



Oconto County Lakes Project



COOLEY LAKE STUDY

SUMMARY REPORT

2021

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**

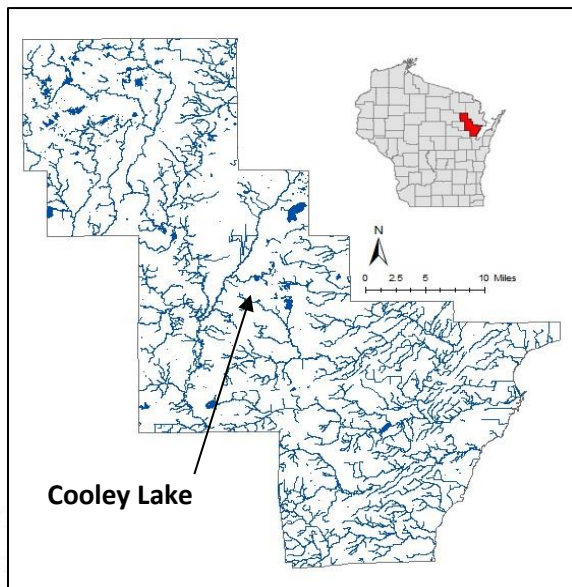
**Lake
Management
Plans**



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College of Natural Resources
University of Wisconsin - Stevens Point

Background

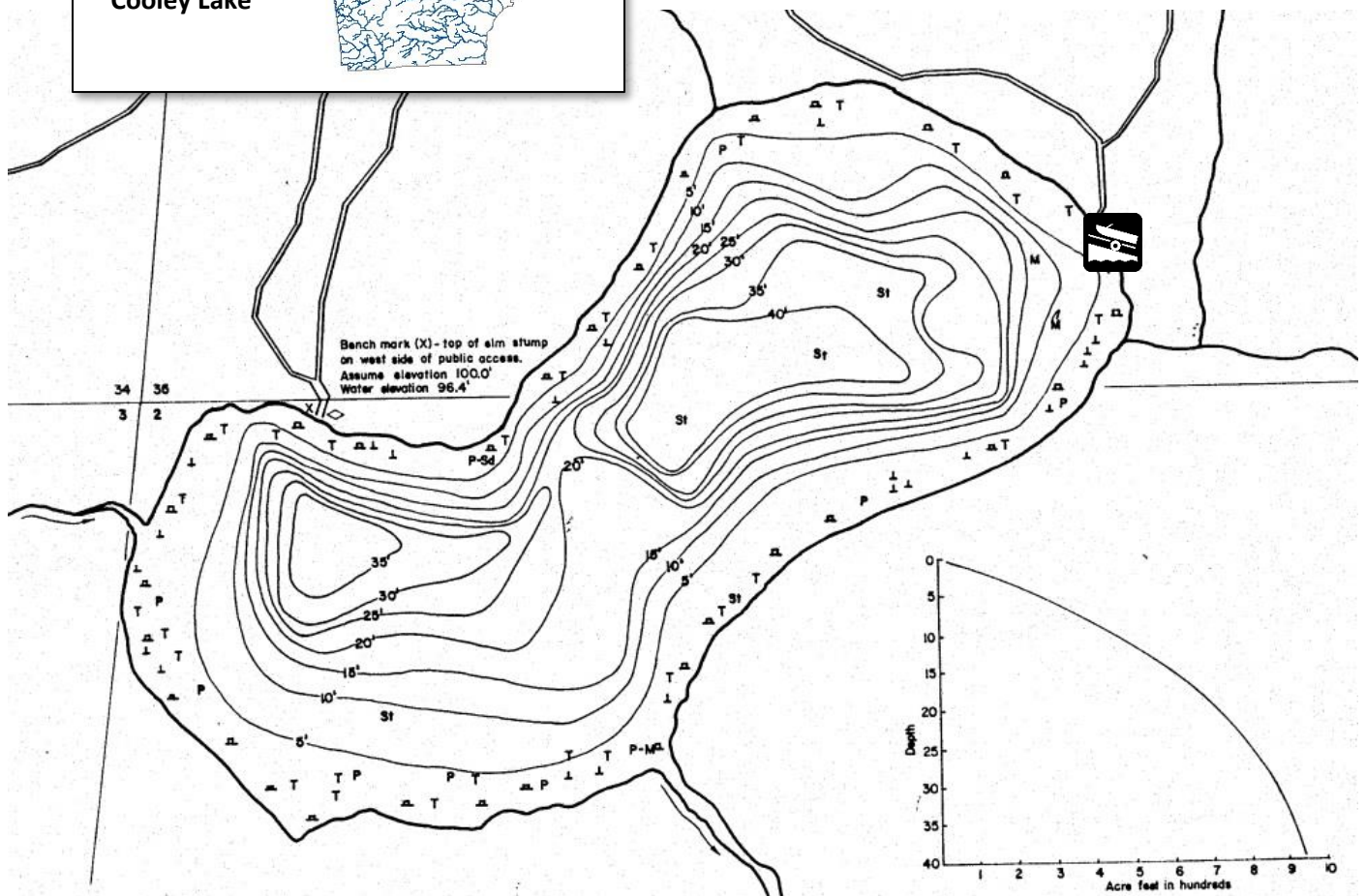
- Cooley Lake is a 62-acre drainage lake in central Oconto County with a maximum depth of 42 feet.
- Most water enters and leaves Cooley Lake via groundwater and Kelly Brook which enters on the west and leaves on the southeast side of the lake. Surface water runoff and direct precipitation also contribute water.
- Visitors have access to the lake from one public carry-in access located on the lake's east side.
- This report summarizes data collected during the 2019-2020 lake study.



