Aquatic Plant Survey Report

for

Round and Little Round Lakes

Sawyer County, Wisconsin, 2014

Map from http://www.roundlakes.org

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Round Lake Property Owners Association

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ABSTRACT

Aquatic plant surveys of Round and Little Round Lakes in Sawyer County, Wisconsin, were conducted July 25th-27th and August 15th-17th, 2014. The surveys employed methods from Hauxwell (2010) using survey point coordinates generated by the Wisconsin Department of Natural Resources (WDNR).

Round Lake has a maximum depth of 73 feet but only survey sites ≤25 feet were actually surveyed. The number of possible survey points (2,749) was reduced to 1,009 using maximum survey depth of 25 feet as a filter. There were 980 survey points that were at or below the maximum rooting depth of 23 feet. Of those 980 points, 425 (43%) had vegetation present. A total of 37 species were documented at survey points with another 5 species recorded as visual observations and another 5 species documented as part of the boat survey. The Simpson Diversity Index was high at 0.92 and the Floristic Quality Index was 38.24, which is higher than other lakes in the same ecoregion. Fern pondweed (*Potamogeton robbinsii*), slender naiad (*Najas flexilis*), and variable pondweed (*Potamogeton gramineus*) were the most common species found at 14%, 12%, and 8% sites, respectively. Filamentous algae were found at 23 sites. Eurasian water-milfoil (*Myriophyllum spicatum*, EWM) was found at only 4 sites and visually observed at another 2 sites. Overall, the community is diverse and vegetation is sparse on a whole-lake scale but locally abundant and diverse in bays. These findings are similar to those from the 2007 aquatic plant survey. The dominant sediment type was sand at 68% of the 1,009 sites that were visited.

Little Round Lake has a maximum depth of 38 feet but only survey sites ≤25 feet were actually surveyed. The number of possible survey points (698) was reduced to 403 due to the maximum survey depth of 25 and because some of the survey points were not navigable due to thick emergent vegetation. There were 385 survey points that were at or below the maximum rooting depth of 23 feet. Of those 385 points, 322 (84%) had vegetation present. A total of 37 species were documented at survey points with another 3 species recorded as visual observations and one species documented as part of the boat survey. The Simpson Diversity Index was high at 0.92 and the Floristic Quality Index was 38.47, which is higher than other lakes in the same ecoregion. Fern pondweed and water celery (*Vallisneria americana*) were the most common species found at 19%, 10%, respectively. Filamentous algae were found at 12 sites. Eurasian water-milfoil (*Myriophyllum spicatum*, EWM) was found at 12 sites and visually observed at another 3 sites. EWM at four sites showed evidence of damage from chemical treatment. A small infestation of purple loosestrife (*Lythrum salicaria*) was visually observed at one site on the northern shore. Overall, the community is diverse with abundant vegetation on a whole-lake scale. These findings are similar to those from the 2005 aquatic plant survey. The dominant sediment type was muck at 53% of the 403 sites that were visited.

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INTRODUCTION

The Round Lake Property Owners Association (RLPOA) partnered with Harmony Environmental, the Wisconsin Department of Natural Resources (WDNR), and Sawyer County to develop an Aquatic Plant Management (APM) Plan that would guide management activities on Round Lake and Little Round Lake from 2009-2013. An updated aquatic plant survey and management plan were needed in 2014 for RLPOA to continue management of invasive species, protect native species, and maintain eligibility for WDNR Surface Water Grants. Aquatic plant surveys of the lakes were completed in July and August of 2014. This report covers the findings of those surveys and is intended to complement the updated APM Plan. This report can also be used as a stand-alone assessment of the aquatic plant community in Round and Little Round Lakes.

Study Site

Round Lake is a seepage lake located in Sawyer County, Wisconsin with a surface area of 3,324 acres. The maximum depth is 74 feet and the mean depth is 33 feet. Connected by a narrow channel to the south is Little Round Lake, also considered a seepage lake with a surface area of 179 acres, maximum depth of 38 feet and mean depth of 12 feet. Although the lakes have their own unique Water Body Identification Code (WBIC, Round 2395600, Little Round 2395500), they are sometimes referred to as the Round Chain and the RLPOA serves both lakes. The lakes are situated approximately 7 miles east of Hayward, Wisconsin (Figure 1). Water clarity for Little Round Lake is moderately clear and the lake is considered mesotrophic (WDNR, 2014) but water quality data from 1999-2013 suggest the lake is borderline oligotrophic with abundant vegetation. Water clarity for Round Lake is very high and the lake is considered oligotrophic with low nutrients and sparse vegetation.

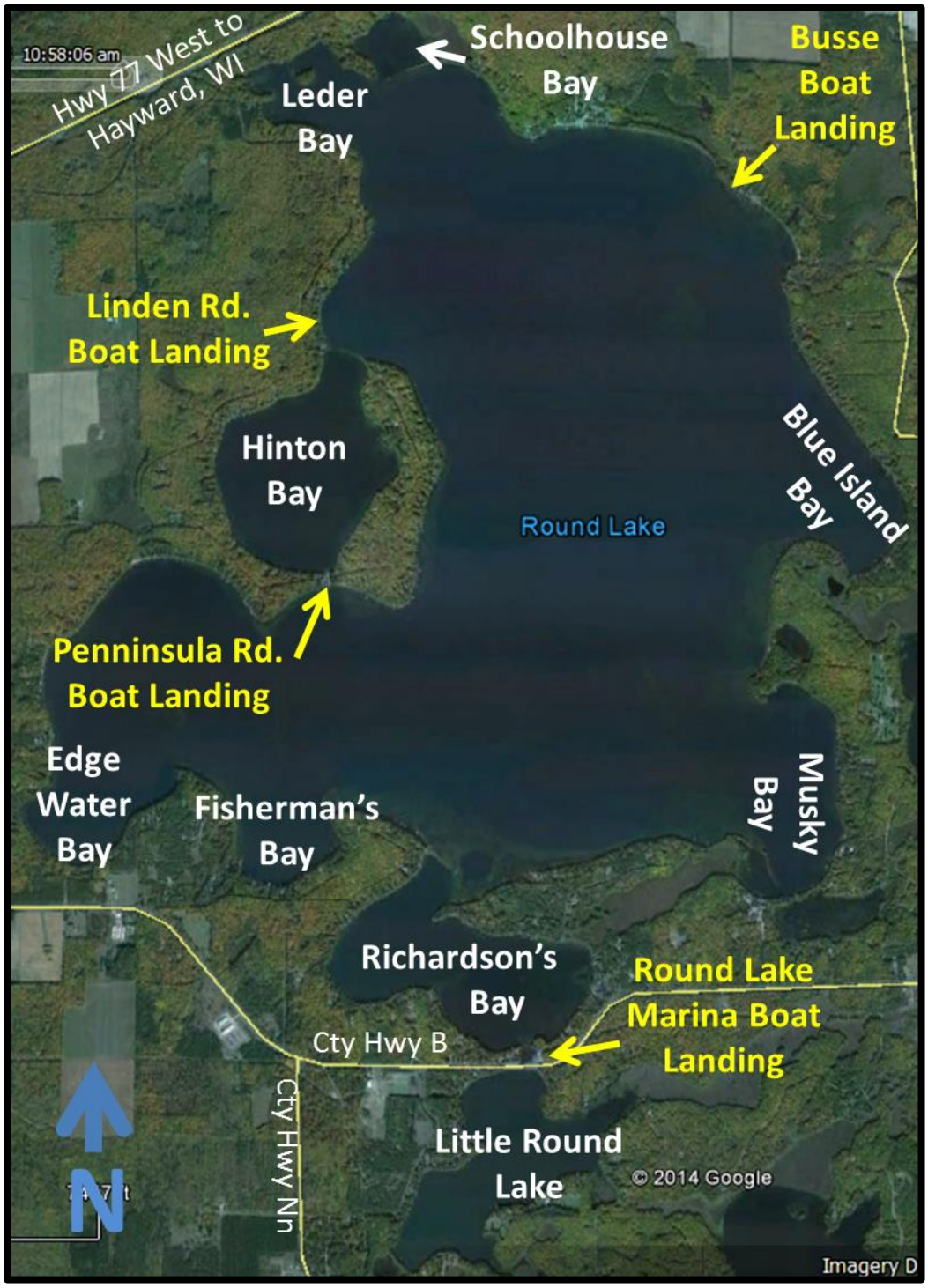


Figure 1 - Round & Little Round Lakes Map

GOAL AND OBJECTIVES

The main goal of this project is to update the Round Lakes Aquatic Plant Management Plan that was implemented from 2009 through 2013. The following objectives were met during this project to work toward the updated APM:

1. Complete a survey of all aquatic plants at survey points determined by the WDNR.
2. Analyze data to provide updated information on the health and status of the aquatic plant community in Round and Little Round Lakes.
3. Create maps of invasive plant species, filamentous algae, and sensitive species.
4. Compile survey results and discussion.

METHODS

Field Methods

Field methods followed the standardized protocol developed by the WDNR in Hauxwell et. al (2010). The WDNR generated point-intercept maps, which resulted in 2,749 sample points in Round Lake spaced 230 feet (70 meters) apart (Figure 2) and 698 sample points in Little Round Lake spaced 105 feeet (32 meters) apart (Figure 3). The sample points were uploaded to a hand-held GPS unit (Garmin 76CSx), which was used at 80 feet of resolution to navigate to each point. A double-sided rake head on a telescopic pole was used to sample points ≤14.5 feet deep. A double-sided rake tied to a rope was used to sample points between 15 and 25 feet deep. Aquatic plant species, water depth, and dominant sediment type (muck, rock, or sand) were recorded at each survey point. The rake fullness rating for total coverage of plants on the rake and a separate rake fullness rating for each species present were recorded (Figure 4). Any survey points that were inaccessible were recorded as such and no sample was taken. Any survey points greater than 25 feet deep were not sampled based on the maximum rooting depth of 21 in Round Lake in 2007 and 23 feet in Little Round Lake in 2005 (Harmony Environmental, 2009)

The aquatic plant surveys of Round and Little Round Lakes were conducted July 25th -27th and August 16th – 17th, 2014 during which substrate type, depth, and species rooted in standing water were recorded per methods in Hauxwell et al. (2010). Aquatic plants found within 6 feet of the sample point but not found on the rake were counted as visual observations. Occurrence of species outside the sampling grid were recorded to note their presence as part of a boat survey, but were not counted in statistical calculations. These boat survey species were only recorded if their roots were in standing water. Plant identification was verified using Crow and Hellquist (2000) and Skawinski (2010).

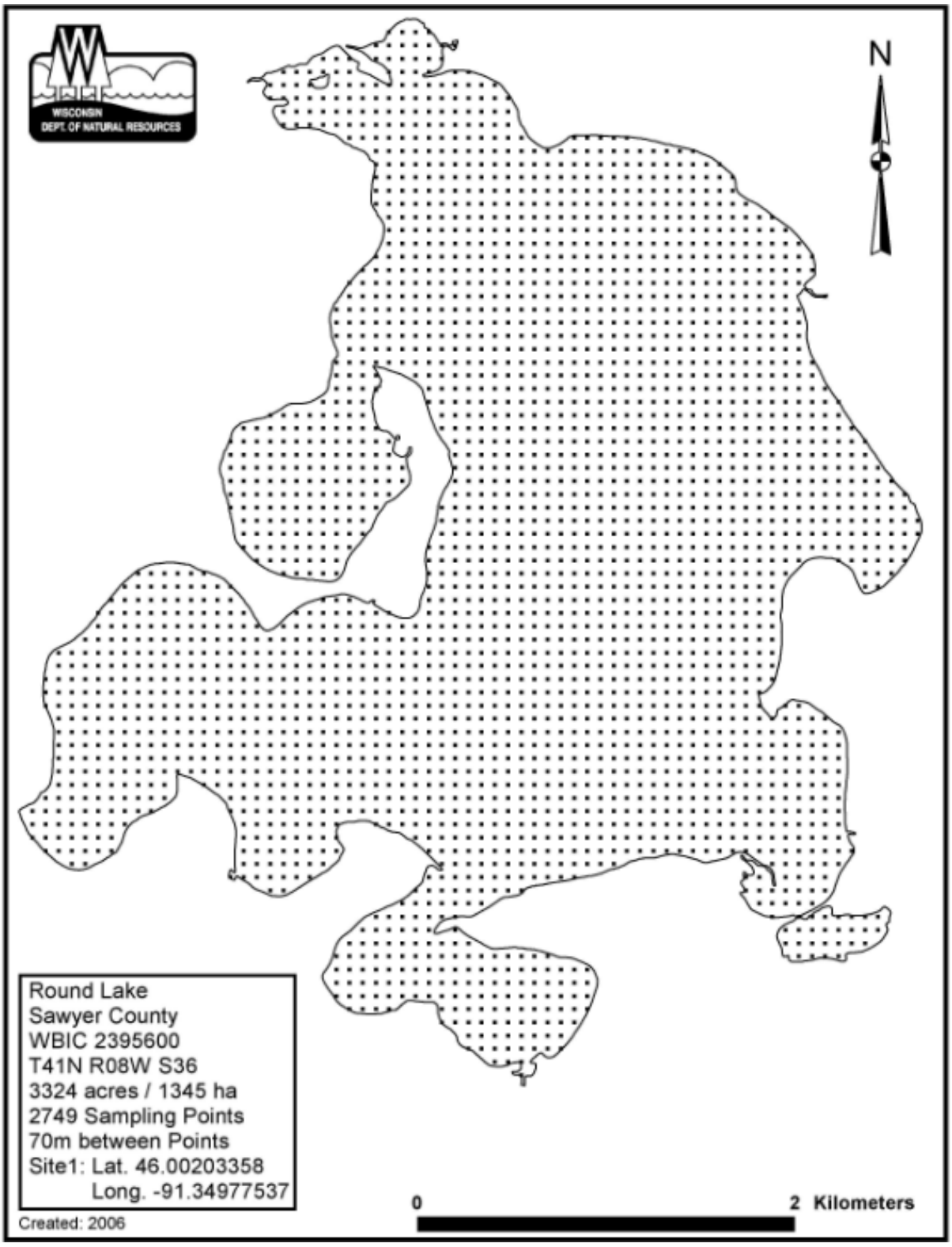


Figure 2 – Round Lake Survey Grid.

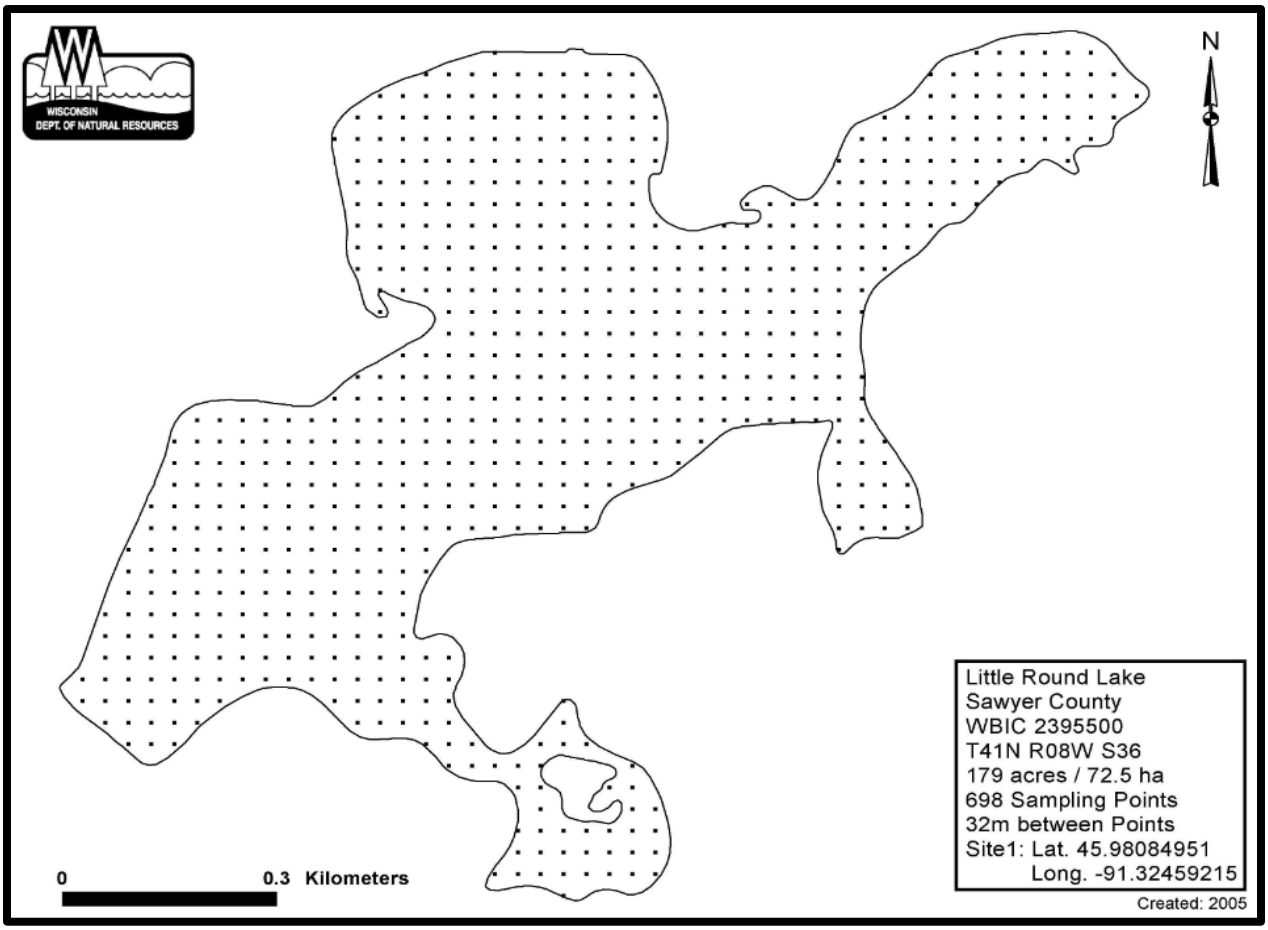


Figure 3 - Little Round Lake Survey Grid

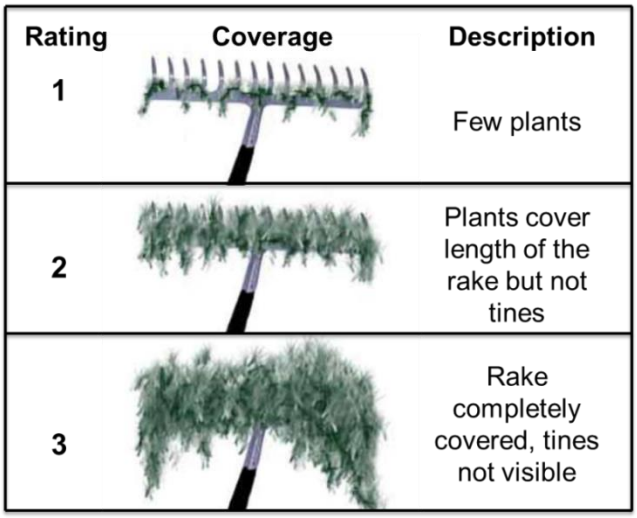


Figure 4 - Rake Fullness Rating Illustration

Data Analysis Methods

Survey data were used to calculate statistics including Simpson Diversity Index, species richness, Nichols' Floristic Quality Index (1999), frequencies, rake fullness and number of visual sightings among other summary statistics. The "Aquatic Plant Survey Data Workbook" was downloaded from the UWEX Lakes webpage[1] and the spreadsheet was populated with data collected from Round and Little Round Lakes. Per guidelines in Hauxwell (2010), species that were recorded as visuals (i.e., within 6 feet of a survey point but not sampled with the rake) were not included in Simpson Diversity Index and FQI calculations. Also, filamentous algae and aquatic moss data were not used in any statistical calculations but were collected to gauge their frequency throughout the lake.

Summary Statistics

From the "Aquatic Plant Survey Data Workbook," several summary statistics were calculated (Table 1). These statistics provide a general overview of the plant community from a whole-lake perspective and can be used in comparisons with other lakes in the same ecoregion or on a broader statewide scale.

Floristic Quality Index (FQI) is summarized in Table 1, but elaborating on this metric developed by Nichols (1999) is worthwhile. Aquatic plant species associated with lake communities and native to Wisconsin were assigned a Coefficient of Conservatism (C) ranging from 0 to 10. The C value estimates the likelihood of that plant species occurring in an environment that is relatively unaltered from pre-settlement conditions. As human disturbance increases, species with a lower C value occur more frequently while more sensitive species with a higher C value occur less frequently. To calculate floristic quality, the mean C value of all species found in the lake is multiplied by the square root of the total number of plant species in the lake. Only plants found on the rake are included in the calculations. In other words, the FQI metric incorporates the C values of species found during the survey to compute how close the aquatic plant community is to one of undisturbed conditions. A higher FQI value assumes a healthier aquatic plant community. Floristic quality values can be compared on a statewide value, but Nichols (1999) recommends comparing values within one of the four ecoregional-lake types. Round and Little Round Lakes fall within the "Northern Lakes and Forests" ecoregional-lake type.

