PRETTY LAKE
PROTECTION & REHABILITATION DISTRICT
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PRETTY LAKE
AQUATIC MANAGEMENT PLAN

PRETTY LAKE PROTECTION & REHABILITATION DISTRICT
CREATED AUGUST 2024

Prepared by:
Pretty Lake Protection & Rehabilitation District

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Executive Summary

Pretty Lake is a 65 acre seepage lake located in Waukesha County. It has a maximum depth of 31 feet. Visitors have access to the lake from a public boat landing. Fish include Panfish, Largemouth Bass Walleye, and Northern Pike. The lake's water clarity is very clear.

One measure of a lake's health is the trophic state, which relates to the amount of algae in the water. The average summer trophic state for the last 5 years was 38 (Oligotrophic) and was determined using chlorophyll data. For a Deep Seepage lake, this is considered Excellent. Deep Seepage lakes stratify, or form separate layers of water, during the summer months and have no inlet or outlet.

Pretty Lake has been monitored by volunteers since 1989. Volunteers monitor water clarity with a black and white Secchi disk. Some also collect water samples, which are sent to the State Lab of Hygiene to be analyzed. Volunteers are the source of most Wisconsin's lake water quality data, and their dedication is greatly appreciated. Additional monitoring has been done through projects funded in part by DNR Aquatic Invasive Species Grants, such as Clean Boats, Clean Waters.

At present the only Aquatic Invasive Species (AIS) the district is aware of is Eurasian Water Milfoil (EWM). Since EWM was first detected in the 1990s, various methods of control have been tried, most with limited success. Some methods of control were hand pulling and passing off the plants to volunteers in kayaks. This method barely made a dent in the problem. The district also tried a chemical treatment in September of 2012. This treatment was more successful, but the dead EWM added to the muck load and there were concerns from the residents regarding the herbicide residue.

From 2013 to 2017, the district engaged vendors that used a Diver Assisted Suction Harvesting (DASH) boat to pull EWM from the lakebed and suction the plants into onion sacks. The EWM was then deposited at the district owned compost pile, about a ¼ mile away from the boat launch site. While more effective than the above methods, it was quite costly, about $5,400 for 3 pulls.

In 2017 the district applied for DNR grant to obtain our own DASH Boat. We did not receive a grant, but the district voted to acquire a DASH Boat and hire a crew to run it ourselves. The initial cost to the district for the boat was about $13,000. Salaries, supplies and maintenance average about $7,000.00 per year.

The Pretty Lake DASH Boat was put into service in 2018. The boat crew average 17-18 pulls per year, removing tons of EWM. Areas of high density that had the EWM removed reverted to native vegetation. In comparing the 2018 Point Intercept Survey (PIS) to the 2024 PIS, there was a marked decrease in the number of locations and frequency of EWM. Locations went from 40 to 14, and the frequency went from .20 to .07.

The 2024 PIS identified several areas that still have high concentrations of EWM, most notably, the area in front of the high capacity well discharge. Our crews have made several pulls there this year and we will be working diligently to remove this colony over the next 5 years. We will also investigate the all the points identified in the 2024 PIS to eliminate EWM from those areas.

The aquatic plant point-intercept survey conducted in 2024 on Pretty Lake shows the lake sustains a healthy plant community. The species sampled included mostly native plants that indicate the lake has high water clarity and quality. The majority of the plant growth is contained in the Southwestern portion of the lake with dense patches of invasive species located in the Southeast bay. It is important to note that there is a decrease in the presence of invasive Eurasian Watermilfoil so previous management efforts may have had a positive effect. Continued harvesting will be beneficial in reducing invasive species growth and increasing navigation ability in the SE bay.

In addition to DASH harvesting, the district has robust a Clean Boats, Clean Waters program. Our paid interns and dozens of our citizens volunteers inspect 100s boats and interact with many boaters each boating season. This is the way the district is doing its best to keep out new invasive species.

