

# Oconto County Lakes Project

## MACHICKANEE FLOWAGE STUDY

### SUMMARY REPORT

2018

*University of Wisconsin-Stevens Point and  
Oconto County Staff and Citizens*

#### 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**

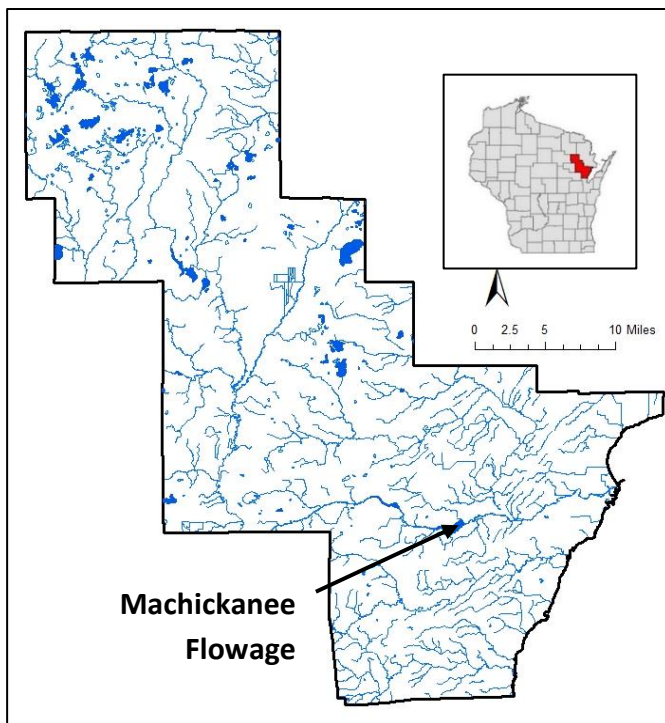
Lake  
Management  
Plans



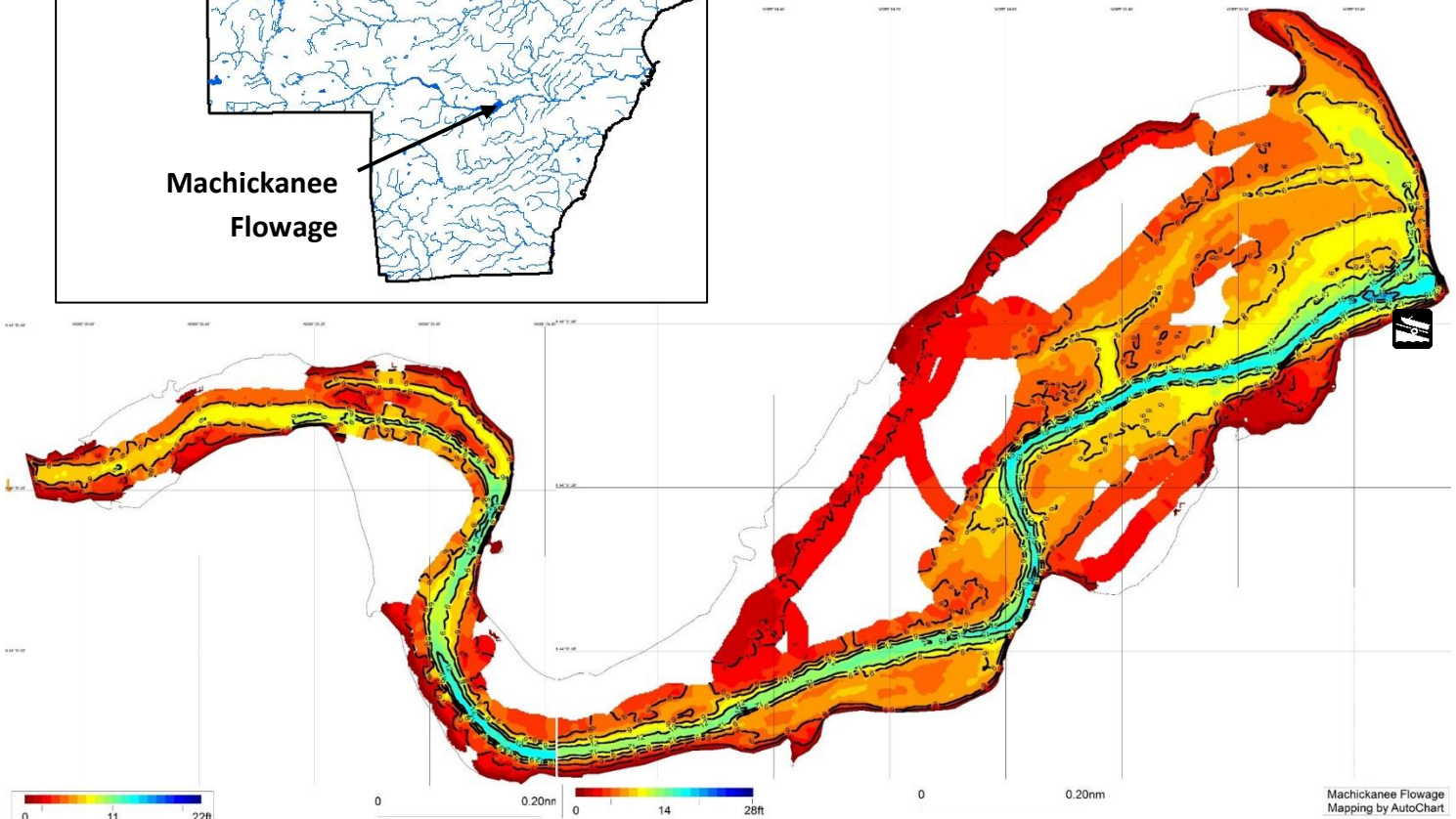
Center for Watershed Science and Education  
College of Natural Resources  
**University of Wisconsin-Stevens Point**

# Background

- ◆ Machickanee Flowage is a 436-acre impoundment in southern Oconto County with a maximum depth of 21 feet.
- ◆ Water enters Machickanee Flowage from the Oconto River (and groundwater) on the west end and leaves via a dam on the east end. Surface water runoff and direct precipitation also contribute water.
- ◆ Visitors have access to the lake from one public boat landing (run by Oconto County Parks) near the dam on the east end.
- ◆ This report summarizes data collected during the 2016-2017 lake study.



