ADDENDUM TO SEWRPC
MEMORANDUM REPORT NO. 177
(2ND EDITION)

# AQUATIC PLANT MANAGEMENT PLAN UPDATE FOR WHITEWATER AND RICE LAKES

# WALWORTH COUNTY, WISCONSIN

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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# AQUATIC PLANT MANAGEMENT PLAN UPDATE FOR WHITEWATER AND RICE LAKES

## WALWORTH COUNTY, WISCONSIN

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# INTRODUCTION 1

The Southeastern Wisconsin Planning Commission (Commission) completed this aquatic plant inventory and management study on behalf of the Whitewater and Rice Lakes Management District (District). The Wisconsin Department of Natural Resources (WDNR) financed much of the project cost through a *Wisconsin Administrative Code* NR 190 *Lake Management Planning Grants* award (project ID AEPP63721). This addendum is the Commission's fourth study focusing on Walworth County's Whitewater and Rice Lakes.[1]

The WDNR used data and conclusions generated as part of the Commission's study to help evaluate the Lakes' aquatic plant communities and draft the updated Aquatic Plant Control permit. While drafting the aquatic plant management permit, the WDNR made suggestions to help clarify information presented in the Commission's report. These suggestions were subsequently incorporated into the Commission's final published plan.

## 1.1 PROJECT SETTING, BACKGROUND, SCOPE, AND INTENT

Whitewater Lake is a 705-acre drainage lake with a maximum water depth of 40 feet. Despite its 40-foot maximum depth, most of Whitewater Lake is quite shallow with a mean depth of only 8.3 feet. Whitewater Lake intermittently drains into Rice Lake, a 167-acre drainage lake with a maximum water depth of 11 feet. Both Lakes were created by damming Whitewater Creek.

The water level of Whitewater Lake did not exceed its spillway elevation until 1973. Water flows intermittently from Whitewater Lake to Rice Lake. These waterbodies collectively form the headwaters of Whitewater Creek. Whitewater Creek flows north and enters the Bark River just above its confluence with the Rock River that in turn discharges to the Mississippi River. The Wisconsin Department of Natural Resources (WDNR) has classified the Lakes as drainage lakes meaning that the Lakes have both an inlet and outlet where the main water source is stream drainage (as opposed to groundwater inflows). However, based upon our observations and available data, Whitewater and Rice Lakes may be better described as seepage lakes, having only occasional flow from an outlet (and inlet in the case of Rice Lake) and groundwater as their primary source of water. Furthermore, because Rice Lake owes more than half of its depth to a dam, it can be considered an artificial lake or impoundment.

This plan has been prepared pursuant to the standards and requirements set forth in the following chapters of the *Wisconsin Administrative Code*: Chapter NR 1, "*Public Access Policy for Waterways;*" Chapter NR 40, "*Invasive Species Identification, Classification and Control;*" Chapter NR 103, "*Water Quality Standards for Wetlands;*" Chapter NR 107, "*Aquatic Plant Management;*" and Chapter NR 109, "*Aquatic Plants Introduction, Manual Removal and Mechanical Control Regulations.*"

The District's aquatic plant management (APM) permit was granted for a five-year period beginning in 2017. Permit extensions were granted to allow aquatic plant harvesting to continue, including permission to continue aquatic plant management under the conditions of the 2017 permit through 2022. A new permit is needed, a situation requiring a comprehensive on-the-water aquatic plant inventory. To support this endeavor, the Commission completed an aquatic plant inventory during 2021. The resultant data were used to evaluate the Lakes' plant community conditions and apparent reaction to recent management practices. This information was then used to update the previous APM plan. The draft plan update was reviewed in 2022 by the District and regulators. This information was then used to update the 2022 APM plan.

[1] *The three earlier Commission reports include: SEWRPC Community Assistance Planning Report No. 224,* A Lake Management Plan for the Whitewater and Rice Lakes, Walworth County, Wisconsin*, February 1997; Memorandum Report No. 177*, An Aquatic Plant Management Plan for Whitewater and Rice Lakes, Walworth County, Wisconsin: *March 2010*, and *Memorandum Report No. 177 (2nd Edition)*, A Lake Protection and Aquatic Plant Management Plan for Whitewater and Rice Lakes, Walworth County, Wisconsin: *April 2017*.

The aquatic plant management component of this memorandum focused upon approaches to monitor and control actively growing nuisance populations of aquatic plants. The plan presents a range of alternatives that could potentially be used to achieve desired APM goals and provides specific recommendations related to each alternative. These measures focus on those that the District can implement and collaborate with Lake residents/users and the WDNR.

In addition, both Whitewater and Rice Lakes are artificial impoundments created by dams. Without the dams, the Lakes would largely disappear. This creates an opportunity where both Lakes' water levels can be reduced if adequate gates were available to allow water to drain away. This would allow lake-bottom areas to be exposed to freezing temperatures and conditions that would allow lake-bottom sediment to dry, decompose, and/or consolidate and could potentially control aquatic invasive species such as Eurasian watermilfoil (*Myriophyllum spicatum*, EWM). In addition, Lake drainage could potentially provide an opportunity for management of fish populations such as invasive carp.

The Commission also collected and examined information regarding the design and operation of both the dams controlling water levels within Whitewater and Rice Lakes. This information was used to evaluate to what extent the Lakes could be drawn down and if sufficient gate capacity exists to drain excess water generated by storm and groundwater surcharges. The opportunities, threats, advantages, and potential consequences of both winter and 18-month drawdowns were discussed. Modifications to dam structures that could promote Lake water manipulation as a management tool were also briefly examined.

The plan covers five main topics:

- APM Goals and Objectives
- Aquatic Plant Community Changes and Quality
- Aquatic Plant Control Alternatives
- Water-Level Manipulation as a Lake Management Tool
- Recommended Aquatic Plant Management Plan

The current study is not intended to be a comprehensive evaluation of the myriad factors influencing the Lake's overall health and recreational use potential and therefore does not address watershed issues, land use, in-depth water quality or quantity interpretations, history, recreational use, fish and wildlife, and other such topics typical of comprehensive lake plans.

In summary, this document helps interested parties understand the particular plant management measures to be used in and around the Lakes. These data and suggestions can be valuable resources when developing requisite APM permit applications and implementing future aquatic plant management efforts.

# INVENTORY FINDINGS AND RELEVANCE TO RESOURCE MANAGEMENT 2

## 2.1 AQUATIC PLANT MANAGEMENT GOALS AND OBJECTIVES

Aquatic plant management (APM) programs are designed to further a variety of lake user and riparian landowner goals and desires. For example, most APM programs aim to improve lake navigability. However, APM programs must also be sensitive to other lake uses and must maintain or enhance a lake's ecological integrity. Consequently, APM program objectives are commonly developed in close consultation with many interested parties. The Whitewater and Rice Lake APM plan considered input from several entities including the Whitewater and Rice Lakes Management District (the District) and the WDNR. Objectives of the Whitewater and Rice Lakes APM program include the following:

- Effectively control the quantity and density of nuisance aquatic plant growth in well-targeted portions of Whitewater and Rice Lakes (the Lakes). This objective helps:
    - Enhance water-based recreational opportunities,
    - Improve community-perceived aesthetic values, and
    - Maintain or enhance the Lakes' natural resource value
- Manage the Lakes in an environmentally sensitive manner in conformance with *Wisconsin Administrative Code* standards and requirements under Chapters NR 103 *Water Quality Standards for Wetlands*, NR 107 *Aquatic Plant Management*, and NR 109 *Aquatic Plants: Introduction, Manual Removal & Mechanical Control Regulations*. Following these rules helps the District preserve and enhance the Lakes' water quality, biotic communities, habitat value, and essential structure and relative function in relation to adjacent areas.
- Protect and maintain public health and promote public comfort, convenience, and welfare while safeguarding the Lakes' ecological health through environmentally sound management of vegetation, wildlife, fish, and other aquatic/semi-aquatic organisms in and around the Lakes.
- Promote a high-quality water-based experience for residents and visitors to the Lakes consistent with the policies and practices of the WDNR, as described in the regional water quality management plan, as amended.[2]

To meet these objectives, the District executed an agreement with the Southeastern Wisconsin Regional Planning Commission (Commission) to investigate the characteristics of the Lakes and to develop an aquatic plant management update. As part of this planning process, surveys of the aquatic plant community and comparison to results of previous surveys were conducted. This chapter presents the results of each of these inventories.

[2] *SEWRPC Planning Report No. 30,* A Regional Water Quality Management Plan for Southeastern Wisconsin—2000, Volume One, Inventory Findings, *September 1978,* Volume Two, Alternative Plans*, February 1979,* Volume Three, Recommended Plan, *June 1979, and SEWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report*, March 1995.*

## 2.2 AQUATIC PLANT COMMUNITY COMPOSITION, CHANGE, AND QUALITY

Efforts to manage aquatic plants in Whitewater and Rice Lakes have been ongoing since at least 1950. Prior to 1950, aquatic plant management interventions probably occurred, but the goals and results were not recorded. Aquatic plant surveys for Whitewater Lake were documented by the WDNR in an unknown month in 1973 and July 1988 and by SEWRPC staff in June 1995, July 2008, and July 2014.[3] Aquatic plants in Rice Lake were surveyed by SEWRPC during June 1995, July 2008, and July 2014. Although Rice Lake was not surveyed as part of the WDNR's 1988 survey, field observations by the U.S. Geological Survey (USGS) in 1991 suggest that less than 20 percent of the Lake was colonized with aquatic plants.[4] The aquatic plant surveys conducted on both Lakes prior to 2014 used line-transect methodology,[5] while the 2014, 2015, 2021 field surveys used the point-intercept method. As a result of the use of two different methodologies, a direct comparison of the historical aquatic plant data to the most recent aquatic plant data was not developed. Nevertheless, earlier data does allow comparison of the presence and abundance of particular aquatic plants species observed over time within both Lakes (Tables 2.1 and 2.2). For example, Whitewater Lake, aside from the 1973 field inventory, has had similar numbers of species present with an increase in the number observed in 2021. In Rice Lake, the plant community has remained roughly the same with very slight fluctuations over the years. Species lists and abundance data derived from the 2021 surveys of Whitewater and Rice Lakes are compared to the previous surveys of each Lake (Tables 2.3 and 2.4). Whitewater Lake was last surveyed in 2015 while Rice Lake was last surveyed in 2014. These four surveys all used the same point-intercept grid and methodology.[6,7,8] Therefore, the same points were sampled using the same techniques on roughly the same date approximately six years apart. Such consistency enables more detailed evaluation of aquatic plant abundance and distribution change than has been possible in the past. The distribution of species found during the 2021 aquatic plant surveys is included in Appendix A.

Each aquatic plant species has preferred habitat conditions in which that species generally thrives as well as conditions that limit or completely inhibit its growth. For example, water conditions (e.g., depth, clarity, source, alkalinity, and nutrient concentrations), substrate composition, the presence or absence of water movement, and pressure from herbivory and/or competition all can influence the type of aquatic plants found in a water body. All other factors being equal, water bodies with a diverse array of habitat variables are more likely to host a diverse aquatic plant community. For similar reasons, some areas of a particular lake may contain plant communities with very little diversity, while other areas of the same lake may exhibit high diversity. Historically, human manipulation has often favored certain plants and reduced biological diversity (biodiversity). Thoughtful aquatic plant management can help maintain or even enhance aquatic plant biodiversity.

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[3] *The 1988 WDNR aquatic plant survey on Whitewater Lake found that ninety-one percent of the Lake was colonized with a nondiverse plant community. About 77 to 96 percent of the plots sampled contained Eurasian watermilfoil populations.*

[4] *8 U.S. Geological Survey Water-Resources Investigations Report No. 94-410,* Hydrology and Water Quality of Whitewater and Rice Lakes in Southeastern Wisconsin, *1990-1991.*

[5] *The line-transect survey was developed from the grid sampling method of Jesson and Lound (1964). Twenty-five transects approximately 1,000 feet apart were established on a Lake map. Each transect (or line) extended from the shoreline to the maximum rooting depth within the Lake. Four sampling points were established on each transect line at 1.5 feet, 5.0 feet, 9.0 feet, and 11.0 feet. Each sampling point was a six-foot diameter circle. Each circle was divided into four quadrants and sampled with a garden rake.*

[6] *It is noteworthy that sampling methodology changed from transect-based methods in the earlier surveys (1967 through 2002) to a point-intercept method beginning in 2011.*

[7] *Jesson, R. and R. Lound,* Minnesota Department of Conservation Game Investigational Report No. 6, An Evaluation of a Survey Technique for Submerged Aquatic Plants, *1962; as refined in the Memo from Stan Nichols to J. Bode, J. Leverence, S. Borman, S. Engel, and D. Helsel, entitled* "Analysis of Macrophyte Data for Ambient Lakes-Dutch Hollow and Redstone Lakes Example," *Wisconsin Geological and Natural History Survey, University of Wisconsin-Extension, February 4, 1994;*

[8] *Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky, and S. Chase,* Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications*, Wisconsin Department of Natural Resources, Bureau of Science Services, Publication No. PUB-SS-1068 201, March 2010.*

## Table 2.1
## Submerged Aquatic Plant Species Observed in Whitewater Lake: 1973-2021

| Submerged Aquatic Plant Species | 1973 | 1988 | 1995 | 2008 | 2014 | 2015 | 2021 |
|---|---|---|---|---|---|---|---|
| Invasive Aquatic Plants | | | | | | | |
| *Myriophyllum spicatum* (Eurasian watermilfoil) | X | X | X | X | X | X | X |
| *Potamogeton crispus* (Curly-leaf pondweed) | X | X | X | X | X | -- | X |
| Total Invasive Species Observed | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| Native Aquatic Plants | | | | | | | |
| *Ceratophyllum demersum* (Coontail) | X | X | X | X | X | X | X |
| *Chara* spp. (Muskgrasses) | -- | X | X | X | X | X | X |
| *Elodea canadensis* (Common waterweed) | X | X | X | X | X | X | X |
| *Heteranthera dubia* (Water stargrass) | -- | -- | X | -- | -- | X | -- |
| *Myriophyllum sibiricum* (Northern watermilfoil) | -- | -- | X | X | -- | -- | -- |
| *Najas flexilis* (Slender naiad) | -- | X | -- | X | -- | -- | -- |
| *Najas guadalupensis* (Southern naiad) | -- | -- | -- | -- | X | X | X |
| *Nitella flexilis* (Slender stonewort) | -- | -- | -- | -- | -- | X | X |
| *Polygonum amphibium* (Water smartweed) | X | -- | -- | -- | -- | -- | -- |
| *Potamogeton pusillus* (Small pondweed) | -- | -- | -- | -- | -- | X | X |
| *Potamogeton zosteriformis* (Flat-stem pondweed) | -- | X | X | -- | -- | -- | -- |
| *Stuckenia pectinata* (Sago pondweed) | X | X | X | X | X | X | X |
| *Utricularia vulgaris* (Common bladderwort) | -- | -- | -- | -- | -- | -- | X |
| *Vallisneria americana* (Wild celery) | -- | -- | -- | -- | -- | -- | X |
| *Zannichellia palustris* (Horned pondweed) | -- | -- | -- | -- | -- | -- | X |
| Total Native Species Observed | 4 | 6 | 7 | 6 | 5 | 8 | 10 |
| Total Species Observed | 6 | 8 | 9 | 8 | 7 | 9 | 12 |

*Source: Wisconsin Department of Natural Resources and SEWRPC*

## Table 2.2
## Submerged Aquatic Plant Species Observed in Rice Lake: 1995-2021

| Submerged Aquatic Plant Species | 1995 | 2008 | 2014 | 2021 |
|---|---|---|---|---|
| Invasive Aquatic Plants | | | | |
| *Myriophyllum spicatum* (Eurasian watermilfoil) | X | X | X | X |
| *Potamogeton crispus* (Curly-leaf pondweed) | X | -- | X | X |
| Total Invasive Species Observed | 2 | 1 | 2 | 2 |
| Native Aquatic Plants | | | | |
| *Ceratophyllum demersum* (Coontail) | X | X | X | X |
| *Chara* spp. (Muskgrasses) | X | X | X | -- |
| *Elodea canadensis* (Common waterweed) | X | -- | X | X |
| *Myriophyllum sibiricum* (Northern watermilfoil) | X | X | -- | -- |
| *Najas flexilis* (Slender naiad) | -- | -- | -- | X |
| *Polygonum amphibium* (Water smartweed) | -- | X | X | -- |
| *Potamogeton natans* (Floating-leaf pondweed) | X | -- | -- | -- |
| *Potamogeton zosteriformis* (Flat-stem pondweed) | X | X | -- | -- |
| *Ranunculus aquatilis* (White water crowfoot) | -- | -- | X | -- |
| *Stuckenia pectinata* (Sago pondweed) | X | X | X | X |
| Total Native Species Observed | 7 | 6 | 6 | 4 |
| Total Species Observed | 9 | 7 | 8 | 6 |

*Source: Wisconsin Department of Natural Resources and SEWRPC*

**Table 2.3**
**Aquatic Plant Abundance, Whitewater Lake: September 2015 versus July 2021**

| Aquatic Plant Species | Native or Invasive | Number of Points Found[a] (2015/2021) | Frequency of Occurrence Within Vegetated Areas[b] (2015/2021) | Average Rake Fullness[c] (2015/2021) | Relative Frequency of Occurrence[d] (2015/2021) | Visual Sightings[e] (2015/2021) |
|---|---|---|---|---|---|---|
| *Myriophyllum spicatum* (Eurasian watermilfoil) | Invasive | 63/2 | 20.4/1.0 | 1.2/1.0 | 12.3/0.7 | 26/0 |
| *Potamogeton crispus* (Curly-leaf pondweedl) | Invasive | 0/19 | 0/9.8 | 0/1.0 | 0/6.5 | 0/0 |
| *Ceratophyllum demersum* (Coontail) | Native | 35/76 | 11.3/39.4 | 1.4/1.7 | 6.8/26.1 | 3/0 |
| *Chara* spp. (Muskgrasses)* | Native | 11/56 | 3.6/29.0 | 1.2/1.2 | 2.2/19.2 | 0/0 |
| *Elodea canadensis* (Common waterweed) | Native | 109/66 | 35.3/34.2 | 1.1/1.4 | 21.3/22.7 | 3/0 |
| *Heteranthera dubia* (Water stargrass) | Native | 1/0 | 0.3/0 | 1.0/0 | 0.2/0 | 0/0 |
| *Najas guadalupensis* (Southern naiad)* | Native | 280/15 | 90.6/7.8 | 1.6/1.1 | 54.8/5.2 | 1/0 |
| *Nitella* spp. (Nitella) | Native | 1/43 | 0.3/22.3 | 2.0/1.2 | 0.2/14.8 | 0/0 |
| *Potamogeton pusillus* (Small pondweed)* | Native | 1/1 | 0.3/0.5 | 1.0/1.0 | 0.2/0.3 | 0/0 |
| *Stuckenia pectinata* (Sago pondweed)[f] | Native | 10/9 | 3.2/4.7 | 1.1/1.0 | 2.0/3.1 | 22/0 |
| *Utricularia vulgaris* (Common bladderwort)* | Native | 0/1 | 0/0.5 | 0/1.0 | 0/0.3 | 0/0 |
| *Vallisneria americana* (Wild celery) | Native | 0/2 | 0/1.0 | 0/1.0 | 0/0.7 | 0/0 |
| *Zannichellia palustris* (Horned pondweed)* | Native | 0/1 | 0/0.5 | 0/1.0 | 0/0.3 | 0/0 |

Notes:

- During the 2015 survey, sampling occurred at 459 sampling points on September 15 and 16, 2015. Of the sampling points visited, 309 were vegetated. During the 2021 survey, sampling occurred at 475 sampling points on July 6, 12, and 13, 2021. Of the sampling points visited, 193 had vegetation.
- Red text indicates non-native and/or invasive species.
- An asterisk (*) next to a species name indicates that the species is considered "sensitive," with a coefficient of conservatism C value of seven or greater.
- See Appendix A for distribution maps and identifying features.

[a] Number of Points *refers to the number of points at which the species was retrieved and identified on the rake during sampling*

[b] Frequency of Occurrence Within Vegetated Areas, *expressed as a percent, is the percentage of times a particular species occurred when there was aquatic vegetation present at the sampling site.*

[c] Average Rake Fullness is the average amount, *on a scale of 0 to 3, of a particular species at each site where that species was retrieved by the rake.*

[d] Relative Frequency of Occurrence, *expressed as a percent, is the frequency of that particular species compared to the frequencies of all species present.*

[e] Visual Sightings *is the number of points where that particular species was visually observed within six feet of the actual rake haul location, but was not actually retrieved on the rake and was not, therefore assigned a rake fullness measurement for that site. At points where this occurred, the species was simply marked as "present" at that site. Recording the number of visual sightings helps give a better picture of species distribution throughout the lake. (It is likely that visual sightings were not taken in 2011).*

[f] *Considered a high-value aquatic plant species known to offer important values in specific aquatic ecosystems under Section NR 107.08 (4) of the* Wisconsin Administrative Code.

*Source: Wisconsin Department of Natural Resources and SEWRPC*

**Table 2.4**
**Aquatic Plant Abundance, Rice Lake: June 2014 versus July 2021**

| Aquatic Plant Species | Native or Invasive | Number of Points Found[a] (2014/2021) | Frequency of Occurrence Within Vegetated Areas[b] (2014/2021) | Average Rake Fullness[c] (2014/2021) | Relative Frequency of Occurrence[d] (2014/2021) | Visual Sightings[e] (2014/2021) |
|---|---|---|---|---|---|---|
| *Myriophyllum spicatum* (Eurasian watermilfoil) | Invasive | 62/102 | 66.0/68.0 | 2.0/1.2 | 42.5/34.6 | 0/0 |
| *Potamogeton crispus* (Curly-leaf pondweed) | Invasive | 19/1 | 20.2/0.7 | 1.1/1.0 | 13.0/0.3 | 0/0 |
| *Ceratophyllum demersum* (Coontail) | Native | 49/126 | 52.1/84.0 | 1.3/1.7 | 33.6/42.7 | 0/0 |
| *Chara* spp. (Muskgrasses)* | Native | 1/0 | 1.1/0.0 | 1.0/0.0 | 0.7/0.0 | 0/0 |
| *Elodea canadensis* (Common waterweed) | Native | 2/58 | 2.1/38.7 | 2.0/1.4 | 1.4/19.7 | 0/0 |
| *Najas flexilis* (Slender naiad) | Native | 0/6 | 0.0/4.0 | 0.0/1.0 | 0.0/2.0 | 0/0 |
| *Polygonum amphibium* (Water smartweed) | Native | 7/0 | 7.4/0.0 | 1.0/0.0 | 4.8/0.0 | 0/0 |
| *Ranunculus aquatilis* (White water crowfoot) | Native | 2/0 | 2.1/0.0 | 2.0/0.0 | 1.4/0.0 | 0/0 |
| *Stuckenia pectinata* (Sago pondweed)[f] | Native | 4/2 | 4.3/1.3 | 1.3/1.5 | 2.7/0.7 | 0/0 |

Notes:

- During the 2014 survey, sampling occurred at 397 sampling points on June 23, 24, and 25, 2014. Of the sampling points visited, 94 were vegetated. During the 2021 survey, sampling occurred at 273 sampling points on July 12, 2021. Of the sampling points visited, 150 had vegetation.
- Red text indicates non-native and/or invasive species.
- An asterisk (*) next to a species name indicates that the species is considered "sensitive," with a coefficient of conservatism C value of seven or greater.
- See Appendix A for distribution maps and identifying features.

[a] Number of Points *refers to the number of points at which the species was retrieved and identified on the rake during sampling*

[b] Frequency of Occurrence Within Vegetated Areas, *expressed as a percent, is the percentage of times a particular species occurred when there was aquatic vegetation present at the sampling site.*

[c] Average Rake Fullness is the average amount, *on a scale of 0 to 3, of a particular species at each site where that species was retrieved by the rake.*

[d] Relative Frequency of Occurrence, *expressed as a percent, is the frequency of that particular species compared to the frequencies of all species present.*

[e] Visual Sightings *is the number of points where that particular species was visually observed within six feet of the actual rake haul location, but was not actually retrieved on the rake and was not, therefore assigned a rake fullness measurement for that site. At points where this occurred, the species was simply marked as "present" at that site. Recording the number of visual sightings helps give a better picture of species distribution throughout the lake. (It is likely that visual sightings were not taken in 2011).*

[f] *Considered a high-value aquatic plant species known to offer important values in specific aquatic ecosystems under Section NR 107.08 (4) of the* Wisconsin Administrative Code.

*Source: Wisconsin Department of Natural Resources and SEWRPC*

Several metrics are useful to describe aquatic plant community condition and design management strategies. These metrics include maximum depth of colonization, species richness, biodiversity, evaluation of sensitive species, and relative species abundance. Metrics derived from the two most recent point-intercept surveys are described below.

**Maximum Depth of Colonization**

Minimal plant growth was found in Whitewater Lake to a depth of 12 feet below the water surface during both the 2015 and 2021 surveys. In Rice Lake, plant growth has been observed minimally throughout all depths of the lake, as the maximum depth of the lake is only 12 feet. Maximum depth of colonization (MDC) is a useful indicator of water quality, as turbid and/or eutrophic (nutrient-rich) lakes generally have shallower MDC than lakes with clear water.[9] It is important to note that for surveys using the point-intercept protocol, the protocol allows sampling to be discontinued at depths greater than the maximum depth of colonization for vascular plants. However, aquatic moss and macroalgae, such as *Chara* spp. and *Nitella* spp., frequently colonize deeper than vascular plants and thus may be under-sampled in some lakes. For example, *Chara globularis* and *Nitella flexilis* have been found growing as deep as 37 feet and 35 feet, respectively, in Silver Lake, Washington County.

**Species Richness**

The number of different types of aquatic plants present in a lake is referred to as the *species richness* of the lake. Larger lakes with diverse lake basin morphology, less human disturbance, and/or healthier, more resilient lake ecosystems generally have greater species richness. Aquatic plants provide a wide variety of benefits to lakes, examples of which are briefly described in Table 2.5.

Whitewater and Rice Lakes exhibited similar species richness throughout all documented surveys. Whitewater Lake's species richness increased in the 2021 survey, however that may be due to lower water levels that could have contributed to growth of other species within the seed bank of the Lake. The 2021 aquatic plant survey of Whitewater Lake identified 12 species, while the survey of Rice Lake identified 6 species. One additional species, marsh mermaidweed (*Proserpinaca palustris*) was also identified in Rice Lake. However, at the time of sampling it was mistaken for stunted Eurasian watermilfoil and was not included in abundance measurements, point-intercept counts, or visual observances. This a species of flowering plant in the watermilfoil family that is often found in wetland areas. Lowered water levels in 2021 may have allowed for this plant to grow from the historic wetland seedbank of Rice Lake.

It is not uncommon for aquatic plant community diversity to fluctuate in response to a variety of drivers such as weather/climate, predation, and lake-external stimuli such as nutrient supply. This is especially true in the case of a lake's individual pondweed species, which tend to vary in abundance throughout the growing season in response to temperature, insolation, and other ecological factors.

**Biodiversity and Species Distribution**

Species richness is often incorrectly used as a synonym for biodiversity. The difference in meaning between these terms is both subtle and significant. Biodiversity is based on the number of species present in a habitat along with the abundance of each species. For the purposes of this study, abundance was determined as the percent of observations of each species compared to the total number of observations made. Aquatic plant biodiversity can be measured with the Simpson Diversity Index (SDI).[10] Using this measure, a community dominated by one or two species would be considered less diverse than one in which several different species have similar abundance. In general, more diverse biological communities are better able to maintain ecological integrity. Promoting biodiversity not only helps sustain an ecosystem but preserves the spectrum of options useful for future management decisions.

Data collected during 2021 reveal that Whitewater Lake's SDI was 0.81, a significant increase from 0.63 measured during 2015. This increase was due to the identification of new species such as common bladderwort (*Utricularia vulgaris*), horned pondweed (*Zannichellia palustris*), and water celery (*Vallisneria americana*). This

[9] *Canfield Jr, D.E., Langeland, L., and Haller, W.T.* "Relations between water transparency and maximum depth of macrophyte colonization in lakes." *Journal of Aquatic Plant Management 23, 1985.*

[10] *The SDI expresses values on zero to one scale where 0 equates to no diversity and 1 equates to infinite diversity.*

**Table 2.5**
**Examples of Positive Ecological Qualities Associated with Aquatic Plant Species Present in Whitewater and Rice Lakes**

| Aquatic Plant Species Present | Ecological Significance |
|---|---|
| *Ceratophyllum demersum* (Coontail) | Provides good shelter for young fish; supports insects valuable as food for fish and ducklings; native |
| *Chara* spp. (Muskgrasses) | A favorite waterfowl food and fish habitat, especially for young fish; native |
| *Elodea canadensis* (Common waterweed) | Provides shelter and support for insects which are valuable as fish food; native |
| *Heteranthera dubia* (Water stargrass) | Locally important food source for waterfowl and forage for fish; native |
| *Myriophyllum spicatum* (Eurasian watermilfoil) | None known. Invasive nonnative. Hinders navigation, outcompetes desirable aquatic plants, reduces water circulation, depresses oxygen levels, and reduces fish/invertebrate populations |
| *Najas guadalupensis* (Southern naiad) | Important food source for waterfowl, marsh birds, and muskrats; provides food and shelter for fish; native |
| *Nitella flexilis* (Slender stonewort) | Sometimes grazed by waterfowl; forage for fish; native |
| *Potamogeton crispus* (Curly-leaf pondweed) | None known. Invasive nonnative |
| *Stuckenia pectinata* (Sago pondweed) | This plant is the most important pondweed for ducks, in addition to providing food and shelter for young fish; native |
| *Utricularia vulgaris* (cCmmon bladderwort) | Stems provide food and cover for fish; native |
| *Vallisneria americana* (Water celery) | Provides good shade and shelter, supports insects, and is valuable fish food; native |

Note: Information obtained from A Manual of Aquatic Plants by Norman C. Fassett, University of Wisconsin Press; Guide to Wisconsin Aquatic Plants, Wisconsin Department of Natural Resources; and, Through the Looking Glass: A Field Guide to Aquatic Plants, Wisconsin Lakes Partnership, University of Wisconsin-Extension.

*Source: SEWRPC*

increase indicates considerably higher biodiversity within Whitewater Lake. Rice Lake's SDI was found to be 0.66 in 2021 and 0.69 in 2014 because of a decrease in different species found. This indicates a considerably low biodiversity in Rice Lake. As mentioned above, the 2021 aquatic plant survey of Whitewater Lake identified 12 different aquatic plant species and 6 species in Rice Lake. Actions that conserve and promote aquatic plant biodiversity are critical to the long-term health of the Lakes. Such actions not only help sustain and increase the robustness and resilience of the existing ecosystem, but also promote efficient and effective future aquatic plant management.

During 2021, between one and three aquatic plant species were found at any one sampling point in Whitewater Lake (Figure 2.1), and one to four species were found at any single sampling point in Rice Lake (Figure 2.2). Whitewater Lake's greatest species richness occurred in the northwestern bay and the southern end of the Lake. Rice Lake's greatest species richness was found in its northeastern bay.

## Sensitive Species

Aquatic plant metrics, such as species richness and the floristic quality index (FQI), can be useful for evaluating lake health. In hard water lakes, such as those common in Southeastern Wisconsin, species richness generally increases with water clarity and decreases with nutrient enrichment.[11] The FQI is an assessment metric used to evaluate how closely a lake's aquatic plant community matches that of undisturbed, pre-settlement conditions.[12] To formulate this metric, Wisconsin aquatic plant species were assigned conservatism (C) values on a scale from zero to ten that reflect the likelihood that each species occurs in undisturbed habitat. These values were assigned based on the species substrate preference, tolerance of water turbidity, water drawdown tolerance, rooting strength, and primary reproductive means. Native "sensitive" species that are intolerant of ecological disturbance receive high C values, while natives that are disturbance tolerant receive low C values. Invasive species are assigned a C value of 0. A lake's FQI is calculated as the average C value of species identified in the lake, divided by the square root of species richness.

