Aquatic Plant Management Plan

Lake Beulah, Walworth County, Wisconsin

January 2017

-Update for Harvesting Permit Renewal

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The Lake Beulah Management District (LBMD) wishes to pursue aquatic plant harvesting for the conditional control of *Eurasian Watermilfoil* (EWM).

Timing

When does Harvesting Commence? Date(s), Season. Harvesting during this period is typical due to the emergence of the target species, hindering lake usage.

Cutting Procedures

All harvesting operations will be limited to water depths that are greater than three feet. Disturbance of the bottom sediment can disrupt spawning activity and beneficial benthic organisms. Furthurmore, the suspension of solids reduces visibility of sight-feeding predators, as well as, the posibility of increasing available nutrients throughout the water column.

By targeting and removing EWM only, it is the operator's intent to promote native species. Top-cutting is a preferred method where native plants are present while still reducing the canopy of the target species.

In stands where the target species dominates, deep harvesting may be implemented. Bottom sediment must remain undisturbed with a minimum buffer of one foot between blades and top of sediment.

Concerns

Care should be taken to eliminate damage to spawning habitat and the conveyer must be monitored for the removal of young-of-the-year fish. All harvester operators must be proficient in basic aquatic plant identification. The harvester supervisor must train all seasonal employees prior to operation.

Harvesting Equipment

Harvesting Locations

Frequency of Harvest

Shoreline Pick-Up Schedule

Disposal Sites

Discussion

Methods

Study Area – Lake Beulah lies in Southeastern Wisconsin in the Kettle Morraine region. The lake is 834 square acres with a mean depth of 23 feet and a maximum depth of 62 feet based on the most recent survey (2016).

Field Sampling – 996 sample points, spaced 57 meters apart as specified by the WDNR were sampled. Depths were recorded at each point using a measuring stick in areas 7 feet or less

in depth and a *Zebco zf200* at points deeper than 7 feet. At each point plants were identified and recorded based on the WDNR approved plant survey methods. A pole rake and a rake-on-a-rope were used to sample plants at each point. Recording was based on a number scale showing the density of plants at each point. A value of (1) showed that the plant was present but with low density. (2) Consisted of moderate density or covering about ½ of the pole rake while (3) showed high density or a rake completely covered with plants.

Results

Areas within the lake are not always accessible or some points are actually on land, this was the case for Lake Beulah as well, with 71 of the 996 points being recorded as either Non-navigable or Terrestrial, resulting in 922 sampled points.

A species richness (total number of species, including visuals) of 40 was found in Lake Beulah with a Simpson diversity index of 0.886. Simpson diversity index is used to quantify the biodiversity of a habitat. It takes into account the number of species present, as well as the relative abundance of each species. The index assumes a value between 0 and 1, with 1 having complete evenness.

Out of the 996 sampling points 624 were found to have plants (67.7%). No plants were found at a depth greater than 38 feet. 90.7 % of the points shallower than 38' contained vegetation. There were 2.19 species recorded on average at sites shallower than 38 feet. Out of the points that had vegetation an average of 2.44 species were recorded, with 2.1 being native. Data described here is listed in Table 1.

The survey conducted in August of 2016 in comparison to previous surveys show that the aquatic plant life in Lake Beulah is prospering. The 2016 survey resulted in 42 species being present, a large leap from the 23 found in the 2008 survey. The surveys found 19 of the same species, 4 that were found in 2008 and 23 found in 2016 and not in 2008 as shown in Table 3

Summary Tables

Table 1: Key Values from Sampling Data

Summary of Statistics	August 2016 Survey
Total Numner of Sites with Vegetation/ All Sites Sampled	624/922 (67.7%)
Maximum depth of Plants	38
Species Richness (including Visuals)	42
Average Number of Species per Vegetated Site (including Exotics)	2.44
Average Number of Native Species Only per Vegetated Site	2.10
Simpson Diversity Index	0.886
Average C-Value	6.15
Floristic Quality	36.2

Table 1: Key Values from Sampling Data.

Table 2: Summary of Lake Beulah's 2016 PI Survey Plant Data

Common Name	Scientific Name	Frequency of occurrence within vegetated areas (%)	Average Rake Fullness	Number of sites where species found (Does not include visuals)	# of visual sightings
Eurasian water-milfoil (or Hybrid)	*Myriophyllum spicatum*	17.28	1.55	108	6
Watershield	*Brasenia schreberi*	0	0	0	1
Coontail	*Ceratophyllum demersum*	10.08	1.62	63	0
Muskgrasses	*Chara sp .*	64.16	1.89	401	2
Swamp loosestrife	*Decodon verticillatus*	0.16	1	1	4
Common waterweed	*Elodea canadensis*	0.8	1.20	5	1
Water star-grass	*Heteranthera dubia*	0.64	1	4	0
Small duckweed	*Lemna minor*	1.76	1.18	11	1
Alternate-flowered water-milfoil	*Myriophyllum alterniflorum*	0.64	1	4	0
Various-leaved water-milfoil	*Myriophyllum heterophyllum*	1.44	1.44	9	0
Northern water-milfoil	*Myriophyllum sibiricum*	3.04	1.42	19	0
Whorled water-milfoil	*Myriophyllum verticillatum*	9.92	1.66	62	16
Slender naiad	*Najas flexilis*	4.96	1.32	31	2
Spiny naiad	*Najas marina*	18.4	1.17	115	4
Spatterdock	*Nuphar variegata*	4.32	2.19	27	8
White water lily	*Nymphaea odorata*	6.88	2.49	43	11
Large-leaf pondweed	*Potamogeton amplifolius*	0.48	1.33	3	3
Leafy pondweed	*Potamogeton foliosus*	0.16	1	1	0
Fries' pondweed	*Potamogeton friesii*	4	1.04	25	0
Variable pondweed	*Potamogeton gramineus*	3.04	1.16	19	11
Illinois pondweed	*Potamogeton illinoensis*	5.44	1.12	34	23
Floating-leaf pondweed	*Potamogeton natans*	3.68	1.26	23	28
Blunt-leaf pondweed	*Potamogeton obtusifolius*	0.16	1	1	0
White-stem pondweed	*Potamogeton praelongus*	0.8	1	5	0
Small pondweed	*Potamogeton pusillus*	1.28	1	8	0
Clasping-leaf pondweed	*Potamogeton richardsonii*	0.96	1.17	6	1
Flat-stem pondweed	*Potamogeton zosteriformis*	1.44	1	9	2
White water crowfoot	*Ranunculus aquatilis*	0.32	1.50	2	0
Arrowhead	*Sagittaria sp.*	0.16	1	1	0
Water bulrush	*Schoenoplectus subterminalis*	0.96	2	6	0
Softstem bulrush	*Schoenoplectus tabernaemontani*	0.16	3	1	5
Narrow-leaved bur-reed	*Sparganium angustifolium*	0.16	3	1	0
Sago pondweed	*Stuckenia pectinata*	15.36	1.19	96	20
Cattail	*Typha sp .*	0.16	3	1	2
Common bladderwort	*Utricularia vulgaris*	28.48	1.05	178	11
Small bladderwort	*Utricularia minor*	0.16	1	1	0
Wild celery	*Vallisneria americana*	9.6	1.18	60	10
Common watermeal	*Wolffia columbiana*	0.32	2	2	0
Aquatic moss	-	0.32	1	2	0
Filamentous algae	-	0.64	1	4	1
Nitella flexilis	*Nitella flexilis*	21.92	1.53	137	0
Unknown Pondweed 1	-	0.16	1	1	1
Overall totals for vegetation		5.83	1.97	625	174

