MEMORANDUM REPORT
NO. 146 (2ND EDITION)

# AQUATIC PLANT MANAGEMENT PLAN FOR LITTLE CEDAR LAKE

# WASHINGTON COUNTY, WISCONSIN

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

Special acknowledgment is due to Dr. Justin Poinsatte, Principal Specialist-Biologist; Christopher Cieszynski, former Environmental Planning Technician, Dr. Thomas Slawski, Chief Biologist; Danielle Matuszak, Specialist-Biologist; Megan Deau, Senior Graphic Designer; Natalie Komplin, Administrative Assistant; and Alexa Carzoli, former Administrative Assistant for their contributions to the conduct of this study and the preparation of this report. Acknowledgement is also extended to the lake monitoring volunteers for their time, efforts, and equipment. Volunteers included Robert Fitts (Little Cedar Lake resident), Joseph Garstecki (Little Cedar Lake resident), and Lauren Kelly (Town of West Bend resident).

COMMUNITY ASSISTANCE PLANNING REPORT
NUMBER 146 (2ND EDITION)

# AQUATIC PLANT MANAGEMENT PLAN FOR LITTLE CEDAR LAKE, WASHINGTON COUNTY, WISCONSIN

Prepared by the
Southeastern Wisconsin Regional Planning Commission
W239 N1812 Rockwood Drive
P.O. Box 1607
Waukesha, Wisconsin 53187-1607
www.sewrpc.org

May 2024

TABLE OF CONTENTS

TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF MAPS



## LIST OF TABLES

# INTRODUCTION 1

*Credit: Commission Staff*

The Southeastern Wisconsin Planning Commission (Commission) completed this aquatic plant inventory and management study of Little Cedar Lake (Lake) on behalf of the Little Cedar Lake Protection and Rehabilitation District (District). This memorandum report is the Commission's second aquatic plant management plan for Little Cedar Lake.[1] The Wisconsin Department of Natural Resources (WDNR) will use data and conclusions generated as part of the Commission's study to help evaluate the Lake's aquatic plant community and draft an updated Aquatic Plant Control permit.

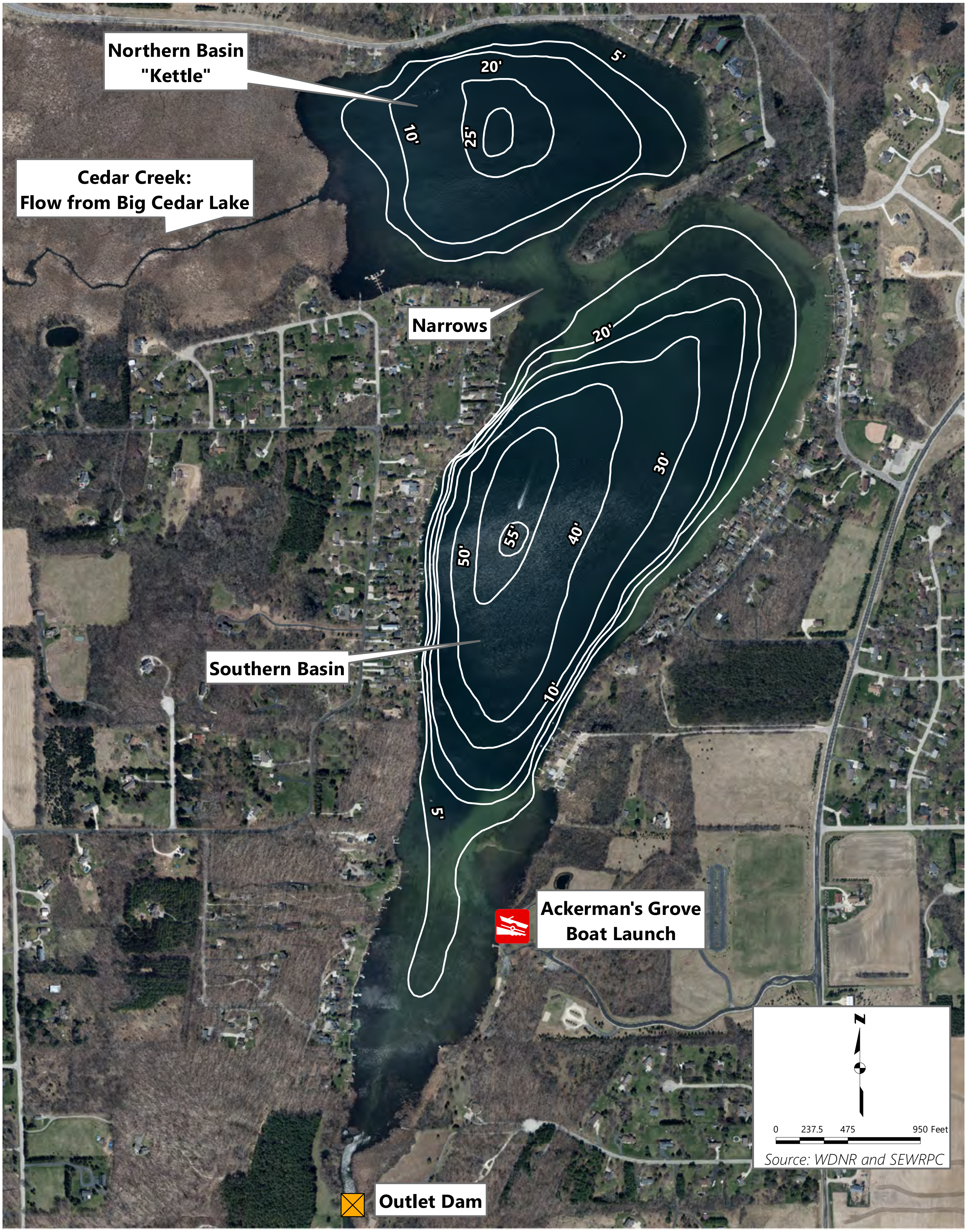
## 1.1 PROJECT SETTING, BACKGROUND, SCOPE, AND INTENT

Little Cedar Lake is a 260-acre drainage lake located entirely within the Towns of West Bend and Polk in Washington County. The Lake is approximately 1.5 miles downstream of Big Cedar Lake on Cedar Creek, which is the Lake's primary inlet and outlet. Cedar Creek is a tributary of the Milwaukee River which ultimately discharges into Lake Michigan. The Lake is impounded by a weir at its southernmost extent. Public access to the Lake is provided through a boat launch at Ackerman's Grove County Park, which is administrated by Washington County.

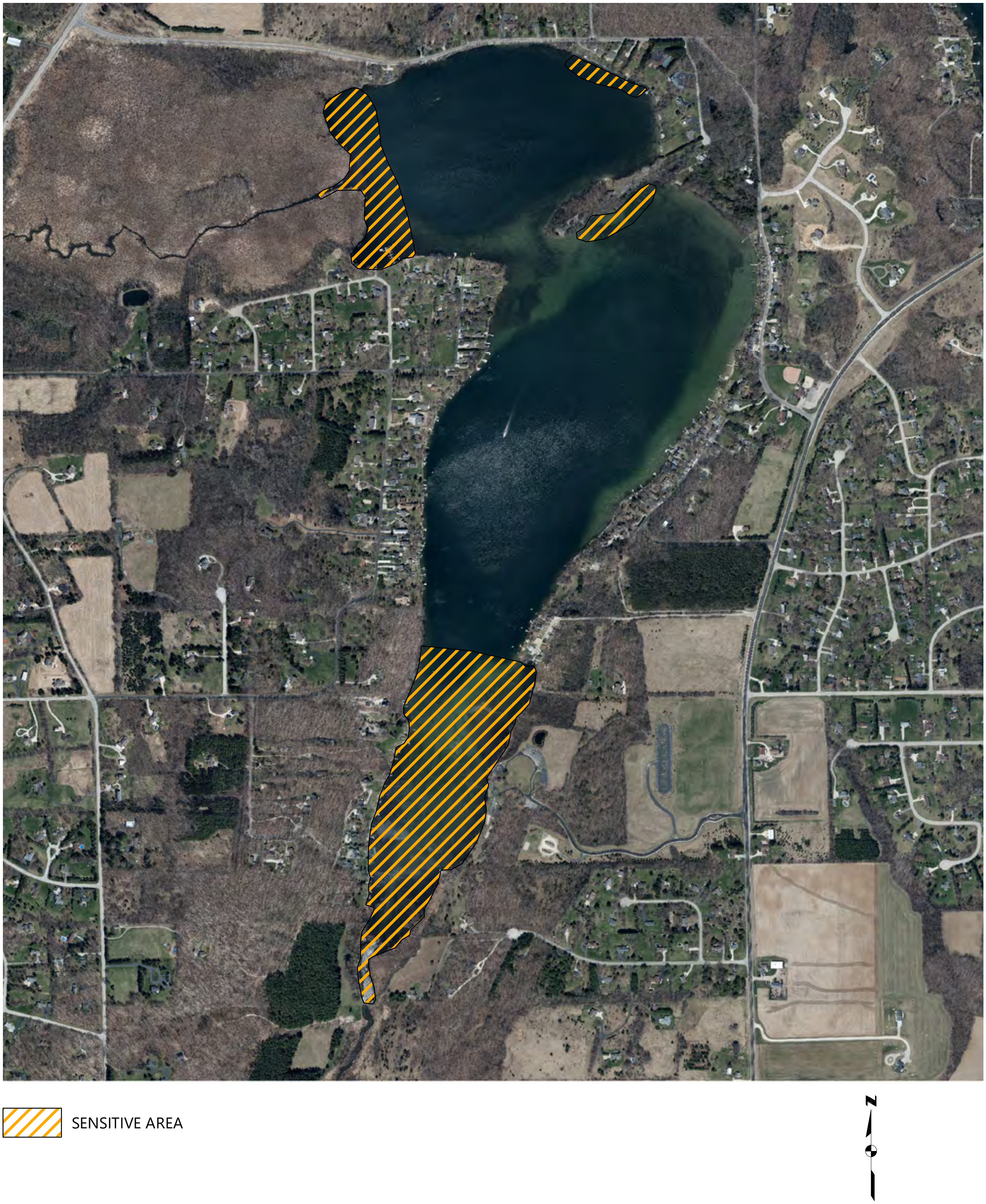
Attaining a maximum depth of 56 feet, the deepest portions of the Lake are not capable of supporting an aquatic plant community, but shallow nearshore areas do support aquatic plant growth (see Map 1.1). The most recent aquatic plant survey conducted by WDNR in 2022 observed 26 species, including native species like eelgrass (*Vallisneria americana*), muskgrass (*Chara* spp.), Sago pondweed (*Stuckenia pectinata*), large-leaf pondweed (*Potamogeton amplifolius*), and Illinois pondweed (*Potamogeton illinoensis*). Invasive aquatic plant species, including Eurasian watermilfoil (EWM) (*Myriophyllum spicatum*), curly-leaf pondweed (*Potamogeton crispus)*, and starry stonewort (SSW) (*Nitellopsis obtusa*) were also observed in the Lake at this time. The SSW population has been a focus of monitoring and management efforts by the District and WDNR. There are three WDNR-designated Sensitive Areas on the Lake (see Map 1.2); these areas are particularly important for sustaining elements of the lake's ecology, such as providing fish spawning and rearing habitat, and consequently intensive management is limited in these areas. During the development

[1] *SEWRPC Memorandum Report No. 146, An Aquatic Plant Management Plan for Little Cedar Lake, Washington County, Wisconsin, 2004.*

**Map 1.1**
**Little Cedar Lake Bathymetry and Place Names**



## Map 1.2
## WDNR-Designated Sensitive Areas in Little Cedar Lake




*Source: WDNR and SEWRPC*

of this aquatic plant management plan update, Little Cedar Lake was listed on the draft 2024 303(d) impaired waters list with an impairment of a degraded aquatic plant community due to an unknown pollutant.[2]

The District manages aquatic plant growth on the Lake to enhance navigation and recreational opportunities, primarily through mechanical harvesting although chemical treatments have previously been used for invasive species control. Aquatic plant management is regulated by the WDNR and requires a permit. The District is required to reevaluate the aquatic plant community, update the aquatic plant management plan, and renew the aquatic plant management permit every five years. Aquatic plant inventories and management plans have been completed at the Lake several times in the past to support aquatic plant management permit applications. The last aquatic plant management plan update was completed in 2019 by Marine Biochemists and the District's harvesting permit expired on December 31, 2023.[3,4] To renew their permit, the District must reevaluate the Lake's aquatic plant community and update the aquatic plant management plan. This updated plan needs to consider the present status of the aquatic plant community, must identify plant community changes that may have occurred, must examine the potential success or lack of success of the current aquatic plant management strategies, must consider current trends and issues that pertain to aquatic plant management issues and techniques, and must describe the methods and procedures associated with proposed continuation of aquatic plant management in the Lake.

This updated APM plan summarizes information and recommendations needed to manage nuisance plants (including EWM, curly-leaf pondweed, and starry stonewort). The plan covers four main topics:

- APM Goals and Objectives
- Aquatic Plant Community Changes and Quality
- Aquatic Plant Control Alternatives
- Recommended Aquatic Plant Management Plan

This memorandum focuses upon approaches to monitor and control actively growing nuisance populations of aquatic plants and presents a range of alternatives that could potentially be used to achieve desired APM goals and provides specific recommendations related to each alternative. These data and suggestions can be valuable resources when developing requisite APM permit applications and implementing future aquatic plant management efforts.

[2] *Wisconsin Department of Natural Resources,* Draft 2024 Water Condition List Updates, *accessed November 10th, 2023. apps.dnr.wi.gov/swims/Documents/DownloadDocument?id=352154095.*

[3] *Marine Biochemists,* An Aquatic Plant Survey and Management Plan Update for Little Cedar Lake – Washington County, WI, *November 2018.*

[4] *Wisconsin Department of Natural Resources, 2019-2023 Mechanical Harvesting Permit SE-2019-67-487M, May 2019.*

# INVENTORY FINDINGS AND RELEVANCE TO RESOURCE MANAGEMENT 2

*Credit: Commission Staff*

## 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 Little Cedar Lake (Lake) APM plan considered input from Little Cedar Lake Protection and Rehabilitation District (District), Wisconsin Department of Natural Resources (WDNR), and the public. Objectives of the Little Cedar APM program include the following.

- Effectively control the quantity and density of nuisance aquatic plant growth in well-targeted portions of Little Cedar. This objective helps:
    - Enhance water-based recreational opportunities,
    - Improve community-perceived aesthetic values, and
    - Maintain or enhance the Lake's natural resource value.
- Manage the Lake 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 Lake's 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 Lake's ecological health through environmentally sound management of vegetation, wildlife, fish, and other aquatic/semi-aquatic organisms in and around the Lake.

- Promote a high-quality water-based experience for residents and visitors to the Lake consistent with the policies and practices of the WDNR, as described in the regional water quality management plan, as amended.[5]

To meet these objectives, the District executed an agreement with the Southeastern Wisconsin Regional Planning Commission (Commission) to investigate the characteristics of the Lake 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.

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

All healthy lakes have plants and native aquatic plants form a foundational part of a lake ecosystem. Aquatic plants form an integral part of the aquatic food web, converting sediments and inorganic nutrients present in the water into organic compounds that are directly available as food to other aquatic organisms. Through photosynthesis, plants utilize energy from sunlight and release the oxygen required by many other aquatic life forms into the water. Aquatic plants also serve several other valuable functions in a lake ecosystem, including:

- Improving water quality by filtering excess nutrients from the water
- Providing habitat for invertebrates and fish
- Stabilizing lake bottom substrates
- Supplying food for waterfowl and various lake-dwelling animals

Even though aquatic plants may hinder human use and/or access to a lake, aquatic plants should not necessarily be eliminated or even significantly reduced in abundance because they often support many other beneficial functions. For example, water lilies play a significant role in providing shade, habitat, and food for fish and other important aquatic organisms. They also help prevent damage to the lakeshore by dampening the power of waves that could otherwise erode the shoreline. Additionally, the shade that these plants provide helps reduce the growth of undesirable plants because it limits the amount of sunlight reaching the lake bottom. Given these benefits, large-scale removal of native plants that may be perceived as a nuisance should be avoided when developing plans for aquatic plant management.

**Aquatic Plant Surveys**

Little Cedar Lake's aquatic plant community has been evaluated at least nine times beginning in 1968 with the most recent survey in 2023 by the Commission. Species abundance data derived from the 2018 and 2023 surveys for the lake are compared in Table 2.1. The 2018 and 2023 surveys both used the same point-intercept grid and methodology.[6,7,8] In this method, sampling sites are based on predetermined global positioning system (GPS) location points that are arranged in a grid pattern across the entire surface of a lake. The grid pattern for Little Cedar Lake consists of 615 sampling points spaced 41 meters (134.5 feet) apart (see Figure 2.1). At each grid point sampling site, a single rake haul is taken and a qualitative assessment of the rake fullness, on a scale of zero to three, is made for each species identified. The same points were sampled using the same techniques during the same time of year in 2018 and 2023.

---

[5] *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.*

[6] *Sampling methodology changed from transect-based methods in the earlier surveys to a point-intercept method beginning with the 2012 survey.*

[7] *R. Jesson 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 S. 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] *J. Hauxwell, 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
## Little Cedar Lake Aquatic Plant Survey Summary: August 2018 Versus August 2023

| Aquatic Plant Species | Native or Invasive | Number of Sites Found[a] (2018/2023) | Frequency of Occurrence Within Vegetated Areas[b] (2018/2023) | Average Rake Fullness[c] (2018/2023) | Relative Frequency of Occurrence[d] (2018/2023) | Visual Sightings[e] (2018/2023) |
|---|---|---|---|---|---|---|
| *Brasenia schreberi* (watershield) | Native | 0/0 | --/-- | --/-- | --/-- | 14/0 |
| *Ceratophyllum demersum* (coontail) | Native | 75/59 | 29.2/23.6 | 1.33/1.56 | 8.9/6.9 | 0/0 |
| *Chara spp.* (muskgrass) | Native | 96/140 | 37.4/56.0 | 1.70/1.34 | 11.4/16.4 | 1/6 |
| *Eleocharis erthryopoda* (needle spikerush) | Native | --/0 | --/-- | --/-- | --/-- | 0/1 |
| *Elodea canadensis* (waterweed) | Native | 39/40 | 15.2/16.0 | 1.13/1.33 | 4.6/4.7 | 0/1 |
| *Heteranthera dubia* (water stargrass) | Native | 23/34 | 9.0/13.6 | 1.35/1.32 | 2.7/4.0 | 4/2 |
| *Lemna minor* (duckweed) | Native | 0/0 | --/-- | --/-- | --/-- | 6/5 |
| *Lemna trisulca* (forked duckweed) | Native | 0/11 | --/4.4 | --/1.00 | --/1.3 | 0/0 |
| *Lythrum salicaria* (Purple loosestrife) | Invasive | 0/0 | --/-- | --/-- | --/-- | 6/0 |
| *Myriophyllum heterophyllum* (Various-leaved watermilfoil) | Native | 7/0 | 2.7/-- | 1.57/-- | 0.8/-- | 1/0 |
| *Myriophyllum sibiricum* (northern watermilfoil) | Native | 23/13 | 9.0/5.2 | 1.13/1.15 | 2.7/1.5 | 0/0 |
| *Myriophyllum spicatum* (Eurasian watermilfoil) | Invasive | 124/51 | 48.3/20.4 | 1.47/1.14 | 14.7/6.0 | 3/8 |
| *Myriophyllum verticillatum* (whorled watermilfoil) | Native | 1/13 | 0.4/5.2 | 1.00/1.31 | 0.1/1.5 | 0/4 |
| *Najas flexilis* (slender naiad) | Native | 57/49 | 22.2/19.6 | 1.32/1.08 | 6.8/5.7 | 1/6 |
| *Najas marina* (spiny naiad)[f] | Naturalized | 1/9 | 0.4/3.6 | 1.00/1.33 | 0.1/1.1 | 0/0 |
| *Nitella* sp. (stonewort) | Native | 2/0 | 0.8/-- | 1.00/-- | 0.2/-- | 0/0 |
| *Nitellopsis obtusa (starry stonewort)* | Invasive | 0/56 | --/22.4 | --/1.11 | --/6.5 | 0/0 |
| *Nuphar variegata* (spatterdock)[g] | Native | 8/7 | 3.1/2.8 | 1.38/1.43 | 1.0/0.8 | 5/10 |
| *Nymphaea odorata* (white water lily) | Native | 21/22 | 8.2/8.8 | 1.67/1.59 | 2.5/2.6 | 20/27 |
| *Potamogeton amplifolius* (large-leaf pondweed)[g] | Native | 31/19 | 12.1/7.6 | 1.10/1.26 | 3.7/2.2 | 7/11 |
| *Potamogeton crispus* (curly-leaf pondweed) | Invasive | 11/23 | 4.3/9.2 | 1.00/1.17 | 1.3/2.7 | 0/0 |
| *Potamogeton friesii* (Fries' pondweed) | Native | 0/7 | --/2.8 | --/1.00 | --/0.8 | 0/0 |
| *Potamogeton gramineus* (variable pondweed) | Native | 0/37 | --/14.8 | --/1.08 | --/4.3 | 0/18 |
| *Potamogeton illinoensis* (Illinois pondweed)[g] | Native | 41/12 | 16.0/4.8 | 1.02/1.08 | 4.9/1.4 | 1/5 |
| *Potamogeton natans* (floating-leaf pondweed) | Native | 13/12 | 5.1/4.8 | 1.08/1.42 | 1.5/1.4 | 10/13 |
| *Potamogeton praelongus* (white-stem pondwed) | Native | 16/0 | 6.2/-- | 1.06/-- | 1.9/-- | 2/0 |
| *Potamogeton richardsonii* (clasping-leaf pondweed)[g] | Native | 0/3 | --/1.2 | --/1.00 | --/0.4 | 1/0 |
| *Potamogeton strictifolius* (stiff pondweed) | Native | 0/1 | --/0.4 | --/1.00 | --/0.1 | 0/0 |
| *Potamogeton zosteriformis* (flat-stem pondweed) | Native | 50/42 | 19.5/16.8 | 1.28/1.12 | 5.9/4.9 | 0/0 |
| *Ranunculus aquatilis* (white water crowfoot) | Native | 2/12 | 0.8/4.8 | 1.00/1.00 | 0.2/1.4 | 0/0 |
| *Schoenoplectus acutus* (hardstem bulrush) | Native | 0/0 | --/-- | --/-- | --/-- | 0/3 |

