

Town of Plum Lake

Aquatic Plant Point Intercept Report: Dorothy Dunn, Jean, and Wharton Lakes

November 11, 2023

Prepared By: North Lakeland Discovery Center



500' 0' 500' 1000' 1,500 2,000

SCALE

◆ Access ◆ Access with Parking ◆ Boat Livery

Drawn by: R. Williams

Field work by: J. Smith, K. Arnold, K. Montreig

OF FISH

	Abundant	Common	Present
Muskie	X		
N. Pike	X		
Walleye	X		
L. M. Bass	X		
S. M. Bass	X		
Panfish	X		
Trout			
Cisco	X		

WATER AREA 807.73

UNDER 3 FT. 5

OVER 20 FT. 45

MAX. DEPTH 53

TOTAL ALK. 37

VOLUME 14,258.28 A

MAIN SHORELINE 6.98

ISLAND SHORELINE 1.05

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INTRODUCTION

The following report provides the results and analysis of the aquatic vegetation found in three lakes through point-intercept surveys conducted by the North Lakeland Discovery Center (NLDC) in the Town of Plum Lake. The three lakes included Dorothy Dunn, Jean, and Wharton Lakes. These surveys were funded by the Town of Plum Lake Lakes Committee. The point-intercept surveys were conducted in July and August of 2023 during peak aquatic vegetation growth. The purpose of the aquatic plant point-intercept survey is to provide data regarding the species present, abundance, and species richness on each lake.

Aquatic plants are vital to the well-being of a lake ecosystem. They provide functions and services to ecosystems such as breeding habitat, water purification, and soil stabilization. Additionally, they provide food and shelter for a variety of animals including moose, deer, waterfowl, fish, turtles, zooplankton, and macroinvertebrates. Despite their many contributions, some people still view plants as a nuisance. Although there are aquatic invasive species which can cause damage, most aquatic plants are essential for maintaining a healthy ecosystem (Skawinski 2022).

Aquatic invasive species are organisms which have spread beyond their natural range. The presence of aquatic invasive species in Northern Wisconsin, such as curly-leaf pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (*Myriophyllum spicatum*), has had a negative impact on the quality of many water bodies. These species outcompete native plant species for space and energy, resulting in an overall decrease in plant biodiversity. Point-intercept surveys are an effective way to detect aquatic invasive species and to understand the aquatic plant communities of each lake.

On Dorothy Dunn Lake, 16 different species of aquatic plants and algae were found (Table 1). On Jean Lake, 13 different species of aquatic plants and algae were found (Table 2). On Wharton Lake, 6 different species of aquatic plants and algae were found (Table 3). Overall, throughout the three point-intercept surveys, 29 different species were found (Table 4). No aquatic invasive species were found on any of the three lakes. Although there was an overlap of species among lakes, each lake's diversity of plants creates its own unique ecosystem. The following report provides information on the point-intercept methods, vegetation found on each lake, and summary of the results found.

METHODS

The point-intercept method used on the Dorothy Dunn, Jean, and Wharton lakes was developed by the Wisconsin Department of Natural Resources (WDNR) named as the "Recommended Baseline Monitoring of Aquatic Plants in Wisconsin: Sampling Design, Field and Laboratory Procedures, Data Entry and Analysis, and Applications" document. The point-intercept survey was conducted using a geo-referenced sampling grid, developed by the WDNR, input into GPS devices. Using a canoe or small boat and a GPS, each point was sampled. At each site, the plant community is surveyed with a pole rake sampler to determine species presence and rake fullness rating. The rake is dropped until it touches the lake bottom, spun around 3 times then is pulled up and given a rake fullness rating. This rating is an estimate of the total coverage of plants on the rake from 1-3. One is a few total plants, two is moderate total plants, and three is abundant total plants. When no plants were on the rake, the rake fullness rating was recorded as zero. Each aquatic plant species on the rake was identified and given a rake fullness rating based on its prevalence on the rake. The overall rake fullness and individual plant rake fullness were both recorded on the data sheet. Aquatic plant species that were not pulled up on the rake but

were visible within six feet of the point were recorded as visual sightings (V) on the data sheet. Boat observations (BO) were species observed that were not raked or visually recorded within six feet of a point. The depth at each point was determined by a depth finder or by foot markings on the rake or rope and recorded on the data sheet. The sediment type (mucky, sandy, or rocky) of the lake bottom was determined by the feel of the rake or when sediment was pulled up and was recorded. The three rakes used were a 7-foot pole rake, an extendable 8-foot pole rake, and a 25-foot rope rake. The pole rakes were used at depths of about 12 feet or less and the rope rake was used at depths that were unable to be reached by the pole rake. Sites that were inaccessible due to various reasons were recorded in categories labeled unnavigable, terrestrial, shallow, rocks, dock, swim area, temporary obstacle, or no information. Sites skipped due to depths greater than maximum depth of plants were labeled as deep on the data sheet. Visual observations of species within the six feet range were recorded (Hauxwell et al., 2010). Samples that were unidentifiable in the field were bagged and identified later using a microscope. Species that were found to be state endangered, threatened, or of special concern were collected and pressed to create an herbarium collection. Species of special concern are those that are becoming less common throughout its range and may soon become a threatened species. Threatened species are protected by law and are at risk of becoming endangered.

The WDNR provides an Excel spreadsheet called “The Aquatic Plant Survey Data Workbook” with formulas to generate statistics about the species found. All data collected from the survey on the field sheet is entered into the entry sheet on the Excel spreadsheet. Any boat surveys are input into the boat survey tab on the Excel sheet. Once all data is entered, the statistics are automatically generated. The statistics worksheet is broken down into individual species statistics and summary statistics. Individual species statistics include the frequency of

occurrence of plants, relative frequency, number of sites with vegetation, average rake fullness, and number of visual sightings. The summary statistics include the total number of sites visited, total number of sites with vegetation, sites shallower than the maximum depth of plants, frequency of occurrence, Simpson's Diversity Index, maximum depth of plants, sites sampled using pole or rope rake, average number of species per site, and species richness, including visuals. A maximum depth of plant colonization graph is automatically generated from the maximum depth data (Hauxwell et al., 2010).

The Simpson's Diversity Index is an estimator of community diversity. It is based on the relative frequency of plants on the lake, and it is not impacted by the visual plant data. Simpson's Diversity Index is based on a scale of 0-1. The closer to 1, the more diverse the plant community is (Hauxwell et al., 2010).

Finally, the worksheet calculates the Floristic Quality Index (FQI). The FQI metric is used to evaluate sampled plant communities' closeness to an undisturbed plant community. In Wisconsin, there is a demand by the WDNR, local governments, and lakeshore riparian for considering the quality of lake plant communities in a variety of planning, zoning, sensitive area designation, and aquatic plant management decisions. Floristic quality provides a standardized analysis technique, which aids in the development of regional and temporal trends of plant community "health". The floristic quality (I) = the average coefficient of conservatism (C) multiplied by the square root of the number of species in the lake ($\sqrt{N}$). All native species are included in the number of species. Conservatism (C) is the likelihood of a plant occurring in a landscape that is not relatively impacted by settlement. The collection of values ranges from 0-10, 10 being the species that are most sensitive to disturbance. Plants are assigned a C value

based on substrate preference, tolerance to turbidity, rooting strength, reproductive means, and water drawdown tolerance (Nichols 1999).

To understand the results, the *I*, *C*, and *N* are compared to state and regional values. Statewide, the median number of species per lake is 13, with ranges from 1-44 species. The *C* value had a median of six, with ranges from 2-9.5. Finally, the *I* value had a median value of 22.2, with ranges from 3-44.6. As *C* values can vary region to region, the state is broken up into eight different ecoregions. The three lakes surveyed are all in the Northern Lakes and Forests Ecoregion. The median number of species in this ecoregion is 13. The median *C* value is 6.7 and the median *I* is 24.3 (Nichols 1999). Each lake surveyed will be compared to these values in the following sections of the report.

RESULTS: Dorothy Dunn Lake Aquatic Vegetation

Dorothy Dunn Lake had 303 total points plotted and of those points, 253 were accessible. 50 points were considered non-navigable due to a high abundance of emergent plants or if the point was on shore. 143 sites visited were sampled with a pole rake, while the remaining 110 depths, those deeper than the maximum depth of plants, were calculated using a Secchi disk. The maximum depth of plants on Dorothy Dunn was 13 feet deep, and the overall maximum depth was 27 feet. Therefore, 179 sites were shallower than the maximum depth of plants. The total number of sites with vegetation was 118. The average rake fullness rating was 1.71, with 50 sites resulting in a rake fullness of zero. The distribution total rake fullness is shown on Map 1. The frequency of occurrence of plants at sites shallower than maximum depth of plants was 65.92%. The average number of species per site shallower than maximum depth was 1.25. The average number of species per site for all vegetated sites was 2.00. The overall species richness was 15 species, pulled up on the rake during sampling. The species richness including visual sightings was 16 species. The Simpson Diversity Index for Dorothy Dunn Lake is .86. This value indicates a high diversity for the lake.

The three most relatively frequent plants on Dorothy Dunn were Watershield (*Brasenia schreberi*), Common bladderwort (*Utricularia vulgaris*), and white waterlily (*Nymphaea odorata*). Watershield had a relative frequency of 22.9% and its distribution is shown on Map 2. Common bladderwort had a relative frequency of 18.2% and its distribution is shown on Map 3. White waterlily had a relative frequency of 14.4% (Figure 1) and its distribution is shown on Map 4.