Table 2: Summary of Lake Beulah's 2016 PI Survey Plant Data

Table 3: Comparison between 2008 and 2016 Plant Composition

2016			
SPECIES	OCCURRENCES	FREQUENCY (%)	AVG. DENSITY
Muskgrasses	401	64.16	1.89
Eurasian water-milfoil (or Hybrid)	108	17.28	1.55
Common bladderwort	178	28.48	1.05
Large-leaf pondweed	3	0.48	1.33
Northern water-milfoil	19	3.04	1.42
Coontail	63	10.08	1.62
White water lily	43	6.88	2.49
Wild celery	60	9.6	1.18
Small pondweed	8	1.28	1
Spatterdock	27	4.32	2.19
Water bulrush	6	0.96	2
Clasping-leaf pondweed	6	0.96	1.17
Floating-leaf pondweed	23	3.68	1.26
Spiny naiad	115	18.4	1.17
Flat-stem pondweed	9	1.44	1
Common waterweed	5	0.8	1.20
Filamentous algae	4	0.64	1
Small duckweed	11	1.76	1.18
Slender naiad	31	4.96	1.32
Alternate-flowered water-milfoil	4	0.64	1
Aquatic moss	2	0.32	1
Arrowhead	1	0.16	1
Blunt-leaf pondweed	1	0.16	1
Cattail	1	0.16	3
Common watermeal	2	0.32	2
Fries' pondweed	25	4	1.04
Illinois pondweed	34	5.44	1.12
Leafy pondweed	1	0.16	1
Narrow-leaved bur-reed	1	0.16	3
Nitella flexilis	137	21.92	1.53
Sago pondweed	96	15.36	1.19
Small bladderwort	1	0.16	1
Softstem bulrush	1	0.16	3
Swamp loosestrife	1	0.16	1
Unknown Pondweed 1	1	0.16	1
Variable pondweed	19	3.04	1.16
Various-leaved water-milfoil	9	1.44	1.44
Water star-grass	4	0.64	1
Watershield	0	0	0
White water crowfoot	2	0.32	1.5
White-stem pondweed	5	0.8	1
Whorled water-milfoil	62	9.92	1.66

2008			
SPECIES	OCCURRENCES	FREQUENCY (%)	AVG. DENSITY
Muskgrasses	470	77.69	2.32
Eurasian water-milfoil	175	28.93	1.54
Common bladderwort	139	22.98	1.12
Large-leaf pondweed	88	14.55	1.22
Northern water milfoil	67	11.07	1.25
Coontail	65	10.74	1.54
White water lilly	61	10.08	1.36
Wild celery	40	6.61	1.30
Small pondweed	39	6.45	1.41
Spatterdock	15	2.48	1
Water bulrush	15	2.48	1
Clasping-leaf pondweed	7	1.16	1.14
Floating-leaf pondweed	6	0.99	1
Spiny naiad	5	0.83	1
Flat-stem pondweed	5	0.83	1
Common waterweed	4	0.66	1
Filamentous algae	2	0.33	1
Small duckweed	2	0.33	2
Bushy pondweed	1	0.17	1
Yellow pond lilly	55	9.09	1.33
Curly-leaf pondweed	3	0.50	1
Ditch grass	61	10.08	1.79
Sp1	8	1.32	1.50

Table 3: Comparison between 2008 and 2016 Plant Composition.

