Twenty-Six Lake (Lake 26) Aquatic Plant Management Plan

April 21st, 2020

Sponsored by:
Twenty-Six Lake Property Owners Association (TSLPOA)
Burnett County Land Services Department – Conservation Division (BCLSD)

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Contents

Introduction

The aquatic plant management plan (APM) for Lake 26 is sponsored by the Twenty Six Lake Property Owners' Association (TSLPOA). The planning phase of the project is funded, in part, by the Burnett County Land Services Department – Conservation Division (BCLSD) and the TSLPOA.

Knowing that Eurasian water milfoil (EWM) and curly leaf pondweed (CLP) are found in nearby area waterbodies, concerned members of the TSLPOA authorized an extensive assessment of the Lake 26 aquatic macrophytes (plants). BCLSD used the Wisconsin Department of Natural Resources (WDNR) statewide guidelines for conducting systematic point intercept macrophyte sampling. This aquatic plant management plan for Lake 26 presents a strategy for managing aquatic plants by protecting native plant populations and preventing the establishment of aquatic invasive species (AIS).

The plan includes data about the aquatic plant community, watershed, water quality, AIS, and more about the health of Lake 26. Based on this data and public input, goals and strategies for the sound management of aquatic plants in Lake 26 are presented. This plan will guide TSLPOA, BCLSD, and the WDNR in aquatic plant management for Lake 26 over the next five - ten years (from 2021 through 2031).

Public Input for Plan Development

A survey was sent out to all of the riparian land owners on Lake 26. A total of 72 surveys were sent out and a total of 42 were returned (58.3% response rate). The survey results were used to help guide decisions by the APM Committee members. TSLPOA announced the availability of the draft Aquatic Plant Management Plan was available for review by July 10th, 2021. Copies were available online at the Burnett County Website, Lake 26 Website, and hard copies were mailed if requested. Comments and suggestions could be mailed or emailed to the address below. Final plan review was conducted October, 2021**.** After this meeting, the plan was sent to the WDNR for approval.

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Executive Summary

An AIS survey was completed during the development of this APM. Following the AIS survey, a complete aquatic macrophyte survey was completed, and all plants found were identified to species level. Both the AIS and complete macrophyte surveys were completed using a point intercept sampling grid (Figure 7), and standard WDNR sampling protocols. Below are some findings from the sampling conducted on Lake 26, and each summarized item is discussed further throughout this document.

Findings:

1. No new AIS were observed during the development of this plan, but future monitoring should continue to occur. Chinese mystery snails are currently the only AIS present in Lake 26. Zebra mussel sampling through veliger tows has been conducted, and no evidence of zebra mussels is present.

2. During the complete aquatic macrophyte survey, there were 34 different plant species observed in or directly near the littoral zone (zone of aquatic plant growth). Diversity was very high with a Simpson's diversity index of 0.91.

3. All 34 species were assigned floristic quality values. The floristic quality index (FQI) for Lake 26 is 34.47 with a mean conservatism value (C-value) of 5.91. These values are above average for the Northwest ecoregion, and suggests that Lake 26 is less tolerant to disturbances.

4. Plants were found growing on approximately 26% of the entire lake bottom. Areas that were shallow and had a mucky substrate supported more plants than areas with a sandy or rocky bottom.

5. The following plant species were the most frequently observed on the lake: Slender naiad (*Najas flexilis*), variable-leaf pondweed (*Potamogeton gramineus*), water celery (*Vallisneria americana*), fern pondweed (*Potamogeton robbinsii*), and Muskgrass (*Chara spp.*). The five species were found at 48.85%, 19.54%, 18.39%, 17.24%, and 17.24% of the survey points with vegetation respectively (Table 5). Each of the five species were widely distributed throughout the lake over muck and sandy bottoms.

Using available information, and the new information gathered from this project, the Lake 26 APM Committee members have developed goals to keep Lake 26 healthy. Below are the summarized goals that were developed by the Committee, and each goal is discussed further throughout this document.

Lake 26 Management Goals:

Prevent the introduction and spread of aquatic invasive species (AIS). This goal is aimed at preventing the introduction of curly-leaf pondweed, Eurasian water milfoil, zebra mussels, and all other AIS. The active Clean Boats, Clean Waters program will be continued, and the Burnett County decontamination ordinance will be enforced. Lake 26 will be routinely surveyed for AIS, and other actions will be taken as needed. More information can be found on page 28 of this document.

Maintain and improve water quality conditions. Secchi disk readings and other water quality data will continue to be gathered by TSLPOA individuals. Lake 26 residents will also be encouraged to restore natural shoreline buffers, reduce phosphorous inputs (i.e. fertilizers), and implement storm water runoff controls to prevent excess erosion. Other actions will be taken as needed. More information can be found on page 29 of this document.

Maintain the diverse population of native aquatic plants. Removal of plants by herbicide use should be discouraged, and strict adherence to treatment standards will be followed if a treatment will ever be needed. Lake 26 residents will also be informed of the importance of aquatic plants and their impacts on them. More information can be found on page 30 of this document.

Educate the Lake 26 community and users regarding aquatic plant management, management strategies found in the plan, and appropriate management actions. Several messages will be distributed to the Lake 26 Community. Messages may include: the summary of the APM plan, native aquatic plant values, identification of AIS, native plant identification, summarization of local and state regulations pertaining to the use of Lake 26, and more. More information can be found on pages 30 and 31 of this document.

Lake Information

Lake 26 (WBIC 2672500) is a 218 acre drainage lake located in Burnett County, WI. It has a maximum depth of 45 feet and a mean depth of 20 feet (Figure 1). The lake is 80% sand, 10% gravel, 0% rock, and 10% muck. Visitors have access to the lake from a public boat launch located at the Burnett County Lake 26 Park.[2] At this launch a decontamination station is present, and Burnett County Ordinance (Article 5, Section 18) requires that any watercraft entering and leaving Lake 26 to use the materials provided.[6] This station has cleaning tools and a 500 ppm Chlorine Bleach solution to kill most AIS. This solution has been proven to be safe for water equipment, and will not harm boat paint or finishes when used as instructed.

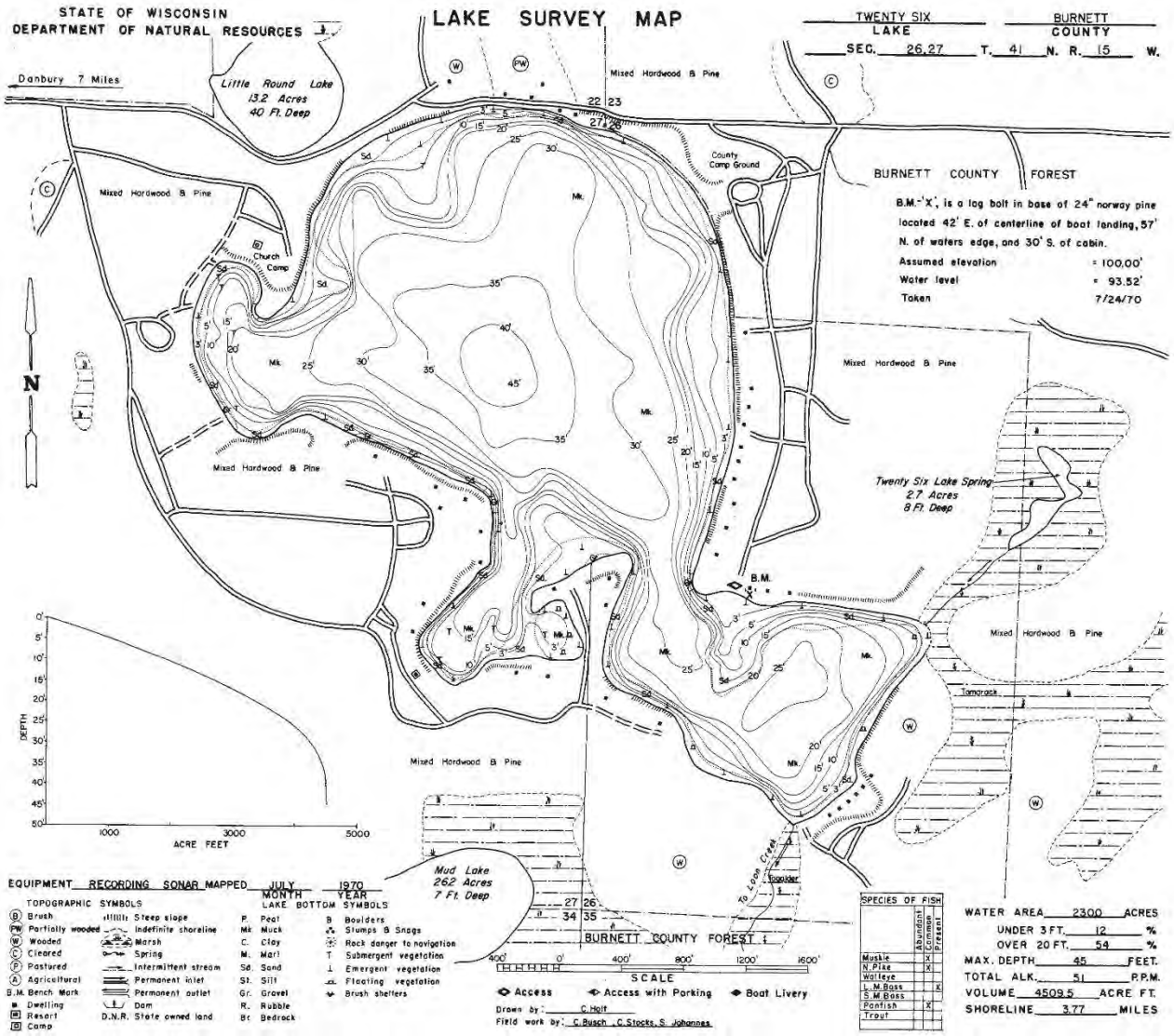


Figure 1: Bathymetric Map of Lake 26

Lake 26's water is clear with an average secchi reading of 13 feet in 2020, which classifies this lake as mesotrophic. The clear water created a littoral zone (zone of plant growth) down to approximately (15) feet. Water quality is frequently reported by the trophic state or nutrient level of the lake, which relates to the amount of algae in the water. Nutrient-rich lakes are classified as eutrophic. These lakes tend to have abundant aquatic plant growth and low water clarity due to algae blooms. Mesotrophic lakes, such as Lake 26 have intermediate nutrient levels and only occasional algae blooms. Oligotrophic lakes are nutrient-poor with little growth of plants and algae.

Secchi depth readings are one way to assess the trophic state of a lake. The Secchi depth is the depth at which the black and white secchi disk is no longer visible when it is lowered into the water. Greater secchi depths occur with greater water clarity. Secchi depth readings, phosphorus concentrations, and chlorophyll measurements can each be used to calculate a Trophic State Index (TSI) for lakes. TSI values range from 0 – 110. Lakes with TSI values greater than 50 are considered eutrophic. Those with values in the 40 to 50 range are mesotrophic. Lakes with TSI values below 40 are considered oligotrophic.[3]

Citizen lake monitoring volunteers have collected lake data for Lake 26 since 1986, and annual monitoring has continued regularly since 2000. The average summer (July-Aug) secchi disk reading for Lake 26 – Deep Hole (station #073060) is 12.2 feet (Figures 2 and 4). The average for the Northwest Georegion was 8.9 feet. In 2020, the secchi TSI value for Lake 26 was 40 (Figure 3). The TSI suggests that Lake 26 is Mesotrophic.[3]

It is important to note that all water quality data used in this report came from the Deep Hole (station #073060). Generally, the deepest portion of a waterbody gives the most accurate readings for water quality sampling. Information about this sampling site can be found here.

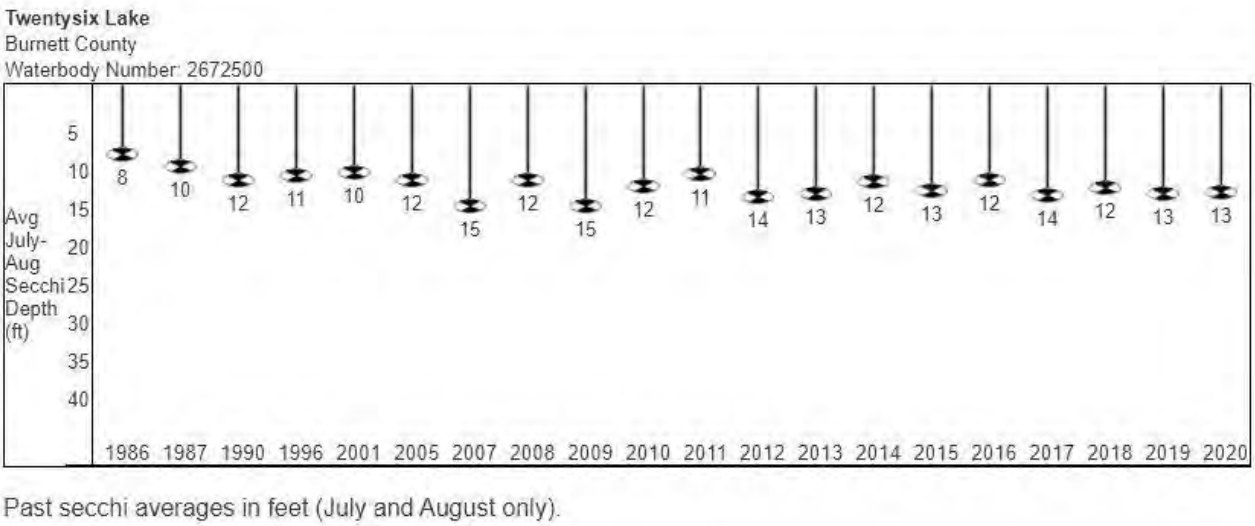


Figure 2: Lake 26 Secchi Averages

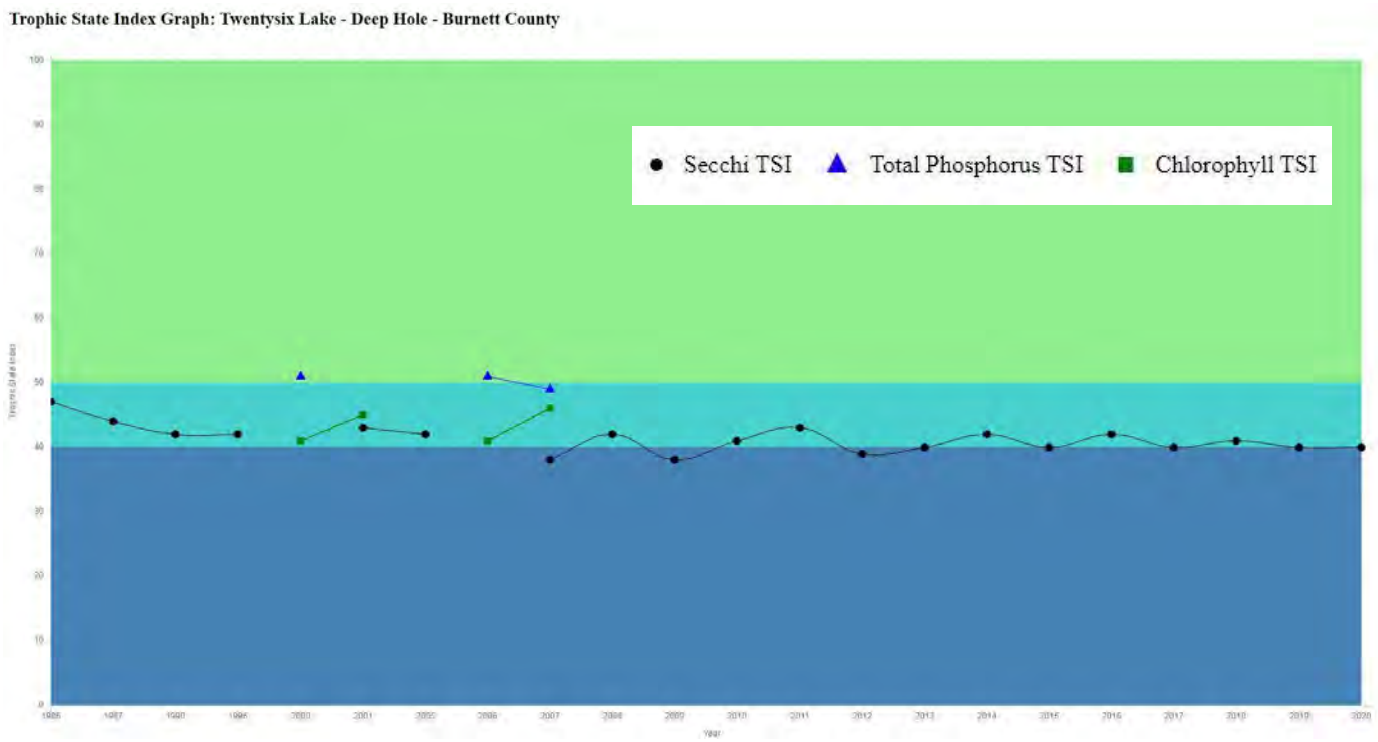


Figure 4: TSI Index Graph for Lake 26

Year	Secchi Mean	Secchi Min	Secchi Max	Secchi Count
1986	8.25	7.75	9.25	6
1987	9.78	8	11.25	8
1990	11.5	10.25	13	4
1996	11.06	9.75	14	4
2001	10.5	10.5	10.5	3
2005	11.63	10	13.5	4
2007	15.08	10	16.8	5
2008	11.6	10	15	5
2009	15	14	16	6
2010	12.38	12	13	4
2011	10.7	10.5	11	5
2012	13.75	13	14	4
2013	13.42	13	14.5	6
2014	11.75	11	13	6
2015	12.9	11	14	5
2016	11.6	11	12	5
2017	13.5	12	15	5
2018	12.5	12	13	4
2019	13.4	12.5	14	5
2020	13.2	12	14	5

Report Generated: 03/04/2021

Figure 3: Lake 26 Secchi Chart

Anglers on Lake 26 could expect to catch a variety of panfish, largemouth bass, Northern pike, and muskellunge. Other less common fish species are present, but they are not considered "targeted" species by anglers. Fish stocking on Lake 26 has been exclusively dedicated to muskellunge (Table 1). Stocking efforts began in 1974 and has continued on a regularly consistent basis since.[17]

Table 1: Lake 26 Fish Stocking Data (WDNR)

Year	Species	Strain (Stock)	Age Class	# of Fish Stocked	Average Fish Length (In.)
2019	Muskellunge	Upper Chippewa River	Large Fingerling	109	12.60
2017	Muskellunge	Upper Chippewa River	Large Fingerling	25	12.80
2015	Muskellunge	Upper Chippewa River	Large Fingerling	75	12.25
2011	Muskellunge	Upper Chippewa River	Large Fingerling	230	10.10
2009	Muskellunge	Upper Chippewa River	Large Fingerling	230	9.40
2007	Muskellunge	Upper Chippewa River	Large Fingerling	123	11.60
2005	Muskellunge	Upper Chippewa River	Large Fingerling	184	12.30
2003	Muskellunge	Unspecified	Large Fingerling	228	11.10
2001	Muskellunge	Unspecified	Large Fingerling	250	10.40
1999	Muskellunge	Unspecified	Large Fingerling	250	11.30
1997	Muskellunge	Unspecified	Large Fingerling	250	11.30
1995	Muskellunge	Unspecified	Fingerling	250	11.80
1993	Muskellunge	Unspecified	Fingerling	460	10.00
1991	Muskellunge	Unspecified	Fingerling	230	10.00
1989	Muskellunge	Unspecified	Fingerling	460	9.00
1988	Muskellunge	Unspecified	Fingerling	422	11.00
1987	Muskellunge	Unspecified	Fingerling	690	9.00
1985	Muskellunge	Unspecified	Fingerling	1,942	8.75
1984	Muskellunge	Unspecified	Fingerling	900	10.00
1982	Muskellunge	Unspecified	Fingerling	130	9.00
1980	Muskellunge	Unspecified	Fingerling	230	11.00
1979	Muskellunge	Unspecified	Fingerling	480	12.00
1977	Muskellunge	Unspecified	Fingerling	7,700	6.00
1976	Muskellunge	Unspecified	Fingerling	119	12.00
1974	Muskellunge	Unspecified	Fingerling	152	13.00

Watershed

Lake 26 resides in the Lower Yellow River Watershed (HUC 10). The Lower Yellow River Watershed encompasses a large portion of central Burnett County. The watershed is approximately 133,725 acres in size, and contains 99 miles of streams and rivers, 13,740 acres of lakes, and 23,442 acres of wetlands. The watershed is dominated by forest (55%) and wetland (17%), and is ranked low for nonpoint source issues affecting groundwater.[16]

Located in the Northwest Sands of Burnett County, the Lower Yellow River Watershed is unique. This region is a large glacial outwash system consisting of two major landforms: flat plains or terraces along glacial meltwater channels, and pitted or "collapsed" outwash plains containing kettle lakes. The soils in this watershed are deep sands that harbor little organic matter or nutrients. Historically, jack pine (*Pinus banksianus*) and scrub oak (*Quercus spp.*) forests dominated this landscape. White pine (*Pinus strobus*) and red pine (*Pinus resinosa*) also comprised a majority of the area as well. Numerous barrens occurred in the Southwest half of the ecological landscape, and a few large barrens within the Northeast half.

The current vegetation in the Lower Yellow River Watershed consists of a variety of forests, agriculture, grasslands, and some wetlands in the river valleys. Now, pine, aspens, and birch species, dominate the landscape in equal quantities. The maple-basswood, spruce-fir, and lowland hardwood forest type groups occupy small percentages of the area. Within the open lands, there is a relatively small amount of wet meadows, but their ecological significance is great. Very little row-crop agriculture is currently found in the watershed.[16]

Figure 6: Lower Yellow River Watershed

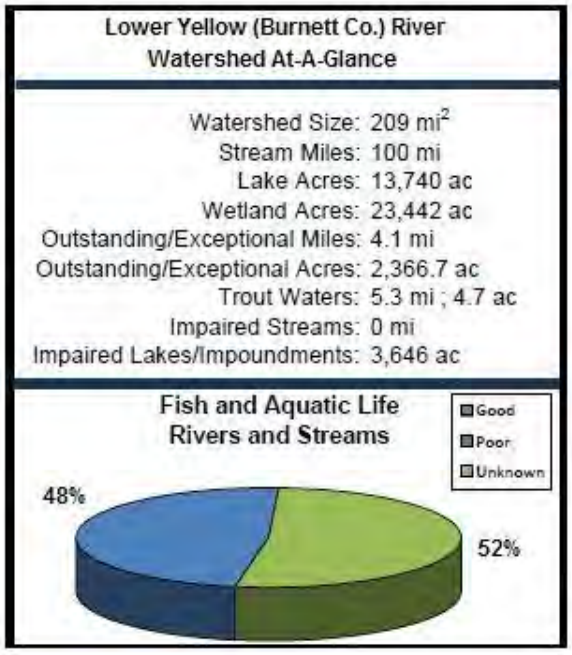


Figure 5: Lower Yellow River Watershed Characteristics

Land cover plays a critical role in a watershed. The type of land cover that exists in the watershed determines the amount of phosphorus (and sediment) that runs off the land and eventually makes its way to the lake. The actual amount of pollutants (nutrients, sediment, toxins, etc.) depends greatly on how the land within the watershed is used. Vegetated areas, such as forests, grasslands, and meadows allow the water to permeate the ground and do not produce much surface runoff. On the other hand, agricultural areas, particularly row crops, along with residential/urban areas, minimize infiltration and increase surface runoff. The increased surface runoff associated with these land cover types leads to increased phosphorus and pollutant loading; which, in turn, can lead to nuisance algal blooms, increased sedimentation, overabundant macrophyte populations, and decreased dissolved oxygen levels. Land that is maintained in a natural, vegetated state is beneficial to soil and water quality.

A 2002 State of the St. Croix River Basin (HUC 6) report[1], identified four key priorities for the basin, all of which are directly associated with water quality:

1. Protection and restoration of shoreland habitat
2. Control of nonpoint source runoff contamination of surface waters
3. Restoration of grasslands, prairies, and wetlands to protect soil and water quality, and to enhance wildlife habitat
4. Implementation of a Northwest Sands Integrated Ecosystem Management Plan

Table 2: Land Cover Classification in the St. Croix Basin

Land Cover Type	*Percentage of Coverage*
Forest	48.01%
Grassland	16.64%
Wetland	14.02%
Agriculture	12.85%
Water	4.55%
Shrubland	3.18%
Urban/Developed	0.43%
Barrens	0.32%

Aquatic Habitats

Functions and Values of Native Aquatic Plants

Naturally occurring native plants are extremely beneficial to the lake. They provide a diversity of habitats, help maintain water quality, sustain fish populations, and support common lakeshore wildlife such as loons and frogs. They are the primary producers in the aquatic food chain, converting energy from the sun into nutrients for all other organisms. Many submerged plants produce seeds and tubers which are eaten by various waterfowl and other species of animals. Submerged plants also provide excellent habitat for numerous fish species, as well as other species like snails and other aquatic macrophytes.

Water Quality

Aquatic plants can improve water quality by absorbing phosphorus, nitrogen, and other nutrients from the water that could otherwise fuel nuisance algae growth. Some plants can even filter and break down pollutants. Plant roots and underground stems help to prevent re-suspension of sediments from the lake bottom. Stands of emergent plants (whose stems protrude above the water surface) and floating plants help to blunt wave action and prevent erosion of the shoreline. The shoreline plant populations around Lake 26 are particularly important to reducing erosion along the shoreline, but these populations are also vulnerable to the nutrient loading and the resultant algae growth in the lakes.

Fishing

Habitat created by aquatic plants provides food and shelter for both young and adult fish. Invertebrates living on or beneath plants are a primary food source for many species of fish. Other fish such as bluegills graze directly on the plants themselves. Plant beds, such as bulrush present on Lake 26, provide important spawning habitat for many fish species.

Waterfowl

Plants offer food, shelter, and nesting material. Birds eat both the invertebrates that live on plants and the plants themselves. During both the June and July plant surveys, a very diverse population of bird species was observed on and around the lake.

Protection against Invasive Species

Non-native invasive species threaten native plants in Northern Wisconsin. The most common are Eurasian water milfoil (EWM) and curly leaf pondweed (CLP). These species are described as opportunistic invaders. This means that they take over openings in the lake bottom where native plants have been removed. Without competition from other plants, these invasive species may become established in the lake. This concept of opportunistic invasion can also be observed on

land in areas where bare soil is quickly taken over by weeds.

Removal of native vegetation not only diminishes the natural qualities of a lake, but it increases the risk of non-native species invasion and establishment. Invasive species can change many of the natural features of a lake and often lead to expensive annual control plans. Allowing native plants to grow may not guarantee protection against invasive plants, but it can discourage their establishment. Native vegetation may cause localized concerns to some users, but as a natural feature of lakes, they generally do not cause harm.

Aquatic Invasive Species Status

During the spring and summer surveys of 2020, no curly leaf pondweed or Eurasian water milfoil was found on Lake 26. Curly leaf pondweed is located in some Burnett County Lakes such as Middle and Big McKenzie, Burlingame Lake, the Minerva chain, and many others. Eurasian water milfoil is found in a few Burnett County Lakes of which the closest to Lake 26 is Ham Lake. Eurasian water milfoil is also found in some Washburn County Lakes such as Lake Nancy and Horseshoe Lake. The TSLPOA will continue to monitor for these species.

Currently, Chinese mystery snails are the only AIS found on Lake 26.

The TSLPOA is also concerned with the recent discovery of zebra mussels (ZM) in Big and Middle McKenzie Lakes. These two lakes border Burnett and Washburn Counties, and both County departments are taking a serious effort to contain the spread. Other organizations/agencies involved in this effort are the National Park Service, U.S. Fish and Wildlife Service, Wisconsin Department of Natural Resources, St. Croix River Association, and the St. Croix Tribe. In 2020, ZM veliger tows were conducted on Lake 26, and results were negative. There is no evidence of zebra mussels in Lake 26.

Rare and Endangered Species Habitat

In addition to sensitive areas designated to aquatic plants, the Natural Heritage Inventory has developed a list of species for the Townships of Jackson and Scott that are listed as being endangered, threatened or of special interest (Tables 3). These species may reside in, or near Lake 26.[10]

Table 3: NHI Data for Township 41N – Range 15W

Scientific Name	Common Name	WI Status	Group
Alasmidonta marginata	Elktoe	SC/P	Mussel
Atrytonopsis hianna	Dusted Skipper	SC/N	Butterfly
Bird Rookery	Bird Rookery	SC	Other
Buteo lineatus	Red-shouldered Hawk	THR	Bird
Cyclonaias tuberculata	Purple Wartyback	END	Mussel
Eleocharis robbinsii	Robbins' Spike-rush	SC	Plant
Emydoidea blandingii	Blanding's Turtle	SC/P	Turtle
Erynnis martialis	Mottled Dusky Wing	SC/N	Butterfly
Glaucomys sabrinus	Northern Flying Squirrel	SC/P	Mammal
Lycaeides melissa samuelis	Karner Blue	SC/FL	Butterfly
Notropis anogenus	Pugnose Shiner	THR	Fish
Oeneis chryxus	Chryxus Arctic	SC/N	Butterfly
Ophiogomphus anomalus	Extra-striped Snaketail	END	Dragonfly
Oporornis agilis	Connecticut Warbler	SC/M	Bird
Percina evides	Gilt Darter	THR	Fish
Potamogeton oakesianus	Oakes' Pondweed	SC	Plant
Potamogeton pulcher	Spotted Pondweed	END	Plant

WDNR and federal regulations regarding special concern species range have a wide range of protection priority. The current categories, and their associated level of protection are the following:

END = Endangered
THR = Threatened
SC = Special Concern
SC/FL = Federally protected
SC/M = Fully protected by federal and state laws under the Migratory Bird Act
SC/P = Fully protected
SC/N = No laws regulating use, possession, or harvesting
SC/H = Take regulated by establishment of open/closed seasons

Methods

Using a standard formula that takes into account the shoreline shape and distance, islands, water clarity, depth and total lake acres, Michelle Nault (WDNR) generated a point intercept sampling grid for Lake 26 (Figure 7). In June of 2020, BCLSD conducted invasive species surveys. During this survey, BCLSD went to each of the 671 points on Lake 26. Appropriate points were sampled for Curly-leaf pondweed and Eurasian water milfoil, as well as any other invasive species that might appear. This type of survey should result in both early detection and mapping of any infestation that may have occurred. During the June survey, we did not discover any Curly-leaf pondweed, or other invasive species within the littoral zone.

