SEWRPC Memorandum Report Number 283

AQUATIC PLANT MANAGEMENT PLAN FOR
ROCK LAKE, KENOSHA COUNTY, WISCONSIN

Chapter 1

INTRODUCTION

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

1.1 PROJECT SETTING, BACKGROUND, SCOPE, AND INTENT

Rock Lake is a 45.6-acre deep headwater lake located in the Village of Salem Lakes in Kenosha County. The Lake is a tributary of Trevor Creek, which drains to the Fox River. Attaining a maximum depth of 33 feet (see Map 1.1), the deepest portions of the Lake are likely not capable of supporting an aquatic plant community, but previous surveys have indicated that the shallow nearshore areas support abundant growth of rooted aquatic plants. The most recent point-intercept survey of the Lake in 2019 by Lake and Pond Solutions Co. observed 28 species, including several beneficial native species like muskgrass (*Chara* spp.), Sago pondweed (*Stuckenia pectinata*), eelgrass (*Vallisneria americana*), and white-stem pondweed (*Potamogeton praelongus*). The invasive aquatic plant species, Eurasian watermilfoil (*Myriophyllum spicatum*), was also observed during this survey.

The RLRA manages aquatic plant growth on Rock Lake to enhance navigation and recreational opportunities through mechanical harvesting and diver-assisted hand-pulling. Aquatic plant management is regulated by the WDNR and requires a permit. Use of chemical treatments requires permit applications annually while mechanical harvesting requires a permit application with accompanying management plan every five years.

---

[1]*SEWRPC Community Assistance Planning Report No. 323,* A Lake Protection and Aquatic Plant Management Plan for Rock Lake, Kenosha County, Wisconsin, *2015*.

To apply for an updated permit, the RLRA has decided to evaluate the Lake's aquatic plant community and prepare an aquatic plant management plan encompassing the lake. This 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. The RLRA requested the assistance of the Commission in conducting an aquatic plant inventory during 2025 and using that information to prepare this aquatic plant management plan.

This updated APM plan summarizes information and recommendations needed to best manage the aquatic plant community of the Lake. 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 on 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.

SEWRPC Memorandum Report Number 283

AQUATIC PLANT MANAGEMENT PLAN FOR
ROCK LAKE, KENOSHA COUNTY, WISCONSIN

Chapter 1 Maps

Map 1.1
Rock Lake Bathymetry and Lake Access Points

BEACH

PUBLIC CARRY-IN ONLY BOAT LAUNCH

PRIVATE BOAT LAUNCH

DAM

0 90 180 360 Feet

Source: SEWRPC

SEWRPC Memorandum Report Number ***

AQUATIC PLANT MANAGEMENT PLAN FOR

ROCK LAKE, KENOSHA COUNTY, WISCONSIN

Chapter 2

INVENTORY FINDINGS AND RELEVANCE TO RESOURCE MANAGEMENT

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 Rock Lake APM plan considered input from many entities including the Rock Lake Restoration Association (RLRA), the Rock Lake Highlands Association (RLHA), and the Wisconsin Department of Natural Resources (WDNR). Objectives of the Rock Lake APM program include the following.

- Effectively control the quantity and density of nuisance aquatic plant growth in well-targeted portions of Rock Lake (Lake). 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 RLRA 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.[1]

To meet these objectives, the RLRA 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 BASICS OF LAKE SCIENCE AND THE ROLE OF AQUATIC PLANTS IN LAKES

Wisconsin is home to nearly 15,000 lakes, each one valued for their recreational, aesthetic, and scenic qualities in addition to the environmental benefits they provide to the landscape. Lakes provide habitat and food for a wide array of wildlife and for humans as well. This section will provide a brief overview of lake science as it relates to aquatic plants and explain some common misconceptions when it comes to aquatic plants. For a glossary of terms related to lake science, used in this section and this report, see Appendix A.

Lakes are dynamic and complex systems whose characteristics can change based on landscape features, nutrient flux, and organism activities. Human activities can further accelerate the rates of change. Lakes in southern Wisconsin typically have higher nutrients and alkalinity, often resulting in higher productivity.[2] This is often due to southern lakes being situated in watershed that have agriculture or urban landscapes as the

---

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

[2] *For a glossary of terms used in this report, see Appendix A*.

dominant land uses as well as the high mineral content in the groundwater of the region. Activities in a lake's watershed directly impact the lake itself and managing the watershed to control nutrients, soil, and pollutants that can run off into the lake is crucial for protecting lake water quality.

Nutrients are elements and compounds needed for plant and algal growth. They are often found in a variety of chemical forms, both inorganic and organic, which may vary in their availability to plants and algae. Typically, growth and biomass of plants and algae in a waterbody are limited by the availability of the nutrient present in the lowest amount relative to the organisms' needs. This nutrient is referred to as the limiting nutrient, where additions of this nutrient will increase organism growth and biomass. Phosphorus is usually, though not always, the limiting nutrient in freshwater systems. Typically lakes that have an abundance of phosphorus in their systems can have increased aquatic plant and algal growth. As will be discussed in Section 2.3 of this chapter, aquatic plant harvesting can be used as a method to remove phosphorus from lakes.

Lake biological productivity is referred to in terms of "trophic status." Low productivity lakes with few nutrients, algae, and plants are in an oligotrophic status; lakes with moderate nutrients and productivity are in a mesotrophic status; and lakes with excessive nutrients and productivity are in a eutrophic status. Like all thing lakes age. There is a natural aging process that occurs in all lakes. This aging causes the lake to change from low productivity, oligotrophic lakes to eutrophic lakes over time, and eventually filling in (see Figure 2.1). However, with the onset of human use and developments around lakes, human activity can accelerate this aging process. Cultural eutrophication, as it has been coined by ecologists, defines the impact of human activity on a lake's trophic state.

Aquatic Plants

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 (see Table 2.1):

- Improving water quality by filtering excess nutrients from the water

- Providing habitat for invertebrates, amphibians, 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.

Lake Science Misconceptions

Through discussions with the RLRA, the RLHA, and lake residents, some common misconceptions were brought to the attention of Commission staff. These misconceptions are addressed below.

Aquatic Plants Cause E. coli

Escherichia coli (*E. coli*) is a species of fecal coliform bacteria. These bacteria are only found in the feces of warm-blooded animals (including humans), so the presence of high concentrations of fecal coliform bacteria or E. coli in water indicates a high probability of fecal contamination by animals. There is no direct relation between the abundance of aquatic plants and *E. coli*. Fecal contamination could occur as an excess of feces from sanitary waste, runoff from agricultural operations, or due to a high abundance of waterfowl. Agencies participating in the monitoring of beaches in the Wisconsin Beach Monitoring program use *E. coli* as the indicator of sanitary quality of the associated waters. Water quality advisories are issued for beaches whenever the concentration of *E. coli* in a sample exceeds 235 cfu[3] per 100 ml or whenever the geometric mean of at least five samples taken over a 30-day period exceeds 126 cfu per 100 ml. Beaches should be closed whenever the concentration of *E. coli* exceeds 1,000 cfu per 100 ml.

---

[3] *Cfu stands for "colony-forming unit"*

All Algae Is Bad Algae

Chlorophyll-a, a photosynthetic pigment whose abundance is used to indicate algal biomass, is the most reliable metric of a lake's trophic status. Algae is an important and healthy part of lake ecosystems. Algae is a foundational component of lake food chains and produces oxygen in the same way as rooted plants. Many kinds of algae exist, from single-cell, colonial, and filamentous algae to cyanobacteria.

Most algae strains are beneficial to lakes when present in moderate levels. However, the presence of toxic strains, as well as excessive growth patterns, should be considered issues of concern. As with aquatic plants, algae grows faster in the presence of abundant phosphorus (particularly in stagnant areas). Consequently, when toxic or high volumes of algae begin to grow in a lake, it often is a sign of phosphorus enrichment or pollution. Algae populations are quantified by abundance and composition and can be examined to determine if the algae present are toxin-forming. Suspended algal abundance is estimated by measuring the chlorophyll-a concentration in the water column, with high concentrations associated with green-colored water.

Aquatic Plants Cause Lakes to Become Shallower

As discussed above, all lakes go through a natural aging process that can be accelerated by human activity. Increased development and agriculture with a decrease in natural land cover can cause more sediment and nutrients to run off into the lake at a higher rate that would occur naturally prior to human settlement of an area. The increase in nutrient availability can cause an increase in aquatic plant and algal growth. The sediment can, over time, be deposited on the lake bottom causing the lake to become shallower.

2.3 AQUATIC PLANT COMMUNITY COMPOSITION, CHANGE, AND QUANTITY

Aquatic Plant Surveys

Aquatic plant surveys have been conducted on Rock Lake since the late 1960s. The earliest survey in 1967 found 27 species in the lake (see Table 2.2). It is unknown what type of survey methodology was used for the initial survey as only a species list exists in historical records.[4] Since this initial survey, aquatic plant inventories of Rock Lake have been completed several times to support aquatic plant management permit applications. Surveys have been conducted in 2004, 2012, 2019, and most recently in 2025. The 2004 survey

[4] *Aquatic plant survey conducted by Wisconsin Department of Natural Resources and Ursula Rowlatt.*

utilized transect survey methodology and was conducted by the WDNR. The 2019 survey was conducted by Lake and Pond Solutions Co. while the 2012 and 2025 surveys were conducted by Commission staff. The 2012, 2019, and 2025 surveys used the same point-intercept grid and methodology.[5,6] 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 of Rock Lake consists of 218 points (provided by WDNR staff) that allows the types and abundance of aquatic plants to be directly contrasted to prior point-intercept surveys (see Figure 2.2). 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 in 2012, 2019, and 2025. This consistency enables more detailed evaluation of aquatic plant abundance and distribution change than has been possible in the past.

Commission staff conducted the 2025 survey on June 18th. Conditions during the survey were excellent, with sunny to partly sunny skies, low wind speeds, and no boat traffic. The Lake's water clarity was adequate, which enhanced visual observations of aquatic plant species within six feet of the sampling location. In general, the aquatic plant specimens were mature, and some species were in flower (e.g., white water lily (*Nymphaea odorata*)). In addition to the aquatic plants, Commission staff observed waterfowl, fish, frogs, and turtles during the survey.

While Commission staff strived to survey as much of the Lake as feasible, certain areas of the Lake were not surveyed in 2025. These areas included the central portion of the main Lake body, which was determined to be too deep for vascular aquatic plants to grow. Other points that were not surveyed were either due to obstacles such as docks or points that were deemed to be on shore. Some points such as the in the northwestern channel were deemed non-navigable from dense plant growth and were subsequently unable to be sampled. Of the 218 points on the Lake, 77 sites were sampled, of which 58 had aquatic plants present (see Table 2.3).

---

[5] *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*

[6] *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.*

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. For similar reasons, some areas of a particular lake may contain plant communities with little diversity, while other areas of the same lake may exhibit good diversity. Historically, human manipulation has often favored certain plants and reduced biological diversity (biodiversity). Thoughtful aquatic plant management can help maintain or even enhance aquatic plant biodiversity.

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 (see Table 2.4). Metrics derived from the 2019 and 2025 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.[7] 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 2.3, total rake fullness across all surveyed points averaged 1.42. Total rake fullness was particularly high in the shallower near-shore areas. Deeper areas generally had lower total rake fullness, likely due to light availability limiting the growth of most plant species.

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.[8] It is important to note that for surveys using the point-intercept protocol, the protocol allows sampling to be discontinued at depths

[7] *This method follows the standard WDNR protocol.*
[8] *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*.

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 Rock Lake, aquatic plants were observed to a maximum depth of 24 feet in 2019 and to a maximum depth of 12 feet in 2025, although many of the plant observations deeper than 12 feet in 2019 were of coontail (*Ceratophyllum demersum*) (see Figure 2.4). Coontail often doesn't fully root to the lake bottom and maybe become dispersed and sink to deeper waters where it would not typically grow.

Species Richness

Species richness is often incorrectly used as a synonym for biodiversity. The difference in meaning between these terms is both subtle and significant. Biodiversity is based on the number of species present in a habitat along with the abundance of each species. For the purposes of this study, abundance was determined as the percent of observations of each species compared to the total number of observations made. 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 2.1.

The observed species richness of Rock Lake has increased since the plant inventory completed in 2012 (see Table 2.5). Some species observed in earlier surveys were not observed during the 2025 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 2025 aquatic plant survey identified 29 species in the Lake, including visual observations and boat survey species. This species richness is higher than average for lakes within Southeastern Wisconsin and is higher than the 25 species observed in 2019. The total number of species observed at each sampling point is shown in Figure 2.5. Species richness ranged from 1 to 13 in 2025 with one point having 13 species and three points having 12 species present. These especially species-rich points were found in the south-southeast portions of the Lake.

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.[9] The FQI is an assessment metric used to evaluate how closely a lake's aquatic plant community matches that of undisturbed, pre-settlement conditions.[10] 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. The mean C value of the Lake in 2019 was 5.64 while the C value was 5.95 in 2025, indicating that the species observed in 2025 were on average more sensitive to ecological disturbance. 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 FQI values in the 2019 and 2025 surveys were similar at 29.0 and 29.8, respectively, with the slight increase caused by the higher mean C value and species richness in 2025 compared to 2019. 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.

The WDNR currently uses an aquatic plant bioassessment method published by Mikulyuk et al., 2017 to assess whether lakes should be listed on the 303(d) impaired waters list. This method identifies species that are tolerant, moderately tolerant, and sensitive to human disturbance. Four sensitive species, as identified in this methodology, were identified during the 2025 survey: water marigold, large-leaf pondweed, variable-leaf pondweed, and small pondweed. Of these species, large-leaf pondweed was the most observed in 2025. The eastern shoreline of the Lake had the most observations of sensitive species (see Figure 2.6).

Relative Species Abundance

The five most abundant plants found during the 2025 aquatic plant survey were: 1) white water lily (*Nymphaea odorata*, found at or near 44 points), 2) Eurasian watermilfoil (*Myriophyllum spicatum*, found

---

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

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

near or at 29 points), 3) coontail (Ceratophyllum demersum, found at or near 26 points), 4) curly leaf pondweed (*Potamogeton crispus*, found at or near 25 points), and 5) Fries' pondweed (*Potamogeton friesii*, found at or near 23 points). For the distribution and rake fullness for the most common plants in Rock Lake, see Appendix B and Figures 2.7 and 2.8.

Like in previous surveys, many beneficial plant species, like those listed above, were found close to shore and in shallower areas of the lake. As noted in Table 2.1, these aquatic plants provide excellent habitat for organisms in and around the lake. Insects, fish, and amphibians rely on these habitats and food sources for survival. When feasible, maintenance of these high value nearshore areas should be protected.

Invasive Species

This subsection will discuss invasive species observations in Rock Lake, as these 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.[11,12] In Southeastern Wisconsin, EWM can grow rapidly and has few natural enemies to inhibit its growth. Furthermore, it can grow explosively following major environmental disruptions, as small fragments of EWM can grow into entirely new plants.[13] For reasons such as these, EWM can grow to dominate an aquatic plant community in as little as two years.[14, 15] 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.[16]

[11] *U. S. Forest Service,* Pacific Islands Ecosystems at Risk (PIER)*, 2019.: hear.org/pier/species/myriophyllum_spicatum.htm*
[12] *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.*
[13] *Ibid.*
[14] *S.R. Carpenter, "The Decline of Myriophyllum spicatum in a Eutrophic Wisconsin (USA) Lake,"* Canadian Journal of Botany *58(5), 1980.*
[15] *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.*
[16] *S.R. Carpenter, 1980, op. cit.*

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.[17] 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.

During the 2025 survey of the Lake, EWM was found at a total of 16 sites. It was also visually observed near an additional 13 sites (see Figure 2.7). The average total rake fullness for EWM was 1.69. Three points on the Lake had a rake fullness of three, two of which were found in the southern tip of the lake and one found in the northern end of the lake in the nearshore area. The three sites that had EWM with a rake fullness of 3 also were growing mixed with densely growing musk grasses and were not growing in a monoculture.