Table 4: Plant Depth Graph

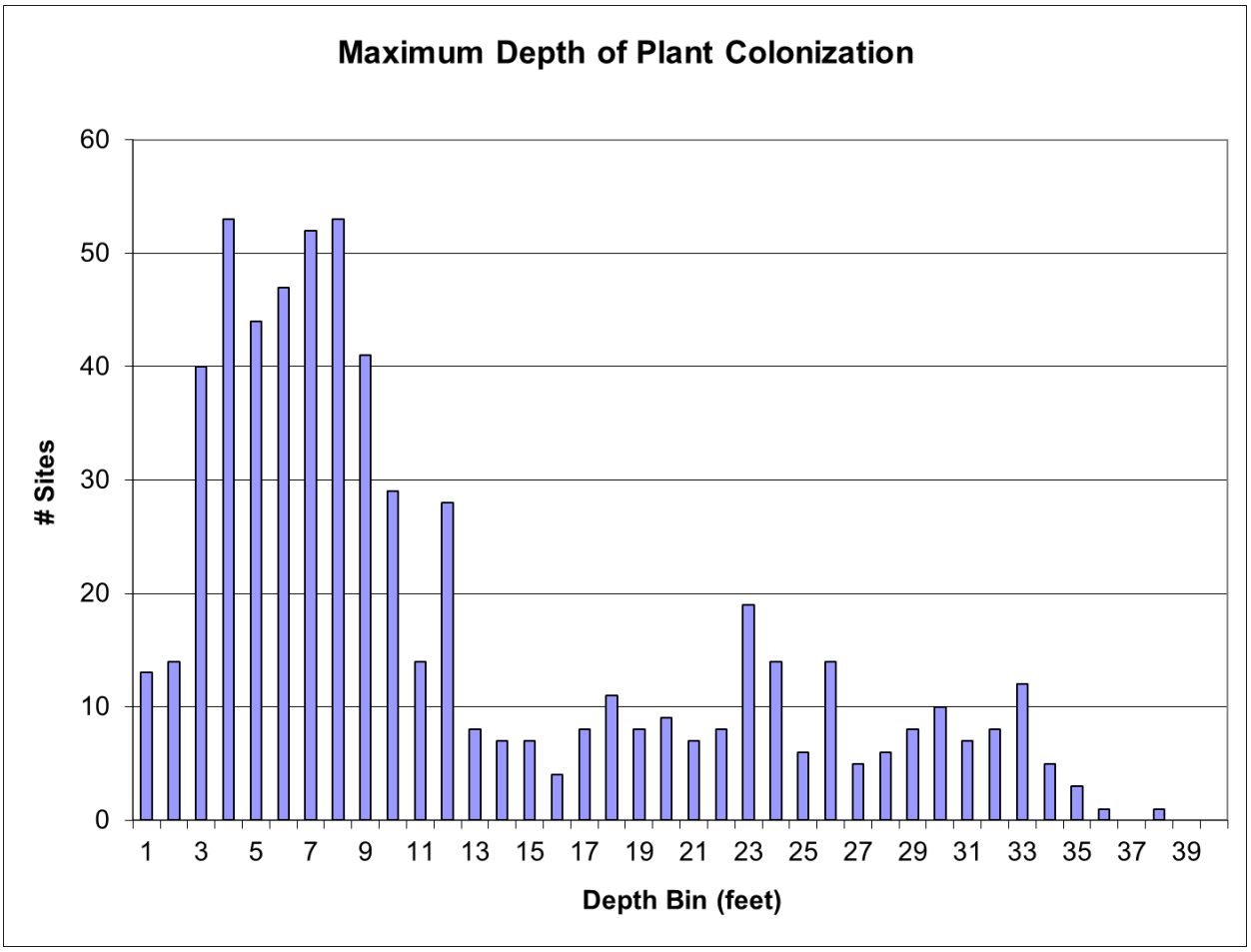


Table 4: Plant Depth Graph

Figures

Figure 1: Exotic Species (EWM) Densities and Distribution

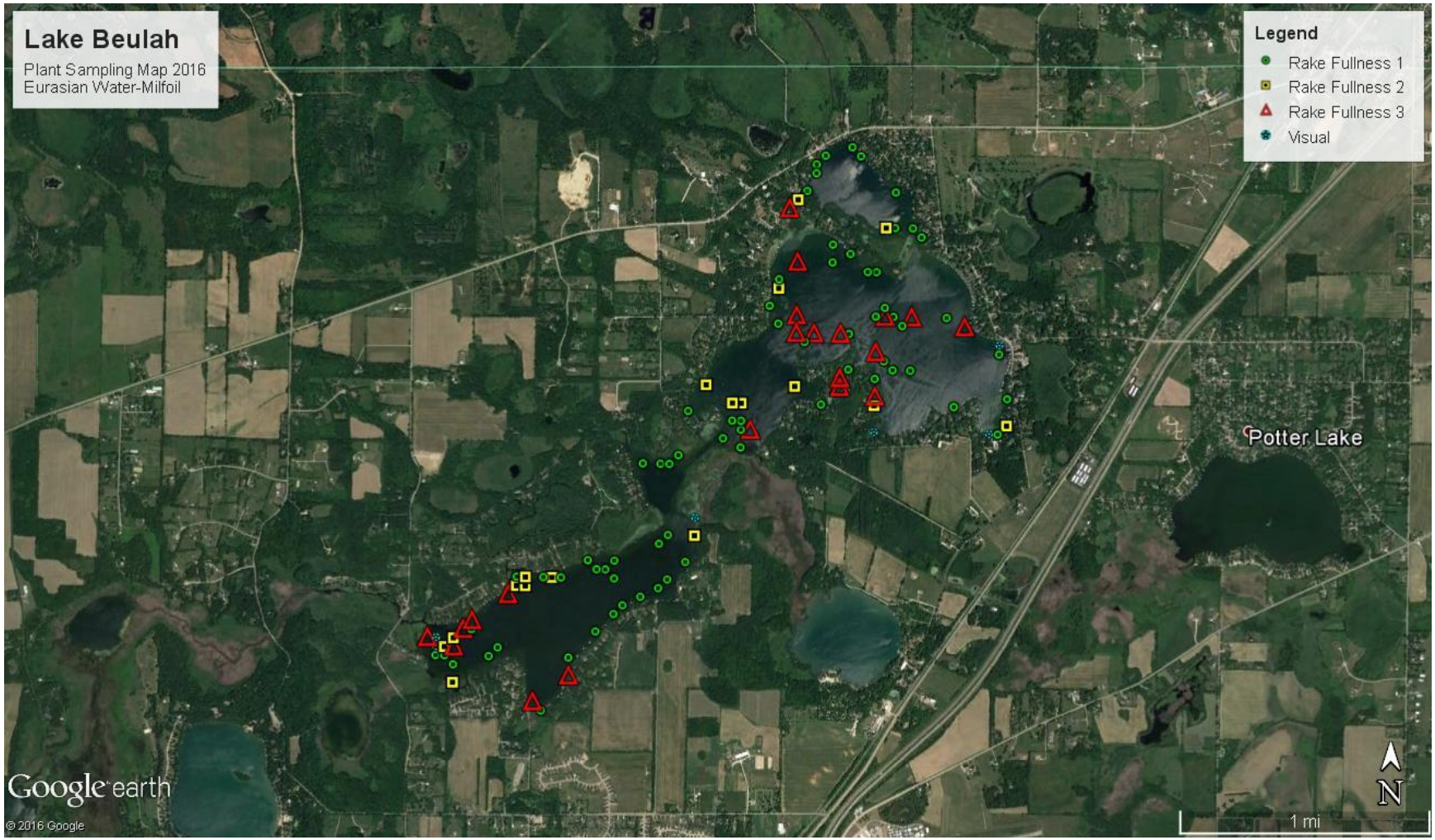


