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White Lake - Aquatic Plant Management Plan

White Lake Preservation Association

WDNR AIS Grant
LPL-1727-20

Prepared by:
Wisconsin Lake and Pond Resource

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February 2, 2023

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Executive Summary

White Lake is the second largest lake in Waupaca County and provides numerous recreational opportunities for a wide spectrum of users. Being a popular fishing and hunting destination and near the Waupaca Chain of Lakes, the upper portion of the Lake Winnebago system, and the Wolf River, White Lake draws a wide array of users from throughout the area and statewide. Some use patterns may be detrimental to the overall health of the lake and bring a higher risk of the introduction of new aquatic invasive species (AIS).

The aquatic plant community in White Lake is very diverse, though it does grow dense in many locations. Dense aquatic plant growth can impact lake users and hamper navigation, which can be exacerbated by the presence of AIS. There are three AIS present within White Lake: Eurasian water-milfoil (*Myriophyllum spicatum* – EWM), curly-leaf pondweed (*Potamogeton crispus* – CLP), and purple loosestrife (*Lythrum salicaria*). Currently all three AIS are present at low densities and have not been actively targeted for control in recent years.

Locally dense aquatic plant growth, spread of AIS, and maintaining a quality fishery are the main issues of concern for lake users. Dense aquatic plant growth regularly hampers navigation throughout the lake, limits enjoyment, and causes increased expenditure on actions to alleviate them. Past management focused on aquatic plant control through targeted herbicide applications and mechanical aquatic plant harvesting. These techniques, though expensive, provide temporary relief to navigation with most an accepted practice on White Lake. Mechanical harvesting, however, does not reduce the presence or spread of aquatic invasive species. Current issues have caused the need for understanding of what is happening and why. Development of an updated management plan for better management of the lake is needed.

This management plan provides a multi-faceted approach to address issues and recommend management options based on best fit, cost, feasibility, and desires based on direct input from the lake user survey questions. Many aquatic plant management options are evaluated and, while there is not one silver bullet, it is likely a combination of techniques over a period of several years that will begin to yield positive results. The basic plan is based on exploration of new aquatic plant management techniques with expanded actions for AIS control, overall aquatic plant community control, and protection of the lake's value to all users. Some of these actions potentially include continued harvesting, herbicide applications, protection of ecologically sensitive areas, and AIS and boat landing monitoring. It would be recommended the group start with a specific project component or area of the lake to gain early and immediate success and build off of that for future projects.

1.0 INTRODUCTION

White Lake is a natural drainage lake located in the Town of Royalton in south central Waupaca County. At 1064-acres, it is the second largest lake in the County. However, much of the lake is more closely resembles a deep wetland marsh in much of its area due to prolific growth of emergent aquatic species. The lake has a maximum depth of 10 feet, mean depth of 4 feet, and 6.2 miles of shoreline. Water levels in White Lake are maintained by a low-head fixed dam.

Water quality of White Lake rates as eutrophic and very productive with good water clarity and provides numerous recreational opportunities. The White Lake Preservation Association (WLPA) is the main organization responsible for management activities on White Lake. The WLPA is a group who supports the restoration and management of the lake with a strong tradition in conservation and resource management to protect and enhance these opportunities. The Association has been active in a number of lake management activities on White Lake including: aquatic plant management, water quality sampling and management, invasive species sampling, and fisheries management through stocking. The WLPA received a grant from WDNR and contracted with Wisconsin Lake & Pond Resource, LLC (WLPR) to help develop an updated aquatic plant management (APM) plan for White Lake.

2.0 LAKE USER SURVEY AND PRIMARY CONCERNS

Any management plan can only be successful if accepted by the lake users it impacts the most. If options are laid out that are not needed or feasible, a plan is set to fail due to lack of support and this management plan is no different. Prior to and throughout the drafting of this plan, multiple meetings and presentations were complete. These direct engagements give us a unique look at all lake users and a better understanding of issues to guide development of a plan that will not only strive to improve current lake conditions, but be successfully implemented and supported by lake users through direct response actions by the people the lake impacts the most.

Multiple project meetings to present the initial user survey results, aquatic plant survey data, and further refine the plan outline and over goals were held on October 12, 2019, April 4, 2021, and October 15, 2021. Review of the draft APM plan was submitted to the Association and WDNR for comments prior to finalization. The APM plan that follows recommends specific management activities for White Lake based on the top two management concerns indicated during the presentations and further discussions with lake users: management or control of nuisance aquatic plant growth hampering recreation, access, and navigation along with preventing the spread of AIS into and out of White Lake. This plan will focus on these main contributing factors to lake user frustrations and concerns. Many options were discussed and it was clear that no action was not acceptable to lake users.

To assist drafting this plan, a questionnaire was sent out to all lakeshore residents, WLPA members, and made available to any interested lake user, and was available online for 30 days. Notification of the survey was sent out as an information postcard with a link to the online survey and an option to request a paper copy. Copies of the survey were also made available at the public boat launch and any other interested party that requested one. In total, postcards were sent to all 128 lakeshore landowners, of which 76 where WLPA membership properties and 52 were not. 51 unique survey responses were submitted with two of these completed by lake visitors, giving a return rate of 38.3%, or 49 responses, directly from the mailing. Results of the questionnaire are included in Appendix A. This questionnaire gives us a unique look at all lake users and a better

understanding of issues to guide development of a plan that will not only strive to improve current lake conditions, but be successfully implemented and supported by lake users through direct response actions by the people the lake impacts the most.

In total, 51 respondents completed the survey across an array of users with a majority (96.1%) being shoreline residents – either year-round or seasonal. The remainder were visitors, off-shore residents, or other affiliations. This shows that the lake and its health is extremely important to riparian owners and all users. Responses give an opportunity to look into personal histories with Pine Lake and to create an average user profile. Overall, the average user looks like this:

- 58.8% have used the lake for over 10 years
    - Average of 22.4-year history with the lake
- Spend a significant portion of their time on the water, with averages of:
    - 15.4 days per month during open water
    - 8.5 days per month during ice cover

- A majority (80.4%) found their time on the water enjoyable with a variety of activities. Activities enjoyed by users are focused on a variety of different uses, including:
    - Pontoon boating (#1)
    - Open water fishing (#2)
    - Pleasure boating (#3)
    - Nature viewing (#4)

Many responses indicated an array of enjoyment of experiences on the lake which have decreased over time.

- 6% indicated no change
- 6% indicated their use has become more enjoyable.
- 92% indicated their use has become less enjoyable, due to:
    - Excessive aquatic plant growth
        - 90.8% of respondents who indicated decreased enjoyment selected this option as a cause
    - Decreased water depth

The respondents' main concerns on lake health focused on excessive aquatic plant growth and a potential spread of invasive species and their impact on the lake and use patterns. The primary concerns were:

- Excessive aquatic plant growth (#1)
    - Primarily driven by a general increase in all aquatic vegetation
    - Wild rice growth was called out as a concern by many comments
    - Negatively affected lake users at 98% of the time
- Spread of aquatic invasive species growth (#2)
    - Wild rice was commonly called out as an "invasive species" in survey comments
    - Negatively affected lake users 75% at least some of their time or more
- Maintaining a quality fishery (#3)

This plan will focus on the main two contributing factors – excessive aquatic plant growth and limiting the spread of invasive aquatic plant within White Lake and out of the lake to other waters. Users were very knowledgeable about AIS and potential harm.

- 76% responded in kind and 84.3% believed there are populations of AIS in White Lake.

  - 79.6% responded that EWM and 69.4% responded that CLP were present in White Lake. This shows continued knowledge of the lake by its residents and users.
  - 36.7% responded that "Other" invasive species were present in White Lake. 15 of 18 "Other" comments identified wild rice as "invasive".

- 94% of respondents want action to manage aquatic plants, primarily general nuisance control. There were only 2 responses that wanted no action for management. Top management options were:
  - Mechanical harvesting (#1)
  - Manual removal or hand pulling (#2)
  - Hydraulic or mechanical dredging (#3)
  - No management was far and away the least preferred option

- Users chose the following elements as the most needed for this APM Plan:
  - Large scale plant management and/or harvesting (#1)
  - Seek grant funding for direct management efforts (#2)
  - Prevent the introduction of new AIS (#3)

The White Lake APM Plan includes a review of available lake information, an aquatic plant survey, and lake user input to determine the most appropriate management alternatives (physical, mechanical, biological or chemical) for protection and health of the lake. Though not all activities desired for management by lake users may be viable or appropriate, their input above provides a strong base to form this plan.

3.0 LAKE HISTORY & PAST MANAGEMENT

Located in south central Waupaca County, the lake has been an important fixture in the lives of residents and non-resident users. Three public landings on the south shore provide excellent accessibility. Numerous accesses to White Lake and its proximity to popular nearby waterbodies have led to a history of heavy recreational use, primarily fishing and waterfowl hunting. White Lake is an extremely productive lake with multiple locations of dense aquatic plant growth. Aquatic plants have created a nuisance to navigation in multiple locations which are exacerbated by AIS, including EWM. Dense aquatic plant growth has been a concern throughout the history of White Lake and has become the main issue for management. These have been dealt with in the past by various management plans and studies, including the following:

- **White Lake Preservation Association – 1985:** WLPA officially founded to protect the lake, deal with management issues, and enhance the lake for future generations. All below activities, including this plan, would not have been possible without them. The WLPA has taken on AIS control tasks including various herbicide applications ranging from small scale (<10 acres) to over 100 acres for EWM control.
- **Aquatic Plant Management**: Earliest methods of control were completed by individual landowners contracting for chemical treatments.
- **Aquatic Plant Survey – 1989**: The first documented aquatic plant survey of the lake was conducted. Many of the species noted in the 1989 survey are still present today and included: Milfoil species, pondweed species, naiad, white water lily, cattail, and others. Dense locations of growth requiring management were noted.

- **WLPA acquires its first mechanical harvester - 1983:** The Association acquired its first mechanical harvester to deal with excessive aquatic plant growth. Harvesting continues today, averaging up to 110+ loads, or 319,500 pounds of material annually.
- **Aquatic Invasive Species Identified:** The first AIS were found growing in White Lake – EWM (1989) and CLP (1990s). Both species can grow extremely dense and hamper recreation al use of the Lake. Management of AIS has been a post focus for the WLPS for both EWM and CLP. No active management of either species has occurred since 2015. In addition, the following AIS has been identified in White Lake: Chinese mystery snail – 2011.
- **Aquatic Plant Management Plan - 1991:** A plan focused on targeted management of White Lake's aquatic plants was created with assistance from the WDNR and the Association. This plan laid the groundwork for aquatic plant management. Updates to the plan to reflect current conditions were completed in 2002 and 2012.

In recent years (2015-2021), management of AIS has taken on a relaxed approach as levels of both EWM and CLP remain at low, background densities and widely scattered. Primary aquatic plant management now completed by the WLPA is focused on maintaining navigational access through intensive aquatic plant mechanical harvesting. A timeline of past AIS management actions includes:

- **2003:** The initial control for EWM in White Lake occurred under a WDNR grant for a 20-acre treatment. Further actions included a whole-lake point intercept survey and APM plan update
- **2009:** A second, larger herbicide application for EWM control occurred, this time for 148-acres. This control was considered a great success and populations of EWM have not needed active management since.
- **2013-2015:** Active management for CLP took place within larger, dense area of CLP growth. Total treatment acres varied from 20-30+. Results have been successful with no follow-up action required.

Management actions carried out for aquatic plant growth within the lake have concentrated on nuisance reduction, primarily through mechanical harvesting. After several plans were created and actions enacted, Issues with dense plant growth still persists in White Lake, as evidenced by the concerns raised by users throughout the plan update process. Continued problems from dense aquatic plant growth drive the desire to continue plant management activities, which requires an updated plan approved by the Wisconsin Department of Natural Resources (WDNR), led to creation of this APM plan.

4.0 AQUATIC PLANTS

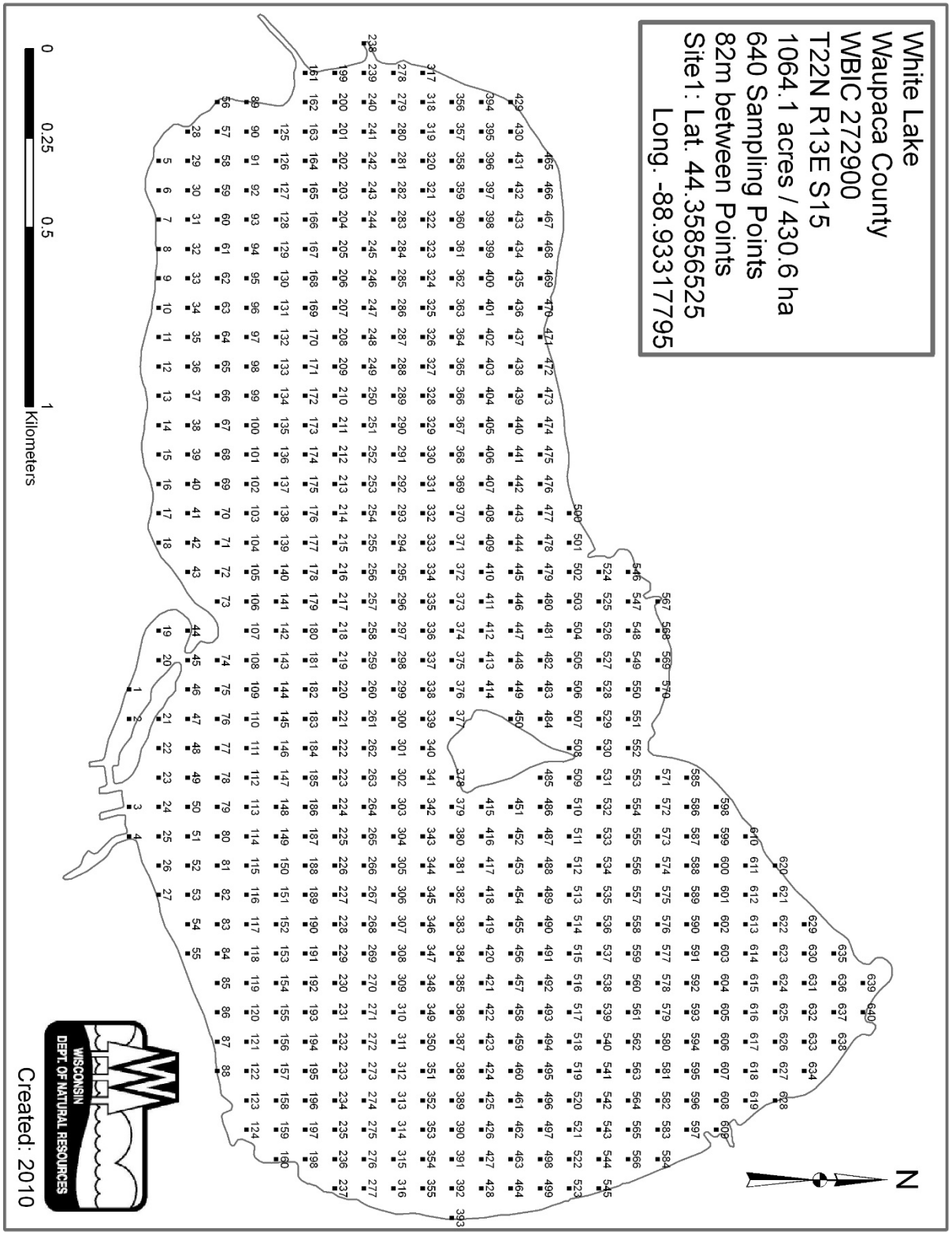
Aquatic plants are vital to the health of a water body. Unfortunately, they are often negatively referred to as "weeds". The misconceptions this type of attitude brings must be overcome in order to properly manage a lake ecosystem. Rooted aquatic plants are extremely important for the well-being of a lake community and possess many positive attributes. Despite their importance, they sometimes grow to nuisance levels that hamper recreational activities and are common in degraded ecosystems. The introduction of AIS, such as Eurasian water-milfoil, often can increase

nuisance conditions, particularly when they successfully out-compete native vegetation and occupy large portions of a lake.

To assess the state of the current plant community, a full point-intercept survey was completed on September 4 and 60, 2019 following all WDNR survey protocol. The survey included sampling at 640 pre-determined locations uniformly spaced 82 meters apart to document the following at each site:

- Individual species present and their density
- Water depth
- Bottom substrate

Each location was assigned coordinates and loaded into a GPS unit, which was used to navigate to each point (Figure 1). Data collected at each point was then entered into a WDNR spreadsheet, which outputs various aquatic plant community indexes and data, allowing for a comparison to past data to monitor changes over time. Information on methods and all referenced tables or charts is included in the attachments.


White Lake
Waupaca County
WBIC 272900
T22N R13E S15
1064.1 acres / 430.6 ha
640 Sampling Points
82m between Points
Site1: Lat. 44.35856525
Long. -88.93317795
N
0
0.25
0.5
1
Kilometers
WISCONSIN
DEPT. OF NATURAL RESOURCES
Created: 2010

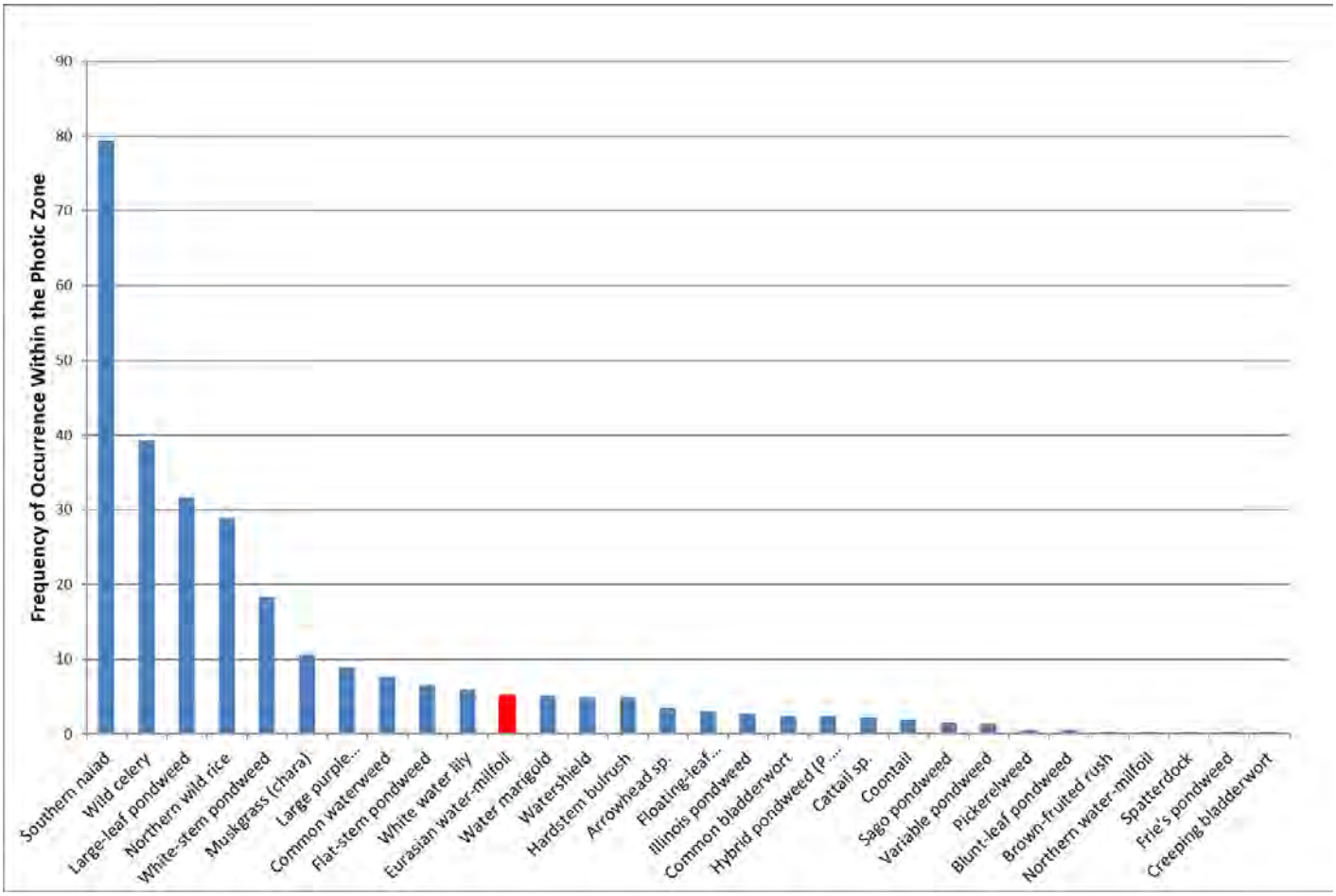
4.1 2019 POINT INTERCEPT SURVEY

In 2019, the aquatic plant survey identified a very diverse community, with large sections of dense submersed and/or emergent vegetation growth. In total, 30 species were identified; one of them being an AIS – Eurasian water-milfoil (Table 3). All remaining species identified are common of lakes in Wisconsin and included eight different species of pondweeds, various emergent species, and floating-leaf species, all of which are vital to fisheries habitat.

Table 2: Aquatic Plant Community Statistics. White Lake, Waupaca County, Wisconsin.

Community Statistics	2019
Number of sites sampled	371
Number of sites with vegetation	343
Number of sites shallower than maximum depth of plants	370
Frequency at sites shallower than maximum depth of plants	92.7%
Simpson Diversity Index	0.87
Maximum depth of plants (feet)	9.5
Species richness	30
Average number of all species per site	2.81
Average number of all species per vegetated site	3.03
Average number of native species per site	2.75
Average number of native species per vegetated site	2.97

Species sampled in White Lake were present in three categories: emergent, near shore species which are rooted below the water's surface with growth extending above the water (cattail - *Typha sp.);* floating-leaf species, which are rooted on the lake bottom but with leaves that float on the water's surface *(*white water lily – *Nymphaea odorata);* and submersed species which root on the lake bottom and remain below the water's surface (common waterweed – *Elodea canadensis*).



The photic zone, or area of the lake where light penetration is able to support plant growth, covered nearly the entire lake with plants found growing to 9.5 feet deep. Plant growth was locally dense with 92.7% of this area vegetated. Much of the sediment was compromised of muck with areas of sand in localized near-shore locations and remnant river channels. A mixture of sand and organic rich muck sediment provides ideal conditions for aquatic plant growth with an excellent nutrient source and solid footing for roots to establish in. In some areas of muck, the loose sediment allows plants to easily uproot due to wave or boat action and float to the surface, creating an additional nuisance to lake users.

Species richness was above average for area lakes at 30 and exhibited excellent diversity per sample point, averaging 2.97 native species per vegetated site with a good spread throughout the system, as exhibited by a Simpson Diversity Index (SDI) of 0.87. An SDI value closer to 1.0 indicates a healthier, more evenly spread plant community. As noted throughout this plan and by many respondents, the aquatic plant community of White Lake does grow very dense. This is backed up by an average rake fullness rating of 1.85 per sampled location. Southern naiad (*Najas guadalupensis*) wild celery (*Vallisnaeria americana*), and large-leaf pondweed (*Potamogeton amplifolius*) were the most dominant species present. All three species were also the most dominant species during the past surveys. Table 3 displays frequency data by individual species from 2019 and past surveys. Table 4 displays rake fullness data by individual species from 2019 and the 2010 and 2015 surveys. Figures 3-11 display the locations of the most common species and any AIS found during sampling.

Though there are two AIS noted as being present in White Lake (CLP & EWM), only EWM was sampled during the 2019 survey. Including visual observations, EWM was sampled at 33 locations and was the 11th most common species (Figure 3). As an invasive species with aggressive growth tendencies, EWM spreads by growing from plant fragments, which can be hastened through mechanical harvesting. Though EWM has the potential to become an extreme nuisance and detriment to a lake's ecosystem, and has done so in the past on White Lake, the recent survey did not indicate EWM as a primary nuisance. Even though EWM is present, it displayed low density when sampled. Much of the navigational nuisance is caused by a dense mix of native species.

Curly-leaf pondweed was first noted in the 1990s, but no direct management efforts for its control have taken place since 2015. However, CLP's life cycle is unique to aquatic plants in Wisconsin. If often begins growing in late fall, overwinters as a small plant 4-8" tall, and continues growth right after ice-out the following spring. This gives CLP a competitive advantage early in the year and often leads to dense populations.

Come mid-summer, CLP begins to naturally die back. The ideal time to map CLP populations is in early spring prior to this occurrence. The point intercept surveys are designed to capture all plans, primarily native species, at their peak densities. Timing of these surveys often under sample populations of CLP. However, during past early season visits and notes from residents, CLP was not noted to be dense at these times either. In White Lake CLP has become part of the natural assemblage of plants and does not present nuisance conditions.

4.2 FLORISTIC QUALITY INDEX

To compare changes in the plant community over time within White Lake and to similar lakes in Wisconsin, the floristic quality index (FQI) can be used. FQI provides the ability to compare aquatic plant communities based on species presence. This value varies throughout Wisconsin, ranging from 3.0 to 44.6, with a statewide average of 22.2. To achieve this, each plant species, except for AIS, is assigned a coefficient of conservatism value (C value). A plant's C value relates to a plant species' ability to tolerate disturbance. Low C values (0-3) indicate that a species is very tolerant

of disturbance, while high C values (7-10) indicate species with a low tolerance of disturbance and are typically found in systems of higher water quality. Intermediate C values (4-6) indicate plant species that can tolerate moderate disturbance. The calculated FQI for White Lake from the 2019 plant survey is 33.49 with an average C value of 6.44 (Table 5).

Not only does this track changes over time within the lake, but allows for comparison of the Lake to lakes with similar environmental conditions within a delineated area, called an eco-region, to be compared. White Lake is located within the North Central Hardwoods Forests eco-region. Lakes within this region are typically natural lakes created by glaciation.

White Lake is found near the eastern border of the ecoregion within the Central Sand Ridges sub-region. Though White lake is a drainage lake with a low-head dam, typical lakes within this area are primarily seepage lakes that formed in low areas between the ridges of deposits created by glaciation. Land use varies within the region from primarily forest to agricultural watersheds, with most lakes having at least moderate development along the shoreline.

Lakes within this eco-region have increased development around the shoreline and increased overall use. Both conditions lead to more disturbances from an expected natural condition, which leads to lower plant community metrics like FQI and coefficient of conservatism. Both of these are below the average for all Wisconsin lakes due to this.

Even after years of mechanical harvesting, AIS impacts, and water level fluctuations White Lake displays a high-quality plant community. Its average C value (6.47) and FQI (33.86) are near or in the upper quartile for the North Central Hardwoods Forest ecoregion. White Lake ranks highly when compared to lakes throughout the State as its FQI is also in the upper quartile (Table 6).

Table 6: FQI and Average Coefficient of White Lake Compared to Wisconsin and North Central Hardwood Forests

	Average Coefficient of Conservatism			Floristic Quality			Total Species		
Quartile*	Lower	Mean	Upper	Lower	Mean	Upper	Lower	Mean	Upper
Wisconsin Lakes	5.5	6	6.9	16.9	22.2	27.5	8	13	20
N.Central Hardwood Forests	5.2	5.6	5.8	17	20.9	24.4	10	14	19
Average: 2002-2019	6.49			33.73			29		
2019	6.44			33.49			30		
2015	6.54			33.34			27		
2010	6.70			36.70			34		
2002	6.28			31.40			26		

* - Values indicate highest value of the lowest quartile, mean, and lowest value of the upper quartile

Due to high shoreline development and recreation use for lakes within the region, many have a disturbed plant community. Eutrophic lakes like White Lake are very productive for both fisheries and aquatic plant growth, sometimes leading to dense nuisance growth, hampering navigation and use of the lake. This is true for White Lake and occasionally worsened by the presence of AIS. 29 native species were found during the 2019 survey with an average of 2.97 native species per sample point with vegetation present and many sample points having more than this and up to seven native species present. This native plant community is important should any AIS management be wanted. A healthy native plant population is already established and present to populate areas vacated by AIS due to potential management. Many lakes within the region with AIS growth lack a native community to do so.

4.3 HISTORICAL COMPARISON

The aquatic plant community of White Lake has been sampled periodically throughout its recent history. Multiple surveys using similar sampling methods provide a unique opportunity to gauge changes over the years. Aquatic plant sampling protocol recommended by WDNR is completion

of point-intercept surveys. These surveys are to be more repeatable between years. A full point-intercept survey was last completed in 2015 and used the same sample sites as 2019.

The relative plant community within the lake has fluctuated slightly over time in species composition while remaining stable and extremely healthy and diverse overall. Species diversity, average coefficient of conservatism, and FQI all display the overall stability trend over time and are shown below for all metrics over time when comparing historical survey data (Tables 1 & 3-9).

Table 8: Species sampled by year. White Lake, Waupaca County, WI.