Curly-leaf Pondweed

Like EWM, curly-leaf pondweed (CLP) is identified in Chapter NR 109 of the *Wisconsin Administrative Code* as a nonnative invasive aquatic plant. CLP is native to Eurasia, Africa and Australia but is now found across North America.[18] CLP (see Figure 2.8) is the only non-native pondweed (Potamogeton spp.) found within Wisconsin. This species is predominantly found in disturbed, eutrophic lakes, where it exhibits a peculiar split-season growth cycle that provides a competitive advantage over native plants and makes management of this species difficult.

This species reproduces using turions, a type of plant bud utilized by some aquatic plants. The turions are produced in late summer and lie dormant in lake sediment until cooler fall water temperatures trigger the turions to germinate. Over the winter, the turions produce winter foliage that thrives under the ice. In spring, when water temperatures begin to rise again, the plant has a head start on the growth of native plants and quickly grows to full size, producing flowers and fruit earlier than its native competitors. CLP begins to die-off in midsummer, releasing phosphorus that reduces lake water quality. It can grow in more turbid waters

[17] *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.*
[18] *Stuckey, R. L. 1979. Distributional history of Potamogeton crispus (Curly pondweed) in North America. Bartonia 46: 2242*

than many native plants, so protecting or improving water quality is an effective method of control of this species, as clearer waters in a Lake can help native plants compete more effectively.

While it was noted that CLP was present in Rock Lake in the late 1960s, it had not been found during the 2004, 2012, or 2019 surveys. In 2025, this species was found at 11 sites and had visual sightings at an additional 14 sites in the Lake. CLP had an average rake fullness of 1.18. 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 activities, the plant can grow dense stands that exclude other high value aquatic plants. For this reason, curly-leaf pondweed must be monitored and managed as an invasive member of the aquatic community.

Water Pennywort

Water pennywort (*Hydrocotyle ranunculoides)* is a prohibited invasive aquatic plant species. This fast growing floating plan can grow up to 20 cm per day and double their biomass in 3 to 7 days. When this plant invades a water body, it makes recreation on the lake difficult due to how densely it can grow. It can lead to degraded water quality due to its ability to block air-water interface and reduce oxygen levels in the water. Additionally, the mats block sunlight thus preventing the growth of beneficial submerged and emergent aquatic plants. It can also impact animal communities by blocking access to the water.[19]

Survey crews visually observed water pennywort during the 2019 survey in the northern nearshore area of the lake. WDNR staff visited the observation site in summer 2020 but did not find the invasive plant. Commission staff did not find any evidence of water pennywort in the Lake during the 2025 survey.

Future Invasive Aquatic Plant Species Threats

Starry stonewort (*Nitellopsis* obtusa) is a relatively novel aquatic invasive species in Wisconsin with the first observations by WDNR in Little Muskego Lake in Waukesha County in 2014. Since that time, starry stonewort has spread to dozens of lakes across Southeastern Wisconsin and no management methods have yet been found to successfully manage its growth. Some of these lakes, including Silver Lake and Camp Lake in Kenosha County, are near Rock Lake and had verified populations of starry stonewort in 2023 and 2021, respectively.[20] This species can form extremely dense vegetative mats that may affect aquatic plant community species richness and can impede recreational use. Dense growth of starry stonewort can also

---

[19] *https://dnr.wisconsin.gov/topic/Invasives/fact/FloatingMarshPennywort*

[20]*https://apps.dnr.wi.gov/lakes/invasives/AISLists.aspx?species=STARRY_STONEW&status+%3c%3e+OBSERVED&groupBy=County*

interfere with life-cycle critical functions of fish and other animals, including fish spawning.[21] This species was not observed in Rock Lake in 2025 nor in any previous surveys, which suggests that it has not spread to the Lake yet. Consequently, the best control for this species is to prevent its introduction to Rock Lake by maintaining vigilant invasive species prevention measures (see more details in Chapter 3).

Brazilian waterweed (*Egeria densa*) is an aquatic plant native to South America and is thought to have been introduced to North America through the aquarium trade. This plant is tolerant of low levels of CO2 and light as well as tolerant to a wide range of temperatures that may allow it to outcompete native plants. It can also grow to form dense mats that can impede recreation on waterbodies.[22] While it has not yet been confirmed to be in Wisconsin, there are verified populations in northern Illinois. Due to Rock Lake's proximity to Illinois, care should be taken to monitor this nonnative species. Additionally, there is a small pond in northern Illinois with a historical presence of Brazilian waterweed that ultimately drains into Rock lake via surface water connections.

Apparent Changes in Observed Aquatic Plant Communities: 2019 versus 2025

The 2025 aquatic plant survey identified a total of 29 different plant species including visuals, similar to the 25 species found in the 2019 aquatic plant survey. Thus, it is evident that Rock Lake has a highly diverse aquatic plant community.

In addition to the number of different aquatic plant species detected in the Lake, several other comparisons can be drawn between the 2019 and 2025 aquatic plant survey results:

- The total littoral vegetated frequency of occurrence increased by 13.16 from 2019 to 2025. It was 96.63 in 2025 compared to 83.67 in 2019 (see Table 2.2).
- The MDC in Rock Lake during the 2025 survey was 13 feet, 11 feet shallower than the 2019 survey, where the MDC was 24 feet (see Table 2.2). However, this is not indicative of decreasing water clarity or a loss of aquatic plant growth. As discussed in previous sections, coontail was the plant found at the points deeper than 13 feet in the 2019 survey, Coontail often doesn't fully root to the lake bottom and get dispersed and can sink to deeper waters where it would not typically grow.

---

[21] "Aquatic Invasive Species Quick Guide: Starry Stonewort (Nitellopsis obtusa L.)", Golden Sands Resource Conservation and Development Council, Inc. Visit www.goldensandsrcd.org/aquatic-invasive-species to download this series of handouts. Developed by Golden Sands Resource Conservation & Development Council, Inc. as part of an aquatic invasive species education program, supported by a grant from the Wisconsin Department of Natural Resources. Maintained and updated by the Wisconsin Citizen Lake Monitoring Network.

[22] https://dnr.wisconsin.gov/topic/Invasives/fact/Egeria

- In 2019 the top five most commonly found plant species in the lake were 1) coontail (found at or near 64 points), 2) white water lily (found at or near 61 points), 3) forked duckweed (*Lemna trisulca*, found at or near 43 points), 4) EWM (found at or near 41 points), and 5) cattails (*Typha sp*., found at or near 38 points). In 2025 those top five species changed to 1) white water lily (found at or near 44 points), 2) Eurasian watermilfoil (found near or at 29 points), 3) coontail (found at or near 26 points), 4) curly leaf pondweed (found at or near 25 points), and 5) Fries' pondweed (found at or near 23 points).
- In 2019 EWM was found at or near 42 points with a FOO of 18.37 percent. In 2025 that decreased to 29 points across the Lake with an FOO of 25 percent (see Figure 2.9). While the number of points decreased, the average rake fullness increased from 1.00 in 2019 to 1.69 in 2025, indicating that while it is not found as often throughout the Lake, where it is found it is higher in density than in 2019.
- While CLP has originally been found in the Lake in 1967, it had not been documented again until 2025. Commission staff hypothesized several potential reasons for this.
    - Original genetic strain of CLP introduced died out and a new strain was later introduced to the Lake.
    - CLP density was so low during previous surveys that it remained undetected.
    - Original turions (winter buds) of CLP became buried too deep under sediment deposition to be able to sustain a population.
- The occurrence of sensitive aquatic plant species changed from 2019 to 2025 (see Figure 2.10). In 2019 sensitive aquatic plants were found at 17 points across the Lake. That increased to 22 points having sensitive species found at them in the 2025 survey.

2.3 PAST AND PRESENT AQUATIC PLANT MANAGEMENT PRACTICES

The Lake has managed its aquatic plant community since 1962 when chemical applications of 2, 4-D were used (see Table 2.6). A variety of chemicals were utilized intermittently between 1962 and 2004 including Endothall/Aquathol, 2, 4-D, copper sulfate and others. Post 2004, the aquatic plants of Rock Lake were not actively managed.

In 2013 the RLRA purchased a Hockey Underwater Cutter to harvest aquatic plants. The cutter was used until 2017 when it was sold to purchase a suction harvesting boat (see Figure 2.11). Since 2013, the RLRA has harvested aquatic plants in the Lake, averaging 13,572 cubic yards of aquatic plants each year (see Table

2.7). Harvested aquatic plants were disposed using the route and location illustrated in Figure 2.12. A benefit of harvesting versus chemical treatment is that harvesting physically removes plant mass and the nutrients contained therein. The amount of phosphorus contained by aquatic plants varies by species, lake, and time.

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.[23,24] More details about aquatic plant management each are discussed in the following sections while recommendations are provided later in this document.

[23] *https://docs.legis.wisconsin.gov/statutes/statutes/30/ii/18*
[24] *https://docs.legis.wisconsin.gov/statutes/statutes/31/02*

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.[25] 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.[26] These plans and plan execution are reviewed and overseen by the WDNR regional lakes and aquatic invasive species coordinators.[27]

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.[28] For example, milfoil weevils (*Eurhychiopsis lecontei)* have been used to control EWM. Milfoil weevils do best in waterbodies with balanced panfish populations,[29] 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.

---

[25]*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.*

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

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

[28]*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.*

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

Manual Measures

Manually removing specific types of vegetation is a highly selective means of controlling nuisance aquatic plant growth, including invasive species such as EWM. Two commonly employed methods include hand raking and hand pulling. Both physically remove target plants from a lake. Since plant stems, leaves, roots, and seeds are actively removed from the lake, the reproductive potential and nutrients contained by pulled/raked plants material is also removed. These plants, seeds, and nutrients would otherwise re-enter the lake's water column or be deposited on the lake bottom. Hence, this aquatic plant management technique helps incrementally maintain water depth, improves water quality, and can help decrease the spread of nuisance/exotic plants. 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, and,
- 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 comingle. Hand pulling is more selective than raking, mechanical removal, and chemical treatments, and, if carefully applied, is less damaging to native plant communities. Recommendations regarding hand-pulling, hand-cutting, and raking are discussed later in this document.

Mechanical Measures

Two methods of mechanical harvesting are currently employed in Wisconsin - mechanical harvesting and suction harvesting. Both are regulated by WDNR and require a permit.[30]

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.

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

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

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,[31] 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 and DASH

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

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

[31]*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.*

aquatic plants. Such labor-intensive work by skilled professional divers is, at present, a costly undertaking and long-term monitoring will need to evaluate the efficacy of the technique. Nevertheless, many apparent advantages are associated with this method including: 1) lower potential to release plant fragments when compared to mechanical harvesting, raking, and hand-pulling, thereby reducing spread and growth of invasive plants like EWM; 2) increased selectivity of plant removal when compared to mechanical techniques and hand raking which in turn reduces native plant loss; and 3) lower potential for disturbing fish habitat.

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

Chemical Measures

Aquatic chemical herbicide use is stringently regulated. A WDNR permit and direct WDNR staff oversight is required during application. Chemical herbicide treatment is used for short time periods to temporarily control excessive nuisance aquatic plant growth. Chemicals are applied to growing plants in either liquid or granular form. Advantages of chemical herbicides aquatic plant growth control include 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.[32] For example, conflicting studies/opinions exist regarding the role of the chemical 2,4-D as a human carcinogen.[33]

[32] *U.S. Environmental Protection Agency,* EPA-738-F-05-002, 2,4-D RED Facts*, June 2005.*
[33] *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.*

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.[34] 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.[35] Ice covered lakes and the deep portions of stratified lakes are particularly vulnerable to oxygen depletion. Excessive oxygen loss can inhibit a lake's ability to support certain fish and can trigger processes that release phosphorus from bottom sediment, further enriching lake nutrient levels.

---

[34] *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.*

[35] *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.*

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.[36,37] 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.[38] 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.

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.[39] 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.

---

[36] *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.*

[37] *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.*

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

[39] *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.*

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.[40] 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.[41,42] 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, bur-reeds, 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.[43]

Water level manipulation can also have unintended impacts on water chemistry and lake fauna.[44,45] 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 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:

---

[40] *G.D. Cooke, "Lake Level Drawdown as a Macrophyte Control Technique,"* Water Resources Bulletin *16(2): 317-322, 1980*
[41] *Onterra, LLC, Lac Sault Dore, Price County, Wisconsin: Comprehensive Management Plan, 2013.*
[42] *Onterra, LLC, Musser Lake Drawdown Monitoring Report, Price County, Wisconsin, 2016.*
[43] *Blanke et al., 2019, op. cit.*
[44] *Ibid.*
[45] *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.

SEWRPC Memorandum Report Number 283

AQUATIC PLANT MANAGEMENT PLAN FOR
ROCK LAKE, KENOSHA COUNTY, WISCONSIN

Chapter 2 Tables

Table 2.1
Ecological Qualities Associated with Select Aquatic Plant Species in Rock Lake

Aquatic Plant Species Present	Ecological Significance
Bidens beckii (water marigold) [a]	
Brasenia schreberi (water shield) [a]	
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
Najas guadalupensis (southern naiad)	Important food source for waterfowl, marsh birds, and muskrats; provides food and shelter for fish; native
Nitella spp. (stonewort)	Sometimes grazed by waterfowl; forage 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 zosteriformis (flat-stem pondweed)	Provides some food for ducks; native
Ranunculus aquatilis (white water crowfoot)	Provides habitat for fish 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.

[a] Water marigold and water shield are not commonly found in southeastern WI lakes, making them an interesting and important find in Rock Lake.

Source: SEWRPC

Table 2.2
Aquatic Plants found in Rock Lake: 1967

Scientific Name	Common Name
Carex sp.	Sedge
Ceratophyllum demersum	Coontail
Chara sp.	Muskgrass
Eleocharis sp.	Spike-rush
Elodea canadensis	Common waterweed
Juncus sp.	Rush
Megalodonta beckii[a]	Water beggar's-ticks
Myriophyllum sibiricum	Watermilfoil[b]
Najas flexilis	Slender naiad
Najas marina	Spiny naiad
Nuphar variegata	Yellow water-lily
Pontederia cordata	Pickerel weed
Potamogeton amplifolius	Big-leafed pondweed
Potamogeton crispus	Beginner's pondweed[c]
Potamogeton natans	Floating pondweed
Potamogeton pectinatus[d]	Sago pondweed
Potamogeton praelongus	White-stemmed pondweed
Potamogeton robbinsii	Fern pondweed
Potamogeton zosteriformis	Flat-stem pondweed
Sagittaria latifolia	Arrowhead
Scirpus validus[e]	Softstem bulrush
Sparganium eurycarpum	Burreed
Typha angustifolia	Cattail
Typha latifoli	Cattail
Vallisneria americana	Water celery
Zannichellia palustris	Horned pondweed
Total Number of Plants	27

Note: Many scientific names and common names have changed since 1967 when this survey was conducted. Additionally, plant identification was less robust than it currently is with modern identification.