Figure 2: Most Common Native Plant Species (Chara) Densities and Distribution

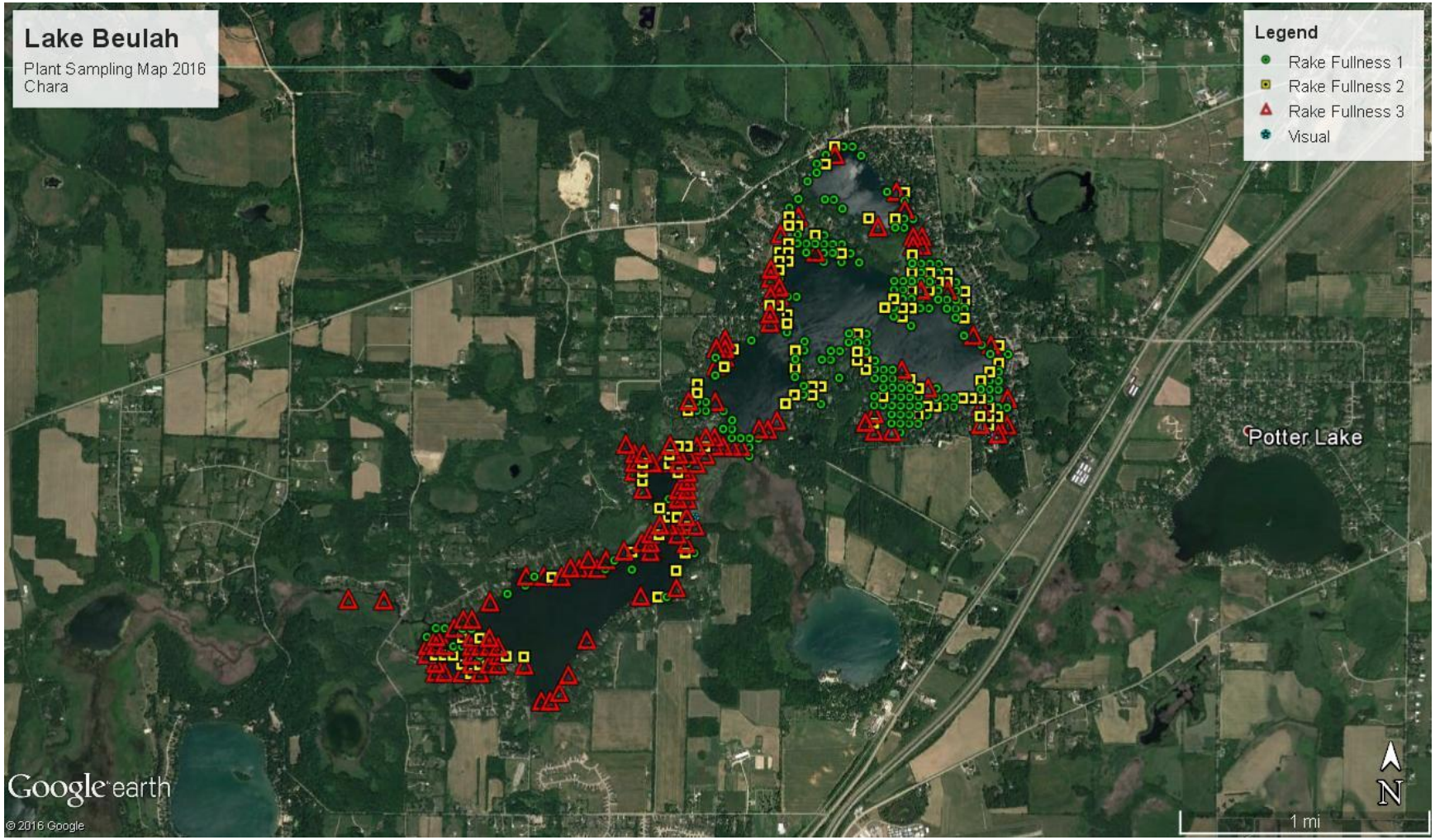


Figure 3: Most Common Native Plant Species (Common Bladderwort) Densities and Distribution