	Presence by Year			
	2002	**2010**	**2015**	**2019**
Invasive Species				
Eurasain water-milfoil	X	X	---	X
Curly-leaf pondweed	---	X	---	X*
Purple loosestrife	---	X	---	X*
Floating-Leaf				
Watershield	X	X	X	X
Spatterdock	X	---	---	X
White water lily	X	X	X	X
Emergent				
Pickerelweed	X	X	---	X
Arrowhead sp.	---	---	---	X
Crested arrowhead	---	X	X	---
Arum leaved arrowhead	---	---	X	---
Hardstem bulrush	X	X	X	X
Cattail sp.	---	---	X	X
Narrow-leaved cattail	---	X	---	---
Broad-leaved cattail	---	X	---	---
Wild rice	X	X	X	X
Submergent				
Water marigold	X	X	X	X
Coontail	X	---	X	X
Muskgrass (chara)	X	X	X	X
Common waterweed	X	---	X	X
Needle spikerush	X	X	---	---
Water stargrass	X	---	---	---
Brown-fruited rush	---	---	---	X
Water lobelia	---	X	---	---
Various-leaved water-milfoil	X	---	---	---
Northern water-milfoil	X	X	---	X
Whorled water-milfoil	X	X	X	---
Southern naiad	X	X	X	X
Nitella	---	X	---	---
Large-leaf pondweed	X	X	X	X
Frie's pondweed	---	X	X	X
Variable pondweed	---	X	---	X
Illinois pondweed	X	X	X	X
Floating-leaf pondweed	X	X	X	X
Blunt-leaf pondweed	---	---	---	X
White-stem pondweed	X	X	X	X
Small pondweed	---	X	---	---
Stiff pondweed	---	X	X	---
Flat-stem pondweed	X	X	X	X
White water crowfoot	X	---	---	---
Sago pondweed	X	X	X	X
Creeping bladderwort	---	X	---	X
Small bladderwort	---	X	X	---
Large purple bladderwort	---	---	X	X
Common bladderwort	X	X	X	X
Wild celery	X	X	X	X
Hybrid pondweed (P. amplifolius x illinoensis)	---	X	X	X

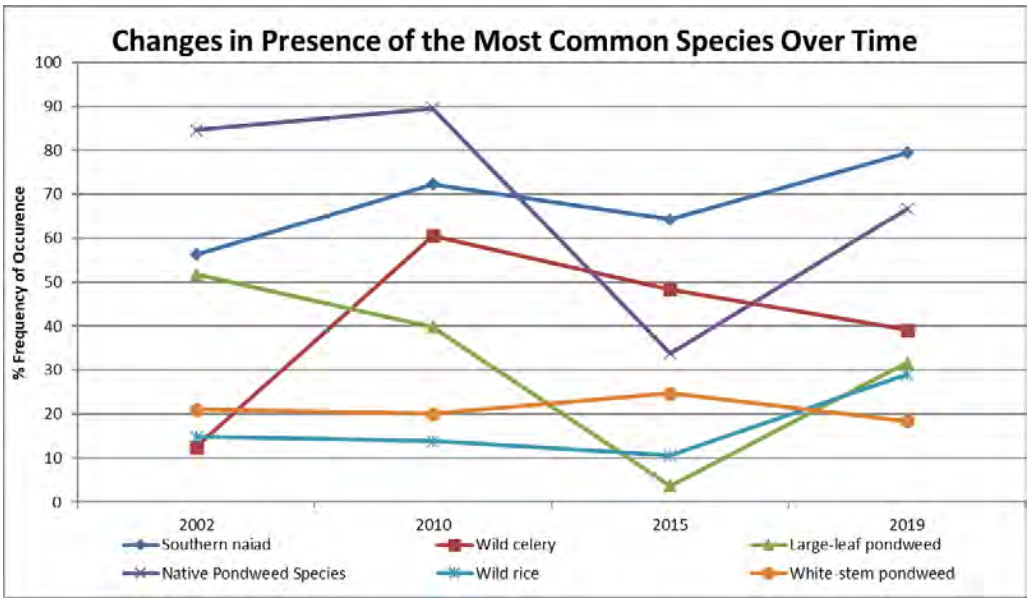
* - not identified during whole-lake survey but still present

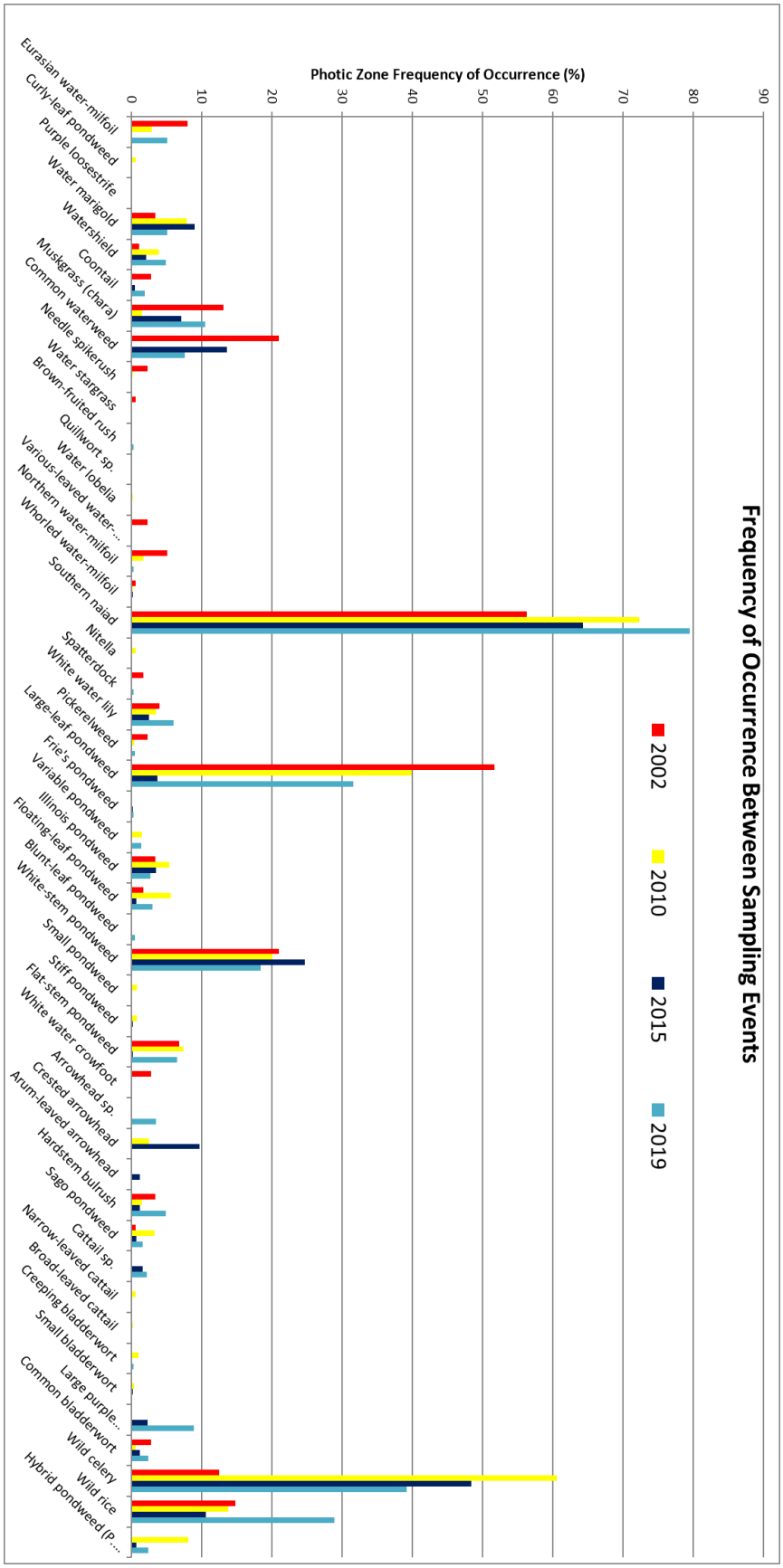
Table 9: Historical Aquatic Plant Community Statistics. White Lake, Waupaca Co., WI.

	2002	2010	2015	2019
Total Number of Species	26	34	27	30
FQI	31.4	36.7	33.34	33.49
Average Coefficient	6.28	6.7	6.54	6.44
Most Common Species	Southern naiad	Southern naiad	Southern naiad	Southern naiad
	Large-leaf pondweed	Wild celery	Wild celery	Wild celery
	Common waterweed	Large-leaf pondweed	White-stem pondweed	Large-leaf pondweed
	White-stem pondweed	White-stem pondweed	Common waterweed	Wild rice
	Wild rice	Wild rice	Wild rice	White-stem pondweed

Over the most recent surveys (2002, 2010, 2015, and 2019) as shown above, the aquatic plant community has seen changes in overall species composition while maintaining many community metrics. Species sampled in prior surveys, but not present in 2019 include needle spikerush (2002 & 2010), water stargrass (2002), water lobelia (2010), various-leaved watermilfoil (2002) whorled water-milfoil (2002, 2010, 2015)), nitella (2010), small and stiff pondweed (2010, 2015), white water crowfoot (2010), small bladderwort (2010 & 2015), crested arrowhead (2010 & 2015), and arum-leaved arrowhead (2015).

Conversely, the 2019 survey had 2 species sampled that were not noted in past surveys; brown-fruited rush and blunt-leaf pondweed. Composition of the plant community changes by year and the lack of finding species in 2019 that were present in past surveys and vice versa is not concerning, especially due to the healthy and diverse community found in White Lake. Many not found in 2019 were historically present in low frequencies and likely still present within the lake.




Photic Zone Frequency of Occurrence (%)
0
10
20
30
40
50
60
70
80
90
Eurasian water-milfoil
Curly-leaf pondweed
Purple loosestrife
Water marigold
Watershield
Coontail
Muskgrass (chara)
Common waterweed
Needle spikerush
Water stargrass
Brown-fruited rush
Quillwort sp.
Water lobelia
Various-leaved water-...
Northern water-milfoil
Whorled water-milfoil
Southern naiad
Nitella
Spatterdock
White water lily
Pickerelweed
Large-leaf pondweed
Fries's pondweed
Variable pondweed
Illinois pondweed
Floating-leaf pondweed
Blunt-leaf pondweed
White-stem pondweed
Small pondweed
Stiff pondweed
Flat-stem pondweed
White water crowfoot
Arrowhead sp.
Crested arrowhead
Arum-leaved arrowhead
Hardstem bulrush
Sago pondweed
Cattail sp.
Narrow-leaved cattail
Broad-leaved cattail
Creeping bladderwort
Small bladderwort
Large purple...
Common bladderwort
Wild celery
Wild rice
Hybrid pondweed (P. ...
Frequency of Occurrence Between Sampling Events
2002
2010
2015
2019

Data comparison between years shows that the lake continually exhibits a dynamic and diverse aquatic plant community. Dominant species will vary year to year depending on many factors including weather patterns, community composition in year's prior, water levels and more. Some conditions may be favorable for certain species during one growing year but not others and vice versa. This is common and indicative of a healthy lake. Variance is normal and that noted within the lake is currently not a cause for concern.

To assess changes between 2019 and past surveys, statistical analysis was completed using a Chi-square test with a 5% Type-I error rate. This error rate is standard in ecological studies and equals that there is a 5% chance of claiming statistically significant change when no real change occurred. Only those species that display a p-value of 0.05 or lower changed significantly population-wise between years. To calculate these values, the total number of sample locations each species was found at is compared between years. Table 7 displays statistical changes, if any, for each species sampled in 2019 versus 2015, 2010, and 2002. These changes further show that the aquatic plant community of a healthy lake is dynamic.

Wild rice (Zizania palustris) is a native, emergent species scattered in Wisconsin lakes that has a cultural significance to Native Americans. Wild rice is also an integral piece of the diets of many waterfowl and other species while being important habitat for nursery and young wetland birds. Residents of White Lake have become increasingly concerned about its growth and expansion of recent years, which has led to decreased navigability, access, and enjoyment of the lake. Management or control of wild rice is highly regulated in Wisconsin with very little, if any, direct control actions permitted or allowed.

Populations of wild rice have been documented since 1931 in the lake. Wild rice can fluctuate wildly depending on many conditions, including prior year's seed crop, weather, and disturbance. Roughly, wild rice populations cycle from high to low every three years. The data collected from the 2019 survey shows that wild rice saw a very large, statistical increase when compared to any past survey. Frequency of occurrence of wild rice nearly tripled from 10.6% of photic zone points in 2015 to 28.9% in 2019. While growth of wild rice remains a very large and potentially valid concern for lake residents and users, large-scale control is not possible due to WDNR regulations. Wild rice control is also not warranted or necessary as it plays an extremely valuable part of the lives of many fish, animal, and invertebrates for White Lake.

AIS are an ever-increasing threat. Eurasian water-milfoil is the most prevalent AIS present and has increased slightly from the 2010 survey while none was found during the 2015 survey. However, presence of EWM is still below all-time highs as found in 2002. In 2019, EWM was found growing at a low frequency and density across the lake.

In many biologically productive lakes, some native species can grow to nuisance levels, hampering navigation and enjoyment of the waterbody. Throughout all surveys and current notes southern naiad, wild rice, and wild celery are the bulk of the species causing navigational impairment and have remained prevalent in White Lake. A combination of dense, native species growth continues to cause navigational nuisance within the system. In many years, wild celery becomes a nuisance later in the growing season. A concern with wild celery is that it is loosely rooted in soft sediments can easily break loose and float within the water column, causing an additional nuisance.

5.0 AQUATIC PLANT MAINTENANCE ALTERNATIVES

Based on the goals of the stakeholders outlined above, several management alternatives are available for this APM plan. Some general alternatives are discussed below. More information on management alternatives are included in Appendix C. The following management alternatives are based on historical, aquatic plant management approaches and incorporate needs established by the questionnaire and recommendations of Wisconsin Lake & Pond Resource.

AQUATIC PLANT MAINTENANCE ALTERNATIVES

A combination of management alternatives may be used on a lake with a healthy native aquatic plant community with invasive or non-native plant species present. Maintenance alternatives tend to be more protection-oriented because no significant plant problems exist or the issues are at levels that are generally acceptable to lake user groups with no active manipulation required. These alternatives can include an educational plan to inform lake shore owners of the value of a natural shoreline and encourage the protection of the lake water quality and the native aquatic plant community.

AQUATIC INVASIVE SPECIES MONITORING

One AIS was identified within the Project Area during the 2019 full point-intercept survey. In order to monitor existing populations of current AIS and for new AIS in the future, a consistent and systematic monitoring program that conducts surveys for AIS is highly recommended. In some lake systems native aquatic plants "hold their own" and AIS never grow to nuisance levels; however, in others active management is required. The spread of AIS can be caused by several factors, including water quality.

It is recommended to complete pre and post treatment aquatic plant monitoring in any areas that are actively managed for AIS control to evaluate management effectiveness. Aquatic plant communities may undergo changes for a variety of reasons, including varying water levels, water clarity, nutrient levels and aquatic plant management actions. In general, lake-wide aquatic plant surveys are recommended every year to monitor changes in the overall aquatic plant community during large-scale treatments and then again every 5 years once small scale, maintenance treatments take place to monitor the effects of the aquatic plant management activities.

In addition to invasive plants, excessive native plant growth combined with shallow water depths can cause navigational issues for lake users. These have historically been addressed through a harvesting program.

CLEAN BOATS/CLEAN WATERS CAMPAIGN

Prevention of the introduction of new AIS to the lake and spread of existing AIS from the lake was the top management priority indicated in the user survey responses. To prevent the spread of AIS from White Lake, a monitoring program such as Clean Boats/Clean Waters (CB/CW) is a good choice. This program is carried out by trained volunteers who inspect incoming and outgoing boats at launches. Boat landing signage also accompanies the use of CB/CW to inform lake users of proper identification of AIS and boat inspection procedures. Education of association members about inspecting watercraft for AIS before launching a boat or leaving access sites on other lakes could help prevent new AIS infestations.

CB/CW on White Lake has been used minimally since 2016 with only three inspections since for 13 hours since 2016 under Golden Sands Resource Conservation and Development Council (Golden

Sands RC&D) monitoring. Increasing participation in this program is strongly encouraged, especially when considering the presence of EWM, CLP, and significant use of harvesting equipment which can lead to increased chances for plant fragments to be picked up by boaters.

Scheduling volunteers for CB/CW landing inspection is often difficult due to time constraints for volunteers. The WDNR offers grant assistance through the Surface Waters program to pay for CB/CW landing inspectors. This establishes a set and known schedule for boat landing monitoring, offering added protection for the Lake. If acquiring CB/CW monitors becomes difficult for White Lake and the Association it is recommended they apply through this grant to program to hire a dedicated monitor. This is often done in conjunction with County-wide AIS monitoring efforts, which are currently led by Golden Sands RC&D.

AQUATIC PLANT PROTECTION AND SHORELINE MANAGEMENT

Protection of the native aquatic plant community is needed to slow the spread of AIS from lake to lake and within a lake once established. Therefore, riparian landowners should refrain from removing native vegetation. Additionally, EWM and CLP can thrive in nutrient (phosphorus and nitrogen) enriched waters or where nutrient rich sediments occur. Two relatively simple actions can prevent excessive nutrients and sediments from reaching the lake.

The first activity is the restoration of natural shorelines, which act as a buffer for runoff containing nutrients and sediments. This can be a potential issue within the lake, as White Lake has a large watershed with portions in agricultural use. Good candidates for shoreline restorations include areas that are mowed to the lake's edge, or that have structures directly adjacent to the lake edge. Establishing natural shoreline vegetation can sometimes be as easy as not mowing to the water's edge. Native plants can also be purchased from nurseries for restoration efforts. Shoreline restoration has the added benefits of providing wildlife habitat and erosion prevention. Or many times a simple "no mow" buffer strip 35'–50' back from the water's edge can provide effective and economical restoration for shoreline property owners. A vegetated buffer area can also prevent surface water runoff from roads, parking areas and lawns from carrying nutrients to the lake. Currently, much of the lake's north and south shorelines are developed, providing potential avenues for increased impacts from runoff.

The second easy nutrient prevention effort is to use lawn fertilizers only when a soil test shows a lack of nutrients. Importantly, fertilizers containing phosphorus, though readily available to the consumer, are illegal for use in Wisconsin, unless a soil test shows a deficiency in phosphorus. The fertilizers commonly used for lawns and gardens have three major plant macronutrients: Nitrogen, Phosphorus and Potassium. These are summarized on the fertilizer package by three numbers. The middle number represents the amount of phosphorus. Since most Wisconsin lakes are "Phosphorus limited", meaning additions of phosphorus can cause increased aquatic plant or algae growth, preventing phosphorus from reaching the lake is a good practice. Local retailers and lawn care companies can provide soil test kits to determine a lawn's nutrient needs. To help prevent fertilizer runoff into local lakes, the Town of Schleswig has restricted fertilization of private properties within 35' of the waterbody. Of course, properties with an intact natural buffer require very little maintenance, and no fertilizers.

The Waupaca County Land and Water Conservation Department may be able to offer assistance with shoreline restoration projects, rain gardens and or additional shoreline protection. Interested landowners can contact the Land and Water Conservation Department at (715) 258-6245 to request additional information.

An additional option is the DNR Healthy Lakes grant program. This program provides initiative for lakeshore owners to improve their shoreline through simple and inexpensive best management

practices. Deadline for application is February 1st with funding of up to $25,000 per group or $1,000 per individual on a 75% DNR / 25% applicant cost sharing. Further information can be obtained at: http:// http://healthylakeswi.com

PUBLIC EDUCATION AND INVOLVEMENT

The WLPA should continue to keep abreast of current AIS issues throughout the County and State. The County Land and Water Conservation Department, WDNR Lakes Coordinator and the UW Extension are good sources of information. Many important materials can be ordered at the following website: http://www.uwsp.edu/cnr/uwexlakes/publications/

If the above hyperlink to web address becomes inactive, please contact WDNR for appropriate program and contact information.

MANUAL (HAND) REMOVAL

Native plants may be found at nuisance levels in scattered locales throughout the waterway. Manual removal efforts, including hand raking or hand pulling unwanted native plants (except wild rice in the northern region), is allowed under Wisconsin law to a maximum width of 30 feet (recreational zone) per riparian property. The intent is to provide pier, boatlift or swimming raft access in the recreation zone. A permit is not required for hand pulling or raking if the maximum width cleared does not exceed this 30-foot recreation zone (manual removal of any native aquatic vegetation beyond the 30-foot area would require a permit from the WDNR that satisfies the requirements of Chapter NR 109, Wisconsin Administrative Code, see Appendix D). However, manual removal is not recommended because it could open a niche for non-native invasive aquatic plants to occupy. Removal of native plants also destroys habitat for fish and wildlife.

Manual removal of aquatic plants can be quite labor intensive and time consuming. This technique is well suited for small areas in shallow water. Hiring laborers to remove aquatic vegetation is an option, but also increases cost. SCUBA divers can be contracted to remove unwanted vegetation in deeper areas. Benefits of manual removal by property owners include low cost compared to chemical control methods, quick containment of pioneering (new) populations of invasive aquatic plants and the ability for a property owner to slowly and consistently work on active management. The drawback of this alternative is that pulling aquatic plants includes the challenge of working in the water, especially deep water, the threat of letting fragments escape and colonize a new area, and the fact that control of any significant sized population is quite labor intensive, and therefore very costly; $1,500 - $2,000 or more, per acre depending on plant densities.

NUISANCE AQUATIC PLANT GROWTH CONTROL – MECHANICAL OR CHEMICAL

Aquatic plants may be mechanically harvested up to five feet below the water surface and one half the depth of the water column without disturbing or contacting the lake bed. Harvesting can be a practical and efficient means of controlling plant growth, as it generally removes the plant biomass from the lake. It can also be effective in controlling AIS such as curly-leaf pondweed if the plants are cut prior to the start of turion production. Harvesting can be an effective measure to control large-scale nuisance growth of aquatic plants.

The advantages of harvesting are that the harvester typically leaves enough plant material in the lake to provide shelter for fish and to stabilize the lake bottom. Navigation lanes cut by harvesting also allow predator fish, such as bass or pike, better ambush opportunities. Many times, prey like minnows or panfish, are able to hide in thick vegetation lacking predation and potentially causing stunting to the population due to too many prey individuals and not being thinned out by predators. The disadvantages of the harvesting are that it does cause fragmentation and may facilitate the spread of some plants, including EWM, and may disturb sediment in shallow water

increasing water turbidity and suspended sediment issues. Another disadvantage is harvesters are limited in depths to which they can effectively operate; typically, it must be greater than 2' – 3' of water. Aquatic plant harvesting is subject to State permitting requirements which are renewable every 5 years.

In some areas of excessive plant growth, particularly in shallow water areas that can't be effectively managed using a harvester, contact herbicides can provide effective season long relief. Navigational channels 30' – 50' in width, as described in the section above, can be created using chemical herbicides. Since selectivity is not a concern for navigational treatment, contact herbicides such as diquat or more recently flumioxazin are used for submersed species. They are typically mixed with a copper-based algaecide for increased efficacy. For floating leaf species, an herbicide such as imazapyr is typically used with a surfactant or sticking agent. A combination of harvesting and treatment is sometimes a wise approach to compare length of control, costs and season long performance.

Mechanical harvesting requires significant infrastructure to complete, many times requiring the purchase of a harvester by the group and, unless already being completed, has significant startup costs.

Currently, harvesting has been done annually since 1983 and is an accepted and practicable control technique for White Lake. Though harvesting can impact native species and enhance the spread of EWM, neither of these instances have been noted on White Lake. EWM has been present in high frequency prior to harvesting began, but is often found at low densities. Additionally, White Lake contains a diverse, high quality native plant community that has remained stable to many outside stressors.

The current harvesting permit expires in 2021 and is based on results from the 2012 plan that may not accurately portray current conditions. As an accepted practice already in place, mechanical harvesting is recommended to continue. An updated and renewed mechanical harvesting permit should be sought and use the Mechanical Harvesting Map attached (Figure 13). Harvesting should only be completed in the outlined areas to alleviate nuisance conditions for pier, swimming or boat access.

6.0 INVASIVE PLANT MANAGEMENT ALTERNATIVES

6.1 AQUATIC INVASIVE SPECIES HERBICIDE TREATMENT

An aquatic herbicide treatment may be an appropriate way to treat larger areas of AIS and to conduct restoration of native plants. When using chemicals to control AIS, it is a good idea to reevaluate the lake's plant community and the extent of the AIS conditions before, during and after chemical treatment. The chosen herbicide may impact native plant communities including coontail, common waterweed, naiad species and others, especially during whole-lake applications and/or extended periods of herbicide exposure. The WDNR may require another aquatic plant survey and may require an AIS survey prior to approving a permit for treatment. Surveys should be included for all aquatic plant treatments and is typically a WDNR requirement.

The science regarding what chemicals are most effective, dosages, timing and how they should be applied is constantly evolving and being updated. Current WDNR and Army Corps of Engineer research has shown that herbicide applied to water diffuses off-site due to a variety of environmental and physical conditions including wind, waves, water depth, and treatment area relative to lake volume. Due to these actions, as treatment areas decrease, herbicide retention time needed for impact is lessened due to diffusion off-site because of the small amount of area treated and herbicide applied relative to the entire water volume. To combat this, it is recommended to apply at higher rates when compared to a whole-lake rate and typically with a granular herbicide with a combination of active ingredients in hopes to extend contact time.

Chemical treatment is usually a long-term commitment and requires a specific plan with a goal set for "tolerable" levels of the relevant AIS. One such landmark might be 25% or less of the littoral area being occupied by aquatic invasive plants. WDNR recommends conducting a whole-lake point-intercept survey on a five-year bases (for White Lake the next would be 2024). Such a survey may reveal new AIS and at the very least would provide good trend data to see how the aquatic plant community is evolving.

Herbicides provide the opportunity for broader control over a larger area than hand pulling, and unlike harvesters, allow for a true restoration effort. Disadvantages include negative public perception of chemicals in natural lakes, the potential to affect non-target plant species (if not applied at an appropriate application rate and/or time of year), and the fact that water use restrictions may be necessary after application.

6.1.1 Curly-leaf Pondweed

Curly-leaf pondweed is the second most prevalent aquatic invasive plant species targeted for chemical treatment in the State. At present, endothall, a contact herbicide is the most common active ingredient in herbicides used for CLP management in Wisconsin. Imazamox has been used periodically in the last several years. Imazamox has shown promise in that it is a systemic herbicide for CLP control and can potentially have a much lower impact to the native plant community than a contact herbicide and appears to show increased year after treatment control than endothall. It is not entirely clear as to why this happens but it may be due to the systemic effect on turion production within the plants, resulting in fewer plants the following year.

Granular based formulations are generally more costly and used for smaller spot type treatments, while liquid formulations are less costly and generally used for larger contiguous treatment areas or whole-lake type treatments. In order to decrease any potential impact to native plants and be as selective as possible for CLP, treatments are completed in the spring when native plant

growth is minimal, typically prior to 60˚ water temperatures, but perhaps most importantly prior to the start of turion production. CLP seems to prefer and flourish in mucky or highly flocculent substrate, which is found in many areas of White Lake's sediments. Given the lack locating populations of CLP during the most recent survey and large locations of appropriate substrate its presence was expected to have been more prevalent. Monitoring may be the best option for management.

6.1.2 Eurasian Water-milfoil

EWM is the most commonly managed AIS within Wisconsin lakes and the most prevalent within White Lake. EWM is an extremely opportunistic plant and could easily expand within White Lake. Should such an event take place, it is prudent to include potential management actions for EWM within this plan, to provide a quick and concise reference for management.

At present, 2,4-D has been the most common active ingredient for selective systemic herbicides used for EWM management in Wisconsin, although triclopyr use is increasing and has been commonly used in Minnesota for well over a decade. Granular based formulations are typically more costly and used for smaller spot type treatments, while liquid formulations tend to be less costly and used for larger contiguous treatment areas or whole-lake type treatments. In order to maximize effectiveness and decrease any potential impact to native plants to the greatest extent possible, treatments should be completed in the spring when native plant growth is minimal.

Current WDNR and Army Corps of Engineer research has shown that herbicide applied to water diffuses off-site due to a variety of environmental and physical conditions including wind, waves, water depth, and treatment area relative to lake volume. Due to these actions, as treatment areas decrease, herbicide retention time needed for impact is lessened due to diffusion off-site because of the small amount of area treated and herbicide applied relative to the entire water volume. To combat this, it is recommended to apply at higher rates when compared to a whole-lake rate and typically with a granular herbicide, a combination of active ingredients, or change of active ingredient in hopes to extend contact time. Recently, the active ingredient florpyrauxifen-benzyl has been approved for EWM and control. This active ingredient requires very limited contact time and has shown to offer excellent control with reduced non-target impacts in comparison to previously used modes of action.

If EWM abundance increased and requires active management within White Lake and smaller treatment areas (< 2.0 ac) are mapped, it is recommended to use florpyrauxifen-benzyl, a fast-acting systemic herbicide, at appropriate rates of around 5-20 parts per billion (ppb). This approach has shown to be an effective management tool in various lakes throughout Wisconsin and is continuing to be researched for efficacy and long-term control.

It is worth noting there are various hybrid strains of EWM being genetically confirmed throughout the State and many of these are showing resistance to typical systemic herbicides. Research projects are currently underway, with the WDNR and herbicide manufacturers' testing various combination herbicides (systemic, such as 2,4-D & contact, such as endothall) at 1:2 or 1:3 ratio as well other modes of action like pigment bleaching herbicides (fluridone) in the field and lab that may be more effective on these strains of hybrid EWM, in particular on a whole-lake basis maintaining a 2-4 PPB residual for 90+ days.

Fluridone is also available in different pelletized slow release formations that are designed to release off the carrier over extended periods of time; from several weeks to several months. These may be useful in a flowing water situation as the pellets can be placed upstream and the herbicide allowed to be carried downstream by the current as it is released off the pellet.

The size of the infestation tends to dictate the type of the treatment. Small treatment areas or beds less than 5 acres are many times consider spot treatments and usually targeted with granular type herbicides, or fast acting contact liquid herbicides. When there are multiple "spot" treatment areas within a lake, it most often makes more sense from economic and efficacy standpoints to target the "whole" lake for treatment. This typically entails calculating the entire volume of water within the lake, in acre/feet, and applying an herbicide at a low dose at a lake wide rate.

6.2 AQUATIC INVASIVE PLANT HARVESTING

MECHANICAL HARVESTING

Aquatic plants may be mechanically harvested up to five feet below the water surface or one half of the water column, whichever is less, and be a practical and efficient means of controlling plant growth as it generally removes the plant biomass from the lake. Early-season harvesting can help reduce nuisance growth from curly-leaf pondweed.

Harvesting can also be used as a means to facilitate native aquatic plant growth by "top cutting" AIS growth that has canopied out. This is done by removing a canopy of AIS that shades out native, lower growing species, such as pondweed species. Use of a top cut only in areas of dense AIS growth, can provide additional sunlight for growth, increasing diversity and available fisheries habitat quality.

MANUAL (HAND) REMOVAL

If a small isolated stand of AIS is present, hand pulling may be a viable option. No permit is required to remove non-native invasive aquatic vegetation as long as the removal is conducted completely by hand with no mechanical assistance. All aquatic plant material must be removed from the water to minimize dispersion and re-germination of unwanted aquatic plants. Portions of the roots may remain in the sediments, so removal may need to be repeated periodically throughout the growing season. This can be a very effective control mechanism for EWM if the entire plant mass and root structure is completely removed. The drawback of this alternative is that pulling aquatic plants includes the challenge of working in the water, especially deep water, threat of letting fragments escape and colonize a new area, and control of any significant sized population is quite labor intensive and very costly. Hand harvesting costs using professionally contracted SCUBA divers are around $2,000 - $3,000 or more, per acre depending on plant densities.

