Tabor Lake
Aquatic Plant Management Plan

October 31, 2024

Sponsored by:
Tabor Lake Association
Burnett County Land Services Department – Conservation Division (BCLSD)
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Introduction

This Aquatic Plant Management Plan (APM) for Tabor Lake, Burnett County, Wisconsin, is the first developed plan for the waterbody. It is sponsored in part by Tabor Lake Association, Burnett County Land Services Department and a Wisconsin Department of Natural Resources (WDNR) Surface Water Planning Grant. It outlines data about the aquatic plant community, watershed and water quality. The goals and objectives of the APM were tailored to the public input survey, knowledge of the Curly leaf pondweed threats and water quality goals discussed in the APM subcommittee meetings. Based on the data collected from the point-intercept, shoreland and public input surveys and historical data collected, an Aquatic Plant Management Plan (APM) was developed and will guide the lake association in aquatic plant management, aquatic invasive species prevention and monitoring, and future shoreline restoration and prevention techniques for the next five years (2025-2030).

This Aquatic Plant Management Plan (APM) is guided by public input, scientific data from lake surveys, historical data collection and the requirements from the Wisconsin Department of Natural Resources (WDNR). This APM is required by the WDNR regulations for certain aquatic plant management activities and the ability to obtain grants that fund aquatic invasive species plant management grants as needed.

This plan follows the WDNR's aquatic plant management planning guidelines and the Northern Region Aquatic Plant Management Strategy. DNR sampling protocol and plant survey methods were followed when completing the Point Intercept and Shoreland and Shallows surveys.

Public Input for Plan Development

A survey was sent out to all riparian landowners on Tabor Lake. A total of 75 surveys were sent out and a total of 26 were returned (35% response rate). The survey results were used to help guide decisions by the APM planning committee members. The results can be found in Appendix E on page 110.

Executive Summary

During the development of this APM, four surveys were conducted to collect data for Tabor Lake; an AIS point-intercept survey, a full macrophyte point-intercept survey, a shoreline assessment and the lake user survey. Below outlines some of the findings from the four surveys.

1. No new AIS were observed during the development of this plan, but future monitoring should continue to occur. Curly leaf pondweed (CLP) was the only documented AIS during the development of this plan.
2. During the macrophyte survey, 39 different plant species were identified in or directly near the littoral zone (zone of aquatic plant growth) by rake toss or visually. Plant diversity was very high with a Simpson's diversity index of 0.91.
3. All plant species were assigned floristic quality values. The floristic quality index (FQI) for Tabor Lake is 43.61 with a mean conservatism value (C-value) of 6.36. These values are above average for the Northwest ecoregion and suggest Tabor Lake is less tolerant to disturbances.
4. The maximum depth of plants were found was 17 feet. Areas where light penetrated the water column supported plants regardless of sediment type.
5. The following plant species were the most frequently observed in the lake: Coontail (*Ceratophyllum demersum*), Common waterweed (*Elodea canadensis*), Flatstem pondweed (*Potamogeton zosterformis*) and Fern pondweed *(Potamogeton robbinsii).* The four species were

found at 50.48%, 48.10%, 40%, and 38.10%, respectively. Each species were widely distributed throughout the lake over muck and sandy bottoms.

6. The shoreland areas of Tabor Lake are fairly undeveloped, with an average canopy and shrub and/or herbaceous layer of 76% and 65%, respectively.

Using the historical information and the new data collected during the 2024 summer field season, the Tabor Lake APM planning committee developed goals to continue keeping Tabor Lake pristine and healthy, while maintaining an understanding of the Curly-leaf pondweed distribution. Below summarizes the goals that were developed by the Committee, and each goal will be discussed further throughout the document.

Tabor Lake Management Goals

Prevent the introduction and spread of aquatic invasive species (AIS). This goal is aimed at preventing the introduction of Eurasian watermilfoil, zebra mussels and all other AIS. The lake association will continue to monitor the boat landing and complete meander surveys looking for AIS.

Reduce and control the spread of Curly leaf pondweed (CLP). The lake association will continue efforts in hand pulling measures to reduce the CLP populations in Tabor Lake. Volunteers will monitor the distribution annually to determine hand pulling effectiveness.

Educate the community about aquatic plant management, appropriate native plant management actions and erosion control practices. The lake residents will be informed on the local and state laws pertaining to aquatic plant and shoreland plant removal.

Develop a rapid response plan for aquatic invasive species. This rapid response plan will assist the association on how to properly document, collect and report a suspected invasive species currently not present in the waterbody.

Maintain and improve water quality with erosion prevention and other practices. Tabor Lake residents will continue participating in the Citizen Lake Monitoring Program to understand the lakes water quality trophic state level.

Promote and improve loon habitat. Tabor Lake Association plans to build and monitor an artificial platform for loons on the lake.

Lake Information

Tabor Lake (WBIC 2671700) is a 170 acre seepage lake located in Burnett County, WI. It has a maximum depth of 31 feet and a mean depth of 13 feet. The lake is 90% sand and 10% muck sediment type. The public can access the lake from the public boat launch on Bradshaw Road, however, the landing is very shallow and narrow up the channel of Loon Creek (2670400) before getting to the main lake. Loon Creek (2670400) connects a multitude of lakes together, including the Minerva Chain of Lakes.

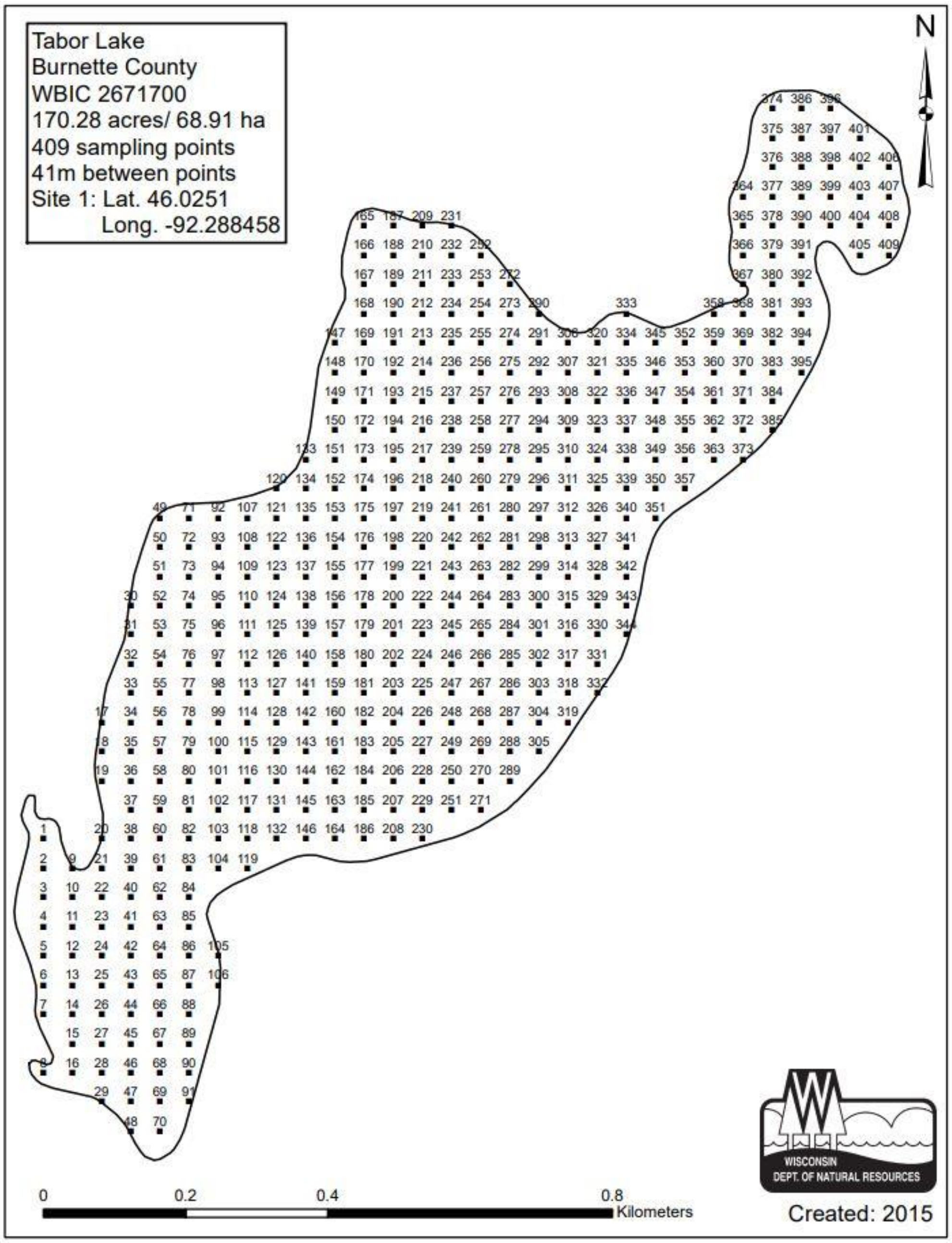


Figure 1. Tabor Lake Point-Intercept Grid

Watershed

Tabor Lake is located in the Lower Yellow River Watershed (SC14; Figure 2). This watershed encompasses a large portion of Burnett County approximately 133,726 acres in size and contains 99.7 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 for groundwater contamination.

The Lower Yellow River Watershed is located primarily in the Northwest Sands Ecological Landscape, which contains large glacial outwash systems and two major landforms; "flat plains or terraces along glacial meltwater channels and pitted or "collapsed" outwash plains containing kettle lakes" (WDNR Explore water page). The soils in the Northwest Sands Ecological Landscape are predominately deep sands with low organic material and nutrients. The watershed contains numerous sand barrens with jack pine and oak savannas scattered across the landscape.

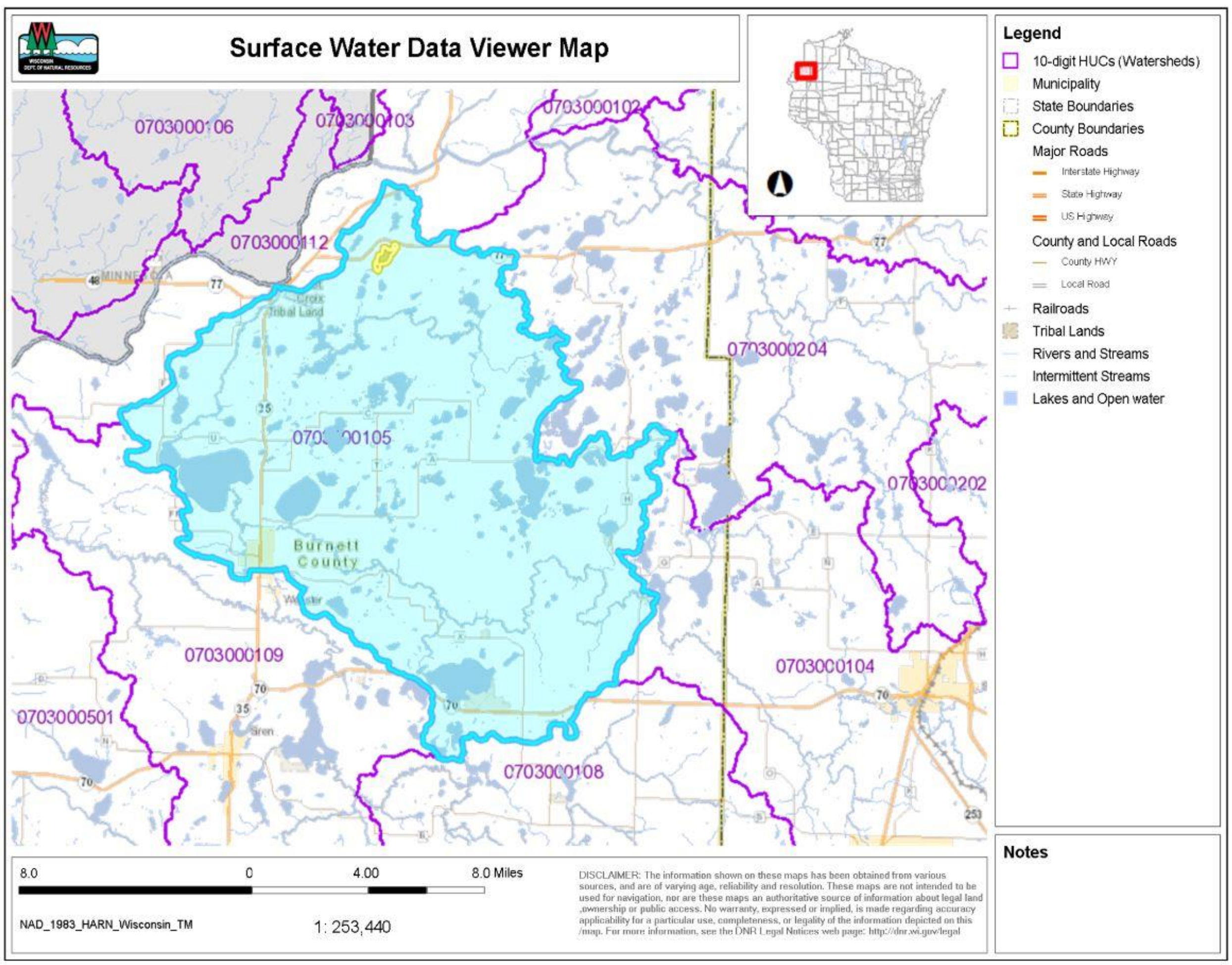


Figure 2. HUC-10 Watershed Boundary for the Lower Yellow River Watershed, Burnett County, Wisconsin.

Immediate Watershed

The immediate watershed of Tabor Lake would have the greatest impact to water quality in terms of runoff entering the lake. The dominant landcover types that make up the 4.5 sq mi area include: N. Pine Oak, Black Oak (33.6%) Jake Pine (26.9%), Open Water (11.2%), Cattails (5.7%), Broad-leaved Evergreen

Scrub/Shrub (3.9%), Floating Aquatic Herbaceous Vegetation (3.9%), White Pine (3.6%), Red Pine (2.7%), Tamarack (2.1%), Other Emergent/Wet Meadow (2%), White Oak, Burr Oak (1.4%) and Mixed Deciduous/Coniferous Forested Wetland (1.1%).

Sources of phosphorus and algae in Tabor Lake would impact the waterbody the most from the immediate watershed by runoff from upland developed areas. These sources primarily come from developed shoreline areas, sedimentation from sand beaches and roads/driveways, faulty septic systems, fertilizer applications, uprooted aquatic vegetation, inadequate stormwater management practices (absent gutters & downspouts, roof runoff, bare ground, lawns sloping to lake, etc) and more.

Curly leaf pondweed can directly contribute to algae blooms given its unique life cycle of dying off in mid-summer. The plant material that dies off, decomposes and can release phosphorus into the water, fueling algal growth and depleting oxygen in the waterbody. The four key components of algae bloom potential include: die-off life cycle in the summer, nutrient enrichment from decaying matter and phosphorus release, oxygen depletion when the algae die and decompose and impacts to water quality with the reduction of clarity.

Tabor Lake Characteristics

Area: 170 acres
Maximum Depth: 45 feet
Mean Depth: 13 feet
Lake Bottom: 90% sand, 10% muck
Hydrological lake type: Seepage
Invasive species present: Curly leaf pondweed, Japanese Knotweed
Fisheries: Northern pike, panfish and Largemouth bass

Water Quality

Tabor Lake has water quality measurements recorded since 1995, but data has been collected consistently from 2010 to 2024. Water quality data collected is inputted into the Surface Water Integrated Monitoring System (SWIMS). The following statistics were generated and subjected for review from the SWIMS database:

1. Trophic state
2. Secchi Disk
3. Total phosphorus
4. Chlorophyll-a

Trophic State

Trophic state describes the overall productivity of a lake. There are three common classifications that describe the trophic state of a waterbody. The most productive lakes are referred to as eutrophic. **Eutrophic** lakes tend to have a soft, mucky lake bottom and are high in nutrient content. Rooted plant growth tend to be abundant in eutrophic lakes and contain high amounts of algae growth. Water clarity is low in eutrophic lakes due to the high productivity of algae. If an eutrophic waterbody is deep enough to stratify, the lake bottom may be devoid of oxygen and capable of releasing phosphorus into the water column fueling algal blooms. **Oligotrophic** lakes are most commonly deep waterbodies with pristine clear water conditions. Oligotrophic lakes tend to have low productive levels and have sparse rooted plant growth. These lakes can experience stratification and maintain oxygen levels throughout the water column. **Mesotrophic** lakes have intermediate trophic states with characteristics of both eutrophic and oligotrophic waterbodies.

Figure 3. Schematic of Oligotrophic, Mesotrophic and Eutrophic Lakes.

Table 1. Trophic State Index General Description.

Trophic State Index (TSI)	General Description
<30	**Oligotrophic** clear water, high dissolved oxygen throughout the year/lake
30-40	**Oligotrophic** clear water, possible periods of oxygen depletion in the lower depths of the lake
40-50	**Mesotrophic** moderately clear water, increasing chance of anoxia near the bottom of the lake in summer, fully acceptable for all recreation/aesthetic uses
50-60	**Mildly eutrophic** decreased water clarity, anoxic near the bottom, may have macrophyte problem, warm-water fisheries only
60-70	**Eutrophic** blue-green algae dominance, scums possible, prolific aquatic plant growth, full body recreation may be decreased
70-80	**Hypereutrophic** heavy algal blooms possible throughout the summer, dense algae and aquatic plants
>80	**Algal scums**, summer fish kills, few aquatic plants due to algal shading, rough fish dominate

Tabor Lake is predominately a mesotrophic waterbody based off of the Citizen Lake Monitoring Network (CLMN) data. The data that has been collected for Secchi depth, Total phosphorus, and chlorophyll-a have shown fairly consistent measurements over the last 14 years, however, this data should be interpreted with caution because it only shows a snapshot in time and contains a lot of gaps.

Secchi Disk

Volunteers on Tabor Lake have been collecting water chemistry periodically since 1995, but most consistently from 2010 to 2024 (Figure 4). Secchi Disk readings are the most common data collected in the CLMN program. A Secchi Disk is used to measure the transparency of the water. A Secchi Disk is an 8-inch disk with alternating black and white quadrants attached to a rope with a 1 foot increments labeled on the rope. The disk is lowered into the water column until it can no longer be seen by the observer, this point is called the transparency level and a reading is taken. Water transparency can be affected by the color of the water, algae and suspended solids in the water column. As the water color, algae and suspended solids increase, the transparency will decrease. The transparency is often used as an indicator of human activity, such as development, recreation or runoff issues. Wind can also reduce the transparency if the lake is shallow enough for the lake bottom to stir from wind waves.

In Figure 4 from the Citizen Lake Monitoring Network Trophic State Index (TSI) data, the TSI samples collected for Secchi (black circle), Total Phosphorus (blue triangle) and Chlorophyll-a (green square) primarily fall within the mesotrophic (middle light blue) category. The other categories include oligotrophic (dark blue) and eutrophic (light green). From the data collected in a snap shot of time, indicates that Tabor Lake has moderate levels of nutrients and algae present within the watercolumn.

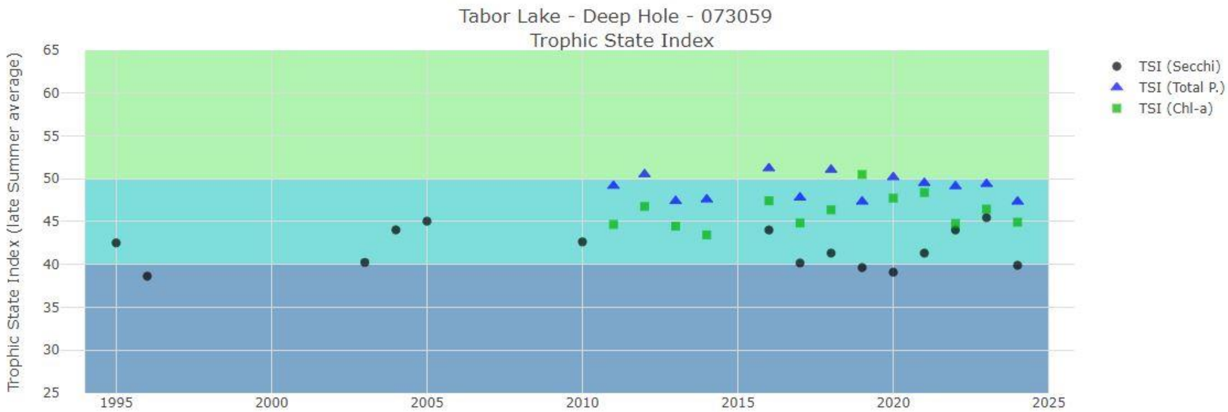


Figure 4. Citizen Lake Monitoring (CLMN) Trophic State Index Data.

Total Phosphorus

Phosphorus is a naturally occurring element present in lakes which is necessary for plant and algae growth. Excessive amounts of phosphorus can lead to an overabundance of plants and algae blooms causing the transparency levels and water quality to decrease. Phosphorus is also naturally occurring in soils and rocks around lakes, which can make its way into waterbodies through groundwater and human disturbances such as soil erosion, sand beaches and manicured lawns. Other external sources of phosphorus inputs caused by human disturbances can include fertilizer runoff, inadequate stormwater practices such as roof runoff and urban or agricultural landscapes.

If these inputs are not properly managed and continually get into lakes, internal phosphorus loading and eutrophication can set in on the bottom of the lake. Phosphorus does not readily dissolve in water, instead it forms insoluble precipitates with other elements naturally occurring in lakes such as calcium and iron. If oxygen is available in the hypolimnion (lake bottom zone) then iron forms sediment particles that store phosphorus in the lake sediments. If oxygen is depleted during the winter or summer months, the hypolimnion becomes anoxic (devoid of oxygen) and these iron particles dissolve and phosphorus is able to be released and redistributed throughout the water column causing negative impacts to the aquatic ecosystem. Tabor Lake does not have any dissolved oxygen measurements taken on the lake, so it is unclear if this is happening. Dissolved oxygen is a very important water quality measurement that should be taken on lakes to monitor the hypolimnion.

Tabor Lake is a deep seepage lake that may and/or does experience stratification, separating the lake into three distinct layers, the **epilimnion** (upper photic layer), **metalimnion** (middle layer that separates the water photic layer from the cool lake bottom layer) and the **hypolimnion** (cool dense layer near the lake bottom). These distinct layers can be shown in a temperature and dissolved oxygen graph by taking temperature and dissolved oxygen readings throughout the water column. Temperature and dissolved oxygen are important readings to take in lakes because both are essential in determining the survivability of aquatic organisms and whether or not the waterbody is experiencing **internal phosphorus loading** (accumulation of phosphorus in the lakebed that can be recycled between the lakebed and water column when low oxygen levels are present). These readings are typically taken at the deep hole in a waterbody.

Tabor Lake’s total phosphorus average is 0.015mg/L or 15 µg/L (micrograms/L).

The Wisconsin DNR sets levels for the amount of allowable phosphorus concentrations within the lake. The basis of these levels can be found within NR 102.06 or Wisconsin's Phosphorus Rule. The maximum level for stratified and seepage lakes is 20 µg/L. When comparing the maximum level to Tabor Lake's level, Tabor Lake is below the maximum level for phosphorus.

Chlorophyll-a

Chlorophyll-a measurements are used as an indicator of water quality in a lake. This indicator gives a general idea on the amount of algae in the water column as Chlorophyll-a is a pigment of algae and in plants. Chlorophyll-a is measured in µg/L (micrograms/L) where the greater the value of Chlorophyll-a, the greater the concentration of algae present in the water column.

Chlorophyll-a has the greatest impact on water clarity when measurements exceed 30 µg/L. The average Chlorophyll-a measurement for Tabor Lake is 4.4 µg/L.

<u>Tabor Lake average summer water quality statistics:</u>

Secchi Disk: The data taken for Secchi Disk is fairly sporadic and contains a lot of gaps, so it's unclear what the average transparency level is for the lake. It is recommended to recruit one volunteer to take consistent data for Tabor Lake once a month during the ice off/ice on period.

Total phosphorus: 0.015mg/L or 15 µg/L (micrograms/L).

- WI-DNR Surface Water Phosphorus Rule for stratified seepage lakes: 20 µg/L
    - Phosphorus levels in Tabor Lake are lower than the maximum allowable concentration in NR 102.06.
- WI-DNR Surface Water Phosphorus Rule was established in 2010 to set the maximum allowable phosphorus concentrations in Wisconsin's waters.

Chlorophyll-a: 4.4 µg/L

- WI-DNR Algae Thresholds for Chlorophyll-a for stratified seepage lakes: 20 µg/L (does not exceed 20 µg/L Chlorophyll-a for more than 30% of days during summer sampling period – July 15 to Sept 15).
    - Chlorophyll-a levels in Tabor Lake is significantly lower than the algae thresholds set for recreational use per NR 102. The thresholds for Chlorophyll-a are the same as the Phosphorus Rule.

Tabor Lake Aquatic Communities

Fish Community

There is currently no fisheries data completed on Tabor Lake to date due to the shallow and narrow nature of the public boat launch. WDNR Fisheries Biologist stated that Tabor Lake's fisheries community may look similar to the Minerva Chain of Lakes fisheries, which includes Largemouth Bass, Northern Pike, Black Crappie, Pumpkinseed, Yellow Perch, and Rock Bass. There are likely a number of non-game species as well.

When considering fish in a management plan, to better the community of the waterbody, the following should be considered:

1. There should be an increase in fisheries habitat including woody debris along the shoreline and an increase in natural shoreline buffers.
2. There should be minimal emergent aquatic plant management by landowners, as bulrushes, cattails, lily pads and submergent plants provide shelter, food and habitat for fisheries.
3. Reduction of sedimentation in the waterbody. Sand and other soils that runoff into a lake can impact spawning by covering and suffocating eggs.

Table 2. Fish Species and Spawning Needs.

Fish Species	**Spawning Temp ^{0}F**	**Spawning Habitat Needs**
Black Crappie	Upper-50s to lower-60s	Build nests in 1-6 feet of water on hard bottoms by sweeping an area on the lakebed
Bluegill, largemouth bass and Pumpkin seed	Mid-60s to lower-70s	Build nests in less than 3 feet of water on hard bottoms
Muskellunge	Mid-50s to near-60s	Broadcast eggs over organic sediment, woody debris and submergent vegetation. Eggs are deposited indiscriminately over several hundred yards of shoreline.
Northern Pike	Upper-30s to mid-40s soon after ice-out	Broadcast eggs onto vegetation (eggs attach)
Smallmouth Bass	62 and 64 degrees, but sometimes mid-50s	Nests in circular, clean gravel
Walleye	Low-40s to-50	Gravel/rocky shoals with moving or windswept water 1-6 feet
Yellow Perch	Mid-40s to lower-50s	Broadcast eggs in submergent vegetation or large woody debris

Aquatic Plant Community

Lake ecosystems rely heavily on the aquatic plant community. Aquatic plants can be found in the littoral zones, where light penetrates and allows for aquatic plants to capture light in the waterbody. This area is found in nearshore areas in shallow waters. There are 3 common plant community types found in lakes: Emergent, Floating-leaf and Submergent aquatic plants.

Emergent aquatic plants are rooted in the lake bottom, but their leaves, stems and flowers extend out of the water. These aquatic plants filter runoff that enters the lake from the immediate watershed area. The extensive root systems stabilize the lake bottom, reducing turbidity from wind and wave action. Emergent aquatic plants also protect the shoreline from erosion by reducing the impacts from waves coming into shore from wind or boat wakes. Emergent aquatic plants provide shelter and important spawning habitats for fish. A lot of fish even attach their eggs to the plants, including northern pike and muskellunge. Many birds, waterfowl and mammals rely on emergent aquatic plants for food, nesting material and habitat areas. Common emergent aquatic plants include: bulrushes, arrowhead, Wild Rice and lake sedges.

Floating-leaf plants are rooted in the lake bottom, but their leaves and flowers float on the water's surface. Floating-leaf aquatic plants protect the shoreline from wave energy and also provide significant habitat for other aquatic communities. Common floating-leaf plants include watershield and waterlilies.

Submergent aquatic plants are rooted to the lake bottom (but not always) and grow completely under the water's surface. If growing conditions are ideal, some submergent aquatic plants can grow like mats on the water's surface, impeding on recreational activities. Many submergent aquatic plants also have fruits or flowers that grow above the water's surface, but their leaves remain under the water. These aquatic plants produce oxygen as a byproduct from photosynthesis. They can absorb nutrients that are present within the water column from roots and leaves, which in turn decreases nutrients that would have been available to algae. Like emergent and floating-leaf plants, submergent aquatic plants stabilize the lakebed and reduce re-suspended sediments caused by wind and boat activity that could cause turbidity in the water column.

Aquatic plants vary greatly from lake to lake and can take on many distributions within a waterbody. Lakes that have high plant diversity tend to prevent rapid establishment of invasive aquatic plant species. Some native aquatic plants can also reach nuisance levels depending on the environmental characteristics in a given growing season. Even some invasive aquatic plants can naturalize in a waterbody with native species depending on the specific growing season.

Non-native species are opportunistic, meaning they are capable of taking over and occupying open and available species along the lake bottom where native species either were removed intentionally or not present to begin with. Non-native species tend to have a jumpstart in the spring if they are already present in a waterbody and begin growing before native species emerge. Without the competition of native species, non-native plants can flourish. Removal of native aquatic plants not only diminishes the natural qualities of a waterbody, but also increases the risk of non-native species invasion and establishment. Allowing native aquatic plants to grow may not guarantee complete protection over non-native species, but it could lead to the discouragement of their establishment into introduced areas.

Aquatic Plant Survey Results for Tabor Lake

The sampling grid for Tabor Lake was generated by the WDNR and the point-intercept survey followed all state guidelines (Hauxwell et al. 2010). Burnett County Land Services Department (BCLSD) completed a WDNR point-intercept survey for aquatic invasive species on May 13, 2024. This survey is separate from the full aquatic macrophyte survey because most invasive species emerge earlier than native aquatic plants. Plant survey methods can be found in Appendix C.

At each sampling point a depth finder was used to record depth of plant colonization. A rake was used to sample the plant community at depths deeper than 5 feet and a pole grabber was used at depths 5 feet or shallower. We tried the recommended sampling method outlined in Hauxwell et al. 2020 by using the pole grabber in depths 15 feet or shallower and we were finding we were missing a fair amount of plant species when comparing the rake toss, so we changed the criteria slightly to ensure the aquatic plant community was documented accurately. All plants were identified to species level and assigned a rake fullness value of 1 (sparse), 2 (half rake full) or 3 (rake is covered) to estimate abundance. Visual sightings of plants were also recorded in shallower waters were visibility was clear or floating-leaf and emergent plants were present. The lake bottom substrate was assigned at each sampling point if it could reliably be determine.

Data collected was entered into a spreadsheet for analysis. Explanations of the following statistics will be described below and values will be compared to the regional Northern Lakes and Forest Eco-region thresholds. Table 3 presents the values associated with #s 1-7 on pages 20-21. The following statistics were generated and subjected for review:

1. Maximum depth of plants (in feet)
2. Sample points with vegetation
3. Species richness
4. Number of sites where each species was found
5. Average rake fullness
6. Frequency of occurrence
7. Relative frequency
8. Simpson's Diversity Index
9. Floristic Quality Index

Maximum depth of plants

Aquatic plants have a maximum depth at which they can grow, referred to as the littoral zone in lakes or where light availability penetrates the water's surface enough for plants to capture light for photosynthesis. Lakes that have greater water clarity tend to have aquatic plants growing in deeper depths, compared to lakes that have poor water clarity. The maximum depth aquatic plants were found in Tabor Lake was 17 feet. Figure 5 below shows the number of sites plants were found in reference to depth.

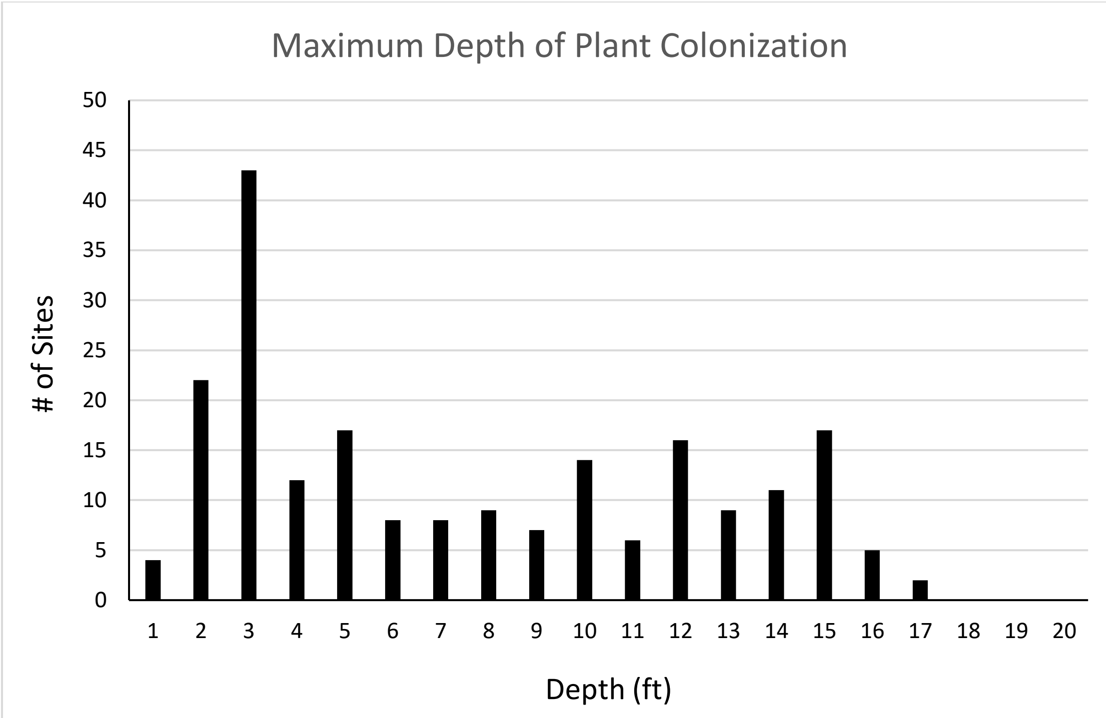


Figure 5. Depth of plant colonization per sample site.

Sample points with vegetation

This is the total number of sites where at least one plant was found during the survey. In total, plants were found at 210 of the 409 sampling sites. That means that 51% of the lake bottom was occupied by at least one plant species.

Species richness

Species richness is the number of different species found in a lake. The total number of plant species found in Tabor lake was 49, including visuals.

Number of sites where each species was found

During the survey, a count is made on how many times a species was found at each site. Table 3 represents each species found and the number of times the plant was documented during the survey.

Average rake fullness

The total average rake fullness for all vegetation was 2.01. During the survey, an average rake fullness is also given for each species found ranging from 1 (sparse), 2 (medium), or 3 (full). Table 3 shows the average rake fullness for species collected on the rake or pole.

Frequency of occurrence

Two values are computed for frequency of occurrence during the aquatic macrophyte survey: frequency of occurrence within vegetative areas and frequency of occurrence at sites shallower than the maximum depth of plans. For both values, the greater the value computed, the more frequent the aquatic plant was found. Table 3 shows the values for both frequency of occurrence criteria, however, species that were found visually only will not be presented in the table.

Frequency of occurrence within vegetated areas is defined as the number of times a species was sampled in a vegetated area divided by the total number of vegetated sites. This value will show how often an aquatic plant would be found everywhere vegetation was found within the waterbody.

Frequency of occurrence at sites shallower than the maximum depth of plants is defined as the number of times a species was sampled divided by the total number of sites shallower than the maximum depth of plants. This value will show how often a plant will be found within depths an aquatic plant would grow.