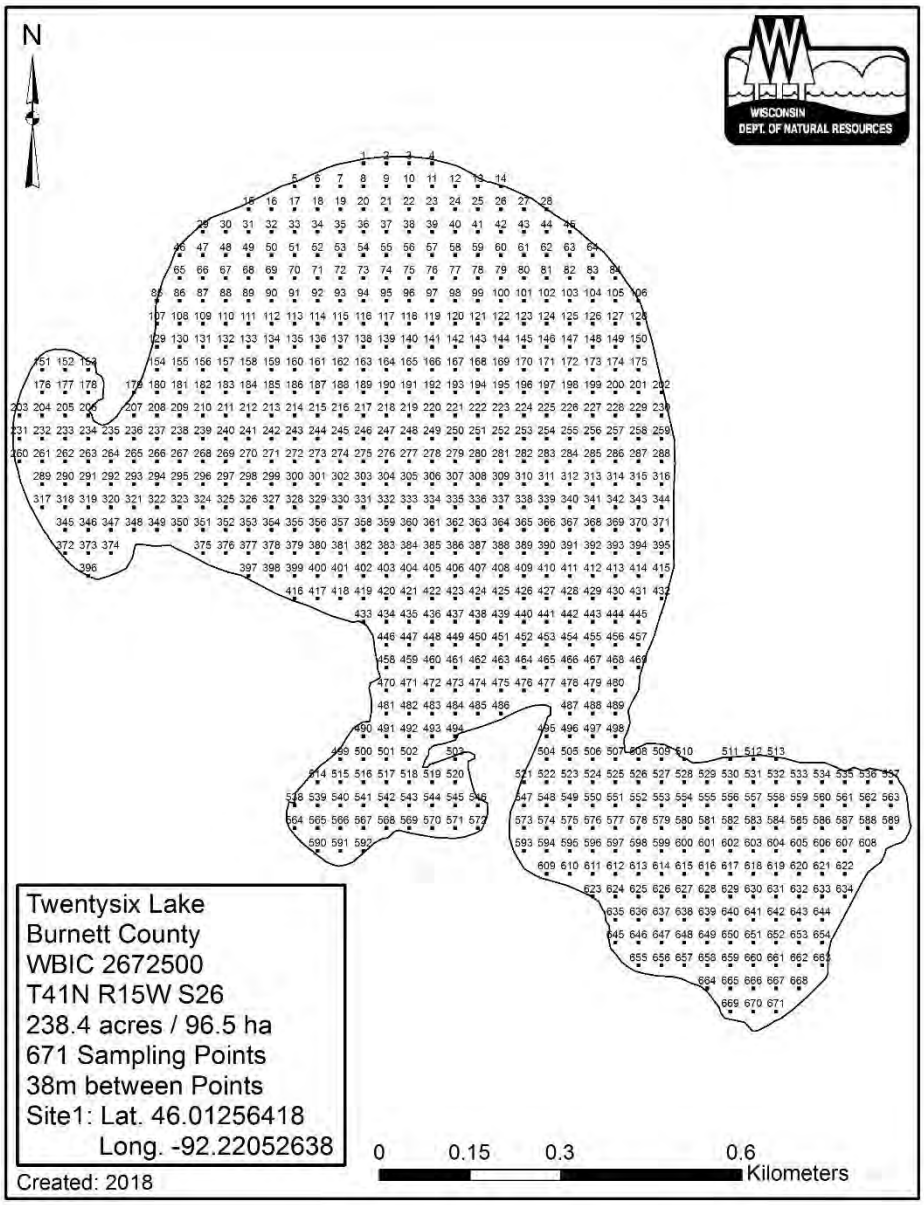


Figure 7: Lake 26 PI Sampling Grid

During the June survey, a general idea for the lake and plant communities was established in preparation for the July survey. During the July survey, all plants found were identified, and two vouchers of each species were pressed and retained for herbarium specimens – one to be retained by either BCLSD or TSLPOA, and one to be sent to the state for identification confirmation. During the point intercept survey, we located each survey point using a handheld mapping GPS unit (*Garmin* 76CSx). At each point, we recorded a depth reading with a *Hummingbird* depth finder unit. The entire lake was considered to be a littoral zone after plants were discovered at the deepest point in Lake 26. At all sampling points, we used a rake (either on a pole or a throw line depending on depth) to sample an approximately 2.5 foot section of the bottom. All plants on the rake, as well as any that were dislodged by the rake were identified, and assigned a rake fullness value of 1-3 as an estimation of abundance.[9]

- **Rake fullness 1** – there are not enough plants to cover the length of the rake in a single layer.
- **Rake fullness 2** – there are enough plants to cover the length of the rake in a single layer, but the tines are not covered.
- **Rake fullness 3** – the rake is completely covered with plants, and the tines are not visible.

We also recorded visual sightings of plants within six feet of the sample point. Substrate type was assigned at each site where the bottom was visible or it could be reliably determined using the rake. The substrate is defined as either being sand, muck or rock.

Data Analysis

We entered all data collected into the standard UW-Extension APM spreadsheet. From this, we calculated the following:

Total number of points sampled: This included the total number of points on the lake that were within the littoral zone (0-maximum depth where plants are found). Since the entire lake was considered the littoral zone, nearly all points on Lake 26 were sampled.

Total number of sites with vegetation: These included all sites where we found vegetation after doing a rake sample. For example, if 20% of all sample sites have vegetation, it suggests that 20% of the lake has plant coverage.

Total number of sites shallower than the maximum depth of plants: This is the number of sites that are in the littoral zone. Because not all sites that are within the littoral zone actually have vegetation, we use this value to estimate how prevalent vegetation is throughout the littoral zone. For example, if 60% of the sites shallower than the maximum depth of plants have vegetation, then we estimate that 60% of the lake's littoral zone has plants.

Frequency of occurrence: The frequency of all plants (or individual species) is generally reported as a percentage of occurrences at all sample points. It can also be reported as a percentage of occurrences at sample points within the littoral zone.

Frequency of occurrence example:
Plant A is sampled at 70 out of 700 total points = 70/700 = 0.10 = 10%
This means that plant A's frequency of occurrence = 10% considering the entire lake sample.

Plant A is sampled at 70 out of 350 total points in the littoral zone = 70/350 = 0.20 = 20%
This means that plant A's frequency of occurrence = 0.20% when only considering the littoral zone.

From these frequencies, we can estimate how common each species was at depths where plants were able to grow. Note the second value will be greater as not all the points (in this example only ½) occur at depths shallow enough for plant growth.

Simpson's diversity index: A diversity index allows the entire plant community at one location to be compared to the entire plant community at another location. It also allows the plant community at a single location to be compared over time thus allowing a measure of community degradation or restoration at that site. With Simpson's diversity index, the index value represents the probability that two individuals (randomly selected) will be different species. The index values range from 0 -1 where 0 indicates that all the plants sampled are the same species, to 1 where none of the plants sampled are the same species. The greater the index value, the higher the diversity in a given location. Although many natural variables like lake size, depth, dissolved minerals, water clarity, mean temperature, etc. can affect diversity, in general, a more diverse lake indicates a healthier ecosystem. Perhaps most importantly, plant communities with high diversity also tend to be **more resistant** to invasion by exotic species.

Maximum depth of plants: This indicates the deepest point that vegetation was sampled. In clear lakes, plants may be found at depths of over 20 feet, while in stained or turbid locations, they may only be found in a few feet of water. While some species can tolerate very low light conditions, others are only found near the surface. In general, the diversity of the plant community decreases with increased depth.

Number of sites sampled using rope/pole rake: This indicates which rake type was used to take a sample. Protocol suggests a 15 foot pole rake, and a 25 foot rope rake for sampling.

Average number of species per site: This value is reported using four different considerations.

1. *Shallower than maximum depth of plants* indicates the average number of plant species at all sites in the littoral zone.
2. *Vegetative sites only* indicate the average number of species where plants were found.
3. *Native species shallower than maximum depth of plants* and
4. *Native species at vegetative sites only* excludes exotic species from consideration.

Species richness: This value indicates the number of different plant species found in and directly adjacent to (on the waterline) the lake.

Mean and median depth of plants: The mean depth of plants indicates the average depth in the water column where plants were sampled. Because a few samples in deep water can skew this data, median depth is also calculated. This tells us that half of the plants sampled were in water shallower than this value, and half were in water deeper than this value.

Relative frequency: This value shows a species' frequency relative to all other species. It is expressed as a percentage, and the total of all species' relative frequency will add up to 100%. Organizing species from highest to lowest relative frequency value gives us an idea of which species are most important within the macrophyte community.

Relative Frequency Example:
Suppose that 100 points were sampled, and 4 species of plants were found with the following results:

Plant A was found at 70 sites. Its frequency of occurrence is thus 70/100 = 70%
Plant B was found at 50 sites. Its frequency of occurrence is thus 50/100 = 50%
Plant C was found at 20 sites. Its frequency of occurrence is thus 20/100 = 20%
Plant D was found at 10 sites. Its frequency of occurrence is thus 10/100 = 10%

To calculate an individual species' relative frequency, divide the number of sites a plant is sampled at by the total number of times all plants were sampled. In our example, this would be 150 samples (70+50+20+10).

Plant A = 70/150 = 0.4667 = 46.67%
Plant B = 50/150 = 0.3333 = 33.33%
Plant C = 20/150 = 0.1333 = 13.33%
Plant D = 10/150 = 0.0667 = 6.67%

This tells us that 46.67% of all plants sampled were plant A.

Floristic Quality Index (FQI): This index measures the impact of human development on a lake's aquatic plants. Species in the index are assigned a Coefficient of Conservatism (C) which ranges from 0-10. The higher the value assigned, the more likely the plant is to be negatively impacted by human activities relating to water quality or habitat modifications. Plants with low values are tolerant of human habitat modifications, and often exploit these changes to the point where they may crowd out other species. The FQI is calculated by averaging the conservatism value for each species found in the lake. Consequently, a higher index value indicates a healthier macrophyte community. Nichols (1999) identified four eco-regions in Wisconsin: Northern Lakes and Forests, Northern Central Hardwood Forests, Driftless Area and Southeastern Wisconsin Till Plain. It is recommended to make comparisons of lakes within ecoregions to determine the target lake's relative diversity and health.[11]

Aquatic Plant Survey Results for Lake 26

A complete aquatic plant (macrophyte) survey was completed for Lake 26 in 2020. Prior to the whole lake monitoring, an invasive species survey was conducted to confirm the presence or absence of any invasive species. The species of high concern was curly leaf pondweed (CLP). Since CLP grows earlier than native species, it typically dies in early July; therefore, an invasive plant survey is done in early June while this plant is still robust. The results of the invasive plant survey and the point intercept complete macrophyte survey are discussed in this section.

Invasive Species Survey:
Invasive species surveys consists of sampling all points on a sampling grid provided by the WDNR. Lake 26's point intercept sampling grid can be viewed in Figure 7. Aquatic plants surveyed are determined to be either "native" or "invasive" and are not identified to species level.

Complete Macrophyte Survey:
A complete aquatic plant (macrophyte) survey utilizes the same point intercept sampling grid as the invasive species survey. However, at each point every plant is identified down to species level. This survey goes beyond determining whether what is examined is a "native" or "invasive" species.

Using a standard formula based on a lake's shoreline shape and distance, islands, water clarity, depth, and size in acres, the Wisconsin Department of Natural Resources (WDNR) generated the point intercept sampling grid of 671 points for Lake 26. Figure 7 shows the locations of these sampling points.

Lake 26 is in the Northern Lakes and Forests Ecoregion. Within this region, the mean FQI ranges

from 20-28, depending on several factors, such as size of the lake and canopy cover. A total of 34 species were identified on the lake, and all have been assigned Floristic Qualities. The FQI for Lake 26 is 34.47 and the data shows a Mean C value of 5.91 (Table 4 below). This data suggests that plants found in Lake 26 are less tolerant to disturbances.

As mentioned before, the Lake 26 survey grid is comprised of 671 points of which 659 (98%) sites were visited. Some points may have been too shallow, too deep, or inaccessible due to boat traffic or other factors. Of these sampled points, plants were found at 174 sites. Areas that were shallow and had a mucky substrate supported more plants than those with sandy or rocky bottoms. A substrate map of Lake 26 can be found in **Appendix A:** Aquatic Plant Maps. Plants were found growing on approximately 26% of the entire lake bottom. The littoral zone (area of plant growth) was found to be approximately 15 feet.

Diversity was very high with a Simpson Diversity Index value of 0.91. Species richness was also high with 34 total species found growing in and immediately adjacent to the lake. Even though there were 34 species of aquatic macrophytes located on the lake, the majority were found growing in shallower water. These zones of plant growth are extremely important in helping to control algal growth and they support diverse plant beds that provide important underwater habitat. Tables 4, 5 and 6 summarize the data from the completed survey.

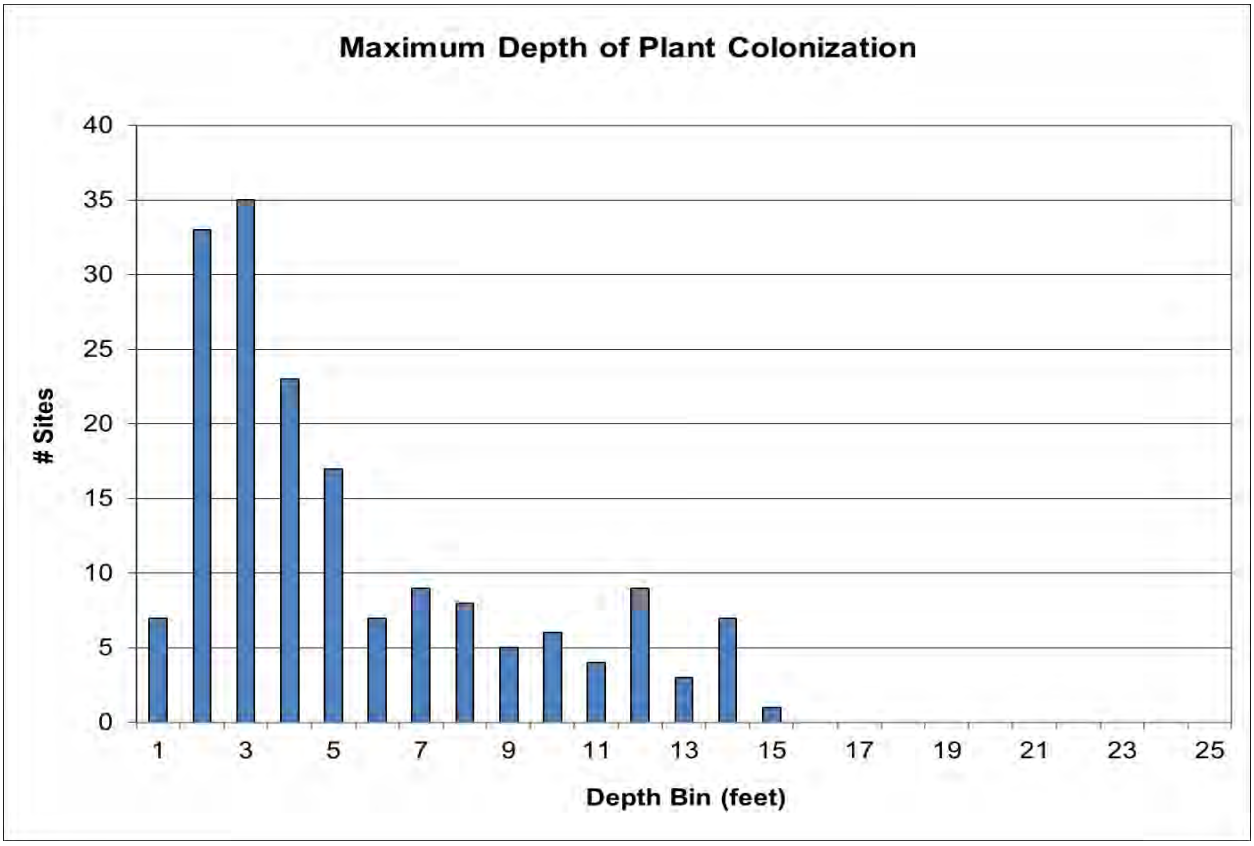


Figure 8: Maximum Depth of Plant Colonization on Lake 26

Table 4: Lake 26 FQI Species and Conservatism Values

Species	*Common Name*	*C-Value*
Bidens beckii	Water Marigold	8
Brasenia schreberi	Watershield	6
Ceratophyllum demersum	Coontail	3
Chara spp.	Muskgrass	7
Eleocharis acicularis	Needle Spikerush	5
Eleocharis palustris	Creeping Spikerush	6
Elodea canadensis	Common Waterweed	3
Eriocaulon aquaticum	Pipewort	9
Heteranthia dubia	Water Star-Grass	6
Isoetes echinospora	Spiny-Spored Quillwort	8
Lemna turionifera	Turion Duckweed	4
Lemna trisulca	Forked Duckweed	6
Myriophyllum sibiricum	Northern Water-Milfoil	6
Myriophyllum tenellum	Dwarf Water-Milfoil	10
Najas flexilis	Slender Naiad	6
Nitella spp.	Nitella	7
Nuphar variegata	Bullhead Pond Lily	6
Nymphaea odorata	White Water Lily	6
Phragmites australis	Common Reed	1
Persicaria amphibia	Water Smartweed	5
Pontederia cordata	Pickerelweed	8
Potamogeton amplifolius	Large-Leaf Pondweed	7
Potamogeton gramineus	Variable Pondweed	7
Potamogeton natans	Floating-Leaf Pondweed	5
Potamogeton richardsonii	Clasping-Leaf Pondweed	5
Potamogeton robbinsii	Fern Pondweed	8
Potamogeton strictifolius	Stiff Pondweed	8
Potamogeton zosteriformis	Flat-Stem Pondweed	6
Sagittaria spp.	Arrowhead	3
Schoenoplectus acutus	Hardstem Bulrush	6
Schoenoplectus pungens	Three-Square Bulrush	5
Sparganium emersum	Short-Stemmed Bur-Reed	8
Typha latifolia	Broad-Leaved Cattail	1
Vallisneria americana	Water Celery	6

Table 5: Frequencies and Mean Rake Sample of Aquatic Macrophytes in Lake 26

Scientific Name	Common Name	Frequency of Occurrence Within Vegetated Areas (%)	Frequency of Occurrence Within the Littoral Zone (%)	Relative Frequency (%)	Total Sites	Mean Rake Fullness
Bidens beckii	Water Marigold	2.30	1.66	1.0	4	1.00
Brasenia schreberi	Watershield	0.57	0.41	0.2	9	3.00
Ceratophyllum demersum	Coontail	10.34	7.47	4.5	18	1.67
Chara spp.	Muskgrass	17.24	12.45	7.4	35	1.23
Eleocharis acicularis	Needle Spikerush	4.60	3.32	2.0	35	1.00
Eleocharis palustris	Creeping Spikerush	Visual	Visual	Visual	5	Visual
Elodea canadensis	Common Waterweed	9.77	7.05	4.2	17	1.29
Eriocaulon aquaticum	Pipewort	Visual	Visual	Visual	7	Visual
Heteranthia dubia	Water Stargrass	1.72	1.24	0.7	7	1.00
Isoetes echinospora	Spiny-Spored Quillwort	1.15	0.83	0.5	14	1.00
Lemna turionifera	Turion Duckweed	Visual	Visual	Visual	1	Visual
Myriophyllum sibiricum	Northern Water-Milfoil	16.09	11.62	6.9	39	1.46
Myriophyllum tenellum	Dwarf Water-Milfoil	10.92	7.88	4.7	32	1.05
Najas flexilis	Slender Naiad	48.85	35.27	21.0	94	1.52
Nitella spp.	Nitella	Visual	Visual	Visual	1	Visual
Nuphar variegata	Bullhead Pond Lily	Visual	Visual	Visual	9	Visual
Nymphaea odorata	White Water Lily	Visual	Visual	Visual	14	Visual
Phragmites australis	Common Reed (Native)	Visual	Visual	Visual	1	Visual
Polygonum amphibium	Water Smartweed	0.57	0.41	0.2	2.	1.00
Pontederia cordata	Pickerelweed	0.57	0.41	0.2	18	3.00
Potamogeton amplifolius	Large-Leaf Pondweed	12.64	9.13	5.4	35	1.23
Potamogeton gramineus	Variable-Leaf Pondweed	19.54	14.11	8.4	63	1.24
Potamogeton natans	Floating-Leaf Pondweed	Visual	Visual	Visual	6	Visual

Scientific Name	Common Name	Frequency of Occurrence Within Vegetated Areas (%)	Frequency of Occurrence Within the Littoral Zone (%)	Relative Frequency (%)	Total Sites	Mean Rake Fullness
Potamogeton richardsonii	Clasping-Leaf Pondweed	5.75	4.15	2.5	12	1.20
Potamogeton robbinsii	Fern Pondweed	17.24	12.45	7.4	32	1.77
Potamogeton strictifolius	Stiff Pondweed	16.09	11.62	6.9	31	1.61
Potamogeton zosteriformis	Flat-Stem Pondweed	14.37	10.37	6.2	31	1.44
Sagittaria cristata	Crested Arrowhead	0.57	0.41	0.2	13	2.00
Schoenoplectus acutus	Hardstem Bulrush	0.57	0.41	0.2	10	1.00
Schoenoplectus pungens	Three-Square Bulrush	2.30	1.66	1.0	19	1.75
Sparganium spp.	Bur-Reed	Visual	Visual	Visual	1	Visual
Typha latifolia	Broad-Leaf Cattail	Visual	Visual	Visual	2	Visual
Vallisneria americana	Water Celery	18.39	13.28	7.9	36	1.13
Cladium mariscoides	Smooth Sawgrass	Visual	Visual	Visual	1	Visual

Table 6: Aquatic Plant Survey Summary Statistics

Summary Statistics	
Total number of sites visited	659
Total number of sites with vegetation	174
Total number of sites shallower than the maximum depth of plants	241
Frequency of occurrence at sites shallower than the maximum depth of plants	72.20
Simpson Diversity Index	0.91
Maximum depth of plants (ft.)	15.00
Median depth of plants (ft.)	5.36
Number of sites sampled using rake on Rope (R)	166
Number of sites sampled using rake on Pole (P)	61
Average number of all species per site (shallower than max depth)	1.68
Average number of all species per site (vegetated sites only)	2.32
Species richness	23
Species richness (including visuals)	34

The following plant species were the most frequently observed on the lake: Slender naiad (*Najas flexilis*), variable-leaf pondweed (*Potamogeton gramineus*), water celery (*Vallisneria americana*), fern pondweed (*Potamogeton robbinsii*), and Muskgrass (*Chara spp.*). The five species were found at 48.85%, 19.54%, 18.39%, 17.24%, and 17.24% of the survey points with vegetation respectively (Table 5). Each of the five species were widely distributed throughout the lake over muck and sandy bottoms.

During the June and July surveys, no invasive aquatic plants were detected. Members of the lake association will be trained through the Citizen Lake Monitoring Network (CLMN) to identify AIS, and will monitor the lake for invasive species. This training can be provided through BCLSD. Chinese Mystery snails were found during the July survey, and continue to be the only AIS present on Lake 26. Some of the riparian land owners have been collecting the snails and disposing of them.

Burnett County Land Services Department (BCLSD)

Burnett County will assist the TSLPOA in management and prevention of aquatic invasive species (AIS). They have individuals available to assist with the following tasks:

- Conduct watercraft inspection at public access points.
- Complete in-lake monitoring for EWM, CLP, ZM, and other invasive species.
- Carry out public outreach and education events related to invasive species including lake meetings, fishing tournaments, county fairs, and local festivals.
- Train local lake residents and others to monitor their own boat landings as part of the WDNR Clean Boats, Clean Waters (CBCW) program.
- Train lake residents and others in Citizen Lake Monitoring, which includes, secchi disk readings, water chemistry data, and AIS identification.
- Assist in rapid response actions to identify and respond to new AIS infestations reported by the public.

In-lake monitoring focuses on searching for potential establishment of Eurasian water milfoil, curly leaf pondweed, starry stonewort, and other aquatic invasive species using point intercept surveys or early detection protocols. Grab samples are taken at boat landings and other areas with high public use.

Workshops and trainings include CBCW training, plant identification, and citizen lake monitoring (CLMN) workshops. Staff generally travels to local lakes to encourage participation and provide more focused training.

The Rapid Response Plans will involve a team of resource professionals from various agencies who can directly assist the lake organization in managing newly discovered invasive species and develop a plan to restore the native plant and animal community. This Rapid Response team will assist with identifying any suspect AIS.

Below is a list of BCLSD recommendations that should be considered to ensure the well-being of Lake 26:

- Preserve and maintain the native plant community in and around Lake 26
- Continue to educate lakeshore owners and boaters about the importance of aquatic plants, and the negative impacts AIS can have on the entire lake ecosystem
- Preserve the lake's many rush/reed beds
- Whenever possible, refrain from removing native plants from the lake
- Reduce and, wherever possible, eliminate fertilizer and pesticide applications near the lakeshore

- Encourage shoreline restoration, and establish native vegetation buffer strips along the lakeshore
- Consider monitoring for aquatic invasive species at and near the boat landing at least once a month during the summer months
- Conduct Clean Boats, Clean Water (CBCW) inspections and continue working on an Aquatic Invasive Species program
- Conduct Citizen Lake Monitoring for aquatic invasive species from May through October
- Explore WI DNR Healthy Lakes cost share grants for the implementation of shoreline management practices. www.healthylakeswi.com

Lake 26 APM Goals

Prevent the introduction and spread of aquatic invasive species (AIS).

Objectives:

1. 100% of boaters inspect, clean, drain, and decontaminate boats, trailers, and equipment.
2. 100% enforcement of Burnett County's AIS ordinance.
3. Maintain the current Clean Boats, Clean Waters (CBCW) program.
4. Use the point intercept survey method every 2 years, as funds are available.

Actions:

- Maintain the permanent decontamination station at the Lake 26 landing.
- Apply for Clean Boats, Clean Waters grants.
- Work with the Burnett County Sheriff's Department to encourage increased enforcement of the AIS ordinance.
- Develop a rapid response plan for Eurasian water milfoil, zebra mussels, and other threatening AIS.
- Continue using the Citizen Lakes Monitoring Network (CLMN) to monitor the lake on a yearly basis.
- Consider hiring a consultant to monitor the lake for AIS every 2 years, as funds are available.
- Plan ahead for fishing tournaments, and have CBCW personnel present. Tournaments can be found on the WDNR website (20 boats or more), and local club websites. Tournament organizers should be contacted ahead of time to ensure peaceful CBCW inspections.

Maintain and improve water quality conditions.

Objectives:

1. Delegate an individual (currently Dave Luka) to continue to record secchi disk readings, and other water quality measurements when possible.
2. Encourage lake residents to restore and preserve natural shoreline buffers.
3. Reduce phosphorous and sediment loads from the immediate watershed.
4. Encourage landowners to adopt and implement storm water runoff controls for existing structures and all new constructions.

Actions:

- The water quality committee will summarize educational material collected from the WDNR, UW-Extension, and BCLSD sources for the creation of informative materials.
- The water quality committee will disperse materials to stakeholders.
- Lake 26 residents will be informed about the Shoreline Incentive Program. SIP Program Link
- Continue to monitor water quality through the Citizens Lakes Monitoring Network (CLMN), and enter all data into the Surface Water Integrated Monitoring System (SWIMS).
- Use best management practices to reduce phosphorous and sediment loads from the immediate watershed.
- Educate and assist Lake 26 residents in restoration and preservation of shoreline buffers and shoreland vegetation. Continue implementation of shoreline owner's education program.
- Educate Lake 26 users of the importance of the watercraft wake regulations.

Messages:

1. Shoreline buffers protect water quality and provide fish and wildlife habitat. Describe ways to restore shoreline buffers (natural recovery, stop mowing, discourage use of lawn fertilizers containing excess nitrogen and phosphorous, use appropriate fertilizers, plant natives, etc.).
2. Cost sharing for restoration of shoreline buffers from Burnett County's Shoreline Incentive Program. SIP Cost Sharing Link
3. Describe the Burnett County shoreline buffer requirements and how to report shoreline violations. Burnett County Ordinances Link
4. Highlight good examples of shoreline buffers on private waterfront property.
5. Explore the WDNR Healthy Lakes cost share grants for the implementation of shoreline management practices. https://healthylakeswi.com/

Maintain the diverse populations of native aquatic plants.

Objectives:

1. Enforce slow-no-wake regulations.
2. Prevent removal of native plants using herbicides.
3. Implement strict adherence with treatment standards and monitoring methods prior to and following herbicide treatment if one is warranted.
4. Inform Lake 26 residents the importance of aquatic plants and their impacts on them.

Discussion: The plant community in Lake 26 is very diverse and extensive. It is important to understand the role these plants play in the ecosystem. Aquatic plants in the lake provide habitat for diverse fish, macroinvertebrate, and microorganism populations. They also provide protection from shoreline erosion. Removing native plants could have adverse effects in the lake ecosystem, and is not recommended. Healthy native plant populations prevent colonization of invasive species, and also help absorb excess nutrients from runoff. Boating can remove native plants near shorelines if boater etiquette isn't followed. Boat motors may also stir up sediment which can release nutrients into the water column which promotes plant and algae growth.

Actions:

- Instead of herbicides, alternative methods for removing native plants (if warranted) should be considered (ex: hand removal).
- Conduct a point intercept survey of the lake every 2-3 years, or as needed.
- Update the APM every 5-10 years, or as needed.
- Inform Lake 26 residents when these updates to the APM are completed.
- Educate Lake Members on how to conduct lake monitoring procedures.

Educate the Lake 26 community and users regarding aquatic plant management, management strategies found in the plan, and appropriate plant management actions.

Audience: (Lake 26 Community):

A. All Lake 26 residents
B. Business owners
C. Lake users
D. State representatives, WDNR, Burnett County associates
E. Fishing clubs and associations

Messages:

1. Summary of APM plan, notice of public meeting, and how to obtain the full APM plan.
2. Contact list for APM committee members.
3. Native aquatic plant values.
4. Limit impacts to native aquatic plants by traveling with no wake in shallow areas.

5. Using hand removal methods near docks and swimming areas, and discourage herbicide use both in and out of the water.
6. Identification of curly leaf pondweed, Eurasian water milfoil, purple loosestrife, yellow iris, zebra mussels, and any other threatening AIS.
7. Native plant identification.
8. Inspect, clean, drain, and dry equipment.
9. All lake users have a legal responsibility to utilize the provided decontamination stations to decontaminate boats and equipment when entering or leaving Lake 26.
10. Many counties have AIS ordinances, and the state has laws to help prevent the spread of AIS as well.
11. Postcard to the above audiences: the APM conclusions, TSLPOA stewardship in dollars, paid landing staff, volunteer stakeholder hours, APM and AIS implementation.
12. Use all materials and brochures created by the WDNR, BCLRA, and BCLSD in newsletters, articles, website information, and boat landing handouts.
13. Encourage strong cooperation among fishing groups to follow the Burnett County decontamination ordinance, and set strong examples to other lake users.