[a] Now named *Bidens beckii*
[b] Now commonly called northern watermilfoil.
[c] Now commonly called curly-leaf pondweed
[d] Now named *Stuckenia pectinata*
[e] Now named *Schoenoplectus tabernaemontani*

Source: SEWRPC, WDNR

Table 2.3
Rock Lake Aquatic Plants Summary Statistics: PI Survey 2025

Total number of sites visited	77
Total number of sites with vegetation	58
Total number of sites shallower than maximum depth of plants	64
Frequency of occurrence at sites shallower than maximum depth of plants	90.63
Simpson Diversity Index	0.93
Maximum depth of plants (feet)	12.00
Number of sites sampled using rake on Rope (R)	15
Number of sites sampled using rake on Pole (P)	61
Average number of all species per site (shallower than max depth)	2.56
Average number of all species per site (veg. sites only)	2.83
Average number of native species per site (shallower than max depth)	2.14
Average number of native species per site (veg. sites only)	2.54
Species Richness	23
Species Richness (including visuals)	29

Source:
SEWRPC

Table 2.4
Rock Lake Aquatic Plant Survey Summary: 2019 Versus 2025

Aquatic Plant Species	Native or Invasive	Number of Sites Found[a] (2019/2025)	Frequency of Occurrence Within Vegetated Areas[b] (2019/2025)	Average Rake Fullness[c] (2019/2025)	Relative Frequency of Occurrence[d] (2019/2025)	Visual Sightings[e] (2019/2025)
Bidens beckii (water marigold)	Native	0/7	0/10.94	0/1.57	0/4.0	3/2
Brasenia schreberi (water shield)	Native	0/--	0/--	0/--	0/--	11/--
Ceratophyllum demersum (coontail)	Native	46/19	76.67/29.69	1.76/1.26	29.9/11.0	18/9
Chara spp. (muskgrass)	Native	15/20	25.00/31.25	1.93/2.05	9.7/11.6	17/1
Elodea canadensis (waterweed)	Native	8/8	13.33/13.33	1.25/1.25	5.2/5.2	8/8
Heteranthera dubia (water stargrass)	Native	11/6	18.33/9.38	1.18/1.17	7.1/3.5	17/3
Lemna minor (duckweed)	Native	0/2	0/3.13	0/1.00	0/1.2	13/3
Lemna trisulca (forked duckweed)	Native	18/3	30.00/4.69	1.28/1.00	11.7/1.7	25/8
Lythrum salicaria (purple loosestrife)	Invasive	0/--	0/--	0/--	0/--	17/--
Myriophyllum spicatum (Eurasian watermilfoil)	Invasive	18/16	30/25	1.92/1.69	1.7/9.2	23/13
Najas flexilis (slender naiad)	Native	1/--	1.67/--	1.00/--	0.6/--	2/--
Najas marina (spiny naiad)[f]	Invasive	0/--	0/--	0/--	0/--	2/--
Nuphar variegata (spatterdock)	Native	1/1	1.67/1.67	2.00/1.00	0.6/0.6	7/1
Nymphaea odorata (white water lily)	Native	17/16	28.33/25.00	1.12/1.13	11.0/9.2	44/27
Phragmites australis (common reed)	Invasive	0/--	0/--	0/--	0/--	1/--
Pontederia cordata (pickerelweed)	Native	0/0	0/0	0/0	0/0	16/5
Potamogeton amplifolius (large-leaf pondweed)[h]	Native	--/0	--/0	--/0	--/0	--/3
Potamogeton crispus (curly-leaf pondweed)	Invasive	--/11	--/17.19	--/1.18	--/6.4	--/14
Potamogeton foliosus (leaf pondweed)	Native	--/3	--/4.69	--/1.00	--/1.7	--/0
Potamogeton friesii (Fries' pondweed)	Native	2/19	3.33/29.69	1.00/1.58	1.3/11.0	11/13
Potamogeton gramineus (variable pondweed)	Native	--/8	--/12.50	--/1.00	--/4.6	--/6
Potamogeton illinoensis (Illinois pondweed)[h]	Native	5/3	8.33/4.69	1.00/1.00	3.2/1.7	15/0
Potamogeton illinoensis x natans	Native Hybrid	--/2	--/3.13	--/1.00	--/1.2	--/0
Potamogeton nodosus (long-leaf pondweed)	Native	1/0	1.67/0	1.00/0	0.6/0	0/1
Potamogeton praelongus (white-stem pondweed)	Native	--/1	--/1.56	--/2.00	--/0.6	--/3
Potamogeton pusillus (small pondweed)[h]	Native	--/	--/1.56	--/1.00	--/0.6	--/2
Potamogeton richardsonii (clasping-leaf pondweed)[h]	Native	0/--	0/--	0/--	0/--	1/--
Potamogeton zosteriformis (flat-stem pondweed)	Native	7/13	11.67/20.31	1.14/1.38	4.5/7.5	12/8
Ranunculus aquatilis (white water crowfoot)	Native	--/4	--/6.25	--/1.00	--/2.3	--/4
Sagittaria sp. (arrowhead))	Native	0/0	0/0	0/0	0/0	1/7
Schoenoplectus tabernaemontani (softstem bulrush)	Native	0/--	0/--	0/--	0/--	13/--
Spirodela polyrhiza (large duckweed)	Native	--/1	--/1.56	--/1.00	--/0.6	--/10
Stuckenia pectinata (Sago pondweed)[h]	Native	2/7	3.33/10.94	1.00/1.14	1.3/4.0	1/15
Typha sp. (cattail)	Hybrid	0/0	0/0	0/0	0/0	38/4
Vallisneria americana (eelgrass/wild celery)[h]	Native	2/2	3.33/3.13	1.00/1.50	1.3/1.2	4/1
Wolffia columbiana (common watermeal)	Native	0/--	0/--	0/--	0/--	9/--

Table continued on next page.

Table 2.1 (Continued)

Note: Sampling occurred at 77 sampling sites on June 16th, 2025. 58 of the 77 surveyed sites had vegetation. Red text indicates non-native and/or invasive species.

[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.*

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

Source: Wisconsin Department of Natural Resources and SEWRPC

Table 2.5
Aquatic Plant Species Observed in Rock Lake: 2004 – 2025

Aquatic Plant Species	Native or Invasive	2004[a] (July)	2012[b] (June)	2019[b] (August)	2025[b] (June)
Bidens beckii	Native	--	--	X	X
Brasenia schreberi	Native	--	--	X	--
Ceratophyllum demersum	Native	X	X	X	X
Chara spp.	Native	--	X	X	X
Elodea canadensis	Native	--	X	X	X
Heteranthera dubia	Native	--	X	X	X
Lemna minor	Native	X	--	X	X
Lemna trisulca	Native	--	--	X	X
Myriophyllum sibiricum	Native	X	X	--	--
Myriophyllum spicatum	Invasive	X	X	X	X
Najas flexilis	Native	X	--	X	--
Najas marina	Naturalized	X	--	X	--
Nuphar variegata	Native	X	X	X	X
Nymphaea odorata	Native	X	X	X	X
Pontederia cordata	Native	--	--	X	X
Potamogeton amplifolius	Native	--	--	--	X
Potamogeton crispus	Invasive	--	--	--	X
Potamogeton epihydrus	Native	X	--	--	--
Potamogeton foliosus	Native	X	--	--	X
Potamogeton friesii	Native	--	--	X	X
Potamogeton gramineus	Native	X	X	--	X
Potamogeton illinoensis	Native	X	--	X	X
Potamogeton illinoensis x natans	Native	--	--	--	X
Potamogeton nodosus	Native	--	--	X	X
Potamogeton praelongus	Native	--	X	--	X
Potamogeton pusillus	Native	--	--	--	X
Potamogeton richardsonii	Native	X	--	X	--
Potamogeton robbinsii	Native	X	--	--	--
Potamogeton zosteriformis	Native	X	X	X	X
Ranunculus aquatilis	Native	X	X	--	X
Sagittaria graminea	Native	--	--	--	X
Sagittaria sp.	Native	--	--	X	X
Schoenoplectus tabernaemontani	Native	--	--	X	--
Spirodela polyrhiza	Native	--	--	--	X
Stuckenia pectinata	Native	X	X	X	X
Typha sp.	Native	--	--	X	X
Vallisneria americana	Native	X	X	X	X
Wolffia sp.	Native	--	--	X	--
Species Total		18	14	25	29

[a] The 2004 aquatic plant survey utilized a transect survey method.
[b] The 2012, 2019, and 2025 surveys utilized a grid-point survey methodology.

Note: Red text indicates nonnative and/or invasive species.

Source: SEWRPC

Table 2.6
Aquatic Plant Chemical Control Agents Applied to Rock Lake: 1962 - 2004

Year	Citrine Plus (gallons)	2, 4-D	Diquat (gallons)	Copper Sulfate	Endothall/ Aquathol
1962	- -	50.0	- -	- -	- -
1968	- -	- -	- -	- -	0.9 gal
1986	5.0	- -	2.0	- -	5.0 gal
1987	- -	- -	3.5	40.0 lbs	11.8 gal
1996	- -	- -	0.8	- -	0.8 gal
2000	- -	- -	- -	- -	60.0 lbs
2002	- -	100.0 lbs, 4.0 gal	4.5	4.5 gal	4.5 gal
2003	- -	- -	- -	5.0 lbs	- -
2004	- -	151.3 lbs	5.0	- -	- -
Total	5.0	-	15.8	45 lbs, 4.5 gal	60.0 lbs, 23 gal

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

Source: WDNR, RLRA, and SEWRPC

Table 2.7
Aquatic Plants Harvested in Rock Lake: 2013 – 2025

Year	Plant Material Removed (cubic yards)
2013	25,317
2014	13,408
2015	10,249
2016	10,453
2017	11,982
2018	11,231
2019	12,602
2020	20,467
2021	18,244
2022	12,660
2023	10,696
2024	5,560
2025	3,748
Mean Per Year	12,816.69
Cumulative Total	166,617

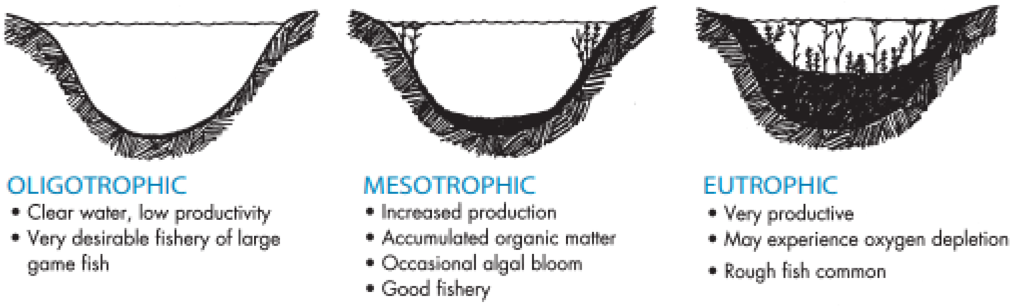
Source: SEWRPC, RLRA

SEWRPC Memorandum Report Number 283

AQUATIC PLANT MANAGEMENT PLAN FOR
ROCK LAKE, KENOSHA COUNTY, WISCONSIN

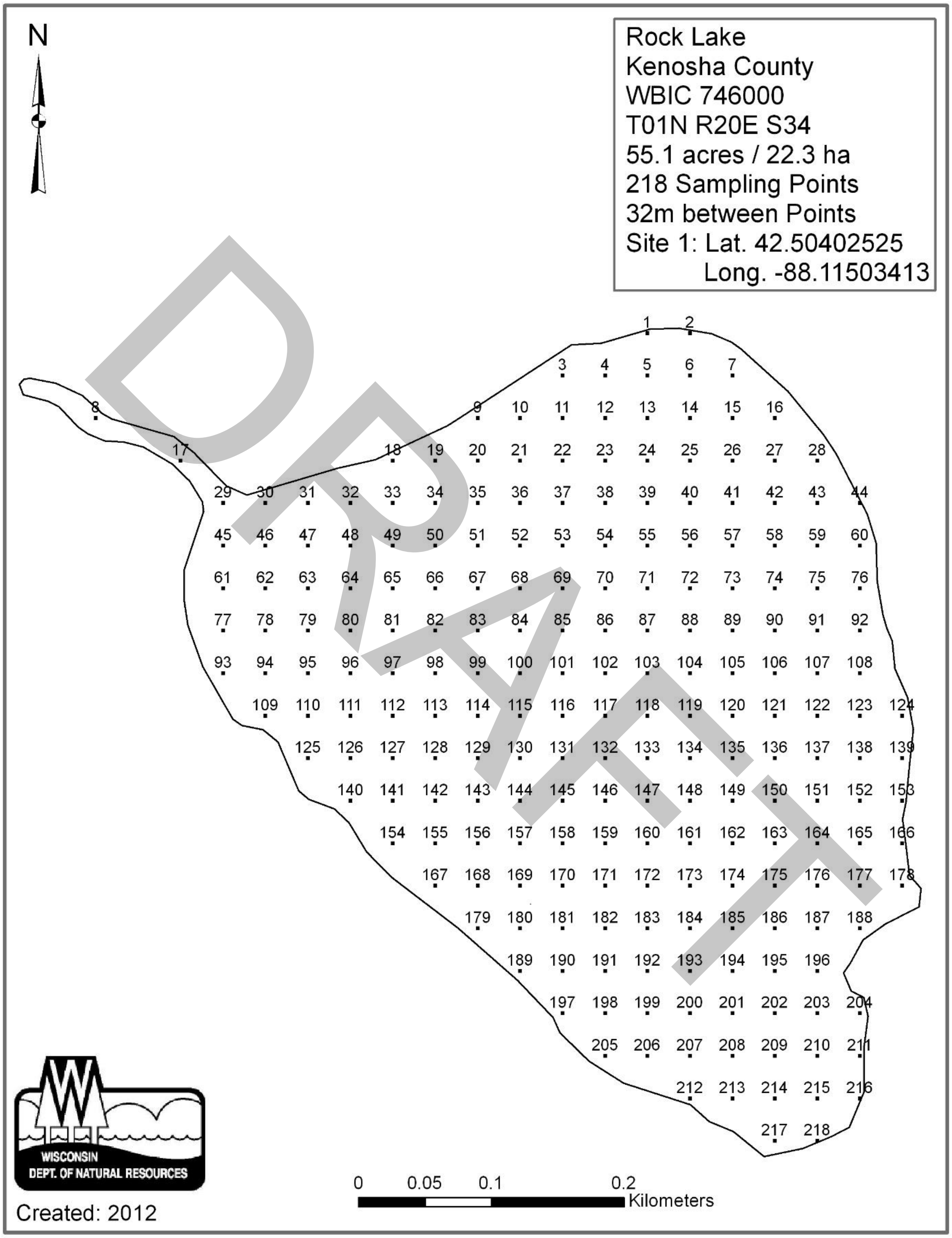
Chapter 2 Figures

Figure 2.1
Lake Trophic States



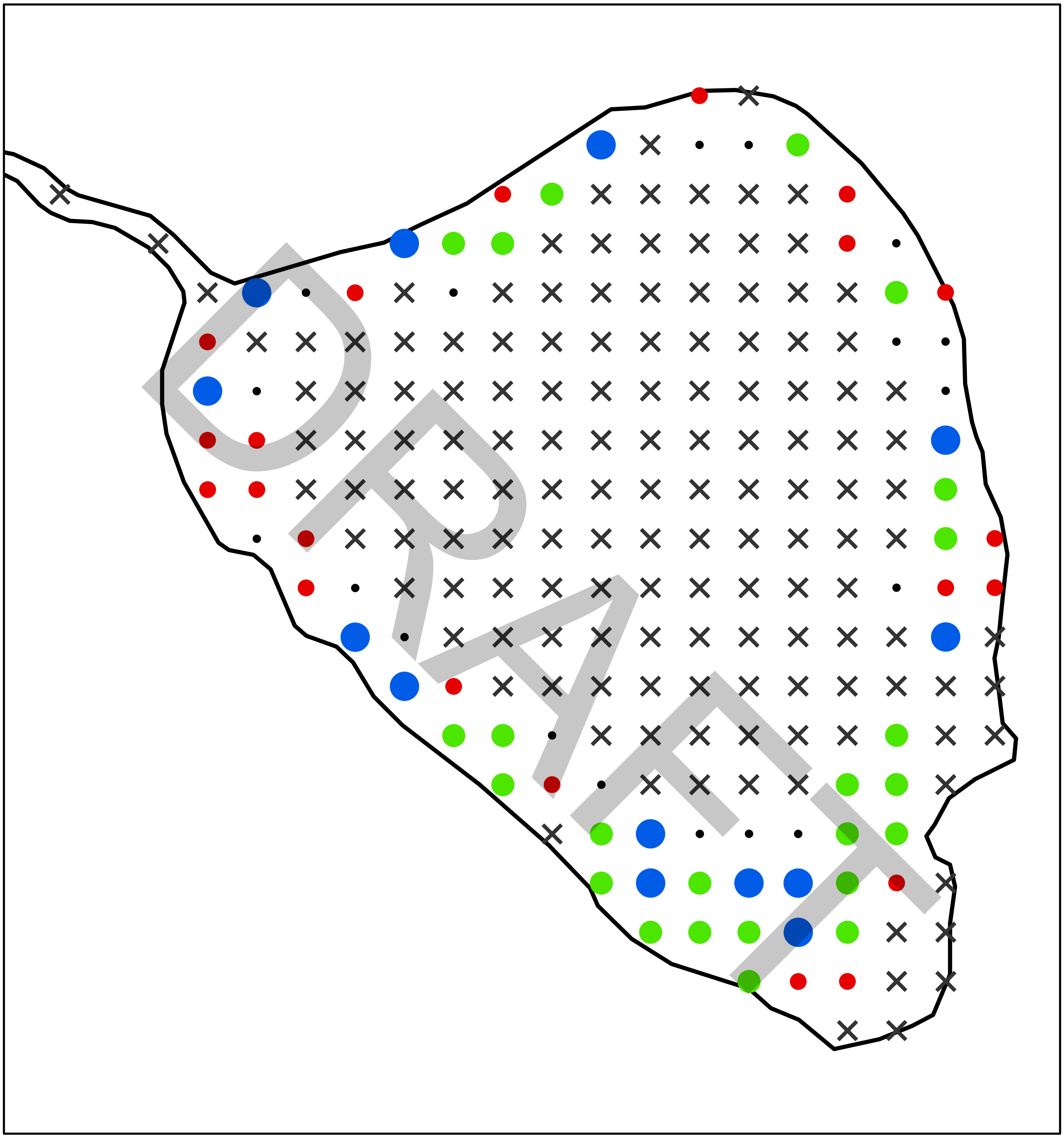
Source: UW-Stevens Point Extension, WDNR

