Town of Manitowish Waters

Aquatic Plant Point Intercept Report: Wild Rice Lake

July 2024

Prepared By: North Lakeland Discovery Center

NORTH LAKELAND DISCOVERY CENTER WOODS AND WATER

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INTRODUCTION

The following report provides the results and analysis of the aquatic vegetation found in Wild Rice Lake through point-intercept surveys conducted by the North Lakeland Discovery Center (NLDC) in Manitowish Waters. The Town of Manitowish Waters funded these surveys in partnership with the Manitowish Waters Lakes Association and a Wisconsin Department of Natural Resources Surface Water Grant[1]. WDNR Surface water grants are applied for each year by NLDC to increase funding for the Town of Manitowish Water's lakes, focusing on the Manitowish Chain of Lakes. The Town's Comprehensive Lake Management Plan is for updating vegetation data on the Manitowish Chain of Lakes and is a phased project partially funded through WDNR grants. Wild Rice Lake is in Phase III of the multi-phased comprehensive plan. The point-intercept survey was conducted in July of 2024 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 for a multitude of aquatic life, water purification, oxygen production, and soil stabilization. Additionally, they provide food and shelter for a variety of animals including moose, deer, waterfowl, fish, turtles, frog tadpoles, zooplankton, and macroinvertebrates. Despite their many contributions to lake health and the inhabitants, some people view plants as a nuisance. Although there are aquatic invasive species which can cause

[1] WDNR Grant # AEPP77424

damage, most aquatic plants are essential for maintaining a healthy ecosystem (Skawinski 2022).

Aquatic invasive species are organisms that have established populations outside of their native range unassisted or by means of human introduction. In Northern Wisconsin, species such as curly-leaf pondweed (Potamogeton crispus) and Eurasian watermilfoil (Myriophyllum spicatum) are present in the area lakes. These species have the potential to spread and impact recreation. However, Scientific literature suggests that invasive species, specifically Eurasian watermilfoil, only in some cases reach nuisance levels while many other populations will often stagnate or decline on unmanaged lakes (Nichols 1999, Kujawa et al. 2017). Point-intercept surveys are an effective way to detect aquatic invasive species and to provide data regarding species' presence, abundance and richness on each lake. At Wild Rice Lake, 44 different species of aquatic plants and algae were found (Table 1). The following report provides information on the point-intercept methods, vegetation found, and a summary of the results found.

METHODS

The point-intercept method used on Wild Rice 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. During this survey, a depth finder was equipped to the boat to speed up the process in determining the depths of sites that were greater than maximum depth of plants.

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. 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 (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. It becomes important 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 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). Wild Rice Lake's statistics will be compared to these values in the following sections of the report.

RESULTS

Wild Rice had 418 total points plotted and of those points, 407 were accessible by boat. 11 Points were considered non-navigable due to a high abundance of plants or points on shore. The maximum depth of plants found growing on Wild Rice was 15 feet deep, and the overall maximum depth recorded was 27 feet. The total number of sites with vegetation was 200. The average rake fullness rating was 1.90. The distribution total rake fullness is shown on Map 1. The overall frequency of occurrence of plants at sites shallower than maximum depth of plants was 75.19. The average number of species per site shallower than maximum depth was 3.08. The average number of species per site for all vegetated sites was 4.10. The overall species richness was 42, the number of species pulled up on the rake during sampling. The species richness including visual sightings was 44 total species. The Simpson Diversity Index for Wild Rice is 0.94. This value indicates an above average diversity for the waterbody.

The three most relatively frequent plants on Wild Rice Lake were fern pondweed (Potamogeton robbinsii), common waterweed (Elodea canadensis), and water marigold (Bidens beckii). Fern pondweed had a relative frequency of 51.5% and its distribution is shown on Map 2. Common waterweed had a relative frequency of 45% and its distribution is shown on Map 3. Water marigold had a relative frequency of 34.5% and its distribution is shown on Map 4.

Fern pondweed is a submerged aquatic plant found in most lakes with sandy or silty substrates. Its stiff, dark green-brown leaves are arranged closely alternating along the stem, giving it a fern-like appearance. Unlike many pondweeds, it never produces floating leaves. Fern pondweed is an important species for aquatic ecosystems, providing habitat for invertebrates,

shelter for fish, and contributing to sediment stabilization. This species is sensitive to water quality degradation, thriving in unpolluted, low-nutrient environments, and serves as an indicator of healthy aquatic habitats (Skawinski 2022).

