

Cloverleaf Lakes
Shawano County, Wisconsin

**2024 Aquatic Plant
Monitoring Report**
April 2025



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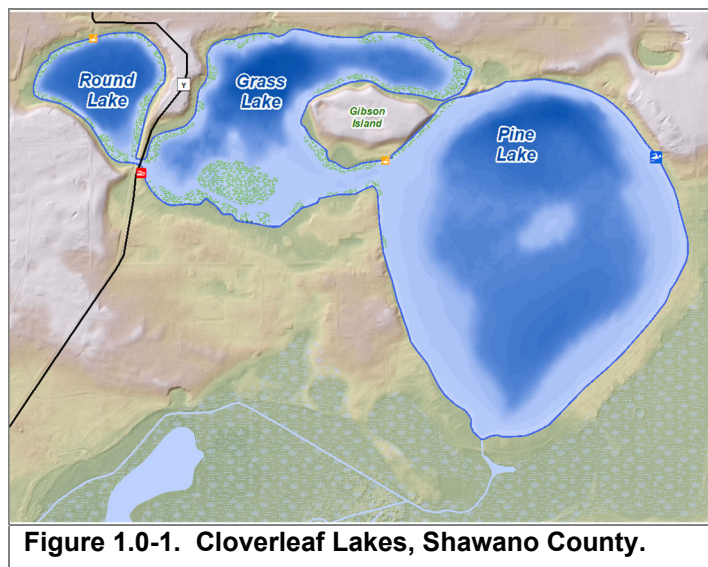
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1.0 INTRODUCTION

The Cloverleaf Lakes are a chain of three spring lakes: Round Lake, Grass Lake, and Pine Lake in Shawano County (Figure 1.0-1). Three submergent non-native aquatic plants species are known to have populations in the Cloverleaf Lakes: Eurasian watermilfoil, curly-leaf pondweed, and starry stonewort.

Eurasian watermilfoil (*Myriophyllum spicatum*; EWM) was first documented in Round Lake in 1992. It was later confirmed via DNA analysis to be a hybrid between EWM and the indigenous northern water milfoil (*M. sibiricum*) in 1994. Curly-leaf pondweed (CLP, (*Potamogeton crispus*), is also present in the system and has periodically

been the target of active management along with continued monitoring. Starry stonewort (*Nitellopsis obtusa*; SSW) was first found in Pine Lake in 2021 and later confirmed in Grass Lake in 2023.



The Town of Belle Plaine and the Cloverleaf Lakes Protective Association (CLPA) have partnered on a number of projects, including Clean Boats Clean Waters staffing and education, enforcement, and cost-sharing on past projects. The CLPA is currently sponsoring all aquatic invasive species monitoring and management activities on the Cloverleaf Lakes.

1.1 Historic Management & Planning

The Cloverleaf Lakes have a history dating back to at least 2004 during which HWM control included nearly annual 2,4-D herbicide treatments. Whole-lake 2,4-D treatments occurred in each lake between 2012 and 2013, with HWM rebound occurring within Grass and Pine Lakes within 2-3 years. Subsequent whole-lake fluridone treatments took place in Grass and Pine Lakes in 2016 and in Round Lake in 2018. In the years since the fluridone treatments, the CLPA has enacted an Integrated Pest Management (IPM) strategy of follow-up efforts largely utilizing professional hand harvesting. Expanding HWM populations in Grass Lake during 2019-2020 culminated in two spot-treatments in 2021 that utilized florypyrauxifen-benzyl, sold exclusively by SePRO corporation as ProcellaCOR. The initial result of the ProcellaCOR treatments was promising during the year of treatment, however HWM rebound was evident by 2022 in the treated sites.

The CLPA conducted a Comprehensive Management Planning project in 2021-2022, being completed and approved by WDNR in June 2022. The Plan set a trigger for considering whole-lake herbicide treatment again in each lake with an integrated pest management strategy that employs the use of hand harvesting as follow up measures after herbicide treatment.

Action # 2 within the CLPA's 2022 Comprehensive Management Plan is to "actively manage HWM to keep system wide population low" as a step towards meeting Goal #3 to "Manage AIS and Prevent Establishment of New AIS." The action outlines the CLPA's integrated pest management strategy which utilizes herbicide application as the primary tool for HWM management, with hand harvesting employed

as follow-up to herbicide treatments and for targeting HWM in strategic scale-appropriate locations. The Plan sets a threshold for when to consider herbicide spot treatments or whole-lake treatments. Whole lake treatment would be considered when the whole lake point-intercept survey is approaching 20% littoral frequency of occurrence of HWM. The 2023 point-intercept surveys confirmed the occurrence of HWM was approaching or had exceeded the trigger set in the management plan for considering herbicide treatments within each of the three lakes comprising the Cloverleaf Lakes.

The CLPA opted to move forward with a fall 2023 WDNR grant application to fund HWM herbicide treatments in spring 2024. This plan included targeting all HWM colonies in Pine & Grass Lakes would with direct application of ProcellaCOR, reaching meaningful concentrations when uniformly mixed within the entire lake. Unfortunately, the AIS Control Grant application was not successful in the competitive grant cycle. After much discussion, the CLPA opted to postpone the large-scale HWM management plan. The CLPA would focus their 2024 efforts on manual removal of HWM with Diver Assisted Suction Harvesting (DASH) in high-use areas, as well as conducting financial fund-raising activities if future grants continue to be difficult to obtain. The CLPA would consider applying for an AIS control grant again in the fall 2024 cycle dependent upon meeting HWM population triggers for conducting large-scale control actions.

This report details the aquatic plant monitoring activities that occurred during 2024 on the Cloverleaf Lakes including whole lake point-intercept surveys on each lake as well as a late-summer HWM mapping survey.

2.0 2024 AQUATIC PLANT MONITORING RESULTS

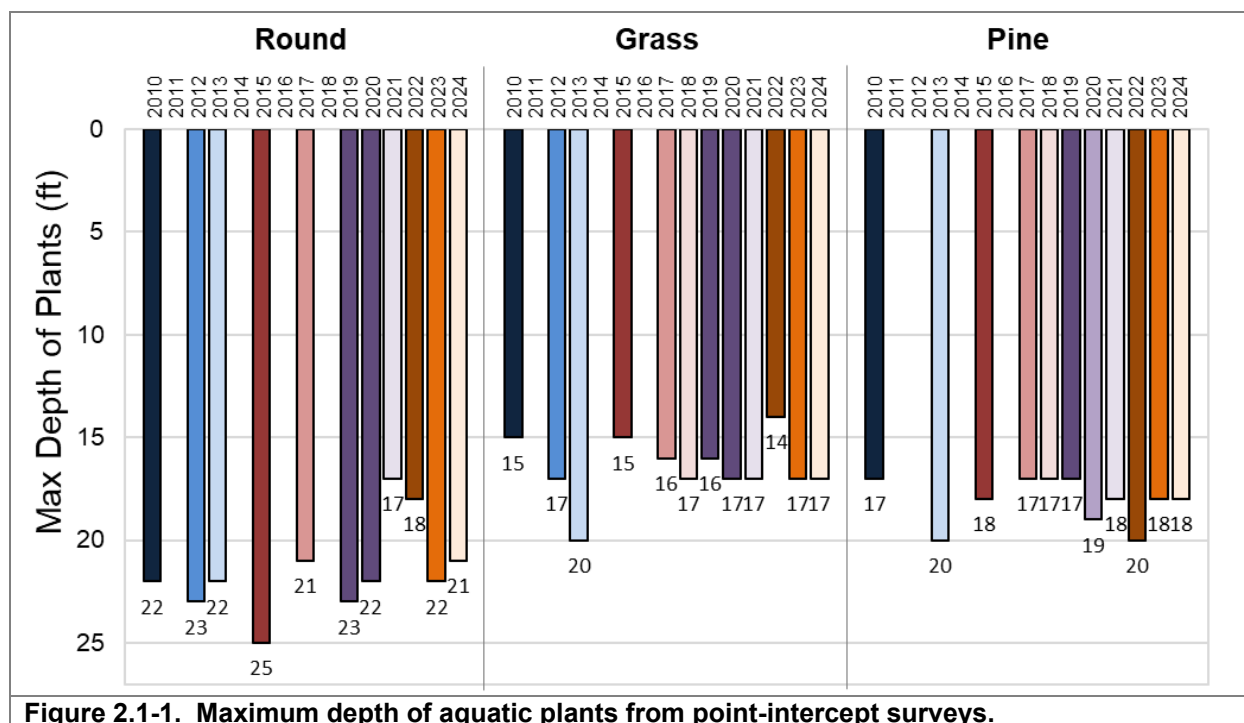
2.1 Whole-Lake Point-Intercept Surveys

The point-intercept survey provides a standardized way to gain quantitative information about a lake's aquatic plant population through visiting predetermined locations and using a rake sampler to identify all the plants at each location (Photograph 2.1-1). The survey methodology allows comparisons to be made over time, as well as between lakes. The point-intercept survey is most often applied at the whole-lake scale. The whole-lake point-intercept survey has been conducted on each of the Cloverleaf Lakes in 2010, 2012, 2013, 2015, and annually from 2017 to 2024, except for Pine Lake in 2012 and Round Lake in 2018, which did not get surveyed. The sampling location spacing (resolution) and resulting total number of locations varied by lake and were created based upon guidance from the WDNR.



Photograph 2.1-1. Point-intercept survey on a WI lake. Photo credit Onterra.

An important component of the point-intercept survey is defining the littoral zone, or the area at which aquatic plants can grow. When comparing each lake in the Cloverleaf Chain, Round Lake usually has the deepest plant growth, Grass Lake generally has the shallowest maximum depth of plant growth, and Pine Lake is usually somewhere in the middle (Figure 2.1-1). Although these lakes are connected, the surveys show that each lake has slightly different maximum depth of plants. Subtle differences in water clarity at key points of the year may contribute to variation in max depth of plant growth between years for some lakes.



Species List

A total of 33 species of plants were located on the rake during the point-intercept survey in the Cloverleaf Lakes and are listed in Table 2.1-1. The list also contains the growth-form of each plant found (e.g., submergent, emergent, etc.), its scientific name, common name, and its coefficient of conservatism. Three of these species are considered non-native, invasive species: Eurasian watermilfoil, curly-leaf pondweed, and starry stonewort. These non-native species will be discussed in a subsequent section, Non-native Aquatic Plants in the Cloverleaf Lakes.

Table 2.1-1. Aquatic plant species located on Cloverleaf Lakes during the 2024 Point-intercept Survey.

Scientific Name	Common Name	Status in Wisconsin	Coefficient of Conservatism	Growth Form	Round 2024	Grass 2024	Pine 2024
<i>Bidens beckii</i>	Water marigold	Native	8	S		X	
<i>Brasenia schreberi</i>	Watershield	Native	7	FL	X	X	
<i>Carex sp. 1</i>	Sedge sp. 1	Native	N/A	E		X	
<i>Ceratophyllum demersum</i>	Coontail	Native	3	S	X	X	X
<i>Chara spp.</i>	Muskgrasses	Native	7	S	X	X	X
<i>Elatine minima</i>	Waterwort	Native	9	S			X
<i>Elodea canadensis</i>	Common waterweed	Native	3	S	X	X	
<i>Heteranthera dubia</i>	Water stargrass	Native	6	S		X	X
<i>Lemna turionifera</i>	Turion duckweed	Native	2	FF		X	
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	Native	7	S			X
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Non-Native - Invasive	N/A	S	X	X	X
<i>Najas flexilis</i>	Slender naiad	Native	6	S	X	X	X
<i>Najas guadalupensis</i>	Southern naiad	Native	7	S		X	X
<i>Nitella spp.</i>	Stoneworts	Native	7	S	X	X	X
<i>Nitellopsis obtusa</i>	Starry stonewort	Non-Native - Invasive	N/A	S		X	X
<i>Nuphar variegata</i>	Spatterdock	Native	6	FL	X	X	
<i>Nymphaea odorata</i>	White water lily	Native	6	FL	X	X	
<i>Potamogeton amplifolius</i>	Large-leaf pondweed	Native	7	S		X	
<i>Potamogeton crispus</i>	Curly-leaf pondweed	Non-Native - Invasive	N/A	S		X	
<i>Potamogeton friesii</i>	Fries' pondweed	Native	8	S			X
<i>Potamogeton gramineus</i>	Variable-leaf pondweed	Native	7	S	X	X	X
<i>Potamogeton illinoensis</i>	Illinois pondweed	Native	6	S	X	X	X
<i>Potamogeton natans</i>	Floating-leaf pondweed	Native	5	S		X	
<i>Potamogeton pusillus</i>	Small pondweed	Native	7	S	X		X
<i>Potamogeton richardsonii</i>	Clasping-leaf pondweed	Native	5	S	X	X	X
<i>Potamogeton strictifolius</i>	Stiff pondweed	Native	8	S		X	X
<i>Potamogeton zosterifolius</i>	Flat-stem pondweed	Native	6	S	X	X	X
<i>Sagittaria sp. (rosette)</i>	Arrowhead sp. (rosette)	Native	N/A	S	X	X	X
<i>Schoenoplectus acutus</i>	Hardstem bulrush	Native	5	E	X	X	
<i>Spirodela polyrrhiza</i>	Greater duckweed	Native	5	FF	X	X	
<i>Stuckenia pectinata</i>	Sago pondweed	Native	3	S	X	X	X
<i>Utricularia vulgaris</i>	Common bladderwort	Native	7	S		X	X
<i>Vallisneria spiralis</i>	Wild celery	Native	6	S	X	X	X

FL = Floating Leaf; S/E = Submergent and Emergent; FF = Free Floating
X = Located on rake during point-intercept survey; I = Incidental Species (none)

Each lake in the Cloverleaf Chain have different niches in their habitat which support different plant communities, however they are relatively similar. Common plants in all three lakes are charophytes, wild celery, and naiads. Descriptions of these species are provided below.