Individual Species Statistics

From the "Aquatic Plant Survey Data Workbook," several individual species statistics were calculated (Table 2). These statistics take a closer look at the plant species composition in the lakes and allow for comparisons of the plant community within the lake.

[1] http://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/default.aspx

Table 1 – Summary Statistics and Explanations

	Summary Statistic	Explanation
1	Total number of sites visited	The total number of sites sampled, which is not necessarily equal to the number of survey points because some sites may not be accessible.
2	Total number of sites with vegetation	Number of sites where at least one plant was found on the rake (does not include moss, sponges, algae, or liverworts).
3	Maximum depth of plants	Depth of deepest site where at least one plant was found on the rake (does not include moss, sponges, algae, or liverworts).
4	Total number of sites shallower than maximum depth of plants	Number of sites where depth was less than or equal to the maximum depth where at least one plant was found on the rake.
5	Frequency of occurrence at sites shallower than maximum depth of plants	Total number of sites with vegetation (2) / Total number of sites shallower than maximum depth of plants (4).
6	Average number of species per site (split into four subcategories)	a) Shallower than maximum depth – the average number of species found per site at sites less than or equal to the maximum depth where at least one plant was found on the rake (4).
		b) Vegetated sites only – the average number of species found per site at sites where at least one plant was found on the rake (2).
		c) Native species shallower than maximum depth – Same explanation as 6(a), non-native species excluded from average.
		d) Native species at vegetated sites only – Same explanation as 6(b), non-native species excluded from average.
7	Species Richness (split into two subcategories)	a) Total number of species found on the rake at all sites (does not include moss, sponges, algae, or liverworts
		b) Including visuals – Same explanation as 7(a) and including visual observations within 6 feet of the sample sight
8	Simpson's Diversity Index	Estimates the heterogeneity of a community by calculating the probability that two individuals randomly selected from the data set will be different species. The index ranges from 0-1, and the closer the value is to one, the more diverse the community. Visual observations (within 6 feet of sample point) are not included in calculation of index.
9	Coefficient of Conservatism (C)	This is not a statistical calculation, but rather a value assigned to each plant species based on how sensitive that species is to disturbance. C values range from 1 to 10 with higher values assigned to species that are more sensitive to disturbance (Nichols, 1999).
10	Floristic Quality Index	How similar the aquatic plant community is to one that is undisturbed (Nichols, 1999). This index only factors species raked at survey points and does not include non-native species. The FQI is calculated using coefficient of conservatism (C) values (9).

Table 2 - Individual Statistics and Explanations

	Individual Statistic	Explanation
11	Average Rake Fullness	Mean rake fullness rating ranging from 1 to 3 for the entire lake or for a particular species.
12	Number of sites where a species was found	The total number of survey points where a particular species was found on the rake.
13	Number of visual sightings	The total number of times a particular species was visually observed within 6 feet of a sampling point, but not collected on the rake
14	Frequency of Occurrence (split into two subcategories	a) Among vegetated sites only – The number of sites at which a particular species is found on the rake divided by the total number of vegetated sites (Table 1, #2)
		b) Among sites shallower than the maximum depth of plants – The number of sites at which a particular species is found on the rake divided by the total number of sites less than or equal to the maximum depth of plants (Table 1, #4)
15	Relative frequency (%)	This value represents the degree to which a particular species contributes to the total of all observations. The sum of all relative frequencies is 100%.

ROUND LAKE RESULTS

A total of 2,749 predetermined survey waypoints (Figure 1) were generated by the WDNR based on standard protocol. A total of 1,009 points were actually surveyed given their depth of 25 feet or less. The maximum rooting depth was 23 feet, compared to 20.9 feet in 2007 (Harmony Environmental, 2009). The total number of sites shallower than the maximum depth of plants was 980 and vegetation was present at 425 of those sites (Table 3). Of those 425 sites, 76% had a total rake fullness value of 1, 12% had a total rake fullness of 2, and the remaining 12% had a total rake fullness of 3 (Figure 5). The average number of species found at the 425 sites was 0.92 and the average rake fullness was 1.35.

A total of 47 species of aquatic plants were found, five of which were "visual only" (i.e., within 6 feet of the survey point but not found on the rake) and another five of which were greater than 6 feet from any survey point and thus counted as part of the boat survey (Table 3). Filamentous algae are not counted as one of the 47 species. Species richness for Round Lake was 42 species including "visuals only" but excluding boat survey species (Table 3).

Simpson Diversity Index includes species raked at survey points but does not include visuals or boat survey species. The Simpson Diversity Index for Round Lake was calculated to be 0.92 on a scale from 0 to 1 (Table 3). The Floristic Quality Index (FQI) only factors species raked at survey points and does not include visuals (5), boat survey species (5), aquatic invasive species (1) and most plants that cannot be identified to species (2). In Round Lake, bur-reed (*Sparganium sp.*) and arrowhead (*Sagittaria sp.*) could not be identified to species because they lacked flowering parts. Therefore, 34 species were included in the calculation, which is higher than the mean number of species (13) for other lakes in the North Lakes and Forests ecoregion. The floristic quality for Round Lake was 38.24, which is higher than the mean values for other lakes in the Northern Lakes and Forests ecoregion. The average C value of plant species in Round Lake was 6.56, which is slightly lower than the average C value of 6.7 for other lakes in the same ecoregion.

Fern pondweed (*P. robbinsii*), slender naiad (*Najas flexilis*), and variable pondweed (*P. gramineus*) were the most common species found at 14%, 12%, and 8% of survey points (≤ maximum rooting depth of 23 feet), respectively (Figure 18, Figure 19, Figure 20). Together they accounted for 37.4% of the total relative frequency. A combined relative frequency of <50% suggests the plant community is relatively heterogeneous.

Sensitive Species in Round Lake

Three species with a conservatism(C) value of 9 or 10 were found at survey points (Table 4) while another three species were found during the boat survey. The C value estimates the likelihood of that plant species occurring in an environment that is relatively unaltered from pre-settlement conditions. As human disturbance occurs, species with a low C value are more likely to dominate a lake. Alternate-flowered water-milfoil (*Myriophyllum alterniflorum*,Figure 27) and creeping spearwort (*Ranunculus flammula*,Figure 28) were each found at one survey point while alpine pondweed (*P. alpinus*, Figure 25) was found at two survey points. Spiny hornwort (*Ceraophyllum echinatum*), wild calla (*Calla palustris*), and narrow-leaved bur-reed (*Spargaium angustifolium*) were noted in southern Musky Bay but they were not found at any survey points.

Perfoliate pondweed (*P. perfoliatus*) is listed as a species of special concern in Wisconsin meaning it is rare. On a global scale the species is secure. However, in Wisconsin perfoliate pondweed is considered "critically imperiled because of extreme rarity or because of some factors making it especially vulnerable" (NHI, 2014). Perfoliate pondweed was found at 16 sites in Round Lake (Figure 22). Spiny hornwort was once on the WDNR Natural Heritage Inventory (NHI) list as "species of special concern." Email correspondence with Julie Bleser of the WDNR clarified that a comprehensive review of all species on the NHI list was done in 2010, resulting in the removal of spiny hornwort from the list in February 2011.

Watershield (*Brasenia schreberi)*, large-leaf pondweed (*Potamogeton amplifolius*), and spikerush (*Eleocharis sp.*) are all species identified in Wisconsin Administrative Code NR 109 as "high value species…….. known to offer important values in specific aquatic ecosystems." Watershied was found at 3 sites (Figure 24), large-leaf pondweed at 20 sites (Figure 21), and spikerushes at 13 sites (Figure 23, Figure 26).

Table 3 – Summary Statistics for 2007 & 2014 Aquatic Plant Surveys of Round Lake.

	Summary Statistic		Results 2007	Results 2014
1	Total number of sites visited		**942**	**1,009**
2	Total number of sites with vegetation		**297**	**425**
3	Maximum depth of plants		**20.6 ft**	**23 ft**
4	Total number of sites shallower than maximum depth of plants		**587**	**980**
5	Frequency of occurrence at sites shallower than maximum depth of plants		**50.6%**	**43.4%**
6	Average number of species per site	e) Shallower than maximum depth	**-**	**0.92**
		f) Vegetated sites only	**1.94**	**2.13**
		g) Native shallower than maximum depth	**-**	**0.92**
		h) Native species at vegetated sites only	**1.93**	**2.12**
7	Species Richness	a) Total # species found on rake at all sites	**42**	**37**
		b) Including visuals	**47**	**42**
8	Simpson's Diversity Index		**0.94**	**0.92**
9	Coefficient of Conservatism (C)		-	See Table 4
10	Floristic Quality Index		**44.05**	**38.24**

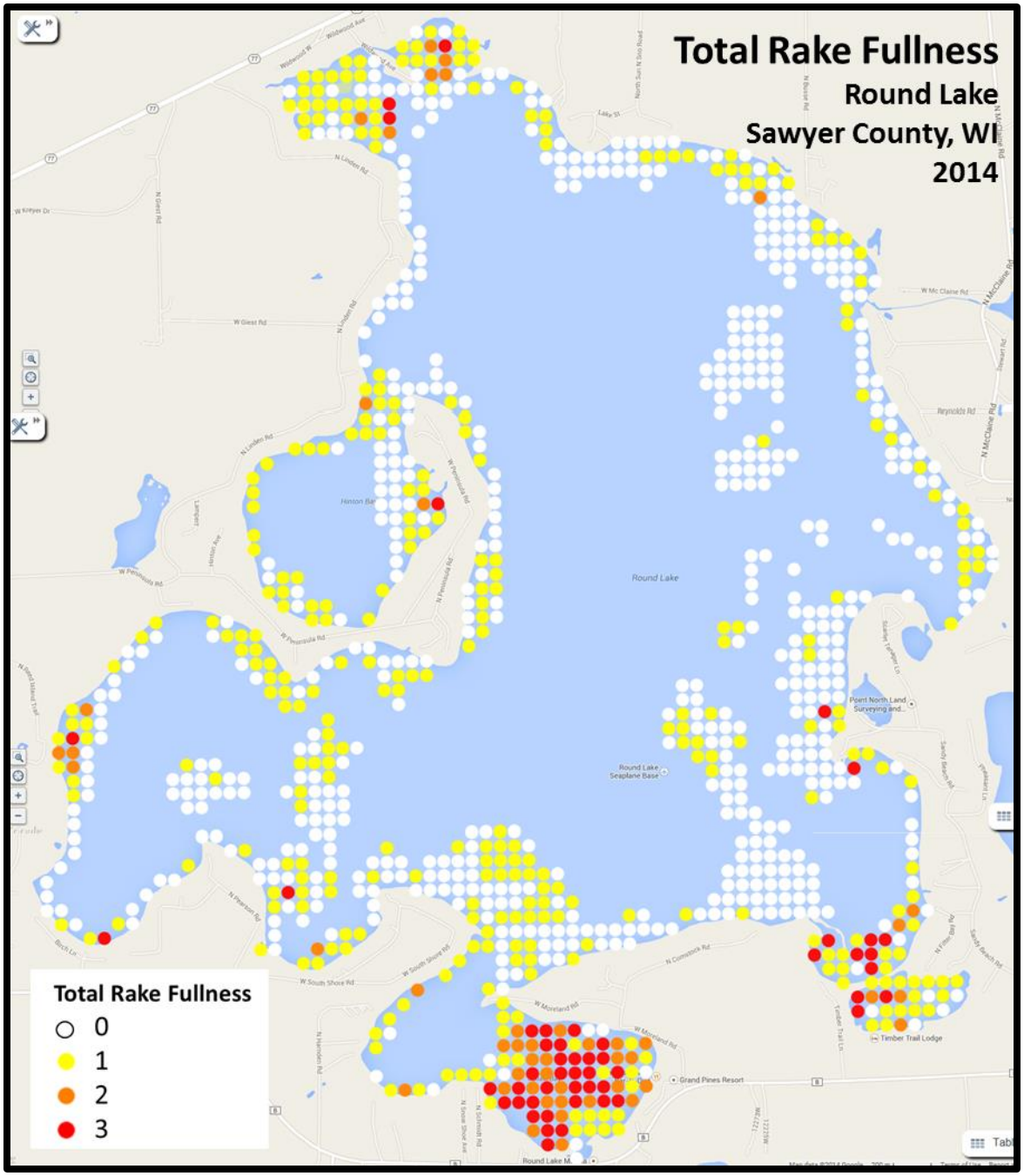


Figure 5 – Round Lake Total Rake Fullness Map

Table 4 – Coefficient of Conservatism (C) of Species Found in Round Lake, 2007 & 2014

Common Name	Scientific Name	C value	2007	2014
Bidens beckii	Water marigold	8	X	X
Brasenia schreberi	Watershield	6	X	X
Ceratophyllum demersum	Coontail	3	X	X
Chara	Muskgrasses	7	X	X
Elatine minima	Waterwort	9	X	
Eleocharis acicularis	Needle spikerush	5	X	X
Eleocharis palustris	Creeping spikerush	6		X
Elodea canadensis	Common waterweed	3	X	X
Eriocaulon aquaticum	Pipewort	9	X	
Heteranthera dubia	Water star-grass	6	X	X
Isoetes lacustris	Lake quillwort	8	X	
Juncus pelocarpus f. submersus	Brown-fruited rush	8		X
Lemna minor	Small duckweed	4		X
Myriophyllum alterniflorum	Alternate-flowered water-milfoil	10	X	X
Myriophyllum sibiricum	Northern water-milfoil	6	X	X
Myriopyllum tenellum	Dwarf water-milfoil	10	X	
Najas flexilis	Slender naiad	6	X	X
Nitella	Nitella	7	X	X
Nuphar variegata	Spatterdock	6	X	X
Nymphaea odorata	White water lily	6	X	X
Pontederia cordata	Pickerelweed	8	X	X
Potamogeton alpinus	Alpine pondweed	9	X	X
Potamogeton amplifolius	Large-leaf pondweed	7	X	X
Potamogeton epihydrus	Ribbon-leaf pondweed	8	X	
Potamogeton foliosus	Leafy pondweed	6	X	X
Potamogeton friesii	Fries' pondweed	8	X	X
Potamogeton gramineus	Variable pondweed	7	X	X
Potamogeton illinoensis	Illinois pondweed	6	X	
Potamogeton natans	Floating-leaf pondweed	5		X
Potamogeton praelongus	White-stem pondweed	8	X	X
Potamogeton pusillus	Small pondweed	7	X	X
Potamogeton richardsonii	Clasping-leaf pondweed	5	X	X
Potamogeton robbinsii	Fern pondweed	8	X	X
Potamogeton strictifolius	Stiff pondweed	8	X	X
Potamogeton vaseyi	Vasey's pondweed	10	X	
Potamogeton zosteriformis	Flat-stem pondweed	6	X	X
Ranaunculus aquatilis	Stiff water crowfoot	8	X	X
Ranunculus flammula	Creeping spearwort	9	X	X
Schoenoplectus tabernaemontani	Softstem bulrush	4	X	X
Sparganium fluctuans	Floating-leaved bur-reed	10	X	
Stuckenia pectinata	Sago pondweed	3	X	
Utricularia vulgaris	Common bladderwort	7		X
Vallisneria americana	Wild celery	6	X	X
N (includes only native species and those in Nichols, 1999)			**38***	**34**
Mean C			**6.88***	**6.56**
FQI			**44.05***	**38.24**

This table includes only native species that were found on the rake at survey points AND are listed in Nichols (1999).

**Calculations from 2009 Aquatic Plant Management Plan based on 41 total species*

Table 5 – Individual Species Statistics From the 2014 Aquatic Plant Survey of Round Lake

Scientific Name	Common Name	Avg. Rake Full.	# Sites	# Visual	Freq. Occur. Veg. Sites	Freq. Occur ≤max depth	Rel. Freq.
Potamogeton robbinsii	Fern pondweed	1.40	139	2	32.71	14.18	15.38
Najas flexilis	Slender naiad	1.03	118	1	27.76	12.04	13.05
Potamogeton gramineus	Variable pondweed	1.01	81	1	19.06	8.27	8.96
Chara sp.	Muskgrasses	1.00	64	0	15.06	6.53	7.08
Potamogeton pusillus	Small pondweed	1.03	62	0	14.59	6.33	6.86
Elodea canadensis	Common waterweed	1.05	59	0	13.88	6.02	6.53
Potamogeton zosteriformis	Flat-stem pondweed	1.35	52	1	12.24	5.31	5.75
Vallisneria americana	Wild celery	1.26	50	0	11.76	5.10	5.53
Myriophyllum sibiricum	Northern water-milfoil	1.07	27	0	6.35	2.76	2.99
Nitella sp.	Nitella	1.07	27	0	6.35	2.76	2.99
Ceratophyllum demersum	Coontail	1.65	26	0	6.12	2.65	2.88
Potamogeton praelongus	White-stem pondweed	1.28	25	0	5.88	2.55	2.77
Not Identified to Species	Filamentous algae	1.04	23	0	5.41	2.35	-
Bidens beckii	Water marigold	1.00	20	0	4.71	2.04	2.21
Potamogeton amplifolius	Large-leaf pondweed	1.15	20	1	4.71	2.04	2.21
Potamogeton friesii	Fries' pondweed	1.21	19	0	4.47	1.94	2.10
Potamogeton richardsonii	Clasping-leaf pondweed	1.05	19	2	4.47	1.94	2.10
Sagittaria sp.	Arrowhead	1.13	16	0	3.76	1.63	1.77
Potamogeton perfoliatus	Perfoliate pondweed	1.13	16	0	3.76	1.63	1.77
Eleocharis acicularis	Needle spikerush	1.00	11	0	2.59	1.12	1.22
Nymphaea odorata	White water lily	1.20	10	8	2.35	1.02	1.11
Schoenoplectus tabernaemontani	Softstem bulrush	1.00	8	10	1.88	0.82	0.88
Potamogeton foliosus	Leafy pondweed	1.00	7	0	1.65	0.71	0.77
Myriophyllum spicatum	Eurasian water milfoil	1.25	4	2	0.94	0.41	0.44
Brasenia schreberi	Watershield	1.67	3	5	0.71	0.31	0.33
Potamogeton strictifolius	Stiff pondweed	1.33	3	0	0.71	0.31	0.33
Utricularia vulgaris	Common bladderwort	1.33	3	1	0.71	0.31	0.33
Heteranthera dubia	Water star-grass	1.00	2	0	0.47	0.20	0.22
Pontederia cordata	Pickerelweed	1.00	2	1	0.47	0.20	0.22

Table 6 Continued from previous page

Scientific Name	Common Name	Avg. Rake Full.	# Sites	# Visual	Freq. Occur. Veg. Sites	Freq. Occur ≤max depth	Rel. Freq.
Potamogeton alpinus	Alpine pondweed	1.50	2	0	0.47	0.20	0.22
Eleocharis palustris	Creeping Spikerush	1.00	2	1	0.47	0.20	0.22
Juncus pelocarpus f. submersus	Brown-fruited rush	1.00	1	0	0.24	0.10	0.11
Lemna minor	Small duckweed	1.00	1	0	0.24	0.10	0.11
Myriophyllum alterniflorum	Alternate-flowered water-milfoil	1.00	1	0	0.24	0.10	0.11
Nuphar variegata	Spatterdock	1.00	1	1	0.24	0.10	0.11
Potamogeton natans	Floating-leaf pondweed	1.00	1	5	0.24	0.10	0.11
Ranunculus flammula	Creeping spearwort	1.00	1	0	0.24	0.10	0.11
Ranunculus aquatilis	White water crowfoot	1.00	1	0	0.24	0.10	0.11
Ceratophyllum echinatum	Spiny hornwort	*	*	1	*	*	*
Polygonum amphibium	Water smartweed	*	*	5	*	*	*
Sparganium angustifolium	Narrow-leaved bur-reed	*	*	1	*	*	*
Sparganium sp.	Bur-reed	*	*	1	*	*	*
Typha latifolia	Broad-leaved cattail	*	*	1	*	*	*
Calla palustris	Wild calla	**	**	**	**	**	**
Butomus umbellatus	Flowering rush	**	**	**	**	**	**
Comarum palustre	Marsh cinquefoil	**	**	**	**	**	**
Iris versicolor	Blue flag	**	**	**	**	**	**
Asclepias incarnate	Swamp milkweed	**	**	**	**	**	**

**Visual Only* ***Boat Survey Only*

Filamentous Algae in Round Lake

Filamentous algae are single algal cells that are microscopic as individuals but they form long filaments of cells that become visible to the naked eye. The filaments entwine to form a mat that resembles wet wool or cotton and remain submerged until enough air is trapped among the filaments to cause a floating mat. Filamentous algae are found in backwaters and near shore areas where nutrients (especially phosphorus) are readily available. At non-nuisance levels, the algae can provide cover for small aquatic organisms that serve as food for fish. However, floating mats of algae are not aesthetically pleasing and they interfere with recreation such as swimming and fishing.