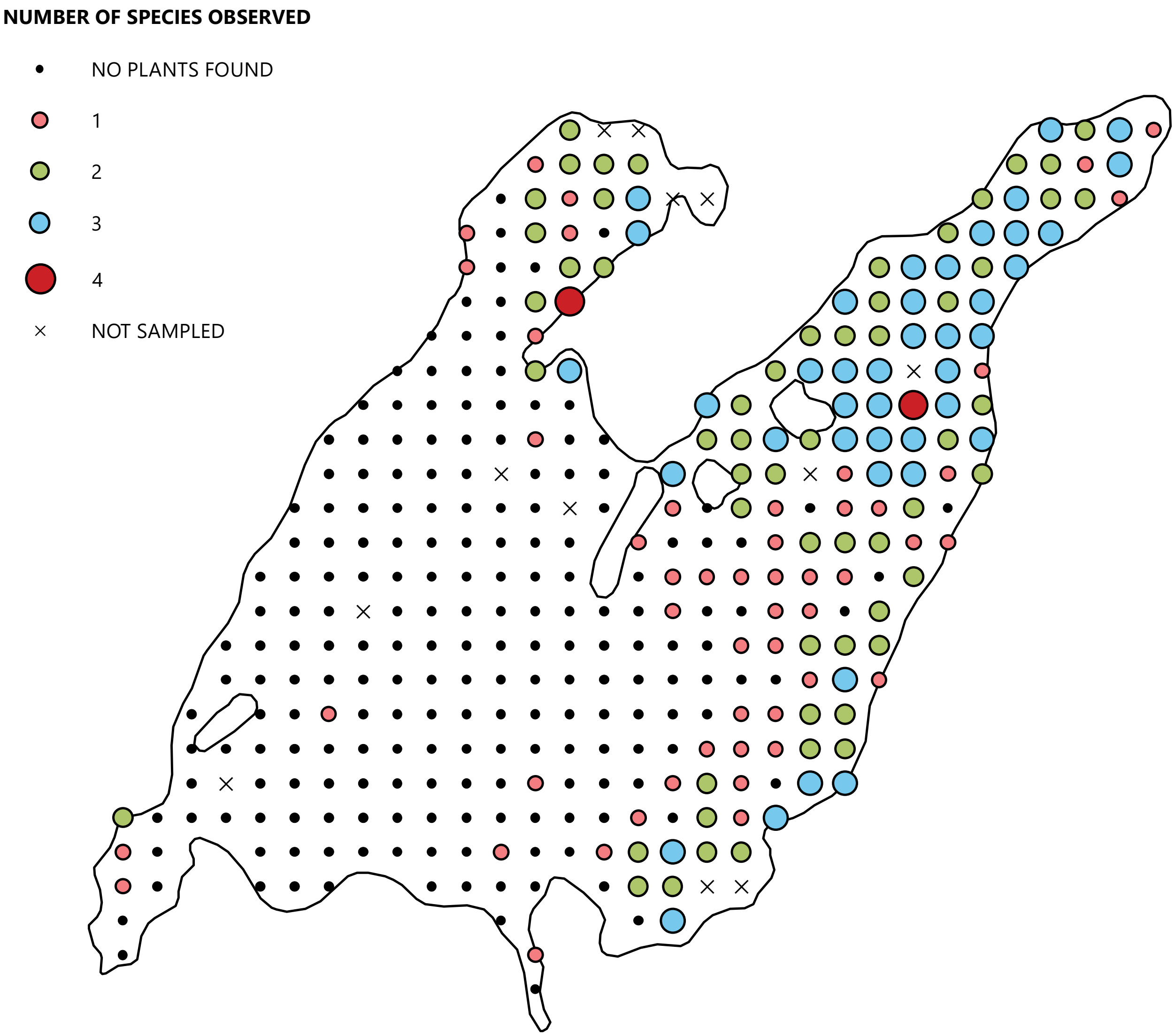
[11] *Vestergaard, O. and Sand-Jensen, K.* "Alkalinity and trophic state regulate aquatic plant distribution in Danish lakes." *Aquatic Botany 67, 2000.*

[12] *Nichols, S.* "Floristic quality assessment of Wisconsin lake plant communities with example applications." *Lake and Reservoir Management 15 (2), 1999.*

**Figure 2.1**
**Aquatic Plant Species Richness, Whitewater Lake: July 2021**


Note: Samples were collected in Whitewater Lake between July 6 and 13, 2021.
*Source: Wisconsin Department of Natural Resources and SEWRPC*

**Figure 2.2**
**Aquatic Plant Species Richness, Rice Lake: July 2021**




Note: Samples were collected in Rice Lake July 12, 2021.
*Source: Wisconsin Department of Natural Resources and SEWRPC*

Rice Lake had lower FQI values than Whitewater in both the 2014 and 2021 aquatic plant surveys. Additionally, Rice Lake exhibited a decreased FQI from 11.8 in 2014 to 7.5 in 2021, indicating a weakened aquatic ecosystem, while Whitewater Lake's FQI slightly increased from 15.5 in 2015 to 18.3 in 2021. All four surveys had FQI values that are lower than average for the Southeastern Wisconsin Till Plains ecoregion of 20.0, indicating that these Lakes have impaired aquatic plant communities, although the Whitewater Lake plant community appears to be improving.

### Relative Species Abundance

Throughout all aquatic plant surveys conducted, muskgrass (*Chara* spp.), a type of macroalgae, has consistently been found in both Lakes. This is a critical species to protect, as muskgrass has several unique environmental preferences as well as beneficial functions in lakes. Muskgrass is nearly always associated with hard water lakes, particularly those with significant groundwater seepage and springs. This species has been found to promote marl formation and induce dissolved phosphorus to be precipitated to the lake bottom, reducing phosphorus concentrations in the water column and thus improving water clarity.[13] Additionally, muskgrass is a favorite waterfowl food and helps stabilize lake-bottom sediment, as it has been observed to grow deeper than most vascular plants. Its prevalence in a lake's aquatic plant community may tangibly contribute to lake water quality, promoting the growth of other desirable native plant species.

A small variety of high value and oftentimes sensitive pondweed species (*Potamogeton*, spp.) have been found in the Lakes. Pondweed species have not been found in Rice Lake since 2008. Other native aquatic plants that have been found over the years in varying abundance include water celery (*Vallisneria americana*), common bladderwort (*Utricularia vulgaris*), and common waterweed (*Elodea canadensis*). Exotic Eurasian watermilfoil (EWM) (*Myriophyllum spicatum*) has been present in the Lakes since they were first sampled. However, the distribution of EWM has been decreasing in Whitewater Lake from 99 sampled locations in 2014, to 26 locations in 2015, and finally only 2 locations in 2021. The occurrence of EWM in Rice Lake almost doubled from 62 sampled locations in 2014 to 102 sampled locations in 2021.

Changing aquatic plant communities, such as those described in the preceding paragraphs, are often the result of change in and around a lake. Causes of change include aquatic plant management practices, land use (which in turn commonly affects nutrient and water supply and availability), lake use, climate, and natural biological processes such as natural population cycles of specific plants. Regarding plant-specific population cycles, it is not uncommon for various pondweed species to succeed each other during the growing season, with some species being more prevalent in cooler water, while others are more prevalent in warmer water. In contrast to such seasonal succession, aquatic plants, such as Eurasian water milfoil, are known to have year-to-year abundance and relative scarcity cycles, possibly because of climatic factors and/or predation cycles related to the relative abundance of milfoil weevils (*Eurhychiopsis lecontei*).

Based on the 2021 point-intercept survey, the four most abundant submerged aquatic plant species in Whitewater Lake were, in decreasing order of abundance: 1) coontail (*Ceratophyllum demersum*), 2) common waterweed (*Elodea canadensis*), 3) muskgrasses (*Chara* spp.), and 4) common stoneworts (*Nitella* spp.).

Based upon the 2021 point-intercept survey, the four most abundant aquatic plants in Rice Lake were, in decreasing order of abundance: 1) coontail, 2) EWM, 3) common waterweed, and 4) slender naiad (*Najas flexilis*).

### Apparent Changes in Observed Aquatic Plant Communities: 2014, 2015 versus 2021

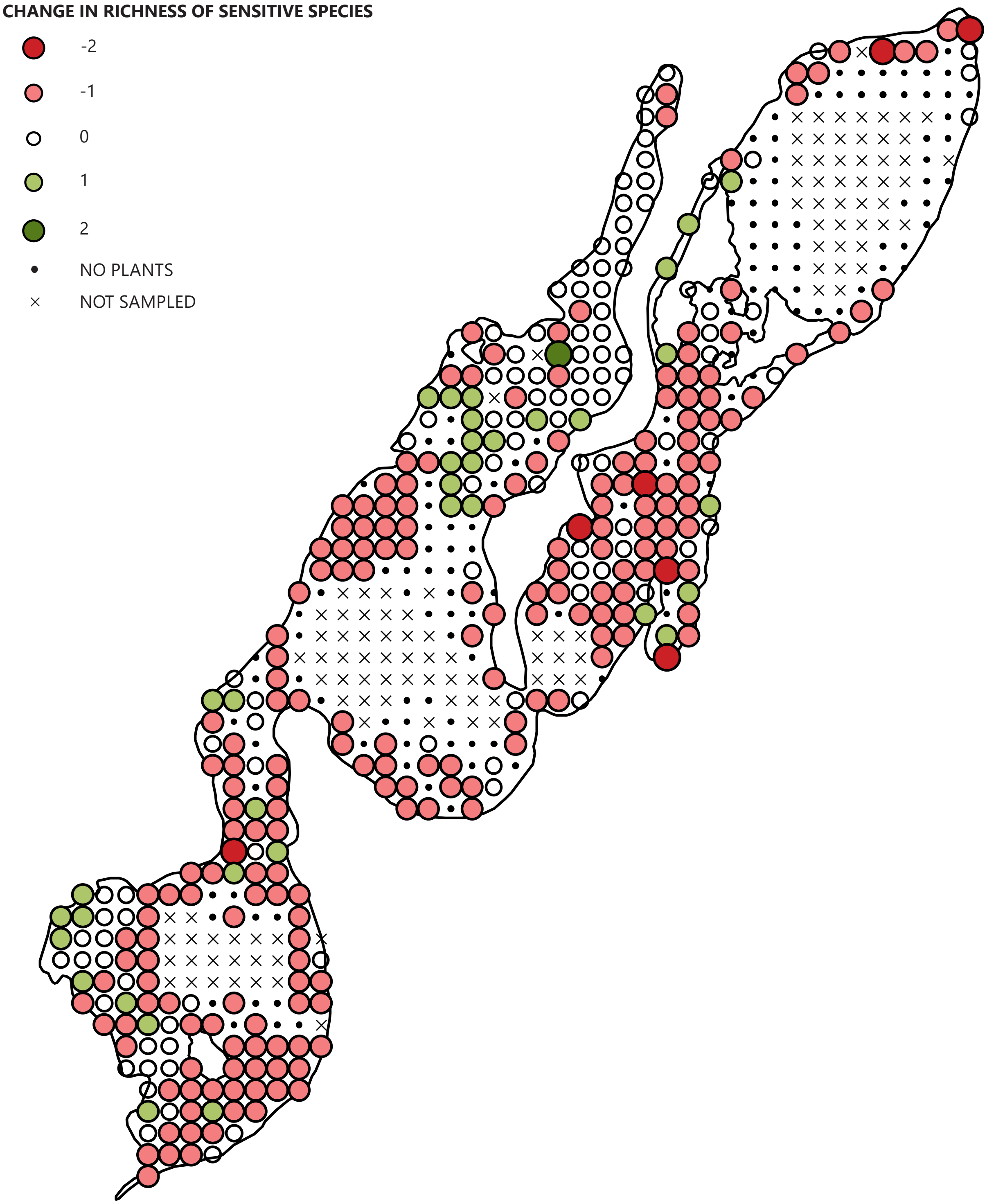
The distribution of each aquatic plant species identified as part of the 2021 survey is mapped in Appendix A. The 2021 aquatic plant inventory identified 12 species of submerged aquatic plants in Whitewater Lake and 6 species in Rice Lake. In contrast, the 2015 aquatic plant inventory identified 9 submerged aquatic plant species in Whitewater Lake while the 2014 aquatic plant survey identified 8 submerged species in Rice Lake. Despite a small increase in the number of submerged species in Whitewater Lake and a small decrease in the number of species in Rice Lake, the number of submerged plant species in the two Lakes has been relatively stable over time (Tables 2.1 and 2.2).

As was described earlier, sensitive aquatic plant species are likely the most vulnerable to human disturbance. Therefore, changes in sensitive species abundance can indicate the general magnitude of human disturbance derived stress on a waterbody's ecosystem. The number of sensitive species (i. e., species with C value of seven or greater) at each sample point during the two most recent surveys were contrasted.

Sensitive species were not found on Rice Lake during the 2014 or 2021 surveys. However, sensitive species decreased on Whitewater Lake between 2015 and 2021 (Figure 2.3). One sensitive species, southern naiad (*Najas gualalupensis,* C value of 7), was identified at far fewer points in Whitewater Lake in 2021 than in 2015. However, new species of high quality were found in Whitewater Lake but in low abundance. These included common bladderwort (*Utricularia vulgaris*), wild celery (*Vallisneria americana*), and horned pondweed (*Zannichellia palustris*). Native stoneworts (*Nitella* spp., C value of 7) and muskgrasses (*Chara* spp., C value of 7) were both found at far more points in 2021 than in 2015 in Whitewater Lake. Both *Chara* and *Nitella* are in the same macroalgae family (*Characeae*) so changes in lake ecology, such

[13] *Scheffer, M., and van Ness, E.H. "Shallow lakes theory revisited: various alternative regimes driven by climate, nutrient, depth, and lake size." Hydrobiologia 584, 2007.*

## Figure 2.3
## Change in Sensitive Species Richness, Whitewater Lake: 2015 Versus 2021




Note: Samples were collected in Whitewater Lake between July 6 and 13, 2021.
*Source: Wisconsin Department of Natural Resources and SEWRPC*

as increasing phosphorus concentrations, may similarly decrease the competitiveness of both genera. On Rice Lake, Eurasian watermilfoil (*Myriophyllum spicatum*), coontail (*Ceratophyllum demersum*), and common waterweed (*Elodea canadensis*) abundance increased significantly across the waterbody.

### *Eurasian Watermilfoil (EWM)*

EWM is an ongoing and serious concern in many Wisconsin lakes, especially nutrient-rich lakes such as those common in Southeastern Wisconsin. EWM has been one of the District's primary targets for control through its ongoing aquatic plant management program. Additionally, riparian landowners also direct substantial effort to EWM control.

EWM is one of eight milfoil species found in Wisconsin and is the only exotic or nonnative milfoil species. EWM favors mesotrophic to moderately eutrophic waters, fine organic-rich lake-bottom sediment, warmer water with moderate clarity and high alkalinity, and tolerates a wide range of pH and salinity.[14,15] In Southeastern Wisconsin, EWM can grow rapidly and has few natural enemies to inhibit its growth. Furthermore, it can grow explosively following major environmental disruptions, as small fragments of EWM can grow into entirely new plants.[16] For reasons such as these, EWM can grow to dominate an aquatic plant community in as little as two years.[17,18] In such cases, EWM can displace native plant species and interfere with the aesthetic and recreational use of waterbodies. However, established populations may rapidly decline after approximately ten to 15 years.[19]

EWM is a significant recreational use problem in Southeastern Wisconsin lakes. For example, boating through dense EWM beds can be difficult and unpleasant. Because EWM can reproduce from stem fragments, recreational use conflicts can help spread EWM. Human produced EWM fragments (e.g., fragments created by power boating through EWM), as well as fragments generated from natural processes (e.g., wind-induced turbulence, animal feeding/disturbance) readily colonize new sites, especially disturbed sites, contributing to EWM spread. EWM fragments can remain buoyant for two to three days in summer and two to six days in fall, with larger fragments remaining buoyant longer than smaller ones.[20] The fragments can also cling to boats, trailers, motors, and/or bait buckets where they can remain alive for weeks contributing to transfer of milfoil to other lakes. For these reasons, it is very important to remove all vegetation from boats, trailers, and other equipment after removing them from the water and prior to launching in other waterbodies.

EWM was substantially decreased during the 2021 survey in Whitewater Lake, occurring at only two points as opposed to 63 in 2015 (Table 2.3). Therefore, the area occupied by EWM relative to other plants declined by 98 percent between 2015 and 2021 (Figure 2.4) In addition, when found, EWM amounted to only a few plants resulting in a rake fullness of one.

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[14] *U. S. Forest Service, Pacific Islands Ecosystems at Risk (PIER), 2019. May be downloaded at the following website: www.hear.org/pier/species/myriophyllum_spicatum.htm*

[15] *Nichols, S. A. and B. H. Shaw, Ecological life histories of the three aquatic nuisance plants Myriophyllum spicatum, Potamogeton crispus, and Elodea Canadensis, Hydrobiologia, Volume 131, Number 1, 1986.*

[16] Ibid.

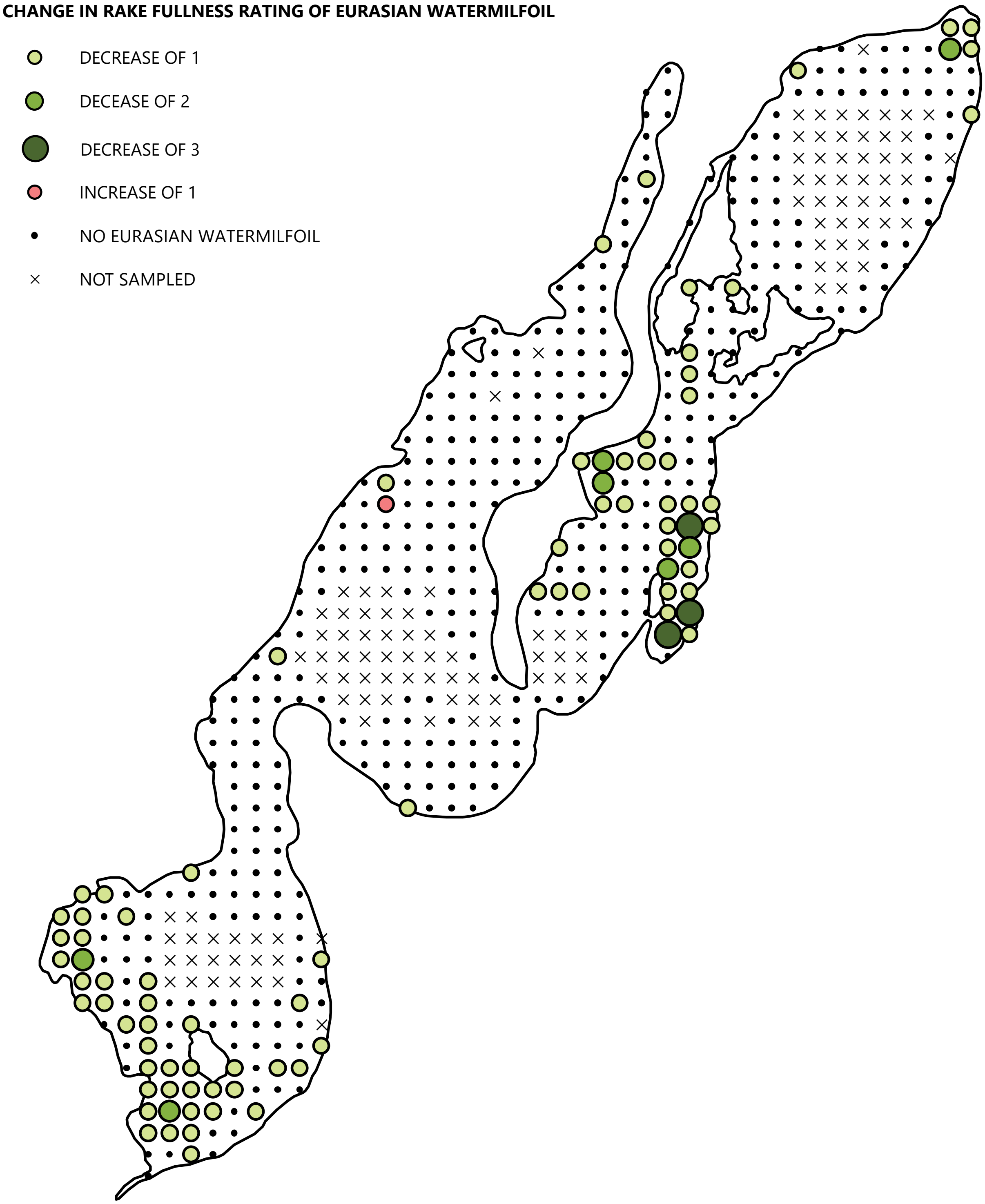
[17] *Carpenter, S. R.,* The Decline of Myriophyllum spicatum in a eutrophic Wisconsin (USA) lake*, Canadian Journal of Botany, Volume 58, Number 5, 1980.*

[18] *Les, D. H., and L. J. Mehrhoff,* Introduction of nonindigenous vascular plants in southern New England: a historical perspective*, Biological Invasions, Volume 1, pages 284-300, 1999.*

[19] *Carpenter, S. R.* op. cit.

[20] *Joshua D. Wood and Michael D. Netherland, "*How long do shoot fragments of hydrilla (*Hydrilla verticillata*) and Eurasian watermilfoil (*Myriophyllum spicatum*) remain buoyant?"*, Journal of Aquatic Plant Management Volume 55: Pages 76-82, July 2021.*

**Figure 2.4**
**Change in Eurasian Watermilfoil Rake Fullness, Whitewater Lake: 2015 Versus 2021**




Note: Samples were collected in Whitewater Lake between July 6 and 13, 2021.
*Source: Wisconsin Department of Natural Resources and SEWRPC*

EWM was much more widespread in Rice Lake than Whitewater Lake. EWM growth was most prevalent in the northeastern and northwestern bays of Rice Lake and also was found along the eastern shore of the Lake (Appendix A). The number of sampling points where EWM was found increased from 62 points in 2014 to 102 points in 2021 (Table 2.4). However, because of an increase in both the common waterweed and coontail populations, it's relative frequency of occurrence was reduced. As can be seen in Figure 2.5, EWM rake fullness increased in both the northwestern and northeastern bays of Rice Lake.

A word of caution: EWM has proven itself to be an aggressive and highly successful species that can overrun desirable aquatic plant communities. While the changes reflected by the results of the 2021 survey of Whitewater Lake are certainly encouraging, this plant is fully capable of staging a complete reversal of this apparent downward population trend. Therefore, EWM must continue to be actively monitored and vigilantly managed.

***Curly-leaf Pondweed (CLP)***

Curly-leaf pondweed continues to be present in both Whitewater and Rice Lakes. This plant, like EWM, is identified in Chapter NR 109 of the *Wisconsin Administrative Code* as a nonnative invasive aquatic plant. Although survey data suggests it presently is only a relatively minor species in terms of dominance, and, as such, is less likely to interfere with recreational boating activities, the plant can grow dense stands that exclude other high value aquatic plants. For this reason, curly-leaf pondweed must continue to be monitored and managed as an invasive member of the aquatic community. Lastly, it must be remembered that curly-leaf pondweed senesces by midsummer, and therefore may be underrepresented in the inventory data presented in this report.

## 2.3 PAST AND PRESENT AQUATIC PLANT MANAGEMENT PRACTICES

Aquathol® and 2,4-D have been applied to Whitewater and Rice Lakes since 1968 to help control nonnative Eurasian watermilfoil and curly-leaf pondweed (Appendix B). In 1990, chemical treatments along developed shorelines were supplemented with mechanical harvesting to control nonnative species.

Various sized areas of developed shoreline are subjected to extensive chemical applications in both Lakes.[21] Aquathol® and 2,4-D have been used to control aquatic plant growth. Aquathol® is a contact herbicide that primarily kills pondweeds, but does not control other potentially nuisance species, such as EWM. The herbicide 2,4-D is a systemic herbicide that is absorbed by the leaves and translocated to other parts of the plant; it is more selective than the other herbicides listed above and is generally used to control EWM. However, it can also kill beneficial species, such as water lilies (*Nymphaea* spp. and *Nuphar* spp.).

In 2021, two areas in Whitewater Lake and one area in Rice Lake were treated with a total of 438 and 345 prescription dose units of the novel herbicide ProcellaCOR™ to control their EWM and CLP populations.[22] EWM was observed at two of the 475 surveyed points within Whitewater Lake in 2021 and at 102 of the 273 surveyed points within Rice Lake in 2021.

ProcellaCOR™ was first registered by the Environmental Protection Agency in for aquatic use in 2017 and by the WDNR in 2018. According to the WDNR chemical fact sheet, ProcellaCOR™ mimics plant growth hormones to kill plants through excessive cell elongation but has a different binding affinity than similar registered products, such as 2,4-D. Toxicity tests conducted using model species suggest that ProcellaCOR™ poses no risk concerns for non-target wildlife, nor does it pose a risk to human health with acute or chronic exposure. However, effects of ProcellaCOR™ on lake ecology is still an area of active research due to its novel use in aquatic plant management.

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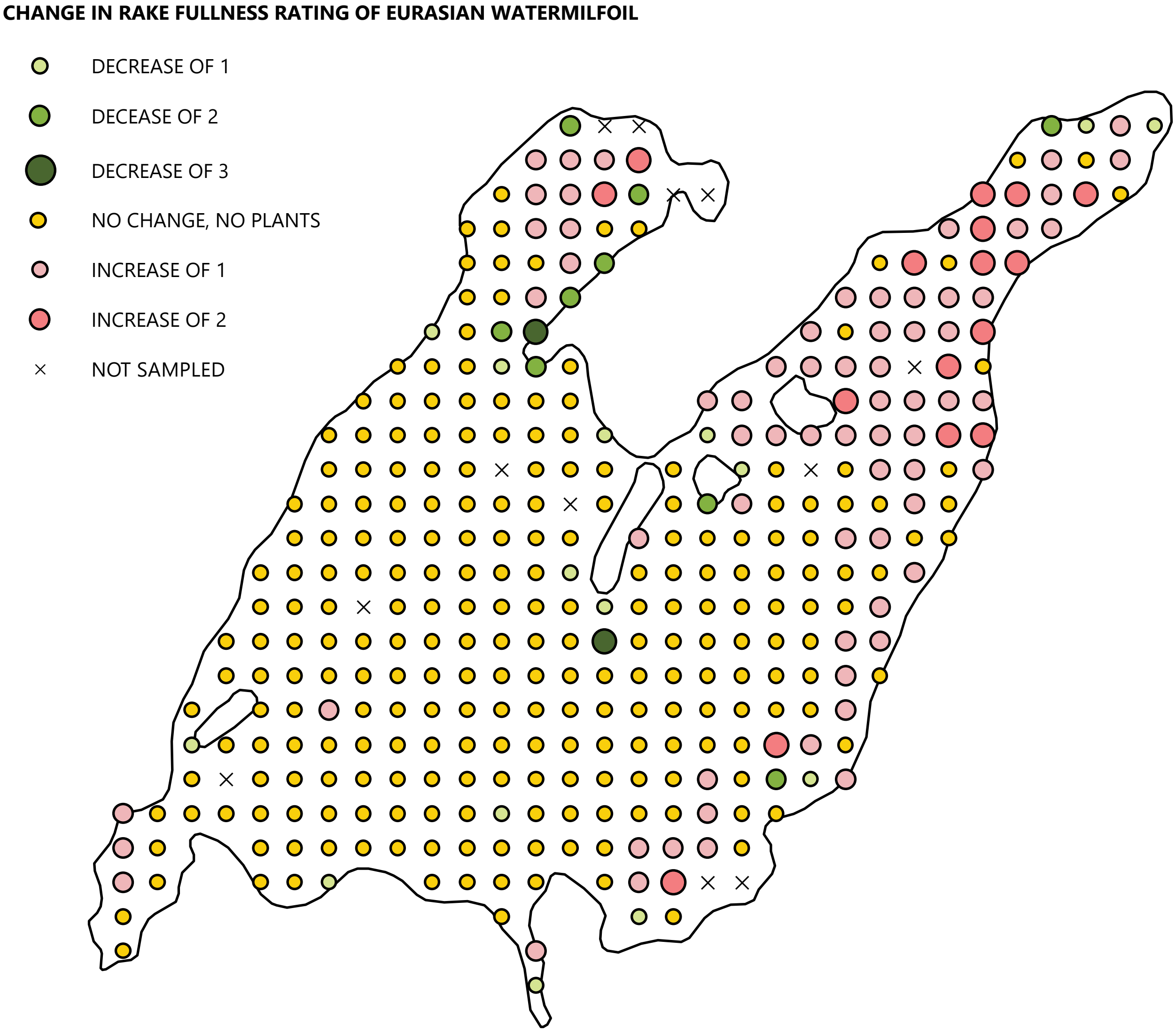
[21] *Memorandum Report No. 177 (2nd Edition), 2017* op. cit.

[22] *The ProcellaCOR™ active ingredients, directions for use, and dose amounts can be found on the following webpage: www.sepro.com/Documents/ProcellaCOR_EC--Label.pdf.*

**Figure 2.5**
**Change in Eurasian Watermilfoil Rake Fullness, Rice Lake: 2014 Versus 2021**




Note: Samples were collected in Rice Lake July 12, 2021.
*Source: Wisconsin Department of Natural Resources and SEWRPC*

Since the 1990s, mechanical aquatic macrophyte harvesting has been an additional aquatic plant control method used on the Lakes. The volume of aquatic plants harvested each year can vary (Table 2.6). A benefit of harvesting versus chemical treatment is that plant mass, and the nutrients contained therein, are physically removed from the Lakes by harvesting. This action also removes phosphorus from the Lakes. The total phosphorus removed from the Lakes by harvesting was calculated for this study, with the following notes and assumptions:

- The density of the wet harvested plants was assumed to be 900 pounds per cubic yard.
- The amount of phosphorus contained by aquatic plants varies by species, lake, and time. The phosphorus content of harvested plants used estimates from the Wisconsin Lutheran College (WLC) on Pewaukee Lake, the U.S. Geological Survey on Whitewater and Rice Lakes (Whitewater-Rice), and a study conducted on a eutrophic lake in Minnesota (Minnesota). The WLC study assumed that plant wet weight is 6.7 percent of dry weight and that total phosphorus constitutes 0.2% of the total dry weight of the plant. The Whitewater-Rice and Minnesota studies assumed

that dry weight is 15 and 7% of the wet weight, respectively, and phosphorus constituted 0.31 and 0.30% of the dry plant weight, respectively. Assumed values for the percent of dry weight to wet weight and the total phosphorus concentrations are similar to those found in other studies.[23,24]

**Table 2.6**
**Volume of Aquatic Plants Harvested from Whitewater and Rice Lakes: 2016-2021**

| Year | Plant Material Removed (cubic yards) | Percentage Removed from Whitewater Lake | Percentage Removed from Rice Lake |
|---|---|---|---|
| 2016 | 4,500 | 95 | 5 |
| 2017 | 4,100 | 95 | 5 |
| 2018 | 3,800 | 95 | 5 |
| 2019 | 2,400 | 95 | 5 |
| 2020 | 1,500 | 90 | 10 |
| 2021 | 1,475 | 90 | 10 |

*Source: Whitewater-Rice Lakes Management District*

Using these methods, the Commission estimates that aquatic plant harvesting has cumulatively removed roughly 3,000 pounds of phosphorus from the Lakes during the past 5 years (Figure 2.6). Initially, approximately 1,000 pounds were removed per year. However, in recent years harvesting amounts have dropped from approximately 4,000 cubic yards to less than 1,500 cubic yards resulting in only about 500 pounds of phosphorus removal in the past two years. The WDNR's Presto-Lite tool estimates that the average total annual phosphorus load to the Lakes from non-point source runoff is 450 pounds. Therefore, aquatic plant harvesting may remove as much phosphorus from the Lakes as is contributed annually by runoff and tributary streams. However, it is important to note that internal loading of phosphorus and long retention times were found to contribute significantly to phosphorus levels in these Lakes in a previous report.[25]

## 2.4 IDENTIFIED SENSITIVE AREAS

The WDNR has identified five sensitive areas in Whitewater Lake while no sensitive areas are identified in Rice Lake (Map 2.1).[26] Area one occupies a portion of the northwestern bay of Whitewater Lake. Area two occupies a portion of the Lake that contains remnant tamaracks and bogs. Areas three and four are relatively small and are located along the eastern shore of the Lake. Area five occupies the southwestern portion of the lake.