**Table continued on next page.**

**Table 2.1 (Continued)**

| Aquatic Plant Species | Native or Invasive | Number of Sites Found[a] (2018/2023) | Frequency of Occurrence Within Vegetated Areas[b] (2018/2023) | Average Rake Fullness[c] (2018/2023) | Relative Frequency of Occurrence[d] (2018/2023) | Visual Sightings[e] (2018/2023) |
|---|---|---|---|---|---|---|
| *Schoenoplectus subterminalis* (water bulrush) | Native | 0/1 | --/0.4 | --/1.00 | --/0.1 | 6/0 |
| *Schoenoplectus tabernaemontanii* (softstem bulrush) | Native | 0/0 | --/-- | --/-- | --/-- | 0/1 |
| *Sparganium emersum* (short-stem burreed) | Native | --/1 | 0/0.4 | --/1.00 | --/0.1 | 0/2 |
| *Spirodela polyrhiza* (large duckweed) | Native | 0/0 | --/-- | --/-- | --/-- | 0/6 |
| *Stuckenia pectinata* (Sago pondweed)[g] | Native | 49/43 | 19.1/17.2 | 1.04/1.12 | 5.8/5.0 | 4/11 |
| *Typha* spp. (cattail) | Native | 0/0 | --/-- | --/-- | --/-- | 5/3 |
| *Utricularia vulgaris* (bladderwort) | Native | 1/2 | 0.4/0.8 | 2.00/1.00 | 0.1/0.2 | 2/2 |
| *Vallisneria americana* (eel-grass/wild celery)[g] | Native | 151/137 | 58.8/54.8 | 1.46/1.45 | 17.9/16.0 | 4/19 |
| *Wolffia columbiana* (common watermeal) | Native | 0/0 | --/-- | --/-- | --/-- | 7/0 |

Note: Red text indicates non-native and/or invasive species. See Appendix A for distribution maps and identifying features

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

[b] *Frequency of Occurrence, 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.*

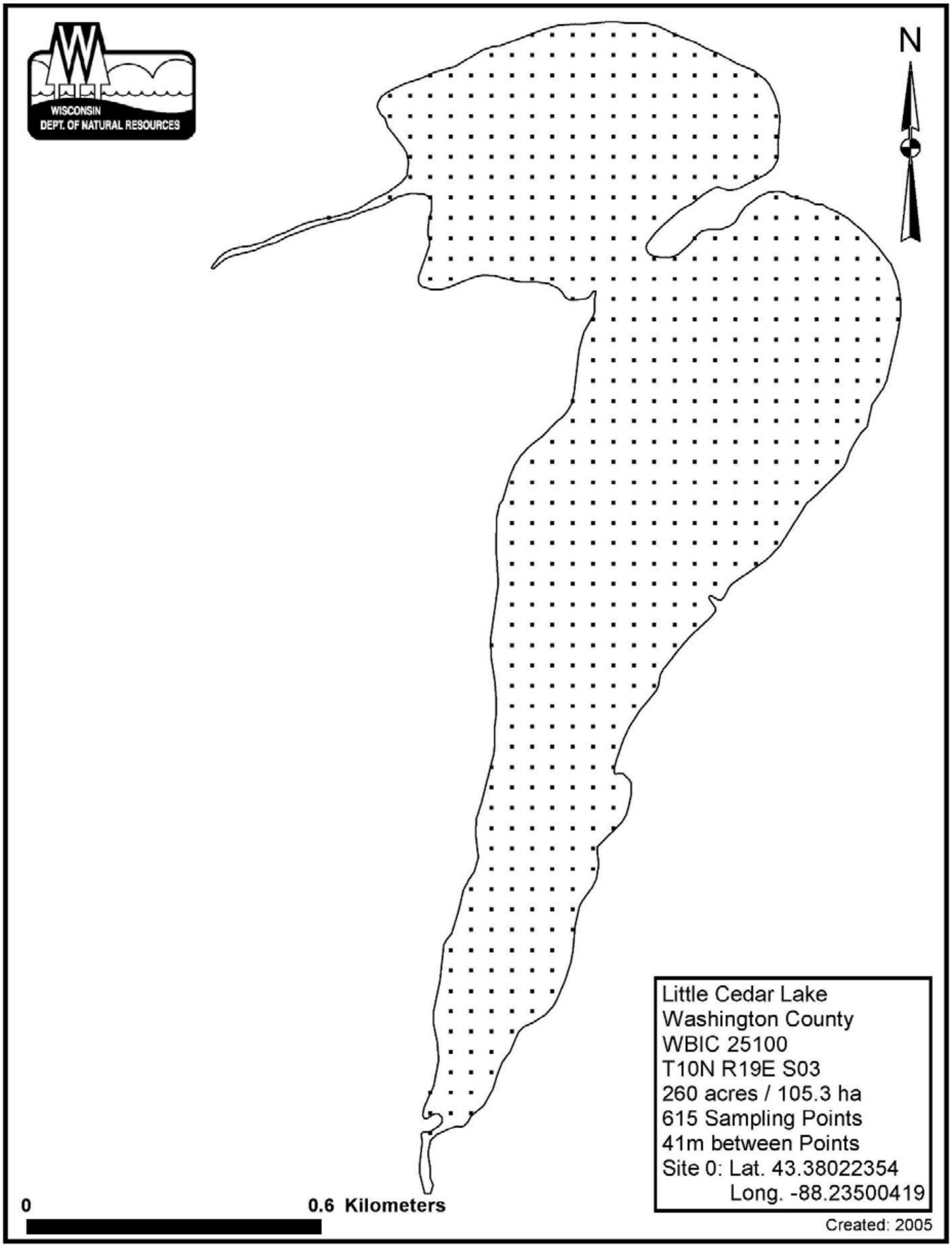
[e] *Visual Sightings is the number of sites where that particular species was visually observed within six feet of the actual rake haul location but was not actually retrieved on the rake and was not, therefore, assigned a rake fullness measurement for that site. At sites where this occurred, the species 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.*

[f] *Spiny naiad was added to the NR 40 list as a restricted species in 2015, meaning it is not allowed to be transported, transferred, or introduced without a permit. Because the species is not native to Wisconsin and can become quite abundant, especially in lakes of poor water quality with hard water, it is currently considered a "naturalized" native species that can provide good habitat and food for fish and macroinvertebrates. Paul M. Skawinski,* Aquatic Plants of the Upper Midwest, 2nd Edition, *2014;* Through the Looking Glass: A Field Guide to Aquatic Plants, 2nd Edition, *2013.*

[g] *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*

**Figure 2.1**
**Aquatic Plant Sampling Map for Little Cedar Lake**




*Source: SEWRPC*

Commission staff conducted the 2023 survey on July 11th and 12th with the assistance of volunteers from the District. Conditions during the survey were good, with low wind speeds and low to moderate boat traffic. The Lake had excellent water clarity during the survey, which enhanced visual observations of aquatic plant species within six feet of the sampling location. In general, the aquatic plant specimens were mature, and several species were in flower (e.g., white water lily).

While Commission staff strived to survey as much of the Lake as feasible, certain areas were not surveyed in 2023. These areas included the central portion of both the northern and southern Little Cedar Lake basins, which were determined to be too deep for vascular aquatic plants to grow.[9] Other points that were not surveyed were either due to the proximity of the dam, docks, temporary obstacles, and points that were deemed too shallow or too heavily vegetated to survey. These shallow and highly vegetated areas were limited to the eastern and western edges of the northern basin and the southern tip of the southern basin.

### Aquatic Plant Survey Metrics

Each aquatic plant species has preferred habitat conditions in which that species 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. Human management can also affect the biological diversity (biodiversity) of waterbodies.

Several metrics are useful to describe aquatic plant community condition and design management strategies. These metrics include total rake fullness, maximum depth of colonization, species richness, biodiversity, evaluation of sensitive species, and relative species abundance. Metrics derived from the 2018 and 2023 point-intercept surveys are described below.

#### *Total Rake Fullness*

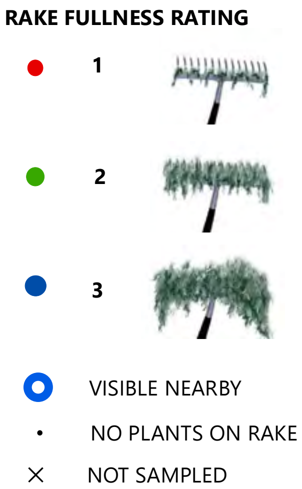
As described earlier in this section, Commission staff qualitatively rated the plant abundance at each survey point by how much of the sampling rake was covered by all aquatic plant species.[10] This rating, called total rake fullness, can be a useful metric evaluating general abundance of aquatic plants as part of the point-intercept survey. As shown in Figure 2.2, total rake fullness across all surveyed points in Little Cedar Lake averaged 1.77 in 2023. The most abundant plant growth, as determined by the total rake fullness, was along the eastern and western shorelines of the “kettle” and in the southwestern extent of the southern basin. These areas are generally shallow with more organic silt sediment compared to the sand and gravel sediment common in other parts of the lake. The western shoreline of the southern basin is not conducive to extensive aquatic plant growth, as this area quickly drops into depths that are light-limiting for aquatic plants at the current water clarity levels. Large expanses of the eastern and northern shorelines of the southern basin had little to no aquatic vegetation despite the gently sloping, shallow extent of these areas. Aquatic plant coverage in these areas was patchy, with dense muskgrass or pondweed beds that abruptly transitioned into uncolonized bare sediment (see Figure 2.3). Most of the sediment in these areas was sand and gravel, which may not provide enough nutrients to support extensive aquatic plant growth. However, it is possible that intense and frequent recreational use, both by boats and human foot traffic, may impede aquatic plant growth in some portions of the southern basin.

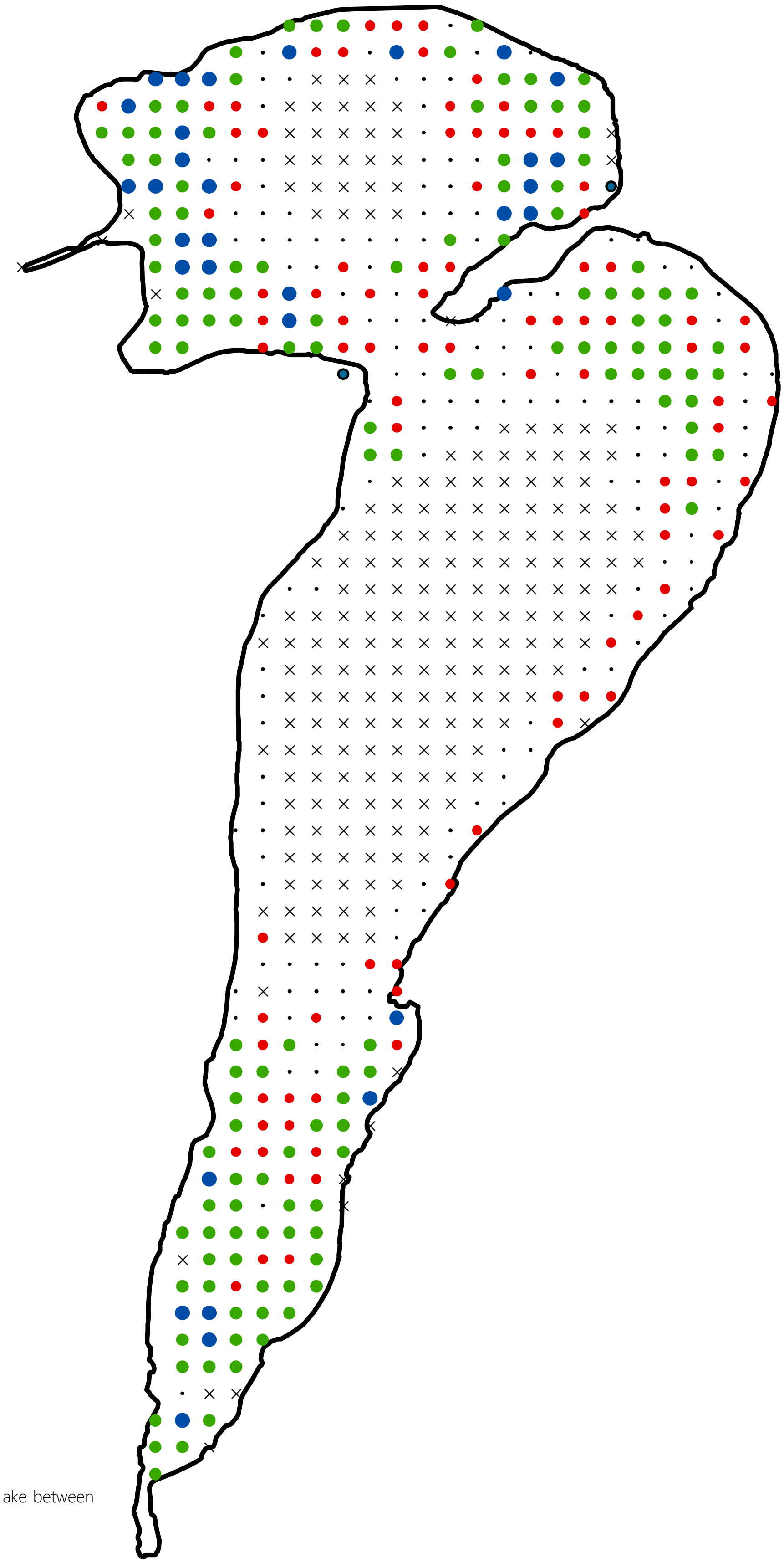
Some areas of the Lake had aquatic vegetation that was too dense to survey and thus were not adequately represented in the total rake fullness data. These areas include southern basin south of the Ackerman’s Grove launch, which had large, dense stands of bulrushes (*Schoenoplectus* spp.) interspersed with water lilies, as well as the western edge of the northern basin near the Cedar Creek inlet, which had dense stands of water lilies and cattails in shallow water (see Figure 2.3).

[9] *The southeast portion of the Lake is not an area with active aquatic plant management, as indicated by the 2018 aquatic plant management plan.*

[10] *This method follows the standard WDNR protocol.*

## Figure 2.2
## Total Rake Fullness in Little Cedar Lake: August 2023



Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

**Figure 2.3**
**Aquatic Plant Community on Little Cedar Lake**

Bulrush and Water Lilies in Southern Sensitive Area

Inlet from Cedar Creek

Submerged Aquatic Plants

Sharp Divide in Vegetated Area

*Source: SEWRPC*

### *Maximum Depth of Colonization*

Maximum depth of colonization (MDC) can be a useful indicator of water quality, as turbid and/or eutrophic (nutrient-rich) lakes generally have shallower MDC than lakes with clear water.[11] 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 muskgrass and nitella (*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.

In Little Cedar Lake, aquatic plants were observed to a maximum depth of 15 feet in 2018 and to a maximum depth of 23 feet in 2023. However, most of the deepest observations were of muskgrass or aquatic moss. Thus, vascular plants were generally light-limited deeper than 19 feet during the 2023 survey, indicating that water clarity appears to have improved from 2018 to 2023.

[11] *D.E. Canfield Jr, L. Langeland, and W.T. Haller, "Relations Between Water Transparency and Maximum Depth of Macrophyte Colonization in Lakes," Journal of Aquatic Plant Management 23, 1985.*

***Species Richness***

The number of distinct 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 have greater species richness. Aquatic plants provide a wide variety of benefits to lakes, examples of which are briefly described in Table 2.2.

The observed species richness of Little Cedar Lake has increased since the initial plant inventory completed in 1968 as well as earlier surveys in 2000 and 2023 (see Table 2.3).[12] Some species observed in earlier surveys were not observed during the 2023 survey. 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. The 2023 aquatic plant survey identified 33 species in the Lake, including visual observations and boat survey species. This species richness is higher than average for lakes within Southeastern Wisconsin. The total number of species observed at each sampling point is shown in Figure 2.4.

***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 percentage 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).[13] 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.

The Lake has good biodiversity with an SDI of 0.90 in 2018 and 0.92 in 2023. Between one and eleven aquatic plant species were found at any single sampling point throughout the Lake, with generally higher diversity in middle depths (four to thirteen feet) areas than in very shallow or deeper areas (Figure 2.4). Actions that conserve and promote aquatic plant biodiversity are critical to the long term health of the Lake. 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.

***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.[14] The FQI is an assessment metric used to evaluate how closely a lake's aquatic plant community matches that of undisturbed, pre-settlement conditions.[15] 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. The Lake's FQI in 2018 was 28.3 while the 2023 FQI was 30.6. Both surveys had higher FQI values than the 20.0 average FQI for the Southeastern Wisconsin Till Plains ecoregion, indicating that the Lake supports species that are more sensitive to ecological disturbance than the average lake in the Region.

---

[12] *SEWRPC MR 146, 2004,* op. cit.

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

[14] *Vestergaard, O. and Sand-Jensen, K. "Alkalinity and Trophic State Regulate Aquatic Plant Distribution in Danish Lakes,"* Aquatic Botany *67, 2000.*

[15] *S. Nichols, "Floristic Quality Assessment of Wisconsin Lake Plant Communities with Example Applications,"* Lake and Reservoir Management *15(2), 1999.*

**Table 2.2**
**Ecological Qualities Associated with Aquatic Plant Species in Little Cedar Lake**

| 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 sibiricum* (northern watermilfoil) | Leaves and fruit provide food for waterfowl and shelter and foraging for fish. |
| *Najas flexilis* (slender naiad) | Important food source for waterfowl, marsh birds, and muskrats; provides food and shelter for fish; native |
| *Nuphar variegata* (spatterdock) | Provides food for waterfowl and mammals; provides habitat for fish and aquatic invertebrates. |
| *Nymphaea odorata* (white water lily) | Seeds consumed by waterfowl while rhizoids consumed by mammals. |
| *Potamogeton crispus* (curly-leaf pondweed) | Adapted to cold water; mid-summer die-off can impair water quality; invasive nonnative |
| *Potamogeton gramineus* (variable pondweed) | The fruit is an important food source for many waterfowl; also provides food for muskrat, deer, and beaver; native |
| *Potamogeton illinoensis* (Illinois pondweed) | Provides shade and shelter for fish; harbor for insects; seeds are eaten by waterfowl. |
| *Potamogeton natans* (floating-leaf pondweed) | The late-forming fruit provides important food source for ducks; provides good fish habitat due to its shade and foraging opportunities; native |
| *Potamogeton zosteriformis* (flat-stem pondweed) | Provides some food for ducks; native |
| *Ranunculus aquatilis* (white water crowfoot) | Provides habitat for fish and macroinvertebrates. |
| *Schoenoplectus* spp. (bulrushes) | Provide food and nesting habitat for birds and food for macroinvertebrates. |
| *Sparganium* spp. (bur-reeds) | Provide food for birds, muskrats, and macroinvertebrates. |
| *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* spp. (bladderworts) | Stems provide food and cover for fish; native |
| *Vallisneria americana* (eelgrass/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*

Six sensitive species, as defined by the general macrophyte assessment of condition model, were identified during the 2023 survey: slender naiad, nitella, large-leaf pondweed (*Potamogeton amplifolius*), variable-leaf pondweed (*Potamogeton gramineus*), stiff pondweed (*Potamogeton strictifolius*), and water bulrush (*Schoenoplectus subterminalis*).[16] The number of sensitive species identified at each survey points are shown in Figure 2.5.