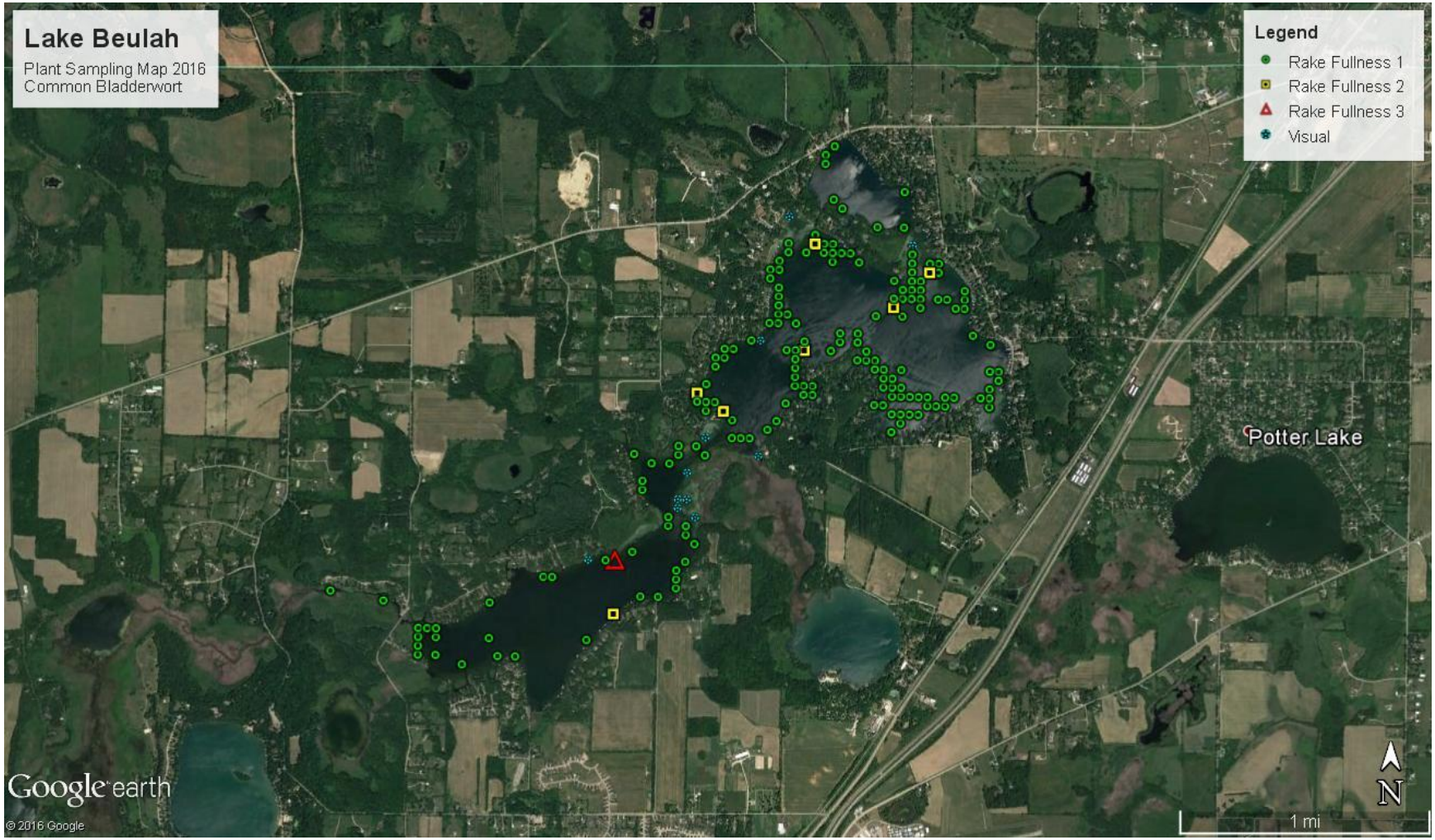


Figure 4: Most Common Native Plant Species (Nitella Flexilis) Densities and Distribution

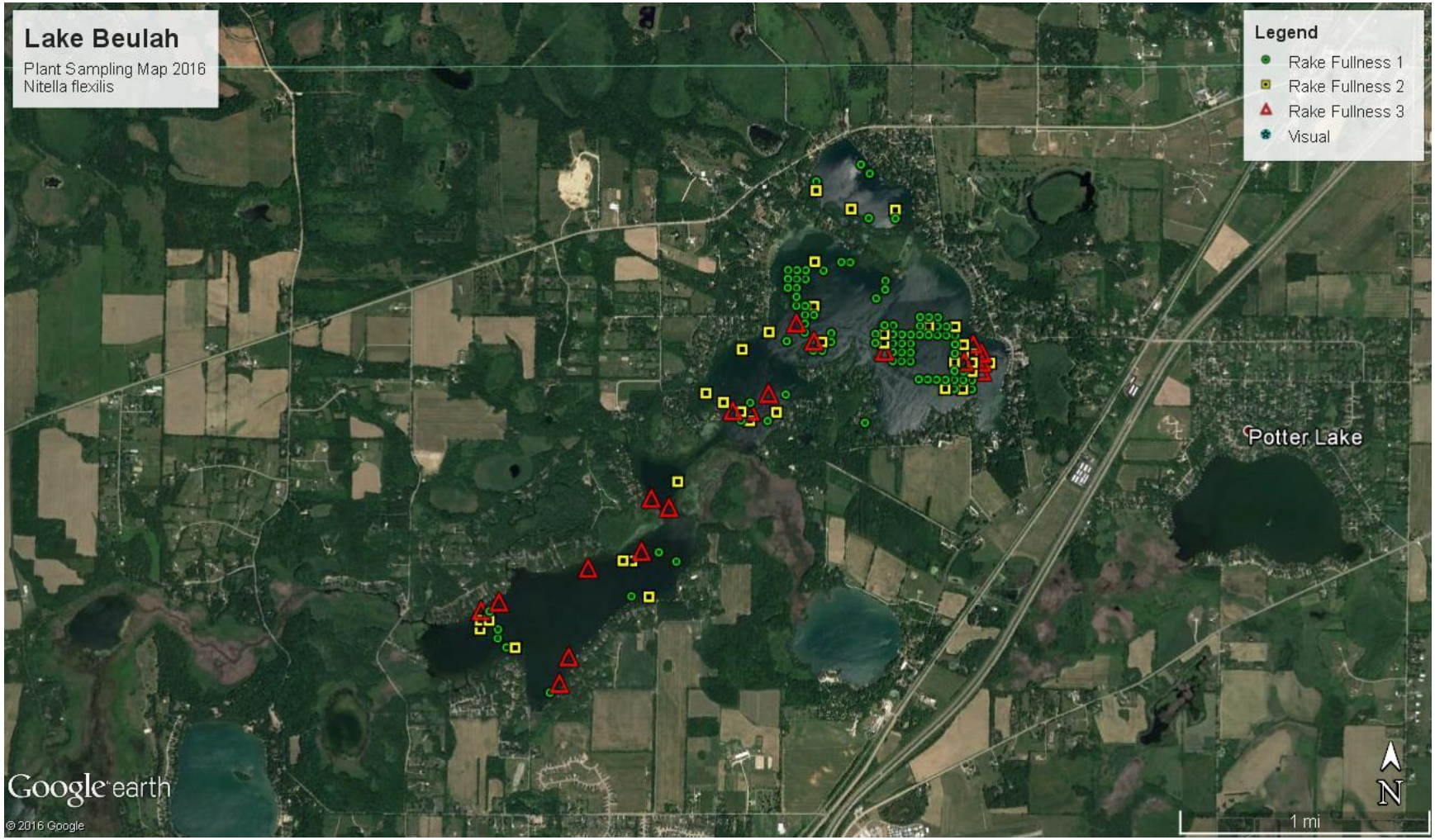


Figure 5: Most Common Native Plant Species (Spiney Naiad) Densities and Distribution

