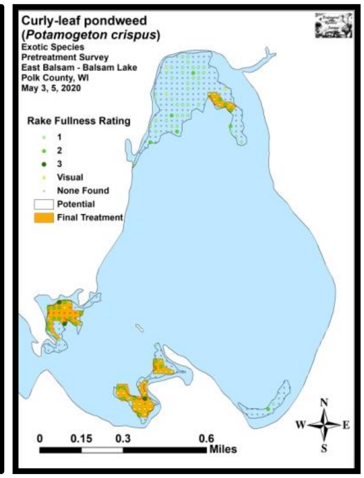
Curly-leaf Pondweed (*Potamogeton crispus*)
Pretreatment, Posttreatment, and Bed Mapping Surveys
Balsam Lake - WBIC: 2620600
Polk County, Wisconsin

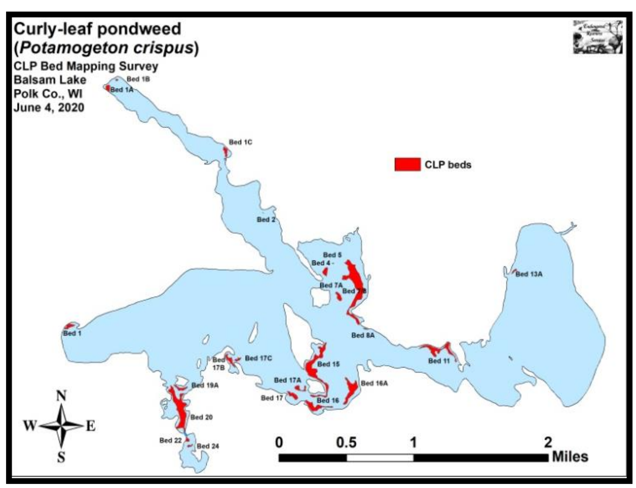
2020 CLP Treatment Areas



2020 CLP Pretreatment in East Balsam

Project Initiated by:

Balsam Lake Protection and Rehabilitation District and the
Wisconsin Department of Natural Resources – Grant ACEI212-18



2020 CLP Beds

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May 3 and 5, June 4 and 20, 2020

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INTRODUCTION:

Balsam Lake (WBIC 2620600) is a 2,054 acre stratified drainage lake in central Polk County, Wisconsin in the Towns of Balsam Lake, Milltown, Georgetown, and Apple River (T34N R17W). It reaches a maximum depth of 37ft north of Cedar Island in the western basin and has an average depth of 20ft (Hopke et al. 1964). The lake is mesotrophic bordering on eutrophic in nature, and water clarity is fair with historical summer Secchi readings averaging 5ft in East Balsam, 6ft in Little Balsam, and 8ft in the deep hole north of Cedar Island (WDNR 2020). Bottom substrate is variable with organic muck in most bays, and rock/sand in the Big and Little Narrows and around the lake's many islands.

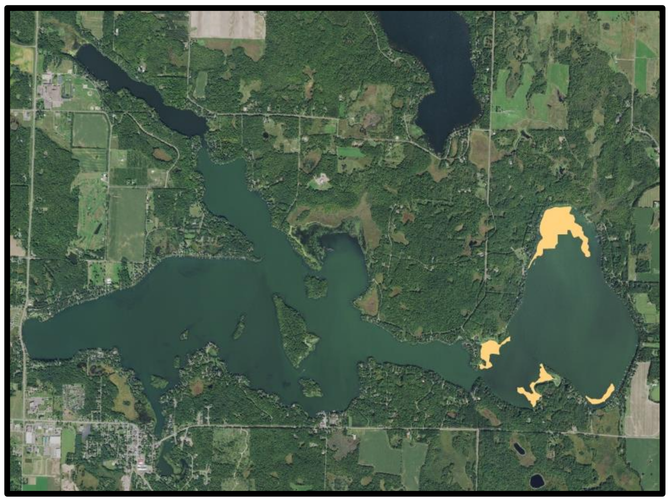


Figure 1: Balsam Lake with Potential 2020 CLP Treatment Areas

BACKGROUND AND STUDY RATIONALE:

In the spring of 2020, the Balsam Lake Protection and Rehabilitation District (BLPRD) and the Wisconsin Department of Natural Resources (WDNR) authorized the herbicide treatment of 50.00 acres (2.43% of the lake's total surface area) within four Curly-leaf pondweed (*Potamogeton crispus*) (CLP) beds totaling 65.45 acres in East Balsam (Figure 1). These beds were selected based on the 2013 spring CLP bed mapping survey that found CLP in these areas was interfering with boat traffic and/or restricting resident access to the lake from their docks, and the fall 2019 turion survey which suggested there would still be CLP growth in this area in 2020.

Prior to the planned 2020 herbicide application in East Balsam, we conducted a pretreatment survey on May 3rd and 5th to determine initial CLP levels and finalize treatment areas. This survey found significant CLP in just 15.60 acres (0.76% of the lake's total surface area). Following the treatment of these areas on May 28th, we completed a posttreatment survey on June 20th to determine the effectiveness of the treatment as well as to determine what, if any, significant impacts it may have had on native vegetation. We also completed a delineation of all CLP beds found within the entire lake's visible littoral zone on June 10th to guide mechanical harvesting in 2020 as well as to help plan potential future management in 2021. This report is the summary analysis of these three field surveys.

METHODS:

Pre/Posttreatment Herbicide Survey:

Following a winter meeting of the BLPRD's Aquatic Plant Management Committee, it was decided to treat the same general areas in 2020 that were treated from 2014-17 (treatment was cancelled in 2018 and 2019 due to low CLP levels). In order to make year-over-year comparisons, we used the same 276 survey points that we established in 2014 (offset regular points at 31m resolution) for each subsequent survey. This sampling grid approximated to just over four points/acre and was based on the WDNR protocol's expected 4-10 survey pts/acre for pre/posttreatment herbicide surveys (Appendix I).

The survey points were uploaded to a handheld mapping GPS (Garmin 76CSx) and located on the lake. At each point, we recorded the depth and bottom substrate and used a rake to sample an approximately 2.5ft section of the bottom. 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. 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.

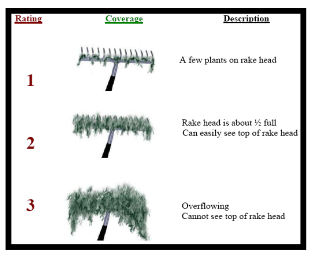


Figure 2: Rake Fullness Ratings

We entered all data collected into the standard APM spreadsheet (Appendix II), and data was analyzed using the linked statistical summary sheet. For pre/post differences of individual plant species and 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 $p<0.001$.

CLP Bed Mapping Survey:

During the bed mapping survey, we searched the lake's visible littoral zone. By definition, a "bed" was determined to be any area where we visually estimated that CLP made up >50% of the area's plants, was generally continuous with clearly defined borders, and was canopied or close enough to being canopied that it would likely interfere with boat traffic. After we located a bed, we motored around the perimeter taking GPS coordinates at regular intervals. We also estimated the rake density range and mean rake fullness of the bed (Figure 2), the range and mean depth of the bed, whether it was canopied, and the impact it was likely to have on navigation (**none** – easily avoidable with a natural channel around or narrow enough to motor through/**minor** – one prop clear to get through or access open water/**moderate** – several prop clears needed to navigate through/**severe** – multiple prop clears and difficult to impossible to row through). These data were then mapped using ArcMap 9.3.1, and we used the WDNR's Forestry Tools Extension to determine the acreage of each bed to the nearest hundredth of an acre.

RESULTS AND DISCUSSION:

Finalization of Treatment Areas:

The potential treatment areas covered 65.45 acres or approximately 3.19% of the lake's 2,054 total acres (Table 1). Following analysis of the pretreatment survey which found CLP occurred at low levels or was patchy in each of the beds, the BLPRD decided to pare down the treatment areas in Beds 12 and 14A/B, significantly reduce treatment in Bed 13, and cancel treatment in Bed 14 altogether. This produced a final treatment area that covered 15.60 acres (0.76% of the lake's total acreage) – 49.85 acres less than (-76.17%) the total acreage for treatment consideration and 34.40 acres less than (-68.80%) the 50.0 acres that were permitted (Figure 3) (Appendix I). Treatment occurred on May 28th with Clarke Aquatic Services (Clearwater, MN) applying 131.4 gallons of Aquathol K (Endothall) at 1-1.5ppm. The reported water temperature at the time of treatment was 68°F, the ambient air temperature was 67°F, and winds were out of the north at 6mph.

Table 1: Spring CLP Treatment Summary
Balsam Lake, Polk County – May 28, 2020

Bed Number	Potential Bed Area (acres)	Final Treatment Area (acres)	Change from Potential Acreage (+/-)	Chemical, Amount, and Dosage
12	10.34	6.00	-4.34	Aquathol K – 64.8 gal – 1.5ppm
13	40.83	2.00	-38.83	Aquathol K – 8.4 gal – 1ppm
14	4.37	0.00	-4.37	None
14A/B	9.91	7.60	-2.31	Aquathol K – 58.2 gal – 1.5ppm
	65.45	**15.60**	**-49.85**	**Aquathol K – 131.4 gal**

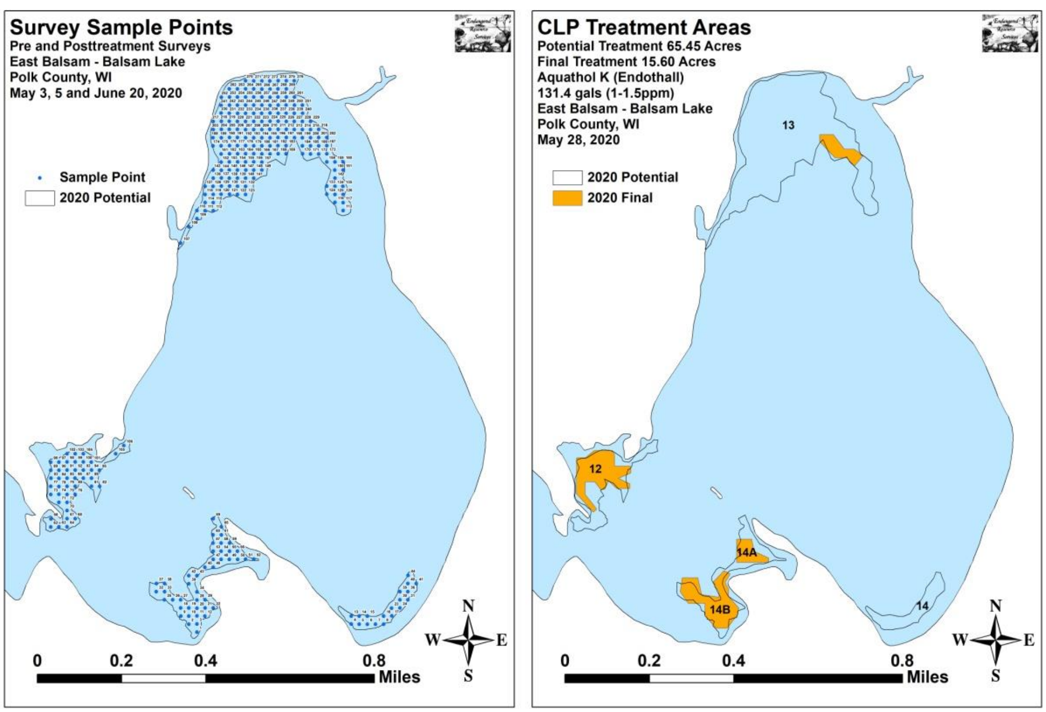


Figure 3: Pre/Posttreatment Survey Points and CLP Treatment Areas

Pretreatment/Posttreatment Surveys:

All beds occurred in areas between 2.1 and 12.0ft of water. During both the pre and posttreatment surveys, we found the mean and median depth of plant growth were an identical 7.5ft (Table 2). Most CLP was established over organic muck, but we also found scattered plants in the sandy/rocky areas of Beds 13 and 14 (Figure 4) (Appendix III).

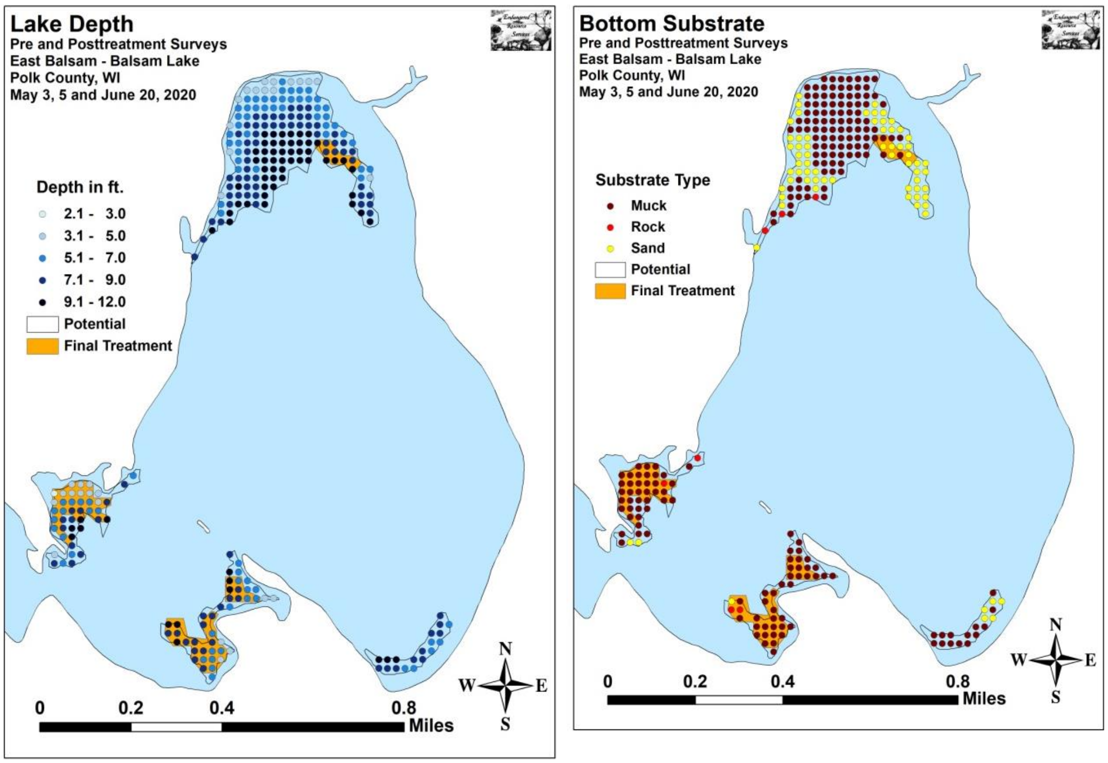


Figure 4: CLP Area Depths and Bottom Substrate

The littoral zone was almost unchanged at 12.0ft pretreatment and 11.5ft posttreatment; however, the frequency of plant occurrence at littoral points jumped from 80.1% during the pretreatment survey to 88.4% during the posttreatment survey (Figure 5) (Appendix IV). Richness also rose sharply from 12 species pretreatment to 15 posttreatment. The Simpson's Diversity Index increased slightly from 0.76 in May to 0.78 in June; and the Floristic Quality Index (another measure of the native plant community health) increased from 19.9 pretreatment to 23.3 posttreatment.

Table 2: Pre/Posttreatment Survey Summary Statistics
Balsam Lake, Polk County
May 3, 5 and June 20, 2020

Summary Statistics:	May	June
Total number of points sampled	276	276
Total number of sites with vegetation	221	244
Total number of sites shallower than the maximum depth of plants	276	276
Frequency of occurrence at sites shallower than maximum depth of plants	80.1	88.4
Simpson Diversity Index	0.76	0.78
Mean Coefficient of Conservatism	6.0	5.8
Floristic Quality Index	19.9	23.3
Maximum depth of plants (ft)	12.0	11.5
Mean depth of plants (ft)	7.5	7.5
Median depth of plants (ft)	7.5	7.5
Average number of all species per site (shallower than max depth)	1.62	2.03
Average number of all species per site (veg. sites only)	2.02	2.30
Average number of native species per site (shallower than max depth)	1.28	1.79
Average number of native species per site (sites with native veg. only)	1.85	2.13
Species Richness	12	17
Mean Rake Fullness (vegetative sites only)	1.53	1.56

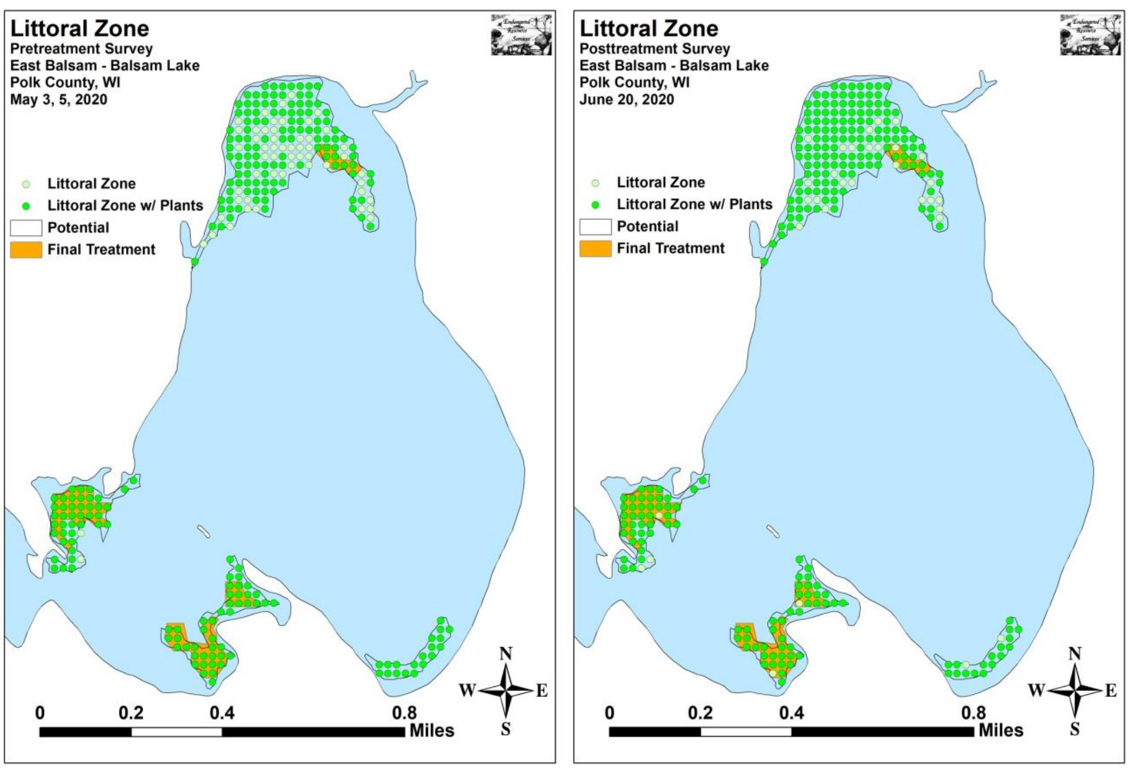


Figure 5: Pre/Posttreatment Littoral Zone

Mean native species richness at points with native vegetation experienced a moderately significant increase **(p=0.005)** from 1.85 species/point in May to 2.13 species/point in June (Figure 6). The total mean rake fullness during the pretreatment survey was a low/moderate 1.53. Posttreatment, this value was almost unchanged at 1.56 (p=0.31) (Figure 7) (Appendix IV).

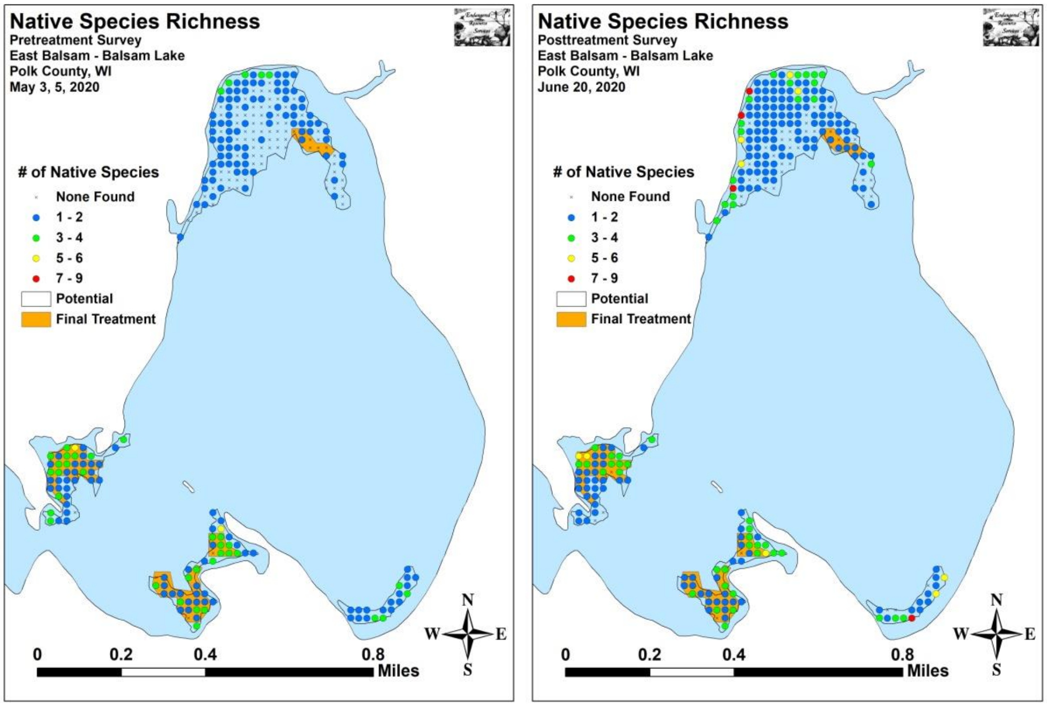


Figure 6: Pre/Posttreatment Native Species Richness

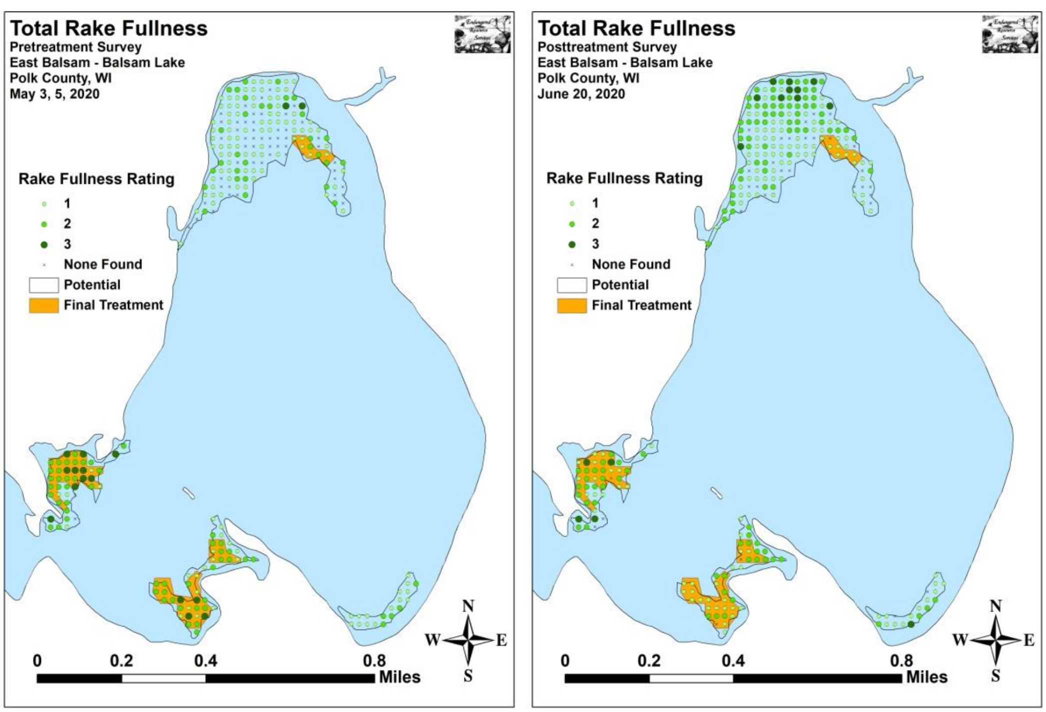


Figure 7: Pre/Posttreatment Total Rake Fullness

We found Curly-leaf pondweed at 94 of 276 sites (34.1% coverage) during the pretreatment survey (Figure 8). This was an increase from 82 sites (29.7% coverage) in 2019 and 53 sites (19.2% coverage) in 2018, but it was still much below the 192 sites (69.6%) with CLP in 2017's pretreatment survey; 159 sites (57.6%) in 2016; and 208 sites (75.4%) in 2015. Of these, three had a rake fullness rating of 3, 27 rated a 2, and 64 were a 1 with nine additional visual sightings. This produced a mean rake fullness for CLP of 1.35 and suggested 10.9% of the beds had a significant infestation (rake fullness of 2 or 3). During the posttreatment survey, we found CLP at 67 points (24.3% coverage) with five rating a 3, 20 rating a 2 (9.1% significant infestation), and the remaining 42 a 1 for a mean rake fullness of 1.45. CLP was also recorded as a visual at one point (Appendix V). Even though only a small portion of the north bay was treated, **our results demonstrated a significant decline in total CLP (*p*=0.01), rake fullness 1 (*p*=0.02), and visual sightings (*p*=0.01)** (Figure 9).

Analysis of the posttreatment survey map showed that CLP's distribution remained patchy in the north bay with plants either occurring in shallow areas <5ft deep or on the outer edge of the littoral zone in >9ft. Almost all CLP occurred at shallower depths where the harvester should be able to make a significant impact. In the southern bays, treatment was highly effective. The biggest negative we saw during the posttreatment survey was, due to the very late date of treatment that occurred over three weeks after the pretreatment survey, many CLP plants were mature enough that, although killed by the herbicide, they had already produce turions that were potentially viable.

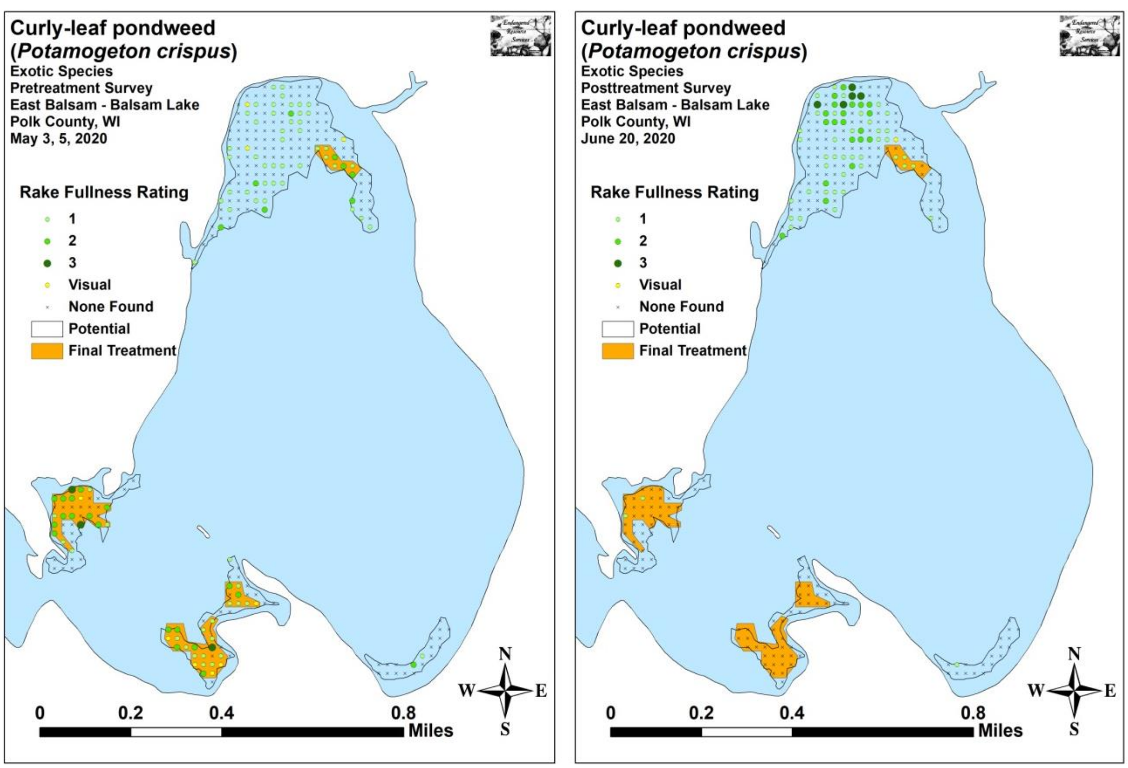
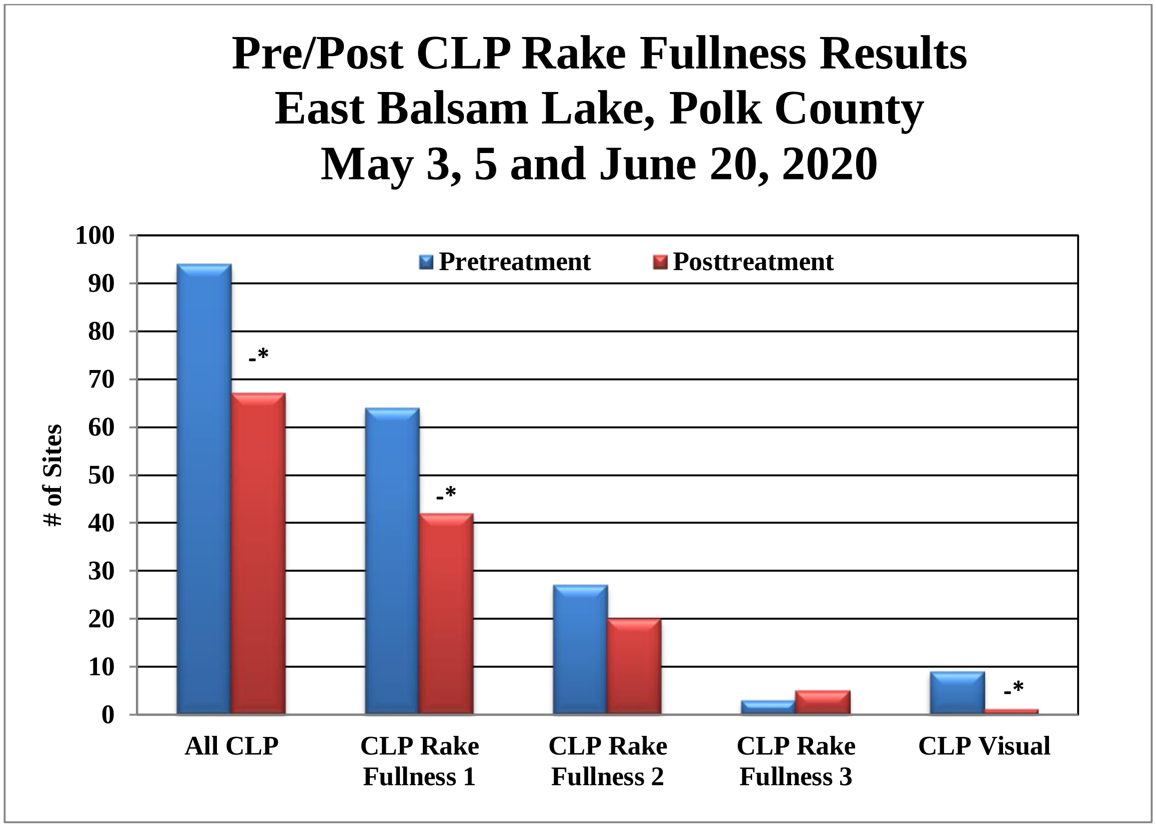


Figure 8: Pre/Posttreatment CLP Density and Distribution



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

Figure 9: Changes in CLP Rake Fullness

Forked duckweed (*Lemna trisulca*) and Coontail (*Ceratophyllum demersum*) were the most common native species in both the pretreatment and posttreatment surveys (Figures 10 and 11) (Tables 3 and 4). Forked duckweed saw a highly significant increase **(*p*<0.001)** in distribution from 155 sites in May to 211 sites in June, but its mean rake fullness was unchanged (1.18). Coontail saw a non-significant increase (*p*=0.86) in distribution (116 sites in May/132 sites in June), but a significant decline **(*p*<0.05)** in density (mean rake 1.54 in May/1.42 in June).