**Townships of Bagley &
Maple Valley**

Surface Area: 62 acres

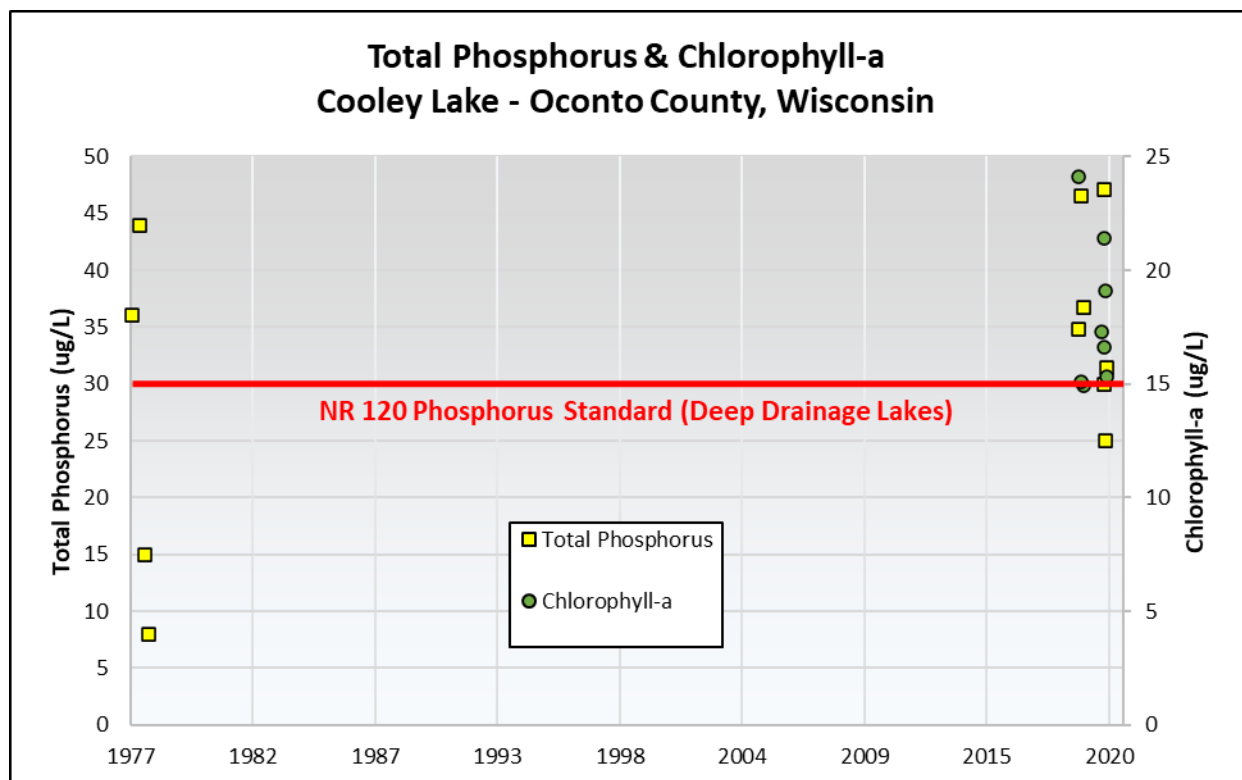
Maximum Depth: 42 feet



Water Quality

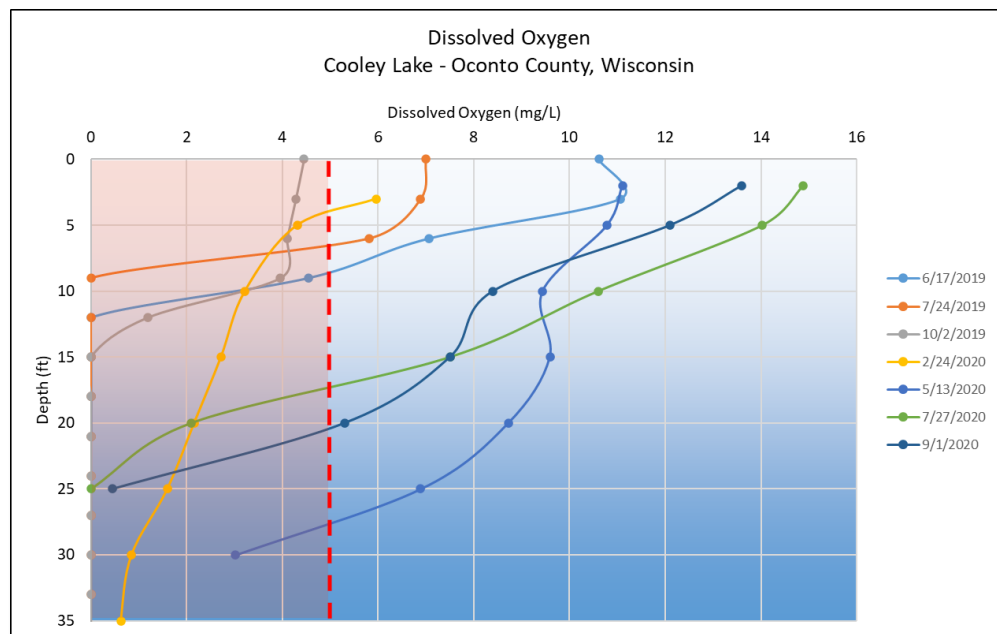
Nutrients such as phosphorus and nitrogen are what feed aquatic plants and algae in a lake. Excessive amounts of nutrients delivered to a lake will result in abundant plant and algae growth. Disturbance within a watershed combined with the landscape's inability to infiltrate and filter runoff is what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

