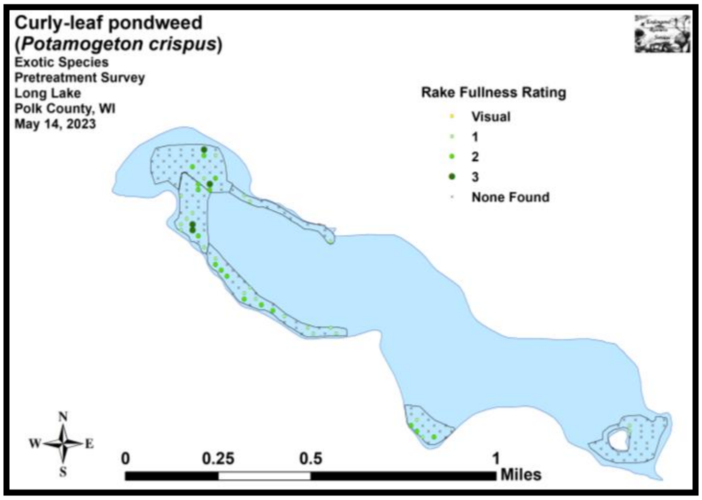
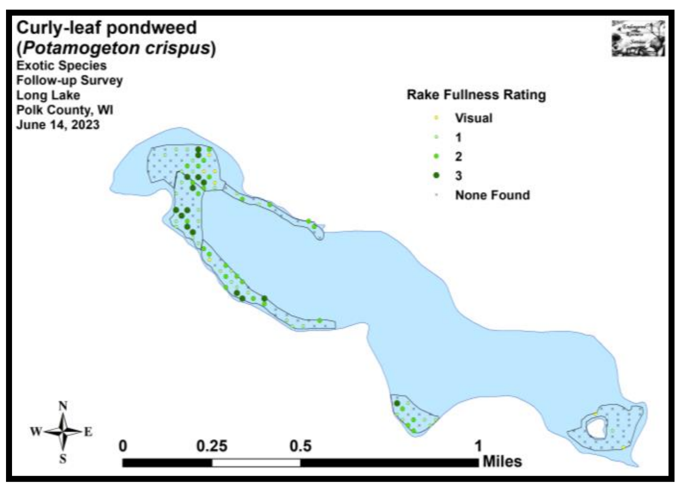
Curly-leaf pondweed (*Potamogeton crispus*)
Pretreatment and Follow-up Surveys
Long Lake - WBIC: 2478200
Polk County, Wisconsin



CLP Pretreatment Density and Distribution 5/14/23

Northwest Bay – Long Lake – 6/14/23

Project Initiated by:
Long Lake Protection and Rehabilitation District, Harmony Environmental, and the Wisconsin Department of Natural Resources – (Grant ACEI20218)



CLP Follow-up Survey Density and Distribution 6/14/23

Surveys Conducted by and Report Prepared by:
Endangered Resource Services, LLC
Matthew S. Berg, Research Biologist
St. Croix Falls, Wisconsin
May 14 and June 14, 2023

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INTRODUCTION:

Long Lake (WBIC 2478200) is a 272-acre seepage lake in central Polk County, Wisconsin in the Town of Balsam Lake (T34N R17W S5-8). It reaches a maximum depth of just over 17ft in the central basin and has an average depth of approximately 11ft (Busch et al. 1969) (Figure 1). The lake is eutrophic and visibility is generally poor with summer Secchi readings averaging 5.1ft since 1992; however, **the 2021 mean reading of 12.0ft (the most recent year available) was the highest since records began** (WDNR 2023). The bottom substrate in the lake's bays and central basin is predominately thick organic muck, while exposed points and most north/south shorelines are dominated by gravel and sand.

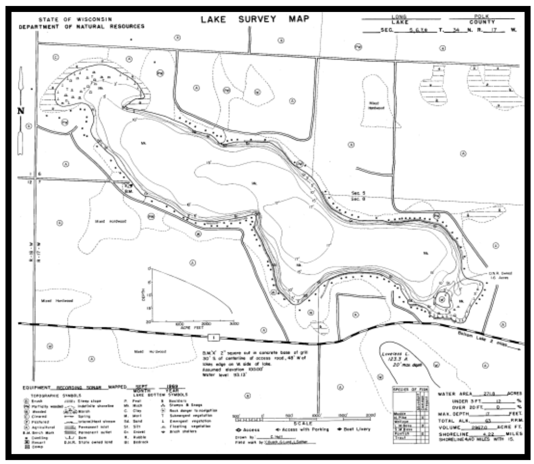


Figure 1: Long Lake Bathymetric Map

BACKGROUND AND STUDY RATIONALE:

Long Lake and the Long Lake Protection and Rehabilitation District (LLPRD) have an extended history of battling Curly-leaf pondweed (*Potamogeton crispus*) (CLP) - an exotic invasive plant species that thrives in the nutrient-rich sediments found in many parts of the lake. In the past, CLP often grew so densely in the spring and early summer that it made lake access and boating difficult for residents. CLP's late-June to early-July senescence was also cited in past studies by Barr Engineering and the Polk County Land and Water Conservation Department (PCLWCD) as a significant contributor to the lake's overall phosphorus load, and it was at least partially responsible for the lake's frequent late-summer toxic blue-green algae blooms.

In 2010, after years of study, the LLPRD and the Wisconsin Department of Natural Resources (WDNR) authorized an initial lakewide herbicide treatment of over 65 acres of CLP. The LLPRD treated nearly 57 acres again in 2011, and 58 acres in 2012. After updating the District's WDNR approved Aquatic Plant Management Plan (APMP) in 2012, it was decided to treat just 27 acres in 2013, and only 20 acres in 2014. Although **the 2010-2013 treatments resulted in highly significant reductions** in both CLP coverage and density on the lake, **the 2014 treatment showed no significant change from pretreatment levels**. A follow-up survey of CLP turions in the lake's sediment also suggested 2015 CLP levels would likely be very low in most parts of the lake. Based on these data and following a discussion with the lake's executive board and APMP director Cheryl Clemens (Harmony Environmental) in the fall of 2014, it was decided **not to treat CLP in 2015**.

Because both the 2015 June CLP point-intercept monitoring survey and the fall CLP turion sediment data suggested CLP had made a significant rebound throughout much of the lake, **it was decided that herbicide treatments (not to exceed 35 acres) would resume in the future**. Ultimately, the LLPRD decided to treat 34.97 acres in 2016 and 33.65 acres in 2017. However, due to low spring CLP levels, the planned treatments in 2018, 2019, and 2020 were cancelled.

Following an uptick in turions detected during the fall 2020 survey and after the spring 2021 pretreatment survey found significant CLP germination, it was decided to resume limited treatment in the worst 8.61 acres of the northwest bay. In 2022, treatment was cancelled after the pretreatment survey again found low levels of CLP. Prior to the planned 2023 herbicide application, we conducted a pretreatment survey of the lake on May 14th to determine initial CLP levels and finalize treatment areas. Because this survey found CLP levels did not exceed the newly updated 2023 APMP's treatment threshold, **it was also decided to cancel the 2023 treatment**. However, to see how CLP and native plant populations responded to skipping treatment for a second year in a row, it was requested that we do a follow-up survey on June 14th. This report is the summary analysis of these two surveys.

METHODS:

Pretreatment/Follow-up Surveys:

From 2015-2022, we conducted annual pretreatment surveys at 523 points throughout the lake's rooted plant littoral zone. Of these, 200 points occurred in historically low CLP density areas, and 323 occurred in historically high CLP density areas. Because no treatment ever occurred within the low-density areas, in 2023, it was decided to abandon surveying in these areas. Also, because the 323 points within the 50 acres of potential treatment areas was higher than required (6.5 points/acre), it was decided to cut this total in half during the 2023 surveys to save on cost and see if the data provided proved good enough for management purposes. This lowering of effort was accomplished by surveying only the 162 odd points from the original 323-point grid (Appendix I).

Prior to each survey, we uploaded the points to a handheld mapping GPS unit (Garmin 76CSx) and then located them on the lake. At each point, we used a rake to sample an approximately 2.5ft section of the bottom and recorded the depth and bottom substrate. CLP was assigned a rake fullness value of 1-3 as an estimation of abundance (Figure 2). We also recorded visual sightings of CLP within six feet of the sample point. However, because visual sightings are not calculated into the pre/posttreatment statistical formulas, we only assigned a rake fullness value for non-CLP plants. A cumulative rake fullness value was also noted at each site.

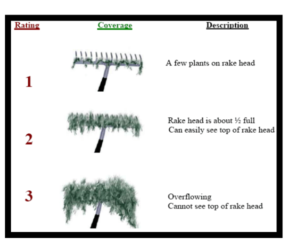


Figure 2: Rake Fullness Ratings

We entered all data collected into the standard Aquatic Plant Management spreadsheet (Appendix II). Data was analyzed using the linked statistical summary sheet (UWEX 2010). For pre/post differences of individual plant species as well as count data, we used the Chi-square analysis on the WDNR pre/post survey worksheet (UWEX 2010). For comparing averages (mean species/point and mean rake fullness/point), we used t-tests. Differences were determined to be significant at $p<0.05$, moderately significant at $p<0.01$ and highly significant at $p<0.001$.

RESULTS AND DISCUSSION:

Finalization of Treatment Areas:

Of the seven areas identified by Barr Engineering as having Curly-leaf pondweed in 2009, we have consistently found high density CLP in only six of them in an area covering 49.88 acres (Table 1). Following analysis of the 2023 pretreatment survey, we found there were no areas larger than the 5-acre minimum for Endothall treatment required by the WDNR and outlined in the newly updated APMP (Figure 3). Because of this, the LLPRD decided to **cancel treatment in all areas in 2023** (Appendix I).

Table 1: 2023 Spring CLP Treatment Summary - Long Lake, Polk Co.

High Density CLP Area	Potential Treatment (acres)	Proposed Treatment (acres)	Final Treatment (acres)	Difference (+/-)
1	13.34	0.00	0.00	0.00
2	8.46	0.00	0.00	0.00
3	3.84	0.00	0.00	0.00
4	9.51	0.00	0.00	0.00
6	4.88	0.00	0.00	0.00
7	9.85	0.00	0.00	0.00
	49.88	**0.00**	**0.00**	**0.00**

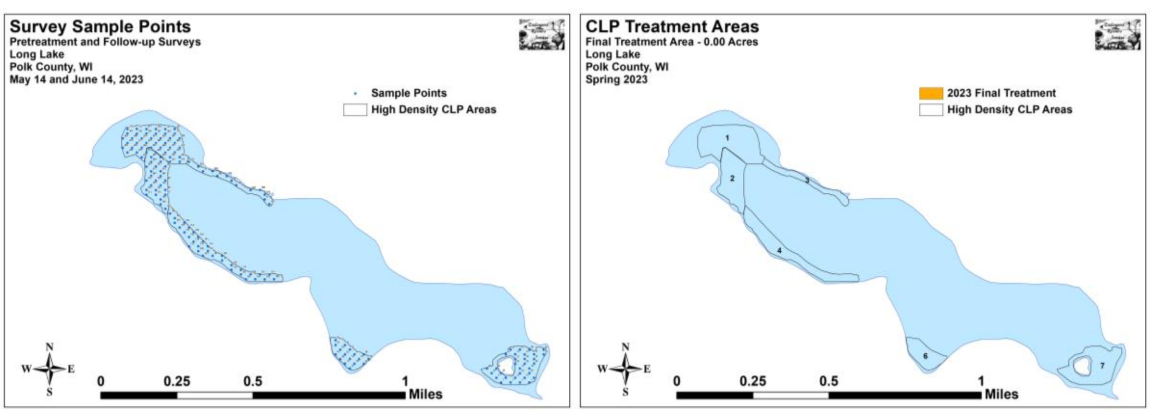


Figure 3: 2023 Pretreatment/Follow-up Survey Sample Points and Final CLP Treatment Areas

Pretreatment/Follow-up Surveys:

All Curly-leaf pondweed areas occurred in water between 1.0ft and 14.5ft deep (Figure 4). During the pretreatment survey, we found the mean and median depths of plant growth were 7.1ft and 6.5ft respectively. In June, both values declined by 0.5ft to 6.6ft and 6.0ft (Table 2). Most CLP occurred over organic muck (Figure 4) (Appendix III).

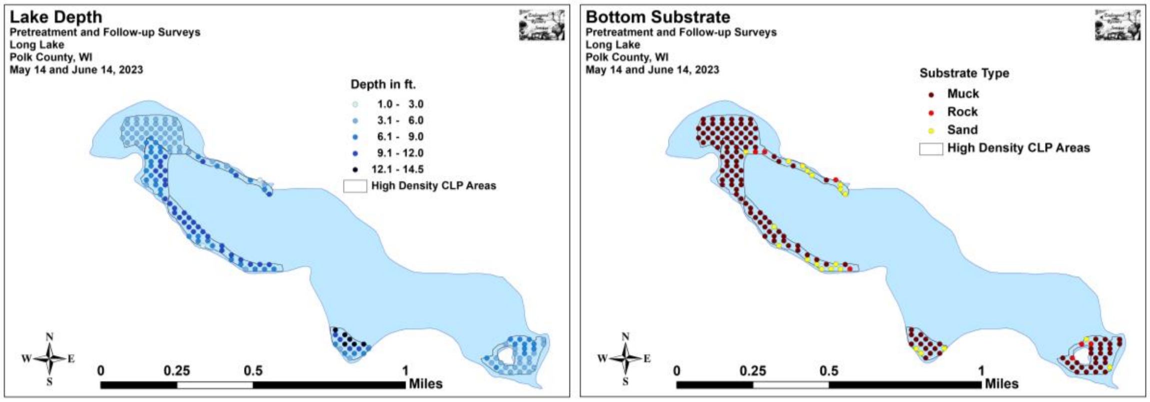


Figure 4: CLP Area Depths and Bottom Substrate

Table 2: Pretreatment/Follow-up Surveys Summary Statistics
Long Lake - Polk County, Wisconsin
May 14 and June 14, 2023

Summary Statistics:	Pre	June
Total number of points sampled	162	162
Total number of sites with vegetation	143	152
Total number of sites shallower than the maximum depth of plants	162	162
Frequency of occurrence at sites shallower than max. depth of plants	88.3	93.8
Simpson Diversity Index	0.67	0.81
Mean Coefficient of Conservatism	5.4	5.3
Floristic Quality Index	16.3	19.8
Average number of all species per site (shallower than max depth)	1.38	1.87
Average number of all species per site (veg. sites only)	1.56	1.99
Ave. number of native species/site (shallower than max depth)	1.10	1.41
Ave. number of native species/site (sites with native plants only)	1.42	1.76
Species Richness	10	15
Maximum depth of plants (ft)	14.5	14.0
Mean depth of plants (ft)	7.1	6.6
Median depth of plants (ft)	6.5	6.0
Mean Rake Fullness (veg. sites only)	1.61	1.73

The littoral zone extended to 14.5ft in May and 14.0ft in June (Figure 5) (Appendix IV). Within this zone, the frequency of plants encountered increased from 88.3% pretreatment to 93.8% during the follow-up. Richness rose from ten species in May to 15 in June. The Simpson's Diversity Indexes increased from 0.67 in May to 0.81 in June. The Floristic Quality Index (another measure of the native plant community health) also rose from 16.3 in May to 19.8 in June.

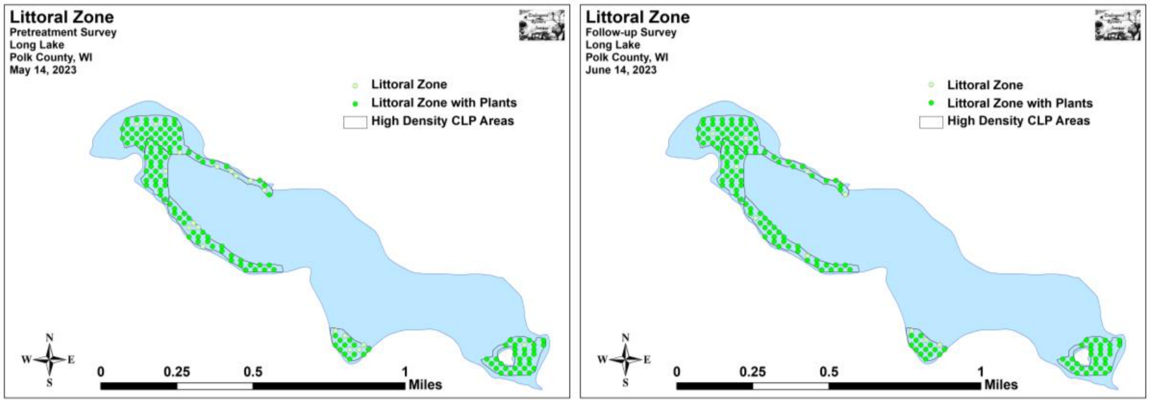


Figure 5: Pretreatment/Follow-up Littoral Zone

We found localized native species richness to be quite low throughout the lake. Mean richness at points with native plants climbed from 1.42 species/site in May to 1.87 species/site in June – a moderately significant increase **(*p*=0.002)**. Analysis of the maps showed most of these increases occurred in the northwest and southeast bays (Figures 6) (Appendix IV).

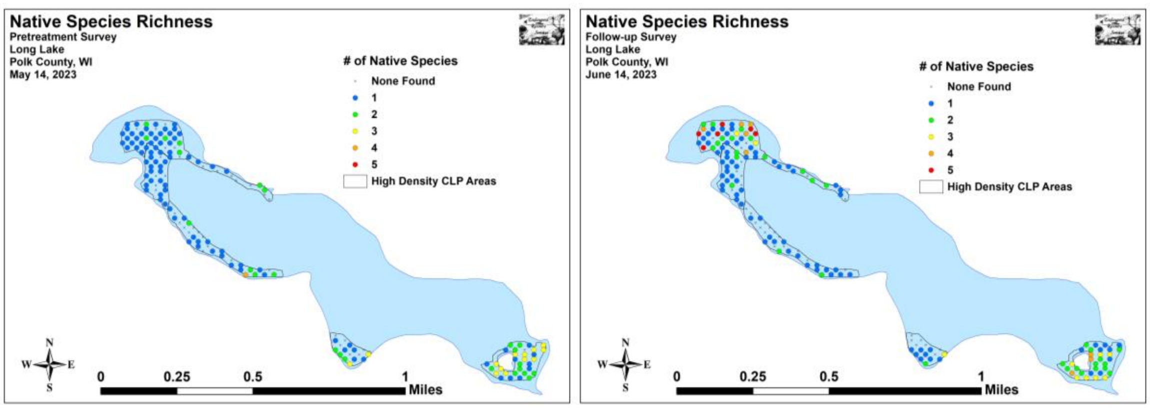


Figure 6: Pretreatment/Follow-up Native Species Richness

Total mean rake fullness was a low/moderate 1.61 in May before undergoing a moderately significant increase **(*p*=0.002)** to a mean of 1.73 in June (Figures 7) (Appendix IV).

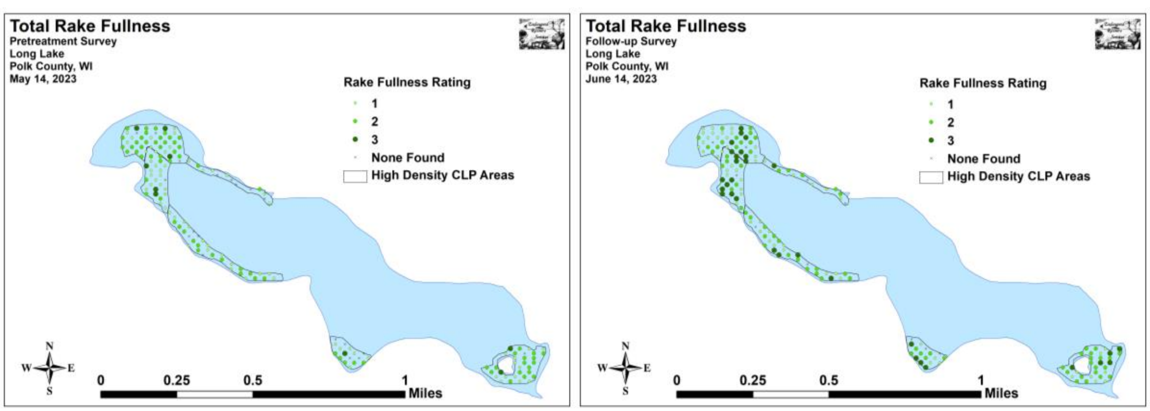


Figure 7: Pretreatment/Follow-up Total Rake Fullness

During the May 2023 survey, we found Curly-leaf pondweed at 44 of 162 total sites (Figure 8) (Appendix V). This approximated to 27.2% of the study area and represented a 39.5% increase in coverage compared to the May 2022 survey when CLP was present at 63 of 323 sites (19.5% coverage). It was, however, still lower than the May 2021 pretreatment survey when CLP was found at 31.0% of survey points. Of the sites with CLP in the rake, we rated four points a rake fullness rating of 3, 16 points a 2, and the remaining 24 points a 1. This produced a low/moderate mean rake fullness of 1.55 and suggested that 12.3% of the study area had a significant infestation (rake fullness 2 or 3).

In June, we found CLP at 74 points (45.7% coverage) with seven additional visual sightings (Figure 8) (Appendix V). This was a 25.2% increase over June 2022 levels when CLP was present at 36.5% of survey points. Of these, 15 rated a 3, 27 were a 2 (25.9% significant infestation), and the remaining 32 were a 1. This produced a low/moderate mean rake fullness of 1.77. As expected without active management and normal growing season expansion, these results suggested that CLP had undergone a highly significant increase **(p<0.001)** in total distribution as well as moderately significant increases in the number of points with rake fullness 3 **(p=0.009)** and visual sightings **(p=0.007)** (Figure 9). We also calculated that the overall mean density of CLP saw a significant increase **(p<0.05)**.