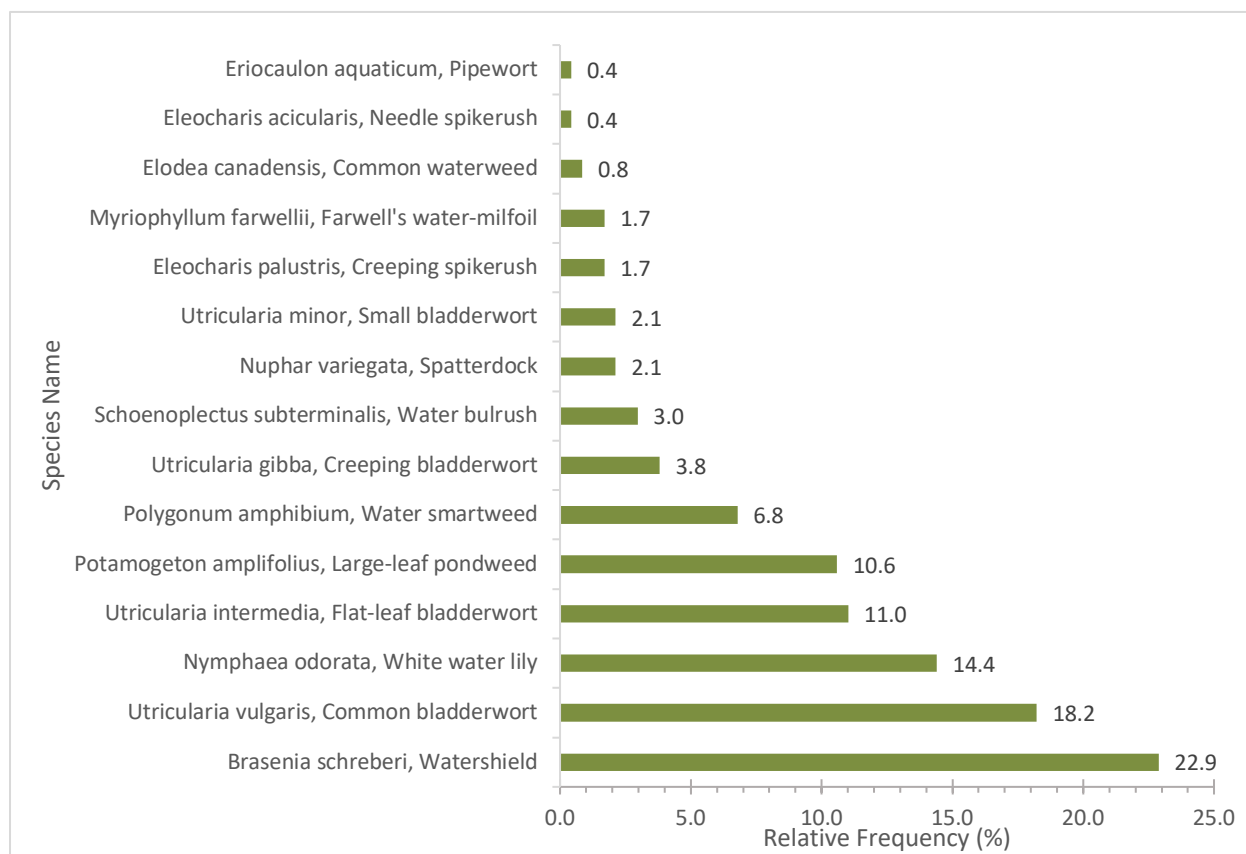


Figure 1. Dorothy Dunn Lake 2023 relative frequency (%) of occurrence of aquatic plant species collected in rake during the 2023 point-intercept survey.

Watershield is a floating species that has a stem upwards of two meters long. The stem is attached to the center on the underside of the leaf with a clear mucus that covers the stem and underside of the leaf. Veins radiate from the center of the leaf and leaves are often 5-15 cm long and can be submergent in early stages. The flower is produced in mid-summer. The flower is a red-purple color that is emergent and about 2 cm wide. Watershield is a common species found in mucky sediment of lakes and streams (Skawinski 2022). Common bladderwort is a submergent plant that finely divided leaves. The tops of the plant are often very bushy. It floats either just beneath the surface or sits upright in the sediment. Leaves branch between three to nine times and are alternate, with tiny hairs on the leaflet margins. Bladderworts are carnivorous plants with bladders that swallow animal prey like zooplankton. Bladders are abundant on

leaflets of common bladderwort. A small, 5-parted, yellow flower is produced mid-summer with a horn like petal below the lower lip. Common bladderwort is found in shallow and deep water and is a common species found in lakes (Skawinski 2022). White water lily is a floating plant with very large round leaves, up to 30 cm in diameter. They are green to purple in color and have a notch from the center of the leaf to the edge. The outer edge of the notch comes to a slight point; 6-27 veins radiate from the petiole. In mid-summer, white flowers are produced with a yellow center. The flower is up to 19 cm across and has 17-43 petals. White water lilies spread by spongy rhizomes that can be very large. It is a common species found in mucky sediments, ranging from shallow water to a few meters deep (Skawinski 2022). No species listed as special concern, threatened, or endangered were found at Dorothy Dunn Lake.

The Floristic Quality Index for Dorothy Dunn is 27.1; this is higher than both the state and ecoregional median values of 22.2 and 24.3 respectively. The mean conservatism is 7, which is higher than the state median value of six and the ecoregional value of 6.7. This indicates that the species on Dorothy Dunn have an average sensitivity to disturbance. The number of species is 15 (not including moss or algae), which is slightly higher than the state and ecoregional medians of 13 (Figure 2).

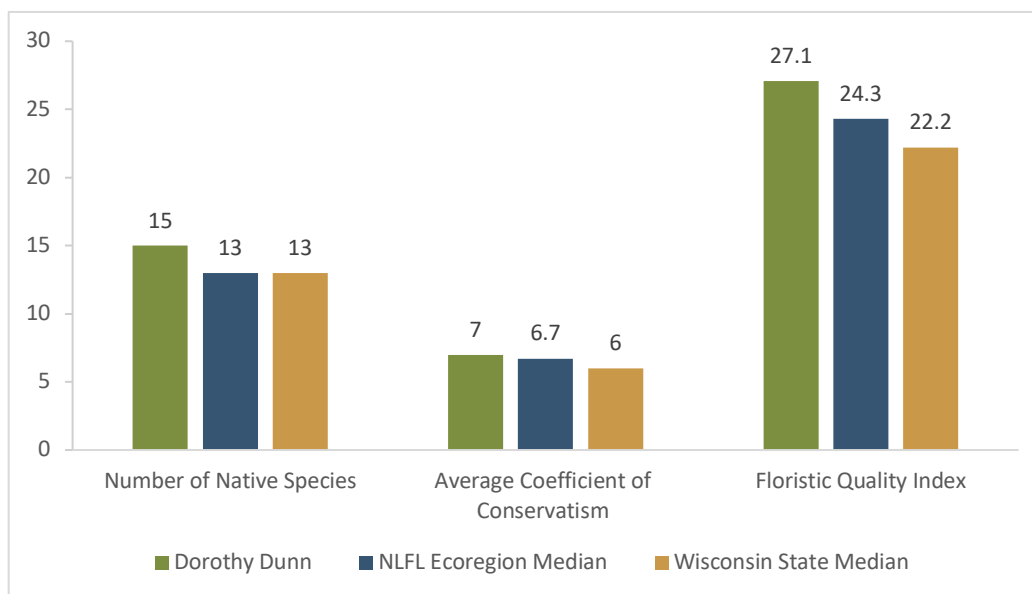


Figure 2. Floristic Quality Assessment of Dorothy Dunn Lake. Created using data from 2023 point intercept survey. Analysis follows Nichols (1999).

Table 1. Dorothy Dunn Lake aquatic species list. Recorded during the 2023 aquatic plant survey on Dorothy Dunn Lake, Vilas County, WI.

Growth	Species	Common Name	Presence
Emergent	<i>Eleocharis acicularis</i>	Needle spikerush	X
Emergent	<i>Eleocharis palustris</i>	Creeping spikerush	X
Emergent	<i>Eriocaulon aquaticum</i>	Pipewort	X
Emergent	<i>Polygonum amphibium</i>	Water smartweed	X
Emergent	<i>Schoenoplectus subterminalis</i>	Water bulrush	X
Emergent	<i>Sparganium sp.</i>	Bur-reed	V
Floating	<i>Brasenia schreberi</i>	Watershield	X
Floating	<i>Nuphar variegata</i>	Spatterdock	X
Floating	<i>Nymphaea odorata</i>	White water lily	X
Submergent	<i>Elodea canadensis</i>	Common waterweed	X
Submergent	<i>Myriophyllum farwellii</i>	Farwell's water-milfoil	X
Submergent	<i>Potamogeton amplifolius</i>	Large-leaf pondweed	X
Submergent	<i>Utricularia gibba</i>	Creeping bladderwort	X
Submergent	<i>Utricularia intermedia</i>	Flat-leaf bladderwort	X
Submergent	<i>Utricularia minor</i>	Small bladderwort	X
Submergent	<i>Utricularia vulgaris</i>	Common bladderwort	X

X = LOCATED ON RAKE DURING POINT INTERCEPT SURVEY

V = VISUAL; SEEN DURING SURVEY, BUT NEVER PICKED UP ON RAKE

BO = BOAT OBSERVATIONS; LOCALIZED OCCURANCES OF SPECIES OUTSIDE THE POINT-INTERCEPT GRID OR IN BETWEEN SAMPLING SITES

*= SPECIES OF SPECIAL CONCERN

**= THREATENED SPECIES

***= ENDANGERED SPECIES

RESULTS: Jean Lake Aquatic Vegetation

Jean Lake had 110-plotted points, 102 of which were visited. Eight sites were non-navigable due to high plant concentration, or the point was terrestrial. 87 sites were sampled with a pole rake, while 4 were sampled with a rope rake. The maximum depth of Jean was 17 feet, and the maximum depth of plants was 8 feet. The total number of sites with vegetation was 74. Therefore, the frequency of occurrence of plants at all visited sites was 89.16%. The average rake fullness was 1.45, and 11 sites had a rake fullness of zero. The distribution of total rake fullness is shown on Map 5. The average number of species per site shallower than the maximum depth of plants was 1.22. The average number of species per site at vegetated sites was 1.36. The species richness for plants pulled up on the rake was 14, including visuals and boat observations. The total number of species including boat observations was 14. The Simpson's Diversity Index for Jean Lake is 0.84. This indicates a high biodiversity of plants in Jean Lake.

The three most relatively frequent plants observed on Jean Lake were northern naiad (*Najas gracillima*), small pondweed (*Potamogeton pusillus*), and white waterlily (*Nymphaea odorata*). Northern naiad had a relative frequency of 25.70% and its distribution is shown on Map 6. Small pondweed had a relative frequency of 17.8% and its distribution is shown on Map 7. White waterlily had a relative frequency of 14.9% (Figure 3) and its distribution is shown on Map 8.