WDNR sensitive area reports include management recommendations and other information that both benefit and constrain aquatic plant management and riparian landowners. A copy of the sensitive area report for Whitewater and Rice Lakes is included in Appendix C. In general, the WDNR's management recommendations are designed to help maintain the valuable functions sensitive areas provide lakes. All sensitive areas trap sediment and nutrients and thereby help protect the Whitewater and Rice Lakes' water quality. They also provide spawning, nursery and foraging opportunities to native fish and are excellent habitat for waterfowl, furbearers, and herptiles. However, protecting these areas requires limitations and restrictions be placed upon aquatic plant management. A few examples of these limitations and restrictions include the following.

- In Sensitive Area One, chemical control is not allowed and mechanical harvesting is not recommended except to open access lanes.
- In Sensitive Area Two, chemical control is allowed for control of exotic aquatic plants as long as it does not have the potential to damage native species. In addition, mechanical plant harvesting is recommended only within 30 feet of the developed shoreline.

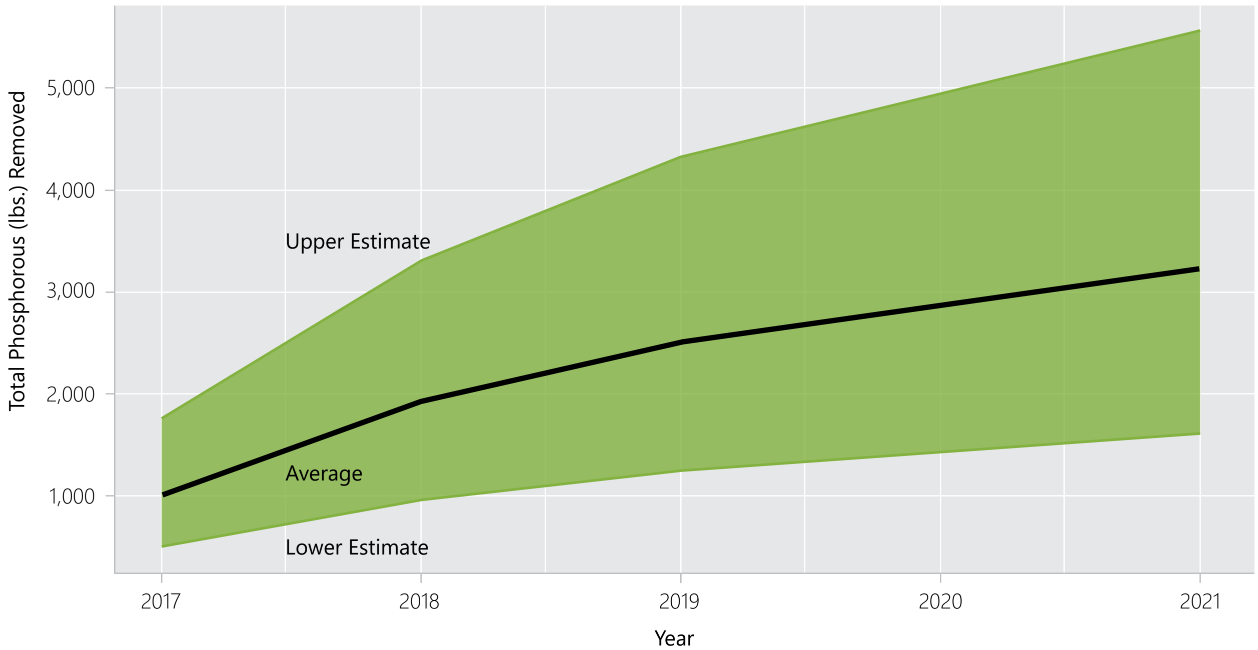
[23] *Carvalho, KM, Martin, DF.* Removal of Aqueous Selenium by Four Aquatic Plants*. Journal of Aquatic Plant Management 39: 33-36, 2001.*

[24] *Thiébaut G. Phosphorus and Aquatic Plants. In: White PJ, Hammond JP (eds)* The Ecophysiology of Plant-Phosphorus Interactions*. Plant Ecophysiology 7, 2008.*

[25] *Memorandum Report No. 177 (2nd Edition), 2017* op. cit.

[26] *The WDNR is granted authority to define sensitive areas under Section NR 107.05(3)(i) of the* Wisconsin Administrative Code*.*

**Figure 2.6**
**Whitewater and Rice Lakes Phosphorus Removal by Harvesting: 2017 - 2021**




*Source: Whitewater and Rice Lakes Management District and SEWRPC*

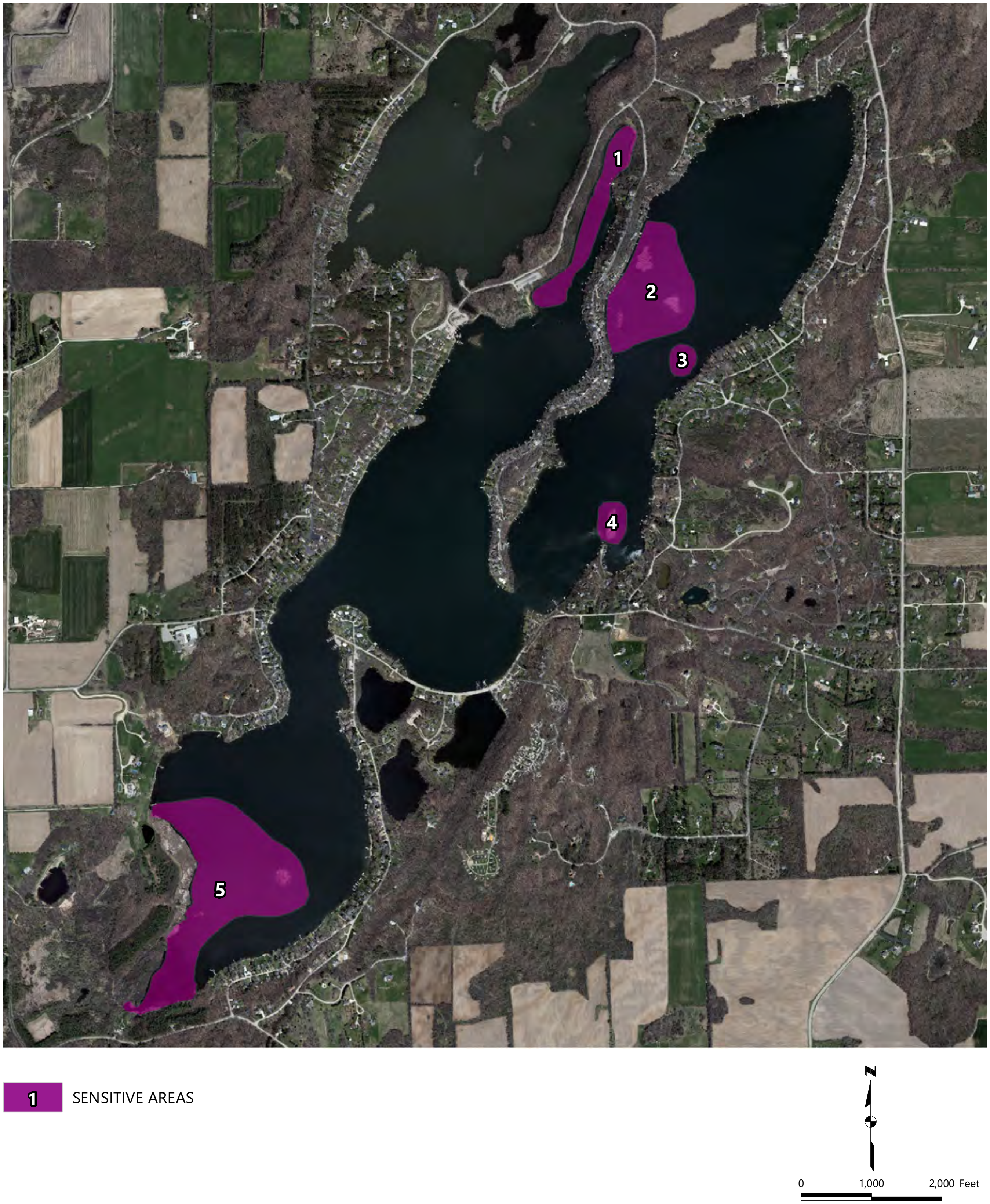
- In Sensitive Area Three, mechanical plant harvesting is not recommended within 100 feet of the floating island and chemical control is not allowed.
- In Sensitive Area Four, mechanical harvesting is not recommended within 100 feet of the sensitive are except to open access lanes and chemical control is not allowed.
- In Sensitive Area Five, mechanical harvesting is not recommended except to open access and fishing lanes and chemical control is restricted to exotic plant species.

## 2.5 DAM DESIGN AND OPERATIONAL CHARACTERISTICS

Most of Southeastern Wisconsin's larger dams impounding navigable watercourses were originally built to power industrial activity. According to the Town of Whitewater website, the first dam impounding the upper reaches of Whitewater Creek was built by immigrants during the 1840's. This dam was reportedly located near the existing Rice Lake dam and likely powered flour milling or timber sawing equipment. Apparently, this dam rapidly fell into disuse. By 1889, the former millpond had largely reverted to conditions similar to those existing before development including features such as wetlands and natural lakes.[27] Unlike the original industrial power dam, the dams presently impounding Whitewater and Rice Lakes were built as part of real estate speculation schemes and/or to facilitate recreation.

[27] *United States Geological Survey*, Wisconsin Whitewater Sheet*, January 1892.*

**Map 2.1**
**WDNR-Designated Whitewater and Rice Lakes Sensitive Areas: 2022**




*Source: Wisconsin Department of Natural Resources and SEWRPC*
Date of Photography: April 2022

***Whitewater Dam***

Whitewater Lake was created by damming a stream draining three small natural lakes: Bass Lake, Kettle or Round Lake, and Whitewater Lake. The current dam was constructed during the 1920's to support land speculation. However, economic challenges caused this venture to fail and the Lake to be drained. Historical aerial photography showing the Whitewater/Rice Lakes area after the dam was constructed but while the Lakes were dewatered was included in the previous SEWRPC report.[28] The reservoir was refilled in 1947 and has remained filled since that date. Walworth County owns the dam impounding Whitewater Lake.

The Whitewater Lake dam is an earthen embankment spanning a narrow gap in a prominent northeast-southwest trending ridge that otherwise completely separates the basins of Whitewater and Rice Lakes. According to information on file with the WDNR, the crest of the dam impounding Rice Lake is 200 feet wide, has a structural height of 11.0 feet, and has a hydraulic height of 7.0 feet. The reservoir normally contains 1,700 acre-feet of water but can hold as much as 4,300 acre-feet during extreme high-water events. Although the dam only has a hydraulic height of 7.0 feet, the maximum depth of the upstream reservoir is 38 feet in the footprint of one of the natural lakes inundated by dam construction.

The Whitewater Lake dam is considered a large, low hazard dam under *Wisconsin Statute* Chapter 31 Regulation of Dams and Bridges Affecting Navigable Waters and *Wisconsin Administrative Code* NR 333 Dam Design and Construction. The dam's crest appears nonarmored, but the downstream face of the dam may be covered with rip rap. Profuse vegetation, including elm trees, invasive Tartarian honeysuckle, and sumac growing on the downstream face of the dam obscured visual inspection attempted by Commission staff on September 2, 2021 (Figure 2.7a). Trees and shrubs should generally not be allowed to grow on earthen dams.

Although the earthen dam impounding Whitewater Lake measures roughly 200 feet wide, a much narrower weir forms the upper end of a uniformly sloped concrete-lined spillway. The spillway measures 10.0 feet wide, 3.0 feet deep, and is capped near its inlet with a concrete slab that acts as a bridge. Based upon casual visual inspection, the concrete-lined spillway appears to be in relatively good condition and is the only visible engineered outlet for water spilling from Whitewater Lake to Rice Lake. The lower end of the concrete-lined spillway is armored with fieldstone rip rap. Nevertheless, erosion is evident at the terminus of the concrete-lined spillway and the spillway's lower end may be partially undermined (Figure 2.7b).

The Whitewater Lake dam is not fitted with gates, flashboards, or other means to manipulate Lake water levels (Figure 2.7c). Furthermore, no alternate spillways were noted during the Commission's 2021 visit to the damsite that could be used to purposely lower Whitewater Lake's water level. However, a spillway structure was apparently present near the base of the dam before filling the Lake during 1947 that allowed the earthen dam to remain in place and the Lake to be dewatered. Without comprehensive file review and/or detailed inspection, the disposition and potential operability of this historical outlet cannot be ascertained.

Although runoff models suggest that an average of 5.5 cubic feet per second of water discharge from Whitewater Lake, water rarely spills over the Whitewater Lake dam. In fact, after Whitewater Lake began to fill in 1947, water did not spill to Rice Lake for 26 years. The Lake's water surface elevation first rose high enough to spill through the concrete-lined spillway in 1973 after a period of extended heavy precipitation. The lack of surface-water discharge from Whitewater Lake attests to the large amount of water seeping through Whitewater Lake's banks and bed. This water ultimately discharges to lower elevation water bodies such as Rice Lake. Given this condition, very little control of the Lake's water surface elevation is presently attainable.

On the date of the Commission's site inspection, Whitewater Lake's water elevation was slightly lower than the spillway elevation. Consequently, no surface water was spilling to Rice Lake except as part of artificially high waves created by boat wakes (Figure 2.7d). However, water movement, iron ocher deposits, and iridescent biological films found at the foot of the dam made it plainly evident that significant volumes of water were discharged below the dam. This water likely results from seepage from Whitewater Lake moving through, around, or below the dam (Figures 2.7e and 2.7f). Depending upon the nature of the

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[28] *Memorandum Report No. 177 (2nd Edition)*, *2017* op. cit.

## Figure 2.7
## Assessment of the Whitewater Lake Dam, September 2, 2021

A

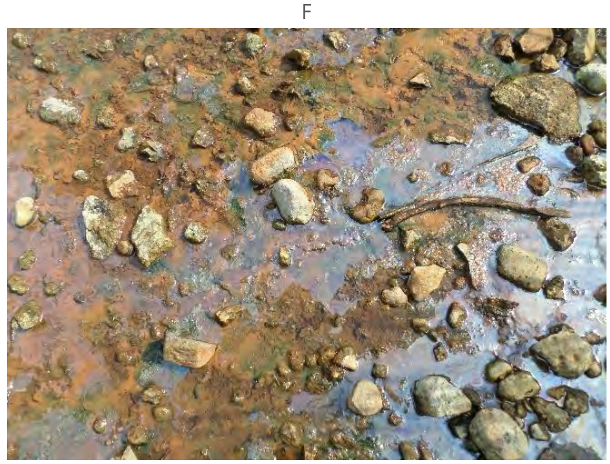
B

C

D

E

F



*Source: SEWRPC*

sediments through which water is moving, seepage can lead to piping.[29] In certain circumstances, piping that can compromise the integrity of earthen dams over time.

A final note regards an area immediately south of the dam and involves spillway functionality. The parking area developed to the south of the dam shortly after the Lake was refilled was extensively graded. Although Commission staff did not have access to survey equipment at the time of their visit, simple visual observation suggests that the dam may be roughly one foot higher than the adjacent parking area. This grading and associated storm drain construction may have inadvertently created a potential alternate surface-water flow path that could convey discharge from the Lake around the dam during extremely high Lake levels. It would be prudent to investigate this potential as part of future dam inspection and management activity.

***Rice Lake Dam***

Whitewater Creek was dammed a short distance downstream of Whitewater Lake during 1954, an action that created Rice Lake. Based upon an 1857 Whitewater Township plat map, the 1954 Rice Lake dam was likely located near the abandoned pioneer-era mill dam built during the 1840's. Kettle Moraine Drive crosses the dam crest. The Rice Lake dam is owned by the Wisconsin Department of Natural Resources. A historical aerial photograph showing the area before construction of the Rice Lake dam can be referenced in the previous SEWRPC report.[30]

The Rice Lake dam is an earthen embankment filling a narrow gap in a long, prominent northeast-southwest trending ridge. According to WDNR file information, the dam has a crest length measuring 200 feet, has a structural height of 18.0 feet, and has a hydraulic height of 12.0 feet. The Rice Lake dam normally impounds 460 acre-feet of water. During extreme high-water events, the reservoir can hold up to 1,140 acre-feet. Since the dam flooded a former riparian wetland, the reservoir is quite shallow with a maximum depth of approximately 10 feet. The dam is considered a large, high hazard dam under *Wisconsin State Statute* Chapter 31 Regulation of Dams and Bridges Affecting Navigable Waters and *Wisconsin Administrative Code* NR 333 Dam Design and Construction.

Commission staff visited the Rice Lake dam site on September 2, 2021. On this date, no water was passing over the dam's spillway. A modest amount of groundwater was emerging near the dam's outlet as was evidenced by iridescent films and clear water. Commission staff noted that the visible portion of the dam's upstream face was mown grass with rip rap armor near the shoreline (Figure 2.8a). The rip rap extended downslope at least a few feet below the water surface. The downstream face of the dam was not mown and well vegetated, but was not overgrown with woody vegetation. Some rip rap was visible at the toe of the downstream dam face near the outlet culvert. However, because of the dense vegetation, the extent of rip rap covering the downstream face of the dam is unknown (Figure 2.8b).

According to WDNR records, the Rice Lake dam's outlet consists of a vertical concrete standpipe connected to a 72-inch diameter galvanized corrugated metal pipe (CMP) passing through the earthen embankment. The concrete standpipe is fitted with a 30-inch slide gate allowing manual control of Lake water level. The gate and the CMP are placed near the bottom of the dam and could allow the reservoir to be dewatered. During high-water periods, the standpipe can overtop allowing water to cascade to the bottom of the standpipe and enter the CMP passing water downstream through the embankment. A screen is fitted to the high-water inlet to avoid debris entrainment. Figure 2.8c illustrates the present-day appearance of the high-water inlet and gate actuator. Figure 2.8d illustrates the appearance and relationship of the gated inlet (square penetration) and CMP outlet (round penetration).

Visual inspection suggests that concrete portions of the dam's outlet structure are in good condition. According to WDNR records, the concrete standpipe was moved out of position by ice shortly after the dam's construction, causing a break in the outlet apparatus. The standpipe was relieved by pressure grouting and was reinforced by placing fill around the standpipe. An 18.0-foot length of 24-inch diameter CMP was connected to the slide gate to convey water through the newly placed fill. The fill extends above

[29] *Piping is a type of erosion caused when seepage discharging to the ground surface entrains sediment particles from the media through which seepage is occurring. Over time, "pipes" are formed in the subsurface. These pipes concentrate discharge and promote further erosion. Piping can create failure-prone voids in an earthen embankment.*

[30] *Memorandum Report No. 177 (2nd Edition)*, *2017* op. cit.

**Figure 2.8**
**Assessment of the Rice Lake Dam, September 2, 2021**


*Source: SEWRPC*

typical water levels allowing dryland access of the standpipe from the earthen embankment (Figure 2.8e). The releveled standpipe was connected to the existing 72-inch diameter CMP by grouting in a 60-inch diameter CMP. Given its appearance and records available from the WDNR, the 72-inch diameter CMP conveying water under the embankment and emerging on the downstream face of the dam is likely the pipe installed during dam construction during 1954. The 72-inch diameter CMP appears to be slightly distorted, taking on an oval shape. The 72-inch diameter CMP, while serviceable, is beginning to rust and is likely approaching the end of its serviceable life.

Given the current configuration of the dam outlet apparatus, the dam's high-water maximum outlet capacity is likely controlled by the length of 60-inch diameter CMP grouted into position when the outlet was repaired. The outlet apparatus does enable Lake water surface elevation control and for drawing water from near the bottom of the Lake. The speed of drawdown and the ability to maintain drawdown are governed by the capacity of the 24-inch diameter CMP leading through fill placed during outlet repair to the Lake's bottom. The condition of this outlet pipe and the inlet portion of this outlet pipe are unknown.

***Basic Lake Morphology and Hydrology Information***

The area's irregular glacial topography makes it relatively easy to block drainageways and create impoundments. However, the glacial landforms facilitating dam construction are often composed of porous, coarse-grained, granular sediment. Porous sediment underlying the Lakes' beds and shorelines allows impounded water to seep out of the Lakes, a situation making them more difficult to completely fill. For this reason, the engineered outlets of the Lakes are often dry or do not convey significant volumes of surface water. The compromised ability for local impoundments to hold water may be the reason why the pioneer-era industrial power dam on Rice Lake was abandoned soon after it was constructed.

Whitewater Lake inundated three small natural lakes. For this reason, Whitewater Lake's maximum depth is much greater than the height of the outlet dam's total height. Rice Lake inundated a wetland area bisected by Whitewater Creek. For this reason, Rice Lake's total depth is roughly equivalent to the height of the dam impounding Rice Lake.

Whitewater Lake's water elevation only rarely exceeds the dam's spillway elevation. Little surface water flows from Whitewater Lake to Rice Lake, however, significant volumes of groundwater seep from Whitewater Lake to Rice Lake. Similarly, little surface water leaves Rice Lake. Instead, seepage through the Lake's bed and banks enters the local groundwater system and discharges to Whitewater Creek downstream of the Lakes.

According to a study completed in 1994 by the United States Geological Survey,[31] groundwater supplies 57 percent of Whitewater Lake's annual water supply (4,010 acre-feet). Similarly, water seeping into Whitewater Lake's bed and banks is its primary outflow (81 percent, 5,720 acre-feet). Although groundwater is an important part of Rice Lake's water budget, precipitation falling upon the Lake's water surface is the primary source of water to Rice Lake. Evaporation is the greatest outflow from Rice Lake.

Even though considerable volumes of water enter and leave both Lakes, water only rarely discharges over the spillways of either dam. Unlike some dams, minimum discharge requirements have not been set for the Whitewater or Rice Lake Dams. Groundwater both enters and exits the Lakes by seeping through the bed and banks of the Lakes and adjacent streams, a defining characteristic of a seepage lake and a finding that can have significant management and regulatory implications. Furthermore, even though Whitewater and Rice Lakes abut one another, their morphologies and hydrology are very different. The general lack of flow over the dams prevent fish from swimming from one Lake to the other. Therefore, the population densities and species of fish in each Lake respond independently to unique conditions occurring within each Lake.

[31] *Goddard, Gerald L. and Stephen J. Field,* Hydrology and Water Quality of Whitewater and Rice Lakes in Southeastern Wisconsin, 1990-1991*, United States Geological Survey Water-Resources Investigations Report 94-4101, 1994.*

***Implications for Aquatic Plant Management***

Whitewater Lake's outlet dam rarely spills water and does not have an operable gate to pass water below the dam. Given the modest inflow to the Lake, refilling the Lake could take extended periods of time, especially during drought periods. These factors make it difficult to employ water-level drawdown as a practical means to control rooted aquatic plants in Whitewater Lake. Furthermore, as explored in the Commission's 2017 plan,[32] hypolimnetic withdrawal to reduce phosphorus internal loading fueling aquatic plant and algae growth is also likely impractical. However, the Whitewater Lake dam does likely prevent common carp from migrating into the Lake from downstream areas. Unfortunately, Whitewater Lake's large size and extensive shallow areas limit the ability to eradicate carp and complicates methods used to control populations of carp already in the Lake.

Rice Lake's outlet dam includes an operable gate that allows water level manipulation. This gate could be used to draw down the Lake to a level desired for aquatic plant and carp control. The gate is positioned near the bottom of the reservoir allowing nearly complete draining of the Lake. Given the small area contributing surface runoff to Rice Lake, the gate could likely maintain lowered water levels for long periods of time. This enables certain aquatic plant, rough fish, and sediment control strategies. However, given Rice Lake's long retention time, it may take long periods of time to fully refill the Lake. This could tax riparian land-owner patience, a factor requiring careful planning for successful implementation. Like Whitewater Lake, the lack of perennial or regular intermittent discharge from the Lake as well as its shallow depth and lack of regular stratification makes hypolimnetic withdrawal to help control phosphorus concentrations impractical.

## 2.6 POTENTIAL AQUATIC PLANT CONTROL METHODOLOGIES

Aquatic plant management techniques can be classified into six categories.

1. *Physical measures* include lake bottom coverings

2. *Biological measures* include the use of organisms, including herbivorous insects

3. *Manual measures* involve physically removing plants by hand or using hand-held tools such as rakes

4. *Mechanical measures* rely on artificial power sources and remove aquatic plants with a machine known as a harvester or by suction harvesting

5. *Chemical measures* use aquatic herbicides to kill nuisance and nonnative plants *in-situ*

6. *Water level manipulation measures* use lake drawdowns to kill aquatic plants through freezing and desiccation

All aquatic plant control measures are stringently regulated and most require a State of Wisconsin permit. Chemical controls, for example, require a permit and are regulated under *Wisconsin Administrative Code* Chapter NR 107, "*Aquatic Plant Management*" while placing bottom covers (a physical measure) requires a WDNR permit under Chapter 30 of the *Wisconsin Statutes*. All other aquatic plant management practices are regulated under *Wisconsin Administrative Code* Chapter NR 109, "*Aquatic Plants: Introduction, Manual Removal and Mechanical Control Regulations.*" Furthermore, the aquatic plant management measures described in this plan are consistent with the requirements of Chapter NR 7, "*Recreational Boating Facilities Program,*" and with the public recreational boating access requirements relating to eligibility under the State cost-share grant programs set forth in *Wisconsin Administrative Code* Chapter NR 1, "*Natural Resources Board Policies.*" More details about each aquatic plant management measures are discussed in the following sections while recommendations are provided later in this document.

[32] *Memorandum Report No. 177 (2nd Edition), 2017* op. cit.

Non-compliance with aquatic plant management permit requirements is an enforceable violation of Wisconsin law and may lead to fines and/or complete permit revocation. The information and recommendations provided in this memorandum help frame permit requirements. Permits can cover up to a five-year period.[33] At the end of that period, the aquatic plant management plan must be updated. The updated plan must consider the results of a new aquatic plant survey and should evaluate the success, failure, and effects of earlier plant management activities that have occurred on the lake.[34] These plans and plan execution are reviewed and overseen by the WDNR regional lakes and aquatic invasive species coordinators.[35]

**Physical Measures**

Lake-bottom covers and light screens provide limited control of rooted plants by creating a physical barrier that reduces or eliminates plant-available sunlight. Various materials such as pea gravel or synthetics like polyethylene, polypropylene, fiberglass, and nylon can be used as covers. The longevity, effectiveness, and overall value of some physical measures is questionable. The WDNR does not permit these kinds of controls. Consequently, lake-bottom covers are not a viable aquatic plant control strategy for either Lake.

**Biological Measures**

Biological control offers an alternative to direct human intervention to manage nuisance or exotic plants. Biological control techniques traditionally use herbivorous insects that feed upon nuisance plants. This approach has been effective in some Southeastern Wisconsin lakes.[36] For example, milfoil weevils have been used to control EWM. Milfoil weevils do best in waterbodies with balanced panfish populations,[37] where dense EWM beds reach the surface close to shore, where natural shoreline areas include leaf litter that provides habitat for over-wintering weevils, and where there is comparatively little boat traffic. This technique is not presently commercially available making the use of milfoil weevils non-viable.

**Manual Measures**

Manually removing specific types of vegetation is a highly selective means of controlling nuisance aquatic plant growth, including invasive species such as EWM. Two commonly employed methods include hand raking and hand pulling. Both physically remove target plants from a lake. Since plant stems, leaves, roots and seeds are actively removed from the lake, the reproductive potential and nutrients contained by pulled/raked plants material is also removed. These plants, seeds, and nutrients would otherwise re-enter the lake's water column or be deposited on the lake bottom. Hence, this aquatic plant management technique helps incrementally maintain water depth, improves water quality, and can help decrease the spread of nuisance/exotic plants. Since hand raking and hand pulling are readily allowed by WDNR, and since both are practical methods to control riparian landowner scale problems, these methods are described in more detail in the following paragraphs.

Raking with specially designed hand tools is particularly useful in shallow nearshore areas. This method allows nonnative plants to be removed and also provides a safe and convenient aquatic plant control method in deeper nearshore waters around piers and docks. Advantages of this method include:

- Tools are relatively inexpensive ($100 to $150 each)
- The method is easy to learn and use
- It may be employed by riparian landowners without a permit if certain conditions are met

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[33] *Five-year permits allow a consistent aquatic plant management plan to be implemented over a significant length of time. This process allows the selected aquatic plant management measures to be evaluated at the end of the permit cycle.*

[34] *Aquatic plant harvesters must report harvesting activities as one of the permit requirements.*

[35] *Information on the current aquatic invasive species coordinator is found on the WDNR website.*

[36] *B. Moorman,* "A Battle with Purple Loosestrife: A Beginner's Experience with Biological Control," LakeLine*, 17(3), 20-21, 34-37, 1997; see also, C.B. Huffacker, D.L. Dahlsen, D.H. Janzen, and G.G. Kennedy,* Insect Influences in the Regulation of Plant Population and Communities*, pp. 659-696, 1984; and C.B. Huffacker and R.L. Rabb, (eds),* Ecological Entomology*, John Wiley, New York, New York, USA.*

[37] *Panfish such as bluegill and pumpkinseed are predators of herbivorous insects. High populations of panfish lead to excess predation of Milfoil weevils.*

- Results are immediately apparent
- Plant material is immediately removed from a lake (including seeds)

The second manual control method, hand-pulling whole plants (stems, roots, leaves, seeds) where they occur in isolated stands, is a simple means to control nuisance and invasive plants in shallow nearshore areas that may not support large-scale initiatives. This method is particularly helpful when attempting to target nonnative plants (e.g., EWM, CLP) during the high growth season when native and nonnative species often comingle. Hand pulling is more selective than raking, mechanical removal, and chemical treatments, and, if carefully applied, is less damaging to native plant communities. Recommendations regarding hand-pulling, hand-cutting, and raking are discussed later in this document.

**Mechanical Measures**

Two methods of mechanical harvesting are currently employed in Wisconsin - mechanical harvesting and suction harvesting. Both are regulated by WDNR and require a permit.[38]

***Mechanical Harvesting***

Aquatic plants can be mechanically gathered using specialized equipment commonly referred to as harvesters. Harvesters use an adjustable depth cutting apparatus that can cut and remove plants from the water surface to up to about five feet below the water surface. The harvester gathers cut plants with a conveyor, basket, or other device. Mechanical harvesting is often a very practical and efficient means to control nuisance plant growth and is widely employed in Southeastern Wisconsin.

In addition to controlling plant growth, gathering, and removing plant material from a lake reduces in-lake nutrient recycling, sedimentation, and targets plant reproductive potential. In other words, harvesting removes plant biomass, which would otherwise decompose and release nutrients, sediment, and seeds or other reproductive structures (e.g., turions, bulbils, plant fragments) into a lake. Mechanical harvesting is particularly effective and popular for large-scale open-water projects. However, small harvesters are also produced that are particularly suited to working around obstacles such as piers and docks in shallow nearshore areas.