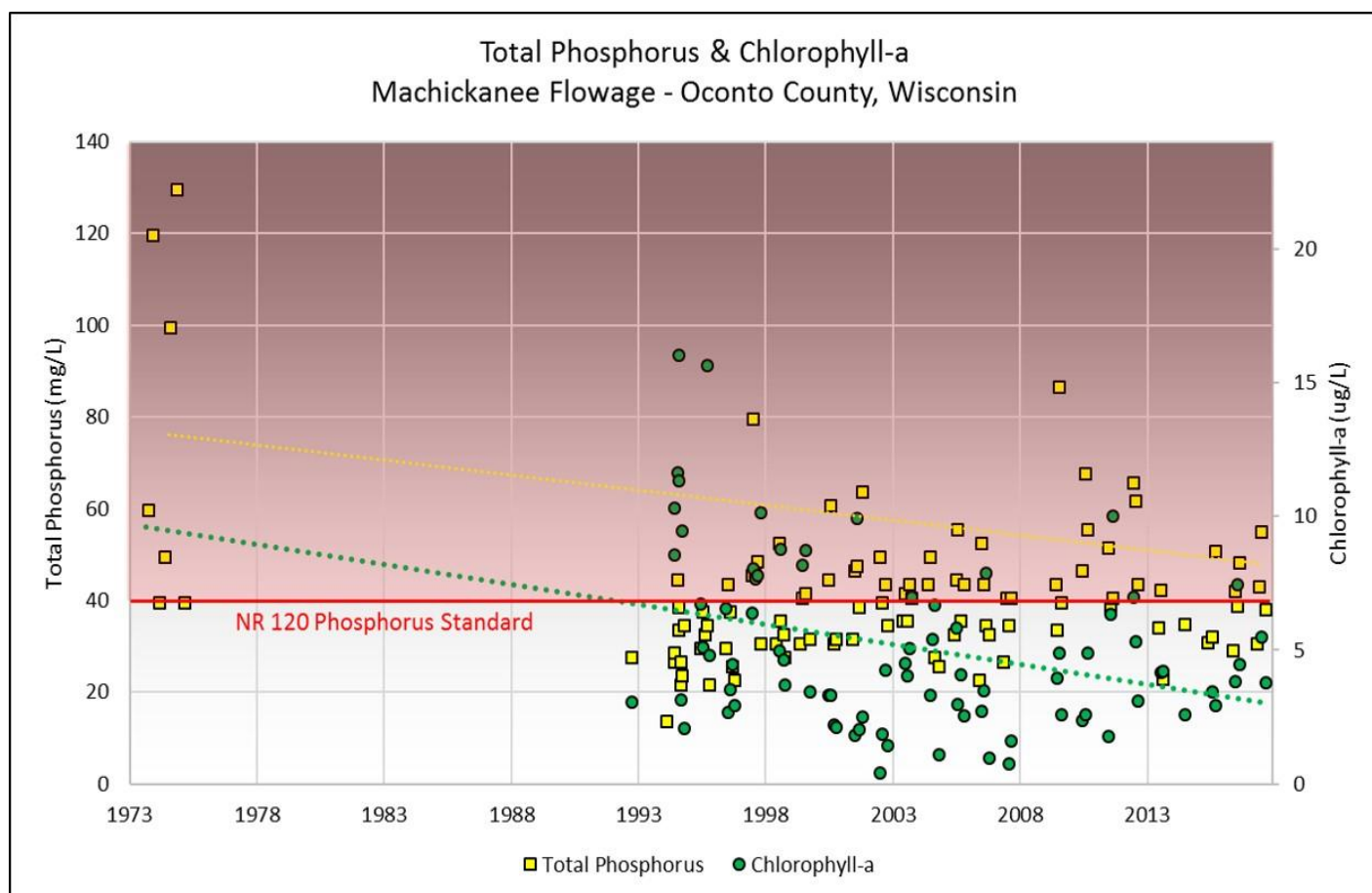
**Township of Stiles**  
**Surface Area: 436 acres**  
**Maximum Depth: 21 feet**



# 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.

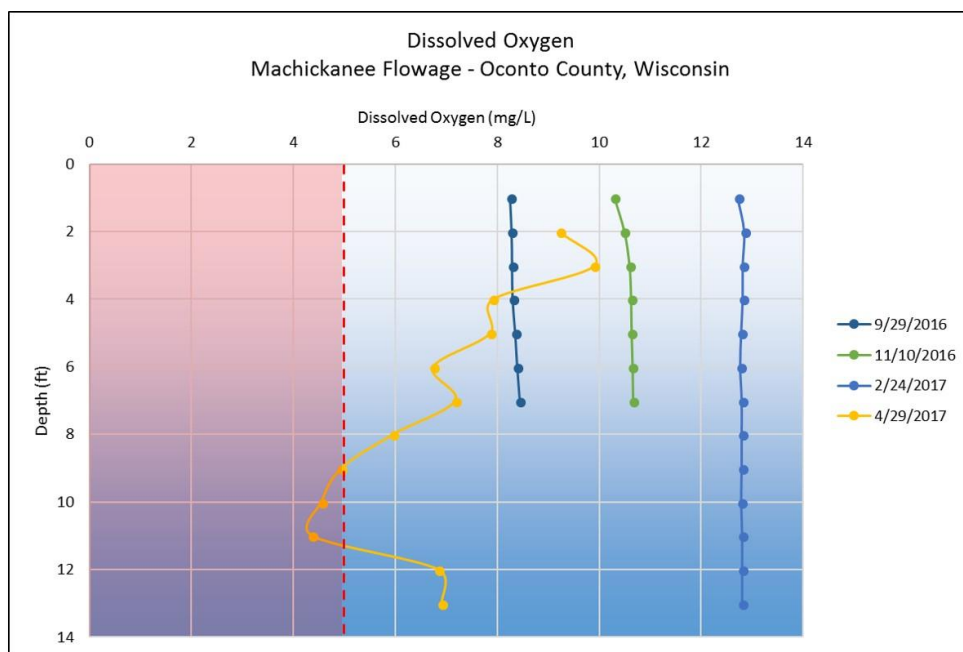
- ◆ Total Phosphorus was occasionally **above** the Wisconsin state phosphorus standard of 40 ug/L for shallow drainage lakes during the two-year study. The long-term trend (based on July data) is slightly decreasing.
- ◆ Inorganic nitrogen (0.5 ug/L) was above the threshold of 0.3 ug/L when algal blooms increase.
- ◆ Chlorophyll-a, an indirect measure of algae, was occasionally above 6 ug/L, indicating nuisance level algal blooms but shows a decreasing trend.