Many additional species, especially those that become active later in the growing season, underwent significant expansions in distribution (Figure 12). Specifically, Wild celery (*Vallisneria americana*) enjoyed a highly significant increase; and Common waterweed (*Elodea canadensis*), filamentous algae, Water star-grass (*Heteranthera dubia*), Spatterdock (*Nuphar variegata*), White-stem pondweed (*Potamogeton praelongus*) and Clasping-leaf pondweed (*Potamogeton richardsonii*) demonstrated significant increases. Conversely, Nitella (*Nitella* sp.) suffered a moderately significant decline (Maps of all native species from the pretreatment and posttreatment surveys can be found in Appendixes VI and VII).

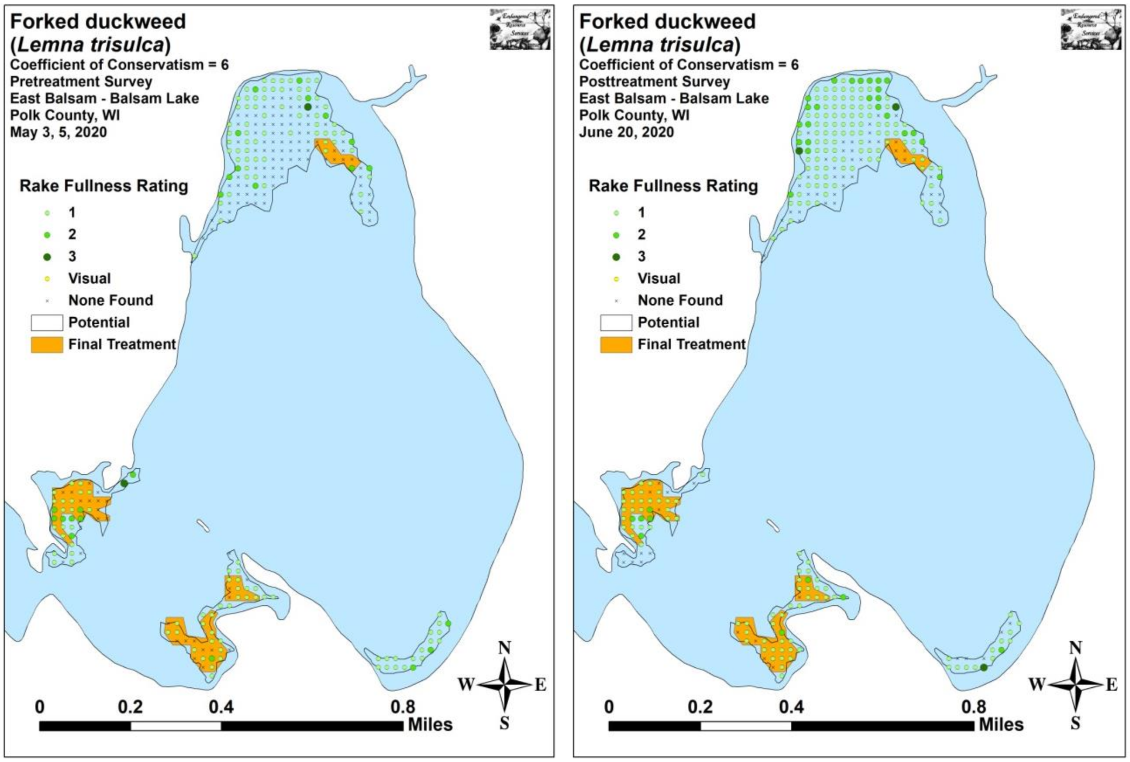


Figure 10: Pre/Posttreatment Forked Duckweed Density and Distribution

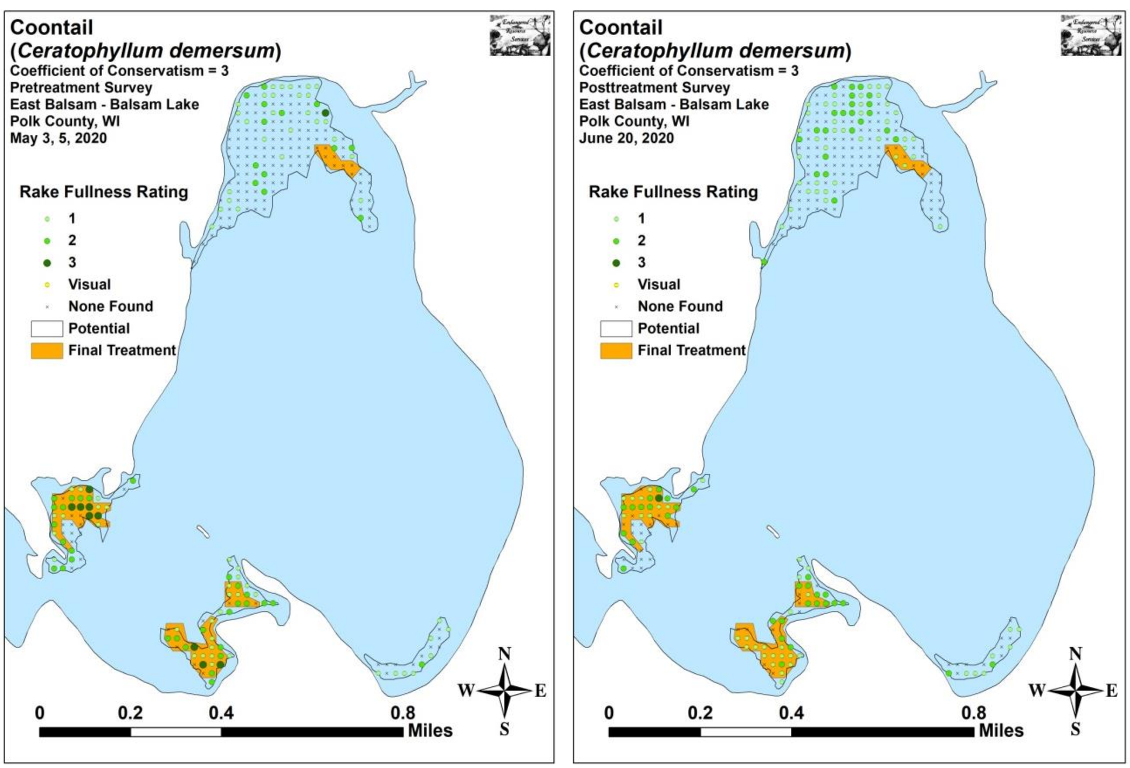


Figure 11: Pre/Posttreatment Coontail Density and Distribution

Table 3: Frequencies and Mean Rake Sample of Aquatic Macrophytes
Pretreatment Survey - Balsam Lake, Polk County
May 3, 5, 2020

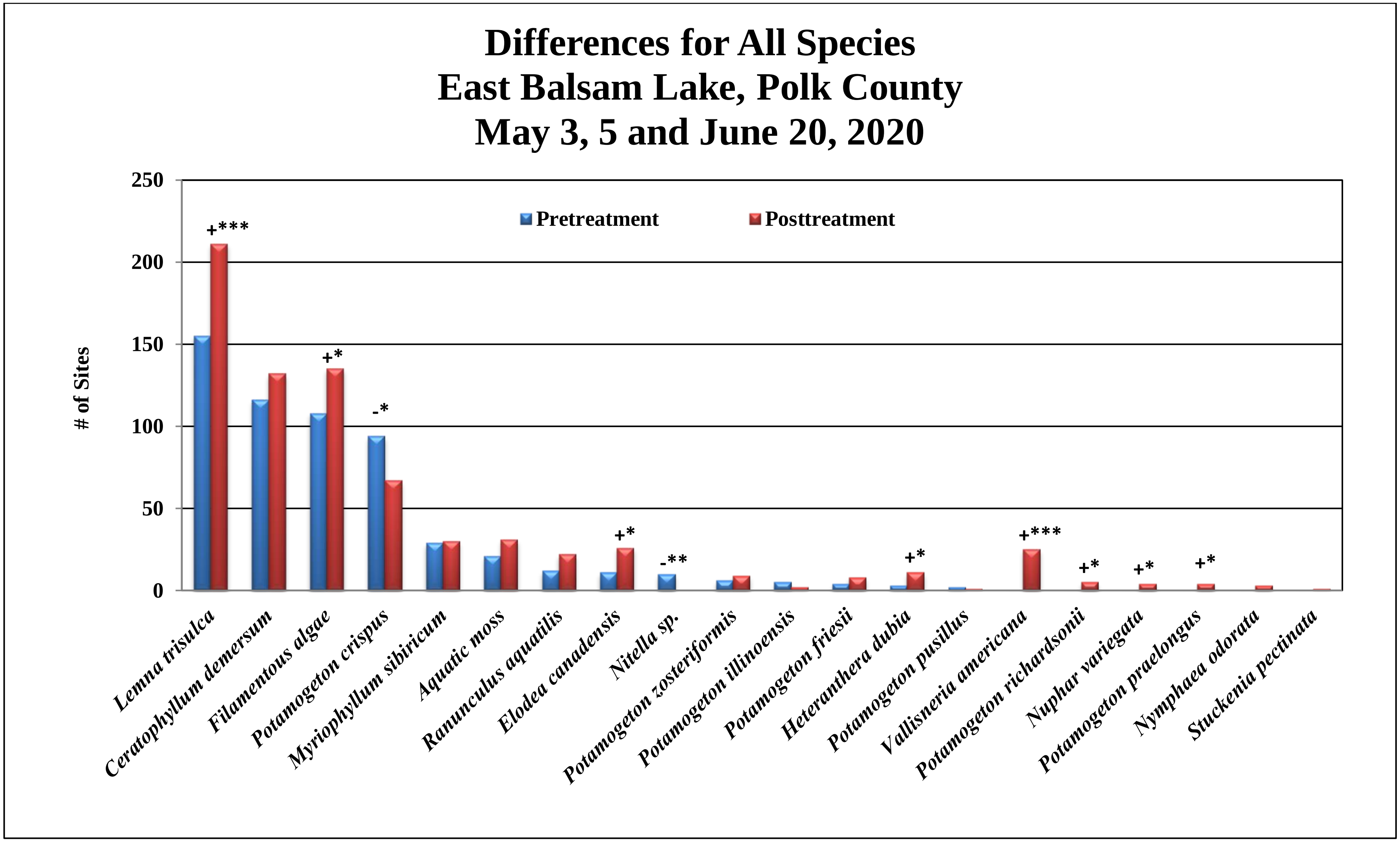
Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
Lemna trisulca	Forked duckweed	155	34.68	70.14	56.16	1.18	0
Ceratophyllum demersum	Coontail	116	25.95	52.49	42.03	1.54	0
	Filamentous algae	108	*	48.87	39.13	1.39	0
Potamogeton crispus	Curly-leaf pondweed	94	21.03	42.53	34.06	1.35	9
Myriophyllum sibiricum	Northern water-milfoil	29	6.49	13.12	10.51	1.24	0
	Aquatic moss	21	*	9.50	7.61	1.29	0
Ranunculus aquatilis	White water crowfoot	12	2.68	5.43	4.35	1.25	0
Elodea canadensis	Common waterweed	11	2.46	4.98	3.99	1.18	0
Nitella sp.	Nitella	10	2.24	4.52	3.62	1.00	0
Potamogeton zosteriformis	Flat-stem pondweed	6	1.34	2.71	2.17	1.17	0
Potamogeton illinoensis	Illinois pondweed	5	1.12	2.26	1.81	1.00	0
Potamogeton friesii	Fries' pondweed	4	0.89	1.81	1.45	1.00	0
Heteranthera dubia	Water star-grass	3	0.67	1.36	1.09	1.00	0
Potamogeton pusillus	Small pondweed	2	0.45	0.90	0.72	1.00	0

* Excluded from Relative Frequency Analysis

Table 4: Frequencies and Mean Rake Sample of Aquatic Macrophytes
Posttreatment Survey - Balsam Lake, Polk County
June 20, 2020

Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
Lemna trisulca	Forked duckweed	211	37.61	86.48	76.45	1.18	0
	Filamentous algae	135	*	55.33	48.91	1.40	0
Ceratophyllum demersum	Coontail	132	23.53	54.10	47.83	1.42	0
Potamogeton crispus	Curly-leaf pondweed	67	11.94	27.46	24.28	1.45	1
	Aquatic moss	31	*	12.70	11.23	1.42	0
Myriophyllum sibiricum	Northern water-milfoil	30	5.35	12.30	10.87	1.27	0
Elodea canadensis	Common waterweed	26	4.63	10.66	9.42	1.31	0
Vallisneria americana	Wild celery	25	4.46	10.25	9.06	1.32	0
Ranunculus aquatilis	White water crowfoot	22	3.92	9.02	7.97	1.45	0
Heteranthera dubia	Water star-grass	11	1.96	4.51	3.99	1.00	0
Potamogeton zosteriformis	Flat-stem pondweed	9	1.60	3.69	3.26	1.67	0
Potamogeton friesii	Fries' pondweed	8	1.43	3.28	2.90	1.00	0
Potamogeton richardsonii	Clasping-leaf pondweed	5	0.89	2.05	1.81	1.80	0
Nuphar variegata	Spatterdock	4	0.71	1.64	1.45	1.00	0
Potamogeton praelongus	White-stem pondweed	4	0.71	1.64	1.45	1.00	0
Nymphaea odorata	White water lily	3	0.53	1.23	1.09	1.00	0
Potamogeton illinoensis	Illinois pondweed	2	0.36	0.82	0.72	1.50	0
Potamogeton pusillus	Small pondweed	1	0.18	0.41	0.36	1.00	0
Stuckenia pectinata	Sago pondweed	1	0.18	0.41	0.36	1.00	0

* Excluded from Relative Frequency Analysis



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

Figure 12: Pre/Posttreatment Macrophyte Changes

Looking back at the cumulative data from the posttreatment and follow-up surveys in East Balsam over the last seven years (2014-2020) showed many species experienced significant changes (Figure 13). Following a relatively late treatment in 2014, Small pondweed (*Potamogeton pusillus*), a previously abundant fine-leaved early-growing species, showed highly significant declines and was not seen again until we found a single individual during the 2018 pretreatment survey.

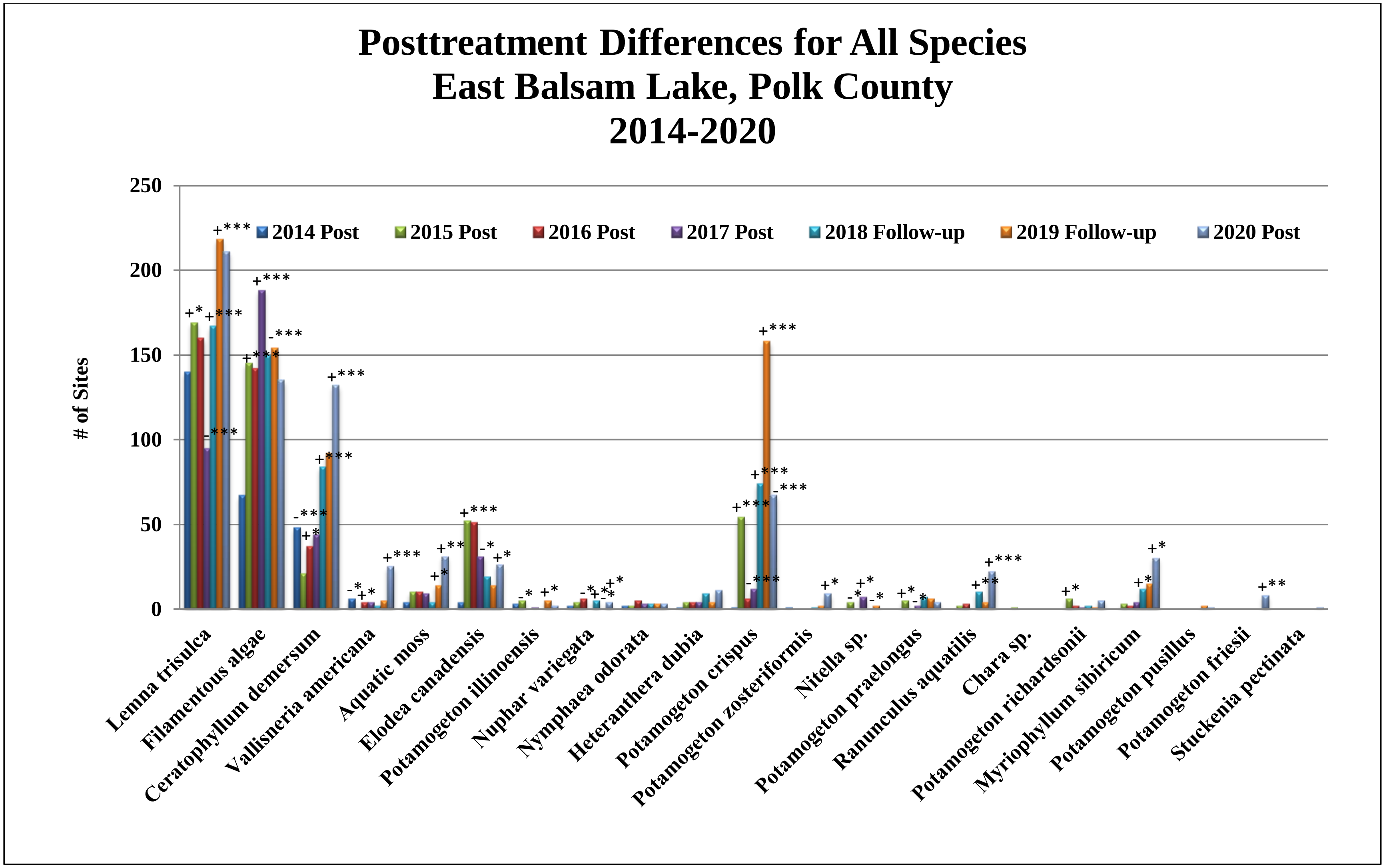
In 2015, although it produced a highly significant reduction from the pretreatment survey, a relatively early treatment proved to be much less effective as Curly-leaf pondweed experienced a highly significant year-over-year increase – a change which was, based on our posttreatment observations, potentially due to latent turions sprouting after the treatment. The 2015 treatment also produced a highly significant year-over-year decrease in Coontail. Conversely, filamentous algae and Common waterweed experienced highly significant year-over-year increases; and Forked duckweed had a significant increase. All three of these species maintained these increases following the 2016 treatment. However, other species that showed year-over-year increases in 2015 - such as Nitella, Illinois pondweed, and White-stem pondweed - dropped back to very low levels in 2016. Wild celery, a species that seems to exploit vacant habitat in the sandy shallows of East Balsam, inversely mirrored the changes in these broad-leaved pondweeds by significantly declining in 2015 before significantly rebounding in 2016. Coontail, a species that seems to be a competitor of CLP over muck in deeper water, experienced a significant rebound in 2016 that inversely mirrored the highly significant reduction in CLP.

Following the treatment in 2017, Forked duckweed experienced a highly significant reduction that mirrored the highly significant increase in filamentous algae and the moderately significant increase in the colonial algae Nitella. It may be that these species were competing for the same suspended nutrients. Common waterweed and Spatterdock also experienced significant year-over-year declines.

With no treatment in 2018, many species showed significant year-over-year changes. Filamentous algae suffered a highly significant decline, and Nitella saw a significant decline – again potentially because these colonial algae absorb nutrients from the water column that may not have been as readily available as they would be following a treatment when other plants are decomposing. Conversely, CLP, Forked duckweed, and Coontail enjoyed highly significant increases; White water crowfoot had a moderately significant increase, and both Spatterdock and Northern water-milfoil (*Myriophyllum sibiricum*) saw significant increases.

Following another year without treatment, the 2019 survey found many species continued to increase albeit at lower rates with few of these changes being significant. Only Forked duckweed and CLP had highly significant expansions in distribution. Aquatic moss and Illinois pondweed also showed significant expansion. Spatterdock was the only species that suffered a significant decline – potentially as a result of the harvesting program.

Somewhat surprisingly, the 2020 posttreatment found highly significant year-over-year expansion in Coontail, White water crowfoot, and Wild celery; moderately significant increases in Aquatic moss and Fries' pondweed (*Potamogeton friesii*); and significant increases in Common waterweed, Northern water-milfoil, Spatterdock, and Flat-stem pondweed (*Potamogeton zosteriformis*). Only CLP showed a highly significant decline.



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

Figure 13: Late May/June 2014-2020 - Differences for All Species – East Balsam

Curly-leaf Pondweed Bed Mapping Survey:

During the June 2020 survey, we mapped 23 beds – a sharp decline from the record 34 beds we found in 2019 and more similar to previous surveys (28 beds in 2018; 21 beds in both 2017 and 2016; 14 beds in both 2015 and 2014; 13 beds in 2013; and 20 beds in 2012). They ranged in size from 0.01 acre (Bed 2 at the Stump Bay outlet) to 14.57 acres (Merged Beds 7-8 in Stump Bay) (Figure 14) (Appendix VIII); and, collectively, they covered a total of 56.77 acres or 2.76% of the lake's 2,054 total acres (Table 5).

The 2020 acreage total represented a 45.99 acre decline (-44.75%) from the 2019 record total of 102.76 acres (5.00% coverage). Looking back on historical data, the 2020 total was generally higher than most previous surveys – 35.41 acres (1.72% coverage) in 2018; 97.73 acres (4.76% coverage) in 2017; 40.91 acres in 2016 (1.99% coverage); 16.32 acres in 2015 (0.79% coverage); 4.54 acres in 2014 (0.22% coverage); 80.58 acres (3.92% coverage) in 2013; and 28.21 acres in 2012 (1.37% coverage) (Table 6). Although the treatment in East Balsam accounted for some of the loss in total acres, comparison with the 2019 map showed most beds shrank inward, and we noted a general decline in density suggesting 2020 growing conditions were not as favorable for CLP as they were in 2019.

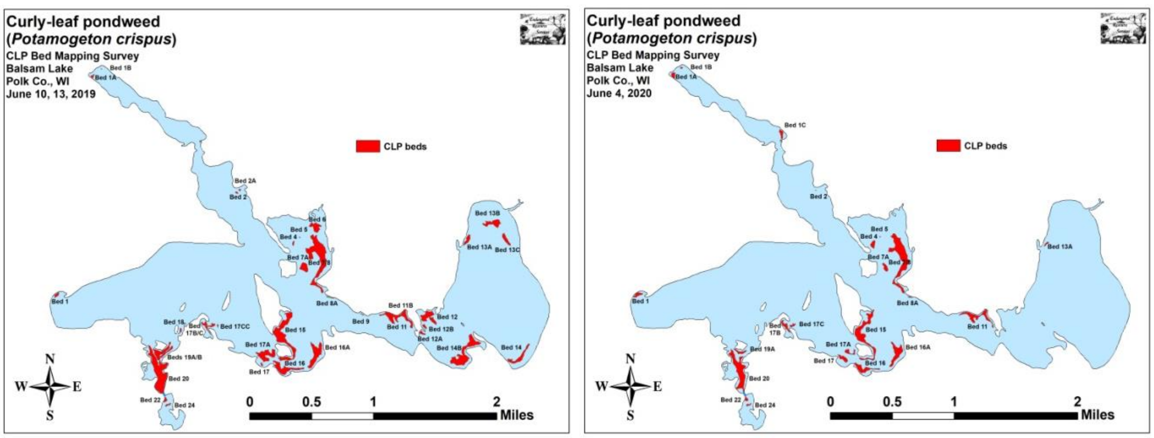


Figure 14: 2019 and 2020 Balsam Lake June CLP Beds

Table 5: CLP Bed Summary - Balsam Lake, Polk Co. June 4, 2020

Bed #	Location	2020 Area (Acres)	2019 Area	2019-20 Change in Area	Est. Range and Mean Rake-full	Depth Range and Mean Depth	Navigation Impairment	Field Notes
1	HWY 46 Landing	0.91	0.51	0.40	<1-3; 2	4-7; 6	Moderate	Mixed with natives
1A, 1B	Rice Creek Inlet	0.84	0.31	0.53	<<1-2; 1	2-4, 3	Minor	Most plants around floating docks
1C	Bay NE of Little Narrows	0.88	0	0.88	<<<1-3; 1	2-6; 3	Minor	Mixed with high value natives
2 and 2A	Boston Bay	0.01	0.3	-0.29	<<1-2; <1	3-7; 5	None	Most of former bed barren; some natives
3-8A	Stump Bay and Outlet	15.69	19.19	-3.50	<<<1-3; 2	3-10; 5	Moderate	Most minor in front of residences
7A	East of Carlson Island	1.05	2.18	-1.13	<<<1-3; 2	7-10; 8	Moderate	Deep water bed mixed with natives.
9-11	Bay NW of Big Narrows	4.44	5.97	-1.53	<<1-3; 2	2-10; 7	Moderate	Mixed with natives; fragmented edges
12	Bay NE of Big Narrows	0	4.79	-4.79	-	-	-	No CLP seen posttreatment
13, A, B, C	N. Bay of East Balsam	0.29	5.7	-5.41	<<<1-1; <1	6-10; 8	None	Patchy CLP near shore/scattered deep
14	SE Bay of East Balsam	0	2.94	-2.94	<<<1	7-10; 8	None	Dominated by NWM; scattered CLP
14B-BB, 14C	Bay SE of Big Narrows	0	10.12	-10.12	-	-	-	No CLP seen posttreatment
15, A, B	E. and SE of Big Island	9.52	12.6	-3.08	<<1-3; 1	5-10, 7	Minor	Mixed with natives/scattered prop trails
16	Bay S. of Paradise Island	2.96	4.96	-2.00	<<<1-2; 1	5-10; 7	Minor	Patchy with natives throughout
16A + B	E. of Paradise Landing	4.71	6.18	-1.47	<<1-3; 2	5-10; 8	Moderate	Mixed with natives/prop trails
17	Bay SW of Paradise Island	1.33	0.2	1.13	<<<1-2; 1	3-10; 6	Minor	Couple of patches; easily avoided
17A	West of Paradise Island	1.02	5.09	-4.07	<<<1-3; 1	5-10; 7	Minor	Mixed with natives/ a few prop trails
17B+D	Raskin Bay	1.25	1.62	-0.37	<<<1-2; 1	2-5; 3	Minor	Plants uprooted by boat traffic
17C and CC	Raskin Bay Outlet	0.41	0.12	0.29	<<<1-2; 1	4-10; 8	Minor	Patchy and mixed with natives
18	Channel E. of Pine Island	0	0.27	-0.27	<<<1	4-7; 6	None	Only widely-scattered CLP
19A , B	Channel S/E. of First Island	0.97	4.3	-3.33	<<1-3; 2	4-10; 7	Moderate	Prop-trails throughout
20, 20A, and 21	East of Idlewild Bay	9.81	14.74	-4.93	<<1-3; 2	4-10; 8	Moderate	Prop-trails throughout
22	Northwest Mill Pond	0.4	0.4	0	<<1-2; 1	4-10; 7	Minor	Lots of natives mixed in
23	Northeast Mill Pond	0	0	0	<<<1	4-6; 5	None	Scattered CLP – native dominated
24	Mill Pond Point	0.29	0.28	0.01	<<1-3	4-6; 5	Moderate	Natural channel around
25	Southeast Mill Pond	0	0	0	<<<1	4-6; 5	None	Scattered CLP – native dominated
	Total	**56.77**	**102.76**	**-45.99**				

Table 6: Historical CLP Bed and Treatment Summary - Balsam Lake, Polk Co. 2012-2020

Bed #	Location	2020 Area (Acres)	2019 Area	2018 Area	2017 Area	2016 Area	2015 Area	2014 Area	2013 Area	2012 Area	Years Treated	Acreage Treated
1	HWY 46 Landing/Ward's	0.91	0.51	0.14	1.00	0.15	0	0.07	0	0.58	-	-
1A, 1B	Rice Creek Inlet	0.84	0.31	0	0.17	0.01	0.01	0.04	0	0	-	-
1C	Bay NE of Little Narrows	0.88	0	0	0	0	0	0	0	0	-	-
2 and 2A	Boston Bay	0.01	0.30	0.13	2.02	0.28	0.03	0.15	0.64	1.23	-	-
3-5	Stump Bay	1.01	0.27	1.08	Merged	1.38	0.42	0	0	0.67	-	-
6-8A	East Shore Stump Bay/Outlet	14.68	18.92	5.33	Merged	9.61	0.42	0.08	3.08	4.91	-	-
3-8A	Stump Bay (Merged)	(15.69)	(19.19)	(6.41)	40.63	-	-	-	-	-	-	-
7A	East of Carlson Island	1.05	2.18	0	0	0	0	0	0	0	-	-
9	NW of Big Narrows	0	0.08	0	Merged	Merged	0	0	0	0.19	-	-
10	NW of Big Narrows	0	0	0	Merged	Merged	0	0	0.18	0	-	-
11	Bay NW of Big Narrows	4.44	5.89	1.03	4.15	3.54	0.56	0	2.70	4.72	2013	4.71
12, 12A/B	Bay NE of Big Narrows	0	4.79	0.52	0	0	0	0	10.34	0	‘20, ’17, ’16, ’15, ‘14, ‘12	6.04, 10.34, 10.34, 10.34, 10.37, 5.91
13 A/B/C	N. Bay of East Balsam	0.29	5.70	2.73	0	0	0	0	40.83	0	‘20, ’17,’16, ’15, ‘14, ‘12	2.01, 32.08, 35.37, 40.83, 38.66, 43.14
14	SE Bay of East Balsam	0	2.94	1.06	0	0	0	0	4.37	0	2017, ’16, ’15, ‘14, ‘12	3.09, 3.27, 4.37, 4.37, 6.95
14B, 14C	Bay SE of Big Narrows	0	10.12	2.37	0	0	0	0	9.92	0	‘20, ’17, ’16, ’15,‘14	7.61, 8.66, 9.29, 9.91, 9.92
15, A, B	E. and SE of Big Island	9.52	12.60	7.26	13.28	12.49	6.75	1.68	8.22	8.78	2013	8.70
16	Bay S. of Paradise Island	2.96	4.96	1.45	3.28	1.56	0.46	0	0	0.65	-	-
16A + B	E. of Paradise Landing	4.71	6.18	4.33	6.46	6.22	4.65	0.53	0	0	-	-
17	Bay SW of Paradise Island	1.33	0.20	0.04	3.39	0.59	0	0.08	0	0	-	-
17A	West of Paradise Island	1.02	5.09	4.27	2.59	0.27	0.16	0.13	<0.01	1.86	-	-
17B+D	Raskin Bay	1.25	1.62	0.11	1.94	0.45	0.24	0	0	0	-	-
17C/ CC	Raskin Bay Outlet	0.41	0.12	0.01	0.50	0.33	<0.01	0	<0.01	1.04	-	-
18	Channel E. of Pine Island	0	0.27	0.13	0.72	0.31	0	0	0	0	-	-
19A , B	Channel S/E. of 1st Island	0.97	4.30	1.18	2.03	0.49	0.19	0	0	0.98	-	-
20, 20A, 21	East of Idlewild Bay	9.81	14.74	2.25	14.18	3.22	2.43	1.58	0.30	0.10	-	-
22	Northwest Mill Pond	0.40	0.40	0	0.25	0	0	0	0	0.40	-	-
23	Northeast Mill Pond	0	0	0	0	0	0	0.05	0	0.43	-	-
24	Mill Pond Point	0.29	0.28	0	0.57	0	0	0.15	0	1.37	-	-
25	Southeast Mill Pond	0	0	0	0.56	0	0	0	0	0.30	-	-
	Total	**56.77**	**102.76**	**35.41**	**97.73**	**40.91**	**16.32**	**4.54**	**80.58**	**28.21**		

Descriptions of Past and Present Curly-leaf Pondweed Beds:

Bed 1 – The small Curly-leaf pondweed bed near Ward's Resort was denser than in recent surveys, but it was also narrower which allowed most boats leaving the docks to simply go around it. Much of the surrounding area was dominated by natives species; especially Coontail, Northern water-milfoil, and Flat-stem pondweed.

Beds 1A and 1B – This bed was again located near the floating docks, and it showed notable expansion from 2019 – potentially in response to incoming/outgoing watercraft disturbing the bottom and making ideal conditions for CLP to establish. Per usual, Bed 1B was little more than a few scattered clusters near the Rice Creek Inlet adjacent to the lake's largest Northern wild rice (*Zizania palustris*) bed.

Bed 1C – Although we've annually observed CLP in the uninhabited bay northeast of the Little Narrows, this was the first time plants had merged together and formed a true bed. The area still had a large numbers of high-value natives which likely makes it a low priority for control.

Beds 2A and 2 – The bed in Boston Bay was reduced to a thin strip of CLP on the outer edge of the bar, and it was easily avoided. The rest of the area was dominated by native species.

Beds 3-8A – The "super bed" in Stump Bay was fragmented, and the majority was mixed with natives except on the outer edge adjacent to deep water. On the eastern shoreline of the bay where most residences occur, Bed 7 was patchy and mixed with significant numbers of native pondweeds. As in the past, we encourage limiting management to the minimal amount needed for residents to access the lake; thereby preserving the area's critical fish habitat.