An advantage of mechanical harvesting is that the harvester, when properly operated, "mows" aquatic plants and, therefore, typically leaves enough living plant material in place to provide shelter for aquatic wildlife and stabilize lake-bottom sediment. Harvesting, when done properly, does not kill aquatic plants, it simply trims plants back. Aside from residual plant mass remaining because of imperfect treatment strategy execution, none of the other aquatic plant management methods purposely leave living plant material in place after treatment. Aquatic plant harvesting has been shown to allow light to penetrate to the lakebed and stimulate regrowth of suppressed native plants. This is particularly effective when controlling invasive plant species that commonly grow quickly very early in the season (e.g., EWM, CLP) when native plants have not yet emerged or appreciably grown.

A disadvantage of mechanical harvesting is that the harvesting process may fragment plants and thereby unintentionally propagate EWM and CLP. EWM fragments are particularly successful in establishing themselves in areas where plant roots have been removed. This underscores the need to avoid harvesting or otherwise disrupting native plant roots. Harvesting may also agitate bottom sediments in shallow areas, thereby increasing turbidity and resulting in deleterious effects such as smothering fish breeding habitat and nesting sites. To this end, most WDNR-issued permits do not allow deep-cut harvesting in water less than three feet deep,[39] which limits the utility of this alternative in many littoral and shoal areas. Nevertheless, if employed correctly and carefully under suitable conditions, harvesting can benefit navigation lane maintenance and can ultimately reduce regrowth of nuisance plants while maintaining, or even enhancing, native plant communities.

[38] *Mechanical control permit conditions depend upon harvesting equipment type and specific equipment specifications.*

[39] *Deep-cut harvesting is harvesting to within one foot of the lake bottom. This is not allowed in shallow water because it is challenging to ensure that the harvester avoids lake-bottom contact in such areas.*

Cut plant fragments can escape the harvester's collection system and form mats or accumulate on shorelines. This negative side effect is fairly common. To compensate for this, most harvesting programs include a plant pickup program. Some plant pickup programs use a harvester to gather and collect significant accumulations of floating plant debris as well as sponsor regularly scheduled aquatic plant pick up from lakefront property owner docks. Property owners are encouraged to actively rake plant debris along their shorelines and place these piles on their docks for collection. This kind of program, when applied systematically, can reduce plant propagation from plant fragments and can help alleviate the negative aesthetic consequences of plant debris accumulating on shorelines. Nevertheless, it is important to remember that normal boating activity (particularly during summer weekends) often creates far more plant fragments than generated from mechanical harvesting. Therefore, a plant pickup program is often essential to protect a lake's health and aesthetics, even in areas where harvesting has not recently occurred.

#### *Suction Harvesting and DASH*

Another mechanical plant harvesting method uses suction to remove aquatic plants from a lake. Suction harvesting removes sediment, aquatic plants, plant roots, and anything else from the lake bottom and disposes this material outside the lake. Since bottom material is removed from the lake, this technique also requires a dredging permit in addition to the aquatic plant management permit.

An alternative aquatic plant suction harvesting method has emerged called Diver Assisted Suction Harvesting (DASH). First permitted in 2014, DASH is a mechanical process where divers identify and pull select aquatic plants and roots from the lakebed and then insert the entire plant into a suction hose that transports the plant to the surface for collection and disposal. The process is essentially a mechanically assisted method for hand-pulling aquatic plants. Such labor-intensive work by skilled professional divers is, at present, a costly undertaking and long-term monitoring will need to evaluate the efficacy of the technique. Nevertheless, many apparent advantages are associated with this method including: 1) lower potential to release plant fragments when compared to mechanical harvesting, raking, and hand-pulling, thereby reducing spread and growth of invasive plants like EWM; 2) increased selectivity of plant removal when compared to mechanical techniques and hand raking which in turn reduces native plant loss; and 3) lower potential for disturbing fish habitat.

Given how costly DASH can be and how widespread EWM is found in the Lake, DASH is not considered a viable control option for managing EWM. Nevertheless, DASH can provide focused relief of nuisance native and non-native plants around piers and other critical areas. If individual property owners chose to employ DASH, a NR 109 permit is required.

### Chemical Measures

Aquatic chemical herbicide use is stringently regulated. A WDNR permit and direct WDNR staff oversight is required during application. Chemical herbicide treatment is used for short time periods to temporarily control excessive nuisance aquatic plant growth. Chemicals are applied to growing plants in either liquid or granular form. Advantages of chemical herbicides aquatic plant growth control include relatively low cost as well as the ease, speed, and convenience of application. However, many drawbacks are also associated with chemical herbicide aquatic plant control including the following examples.

- **Unknown and/or conflicting evidence about the effects of long-term chemical exposure on fish, fish food sources, and humans.** The U.S. Environmental Protection Agency, the agency responsible for approving aquatic plant treatment chemicals, studies aquatic plant herbicides to evaluate short-term exposure (acute) effects on human and wildlife health. Some studies also examine long-term (chronic) effects of chemical exposure on animals (e.g., the effects of being exposed to these herbicides for many years). However, it is often impossible to conclusively state that no long-term effects exist due to the animal testing protocol, time constraints, and other factors. Furthermore, long-term studies cannot address all potentially affected species.[40] For example, conflicting studies/opinions exist regarding the role of the chemical 2,4-D as a human carcinogen.[41] Some lake property owners judge the risk of using chemicals as being excessive despite legality of use. Consequently, the concerns of lakefront owners should be considered

[40] *U.S. Environmental Protection Agency, EPA-738-F-05-002, 2,4-D RED Facts, June 2005.*

[41] *M.A. Ibrahim, G.G. Bond, T.A. Burke, et al., "Weight of the Evidence on the Human Carcinogenicity of 2,4-D,"* Environmental Health Perspectives*, 96, 213-222, 1991.*

whenever chemical treatments are proposed. Moreover, if chemicals are used, they should be applied as early in the season as practical. This helps assure that the applied chemical decomposes before swimming, water skiing, and other active body-contact lake uses begin.[42] Early season application also is generally the best time to treat EWM and CLP for a variety of technical reasons explained in more detail as part of the "loss of native aquatic plants and related reduction or loss of desirable aquatic organisms" bullet below.

- **Reduced water clarity and increased risk of algal blooms.** Water-borne nutrients promote growth of both aquatic plants and algae. If rooted aquatic plant populations are depressed, demand for dissolved nutrients will be lessened. In such cases, algae tends to become more abundant, a situation reducing water clarity. For this reason, lake managers must avoid needlessly eradicating native plants and excessive chemical use. Lake managers must strive to maintain balance between rooted aquatic plants and algae - when the population of one declines, the other may increase in abundance to nuisance levels. In addition to upsetting the nutrient balance between rooted aquatic plants and algae, dead chemically treated aquatic plants decompose and contribute nutrients to lake water, a condition that may exacerbate water clarity concerns and algal blooms.

- **Reduced dissolved oxygen/oxygen depletion.** When chemicals are used to control large mats of aquatic plants, the dead plant material generally settles to the bottom of a lake and decomposes. Plant decomposition uses oxygen dissolved in lake water, the same oxygen that supports fish and many other vital beneficial lake functions. In severe cases, decomposition processes can deplete oxygen concentrations to a point where desirable biological conditions are no longer supported.[43] Ice covered lakes and the deep portions of stratified lakes are particularly vulnerable to oxygen depletion. Excessive oxygen loss can inhibit a lake's ability to support certain fish and can trigger processes that release phosphorus from bottom sediment, further enriching lake nutrient levels. These concerns emphasize the need to limit chemical control and apply chemicals in early spring, when EWM and CLP have not yet formed dense mats.

- **Increased organic sediment deposition.** Dead aquatic plants settle to a lake's bottom, and, because of limited oxygen and/or rapid accumulation, may not fully decompose. Flocculent organic rich sediment often results, reducing water depth. Care should be taken to avoid creating conditions leading to rapid thick accumulations of dead aquatic plants so as to promote more complete decomposition of dead plant material.

- **Loss of native aquatic plants and related reduction or loss of desirable aquatic organisms.** EWM and other invasive plants often grow in complexly intermingled beds. Additionally, EWM is physically similar to, and hybridizes with, native milfoil species. Native plants, such as pondweeds, provide food and spawning habitat for fish and other wildlife. A robust and diverse native plant community forms the foundation of a healthy lake and the conditions needed to provide and host desirable gamefish. Fish, and the organisms fish eat, require aquatic plants for food, shelter, and oxygen. If native plants are lost due to insensitive herbicide application, fish and wildlife populations often suffer. For this reason, if chemical herbicides are applied to the Lakes, these chemicals must target EWM or CLP and therefore should be applied in early spring when native plants have not yet emerged. Early spring application has the additional advantage of being more effective due to colder water temperatures, a condition enhancing herbicidal effects and reducing the dosing needed for effective treatment. Early spring treatment also reduces human exposure concerns (e.g., swimming is not particularly popular in very early spring).

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[42] *Though the manufacturers indicate that swimming in 2,4-D-treated lakes is allowable after 24 hours, it is possible that some swimmers may want more of a wait time to lessen chemical exposure. Consequently, allowing extra wait time is recommended to help lake residents and l users can feel comfortable that they are not being unduly exposed to aquatic plant control chemicals.*

[43] *The WDNR's water quality standard to support healthy fish communities is 5 mg/L for warmwater fish communities and 7 mg/L for coldwater fish communities.*

- **Need for repeated treatments.** Chemical herbicides are not a one-time silver-bullet solution – instead, treatments generally need to be regularly repeated to maintain effectiveness. Treated plants are not actively removed from the lake, a situation increasing the potential for viable seeds/fragments to remain after treatment, allowing target species resurgence in subsequent years. Additionally, leaving large expanses of lake bed devoid of plants (both native and invasive) creates a disturbed area without an established plant community. EWM thrives in disturbed areas. In summary, applying chemical herbicides to large areas can provide opportunities for exotic species reinfestation and new colonization that necessitates repeated and potentially expanded herbicide applications.

- **Hybrid watermilfoil's resistance to chemical treatment**. The presence of hybrid watermilfoil complicates chemical treatment programs. Research suggests that certain hybrid strains may be more tolerant to commonly utilized aquatic herbicides such as 2,4-D and Endothall.[44,45] Consequently, further research regarding hybrid watermilfoil treatment efficacy is required to apply appropriate herbicide doses. This increases the time needed to acquire permits and increases application program costs. Hybrid watermilfoil was verified to exist in Rice Lake in 2013.

- **Effectiveness of small-scale chemical treatments**. Small-scale EWM treatments using 2,4-D have yielded highly variable results. A study completed in 2015 concluded that less than half of 98 treatment areas were effective, or had more than a 50 percent EWM reduction.[46] For a treatment to be effective, a target herbicide concentration must be maintained for a prescribed exposure time. However, wind, wave, and other oftentimes difficult to predict mixing actions often dissipate herbicide doses. Therefore, when deciding to implement small-scale chemical treatments, the variability in results and treatment cost of treatment should be examined and contrasted.

Considering the expanse of EWM and the size of Whitewater Lake, a whole-lake treatment, or large spot treatment would be too costly.[47] However, small spot treatments enclosed with a barrier (e.g., turbidity barrier) could be a viable alternative for treating shoreline areas and navigation lanes if determined feasible by the District. Whatever the case, monitoring should continue to ensure that EWM does not become more problematic. If further monitoring suggests a dramatic change in these invasive species populations, management recommendations should be reviewed.

**Water Level Manipulation**

The water-surface elevations of natural waterbodies vary day to day, year to year, and season to season. Water levels are commonly higher during early spring, lower in late summer, and may be lower than usual during drought periods. Varying water levels help sustain certain plant and animal species while static water levels benefit other species. Naturally fluctuating water levels typically promote a variety of desirable native plants, can benefit shoreline stability, and are often considered more beneficial to overall waterbody health. Humans commonly attempt to manipulate and stabilize water levels to benefit recreational activities and perceived shoreline aesthetics. This commonly takes the form of higher than natural, near static, water elevations during summer and static lower than natural water elevations during winter. Because of the significant effect water level manipulation can have on waterbody ecology and health, water level manipulation is strictly regulated.

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[44] *L.M. Glomski and M.D. Netherland, "Response of Eurasian and Hybrid Watermilfoil to Low Use Rates and Extended Exposures of 2,4-D and Triclpyr",* Journal of Aquatic Plant Management, *48, 12-14, 2010.*

[45] *E.A. LaRue, M/P/ Zuellig, M.D. Netherland, et al., 'Hybrid Watermilfoil Lineages are More Invasive and Less Sensitive to a Commonly Used Herbicide than Their Exotic Parent (Eurasian Watermilfoil),"* Evolutionary Applications*, 6, 462-471, 2013.*

[46] *M. Nault, S. Knight, S. Van Egeren, et al., "Control of Invasive Aquatic Plants on a Small Scale,"* LakeLine*, 35: 35-39, 2015.*

[47] *WDNR has been studying the efficacy of spot treatments versus whole lake treatments for the control of EWM and it has been found that spot treatments are not an effective measure for reducing EWM populations, while whole lake treatments have proven effective depending on conditions.*

Carefully controlled water levels can be a component of managing aquatic plant growth and restoring native aquatic plant species, particularly emergent species such as bulrush and wild rice.[48] In Wisconsin, water level manipulation is generally most effective if done over winter, an approach exposing lake-bottom sediment to freezing temperatures while avoiding conflict with summer recreational uses. One to two months of lake sediment exposure can damage or kill aquatic plant roots, seeds, and turions through freezing and/or desiccation. Since large areas of lake sediment need to remain exposed for long time periods, water level manipulation is most practical and cost effective in lakes with operable dam gates capable of maintaining low water elevations. In lakes without gated dams, high-capacity water pumps and/or siphons can sometimes be used to reduce lake levels, albeit with more complexity and at greater cost.

While water level manipulation affects all aquatic plants within the drawdown zone, not all plants are equally sensitive to drawdown effects. For example, water lily (*Nymphaea* spp. and *Nuphar* spp.) and milfoil (*Myriophyllum* spp.) abundance can be greatly reduced by winter drawdowns while other species, such as duckweeds (*Lemna* spp.), may become more abundant.[49] Two studies from Price County, Wisconsin show reduced abundance of invasive EWM and CLP and increased abundance of native plant species following winter drawdowns.[50,51] Drawdowns can be used to significantly alter the composition of a lake's aquatic plant community. Many emergent species rely upon the natural fluctuations of water levels within a lake. Summer and early fall drawdowns have effectively been used to stimulate the growth of desired emergent vegetation species such as bulrush, burreeds, and wild rice in exposed lake sediments. Such plants often provide critical food and habitat for desirable fish and wildlife. However, invasive emergent species such as narrow-leaved cattails (*Typha angustifolia*), hybrid cattails (*Typha x glauca*), and common reed (*Phragmites australis subsp. Australis*) can also colonize exposed sediment. Therefore, measures must be considered to help curb invasive species colonization during a drawdown.[52]

In addition, water level manipulation can affect water quality and lake fauna.[53,54] Diminished water clarity, decreased dissolved oxygen concentrations, increased nutrient concentrations, and more abundant algae have all been reported following lake drawdowns. Excessively rapid drawdowns can leave lake macroinvertebrates and mussels stranded in exposed lake sediment, causing mortality and subsequently reducing prey availability for fish and waterfowl. Similarly, drawdowns can disrupt the habitat and food sources of mammals, birds, and herptiles, particularly when water levels are substantially manipulated in the early spring or fall. Therefore, lake managers must carefully consider drawdown and refill timing, rates, and elevation as well as the life history of aquatic plants and fauna within a waterbody. Mimicking the natural water level regimen of the lake may be the best approach to achieve the desired drawdown effects and minimize unintended and detrimental consequences.

Water level drawdown can be a useful component of programs designed to reduce in-lake populations of common carp (*Cyprinus carpio*). Dams can also physically block upstream migration of invasive fish such as carp, benefiting upstream population reduction programs. However, dams can also interfere with critical life-cycle migration of native species. In addition, carp control programs can be short-lived because of reintroduction of carp from adjacent waterbodies such as river and lake systems interconnected by perennial streams.

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[48] *For detailed literature reviews on water level manipulation as an aquatic plant control measure, see C. Blanke, A. Mikulyuk, M. Nault, et al.,* Strategic Analysis of Aquatic Plant Management in Wisconsin*, Wisconsin Department of Natural Resources, pp. 167-171, 2019 and J.R. Carmignani and A.H. Roy, "*Ecological Impacts of Winter Water Level Drawdowns on Lake Littoral Zones: A Review,*" Aquatic Sciences, 79, 803-824, 2017.*

[49] *G.D. Cooke, "*Lake Level Drawdown as a Macrophyte Control Technique,*" Water Resources Bulletin, 16(2): 317-322, 1980*

[50] *Onterra, LLC, Lac Sault Dore,* Price County, Wisconsin: Comprehensive Management Plan*, 2013.*

[51] *Onterra, LLC,* Musser Lake Drawdown Monitoring Report, Price County, Wisconsin*, 2016.*

[52] *Blanke et al.,* op. cit.

[53] Ibid.

[54] *Cooke,* op. cit.

Rice Lake's outlet dam has existing infrastructure that could allow Lake water levels to be reduced and held at low levels. However, refilling Rice Lake could take a substantial amount of time, potentially causing dissatisfaction in the riparian community. Fortunately, Rice Lake is substantially smaller and shallower than Whitewater Lake and therefore contains much less water. If Rice Lake's water surface were lowered and held in this lowered state as part of an aquatic plant management or carp control plan, consideration should be given to speeding refill time by transferring water from Whitewater Lake. Even if Rice Lake were to be completely dewatered, actively transferring two or three feet of Whitewater Lake's volume into Rice Lake could completely refill Rice Lake. According to available data, Whitewater Lake naturally refills at a rate roughly seven times as fast as Rice Lake.

Manipulating Whitewater Lake's water levels would require construction of a gated spillway, active pumping, and/or siphoning water over the embankment and down into Rice Lake. Constructing a gated spillway requires extensive engineering and would likely be expensive. However, the supplemental gated spillway could provide other longer-term benefits, including the ability to manipulate water levels for infrastructure inspection and maintenance. With careful planning and sequencing, pumps and/or siphons could also likely be used to lower Whitewater Lake's water levels for a length of time consistent with typical aquatic plant management schemes.

Water level manipulation appears to be a technically feasible approach to influencing the aquatic plant communities in both Lakes. However, the aquatic plant community in Whitewater Lake appears to be improving while the plant community in Rice Lake remains stable. For this reason, the Commission does not currently recommend active water level manipulation as an aquatic plant management practice. However, should conditions develop or be identified in the future that could benefit from water level manipulation, it could be considered.

Action to reduce Rice Lake's carp population can be supported through the capacity to largely dewater the Lake. If water level manipulation is used to support efforts to reduce Rice Lake's common carp population, short-term water level reductions and rapid refilling using Whitewater Lake water are recommended. A program focused on greatly reducing common carp populations in Rice Lake would likely allow Rice Lake's aquatic plant community to improve more rapidly and would also likely benefit water quality. Both the Whitewater Lake and Rice Lake dams are likely impassable to fish migrating upstream. However, fish could pass downstream from Whitewater Lake to Rice Lake in relatively rare instances. To prolong the effect of any carp control programs on Rice Lake, consideration should be given to hindering downstream migration of carp from Whitewater Lake. This could be done with a relatively simple carp barrier.

# MANAGEMENT RECOMMENDATIONS AND PLAN IMPLEMENTATION 3

Whitewater and Rice Lakes are very different aquatic ecosystems. This situation warrants differences in the aquatic plant management plans employed within each Lake. Rice Lake is shallow with sparse aquatic vegetation, limited to very few species and suffers from persistent algae blooms throughout recreational months. Whitewater Lake, as a deeper lake with more open water, has a healthier aquatic plant community, including a few more sensitive aquatic plant species as discussed in Chapter 2. Invasive aquatic plants, particularly EWM, are present in both Lakes. However, the presence of EWM has been greatly reduced in Whitewater Lake. Aquatic plant management continues to be an important issue of concern to the communities and visitors of both Lakes.

Holistic management alternatives and recommended refinements to the existing aquatic plant management plan are presented in this chapter. These measures focus upon in-lake actions (e.g., active aquatic plant management, stakeholder education, riparian outreach), activities that are primarily (and oftentimes solely) District responsibilities. Given the scope of this study, little emphasis is given to measures whose scope and location are more suitably taken up by other governmental agencies. For example, agencies with jurisdiction over areas tributary to the Lakes (e.g., Town or County government) may be better suited to address measures to reduce nutrient inputs to the Lakes. Reduced nutrient input can passively reduce aquatic plant abundance and thereby tangibly influence aquatic plant management. Nevertheless, to most effectively manage aquatic plants, the District should actively seek out and collaborate with such agencies.

## 3.1 RECOMMENDED AQUATIC PLANT MANAGEMENT PLAN

The most effective plans to manage nuisance and invasive aquatic plant growth generally rely on a combination of methods and techniques. A single-minded "silver bullet" strategy rarely produces the most efficient, most reliable, or best overall result. Therefore, to enhance lake access, recreational use, and lake health, this plan recommends a combination of six aquatic plant management techniques. For the reader's convenience, the various elements of the recommended aquatic plant management plan are identified and briefly summarized in the following paragraphs.

1. **Mechanically harvest invasive and nuisance aquatic plants.** Mechanical harvesting should remain a method to manage invasive and nuisance aquatic plants on both Whitewater and Rice Lakes. Harvesting must avoid, or must be substantially restricted, in certain areas of both Lakes. This includes areas of particular ecological value, areas that provide unique habitat, areas that are difficult to harvest due to lake morphology (e.g., excessively shallow water depth), and where boat access is not desired or necessary (e.g., marshland areas).

2. **Manually remove nearshore invasive and nuisance plant growth.** Manual removal involves controlling aquatic plants by hand or using hand-held non-powered tools. Riparian landowners should consider manual removal of undesirable plants an integral and vital part of the Lakes' overall plant management plan. Manual removal is often the plan element that yields the transitional interface between landowner uses, desires, concerns, and public management of the overall waterbody. Manual removal does not require a permit if riparian landowners remove only invasive plants without injuring native plants or remove nuisance native aquatic plants along 30 or less feet of shoreline (inclusive of dock, pier, and other lake access areas) and generally not more than 100 feet into the lake.

3. **Use diver assisted suction harvesting (DASH) in high-use, congested, nearshore areas.** Riparian landowners could supplement or supplant manual harvesting by using DASH. If an individual landowner chooses to implement DASH, the activity is typically confined to the same area undergoing manual aquatic plant control – it is not a method to increase the amount of lakefront undergoing active management. DASH requires a Chapter NR 109 permit.

4. **Chemically treat navigational shorelines in early spring to control Eurasian water milfoil, hybrid water milfoil, and curly-leaf pondweed in areas where these plants begin displacing the native community**. Chemical treatment, along with mechanical harvesting, have been the primary methods of aquatic plant management employed in both Whitewater and Rice Lakes, and have been an effective short-term management technique for navigation and access. If chemical treatments continue to be applied along developed shoreline and critical boating areas that cannot be mechanically harvested, treatment should only occur in the early spring when human contact and risks to native plants are most limited. A WDNR permit and WDNR staff supervision are required to implement this alternative. Lakeshore property owners need to be informed of the chemical treatment and permit conditions well before chemicals are applied.

5. **Monitor established and novel chemical treatments**. Chemical treatment for aquatic plant control has a number of drawbacks (e.g., water quality, comparatively nonselective, chemical side effects, and more) that should be considered. Since the District is now utilizing the novel herbicide ProcellaCOR™, regular monitoring is recommended to evaluate the efficacy and long-term effects of this chemical and other chemicals being utilized. Staggering of treatment of various areas of the Lakes is recommended. Sub-Point Intercept surveys could be considered to monitor areas that have been chemically treated in order to assess effectiveness and biodiversity.

6. **Consider participation in the Clean Boats Clean Waters program** to proactively encourage Lake users to clean boats and equipment before launching and using them in both Lakes in order to reduce the probability of invasive species entering the Lakes and traveling to other Lakes.

**Mechanical Harvesting**

The District operates several vehicles for their harvesting program. These include:

- 7 Foot Harvester (HM-420)
- 10 Foot Harvester (HM-620 equivalent)
- 12 Foot Harvester (HM-820)
- Small Transport Barge (TR-34)
- Large Transport Barge (TR-45)

These full-size harvesters are well suited to open water areas where water is generally greater than 36-inches deep. Additionally, the District could consider acquiring a mini harvester such as an Aquarius Systems Model FB-120 to allow it to efficiently harvest plants in shallow and/or congested nearshore areas. The Model FB-120 can be operated in as little as 18 inches of water and, due to its smaller size, is very maneuverable. In shallow waters, slow speed operation and extreme diligence must be taken to avoid contacting the lake bottom with the cutter head. In all areas, at least one foot of living plant material must remain attached to the lake bottom after cutting.

1. **Maintain at least 12 inches of living plant material after harvesting**. The District's current aquatic plant harvesters can cut aquatic plants up to 66 inches below the water surface. Harvesting equipment operators must not intentionally denude the lakebed. Instead, the goal of harvesting is to maintain and promote healthy native aquatic plant growth. Harvesting invasive aquatic plants can promote native plant regrowth since many invasive aquatic plants grow very early in the season depriving later emerging native plants of light and growing room. At least one foot of living plant material must be retained after harvesting to reduce resuspension of lake-bottom sediments and to maintain desirable plant communities. When water depths are shallow (e.g., less than four or five feet deep), slow speed and extreme care must be employed while harvesting aquatic plants to avoid contacting the harvester's cutter head with the lake bottom.

2. **Collect and properly dispose harvested plants and collected plant fragments**. Plant cuttings and fragments must be immediately collected upon cutting to the extent practicable. Plant fragments accumulating along shorelines should be collected by riparian landowners. Fragments collected by the landowners can be used as garden mulch or compost or may be picked up by harvester operators. All plant debris collected from harvesting and riparian landowner plant pickup must be properly disposed. Harvested/collected plant material will be offloaded at one of four disposal sites located around Whitewater Lake and one location in Rice Lake (Map 3.1). A conveyor will transfer plant material to a dump truck which will in turn transport harvested plants to a disposal site. The locations of the currently approved disposal sites are shown in Map 3.1. Detailed maps of each disposal site are found in Maps 3.2, 3.3, 3.4, and 3.5. Disposing any aquatic plant material within identified floodplain and wetland areas is prohibited. Plant material will be collected and disposed daily to reduce undesirable odors and pests, to avoid leaching nutrients back into waterbodies, and to minimize visual impairment of lakeshore areas. Operators will stringently police the off-loading to assure efficient, neat operation.

3. **Adapt harvester cutting patterns and depths to support lake use and promote ecological health**. Aquatic plant harvesting techniques should vary in accordance with the type and intensity of human recreational use, lake characteristics, the distribution and composition of aquatic plants, and other biological considerations. For example, in sensitive areas, relatively wide transit lanes connect boat launches, highly populated shorelines, and open-water areas. Narrower access lanes connect less trafficked areas and sparsely populated shorelines to open-water areas and transit lanes. The approaches to employ in differing management areas are summarized below and illustrated in Map 3.6.

    a. <u>Navigation Lanes</u>: Channels about 50 feet wide are intended to provide travel thoroughfares for recreational watercraft. These channels generally parallel the shoreline or cross a Lake. Plant cutting depth will be no more than five feet deep below the water's surface. At least one foot of plant material must remain on the Lake bottoms to minimize resuspension of lake-bottom sediment and maintain desirable plant communities.

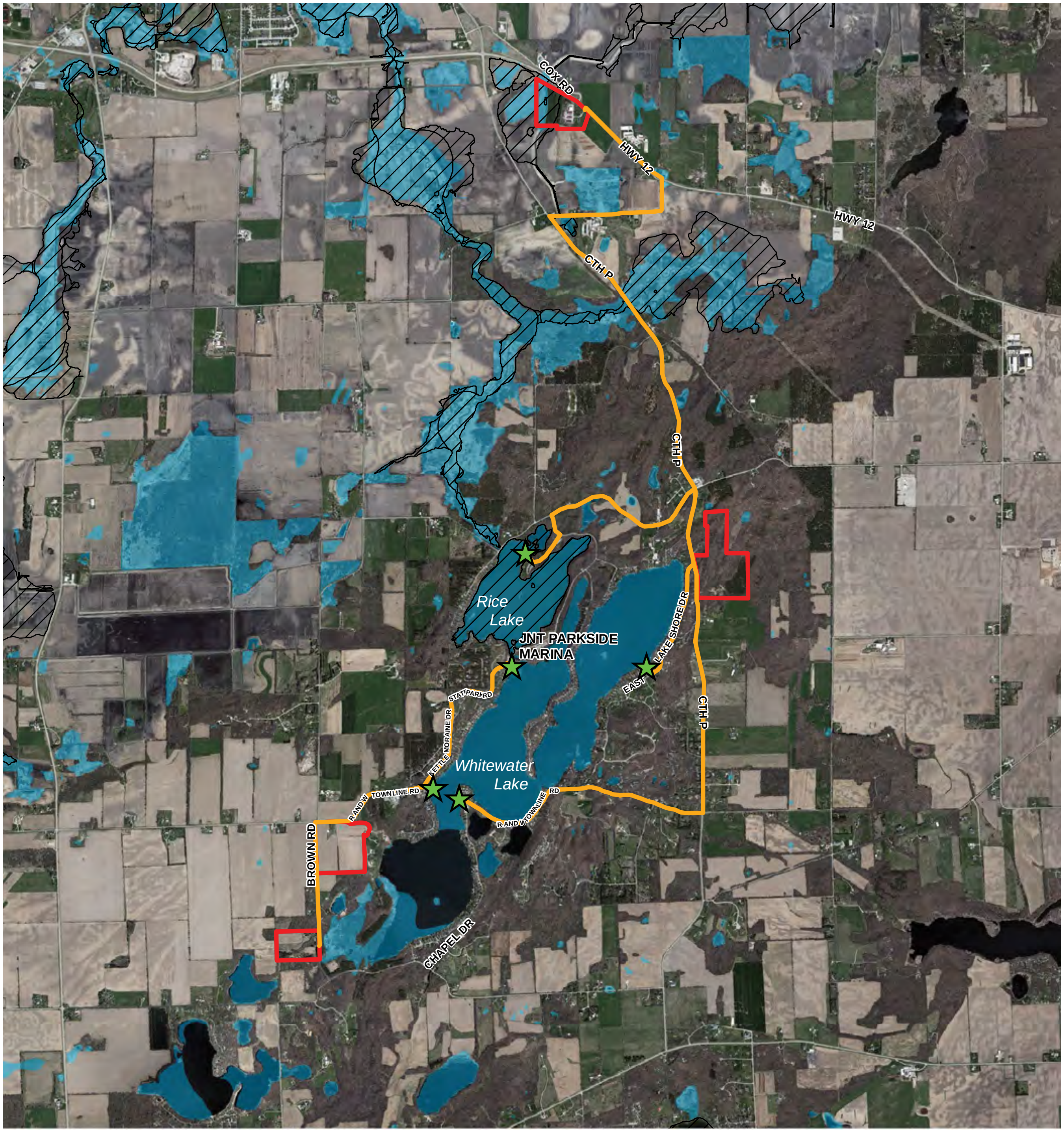
    b. <u>Access Lanes</u>: Channels about 20 feet wide are intended to provide access to the main water body. These channels are generally perpendicular to the shoreline. Plant cutting depth will be no more than three to four feet deep below the water's surface. At least one foot of plant material must remain on the Lake bottoms to minimize resuspension of lake-bottom sediment and maintain desirable plant communities.

    c. <u>Sensitive Areas</u>: As described previously, Whitewater Lake has five WDNR-designated sensitive areas that have restrictions for chemical treatment and harvesting. Navigation lanes may be cut 50 feet wide and no more than three feet deep in Sensitive Areas one, two, and five if aquatic plants become a nuisance and impede navigation. At least one foot of plant material must remain on the Lake bottoms to minimize resuspension of lake-bottom sediment and maintain desirable plant communities.

    d. <u>Top-Cut Areas</u>: These areas are found only in open water portions of Whitewater Lake outside of sensitive areas where water depth is anticipated to support rooted aquatic plant growth. Aquatic plants should be monitored for the presence of invasive species, and mechanical harvesting work should focus on areas dominated by invasive species or areas needed to promote reasonable recreational use of the Lake. Top-cutting may be cut between three to five feet below the water's surface. At least one foot of plant material must remain on the Lake bottoms to minimize resuspension of lake-bottom sediment and maintain desirable plant communities.

    e. <u>Open Water Areas</u>: Deep-water areas of Whitewater Lake where water depth precludes growth of vascular rooted aquatic plants. No control should be necessary in these areas.