Dominance of the aquatic plant community by muskgrasses is common in hardwater lakes and these macroalgae have been found to be more competitive against vascular plants (e.g., pondweeds, milfoils, etc.) in lakes with higher concentrations of calcium carbonate in the sediment (Kufel & Kufel, 2002); (Wetzel, 2001). Muskgrasses require lakes with good water clarity, and their large beds stabilize bottom sediments. Studies have also shown that muskgrasses sequester phosphorus in the calcium carbonate encrustations which form on these plants, aiding in improving water quality by making the phosphorus unavailable to phytoplankton (Coops, 2002). Muskgrasses can be easily identified by their strong skunk-like odor. As well as providing a food source for waterfowl, muskgrasses often serve as a sanctuary for small fish and other aquatic organisms. For this analysis, muskgrasses and stoneworts are lumped together due to the difficulty in distinguishing these species apart in a field survey setting.

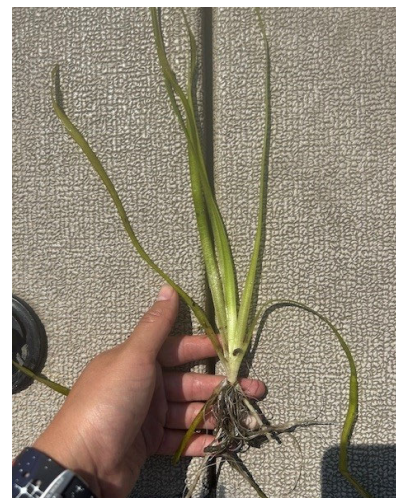
Wild celery (*Vallisneria spiralis*) produces long, grass-like leaves which extend in a circular fashion from a basal rosette (Photograph 2.1-1). To keep the leaves standing in the water column, lacunar cells in the leaves contain gas making them buoyant. Towards the late summer when wild celery is at its peak growth stage, it is easily uprooted by wind and wave activity and can pile up on shorelines depending on the predominant wind direction. The leaves, fruits, and winter buds of wild celery are food sources

for numerous species of waterfowl and other wildlife and are an important component of the Cloverleaf Lakes ecosystem.

Muskgrasses and Stoneworts (*Chara spp.* & *Nitella spp.*)



Wild celery (*Vallisneria americana*)



Slender and southern naiad (*Najas flexilis* & *Najas guadalupensis*)



Photograph 2.1-1. Common native aquatic plant species in Cloverleaf Lakes. Photo credit Onterra.

Slender naiad (*Najas flexilis*) and southern naiad (*Najas guadalupensis*) are morphologically similar species and can sometimes be difficult to differentiate in the field (Photograph 3.4-8). Both of these species were relatively common in Grass and Pine lakes, while only slender naiad has been located in Round Lake. Slender naiad is an annual which produces numerous seeds on an annual basis and is considered to be one of the most important food sources for a number of migratory waterfowl species (Borman et al. 1997). In addition, slender naiad's small, condensed network of leaves provide excellent habitat for aquatic invertebrates. While closely related to slender naiad, southern naiad is often perennial and lacking fruit (Les et al. 2010). Emerging research is indicating that hybrids between southern naiad subspecies exist and are often observed growing aggressively and reaching nuisance levels in certain lakes.

Figure 2.1-3 shows the average number of native plant species found per sampling site during each of the surveys on the Cloverleaf Lakes. These data show variability over time with each lake declining between 2022-2023 and then rebounding to higher levels from 2023-2024. Herbicide management activities likely influence changes in these values in some cases, such as between 2015-2017 when whole lake fluridone treatments occurred in Grass and Pine Lakes.

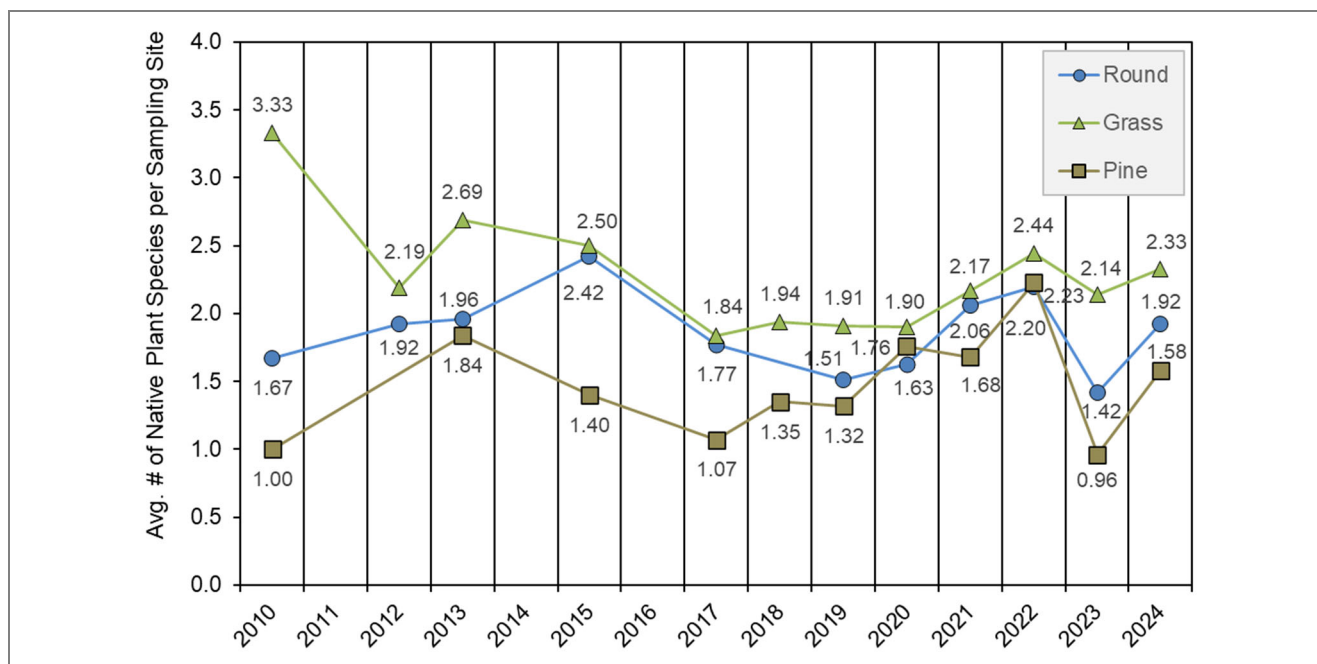


Figure 2.1-2. Cloverleaf Lakes Average Number of Native Aquatic Plant Species per Sampling Site.
Created using data from available aquatic plant point-intercept survey.

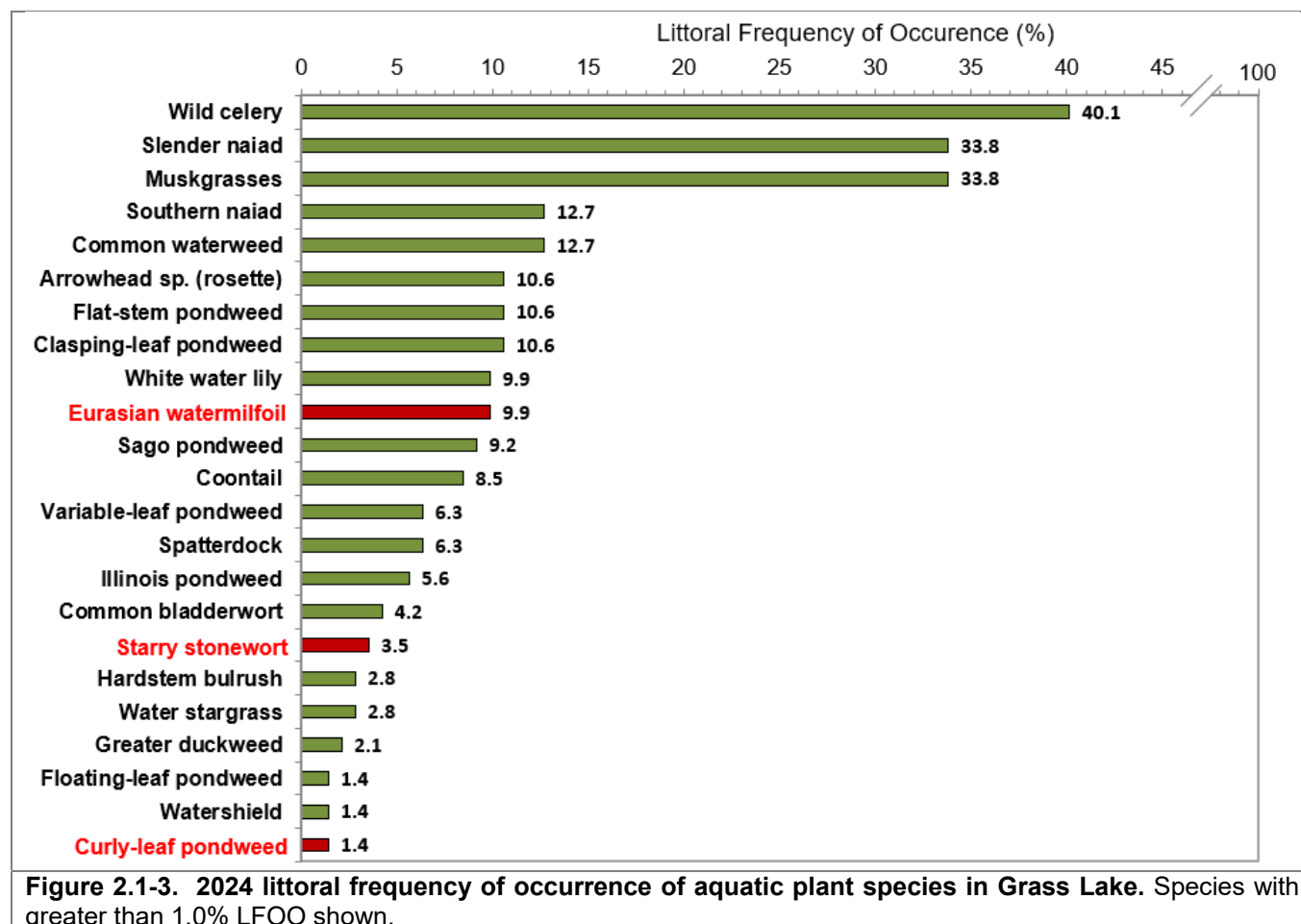
Frequency of Occurrence

Littoral Frequency of Occurrence (LFOO) is one of the most common metrics used from point-intercept data, as it relays how often aquatic plants are found within the zone of the lake that can support aquatic plants (littoral zone). This metric is calculated by taking the number of sampling points with a given species, divided by the number of sampling points that season that were found to be less than or equal to the maximum depth of plants. Although each of the lakes in the Cloverleaf Chain have similar plant communities, there are some differences, so the LFOO of plants are separated by lake below.

The data that continues to be collected from Wisconsin lake's is revealing that aquatic plant communities are highly dynamic, and populations of individual species have the capacity to fluctuate, sometimes greatly, in their occurrence from year to year and over longer periods of time. These fluctuations can be driven by a combination of natural factors including variations in temperature, ice and snow cover (winter light availability), nutrient availability, water levels and flow, water clarity, length of the growing season, herbivory, disease, and competition (Lacoul and Freedman 2006). Adding to the complexity of factors which affect aquatic plant community dynamics, human-related disturbances such as the application of herbicides for non-native plant management, mechanical harvesting, watercraft use, and pollution runoff also affect aquatic plant community composition (Asplund and Cook 1997); (Lacoul and Freedman 2006).

Grass Lake

A total of 26 native aquatic plant species were sampled on the rake during the 2024 point-intercept survey in Grass Lake. Of these 26 species, wild celery (*Vallisneria americana*), slender naiad (*Najas flexilis*), muskgrasses (*Chara spp.*), and southern naiad (*Najas guadalupensis*) were the most frequently encountered while another 22 species were present in lesser amounts (Figure 3.2-1). HWM, SSW, and CLP are three non-native species that were sampled on the rake in Grass Lake during this survey.