7.0 OVERALL LAKE MANGEMENT GOALS

White Lake is a natural drainage lake with good water quality, a very dense aquatic plant community, and moderate recreational use. Management actions recommended below are based on the findings of this APM plan and chosen to protect and enhance the conditions present:

- Users of the lake enjoy their time on the water with over 22.4 average years of experience, indicating a longevity that is important to generations of families and an increased importance on maintaining conditions for future generations (Section 2.0, pg. 2.2)

- Largely, the aquatic plant community of White Lake is of high quality with great diversity and includes 29 native species (Section 4.1, pg 4.7, & Figures 3-11)

- Though of high diversity, aquatic plants can and do grow to nuisance levels, requiring active management through mechanical harvesting since 1983 and periodic herbicide applications (Section 3.0, pg 3.3)

- Aquatic invasive species are a constant threat to the quality of the lake. Currently they are present in low frequency and do not require active management (Section 4.1, pg 4.8, & Figure 3)

- Public input was gathered to gauge the perception of the lake and formulate aquatic plant management options that are not only viable for White Lake, but also desired by its users and able to be successful (Section 2.0, Pg. 2.1, Appendix A)

- Current management actions have shown to have no lasting negative impact to the native aquatic plant over time (Section 4.3, pg 4.14) and are the most accepted and recommended by lake users to achieve results.

- Selected management actions below are the most accepted and recommended by lake users to achieve results (Appendix A)

- No matter what management options are chosen some users may continue to see an impact to their activities from dense aquatic plant growth. Much of the growth is from high value native species and broad, large-scale control is not a viable option for lake and fishery health. It must be realized that not all user requests are warranted or permittable. Wild rice is a high value native aquatic plant and direct control efforts will not be allowed by the DNR.

Even with AIS present in White Lake their impact to the system is minimal and are not currently at levels that require active, targeted management. Though the aquatic plant community in White Lake is healthy, it consistently grows dense and impacts recreational use on the water. Dense aquatic plant growth only worsens navigational issues throughout the lake and negatively impacted users, with many residents and users wanting management actions to reduce aquatic plant issues.

Only those options that will be supported by the users and WLPA with high likelihood of subsequent approval from the WDNR will be selected to help accomplish management goals. Though wild rice is a hot topic for users and can grow dense in White Lake, large-scale control of this species will not be approved or allowed by the WDNR, nor should it happen due to its importance in White Lake's ecosystem. However, not all desired management options are viable or feasible for each situation. All options are disused further in Appendix C. Based on the above, the following recommended action plan includes a combination of management actions to achieve desired results.

Goal: Renew the mechanical harvesting permit

Primary Action: The current permit expires in 2021 and was issued using the 2012 APM plan. Use the contents of this plan, including Figure 13, to update the harvesting permit based on current conditions.

Goal: Reduce Nuisance Aquatic Plant Growth Hampering Navigation

Primary Action: Mechanically harvest common navigational channels to a depth of 5' or ½ the water column - whichever is shallower, for riparian boat access, increase recreational potential for fishing, and maintain boating, swimming, and pier access. See Figure 13 for recommended harvest areas. The following guideline should be used for all mechanical plant harvesting activities:

- Harvest areas using the prioritized designation and widths as follows:
  - **Navigational Access Channels** (62.22 acres) – harvest up to a **100-ft** width for navigational access lanes across the lake that serve as important throughfares for all lake users, boat access from launches, or mechanical harvesting storage and access.
  - **Riparian Access Channels** (7.96 acres) – harvest up to a **30-ft** width for navigational access for riparian owners where necessary and feasible.
- Only cut in depths of two feet or more
- Only cut to a maximum depth of ½ the water column or 5', whichever is shallower
- Do not disturb the lake bed during harvesting activity
- Avoid cutting in environmentally sensitive areas
- All cut material should be inspected for fish and animals. Any organisms found should be immediately returned to the water
- All cut materials should be collected and deposited at the designated disposal site as indicated on the permit
- Free floating plants or algae uprooted by wave and boating action may be surface skimmed without use of the cutting head if outside of designated harvest areas
- Free floating bogs should not be harvested or removed from the lake. If bogs become present in primary navigational channel, they can be pushed to the side to reduce navigational impact.

Possible Secondary Action: Maintain navigational access through herbicide applications in areas to shallow or difficult to mechanically harvest – only if necessary and requested by the WLPA.

- Apply for a small-scale (<10 acre) WDNR permit for navigational relief
- Manage areas with a mixture of the active ingredients copper, diquat, and/or flumioxazin at prescribed rates, depending on water depth.
- Limit application width to 30' and only for riparian access

Goal: Manage AIS to improve recreation, increase use opportunities, and maintain native plants by reducing AIS abundance and frequency within the littoral zone. If active AIS management is pursued, the goal should be to maintain the presence of the target species over a 3–5-year period. The following levels of AIS should be used to trigger active management of the target species, primarily EWM:

- Frequency of occurrence over 10% and an average rake density over 1.5.

or

- Frequency of occurrence over 20% with any average rake density.

Primary Action: Continue monitoring for and mapping of AIS.

Possible AIS Control Action: If populations of AIS exceed the above listed triggers pursue active management.

***Possible AIS control Action*:** Herbicide application dosed at to individual treatment area rates.

- Application may be completed using a variety of active ingredients and rates. Due to limited contact time within the small treatment areas expected, fast-acting products should be used. Some recommended active ingredients and application rates are as follows:
  - Active ingredient florpyrauxifen-benzyl at 5-20 PPB
  - Active ingredient diquat at up to 0.36 PPM
  - Active ingredients diquat & endothall at up to 0.36 & 1.8 PPM, respectively.

Goal: Obtain financial assistance for AIS management activities if necessary.

Primary Action: Apply for an AIS Established Population Control Grant through the WDNR's Surface Water Grant program for small-scale AIS control projects. The deadline for application is November 1 and can fund up to 75% of eligible project costs.

Goal: Enhance monitoring within White Lake through the WDNR Citizen Lake Monitoring Network and support CB/CW efforts.

Primary Action: Begin monitoring for water quality through secchi readings, chlorophyll-a, and total phosphorus. Samples should be taken once monthly between May – September or at least 3 times a year spaced 30 days apart, or at a bare minimum once a year mid-summer.

Primary Action: Increase participation in the Clean Boats / Clean waters program and commit to a minimum of 50 hours of monitoring per year.

There are multiple resources and organizations able to help achieve plan goals and related actions. Contacts for those referenced in the plan and additional groups are included as follows.

Golden Sands Resource Conservation and Development Council, Inc.
1100 Main Street Suite 150
Stevens Point, WI 55481
(715) 343-6215
info@goldensandsrcd.org

Wisconsin Department of Natural Resources
Ted Johnson – Water Resources Management Specialist - Senior
(920) 424-2104
TedM.Johnson@wisconsin.gov

Waupaca County Land and Water Conservation Department
Brian Haase – County Conservationist
(608) 296-2815 ext 4
brian.haase@co.waupaca.wi.us

University of Wisconsin – Extension Lakes
(715) 346-2116
uwexlakes@uwsp.edu

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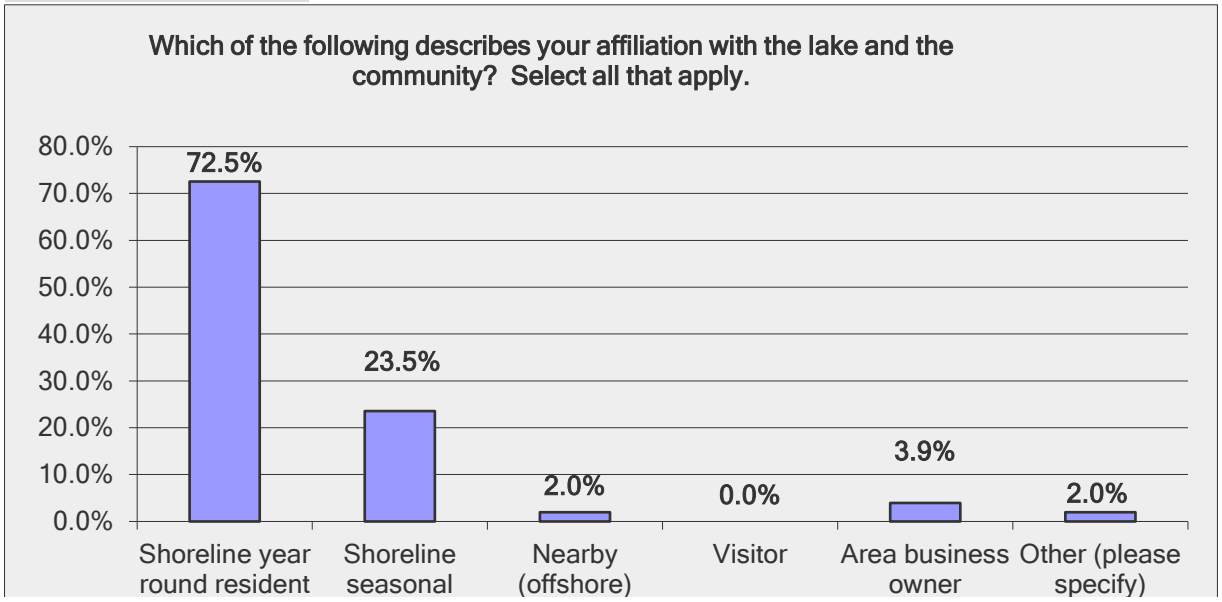
APPENDIX A – PUBLIC SURVEY RESULTS

Which of the following describes your affiliation with the lake and the community? Select all that apply.

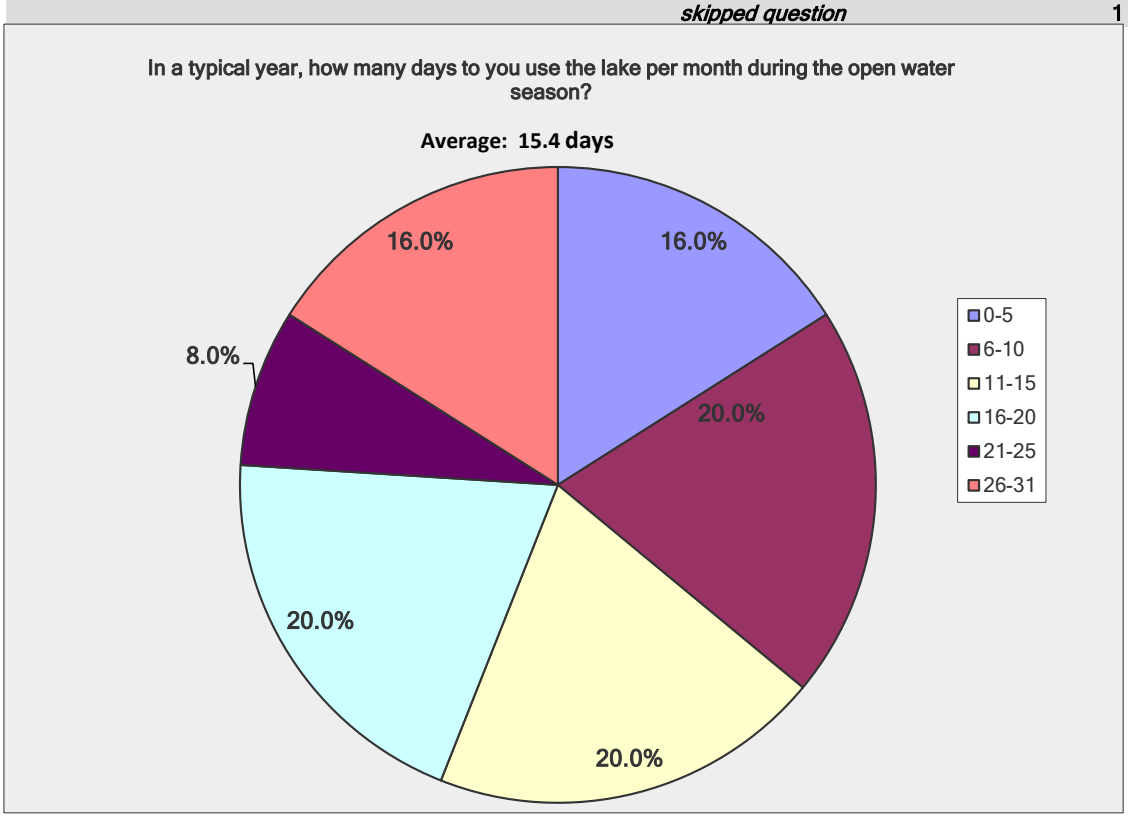
Answer Options	Response Percent	Response Count
Shoreline year round resident	72.5%	37
Shoreline seasonal resident	23.5%	12
Nearby (offshore) resident	2.0%	1
Visitor	0.0%	0
Area business owner	3.9%	2
Other (please specify)	2.0%	1
	answered question	51
	skipped question	0

Other (please specify)

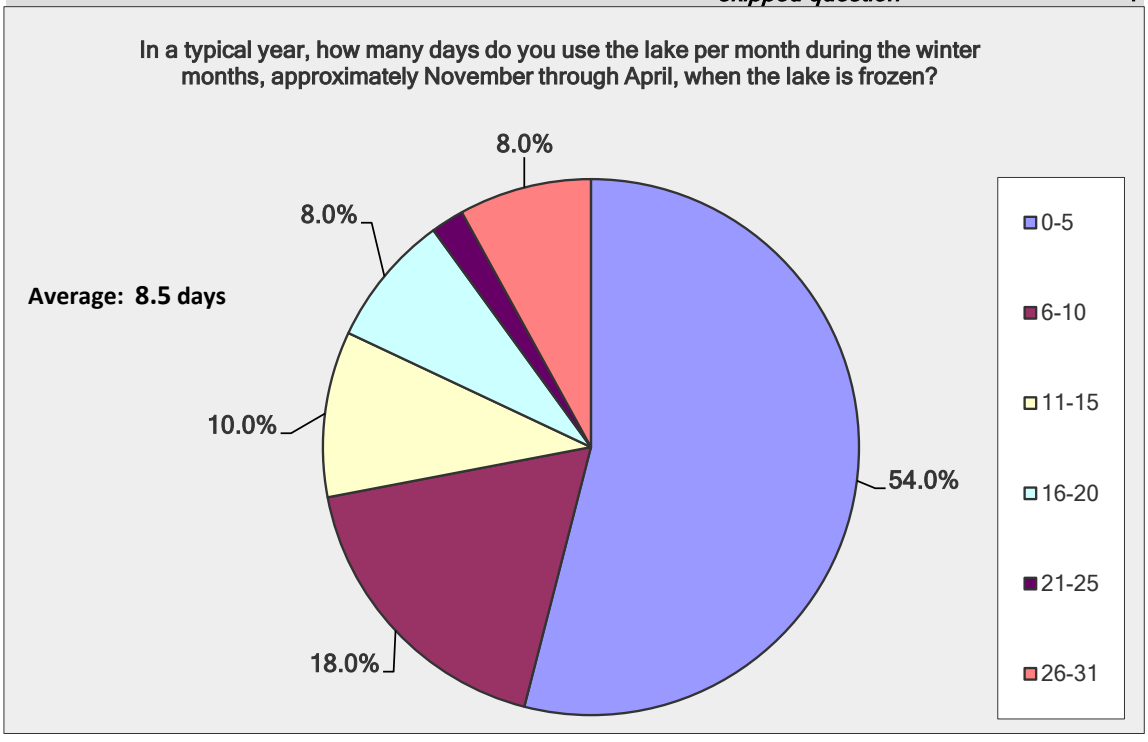
1	Nearby landowner - hunting purposes



In a typical year, how many days do you use the lake per month during the open water months, approximately May through October		
Answer Options	**Response Percent**	**Response Count**
0	4.0%	2
1	4.0%	2
2	2.0%	1
3	2.0%	1
4	2.0%	1
5	2.0%	1
6	0.0%	0
7	2.0%	1
8	2.0%	1
9	0.0%	0
10	16.0%	8
11	0.0%	0
12	8.0%	4
13	4.0%	2
14	0.0%	0
15	8.0%	4
16	2.0%	1
17	4.0%	2
18	2.0%	1
19	0.0%	0
20	12.0%	6
21	0.0%	0
22	0.0%	0
23	0.0%	0
24	2.0%	1
25	6.0%	3
26	2.0%	1
27	0.0%	0
28	0.0%	0
29	0.0%	0
30	14.0%	7
31	0.0%	0
	answered question	50
	skipped question	1

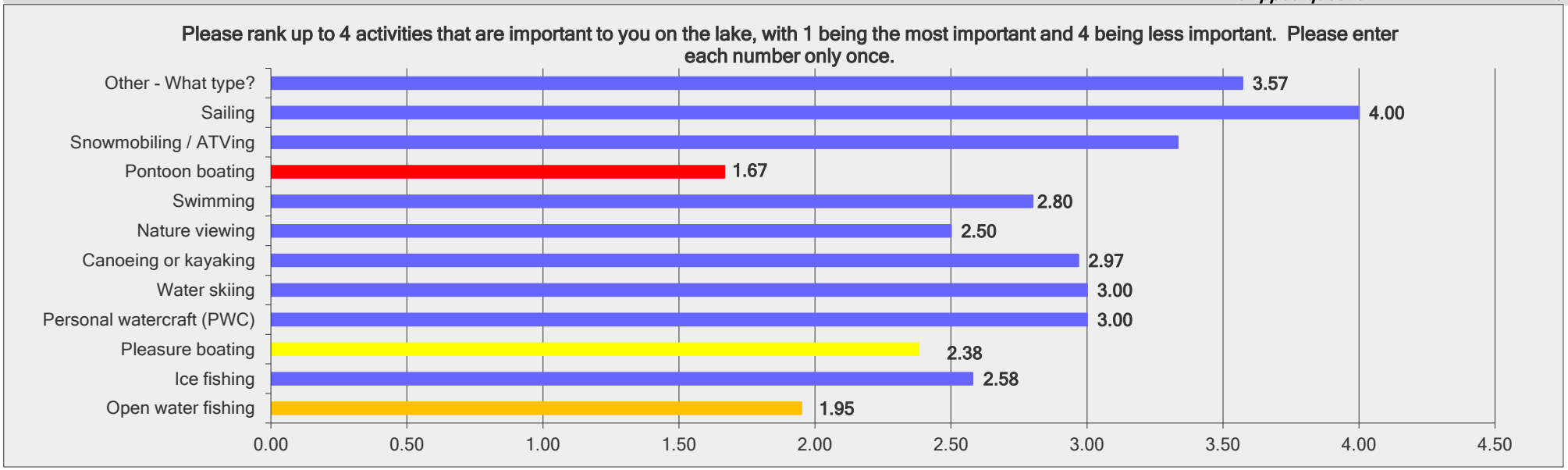


In a typical year, how many days do you use the lake per month during the winter months when the lake is frozen, approximately November through April?		
Answer Options	Response Percent	Response Count
0	14.0%	7
1	10.0%	5
2	8.0%	4
3	2.0%	1
4	2.0%	1
5	18.0%	9
6	0.0%	0
7	4.0%	2
8	2.0%	1
9	0.0%	0
10	12.0%	6
11	0.0%	0
12	4.0%	2
13	0.0%	0
14	2.0%	1
15	4.0%	2
16	2.0%	1
17	2.0%	1
18	0.0%	0
19	0.0%	0
20	4.0%	2
21	0.0%	0
22	0.0%	0
23	2.0%	1
24	0.0%	0
25	0.0%	0
26	2.0%	1
27	0.0%	0
28	0.0%	0
29	0.0%	0
30	6.0%	3
31	0.0%	0
	answered question	50
	skipped question	1

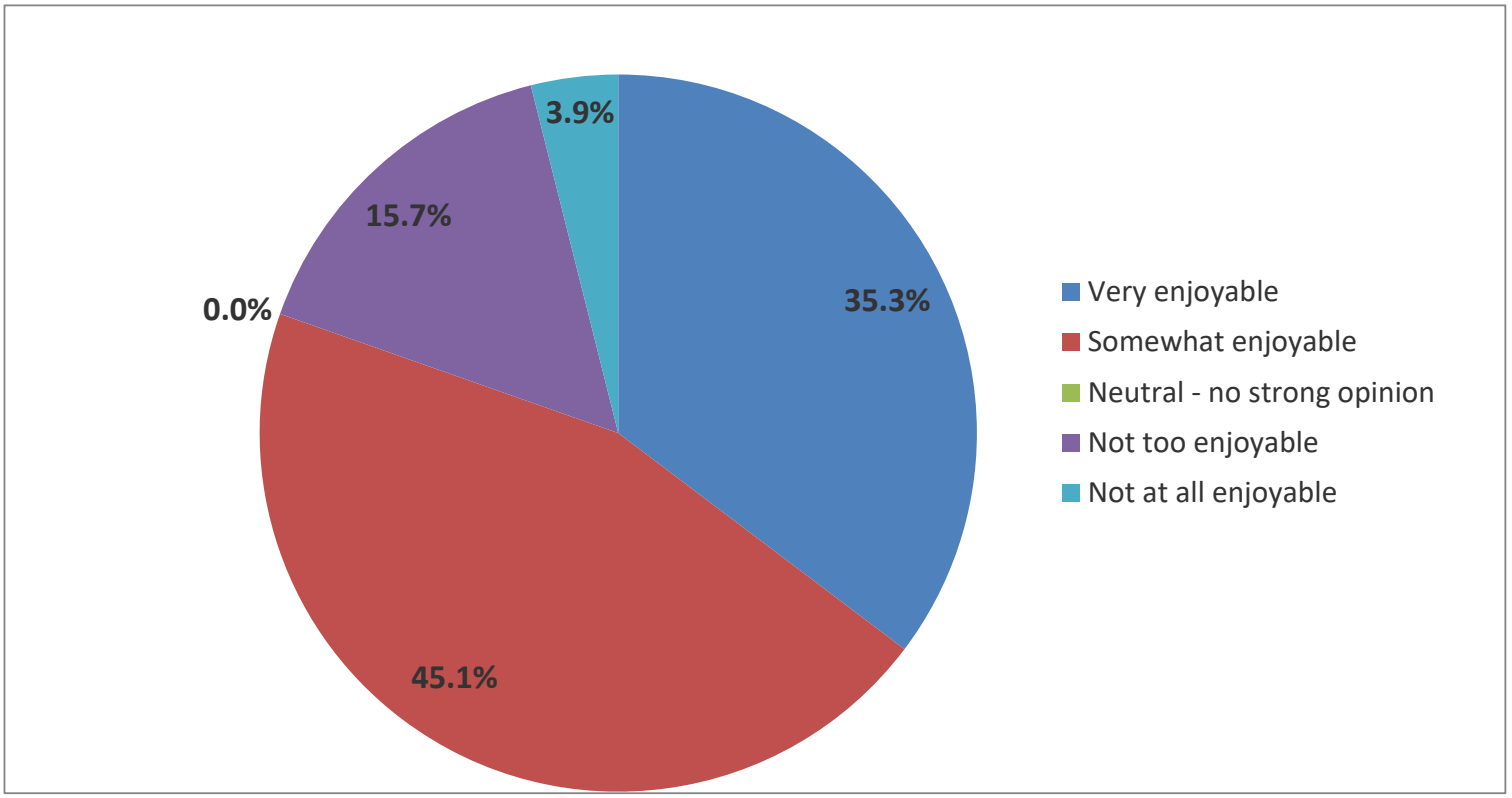


Please rank up to 4 activities that are important to you on the lake, with 1 being most important and 4 being less important. Please enter each number only once.

Answer Options	1	2	3	4	Rating Average	Response Count
Open water fishing	17	11	9	3	1.95	40
Ice fishing	2	7	7	3	2.58	19
Pleasure boating	4	8	6	3	2.38	21
Personal watercraft (PWC)	0	1	1	1	3.00	3
Water skiing	1	0	0	2	3.00	3
Canoeing or kayaking	4	6	8	13	2.97	31
Nature viewing	4	5	5	4	2.50	18
Swimming	4	4	10	7	2.80	25
Pontoon boating	15	5	1	3	1.67	24
Snowmobiling / ATVing	0	2	2	5	3.33	9
Sailing	0	0	0	1	4.00	1
Other - What type?	0	1	1	5	3.57	7
Other (please specify)		Hunting / Duck Hunting				
					answered question	51
					skipped question	0



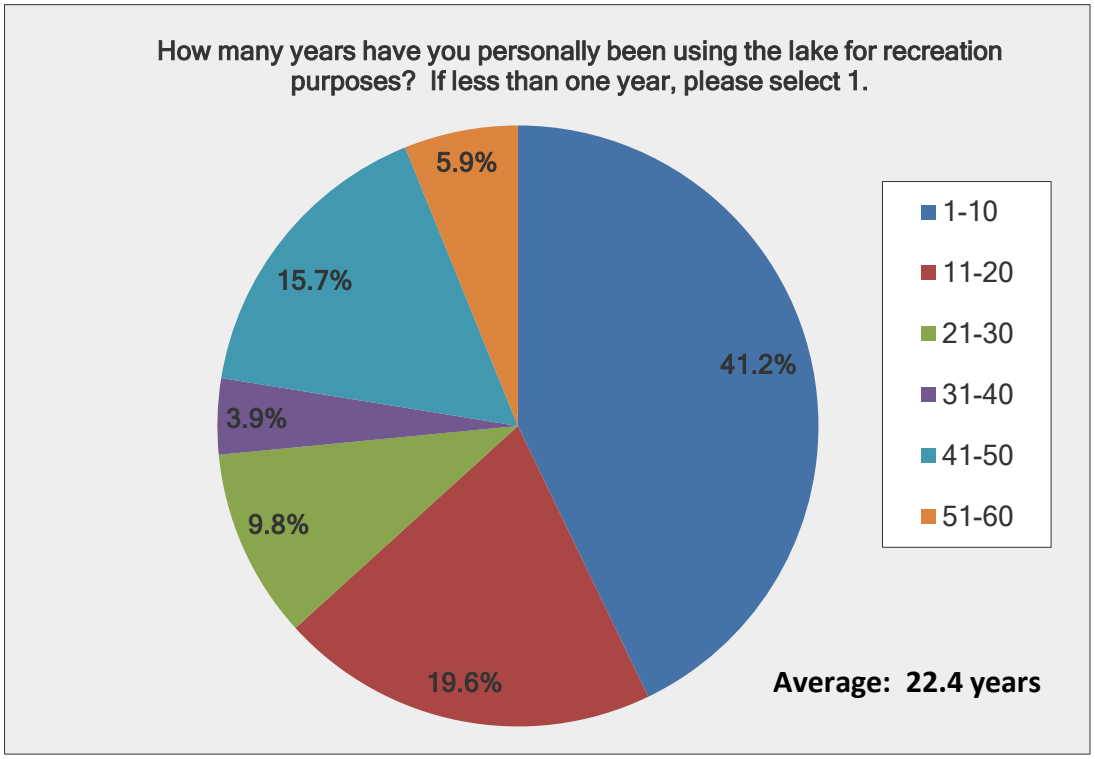
Overall, how would you rate the enjoyment of your experiences on White Lake?							
Answer Options	Very enjoyable	Somewhat enjoyable	Neutral - no strong opinion	Not too enjoyable	Not at all enjoyable	Rating Average	Response Count
	18 35.3%	23 45.1%	0 0.0%	8 15.7%	2 3.9%	2.08	51
						answered question	51
						skipped question	0



How many years have you personally been using the lake for recreation purposes? If less than one year, please select 1.		
Answer Options	Response Percent	Response Count
1	0.0%	0
2	11.8%	6
3	5.9%	3
4	3.9%	2
5	7.8%	4
6	3.9%	2
7	0.0%	0
8	0.0%	0
9	2.0%	1
10	5.9%	3
11	7.8%	4
12	2.0%	1
13	0.0%	0
14	0.0%	0
15	2.0%	1
16	2.0%	1
17	2.0%	1
18	2.0%	1
19	0.0%	0
20	2.0%	1
21	0.0%	0
22	0.0%	0
23	0.0%	0
24	0.0%	0
25	0.0%	0
26	0.0%	0
27	2.0%	1
28	2.0%	1
29	0.0%	0
30	5.9%	3
31	0.0%	0
32	0.0%	0
33	0.0%	0
34	0.0%	0
35	3.9%	2
36	0.0%	0
37	0.0%	0
38	0.0%	0
39	0.0%	0
40	0.0%	0
41	0.0%	0
42	0.0%	0
43	0.0%	0
44	0.0%	0
45	0.0%	0
46	0.0%	0
47	3.9%	2
48	0.0%	0
49	0.0%	0

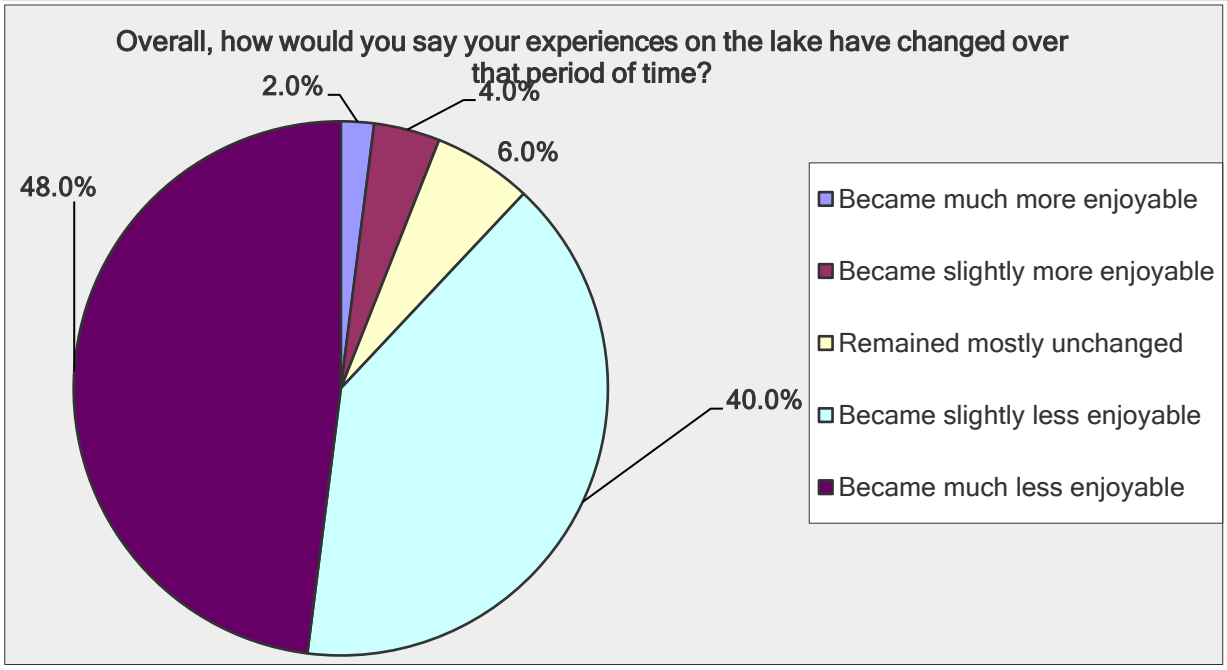
How many years have you personally been using the lake for recreation purposes? If less than one year, please select 1.		
50	11.8%	6
51	0.0%	0
52	2.0%	1
53	2.0%	1
54	0.0%	0
55	0.0%	0
56	0.0%	0
57	0.0%	0
58	0.0%	0
59	0.0%	0
60	2.0%	1
61	2.0%	1
62	0.0%	0
63	0.0%	0
64	0.0%	0
65	0.0%	0
66	0.0%	0
67	2.0%	1
68	0.0%	0
69	0.0%	0
70	0.0%	0
71	0.0%	0
72	0.0%	0
73	0.0%	0
74	0.0%	0
75	0.0%	0
76	0.0%	0
77	0.0%	0
78	0.0%	0
79	0.0%	0
80	0.0%	0
81	0.0%	0
82	0.0%	0
83	0.0%	0
84	0.0%	0
85	0.0%	0
86	0.0%	0
87	0.0%	0
88	0.0%	0
89	0.0%	0
90	0.0%	0
91	0.0%	0
92	0.0%	0
93	0.0%	0
94	0.0%	0
95	0.0%	0
96	0.0%	0
97	0.0%	0
98	0.0%	0
99	0.0%	0
100	0.0%	0
	answered question	**51**
	skipped question	**0**

How many years have you personally been using the lake for recreation purposes? If less than one year, please select 1.