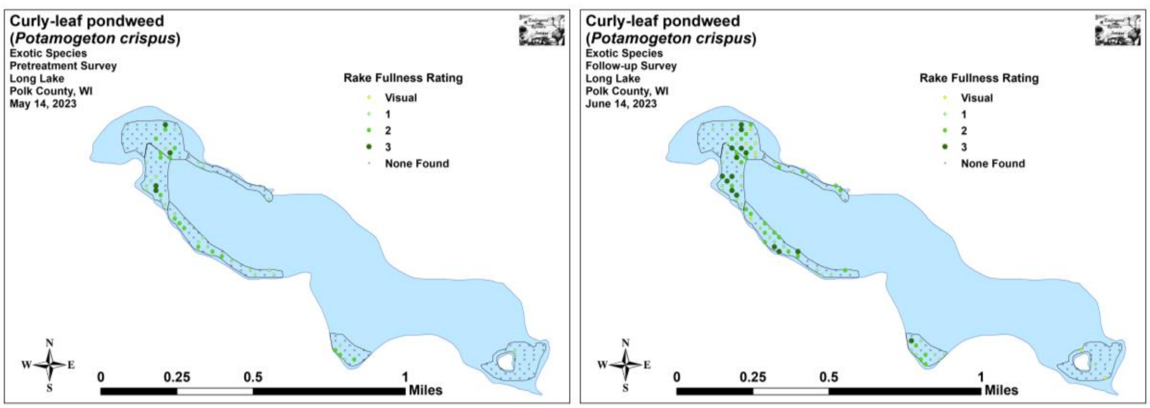
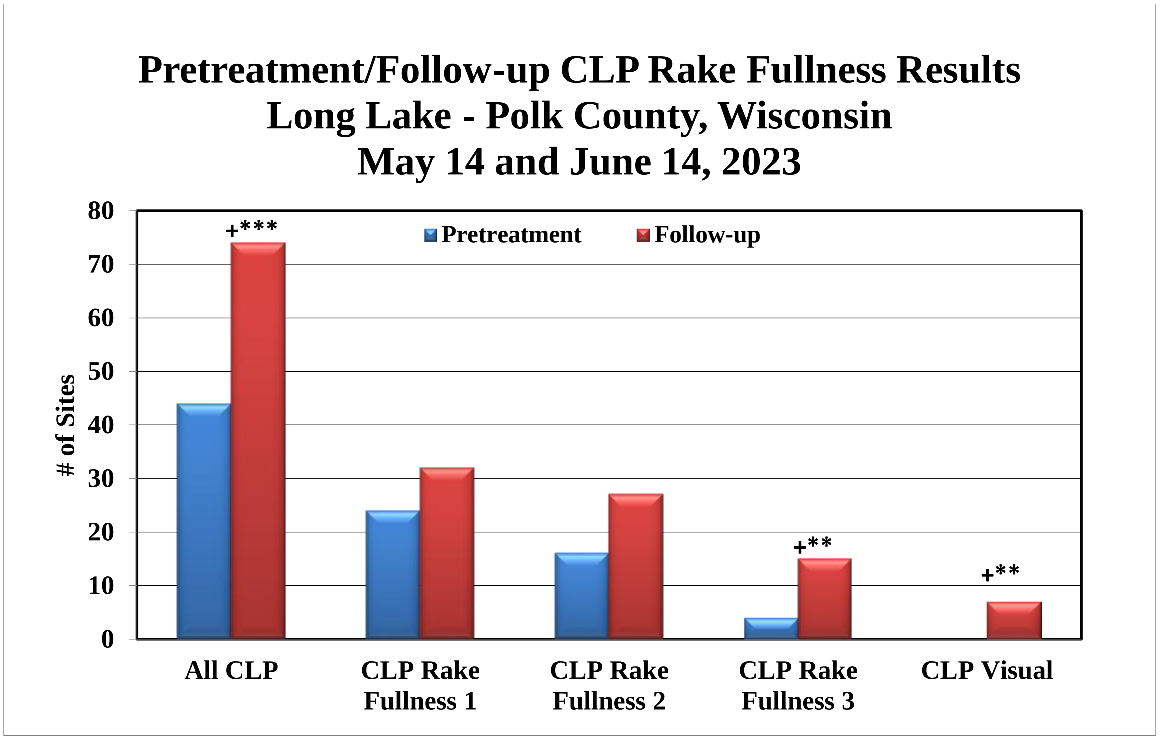


Figure 8: Pretreatment/Follow-up CLP Density and Distribution



Significant differences = * *p*<0.05, ** *p*<0 .01, * *p*<0.001**

Figure 9: Changes in Curly-leaf Pondweed Rake Fullness Ratings

Coontail (*Ceratophyllum demersum*) was the most common native species during both the pretreatment and follow-up surveys (Figure 10) (Tables 3 and 4). In May, it was present at 113 sites with a mean rake fullness of 1.54. For unknown reasons, by June, we found it had undergone moderately significant declines **(*p*=0.004/*p*=0.003)** in both distribution (88 sites) and density (mean rake of 1.33). Despite this, it was still common throughout all areas with nutrient-rich organic muck substrates – especially in the northwest, south-central, and southeast bays.

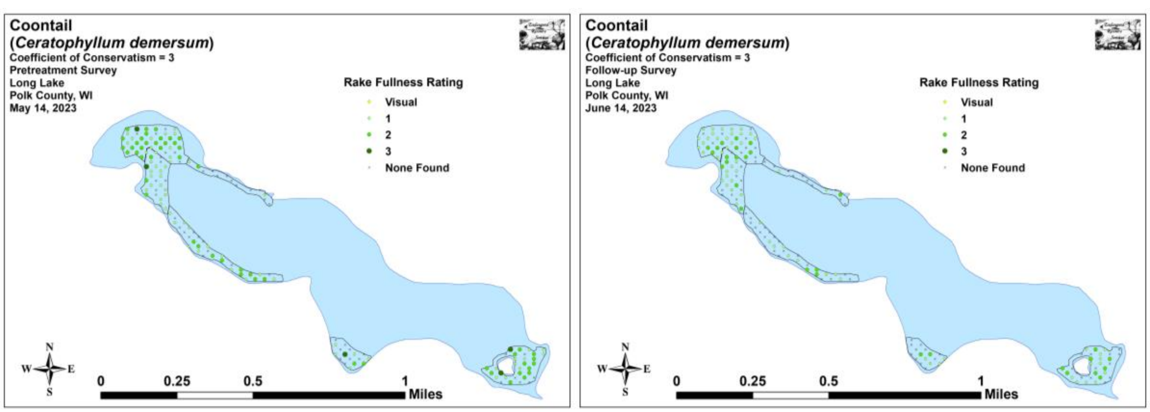


Figure 10: Pre/Follow-up Coontail Density and Distribution

Northern water-milfoil (*Myriophyllum sibiricum*) was the second most common species during each survey (Figure 11). Its increase in distribution from 28 sites in May to 58 sites in June was highly significant **(p<0.001)**, and its increase in density from a mean rake of 1.12 to 1.22 was nearly significant (p=0.08). Despite these increases, outside a few nearshore areas, this species was much less common than in 2021 and 2022 when canopied beds of NWM caused moderate to severe navigation impairment for many of the lake's residents.

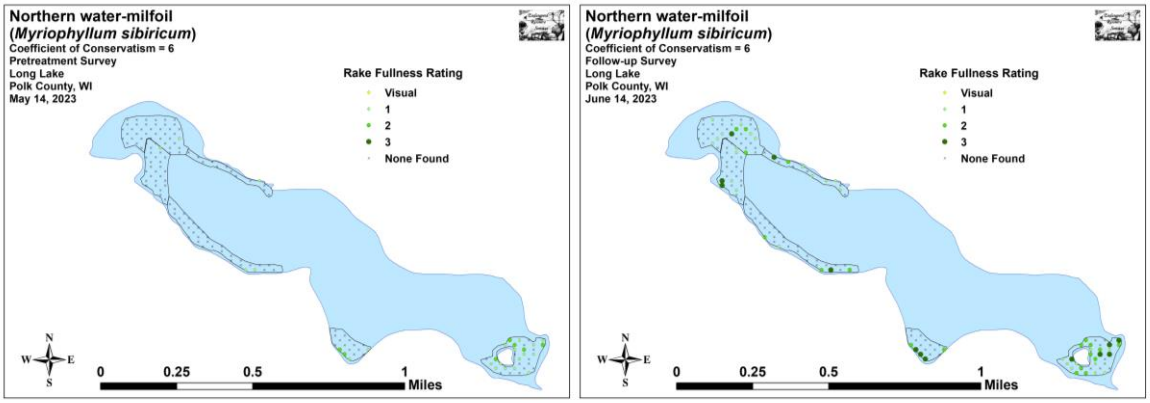


Figure 11: Pre/Follow-up Northern Water-milfoil Density and Distribution

As is typical, many later-growing native species that were largely dormant during the pretreatment survey showed significant lakewide increases in distribution by June (Figure 12). Specifically, in addition to Northern water-milfoil, White water lily (*Nymphaea odorata*), Small duckweed (*Lemna minor*), Common watermeal (*Wolffia columbiana*), Large duckweed (*Spirodela polyrhiza*), and filamentous algae all enjoyed highly significant increases **(p<0.001)** in coverage. Other than Coontail's moderately significant decline **(p=0.004)**, no other species showed evidence of a decline in distribution over this time (Maps of all native species from the pretreatment and follow-up surveys are located in Appendixes VI and VII).

Table 3: Frequencies and Mean Rake Sample of Aquatic Macrophytes
Pretreatment Survey – Long Lake - Polk County, Wisconsin
May 14, 2023

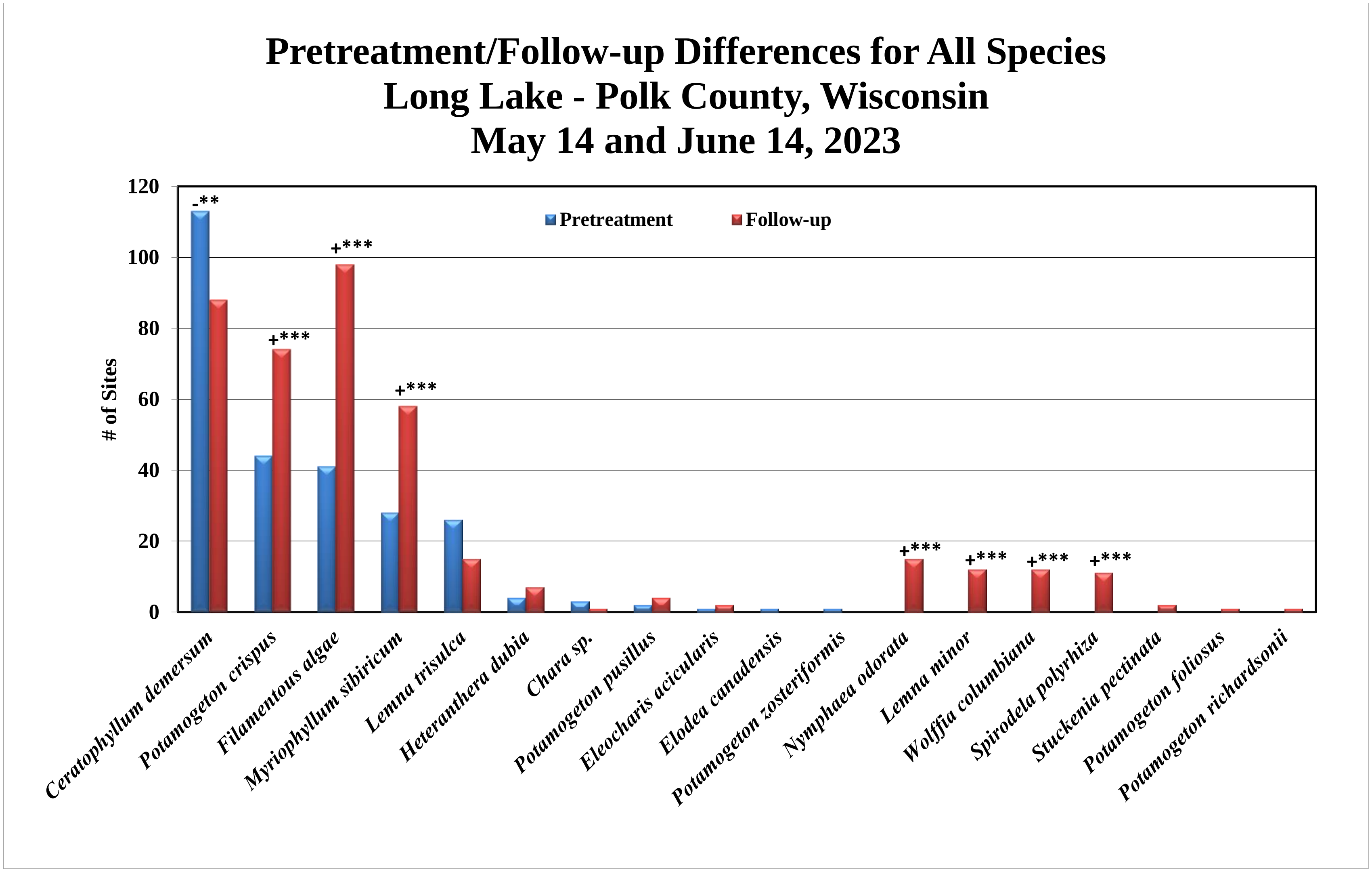
Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
Ceratophyllum demersum	Coontail	113	50.67	79.02	69.75	1.54	0
Potamogeton crispus	**Curly-leaf pondweed**	**44**	**19.73**	**30.77**	**27.16**	**1.55**	**0**
	Filamentous algae	41	*	28.67	25.31	1.12	0
Myriophyllum sibiricum	Northern water-milfoil	28	12.56	19.58	17.28	1.25	0
Lemna trisulca	Forked duckweed	26	11.66	18.18	16.05	1.04	0
Heteranthera dubia	Water star-grass	4	1.79	2.80	2.47	1.25	0
Chara sp.	Muskgrass	3	1.35	2.10	1.85	1.00	0
Potamogeton pusillus	Small pondweed	2	0.90	1.40	1.23	1.00	0
Eleocharis acicularis	Needle spikerush	1	0.45	0.70	0.62	1.00	0
Elodea canadensis	Common waterweed	1	0.45	0.70	0.62	1.00	0
Potamogeton zosteriformis	Flat-stem pondweed	1	0.45	0.70	0.62	1.00	0

* Excluded from relative frequency analysis **Exotic species in bold**

Table 4: Frequencies and Mean Rake Sample of Aquatic Macrophytes
Follow-up Survey - Long Lake - Polk County, Wisconsin
June 14, 2023

Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
	Filamentous algae	98	*	64.47	60.49	1.22	0
Ceratophyllum demersum	Coontail	88	29.04	57.89	54.32	1.33	0
Potamogeton crispus	**Curly-leaf pondweed**	**74**	**24.42**	**48.68**	**45.68**	**1.77**	**7**
Myriophyllum sibiricum	Northern water-milfoil	58	19.14	38.16	35.80	1.78	0
Lemna trisulca	Forked duckweed	15	4.95	9.87	9.26	1.00	0
Nymphaea odorata	White water lily	15	4.95	9.87	9.26	1.27	0
Lemna minor	Small duckweed	12	3.96	7.89	7.41	1.25	0
Wolffia columbiana	Common watermeal	12	3.96	7.89	7.41	1.50	0
Spirodela polyrhiza	Large duckweed	11	3.63	7.24	6.79	1.64	0
Heteranthera dubia	Water star-grass	7	2.31	4.61	4.32	1.14	0
Potamogeton pusillus	Small pondweed	4	1.32	2.63	2.47	1.25	0
Eleocharis acicularis	Needle spikerush	2	0.66	1.32	1.23	1.00	0
Stuckenia pectinata	Sago pondweed	2	0.66	1.32	1.23	1.50	0
Chara sp.	Muskgrass	1	0.33	0.66	0.62	2.00	0
Potamogeton foliosus	Leafy pondweed	1	0.33	0.66	0.62	1.00	0
Potamogeton richardsonii	Clasping-leaf pondweed	1	0.33	0.66	0.62	1.00	0

* Excluded from relative frequency analysis **Exotic species in bold**



Significant differences = * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Figure 12: Pretreatment/Follow-up Changes for All Species

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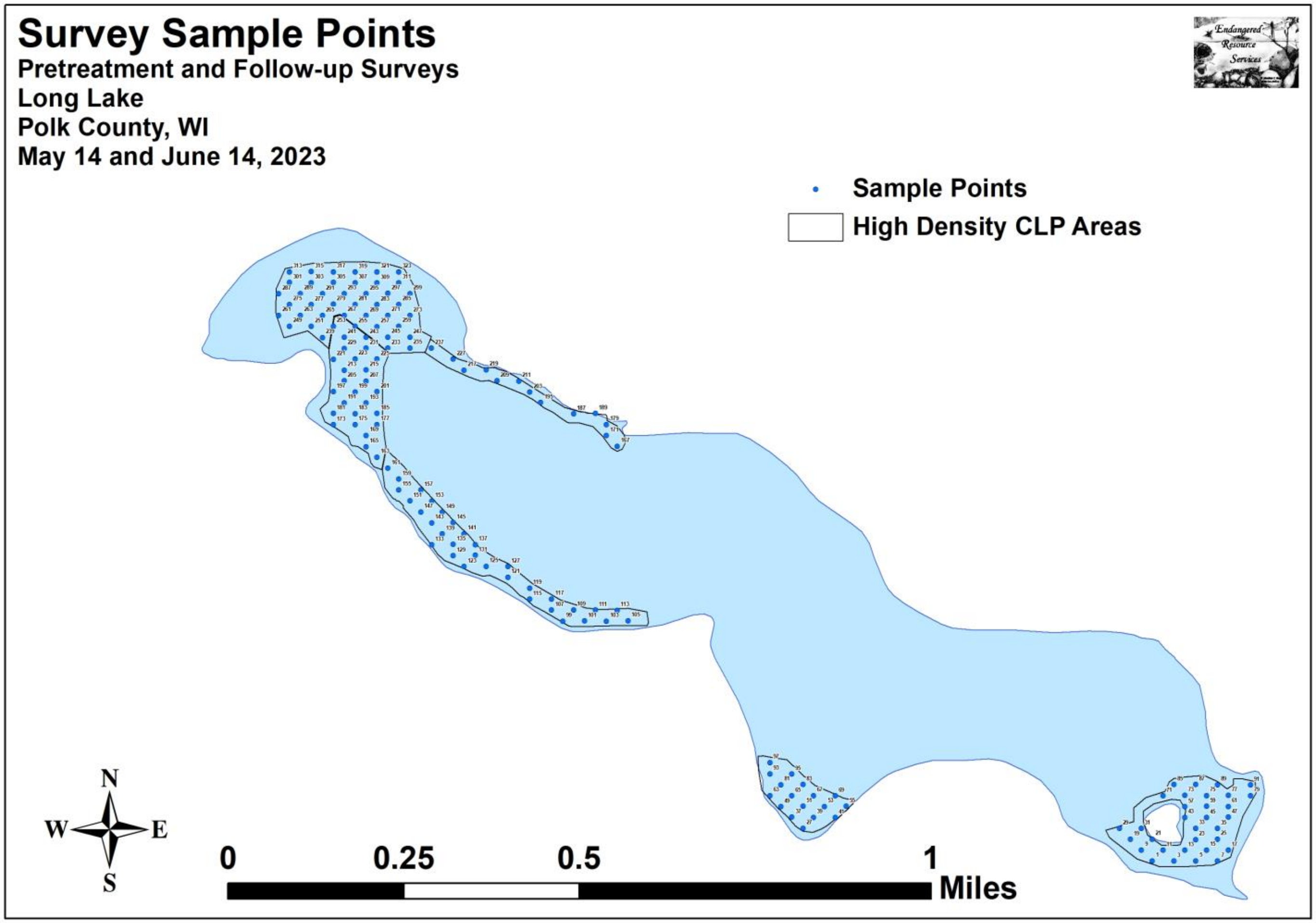
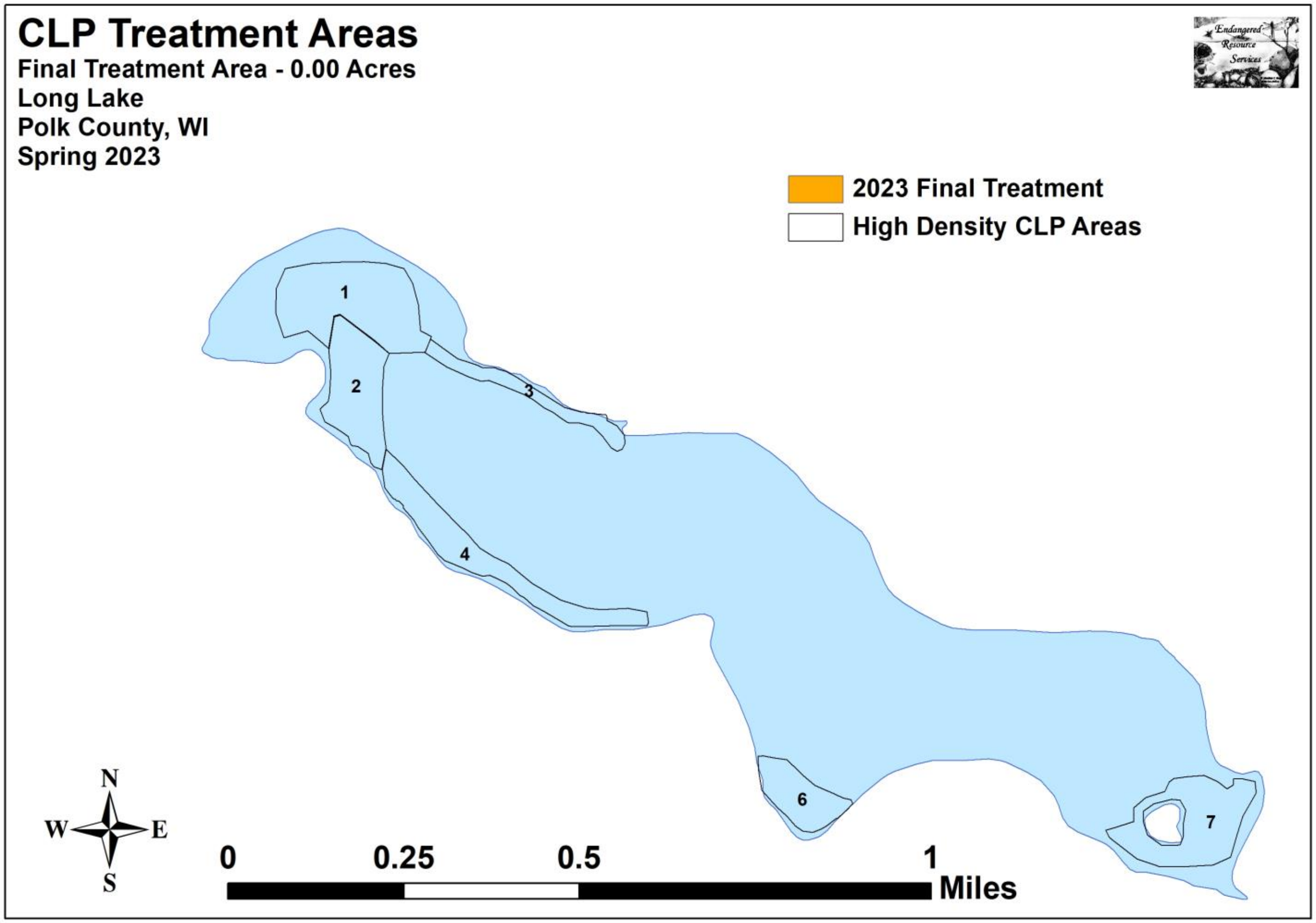
Appendix I: CLP Pretreatment/Follow-up Survey Sample Points and Final Treatment Areas