Filamentous algae were found at only 23 sites or only 2.3% of the 1009 sites ≤ maximum rooting depth of 23 feet (Figure 6). The majority of filamentous algae were present in a submerged form and entwined with aquatic plants. Therefore, very few findings of the algae were in the form of floating mats.

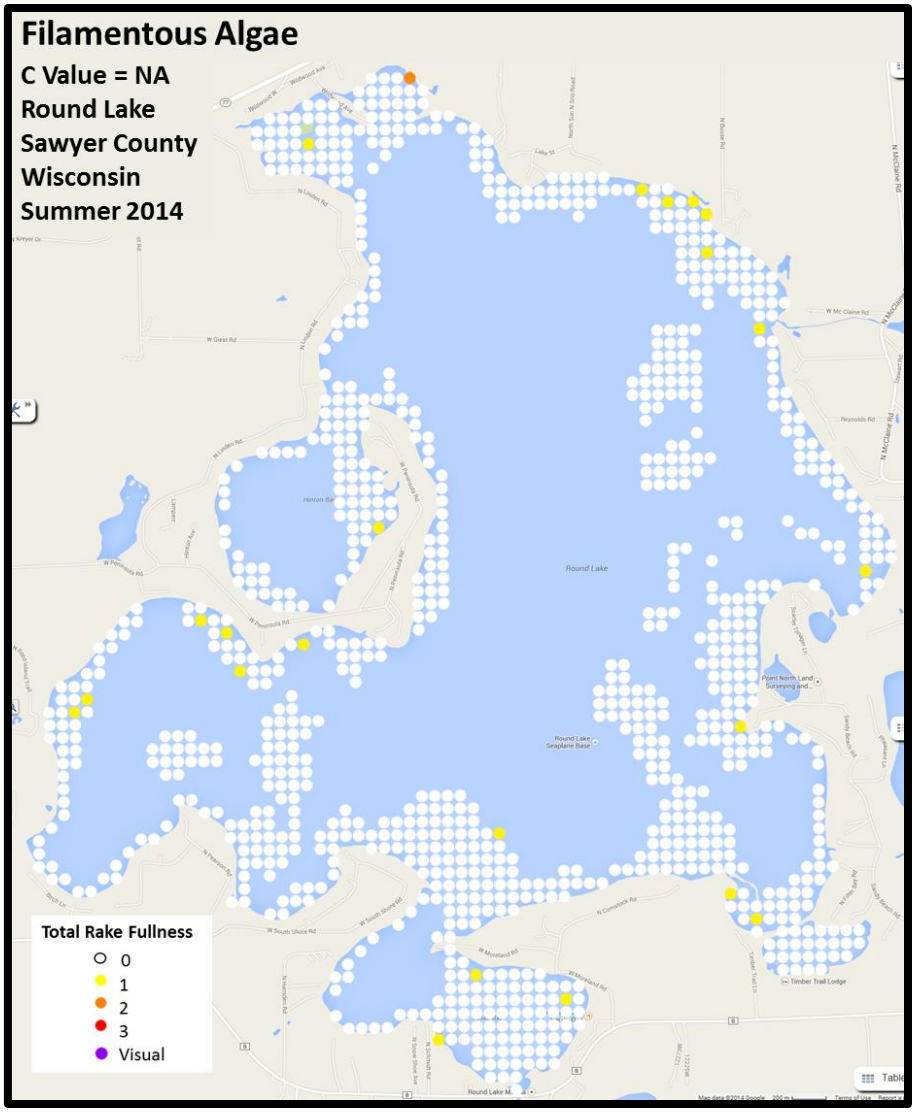


Figure 6 - Round Lake Filamentous Algae Locations & Rake Fullness

Non-Native Invasive Species in Round Lake

Flowering Rush

Flowering rush (*Butomus umbellatus)* is an emergent aquatic perennial and native to Eurasia. It was introduced to the Midwest United States as an ornamental and was often planted in water gardens (Czarapata, 2005). Flowering rush was not found during the 2007 aquatic plant survey of Round Lake. However, WDNR staff and RLPOA volunteers hand pulled flowering rush from six sites in Leder and Schoolhouse Bays in 2005. Flowering rush was found at one survey site in Musky Bay during the aquatic plant survey in 2014 near survey point 2454.

Flowering rush does not appear to pose a problem to the biotic integrity of the native aquatic plant community in Round Lake nor in Schoolhouse Bay at the time of the survey. However, regular monitoring and hand-pulling is important to keep flowering rush from growing to nuisance conditions and/or spreading to other parts of Round Lake.

Eurasian Water-milfoil

Eurasian water-milfoil (EWM) is a submergent, herbaceous aquatic plant native to Eurasia and northern Africa. EWM has a tendency to outcompete native plants due to its ability to stay alive throughout the winter and begin rapid growth in the spring before many native plants. Consequently, EWM continues to grow and can form dense mats of vegetation on the surface that block sunlight for other plant species. EWM is usually found in depths of 3-12 feet and fertile, fine-textured sediment (i.e., "muck) and seems to prefer disturbed lake beds and highly used lakes (Czarapata, 2005).

Eurasian water-milfoil (*Myriophyllum spicatum*) was first discovered in Round Lake in 1993. Chemical treatment, volunteer and professional monitoring, and watercraft inspections have been used since its discovery in Round Lake to keep EWM from dominating habitats conducive to EWM growth, especially bays with soft sediment.

During the 2007 aquatic plant survey, EWM was documented at 6 sites while in 2014 it was found at four survey sites in all of Round Lake (Figure 7). The relatively frequency of EWM is very low (0.44%, Table 5) when compared to the relative frequency of native species. More detailed surveying of EWM in 2014 was done by a licensed herbicide applicator to determine the best areas for chemical treatment. Detailed information regarding management is found in the updated Aquatic Plant Management Plan for Round and Little Round Lakes.

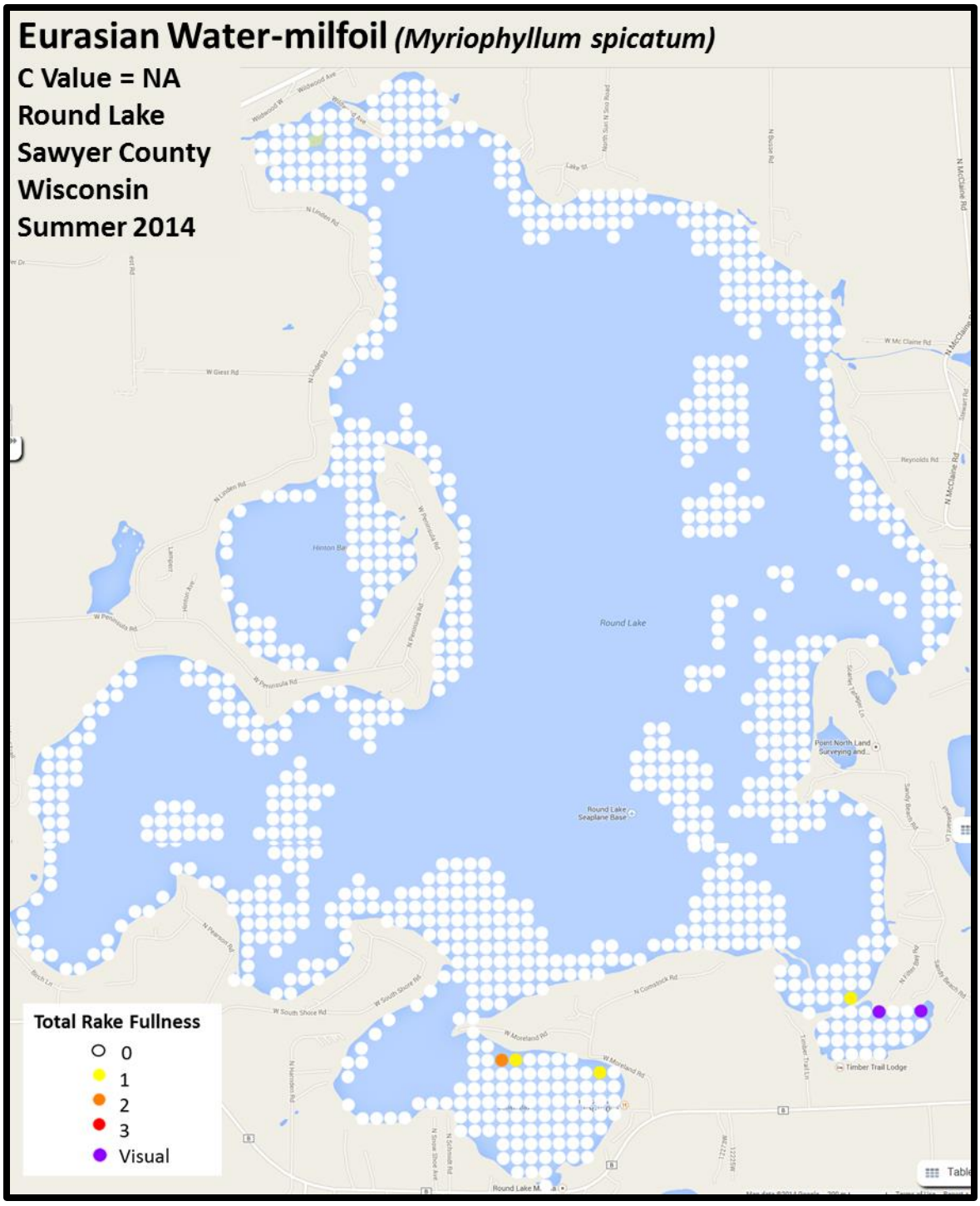


Figure 7 – Round Lake Eurasian Water-milfoil Locations & Rake Fullness

Round Lake Sediment

There were 1,009 survey points that were actually visited during the 2014 aquatic plant survey. The dominant sediment type at each site was determined using the rake head attached to a pole for sites <15 feet and the rope rake for sites ≥15 feet. Dominant sediment type can be difficult to determine with the rope rake, but this assessment is general and intended to provide an overall idea of the sediment types and distributions.

Round Lake sediment was largely sand at 683 sites (68%). The presence of muck and rock were similar in frequency with 168 (17%) and 158 (15%) respectively (Figure 8).

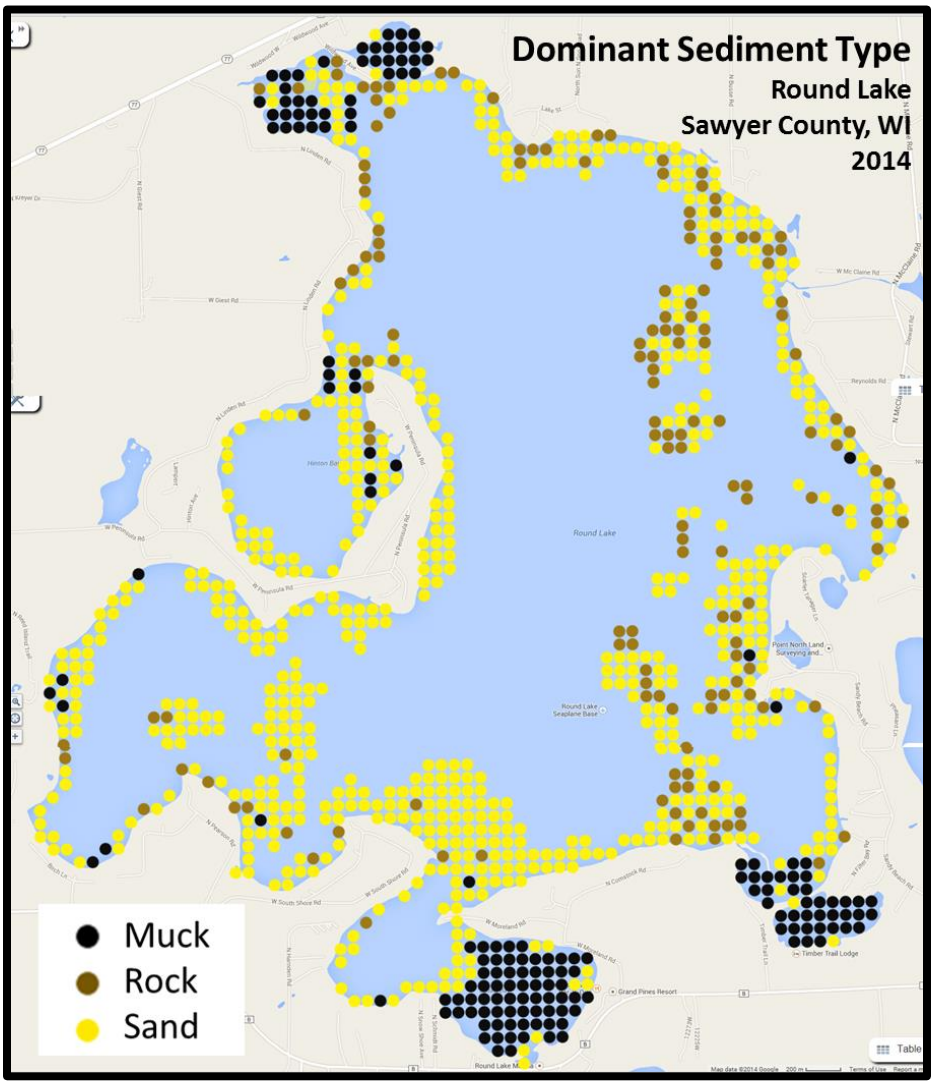


Figure 8 - Round Lake Dominant Sediment Map

Round Lake Depth

The maximum depth of Round Lake is 74 with a mean depth of 33 feet (WDNR, 2014). During the aquatic plant survey of 2014, there were a possible 2,749 survey points, 1,009 of which were ≤25 feet deep. Of the 1,009 sites surveyed, one-third (337, 33%) were between 5.5 and 10 feet in depth while another one-third (310, 31%) were between 10.5 and 15 feet in depth. The remaining one-third of survey points were split nearly equal into the remaining three depth ranges. In other words, 126 (12.5%) were between 0 and 5 feet, 121 (12%) were between 15.5 and 20 feet, and 115 (11%) were between 20.5 and 25 feet (Figure 9).

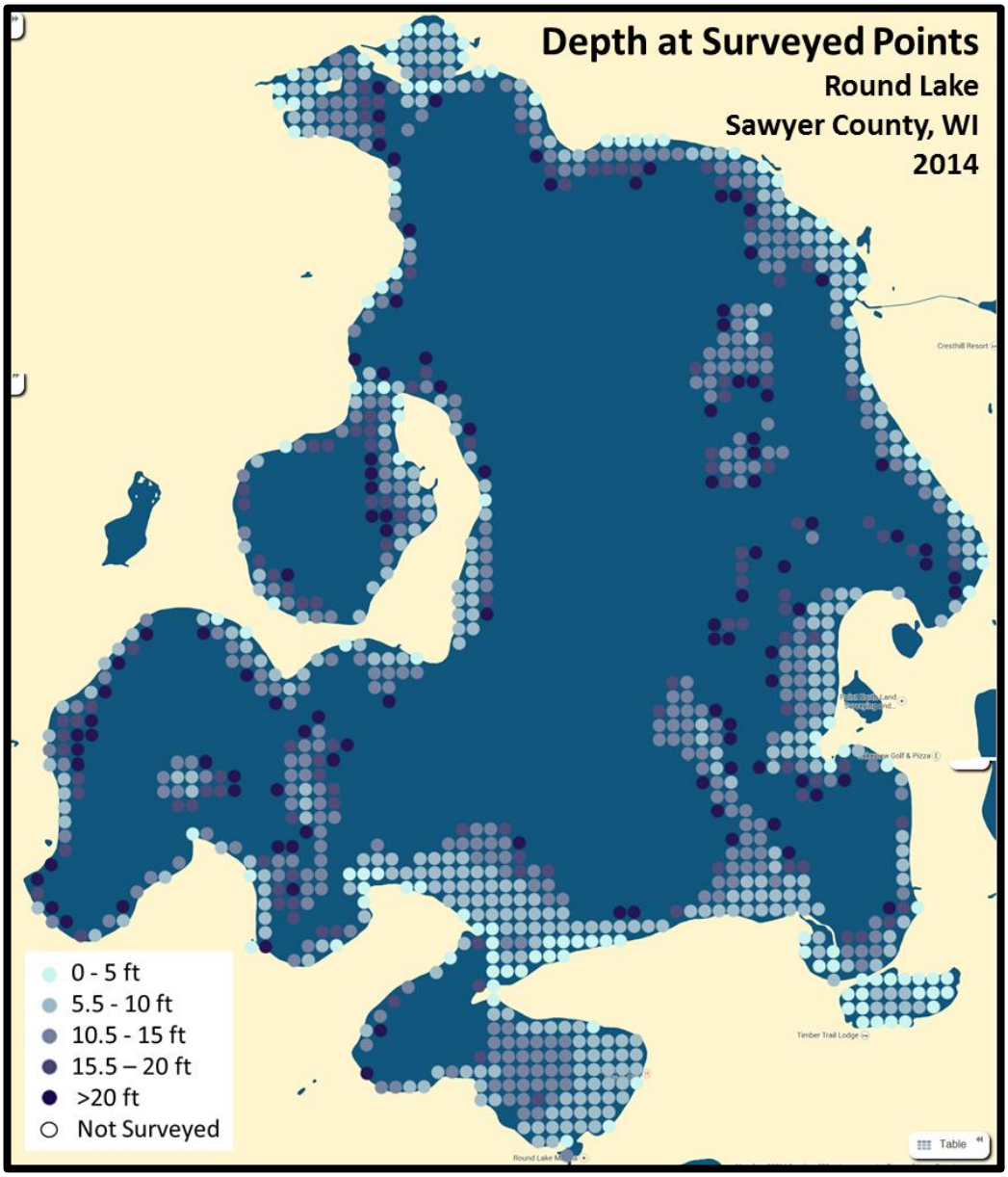


Figure 9 - Round Lake Depth at Surveyed Points

LITTLE ROUND LAKE RESULTS

A total of 698 predetermined survey waypoints (Figure 3) were generated by the WDNR based on standard protocol. A total of 403 points were actually surveyed given their depth of 25 feet or less and the ability to navigate to those sites. One site was blocked by an isthmus, one was occupied by anglers, 65 were not navigable due to thick emergent vegetation, and 228 were too deep to survey (Figure 10). The maximum rooting depth was 23 feet. The total number of sites shallower than the maximum depth of plants was 385 and vegetation was present at 322 of those sites (Table 6). Most of the sites with vegetation had a total rake fullness of three (132 sites, 41%), 101 sites (32%) had a total rake fullness of 1 and 87 sites (27%) had a total rake fullness of 2 (Figure 11). The average number of species found at the 322 sites was 3.07 and the average rake fullness was 2.10.

A total of 41 species of aquatic plants were found, three of which were "visual only" (i.e., within 6 feet of the survey point but not found on the rake) and one species greater than 6 feet from any survey point and thus counted as part of the boat survey. Filamentous algae and aquatic moss are not counted as one of the 41 species. Species richness for Little Round Lake was 40 species including "visuals only" but excluding boat survey species (Table 6).

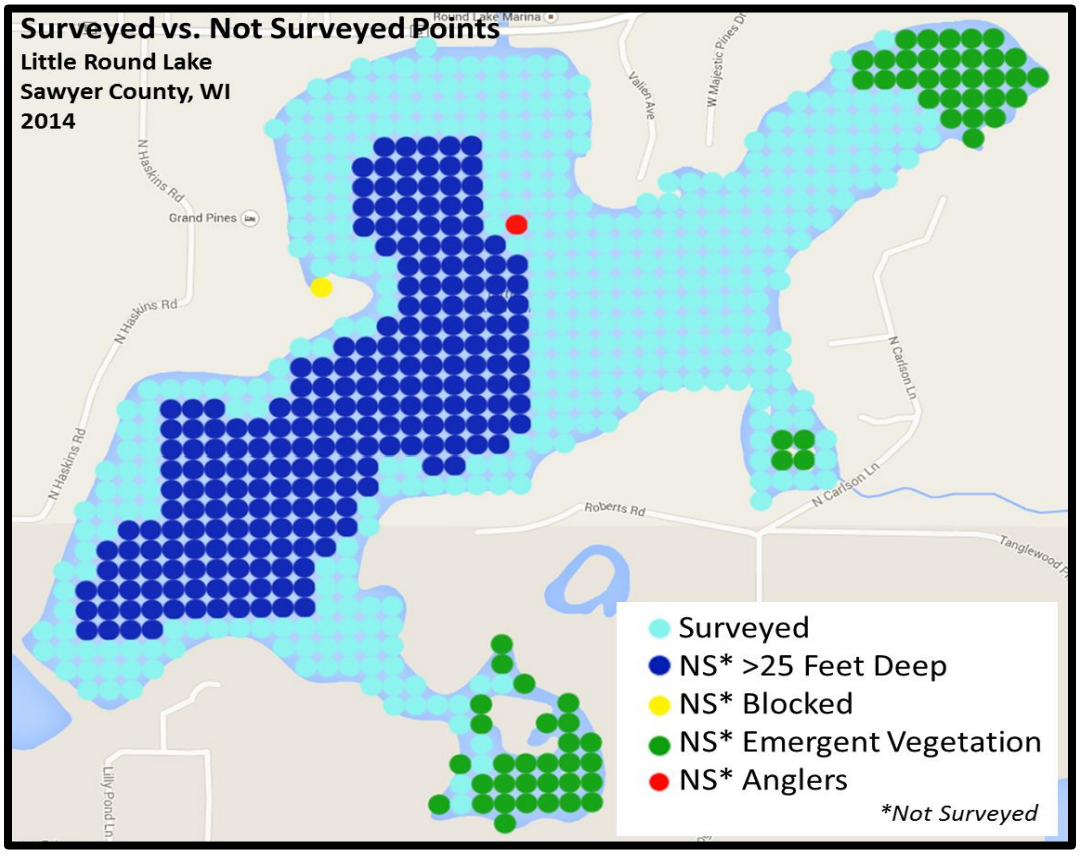


Figure 10 - Surveyed vs. Not Surveyed Points in Little Round Lake

Simpson Diversity Index includes species raked at survey points but does not include visuals or boat survey species. The Simpson Diversity Index for Little Round Lake was calculated to be 0.92 on a scale from 0 to 1 (Table 6). The Floristic Quality Index (FQI) only factors species raked at survey points and does not include visuals (3), boat survey species (1), aquatic invasive species (2) and plants that can only be identified to genus (2). In Little Round Lake, some cattail (*Typha sp.*) and arrowhead (*Sagittaria sp.*) could not be identified to species because they lacked flowering parts. Therefore, 34 species were included in the calculation, which is higher than the mean number of species (13) for other lakes in the North Lakes and Forests ecoregion. The floristic quality for Little Round Lake was 38.93, which is higher than the mean values for other lakes in the Northern Lakes and Forests ecoregion. The average C value of plant species in Little Round Lake was 6.7, which is equal to the average C value for other lakes in the same ecoregion.