Overall, how would you say your experiences on the lake have changed over that period of time?

Answer Options	Response Percent	Response Count
Became much more enjoyable	2.0%	1
Became slightly more enjoyable	4.0%	2
Remained mostly unchanged	6.0%	3
Became slightly less enjoyable	40.0%	20
Became much less enjoyable	48.0%	24
	answered question	50
	skipped question	1

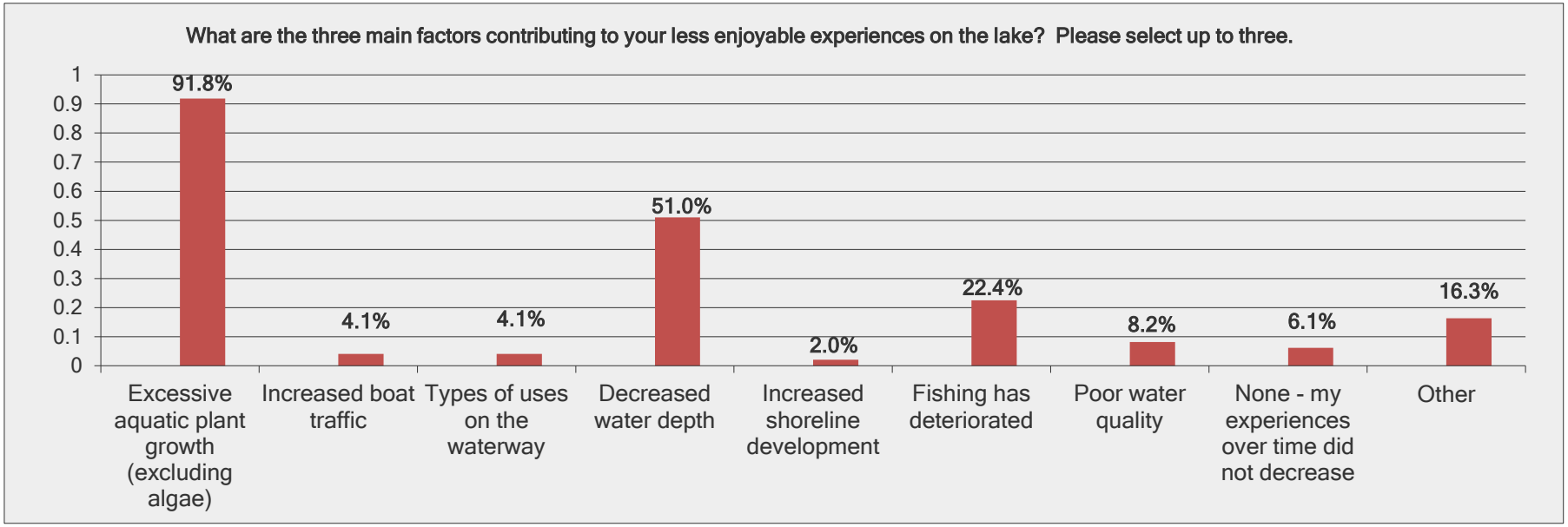


If your experience using the lake over time has become less enjoyable what do you consider the three main factors contributing to your less enjoyable experiences on the lake? Please select up to three.

Answer Options	Response Percent	Response Count
Excessive aquatic plant growth (excluding algae)	91.8%	45
Increased boat traffic	4.1%	2
Types of uses on the waterway	4.1%	2
Decreased water depth	51.0%	25
Increased shoreline development	2.0%	1
Fishing has deteriorated	22.4%	11
Poor water quality	8.2%	4
None - my experiences over time did not decrease	6.1%	3
Other	16.3%	8
	answered question	49
	skipped question	2

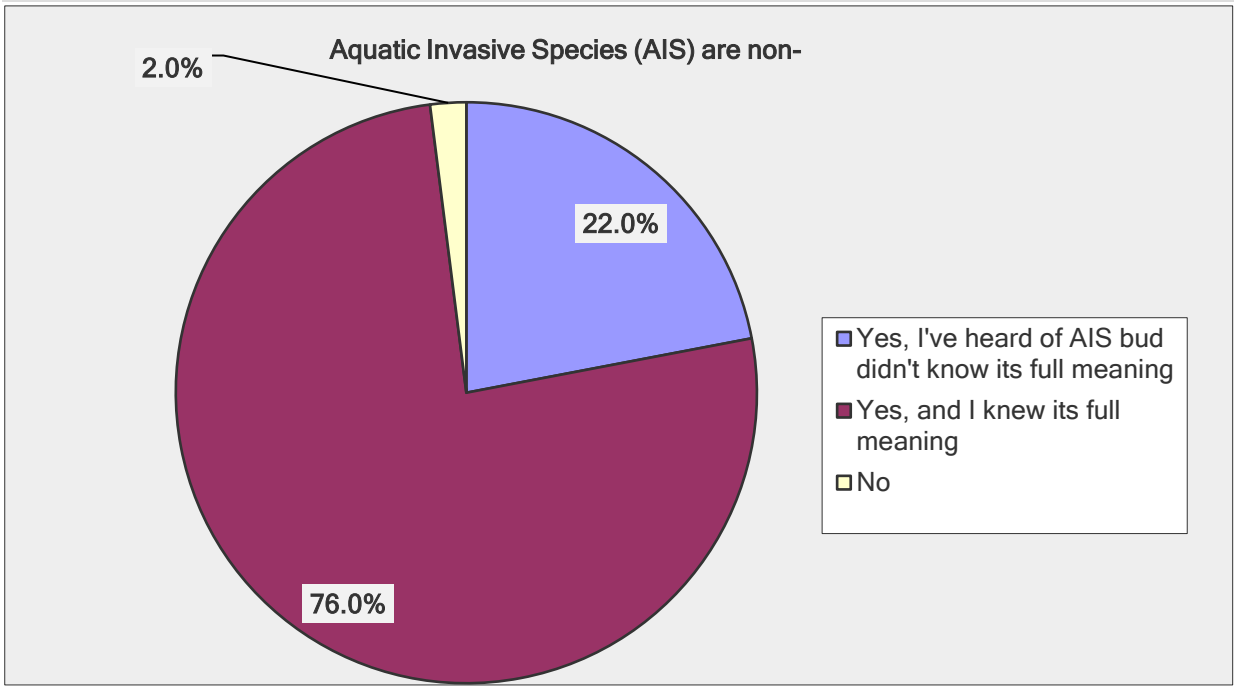
Other (please specify)

1. Ice push causes rip rap to heave which pushes ground upward unevenly
2. wild rice
3. Wild rice
4. Rice
5. THE LAKE NEEDS TO BE DRAINED, DREDGED, AND REFILLED
6. Limited boat use due to excessive aquatic plant growth
7. Decreased size of lake shoreline and large weed areas in lake
8. The lack of cooperation from the DNR

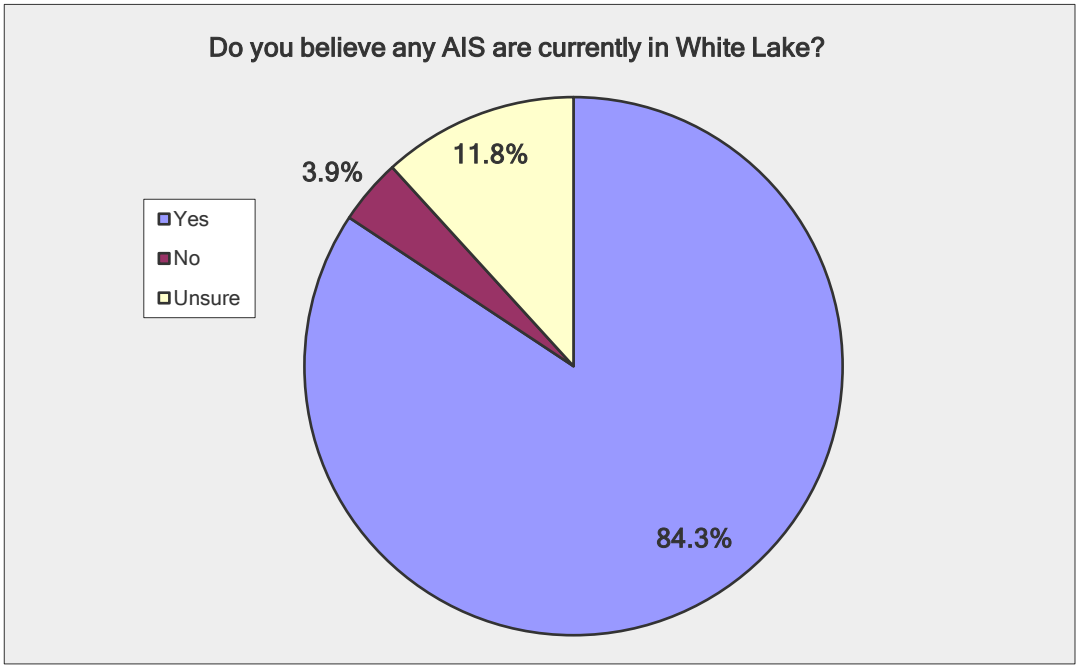


Aquatic Invasive Species (AIS) are non-native plants or animals that can out-compete their native counterparts and can potentially cause many problems within the lake and/or an ecosystem. Prior to this survey, have you heard the term Aquatic Invasive Species or AIS and did you know what it meant?

Answer Options	Response Percent	Response Count
Yes, I've heard of AIS bud didn't know its full meaning	22.0%	11
Yes, and I knew its full meaning	76.0%	38
No	2.0%	1
	answered question	50
	skipped question	1

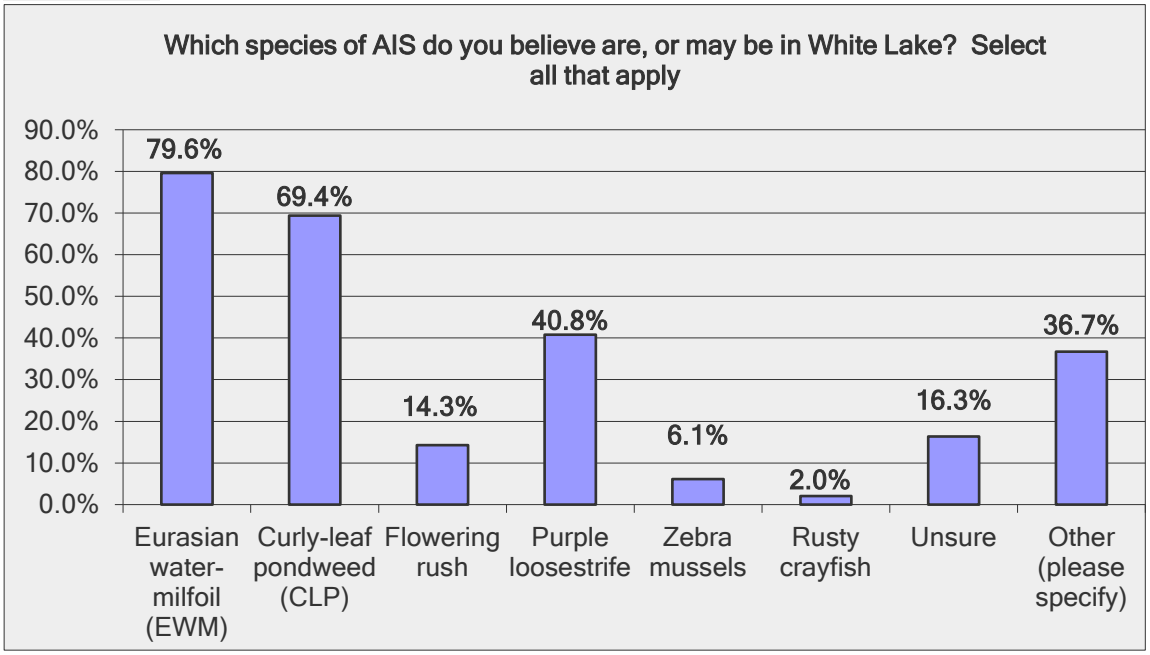


Do you believe any AIS are currently in White Lake?		
Answer Options	**Response Percent**	**Response Count**
Yes	84.3%	43
No	3.9%	2
Unsure	11.8%	6
	answered question	**51**
	skipped question	**0**



Which species of AIS do you believe are, or may be in White Lake? Select all that apply		
Answer Options	**Response Percent**	**Response Count**
Eurasian water-milfoil (EWM)	79.6%	39
Curly-leaf pondweed (CLP)	69.4%	34
Flowering rush	14.3%	7
Purple loosestrife	40.8%	20
Zebra mussels	6.1%	3
Rusty crayfish	2.0%	1
Unsure	16.3%	8
Other (please specify)	36.7%	18
	answered question	49
	skipped question	2

Other (please specify)	
1	Wild Rice (9 responses)
2	Invasive Cattails
3	The wild rice population has grown noticeably in just a year, it's now everywhere
4	Snails
5	Rice keeps expanding
6	Wild rice overgrowth
7	RICE - not native to this lake. Planted by a lake owner
8	Carp
9	Banded myster snail, non-native wild rice
10	the wild rice is not native to the lake, I remember coming to the lake with my grandfather and father on the lake as a kid and there was no rice on the lake at that time. It was not until a few fellas thought that it would be a good a idea to start it on the west and east ends of the lake

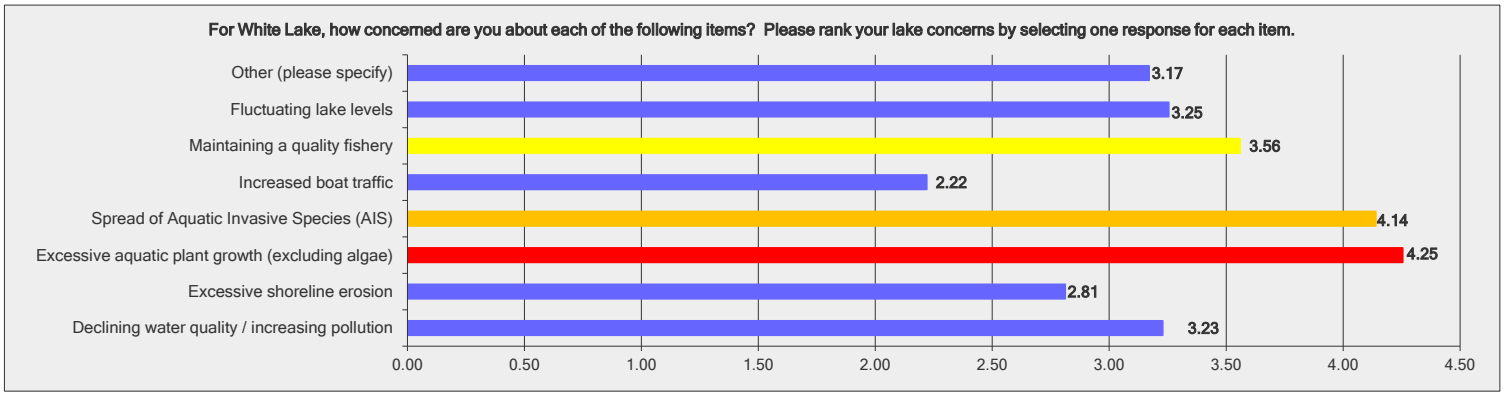


For White Lake, how concerned are you about each of the following items? Please rank your lake concerns by circling one response for each item.

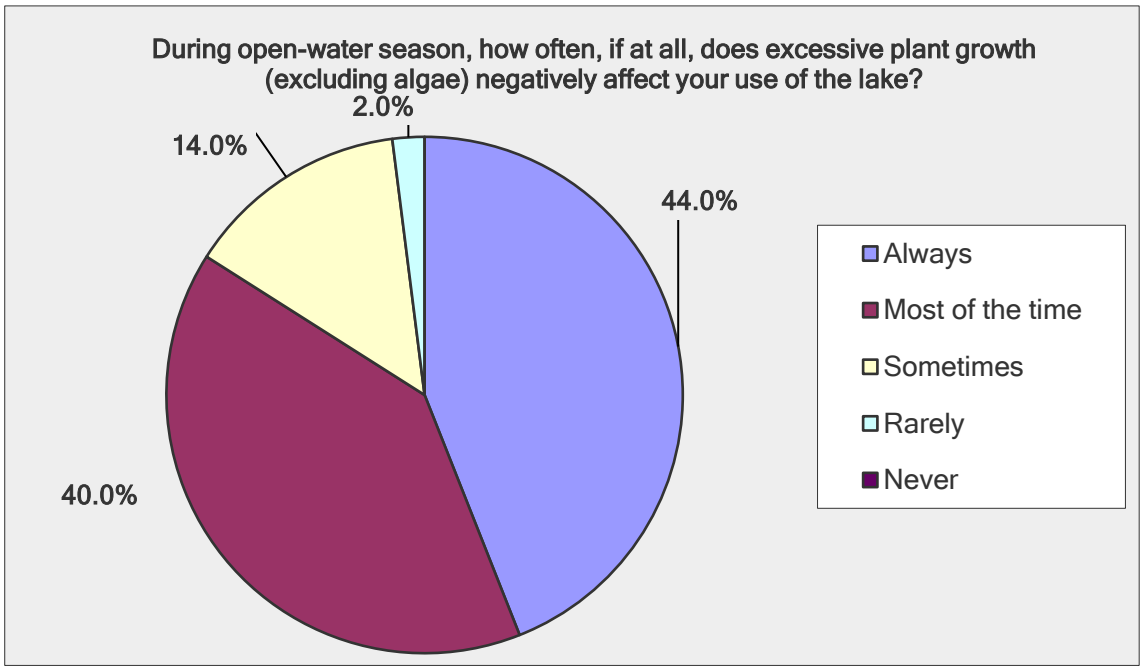
Answer Options	Very Unconcerned	Somewhat Unconcerned	Neutral	Somewhat Concerned	Very Concerned	Unsure - need more information	Rating Average	Response Count
Declining water quality / increasing pollution	4	9	15	12	8	2	3.23	50
Excessive shoreline erosion	10	8	15	11	4	2	2.81	50
Excessive aquatic plant growth (excluding algae)	7	1	1	5	37	0	4.25	51
Spread of Aquatic Invasive Species (AIS)	8	0	2	7	33	1	4.14	51
Increased boat traffic	17	12	15	5	1	0	2.22	50
Maintaining a quality fishery	4	8	9	14	15	0	3.56	50
Fluctuating lake levels	7	5	16	14	9	0	3.25	51
Other (please specify)	11	3	10	2	15	7	3.17	48
							answered question	51
							skipped question	0

Other (please specify)

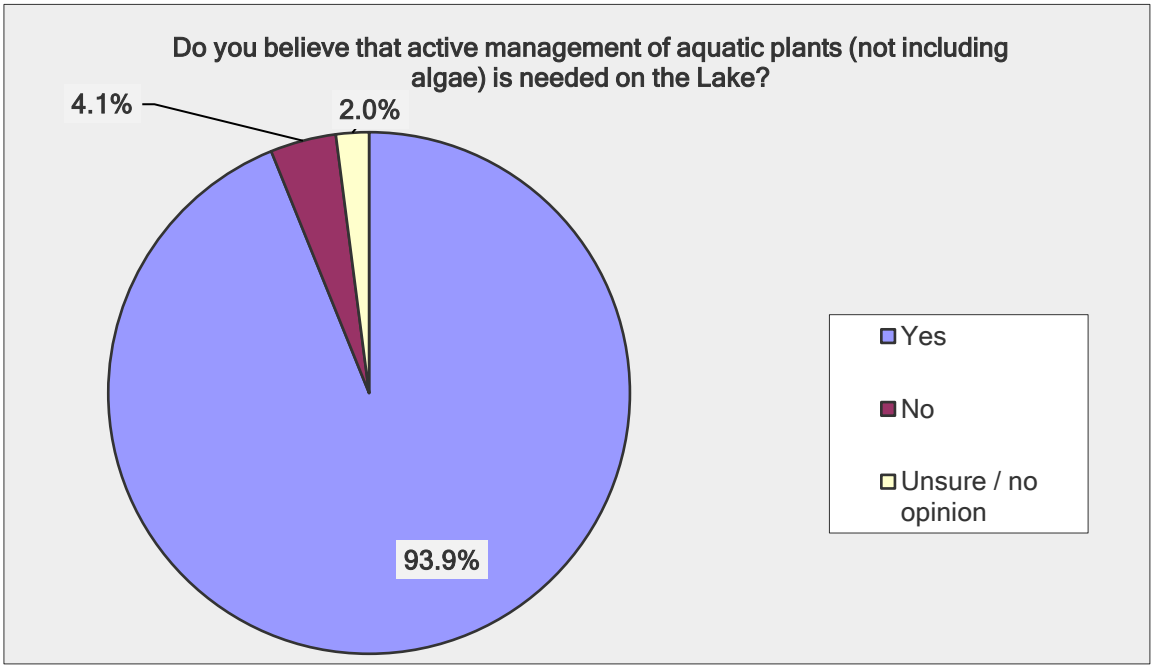
1	The amount of Muck that keeps getting deeper
2	spread of wild rice
3	I have no answer for other
4	Concerned about the amount of wild rice weeds that are taking over the lake
5	Let nature take it's course. Growing up on the lake I enjoy all it's phases, and If it morphs into a swamp, but that won't happen in my lifetime. There have always been weeds on this lake, and they contribute to the fish population, birds, plant study, and more.
6	wild rice
7	wild rice and other weeds are taking over the lake, and soon we will have no lake or a lake for future generations to enjoy.
8	The introduction of wild rice that is taking over large areas of the lake. Should never have been introduced.
9	We've only been there 2 yrs so not sure of the typical cycles. However, seems like we have far more shoreline weeds growing and consistent debris.
10	Swimming quality
11	WILD RICE THAT WAS NOT NATIVE IS SPREADING
12	"Wild Rice" which was planted by a previous homeowner has overtaken the lake and made it look like a marsh. It is hard to navigate a boat through the rice in fact impossible.
13	Loss of shore line on property due to weed growth
14	Rapid spreading of rice grass
15	Phosphate and nitrates entering the lake system.
16	?
17	increase of wild rice
18	Wild rice and cattail growth
19	Have more concern for property owners and tax payers than rice. Humans are important also.
20	Concern over the rice covering the lake
21	Carp and wild rice
22	I'm concerned about lily pads and wild rice. It's taking over our lake.
23	Excessive plant growth
24	cattails
25	Invasive species, excessive plant growth, invasive wild rice
26	excessive plant growth
27	Wild rice
28	Carp



During open-water season, how often, if at all, does excessive plant growth (excluding algae) negatively affect your use of the lake?		
Answer Options	**Response Percent**	**Response Count**
Always	44.0%	22
Most of the time	40.0%	20
Sometimes	14.0%	7
Rarely	2.0%	1
Never	0.0%	0
	answered question	50
	skipped question	1

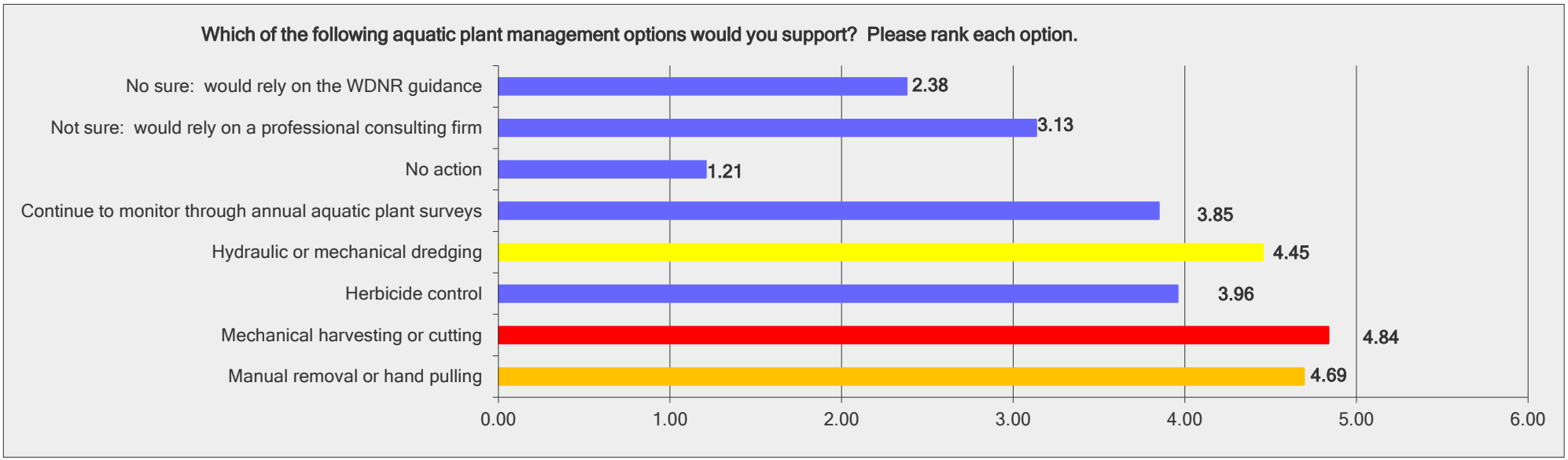


Do you believe that active management of aquatic plants (not including algae) is needed on the Lake? Active management may include any of the following: manual removal, mechanical harvesting, chemical control		
Answer Options	**Response Percent**	**Response Count**
Yes	93.9%	46
No	4.1%	2
Unsure / no opinion	2.0%	1
	answered question	**49**
	skipped question	**2**



For each of following aquatic plant and/or algae management options please tell us the extent you would support or oppose each potential option for White Lake? Please rank each option.

Answer Options	Strongly Oppose	Oppose	Neutral	Support	Strongly Support	Unsure - need more information	Rating Average	Response Count
Manual removal or hand pulling	0	0	3	9	37	0	4.69	49
Mechanical harvesting or cutting	0	0	2	4	43	0	4.84	49
Herbicide control	4	3	8	9	24	1	3.96	49
Hydraulic or mechanical dredging	0	3	5	5	31	6	4.45	50
Continue to monitor through annual aquatic plant	0	6	12	11	17	3	3.85	49
No action	39	8	1	0	0	1	1.21	49
Not sure: would rely on a professional consulting firm	6	6	16	10	7	4	3.13	49
No sure: would rely on the WDNR guidance	15	7	17	3	3	4	2.38	49
							answered question	50
							skipped question	1

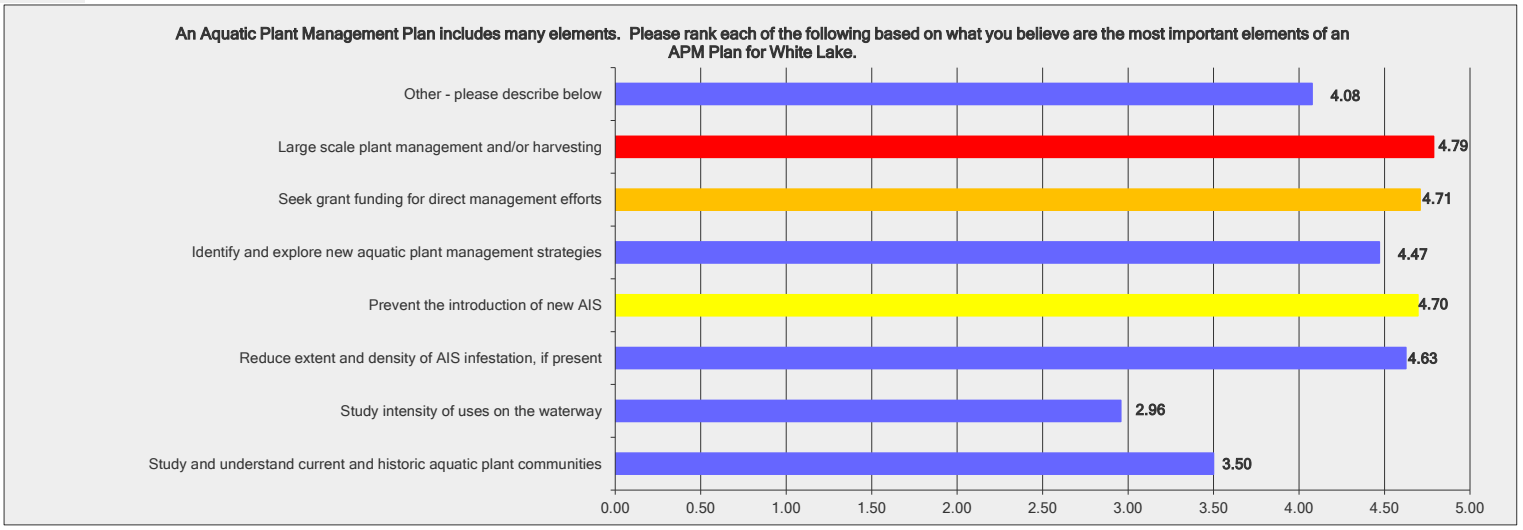


An Aquatic Plant Management Plan includes many elements. For each of the following, please tell us how necessary or unnecessary you believe each element is for White Lake.

