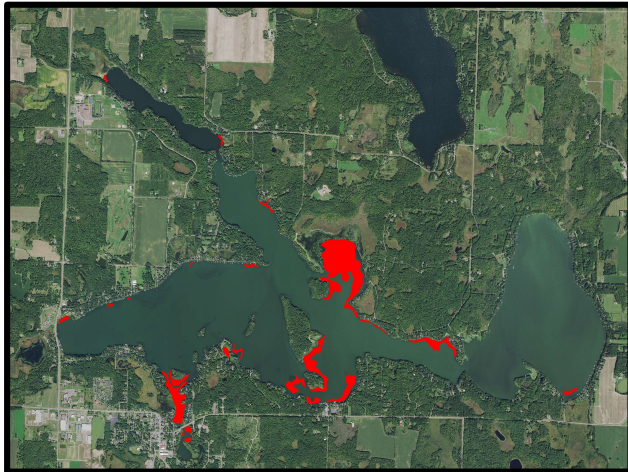
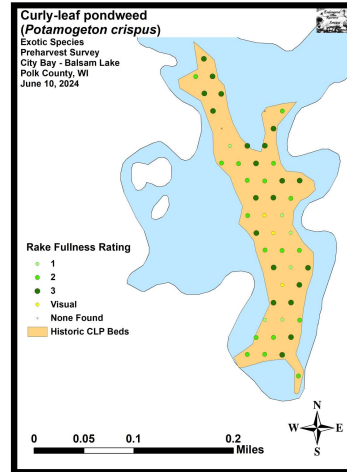


Curly-leaf Pondweed (*Potamogeton crispus*) Preharvest Surveys City Bay – Balsam Lake - WBIC: 2620600 Polk County, Wisconsin



Spring 2024 Curly-leaf Pondweed Beds



2024 CLP Preharvest in City Bay

Project Initiated by:

Balsam Lake Protection and Rehabilitation District and the
Wisconsin Department of Natural Resources – Grant ACEI21218



Canopied Mat of Curly-leaf pondweed on Balsam Lake

Surveys Conducted by and Report Prepared by:

Endangered Resource Services, LLC

Matthew S. Berg, Research Biologist

St. Croix Falls, Wisconsin

May 31, 2021, May 30, 2022, June 6, 2023, and June 10, 2024

TABLE OF CONTENTS

	Page
LIST OF FIGURES AND TABLES.....	ii
INTRODUCTION.....	1
BACKGROUND AND STUDY RATIONALE.....	1
METHODS.....	2
RESULTS AND DISCUSSION.....	3
Preharvest Surveys.....	3
LITERATURE CITED.....	22
APPENDIXES.....	23
I: Survey Sample Points and Historic CLP Bed Map.....	23
II: Vegetative Survey Datasheet.....	26
III: Preharvest Habitat Variables.....	28
IV: 2021, 2022, 2023, and 2024 Preharvest Littoral Zone, Native Species Richness and Total Rake Fullness.....	31
V: 2021, 2022, 2023, and 2024 Preharvest CLP Density and Distribution.....	44
VI: 2021 Preharvest Native Species Density and Distribution.....	49
VII: 2022 Preharvest Native Species Density and Distribution.....	67
VIII: 2023 Preharvest Native Species Density and Distribution.....	81
XI: 2024 Preharvest Native Species Density and Distribution.....	94

LIST OF FIGURES AND TABLES

	Page
Figure 1: Balsam Lake with 2024 CLP Beds.....	1
Figure 2: Survey Sample Points in Historic CLP Beds.....	2
Figure 3: Rake Fullness Ratings.....	2
Figure 4: CLP Area Depths and Bottom Substrate.....	3
Figure 5: 2021, 2022, 2023, and 2024 Preharvest Littoral Zone.....	4
Table 1: Preharvest Surveys Summary Statistics – City Bay – Balsam Lake – Polk County, WI – May 31, 2021, May 30, 2022, June 6, 2023, and June 10, 2024.	5
Figure 6: 2021, 2022, 2023, and 2024 Preharvest Native Species Richness	6
Figure 7: 2021, 2022, 2023, and 2024 Preharvest Total Rake Fullness.....	7
Figure 8: 2021, 2022, 2023, and 2024 Preharvest CLP Density and Distribution...	9
Figure 9: 2021, 2022, 2023, and 2024 Preharvest Changes in CLP Rake Fullness..	10
Figure 10: 2021, 2022, 2023, and 2024 Preharvest Coontail Density and Distribution.....	12
Figure 11: 2021, 2022, 2023, and 2024 Preharvest Common Waterweed Density and Distribution.....	13
Figure 12: 2021, 2022, 2023, and 2024 Preharvest Flat-stem Pondweed Density and Distribution.....	14
Figure 13: 2021, 2022, 2023, and 2024 Preharvest Fern Pondweed Density and Distribution.....	15
Table 2: Frequencies and Mean Rake Sample of Aquatic Macrophytes Preharvest Survey – City Bay – Balsam Lake – Polk County, WI – May 31, 2021..	16
Table 3: Frequencies and Mean Rake Sample of Aquatic Macrophytes Preharvest Survey – City Bay – Balsam Lake – Polk County, WI – May 30, 2022..	17
Table 4: Frequencies and Mean Rake Sample of Aquatic Macrophytes Preharvest Survey – City Bay – Balsam Lake – Polk County, WI – June 6, 2023...	18
Table 5: Frequencies and Mean Rake Sample of Aquatic Macrophytes Preharvest Survey – City Bay – Balsam Lake – Polk County, WI – June 10, 2024..	19
Figure 14: 2021, 2022, 2023, and 2024 Preharvest Macrophyte Changes.....	21

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) (Figure 1). 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 summer Secchi readings over the last 10 years averaging 3.4ft in East Balsam, 5.9ft in Little Balsam, and 10.8ft in the deep hole north of Cedar Island (WDNR 2024). The lake's 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.

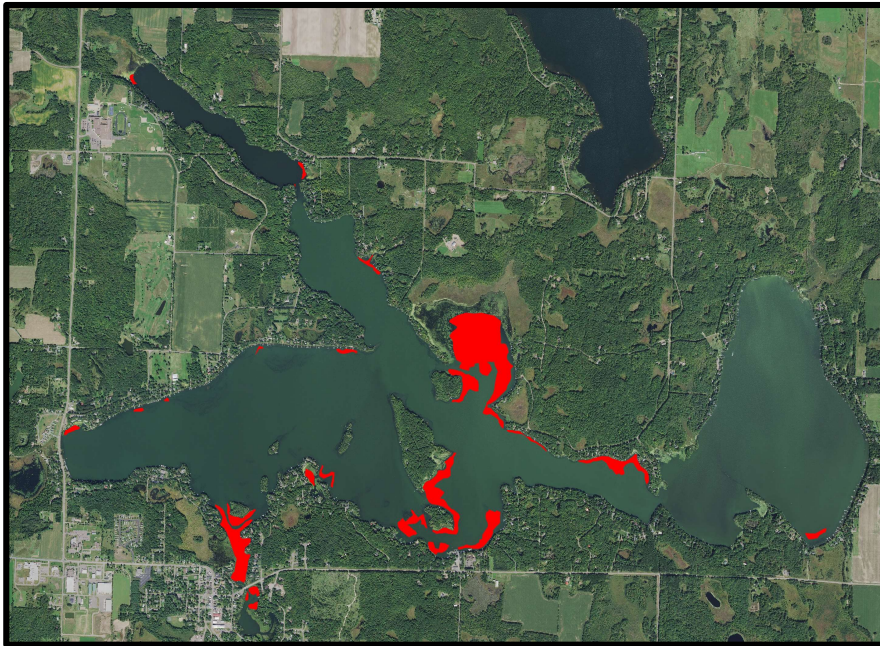


Figure 1: Balsam Lake with 2024 CLP Beds

BACKGROUND AND STUDY RATIONALE:

Curly-leaf pondweed (*Potamogeton crispus*) (CLP) is an invasive exotic plant that is common to abundant in parts of Balsam Lake. In their 2010 and 2015 Wisconsin Department of Natural Resources (WDNR) approved Aquatic Plant Management Plans (APMP), the Balsam Lake Protection and Rehabilitation District's (BLPRD) identified a) reducing overall lake coverage of CLP to <20 acres and b) relieving navigation impairment caused by canopied CLP beds as management goals (Clemens 2010, Clemens 2015). As part of their continuing efforts to meet these goals, the BLPRD is actively engaged in both herbicide treatments and mechanical harvesting. Although levels of CLP and native plants before and after herbicide use have been carefully studied, the long-term impacts of harvesting on the lake's vegetation have not been quantified. Because of this, in 2021, the BLPRD and Harmony Environmental (HE) requested we initiate annual preharvest sub point-intercept surveys of all plant species and fall CLP turion surveys in City Bay north of the CTH I bridge/south of First Island within areas historically dominated by CLP. This report is the summary analysis of our June 10, 2024 preharvest sub-PI survey.

METHODS:

Preharvest Point-intercept Macrophyte Survey:

Starting with the spring 2020 survey that outlined a 9.81-acre Curly-leaf pondweed bed in City Bay, we used Hawth’s Analysis Tools Extension to ArcGIS 9.3.1 to generate regular points at the rate of just over five points/acre within the historic bed. This produced a 50-point sampling grid which was used during each survey to allow for direct comparisons (Figure 2) (Appendix I).

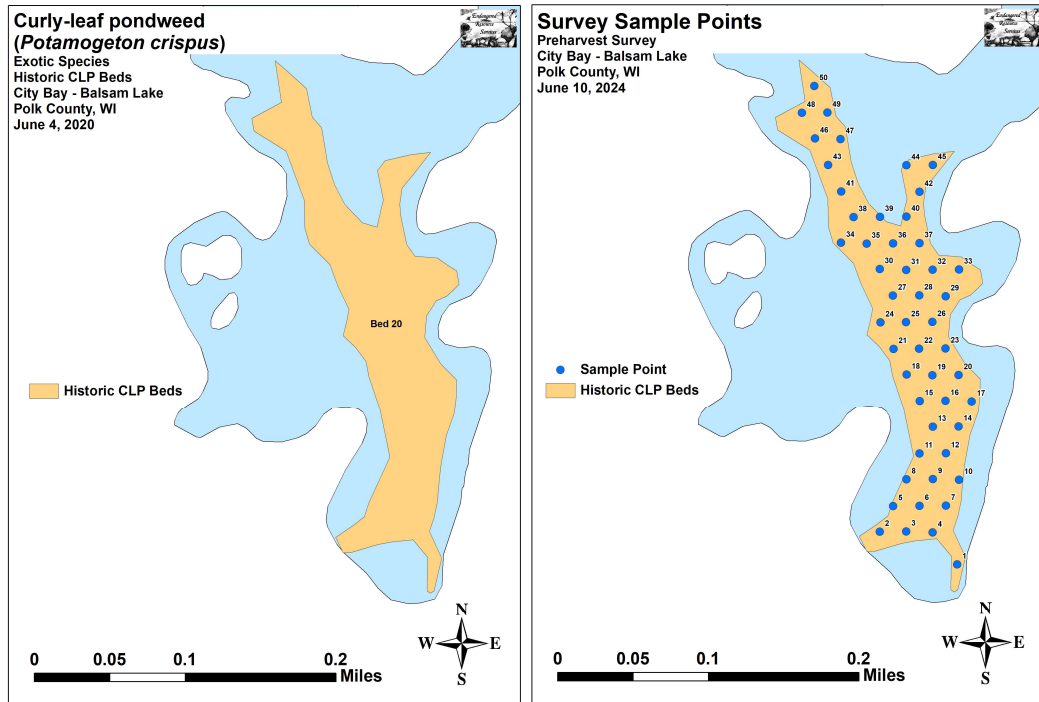


Figure 2: Survey Sample Points in Historic CLP Beds

These 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 3). We also recorded visual sightings of CLP within six feet of the sample point. Because visual sightings are not calculated into the statistical formulas, we only assigned a rake fullness value for non-CLP plants. A cumulative rake fullness value was also noted.

Rating	Coverage	Description
1		A few plants on rake head
2		Rake head is about 1/2 full Can easily see top of rake head
3		Overflowing Cannot see top of rake head

Figure 3: 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 $p < 0.001$.

RESULTS AND DISCUSSION:

Preharvest Surveys:

All points occurred in areas between 2.0ft and 10.0ft of water. We found the mean and median depths of plant growth were 7.4ft and 7.5ft respectively during each of the four preharvest surveys (Table 1). Most Curly-leaf pondweed was established over nutrient-rich organic muck, but we also found scattered plants in the few areas that had sandy muck substrates (Figure 4) (Appendix III).

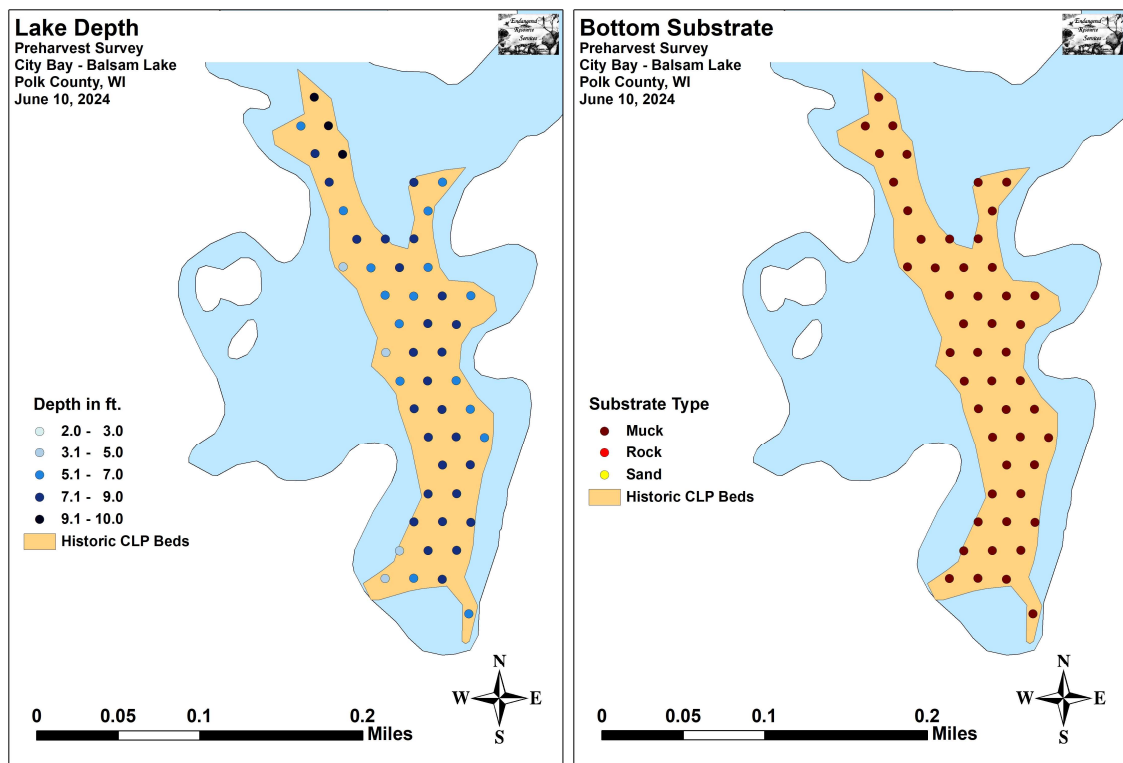


Figure 4: CLP Area Depths and Bottom Substrate

The entire study area fell within the littoral zone, and plants were found at all points during each survey. In 2021 and 2022, the maximum depth of vegetation was 10.5ft before falling slightly to 10.0ft in both 2023 and 2024 (Figure 5) (Appendix IV).

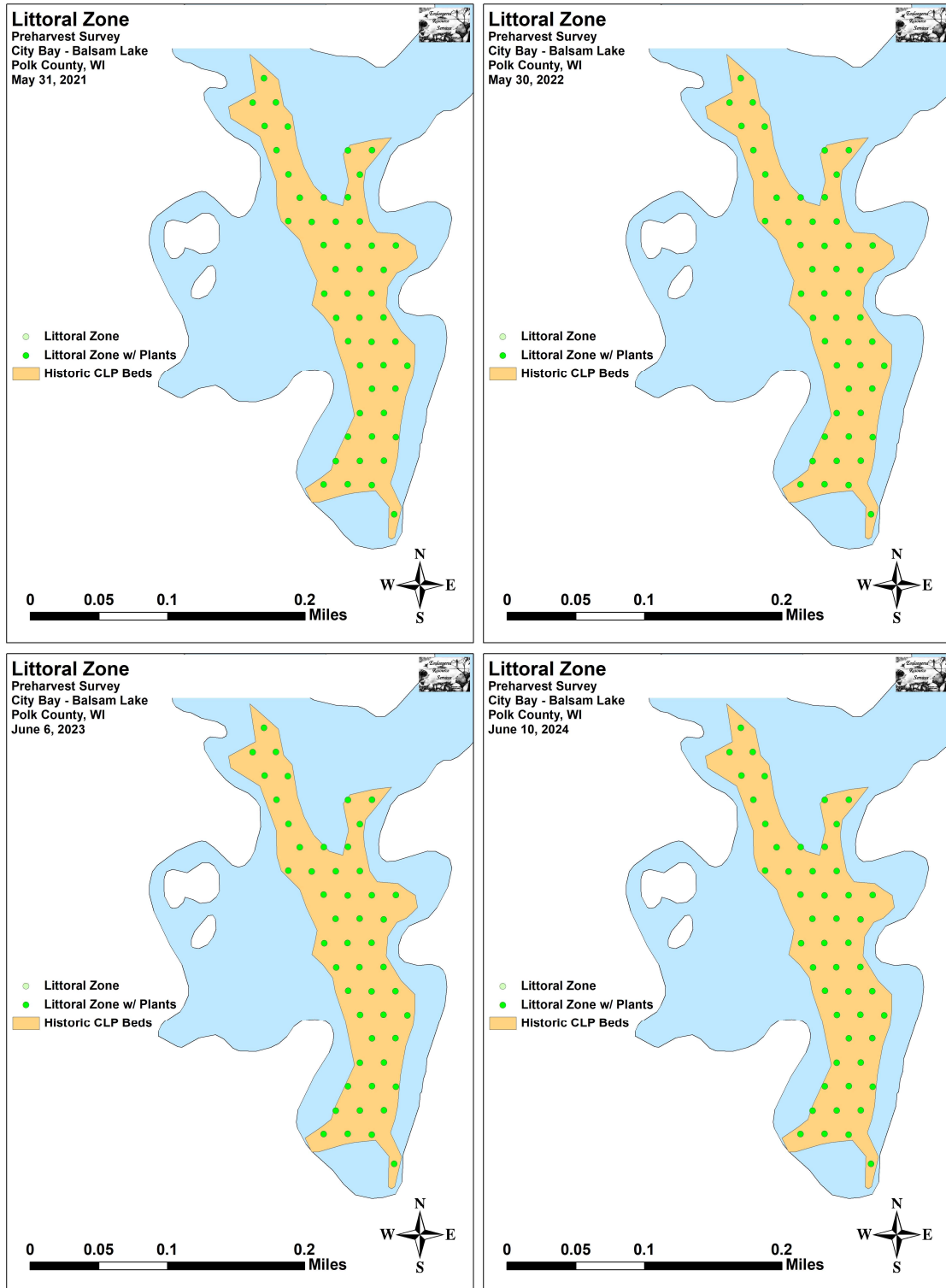


Figure 5: 2021, 2022, 2023, and 2024 Preharvest Littoral Zone

**Table 1: Preharvest Surveys Summary Statistics
City Bay – Balsam Lake – Polk County, WI
May 31, 2021, May 30, 2022, June 6, 2023, and June 10, 2024**

Summary Statistics:	5/31/21	5/30/22	6/6/23	6/10/24
Total number of points sampled	50	50	50	50
Total number of sites with vegetation	50	50	50	50
Total #of sites shallower than the max. depth of plants	50	50	50	50
Freq. of occur. at sites shallower than max. depth of plants	100.00	100.00	100.00	100.00
Simpson Diversity Index	0.87	0.81	0.82	0.85
Mean Coefficient of Conservatism	6.4	6.3	6.1	6.1
Floristic Quality Index	25.8	21.7	20.2	20.2
Maximum depth of plants (ft)	10.5	10.5	10.0	10.00
Mean depth of plants (ft)	7.4	7.4	7.4	7.4
Median depth of plants (ft)	7.5	7.5	7.5	7.5
Average # of all species/site (shallower than max depth)	3.58	2.68	3.04	3.60
Average # of all species/site (veg. sites only)	3.58	2.68	3.04	3.60
Average # of native species/site (shallower than max depth)	2.98	2.00	2.30	2.70
Average # of native species/site (sites with native veg. only)	3.10	2.22	2.30	3.00
Species richness	17	13	12	12
Mean rake fullness (veg. sites only)	2.18	2.24	1.98	2.62

Total species richness declined from 17 in 2021 to 13 in 2022 to 12 in both 2023 and 2024. The Simpson’s Diversity Index also declined from 0.87 in 2021 to 0.81 in 2022 before recovering slightly to 0.82 in 2023 and back to 0.85 in 2024. The Floristic Quality Index, another measure of the native plant community health, declined from 25.8 in 2021 to 21.7 in 2022 with a further decline to 20.2 in both 2023 and 2024.

Mean native species richness at points with native vegetation experienced a highly significant decline ($p<0.001$) from 3.10 species/point in 2021 to 2.22 species/point in 2022. In 2023, it underwent an increase to 2.30 species/point, but this was not significant ($p=0.37$). The 2024 survey found a moderately significant increase ($p=0.001$) to 3.00 species/point (Figure 6). Although this initial decline could be related to the harvesting program, it should be noted that growth for many species in 2022 and 2023 appeared to be much behind normal due to the exceptionally late ice-out seen during each of these years. Although anecdotal, this could be a contributing factor to the observed declines in total richness since the original 2021 survey.

The mean total rake fullness during the 2021 survey was a moderate 2.18. The 2022 survey found these levels were almost unchanged at 2.24 – a non-significant increase ($p=0.27$). In 2023, we found mean rake fullness underwent a moderately significant decline ($p=0.004$) to a moderate 1.98; however, in 2024, plant growth levels rose sharply to a high mean density of 2.62 – a highly significant increase ($p<0.001$) (Figure 7) (Appendix IV).

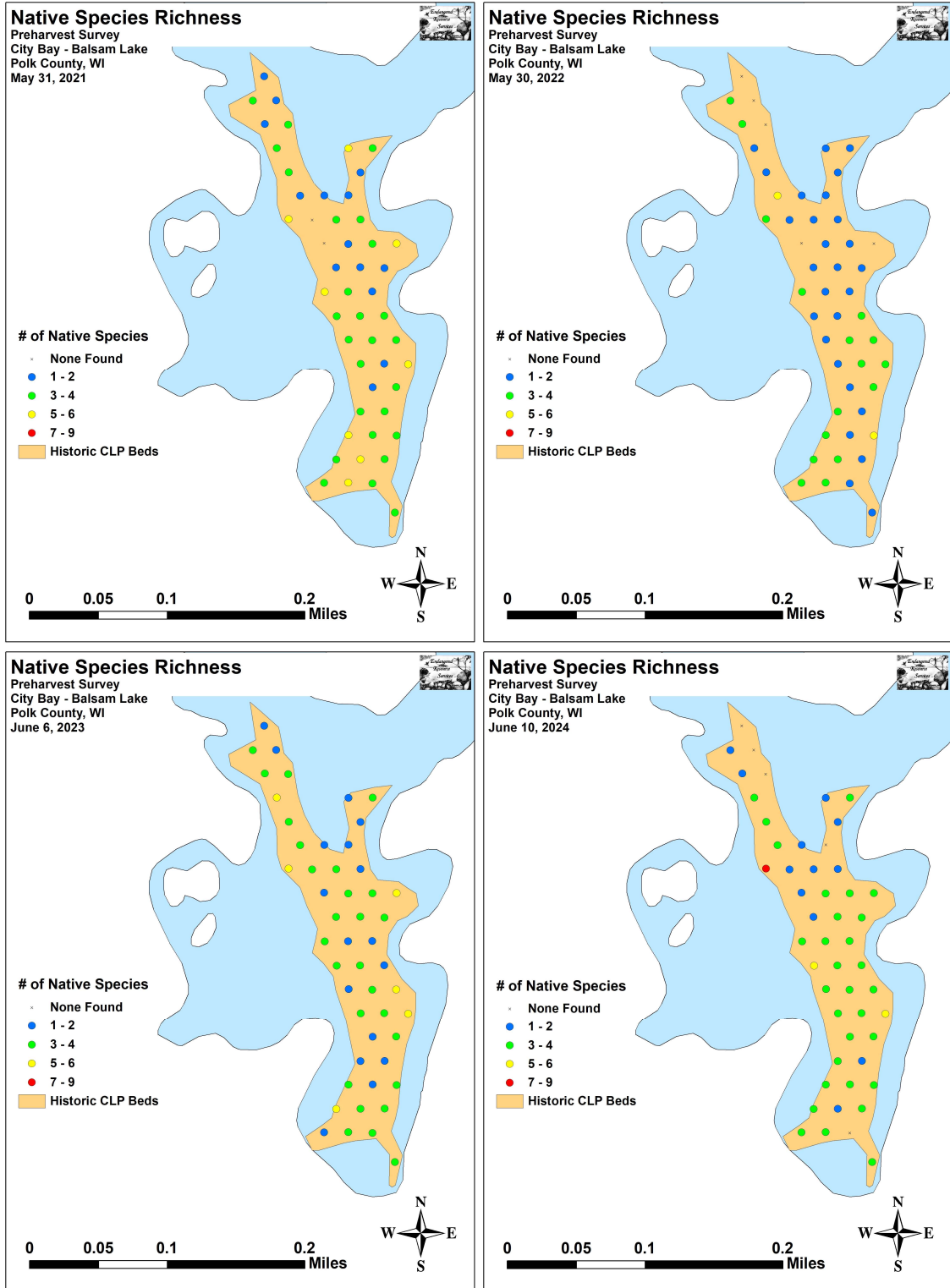


Figure 6: 2021, 2022, 2023, and 2024 Preharvest Native Species Richness

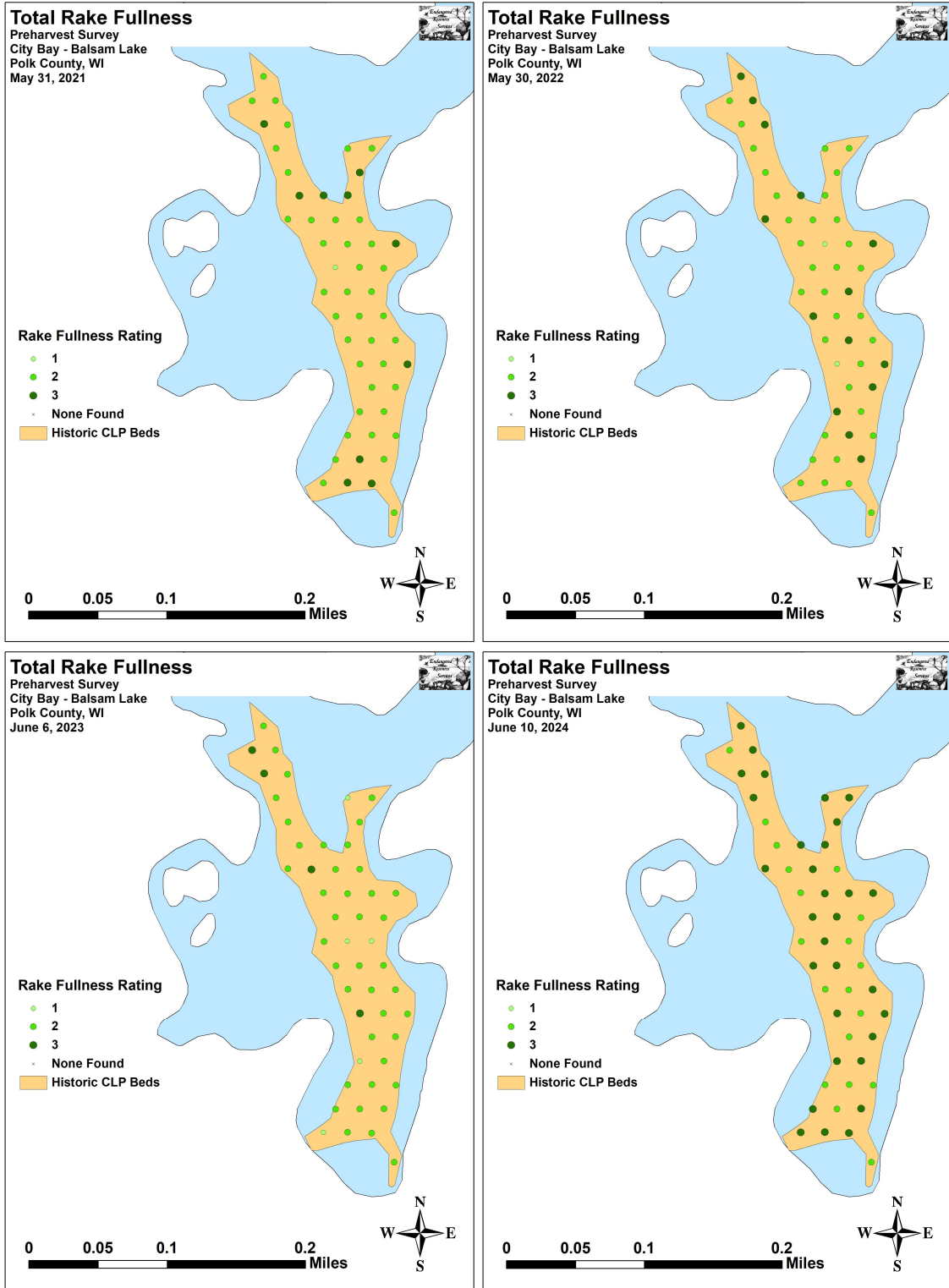


Figure 7: 2021, 2022, 2023, and 2024 Preharvest Total Rake Fullness

In 2021, we found Curly-leaf pondweed at 30 of 50 sites (60.0% coverage) during the preharvest survey (Figure 8). Of these, four points had a rake fullness rating of 3, 15 rated a 2, and 11 were a 1. This produced a mean rake fullness of 1.77 and suggested 38.0% of the beds had a significant infestation (rake fullness of 2 or 3). CLP was also recorded as a visual at eight points (Appendix V).

The 2022 survey documented CLP at 34 points (68.0% coverage) – a non-significant increase ($p=0.40$) in distribution when compared to 2021 (Figure 8). We rated seven of these points a 3, 12 points a 2 (38.0% significant infestation), and the remaining 15 points a 1. This produced a mean rake fullness of 1.76 – a non-significant decrease ($p=0.50$) compared to 2021 levels. Similarly, none of the changes in rake fullness rating were significantly different; however, the decline in visual sightings was **moderately significant** ($p=0.002$) (Figure 9).

Our 2023 survey found CLP at 37 sites (74.0% coverage) (Figure 8). Although this further increase in distribution was not significant ($p=0.51$), its decline in mean rake fullness to 1.54 was nearly significant ($p=0.09$). Broken out by density, two points rated a rake fullness of 3, 16 points rated a rake fullness of 2 (36.0% significant infestation), and the remaining 19 were a rake fullness of 1. We also recorded CLP as a visual at a single point. None of these changes were significantly different when compared to the 2022 survey (Figure 9).

A record warm winter with late ice-on/early ice-off and almost no snowfall appeared to benefit CLP as Balsam and many other area lakes had dense growth in 2024. In City Bay, we found CLP at 45 sites (90% coverage) with three additional visual sightings – **a significant increase** ($p=0.04$) **in distribution** over 2023 levels and the highest coverage at any point over the past four years (Figure 8). Of these, we rated 21 points a rake fullness of 3, 18 points a 2 (78% significant infestation), and the remaining six points a 1 for a mean rake fullness of 2.33. In addition to the significant increase in distribution, these results also demonstrated **a highly significant increase** ($p<0.001$) **in mean density and rake fullness 3** with a corresponding moderately significant decline ($p=0.003$) in rake fullness 1 (Figure 9).

