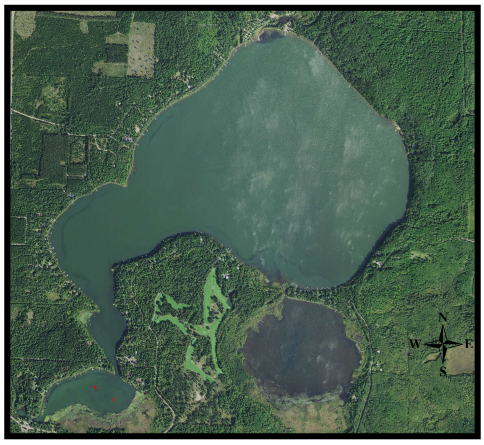
Curly-leaf pondweed (*Potamogeton crispus*) Point-intercept and Bed Mapping Surveys, and Warm-water Point-intercept Macrophyte Survey Lower Eau Claire Lake – WBIC: 2741600 Douglas and Bayfield Counties, Wisconsin

View from the landing – Lower Eau Claire Lake – 8/2/22



Lower Eau Claire Lake aerial photo with 2022 CLP beds (red)

Project Initiated by:

The Town of Barnes – Aquatic Invasive Species Committee,
Lake Education and Planning Services, LLC, and the
Wisconsin Department of Natural Resources (Grant AEPP66422)

Purple loosestrife at the lake outlet – 8/2/22

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June 29-30 and August 1-2, 2022

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ABSTRACT

Lower Eau Claire Lake (WBIC 2741600) is a 784-acre stratified drainage lake in southwest Bayfield and southeast Douglas Counties, WI. The lake is mesotrophic in nature with Secchi readings averaging 14.0ft from 1993-2022. A desire to determine if exotic species such as Curly-leaf pondweed (*Potamogeton crispus*) (CLP) or Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM) had invaded the lake; and to establish baseline data on the richness, diversity, abundance, and distribution of other native aquatic plant populations prompted members of the Town of Barnes Aquatic Invasive Species Committee (TOB) to apply for a Wisconsin Department of Natural Resources (WDNR) lake planning grant to fund three plant surveys on the lake in 2022: early-season CLP point-intercept and bed mapping surveys on June 29-30, and a warm-water point-intercept survey of all aquatic plants on August 1-2, 2022. The early-season survey found CLP at two points (0.3% total lake coverage) with a mean rake fullness of 2.00. This suggested 0.1% of the lake/0.3% of the early-season littoral zone had a significant infestation (one total point with a rake fullness of 2 or 3). We also mapped six CLP beds totaling 0.11 acre (0.01% coverage). In August, we found macrophytes growing at 266 of 745 survey points (one point was terrestrial). This extrapolated to 35.7% of the total lake bottom and 84.7% of the 19.5ft littoral zone. Overall diversity was exceptionally high with a Simpson Index value of 0.95. Richness was also high with 49 species found in the rake. This total increased to 69 species when including visuals and plants found during the boat survey. Localized richness was moderately high as we calculated a mean native species at sites with native vegetation of 3.24 species/site. We found that biomass at sites with vegetation was a moderate mean total rake fullness of 1.88. Northern water-milfoil (*Myriophyllum sibiricum*), Muskgrass (*Chara* sp.), Slender naiad (*Najas flexilis*), and Coontail (*Ceratophyllum demersum*) were the most widely-distributed macrophyte species. They were present at 26.69%, 24.44%, 24.06%, and 21.80% of sites with vegetation; and, collectively, they accounted for 29.86% of the total relative frequency. The 45 native index species found in the rake during the point-intercept survey produced a mean Coefficient of Conservatism of 6.4 and a Floristic Quality Index of 43.2. When compared to other lakes in the Northern Lakes and Forest Ecoregion, Lower Eau Claire Lake was below the average mean C of 6.7, but much above the median FQI of 24.3. Filamentous algae were present at 24 points with a mean rake fullness of 1.25. In addition to CLP, we found three other exotic species. A few clusters of Purple loosestrife (*Lythrum salicaria*) were removed near the public landing by the dam; Reed canary grass (*Phalaris arundinacea*) was also scattered by the landing; and Narrow-leaved cattail (*Typha angustifolia*) and Hybrid cattail (*Typha* X *glauca*) were growing on and adjacent to the bogs on the south shoreline of the outlet bay. Future management considerations include preserving the lake's high quality and sensitive native plant communities; working to maintain water clarity and limit nutrient inputs along the lakeshore by such things as establishing buffer strips of native vegetation, eliminating fertilizer applications, bagging grass clippings, removing pet waste, disposing of fire pit ash away from the lake, maintaining septic systems, and avoiding motor startups in shallow water; managing CLP with suction harvesting to minimize impacts on native vegetation; and continuing to monitor for and eliminate Purple loosestrife wherever it is found.

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INTRODUCTION:

Lower Eau Claire Lake (WBIC 2741600) is a 784-acre stratified drainage lake located in southwestern Bayfield and southeast Douglas Counties, Wisconsin in the Towns of Barnes and Gordan (T44N R9 and 10W S19, 24-25, 30, and 36). It reaches a maximum depth of 41ft in the hole southeast of the Eau Claire River Inlet and has an average depth of approximately 22ft (Figure 1). The lake is mesotrophic in nature with summer Secchi readings from 1993-2022 averaging 14.0ft (WDNR 2022). This very good clarity produced a littoral zone that reached approximately 19.5ft in 2022. The bottom substrate is predominately sand and sandy muck although areas of gravel are located throughout the lake – especially around exposed points and on shallow flats. The lake's only nutrient-rich organic muck occurs in the bays near the lake outlet (Holt et al 1972).