# Water Quality

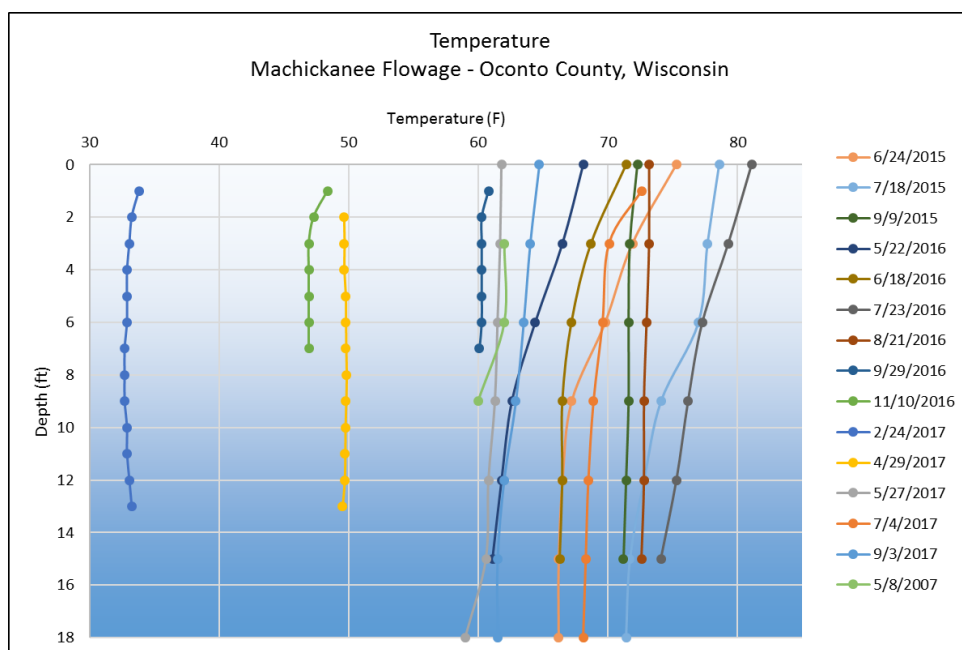
Sufficient **dissolved oxygen** in lake water is essential to the survival of aquatic organisms. The amount of dissolved oxygen present within a lake varies by season and depth. It is determined by the biological activity that consumes or produces oxygen, by water mixing through wind, changes in temperature,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

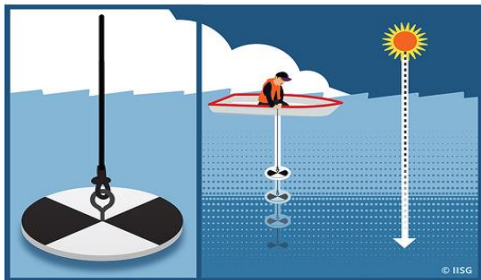


◆ Sufficient oxygen is available in the top 8 feet of the water column in Machickanee Flowage throughout the year.

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

◆ The temperature gradient in Machickanee Flowage is relatively uniform most of the year, typical of a shallow, mixed lake.



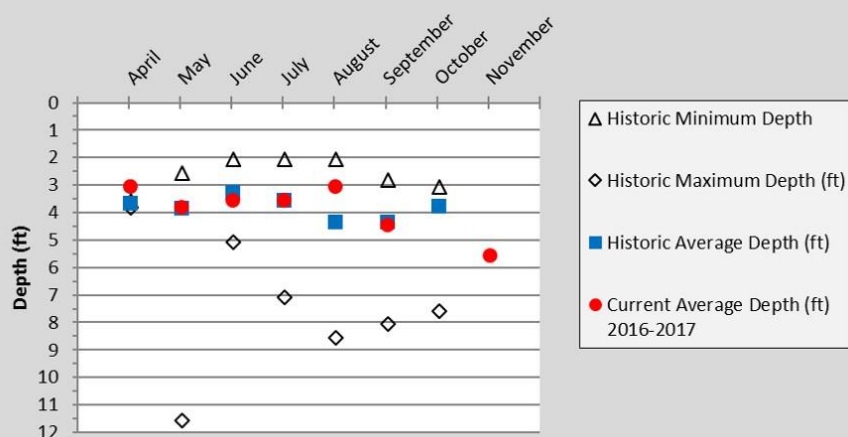


**Water clarity** is a measure of how deep light can penetrate (Secchi depth). Clarity is affected by water color, turbidity (suspended sediment), and algae. Water clarity helps determine where rooted aquatic plants can grow. It is typical for water clarity to vary throughout the year.