- Total Phosphorus was routinely **above** the Wisconsin state standard of 30 $\mu\text{g/L}$ for deep drainage lakes during the two-year study. Too little data is available to determine a long-term trend.
- Inorganic nitrogen remained below the threshold of 0.3 mg/L when algal blooms increase.
- Chlorophyll-a, an indirect measure of algae, exceeded the threshold of 6 $\mu\text{g/L}$ in all samples. Not enough data is available to determine a trend.



Water Quality

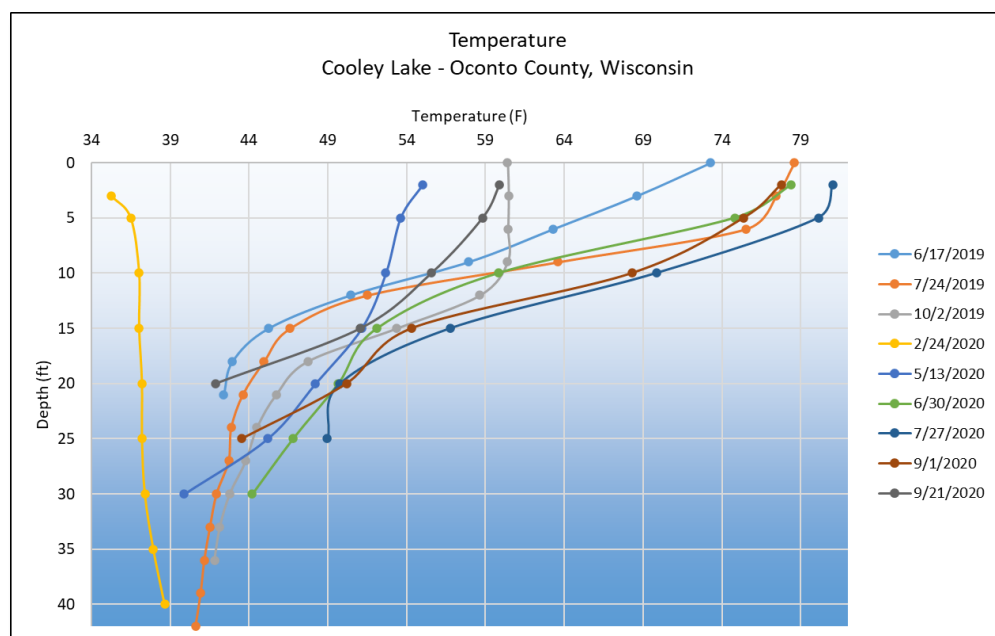
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature,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