Deliverables and Outcomes

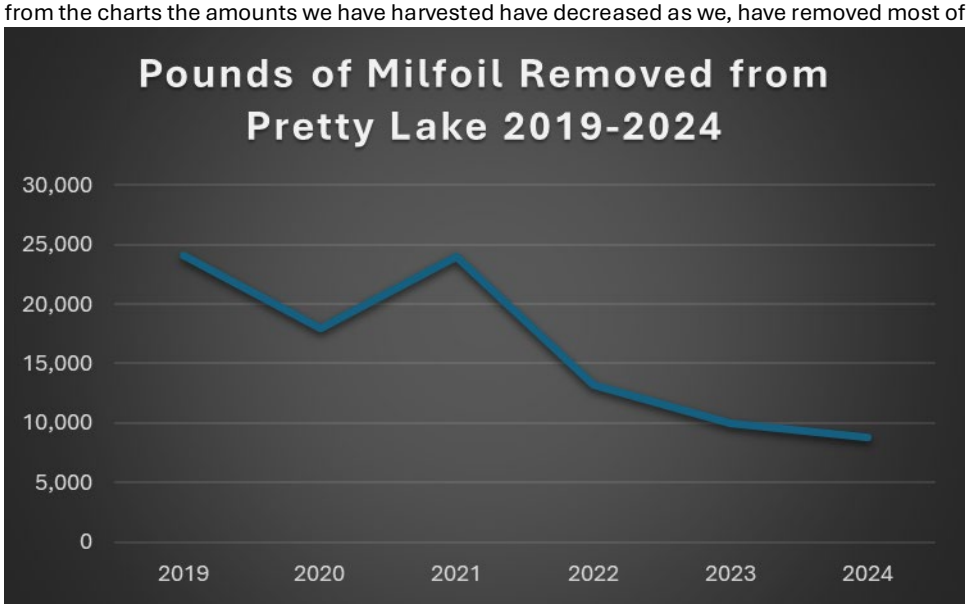
Here is a summary of the district's operations and plans going forward.

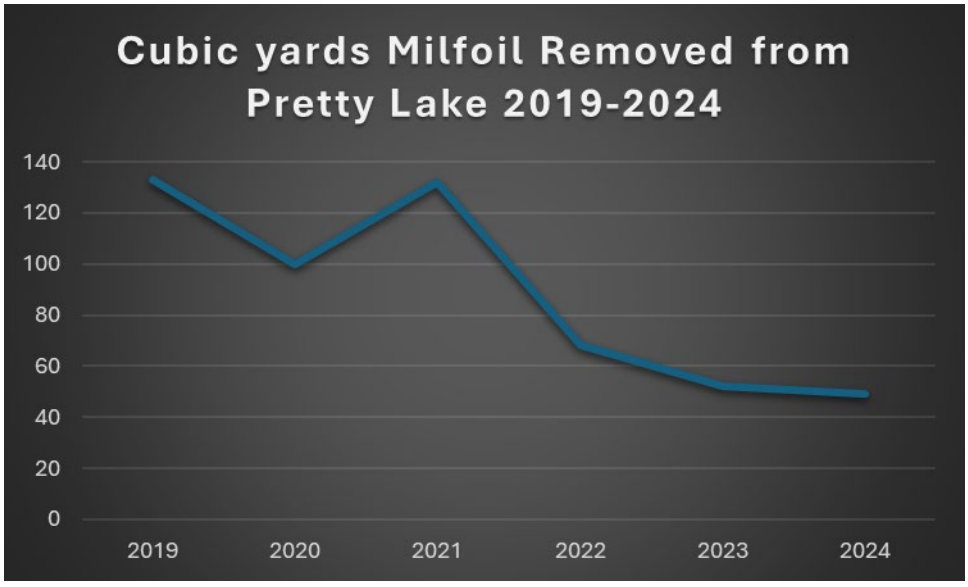
Operations: Since the district's purchase of a DASH boat in 2018/19, many improvements have been made. A Hookah breathing system, underwater communications, upgraded pump motor, new bunk style trailer, and most recently a new 25 HP Outboard motor. All these

upgrades have been added to allow for safer and more efficient harvesting. The total investment in these upgrades was nearly $20,000. This investment in the DASH program underlies the district's commitment to removing the lake of Eurasian Water Milfoil.

Typical Harvesting Day Summary:
The DASH boat is picked up from its storage location on district land and launched. It motors out to the days harvesting location. The crew consists of the captain and chief diver, the deck hand, and a crew member in a kayak with a net to retrieve milfoil fragments. The Diver enters the laker and the deck hand gives him the suction hose. Then diver begins pulling the milfoil up, roots and all. The milfoil is suction to the DASH boat where the deckhand directs the plants into onion sacks that catch them. The lake water then cascades off the deck back into the lake. After the morning harvest, the onion sacks are off loaded into a trailer. The process is repeated in the afternoon. Then the DASH boat is landed and taken to storage. The harvested milfoil is then transported to the district's compost pile. Eventually the composted milfoil will be ploughed into a corn or soybean field to nourish a crop.