- The graph to the left shows water clarity measurements taken between April and November.
- During 2016-17, on average, the poorest water clarity in Machickanee Flowage was in April and August and the best was in September and November. This is consistent with previous observations and demonstrates a slightly increasing depth trend (based on July data) over the long term.

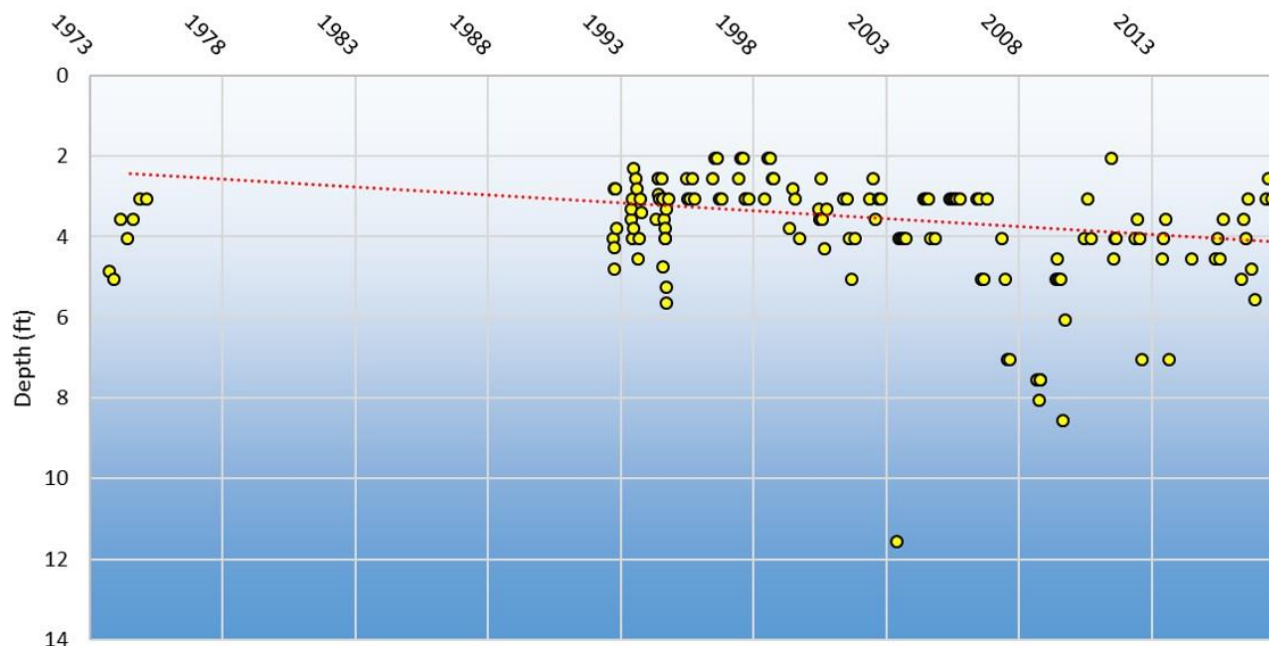
## Water Clarity

Machickanee Flowage - Oconto County, Wisconsin



## Water Clarity

Machickanee Flowage - Oconto County, Wisconsin



# 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 (1.5 mg/L), chloride (6.3 mg/L) and sodium (3.9 mg/L) were all relatively 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 Machickanee Flowage is moderately hard (112 mg/L CaCO<sub>3</sub>), having an elevated level of dissolved minerals which can bind with phosphorus making it less available 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.*