Common waterweed is a submergent species that has flat, lance shaped leaves that are pointed, with no leaf stalk. The leaves whorl in sets of three. It is often bushier near the top of each branch. Tiny white or pink 3 petaled flowers are produced on a long, thread-like stalk that reaches the water's surface. This species prefers soft substrates and is found in mucky shallow or deep clear water (Skawinski 2022).

Water marigold is found in nutrient-rich lakes and slow-moving streams. It features finely dissected, feathery submerged leaves and sometimes broader sub surface and emergent leaves that adapt to fluctuating water levels. Its bright yellow, daisy-like flowers bloom above the water surface from mid-summer to early fall, attracting pollinators. Skawinski notes that water marigold plays a vital ecological role by stabilizing sediments, reducing erosion, and supporting aquatic biodiversity.

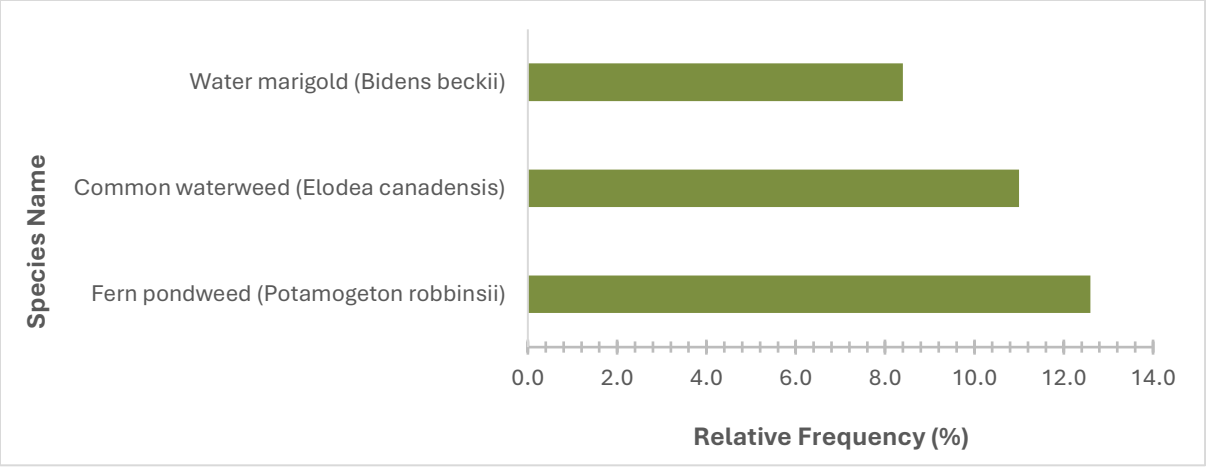

Figure 1: Wild Rice Lake 2024 relative frequency (%) of occurrence of aquatic plant species collected in rake during the 2024 point-intercept survey.

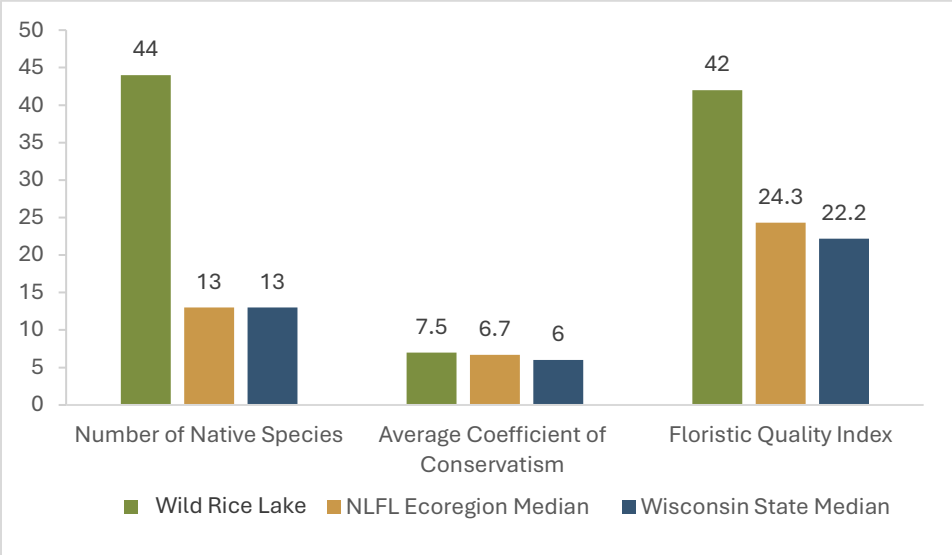

Figure 2: Floristic Quality Assessment of Wild Rice Lake using data from 2024-point intercept survey. Analysis follows Nichols (1999).