Long Term Goal:
Our long term goal is to remove milfoil from stubborn areas and then seek and destroy small random pockets of the weed. As you can see from the charts the amounts we have harvested have decreased as we, have removed most of the dense areas.





The distreict is looking forward to the next Point Intercept Survey.

High Quality Waters Within Walworth and Waukesha Counties

There are a variety of types of HQWs in Southeastern Wisconsin. This lake "type" is determined using WDNR Natural Community model which categorizes lakes based on surface area, stratification status, hydrology, and watershed size. Headwater lakes are lakes with a watershed less than 4 square miles and lowland lakes are lakes with watershed greater than 4 square miles.

Two-Story	Seepage	Deep Headwater	Deep Lowland	Shallow Lowland/Reservoir
Geneva	Pretty	Golden	Lulu	Eagle Spring
Fowler	Spring	Beaver	Middle	LowerPhantom
Oconomowoc	Booth	Ottawa	Whitewater	Big Muskego
Nagawicka	Wandawega	Pleasant	Little Muskego	
Beulah		Turtle		
Nemahbin				
Lower Nashotah				
Pine				

Lake Type – Seepage Lakes

A seepage lake is "a lake that does not have an outlet stream that continually flows under average summer conditions based on the past 30 years." (Wisconsin State Legislature Code NR 102.03(6e))

Seepage lakes are lakes that have no streams contributing to or draining water from these lakes. Their main water sources are groundwater and precipitation, with their main sources of water loss coming from evaporation and loss to groundwater. Because of this, lake water levels can fluctuate substantially with weather conditions. In general, seepage lakes are smaller with small watershed-to-lake ratios. Seepage lakes' watershed land use can vary with many high-quality seepage lakes having natural watersheds. In many cases, most of the watershed development is along the lake's shoreline. When it comes to water quality for seepage lakes, protecting groundwater recharge areas is essential to maintain water quantity and quality. Additionally, since most of the development is along the shoreline, having good shoreline practices in place is important for improving water quality.

Natural Community	Stratification Status	Hydrology
Lakes/Reservoirs <10 acres		
Small	Variable	Any
Lakes/Reservoirs >10 acres		
Shallow Seepage	Mixed	Seepage
Shallow Headwater		Headwater Drainage
Shallow Lowland		Lowland Drainage
Deep Seepage	Stratified	Seepage
Deep Headwater		Headwater Drainage
Deep Lowland		Lowland Drainage
Other Classification (any size)		
Spring Ponds	Variable	Spring Hydrology
Two-Story Fishery Lakes	Stratified	Any
Impounded Flowing Waters	Variable	Headwater or Lowland Drainage

Aquatic Plant Point-Intercept Survey Pretty Lake, Waukesha County Wisconsin July 2024

Survey completed and report prepared by:

Lake Country Conservationists

Pretty Lake- Aquatic Plant Point-Intercept Survey

Introduction

An aquatic plant point-intercept survey was completed in July 2024 on Pretty Lake located in Waukesha County, Wisconsin. The survey was completed using the point intercept method developed by the Wisconsin Department of Natural Resources (WI DNR). Pretty Lake is a 65-acre lake with a maximum depth of approximately 33 feet. The lake is known to have a very clear water clarity which can result in submerged vegetation growing at increased depths. This report summarizes and analyzes data collected in 2024 and compares some previously collected data from 2018. According to the WI DNR the primary objective of a point-intercept survey is to: 1) collect quantitative data describing the frequencies of occurrence of effect plant species, as well as estimates of species richness, abundance, and maximum depth of plant colonization for use in developing various management plans, as well as 2) use the data to statistically compare aquatic plant variables over time and among lakes.