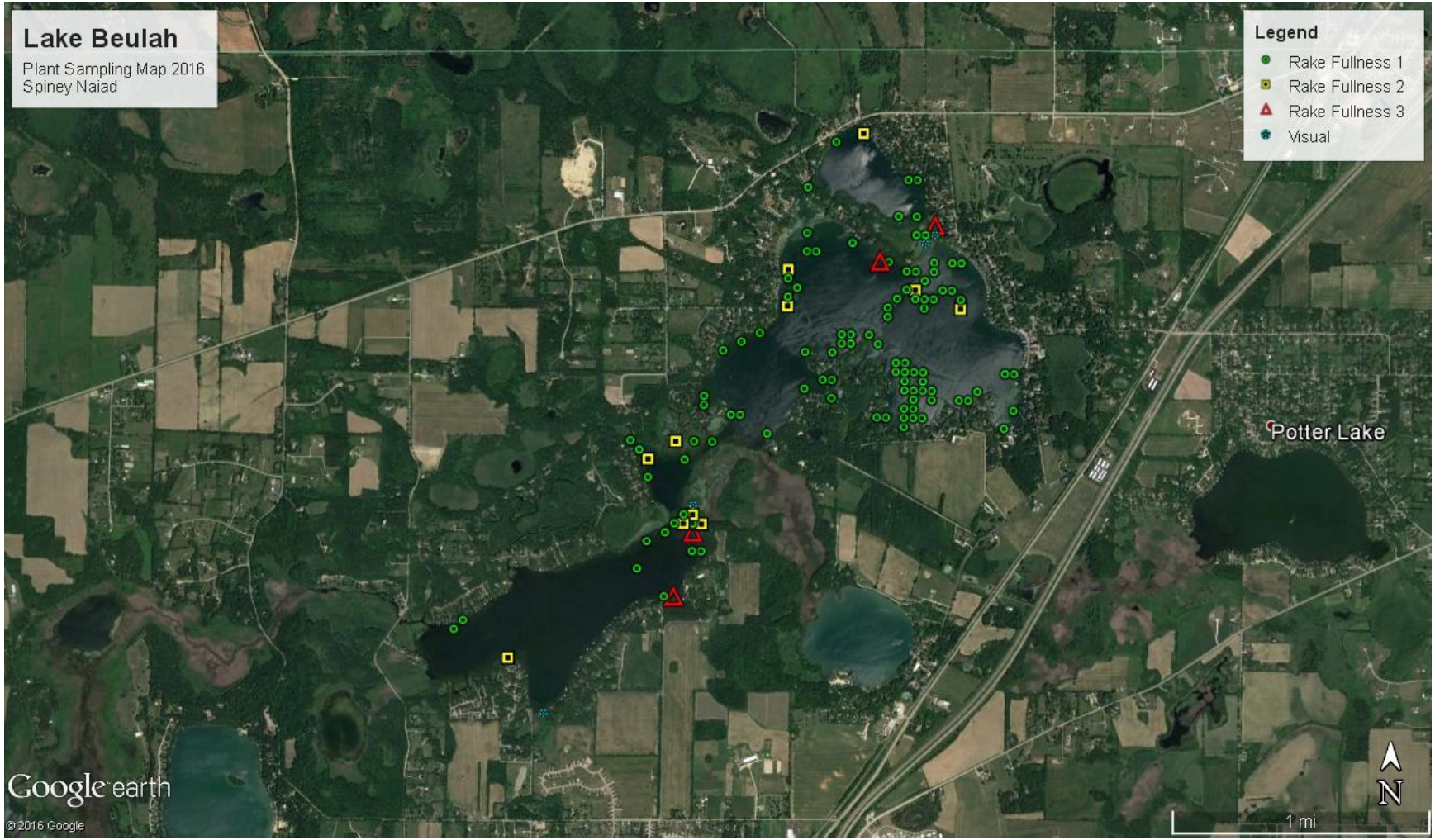


Figure 6: Most Common Native Plant Species (Sago Pondweed) Densities and Distribution