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Table 1. Wild Rice aquatic species list recorded in the 2024 survey.

Growth	Species	Common Name	Presence
Submergent	*Bidens beckii*	Water marigold	X
Floating	*Brasenia schreberi*	Watershield	X
Submergent	*Ceratophyllum demersum*	Coontail	X
Submergent	*Chara*	Muskgrasses	X
Submergent	*Chara braunii*	Muskgrasses	X
Submergent	*Chara globularis*	Muskgrasses	X
Submergent	*Drepanocladas sp.*	Aquatic Moss	X
Submergent	*Eleocharis acicularis*	Needle spikerush	X
Submergent	*Elodea canadensis*	Common waterweed	X
Submergent	*Heteranthera dubia*	Water star-grass	X
Submergent	*Isoetes echinospora*	Spiny-spored quillwort	X
Submergent	*Isoetes* sp.	Quillwort	X
Submergent	*Myriophyllum sibiricum*	Northern water-milfoil	X
Submergent	*Najas flexilis*	Slender naiad	X
Submergent	*Nitella flexilis*	Stonewort sp.	X
Submergent	*Nitella furcata*	Stonewort sp.	X
Floating	*Nuphar microphylla*	Small pond lily	X
Floating	*Nuphar variegata*	Spatterdock	V
Floating	*Nuphar X rubrodisca*	Intermediate pond lily	X
Floating	*Nymphaea odorata*	White water lily	X
Submergent	*Potamogeton amplifolius*	Large-leaf pondweed	X
Submergent	*Potamogeton epihydrus*	Ribbon-leaf pondweed	X
Submergent	*Potamogeton friesii*	Fries' pondweed	X
Submergent	*Potamogeton gramineus*	Variable pondweed	X
Submergent	*Potamogeton natans*	Floating-leaf pondweed	X
Submergent	*Potamogeton obtusifolius*	Blunt-leaf pondweed	X
Submergent	*Potamogeton praelongus*	White-stem pondweed	X
Submergent	*Potamogeton pusillus*	Small pondweed	X
Submergent	*Potamogeton richardsonii*	Clasping-leaf pondweed	X
Submergent	*Potamogeton robbinsii*	Fern pondweed	X
Submergent	*Potamogeton spirillus*	Spiral-fruited pondweed	X
Submergent	*Potamogeton zosteriformis*	Flat-stem pondweed	X

Growth	Species	Common Name	Presence
Emergent	*Schoenoplectus acutum*	Hardstem bullrush	V
Submergent	*Schoenoplectus subterminalis*	Water bulrush	X
Emergent	*Sparganium fluctuans*	Floating-leaf bur-reed	X
Emergent	*Sparganium natans*	Small bur-reed	X
Floating	*Spirodela polyrhiza*	Large duckweed	X
Submergent	*Stuckenia pectinata*	Sago pondweed	X
Submergent	*Utricularia intermedia*	Flat-leaf bladderwort	X
Submergent	*Utricularia minor*	Small bladderwort	X
Submergent	*Utricularia vulgaris*	Common bladderwort	X
Submergent	*Vallisneria americana*	Wild celery	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.

CONCLUSION

Analysis of the data collected from the plant point-intercept survey conducted on Wild Rice Lake indicates that it contains a relatively healthy plant community, and no aquatic invasive species were detected. Throughout the lake, 44 species were identified, including both submerged and emergent vegetation. Wild Rice Lake's floristic quality index value of 42 is higher than the state and regional means. Wild Rice Lake also has a conservatism value of 7.5 out of 10. These values indicate a low floristic 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 lake (Bernthal 2003). Smaller lakes, such as Wild Rice Lake, 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 Wild Rice Lake is relatively healthy. Wild Rice Lake had a Simpson's Diversity Index of .94. The closer the diversity index is to 1, the more species diversity and even distribution of aquatic plants. Wild Rice Lake demonstrates a high level of plant diversity, exceeding state and regional median values and indicates a healthy aquatic ecosystem.