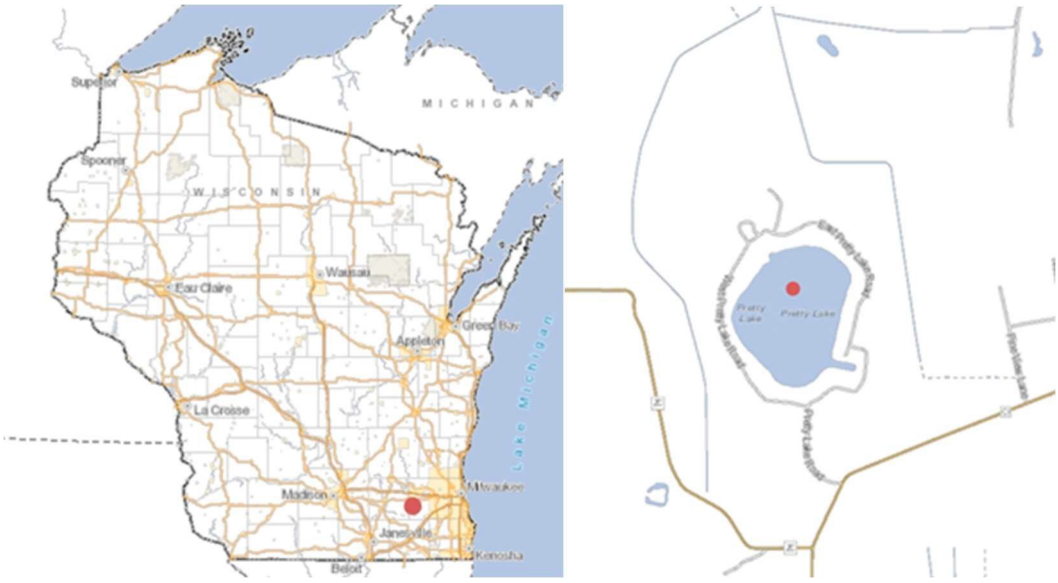


Figure 1: Map of Pretty Lake located within Waukesha County, Wisconsin.

Field Methods

A point intercept method was employed for the aquatic plant sampling. The WI DNR provides the sampling point grids (Figure 2) for lakes within Wisconsin. 203 sampling site locations are found at Pretty Lake. At each point depth was recorded. For sites with a depth of less than 0.5 feet or were obstructed by land, structures, etc., only visuals observations were recorded. For all other sites a double-sided weighted sampling rake attached to a 40-ft (12m) rope was used at each sample location. The rake was dropped, drug, and towed to the surface to evaluate plant species found at that location. All plants present on the rake and those that fell of the rake were identified

and rated for rake fullness. The rake fullness value was used based on the criteria contained in figure 3 and table 1 below. Any additional plants that were within 6 feet of the location were recorded as "viewed," but no rake fullness rating was given. For more information on methodology reference: "Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications" (2010) developed by the Wisconsin Department of Natural Resources Bureau of Science Services.

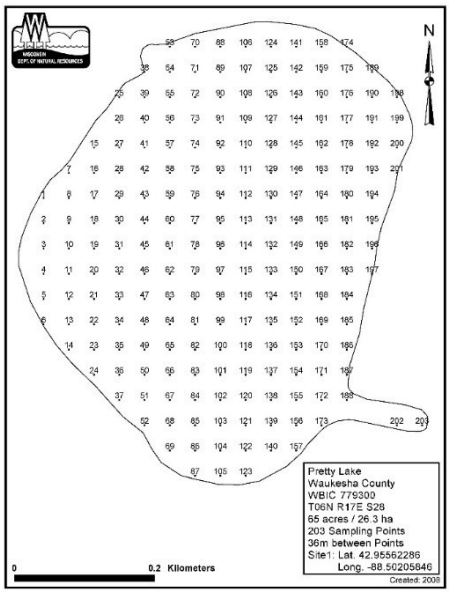
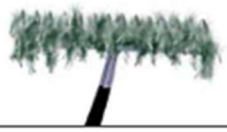
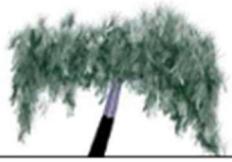


Figure 2: ***Point-intercept sample grid for Pretty Lake, Waukesha County, WI, with 203 sampling sites. Provided by WI DNR.***

Rake Fullness rating	Criteria for rake fullness rating
0	No submerged plants observed
1	Plant present occupies less than ½ of tine space
2	Plant presence occupies more than ½ tine space
3	Plant present occupies all or more than tine space
V	Plant not sampled but observed within 6 feet of boat

Table 1: Rake fullness criteria descriptions.

Figure 3: Rake fullness diagram.

Fullness Rating	Coverage
1	
2	
3	

Data analysis methods

Once data was collected it was analyzed for the following statistics.