### *Relative Species Abundance*

Based on the 2023 point-intercept survey, the five most abundant submerged aquatic plant species in the Lake were, in decreasing order of abundance: 1) muskgrass, 2) eelgrass (*Vallisneria americana*), 3) coontail (*Ceratophyllum demersum*), 4) SSW, and 5) EWM). Much of the submergent plant community consisted of dense intermixed beds of muskgrass, eelgrass, coontail, naiads, and pondweeds. The invasive EWM and

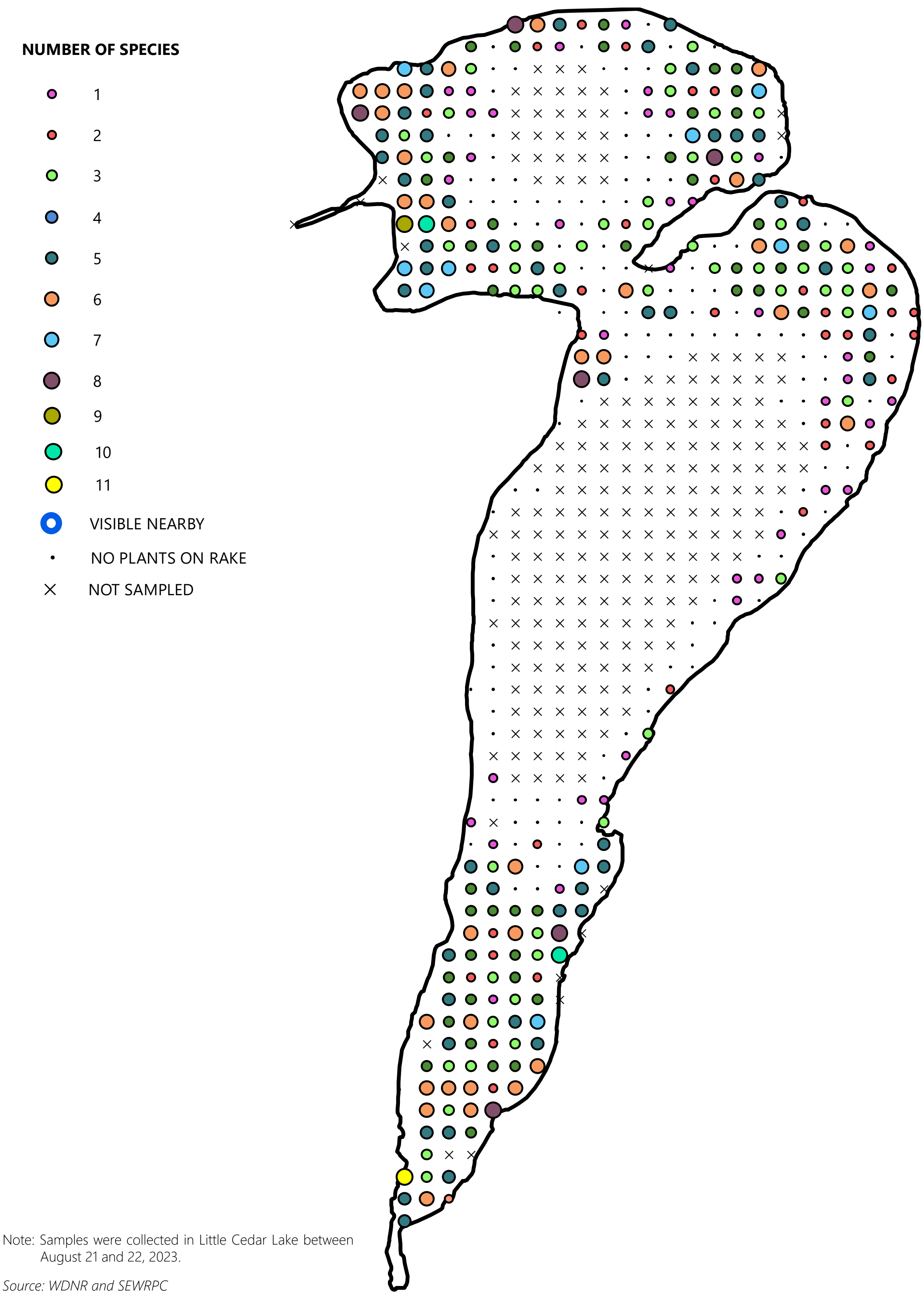
[16] *Mikulyuk, A.M., et al., "A Macrophyte Bioassessment Approach Linking Taxon-Specific Tolerance and Abundance in North Temperate Lakes,"* Journal of Environmental Management *199: 172-180, 2017.*

## Table 2.3
## Little Cedar Lake Aquatic Plant Frequency of Occurrence: 2000-2023

| Aquatic Plant Species | 2000 | 2012 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|
| Aquatic moss | -- | | -- | -- | 0.4 | 0.8 | -- | 1.6 |
| *Bidens beckii*, Water marigold | -- | 0.4 | -- | -- | -- | -- | -- | -- |
| *Ceratophyllum demersum*, Coontail | 31.1 | 6.3 | 29.2 | 28.3 | 42.3 | 36.0 | 31.5 | 23.6 |
| *Chara aspera,* Rough stonewort | -- | -- | -- | -- | 0.4 | -- | -- | -- |
| *Chara braunii*, Braun's stonewort | -- | -- | -- | -- | 4.0 | 0.8 | -- | -- |
| *Chara contraria*, Common stonewort | -- | -- | -- | -- | 47.6 | 51.4 | -- | -- |
| *Chara globularis*, Globular stonewort | -- | -- | -- | -- | 10.5 | 18.6 | -- | -- |
| *Chara* sp., Muskgrasses | 66.3 | 26.3 | 37.4 | 39.0 | -- | -- | 58.1 | 56.0 |
| *Elodea canadensis*, Common waterweed | 18.9 | 10.0 | 15.2 | 23.8 | 21.4 | 20.6 | 23.0 | 16.0 |
| Filamentous algae | -- | -- | -- | -- | 2.0 | 0.4 | -- | -- |
| *Heteranthera dubia*, Water star-grass | 18.9 | 12.1 | 8.9 | -- | 13.3 | 7.3 | 14.0 | 13.6 |
| *Lemna minor*, Small duckweed | -- | -- | -- | -- | -- | 0.4 | -- | -- |
| *Lemna trisulca*, Forked duckweed | -- | -- | -- | 0.4 | 3.2 | 3.2 | -- | 4.4 |
| *Myriophyllum heterophyllum*, Various-leaved watermilfoil | | -- | 2.7 | -- | 1.6 | 5.7 | -- | -- |
| *Myriophyllum sibiricum*, Northern watermilfoil | | 5.8 | 8.9 | 29.6 | 4.0 | -- | -- | 5.2 |
| *Myriophyllum* sp. Watermilfoils | 13.3 | -- | -- | -- | -- | -- | -- | -- |
| *Myriophyllum spicatum*, Eurasian watermilfoil | 81.1 | 60.4 | 48.2 | 36.3 | 41.9 | 48.2 | 46.4 | 20.4 |
| *Myriophyllum verticillatum*, Whorled watermilfoil | -- | 12.9 | 0.4 | 1.3 | -- | -- | -- | 5.2 |
| *Najas flexilis*, Slender naiad | 12.2 | 16.3 | 22.2 | 17.9 | 27.0 | 24.7 | 21.6 | 19.6 |
| *Najas marina*, Spiny naiad | 10.0 | 1.7 | 0.4 | -- | 0.8 | 0.4 | -- | 3.6 |
| *Nitella* sp., Nitella | -- | 0.8 | 0.8 | -- | 0.8 | -- | -- | -- |
| *Nitellopsis obtusa*, Starry stonewort | -- | -- | -- | 0.4 | 2.4 | 8.1 | 12.2 | 22.4 |
| *Nuphar variegata*, Spatterdock | -- | 2.5 | 3.1 | 0.4 | 2.4 | 3.2 | 2.7 | 2.8 |
| *Nymphaea odorata*, White water lily | -- | 15.4 | 8.2 | 4.0 | 6.5 | 9.7 | 7.2 | 8.8 |
| *Persicaria amphibia*, Water smartweed | -- | 0.4 | -- | -- | -- | -- | -- | -- |
| *Potamogeton amplifolius*, Large-leaf pondweed | 5.6 | 6.3 | 12.1 | 3.6 | 6.9 | 6.5 | 6.8 | 7.6 |
| *Potamogeton crispus*, Curly-leaf pondweed | 13.3 | 0.8 | 4.3 | 0.9 | 1.2 | 4.0 | 1.4 | 9.2 |
| *Potamogeton foliosus*, Leafy pondweed | -- | 0.4 | -- | -- | -- | -- | -- | -- |
| *Potamogeton friesii*, Fries' pondweed | -- | -- | -- | 0.9 | 10.5 | 7.7 | 5.4 | 2.8 |
| *Potamogeton gramineus*, Variable pondweed | 5.6 | -- | -- | 2.7 | 4.4 | 6.5 | 5.0 | 14.8 |
| *Potamogeton illinoensis*, Illinois pondweed | -- | 42.9 | 16.0 | 8.1 | 23.0 | 14.2 | 12.2 | 4.8 |
| *Potamogeton natans*, Floating-leaf pondweed | -- | 7.1 | 5.1 | 0.9 | 2.4 | 3.6 | 1.8 | 4.8 |
| *Potamogeton praelongus*, White-stem pondweed | -- | -- | 6.2 | 0.4 | -- | -- | -- | -- |
| *Potamogeton richardsonii*, Clasping-leaf pondweed | 3.3 | 5.0 | -- | 0.4 | 0.8 | 0.4 | -- | 1.2 |
| *Potamogeton robbinsii*, Robbins' pondweed | 1.1 | -- | -- | -- | -- | -- | -- | -- |
| *Potamogeton strictifolius*, Stiff pondweed | -- | -- | -- | 13.0 | -- | -- | -- | 0.4 |
| *Potamogeton X scoliophyllus* *(Potamogeton amplifolius X illinoensis),* Hybrid pondweed | -- | -- | -- | -- | -- | 1.6 | -- | -- |
| *Potamogeton X spathuliformis* *(Potamogeton gramineus X illinoensis),* Hybrid pondweed | -- | -- | -- | -- | -- | 3.2 | -- | -- |
| *Potamogeton zosteriformis*, Flat-stem pondweed | 22.2 | 39.6 | 19.5 | 16.1 | 38.3 | 32.4 | 22.5 | 16.8 |
| *Ranunculus aquatilis*, White water crowfoot | 7.8 | 7.1 | 0.8 | 1.3 | 1.2 | 1.2 | 4.1 | 4.8 |
| *Schoenoplectus acutus*, Hardstem bulrush | -- | 4.6 | -- | -- | -- | 1.2 | -- | -- |
| *Schoenoplectus subterminalis*, Water bulrush | 2.2 | -- | -- | -- | -- | -- | -- | 0.4 |
| *Schoenoplectus tabernaemontani*, Softstem bulrush | -- | -- | -- | -- | -- | 0.8 | -- | -- |
| *Sparganium emersum*, Short-stemmed bur-reed | -- | -- | -- | -- | -- | -- | -- | 0.4 |
| *Sparganium* sp., Bur-reed | -- | -- | -- | -- | -- | 0.4 | -- | -- |
| *Spirodela polyrrhiza*, Large duckweed | -- | -- | -- | -- | -- | 0.4 | 0.9 | -- |
| *Spongillina*, Freshwater sponge | -- | -- | -- | -- | 0.8 | 0.8 | 0.9 | -- |
| *Stuckenia pectinata*, Sago pondweed | 8.9 | 17.5 | 19.1 | 9.4 | 29.4 | 10.1 | 14.9 | 17.2 |
| *Utricularia gibba*, Creeping bladderwort | -- | -- | -- | -- | -- | 0.4 | -- | -- |
| *Utricularia minor*, Small bladderwort | -- | -- | -- | -- | -- | 0.4 | -- | -- |
| *Utricularia vulgaris*, Common bladderwort | -- | 1.7 | 0.4 | 1.3 | 0.8 | 1.6 | 0.9 | 0.8 |
| *Vallisneria americana*, Wild celery | 16.7 | 55.0 | 58.8 | 65.0 | 61.7 | 63.6 | 58.6 | 54.8 |
| Total Number of Species | 18 | 26 | 23 | 25 | 32 | 38 | 22 | 29 |

*Source: Wisconsin Department of Natural Resources and SEWRPC*

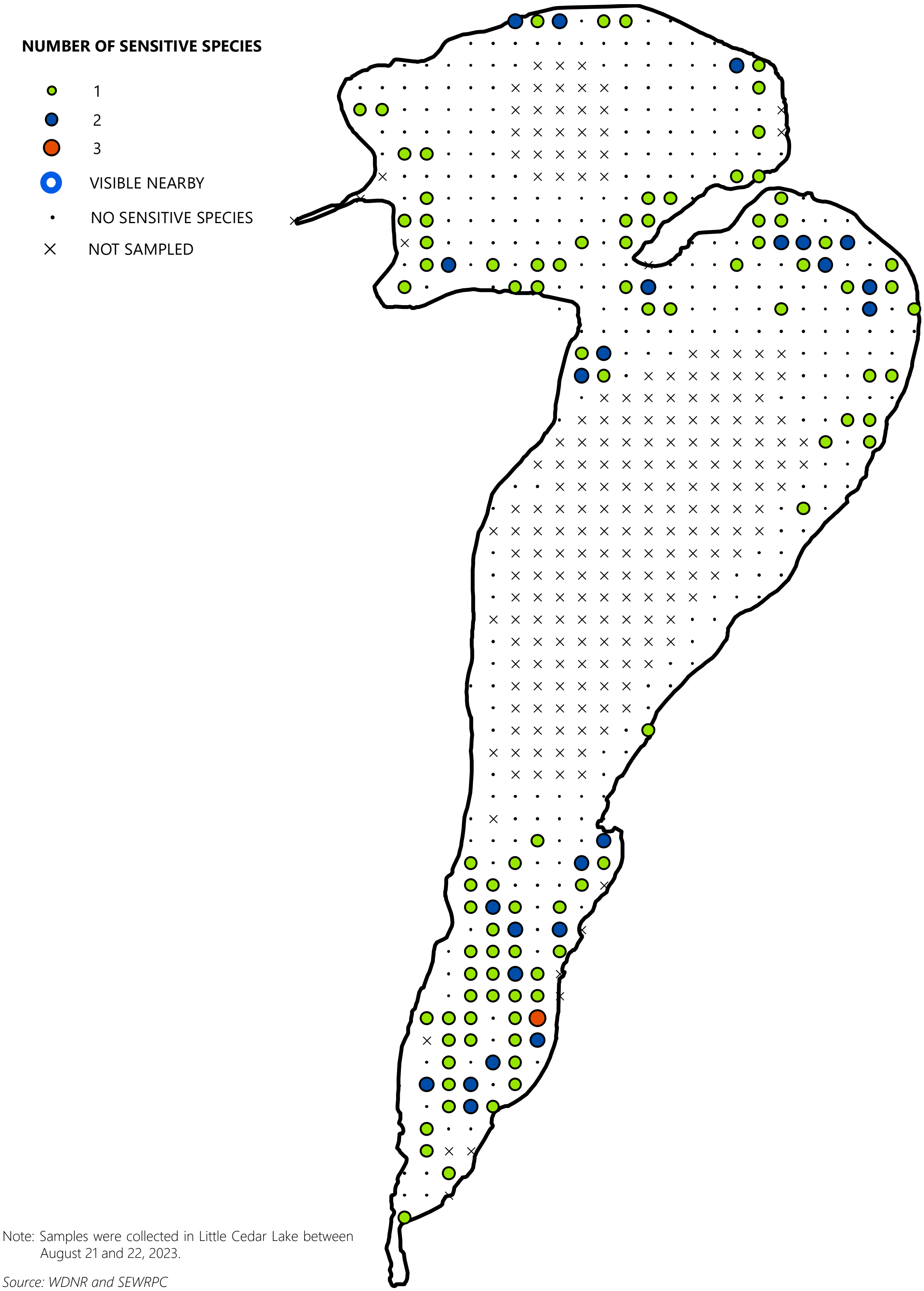
**Figure 2.4**
**Species Richness in Little Cedar Lake: August 2023**




Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

**Figure 2.5**
**Sensitive Species Richness in Little Cedar Lake: August 2023**




Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

SSW were observed throughout the lake but were largely in low abundance and often were intermixed with natives. The southern Sensitive Area sustains bulrush stands with abundant water lilies and a submergent community of muskgrass, naiads, pondweeds, SSW, and bladderworts (*Utricularia* spp.). The northwestern shoreline near the Cedar Creek inlet also has substantial water lily growth which borders an extensive cattail marsh. Photographs of the Lake's aquatic plant community are presented in Figure 2.3.

Since the 1968 survey, muskgrass, a type of macroalgae, has consistently been either the most or one of the most abundant aquatic plants in the Lake (see Table 2.3). This is a critical group of 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.[17] 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.

Changing aquatic plant communities 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 EWM are known to have year-to-year abundance and relative scarcity cycles, possibly due to climatic factors and/or herbivory cycles related to the relative abundance of milfoil weevils (*Eurhychiopsis lecontei*).

**Apparent Changes in Observed Aquatic Plant Communities: 2018 Versus 2023**

The distribution of each aquatic plant species identified as part of the 2023 survey is mapped in Appendix A. The 2023 aquatic plant inventory identified 34 species of aquatic plants in the lake while the 2018 survey identified 30 species. Overall, the number of aquatic plant species in the Lake has substantially increased since the 1968 survey (10 species identified), but this is due in part to the difference in methodology and better aquatic plant identification over the course of these surveys.

In addition to the number of different aquatic plant species detected in the Lake, several other comparisons can be drawn between the 2018 and 2023 aquatic plant survey results, as examined below.

- The total littoral vegetated frequency of occurrence has notably decreased (81.1 to 67.6 percent) between 2018 and 2023. However, the maximum depth of plant colonization has increased over that period, so the area of the lake considered to be littoral zone has increased as well. Much of the lake bottom in the littoral zone continues to be covered by aquatic vegetation but there are large expanses of unvegetated sediment in the shallow nearshore areas, particularly along the northern and eastern edges of the southern basin. These areas are predominantly sand and gravel bottom and may not provide enough nutrients for a more abundant plant community. Physical stress from wave activity, boat travel, and human foot traffic may limit plant growth in these areas as well.

- The MDC has increased from 15 to 23 feet between 2018 and 2023, indicating that water clarity may have improved and currently supports aquatic plant growth into deeper areas of the lake.

- The composition and order of the five most common species shifted between 2018 and 2023. Muskgrass became the most common species in the Lake, overtaking eelgrass which was the second most common species in 2023. Coontail, which was the fourth most common species in 2018, became the third most common species. Starry stonewort, which was not previously within the top five most common species, became the fourth most common species. Eurasian watermilfoil, which had been the second most common species, became the fifth most common. Slender naiad, which was the fifth most common species in 2018, became the sixth most common.

---

[17] *M. Scheffer and E.H. van Ness, "Shallow Lakes Theory Revisited: Various Alternative Regimes Driven by Climate, Nutrient, Depth, and Lake Size,"* Hydrobiologia *584, 2007.*

- EWM occurrence was consistent between 2018 and 2023 while curly-leaf pondweed was found at six more points in 2023 than 2018 and spiny naiad was observed at 16 fewer points in 2023 than in 2018. Starry stonewort, an invasive macroalga that was first observed in the lake in 2018, was observed at 56 points in 2023. This was a substantial increase compared to the 20 and 27 points that WDNR staff observed SSW at in the 2021 and 2022 surveys, respectively.