Fern pondweed (*Potamogeton robbinsii*), water celery (*Vallisneria americana*), and coontail (*Ceratophyllum demersum*) were the most common species found at 49%, 20%, and 18% of survey points (≤ maximum rooting depth of 23 feet), respectively (Figure 29, Figure 30). Together they accounted for 37% of the total relative frequency. A combined relative frequency of <50% for the top three species suggests the plant community is relatively heterogeneous.

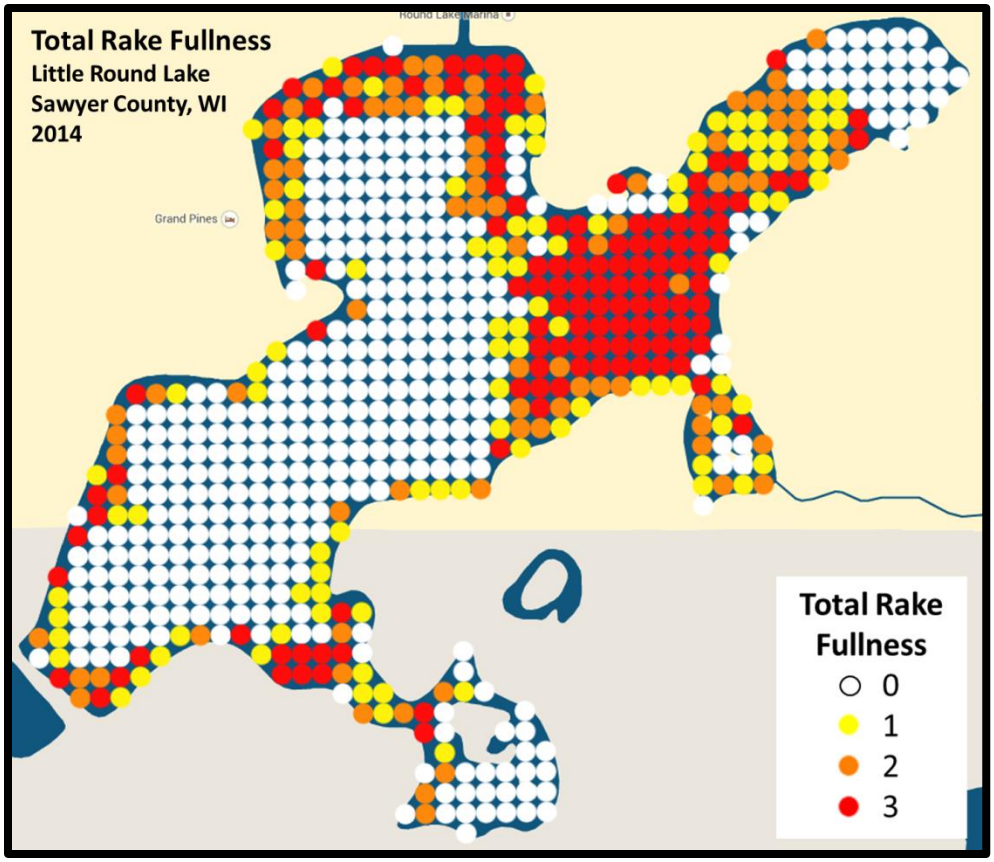


Figure 11 - Little Round Lake Total Rake Fullness Map

Table 6 – Summary Statistics for 2005 & 2014 Aquatic Plant Surveys of Little Round Lake.

	Summary Statistic		Results 2005	Results 2014
1	Total number of sites visited		**352**	**403**
2	Total number of sites with vegetation		**246**	**322**
3	Maximum depth of plants		**23.6 feet**	**23 feet**
4	Total number of sites shallower than maximum depth of plants		**345**	**385**
5	Frequency of occurrence at sites shallower than maximum depth of plants		**71.3%**	**83.64%**
6	Average number of species per site	i) Shallower than maximum depth	**NA**	**2.57**
		j) Vegetated sites only	**NA**	**3.07**
		k) Native shallower than maximum depth	**NA**	**2.54**
		l) Native species at vegetated sites only	**NA**	**3.04**
7	Species Richness	c) Total # species found on rake at all sites	**32**	**37**
		d) Including visuals	**35**	**40**
8	Simpson's Diversity Index		**0.90**	**0.92**
9	Coefficient of Conservatism (C)		NA	See Table 7
10	Floristic Quality Index		**NA**	**38.93**

Sensitive Species in Little Round Lake

Five species with a conservatism(C) value of 9 or 10 were found at survey points in Little Round Lake. The C value estimates the likelihood of that plant species occurring in an environment that is relatively unaltered from pre-settlement conditions. As human disturbance occurs, species with a low C value are more likely to dominate a lake. Three-way sedge (*Dulichium arundinaceum*) and dwarf water-milfoil (*Myriophyllum tenellum*) were each found at one survey point. Small bladderwort (*Utricularia minor*) was found at 9 survey points. Water bulrush (*Schoenoplectus subterminalis*) and flat-leaf bladderwort (*Myriophyllum intermedia*) were found at 23 and 34 sites, respectively (Figure 30, Figure 31, Figure 32).

Perfoliate pondweed (*Potamogeton perfoliatus*) is listed as a species of special concern in Wisconsin meaning it is rare. On a global scale the species is secure. However, in Wisconsin perfoliate pondweed is considered "critically imperiled because of extreme rarity or because of some factors making it especially vulnerable" (NHI, 2014). Perfoliate pondweed was found at 17 locations in Little Round Lake (Figure 33). Small bladderwort was once on the WDNR Natural Heritage Inventory (NHI) list as "species of special concern." Email correspondence with Julie Bleser of the WDNR clarified that a comprehensive review of all species on the NHI list was done in 2010, resulting in the removal of this species from the list in February 2011.

Watershield (*Brasenia schreberi)*, large-leaf pondweed (*Potamogeton amplifolius*), and spikerush (*Eleocharis sp.*) are all species identified in Wisconsin Administrative Code NR 109 as "high value species…….. known to offer important values in specific aquatic ecosystems." Watershied was found at 49sites, large-leaf pondweed at 32 sites, and spikerushes at 10 sites (Figure 33, Figure 34, Figure 35).

Table 7 – Coefficient of Conservatism (C) of Species in Little Round Lake 2005 & 2014

Common Name	Scientific Name	C value	2005	2014
Bidens beckii	Water marigold	8	X	X
Brasenia schreberi	Watershield	6	X	X
Ceratophyllum demersum	Coontail	3	X	X
Chara	Muskgrasses	7	X	X
Dulichium arundinaceum	Three-way sedge	9		X
Eleocharis acicularis	Needle spikerush	5	X	X
Eleocharis palustris	Creeping Spikerush	6		X
Elodea canadensis	Common waterweed	3	X	X
Equisetum fluviatile	Water horsewort	7		X
Eriocaulon aquaticum	Pipewort	9	X	
Heteranthera dubia	Water star-grass	6	X	X
Juncus pelocarpus f. submerses	Brown-fruited rush	8	X	
Myriophyllum sibiricum	Northern water-milfoil	6	X	X
Myriopyllum tenellum	Dwarf water-milfoil	10	X	X
Najas flexilis	Slender naiad	6	X	X
Nitella sp.	Nitella	7	X	
Nuphar variegata	Spatterdock	6	X	X
Nymphaea odorata	White water lily	6	X	X
Polygonum amphibium	Water smartweed	5		X
Pontederia cordata	Pickerelweed	8		X
Potamogeton amplifolius	Large-leaf pondweed	7	X	X
Potamogeton foliosus	Leafy pondweed	6		X
Potamogeton friesii	Fries' pondweed	8		X
Potamogeton gramineus	Variable pondweed	7	X	X
Potamogeton illinoensis	Illinois pondweed	6	X	
Potamogeton natans	Floating-leaf pondweed	5	X	X
Potamogeton obtusifolius	Blunt-leaf pondweed	9	X	
Potamogeton praelongus	White-stem pondweed	8	X	X
Potamogeton pusillus	Small pondweed	7	X	X
Potamogeton richardsonii	Clasping-leaf pondweed	5	X	X
Potamogeton robbinsii	Fern pondweed	8	X	X
Potamogeton strictifolius	Stiff pondweed	8		X
Potamogeton zosteriformis	Flat-stem pondweed	6	X	X
Ranunculus flammula	Creeping spearwort	9	X	
Schoenoplectus subterminalis	Water bulrush	9		X
Schoenoplectus tabernaemontani	Softstem bulrush	4		X
Utricularia intermedia	Flat-leaf bladderwort	9		X
Utricularia minor	Small bladderwort	10		X
Utricularia vulgaris	Common bladderwort	7		X
Vallisneria americana	Wild celery	6	X	X
N (includes only native species and those in Nichols, 1999)			**27**	**34**
Mean C			**NA**	**6.7**
FQI			**NA**	**38.93**

This table includes only native species that were found on the rake at survey points AND are listed in Nichols (1999).

Table 8 – Individual Species Statistics From the 2014 Aquatic Plant Survey of Little Round Lake

Scientific Name	Common Name	Avg. Rake Full.	Number of Sites	Number of Visual	Freq. Occur. Veg. Sites	Freq. Occur ≤max depth	Rel. Freq.
Potamogeton robbinsii	Fern pondweed	2.02	190	0	59.01	49.35	19.19
Vallisneria americana	Wild celery	1.69	103	0	31.99	26.75	10.40
Ceratophyllum demersum	Coontail	1.23	70	0	21.74	18.18	7.07
Potamogeton gramineus	Variable pondweed	1.06	67	0	20.81	17.40	6.77
Elodea canadensis	Common waterweed	1.02	66	0	20.50	17.14	6.67
Brasenia schreberi	Watershield	1.20	49	10	15.22	12.73	4.95
Najas flexilis	Slender naiad	1.00	48	0	14.91	12.47	4.85
Potamogeton zosteriformis	Flat-stem pondweed	1.00	35	0	10.87	9.09	3.54
Utricularia intermedia	Flat-leaf bladderwort	1.15	34	1	10.56	8.83	3.43
Bidens beckii	Water marigold	1.00	32	0	9.94	8.31	3.23
Potamogeton amplifolius	Large-leaf pondweed	1.03	32	0	9.94	8.31	3.23
Potamogeton praelongus	White-stem pondweed	1.08	26	0	8.07	6.75	2.63
Nymphaea odorata	White water lily	1.09	23	17	7.14	5.97	2.32
Schoenoplectus subterminalis	Water bulrush	1.04	23	1	7.14	5.97	2.32
Myriophyllum sibiricum	Northern water-milfoil	1.05	20	0	6.21	5.19	2.02
Potamogeton friesii	Fries' pondweed	1.11	18	0	5.59	4.68	1.82
Potamogeton pusillus	Small pondweed	1.06	18	0	5.59	4.68	1.82
Potamogeton perfoliatus	Perfoliate Pondweed	1.00	17	0	5.28	4.42	1.72
Potamogeton strictifolius	Stiff pondweed	1.33	15	0	4.66	3.90	1.52
Utricularia vulgaris	Common bladderwort	1.00	14	0	4.35	3.64	1.41
Myriophyllum spicatum	Eurasian water milfoil	1.00	12	3	3.73	3.12	1.21
Chara sp.	Muskgrasses	1.00	12	0	3.73	3.12	1.21
Nuphar variegata	Spatterdock	1.00	12	14	3.73	3.12	1.21
Not Identified to Species	Filamentous algae	1.08	12	0	3.73	3.12	-
Utricularia minor	Small bladderwort	1.00	9	0	2.80	2.34	0.91
Eleocharis palustris	Creeping spikerush	1.22	9	3	2.80	2.34	0.91
Heteranthera dubia	Water star-grass	1.00	7	0	2.17	1.82	0.71
Potamogeton richardsonii	Clasping-leaf pondweed	1.00	7	0	2.17	1.82	0.71
Not Identified to Species	Aquatic Moss	1.00	7	0	217	1.82	-

Table 8 Continued from Previous Page

Potamogeton foliosus	Leafy pondweed	1.17	6	0	1.86	1.56	0.61
Potamogeton natans	Floating-leaf pondweed	1.00	4	5	1.24	1.04	0.40
Sagittaria sp.	Arrowhead	1.00	4	3	1.24	1.04	0.40
Pontederia cordata	Pickerelweed	1.00	2	5	0.62	0.52	0.20
Dulichium arundinaceum	Three-way sedge	1.00	1	5	0.31	0.26	0.10
Eleocharis acicularis	Needle spikerush	1.00	1	0	0.31	0.26	0.10
Equisetum fluviatile	Water horsetail	1.00	1	0	0.31	0.26	0.10
Myriophyllum tenellum	Dwarf water-milfoil	1.00	1	0	0.31	0.26	0.10
Polygonum amphibium	Water smartweed	1.00	1	3	0.31	0.26	0.10
Schoenoplectus tabernaemontani	Softstem bulrush	1.00	1	2	0.31	0.26	0.10
Sparganium americanum	American bur-reed	*	*	*	*	*	*
Typha latifolia	Broad-leaved cattail	*	*	*	*	*	*
Typha sp.	Cattail	*	*	*	*	*	*
Lytrhum salicaria	Purple loosestrife	**	**	**	**	**	**

**Visual Only* ***Boat Survey Only*

Filamentous Algae in Little Round Lake

Filamentous algae are single algal cells that are microscopic as individuals but they form long filaments of cells that become visible to the naked eye. The filaments entwine to form a mat that resembles wet wool or cotton and remain submerged until enough air is trapped among the filaments to cause a floating mat. Filamentous algae are found in backwaters and near shore areas where nutrients (especially phosphorus) are readily available. At non-nuisance levels, the algae can provide cover for small aquatic organisms that serve as food for fish. However, floating mats of algae are not aesthetically pleasing and they interfere with recreation such as swimming and fishing.

Filamentous algae were found at only 12 sites or only 3% of the 403 sites ≤ 25 feet (Figure 12). The majority of filamentous algae were present in a submerged form and entwined with aquatic plants. Therefore, very few findings of the algae were in the form of floating mats.

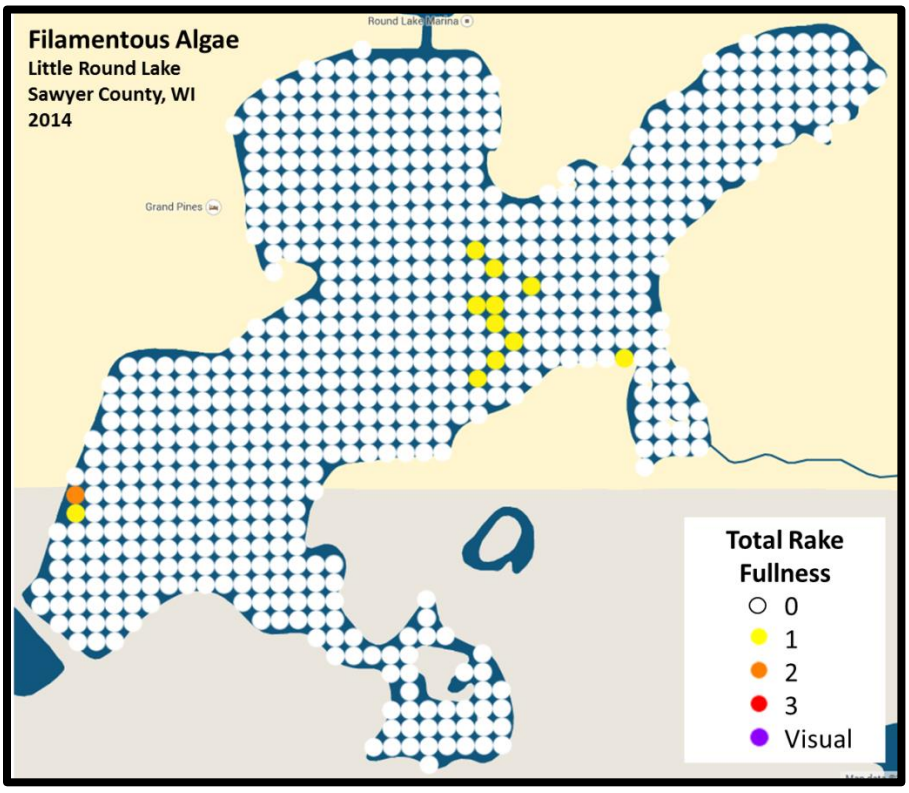


Figure 12 - Little Round Lake Filamentous Algae Locations & Rake Fullness

Non-Native Invasive Species in Little Round Lake

Purple Loosestrife

Purple loosestrife (*Lythrum salicaria)* is a wetland perennial that was introduced to the Midwest United States as an ornamental. The species is widespread throughout Wisconsin with reports in all but four counties as of July 2011 (WDNR, 2014). A single stem of purple loosestrife flowers can produce up to 300,000 seeds per year and a mature plant can produce 2 million seeds, which are viable for at least 7 years. Early detection and elimination of purple loosestrife is the most effective means for control. Once the species spreads, it can form dense monocultures that out-compete native species. This is especially problematic in wetlands where a diverse plant community provides food and habitat to a diverse animal community. A dense stand of purple loosestrife compromises the plant community and provides limited habitat for animals. Purple loosestrife along shorelines of lakes is less of an issue, unless the shoreline is wetland.

Purple loosestrife was found at one point on Little Round Lake near County Highway B, just west of the bridge (Figure 13). The plant was found as part of the boat survey, therefore it was greater than 6 feet from any survey point but it was closest to survey point 303. The occurrence was not very substantial and could be controlled manually by cutting the plant a couple times each growing season before any flowering occurs, thereby not allowing seeds to form. There may already be a bank of seeds in the soil, so continued monitoring of the site after any removal will be required. Keeping this purple loosestrife occurrence from spreading is important because there are areas in Little Round Lake that would be ideal for purple loosestrife to infest and possibly outcompete native species (i.e., the two bays along the southern shore that are quite wetland-like with shallow water, mucky sediment, and dense emergent and floating vegetation).

Figure 13 - Purple Loosestrife on Little Round Lake

Eurasian Water-milfoil

Eurasian water-milfoil (EWM) is a submergent, herbaceous aquatic plant native to Eurasia and northern Africa. EWM has a tendency to outcompete native plants due to its ability to stay alive throughout the winter and begin rapid growth in the spring before many native plants. Consequently, EWM continues to grow and can form dense mats of vegetation on the surface that block sunlight for other plant species. EWM is usually found in depths of 3-12 feet and fertile, fine-textured sediment (i.e., "muck) and seems to prefer disturbed lake beds and highly used lakes (Czarapata, 2005).

Eurasian water-milfoil (*Myriophyllum spicatum*) was first discovered in Little Round Lake in 1999 Chemical treatment, volunteer and professional monitoring, and watercraft inspections have been used to control EWM since its discovery in Little Round Lake.

During the 2005 aquatic plant survey, EWM was documented at 3 sites while in 2014 it was found at 12 survey sites with a rake fullness value of 1 and was visually observed near an additional three points (Figure 15). The relatively frequency of EWM is low (1.21%, Table 5) when compared to the relative frequency of native species. At four sites, the EWM showed signs of damage from chemical treatment such as fused leaflets, especially toward the top of the plant where new growth occurs (Figure 14). More detailed surveying of EWM in 2014 was completed by a licensed herbicide applicator to determine the best areas for chemical treatment. Detailed information regarding management are found in the updated Aquatic Plant Management Plan for Round and Little Round Lakes.