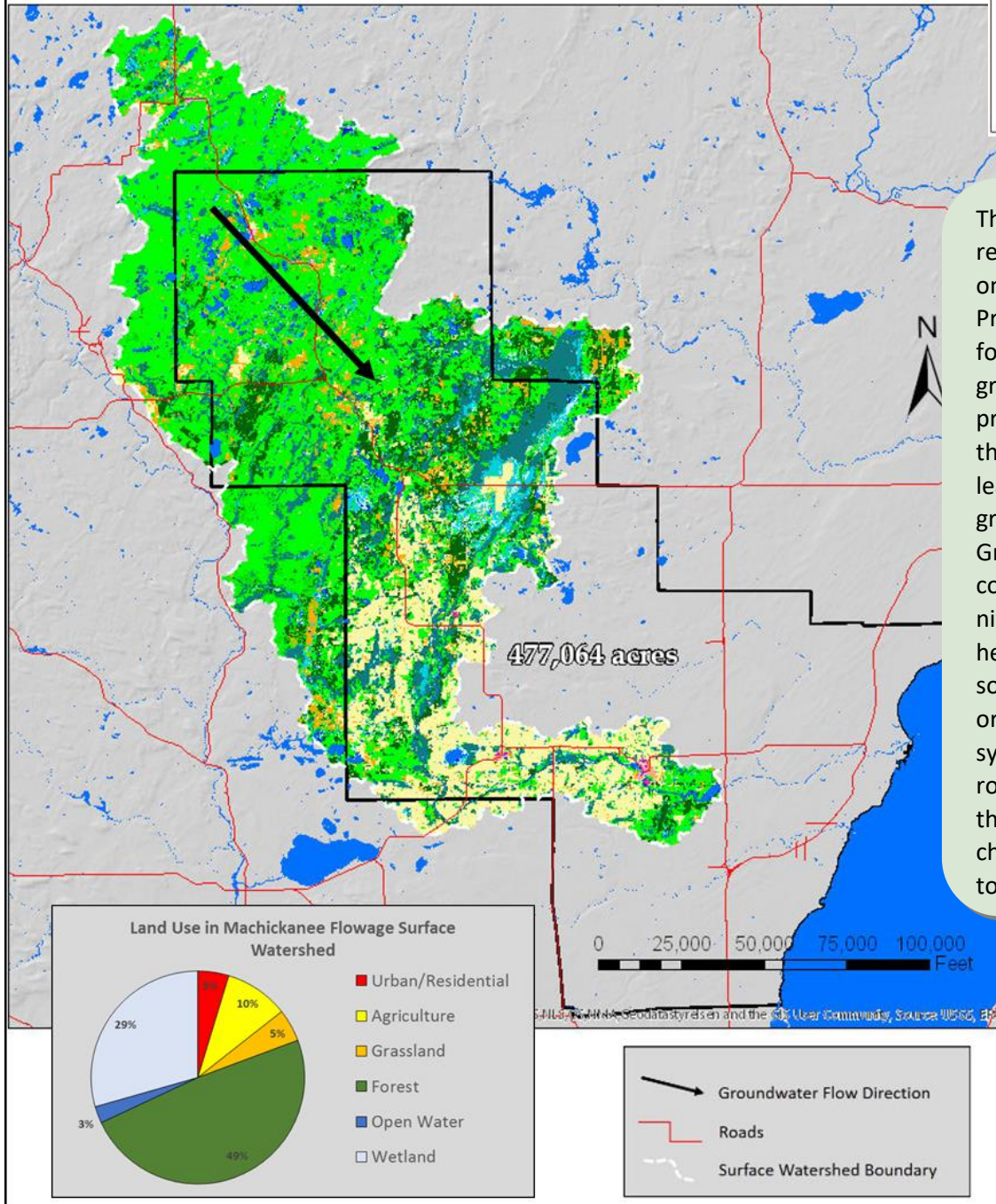


**Groundwater** provides water to lakes in Oconto County throughout the entire year. Hard surfaces on the landscape prevent water from soaking into the ground and becoming groundwater. This results in less water flowing to the lake during snowmelt and rain events. Water that does not infiltrate to groundwater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



The quality of groundwater 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 leach contaminants to groundwater. Groundwater contamination may include nitrogen, pesticides, herbicides and other soluble chemicals originating from septic systems, crops, barnyards, road de-icing, etc. Once in the groundwater, these chemicals move slowly towards a lake or river.

## Machickanee Flowage Surface Watershed & Groundwater Flow



# 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 Machickanee Flowage were surveyed in August 2017. Much of Machickanee Flowage's shoreland is healthy, but many stretches are in need of restoration.

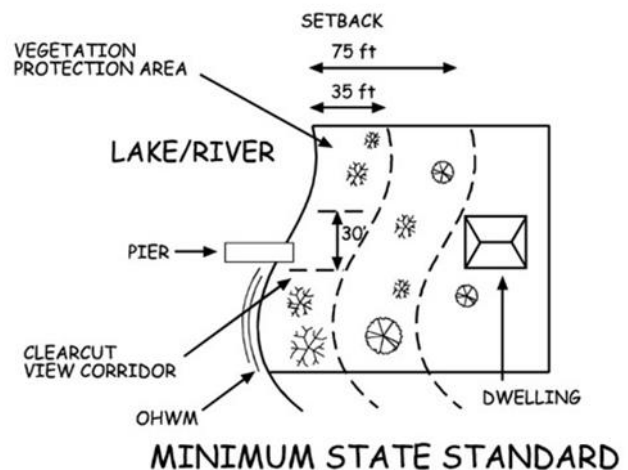
| Total lakefront footage | No. Riparian lots | Measured shoreland disturbance (feet) | Measured shoreland disturbance (%) |
|-------------------------|-------------------|---------------------------------------|------------------------------------|
| 38,794                  | 221               | 9,964                                 | 26%                                |