Bed 7A – CLP was again canopied in this area, but the overall size of the bed was noticeably smaller. Although it was moderately dense, there were clear channels around both sides to access deep water. Anglers were also present around the entire periphery as this deep water bed appeared to be holding schools of panfish.

Beds 9 and 10 – We found almost no CLP along this shoreline. Plants that were present tended to occur as singles or low density clusters, and there were no areas that were true beds and could be mapped.

Bed 11 – The bay just northwest of the Big Narrows was again moderately dense and an obvious impairment to residents on this highly developed shoreline. Because of this, it's an area that's likely early on the harvesting schedule.

Beds 12, 12A, and 12B – We saw no CLP in the bay northeast of the Big Narrows following the herbicide treatment.

Beds 13A, 13B, and 13C – Despite only treating a small area, most of the former giant bed that dominated the north bay of East Balsam continues to be very patchy although those patches appeared to be growing in size near shore on the north side. The only true bed occurred in deep water at low density and was easily avoided.

Bed 14 – Despite not being treated in 2020, this area had almost no CLP – potentially due to large beds of Northern water-milfoil which dominated the area and appeared to be outcompeting all other species.

Beds 14B, 14BB, and 14C – We saw no evidence of CLP posttreatment in these areas.

Beds 15 and 15A – This bed wrapped around the east side of Big Island and the north, east, and south sides of Paradise Island. It was canopied, but the overall density was less than normal, and we only saw scattered prop trails.

Bed 16 – The bed south of Paradise Island was also canopied, but it was not dense and likely only a minor impairment to shoreline residents. Natives were mixed throughout, and it was more a collection of patches than a continuous bed.

Beds 16A and 16B – These areas again merged into a single large bed that was one of the worst on the lake. We noted that it would likely have been at least a moderate impairment, and we could see numerous prop trails cut through it.

Bed 17 – This bed was patchy, easily avoided, and likely not more than a minor impairment. The rest of the bay was full of native species, but they weren't canopied and didn't appear to be causing any issues.

Bed 17A – As in the past, 17A was situated next to a Hardstem bulrush (*Schoenoplectus acutus*) bed that provides important spawning habitat for the lake's panfish (pers. obs.). Because of this, even harvesting in this area may be better off avoided even though we noted some parts of the bed had prop trails.

Beds 17B, 17C, 17CC, and 17D – Raskin Bay was the usual collection of dense canopied vegetation with scattered patches of CLP. Most of the bay was dominated by Coontail and White water lilies.

Beds 18 and 19A/B – We only found a few scattered patches of CLP in the channel east of Pine Island, and none of it was big enough to map. The bed near First Island was somewhat thicker and may have been a moderate issue as we saw prop-trails throughout.

Beds 20 and 21 – CLP again filled much of the channel that stretches from the village beach, past Idlewild Bay, and beyond the "No Wake Zone" buoy to the north. As usual, we noted that many plants were prop-clipped or had been ripped out of the sediment by boat traffic. Outside of the immediate channel, CLP was likely at least a moderate impairment.

Beds 22-25 – Most of the Mill Pond had very low levels of CLP, and we found the only true beds were near the bridge and in front of "the Thirsty Otter". Fortunately, they were small, likely easily avoided, and probably not more than a moderate impairment. Most other areas within the former beds were dominated by Coontail and Northern water-milfoil.

LITERATURE CITED

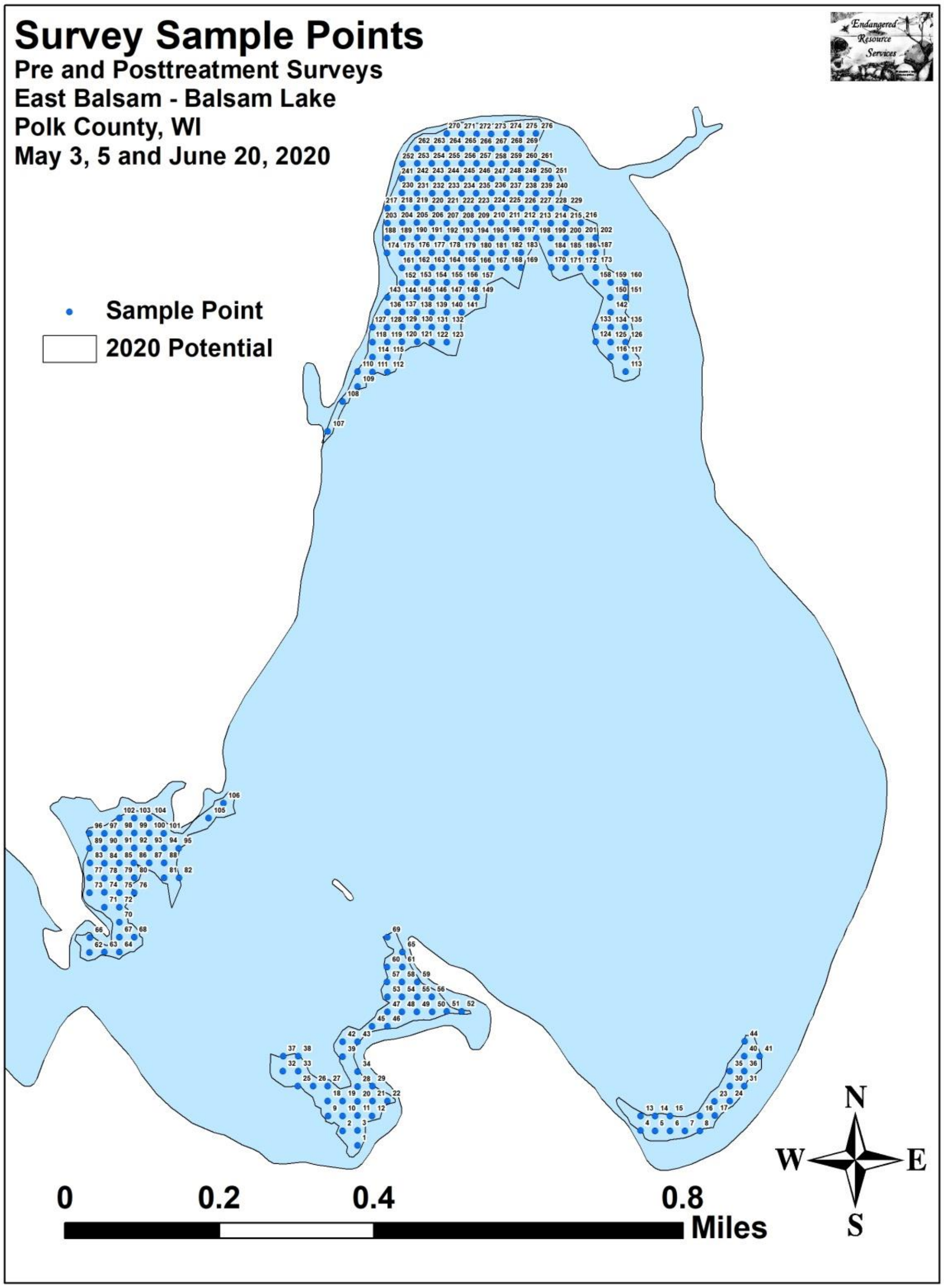
Hopke, R., E. Nelson, and E. Eaton [online]. 1964. Balsam Lake Maps. Available from http://dnr.wi.gov/lakes/maps/DNR/2620600a.pdf (2020, November).

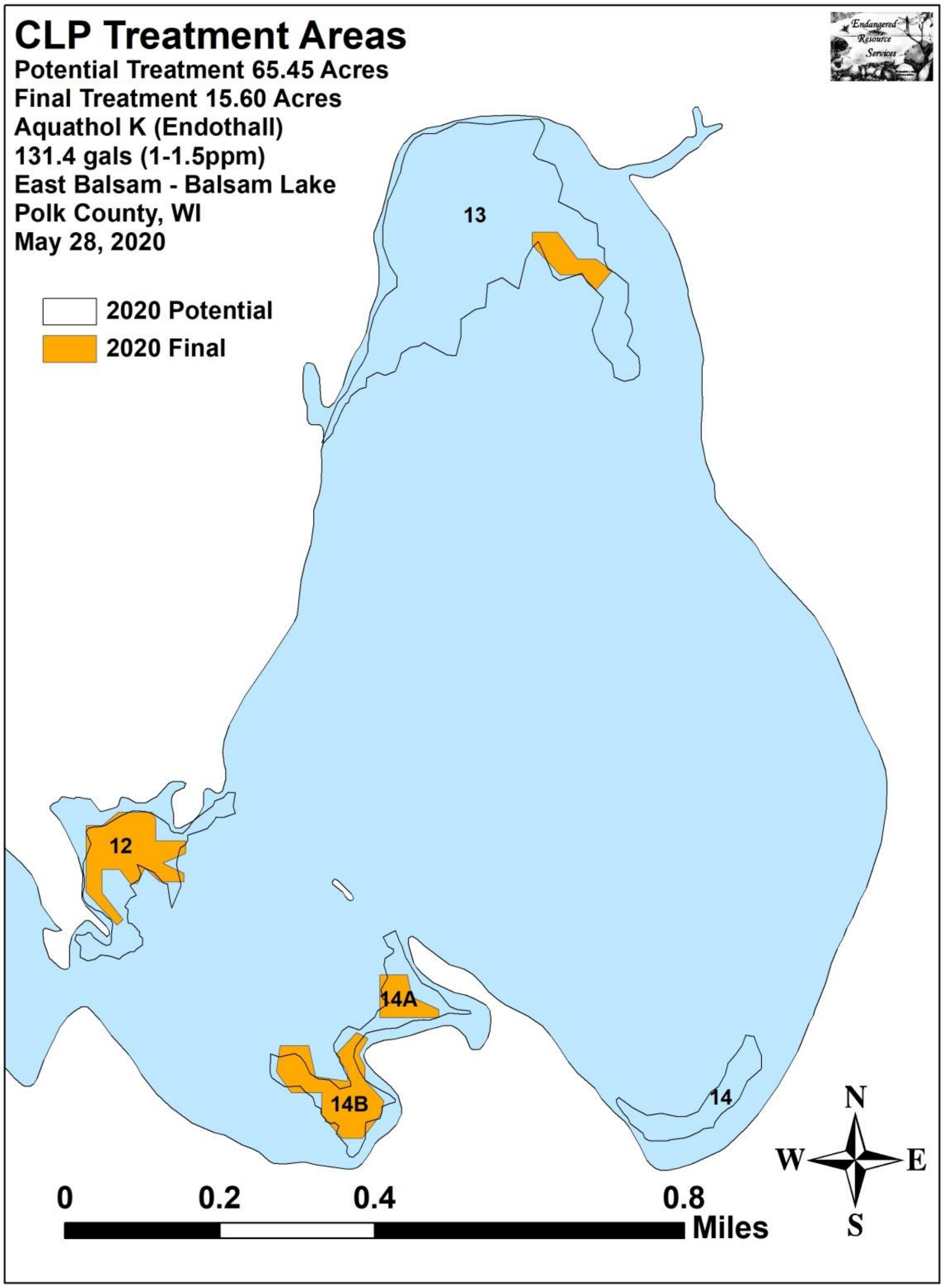
UWEX Lakes Program. [online]. 2010. Aquatic Plant Management in Wisconsin. Available from http://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/ecology/aquaticplants/default.aspx (2020, November).

UWEX Lakes Program. [online]. 2010. Pre/Posttreatment Herbicide Comparison. Available from http://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/ecology/Aquatic%20Plants/Appendix-D.pdf (2020, November).

WDNR. [online]. 2020. Balsam Lake Citizen Monitoring Water Quality Database. Available from http://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2620600&page=waterquality (2020, November)

Appendix I: CLP Pre/Posttreatment Survey Sample Points and Potential and Final Treatment Areas


Survey Sample Points
Pre and Posttreatment Surveys
East Balsam - Balsam Lake
Polk County, WI
May 3, 5 and June 20, 2020
Sample Point
2020 Potential
0
0.2
0.4
0.8
Miles
N
S
W
E

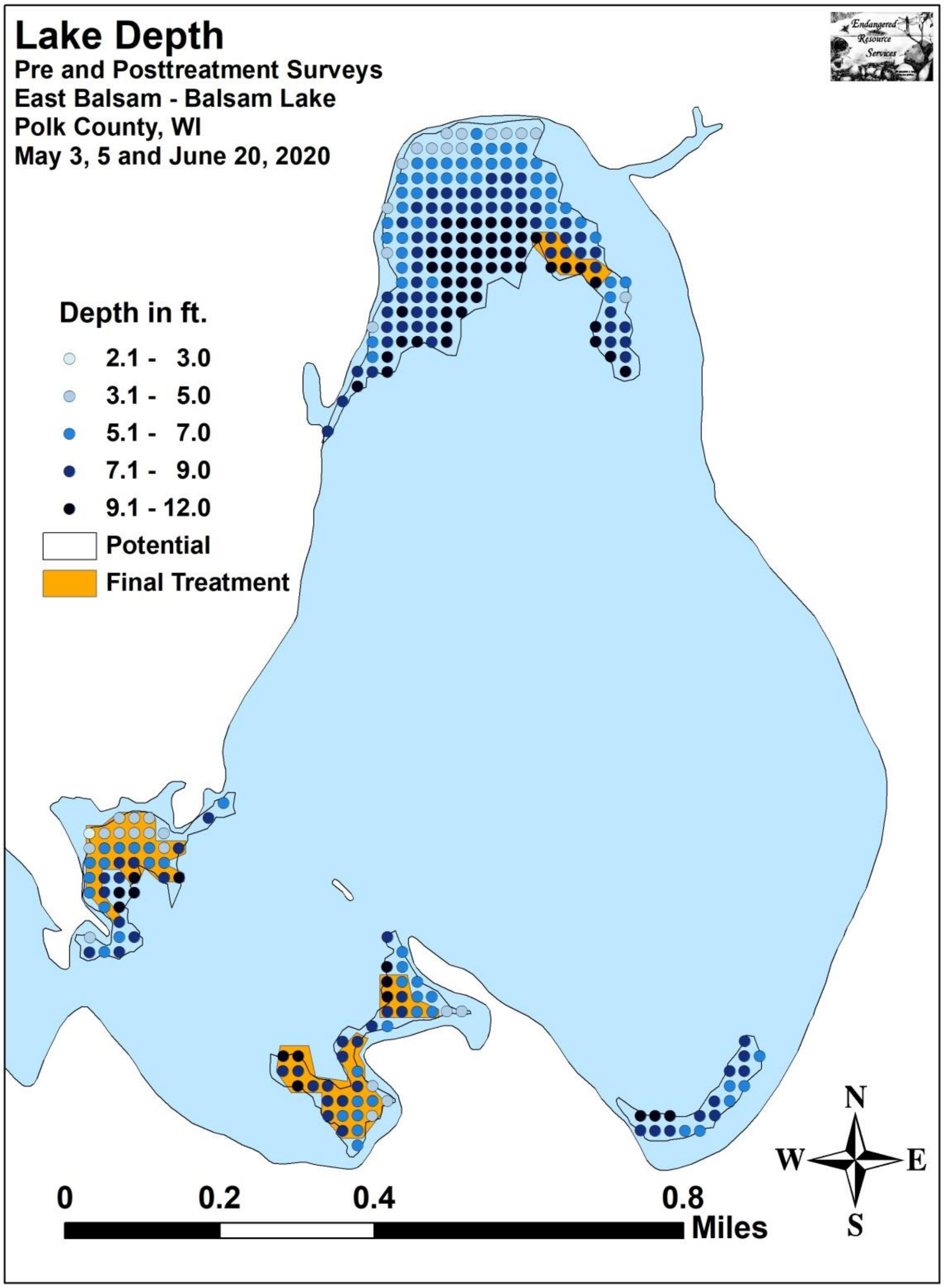


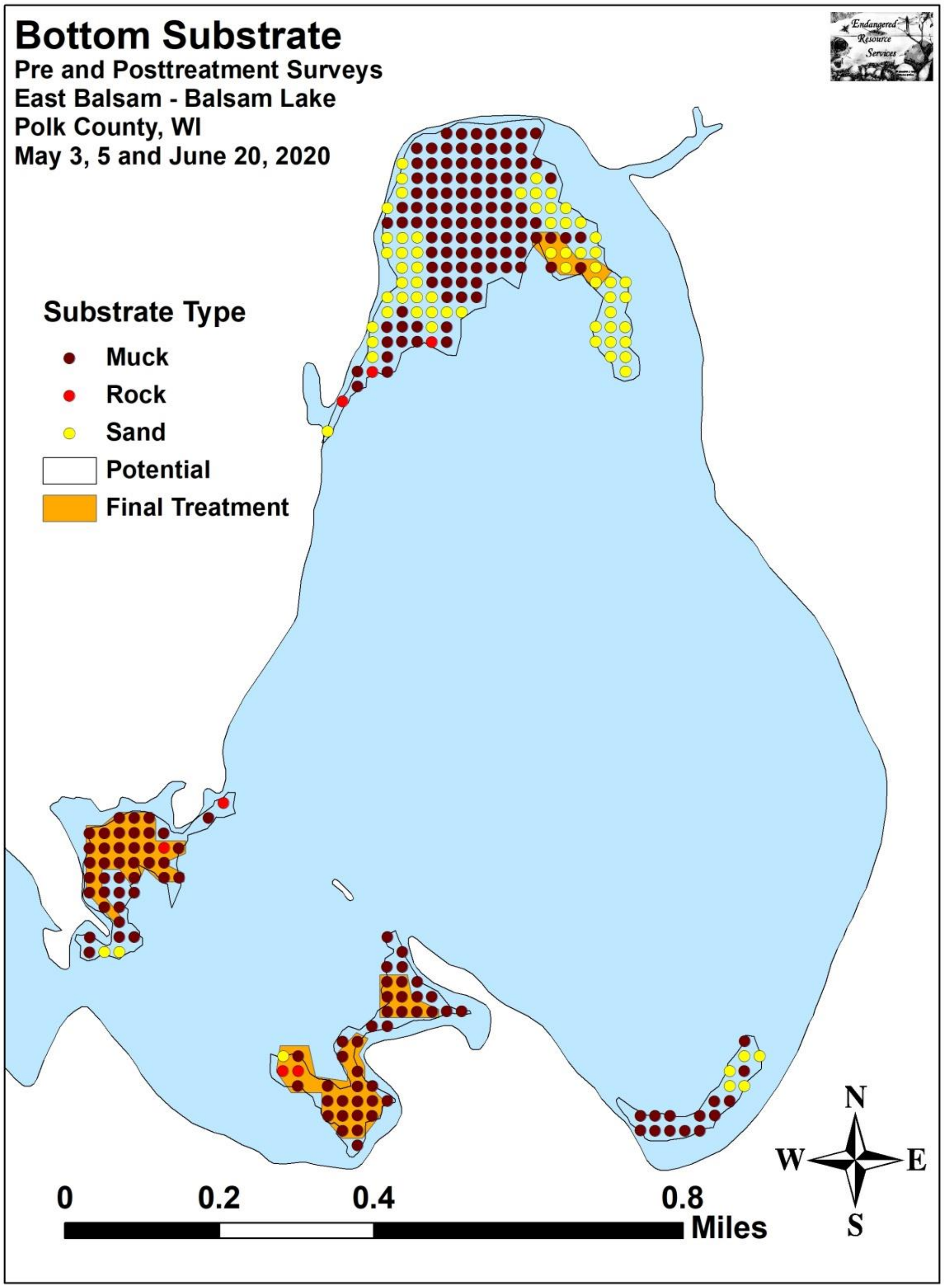
CLP Treatment Areas
Potential Treatment 65.45 Acres
Final Treatment 15.60 Acres
Aquathol K (Endothall)
131.4 gals (1-1.5ppm)
East Balsam - Balsam Lake
Polk County, WI
May 28, 2020
2020 Potential
2020 Final
Endangered Resource Services
13
12
14A
14B
14
N
W
E
S
0
0.2
0.4
0.8
Miles

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																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									
13																									
14																									
15																									
16																									
17																									
18																									
19																									
20																									

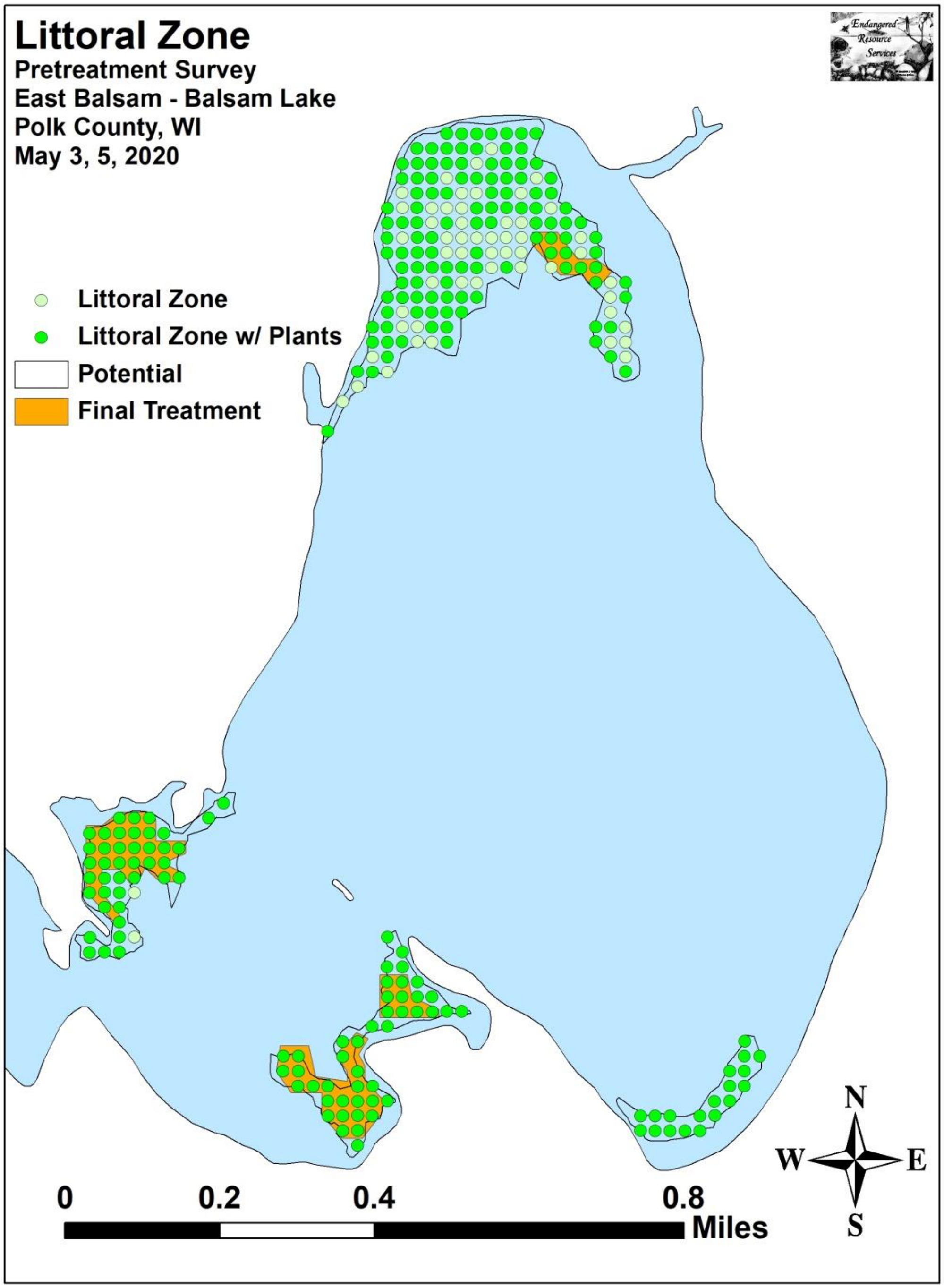
Appendix III: Pre/Posttreatment Habitat Variables

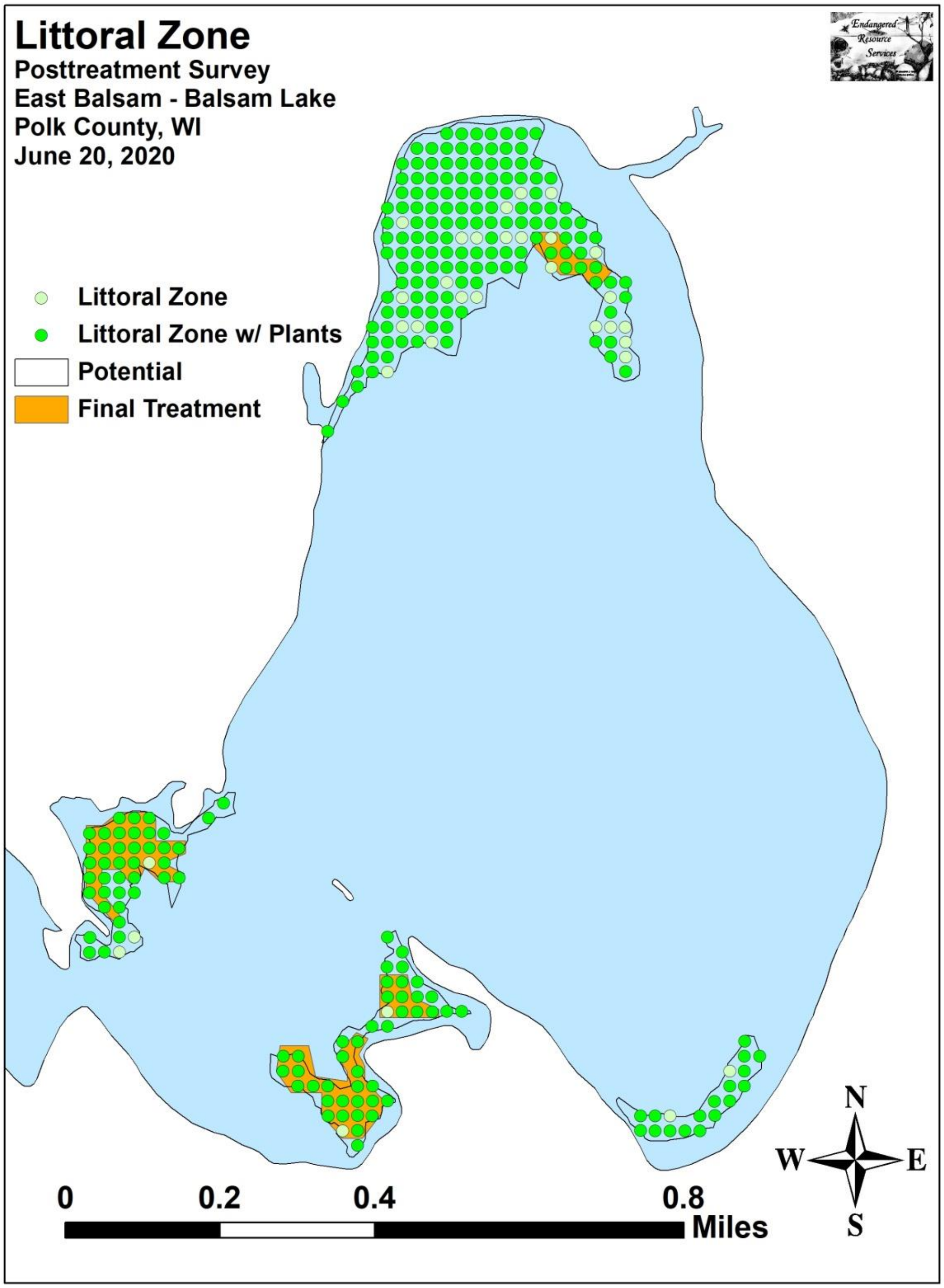

Lake Depth
Pre and Posttreatment Surveys
East Balsam - Balsam Lake
Polk County, WI
May 3, 5 and June 20, 2020
Endangered Resource Services
Depth in ft.
2.1 - 3.0
3.1 - 5.0
5.1 - 7.0
7.1 - 9.0
9.1 - 12.0
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

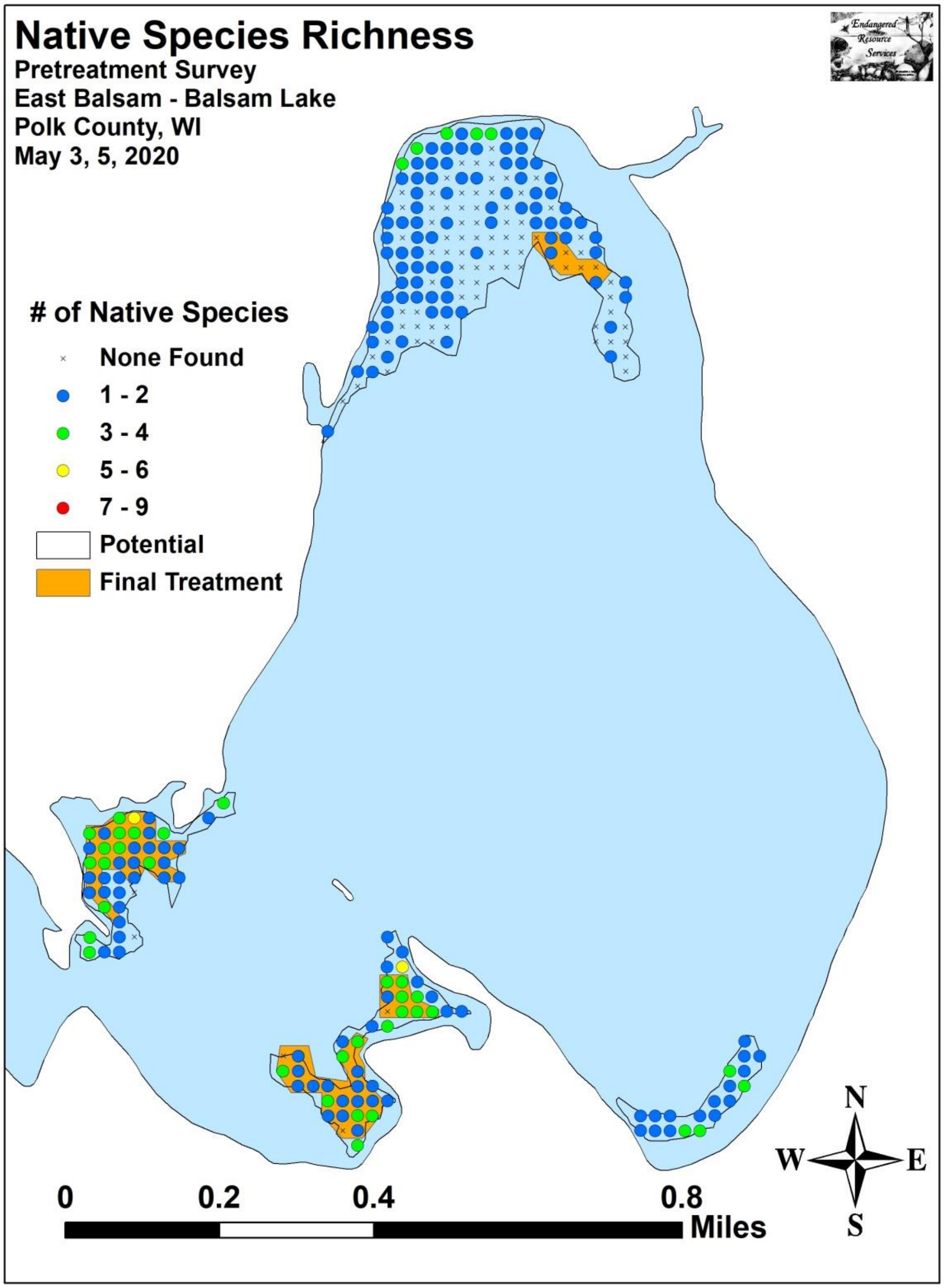


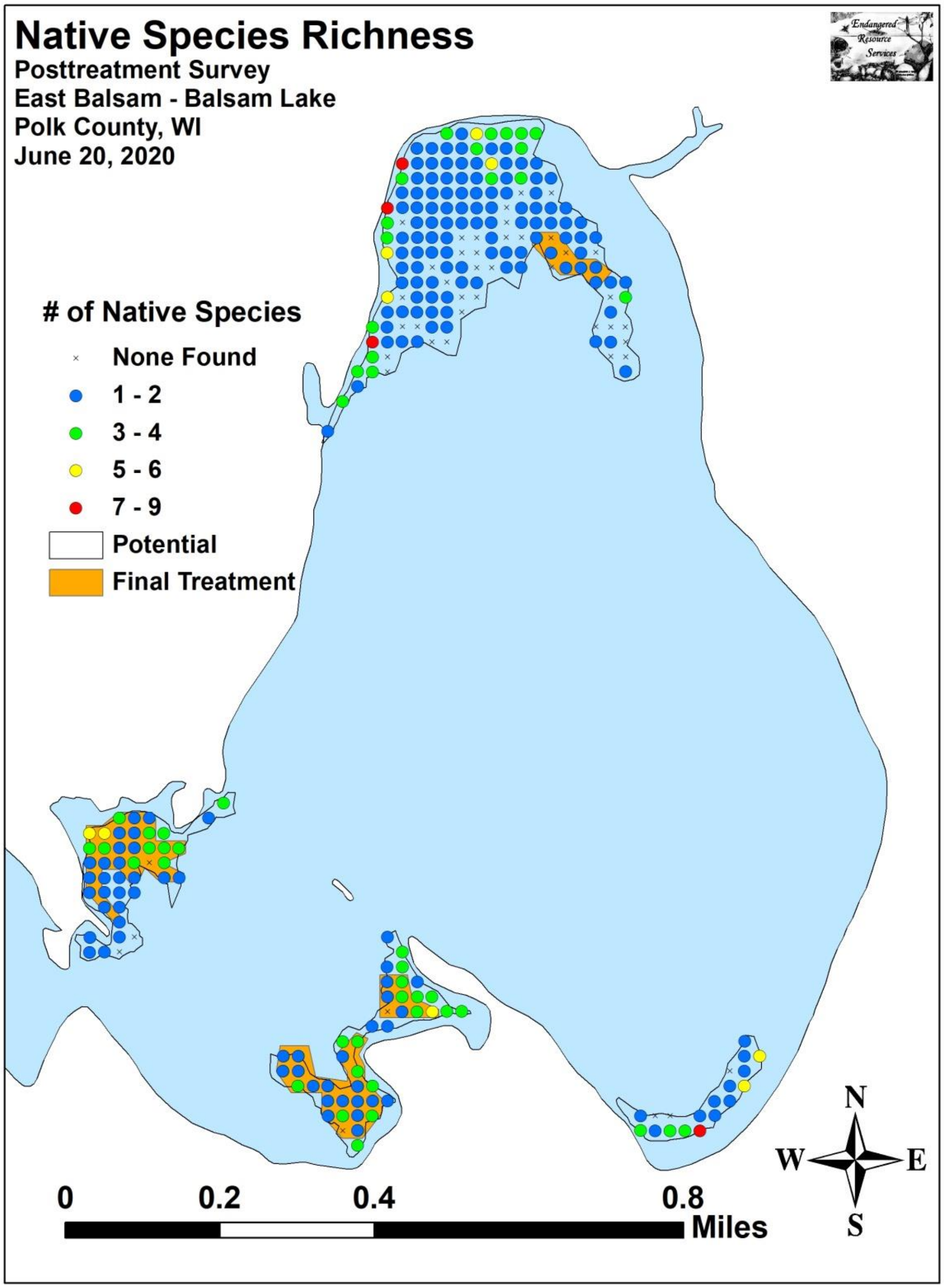
Bottom Substrate
Pre and Posttreatment Surveys
East Balsam - Balsam Lake
Polk County, WI
May 3, 5 and June 20, 2020
Endangered Resource Services
Substrate Type
Muck
Rock
Sand
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