- Frequency of occurrence within vegetated areas (%): Number of sites at which a species was observed divided by the total number of vegetated sites.
- Frequency of occurrence at sites shallower than maximum depth of plants: Number of sites a species was observed at divided by the total number of sites shallower than maximum depth of plants.
- Relative frequency (%): This is a proportional value that reflects the degree to which an individual species contributes to the sum total of all species observations. The sum of the relative frequencies of all species is 100%.
- Number of sites where a species was found: This is the sum of the number of sites at which a species was recorded on the rake
- Average rake fullness: Mean rake fullness rating, ranges from 1-3.
- Number of visual sightings: This is the total number of times a plant was seen within 6 feet of the boat, but not collected on the rake.
- Total number of sites with vegetation: Total number of sites where at least one plant was found on the rake.
- Total number of sites shallower than maximum depth of plants: Total number of sites where the depth was less than or equal to the maximum depth at which plants were found. This value is used for frequency of occurrence at sites shallower than maximum depth of plants.
- Simpson's Diversity Index: A nonparametric estimator of community heterogeneity. The closer the Simpson Diversity Index is to 1, the more diverse the community.
- The maximum depth of plants: This is the depth of the deepest site sampled at which vegetation was present.
- Average number of species per site (vegetated sites only): Mean number of species found at sample sites where vegetation was present.
- Average number of invasive species per site (vegetated sites only).

Results

Submerged vegetation was found in 158 of the 203 sampling locations within Pretty Lake. A total of 11 submerged plants species were observed within the lake, including one invasive species, Eurasian Watermilfoil. There were also two emergent plants observed and recorded at shallow site locations, however these are not included in the summarized statistics. The maximum depth with plants was 23.6 feet and a mean depth with plants at 8.6 feet. Plant growth was observed at 77.8% of the lake with an average of 2 diferent plant species per site.

Pretty Lake- Aquatic Plant Point-Intercept Survey	
Total number of sites in entire lake	203
Total number of sites with submerged vegetation	158
Percent of sites with submerged vegetation	77.83%
Total number of sites with no vegetation on rake	50
Total number of sites rake was unable to used due to shallowness (<0.5ft) or obstructions	12
Total number of sites with only visual observations of submerged vegetation	5
Total number of sites with emergent vegetation	5
Total number of sites shallower than maximum depth of plants	183
Simpson Diversity Index	0.73
Frequency of occurrence at sites shallower than maximum depth of plants	0.86
Frequency of occurrence in entire lake	0.78
Maximum depth of plants	23.6 ft
Mean depth of plants	8.6 ft
Maximum number of species per site (veg. sites only)	6
Average number of all species per site (veg. sites only)	1.94
Number of sites with invasive species present	15
Percent of sites with invasive species present relative to vegetated sites	9.49%

Table 2: Summary of 2024 survey statistics.

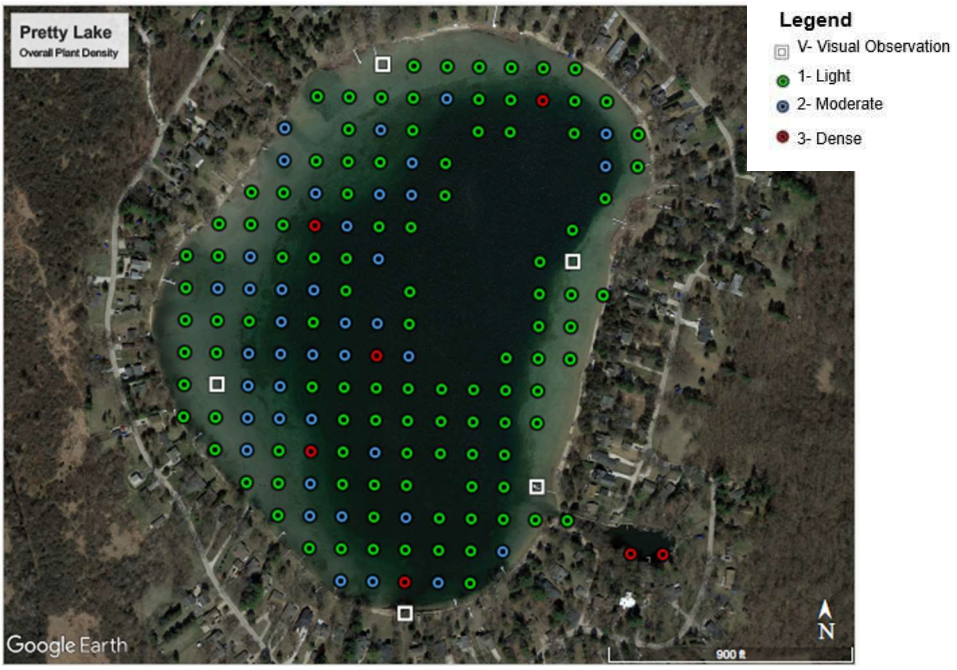


Figure 4: Rake fullness/plant distribution map of all sites with plant growth.