The most frequently found species include Coontail (*Ceratophyllum demersum*), Common waterweed (*Elodea canadensis*), Flatstem pondweed (*Potamogeton zosterformis*) and Fern pondweed (*Potamogeton robbinsii*). The four species were found at 50.48%, 48.10%, 40%, and 38.10%, respectively.

Relative Frequency

The relative frequency is the frequency of a plant relative to other species. This value shows which species are dominant amongst other species within a waterbody, where the higher the value, the more common the species is compared to others collected. The relative frequency will add up to 100%. If a species has a relative frequency of 10%, this species will have occurred 10% of the time compared to all species sampled.

The most dominant aquatic plant found in Tabor Lake indicated by the relative frequency was Coontail (14.5%), followed by Common waterweed (13.9%), Flatstem pondweed (11.5%) and Fern pondweed (11%).

Table 3. Species found during aquatic macrophyte survey and their corresponding frequency of occurrence statistics.

	FO VEGETATED (%)	FO < MAX DEPTH (%)	RELATIVE FREQUENCY	# OF SITES	AVE RAKE FULLNESS
Coontail	50.48	39.41	14.5	116	1.41
Common waterweed	48.1	37.55	13.8	110	1.53
Flat-stem pondweed	40	31.23	11.5	110	1.35
Fern pondweed	38.1	29.74	11	88	1.59
Chara	37.14	29	10.7	90	1.59
Leafy pondweed	21.9	17.1	6.3	54	1.35
Slender waterweed	18.1	14.13	5.2	39	1.11
Southern naiad	13.81	10.78	4	31	1.66
Northern watermilfoil	12.38	9.67	3.6	60	1.27
Slender naiad	11.9	9.29	3.4	44	1.16
Water celery	10	7.81	2.9	25	1.14
Illinois pondweed	7.62	5.95	2.2	66	1.13
Nitella	7.14	5.58	2.1	16	1.27
Variable pondweed	5.24	4.09	1.5	73	1.18
Filamentous algae	4.29	3.35		13	1.89
White-stem pondweed	3.81	2.97	1.1	14	1
White water-crowfoot	3.33	2.6	1	20	1.57
Fries' pondweed	3.33	2.6	1	7	1.43
Large-leaf pondweed	2.38	1.86	0.7	19	2
Water marigold	2.38	1.86	0.7	6	1
Dwarf watermilfoil	2.38	1.86	0.7	6	1
Clasping-leaf pondweed	0.95	0.74	0.3	15	1
Water smartweed	0.95	0.74	0.3	12	1
Waterwort	0.95	0.74	0.3	7	2
Needle spikerush	0.95	0.74	0.3	4	1
Stiff pondweed	0.95	0.74	0.3	3	1
Forked duckweed	0.95	0.74	0.3	2	1
Watershield	0.48	0.37	0.1	23	1
Water star-grass	0.48	0.37	0.1	3	1
Small pondweed	0.48	0.37	0.1	2	1
Spiny hornwort	0.48	0.37	0.1	1	1
White water lily				56	V
Spatterdock				35	V
Quillwort				6	V
Sago pondweed				6	V
Swamp loosestrife				5	V
Floating-leaf pondweed				5	V
Softstem bulrush				3	V
Creeping spikerush				2	V
Ribbon pondweed				2	V
Arrowhead				2	V
Small bladderwort				2	V
Small duckweed				1	V
Pickerelweed				1	V

American bur-reed				1	V
Large duckweed				1	V
Narrow-leaf cattail				1	V
Wild calla				1	V

Simpson's Diversity Index

The Simpson's Diversity Index is used to determine how diverse the aquatic plant community is within the lake by measuring the probability that two individuals randomly selected from a sample will below to the same species. This value ranges from 0 to 1, with the greater or closer the value is to 1, the more diverse the plant community is. An Index of 1 means that the two plant species sampled will always be different or diverse versus an Index of 0 means that the two plants sampled will never be different or more common/same.

The Simpson's Diversity Index for Tabor Lake was 0.91.

Floristic Quality Index (FQI)

The Floristic Quality Index (FQI) evaluates the closeness of the flora in an area to that of an undisturbed condition. The FQI measures the aquatic plant species tolerances for changing water quality and habitat modifications and assigns each species with a coefficient of conservation (C) score between 1 to 10 (Table 4). A high value of C indicates a plant species is intolerant of changes, whereas, a low value of C indicates a plant is tolerant to changes. Plants that score higher are likely to respond adversely to changes in water quality and habitat, like eutrophication. Invasive species have a C of 0. A higher FQI score indicates a healthy plant community.

Table 4. Floristic Quality Index Conservation C Scores.

Species	Common Name	C
Bidens beckii	Water marigold	8
Brasenia schreberi	Watershield	6
Calla palustris	Wild calla	9
Ceratophyllum demersum	Coontail	3
Ceratophyllum echinatum	Spiny hornwort	10
Chara	Muskgrasses	7
Elatine minima	Waterwort	9
Eleocharis acicularis	Needle spikerush	5
Elodea canadensis	Common waterweed	3
Elodea nuttallii	Slender waterweed	7
Heteranthera dubia	Water star-grass	6
***Isoetes* sp.**	Quillwort	8
Lemna minor	Small duckweed	4
Lemna trisulca	Forked duckweed	6
Myriophyllum sibiricum	Northern water-milfoil	6
Myriophyllum tenellum	Dwarf water-milfoil	10
Najas flexilis	Slender naiad	6
Najas guadalupensis	Southern naiad	8

Nitella	Nitella	7
Nuphar variegata	Spatterdock	6
Nymphaea odorata	White water lily	6
Polygonum amphibium	Water smartweed	5
Pontederia cordata	Pickerelweed	8
Potamogeton amplifolius	Large-leaf pondweed	7
Potamogeton epihydrus	Ribbon-leaf pondweed	8
Potamogeton foliosus	Leafy pondweed	6
Potamogeton friesii	Fries' pondweed	8
Potamogeton gramineus	Variable pondweed	7
Potamogeton illinoensis	Illinois pondweed	6
Potamogeton natans	Floating-leaf pondweed	5
Potamogeton praelongus	White-stem pondweed	8
Potamogeton pusillus	Small pondweed	7
Potamogeton richardsonii	Clasping-leaf pondweed	5
Potamogeton robbinsii	Fern pondweed	8
Potamogeton strictifolius	Stiff pondweed	8
Potamogeton zosteriformis	Flat-stem pondweed	6
Ranunculus aquatilis	White water crowfoot	8
Sagittaria latifolia	Common arrowhead	3
Schoenoplectus tabernaemontani	Softstem bulrush	4
Sparganium americanum	American bur-reed	8
Spirodela polyrhiza	Large duckweed	5
Stuckenia pectinata	Sago pondweed	3
Typha angustifolium	Narrow-leaved cattail	1
***Typha* sp.**	Cattail	1
Utricularia minor	Small bladderwort	10
Vallisneria americana	Wild celery	6
N (# of plant species)		46
Mean C		6.36
FQI		43.61

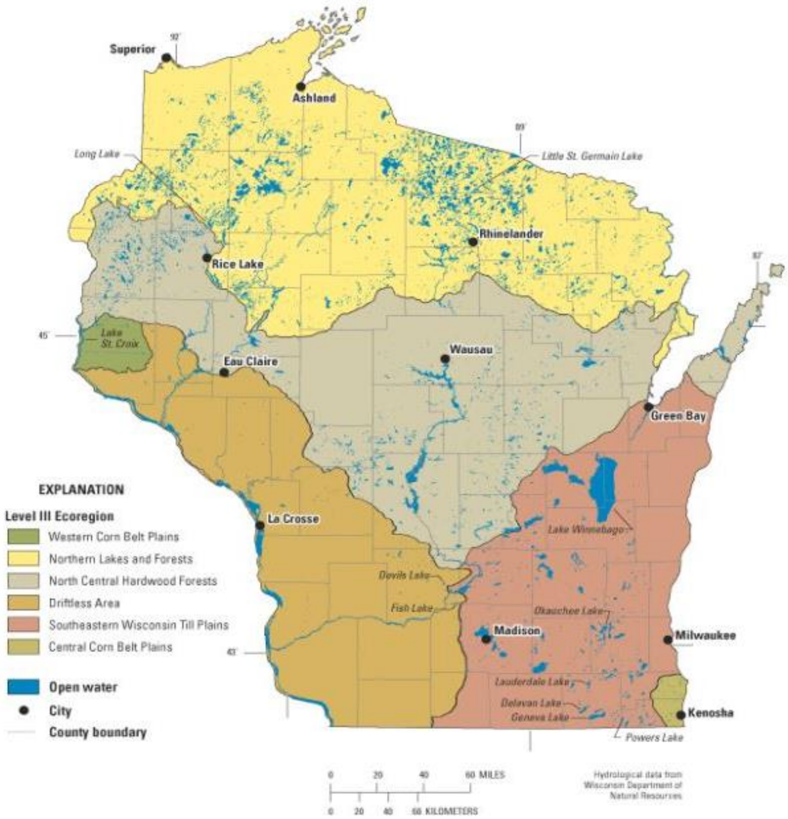


Figure 6. Map of Ecoregions for Wisconsin.

Summary of Northern Lakes and Forest (NLFL) value for FQI

A Floristic Quality Assessment of Wisconsin's aquatic plant community was created to evaluate the closeness of the flora in undisturbed areas. Wisconsin was split into ecoregions in order to calibrate the community effectively (Figure 6). Tabor Lake is within the Northern Lakes and Forest ecoregion. This region has the highest floristic quality and average coefficient values compared to all other ecoregions primarily due to the lack of human developmental pressure (Nicols, 1999). This ecoregion was developed in 1999, which Is fairly outdated and the values may have changed since then. Table 5 represents the mean FQI values compared to the values calculated for Tabor Lake during the aquatic macrophyte survey.

Table 5. Northern Lakes and Forest (NLFL) Ecoregion Floristic Quality Values compared to Tabor Lake.

	Ecoregion Mean Values	Tabor Lake
Species Richness	13	47
Conservatism	6	6.36
Floristic Quality	22.2	43.6

Aquatic Invasive Species (AIS) Survey

An aquatic invasive species survey was completed on Tabor Lake early in the season to document Curly-leaf pondweed and any new invasive species not currently detected. AIS surveys occur earlier than the aquatic macrophyte survey because AIS have shown to start growing earlier in the season, compared to native aquatic plants. This survey used the same methods as described above from the aquatic macrophyte survey.

The only invasive species that was detected during the AIS survey was Curly-leaf pondweed (CLP). This survey was completed on May 13, 2024 (Figure 7). We conducted this survey earlier than June due to the lack of ice coverage the winter prior and the rapid growth of Curly-leaf pondweed in the spring. We primarily found stands of CLP in the northeast bay and northwest shoreline of Tabor Lake. The northeast bay has the lowest water quality compared to the entire lake with extensive underwater green filamentous algal growth, said to be occurring from the underwater springs entering the lake. There is also a muck blower present in the North Bay, which could also be causing the poor water clarity and accelerated plant growth in this location. Both locations also contained high species diversity from the macrophyte survey. During the aquatic macrophyte survey we also detected CLP in the Loon Creek channel where the boat landing is located and where Loon Creek meets the main lake. It is possible (as detections were noted by lake association volunteers) that after we completed the AIS survey, new locations of CLP were found and not depicted on Figure 7.

Data collected was entered into a spreadsheet for analysis. The following statistics were generated and subjected for review for Curly-leaf pondweed (CLP):

1. Average depth CLP was found:
    - 4.8 ft
2. Number of sites CLP was found:
    - 9 sites had CLP in the spring survey.
3. Average rake fullness of CLP:
    - The average rake fullness was a 2 or half the rake was full with CLP.

The data taken during the development of the Aquatic Plant Management Plan will act as a baseline for future distribution data taken for CLP in future years. By implementing the point-intercept survey, we can track changes over time and calculate aquatic plant statistics relative to the distribution, average depth and detect changes in the native aquatic plant community.

The Tabor Lake Association has been very active since CLP detection in hand pulling plants and disposing of appropriately. The association continues thorough monitoring of the waterbody for new locations of CLP presence and updates the membership accordingly.

It is recommended that the association continues documentation of the changes in CLP and native aquatic plant abundance. This would include keeping a record of locations on the lake CLP is detected in every year and any changes to native plant species. A native aquatic plant workshop can be offered at the request of the Tabor Lake Association at any time. Additionally, monitoring techniques that are WDNR approved can be offered as a training workshop if requested.

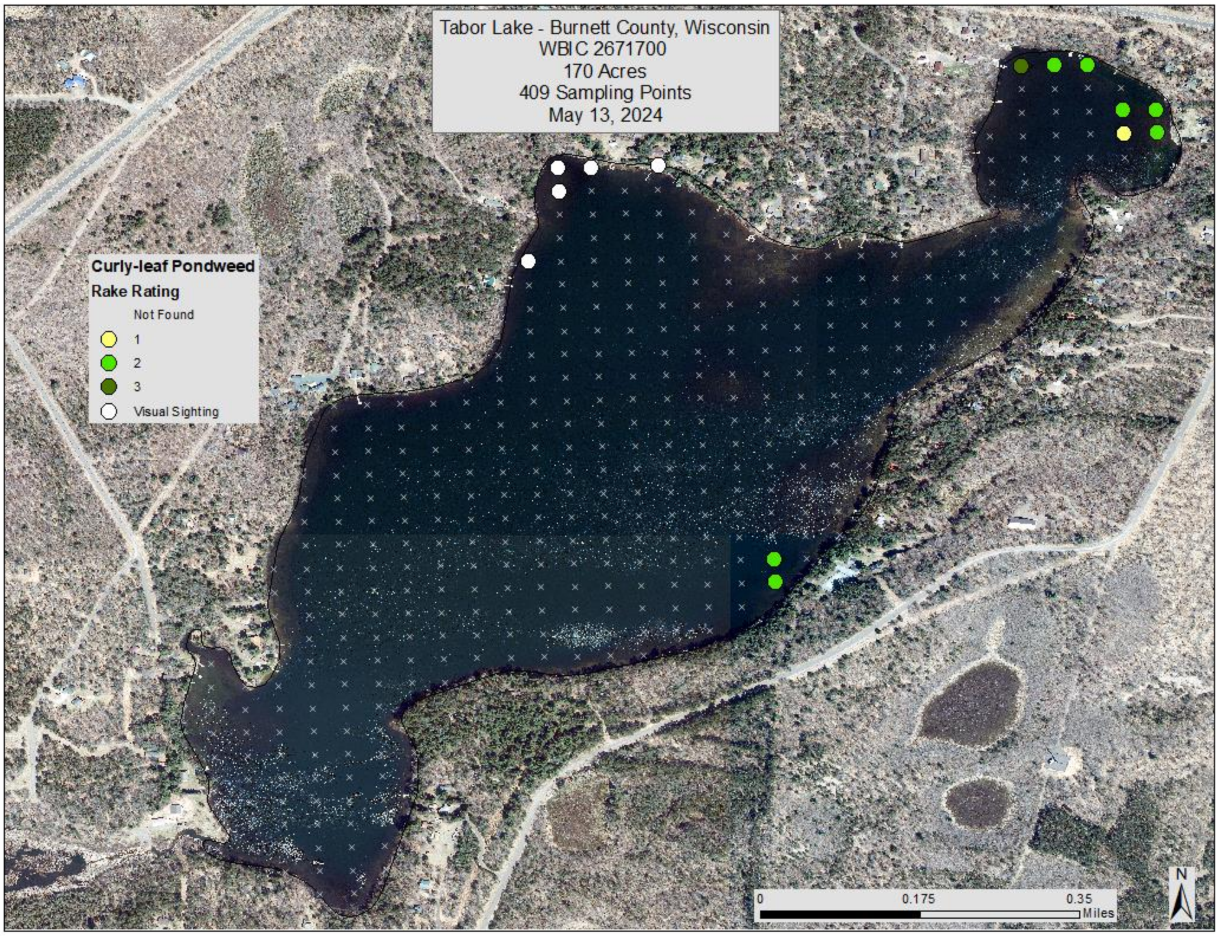


Figure 7. Curly-leaf pondweed distribution from the May 13, 2024 Point-Intercept Survey.

Hand pulling efforts have primarily been completed in the northeast bay of the lake where CLP has been the most abundant. If the association plans to move towards control efforts beyond hand removal, a WDNR permit will need to be approved.

Shoreline Survey

In July 2024, a lake shoreland and shallows habitat survey was conducted on Tabor Lake, Burnett County, Wisconsin. This survey followed the Wisconsin Department of Natural Resources (WDNR) field protocol for a shoreland and shallows survey. The methodology included surveying, assessing and mapping habitat in lakeshore areas, including the riparian zone, bank and littoral zone of the waterbody. The riparian zone (35 feet inland from the water's edge) is assessed the following: percent tree cover, percent ground cover by type (impervious surface, manicured lawns and natural). The bank zone (the immediate shoreline) assessed for lengths of modified banks, the density of human structures and erosion control practices. The littoral zone (the area of the lake where sunlight reaches the lake bottom) assessed for the presence of floating/emergent plants and coarse woody habitat. This data will provide information on riparian zone, bank and littoral zone concerns and how to move forward with restoration activities. The data is presented as an overview, followed by maps showing the presence of each category and the magnitude scale for each category.

Results

Canopy Cover

Canopy cover is defined as the area that is shaded by trees at least 16 feet tall. The canopy cover along shoreland areas is an important variable to measure when thinking about the health of the shoreland habitat along lakes. Canopy Cover offer protection to shoreland areas by slowing precipitation, reducing erosion from tree roots, supports vital habitat, adds aesthetic value and provides privacy and shade.

The average percent canopy cover was 79%. There was 43 parcels that were ‘natural’ with 100% canopy cover, 100% shrub and herbaceous cover and little to no human structures present. Only 10 parcels had less than 50% canopy cover on Tabor Lake. It is important to note that not all shoreland frontages are created equal, some parcels have 50 ft of frontage, others have over 500+ ft of frontage. The smaller the frontage on parcels can (but not all the time) can have more development because shoreland area is smaller.

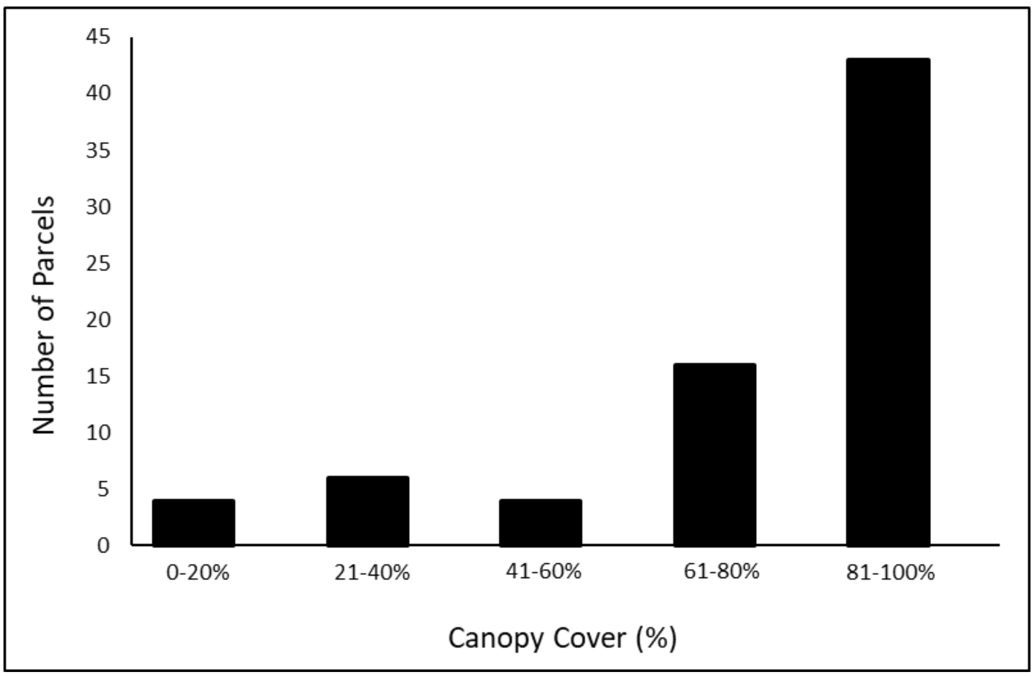


Figure 8. The percentage of canopy cover per parcel on Tabor Lake.

The current state of Tabor Lake’s canopy cover is very good, but could improve slightly by restoring the canopy cover on parcels that have less than 50%.

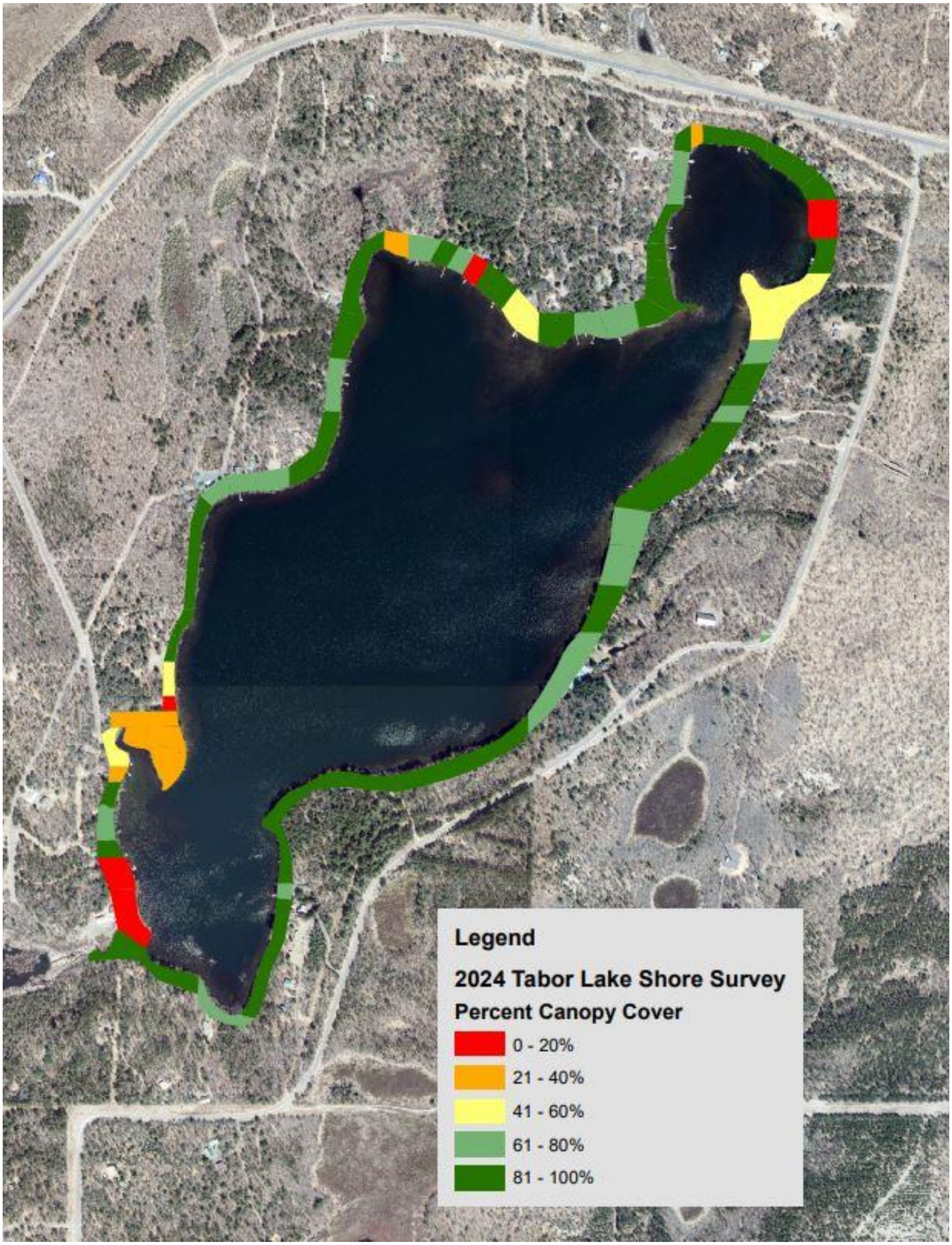


Figure 9. Percent Canopy Cover Map.

Shrub and Herbaceous Cover

Shrub and herbaceous cover is the most common layer to be removed in shoreland areas and replaced with manicured lawns or artificial sand beaches. Shrubs and herbaceous cover is important to have along shoreland areas because it adds further protection for erosion, runoff from upland areas, stabilizes the soil, provides habitat, and adds to the aesthetic value of the property and privacy to the parcel. For the purpose of this assessment, shrub and herbaceous layer was defined as woody plants less than 16 feet tall and herbaceous plants like grasses and forbs.

The average shrub and herbaceous cover for parcels on Tabor Lake was 67%. There was 11 and 39 parcels with 100% and 80% shrub and herbaceous coverage, respectively (Figure 10). Roughly 23 parcels had 50% or lower shrub and herbaceous coverage. Some shoreland areas on Tabor Lake that have naturally dense canopy coverage of coniferous (evergreens; cone and needled trees) were shown to have naturally sparse shrub and herbaceous cover due to the heavy pine needle understory. Coniferous litter, like pine needles, have been shown to be more acid in nature than deciduous litter, like leaves (Burgess-Conforti et al. 2019).

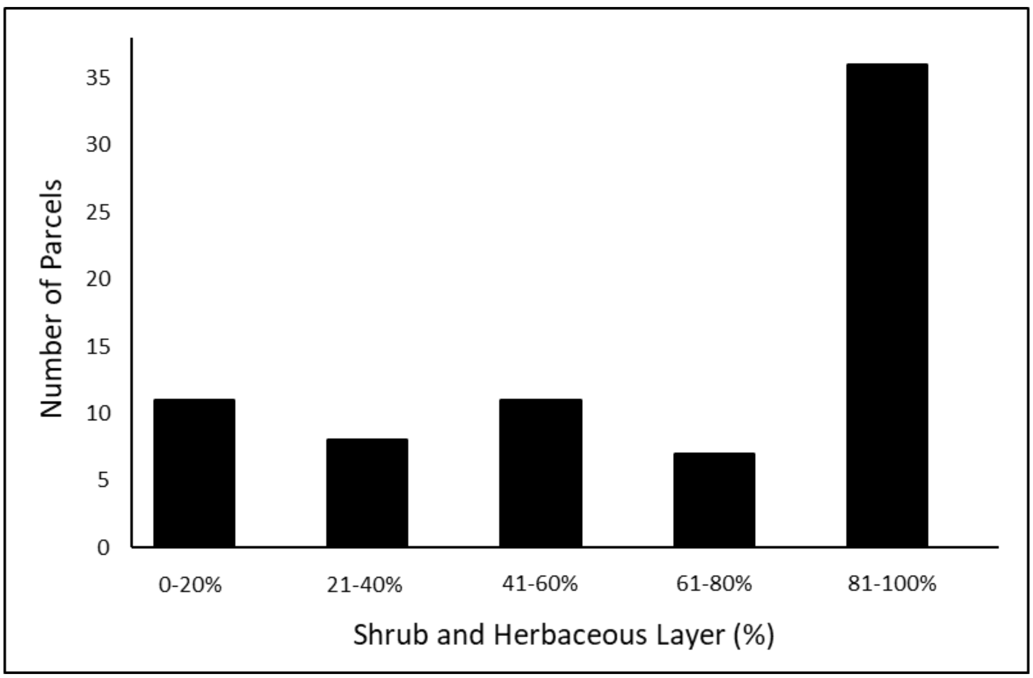


Figure 10. Percentage of shrub and herbaceous layer per parcel on Tabor Lake.

The current state of Tabor Lake's shrub and herbaceous layer is good but could be improved, as there are some areas where coverage was replaced by manicured lawns or displaced naturally by coniferous tree litter. Preserving the current shrub and herbaceous cover is strongly encourage as well as encouraging more vegetative growth at the parcels that have less than 50% coverage. In Table 6, showcases some of the shrub and herbaceous plants that can within dry, acidic, sandy soils in shady environments. These plants can be purchased during the Burnett County Annual Tree, Shrub and Plant Sale.

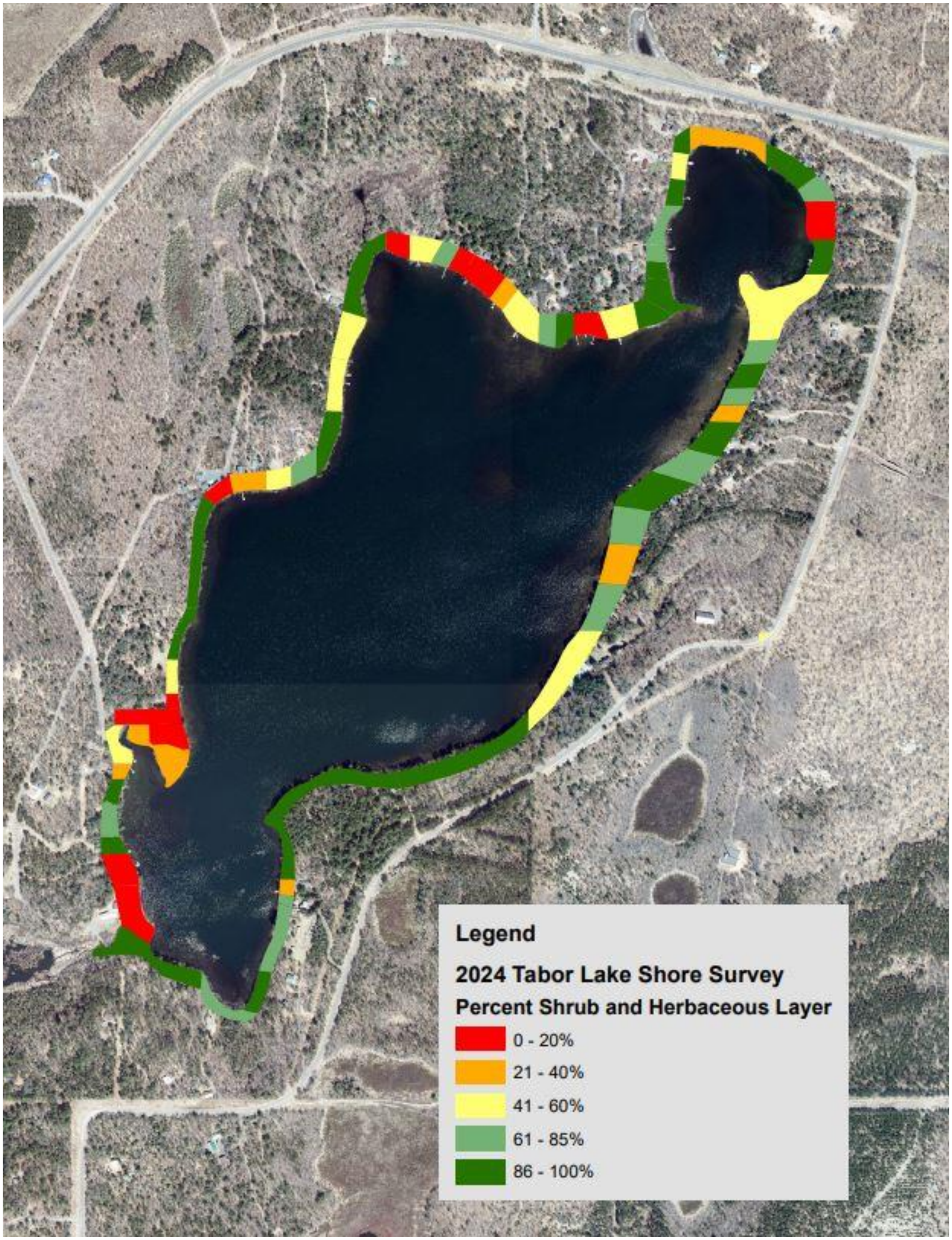


Figure 11. Percent Shrub and Herbaceous Layer map.

Table 6. Plant suggestions for shoreline areas that are in a pine setting, shady landscapes with sandy soils.

	COMMON NAME	SCIENTIFIC NAME	HEIGHT
GROUNDCOVERS	Braken fern	*Pteridium aquilinum*	2-3'
	Bunchberry	*Cornus canadensis*	6-8"
	False solomon's seal	*Smilacina racemosa*	18-24"
	Pennsylviana sedge	*Carex pensylvanica*	6-18"
	Wintergreen	*Gaultheria procumbens*	3-6"
FLOWERS	Bellwort	*Uvularia grandiflora*	1'
	Big-leaf aster	*Aster macrophyllus*	6-12"
	Columbine	*Aquilegia canadensis*	8-24"
	Hareball	*Campanula rotundifolia*	4-20"
	Wild geranium	*Geranium maculatum*	1-2'
SHRUBS	Chokecherry	*Prunus virginiana*	to 20'
	Gray dogwood	*Cornus racemosa*	to 8'
	Hazelnut	*Corylus americana*	to 8'
	Serviceberry/Juneberry	*Amelanchier laevis*	15-25'
	Snowberry	*Symphoricarpos albus*	2-4'

Impervious Surface

As lakeshore development increases, so does the amount of impervious surfaces on parcels. Burnett County has adopted the Wisconsin State Shoreland Ordinance and regulates impervious surface percentages on lakeshore parcels. Without the Chapter 45 Shoreland Ordinance, lakes and rivers would be at risk for overdevelopment which in turn would lead to poor water quality, increases in algal blooms and nuisance aquatic plant growth. Impervious surfaces include driveways, rooftops, decks, sidewalks and more. These surfaces increase the amount of surface flow across properties causing washouts, gullies and erosion issues. A decline in water quality often lowers values and the overall enjoyment of lakes.

The average impervious surface cover for Tabor Lake was 7.8%. There was 54 parcels with less than 5% of impervious surface cover (Figure 12). Some cabins built within the 35 ft setback to the lake before shoreland zoning was implemented still exist on Tabor Lake and were counting within the percentage during the assessment. The majority of impervious surface present on the lake included walkways to gain access to the lake. At this time, the first 35 feet from the ordinary high water mark landward is the most restricted shoreland zone on lake properties and the only development that can occur is a 5 ft wide walkway to gain access to the lake.

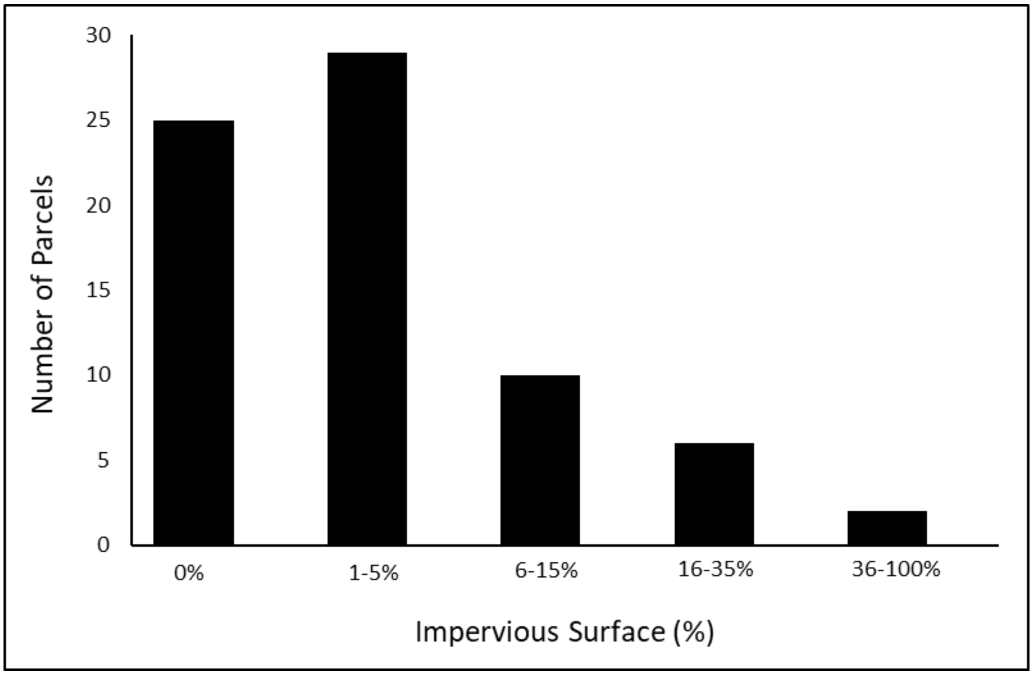


Figure 12. Percentage of impervious surface per parcel on Tabor Lake.