Figure 14 - Damaged EWM from Little Round Lake

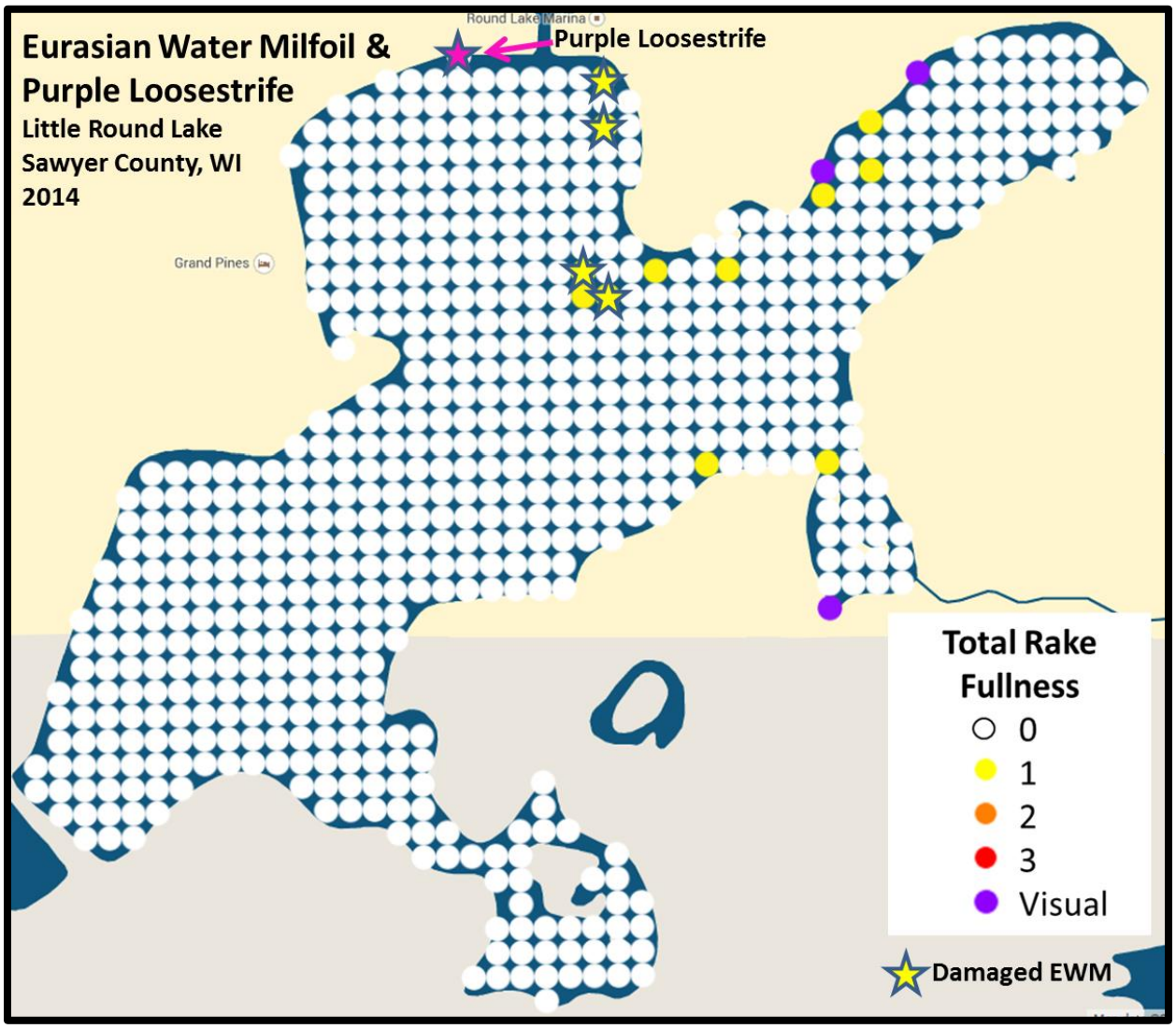


Figure 15 - EWM & Purple Loosestrife Locations and Rake Fullness in Little Round Lake

Little Round Lake Sediment

There were 403 survey points that were actually visited during the 2014 aquatic plant survey. The dominant sediment type at each site was determined using the rake head attached to a pole for sites <15 feet and the rope rake for sites ≥15 feet. Dominant sediment type can be difficult to determine with the rope rake, but this assessment is general and intended to provide an overall idea of the sediment types and distributions.

Little Round Lake sediment was largely muck at 213 sites (53%). Sandy sediment was found at 173 sites (43%) and rocky substrate was found at 17 sites (4%) (Figure 16).

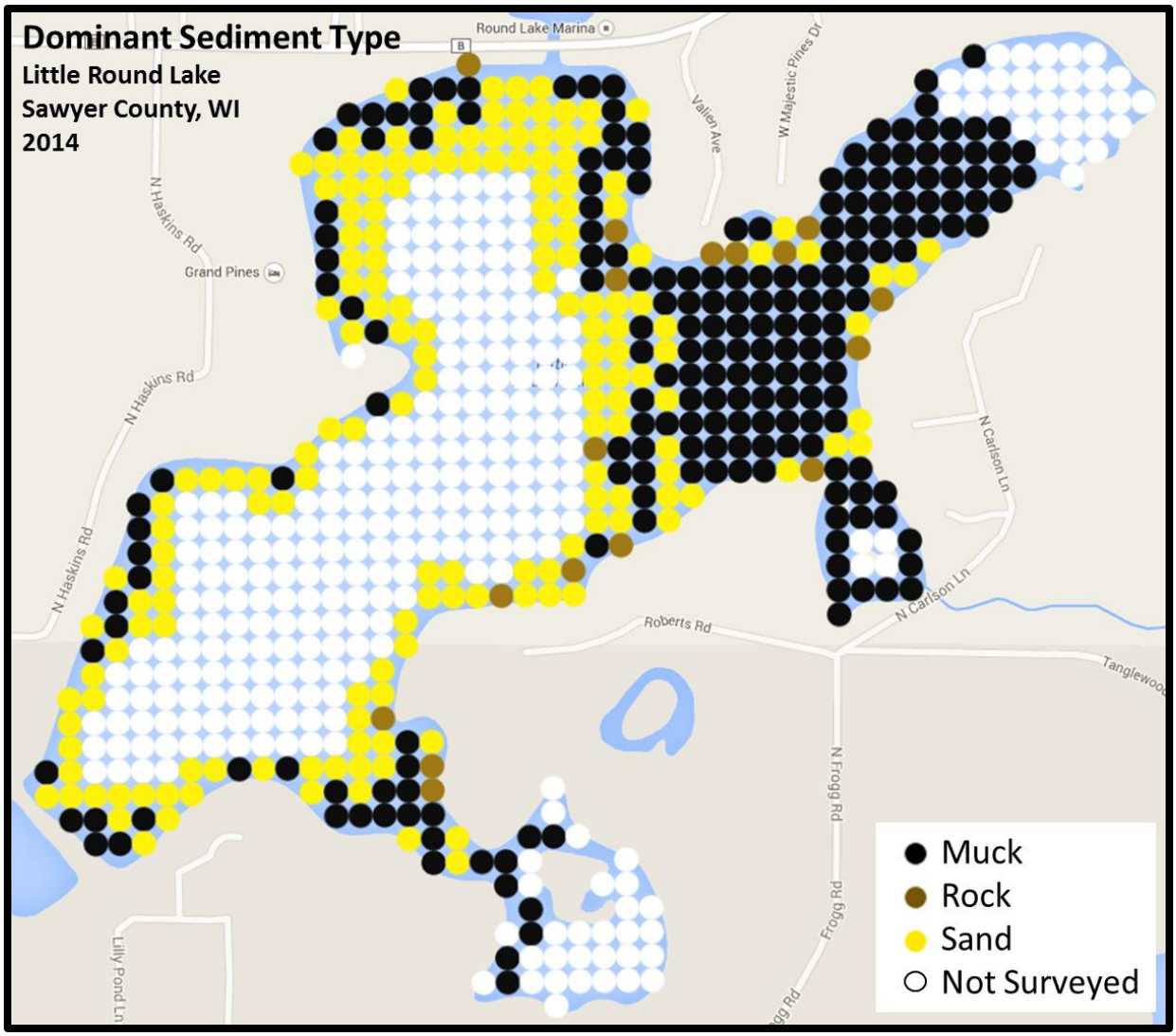


Figure 16 - Little Round Lake Dominant Sediment Map

Little Round Lake Depth

The maximum depth of Little Round Lake is 38 feet with a mean depth of 12 feet (WDNR, 2014). During the aquatic plant survey of 2014, there were a possible 698 survey points, 403 of which were ≤25 feet deep. Most of the 403 sites surveyed were within the 5.5-10 foot depth range (108, 27%) followed by 93 (23%) sites that were between 10.5 and 15 feet in depth. Of the remaining sites, 86 (21%) were between 0 and 5 feet, 58 (14%) were between 15.5 and 20 feet, and 58 (14%) were between 20.5 and 25 feet (Figure 17).

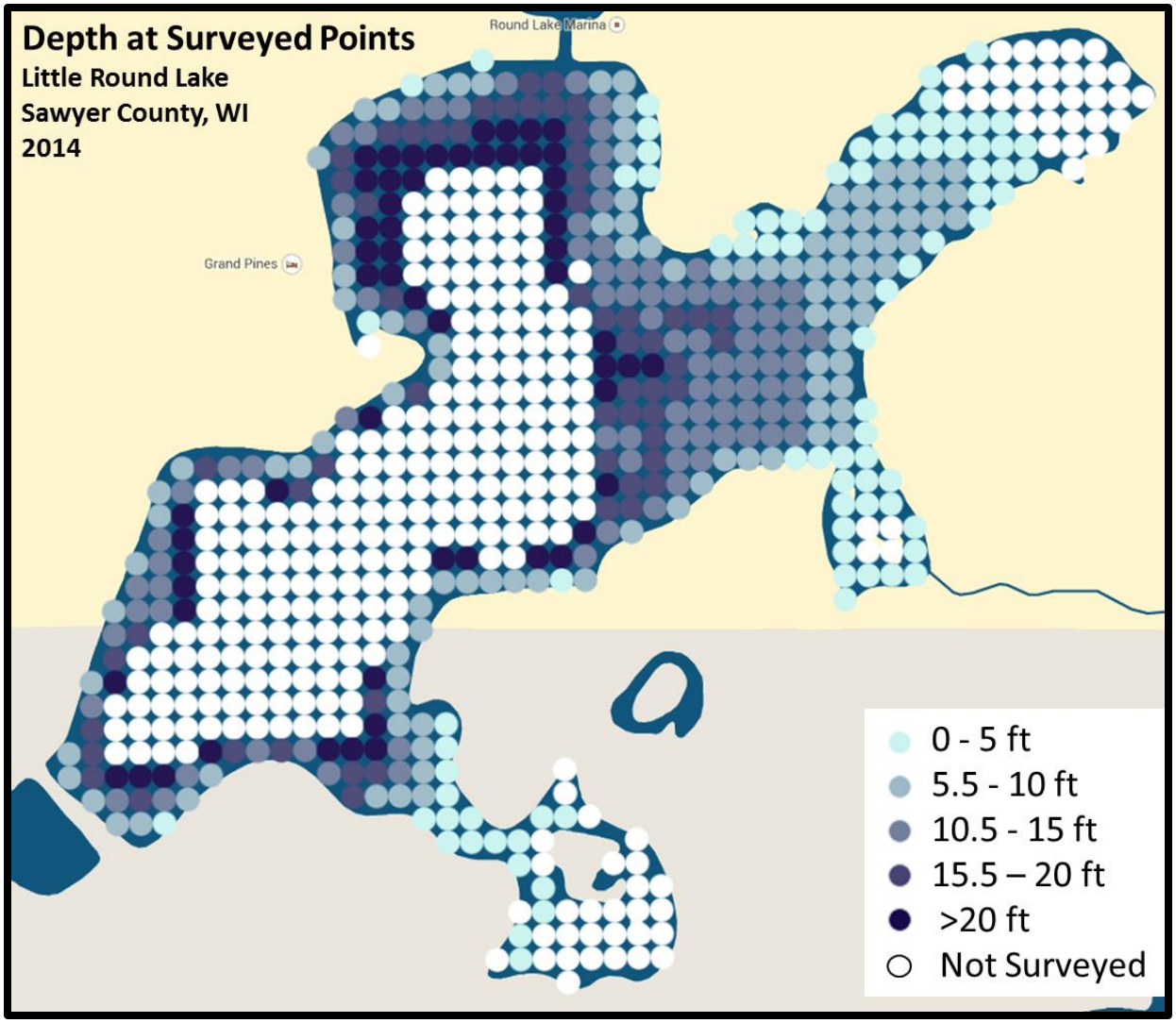


Figure 17 – Little Round Lake Depth at Surveyed Points

REFERENCES

Crow, G.E. and C.B. Hellquist. 2000. Aquatic and Wetland Plants of Northeastern North America, Volumes 1 & 2. University of Wisconsin Press. Madison, Wisconsin.

Czarapata, E.J. 2005. Invasive Plants of the Upper Midwest. An Illustrated Guide to Their Identification and Control. University of Wisconsin Press. Madison, Wisconsin.

Harmony Environmental. 2009. Aquatic Plant Management Plan, Round Lake and Little Round Lake, Sawyer County, Wisconsin.

Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010. Madison, Wisconsin. 46pp.

LakeSat.org. 2013. Environmental Remote Sensing Center, University of Wisconsin-Madison. 13 December 2013. http://www.lakesat.org/.

Nichols, S.A. 1999. Floristic Quality Assessment of Wisconsin Lake Plant Communities with Example Applications. Journal of Lake and Reservoir Management. 15(2):133-141.

Skawinski, P.M. 2010. Aquatic Plants of Wisconsin: A photographic field guide to submerged and floating-leaf aquatic plants.

Surface Water Data Viewer (SWDV). 2013. Wisconsin Department of Natural Resources. Dec. 2013. http://dnrmaps.wi.gov/imf/imf.jsp?site=SurfaceWaterViewer.

Tobiessen, P. and Snow, P.D. 1984. Temperature and light effects on the growth of *Potamogeton crispus* in Collins Lake, New York State. Canadian Journal of Botany 62:2822-2826.

UWEX. 2013. University of Wisconsin Extension Lakes. Lake Ecology, Aquatic Plant Management in Wisconsin. 15 Dec. 2013. http://www4.uwsp.edu/cnr/uwexlakes/ecology/APMguide.asp.

Washington State Department of Ecology (WSDE). 2014. Aquatic Plant Management – Mechanical Cutting. 8 Sept. 2014. http://www.ecy.wa.gov/programs/wq/plants/management/aqua025.html.

NHI. 2014. Wisconsin Natural Heritage Working List. 9 Oct. 2014. http://dnr.wi.gov/topic/nhi/wlist.html.

WDNR. 2014. Wisconsin Department of Natural Resources. 3 Sept. 2014 http://dnr.wi.gov/lakes/lakepages/.