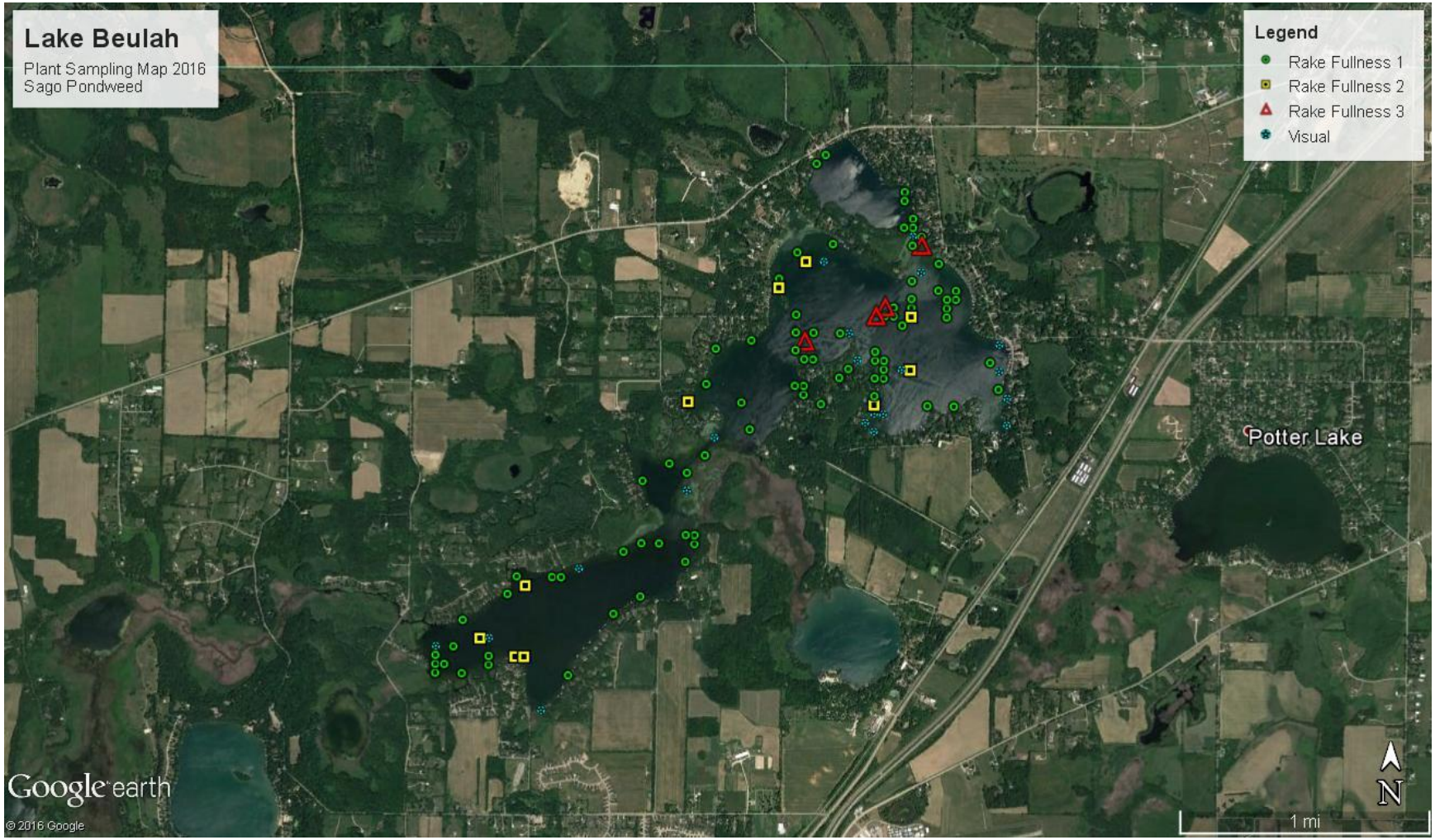


Figure 7: Most Common Native Plant Species (Coontail) Densities and Distribution

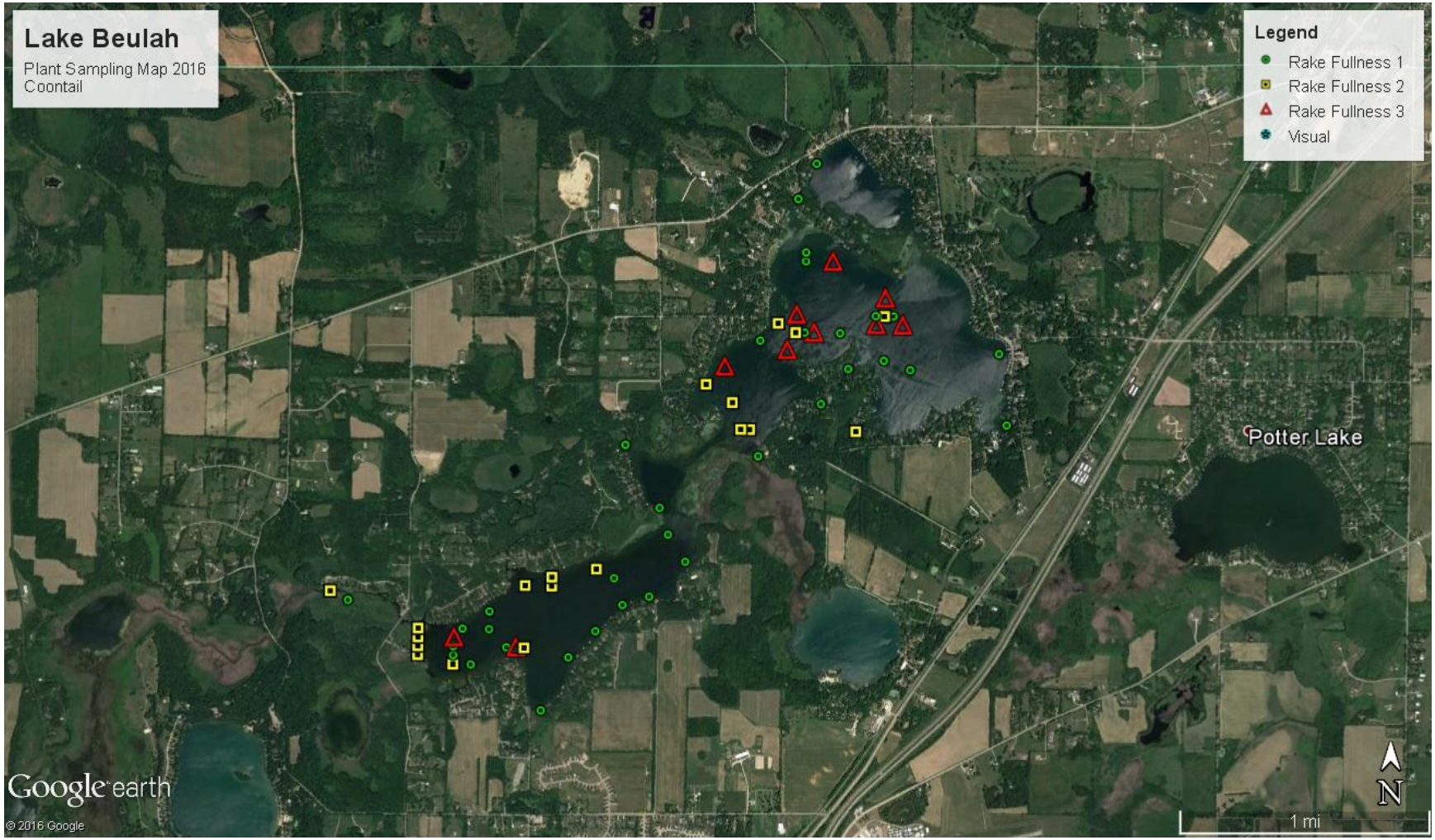
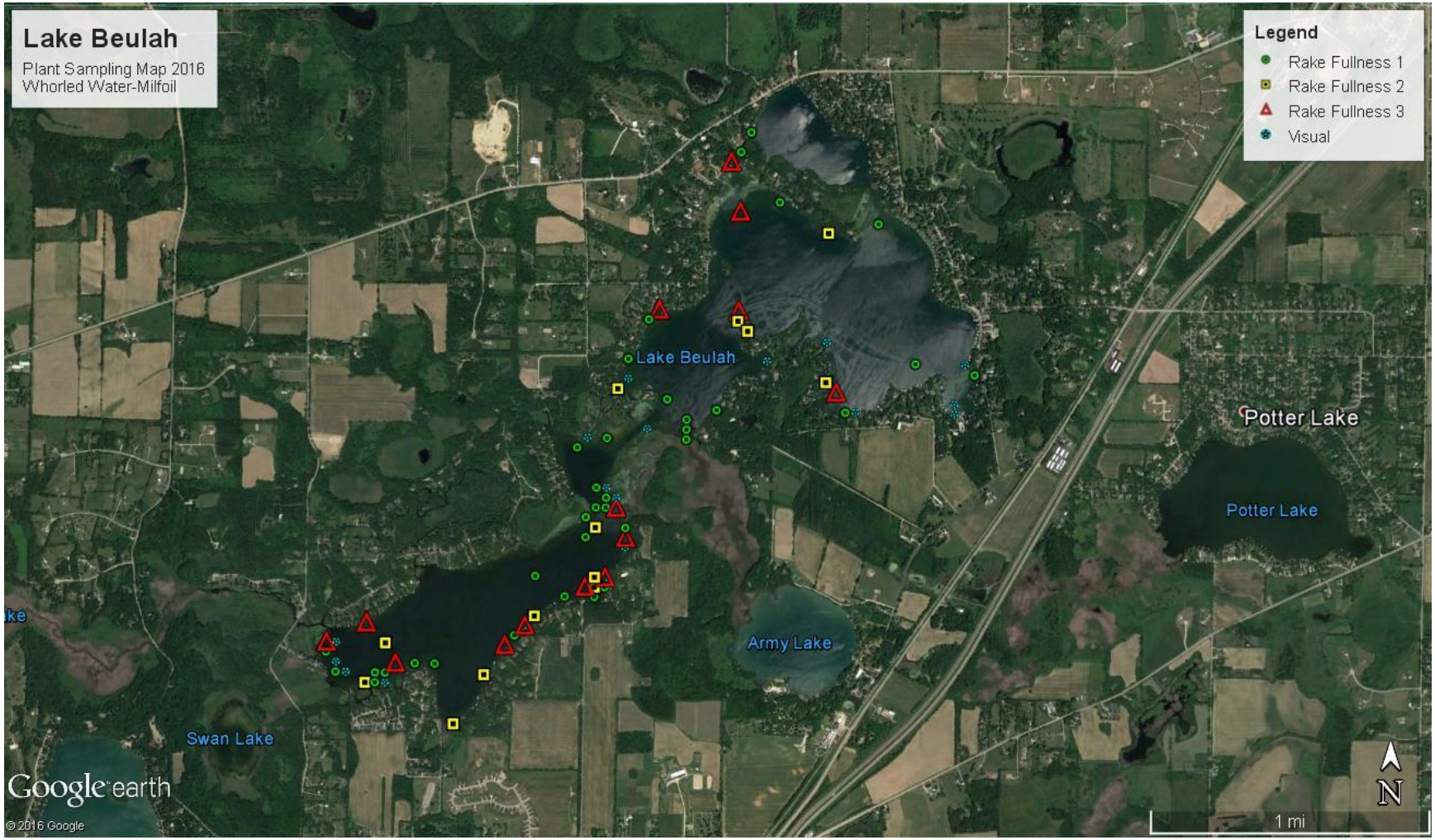


Figure 8: Most Common Native Plant Species (Whorled Water-Milfoil) Densities and Distribution



Maps

Need maps depicting the harvester cutting areas. Trucking routes to disposal sites? Also, need a map of any new proposed cutting areas.

Rapid Response Plan

Rapid response to a new aquatic invasive is imperative. But, the first step is ensuring that it is, in fact, an invasive species not previously found on the waterbody.

If a suspected invasive species is found:

- Take a digital photo of the plant in the setting where it was found and mark with a GPS (if possible). Then collect 5 – 10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in a Ziploc bag with no water. Place on ice and transport to refrigerator.
- Fill out form http://dnr.wi.gov/lakes/forms/3200-125-plantincident.pdf.
- Contact the WDNR Aquatic Invasive Species Contact (currently Heidi Bunk, WDNR Lakes Biologist) and deliver the specimens, report, digital photo and coordinates (if available). Do this as soon as possible; but no later than 4 days after the plant is discovered. The Lake Beulah Management District and current lake consultant should also be notified.

Upon determination of species, a coordinated response plan should be developed in consultation with the WDNR, the Township, Lake Beulah Management District and lake consultant(s) as needed.

References

The Free Library, 2006. The history and aquatic flora of Silver Lake, Porter County, Indiana, with comments on the adequacy of floristic quality assessment for lakes. Indiana Academy of Science. Retrieved November 29th, 2016 from:

https://www.thefreelibrary.com/The+history+and+aquatic+flora+of+Silver+Lake%2c+Porter+County%2c+Indiana%2c...-a0162455039