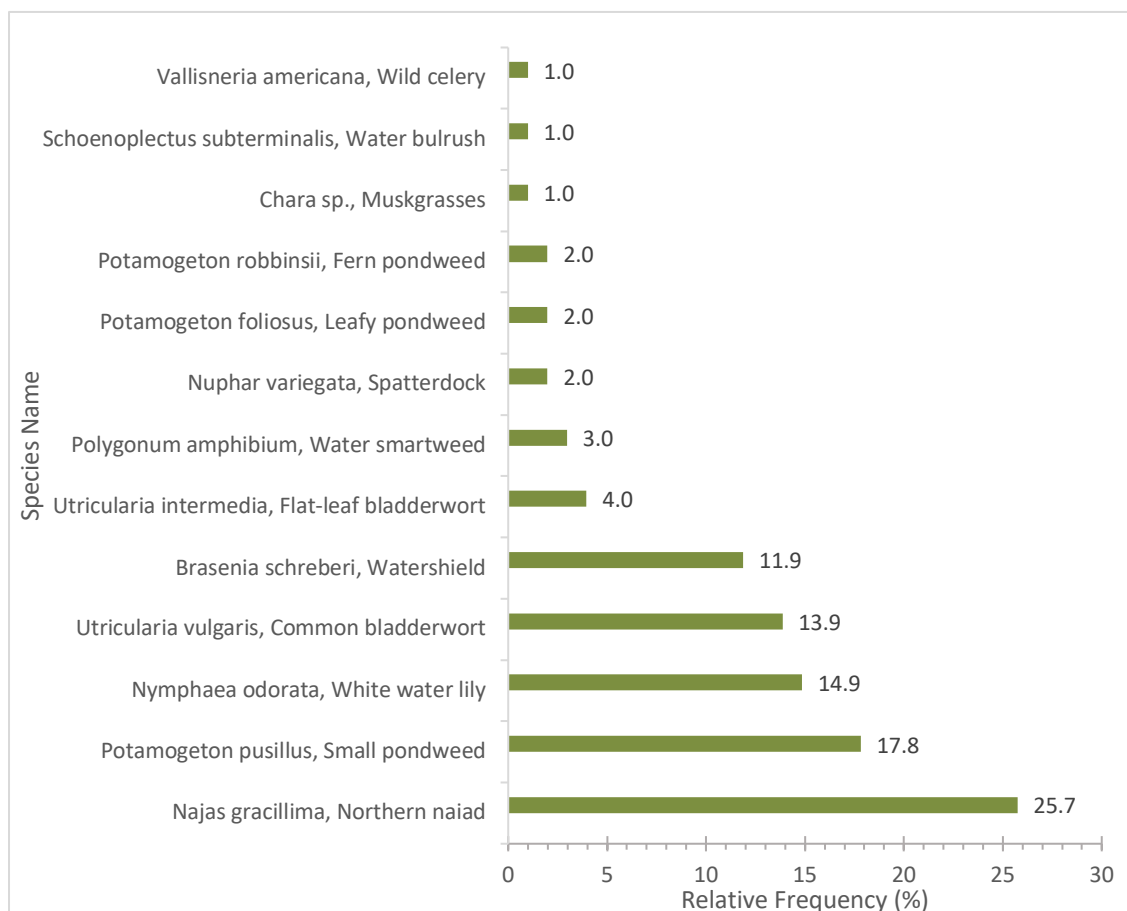


Figure 3. Jean Lake relative frequency (%) of occurrence of aquatic plant species collected in rake during the 2023 point-intercept survey.

Northern naiad (*Najas gracillima*) is typically found in clear lakes with soft sediment and was the most frequent species found in Jean Lake. Not to be confused with slender naiad, it has delicate branches with opposite, narrow, light-green leaves that clasp to the stem. The leaves contain 13-17 teeth per side, no petiole, and a jagged lobe at the base. The fruits can be dark green to light brown and are found forming in the leaf. Northern naiad is intolerant of pollution and is considered a species of special concern in Wisconsin (Skawinski 2020). Small pondweed (*Potamogeton pusillus*) is commonly found in lakes and streams with soft sediments. The leaves have a pointed tip, a prominent midvein, and 3-5 veins. At the base of leaves, tiny glands are usually present. The flowers are in a spike with 1-4 distinct whorls. The obovoid fruits have

concave sides and no keel. All small pondweeds had to be bagged in the field for further identification under a microscope because slender pondweed (*Potamogeton berchtoldii*) is a species that looks very similar. The difference is that the membranous stipules of *Potamogeton pusillus* are fused together on the lower half (adenate), with an obtuse tip. *Potamogeton berchtoldii* has stipules that are free from the stem and are not fused. The flowers of *P. berchtoldii* are found in 3 or more inflorescences with 1-3 crowded indistinct whorls (Skawinski 2020). The description of White waterlily has been mentioned previously in the Dorothy Dunn Lake section.

The Floristic Quality Index for Jean Lake is 24.7 which is higher than both the state and ecoregional median values. The mean value of conservatism is 6.8, which is slightly higher than both the state and ecoregional median values. Therefore, it is more sensitive to disturbance. The number of species is 24.7, which is greater than the state and ecoregional medians (Figure 4).

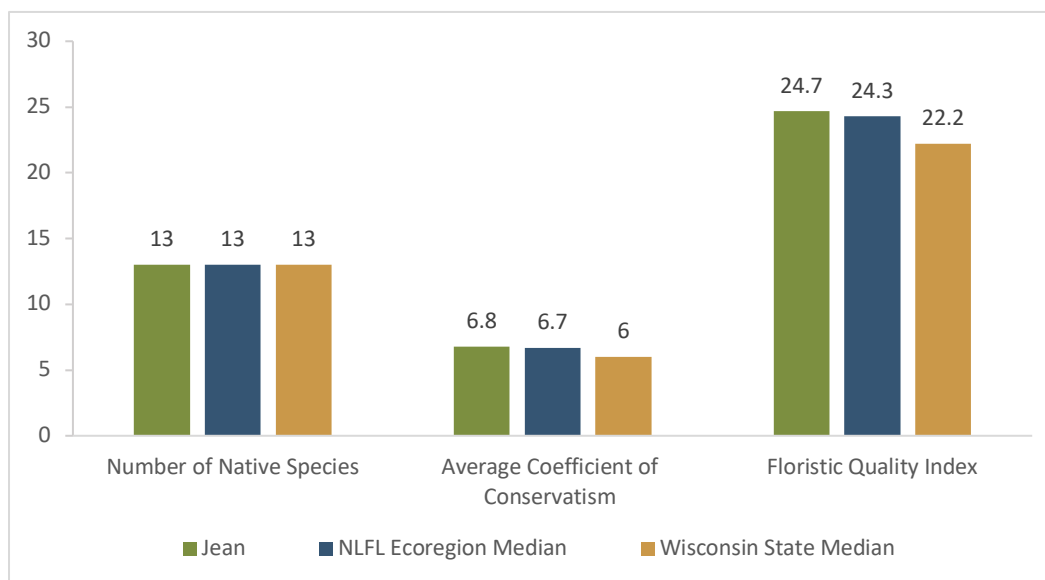


Figure 4. Floristic Quality Assessment of Jean Lake using data from 2023 point intercept survey. Analysis follows Nichols (1999).

Table 2. Jean Lake aquatic species list. Recorded during the 2023 aquatic plant survey on Jean Lake, Vilas County, WI.

Growth	Species	Common Name	Presence
Emergent	<i>Polygonum amphibium</i>	Water smartweed	X
Emergent	<i>Schoenoplectus subterminalis</i>	Water bulrush	X
Floating	<i>Brasenia schreberi</i>	Watershield	X
Floating	<i>Nuphar variegata</i>	Spatterdock	X
Floating	<i>Nymphaea odorata</i>	White water lily	X
Submergent	<i>Chara sp.</i>	Muskgrasses	X
Submergent	<i>Najas gracillima</i>	Northern naiad	X
Submergent	<i>Potamogeton amplifolius</i>	Large-leaf pondweed	BO
Submergent	<i>Potamogeton foliosus</i>	Leafy pondweed	X
Submergent	<i>Potamogeton pusillus</i>	Small pondweed	X
Submergent	<i>Potamogeton robbinsii</i>	Fern pondweed	X
Submergent	<i>Utricularia intermedia</i>	Flat-leaf bladderwort	X
Submergent	<i>Utricularia vulgaris</i>	Common bladderwort	X
Submergent	<i>Vallisneria americana</i>	Wild celery	X

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Wharton Lake had 141-plotted points, 140 of which were visited. One site was non-navigable due to the point being on land. 65 sites were sampled with the rope rake and 75 sites were sampled with the pole rake. The maximum depth of Wharton Lake is 24 feet. The maximum depth of plants was at 4 feet. The maximum depth of vegetation was 5 feet. Of the 140 sites visited, 16 sites were shallower than the maximum depth of plants. The total number of sites with vegetation was 5 sites. The frequency of occurrence of sites shallower than the maximum depth of plants was 31.25%. The average rake fullness was 1.60, with 136 sites with a rake fullness of zero. The distribution of total rake fullness is shown on Map 9. The average number of all species per site at depths shallower than the maximum depth of vegetation was .38. The average number of all species per site at vegetated sites was 1.20. The species richness for all sites with plants on the rakes was 4. The species richness including visuals was 6. The total number of species including boat observations was 6. The Simpson's Diversity Index for Wharton was .72; this indicates slightly above average plant diversity in the lake, yet lower than Dorothy Dunn and Jean Lake.

The top three most frequent plants observed on Wharton were spatterdock (*Nuphar variegata*), spiny-spored quillwort (*Isoetes echinospora*), and watershield (*Brasenia schreberi*). Spatterdock had a relative frequency of 33.3% and its distribution is shown on Map 10. Spiny-spored quillwort had a relative frequency of 33.3% and its distribution is shown on Map 11. Watershield had a relative frequency of 16.7% (Figure 5) and its distribution is shown on Map 12.

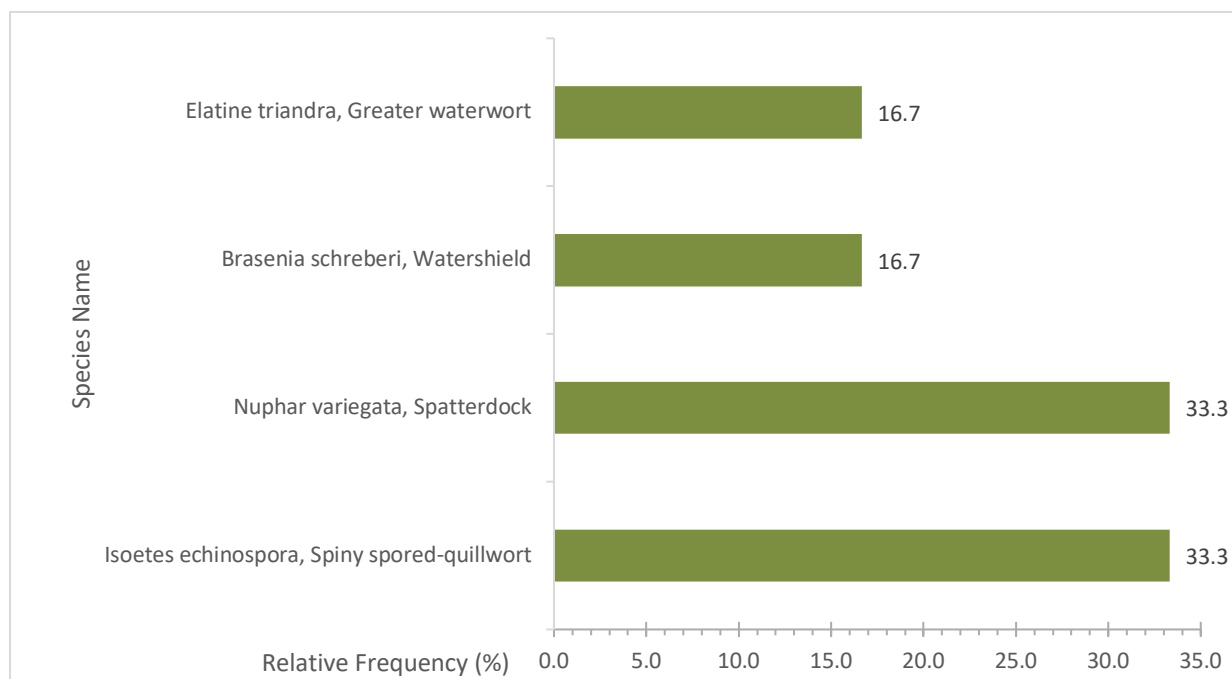


Figure 5. Wharton Lake 2023 relative frequency (%) of occurrence of aquatic plant species collected in rake during the 2023 point-intercept survey.