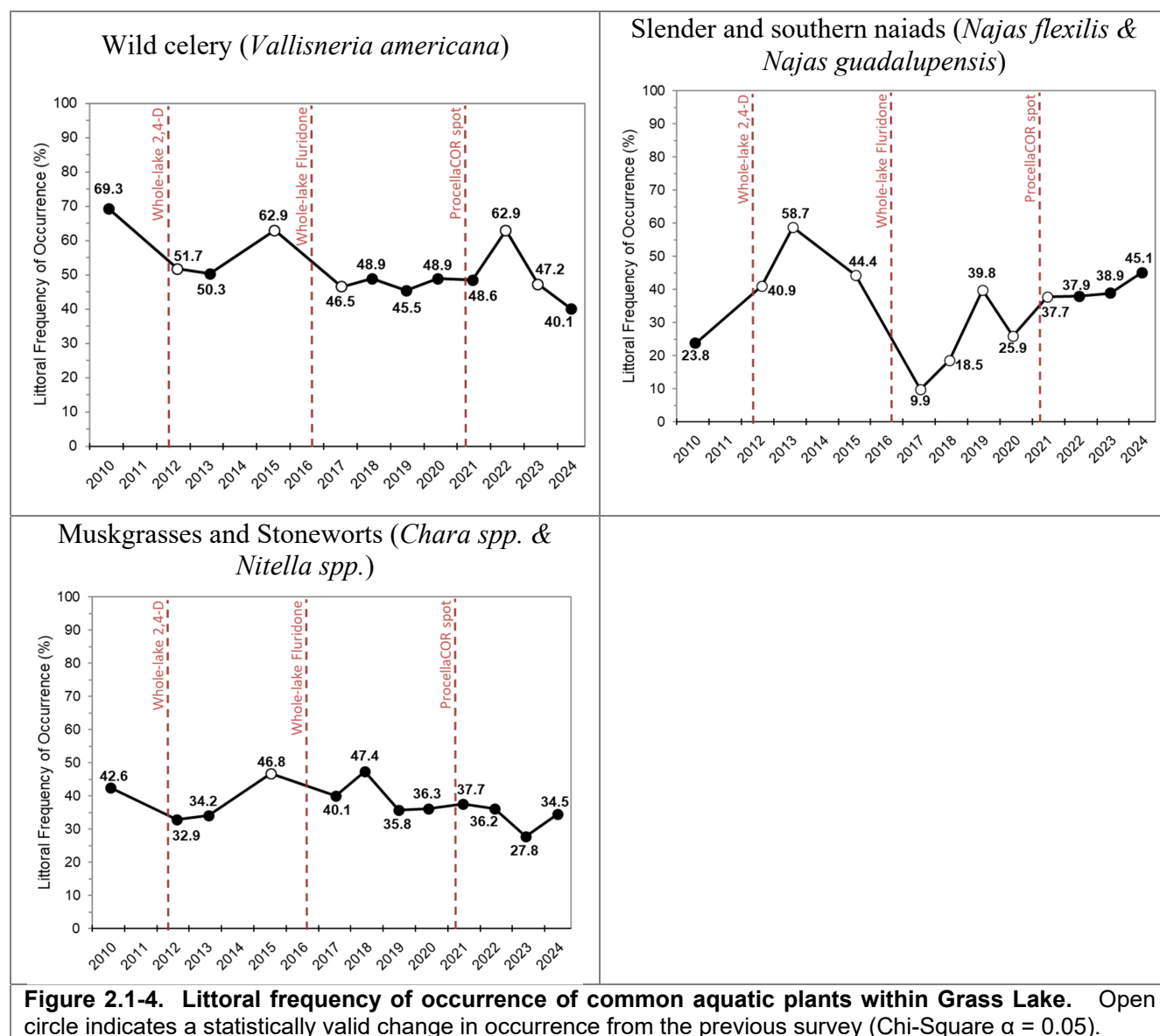


The most common native plant found in Grass Lake during the 2024 point-intercept survey was wild celery. The occurrence of wild celery has been fairly consistent over time, although the 2024 occurrence of 40.1% is the lowest occurrence during the study period.

The changes in LFOO from 2010 to 2024 for naiads in Grass lake have been highly variable. Since 2020 naiads have shown a slight increasing trend in occurrence (Figure 3.2-4).

The third-most frequent species observed during the 2024 Grass Lake point-intercept survey were combined occurrences of muskgrasses (*Chara spp.*) and stoneworts (*Nitella spp.*). Charophytes in Grass Lake have remained relatively stable from 2010 to 2024.

The only native species that showed a statistically valid change in occurrence from 2023-2024 was clasping-leaf pondweed (-54.4%) (Appendix A).



Pine Lake

During the 2024 point-intercept survey on Pine Lake, 21 different aquatic plant species were observed on the rake. Of these 21 species, muskgrasses wild celery, and slender naiad were the three most frequently encountered while another 22 species were present in lesser amounts (Figure 2.1-5). Starry stonewort and HWM are two non-native species that were sampled during this survey.

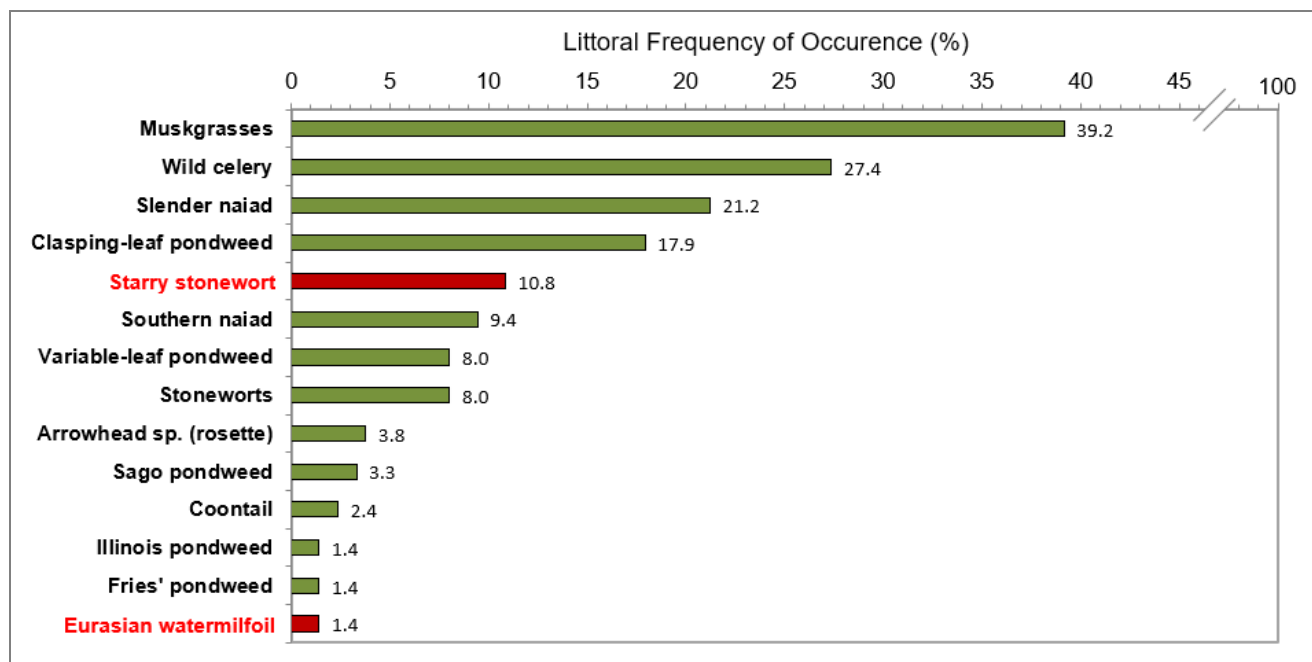


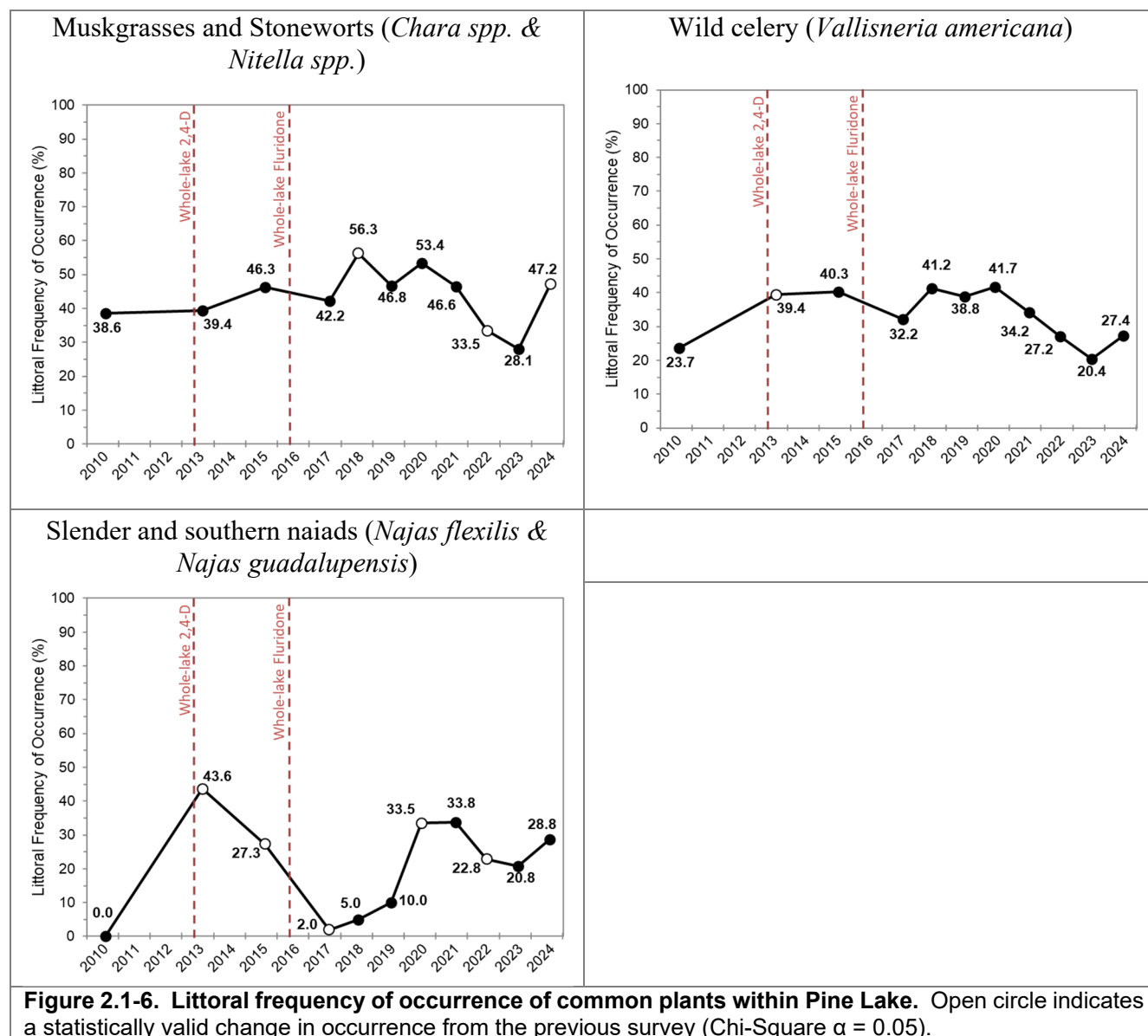
Figure 2.1-5. 2024 littoral frequency of occurrence of aquatic plant species in Pine Lake. All species with greater than 1.0% LFOO shown.

The most common native plants found in Pine Lake during the 2024 point-intercept survey were the combined occurrence of muskgrasses and stoneworts. From 2020 to 2023, a decrease in LFOO was observed every survey. In 2024, a statistically valid increase in LFOO was observed.

The second most frequently sampled species during the 2024 Pine Lake point-intercept survey was wild celery. The highest occurrence was observed in 2020 where it was found at 41.7% of the littoral sampling locations. In the following years, this value gradually dropped every year through 2023 before increasing slightly between 2023-2024.

Naiads were the third most common species during the Pine Lake 2024 point-intercept survey. This group of plants has shown high variability over the years of monitoring. In 2010, the species was not even observed on the survey and the following survey, in 2013, it reached 43.6% LFOO. These two surveys were the highest and lowest abundance it was recorded. In 2017, it dropped back down to 2%, likely from the whole lake fluridone treatment, but quickly rose again in the following years. The last few years have remained relatively consistent compared to the past.

No native species showed a statistically valid decrease in occurrence from 2023-2024, while four species showed valid increases including clasping-leaf pondweed, muskgrasses/stoneworts, variable-leaf pondweed, and coontail (Appendix A).



Round Lake

A total of 19 native aquatic plant species were sampled on the rake during the 2024 point-intercept survey in Round Lake. Of these 19 species, muskgrasses, wild celery, and slender naiad were the most frequently encountered (Figure 3.2-1). These top species have all exhibited increases in abundance from the 2023 survey to the 2024 survey. Eurasian watermilfoil was the only non-native species sampled on the rake in Round Lake during this survey.