## Map 3.1
## Whitewater and Rice Lakes Harvesting Disposal Sites




HARVESTER OFF LOAD SITES

HARVESTER LOAD ROUTES

IDENTIFIED WETLANDS

100-YEAR FLOODPLAIN

DISPOSAL LOCATION

0 2,500 5,000 Feet

*Source: Wisconsin Department of Natural Resources and SEWRPC*
Date of Photography: April 2022

## Map 3.2
## Northern Mechanical Harvesting Disposal Site Location, Whitewater and Rice Lakes


*Source: Wisconsin Department of Natural Resources and SEWRPC*
Date of Photography: April 2022

**Map 3.3**
**Central Mechanical Harvesting Disposal Site Location, Whitewater and Rice Lakes**


*Source: Wisconsin Department of Natural Resources and SEWRPC*
Date of Photography: April 2022

## Map 3.4
## Southern Mechanical Harvesting Disposal Site Location, Whitewater and Rice Lakes


*Source: Wisconsin Department of Natural Resources and SEWRPC*
Date of Photography: April 2022

**Map 3.5**
**Southwestern Mechanical Harvesting Disposal Site Location, Whitewater and Rice Lakes**


IDENTIFIED WETLANDS

100-YEAR FLOODPLAIN

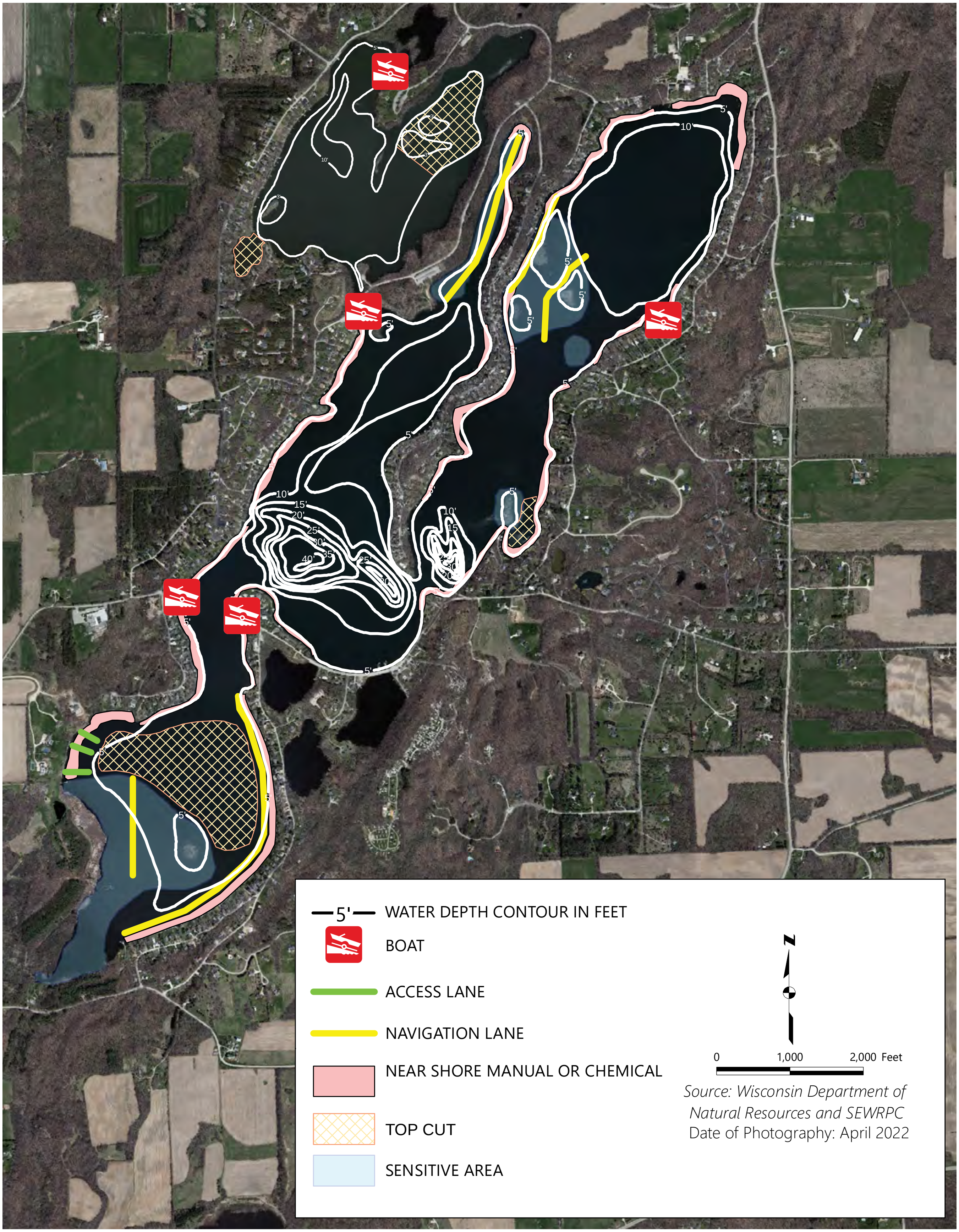
DISPOSAL LOCATION

N

0 250 500 Feet

*Source: Wisconsin Department of Natural Resources and SEWRPC*
Date of Photography: April 2022

**Map 3.6**
**Harvesting Operations, Whitewater and Rice Lakes**



f. Shoreland Areas: Areas immediately adjacent to piers and docks along developed shorelines. To the extent practical, aquatic and riparian vegetation should be maintained. Plant management within shoreland is recommended to be left to the riparian landowners. Since shoreland areas are generally densely populated, it is time consuming, difficult, and costly for mechanical harvesters to maneuver between piers and boats, a situation that may also generate liability for damage to boats and piers. If a small-scale harvester is acquired, it may be used in shoreland areas provided that water depths are greater than 18 inches and that at least 12 inches of living plant material is maintained on the lake bottom after cutting.

4. **Focus harvesting efforts on invasive aquatic plant growth**. To reduce the risk for water quality degradation, special effort should be taken to avoid cutting native aquatic plants wherever and whenever possible. Conversely, harvesting intensity should be increased during times of the year (i.e., spring and early summer) when invasive aquatic plant growth is predominant and within areas where invasive species are most abundant. For example, curly leaf pondweed may be particularly abundant early in the cutting season but is largely absent by midsummer, a growth cycle that may require changes to harvesting routes and schedules over the season.

5. **Limit aquatic plant management and human disturbance in designated sensitive areas**. As discussed in Chapter 2, five sensitive areas have been designated in Whitewater Lake by WDNR. Delineation/management reports for these environmentally sensitive areas are included in Appendix C. Applying aquatic plant management measures in each of these areas is subject to State of Wisconsin permitting requirements pursuant to Chapters NR 107 and NR 109 of the *Wisconsin Administrative Code*, and the specific recommendations described in this SEWRPC Staff Memorandum.

6. **Adapt harvesting patterns and schedules to ambient conditions**. Operators shall be provided with a laminated copy of the approved harvesting plan. A copy of the plan shall be kept on board the harvester at all times. Harvester operators must fully understand that aquatic plant management maps are schematic in nature and care must be taken to choose harvester routes that best accomplish overall plan objectives (e.g., favor deeper water areas).

7. **Do not harvest in the early spring to avoid disturbing fish spawning**. Many fish species spawn in early spring and some studies suggest that spawning can be significantly disturbed by harvesting activities. Thus, avoiding harvesting during this time can benefit the Lake's fishery. If a chemical treatment is applied in the early spring, harvesting should not occur until after Memorial Day to allow time for the chemical treatment to be effective.

8. **Immediately return incidentally captured living animals to the water**. As harvested plants are brought on board the harvester, plant material must be actively examined for live animals. Animals such as turtles, fish, and amphibians commonly become entangled within harvested plants, particularly when cutting large plant mats. A second deckhand equipped with a net should accompany and help the harvester operator rescue animals incidentally collected during aquatic plant harvesting. If a second deckhand is not available, the harvester operator shall halt harvesting and remove animals incidentally collected during plant harvesting. Such stop-and-start work can dramatically decrease harvesting efficiency. Therefore, the WDNR recommends two staff be present on operating harvesters.

9. **Using marker buoys and landmarks**. Temporary marker buoys may benefit harvesting operations by denoting areas to be cut. The modest size of Rice Lake generally reduces the need for marker buoys except as may be required to alert and control recreational boat traffic. Harvester operators must be familiar with the intent and execution logistics related to harvesting. Familiarity with local landmarks to the degree necessary to carry out the plan and/or use of marker buoys is component to this endeavor.

10. **Insurance, maintenance, repair, and storage**. Appropriate insurance covering the harvester and ancillary equipment will be incorporated into the District's policy. The District will provide liability insurance for harvester operators and other staff. Insurance certificates will be procured and held by the District. Routine day-to-day equipment maintenance will be performed by the harvester operator

or other individuals identified by the District in accordance with the manufacturer's recommendations and suggestions. To this end, harvester operators shall be familiar with equipment manuals and appropriate maintenance/manufacturer contacts. Operators will immediately notify District staff of any equipment malfunctions, operating characteristics, or sounds suggesting malfunction and/or the need for repair. Equipment repair beyond routine maintenance will be arranged by the District. Maintenance and repair costs will be borne by the District. The District will be responsible for properly transporting and storing harvesting equipment during the off season.

11. **Management, record keeping, monitoring, and evaluation**. District staff manage harvesting operations, and, although they may delegate tasks, are ultimately responsible for overall plan execution and logistics. Nevertheless, daily harvesting activities will be documented in writing by the harvester operator in a permanent harvester operations log. Harvesting patterns, harvested plant volumes, weed pickup, plant types, and other information will be recorded. Daily maintenance and service logs recording engine hours, fuel consumed, lubricants added, oil used, and general comments will be recorded. Furthermore, this log should include a section to note equipment performance problems, malfunctions, or anticipated service. Monitoring information will be summarized in an annual summary report prepared by the District, submitted to the WDNR, and available to the general public. The report will also present information regarding harvesting operation and maintenance, equipment acquisitions and/or needs, expenditures, and budgets.

12. **Logistics, supervision, and training**. Harvesting equipment is owned and operated by the District. District staff or delegated board members are responsible for overall harvesting program oversight and supervision. Although District staff are ultimately responsible for equipment operation, they may delegate tasks to competent individuals when technically and logistically feasible. The District must assure such individuals are appropriately trained to successfully and efficiently carry out their respective job functions. For example, District members/staff likely have extensive experience operating and maintaining harvesting equipment and have detailed knowledge of lake morphology, plant growth, and overall lake biology. These individuals should actively share this knowledge through an on-the-job training initiative. The equipment manufacturer may also be able to provide advice, assistance, and insight regarding equipment operation and maintenance. Boating safety courses are available through many media and are integral to individuals involved with on-the-water work. All harvester operators must successfully complete appropriate training, must be thoroughly familiar with equipment function, must be able to rapidly respond to equipment malfunction, must be familiar with the Lake's morphology and biology, and must recognize landmarks to help assure adherence to harvesting permit specifications and limitations. Additionally, harvester operators must be able to recognize the various native and invasive aquatic plants present in the Lakes. Such training may be provided through printed and on-line study aids, plant identification keys, and the regional WDNR aquatic species coordinator. At a minimum, training should explain "deep-cut" versus "shallow-cut" techniques and when to employ each in accordance with this plan.

    - Discuss equipment function, capabilities, limitations, hazards, general maintenance, and the similarities and differences between the various pieces of equipment they may be expected to operate,

    - Review the aquatic plant management plan and associated permits with special emphasis focused on the need to restrict cutting in shallow and nearshore areas,

    - Help operators identify WDNR-designated sensitive Areas and be well versed regarding the aquatic plant management restrictions therein,

    - Assure operators can confidentially identify aquatic plants and understand the positive values such plants provide to the Lakes' ecosystem which in turn encourages preservation of native plant communities, and

    - Reaffirm that all harvester operators are legally obligated to accurately track and record their work for inclusion in permit-requisite annual reports.

The training program must integrate other general and job-specific items such as boating navigational conventions, safety, courtesy and etiquette, and State and local boating regulations. Other topics that should be covered include first aide training, safety training, and other elements that help promote safe, reliable service.

**Nearshore Manual Aquatic Plant Removal**

In nearshore areas where other management efforts are not feasible, raking may be a viable and practical method to manage overly abundant and/or undesirable plant growth. Should Whitewater and Rice Lakes residents decide to utilize raking to manually remove aquatic plants, the District or other interested party could acquire a number of specially designed rakes for riparian owners to use on a trial basis and/or rent or loan. If those rakes satisfy users' needs and objectives, additional property owners would be encouraged to purchase their own rakes.

Hand-pulling EWM and curly-leaf pondweed is considered a viable option in Whitewater and Rice Lakes and should be employed wherever practical. Volunteers or homeowners could employ this method, as long as they are properly trained to identify EWM, curly-leaf pondweed, or any other invasive plant species of interest. WDNR provides a wealth of guidance materials (including an instructional video describing manual plant removal) to help educate volunteers and homeowners.

Pursuant to Chapter NR 109 *Aquatic Plants: Introduction, Manual Removal and Mechanical Control Regulations* of the *Wisconsin Administrative Code*, riparian landowners may rake or hand pull aquatic plants without a WDNR permit under the following conditions:

- Eurasian water milfoil, curly-leaf pondweed, and purple loosestrife may be removed by hand if the native plant community is not harmed in the process.
- Raked, hand-cut, and hand-pulled plant material must be removed from the lake.
- No more than 30 lineal feet of shoreline may be cleared, however, this total must include shoreline lengths occupied by docks, piers, boatlifts, rafts, and areas undergoing other plant control treatment. In general, regulators allow vegetation to be removed up to 100 feet out from the shoreline.
- Plant material that drifts onto the shoreline must be removed.
- The subject shoreline cannot be a designated sensitive area.
- Emergent plant community augmentation could be pursued. This would require a field observation of water quality and sediment composition during summer months and would require permits from WDNR to introduce emergent plants.

Any other manual removal technique requires a State permit, unless specifically used to control designated nonnative invasive species such as Eurasian water milfoil. Mechanical equipment (e.g., dragging equipment such as a rake behind a motorized boat or the use of weed rollers) is not authorized for use in Wisconsin at this time. Nevertheless, riparian landowners may use mechanical devices to cut or mow exposed lakebed. Furthermore, purple loosestrife may also be removed with mechanical devices if native plants are not harmed and if the control process does not encourage spread or regrowth of purple loosestrife or other nonnative vegetation.

Permits are also required if shoreland property owners abut a sensitive area or if another group actively engages in such work.[55] Several locations in Whitewater Lake are designated sensitive areas, and a permit is therefore required to manually remove aquatic plants in those shoreline areas.

[55] *If a lake district or other group wants to remove invasive species along the shoreline, a permit is necessary under Chapter NR 109, "*Aquatic Plants: Introduction, Manual Removal and Mechanical Control Regulations,*" of the* Wisconsin Administrative Code*, as the removal of aquatic plants is not being completed by an individual property owner along his or her property.*

Prior to the hand-pulling season, shoreline residents should be reminded of the utility of manual aquatic plant control through an educational campaign. This campaign should also foster shoreline resident awareness of native plant values and benefits, promote understanding of the interrelationship between aquatic plants and algae (i.e., if aquatic plants are removed, more algae may grow), assist landowners identify the types of aquatic plants along their shorelines, and familiarize riparian landowners with the specific tactics they may legally employ to "tidy up" their shorelines.[56]

**Suction Harvesting and DASH**

Suction harvesting may be a practical method to control aquatic plants if dredging is warranted, but it is not likely to be a cost-effective, environmentally friendly, or practical method to manage aquatic plants alone. For this reason, suction harvesting is not practical for widespread application at the Lakes. However, it may provide a practical alternative in excessively shallow nearshore areas where increased water depth could meaningfully improve navigability (e.g., narrow access channels connecting lots without open-water frontage to the Lake).

Given how time consuming and costly DASH can be to employ and given the prevalence of invasive and nuisance plant growth across the Lakes, DASH will never likely be a primary component part of the District's general nuisance and invasive plant management strategy. Nevertheless, some lake districts have employed DASH to aggressively combat small-scale pioneer infestations of invasive species. The District may wish to consider using DASH should such a situation arise in the future. Furthermore, DASH may also be considered as a temporary solution to remove nuisance plants in nearshore areas until a mini-harvester is acquired. Therefore, using DASH in specialized spot applications is component to this plan.

DASH may be of interest to private parties in specific situations. For example, DASH could be employed by individuals to control nuisance native and nonnative plants around piers and other congested areas. If an individual landowner or groups of landowners choose to utilize DASH, the activity is typically confined to the same area as riparian landowner manual aquatic plant manual control (30 feet of shoreline per property generally extending no more than 100 feet in areas including piers and other navigation aids). DASH requires a permit under *Wisconsin Administrative Code* Chapter NR 109 *Aquatic Plants: Introduction, Manual Removal and Mechanical Control Regulations*.

**Water Manipulation**

As discussed above, water level manipulation is a large-scale, permitted operation that can have major effects on lake ecology. Consequently, detailed information on the Lakes' hydrology, including groundwater, should be compiled before undertaking such an operation. The WDNR would likely require and consider the following during review of the drawdown permit application:

- Existing lake bottom contours should be reevaluated with any changes mapped in order to develop updated bathymetric information.
- Lake volume needs to be accurately determined for each foot of depth contour.
- Lake bottom acreage exposed during various intervals of the drawdown must be determined.
- Knowledge of the drawdown and refill times for the Lake would guide proper timing of drawdown to maximize effectiveness and minimize impacts to Lake users.
- A safe drawdown discharge rate would need to be calculated to prevent downstream flooding and erosion.
- Effects of the lake drawdown to the structural integrity of outlet dams should be examined.

[56] *SEWRPC and WDNR staff could help review documents developed for this purpose.*

- A WDNR permit and WDNR staff supervision are required to draw down a lake. Additionally, lakeshore property owners need to be informed of the drawdown and permit conditions before the technique is implemented. Targeted invasive species populations should be monitored before and after refill is complete to assess efficacy and guide future management.

**Shoreline Protection**

Undercutting of shoreline has been observed along either side of Kettle Moraine State Park located on State Park Road between Whitewater and Rice Lakes. Eroded sediment has been accumulating in these areas. Because of this, a future plan could include possible shoreland stabilization measures to reduce erosion in these areas. The District is encouraged to partner with WDNR Parks staff to address shoreline protection.

## 3.2 CONCLUSION

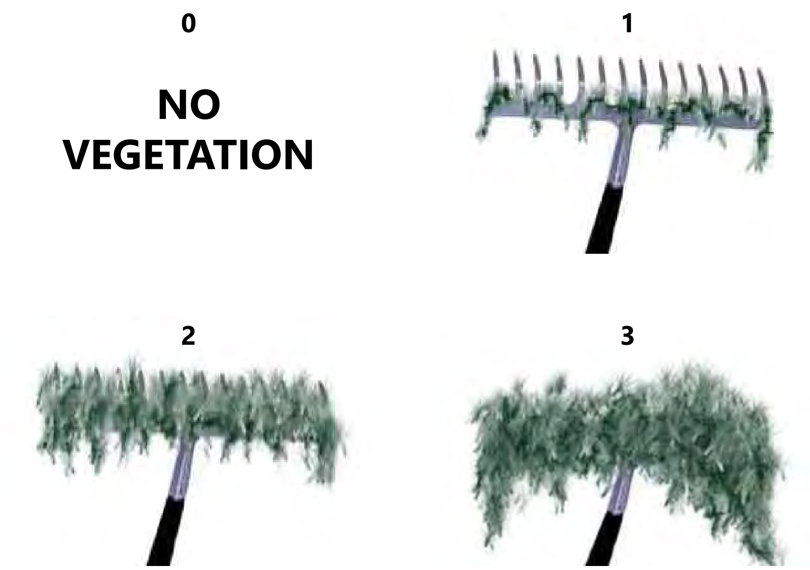
This document is intended to inspire and guide ideas and actions. The recommendations should, therefore, be considered a starting point for addressing issues identified in Whitewater and Rice Lakes. Successfully implementing this plan will require vigilance, cooperation, and enthusiasm, not only from local management groups, but also from State and regional agencies, Walworth County, municipalities, and residents/users of the Lakes. The recommended measures aim to foster conditions that enhance the health of the Whitewater and Rice Lake ecosystems while promoting a wide array of water-based recreational activities suitable for the Lakes' intrinsic characteristics.

# APPENDICES

# APPENDIX A

## WHITEWATER AND RICE LAKES AQUATIC PLANT SPECIES DETAILS

**Figure A.1**
**Rake Fullness Ratings**




*Source: Wisconsin Department of Natural Resources and SEWRPC*

**SOURCES OF INFORMATION:**

Borman, S., Korth, R., & Temte, J. (2014). Through the Looking Glass: A Field Guide to Aquatic Plants, Second Edition. Stevens Point, WI, USA: Wisconsin Lakes Partnership.

Robert W. Freckman Herbarium: wisplants.uwsp.edu

Skawinski, P. M. (2014). Aquatic Plants of the Upper Midwest: A Photographic Field Guide to Our Underwater Forests, Second Edition. Wausau, Wisconsin, USA: Self-Published.

University of Michigan Herbarium: michiganflora.net/home.aspx

UW-System WisFlora. 2016. wisflora.herbarium.wisc.edu/index.php

# APPENDIX A-1
# WHITEWATER LAKE AQUATIC PLANT SPECIES DETAILS

# COMMON BLADDERWORT

*Utricularia vulgaris*

Credit: Wikimedia Commons User Leonhard Lenz

Native

## Identifying Features

- Flowers snapdragon-like, yellow, held on stalks above the water surface
- *Producing bladders* (small air chambers on the stem) that capture prey and give buoyancy to the stem
- Stems floating (due to air bladders; branches finely divided

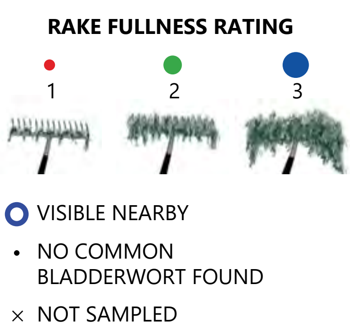
Several similar bladderworts occur in southeastern Wisconsin

## Ecology

- Most often found in quiet shallows and along shores, but common bladderwort sometimes occurs in water several feet deep
- Provides forage and cover for a wide range of aquatic organisms
- Bladders capture and digest prey, including small invertebrates and protozoans

*Credit: Flickr User Andreas Rockstein*

*Credit: Flickr User Joshua Mayer*




Native

# COMMON WATERWEED

*Elodea canadensis*

*Credit: Flickr User Corey Raimond*

## Identifying Features

- Slender stems, occasionally rooting
- Leaves lance-shaped, in whorls of three (rarely two or four), 6.0 to 17 mm long and averaging 2.0 mm wide
- When present, tiny male and female flowers on separate plants (females more common), raised to the surface on thread-like stalks

## Ecology

- Found in lakes and streams over soft substrates tolerating pollution, eutrophication and disturbed conditions
- Often overwinters under the ice
- Produces seeds only rarely, spreading primarily via stem fragments
- Provides food for muskrat and waterfowl
- Habitat for fish or invertebrates, although dense stands can obstruct fish movement

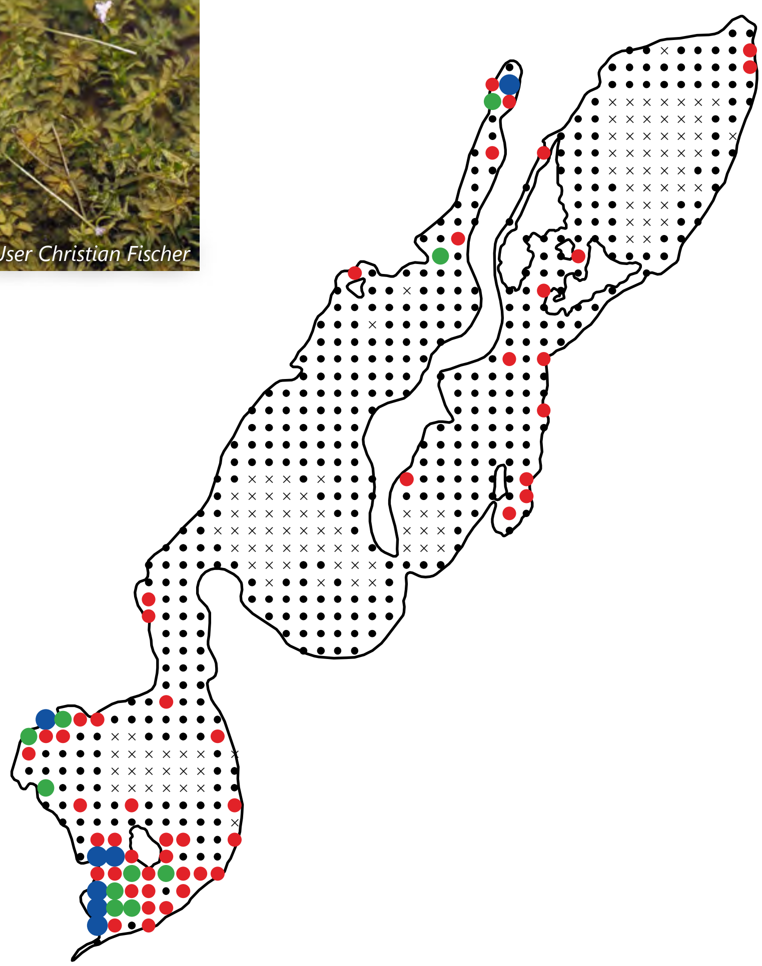
*Credit: Wikimedia Commons User Christian Fischer*

RAKE FULLNESS RATING


VISIBLE NEARBY

NO COMMON WATERWEED FOUND

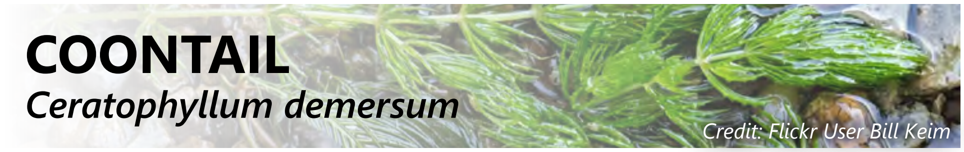
NOT SAMPLED



Native

# COONTAIL

*Ceratophyllum demersum*



*Credit: Flickr User Bill Keim*

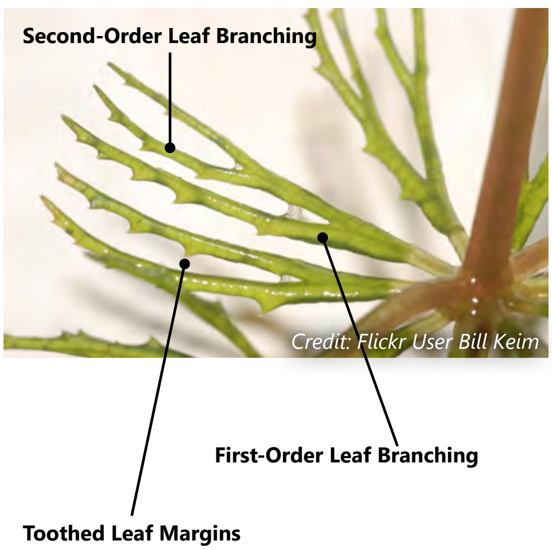
## Identifying Features

- Often bushy near tips of branches, giving the raccoon tail-like appearance (“coontail”)
- Whorled leaves with one to two orders of
- branching and small teeth on their margins
- Flowers (rare) small and produced in leaf axils

Coontail is similar to spiny hornwort (C. echinatum) and muskgrass (Chara spp.), but spiny hornwort has some leaves with three to four orders of branching, and coontail does not produce the distinct garlic-like odor of muskgrass when crushed

## Ecology

- Common in lakes and streams, both shallow and deep
- Tolerates poor water quality (high nutrients, chemical pollutants) and disturbed conditions
- Stores energy as oils, which can produce slicks on the water surface when plants decay
- Anchors to the substrate with pale, modified leaves rather than roots
- Eaten by waterfowl, turtles, carp, and muskrat




*Credit: Flickr User Bill Keim*

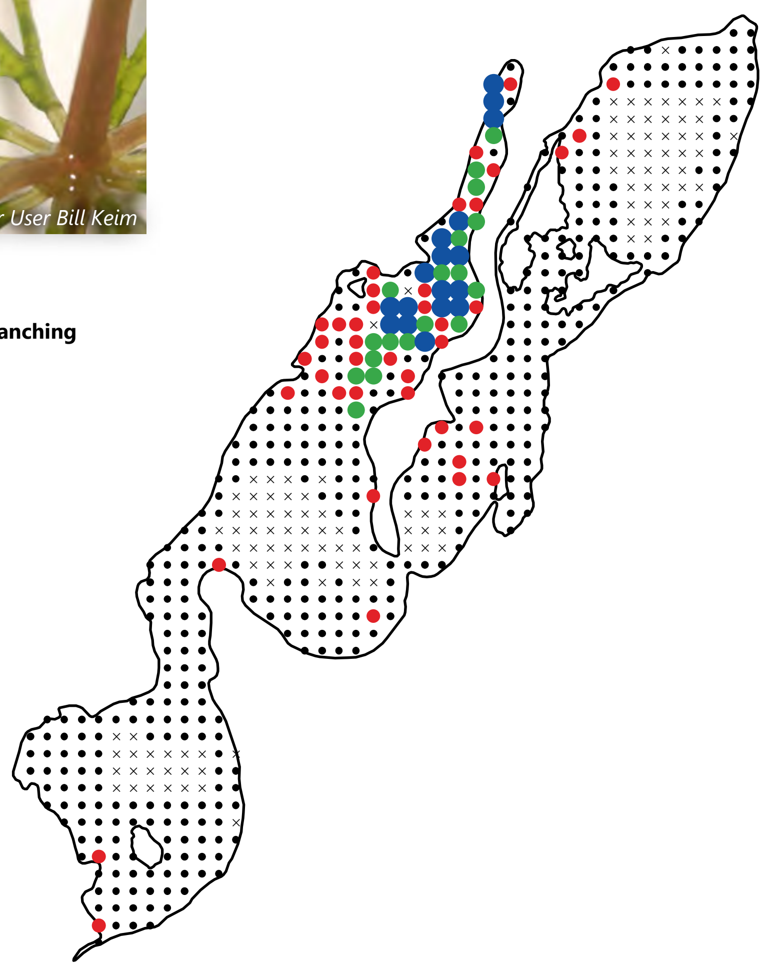
**RAKE FULLNESS RATING**

1 2 3

VISIBLE NEARBY

NO COONTAIL FOUND

NOT SAMPLED



**Nonnative/ Exotic**

# CURLY-LEAF PONDWEED

*Potamogeton crispus*

*Credit: Paul Skawinski*

## Identifying Features

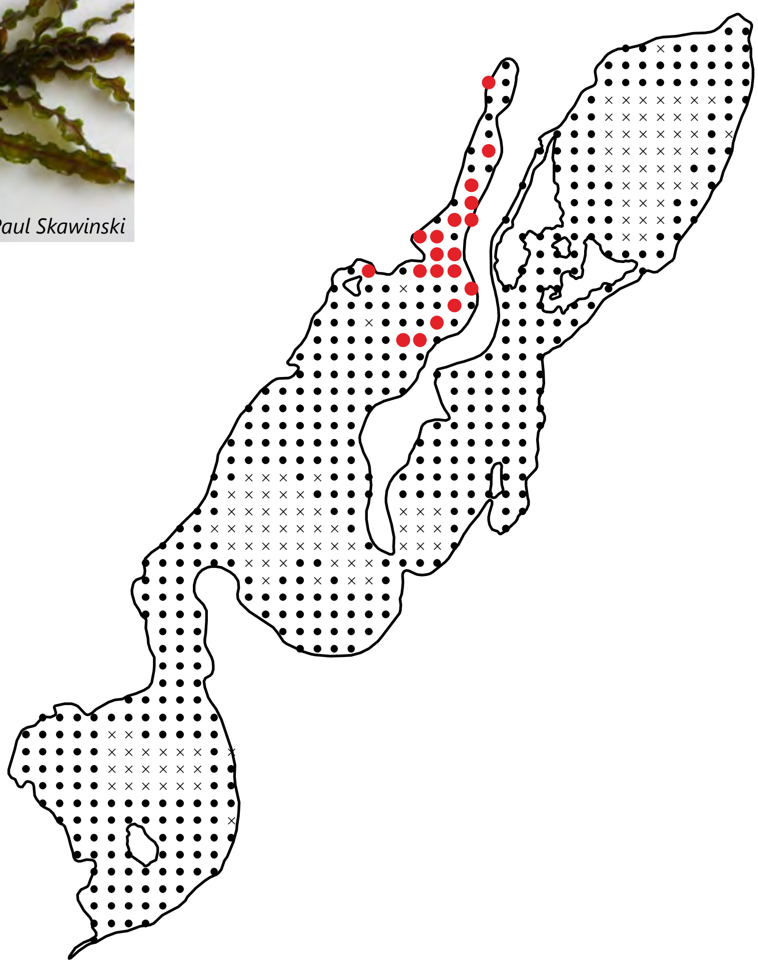
- Stems slightly flattened and both stem and leaf veins often somewhat pink
- Leaf margins very wavy and finely serrated
- Stipules (3.0 to 8.0 mm long) partially attached to leaf bases, disintegrating early in the season
- Produces pine cone-like overwintering buds (turions)