While impervious surface cover on Tabor Lake is relatively low, the cumulative impact over time could be detrimental to the lake's water quality, habitat, ecological integrity and potentially property values. For cabins closer to shore, implementing stormwater practices, such as rain gardens, to capture and control runoff it a vital open in preserving water quality. There are many opportunities for funding for stormwater practices including the Healthy Lakes and Rivers grant program or enrolling into the Burnett County Shoreline Incentives Program.

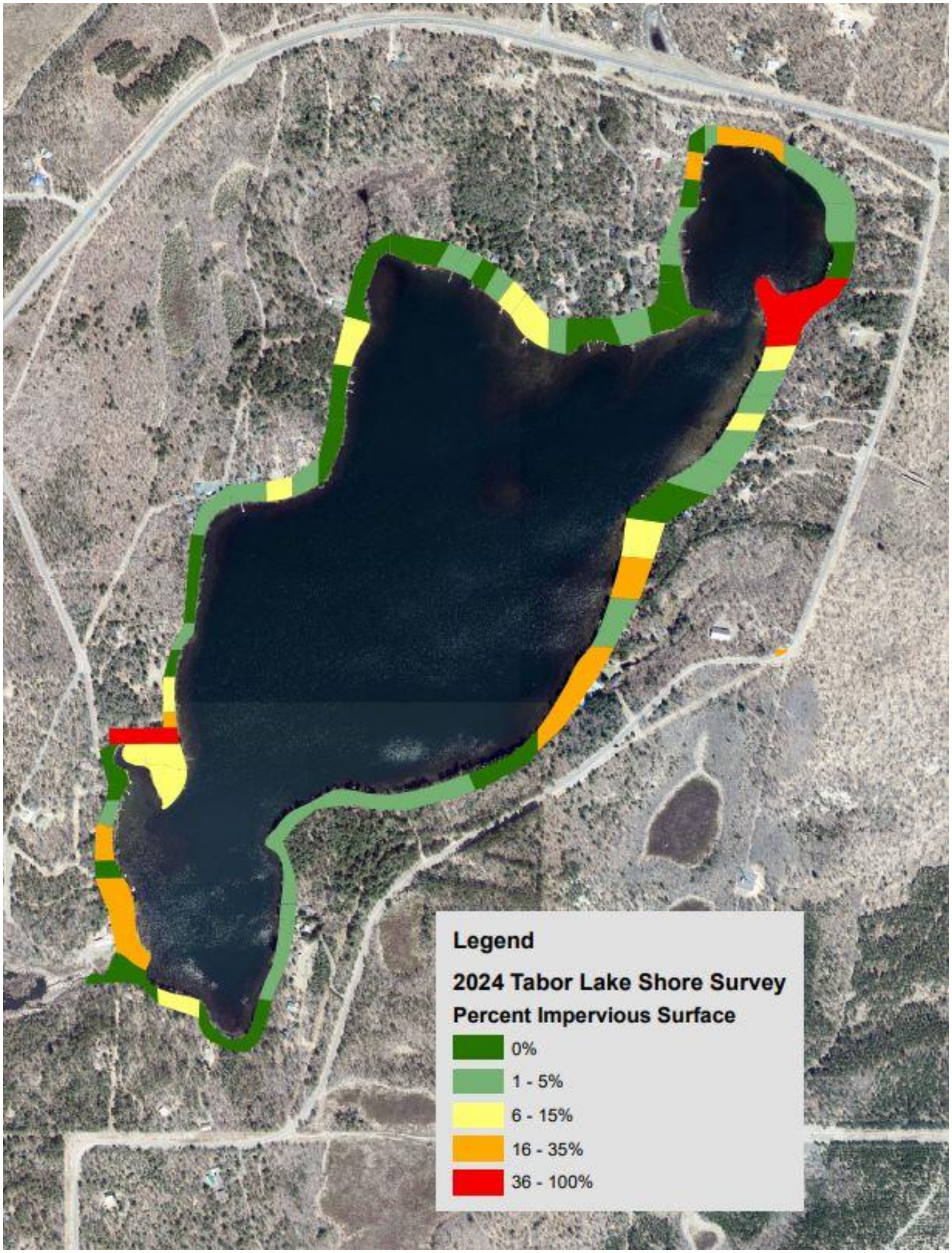


Figure 13. Percent Impervious Surface map.

Manicured Lawn

Manicured Lawn includes lawn areas that are regularly maintained. Much like impervious surfaces, lawns can decrease the ability for shoreland areas to serve its natural functions like reduce erosion and runoff potential. The plant species that serve most of the manicured lawn sod or seed mixes only have a few centimeters of root systems, reducing the infiltration rate of stormwater into the ground like native plants can. Manicured lawns also create habitat deserts that can no longer support a healthy diverse wildlife habitat. Additionally, stormwater runoff from lawns can carry pollutants and nutrient sources (lawn fertilizer, natural phosphorus in plants, pet waste, lawn clippings, goose feces etc) directly into the lake without being filtered out or mitigation like vegetation on an undeveloped shoreline.

The average manicured lawn cover for Tabor Lake was 18%. There was roughly 53 parcels below 25% manicured lawn and 20 parcels over 30% (Figure 14). Manicured lawn and shrub and herbaceous cover are inversely related – meaning when the parcel has more lawn, there would be less shrub and herbaceous cover and vice versa. For Tabor Lake, the shrub and herbaceous layer was 67%. All lakeshore property owners can have some manicured lawn or a maintainable space to access and view the waterbody, which is called their 'viewing and access corridor'. However, parcels must have natural vegetation outside of the viewing and access corridor to serve the natural functions. The viewing and access corridor is different for all properties as it is dependent on the amount of shoreland frontage a property has. Contact the Burnett County Land Services Department to learn about the viewing and access corridor.

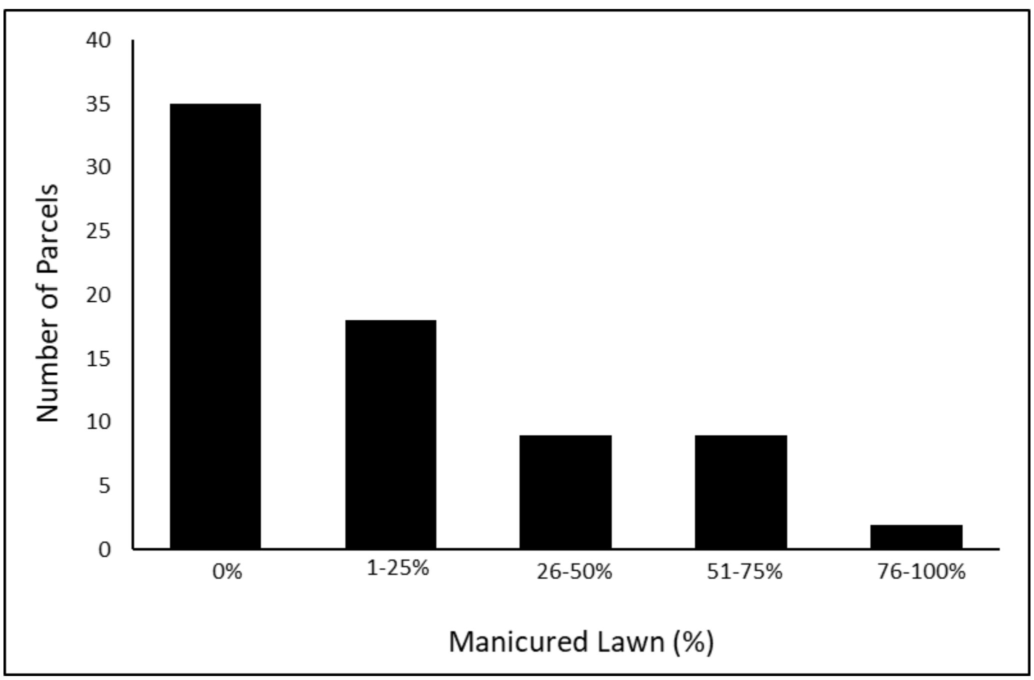


Figure 14. Percentage of manicured lawn per parcel on Tabor Lake.

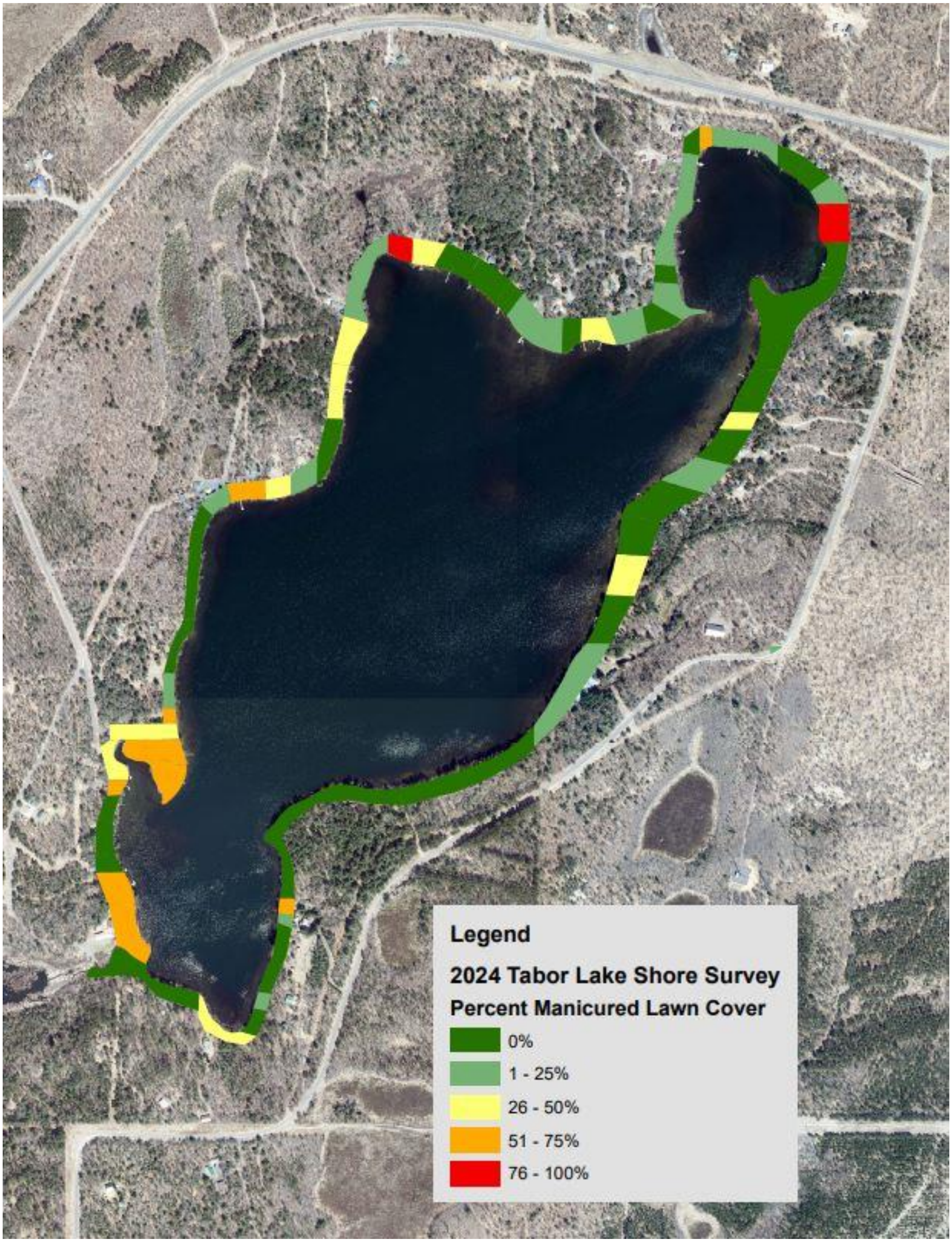


Figure 15. Percent Manicured Lawn Cover map.

Restoration Potential

Using the assessment data collected for canopy cover, percentages of shrub and herbaceous cover, impervious surfaces and manicured lawn as indicators for development, scores were assigned to parcels on a scale of 0-5 with 5 representing totally undeveloped shorelines and 0 representing heavily developed shoreland (Figure 16). The survey shows the number of parcels that could benefit from improvements from the assessment criteria and which shoreland areas should continue to be protected. Roughly 25 parcels on Tabor Lake could benefit from some type of shoreland restoration or stormwater runoff practice to help protect and preserve the lake. Roughly 50 parcels scored high based of off the assessment criteria and should remain protected from development. Of the 50 parcels, 8 are enrolled in the Burnett County Shoreland Incentives Program that offers the highest quality of protection. The remaining 42 parcels may also qualify for enrollment. If interested, contact the Burnett County Land Services Department for further determination.

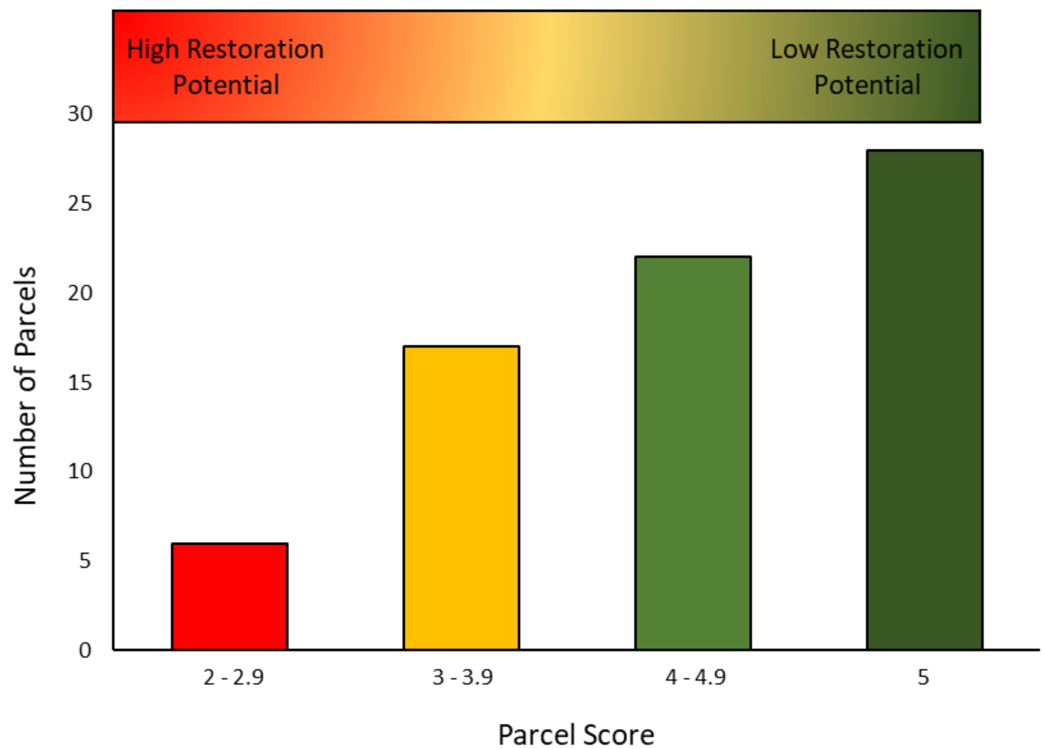


Figure 16. Tabor Lake Parcel Restoration Potential.

Human Structures

Human structures (buildings, boats on shore, fire pits, etc) within the riparian area (35 feet from the ordinary high water mark) were also noted during the assessment. Buildings and other structures can cause shoreline degradation overtime by increasing runoff potential and contributing to habitat loss.

Tabor Lake has about 3.23 miles of shoreline and 75 parcels. The average parcel has 227 feet of shoreline frontage. There were roughly 30 structures/buildings documented in the riparian zone. These were often small storage buildings, 3 boathouses were present, patios and some cabins built closer to the lake. There was roughly 161 boats on shore, primarily canoes, kayaks or floaties. There was roughly 10 fire pits near the lakeshore. Overall almost 40% of the parcels on Tabor Lake had some form of structure within the lake setback. These structures may or can have an influence on shoreline erosion, runoff and habitat loss if not maintained or contain adequate stormwater control devices.

The assessment also captured structures within the littoral zone of Tabor Lake. This area is immediately in front of the shoreland area in the shallow portion of the lake. Within the littoral zone of Tabor Lake, the survey captured the presence of human structures like piers, boat lifts and swim rafts. There were 70 piers, 53 boat lifts, and 10 swim rafts.

Erosion Concerns

Erosion is the process of the land wearing away from natural and man-made processes such as wind, waves, moving soil and being transferred to a different location. Erosion is the most common threats to water quality and degradation of lake health. Erosion can occur immediately at the water's edge from waves and wakes crashing into the shore, causing loss of shoreline frontage. It can also occur in the riparian zone or upland where water is running off of impervious surfaces and areas with low plant cover.

From the assessment, runoff concerns were documented using the categories shown in Table 7. Stairs/Trails/Roads to lake and Lawn/Soil Sloping to lake were the most prevalent runoff concerns present across the assessment. Bare soil was also present, primarily on parcels with heavy coniferous canopy cover and low shrub and herbaceous cover. These parcels could benefit from remediation efforts by implementing shoreline restoration practices, slowing the flow from upland areas and/or installing erosion control blankets on bare soil areas.

Table 7. Runoff concerns in and out of riparian zone.

RUNOFF CONCERN	PRESENT IN RIPARIAN ZONE	PRESENT OUT OF RIPARIAN ZONE	TOTAL
Point Source Pollution	0	0	0
Channelized Water Flow/Gully	2	0	2
Stair/Trail/Road To Lake	42	4	46
Lawn/Soil Sloping To Lake	30	3	33
Bare Soil	20	2	22
Sand/Silt Deposits	2	0	2

Modified Banks

Shoreline areas have become modified with the thought that armoring may help against erosion from fluctuating water levels and reducing shoreline frontage reductions. Different modified bank structures are old railroad tie armoring, rock rip rap, artificial beaches and log revetments (armoring shoreline with logs). A total of 8 parcels had some form of rip rap armoring the shoreline, totaling 235 feet. Railroad ties or log revetment structures consisted of 3 parcels totaling 40 feet of shoreline armored. Some forms of artificial beaches were found at 4 parcels totaling 36 feet of shoreline covered. There was 3 parcels that showed signs of bank erosion less than 1 foot of the hillside face (50 feet in total) and 1 parcel that had bank erosion greater than 1 foot of hillside face erosion (5 feet in total).

Table 8. Modified bank statistics on Tabor Lake.

MODIFIED BANKS	NUMBER OF PARCELS	TOTAL FEET
Vertical Sea Wall	0	0
Rip Rap	8	235
Other Erosion Control Structures	3	40
Artificial Beach	4	36
Bank Erosion > 1 Ft Face	3	50
Bank Erosion < 1 Ft Face	1	5

In some cases, rip rap and other erosion control structures can be necessary when parcels experience high energy from wind or waves, but often times rip rap is placed for the landowner's aesthetic appeal and adds a 'natural' look to the shoreline. The only time rip rap is accurately considered natural is if the lake contains a rocky shoreline and the rock is not transported in. Rip rap does not filter runoff, is costly, and can cause harm if not installed properly. Burnett County has waterbodies that have drastic fluctuating water levels and often times when water levels are high or runoff is occurring from upland areas, erosion occurs by undercutting the rock and doesn't help with flooding events.

There are more natural and cost-effective biological control structures that are recommended before the installation of rip rap. Some of these include fish sticks, log revetments, native plants, and allowing emergent aquatic vegetation to grow in the littoral zone, and bio logs. For examples of these practices, follow the link to the Shoreline Stabilization Guide:
https://wisconsinlandwater.org/assets/documents/Shoreline-Stabilization-Guide-for-Homeowners_Print-Version.pdf

Distribution of Floating and Emergent Aquatic Plants

Floating and emergent aquatic plants provide valuable habitat, protect the shoreline from wave energy that can cause erosion and improve water quality. Floating aquatic plants were documented at 54 parcels, which is nearly 72% of the littoral zone occupied by at least one floating plant. Emergent plants were documented at 44 parcels (58% of the littoral zone) and only 3 sites had visible plant removal.

Course Woody Habitat

Coarse Woody Habitat (CWH) in the littoral or near-shore zone serves many functions within the lake including, providing habitat and shelter for fish, allowing turtles to bask in the sun, erosion control structures and preventing suspension of lakebed sediments.

For this assessment, coarse wood habitat is a piece of wood greater than 4 inches in diameter and 5 feet in length that is in the water or below the ordinary high water mark. Live and dead wood standing vertically in the water or tree stumps were counted if it met the size criteria. There was a total of 8 parcels that had CWH present, of which all included branches and touched the shore and 2 of the 8 parcels had CWH in the water. The lake could benefit in having more littoral areas containing CWH. The Healthy Lakes and Rivers Grant Program offers funding to install CWH habitats in the lake.

Plan Goals and Strategies

Overall Purpose

This section of the plan lists the goals, objectives and actions for the Aquatic Plant Management Plan (APM) for Tabor Lake. This section was created by the Tabor Lake APM planning committee, the public lake user survey and several meetings with the Burnett County Water Resources Specialist. This plan was requested from the Tabor Lake Association after the finding of Curly-leaf pondweed in 2020-2021. This section presents a detailed strategy on how Tabor Lake Association plans to prevent, reduce and control populations of aquatic invasive species, provide education and recruit volunteers from memberships, address erosion concerns and improve water quality on Tabor Lake.

Plan Goals

1. Prevent the introduction and spread of AIS.
2. Reduce and control the spread of Curly-leaf pondweed.
3. Educate the community about aquatic plant management, appropriate native plant management actions and erosion control practices.
4. Develop a rapid response plan for aquatic invasive species.
5. Maintain and improve water quality with erosion prevention and other practices.
6. Promote and improve loon habitat.

Goal 1. Prevent the introduction and spread of AIS.

Objectives:

- Provide information and trainings to the Tabor Lake community of invasive species identification and impacts to aquatic ecosystems.
- Monitor for invasive species following Wisconsin DNR protocol.

Goal 2. Reduce and control the spread of CLP.

Objectives:

- Continue hand pulling measures to reduce CLP.
- Monitor areas that were removed and compare removal effectiveness.
- Apply for a WDNR Rapid Response Grant to receive funding for control measures.
- Monitor the lake annually for all aquatic invasive species.
- Using an early detection survey method, monitor the changes of the CLP distribution biennially.

Curly leaf pondweed control considerations beyond hand pulling measures:

If consideration is made for control efforts beyond hand removal several items should be considered:

1. Methods of plant removal (i.e. mechanical harvesting, chemical control, dredging, etc). Permits to be obtained.
2. Removal locations and proximity of native plants.
3. Times of removal would be performed.
4. Methods for disposing of plants.

Goal 3. Educate the community about aquatic plant management, appropriate native plant management actions and erosion control practices.

Objectives:

Audience: Tabor Lake Community
A. All lake residents
B. Business owners
C. Lake users
D. Residents who treated waterfront with herbicides or hand pulling in the past.

Messages

1. Educate the next generation of lake users on the importance of water quality, AIS preventive measures and being a good lake steward.
2. Where to find summary of APM plan and when APM meeting(s) are being conducted.
3. List of APM do's and don'ts.
4. Importance of native aquatic plants.
5. Limit impacts to native aquatic plants by traveling with no wake in shallow areas, using hand removal methods near docks, and swimming areas.
6. Explain procedures for individual corridor herbicide applications and describe conditions where herbicide treatments may be allowed.
7. Explain aquatic plant management techniques and permitting procedures.
8. Provide audience information on CLP, PLS, EWM and Zebra mussel identification and removal methods.
9. Provide the audience with information on lakes nearby with aquatic invasive species, especially Clean Boats Clean Waters inspectors.
10. Describe new potential invasive species and why they are a threat.
11. Native plant identification.
12. CBCW methods on proper inspections.
13. Updates on Burnett County Ordinances.

Goal 4. Develop a rapid response plan for aquatic invasive species.

Objectives:

- Develop a rapid response plan for Eurasian water milfoil, zebra mussels and other aquatic invasive species.

Goal 5. Maintain and improve water quality with erosion prevention and other practices.

Objectives:

- Continue to sample and record both water samples and Secchi readings.
- Encourage lake residents to restore and preserve shoreline buffers with native vegetation.
- Encourage lake residents to reduce hand pulling of aquatic plants near the immediate shoreline.
- Reduce phosphorus and sediment loads from immediate watersheds.
- Encourage riparian landowners to adopt and implement stormwater runoff controls for existing structures and all new construction.

Actions

- Train and recruit Citizen Scientists on the proper protocols for sampling water clarity and water chemistry and submit data into SWIMS.
- Provide workshops and presentations to lake residents on best management practices for healthy shorelines.
- Introduce property owners to different cost share programs available for stormwater practices, including Healthy Lakes and Rivers and Burnett County Shoreline Incentives Program.

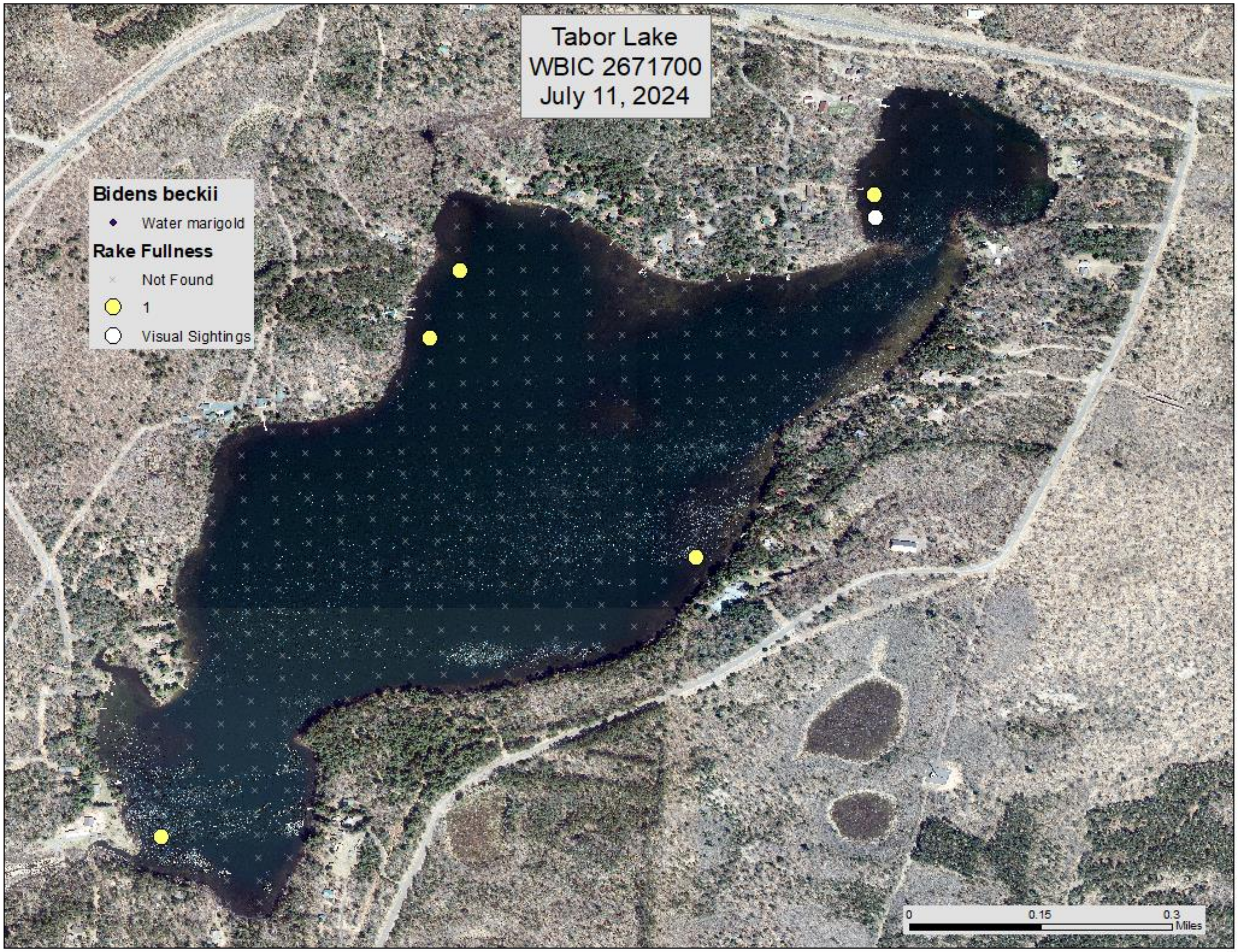
- Provide onsite visits for property owners having issues with erosion and runoff. (Provided by Burnett County Water Resources Specialist)
- Educate property owners on the benefits aquatic plants have at protecting the shoreline and reducing sediment suspension.
- Send messages out about the impacts pollution, littering, plastic, fireworks, balloons have on the water quality.
- Educate property owners on the do's and don'ts along the shoreline, including zoning regulations, setbacks and aquatic plant removal.
- Provide education on the impacts of leaky or old septic systems and plumbers to contact in the area to do regular maintenance.

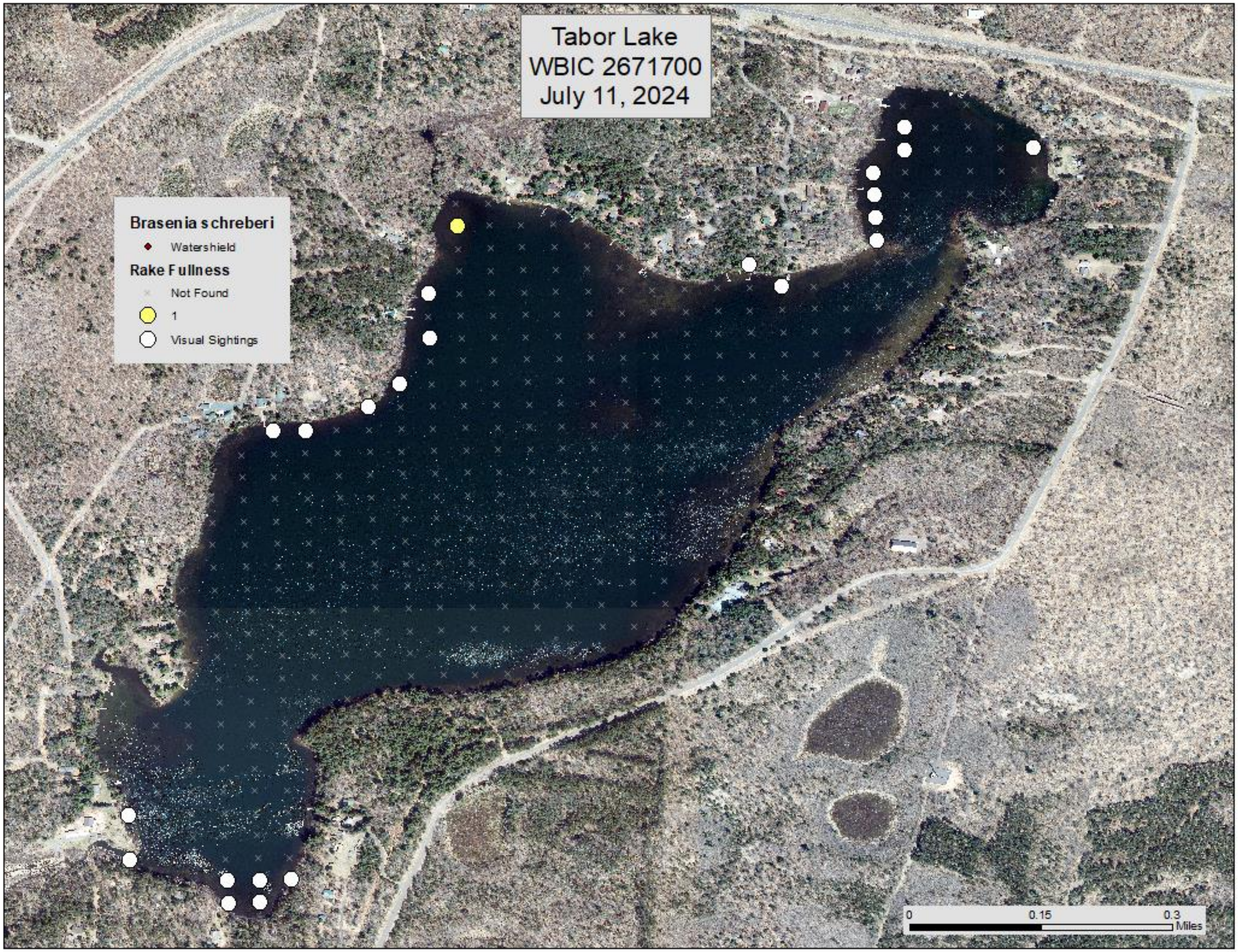
Goal 6. Promote and improve loon habitat.