Answer Options	Definitely not necessary	Somewhat Unnecessary	Neutral	Somewhat Needed	Definitely needed	Unsure - need more information	Rating Average	Response Count
Study and understand current and historic aquatic plant communities	6	9	4	10	17	3	3.50	49
Study intensity of uses on the waterway	10	8	10	12	7	2	2.96	49
Reduce extent and density of AIS infestation, if present	1	1	1	9	36	1	4.63	49
Prevent the introduction of new AIS	1	0	1	8	36	2	4.70	48
Identify and explore new aquatic plant management strategies	1	0	5	12	31	0	4.47	49
Seek grant funding for direct management efforts	1	0	3	4	40	1	4.71	49
Large scale plant management and/or harvesting	1	1	0	3	42	2	4.79	49
Other - please describe below	1	0	4	0	8	4	4.08	17
Other (please specify)								
							answered question	49
							skipped question	2

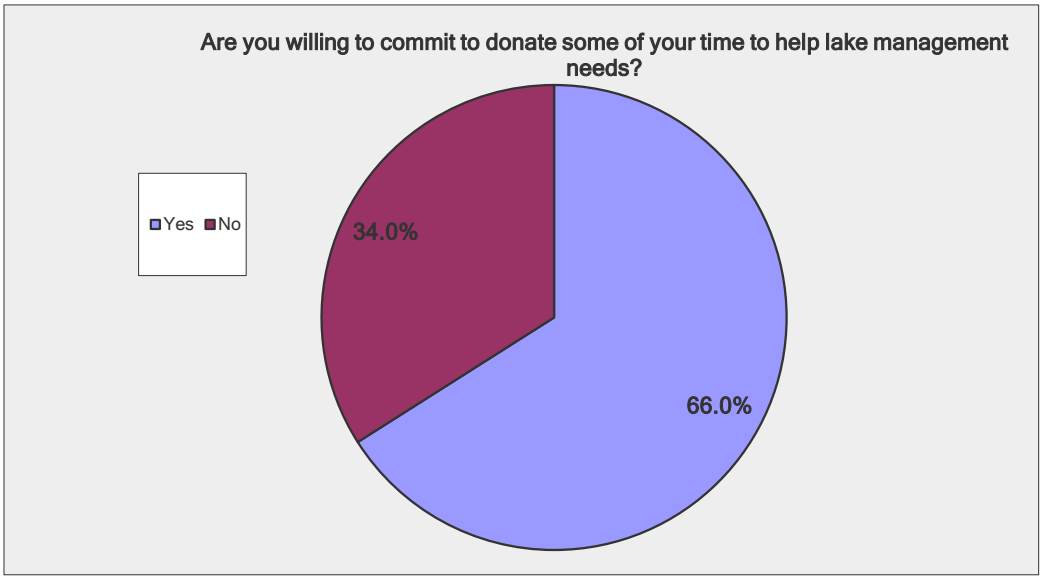
Other (please specify)

1	Dredging to make the water depth deeper around that lake.
2	spread of wild rice
3	I have no answer for other
4	I don't want to totally eradicate all the weeds in the lake. Just want to help contain them like it is now. I like the wilderness feel of the lake. The lake has good fishing because of the weeds that help hold the bait fish. I also like the weeds to a point that it keeps the Water-skiers/ jet skis off the lake. Keeping them off, keeps the "Party crowd" away
5	In the past, WLPA has spent a lot of money of Lake Management Plans and has basically received no benefit from having it completed except to check the requirement box for the DNR.
6	WILD RICE THAT WAS NOT NATIVE IS SPREADING NEEDS ATTENTION
7	Rice and navigation lanes. Fisherman fish in the boating lanes as the rest of the lake looks like the Horicon Marsh and cannot be navigated. Fishing is terrible. DNR does nothing for the lake. Would rather see a marsh and charge the homeowners for Lake Management Programs, harvesting permits, and have the clubs stock the fish. All they do is make our lake miserable. My house may be for sale soon. After 50 years of being on this lake, I am ready for a parcel off the lake and as far away for the DNR that I can get.
8	Remove wild rice
9	Maintain existing dam, manage aquatic vegetation-invasive wild rice for maximum fish- wildlife benefit
10	Manage the wild rice for hunting and fishing, it is out of control, need to do a better job of managing and Maintaining of the dam water level
11	Rid the wild rice



Are you willing to commit to donate some of your time to help lake management needs? Such as "Clean Boats / Clean Water" inspecitons, lake water sampling, etc.? Please not this not regarded as a formal commitment but will be used to gauge potential participation of area stakeholders.

Answer Options	Response Percent	Response Count
Yes	66.0%	33
No	34.0%	17
If Yes, how many hours per summer are you willing to commit?	20.4 hrs	average
answered question		50
skipped question		1



If you have any additional general comments about the White Lake Preservation Association, lake planning process, or something that you felt wasn't addressed in this survey please enter them here.

Answer Options	Response Count
answered question	23
skipped question	28

Number	
1	My Wife use to live in the lake as a child and it was a beautiful lake when she was a child. With the poor management of the WDNR, the lake has basically become awful and basically unusable. Fishing is very poor, the water depth has been greatly decreased over the years and even the 2 years I have watched it is getting rapidly worse and something major needs to be done soon or White Lake will become a Swap in the next few years. I have seen the aerial photos and it is shocking how bad the lake has become, every time I see or find a new photo that compares the past to the current state. Hopefully you can do something to reverse the current path the lake is on as it seems like it might be too late to save the lake.
2	I am directly concerned about spread of wild rice
3	live on west shore - limited access and use
4	The strip of thick aquatic plants between the channel and the shoreline on the south side continues to expand and threatens to fill in. Something needs to be done to address this as there is a LOT of milfoil as well as other invasive species. If the DNR does not allow mechanical removal of this strip (?), other solutions need to be used.
5	Aid money, White Lake is a public lake and public money should be used Charge a management fee at the boat launch in addition to the launch fee. There are several Airbnb cottages on White Lake. They are profiting from our Lake. Charge them an addition fee like hotels have addition fees/taxes guests pay. This is also a public lake owned by the State, where is the State aid? All roads/highways are supported by taxes and registration fees This weed management should not just be paid by shoreline residents only. No public money from other boaters, close the public launches.
6	Concerned about lake access being available for all property owners who are paying "Lake front" taxes
7	Lake management plan has been a waist of money!
8	If we can get approval for dredging, chemical treatment or other large scale weed removal, I would be willing to accept a one time lake owner assessment up to $1,500 to support efforts.
9	Our hope is the wild rice and evasive plant growth can be addressed. There won't be a usable lake left eventually. Living on this lake is less and less enjoyable.
10	The lake owners are trying so hard and giving all they can, but the DNR now wants to raise fees for harvesting and again, a few homeowners cannot support this. We get no support to make this lake enjoyable. We have sold a jet ski and fishing boat already. Down to a pontoon as this may be next if we can't control the rice.
11	I have noticed increased rice coverage on the lake since we have purchased our property. The bogs, along with the rice, are squeezing the open water of the lake. #1 concern, thank you.
12	Maintain property values
13	Water quality,fertilizer run on, farming practices,...non of these key components addressed in this survey. I believe a major contribution to weed growth has been increased nutrient source for aquatic plants. Water quality data base?
14	Drain and dredge the lake. It's the only REAL fix for the problem. Everything else is cosmetic. No long term affects from weed management. The lake was drained 75-100 years ago and that was what created a nice White Lake. Everything else is a waste of time.
15	Survey only focused AIS while the lake is being overtaken by rice, cattails and bullrush..DNR refuses to address this issue..
16	Wild rice, sediment fill-in, floating bog and cattail are out of control.
17	The lake has changed so much in 11 years. We used to have so much more open water. People used to water ski on the West end. Now it's completely filled in with weeds, etc.. It hurts everyone who wants to use this lake. Boating, fishing, swimming and kayaking can't be done. We also could harvest 200 feet in the boating lanes. I know it was our Lake Association;s fault but it's time to change it back to 200 feet.
18	Allow more flexibility in where we can harvest weeds. Current rules limit ability to get to small areas of concentrated weed infestation. This does not mean more harvesting just better focused will more flexible guidelines. 50 feet each side of the marker bouys does not help address issues.
19	White Lake in Waupaca County is one of the most diverse lakes and a great natural resource for many uses. Aquatic vegetation and prolific wild rice has changed the lake dramatically over the short period of 20+ years. Management is necessary to prevent the continual spread throughout the lake and preserve the lake for future generations.
20	White lake in Waupaca county is a great lake for all to enjoy, it is unfortunate that the wild rice, and aquatic vegetation is taking over the lake in a very short time (15-20 years). I believe that we need to step to the plate to preserve the lake for future generations, I also would like to see the wildlife preserve put back in place.
21	I am a divorced man with 2 adult childern. I am 61 years old and plan to work until 65. After that, I plan on using the lake more often and yes, weeds are a big problem
22	When we bought our property back in the early 80's we did not have what we have now. Weeds are a big problem.
23	I caught a limit of bluegills the other day. I decided to try for perch. In 5 minutes time I had 3 hook swallowing bluegills floppping around on top of the water half dead, I went home. I stop fishin on Sept. 1 when the duck hunters begin. Waukaunaka St landing needs fixed. I love the lake, but sometimes it's a little frustrating.

APPENDIX B – SUPPORTING AQUATIC PLANT DOCUMENTATION

Appendix B – Supporting Aquatic Plant Documentation

The point intercept method was used to evaluate the existing emergent, submergent, floating-leaf and free-floating aquatic plants. If a species was not collected at a specific point, the space on the datasheet was left blank. For the survey, the data for each sample point was entered into the WDNR "Worksheets" (i.e., a data-processing spreadsheet) to calculate the following statistics:

Taxonomic richness (the total number of taxa detected)

- **Maximum depth of plant growth**
- **Community frequency of occurrence** (number of intercept points where aquatic plants were detected divided by the number of intercept points shallower than the maximum depth of plant growth)
- **Mean intercept point taxonomic richness** (the average number of taxa per intercept point)
- **Mean intercept point native taxonomic richness** (the average number of native taxa per intercept point)
- **Taxonomic frequency of occurrence within vegetated areas** (the number of intercept points where a particular taxon (e.g., genus, species, etc.) was detected divided by the total number of intercept points where vegetation was present)
- **Taxonomic frequency of occurrence at sites within the photic zone** (the number of intercept points where a particular taxon (e.g., genus, species, etc.) was detected divided by the total number of intercept points which are equal to or shallower than the maximum depth of plant growth)
- **Relative taxonomic frequency of occurrence** (the number of intercept points where a particular taxon (e.g., genus, species, etc.) was detected divided by the sum of all species' occurrences)
- **Mean density** (the sum of the density values for a particular species divided by the number of sampling sites)
- **Simpson Diversity Index (SDI)** is an indicator of aquatic plant community diversity. SDI is calculated by taking one minus the sum of the relative frequencies squared for each species present. Based upon the index of community diversity, the closer the SDI is to one, the greater the diversity within the population.

Floristic Quality Index (FQI) (This method uses a predetermined Coefficient of Conservatism (C), that has been assigned to each native plant species in Wisconsin, based on that species' tolerance for disturbance. Non-native plants are not assigned conservatism coefficients. The aggregate conservatism of all the plants inhabiting a site determines its floristic quality. The mean C value for a given lake is the arithmetic mean of the coefficients of all native vascular plant species occurring on the entire site, without regard to dominance or frequency. The FQI value is the mean C times the square root of the total number of native species. This formula combines the conservatism of the species present with a measure of the species richness of the site.

APPENDIX C – ADDITIONAL MANAGEMENT OPTIONS

Management Options for Aquatic Plants

Option	Permit Needed	How it Works	Pros	Cons
No Management	No	No active plant management	Possible protects native species that can enhance water quality and provide habitat for aquatic fauna: • No financial cost • No system disturbance • No harmful effects of chemicals • Permit not required	May allow small populations of invasive plants to become larger and more difficult to control later • Requires intensive monitoring
Mechanical Control	Required under NR 109	Plants reduced by mechanical means	Flexible control	Must be repeated, often more than once per season, sometimes weekly
		Wide range of techniques from manual to mechanized	Can balance habitat and recreational needs	Can suspend sediments and increase highly turbidity and nutrient release
a. Handpulling/ Manual raking	Yes/No	Scuba divers or snorkelers remove plants are removed with a rake	Little to no damage done to lake or to native plant species	Very labor intensive and costly by hand or plants
		Works best in soft sediments	Can be highly selective Can be done by shoreline property owners within an area <30 ft wide or removing EWM or CLP Can be very effective at removing problems particularly following early detection of an invasive specie	Needs to be carefully monitored Roots, runners and even fragments of some without permits species (including EWM) will start new where selectively planted, so all of plant must be removed Small scale control only plants Can be very costly if subcontracted
b. Harvesting	Yes	Plants are “mowed” at depths of 2-5 ft., collected with a conveyor and off loaded onto shore	Immediate results	Not selective in species removed
		Harvest invasives only if invasive is already present throughout the lake	Good for CLP management if cut prior to turion production and is then cut to be kept in check through its growth cycle Usually minimal impact to the lake Harvested lanes through dense weed beds can increase growth and forage ability of some fish Can remove some nutrients from the lake	Fragments of EWM can re-root Difficulty in finding disposal sites Can remove some small fish and reptiles from lake Initial cost of harvester expensive High transport, maintenance and operational costs Liability if owned
Biological Control	Yes	Living organisms (e.g. insects or fungi) eat or infect plants	Self sustaining organism will over winter resume eating its host the next year Lowers density of problem plant to allow growth of natives	Effectiveness will vary as control agent’s population fluctuates Provides moderate control – complete control unlikely Control response may be slow. Must have enough control agent to be effective

Management Options for Aquatic Plants

a. Weevils on EWM	Yes	Native weevil prefers EWM to other native water milfoil	Native to Wisconsin: Weevil cannot "escape" and become a problem Selective control of target species Longer term control with limited management	Excessive cost need to stock large numbers, even if some already present and are costly **$1.00/each** Need good habitat for over wintering on shore (leaf litter) associated with undeveloped shorelines High Panfish populations decrease densities through predation
b. Pathogens	Yes	Fungal/bacterial/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
c. 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 Eurasian watermill foil growth	Initial transplanting slow and labor intensive Spikerushes native to Wisconsin and have not effectively limited EWM growth Wave action along shore makes it difficult to establish plants; plants will not grow in deep or turbid water
d. Restoration of native plants	Possibly, strongly recommend plan and consultation with DNR	Diverse native plant community established to help repel invasive species	Native plants provide food and habitat for aquatic fauna Diverse native community more repellant to invasive species Supplements removal techniques	Initial transplanting slow and labor intensive Nuisance invasive plants may outcompete plantings Largely experimental; few well documented successful cases and very costly
Physical Control	Required under Ch. 30/NR 107	Plants are reduced by altering variables that affect growth, such as water depth or light levels		
a. Drawdown	Yes, may require Environmental Assessment	Lake water lowered; plants killed when sediment dries, compacts or freezes	Can be effective for EWM, especially when done over winter, provided drying and freezing occur. Sediment compaction is possible over winter.	Plants with large seed bank or propagules that survive drawdown may become more abundant upon refilling
		Must have a water level control or device or siphon	Summer drawdown can restore large portions of shoreline and shallow areas as well as provide sediment compaction	Species growing in deep water (e.g. EWM) that survive may increase, particularly if desired native species are reduced
		Season or duration of drawdown can change effects	Emergent plant species often rebound near shore providing fish and wildlife habitat, sediment stabilization and increased water quality Successful for EWM	May impact attached wetlands and shallow wells near shore Not a good control measure for CLP

Management Options for Aquatic Plants

			Low cost if not a hydroelectric dam Restores natural water fluctuation important for all aquatic ecosystems	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 Controversial
b. Dredging	Yes	Plants are removed along with sediment	Increases water depth	Expensive
		Most effective when soft sediments overlay harder substrate	Removes nutrient rich sediments	Increases turbidity and releases nutrients
		For extremely impacted systems	Removes soft bottom sediments that may have high oxygen demand	Exposed sediments may be recolonized by invasive species
		Extensive planning and permitting required		Sediment testing is expensive Removes benthic organisms Dredged materials must be disposed if Severe impact on lake ecosystem
c. Dyes	Yes	Colors water, reducing light and reducing plant and algal growth	Impairs plant growth without increasing turbidity Usually non-toxic, degrades naturally over a few weeks	Appropriate for very slam water bodies Should not be used in pond or lake with outflow Impairs aesthetics Affects to microscopic organisms unknown
d. Mechanical circulation (Solarbees)	Yes	Water is circulated and oxygenated	Reduces blue green algae	Method is experimental; no published studies have been done
		Oxygenation of water decreases ammonium-nitrogen, which is a preferred nutrient source of EWM, theoretically limiting EWM growth (has not been demonstrated scientifically)	May reduce levels of ammonium-nitrogen in the water and at the sediment interface, which could reduce EWM growth Oxygenated water may reduce phosphorus release from sediments if mixing is complete Reduces chance of fish kills by aerating water	Although EWM prefers ammonium-nitrogen to nitrate, it will uptake nitrate efficiently, so EWM growth may not be affected Units are aesthetically unpleasing Units could be a navigational hazard
e. Non-point source nutrient control	No	Runoff of nutrients from the watershed are reduced (e.g. by controlling construction erosion or reducing fertilizer use)	Attempts to correct source of problem, not treat symptoms Could improve water clarity and reduce occurrences of algal blooms	Results can take years to be evident due to internal recycling of already resent lake nutrients Expensive

Management Options for Aquatic Plants

			Native plants may be able to compete invasive species better in low nutrient conditions	Requires landowner cooperation and regulation Improved water clarity may increase plant growth
Chemical Control	Required under NR 107	Granules or liquid chemicals kill plants or cease plant growth; some chemicals used primarily for algae	Some flexibility for different situations	Possible toxicity to aquatic animals or humans, especially applicators
		Results usually within 10 days of treatment, but repeat treatments usually needed	Some can be selective if applied correctly Can be used for restoration activities	May kill desirable plant species, e.g. native water milfoil or native pondweeds Treatment set back requirements from potable water sources and/or drinking water use restrictions after application, usually based on concentration May cause severe drop in dissolved oxygen causing fish kill, depends on plant biomass killed, temperatures and lake size and shape Controversial
a. 2,4-D (DMA-4; Sculpin	Yes	Systemic[1] herbicide selective to broadleaf[2] plants that inhibit cell division in new tissue	Moderately to highly effective; especially on EWM	May cause oxygen depletion after plants die and decompose
		Applied as liquid or granules during early growth phase	Monocots, such as pondweeds (e.g. CLP) and many other native species not affected Can be used in synergy with endotholl for early season CLP and EWM treatments Widely used aquatic herbicides	Cannot be used in combination with copper herbicides (used for algae) Toxic to fish
b. Endothall (Aquathol)	Yes	Broad-spectrum[3], contact [4] herbicide that inhibits protein synthesis	Especially effective on CLP and also effective on EWM	Kills many native pondweeks
		Applied as liquid or granules	May be effective in reducing reestablishment of CLP if reapplied several years in a row in 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	Not as effective in dense plant beds Not to be used in water supplies Toxic to aquatic fauna (to varying degrees)
c. Diquat (Reward)	Yes	Broad-spectrum, contact herbicide that disrupts cellular functioning	Mostly used for water-milfoil and duckweed	May impact non-target plants, especially native pondweeds, coontail, elodea, naiads
		Applied as liquid, can be combined with copper treatment	Rapid action Limited direct toxicity on fish and other animals	Toxic to aquatic invertebrates Needs to be reapplied several years in a row

Management Options for Aquatic Plants

				Ineffective in muddy or cold water (<50°F)
d. Fluridone (Sonar)	Yes	Broad-spectrum, systemic pigment bleaching herbicide that inhibits photosynthesis, some reduction in non target effects can be achieved by lowering dosage	Effective on EWM for 2 to 4+ years Applied at very low concentration typically on lake wide basis of less than 8 PPB Specific granular formulation release over extended periods of time 30 – 60 days eliminating peaks and lessening impacts to non targets (natives)	Affects some non-target plants, particularly native milfoils, coontails, elodea and naiads, even at low concentrations. These plants are important to combat invasive species Requires long contact time: 60-90 + days Requires residual monitoring
			Slow decomposition of plants may limit decreases in dissolved oxygen Low toxicity to aquatic animals	Demonstrated herbicide resistance in hydrilla subjected to repeat treatments Unknown effect of repeat whole lake treatments on lake ecology
e. Glyphosate (Rodeo)	Yes	Broad spectrum, systemic herbicide that disrupts enzyme formation and function	Effective on floating and emergent plants such as purple loosestrife	Effective control for 1-5 years
		Usually used for purple loosestrife stems or cattails	Selective if carefully applied to individual plants	Ineffective in muddy water
		Applied as liquid spray or painted on loosestrife stems	Non-toxic to most aquatic animals at recommended dosages	Cannot be used near potable water intakes No control of submerged plants
f. Triclopyr (Renovate)	Yes	Systemic herbicide selective to broadleaf plants that disrupts enzyme function	Effective on many emergent and floating plants	Impacts may occur to some native plants at higher does (e.g. coontail)
		Applied as liquid spray or liquid	More effective on dicots, such as purple loosestrife; may be more effective than glyphosate Results in 3-5 weeks Low toxicity to aquatic animals No recreational use restrictions following treatment	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 Relatively new management option for aquatic plants (since 2003)
g. Copper compounds (Cutrine, Captain)	Yes	Broad-spectrum, systemic herbicide that prevents photosynthesis	Reduces algal growth and increases water clarity	Elemental copper accumulates and persists in sediments
		Used to control planktonic and filamentous algae	No recreational or agricultural restrictions on water use following treatment Herbicidal action on hydrilla, an invasive plant not yet present in Wisconsin	Short term results Small-scale control only, because algae are easily windblown

Management Options for Aquatic Plants

					Toxic to invertebrates, trout and other fish, depending on the hardness of the water Long-term effects of repeat treatments to benthic organism unknown Clear water may increase plant growth
h.	**Lime slurry**	Yes	Applications of lime temporarily raise water pH, which limits the availability of inorganic carbon to plants, preventing growth	Appears to be particularly effective against EWM and CLP Prevents release of sediment phosphorus, which reduces algal growth Increases growth of native plants beneficial as fish habitat	Relatively new technique, so effective dosage levels and exposure requirements are not yet known Short-term increase in turbidity due to suspended lime particles High pH detrimental to aquatic invertebrates May restrict growth of some native plants
i.	**Alum (aluminum sulfate)**	Yes	Remove phosphorus from water column and creates barrier on sediment to prevent internal loading of phosphorus	Most often used against algal problems Lasts up to 5 years	Most not eat fish for 30 days from treatment area
			Dosage must consider pH, hardness and water volume	Improves water clarity	Minimal effect on aquatic plants, or increased light penetration may increase aquatic plants Potential ecosystem toxicity issues for aquatic animals, including fish at some concentrations
j.	**Phoslock**	yes	Remove/sequesters phosphorus from water column and creates barrier on sediment to prevent internal loading of phosphorus	Most often used against algal problems/blooms Improves water quality	Higher cost than Alum
			Dosing based on water quality parameters and volumes	Lasts up to 5 years Made from natural materials/carriers and tends to be more environmentally friendly than alum	

***EWM** - Eurasian water-milfoil
***CLP** - Curly-leaf pondweed

[1]**Systemic herbicide -** Must be absorbed by the plant and moved to the site of action. Often slower-acting than contact herbicides.

[2]**Broadleaf herbicide -** Affects only dicots, one of two groups of plants. Aquatic dicots include waterlilies, bladderworts, watermilfoils, and coontails.

[3]**Broad-spectrum herbicide -** Affects both monocots and dicots.

[4]**Contact herbicide -** Unable to move within the plant; kills only plant tissue it contacts directly

Techniques for Aquatic Plant Control Not Allowed in Wisconsin

Option	How it Works	Pros	Cons
Biological Control			
a. Carp	Plants 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 resuspension 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 or CLP turions can lead to accelerated spreading of plants
b. Crayfish	Plants eaten by stocked crayfish	Reduces macrophyte biomass	Illegal to transport or stock crayfish in Wisconsin Control not selective and may decimate plant community Not successful in productive, soft-bottom lakes with many fish predators Complete alteration of fish assemblage possible
Mechanical Control			
a. Cutting (no removal)	Plants are “mowed” with underwater cutter	Creates open water areas rapidly Works in water up to 25 ft	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 property owners Not selective in species removed small-scale control only
b. Rototilling	Sediment is tilled to uproot plant roots and stems	Decreases stem density, can affect entire plant	Creates turbidity
	Works in deep water (up to 17 ft)	Small scale control May provide long-term control	Not selective in species removed Fragments of vegetation can re-root Complete elimination of fish habitat

Techniques for Aquatic Plant Control Not Allowed in Wisconsin

			Releases nutrients Increased likelihood of invasive species recolonization
c. Hydroraking	Mechanical rake removes plants from lake Works in deep water (14 ft)	Creates open water areas rapidly	Fragments of vegetation can re-root May impact lake fauna Creates turbidity Plants regrown quickly Requires plant disposal
Physical Control			
a. Fabrics/Bottom Barriers	Prevents light from getting to lake bottom	Reduces turbidity in soft substrate areas Useful for small areas	Eliminates all plants, including native plants important for a healthy lake ecosystem May inhibit spawning by some fish Need maintenance or will become covered in sediment and ineffective Gas accumulation under blankets can cause them to dislodge from the bottom Affects benthic invertebrates Anaerobic environment forms that can release excessive nutrients from sediment

APPENDIX D – WI ADMIN CODES NR 107 & NR 109

Chapter NR 107

AQUATIC PLANT MANAGEMENT

Note: Chapter NR 107 as it existed on February 28, 1989 was repealed and a new Chapter NR 107 was created effective March 1, 1989.

NR 107.01 Purpose. The purpose of this chapter is to establish procedures for the management of aquatic plants and control of other aquatic organisms pursuant to s. 227.11 (2) (a), Stats., and interpreting s. 281.17 (2), Stats. A balanced aquatic plant community is recognized to be a vital and necessary component of a healthy aquatic ecosystem. The department may allow the management of nuisance–causing aquatic plants with chemicals registered and labeled by the U.S. environmental protection agency and labeled and registered by firms licensed as pesticide manufacturers and labelers with the Wisconsin department of agriculture, trade and consumer protection. Chemical management shall be allowed in a manner consistent with sound ecosystem management and shall minimize the loss of ecological values in the water body.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; **correction made under s. 13.93 (2m) (b) 7., Stats., Register, December, 2000, No. 540.**

NR 107.02 Applicability. Any person sponsoring or conducting chemical treatment for the management of aquatic plants or control of other aquatic organisms in waters of the state shall obtain a permit from the department. Waters of the state include those portions of Lake Michigan and Lake Superior, and all lakes, bays, rivers, streams, springs, ponds, wells, impounding reservoirs, marshes, watercourses, drainage systems and other ground or surface water, natural or artificial, public or private, within the state or its jurisdiction as specified in s. 281.01 (18), Stats.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; **correction made under s. 13.93 (2m) (b) 7., Stats., Register, December, 2000, No. 540.**

NR 107.03 Definitions. (1) "Applicator" means the person physically applying the chemicals to the treatment site.

(2) "Chemical fact sheet" means a summary of information on a specific chemical written by the department including general aquatic community and human safety considerations applicable to Wisconsin sites.

(3) "Department" means the department of natural resources.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89.

NR 107.04 Application for permit. (1) Permit applications shall be made on forms provided by the department and shall be submitted to the district director for the district in which the project is located. Any amendment or revision to an application shall be treated by the department as a new application, except as provided in s. NR 107.04 (3) (g).

Note: The DNR district headquarters are located at:

1. Southern — 3911 Fish Hatchery Road, Fitchburg 53711
2. Southeast — 2300 N. Dr. Martin Luther King Jr. Dr., Box 12436, Milwaukee 53212
3. Lake Michigan — 1125 N. Military Ave., Box 10448, Green Bay 54307
4. North Central — 107 Sutliff Ave., Box 818, Rhinelander 54501
5. Western — 1300 W. Clairemont Ave., Call Box 4001, Eau Claire 54702
6. Northwest — Hwy 70 West, Box 309, Spooner 54801

(2) The application shall be accompanied by:

(a) A nonrefundable permit application fee of $20, and, for proposed treatments larger than 0.25 acres, an additional refundable acreage fee of $25.00 per acre, rounded up to the nearest whole acre, applied to a maximum of 50.0 acres.

1. The acreage fee shall be refunded in whole if the entire permit is denied or if no treatment occurs on any part of the permitted treatment area. Refunds will not be prorated for partial treatments.

2. If the permit is issued with the proposed treatment area partially denied, a refund of acreage fees shall be given for the area denied.

(b) A legal description of the body of water proposed for treatment including township, range and section number;

(c) One copy of a detailed map or sketch of the body of water with the proposed treatment area dimensions clearly shown and with pertinent information necessary to locate those properties, by name of owner, riparian to the treatment area, which may include street address, local telephone number, block, lot and fire number where available. If a local address is not available, the home address and phone number of the property owner may be included;

(d) A description of the uses being impaired by plants or aquatic organisms and reason for treatment;

(e) A description of the plant community or other aquatic organisms causing the use impairment;

(f) The product names of chemicals proposed for use and the method of application;

(g) The name of the person or commercial applicator, and applicator certification number, when required by s. NR 107.08 (5), of the person conducting the treatment;

(h) A comparison of alternative control methods and their feasibility for use on the proposed treatment site.