Appendix IV: Pre/Posttreatment Littoral Zone, Native Species Richness, and Total Rake Fullness

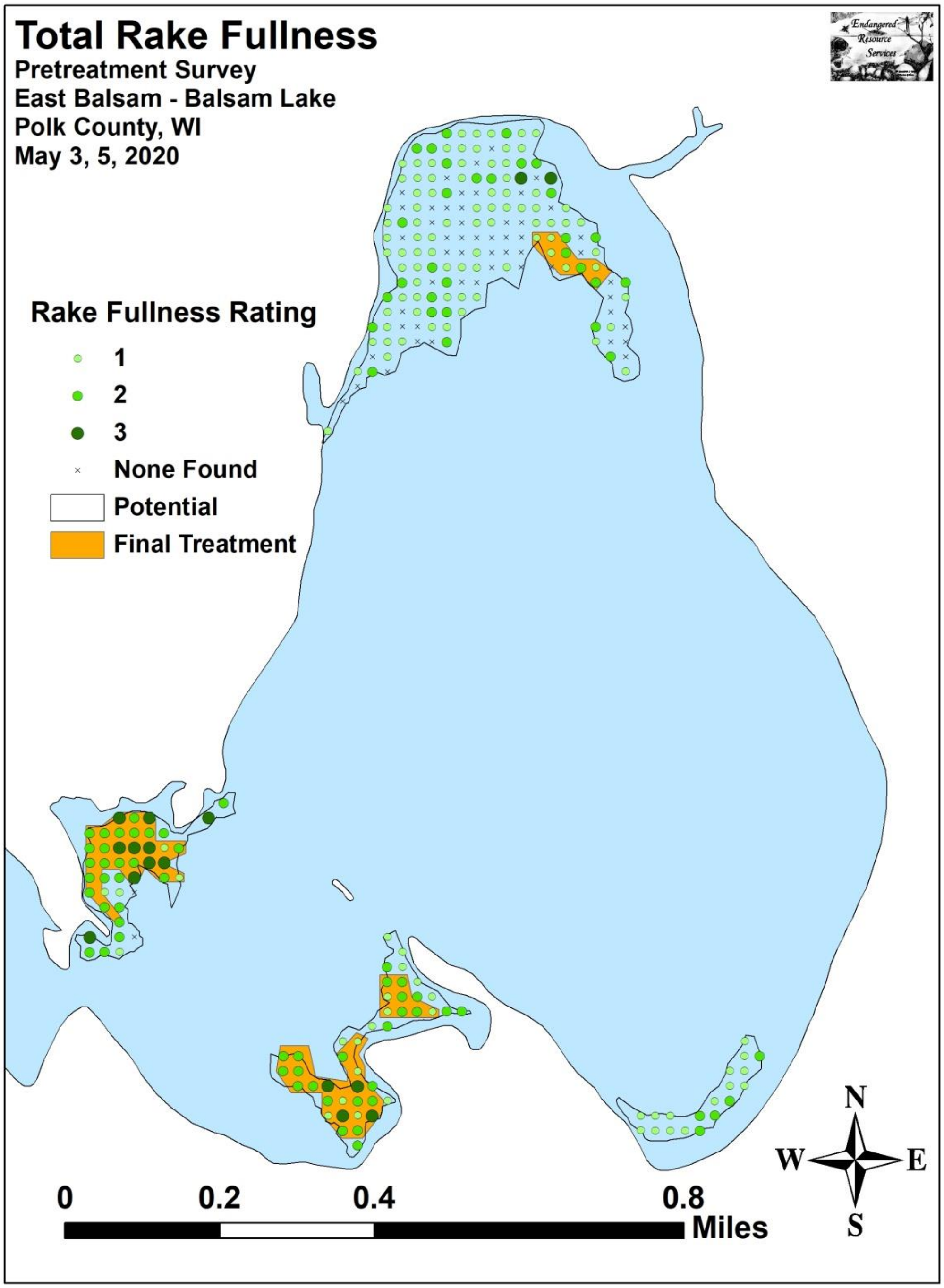

Littoral Zone
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Littoral Zone
Littoral Zone w/ Plants
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

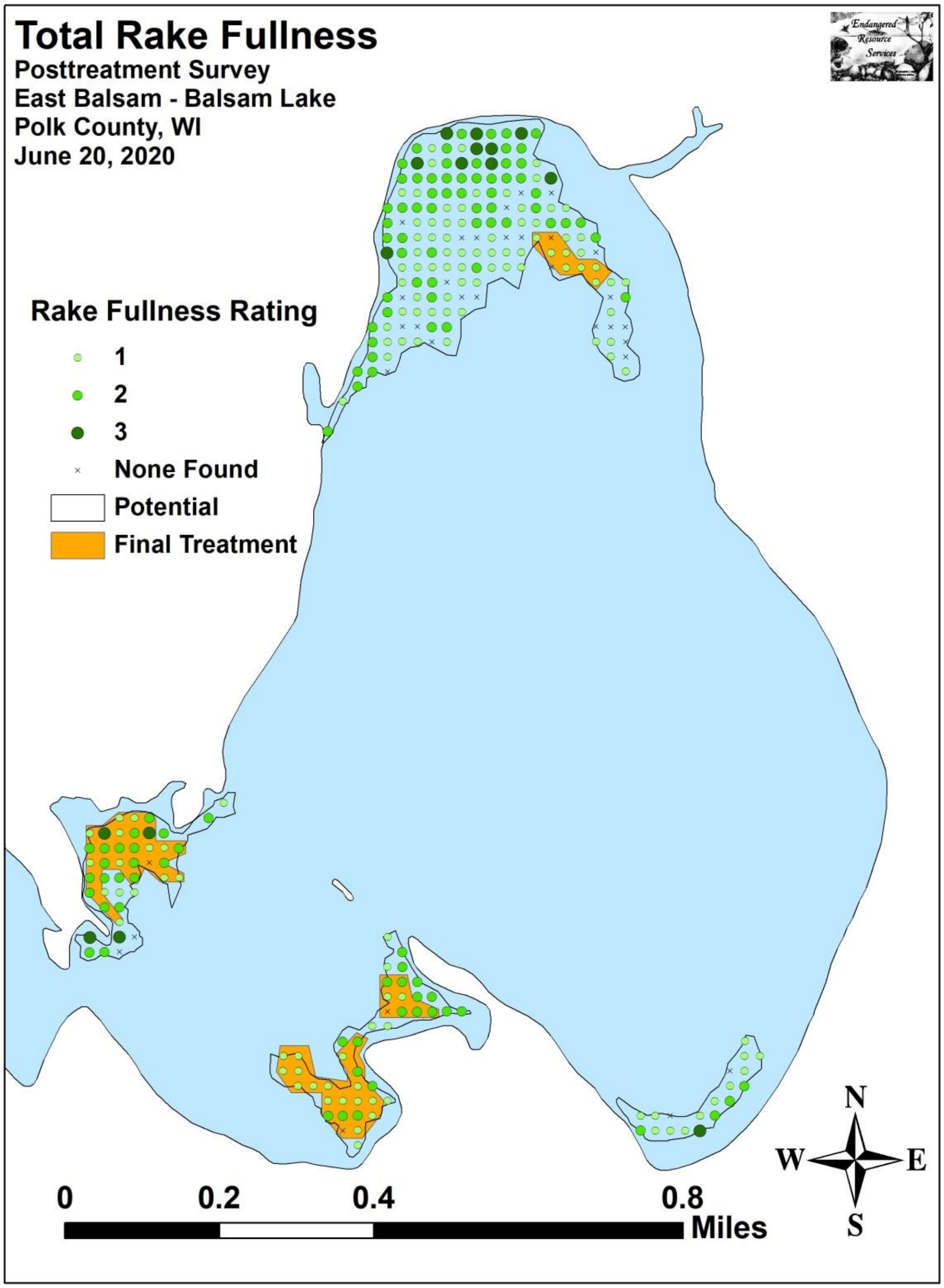

Littoral Zone
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Littoral Zone
Littoral Zone w/ Plants
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S


Native Species Richness
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
# of Native Species
None Found
1 - 2
3 - 4
5 - 6
7 - 9
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S



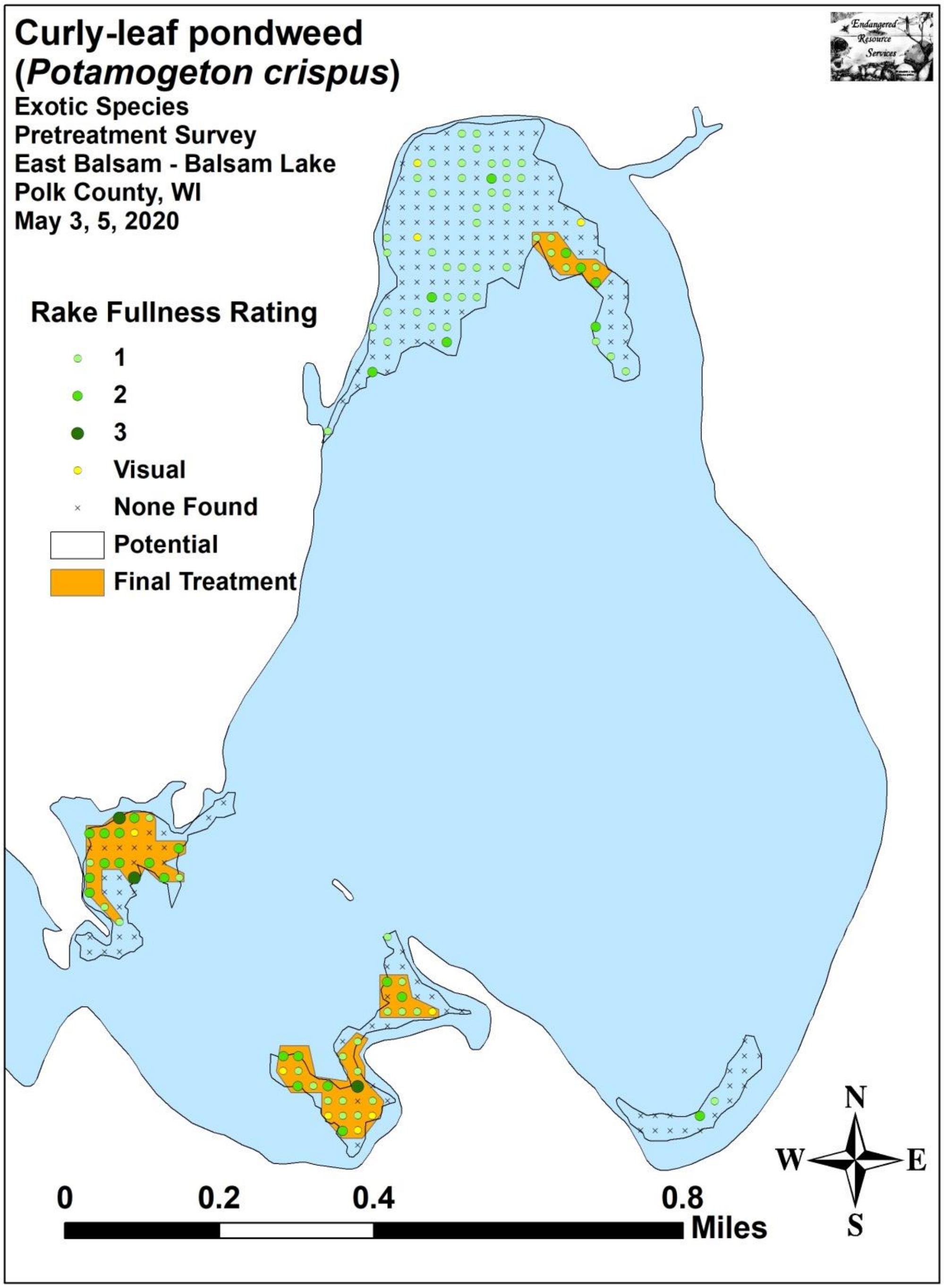
Native Species Richness
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
# of Native Species
None Found
1 - 2
3 - 4
5 - 6
7 - 9
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S


Total Rake Fullness
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Rake Fullness Rating
1
2
3
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

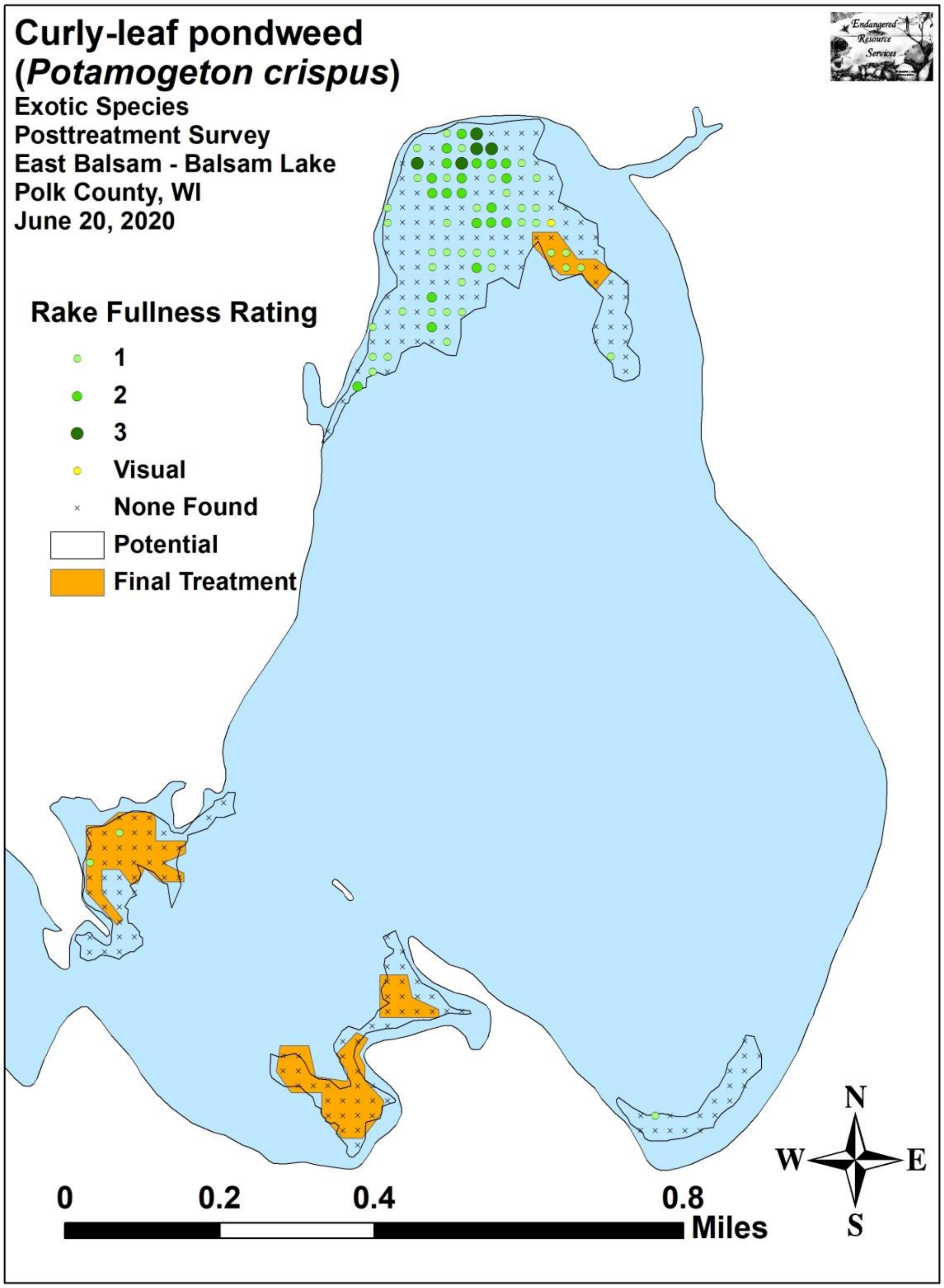


Total Rake Fullness
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Rake Fullness Rating
1
2
3
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

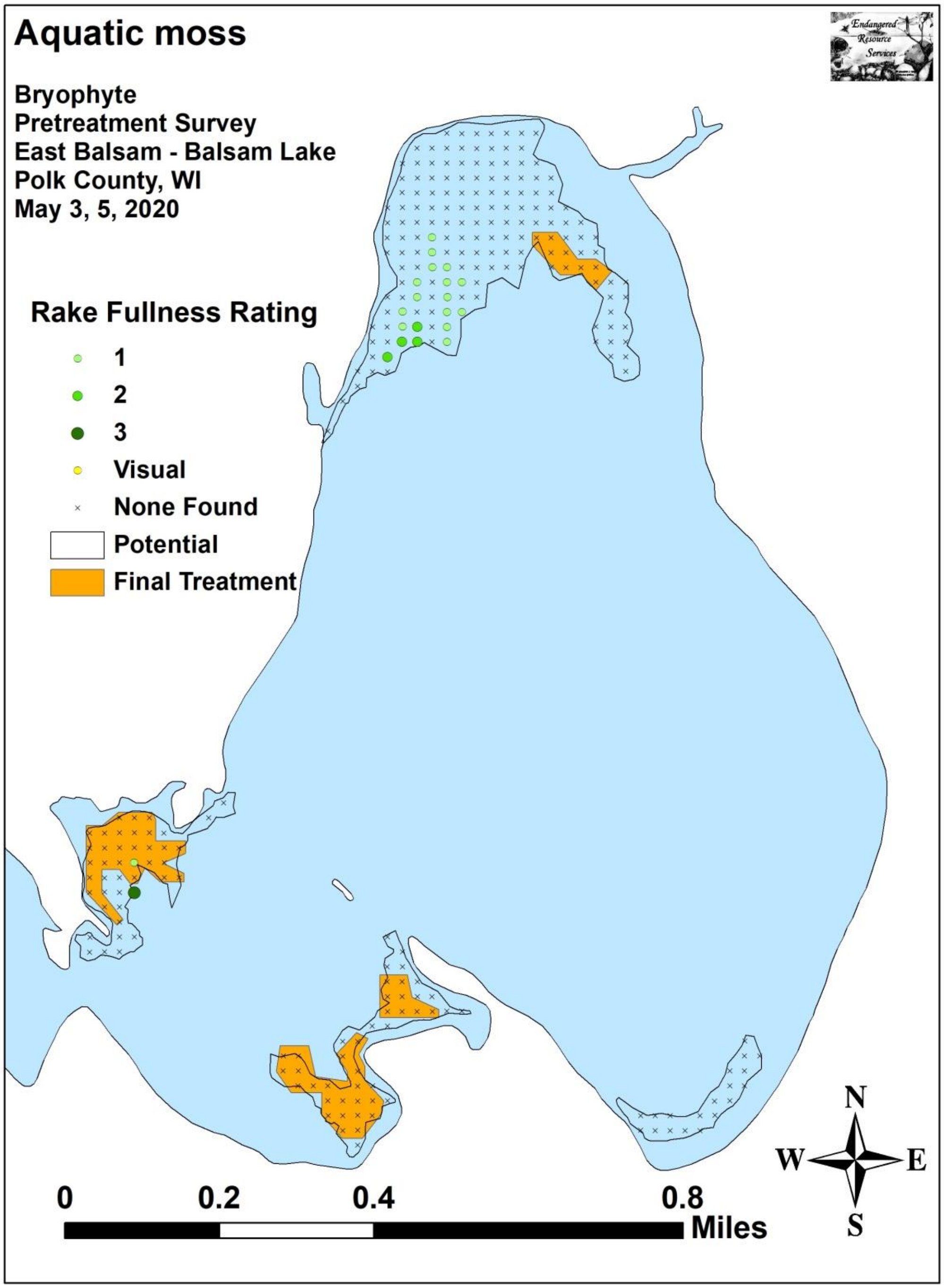
Appendix V: CLP Pre/Posttreatment Density and Distribution

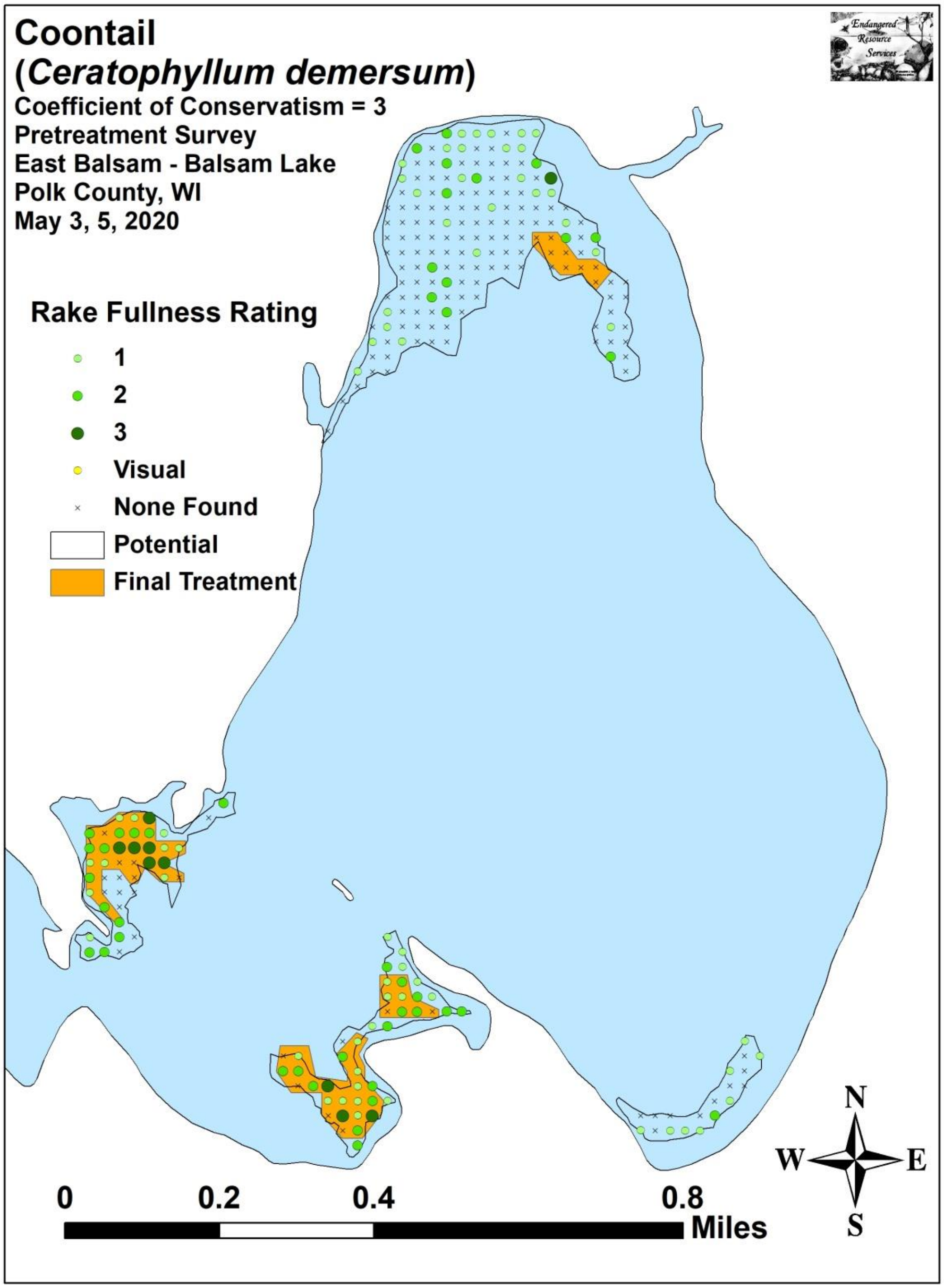


Curly-leaf pondweed
(Potamogeton crispus)
Exotic Species
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

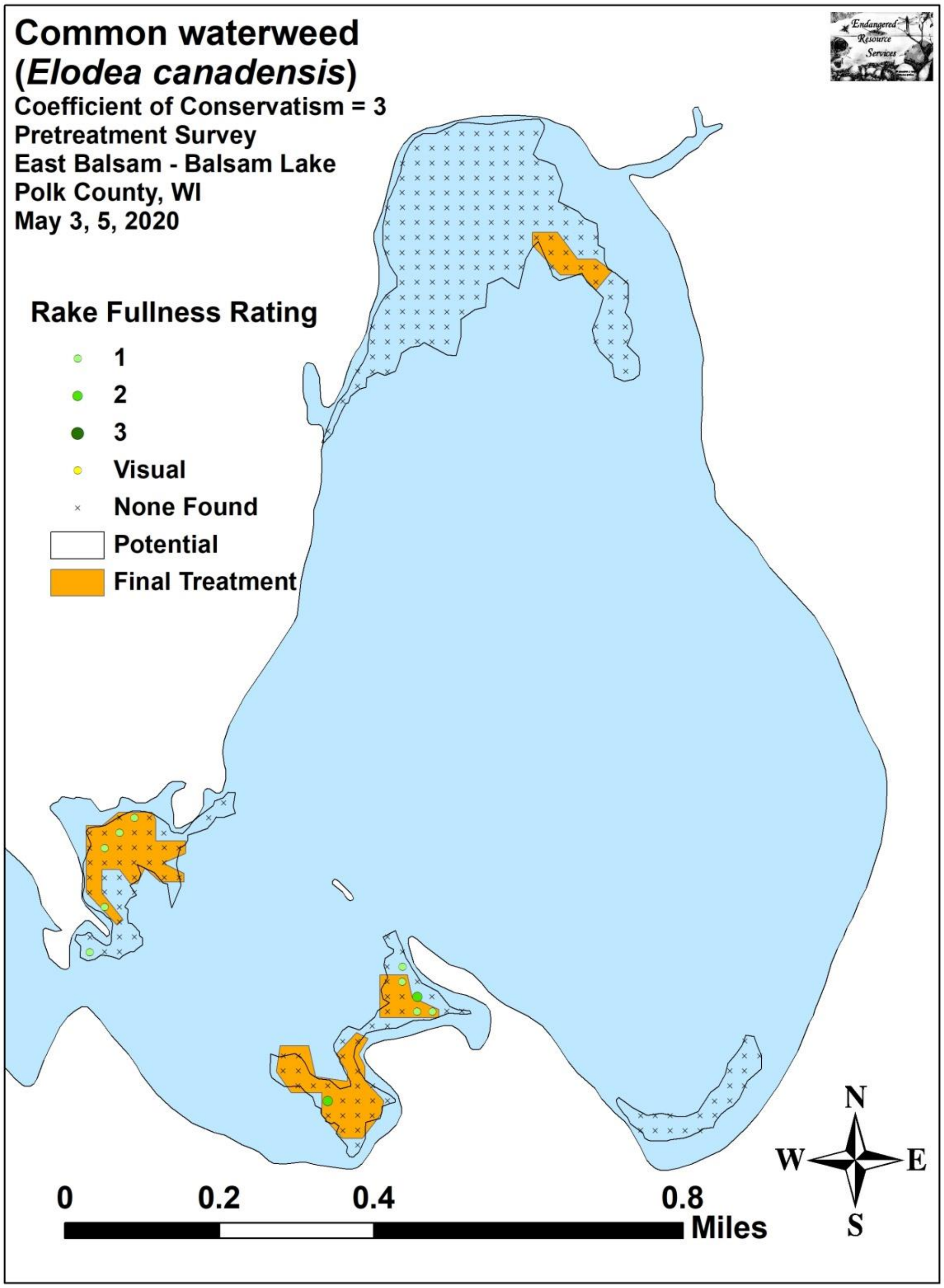

Curly-leaf pondweed
(*Potamogeton crispus*)
Exotic Species
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
Endangered Resource Services
N
W
E
S
0
0.2
0.4
0.8
Miles