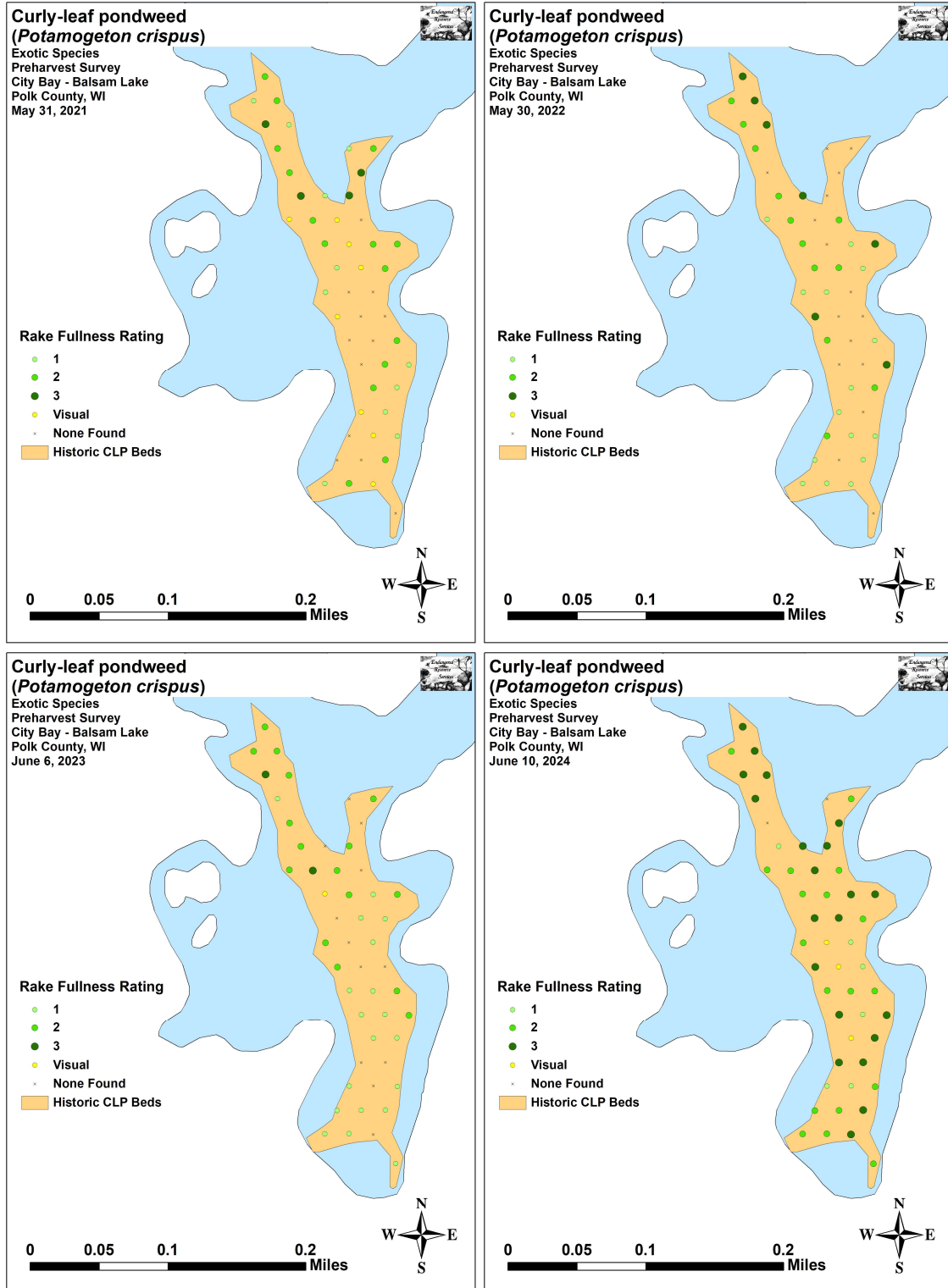
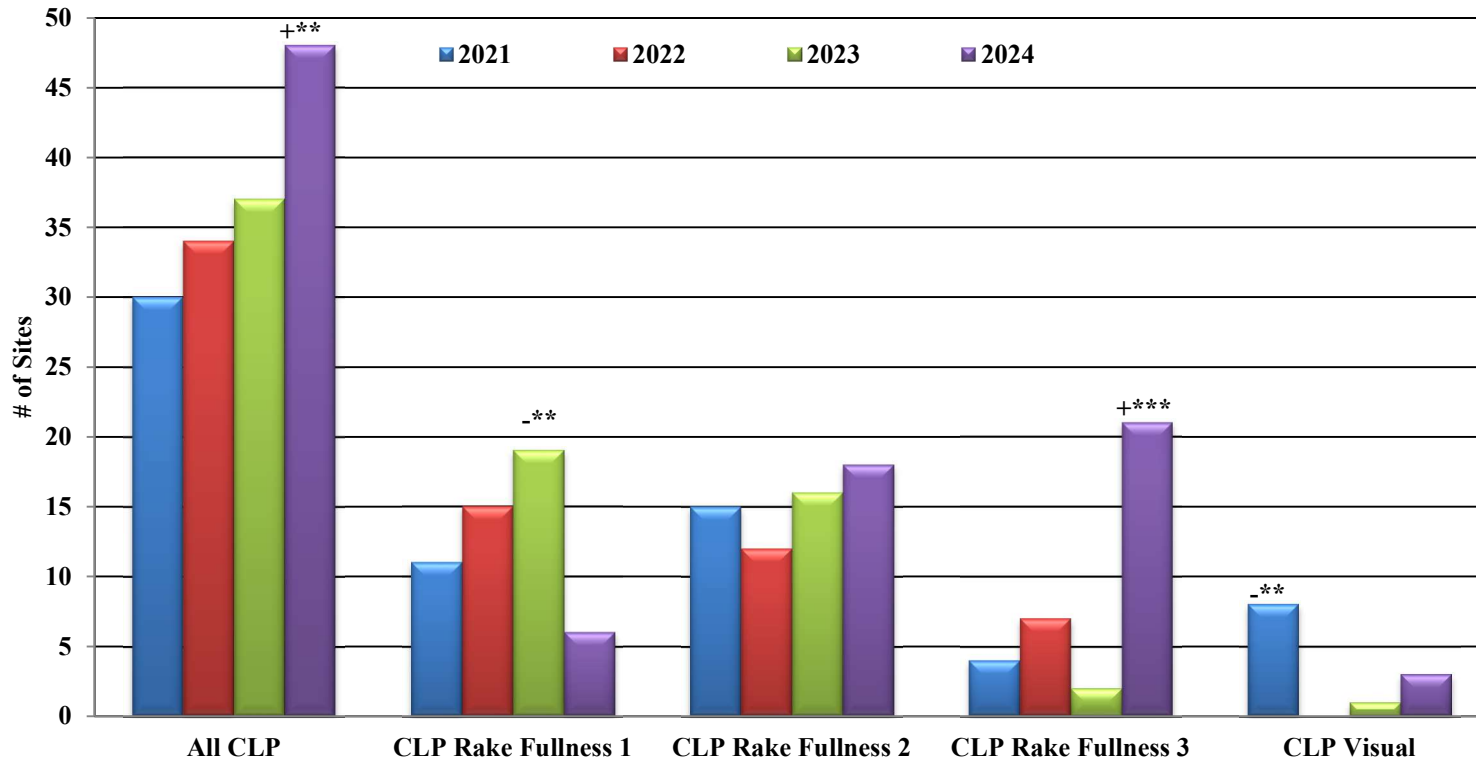


Figure 8: 2021, 2022, 2023, and 2024 Preharvest Curly-leaf Pondweed Density and Distribution

**Preharvest Curly-leaf Pondweed Rake Fullness Results
City Bay - Balsam Lake - Polk County, WI
May 31, 2021, May 30, 2022, June 6, 2023, and June 10, 2024**



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

Figure 9: 2021, 2022, 2023, and 2024 Preharvest Changes in CLP Rake Fullness

Coontail (*Ceratophyllum demersum*) was the most common native species from 2021-2023, and the second most common in 2024 (Figure 10) (Tables 2-5). From 2021 to 2022, it experienced non-significant increases ($p=0.48/p=0.17$) in both distribution (37 sites in 2021/40 sites in 2022) and density (mean rake 1.68 in 2021/1.83 in 2022). Our 2023 survey found its distribution was unchanged (40 sites), but it had undergone a moderately significant decline ($p=0.004$) in density (mean rake of 1.45). This decline continued into 2024 as it suffered a moderately significant decline ($p=0.003$) in distribution (26 sites) and a highly significant decline ($p<0.001$) in density (mean rake fullness of 1.08).

Common waterweed (*Elodea canadensis*), the second most common native species in 2021, underwent a highly significant decline ($p<0.001$) in distribution (32 sites in 2021/14 sites in 2022) and fell to the third most common species in 2022 (Figure 11). It also underwent a significant decline ($p=0.04$) in density from a mean rake of 1.47 in 2021 to 1.21 in 2022. This species was little changed in 2023 as neither its increase in distribution (16 sites) nor density (mean rake fullness of 1.44) were significant ($p=0.66/p=0.10$), and it remained the third-ranked native species. In 2024, it was the most common native species following a moderately significant increase ($p=0.004$) in distribution (30 sites) and a non-significant rise ($p=0.22$) in density (mean rake of 1.57).

Flat-stem pondweed (*Potamogeton zosteriformis*) was the third most common native species in 2021 and 2024 and the fourth most common in 2022 and 2023 (Figure 12). The 2021 survey found it at 20 sites with a mean rake fullness of 1.20. In 2022, we found it had undergone a significant decline ($p=0.02$) in distribution (nine sites) and a non-significant decline ($p=0.27$) in density (mean rake 1.11). The 2023 survey documented an increase in distribution to 14 sites, but a decline in density to a mean rake of 1.07; however, neither of these changes were significant ($p=0.23/p=0.30$). Similarly, in 2024, it was present at 21 sites with a mean rake of 1.14 – both non-significant increases ($p=0.14/p=0.25$).

From 2021 to 2022, Fern pondweed (*Potamogeton robbinsii*) increased its rank from the fourth to the third most common native species (Figure 13). However, neither its increase in distribution (17 sites 2021/20 sites 2022), nor its increase in density (mean rake 1.41 2021/1.60 2022) were significant ($p=0.53/p=0.13$). In 2023, it became the second most common native species following a further non-significant increase ($p=0.23$) in distribution (26 sites). Although it declined slightly in density (mean rake fullness 1.58), this wasn't significant either ($p=0.44$). The 2024 survey found non-significant declines ($p=0.32/p=0.21$) in distribution (21 sites) and density (mean rake 1.43) as it fell back to the third-ranked species in the native community.

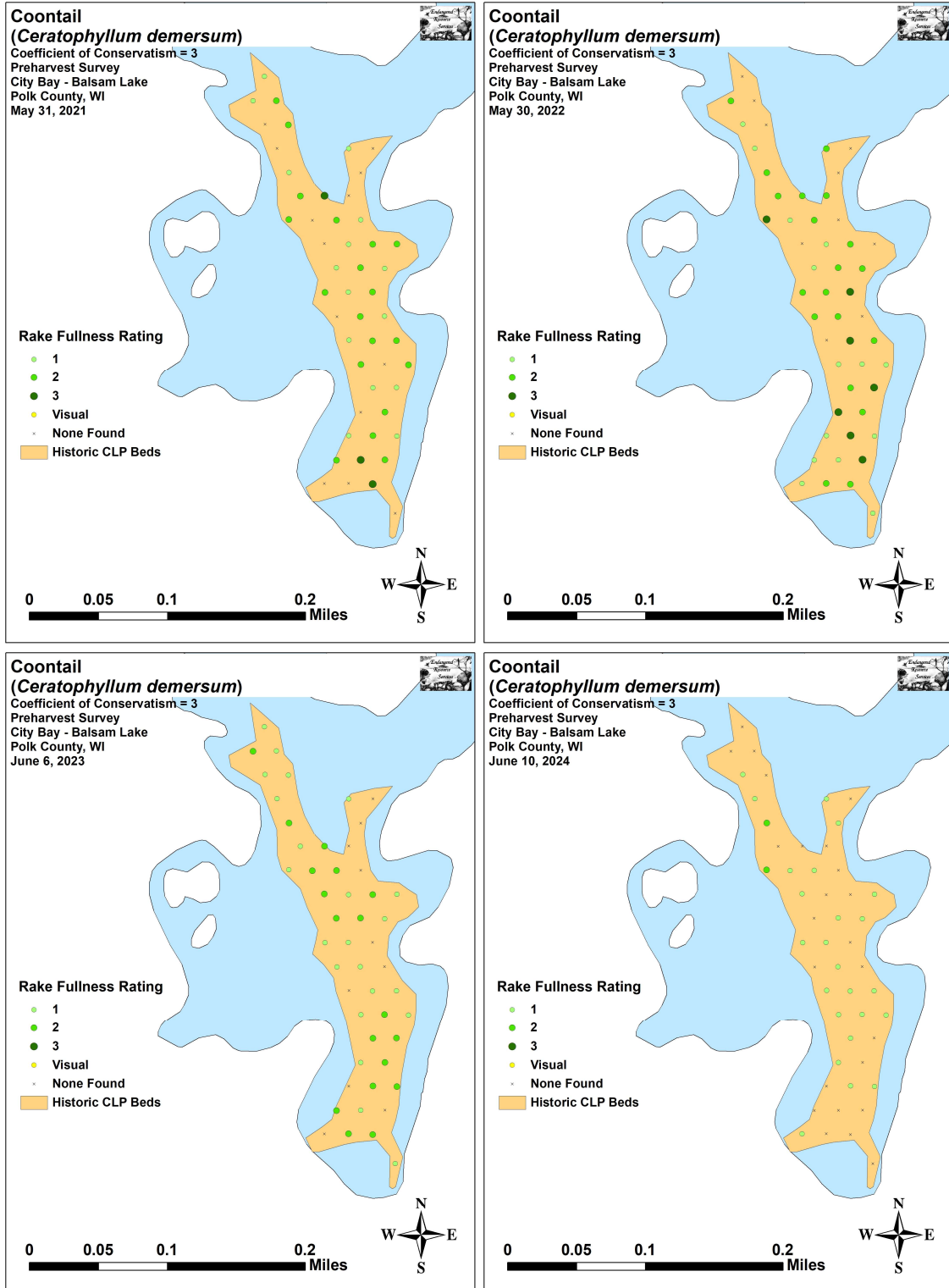


Figure 10: 2021, 2022, 2023, and 2024 Preharvest Coontail Density and Distribution

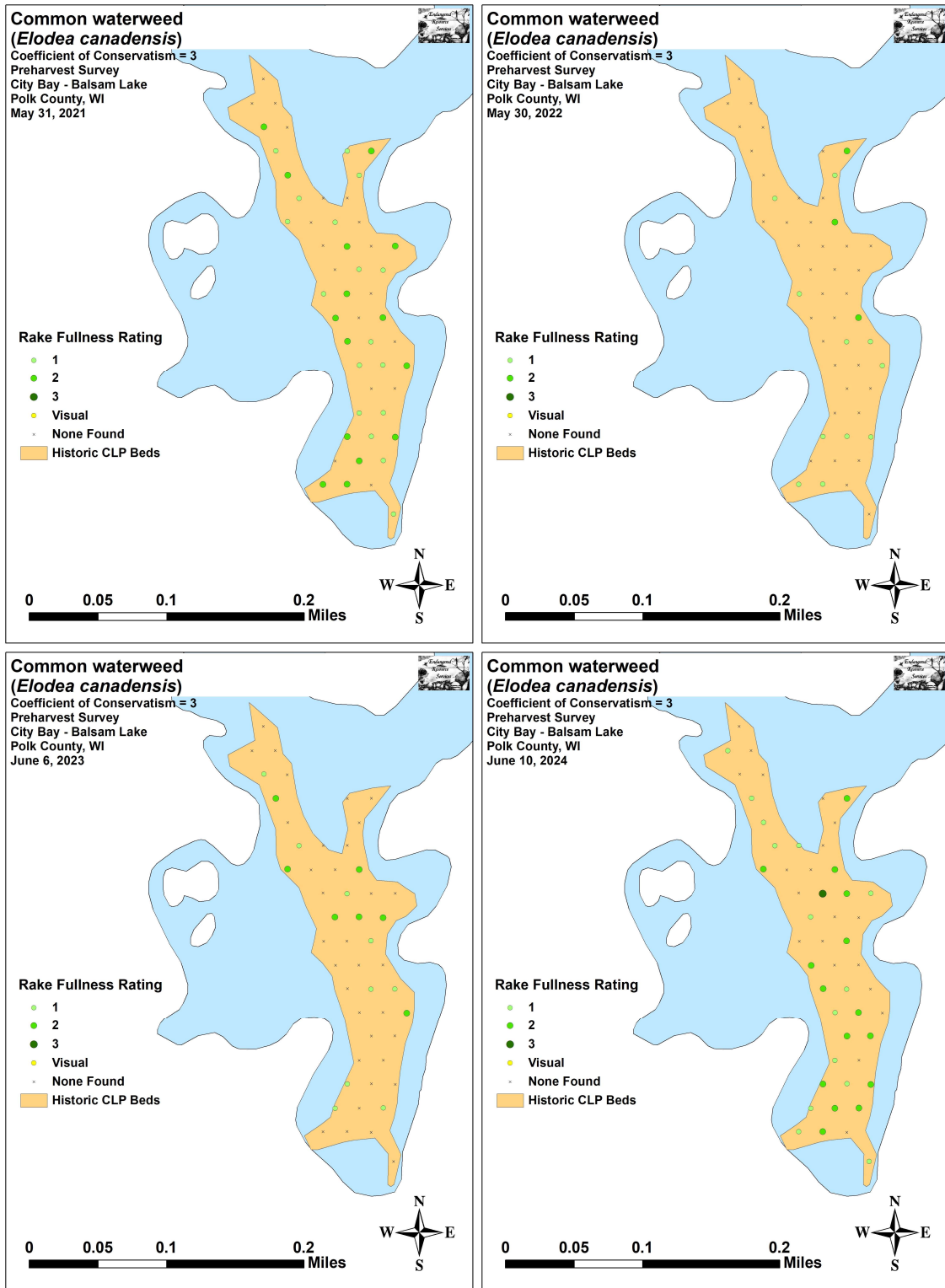


Figure 11: 2021, 2022, 2023, and 2024 Preharvest Common Waterweed Density and Distribution

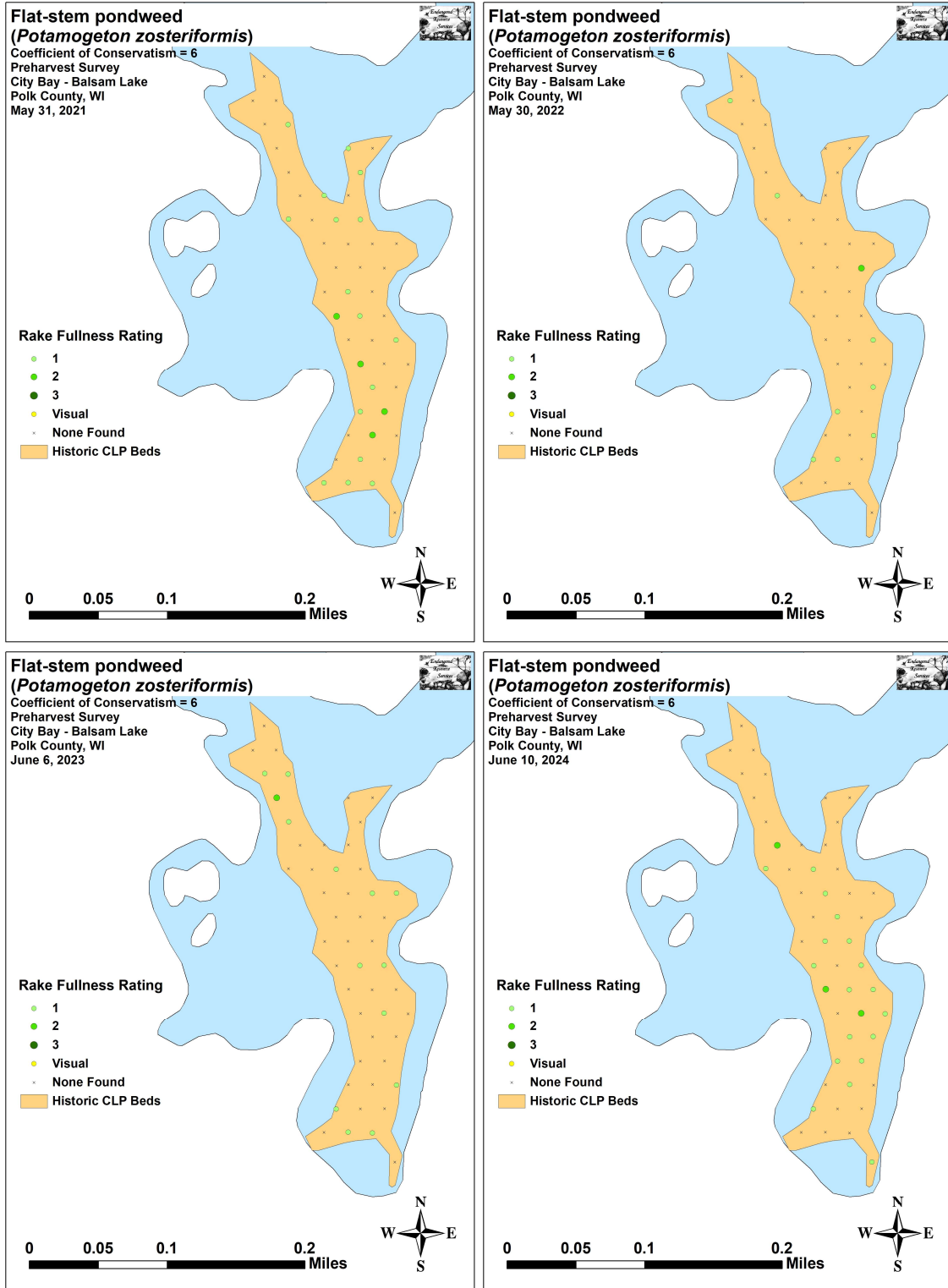


Figure 12: 2021, 2022, 2023, and 2024 Preharvest Flat-stem Pondweed Density and Distribution

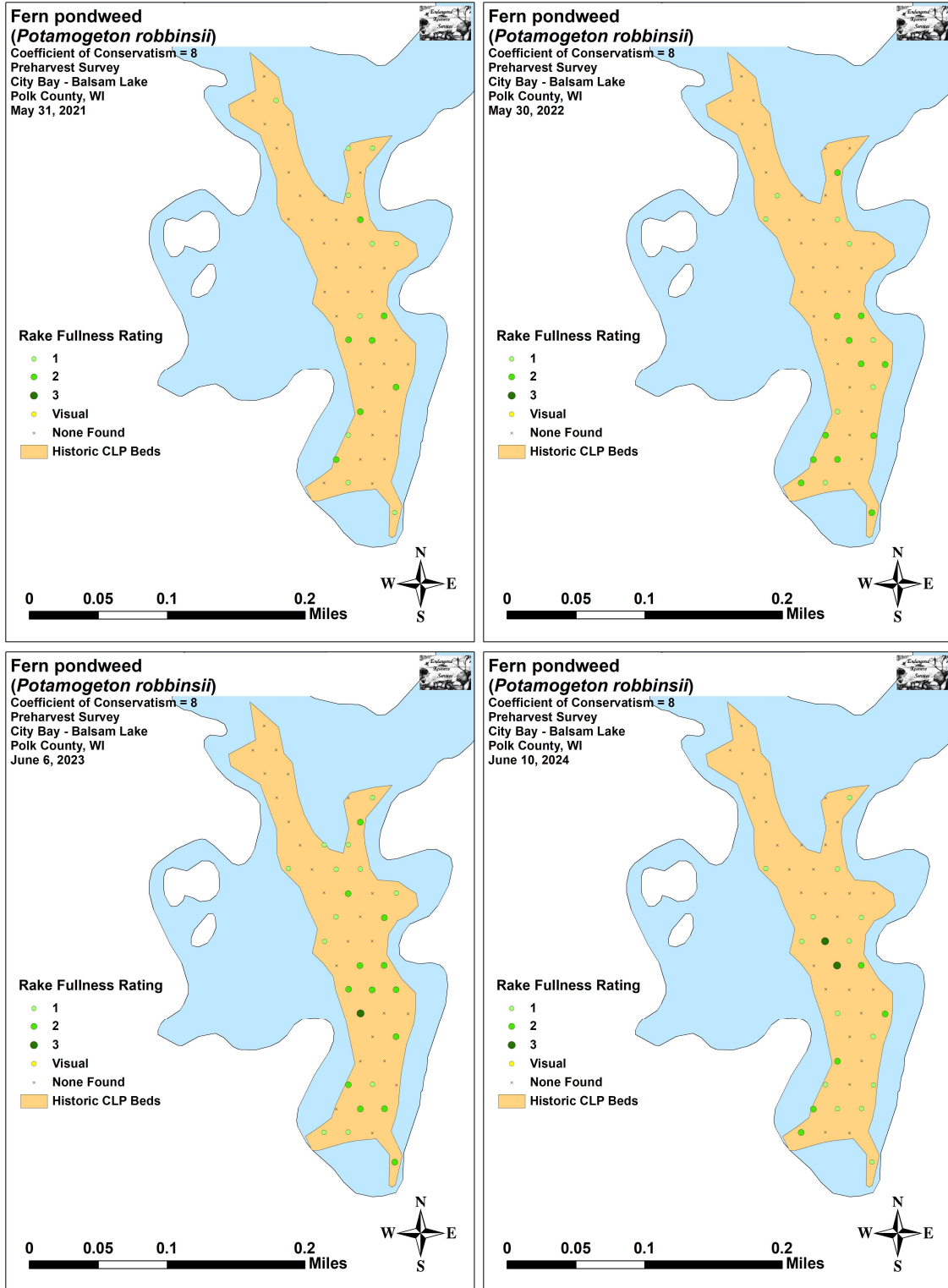


Figure 13: 2021, 2022, 2023, and 2024 Preharvest Fern pondweed Density and Distribution

**Table 2: Frequencies and Mean Rake Sample of Aquatic Macrophytes
Preharvest Survey – City Bay – Balsam Lake – Polk County, Wisconsin
May 31, 2021**

Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
<i>Ceratophyllum demersum</i>	Coontail	37	20.67	74.00	74.00	1.68	0
<i>Elodea canadensis</i>	Common waterweed	32	17.88	64.00	64.00	1.47	0
<i>Potamogeton crispus</i>	Curly-leaf pondweed	30	16.76	60.00	60.00	1.77	8
<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	20	11.17	40.00	40.00	1.20	0
<i>Potamogeton robbinsii</i>	Fern pondweed	17	9.50	34.00	34.00	1.41	0
	Filamentous algae	10	*	20.00	20.00	1.30	0
<i>Myriophyllum sibiricum</i>	Northern water-milfoil	8	4.47	16.00	16.00	1.38	0
<i>Ranunculus aquatilis</i>	White water crowfoot	8	4.47	16.00	16.00	1.25	0
<i>Potamogeton praelongus</i>	White-stem pondweed	7	3.91	14.00	14.00	1.14	0
<i>Potamogeton amplifolius</i>	Large-leaf pondweed	6	3.35	12.00	12.00	1.67	0
<i>Heteranthera dubia</i>	Water star-grass	3	1.68	6.00	6.00	1.00	0
<i>Potamogeton illinoensis</i>	Illinois pondweed	3	1.68	6.00	6.00	1.00	0
<i>Nitella</i> sp.	Nitella	2	1.12	4.00	4.00	1.50	0
<i>Potamogeton richardsonii</i>	Clasping-leaf pondweed	2	1.12	4.00	4.00	1.00	0
<i>Bidens beckii</i>	Water marigold	1	0.56	2.00	2.00	2.00	0
<i>Chara</i> sp.	Muskgrass	1	0.56	2.00	2.00	1.00	0
<i>Nymphaea odorata</i>	White water lily	1	0.56	2.00	2.00	1.00	0
<i>Utricularia gibba</i>	Creeping bladderwort	1	0.56	2.00	2.00	1.00	0

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

**Table 3: Frequencies and Mean Rake Sample of Aquatic Macrophytes
Preharvest Survey – City Bay – Balsam Lake – Polk County, Wisconsin
May 30, 2022**

Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
<i>Ceratophyllum demersum</i>	Coontail	40	29.85	80.00	80.00	1.83	0
<i>Potamogeton crispus</i>	Curly-leaf pondweed	34	25.37	68.00	68.00	1.76	0
<i>Potamogeton robbinsii</i>	Fern pondweed	20	14.93	40.00	40.00	1.60	0
	Filamentous algae	19	*	38.00	38.00	1.42	0
<i>Elodea canadensis</i>	Common waterweed	14	10.45	28.00	28.00	1.21	0
<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	9	6.72	18.00	18.00	1.11	0
<i>Potamogeton amplifolius</i>	Large-leaf pondweed	3	2.24	6.00	6.00	1.33	0
<i>Ranunculus aquatilis</i>	White water crowfoot	3	2.24	6.00	6.00	1.00	0
<i>Chara</i> sp.	Muskgrass	2	1.49	4.00	4.00	2.00	0
<i>Heteranthera dubia</i>	Water star-grass	2	1.49	4.00	4.00	1.00	0
<i>Myriophyllum sibiricum</i>	Northern water-milfoil	2	1.49	4.00	4.00	1.50	0
<i>Nitella</i> sp.	Nitella	2	1.49	4.00	4.00	1.00	0
<i>Potamogeton praelongus</i>	White-stem pondweed	2	1.49	4.00	4.00	1.50	0
<i>Nymphaea odorata</i>	White water lily	1	0.75	2.00	2.00	1.00	0

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

**Table 4: Frequencies and Mean Rake Sample of Aquatic Macrophytes
Preharvest Survey – City Bay – Balsam Lake – Polk County, Wisconsin
June 6, 2023**

Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
<i>Ceratophyllum demersum</i>	Coontail	40	26.32	80.00	80.00	1.45	0
<i>Potamogeton crispus</i>	Curly-leaf pondweed	37	24.34	74.00	74.00	1.54	1
<i>Potamogeton robbinsii</i>	Fern pondweed	26	17.11	52.00	52.00	1.58	0
<i>Elodea canadensis</i>	Common waterweed	16	10.53	32.00	32.00	1.44	0
<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	14	9.21	28.00	28.00	1.07	0
<i>Nitella</i> sp.	Nitella	11	7.24	22.00	22.00	1.27	0
	Filamentous algae	11	*	22.00	22.00	1.27	0
<i>Ranunculus aquatilis</i>	White water crowfoot	3	1.97	6.00	6.00	1.00	0
<i>Chara</i> sp.	Muskgrass	1	0.66	2.00	2.00	1.00	0
<i>Potamogeton amplifolius</i>	Large-leaf pondweed	1	0.66	2.00	2.00	1.00	0
<i>Potamogeton pusillus</i>	Small pondweed	1	0.66	2.00	2.00	1.00	0
<i>Potamogeton richardsonii</i>	Clasping-leaf pondweed	1	0.66	2.00	2.00	1.00	0
<i>Vallisneria americana</i>	Wild celery	1	0.66	2.00	2.00	1.00	0

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

**Table 5: Frequencies and Mean Rake Sample of Aquatic Macrophytes
Preharvest Survey – City Bay – Balsam Lake – Polk County, Wisconsin
June 10, 2024**

Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
<i>Potamogeton crispus</i>	Curly-leaf pondweed	45	25.00	90.00	90.00	2.33	3
<i>Elodea canadensis</i>	Common waterweed	30	16.67	60.00	60.00	1.57	0
<i>Ceratophyllum demersum</i>	Coontail	26	14.44	52.00	52.00	1.08	0
<i>Potamogeton robbinsii</i>	Fern pondweed	21	11.67	42.00	42.00	1.43	0
<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	21	11.67	42.00	42.00	1.14	0
<i>Potamogeton amplifolius</i>	Large-leaf pondweed	13	7.22	26.00	26.00	1.38	0
<i>Ranunculus aquatilis</i>	White water crowfoot	12	6.67	24.00	24.00	1.42	0
	Filamentous algae	9	*	18.00	18.00	1.56	0
<i>Potamogeton richardsonii</i>	Clasping-leaf pondweed	7	3.89	14.00	14.00	1.43	0
<i>Chara</i> sp.	Muskgrass	2	1.11	4.00	4.00	1.00	0
<i>Myriophyllum sibiricum</i>	Northern water-milfoil	1	0.56	2.00	2.00	1.00	0
<i>Nitella</i> sp.	Nitella	1	0.56	2.00	2.00	2.00	0
<i>Potamogeton pusillus</i>	Small pondweed	1	0.56	2.00	2.00	1.00	0

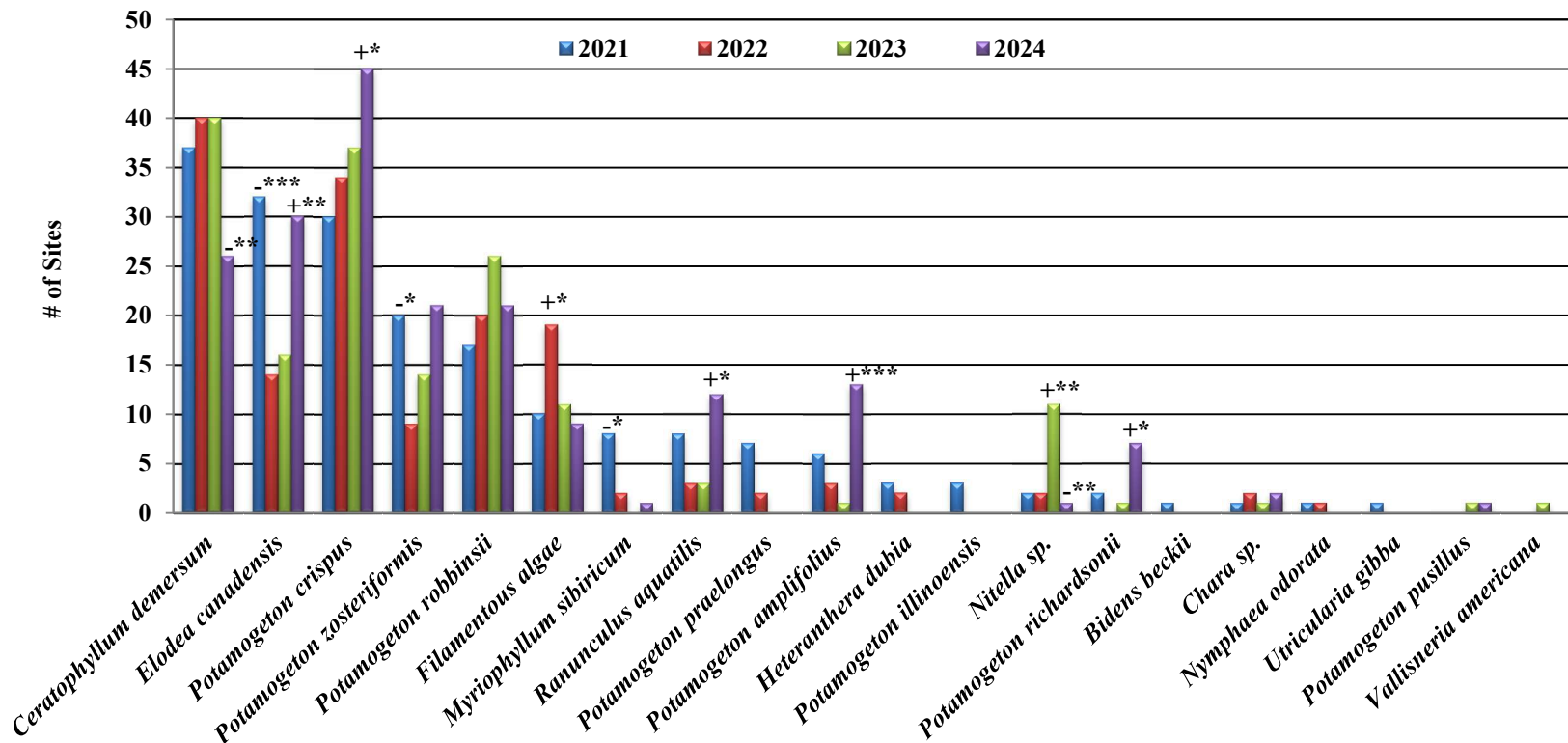
* Excluded from relative frequency analysis **Exotic species in bold**

Several species experienced significant year-over-year changes from 2021 to 2022 (Figure 14). Filamentous algae underwent a significant increase ($p < 0.05$) in distribution, but a non-significant increase in density ($p = 0.32$) (10 sites/mean rake 1.30 in 2021 – 19 sites/mean rake 1.42 in 2022). In addition to Common waterweed and Flat-stem pondweed, Northern water-milfoil (*Myriophyllum sibiricum*) also suffered a significant decline in distribution ($p < 0.05$).