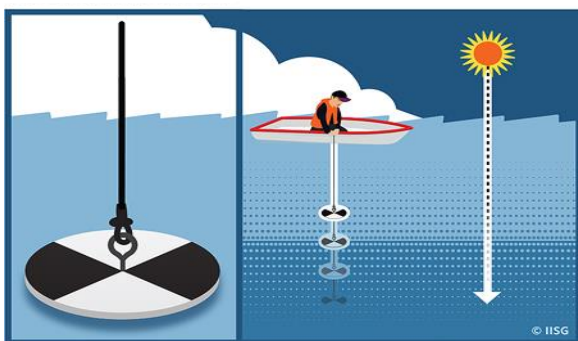
➤ Dissolved oxygen concentrations periodically go below the threshold of 5 mg/L, where many fish species become stressed or can't survive, in most parts of the water column. Fall and winter concentrations, when aquatic plants die off and decay are particularly low, making this lake susceptible to fish kills.

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

➤ The temperature gradient in Cooley Lake shows a clear thermocline between 10 and 20 feet, typical of a deep lake.

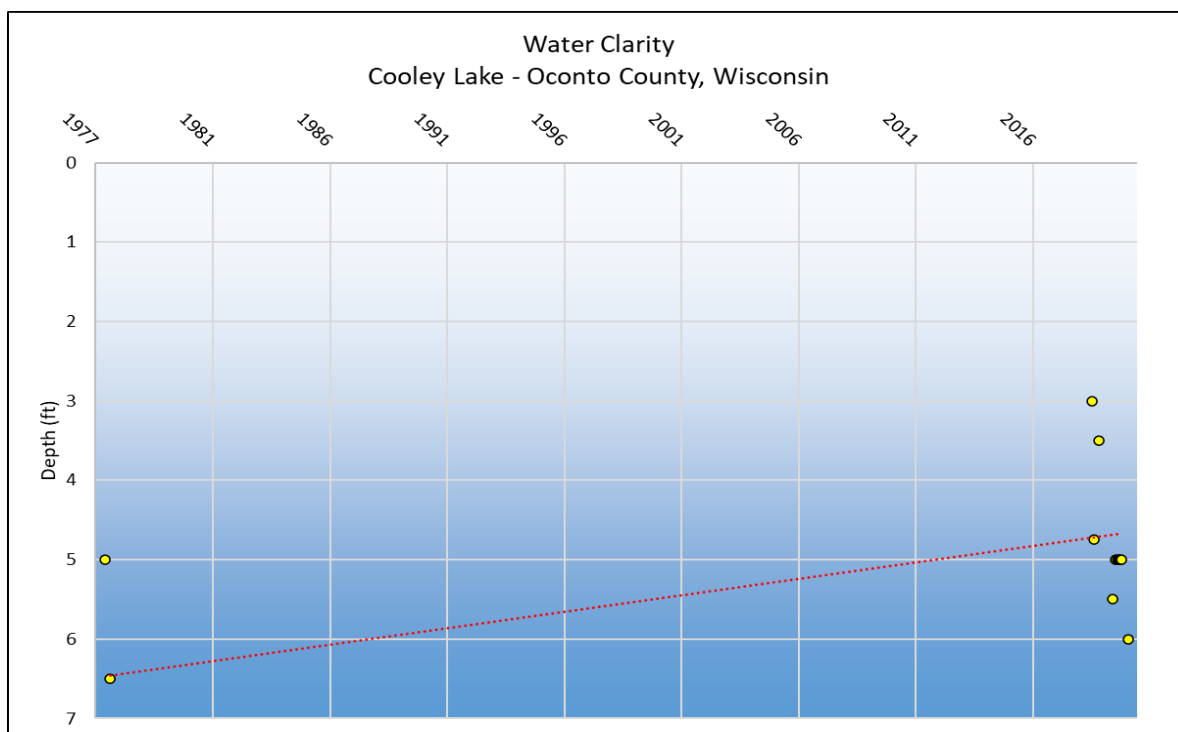
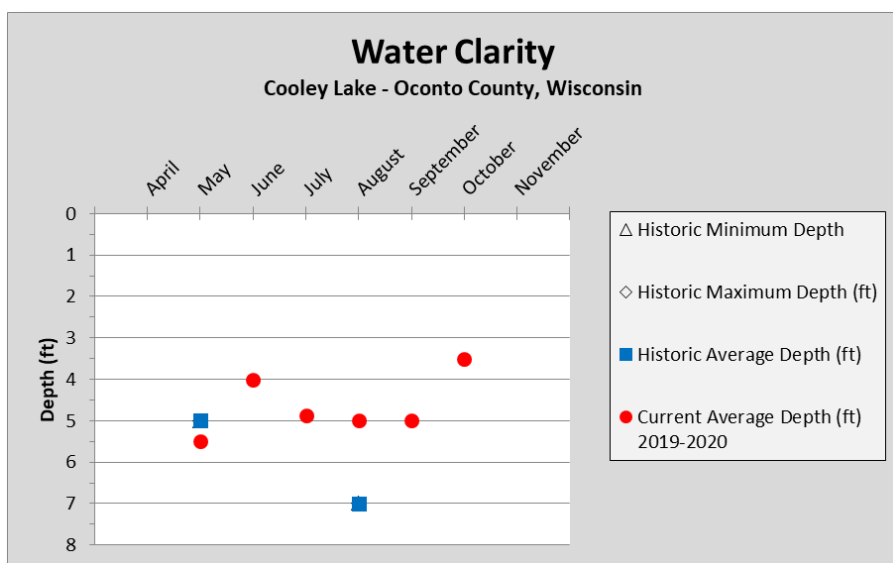