Methods:

- Summary of APM plan
- AIS education workshops for all lake users
- Improvements to signage at boat landing
- AIS handouts
- Mailings and/or handouts to lake residents
- Clean Boats, Clean Waters monitoring and education
- Annual meeting/special meetings
- Door-to-door distribution of information

Method	***Audience***	***Message***
Summary of APM	A-D	1, 2
AIS Workshops	A, B, C, E	3, 6-10
Signage	A-C	9-10
AIS Handouts	A, B, C, E	3-10
Mailings	A-B	1-13
Clean Boats, Clean Waters	C	6-10, 13
Annual and Special meetings	A	1-13
Social Media/Website	A-E	3-10, 12

Rapid Response for Early Detection of AIS

1. If there is a suspect AIS plant or animal specimen, the Lake 26 community will be directed to contact the Burnett County AIS Coordinator, currently Thomas Boisvert by phone: (715)-349-2109 Ext. 2613. Signs at the public boat landing, webpages, and newsletter articles will provide instructions and contact information.

2. The location of the suspected AIS should immediately be marked with GPS coordinates and a small float. Photos should be taken of the infestation, and several specimens should be obtained to send to the Burnett County AIS Coordinator and the WDNR.

3. When the suspected AIS specimens have been obtained, the Burnett County AIS Coordinator will identify the species in coordination with the WDNR within 36 hours. All specimens will be verified by two WDNR approved personnel.

4. If identification is positive, the BCLSD and the WDNR will inform the TSLPOA (TSLPOA) president, and the APM committee. The lake association will then inform the person who reported the species, users of the lake, and all Lake 26 residents.

5. A notice will be posted at the public boat landing of any new AIS, and inform users of Lake 26 where the AIS is located, and what precautions need to be taken to prevent the spread of said species.

6. TSLPOA will contact the BCLSD and the WDNR to seek assistance with managing the new AIS infestation.

7. TSLPOA will hire a consultant (if needed) to determine the extent of the AIS infestation.

8. If the AIS identified is a plant, removal should be done using hand removal methods only (as long as viable). Special care should be taken to collect all plant fragments during harvesting.

9. Select a control plan for the AIS in cooperation with the BCLSD and the WDNR.

10. Implement the selected control plan including applying for the necessary permits. Regardless of the control plan selected, it will be implemented by persons who are qualified and experienced in the technique(s) selected.

11. The TSLPOA President, and APM committee will work with the WDNR to confirm, as soon as possible, a start date for an early detection and rapid response AIS control grant. Thereafter, the TSLPOA will formally apply for the grant.

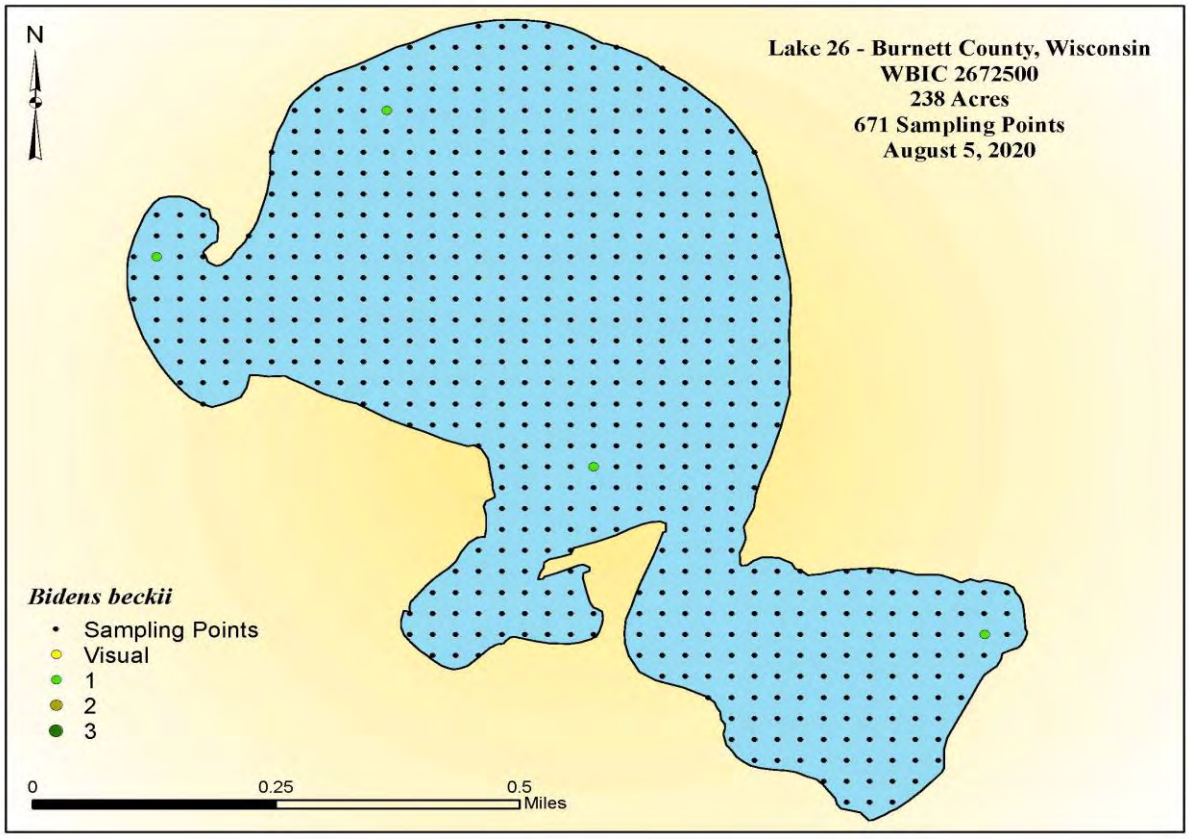
12. The TSLPOA board has the responsibility to raise funds to match the grant. TSLPOA may develop a rapid response contingency fund with special donations. TSLPOA funds may be used to pay for any reasonable expense incurred in implementing the selected control plan.

13. Frequently inspect the original area of where the infestation of AIS first occurred, and monitor other areas on Lake 26 for possible spread. Hire a consultant for additional monitoring.

Implementation Plan:

Action Items	Timeline	2021	2022	2023	2024	2025	Responsible Parties
Prevent AIS Introduction							
Maintain decontamination Station	Ongoing	✓	✓	✓	✓	✓	TSLPOA
Maintain ILIDS Camera	Ongoing	✓	✓	✓	✓	✓	TSLPOA
Train members to conduct CBCW	As needed	$0	$0	$0	$0	$0	TSLPOA, BCLSD
Apply for CBCW grants	Ongoing	$0	$0	$0	$0	$0	TSLPOA
Increase the enforcement of BC Do Not Transport Ordinance	Ongoing	N/A	N/A	N/A	N/A	N/A	TSLPOA, BCLSD, BC Sheriff's Dept.
Train members to conduct CLMN	As needed	$0	$0	$0	$0	$0	TSLPOA, BCLSD
Hire a consultant to monitor the lake for AIS	Mid May–Mid June	X	X	$1,350.00	X	X	TSLPOA, BCLSD
Water Quality							
Water Chemistry and Secchi Sampling	Ongoing	$0	$0	$0	$0	$0	TSLPOA
Reduce phosphorus and sediment loads from immediate watershed	Ongoing	N/A	N/A	N/A	N/A	N/A	TSL Residents
Assist Lake 26 community members in the restoration and preservation of shoreland buffers and shoreland vegetation	Ongoing	N/A	N/A	N/A	N/A	N/A	TSLPOA, BCLSD
Native Plant Community							
Hire a consultant to monitor for AIS	5-10 years	N/A	N/A	N/A	N/A	$1,350.00	TSLPOA, BCLSD
Update the aquatic plant management plan	5-10 years	N/A	N/A	N/A	N/A	$3,750.00	TSLPOA, BCLSD
Educate Lake 26 Community							
AIS Workshops	Ongoing	$0	$0	$0	$0	$0	BCLSD, TSLPOA
Educational Materials	Ongoing	✓	✓	✓	✓	✓	TSLPOA
Lake 26 Website Maintenance	Ongoing	✓	✓	✓	✓	✓	TSLPOA