The 2023 survey found comparatively few changes as Nitella (*Nitella* sp.) was the only species that demonstrated a significant change in distribution. Its moderately significant increase ($p = 0.007$) from two sites in 2022 to 11 sites in 2023 saw it jump from the seventh to the fifth-ranked native species in the community.

In 2024, we found many significant changes in distribution most of which were increases. In addition to the previously mentioned moderately significant increase in Common waterweed and significant increase in Curly-leaf pondweed, Large-leaf pondweed (*Potamogeton amplifolius*) enjoyed a highly significant increase ($p < 0.001$) as it jumped to the fifth-ranked native species (13 sites/mean rake 1.38). White water crowfoot (*Ranunculus aquatilis*) (12 sites/mean rake 1.42) and Claspingleaf pondweed (*Potamogeton richardsonii*) (seven sites/mean rake 1.43) also both saw significant increases ($p = 0.01/p = 0.03$) as they increased to the sixth and seventh-ranked native species respectively. Other than Coontail, Nitella, which had a sharp uptick in 2023, was the only other species that demonstrated a significant decline, and it was moderately significant ($p = 0.002$) (Maps for all native species from the 2021, 2022, 2023, and 2024 surveys can be found in Appendixes VI, VII, VIII, and IX).

Differences for All Species
City Bay - Balsam Lake - Polk County, WI
May 31, 2021, May 30, 2022, June 6, 2023, and June 10, 2024



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

Figure 14: 2021, 2022, 2023, and 2024 Preharvest Macrophyte Changes

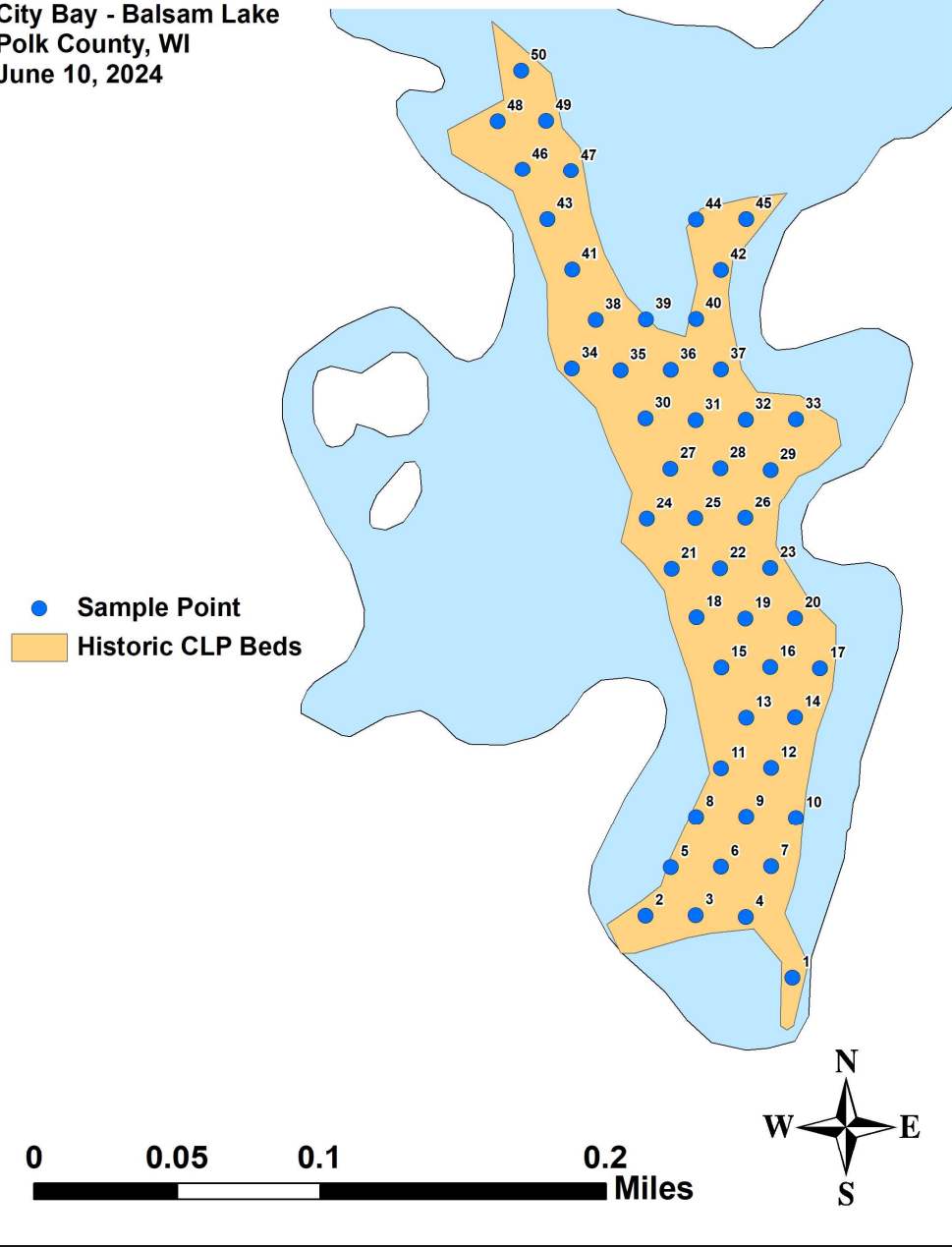
LITERATURE CITED

- Clemens, C. [online]. 2010. Aquatic Plant Management Plan - Balsam Lake Polk County, WI. Sponsored by Balsam Lake Protection and Rehabilitation District - Prepared by Harmony Environmental – October 2010. Available from <http://www.blprd.com/docs/BalsamLakeAPMfinal101810.pdf> (2024, October).
- Clemens, C. [online]. 2015. Aquatic Plant Management Plan - Balsam Lake Polk County, WI. Sponsored by Balsam Lake Protection and Rehabilitation District - Prepared by Harmony Environmental – September 2015. Available from <http://www.blprd.com/docs/BalsamLakeAPM2015FINAL.pdf> (2024, October).
- Hopke, R., E. Nelson, and E. Eaton [online]. 1964. Balsam Lake Maps. Available from https://apps.dnr.wi.gov/doclink/lakes_maps/2620600a.pdf (2024, October).
- UWEX Lakes Program. [online]. 2010. Aquatic Plant Management in Wisconsin. Available from <http://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/ecology/aquaticplants/default.aspx> (2024, October).
- UWEX Lakes Program. [online]. 2010. Pre/Post Herbicide Comparison. Available from <http://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/ecology/Aquatic%20Plants/Appendix-D.pdf> (2024, October).
- WDNR. [online]. 2024. Balsam Lake Citizen Monitoring Water Quality Database. Available from <https://apps.dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2620600&page=waterquality> (2024, October).
- WDNR. [online]. 2024. Wisconsin Lakes Information – Balsam Lake – Polk County. <https://apps.dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2620600> (2024, October).

Appendix I: Survey Sample Points and Historic CLP Bed Map

Survey Sample Points

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024

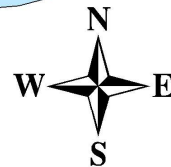
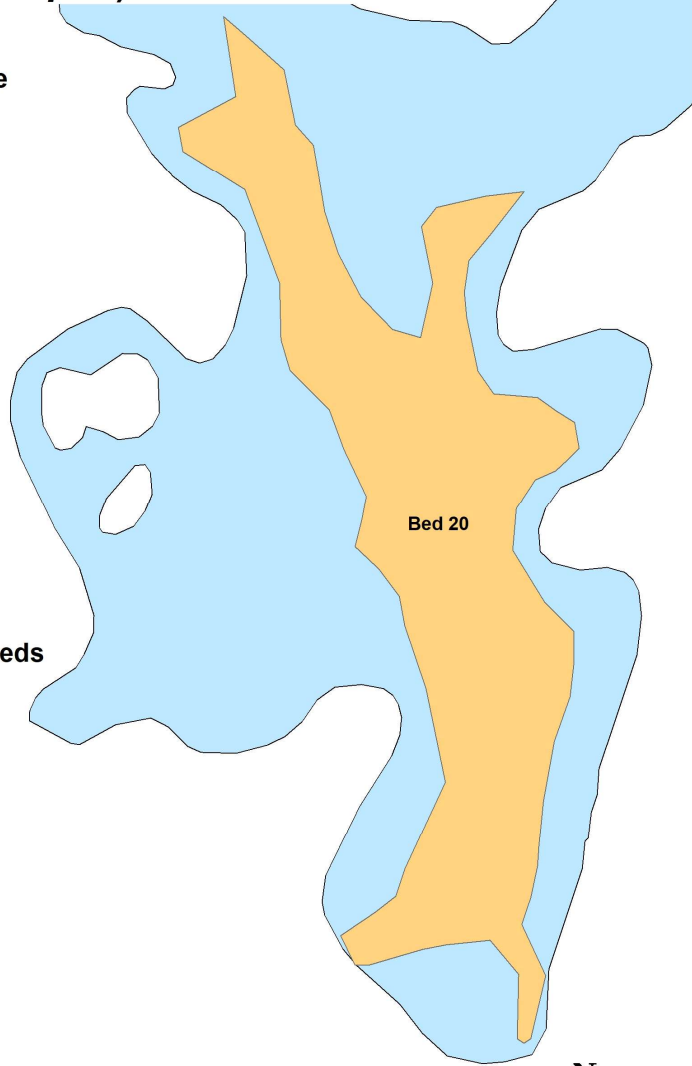


Curly-leaf pondweed (*Potamogeton crispus*)

Exotic Species
Historic CLP Beds
City Bay - Balsam Lake
Polk County, WI
June 4, 2020



 Historic CLP Beds

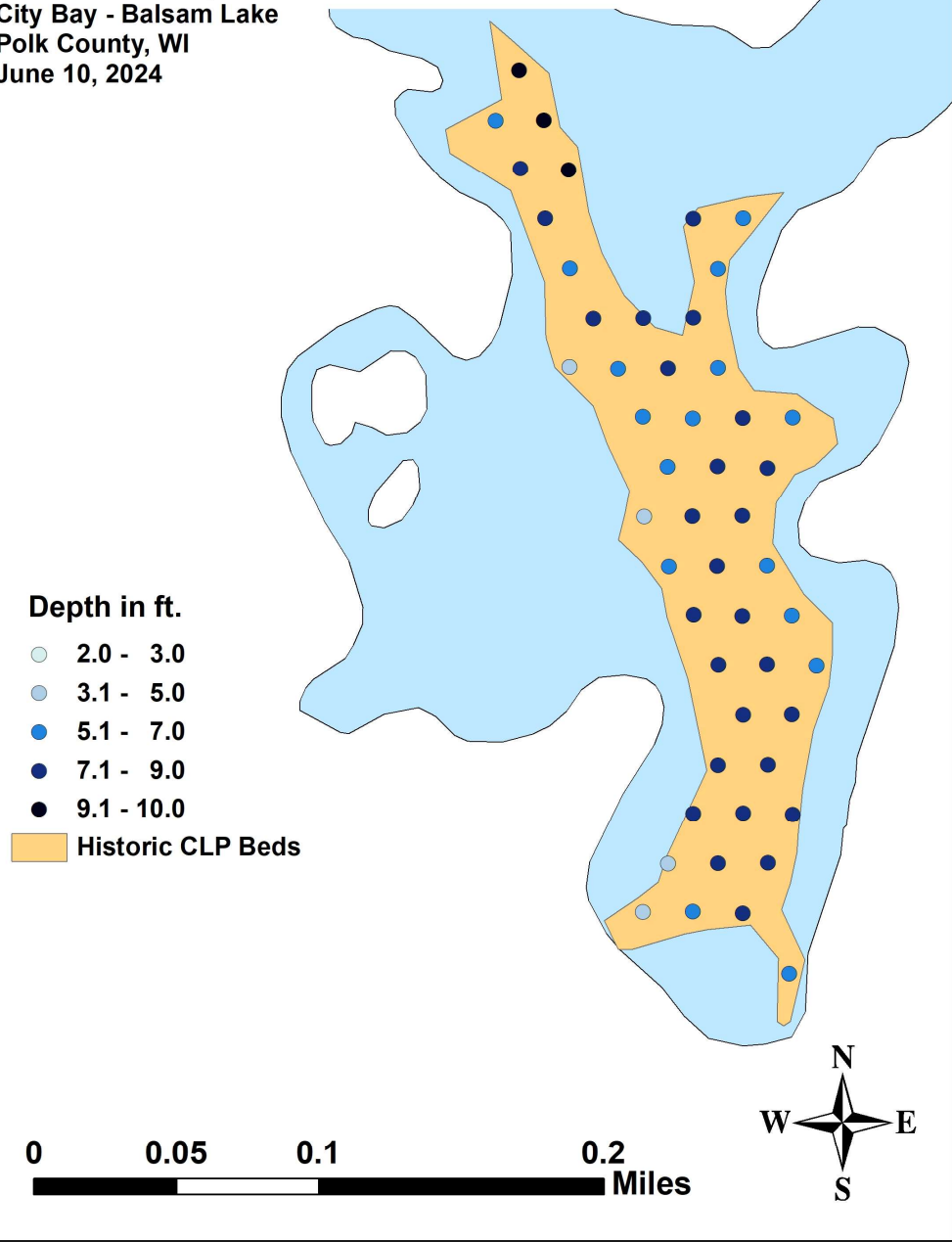


Appendix II: Vegetative Survey Datasheet

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: Preharvest Habitat Variables

Lake Depth
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



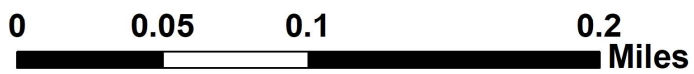
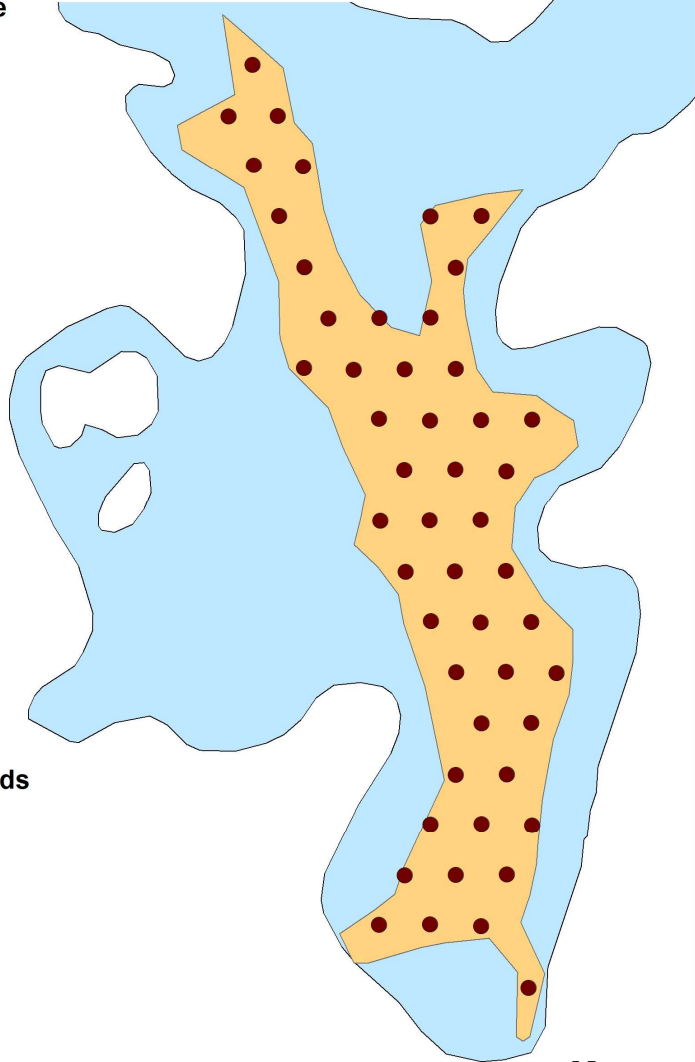
Bottom Substrate

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



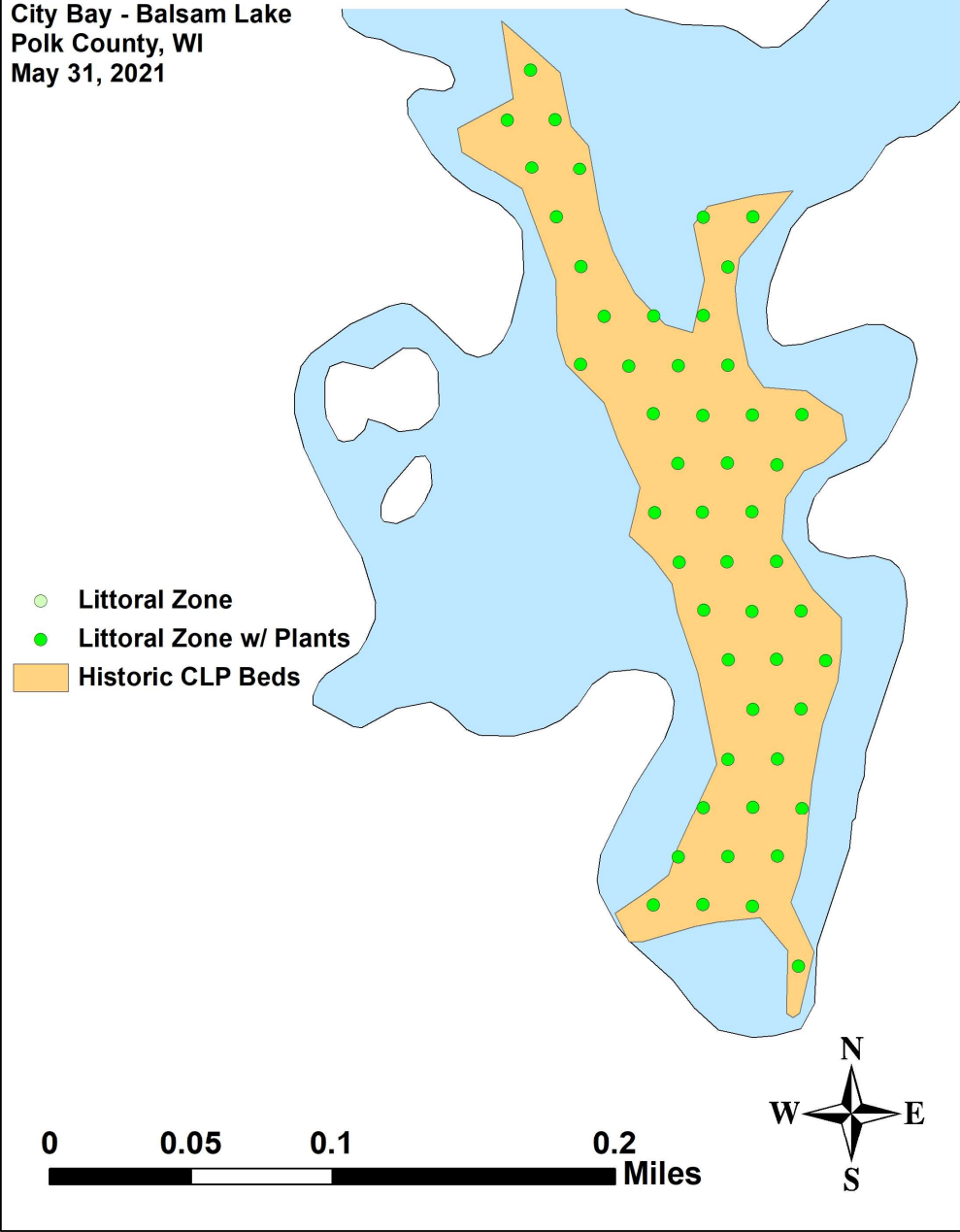
Substrate Type

- Muck
- Rock
- Sand
- Historic CLP Beds

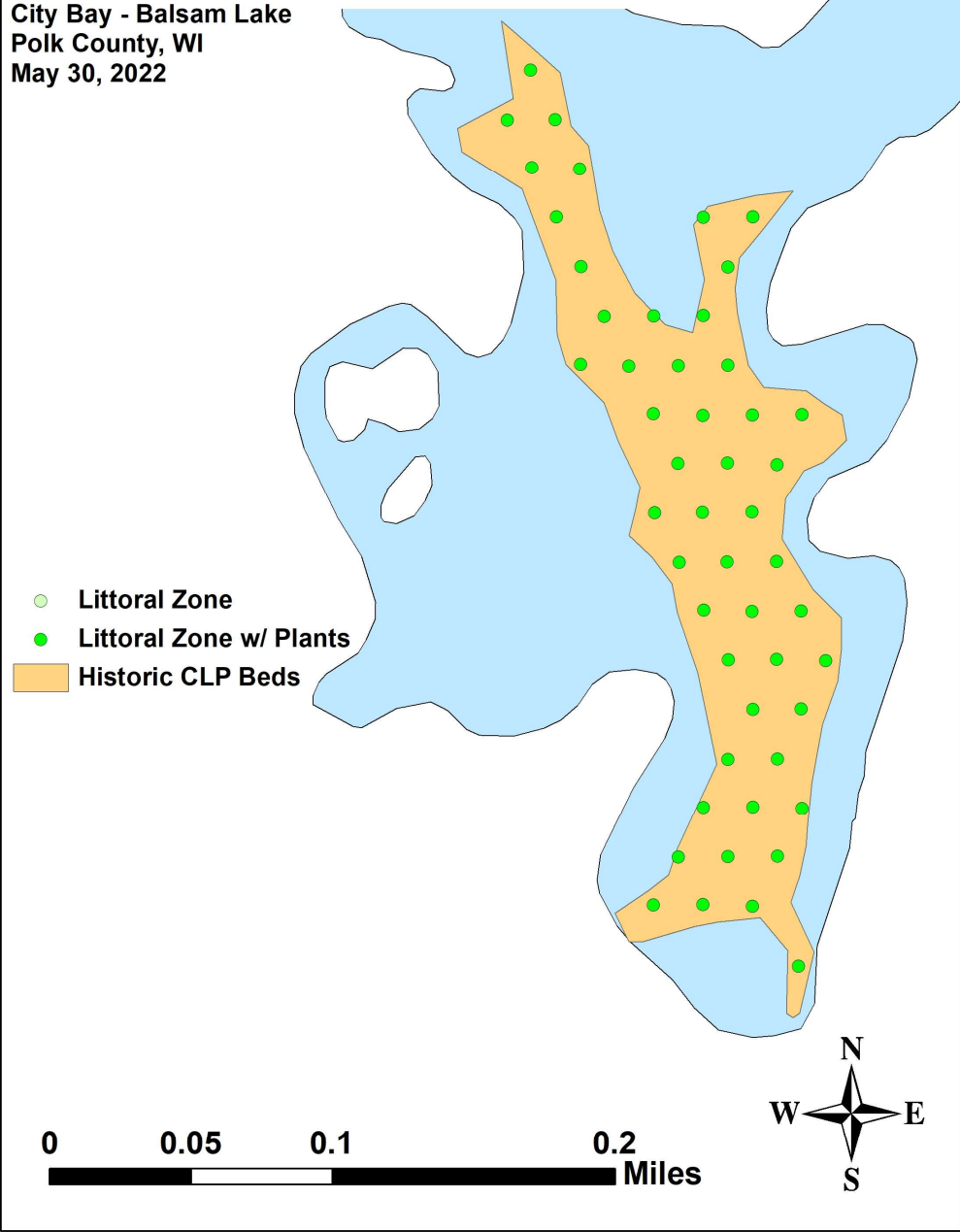


**Appendix IV: 2021, 2022, 2023, and 2024 Preharvest Littoral Zone,
Native Species Richness and Total Rake Fullness**

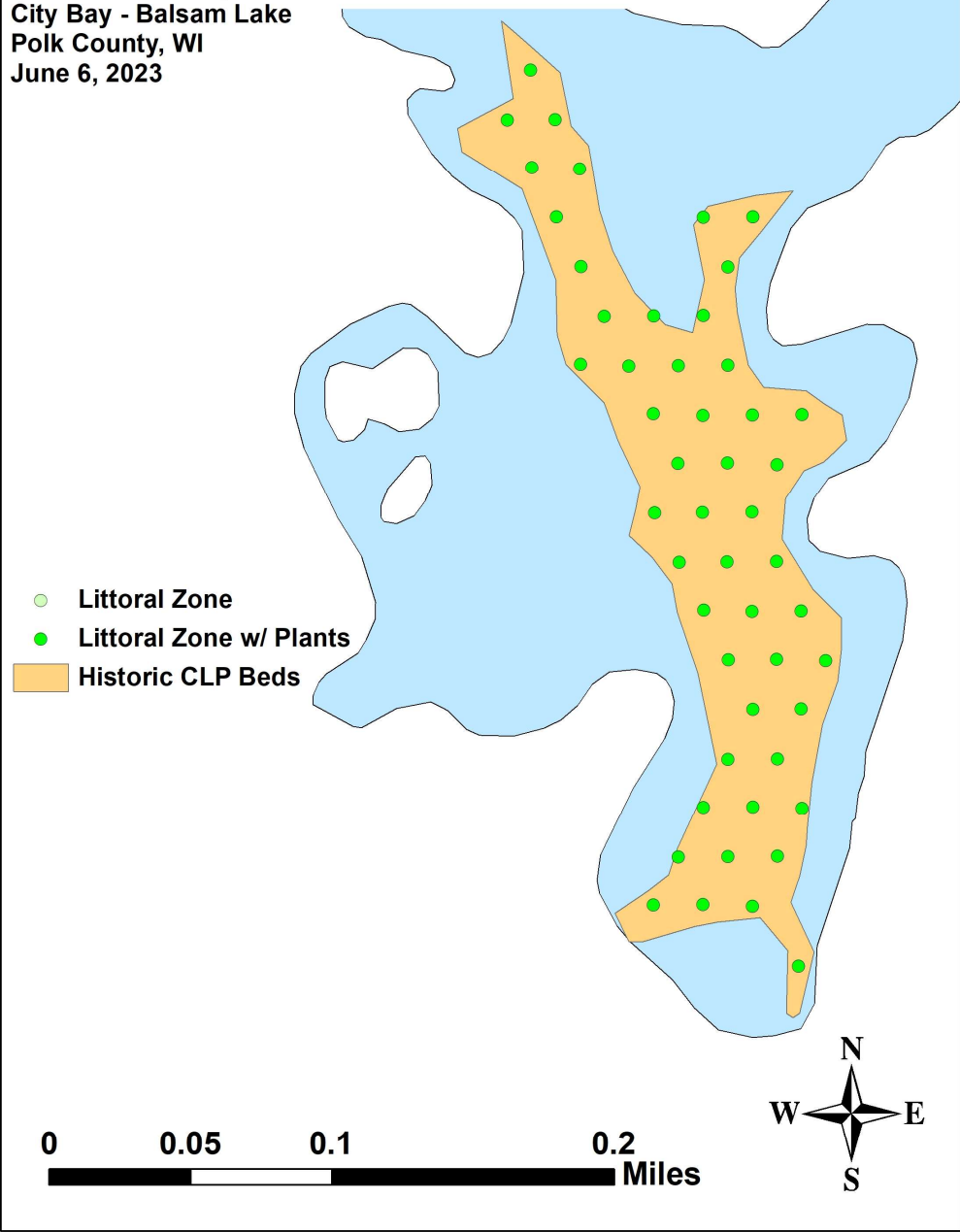
Littoral Zone
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



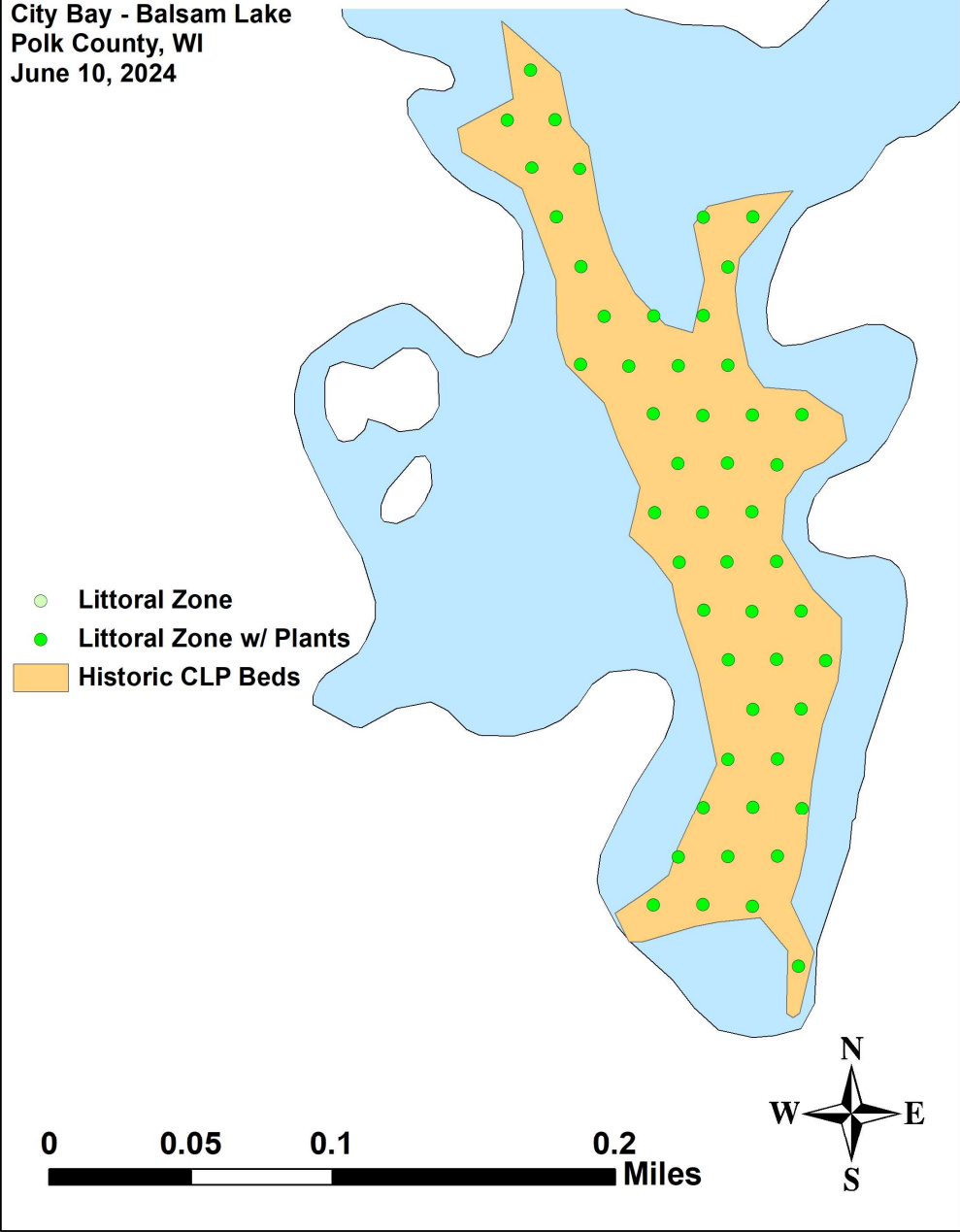
Littoral Zone
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



Littoral Zone
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



Littoral Zone
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024

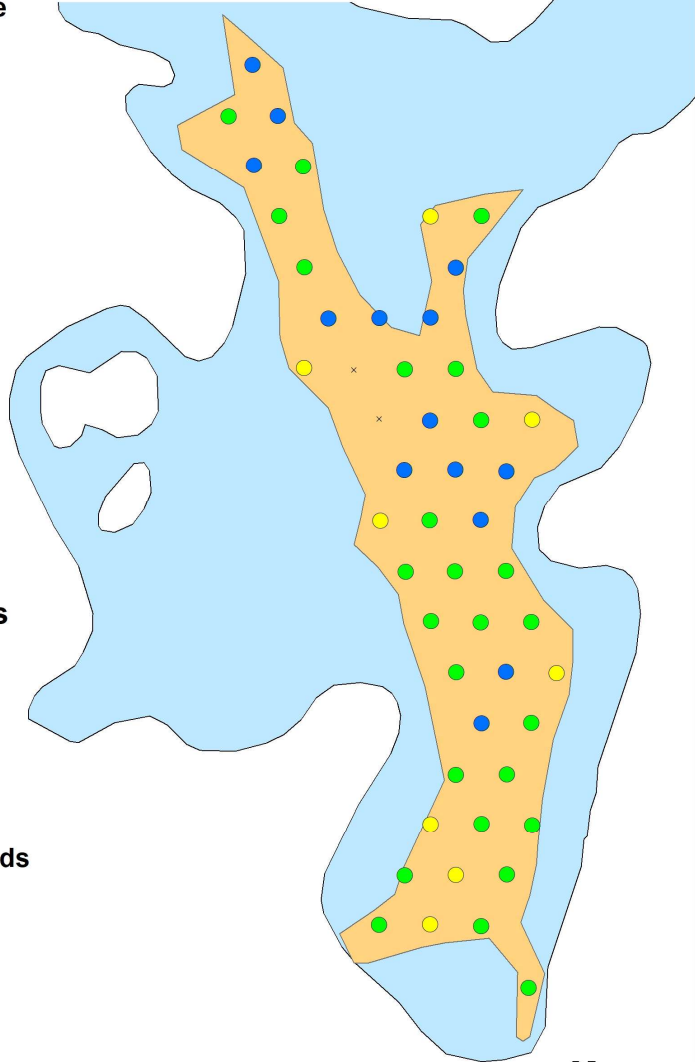


Native Species Richness

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



- # of Native Species**
- × None Found
 - 1 - 2
 - 3 - 4
 - 5 - 6
 - 7 - 9
 - Historic CLP Beds