- Several native aquatic plant species have small populations within Little Cedar Lake. White water crowfoot, forked duckweed, spatterdock, and several pondweeds (Fries', stiff, and clasping-leaf) were only observed at a few points in the 2023 survey.

As was described earlier, sensitive aquatic plant species are 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 2018 and 2023 were contrasted (Figure 2.6). Overall, the sensitive species richness increased between 2018 and 2023, reflecting a stable and healthy plant community. A few significant observations were noted:

- Slender naiad was the most common sensitive species in both the 2018 and 2023 surveys.[18] Large-leaf and variable-leaf pondweeds were the second and third most common sensitive species.

- Sensitive species were distributed throughout much of the vegetated areas of the Lake but were most common in the southern Sensitive Area (see Figure 2.4).

- Gains and losses in the number of sensitive species at each survey point were distributed throughout the Lake with similar numbers of points gaining sensitive species numbers compared to losing them (see Figure 2.6).

**Invasive Species**

This subsection will discuss invasive species observations in Little Cedar Lake, as these species are often the focus of aquatic plant management efforts.

***Eurasian Watermilfoil (EWM)***

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; these conditions are common in Southeastern Wisconsin.[19,20] Following environmental disturbance, EWM can rapidly expand into disturbed areas as small fragments of EWM can grow into entirely new plants.[21] For these reasons, EWM can grow to dominate an aquatic plant community in as little as two years.[22, 23] 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.[24]

---

[18] *Commission staff did not identify muskgrass to species at each point in the plant survey, so all references to muskgrass are to the genus (*Chara *spp.). All species of* Chara *are currently identified as sensitive species.*

[19] *U. S. Forest Service,* Pacific Islands Ecosystems at Risk (PIER)*, 2019.: hear.org/pier/species/myriophyllum_spicatum.htm.*

[20] *S.A. Nichols and B. H. Shaw, "Ecological Life Histories of the Three Aquatic Nuisance Plants: Myriophyllum spicatum, Potamogeton crispus, and Elodea canadensis,"* Hydrobiologia *131(1), 1986.*

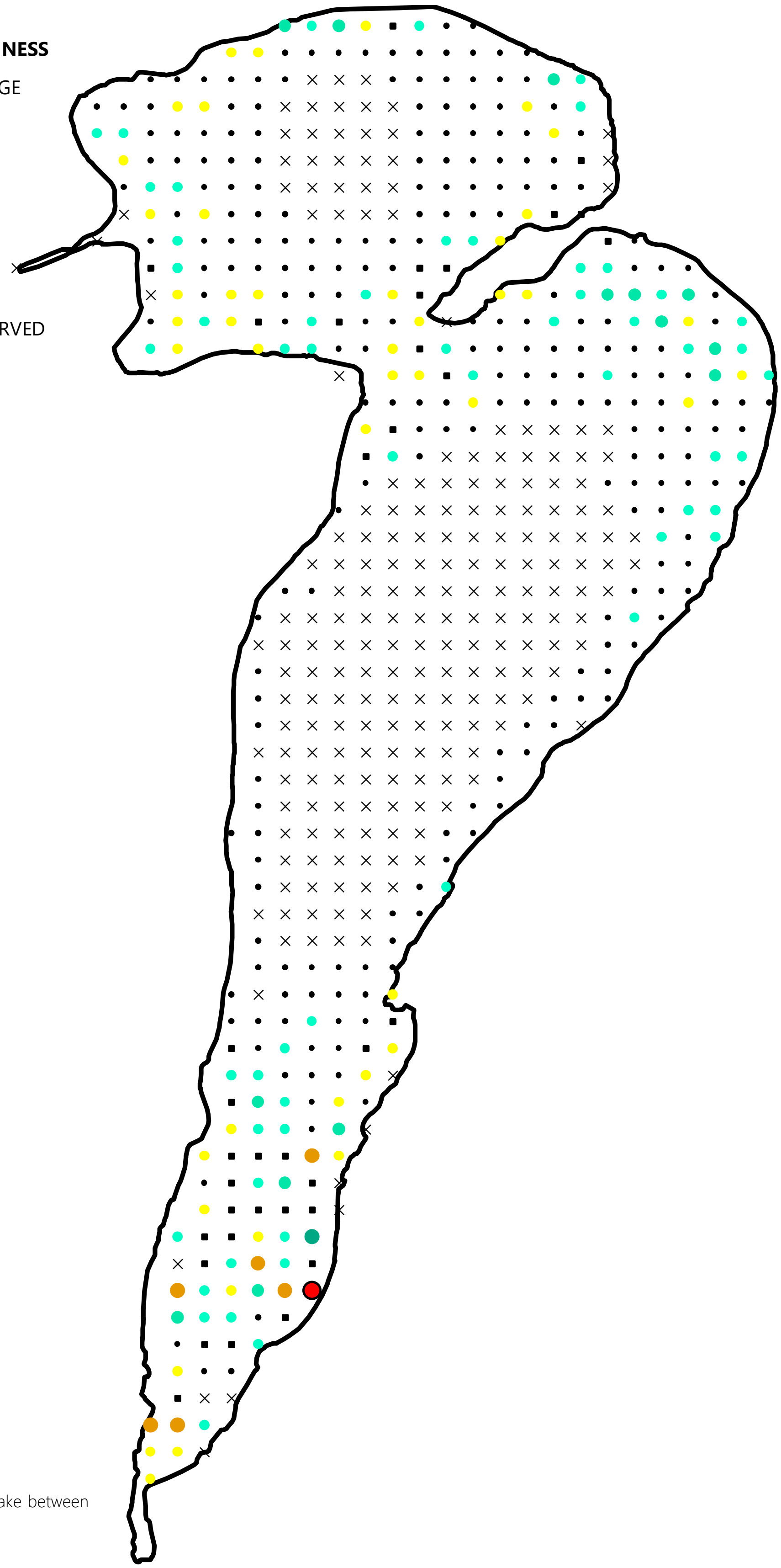
[21] Ibid*.*

[22] *S.R. Carpenter, "The Decline of Myriophyllum spicatum in a Eutrophic Wisconsin (USA) Lake,"* Canadian Journal of Botany *58(5), 1980.*

[23] *Les, D. H., and L. J. Mehrhoff, "Introduction of Nonindigenous Vascular Plants in Southern New England: a Historical Perspective,"* Biological Invasions *1: 284-300, 1999.*

[24] *S.R. Carpenter, 1980, op. cit.*

**Figure 2.6**
**Change in Sensitive Species Richness in Little Cedar Lake: 2018 Versus 2023**




Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

Human produced EWM fragments (e.g., created by boating through EWM), as well as fragments generated from natural processes (e.g., wind-induced turbulence, animal feeding/disturbance) readily colonize 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.[25] 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 especially 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 has substantially declined since the 2018 survey, when it was observed at 48.3 percent of vegetated points in Little Cedar Lake during 2018 compared to the 20.4 percent of vegetated points in 2023. The average rake fullness also declined from 1.47 in 2018 to 1.14 in 2023. This trend has continued a declining abundance of EEWM in the Lake since 2000, when the littoral frequency of occurrence was 81.1 percent. The previous aquatic plant management plan attributed at least some of this decline to the effectiveness of chemical treatments targeting the EWM population.[26] The highest EWM coverage in 2023 was along the eastern and western shorelines of the northern basin (see Figure 2.7).

***Starry Stonewort***

Starry stonewort is a novel aquatic invasive macroalga species in Wisconsin. As a member of the Characeae, SSW is related to native *Chara*, *Lychnothamnus*, *Nitella*, and *Tolypella* species, which have roughly similar characteristics and are found in many hardwater lakes across Wisconsin. Native to Eurasia, the first discovery of SSW in North America was in the St. Lawrence Seaway in 1978; it has since spread to several northeastern and midwestern US states as well as southern Ontario.[27] First observed within Wisconsin in Little Muskego Lake during September 2014, SSW has since been found in 17 lakes in Southeastern Wisconsin.[28] Within Washington County, SSW has been observed in Big Cedar, Green, Gilbert, Lucas, Pike, and Silver lakes.

In its native range, SSW has been shown to provide food and habitat for aquatic organisms as well as enhance lake water quality by reducing sediment suspension and acting as a phosphorus sink.[29] In invaded lakes, SSW can form dense beds, with reported maximum heights of 4 to 7 feet, outcompete both native and other invasive plant species, and cover fish spawning areas.[30,31,32] This species is capable of both sexual and asexual reproduction, which can occur through plant fragments as well as the star-shaped bulbils for which the species is named.[33] Only male species have been observed in North America thus far, indicating that all spread has been through asexual reproduction. Bulbils may stay viable in lake sediment for several years, making it extremely difficult to eradicate SSW from a waterbody.

Starry stonewort was the fourth-most observed species in the 2023 survey with observations at 56 out of 398 surveyed points (22.4 percent frequent of occurrence in littoral zone). Initially observed in Little Cedar lake near the Ackerman's Grove boat launch, SSW has since been observed in multiple locations across the lake with an increasing littoral frequency of occurrence in recent aquatic plant surveys by

---

[25] *J.D. Wood and M. D. Netherland, "How Long Do Shoot Fragments of Hydrilla (Hydrilla verticillata) and Eurasian Watermilfoil (Myriophyllum spicatum) Remain Buoyant?",* Journal of Aquatic Plant Management *55: 76-82, 2017.*

[26] *Marine Biochemists, 2018,* op. cit.

[27] *starrystonewort.org/maps.*

[28] *apps.dnr.wi.gov/lakes/invasives/AISLists.aspx?species=STARRY_STONEW.*

[29] *For a more complete review of SSW ecology in its native and invasive range, see D.J. Larkin, A.K. Monfils, A. Boissezon, R.S. Sleith, P.M. Skawinski, C.H. Welling, B.C. Cahill, and K.G. Karol, "Biology, Ecology, and Management of Starry Stonewort (*Nitellopsis obtusa; *Characeae): A Red-listed Eurasian Green Alga Invasive in North America,"* Aquatic Botany *148: 15-24, 2018 as well as State of Michigan,* Status and Strategy for Starry Stonewort (*Nitellopsis obtusa* (Desv. In Loisel.) J. Groves) Management, *last updated December 2017* (www.michigan.gov/documents/invasives/egle-ais-nitellopsis-obtusa-strategy_708937_7.pdf).

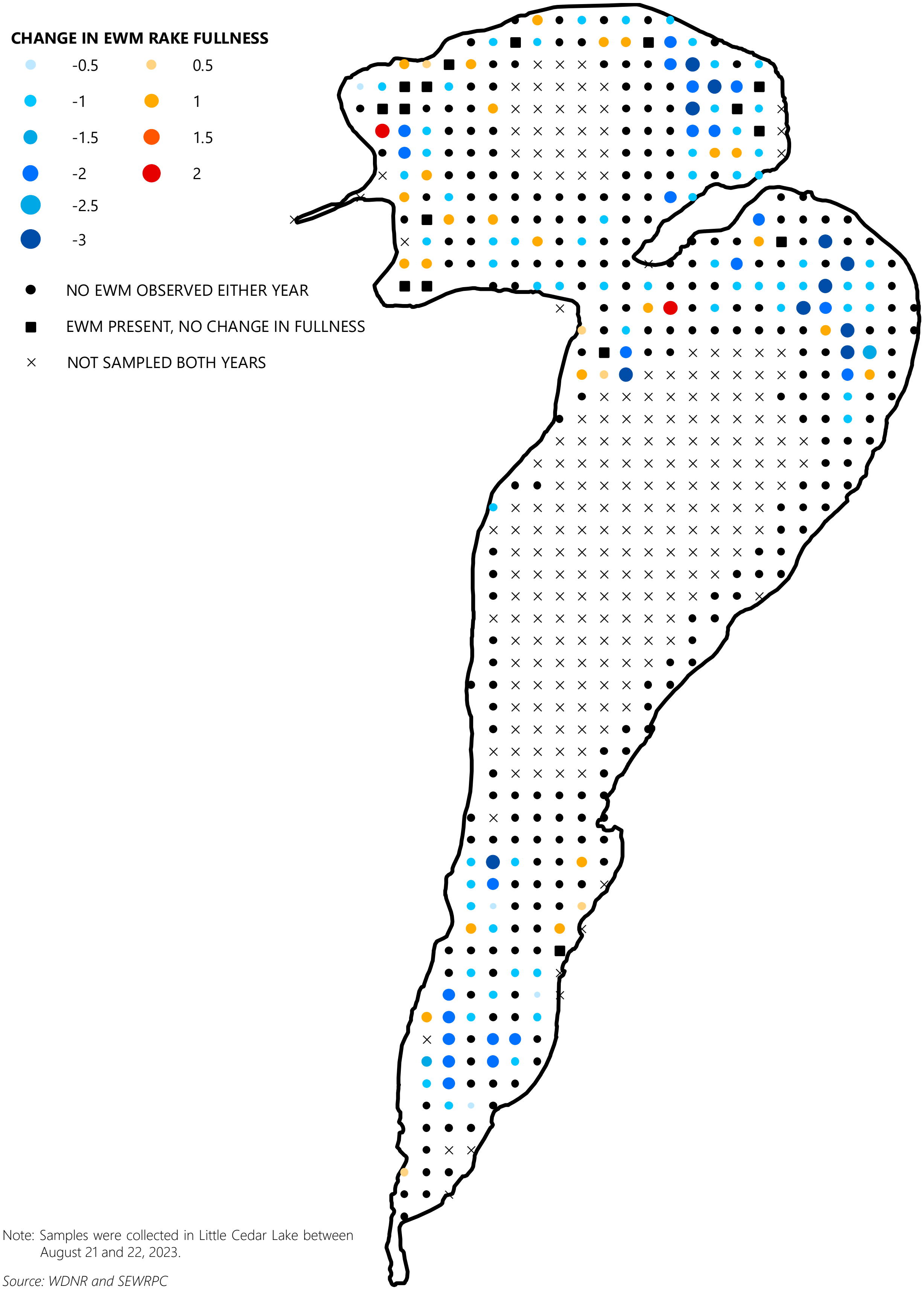
[30] Ibid.

[31] *dnr.wisconsin.gov/sites/default/files/topic/Invasives/Nitellopsis%20obtusa.pdf.*

[32] *G.D. Pullman and G. Crawford, "A Decade of Starry Stonewort in Michigan,"* Lakeline *36-42, 2010.*

[33] *dnr.wisconsin.gov/topic/Invasives/fact/StarryStonewort.html.*

## Figure 2.7
## Change in Eurasian Watermilfoil (*Myriophyllum spicatum*) Distribution in Little Cedar Lake: 2018 vs. 2023




Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

WDNR staff (see Table 2.3). This trend continued in the 2023 survey, with SSW observations in several locations within the southern basin as well as along the eastern edge of the northern basin. However, the overall abundance of SSW remained fairly low with an average rake fullness of 1.1 and SSW appeared to be growing intermixed with native species at most points where it was observed. One exception to this intermixing is a particularly dense and monocultural stand of SSW that Commission staff observed in the channel leading to the outlet dam. This stand has the potential to spread bulbils to Cedar Creek and downstream waterbodies and should be considered for potential treatment.

***Other Exotic Submergent Aquatic Plants***

Curly-leaf pondweed was observed at 11 points in the 2018 Little Cedar Lake survey and at 23 points in the 2023 Little Cedar Lake survey, which were located entirely within the northern basin. 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 that it is presently a 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. As curly-leaf pondweed senesces by midsummer, it may be underrepresented in the inventory data presented in this report.

Spiny naiad is native to North America but was introduced to, and has become naturalized in, Wisconsin. This species is not common within Little Cedar Lake, with observations at one point in 2018 and 9 points in 2023. The WDNR has labeled spiny naiad as a restricted species in Wisconsin, identifying it as an established invasive species that has the potential to cause significant environmental or economic harm.[34] However, spiny naiad is reported to be used as a food source for waterfowl, marsh birds, muskrat, and shelter/forage area for fish.

## 2.3 PAST AND PRESENT AQUATIC PLANT MANAGEMENT PRACTICES

Aquatic plants have been controlled on Little Cedar Lake since at least the 1950s – the earliest date that control program records were kept by State agencies. However, aquatic plant control on the Lake probably predates the 1950s by several decades. Practices employed on Little Cedar Lake to control aquatic plants include chemical applications, mechanical harvesting, and hand-pulling including diver-assisted pulling.

Several aquatic herbicides have previously been used to manage aquatic plants and algae on Little Cedar Lake, including 2,4-D, Diquat, Endothall/Aquathol®, Cutrine®-Plus, and copper sulfate (see Table 2.4).[35] Copper sulfate and Cutrine®-Plus are algaecides that have not been applied to the Lake since 1991. These algaecides are both copper-based contact herbicides that rapidly kill free-floating algae, are toxic to freshwater fish and macroinvertebrates, and can have detrimental effects on amphibians.[36] The effectiveness of these algaecides on the invasive SSW is an area of active research. Diquat and Aquathol® are aquatic herbicides that were applied to the Lake between 1970 and 1991. Endothall/Aquathol® is a contact herbicide that primarily kills pondweeds, but does not control other potentially nuisance species, such as EWM.[37] Diquat is also a contact herbicide that can treat EWM and curly-leaf pondweed but can also affect native aquatic plant species such as coontail, bladderworts, pondweeds, and naiads (*Najas* spp.) and is toxic to freshwater fish and macroinvertebrates.[38]

[34] *Wisconsin Department of Natural Resources, Chapter NR 40, Invasive Species Identification, Classification and Control, April 2017.*

[35] *SEWRPC MR 146, 2004,* op. cit.

[36] *Wisconsin Department of Natural Resources,* Copper Compounds Chemical Fact Sheet EGAD # 3200-2022-20, *December 2022. apps.dnr.wi.gov/swims/Documents/DownloadDocument?id=330737998.*

[37] *Wisconsin Department of Natural Resources,* Endothall Chemical Fact Sheet EGAD # 3200-2022-22, *December 2022. apps.dnr.wi.gov/swims/Documents/DownloadDocument?id=330738024.*

[38] *Wisconsin Department of Natural Resources,* Diquat Chemical Fact Sheet EGAD # 3200-2022-21, *December 2022. apps.dnr.wi.gov/swims/Documents/DownloadDocument?id=332109158.*

## Table 2.4
## Little Cedar Lake Aquatic Plant Chemical Control History: 1950 - 2022

| | Algae Control | | | Macrophyte Control | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | Copper Sulfate (pounds) | Cutrine® Plus (gallons) | Sodium Arsenite (pounds) | 2,4-D (gallons) | 2,4-D (pounds) | 2,4-D (ppb) | Diquat (gallons) | Glyphosate (gallons) | Endothall/ Aquathol® (gallons) | Endothall/ Aquathol® (pounds) |
| 1950-1969 | 700 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1970 | -- | -- | -- | -- | -- | -- | 5.0 | -- | -- | -- |
| 1971 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1972 | -- | -- | -- | -- | -- | -- | -- | -- | 100.0 | -- |
| 1973-1976 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1977 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 50.0 |
| 1978-1983 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1984 | -- | 37.0 | -- | 61 | -- | -- | -- | -- | 4.0 | -- |
| 1985 | -- | 11.0 | -- | 44 | -- | -- | -- | -- | 105.0 | -- |
| 1986 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1987 | -- | 8.0 | -- | -- | -- | -- | 6.5 | -- | 1.5 | -- |
| 1988 | -- | -- | -- | -- | 5.0 | -- | -- | -- | -- | -- |
| 1989 | -- | 6.0 | -- | 15 | -- | -- | 1.5 | -- | 4.3 | -- |
| 1990 | -- | 9.53 | -- | 53 | -- | -- | 6.78 | -- | -- | -- |
| 1991 | -- | 5.75 | -- | 16 | -- | -- | 59.0 | -- | 1.5 | -- |
| 1992-2002 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2003 | -- | -- | -- | 110 | -- | 1,300 | -- | -- | -- | -- |
| 2004 | -- | -- | -- | -- | -- | 800 | -- | -- | -- | -- |
| 2005 | -- | -- | -- | -- | -- | 400 | -- | -- | -- | -- |
| 2006 | -- | -- | -- | -- | -- | 325 | -- | -- | -- | -- |
| 2007 | -- | -- | -- | -- | -- | 1,100 | -- | -- | -- | -- |
| 2008 | -- | -- | -- | -- | -- | 800 | -- | -- | -- | -- |
| 2009 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2010 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2011 | -- | -- | -- | -- | -- | 1,600 | -- | -- | -- | -- |
| 2012 | -- | -- | -- | 155 | -- | -- | -- | -- | -- | -- |
| 2013 | -- | -- | -- | 57 | -- | 700 | -- | -- | -- | -- |
| 2014 | -- | -- | -- | 104.5 | -- | 150 | -- | -- | -- | -- |
| 2015-2022 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total | 700 | 77.28 | -- | 615.5 | 5.0 | N/A | 78.78 | -- | 216.3 | 50.0 |

Note: Gallons represent liquid forms of chemical; pounds represent granular forms.