Appendix VI: Pretreatment Native Species Density and Distribution

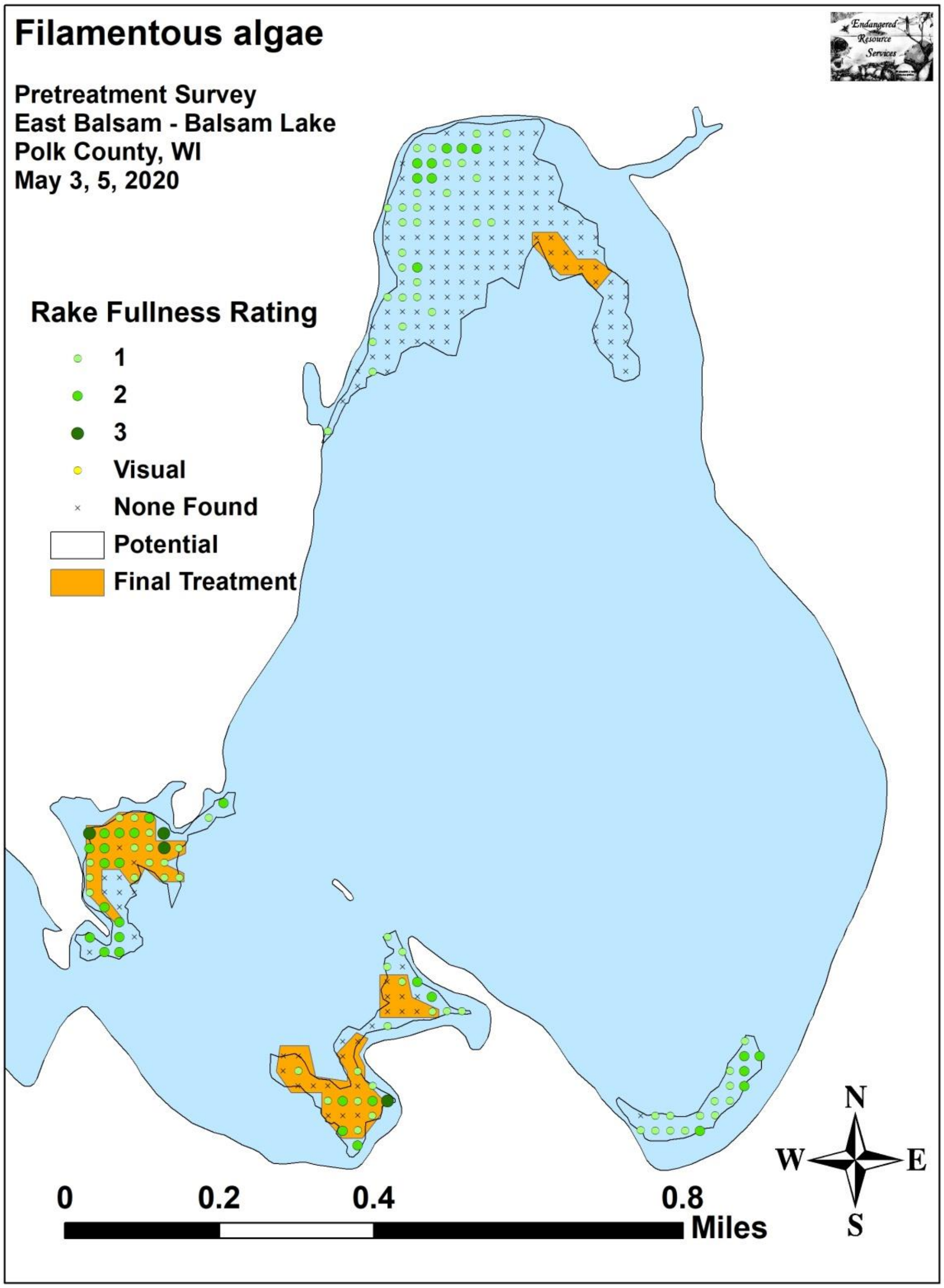

Aquatic moss
Endangered Resource Services
Bryophyte
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

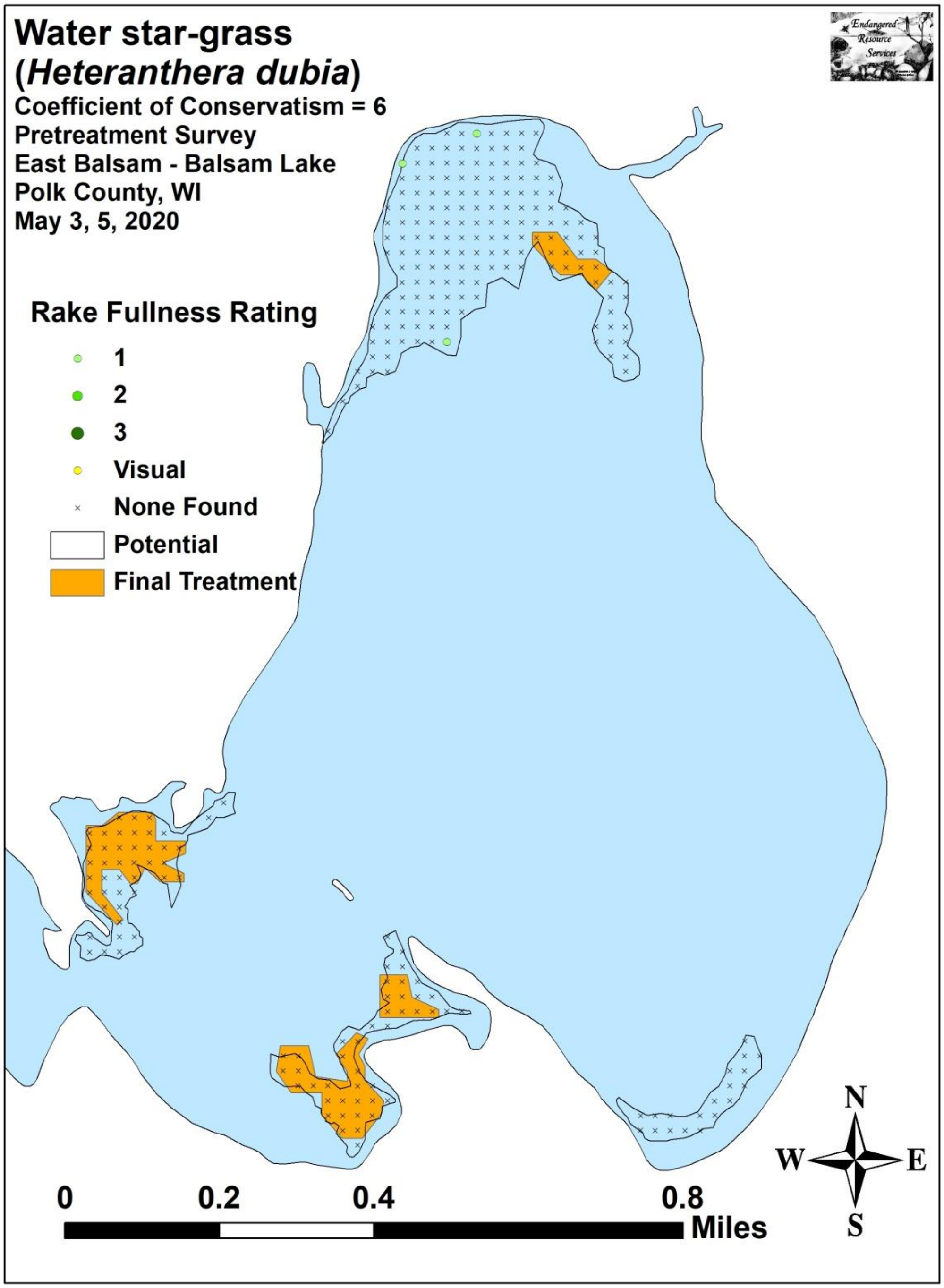


Coontail
(*Ceratophyllum demersum*)
Coefficient of Conservatism = 3
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
Endangered Resource Services
N
W
E
S
0
0.2
0.4
0.8
Miles

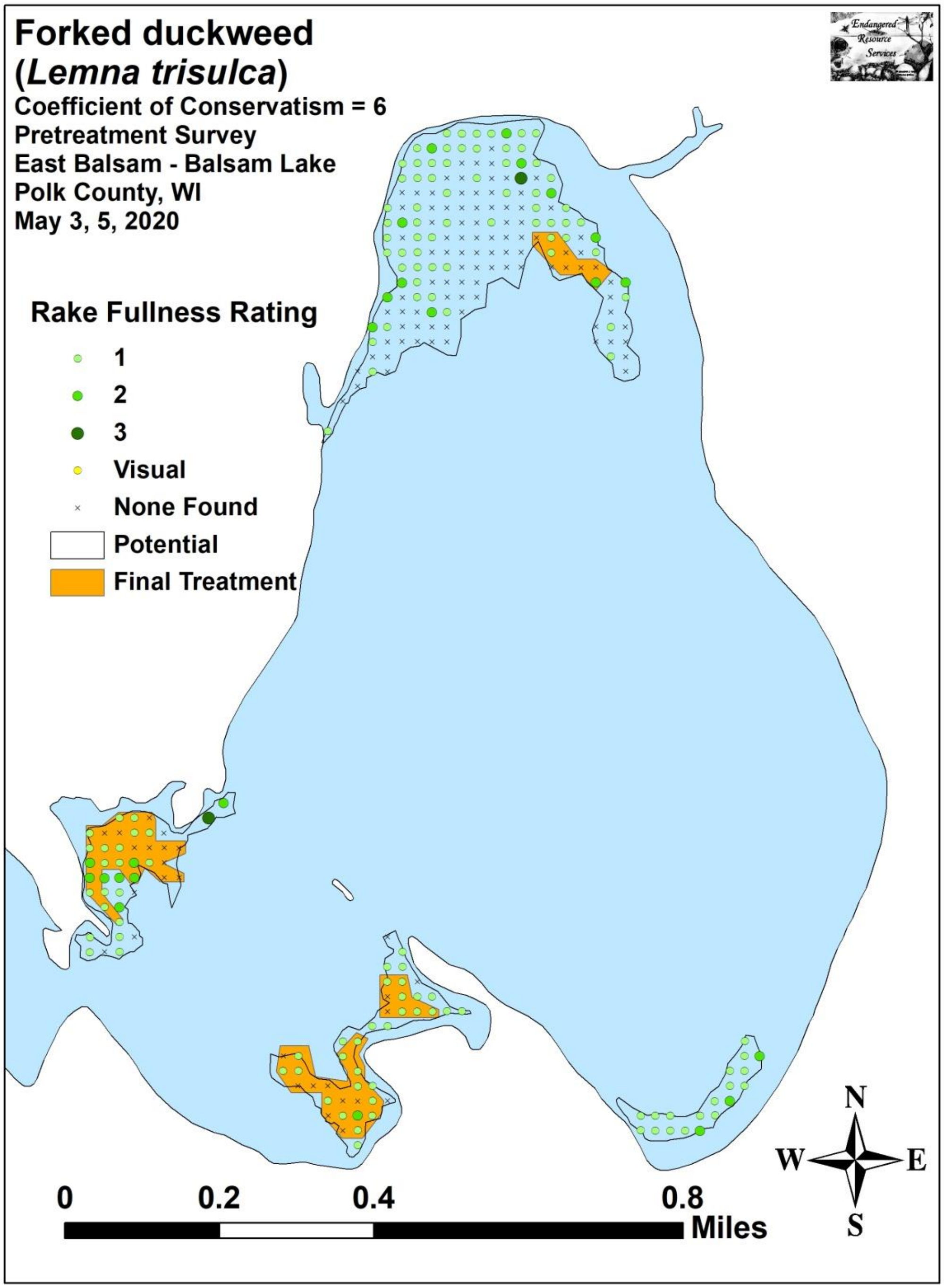


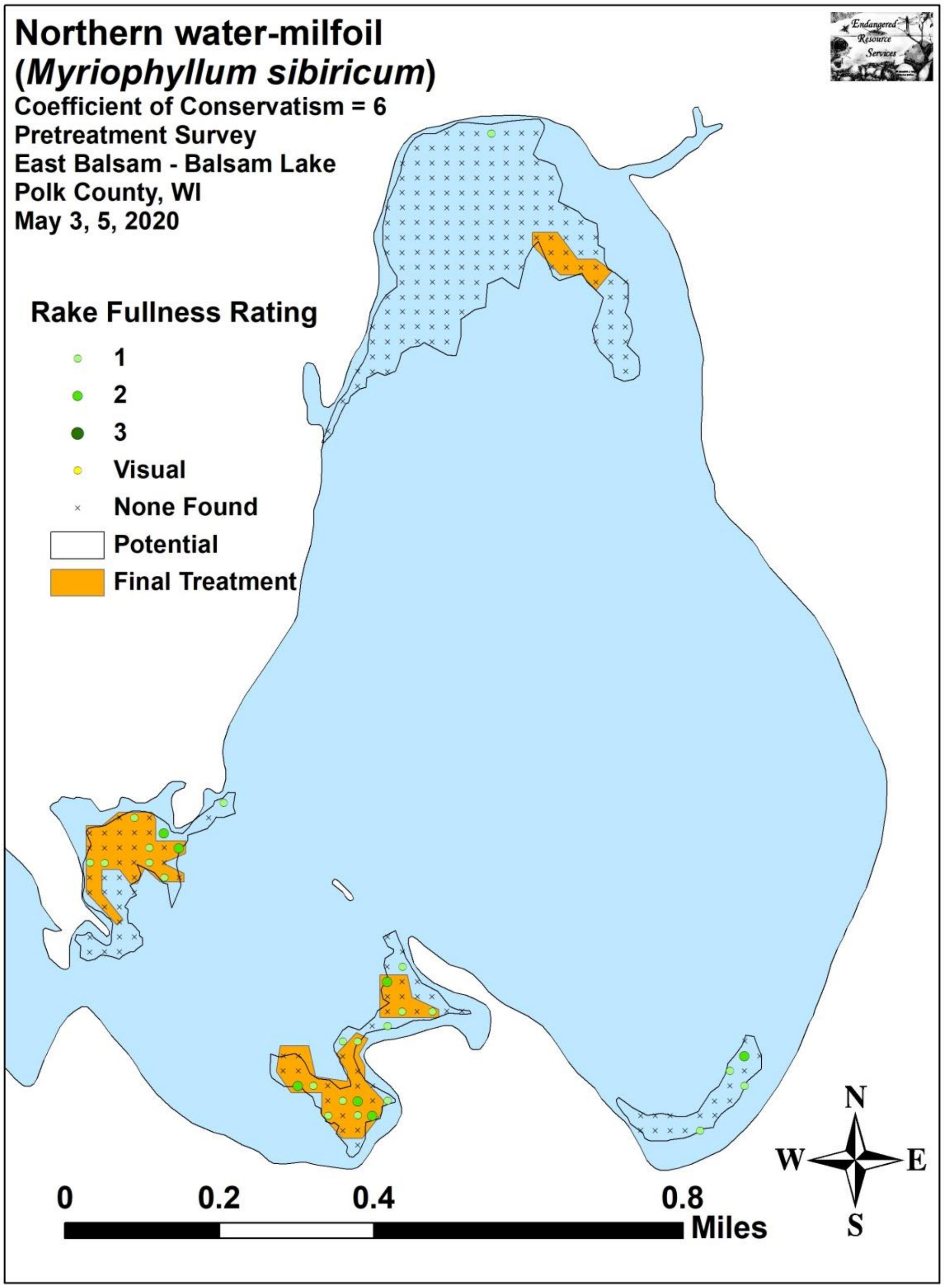
Common waterweed
(*Elodea canadensis*)
Coefficient of Conservatism = 3
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
N
W
E
S
0
0.2
0.4
0.8
Miles

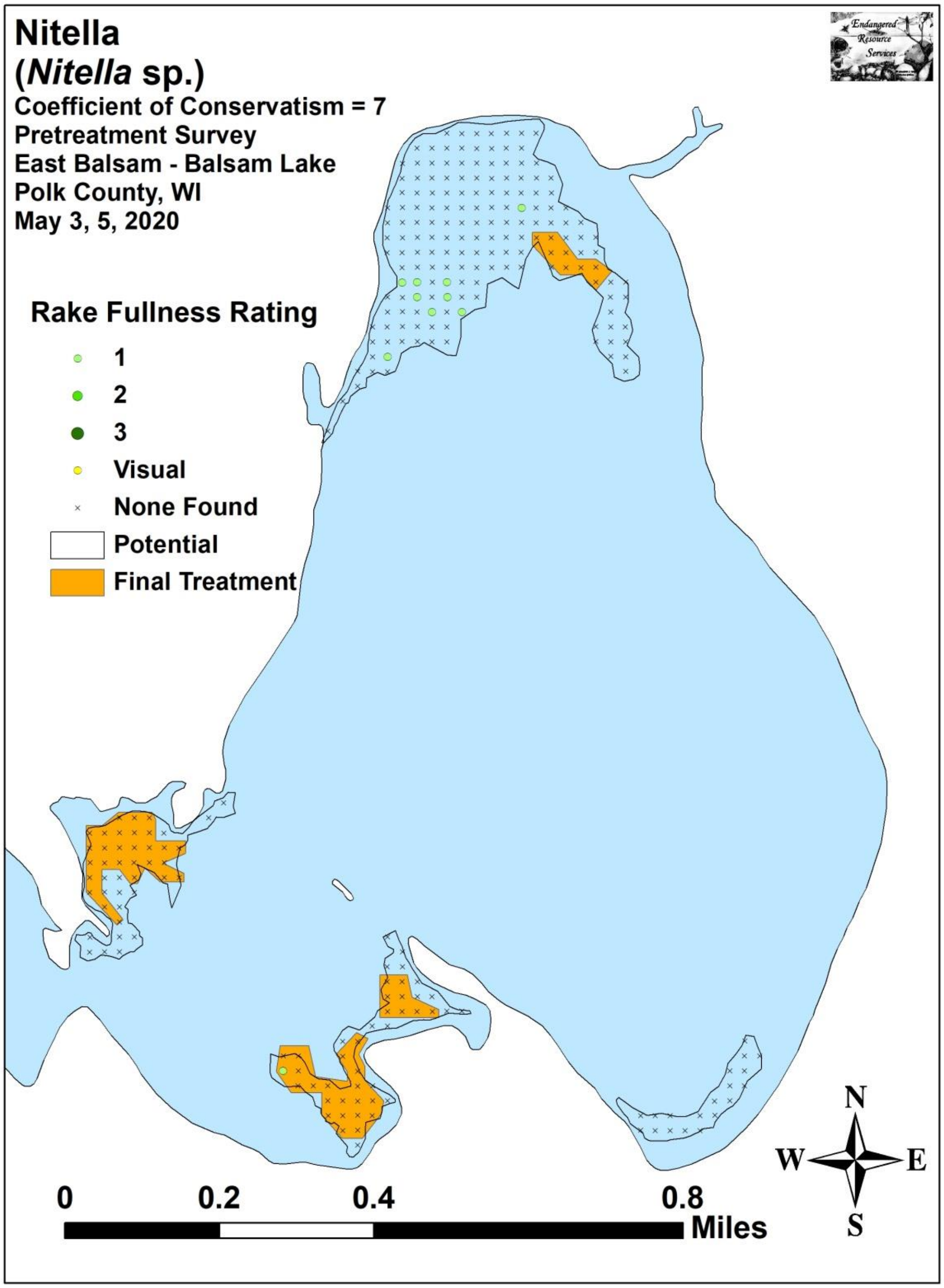

Filamentous algae
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

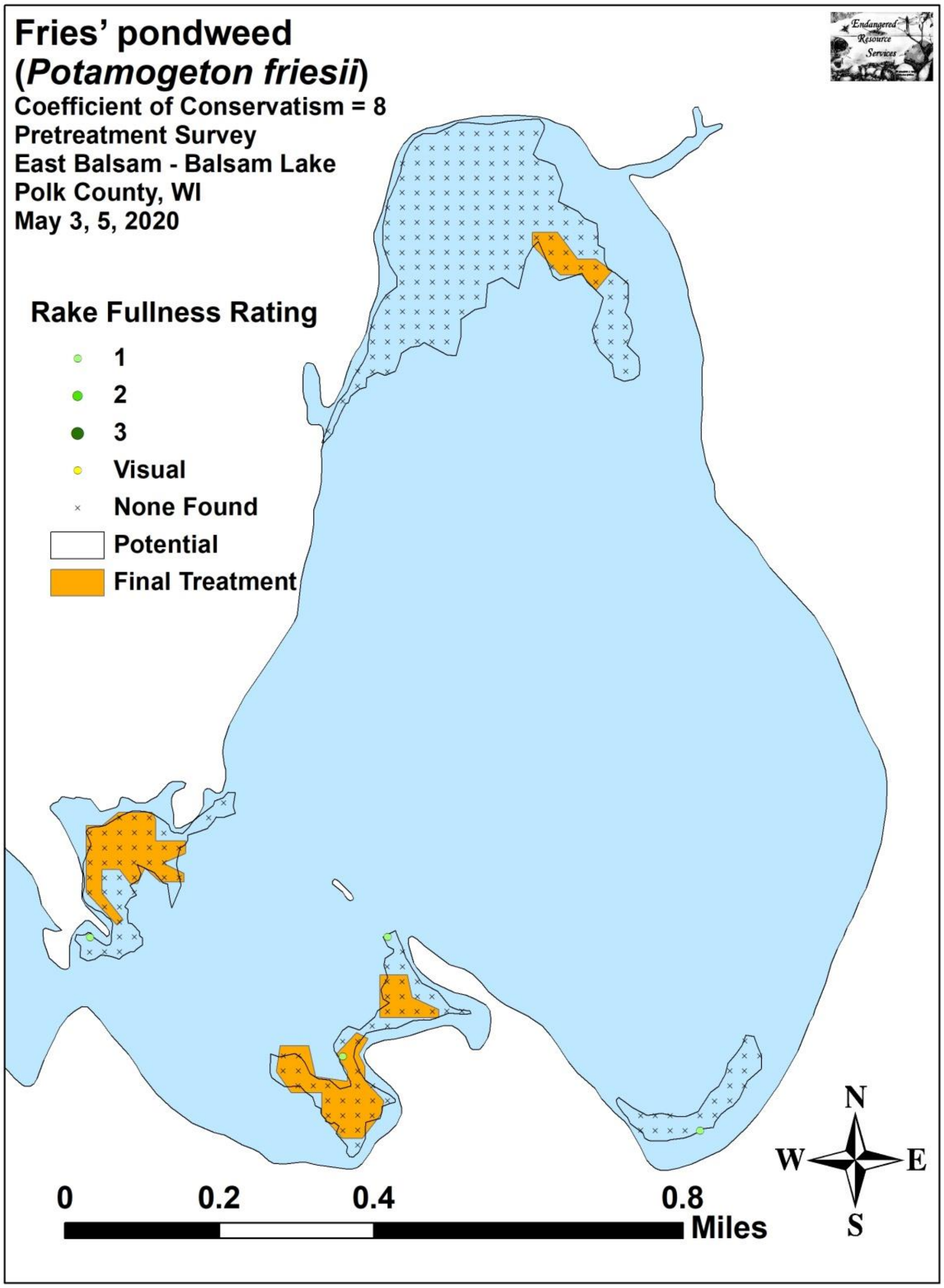


Water star-grass
(*Heteranthera dubia*)
Coefficient of Conservatism = 6
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

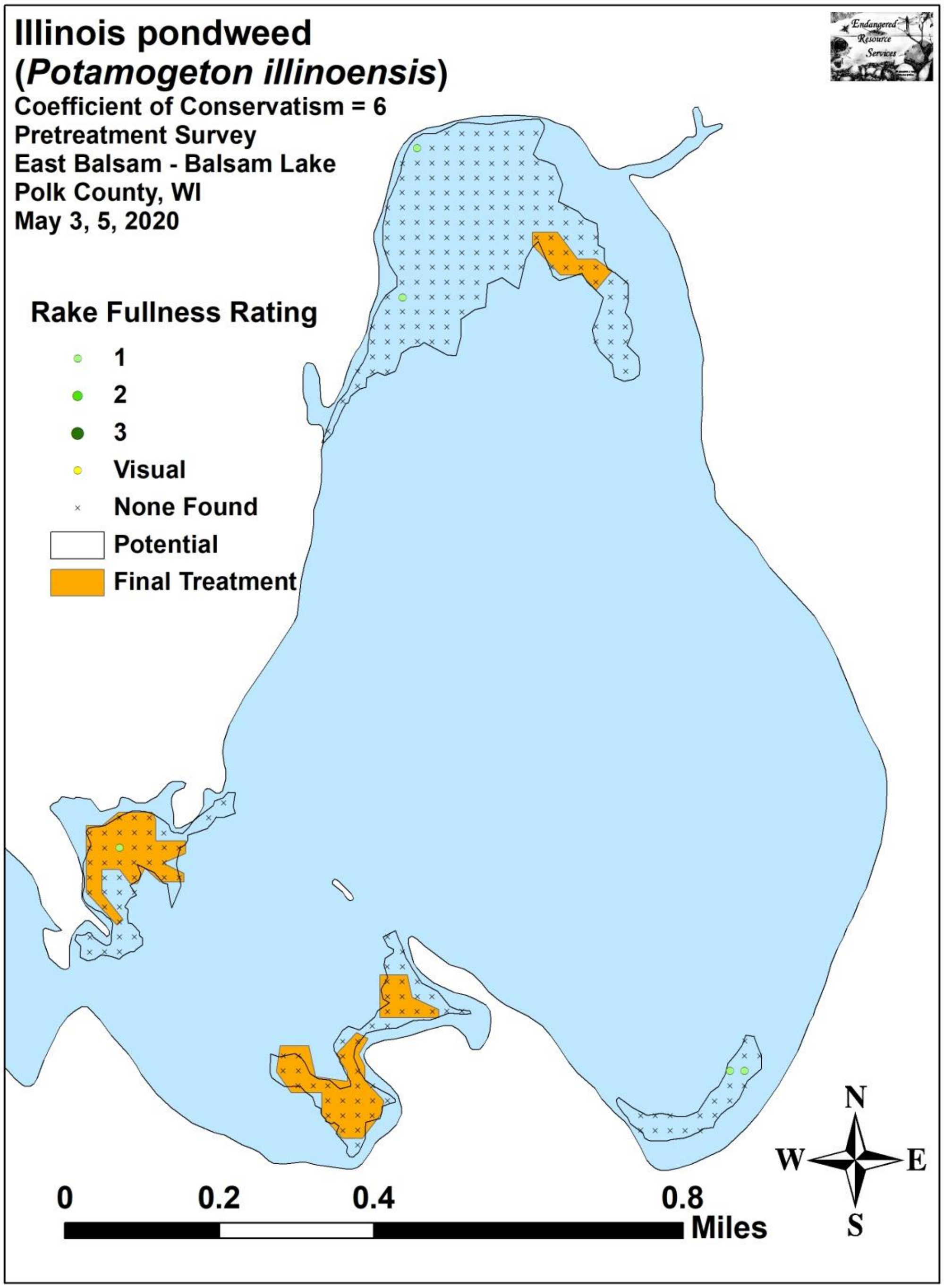

Forked duckweed
(*Lemna trisulca*)
Coefficient of Conservatism = 6
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S


Northern water-milfoil
(*Myriophyllum sibiricum*)
Coefficient of Conservatism = 6
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

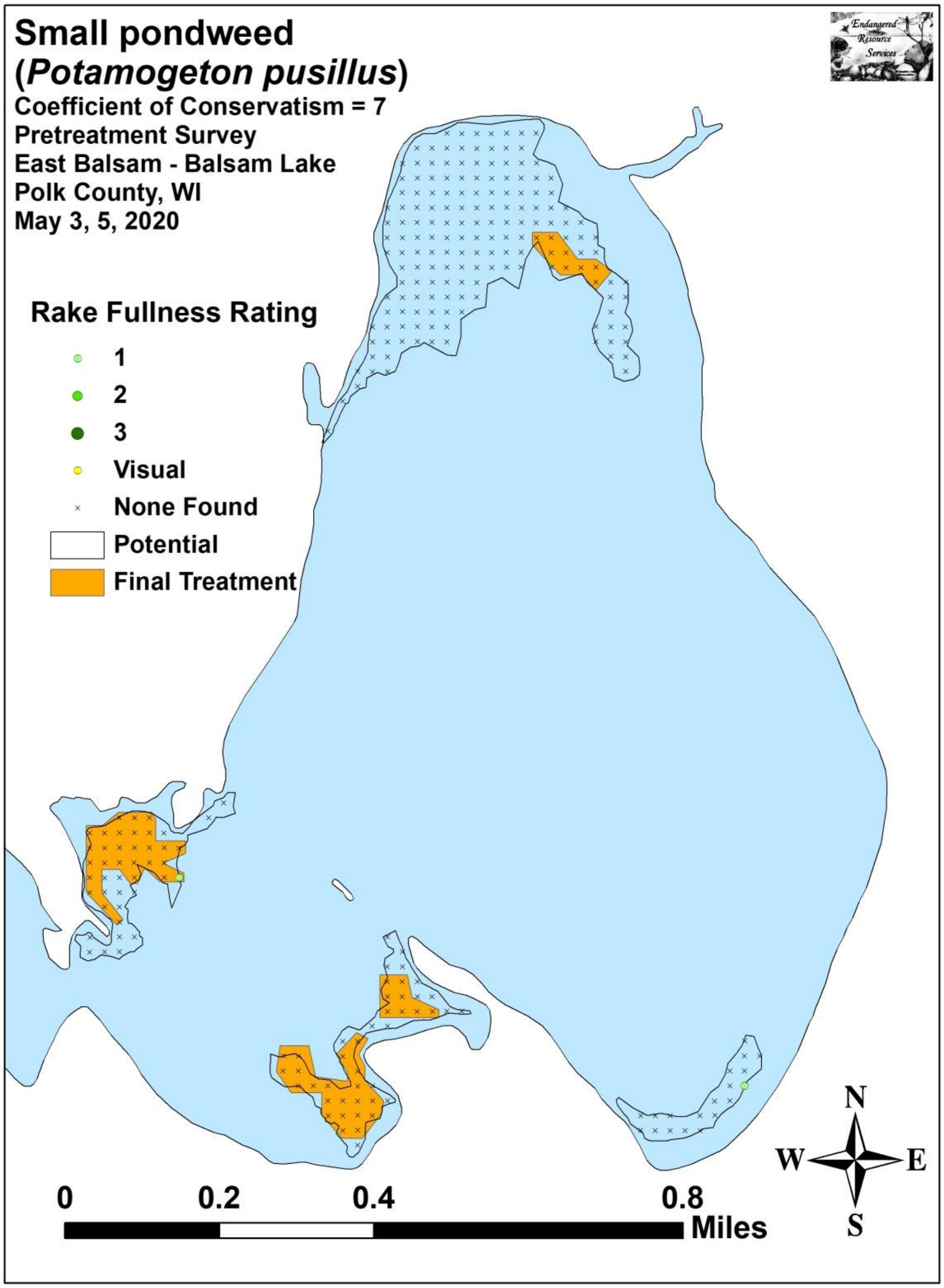

Nitella
(*Nitella* sp.)
Coefficient of Conservatism = 7
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

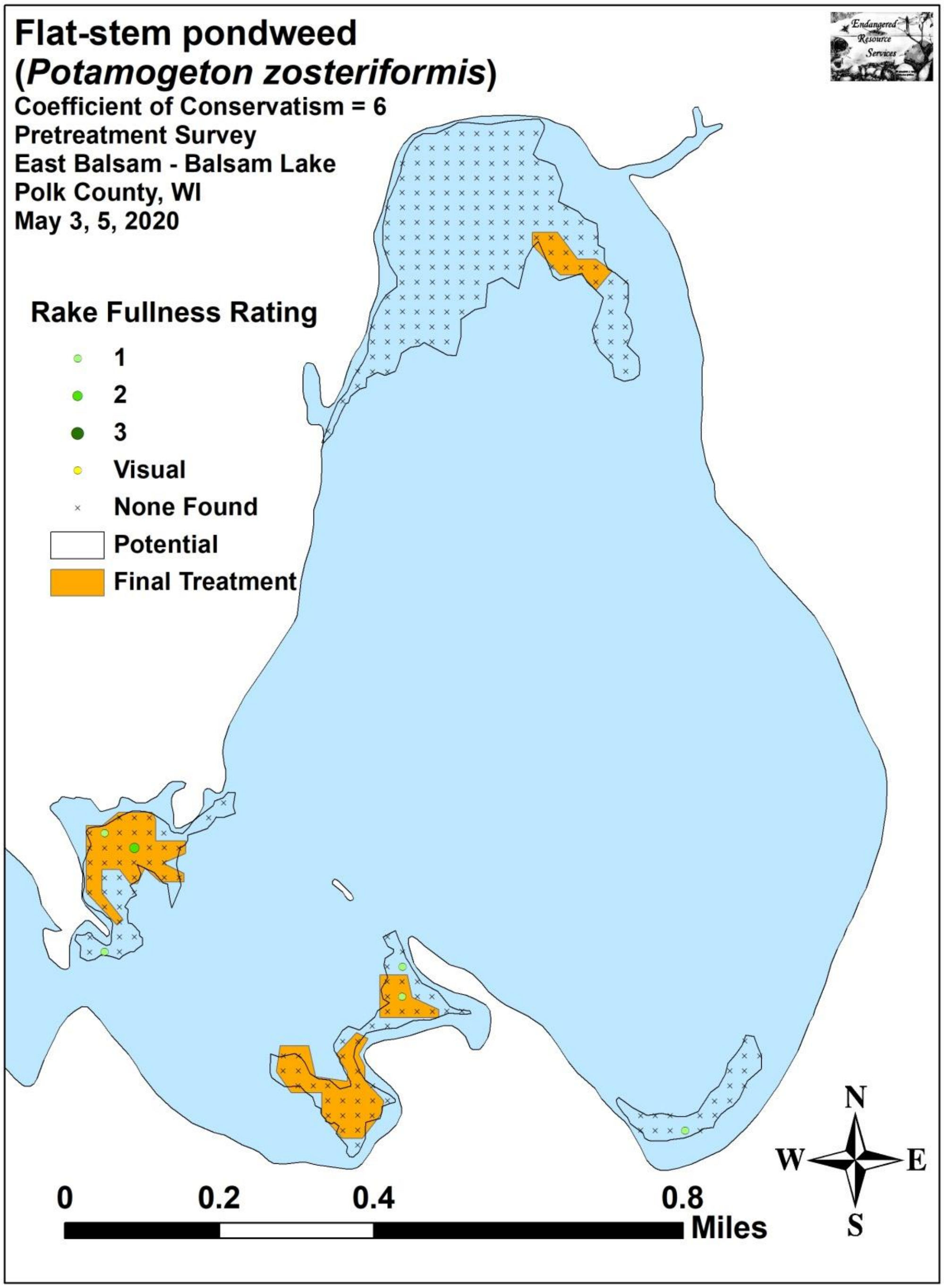


Fries' pondweed
(*Potamogeton friesii*)
Coefficient of Conservatism = 8
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