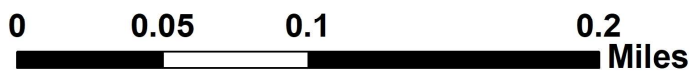
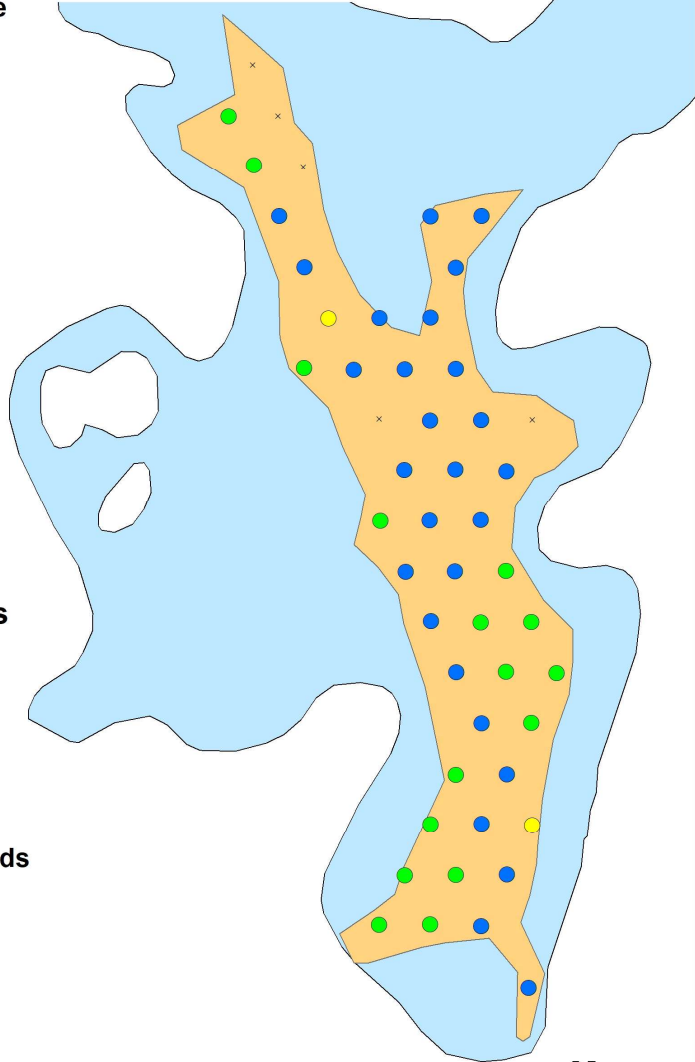


Native Species Richness

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



- # of Native Species**
- × None Found
 - 1 - 2
 - 3 - 4
 - 5 - 6
 - 7 - 9
 - Historic CLP Beds

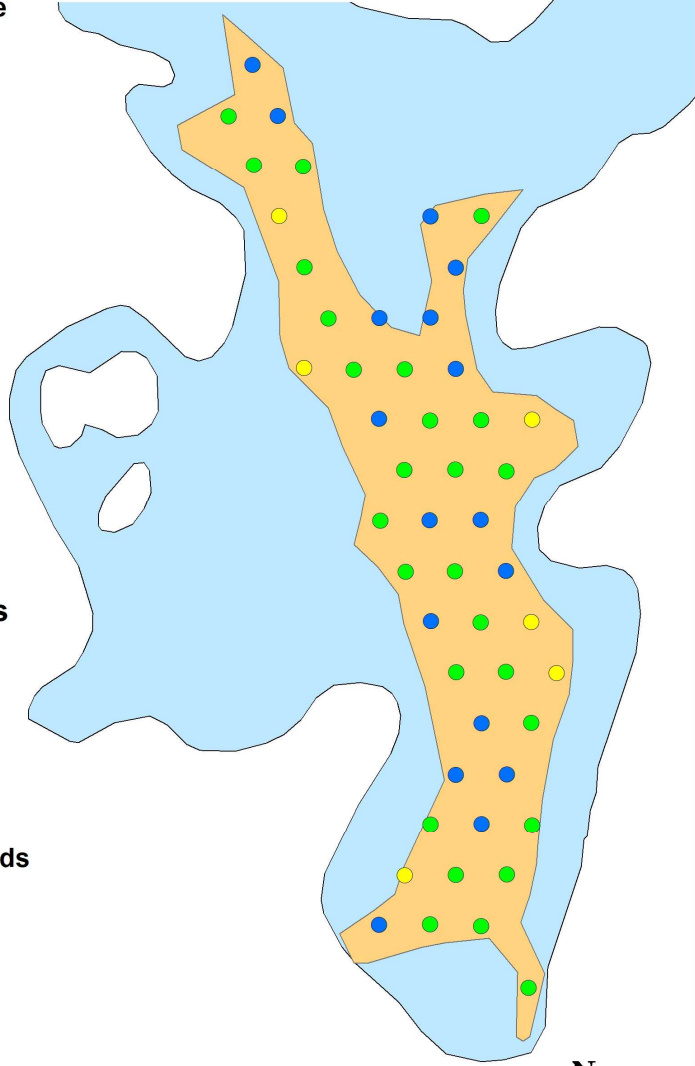


Native Species Richness

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



- # of Native Species**
- × None Found
 - 1 - 2
 - 3 - 4
 - 5 - 6
 - 7 - 9
 - Historic CLP Beds

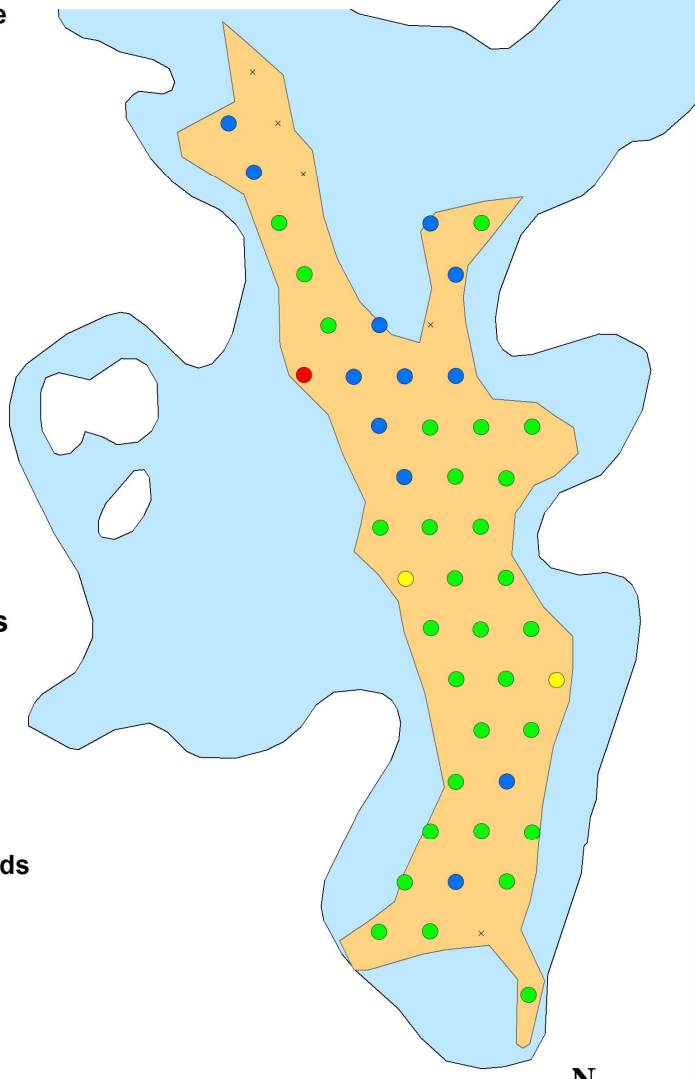


Native Species Richness

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



- # of Native Species**
- × None Found
 - 1 - 2
 - 3 - 4
 - 5 - 6
 - 7 - 9
 - Historic CLP Beds



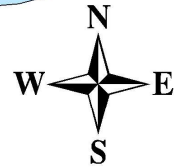
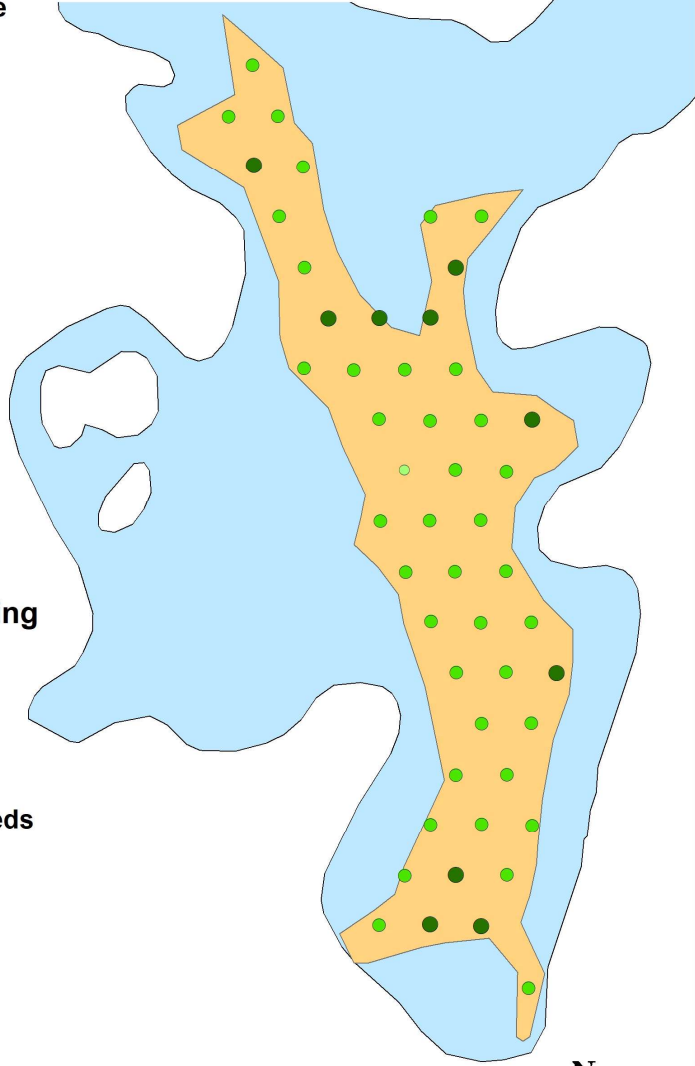
Total Rake Fullness

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- × None Found
- Historic CLP Beds



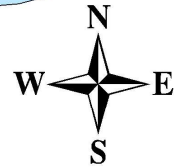
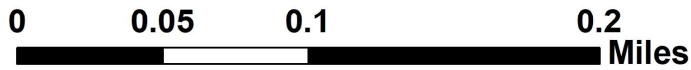
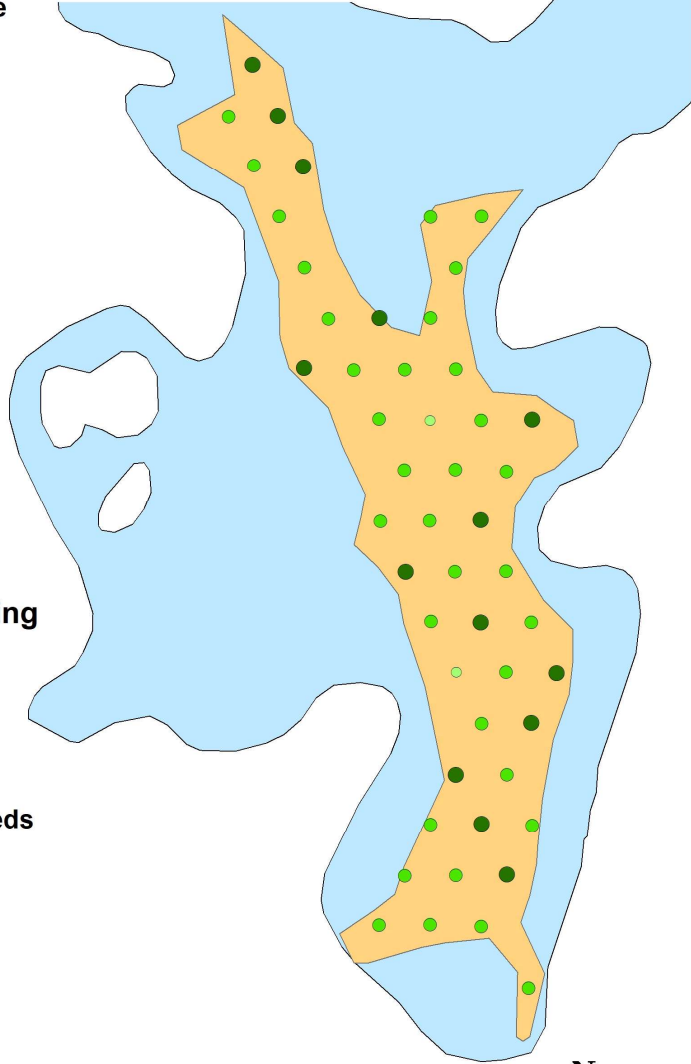
Total Rake Fullness

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- × None Found
- Historic CLP Beds



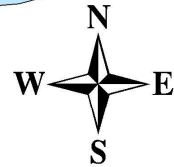
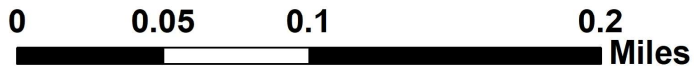
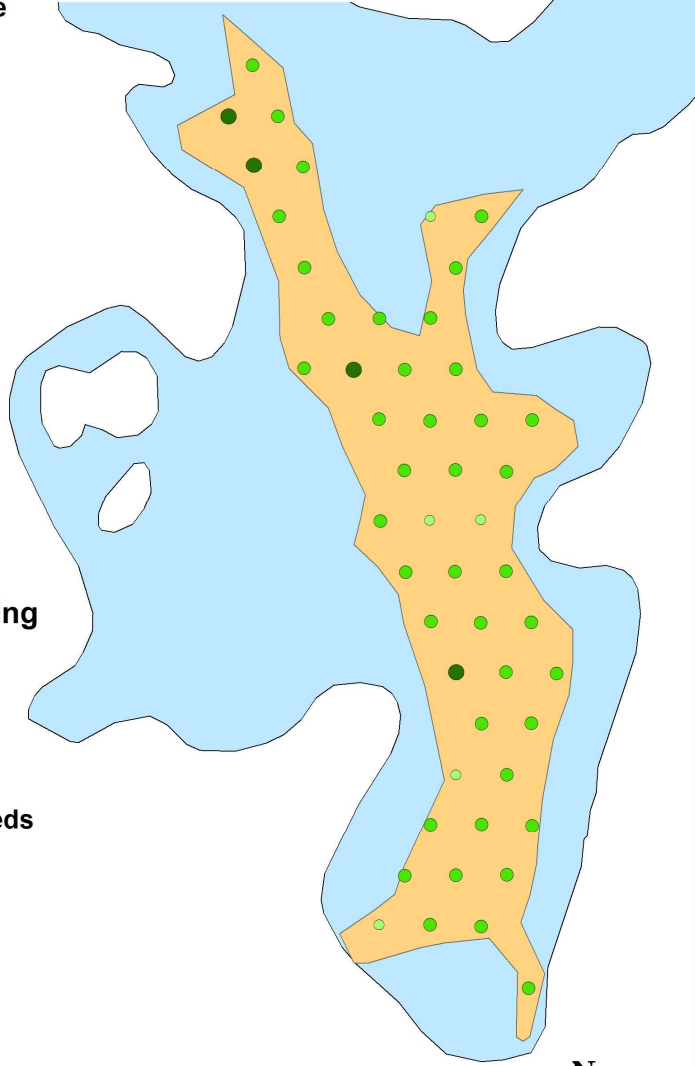
Total Rake Fullness

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- × None Found
- Historic CLP Beds



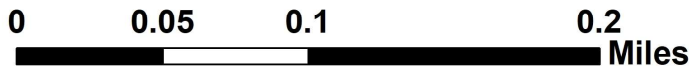
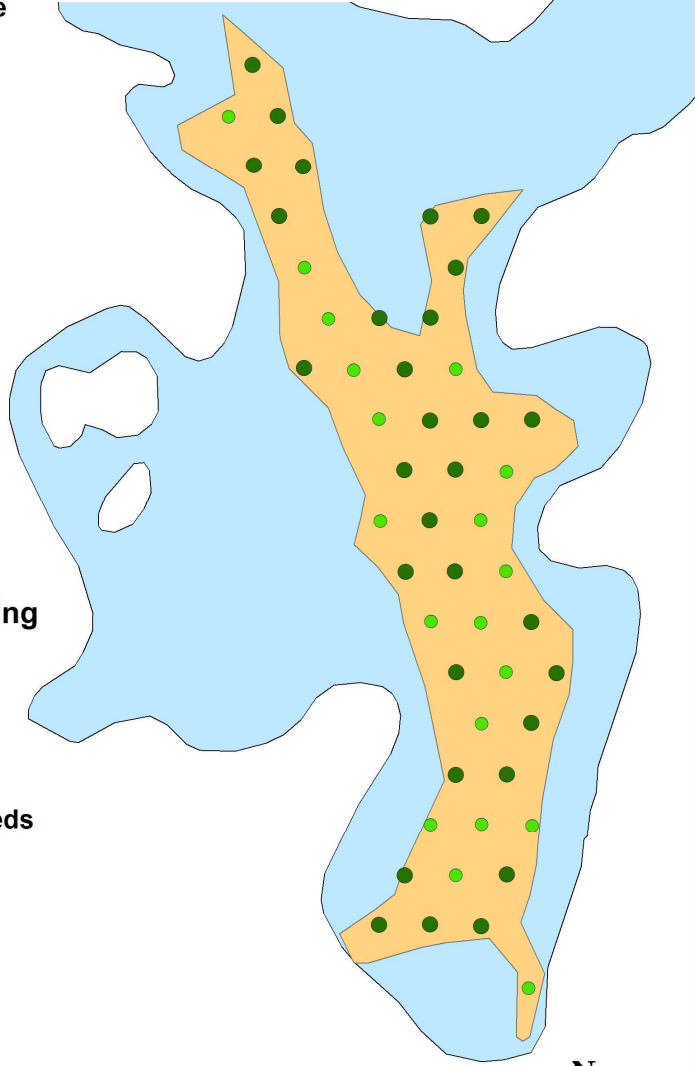
Total Rake Fullness

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



Rake Fullness Rating

- 1
- 2
- 3
- × None Found
- Historic CLP Beds



**Appendix V: 2021, 2022, 2023, and 2024 Preharvest
CLP Density and Distribution**

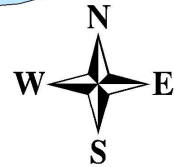
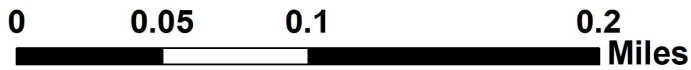
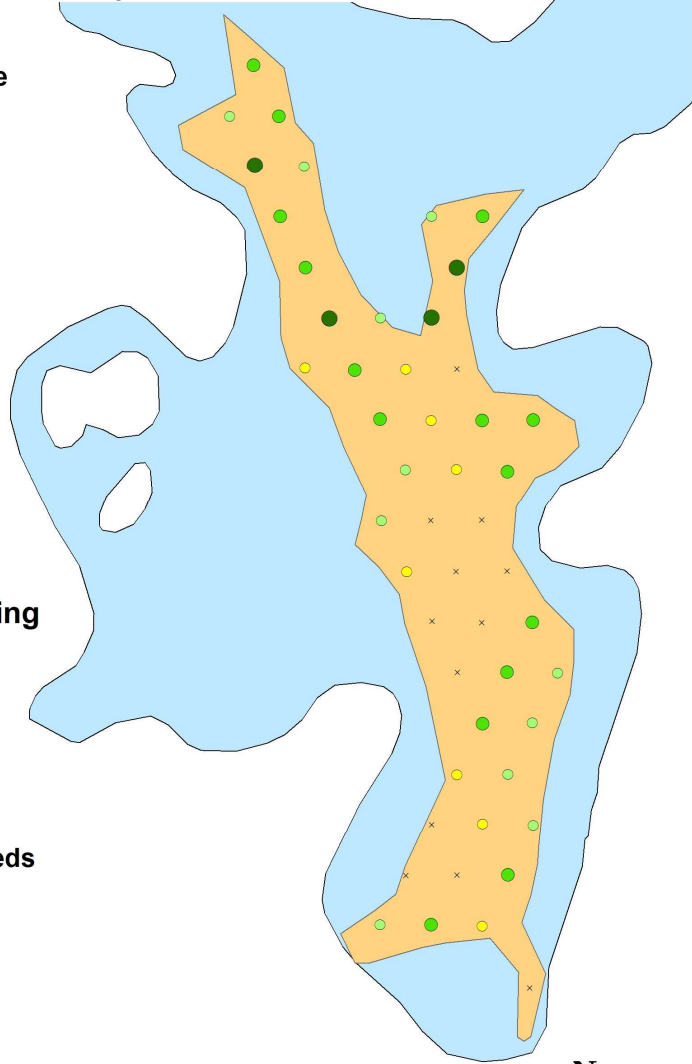
Curly-leaf pondweed (*Potamogeton crispus*)

Exotic Species
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



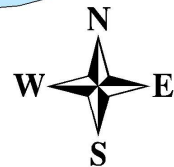
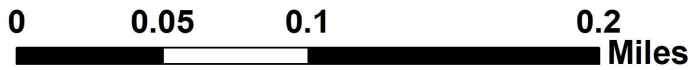
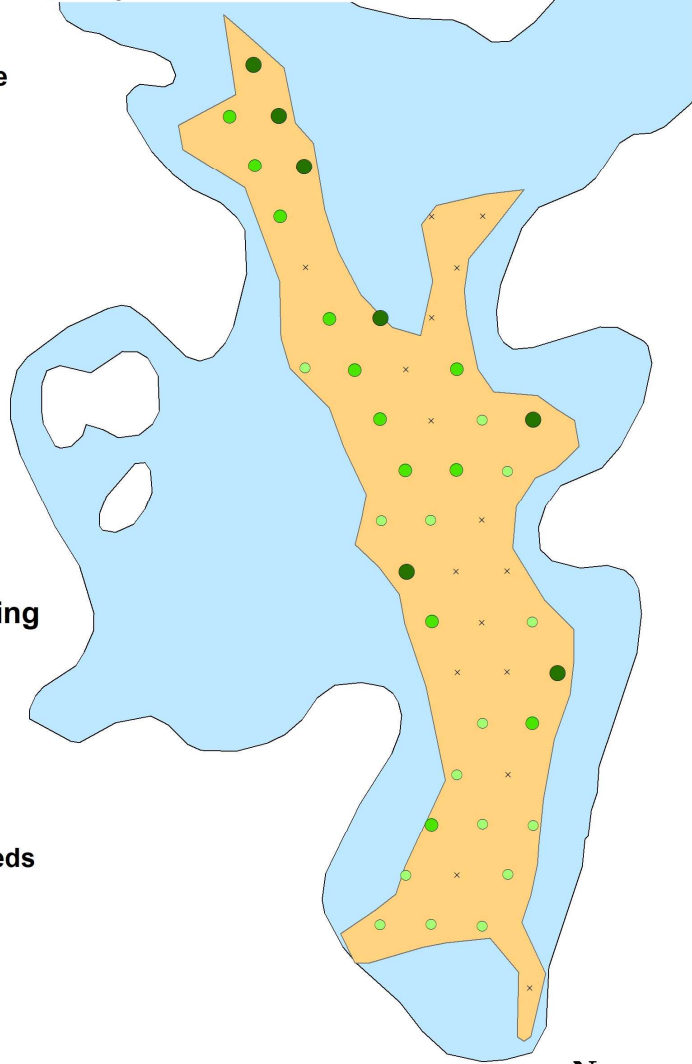
Curly-leaf pondweed (*Potamogeton crispus*)

Exotic Species
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



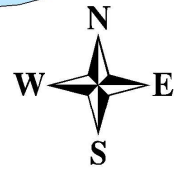
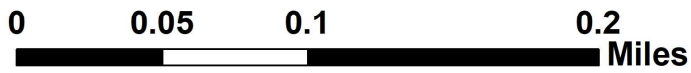
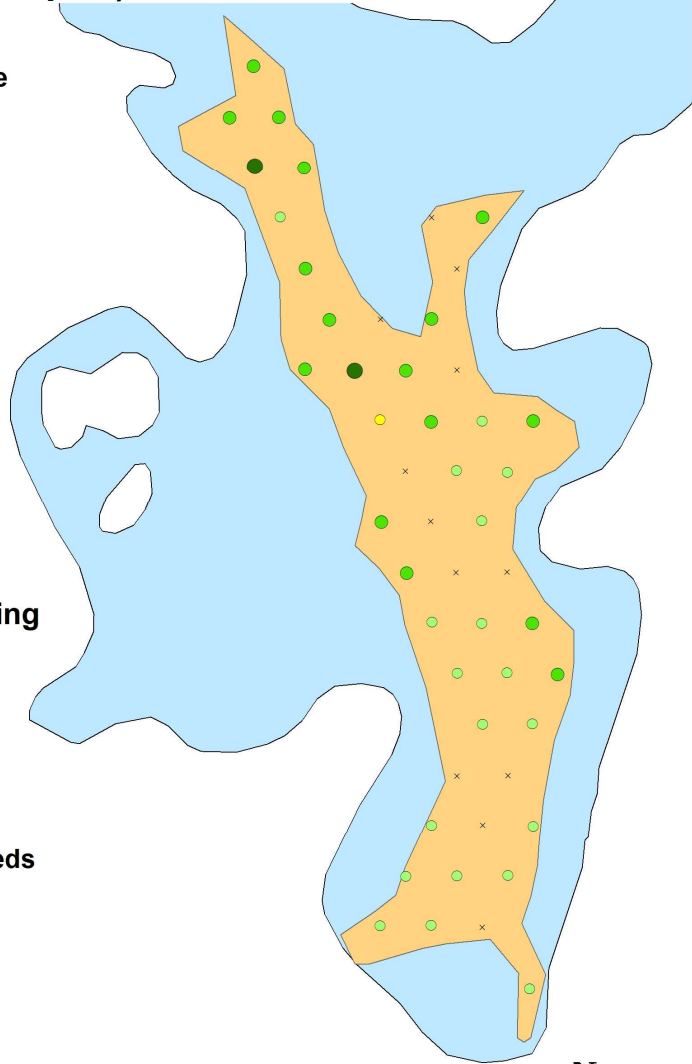
Curly-leaf pondweed (*Potamogeton crispus*)

Exotic Species
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



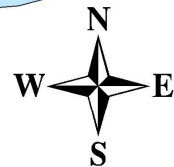
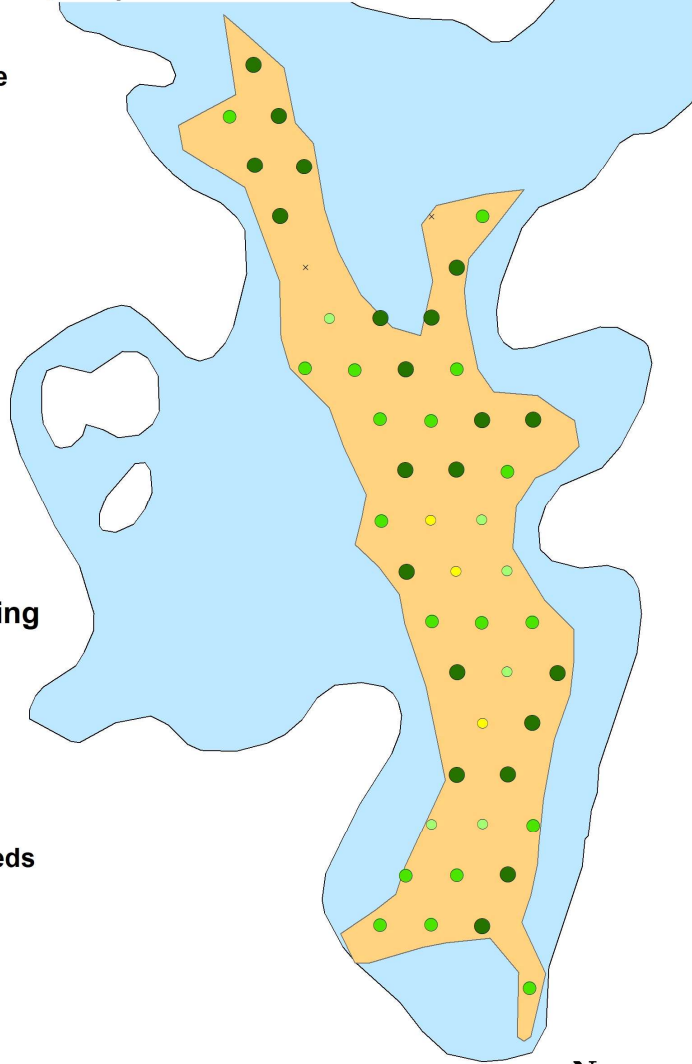
Curly-leaf pondweed (*Potamogeton crispus*)

Exotic Species
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



Appendix VI: 2021 Preharvest Native Species Density and Distribution

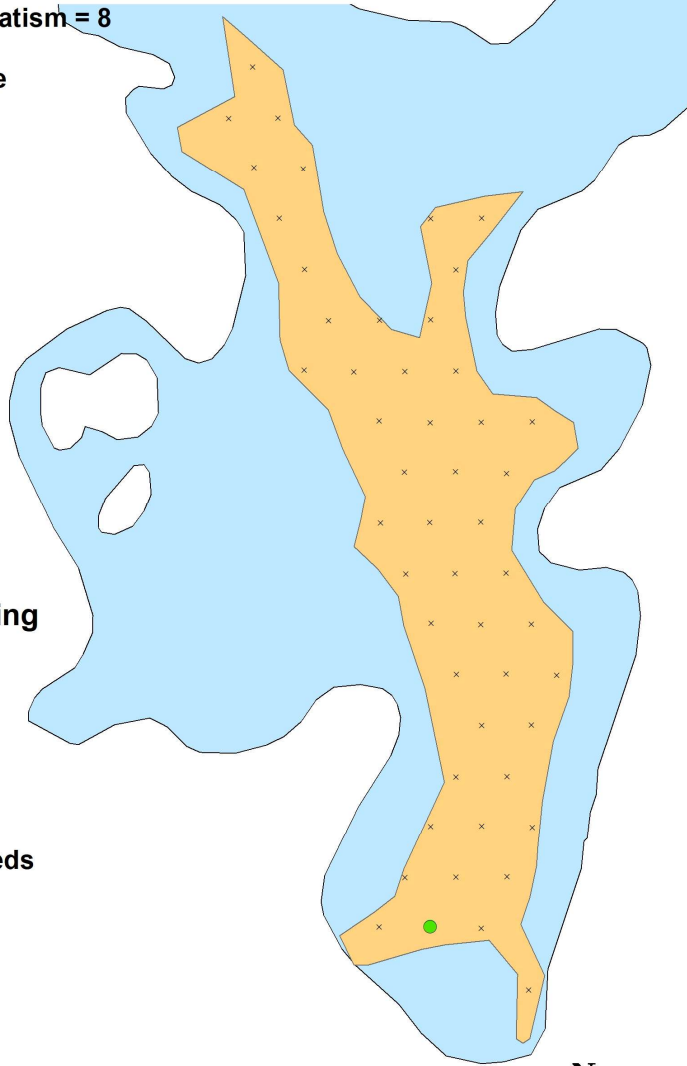
Water marigold (*Bidens beckii*)

Coefficient of Conservatism = 8
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021

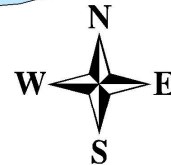


Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



0 0.05 0.1 0.2 Miles



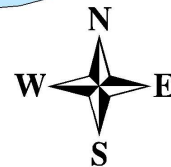
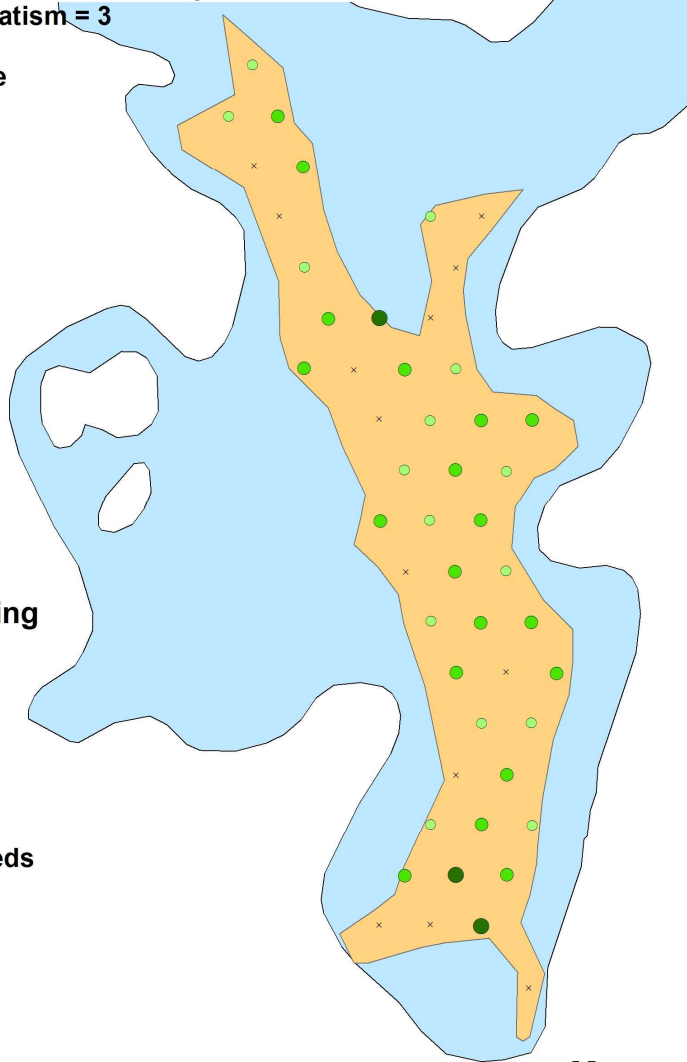
Coontail (*Ceratophyllum demersum*)

Coefficient of Conservatism = 3
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



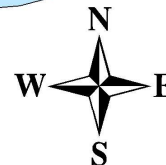
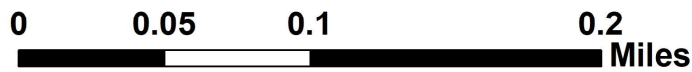
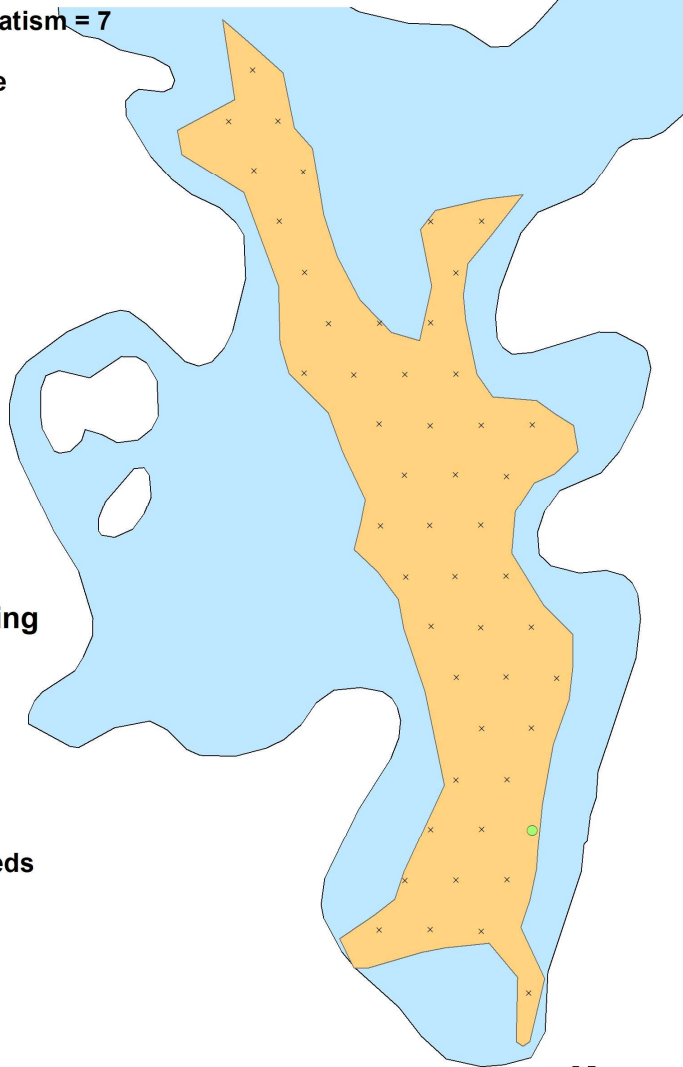
Muskgrass (*Chara sp.*)