Spatterdock, also called bullhead pond lily (*Nuphar variegata*) has floating heart shaped leaves up to 40cm long. The stems are winged, which can be seen in a cross section. The cup-shaped yellow flower is held above the water and is 3-6 cm wide, containing 6-8 sepals. The rhizomes are thick and spongy, and when uprooted, they can form mats that we ran into more so on Jean and Dorothy Dunn Lakes, where *Nuphar variegata* was more abundant. Spiny-spored quillwort (*Isoetes echinospora*) is typically found in oligotrophic lakes with slightly acidic water. This submergent species has pointed leaves that form a wide rosette that grow from a fleshy underground stem. Slicing a leaf in half reveals 4 tiny air chambers that run the length of the leaves. Spores are produced in summer and are released into the water column, allowing for dispersal and asexual reproduction. The macrospores are covered by the swollen spoon-shaped base of the leaf. Under 80X magnification, *Isoetes echinospora* macrospores are spiny so all

Isoetes species had to be bagged in the field and identified later (Skawinski 2022). Watershield (*Brasenia schreberi*) is a very common species that is found in mucky soils. Species characteristics of watershield are described in the Dorothy Dunn Lake section. Greater waterwort (*Elatine triandra*) is a species of special concern found in sandy or mucky shallows of clear lakes. It is a small non-discript plant with opposite oval shaped leaves with no leaf stalk. Fruit and flower structures are found in the leaf axils. Fruits are 3 parted compared to the similar species common waterwort (*Elatine minima*) which has a 2 parted fruit (Skawinski 2020). Algal-lead pondweed (*Potamogeton confervoides*) is a threatened species found on Wharton during the survey. Often found in soft water or open bog lake. It has a stout rhizome with thin and thread-like submerged leaves. The leaves are one vein and have lacunar cells or empty spaces that occur from the midvein to the margin. The plant does not produce floating leaves. The fruiting and flower structures are held on the end of a long stout stalk. Fruits or achenes resemble the spiral shape of a snail but have 3 distinct ridges, one large sharp ridge in the middle and then 2 side ridges (Skawinski 2020).

The Floristic Quality Index for Wharton Lake is 14.5; which is lower than both the state and ecoregional median values. The mean value of conservatism is 7.25, which is higher than both the state and ecoregional median values. This indicates that the lake is sensitive to disturbance. The number of native species found is 4, which is much lower than the state and ecoregional number of species of 13 (Figure 6).

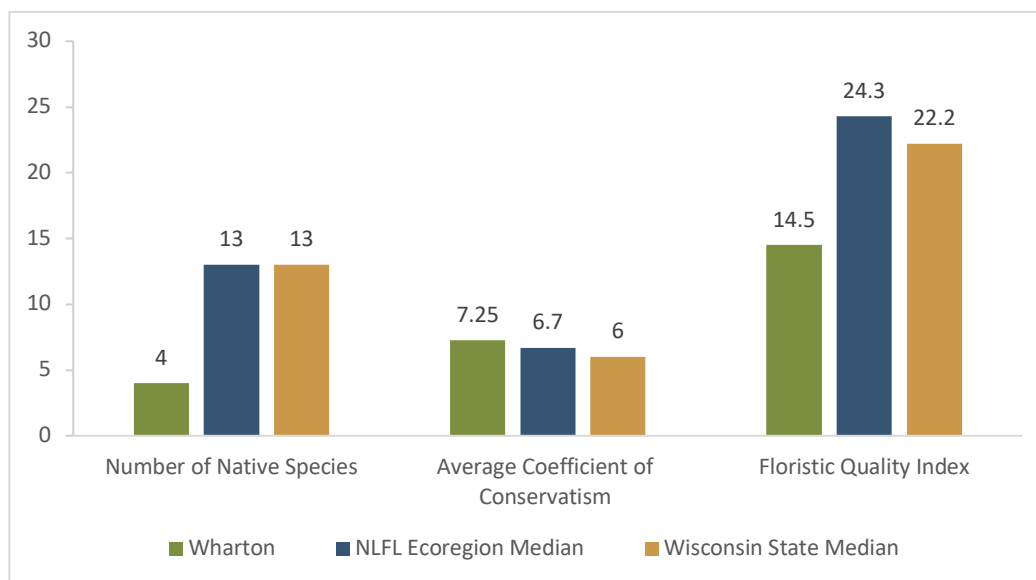


Figure 6. Floristic Quality Assessment of Wharton Lake. Created using data from 2023 point intercept survey. Analysis follows Nichols (1999).

Table 3. Wharton Lake aquatic species list. Recorded during the 2023 aquatic plant survey on Wharton Lake, Vilas County, WI.

Growth	Species	Common Name	Presence
Floating	<i>Brasenia schreberi</i>	Watershield	X
Floating	<i>Nuphar variegata</i>	Spatterdock	X
Submergent	<i>Elatine triandra</i>	Greater waterwort	X
Submergent	<i>Isoetes echinospora</i>	Spiny spored-quillwort	X
Submergent	<i>Potamogeton confervoides</i>	Algal-leaved pondweed	V
Submergent	<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	V
		Aquatic moss	X
		Filamentous algae	X

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CONCLUSION

Analysis of the data collected from the plant point-intercept surveys, conducted on the lakes of Dorothy Dunn, Jean, and Wharton, indicate that all three lakes have a healthy and diverse plant community. A baseline that led to the conclusion is that no aquatic invasive species were detected, the presence of which would indicate declining lake health or disturbance.

Another baseline that led to this conclusion is that two out of the three lakes had FQI values greater than the state and regional means. This is not surprising, given that northern Wisconsin is largely forested and the least developed out of the other ecoregions. Notably, Dorothy Dunn Lake had the highest Floristic Quality Index of 27.1, followed by Jean Lake's index of 24.7 which indicates a high floristic integrity. The state FQI values ranged from 3-44.6 with a median value of 22.2. Comparing Dorothy Dunn and Jean Lake to state values indicates that these lakes have a notable high quality of plant vegetation. Therefore, Dorothy Dunn, in comparison to the other lakes surveyed, is undisturbed; however, the plants present are highly sensitive to disturbances, as the conservatism value is 7 out of 10.

On the other hand, Wharton Lake had the lowest FQI value of 14.5 and a conservatism value of 7.25 out of 10. This indicates a low florist integrity and a higher sensitivity to changes in the proportion and distribution of vegetation. It is important to note that the FQI can be impacted by both the size and the heterogeneity of the lakes (Bernthal 2003). Smaller lakes, such as Wharton and Jean, can be impacted by this in their calculations and misrepresented due to low *N* value, resulting in a low *I* value.

Lastly, the Simpson Diversity index was another vital point of reference supporting the claim that the three lakes surveyed are healthy. Dorothy Dunn had the highest Simpson's Diversity Index of .86, followed by Jean at .84, and Wharton with .72. The closer the diversity

index is to 1, the more species diversity and even distribution of aquatic plants. Dorothy Dunn's index indicates that the lake has a very high diversity. Overall, all three lakes surveyed during the 2023 point intercept survey had a Simpson's diversity index of .66 or greater. Concluding that all three lakes' aquatic plants communities have above average species richness and evenness.