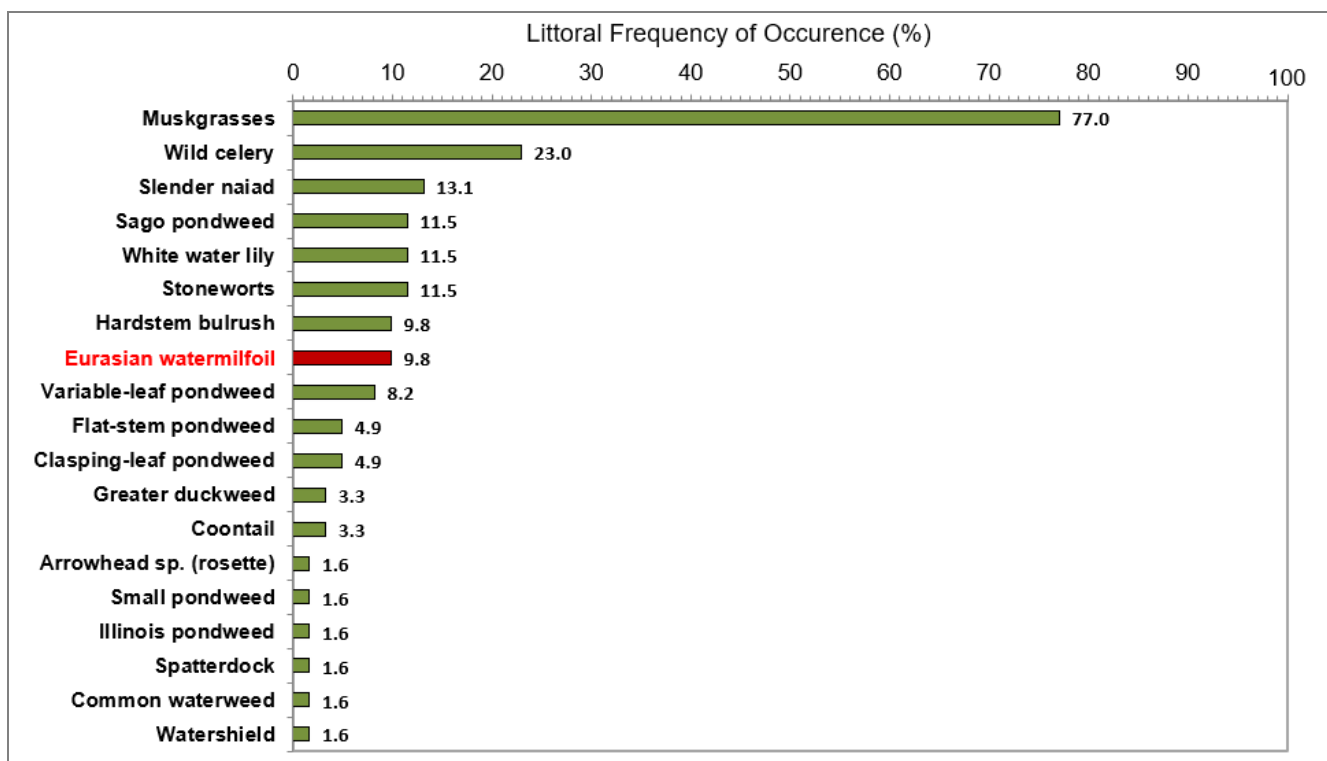


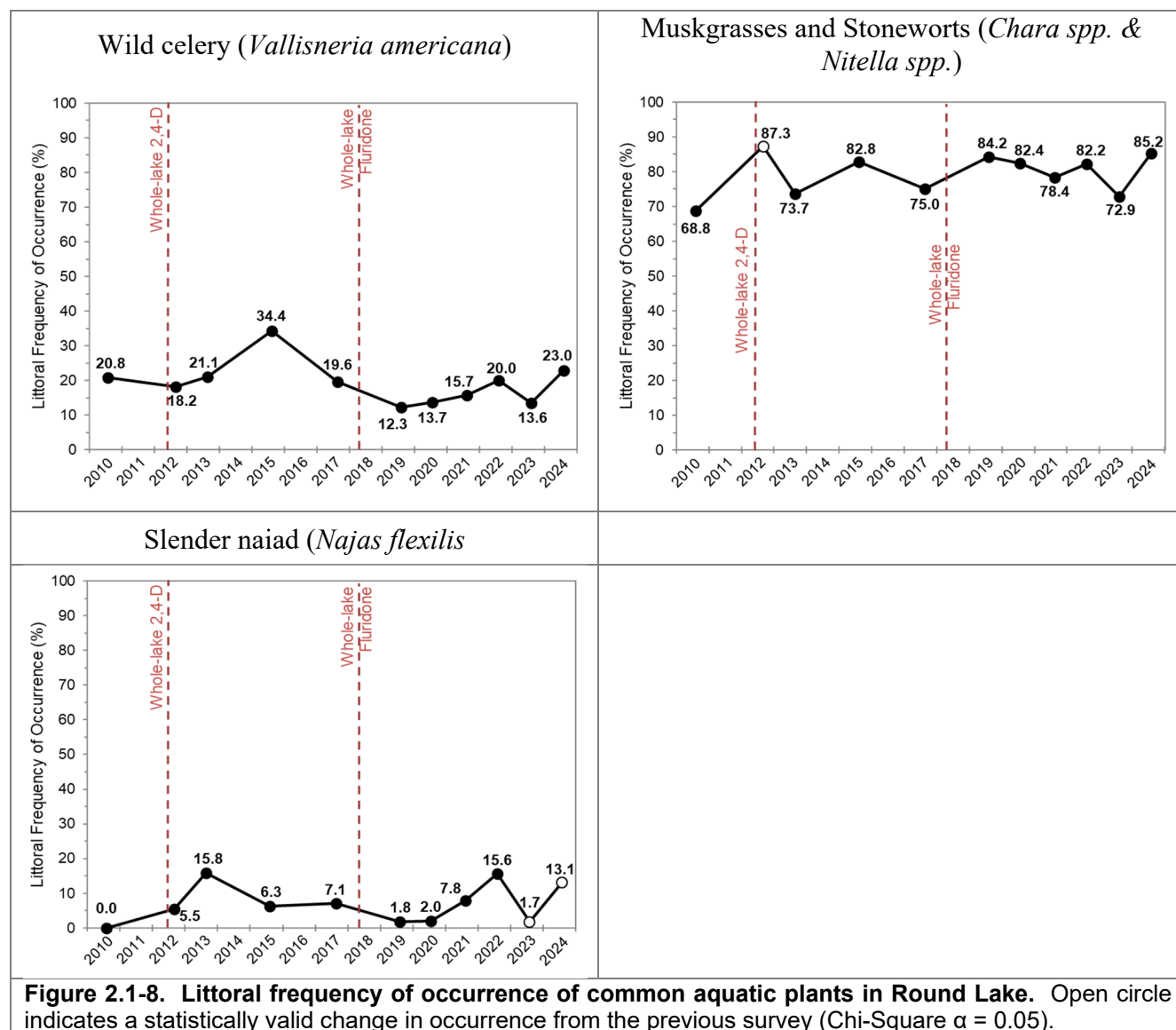
Figure 2.1-7. 2024 littoral frequency of occurrence of aquatic plant species in Round Lake.

Charophytes have consistently been in a much higher abundance than the other aquatic plants in Round Lake observed throughout the point-intercept surveys from 2010-2024. Point-intercept data shows that charophytes have been observed at around 80% of the littoral points every year. LFOO values have ranged from 68.8% to 87.3%. During the 2024 survey Charophytes were found at 85.2% of the littoral points which is the second highest percentage observed since 2010 (Figure 2.1-10).

The second most common native plant found in Round Lake during the 2024 point-intercept survey was wild celery. Wild celery has remained relatively stable between 2010 and 2024 (Figure 2.1-13).

Slender naiad is the only confirmed naiad species found on Round Lake. In 2023, a significant decrease of slender naiad from 2022 went from 15.6 % of the littoral points where it was sampled down to 1.7%. In 2024, a statistically valid increase in LFOO was documented with occurrences returning to similar levels as the 2022 survey.

Slender/southern naiad and hardstem bulrush each showed valid increases in occurrence from 2023-2024 while no species showed valid decreases in occurrence during this period. Most species did not show a statistically significant change in occurrence between the 2023 and 2024 surveys (Appendix A).



Floristic Quality Assessment

The floristic quality of a lake's aquatic plant community is calculated using its native *species richness* and their *average conservatism*. Species richness is the number of native aquatic plant species that were physically encountered on the rake during the point-intercept survey. Average conservatism is calculated by taking the sum of the coefficients of conservatism (C-values) of the native species located and dividing it by species richness. Every plant in Wisconsin has been assigned a coefficient of conservatism, ranging from 1-10, which describes the likelihood of that species being found in an undisturbed environment. Species which are more specialized and require undisturbed habitat are given higher coefficients, while species which are more tolerant of environmental disturbance have lower coefficients. Higher average conservatism values generally indicate a healthier lake as it is able to support a greater number of environmentally-sensitive aquatic plant species. Low average conservatism values indicate a degraded environment, one that is only able to support disturbance-tolerant species.

On their own, the species richness and average conservatism values for a lake are useful in assessing a lake's plant community; however, the best assessment of the lake's plant community health is determined when the two values are used to calculate the lake's floristic quality. The floristic quality is calculated using the species richness and average conservatism value of the aquatic plant species that were solely encountered on the rake during the point-intercept surveys (equation shown below). This assessment allows the aquatic plant community of Cloverleaf Lakes to be compared to other lakes within the region and state.

$$FQI = \text{Average Coefficient of Conservatism} * \sqrt{\text{Number of Native Species}}$$

Figure 2.1-12 displays the floristic quality of the Cloverleaf Lakes found from point intercept surveys of 2010 to 2024. The multiple years of data show the changes that occur over time. Variation in these values can be due to species not showing up on the survey but doesn't necessarily mean that it has been extirpated from the lake. Some years species with low abundance will not be observed on the survey and the species richness would be lower.

Grass Lake generally has had a higher calculated floristic quality value than Pine and Round Lakes through the years of monitoring. In Grass Lake, water marigold (*Bidens beckii*) and large-leaf pondweed (*Potamogeton amplifolius*) were both found on the rake while they were not on the other two lakes in 2024. These two species help raise the floristic quality value because they have relatively high C-values.

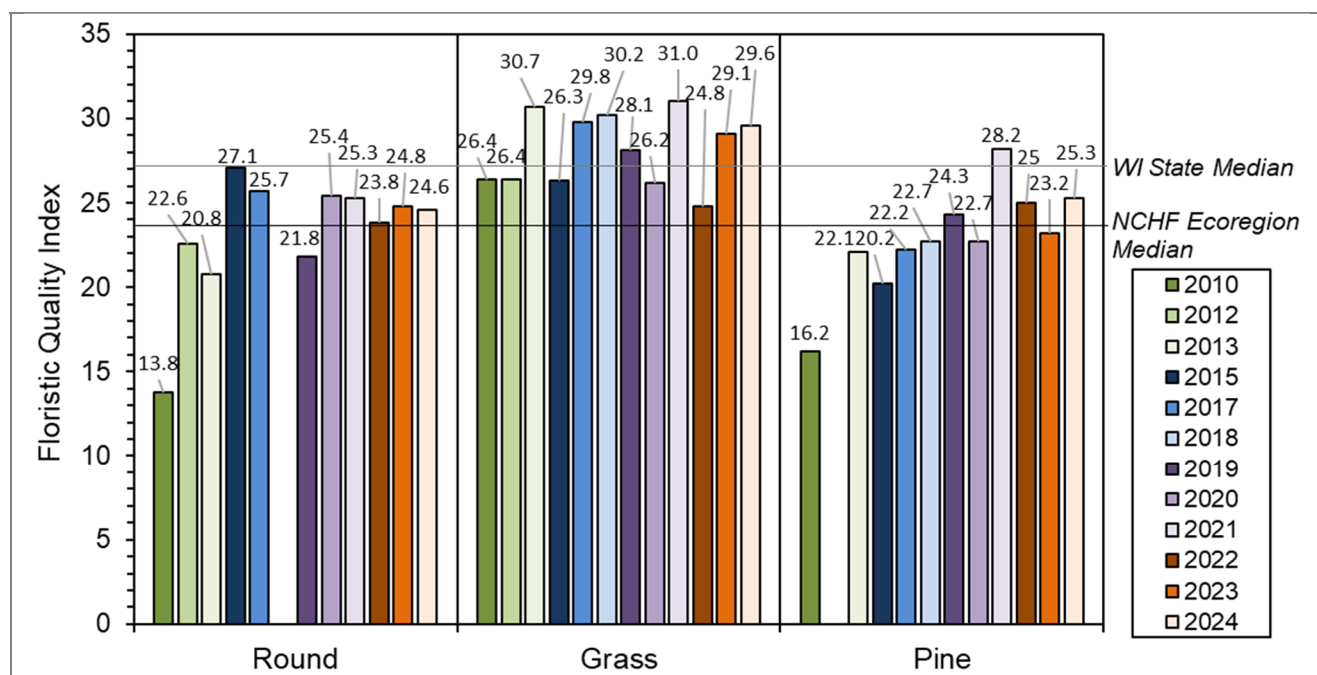


Figure 2.1-9. Cloverleaf Lakes Floristic Quality Assessment. Created using data from point-intercept surveys. Analysis following Nichols (1999) where NCHF = North Central Hardwood Forests Ecoregion.

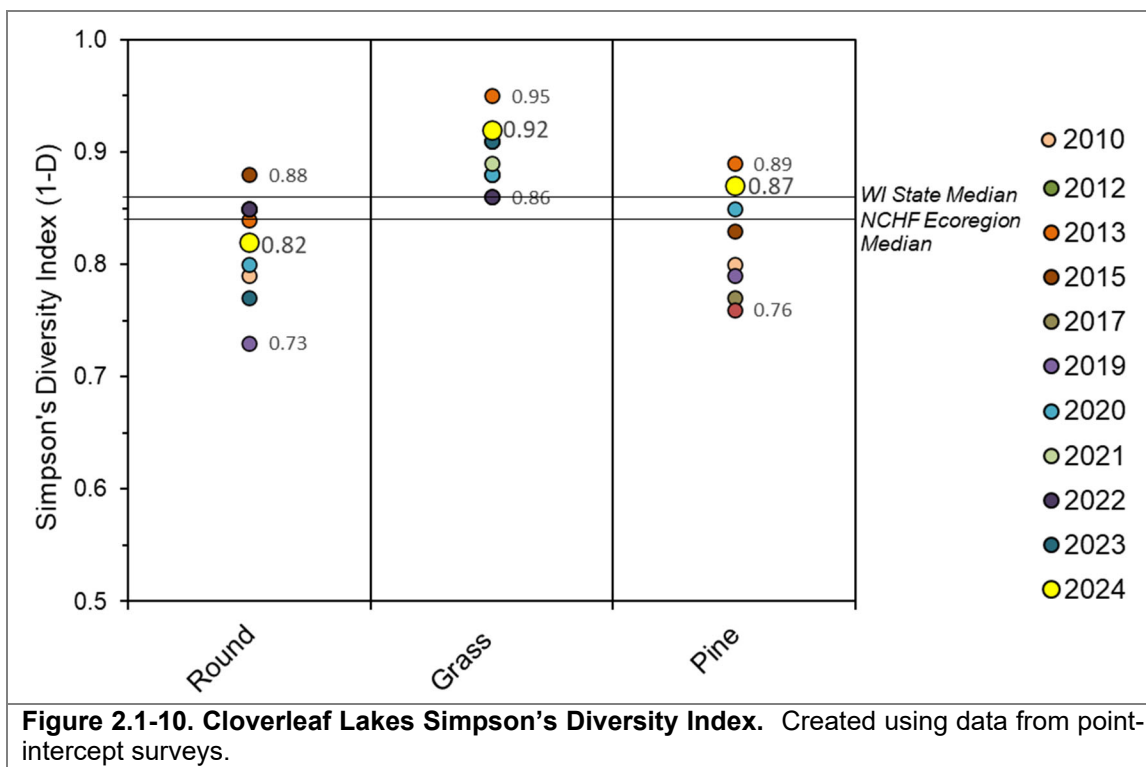
Species Diversity

Species diversity is often confused with species richness. Species richness is simply the number of species found within a given community. While species diversity utilizes species richness, it also takes into account evenness or the variation in abundance of the individual species within the community. For

example, a lake with 10 aquatic plant species that had relatively similar abundances within the community would be more diverse than another lake with 10 aquatic plant species where 50% of the community was comprised of just one or two species.