Coefficient of Conservatism = 7
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



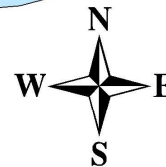
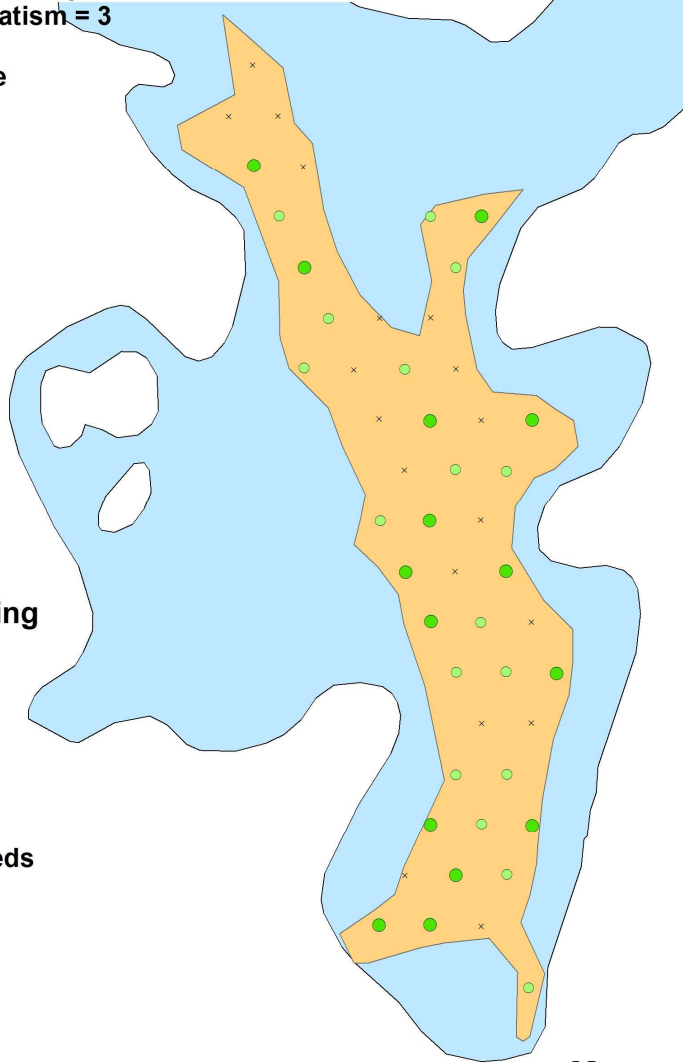
Common waterweed (*Elodea canadensis*)

Coefficient of Conservatism = 3
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



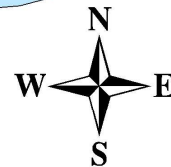
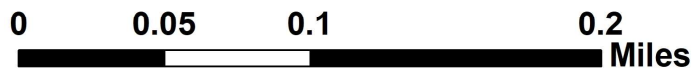
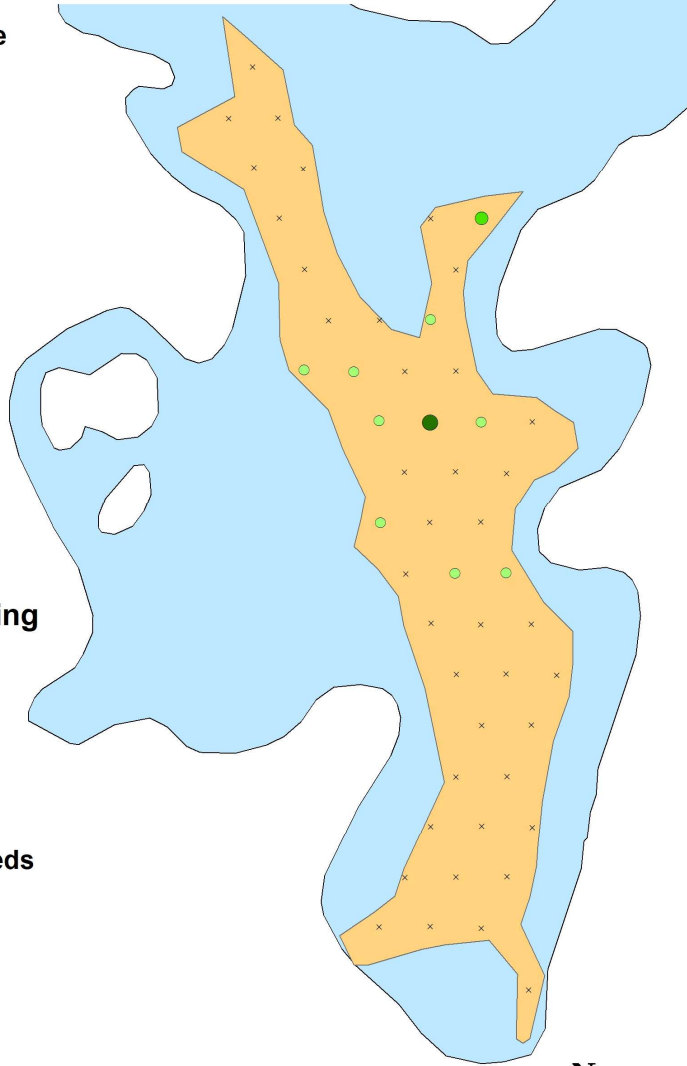
Filamentous algae



Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021

Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



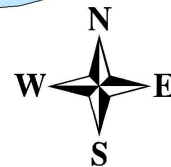
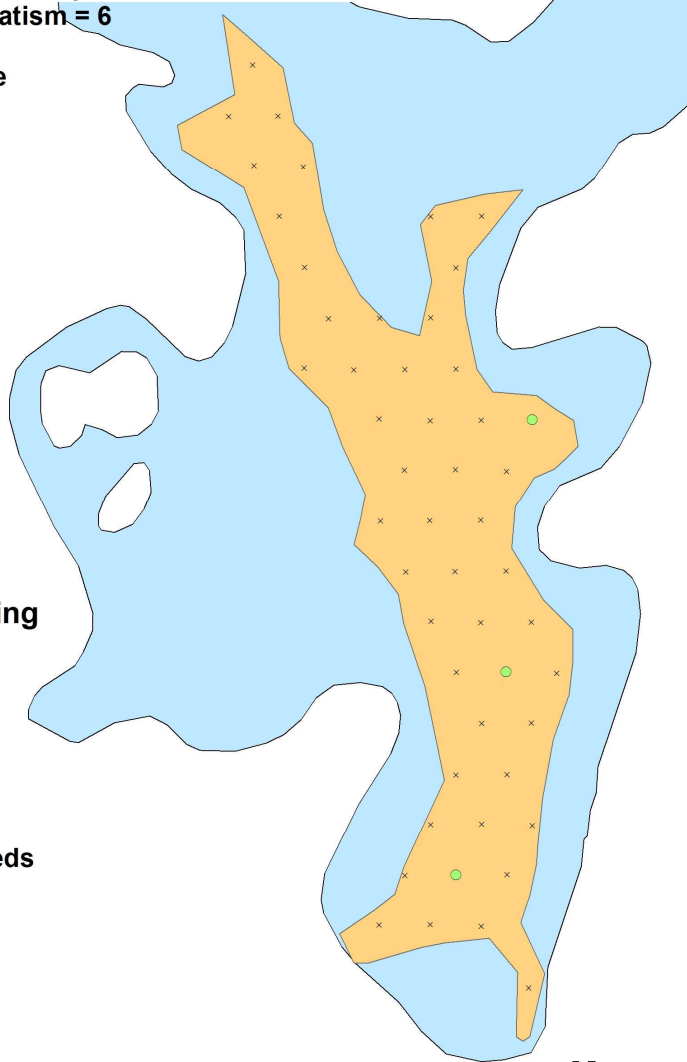
Water star-grass (*Heteranthera dubia*)

Coefficient of Conservatism = 6
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



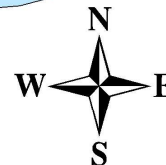
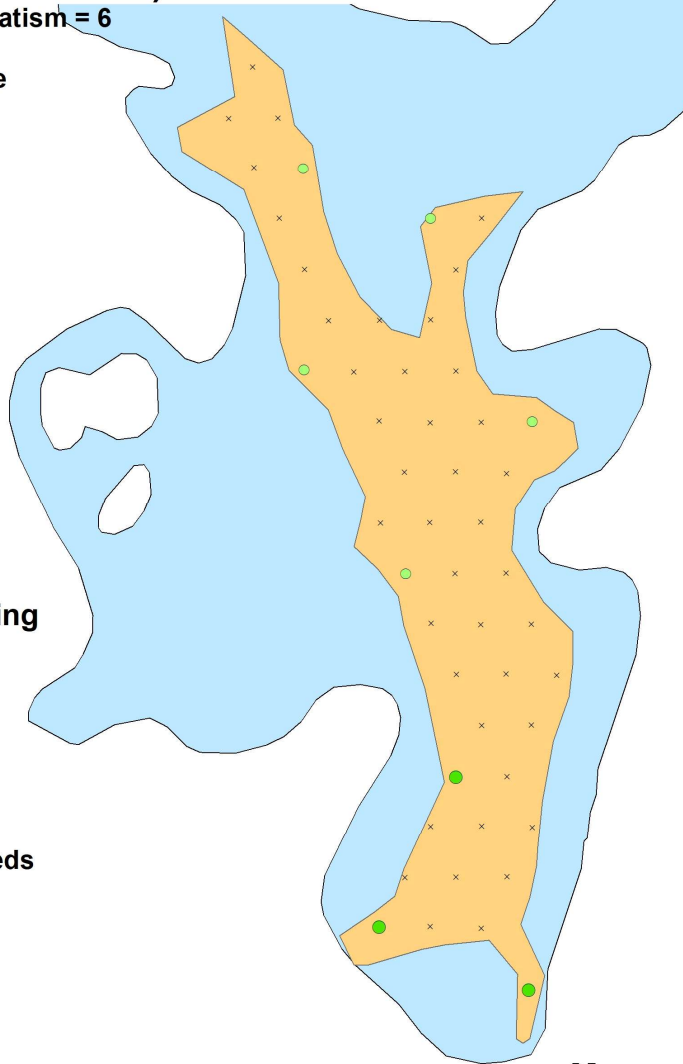
Northern water-milfoil (*Myriophyllum sibiricum*)

Coefficient of Conservatism = 6
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



Nitella

(*Nitella* sp.)

Coefficient of Conservatism = 7

Preharvest Survey

City Bay - Balsam Lake

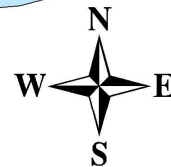
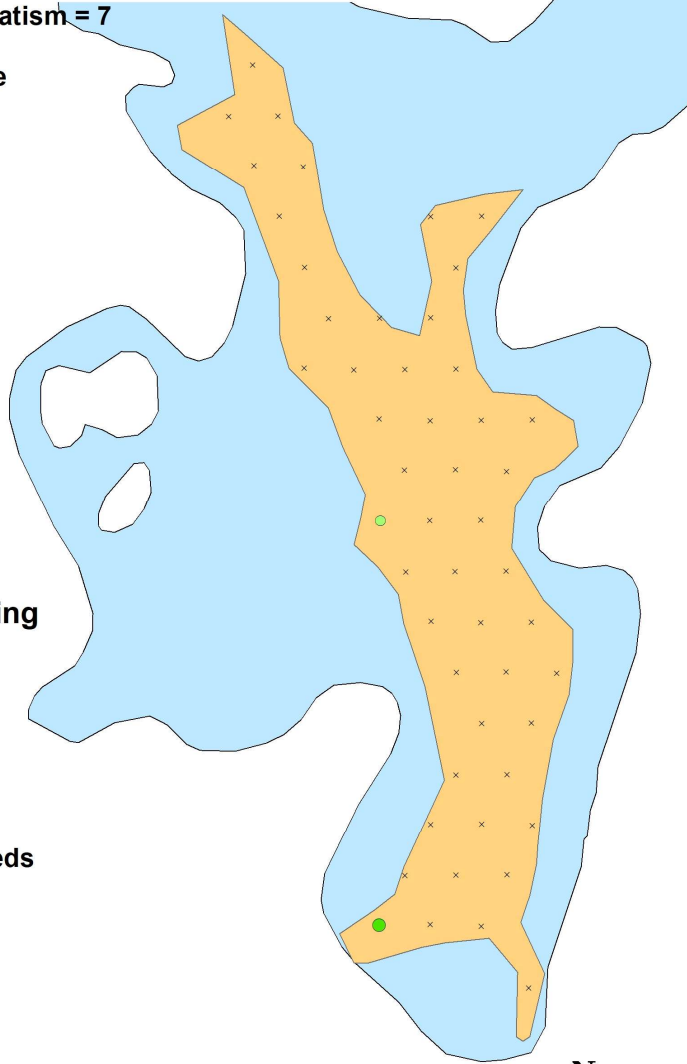
Polk County, WI

May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



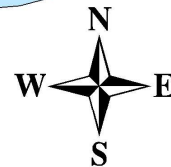
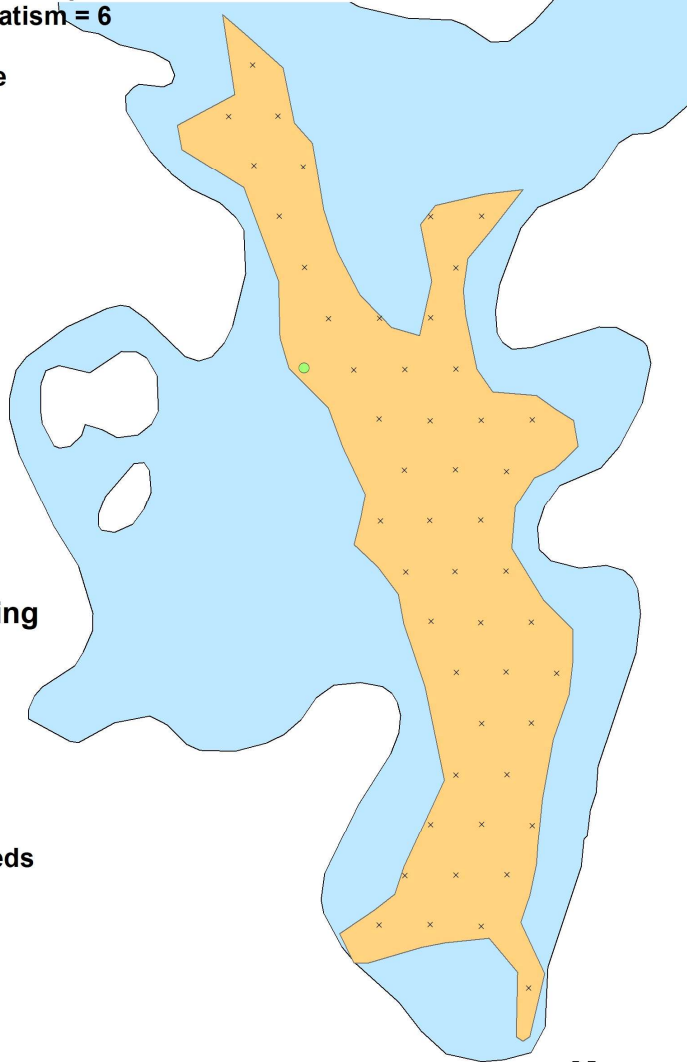
White water lily (*Nymphaea odorata*)

Coefficient of Conservatism = 6
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



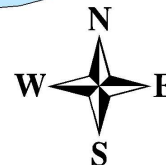
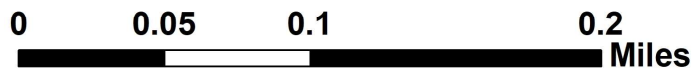
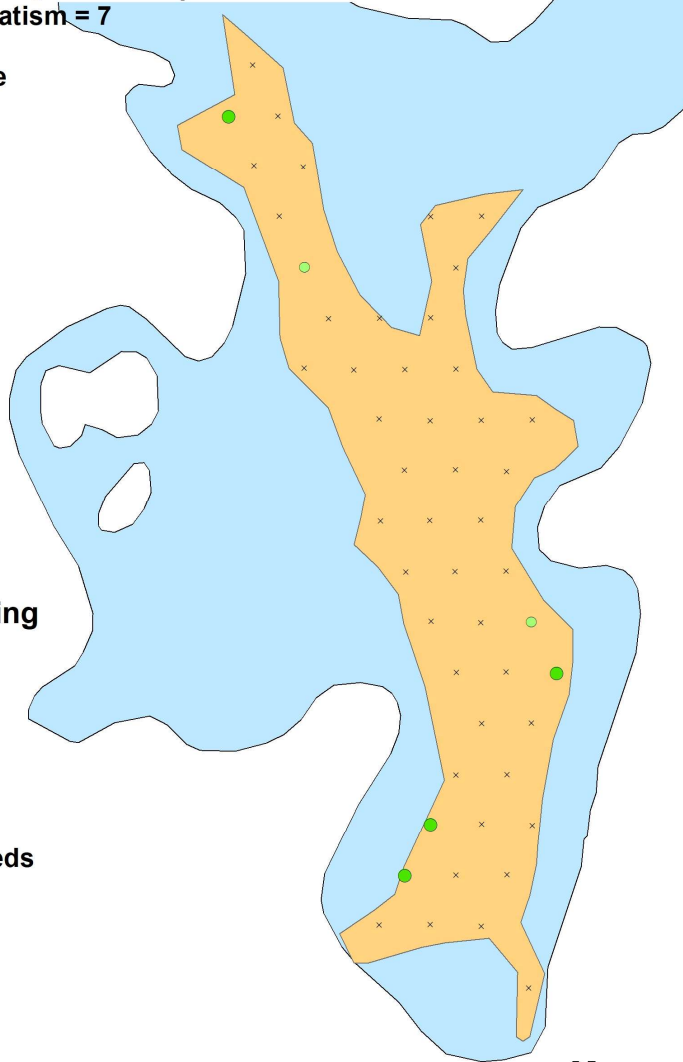
Large-leaf pondweed (*Potamogeton amplifolius*)

Coefficient of Conservatism = 7
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



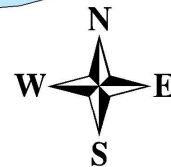
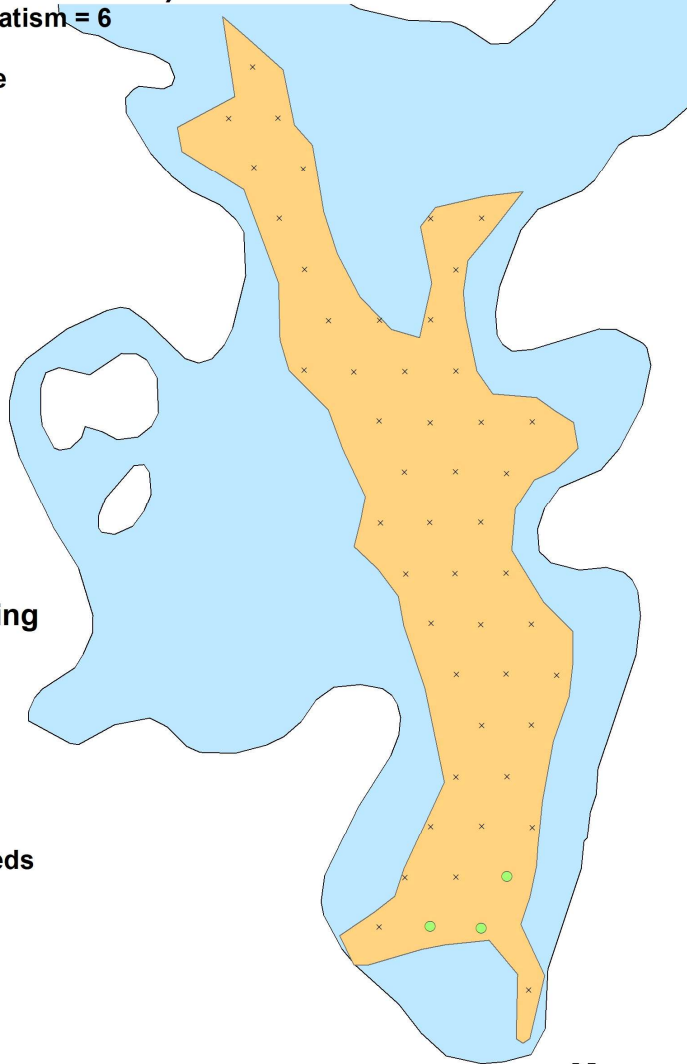
Illinois pondweed (*Potamogeton illinoensis*)

Coefficient of Conservatism = 6
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



White-stem pondweed (*Potamogeton praelongus*)

Coefficient of Conservatism = 8

Preharvest Survey

City Bay - Balsam Lake

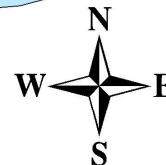
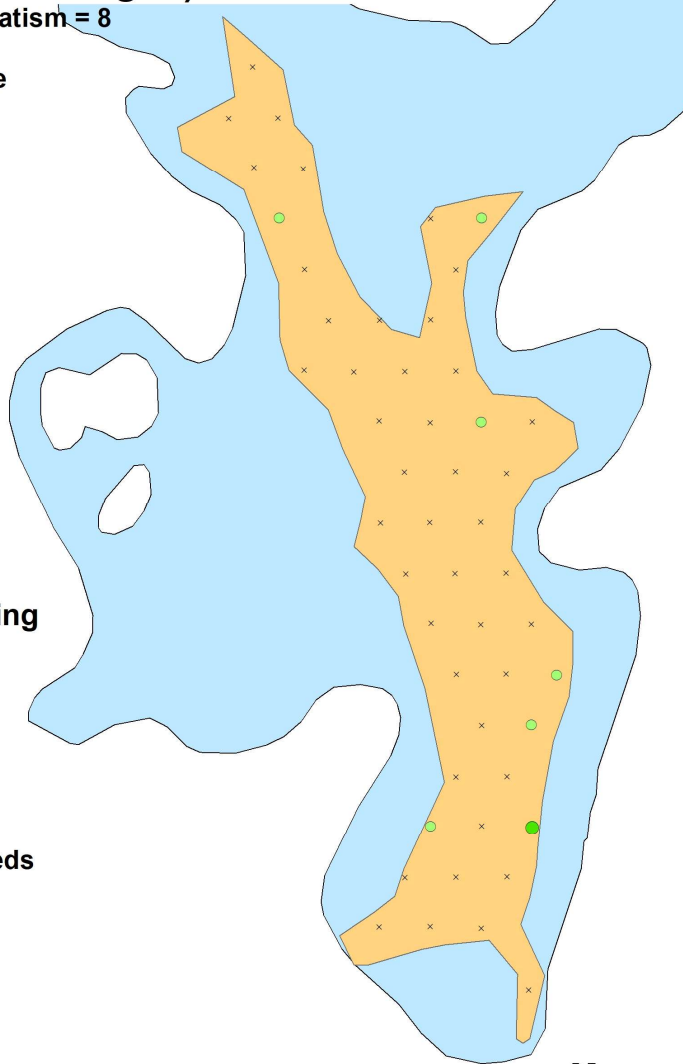
Polk County, WI

May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



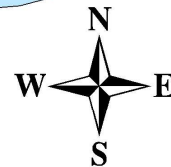
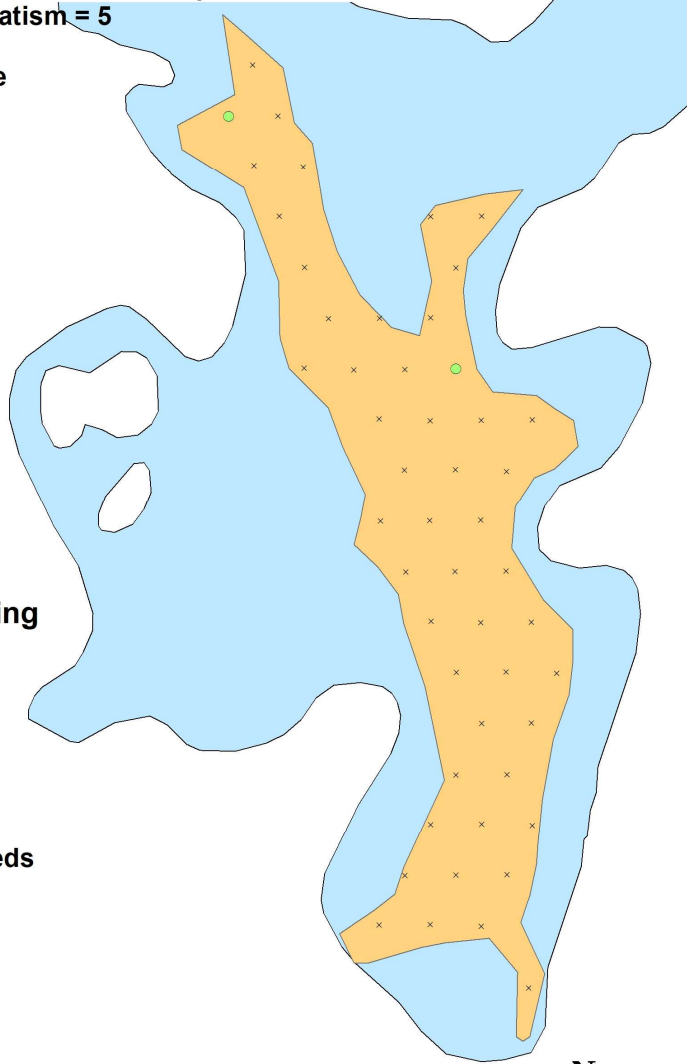
Clasping-leaf pondweed (*Potamogeton richardsonii*)

Coefficient of Conservatism = 5
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



Fern pondweed (*Potamogeton robbinsii*)

Coefficient of Conservatism = 8

Preharvest Survey

City Bay - Balsam Lake

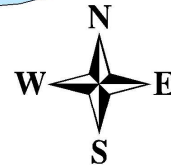
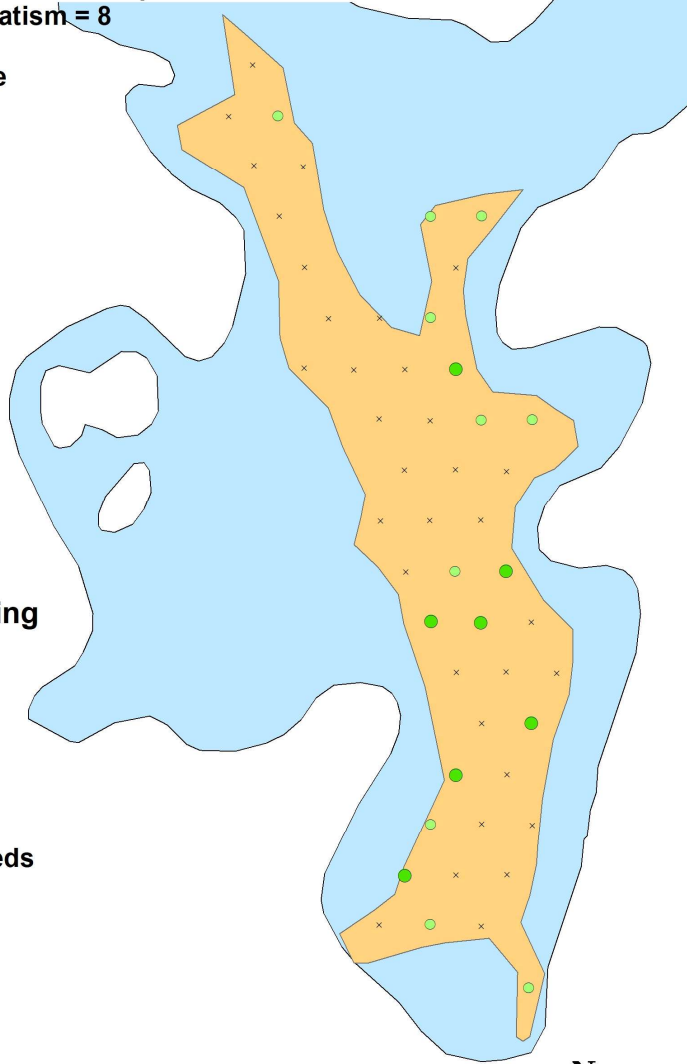
Polk County, WI

May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



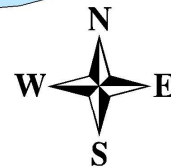
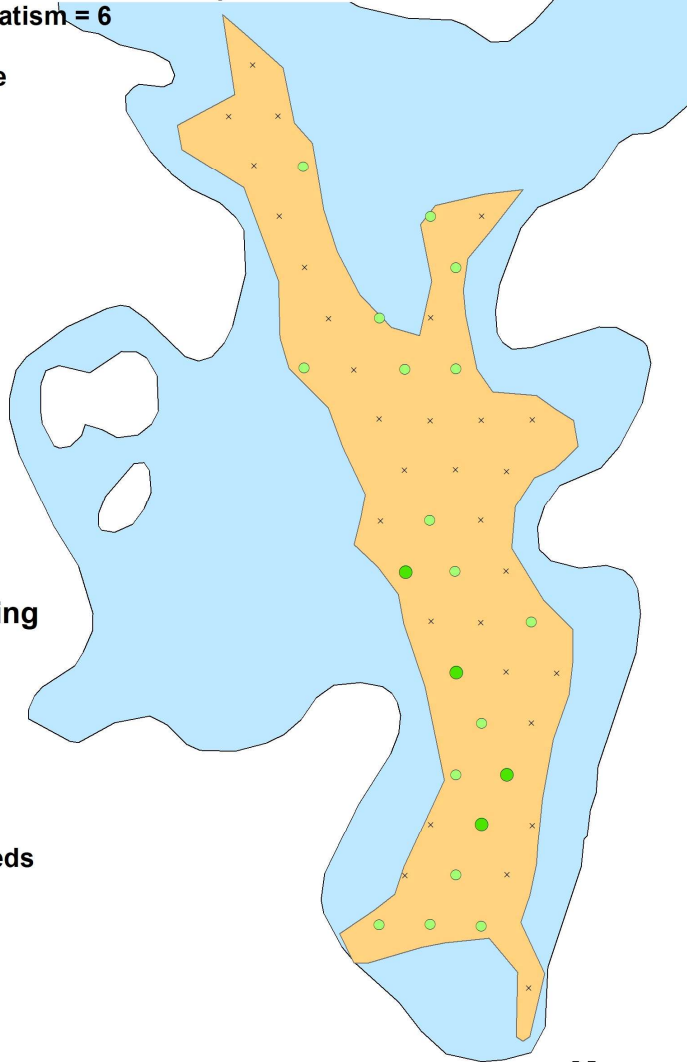
Flat-stem pondweed (*Potamogeton zosteriformis*)

Coefficient of Conservatism = 6
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



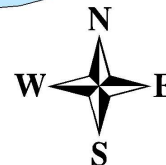
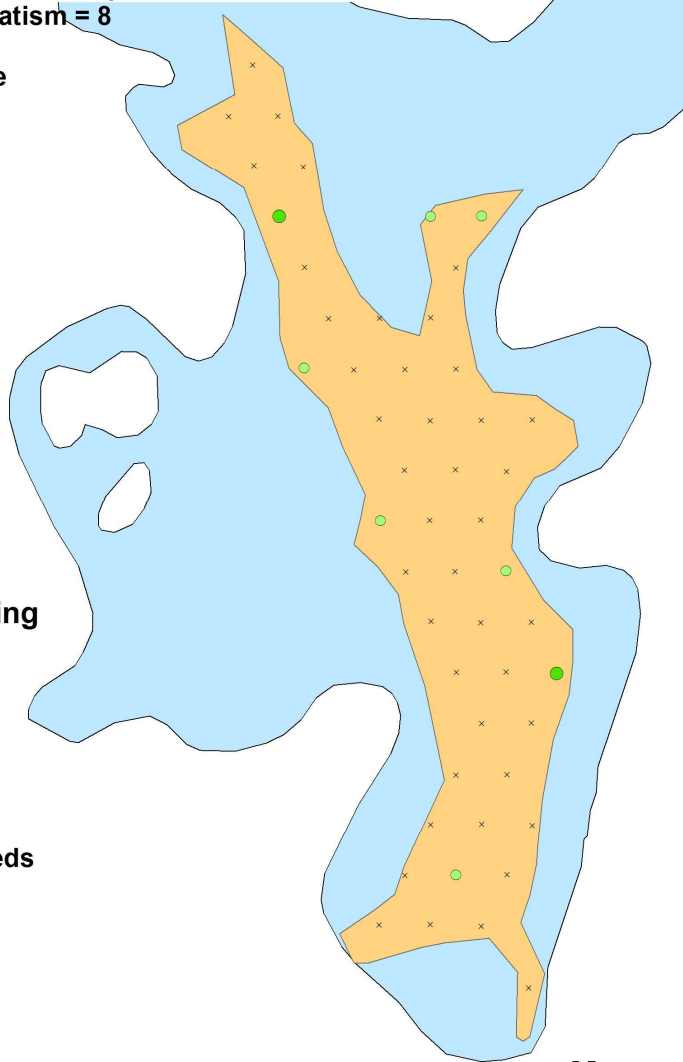
White water crowfoot (*Ranunculus aquatilis*)

Coefficient of Conservatism = 8
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