(3) In addition to the information required under sub. (2), when the proposed treatment is a large–scale treatment exceeding 10.0 acres in size or 10% of the area of the water body that is 10 feet or less in depth, the application shall be accompanied by:

(a) A map showing the size and boundaries of the water body and its watershed.

(b) A map and list identifying known or suspected land use practices contributing to plant–related water quality problems in the watershed.

(c) A summary of conditions contributing to undesirable plant growth on the water body.

(d) A general description of the fish and wildlife uses occurring within the proposed treatment site.

(e) A summary of recreational uses of the proposed treatment site.

(f) Evidence that a public notice of the proposed application has been made, and that a public informational meeting, if required, has been conducted.

1. Notice shall be given in 2 inch x 4 inch advertising format in the newspaper which has the largest circulation in the area affected by the application.

2. The notice shall state the size of the proposed treatment, the approximate treatment dates, and that the public may request within 5 days of the notice that the applicant hold a public informational meeting on the proposed application.

a. The applicant will conduct a public informational meeting in a location near the water body when a combination of 5 or more individuals, organizations, special units of government, or local units of government request the meeting in writing to the applicant

with a copy to the department within 5 days after the notice is made. The person or entity requesting the meeting shall state a specific agenda of topics including problems and alternatives to be discussed.

b. The meeting shall be given a minimum of one week advance notice, both in writing to the requestors, and advertised in the format of subd. 1.

(g) The provisions of pars. (a) to (e) shall be repeated once every 5 years and shall include new information. Annual modifications of the proposed treatment within the 5–year period which do not expand the treatment area more than 10% and cover a similar location and target organisms may be accepted as an amendment to the original application. The acreage fee submitted under sub. (2) (a) shall be adjusted in accordance with any proposed amendments.

(4) The applicant shall certify to the department that a copy of the application has been provided to any affected property owners' association, inland lake district, and, in the case of chemical applications for rooted aquatic plants, to any riparian property owners adjacent to and within the treatment area.

(5) A notice of the proposed treatment shall be provided by the department to any person or organization indicating annually in writing a desire to receive such notification.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89.

NR 107.05 Issuance of permit. (1) The department shall issue or deny issuance of the requested permit between 10 and 15 working days after receipt of an acceptable application, unless:

(a) An environmental impact report or statement is required under s. 1.11, Stats. Notification to the applicant shall be in writing within 10 working days of receipt of the application and no action may be taken until the report or statement has been completed; or

(b) A public hearing has been granted under s. 227.42, Stats.

(2) If a request for a public hearing is received after the permit is issued but prior to the actual treatment allowed by the permit, the department is not required to, but may, suspend the permit because of the request for public hearing.

(3) The department may deny issuance of the requested permit if:

(a) The proposed chemical is not labeled and registered for the intended use by the United States environmental protection agency and both labeled and registered by a firm licensed as a pesticide manufacturer and labeler with the Wisconsin department of agriculture, trade and consumer protection;

(b) The proposed chemical does not have a current department aquatic chemical fact sheet;

(c) The department determines the proposed treatment will not provide nuisance relief, or will place unreasonable restrictions on existing water uses;

(d) The department determines the proposed treatment will result in a hazard to humans, animals or other nontarget organisms;

(e) The department determines the proposed treatment will result in a significant adverse effect on the body of water;

(f) The proposed chemical application is for waters beyond 150 feet from shore except where approval is given by the department to maintain navigation channels, piers or other facilities used by organizations or the public including commercial facilities;

(g) The proposed chemical applications, other than those conducted by the department pursuant to ss. 29.421 and 29.424, Stats., will significantly injure fish, fish eggs, fish larvae, essential fish food organisms or wildlife, either directly or through habitat destruction;

(h) The proposed chemical application is in a location known to have endangered or threatened species as specified pursuant to s. 29.604, Stats., and as determined by the department;

(i) The proposed chemical application is in locations identified by the department as sensitive areas, except when the applicant demonstrates to the satisfaction of the department that treatments can be conducted in a manner that will not alter the ecological character or reduce the ecological value of the area.

1. Sensitive areas are areas of aquatic vegetation identified by the department as offering critical or unique fish and wildlife habitat, including seasonal or lifestage requirements, or offering water quality or erosion control benefits to the body of water.

2. The department shall notify any affected property owners' association, inland lake district, and riparian property owner of locations identified as sensitive areas.

(4) New applications will be reviewed with consideration given to the cumulative effect of applications already approved for the body of water.

(5) The department may approve the application in whole or in part consistent with the provisions of subs. (3) (a) through (i) and (4). Denials shall be in writing stating reasons for the denial.

(6) Permits may be issued for one treatment season only.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; **corrections in (3) (g) and (h) made under s. 13.93 (2m) (b) 7., Stats., Register, December, 2000, No. 540.**

NR 107.06 Chemical fact sheets. (1) The department shall develop a chemical fact sheet for each of the chemicals in present use for aquatic nuisance control in Wisconsin.

(1m) Chemical fact sheets for chemicals not previously used in Wisconsin shall be developed within 180 days after the department has received notice of intended use of the chemical.

(2) The applicant or permit holder shall provide copies of the applicable chemical fact sheets to any affected property owners' association and inland lake district.

(3) The department shall make chemical fact sheets available upon request.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89.

NR 107.07 Supervision. (1) The permit holder shall notify the district office 4 working days in advance of each anticipated treatment with the date, time, location, and proposed size of treatment. At the discretion of the department, the advance notification requirement may be waived.

(2) Supervision by a department representative may be required for any aquatic nuisance control project involving chemicals. Supervision may include inspection of the proposed treatment area, chemicals, and application equipment before, during or after treatment. The inspection may result in the determination that treatment is unnecessary or unwarranted in all or part of the proposed area, or that the equipment will not control the proper dosage.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89.

NR 107.08 Conditions of the permit. (1) The department may stop or limit the application of chemicals to a body of water if at any time it determines that chemical treatment will be ineffective, or will result in unreasonable restrictions on current water uses, or will produce unnecessary adverse side effects on nontarget organisms. Upon request, the department shall state the reason for such action in writing to the applicant.

(2) Chemical treatments shall be performed in accordance with label directions, existing pesticide use laws, and permit conditions.

(3) Chemical applications on lakes and impoundments are limited to waters along developed shoreline including public parks except where approval is given by the department for projects of public benefit.

(4) Treatment of areas containing high value species of aquatic plants shall be done in a manner which will not result in adverse long–term or permanent changes to a plant community in a specific aquatic ecosystem. High value species are individual species of aquatic plants known to offer important values in spe-

cific aquatic ecosystems, including *Potamogeton amplifolius, Potamogeton Richardsonii, Potamogeton praelongus, Potamogeton pectinatus, Potamogeton illinoensis, Potamogeton robbinsii, Eleocharis spp., Scirpus spp., Valisneria spp., Zizania aquatica, Zannichellia palustris* and *Brasenia schreberi.*

(5) Treatment shall be performed by an applicator currently certified by the Wisconsin department of agriculture, trade and consumer protection in the aquatic nuisance control category whenever:

(a) Treatment is to be performed for compensation by an applicator acting as an independent contractor for hire;

(b) The area to be treated is greater than 0.25 acres;

(c) The product to be used is classified as a "restricted use pesticide"; or

(d) Liquid chemicals are to be used.

(6) Power equipment used to apply liquid chemicals shall include the following:

(a) Containers used to mix and hold chemicals shall be constructed of watertight materials and be of sufficient size and strength to safely contain the chemical. Measuring containers and scales for the purpose of measuring solids and liquids shall be provided by the applicator;

(b) Suction hose used to deliver the chemical to the pump venturi assembly shall be fitted with an on–off ball–type valve. The system shall also be designed to prevent clogging from chemicals and aquatic vegetation;

(c) Suction hose used to deliver surface water to the pump shall be fitted with a check valve to prevent back siphoning into the surface water should the pump stop;

(d) Suction hose used to deliver a premixed solution shall be fitted with an on–off ball–type valve to regulate the discharge rate;

(e) Pressure hose used to discharge chemicals to the surface water shall be provided with an on–off ball–type valve. This valve will be fitted at the base of the hose nozzle or as part of the nozzle assembly;

(f) All pressure and suction hoses and mechanical fittings shall be watertight;

(g) Equipment shall be calibrated by the applicator. Evidence of calibration shall be provided at the request of the department supervisor.

(h) Other equipment designs may be acceptable if capable of equivalent performance.

(7) The permit holder shall be responsible for posting those areas of use in accordance with water use restrictions stated on the chemical label, but in all cases for a minimum of one day, and with the following conditions:

(a) Posting signs shall be brilliant yellow and conspicuous to the nonriparian public intending to use the treated water from both the water and shore, and shall state applicable label water use restrictions of the chemical being used, the name of the chemical and date of treatment. For tank mixes, the label requirements of the most restrictive chemical will be posted;

(b) Minimum sign dimensions used for posting shall be 11 inches by 11 inches or consistent with s. ATCP 29.15. The department will provide up to 6 signs to meet posting requirements. Additional signs may be purchased from the department;

(c) Signs shall be posted at the beginning of each treatment by the permit holder or representing agent. Posting prior to treatment may be required as a permit condition when the department determines that such posting is in the best interest of the public;

(d) Posting signs shall be placed along contiguous treated shoreline and at strategic locations to adequately inform the public. Posting of untreated shoreline located adjacent to treated shoreline and noncontiguous shoreline shall be at the discretion of the department;

(e) Posting signs shall be made of durable material to remain up and legible for the time period stated on the pesticide label for water use restrictions, after which the permit holder or representing agent is responsible for sign removal.

(8) After conducting a treatment, the permit holder shall complete and submit within 30 days an aquatic nuisance control report on a form supplied by the department. Required information will include the quantity and type of chemical, and the specific size and location of each treatment area. In the event of any unusual circumstances associated with a treatment, or at the request of the department, the report shall be provided immediately. If treatment did not occur, the form shall be submitted with appropriate comment by October 1.

(9) Failure to comply with the conditions of the permit may result in cancellation of the permit and loss of permit privileges for the subsequent treatment season. A notice of cancellation or loss of permit privileges shall be provided by the department to the permit holder accompanied by a statement of appeal rights.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89**;** correction in (7) (b) made under s. 13.93 (2m) (b) 7., Stats., Register, September, 1995, No. 477.

NR 107.09 Special limitation. Due to the significant risk of environmental damage from copper accumulation in sediments, swimmer's itch treatments performed with copper sulfate products at a rate greater than 10 pounds of copper sulfate per acre are prohibited.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89.

NR 107.10 Field evaluation use permits. When a chemical product is considered for aquatic nuisance control and does not have a federal label for such use, the applicant shall apply to the administrator of the United States environmental protection agency for an experimental use permit under section 5 of the federal insecticide, fungicide and rodenticide act as amended (7 USC 136 et seq.). Upon receiving a permit, the permit holder shall obtain a field evaluation use permit from the department and be subject to the requirements of this chapter. Department field evaluation use permits shall be issued for the purpose of evaluating product effectiveness and safety under field conditions and will require in addition to the conditions of the permit specified in s. NR 107.08 (1) through (9), the following:

(1) Treatment shall be limited to an area specified by the department.

(2) The permit holder shall submit to the department a summary of treatment results at the end of the treatment season. The summary shall include:

(a) Total chemical used and distribution pattern, including chemical trade name, formulation, percent active ingredient, and dosage rate in the treated water in parts per million of active ingredient;

(b) Description of treatment areas including the character and the extent of the nuisance present;

(c) Effectiveness of the application and when applicable, a summary comparison of the results obtained from past experiments using the same chemical formulation;

(d) Other pertinent information required by the department; and

(e) Conclusions and recommendations for future use.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89.

NR 107.11 Exemptions. (1) Under any of the following conditions, the permit application fee in s. NR 107.04 (2) (a) will be limited to the basic application fee:

(a) The treatment is made for the control of bacteria on swimming beaches with chlorine or chlorinated lime;

(b) The treatment is intended to control algae or other aquatic nuisances that interfere with the use of the water for potable purposes;

(c) The treatment is necessary for the protection of public health, such as the control of disease carrying organisms in sanitary sewers, storm sewers, or marshes, and the treatment is sponsored by a governmental agency.

(2) The treatment of purple loosestrife is exempt from ss. NR 107.04 (2) (a) and (3), and 107.08 (5).

(3) The use of chemicals in private ponds is exempt from the provisions of this chapter except for ss. NR 107.04 (1), (2), (4) and (5), 107.05, 107.07, 107.08 (1), (2), (8) and (9), and 107.10.

(a) A private pond is a body of water located entirely on the land of an applicant, with no surface water discharge or a discharge that can be controlled to prevent chemical loss, and without access by the public.

(b) The permit application fee will be limited to the non–refundable $20 application fee.

(4) The use of chemicals in accordance with label instructions is exempt from the provisions of this chapter, when used in:

(a) Water tanks used for potable water supplies;

(b) Swimming pools;

(c) Treatment of public or private wells;

(d) Private fish hatcheries licensed under s. 95.60, Stats.;

(e) Treatment of emergent vegetation in drainage ditches or rights–of–way where the department determines that fish and wildlife resources are insignificant; or

(f) Waste treatment facilities which have received s. 281.41, Stats., plan approval or are utilized to meet effluent limitations set forth in permits issued under s. 283.31, Stats.

History: Cr. Register, February, 1989, No. 398, eff. 3–1–89; **corrections in (4) (d) and (f) made under s. 13.93 (2m) (b) 7., Stats., Register, December, 2000, No. 540.**

Chapter NR 109

AQUATIC PLANTS: INTRODUCTION, MANUAL REMOVAL and MECHANICAL CONTROL REGULATIONS

NR 109.01 Purpose. The purpose of this chapter is to establish procedures and requirements for the protection and regulation of aquatic plants pursuant to ss. 23.24 and 30.715, Stats. Diverse and stable communities of native aquatic plants are recognized to be a vital and necessary component of a healthy aquatic ecosystem. This chapter establishes procedures and requirements for issuing aquatic plant management permits for introduction of aquatic plants or control of aquatic plants by manual removal, burning, use of mechanical means or plant inhibitors. This chapter identifies other permits issued by the department for aquatic plant management that contain the appropriate conditions as required under this chapter for aquatic plant management, and for which no separate permit is required under this chapter**.** Introduction and control of aquatic plants shall be allowed in a manner consistent with sound ecosystem management, shall consider cumulative impacts, and shall minimize the loss of ecological values in the body of water. The purpose of this chapter is also to prevent the spread of invasive and non–native aquatic organisms by prohibiting the launching of watercraft or equipment that has any aquatic plants or zebra mussels attached.

History: CR 02–061: cr. Register May 2003 No. 569, eff. 6–1–03.

NR 109.02 Applicability. A person sponsoring or conducting manual removal, burning or using mechanical means or aquatic plant inhibitors to control aquatic plants in navigable waters, or introducing non–native aquatic plants to waters of this state shall obtain an aquatic plant management permit from the department under this chapter.

History: CR 02–061: cr. Register May 2003 No. 569, eff. 6–1–03.

NR 109.03 Definitions. In this chapter:

(1) "Aquatic community" means lake or river biological resources.

(2) "Beneficial water use activities" mean angling, boating, swimming or other navigational or recreational water use activity.

(3) "Body of water" means any lake, river or wetland that is a water of this state.

(4) "Complete application" means a completed and signed application form, the information specified in s. NR 109.04 and any other information which may reasonably be required from an applicant and which the department needs to make a decision under applicable provisions of law.

(5) "Department" means the Wisconsin department of natural resources.

(6) "Manual removal" means the control of aquatic plants by hand or hand–held devices without the use or aid of external or auxiliary power.

(7) "Navigable waters" means those waters defined as navigable under s. 30.10, Stats.

(8) "Permit" means aquatic plant management permit.

(9) "Plan" means aquatic plant management plan.

(10) "Wetlands" means an area where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions.

History: CR 02–061: cr. Register May 2003 No. 569, eff. 6–1–03.

NR 109.04 Application requirements and fees. **(1)** Permit applications shall be made on forms provided by the department and shall be submitted to the regional director or designee for the region in which the project is located. Permit applications for licensed aquatic nursery growers may be submitted to the department of agriculture, trade and consumer protection.

Note: Applications may be obtained from the department's regional headquarters or service centers. DATCP has agreed to send application forms and instructions provided by the department to aquatic nursery growers along with license renewal forms. DATCP will forward all applications to the department for processing.

(2) The application shall be accompanied by all of the following unless the application is made by licensed aquatic nursery growers for selective harvesting of aquatic plants for nursery stock. Applications made by licensed aquatic nursery growers for harvest of nursery stock do not have to include the information required by par. (d), (e), (h), (i) or (j).

(a) A nonrefundable application fee. The application fee for an aquatic plant management permit is:

1. $30 for a proposed project to manage aquatic plants on less than one acre.

2. $30 per acre to a maximum of $300 for a proposed project to manage aquatic plants on one acre or larger. Partial acres shall be rounded up to the next full acre for fee determination. An annual renewal of this permit may be requested with an additional application fee of one–half the original application fee, but not less than $30.

(b) A legal description of the body of water including township, range and section number.

(c) One copy of a detailed map of the body of water with the proposed introduction or control area dimensions clearly shown. Private individuals doing plant introduction or control shall provide the name of the owner riparian to the management area, which includes the street address or block, lot and fire number where available and local telephone number or other pertinent information necessary to locate the property.

(d) One copy of any existing aquatic management plan for the body of water, or detailed reference to the plan, citing the plan references to the proposed introduction or control area, and a description of how the proposed introduction or control of aquatic plants is compatible with any existing plan.

(e) A description of the impairments to water use caused by the aquatic plants to be managed.

(f) A description of the aquatic plants to be controlled or removed.

(g) The type of equipment and methods to be used for introduction, control or removal.

(h) A description of other introduction or control methods considered and the justification for the method selected.

(i) A description of any other method being used or intended for use for plant management by the applicant or on the area abutting the proposed management area.

(j) The area used for removal, reuse or disposal of aquatic plants.

(k) The name of any person or commercial provider of control or removal services.

(3) (a) The department may require that an application for an aquatic plant management permit contain an aquatic plant management plan that describes how the aquatic plants will be introduced, controlled, removed or disposed. Requirements for an aquatic plant management plan shall be made in writing stating the reason for the plan requirement. In deciding whether to require a plan, the department shall consider the potential for effects on protection and development of diverse and stable communities of native aquatic plants, for conflict with goals of other written ecological or lake management plans, for cumulative impacts and effect on the ecological values in the body of water, and the long–term sustainability of beneficial water use activities.

(b) Within 30 days of receipt of the plan, the department shall notify the applicant of any additional information or modifications to the plan that are required. If the applicant does not submit the additional information or modify the plan as requested by the department, the department may dismiss the aquatic plant management permit application.

(c) The department shall approve the aquatic plant management plan before an application may be considered complete.

(4) The permit sponsor may request an annual renewal in writing from the department under s. NR 109.05 if there is no change proposed in the conditions of the original permit issued.

History: CR 02–061: cr. Register May 2003 No. 569, eff. 6–1–03.

NR 109.05 Permit issuance. (1) The department shall issue or deny issuance of the requested permit within 15 working days after receipt of a completed application and approved plan as required under s. NR 109.04 (3).

(2) The department may specify any of the following as conditions of the permit:

(a) The quantity of aquatic plants that may be introduced or controlled.

(b) The species of aquatic plants that may be introduced or controlled.

(c) The areas in which aquatic plants may be introduced or controlled.

(d) The methods that may be used to introduce or control aquatic plants.

(e) The times during which aquatic plants may be introduced or controlled.

(f) The allowable methods used for disposing of or using aquatic plants that are removed or controlled.

(g) Annual or other reporting requirements to the department that may include information related to pars. (a) to (f).

(3) The department may deny issuance of the requested permit if the department determines any of the following:

(a) Aquatic plants are not causing significant impairment of beneficial water use activities.

(b) The proposed introduction or control will not remedy the water use impairments caused by aquatic plants as identified as a part of the application in s. NR 109.04 (2) (e).

(c) The proposed introduction or control will result in a hazard to humans.

(d) The proposed introduction or control will cause significant adverse impacts to threatened or endangered resources.

(e) The proposed introduction or control will result in a significant adverse effect on water quality, aquatic habitat or the aquatic community including the native aquatic plant community.

(f) The proposed introduction or control is in locations identified by the department as sensitive areas, under s. NR 107.05 (3) (i) 1., except when the applicant demonstrates to the satisfaction of the department that the project can be conducted in a manner that will not alter the ecological character or reduce the ecological value of the area.

(g) The proposed management will result in significant adverse long–term or permanent changes to a plant community or a high value species in a specific aquatic ecosystem. High value species are individual species of aquatic plants known to offer important values in specific aquatic ecosystems, including Potamogeton amplifolius, Potamogeton Richardsonii, Potamogeton praelongus, Stuckenia pectinata (Potamogeton pectinatus), Potamogeton illinoensis, Potamogeton robbinsii, Eleocharis spp., Scirpus spp., Valisneria spp., Zizania spp., Zannichellia palustris and Brasenia schreberi.

(h) If wild rice is involved, the stipulations incorporated by *Lac Courte Oreilles v. Wisconsin*, 775 F. Supp. 321 (W.D. Wis. 1991) shall be complied with.

(i) The proposed introduction or control will interfere with the rights of riparian owners.

(j) The proposed management is inconsistent with a department approved aquatic plant management plan for the body of water.

(4) The department may approve the application in whole or in part consistent with the provisions of sub. (3). A denial shall be in writing stating the reasons for the denial.

(5) (a) The department may issue an aquatic plant management permit on less than one acre in a single riparian area for a 3–year term.

(b) The department may issue an aquatic plant management permit for a one–year term for more than one acre or more than one riparian area. The permit may be renewed annually for up to a total of 3 years in succession at the written request of the permit holder, provided no modifications or changes are made from the original permit.

(c) The department may issue an aquatic plant management permit containing a department–approved plan for a 3 to 5 year term.

(d) The department may issue an aquatic plant management permit to a licensed nursery grower for a 3–year term for the harvesting of aquatic plants from a publicly owned lake bed or for a 5–year term for harvesting of aquatic plants from privately owned beds with the permission of the property owner.

(6) The approval of an aquatic plant management permit does not represent an endorsement of the permitted activity, but represents that the applicant has complied with all criteria of this chapter.

History: CR 02–061: cr. Register May 2003 No. 569, eff. 6–1–03**; reprinted to restore dropped language from rule order, Register October 2003 No. 574.**

NR 109.06 Waivers. The department waives the permit requirements under this chapter for any of the following:

(1) Manual removal or use of mechanical devices to control or remove aquatic plants from a body of water 10 acres or less that is entirely confined on the property of one person with the permission of that property owner.

Note: A person who introduces native aquatic plants or removes aquatic plants by manual or mechanical means in the course of operating an aquatic nursery as authorized under s. 94.10, Stats., on privately owned non–navigable waters of the state is not required to obtain a permit for the activities.

(2) A riparian owner who manually removes aquatic plants from a body of water or uses mechanical devices designed for cutting or mowing vegetation to control plants on an exposed lake bed that abuts the owner's property provided that the removal meets all of the following:

(a) 1. Removal of native plants is limited to a single area with a maximum width of no more than 30 feet measured along the

shoreline provided that any piers, boatlifts, swimrafts and other recreational and water use devices are located within that 30–foot wide zone and may not be in a new area or additional to an area where plants are controlled by another method; or

2. Removal of nonnative or invasive aquatic plants as designated under s. NR 109.07 when performed in a manner that does not harm the native aquatic plant community; or

3. Removal of dislodged aquatic plants that drift on–shore and accumulate along the waterfront.

(b) Is not located in a sensitive area as defined by the department under s. NR 107.05 (3) (i) 1., or in an area known to contain threatened or endangered resources or floating bogs.

(c) Does not interfere with the rights of other riparian owners.

(d) If wild rice is involved, the procedures of s. NR 19.09 (1) shall be followed.

(4) Control of purple loosestrife by manual removal or use of mechanical devices when performed in a manner that does not harm the native aquatic plant community or result in or encourage re–growth of purple loosestrife or other nonnative vegetation.

(5) Any aquatic plant management activity that is conducted by the department and is consistent with the purposes of this chapter.

(6) Manual removal and collection of native aquatic plants for lake study or scientific research when performed in a manner that does not harm the native aquatic plant community.

Note: Scientific collectors permit requirements are still applicable.

(7) Incidental cutting, removal or destroying of aquatic plants when engaged in beneficial water use activities.

History: CR 02–061: cr. Register May 2003 No. 569, eff. 6–1–03.

NR 109.07 Invasive and nonnative aquatic plants. (1) The department may designate any aquatic plant as an invasive aquatic plant for a water body or a group of water bodies if it has the ability to cause significant adverse change to desirable aquatic habitat, to significantly displace desirable aquatic vegetation, or to reduce the yield of products produced by aquaculture.

(2) The following aquatic plants are designated as invasive aquatic plants statewide: Eurasian water milfoil, curly leaf pondweed and purple loosestrife.

(3) Native and nonnative aquatic plants of Wisconsin shall be determined by using scientifically valid publications and findings by the department.

History: CR 02–061: cr. Register May 2003 No. 569, eff. 6–1–03.

NR 109.08 Prohibitions. (1) No person may distribute an invasive aquatic plant, under s. NR 109.07.

(2) No person may intentionally introduce Eurasian water milfoil, curly leaf pondweed or purple loosestrife into waters of this state without the permission of the department.

(3) No person may intentionally cut aquatic plants in public/navigable waters without removing cut vegetation from the body of water.

(4) (a) No person may place equipment used in aquatic plant management in a navigable water if the person has reason to believe that the equipment has any aquatic plants or zebra mussels attached.

(b) This subsection does not apply to equipment used in aquatic plant management when re–launched on the same body of water without having visited different waters, provided the re–launching will not introduce or encourage the spread of existing aquatic species within that body of water.

History: CR 02–061: cr. Register May 2003 No. 569, eff. 6–1–03.

NR 109.09 Plan specifications and approval. (1) Applicants required to submit an aquatic plant management plan, under s. NR 109.04 (3), shall develop and submit the plan in a format specified by the department.

(2) The plan shall present and discuss each of the following items:

(a) The goals and objectives of the aquatic plant management and protection activities.

(b) A physical, chemical and biological description of the waterbody.

(c) The intensity of water use.

(d) The location of aquatic plant management activities.

(e) An evaluation of chemical, mechanical, biological and physical aquatic plant control methods.

(f) Recommendations for an integrated aquatic plant management strategy utilizing some or all of the methods evaluated in par. (e).

(g) An education and information strategy.

(h) A strategy for evaluating the efficacy and environmental impacts of the aquatic plant management activities.

(i) The involvement of local units of government and any lake organizations in the development of the plan.

(3) The approval of an aquatic plant management plan does not represent an endorsement for plant management, but represents that adequate considerations in planning the actions have been made.

History: CR 02–061: cr. Register May 2003 No. 569, eff. 6–1–03.

NR 109.10 Other permits. Permits issued under s. 30.12, 30.20, 31.02 or 281.36, Stats., or under ch. NR 107 may contain provisions which provide for aquatic plant management. If a permit issued under one of these authorities contains the appropriate conditions as required under this chapter for aquatic plant management, a separate permit is not required under this chapter. The permit shall explicitly state that it is intended to comply with the substantive requirements of this chapter.

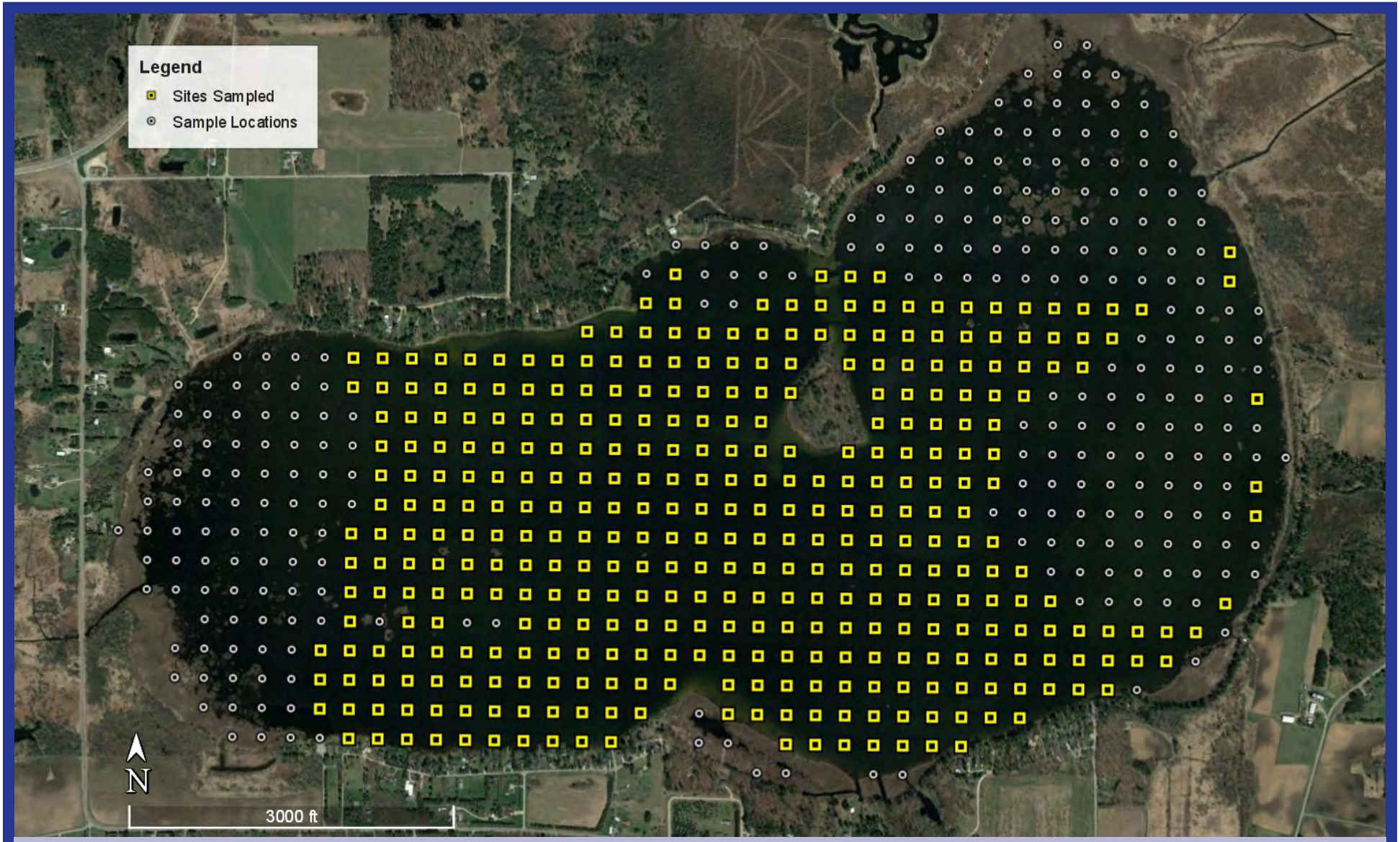
History: CR 02–061: cr. Register May 2003 No. 569, eff. 6–1–03.