If a lake has a diversity index value of 0.90, it means that if two plants were randomly sampled from the lake there is a 90% probability that the two individuals would be of a different species. The Simpson's Diversity Index value from the Cloverleaf Lakes is compared to data collected by Onterra on lakes within the North Central Hardwood Forests ecoregion and on lakes throughout Wisconsin (Figure 2.1-13). While a method for characterizing diversity values of fair, poor, etc. does not exist, lakes within the same ecoregion may be compared to provide an idea of how the Cloverleaf Lake's diversity values rank.

Figure 2.1-10 shows the calculated Simpson's Diversity Index of each Lake in the Cloverleaf Chain. The higher the value, the more diverse the community of plants in each lake is. A low diversity doesn't necessarily mean that there is an unhealthy plant community, but a decrease in this value over time would indicate that there could be something degrading the habitat in the lake. The diversity values appear to be fairly stable in the Cloverleaf Lakes over time based on the point intercept surveys from 2010 to 2024. In Grass Lake, there is a higher Simpson's Diversity Index value possibly because the lake has more variety of habitat for plants to grow than Pine Lake and Round Lake do. In 2024, the Simpson's diversity value for Round Lake fell below the ecoregion (0.84) and state (0.86) median values, while Grass and Pine lakes fell above both medians.



2.2 Eurasian watermilfoil monitoring

It is important to note that two types of surveys are discussed in the subsequent materials: 1) point-intercept surveys and 2) HWM mapping surveys. Overall, each survey has its strengths and weaknesses, which is why both are utilized in different ways as part of this project.

While the point-intercept survey is a valuable tool to understand the overall plant population of a lake, it does not offer a full account (census) of where a particular species exists in the lake. HWM grows high in the water column, which can cause recreation and navigation impediments. This factor allows it to typically be mapped through surface observation. During an HWM mapping survey, the entire littoral area of the lake is surveyed through visual observations from the boat (Photograph 2.2-1). Field crews may supplement the visual survey by deploying a submersible camera along with periodically doing rake tows. The HWM population is mapped using sub-meter GPS technology by using either 1) point-based or 2) area-based methodologies. Large colonies >40 feet in diameter are mapped using polygons (areas) and are qualitatively attributed a density rating based upon a five-tiered scale from *highly scattered* to *surface matting*. Point-based techniques were applied to AIS locations that were considered as *small plant colonies* (<40 feet in diameter), *clumps of plants*, or *single or few plants*.



Photograph 2.2-1. HWM mapping survey on a Wisconsin lake. Photo credit Onterra.

Grass Lake

The LFOO of HWM in Grass Lake over all surveys since 2010 is shown in Figure 2.2-1. Following treatments in 2012, 2016, and 2021, post treatment surveys have shown significant reductions in HWM. In 2024, the occurrence of HWM unexpectedly declined to 9.9%, a statistically valid 71.0% decrease from 2023. Figure 2.2-2 shows the locations where HWM was found during the 2024 Grass Lake point intercept survey.

Pine Lake

Figure 2.2-3 shows the HWM LFOOs found during all surveys from 2010 to 2024 in Pine Lake. Significant changes to the HWM population based on the LFOO values were observed around the time of treatments in the lake. In 2013, the LFOO dropped in response to the 2,4-D treatment. The treatment was effective in limiting the HWM during the year of treatment, but two years after treatment, the LFOO was recorded at 19.4% which was the highest in this time of monitoring. A fluridone treatment in 2016 resulted in no HWM to be found for the next survey in 2017 and the population remained well below pretreatment levels for approximately four years. The population increased incrementally following the fluridone treatment and reached 16.5% in 2022 and 17.2% in 2023. By 2022-2023, large colonized areas were forming around the lake causing impacts to recreational uses. In 2024, in the absence of active management, an unexpected significant decrease in occurrence was observed with a 91.8% decrease compared to 2023. The occurrence of 1.4% in 2024 was the lowest since around 2019 when the population was beginning to rebound from the 2016 fluridone treatment. The three sampling locations with HWM in the 2024 survey are indicated on Figure 2.2-4.

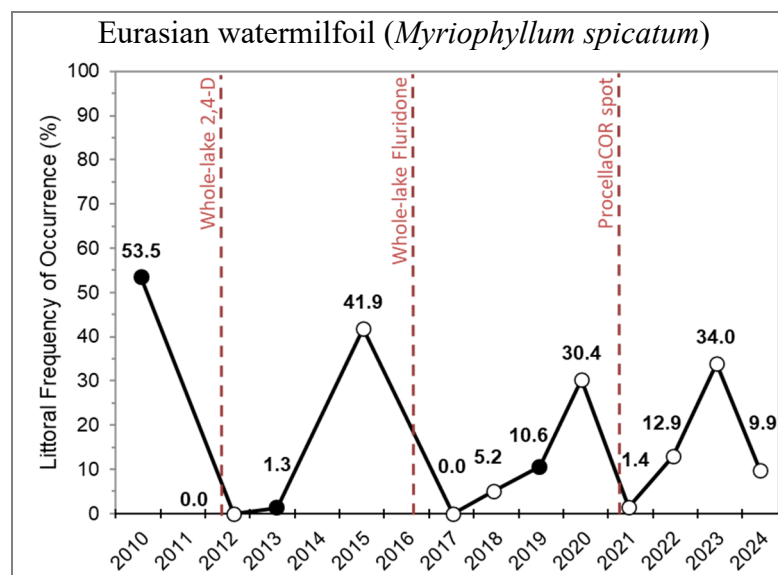


Figure 2.2-1. Littoral frequency of occurrence of Eurasian watermilfoil in Grass Lake. Open circle indicates a statistically valid change in occurrence from the previous survey (Chi-Square $\alpha = 0.05$).

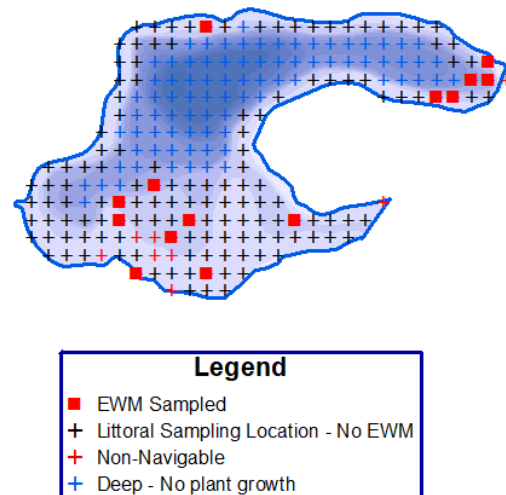


Figure 2.2-2. HWM locations from 2024 point-intercept survey.

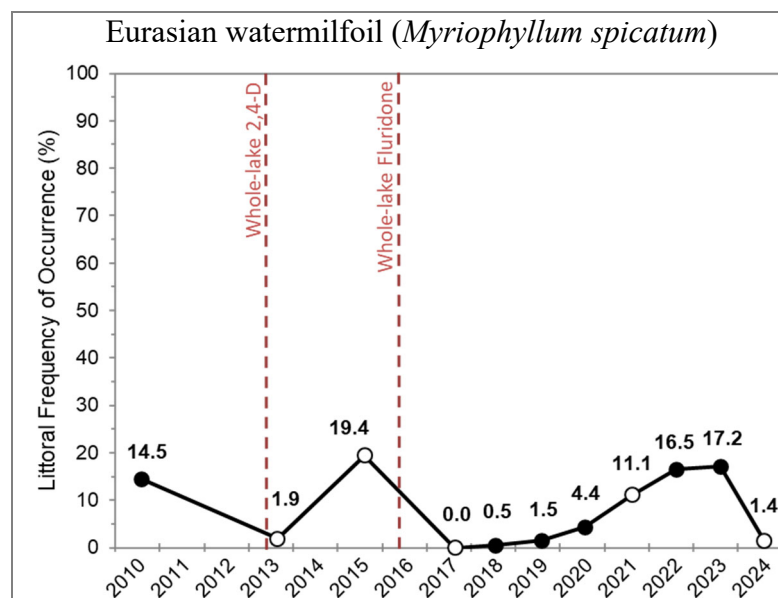


Figure 2.2-3. Littoral frequency of occurrence of Eurasian watermilfoil in Pine Lake. Open circle indicates a statistically valid change in occurrence from the previous survey (Chi-Square $\alpha = 0.05$).

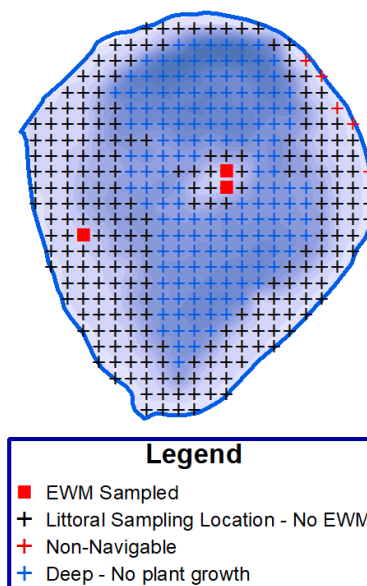


Figure 2.2-4. HWM locations from 2024 point-intercept survey.

Round Lake

Five points with HWM were sampled during the 2024 point-intercept survey (Figure 2.2-6). Although there were only five points with HWM, the LFOO for HWM was still found to be approximately 10% due to Round Lake only having around 50 littoral points. The occurrence of HWM reached as high as

48.2% in 2017 prior to a whole lake fluridone treatment (Figure 2.2-5). In the years since, HWM populations trended higher from 2019-2022 and has been on a gradual declining trend from 2022-2024.

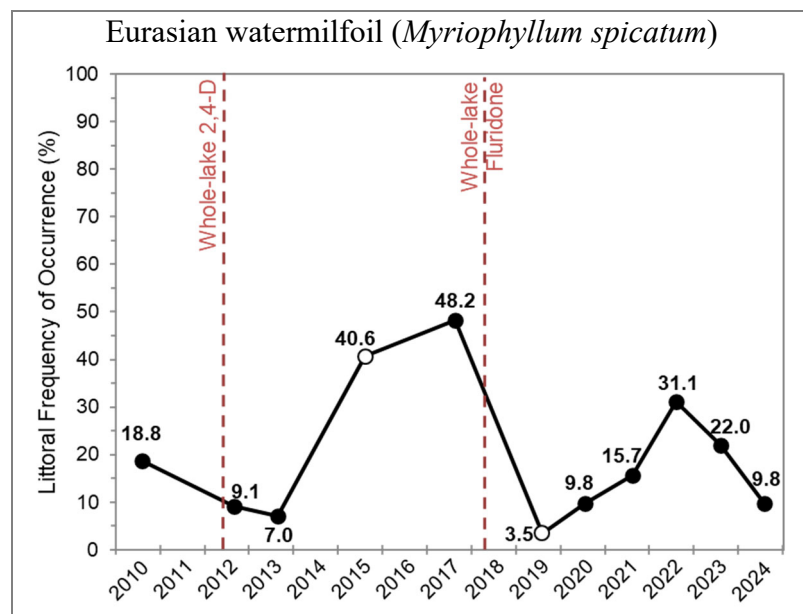


Figure 2.2-5. Littoral frequency of occurrence of Eurasian watermilfoil in Round Lake. Open circle indicates a statistically valid change in occurrence from the previous survey (Chi-Square $\alpha = 0.05$).