Survey Sample Points
Pretreatment and Follow-up Surveys
Long Lake
Polk County, WI
May 14 and June 14, 2023
Sample Points
High Density CLP Areas
Endangered Resource Services
N
W
E
S
0
0.25
0.5
1
Miles


CLP Treatment Areas
Final Treatment Area - 0.00 Acres
Long Lake
Polk County, WI
Spring 2023
2023 Final Treatment
High Density CLP Areas
1
2
3
4
6
7
N
W
E
S
0
0.25
0.5
1
Miles

Appendix II: Vegetative Survey Datasheet

Observers for this lake: names and hours worked by each:																									
Lake:									WBIC									County						Date:	
Site #	Depth (ft)	Muck (M), Sand (S), Rock (R)	Rake pole (P) or rake rope (R)	Total Rake Fullness	CLP	CLP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1																									
2																									
3																									
4																									
5																									
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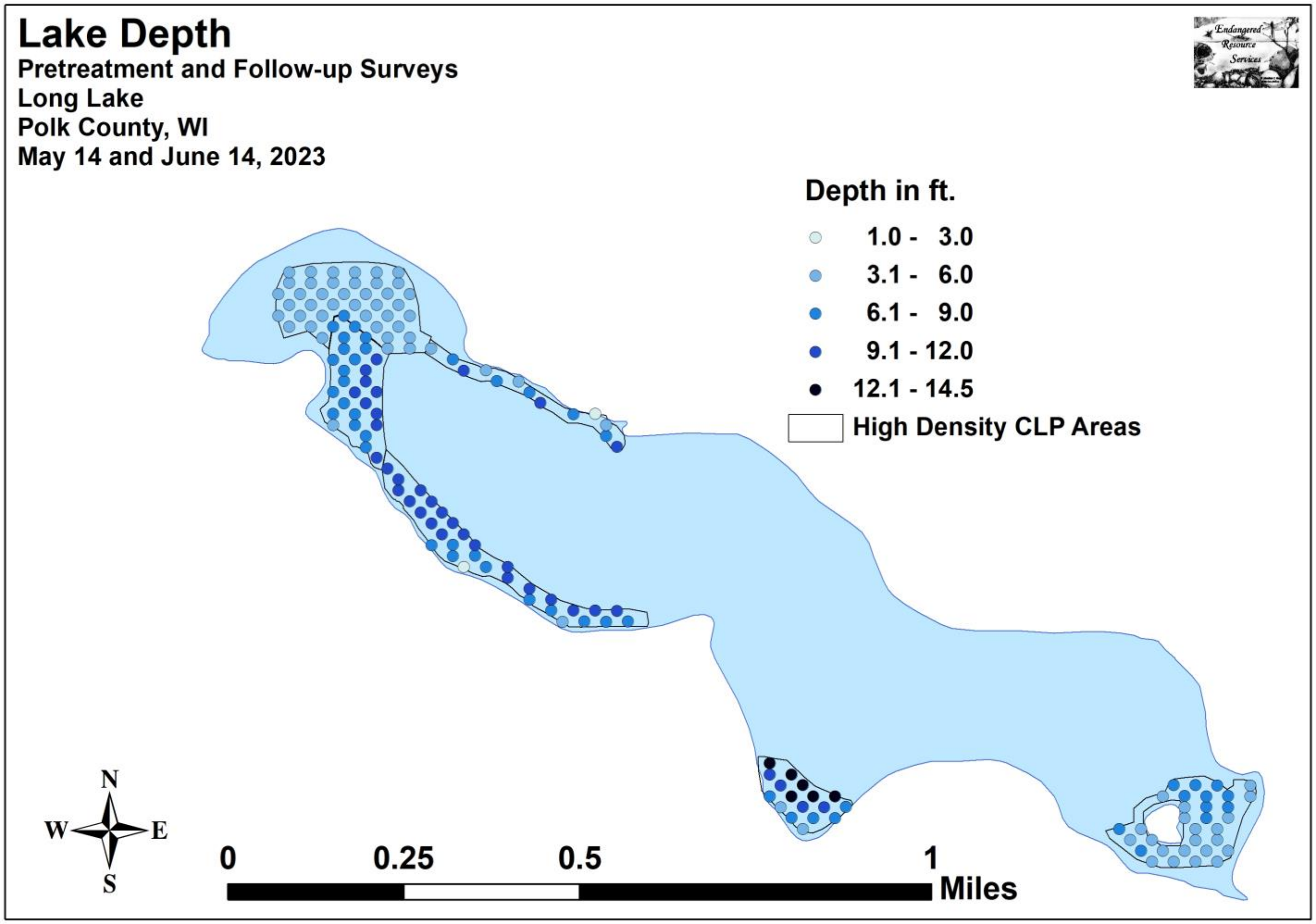
19																									
20																									

Appendix III: Pretreatment/Follow-up Habitat Variables


Lake Depth
Pretreatment and Follow-up Surveys
Long Lake
Polk County, WI
May 14 and June 14, 2023
Endangered Resource Services
Depth in ft.
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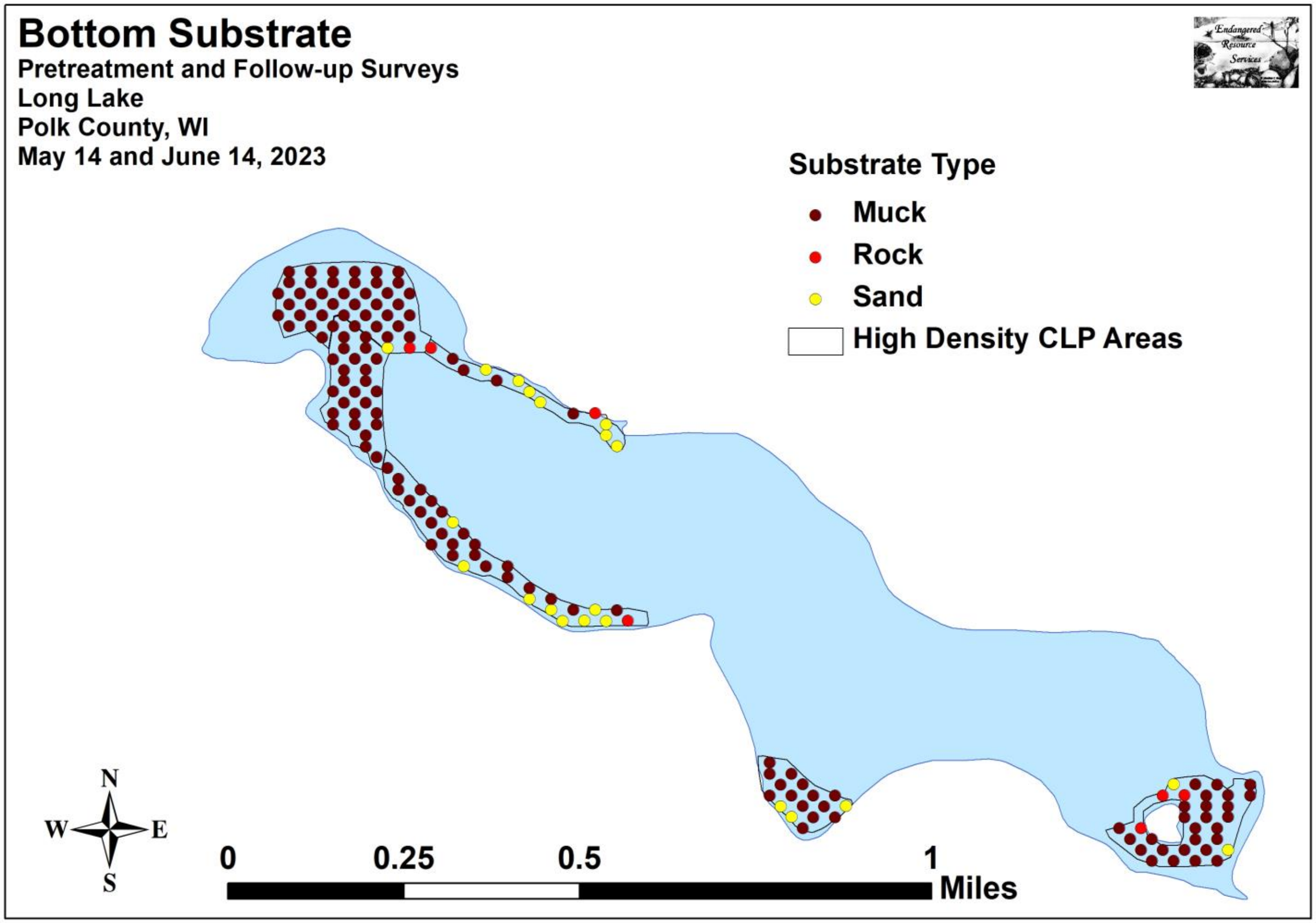
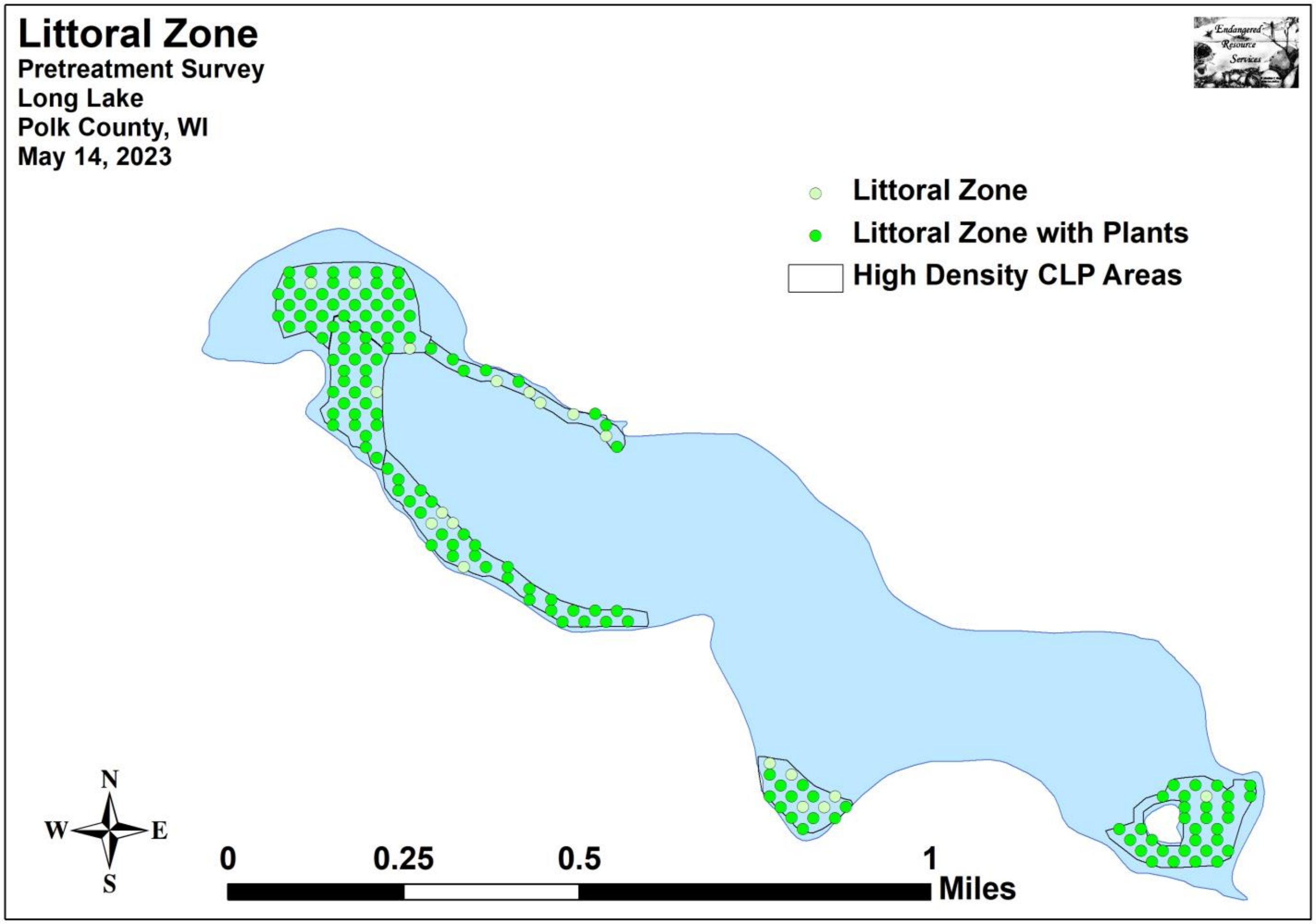
3.1 - 6.0
6.1 - 9.0
9.1 - 12.0
12.1 - 14.5
High Density CLP Areas
N
W
E
S
0
0.25
0.5
1
Miles


Bottom Substrate
Pretreatment and Follow-up Surveys
Long Lake
Polk County, WI
May 14 and June 14, 2023
Substrate Type
Muck
Rock
Sand
High Density CLP Areas
N
W
E
S
0
0.25
0.5
1
Miles

Appendix IV: Pretreatment/Follow-up Littoral Zone, Native Species Richness, and Total Rake Fullness


Littoral Zone
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Littoral Zone
Littoral Zone with Plants
High Density CLP Areas
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W
E
S
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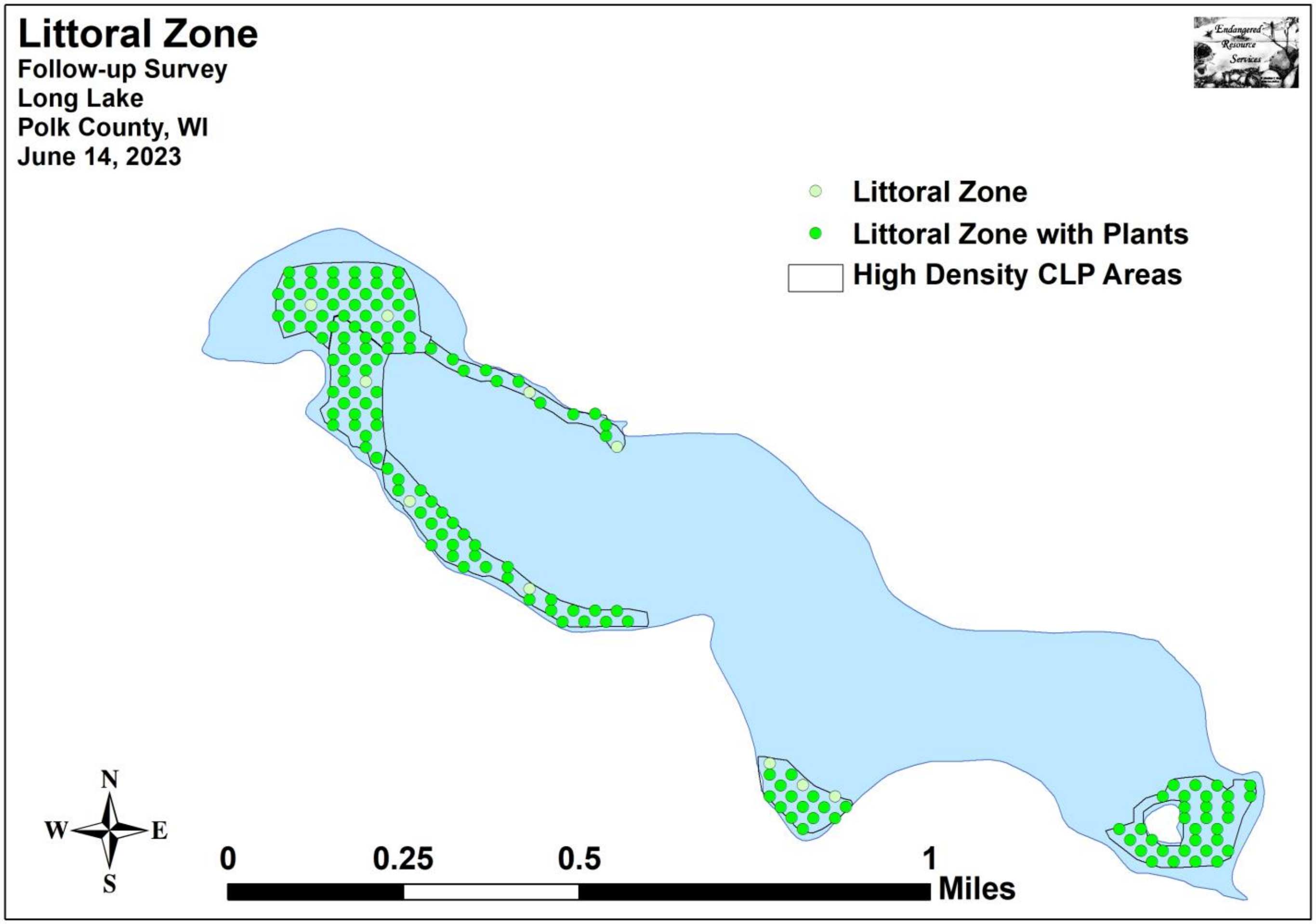
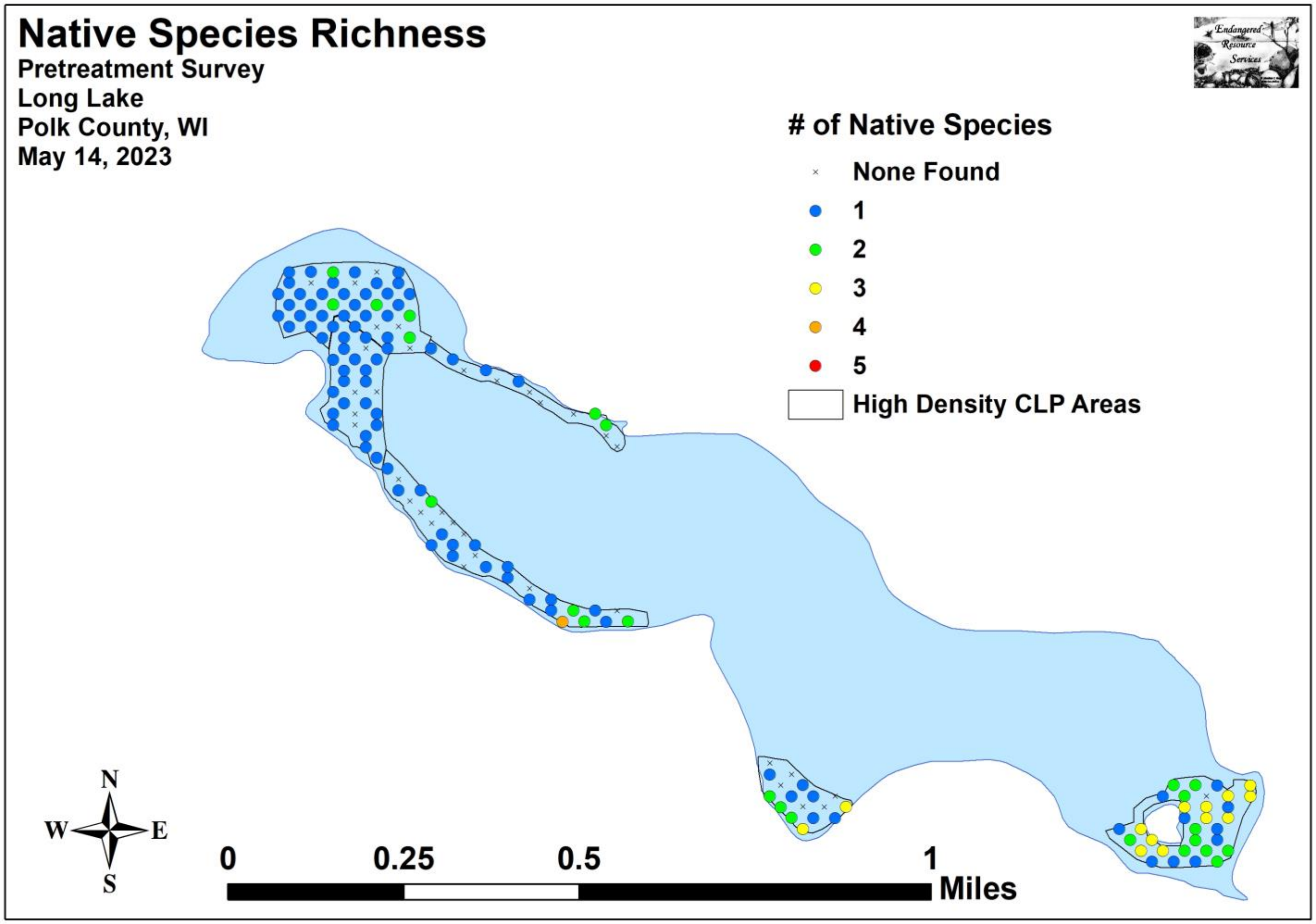
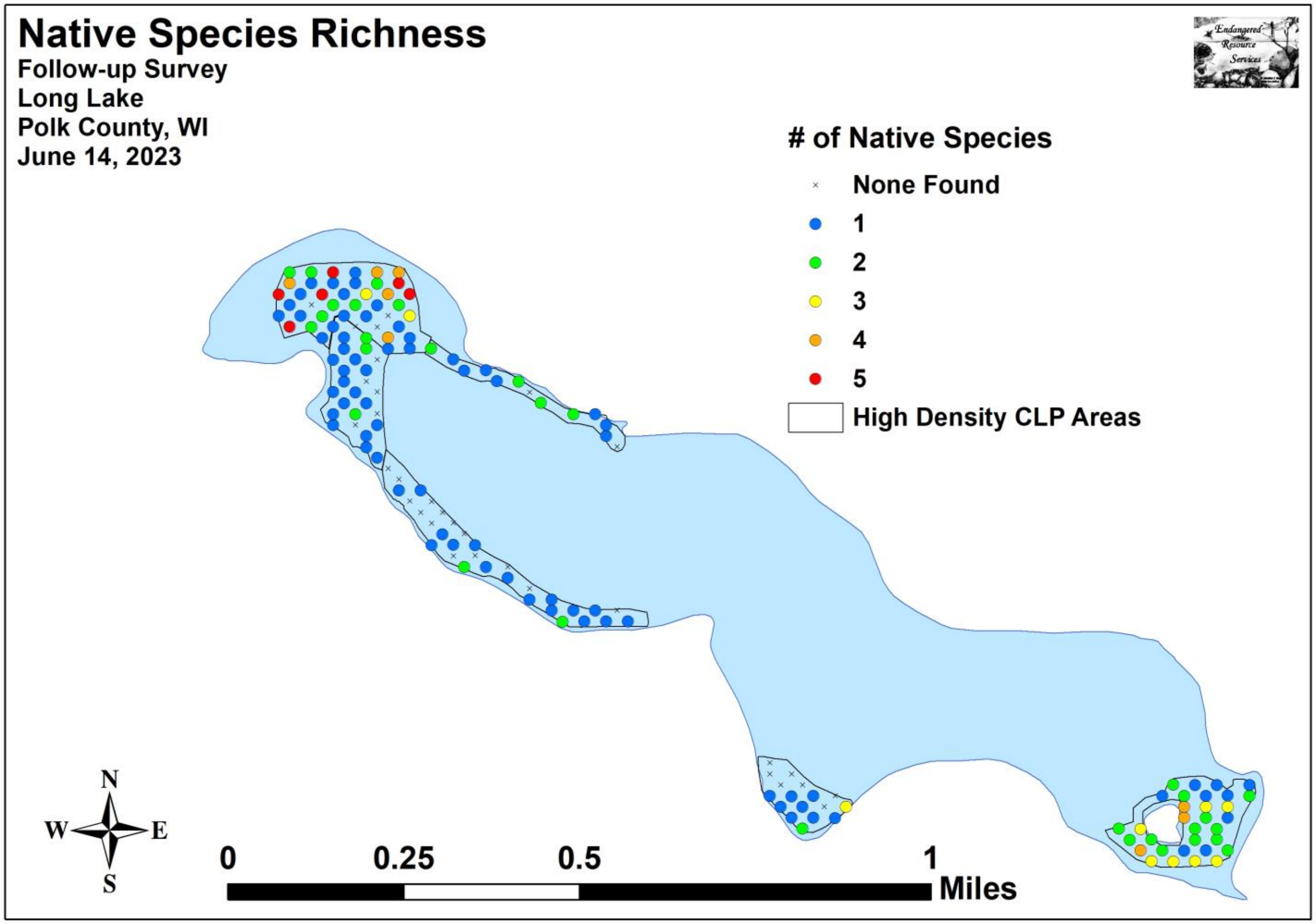
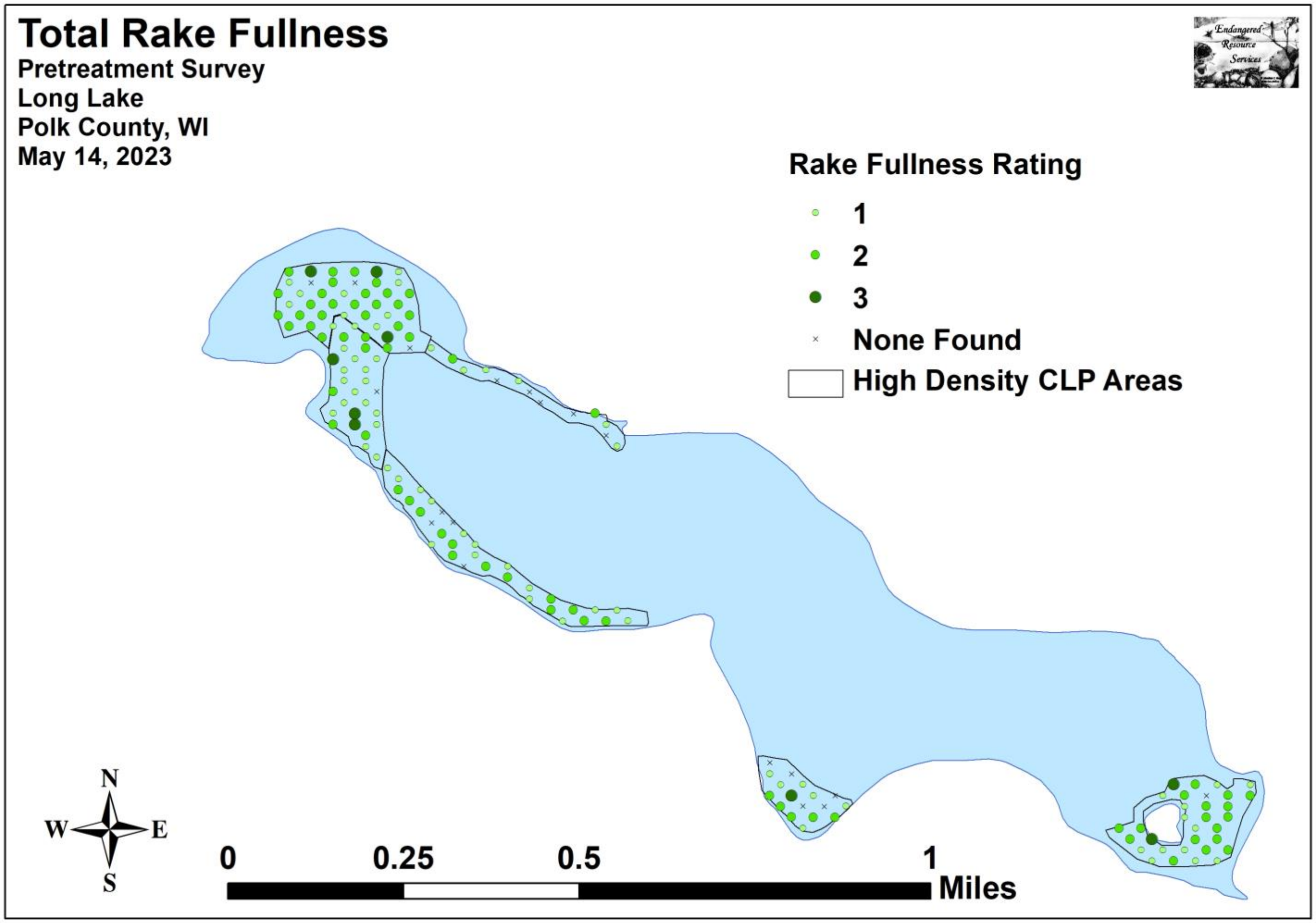
0.25
0.5
1
Miles
Endangered Resource Services