Dominant species such as fern pondweed, common waterweed, and water marigold are not only ecologically significant but also act as indicators of overall lake health due to their roles in habitat structure, sediment stabilization, and water quality maintenance. Wild Rice Lake contains a moderate abundance of macrophytes, and is classified as mesotrophic, having a weighted average trophic state index that is higher than the median value for lakes in the Northern Lakes and Forests ecoregion. The Floristic Quality Index, when compared with regional benchmarks, supports the conclusion that Wild Rice Lake contains a relatively undisturbed and ecologically valuable aquatic plant community. Continued monitoring through point-intercept surveys will be crucial for managing invasive species, preserving biodiversity, and informing conservation decisions as part of the broader Manitowish Chain of Lakes management plan.

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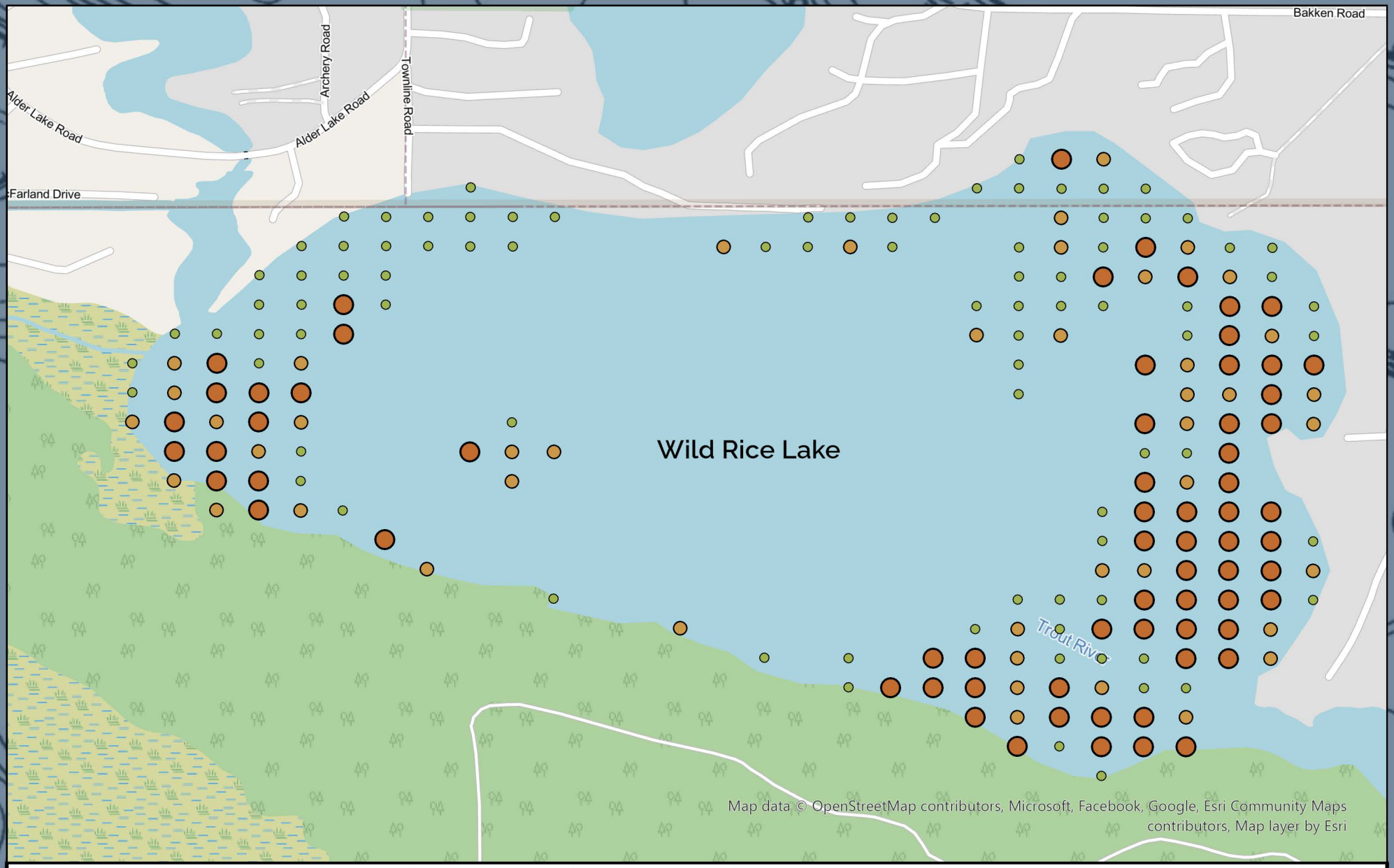