*Source: Wisconsin Department of Natural Resources, Marine Biochemists, and SEWRPC*

The most recent chemical treatments on the Lake, ranging from 1988 to 2014, were of the aquatic herbicide 2,4-D.[39] 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 most frequently used to control EWM as was the intent of these applications in Little Cedar Lake.[40,41] However, 2,4-D can also kill beneficial species, such as water lilies. The toxicity of 2,4-D to freshwater fish and macroinvertebrates varies from essentially non-toxic to moderately toxic depending on the 2,4-D chemical formulation applied and the length of the organism's exposure to the application.

Mechanical harvesting is the predominant method used to control aquatic plant growth on the Lake with a primary focus on facilitating recreational boating access and reducing the spread of invasive species. The District is currently permitted to harvest 13.25 acres and harvesting operations are carried out by the Big Cedar Lake Protection and Rehabilitation District through an intergovernmental agreement.[42,43] The District has maintained records of the total volume of harvested plants since 2016 (see Table 2.5). The District also contracted Eco Waterway Services, LLC for diver-assisted hand-pulling to remove SSW near the Ackerman's Grove public launch with the goal of minimizing the spread of SSW within the Lake and to other lakes.[44]

**Table 2.5**
**Aquatic Plants Harvested in Little Cedar Lake: 2016-2023**

| Year | Plant Material Removed (cubic yards) |
|---|---|
| 2016 | 68.8 |
| 2017 | 95.4 |
| 2018 | 120.9 |
| 2019 | 181.9 |
| 2020 | 159.7 |
| 2021 | 146.4 |
| 2022 | 128.7 |
| 2023 | 86.5 |
| Mean Per Year | 123.6 |

*Source: Little Cedar Lake Protection and Rehabilitation District and SEWRPC*

A benefit of harvesting versus chemical treatment is that harvesting physically removes plant mass and the nutrients contained therein. The Commission calculated the pounds of total phosphorus removed through harvesting in Little Cedar Lake by multiplying the annual mass of aquatic plants removed by the phosphorus concentration of those aquatic plants, with the following notes and assumptions:

- The density of the wet harvested plants was assumed to be approximately 300 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 percent of the total dry weight of the plant. The Whitewater-Rice and Minnesota studies assumed that dry weight is 15 and 7 percent of the wet weight, respectively, and phosphorus constituted 0.31 and 0.30 percent 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 other studies.[45, 46]

[39] *Marine Biochemists, 2018,* op. cit.

[40] *Wisconsin Department of Natural Resources,* 2,4-D Chemical Fact Sheet EGAD # 3200-2022-14, *December 2022. apps.dnr.wi.gov/swims/Documents/DownloadDocument?id=330737905.*

[41] *Marine Biochemists, 2018,* op. cit.

[42] *WDNR Permit SE-2019-67-4187M, 2019,* op. cit.

[43] *Personal communication between SEWRPC and Big Cedar Lake Protection and Rehabilitation District staff on October 18th, 2023.*

[44] *WDNR Permit SE-2019-67-5204M,* Aquatic Plant Management Permit Application, *2019.*

[45] *K.M. Carvalho and D.F. Martin, "Removal of Aqueous Selenium by Four Aquatic Plants," Journal of Aquatic Plant Management 39: 33-36, 2001.*

[46] *G. Thiébaut "Phosphorus and Aquatic Plants. In: P.J. White and J.P. Hammond (eds) The Ecophysiology of Plant-Phosphorus Interactions,"* Plant Ecophysiology *7, 2008.*

Using these methods, the Commission estimates that aquatic plant harvesting has removed approximately 680 pounds of phosphorus from the Lake during the six years for which plant harvest records are available (see Figure 2.8). The District's harvesting removes an average of 30 pounds of phosphorus from the Lake each year. A 2001 Commission study estimated that the average total annual phosphorus load to the Lake in 1995 was 2,100 pounds.[47] Therefore, aquatic plant harvesting may remove up to 1.4 percent of the total phosphorus contributed annually by surface runoff and tributary streams.

## 2.4 POTENTIAL AQUATIC PLANT CONTROL METHODOLOGIES

Aquatic plant management techniques can be classified into six categories.

- *Physical measures* include lake bottom coverings
- *Biological measures* include the use of organisms such as herbivorous insects
- *Manual measures* involve physically removing plants by hand or using hand-held tools such as rakes
- *Mechanical measures* rely on artificial power sources and remove aquatic plants with a machine known as a harvester or by suction harvesting
- *Chemical measures* use aquatic herbicides to kill nuisance and nonnative plants *in-situ*.
- *Water level manipulation measures* utilize fluctuations in water levels to reduce aquatic plant abundance and promote growth of specific native species

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." Water level manipulations require a permit and are regulated under *Wisconsin Statutes* 30.18 and 31.02.[48,49] More details about aquatic plant management each are discussed in the following sections while recommendations are provided later in this document.

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.[50] 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.[51] These plans and plan execution are reviewed and overseen by the WDNR regional lakes and aquatic invasive species coordinators.[52]

---

[47] *SEWRPC MR 137, 2001, op. cit.*

[48] *docs.legis.wisconsin.gov/statutes/statutes/30/ii/18.*

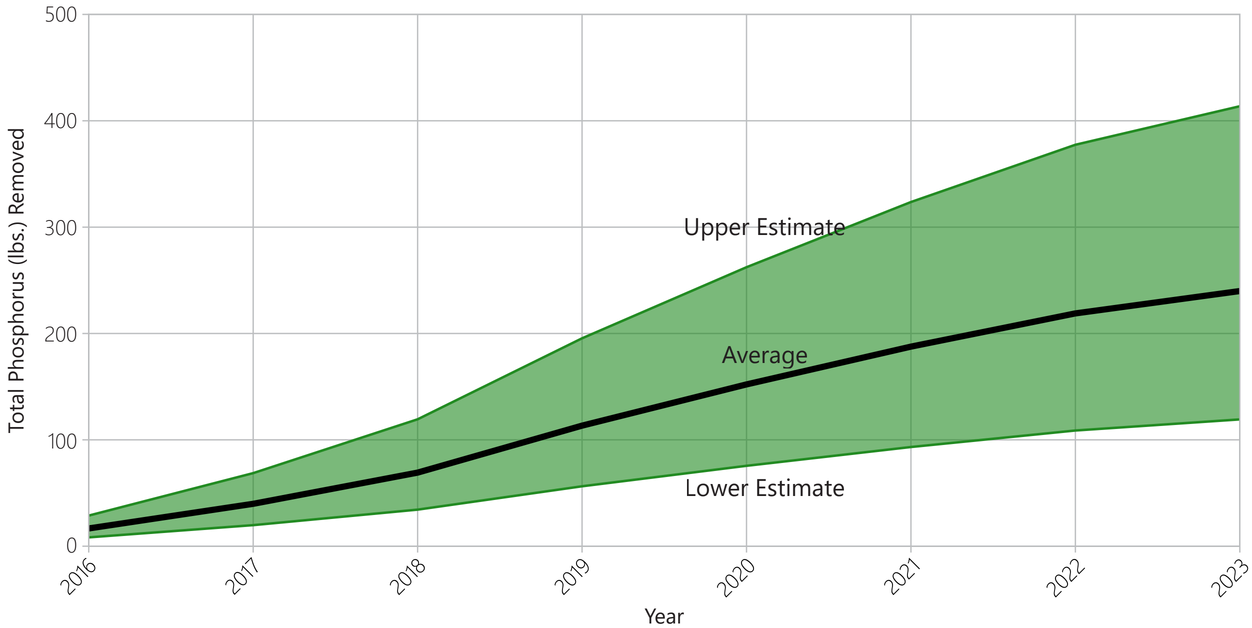
[49] *docs.legis.wisconsin.gov/statutes/statutes/31/02.*

[50] *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.*

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

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

**Figure 2.8**
**Little Cedar Lake Phosphorus Removal by Harvesting: 2016-2023**




*Source: Little Cedar Lake Protection and Rehabilitation District and SEWRPC*

### 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 the 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.[53] For example, milfoil weevils (*Eurhychiopsis lecontei)* have been used to control EWM. Milfoil weevils do best in waterbodies with balanced panfish populations,[54] 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

[53] *B. Moorman, "A Battle with Purple Loosestrife: A Beginner's Experience with Biological Control,"* LakeLine *17(3): 20-21, 34-37, September 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, editors,* Ecological Entomology*, John Wiley, New York, New York, USA.*

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

incrementally maintain water depth, improves water quality, and can help decrease the spread of nuisance/exotic plants. Hand raking and hand pulling are readily allowed by WDNR and are practical methods to control riparian landowner scale problems.

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

- Tools are 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
- 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, curly-leaf pondweed) during the high growth season when native and nonnative species often mix. 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.[55]

***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 early in the season (e.g., EWM, curly-leaf pondweed) when native plants have not yet emerged or appreciably grown.

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

A disadvantage of mechanical harvesting is that the harvesting process may fragment plants and thereby unintentionally propagate EWM and curly-leaf pondweed. 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,[56] 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 reduce regrowth of nuisance plants while maintaining, or even enhancing, native plant communities.

Cut plant fragments commonly escape the harvester's collection system and form mats or accumulate on shorelines. 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, DASH, and Diver-Assisted Hand Pulling***

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.

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 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. If the District or individual property owners choose to employ DASH, a NR 109 permit is required. 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 harvesting which in turn reduces native plant loss; and 3) lower potential for disturbing fish habitat.

The District has been actively collaborating with WDNR staff and the Washington County Aquatic Invasive Species (AIS) Coordinator to monitor and manage the Lake's populations of starry stonewort since its discovery within the Lake. In 2019, the District received a mechanical/manual aquatic plant control permit from the WDNR to utilize diver-assisted hand-pulling across a 0.11-acre area on a recently discovered SSW population near Ackerman's Grove launch.[57] This permit only allows for hand-pulling of SSW and does not allow for any sediment to be suctioned by divers.

In July and August 2023, the Washington County AIS Coordinator and WDNR staff completed two sub-point-intercept surveys for SSW near the boat launch at Ackerman's Grove County Park to inform and examine diver-assisted hand-pulling treatments of this SSW population. As illustrated on Figures B.1 and B.2 of Appendix B, SSW was observed at 44 of 57 points (77 percent) in July and at 30 of 57 points (53 percent) in August, indicating a decrease in the SSW coverage within this area following the hand-pulling treatment. The abundance of SSW in the treatment area seemed to decrease as well, with 11 points having

---

[56] *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.*

[57] *WDNR, Chemical Aquatic Control Permit SE-2019-67-5204M, July 2019.*

a rake fullness of two or three in July but only two points having a rake fullness of two or three in August. This treatment was conducted prior to the Commission's aquatic plant survey and Commission staff noted areas without any SSW where it had previously been observed (see Figure A.3 in Appendix A).

**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 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.[58] For example, conflicting studies/opinions exist regarding the role of the chemical 2,4-D as a human carcinogen.[59] 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 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.[60] Early season application also is generally the best time to treat EWM and curly-leaf pondweed 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 tend 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 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.[61] Ice covered lakes and the deep portions of stratified lakes are particularly vulnerable to oxygen

---

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

[59] *M.A. Ibrahim et al., "Weight of the Evidence on the Human Carcinogenicity of 2,4-D",* Environmental Health Perspectives *96: 213-222, December 1991.*

[60] *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.*

[61] *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.*

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 curly-leaf pondweed 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 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 Lake, these chemicals must target EWM or curly-leaf pondweed 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 early spring).

- **Need for repeated treatments.** Chemical herbicides are not a one-time silver-bullet solution—instead, treatments 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 lakebed 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 which in turn 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.[62,63] 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.

- **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.[64] 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.

---

[62] *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.*

[63] *E.A. LaRue 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.*

[64] *M. Nault et al., "Control of Invasive Aquatic Plants on a Small Scale,"* Lakeline *35-39, 2015.*

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 Measures**

Manipulating water levels can also be an effective method for controlling aquatic plant growth and restoring native aquatic plant species, particularly emergent species such as bulrush and wild rice.[65] In Wisconsin, water level manipulation is considered to be most effective by using winter lake drawdowns, which expose lake 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. As large areas of lake sediment need to remain exposed for extended periods, water level manipulation is most cost effective in lakes with operable dam gates that can provide fine levels of control of water elevations within the lake. In lakes without dams, high capacity water pumping can be used to reduce lake levels at much greater cost.

While water level manipulation affects all aquatic plants within the drawdown zone, not all plants are equally susceptible to drawdown effects. Abundance of water lilies and milfoils (*Myriophyllum* spp.) can be greatly reduced by winter drawdowns while other species, such as duckweeds, may increase in abundance.[66] Two studies from Price County, Wisconsin show reduced abundance of invasive EWM and curly-leaf pondweed and increased abundance of native plant species following winter drawdowns.[67,68] Thus, drawdowns can be used to dramatically alter the composition of a lake's aquatic plant community. Many emergent species rely upon the natural fluctuations of water levels within a lake. Conducting 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 the exposed lake sediments, which subsequently provide food and habitat for fish and wildlife. However, undesired emergent species, such as invasive cattails and phragmites, can also colonize exposed sediment, so measures should be taken to curtail their growth during a drawdown.[69]

Water level manipulation can also have unintended impacts on water chemistry and lake fauna.[70,71] Decreased water clarity and dissolved oxygen concentrations as well as increased nutrient concentrations and algal abundance have all been reported following lake drawdowns. Rapid drawdowns can leave lake macroinvertebrates and mussels stranded in exposed lake sediment, increasing their 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 nests are flooded as water levels are raised in the spring. Therefore, thoughtful consideration of drawdown timing, rates, and elevation as well as the life history of aquatic plants and fauna within the lake is highly recommended. Mimicking the natural water level regime of the lake as closely as possible may be the best approach to achieve the desired drawdown effects and minimize unintended and detrimental consequences.

As discussed above, water level manipulation is large-scale, permitted operation that can have major effects on lake ecology. Consequently, detailed information on the Lake's 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:

---

[65] *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 as well as 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.*

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

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

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

[69] *Blanke et al., 2019, op. cit.*

[70] Ibid.

[71] *Cooke, op. cit.*

- Existing lake bottom contours should be reevaluated (see Map 1.1) with any changes mapped 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 on the lake drawdown to the structural integrity of outlet dams should be examined.

- 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.

# 3 MANAGEMENT RECOMMENDATIONS AND PLAN IMPLEMENTATION

*Credit: Commission Staff*

Little Cedar Lake supports a robust and diverse aquatic plant communities. However, the invasives Eurasian watermilfoil (EWM), starry stonewort (SSW), and curly-leaf pondweed are present in the Lake and require careful management. On account of these and other factors, aquatic plant management continues to be an important approach to maintaining the excellent natural resource service the Lake provides. This chapter presents holistic management alternatives and recommended refinements to the existing aquatic plant management plan.

## 3.1 RECOMMENDED AQUATIC PLANT MANAGEMENT PLAN

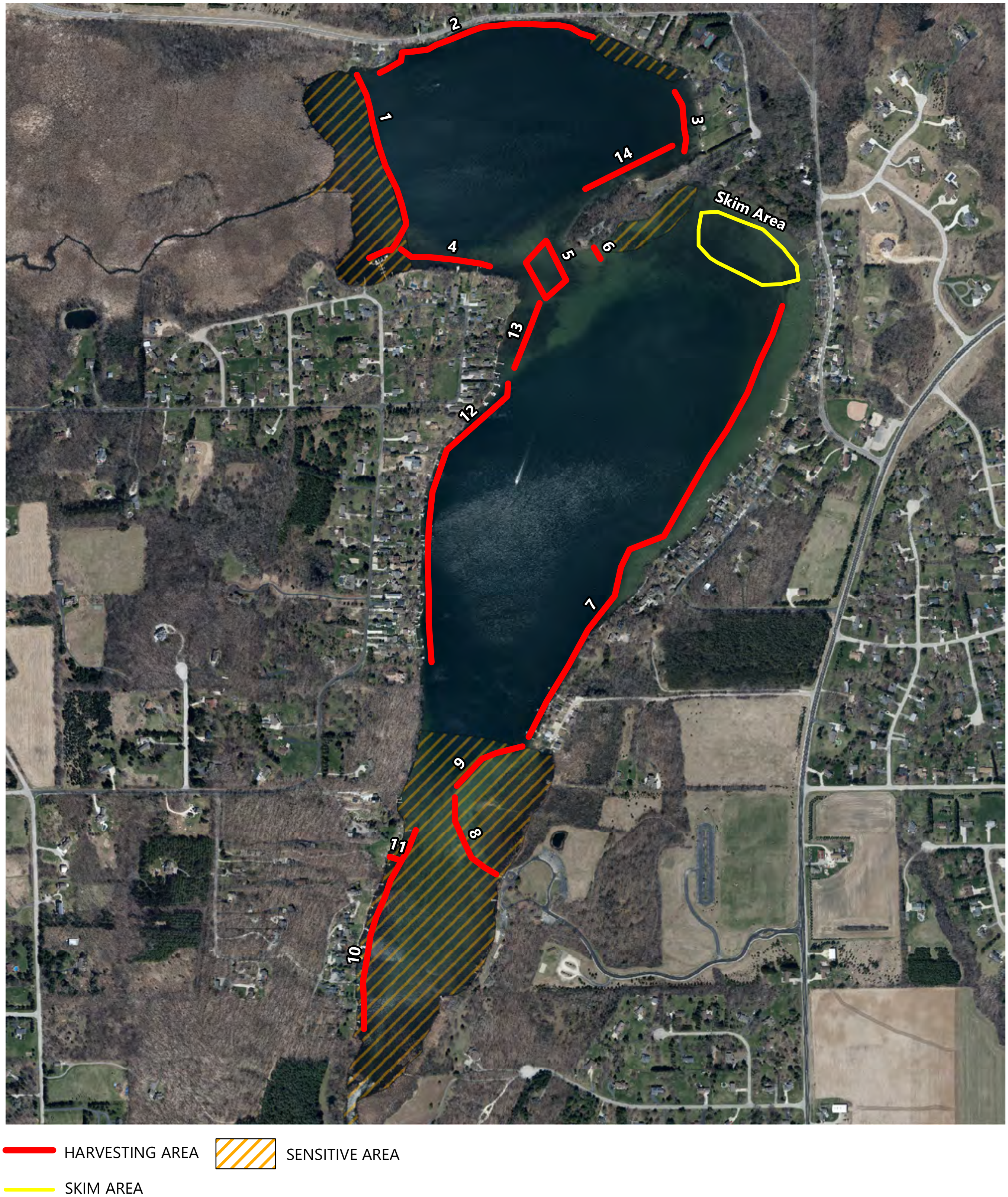
The most effective plans to manage nuisance and invasive aquatic plant growth rely on a combination of methods and techniques as well as consideration of when and where these techniques should be applied. The recommended aquatic plant management plan is presented in Figure 3.1 and briefly summarized in the following paragraphs. These management techniques were discussed with both the Little Cedar Lake Protection and Rehabilitation District (District) and the WDNR (see Appendix B).[72]

1. **Mechanically harvest invasive and nuisance aquatic plants.** Mechanical harvesting should remain the primary means to manage invasive and nuisance aquatic plants on Little Cedar Lake. Harvesting must avoid, or must be substantially restricted, in certain areas of the Lake. This includes areas of greater 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. 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.

[72] *Wisconsin Department of Natural Resources,* Proposed Edits to Aquatic Plant Management Plan, Little Cedar Lake*, April 30th, 2024.*

**Figure 3.1**
**Aquatic Plant Management Plan for Little Cedar Lake**




Note: See Table 3.1 for recommended dimensions of harvesting areas and skim area.

*Source: WDNR and SEWRPC*

3. **Limit chemical use.** Large-scale chemical treatment is not part of the District's aquatic plant management plan. Chemical use is not recommended within WDNR-designated "Sensitive Areas." Nevertheless, the District may want to consider a rapid response chemical treatment for Chapter NR 40 prohibited species (e.g., hydrilla, *Hydrilla verticillata)*, where appropriate, if such a species were to appear in the Lake in the future. However, this method of aquatic plant control has several drawbacks (e.g., water quality, comparatively nonselective, chemical side effects, and more) and should only be considered under exceptional circumstances.