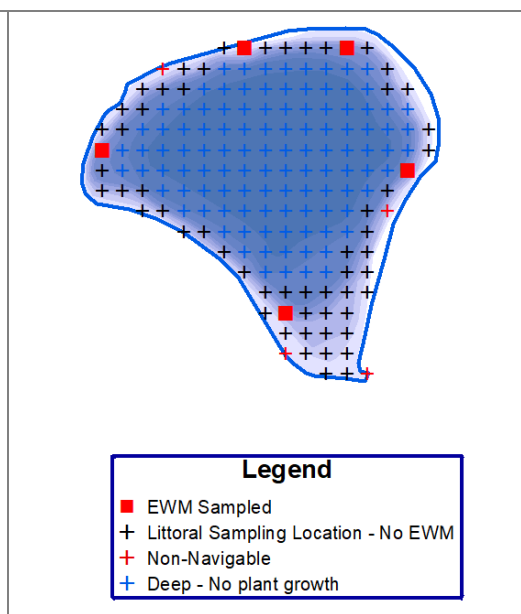
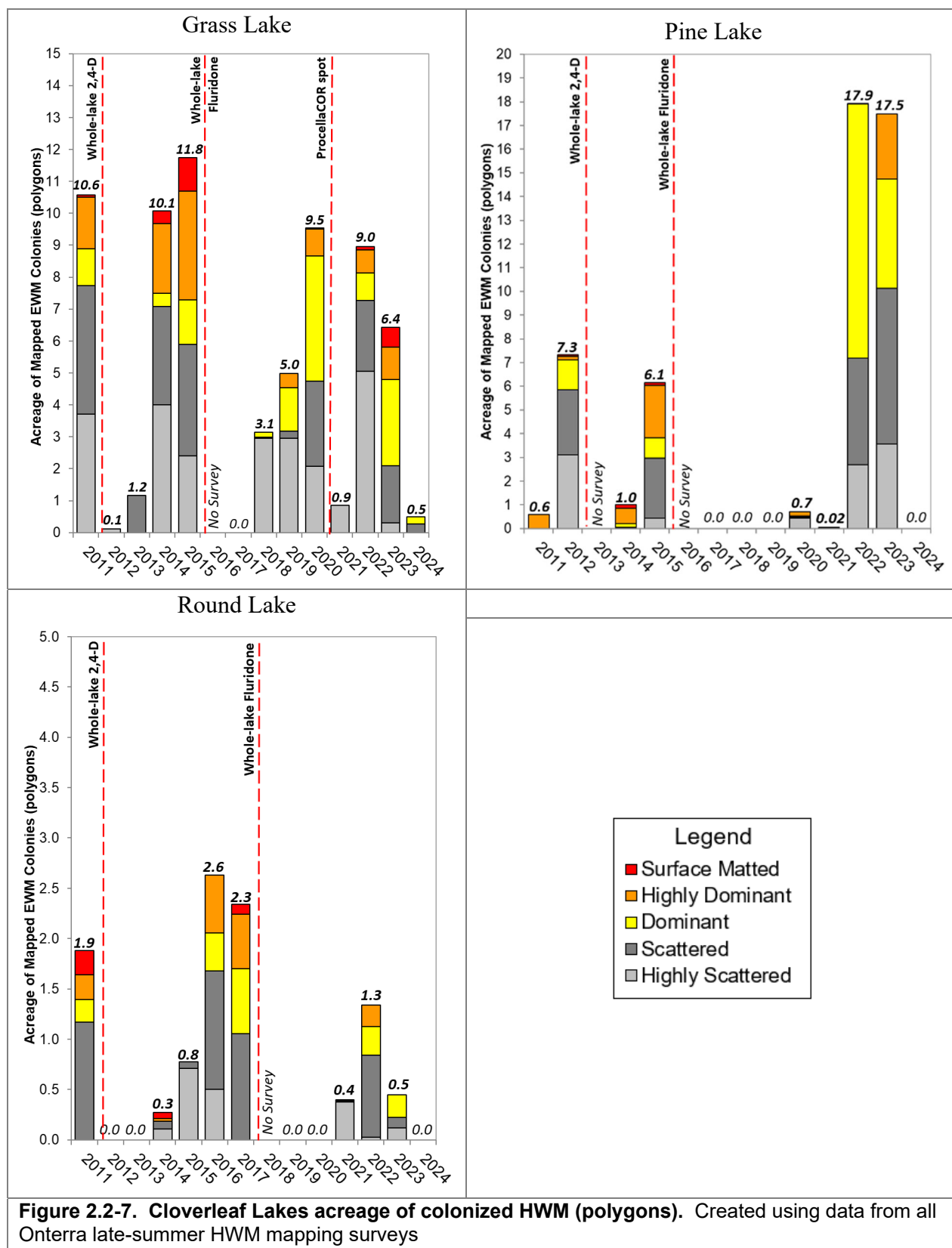


Figure 2.2-6. HWM locations from 2024 point-intercept survey.

Late-Season HWM Mapping Survey

Late-season HWM mapping surveys have been conducted on Cloverleaf Lakes using a consistent methodology by Onterra since 2011. The purpose of the survey is to search for and map all occurrences of HWM while it is expected to be near its peak growth stage. Figure 2.2-7 displays the acres of HWM mapped during the annual late-season mapping surveys in each lake. It is important to note that Figure 2.2-7 only accounts for HWM that is mapped with area-based mapping (polygons) and does not account for any occurrences mapped with point-based attributes such as *single plants*, *clumps of plants*, or *small plant colonies*.

Onterra field crews visited Cloverleaf Lakes on September 30, 2024 to conduct the Late-Season HWM Mapping Survey. Minimal colonized areas of HWM were identified anywhere within the Chain with most occurrences mapped with point-based methods including single plants, clumps of plants, or small plant colonies (Map 1). The survey found low-density HWM present throughout many littoral areas of the lakes consistent with its historical footprint within the lakes, however, the population showed a large decrease in size and density compared to the previous survey completed in late-summer 2023 (Map 2).



3.0 STARRY STONEWORT

Starry stonewort (*Nitellopsis obtusa*; SSW) is a non-native, invasive macroalgae that was first observed in the United States in 1978 within the St. Lawrence River. The species has a distinct star-shaped reproductive structure called a bulbil which forms during late-summer or fall and is deposited into the lake sediments (Photo 3.0-1). Interestingly, this species receives special protections in its native range due to low population numbers. Starry stonewort was discovered in a southeastern Wisconsin lake in 2014, and has now been verified within 21 inland lakes within eight counties. Starry stonewort was also found in Sturgeon Bay in 2016 and subsequent investigations indicate this species is present in coastal areas of Lake Michigan and Green Bay.

A suspected occurrence of SSW was first detected in Pine Lake in 2019; however the quality of that specimen was not sufficient to get a definitive identification. Starry stonewort was subsequently located during the 2021 point-intercept survey of Pine Lake. Specimens were confirmed by WDNR staff and later sent to the New York Botanical Garden for additional genetic confirmation and understanding. This finding represents the first known population of this species in Shawano County.



Like other non-native species, SSW has been shown to dominate aquatic plant communities, in some cases growing to nuisance levels and hindering recreation. However, this species does not act invasively in all situations. Preliminary data from surveys in Wisconsin indicate that frequency can vary across lakes, with some lakes experiencing rapid increase in SSW frequency after discovery, while other lakes have seen a much slower rate of expansion. To date, there have not been any effective chemical management strategies for SSW. Copper-based algaecides can temporarily suppress SSW populations (months), but have been ineffective at long-term population control. While control methods attempted to date in Wisconsin have demonstrated a lack of control efficacy, the WDNR and other lake managers are working towards developing and testing new management strategies.

The WDNR encourages monitoring of all SSW populations on inland lakes through the point-intercept survey methodology. The point-intercept survey is a plot-based inventory characterizing relative frequency of all plants, native and exotic, and is performed at the height of the growing season. The

Cloverleaf Lakes Protection Association (CLPA) secured a WDNR Aquatic Invasive Species Early Detection & Response (AIS-EDR) Grant to offset the costs associated with three years of point-intercept surveys on all of the Cloverleaf Lakes. These surveys would take place during August, corresponding with the phenology of SSW.

The first deliverable narrative report for this project was issued in December 2022 (*Cloverleaf Lakes 2022 Point-Intercept Results Report*) and provided a summary of the aquatic plant surveys that occurred in 2022. A second deliverable narrative report for this project was issued in December 2023 (*Cloverleaf Lakes 2023 Point-Intercept Results Report*), in which a summary was provided of the aquatic plant surveys that occurred in 2023. This document serves as the deliverable for the third and final year of the project and reports on studies that took place during 2024.

While the point-intercept survey is a valuable tool to understand the overall plant population of a lake, it does not offer a full account (census) of where a particular species exists in the lake. Starry stonewort could exist between sampling locations, so it is important to understand the limitations of this survey methodology. In the Cloverleaf Lakes, SSW has been located primarily in deeper waters, not visible from surface viewing, and therefore is difficult to understand its system-wide distribution.

Starry stonewort was located at six point-intercept survey sampling locations within Pine Lake during the 2021 survey and five completely different locations during the 2022 survey. The 2023 survey found SSW to be present at nine sampling locations in Pine Lake representing a littoral frequency of occurrence of 4.1%. The 2024 survey found SSW to be present at 23 sampling locations in Pine Lake representing a littoral frequency of occurrence of 10.8%. The 2024 findings included six repeat points from past surveys and 17 new locations around the lake. The occurrence of SSW from the 2021-2024 point-intercept surveys on Grass and Pine Lakes are displayed on Figure 3.0-1.

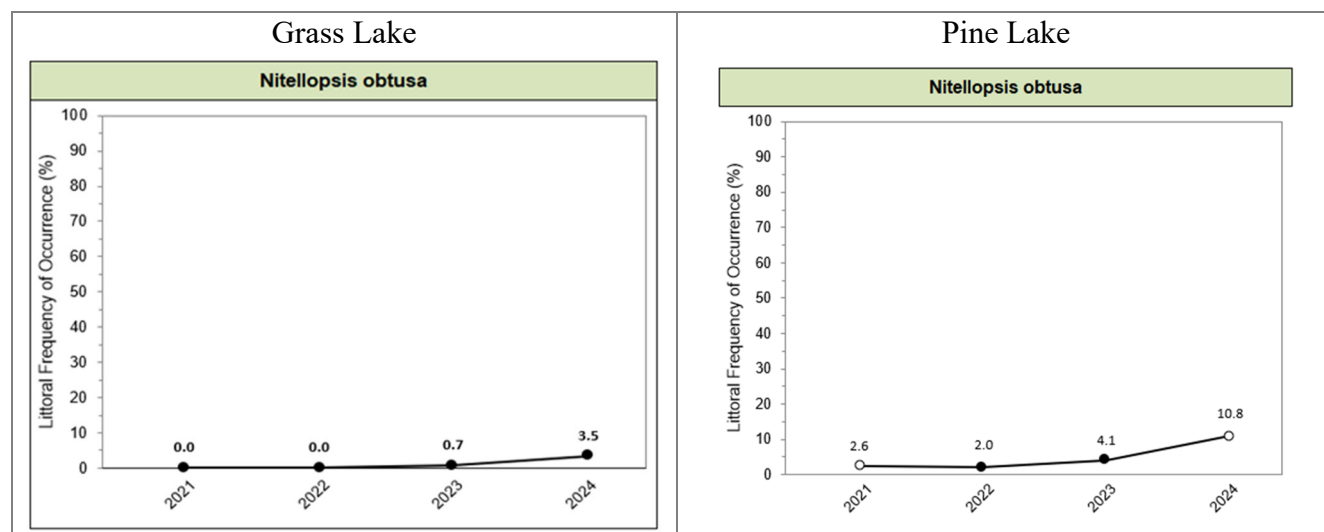


Figure 3.0-1. Littoral frequency of occurrence of starry stonewort in Grass and Pine Lakes from 2021-2024. Open circle indicates a statistically valid change in occurrence from the previous survey (Chi-Square $\alpha = 0.05$).

Starry stonewort was found at one sampling location in Grass Lake during the 2023 survey, making this the first documented occurrence in the system outside of Pine Lake. The sample was vouchered and confirmed by WDNR. The 2024 survey found SSW to be present at five sampling locations in Grass

Lake representing a littoral frequency of occurrence of 3.5%. The 2024 findings included one repeat point from 2023 and four new locations around the lake.

Starry stonewort has not been located within Round Lake to-date. Figure 3.0-2 displays all locations for which SSW has been identified during the 2021-2024 point-intercept surveys.

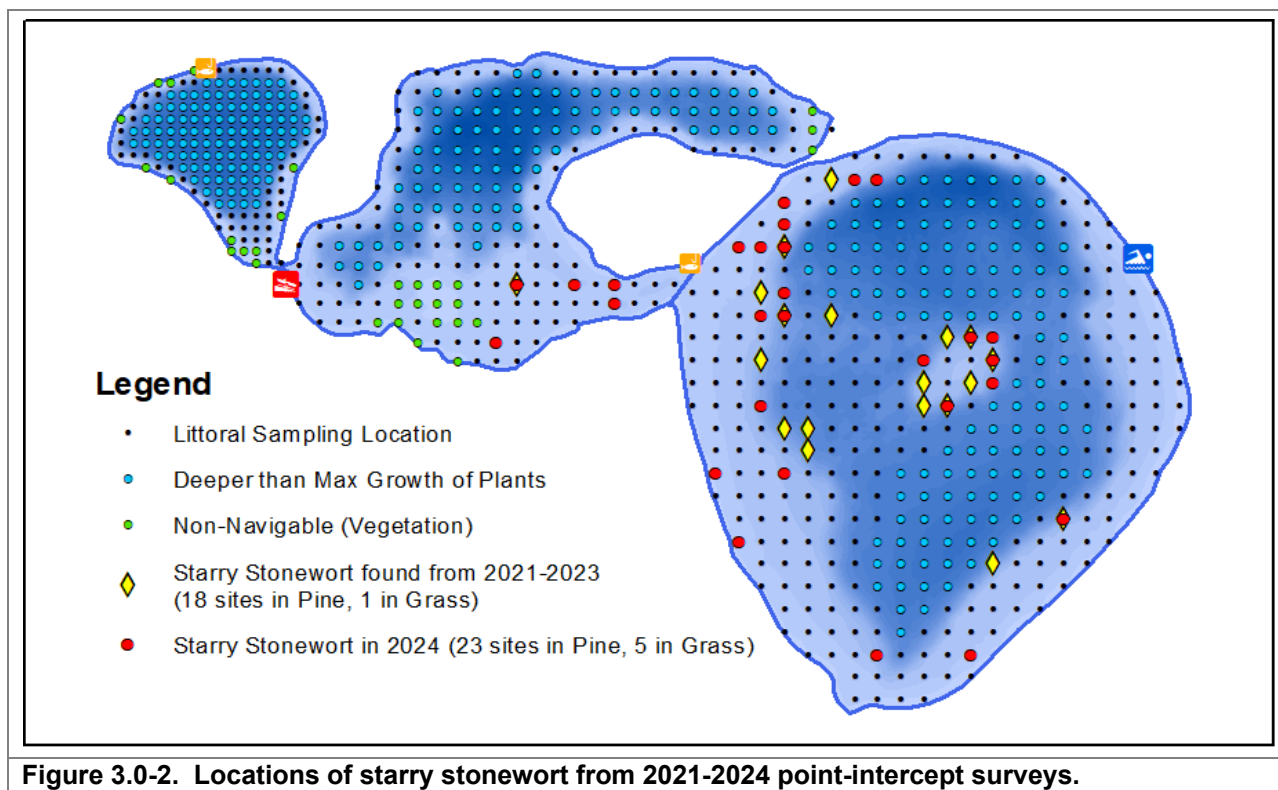


Figure 3.0-2. Locations of starry stonewort from 2021-2024 point-intercept surveys.