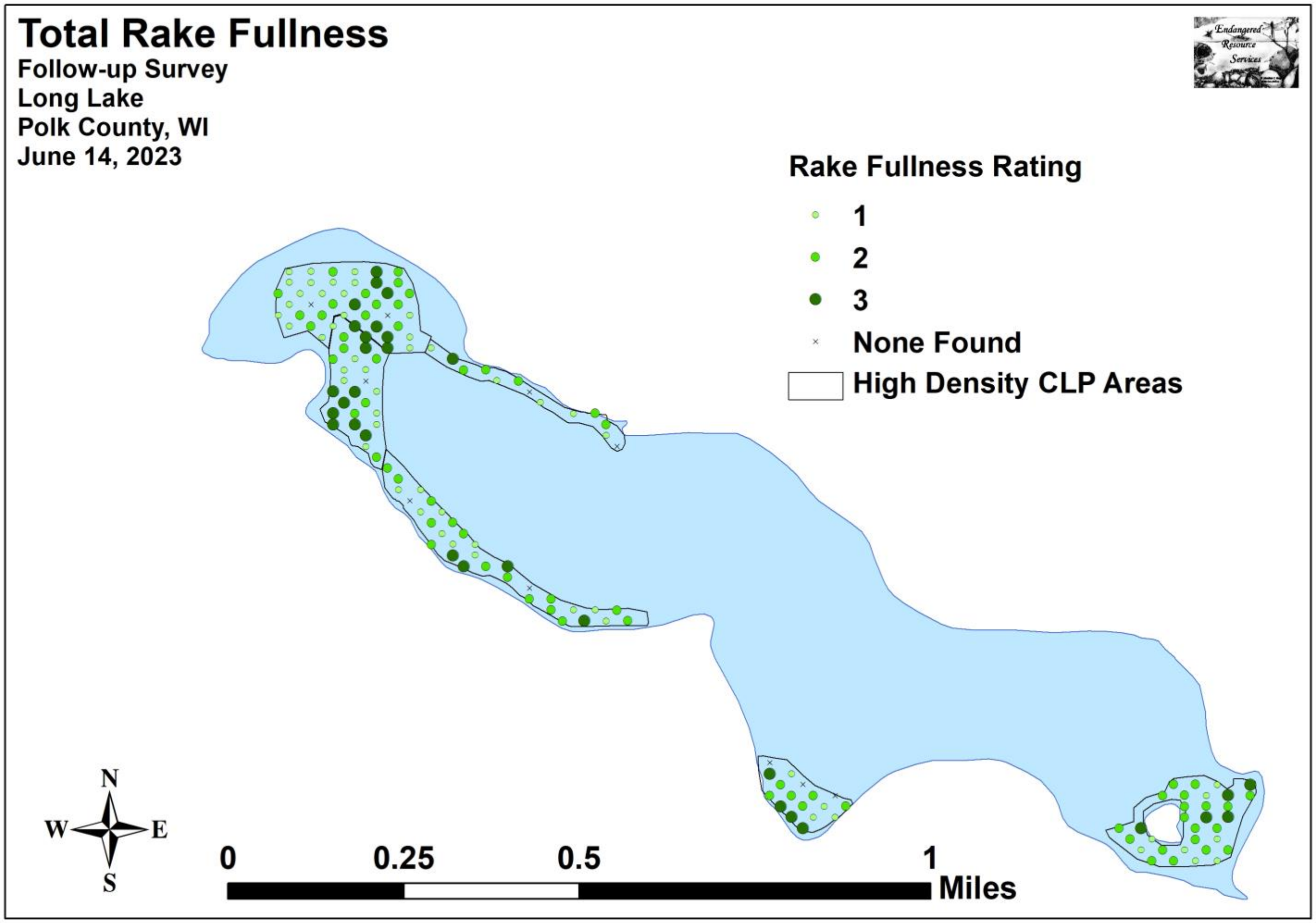

Littoral Zone
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Littoral Zone
Littoral Zone with Plants
High Density CLP Areas
N
W
E
S
0
0.25
0.5
1
Miles


Native Species Richness
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
# of Native Species
None Found
1
2
3
4
5
High Density CLP Areas
N
W
E
S
0
0.25
0.5
1
Miles

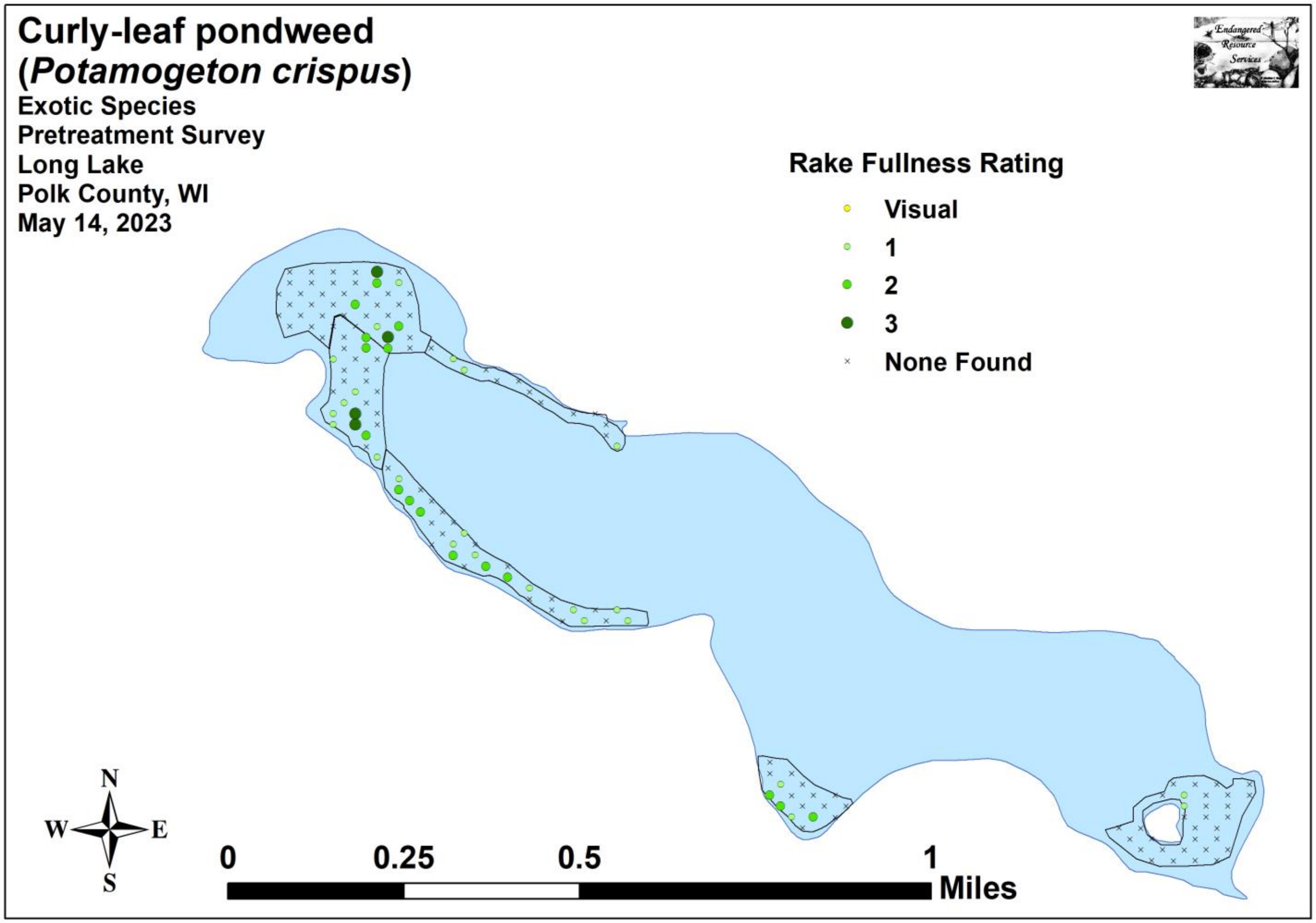


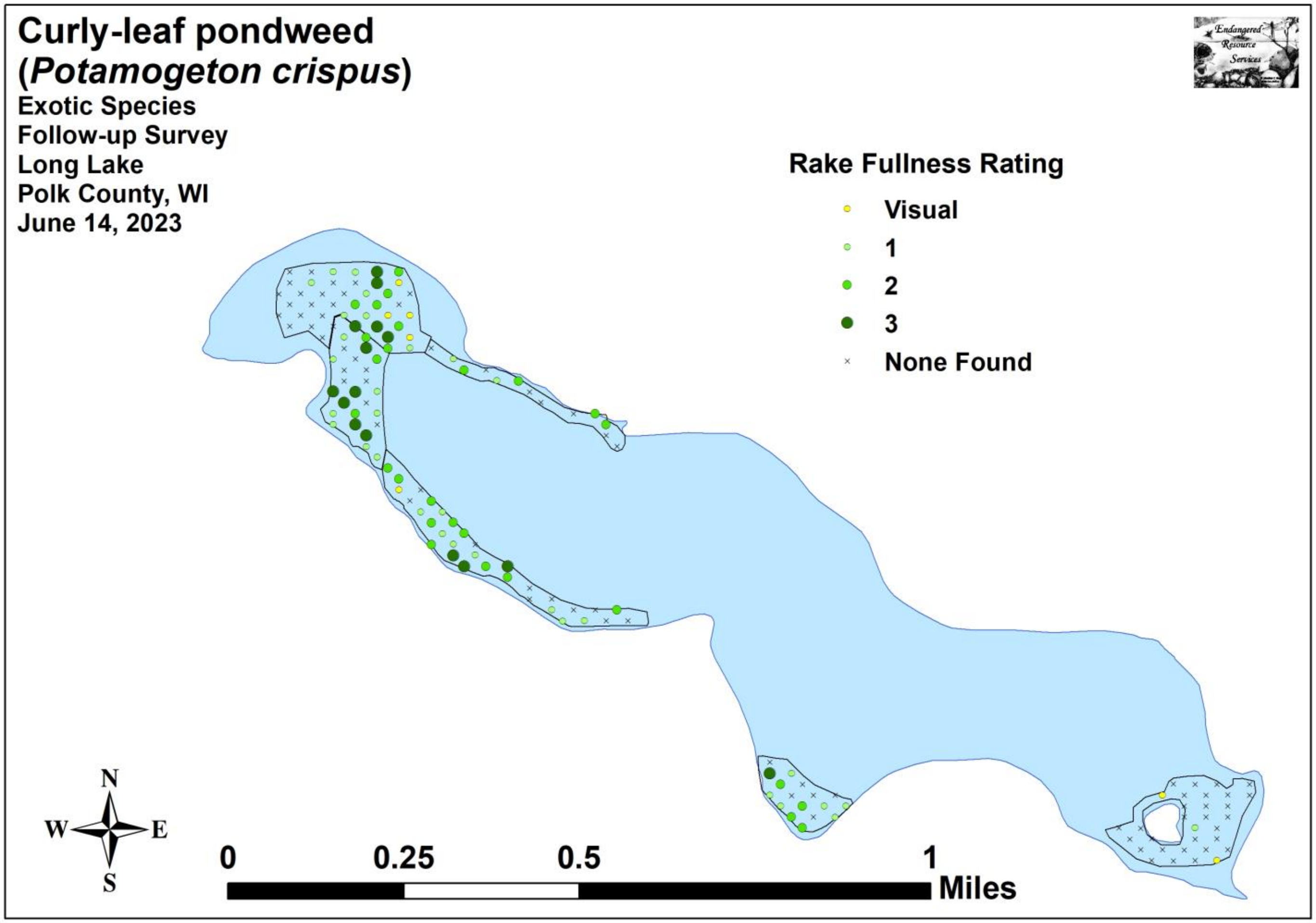
Native Species Richness
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
# of Native Species
None Found
1
2
3
4
5
High Density CLP Areas
N
W
E
S
0
0.25
0.5
1
Miles


Total Rake Fullness
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Rake Fullness Rating
1
2
3
None Found
High Density CLP Areas
N
W
E
S
0
0.25
0.5
1
Miles

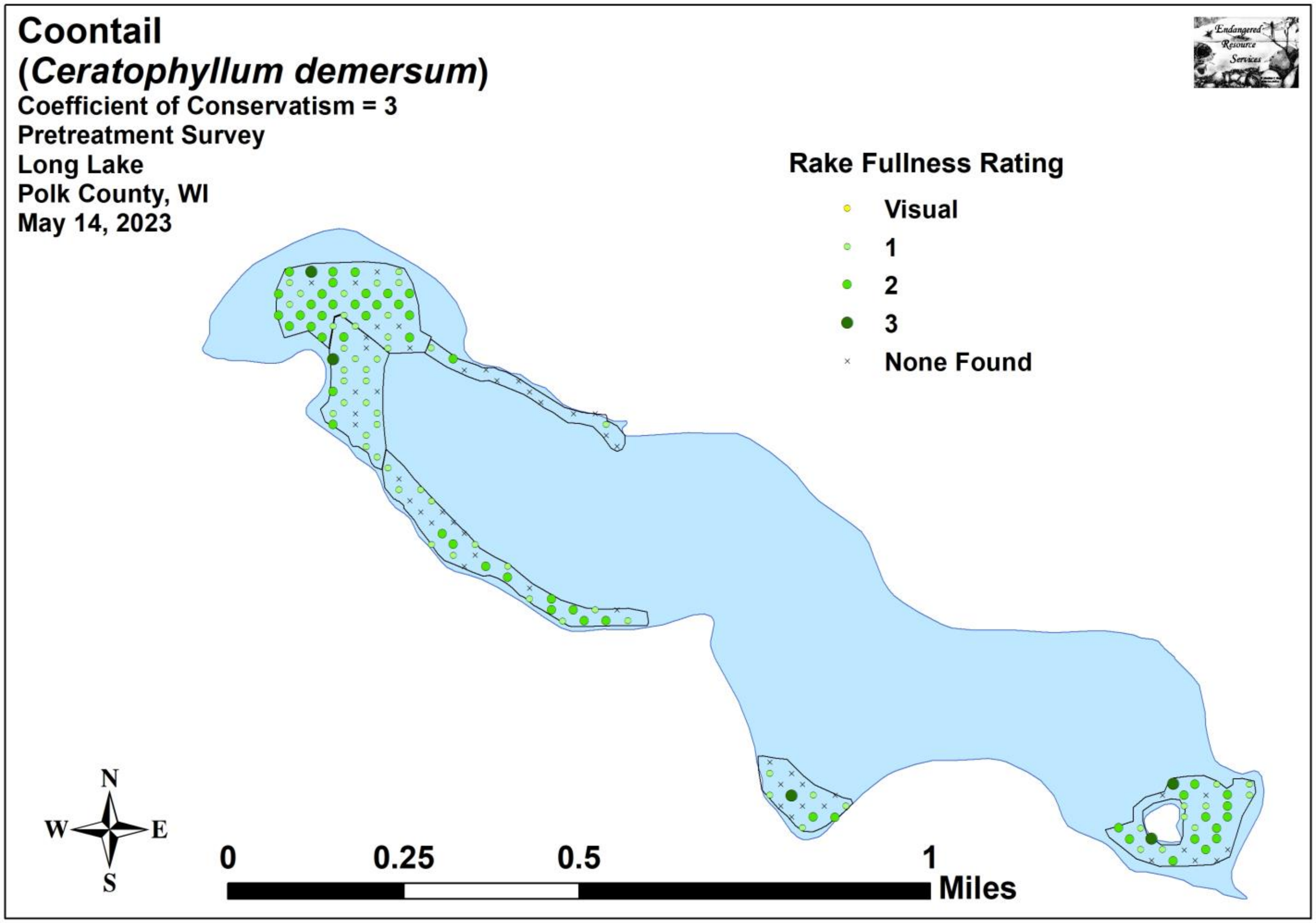

Total Rake Fullness
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Endangered Resource Services
Rake Fullness Rating
1
2
3
None Found
High Density CLP Areas
N
W
E
S
0
0.25
0.5
1
Miles