APPENDIX A – ROUND LAKE AQUATIC PLANT SURVEY MAPS

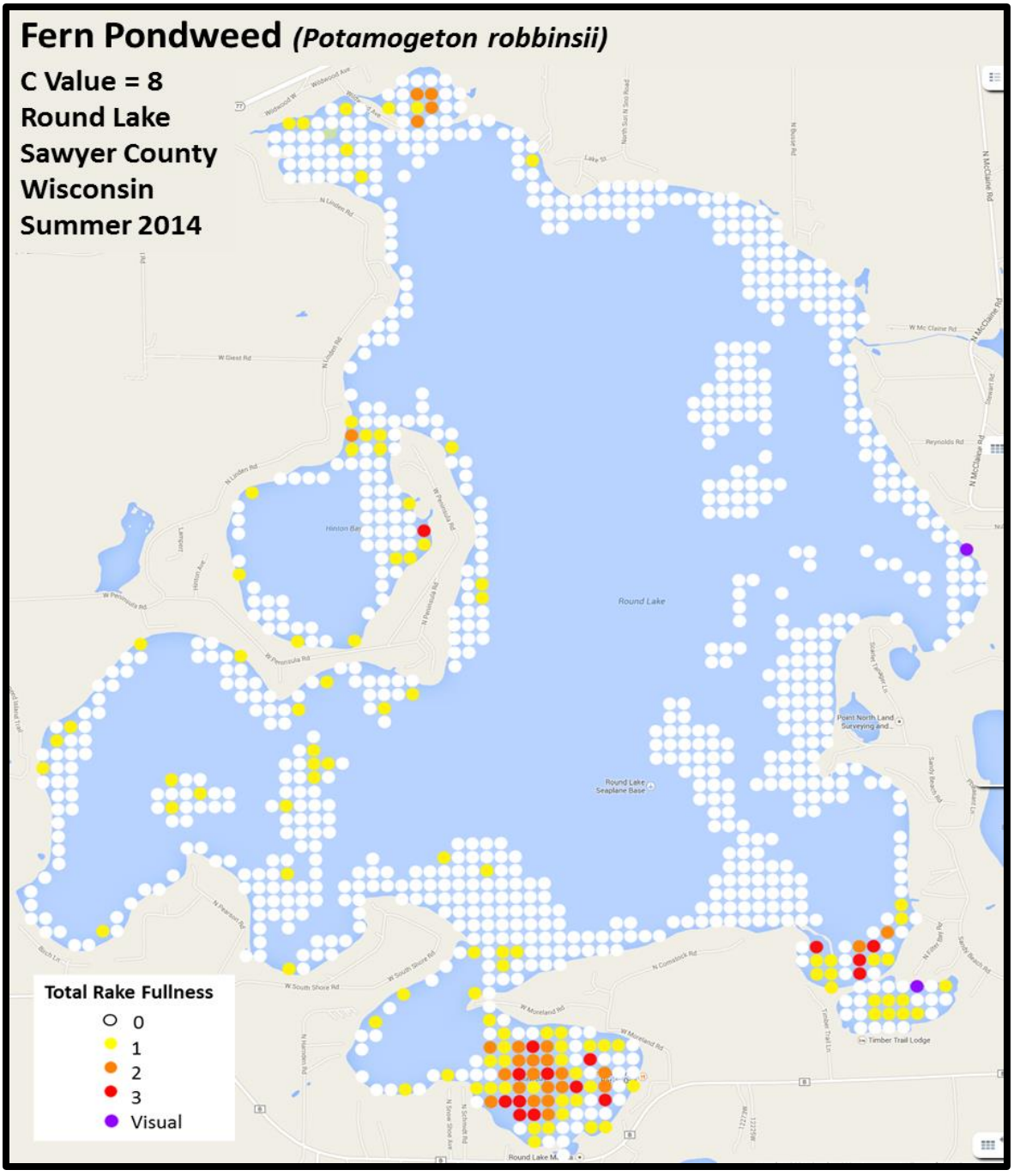


Figure 18 – Round Lake Fern Pondweed Locations & Rake Fullness

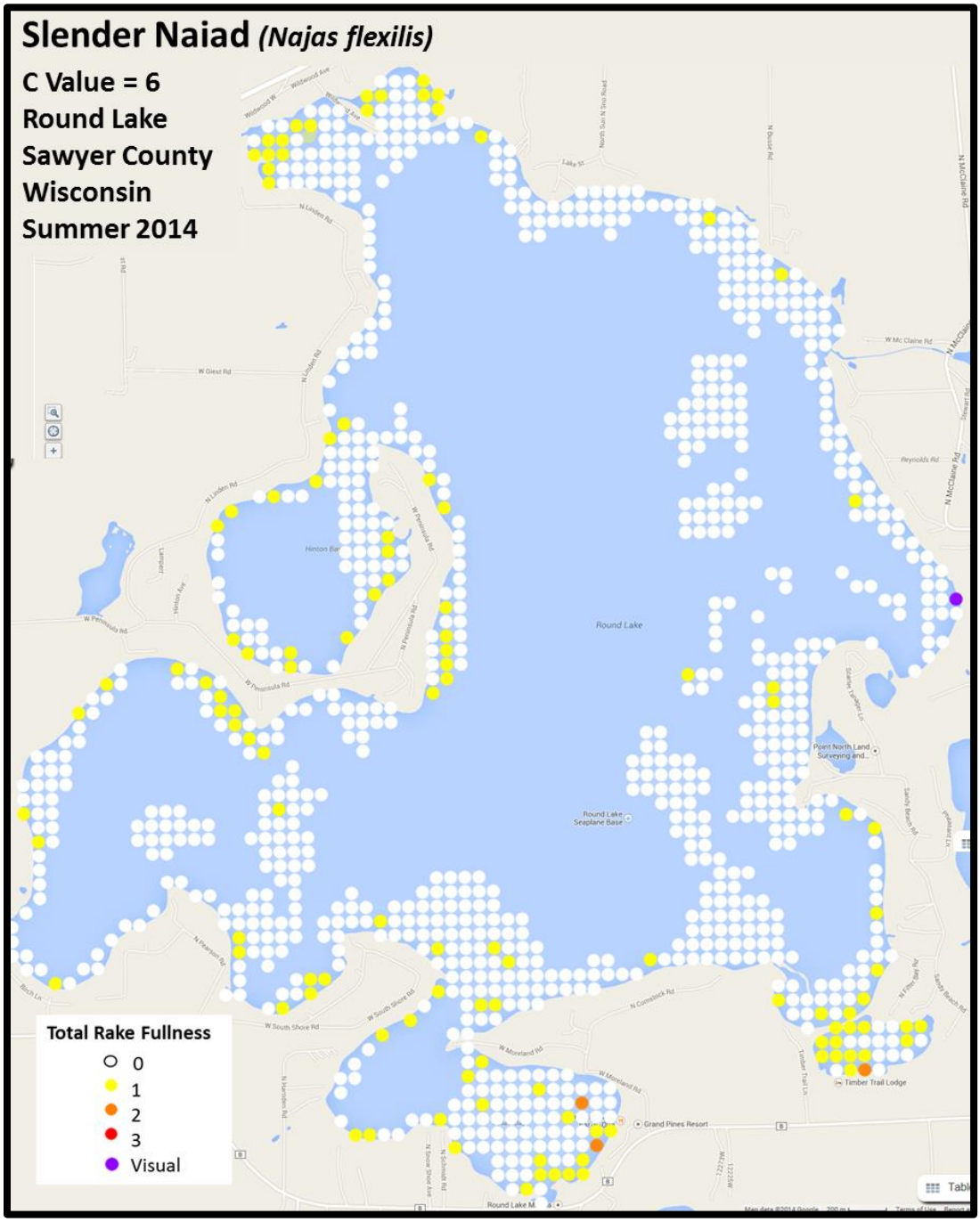


Figure 19 – Round Lake Slender Naiad Locations & Rake Fullness

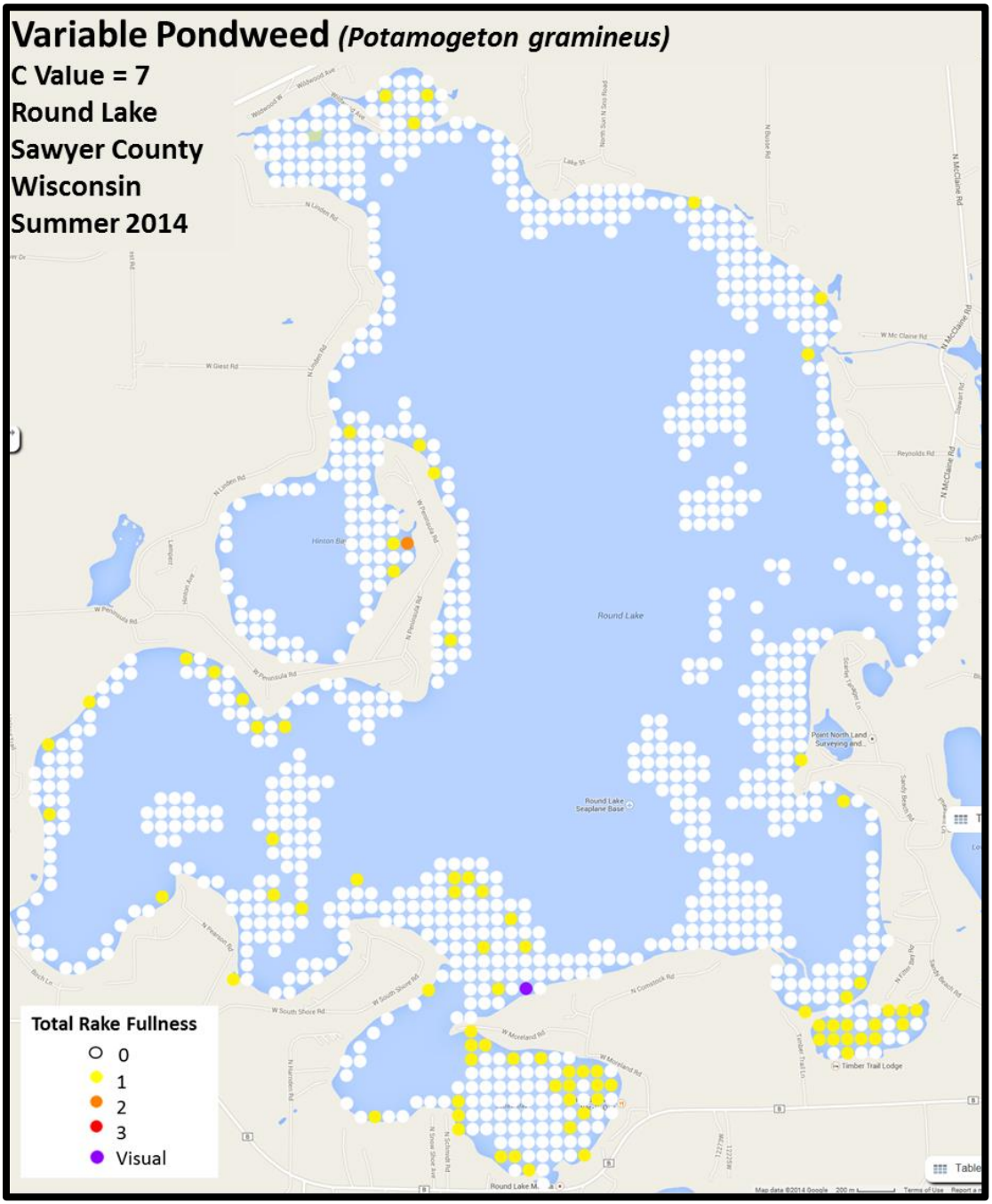


Figure 20 - Round Lake Variable Pondweed Locations & Rake Fullness

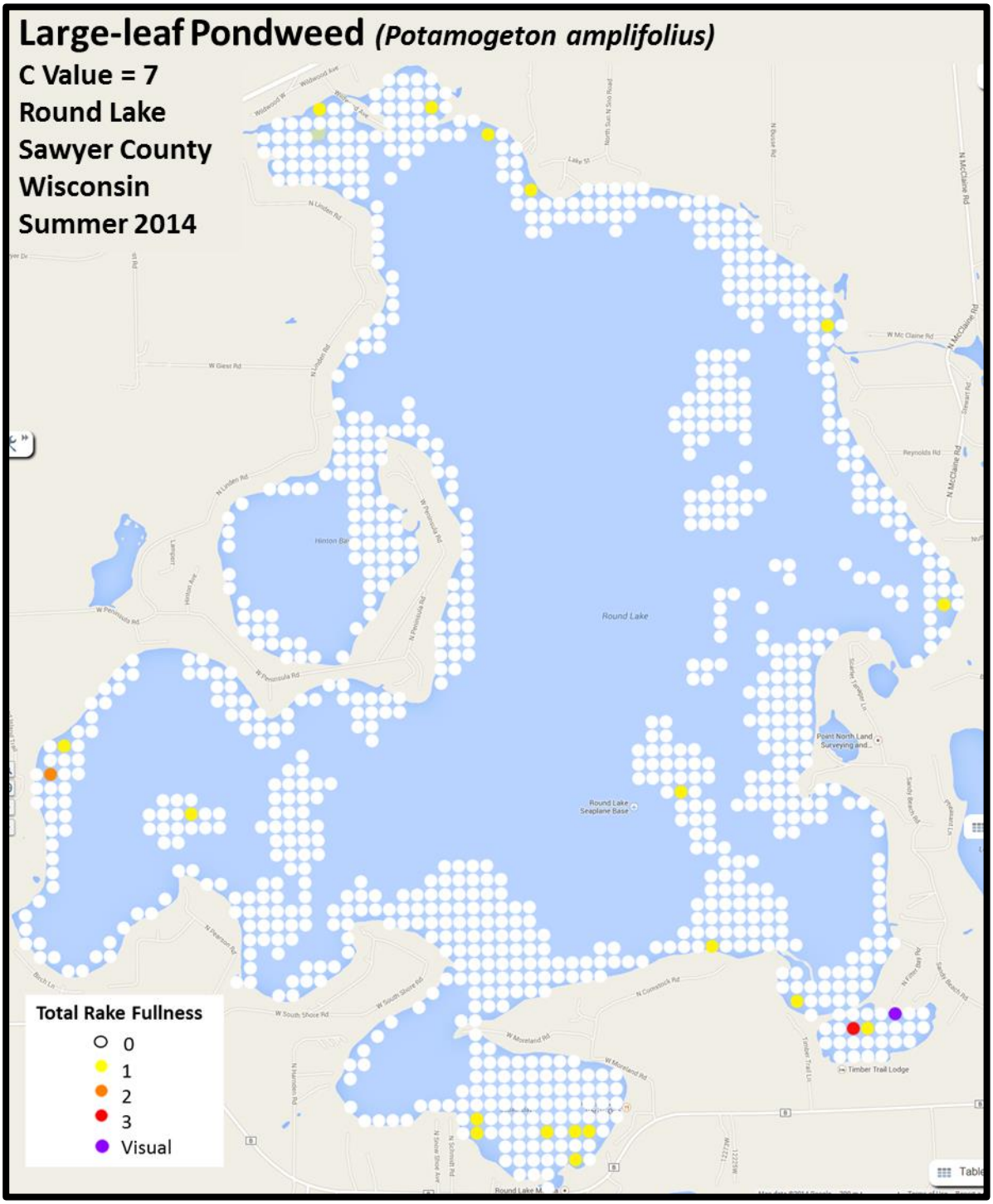


Figure 21 - Round Lake Large-leaf Pondweed Locations & Rake Fullness

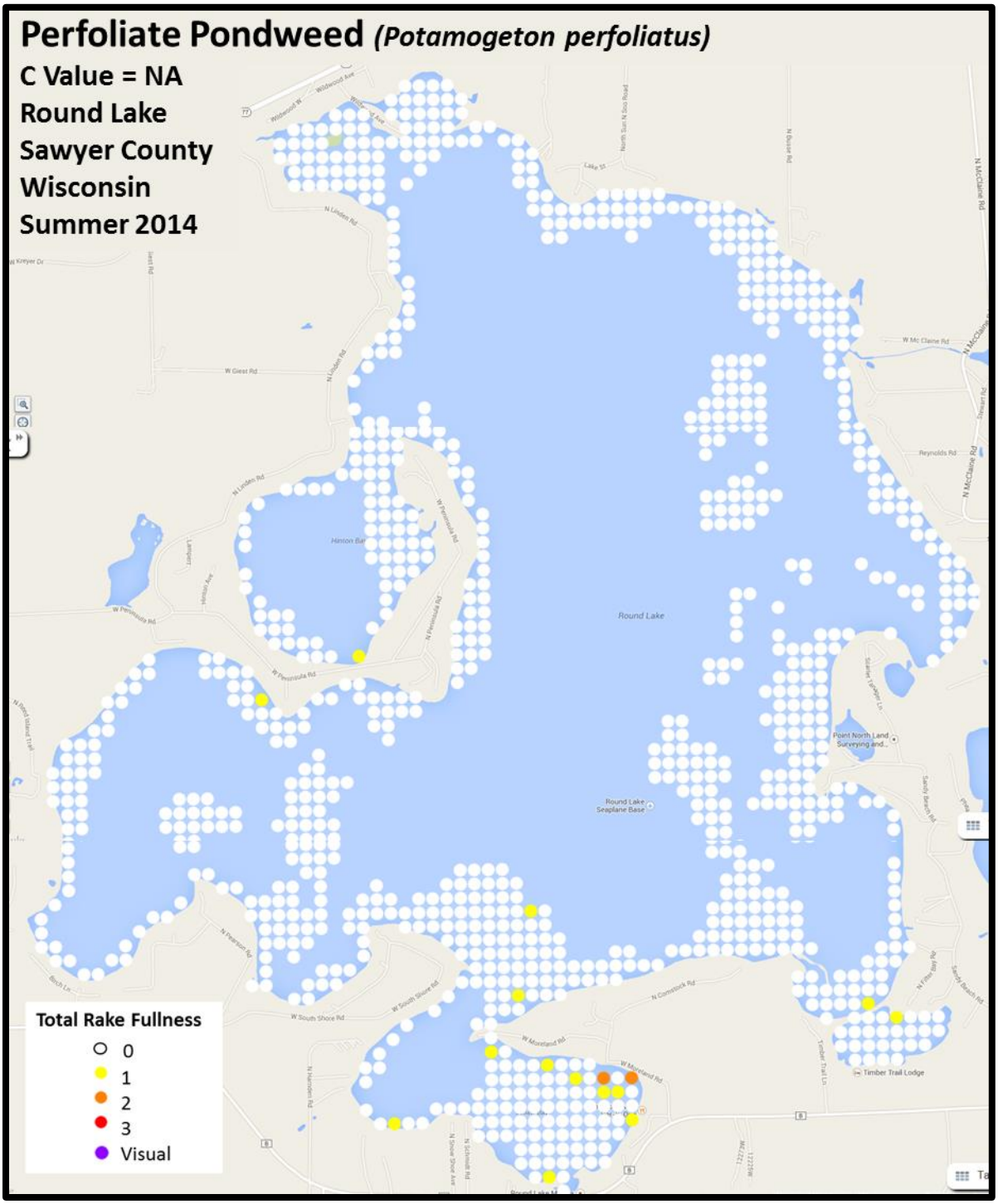


Figure 22 - Round Lake Perfoliate Pondweed Locations & Rake Fullness

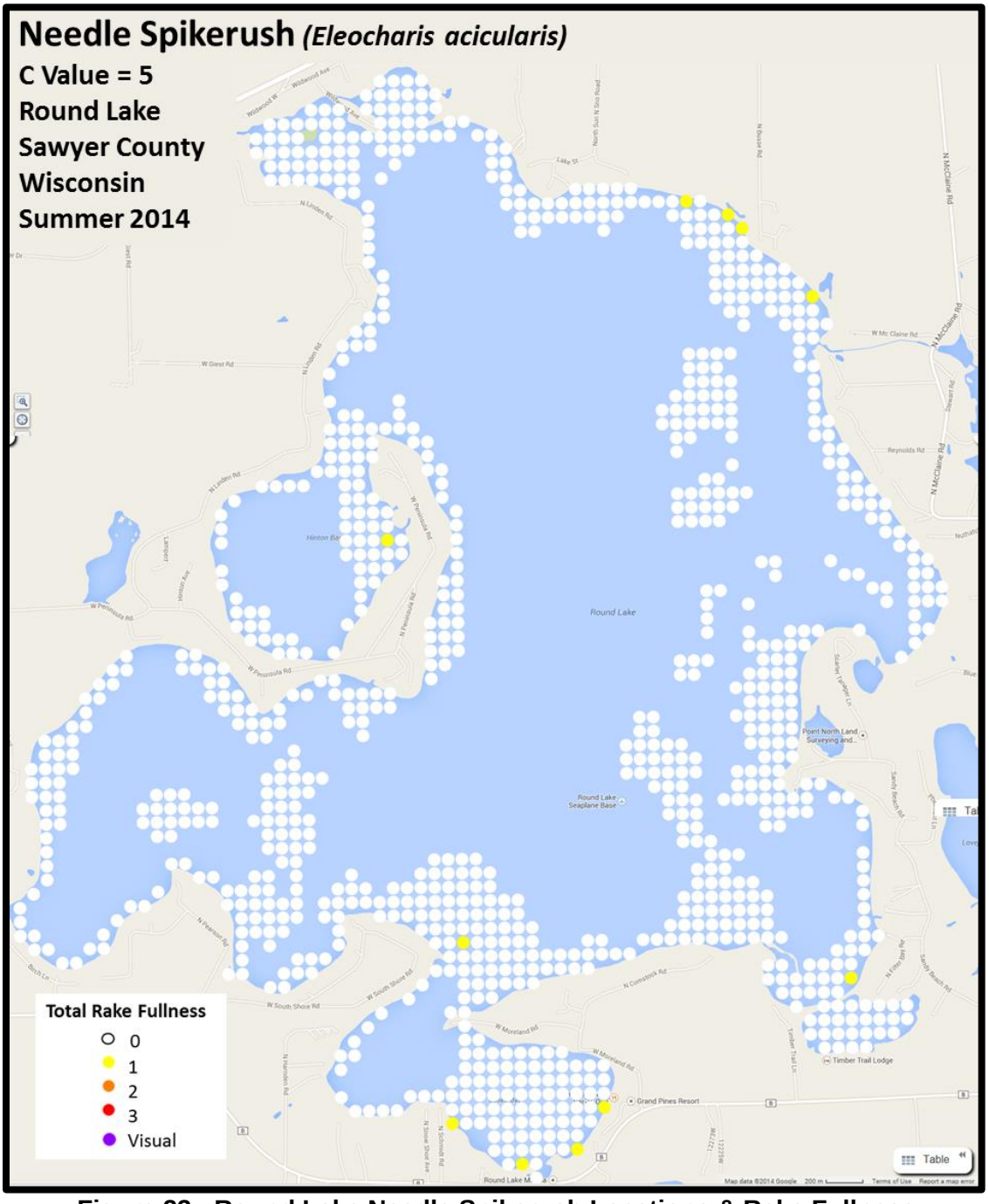


Figure 23 - Round Lake Needle Spikerush Locations & Rake Fullness