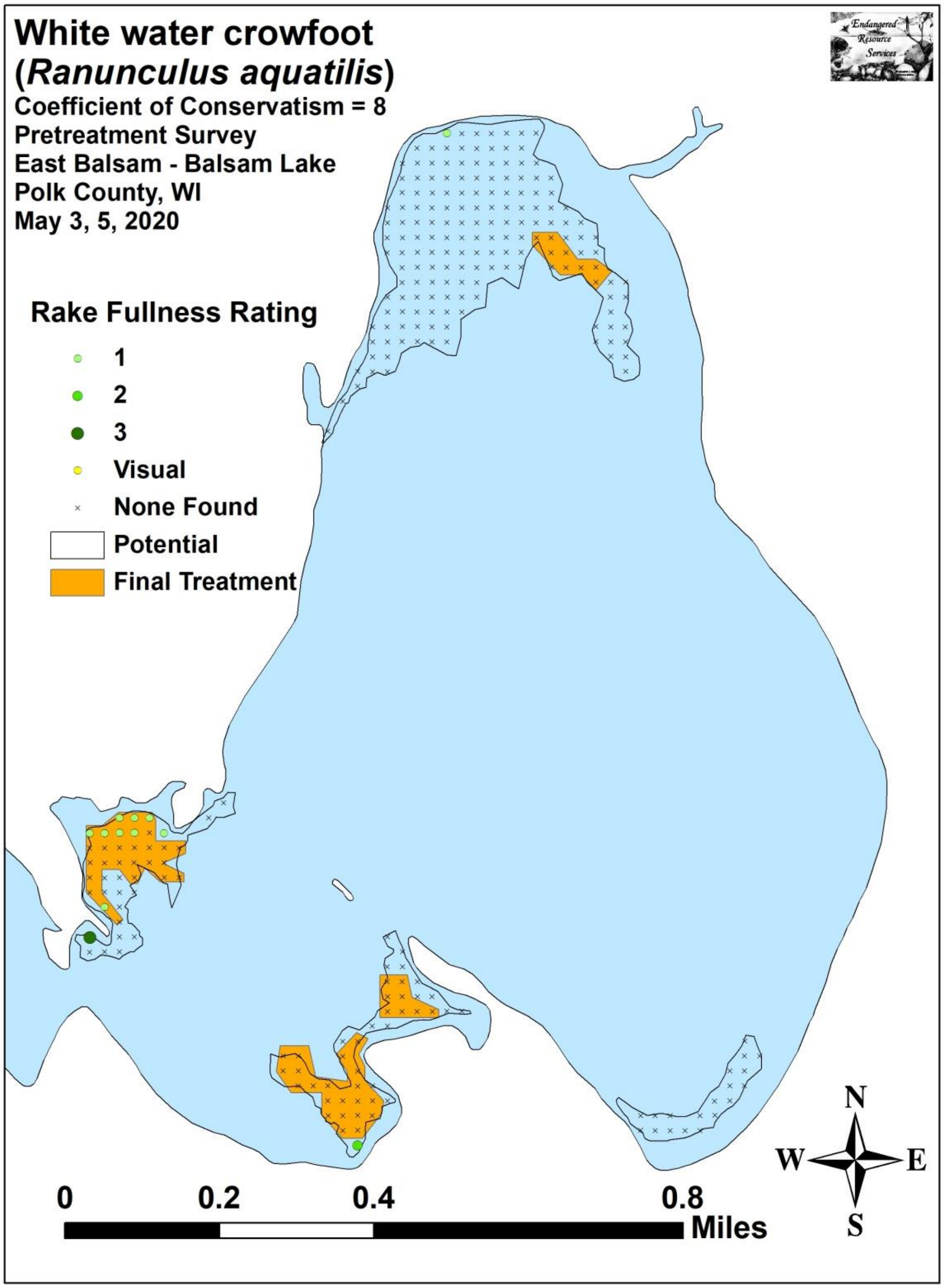


Illinois pondweed
(Potamogeton illinoensis)
Coefficient of Conservatism = 6
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
N
W
E
S
0
0.2
0.4
0.8
Miles

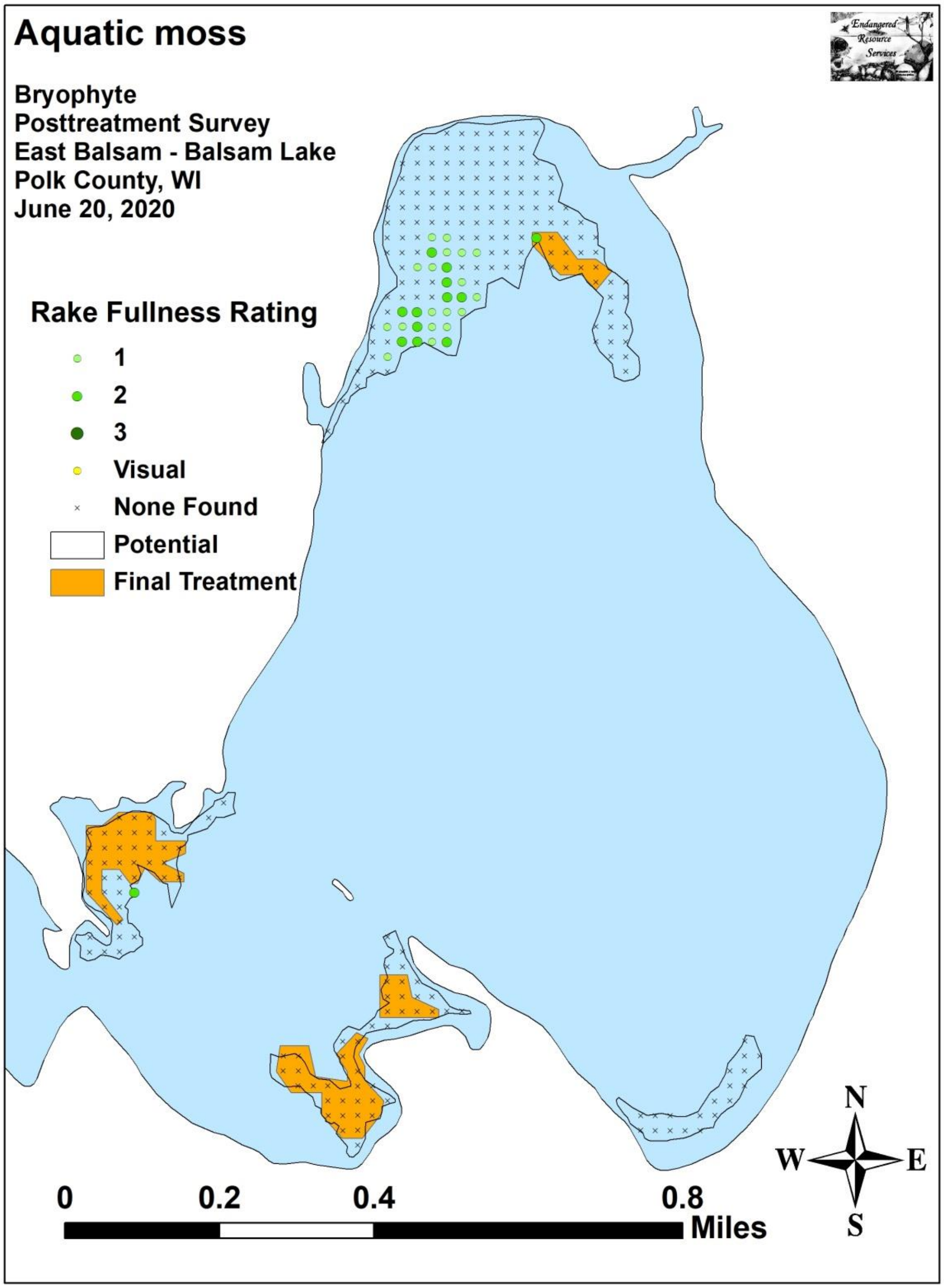

Small pondweed
(*Potamogeton pusillus*)
Coefficient of Conservatism = 7
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S



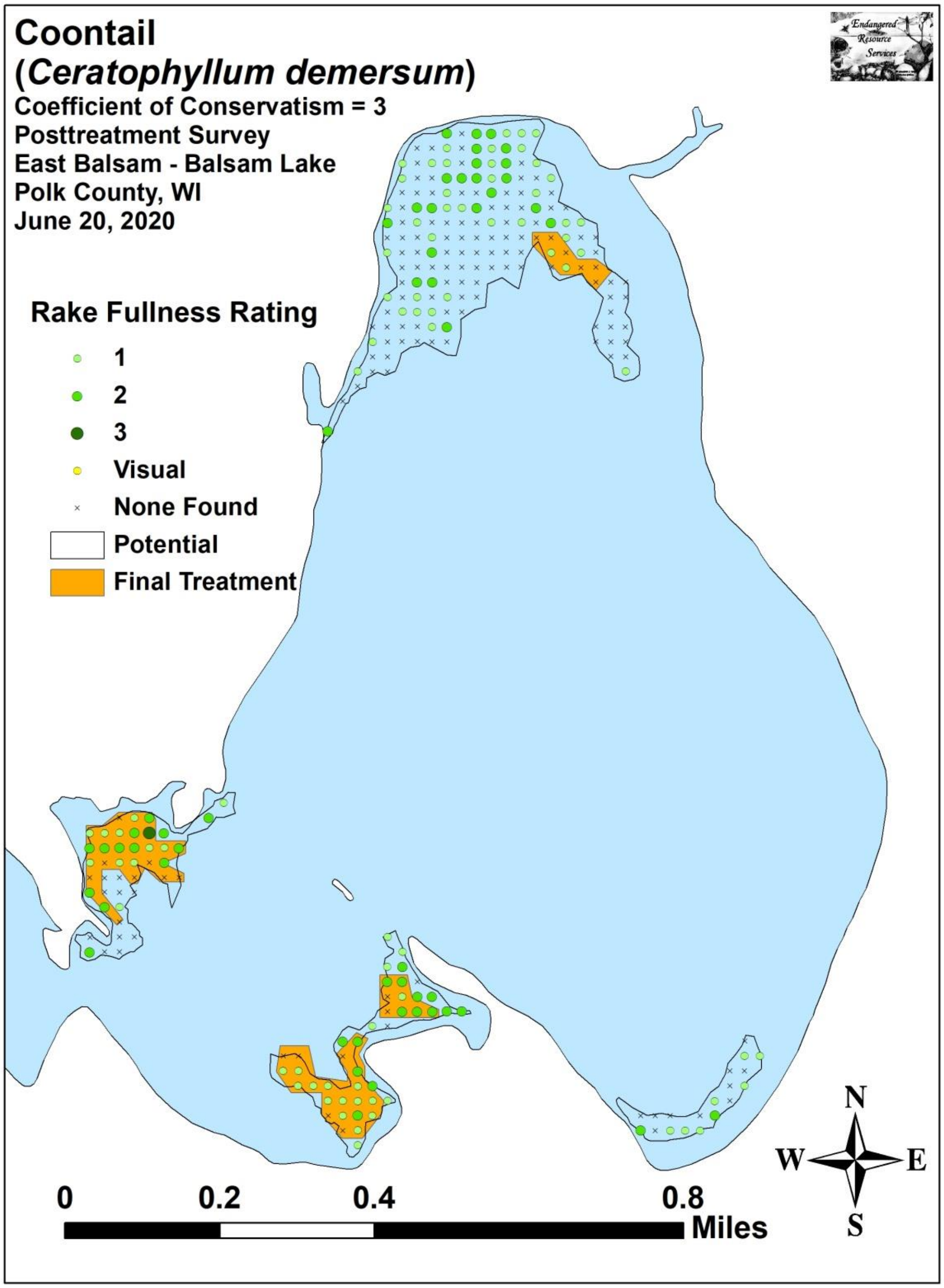
Flat-stem pondweed
(Potamogeton zosteriformis)
Coefficient of Conservatism = 6
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
Endangered Resource Services
0
0.2
0.4
0.8
Miles
N
W
E
S

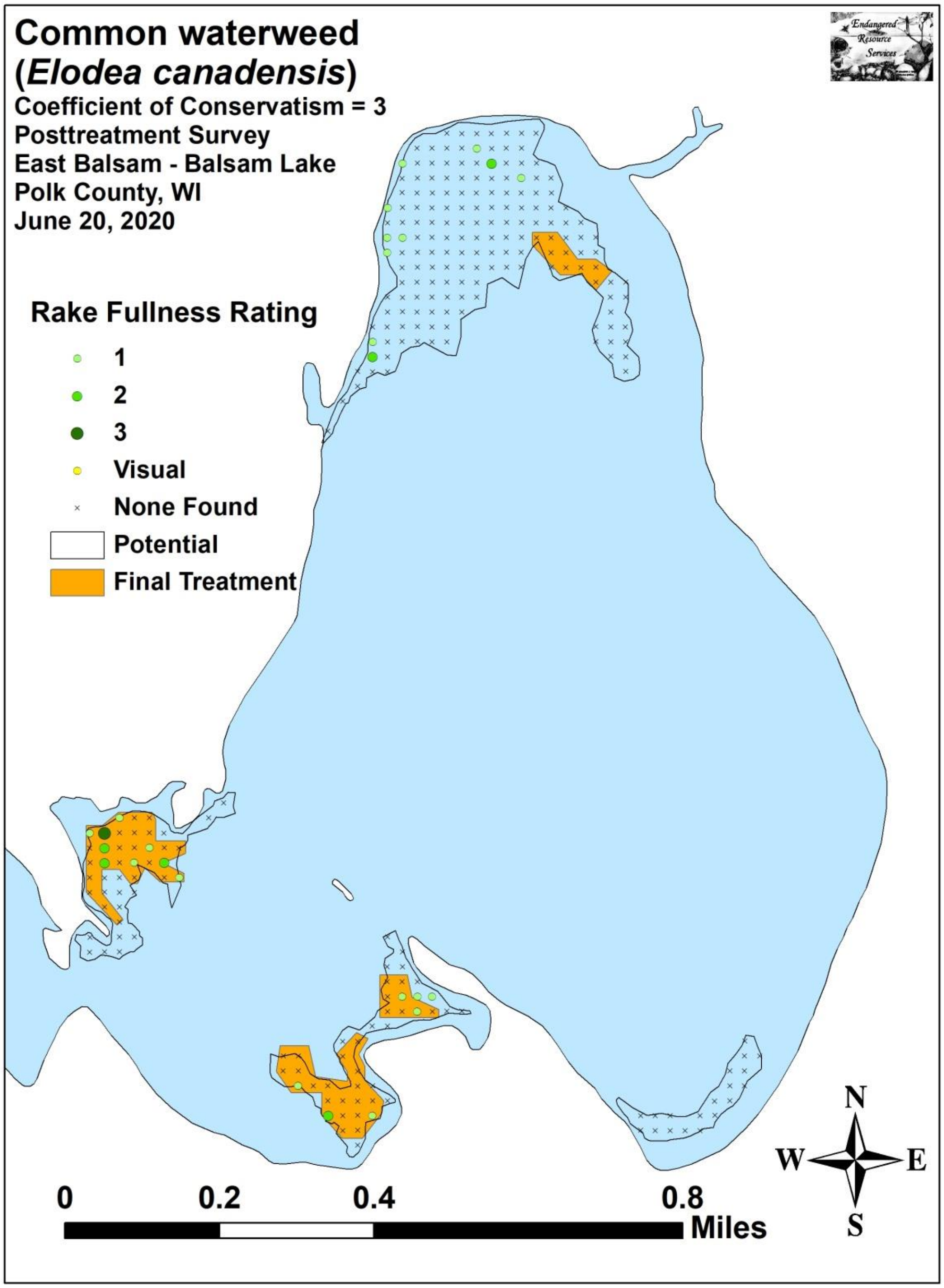

White water crowfoot
(*Ranunculus aquatilis*)
Coefficient of Conservatism = 8
Pretreatment Survey
East Balsam - Balsam Lake
Polk County, WI
May 3, 5, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

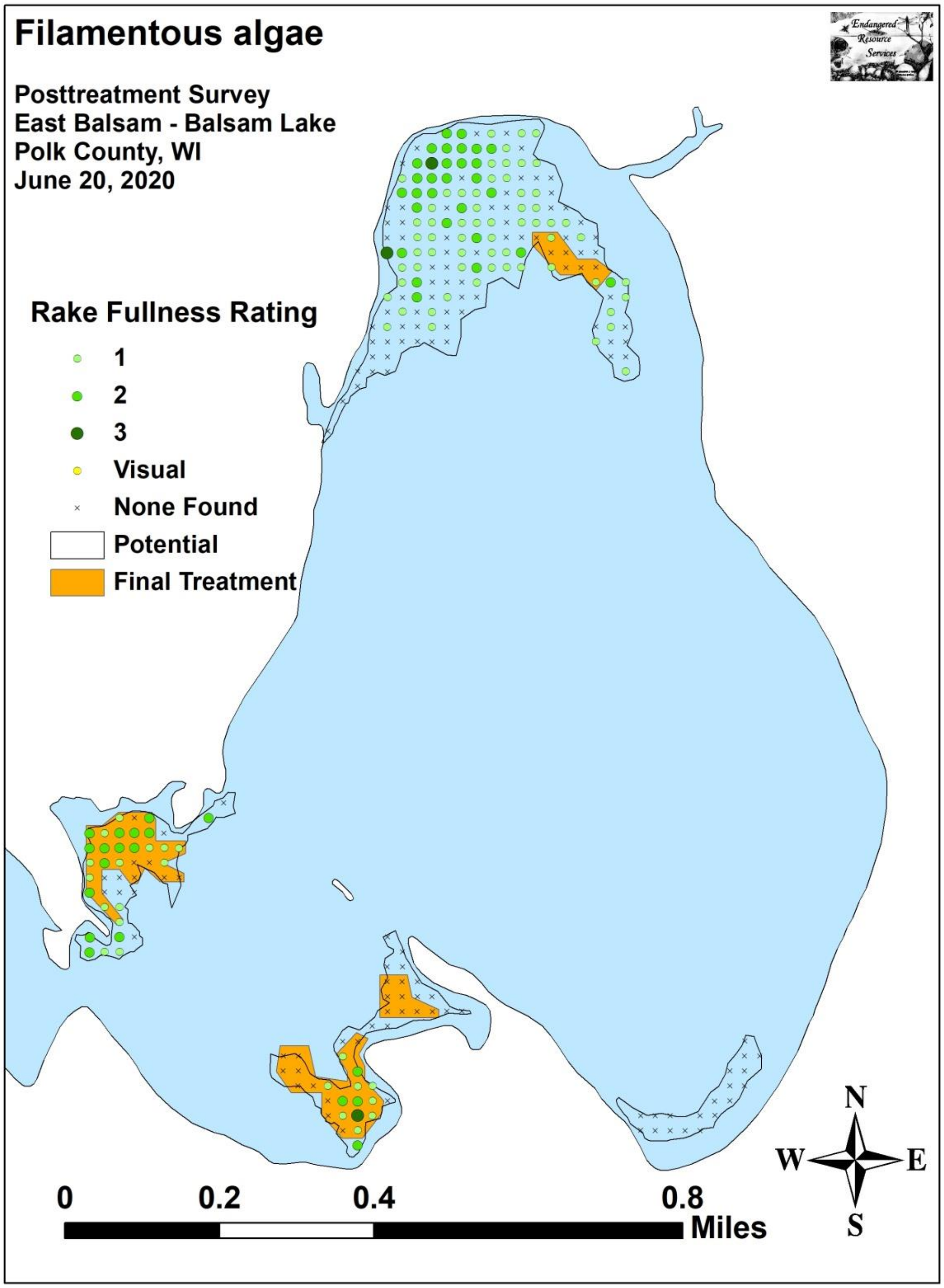
Appendix VII: Posttreatment Native Species Density and Distribution



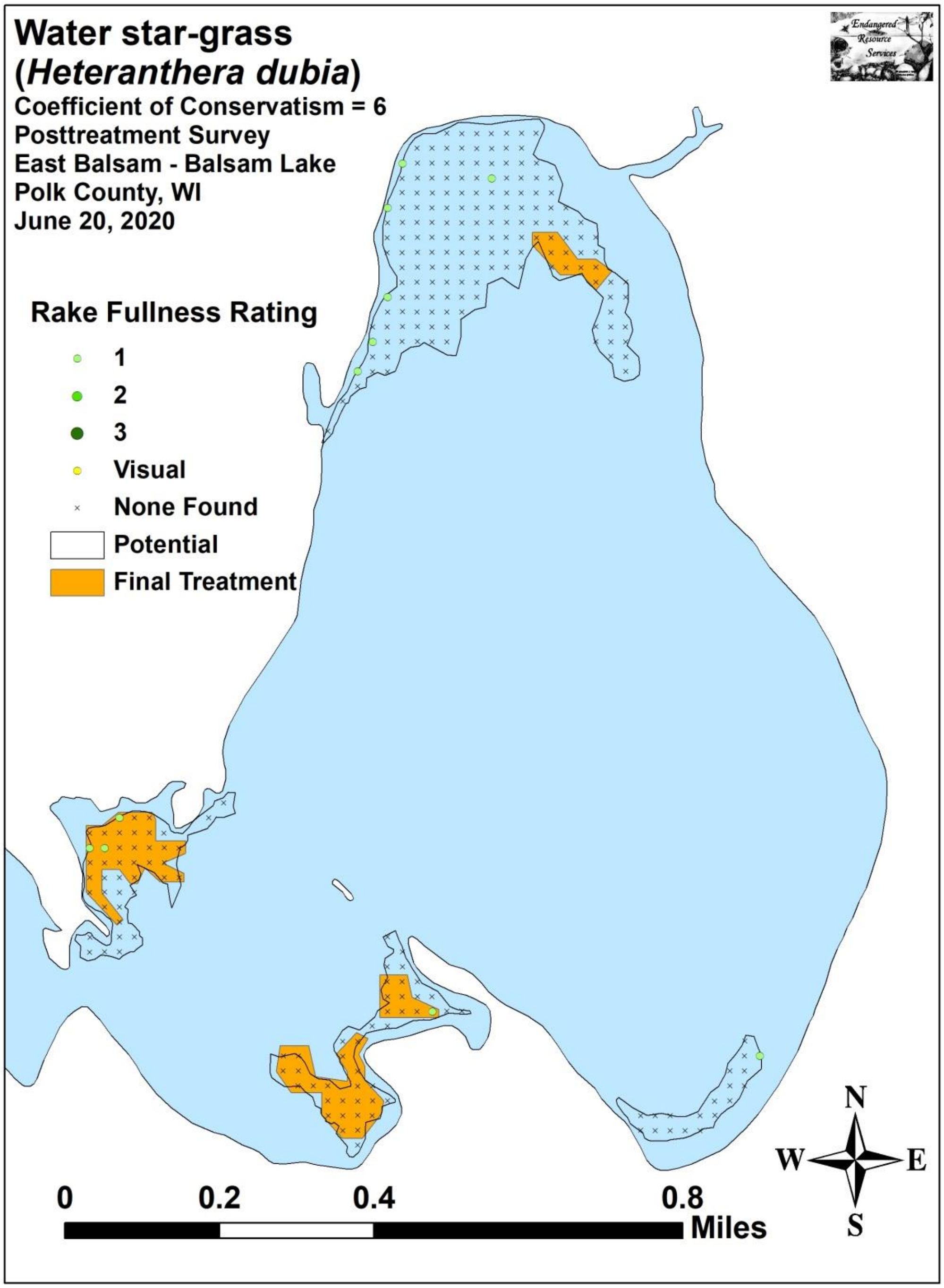
Aquatic moss
Bryophyte
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S


Coontail
(*Ceratophyllum demersum*)
Coefficient of Conservatism = 3
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

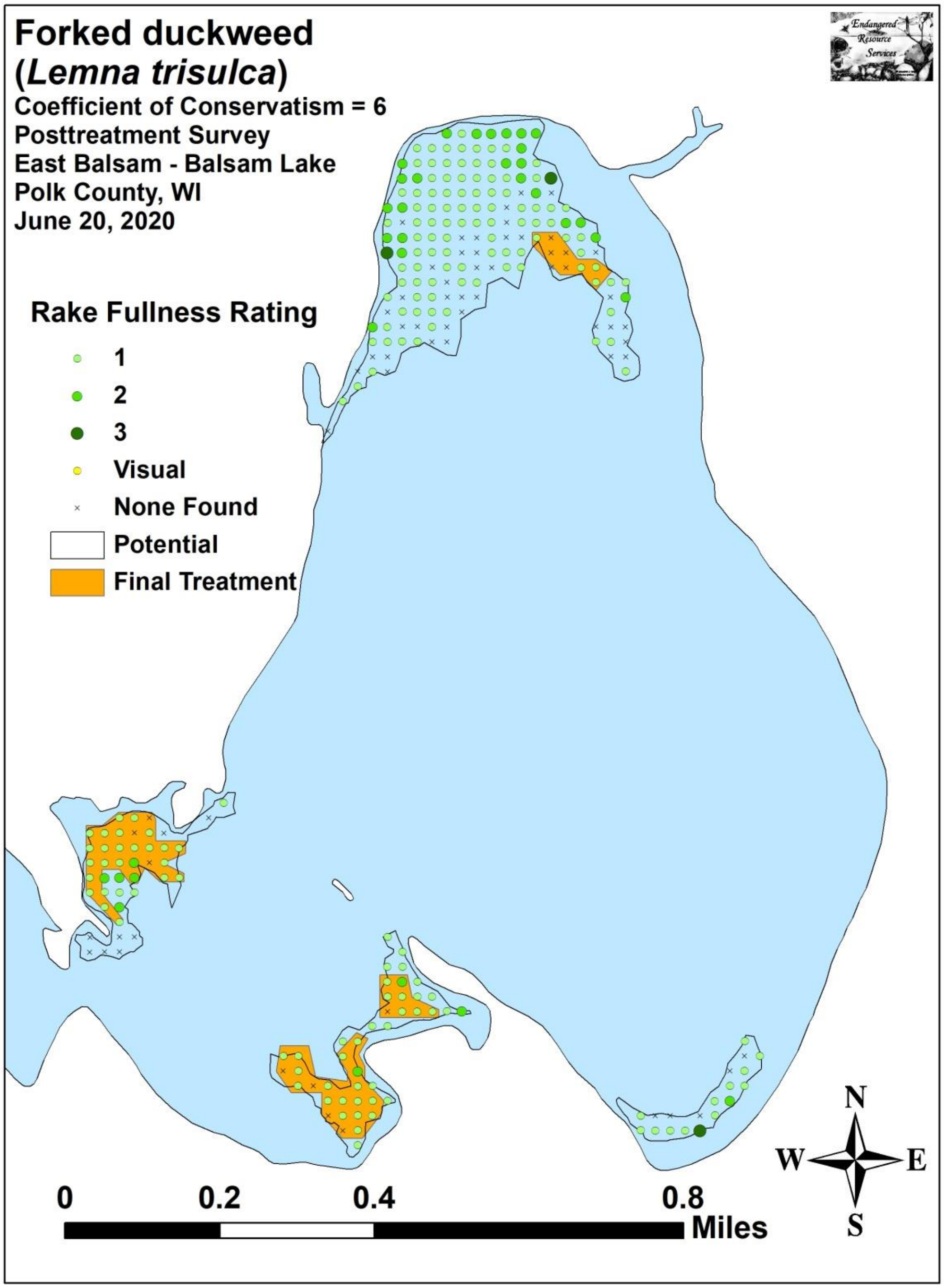

Common waterweed
(Elodea canadensis)
Coefficient of Conservatism = 3
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
N
W
E
S
0
0.2
0.4
0.8
Miles

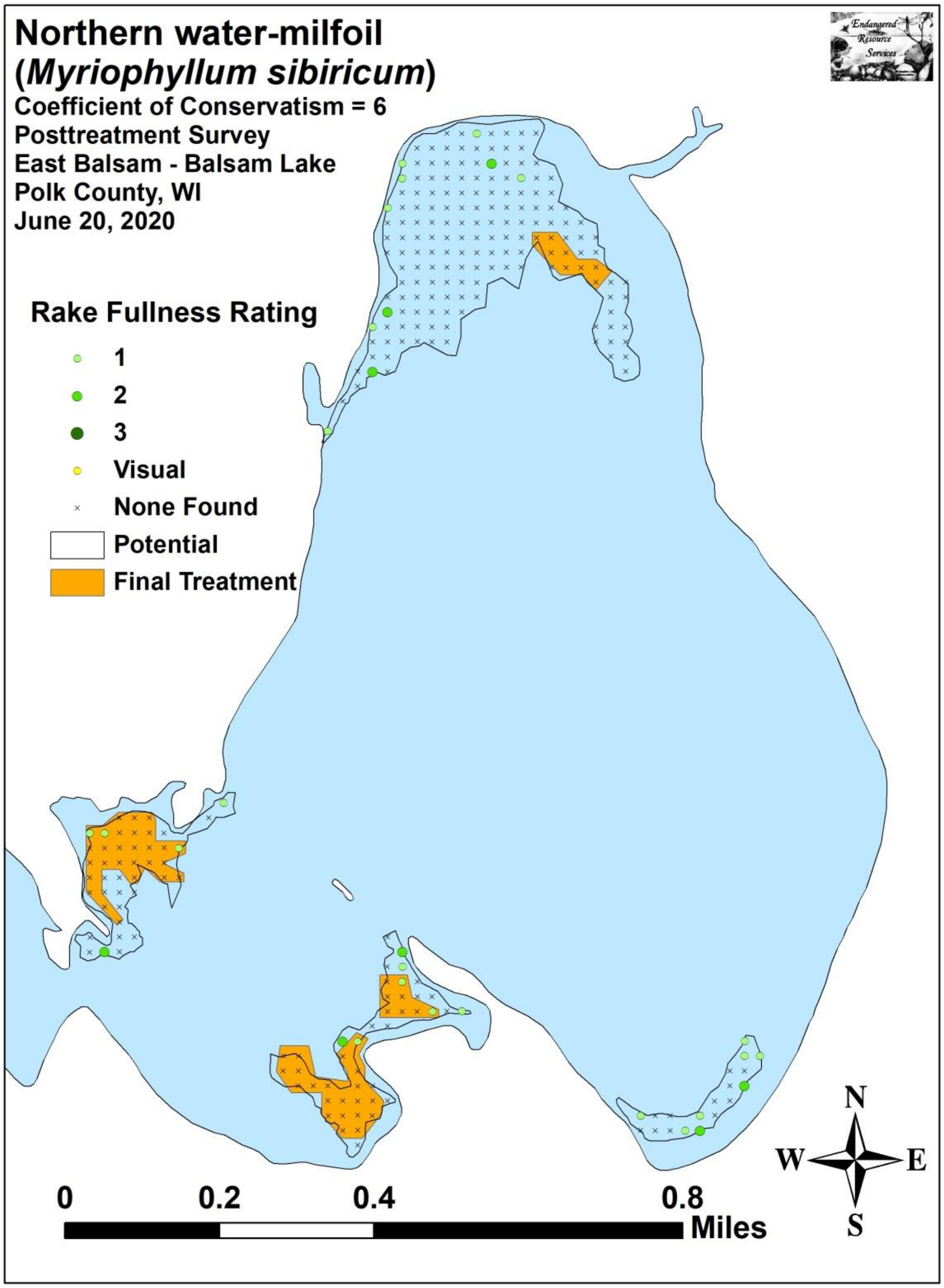


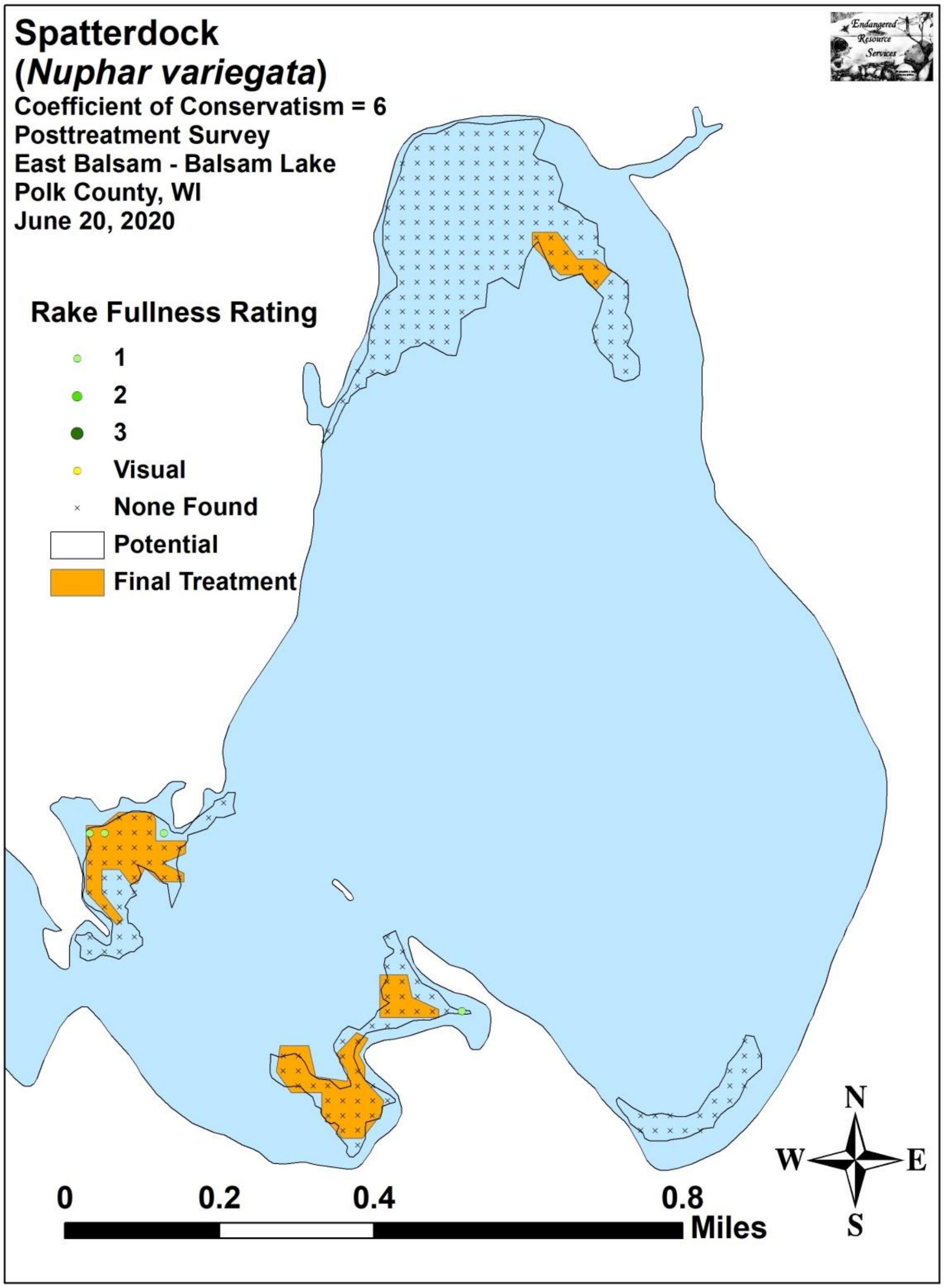
Filamentous algae
Endangered Resource Services
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
N
W
E
S
0
0.2
0.4
0.8
Miles