APPENDIX A: AQUATIC PLANT MAPS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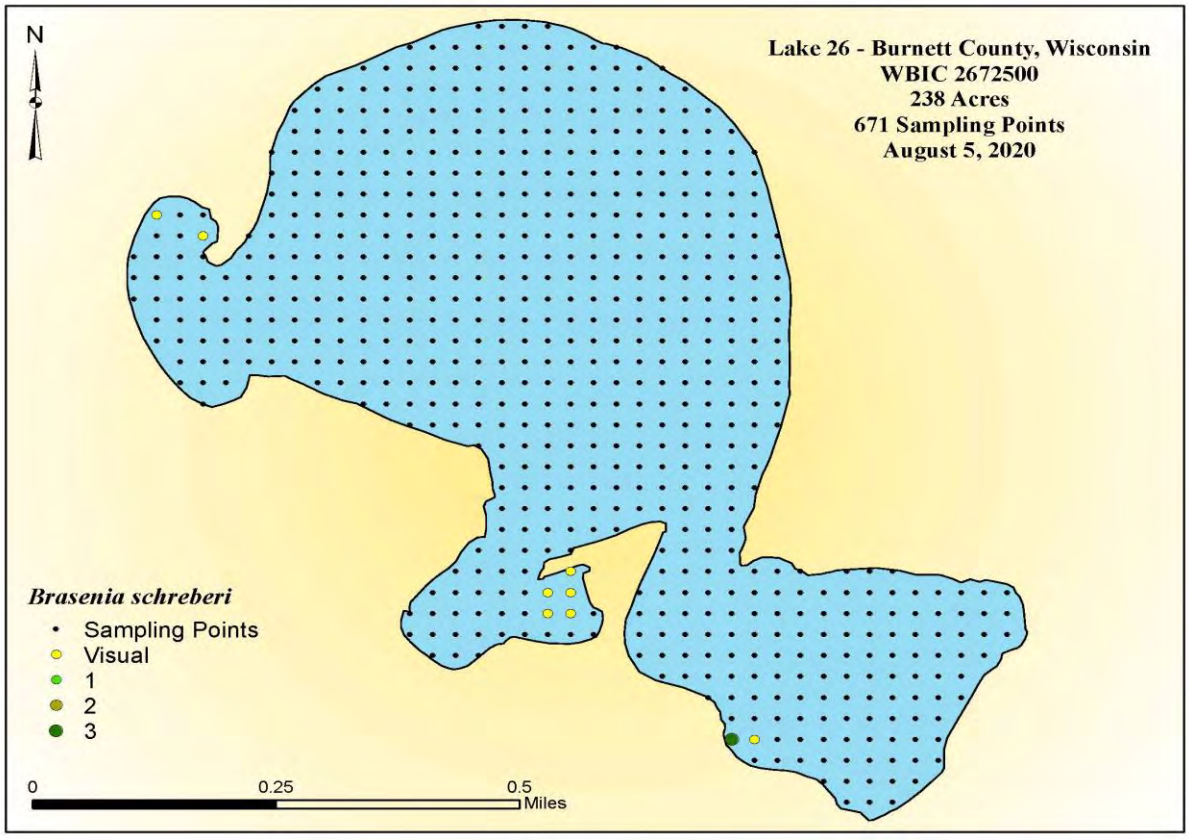
671 Sampling Points
August 5, 2020
Bidens beckii
Sampling Points
Visual
1
2
3
0
0.25
0.5
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Brasenia schreberi
Sampling Points
Visual
1
2
3
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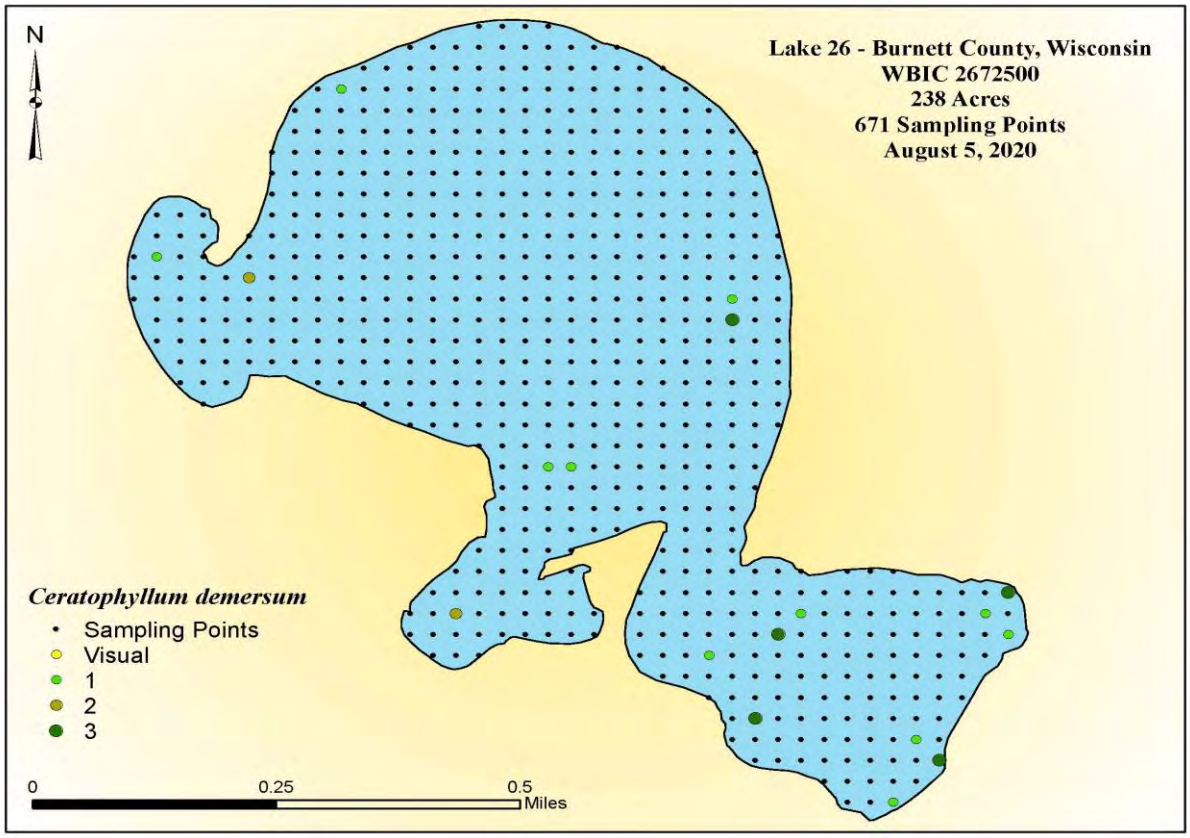
0.25
0.5
Miles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671 Sampling Points
August 5, 2020
Ceratophyllum demersum
Sampling Points
Visual
1
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0
0.25
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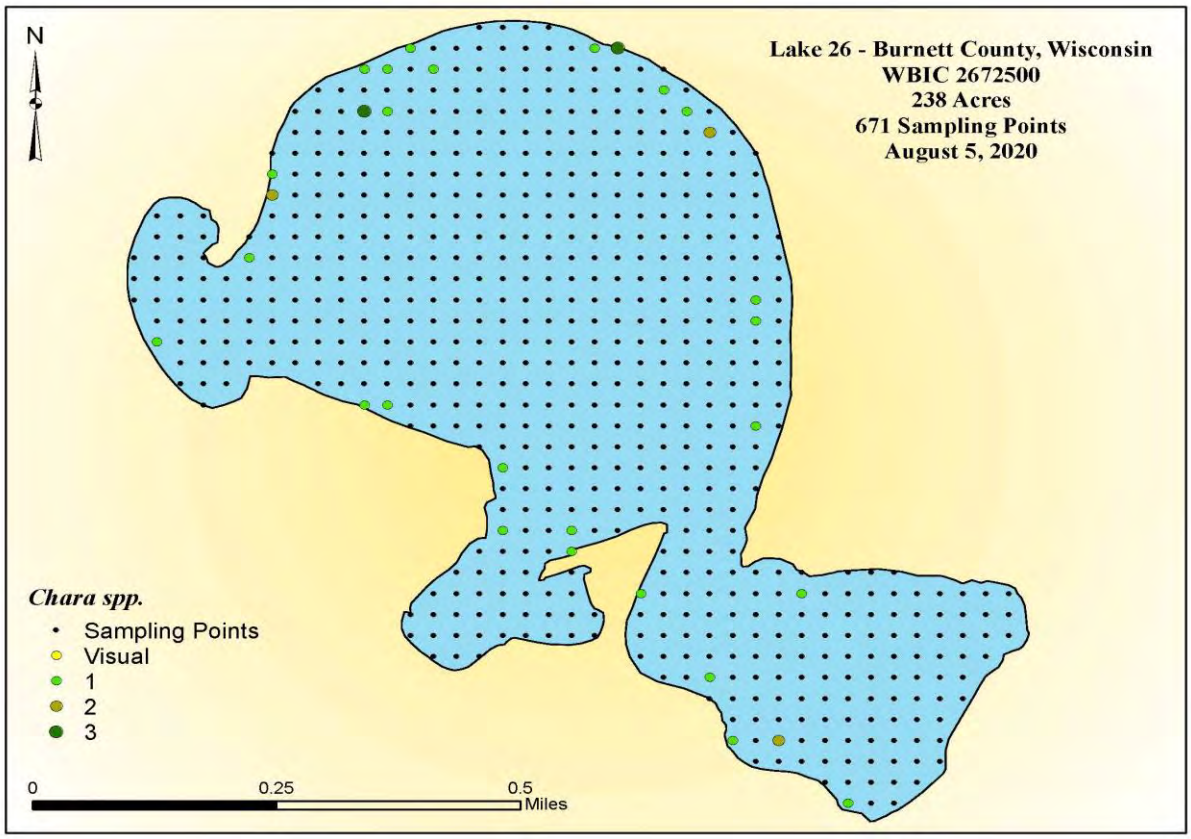
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Chara spp.
Sampling Points
Visual
1
2
3
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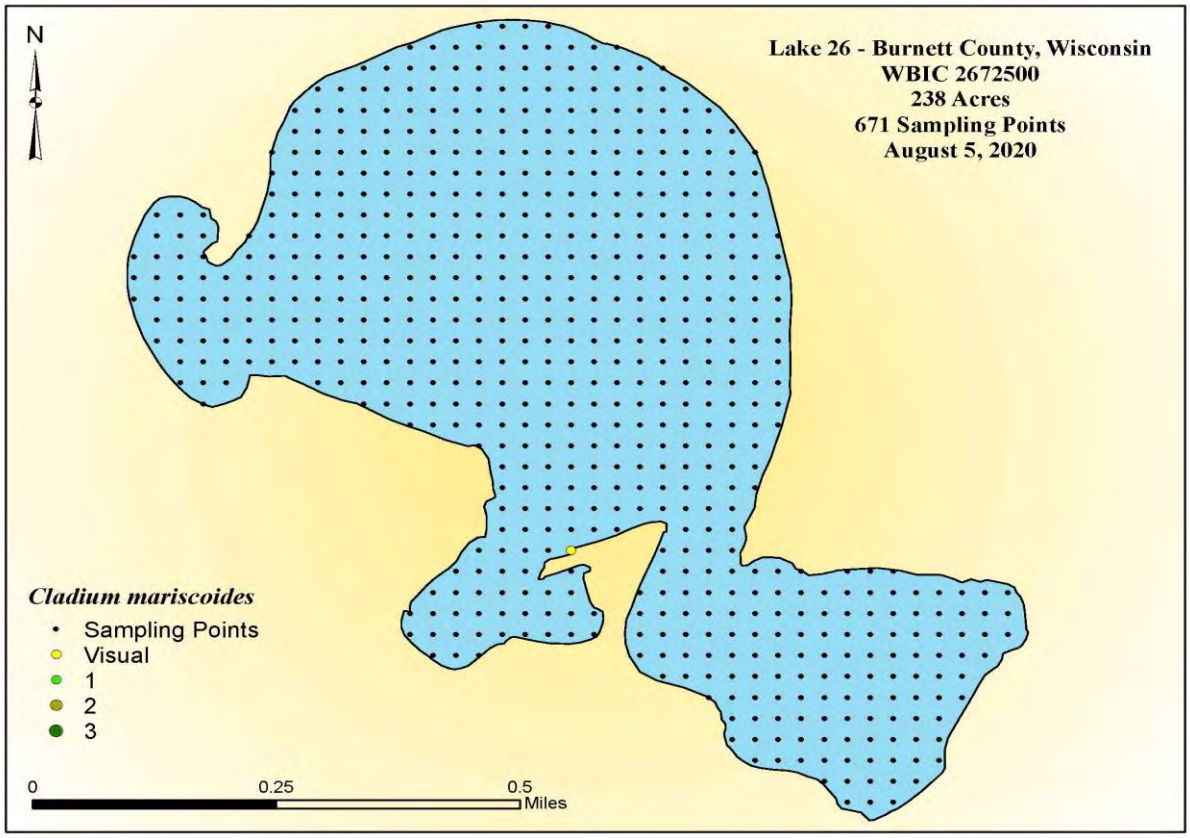
0.25
0.5
Miles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August 5, 2020
Cladium mariscoides
Sampling Points
Visual
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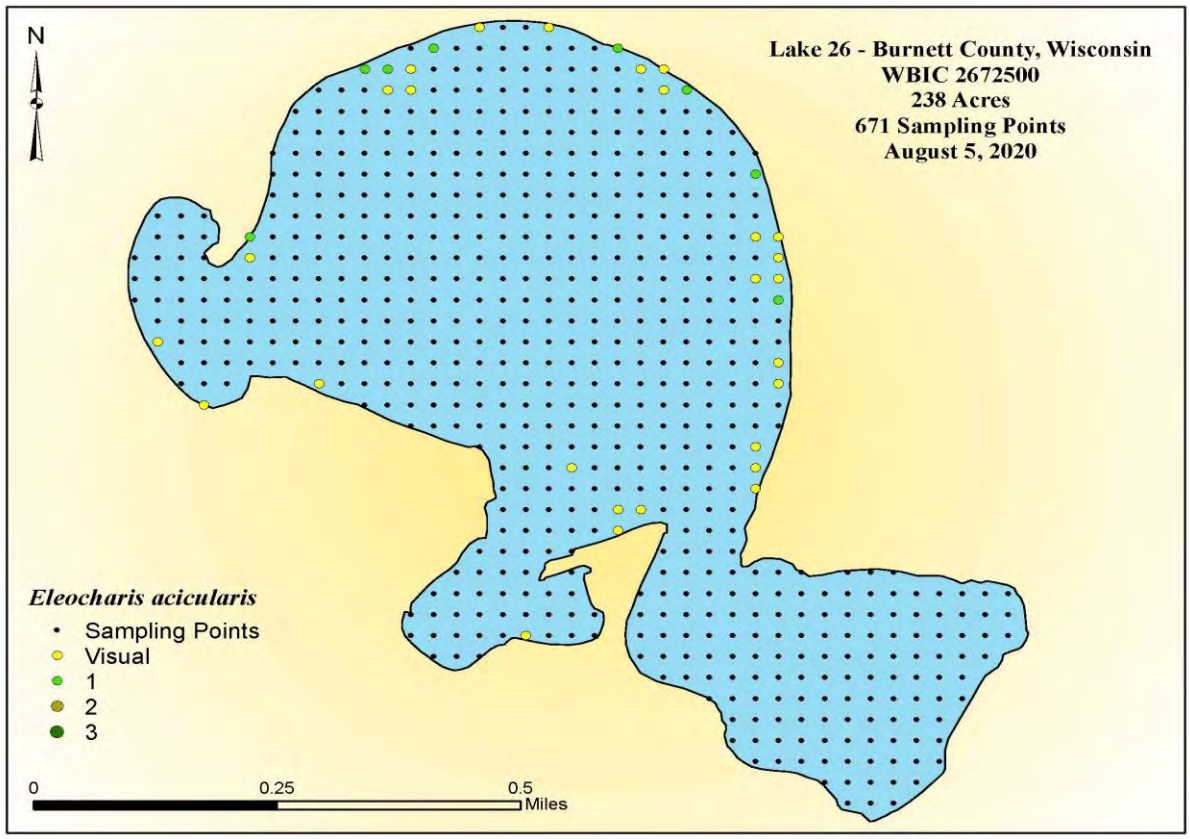
0.25
0.5
Miles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August 5, 2020
Eleocharis acicularis
Sampling Points
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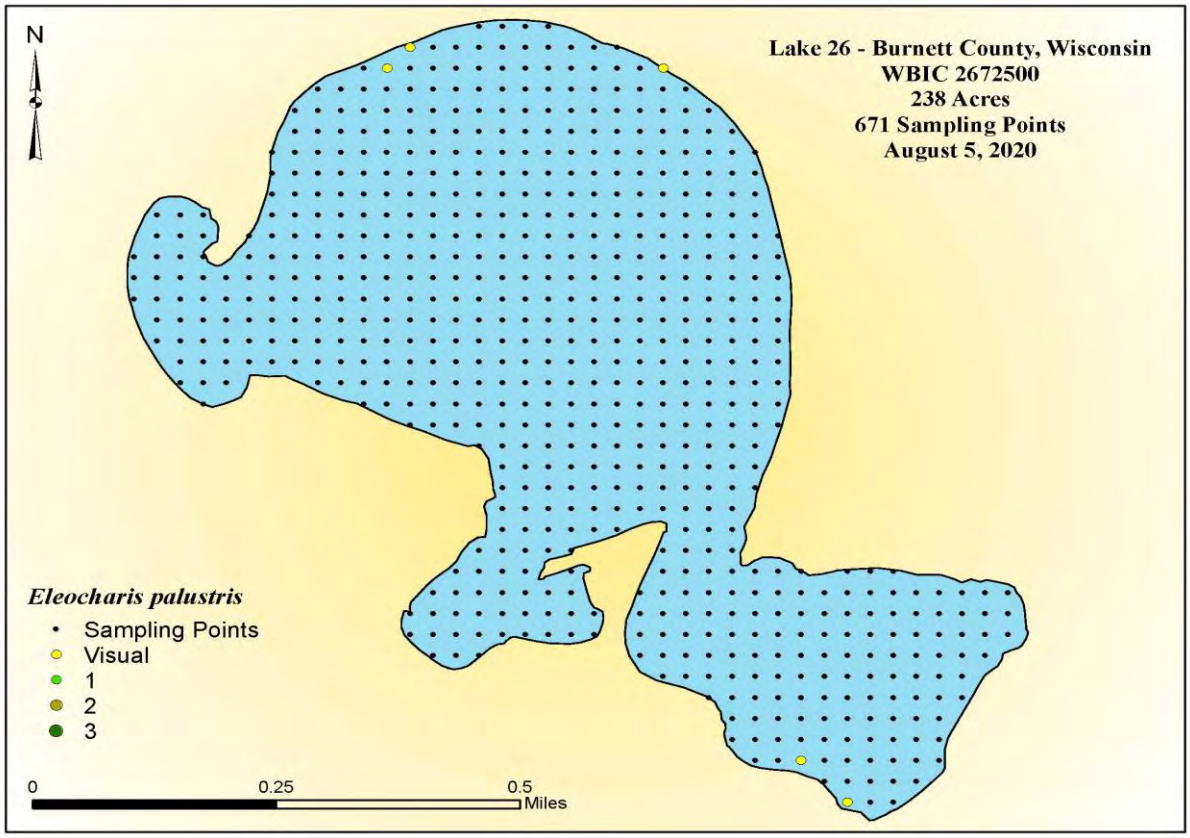
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Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Eleocharis palustris
Sampling Points
Visual
1
2
3
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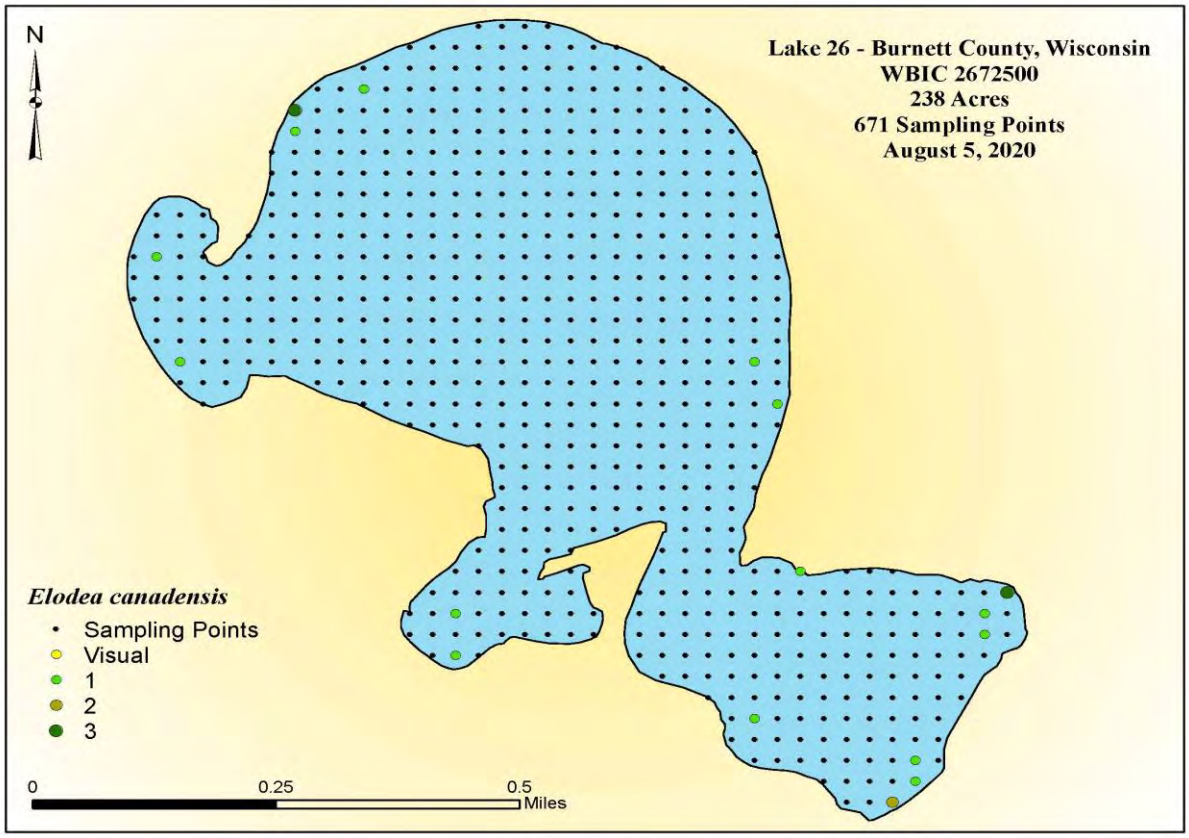
0.25
0.5
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Elodea canadensis
Sampling Points
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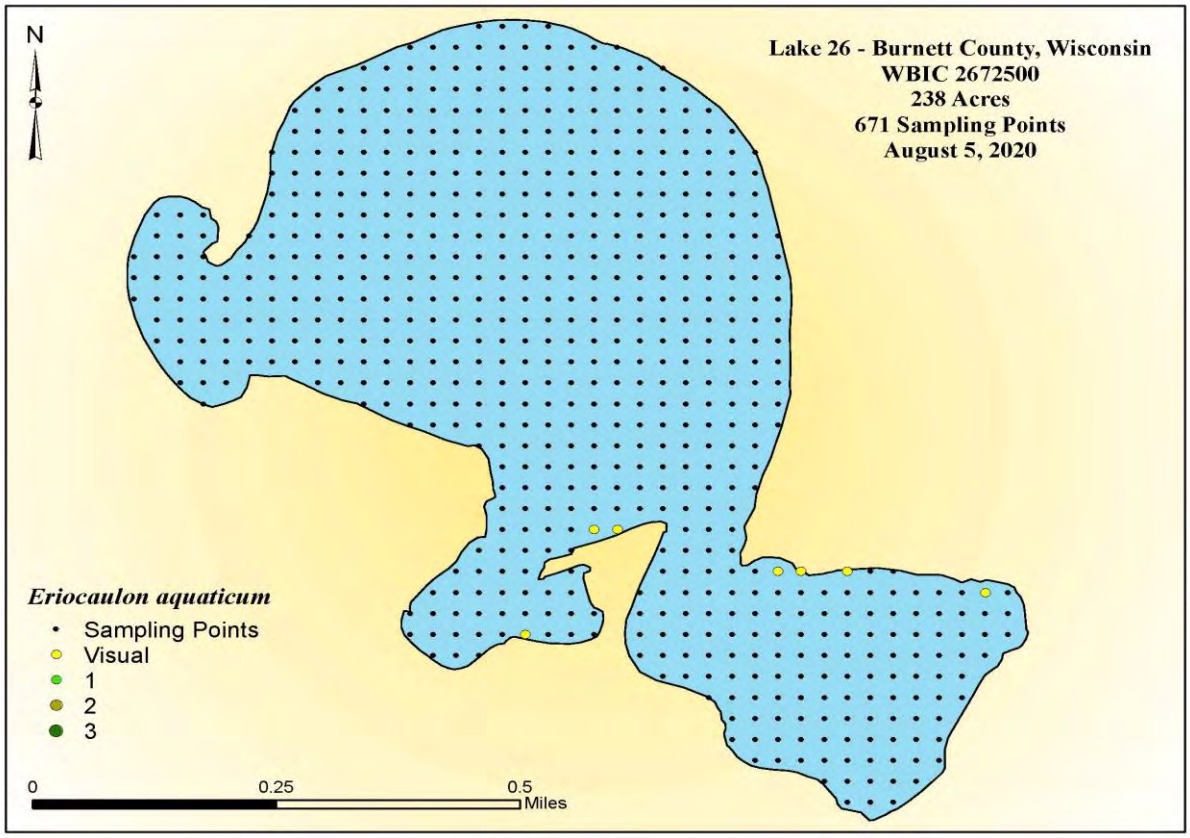
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
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Sampling Points
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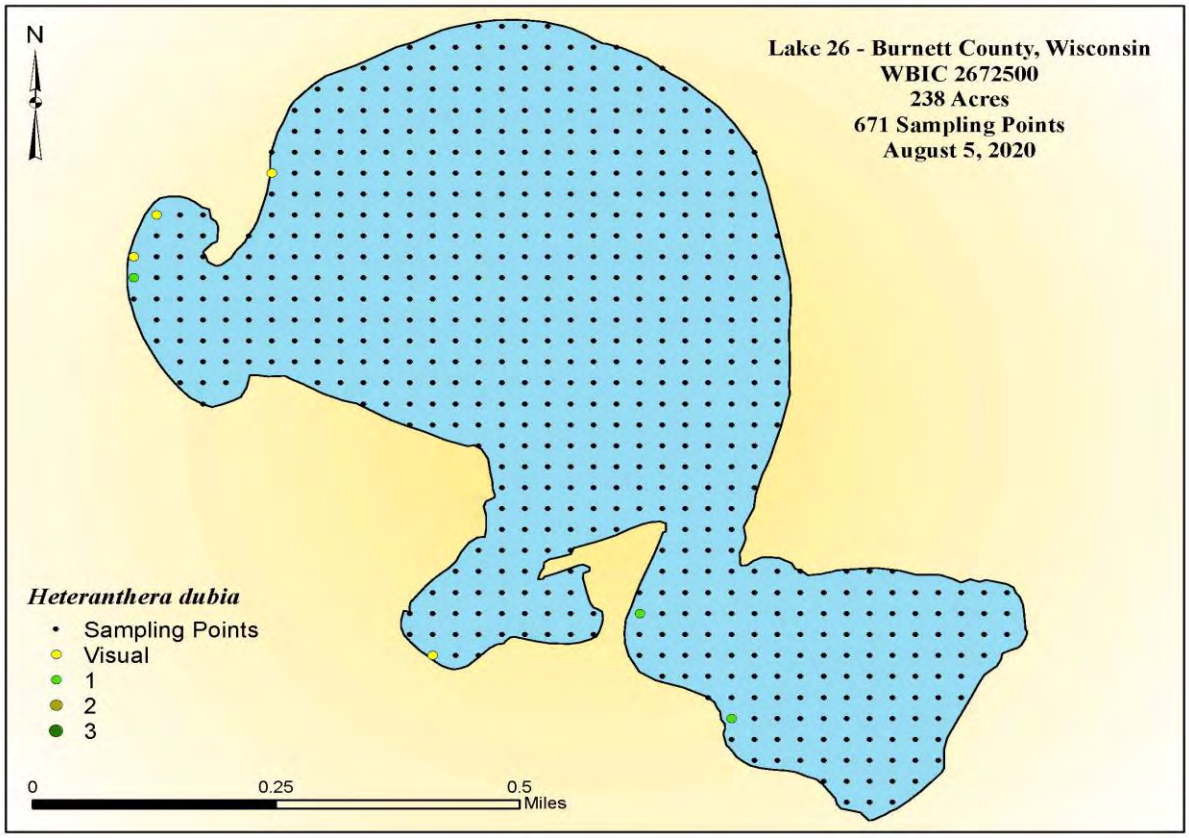
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
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Sampling Points
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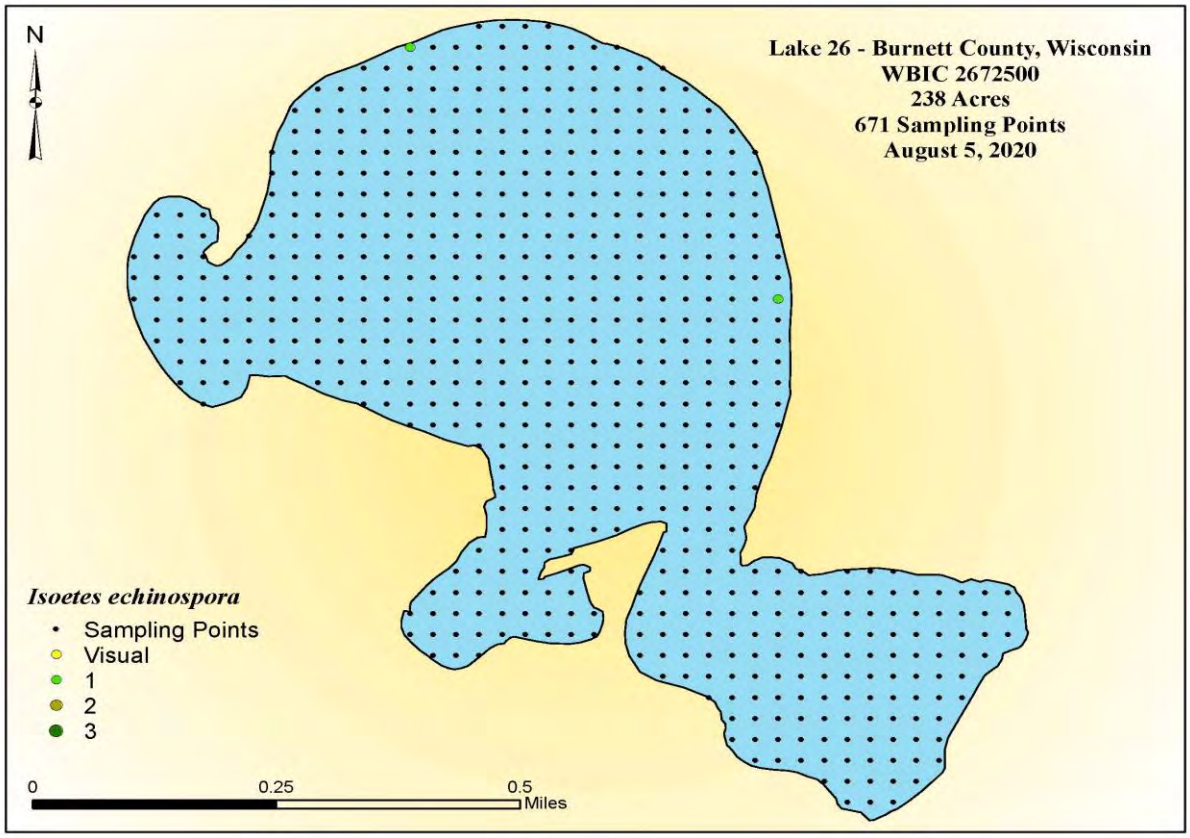
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
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Sampling Points
Visual
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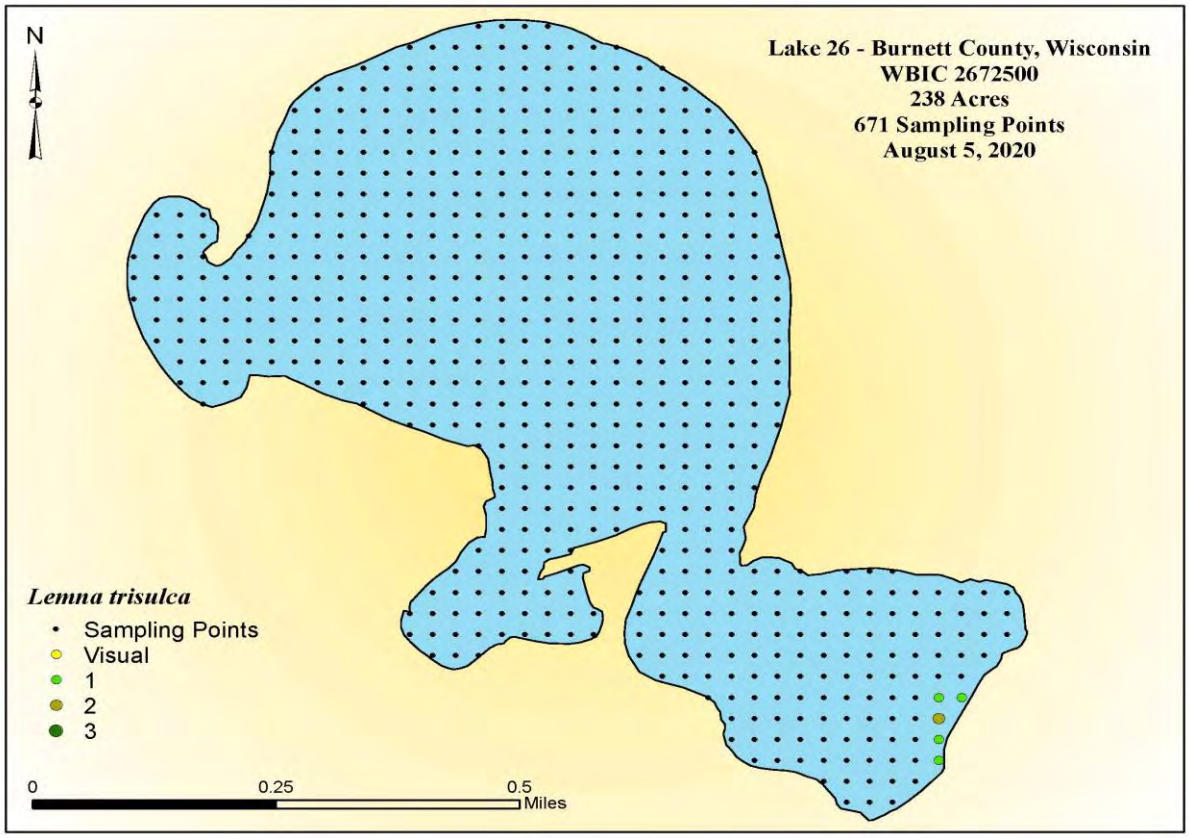
0.5
Miles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WBIC 2672500
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671 Sampling Points
August 5, 2020
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Sampling Points
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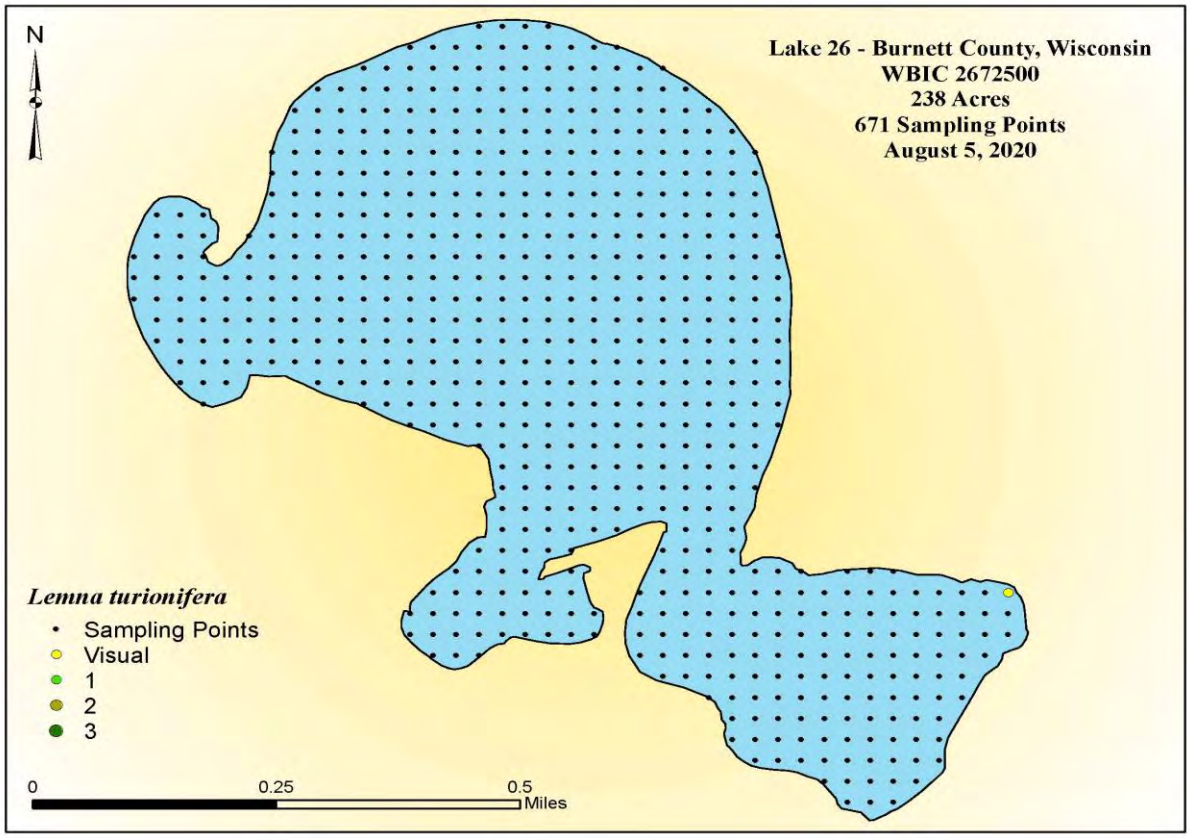
Miles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WBIC 2672500
238 Acres
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August 5, 2020
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Sampling Points
Visual
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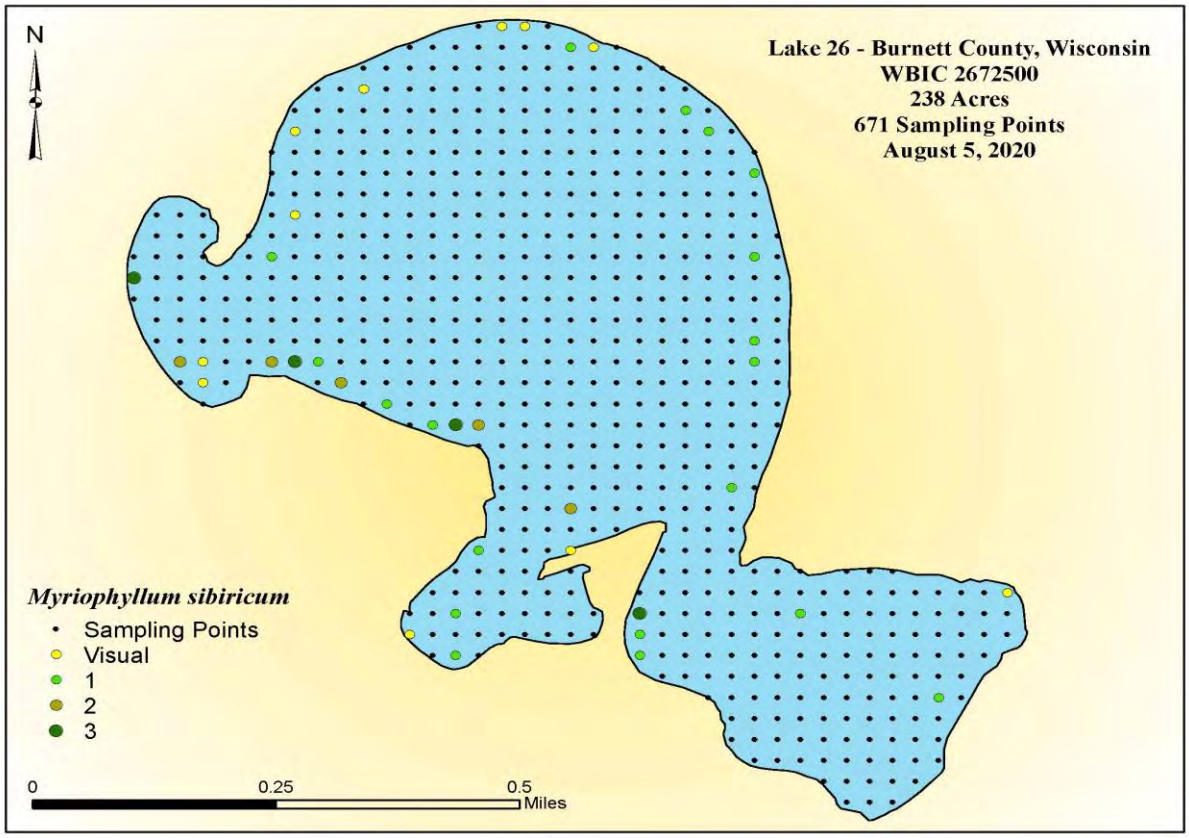
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
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Sampling Points
Visual
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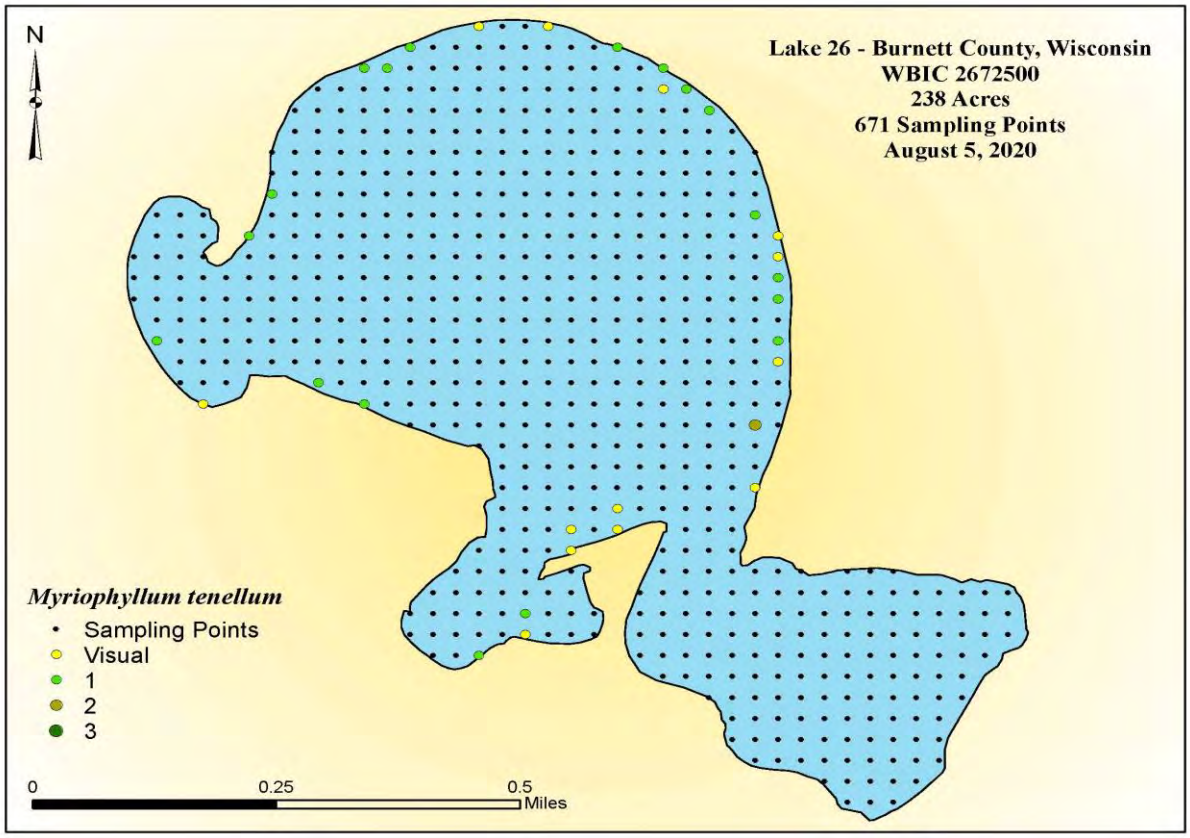
0.5
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