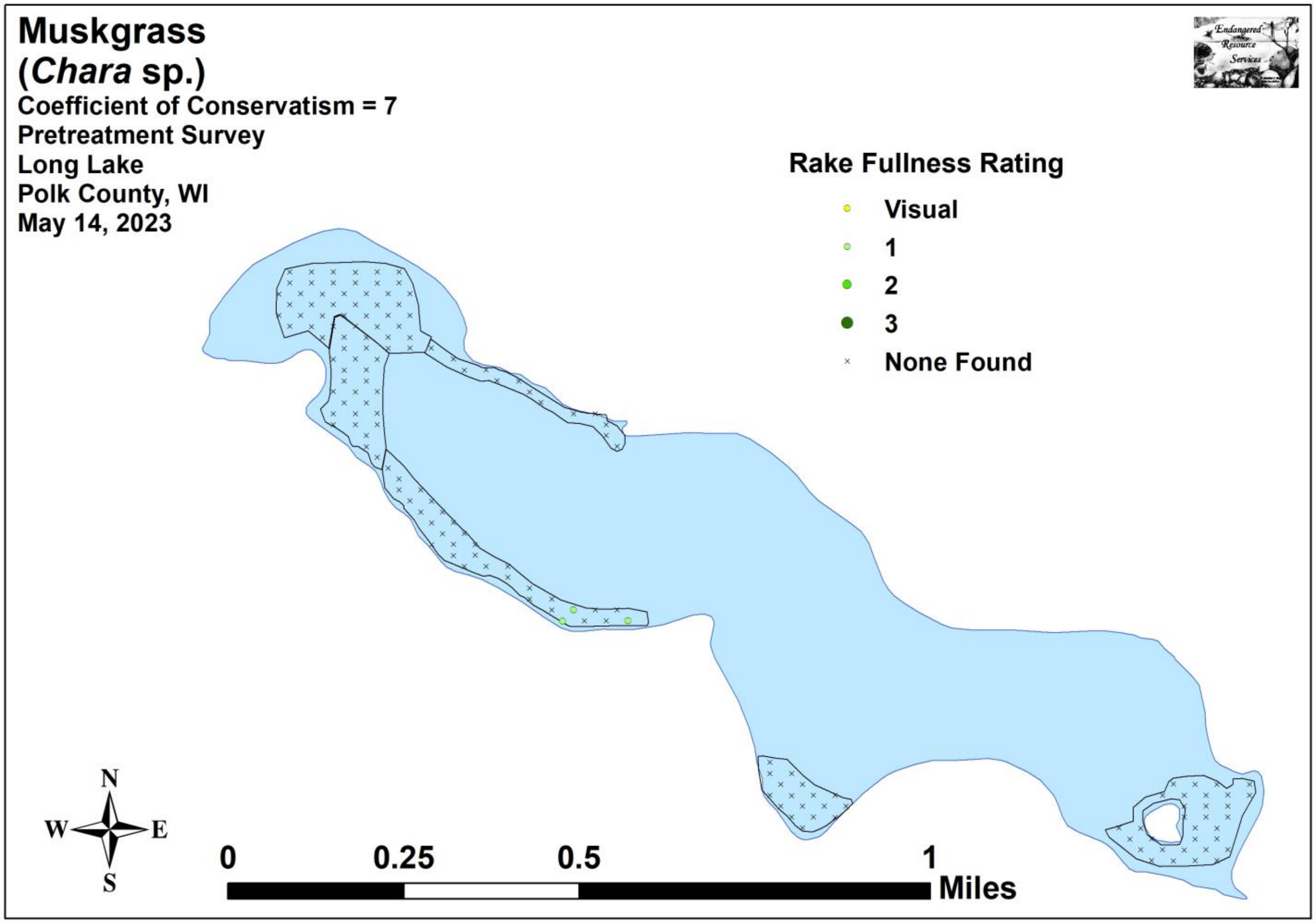
Appendix V: CLP Pretreatment/Follow-up Density and Distribution

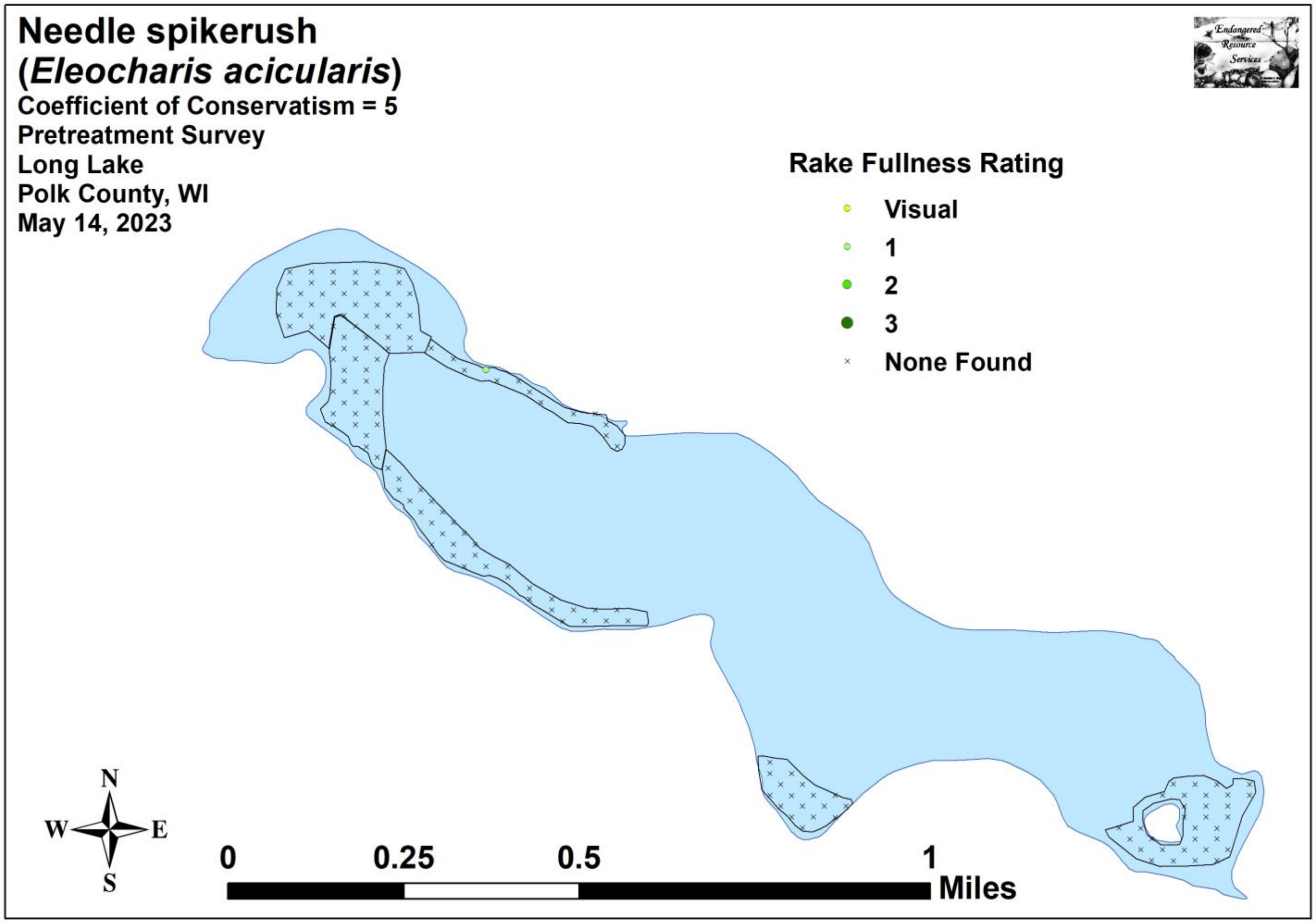

Curly-leaf pondweed
(*Potamogeton crispus*)
Exotic Species
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles


Curly-leaf pondweed
(Potamogeton crispus)
Exotic Species
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

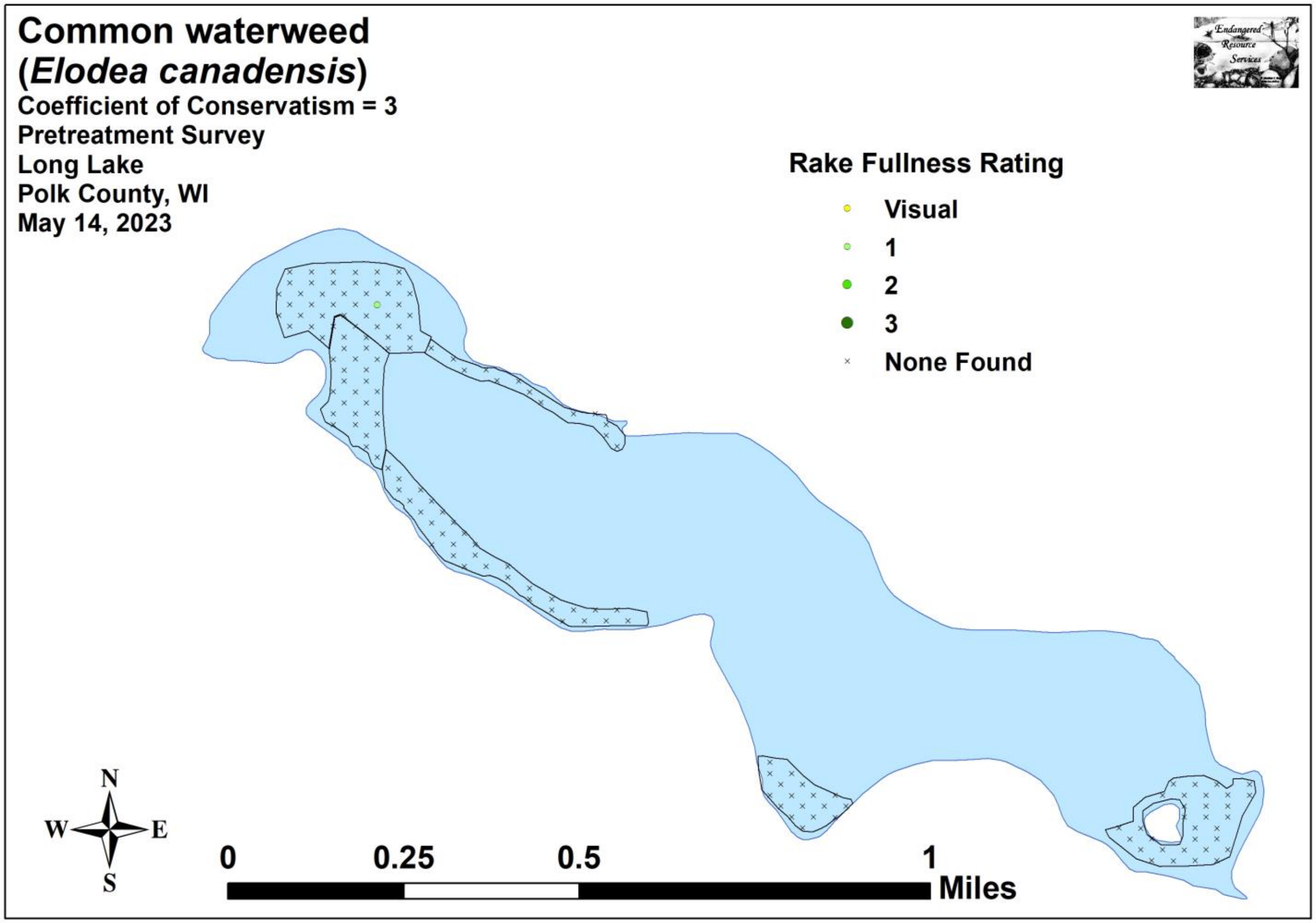
Appendix VI: Pretreatment Native Species Density and Distribution

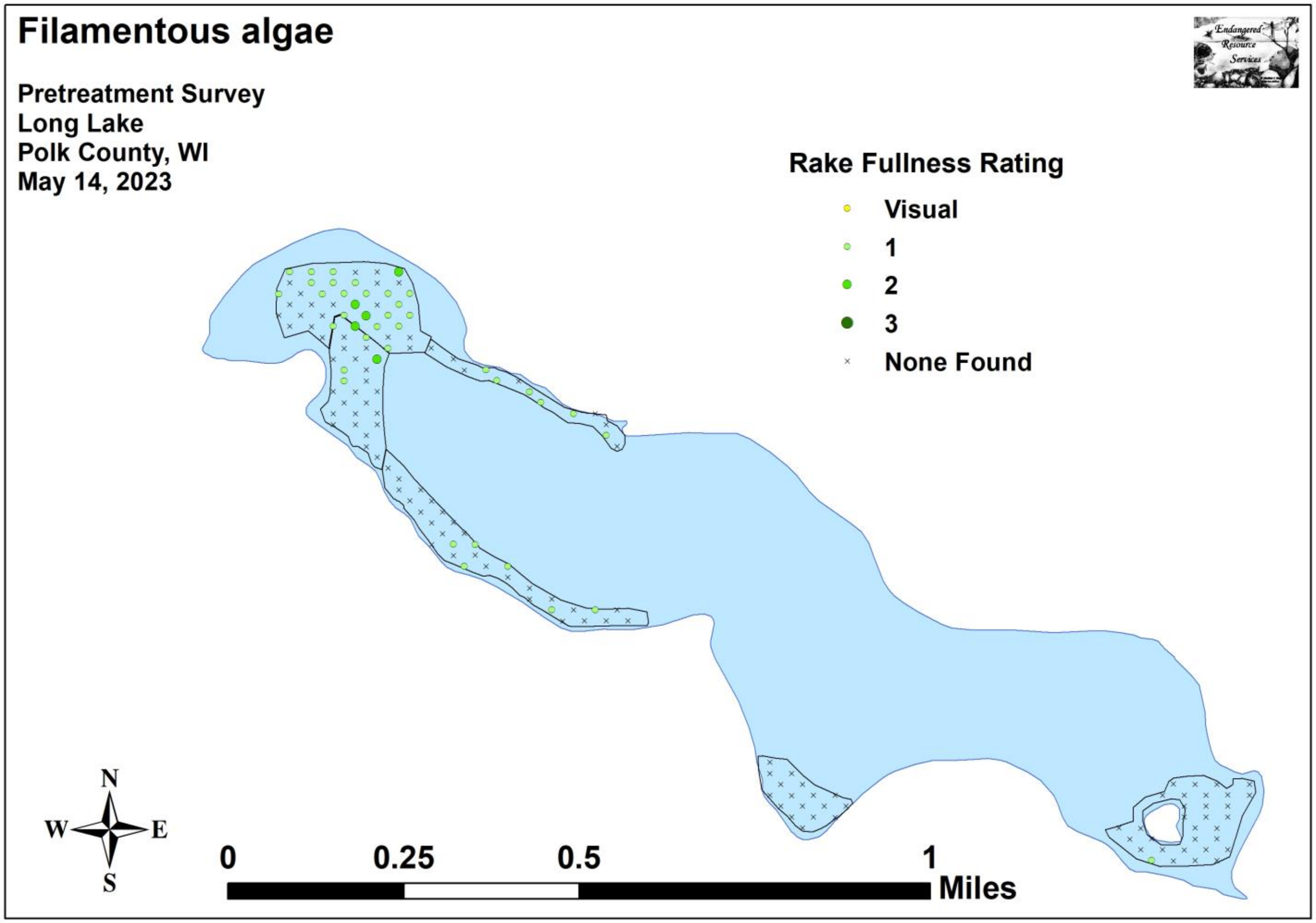

Coontail
(Ceratophyllum demersum)
Coefficient of Conservatism = 3
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

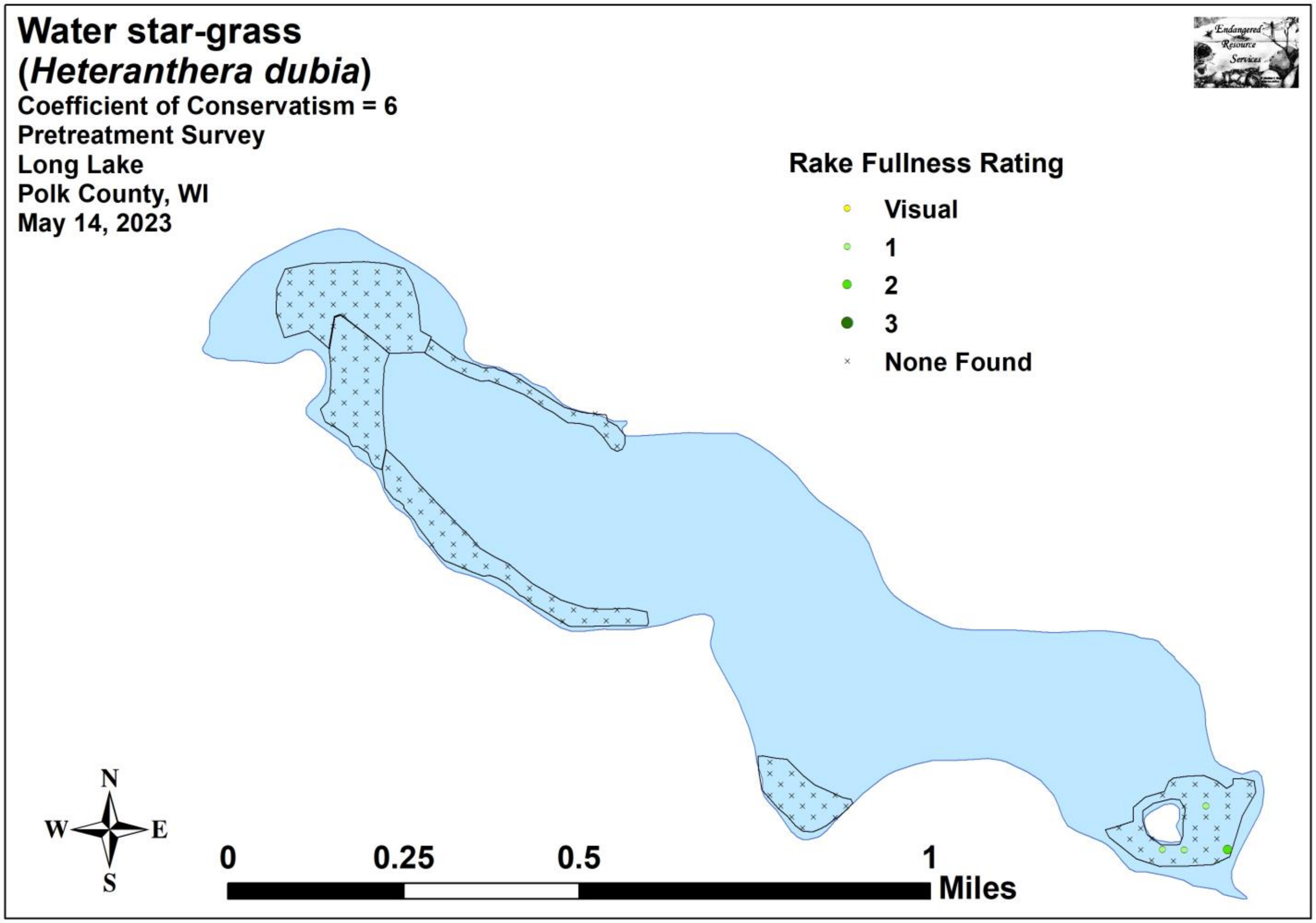

Muskgrass
(Chara sp.)
Coefficient of Conservatism = 7
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

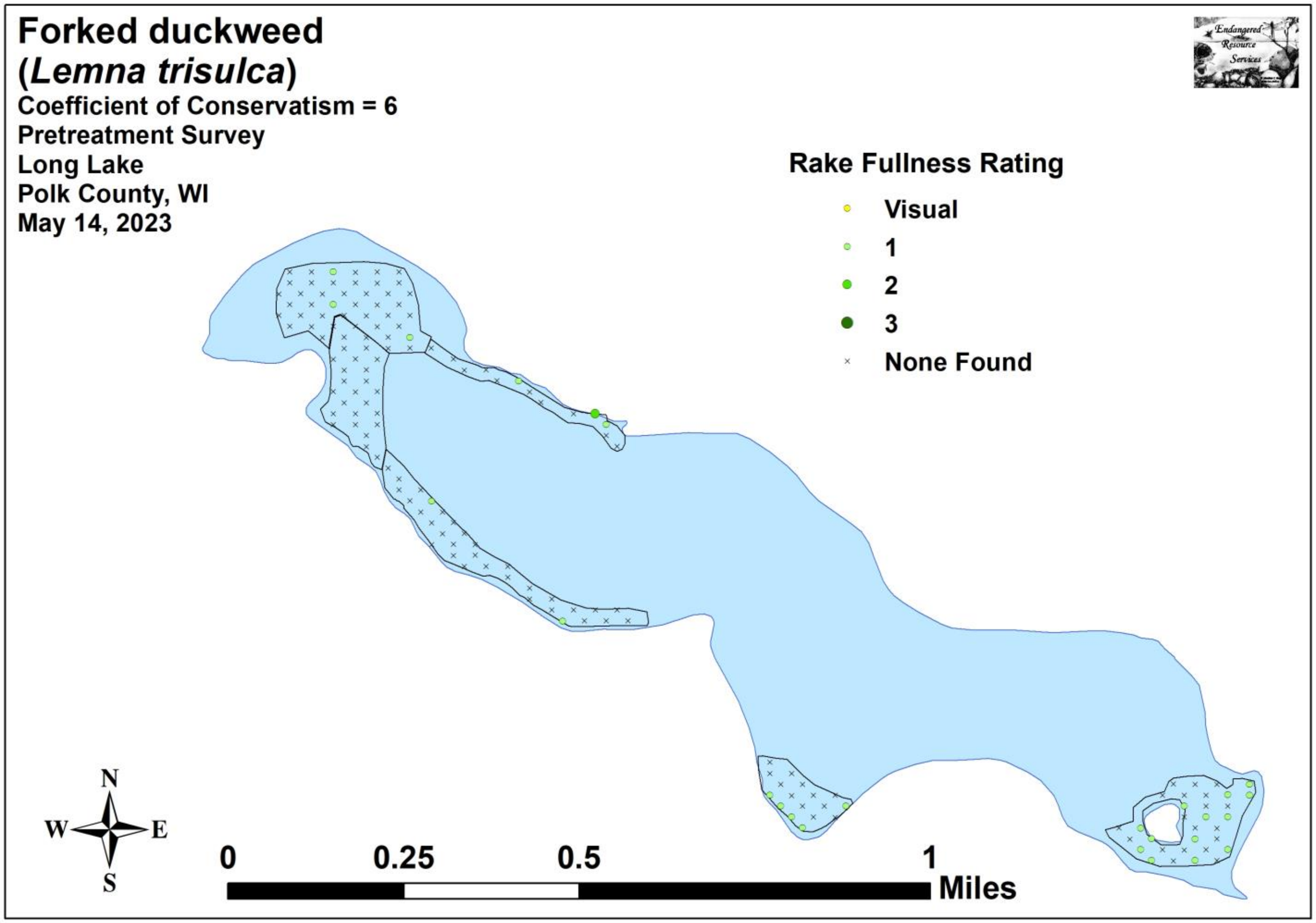


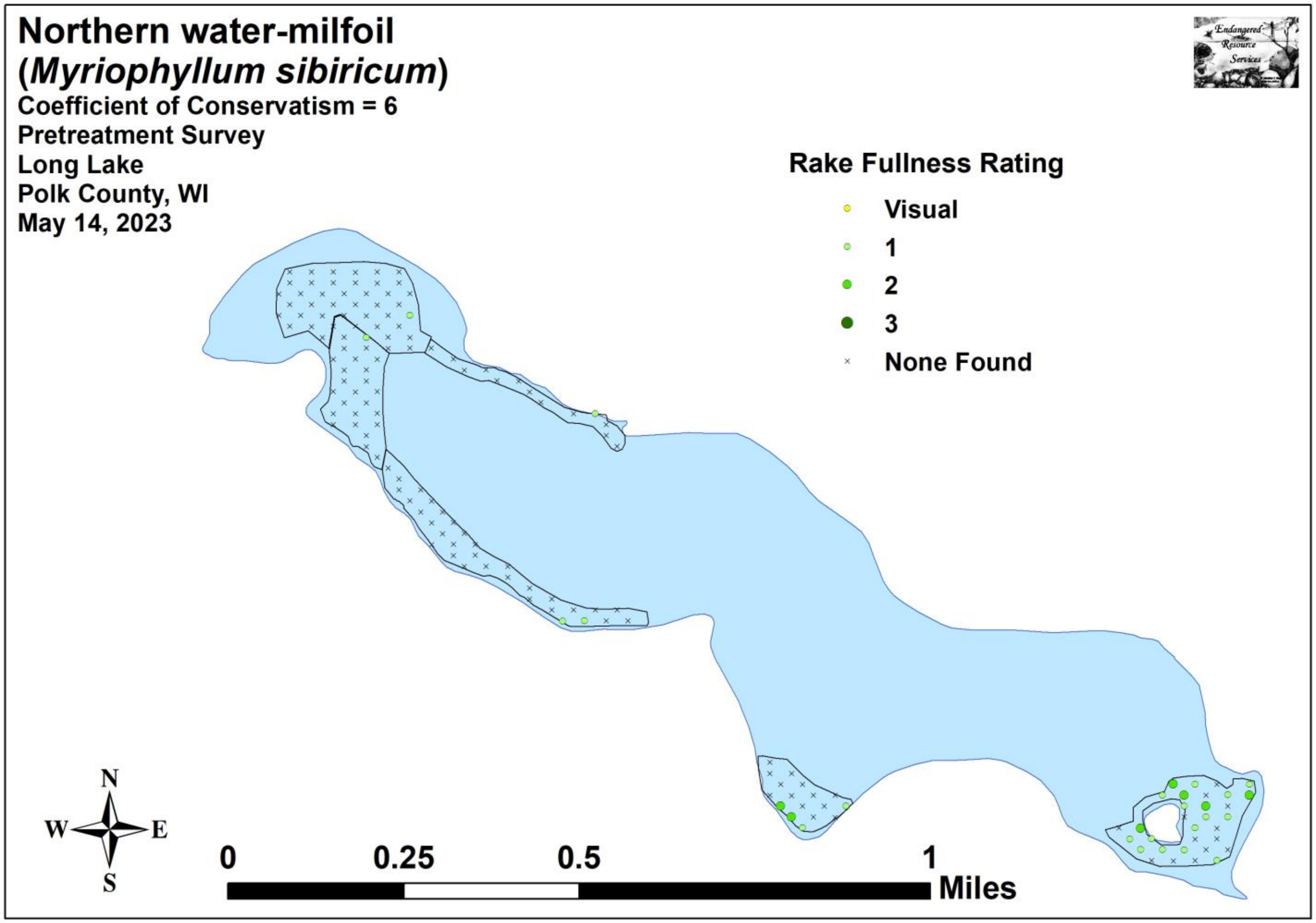
Needle spikerush
(*Eleocharis acicularis*)
Coefficient of Conservatism = 5
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

