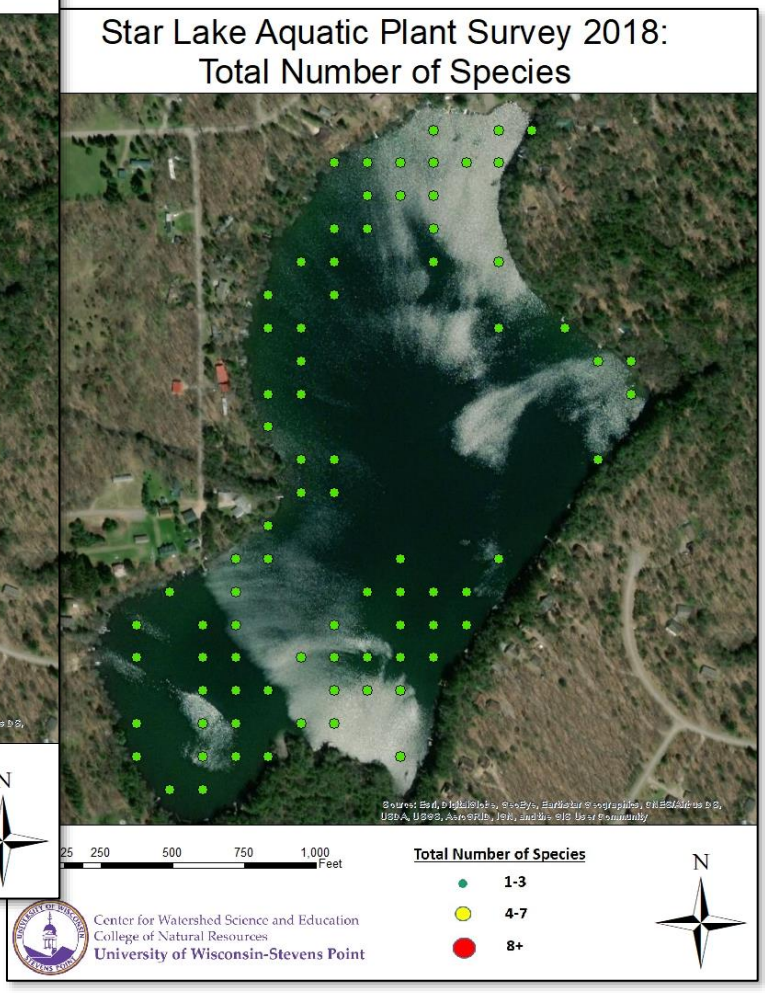


Aquatic Plants

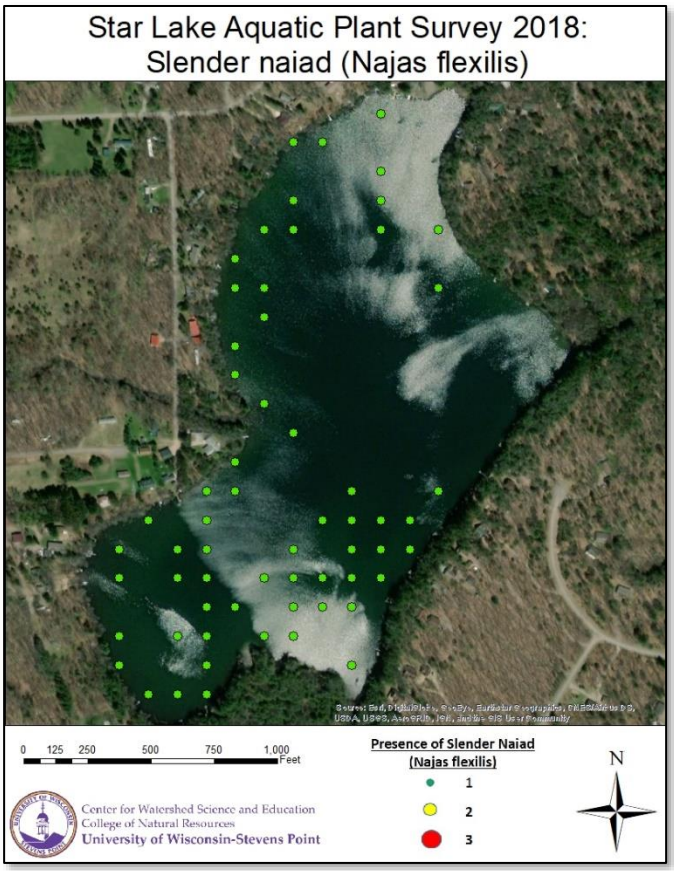
Aquatic plants are the forest landscape within a lake. They provide food and habitat for terrestrial and aquatic creatures such as fish, ducks, turtles, invertebrates and other animals. They increase oxygen levels in the water and utilize nutrients that would otherwise be used by algae. A healthy lake 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 Star Lake is characterized by below-average diversity of plant species when compared to other lakes in the Oconto County Lakes Project, with a total of 17 species in the 2018 survey.
- During the 2018 aquatic plant survey of Star Lake, 44% of the visited sites had vegetative growth. The maximum depth of vegetation was 16.5 feet.
- The most frequently encountered plant species were slender naiad (73%), stiff pondweed (14%), and flat-stem pondweed (12%). All three species are native to Wisconsin.
- No invasive species were observed.