Figure 2.2
Aquatic Plant Sampling Map for Rock Lake

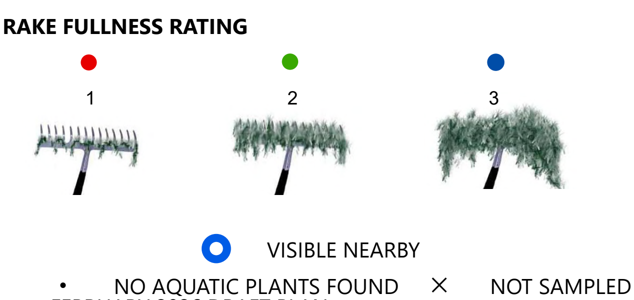


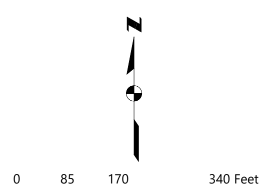
Source: WDNR

Figure 2.3
Total Rake Fullness in Rock Lake: June 2025



NOTE: Survey was conducted on Rock Lake on June 18th, 2025.

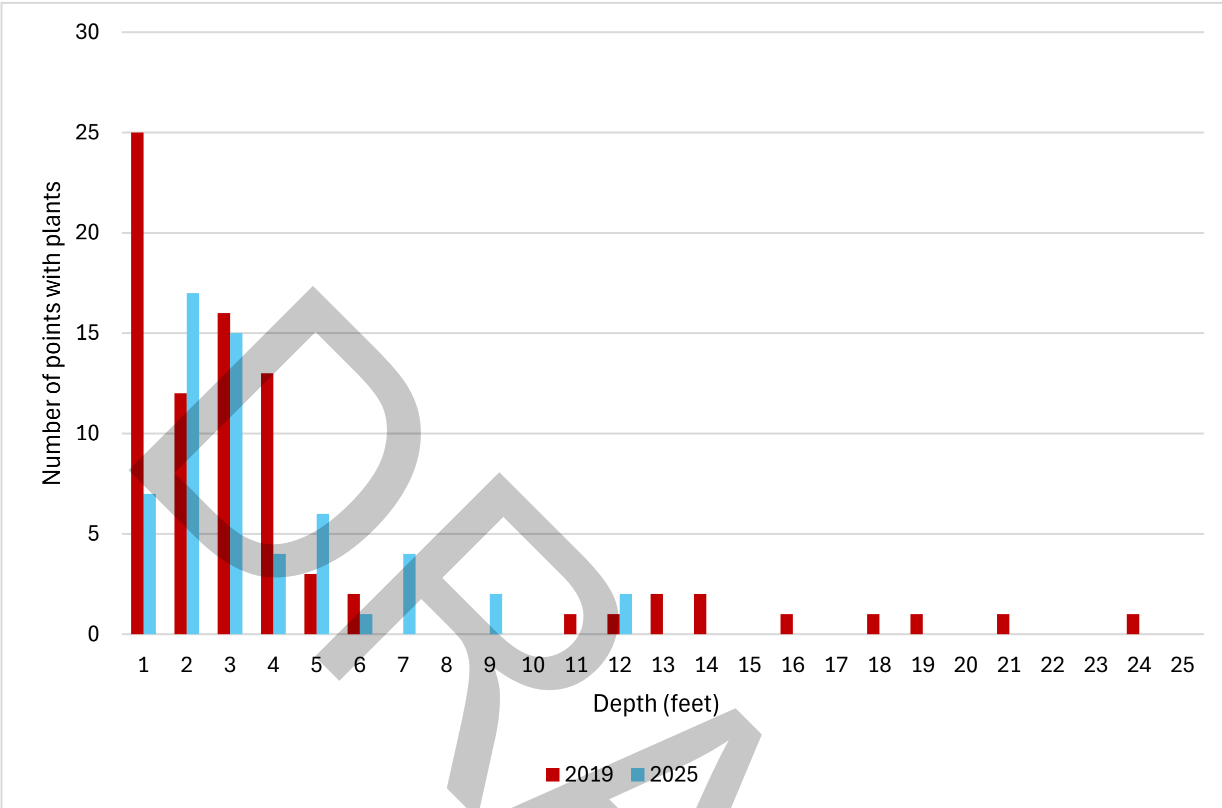




Source: SEWRPC

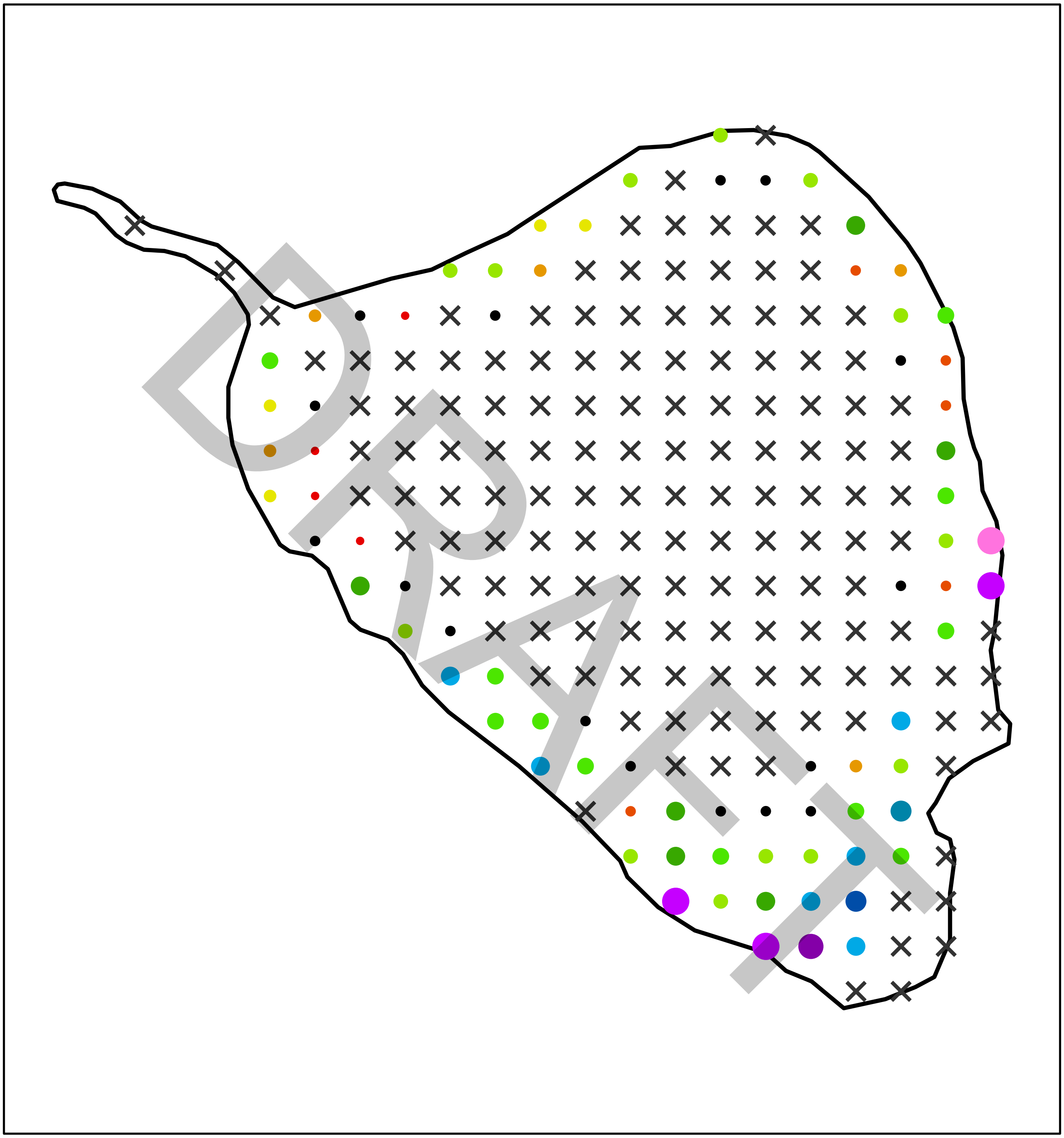
Source: WDNR and SEWRPC

Figure 2.4
Maximum Depth of Colonization: 2019-2025 for Rock Lake



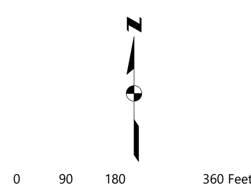
Source: SEWRPC

Figure 2.5
Rock Lake Species Richness: June 2025



NOTE: Survey was conducted on Rock Lake on June 18th, 2025.

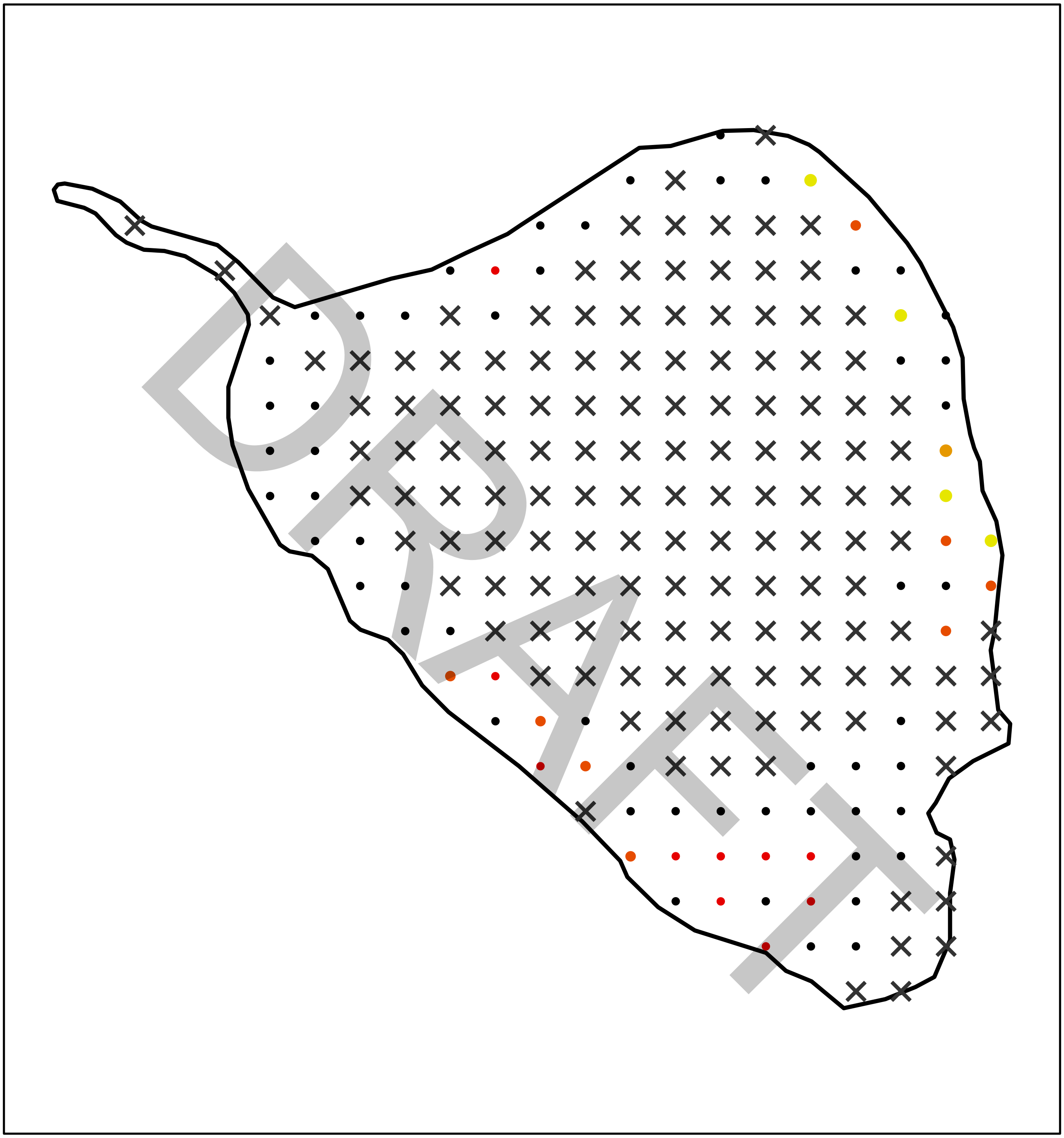
SPECIES RICHNESS



Source: SEWRPC

Source: WDNR and SEWRPC

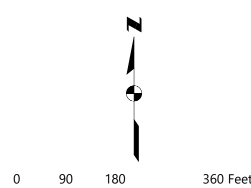
Figure 2.6
Sensitive Aquatic Plant Species - Species Richness in Rock Lake: June 2025



NOTE: Survey was conducted on Rock Lake on June 18th, 2025.