Water Quality



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 graph below shows water clarity measurements taken between April and November.
- During 2019-20, on average, the poorest water clarity was in June and October and the best was in May. Compared to historic measurements, this suggests a decreasing trend (based on limited data).



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.

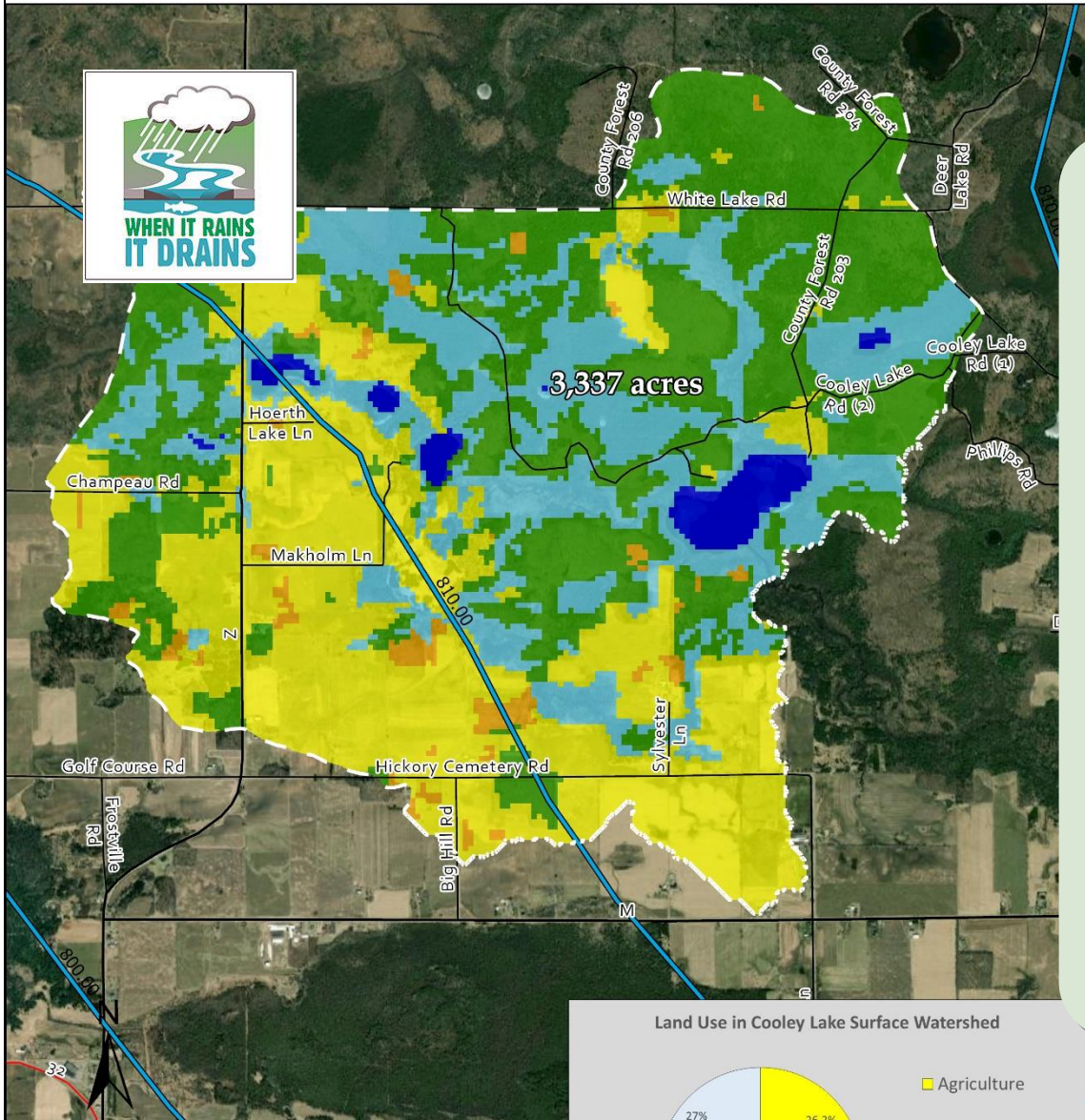
- Concentrations of potassium (2.2 mg/L), chloride (1.75 mg/L) and sodium (2 mg/L) were all low. This suggests minimal impact from septic systems, road salt, animal waste and fertilizers.
- DACT, a screening tool to determine if your lake is being impacted by pesticides, was not detected.
- Water in Cooley Lake is hard (119 mg/L CaCO_3), 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.