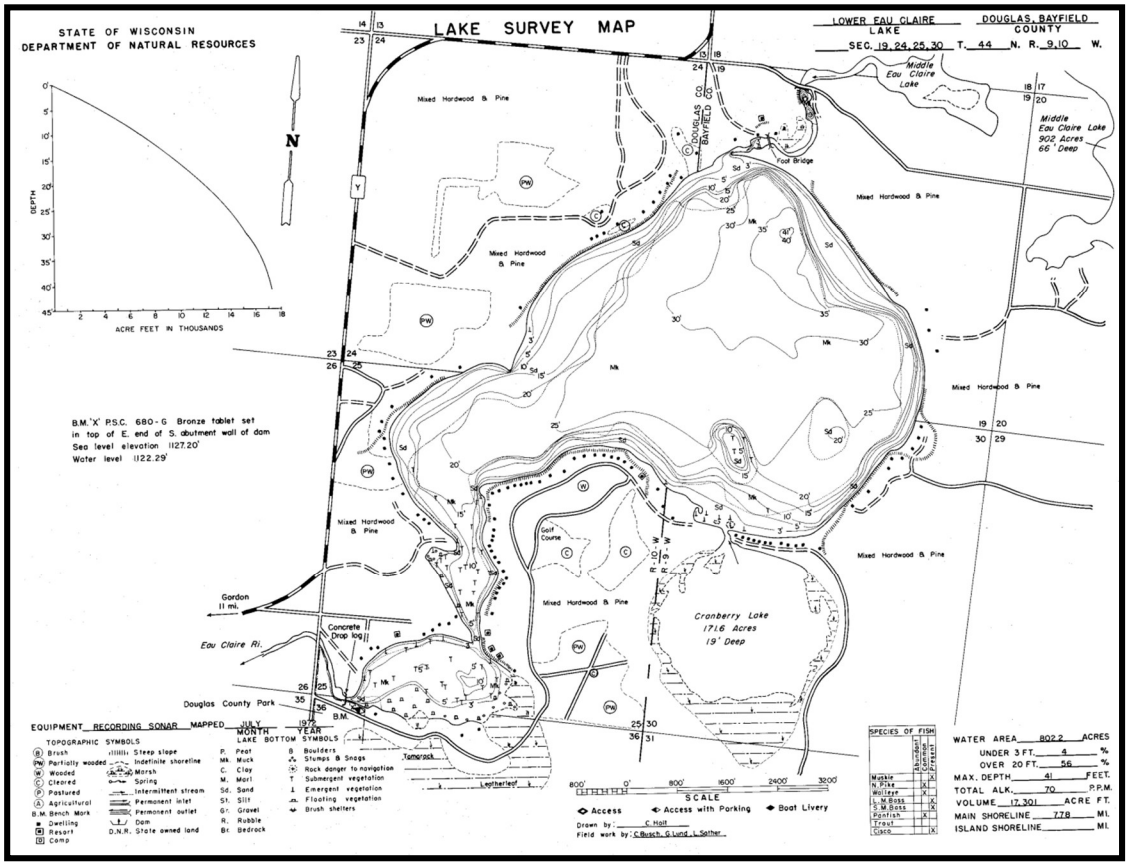


Figure 1: Lower Eau Claire Lake Bathymetric Map

BACKGROUND AND STUDY RATIONALE:

In 2005, concern over the spread of Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM) into nearby Tomahawk and Sand Bar Lakes prompted members of the Town of Barnes Aquatic Invasive Species Committee (then the Eurasian water-milfoil Committee) and the Eau Claire Lakes Area Property Owners Association (ECLAPOA) to authorize an initial point-intercept survey to look for exotic plant species in the lake. This survey did **not** find EWM, Curly-leaf pondweed (*Potamogeton crispus*) (CLP), or any other exotic species in Lower Eau Claire Lake (Kudlas et al. – pers. comm.).

In an effort to determine if the lake remained free of these harmful exotic species, the TOB applied for and received a Wisconsin Department of Natural Resources (WDNR) lake planning grant that authorized three plant surveys in 2022: June Curly-leaf pondweed point-intercept and bed mapping surveys and an August warm-water point-intercept survey of all macrophyte species. The goals of these studies were to look for and, if found, quantify the density and distribution of any exotic species; and to gather baseline data on the richness, diversity, abundance, distribution, and density of the lake's native vegetation. This report is the summary analysis of those surveys conducted on June 29-30 and August 1-2, 2022.

METHODS:

Curly-leaf Pondweed Point-intercept Survey:

Using a standard formula that takes into account the shoreline shape and distance, water clarity, depth, and total acreage, Jennifer Hauxwell (WDNR) generated the original 746-point sampling grid for Lower Eau Claire Lake (Appendix I). Using this grid, we completed a density survey where we sampled for Curly-leaf pondweed at each point in and adjacent to the lake's littoral zone. We located each survey point using a handheld mapping GPS unit (Garmin 76CSx) and used a rake to sample an approximately 2.5ft section of the bottom. When found, CLP was assigned a rake fullness value of 1-3 as an estimation of abundance (Figure 2). We also noted visual sightings of CLP within six feet of the sample point.

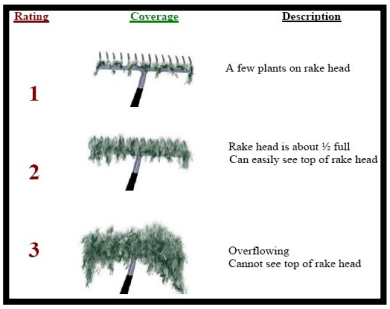


Figure 2: Rake Fullness Ratings (UWEX 2010)

Curly-leaf Pondweed 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 Curly-leaf pondweed 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 of the area taking GPS coordinates at regular intervals. We also estimated the rake density range and mean rake fullness of the bed (Figure 2), the depth 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 (Table 1).

Warm-water Full Point-intercept Macrophyte Survey:

Prior to beginning the August point-intercept survey, we conducted a general boat survey to gain familiarity with the lake's macrophytes. All plants found were identified (Voss 1996, Boreman et al. 1997; Chadde 2012; Crow and Hellquist 2005; Skawinski 2019), a datasheet was built from the species present, and two vouchers were collected to be pressed and mounted for herbarium specimens – one to be retained by the lake association, and one to be sent to the state herbarium the University of Wisconsin - Stevens Point for identification confirmation (Appendix II).

During the survey, we again located each survey point with a GPS, recorded a depth reading using a metered pole or handheld sonar, and took a rake sample. All plants on the rake, as well as any that were dislodged by the rake were identified and assigned a rake fullness value of 1-3 as an estimation of abundance (Figure 2). We also recorded visual sightings of all plants within six feet of the sample point not found in the rake. In addition to a rake rating for each species, a total rake fullness rating was also noted. Substrate (bottom) type was assigned at each site where the bottom was visible, or it could be reliably determined using the rake.

DATA ANALYSIS:

We entered all data collected into the standard WDNR aquatic plant management spreadsheet (Appendix II) (UWEX 2010). From this, we calculated the following:

Total number of sites visited: This included the total number of points on the lake that were accessible to be surveyed by boat or kayak.

Total number of sites with vegetation: These included all sites where we found vegetation after doing a rake sample. For example, if 20% of all sample sites have vegetation, it suggests that 20% of the lake has plant coverage.

Total number of sites shallower than the maximum depth of plants: This is the number of sites that are in the littoral zone. Because not all sites that are within the littoral zone actually have vegetation, we use this value to estimate how prevalent vegetation is throughout the littoral zone. For example, if 60% of the sites shallower than the maximum depth of plants have vegetation, then we estimate that 60% of the littoral zone has plants.

Frequency of occurrence: The frequency of all plants (or individual species) is generally reported as a percentage of occurrences within the littoral zone. It can also be reported as a percentage of occurrences at sample points with vegetation.

Frequency of occurrence example:

Plant A is sampled at 70 out of 700 total littoral points = 70/700 = .10 = 10%

This means that Plant A's frequency of occurrence = 10% when considering the entire littoral zone.

Plant A is sampled at 70 out of 350 total points with vegetation = 70/350 = .20 = 20%

This means that Plant A's frequency of occurrence = 20% when only considering the sites in the littoral zone that have vegetation.

From these frequencies, we can estimate how common each species was at depths where plants were able to grow, and at points where plants actually were growing.

Note the second value will be greater as not all the points (in this example, only ½) had plants growing at them.

Simpson's Diversity Index: A diversity index allows the entire plant community at one location to be compared to the entire plant community at another location. It also allows the plant community at a single location to be compared over time thus allowing a measure of community degradation or restoration at that site. With Simpson's Diversity Index, the index value represents the probability that two individual plants (randomly selected) will be different species. The index values range from 0 -1 where 0 indicates that all the plants sampled are the same species to 1 where none of the plants sampled are the same species. The greater the index value, the higher the diversity in a given location. Although many natural variables like lake size, depth, dissolved minerals, water clarity, mean temperature, etc. can affect diversity, in general, a more diverse lake indicates a healthier ecosystem. Perhaps most importantly, plant communities with high diversity also tend to be **more resistant** to invasion by exotic species.

Maximum depth of plants: This indicates the deepest point that vegetation was sampled. In clear lakes, plants may be found at depths of over 20ft, while in stained or turbid locations, they may only be found in a few feet of water. Although some species can tolerate very low light conditions, others are only found near the surface. In general, the diversity of the plant community decreases with increased depth.

Mean and median depth of plants: The mean depth of plants indicates the average depth in the water column where plants were sampled. Because a few samples in deep water can skew this data, median depth is also calculated. This tells us that half of the plants sampled were in water shallower than this value, and half were in water deeper than this value.

Number of sites sampled using rope/pole rake: This indicates which rake type was used to take a sample. We use a 20ft pole rake and a 35ft rope rake for sampling.