NR 109.11 Enforcement. (1) Violations of this chapter may be prosecuted by the department under chs. 23, 30 and 31, Stats.

(2) Failure to comply with the conditions of a permit issued under or in accordance with this chapter may result in cancellation of the permit and loss of permit privileges for the subsequent year. Notice of cancellation or loss of permit privileges shall be provided by the department to the permit holder.

History: CR 02–061: cr. Register May 2003 No. 569, eff. 6–1–03.

FIGURES



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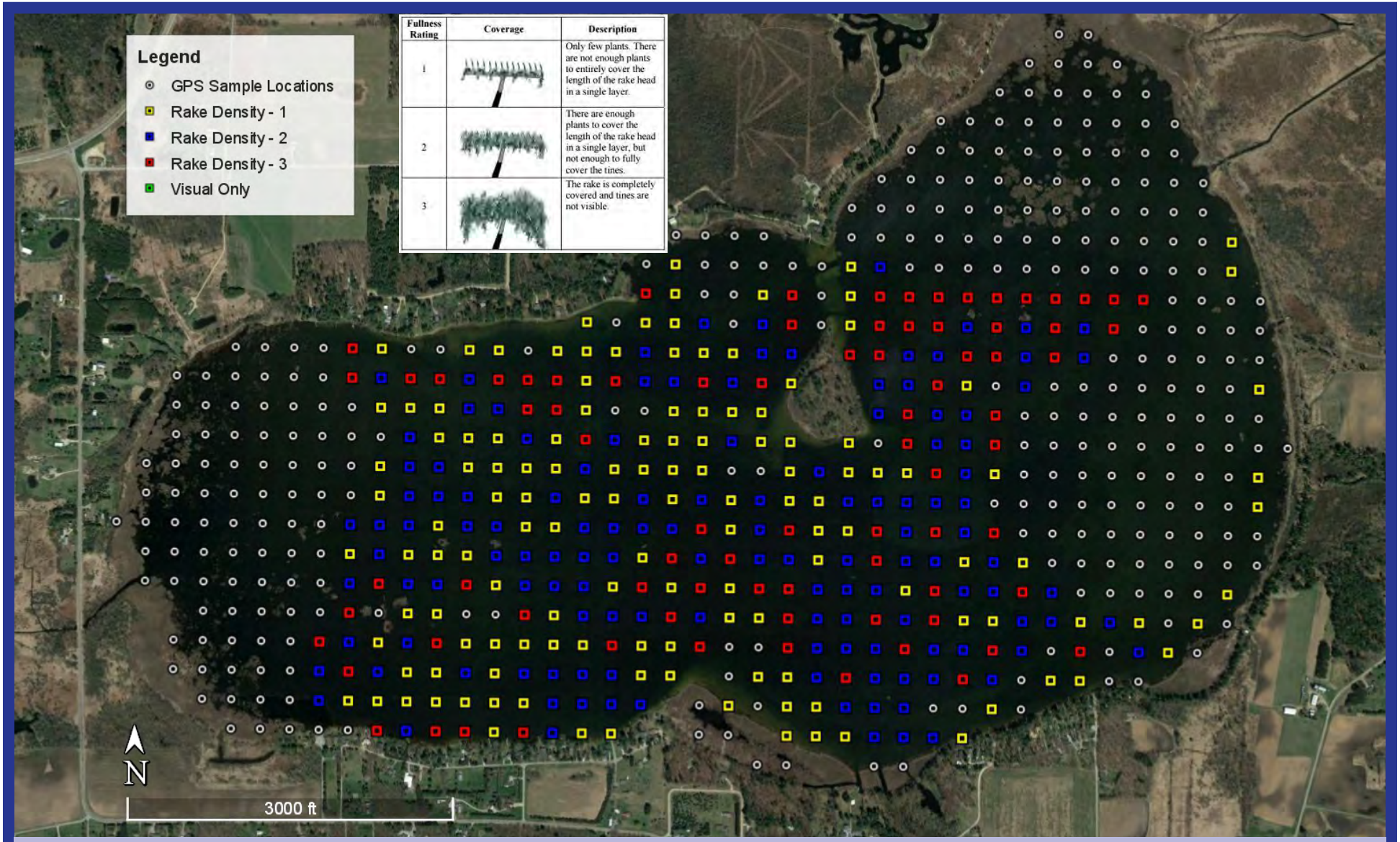
Sample Site Locations

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 1



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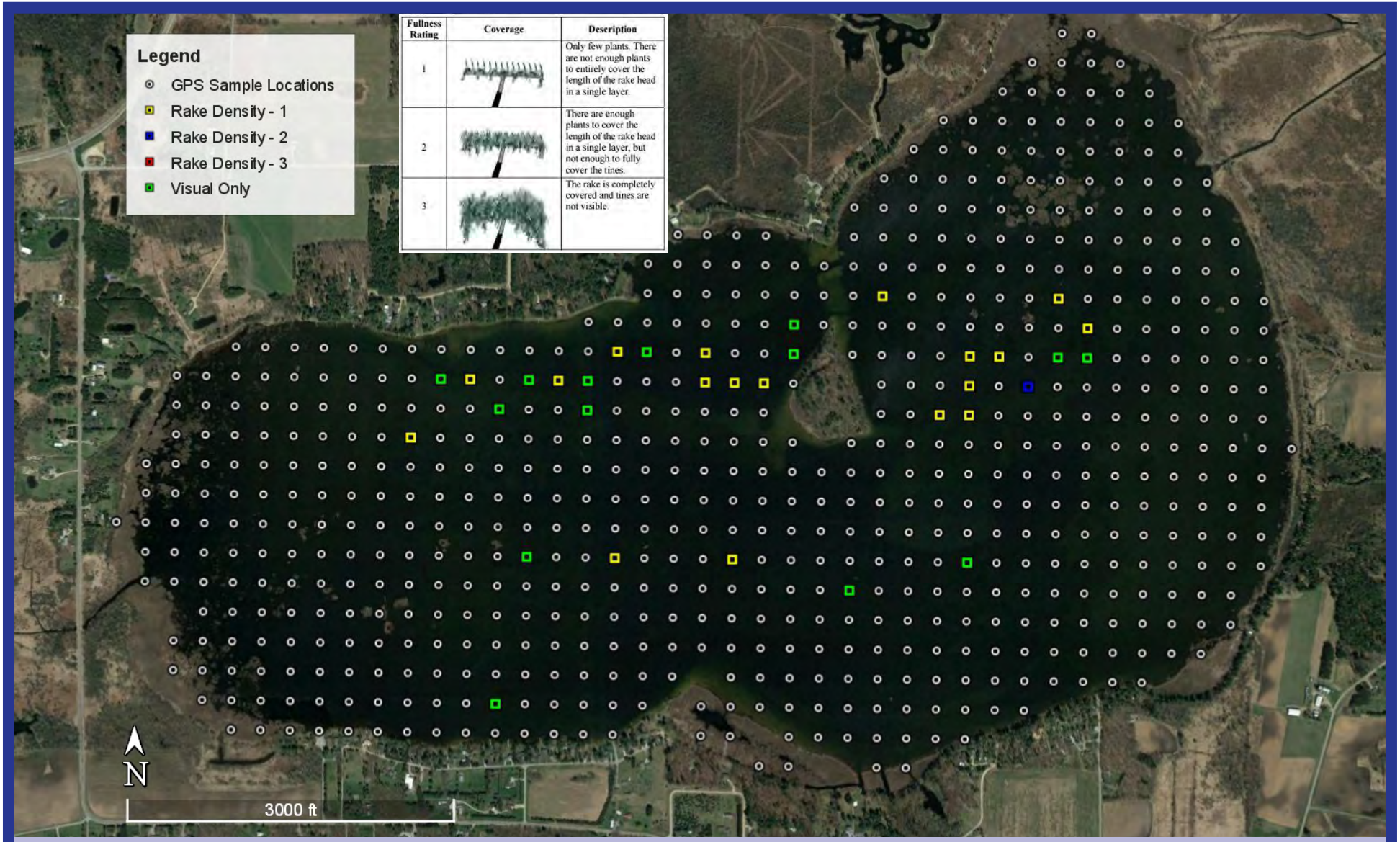
Total Rake Fullness

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 2



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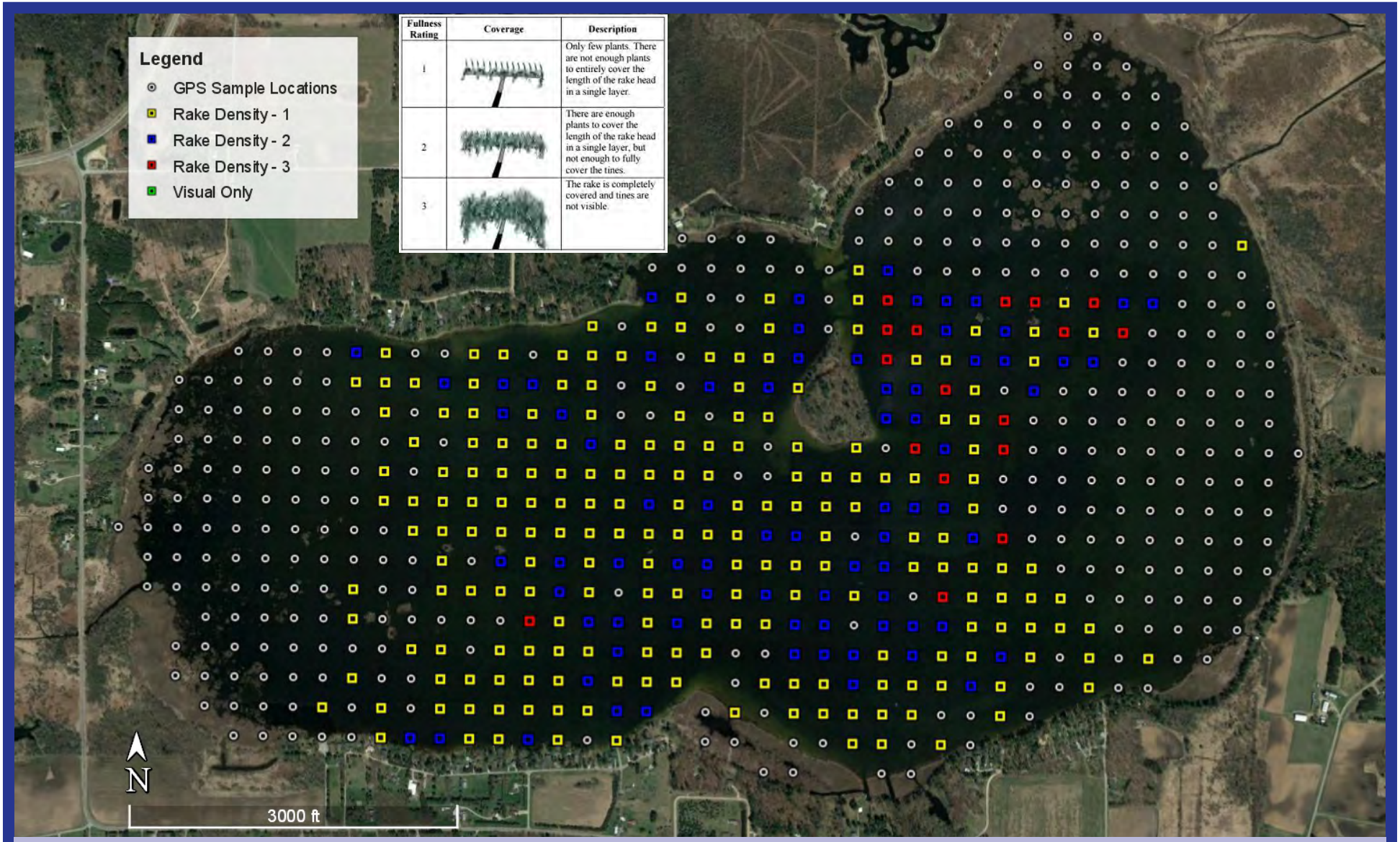
Eurasian Water-milfoil

Myriophyllum spicatum

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 3



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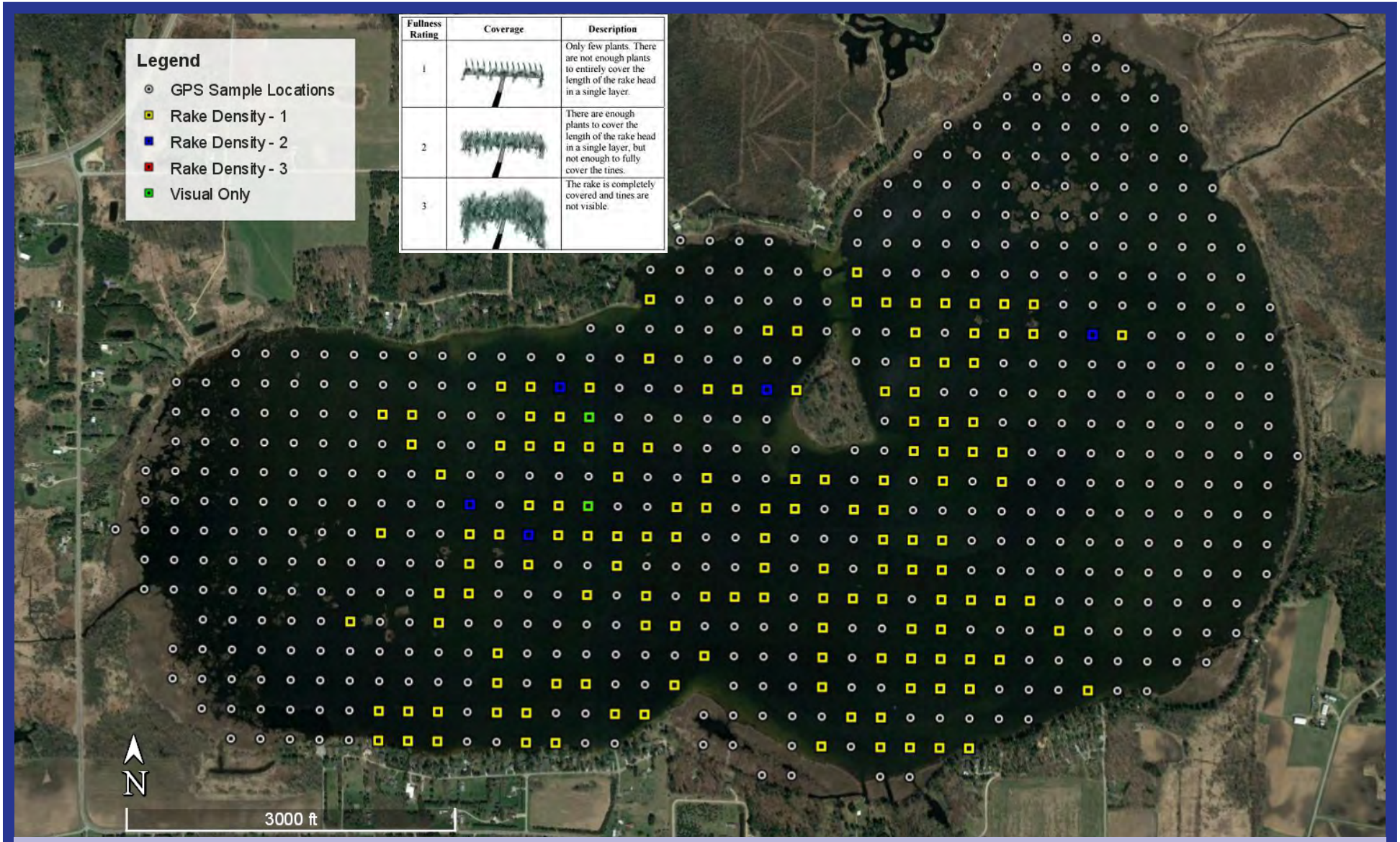
Southern Naiad

Najas guadalupensis

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 4



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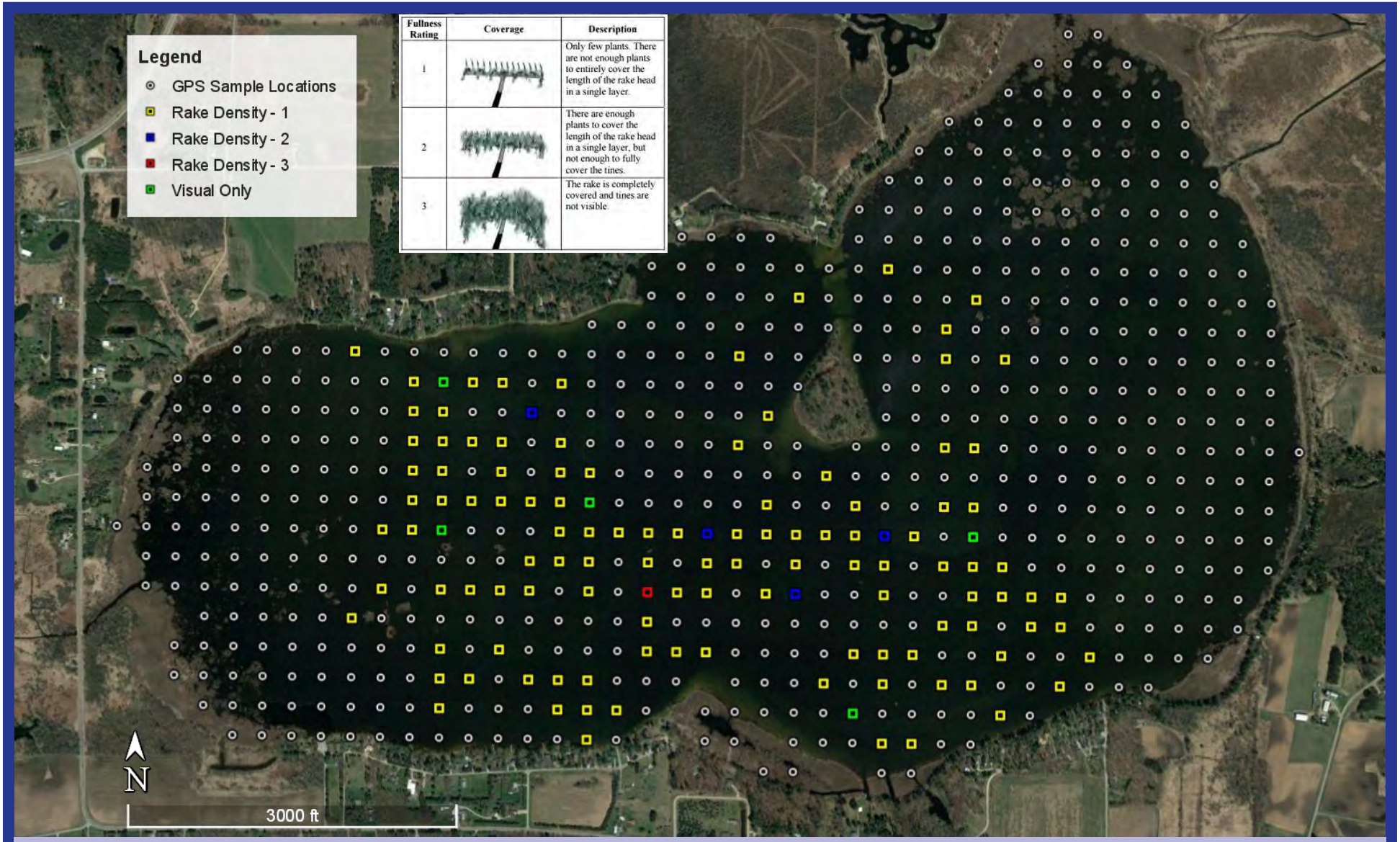
Wild Celery

Vallisneria americana

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 5



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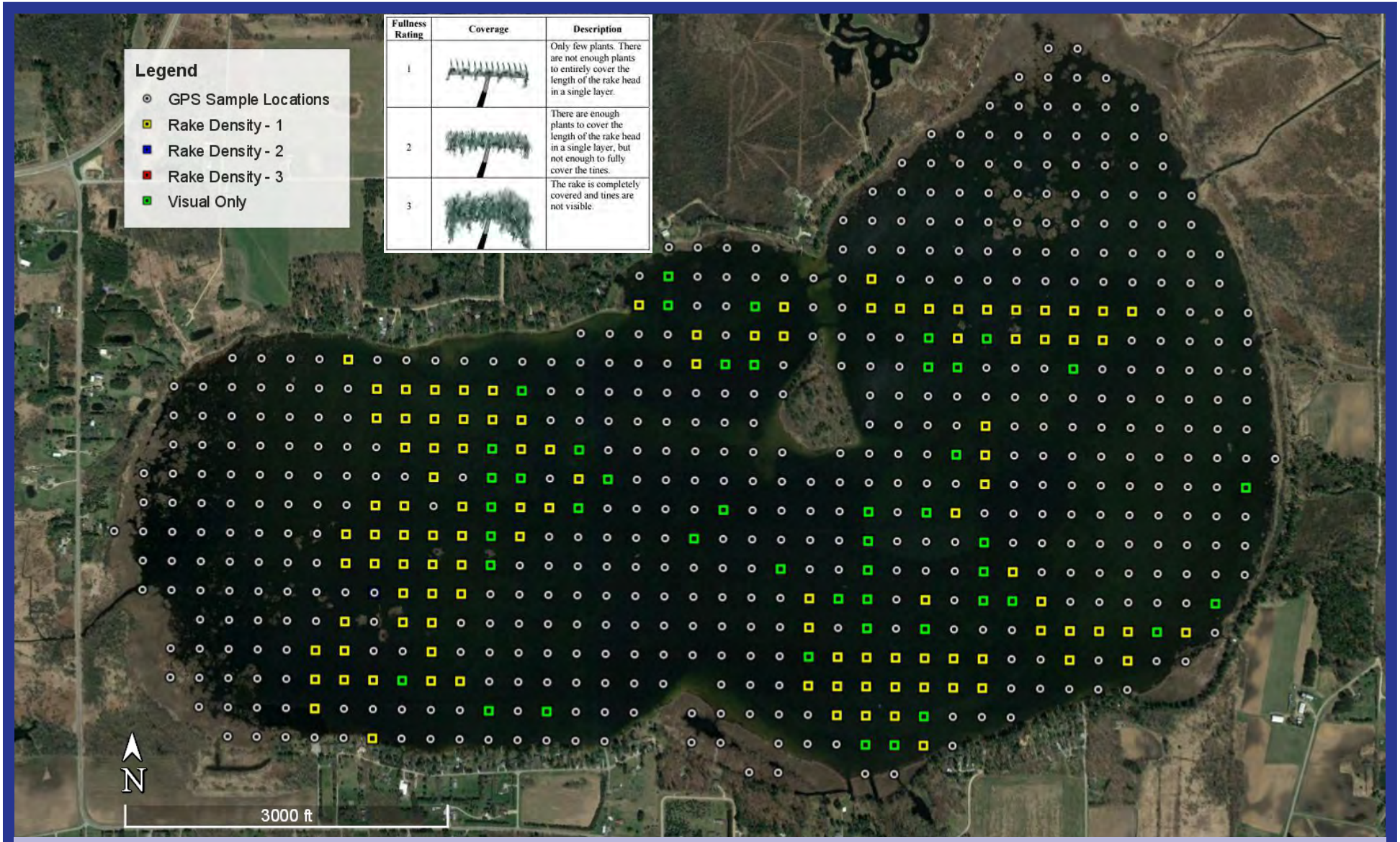
Large-leaf Pondweed

Potamogeton amplifolius

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 6



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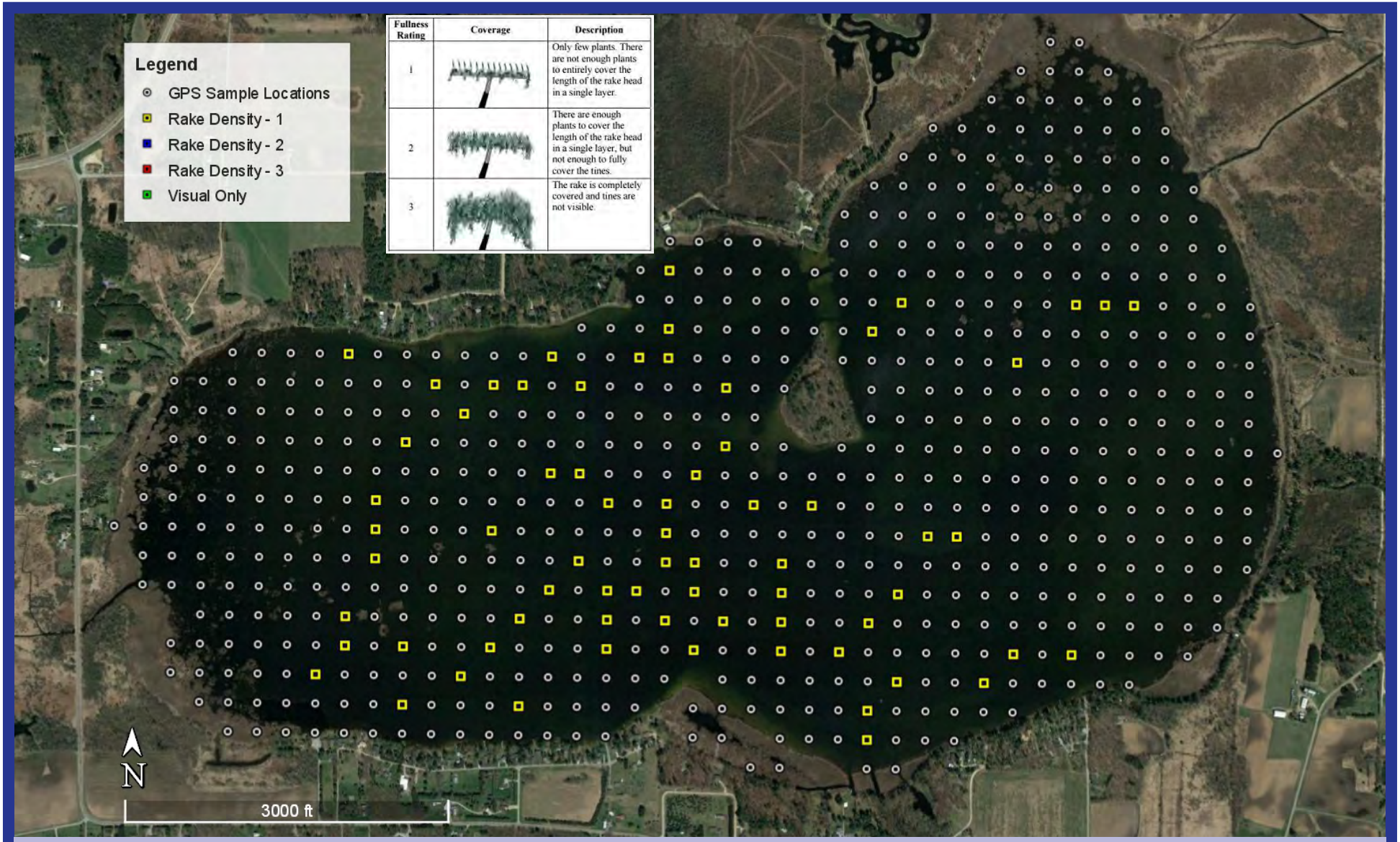
Wild Rice

Zizania palustris

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 7



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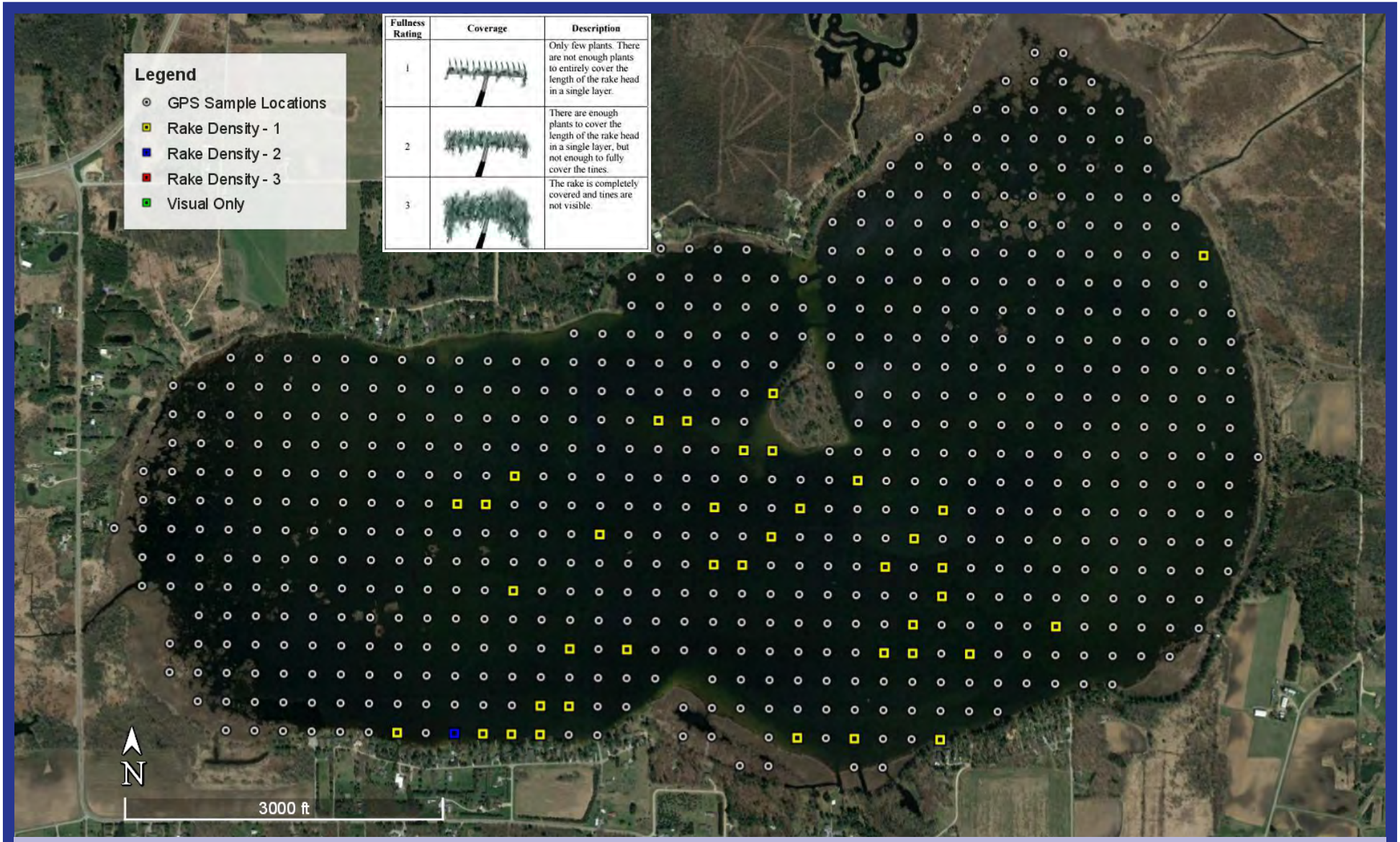
White-stem Pondweed