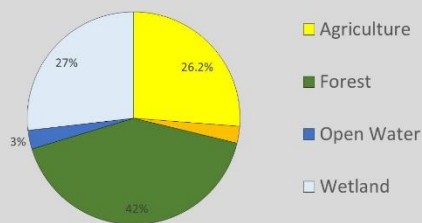
Groundwater provides water to lakes in Oconto County throughout the entire year. Hard surfaces on the landscape prevent water from soaking into the ground and becoming groundwater. This results in less water flowing to the lake during snowmelt and rain events. Water that does not infiltrate to groundwater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

Cooley 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.

Land Use in Cooley Lake Surface Watershed

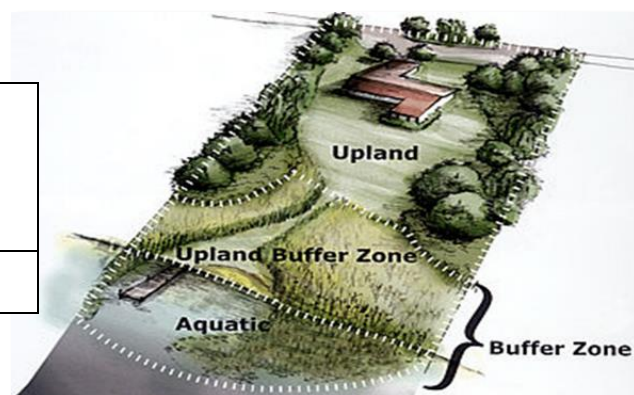


Shorelands

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 Cooley Lake were surveyed in July 2019. All of Cooley Lake's shoreland is considered in good health.

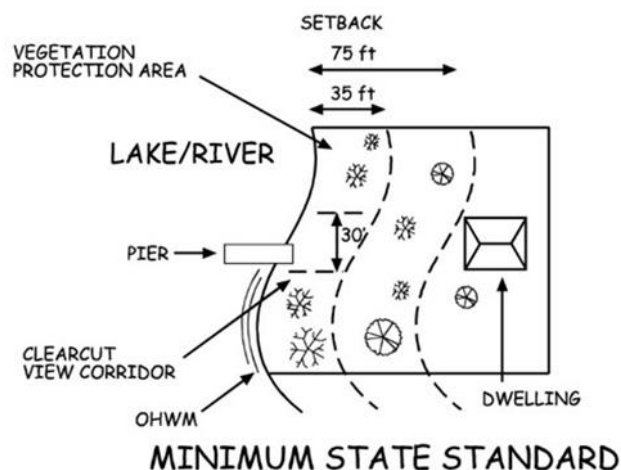
Total lakefront footage	No. Riparian lots	Measured shoreland disturbance (feet)	Measured shoreland disturbance (%)
7,730	5	0	0 %



State Shoreland Zoning Ordinance NR 115 Wisc. Adm. Code for Unincorporated Municipalities