Average number of species per site: This value is reported using four different considerations. 1) **shallower than maximum depth of plants** indicates the average number of plant species at all sites in the littoral zone. 2) **vegetative sites only** indicate the average number of plants at all sites where plants were found. 3) **native species shallower than maximum depth of plants** and 4) **native species at vegetative sites only** excludes exotic species from consideration.

Species richness: This value indicates the number of different plant species found in and directly adjacent to (on the waterline) the lake. Species richness alone only counts those plants found in the rake survey. The other two values include those seen at a sample point during the survey but not found in the rake, and those that were only seen during the initial boat survey or inter-point. **Note: Per WDNR protocol, filamentous algae, freshwater sponges, aquatic moss and the aquatic liverworts *Riccia fluitans* and *Ricciocarpus natans* are excluded from these totals.**

Average rake fullness: This value is the average rake fullness of all species in the rake. It only takes into account those sites with vegetation (Table 2).

Relative frequency: This value shows a species' frequency relative to all other species. It is expressed as a percentage, and the total of all species' relative frequencies will add up to 100%. Organizing species from highest to lowest relative frequency value gives us an idea of which species are most important within the macrophyte community (Table 3).

Relative frequency example:

Suppose that we sample 100 points and found four species of plants with the following results:

Plant A was located at 70 sites. Its frequency of occurrence is thus 70/100 = 70%
Plant B was located at 50 sites. Its frequency of occurrence is thus 50/100 = 50%
Plant C was located at 20 sites. Its frequency of occurrence is thus 20/100 = 20%
Plant D was located at 10 sites. Its frequency of occurrence is thus 10/100 = 10%

To calculate an individual species' relative frequency, we divide the number of sites a plant is sampled at by the total number of times all plants were sampled. In our example that would be 150 samples (70+50+20+10).

Plant A = 70/150 = .4667 or 46.67%
Plant B = 50/150 = .3333 or 33.33%
Plant C = 20/150 = .1333 or 13.33%
Plant D = 10/150 = .0667 or 6.67%

This value tells us that 46.67% of all plants sampled were Plant A.

Floristic Quality Index (FQI): This index measures the impact of human development on a lake's aquatic plants. The species in the index are assigned a Coefficient of Conservatism (C) which ranges from 1-10. The higher the value assigned, the more likely the plant is to be negatively impacted by human activities relating to water quality or habitat modifications. Plants with low values are tolerant of human habitat modifications, and they often exploit these changes to the point where they may crowd out other species. The FQI is calculated by averaging the conservatism value for each native index species found in the lake during the point-intercept survey**, and multiplying it by the square root of the total number of plant species (N) in the lake ($FQI=(\Sigma(c1+c2+c3+\ldots cn)/N)*\sqrt{N}$). Statistically speaking, the higher the index value, the healthier the lake's macrophyte community is assumed to be. Nichols (1999) identified four eco-regions in Wisconsin: Northern Lakes and Forests, North Central Hardwood Forests, Driftless Area and Southeastern Wisconsin Till Plain. He recommended making comparisons of lakes within ecoregions to determine the target lake's relative diversity and health. Lower Eau Claire Lake is in the Northern Lakes and Forests Ecoregion (Table 4).

**** Species that were only recorded as visuals or during the boat survey, and species found in the rake that are not included in the index are excluded from FQI analysis.**

RESULTS:

Curly-leaf Pondweed Point-intercept Survey:

Following the establishment of the June 2022 littoral zone at approximately 19.5ft of water, we sampled for Curly-leaf pondweed at all points in and adjacent to this zone. CLP was present in the rake at two points with one additional visual sighting. This extrapolated to 0.3% of the entire lake and 0.6% of the 314-point littoral zone having at least some CLP present. Of these, one rated a rake fullness value of 3, none were a 2, and one was a 1 for a combined mean rake fullness of 2.00 (Figure 3) (Appendix III). The single point with a rake fullness of a 2 or a 3 suggested 0.1% of the entire lake and 0.3% of the spring littoral zone had a significant infestation.

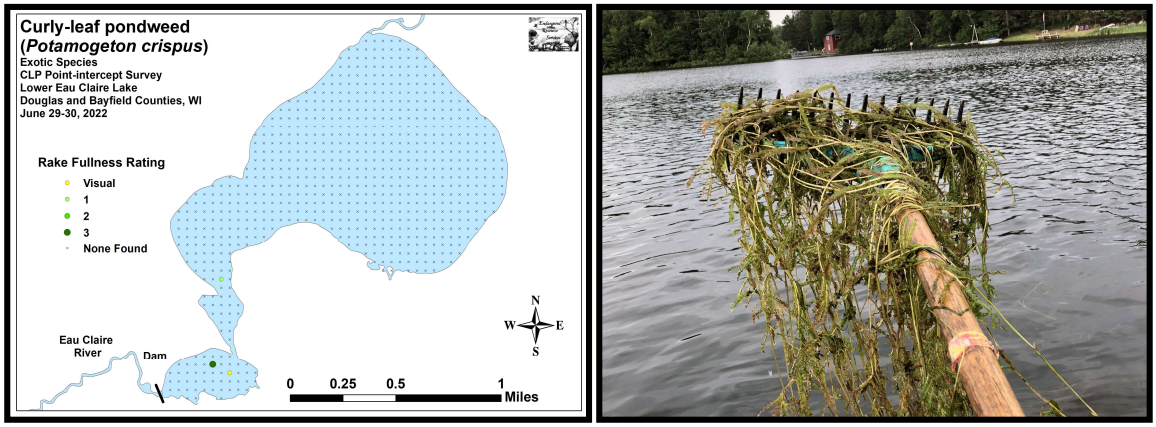


Figure 3: June Curly-leaf Pondweed Density and Distribution and Dense Rake of CLP in the Outlet Bay

Curly-leaf Pondweed Bed Mapping Survey:

During the point-intercept and bed mapping survey, we searched transects totaling 41.6km (25.9 miles) throughout the lake's littoral zone. In total, we mapped six beds covering 0.11 acre (0.01% of the lake's surface area) (Figure 4) (Appendix III). The biggest was 0.06 acre (Bed 2) while the smallest were <0.01 acre (Beds 1, 4, 5 and 6) and consisted of just a few handfuls of plants (Table 1).

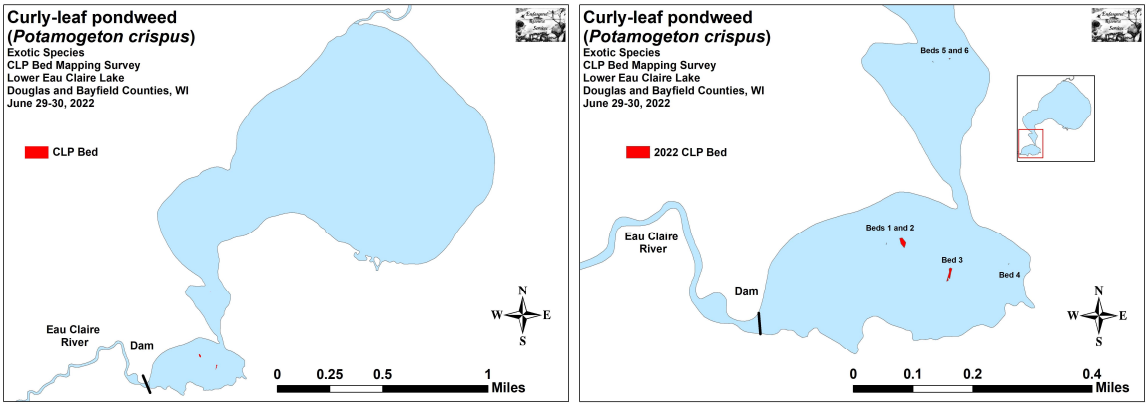


Figure 4: Curly-leaf Pondweed Beds – Close-up of Outlet Bay

Table 1: Curly-leaf Pondweed Bed Summary
Lower Eau Claire Lake – Douglas and Bayfield Counties Wisconsin
June 29-30, 2022