Curly-leaf pondweed may resemble clasping-leaf pondweed (*P. richardsonii*), but the leaf margins of the latter are not serrated

## Ecology

- Found in lakes and streams, both shallow and deep
- Tolerant of low light and turbidity
- Disperses mainly by turions
- Adapted to cold water, growing under the ice while other plants are dormant, but dying back during mid-summer in warm waters
- Produces winter habitat, but mid-summer die-offs can degrade water quality and cause algal blooms
- Maintaining or improving water quality can help control this species, because it has a competitive advantage over native species when water clarity is poor

*Credit: Paul Skawinski*



**RAKE FULLNESS RATING**

1 2 3

VISIBLE NEARBY

• NO CURLY-LEAF PONDWEED FOUND

× NOT SAMPLED

Nonnative/ Exotic

# EURASIAN WATERMILFOIL

*Myriophyllum spicatum*

*Credit: Paul Skawinski*

## Identifying Features

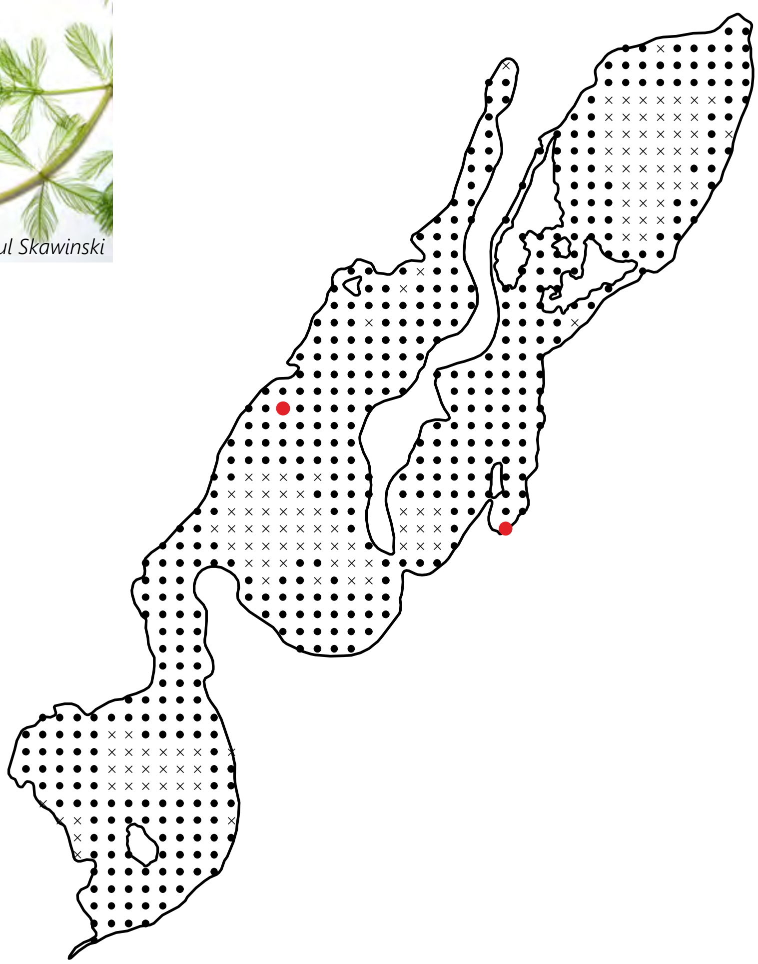
- Stems spaghetti-like, often pinkish, growing long with many branches near the water surface
- Leaves with 12 to 21 pairs of leaflets
- Produces no winter buds (turions)

Eurasian watermilfoil is similar to northern watermilfoil (*M. sibiricum*). However, northern watermilfoil has five to 12 pairs of leaflets per leaf and stouter white or pale brown stems

## Ecology

- Hybridizes with northern (native) watermilfoil, resulting in plants with intermediate characteristics
- Invasive, growing quickly, forming canopies, and getting a head-start in spring due to an ability to grow in cool water
- Grows from root stalks and stem fragments in both lakes and streams, shallow and deep; tolerates disturbed conditions
- Provides some forage to waterfowl, but supports fewer aquatic invertebrates than mixed stands of aquatic vegetation

*Credit: Paul Skawinski*



**RAKE FULLNESS RATING**

1 2 3

VISIBLE NEARBY

NO EURASIAN WATERMILFOIL FOUND

NOT SAMPLED

Native

# HORNED PONDWEED

*Zannichellia palustris*

Credit: Paul Skawinski

## Identifying Features

- Slender stem and long, narrow leaves (3-10 cm long, 0.5 mm wide)
- Produces flattened fruit at leaf axils that is slightly curved like a horn and is the most distinguishing feature

Horned pondweed can be mistaken for pondweeds (Potamogeton spp.) and naiads (Najas spp.) However, pondweeds have alternate leaves instead of opposite leaves, and naiads have shorter, more crowded leaves.

## Ecology

- Commonly located in shallow and deep areas of hard water lakes and rivers
- Often partially buried and difficult to spot
- Relies on seeds to overwinter because it is an annual plant
- Fruit and foliage provide food for waterfowl and trout

Credit: Paul Skawinski

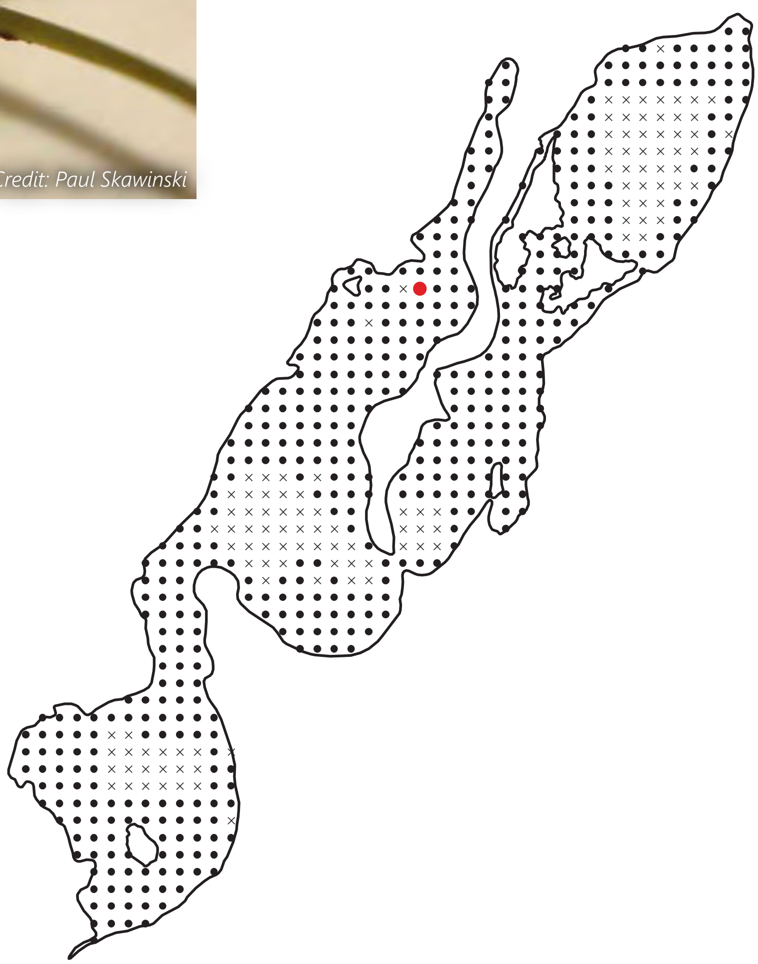
**RAKE FULLNESS RATING**

1 2 3

VISIBLE NEARBY

• NO COMMON BLADDERWORT FOUND

× NOT SAMPLED



Native

# MUSKGRASSES

*Chara* spp.

Credit: Flickr User Jeremy Halls

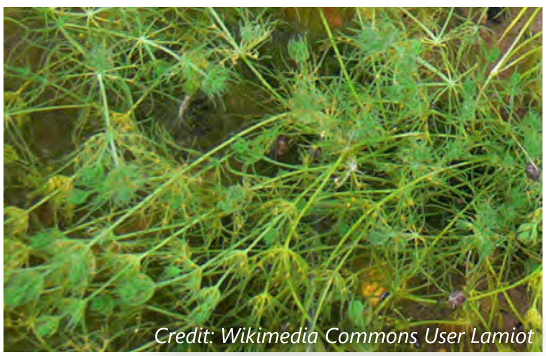
## Identifying Features

- Leaf-like, ridged side branches develop in whorls of six or more
- Often encrusted with calcium carbonate, which appears white upon drying (see photo below)
- Yellow reproductive structures develop along the whorled branches in summer
- Emits a garlic-like odor when crushed

Stoneworts (*Nitella* spp.) are similar large algae, but their branches are smooth rather than ridged and more delicate

## Ecology

- Found in shallow or deep water over marl or silt, often growing in large colonies in hard water
- Overwinters as rhizoids (cells modified to act as roots) or fragments
- Stabilizes bottom sediments, often among the first species to colonize open areas
- Food for waterfowl and excellent habitat for small fish



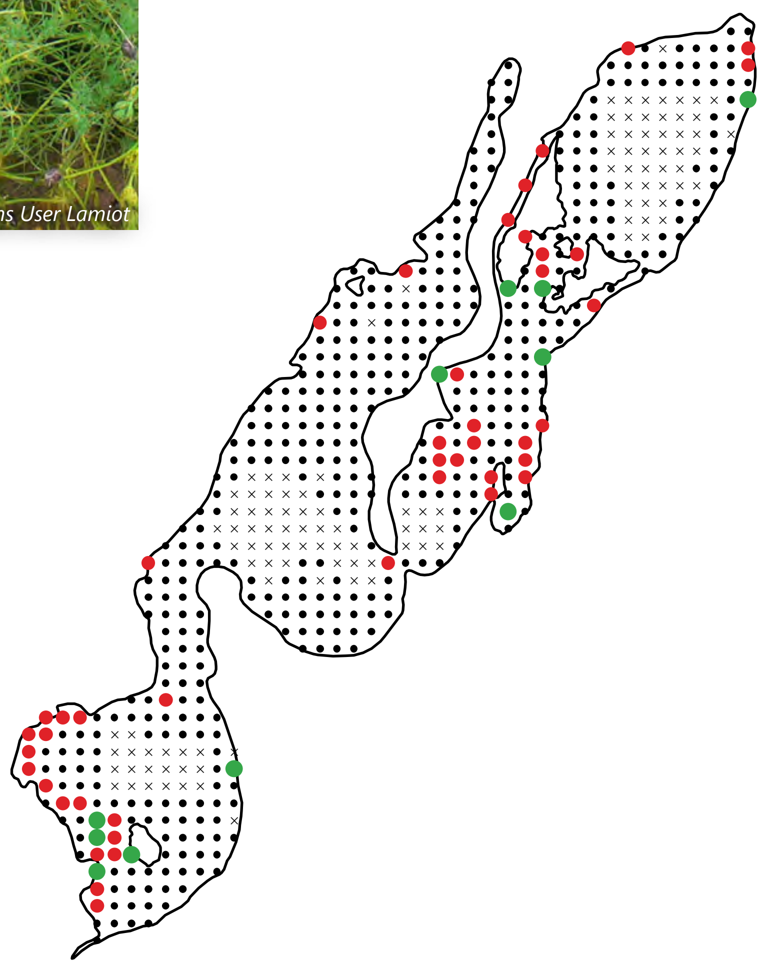
Credit: Wikimedia Commons User Lamiot

**RAKE FULLNESS RATING**


VISIBLE NEARBY

NO MUSKGRASS FOUND

NOT SAMPLED



Native

# NITELLAS OR STONEWORTS

*Nitella* spp.

Credit: Wikimedia Commons User Show_ryu

## Identifying Features

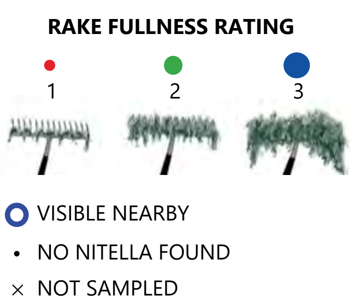
- Stems and leaf-like side branches delicate and smooth, side branches arranged in whorls
- Bright green
- Reproductive structures developing along the whorled branches

Muskgrasses (*Chara* spp.) are large algae similar to stoneworts (*Nitella* spp.), but their branches are ridged and more robust than those of stoneworts. Another similar group of algae, *Nitellopsis* spp., differ from stoneworts by having whorls of side branches that are at more acute angles to the main stem and star-shaped, pale bulbils that, when present, are near where side branches meet the main stem

## Ecology

- Often found in deep lake waters over soft sediments
- Overwinters as rhizoids (cells modified to act as roots) or fragments
- Habitat for invertebrates, creating foraging opportunities for fish
- Sometimes browsed upon by waterfowl

Credit: Wikimedia Commons User Kristian Peters




Native

# SAGO PONDWEED

*Stuckenia pectinata*

*Credit: Flickr User Christian Fischer*

## Identifying Features

- Stems often *slightly zig-zagged* and forked multiple times, yielding a fan-like form
- Leaves one to four inches long, very thin, and ending in a sharp point
- Whorls of fruits spaced along the stem may appear as beads on a string

## Ecology

- Lakes and streams
- Overwinters as rhizomes and starchy tubers
- Tolerates murky water and disturbed conditions
- Provides abundant fruits and tubers, which are an *important food for waterfowl*
- Provides habitat for juvenile fish

*Credit: Flickr User Christian Fischer*

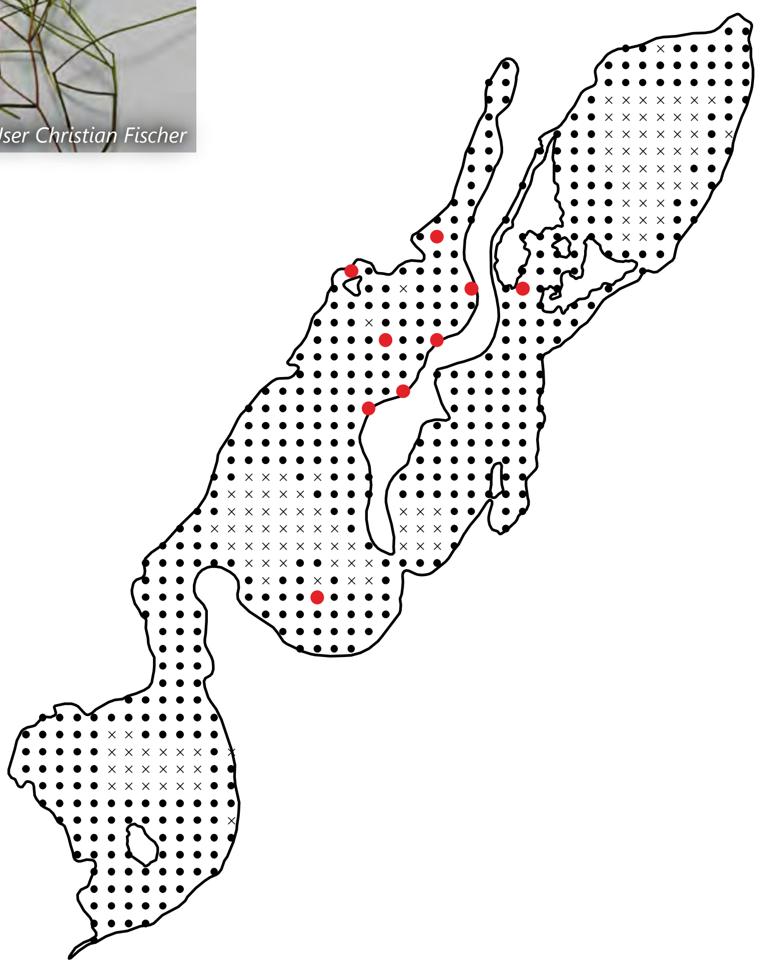
**RAKE FULLNESS RATING**

1 2 3

VISIBLE NEARBY

• NO SAGO PONDWEED FOUND

× NOT SAMPLED



Native

# SLENDER NAIAD

*Najas flexilis*

*Credit: Flickr User Tab Tannery*

## Identifying Features

- Leaves narrow (0.4 to 1.0 mm) and pointed with broader bases where they attach to the stem and finely serrated margins
- Flowers, when present, tiny and located in leaf axils
- Variable size and spacing of leaves, as well as compactness of plant, depending on growing conditions

Two other Najas occur in southeastern Wisconsin. Southern naiad (N. guadalupensis) has wider leaves (to 2.0 mm). Spiny naiad (N. marina) has coarsely toothed leaves with spines along the midvein below

## Ecology

- In lakes and streams, shallow and deep, often in association with wild celery
- One of the most important forages of waterfowl
- An annual plant that completely dies back in fall and regenerates from seeds each spring; also spreading by stem fragments during the growing season


*Credit: Wikimedia Commons User Robert H. Mohlenbrock*

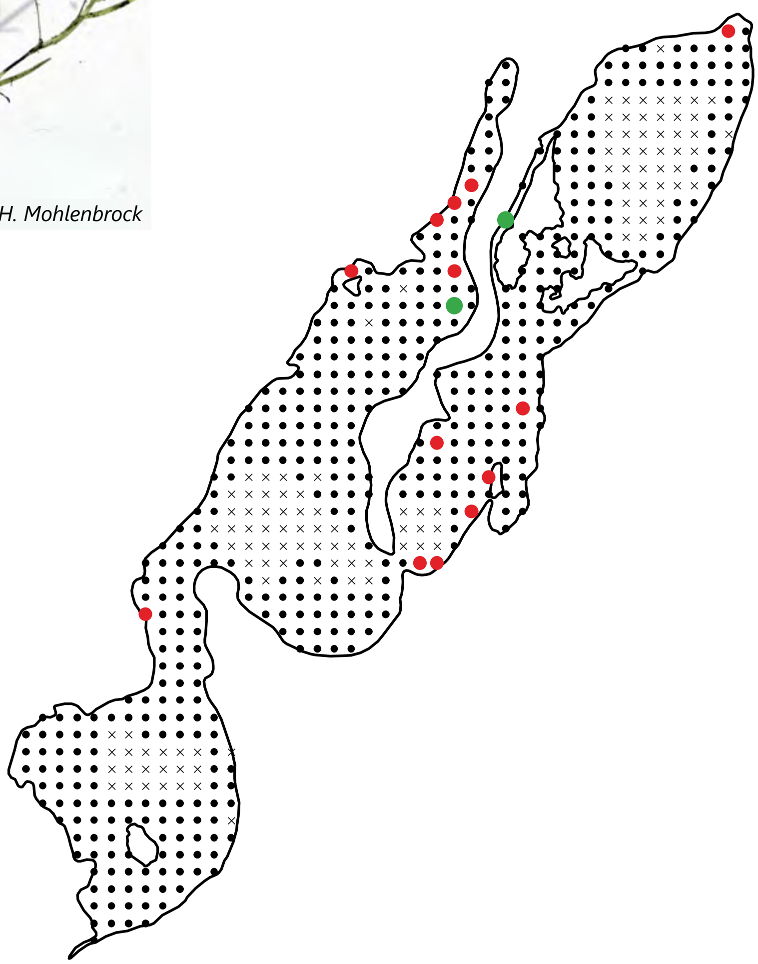
**RAKE FULLNESS RATING**

1 2 3

VISIBLE NEARBY

• NO SLENDER NAIAD FOUND

× NOT SAMPLED



**Native**

# SMALL PONDWEED
*Potamogeton pusillus*

*Credit: Wikimedia Commons User Christian Fischer*

## Identifying Features

- Narrow, submersed leaves (1-7 cm long and 0.2-2.5 mm wide), attaching directly to the stem, with 3 veins, leaf tips blunt or pointed, and often with raised glands where the leaf attaches to the stem
- Produces no floating leaves
- Numerous winter buds (turions) produced with rolled, inner leaves resembling cigars
- Flowers and fruits produced in whorls spaced along slender stalk

Small pondweed is similar to leafy pondweed (*P. foliosus*), when not in flower and fruit. However, unlike leafy pondweed, it often has raised glands where the leaves meet the stem. The flowers and fruits of small pondweed are also borne on longer, more slender stalks and in whorls that are spaced apart.

## Ecology

- Streams and lakes, shallow and deep, but more often in flowing water
- Emerges in spring from buds formed along rhizomes
- Provides food for waterfowl, muskrat, beaver, and deer
- Harbors large numbers of aquatic invertebrates, which provide food for fish

*Credit: Wikimedia Commons User Christian Fischer*

**RAKE FULLNESS RATING**

1 2 3

VISIBLE NEARBY

• NO COMMON BLADDERWORT FOUND

× NOT SAMPLED

Native

# WATER CELERY OR EELGRASS

*Vallisneria americana*

*Credit: Wikimedia Commons User Fredlyfish4*

## Identifying Features

- Leaves ribbon-like, up to two meters long, with a prominent stripe down the middle, and emerging in clusters along creeping rhizomes
- Male and female flowers on separate plants, female flowers raised to the surface on spiral-coiled stalks

The foliage of eelgrass could be confused with the submersed leaves of bur-reeds (*Sparganium* spp.) or arrowheads (*Sagittaria* spp.), but the leaves of eelgrass are distinguished by their prominent middle stripe. The leaves of ribbon-leaf pondweed (*Potamogeton epihydrus*) are also similar to those of eelgrass, but the leaves of the former are alternately arranged along a stem rather than arising from the plant base

## Ecology

- Firm substrates, shallow or deep, in lakes and streams
- Spreads by seed, by creeping rhizomes, and by offsets that break off and float to new locations in the fall
- All portions of the plant consumed by waterfowl; an especially important food source for Canvasback ducks
- Provides habitat for invertebrates and fish

*Credit: Wikimedia Commons User Fredlyfish4*

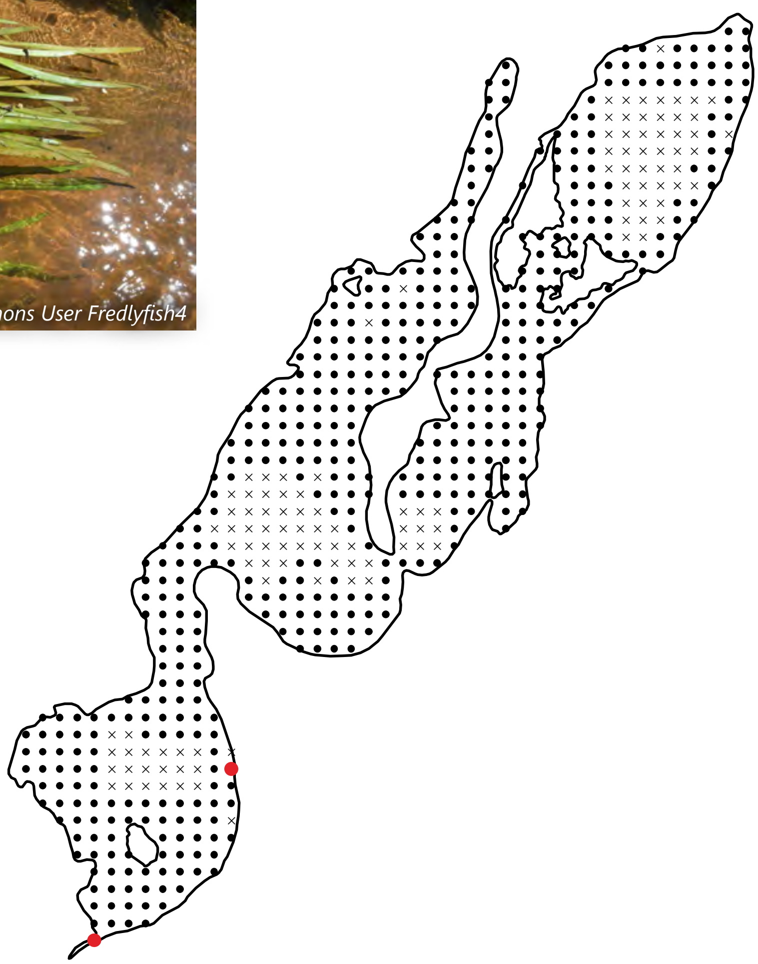
**RAKE FULLNESS RATING**

1 2 3

VISIBLE NEARBY

• NO COMMON BLADDERWORT FOUND

× NOT SAMPLED



# APPENDIX A-2
# RICE LAKE AQUATIC PLANT SPECIES DETAILS

Native

# COMMON WATERWEED

*Elodea canadensis*

*Credit: Flickr User Corey Raimond*

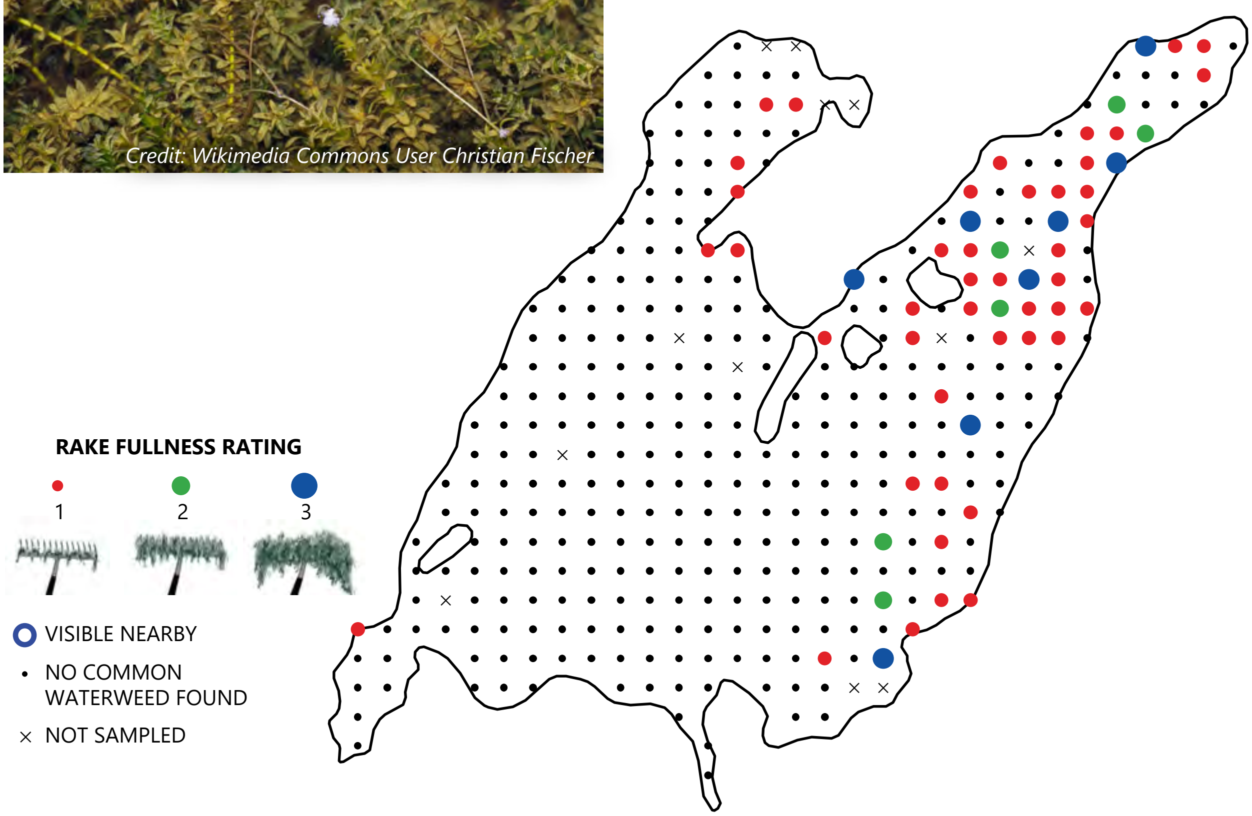
## Identifying Features

- Slender stems, occasionally rooting
- Leaves lance-shaped, in whorls of three (rarely two or four), 6.0 to 17 mm long and averaging 2.0 mm wide
- When present, tiny male and female flowers on separate plants (females more common), raised to the surface on thread-like stalks

## Ecology

- Found in lakes and streams over soft substrates tolerating pollution, eutrophication and disturbed conditions
- Often overwinters under the ice
- Produces seeds only rarely, spreading primarily via stem fragments
- Provides food for muskrat and waterfowl
- Habitat for fish or invertebrates, although dense stands can obstruct fish movement

*Credit: Wikimedia Commons User Christian Fischer*



Native


# COONTAIL

## *Ceratophyllum demersum*

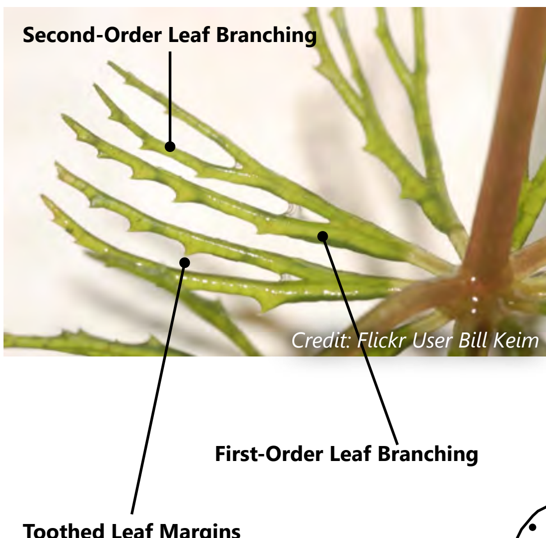
### Identifying Features

- Often bushy near tips of branches, giving the raccoon tail-like appearance ("coontail")
- Whorled leaves with one to two orders of
- branching and small teeth on their margins
- Flowers (rare) small and produced in leaf axils