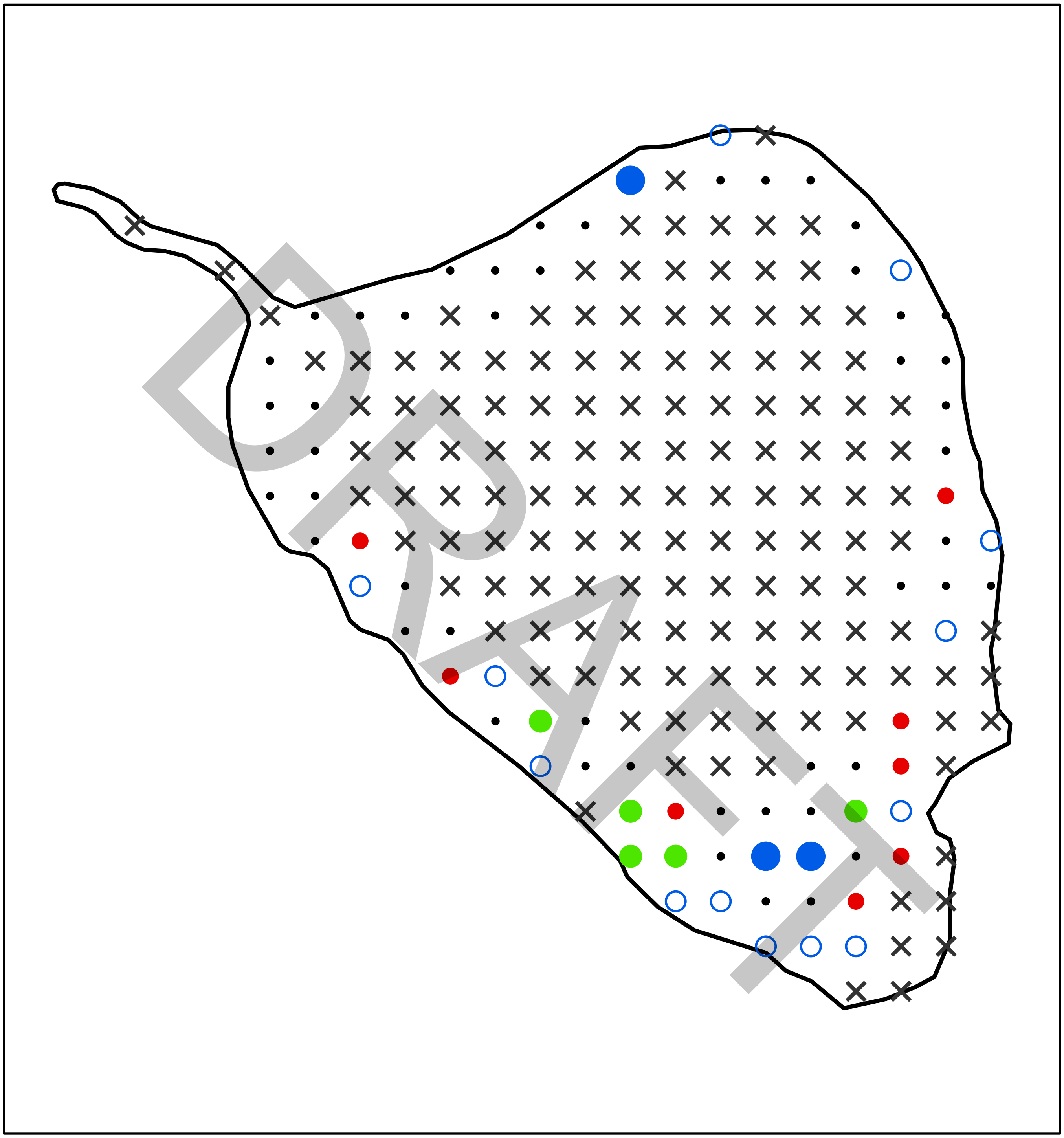
SENSITIVE SPECIES RICHNESS

- ● 0.5
- ● 1
- ● 1.5
- ● 2
- × NOT SAMPLED
- • NO AQUATIC PLANTS FOUND



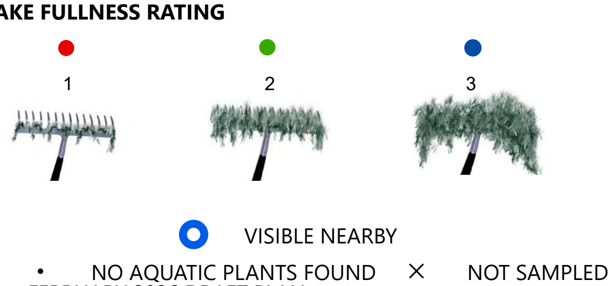
Source: SEWRPC

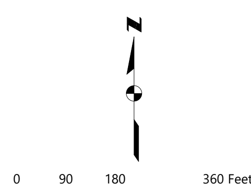
Figure 2.7
Eurasian Watermilfoil Rake Fullness in Rock Lake: June 2025



NOTE: Survey was conducted on Rock Lake on June 18th, 2025.

RAKE FULLNESS RATING

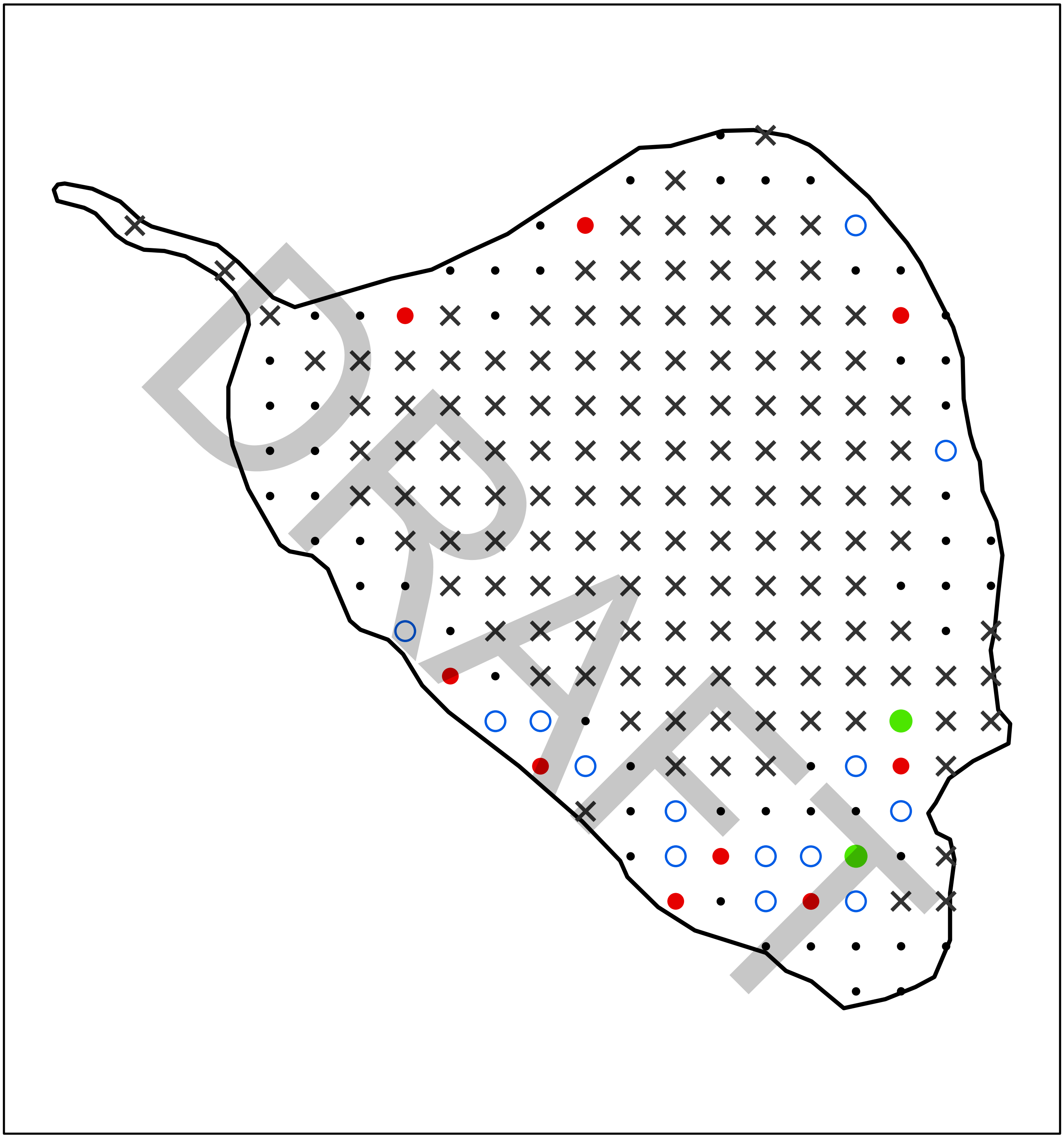




Source: SEWRPC

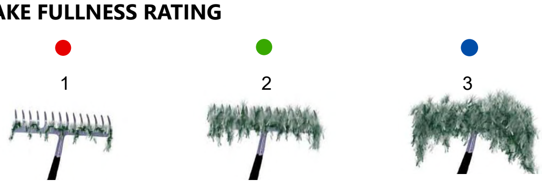
Source: WDNR and SEWRPC

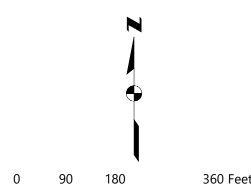
Figure 2.8
Curly Leaf Pondweed Total Rake Fullness: June 2025



NOTE: Survey was conducted on Rock Lake on June 18th, 2025.

RAKE FULLNESS RATING





Source: SEWRPC

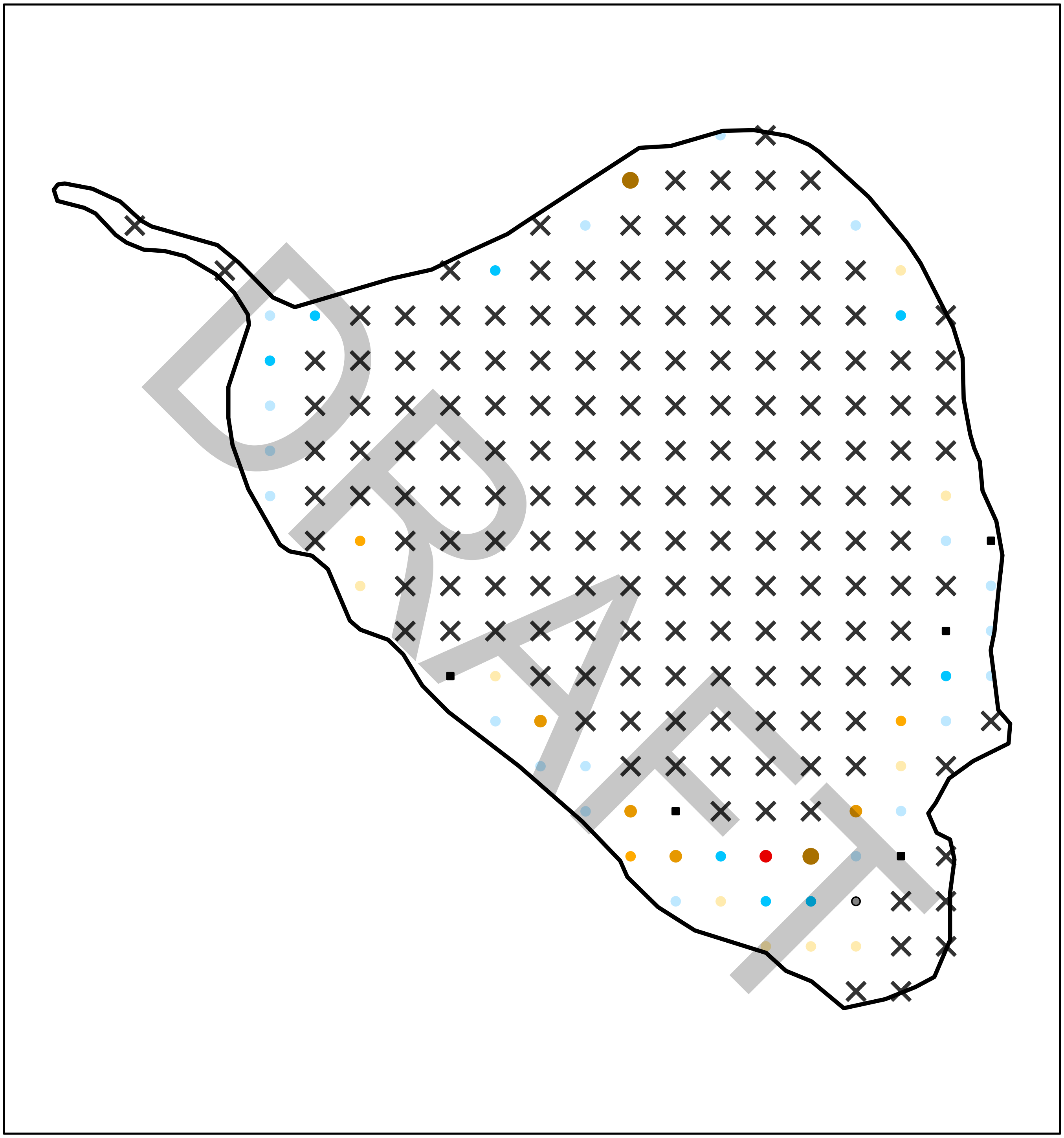
VISIBLE NEARBY

• NO AQUATIC PLANTS FOUND

× NOT SAMPLED

Source: WDNR and SEWRPC

Figure 2.9
Change in EWM Rake Fullness in Rock Lake: 2019-2025



NOTE: Survey was conducted on Rock Lake on June 18th, 2025; visual sightings were counted as 0.5.

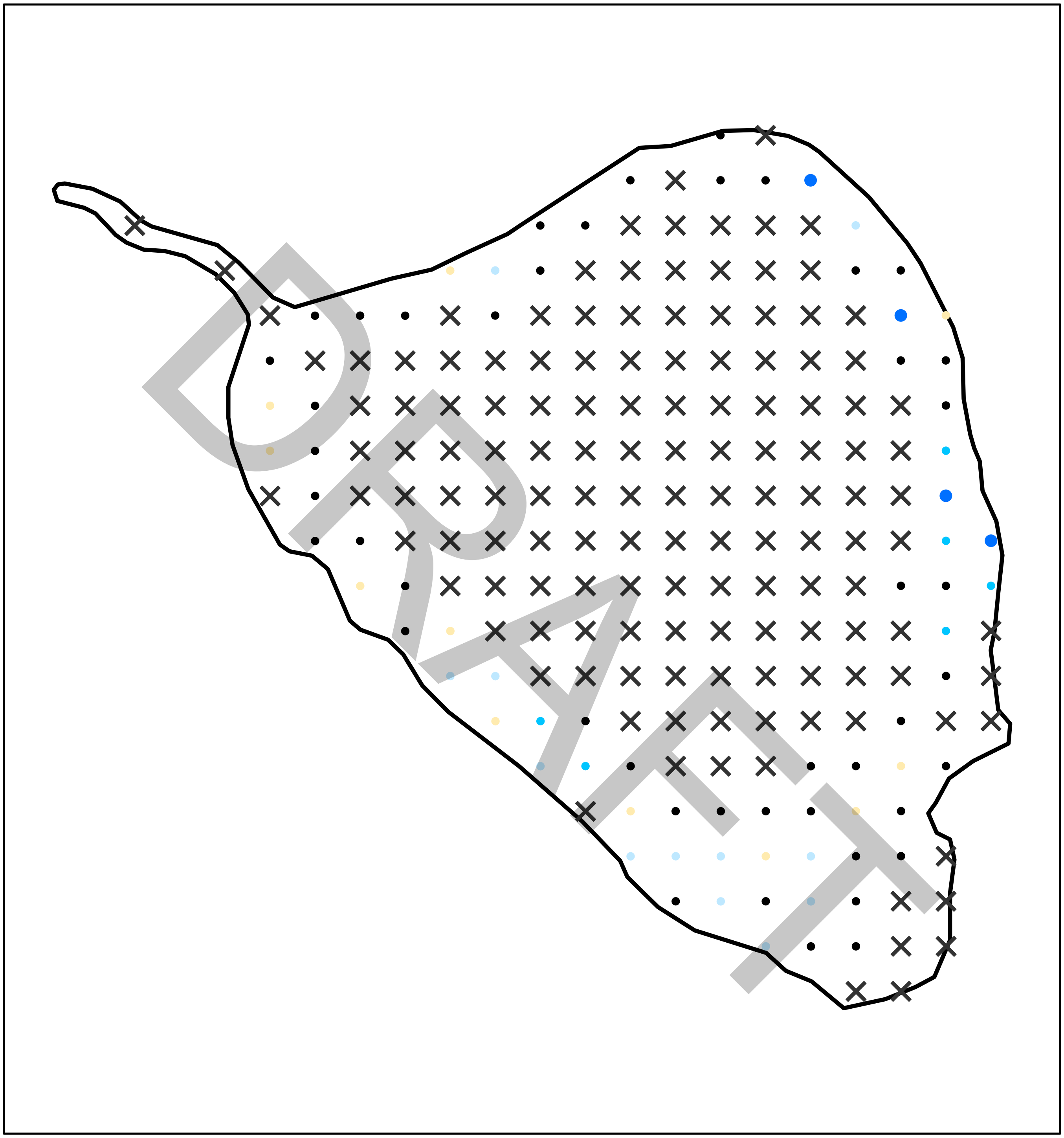
CHANGE IN RAKE FULLNESS

- -0.5
- -1
- 0.5
- 1
- 1.5
- 2
- 3
- NO CHANGE
- NONE FOUND

0 90 180 360 Feet

Source: SEWRPC

Figure 2.10
Change in Sensitive Aquatic Plant Species in Rock Lake: 2019-2025

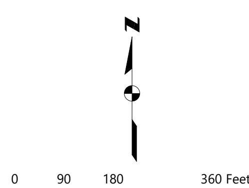


NOTE: Survey was conducted on Rock Lake on June 18th, 2025.