Wild Rice Lake

Town of Manitowish Waters
Vilas County, Wisconsin

Total Rake Fullness

07/09/24 - 07/20/24

Legend
Total Rake Fullness
- 1
- 2
- 3

0 500 1,000 2,000 Feet

N
W E
S

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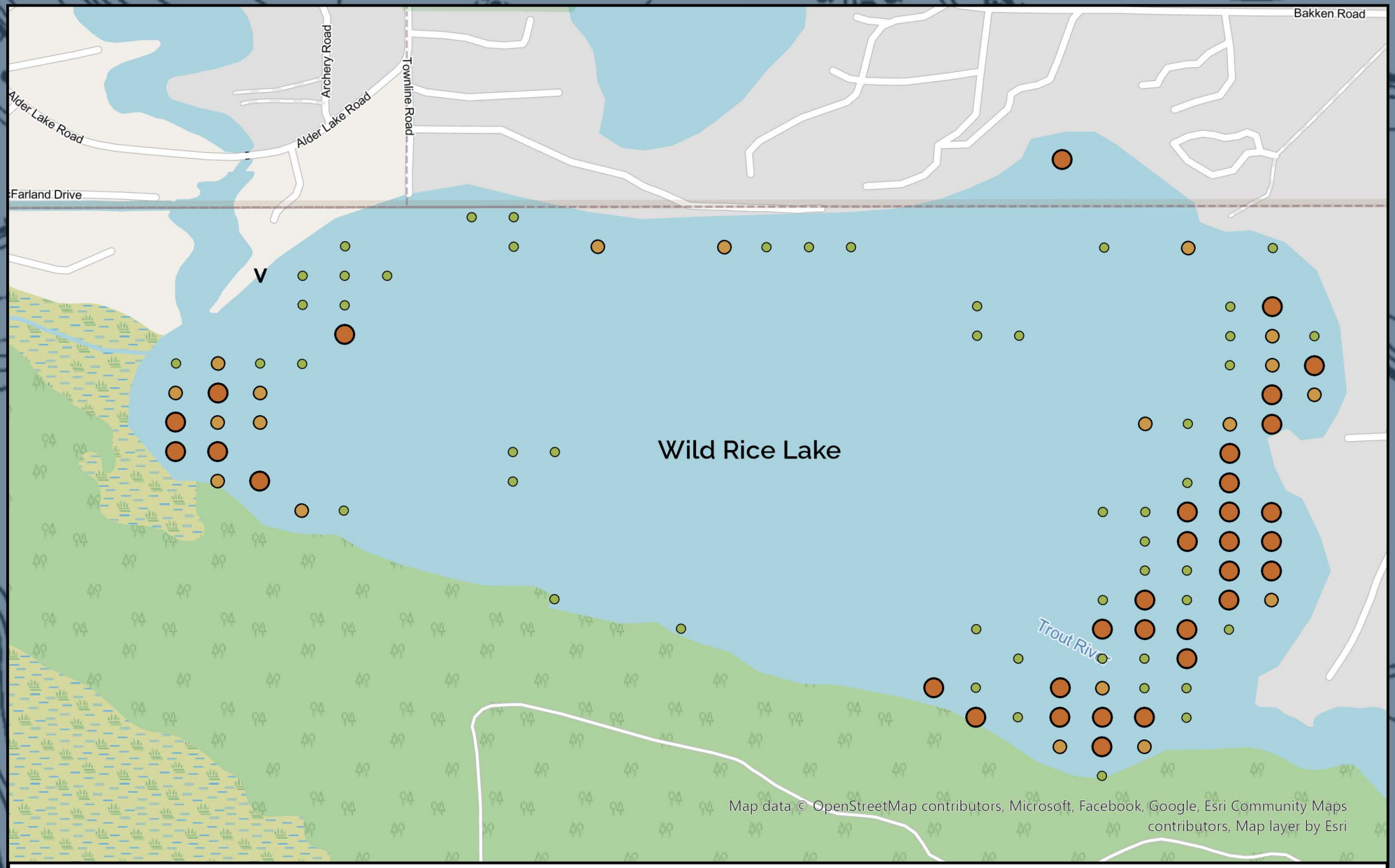

Wild Rice Lake

Town of Manitowish Waters
Vilas County, Wisconsin

Distribution of Plant Species
Fern Pondweed
(Potamogeton robbinsii)
07/09/24 - 07/20/24

Legend
Total Rake Fullness
- 1
- 2
- 3
V - Visual from boat

0 500 1,000 2,000 Feet

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Wild Rice Lake

Town of Manitowish Waters
Vilas County, Wisconsin

Distribution of Plant Species
Common Waterweed
(Elodea canadensis)
07/09/24 - 07/20/24