Bed Number	2022 Acreage	Depth Range and Mean Depth	Est. Range and Mean Rake-full	Canopied	Navigation Impairment	Field Notes
1	<0.01	7-9; 8	1-3; 3	Near	Minor	Dense microbed.
2	0.06	8-10; 9	1-3; 3	Near	Minor	Most plants 2ft subcanopy.
3	0.05	9-13; 11	1-3; 3	Yes	Minor	Too small to be mod/severe.
4	<0.01	2-4; 4	1-3; 2	Near	None	Mixed in with Spatterdock.
5	<0.01	7-9; 8	1-3; 3	No	None	Dense microbed.
6	<0.01	7-10; 8	<1-2; 1	Near	None	Open microbed.
Total Acres	**0.11**					

Descriptions of Curly-leaf Pondweed Beds:

Beds 1 and 2 – These two beds occurred just north of the main navigation channel leading away from the public boat landing which likely makes them a high priority for management (Figure 4). Despite being 1-2ft below the surface, they were likely dense enough to still cause at least minor impairment.

Bed 3 – This bed grew just southeast of the main navigation channel leading away from the landing making it another likely high priority for management. CLP was at or near canopy throughout the area, and we found the bed extended to at least 11ft around the spring hole.

Bed 4 – We found this low-density microbed growing among Spatterdock (*Nuphar variegata*) lilypads in an area that is unlikely to have boat traffic due to the shallow depth and stumps. Because of this, it is likely the lowest priority for management of any of the beds.

Beds 5 and 6 – Each of these beds in the narrows were subcanopy making them a non-issue for navigation. Because most of Bed 5 was not visible from the surface, we delineated the boundary by test raking. This may mean that more CLP is growing in this area and plants are simply not tall enough to be detected.

Warm-water Full Point-intercept Macrophyte Survey:

Depth readings taken at Lower Eau Claire Lake's 745 survey points – one point was terrestrial – (Appendix I) revealed a varied underwater topography (Figure 5). Most of the upper lake is a steep-sided bowl rimmed with relatively narrow sand and gravel flats. The most notable exception to this is on the south side where a broad sand flat and sunken island occur immediately north/northeast of the Cranberry Lake inlet. On the lake's southwest end, a broad 20ft+ flat becomes increasingly shallow as it approaches the narrows and outlet bay (Appendix IV).

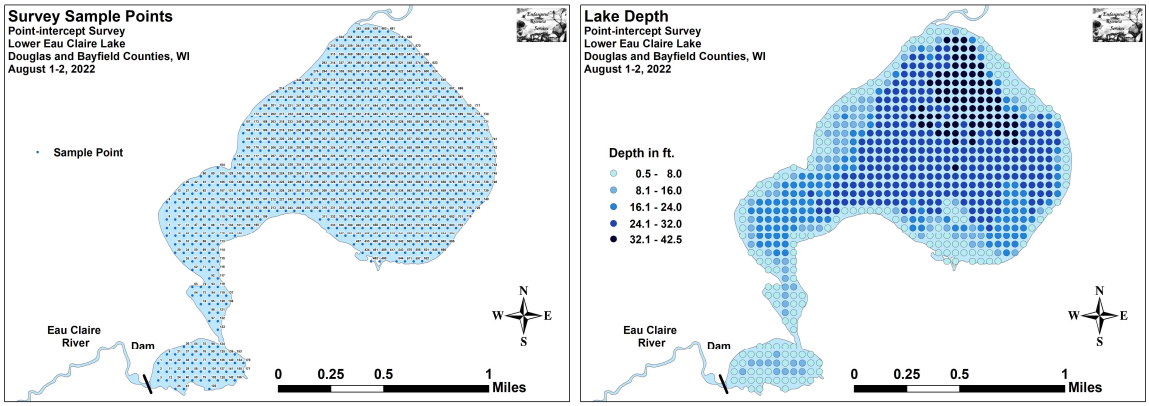


Figure 5: Survey Sample Points and Lake Depth

Of the 321 points where we could determine the bottom substrate, we categorized 22.1% as sandy or organic muck (71 points), 4.0% as rock and gravel (13 points), and 73.8% as pure sand (237 points) (Figure 6) (Appendix IV). The majority of areas along the immediate shoreline were sand or a mix of sand and gravel. With increasing depth, most areas tended to have a very thin layer of soft sandy muck over a pure sand base; however, we didn't classify these points as muck unless it was obviously more than a few inches thick. Most of the pure muck areas occurred in the narrows and the outlet bay.

We found plants growing at 266 points (Table 2). This extrapolated to 35.7% of the total lake bottom and 84.7% of the 19.5ft littoral zone (Figure 6) (Appendix V). Overall plant colonization was strongly skewed to deep water as the mean depth of 7.7ft was much greater than the median depth of 6.5ft (Figure 7).

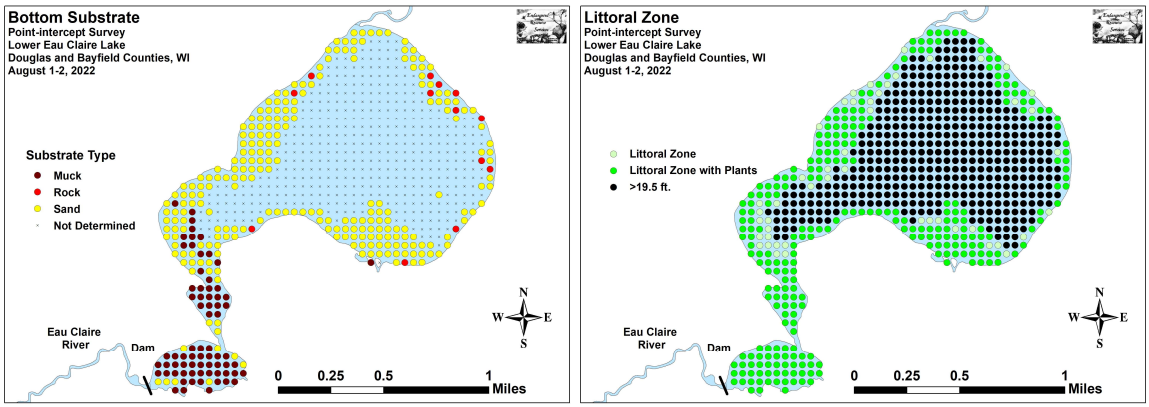


Figure 6: Bottom Substrate and Littoral Zone

Table 2: Aquatic Macrophyte P/I Survey Summary Statistics
Lower Eau Claire Lake – Douglas and Bayfield Counties, Wisconsin
August 1-2, 2022

Summary Statistics:

Total number of points sampled	745
Total number of sites with vegetation	266
Total number of sites shallower than the maximum depth of plants	314
Frequency of occurrence at sites shallower than maximum depth of plants	84.7
Simpson Diversity Index	0.95
Number of sites sampled using rake on Rope (R)	0
Number of sites sampled using rake on Pole (P)	321
Maximum depth of plants (ft)	19.5
Mean depth of plants (ft)	7.7
Median depth of plants (ft)	6.5
Average number of all species per site (shallower than max depth)	2.75
Average number of all species per site (veg. sites only)	3.25
Average number of native species per site (shallower than max depth)	2.75
Average number of native species per site (sites with native veg. only)	3.24
Species richness	49
Species richness (including visuals)	55
Species richness (including visuals and boat survey)	69
Mean total rake fullness (veg. sites only)	1.88