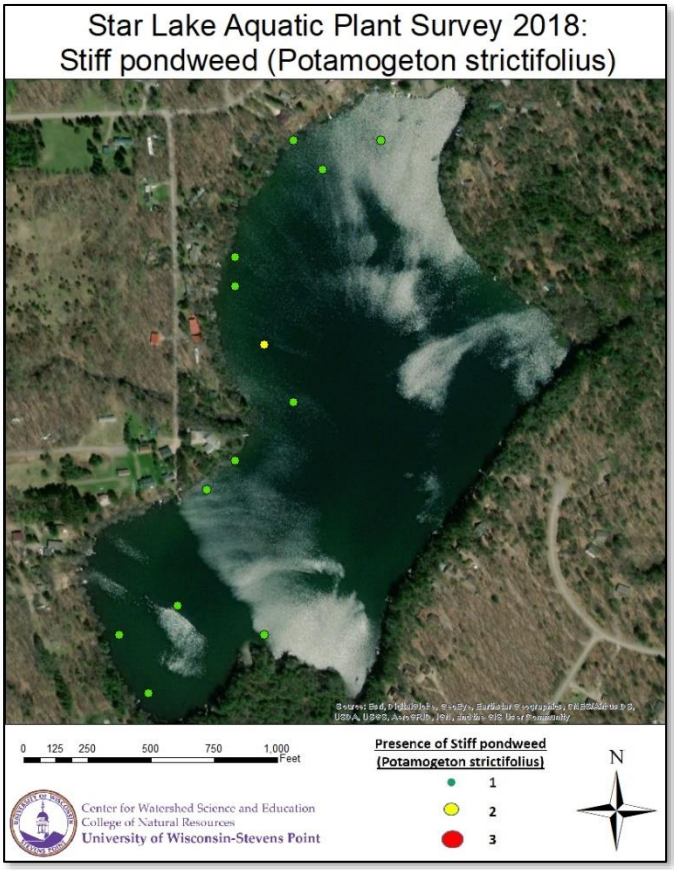




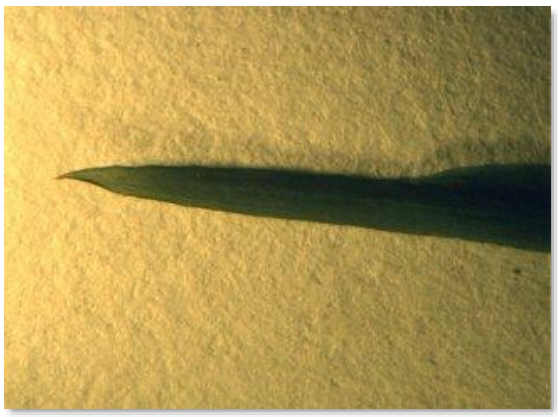
Aquatic Plants



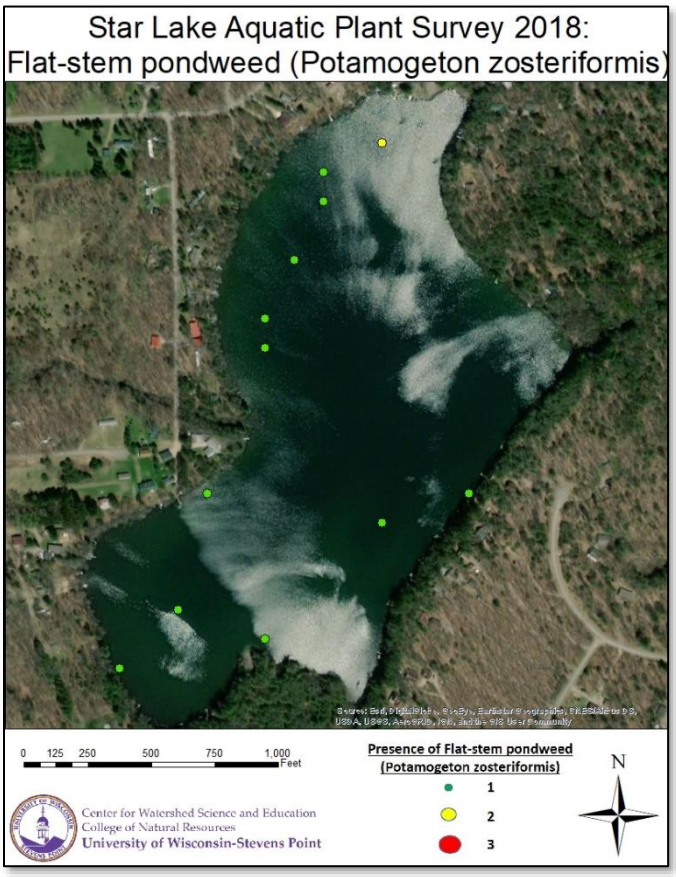
Slender naiad, also called nodding water-nymph, is a primary food source for waterfowl and provides habitat for many invertebrates.



Stiff pondweed, or narrow-leaved pondweed, is an important food source for fish, waterfowl and some mammals.



Aquatic Plants



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 **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 2018 survey.
- ✓ Banded mystery snail (2010 and ornamental water lilies (2016) have been documented in Star 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.

Ornamental water lilies, having escaped private ponds, are non-native lilies that aggressively root in the substrate and crowd out native species, disrupting habitat and the food chain.

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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