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Sampling Points
Visual
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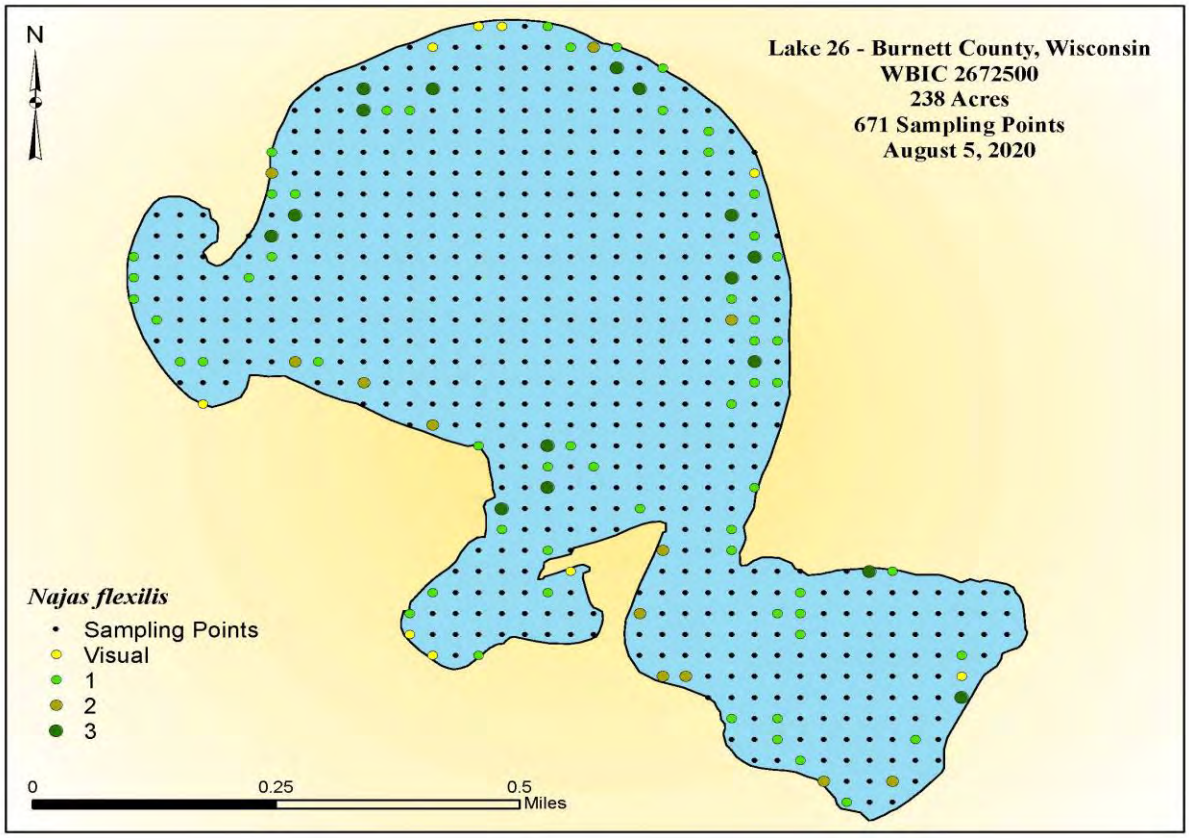
Miles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Sampling Points
Visual
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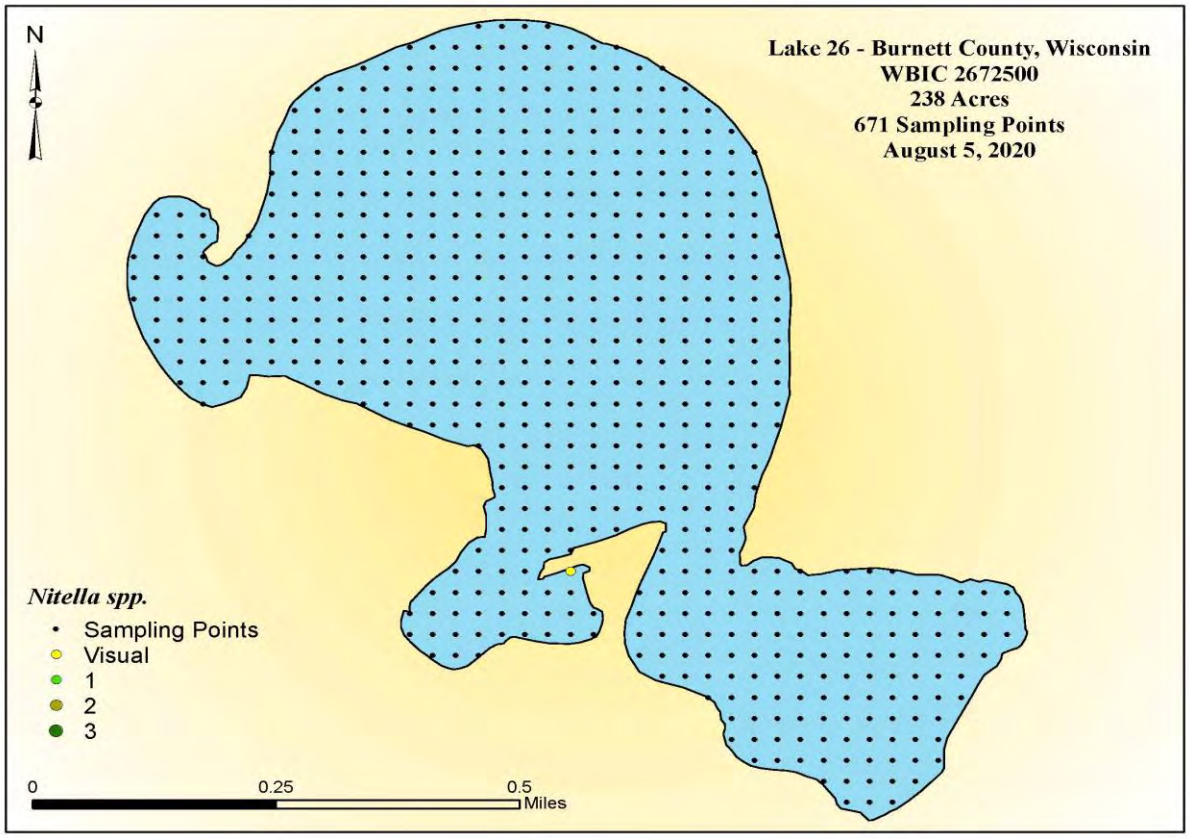
Miles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WBIC 2672500
238 Acres
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August 5, 2020
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Sampling Points
Visual
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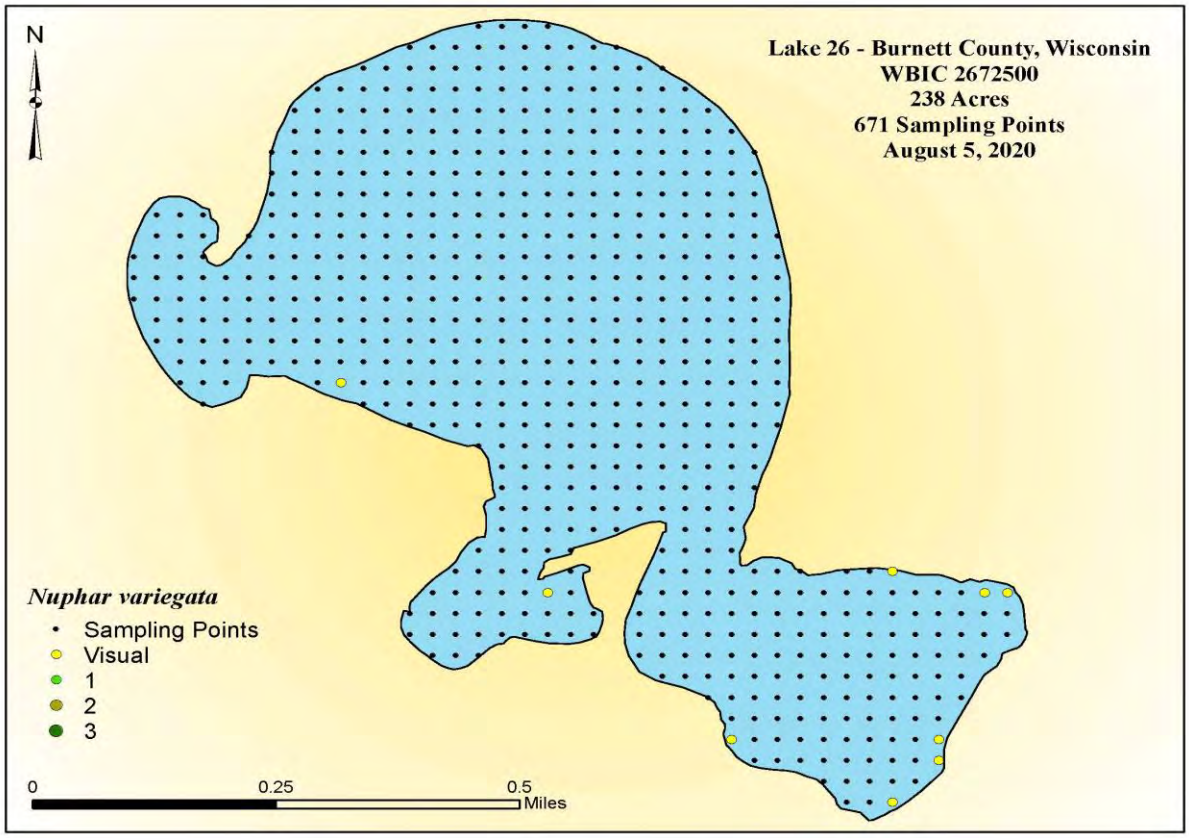
Miles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WBIC 2672500
238 Acres
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Sampling Points
Visual
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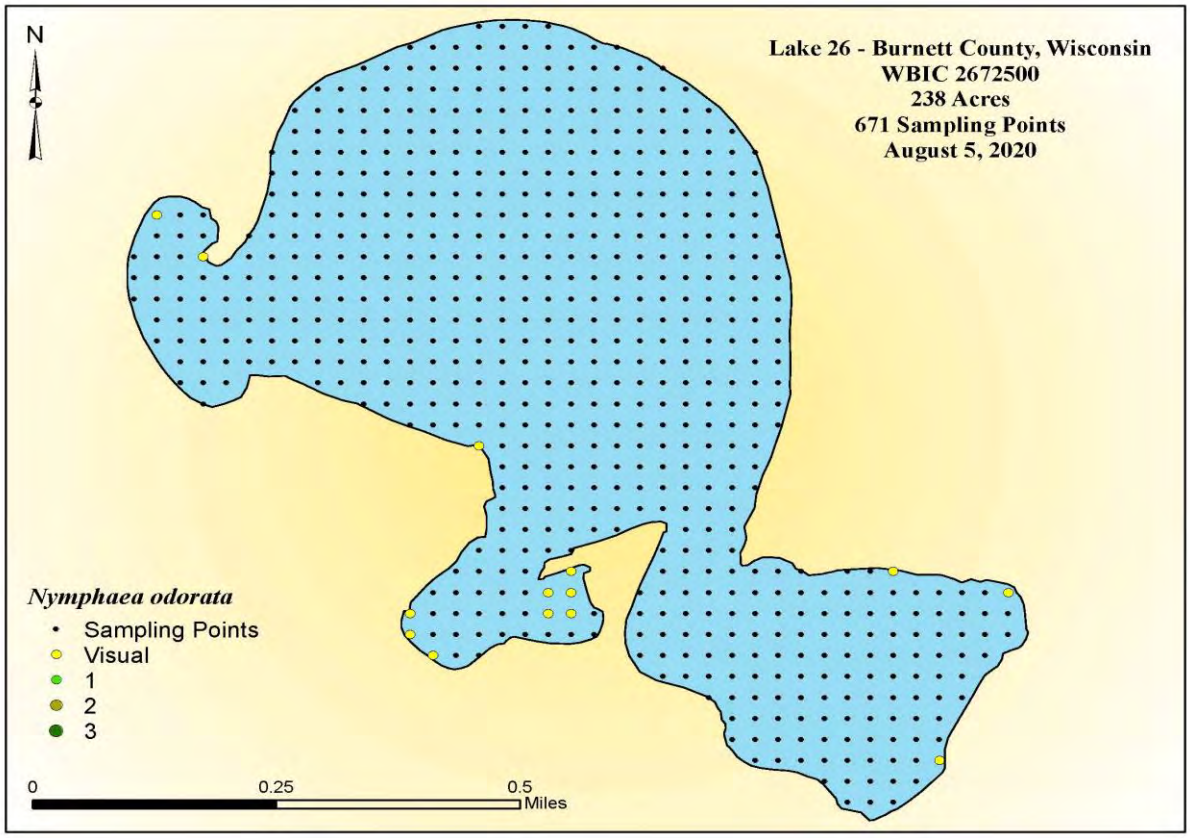
0.5
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
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Sampling Points
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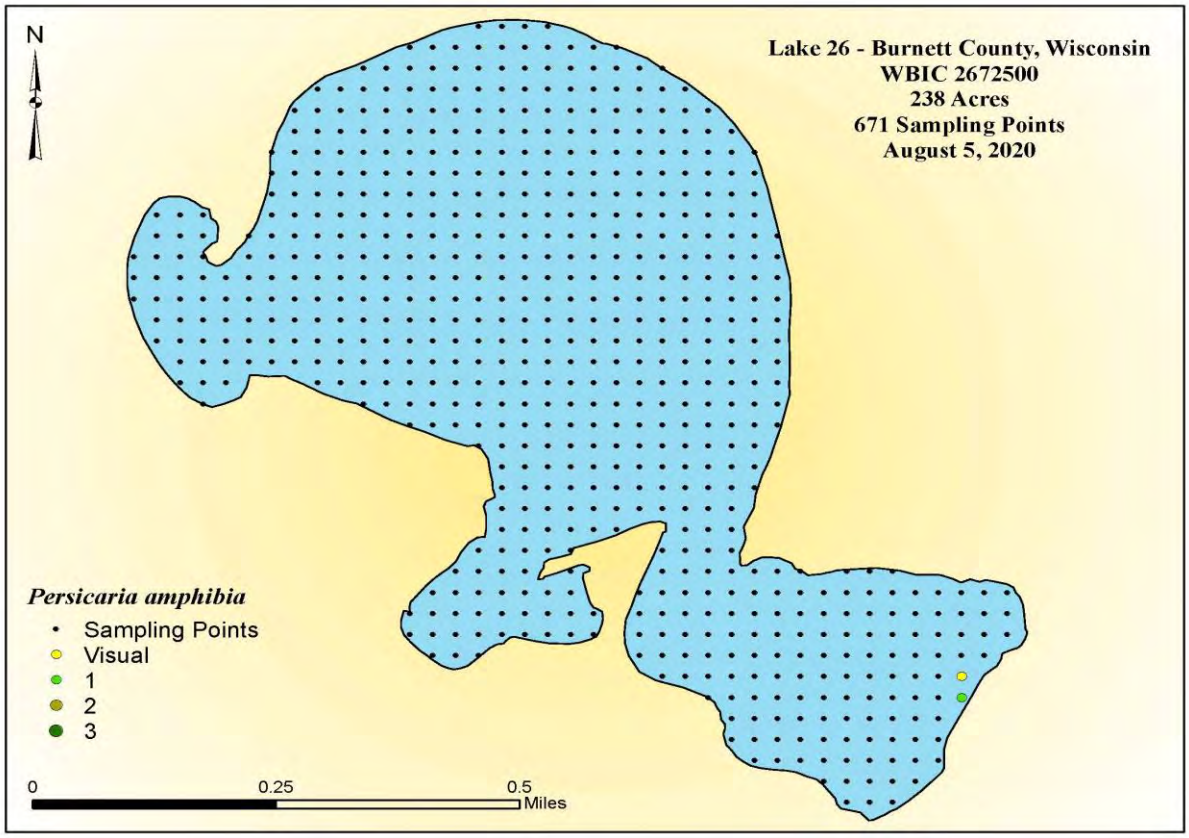
Miles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WBIC 2672500
238 Acres
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August 5, 2020
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Sampling Points
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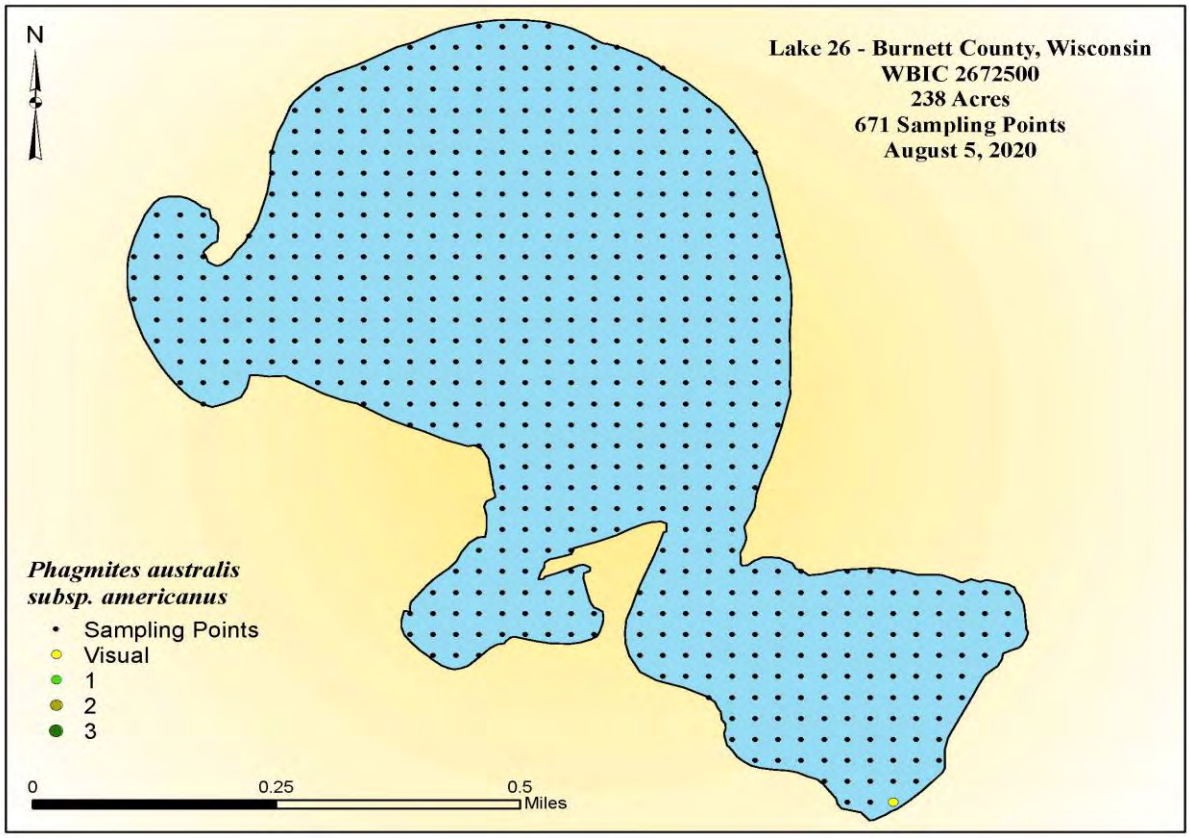
0.5
Miles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Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Phagmites australis
subsp. americanus
Sampling Points
Visual
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2
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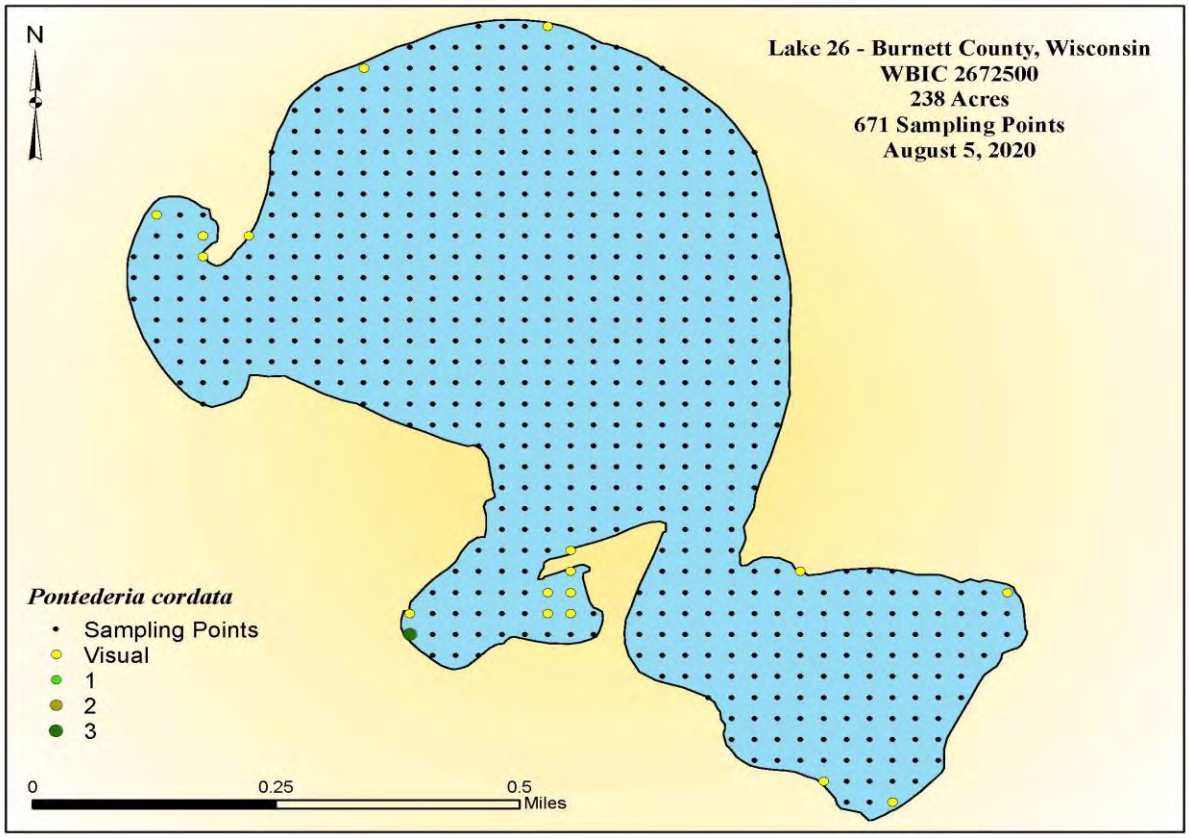
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
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Sampling Points
Visual
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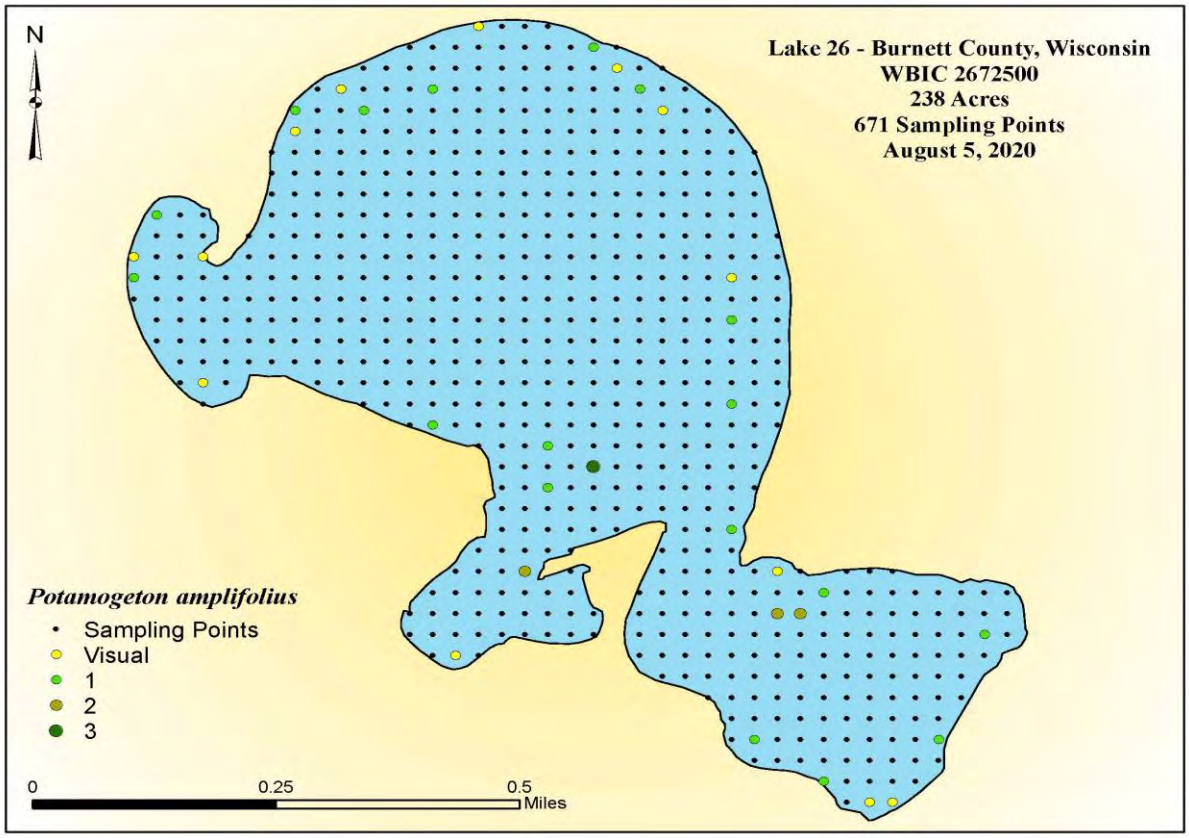
0.5
Miles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Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Potamogeton amplifolius
Sampling Points
Visual
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2
3
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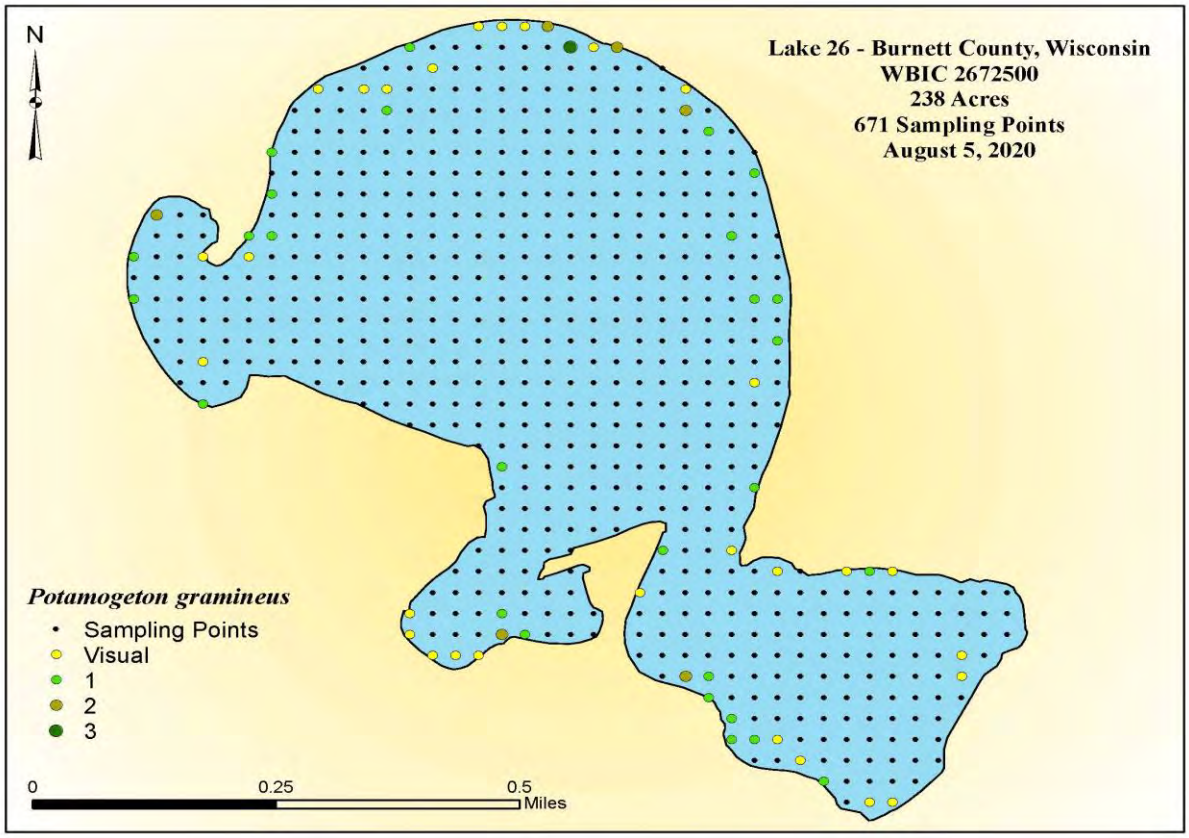
0.25
0.5
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
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Sampling Points
Visual
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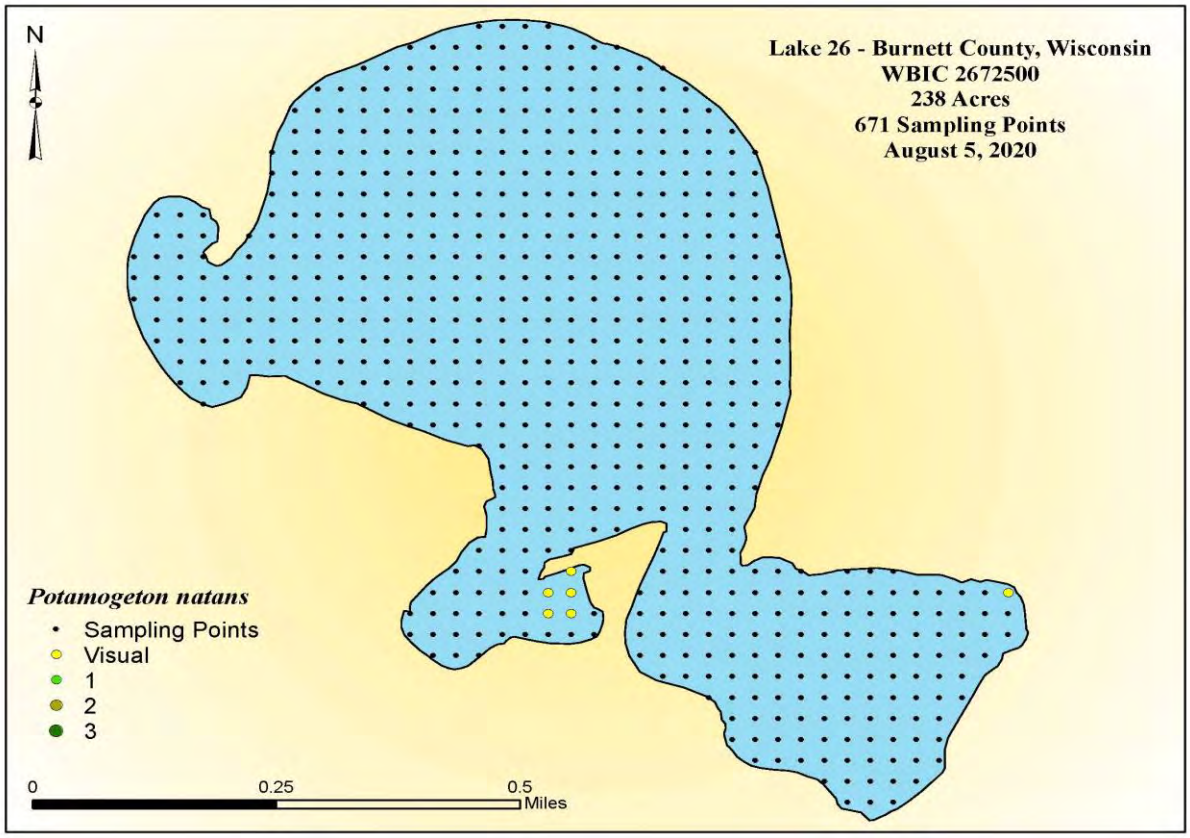
0.5
Miles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Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
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August 5, 2020
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Sampling Points
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2
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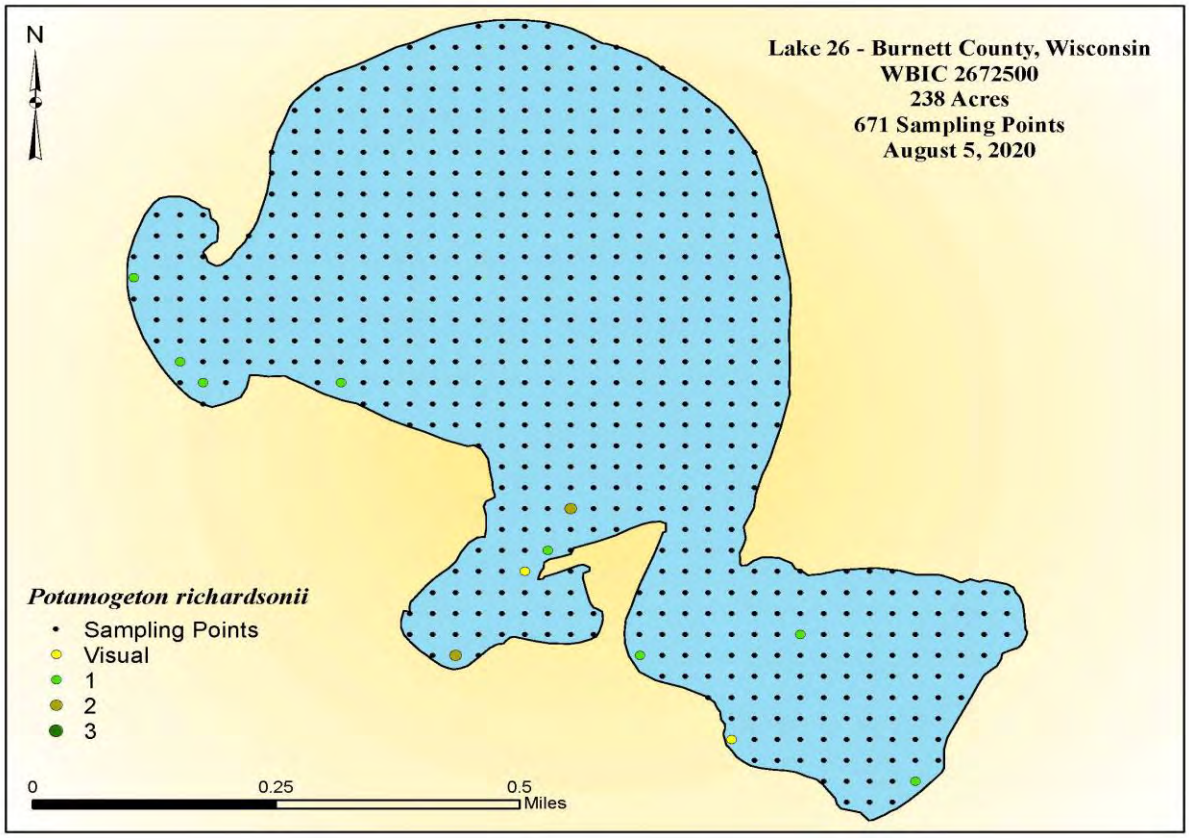
0.5
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Potamogeton richardsonii
Sampling Points
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2
3
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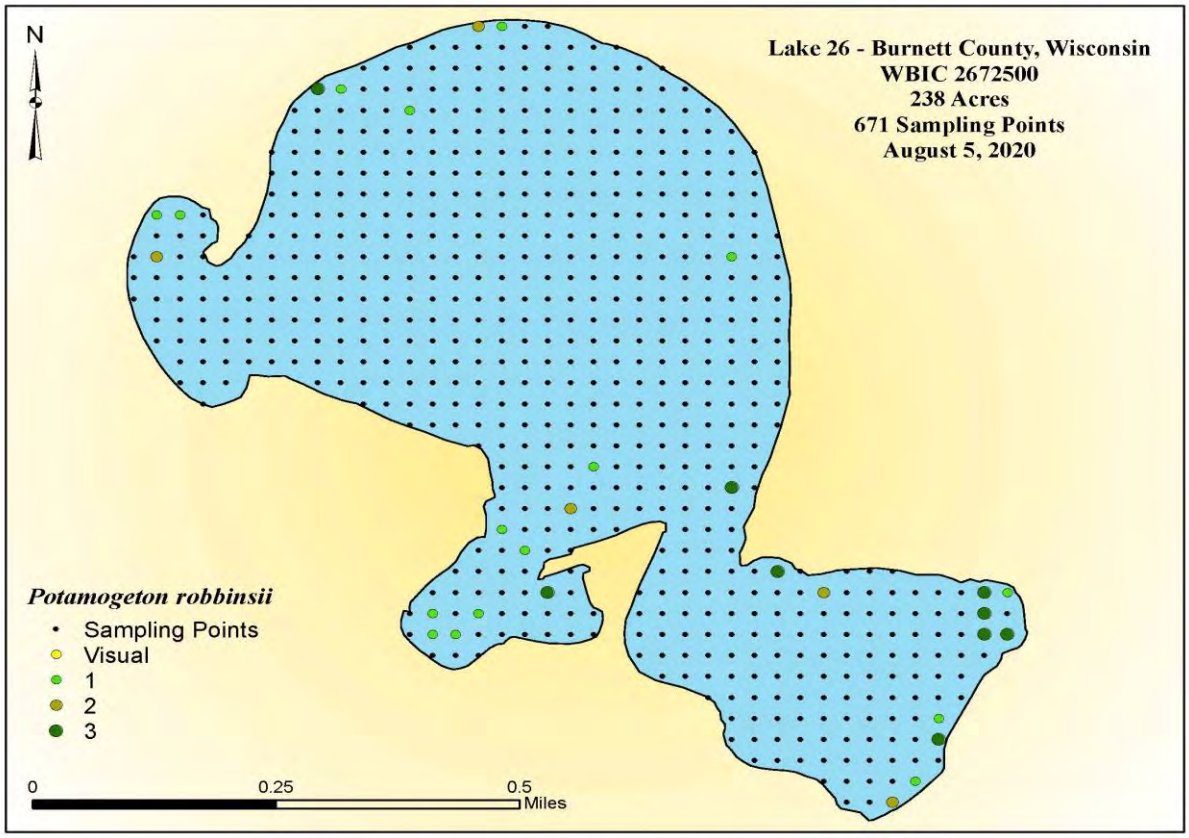
0.5
Miles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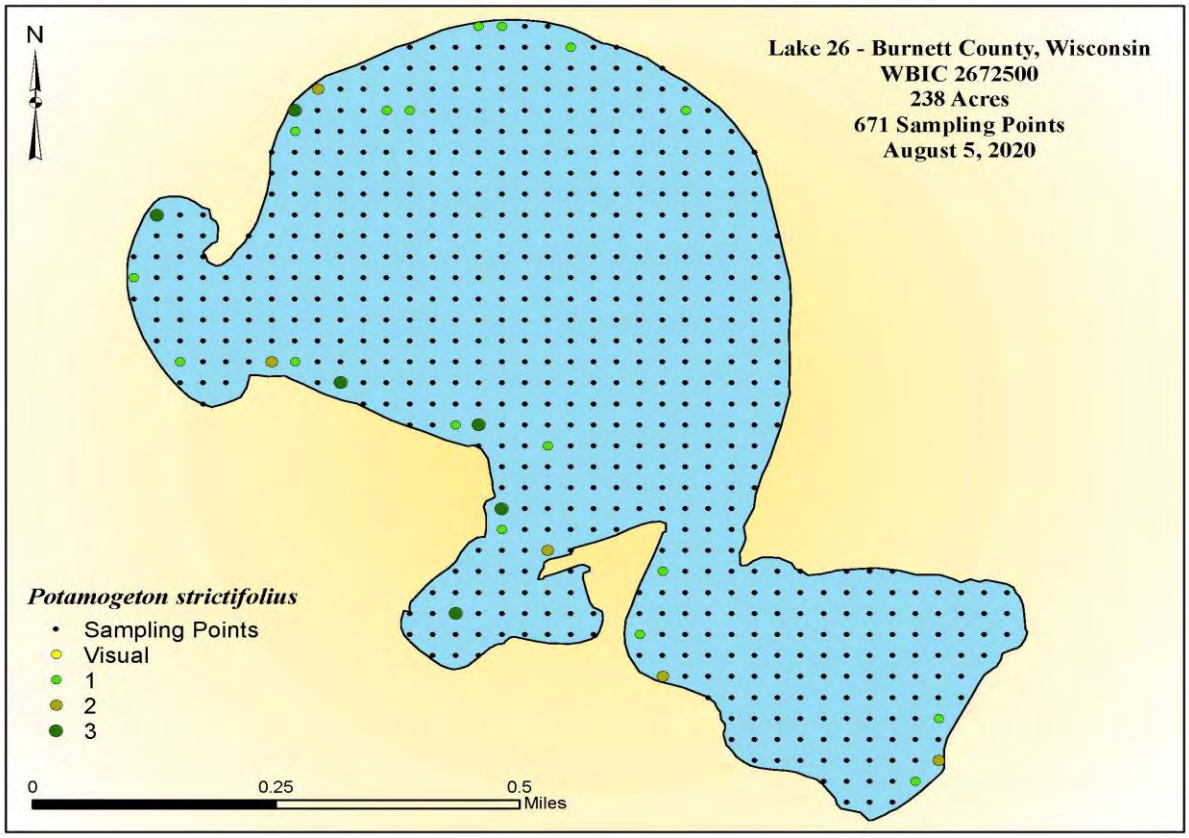
Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Potamogeton robbinsii
Sampling Points
Visual
1
2
3
0
0.25
0.5
Miles