Potamogeton praelongus

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 8



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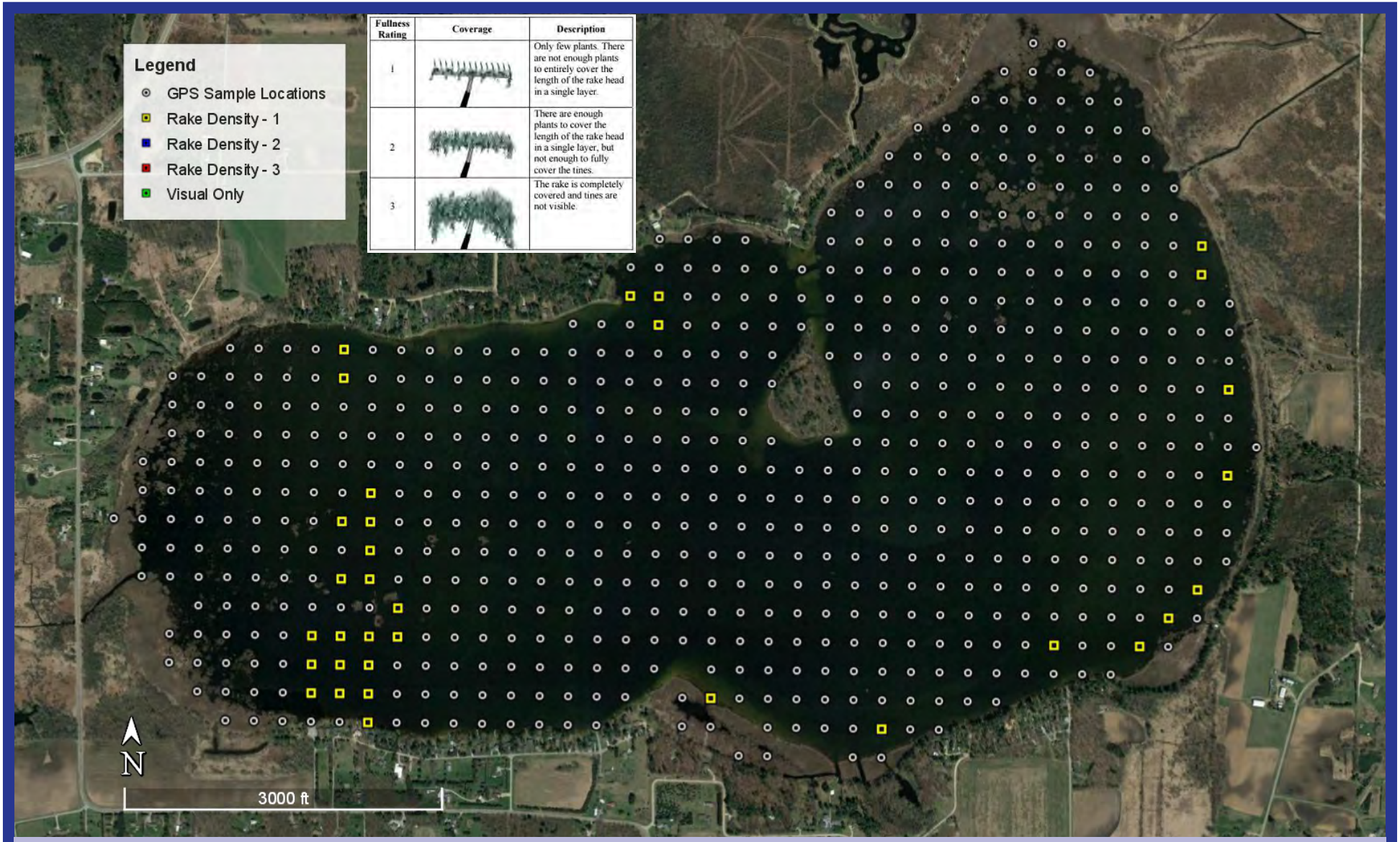
Muskgrass

Chara sp.

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 9



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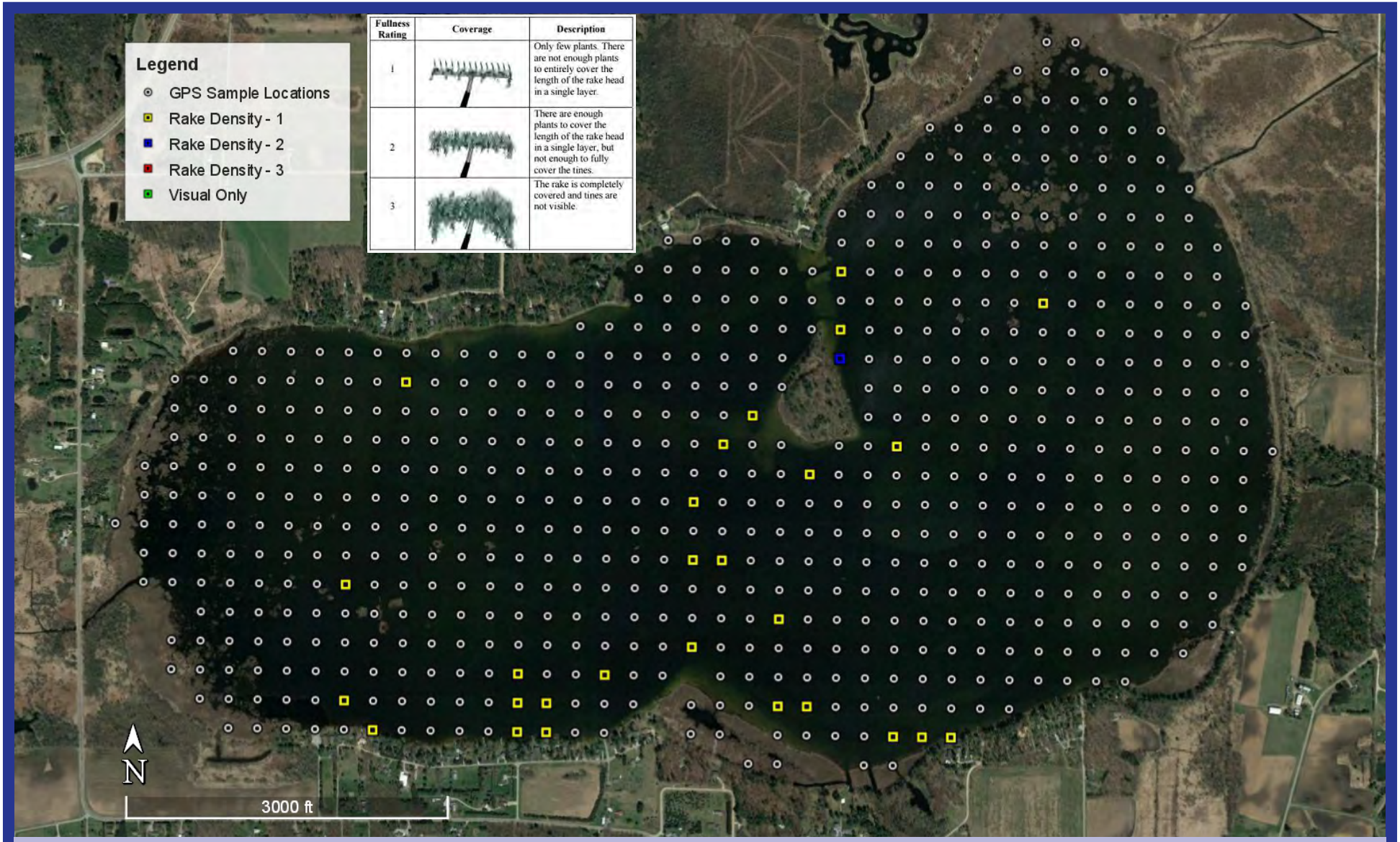
Large Purple Bladderwort

Utricularia purpurea

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 10



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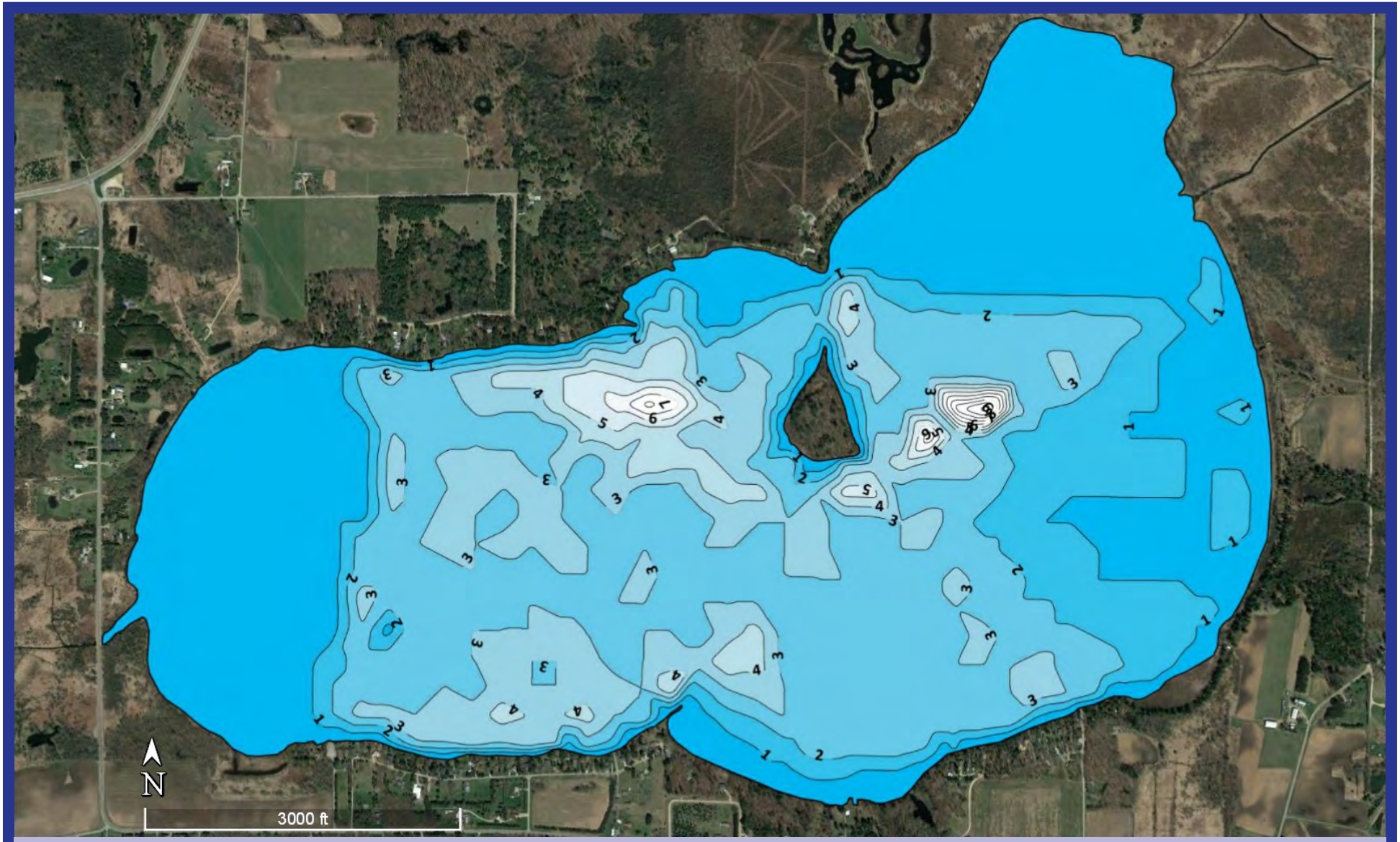
Common Waterweed

Elodea canadensis

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 11



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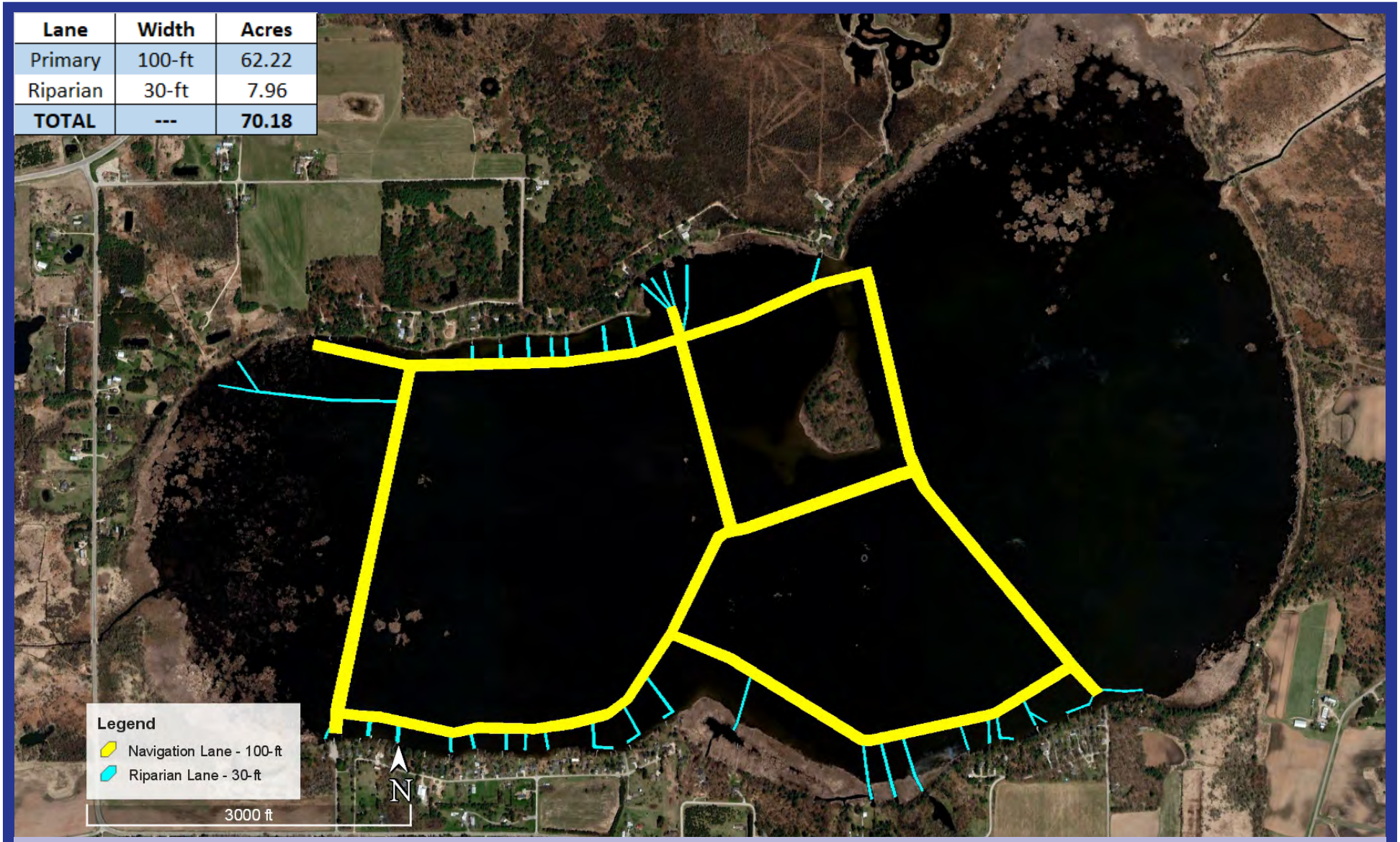
Depth Contour Map

White Lake, Waupaca County
Surveyed: September 4 & 6, 2019
Figure 12

Lane	Width	Acres
Primary	100-ft	62.22
Riparian	30-ft	7.96
TOTAL	**---**	**70.18**



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Mechanical Harvesting Locations

-Only harvest in depths of 2-ft or more
-Do not disturb the lake bed during harvesting
-Only cut to a depth of 1/2 the water column

Figure 13
White Lake
Waupaca County

TABLES

Table 1: Aquatic Plant Community Statistics, White Lake, Waupaca County, Wisconsin*

	2010	2015	2019
Number of sites sampled**	486	435	371
Number of sites with vegetation	452	378	343
Number of sites shallower than maximum depth of plants	484	434	370
Frequency of occurrence at sites shallower than maximum depth of plants (%)	93.39	87.1	92.7
Simpson Diversity Index	0.84	0.83	0.87
Maximum Depth of Plants (Feet)	10	10	9.5
Taxonomic Richness (Number Taxa - includes visuals)	34	26	30
Average Number of Species per Site (less than max depth of plant growth)	2.7	2.1	2.81
Average Number of Species per Site (sites with vegetation)	2.89	2.41	3.03
Average Number of Native Species per Site (less than max depth of plant growth)	2.66	2.1	2.75
Average Number of Native Species per Site (sites with vegetation)	2.85	2.41	2.97

*Surveys prior to 2010 were not completed as point-intercept surveys and are not included

Table 3: Frequency of Occurrence of Aquatic Plant Species by Year, White Lake, Waupaca County, Wisconsin.

Species	Frequency of Occurrence by Year^			
	2002	2010	2015	2019
Eurasian water-milfoil	**8**	**2.89**	**---**	**5.14**
Curly-leaf pondweed	**---**	**0.62**	**---**	**---**
Purple loosestrife	**---**	**0***	**---**	**---**
Water marigold	3.4	7.85	8.99	5.14
Watershield	1.1	3.93	2.07	4.86
Coontail	2.8	---	0.46	1.89
Muskgrass (chara)	13.1	1.45	7.14	10.54
Common waterweed	21	---	13.59	7.57
Needle spikerush	2.3	0.21	---	---
Water stargrass	0.6	---	---	---
Brown-fruited rush	---	---	---	0.27
Quillwort sp.	---	---	---	---
Water lobelia	---	0.21	---	---
Various-leaved water-milfoil	2.3	---	---	---
Northern water-milfoil	5.1	1.65	---	0.27
Whorled water-milfoil	0.6	0.21	0.23	---
Southern naiad	56.3	72.31	64.29	79.46
Nitella	---	0.62	---	---
Spatterdock	1.7	---	---	0.27
White water lily	4	3.51	2.53	5.95
Pickerelweed	2.3	0.41	---	0.54
Large-leaf pondweed	51.7	39.88	3.69	31.62
Frie's pondweed	---	0*	0.23	0.27
Variable pondweed	---	1.45	---	1.35
Illinois pondweed	3.4	5.37	3.46	2.70
Floating-leaf pondweed	1.7	5.58	0.69	2.97
Blunt-leaf pondweed	---	---	---	0.54
White-stem pondweed	21	20.04	24.65	18.38
Small pondweed	---	0.83	---	---
Stiff pondweed	---	0.83	0.23	---
Flat-stem pondweed	6.8	7.44	0.23	6.49
White water crowfoot	2.8	---	---	---
Arrowhead sp.	---	---	---	3.51
Crested arrowhead	---	2.48	9.68	---
Arum-leaved arrowhead	---	---	1.15	---
Hardstem bulrush	3.4	1.45	1.15	4.86
Sago pondweed	0.6	3.31	0.69	1.62
Cattail sp.	---	---	1.61	2.16
Narrow-leaved cattail	---	0.62	---	---
Broad-leaved cattail	---	0.21	---	---
Creeping bladderwort	---	1.03	---	0.27
Small bladderwort	---	0.41	0.23	---
Large purple bladderwort	---	---	2.30	8.92
Common bladderwort	2.8	0.62	1.15	2.43
Wild celery	12.5	60.54	48.39	39.19
Wild rice	14.8	13.84	10.60	28.92
Hybrid pondweed (P. amplifolius x illinoensis)	---	8.06	0.69	2.43

* - recorded as visual only

--- - species not sampled

^ - surveys prior to 2002 were not comprehensive and without frequency data

Table 4: Average Rake Fullness of Aquatic Plant Species by Year, White Lake, Waupaca County, Wisconsin.

Species	Average Rake Fullness Rating		
	2015	2019	Change
Total Rake Fullness	1.53	1.85	0.32
Eurasian water-milfoil	**---**	**1.05**	**1.05**
Water marigold	1.03	1.00	-0.03
Watershield	1.22	1.06	-0.16
Coontail	1.00	1.43	0.43
Muskgrass (chara)	1.25	1.03	-0.22
Common waterweed	1.17	1.04	-0.13
Brown-fruited rush	---	1.00	1.00
Northern water-milfoil	---	1.00	1.00
Whorled water-milfoil	1.00	---	-1.00
Southern naiad	1.18	1.37	0.19
Spatterdock	---	1.00	1.00
White water lily	1.00	1.00	0.00
Pickerelweed	---	1.00	1.00
Large-leaf pondweed	1.00	1.05	0.05
Frie's pondweed	1.00	1.00	0.00
Variable pondweed	---	1.00	1.00
Illinois pondweed	1.00	1.00	0.00
Floating-leaf pondweed	1.00	1.00	0.00
Blunt-leaf pondweed	---	1.00	1.00
White-stem pondweed	1.07	1.00	-0.07
Stiff pondweed	1.00	---	-1.00
Flat-stem pondweed	1.00	1.04	0.04
Arrowhead sp.	---	1.00	1.00
Crested arrowhead	1.02	---	-1.02
Arum-leaved arrowhead	1.20	---	-1.20
Hardstem bulrush	1.00	1.00	0.00
Sago pondweed	1.00	1.00	0.00
Cattail sp.	1.00	1.13	0.13
Creeping bladderwort	---	1.00	1.00
Small bladderwort	1.00	---	-1.00
Large purple bladderwort	1.30	1.00	-0.30
Common bladderwort	1.20	1.00	-0.20
Wild celery	1.26	1.03	-0.23
Wild rice	1.07	1.01	-0.06
Hybrid pondweed (P. amplifolius x illinoensis)	1.00	1.00	0.00

--- - species was not sampled

Table 5: FQI Breakdown by species for White Lake, Waupaca County, Wisconsin

	Coefficient of Conservatism			
Common Name	**2002**	**2010**	**2015**	**2019**
Water marigold	8	8	8	8
Watershield	6	6	6	6
Coontail	3	---	3	3
Muskgrass (chara)	7	7	7	7
Common waterweed	3	---	3	3
Needle spikerush	5	5	---	---
Water stargrass	6	---	---	---
Brown-fruited rush	---	---	---	8
Quillwort sp.	---	---	8	---
Water lobelia	---	10	---	---
Various-leaved water-milfoil	7	---	---	---
Northern water-milfoil	6	6	---	6
Whorled water-milfoil	8	8	8	---
Southern naiad	8	8	7	8
Nitella	---	7	---	---
Spatterdock	6	---	---	6
White water lily	6	6	6	6
Pickerelweed	8	8	---	8
Large-leaf pondweed	7	7	7	7
Frie's pondweed	---	8	8	8
Variable pondweed	---	7	---	7
Illinois pondweed	6	6	6	6
Floating-leaf pondweed	5	5	5	5
Blunt-leaf pondweed	---	---	---	9
White-stem pondweed	8	8	8	8
Small pondweed	---	7	---	---
Stiff pondweed	---	8	8	---
Flat-stem pondweed	6	6	6	6
White water crowfoot	8	---	---	---
Crested arrowhead	---	9	9	---
Arum-leaved arrowhead	---	---	7	---
Hardstem bulrush	6	6	6	6
Sago pondweed	3	3	3	3
Cattail sp.	---	---	1	1
Narrow-leaved cattail	---	1	---	---
Broad-leaved cattail	---	1	---	---
Creeping bladderwort	---	9	---	9
Small bladderwort	---	10	10	---
Large purple bladderwort	---	---	9	9
Common bladderwort	7	7	7	7
Wild celery	6	6	6	6
Wild rice	8	8	8	8
Total Species	25	30	26	27
Mean C	6.28	6.70	6.54	6.44
Floristic Quality Index (FQI)	**31.40**	**36.70**	**33.34**	**33.49**

Table 7: Statistical Significance of Species between Sampling Events, White Lake, Waupaca County, Wisconsin

Species	2019 v 2002			2019 v 2010			2019 v 2015		
	P-value	Significance	+ / -	P-value	Significance	+ / -	P-value	Significance	+ / -
Eurasian water-milfoil	0.661149645	n.s.	↑	0.43134	n.s.	+	2.10695E-10	***	↑
Curly-leaf pondweed	---	---	---	0.129251	n.s.	↓	---	---	---
Purple loosestrife	---	---	---	0.381657	n.s.	↓	---	---	---
Water marigold	0.227890217	n.s.	↑	0.159221	n.s.	↓	0.052301405	n.s.	↓
Watershield	0.008181227	**	↑	0.486638	n.s.	↑	0.018282353	*	↑
Coontail	0.482408733	n.s.	↓	0.002378	**	↑	0.054564493	n.s.	↑
Muskgrass (chara)	0.373999139	n.s.	↓	5.43E-09	***	↑	0.088535078	n.s.	↑
Common waterweed	2.71538E-06	***	↓	7.57E-10	***	↑	0.006108834	**	↓
Needle spikerush	0.003291283	**	↓	0.381657	n.s.	↓	---	---	---
Water stargrass	0.19022281	n.s.	↓	---	---	---	---	---	---
Brown-fruited rush	0.444444125	n.s.	↑	0.25246	n.s.	↑	0.278492102	n.s.	↑
Quillwort	---	---	---	---	---	---	---	---	---
Water lobelia	---	---	---	0.381657	n.s.	-	---	---	---
Various-leaved water-milfoil	0.003291283	**	↓	---	---	---	---	---	---
Northern water-milfoil	6.99768E-05	***	↓	0.049917	*	↓	0.278492102	n.s.	↑
Whorled water-milfoil	0.19022281	n.s.	↓	0.381657	n.s.	↓	0.355536963	n.s.	↓
Southern naiad	3.35673E-09	***	↑	0.016268	*	↑	2.14816E-06	***	↑
Nitella	---	---	---	0.129251	n.s.	↓	---	---	---
Spatterdock	0.044627882	*	↓	0.25246	n.s.	↑	0.278492102	n.s.	↑
White water lily	0.051136391	n.s.	↑	0.009464	**	↑	0.000205905	***	↑
Pickerelweed	0.130122451	n.s.	↓	0.74057	n.s.	↑	0.060191565	n.s.	↑
Large-leaf pondweed	6.74222E-06	***	↓	0.038286	*	↓	4.96001E-28	***	↑
Frie's pondweed	0.444444125	n.s.	↑	0.848752	n.s.	↑	0.909972438	n.s.	↑
Variable pondweed	0.059943846	n.s.	↑	0.835714	n.s.	↑	0.007748265	**	↑
Illinois pondweed	0.708123998	n.s.	↓	0.05441	n.s.	↓	0.539532367	n.s.	↓
Floating-leaf pondweed	0.318727426	n.s.	↑	0.105262	n.s.	↓	0.007688595	**	↑
Blunt-leaf pondweed	0.279079685	n.s.	↑	0.105368	n.s.	↑	0.125138745	n.s.	↑
White-stem pondweed	0.467414756	n.s.	↓	0.54191	n.s.	↓	0.031604642	*	↓
Small pondweed	---	---	---	0.07964	n.s.	↓	---	---	---
Stiff pondweed	---	---	---	0.07964	n.s.	↓	0.355536963	n.s.	↓
Flat-stem pondweed	0.969841382	n.s.	↑	0.818586	n.s.	↓	9.7244E-08	***	↑
White water crowfoot	0.001271052	**	↓	---	---	---	---	---	---
Arrowhead sp.	0.005337547	**	↑	3.25E-05	***	↑	8.25376E-05	***	↑
Crested arrowhead	---	---	---	0.002286	**	↓	7.9188E-10	***	↓
Arum-leaeved arrowhead	---	---	---	---	---	---	0.038351873	*	↓
Hardstem bulrush	0.998683495	n.s.	↑	0.503279	n.s.	↑	0.039952477	*	↑
Sago pondweed	0.150415852	n.s.	↑	0.205961	n.s.	↓	0.125766008	n.s.	↑
Cattail sp.	0.001942882	**	↑	3.87E-06	***	↑	0.021522284	*	↑
Narrow-leaved cattail	---	---	---	0.07964	n.s.	↓	---	---	---
Broad-leaved cattail	---	---	---	0.0499	*	↓	---	---	---
Creeping bladderwort	0.444444125	n.s.	↑	0.186015	n.s.	↓	0.278492102	n.s.	↑
Small bladderwort	---	---	---	0.215735	n.s.	↓	0.355536963	n.s.	↓
Large purple bladderwort	6.2356E-06	***	↑	2.07E-11	***	↑	3.2541E-05	***	↑
Common bladderwort	0.798438887	n.s.	↓	0.025747	*	↑	0.166561703	n.s.	↑
Wild celery	3.40761E-12	***	↑	1.65E-09	***	↓	0.013798205	*	↓
Wild rice	2.60205E-11	***	↑	9.96E-17	***	↑	7.46733E-24	***	↑

* - somewhat significant change, ** - moderatly significant change, *** - very significant change

n.s. - Change not significant

--- - Specie was not sampled in both comparison years