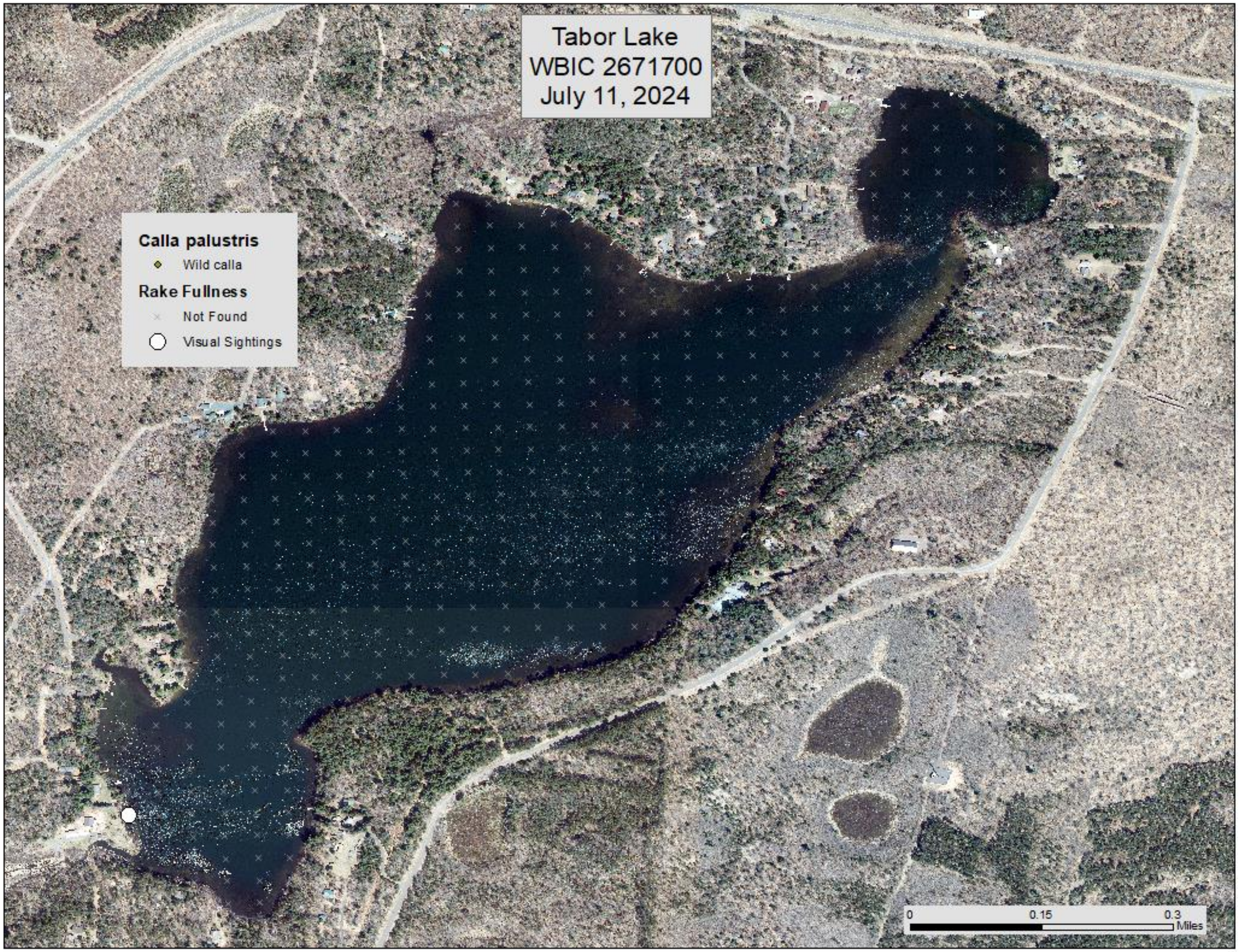
Objective:

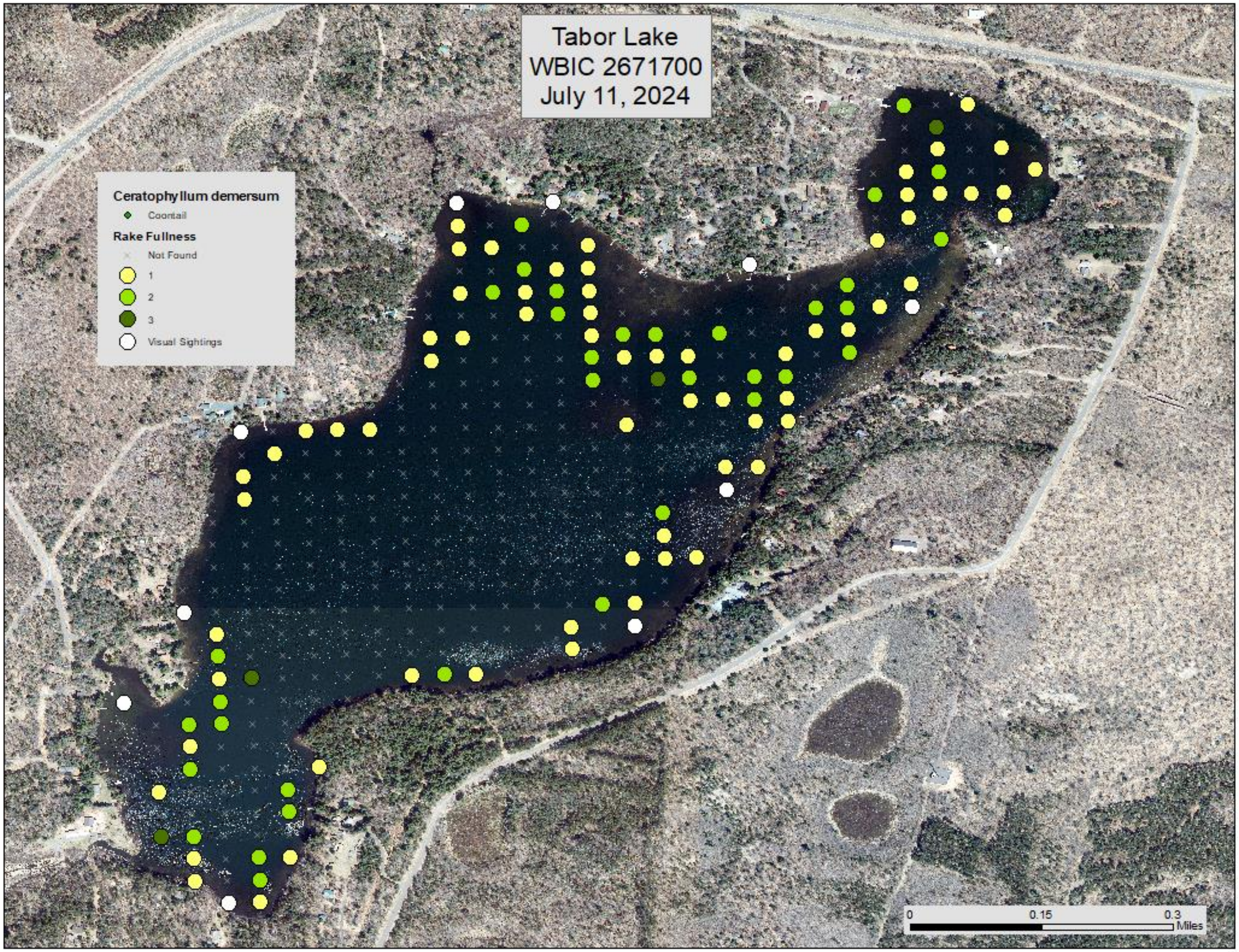
- Build a loon platform.
- Monitor for loon and young annually.
- Education boaters on the importance of being a good lake steward and using no-wake near loon habitat.

Appendix A: Aquatic Plant Maps

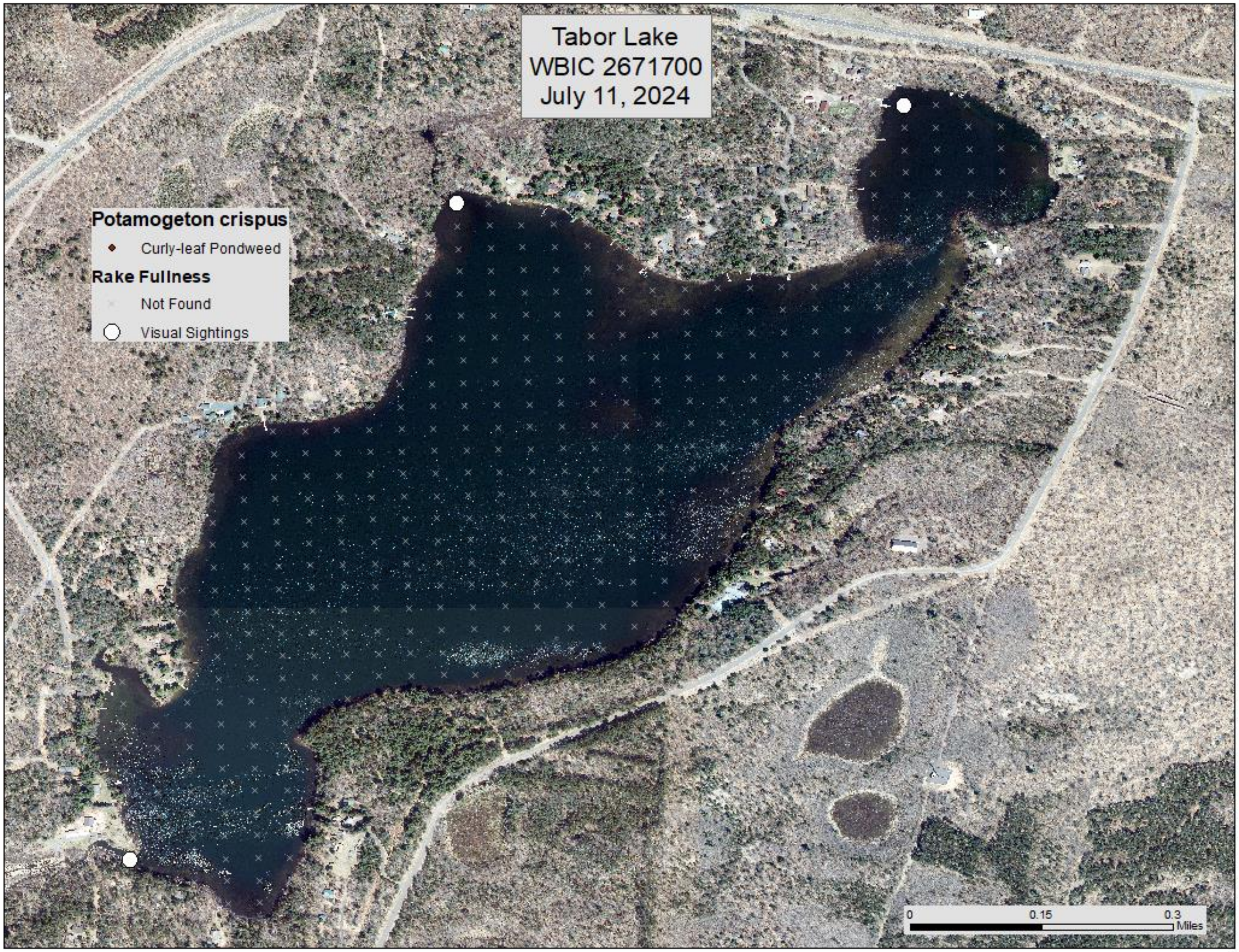


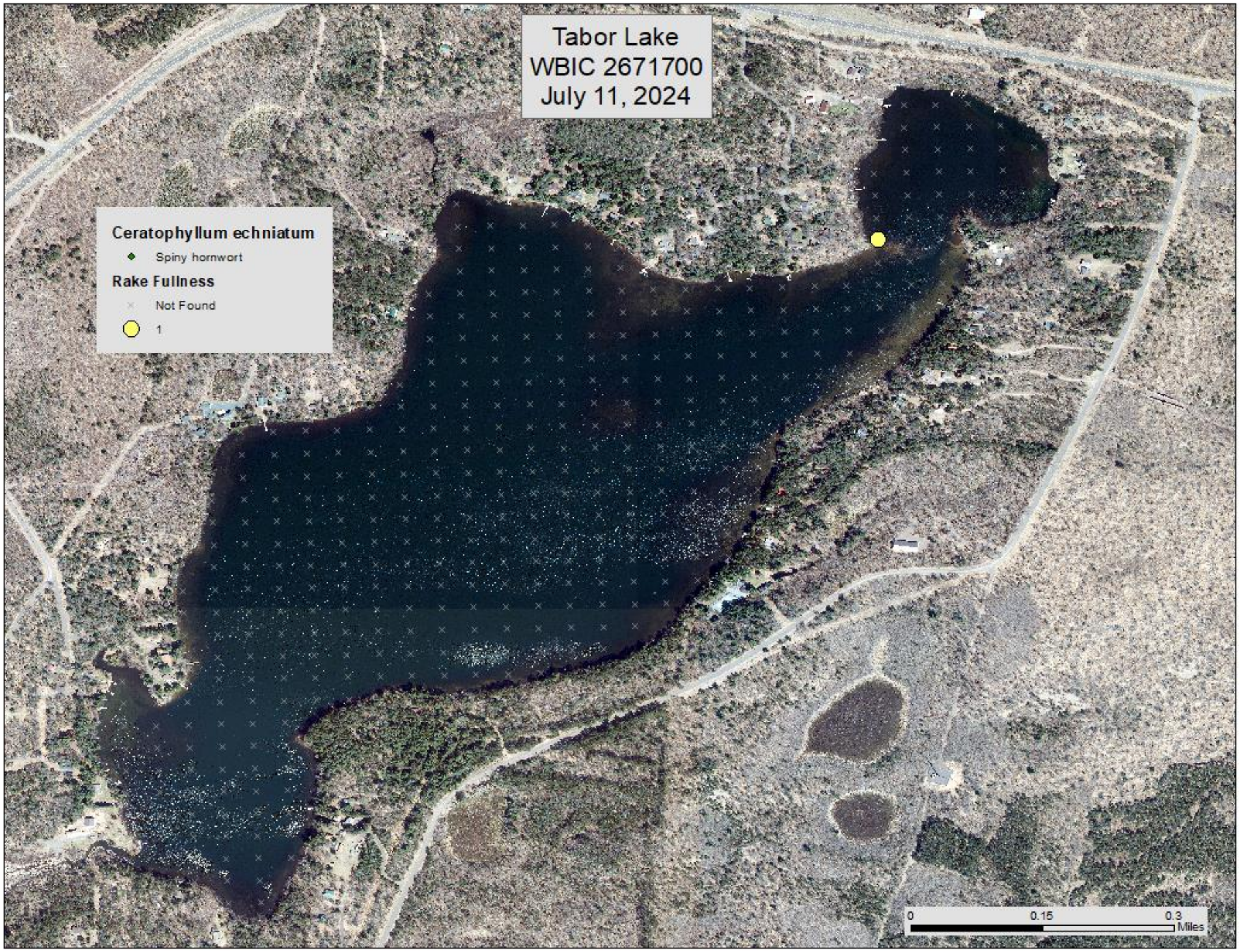

Tabor Lake
WBIC 2671700
July 11, 2024
Brasenia schreberi
Watershield
Rake Fullness
Not Found
1
Visual Sightings
0
0.15
0.3
Miles

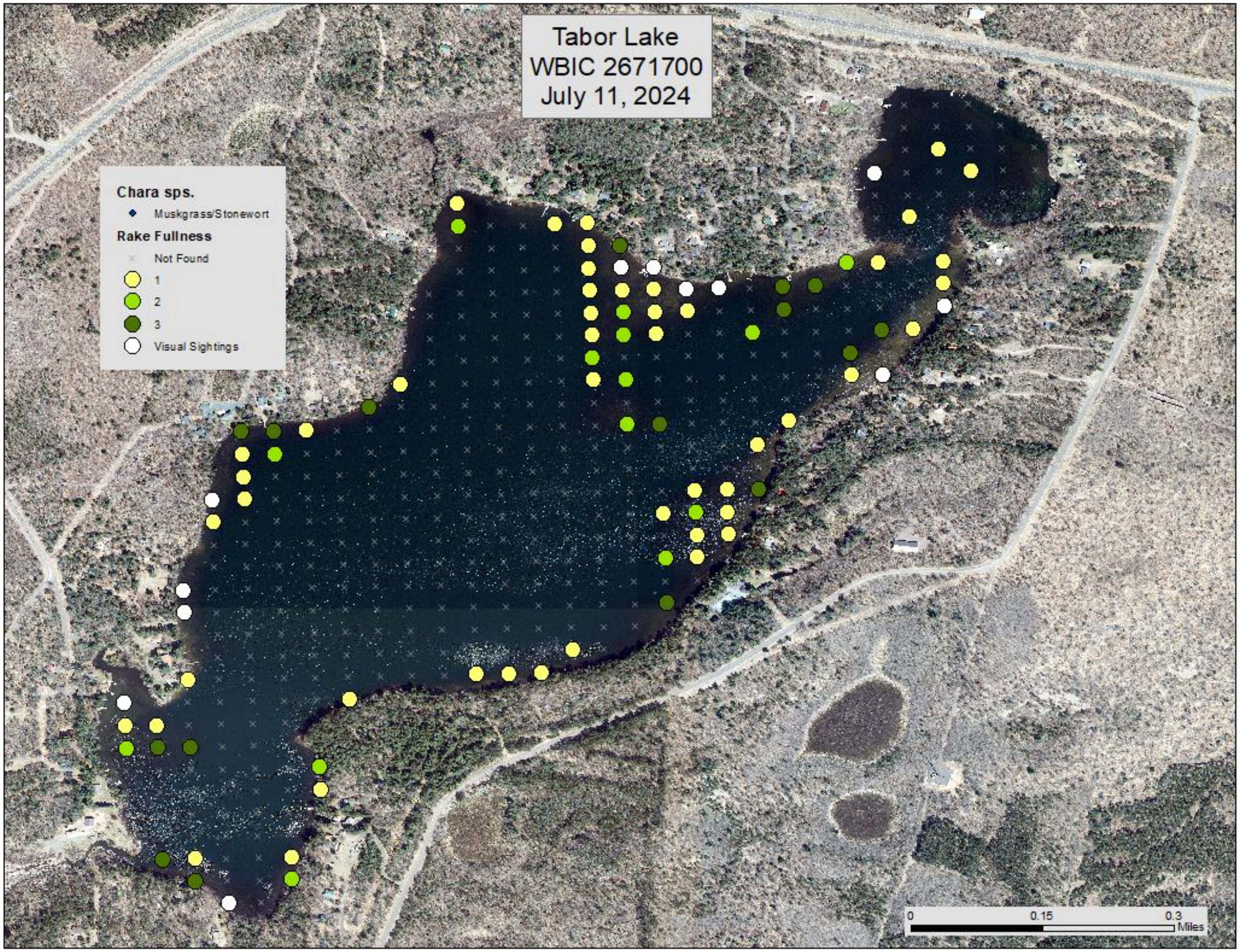

Tabor Lake
WBIC 2671700
July 11, 2024
Calla palustris
Wild calla
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles

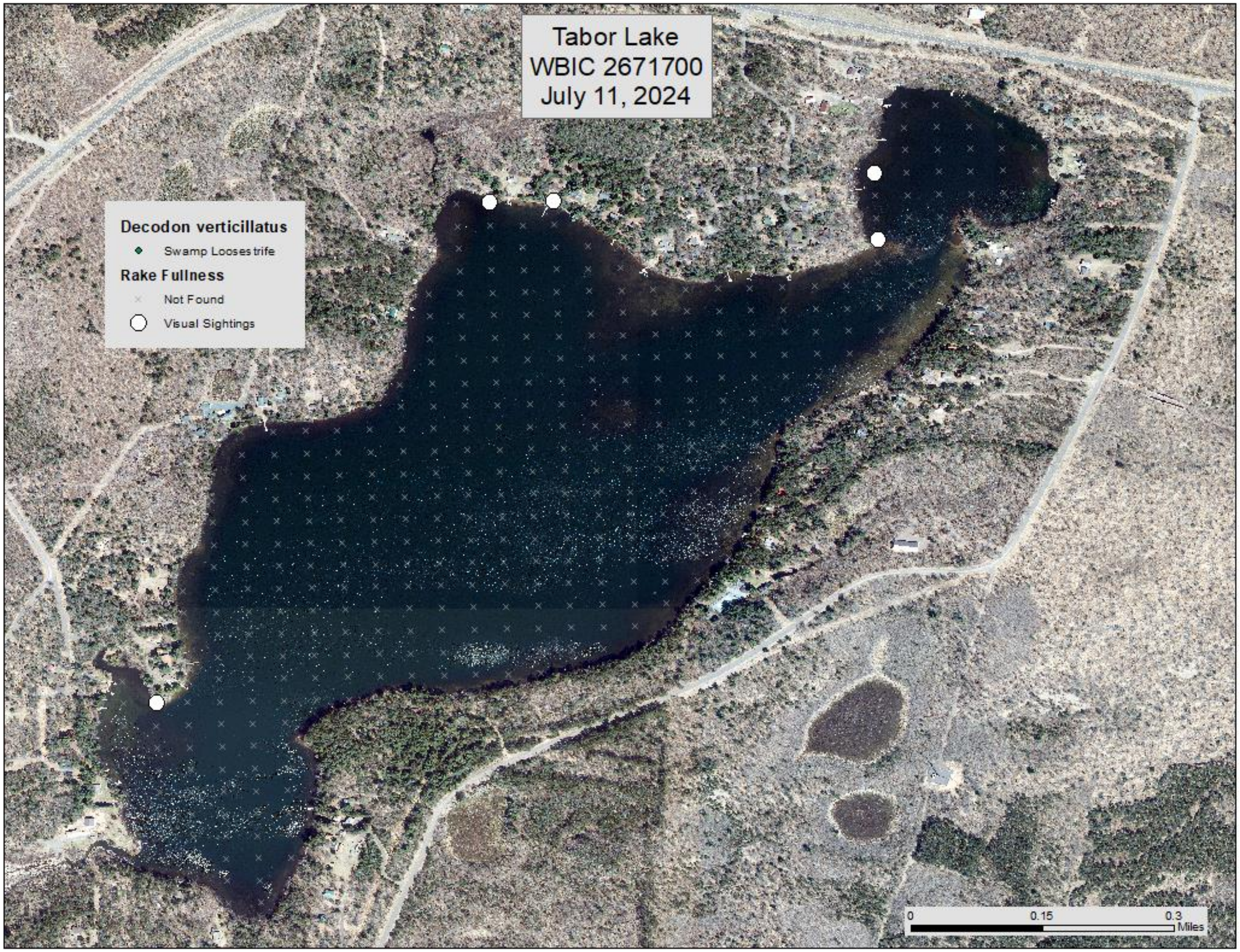


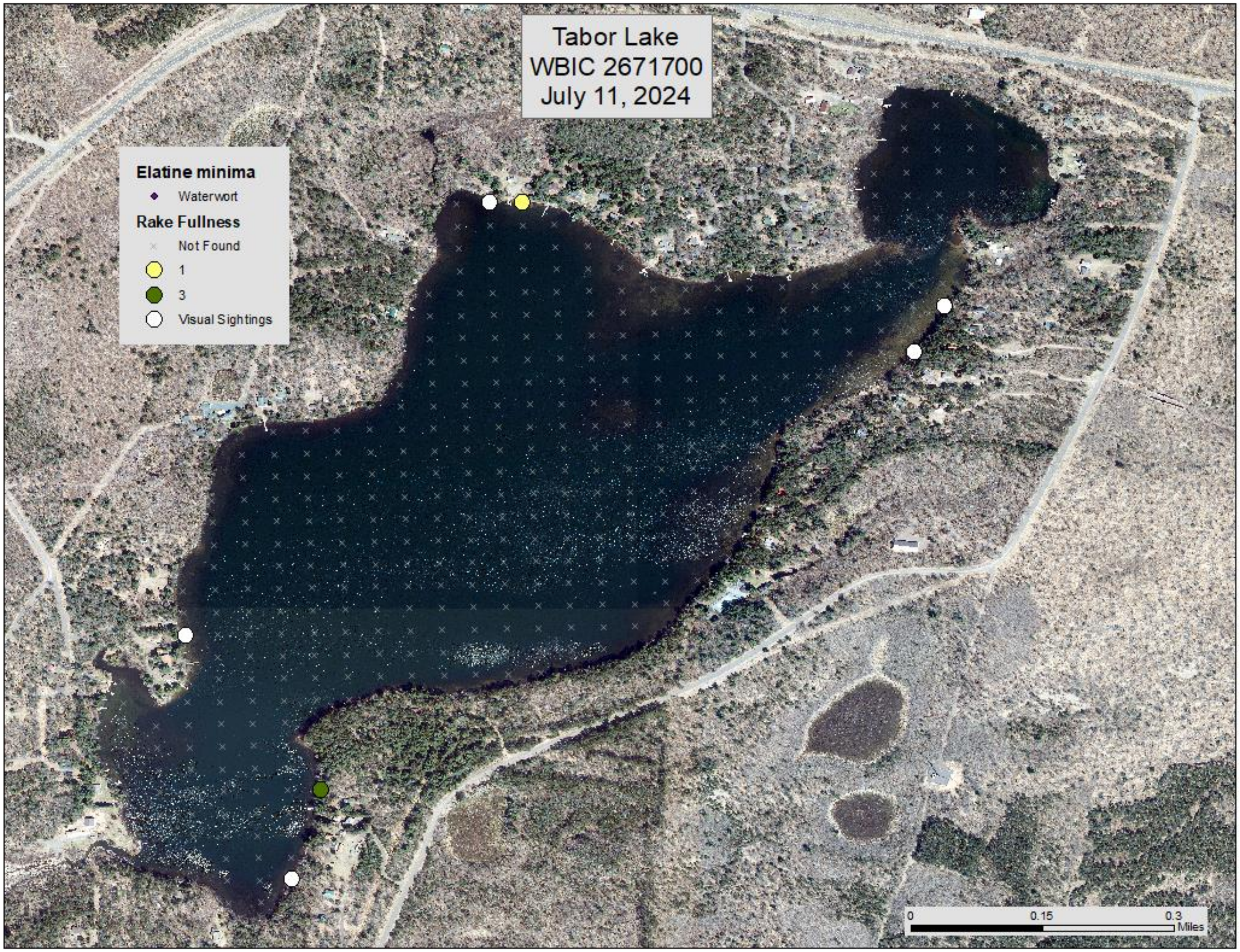
Tabor Lake
WBIC 2671700
July 11, 2024
Ceratophyllum demersum
Coontail
Rake Fullness
Not Found
1
2
3
Visual Sightings
0
0.15
0.3
Miles

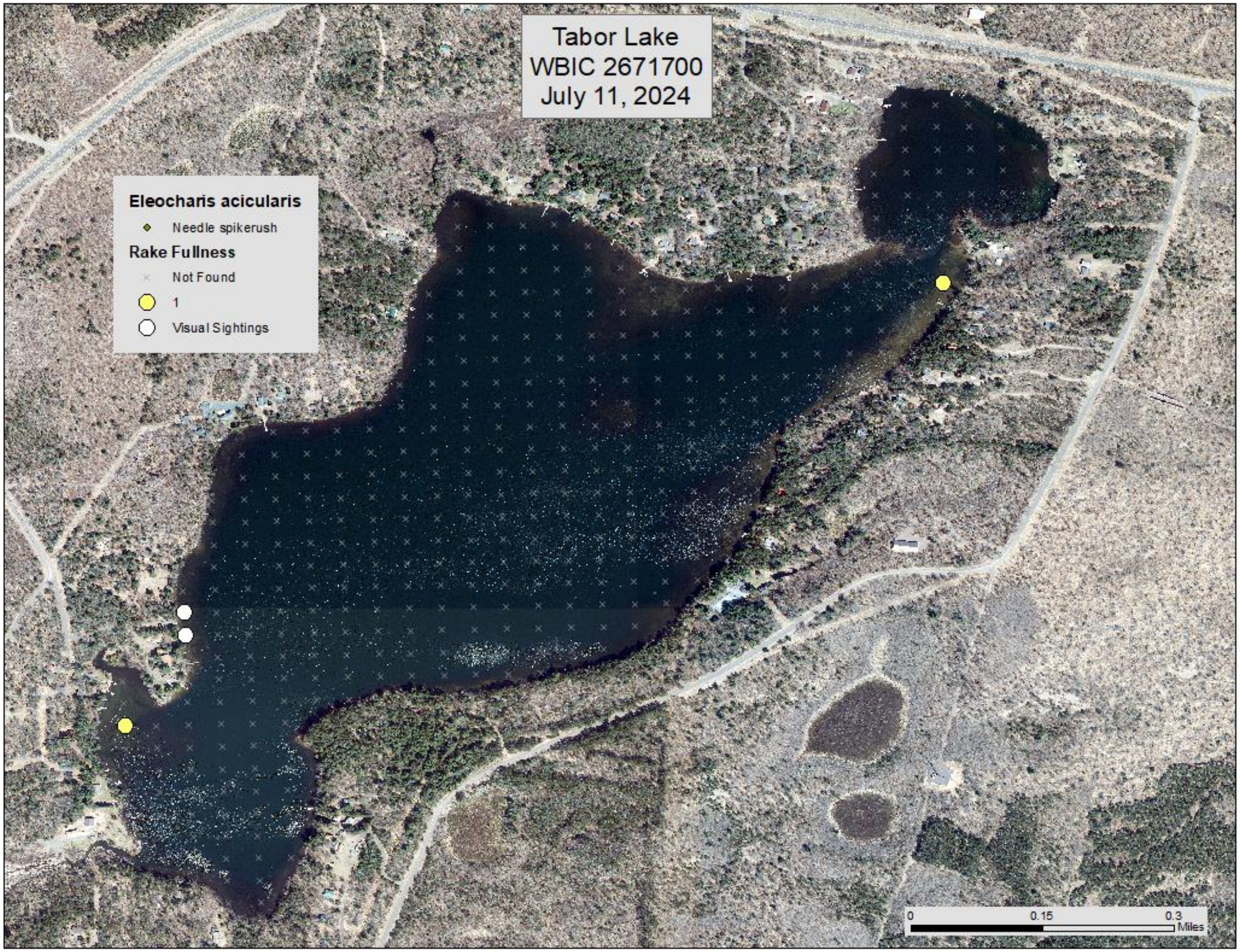

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton crispus
Curly-leaf Pondweed
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles

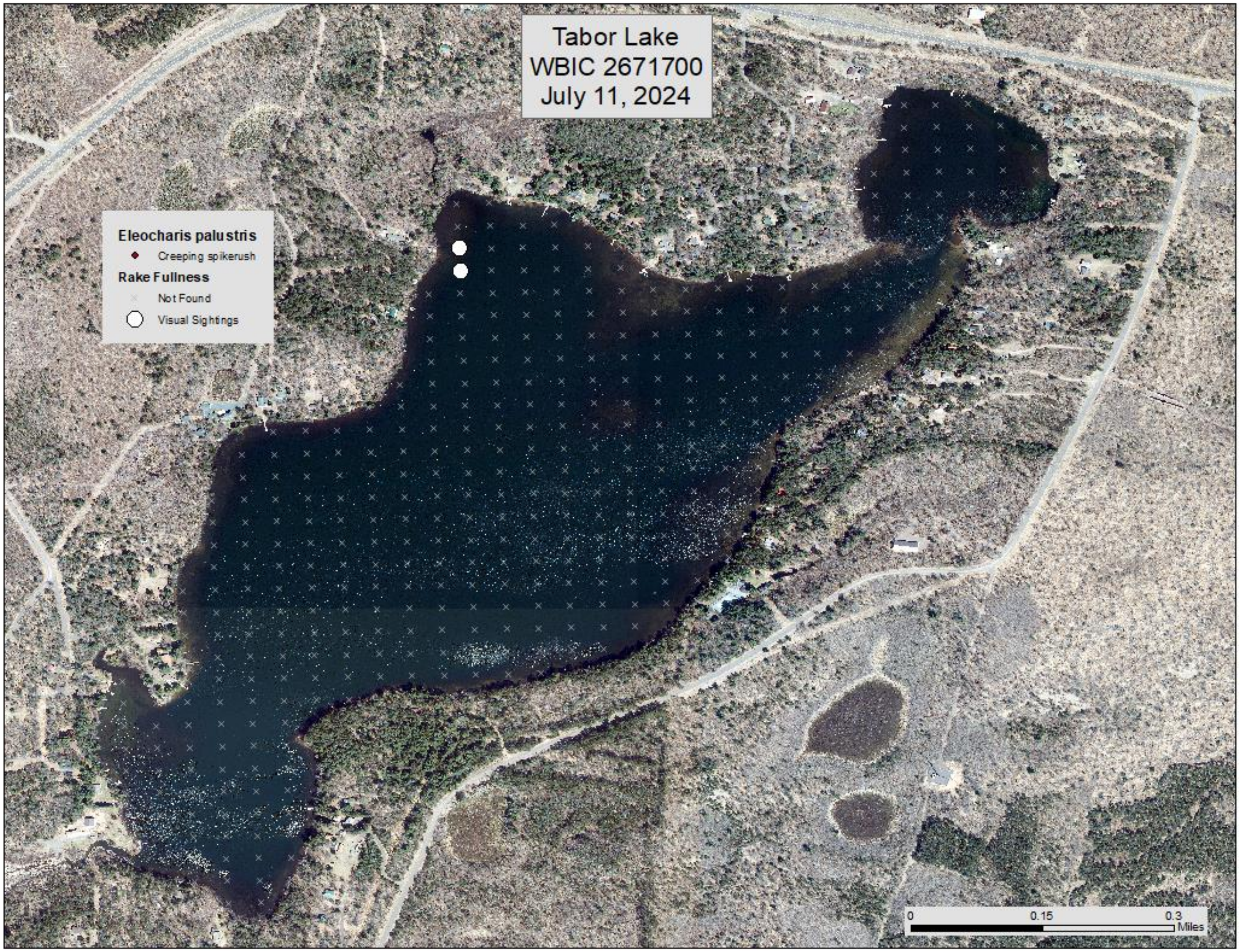

Tabor Lake
WBIC 2671700
July 11, 2024
Ceratophyllum echniatum
Spiny hornwort
Rake Fullness
Not Found
1
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Chara sps.
Muskgrass/Stonewort
Rake Fullness
Not Found
1
2
3
Visual Sightings
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Decodon verticillatus
Swamp Loosestrife
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Elatine minima
Waterwort
Rake Fullness
Not Found
1
3
Visual Sightings
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Eleocharis acicularis
Needle spikerush
Rake Fullness
Not Found
1
Visual Sightings
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Eleocharis palustris
Creeping spikerush
Rake Fullness
Not Found
Visual Sightings
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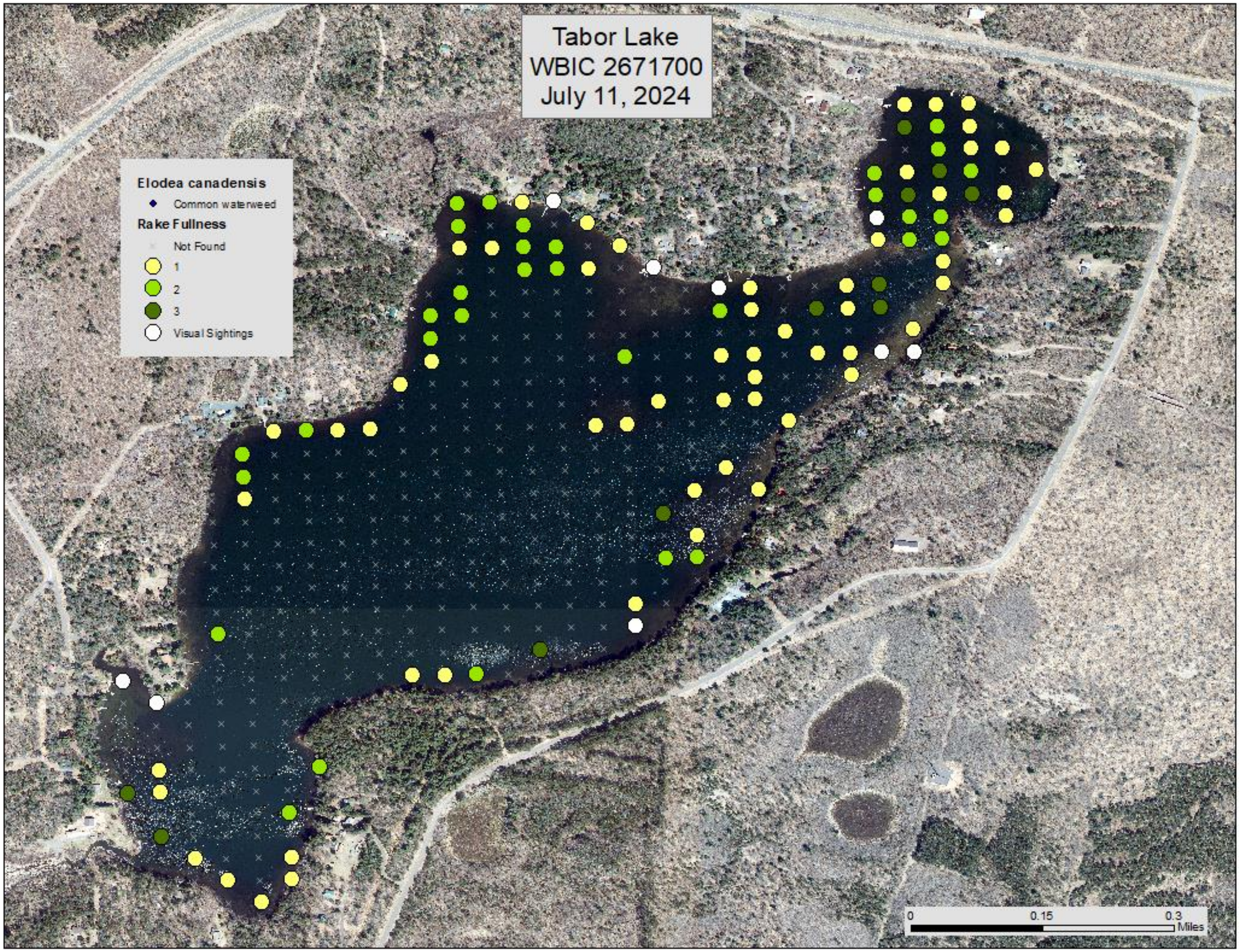
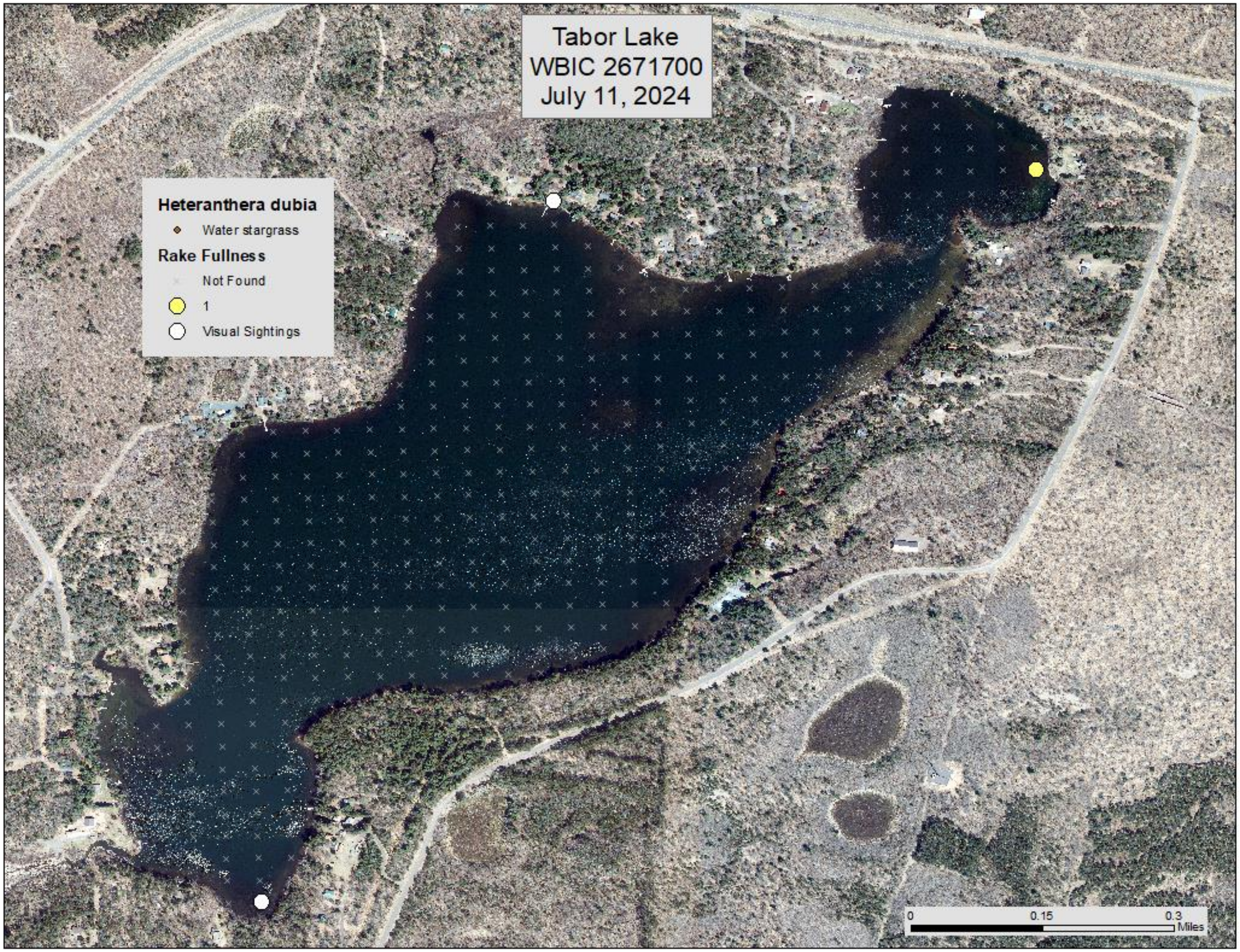
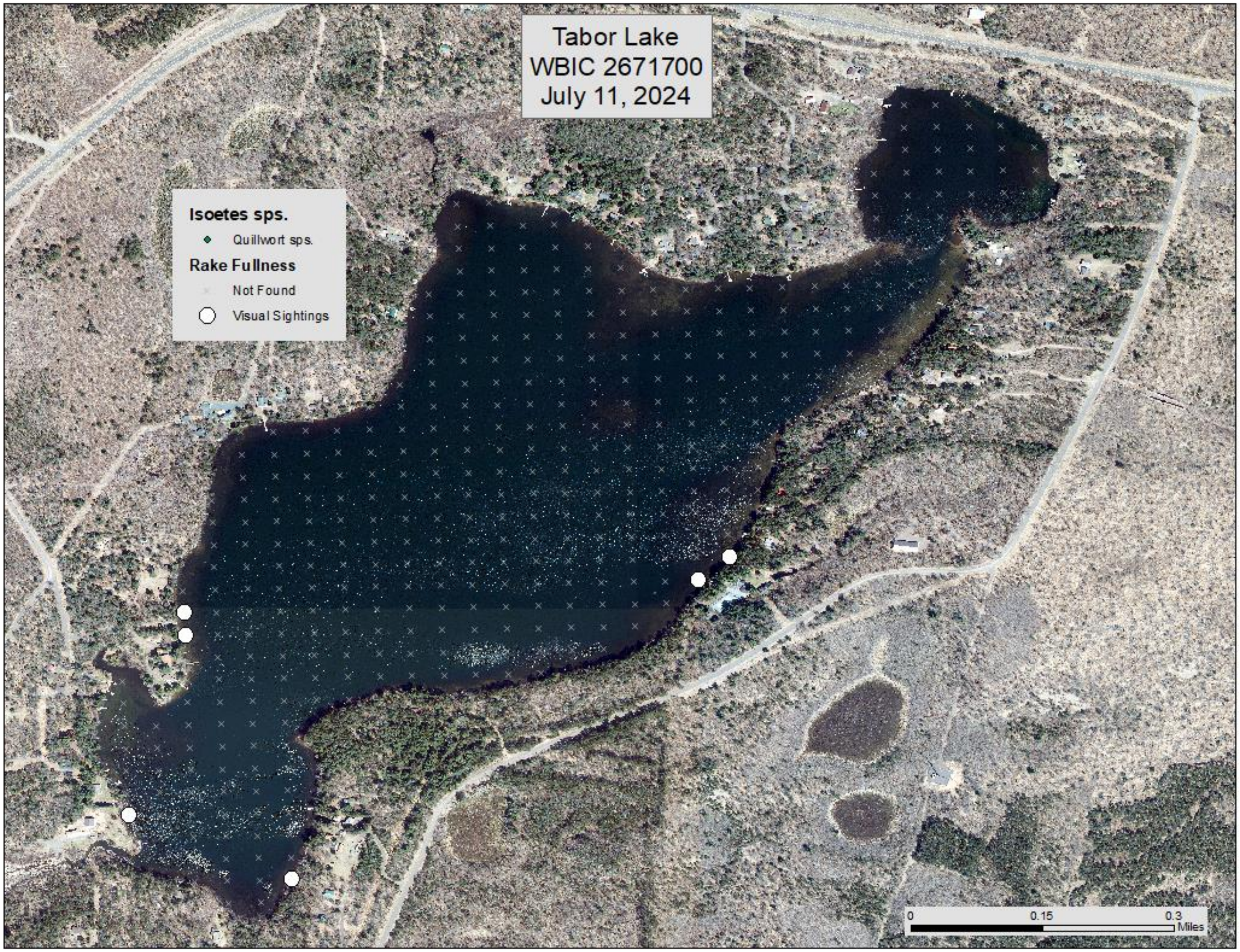
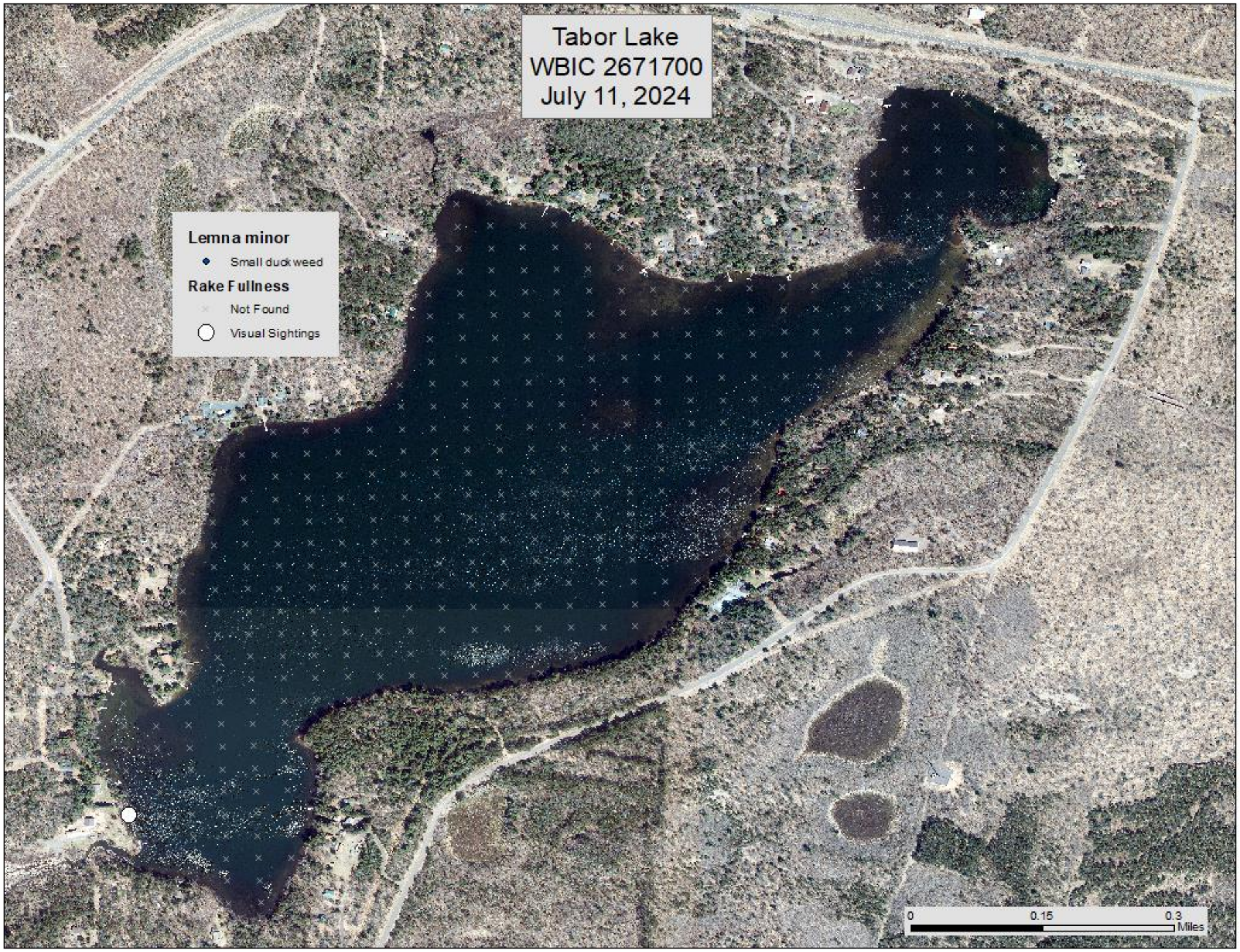
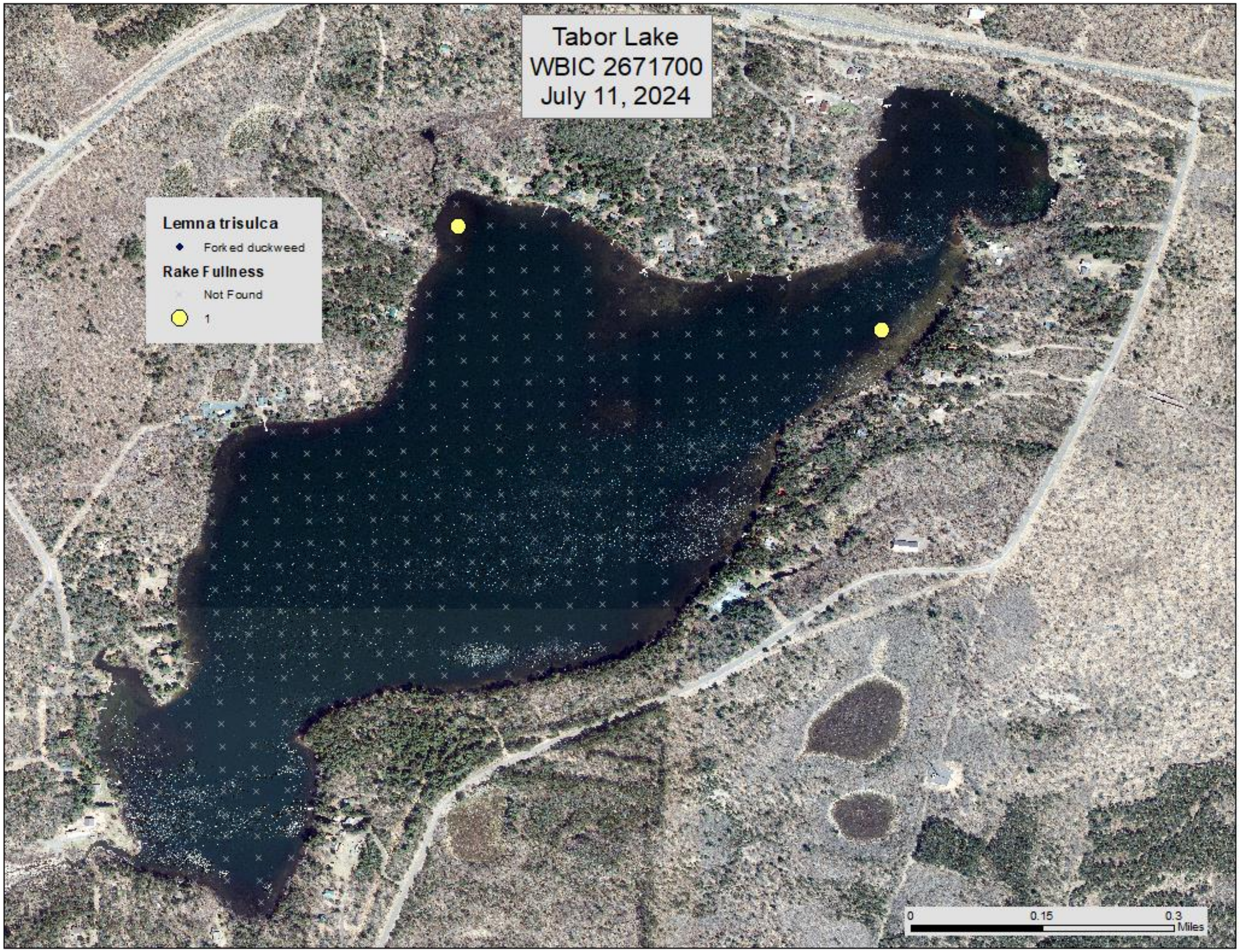
0.3
Miles

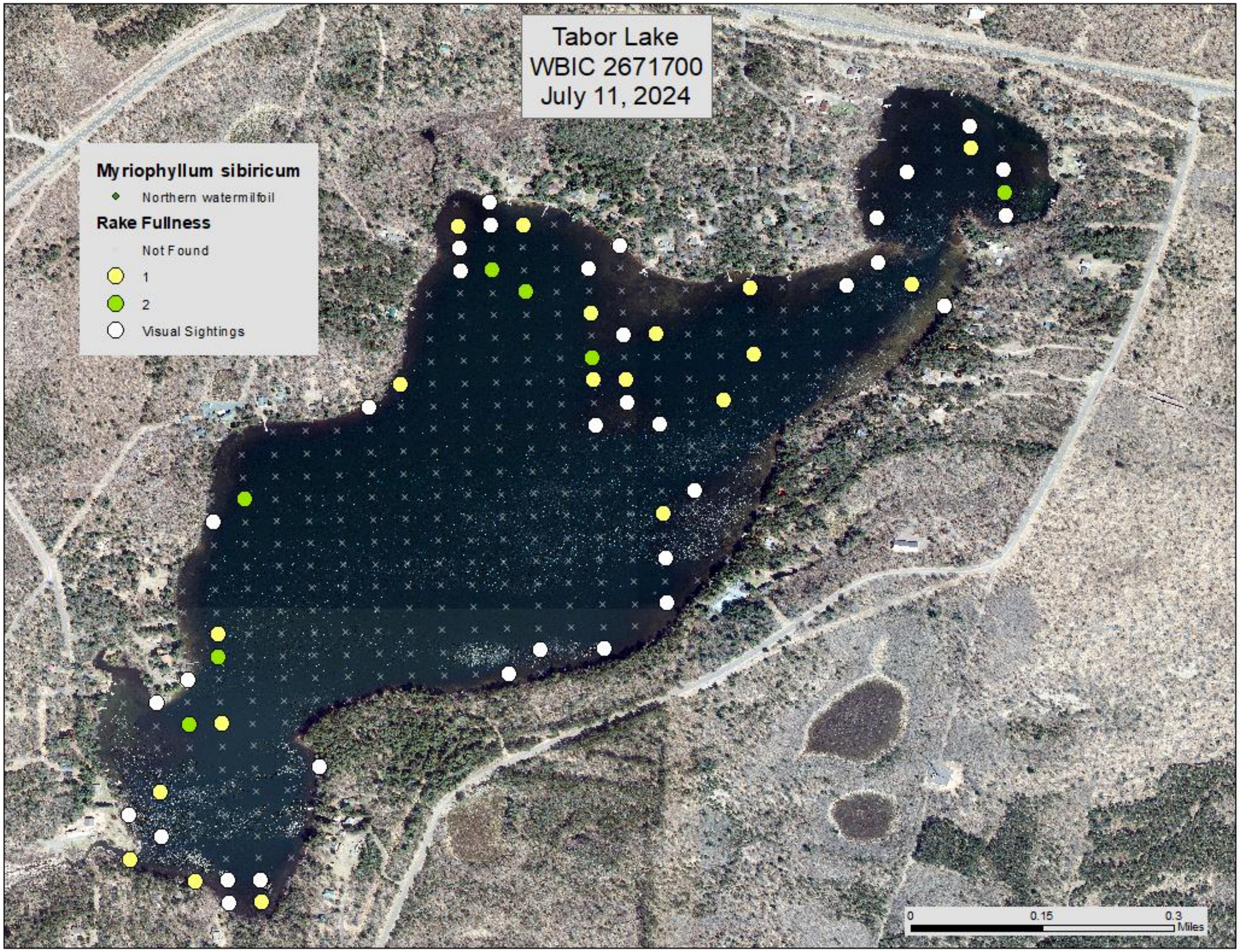

Tabor Lake
WBIC 2671700
July 11, 2024
Elodea canadensis
Common waterweed
Rake Fullness
Not Found
1
2
3
Visual Sightings
0
0.15
0.3
Miles

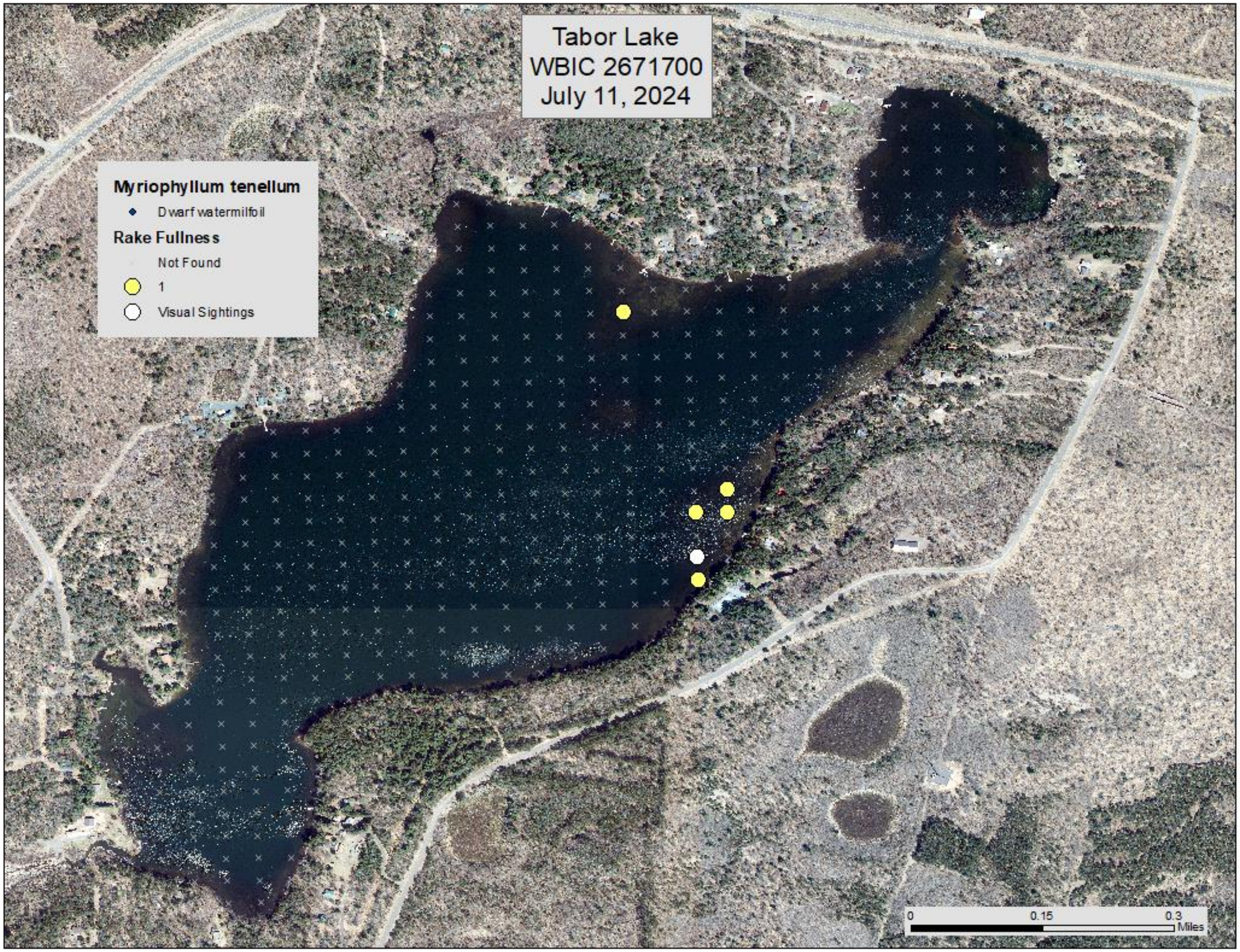

Tabor Lake
WBIC 2671700
July 11, 2024
Heteranthera dubia
Water stargrass
Rake Fullness
Not Found
1
Visual Sightings
0
0.15
0.3
Miles

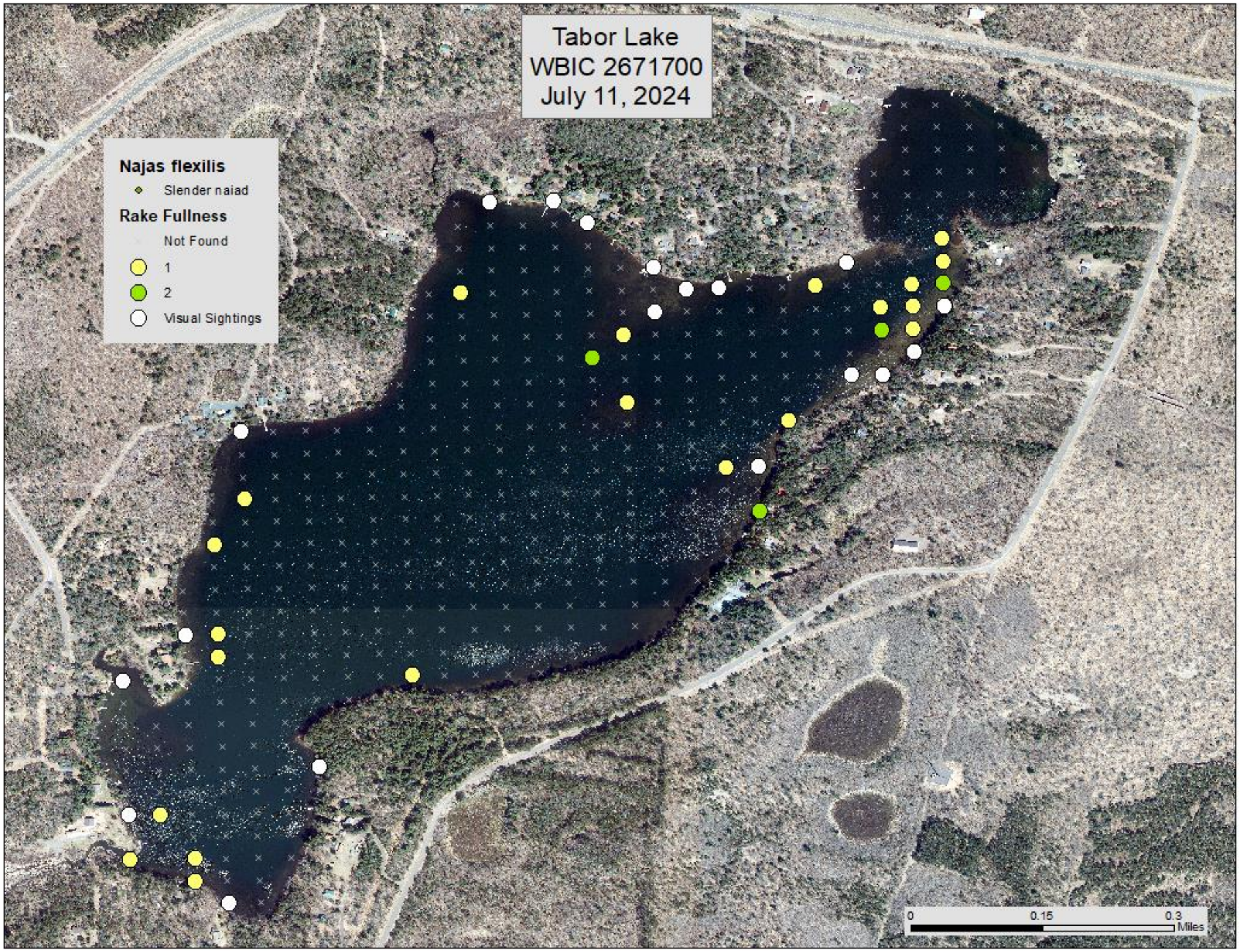

Tabor Lake
WBIC 2671700
July 11, 2024
Isoetes sps.
Quillwort sps.
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles

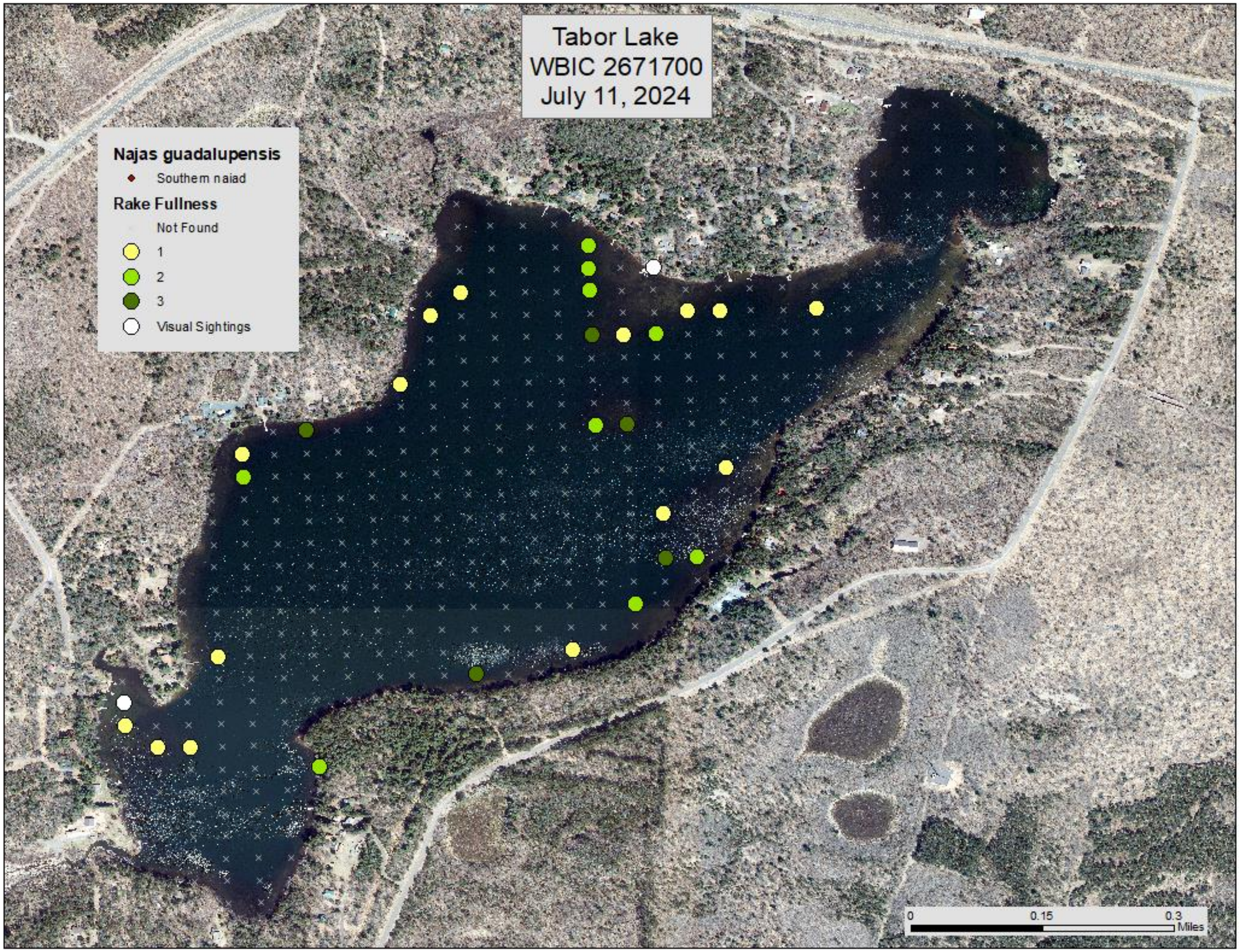

Tabor Lake
WBIC 2671700
July 11, 2024
Lemna minor
Small duckweed
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles

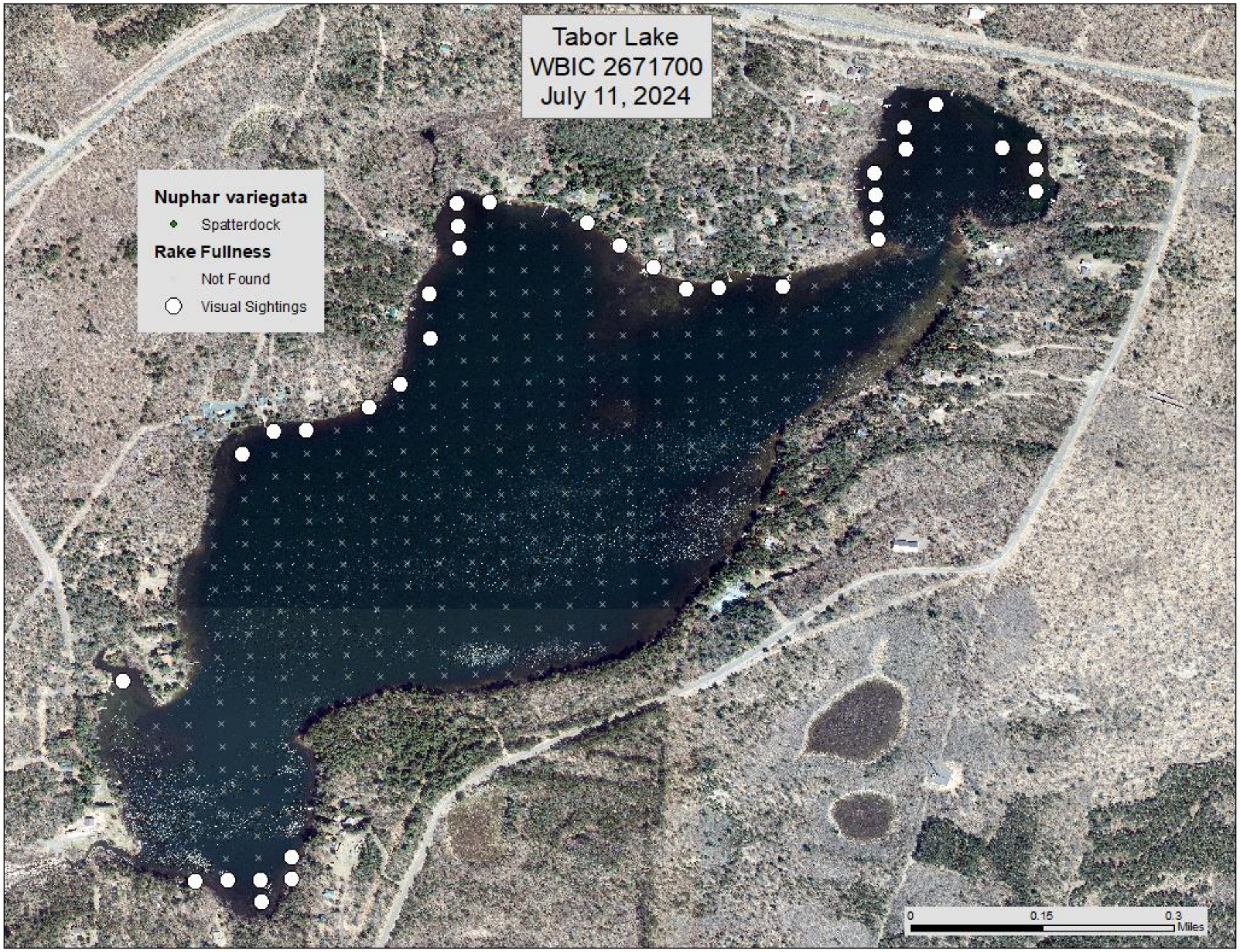

Tabor Lake
WBIC 2671700
July 11, 2024
Lemna trisulca
Forked duckweed
Rake Fullness
Not Found
1
0
0.15
0.3
Miles