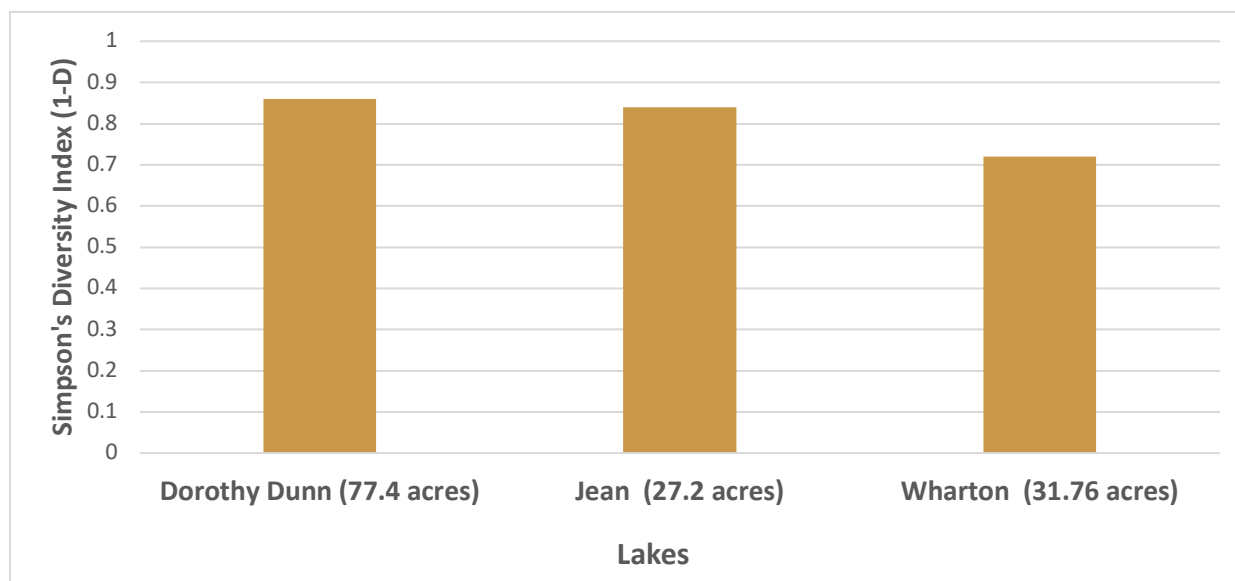


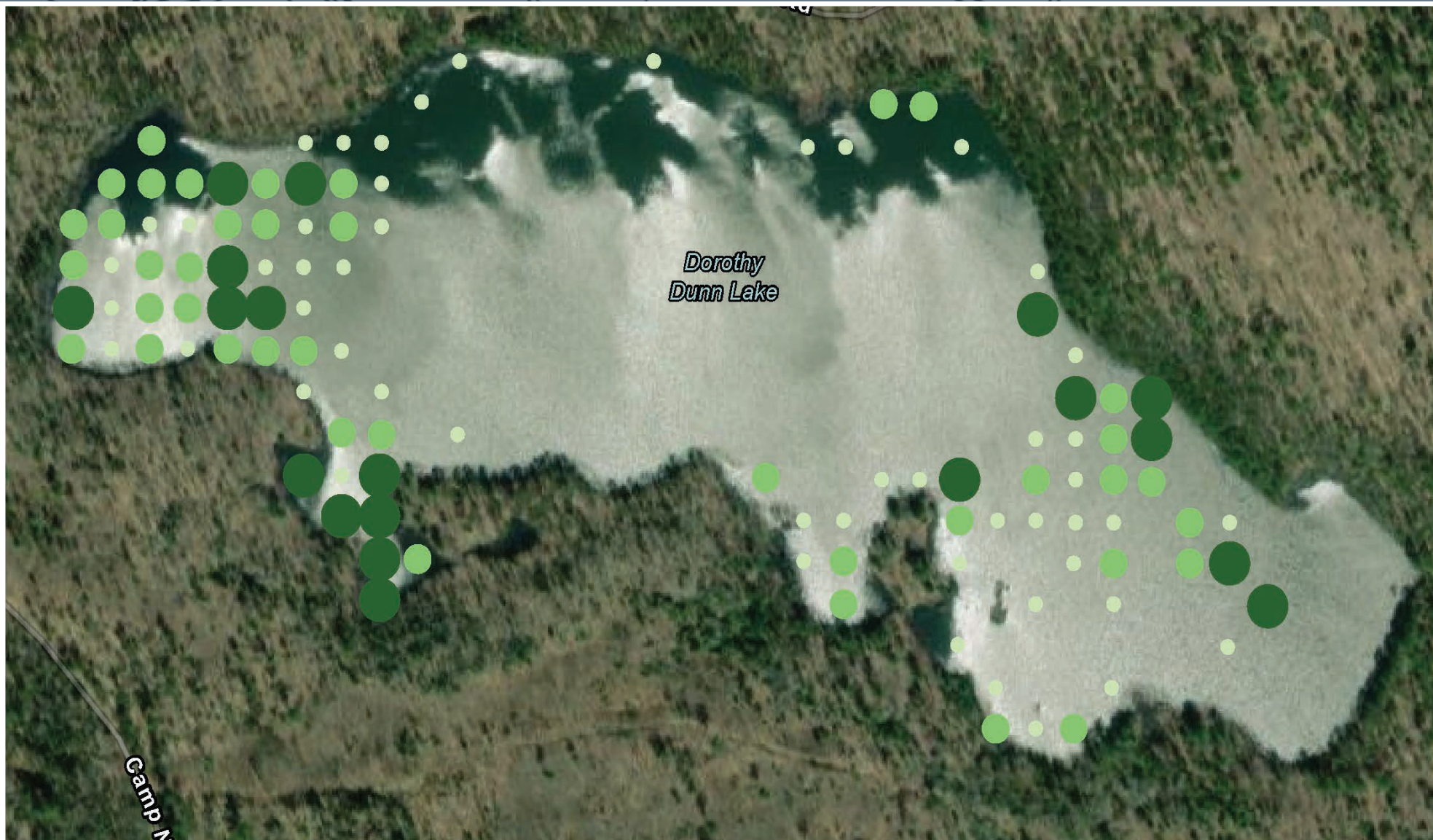
Figure 9. Simpson diversity index comparison of three lakes sampled during the 2023 plant intercept survey in Vilas County, WI.

Table 4. Total aquatic species list of all three lakes. Recorded during the 2023 aquatic plant survey in Vilas County, WI at Dorothy Dunn Lake, Jean Lake, and Wharton Lake.

Growth	Species	Common Name
Emergent	<i>Eleocharis acicularis</i>	Needle spikerush
Emergent	<i>Eleocharis palustris</i>	Creeping spikerush
Emergent	<i>Eriocaulon aquaticum</i>	Pipewort
Emergent	<i>Polygonum amphibium</i>	Water smartweed
Emergent	<i>Schoenoplectus subterminalis</i>	Water bulrush
Floating	<i>Brasenia schreberi</i>	Watershield
Floating	<i>Nuphar variegata</i>	Spatterdock
Floating	<i>Nymphaea odorata</i>	White water lily
Floating	<i>Sparganium sp.</i>	Bur-reed
Submergent	<i>Chara sp.</i>	Muskgrasses
Submergent	<i>Elatine triandra</i>	Greater waterwort
Submergent	<i>Elodea canadensis</i>	Common waterweed
Submergent	<i>Isoetes echinospora</i>	Spiny spored-quillwort
Submergent	<i>Myriophyllum farwellii</i>	Farwell's water-milfoil
Submergent	<i>Najas gracillima</i>	Northern naiad
Submergent	<i>Potamogeton amplifolius</i>	Large-leaf pondweed
Submergent	<i>Potamogeton confervoides</i>	Algal-leaved pondweed
Submergent	<i>Potamogeton foliosus</i>	Leafy pondweed
Submergent	<i>Potamogeton pusillus</i>	Small pondweed
Submergent	<i>Potamogeton robbinsii</i>	Fern pondweed
Submergent	<i>Potamogeton zosteriformis</i>	Flat-stem pondweed
Submergent	<i>Utricularia gibba</i>	Creeping bladderwort
Submergent	<i>Utricularia intermedia</i>	Flat-leaf bladderwort
Submergent	<i>Utricularia minor</i>	Small bladderwort
Submergent	<i>Utricularia vulgaris</i>	Common bladderwort
Submergent	<i>Vallisneria americana</i>	Wild celery
		Aquatic moss
		Filamentous algae

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Dorothy Dunn Lake - Map 1

Town of Plum Lake
Vilas County, Wisconsin

Total Rake Fullness Rating

LEGEND

Total Rake Fullness



3



2



1



0 0.05 0.1 0.2 mi
0 0.07 0.15 0.3 km

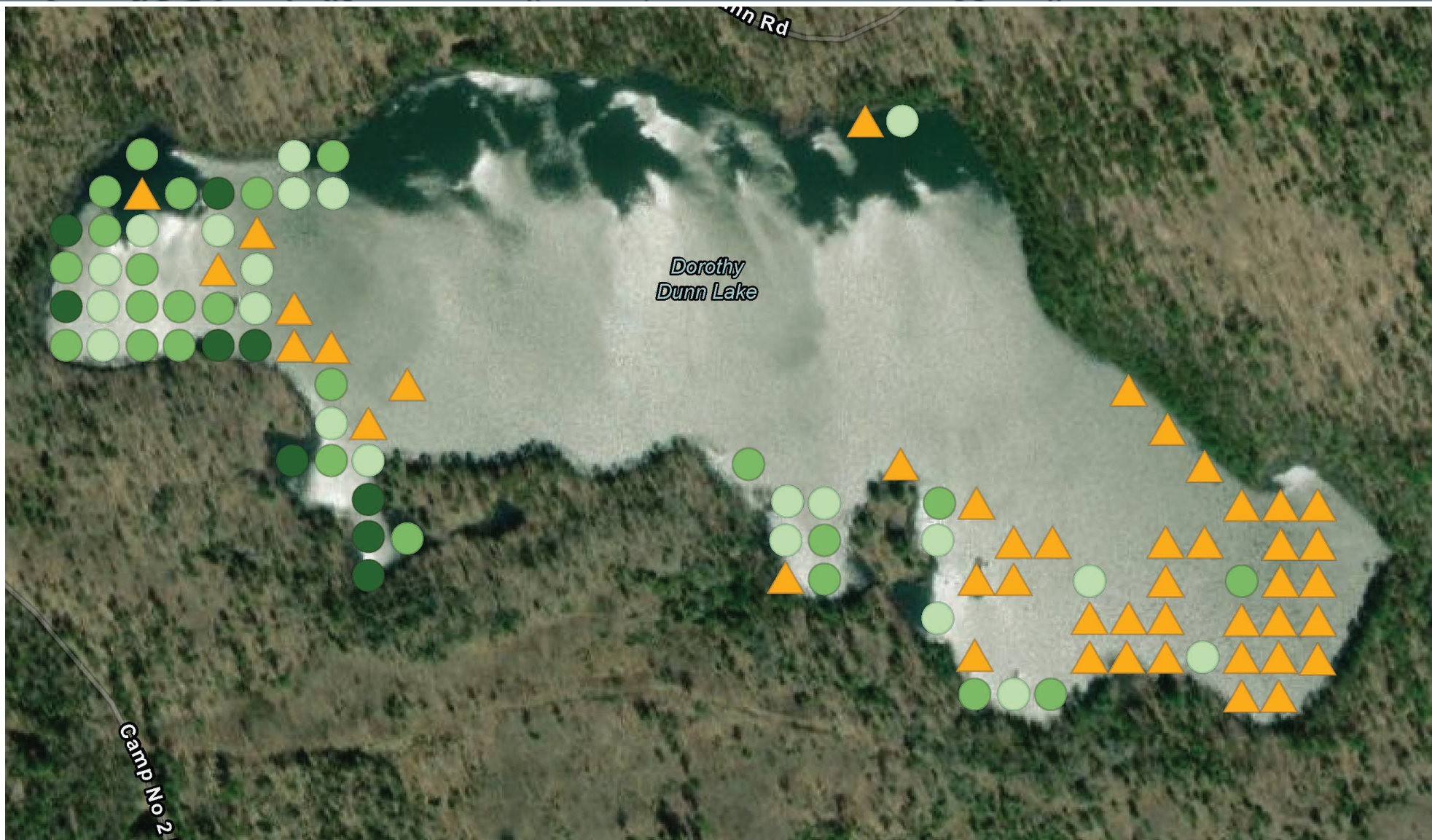
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Dorothy Dunn Lake - Map 2