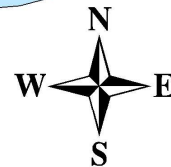
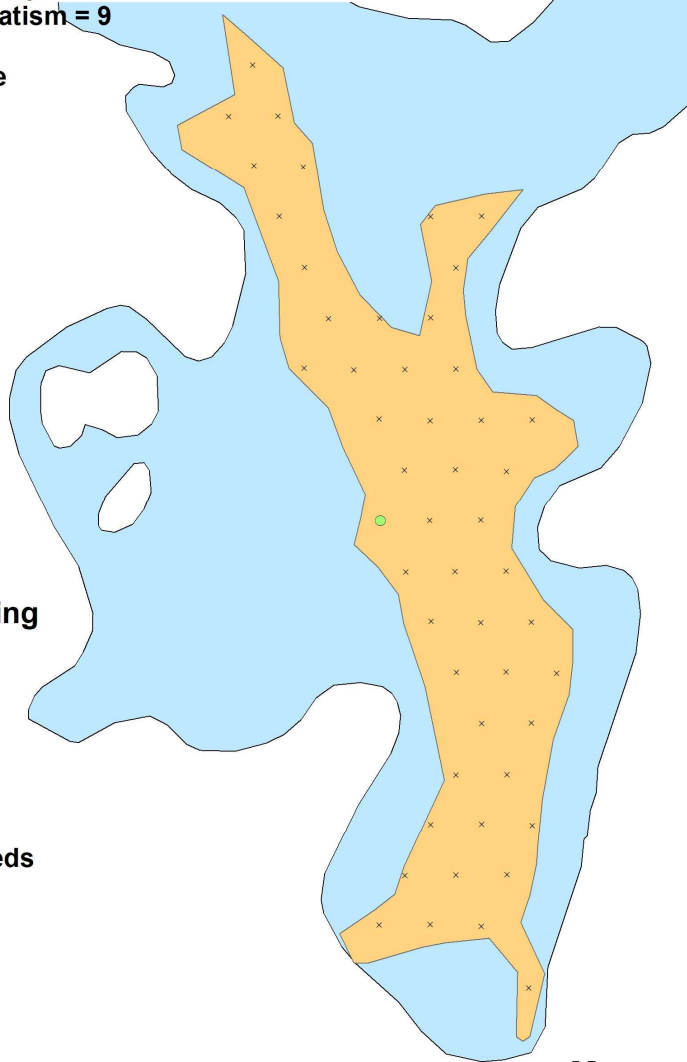
Creeping bladderwort (*Utricularia gibba*)

Coefficient of Conservatism = 9
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 31, 2021



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



Appendix VII: 2022 Preharvest Native Species Density and Distribution

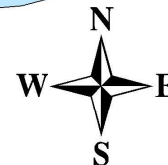
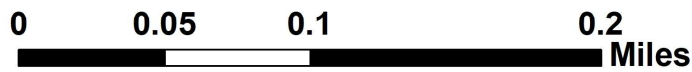
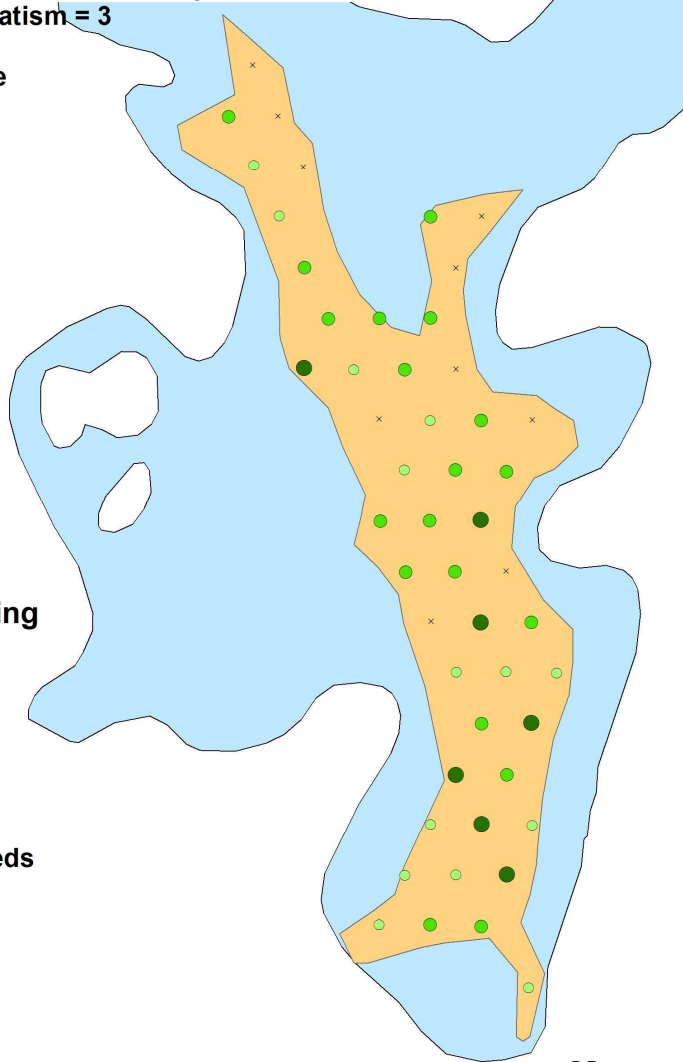
Coontail (*Ceratophyllum demersum*)

Coefficient of Conservatism = 3
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



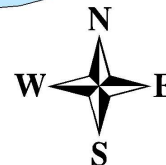
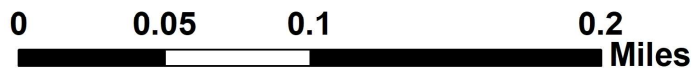
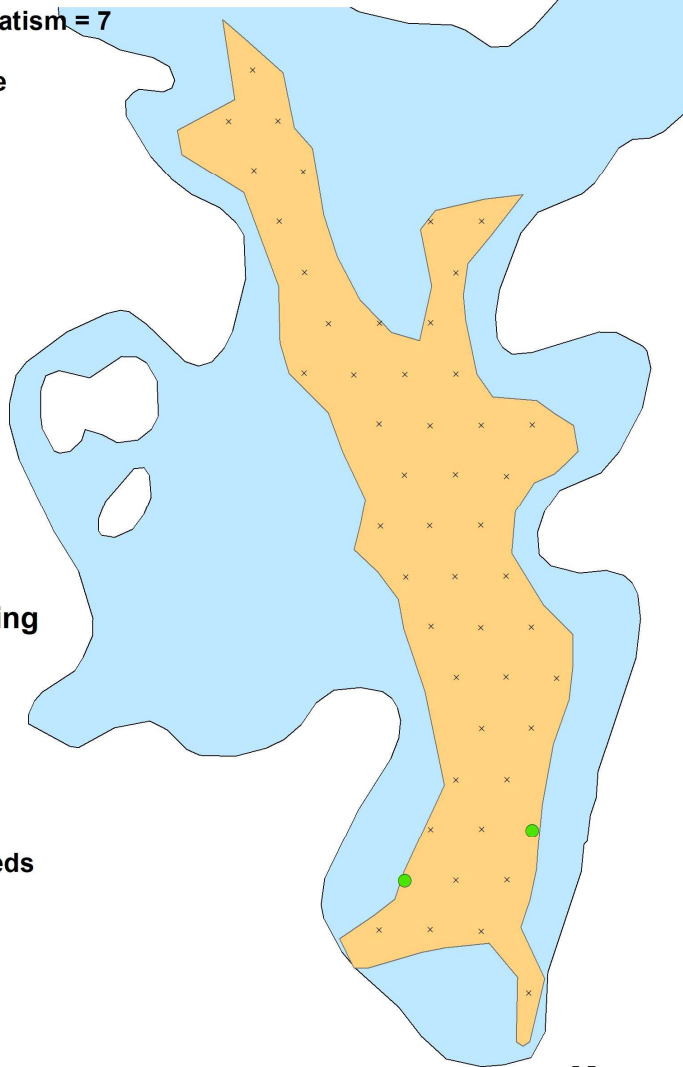
Muskgrass (*Chara sp.*)

Coefficient of Conservatism = 7
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



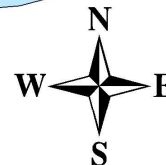
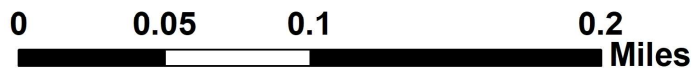
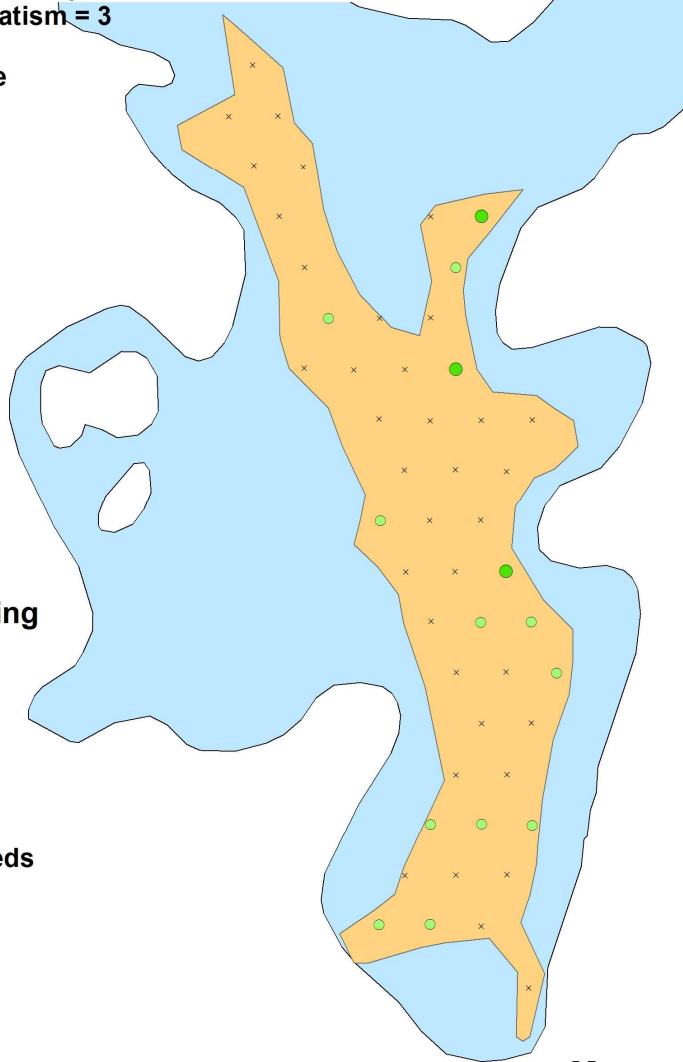
Common waterweed (*Elodea canadensis*)

Coefficient of Conservatism = 3
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



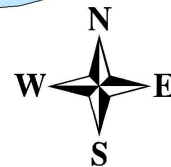
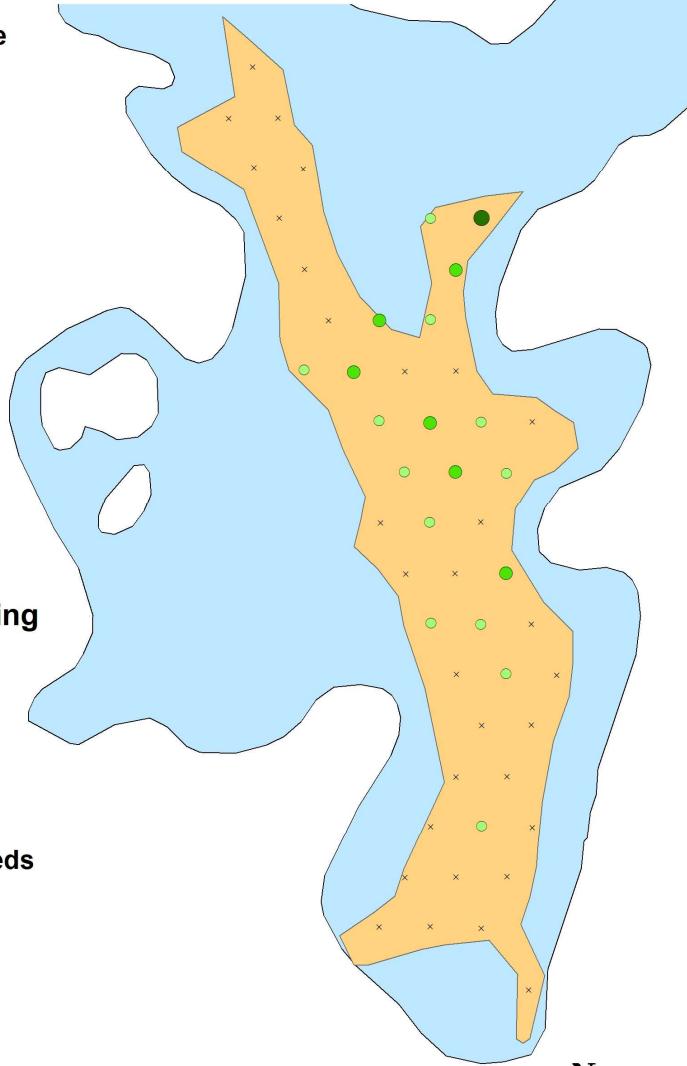
Filamentous algae



Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022

Rake Fullness Rating

- 1
- 2
- 3
- Visual
- x None Found
- Historic CLP Beds



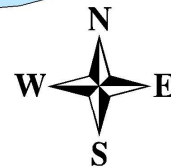
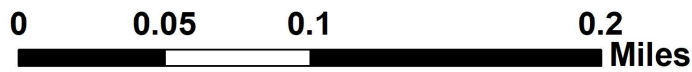
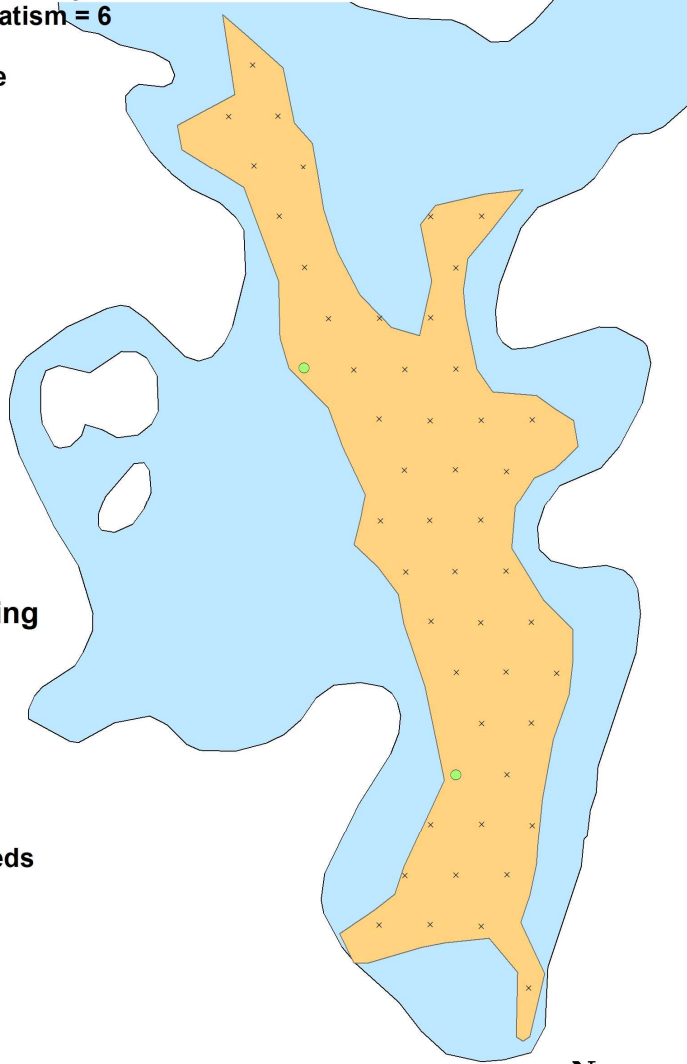
Water star-grass (*Heteranthera dubia*)

Coefficient of Conservatism = 6
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



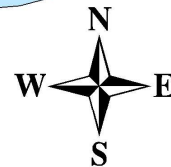
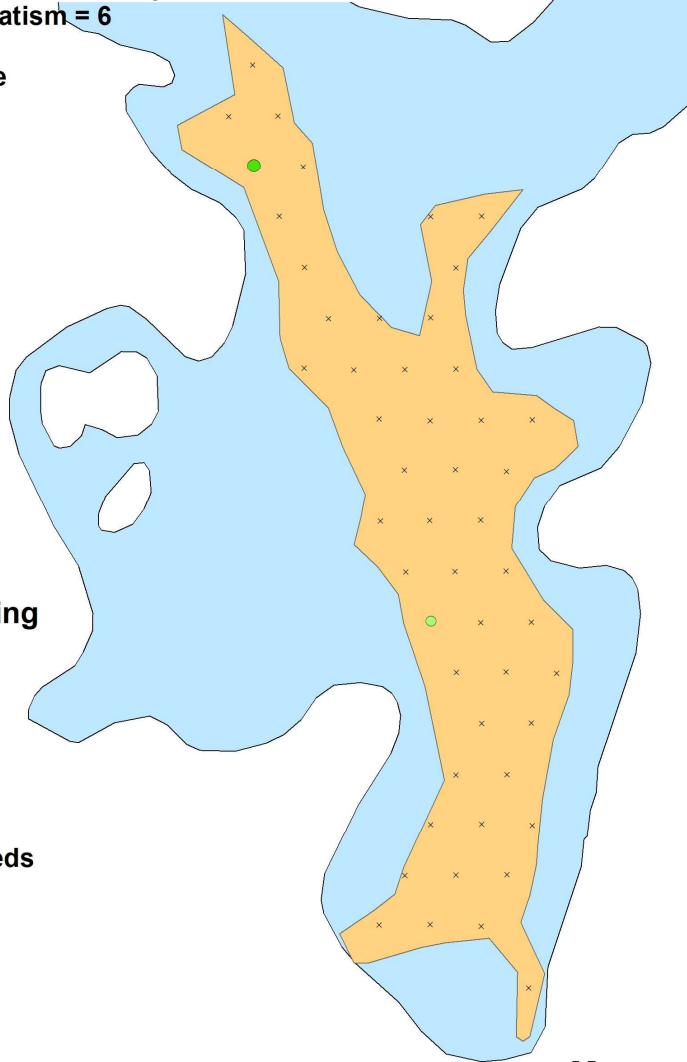
Northern water-milfoil (*Myriophyllum sibiricum*)

Coefficient of Conservatism = 6
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



Nitella

(*Nitella* sp.)

Coefficient of Conservatism = 7

Preharvest Survey

City Bay - Balsam Lake

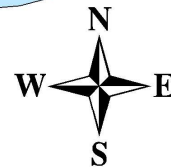
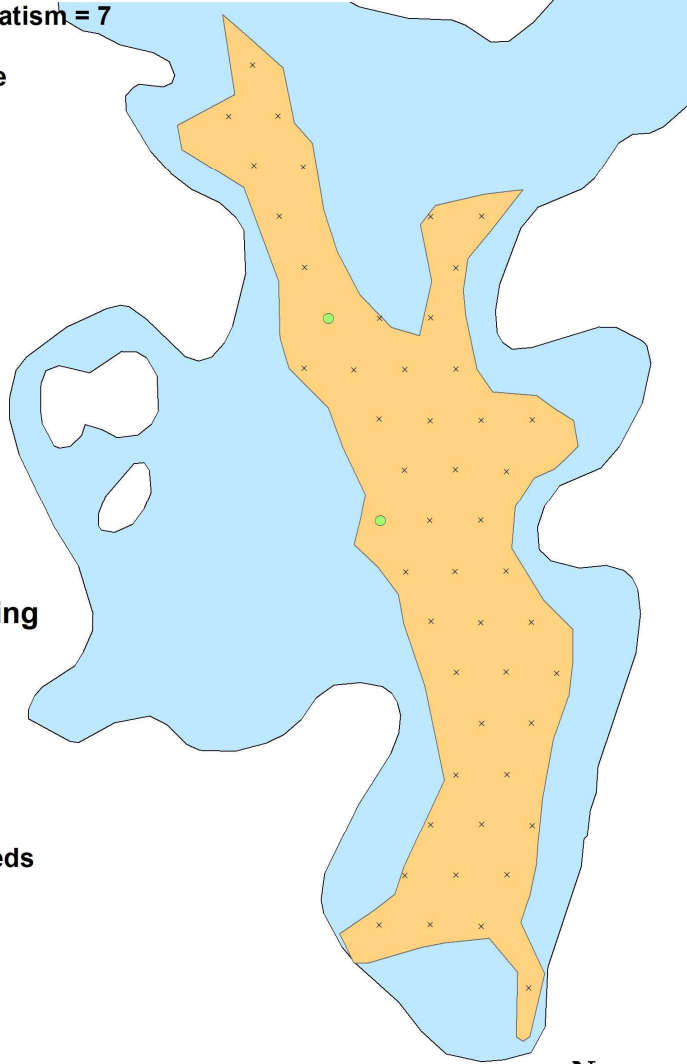
Polk County, WI

May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



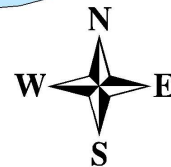
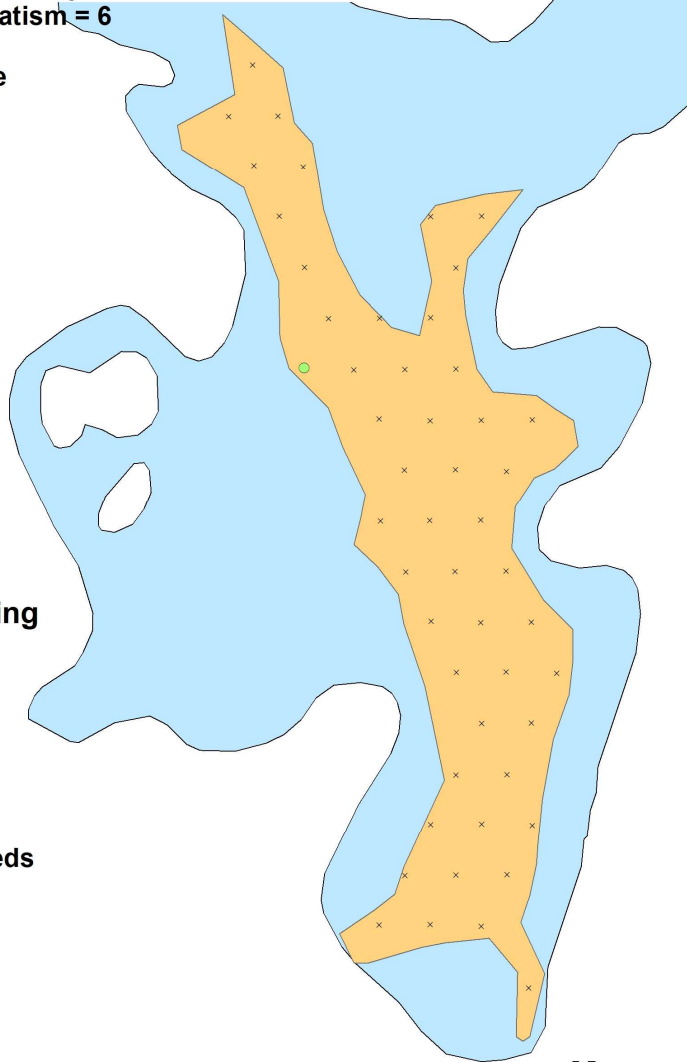
White water lily (*Nymphaea odorata*)

Coefficient of Conservatism = 6
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



Large-leaf pondweed (*Potamogeton amplifolius*)

Coefficient of Conservatism = 7

Preharvest Survey

City Bay - Balsam Lake

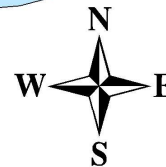
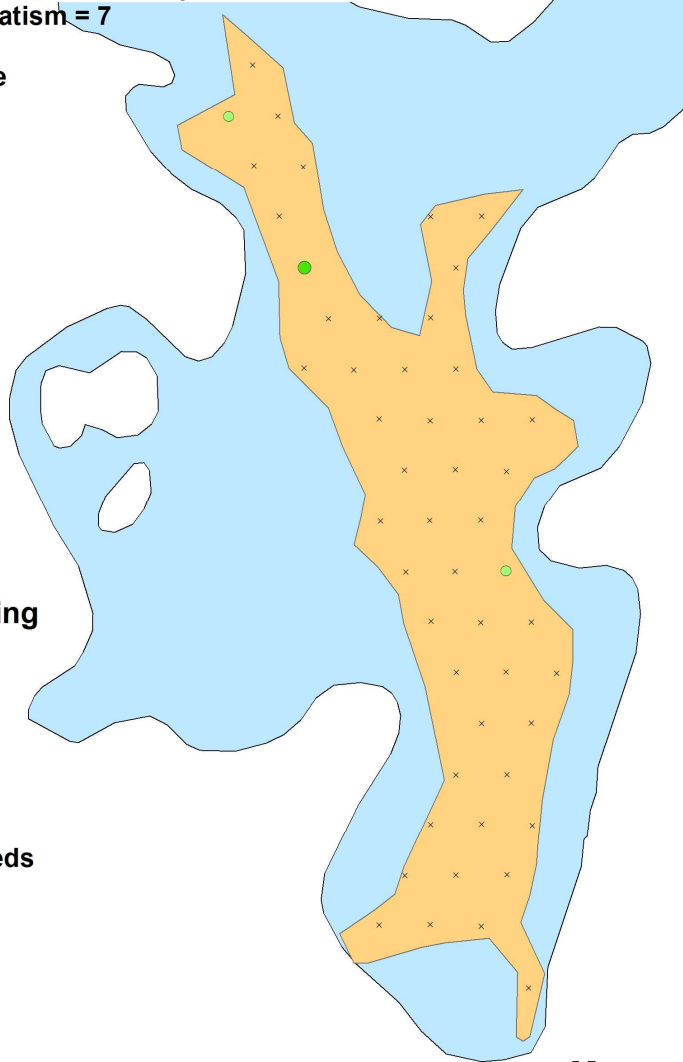
Polk County, WI

May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



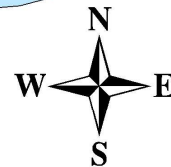
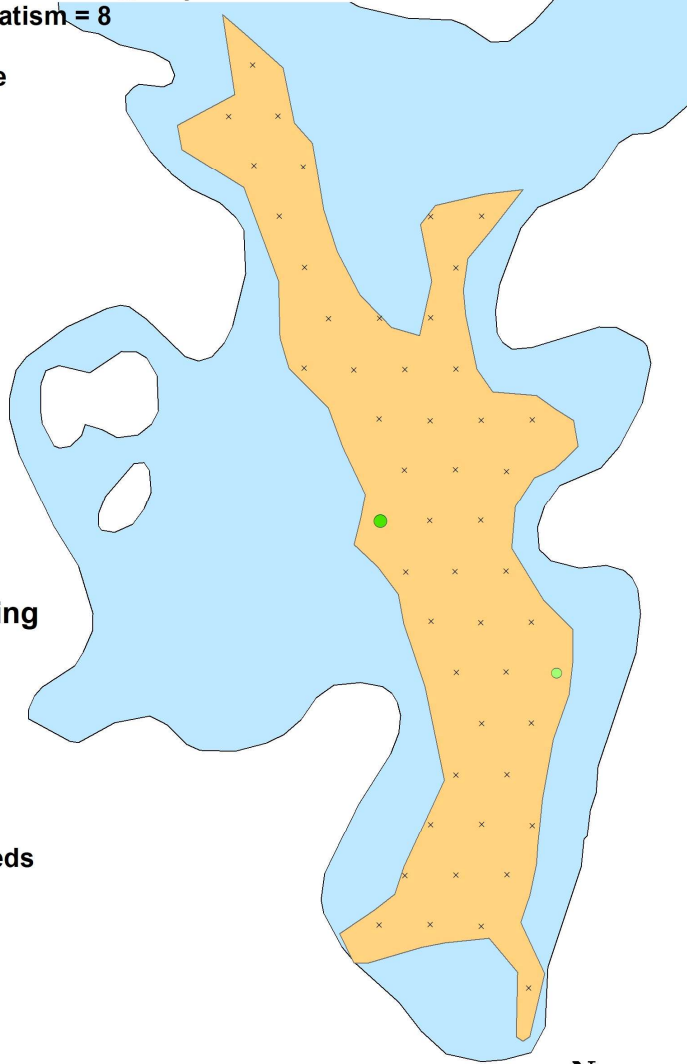
White-stem pondweed (*Potamogeton praelongus*)

Coefficient of Conservatism = 8
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



Fern pondweed (*Potamogeton robbinsii*)

Coefficient of Conservatism = 8

Preharvest Survey

City Bay - Balsam Lake

Polk County, WI

May 30, 2022



Rake Fullness Rating

● 1

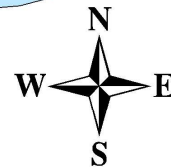
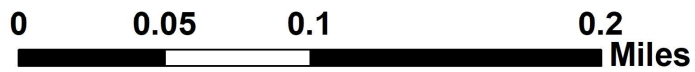
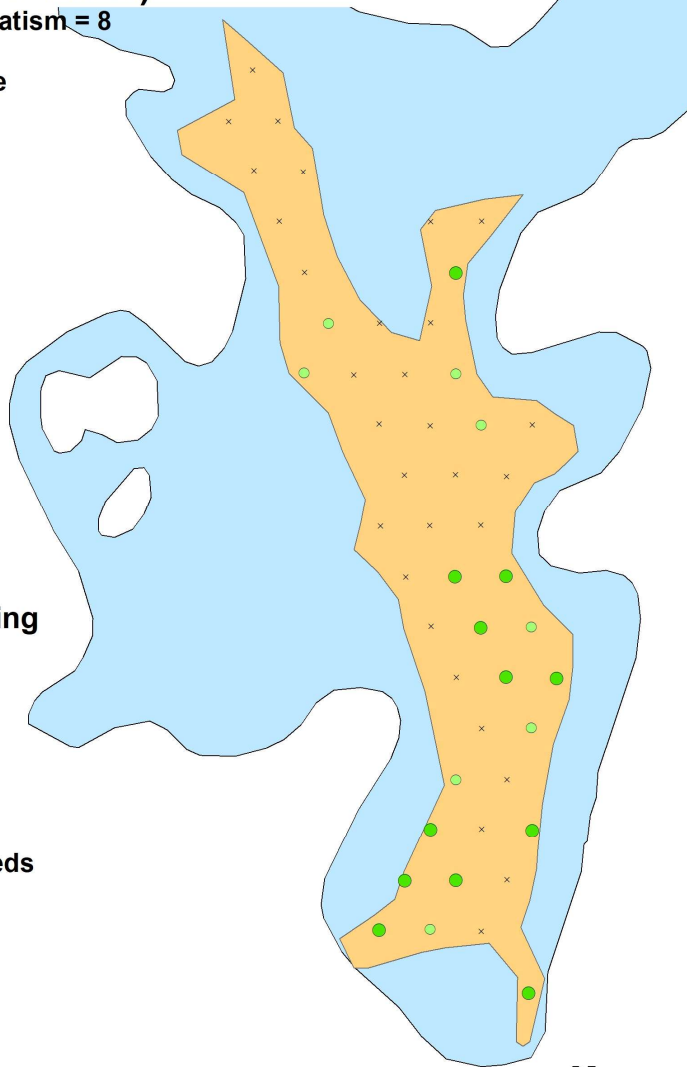
● 2

● 3

● Visual

× None Found

■ Historic CLP Beds



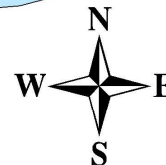
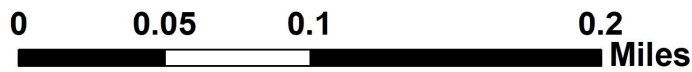
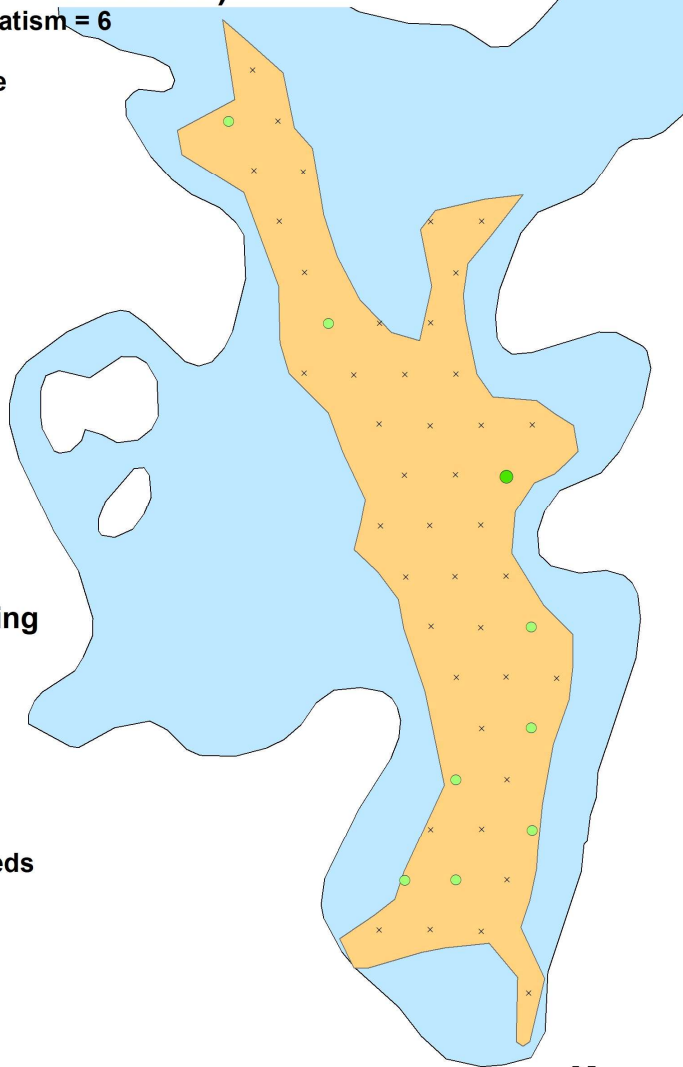
Flat-stem pondweed (*Potamogeton zosteriformis*)

Coefficient of Conservatism = 6
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



White water crowfoot (*Ranunculus aquatilis*)