Coontail is similar to spiny hornwort (C. echinatum) and muskgrass (Chara spp.), but spiny hornwort has some leaves with three to four orders of branching, and coontail does not produce the distinct garlic-like odor of muskgrass when crushed

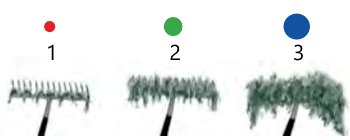
### Ecology

- Common in lakes and streams, both shallow and deep
- Tolerates poor water quality (high nutrients, chemical pollutants) and disturbed conditions
- Stores energy as oils, which can produce slicks on the water surface when plants decay
- Anchors to the substrate with pale, modified leaves rather than roots
- Eaten by waterfowl, turtles, carp, and muskrat




**RAKE FULLNESS RATING**

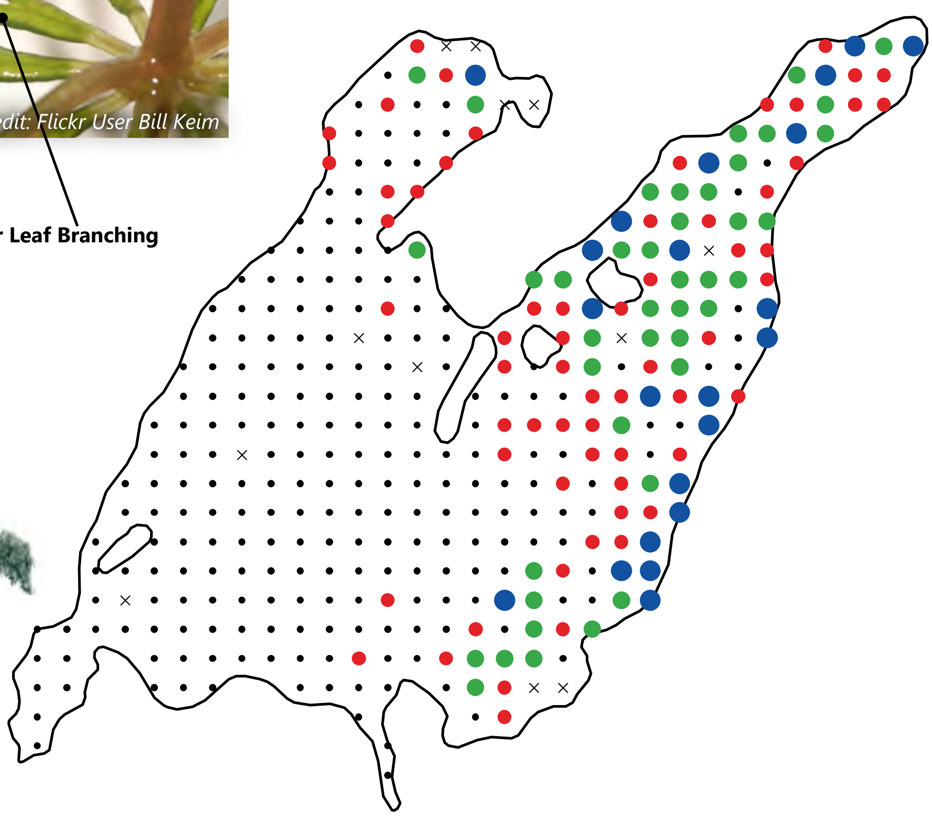
1 2 3



VISIBLE NEARBY

NO COONTAIL FOUND

NOT SAMPLED



**Nonnative/ Exotic**

# CURLY-LEAF PONDWEED

*Potamogeton crispus*

*Credit: Paul Skawinski*

## Identifying Features

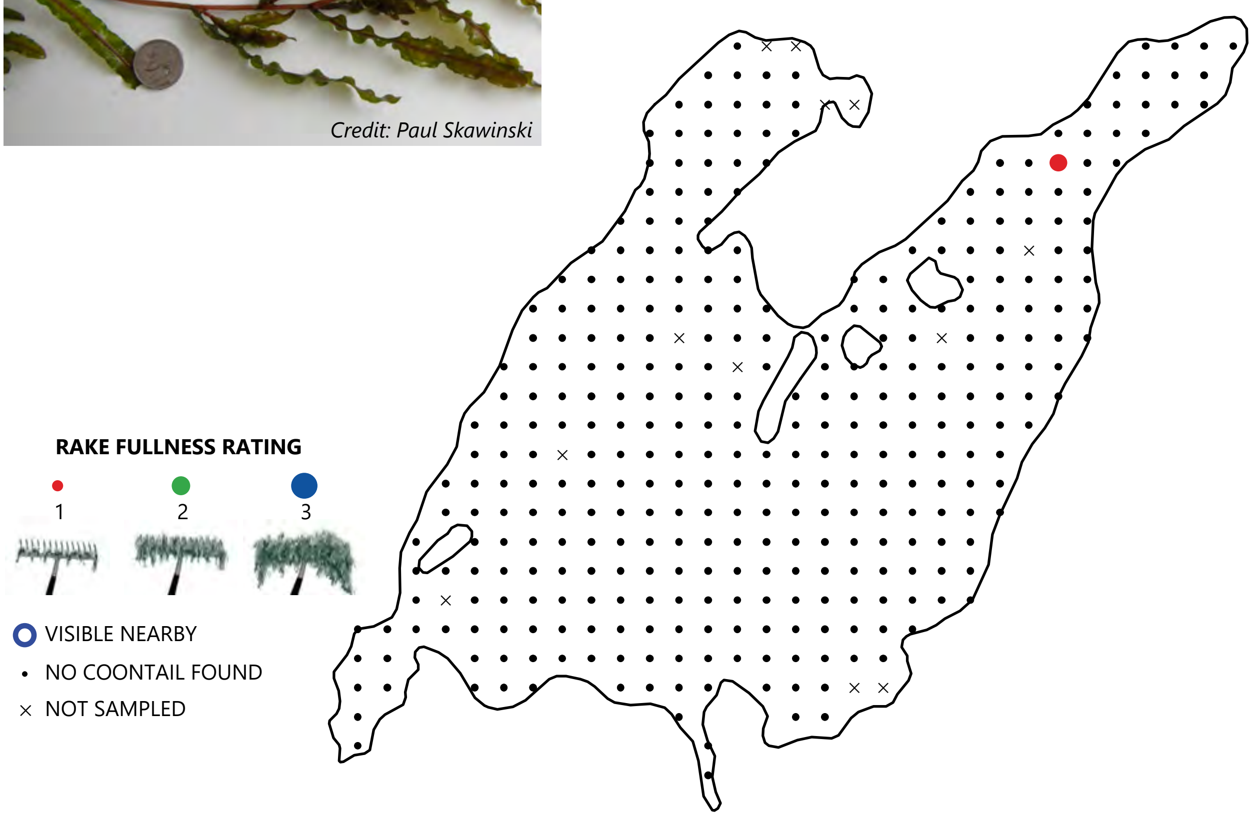
- Stems slightly flattened and both stem and leaf veins often somewhat pink
- Leaf margins very wavy and finely serrated
- Stipules (3.0 to 8.0 mm long) partially attached to leaf bases, disintegrating early in the season
- Produces pine cone-like overwintering buds (turions)

Curly-leaf pondweed may resemble clasping-leaf pondweed (*P. richardsonii*), but the leaf margins of the latter are not serrated

## Ecology

- Found in lakes and streams, both shallow and deep
- Tolerant of low light and turbidity
- Disperses mainly by turions
- Adapted to cold water, growing under the ice while other plants are dormant, but dying back during mid-summer in warm waters
- Produces winter habitat, but mid-summer die-offs can degrade water quality and cause algal blooms
- Maintaining or improving water quality can help control this species, because it has a competitive advantage over native species when water clarity is poor

*Credit: Paul Skawinski*



**Nonnative/ Exotic**

# EURASIAN WATERMILFOIL

*Myriophyllum spicatum*

*Credit: Paul Skawinski*

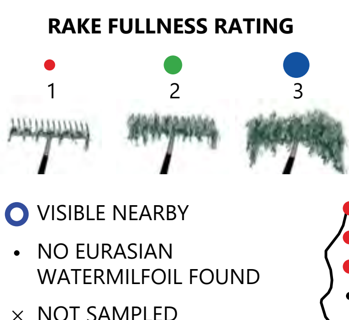
## Identifying Features

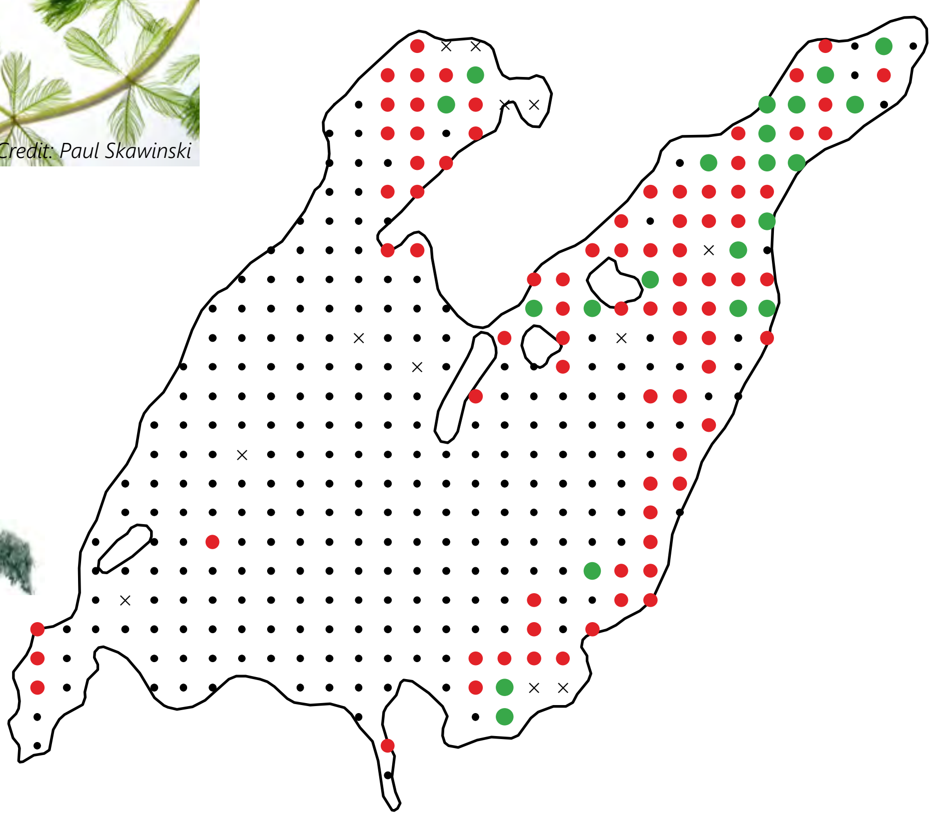
- Stems spaghetti-like, often pinkish, growing long with many branches near the water surface
- Leaves with 12 to 21 pairs of leaflets
- Produces no winter buds (turions)

Eurasian watermilfoil is similar to northern watermilfoil (*M. sibiricum*). However, northern watermilfoil has five to 12 pairs of leaflets per leaf and stouter white or pale brown stems

## Ecology

- Hybridizes with northern (native) watermilfoil, resulting in plants with intermediate characteristics
- Invasive, growing quickly, forming canopies, and getting a head-start in spring due to an ability to grow in cool water
- Grows from root stalks and stem fragments in both lakes and streams, shallow and deep; tolerates disturbed conditions
- Provides some forage to waterfowl, but supports fewer aquatic invertebrates than mixed stands of aquatic vegetation

**Native**

# SAGO PONDWEED

*Stuckenia pectinata*

*Credit: Flickr User Christian Fischer*

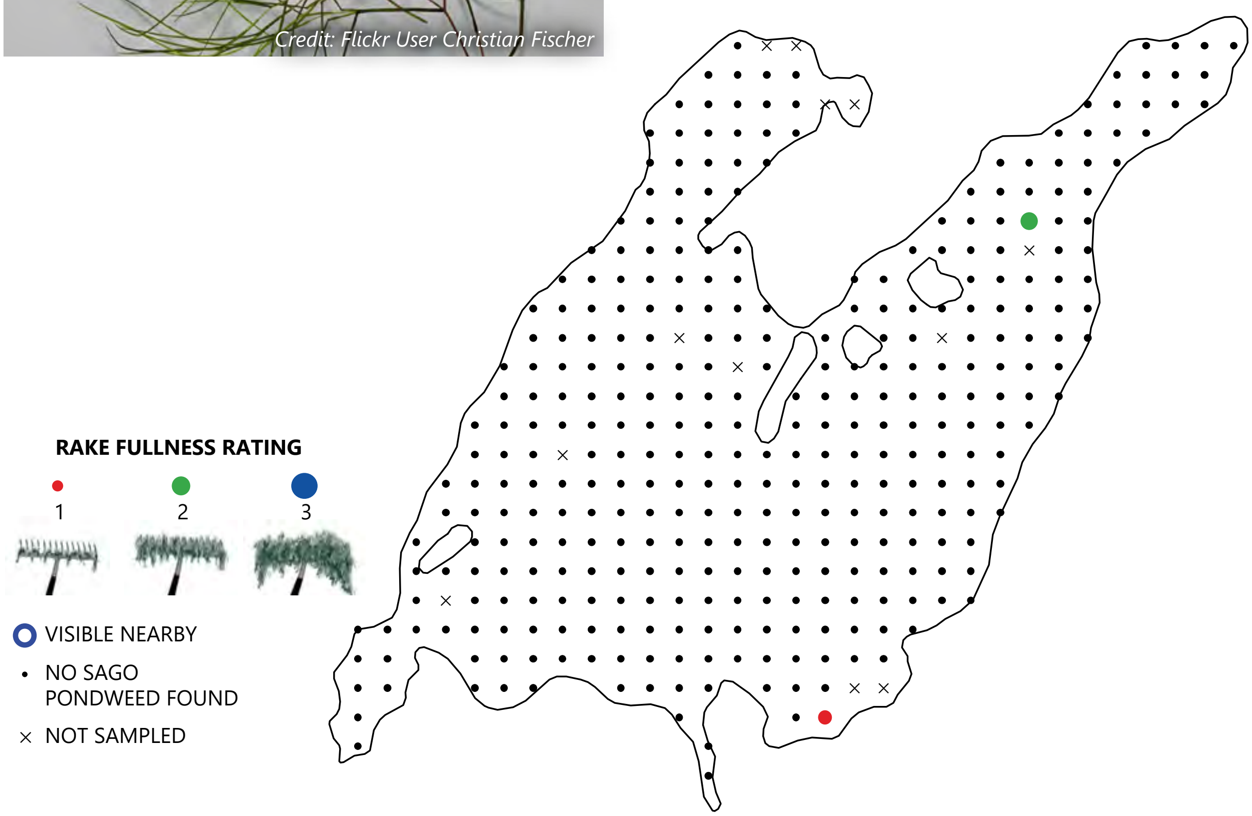
## Identifying Features

- Stems often *slightly zig-zagged* and forked multiple times, yielding a fan-like form
- Leaves one to four inches long, very thin, and ending in a sharp point
- Whorls of fruits spaced along the stem may appear as beads on a string

## Ecology

- Lakes and streams
- Overwinters as rhizomes and starchy tubers
- Tolerates murky water and disturbed conditions
- Provides abundant fruits and tubers, which are an *important food for waterfowl*
- Provides habitat for juvenile fish

*Credit: Flickr User Christian Fischer*



Native

# SLENDER NAIAD

*Najas flexilis*

*Credit: Flickr User Tab Tannery*

## Identifying Features

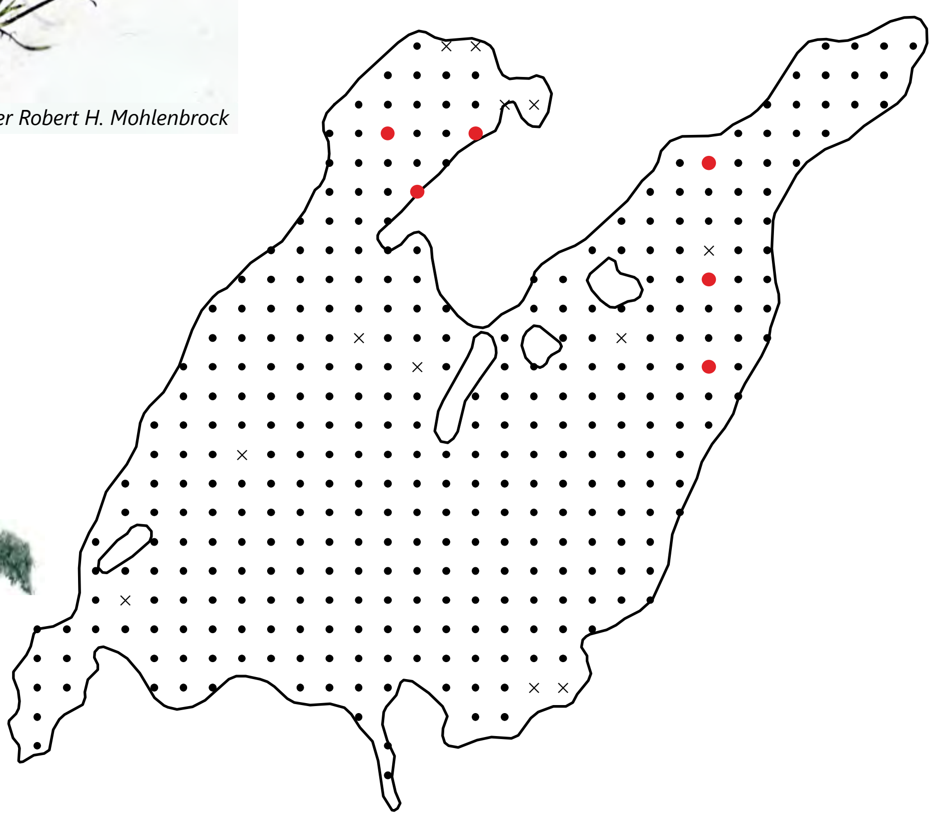
- Leaves narrow (0.4 to 1.0 mm) and pointed with broader bases where they attach to the stem and finely serrated margins
- Flowers, when present, tiny and located in leaf axils
- Variable size and spacing of leaves, as well as compactness of plant, depending on growing conditions

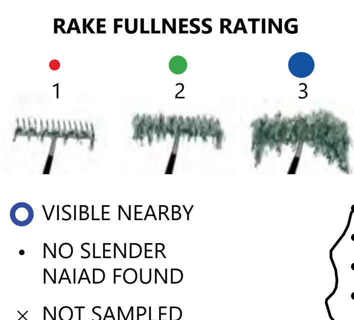
Two other Najas occur in southeastern Wisconsin. Southern naiad (N. guadalupensis) has wider leaves (to 2.0 mm). Spiny naiad (N. marina) has coarsely toothed leaves with spines along the midvein below

## Ecology

- In lakes and streams, shallow and deep, often in association with wild celery
- One of the most important forages of waterfowl
- An annual plant that completely dies back in fall and regenerates from seeds each spring; also spreading by stem fragments during the growing season


*Credit: Wikimedia Commons User Robert H. Mohlenbrock*





# APPENDIX B

## CHEMICAL TREATMENTS

**2021**

| 2021 WHITEWATER LAKE Treatment Site/Herbicide Rate/Cost Data | | | | | AQUATHOL K (liquid endothall) | | PROCELLACOR EC (liquid florpyrauxifen-benzyl) | |
|---|---|---|---|---|---|---|---|---|
| SITE ID | SITE DESCRIPTION | SURFACE ACRES | MEAN DEPTH ESTIMATE | VOLUME | RATE PPM | TOTAL GALLONS | RATE PDU | TOTAL PDU |
| A-21 | CLP | 78.0 | 4.5 | 351.0 | 1.0 | 225.3 | | |
| C-21 | CLP | 30.6 | 6.0 | 183.6 | 1.0 | 117.9 | | |
| D-21 | CLP | 42.0 | 6.1 | 256.2 | 1.0 | 164.5 | | |
| E-21 | EWM+CLP | 21.9 | 6.0 | 131.4 | | | 3.0 | 394.2 |
| F-21 | EWM | 2.0 | 4.4 | 8.8 | | | 5.0 | 44.0 |
| TOTALS | | 174.5 | | 931.0 | | 507.7 | | 438.2 |

| 2021 RICE LAKE Treatment Site/Herbicide Rate/Cost Data | | | | | AQUATHOL K (liquid endothall) | | | PROCELLACOR EC (liquid florpyrauxifen-benzyl) | |
|---|---|---|---|---|---|---|---|---|---|
| SITE ID | SITE DESCRIPTION | SURFACE ACRES | MEAN DEPTH ESTIMATE | VOLUME | RATE PPM | GALLONS PER ACRE | TOTAL GALLONS | RATE PDU | TOTAL PDU |
| G-21 | EWM+CLP | 10.0 | 6.9 | 69.0 | | | | 5.0 | 345.0 |
| H-21 | CLP | 15.1 | 5.6 | 84.6 | 2.0 | 7.2 | 108.6 | | |
| TOTALS | | 25.1 | | 153.6 | | | 108.6 | | 345.0 |

**2020**

| Whitewater Lake 2020 Treatment Site and Herbicide Rate Data | | | | ProcellaCOR EC (liquid florpyrauxifen-benzyl) | | |
|---|---|---|---|---|---|---|
| ID | Acreage | Mean Depth Estimate | Volume | Rate PDU | PDU Per Acre | Total PDU |
| A-20 | 8.5 | 4.5 | 38.3 | 2.5 | 11.3 | 96 |
| B-20 | 16 | 4.8 | 76.8 | 2.5 | 12 | 192 |
| C-20 | 62.5 | 3.5 | 218.8 | 2.5 | 8.8 | 547 |
| D-20 | 9 | 3.5 | 31.5 | 2.5 | 8.8 | 79 |
| TOTALS | 96 | | 365.3 | | | 914 |

| Rice Lake 2020 Treatment Site and Herbicide Rate Data | | | | ProcellaCOR EC (liquid florpyrauxifen-benzyl) | | |
|---|---|---|---|---|---|---|
| ID | Acreage | Mean Depth Estimate | Volume | Rate PDU | PDU Per Acre | Total PDU |
| A-20 | 15.0 | 5.0 | 75.0 | 2.5 | 12.5 | 187.5 |

## 2019

| Whitewater Lake 2019 | | | | Aquathol K (liquid endothall) | | | Weedar 64 (liquid 2, 4-D) | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **Acreage** | **Mean Depth Estimate** | **Volume** | **Rate** | **Qty/Acre** | **Total** | **Rate** | **Qty/Acre** | **Total** |
| **A-19** | **9.2** | **4.5** | **41** | 1.00 | 2.88 | 26.5 | 2.00 | 6.4 | 59.3 |
| **B-19** | **8.3** | **8.0** | **66** | 1.00 | 5.12 | 42.5 | 2.00 | 11.5 | 95.1 |
| **C-19** | **20.7** | **8.6** | **178** | 1.00 | 5.5 | 113.9 | 2.00 | 12.3 | 254.8 |
| **D-19** | **16.8** | **4.6** | **77** | 1.00 | 2.94 | 49.5 | 2.00 | 6.6 | 110.6 |
| **E-19** | **15.4** | **4.2** | **65** | 1.00 | 2.69 | 41.4 | 2.00 | 6.0 | 92.6 |
| **F-19** | **7.3** | **2.7** | **20** | 1.00 | 1.73 | 12.6 | 2.00 | 3.9 | 28.2 |
| **G-19** | **7.0** | **4.5** | **32** | 1.00 | 2.88 | 20.2 | 2.00 | 6.4 | 45.1 |
| **H-19** | **4.2** | **5.5** | **23** | 1.00 | 3.52 | 14.8 | 2.00 | 7.9 | 33.1 |
| **I-19** | **3.8** | **5.3** | **20** | 1.00 | 3.39 | 12.9 | 2.00 | 7.6 | 28.8 |
| **J-19** | **9.7** | **6.0** | **58** | 1.00 | 3.84 | 37.2 | 2.00 | 8.6 | 83.3 |
| **K-19** | **7.2** | **4.8** | **35** | 1.00 | 3.07 | 22.1 | 2.00 | 6.9 | 49.5 |
| **L-19** | **4.3** | **5.8** | **25** | 1.00 | 3.71 | 16.0 | 2.00 | 8.3 | 35.7 |
| **TOTALS** | **113.9** | | **640** | | | **409.6** | | | **916.1** |

| Whitewater Lake 2019 Treatment Site and Herbicide Rate Data | | | | ProcellaCOR EC (liquid florpyrauxifen-benzyl) | | |
|---|---|---|---|---|---|---|
| **ID** | **Acreage** | **Mean Depth Estimate** | **Volume** | **Rate PDU** | **PDU Per Acre** | **Total PDU** |
| **PCOR-19** | **34.4** | **7.2** | **248.0** | 2.5 | 12.5 | 620 |

**2018**

| 2018 Whitewater Lake Herbicide Rate/Cost Data | | | | | | Aquathol K (liquid endothall) | | | DMA 4 IVM (liquid 2, 4-D) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | Acreage | Mean Depth Estimate | Volume | Product | Rate | Rate | Qty/Acre | Total | Rate | Qty/Acre | Total |
| A-18 | 13.0 | 5.0 | 65 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.2 | 41.6 | 2.00 | 7.2 | 93.1 |
| B-18 | 7.9 | 6.0 | 47 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.84 | 30.3 | 2.00 | 8.6 | 67.9 |
| C-18 | 18.5 | 5.0 | 93 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.2 | 59.2 | 2.00 | 7.2 | 132.4 |
| D-17 | 1.7 | 6.0 | 10 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.84 | 6.5 | 2.00 | 8.6 | 14.6 |
| E-18 | 2.8 | 6.0 | 17 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.84 | 10.8 | 2.00 | 8.6 | 24.1 |
| F-18 | 14.5 | 6.0 | 87 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.84 | 55.7 | 2.00 | 8.6 | 124.5 |
| G-18 | 1.8 | 6.0 | 11 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.84 | 6.9 | 2.00 | 8.6 | 15.5 |
| H-18 | 1.0 | 6.0 | 6 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.84 | 3.8 | 2.00 | 8.6 | 8.6 |
| I-18 | 3.6 | 4.0 | 14 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 2.56 | 9.2 | 2.00 | 5.7 | 20.6 |
| J1-18 | 10.9 | 3.7 | 40 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 2.37 | 25.8 | 2.00 | 5.3 | 57.7 |
| J2-18 | 10.1 | 2.8 | 28 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 1.79 | 18.1 | 2.00 | 4.0 | 40.5 |
| J3-18 | 15.3 | 3.3 | 50 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 2.11 | 32.3 | 2.00 | 4.7 | 72.3 |
| K-18 | 1.6 | 4.2 | 7 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 2.69 | 4.3 | 2.00 | 6.0 | 9.6 |
| L-18 | 2.5 | 5.0 | 13 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.2 | 8.0 | 2.00 | 7.2 | 17.9 |
| M-18 | 8.4 | 5.0 | 42 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.2 | 26.9 | 2.00 | 7.2 | 60.1 |
| N-18 | 17.0 | 5.0 | 85 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.2 | 54.4 | 2.00 | 7.2 | 121.7 |
| O-18 | 2.3 | 6.0 | 14 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.84 | 8.8 | 2.00 | 8.6 | 19.8 |
| P-18 | 2.7 | 5.5 | 15 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.52 | 9.5 | 2.00 | 7.9 | 21.3 |
| Q-18 | 1.2 | 4.6 | 6 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 2.94 | 3.5 | 2.00 | 6.6 | 7.9 |
| R-18 | 10.6 | 5.5 | 58 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.52 | 37.3 | 2.00 | 7.9 | 83.5 |
| S-18 | 9.9 | 4.0 | 40 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 2.56 | 25.3 | 2.00 | 5.7 | 56.7 |
| T-18 | 2.7 | 5.0 | 14 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 3.2 | 8.6 | 2.00 | 7.2 | 19.3 |
| U-18 | 4.5 | 10.6 | 48 | Endothall/2,4-D | 1.0/2.0 | 1.00 | 6.78 | 30.5 | 2.00 | 15.2 | 68.3 |
| TOTALS | 164.5 | | 809 | | | | | 517.6 | | | 1157.7 |

**2017**

| 2017 Whitewater Lake Treatment Area Data | | | | Aquathol K (liquid endothall) | | | DMA 4 IVM (liquid 2, 4-D) | | |
|---|---|---|---|---|---|---|---|---|---|
| ID | Acreage | Mean Depth Estimate | Volume | Rate PPM | Qty/Acre | Total Gallons | Rate PPM | Qty/Acre | Total Gallons |
| A-17 | 4.3 | 3.50 | 15 | 1.00 | 2.1 | 9.0 | 2.00 | 5.0 | 21.5 |
| B-17 | 0.1 | 4.50 | 0 | 1.00 | 2.7 | 0.3 | 2.00 | 6.4 | 0.6 |
| C-17 | 0.7 | 4.00 | 3 | 1.00 | 2.4 | 1.7 | 2.00 | 5.7 | 4.0 |
| D-17 | 11.3 | 4.00 | 45 | 1.00 | 2.4 | 27.1 | 2.00 | 5.7 | 64.7 |
| E-17 | 2.7 | 4.00 | 11 | 1.00 | 2.4 | 6.5 | 2.00 | 5.7 | 15.5 |
| F-17 | 13.8 | 6.00 | 83 | 1.00 | 3.6 | 49.7 | 2.00 | 8.6 | 118.5 |
| G-17 | 18.3 | 3.70 | 68 | 1.00 | 2.22 | 40.6 | 2.00 | 5.3 | 96.9 |
| H-17 | 4.6 | 3.70 | 17 | 1.00 | 2.22 | 10.2 | 2.00 | 5.3 | 24.4 |
| I-17 | 0.9 | 4.00 | 4 | 1.00 | 2.4 | 2.2 | 2.00 | 5.7 | 5.2 |
| J-17 | 5.1 | 4.00 | 20 | 1.00 | 2.4 | 12.2 | 2.00 | 5.7 | 29.2 |
| TOTALS | 61.8 | | 266 | | | 160 | | | 380 |

# AQUATIC PLANT MANAGEMENT SENSITIVE AREA DESIGNATION FOR WHITEWATER LAKE

# APPENDIX C

WISCONSIN DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny
Secretary

Southeast District
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# AQUATIC PLANT MANAGEMENT
## SENSITIVE AREA DESIGNATION FOR **AREA 1**
## WHITEWATER LAKE, WALWORTH COUNTY, WISCONSIN

Date of Designation: July 7, 1992

Sensitive Area Site Description

Sensitive area 1 is located within the northwestern lobe of Whitewater Lake. It begins on the lobe's west side at the peninsula north of the developed shoreline. The area extends north to the tip of the bay and continues south to a point before the developed shoreline (see map). Substrate in sensitive area 1 is 50 percent sand and 50 percent gravel near shore gradating to muck at the end of the bay. This area contains approximately 3800 feet of shoreline.

Four plant species were identified within this sensitive area. The area currently supports Coontail (Ceratophyllum demersum), Eurasian Water Milfoil (Myriophyllum spicatum), Curly-Leaf Pondweed (Potamogeton crispus), and Cattail (Typha).

The cattails are located primarily along the northern tip and create a wetland that is regulated by the Wisconsin Department of Natural Resources.

Table 1 lists the aquatic plants found in sensitive area 1 and identifies the benefits each provides.

Why is this area a sensitive area?

Following an inspection of Whitewater Lake, Department of Natural Resources personnel concluded this area was particularly valuable to the water quality and biological integrity of the lake. Each biologist considered the qualities of this area unique and valuable for the following reasons:

Water Resource Manager Dan Helsel noted the aquatic vegetation benefits the water quality and clarity of Whitewater Lake. He also recognized the undeveloped shoreline as relatively unique to the lake as well as other lakes in southeastern Wisconsin.

variety of gamefish throughout their life cycle. Loss of this habitat could result in a negative impact upon the sport fishery.