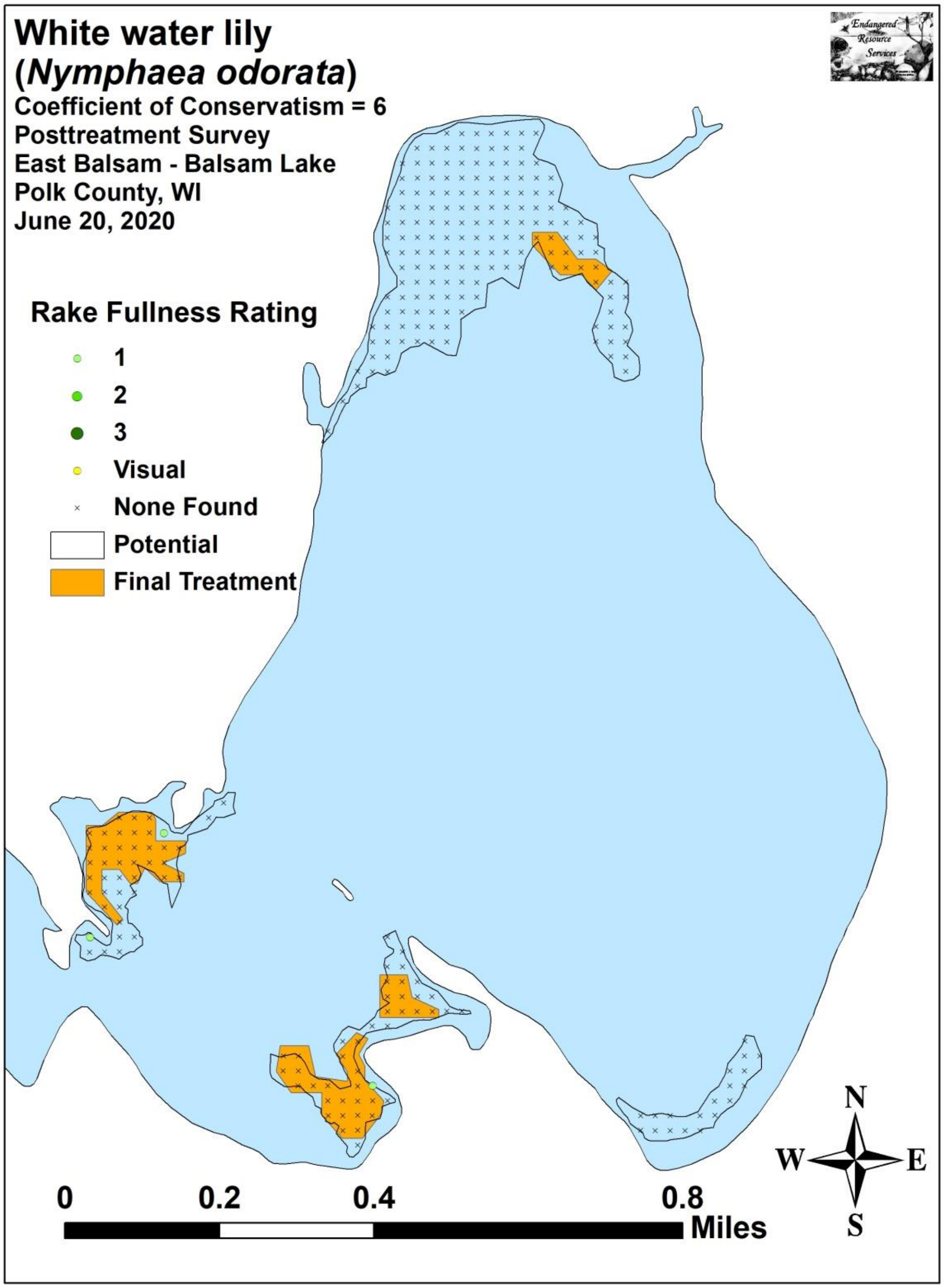


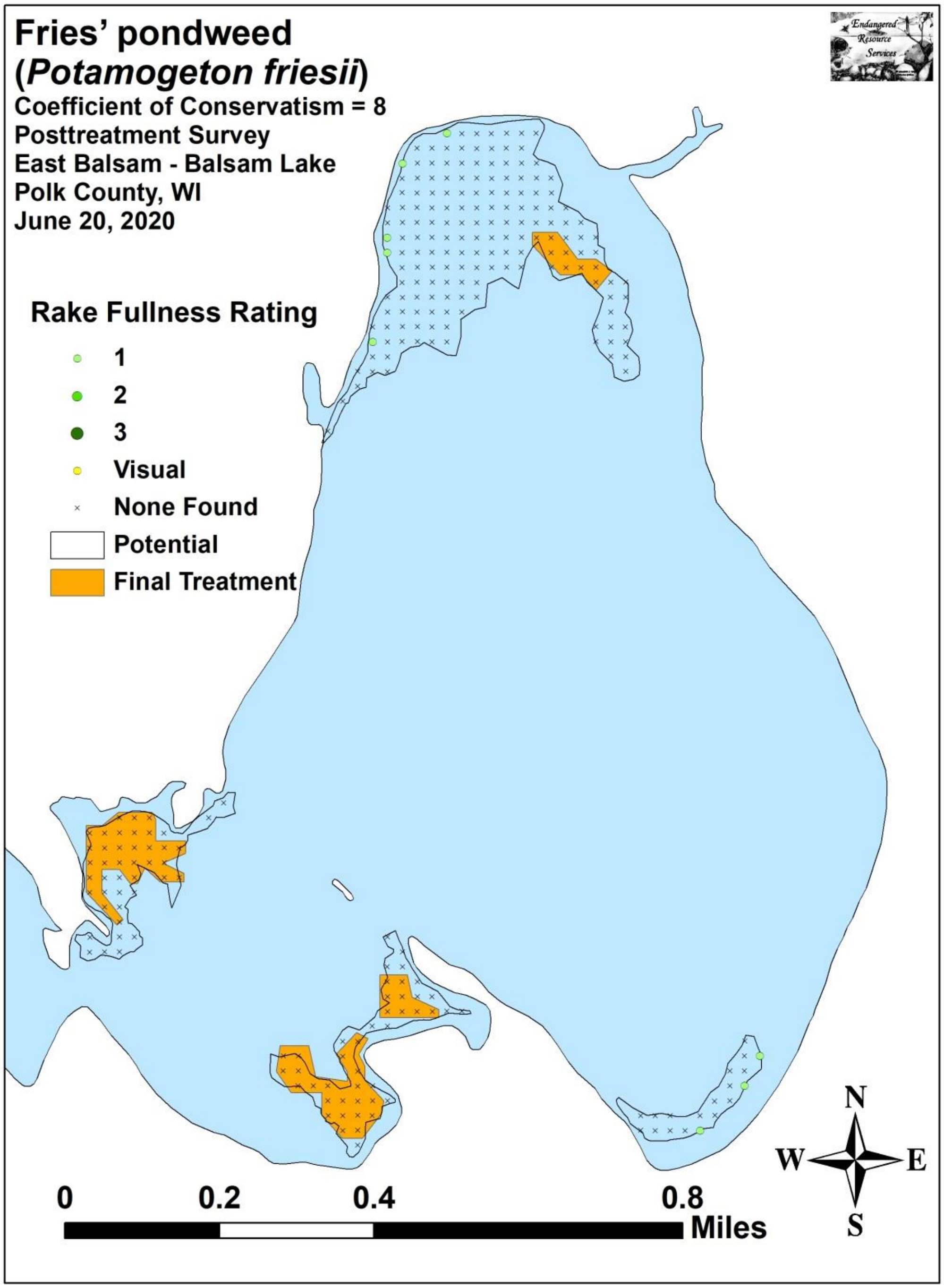
Water star-grass
(Heteranthera dubia)
Coefficient of Conservatism = 6
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S
Endangered Resource Services

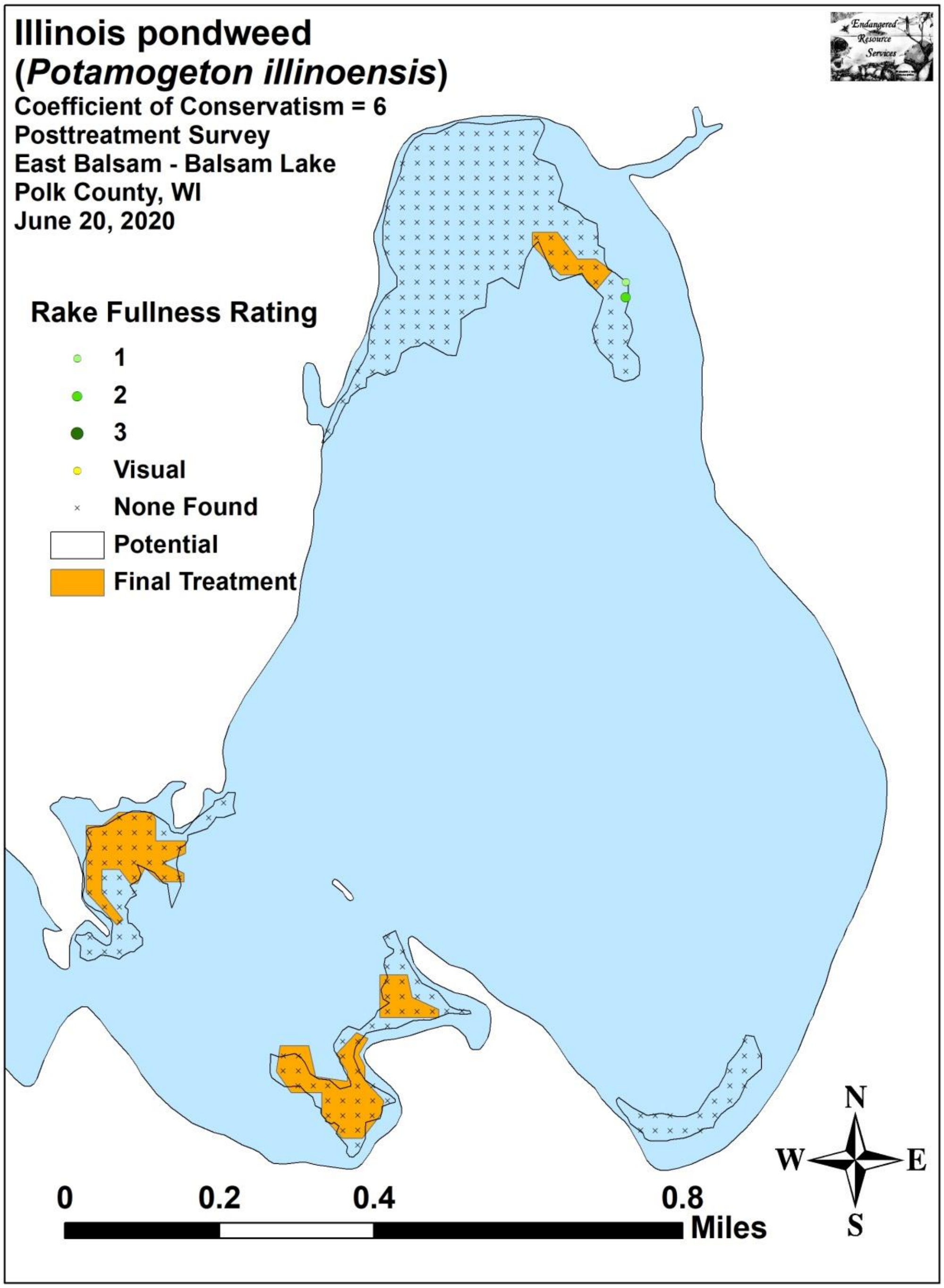

Forked duckweed
(*Lemna trisulca*)
Coefficient of Conservatism = 6
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
N
W
E
S
0
0.2
0.4
0.8
Miles

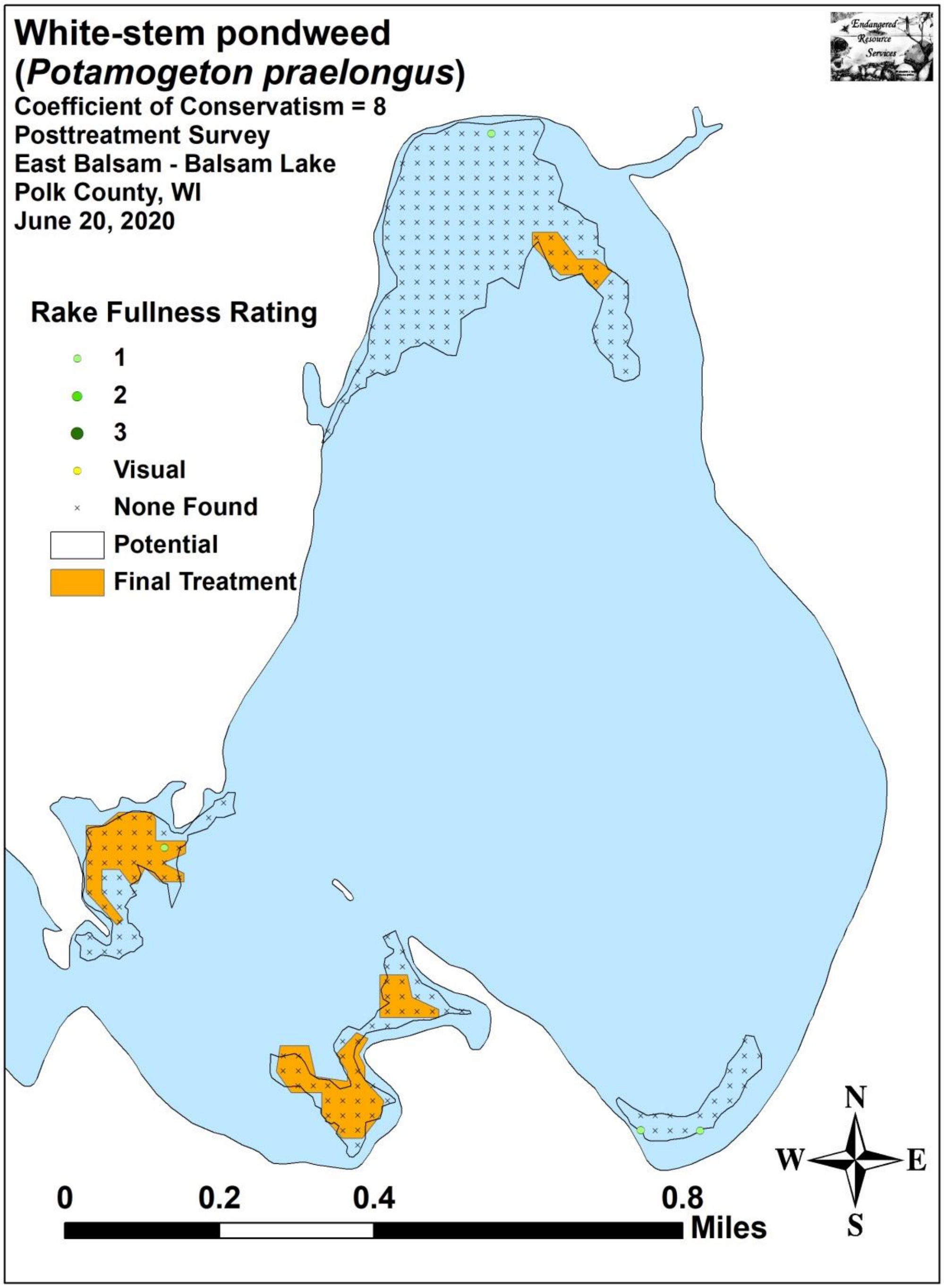

Northern water-milfoil
(Myriophyllum sibiricum)
Coefficient of Conservatism = 6
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

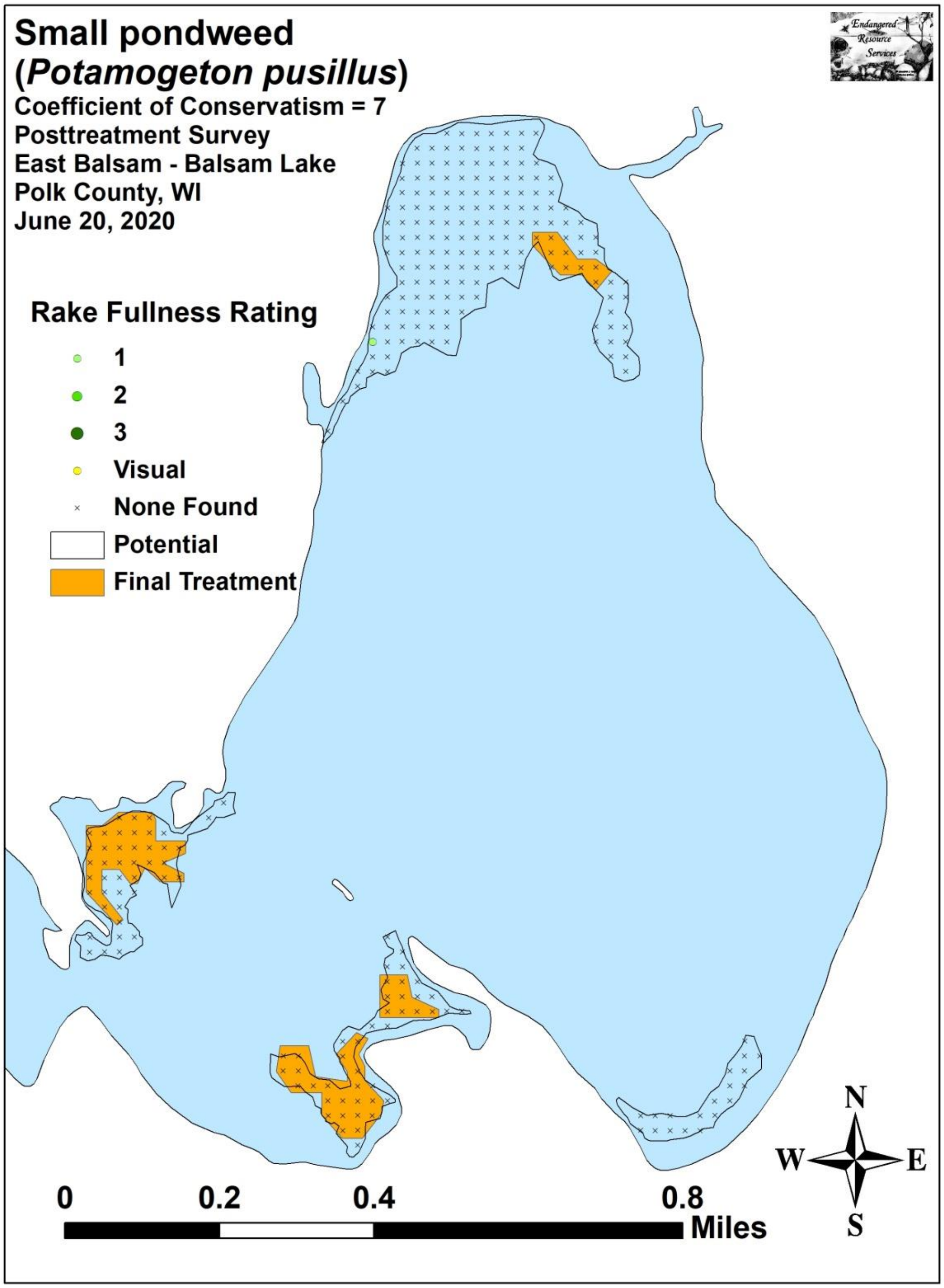

Spatterdock
(Nuphar variegata)
Coefficient of Conservatism = 6
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
N
W
E
S
0
0.2
0.4
0.8
Miles

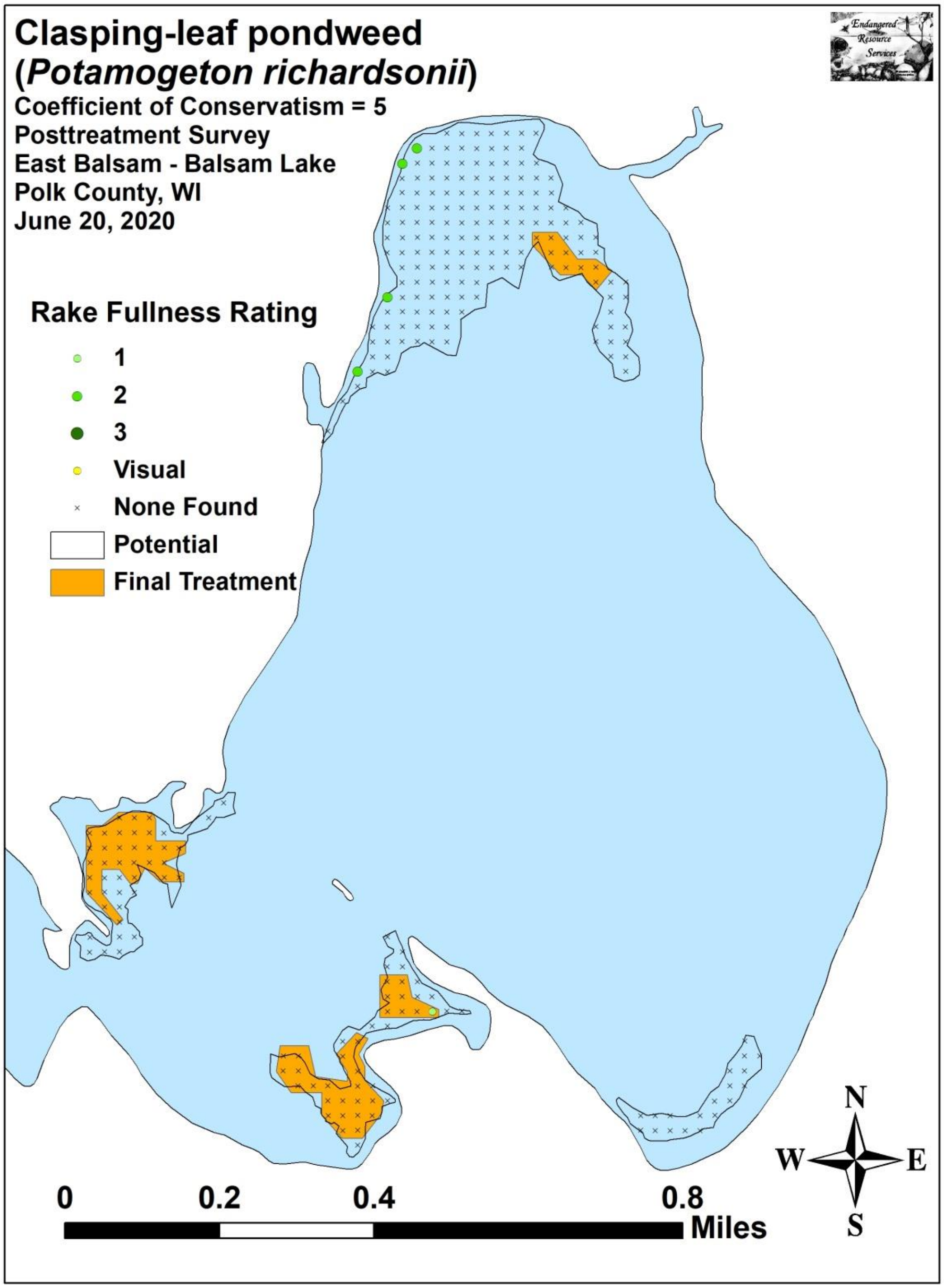

White water lily
(Nymphaea odorata)
Coefficient of Conservatism = 6
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

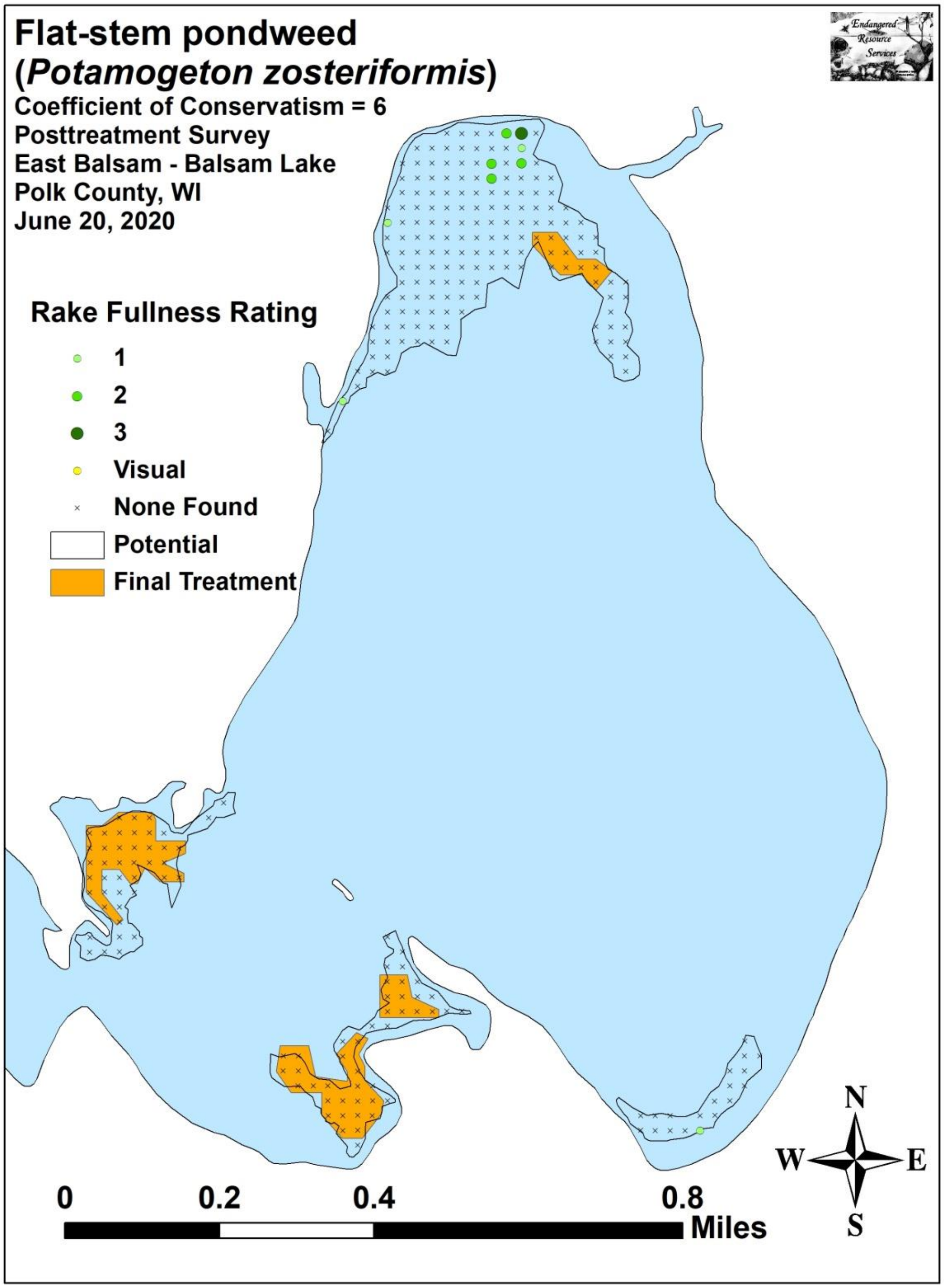

Fries' pondweed
(Potamogeton friesii)
Coefficient of Conservatism = 8
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
N
W
E
S
0
0.2
0.4
0.8
Miles


Illinois pondweed
(Potamogeton illinoensis)
Coefficient of Conservatism = 6
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
N
W
E
S
0
0.2
0.4
0.8
Miles

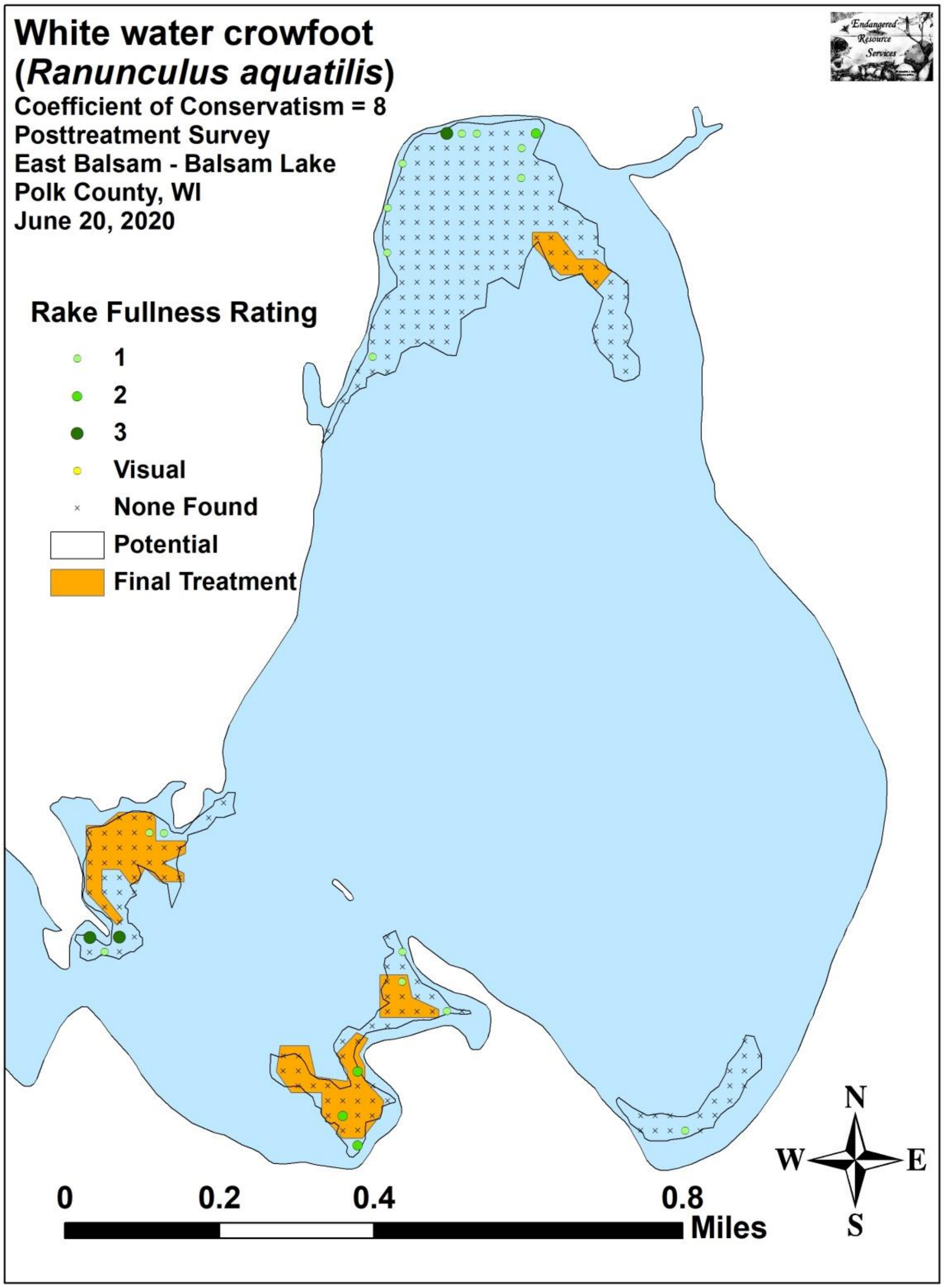

White-stem pondweed
(*Potamogeton praelongus*)
Coefficient of Conservatism = 8
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S