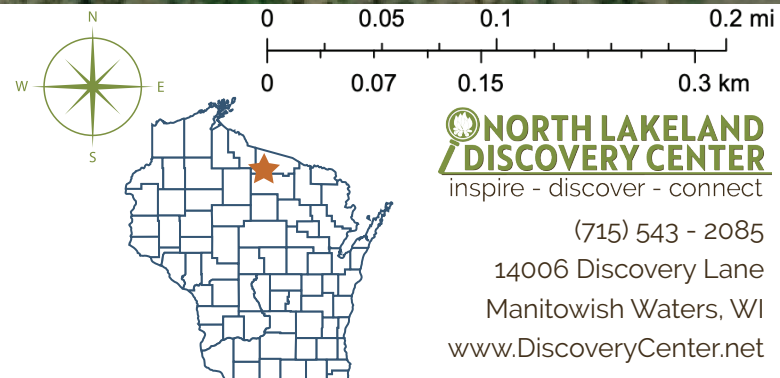
Town of Plum Lake
Vilas County, Wisconsin

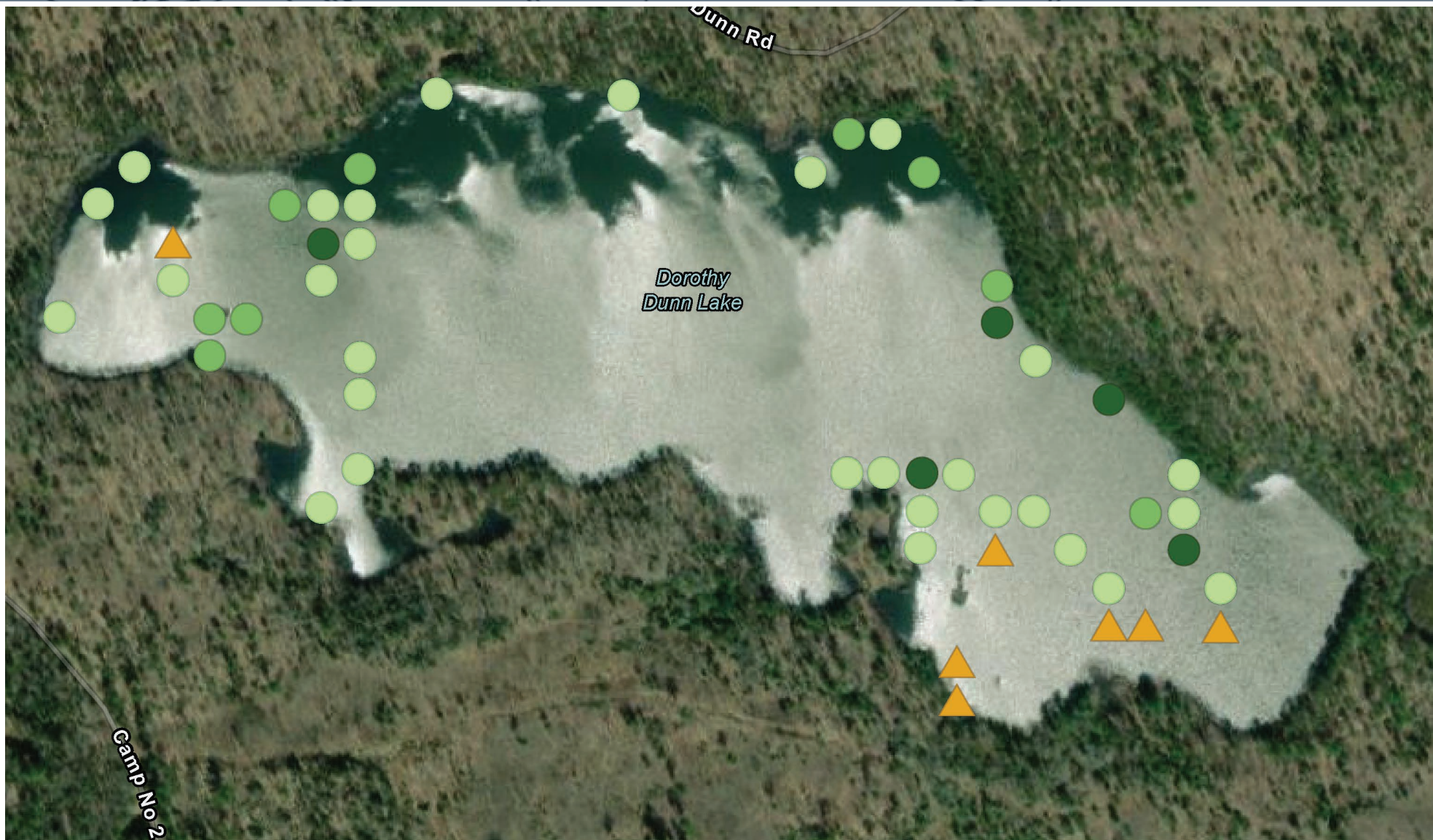
**Relative Frequency and Rake Fullness
Watershield**
(*Brasenia schreberi*)

LEGEND

Distribution of Plant Species

-  Visual
-  3
-  2
-  1





Dorothy Dunn Lake - Map 3

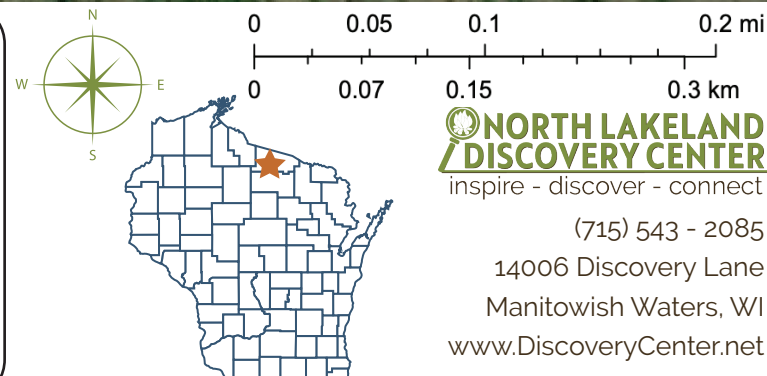
Town of Plum Lake
Vilas County, Wisconsin

Relative Frequency and Rake Fullness
Common bladderwort
(*Utricularia vulgaris*)

LEGEND

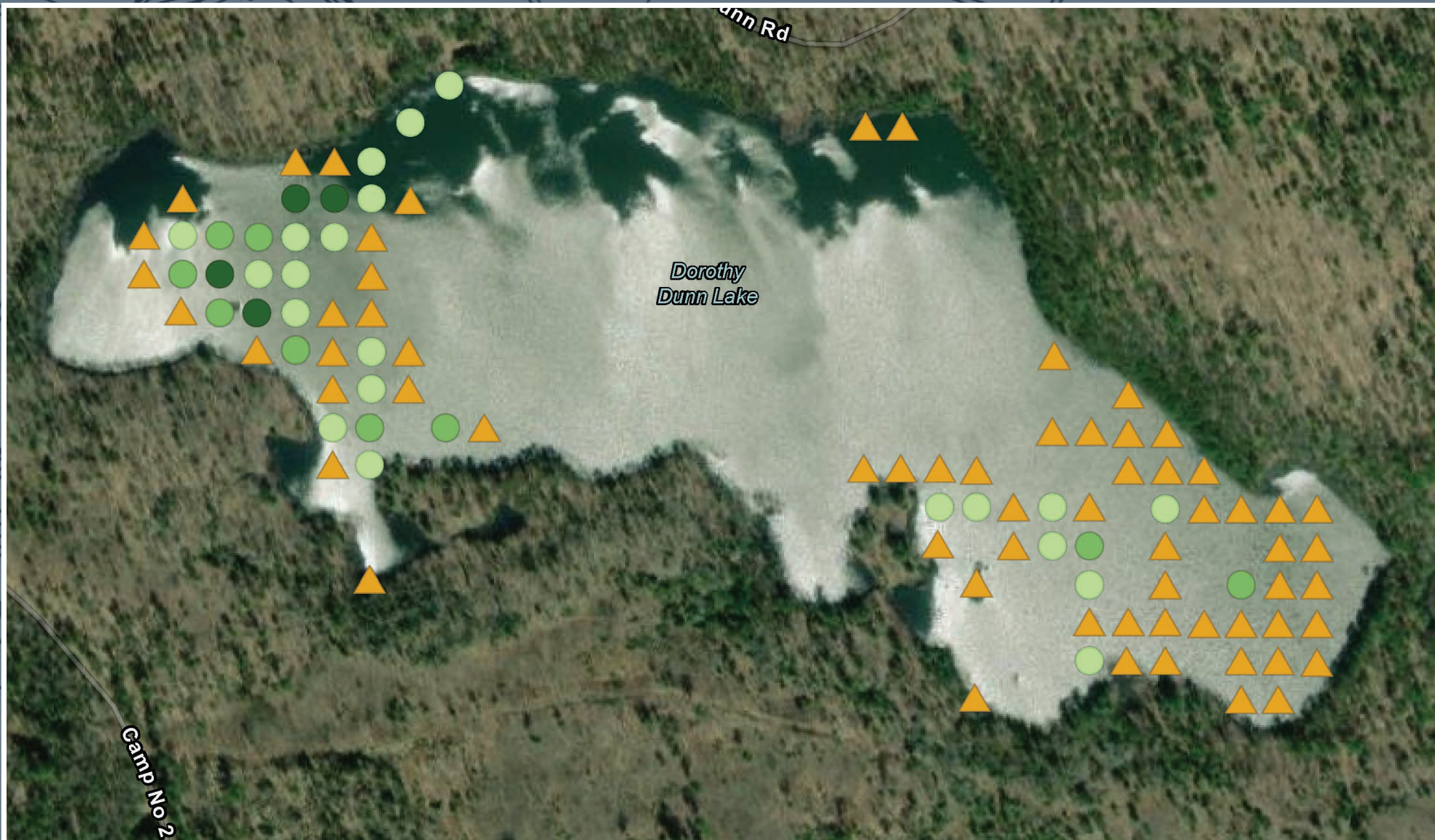
Distribution of Plant Species

-  Visual
-  3
-  2
-  1



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Dorothy Dunn Lake - Map 4

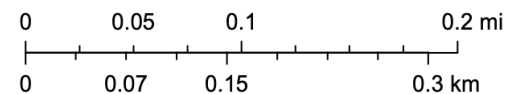
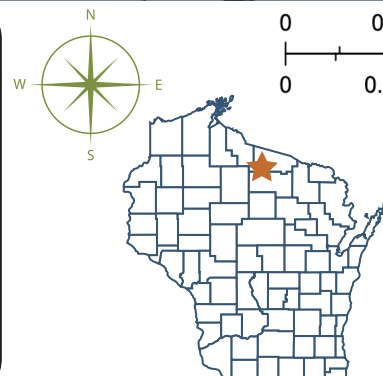
Town of Plum Lake
Vilas County, Wisconsin

Relative Frequency and Rake Fullness
White waterlily
(*Nymphaea odorata*)