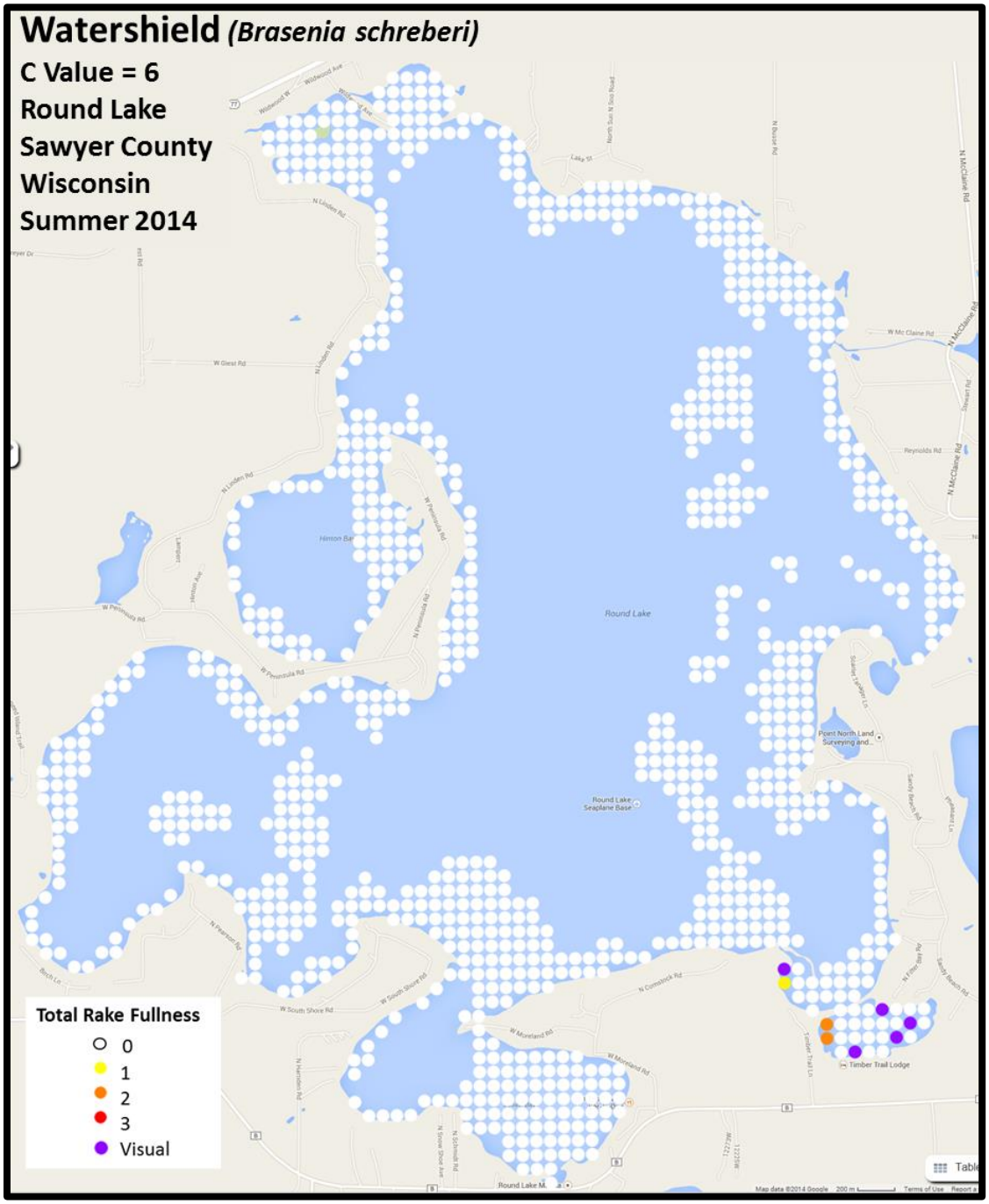


Figure 24 - Round Lake Watershield Locations & Rake Fullness

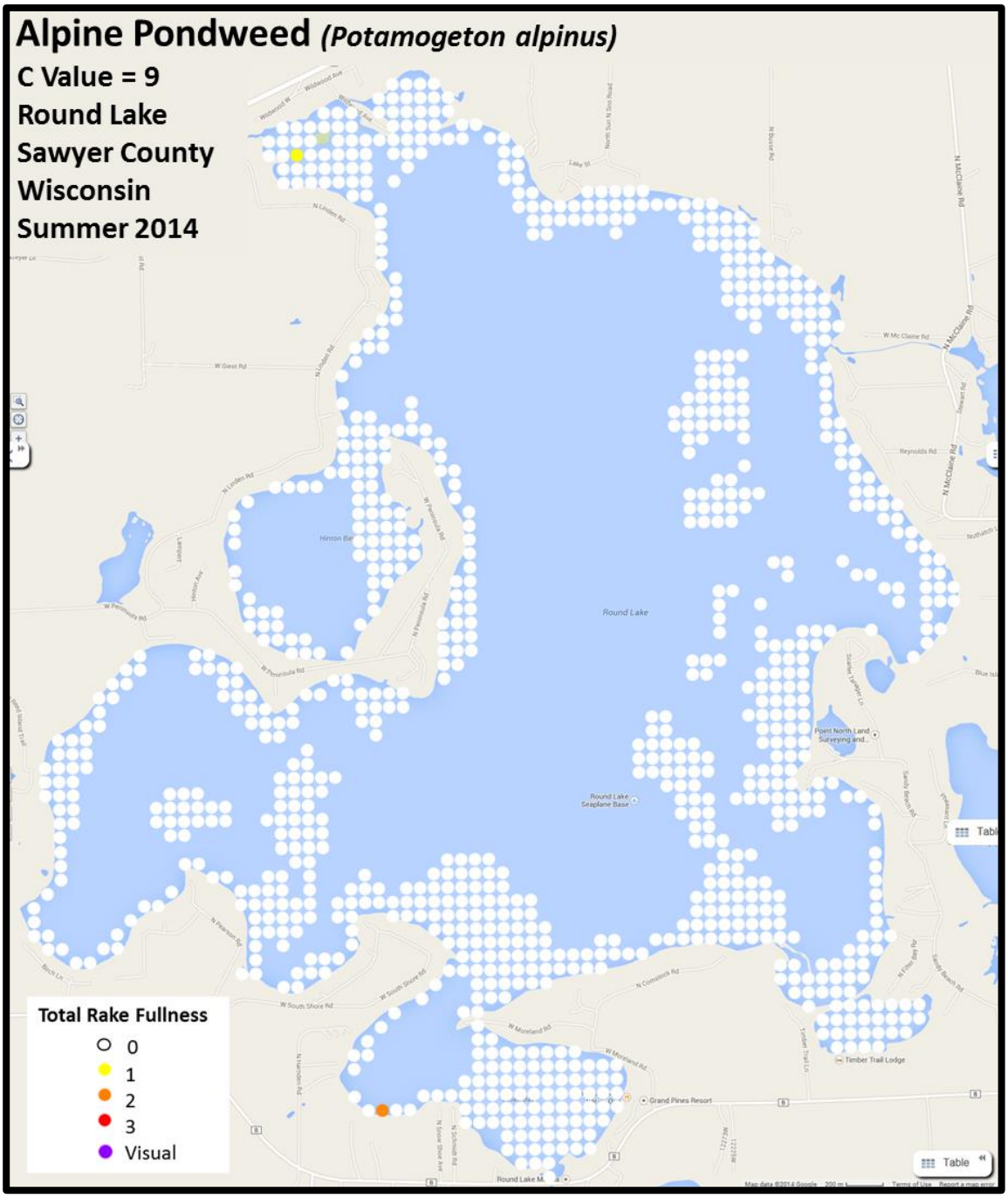


Figure 25 - Round Lake Alpine Pondweed Locations & Rake Fullness

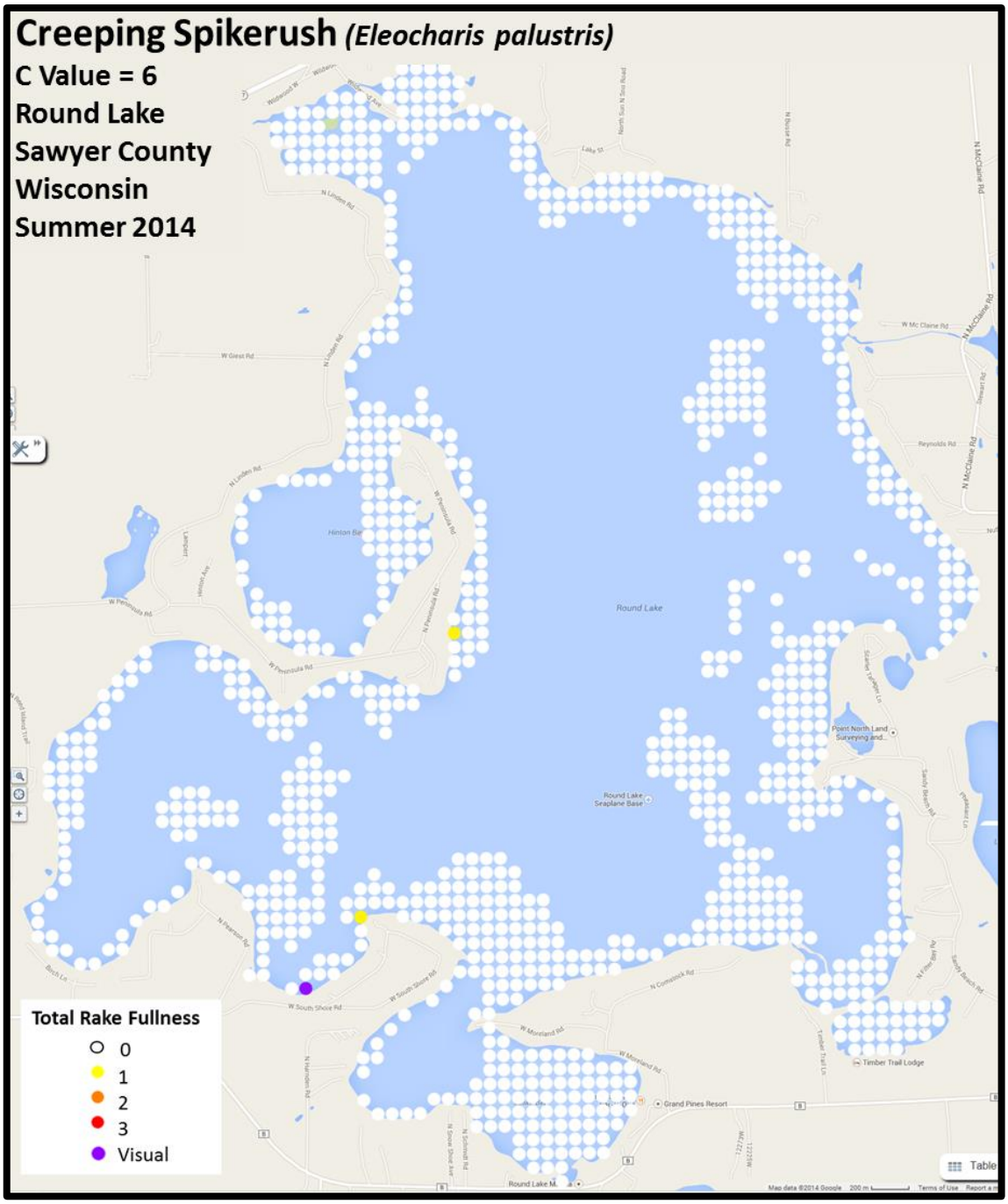


Figure 26 - Round Lake Creeping Spikerush Locations & Rake Fullness

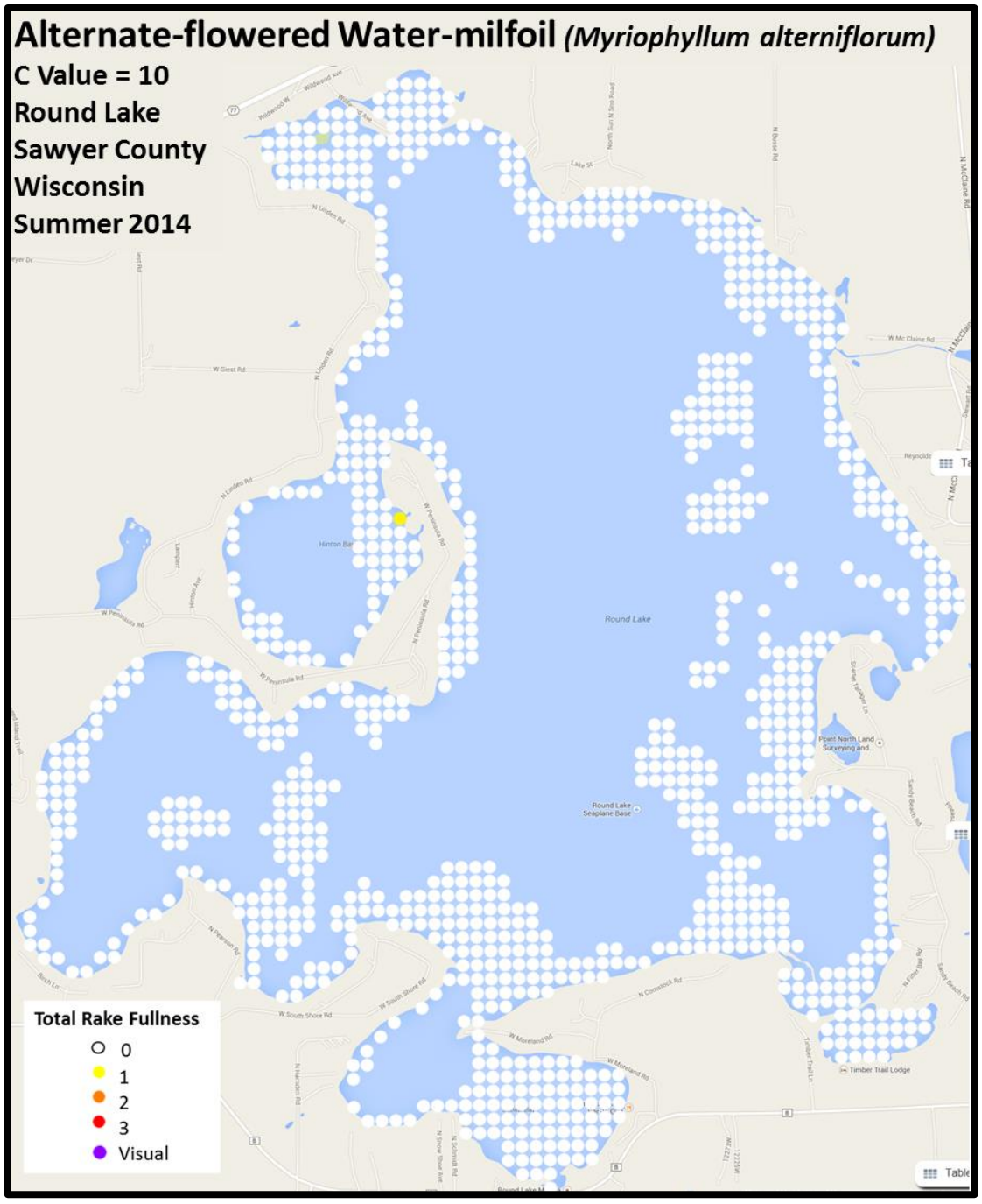


Figure 27 - Round Lake Alternate-flowered Water-milfoil Location & Rake Fullness

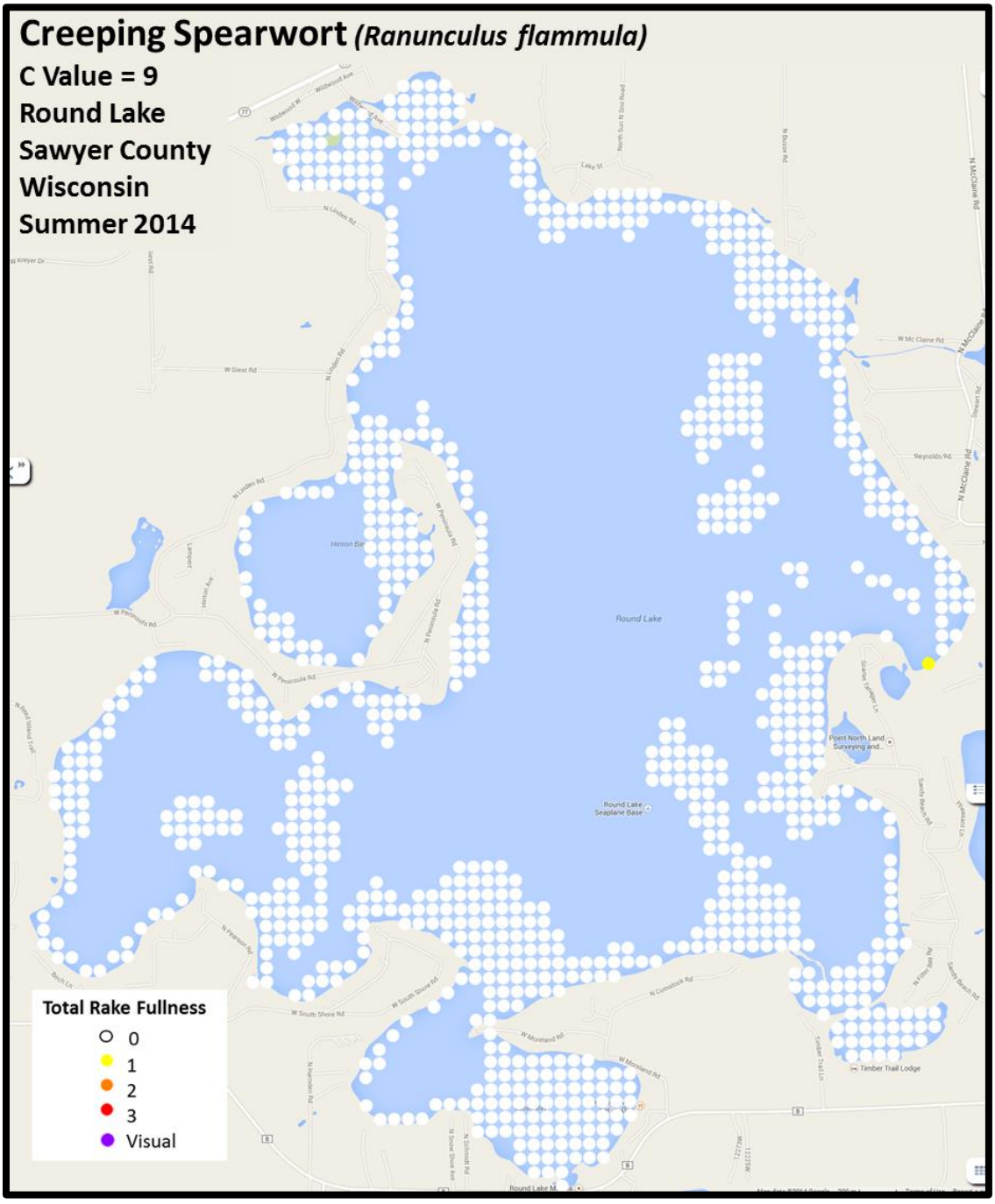


Figure 28 - Round Lake Creeping Spearwort Locations & Rake Fullness

APPENDIX B – LITTLE ROUND LAKE AQUATIC PLANT MAPS

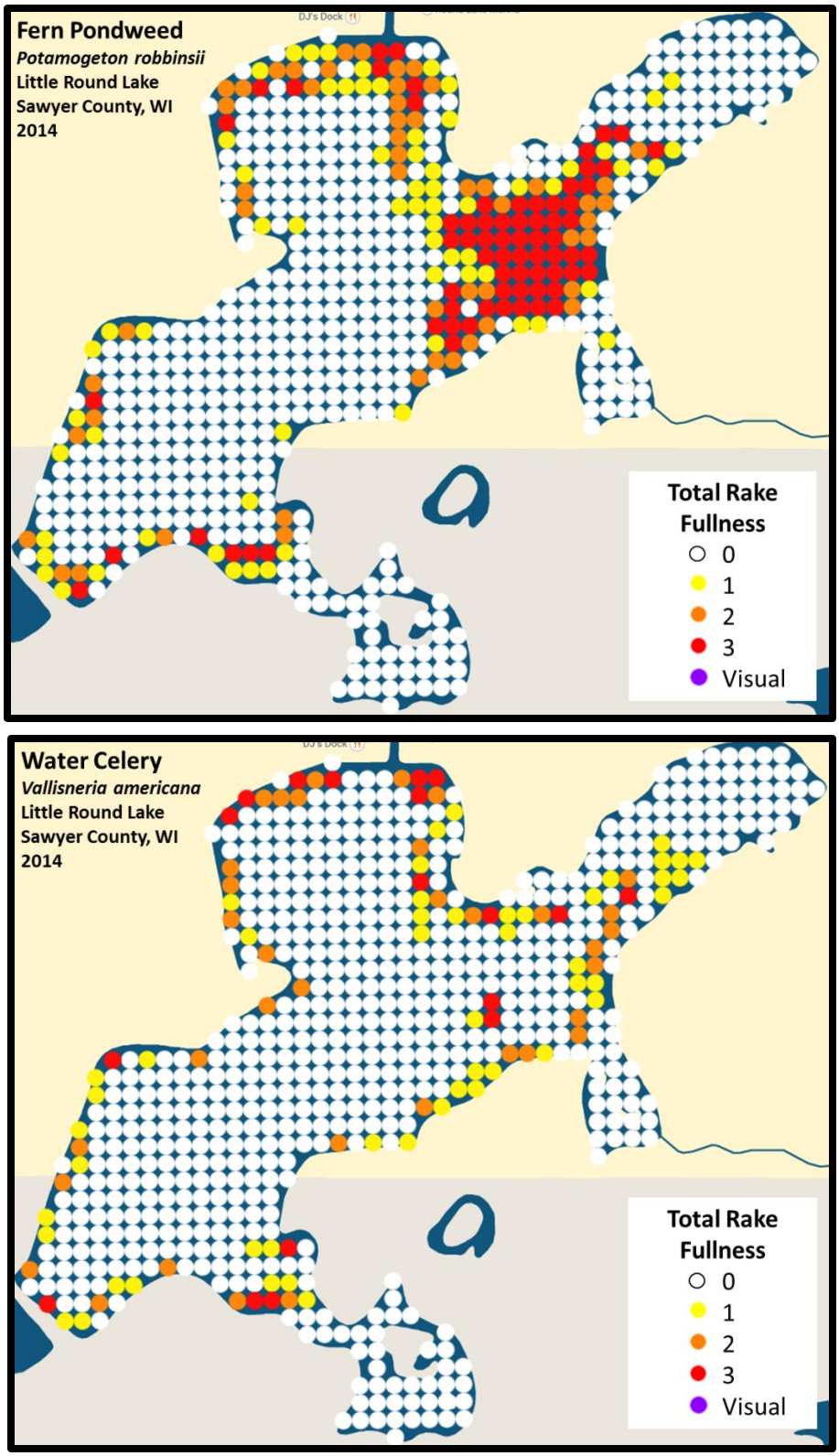


Figure 29 - Little Round Lake Fern Pondweed & Water Celery Locations & Rake Fullness