N
Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Potamogeton strictifolius
Sampling Points
Visual
1
2
3
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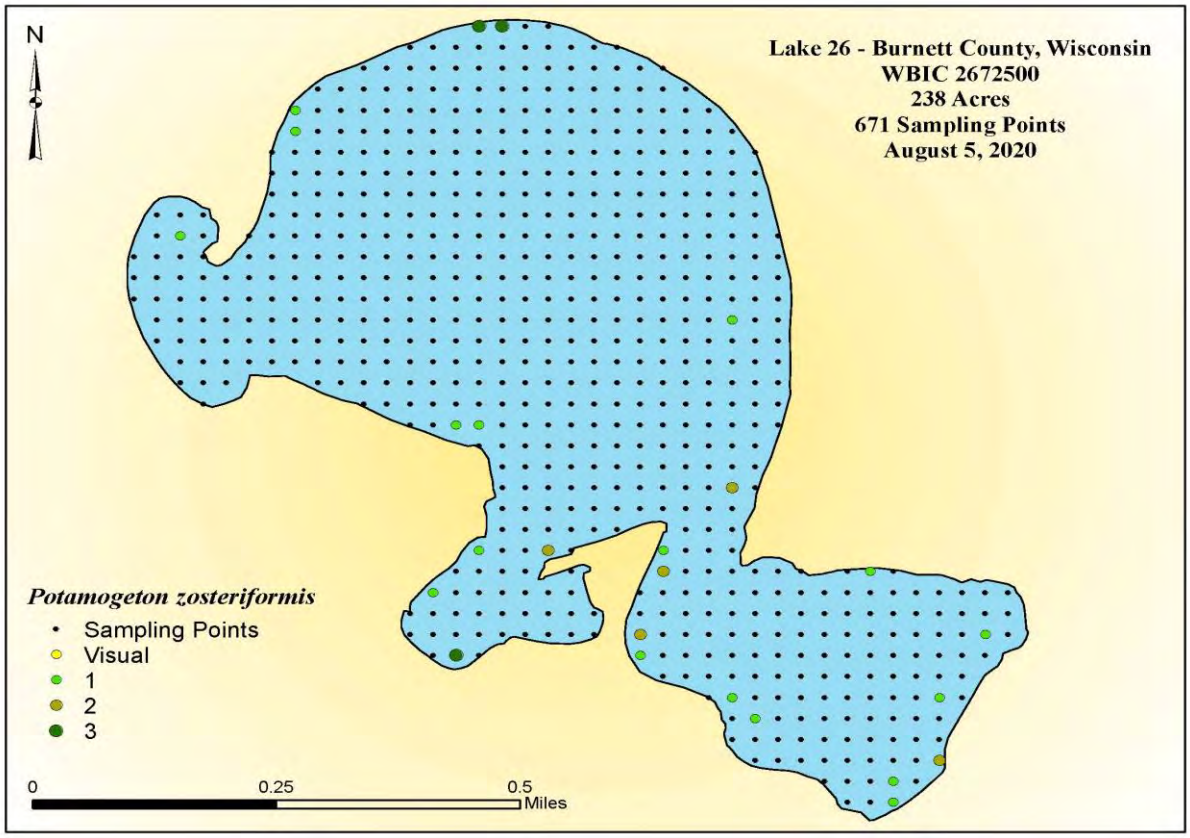
0.25
0.5
Miles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Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Potamogeton zosteriformis
Sampling Points
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1
2
3
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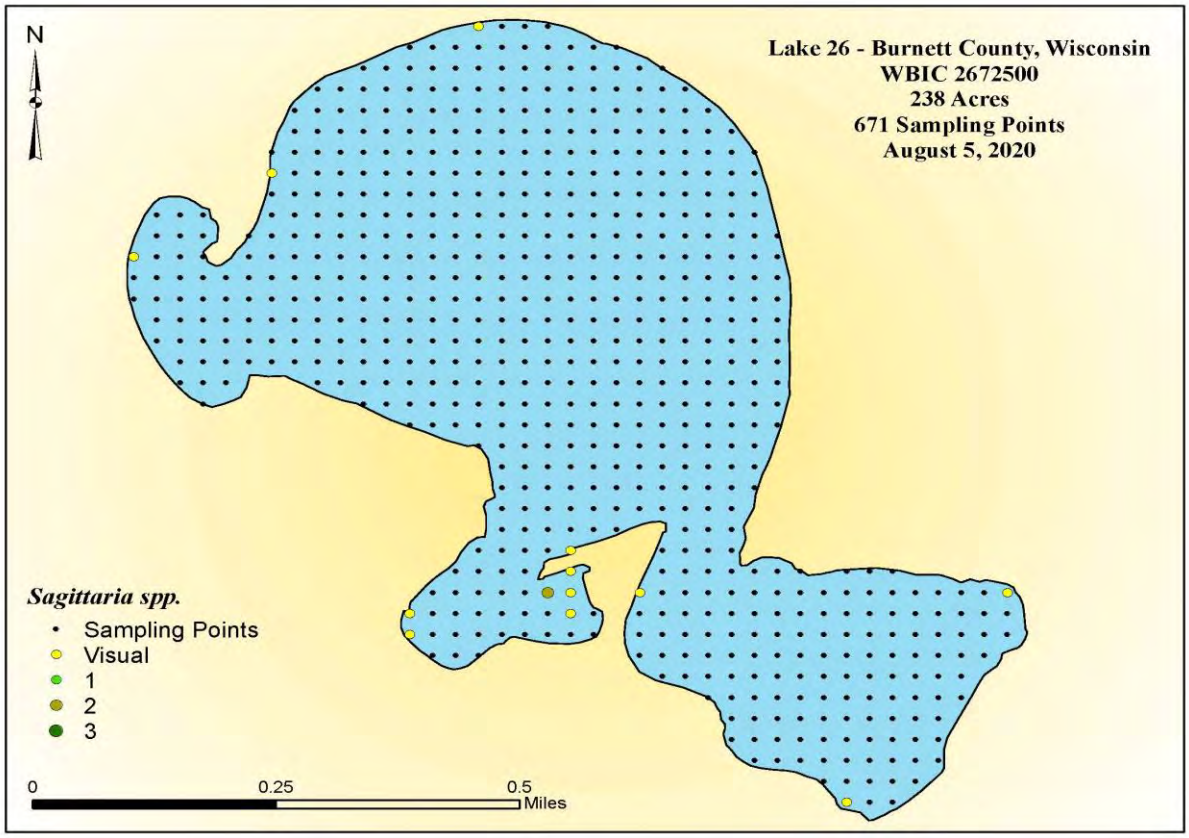
Miles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Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Sagittaria spp.
Sampling Points
Visual
1
2
3
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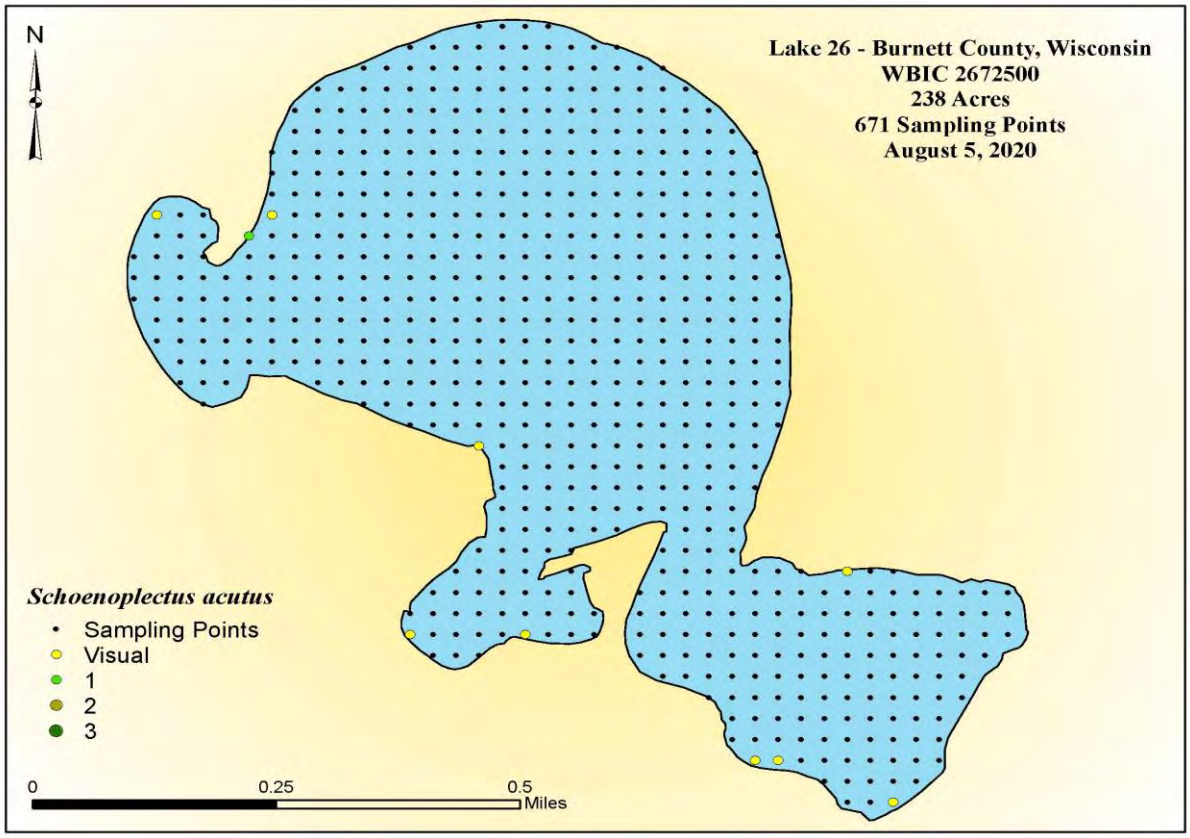
0.25
0.5
Miles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Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
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Sampling Points
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1
2
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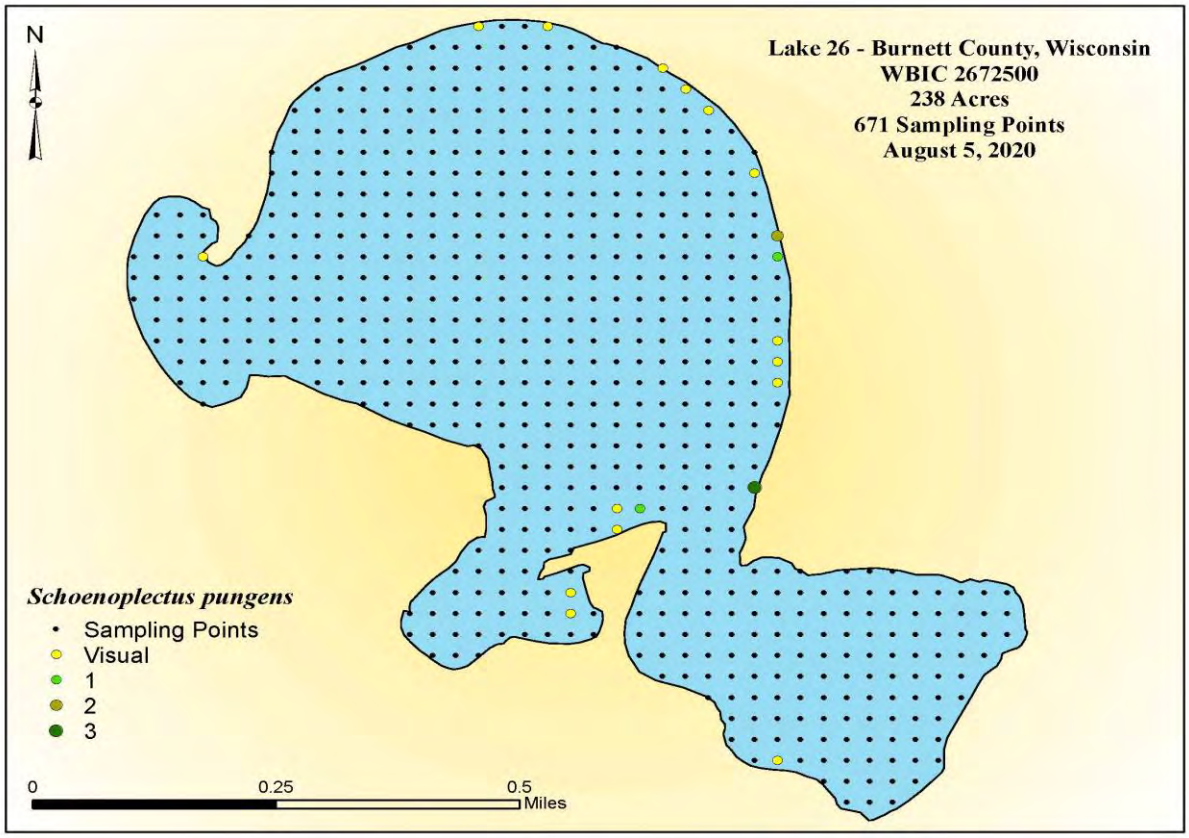
Miles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WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
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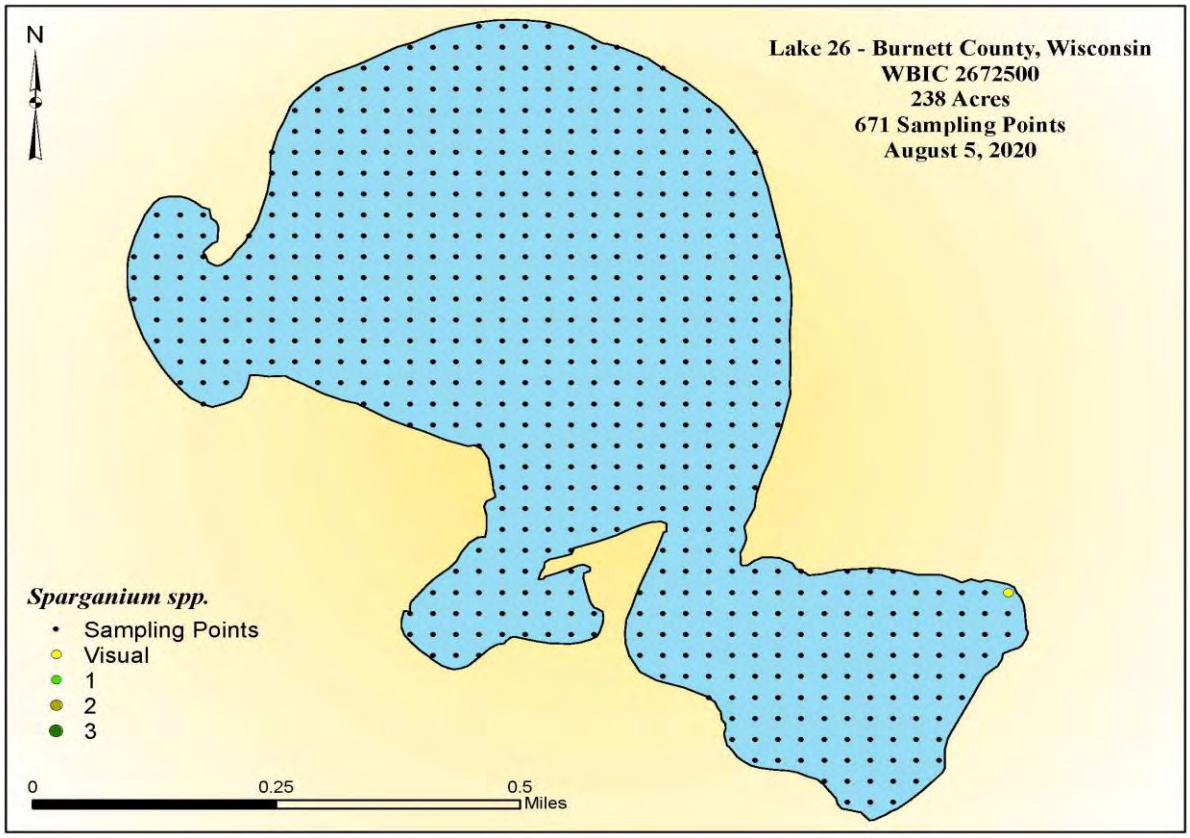
Miles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Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Sparganium spp.
Sampling Points
Visual
1
2
3
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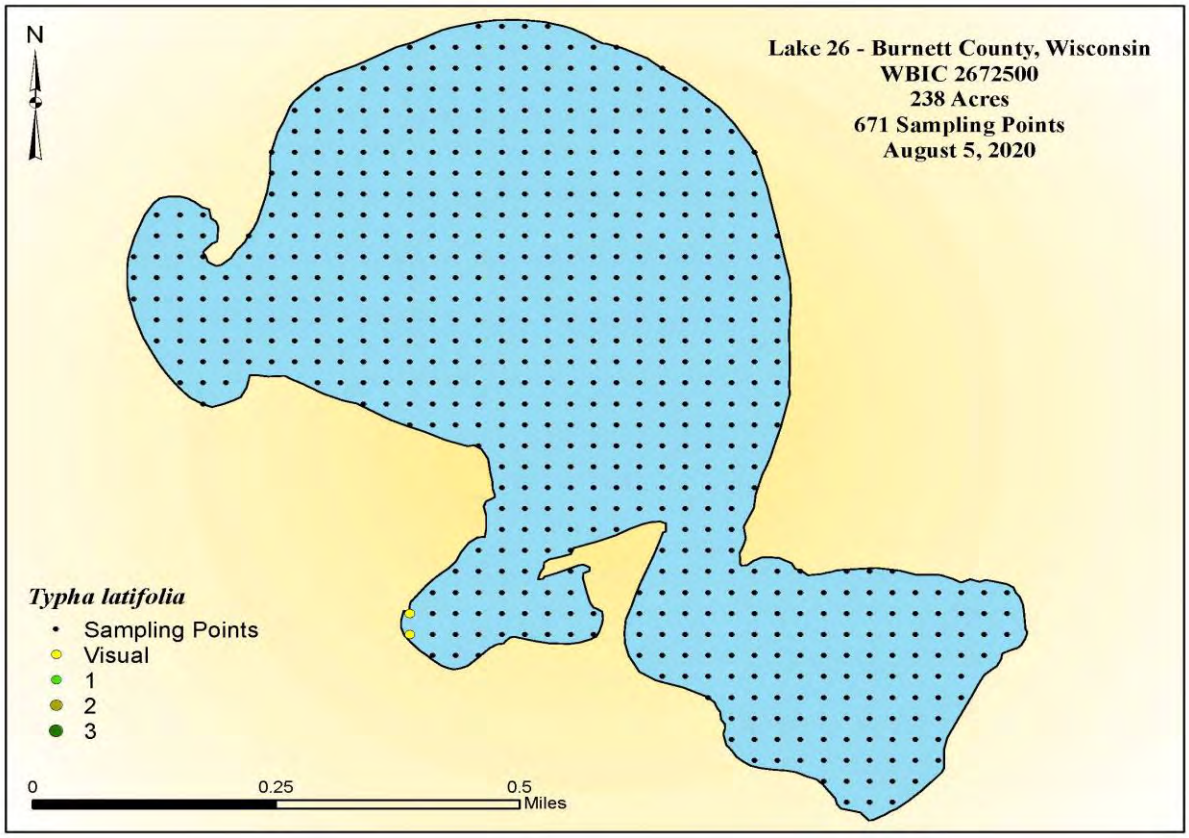
Miles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Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
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Sampling Points
Visual
1
2
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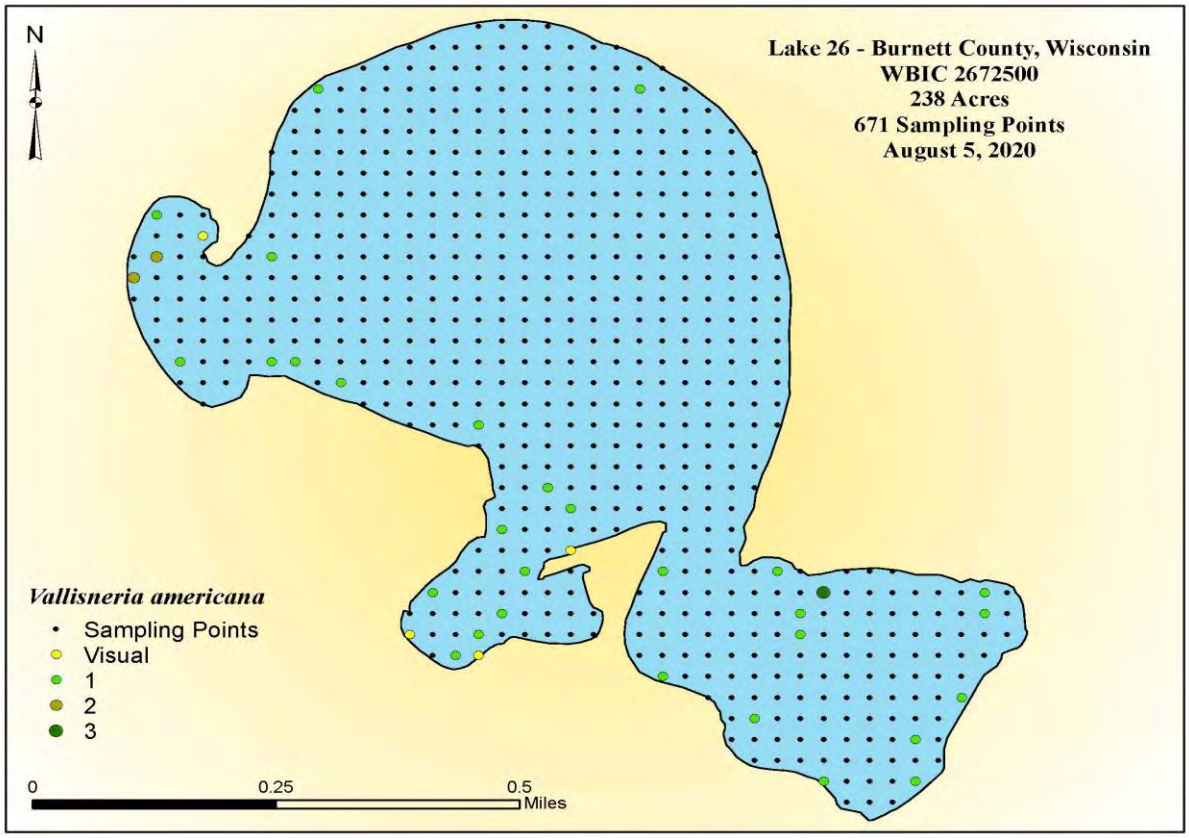
0.5
Miles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Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Vallisneria americana
Sampling Points
Visual
1
2
3
0
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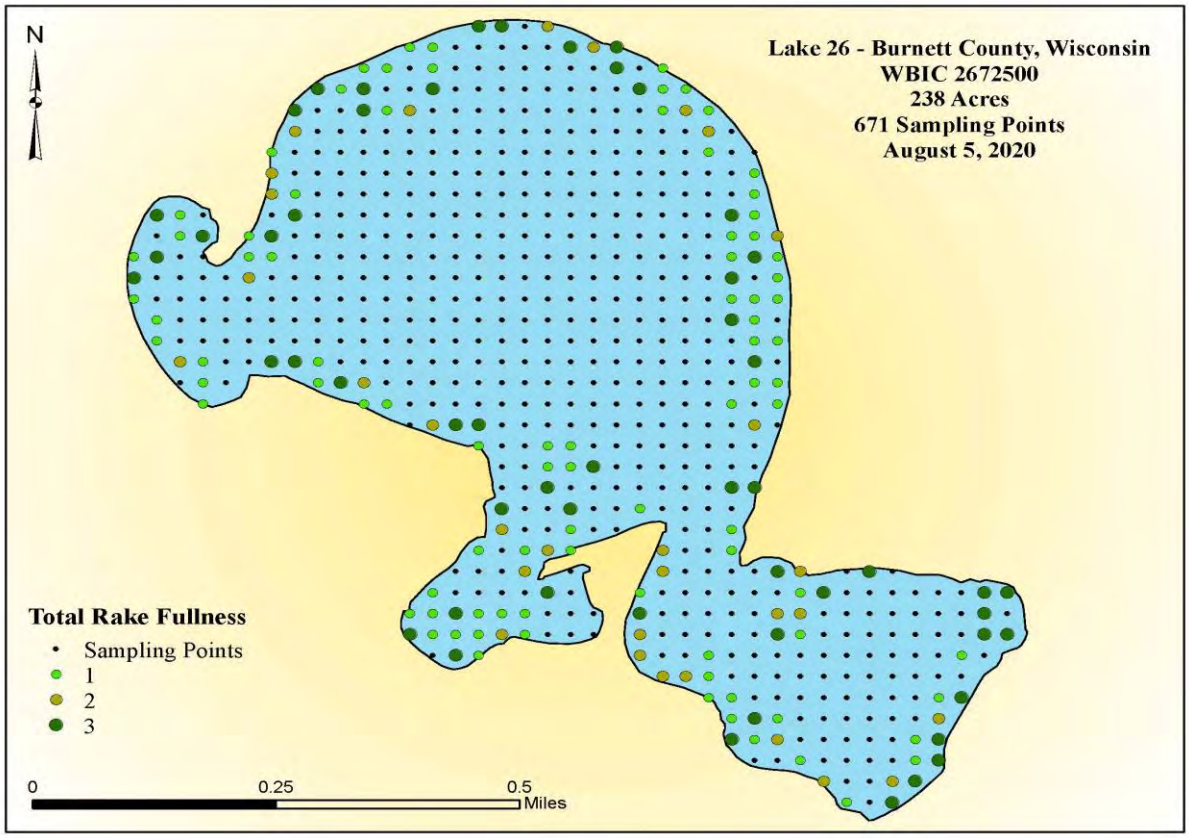
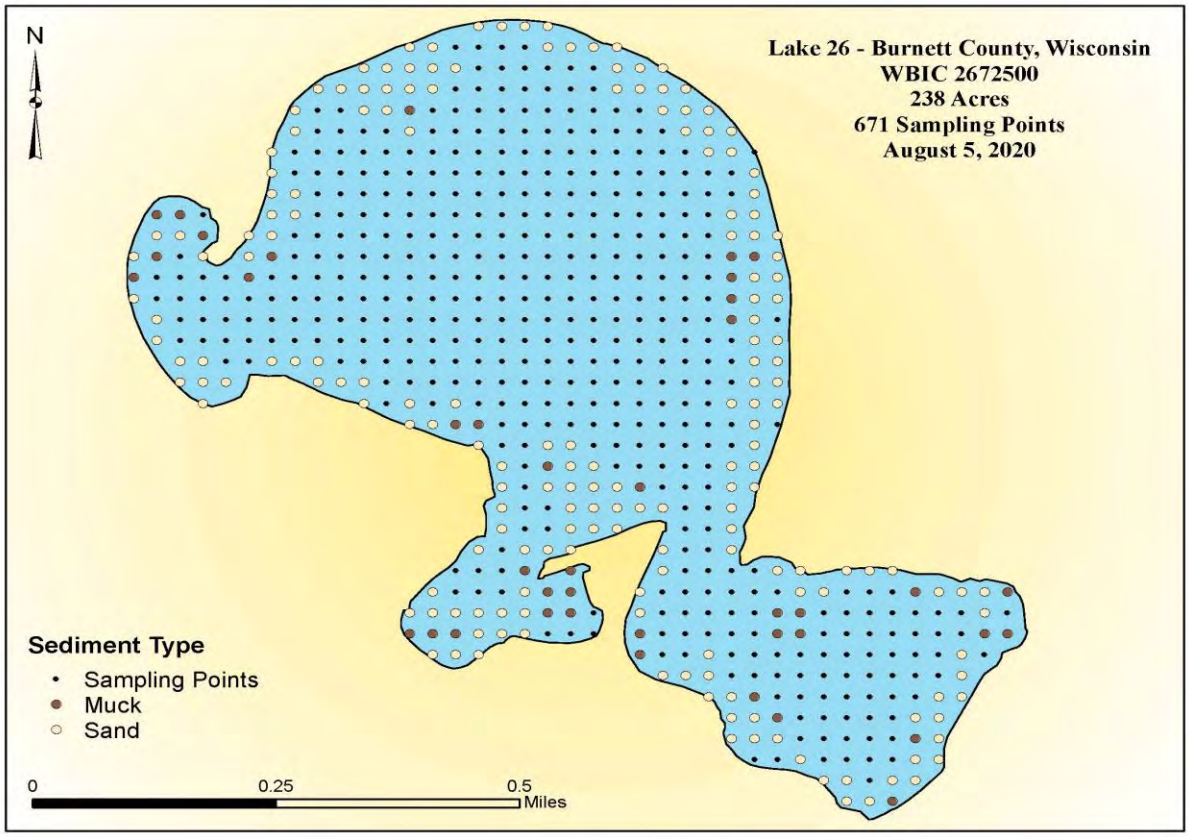
0.5
Miles