Small pondweed
(*Potamogeton pusillus*)
Coefficient of Conservatism = 7
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
N
W
E
S
0
0.2
0.4
0.8
Miles

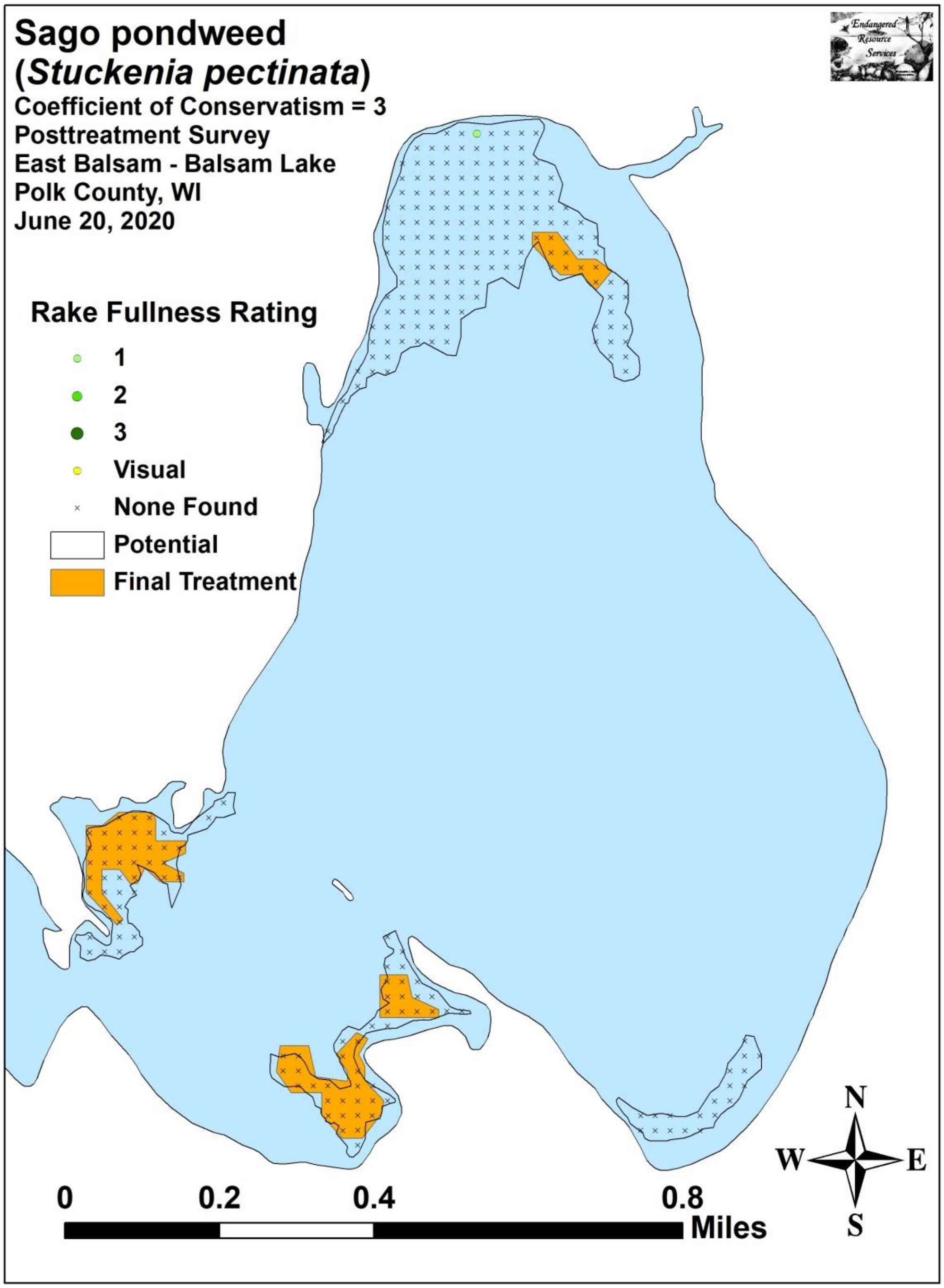

Clasping-leaf pondweed
(Potamogeton richardsonii)
Coefficient of Conservatism = 5
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

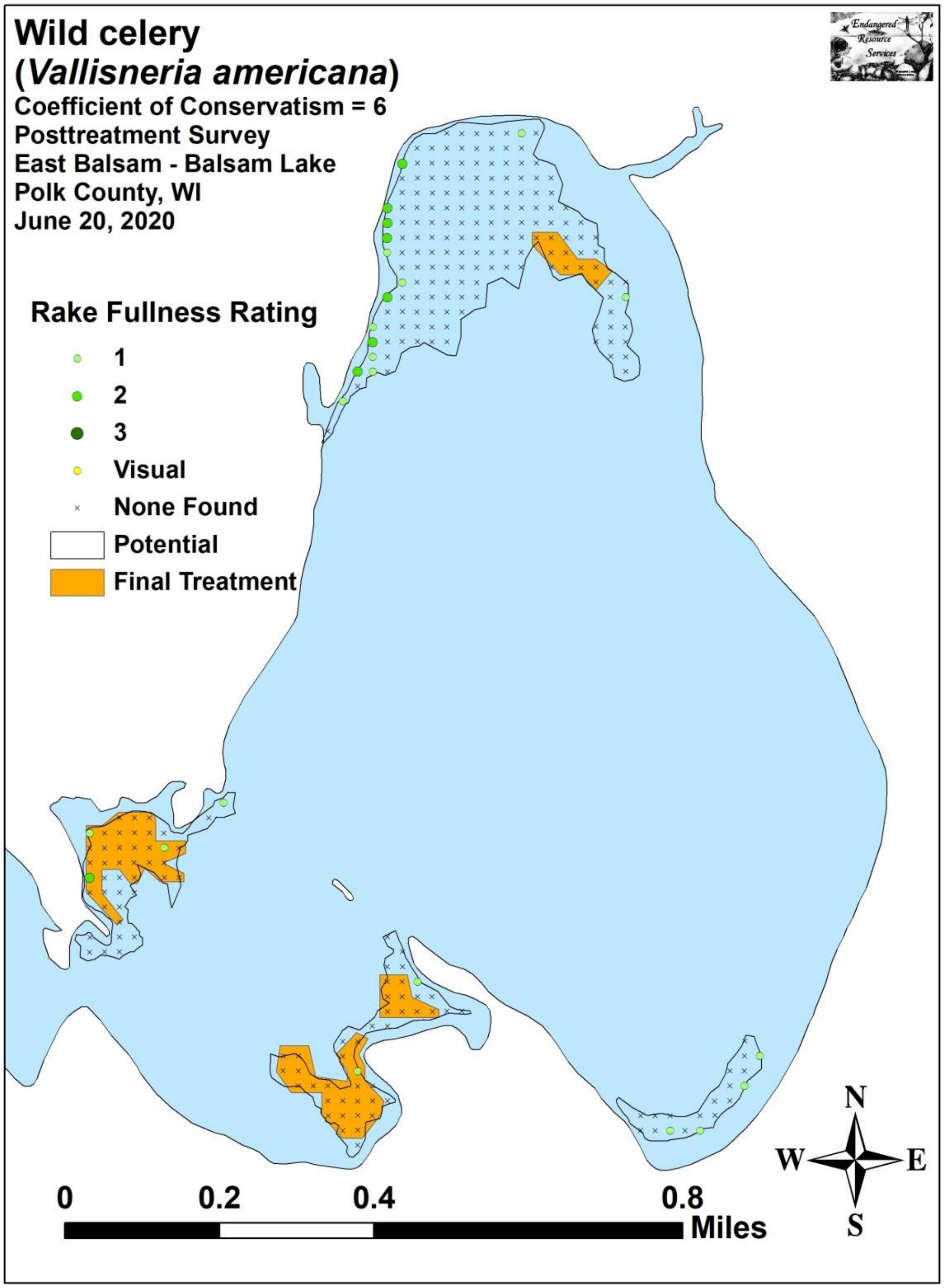


Flat-stem pondweed
(Potamogeton zosteriformis)
Coefficient of Conservatism = 6
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

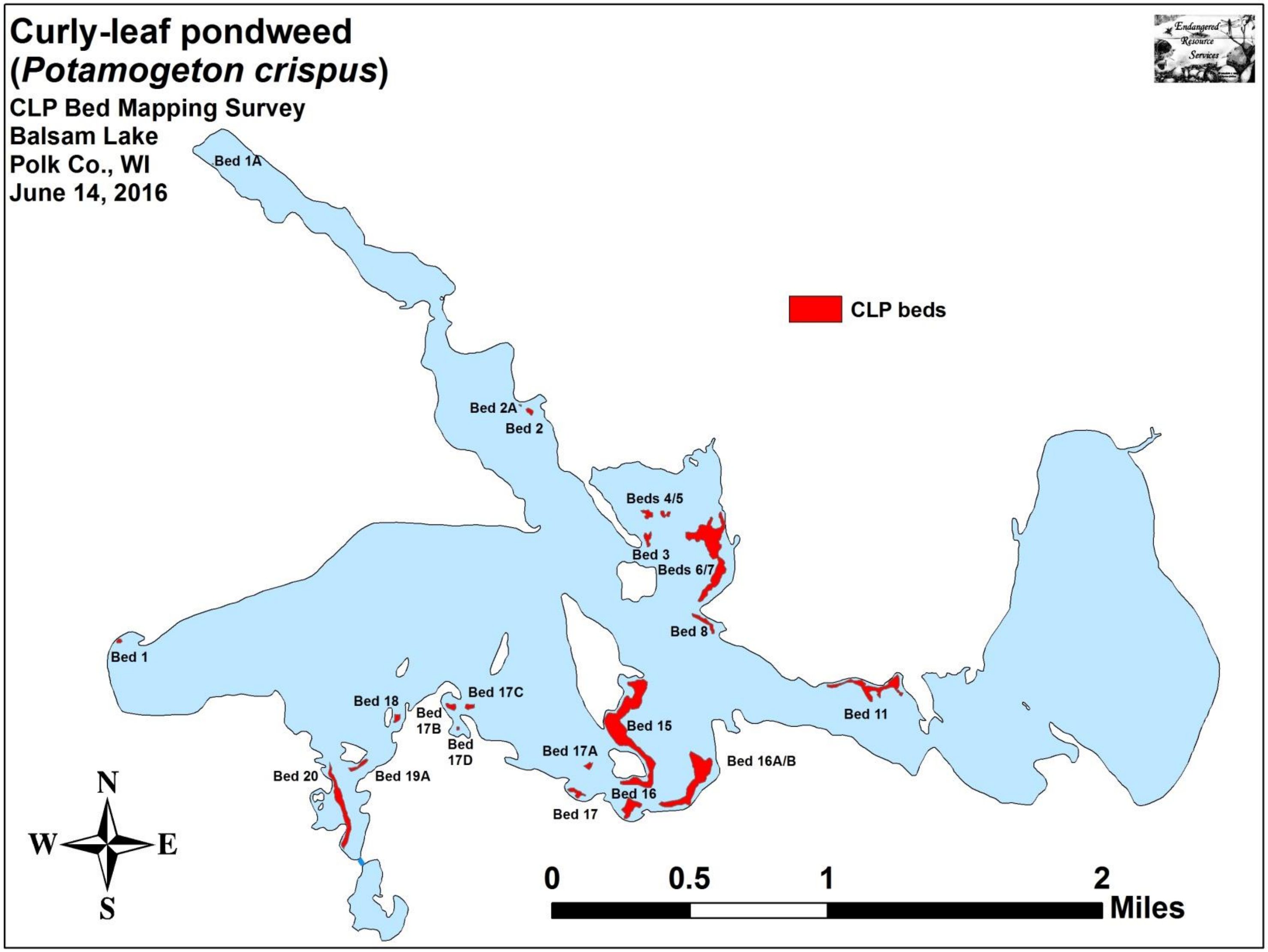


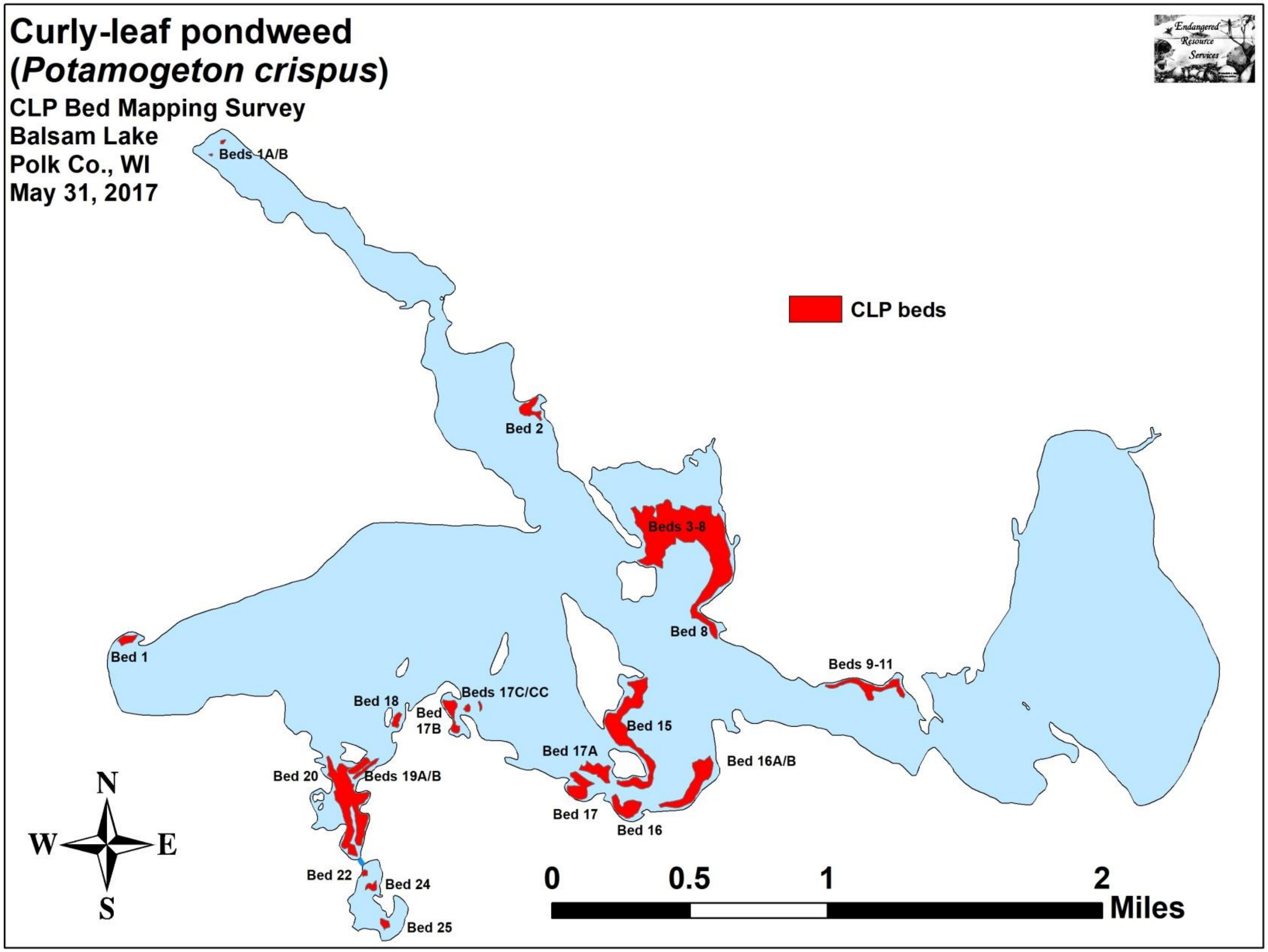
White water crowfoot
(*Ranunculus aquatilis*)
Coefficient of Conservatism = 8
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

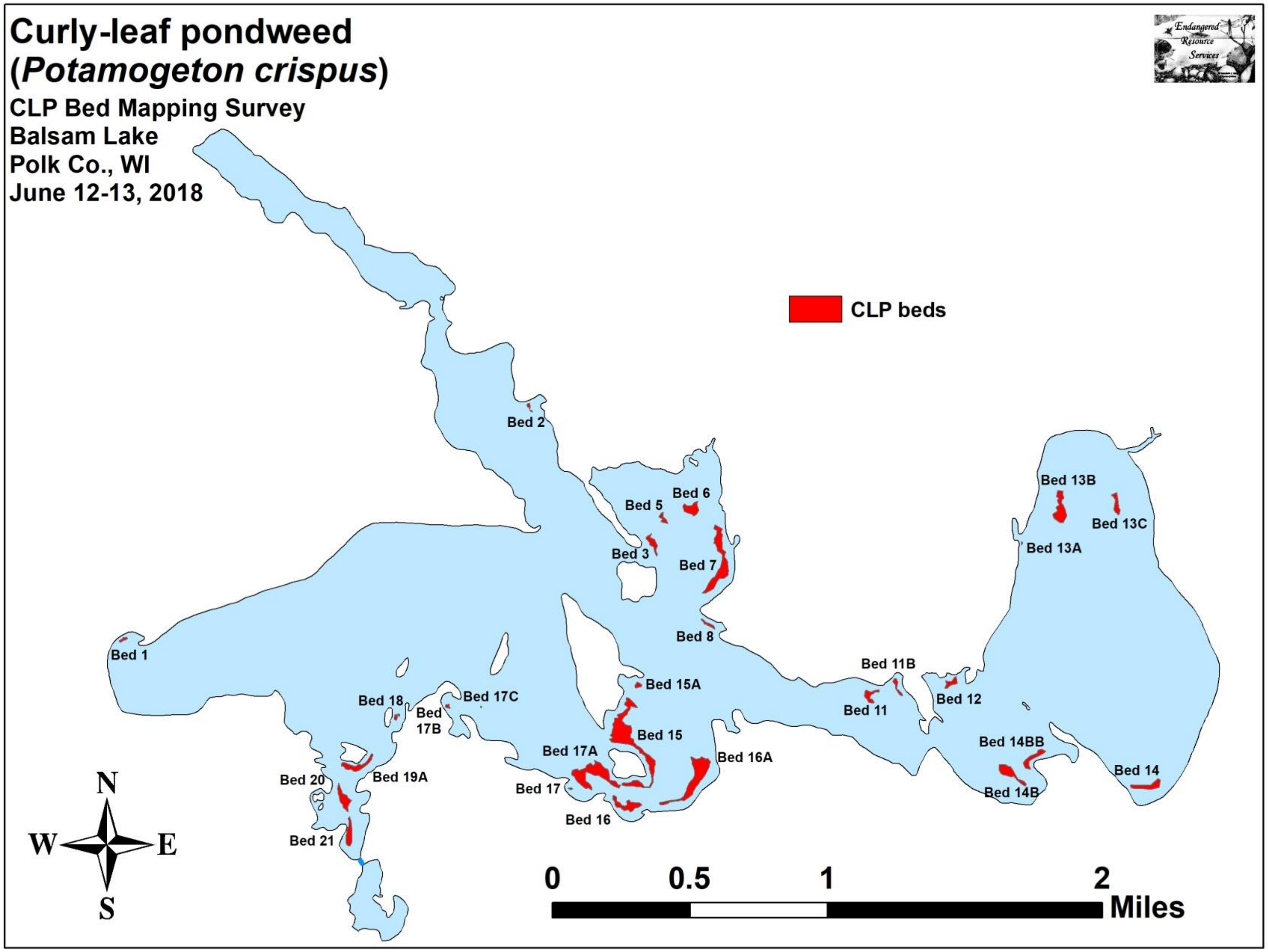

Sago pondweed
(Stuckenia pectinata)
Coefficient of Conservatism = 3
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
N
W
E
S
0
0.2
0.4
0.8
Miles

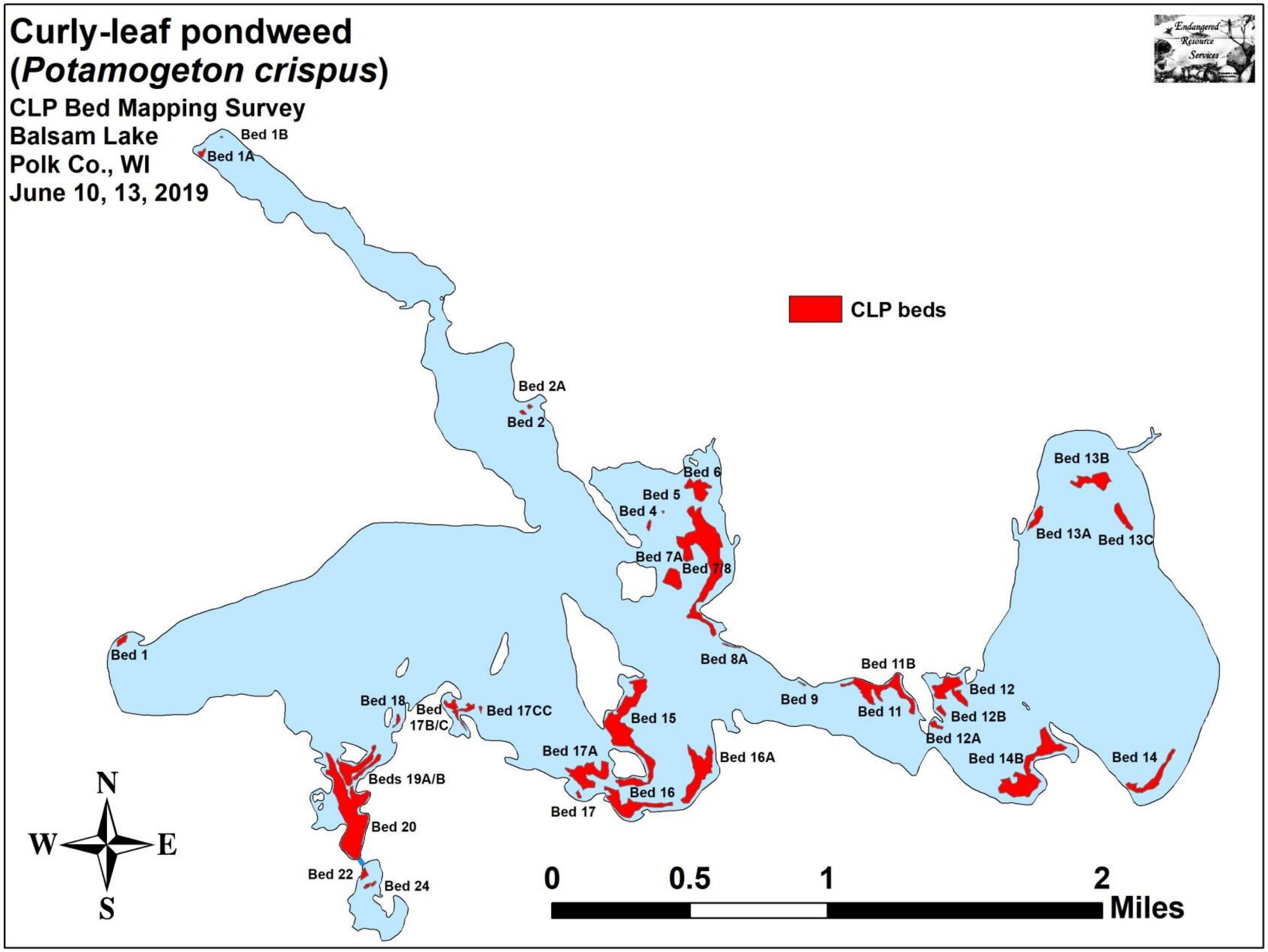

Wild celery
(*Vallisneria americana*)
Coefficient of Conservatism = 6
Posttreatment Survey
East Balsam - Balsam Lake
Polk County, WI
June 20, 2020
Endangered Resource Services
Rake Fullness Rating
1
2
3
Visual
None Found
Potential
Final Treatment
0
0.2
0.4
0.8
Miles
N
W
E
S

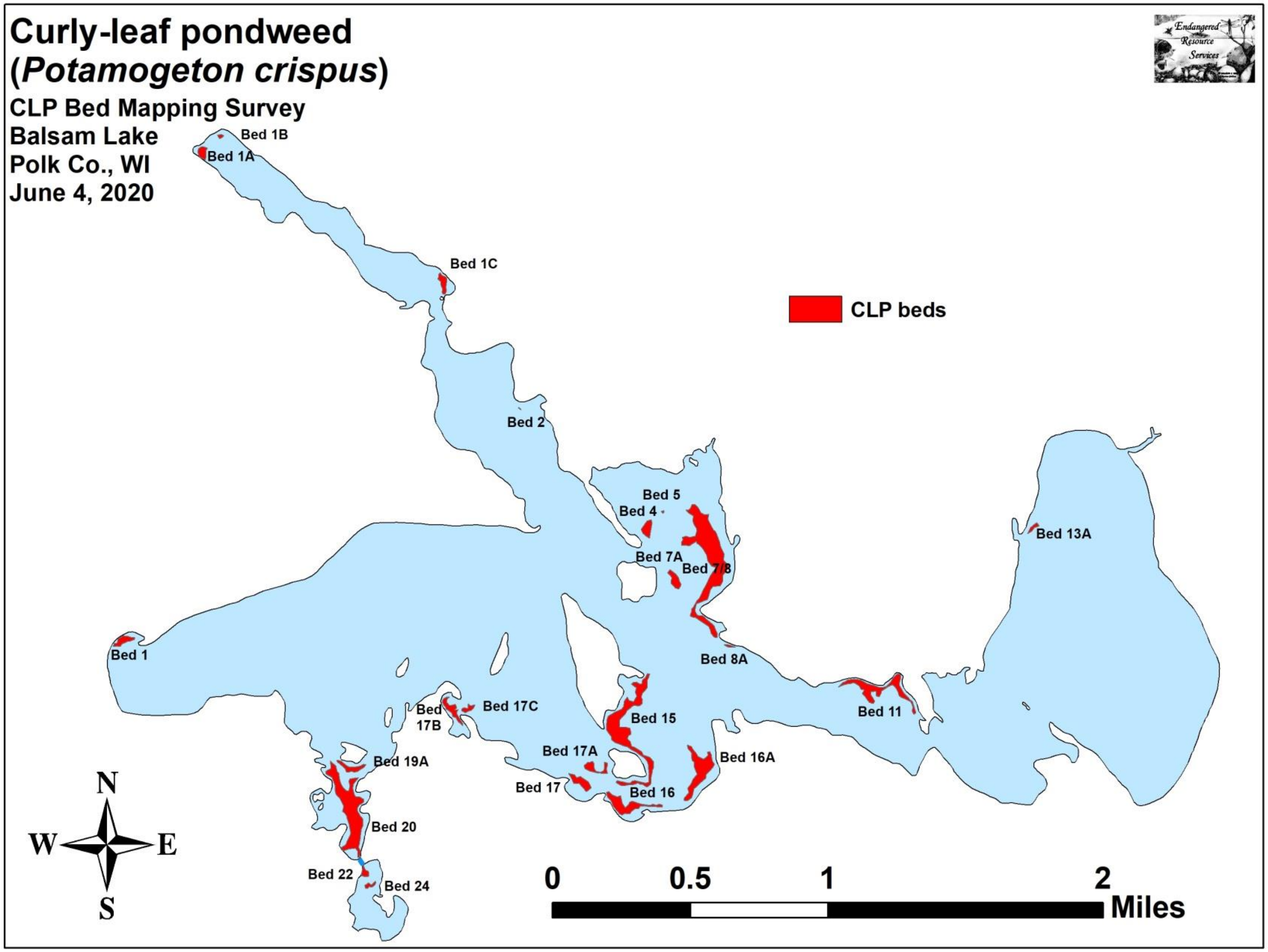
Appendix VIII: 2016-2020 Spring Curly-leaf Pondweed Bed Maps


Curly-leaf pondweed
(*Potamogeton crispus*)
CLP Bed Mapping Survey
Balsam Lake
Polk Co., WI
June 14, 2016
CLP beds
Bed 1A
Bed 2A
Bed 2
Beds 4/5
Bed 3
Beds 6/7
Bed 8
Bed 1
Bed 11
Bed 17C
Bed 18
Bed 17B
Bed 17D
Bed 15
Bed 17A
Bed 16A/B
Bed 20
Bed 19A
Bed 16
Bed 17
N
W
E
S
0
0.5
1
2
Miles


Curly-leaf pondweed
(Potamogeton crispus)
CLP Bed Mapping Survey
Balsam Lake
Polk Co., WI
May 31, 2017
Endangered Resource Services
CLP beds
Beds 1A/B
Bed 2
Beds 3-8
Bed 8
Beds 9-11
Bed 1
Bed 18
Bed 17B
Beds 17C/CC
Bed 15
Bed 17A
Bed 16A/B
Bed 17
Bed 16
Bed 20
Beds 19A/B
Bed 22
Bed 24
Bed 25
N
W
E
S
0
0.5
1
2
Miles


Curly-leaf pondweed
(Potamogeton crispus)
CLP Bed Mapping Survey
Balsam Lake
Polk Co., WI
June 12-13, 2018
Endangered Resource Services
CLP beds
Bed 1
Bed 2
Bed 3
Bed 5
Bed 6
Bed 7
Bed 8
Bed 11B
Bed 11
Bed 12
Bed 13A
Bed 13B
Bed 13C
Bed 14
Bed 14B
Bed 14BB
Bed 15
Bed 15A
Bed 16
Bed 16A
Bed 17
Bed 17A
Bed 17B
Bed 17C
Bed 18
Bed 19A
Bed 20
Bed 21
N
S
E
W
0
0.5
1
2
Miles


Curly-leaf pondweed
(Potamogeton crispus)
CLP Bed Mapping Survey
Balsam Lake
Polk Co., WI
June 10, 13, 2019
CLP beds
Endangered Resource Services
Bed 1B
Bed 1A
Bed 1
Bed 2A
Bed 2
Bed 4
Bed 5
Bed 6
Bed 7A
Bed 7/8
Bed 8A
Bed 9
Bed 11B
Bed 11
Bed 12
Bed 12B
Bed 12A
Bed 13B
Bed 13A
Bed 13C
Bed 14B
Bed 14
Bed 15
Bed 16A
Bed 16
Bed 17A
Bed 17
Bed 17CC
Bed 17B/C
Bed 18
Beds 19A/B
Bed 20
Bed 22
Bed 24
N
S
W
E
0
0.5
1
2
Miles


Curly-leaf pondweed
(Potamogeton crispus)
CLP Bed Mapping Survey
Balsam Lake
Polk Co., WI
June 4, 2020
Endangered Resource Services
CLP beds
Bed 1B
Bed 1A
Bed 1C
Bed 2
Bed 5
Bed 4
Bed 7A
Bed 7/8
Bed 13A
Bed 1
Bed 8A
Bed 11
Bed 17B
Bed 17C
Bed 15
Bed 17A
Bed 16A
Bed 19A
Bed 17
Bed 16
Bed 20
Bed 22
Bed 24
N
W
E
S
0
0.5
1
2
Miles