4. **Continue monitoring for invasive species populations.** The District should continue to conduct frequent monitoring near the Ackerman's Grove boat launch and any other access points. Conducting pre- and post-treatment sub-point-intercept surveys would be ideal for evaluating the effects of any treatment on SSW, EWM, and non-target species. Frequently conducting meander surveys or spot checks near the outlet dam and public and private launches can allow more rapid detection and response before SSW can spread from these locations. The District should share updates on its invasive species population monitoring with the WDNR and the Washington County AIS Coordinator.

5. **Continue participation in the Clean Boats Clean Waters program.** Participation in this program proactively encourages lake users to clean boats and equipment before launching and using them in the Lake.[73] This will help lower the probability of invasive species entering and leaving the Lake. An aquatic invasive species removal sign is already present at the Ackerman's Grove launch.

6. **Stay abreast of best management practices to address invasive species.** The District should continue to regularly communicate with the Washington County AIS Coordinator and WDNR staff about the most effective treatment options for EWM and SSW as novel techniques and/or chemical products that may more effectively target these species become available.

**Management Methods**

The following subsection provides recommendations on which aquatic plant management methods are currently suitable for Little Cedar Lake.

***Mechanical Harvesting***

Prior to 2016, the District utilized the services of a private firm to conduct harvesting operations on Little Cedar Lake.[74] Since 2016, the District has contracted its harvesting operations and pier pickup through an intergovernmental agreement with the Big Cedar Lake Protection and Rehabilitation District. The District owns one aquatic plant harvester: an ILH7-450 from Inland Lake Harvester. This model is a moderately sized harvester with a length of 39 feet, a weight of 12,200 pounds, a 450 cubic foot payload, and a seven foot cutting bar. This harvester can cut down to six feet deep, which is suitable for harvesting in most of the Lake. 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. Recent maintenance records indicate that the harvester is largely in "OK" condition with 383.9 operating hours as of October 2023.[75] The only major equipment change on the harvester was a replacement of the original Isuzu engine with a Kubota engine that is still under warranty.

This harvester is currently supported by a conveyor and dump truck stationed at the current offload site: a private launch owned by the Cedar Bay Association, Inc., a homeowner association for homes along the northwestern shore of the Lake (see Map 3.1).[76] The District's current agreement with the Cedar Bay Association, Inc. allows them to use the launch for harvesting operations on Tuesday, Wednesday, and Thursday every other week except for during holiday weeks, such as the 4th of July. The District is also in the process of obtaining a conveyor trailer that would be used at a second offload site: the Ackerman's Grove County Park launch on the southeastern shore of the Lake. Use of this secondary site would save time and expenses shuttling plants harvested in the southern bay across the Lake to the northern disposal

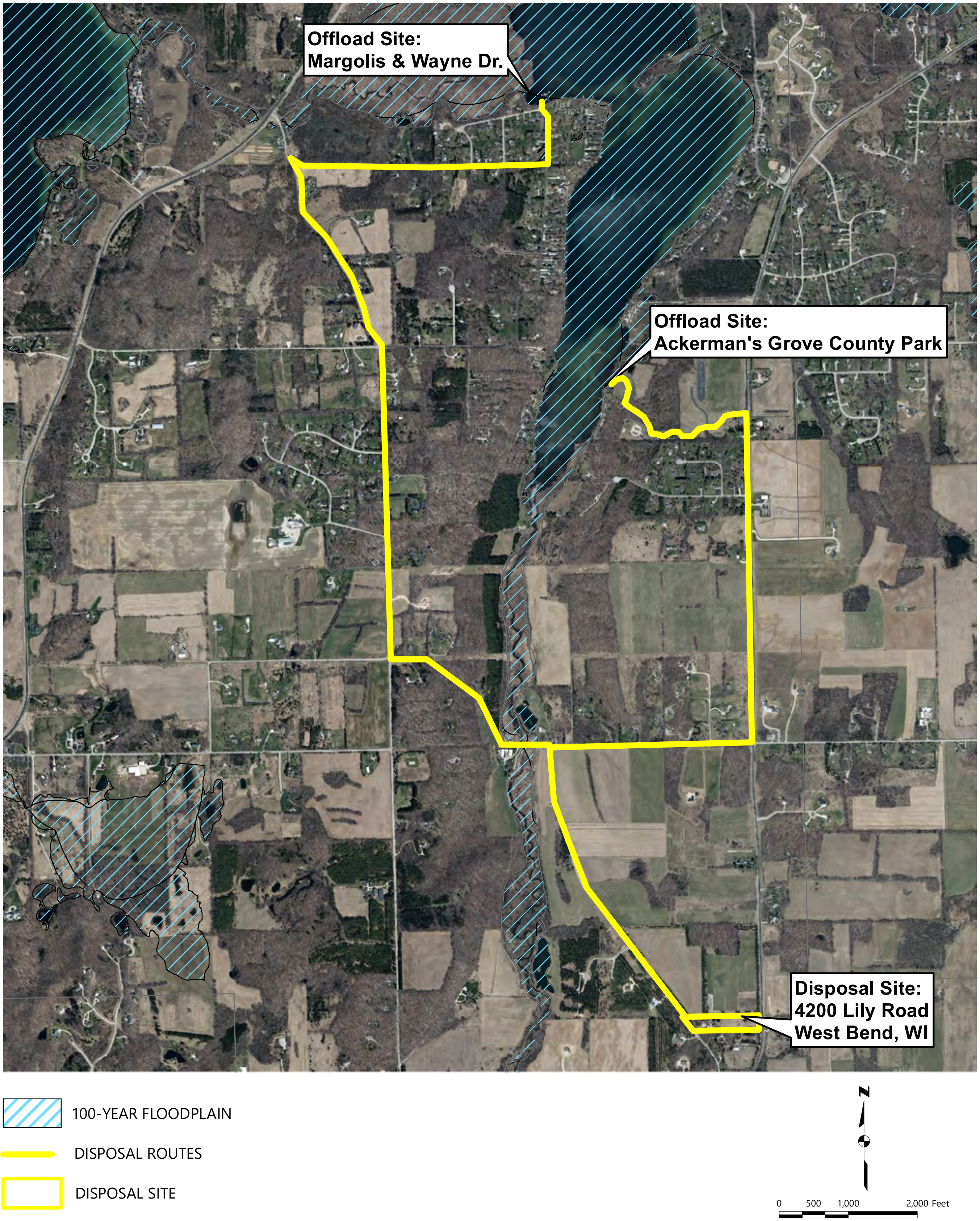
[73] *Further information about Clean Boats Clean Waters can be found on the WDNR website at: dnr.wi.gov/lakes/cbcw.*

[74] *Personal communication between the District and Commission staff on January 9th, 2024.*

[75] *Inland Lake Harvesters*, Inspection Checklist*, October 24, 2023.*

[76] *Personal communication between the District and Commission staff on January 9th, 2024.*

**Map 3.1**
**Harvesting Offloading and Disposal Sites and Routes**




*Source: WDNR and SEWRPC*

site. Additionally, this change would enable the District to harvest when they would currently be limited by launch access for disposal, such as holiday weeks.

According to the harvesting operator, the time spent harvesting different areas of the Lake under the current harvesting plan varies by the year.[77] The general locations of harvesting areas are schematically illustrated in Figure 3.1 with detailed cutting depths and lengths in Table 3.1. The approximate orientation and extent of proposed harvesting areas within the Lake were largely maintained as published in the 2018 aquatic plant management plan, but changes were recommended for the "Skim Area".[78,79] The WDNR would not be able to approve other proposed changes to Area 10 and Area 13 in a NR 109 permit application; these changes are not recommended as part of this management plan as the entirety of the plan could not be approved in a NR 109 permit application (see "Area 10 Proposed Change Comments", "Area 13 Proposed Change Comments", and "Water Resource Biologist NR 109 permit decisions" in Appendix B).[80] The precise locations of the harvest areas must be chosen carefully and must be maintained in a fixed position throughout the year to avoid unintentional disturbance to adjacent sensitive areas. Harvesting lane position should consider water depth, plant species present, lane use, and boating habits/practices on the Lake. For example, whenever possible, lanes should favor deeper water areas, should support the Lake's recreational uses, and should attempt to focus plant harvest on invasive species. Additional information regarding cutting patterns and depth is provided below.

1. **Except for navigational access lanes, harvesters must not be operated nearshore in water less than 36 inches feet deep.** Mechanical harvesting may be expanded in shallow, obstacle-prone nearshore areas throughout the Lake if a small-scale harvester is available. Even though the District's harvester may be able to navigate in waters in as shallow as 12 inches when empty, at least 12 inches of plant growth should remain standing after harvesting. Therefore, aside from regulatory restrictions, mechanically harvesting aquatic plants in extremely shallow water (e.g., areas with less than 18 inches of water depth) is not practical.

2. **Maintain at least 12 inches of living plant material after harvesting.** The District's current aquatic plant harvester can cut aquatic plants up to 65 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 early in the season depriving later emerging native plants of light and growing room.

3. **Collect and properly dispose harvested plants and collected plant fragments.** Outside of mapped areas, the harvester may surface skim free-floating vegetation that has been previously cut or uprooted, but not collected, to a depth of one foot. Use of the cutter head is not permitted for this action. In addition, 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.

   All harvested and collected plant material is deposited at individual sites within the Township that are not located in a floodplain or wetland. Disposing of any aquatic plant material within identified floodplain and wetland areas is prohibited. Plant material will be collected and disposed of 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.

---

[77] *Personal communication between the District and Commission staff on January 9th, 2024.*

[78] *Marine Biochemists, 2018,* op. cit.

[79] *Wisconsin Department of Natural Resources,* Proposed Edits to Aquatic Plant Management Plan, Little Cedar Lake*, April 30th, 2024.*

[80] Ibid.

## Table 3.1
## Aquatic Plant Harvesting Lane and Skim Area Dimensions for Little Cedar Lake

| Area | Acres | Length (feet) | Width (feet) | Depth of Cut (feet) | Skim Acres | Skim Length (feet) | Skim Width (feet) | Skim Depth (feet) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.76 | 1,100 | 30 | 2 | 0.51 | 1,100 | 20 | 1 | Skim east of harvest lane |
| 2 | 0.9 | 1,300 | 30 | 3 | | | | | |
| 3 | 0.8 | 700 | 50 | 2 | | | | | |
| 4 | 0.41 | 600 | 30 | 2 | 0.28 | 600 | 20 | 1 | Skim north of harvest lane |
| 5 | 1.9 | 420 | 100-200[a] | 2 | | | | | |
| 6 | 1.2 | 300 | 30 | 2 | | | | | |
| Skim Area[b] | | | | | 2.30 | 500 | 200 | 1 | Skim between Areas 6 & 7 |
| 7 | 1.8 | 2,600 | 30 | 2 | | | | | |
| 8 | 0.48 | 700 | 30 | 2 | | | | | |
| 9 | 0.41 | 600 | 30 | 2 | | | | | |
| 10 | 0.38 | 1,100 | 15 | 1 | | | | | |
| 11 | 0.07 | 100 | 30 | 1 | | | | | |
| 12 | 1.31 | 2,400 | 30 | 2 | | | | | |
| 13 | 0.34 | 500 | 30 | 2 | | | | | Cut for EWM and do not cut pondweeds by piers |
| 14 | 0.34 | 30 | 30 | 2 | | | | | |
| Total | 10.16 | | | | 3.09 | | | | |

[a] *100 feet permitted for Area 5; 100 additional feet only if severe navigational impediment.*

[b] *Harvesting only permitted during spring (late April to late May) & early fall (before September 30th) and only when EWM canopy is present.*

*Source: SEWRPC*

4. **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. The approaches to employ in differing management areas are illustrated in Figure 3.1 and described below.

    a. Harvesting is limited to certain areas of the Lake: Harvesting is limited to navigational lanes only in areas denoted as WDNR-designated "Sensitive Areas" in Figure 3.1. Raking and other manual aquatic plant removal methods should be utilized in these areas. A shallow cut should be used in Areas 10 and 11, which provide private navigational access in WDNR-designated "Sensitive Areas (see Table 3.1).

    b. Main navigational access lanes are given high priority: Channels providing travel thoroughfares for watercraft, such as Area 5 which covers the channel between the northern and southern basins and Area 8 that provides main lake access from the Ackerman's Grove boat launch, should continue to be prioritized (see Figure 3.1). Harvesting in these areas should strive to leave at least two feet of vegetation above the Lake bottom to promote fish habitat, particularly in Area 8 which is within WDNR-designated "Sensitive Area."

    c. Private navigational access lanes are given moderate priority: Harvesting in nearshore areas should focus on providing access to and from private docks and piers to the main lake. At least one foot of plant material must remain on the Lake bottom to minimize resuspension of lake-bottom sediment and maintain desirable plant communities. Given the potential to spread SSW through harvesting activities, harvesting should strive to use a shallow cut in these areas whenever possible.

    d. Harvesting in the "Skim Area" should only occur when EWM canopy is present: In the previous aquatic plant management plan, this area was identified as a concentrated area for EWM. Consequently, the previous management plan and permit allowed harvested in early spring (defined as late April to early May) and early fall (defined as before September 30th) only when an EWM canopy was present. These restrictions were set in place as the vegetated part of the "Skim Area" has been identified as an important fish rearing habitat and intensive harvesting in this area during summer could disrupt or destroy that habitat.

       However, during years with late ice off, there can be little to no aquatic growth in this area until after mid or late May when harvesting is restricted. Consequently, EWM can grow unabated by harvesting; this harvesting could help to promote late-growing native species in the Skim Area by reducing EWM cover. While EWM was not abundant in the Skim Area in 2023, it has been observed more abundantly in recent surveys and the overall lake EWM population was much lower in 2023 than in recent years. Muskgrass, eelgrass (*Vallisneria americana*), naiads, and pondweeds were observed in the vegetated parts of the Skim Area in 2023. Spring harvesting of EWM within the Skim Area should be extended to late May and then discontinued until early fall (see "Skim Window Change Comments" in Appendix B). As with the previous management plan, harvesting should only occur in this area when there is an EWM canopy present and a minimum of three feet water depth. At least one foot of plant material should be left on the lake bottom following harvesting.

5. **Harvesting native pondweeds (*Potamogeton* spp.) and muskgrasses (*Chara* spp.) is prohibited.** These plants provide habitat for young fish, reptiles, and insects in the Lake.

6. **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.

7. **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.

8. **Management, record keeping, monitoring, and evaluation.** District staff manage harvesting operations, and, although they may delegate tasks, are 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 public. The report will also present information regarding harvesting operation and maintenance, equipment acquisitions and/or needs, expenditures, and budgets.

9. **Logistics, supervision, and training. Harvesting equipment is owned and operated by the District.** District staff are responsible for overall harvesting program oversight and supervision. Although District staff are 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 carry out their respective job functions successfully and efficiently. For example, District staff 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. 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 Lake. 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

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

- Reaffirm that all harvester operators are legally obligated to accurately track and record their work to include 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 aid training, safety training, and other elements that help promote safe, reliable service.

10. **Dispose of debris and collected plant material from harvesting activities at the designated disposal sites.** The disposal sites currently used by the District's harvesting program are illustrated on Map 3.1. Disposing of any aquatic plant material within identified floodplain and wetland areas is prohibited and special care should be taken to ensure that plant debris is not disposed of in such areas.

***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 Lake residents decide to utilize raking to manually remove aquatic plants, the District or other interested party could acquire several 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 is considered a viable option in the Lake and should be employed wherever practical. Volunteers or homeowners could employ this method, if 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.[81]

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:

- EWM, 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

Any other manual removal technique requires a State permit, unless specifically used to control designated nonnative invasive species such as EWM. 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.

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.[82]

[81] *Visit dnr.wi.gov/lakes/plants for more information on identification and control of invasive aquatic plants.*

[82] *Commission and WDNR staff could help review documents developed for this purpose.*

***Suction Harvesting, DASH, and Diver-Assisted Hand Pulling***

Suction harvesting, DASH, and diver-assisted hand pulling are not practical for widespread application across the Lake but can be effective for spot treatments of dense invasive species populations. The District has been utilizing diver-assisted hand-pulling in this manner to control SSW near the Ackerman's Grove boat launch. As described in Section 2.4, this hand-pulling was effective in reducing biomass of SSW in this area, but it remains in the plant community. Following treatment, rake fullness was reduced to one in nearly all points in annual sub-point-intercept plant surveys near the boat launch (see Figure B.2 in Appendix B). Continued diver-assisted hand-pulling near the Ackerman's Grove launch is recommended to help reduce the spread of SSW from Little Cedar to other lakes. Targeted treatment of dense, monocultural beds of SSW, such as found in the channel to the outlet dam, using diver-assisted hand-pulling is also recommended to help reduce the spread of SSW into Cedar Creek and downstream waterbodies, such as the Milwaukee River and the Milwaukee River estuary. The subsection "Starry Stonewort Management at Outlet Dam and Boat Launch" later in this chapter describes a plan to begin hand-pulling treatments at the SSW population near the outlet dam and to continue treatments on the SSW population near the boat launch.

Diver-assisted hand-pulling treatments are not recommended in areas where SSW is growing intermixed with native species as the disturbance from the treatment may help facilitate the spread and establishment of SSW at the expense of native species. In these instances, the most effective control method for reducing the spread and density of SSW may be to minimize disturbance and allow the native species to compete with SSW. This strategy has been effective thus far on nearby Pike Lake in Washington County, where SSW frequency of occurrence has remained relatively low observed despite no active management of the population.[83]

***Chemical Treatment***

Large-scale chemical treatment is currently not recommended in Little Cedar Lake due to the low impact of chemical treatments on SSW, the relatively low abundance of other invasive species that are susceptible to chemical treatments, and the high diversity of susceptible native species within the Lake. 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. If monitoring suggests a dramatic change in invasive species populations, particularly EWM, recommendations regarding large-scale chemical treatments should be reviewed as chemical treatments have suggested to be effective at controlling EWM within the Lake in the past.[84]

***Water Level Manipulation***

The Little Cedar Lake dam controls water levels in the Lake. A lake-wide drawdown would not effectively target the invasive species populations in the lake and would expose many sensitive species to desiccation. Consequently, a drawdown is not recommended at this time, but the option should be considered if an invasive species population becomes much more widespread. If the District wishes to utilize drawdowns as a lake management tool, a hydrologic study of the Lake should first be conducted to better inform how the Lake would respond to drawdown scenarios.

**Starry Stonewort Management at Outlet Dam and Boat Launch**

As described in Section 2.2, "Aquatic Plant Community Composition, Change, and Quality," Commission staff observed a dense, near monocultural bed of SSW at the southern end of the lake near the outlet dam. This bed had also been observed by lake residents and communicated to the District, Washington County, and the WDNR. On March 14th, 2024, WDNR staff met with the District and the Washington County AIS Coordinator to review a plan to monitor and address this SSW population near the outlet dam as well as plan for continued treatment of the SSW population near the boat launch at Ackerman's Grove.[85] The following is a summary of the resulting plan:

[83] *Wisconsin Department of Natural Resources,* 3200-2020-02 Starry Stonewort Research Factsheet*, revised January 2024. See apps.dnr.wi.gov/swims/Documents/DownloadDocument?id=236973678 for more information.*

[84] *Marine Biochemists, 2018,* op. cit.

