



Wamplers Lake 2023 Aquatic Vegetation, Water Quality, & 2024 Management Recommendations Report



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Wamplers Lake 2023 Aquatic Vegetation, Water Quality, & 2024 Management Recommendations Report

The following information is a summary of key lake findings collected during 2023.

The overall condition of Wamplers Lake is ranked in the top 25% of developed lakes of similar size in the state of Michigan according to RLS scientists. The lake has good water clarity and also has enough nutrients (phosphorus and nitrogen) to support some algae and submersed aquatic plant growth. Invasive species such as Eurasian Watermilfoil (EWM), Curly-leaf Pondweed (CLP), and Starry Stonewort are able to grow in moderate nutrient waters and thus are a challenge to the Wamplers Lake ecosystem. In 2015, there were approximately 140 acres of invasive EWM in Wamplers Lake which have been successfully reduced over the past several years. A new program is proposed to begin in 2024 and will include continued reductions of all invasives and continued detailed whole-lake surveys.

Protection of the 26 native aquatic plant species is paramount for the health of the lake fishery and these plants should not be managed unless they are a nuisance to lakefront property owners and possess navigational and recreational hazards (i.e., lily pads or nuisance growth in the canals). The plan for 2024 will include whole-lake aquatic vegetation sampling and scanning and spot-treatment of remaining invasives (milfoil, Curly-leaf Pondweed, and Starry Stonewort) as needed. The new systemic herbicide ProcellaCOR® will also be used for more sustained control of the milfoil.



Wamplers Lake Water Quality Data (2023)

Water Quality Parameters Measured

There are hundreds of water quality parameters one can measure on an inland lake, but several are the most critical indicators of lake health. These parameters include water temperature (measured in °F), dissolved oxygen (measured in mg/L), pH (measured in standard units-SU), conductivity (measured in micro-Siemens per centimeter- $\mu\text{S}/\text{cm}$), total dissolved solids (mg/L), Secchi transparency (feet), total phosphorus and total nitrate nitrogen (both in $\mu\text{g}/\text{L}$), chlorophyll-*a* (in $\mu\text{g}/\text{L}$), and algal species composition. Water quality was measured in the deep basin of Wamplers Lake in August of 2023.

Table 1 below demonstrates how lakes are classified based on key parameters. Wamplers Lake would be considered mesotrophic (relatively productive) since it does contain ample phosphorus, nitrogen, and aquatic vegetation growth but has excellent water clarity and moderate algal growth. 2023 water quality data for Wamplers Lake is shown below in Table 2.

Table 1. Lake trophic classification (MDNR).

| <i>Lake Trophic Status</i> | <i>Total Phosphorus ($\mu\text{g L}^{-1}$)</i> | <i>Chlorophyll-<i>a</i> ($\mu\text{g L}^{-1}$)</i> | <i>Secchi Transparency (feet)</i> |
|----------------------------|---|---|-----------------------------------|
| Oligotrophic | < 10.0 | < 2.2 | > 15.0 |
| Mesotrophic | 10.0 – 20.0 | 2.2 – 6.0 | 7.5 – 15.0 |
| Eutrophic | > 20.0 | > 6.0 | < 7.5 |

Table 2. Wamplers Lake water quality parameter data collected in the deep basin (August 9, 2023).

| <i>Depth ft.</i> | <i>Water Temp °F</i> | <i>DO mg L⁻¹</i> | <i>pH S.U.</i> | <i>Cond. µS cm⁻¹</i> | <i>Total Kjeldahl Nitrogen mg L⁻¹</i> | <i>Chl-a µg L⁻¹</i> | <i>Total Phos. mg L⁻¹</i> |
|----------------------|------------------------------|---------------------------------|--------------------|-------------------------------------|--|------------------------------------|--|
| 0 | 77.2 | 7.9 | 8.6 | 350.7 | 0.8 | 7.0 | < 0.010 |
| 17 | 74.9 | 5.2 | 8.4 | 351.8 | 0.7 | -- | < 0.010 |
| 31 | 57.4 | 1.6 | 7.7 | 427.4 | 0.9 | -- | 0.022 |

Water Clarity (Transparency) Data

Secchi transparency is a measure of water clarity using a weighted disk with black and white markings. The depth is recorded as a mean of the depth at which the disk disappears and reappears. Elevated Secchi transparency readings allow for more aquatic plant and algae growth. The standard transparency throughout Wamplers Lake is adequate (13.5-18.0 feet) to allow abundant growth of algae and aquatic plants in the majority of the littoral zone of the lake during the season. Secchi transparency depends on the amount of suspended particles in the water (often due to windy conditions of lake water mixing) and the amount of sunlight present at the time of measurement. During the 2023 sampling event, the total dissolved solids in Wamplers Lake were a bit on the higher end at 238 mg/L with a Secchi reading of 4.6 feet. These values could have been lower than preferred due to recently observed heavy boating activity which can reduce water clarity.