The most common species observed was Chara or commonly known as Muskgrass. This species was observed at 70% of all sampling points and was the species seen growing at the greatest depths. Chara is a native advanced form of algae which usually thrives in clear, hard water. The second most common species found was Sago Pondweed. This species was found in 22% of all sampling points. Table 3 lists all species sampled and their frequencies of occurrence.

Pretty Lake- Aquatic Plant Point-Intercept Survey

Species Common Name	Species Scientific Name	Number of Sites Species Observed	Overall Frequency of Occurrence	Relative Frequency of Occurrence	Average Rake Fullness	# Visual Observations
Submerged Vegetation						
Muskgrass	*Chara Spp.*	143	0.70	0.91	1.29	4
Eurasian Watermilfoil	*Myriophyllum spicatum*	14	0.07	0.09	1.60	5
Sago Pondweed	*Stuckenia pectinata*	45	0.22	0.28	1.58	2
Common waterweed	*Elodea canadensis*	1	0.00	0.01	N/A	1
Eelgrass (Water Celery)	*Vallisneria americana*	36	0.18	0.23	1.00	3
Slender Naiad	*Najas flexilis*	9	0.04	0.06	1.00	0
Southern Naiad	*Najas guadalupensis*	6	0.03	0.04	1.00	0
Flat-Stem Pondweed	*Potamogeton zosteriformis*	21	0.10	0.13	1.62	0
White-Stem Pondweed	*Potamogeton praelongus*	14	0.07	0.09	1.40	4
Illinois Pondweed	*Potamogeton illinoensis*	14	0.07	0.09	1.64	3
Coontail	*Ceratophyllum demersum*	1	0.00	0.01	1.00	0
Emergent Vegetation						
Cattail Spp.	*Cattail Spp.*	4	0.02	N/A	N/A	4

Bullrush Spp.	*Bullrush Spp.*	5	0.02	N/A	N/A	5

Table 3: Species list with observations, frequency of occurrence data, and rake fullness.

Figures 5 through 8 show the distribution of all the submerged plants that were observed more than once. They are all common native aquatic plants in Wisconsin lakes and serve important roles in the lake's ecosystem. This includes providing important habitat for invertebrates and fish, as well as providing cover for important components of the lake food web.

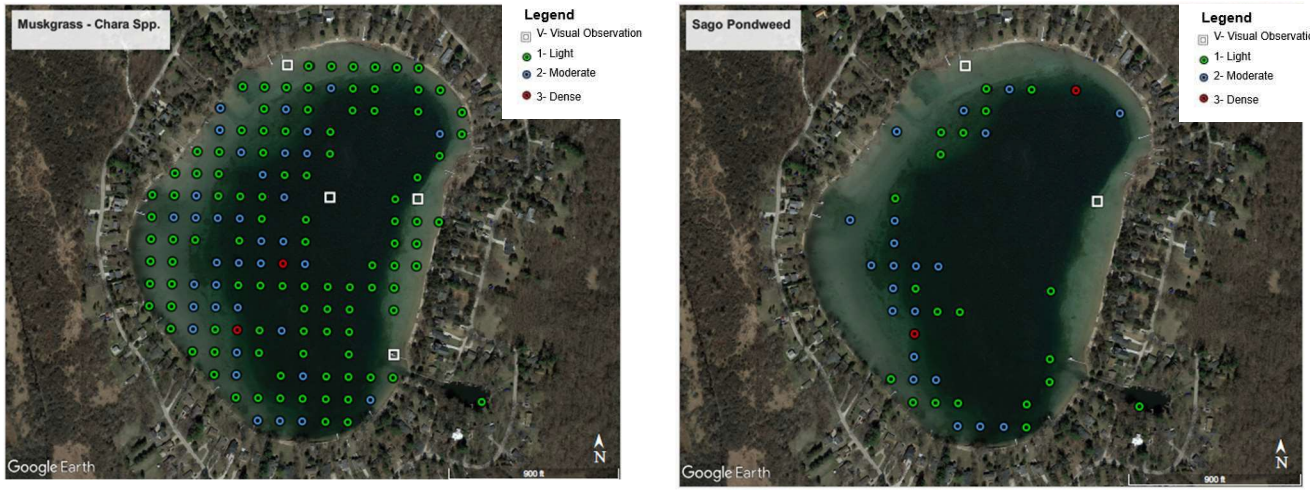


Figure 5: Distribution maps of the two most common species, Chara and Sago Pondweed, sampled in 2024.