4.0 CONCLUSIONS & DISCUSSION

Aquatic plant monitoring completed on the Cloverleaf Lakes during 2024 showed the native species occurrence to be comparable to past surveys. The lakes have a moderate quality aquatic plant community that is dominated by muskgrasses, wild celery, naiads, and a handful of other native species.

Both the whole-lake point-intercept surveys and the late-summer HWM mapping survey showed dramatic declines in the HWM population in the system between 2023-2024 in the absence of active management. Native species did not seem to show any meaningful declines in population between 2023-2024 through analysis of the point-intercept survey. Eurasian watermilfoil populations are known to be variable from year to year based on environmental factors and this seems to be the case in 2024. For whatever reason, HWM did not grow well during 2024, potentially related to the much shorter than usual winter ice cover period and mild overall winter, or other regional factors. Onterra observed HWM population declines on a few lakes in this region of the state during 2024, while many other lakes around the state showed strong HWM growth during 2024. The HWM population in 2024 was not likely to be causing any significant impacts to recreational use of the lakes.

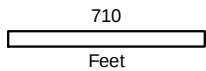
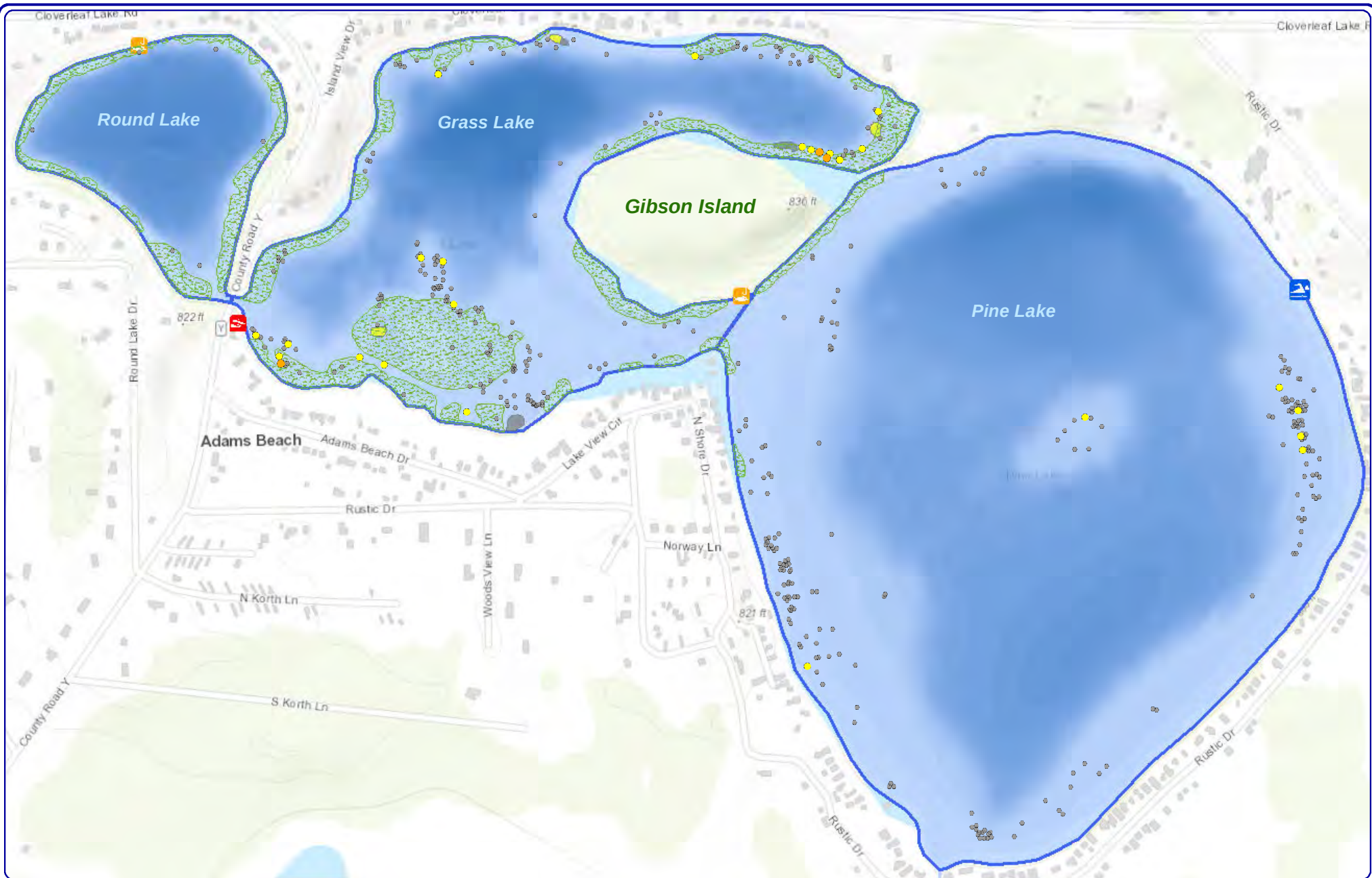
In 2025, the CLPA will focus their management efforts on manual removal of HWM with Diver Assisted Suction Harvesting (DASH) in high-use areas. The CLPA and their contracted DASH firm will

determine a prioritized strategy for 2025 and will utilize the mapping data from Onterra's 2024 survey to guide the removal efforts.

During this three-year monitoring program, starry stonewort has shown an increasing population within Pine Lake while also being introduced to Grass Lake. Starry stonewort has not been located within Round Lake to-date. The population in Pine Lake has shown an increasing trend with the latest survey indicating an occurrence of 10.8%, making it the fifth-most encountered species in the lake. Starry stonewort was encountered across all littoral depths of Pine Lake in 2024 with the highest prevalence in depths between 11-15 feet. All known occurrences within Grass Lake thus far have been in relatively shallow water depths on the western portion of the lake nearest to the channel connecting to Pine Lake.

Starry stonewort has not been found to be causing impacts to recreational uses on Cloverleaf Lakes to-date. Much of the biomass of this plant has been near the bottom of the water column and is not visible from surface viewing. No direct active management efforts have been conducted targeting this species within Cloverleaf Lakes.

The CLPA will continue to communicate with WDNR in terms of future monitoring plans for starry stonewort in the coming years.



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Sources:
 Roads and Hydro: WDNR
 Bathymetry: Digitized by Onterra
 Aquatic Plants: Onterra, 2024
 Basemap: ESRI AGOL
Map Date: October 11, 2024 -ALC



Project Location in Wisconsin

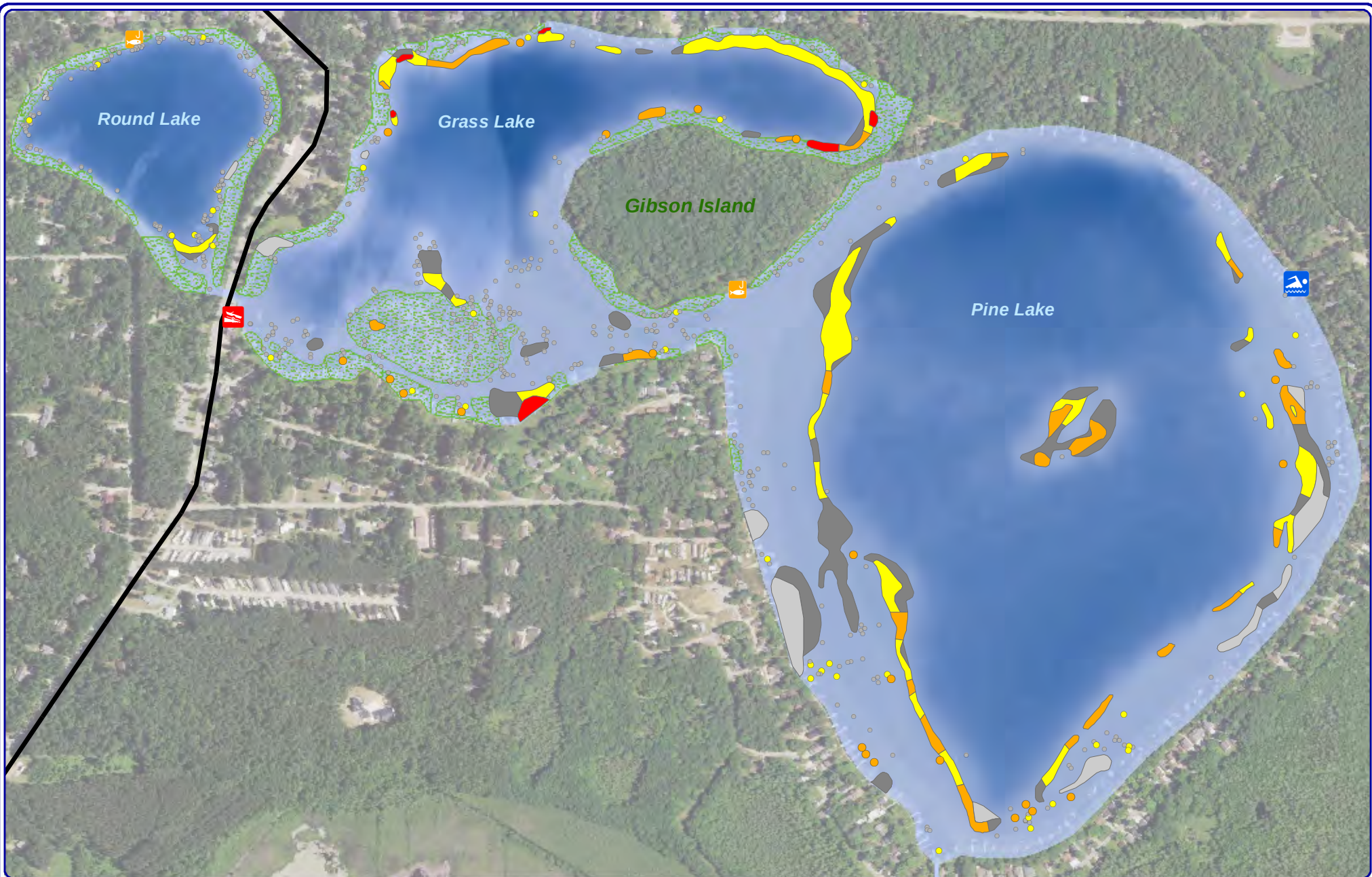
Legend

HWM Survey Results (Septemeber 30, 2024)

- | | |
|------------------------|---|
| Highly Scattered | Single or Few Plants |
| Scattered | Clumps of Plants |
| Dominant | Small Plant Colony |
| Highly Dominant (none) | Floating-leaf and/or Emergent Plant Colony (2020) |
| Surface Matting (none) | |

Map 1 Cloverleaf Lakes Shawano County, Wisconsin

2024 Late-Season Hybrid watermilfoil Survey Results



710

Feet

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www.onterra-eco.com

Sources:

Roads and Hydro: WDNR
Bathymetry: Digitized by Onterra
Aquatic Plants: Onterra, 2023
Orthophotography: NAIP, 2022

Map Date: October 11th, 2023 KLV



Project Location in Wisconsin

Legend

HWM Survey Results (September 26, 2023)

- Highly Scattered
- Scattered
- Dominant
- Highly Dominant
- Surface Matting

- Single or Few Plants
- Clumps of Plants
- Small Plant Colony
- Floating-leaf and/or Emergent Plant Colony (2020)