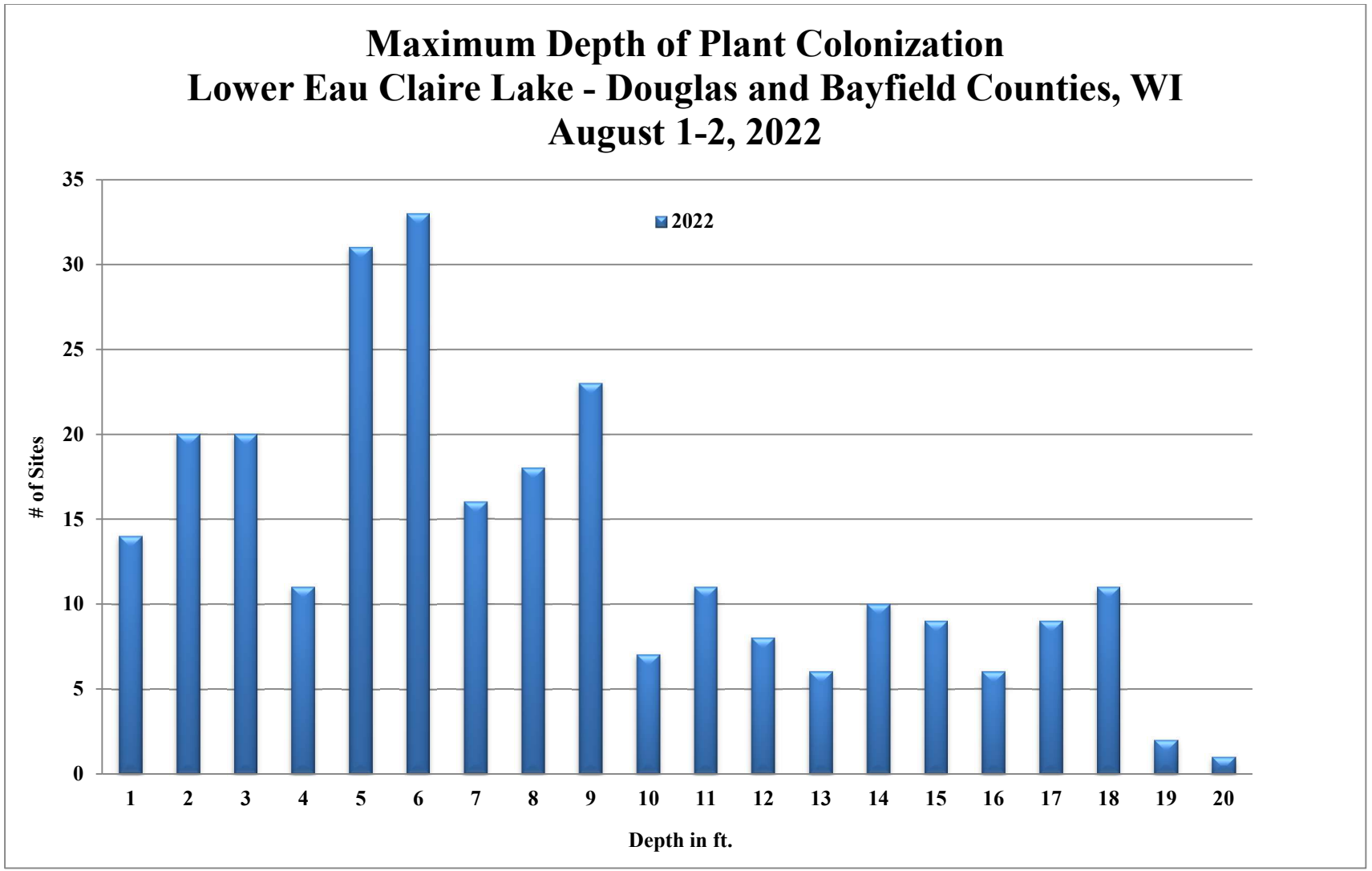


Figure 7: Plant Colonization Depth Chart

Plant diversity was exceptionally high with a Simpson Index value of 0.95. Richness was also high with 49 species found in the rake. This total increased to 69 species when including visuals and plants seen during the boat survey.

Localized richness was moderately high as we calculated a mean native species at sites with native vegetation of 3.24 species/site. We noted that most high richness areas occurred nearshore in the narrows and outlet bay over muck substrates. In the main basin, we found that few deepwater sites had more than two species present; especially when they occurred over pure sand or gravel (Figure 8) (Appendix V).

Biomass at sites with vegetation was a moderate mean total rake fullness of 1.88. Visual analysis of the map showed most areas over sandy and organic muck had dense plant growth; especially in the narrows and the outlet bay. Conversely, most areas over sand and gravel in the main lake had low to moderate plant densities (Figure 8) (Appendix V).

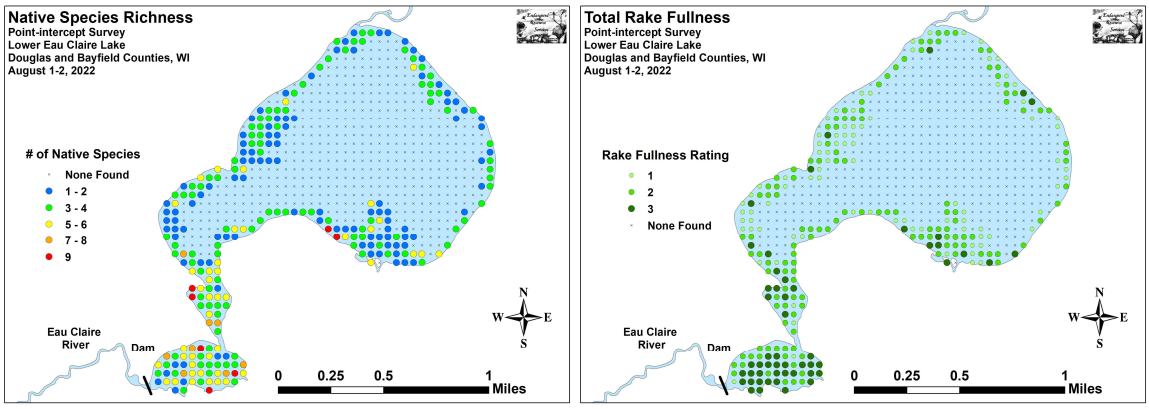


Figure 8: Native Species Richness and Total Rake Fullness

Lower Eau Claire Lake Plant Community:

The Lower Eau Claire Lake ecosystem is home to a rich and diverse plant community that is typical of low to moderate-nutrient lakes with good water quality. This community can be subdivided into four distinct zones (emergent, floating-leaf, shallow submergent, and deep submergent) with each zone having its own characteristic functions in the aquatic ecosystem. Depending on the local bottom type (sand, rock, sandy muck, or nutrient-rich organic muck), these zones often had somewhat different species present.

In shallow areas, beds of emergent plants prevent erosion by stabilizing the lakeshore, break up wave action, provide a nursery for baitfish and juvenile gamefish, offer shelter for amphibians, and give waterfowl and predatory wading birds like herons a place to hunt. These areas also provide important habitat for invertebrates like dragonflies and mayflies.

Bluejoint (*Calamagrostis canadensis*) and Sweet gale (*Myrica gale*) were common at the waterline on undeveloped sandy lakeshores throughout the system. In disturbed soil at the public boat landing, we also found Broom sedge (*Carex scoparia*), Common rush (*Juncus effusus*), and the exotic species Purple loosestrife (*Lythrum salicaria*) and Reed canary grass (*Phalaris arundinacea*).