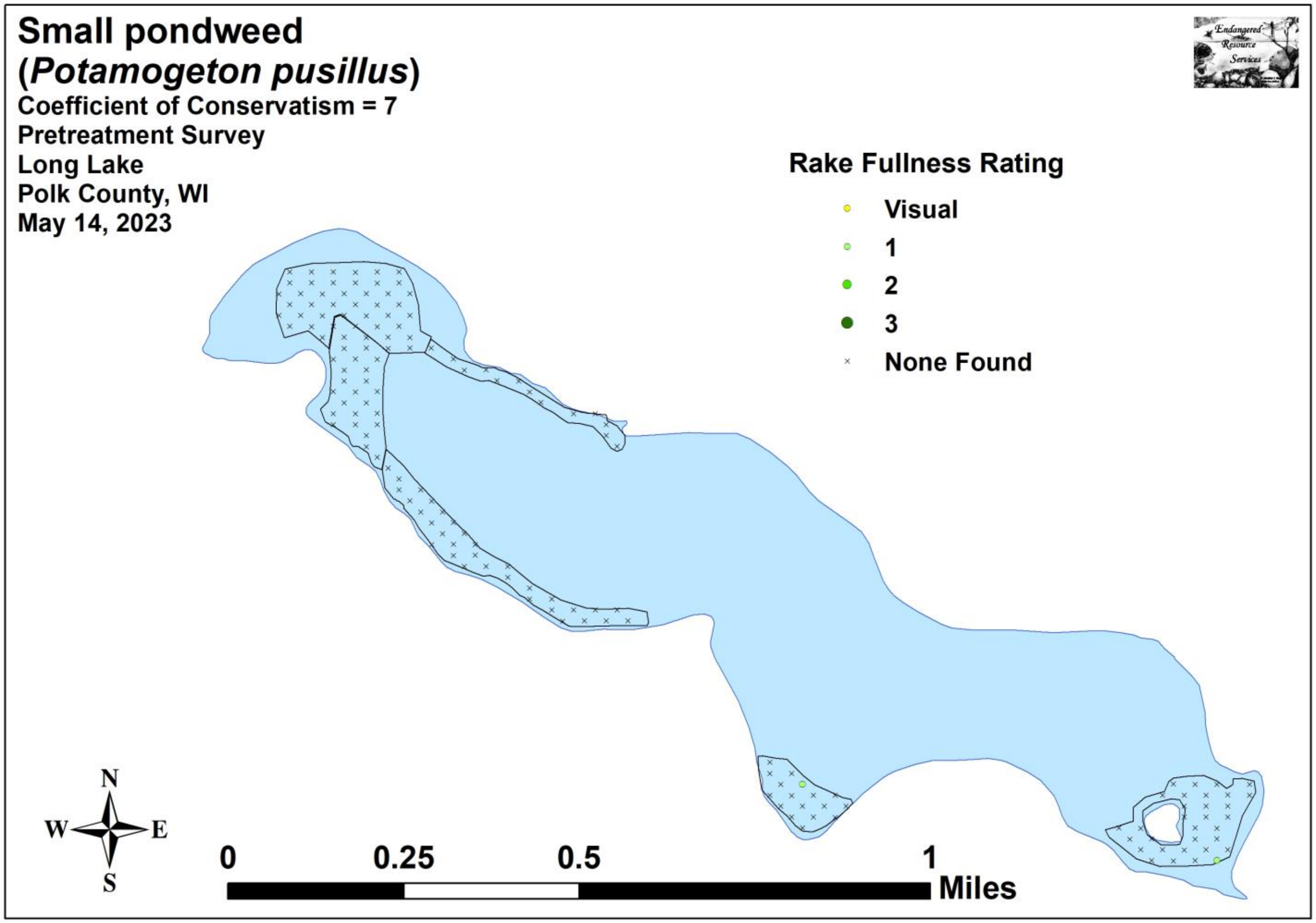

Common waterweed
(Elodea canadensis)
Coefficient of Conservatism = 3
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

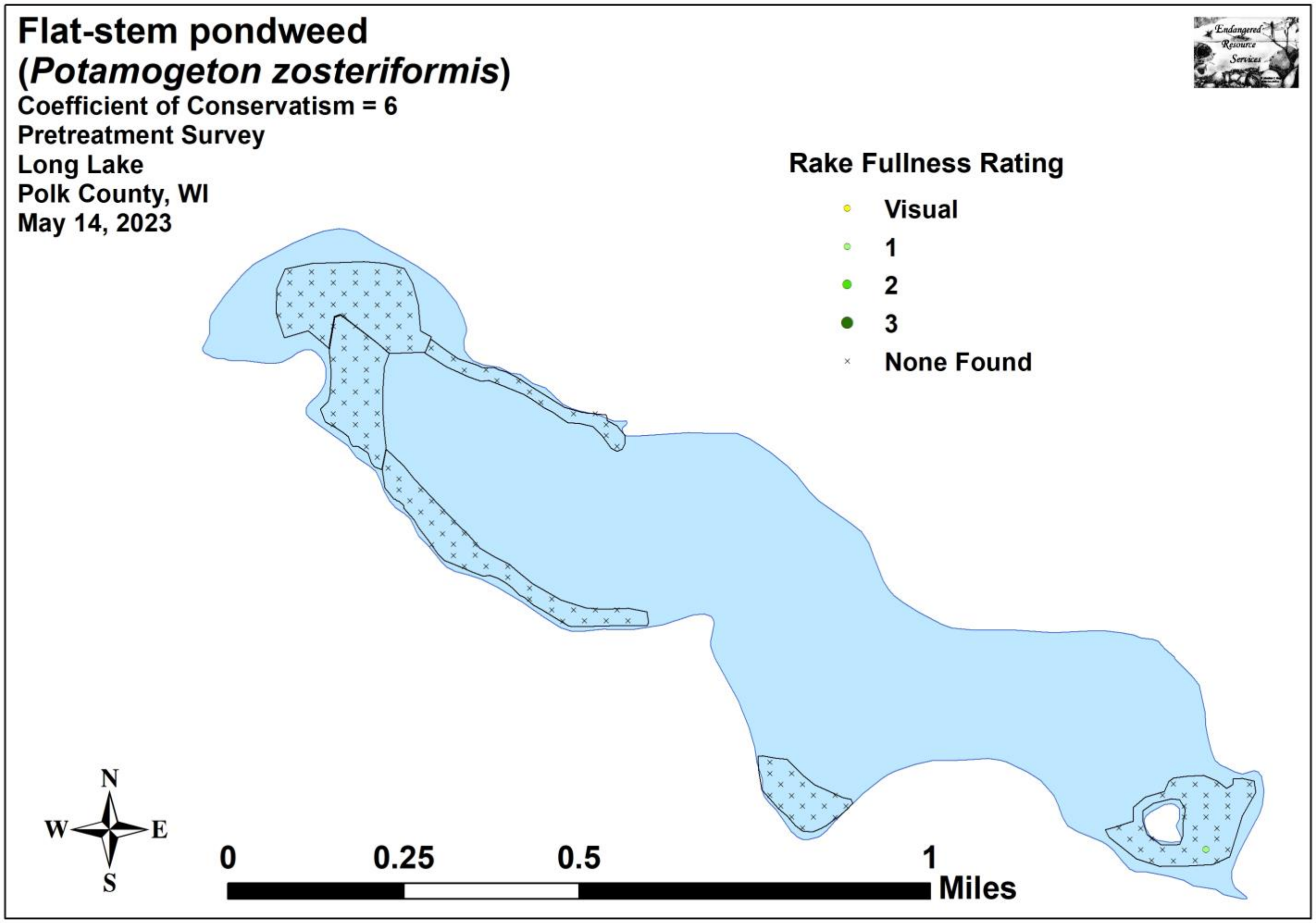

Filamentous algae
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles


Water star-grass
(Heteranthera dubia)
Coefficient of Conservatism = 6
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

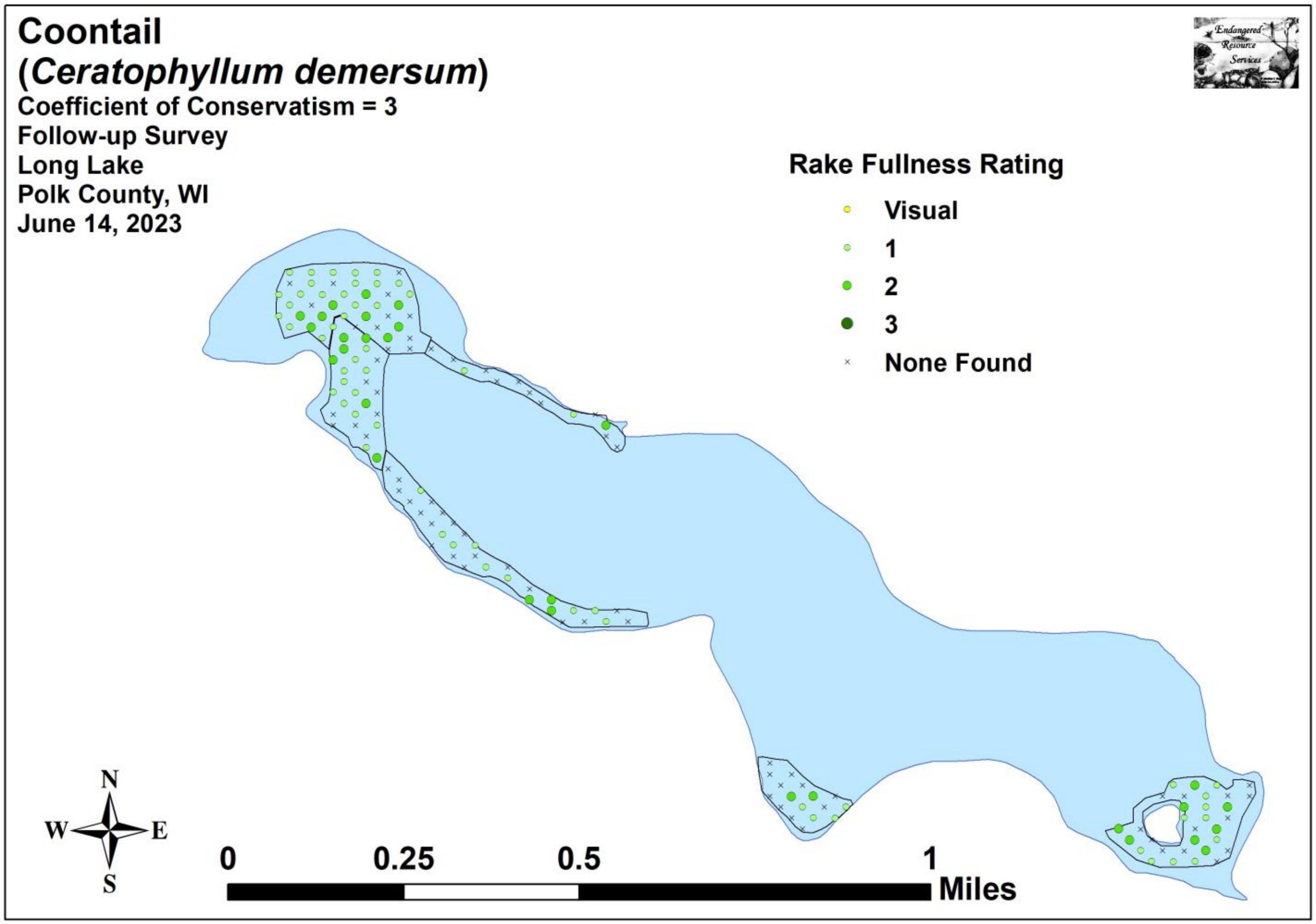

Forked duckweed
(Lemna trisulca)
Coefficient of Conservatism = 6
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

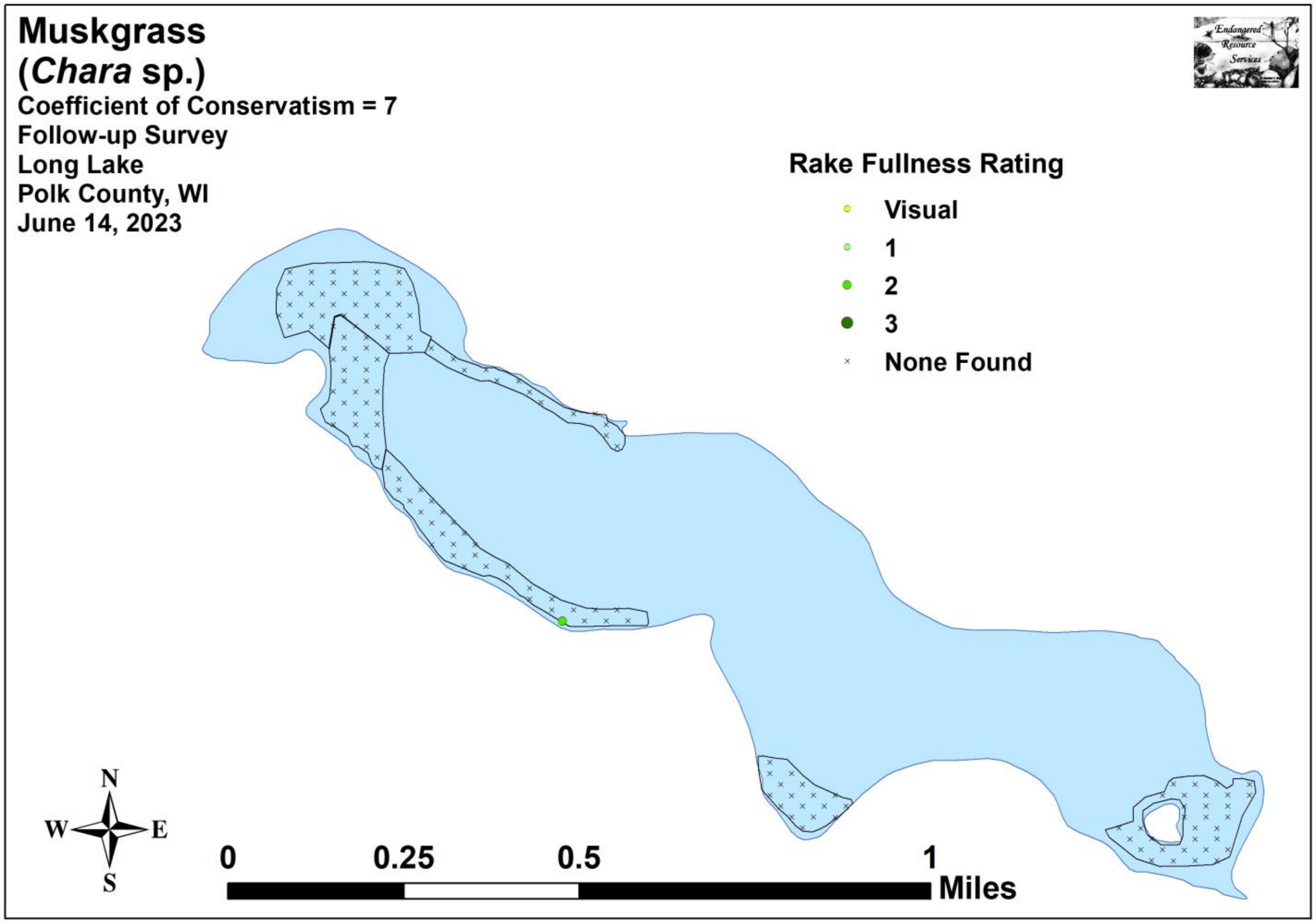

Northern water-milfoil
(*Myriophyllum sibiricum*)
Coefficient of Conservatism = 6
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

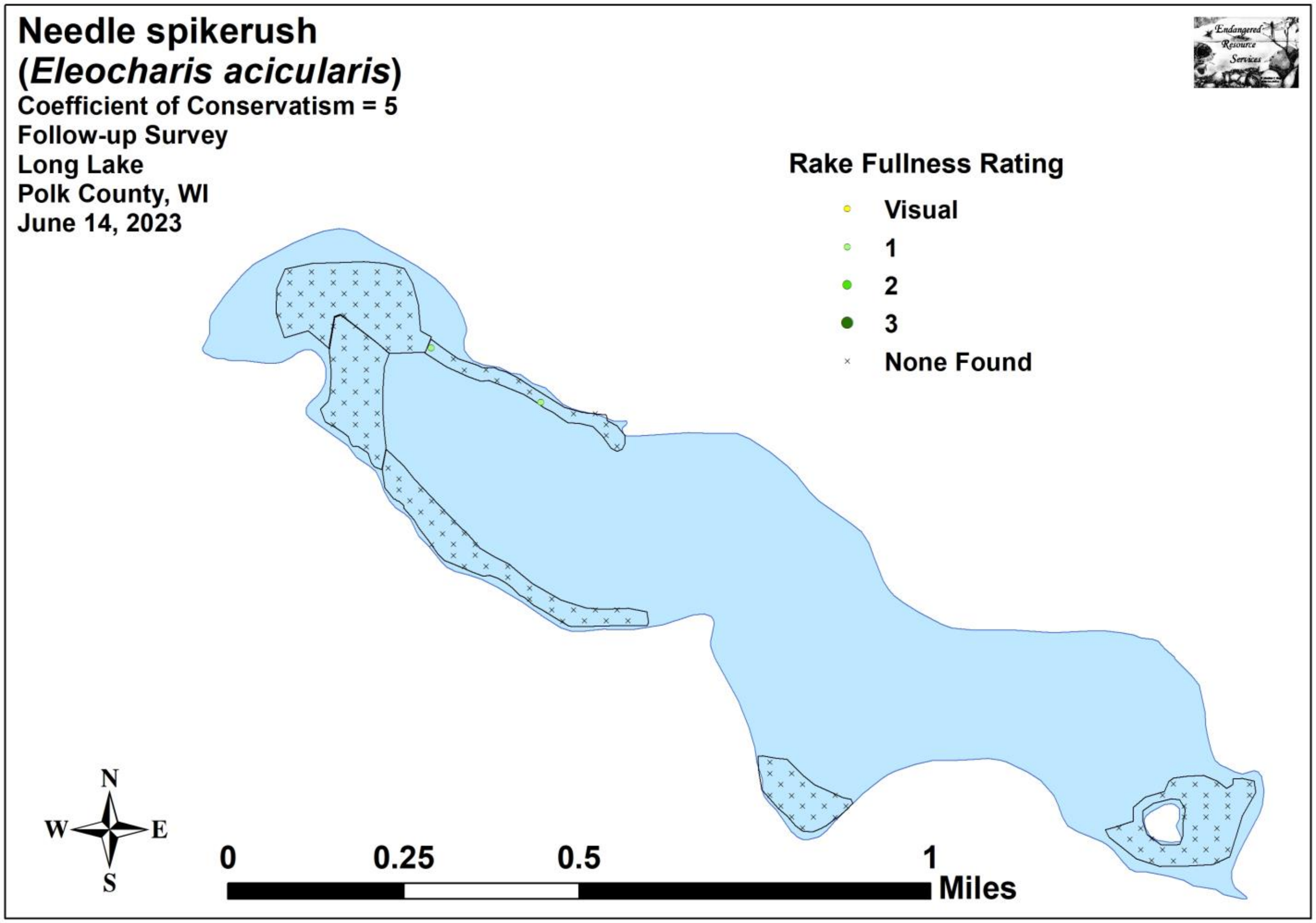

Small pondweed
(Potamogeton pusillus)
Coefficient of Conservatism = 7
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