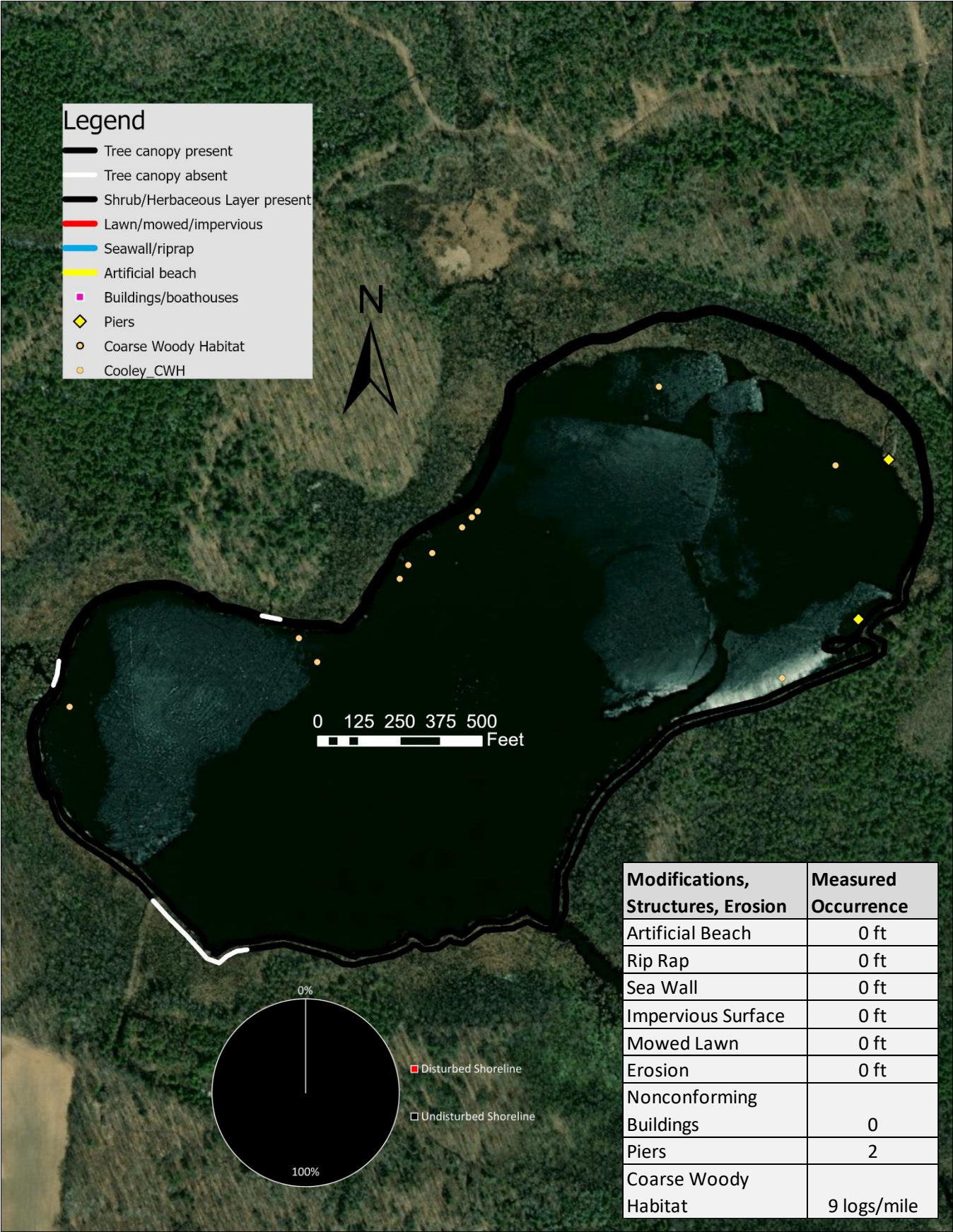
No vegetation within 35 feet of the lake's edge shall be removed except for:

- 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 Cooley 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.

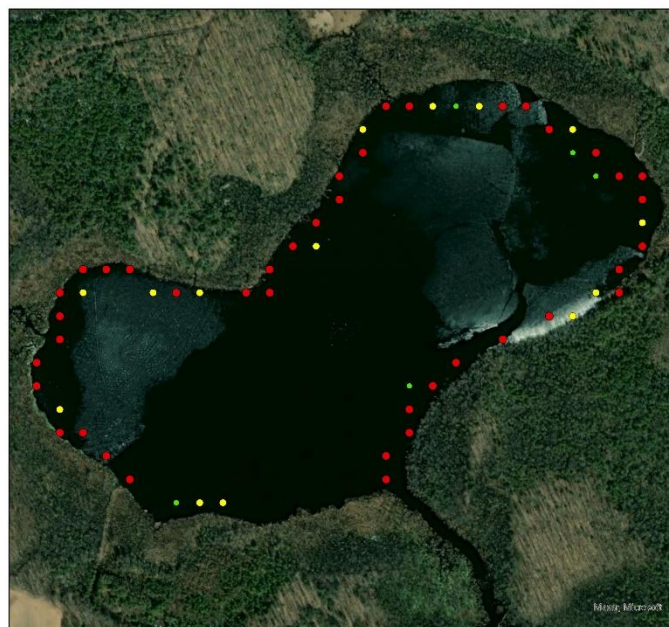


Aquatic Plants

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 Cooley Lake is characterized by average diversity of plant species when compared to other lakes in the Oconto County Lakes Project, with a total of 17 species in the 2019 survey.
- During the 2019 aquatic plant survey of Cooley Lake, 23% of visited sites had vegetative growth. The maximum depth of vegetation was 12.5 feet.
- The most frequently encountered plant species were coontail (97%), white water lily (74%) and flat-stem pondweed (52%). All three species are native to Wisconsin.
- No invasive species were observed.