The aquatic plants in this sensitive area supply valuable wildlife habitat for waterfowl, songbirds, and furbearers. Wildlife Biologist Mark Anderson states the area offers a variety of habitat that needs to be protected due to its wildlife value.

The important role of the aquatic plants, proximity of the adjacent cattail wetland, and extent of undeveloped shoreline warrants protection of this area. Whitewater Lake will benefit as a result of this sensitive area designation and subsequent aquatic plant protection.

How will the lake benefit from this area?

Water quality of Whitewater Lake will benefit as a result of protection of the aquatic plant community in this area. Water Resources Manager Dan Helsel noted the vegetation is valuable for erosion control as well as sediment and nutrient retention. The aquatic plants and cattails act as a buffer against waves to protect the shoreline from erosion. Rooted aquatic plants also trap suspended soil particles, stabilize bottom sediment, and prevent resuspension from waves caused by wind and boating activities. Furthermore, the aquatic plants compete for the nutrients, space, and sunlight that could otherwise support nuisance algae.

The plants' resource value for gamefish and panfish populations in Whitewater Lake has been highly rated. Department of Natural Resource's Fish Manager Doug Welch identified 100 percent of the vegetation present necessary for the feeding habits of bluegill, largemouth bass and northern pike. The habitat supplied by the vegetation and substrate is also very valuable for fish spawning and as a nursery. The plants provide protection for young fish and support insect populations, which in turn are eaten by the young fish.

Department of Natural Resources Biologist Mark Anderson rated the wildlife habitat in this area as essential for a variety of reptiles, furbearers, and birds. This site provides habitat for frogs, turtles, muskrats, raccoons, opossum, and deer. Mark also identified seasonal habitat valuable for ducks, geese, great blue herons, kingfishers, sandpipers, and songbirds. Many of the aquatic plants and insects associated with the plants provide a valuable food source for these animals. This sensitive area provides habitat necessary for feeding, roosting, nesting, raising broods, and resting during migration. A muskrat was observed in the area feeding on the Eurasian Water Milfoil. Protection of the aquatic vegetation will continue to benefit and attract wildlife.

Certain lake management activities are restricted based upon the Department's inspection, evaluation, and classification of this sensitive area. These restrictions are intended to protect the area's aforementioned aquatic vegetation, water quality, fish, and wildlife.

Management Restrictions

The following **in-lake activities** will be restricted as follows:

Piers and boardwalks are allowed for public benefit only.

Pea gravel and sand blankets are restricted to the existing beach.

Mechanical plant harvesting is not recommended except to open access lanes.

Chemical control is not allowed.

Aquatic plant screens are not allowed.

Dredging is not allowed.

Filling is not allowed.

The following **riparian activities** will be restricted as follows:

Boardwalks are allowed for public benefit only.

Wetland alterations are not allowed. Wetlands are protected under shoreline wetland ordinances.

The protection of Whitewater Lake will require cooperation and understanding by everyone that uses the lake. Positive actions today will help protect the lake for future generations. If you have any questions regarding the identification of Whitewater Lake as a sensitive area or the management implications, please feel free to contact any o of the identification team members listed below:

Identification Team
Mark Anderson, Wildlife Manager - (414)594-2135
Doug Welch, Fish Manager - (414)878-5229
Liesa Nesta, Water Regulation and Zoning - (414)263-8678
Dan Helsel, Water Resources Manager - (414)263-8714

Table 1. Aquatic Plants Found in Sensitive Area 1.

| | |
|---|---|
| Submergent Plants | |
| Eurasian Water Milfoil<br>Myriophyllum spicatum | Exotic species, supports insects eaten by fish, provides some cover for bluegills, waterfowl occasionally eat its seeds, stabilizes bottom sediments |
| Curly-Leaf Pondweed<br>Potamogeton crispus | Exotic species, supports insects eaten by fish provides some cover for bluegills, largemouth bass, and northern pike |
| Coontail<br>Ceratophyllum demersum | Native species, supports insects eaten by fish, provides cover for young bluegills, largemouth bass, and northern pike |
| Emergent/Wetland Plants | |
| Cattails<br>Typha | Provide cover for fish and spawning areas for northern pike, good food source for waterfowl and stabilizes shoreline and protects against erosion |

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

WISCONSIN DEPT. OF NATURAL RESOURCES

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# AQUATIC PLANT MANAGEMENT
# SENSITIVE AREA DESIGNATION FOR **AREA 2**
# WHITEWATER LAKE, WALWORTH COUNTY, WISCONSIN

Date of Designation: July 7, 1992

Sensitive Area Site Description

Sensitive area 2 is located within the northeastern lobe of Whitewater Lake. It encompasses two floating islands, one upland island, and the shoreline west of the islands (see map). This area contains approximately 1500 feet of mainland shoreline. The shoreline in sensitive area 2 is 75 percent sand, 20 percent gravel, and 5 percent muck. Substrate from the shoreline to five feet of water is 90 percent muck and ten percent sand.

Several plant species were identified within this sensitive area. Submergent aquatic vegetation includes Coontail (Ceratophyllum dermersum), Eurasian Water Milfoil (Myriophyllum spicatum), Curly-Leaf Pondweed (Potamogeton crispus), and Sago Pondweed (Potamogeton pectinatus). Emergent/wetland species include Cattail (Typha), Tamarack (Larix laricina), Sumac (Rhus), Willow (Salix), and Dogwood (Cornus).

Table 1 lists the aquatic plants found in sensitive area 2 and identifies the benefits each provides.

Why is this area a sensitive area?

Following an inspection of Whitewater Lake, Department of Natural Resources personnel concluded this area was particularly valuable to the water quality and biological integrity of the lake. Each biologist considered the qualities of this area unique and valuable for the following reasons:

Water Resource Manager Dan Helsel noted the aquatic vegetation benefits the Whitewater Lake's water quality and clarity. He also stated the species richness and diversity of the area was possibly the best he observed during the entire inspection.

Department Fishery Biologist Doug Welch notes the islands provide important fish habitat. This site is extensively used by a variety of gamefish throughout their life cycle. Loss of this habitat could result in a negative impact upon the sport fishery.

The islands and aquatic vegetation in this sensitive area supply valuable wildlife habitat for waterfowl, predatory birds, songbirds, reptiles, and furbearers. Wildlife Biologist Mark Anderson states the area offers a variety of habitat that needs to be protected due to its wildlife value.

The important role of the aquatic plants and value of the islands warrants protection of this area. Whitewater Lake will benefit as a result of this sensitive area designation and subsequent aquatic plant protection.

How will the lake benefit from this area?

The undeveloped shoreline supplied by the islands in sensitive area 2 is relatively unique to Whitewater Lake and Southeastern Wisconsin. This sensitive area also includes valuable aquatic plants. Water Resources Manager Dan Helsel observed what he noted was possibly the best aquatic plant species diversity in the lake. He believes this plant reservoir has the potential to reestablish native aquatic plant species throughout Whitewater Lake. Protection of this area will help preserve the natural integrity of the islands. Protection of the native plant species will help preserve and enhance the biological integrity and diversity of Whitewater Lake.

Water quality of Whitewater Lake will also benefit as a result of aquatic plant protection in this area. Water Resources Manager Dan Helsel noted the vegetation is valuable for erosion control as well as sediment and nutrient retention. The aquatic plants act as a buffer against waves to protect the shoreline from erosion. Rooted aquatic plants also trap suspended soil particles, stabilize bottom sediment, and prevent resuspension from waves caused by wind and boating activities. Furthermore, the aquatic plants compete for the nutrients, space, and sunlight that could otherwise support nuisance algae.

The plants' resource value for gamefish and panfish populations in Whitewater Lake has been highly rated. Department of Natural Resource's Fish Manager Doug Welch identified 100 percent of the vegetation present necessary for the feeding habits of bluegill, largemouth bass, northern pike, and walleye. The habitat supplied by the vegetation and substrate is also very valuable for fish spawning and as a nursery. The plants provide protection for young fish and support insect populations, which in turn are eaten by the young fish.

Department of Natural Resources Biologist Mark Anderson rated the wildlife habitat in this area as essential for a variety of reptiles, furbearers, and birds. This site provides habitat for frogs, turtles, muskrats, beaver, raccoons, and opossum. Mark also identified seasonal habitat valuable for ducks, geese, egrets, great blue herons, kingfishers, sandpipers, and songbirds. Many of the aquatic plants and insects associated with the plants provide a valuable food source for these animals.

This sensitive area provides habitat necessary for feeding, roosting, nesting, raising broods, and resting during migration. A great blue heron was observed in this area as well as a beaver lodge and redtail hawk nest. Protection of the islands and aquatic vegetation in this sensitive area will continue to benefit and attract wildlife.

Certain lake management activities are restricted based upon the Department's inspection, evaluation, and classification of this sensitive area. These restrictions are intended to protect the area's aforementioned aquatic vegetation, water quality, fish, and wildlife.

Management Restrictions

The following **in-lake activities** will be restricted as follows:

Chemical control is allowed for control of exotic aquatic plants only. Chemical control will not be allowed if potential of damage to native species exists.

Piers and boardwalks are allowed along the mainland shoreline within WDNR guidelines. No piers or boardwalks are allowed on the islands.

Mechanical plant harvesting is recommended only within 30 feet of the developed shoreline and no less than 100 feet from the islands.

Pea gravel and sand blankets are not allowed.

Aquatic plant screens are not allowed.

Dredging is not allowed.

Filling is not allowed.

The following **riparian activities** will be restricted as follows:

Boardwalks are not allowed.

Wetland alterations are not allowed. Wetlands are protected under shoreline wetland ordinances.

The protection of Whitewater Lake will require cooperation and understanding by everyone that uses the lake. Positive actions today will help protect the lake for future generations. If you have any questions regarding the identification of Whitewater Lake as a sensitive area or the management implications, please feel free to contact any of the identification team members listed on the other side.

Identification Team
Mark Anderson, Wildlife Manager - (414)594-2135
Doug Welch, Fish Manager - (414)878-5229
Liesa Nesta, Water Regulation and Zoning - (414)263-8678
Dan Helsel, Water Resources Manager - (414)263-8714

Table 1. Aquatic Plants Found in Sensitive Area 2.

| | |
|---|---|
| Submergent Plants | |
| Eurasian Water Milfoil<br>Myriophyllum spicatum | Exotic species, supports insects eaten by fish, provides some cover for bluegills, waterfowl occasionally eat its seeds, stabilizes bottom sediments |
| Curly-Leaf Pondweed<br>Potamogeton crispus | Exotic species, supports insects eaten by fish provides some cover for bluegills, largemouth bass, and northern pike |
| Coontail<br>Ceratophyllum demersum | Native species, supports insects eaten by fish, provides cover for young bluegills, largemouth bass, and northern pike |
| Sago Pondweed<br>Potamogeton pectinatus | Native species, supports insects eaten by fish, provides some cover for bluegill, northern pike, and walleye, excellent food source for waterfowl |
| Emergent/Wetland Plants | |
| Cattails<br>Typha | Provide cover for fish and spawning areas for northern pike, good cover for waterfowl and marsh birds, stabilizes shoreline and protects against erosion |
| Tamarack<br>Larix laricina<br><br>Sumac<br>Rhus<br><br>Dogwood<br>Cornus<br><br>Willow<br>Salix | Provide cover, protection, feeding, roosting, and nesting habitat for a variety of aquatic and terrestrial wildlife species, overhanging vegetation provides protection and cover for fish |

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# AQUATIC PLANT MANAGEMENT
## SENSITIVE AREA DESIGNATION FOR **AREA 3**
## WHITEWATER LAKE, WALWORTH COUNTY, WISCONSIN

Date of Designation: July 7, 1992

Sensitive Area Site Description

Sensitive area 3 is located within the northeastern lobe of Whitewater Lake. It encompasses one floating island approximately 20 by 40 feet in length. The area does not include the mainland (see map). Substrate in sensitive area 3 is 100 percent muck. This area contains approximately 120 feet of island shoreline.

Three plant species were identified within this sensitive area. This site currently supports Eurasian Water Milfoil (Myriophyllum spicatum), Floating-Leafed Pondweed (Potamogeton natans), and Spiked Rush (Eleocharis).

Table 1 lists the aquatic plants found in sensitive area 3 and identifies the benefits each provides.

Why is this area a sensitive area?

Following an inspection of Whitewater Lake, Department of Natural Resources personnel concluded this area was particularly valuable to the physical and biological integrity of the lake. Each biologist considered the qualities of this area unique and valuable for the following reasons:

Water Resource Manager Dan Helsel noted the aquatic vegetation may benefit Whitewater Lake's water quality. He also stated the species richness and diversity of the area was relatively high compared to the other areas inspected during the investigation.

Department Fishery Biologist Doug Welch notes the island provides important fish habitat. This site is extensively used by a variety of gamefish throughout their life cycle. Loss of this habitat could result in a negative impact upon the sport fishery.

The island and aquatic vegetation in this sensitive area supplies valuable wildlife habitat for waterfowl, reptiles, and furbearers. Wildlife Biologist Mark Anderson states the area offers a variety of habitat that needs to be protected due to its wildlife value.

The important role of the aquatic plants and value of the island warrants protection of this area. Whitewater Lake will benefit as a result of this sensitive area designation and subsequent aquatic plant protection.

How will the lake benefit from this area?

The undeveloped shoreline supplied by the island in sensitive area 3 is relatively unique to Whitewater Lake and Southeastern Wisconsin. This sensitive area also includes valuable aquatic plants. Water Resources Manager Dan Helsel observed what he noted was among the best aquatic plant species diversity in the lake. He believes this plant reservoir has the potential to reestablish native aquatic plant species in other parts of Whitewater Lake. Protection of this area will help preserve the natural integrity of the island. Protection of the native plant species will help preserve and enhance the biological integrity and diversity of Whitewater Lake.

Water quality of Whitewater Lake may also benefit as a result of aquatic plant protection in this area. Water Resources Manager Dan Helsel noted the vegetation may assist with internal sediment and nutrient retention. Aquatic plants trap suspended soil particles, stabilize bottom sediment, and prevent resuspension from waves caused by wind and boating activities. Furthermore, the aquatic plants compete for the nutrients, space, and sunlight that could otherwise support nuisance algae.

The plants' resource value for gamefish and panfish populations in Whitewater Lake has been highly rated. Department of Natural Resource's Fish Manager Doug Welch identified 100 percent of the vegetation present necessary for the feeding habits of bluegill, largemouth bass, northern pike, and walleye. The habitat supplied by the vegetation and substrate is also very valuable for fish spawning and as a nursery. The plants provide protection for young fish and support insect populations, which in turn are eaten by the young fish.

Department of Natural Resources Biologist Mark Anderson rated the wildlife habitat in this area as essential for a variety of reptiles, furbearers, and birds. This site provides habitat for frogs, turtles, and muskrats. Mark also identified seasonal habitat valuable for ducks, geese, egrets, great blue herons, and sandpipers. Many of the aquatic plants and insects associated with the plants provide a valuable food source for these animals. This sensitive area provides habitat necessary for feeding, roosting, nesting, raising broods, and resting during migration. Protection of the islands and aquatic vegetation in this sensitive area will continue to benefit and attract wildlife.

Certain lake management activities are restricted based upon the Department's inspection, evaluation, and classification of this sensitive area. These restrictions are intended to protect the area's aforementioned aquatic vegetation, water quality, fish, and wildlife.

Management Restrictions

The following **in-lake activities** will be restricted as follows:

Piers and boardwalks are not allowed.

Mechanical plant harvesting is not recommended within 100 feet of the floating island.

Pea gravel and sand blankets are not allowed.

Chemical control is not allowed.

Aquatic plant screens are not allowed.

Dredging is not allowed.

Filling is not allowed.

The following **riparian activities** will be restricted as follows:

Boardwalks are not allowed.

Wetland alterations are not allowed. Wetlands are protected under shoreline wetland ordinances.

The protection of Whitewater Lake will require cooperation and understanding by everyone that uses the lake. Positive actions today will help protect the lake for future generations. If you have any questions regarding the identification of Whitewater Lake as a sensitive area or the management implications, please feel free to contact any o of the identification team members listed below:

Identification Team
Mark Anderson, Wildlife Manager - (414)594-2135
Doug Welch, Fish Manager - (414)878-5229
Liesa Nesta, Water Regulation and Zoning - (414)263-8678
Dan Helsel, Water Resources Manager - (414)263-8714

Table 1. Aquatic Plants Found in Sensitive Area 3.

| | |
|---|---|
| <u>Submergent Plants</u> | |
| Eurasian Water Milfoil<br>*Myriophyllum spicatum* | Exotic species, supports insects eaten by fish, provides some cover for bluegills, waterfowl occasionally eat its seeds, stabilizes bottom sediments |
| Floating-Leaf Pondweed<br>*Potamogeton natans* | Native species, supports insects eaten by fish, provides cover for bluegill, largemouth bass, and northern pike, stabilizes bottom sediments |
| <u>Emergent/Wetland Plants</u> | |
| Spiked Rush<br>*Eleocharis* | Provides cover, protection, and roosting habitat for a variety of aquatic and terrestrial wildlife species, overhanging vegetation provides protection and cover for fish |

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AQUATIC PLANT MANAGEMENT
SENSITIVE AREA DESIGNATION FOR **AREA 4**
WHITEWATER LAKE, WALWORTH COUNTY, WISCONSIN

Date of Designation: July 7, 1992

Sensitive Area Site Description

Sensitive area 4 is located within the northwestern lobe of Whitewater Lake. It encircles the island immediately northwest of the narrows (see map). Substrate in sensitive area 4 is 60 percent gravel, 20 percent sand, and 20 percent muck. This area contains approximately 500 feet of shoreline.

The aquatic plant Eurasian Water Milfoil (Myriophyllum spicatum) was the predominant species identified in this area. No other species were observed.

Why is this area a sensitive area?

Following an inspection of Whitewater Lake, Department of Natural Resources personnel concluded this area was particularly valuable to the biological integrity of the lake. Each biologist considered the qualities of this area unique and valuable for the following reasons:

The aquatic plants in this sensitive area supply valuable wildlife habitat for waterfowl, songbirds, and furbearers. Wildlife Biologist Mark Anderson states the area offers a variety of habitat that needs to be protected due to its wildlife value.

Department Fishery Biologist Doug Welch notes this area offers important fish habitat. This site is extensively used by a variety of gamefish throughout their life cycle. Loss of this habitat could result in a negative impact upon the sport fishery.

Water Resource Manager Dan Helsel noted the aquatic vegetation benefits the water quality and clarity of Whitewater Lake. He also recognized the undeveloped island shoreline as relatively unique to the lake as well as other lakes in southeastern Wisconsin.

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The extent of undeveloped shoreline and subsequent benefits to wildlife warrants protection of this area. Whitewater Lake will benefit as a result of this sensitive area designation.

How will the lake benefit from this area?

Department of Natural Resources Biologist Mark Anderson rated the wildlife habitat in this area as essential for a variety of reptiles, furbearers, and birds. This site provides habitat for frogs, turtles, muskrats, raccoons, and opossum. Mark also identified seasonal habitat valuable for ducks, geese, great blue herons, egrets, sandpipers, and songbirds. This sensitive area provides habitat necessary for feeding, roosting, nesting, raising broods, and resting during migration. Protection of the aquatic vegetation will continue to benefit and attract wildlife.

Eurasian Water Milfoil is the predominant aquatic species of Whitewater Lake. It is an exotic plant native to Europe, Asia, and North Africa. Because Eurasian Water Milfoil is so prevalent, fish must utilize it to survive. It's resource value for gamefish and panfish populations in Whitewater Lake has therefore been highly rated. Department of Natural Resource's Fish Manager Doug Welch identified 100 percent of the vegetation present necessary for the feeding habits of bluegill, largemouth bass and northern pike. The habitat supplied by the vegetation and substrate is also valuable for fish spawning and as a nursery. The plants provide protection for young fish and support insect populations, which in turn are eaten by the young fish.

Water Resources Manager Dan Helsel noted the vegetation helps control erosion and stabilize bottom sediments. The Eurasian Water Milfoil acts a buffer against waves to protect the island from erosion. Milfoil's roots also anchor bottom sediment. This helps prevent resuspension from waves caused by wind and boating activities.

Certain lake management activities are restricted based upon the Department's inspection, evaluation, and classification of this sensitive area. These restrictions are intended to protect the area's aforementioned water quality, fish, and wildlife.

<u>Management Restrictions</u>

The following **in-lake activities** will be restricted as follows:

Piers are allowed on the island within WDNR guidelines.

Mechanical plant harvesting is not recommended within 100 feet of the sensitive area except to open access lanes.

Hand harvesting is not recommended.

Piers are not allowed from the mainland to the island as they would create an obstruction to navigation.

Boardwalks are not allowed.

Pea gravel and sand blankets are not allowed,

Chemical control is not allowed.

Aquatic plant screens are not allowed.

Dredging is not allowed.

Filling is not allowed.

The following **riparian activities** will be restricted as follows:

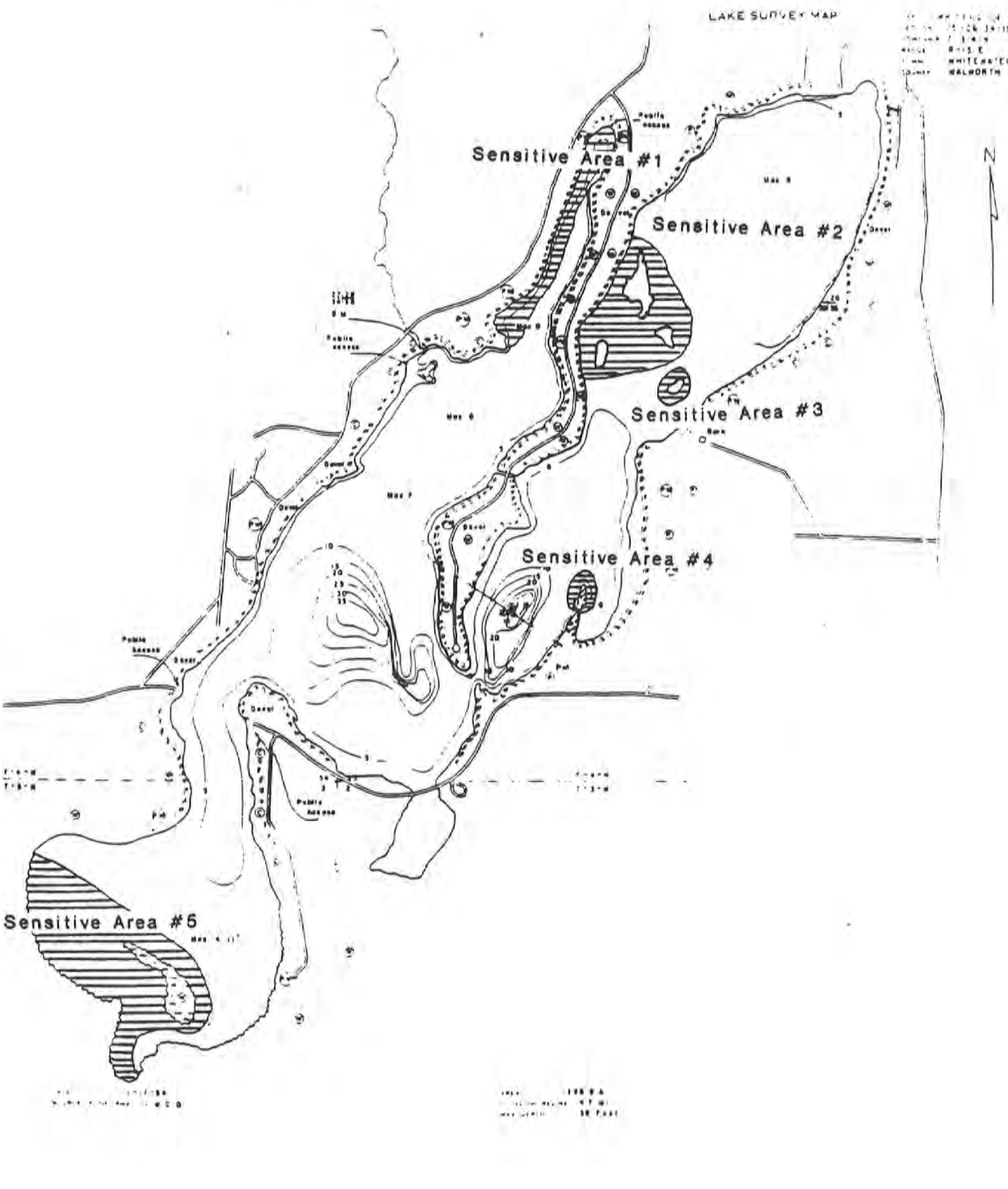
Boardwalks are not allowed.

Wetland alterations are not allowed. Wetlands are protected under shoreline wetland ordinances.

The protection of Whitewater Lake will require cooperation and understanding by everyone that uses the lake. Positive actions today will help protect the lake for future generations. If you have any questions regarding the identification of Whitewater Lake as a sensitive area or the management implications, please feel free to contact any o of the identification team members listed below:

Identification Team
Mark Anderson, Wildlife Manager - (414)594-2135
Doug Welch, Fish Manager - (414)878-5229
Liesa Nesta, Water Regulation and Zoning - (414)263-8678
Dan Helsel, Water Resources Manager - (414)263-8714

# Whitewater Lake
## Sensitive Areas



WISCONSIN DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

**Southeast District**

Post Office Box 12436
2300 N. Martin Luther King Jr. Drive
Milwaukee, Wisconsin 53212
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Carroll D. Besadny
Secretary

AQUATIC PLANT MANAGEMENT
SENSITIVE AREA DESIGNATION FOR **AREA 5**
WHITEWATER LAKE, WALWORTH COUNTY, WISCONSIN

Date of Designation: July 7, 1992

Sensitive Area Site Description

Sensitive area 5 is located in the southern part of Whitewater Lake. It begins on the western shore at N7180 Brown Road, extends around and includes the island, and ends past the southern tip of the lake (see map). Substrate in sensitive area 5 is 100 percent muck. The maximum depth in the area is six feet, average depth is three feet. This area contains approximately 3300 feet of mainland shoreline, and 2800 feet of island shoreline.

Seven aquatic and wetland plant species were identified within this sensitive area. The area currently supports Coontail (Ceratophyllum demersum), Eurasian Water Milfoil (Myriophyllum spicatum), Curly-Leaf Pondweed (Potamogeton crispus), Duckweed (Lemna), and Filamentous Algae (Cladophora, Spirogyra), Cattail (Typha), and Bulrush (Scirpus americanus), .

A portion of the shoreline adjacent to the sensitive area has been mapped and classified as an E2/4H wetland. This type of wetland is Emergent/wet meadow, Narrow-leaved persistent, Nonpersistent, Standing water, Palustrine. This wetland is regulated by the U.S. Army Corps of Engineers, Walworth County, and the Wisconsin Department of Natural Resources.

Table 1 lists the aquatic plants found in sensitive area 5 and identifies the benefits each provides.

Why is this area a sensitive area?

Following an inspection of Whitewater Lake, Department of Natural Resources personnel concluded this area was particularly valuable to the water quality and biological integrity of the lake. Each biologist considered the qualities of this area unique and valuable for the following reasons:

Water Resource Manager Dan Helsel noted the aquatic vegetation benefits the water quality and clarity of Whitewater Lake. He also recognized the undeveloped shoreline as relatively unique to the lake as well as other lakes in southeastern Wisconsin.

Department Fishery Biologist Doug Welch notes this area offers important fish habitat. This site is extensively used by a variety of gamefish throughout their life cycle. Loss of this habitat could result in a negative impact upon the sport fishery.

The aquatic plants in this sensitive area supply valuable wildlife habitat for waterfowl, songbirds, and furbearers. Wildlife Biologist Mark Anderson states the area offers a variety of habitat that needs to be protected due to its wildlife value.

The important role of the aquatic plants, proximity of the adjacent wetland, and extent of undeveloped shoreline warrants protection of this area. Whitewater Lake will benefit as a result of this sensitive area designation and subsequent aquatic plant protection.

How will the lake benefit from this area?

Water quality of Whitewater Lake will benefit as a result of protection of the aquatic plant community in this area. Water Resources Manager Dan Helsel noted the vegetation is valuable for erosion control as well as sediment and nutrient retention. The vegetation helps trap sediment and nutrients that are delivered from the surrounding hillsides. The aquatic plants and wetland also act as a buffer against waves to protect the shoreline from erosion. Furthermore, rooted aquatic plants trap suspended soil particles, stabilize bottom sediment, and prevent resuspension from waves caused by wind and boating activities.

The plants' resource value for gamefish and panfish populations in Whitewater Lake has been highly rated. Department of Natural Resource's Fish Manager Doug Welch identified 100 percent of the vegetation present necessary for the feeding habits of bluegill, largemouth bass and northern pike. The habitat supplied by the vegetation and substrate is also very valuable for fish spawning and as a nursery. The plants provide protection for young fish and support insect populations, which in turn are eaten by the young fish.

Department of Natural Resources Biologist Mark Anderson rated the wildlife habitat in this area as essential for a variety of reptiles, furbearers, and birds. This site provides habitat for frogs, turtles, muskrats, raccoons, opossum, and deer. Mark also identified seasonal habitat valuable for ducks, geese, great blue herons, kingfishers, sandpipers, and songbirds. Many of the aquatic plants and insects associated with the plants provide a valuable food source for these animals. This sensitive area provides habitat necessary for feeding, roosting, nesting, raising broods, and resting during migration. Protection of the aquatic vegetation will continue to benefit and attract wildlife.

Certain lake management activities are restricted based upon the Department's inspection, evaluation, and classification of this sensitive area. These restrictions are intended to protect the area's aforementioned aquatic vegetation, water quality, fish, and wildlife.

Management Restrictions

The following **in-lake activities** will be restricted as follows:

Piers allowed within WDNR guidelines.

Boardwalks allowed for public interest/educational purposes.

Mechanical plant harvesting is not recommended except to open access and fishing lanes.

Chemical control restricted to exotic plant species. Chemical control will not be permitted if the potential of damage to native species exists.

Aquatic plant screens are not allowed.

Pea gravel and sand blankets are not allowed.

Dredging is not allowed.

Filling is not allowed.

The following **riparian activities** will be restricted as follows:

Boardwalks are allowed for public benefit only.

Wetland alterations are not allowed. Wetlands are protected under shoreline wetland ordinances.

The protection of Whitewater Lake will require cooperation and understanding by everyone that uses the lake. Positive actions today will help protect the lake for future generations. If you have any questions regarding the identification of Whitewater Lake as a sensitive area or the management implications, please feel free to contact any o of the identification team members listed below:

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Table 1. Aquatic Plants Found in Sensitive Area 5.

| | |
|---|---|
| **Submergent Plants** | |
| Eurasian Water Milfoil<br>*Myriophyllum spicatum* | Exotic species, supports insects eaten by fish, provides some cover for bluegills, waterfowl occasionally eat its seeds, stabilizes bottom sediments |
| Curly-Leaf Pondweed<br>*Potamogeton crispus* | Exotic species, supports insects eaten by fish provides some cover for bluegills, largemouth bass, and northern pike |
| Coontail<br>*Ceratophyllum demersum* | Native species, supports insects eaten by fish provides cover for young bluegills, largemouth bass, and northern pike |
| **Floating Vegetation** | |
| Duckweed<br>*Lemna* | Provides cover for largemouth bass and northern pike, provides food for waterfowl and marsh birds, supports insects valuable as food for fish |
| Filamentous Algae<br>*Cladophora*<br>*Spirogyra* | Provides cover for insects valuable as fish food |
| **Emergent/Wetland Plants** | |
| Cattails<br>*Typha*<br><br>Bulrush<br>*Scirpus americanus* | Provide cover for fish and spawning areas for northern pike, good food source for waterfowl and stabilizes shoreline and protects against erosion |

# Whitewater Lake
## Sensitive Areas