[85] *Personal communication between WDNR (Heidi Bunk) and Commission staff (Justin Poinsatte) on April 25th, 2024.*

- SSW Population Near Outlet Dam
  - Near Memorial Day, the District and the Washington County AIS Coordinator will examine the SSW population near the outlet dam to observe when it begins to start growing and will begin to monitor water levels throughout the growing season.
  - In mid-June, WDNR and the Washington County AIS Coordinator may conduct a quadrat survey on this population to record species present and estimate percent cover.[86] This survey would inform a following hand-pull treatment.
  - In late June, the District may contract with divers to conduct diver-assisted hand-pulling of the southern SSW population near the outlet dam. This treatment would be supervised by the Washington County AIS Coordinator. Prior to this treatment, the District would contact WDNR dam engineers to determine if the District can temporarily put boards up on the dam during the treatment to prevent pulled SSW from traveling downstream over the dam. The dam boards would be returned to normal immediately after the conclusion of the hand-pulling.
- SSW Population Near Boat Launch
  - In early July, WDNR staff and the Washington County AIS Coordinator will conduct a sub-point-intercept survey at the boat launch to examine the SSW distribution.
  - In late July to early August, the District may contract with divers to conduct diver-assisted hand-pulling of SSW near the boat launch. The Washington County AIS Coordinator plans to be present during this hand-pulling treatment.
  - In mid-August , WDNR staff and the Washington County AIS Coordinator will conduct a second sub-point-intercept survey at the boat launch to examine the SSW distribution following the first treatment.
  - In late August, a second diver-assisted hand-pulling at the boat launch may be conducted if the mid-August sub-point-intercept survey results warrant this treatment.
- Potential 2024 Point-Intercept Survey
  - The Early Detection and Response grant that the District received in 2023 included funding for a lake-wide aquatic plant point-intercept survey that could be completed in summer 2024 pending the results of the 2023 point-intercept survey.[87]

**Future Funding**

Current efforts pursued by the District have focused on protecting native aquatic plant species in the Lake while suppressing the growth and limiting the spread of SSW. These efforts have been funded in part through WDNR Early Detection and Response grants.[88] The District should continue to utilize WDNR Surface Water Grants to further their efforts with monitoring in the Lake, watercraft inspection efforts at the Ackerman's Grove boat launch, and targeted management of invasive species within the Lake. Key grant programs to fund these efforts are as follows:

- **Clean Boats, Clean Waters** – this grant program covers up to 75 percent of up to $24,000 to conduct watercraft inspections, collect data, educate boaters about invasive species, and reporting invasive species to the WDNR.

---

[86] *A quadrat survey will be utilized as this population was deemed too small for a sub-point-intercept survey.*

[87] *Wisconsin Department of Natural Resources Aquatic Invasive Species Grant AIRR28423,* Little Cedar Lake Protection and Rehabilitation District: Starry Stonewort Containment in Little Cedar Lake 2, *March 2023. See apps.dnr.wi.gov/swims/Projects/ProjectDetail?id=342725688#tab5 for more information.*

[88] Ibid.

- **Aquatic Invasive Species Supplemental Prevention** – this grant program provides supplemental funding for waterbodies that are high priorities for AIS spread statewide, due to large amounts of boat traffic and/or the presence of particular invasive species. Little Cedar is an eligible waterbody for this program, which covers up to 75 percent of up to $4,000 that can fund the acquisition of decontamination equipment at the boat launches as well as targeted management at the boat launch or other access points. The District must continue to participate in the Clean Boats, Clean Waters program to maintain eligibility for this grant program.

- **Aquatic Invasive Species Control** – this grant program covers up to 75 percent of up to $50,000 for small-scale projects and $150,000 for large-scale projects that suppress or reduce an AIS population within a lake. Given the current spread of EWM and SSW within the Lake, the small-scale project is more appropriate at this time. Aquatic Invasive Species Control grants fund projects that utilize integrated pest management and are designed to cause multi-season suppression of the target species. An approved aquatic plant management plan is a requirement to participate in this program and only approved recommendations from the plan are eligible projects for funding through this program.

The District should consider applying for these grant programs whenever possible to support the monitoring, communication, watercraft inspection, and targeted management recommended in this aquatic plant management plan.

## 3.2 SUMMARY AND CONCLUSIONS

As requested by the District, the Commission worked with the District to develop a scope of work and secure funding to provide information useful to short- and long-term lake management. The primary motivation for this effort was to gather information needed to renew the District's aquatic plant management permit. This report, which documents the findings and recommendations of the study, examines existing and anticipated conditions, potential aquatic plant management problems, and lake-use. Conformant with the study's intent, the plan includes recommended actions and management measures. Figure 3.1 summarizes and locates where aquatic plant management recommendations should be implemented.

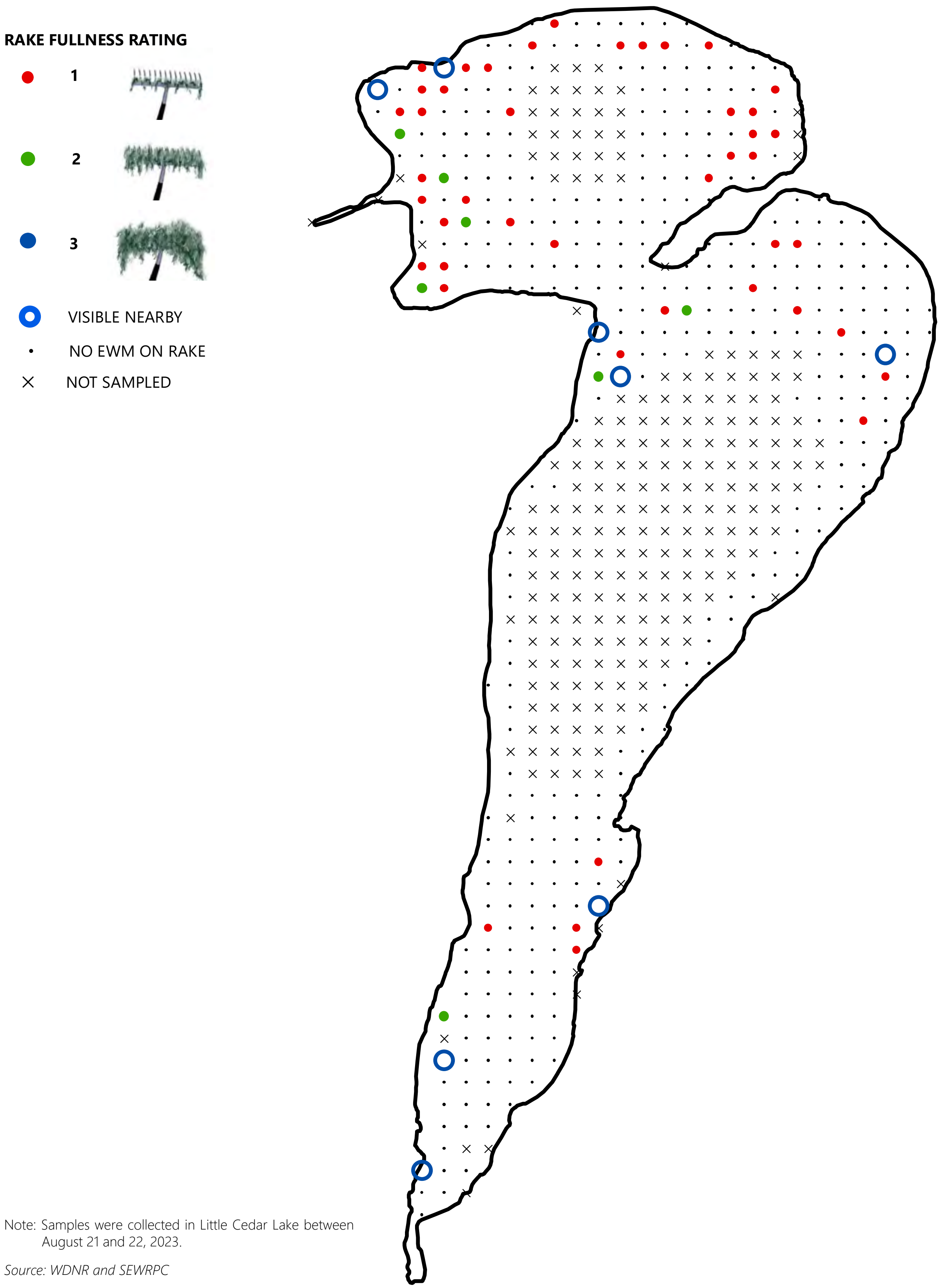
Successfully implementing this plan will require vigilance, cooperation, and enthusiasm, not only from local management groups, but also from State and regional agencies, Washington County, municipalities, and residents/users of the Lake. The recommended measures help foster conditions sustaining and enhancing the natural beauty and ambience of the Lake ecosystem while promoting a wide array of water-based recreational activities suitable for the Lake's intrinsic characteristics.

# APPENDICES

# LITTLE CEDAR LAKE AQUATIC PLANT SPECIES DETAILS

# APPENDIX A

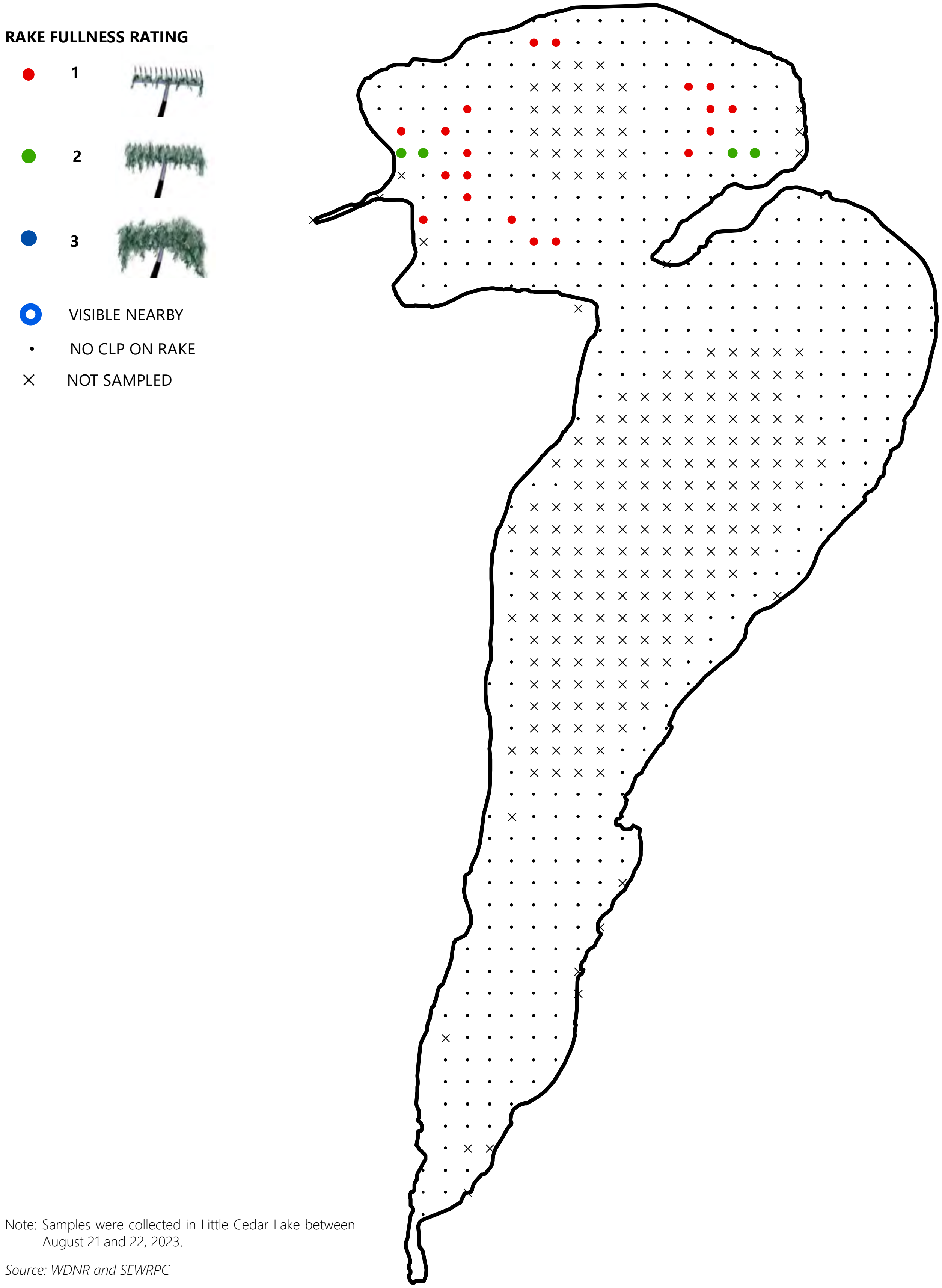
**Figure A.1**
**Eurasian Watermilfoil (*Myriophyllum spicatum*) Rake Fullness in Little Cedar Lake: August 2023**




Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

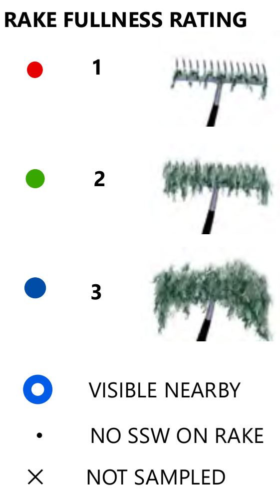
**Figure A.2**
**Curly-leaf Pondweed (*Potamogeton crispus*) Rake Fullness in Little Cedar Lake: August 2023**