Figure 6: Distribution maps of Eelgrass and Flat-Stem Pondweed, the third and fourth most sampled plants in 2024.

Figure 7: Distribution maps of Illinois and White-Stem Pondweed.

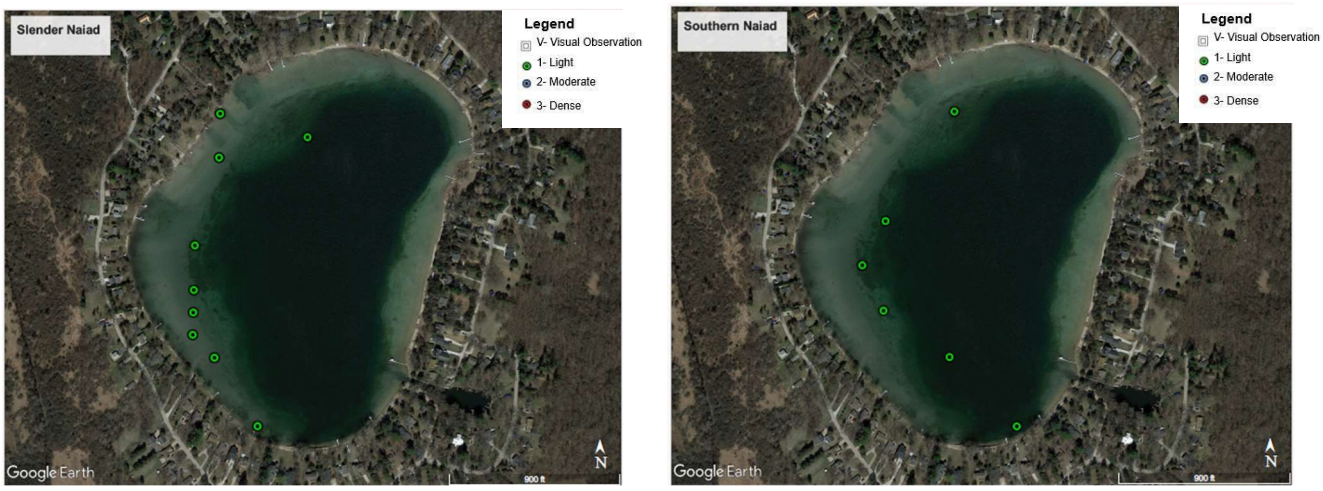


Figure 8: Distribution maps of Slender and Southern Naiad.

Pretty Lake- Aquatic Plant Point-Intercept Survey

Invasive species-Eurasian watermilfoil

The one invasive species that was found to be present was, *Myriophyllum spicatum* (Eurasian Watermilfoil or EWM.) This plant has been known to be present in Pretty Lake for several years. Figure 9 is a map showing the distribution and density of EWM in Pretty Lake in July 2024.

EWM had a frequency of occurrence of 6.8% within the entire lake and 9.5% within vegetated sites.