N
Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Total Rake Fullness
Sampling Points
1
2
3
0
0.25
0.5
Miles


N
Lake 26 - Burnett County, Wisconsin
WBIC 2672500
238 Acres
671 Sampling Points
August 5, 2020
Sediment Type
Sampling Points
Muck
Sand
0
0.25
0.5
Miles

Aquatic Plant Management

Maintaining the current healthy native plant populations on Lake 26 is the priority of this plan. However, information regarding aquatic plant management is included in this plan for reference. This information could become useful if AIS invasions occur or nuisance levels of aquatic plants arise. Contact must be made with the WDNR and BCLSD before any management occurs.

This section reviews the potential management methods available, and reports recent management activities on the lakes. The application, location, timing, and combination of techniques must be considered carefully.

Permitting Requirements

The Department of Natural Resources regulates the removal of aquatic plants when chemicals are used, and in some instances when plants are removed mechanically. The requirements for chemical plant removal are described in Administrative Rule NR 107 – Aquatic Plant Management.[18] A permit is required for any aquatic chemical application in Wisconsin. Additional requirements exist when a lake is considered an ASNRI (Area of Special Natural Resource Interest).

The requirements for manual and mechanical plant removal are described in NR 109 – Aquatic Plants: Introduction, Manual Removal & Mechanical Control Regulations.[19] A permit is required for manual and mechanical removal except for when a riparian (waterfront) landowner manually removes or gives permission to someone to manually remove plants, (with the exception of wild rice) from his/her shoreline within their viewing corridor. A riparian landowner may also manually remove invasive plants along their shoreline without a permit. Manual removal refers to the control of aquatic plants by hand or hand–held devices without the use or aid of external or auxiliary power.

Manual Removal[9]

Manual removal—hand pulling, cutting, or raking—will effectively remove plants from small areas. It is likely that plant removal will need to be repeated more than once during the growing season. The best timing for hand removal of herbaceous plant species is after flowering but before seed head production. For plants with rhizomatous (underground stem) growth, pulling roots is not generally recommended since it may stimulate new shoot production. Careful hand removal is a strategy recommended for rapid response to a Eurasian water milfoil establishment and for private landowners who wish to remove small areas of curly leaf pondweed growth. Raking is recommended to clear nuisance growth in riparian area corridors up to 20 feet wide.

SCUBA divers may engage in manual removal for invasive species like Eurasian water milfoil. Care must be taken to ensure that all plant fragments are removed from the lake. Manual removal with divers is recommended for shallow areas with sporadic EWM growth.

Mechanical Control[9]

Larger-scale control efforts require more mechanization. Mechanical cutting, mechanical harvesting, diver-operated suction harvesting, and rotovating (tilling) are the most common forms of mechanical control available. WDNR permits under Chapter NR 109 are required for mechanical plant removal.

Aquatic plant harvesters are floating machines that cut and remove vegetation from the water. The cutter head uses sickles similar to those found on farm equipment, and generally cut to depths from one to six feet. A conveyor belt on the cutter head brings the clippings onboard the machine for storage. Once full, the harvester travels to shore to discharge the load of weeds off the vessel.

The size, and consequently the harvesting capabilities, of these machines vary greatly. As they move, harvesters cut a swath of aquatic plants that is between 4 and 20 feet wide, and can be up to 10 feet deep. The on-board storage capacity of a harvester ranges from 100 to 1000 cubic feet (by volume) or 1 to 8 tons (by weight).

In some cases the plants are transported to shore by the harvester itself for disposal, while in other cases a barge is used to store and transport the plants in order to increase the efficiency of the cutting process. The plants are deposited on shore, where they can be transported to a local farm (the nutrient content of composted aquatic plants is comparable to that of cow manure) or to an upland landfill for proper disposal. Most harvesters can cut between 2 and 8 acres of aquatic vegetation per day, and the average lifetime of a mechanical harvester is 10 years.

Mechanical harvesting of aquatic plants presents both positive and negative consequences to any lake. Its results—open water and accessible boat lanes—are immediate, and can be enjoyed without the restrictions on lake use which follow herbicide treatments. In addition to the human use benefits, the clearing of thick aquatic plant beds may also increase the growth and survival of some fish. By eliminating the upper canopy, harvesting reduces the shading caused by aquatic plants. The nutrients stored in the plants are also removed from the lake, and the sedimentation that would normally occur as a result of the decaying of this plant matter is prevented. Additionally, repeated treatments may result in thinner, more scattered growth.

Aside from the obvious effort and expense of harvesting aquatic plants, there are many environmentally detrimental consequences to consider. The removal of aquatic species during harvesting is non-selective. Native and invasive species alike are removed from the target area. This loss of plants results in a subsequent loss of the functions they perform, including sediment stabilization and wave absorption. Shoreline erosion may therefore increase. Other organisms such as fish, reptiles, and insects are often displaced or removed from the lake in the harvesting process. This may have adverse effects on these organisms' populations as well as the lake ecosystem as a whole.

While the enjoyed results of harvesting aquatic plants may be short term, the negative consequences are not so short lived. Much like mowing a lawn, harvesting must be conducted numerous times throughout the growing season. Although the harvester collects most of the plants that it cuts, some plant fragments inevitably persist in the water. This may allow the invasive plant species to propagate and colonize in new, previously unaffected areas of the lake. Harvesting may also result in re-suspension of contaminated sediments and the excess nutrients they contain.

Disposal sites are a key component when considering the mechanical harvesting of aquatic plants. The sites must be on shore and upland to make sure the plants and their reproductive structures don't make their way back into the lake or to other lakes. The number of available disposal sites and their distance from the targeted harvesting areas will determine the efficiency of the operation, in terms of time as well as cost.

Timing is also important. The ideal time to harvest, in order to maximize the efficiency of the harvester, is just before the aquatic plants break the surface of the lake. For curly leaf pondweed, it should also be before the plants form turions to avoid spreading of the turions within the lake. If the harvesting is conducted too early, the plants will not be close enough to the surface, and the cutting will not do much damage to them. If too late, there may be too much plant matter on the surface of the lake for the harvester to cut effectively.

If the harvesting work is contracted, be sure to inspect the equipment before and after it enters the lake. Since these machines travel from lake to lake, they may carry plant fragments with them, and facilitate the spread of aquatic invasive species from one body of water to another. One must also consider prevailing winds, since cut vegetation can be blown into open areas of the lake or along shorelines.

Diver dredging operations use pump systems to collect plant and root biomass. The pumps are mounted on a barge or pontoon boat. The dredge hoses are from 3 to 5 inches in diameter and are handled by one diver. The hoses normally extend about 50 feet in front of the vessel. Diver dredging is especially effective against the pioneering establishment of submersed invasive plant species. When a weed is discovered in a pioneering state, this methodology can be considered. To be effective, the entire plant, including the subsurface portions, should be removed.

Plant fragments can result from this type of operation, but fragmentation is not as great a problem when infestations are small. Diver dredging operations may need to be repeated more than once to be effective. When applied to a pioneering infestation, control can be complete. However, periodic inspections of the lake should be performed to ensure that all the plants have been found and collected.

Lake substrates play an important part in the effectiveness of a diver dredging operation. Soft substrates are very easy to work in. Divers can remove the plant and root crowns with little difficulty. Hard substrates, however, pose more of a problem. Divers may need hand tools to help dig the root crowns out of hardened sediment.

Rotovation involves using large underwater rototillers to remove plant roots and other plant tissue. Rotovators can reach bottom sediments to depths of 20 feet. Rotovating may significantly affect non-target organisms and water quality as bottom sediments are disturbed. However, the suspended sediments and resulting turbidity produced by rotovation settles fairly rapidly once the tiller has passed. Tilling contaminated sediments could possibly release toxins into the water column. If there is any potential of contaminated sediments in the area, further investigation should be performed to determine the potential impacts from this type of treatment. Tillers do not operate effectively in areas with many underwater obstructions such as trees and stumps. If operations are releasing large amounts of plant material, harvesting equipment should be on hand to collect this material and transport it to shore for disposal.

Biological Control[9]

Biological control is the purposeful introduction of parasites, predators, and/or pathogenic microorganisms to reduce or suppress populations of plant or animal pests. Biological control counteracts the problems that occur when a species is introduced into a new region of the world without a complex or assemblage of organisms that feed directly upon it, attack its seeds or progeny through predation or parasitism, or cause severe or debilitating diseases. With the introduction of native pests to the target invasive organism, the exotic invasive species may be maintained at lower densities.

Weevils

Weevils have potential for use as a biological control agent against Eurasian water milfoil. There are several documented "natural" declines of EWM infestations. In these cases, EWM was not eliminated but its abundance was reduced enough so that it did not achieve dominance. These declines are attributed to an ample population of native milfoil weevils (*Euhrychiopsis lecontei*).

Weevils feed on native milfoils but will shift preference over to EWM when it is present. Lakes where weevils can become an effective control have an abundance of native Northern water milfoil and fairly extensive natural shoreline where the weevils can over winter. Because native milfoils are susceptible to higher doses of herbicides, any control strategy for EWM that would also harm native milfoil may hinder the ability of this natural bio-control agent. Lakes with large bluegill populations are not good candidates for weevils because bluegills feed on the weevils. The presence and efficacy of stocking weevils in EWM lakes is being evaluated in Wisconsin lakes. So far, stocking does not appear to be effective.

The effectiveness of biocontrol efforts varies widely (Madsen, 2000). Beetles are commonly used to control Purple loosestrife populations in Wisconsin with good success. As mentioned above, weevils are used as an experimental control for Eurasian water milfoil once the plant is established. Tilapia and carp are used to control the growth of filamentous algae in ponds. Grass carp, an herbivorous fish, is sometimes used to feed on pest plant populations, but grass carp introduction is not allowed in Wisconsin.

There are advantages and disadvantages to the use of biological control as part of an overall aquatic plant management program. Advantages include longer-term control relative to other technologies, lower overall costs, and plant-specific control. On the other hand there are several disadvantages to consider, including very long control times (years instead of weeks), a lack of available agents for particular target species, and relatively specific environmental conditions necessary for success.

Biological control is not without risks; new non-native species introduced to control a pest population may cause problems of its own. Biological control is not currently proposed for management of aquatic plants in Lake 26, although it will be considered for Purple loosestrife control.

Re-vegetation with Native Plants[11]

Another aspect to biological control is native aquatic plant restoration. The rationale for re- vegetation is that restoring a native plant community should be the end goal of most aquatic plant management programs (Nichols 1991; Smart and Doyle 1995). However, in communities that have only recently been

invaded by nonnative species, a propagule (seed) bank probably exists that will restore the community after nonnative plants are controlled (Madsen, Getsinger, and Turner, 1994). Re-vegetation following plant removal is probably not necessary on Lake 26 because a healthy, diverse native plant population is present.

Physical Control[9]

In physical management, the environment of the plants is manipulated, which in turn acts upon the plants. Several physical techniques are commonly used: dredging, drawdown, benthic (lake bottom) barriers, and shading or light attenuation. Because they involve placing a structure on the bed of a lake and/or affect lake water level, a Chapter 30 or 31 DNR permit would be required.

Dredging removes accumulated bottom sediments that support plant growth. Dredging is usually not performed solely for aquatic plant management but to restore lakes that have been filled in with sediments, have excess nutrients, need deepening, or require removal of toxic substances (Peterson 1982). Lakes that are very shallow due to sedimentation tend to have excess plant growth. Dredging can form an area of the lake too deep for plants to grow, thus creating an area for open water use (Nichols 1984). By opening more diverse habitats and creating depth gradients, dredging may also create more diversity in the plant community (Nichols 1984). Results of dredging can be very long term. However, due to the cost, environmental impacts, and the problem of disposal, dredging should not be performed for aquatic plant management alone. It is best used as a lake remediation technique. Dredging is not suggested for Lake 26 as part of the aquatic plant management plan.

Benthic barriers or other bottom-covering approaches are another physical management technique. The basic idea is to cover the plants with a layer of a growth-inhibiting substance. Many materials have been used, including sheets or screens of organic, inorganic, and synthetic materials; sediments such as dredge sediment, sand, silt or clay; fly ash; and various combinations of the above materials (Cooke 1980b; Nichols 1974; Perkins 1984; Truelson 1984). The problem with using sediments is that new plants establish on top of the added layer (Engel and Nichols 1984). The problem with synthetic sheeting is that the gasses evolved from plant and sediment decomposition collect underneath and lift the barrier (Gunnison and Barko 1992). Benthic barriers will typically kill the plants under them within 1 to 2 months, after which time they may be removed (Engel 1984). Sheet color is relatively unimportant; opaque (particularly black) barriers work best, but even clear plastic barriers will work effectively (Carter et al. 1994). Sites from which barriers are removed will be rapidly re-colonized (Eichler et al. 1995). Synthetic barriers, if left in place for multi-year control, will eventually become sediment-covered and will allow colonization by plants. Benthic barriers may be best suited to small, high-intensity use areas such as docks, boat launch areas, and swimming areas. However, they are too expensive to use over widespread areas, and heavily affect benthic communities by removing fish and invertebrate habitat. A WDNR permit would be required for a benthic barrier.

Shading or light attenuation reduces the light plants need to grow. Shading has been achieved by fertilization to produce algal growth, by application of natural or synthetic dyes, shading fabric, or covers, and by establishing shade trees (Dawson 1981, 1986; Dawson and Hallows 1983; Dawson and Kern-Hansen 1978; Jorga et al. 1982; Martin and Martin 1992; Nichols 1974).

During natural or cultural eutrophication, algae growth alone can shade aquatic plants (Jones et al. 1983). Although light manipulation techniques may be useful for narrow streams or small ponds, in general these techniques are of only limited applicability. Physical control is not currently proposed for management of aquatic plants in Lake 26.

Herbicide and Algaecide Treatments

Herbicides are chemicals used to kill plant tissue. Currently, no product can be labeled for aquatic use if it poses more than a one in a million chance of causing significant damage to human health, the environment, or wildlife resources. In addition, it may not show evidence of biomagnification, bioavailability, or persistence in the environment (Joyce, 1991). Thus, there are a limited number of active ingredients that are assured to be safe for aquatic use (Madsen, 2000).

An important caveat is that these products are considered safe when used according to the label. The U.S. Environmental Protection Agency (EPA)-approved label gives guidelines protecting the health of the environment, the humans using that environment, and the applicators of the herbicide. WDNR permits under Chapter NR 107 are required for herbicide application.

General descriptions of herbicide classes are included below.[9]

Contact herbicides

Contact herbicides act quickly and are generally lethal to all plant cells that they contact. Because of this rapid action, or other physiological reasons, they do not move extensively within the plant and are effective only where they contact plants directly. They are generally more effective on annuals (plants that complete their life cycle in a single year). Perennial plants (plants that persist from year to year) can be defoliated by contact herbicides, but they quickly resprout from unaffected plant parts. Submersed aquatic plants that are in contact with sufficient concentrations of the herbicide in the water for long enough periods of time are affected, but regrowth occurs from unaffected plant parts, especially plant parts that are protected beneath the sediment. Because the entire plant is not killed by contact herbicides, retreatment is necessary, sometimes two or three times per year. **Endothall, diquat,** and **copper** are contact aquatic herbicides.

Systemic herbicides

Systemic herbicides are absorbed into the living portion of the plant and move within the plant. Different systemic herbicides are absorbed to varying degrees by different plant parts. Systemic herbicides that are absorbed by plant roots are referred to as soil active herbicides and those that are absorbed by leaves are referred to as foliar active herbicides. **2,4-D, dichlobenil, fluridone, and glyphosate** are systemic aquatic herbicides. When applied correctly, systemic herbicides act slowly in comparison to contact herbicides. They must move to the part of the plant where their site of action is. Systemic herbicides are generally more effective for controlling perennial and woody plants than contact herbicides. Systemic herbicides also generally have more selectivity than contact herbicides.

Broad spectrum herbicides

Broad spectrum (sometimes referred to as nonselective) herbicides are those that are used to control all or most species of vegetation. This type of herbicide is often used for total vegetation control in areas such as equipment yards and substations where bare ground is preferred. **Glyphosate** is an example of a broad spectrum aquatic herbicide. **Diquat, endothall, and fluridone** are used as broad spectrum aquatic herbicides, but can also be used selectively under certain circumstances.

Selective herbicides

Selective herbicides are those that are used to control certain plants but not others. Herbicide selectivity is based upon the relative susceptibility or response of a plant to an herbicide. Many related physical and biological factors can contribute to a plant's susceptibility to an herbicide. Physical factors that contribute to selectivity include herbicide placement, formulation, timing, and rate of application. Biological factors that affect herbicide selectivity include physiological factors, morphological factors, and stage of plant growth.

Environmental considerations

Aquatic communities consist of aquatic plants including macrophytes (large plants) and phytoplankton (free floating algae), invertebrate animals (such as insects and clams), fish, birds, and mammals (such as muskrats and otters). All of these organisms are interrelated in the community. Organisms in the community require a certain set of physical and chemical conditions to exist such as nutrient requirements, oxygen, light, and space. Aquatic weed control operations can affect one or more of the organisms in the community, and in turn affect other organisms or weed control operations. These operations can also impact water chemistry which may result in further implications for aquatic organisms.

Copper

Copper is a naturally occurring element that is essential at low concentrations for plant growth. It does not break down in the environment, but it forms insoluble compounds with other elements and is bound to charged particles in the water. It rapidly disappears from water after application as an herbicide. Because it is not broken down, it can accumulate in bottom sediments after repeated or high rates of application. Accumulation rarely reaches levels that are toxic to organisms or significantly above background concentrations in the sediment.

2,4-D

2,4-D photodegrades on leaf surfaces after being applied to leaves, and is broken down by microbial degradation in water and in sediments. Complete decomposition usually takes about 3 weeks in water but can be as short as 1 week. 2,4-D breaks down into naturally occurring compounds.

Diquat

When applied to enclosed ponds for submersed weed control, Diquat is rarely found longer than 10 days after application and is often below detection levels 3 days after application. The most important reason

for the rapid disappearance of Diquat from water is that it is rapidly taken up by aquatic vegetation and bound tightly to particles in the water and bottom sediments. When bound to certain types of clay particles, Diquat is not biologically available. When Diquat is bound to organic matter, it can be slowly degraded by microorganisms. When Diquat is applied foliarly, it is degraded to some extent on the leaf surfaces by photodegradation. Because it is bound in the plant tissue, a proportion is probably degraded by microorganisms as the plant tissue decays.

Endothall

Like 2,4-D, Endothall is rapidly and completely broken down into naturally occurring compounds by microorganisms. The by-products of Endothall dissipation are carbon dioxide and water. Complete breakdown usually occurs in about 2 weeks in water and 1 week in bottom sediments.

Fluridone

Dissipation of Fluridone from water occurs mainly by photodegradation. Metabolism by tolerant organisms and microbial breakdown also occurs, and microbial breakdown is probably the most important method of breakdown in bottom sediments. The rate of breakdown of Fluridone is variable and may be related to time of application. Applications made in the fall or winter, when the sun's rays are less direct and days are shorter, result in longer half-lives. Fluridone usually disappears from pondwater after about 3 months but can remain up to 9 months. It may remain in bottom sediment between 4 months and 1 year.

Glyphosate

Glyphosate is not applied directly to water for weed control, but when it does enter the water it is bound tightly to dissolved and suspended particles and to bottom sediments and becomes inactive. Glyphosate is broken down into carbon dioxide, water, nitrogen, and phosphorus over a period of several months.

Copper Compounds

Copper-based compounds are generally used to treat filamentous algae. Common chemicals used are copper sulfate and Cutrine Plus, a chelated copper algaecide.

Herbicide Use to Manage Invasive Species

Eurasian water milfoil

The WDNR identifies the following herbicides for control of Eurasian water milfoil: 2,4-D, Diquat, and Endothall. All of these herbicides with the exception of Diquat are available in both granular and liquid formulations. It is possible to target invasive species by using the appropriate herbicide and timing. The herbicide 2,4-D is most commonly used to treat EWM in Wisconsin. This herbicide kills dicots including native aquatic species such as northern water milfoil, coontail, water lilies, spatterdock, and watershield.

Early season (April to May) treatment of Eurasian water milfoil is recommended to limit the impact on native aquatic plant populations because EWM tends to grow before native aquatic plants.

Granular herbicide formulations are more expensive than liquid formulations (per active ingredient). However, granular formulations release the active ingredient over a longer period of time. Granular formulations, therefore, may be more suited to situations where herbicide exposure time will likely be limited, as is the case in small bands or blocks. In large, shallow lakes with widespread EWM, a whole lake treatment with a low rate of liquid herbicide may be most cost effective because exposure time is greater. Factors that affect exposure time are size and configuration of treatment area, water flow, and wind.

Application rates for liquid and granular formulations are not interchangeable. A rate of 1 to 1.5 mg/L 2,4-D applied as a liquid is a middle rate that will require a contact time of 36 to 48 hours. Application rates recommended for Navigate (granular 2,4-D) are 100 pounds per acre for depths of 0 to 5 feet, 150 pounds per acre for 5 to 10 feet, and 200 pounds per acre for depths greater than 10 feet.

Curly leaf pondweed

The WDNR identifies three herbicides for control of curly leaf pondweed: Diquat, Endothall, and Fluridone. Fluridone requires exposure of 30 to 60 days making it infeasible to target a discreet area in a lake system. The other herbicides act more rapidly. Herbicide labels provide water use restriction following treatment. Diquat (Reward) has the following use restrictions: drinking water 1-3 days, swimming and fish consumption 0 days. Endothall (Aquathol K) has the following use restrictions: drinking water 7 – 25 days, swimming 0 days, fish consumption 3 days.

Studies have demonstrated that curly leaf pondweed can be controlled with Aquathol K (a formulation of Endothall) in 50 to 60 degree F water, and that treatments of CLP this early in its life cycle can prevent turion formation. Since curly leaf pondweed is actively growing at these low water temperatures and many native aquatic plants are still dormant, early season treatment selectively targets curly leaf pondweed. Staff from the Minnesota Department of Natural Resources and the U.S Army Engineer Research and Development Center are conducting trials of this method.

Because the dosage is at lower rates than the dosage recommended on the label, a greater herbicide residence time is necessary. To prevent drift of herbicide and allow greater contact time, application in shallow bays is likely to be most effective. Herbicide applied to a narrow band of vegetation along the shoreline is likely to drift, rapidly decrease in concentration, and be rendered ineffective.

Management Options for Aquatic Plants				
Option	**Permit Needed?**	**How it Works**	**PROS**	**CONS**
No Management	No	Do not actively manage aquatic plants	Minimizing disturbance can protect native species that provide habitat for aquatic fauna, reduce shoreline erosion, may improve water clarity, and may limit spread of invasive species. No financial cost. No system disturbance. No unintended effects of chemicals. Permit not required.	May allow small populations of invasive plants to become larger, and more difficult to control later. Excessive plant growth can hamper navigation and recreational use. May require modification of lake users' behavior and perception.
Mechanical Control	May be required under NR 109	Plants reduced by mechanical means. Wide range of techniques, from manual to highly mechanized.	Flexible control. Can balance habitat and recreational needs.	Must be repeated, often more than once per season. Can suspend sediments and increase turbidity and nutrient release.
Hand pulling/raking	Yes/No	SCUBA divers or snorkelers remove plants by hand or plants are removed with a rake. Works best in soft sediments.	Little to no damage done to the lake or to native plant species. Can be highly selective. Can be done by shoreline property owners without permits within an area <30 feet wide OR where selectively removing exotics.	Very labor intensive. Needs to be carefully monitored. Roots, runners, even fragments of some species, particularly EWM will start new plants, so all of the plant must be removed. Small-scale control only.
Harvesting	Yes	Plants are "mowed" at depths of 2-5 feet. Harvest invasives only if invasive is already present throughout the lake.	Immediate results. EWM removed before it has the opportunity to auto-fragment, which may create more fragments than created by harvesting. Harvested lanes through dense weed beds can increase growth and survival of some fish. Can remove some nutrients from the lake.	Not selective in species removed. Fragments of vegetation can re-root sometimes causing increased invasive species expansion. Can remove some small fish and reptiles from the lake. Initial cost of the harvester is expensive.

Option	Permit Needed?	How it Works	PROS	CONS
Biological Control	Yes	Living organisms (e.g. insects or fungi) eat or infect plants.	Self-sustaining; organism will over-winter, resume eating its host the next year. Lowers density of problem plant to allow the growth of natives.	Effectiveness will vary as control agent's population fluctuates. Provides moderate control – complete control unlikely. Control response may be slow. Must have enough control agent to be effective.
Weevils on EWM	Yes	Native weevil prefers EWM to other native water-milfoils.	Native to Wisconsin – weevil cannot "escape" and become a problem. Selective control of target species. Longer-term control with limited management.	Need to stock large numbers, even if there are some already present. Need good habitat for overwintering on shore (leaf litter) associated with undeveloped shorelines. Bluegill populations decrease densities through predation.
Pathogens	Yes	Fungal, bacterial, or viral pathogen introduced to target species to induce mortality.	May be species specific. May provide long term control. Few dangers to humans or animals.	Largely experimental; effectiveness and longevity unknown. Possible side effects not understood.
Allelopathy	Yes	Aquatic plants release chemical compounds that inhibit other plants from growing.	May provide long-term, maintenance-free control. Spikerushes (*Eleocharis spp*.) appear to inhibit EWM growth.	Initial transplanting slow and labor-intensive. Spikerushes native to WI, and have not effectively limited EWM growth. Wave action along the shore makes it difficult to establish plants; plants will not grow in deep turbid water.
Native Plantings	Yes	Diverse native plant community established to compete with invasive species.	Native plants provide food and habitat for aquatic fauna. Diverse native community more repellant to invasive species.	Initial transplanting slow and labor-intensive. Nuisance invasive plants may outcompete plantings. Transplants from another lake or nursery may unintentionally introduce invasive species.

Option	Permit Needed?	How it Works	PROS	CONS
Physical Control	Yes	Plants are reduced by altering variables that affect growth, such as water depth or light levels.	Varies by treatment.	Varies by treatment.
Fabrics/Bottom Barriers	Yes	Prevents light from getting to the lake bottom.	Reduces turbidity in soft-substrate areas. Useful for small areas.	Eliminates all plants, including native plants important to a healthy lake ecosystem. May inhibit spawning of some fish, and affects benthic invertebrates. Needs maintenance or will become covered in sediment and be ineffective. Gas accumulation under the blankets can cause them to dislodge from the bottom. Anaerobic environment forms that can release excessive nutrients from the sediment.
Drawdown	Yes, may require an environmental assessment.	Lake water lowered with siphon or water control device; plants killed when sediment dries, compacts, or freezes. Season or duration of drawdown can change effects.	Winter drawdown can be effective at restoration, provided drying and freezing occur. Sediment compaction is possible over winter. Summer drawdown can restore large portions of shoreline and shallow areas as well as provide sediment compaction. Emergent plant species often rebound near shore providing fish and wildlife habitat, sediment stabilization, and increased water quality. Success demonstrated for reducing EWM, variable success for curly leaf pondweed (CLP).	Plants with large seed bank or propagules that survive drawdown may become more abundant upon refilling. May impact attached wetlands and shallow wells near shore. Species growing in deep water (e.g. EWM) that survive might increase, particularly if desirable native species are reduced. Can affect fish, particularly in shallow lakes if oxygen levels drop or if water levels are not restored before spring spawning. Winter drawdown must start in early fall or will kill hibernating reptiles and amphibians. Navigation and use of lake is limited during a drawdown.

Option	Permit Needed?	How it Works	PROS	CONS
Dredging	Yes	Plants are removed along with sediment. Most effective when soft sediments overlay a harder substrate. For extremely impacted systems. Extensive planning required.	Increases the water depth. Removes nutrient rich sediments. Removes soft bottom sediments that may have high oxygen demand.	Severe impact on the lake ecosystem. Increases turbidity and releases nutrients. Exposed sediments may be recolonized by invasive species. Sediment testing may be necessary. Removes benthic organisms. Dredged materials must be disposed of.
Dyes	Yes	Colors the water, reducing light. This reduces plant and algal growth.	Impairs plant growth without increasing turbidity. Usually non-toxic, degrades naturally over a few weeks.	Appropriate for very small waterbodies. Should not be used in a pond or lake having an outflow. Impairs aesthetics. Effects to microscopic organisms unknown.
Non-point source nutrient control	No	Runoff of nutrients from the watershed are reduced (e.g. by controlling construction erosion or reducing fertilizer use) thereby providing fewer nutrients available for growth.	Attempts to correct source of the problem, not treat symptoms. Could improve the water clarity and reduce occurrences of algal blooms. Native plants may be able to better compete with invasive species in low-nutrient conditions.	Results can take years to be evident due to internal recycling of already present lake nutrients. Requires landowner cooperation and regulation. Improved water clarity may increase plant growth.
Chemical Control	Required under NR 107	Granules or liquid chemicals kill plants or cease algal growth. Chemical must be used to label guidelines.	Results usually within 10 days of treatment, but repeat treatments may be needed. Some flexibility for different situations. Some can be selectively applied. Can be used for restoration activities.	Possible toxicity to aquatic animals or humans, especially applicators. Often affect desirable plant species that are important to lake ecology. Treatment set-back requirements from potable water sources and/or drinking water. May cause severe drop in dissolved oxygen.

Option	Permit Needed?	How it Works	PROS	CONS
2, 4-D	Yes	Systemic herbicide selective to broadleaf plants that inhibits cell division in new tissue. Applied as a liquid or granules during early plant growth phase.	Moderately to highly effective, especially on EWM. Monocots, such as pondweeds (e.g. CLP) and many other native species are not affected. Can be used in synergy with endothall for early season CLP and EWM treatments. Can be selective depending on concentration and seasonal timing. Widely used aquatic herbicide.	May cause oxygen depletion after plants die and decompose. May affect native dicots such as water lilies and coontail. Can be used in combination with copper herbicides (used for algae). Toxic to fish.
Endothall (e.g. Aquathol)	Yes	Broad-spectrum, contact herbicide that inhibits protein synthesis. Applied as liquid or as granules.	Especially effective on CLP and also effective on EWM. May be effective in reducing reestablishment of CLP if reapplied several years in a row during early spring. Can be selective depending on concentration and seasonal timing. Can be combined with 2, 4-D for early season CLP and EWM treatments, or with copper compounds. Limited off-site drift.	Affects many native pondweeds. Not as effective in dense plant beds; heavy vegetation requires multiple treatments. Not to be used in water supplies; post-treatment restriction on irrigation. Toxic to aquatic fauna (to varying degrees).
Diquat (e.g. Reward)	Yes	Broad-spectrum, contact herbicide that disrupts cellular functioning. Applied as a liquid, can be combined with copper treatments.	Mostly used for water-milfoil and duckweed. Rapid action. Limited direct toxicity on fish and other animals.	May affect non-target plants, especially native pondweeds, coontail, elodea, and naiads. Toxic to aquatic invertebrates. Must be reapplied several years in a row. Ineffective in muddy or cold water (<50F).