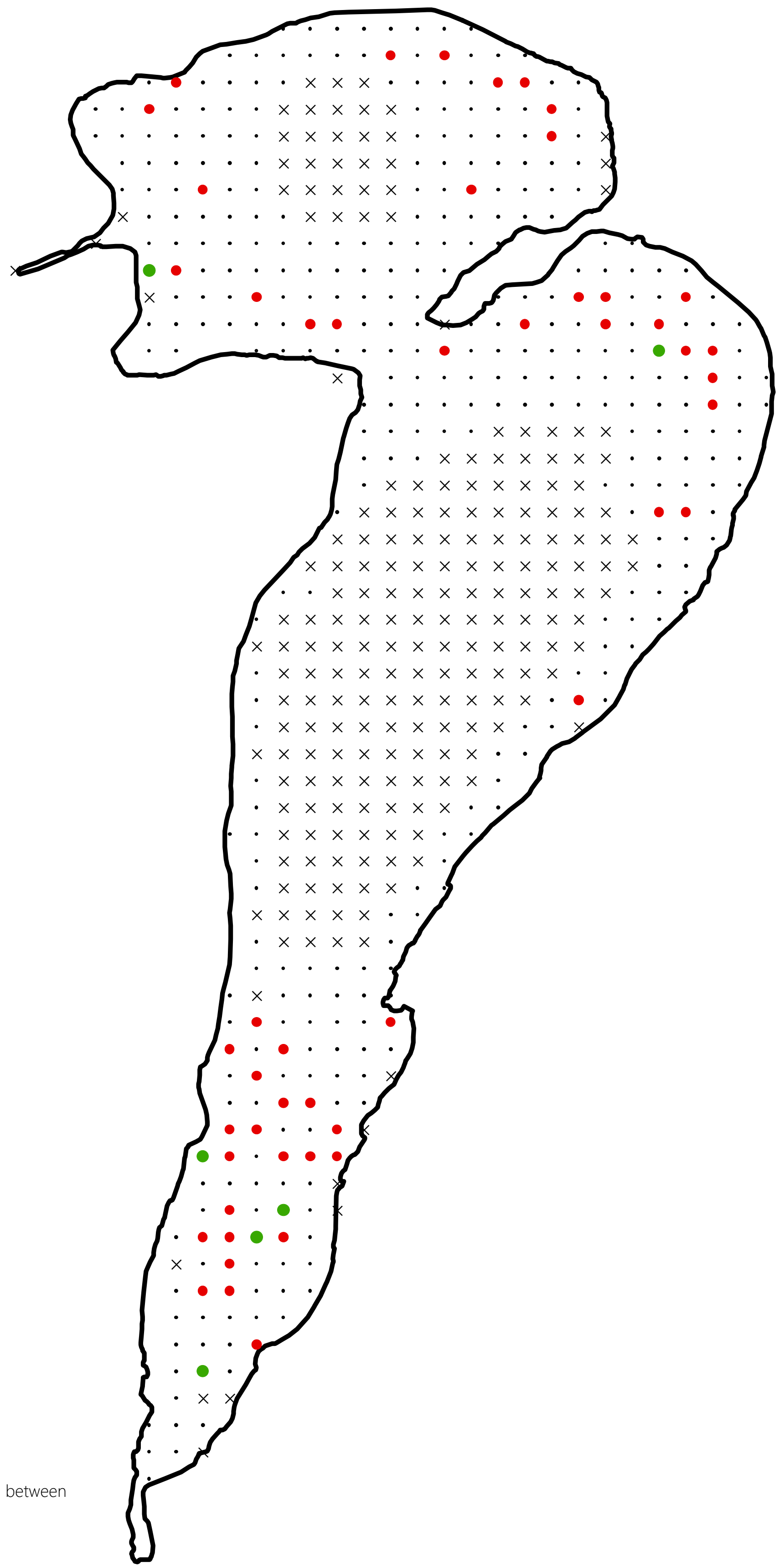



Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

## Figure A.3
## Starry Stonewort (*Nitellopsis obtusa*) Rake Fullness in Little Cedar Lake: August 2023

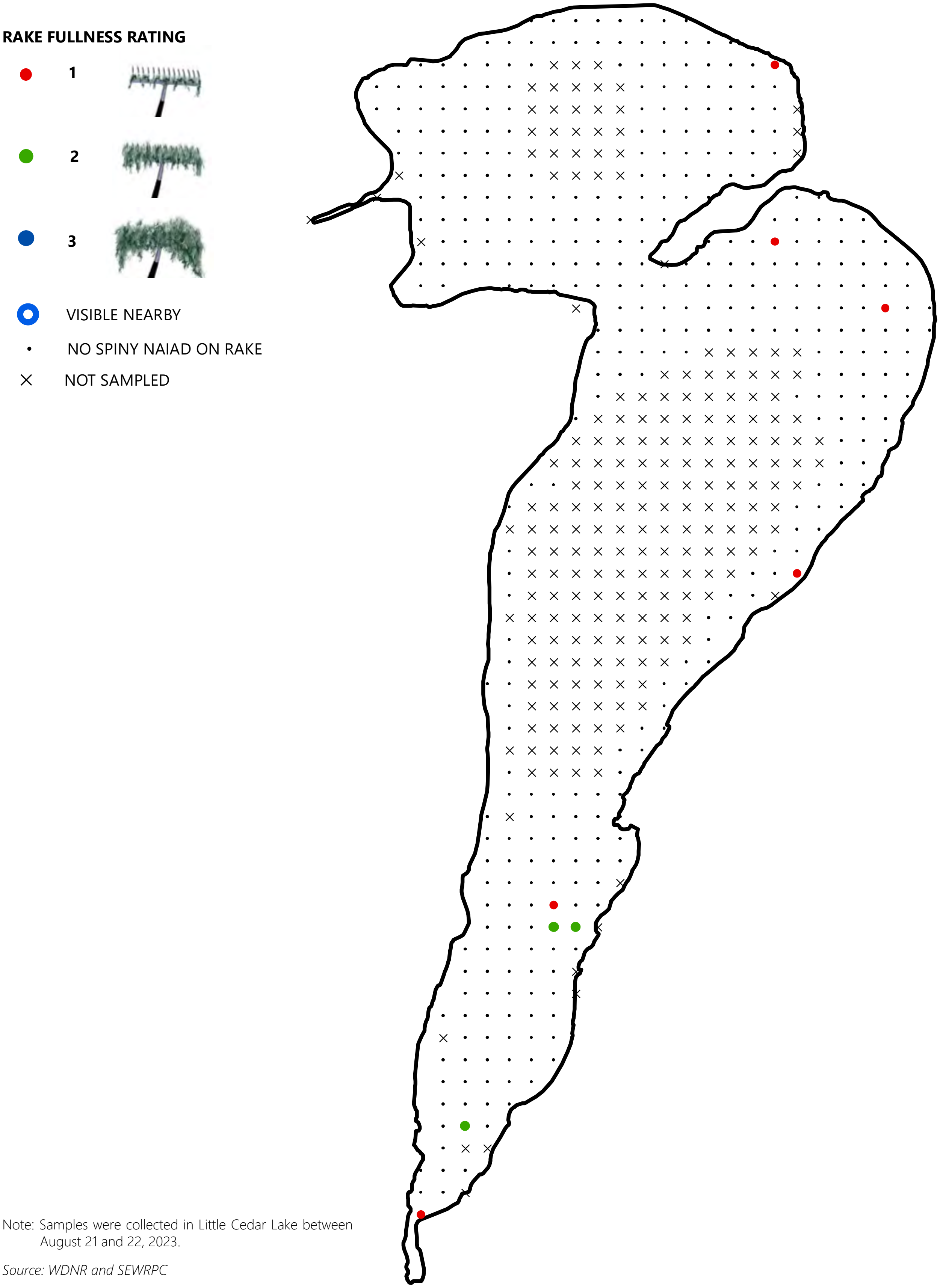


Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

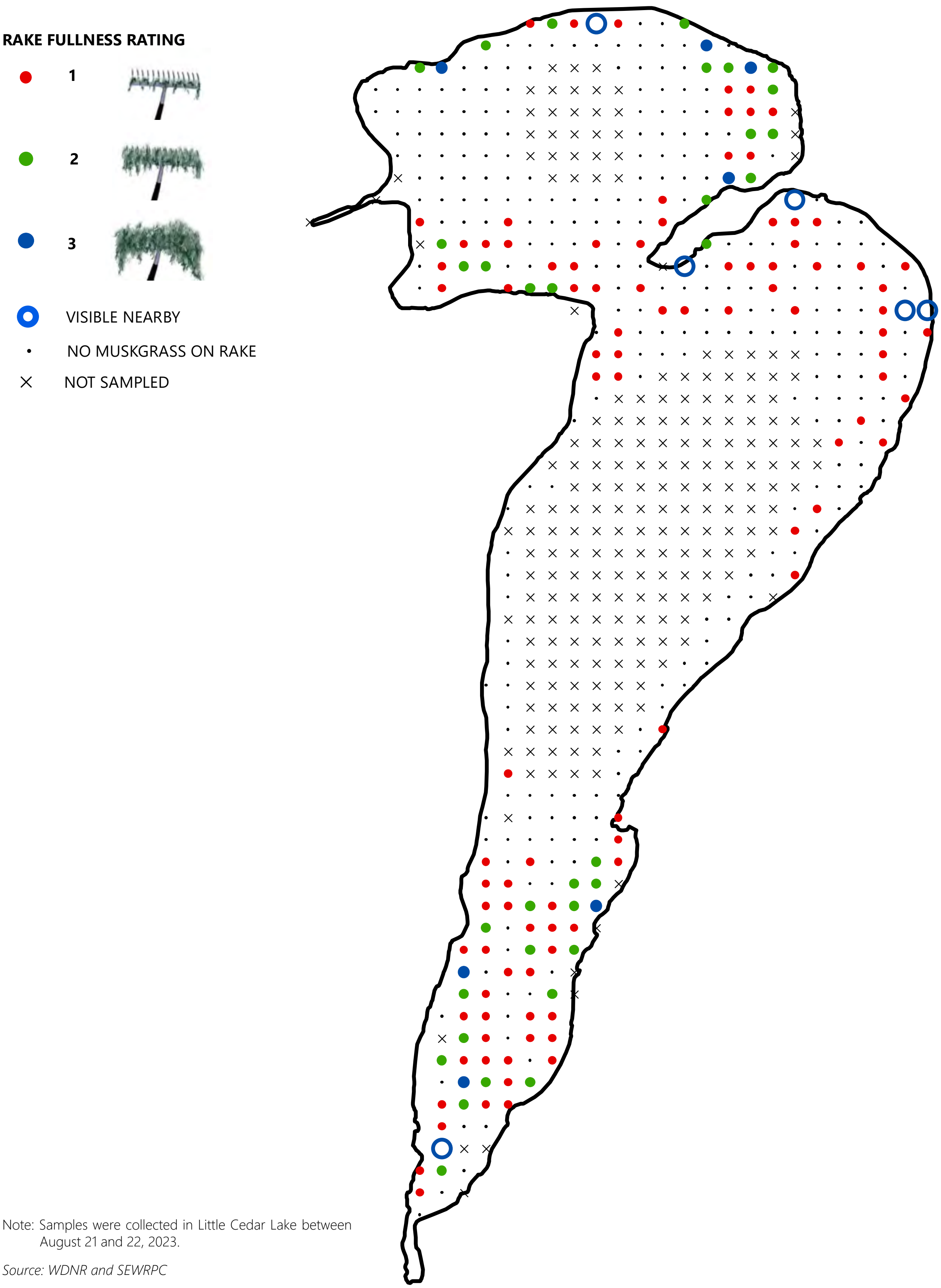
## Figure A.4
## Spiny Naiad (*Najas marina*) Rake Fullness in Little Cedar Lake: August 2023




Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

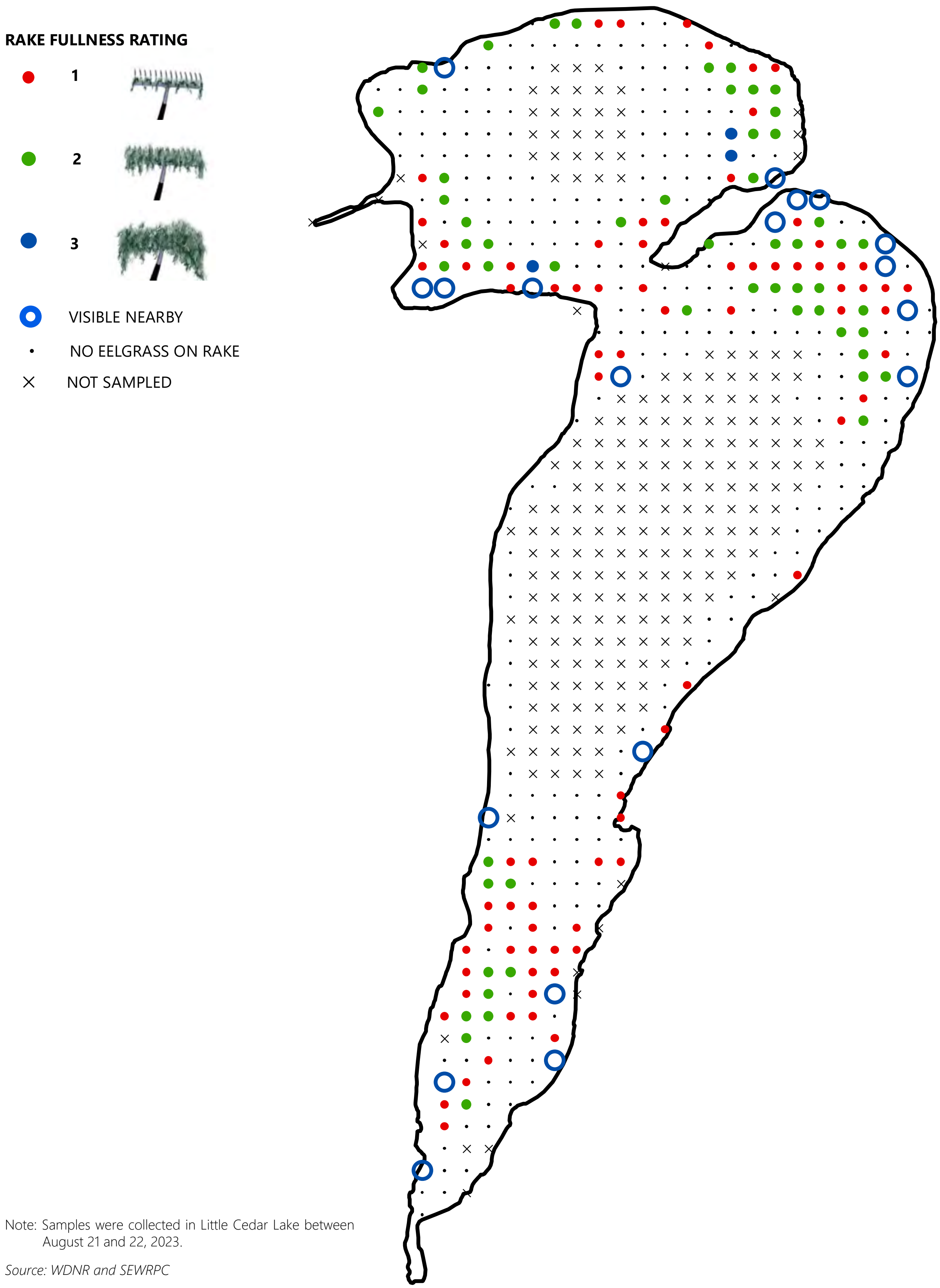
**Figure A.5**
**Muskgrass (*Chara* spp.) Rake Fullness in Little Cedar Lake: August 2023**




Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

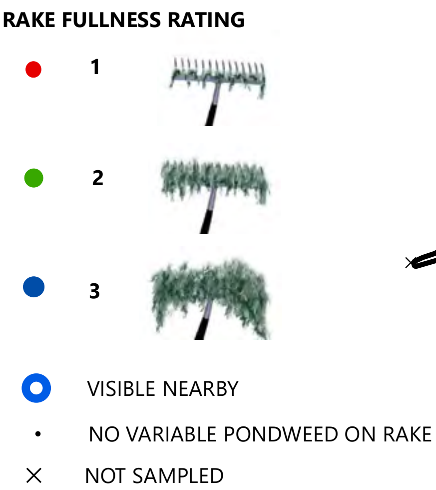
## Figure A.6
## Eelgrass (*Vallisneria americana*) Rake Fullness in Little Cedar Lake: August 2023

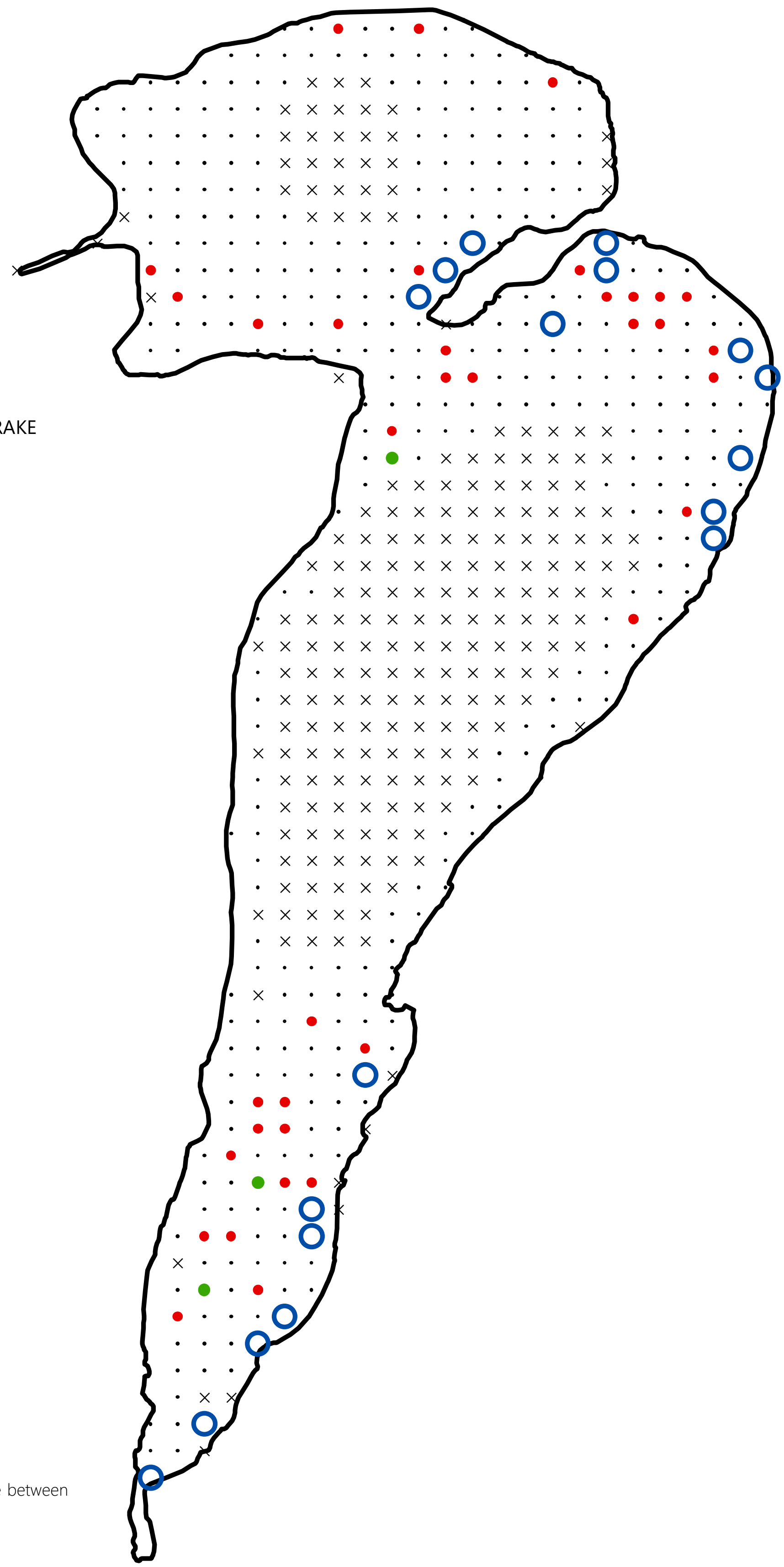



Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

## Figure A.7
## Variable-leaf Pondweed (*Potamogeton gramineus*) Rake Fullness in Little Cedar Lake: August 2023



Note: Samples were collected in Little Cedar Lake between August 21 and 22, 2023.

*Source: WDNR and SEWRPC*

# APPENDIX B

## MATERIALS RECEIVED FROM WISCONSIN DEPARTMENT OF NATUTRAL RESOURCES

Proposed Edits to Aquatic Plant Management Plan, Little Cedar Lake

APM Update written by Justin Poinsatte, SEWRPC
Department Comments provided 4/30/2024

Management of Starry Stonewort at Outlet comments:

- Comments from Southeast Region AIS Biologist
- Removal of the starry stonewort beds may cause unintentional release of bulbils downstream and may also cause the algae to produce more bulbils as a response to stress.
- AIS Biologist understands the desire to not spread starry stonewort downstream. Current known/used methods of removal may end up spreading the bulbils.
- AIS Biologist and Lake District have developed a plan to hand pull at the outlet. This includes:
    - Start spot checks of southern SSW patch near dam (starting around/after Memorial Day)
    - Quadrat survey approximately June 17th
    - Hand pull in late June – temporarily place boards in outlet if possible, use 2 divers, have kayaks available to support, supervision of divers by Washington County AIS Coordinator
    - Repeat Quadrat survey in August

General Management of Starry Stonewort comments:

- AIS Biologist suggests a word change on page 40: "As described in Section 2.4, this hand-pulling was effective at removing SSW in this area, but SSW has still spread to other areas within the Lake."
- AIS biologist suggests: "The hand pulling was effective in reducing biomass of SSW in this area but it remains in the plant community. Rake fullness has been reduced to 1 in annual sub P/I plant surveys."
- AIS biologist is able to provide sub P/I data from 2 x annual surveys if SEWRPC requests it.

Skim Window Change Comments:

The proposed change would extend the spring harvesting window for EWM within the Skim Area into late May. The other harvesting restrictions, such as only harvesting when a robust EWM canopy is present, would still apply. This change would enable the harvester to reduce EWM abundance and help promote native growth during years when overall aquatic plant growth is delayed by late ice off or other weather conditions.

AIS Biologist, Fisheries Biologist and Water Resources Biologist all approve this change.

Area 10 Proposed Change Comments:

- The current harvesting permit allows harvesting a 1,100-foot by 15-foot lane (0.38 acres) with a one-foot cutting depth.
- The proposed change would utilize the same harvesting lane dimensions but extend the cutting depth to two feet in areas where the water depth is at least three feet deep. At least one foot of uncut material must be left on the lake bottom. This change would help alleviate navigational concerns raised by residents located along the Area 10 shoreline.

AIS Biologist is not in favor of this proposal. The deeper cutting will increase the potential to spread starry stonewort.

Fisheries Biologist and Water Resources Biologist are not in favor of this proposal. The deeper cutting will increase turbidity in this area, decreasing sight feeding for animals utilizing the water – wading birds, ducks, turtles, frogs, young of year fish.

Area 13 Proposed Change Comments:

- The current harvesting permit allows harvesting a 500-foot by 30-foot lane (0.34 acres) with a two-foot cutting depth near the buoy line for EWM. Harvesting pondweeds near the piers is restricted.
- The proposed change would adjust the harvesting lane to follow the contours of the shoreline, allowing harvesting closer to shore along the northernmost 250 feet of the lane (see Figure 3.1a). Harvesting in this Area should still focus on the EWM population and avoid pondweeds near the piers.

The Water Resources Biologist is not in favor of this proposal. This area exhibits a high diversity of pondweed species. The density is 1 or 2 for each of the species. There is not a demonstrated navigational impediment in this location.

Water Resource Biologist NR 109 permit decisions:

- The Department and the Lake District have put together a draft plan (summarized above) for management of starry stonewort at the outlet. The Department will be able to approve an NR 109 permit application that includes this plan.
- The Department will be able to approve an NR 109 permit application that extends the spring harvesting window for EWM within the Skim Area into late May.
- Area 10: The Department will not be able to approve an NR 109 permit application that includes a cutting depth to two feet in areas where the water depth is at least three feet deep.
- Area 7: The Department will not be able to approve an NR 109 permit application that includes a cut closer to the shoreline as denoted in Figure 3.1a.

Biologist Review Staff:

Fisheries: Travis Motl
AIS: Patrick Siwula
Water Resources: Heidi Bunk

**Figure B.1**
**WDNR Starry Stonewort Sub-Point-Intercept Survey: July 2023**

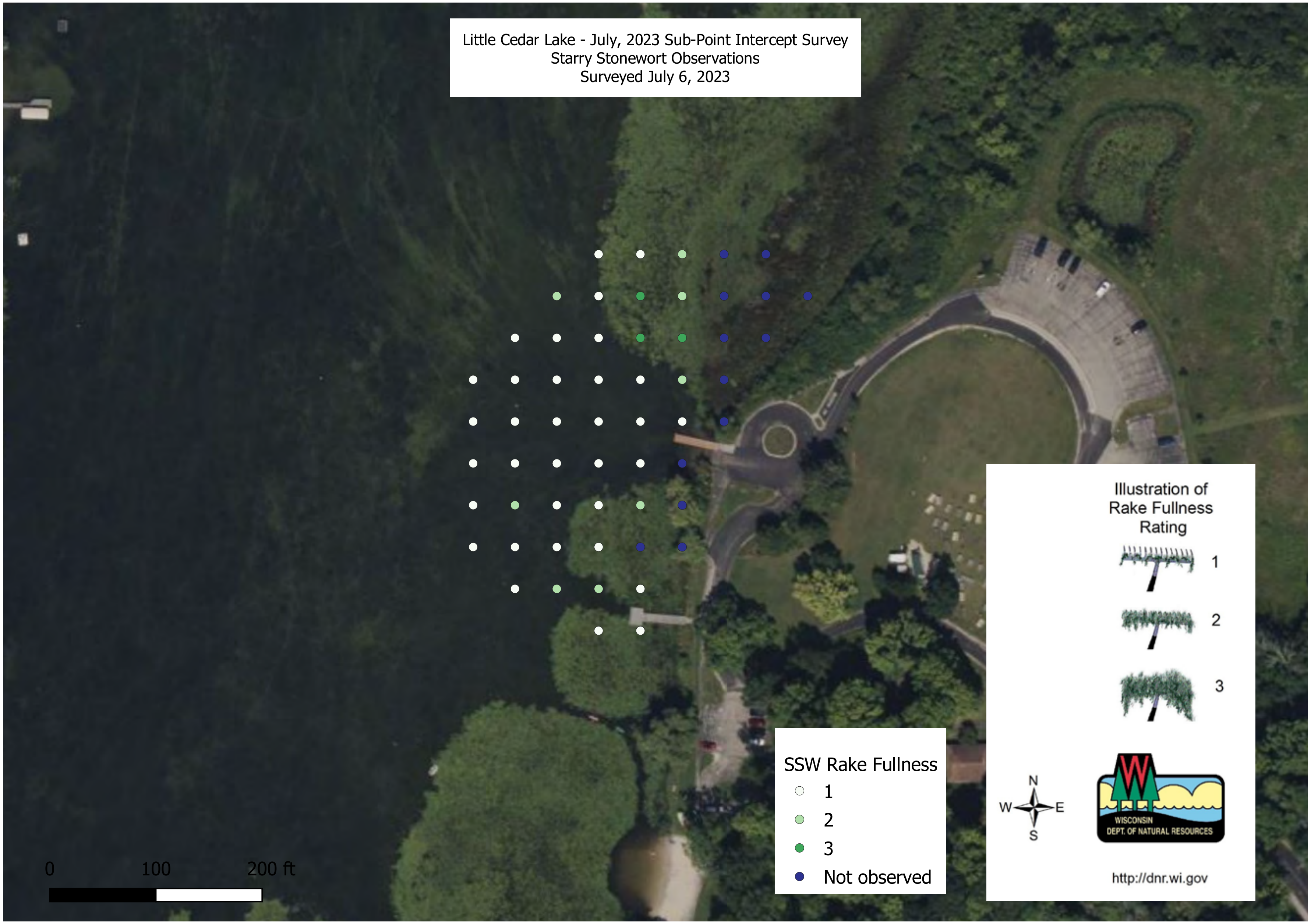


**Figure B.2**
**WDNR Starry Stonewort Sub-Point-Intercept Survey: August 2023**