Total Phosphorus

Total phosphorus (TP) is a measure of the amount of phosphorus (P) present in the water column. Phosphorus is the primary nutrient necessary for abundant algae and aquatic plant growth. TP concentrations are usually higher at increased depths due to higher release rates of P from lake sediments under low oxygen (anoxic) conditions and due to mineralization. Phosphorus may also be released from sediments as pH increases. In summer, the dissolved oxygen levels are lower at the bottom and likely cause release of phosphorus from the bottom. TP concentrations from <0.010-0.022 mg L⁻¹ from top to bottom during the 2023 sampling event. These TP concentrations are moderate for a lake the size and depth of Wamplers Lake but are still ample enough to promote aquatic vegetation and algae growth.

pH

Most Michigan lakes have pH values that range from 6.5 to 9.5 with typical being slightly basic (pH>7.0). Acidic lakes (pH < 7) are rare in Michigan and are most sensitive to inputs of acidic substances due to a low acid neutralizing capacity (ANC). Wamplers Lake is considered “slightly basic” on the pH scale. The pH of Wamplers Lake ranged from 7.7-8.6 S.U. during the 2023 sampling event, which is ideal for an inland lake. pH is usually lower at the lake bottom and can increase when aquatic vegetation is actively growing due to photosynthesis.

Conductivity

Conductivity is a measure of the amount of mineral ions present in the water, especially those of salts and other dissolved inorganic substances. Conductivity generally increases as the amount of dissolved minerals and salts in a lake increases, and also increases as water temperature increases. The conductivity values for Wamplers Lake were moderate during the 2023 sampling event and ranged from 351-421 $\mu\text{S}/\text{cm}$. Severe water quality impairments in freshwater lakes do not occur until values exceed 800 $\mu\text{S}/\text{cm}$ and are toxic to aquatic life around 1,000 $\mu\text{S}/\text{cm}$.

Chlorophyll-*a* and Algal Species Composition

Chlorophyll-*a* is the primary photosynthetic pigment found in all plants and algae. Chlorophyll-*a* is a measure of the amount of green plant pigment present in the water, often in the form of planktonic algae. High chlorophyll-*a* concentrations are indicative of nutrient-enriched lakes. Chlorophyll-*a* concentrations greater than 6 $\mu\text{g L}^{-1}$ are found in eutrophic or nutrient-enriched aquatic systems, whereas chlorophyll-*a* concentrations less than 2.2 $\mu\text{g}/\text{L}$ are found in nutrient-poor or oligotrophic lakes. The chlorophyll-*a* concentration during the 2023 sampling event in Wamplers Lake was 7.0 $\mu\text{g}/\text{L}$ which is moderately high for an inland Michigan lake.

The algal genera were determined from composite water samples collected over the deep basin of Wamplers Lake in 2023 were analyzed with a compound bright field microscope. The genera present included the Chlorophyta (green algae; Figure 1): *Chlorella* sp. and *Scenedesmus* sp.; The Cyanophyta (blue-green algae; Figure 2): *Microcystis* sp. and *Oscillatoria* sp.; The Bascillariophyta (diatoms; Figure 3): *Synedra* sp., *Fragilaria* sp., and *Navicula* sp. With such diverse algal flora and an abundance of diatoms that are indicative of great water quality, conditions were favorable to support zooplankton such as *Bosmina* sp. (Figure 4). Photos of the general algae and zooplankton types are shown below.