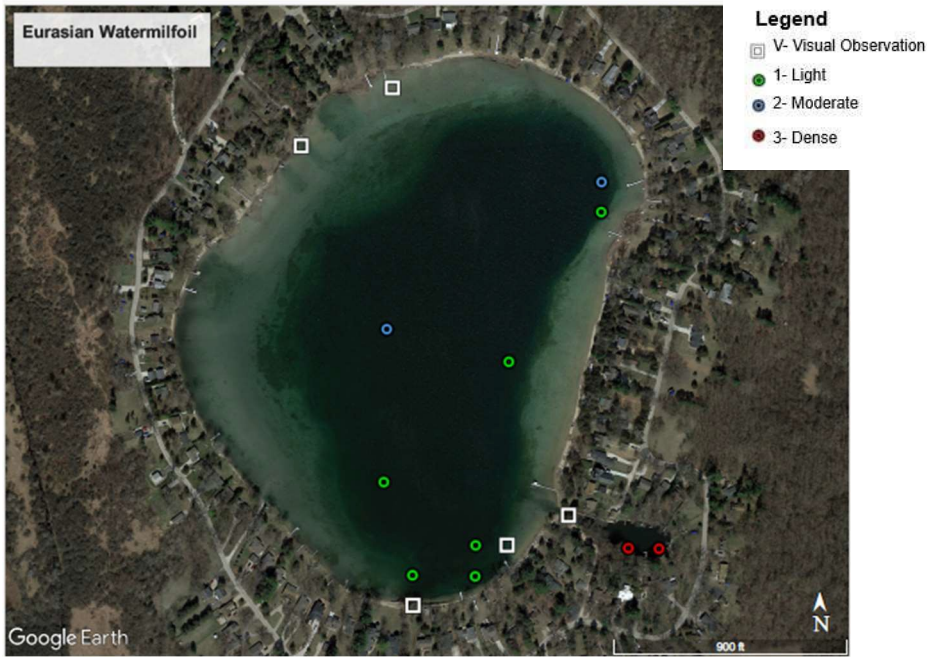


Figure 9: Distribution map of invasive Eurasian watermilfoil (EWM) in 2024.

Maximum Depth Comparison to previous surveys

Figure 10 shows the maximum depth of colonization. This is the depth of the deepest site sampled at which vegetation was present. The maximum depth of colonization is an important metric as it can be indicator of water clarity and water quality.

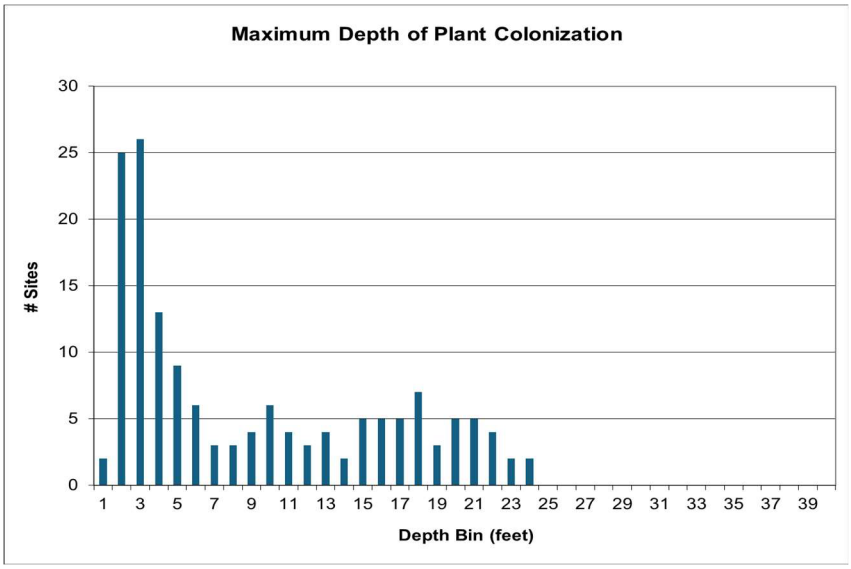


Figure 9: Distribution of plant occurrences versus water column depth

Comparison to previous surveys

The 2024 survey results were compared to the most recent survey in 2018. The results are shown below in Table 4. There was one additional species that was found in 2018 that was not recorded in 2024.

Species Common Name	Species Scientific Name	Change in Total Observations 2018/2024
Muskgrass	*Chara Spp.*	↑139
Eurasian Watermilfoil	*Myriophyllum spicatum*	↓26
Sago Pondweed	*Stuckenia pectinata*	↓2
Common waterweed	*Elodea canadensis*	↓1
Eelgrass (Water Celery)	*Vallisneria americana*	↑18
Slender Naiad	*Najas flexilis*	↓14
Southern Naiad	*Najas guadalupensis*	↓1
Flat-Stem Pondweed	*Potamogeton zosteriformis*	↑5
White Stem Pondweed	*Potamogeton praelongus*	↑7
Illinois Pondweed	*Potamogeton illinoensis*	↓10
Coontail	*Ceratophyllum demersum*	↓119
Spiny Naiad	*Najas marina*	↓1

Table 4: Summary of change in species observations from 2018 and 2021 surveys. This table includes visual observations.

Discussion

The aquatic plant point-intercept survey conducted in 2024 on Pretty Lake shows the lake sustains a healthy plant community. The species sampled included mostly native plants that indicate the lake has high water clarity and quality. The majority of the plant growth is contained in the Southwestern portion of the lake with dense patches of invasive species located in the Southeast bay. It is important to note that there is a decrease in the presence of invasive Eurasian Watermilfoil so previous management efforts may have had a positive □ffect. Continued harvesting or herbicide treatments may be beneficial in reducing invasive species growth and increasing navigation ability in the SE bay.