Coefficient of Conservatism = 8

Preharvest Survey

City Bay - Balsam Lake

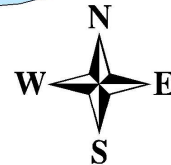
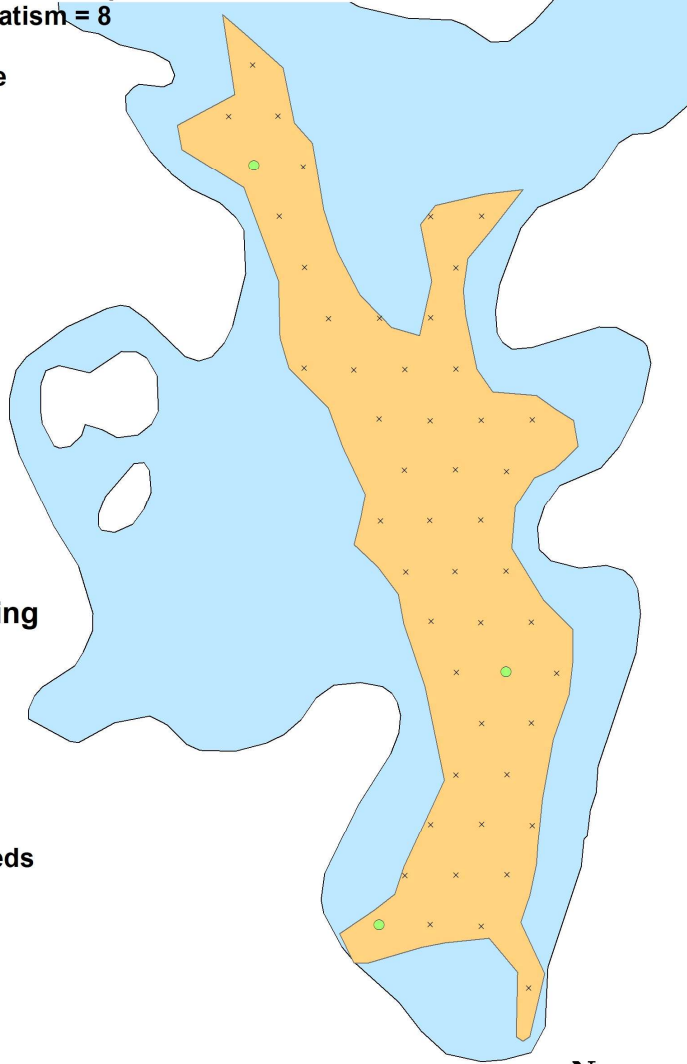
Polk County, WI

May 30, 2022



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



Appendix VIII: 2023 Preharvest Native Species Density and Distribution

Coontail

(*Ceratophyllum demersum*)

Coefficient of Conservatism = 3

Preharvest Survey

City Bay - Balsam Lake

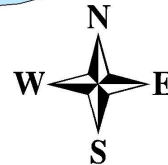
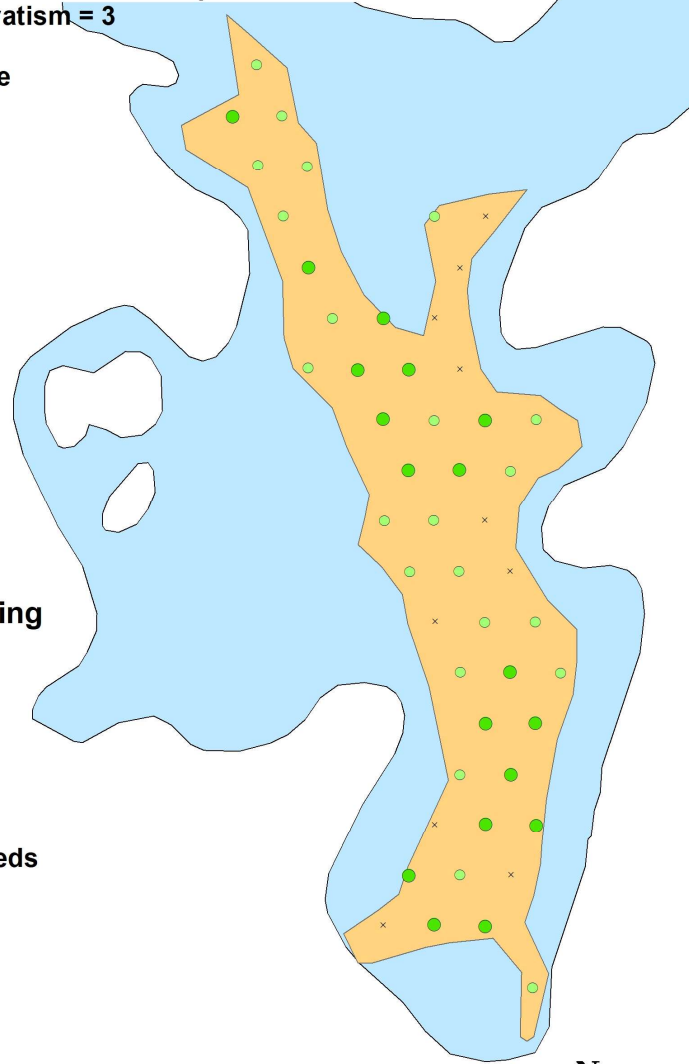
Polk County, WI

June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



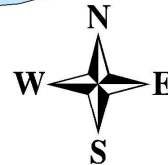
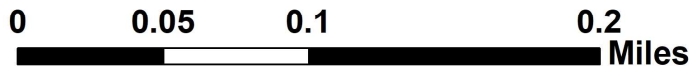
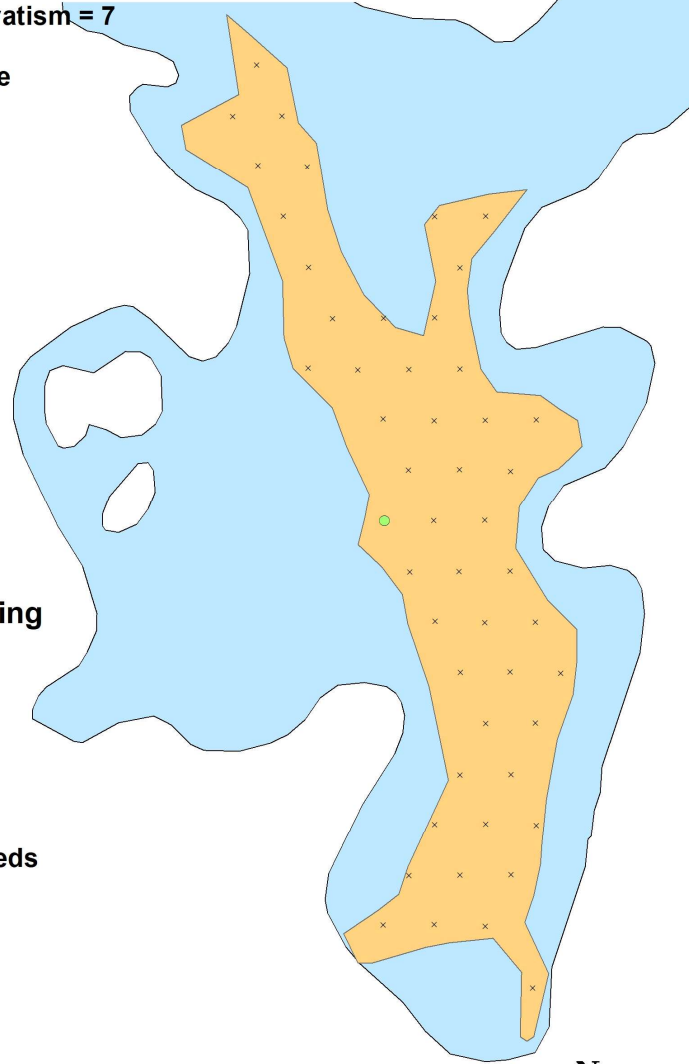
Muskgrass (*Chara* sp.)

Coefficient of Conservatism = 7
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



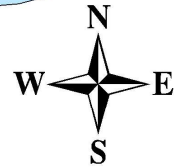
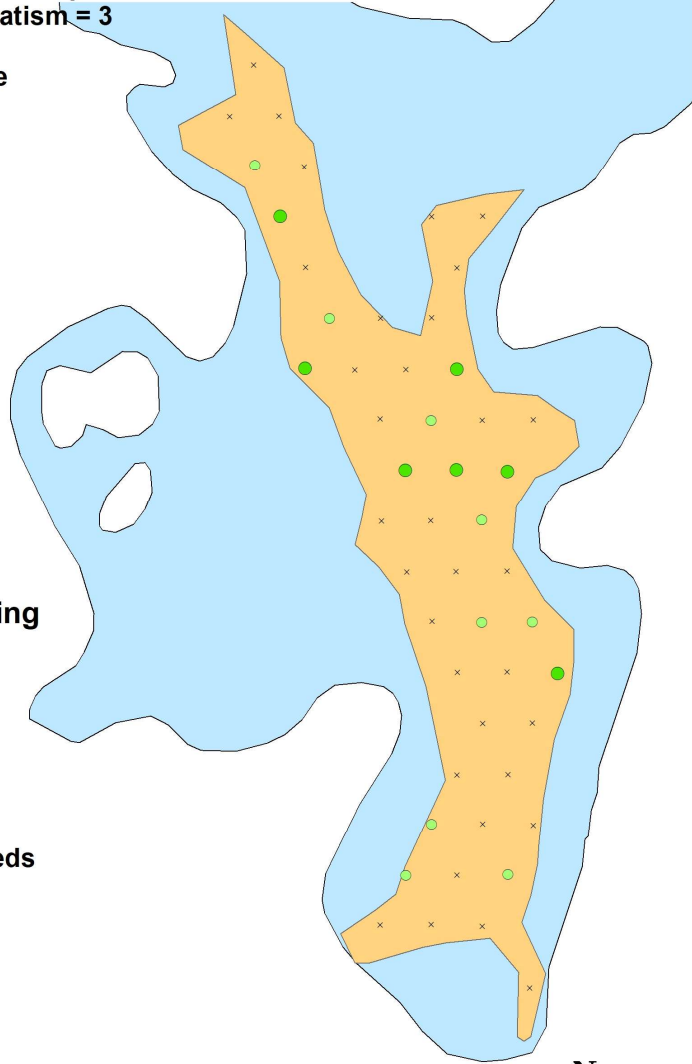
Common waterweed (*Elodea canadensis*)

Coefficient of Conservatism = 3
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



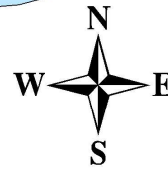
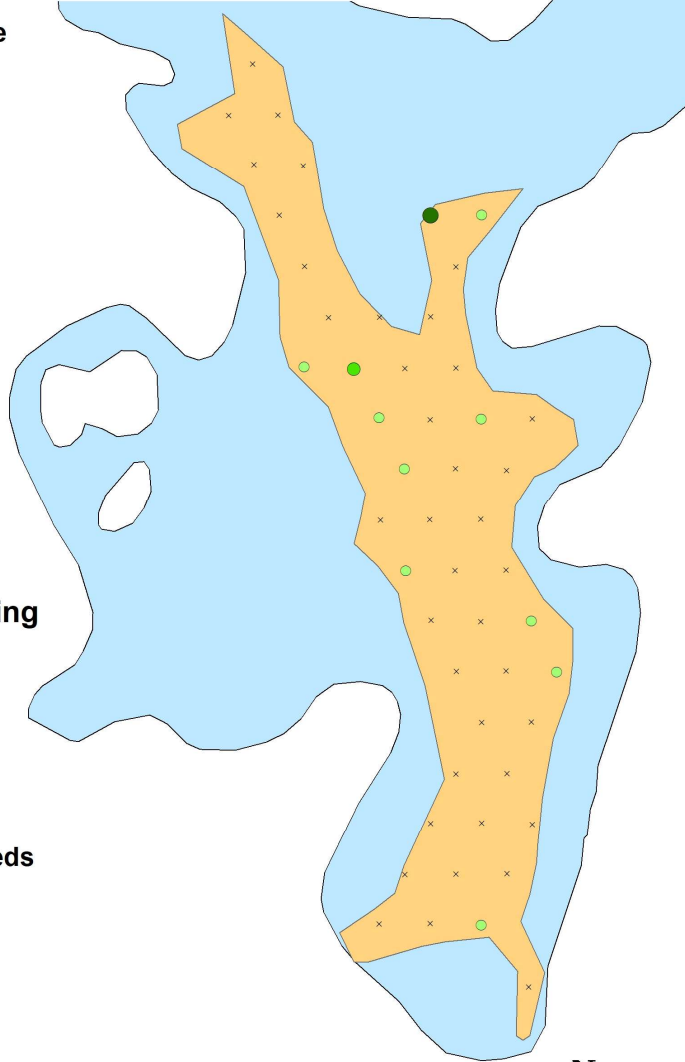
Filamentous algae

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



Nitella

(*Nitella* sp.)

Coefficient of Conservatism = 7

Preharvest Survey

City Bay - Balsam Lake

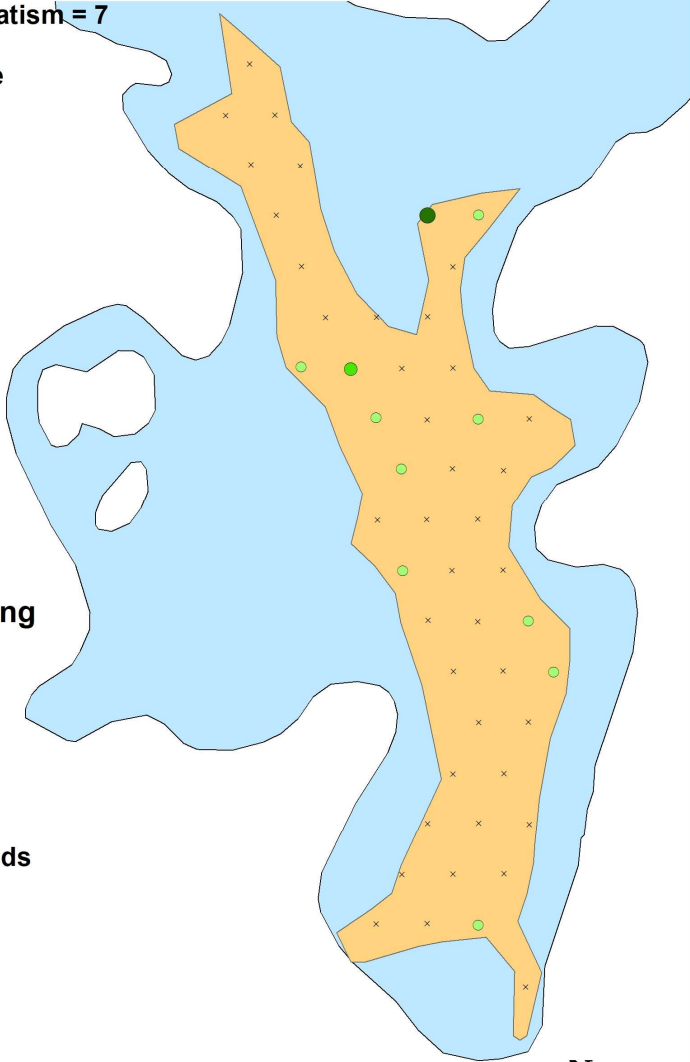
Polk County, WI

June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



**Large-leaf pondweed
(*Potamogeton amplifolius*)**

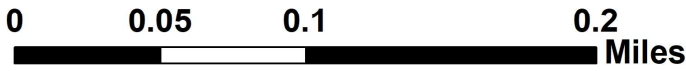
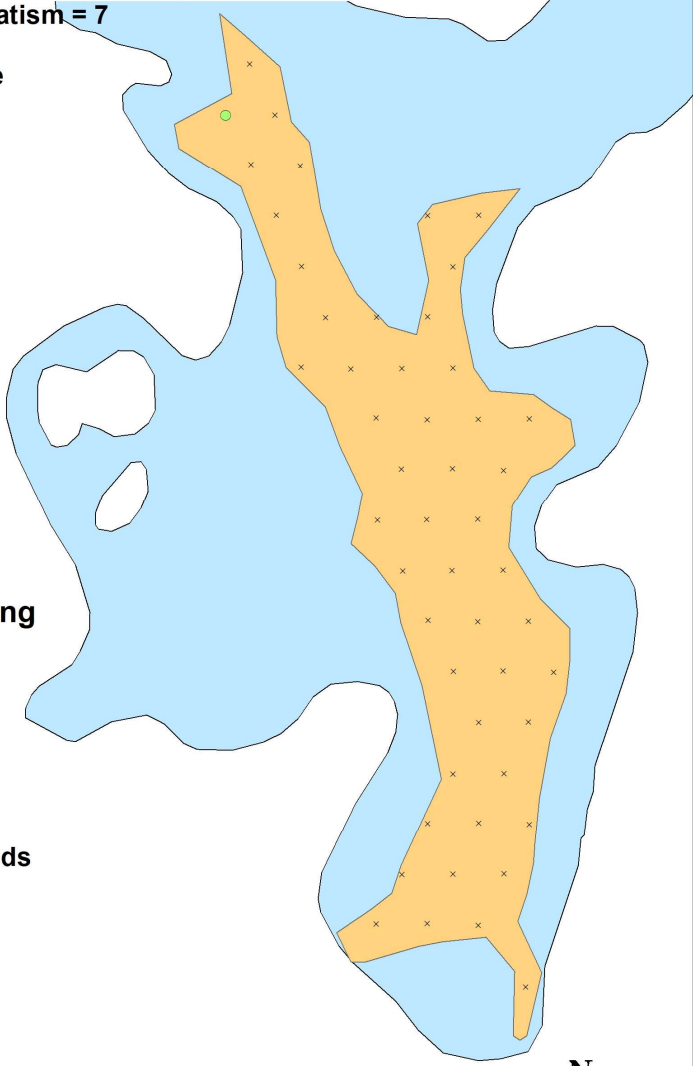
Coefficient of Conservatism = 7

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



**Small pondweed
(*Potamogeton pusillus*)**

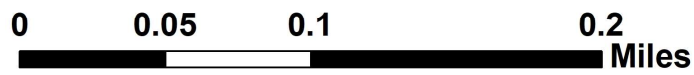
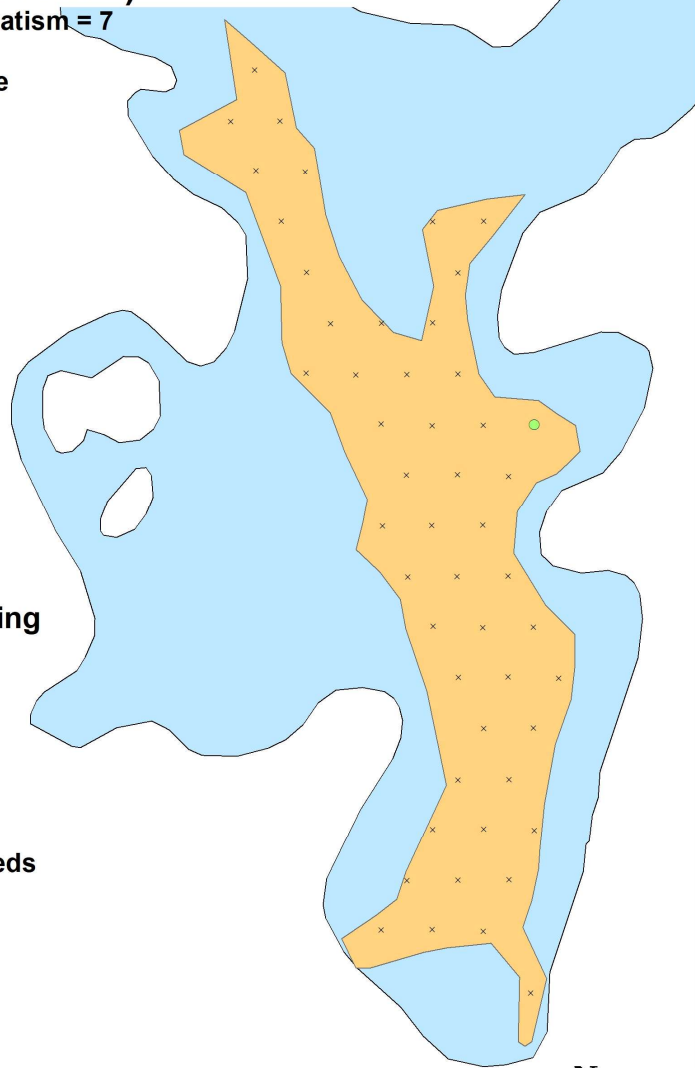
Coefficient of Conservatism = 7

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



**Clasping-leaf pondweed
(*Potamogeton richardsonii*)**

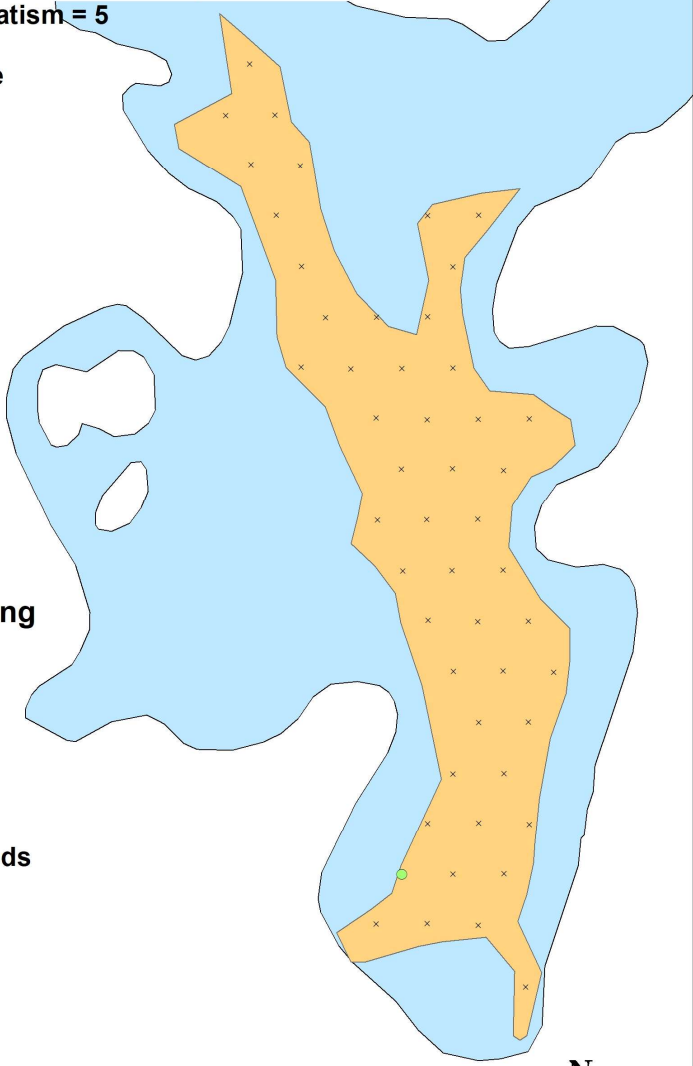
Coefficient of Conservatism = 5

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds

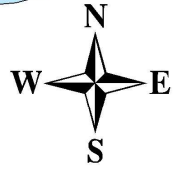
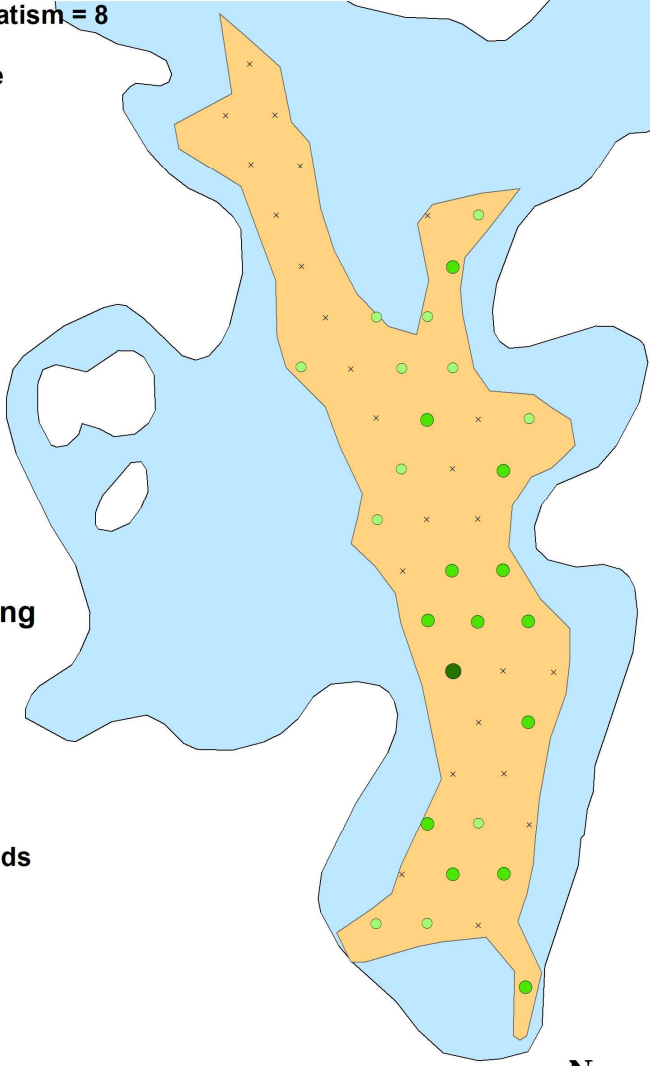


Fern pondweed
(*Potamogeton robbinsii*)
Coefficient of Conservatism = 8
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



Flat-stem pondweed
(*Potamogeton zosteriformis*)

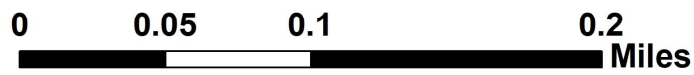
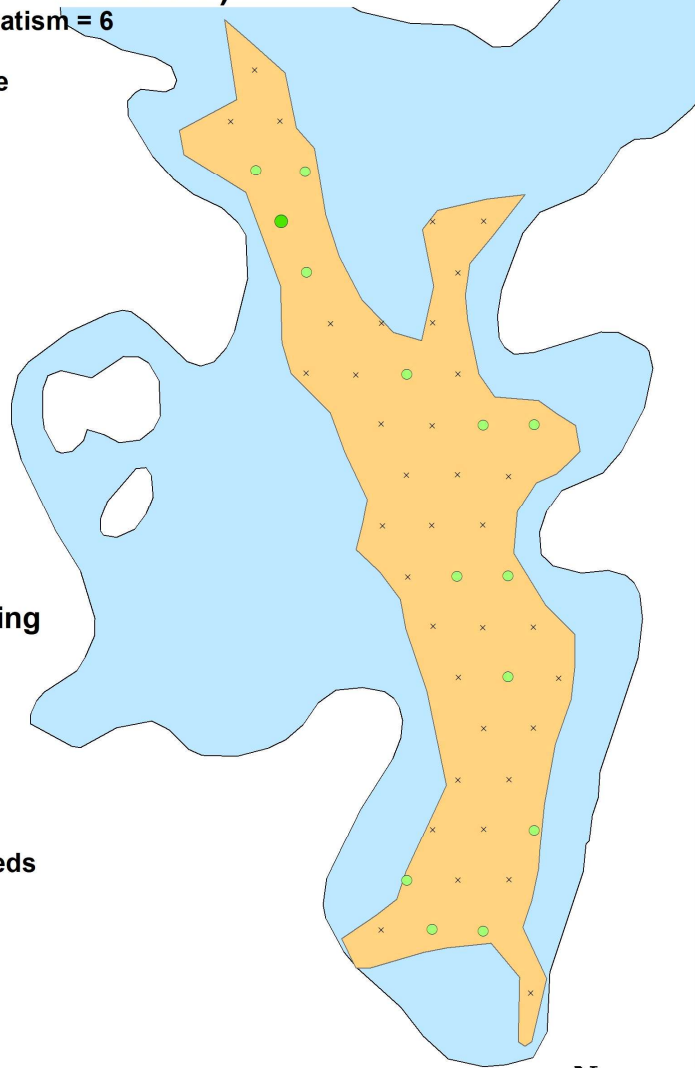
Coefficient of Conservatism = 6

Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



White water crowfoot (*Ranunculus aquatilis*)

Coefficient of Conservatism = 8

Preharvest Survey

City Bay - Balsam Lake

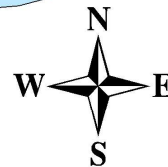
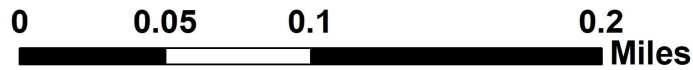
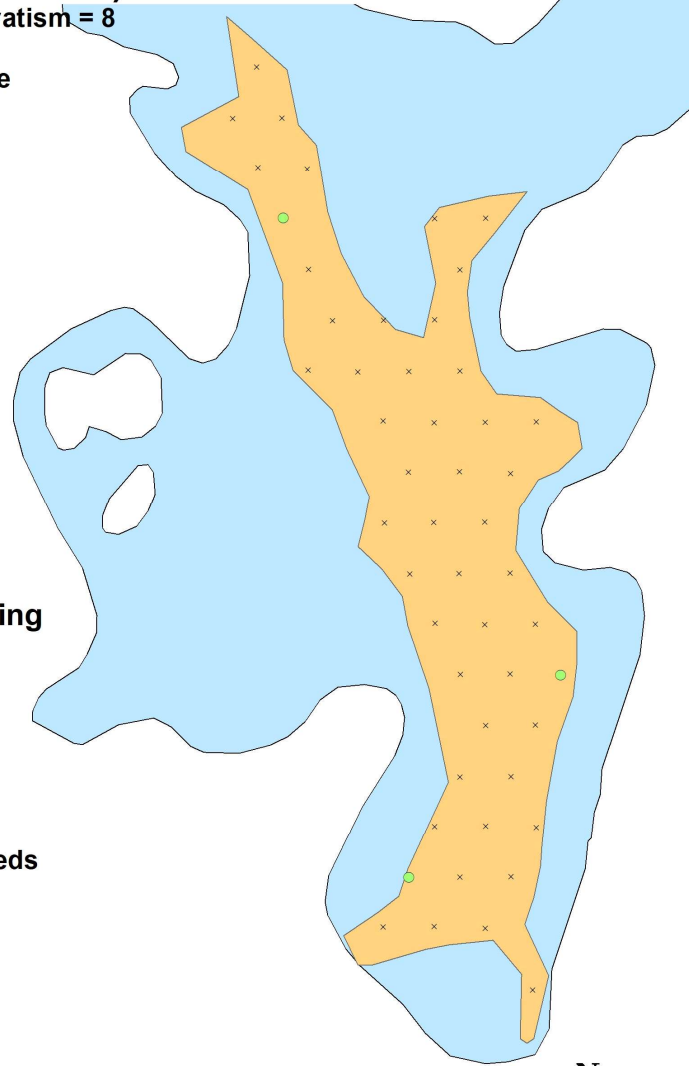
Polk County, WI

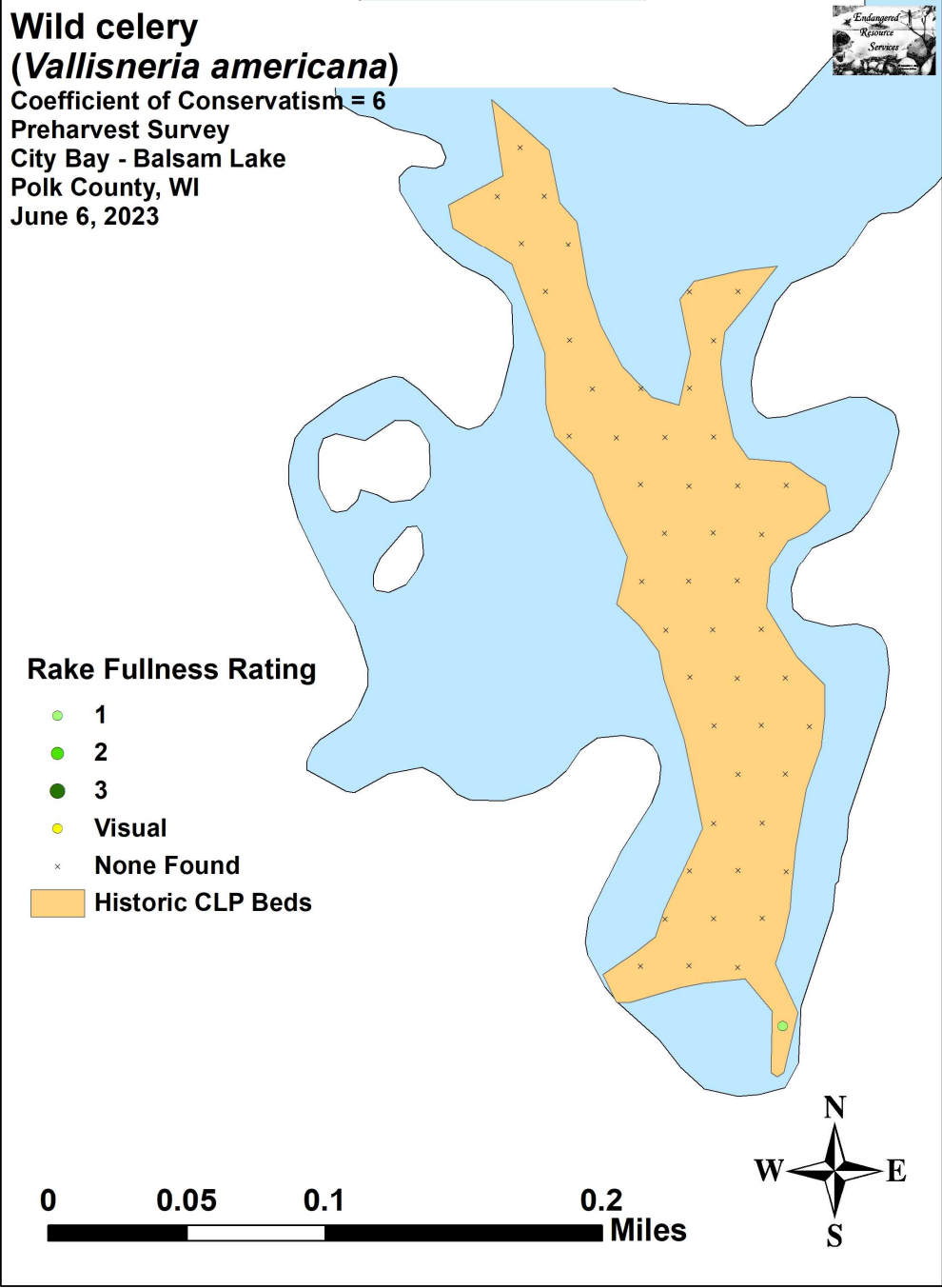
June 6, 2023



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds





Appendix IX: 2024 Preharvest Native Species Density and Distribution

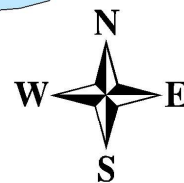
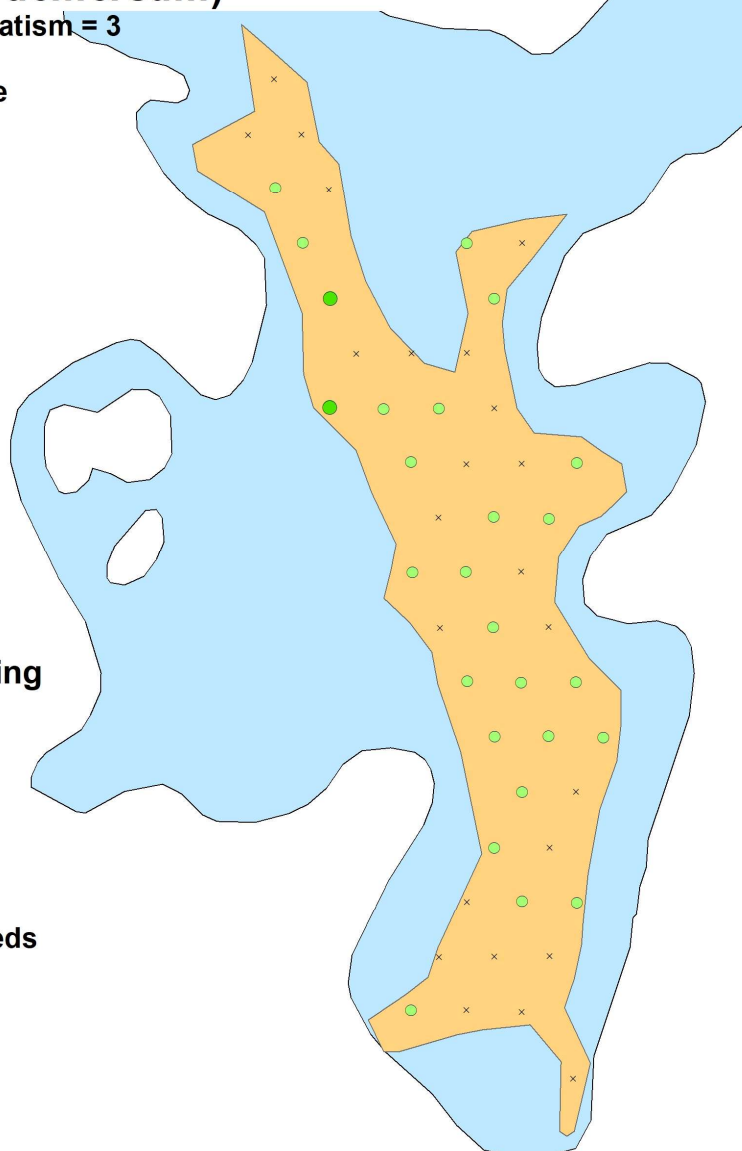
Coontail (*Ceratophyllum demersum*)