## 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

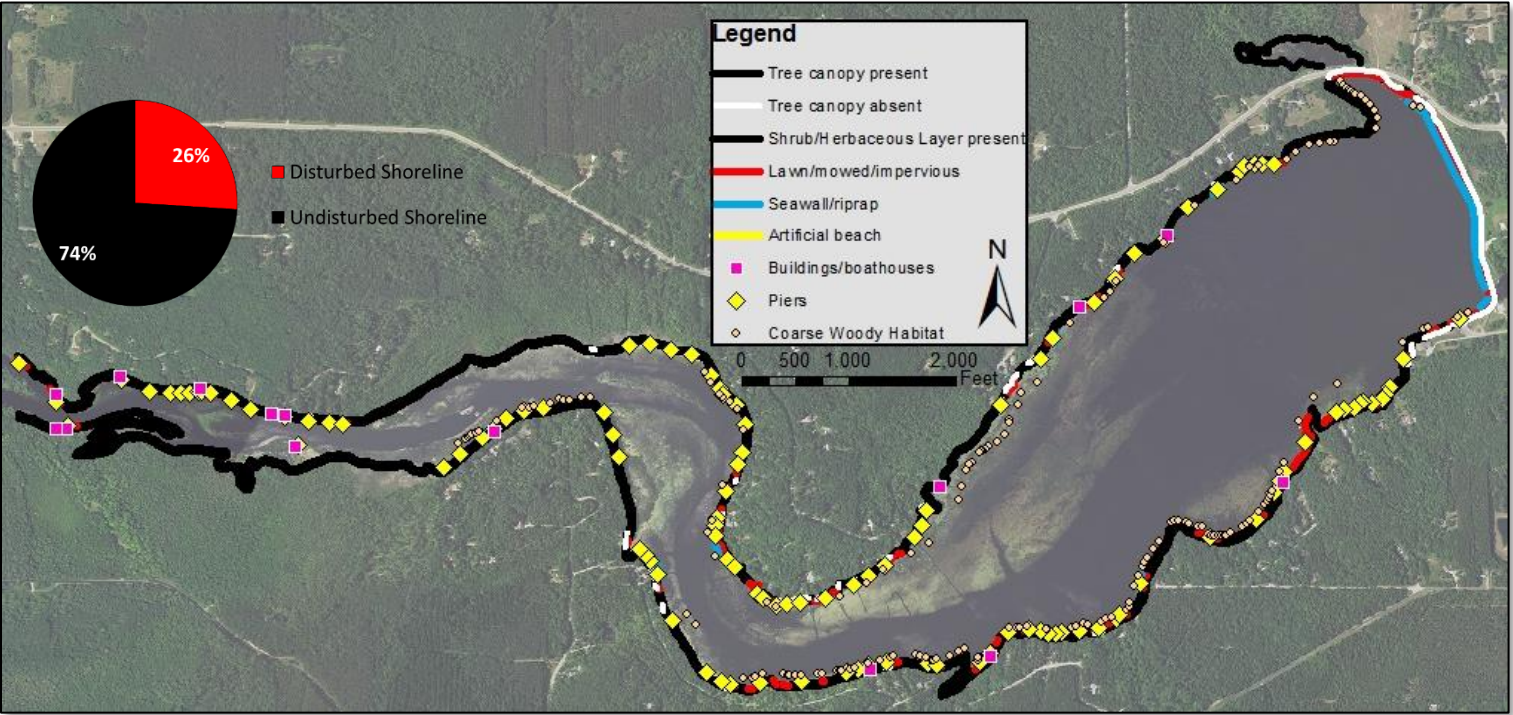


## What Can You Do To Help the Machickanee Flowage?

- ✓ 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 ft                |
| Rip Rap                            | 1,545 ft            |
| Sea Wall                           | 315 ft              |
| Impervious Surface                 | 238 ft              |
| Mowed Lawn                         | 5,300 ft            |
| Erosion                            | 1,935 ft            |
| Nonconforming Buildings            | 18                  |
| Piers                              | 118                 |
| Coarse Woody Habitat               | 24 logs/mile        |

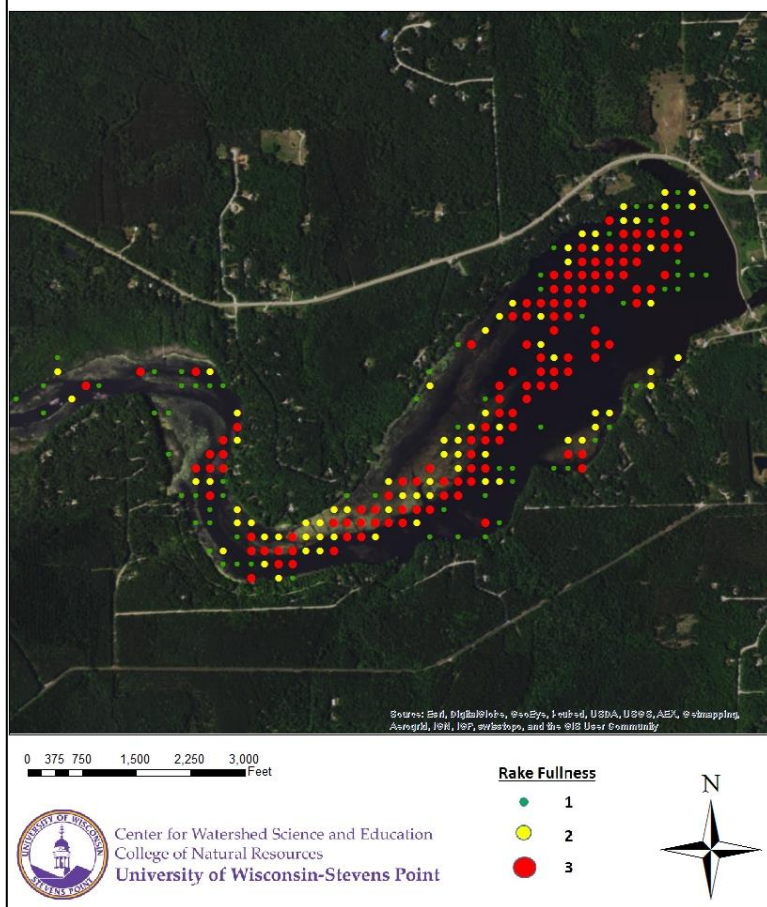


# Aquatic Plants

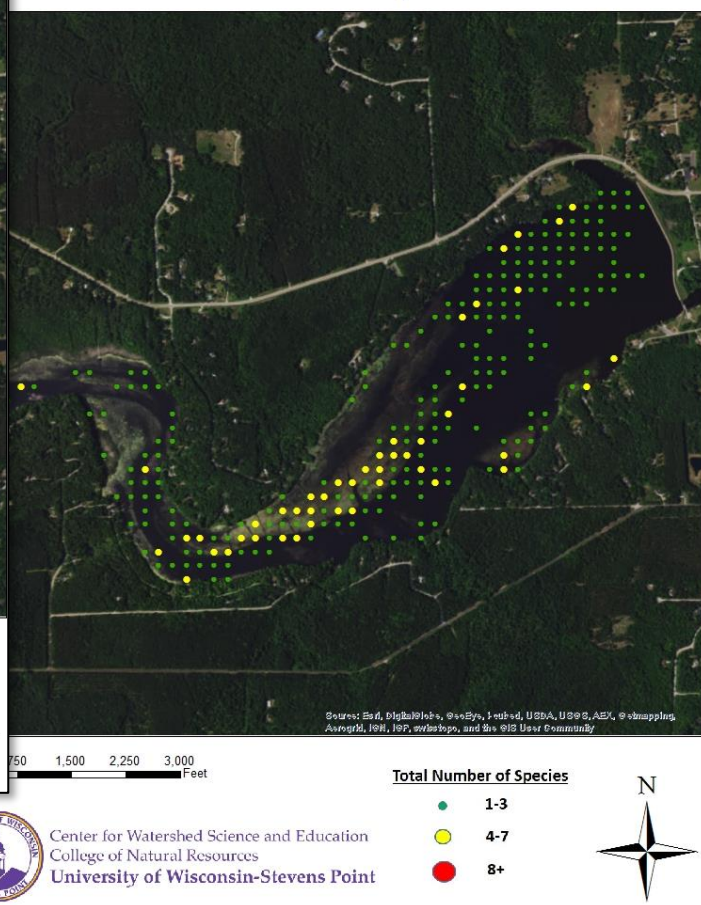
**Aquatic plants** are the forest landscape within a lake. They provide food and habitat for terrestrial and aquatic creatures such as fish, ducks, turtles, invertebrates and other animals. They increase oxygen levels in the water and utilize nutrients that would otherwise be used by algae. A healthy 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 Machickanee Flowage is characterized by quality vegetation with a floristic quality index (23.5) slightly above the regional average. A total of 20 species were observed in the 2017 survey.
- ◆ During the 2017 aquatic plant survey of Leigh Flowage, 50% of the sites had vegetative growth. The maximum depth of vegetation was 13 feet.
- ◆ The most frequently encountered plant species were coontail (88%), flat-stem pondweed (46%) and northern water-milfoil (25%). All three species are native to Wisconsin.