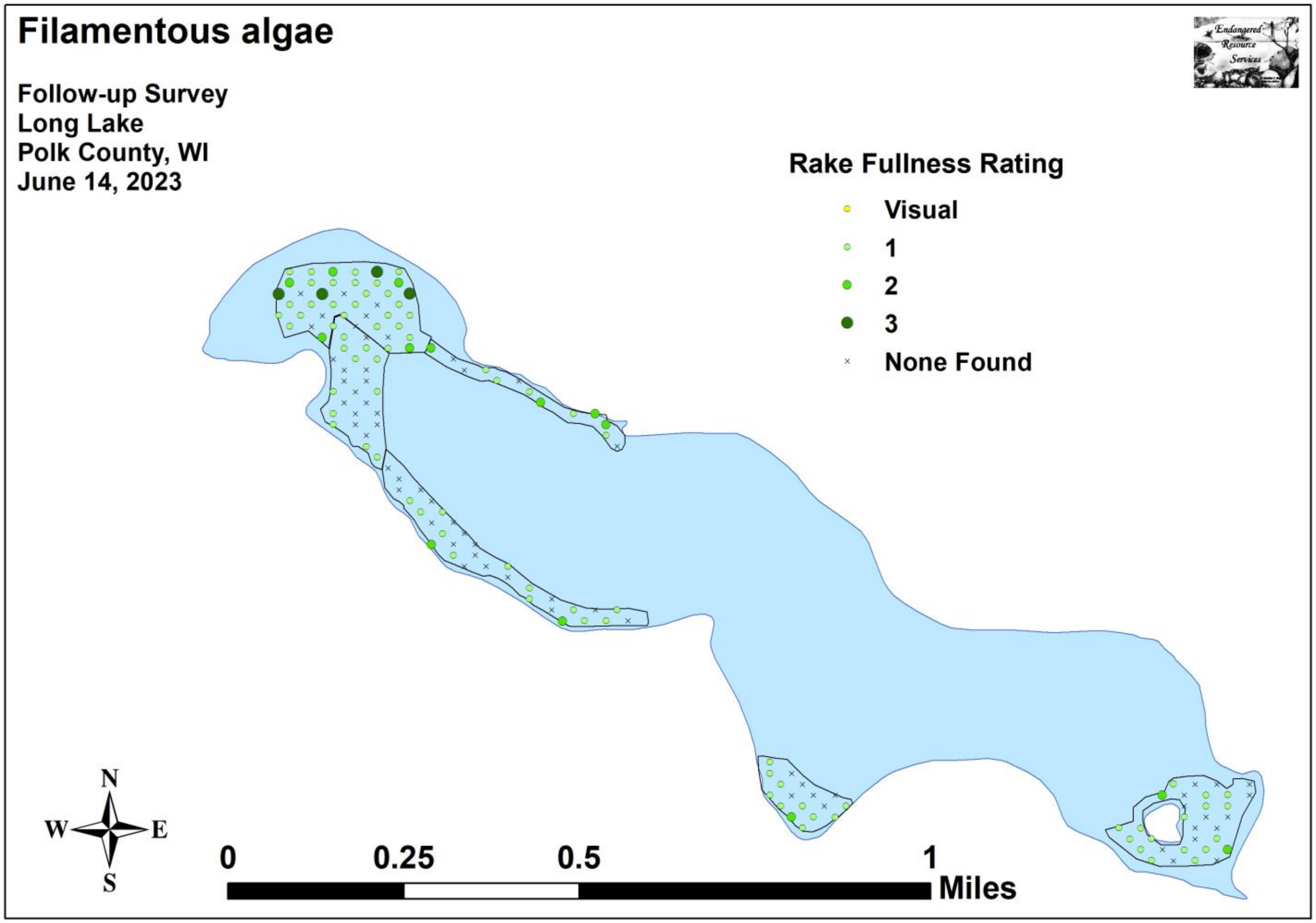

Flat-stem pondweed
(*Potamogeton zosteriformis*)
Coefficient of Conservatism = 6
Pretreatment Survey
Long Lake
Polk County, WI
May 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

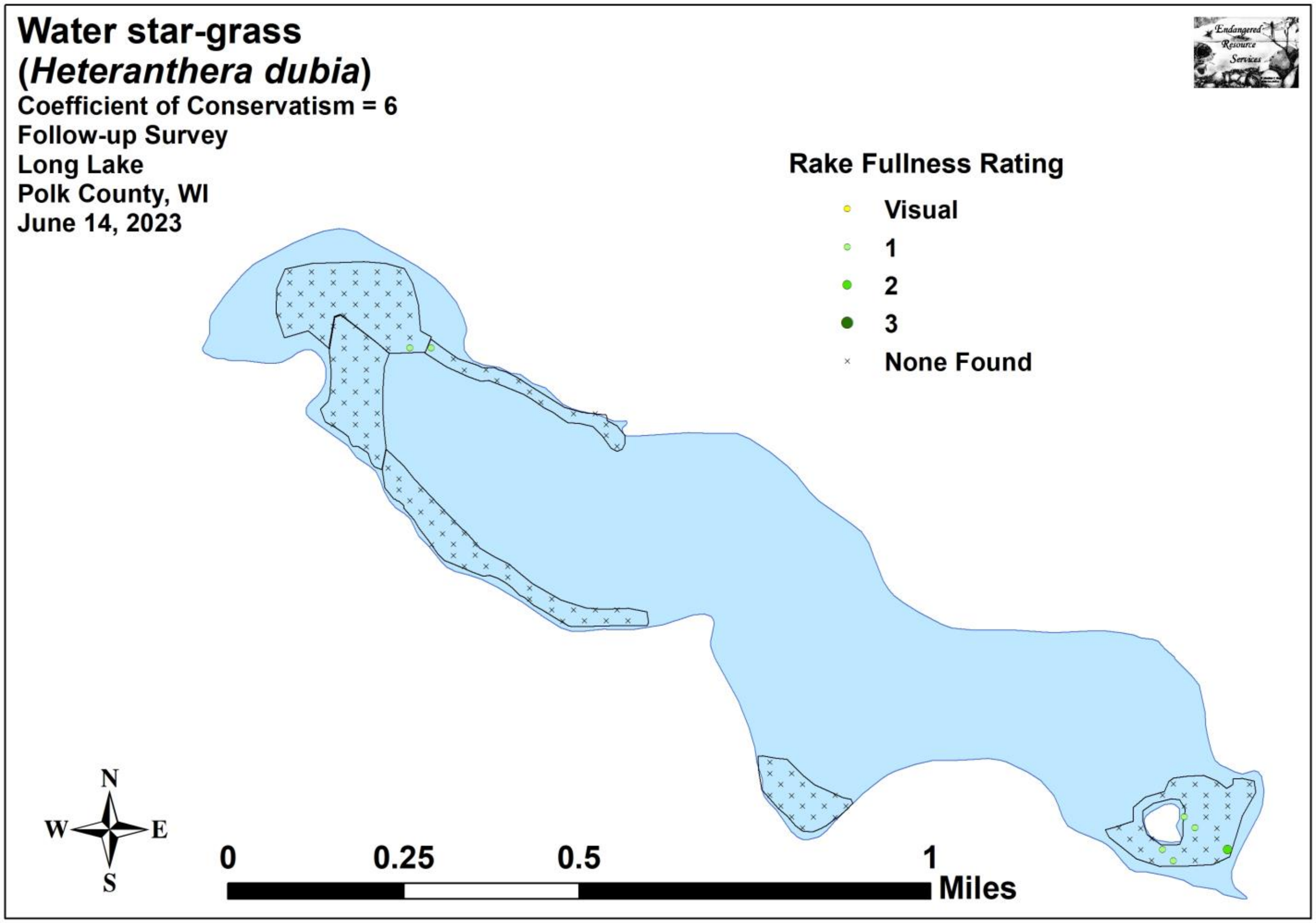
Appendix VII: Follow-up Native Species Density and Distribution

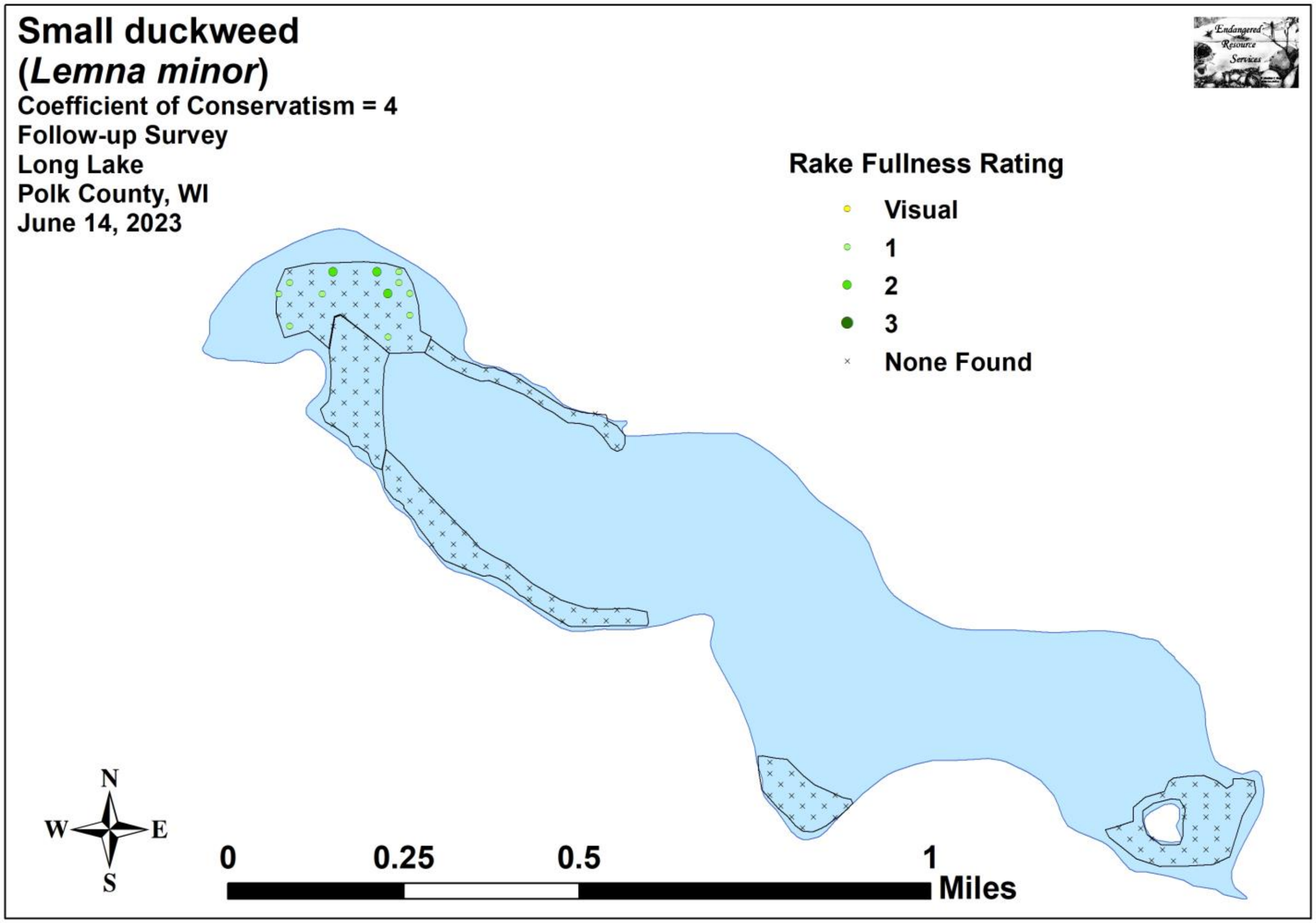

Coontail
(*Ceratophyllum demersum*)
Coefficient of Conservatism = 3
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

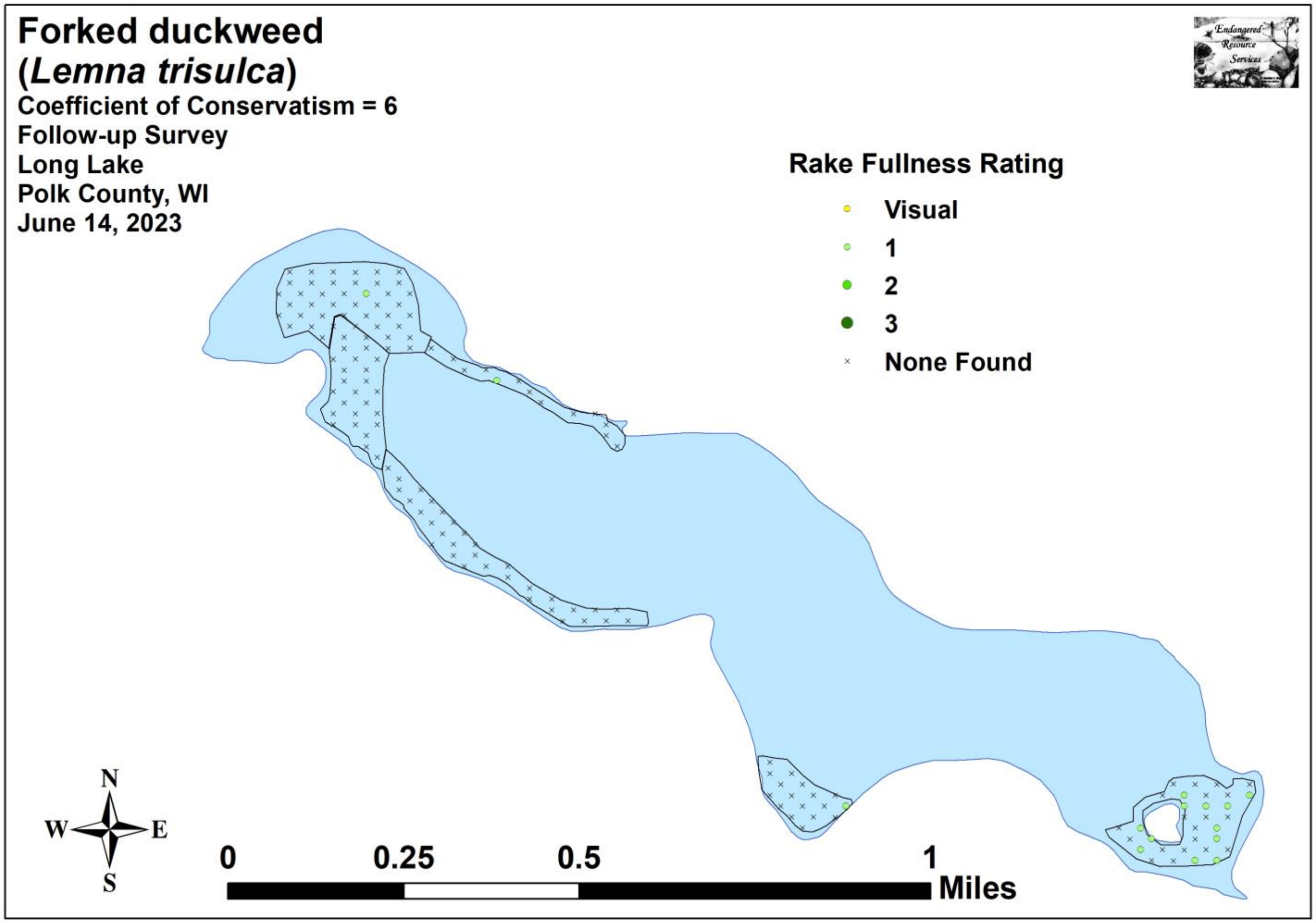

Muskgrass
(*Chara* sp.)
Coefficient of Conservatism = 7
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

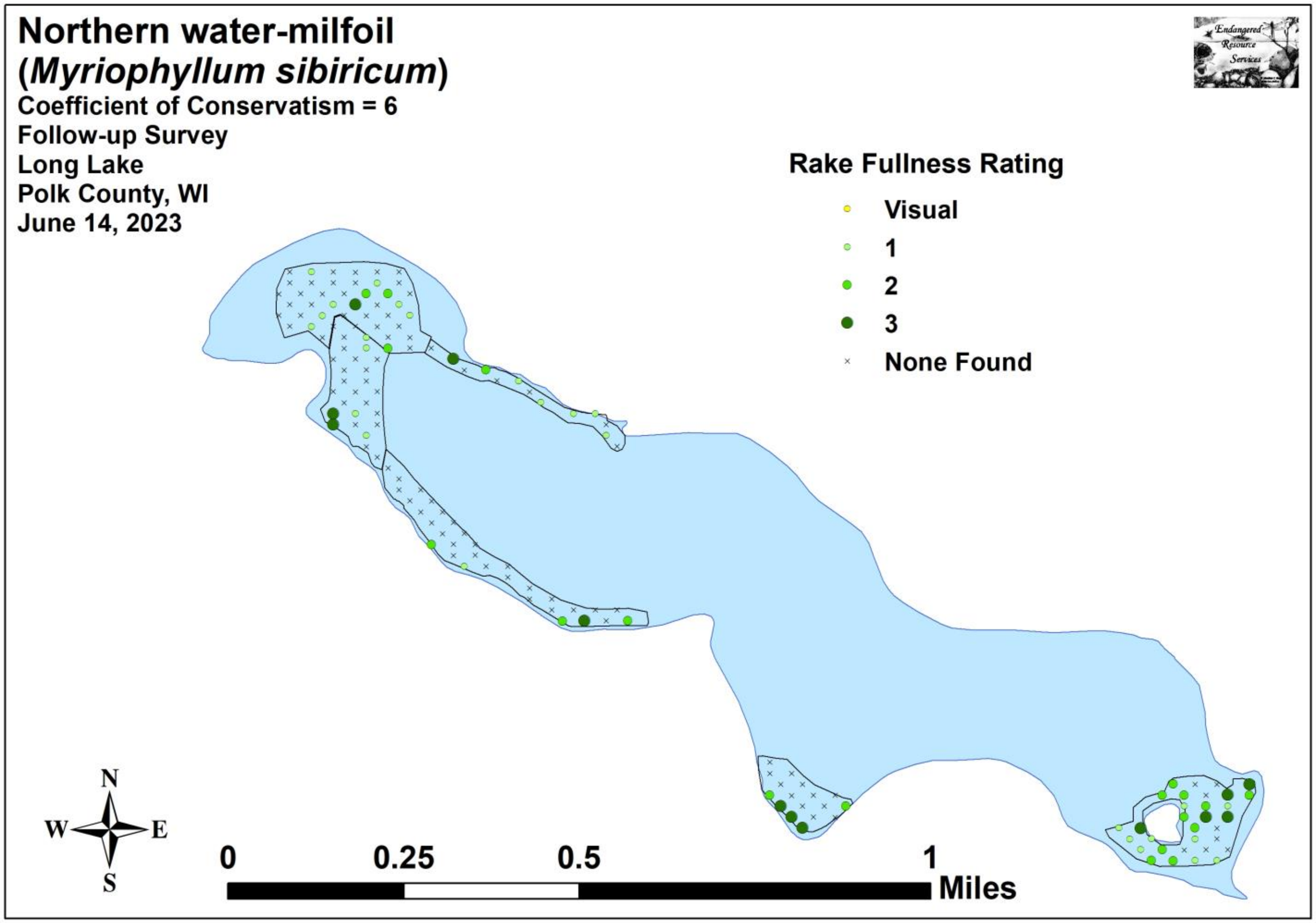

Needle spikerush
(Eleocharis acicularis)
Coefficient of Conservatism = 5
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

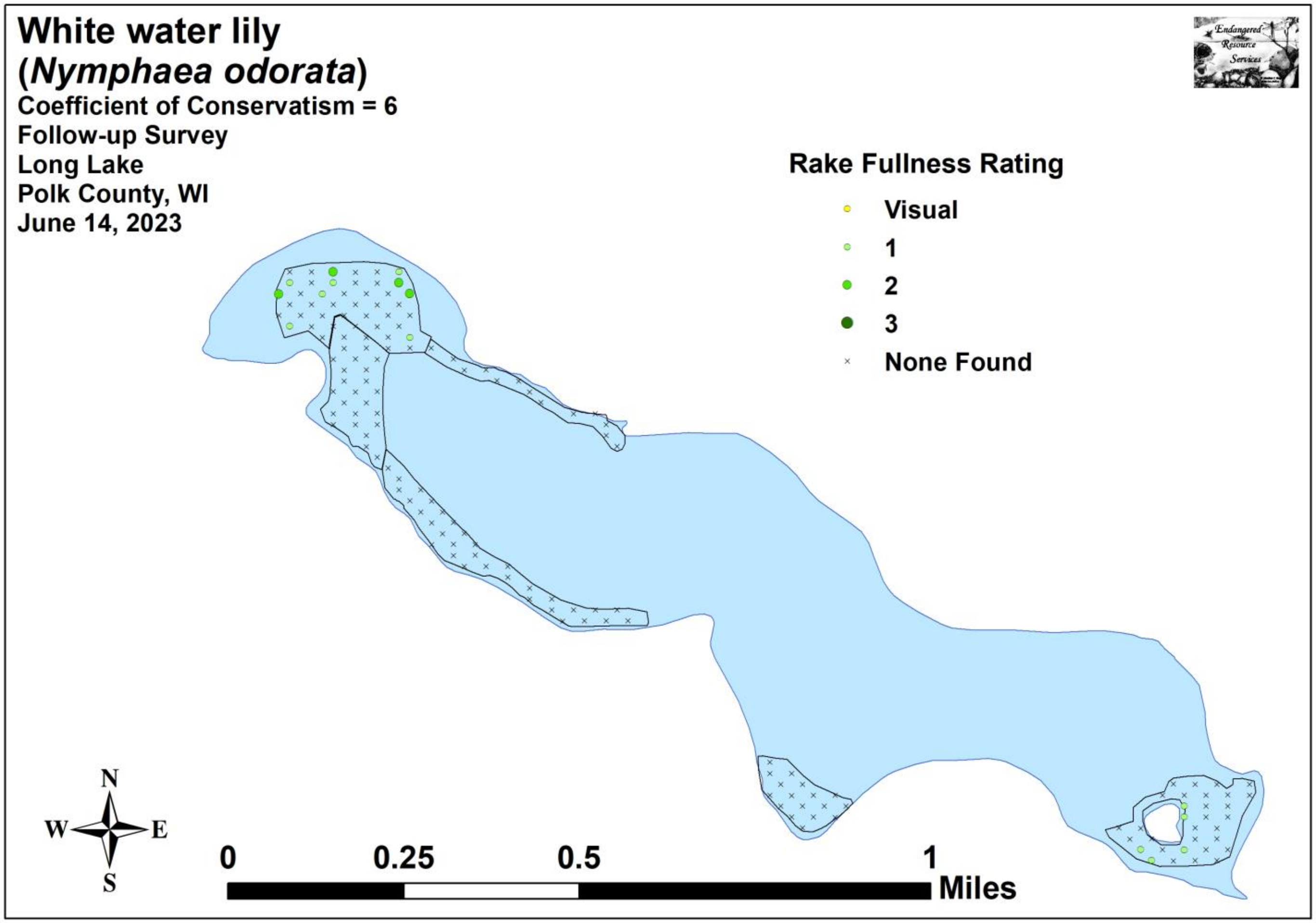

Filamentous algae
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

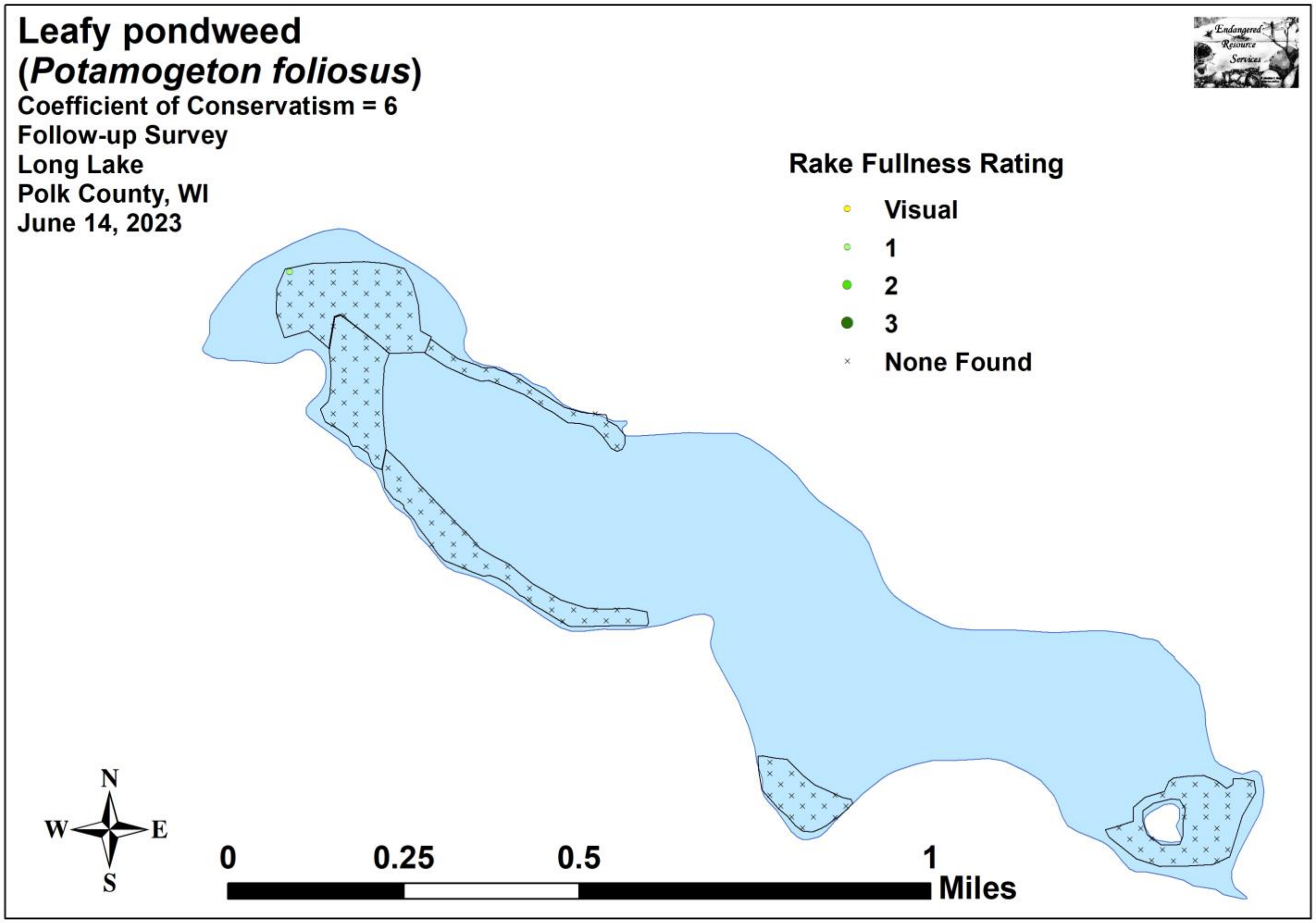

Water star-grass
(*Heteranthera dubia*)
Coefficient of Conservatism = 6
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