Cooley Lake Aquatic Plant Survey 2019:
Rake Fullness



0 125 250 500 750 1,000 Feet

Rake Fullness

- 1
- 2
- 3



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Cooley Lake Aquatic Plant Survey 2019:
Total Number of Species



0 150 300 600 900 1,200 Feet

Total Number of Species

- 1-3
- 4-7
- 8+

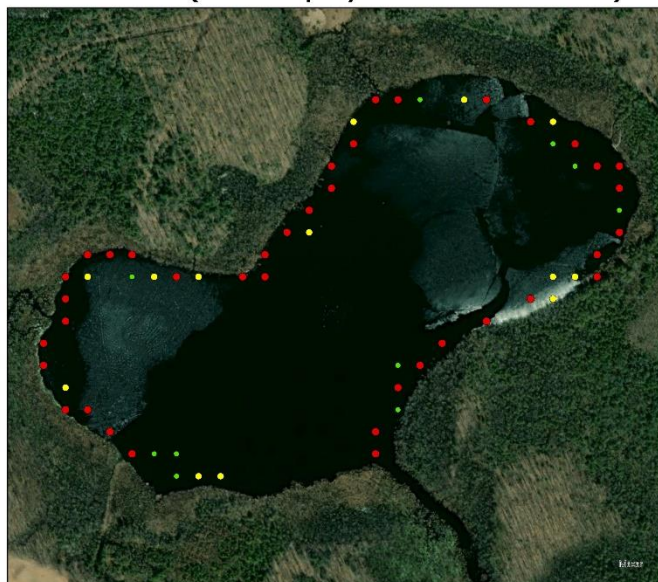


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Aquatic Plants


Cooley Lake Aquatic Plant Survey: 2019 Coontail (*Ceratophyllum demersum*)



0 125 250 500 750 1,000 Feet

Presence of Coontail
(*Ceratophyllum demersum*)

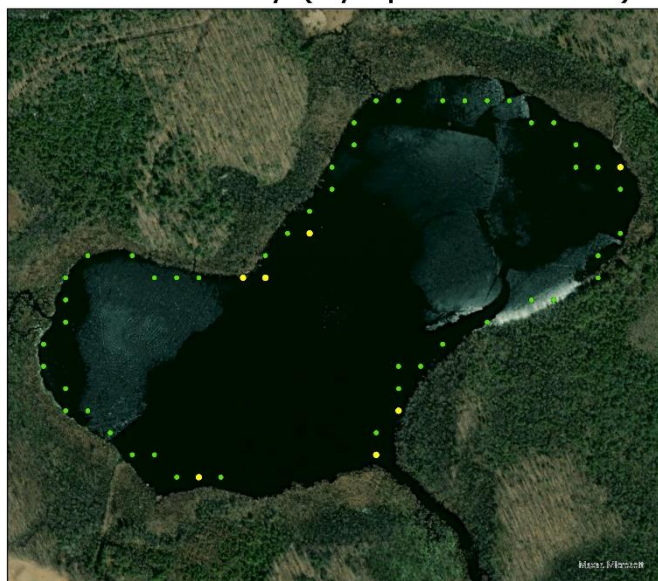
● 1
● 2
● 3

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Coontail lacks roots and can form dense mats just below the surface. It is usually in calm, nutrient-rich water and provides habitat for young fish and other aquatic animals. Waterfowl will eat the seeds and foliage.




Cooley Lake Aquatic Plant Survey: 2019 White water lily (*Nymphaea odorata*)



0 125 250 500 750 1,000 Feet

Presence of White water lily
(*Nymphaea odorata*)

● 1
● 2
● 3

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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 Plants

Cooley Lake Aquatic Plant Survey: 2019 Flat-stem pondweed (*Potamogeton zosteriformis*)



0 125 250 500 750 1,000 Feet

Presence of Flat-stem pondweed
(*Potamogeton zosteriformis*)

- 1
- 2
- 3



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Flat-stem pondweed has flattened stems with an angled appearance. The nutlike fruits provide important food for waterfowl.



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 Cooley Lake.



Prohibited Species

Restricted Species

www.dnr.wi.gov keyword: invasives



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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 & Water Conservation Department. Written and prepared by the Center for Watershed Science and Education at the University of Wisconsin-Stevens Point.*

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