Legend
Total Rake Fullness
- 1
- 2
- 3
V - Visual from boat

0 500 1,000 2,000 Feet

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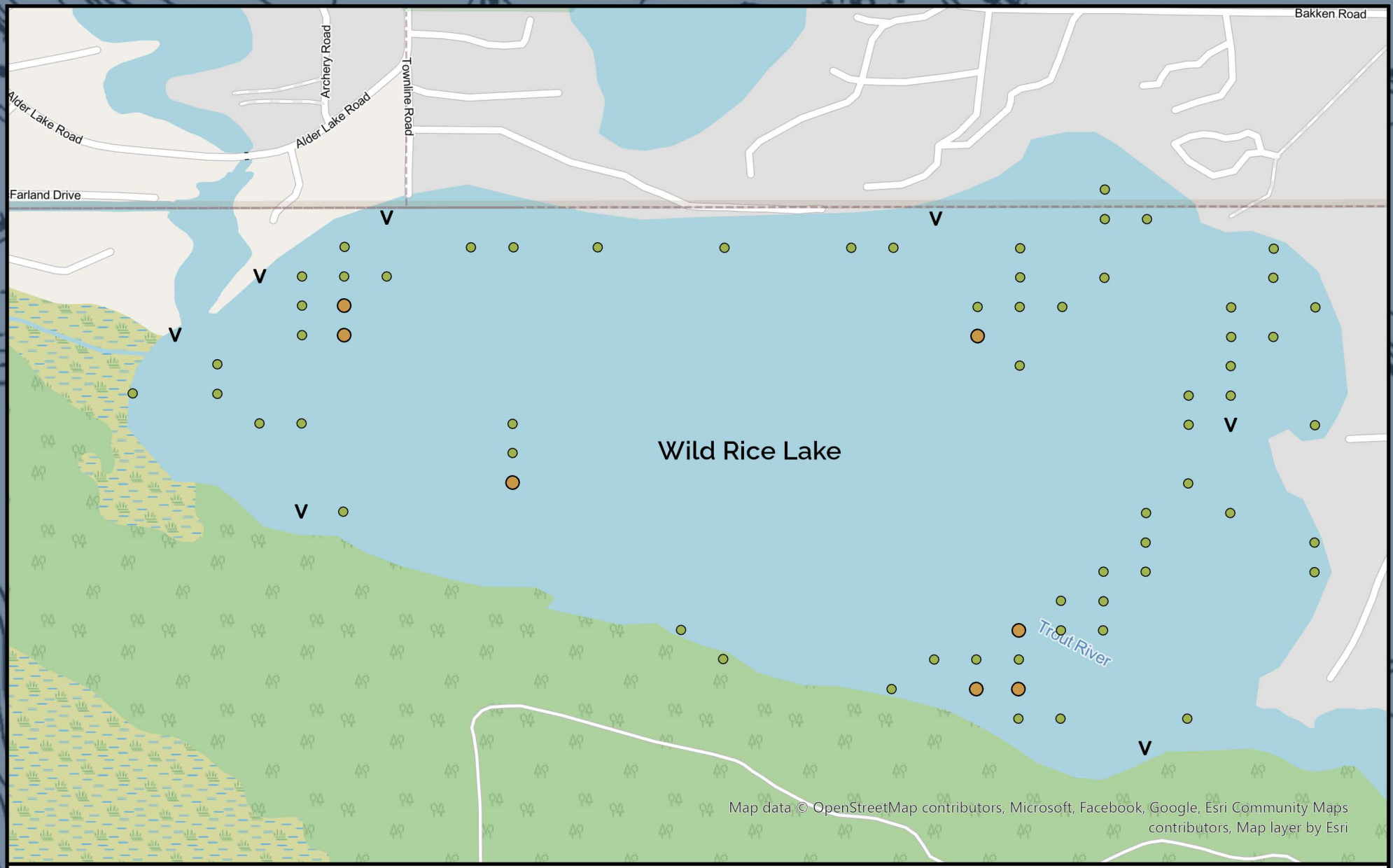

Wild Rice Lake

Town of Manitowish Waters
Vilas County, Wisconsin

Distribution of Plant Species
Water Marigold
(Bidens beckii)
07/09/24 - 07/20/24

Legend
Total Rake Fullness
- 1
- 2
- 3
V - Visual from boat

0 500 1,000 2,000 Feet

N
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