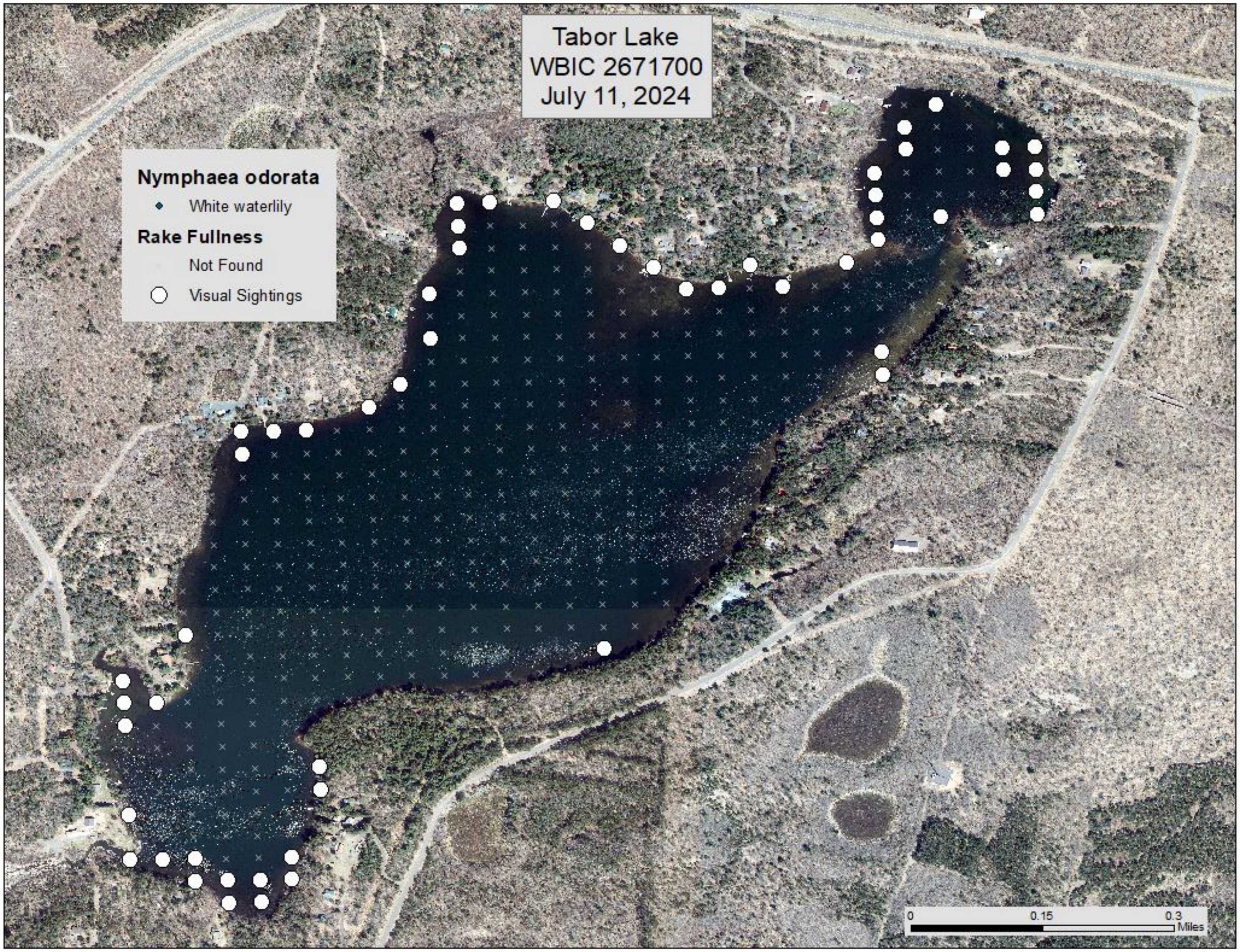

Tabor Lake
WBIC 2671700
July 11, 2024
Myriophyllum sibiricum
Northern watermilfoil
Rake Fullness
Not Found
1
2
Visual Sightings
0
0.15
0.3
Miles

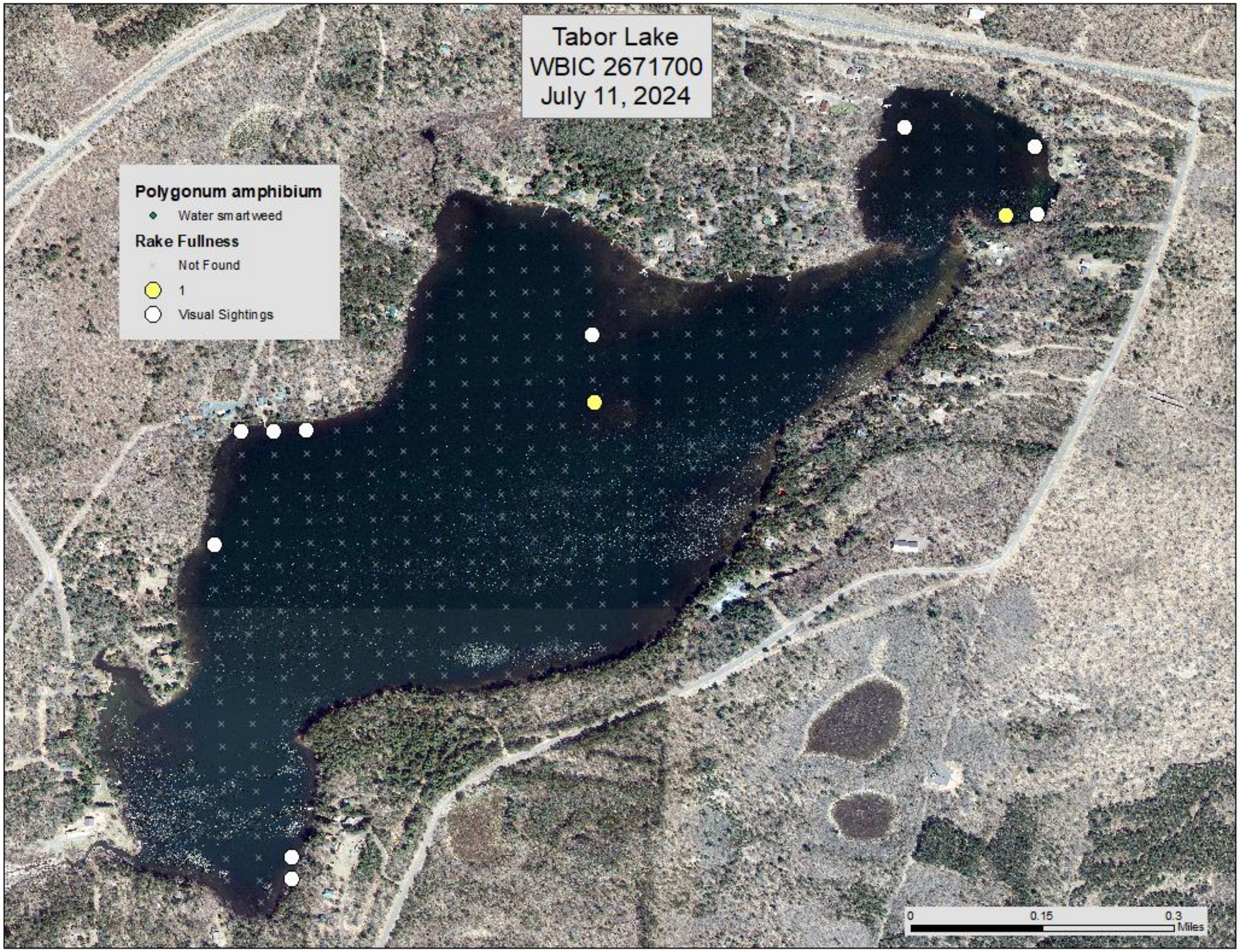

Tabor Lake
WBIC 2671700
July 11, 2024
Myriophyllum tenellum
Dwarf watermilfoil
Rake Fullness
Not Found
1
Visual Sightings
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Najas flexilis
Slender naiad
Rake Fullness
Not Found
1
2
Visual Sightings
0
0.15
0.3
Miles

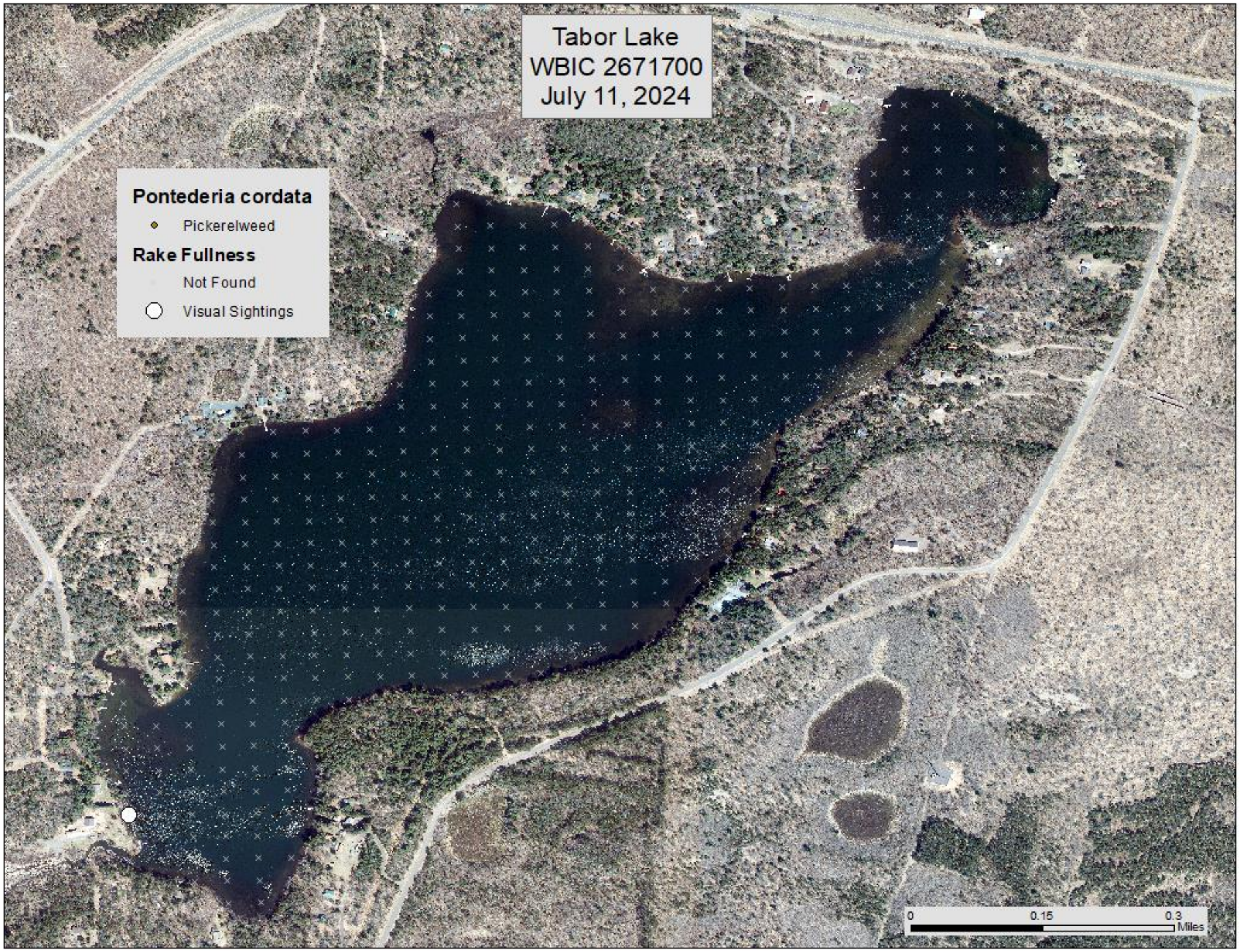

Tabor Lake
WBIC 2671700
July 11, 2024
Najas guadalupensis
Southern naiad
Rake Fullness
Not Found
1
2
3
Visual Sightings
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Nuphar variegata
Spatterdock
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Nymphaea odorata
White waterlily
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles



Tabor Lake
WBIC 2671700
July 11, 2024
Polygonum amphibium
Water smartweed
Rake Fullness
Not Found
1
Visual Sightings
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Pontederia cordata
Pickerelweed
Rake Fullness
Not Found
Visual Sightings
0
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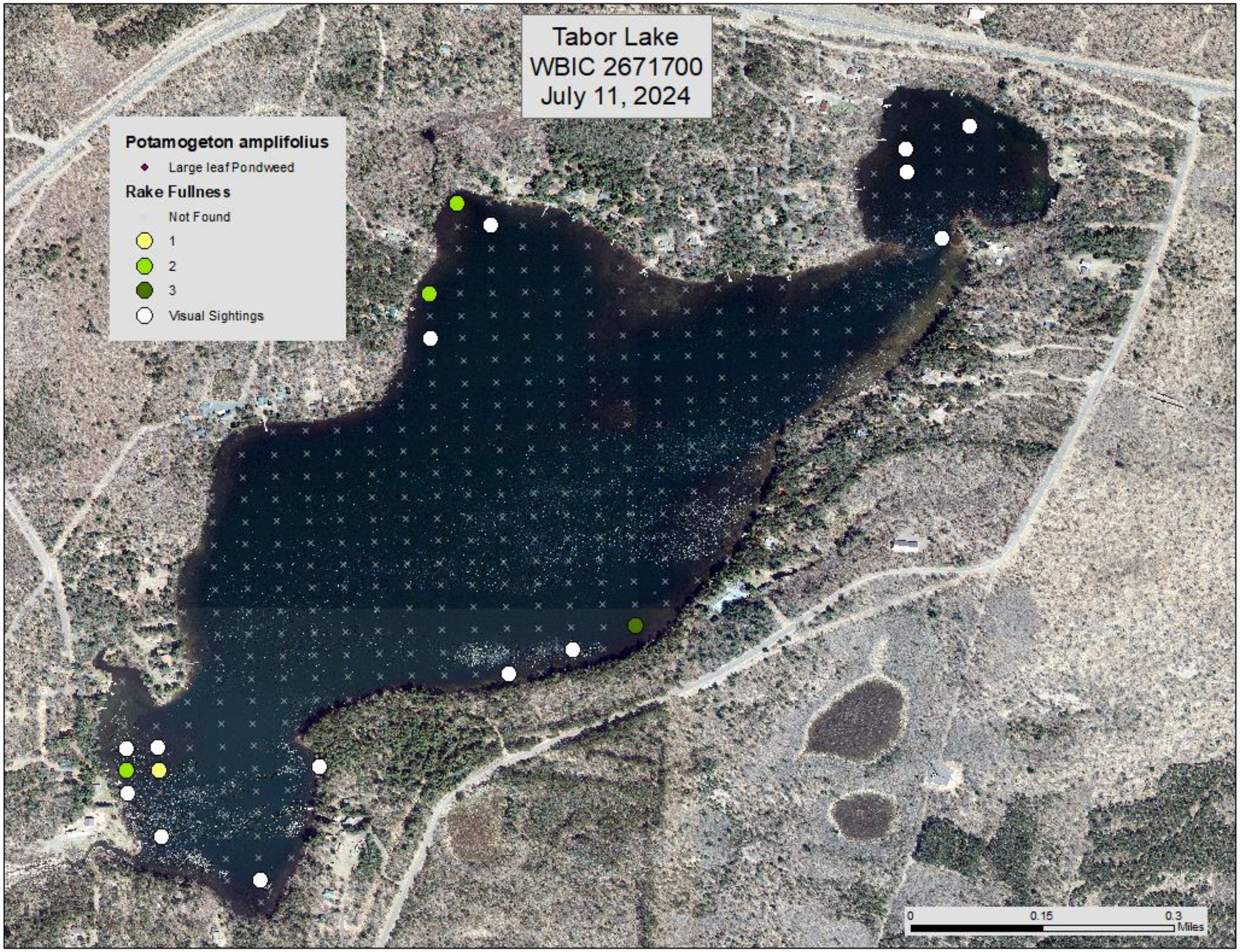
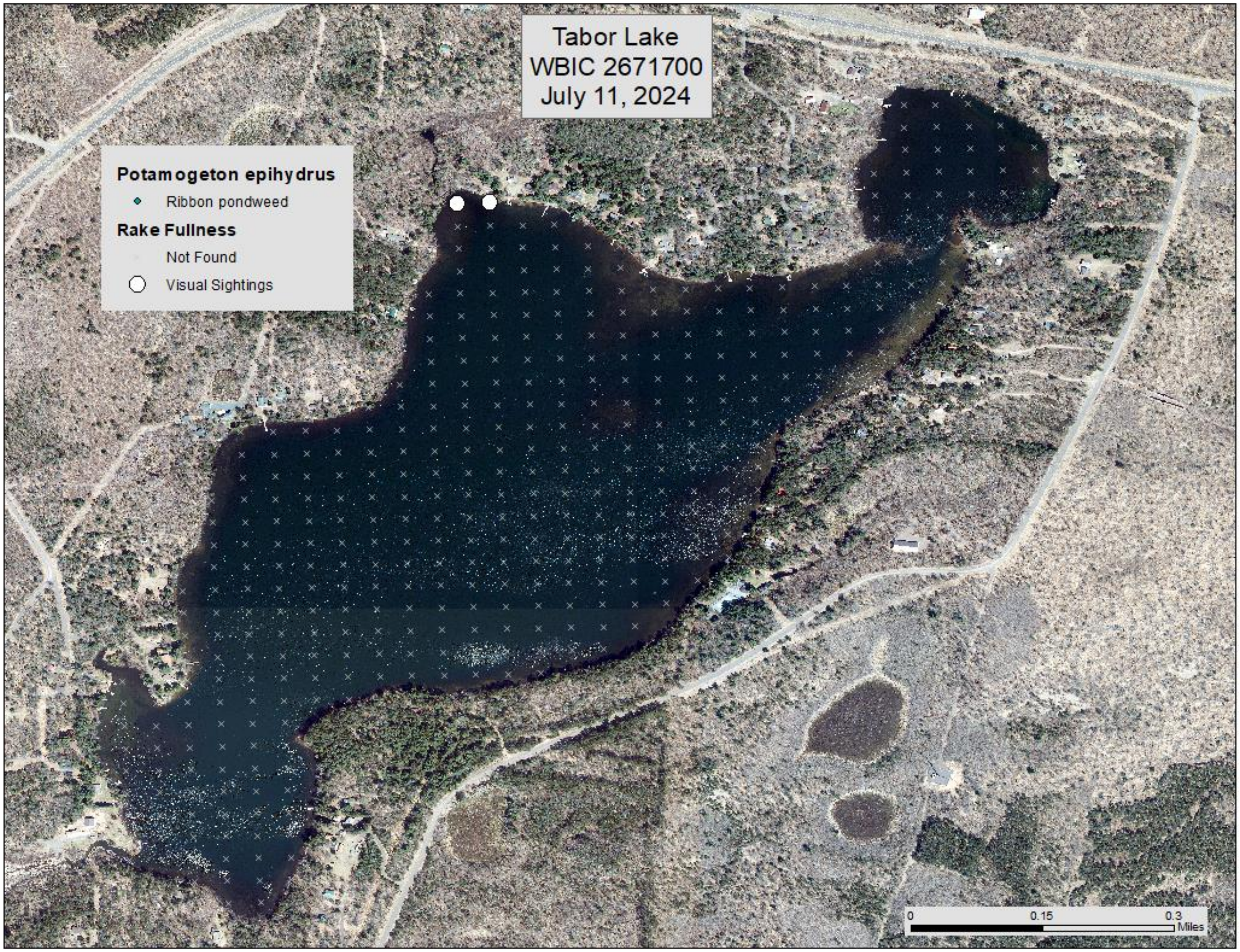
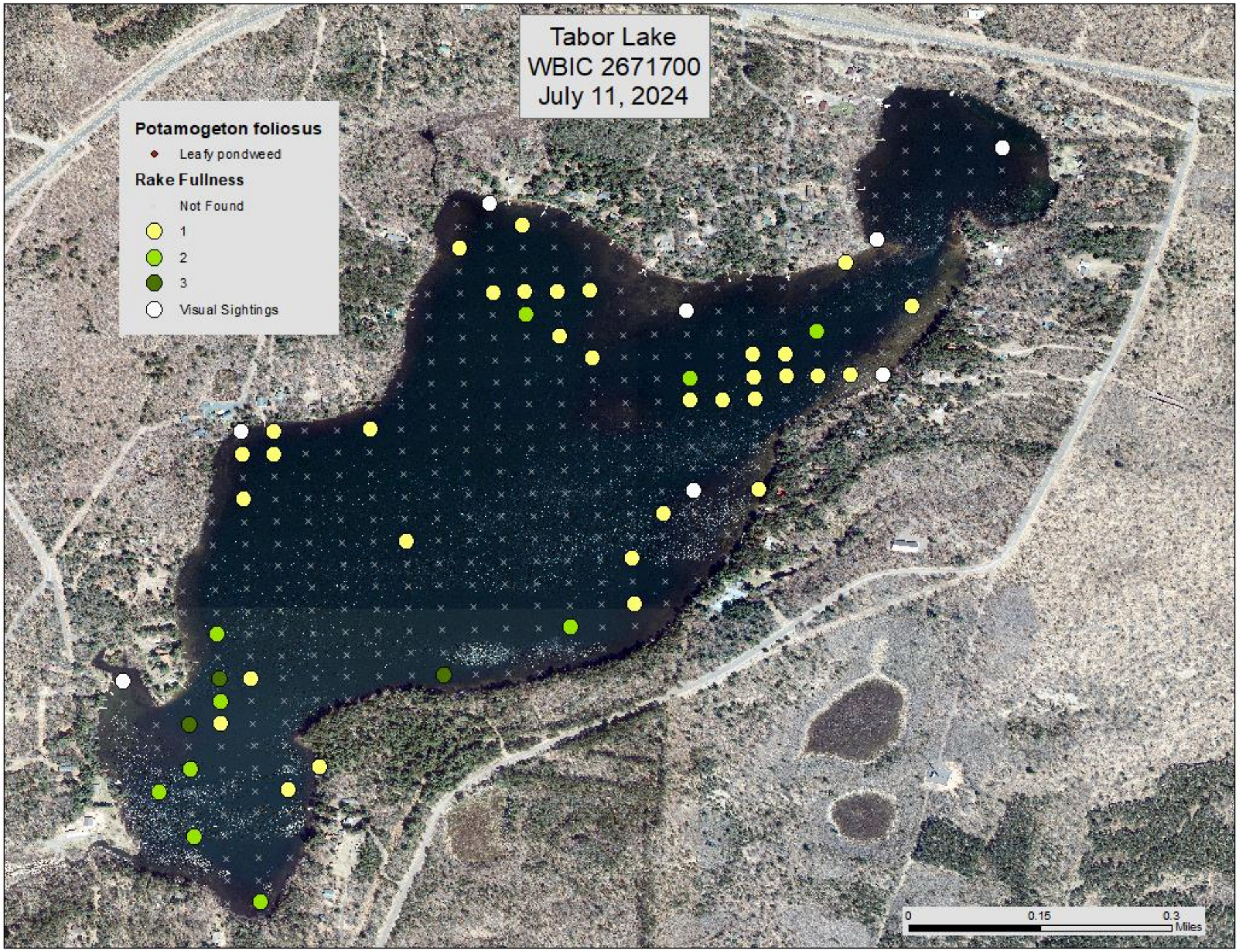
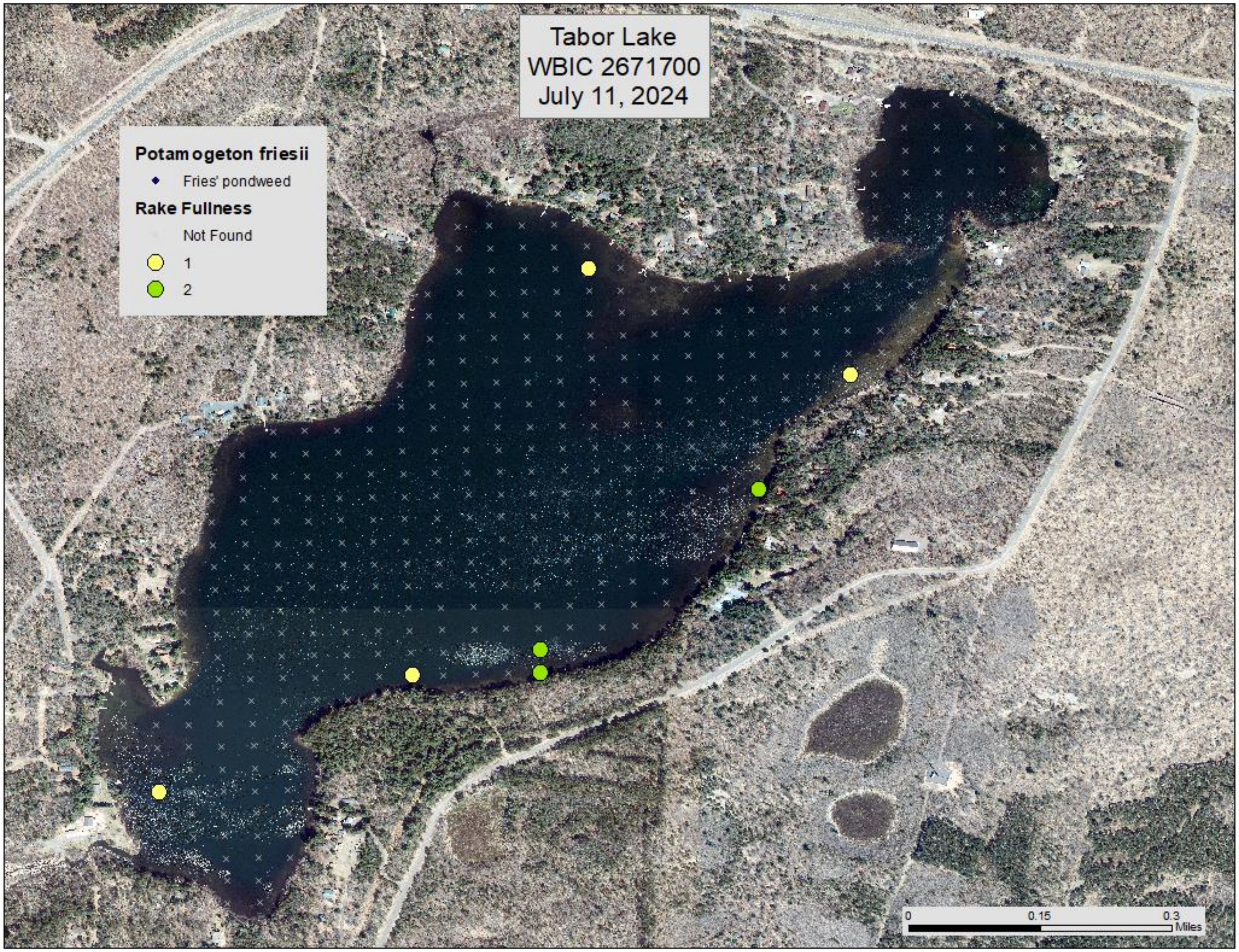
0.3
Miles

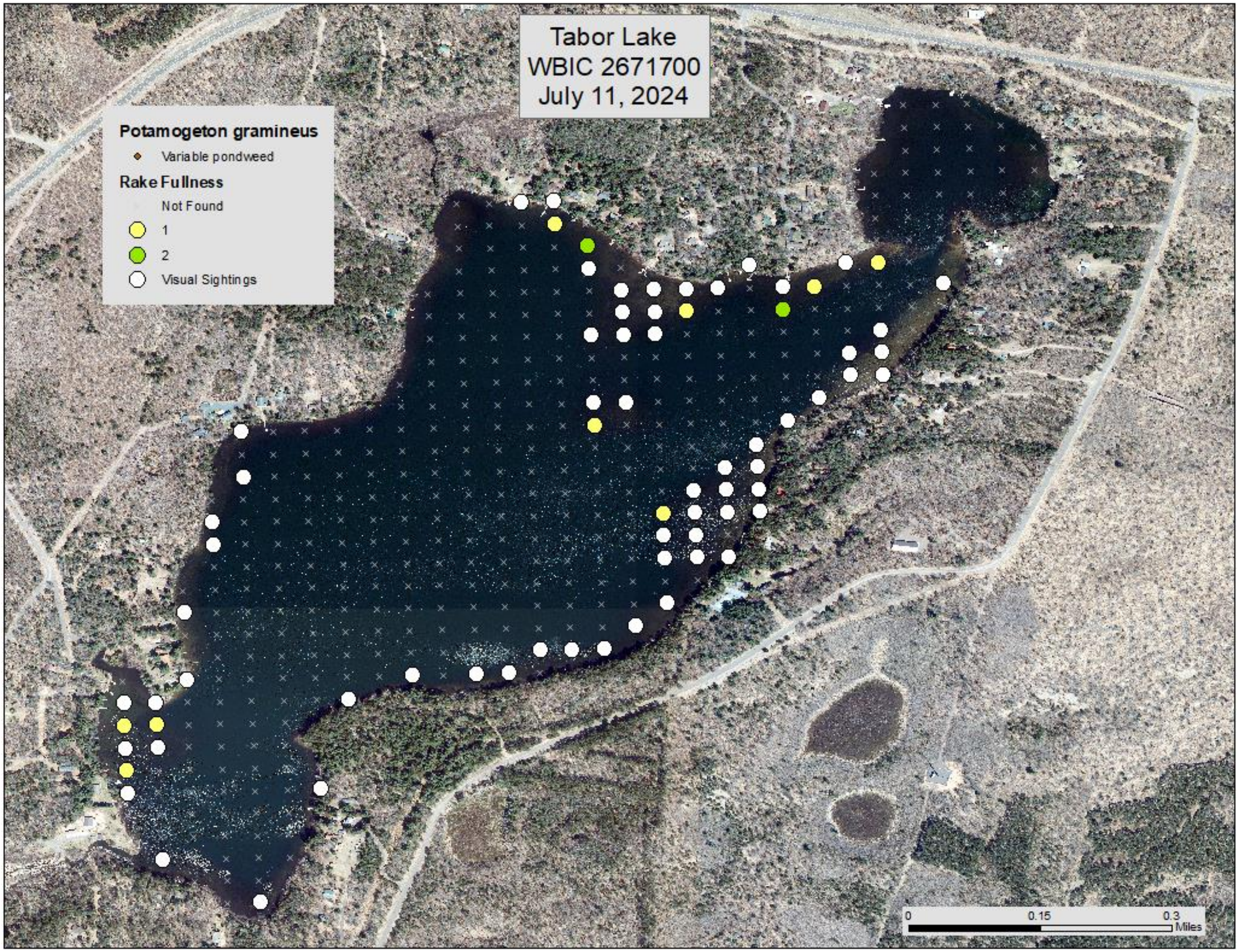


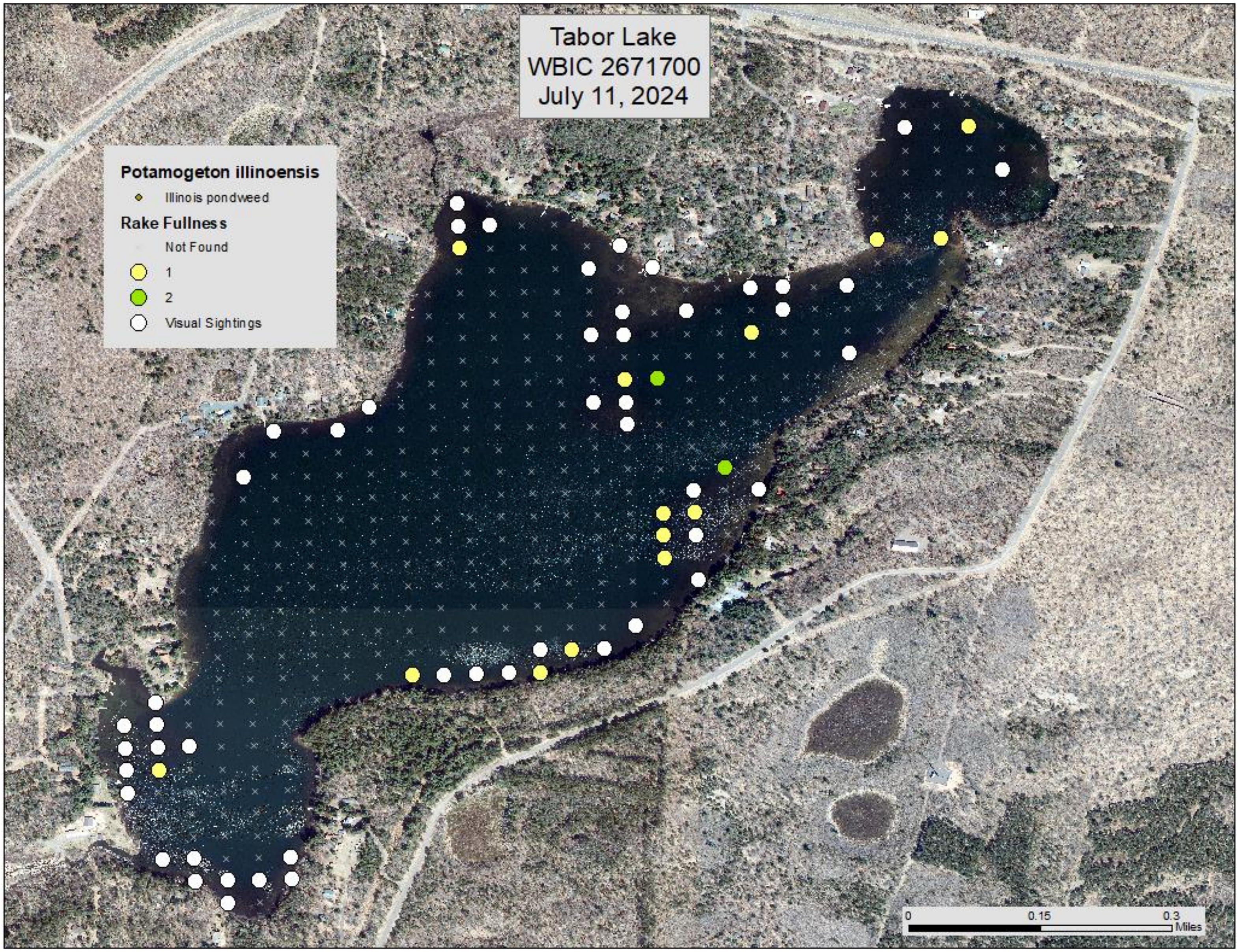
Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton amplifolius
Large leaf Pondweed
Rake Fullness
Not Found
1
2
3
Visual Sightings
0
0.15
0.3
Miles

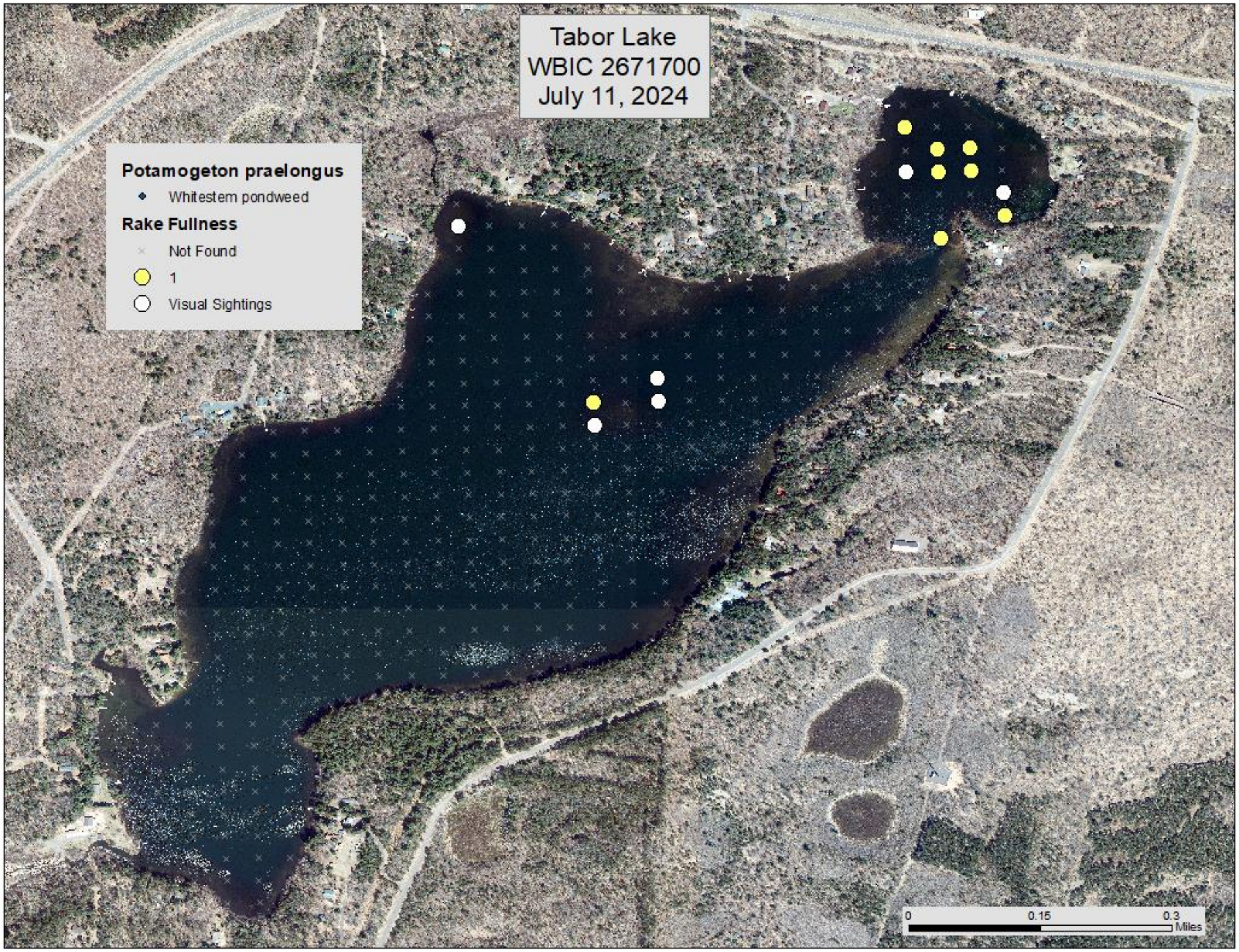

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton epihydrus
Ribbon pondweed
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles

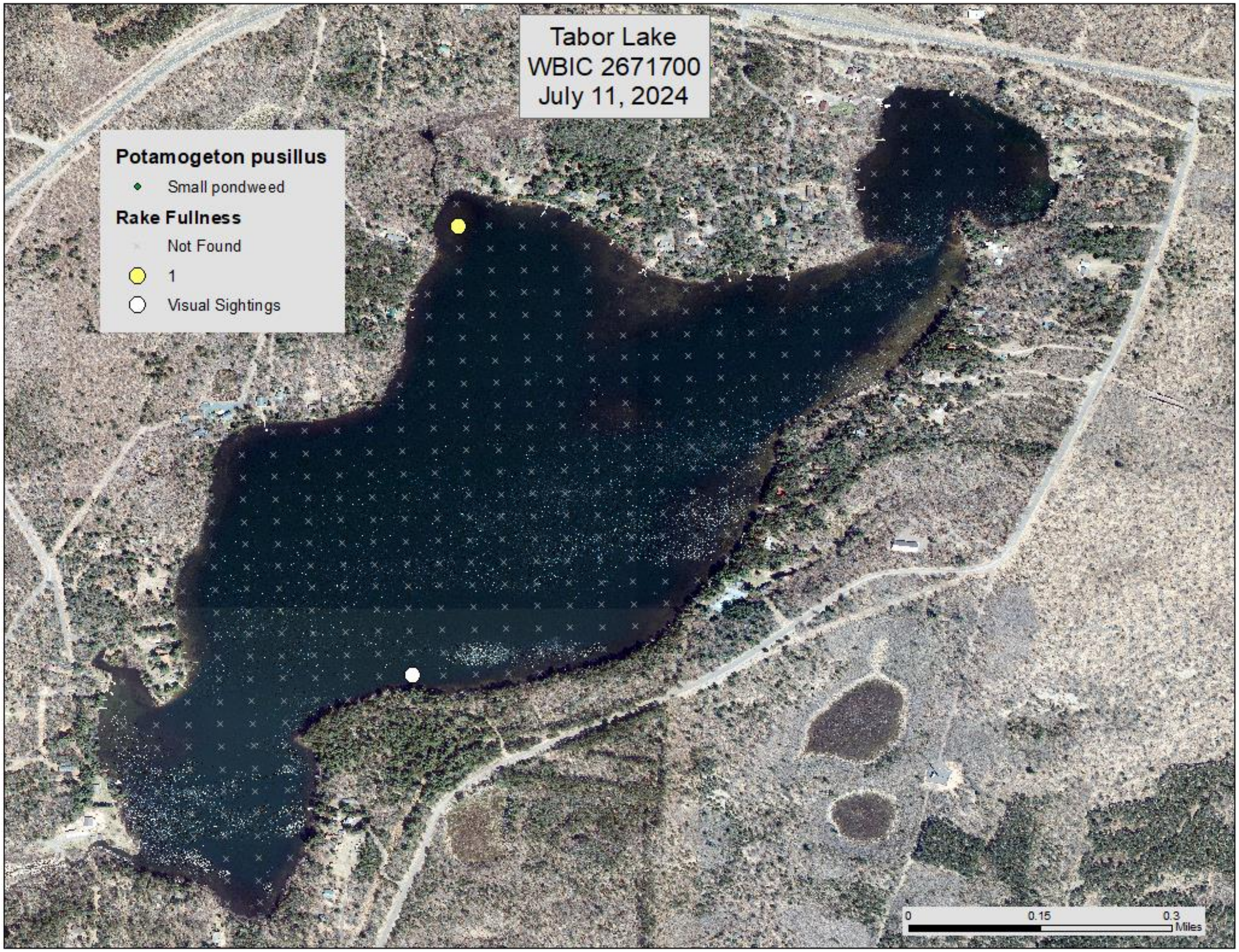

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton foliosus
Leafy pondweed
Rake Fullness
Not Found
1
2
3
Visual Sightings
0
0.15
0.3
Miles

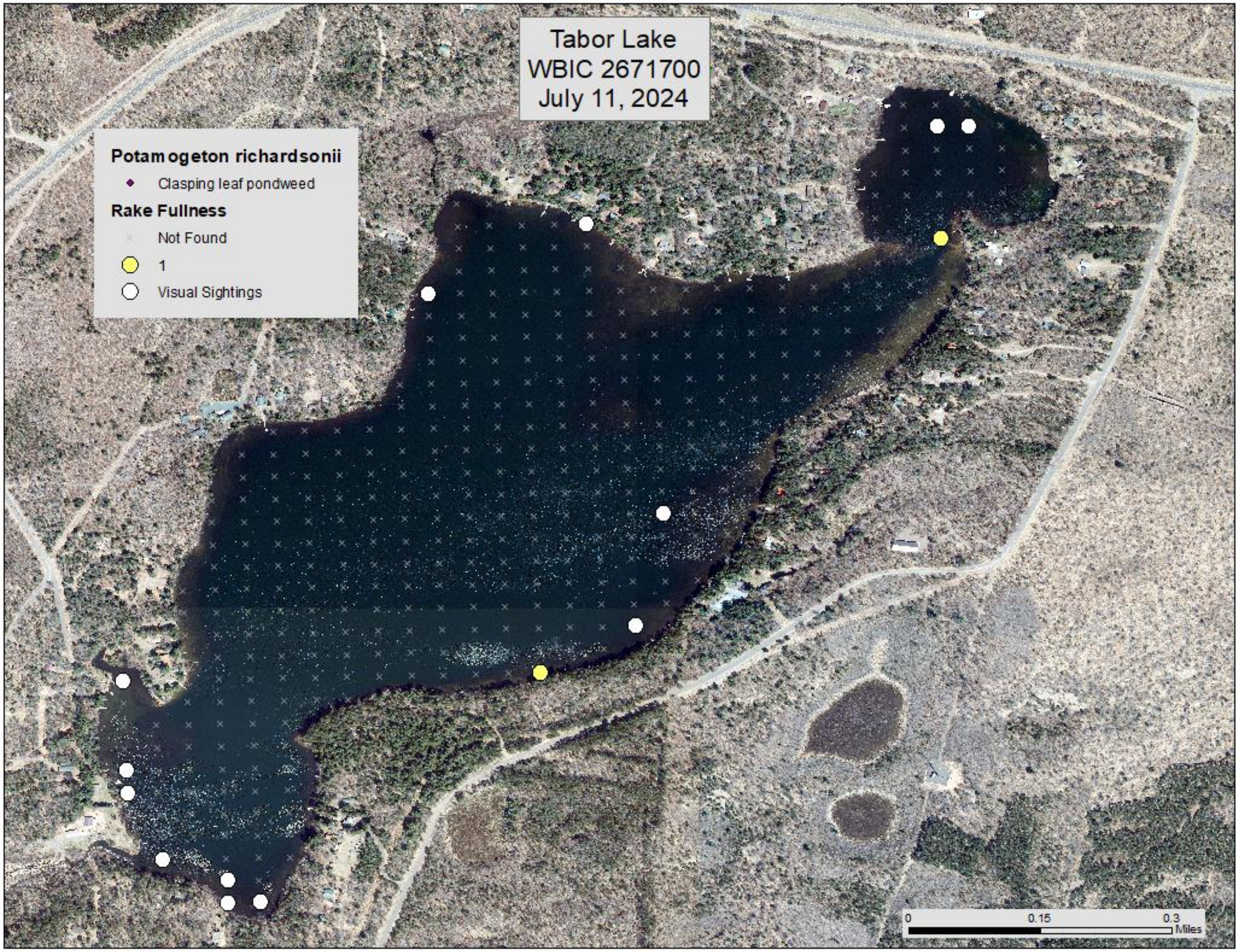

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton friesii
Fries' pondweed
Rake Fullness
Not Found
1
2
0
0.15
0.3
Miles

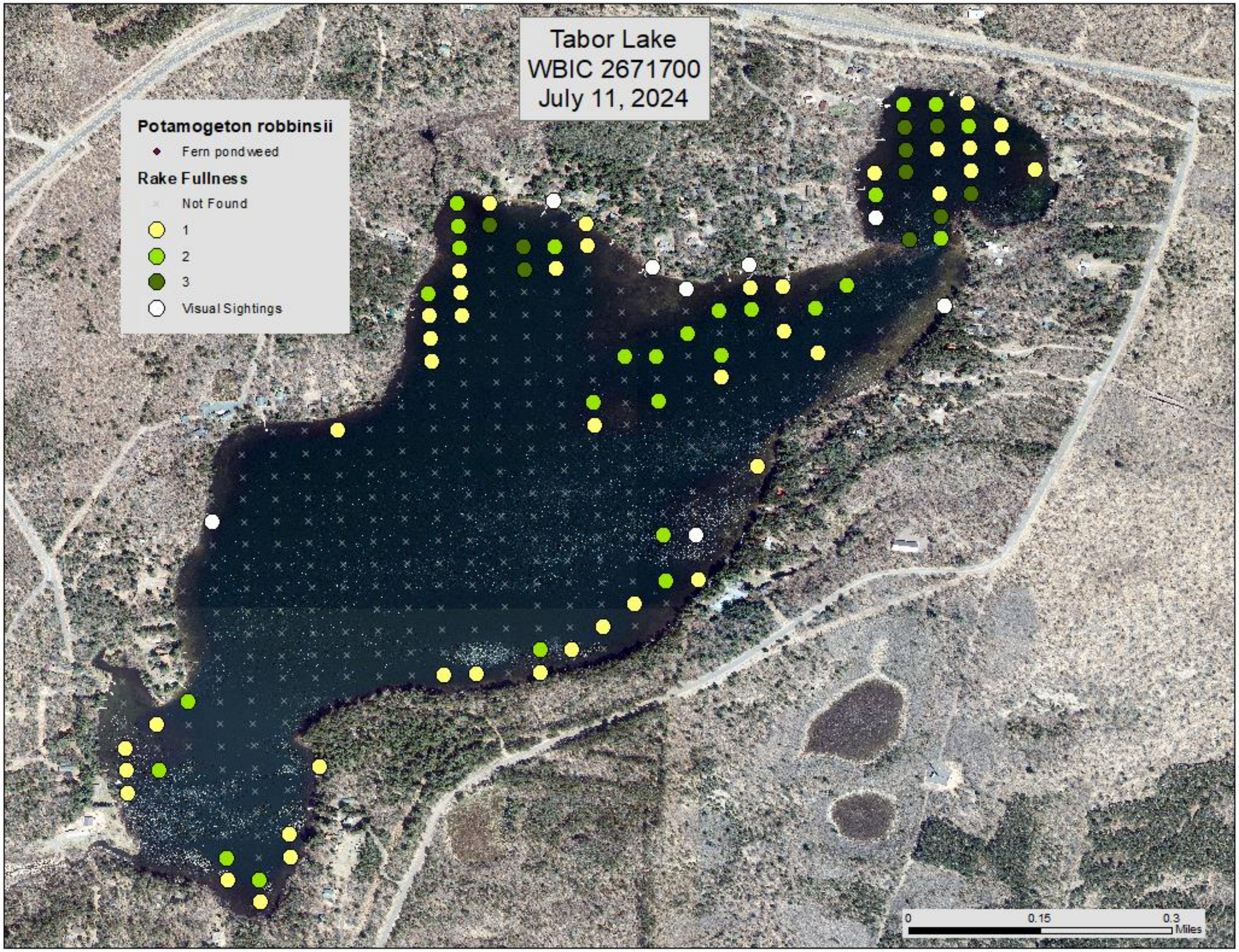

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton gramineus
Variable pondweed
Rake Fullness
Not Found
1
2
Visual Sightings
0
0.15
0.3
Miles

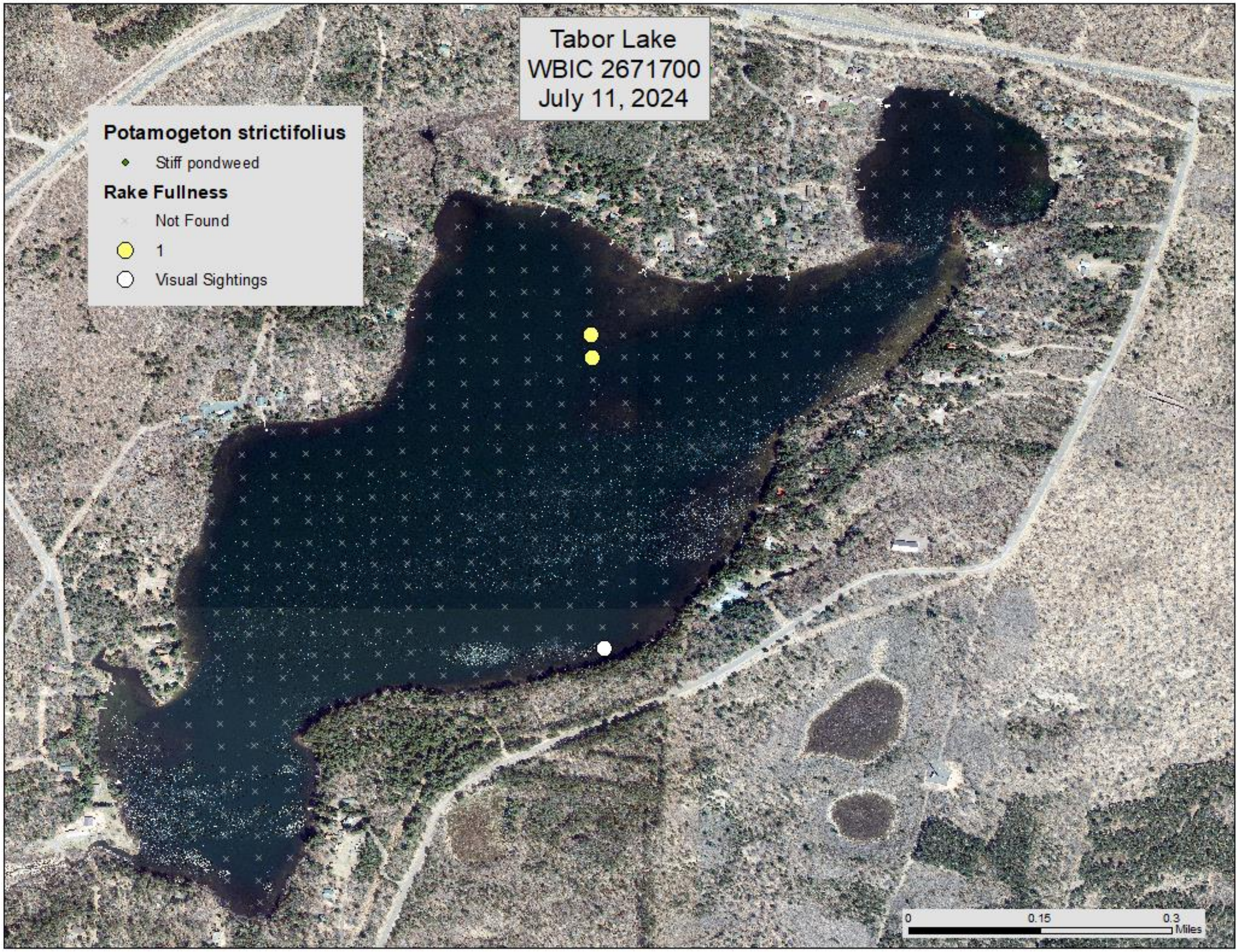

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton illinoensis
Illinois pondweed
Rake Fullness
Not Found
1
2
Visual Sightings
0
0.15
0.3
Miles

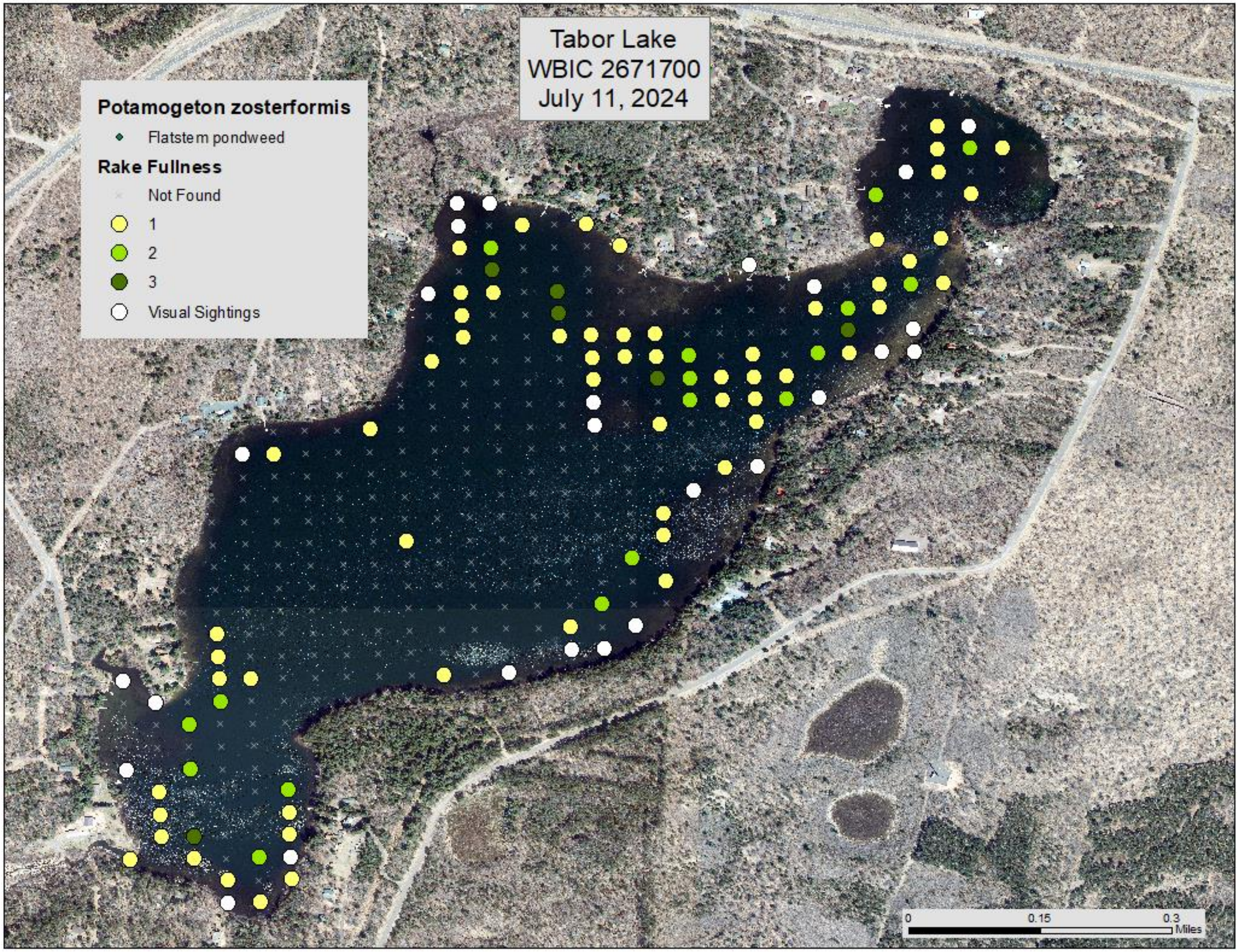

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton praelongus
Whitestem pondweed
Rake Fullness
Not Found
1
Visual Sightings
0
0.15
0.3
Miles

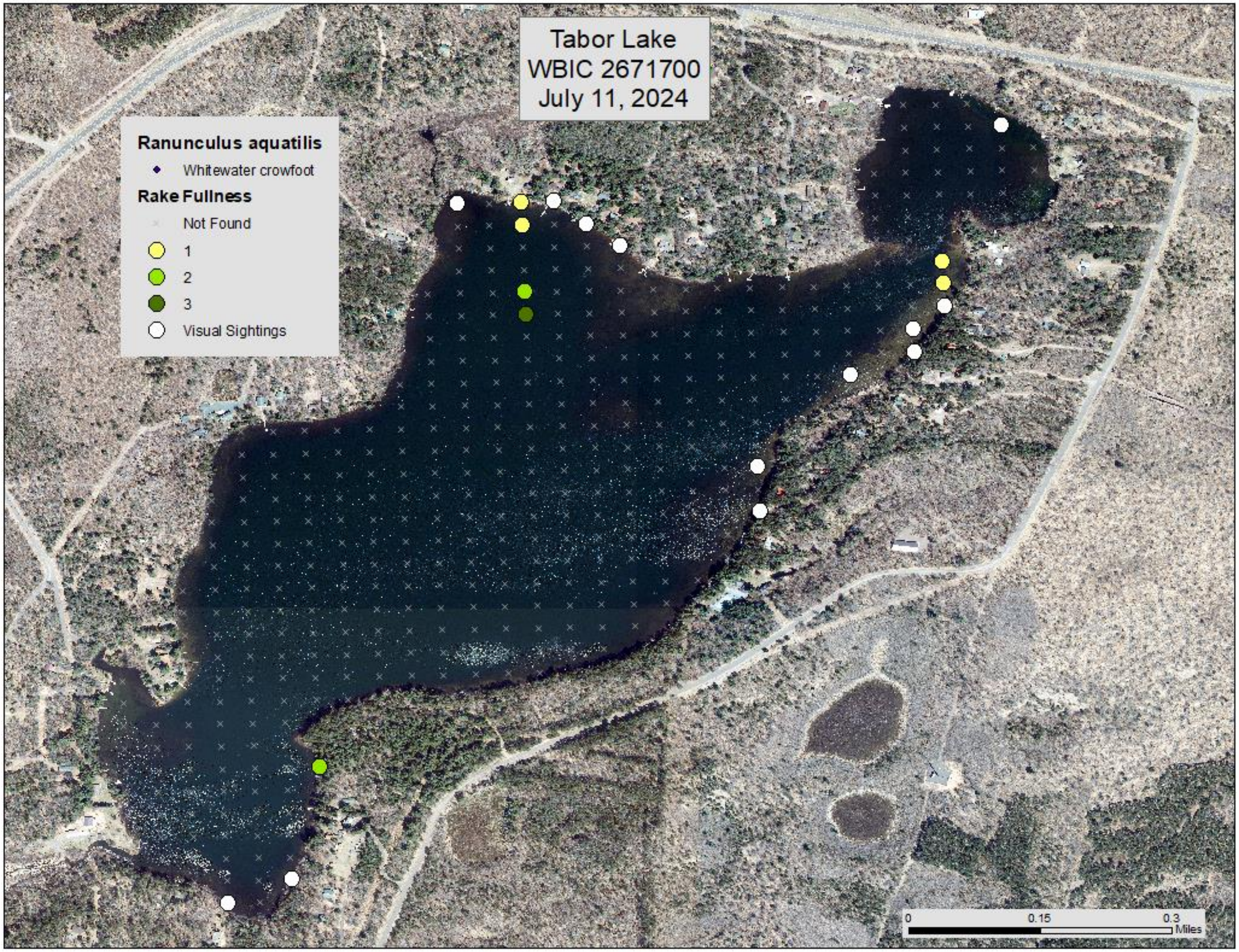

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton pusillus
Small pondweed
Rake Fullness
Not Found
1
Visual Sightings
0
0.15
0.3
Miles

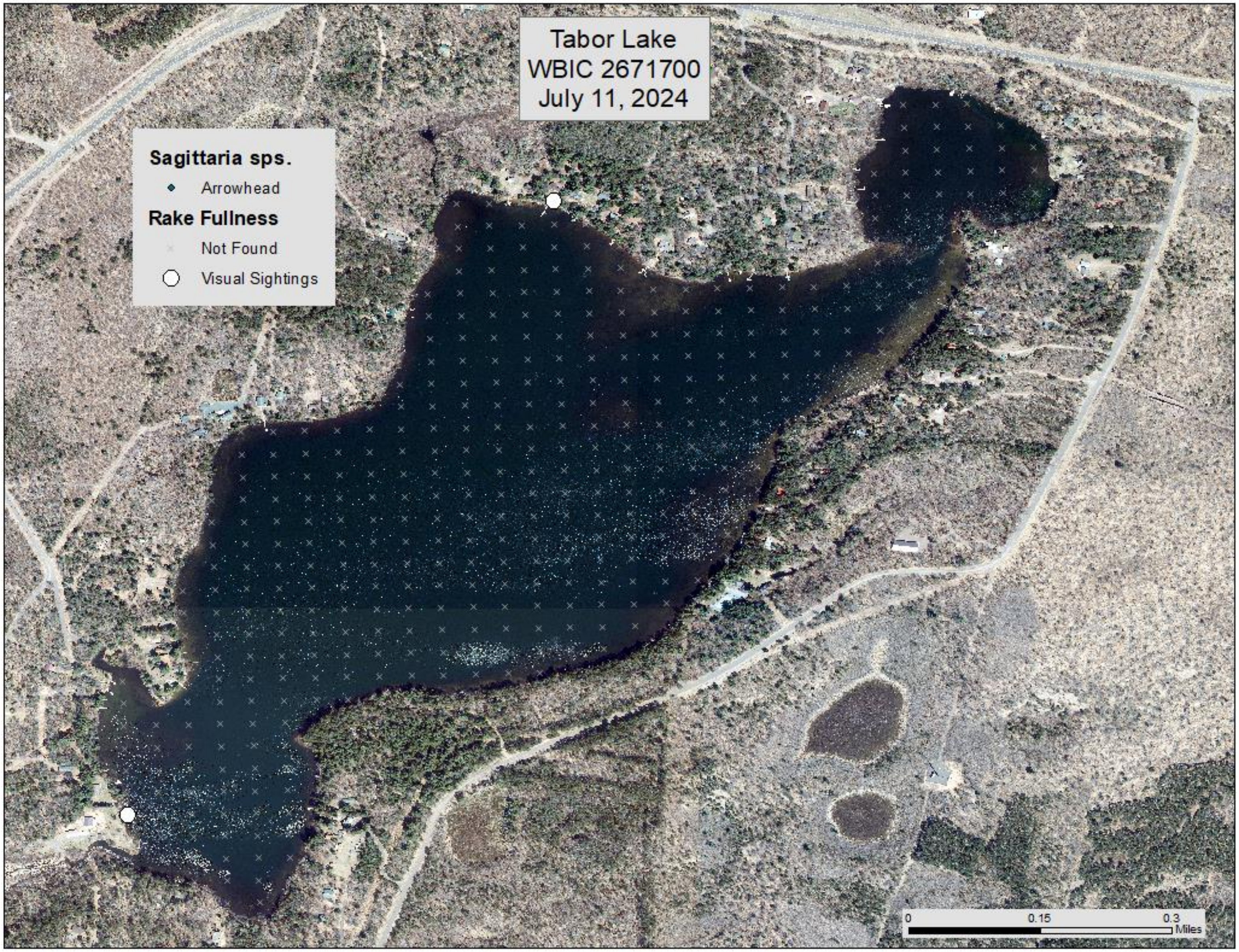

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton richardsonii
Clasping leaf pondweed
Rake Fullness
Not Found
1
Visual Sightings
0
0.15
0.3
Miles

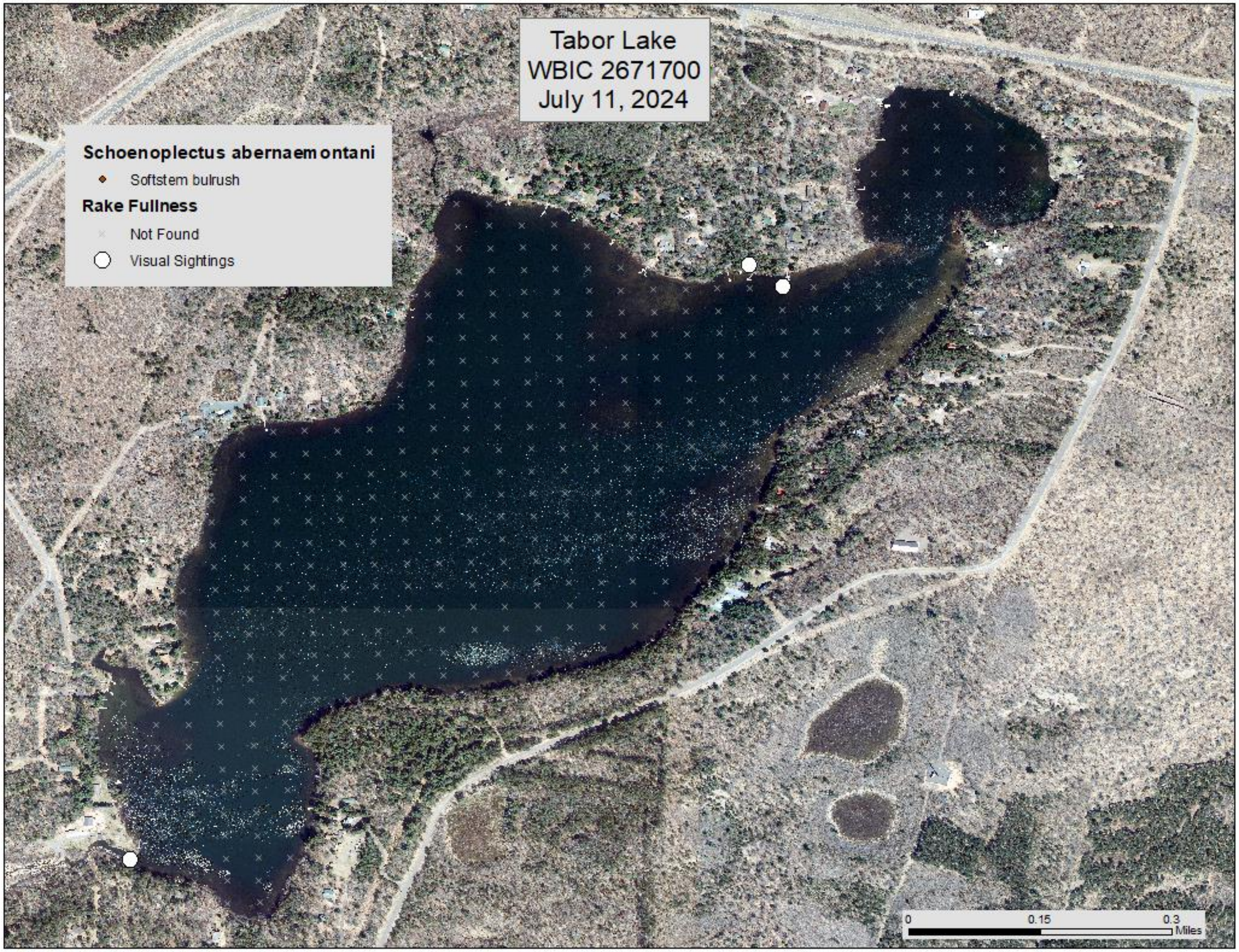

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton robbinsii
Fern pondweed
Rake Fullness
Not Found
1
2
3
Visual Sightings
0
0.15
0.3
Miles

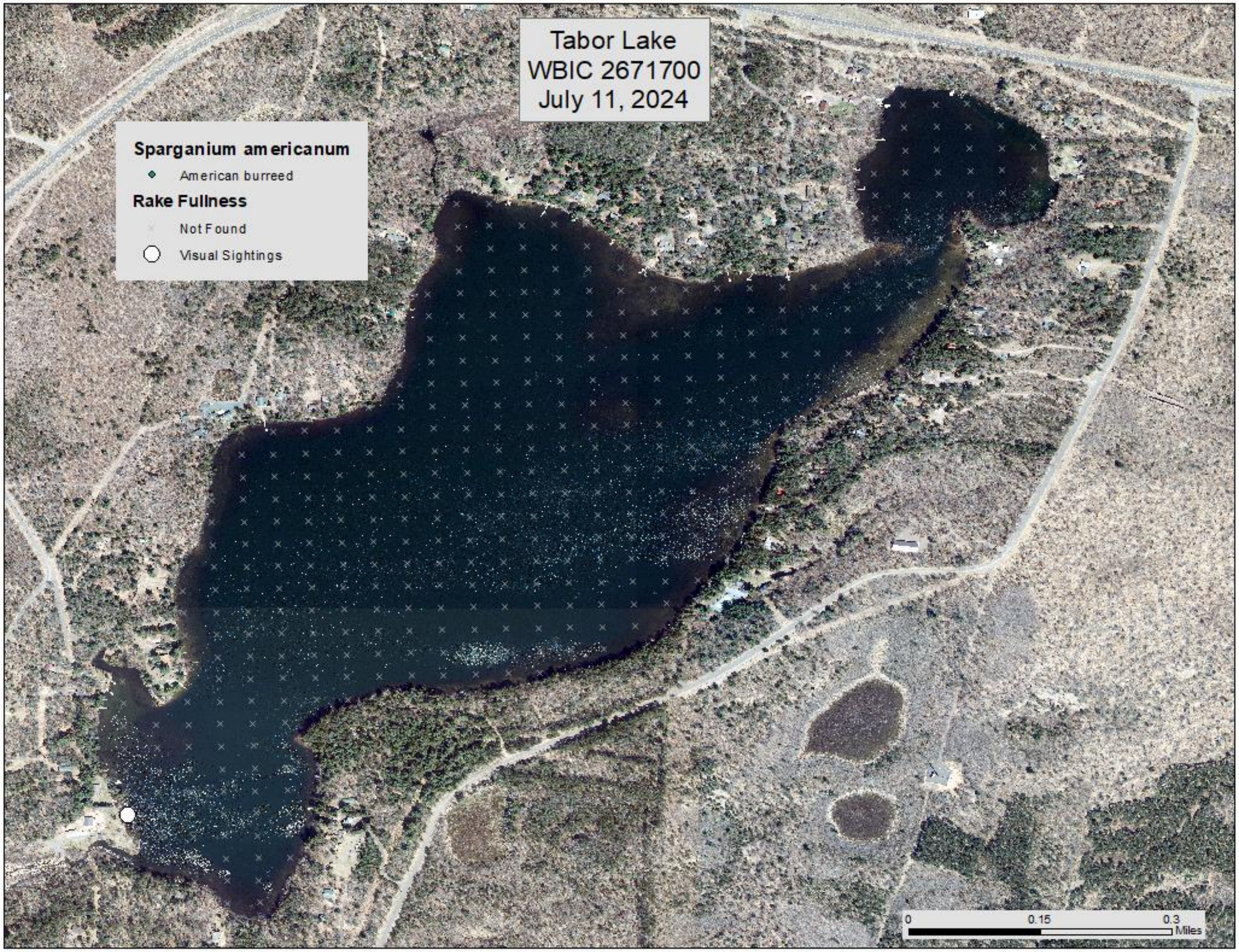

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton strictifolius
Stiff pondweed
Rake Fullness
Not Found
1
Visual Sightings
0
0.15
0.3
Miles