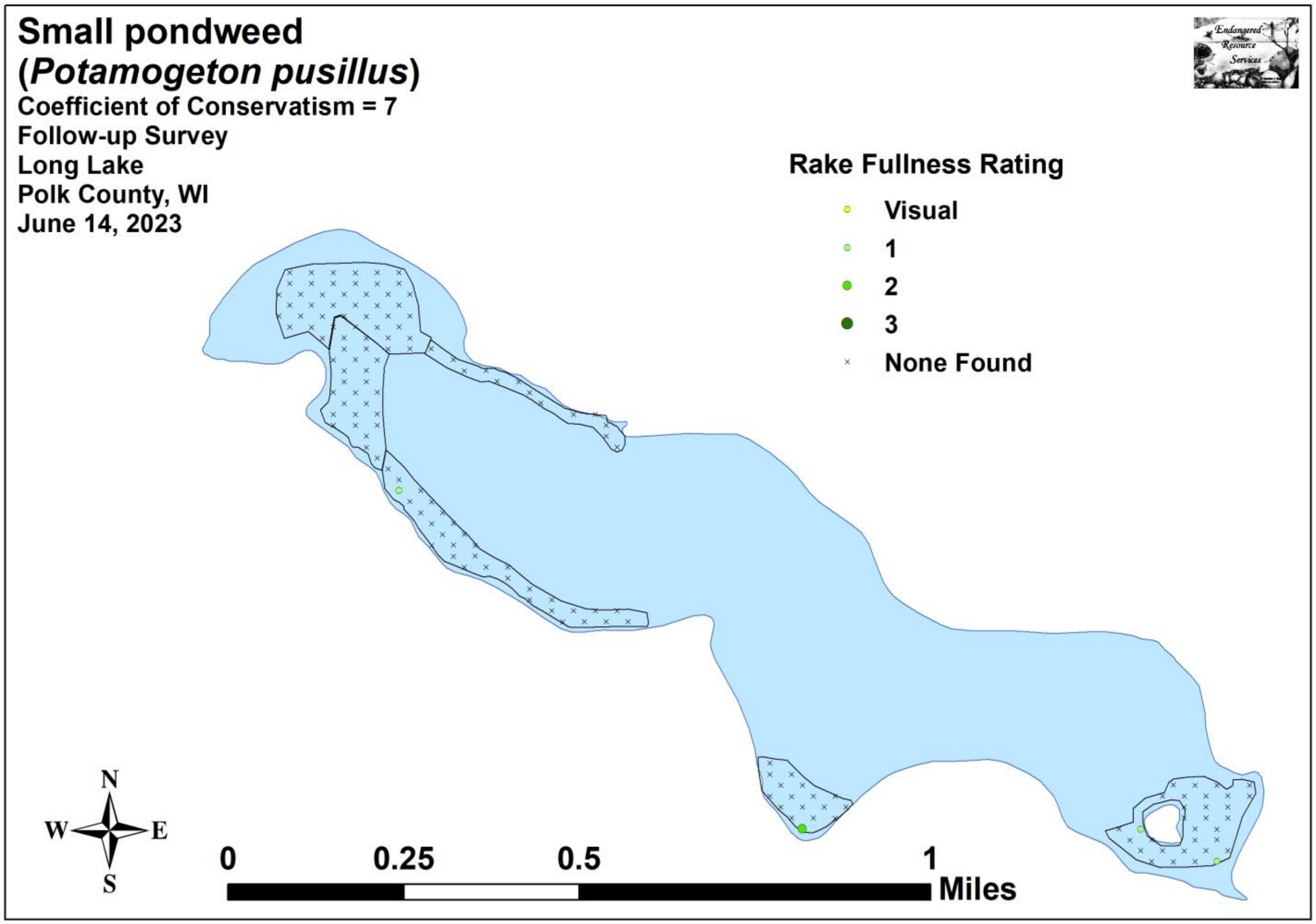

Small duckweed
(*Lemna minor*)
Coefficient of Conservatism = 4
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
Endangered Resource Services
N
W
E
S
0
0.25
0.5
1
Miles

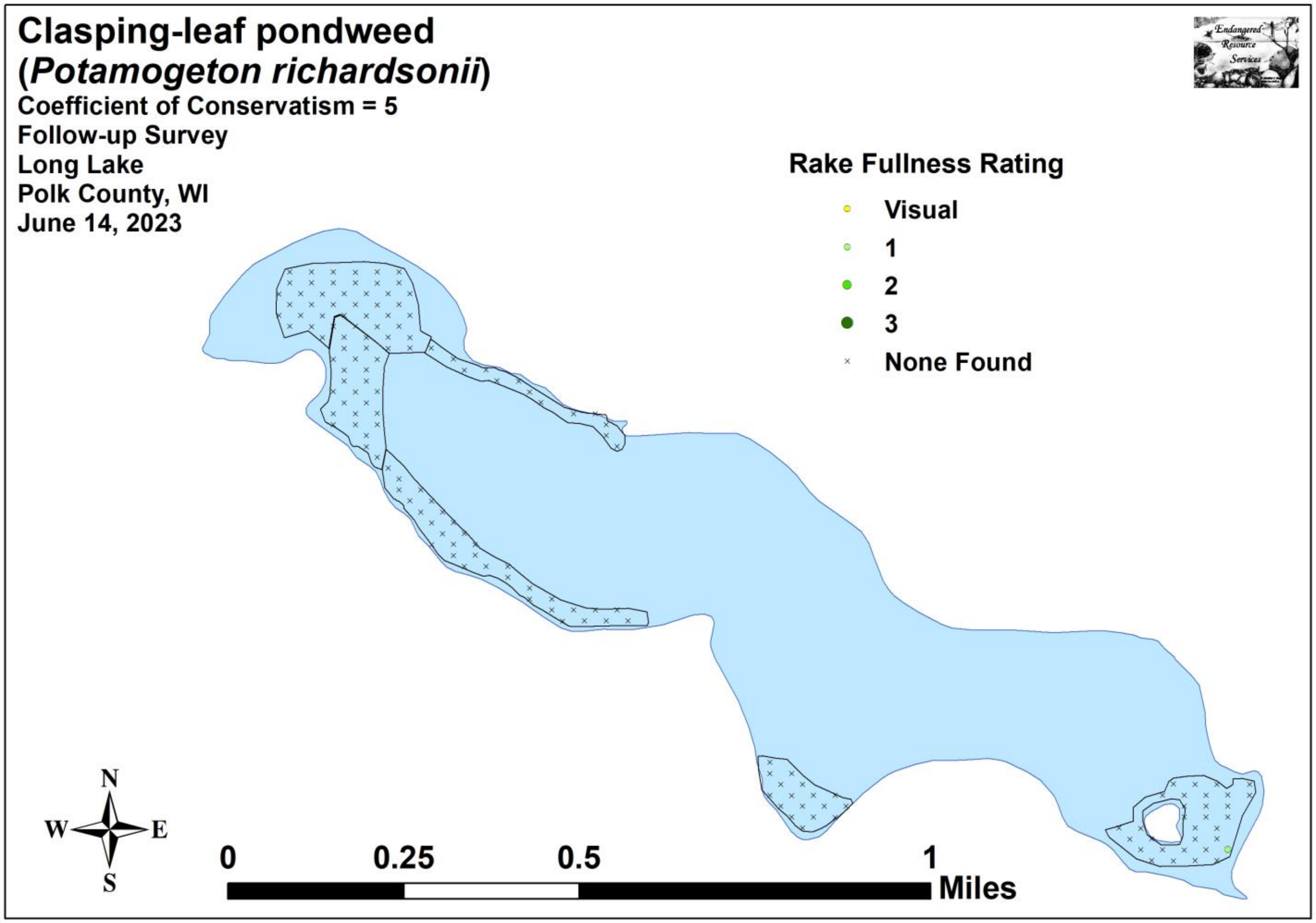

Forked duckweed
(*Lemna trisulca*)
Coefficient of Conservatism = 6
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles


Northern water-milfoil
(*Myriophyllum sibiricum*)
Coefficient of Conservatism = 6
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

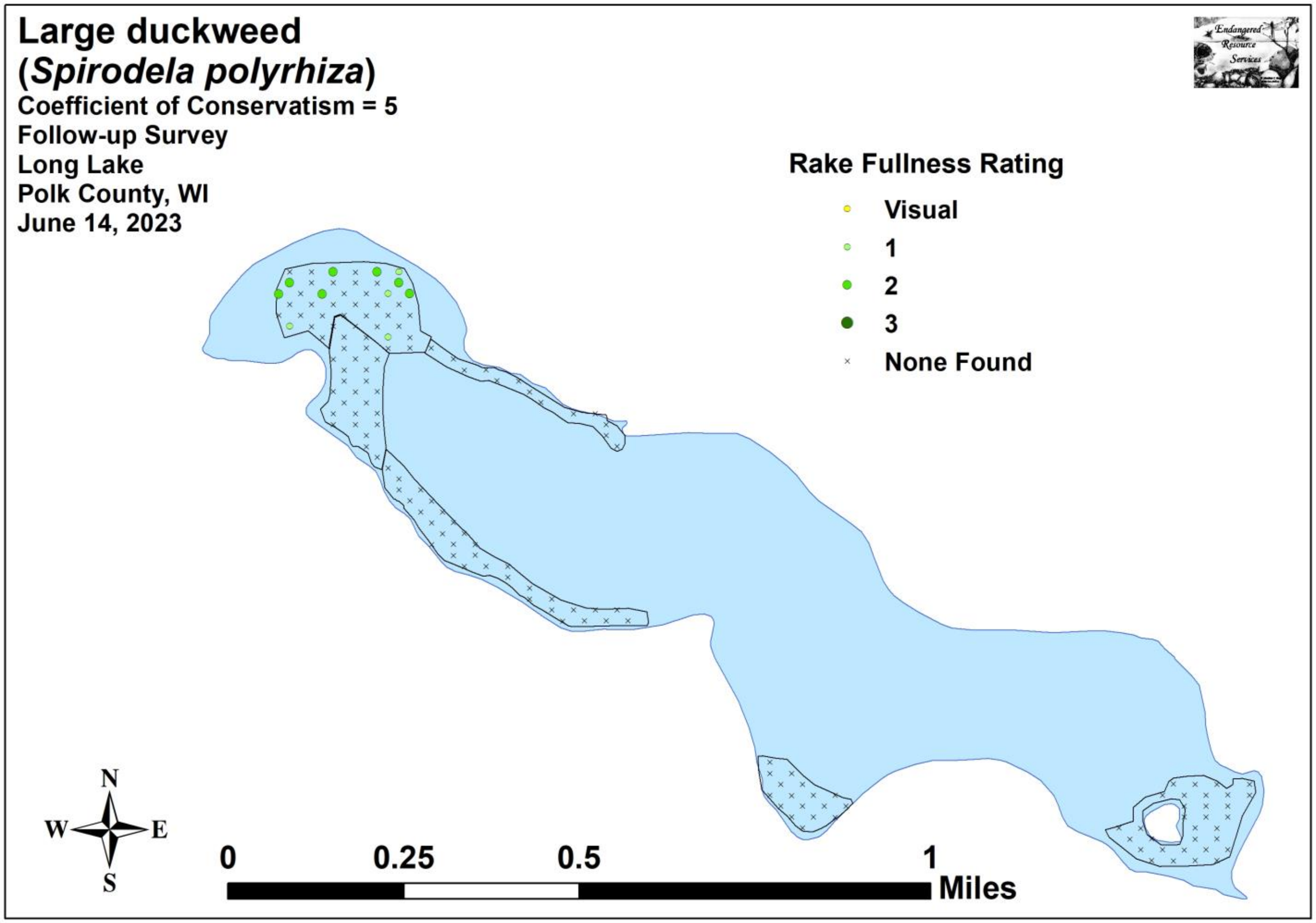

White water lily
(Nymphaea odorata)
Coefficient of Conservatism = 6
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

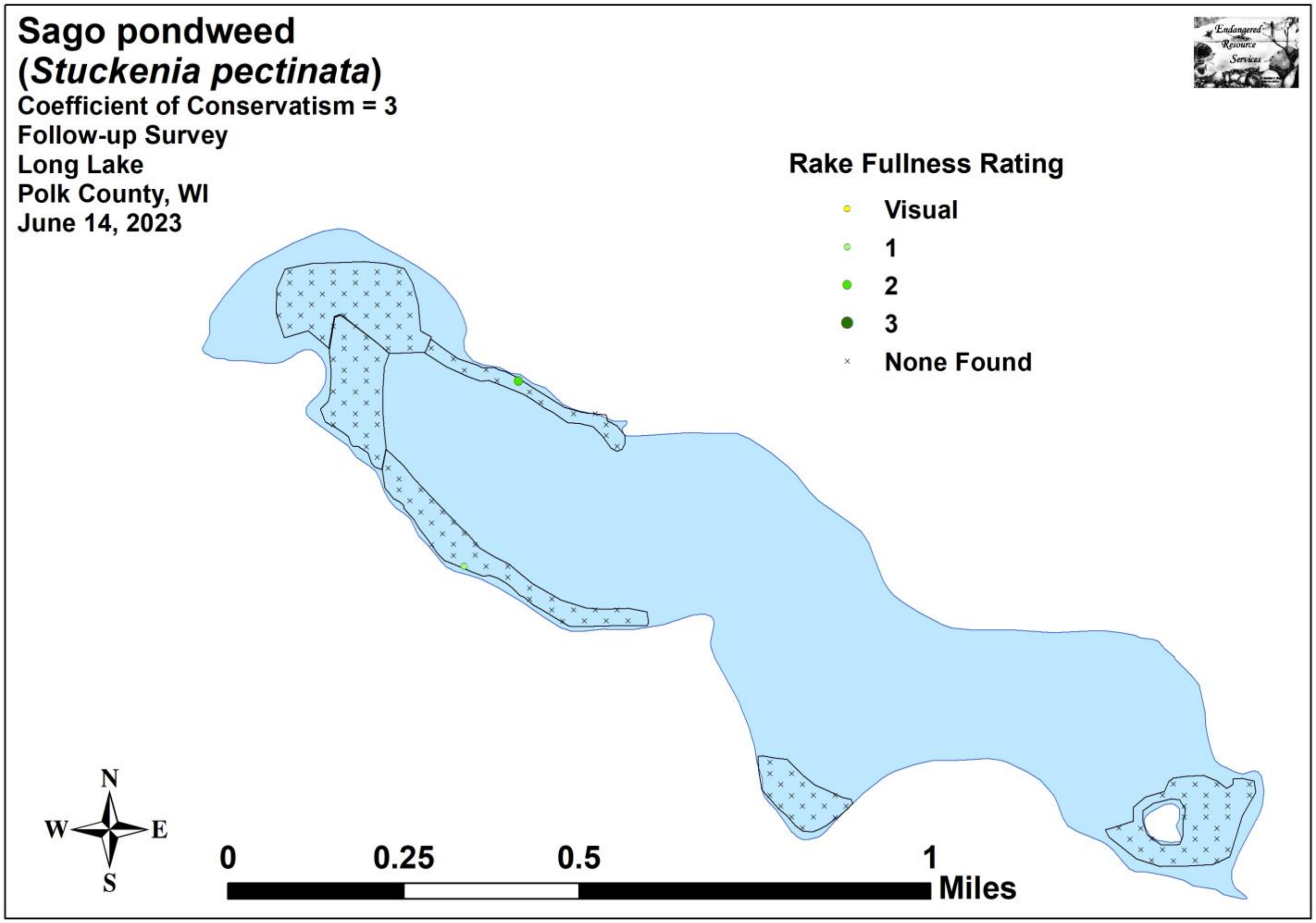

Leafy pondweed
(*Potamogeton foliosus*)
Coefficient of Conservatism = 6
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles

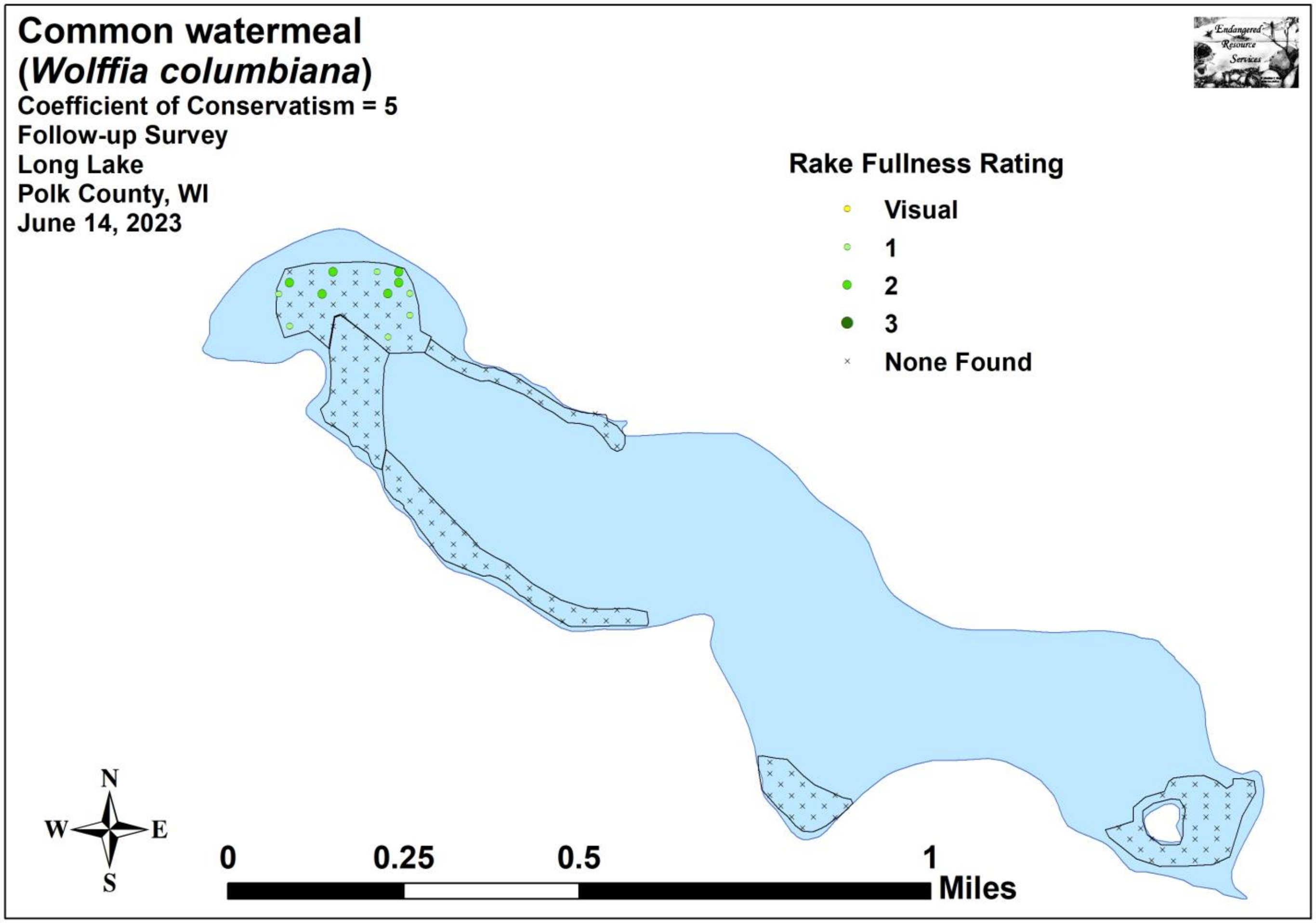

Small pondweed
(Potamogeton pusillus)
Coefficient of Conservatism = 7
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles



Clasping-leaf pondweed
(*Potamogeton richardsonii*)
Coefficient of Conservatism = 5
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles


Large duckweed
(*Spirodela polyrhiza*)
Coefficient of Conservatism = 5
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles


Sago pondweed
(*Stuckenia pectinata*)
Coefficient of Conservatism = 3
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles


Common watermeal
(*Wolffia columbiana*)
Coefficient of Conservatism = 5
Follow-up Survey
Long Lake
Polk County, WI
June 14, 2023
Rake Fullness Rating
Visual
1
2
3
None Found
N
W
E
S
0
0.25
0.5
1
Miles