Bluejoint (Routledge 2013)

Sweet gale (Devlin 2016)

Broom sedge (Kent 2020)

Common rush (Eggers 2008)

Purple loosestrife (Stanze 2021)

Reed canary grass (Berg 2019)

At the edge of the bogs along the south shoreline in the outlet bay where the soil was a more nutrient-rich organic muck, we also documented scattered Wild calla (*Calla palustris*), Bottle brush sedge (*Carex comosa*), Bald spikerush (*Eleocharis erythropoda*), Narrow-panicle rush (*Juncus brevicaudatus*), and both Narrow-leaved cattail (*Typha angustifolia*) and Broad-leaved cattail (*Typha latifolia*).

Wild calla (Pierce 2001)

Bottle-brush sedge (Penta 2009)

Bald spikerush (Schipper 2019)

Narrow-panicle rush (Chayka 2015)

Narrow-leaved cattail (Young 2010)

Broad-leaved cattail (Raymond 2011)

On shallow sand flats and gravel bars, we documented a diverse emergent community that included Narrow-leaved woolly sedge (*Carex lasiocarpa*), Common yellow lake sedge (*Carex utriculata*), Smooth saw-grass (*Cladium mariscoides*), Creeping spikerush (*Eleocharis palustris*), Grass-leaved arrowhead (*Sagittaria graminea*), Hardstem bulrush (*Schoenoplectus acutus*), Three-square bulrush (*Schoenoplectus pungens*), and Torrey's three-square bulrush (*Schoenoplectus torreyi*).

Narrow-leaved wooly sedge (Navratil 2016)

Common yellow lake sedge (Lavin 2011)

Smooth saw-grass (Perlman 2011)

Creeping spikerush (Legler 2016)

Grass-leaved arrowhead (Flaigg 2003)

Hardstem bulrush (Elliot 2007)

Three-square bulrush (Mittlhauser 2016)

Torrey's three-square bulrush (Rothrock 2018)

Shallow sandy muck areas supported beds of Lake sedge (*Carex lacustris*), Three-way sedge (*Dulichium arundinacea*), Water horsetail (*Equisetum fluviatile*), and American bur-reed (*Sparganium americanum*). Next to the bogs in the outlet bay, we also found scattered Water bulrush (*Schoenoplectus subterminalis*) and Softstem bulrush (*Schoenoplectus tabernaemontani*).

Lake sedge (Dziuk 2016)

Three-way sedge (GMNRI 2016)

Water horsetail (Elliot 2007)

American bur-reed (Hubick 2018)

Water bulrush (Haines 2013)

Softstem bulrush (Schwarz 2011)

Just beyond the emergents, pure sand areas seldom provided enough nutrients for floating-leaf species. In this environment, we found Variable pondweed (*Potamogeton gramineus*) occasionally produced floating leaves. We also found a few scattered beds of Narrow-leaved bur-reed (*Sparganium angustifolium*) with its long ribbon-like leaves growing in these areas.

Variable pondweed – with and without floating leaves (Koshere 2002)

Narrow-leaved bur-reed (Schouh 2006)

Most beds of floating-leaf species occurred in sheltered muck-bottomed areas in the narrows and the outlet bay in up to 5ft of water. This habitat was dominated by beds of Watershield (*Brasenia schreberi*), Spatterdock, (*Nuphar variegata*), and White-water lily (*Nymphaea odorata*).

Watershield (WED 2019)

Spatterdock and White water lily (Falkner 2009)

Near the bogs in the outlet bay, we also found lesser amounts of species that only occasionally produce floating leaves. They included Alpine pondweed (*Potamogeton alpinus*), Large-leaf pondweed (*Potamogeton amplifolius*), Ribbon-leaf pondweed (*Potamogeton epihydrus*), Floating-leaf pondweed (*Potamogeton natans*), Short-stemmed bur-reed (*Sparganium emersum*), and Small bur-reed (*Sparganium natans*). The protective canopy cover all these species provide is often utilized by panfish and bass.

Alpine pondweed (Holm 2016)

Large-leaf pondweed (Dziuk 2018)

Ribbon-leaf pondweed (Petroglyph 2007)

Floating-leaf pondweed (Petroglyph 2007)

Short-stemmed bur-reed (Cameron 2016)

Small bur-reed (Taylor 2004)

Growing among these floating-leaf species, especially next to the bogs in the outlet bay, we found scattered "duckweeds". They included Small duckweed (*Lemna minor*) and Forked duckweed (*Lemna trisulca*).

Small duckweed (Kramer 2013)

Forked duckweed (Curtis 2010)

This environment also supported the submergent species Alpine pondweed (*Potamogeton alpinus*) and Leafy pondweed (*Potamogeton foliosus*) as well as a variety of carnivorous plants including Creeping bladderwort (*Utricularia gibba*), Flat-leaf bladderwort (*Utricularia intermedia*), Small bladderwort (*Utricularia minor*), and Common bladderwort (*Utricularia vulgaris*). Rather than drawing nutrients up through roots like other plants, bladderworts trap zooplankton and minute insects in their bladders, digest their prey, and use the nutrients to further their growth.

Alpine pondweed (Gmelin 2009)

Leafy pondweed (Kleinman 2009)

Creeping bladderwort showing bladders for catching prey (Eyewed 2010)

Flat-leaf bladderwort (Woods 2012)

Small bladderwort (Cameron 2019)

Common bladderwort flowers among lilypads (Hunt 2010)

Just beyond the emergents, in water up to 5ft deep, shallow sugar sand and gravel areas tended to have low total biomass as these nutrient-poor substrates provide habitat most suited to fine-leaved "isoetid" turf-forming species. In this environment, we documented Rough stonewort – a Muskgrass (*Chara aspera*), Needle spikerush (*Eleocharis acicularis*), Slender naiad (*Najas flexilis*), and Variable pondweed.

Rough Stonewort – a Muskgrass (Gibbons 2012)

Needle spikerush (Fewless 2005)

Slender naiad (Apipp 2009)

Variable pondweed – submergent leaves (Cameron 2018)

In the most pristine shoreline areas on the lake, these shallow sandy habitats also supported an often limited number of uncommon to rare species. These plants, which are extremely sensitive to human disturbance, included Waterwort (*Elatine minima*), Spiny-spored quillwort (*Isoetes echinospora*), Crested arrowhead (*Sagittaria cristata*), and Grass-leaved arrowhead. All of these "turf" species, along with the emergents, stabilize the bottom and prevent wave action erosion.

Waterwort (Fewless 2005)

Spiny-spored quillwort (Fewless 2005)

Crested arrowhead (Fewless 2004)

Grass-leaved arrowhead (Cameron 2019)

Shallow sandy muck tended to support slightly broader-leaved species like Water star-grass (*Heteranthera dubia*), Northern water-milfoil (*Myriophyllum sibiricum*), Slender naiad, Fries' pondweed (*Potamogeton friesii*), Variable pondweed, Clasping-leaf pondweed (*Potamogeton richardsonii*), Stiff pondweed (*Potamogeton strictifolius*), White water crowfoot (*Ranunculus aquatilis*), Sago pondweed (*Stuckenia pectinata*), and Wild celery (*Vallisneria americana*). The roots, shoots, and seeds of these species are heavily utilized by both resident and migratory waterfowl for food. They also provide important habitat for the lake's fish throughout their lifecycles, as well as a myriad of invertebrates like scuds, dragonfly and mayfly nymphs, and snails.