LEGEND

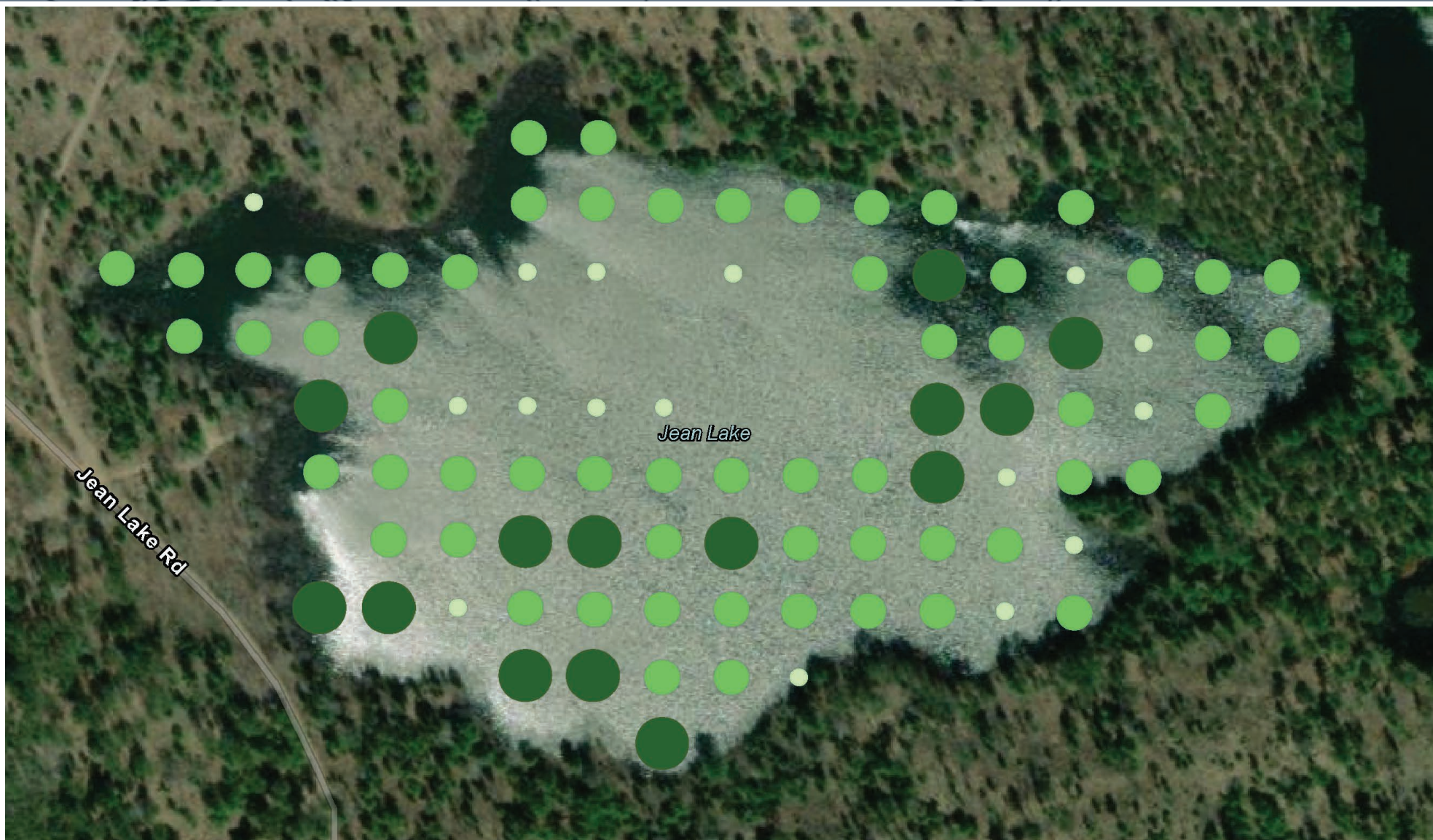
Distribution of Plant Species

-  Visual
-  3
-  2
-  1



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Jean Lake - Map 5

Town of Plum Lake
Vilas County, Wisconsin

Total Rake Fullness Rating

LEGEND Total Rake Fullness



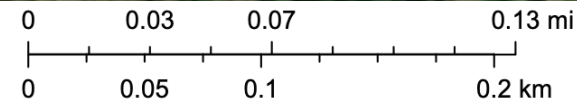
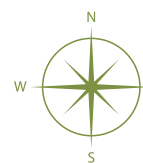
3



2



1



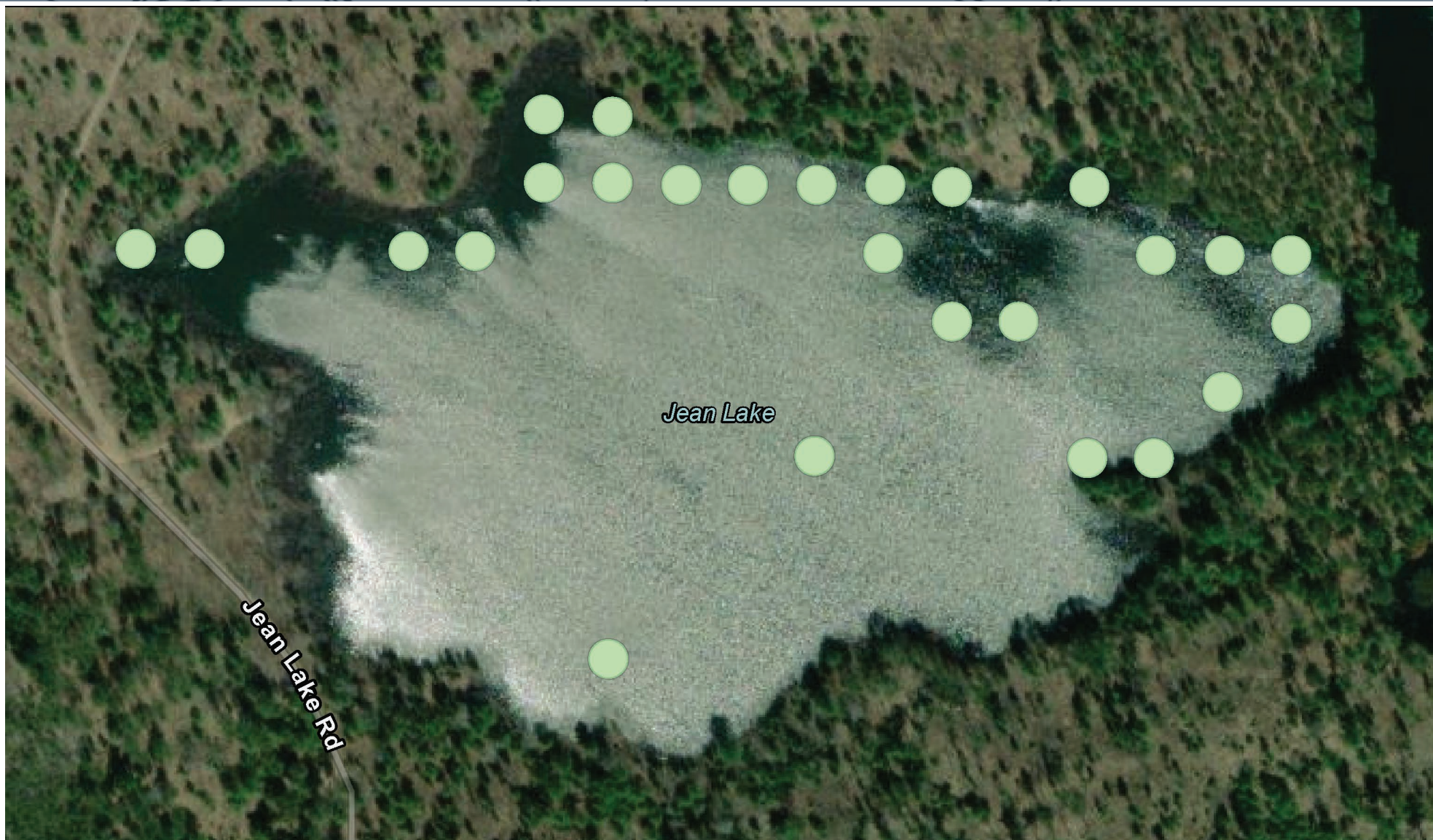
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Jean Lake - Map 6

Town of Plum Lake
Vilas County, Wisconsin

Relative Frequency and Rake Fullness
Northern Naiad
(*Najas gracillima*)

LEGEND

Distribution of Plant Species



Visual



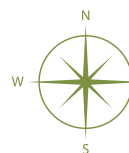
3



2



1



0 0.03 0.07 0.13 mi
0 0.05 0.1 0.2 km

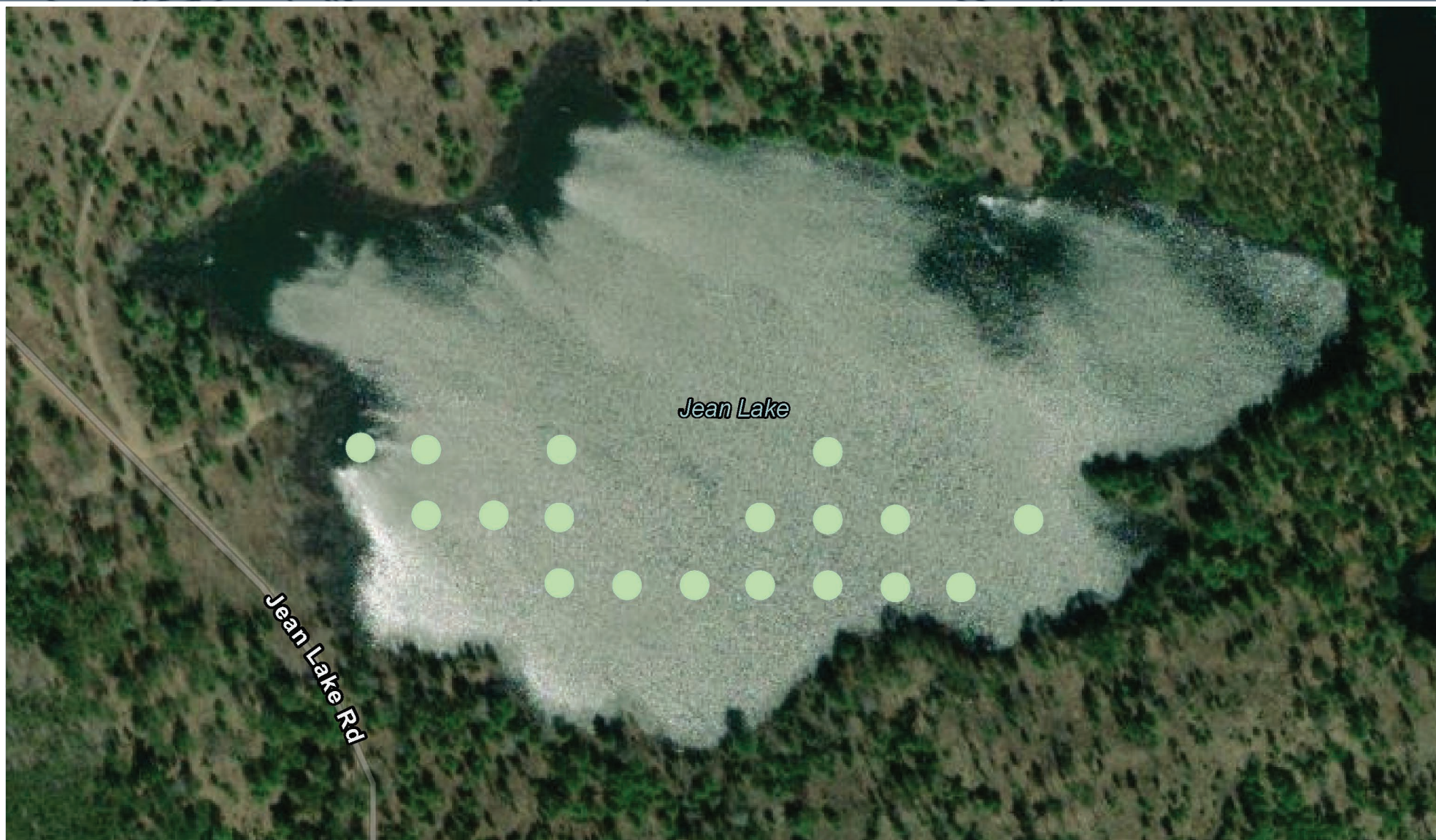
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Jean Lake - Map 7