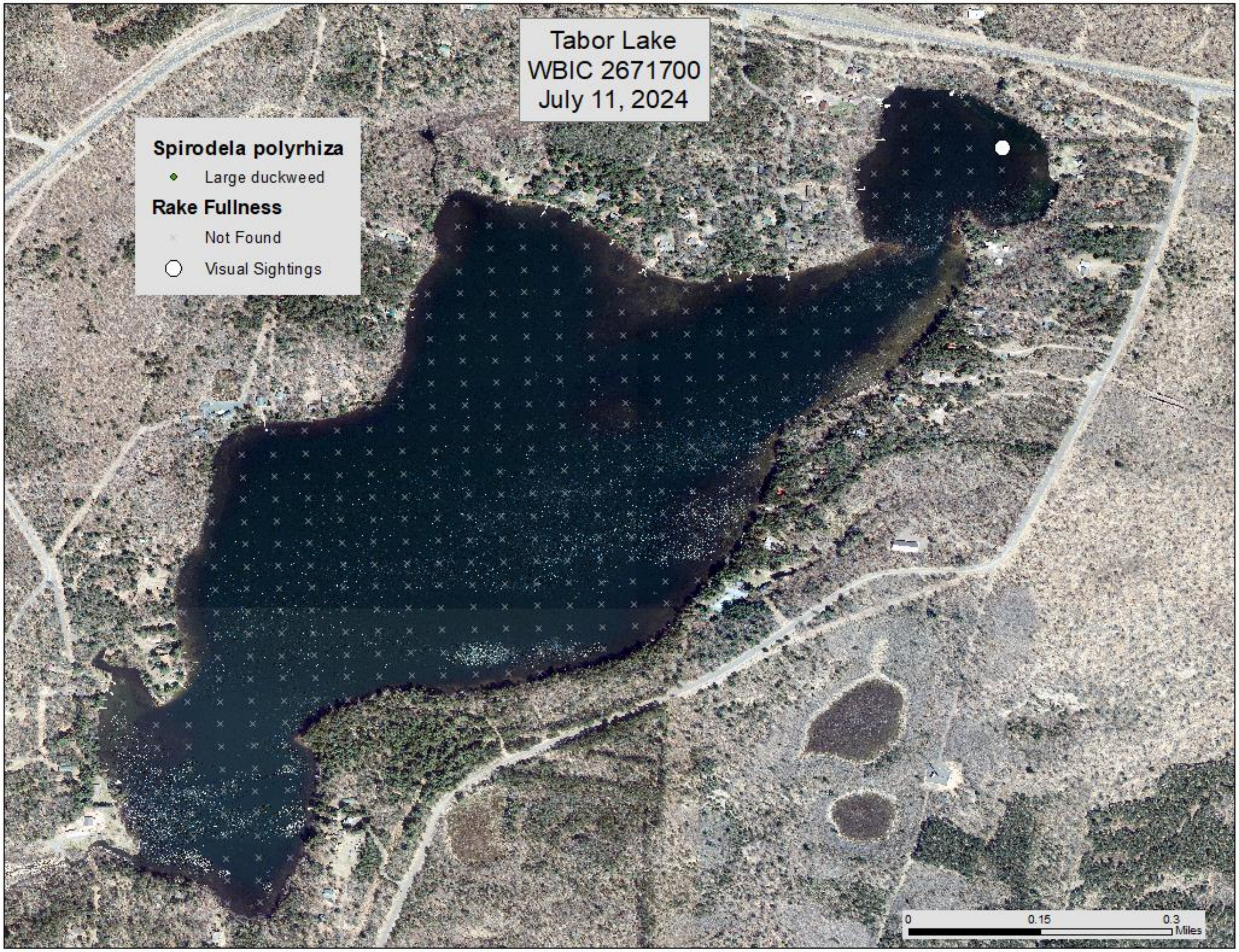

Tabor Lake
WBIC 2671700
July 11, 2024
Potamogeton zosterformis
Flatstem pondweed
Rake Fullness
Not Found
1
2
3
Visual Sightings
0
0.15
0.3
Miles

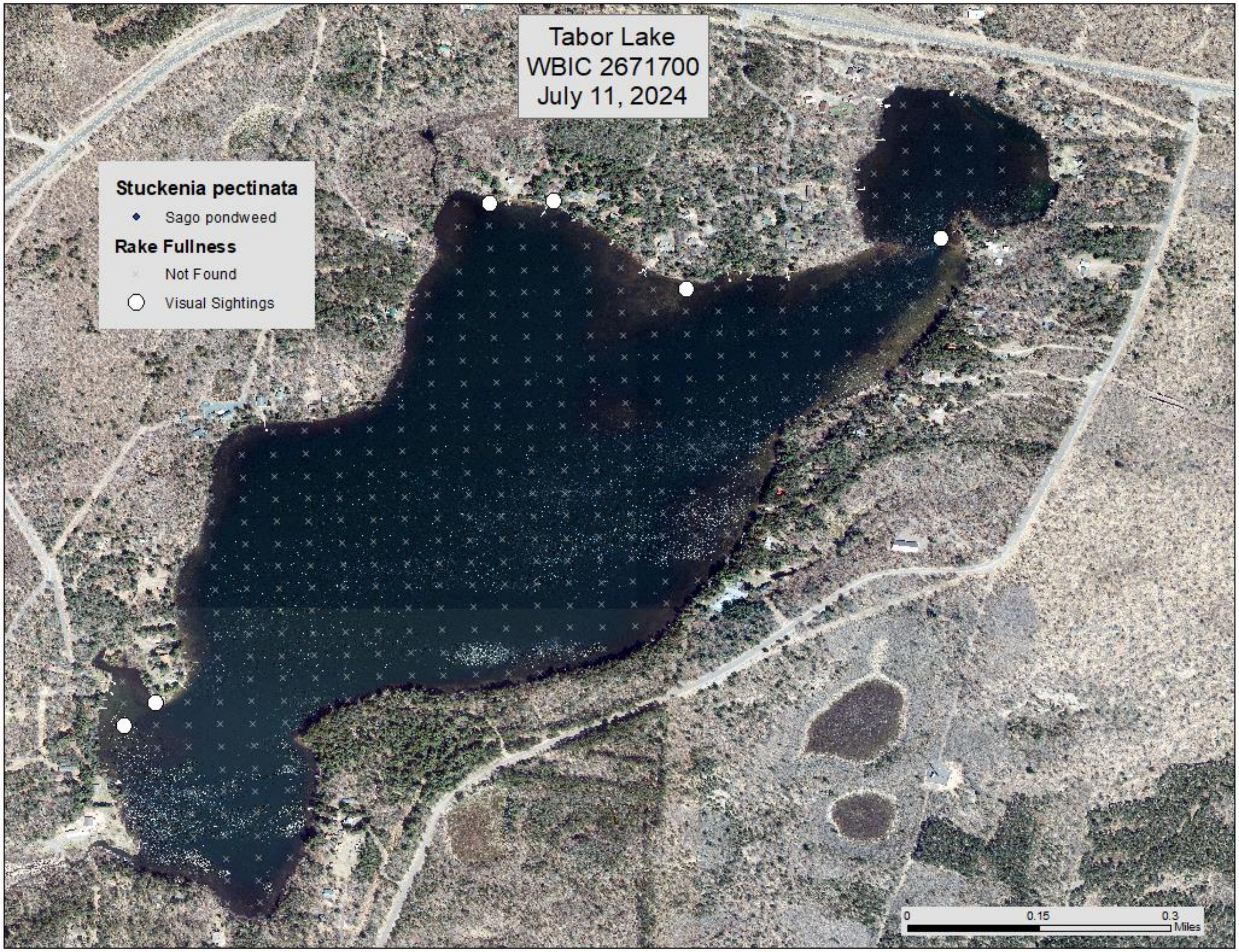

Tabor Lake
WBIC 2671700
July 11, 2024
Ranunculus aquatilis
Whitewater crowfoot
Rake Fullness
Not Found
1
2
3
Visual Sightings
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Sagittaria sps.
Arrowhead
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles

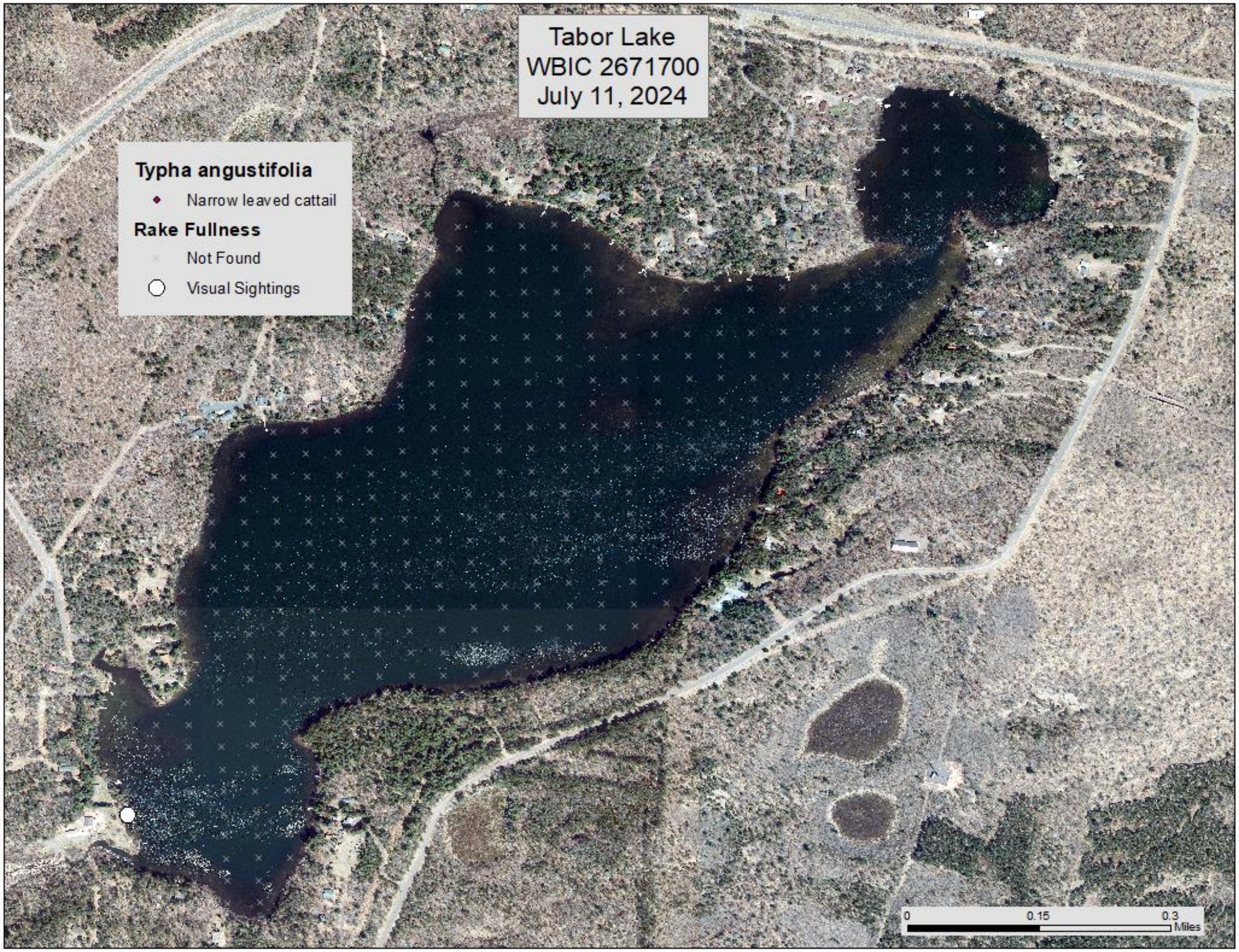

Tabor Lake
WBIC 2671700
July 11, 2024
Schoenoplectus abernaemontani
Softstem bulrush
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Sparganium americanum
American burreed
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles

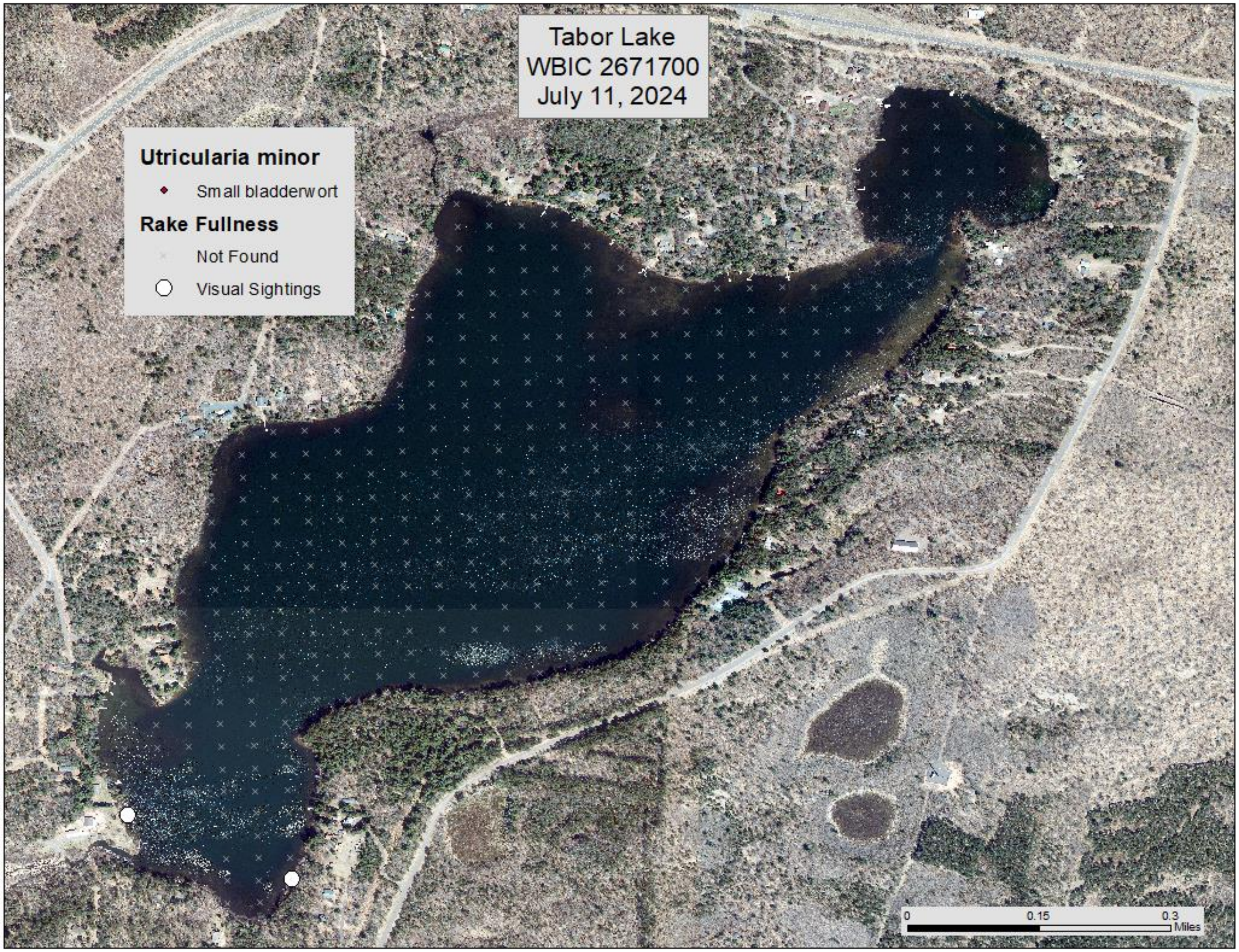

Tabor Lake
WBIC 2671700
July 11, 2024
Spirodela polyrhiza
Large duckweed
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles



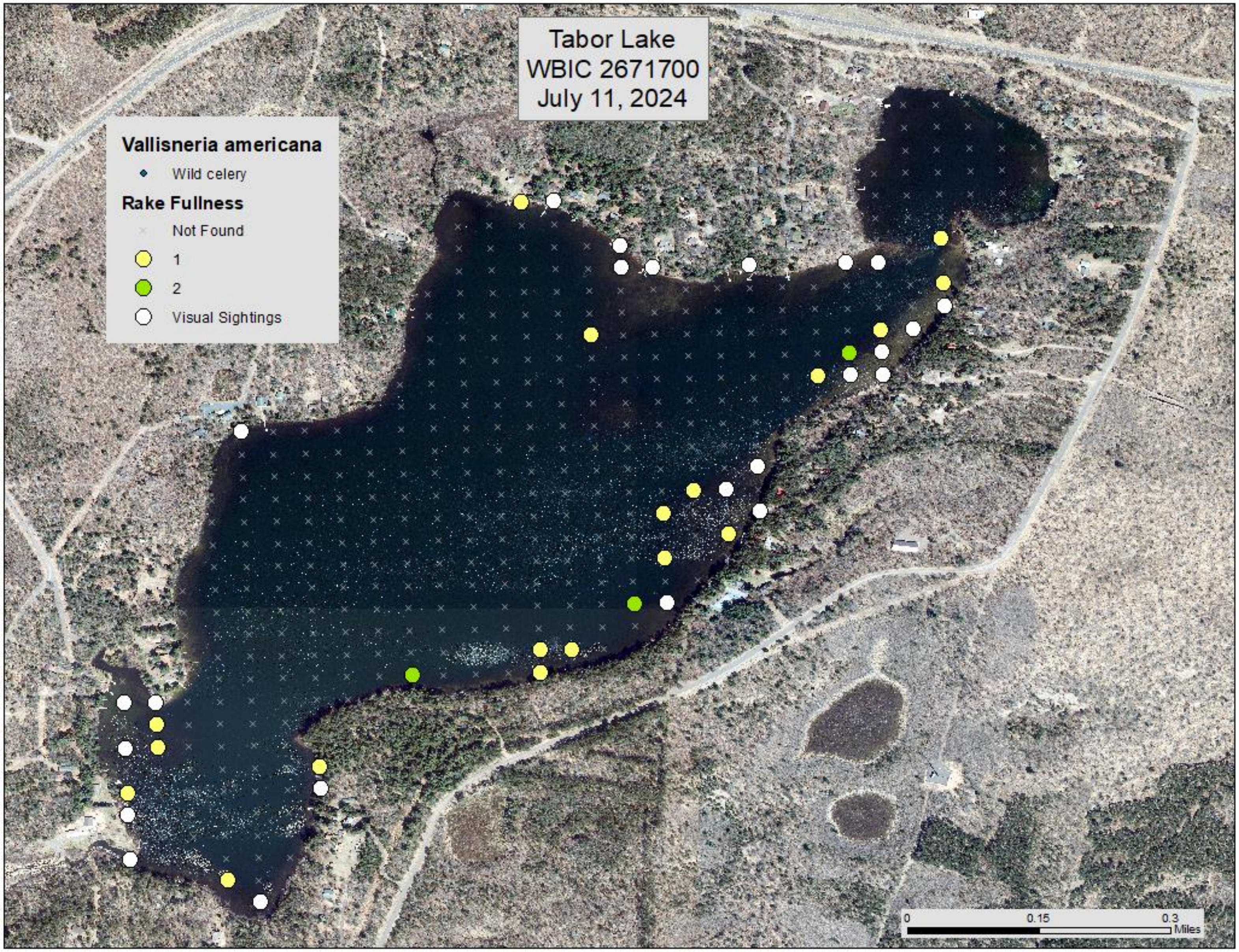
Tabor Lake
WBIC 2671700
July 11, 2024
Stuckenia pectinata
Sago pondweed
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles



Tabor Lake
WBIC 2671700
July 11, 2024
Typha angustifolia
Narrow leaved cattail
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles



Tabor Lake
WBIC 2671700
July 11, 2024
Utricularia minor
Small bladderwort
Rake Fullness
Not Found
Visual Sightings
0
0.15
0.3
Miles


Tabor Lake
WBIC 2671700
July 11, 2024
Vallisneria americana
Wild celery
Rake Fullness
Not Found
1
2
Visual Sightings
0
0.15
0.3
Miles

Aquatic Plant Rake Criteria: At each point a double-sided rake is thrown and aquatic plants are documented by a fullness criteria. Below outlines this criteria:

- **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).

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.

Invasive Species Survey:
Invasive species surveys consists of sampling all points on a sampling grid provided by the WDNR in early June. The Tabor Lakes point intercept sampling grid can be viewed in Figure 1. 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.

Maintaining the current healthy native plant populations on Tabor Lake 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[10]

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[10]

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[10]

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 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 Tabor Lake, although it will be considered for Purple loosestrife control.

Re-vegetation with Native Plants is 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 Tabor Lake because a healthy, diverse native plant population is present.

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 Tabor Lake 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 Tabor Lake.

Herbicide and Algaecide Treatments[10]

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.[10]

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 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 (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 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 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. Unlikely to be permitted.

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. Must be larger than 5 acres.

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. Unlikely to be permitted.

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 Compound 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 (No Management)				
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.

Management Options for Aquatic Plants (Mechanical Control)				
Option	**Permit?**	**How it Works**	**PROS**	**CONS**
Mechanical Control	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 invasive species 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.

Management Options for Aquatic Plants (Biological Control)				
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.	Effectiveness will vary as control agent's population fluctuates. Provides moderate control – complete control unlikely.

			*Lowers density of problem plant to allow the growth of natives.	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.
Native Plantings of aquatic plants	**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.

Management Options for Aquatic Plants (Physical Control)				
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.	*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.

	*Success demonstrated for reducing EWM, variable success for curly leaf pondweed (CLP).	

Management Options for Aquatic Plants (Physical Control)				
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.	*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.
Dredging	Yes	*Plants are removed along with sediment. *Most effective when soft sediments overlay a harder substrate.	*Increases the water depth. *Removes nutrient rich sediments.	*Severe impact on the lake ecosystem. *Increases turbidity and releases nutrients. *Exposed sediments may be recolonized by invasive species. *Sediment testing may be necessary.

		*For extremely impacted systems.	*Removes soft bottom sediments that may have high oxygen demand.	*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.

Management Options for Aquatic Plants (Chemical Control)				
Option	**Permit Needed?**	**How it Works**	**PROS**	**CONS**
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.
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.	*Especially effective on CLP and also effective on EWM. *May be effective in reducing reestablishment of CLP if reapplied several	*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.

		*Applied as liquid or as granules. *Must be larger than 5 acres	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.	*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).
Fluridone (e.g. Sonar or Avast)	Yes, but unlikely; 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.

Glyphosate (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.
Copper compounds (e.g. Cutrine Plus)	Yes, but unlikely	*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 D: Aquatic Plant Control Techniques 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 E. Tabor Lake User Survey

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

4 Permanent residence	**0** Business
9 Seasonal residence	**0** Underdeveloped land
12 Weekend visits throughout the year	**1** Other_______________

Section 2 – Lake Use

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

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

16 A. Fishing from shore	**5** F. Ice fishing	**19** K. Wildlife viewing
17 B. Fishing from a boat	**7** G. Speed boating	**25** L. Canoe/Kayak/Paddle.
16 C. Pontoon boating	**6** H. Jet Skiing	**14** M. Water skiing/Tubing
26 D. Rest/Relaxation	**1** I. Wild rice harvest	**2** N. Other (please list)
26 E. Swimming/Wading	**4** J. Sailing	**Snowmobiling, skiing**

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.

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?

2 Daily	**3** Once or twice per month
15 Several times per week	**0** Once or twice per open-water season
6 3 or 4 times per month	

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

10 Motorized boat (0-50 hp)	**25** Canoe or Kayak
7 Motorized boat (greater than 50 hp)	**4** Sailboat
12 Paddle boat	**2** Other **-** Row Boat, floating waterslide
15 Pontoon boat	**0** I do not own, rent, or use a boat or other
5 Personal watercraft – PWC (jet ski)	watercraft on Tabor Lake

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)***

0 Mowed lawn at shoreline (no plantings)	**11** Managed natural vegetation at shoreline
1 Landscaped shoreline (ex., planted flowers, shrubs, trees)	**11** 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)***

11 Rain garden	**17** Natural shoreline restoration
21 Shoreline buffers	**11** Septic system upgrade
10 Native prairie restoration	**17** Native flower/tree planting
22 Benefits of not fertilizing	**0** Other ***(please describe)***__________________
16 Using zero phosphorus fertilizers	___________________________________
10 Diversion of surface water runoff away from the lake	**0** 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 Tabor Lake? **(*Check all that apply)***

2 Rain garden	**10** Natural shoreline restoration
12 Shoreline buffers	**6** Septic system upgrade
3 Native prairie restoration	**10** Native flower/tree planting
20 Benefits of not fertilizing	**2** Other ***(please describe)***_rip rap
6 Using zero phosphorus fertilizers	___________________________________
2 Diversion of surface water runoff away from the lake	**0** None of the above water quality/landscaping practices

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

1 Mound system	**10** Holding tank
2 At-grade system	**5** Lift pump system
9 Convention system	**2** None ***(skip to Section 4)***
___ Other ***(please list)***	

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

24 1-5 years	**0** 6-10 years	**0** 11+ years	**2** Never	**0** Not Sure

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

24 1-5 years	**0** 6-10 years	**0** 11+ years	**2** Never	**0** Not Sure

Section 4 – Lake Issues

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

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

7 A. Poor quality fishing	**6** J. Too much shoreline lighting
7 B. Too much public use	**1** K. Too much wild rice
3 C. Not enough weed growth	**1** L. Not enough wild rice
4 D. Poorly maintained boat access	**17** M. Too much weed growth (not including algae)
9 E. Low water level in the lake	**21** N. Introduction of undesirable aquatic plants and animals
1 F. High water level in the lake	**5** O. Nuisance wildlife: Beavers, snails, zebra mussels___________________
6 G. Overdevelopment of the shoreline	**5** P. Other: Jet Ski, non-adherence to no-wake times
0 H. Foul or offensive odor	**0** Q. Not concerned about any of these issues ***(Skip to***
7 I. "Icky" or "green" water	***Question 3)***

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**, **B**, and **A**.

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

5 Excellent	**19** Good	**2** Fair	**0** Poor	**0** Very Poor	**0** I don't know

4. 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 …."

0 Too high	**16** Just Right	**8** Too low	**2** I don't know

5. How often, if ever has low water prevented you from using Tabor Lake?

1 Yes	**25** No	**0** I don't use the lake

6. 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:

19 Increased	**4** Decreased	**2** Stayed the same	**1** Unsure

7. 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 Tabor Lake? ***(Check all that apply)***

2 May	**5** June	**10** July	**4** It is never a problem
13 August	**4** September	**0** October	**8** I don't know

8. Do you think you would recognize Wild Rice in the lake if you saw it?

6 definitely yes	**9** probably yes	**4** unsure	**4** probably not	**3** definitely not

9. Please check all answers that best complete the following sentence: "Wild rice…"

12 is a valuable resource in the lake	**0** has no resource value
12 is a state protected plant species	**0** is not a state protected species
3 can legally be removed from the lake	**7** cannot be legally removed from the lake
0 is a nuisance weed	**9** fill in blank: unsure

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 Tabor Lake and do not belong there.

Curly-leaf pondweed (CLP)

Curly-leaf pondweed has been documented in Tabor Lake 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. How much do you know about CLP and the problems it can cause in a lake?

8 a lot	15 some	3 very little	0 just what I read here

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

11 Definitely yes	11 Probably yes	2 Unsure	2 Probably not	0 Definitely not

Eurasian Watermilfoil (EWM)

Eurasian watermilfoil has not been documented in Tabor Lake 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?

4 a lot	13 some	7 very little	2 just what I read here

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

2 Definitely yes	9 Probably yes	9 Unsure	4 Probably not	2 Definitely not

Purple Loosestrife

Purple loosestrife, an invasive shoreline/wetland plant species, has been documented in Tabor Lake. 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?

2 a lot	9 some	10 very little	5 just what I read here

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

3 Definitely yes	8 Probably yes	3 Unsure	10 Probably not	2 Definitely not

Other Aquatic Invasive Species

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

13 Rusty crayfish	4 Spiny waterflea	1 Hydrilla
25 Zebra mussels	5 Banded mystery snail	1 Phragmites (giant reed grass)
13 Chinese mystery snail	0 Freshwater jellyfish	10 Japanese knotweed
0 New Zealand mudsnail	25 Carp	0 I have not heard of these AIS

8. 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?

8 Definitely yes	14 Probably yes	3 Unsure	1 Probably not	0 Definitely not

SECTION 6 – Aquatic Plant Management

Currently aquatic plant growth in Tabor Lake 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. Do you think that management of aquatic plants in Tabor Lake is necessary?

13 definitely yes	10 probably yes	3 unsure	0 probably not	0 definitely not

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

16 Grow below the water's surface	13 Algae on the water's surface
12 Stick out of the water	8 Grow on the shoreline, out of the water
4 Float on the water's surface (non-algae)	4 Other:

Common Aquatic Plant Management Methods

If plant management is recommended for Tabor Lake, 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.

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

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

13 Support	**2** Oppose	**11** Need more information

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

10 Support	**4** Oppose	**13** Need more information

Hand-pulling and raking in shallow waters:

26 Support	**0** Oppose	**1** Need more information

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

8 Support	**4** Oppose	**15** Need more information

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

6 Support	**7** Oppose	**14** Need more information

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

6 Support	**3** Oppose	**17** Need more information

No management:

0 Support	**17** Oppose	**7** Need more information

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

8 No *(Skip to Section 7)*	**0** Yes, I did it myself
16 Yes, I hired someone	**2** Yes, I did some myself and I hired someone

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

2 Hire someone to hand-pull or rake	**19** Self-hand pull or rake
0 Hire someone to apply chemical herbicide	**3** Self-application of chemical herbicide
1 Mechanical plant removal with boat and motor or other apparatus	**0** Other

SECTION 7 – Community Support

Local, county, state, and federal resources will be sought in addition to Lake Association funds to implement management recommendations for Tabor Lake. 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.***

2 Watercraft inspection at the boat landings such as Clean Boats Clean Waters
20 On the water monitoring for aquatic invasive species
15 Shore land monitoring for aquatic invasive species
2 Raising beetles for purple loosestrife control
16 Native aquatic plant monitoring and identification
20 Water quality monitoring
15 Wildlife monitoring (ex. frogs, turtles, loons, other waterfowl, mussels & clams)
3 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?

7 A few hours a year	**13** A few days a year	**3** 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)***

2 GPS use	**0** Graphic design	**0** Legal services
2 SCUBA diving	**2** Grant writing	**17** Physical labor
2 Printing services	**5** Construction services	**0** Other **(please specify)**______
1 Garden/Landscaping design **1** Web development	**1** Sewing **1** Outdoor design	**5** I am not interested or not able to provide assistance

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

23 Yes ***(skip to Question 6)***	**3** No

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

1 Not interested	**1** I don't have time	**1** I never know when they are occurring
1 Other *(please explain)* **First lake season, bad timing**		

6. The Tabor Lake Association annual meeting is generally held on the Saturday of Memorial Day Weekend. ***In the following list of meeting dates and times, please check up to three meeting dates that would work for you.***

__19__ The current date and time works for me
__1__ Hold the meeting in the afternoon on the Saturday of Memorial Day
__3__ Hold the meeting in the evening on the Saturday of Memorial Day
__4__ Hold the meeting the Saturday before Memorial Weekend
__1__ Hold the meeting the Saturday after Memorial Weekend
__0__ Hold the meeting a different day (please indicate when) Friday evening/Sat Morning non-holiday weekends
__1__ I am not interested in the Tabor Lake Association annual meeting

*Wrong date sent in survey, Tabor Lake Association meeting is last Saturday in July**

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

__22__ Current member **(skip to Question 9)**	__3__ 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: **Interpersonal conflicts**

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
Communication with community	**17**	**5**	**2**	**2**	**0**
Meeting Frequency	**15**	**5**	**6**	**0**	**0**
Meeting atmosphere (parliamentary procedure)	**11**	**6**	**6**	**1**	**2**
Executing Lake Association business	**12**	**7**	**6**	**1**	**0**
Promoting cooperation to achieve goals and objectives	**17**	**3**	**5**	**1**	**0**
Management of Association finances	**19**	**2**	**4**	**1**	**0**
Listening to property owners' needs and concerns	**16**	**5**	**3**	**1**	**1**

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

9 Mail	**20** Email	**2** Phone	**1** In person	**0** I do not want to be contacted

Appendix E: Rapid Response Plan

Rapid Response for Early Detection of Eurasian Water Milfoil, Zebra Mussels and other aquatic invasive species.

1. The Tabor Lake Association community will be directed to contact the Aquatic Invasive Species (AIS) identification (ID) lead, if they see a plant or animal in the lake they suspect might be Eurasian water milfoil (EWM), zebra mussels (ZM) or other aquatic plants that may look invasive. Signs at the public boat landings, web pages, and newsletter articles will provide contact information and instructions.

2. If plant/animal is likely EWM/ZM (or other AIS), the AIS ID lead will confirm identification with Burnett County AIS Coordinator and WDNR then inform the rest of the lake association board.

3. Mark the location of suspected invasive species (AIS ID Lead). Use GPS points, if available, or mark the location with a small float.

4. Confirm identification of EWM/ZM (or other AIS) with the WDNR (within 72 hours) (AIS ID Lead).
    a. EWM: Leaf sections that contain the fully intact leaflets. If applicable, the tip of the plant that may be reddish in color.
    b. ZM: Two adult specimens will be collected and delivered to the WDNR. WDNR may confirm identification with the herbarium at the University of Wisconsin – Stevens Point or the University of Wisconsin – Madison.

5. If the suspect plants are determined to be EWM (or other AIS), the location of EWM (or other AIS) will be marked with a more permanent marker. If the suspect animals are determined to be ZM, the appropriate signage will be posted at the landing (AIS ID Lead).

6. If identification is positive, inform the board, Burnett County Land Services Department (BCLSD), herbicide applicator, the person who reported the invasive species, lake management consultant, and all lake residents. (AIS ID Lead).

7. If identification is positive, post a notice at the public landing and include a notice on the website. These notices will inform residents and visitors of the approximate location of the invasive species and provide appropriate means to avoid spread. (Lake Association)

8. Contact BCLSD to seek assistance in EWM/ZM (or other AIS) control efforts. The county has a rapid response plan in place that includes assisting lakes where new invasive species are discovered. EWM/ZM (or other AIS): Request that the county determine the extent of the introduction and conduct initial removal efforts. ZM: Request that the

county determine the extent of the ZM introduction and conduct ZM veliger tows. If unavailable to assist within two weeks, proceed to step 9.

9. Hire a consultant to determine the extent of the EWM/ZM (or other AIS) introduction. A diver may be used. EWM (or other aquatic plants): If small amounts of the plant are found during this assessment, the consultant will be directed to identify locations with GPS points and hand pull plants found. All plant fragments will be removed from the lake when hand pulling. ZM: If small amounts of ZM are found, the consultant will be directed to hand remove and record GPS points.

10. Select a control plan in cooperation with Burnett County AIS Coordinator and WDNR (board of directors).

    Control methods may include hand pulling, use of divers to manually or mechanically remove the EWM/ZM (or other AIS) from the lake bottom, application of herbicides (EWM/ZM (or other AIS), and/or other effective and approved control methods.

    The goal of the control plan will be eradication of the EWM/ZM (or other AIS), if feasible depending on the full extent of the population.

11. 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.

12. Lake Association funds may be used to pay for any reasonable expense incurred in implementing the selected control plan, and implementation will not be delayed by waiting for WDNR to approve or fund a grant application.

13. The President of the Tabor Lake Association 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 lake association shall formally apply for the grant.

14. The Tabor Lake Association shall have the authority to accept donations or borrow money for the purpose of paying for control of EWM/ZM (or other AIS).

15. Frequently inspect the area of the EWM/ZM (or other AIS) to determine the population size and/or the effectiveness of the treatment and whether additional treatment is necessary.

16. Contract for professional monitoring to supplement volunteer monitoring in years following EWM/ZM (or other AIS) discovery.

Appendix F: References

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