SENSITIVE SPECIES RICHNESS

- -0.5
- 0
- 0.5
- 1
- 2

- NO SENSITIVE AQUATIC PLANTS FOUND
- NO CHANGE IN SENSITIVE AQUATIC PLANTS FOUND
- × NOT SAMPLED



Source: SEWRPC

Figure 2.11
Past and Present Harvesting Equipment for Rock Lake

Hockey Underwater Cutter (photo: SEWRPC 2014) *Rock Lake DASH Boat (photo: Lake and Pond Solutions Co. 2019)*

Source: SEWRPC

Figure 2.12
Disposal route and Site for Rock Lake Aquatic Plant Harvesting

OFFLOAD SITE

DISPOSAL SITE

DISPOSAL ROUTE

0 265 530 1,060 Feet

Source: SEWRPC

Chapter 3

MANAGEMENT RECOMMENDATIONS AND PLAN IMPLEMENTATION

This Chapter summarizes the information and recommendations needed to manage aquatic plants in Rock Lake, particularly the nonnative species of Eurasian watermilfoil ("EWM") and curly-leaf pondweed ("CLP"). Accordingly, it presents a range of alternatives that could potentially be used, and provides specific recommendations related to each alternative. The measures discussed focus on those that can be implemented by the Rock Lake Restoration Association ("RLRA") in collaboration with the Wisconsin Department of Natural Resources ("WDNR") and Lake residents. The aquatic plant management recommendations contained in this chapter are limited to approaches that monitor and control nuisance level aquatic plant growth in the Lake after the growth has already occurred.

The individual recommendations presented below, and which collectively constitute the recommended aquatic plant management plan, balance three major goals:

- Improving navigational access within the Lake
- Protecting the native aquatic plant community
- Controlling CLP and EWM

Plan provisions also ensure that current recreational uses of the Lake (e.g., swimming, boating, fishing) are maintained or promoted. The plan recommendations described below consider common, State-approved, aquatic plant management alternatives including manual, biological, physical, chemical, and mechanical measures.

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 Figures 3.1 through 3.2 and briefly summarized in the following paragraphs. These management techniques were discussed with both the RLRA and the WDNR.

Aquatic Plant Management Recommendations

The most effective plans to manage nuisance and invasive aquatic plant growth rely on a *combination* of methods and techniques. A "silver bullet" single-minded strategy rarely produces the most efficient, most reliable, or best overall result. This plan recommends three primary aquatic plant management techniques: mechanical harvesting, chemical treatment, and invasive species prevention. Each of these techniques have custom adaptations for the conditions present in certain portions of the Lake or adaptations for when certain conditions arise within the aquatic plant community in the Lake. Figure 3.1 illustrates the primary aquatic plant recommendations for Rock Lake. Figure 3.2 illustrates secondary recommendations for the Lake. The elements described below are combined to form the recommended Rock Lake aquatic plant management program.

1. **Mechanically harvest invasive and nuisance aquatic plants.** DASH is recommended to be the primary means to manage invasive and nuisance aquatic plants on Rock Lake. Harvesting must avoid, or must be substantially restricted, in certain areas of the Lake. This includes areas of greater ecological value or where boat access is not desired or necessary.

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.

3. **Invasive species plant control**. While the 2025 aquatic plant survey did not reveal a need to actively control Eurasian water milfoil or curly-leaf pondweed on a large scale, these plants should still be monitored. As aquatic plant community species change, the need for management changes.

Populations should be controlled with top-cut harvesting, DASH, or early spring chemical treatments. This recommendation should be considered a <u>high priority</u>.

4. **Limited chemical use**. As described in Chapter 2 of this plan, chemical treatment has not been a primary part of the RLRA's aquatic plant management strategies in the recent past. While this method of aquatic plant control has several drawbacks (e.g., water quality, comparatively nonselective, chemical side effects, and more) it may be considered under exceptional circumstances going forward. Recent surveys have shown that the invasive and nuisance species are well under control and there are several sensitive species present in the Lake that may be negatively impacted by chemical treatment. Thus, chemical usage as the main practice to manage EWM and CLP are not recommended at this time. Limited chemical use in areas where harvesting is not feasible or when invasive species reach 25%, is recommended and described in further detail below.

5. **Manual removal of nuisance plant growth in near-shore areas, Eurasian water milfoil and curly-leaf pondweed** should be considered in areas too shallow, inaccessible, or otherwise unsuitable for other plant control methods**.** "Manual removal" is defined as control of aquatic plants by hand or using hand-held non- powered tools. Riparian landowners need not obtain a permit for manually removing aquatic plants if they confine this activity to a 30-foot width of shoreline (including the recreational use area such as a pier) that does not extend more than 100 feet into the Lake and they remove all resulting plant materials from the Lake.[1] Prior to the "raking/hand-pulling" season, an educational campaign should be actively conducted to help assure that shoreline residents appreciate the value of native plants, understand the relationship between algae and plants (i.e., more algae will grow if fewer plants remain), know the basics of plant identification, and the specifics about the actions they are allowed to legally take to "clean up" their shorelines.[2]

6. **Begin participation in the Clean Boats Clean Waters program at the public access sites.** Participation in this program proactively encourages lake users to clean boats and equipment before launching and using them in Rock Lake.[3] This will help lower the probability of invasive species entering and leaving the Lake.

---

[1] *The manual removal area limitation for nearshore aquatic plants applies to shorelines where native plants are present. The removal area limitation does not apply to areas populated solely with nonnative and invasive plants.*

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

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

7. **Stay abreast of best management practices to address invasive species.** The RLRA should regularly communicate with Kenosha County and WDNR staff about the most effective treatment options for invasive species as novel techniques and/or chemical products that may more effectively target these species become available.

8. **Consider formation of a Lake District.** Lake Districts have the power to levy taxes from their jurisdiction. This recommendation should be considered a high priority if WDNR grant funds prove insufficient to cover the cost of Lake management efforts. Additionally, the legal openness by which Districts are governed by means it is a democratic system of management for the Lake and may be useful when making decision regarding the methods for managing Rock Lake.

9. **Ensure accessible, accurate record-keeping of RLRA activities through training, utilizing existing informational resources, and centralizing information.** Maintaining accessible report records within the RLRA allows direct and standardized comparison of operations (i.e., harvesting, chemical treatments, and other lake management efforts) across time and may be used in guiding future management decisions. It is important that these records are housed somewhere accessible to future board members (e.g., a shared cloud storage system), as board turnover can cause loss of information if kept by individuals only. Information can be shared at the RLRA's annual meeting, hosted on the RLRA or town website, or entered into the ePermitting System through the WDNR.[4]

10. **Inform Lake Residents of Management Efforts.** Efforts should be made to keep lake residents abreast of current aquatic plant management efforts as outlined in this plan. Additionally, information should be disbursed to inform riparian residents of the actions they can take as individual property owners regard aquatic plant management.

Diver Assisted Suction Harvesting

As mentioned in previous chapters, the RLRA owns a diver-assisted suction harvesting boat that they have been utilizing as their main form of aquatic plant management. When the harvesting boat is fully manned and fully operational, it successfully manages the aquatic plant population and provided navigation lanes

[4] *https://dnr.wisconsin.gov/permits/water*

to homeowners. Figure 3.1 shows the recommended lanes for harvesting in Rock Lake. Priority should be given to public access sites.

However, in the last several years the RLRA has noted difficulties with funding the mechanical maintenance associated with the harvester. Operating and maintaining a harvesting program is an expensive endeavor but funding may be available to help purchase and/or repair a harvester through the WDNR Recreational Boating Facilities grant program described in the "Future Funding" section later in this chapter.[5] If the RLRA is unable to staff or maintain its own harvester, then the RLRA could consider contracting a local private harvesting firm if harvesting within the Lake is permitted through WDNR. Alternatively, there may be opportunities to acquire and share equipment with neighboring lakes.

General Harvesting Conditions

1. **Harvesting native pondweeds (*Potamogeton* spp.) and muskgrasses (*Chara* spp.) outside of the designated harvesting lanes is prohibited**. These plants provide habitat for young fish, reptiles, and insects in the Lake.

2. **Inspect all cut plants for live animals. Immediately return live animals to the water**. A second staff person equipped with a net should accompany and assist the harvester operator. Animals can be caught in the harvester and harvested plants, particularly when cutting larger plant mats. Consequently, carefully examine cut materials to avoid inadvertent harvest of fish, crustaceans, amphibians, turtles, and other animals.

3. **Harvesting should not occur in the early spring** to avoid disturbing fish spawning. Studies suggest that harvesting activities can significantly disturb the many fish species that spawn in early spring. Thus, avoiding harvesting during this time can benefit the Lake's fishery. Additionally, care should be taken to avoid active spawning areas and critical fish habitat areas through the open water reasoning.

4. **All harvester operators should adhere to the harvesting specifications and practices as described in the harvesting permit**. Harvester operators should 1) understand harvesting techniques and when to employ each in accordance with this plan, 2) review of the aquatic plant

[5] *See https://dnr.wisconsin.gov/aid/RBF.html for information on the Recreational Boating Facilities program.*

management plan and associated permits with special emphasis focused on the need to restrict cutting in shallow areas, and 3) have plant identification skills to encourage preservation of native plant communities. Additionally, all harvester operators are obligated to record their work for inclusion in annual reports that are required under harvesting permits.

5. **Proper disposal of aquatic plants is required**. All plant debris collected from harvesting activities must be collected and disposed at the designated disposal sites using the designated disposal route, as shown on Figure 2.12. No aquatic plant material may be deposited within identified floodplain and wetland areas.

6. **Management, record keeping, monitoring, and evaluation**. The RLRA manage harvesting operations and are responsible for the overall plan execution and logistics. All daily harvesting activities will be documented in writing by the harvester operator in a permanent harvesting operations log. Harvesting patterns, harvested plant volumes, weed pickup, plant types, harvesting location, and other information will be recorded.[6] 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. All data will streamline functionality in harvesting operations. Monitoring information will be summarized in an annual summary report prepared by the District, submitted to WDNR, and available to the public.

7. **Standardization of harvesting reporting**. When defining the amount of harvested plant material from the Lake, estimations are typically made regarding the mass of plants harvested. As previously mentioned, accurate record keeping is essential for organization, but standardization of these estimations allows for continued accuracy. Standardization methods should define:

    - *What is a "load" of plants?* These loads can vary based on if the load is for a harvester or a truck.
    - *How are partial loads accounted for?* Partial loads can be rounded to the nearest quarter or half.

[6] *Volume is most often reported in cubic yards of harvested material.*

- *What is the volume capacity of your equipment?* Knowing the capacity can help with estimations of harvested aquatic plant material carried.
- *How is the weight of aquatic plants accounted for?* Different aquatic plant communities can have differing weights at the same volume due to their intrinsic density, or how tightly packed together they are when harvested. Periodically weighing a sample of harvested plants to ensure accuracy may be useful when making estimations.

Mechanical Cutting Harvesting

In the past the RLRA owned and operated an underwater cutter as described in Chapter 2 of this report. Should the RLRA purchase or contract use of a cutter the following conditions must be followed in addition to those outlined above.

8. **Maintain at least 12 inches of living plant material after harvesting via cutting**. 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.

9. **Harvesting can fragment plants.** Plant fragments may float in the Lake, accumulate on shorelines, and help spread undesirable plants. The harvesting program should include a comprehensive plant pickup program that all residents can use. This helps assure that harvesting does not create a nuisance for Lake residents. The program typically includes residents raking plants, placing them in a convenient location accessible to the harvester (e.g., the end of a pier), and regularly scheduled pickup of cut plants by the harvester operators. This effort should be as collaborative as practical.

Hand-Pulling

In nearshore areas where other management efforts are not feasible, raking is 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 RLRA 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.[7]

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

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

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.[8]

Chemical Treatment

Large-scale chemical treatment is not recommended in Rock Lake due to the low density of invasive species and the high diversity of native species distributed throughout much of the Lake; these native species may be negatively affected by such a treatment. If monitoring suggests a dramatic change in invasive species populations, recommendations regarding large-scale chemical treatments should be reviewed. For example, the RLRA 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. Additionally should the invasive species of CLP or EWM reach a growth biomass density of 25% of aquatic plant densities in the Lake then chemical treatments may be considered (see Figure 3.2).[9] 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 and be thoroughly discussed with WDNR biologists.[10]

1. ***Early spring* chemical treatment in designated areas only if nuisance plant growth impedes Lake access**. Treatment should be limited to Eurasian water milfoil and curly-leaf pondweed infested areas in navigation lanes or in areas where native plant growth impedes lake access. If chemical treatment is used it should only occur in the early spring when human contact and risks to native plants are most limited, and not after July 1st. Treatments are typically most effective in water temperatures between 50 and 60°F and any treatment should try and avoid impacts to spawning fish. A WDNR permit and WDNR staff supervision are required to implement this alternative. Lakeshore property owners must be notified of planned chemical treatment schedules and permit conditions before chemicals are applied to the lake.

---

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

[9] Decisions as to if the Lake has reached and/or surpassed the 25% threshold will be made collaboratively among lake managers with WDNR Biologists having final authority for permit issuance.

[10] *More information regarding chemical treatment of aquatic plants can be found at the following webpage: https://dnr.wisconsin.gov/topic/Lakes/AquaticHerbicidesFAQ.html.*

Future Funding

Current efforts pursued by the RLRA have been mostly effective at maintaining a healthy and diverse aquatic plant community while suppressing aquatic invasive species populations. The RLRA should utilize WDNR Surface Water Grants to further their efforts in monitoring the Lake, inspecting watercraft at boat launches, and targeting areas for management. 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.
- **Aquatic Invasive Species Prevention** – this grant program covers up to 75 percent of either $4,000 or $24,000 for projects that help prevent the spread of AIS species. Eligible costs include the acquisition of decontamination equipment at public boat launches as well as targeted management at boat launches or other access points. All lakes are eligible for at least $4,000 in funding but lakes that are designated as high priorities for AIS spread statewide, due to large amounts of boat traffic and/or the presence of particular invasive species, are eligible for $24,000. The RLRA must participate in the Clean Boats, Clean Waters program to achieve 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 limited spread of EWM and CLP within the lakes, the small-scale project is more appropriate at this time. The large-scale projects should be considered if the populations of these species increase or a novel invasive species, such as starry stonewort, is observed within the lake. 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.
- **Recreational Boating Facilities Grant Program**[11] – this grant program covers up to 50% of $250,00 for a recreational boating facility project. These projects can include aquatic plant harvesting equipment, rehabilitation of facilities, trash skimming equipment, improvement or repair of locks, construction projects such as ramps or dredging for safe water depths.