Map 2
Cloverleaf Lakes
Shawano County, Wisconsin

2023 Late-Season
HWM Survey Results

A

APPENDIX A

Point-Intercept Survey – Aquatic Plant Littoral Frequency Matrix

Grass Lake

Scientific Name	Common Name	LFOO (%)											
		2010	2012	2013	2015	2017	2018	2019	2020	2021	2022	2023	2024
<i>Vallisneria americana</i>	Wild celery	69.3	51.7	50.3	62.9	46.5	48.9	45.5	48.9	48.6	62.9	47.2	40.1
<i>Chara</i> spp.	Muskgrasses	42.6	31.5	34.2	46.8	39.4	47.4	35.8	36.3	37.0	36.2	27.8	33.8
<i>Najas flexilis</i>	Slender naiad	1.0	40.9	3.9	7.3	9.2	16.3	21.1	13.3	29.7	32.8	28.5	33.8
<i>Najas guadalupensis</i>	Southern naiad	22.8	0.0	58.1	41.9	0.7	2.2	23.6	14.1	8.0	7.8	12.5	12.7
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	53.5	0.0	1.3	41.9	0.0	5.2	10.6	30.4	1.4	12.9	34.0	9.9
<i>Potamogeton richardsonii</i>	Clasping-leaf pondweed	48.5	17.4	23.9	14.5	8.5	8.1	1.6	2.2	13.0	7.8	9.7	10.6
<i>Elodea canadensis</i>	Common waterweed	6.9	5.4	13.5	11.3	6.3	8.1	8.9	13.3	2.9	6.0	12.5	12.7
<i>Nuphar variegata</i>	Spatterdock	43.6	7.4	8.4	7.3	4.9	5.9	4.9	8.9	3.6	12.1	7.6	6.3
<i>Stuckenia pectinata</i>	Sago pondweed	22.8	6.0	12.3	7.3	10.6	9.6	3.3	6.7	8.7	2.6	9.7	9.2
<i>Nymphaea odorata</i>	White water lily	7.9	9.4	13.5	8.9	6.3	5.2	7.3	10.4	10.1	9.5	6.9	9.9
<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	5.0	2.0	6.5	9.7	10.6	10.4	6.5	6.7	6.5	6.0	13.2	10.6
<i>Potamogeton gramineus</i>	Variable-leaf pondweed	0.0	0.0	0.6	3.2	2.8	2.2	7.3	14.8	13.8	13.8	13.9	6.3
<i>Potamogeton illinoensis</i>	Illinois pondweed	0.0	16.8	20.0	4.0	2.8	5.2	0.0	1.5	7.2	4.3	2.8	5.6
<i>Ceratophyllum demersum</i>	Coontail	5.0	8.7	3.9	1.6	3.5	2.2	3.3	4.4	0.7	1.7	4.2	8.5
<i>Brasenia schreberi</i>	Watershield	15.8	4.7	5.8	5.6	4.2	3.0	3.3	3.0	6.5	0.9	2.8	1.4
<i>Sagittaria</i> sp. (rosette)	Arrowhead sp. (rosette)	0.0	2.7	0.0	3.2	2.1	2.2	2.4	0.0	7.2	3.4	8.3	10.6
<i>Schoenoplectus acutus</i>	Hardstem bulrush	0.0	2.0	3.2	3.2	1.4	1.5	0.0	0.7	1.4	0.9	1.4	2.8
<i>Utricularia vulgaris</i>	Common bladderwort	0.0	0.0	1.3	2.4	2.1	1.5	0.8	0.7	2.2	0.0	0.7	4.2
<i>Potamogeton natans</i>	Floating-leaf pondweed	3.0	1.3	1.3	3.2	1.4	0.7	1.6	0.7	1.4	0.9	2.8	1.4
<i>Potamogeton amplifolius</i>	Large-leaf pondweed	4.0	0.0	1.3	0.0	0.0	3.0	1.6	0.7	1.4	4.3	1.4	0.7
<i>Potamogeton foliosus</i>	Leafy pondweed	17.8	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Spirodela polyrrhiza</i>	Greater duckweed	0.0	0.7	1.3	0.8	1.4	0.7	2.4	1.5	1.4	0.0	0.0	2.1
<i>Schoenoplectus tabernaemontani</i>	Softstem bulrush	9.9	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0
<i>Nitellopsis obtusa</i>	Starry stonewort	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	3.5
<i>Heteranthera dubia</i>	Water stargrass	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7	2.8
<i>Potamogeton praelongus</i>	White-stem pondweed	0.0	0.0	0.0	2.4	2.1	1.5	0.0	0.0	0.0	0.0	1.4	0.0
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	0.0	0.0	0.0	0.8	0.0	0.0	7.3	0.0	0.0	0.0	0.0	0.0
<i>Potamogeton strictifolius</i>	Stiff pondweed	0.0	0.0	1.3	0.0	0.0	1.5	0.0	0.0	1.4	0.0	0.0	0.7
<i>Potamogeton crispus</i>	Curly-leaf pondweed	1.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.7	0.0	0.7	1.4
<i>Lemna turionifera</i>	Turion duckweed	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7	0.7
<i>Utricularia gibba</i>	Creeping bladderwort	0.0	0.0	0.6	0.0	0.0	3.7	0.0	0.0	0.7	0.0	0.0	0.0</

Pine Lake

Scientific Name	Common Name	LFOO (%)										
		2010	2013	2015	2017	2018	2019	2020	2021	2022	2023	2024
<i>Chara spp.</i>	Muskgrasses	38.6	37.5	42.6	36.7	51.3	43.3	47.1	39.7	28.7	21.3	39.2
<i>Vallisneria americana</i>	Wild celery	23.7	39.4	40.3	32.2	41.2	38.8	41.7	34.2	27.2	20.4	27.4
<i>Potamogeton richardsonii</i>	Clasping-leaf pondweed	23.7	19.3	4.6	11.6	10.6	13.9	6.8	15.4	7.5	8.6	17.9
<i>Najas guadalupensis</i>	Southern naiad	0.0	43.6	20.8	0.5	0.0	2.0	17.5	14.1	15.7	5.0	9.4
<i>Najas flexilis</i>	Slender naiad	0.0	0.4	6.9	2.0	5.0	8.5	21.8	21.4	8.3	16.7	21.2
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	14.5	1.9	19.4	0.0	0.5	1.5	4.4	11.1	16.5	17.2	1.4
<i>Stuckenia pectinata</i>	Sago pondweed	1.0	6.2	6.0	8.0	8.0	3.5	8.3	7.7	3.9	5.0	3.3
<i>Nitella spp.</i>	Stoneworts	0.0	1.9	3.7	5.5	5.0	3.5	6.3	6.8	5.9	7.2	8.0
<i>Potamogeton gramineus</i>	Variable-leaf pondweed	0.0	5.8	1.4	2.5	3.5	5.5	10.2	11.1	2.8	2.3	8.0
<i>Potamogeton illinoensis</i>	Illinois pondweed	0.0	15.4	3.7	0.5	1.5	3.5	6.8	2.1	1.6	0.0	1.4
<i>Nitellopsis obtusa</i>	Starry stonewort	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	2.0	4.1	10.8
<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	0.0	1.2	4.6	3.5	4.0	5.0	3.4	1.7	2.4	2.3	0.9
<i>Ceratophyllum demersum</i>	Coontail	0.0	10.0	2.3	0.5	2.0	0.5	1.0	0.4	0.8	0.0	2.4
<i>Potamogeton amplifolius</i>	Large-leaf pondweed	21.7	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
<i>Elodea canadensis</i>	Common waterweed	0.0	1.2	2.8	1.0	2.0	1.0	3.4	1.7	2.8	0.5	0.0
<i>Sagittaria sp. (rosette)</i>	Arrowhead sp. (rosette)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.6	1.8	3.8
<i>Potamogeton strictifolius</i>	Stiff pondweed	0.0	0.0	0.0	0.0	1.0	1.5	0.0	3.4	0.0	0.5	0.5
<i>Potamogeton friesii</i>	Fries' pondweed	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.9	0.8	0.0	1.4
<i>Utricularia vulgaris</i>	Common bladderwort	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.9	1.2	0.0	0.5
<i>Potamogeton pusillus</i>	Small pondweed	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.9	0.8	0.5	0.5
<i>Potamogeton foliosus</i>	Leafy pondweed	0.0	0.4	0.0	1.0	0.5	0.0	0.0	0.4	0.8	0.0	0.0
<i>Potamogeton crispus</i>	Curly-leaf pondweed	0.5	0.0	0.0	0.0	0.5	0.0	1.0	0.9	0.0	0.0	0.0
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.4	0.0	0.0	0.5
<i>Heteranthera dubia</i>	Water stargrass	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.4	0.0	0.0	0.5
<i>Potamogeton praelongus</i>	White-stem pondweed	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.4	0.0	0.0	0.0
<i>Nymphaea odorata</i>	White water lily	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Nuphar variegata</i>	Spatterdock	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
<i>Elatine minima</i>	Waterwort	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
<i>Potamogeton robbinsii</i>	Fern-leaf pondweed	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Potamogeton hybrid 1</i>	Pondweed Hybrid 1	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Ceratophyllum echinatum</i>	Spiny hornwort	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0

Round Lake

Scientific Name	Common Name	LFOO (%)										
		2010	2012	2013	2015	2017	2019	2020	2021	2022	2023	2024
<i>Chara spp.</i>	Muskgrasses	68.8	70.9	73.7	75.0	64.3	77.2	74.5	74.5	77.8	69.5	77.0
<i>Vallisneria americana</i>	Wild celery	20.8	18.2	21.1	34.4	19.6	12.3	13.7	15.7	20.0	13.6	23.0
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	18.8	9.1	7.0	40.6	48.2	3.5	9.8	15.7	31.1	22.0	9.8
<i>Nymphaea odorata</i>	White water lily	0.0	21.8	15.8	18.8	14.3	10.5	2.0	9.8	11.1	22.0	11.5
<i>Stuckenia pectinata</i>	Sago pondweed	0.0	9.1	21.1	7.8	19.6	7.0	5.9	23.5	17.8	3.4	11.5
<i>Nitella spp.</i>	Stoneworts	0.0	16.4	0.0	12.5	10.7	8.8	11.8	5.9	11.1	3.4	11.5
<i>Potamogeton richardsonii</i>	Clasping-leaf pondweed	16.7	14.5	1.8	12.5	8.9	5.3	2.0	11.8	2.2	1.7	4.9
<i>Schoenoplectus acutus</i>	Hardstem bulrush	0.0	9.1	10.5	4.7	5.4	7.0	3.9	9.8	4.4	0.0	9.8
<i>Najas flexilis</i>	Slender naiad	0.0	0.0	5.3	4.7	5.4	1.8	2.0	7.8	8.9	1.7	13.1
<i>Nuphar variegata</i>	Spatterdock	35.4	7.3	1.8	0.0	1.8	1.8	3.9	3.9	6.7	3.4	1.6
<i>Potamogeton gramineus</i>	Variable-leaf pondweed	0.0	3.6	17.5	1.6	3.6	1.8	0.0	7.8	2.2	1.7	8.2
<i>Ceratophyllum demersum</i>	Coontail	4.2	3.6	8.8	7.8	1.8	0.0	2.0	5.9	2.2	1.7	3.3
<i>Potamogeton illinoensis</i>	Illinois pondweed	0.0	5.5	0.0	4.7	3.6	1.8	5.9	2.0	13.3	1.7	1.6
<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	0.0	0.0	3.5	3.1	1.8	3.5	5.9	3.9	6.7	0.0	4.9
<i>Spirodela polyrrhiza</i>	Greater duckweed	0.0	0.0	1.8	6.3	1.8	7.0	2.0	3.9	0.0	3.4	3.3
<i>Najas guadalupensis</i>	Southern naiad	0.0	5.5	14.0	1.6	3.6	0.0	0.0	0.0	6.7	0.0	0.0
<i>Lemna minor</i>	Lesser duckweed	0.0	0.0	0.0	15.6	0.0	0.0	3.9	9.8	0.0	0.0	0.0
<i>Schoenoplectus tabernaemontani</i>	Softstem bulrush	14.6	0.0	0.0	4.7	0.0	0.0	0.0	0.0	2.2	5.1	0.0
<i>Elodea canadensis</i>	Common waterweed	0.0	3.6	1.8	0.0	3.6	1.8	3.9	0.0	2.2	1.7	1.6
<i>Potamogeton pusillus</i>	Small pondweed	0.0	3.6	0.0	1.6	0.0	1.8	0.0	2.0	2.2	0.0	1.6
<i>Wolffia spp.</i>	Watermeal spp.	0.0	0.0	0.0	6.3	0.0	0.0	3.9	2.0	0.0	0.0	0.0
<i>Potamogeton crispus</i>	Curly-leaf pondweed	2.1	0.0	0.0	0.0	0.0	1.8	5.9	0.0	2.2	0.0	0.0
<i>Potamogeton amplifolius</i>	Large-leaf pondweed	4.2	0.0	0.0	0.0	0.0	0.0	3.9	0.0	0.0	1.7	0.0
<i>Fissidens spp. & Fontinalis spp.</i>	Aquatic Moss	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	3.3
<i>Brasenia schreberi</i>	Watershield	0.0	0.0	0.0	0.0	1.8	0.0	0.0	2.0	2.2	0.0	1.6
<i>Sagittaria sp. (rosette)</i>	Arrowhead sp. (rosette)	0.0	0.0	0.0	0.0	1.8	0.0	0.0	2.0	0.0	0.0	1.6
<i>Ranunculus aquatilis</i>	White water crowfoot	0.0	0.0	0.0	1.6	1.8	0.0	2.0	0.0	0.0	1.7	0.0
<i>Potamogeton foliosus</i>	Leafy pondweed	0.0	0.0	1.8	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Potamogeton bertholdii</i>	Slender pondweed	0.0	0.0	0.0	0.0	0.0	0.0	3.9	0.0	0.0	3.4	0.0
<i>Lemna turionifera</i>	Turion duckweed	0.0	1.8	1.8	0.0	0.0	1.8	2.0	0.0	0.0	0.0	0.0
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0
<i>Lemna trisulca</i>	Forked duckweed	0.0	1.8	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Heteranthera dubia</i>	Water stargrass	0.0	0.0	0.0	1.6	1.8	0.0	0.0	0.0	0.0	0.0	0.0
<i>Typha spp.</i>	Cattail spp.	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Potamogeton strictifolius</i>	Stiff pondweed	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
<i>Eleocharis acicularis</i>	Needle spikerush	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0