Option	Permit Needed?	How it Works	PROS	CONS
Fluridone (e.g. Sonar or Avast)	Yes; special permit and environmental assessment may be required.	Broad-spectrum, systemic herbicide that inhibits photosynthesis. Must be applied during the early growth stage. Available with a special permit only; chemical applications beyond 150 feet from shore are not allowed under NR 107. Applied at very low concentration at whole lake scale.	Effective on EWM for 1 to 4 years with aggressive follow-up treatments. Some reduction in non-target effects can be achieved by lowering dosage. Slow decomposition of plants may limit decreases in dissolved oxygen. Low toxicity to aquatic animals.	Affects native milfoils, coontail, elodea, and naiads, even at low concentrations. Requires long contact time: 60-90 days. Often decreases water clarity, particularly in shallow eutrophic systems. Demonstrated herbicide resistance in hydrilla subjected to repeat treatments. Unknown effect of repeat whole-lake treatments on lake ecology.
Glyphosphate (e.g. Rodeo)	Yes	Broad-spectrum, systemic herbicide that disrupts enzyme formation and function. Usually used for purple loosestrife stems or cattails. Applied as a liquid spray or painted on.	Effective on floating and emergent plants. Selective if carefully applied to individual plants. Non-toxic to most aquatic animals at recommended dosages. Effective control for 1-5 years.	RoundUp is often illegally substituted for Rodeo; surfactants in RoundUp believed to be toxic to reptiles and amphibians. Human exposure should be limited as well. Cannot be used near potable water intakes. Ineffective in muddy water. No control of submerged plants.
Triclopyr (e.g. Renovate)	Yes	Systemic herbicide selective to broadleaf plants that disrupts enzyme function. Applied as liquid spray.	Effective on many emergent and floating plants. Most effective on dicots, such as purple loosestrife; may be more effective than glyphosate. Control of target plants occur in 3-5 weeks. Low toxicity to aquatic animals. No recreational use restrictions following treatment.	Impacts may occur to some native plants at higher doses (e.g. coontail). May be toxic to sensitive invertebrates at higher concentrations. Retreatment opportunities may be limited due to maximum seasonal rate (2.5 ppm). Sensitive to UV light; sunlight can break herbicide down prematurely.

Option	Permit Needed?	How it Works	PROS	CONS
Copper compounds (e.g. Cutrine Plus)	Yes	Broad-spectrum, systemic herbicide that prevents photosynthesis. Used to control planktonic and filamentous algae. Wisconsin allows small-scale control only.	Reduces algal growth and increases water clarity. No recreational or agricultural restrictions on water use following treatment. Herbicidal action on hydrilla.	Elemental copper accumulates and persists in sediments. Short-term results. Long-term effects of repeat treatments to benthic organisms unknown. Toxic to invertebrates, trout and other fish, depending on the hardness of the water. Clear water may increase plant growth.

APPENDIX C: AQUATIC PLANT CONTROL NOT ALLOWED IN WISCONSIN

Aquatic Plant Control Techniques Not Allowed in Wisconsin			
Option	**How it works**	**PROS**	**CONS**
Biological Control			
Carp	Plants are eaten by stocked carp.	Effective at removing aquatic plants. Involves species already present in Madison Lakes.	Illegal to transport or stock carp in Wisconsin. Carp cause re-suspension of sediments, increased water temperature, lower dissolved oxygen levels, and reduction of light penetration. Widespread plant removal deteriorates habitat for other fish and aquatic organisms. Complete alteration of fish assemblage possible. Dislodging of plants such as EWM and CLP can lead to accelerated spreading of the plants.
Crayfish	Plants are eaten by stocked crayfish.	Reduces macrophyte biomass.	Illegal to transport or stock crayfish in Wisconsin. Control not selective and may deteriorate the plant community. Not successful in productive, soft-bottom lakes with many fish predators. Complete alteration of fish assemblage possible.
Mechanical Control			
Cutting (no removal)	Plants are “mowed” with underwater cutter.	Creates open water areas rapidly. Works in water up to 25 feet.	Root system remains for regrowth. Fragments of vegetation can re-root and spread infestation throughout the lake. Nutrient release can cause increased algae and bacteria and be a nuisance to riparian land owners. Not selective in species removed. Small-scale control only.
Rototilling	Sediment is tilled to uproot plants and stems. Works in deep water (17 feet).	Decreases stem density, can affect entire plant. Small-scale control. May provide long-term control.	Creates turbidity. Not selective in species removed. Fragments of vegetation can re-root. Complete elimination of fish habitat. Releases nutrients into the water column. Increased likelihood of invasive species recolonization.
Hyrdroraking	Mechanical rake removes plants from the lake. Works in deep water (14 feet).	Creates open water areas rapidly.	Fragments of vegetation can re-root, and creates turbidity in the lake. Requires plant disposal. May impact the lake fauna. Plants re-grow quickly.

APPENDIX D: LAKE 26 USER SURVEY

Lake 26 User Survey

Section 1 – Residency

These first few questions will help us to determine who is responding to this survey and how those people would like to use Lake 26. If you have more than one property on the lake, please comment on the one property you have had the longest.

1. How is your property on Lake 26 utilized? If you have more than one type of property, please report on only the property you have had the longest. *(Please select one)*

3 Permanent residence	**1** Business
12 Seasonal residence	**0** Underdeveloped land
21 Weekend visits throughout the year	**4** Other_____

2. How long have you owned your property on Lake 26? ***(If less than 1 year, please write '1' in the space provided. If you own multiple properties, please comment on the one you have owned for the longest period of time.)***

I have owned the property for **28** year(s).

3. During a 12-month period (Jan. 1 – Dec. 31) how many days are you, members of your family, or guests at the property indicated in Question 1? ***(Please provide your best estimate in the space below)***

There are people at the property approximately **90** days a year.

4. On average, about how many people are at the property each time it is being used? **3.5**

Section 2 – Lake Use

The purpose of this section is to gather information on how Lake 26 is used by its residents.

1. From the list below, check all activities on Lake 26 that you, your family, or guests participate in.

29 A. Fishing from shore	**12** F. Ice fishing	**28** K. Wildlife viewing
32 B. Fishing from a boat	**7** G. Speed boating	**34** L. Canoe/Kayak/Paddle B.
35 C. Pontoon boating	**10** H. Jet Skiing	**25** M. Water skiing/Tubing
40 D. Rest/Relaxation	**0** I. Wild rice harvest	**5** N. Other (please list)
40 E. Swimming/Wading	**8** J. Sailing	**Campfires, Paddle Boards**

2. Which 3 activities from the above list do you or members of your family or guests participate in most often? ***(Write the letters of the corresponding activities in the spaces below)***

I (We) participate in **C** most often, **E** second most often, and **D** third most often.

3. During the open-water (no ice) season, how frequently do you use the lake for any of the activities listed in Question 1, this section?

5 Daily
10 Several times per week
19 3 or 4 times per month
4 Once or twice per month
2 Once or twice per open-water season

4. What type(s) of watercraft do you own, rent, or use on Lake 26? ***(Check all that apply. If you do not use any watercraft on Lake 26, please check the last box.)***

16 Motorized boat (0-50 hp)
15 Motorized boat (greater than 50 hp)
12 Paddle boat
33 Pontoon boat
9 Personal watercraft – PWC (jet ski)
34 Canoe or Kayak
9 Sailboat
5 Other **(please specify)**_____
0 I do not own, rent, or use a boat or other watercraft on Lake 26

Section 3 – Lake Stewardship

This section of the survey will provide information about the lake stewardship practices of lake property owners.

1. Which of the following do you consider the most desirable shoreline for your property? ***(Please check one)***

2 Mowed lawn at shoreline (no plantings)
2 Landscaped shoreline (ex., planted flowers, shrubs, trees)
3 Other ***(please describe)***_____
19 Managed natural vegetation at shoreline
15 Unmanaged natural vegetation at shoreline

2. Which, if any, of the following water quality/landscaping practices do you have some knowledge of? **(*Check all that apply)***

14 Rain garden
23 Shoreline buffers
14 Native prairie restoration
31 Benefits of not fertilizing
21 Using zero phosphorus fertilizers
16 Diversion of surface water runoff away from the lake
19 Natural shoreline restoration
17 Septic system upgrade
18 Native flower/tree planting
1 Other ***(please describe)***_____
_____
4 Not familiar with any of these ***(skip to Question 4)***

3. Which, if any, of the following water quality/landscaping practices have been installed or do you practice on your property on Lake 26? **(*Check all that apply)***

1 Rain garden
17 Shoreline buffers
2 Native prairie restoration
30 Benefits of not fertilizing
12 Using zero phosphorus fertilizers
10 Diversion of surface water runoff away from the lake
14 Natural shoreline restoration
9 Septic system upgrade
8 Native flower/tree planting
2 Other ***(please describe)***_____
_____
0 None of the above water quality/landscaping practices

4. Which, if any, of the following outcomes might motivate you to install a water quality/landscaping practice on your property? ***(Check all that apply)***

22 A. Increasing the natural beauty of your property
29 B. Improving the water quality of Lake 26
22 C. Improving the water quality around your property's shoreline
26 D. Providing better habitat for fish
23 E. Providing better habitat for birds and wildlife
16 F. Setting an example for other lake residents
8 G. Less lawn mowing time
22 H. A property tax rebate
20 I. Financial assistance that pays a portion of the cost/installation
15 J. Technical assistance that would evaluate my property for water quality concerns
18 K. Technical assistance that would identify appropriate practices to install
1 L. Other ***(please describe)***_____
4 M. I have no interest in installing additional practices or brand new practices on my property **(skip to question 6)**

5. From the list above, select your first and second strongest motivators. ***(Write the letters of the corresponding activities in the spaces below)***

B (23) Strongest motivator **A & C (7)** Second strongest motivator

6. What type of septic system do you have on your property? ***(Select all that apply)***

1 Mound system
2 At-grade system
13 Convention system
4 Other ***(please list)*** **Unsure**
19 Holding tank
8 Lift pump system
1 None ***(skip to Section 4)***

7. How many years ago was your septic system last inspected? ***(Please provide your best recall)***

35 1-5 years **4** 6-10 years **1** 11+ years **0** Never **1** Not Sure

8. When was your septic system last 'pumped' or 'sewered'? ***(Please provide your best recall)***

38 1-5 years **4** 6-10 years **1** 11+ years **0** Never **1** Not Sure

Section 4 – Lake Issues

The questions in this section pertain to various possible issues in Lake 26 including water quality, lake level, and aquatic plant growth.

1. Below are numerous issues that may negatively affect your use of Lake 26. From the list below, please mark all of the issues that are of concern to you.

15 A. Poor quality fishing	**5** J. Too much shoreline lighting
17 B. Too much public use	**0** K. Too much wild rice
0 C. Not enough weed growth	**0** L. Not enough wild rice
10 D. Poorly maintained boat access	**9** M. Too much weed growth (not including algae)
8 E. Low water level in the lake	**27** N. Introduction of undesirable aquatic plants and animals
2 F. High water level in the lake	**2** O. Nuisance wildlife (please specify) _____
16 G. Overdevelopment of the shoreline	**3** P. Other (please specify) _____
8 H. Foul or offensive odor	**3** Q. Not concerned about any of these issues ***(Skip to Question 3)***
15 I. "Icky" or "green" water	

2. Which **three** issues from the above list are of the most concern to you? ***(Write the letters of the corresponding issues in the spaces below)***

I am most concerned about issues **N (25)** , **B (13)** , and **G (12)** .

3. In your opinion, the water quality in the summer (June – September) in Lake 26 is:

18 Excellent **22** Good **1** Fair **0** Poor **0** Very Poor **0** I don't know

4. Considering how you answered the question above, what do you think of when assessing water quality? ***(Select all that apply)***

41 Water clarity (clearness of water)	**19** Smell
18 Aquatic plant growth (excluding algae blooms)	**6** Water level
24 Water color	**10** Fish kills
18 Algae blooms	**1** Other **(please specify)**_____

5. Based on your answer above, which of the following are the TWO most important aspects when considering water quality? **Please check only TWO**.

39 Water clarity (clearness of water)	**8** Smell
9 Aquatic plant growth (excluding algae blooms)	**4** Water level
7 Water color	**1** Fish kills
12 Algae blooms	**0** Other **(please specify)**_____

6. Please check the answer that best completes the following sentence: "In my opinion, the overall level of the lake, given fluctuation with rainfall, seems to be …."

1 Too high **35** Just Right **3** Too low **2** I don't know

7. How often, if ever has low water prevented you from using Lake 26?

34 Never **6** Rarely **1** Sometimes **0** Often **0** Always **0** I don't use the lake

8. Aquatic plants (rooted and floating) are an important part of any healthy lake system. In the time that you have owned the property indicated in Section 1, Question 1, would you say the amount of visible aquatic plant growth in the lake, **excluding algae**, has:

12 Increased **3** Decreased **19** Stayed the same **7** Unsure

9. Aquatic plant growth varies throughout the open water season. Which month(s) of the season do you consider aquatic plant growth, excluding algae, to be problematic in Lake 26? ***(Check all that apply)***

0 May **1** June **6** July **20** It is never a problem
14 August **1** September **0** October **5** I don't know

SECTION 5 – Aquatic Invasive Species

This section of the survey seeks to determine how much lake residents know about aquatic invasive species. Aquatic invasive species are plants and animals that are foreign to Lake 26 and do not belong there.

Curly-leaf pondweed (CLP)

Curly-leaf pondweed has not been documented in Lake 26 but could be a threat in the future. CLP can create nuisance levels of plant growth and negatively impact water quality in a lake.

1. Prior to reading the above statement, were you aware of the potential problems CLP can cause?

11 Yes **30** No

2. Do you think you would recognize CLP in the lake if you saw it?

1 Definitely yes **5** Probably yes **4** Unsure **21** Probably not **10** Definitely not

Eurasian Watermilfoil (EWM)

Eurasian watermilfoil has not been documented in Lake 26 but could be a threat in the future. EWM can form dense beds of vegetation that interfere with many lake uses.

3. Prior to reading the above statement, were you aware of the potential problems EWM can cause?

36 Yes **5** No

4. Do you think you would recognize EWM in the lake if you saw it?

6 Definitely yes **12** Probably yes **11** Unsure **11** Probably not **1** Definitely not

Purple Loosestrife

Purple loosestrife, an invasive shoreline/wetland plant species, has not been documented in Lake 26. Purple loosestrife can take over shorelines and wetlands displacing more beneficial native plants.

5. Prior to reading the above statement, were you aware of the potential problems purple loosestrife can cause?

17 Yes **24** No

6. Do you think you would recognize purple loosestrife in the lake if you saw it?

2 Definitely yes **7** Probably yes **10** Unsure **19** Probably not **3** Definitely not

Zebra Mussel

Zebra mussel, an invasive mussel species, has not been documented in Lake 26 but could be a threat in the future. Zebra mussel can disrupt the aquatic food chain, out compete native clams and mussels, and leave sharp shells on the lake bottom and shoreline.

7. Prior to reading the above statement, were you aware of the potential problems zebra mussel can cause?

38 Yes **3** No

8. Do you think you would recognize zebra mussel in the lake if you saw it?

11 Definitely yes **17** Probably yes **6** Unsure **7** Probably not **1** Definitely not

Other Aquatic Invasive Species

9. Below is a list of additional aquatic invasive species. Please check all of those that you have heard of before.

9 Rusty crayfish	**11** Spiny waterflea	**36** Carp
25 Chinese mystery snail	**5** Banded mystery snail	**3** Hydrilla
0 New Zealand mudsnail	**3** Freshwater jellyfish	**2** Phragmites (giant reed grass)
2 Japanese knotweed		**2** I have not heard of these AIS

10. In order to gauge *potential* interest, would you be willing to take part in a training session to help you identify aquatic invasive species in the lake?

11 Definitely yes **15** Probably yes **7** Unsure **6** Probably not **1** Definitely not

SECTION 6 – Aquatic Plant Management

Currently aquatic plant growth in Lake 26 is not managed. Algae growth is also not managed. A benefit of aquatic plant management strategies is that they can also help reduce algae growth. Aquatic plants in a lake can be managed in many different ways. Sometimes no aquatic plant management may be the best option.

1. During open water season how often, if at all, does aquatic plant growth (including algae) negatively impact your enjoyment of Lake 26?

20 Never **15** Rarely **4** Sometimes **1** Often **0** Always

2. Considering your answer to the question above, do you believe aquatic plant management (which would also help reduce algae growth) is needed on Lake 26?

2 Definitely yes **6** Probably yes **19** Unsure **13** Probably not **1** Definitely not

3. Which type(s) of aquatic plants do you think should be managed on Lake 26? ***(Check all that apply)***

8 Grow below the water's surface
9 Stick out of the water
16 Float on the water's surface (non-algae)
17 Algae on the water's surface
5 Grow on the shoreline, out of the water
3 Other ***(please explain)*** _____
_____

Common Aquatic Plant Management Methods

If plant management is recommended for Lake 26, what methods might you support? Please assume that the following management methods are safe and legal, and would only be performed by professionals and only be used if approved by the State of Wisconsin. Total removal or eradication of aquatic plants is not possible.

4. Please mark whether you would support, oppose, or need more information about the use of these aquatic plant management methods on Lake 26.

Small-scale (less than 10 acres) mechanical harvesting:

10 Support **6** Oppose **23** Need more information

Large-scale (10 acres or greater) mechanical harvesting:

6 Support **10** Oppose **23** Need more information

Hand-pulling and raking in shallow waters:

18 Support **5** Oppose **16** Need more information

Small-scale (less than 10 acres) of chemical herbicide application:

5 Support **11** Oppose **23** Need more information

Large-scale (10 acres or greater) of chemical herbicide application:

4 Support	**14** Oppose	**21** Need more information

Biological control (using one live species to control another):

2 Support	**9** Oppose	**28** Need more information

No management:

7 Support	**10** Oppose	**24** Need more information

5. Have you made any attempts to remove or control aquatic plants in Lake 26 by your shore property? ***(Check one)***

30 No *(Skip to Section 7)*
0 Yes, I hired someone
11 Yes, I did it myself
0 Yes, I did some myself and I hired someone

6. What have you done to remove aquatic plants from the lake by your property? ***(Check all that apply)***

0 Hire someone to hand-pull or rake
0 Hire someone to apply chemical herbicide
0 Mechanical plant removal with boat and motor or other apparatus
11 Self-hand pull or rake
0 Self-application of chemical herbicide
0 Other **(please specify)**_____

SECTION 7 – Community Support

Local, county, state, and federal resources will be sought in addition to Lake Association funds to implement management recommendations for Lake 26. Donations of volunteer time, services, materials, and equipment can be used as match funding for many grant programs reducing the overall financial burden to the Lake Association. The following questions will help to determine your willingness to support future projects involving the implementation of aquatic plant and lake management recommendations.

1. The following are activities that lake residents could participate in. ***Please check all those activities you might be willing to volunteer your time if additional assistance is needed. This is not a commitment but rather a measure of possible assistance if needed.***

16 Watercraft inspection at the boat landings such as Clean Boats Clean Waters
21 On the water monitoring for aquatic invasive species
17 Shore land monitoring for aquatic invasive species
4 Raising beetles for purple loosestrife control
15 Native aquatic plant monitoring and identification
17 Water quality monitoring
15 Wildlife monitoring (ex. frogs, turtles, loons, other waterfowl, mussels & clams)
1 Some other activity_____
11 I am not interested in volunteering any time ***(skip to question 3)***

2. How much time would you be willing to contribute to support any of the activities in Question 1 above?

11 A few hours a year	**16** A few days a year	**2** Longer periods of time

3. Donated service needs are varied and somewhat unknown, but could include any of the options listed below. Do you think you would be willing to provide any of the services that may be necessary? This is not a commitment but rather a measure of possible assistance if needed. ***(Check all that apply)***

8 GPS use	**1** Graphic design	**0** Legal services
3 SCUBA diving	**5** Grant writing	**18** Physical labor
0 Printing services	**8** Construction services	**0** Other **(please specify)**_____
0 Garden/Landscaping design	**3** Sewing	**12** I am not interested or not able
1 Web development	**2** Outdoor design	to provide assistance

4. Have you ever attended a Lake 26 Property Owners Association meeting?

30 Yes ***(skip to Question 6)*** **11** No

5. What, if anything, has prevented you from attending a Lake 26 Property Owners Association meeting?

2 Not interested **4** I don't have time **0** I never know when they are occurring
5 Other *(please explain)* **Unavailable during meeting time**

6. The Lake 26 Property Owners Association annual meeting is generally held in the evening on the third Saturday in July. ***In the following list of meeting dates and times, please check up to three meeting dates that would work for you.***

22 The current date and time works for me
5 Hold the meeting in the afternoon on the Saturday of Memorial Day
4 Hold the meeting in the evening on the Saturday of Memorial Day
4 Hold the meeting the Saturday before Memorial Weekend
3 Hold the meeting the Saturday after Memorial Weekend
2 Hold the meeting a different day (please indicate when) **Spring, Sunday evening on Memorial Day weekend**
7 I am not interested in the Lake 26 Association annual meeting

7. What is your affiliation with the Lake 26 Property Owners Association?

36 Current member **(skip to Question 9)** **1** Former member **1** Never been a member

8. What, if anything has kept you from being a member of the association **(check all that apply)**?

0 Not interested	**0** I disagree with what they are doing
0 Dues are too high	**0** I haven't been asked to be a member
0 I did not know it existed	**0** I feel there is no benefit for being a member
1 I do not have enough time	**1** Other **Not able to attend**

9. How satisfied are you with the following aspects of Lake Association activity? If you are unfamiliar with an activity, please check the last column.

	Very Satisfied	Somewhat Satisfied	Unsure	Somewhat Dissatisfied	Very Dissatisfied	Unfamiliar with Activity
Communication with community	**25**	**7**	**1**	**1**	**0**	**5**
Meeting Frequency	**17**	**11**	**3**	**1**	**0**	**7**
Meeting atmosphere (parliamentary procedure)	**18**	**3**	**5**	**1**	**0**	**11**
Executing Lake Association business	**22**	**5**	**2**	**0**	**0**	**9**
Promoting cooperation to achieve goals and objectives	**20**	**7**	**2**	**0**	**0**	**8**
Management of Association finances	**24**	**3**	**2**	**1**	**0**	**9**
Listening to property owners' needs and concerns	**18**	**7**	**4**	**0**	**0**	**9**

10. When information from Lake 26 Property Owners Association is available, how would you most prefer to be contacted? ***(Please check one)***

10 Mail **30** Email **0** Phone **0** In person **0** I do not want to be contacted

11. If there are any additional issues you would like the Lake Association to address, please use the space below to explain.

"I would like a discussion on restricting hours for jet-ski and waterskiing times."

"Barking dogs."

"Excessive barking dogs."

"Jet-ski education regarding shoreline protection, preservation of underdeveloped shorelines, share water quality data, what does the data say about trends into the future? Would be interested in building a historical timeline of the lake, plotting of lots, lake residents 50-100 years of age, etc."

"Although it doesn't affect our use, we are very concerned about increased motor boat traffic and huge waves that are seriously eroding natural shorelines."

"All property owners should be required to join the association."

"Create focus on minimizing impact on the lake, habitat, and wildlife. Address lack of guidelines for use of motorized watercraft, noise pollution, overdevelopment, and the use of chemicals in lake and to create lawns."

"We understand that walleye used to be in Lake 26, and that the WDNR has programs to stock the lakes in WI. Could this or has it ever been addressed?"

Thank you for your time and your answers! Providing your contact information is *OPTIONAL* but if you wish to, please do! Contact information will be used for follow up if needed.

Name: _____

Address: _____City_____ State _____ Zip _____

Phone number: _____ Email address _____

APPENDIX E: AIS IDENTIFICATION

AIS Identification Fact Sheets
https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/programs/CLMN/AISfactsheets/AISfactsheetsALL.pdf

Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) Website
https://www.glerl.noaa.gov/glansis/

Wisconsin Lakes and AIS Viewer
https://dnr.wi.gov/lakes/viewer/

Minnesota Aquatic Invasive Species Research Center (MAISRC) Website
https://www.maisrc.umn.edu/

River Alliance of Wisconsin
https://www.wisconsinrivers.org/homepage/aquatic-invasive-species/

AIS Smart Prevention Tool
https://uwlimnology.shinyapps.io/AISSmartPrevention2/

U.S. Department of Agriculture AIS Webpage
https://www.invasivespeciesinfo.gov/aquatic-invasives

U.S. Fish and Wildlife Service AIS Webpage
https://www.fws.gov/fisheries/ANS/index.html

U.S. National Park Service AIS Webpage
https://www.nps.gov/subjects/invasive/aquatic-invasive-species.htm

UW-Extension Lakes AIS Monitoring
https://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/programs/clmn/AIS.aspx

WDNR AIS Website
https://dnr.wi.gov/topic/Invasives/species.asp?filterBy=Aquatic&filterVal=Y

Wisconsin Sea Grant
https://www.seagrant.wisc.edu/our-work/focus-areas/ais/

APPENDIX F: ADDITIONAL RESOURCES

Aquatic Plant Management in Wisconsin
https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/ecology/Aquatic%20Plants/APMguideFull2010.pdf

TSLPOA Website
https://lake26.org/index.html

Burnett County Ordinances
https://library.municode.com/wi/burnett_county/codes/code_of_ordinances?nodeId=CD_ORD_CH1GEPR

Burnett County Website
https://www.burnettcounty.com/

Citizen Lake Monitoring Network (CLMN)
https://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/programs/clmn/default.aspx

Clean Boats, Clean Waters (CBCW)
https://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/programs/cbcw/default.aspx

Lake 26 General Information
https://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2672500

State of the St. Croix Basin Report (2002)
https://dnr.wi.gov/water/basin/stcroix/stcroix_final_3-26-02.pdf

Strategic Analysis of Aquatic Plant Management in Wisconsin
https://dnr.wi.gov/topic/EIA/documents/APMSA/APMSA_Final_2019-06-14.pdf

WDNR Aquatic Plant Management Website
https://dnr.wi.gov/lakes/plants/

WDNR Fish Stocking Database
https://infotrek.er.usgs.gov/doc/wdnr_biology/Public_Stocking/StateMapHotspotsAllYears.htm

WDNR Surface Water Grants Page
https://dnr.wi.gov/aid/surfacewater.html

Wisconsin Administrate Code Website
https://docs.legis.wisconsin.gov/code/admin_code/nr/100

APPENDIX G: REFERENCES

References

1. Anderson, Phil, and Jim Varro, et. al. *The State of the St. Croix Basin*. Wisconsin Department of Natural Resources, Mar. 2002, dnr.wi.gov/water/basin/stcroix/stcroix_final_3-26-02.pdf. Link

2. Lake 26 Facts and Figures. *Lake 26*, Wisconsin Department of Natural Resources, https://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2453500&page=facts. Link

3. Lake 26 Water Quality Data. *Lake 26 at Deepest Point*, Wisconsin Department of Natural Resources, https://dnr.wi.gov/lakes/waterquality/Station.aspx?id=073099. Link

4. Blanke, Chelsey, and Mikulyuk, Alison, et. al. *Strategic Analysis of Aquatic Plant Management in Wisconsin.* Wisconsin Department of Natural Resources. June, 2019.

5. County, Burnett. *Code of Ordinances – Burnett County, Wisconsin. Chapter 45 – Shoreland Protection Ordinance*. February 23, 2017.

6. County, Burnett. *Code of Ordinances – Burnett County, Wisconsin. Chapter 18, Article 5 – Aquatic Plants and Invasive Animals Ordinance*. January 1, 2018.

7. Crow, Garret E. and C. Barre Hellquist. *Aquatic and Wetland Plants of Northeastern North America.* The University of Wisconsin Press. Madison, Wisconsin. Volumes 1 and 2. 2000.

8. Harmony Environmental. *Aquatic Plant Management Plan*. 2009.

9. Jennifer Hauxwell, et. al. *Aquatic Plant Management in Wisconsin*. University of Wisconsin – Extension. March, 2010.

10. Natural Heritage Inventory Data Township Tool. *NHI Data for Township 41N, Range 15W*, Wisconsin Department of Natural Resources, 4 Mar. 2020, https://dnr.wi.gov/topic/NHI/Data.asp?tool=township&mode=detail. Link

11. Nichols, Stanley A. *Distribution and Habitat Descriptions of Wisconsin Lake Plants.* Wisconsin Geological and Natural History Survey. Bulletin 96. Madison, Wisconsin. 1999.

12. Skawinski, Paul M. *Aquatic Plants of the Upper Midwest*. 3rd ed., 2018.

13. University of Wisconsin – Extension, Wisconsin Department of Natural Resources. *Citizen Lake Monitoring Network – AIS Monitoring Manual.* Revised February, 2016.

14. U.S. Army Corps of Engineers. *Aquatic Plant Information System (APIS).* 2005

15. University of Wisconsin – Madison. *Wisconsin Floristic Quality Assessment (WFQA).* 2001.

16. *Watershed Detail - Lower Yellow (Burnett Co.) River*, dnr.wi.gov/water/watershedDetail.aspx?code=SC14&Name=Lower+Yellow+%28Burnett+Co.%29+River. Link

17. *WDNR Fish Stocking Summaries*. Wisconsin Department of Natural Resources, infotrek.er.usgs.gov/doc/wdnr_biology/Public_Stocking/StateMapHotspotsAllYears.htm. Link

18. Wisconsin Administrative Code. *Natural Resources, Chapter 107 – Aquatic Plant Management.* December, 2000.

19. Wisconsin Administrative Code. *Natural Resources, Chapter 109 – Aquatic Plants: Introduction, Manual Removal and Mechanical Control Regulations.* March, 2011.

20. Wisconsin Administrative Code. *Natural Resources, Chapter 115 – Wisconsin's Shoreland Protection Program.* January, 2017.

21. Wisconsin Administrative Code. *Natural Resources, Chapter 198 – Aquatic Invasive Species Prevention and Control Grants.* January, 2018.

22. Wisconsin Administrative Code. *Natural Resources, Chapter 40 – Invasive Species Identification, Classification, and Control.* April, 2017.