[11] *https://dnr.wisconsin.gov/aid/RBF.html*

The RLRA should consider applying for these grant programs whenever feasible to support the monitoring, communication, watercraft inspection, and targeted management recommended in this aquatic plant management plan. Additionally, as mentioned earlier in this chapter, taxes levied by the formation of a lake district could help fund both the capital and operational costs of an aquatic plant management program for the Lake.

3.2 SUMMARY AND CONCLUSIONS

As requested by the RLRA, the Commission worked with the RLRA to develop a scope of work and secure funding to provide information needed to renew the RLRA'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 as well as options for future funding. Figures 3.1 and 3.2 summarize and locate where aquatic plant management recommendations should be implemented.

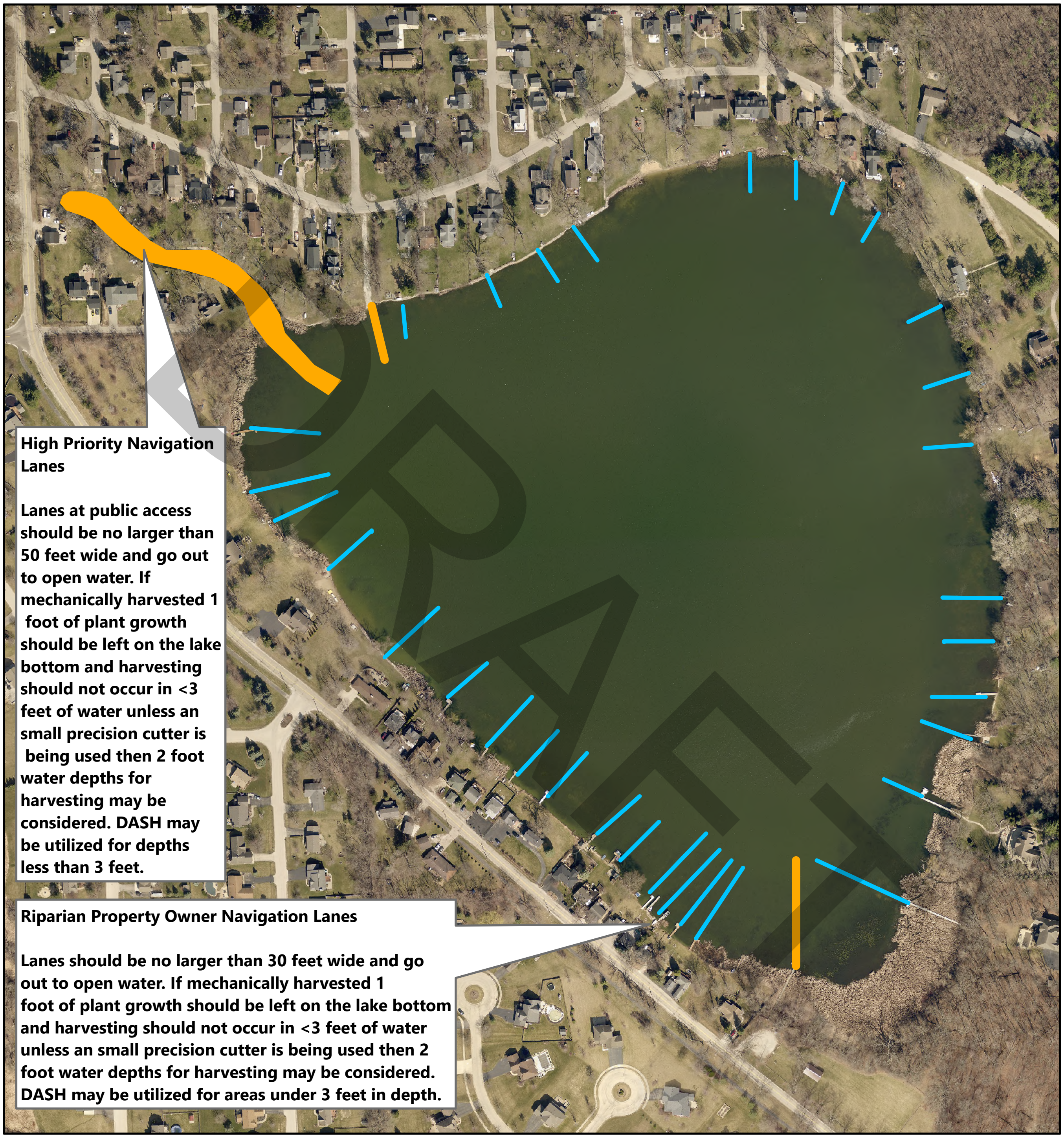
Successfully implementing this plan will require cooperative engagement from the RLRA, RLHA, State and regional agencies, Kenosha County, municipalities, and residents/users of the Lake. The recommended measures help foster conditions sustaining and enhancing the natural beauty and ambience of Rock Lake while promoting a wide array of water-based recreational activities suitable for the Lake's intrinsic characteristics.

SEWRPC Memorandum Report Number 283

AQUATIC PLANT MANAGEMENT PLAN FOR
ROCK LAKE, KENOSHA COUNTY, WISCONSIN

Chapter 3 Figures

Figure 3.1
Aquatic Plant Management Recommendations for Rock Lake: 2026-2030



HIGH PRIORITY NAVIGATIONAL HARVESTING

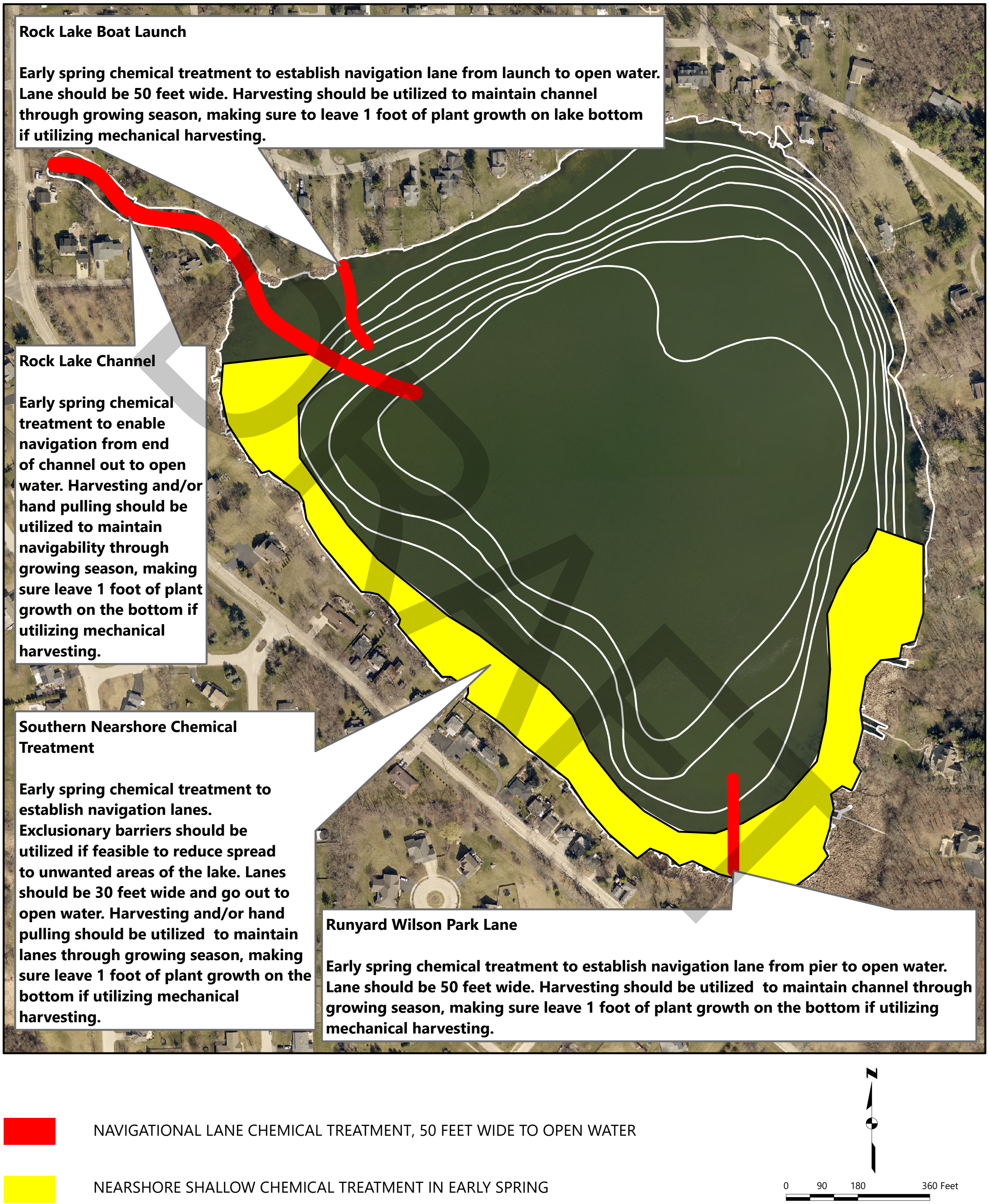
HARVESTING LANES FOR NAVIGATION FOR RIPARIAN PROPERTY OWNERS

N

0 90 180 360 Feet

Source: SEWRPC

Figure 3.2
Secondary APM Measures - Chemical Treatment for Rock Lake: 2026-2030



Source: SEWRPC

SEWRPC Memorandum Report Number 283

AQUATIC PLANT MANAGEMENT PLAN FOR
ROCK LAKE, KENOSHA COUNTY, WISCONSIN

Appendix A

Appendix A.1 Lake Glossary of Terms

Alkalinity – the capacity of water to buffer against acidity, having a pH greater than 7

Anoxic – without oxygen

Aquifer – unconsolidated, porous and/or fractured bedrock units that can supply water over prolonged periods of time

Benthic – pertaining to the bottom of waterbodies

Biocontrol – biological control; use of animals, fungi, or diseases to control invasive populations. Referred to as 'control organisms', the chosen measure usually comes from the native range of the targeted invasive. The chosen control organisms require studies to ensure they will remain specific to the target population and will not harm native species

Biodiversity – biological diversity; a measure of the variety of kinds of organisms present in an ecosystem

Biomass - The total quantity of plants and animals in a lake. Measured as organisms or dry matter per cubic meter, biomass indicates the degree of a lake system's eutrophication or productivity

C values- coefficient of conservation values; numerical scores on a scale of zero to ten that reflect the likelihood that each species occurs in undisturbed habitat. These individual values are combined, then averaged in the calculation of a lake's FQI score

Chloride – a water-soluble ion (Cl^-) that carries a negative charge and can be found in all water systems. High concentrations of this ion in water systems can have impacts on the biological integrity of the ecosystem. Often the addition of chloride into systems can be attributed to human activities

Chlorophyll – the major pigment involved in photosynthesis. The concentration of chlorophyll in a water sample is commonly used as an estimate of algal biomass

Clarity – the transparency of water, influenced by the amount of suspended particles (e.g. algae, sediment, tannins) in the water. Higher water clarity allows deeper light penetration into waterbodies and is important for aquatic life. Water clarity is often monitored by a Secchi disk

Cultural eutrophication – the process by which human activity accelerates the natural aging and eutrophication of lakes

DASH – Diver-Assisted Suction Harvesting. A mechanical aquatic plant removal method. Divers identify and pull selected aquatic plants from the lakebed and insert the entire plant in a suction hose that transports it to the surface for collection and further disposal. This removal method can be employed by individuals or groups, though it requires a NR 109 permit

Deep headwater lake – a hydrological classification of a lake. Lakes within this classification stratify as well as have less than 4 square miles of direct watershed drainage

Deep lowland lake – a hydrological classification of a lake. Lakes within this classification stratify as well as have 4 square miles or more of direct watershed drainage

Drainage lake – a hydrological classification of a lake. Lakes within this classification have both an inlet and outlet, usually fed from stream drainage

Drainage basin - The total land area that drains toward the lake

E. coli – a bacterium commonly found in waterbodies. *E. coli* is often monitored at beaches, as all warm-blooded animals have the bacteria in their feces; therefore, high amounts of E. coli suggest a high chance of fecal contamination in the water

Emergent plants – aquatic vegetation that is rooted to the bottom but has leaves that float on the surface or protrude above the water

Epilimnion – the stratum of warm, mixed water above the thermocline in stratified lakes

Erosion – the processes that loosen and move particles from one place to another

Eutrophic – nutrient-rich, high-productivity lakes. These systems are typically shallow and support high amounts of aquatic plant growth

Filamentous algae - Algae that forms filaments or mats attached to sediment, weeds, piers, etc

FQI – floristic quality index. The average C value of all plant species identified in the lake, divided by the square root of species richness

Frequency of occurrence – expressed as a percent, the percentage of times a species occurred when there was aquatic vegetation present at the sampling site

Herbicide – a pesticide designed to kill or control plants

Hypolimnion – the cold, deep layer in stratified lakes

Impoundment – a hydrological classification of a lake. Lakes within these classifications are human-made bodies of water and are usually classified as such if more than one-half of its maximum depth results from a dam or other type of control structure

Invasive species – plants, animals, or pathogens that have been introduced to a location where it is does not occur naturally, and is then capable of reproduction and widespread establishment in the new location if no human intervention is taken

Lake ecosystem – the interaction between living organisms and their nonliving environment

Littoral zone – the shallow, nearshore area of a lake or pond characterized by light penetration to the bottom

Macrophytes - Refers to higher (multi-celled) plants growing in or near water. Macrophytes are beneficial to lakes because they produce oxygen and provide substrate for fish habitat and aquatic insects.

Overabundance of such plants, especially problem species, is related to shallow water depth and high nutrient levels

Maximum depth of colonization – the deepest point of a waterbody at which vascular aquatic plants can grow

Mechanical harvesting – an aquatic plant removal method in which specialized equipment, called 'harvesters', cut and subsequently remove aquatic plants at specified depths

Mesotrophic – an aquatic system that's nutrient levels are between eutrophic (nutrient-rich) and oligotrophic (nutrient-poor) conditions

Metalimnion – the stratum between the epilimnion and hypolimnion exhibiting the marked thermal change; synonymous to thermocline

Natural resources – structures and processes that can be used by humans but cannot be created by them

Nonnative species – organisms that did not naturally occur in the region and were instead introduced. Nonnative species are not inherently invasive species

Nonpoint source – diffuse pollutants, such as agricultural runoff, road salt, and acid rain, that are not from a single, confined source

Oligotrophic – nutrient-poor, low productivity aquatic systems. These lakes are typically clear, have little aquatic plant growth, with sufficient dissolved oxygen near the bottom to support cold-water fish like cisco or trout.