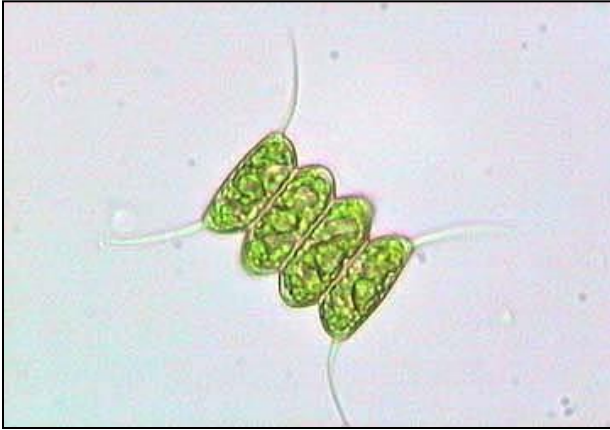


Figure 1. A Green Alga



Figure 2. A Blue-Green Alga

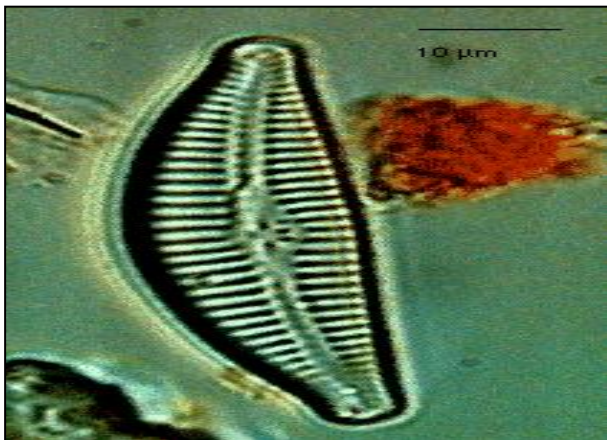


Figure 3. A Diatom Alga

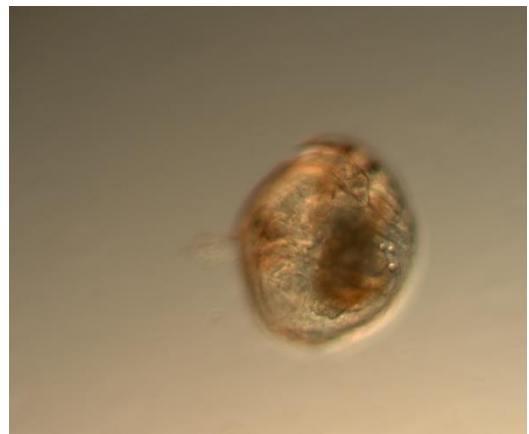


Figure 4. A Zooplankton



Aquatic Vegetation Data (2023)

Status of Native Aquatic Vegetation in Wamplers Lake

A whole-lake grid survey (n=318 sampling points) and bottom scanning survey of Wamplers Lake was conducted on August 9, 2023 by RLS scientists. The native aquatic vegetation present in Wamplers Lake is essential for the overall health of the lake and the support of the lake fishery which is quite robust.

This most recent survey determined that there was a total of 20 native aquatic plant species in Wamplers Lake. These included 11 submersed species, 1 floating-leaved species, and 8 emergent species. This indicates a very high biodiversity of aquatic vegetation in Wamplers Lake. The overall % cover of the lake by native aquatic plants is low relative to the lake size and thus these plants should be protected unless growing near swim areas at nuisance levels.

Among the most dominant native aquatic plants was the macro alga, Chara (Figure 5) which lies close to the lake bottom and serves as excellent fish spawning habitat. In addition, Chara also helps to keep the small sediment particles from being suspended in the water column. The plant has a distinctive musky odor which smells skunk-like. Also abundant was the Southern Naiad (Figure 6), another submersed native that has many small, flexible leaves that appear bushy along a central stem.

A list of all native aquatic plant species found in Wamplers Lake in 2023 is shown in Table 3 below.



Figure 5. Chara (aka Muskgrass)



Figure 6. Southern Naiad (*Najas guadalupensis*)

Table 3. Wampplers Lake Native Aquatic Plant Species (August 9, 2023).

| <u>Aquatic Plant Species</u> | <u>Common Name</u> | <u>Growth Form</u> | <u>Frequency (%)</u> |
|----------------------------------|------------------------|--------------------|----------------------|
| <i>Chara vulgaris</i> | Muskgrass | Submersed | 29.5 |
| <i>Potamogeton zosteriformis</i> | Flat-stem Pondweed | Submersed | 1.2 |
| <i>Potamogeton gramineus</i> | Variable-leaf Pondweed | Submersed | 0.7 |
| <i>Potamogeton filiformis</i> | Thin-leaf Pondweed | Submersed | 1.5 |
| <i>Potamogeton illinoensis</i> | Illinois Pondweed | Submersed | 1.6 |
| <i>Potamogeton amplifolius</i> | Large-leaf Pondweed | Submersed | 4.3 |
| <i>Potamogeton natans</i> | Floating-leaf Pondweed | Submersed | 0.3 |
| <i>Vallisneria americana</i> | Wild Celery | Submersed | 3.7 |
| <i>Ceratophyllum demersum</i> | Coontail | Submersed | 0.1 |
| <i>Utricularia</i> sp. | Bladderwort | Submersed | 2.1 |
| <i>Najas guadalupensis</i> | Southern Naiad | Submersed | 22.5 |
| <i>Lemna minor</i> | Duckweed | Floating-leaf | 1.2 |
| <i>Nymphaea odorata</i> | White Lily | Emergent | 8.6 |
| <i>Nuphar advena</i> | Yellow Lily | Emergent | 3.1 |
| <i>Brasenia schreberi</i> | Water Shield | Emergent | 0.6 |
| <i>Pontedaria cordata</i> | Pickerelweed | Emergent | 0.6 |
| <i>Peltandra virginica</i> | Arrow Arum | Emergent | 8.2 |
| <i>Typha latifolia</i> | Cattails | Emergent | 5.4 |
| <i>Schoenoplectus</i> sp. | Bullrushes | Emergent | 1.9 |
| <i>Decodon verticillata</i> | Swamp Loosestrife | Emergent | 2.8 |