Machickanee Flowage Aquatic Plant Survey 2017:  
Rake Fullness

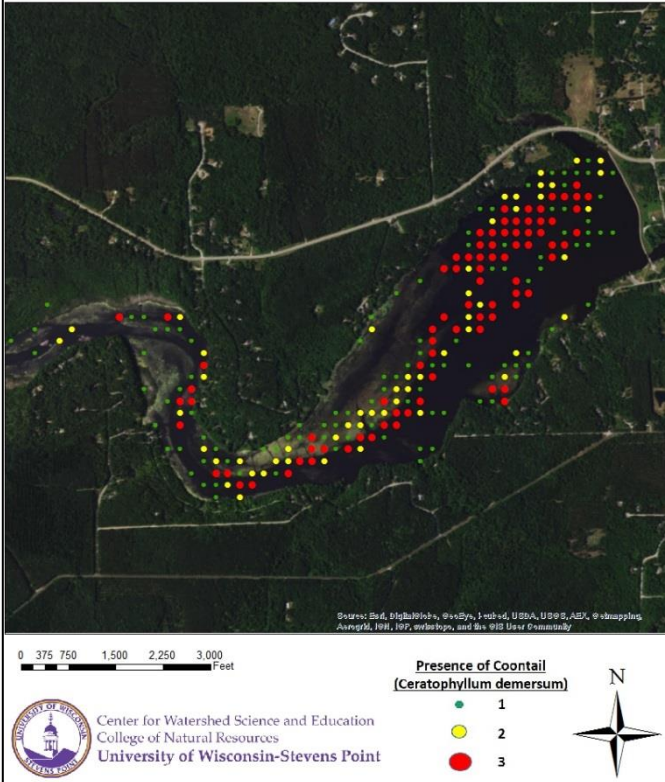


Machickanee Flowage Aquatic Plant Survey 2017:  
Total Number of Species



# Aquatic Plants

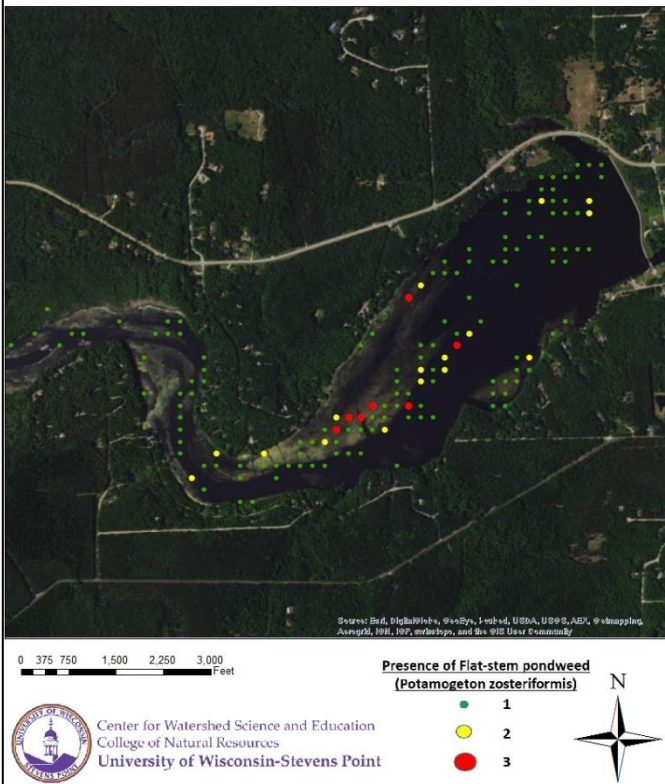
Machickanee Flowage Aquatic Plant Survey 2017:  
Coontail (*Ceratophyllum demersum*)



**Coontail** lacks roots 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.



Machickanee Flowage Aquatic Plant Survey 2017:  
Flat-stem pondweed (*Potamogeton zosteriformis*)



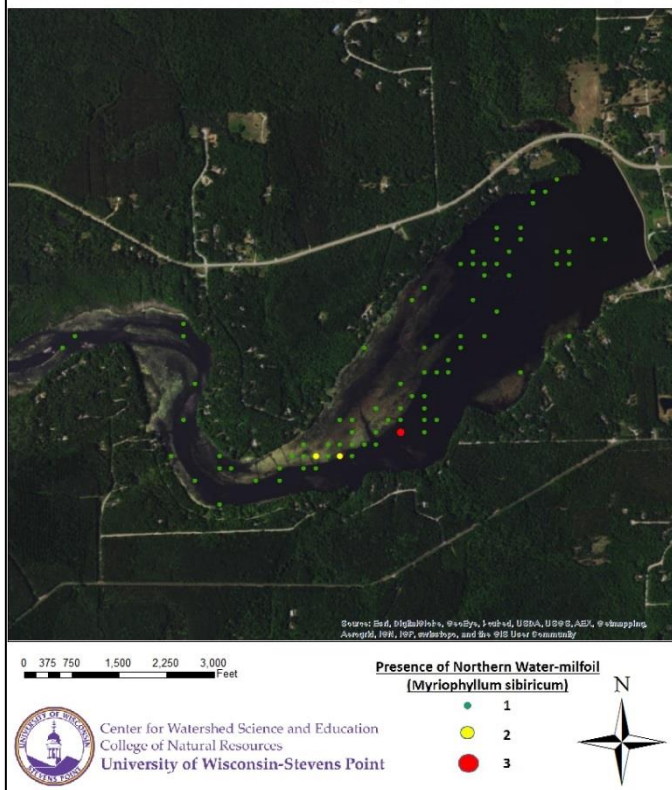
**Flat-stem pondweed** has flattened stems with an angled appearance. The nutlike fruits provide important food for waterfowl.