Ordinary high watermark – generally represented by a physical mark on the shoreline that stays consistent over time. These physical marks show above average water levels that still occur regularly enough to maintain the mark. These physical marks can be bank impressions, lack of vegetation, and/or soil differences

Phosphorus – a common nutrient found in fertilizers, organic wastes, and industrial effluent. In excess, it can speed up the eutrophication of aquatic systems, leading to algal blooms

Pollution – any substance or material that degrades the environment for humans or other organisms

Relative species abundance – shown as a percentage, the proportion of a species to the total number of species in a given environment

Reservoir – can reference a formation that acts as storage for fluids, such as groundwater or a hydrological classification of a waterbody type, interchangeably used with 'impoundment', where the waterbody is largely maintained through a dam

Riparian – adjacent to waterbodies

Secchi disk – a black and white circular disk that measures the clarity of waterbodies. Secchi disks are lowered into the water until the disk is no longer visible. This depth is referred to as the 'secchi depth/reading'

Sedimentation - Accumulated organic and inorganic matter on the lake bottom. Sediment includes decaying algae and weeds, marl, and soil and organic matter eroded from the lake's watershed

Seepage lakes - Lakes without a significant inlet or outlet, fed by rainfall and groundwater. Seepage lakes lose water through evaporation and groundwater moving on a down gradient

Sensitive species – organisms that are vulnerable to ecological disturbance, and thusly more likely to be found in less developed or disturbed areas

Shallow lowland lake – a hydrological classification of a waterbody. This lake type is naturally occurring, does not thermally stratify, and contains both an inlet and outlet

Shoreline – the physical point or general area of where a large waterbody meets the land

Species richness – a count of the total number of unique species found in an area of interest

Substrate – the substance found at the bottom of aquatic environments. In lakes, these are most commonly muck, sand, gravel

Stratification – the development of distinct layers in an ecological system. Examples of stratification can include temperature (epilimnion, metalimnion, and hypolimnion) and community types (canopy, shrub, and ground layer)

Thermocline – the region of the greatest vertical temperature change in a stratified waterbody

Two-story lake – referring to a thermally stratified lake with distinct temperature and density differences. These lakes must often be large and deep enough to prevent entire mixing of the water column

Wakesports – a type of recreational watersport in which specifically designed motorboats, called wakeboats, create high waves to surf or board on. Wakeboats achieve large wakes through hull shapes, hydrofoil devices, and/or built-in-ballast tanks to displace more water

WDNR sensitive areas – designated by the DNR, these areas of waterbodies help trap sediment and nutrients while providing habitat and food for fish, waterfowl, and other aquatic life. Areas under this designation have specific rules and regulations for possible aquatic plant management and recreational opportunities.

Watershed – an area of which its water runoff flows to a specified waterbody

Wetland – a land type classification, characterized by the presence of plants adapted to wet conditions and water-saturated soils

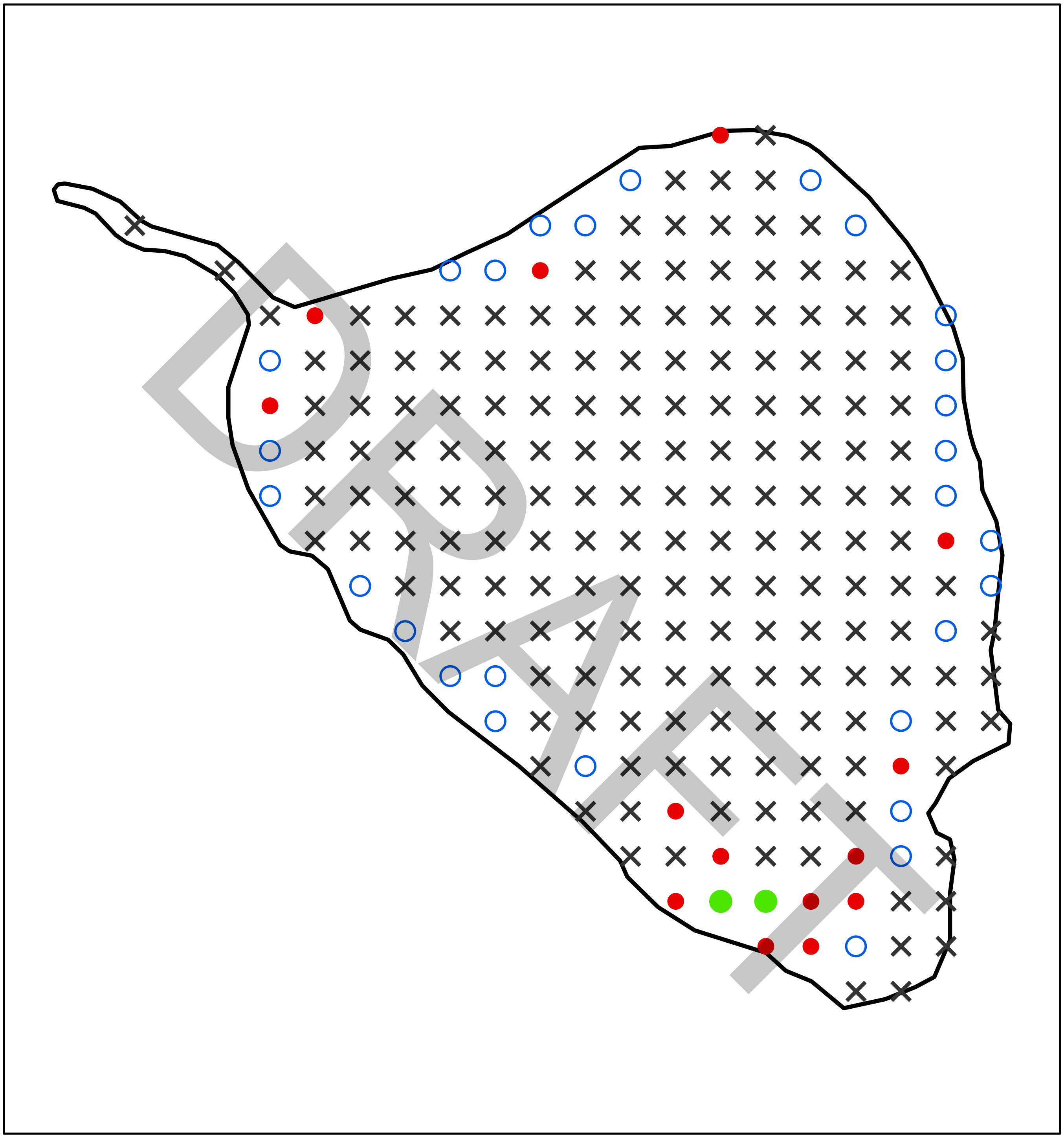
Zooplankton - Microscopic or barely visible animals that eat algae. These suspended plankton are an important component of the lake food chain and ecosystem. For many fish, they are the primary source of food

SEWRPC Memorandum Report Number 283

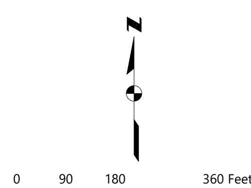
AQUATIC PLANT MANAGEMENT PLAN FOR
ROCK LAKE, KENOSHA COUNTY, WISCONSIN

Appendix B

Appendix B.1
White Water Lily Rake Fullness in Rock Lake: June 2025

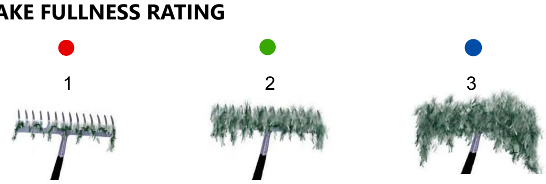


NOTE: Survey was conducted on Rock Lake on June 18th, 2025.



Source: SEWRPC

RAKE FULLNESS RATING



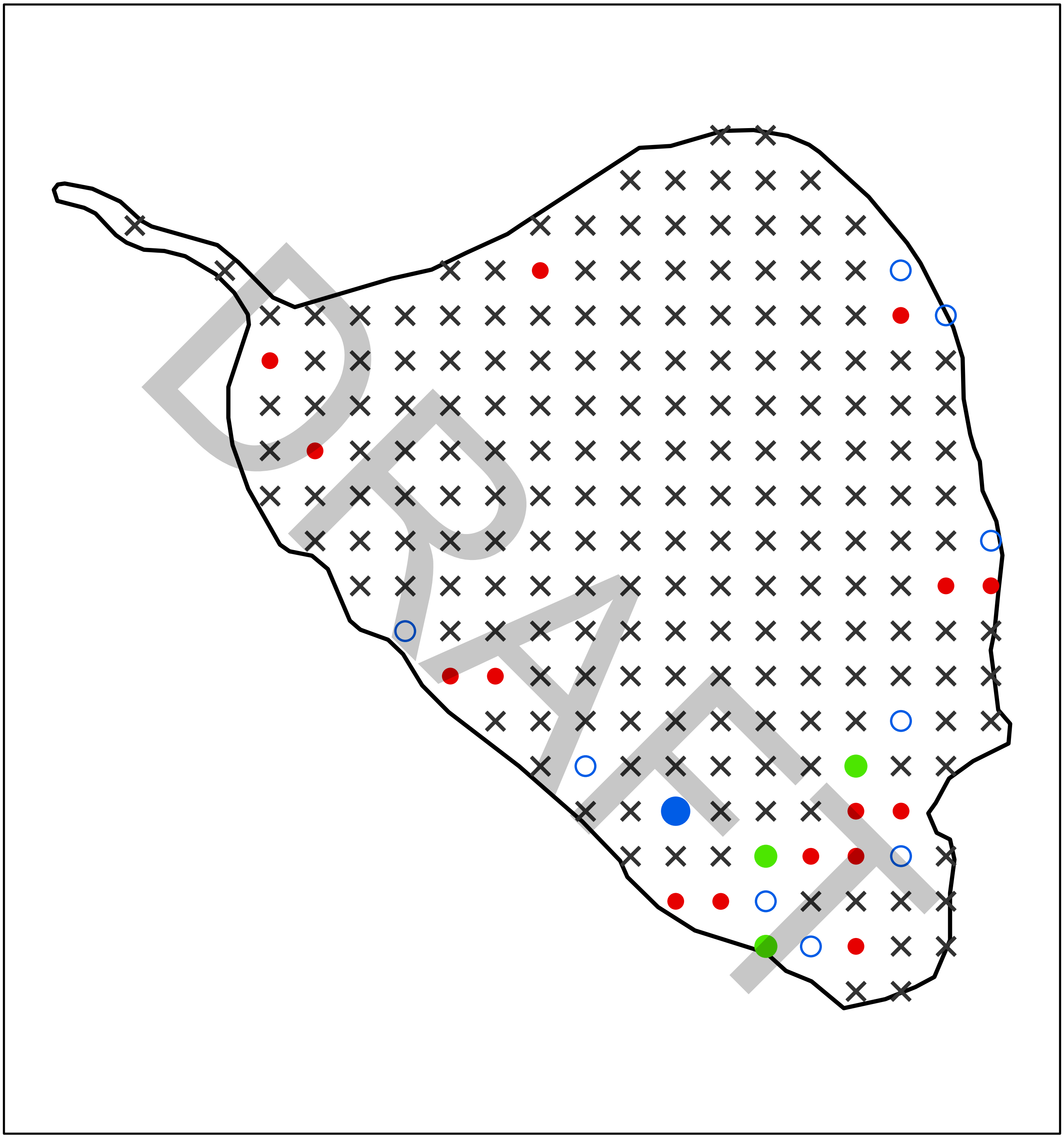
VISIBLE NEARBY

NO AQUATIC PLANTS FOUND

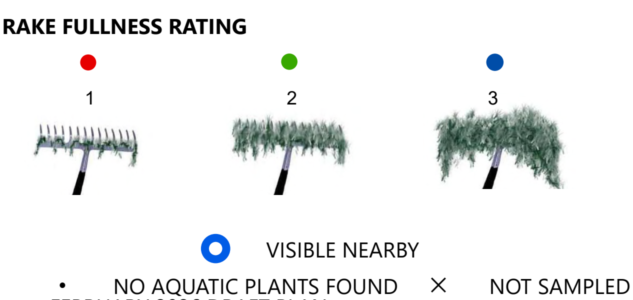
NOT SAMPLED

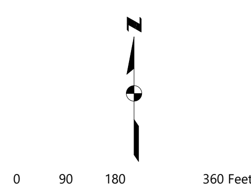
Source: WDNR and SEWRPC

Appendix B.2
Coontail Rake Fullness in Rock Lake: June 2025



NOTE: Survey was conducted on Rock Lake on June 18th, 2025.

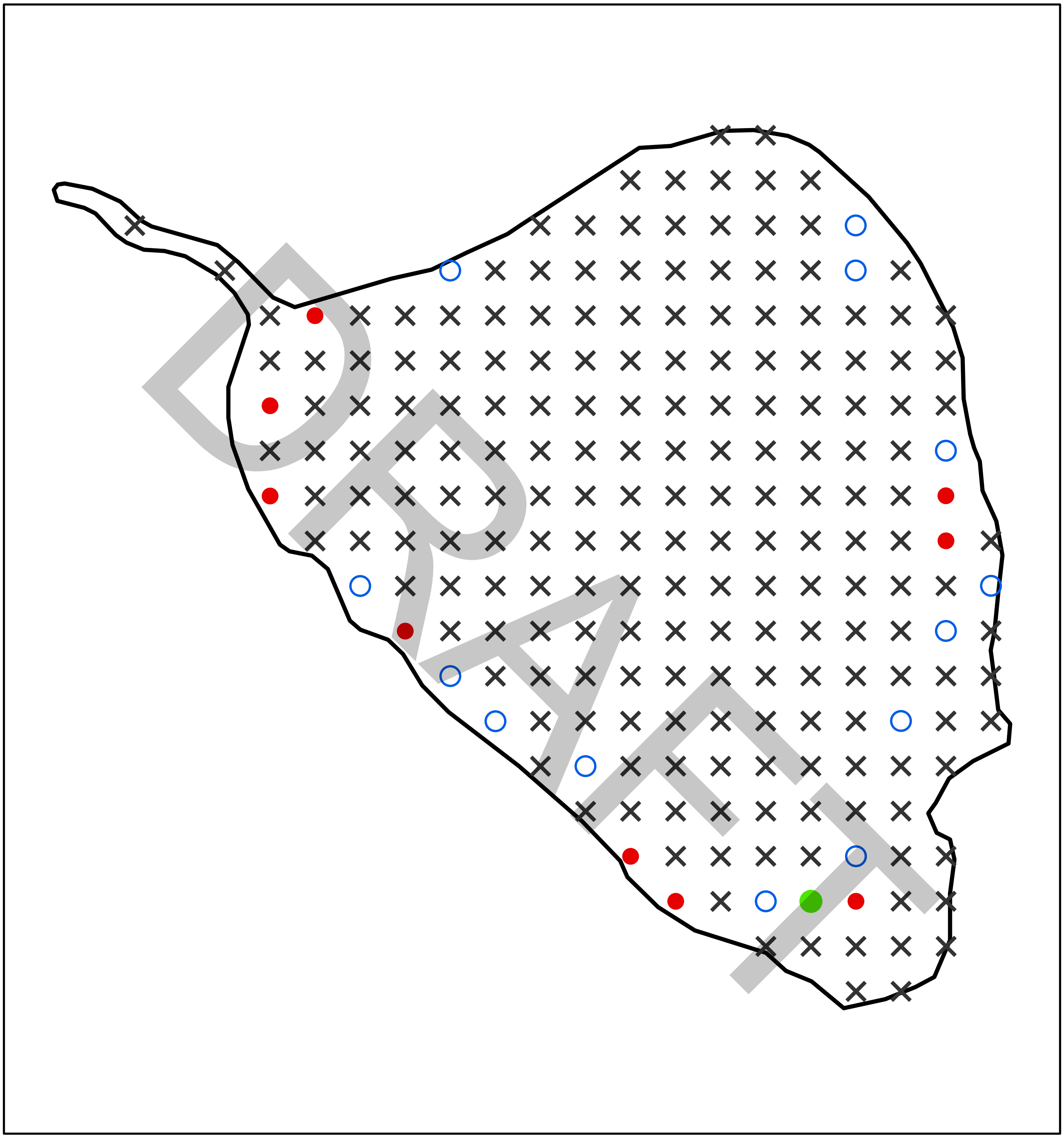




Source: SEWRPC

Source: WDNR and SEWRPC

Appendix B.3
Fries' Pondweed Rake Fullness in Rock Lake: June 2025



NOTE: Survey was conducted on Rock Lake on June 18th, 2025.

RAKE FULLNESS RATING

Source: SEWRPC

VISIBLE NEARBY

NO AQUATIC PLANTS FOUND

NOT SAMPLED

Source: WDNR and SEWRPC