Status of Invasive (Exotic) Aquatic Plant Species in Wamplers Lake

The amount of Eurasian Watermilfoil (Figure 7) present in Wamplers Lake varies each year and is dependent upon climatic conditions, especially runoff-associated nutrients. This year, we saw above average temperatures and many lakes experienced nuisance milfoil and algal outbreaks. The June 1, 2023 survey revealed that approximately 11.7 acres of hybrid milfoil was found throughout the entire lake. On June 12, 2023, the milfoil was treated with diquat. RLS was present to oversee the treatments conducted by Aqua-Weed Control, Inc. On August 9, 2023, a thorough treatment of the canals was conducted. A late summer whole-lake aquatic plant survey revealed that the treatments were very successful. An additional 26.5 acres of very dense Curly-leaf Pondweed (Figure 8) and 4 acres of Starry Stonewort (Figure 9) were also treated with diquat at the same time.

The Treatment maps for milfoil for each of these invasive species are shown in the maps below (Figures 10-12).



Figure 7. Eurasian Watermilfoil (*Myriophyllum spicatum*)



Figure 8. Curly-leaf Pondweed (*Potamogeton crispus*)



Figure 9. Starry Stonewort (*Nitellopsis obtusa*)



Figure 10. Eurasian Watermilfoil distribution in Wamplers Lake (June 1, 2023).

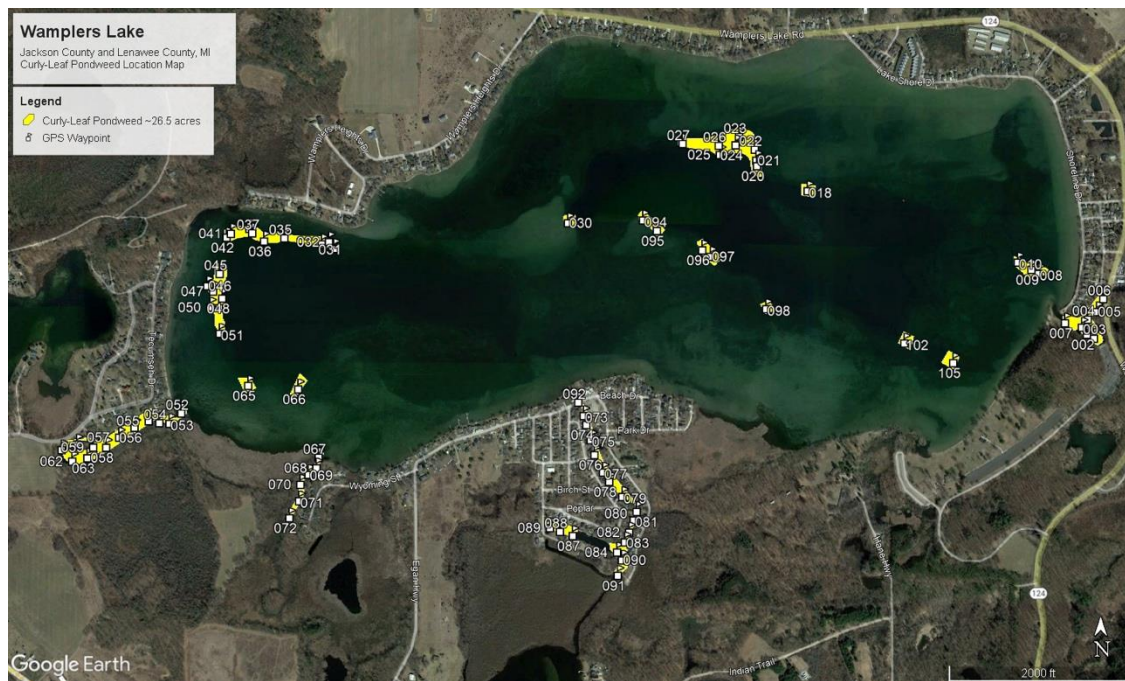


Figure 11. Curly-Leaf Pondweed distribution in Wamplers Lake (June 1, 2023).