# Aquatic Plants

## Machickanee Flowage Aquatic Plant Survey 2017: Northern Water-milfoil (*Myriophyllum sibiricum*)



**Northern water-milfoil** is important forage and cover for aquatic animals and an important food source for waterfowl.



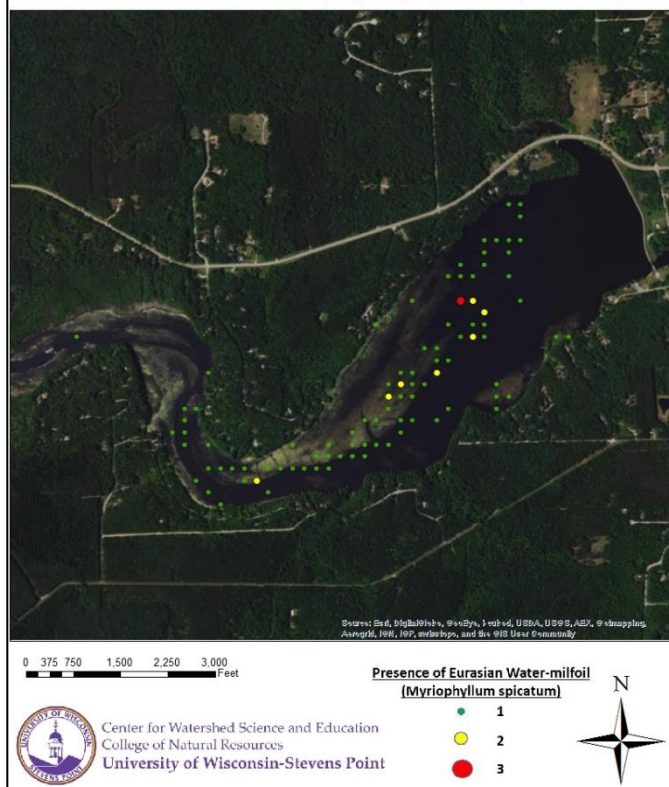
Aquatic **invasive species** are non-native aquatic plants and animals that are most often unintentionally introduced into lakes by lake users. In some lakes, aquatic invasive plant species can exist as a part of the plant community, while in other lakes populations explode, creating dense beds that can damage boat motors, make areas non-navigable, inhibit activities like swimming and fishing, and disrupt the lakes' ecosystems.

- ✓ Eurasian water-milfoil and curly-leaf pondweed were both observed in the 2017 aquatic plant survey.
- ✓ Flowering Rush (1981), Eurasian water-milfoil (1994), Zebra Mussel (2002), Curly-Leaf pondweed (2009) and purple loosestrife (2017) have been previously documented in Machickanee Flowage.

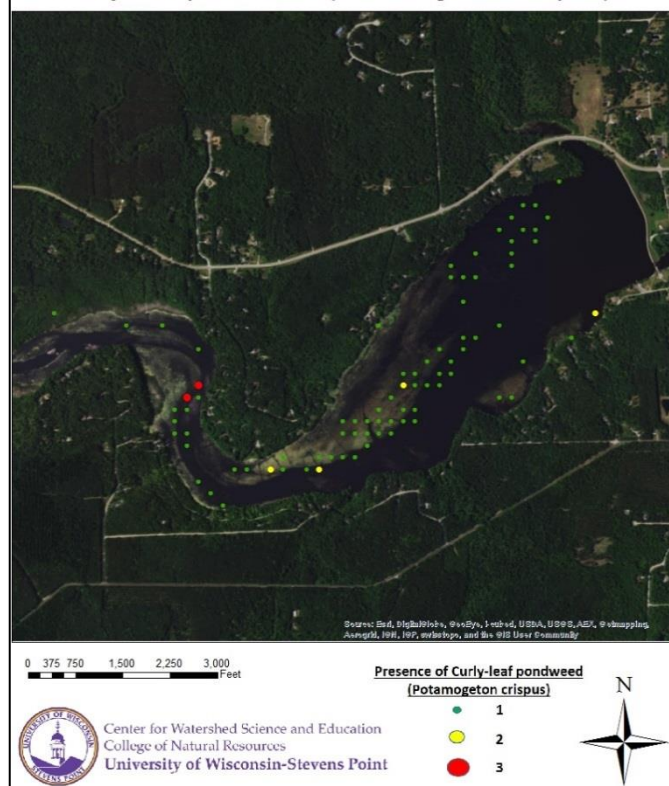


# Aquatic Plants

Machickanee Flowage Aquatic Plant Survey 2017:  
Eurasian Water-milfoil (*Myriophyllum spicatum*)



Machickanee Flowage Aquatic Plant Survey 2017:  
Curly-leaf pondweed (*Potamogeton crispus*)



**Eurasian water-milfoil** is one of the most common invasive aquatic plants in Wisconsin. It can form dense mats that choke out native plants and inhibit navigation. New plants can grow from stem fragments that root on contact with the substrate.



**Curly-leaf pondweed** invades freshwater lakes and can become dominant due to its tolerance of a variety of habitats. CLP grows primarily during the winter and dies off by June, just as water is warming up which can drastically increase nutrient concentrations.





# 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

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## Acknowledgments

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