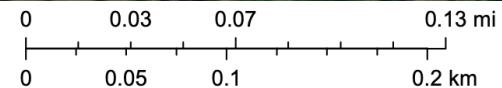
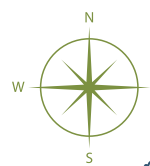
Town of Plum Lake
Vilas County, Wisconsin

Relative Frequency and Rake Fullness
Small pondweed
(*Potamogeton pusillus*)

LEGEND

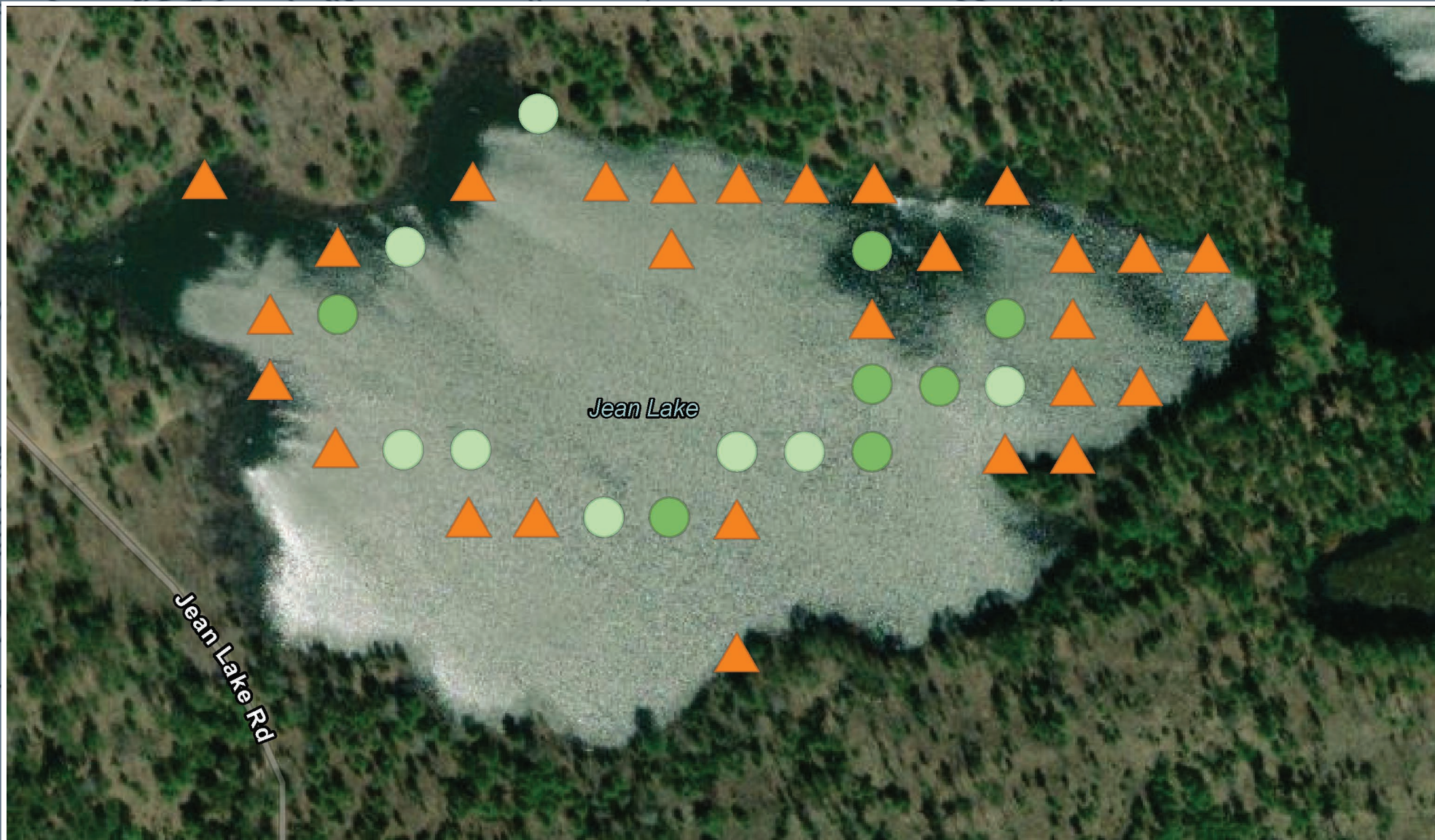
Distribution of Plant Species

-  Visual
-  3
-  2
-  1



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Jean Lake - Map 8

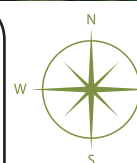
Town of Plum Lake
Vilas County, Wisconsin

Relative Frequency and Rake Fullness
White waterlily
(*Nymphaea odorata*)

LEGEND

Distribution of Plant Species

-  Visual
-  3
-  2
-  1



0 0.03 0.07 0.13 mi
0 0.05 0.1 0.2 km

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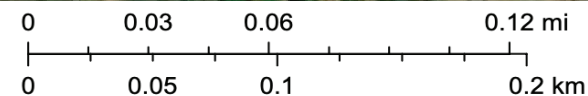
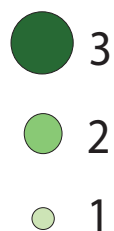
Wharton Lake - Map 9

Town of Plum Lake
Vilas County, Wisconsin

Total Rake Fullness Rating

LEGEND

Total Rake Fullness



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Wharton Lake - Map 10

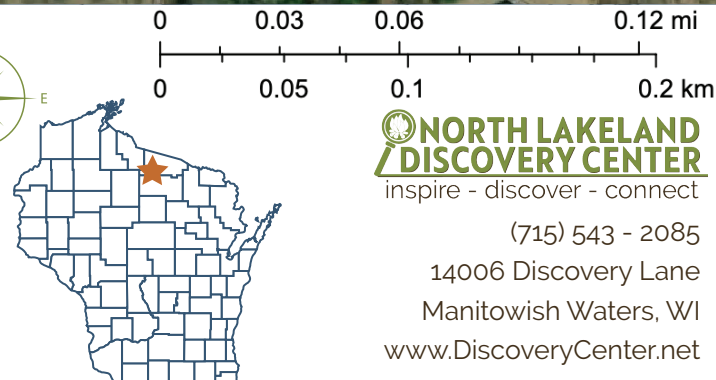
Town of Plum Lake
Vilas County, Wisconsin

Relative Frequency and Rake Fullness
Yellow pond-lily
(*Nuphar variegata*)

LEGEND

Distribution of Plant Species

-  Visual
-  3
-  2
-  1



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Wharton Lake - Map 11

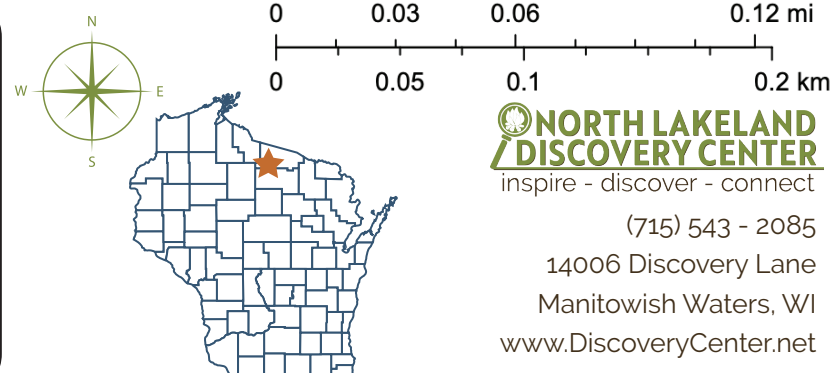
Town of Plum Lake
Vilas County, Wisconsin

Relative Frequency and Rake Fullness
Spiny-spored quillwort
(*Isoetes echinospora*)

LEGEND

Distribution of Plant Species

-  Visual
-  3
-  2
-  1





Wharton Lake - Map 12

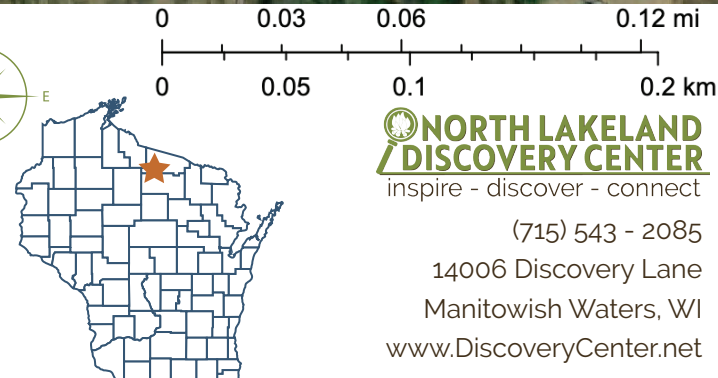
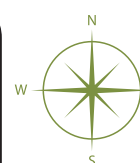
Town of Plum Lakes
Vilas County, Wisconsin

**Relative Frequency and Rake Fullness
Watershield**
(*Brasenia schreberi*)

LEGEND

Distribution of Plant Species

-  Visual
-  3
-  2
-  1



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