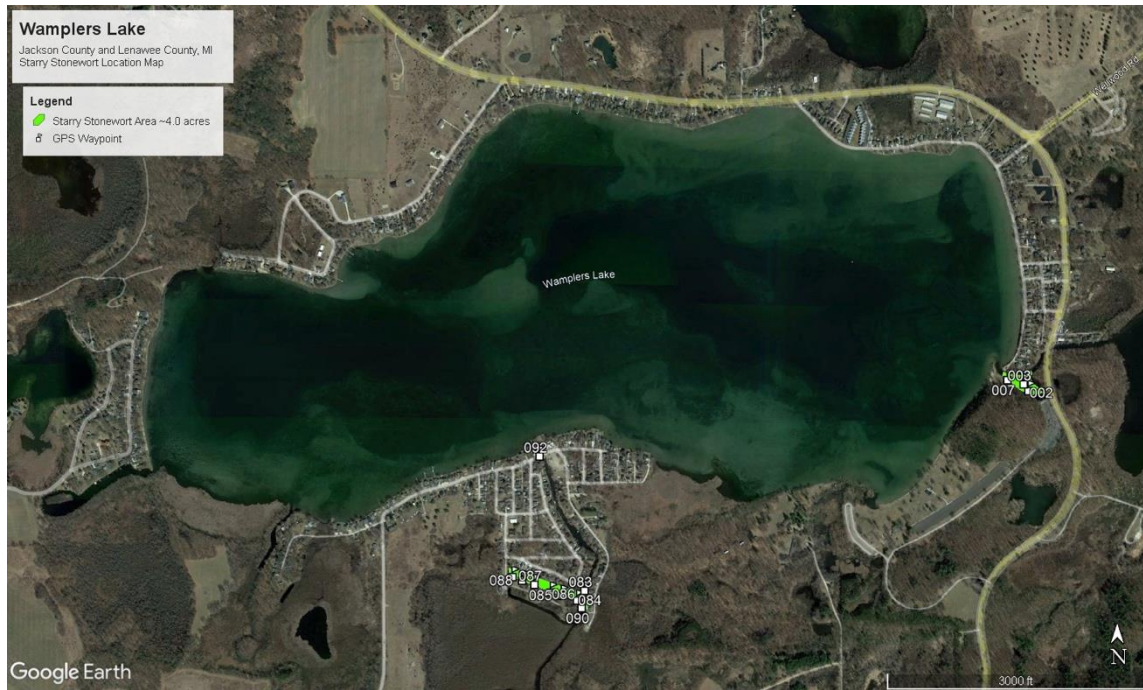


Figure 12. Starry Stonewort distribution in Wampplers Lake (June 1, 2023).



Management Recommendations for 2024

Continuous aquatic vegetation surveys are needed to determine the precise locations of EWM, CLP, or Starry Stonewort (primarily found in the canals) or other problematic invasives in Wamplers Lake. These surveys should occur in mid to late-May to early-June and again post-treatment in 2024.

Due to the relative scarcity of native aquatic vegetation in Wamplers Lake, the treatment of these species with aquatic herbicides is not recommended (one exception is the overgrowth of nuisance weeds in the canals). The plan for 2024 includes the use of higher doses of systemic aquatic herbicides due to the genetically determined strains of hybrid milfoil that require such doses for effective treatment. A new systemic herbicide ProcellaCOR® may also be used and has demonstrated good efficacy. It is costly but has sustained control. The nuisance growth in the canals would respond well to flumioxazin at 200 ppb if needed or with a combination of diquat and hydrothol. Curly-leaf Pondweed will respond well to Aquathol-K® at 1-2 gallons per acre or with diquat at the same doses. Starry Stonewort will respond well to a mixture of Clipper® at 200 ppb and chelated copper. Table 4 below displays the treatment history since 2015. In 2015, there were 140 acres of EWM throughout the lake. Due to budgetary issues, that acreage had to be treated partially in 2015 and then in 2016 and future years. RLS recommends the new budget allow for a seedbank re-emergence that can occur at any time. In addition, the costs of herbicides, permits, surveys, and other necessary services are increasing due to inflation. Table 5 displays a sound 5 year budget with all costs, including a healthy contingency, accounted for in the new program.

In conclusion, Wamplers Lake is a healthy lake with good aquatic plant biodiversity, good water clarity, moderate nutrients, and a healthy lake fishery. Management of the EWM, CLP, and Starry Stonewort are paramount for the long-term health of the lake. Thus far, the invasive species management efforts have been very successful with over 80% of the original milfoil infestation reduced.