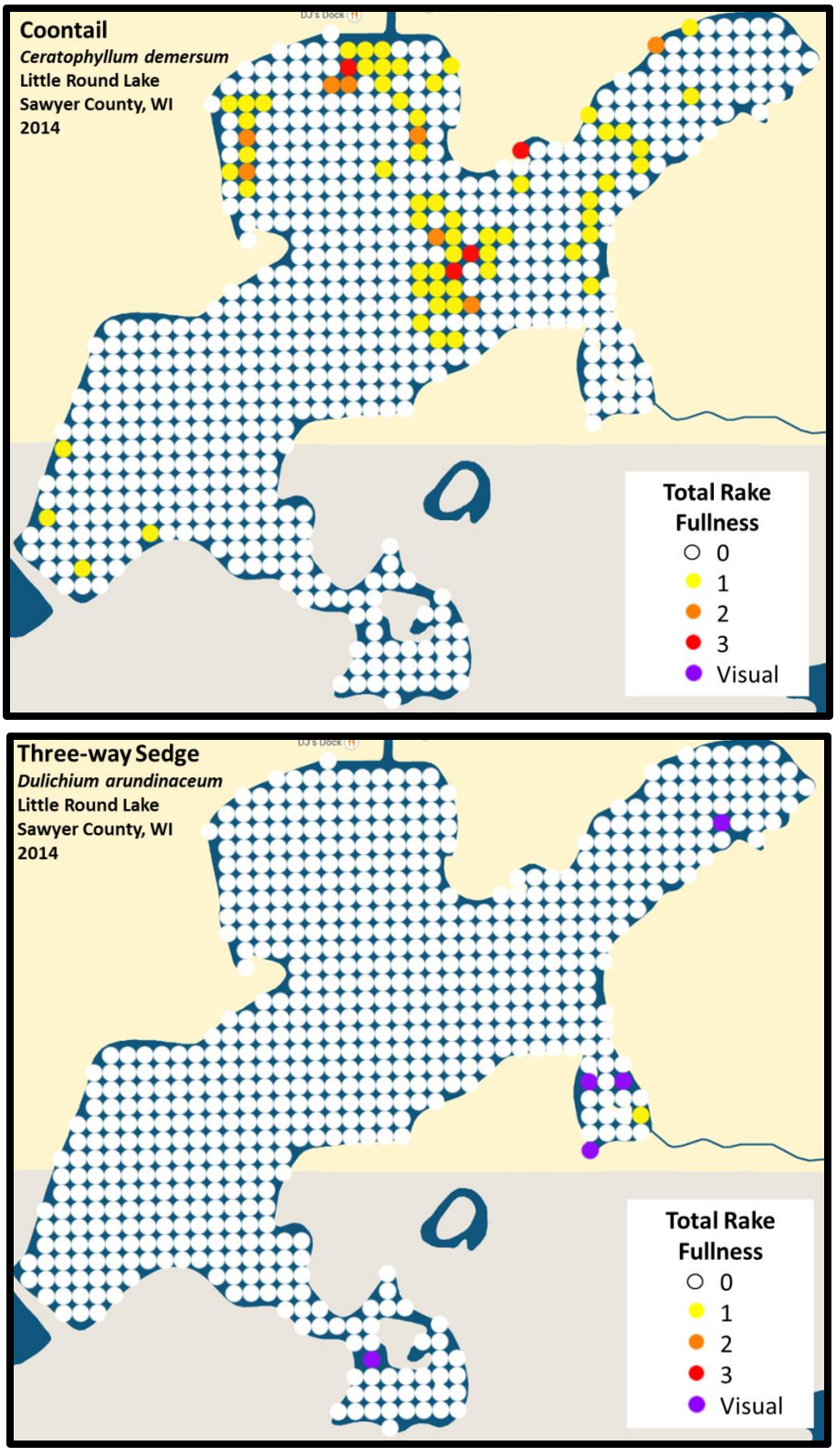


Figure 30 - Little Round Lake Coontail & Three-way Sedge Locations & Rake Fullness

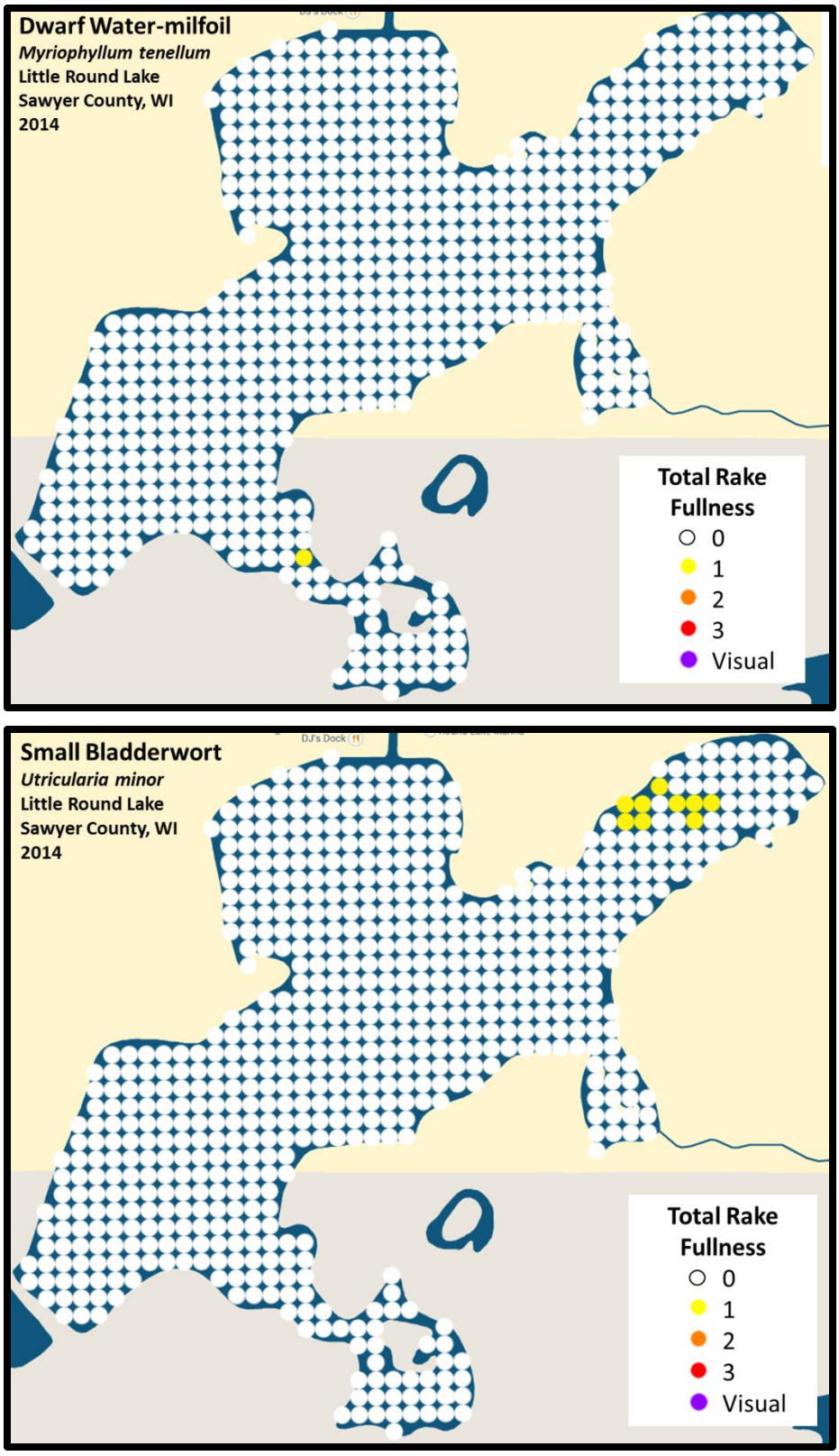


Figure 31 - Little Round Lake Dwarf Water-milfoil & Small Bladderwort Locations & Rake Fullness

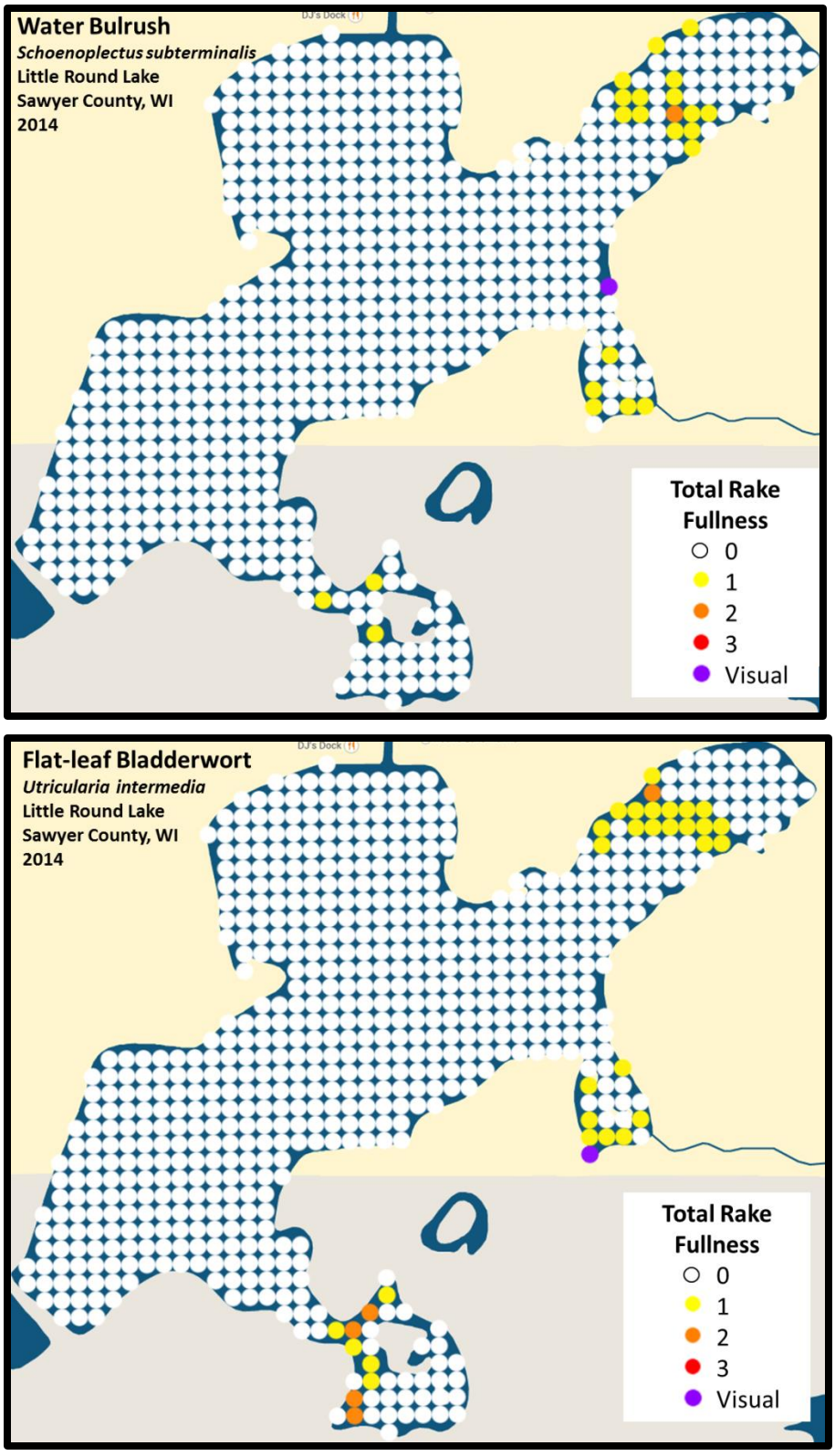
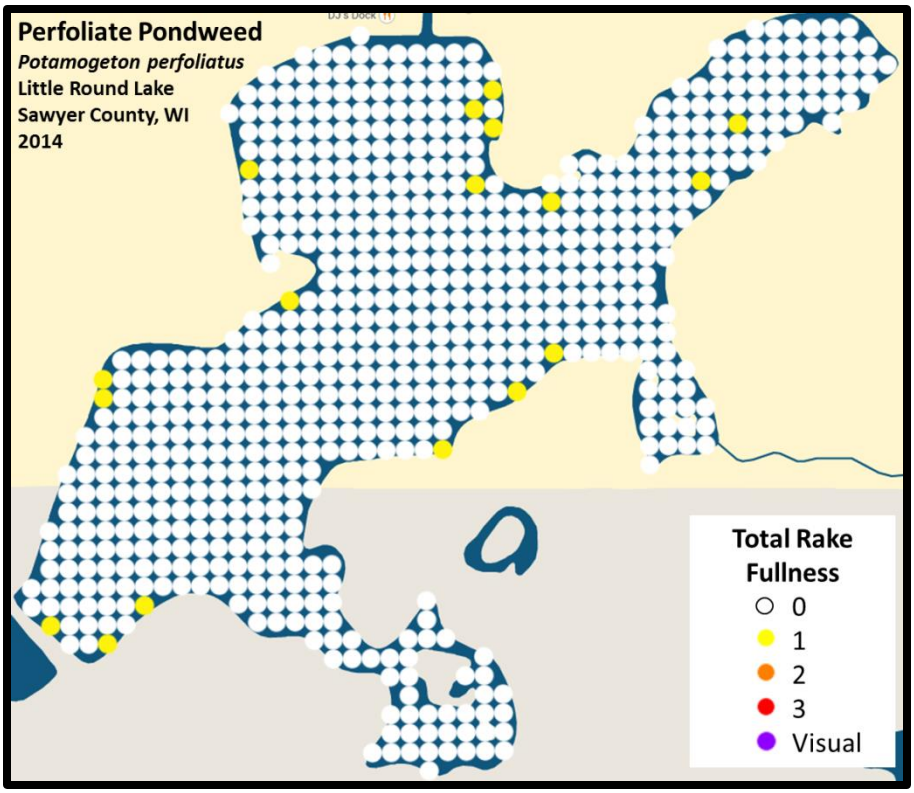


Figure 32 - Little Round Lake Water Bulrush & Flat-leaf Bladderwort Locations & Rake Fullness



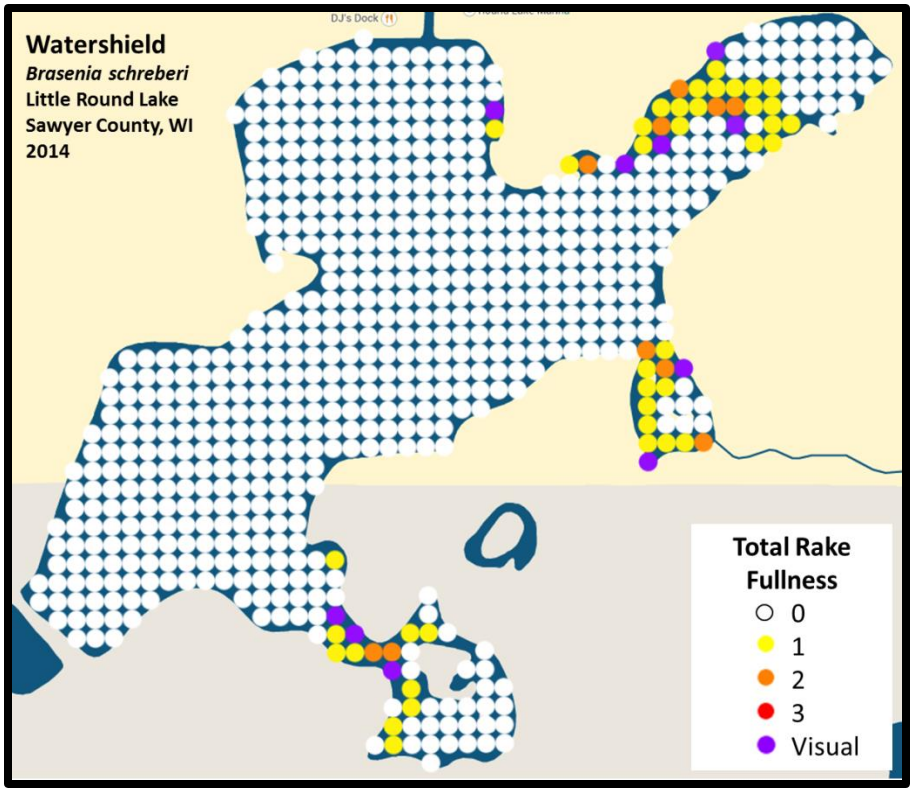


Figure 33 - Little Round Lake Perfoliate Pondweed & Watershield Locations & Rake Fullness

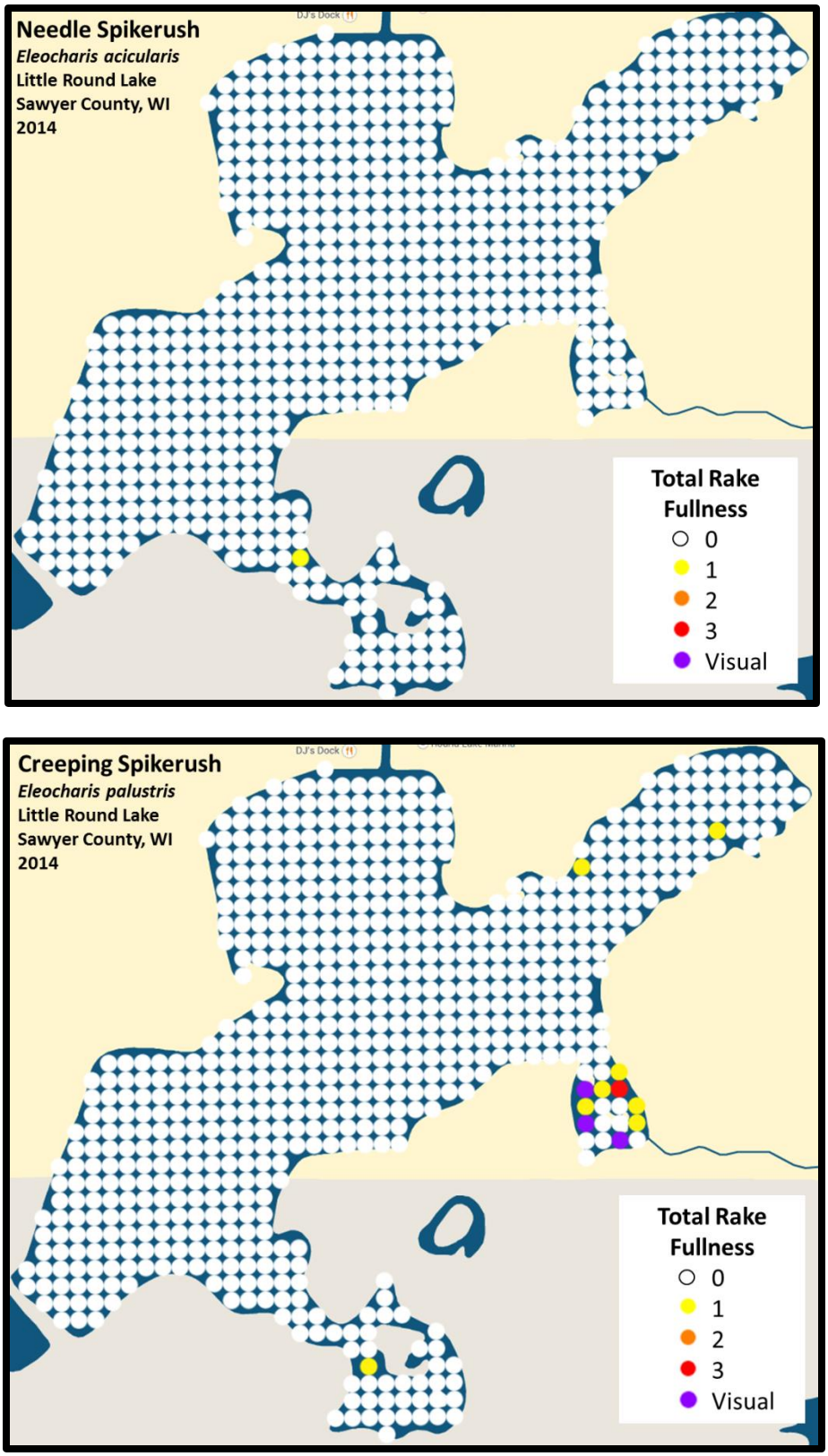


Figure 34 - Little Round Lake Spikerush Locations & Rake Fullness

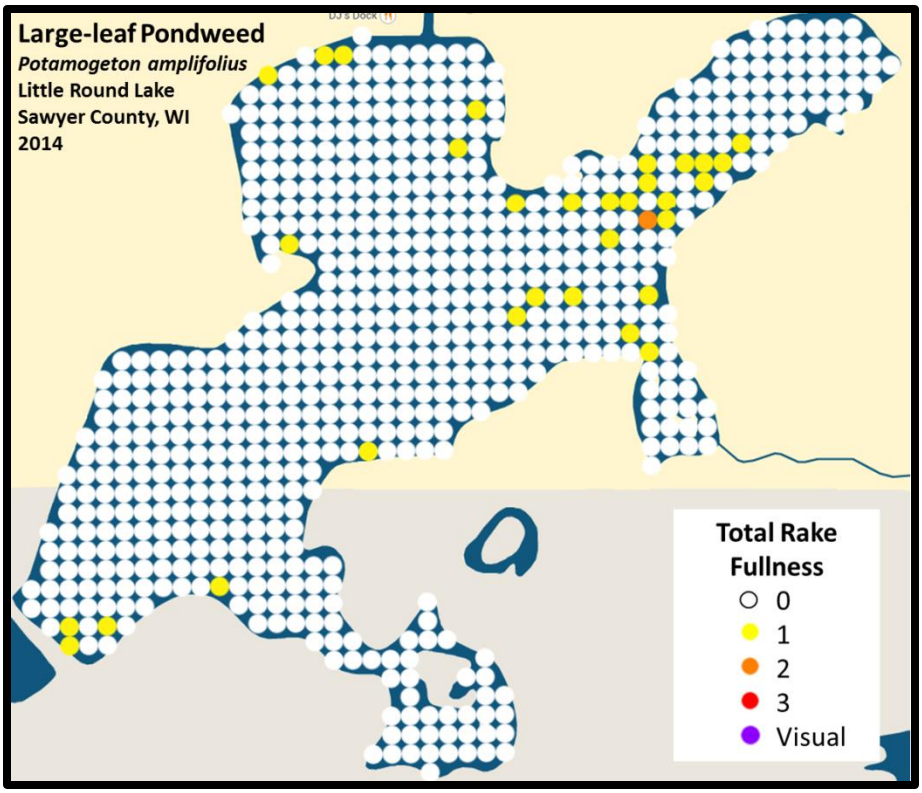


Figure 35 - Little Round Lake Large-leaf Pondweed Locations & Rake Fullness