Coefficient of Conservatism = 3
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



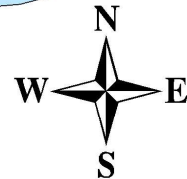
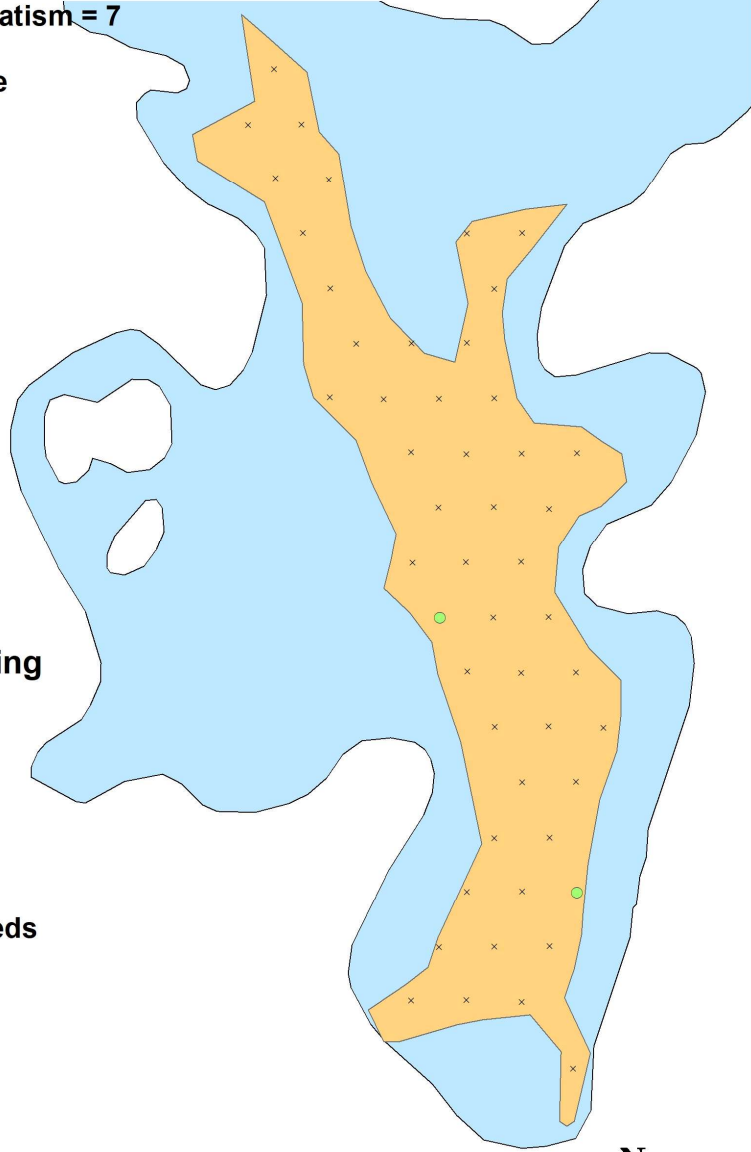
Muskgrass (*Chara* sp.)

Coefficient of Conservatism = 7
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



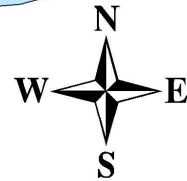
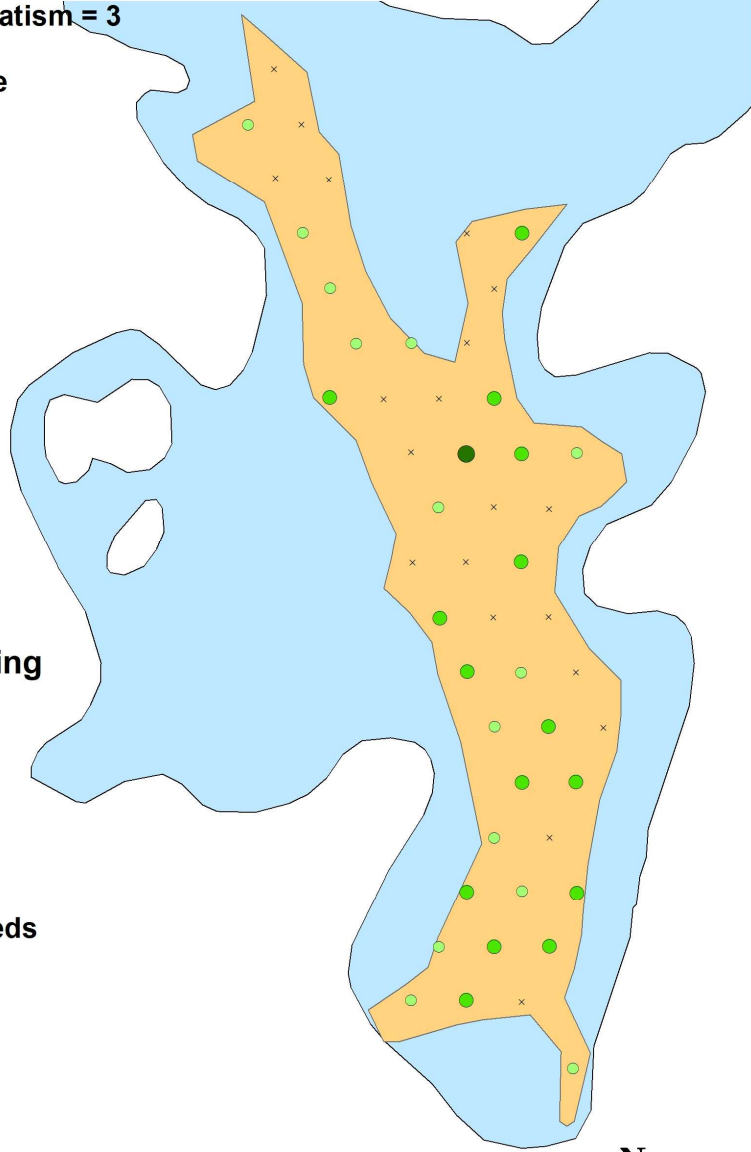
Common waterweed (*Elodea canadensis*)

Coefficient of Conservatism = 3
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



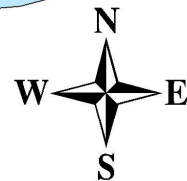
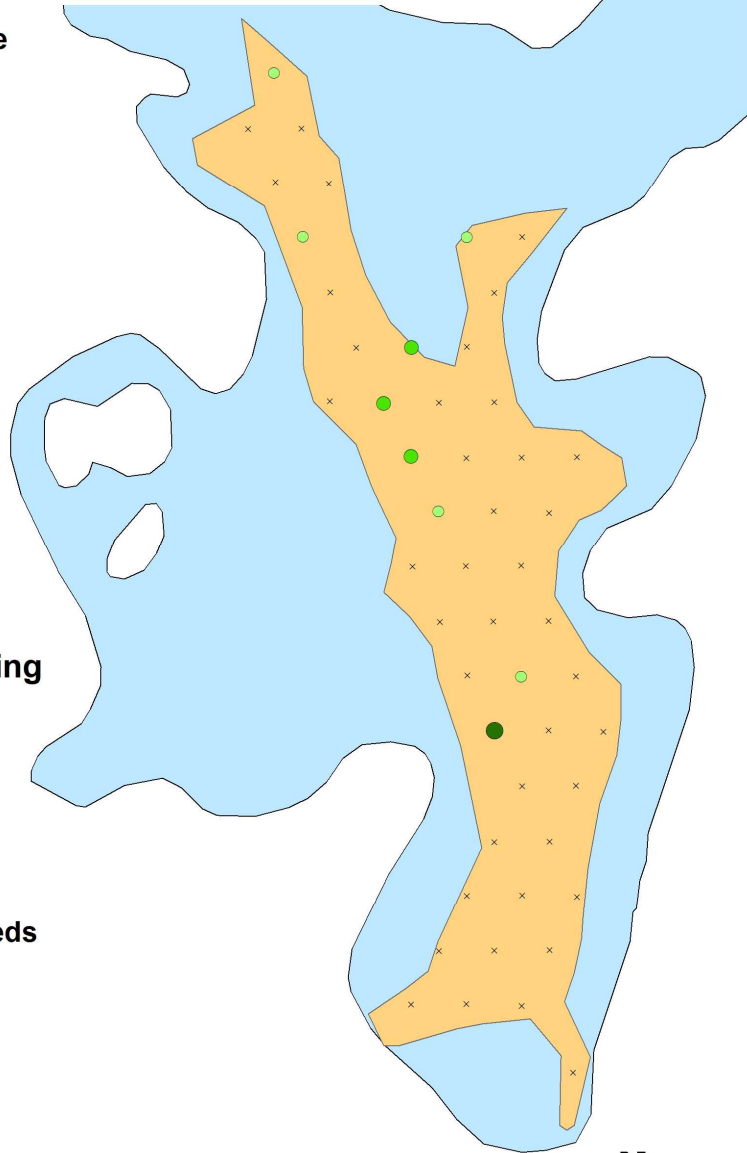
Filamentous algae

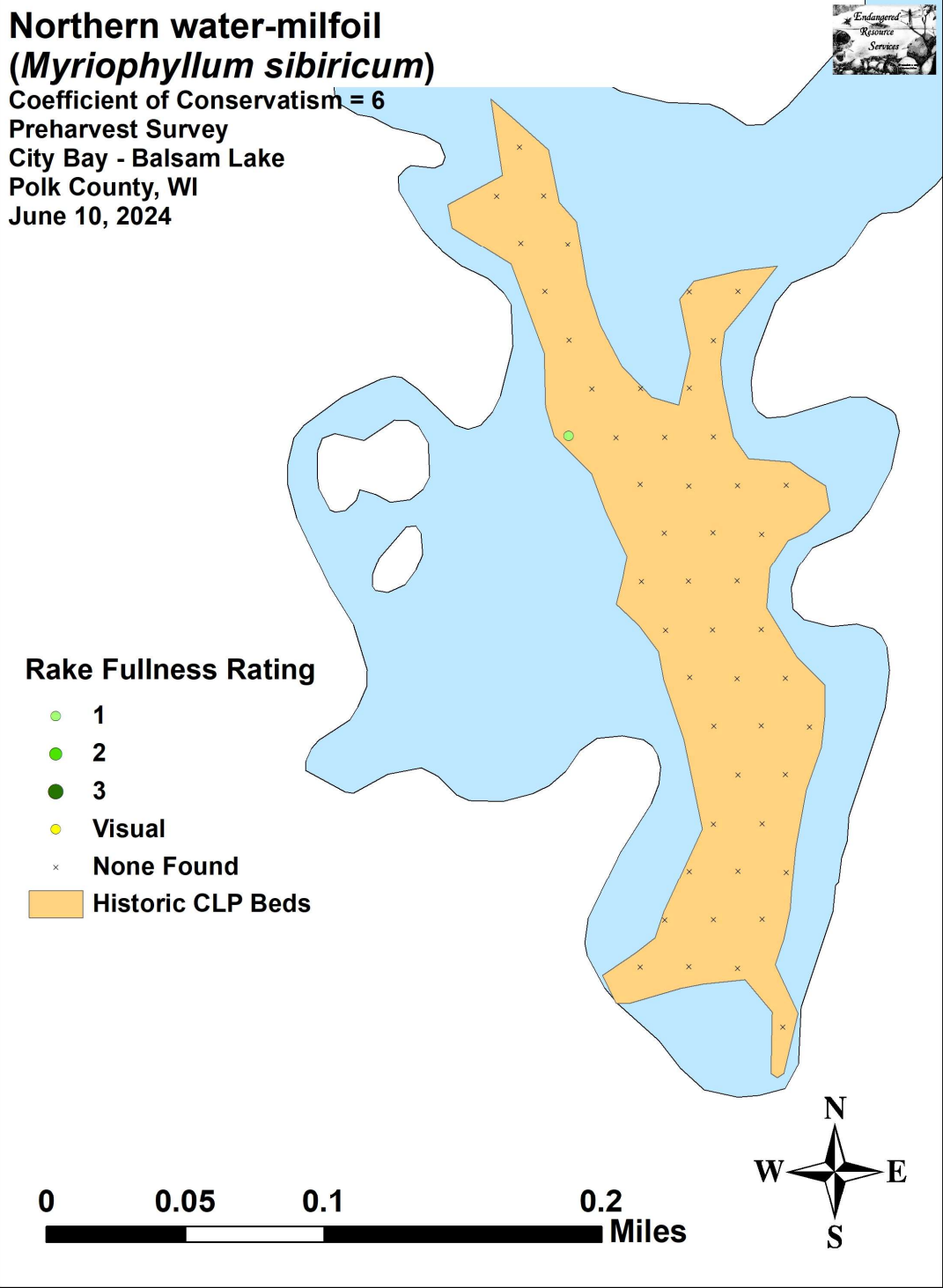
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024

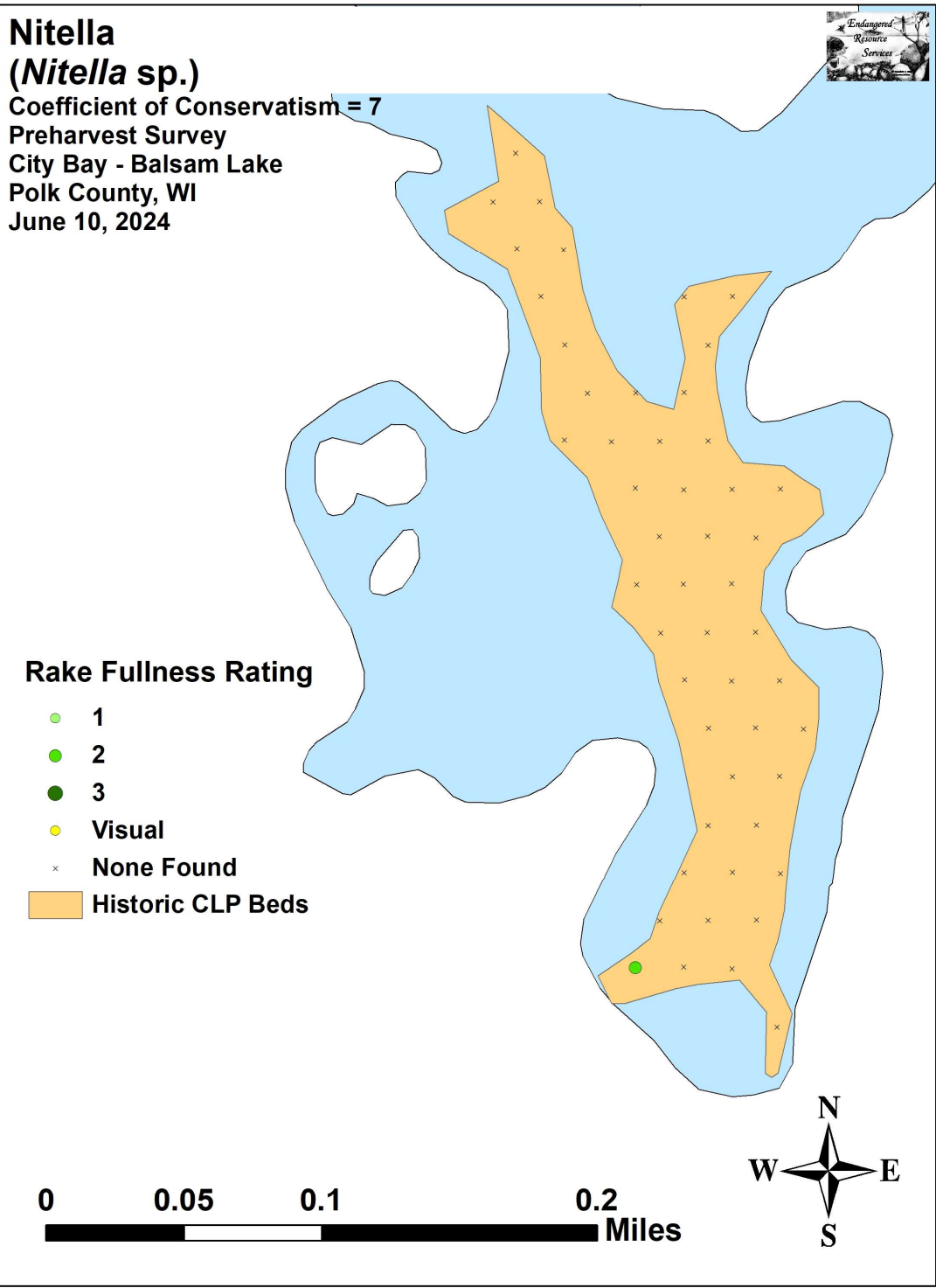


Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds







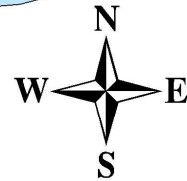
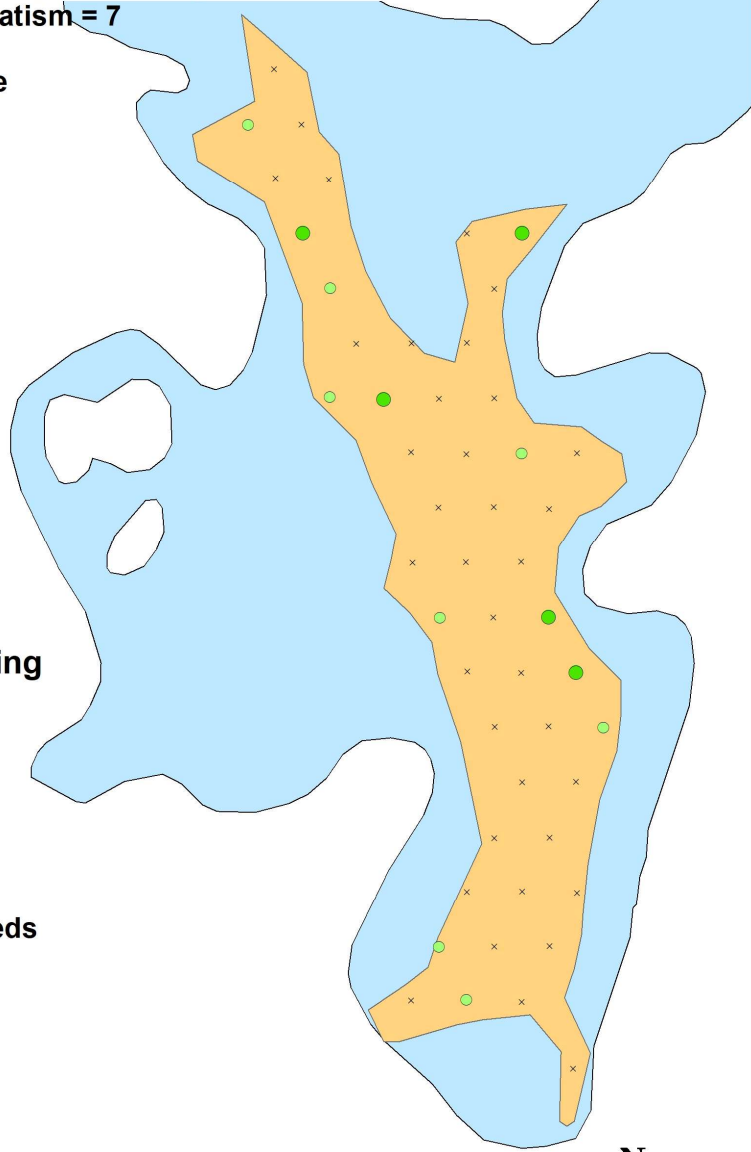
Large-leaf pondweed (*Potamogeton amplifolius*)

Coefficient of Conservatism = 7
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



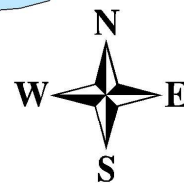
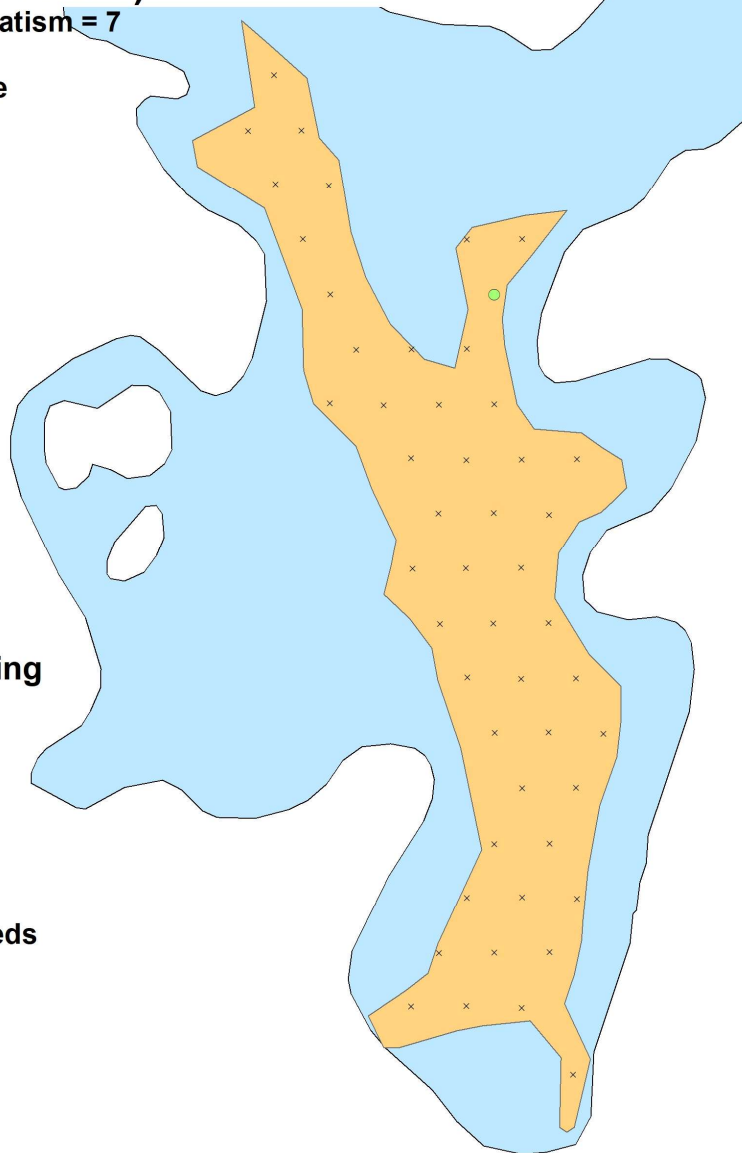
Small pondweed (*Potamogeton pusillus*)

Coefficient of Conservatism = 7
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



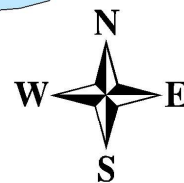
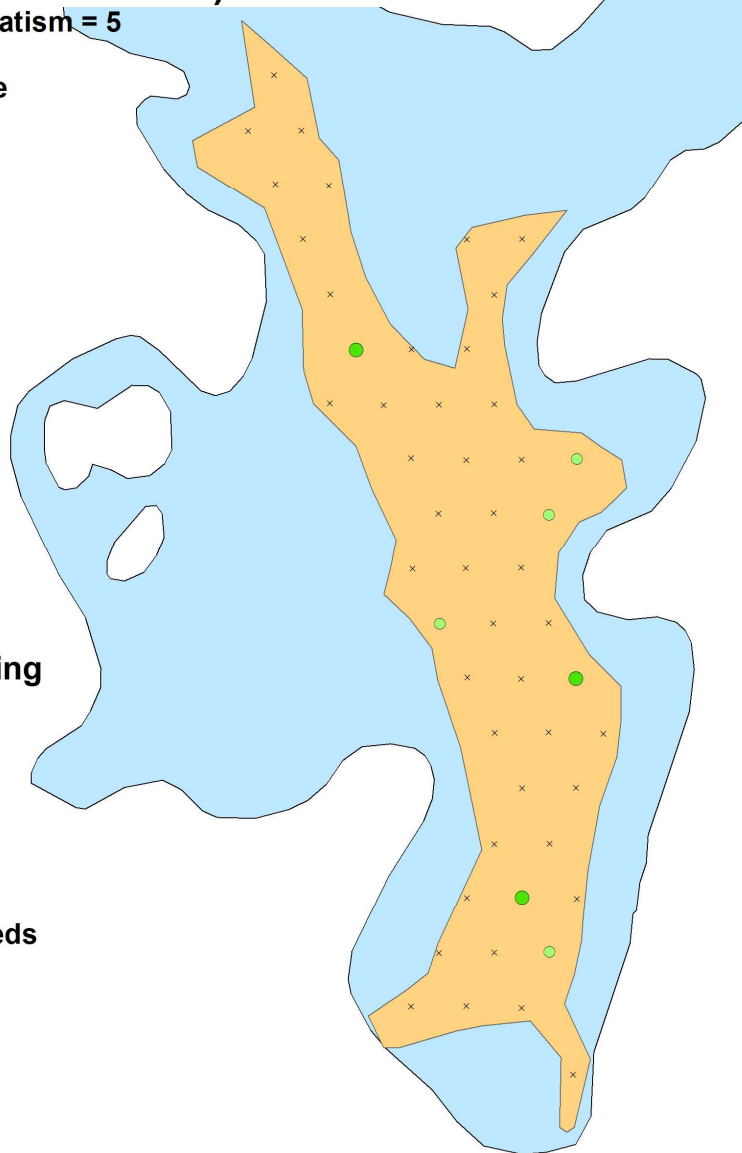
Clasping-leaf pondweed (*Potamogeton richardsonii*)

Coefficient of Conservatism = 5
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



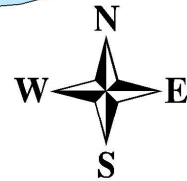
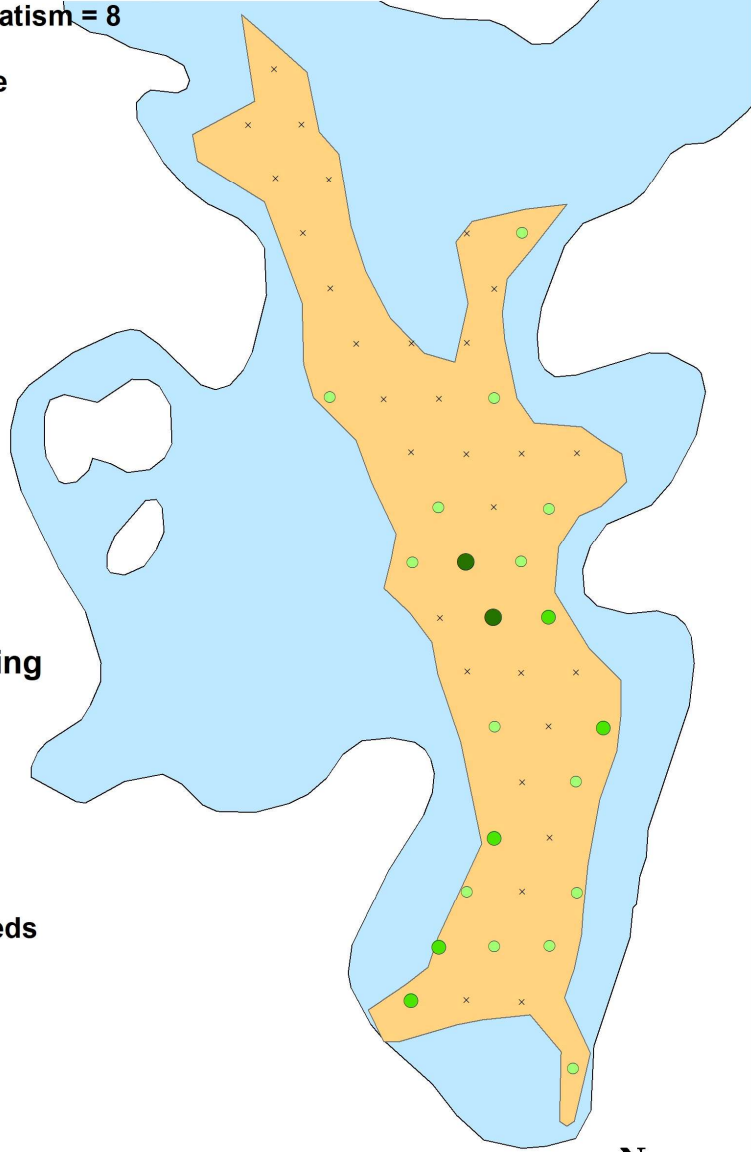
Fern pondweed (*Potamogeton robbinsii*)

Coefficient of Conservatism = 8
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



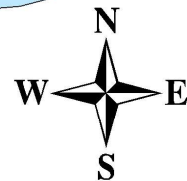
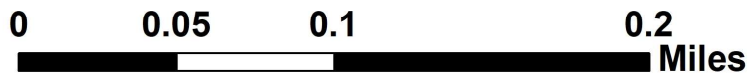
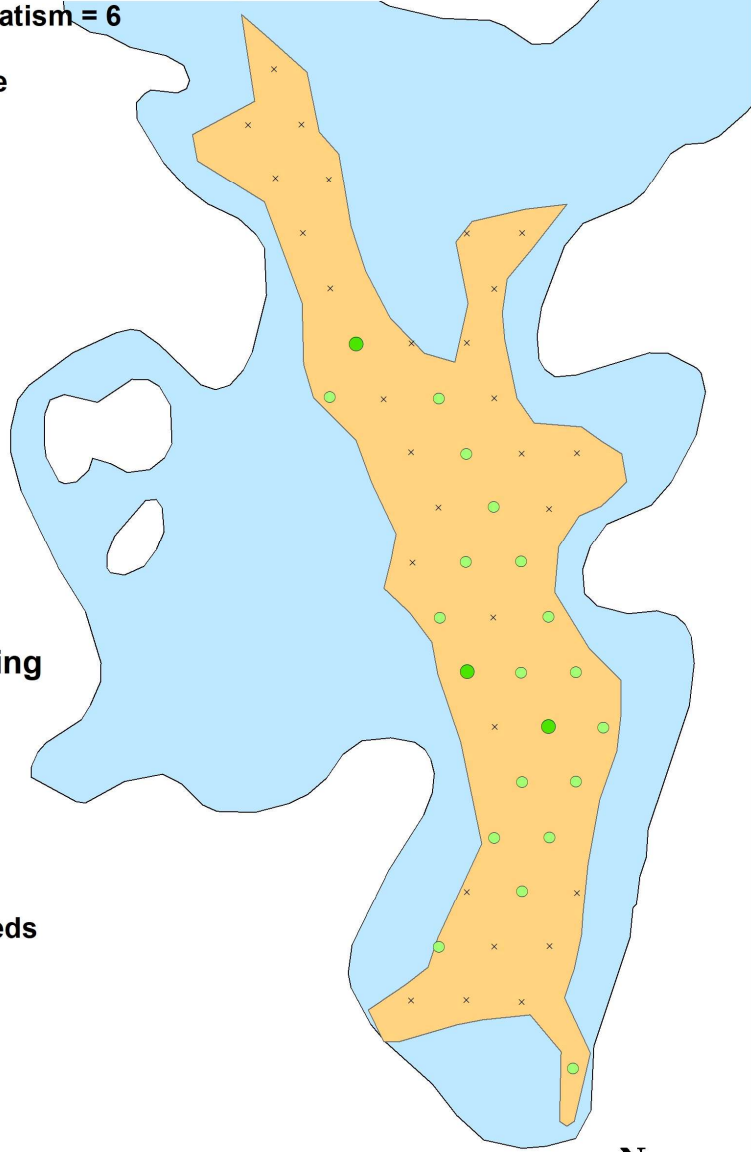
Flat-stem pondweed (*Potamogeton zosteriformis*)

Coefficient of Conservatism = 6
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds



White water crowfoot (*Ranunculus aquatilis*)

Coefficient of Conservatism = 8
Preharvest Survey
City Bay - Balsam Lake
Polk County, WI
June 10, 2024



Rake Fullness Rating

- 1
- 2
- 3
- Visual
- × None Found
- Historic CLP Beds