Water star-grass (Mueller 2010)

Northern water-milfoil (Berg 2007)

Fries' pondweed (End 2012)

Clasping-leaf pondweed (Cameron 2014)

Stiff pondweed (Andrews 2012)

White water crowfoot (Wasser 2014)

Sago pondweed (Hilty 2012)

Wild celery (Dalvi 2009)

In water from 6-19ft over sandy and organic muck, the plant community was dominated by Water marigold (*Bidens beckii*), Coontail (*Ceratophyllum demersum*), Common waterweed (*Elodea canadensis*), Large-leaf pondweed, Curly-leaf pondweed, Illinois pondweed (*Potamogeton illinoensis*), White-stem pondweed (*Potamogeton praelongus*), Small pondweed (*Potamogeton pusillus*), Fern pondweed (*Potamogeton robbinsii*), and Flat-stem pondweed (*Potamogeton zosteriformis*). Predatory fish like the lake's Musky (*Esox masquinongy*) and Northern pike (*Esox lucius*) are often found along the edges of these rich underwater forests waiting in ambush.

Water marigold (Dziuk 2012)

Coontail (Hassler 2011)

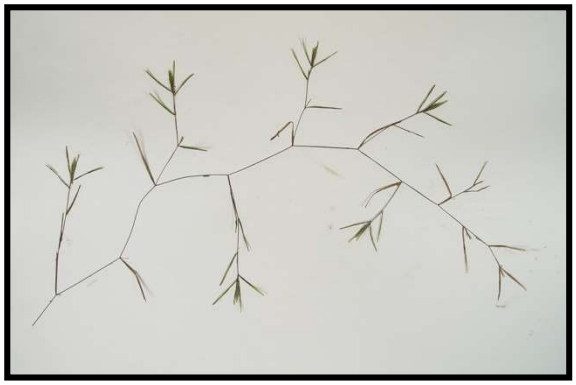
Common waterweed (Fischer 2005)

Large-leaf pondweed (Cameron 2022)

Curly-leaf pondweed (USGS 2019)

Illinois pondweed (UAF 2018)

White-stem pondweed (Fewless 2005)



Small pondweed (Cameron 2013)

Fern pondweed (Apipp 2011)

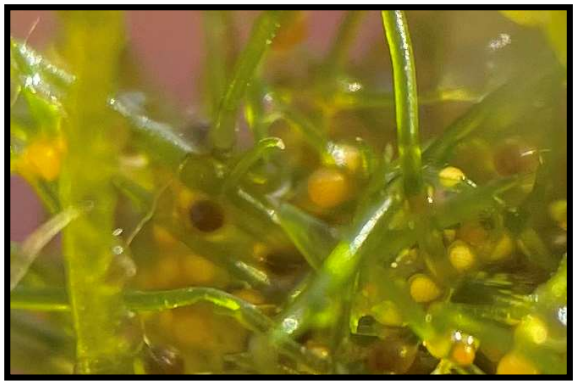
Flat-stem pondweed (Dziuk 2019)

Growing on the outer edge of the littoral zone, the colonial charophytes Muskgrass (*Chara* sp.), Nitella (*Nitella* sp.), and Bird's nest stonewort (*Tolypella intricata*) were widely-distributed and occasionally abundant. Able to survive in low-light conditions, these species combined to provide significant deepwater habitat.

Muskgrass (Skawinski 2018)

Smooth stonewort – a Nitella (Schou 2003)

Bird's nest stonewort – Lower Eau Claire Lake – 8/2/22



Close-up of Oogonia from Bird's nest stonewort

Plant Community Dominance:

When considering the lake as a whole, Northern water-milfoil, Muskgrass, Slender naiad, and Coontail were the most widely-distributed macrophyte species (Figure 9). They were present at 26.69%, 24.44%, 24.06%, and 21.80% of survey points with vegetation respectively; and, collectively, they accounted for 29.86% of the total relative frequency (Table 3). Wild celery (6.71%), Small pondweed (6.60%), Flat-stem pondweed (6.37), Needle spike-rush (6.02), Fries' pondweed (5.32), and Forked duckweed (4.17%) also had relative frequencies over 4.00% (Maps and species accounts for all plants are located in Appendixes VI and VII).

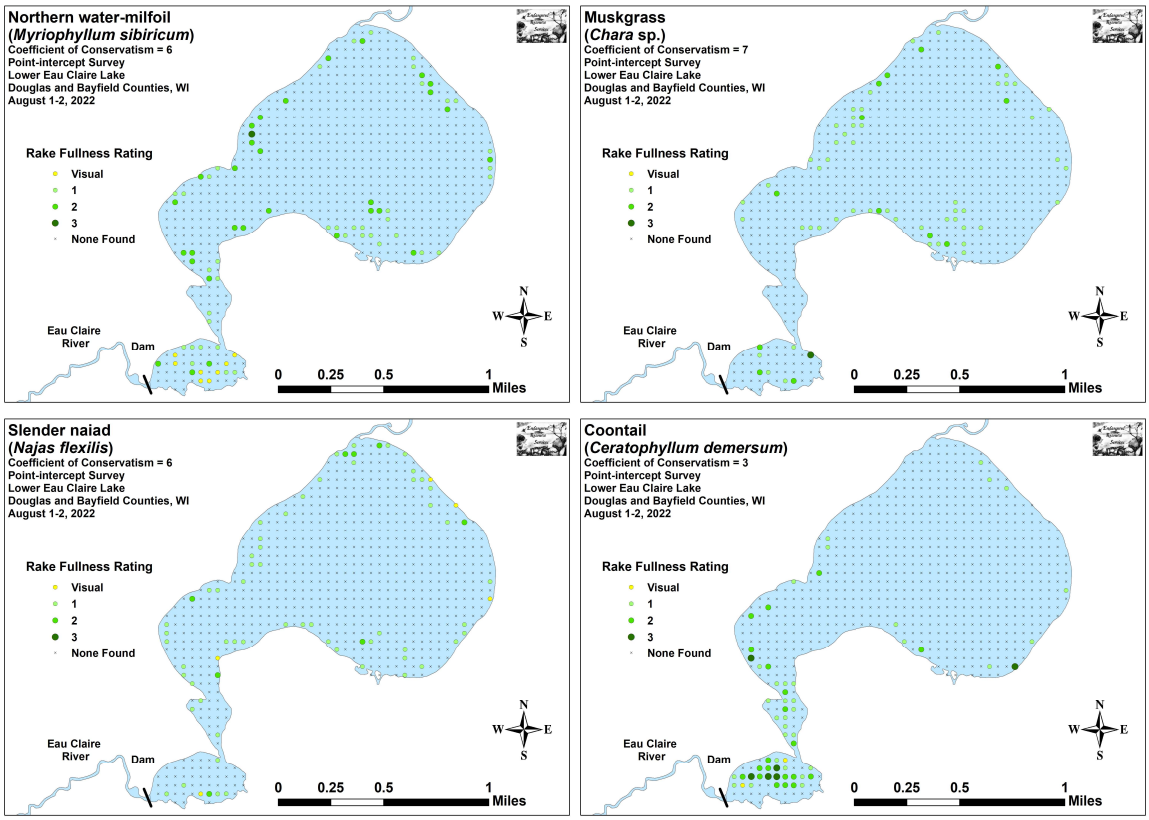


Figure 9: Lower Eau Claire Lake's Most Common Species

Table 3: Frequencies and Mean Rake Sample of Aquatic Macrophytes
Lower Eau Claire Lake – Douglas and Bayfield Counties, Wisconsin
August 1-2, 2022

Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
Myriophyllum sibiricum	Northern water-milfoil	71	8.22	26.69	22.61	1.45	8
Chara sp.	Muskgrass	65	7.52	24.44	20.70	1.23	0
Najas flexilis	Slender naiad	64	7.41	24.06	20.38	1.13	5
Ceratophyllum demersum	Coontail	58	6.71	21.80	18.47	1.55	2
Vallisneria americana	Wild celery	58	6.71	21.80	18.47	1.14	2
Potamogeton pusillus	Small pondweed	57	6.60	21.43	18.15	1.33	1
Potamogeton zosteriformis	Flat-stem pondweed	55	6.37	20.68	17.52	1.62	3
Eleocharis acicularis	Needle spikerush	52	6.02	19.55	16.56	1.73	0
Potamogeton friesii	Fries' pondweed	46	5.32	17.29	14.65	1.26	0
Lemna trisulca	Forked duckweed	36	4.17	13.53	11.46	1.00	0
Elodea canadensis	Common waterweed	32	3.70	12.03	10.19	1.06	0
Nitella sp.	Nitella	29	3.36	10.90	9.24	1.03	0
Potamogeton richardsonii	Clasping-leaf pondweed	29	3.36	10.90	9.24	1.24	8
	Filamentous algae	24	*	9.02	7.64	1.25	0
Potamogeton amplifolius	Large-leaf pondweed	22	2.55	8.27	7.01	1.27	4
Potamogeton robbinsii	Fern pondweed	22	2.55	8.27	7.01	1.45	1
Potamogeton gramineus	Variable pondweed	17	1.97	6.39	5.41	1.18	2
Nymphaea odorata	White water lily	15	1.74	5.64	4.78	1.53	5
Bidens beckii	Water marigold	13	1.50	4.89	4.14	1.31	1
Ranunculus aquatilis	White water crowfoot	13	1.50	4.89	4.14	1.08	0
Brasenia schreberi	Watershield	12	1.39	4.51	3.82	1.75	1
Tolypella intricata	Bird's nest stonewort	10	1.16	3.76	3.18	1.40	0
Nuphar variegata	Spatterdock	7	0.81	2.63	2.23	2.14	3
Potamogeton strictifolius	Stiff pondweed	7	0.81	2.63	2.23	1.29	2

*Excluded from relative frequency analysis

Table 3 (continued): Frequencies and Mean Rake Sample of Aquatic Macrophytes
Lower Eau Claire Lake – Douglas and Bayfield Counties, Wisconsin
August 1-2, 2022

Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
Isoetes echinospora	Spiny spored-quillwort	6	0.69	2.26	1.91	1.17	0
Stuckenia pectinata	Sago pondweed	6	0.69	2.26	1.91	1.50	1
Heteranthera dubia	Water star-grass	5	0.58	1.88	1.59	1.00	0
Schoenoplectus subterminalis	Water bulrush	5	0.58	1.88	1.59	1.80	0
Typha latifolia	Broad-leaved cattail	5	0.58	1.88	1.59	1.00	0
Utricularia vulgaris	Common bladderwort	5	0.58	1.88	1.59	1.20	1
Sagittaria graminea	Grass-leaved arrowhead	4	0.46	1.50	1.27	1.00	1
Dulichium arundinaceum	Three-way sedge	3	0.35	1.13	0.96	1.00	0
Elatine minima	Waterwort	3	0.35	1.13	0.96	1.00	1
Eleocharis erythropoda	Bald spikerush	3	0.35	1.13	0.96	3.00	1
Potamogeton natans	Floating-leaf pondweed	3	0.35	1.13	0.96	1.00	3
Schoenoplectus acutus	Hardstem bulrush	3	0.35	1.13	0.96	2.00	0
Typha angustifolia	**Narrow-leaved cattail**	**3**	**0.35**	**1.13**	**0.96**	**2.00**	**0**
Utricularia intermedia	Flat-leaf bladderwort	3	0.35	1.13	0.96	1.33	1
Eleocharis palustris	Creeping spikerush	2	0.23	0.75	0.64	1.50	0
Potamogeton illinoensis	Illinois pondweed	2	0.23	0.75	0.64	1.00	0
Sagittaria cristata	Crested arrowhead	2	0.23	0.75	0.64	1.00	1
Utricularia gibba	Creeping bladderwort	2	0.23	0.75	0.64	1.00	1
Utricularia minor	Small bladderwort	2	0.23	0.75	0.64	1.00	0
	Aquatic moss	2	*	0.75	0.64	1.50	0
Calla palustris	Wild calla	1	0.12	0.38	0.32	1.00	0
Carex comosa	Bottle brush sedge	1	0.12	0.38	0.32	1.00	2
Carex lasiocarpa	Narrow-leaved wooly sedge	1	0.12	0.38	0.32	3.00	0
Carex utriculata	Common yellow lake sedge	1	0.12	0.38	0.32	1.00	0

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

Table 3 (continued): Frequencies and Mean Rake Sample of Aquatic Macrophytes
Lower Eau Claire Lake – Douglas and Bayfield Counties, Wisconsin
August 1-2, 2022

Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
Lemna minor	Small duckweed	1	0.12	0.38	0.32	1.00	0
Potamogeton crispus	**Curly-leaf pondweed**	**1**	**0.12**	**0.38**	**0.32**	**1.00**	**0**
Potamogeton praelongus	White-stem pondweed	1	0.12	0.38	0.32	1.00	1
	Freshwater sponge	1	*	0.38	0.32	1.00	0
Cladium mariscoides	Smooth sawgrass	**	**	**	**	**	1
Equisetum fluviatile	Water horsetail	**	**	**	**	**	1
Juncus brevicaudatus	Narrow-panicle rush	**	**	**	**	**	1
Potamogeton foliosus	Leafy pondweed	**	**	**	**	**	1
Schoenoplectus tabernaemontani	Softstem bulrush	**	**	**	**	**	2
Sparganium emersum	Short-stemmed bur-reed	**	**	**	**	**	3
Calamagrostis canadensis	Bluejoint	***	***	***	***	***	***
Carex lacustris	Lake sedge	***	***	***	***	***	***
Carex scoparia	Broom sedge	***	***	***	***	***	***
Juncus effusus	Common Rush	***	***	***	***	***	***
Lythrum salicaria	**Purple loosestrife**	***	***	***	***	***	***
Myrica gale	Sweet gale	***	***	***	***	***	***
Phalaris arundinacea	**Reed canary grass**	***	***	***	***	***	***
Potamogeton alpinus	Alpine pondweed	***	***	***	***	***	***
Potamogeton epihydrus	Ribbon-leaf pondweed	***	***	***	***	***	***
Schoenoplectus pungens	Three-square bulrush	***	***	***	***	***	***
Schoenoplectus torreyi	Torrey's three-square bulrush	***	***	***	***	***	***
Sparganium americanum	American bur-reed	***	***	***	***	***	***
Sparganium angustifolium	Narrow-leaved bur-reed	***	***	***	***	***	***
Sparganium natans	Small bur-reed	***	***	***	***	***	***

* Excluded from relative frequency **Visual only *** Boat survey only **Exotic species in bold**

Floristic Quality Index:

We identified a total of 45 **native index plants** in the rake during the point-intercept survey. They produced a mean Coefficient of Conservatism of 6.4 and a Floristic Quality Index of 43.2 (Table 4). Nichols (1999) reported an average mean C for the Northern Lakes and Forest Region of 6.7 putting Lower Eau Claire Lake below average for this part of the state. The FQI was, however, much above the region's median FQI of 24.3 (Nichols 1999). Nine highly sensitive index plants of note included Wild calla (C = 9), Three-way sedge (C = 9), Waterwort (C = 9), Crested arrowhead (C = 9), Grass-leaved arrowhead (C = 9), Water bulrush (C = 9), Creeping bladderwort (C = 9), Flat-leaf bladderwort (C = 9), and Small bladderwort (C = 10). Six other high-value species that were visuals, found during the boat survey, or not included in the index included – Narrow-leaved woolly sedge (C = 9), Smooth sawgrass (C = 10), Alpine pondweed (C = 9), ***Torrey's three-square bulrush (C = 9), Narrow-leaved bur-reed (C = 9), and Small bur-reed (C = 9).

*** Torrey's three-square bulrush is a **Wisconsin State Species of Special Concern** - those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose of this category is to focus attention on certain species before they become threatened or endangered.

Table 4: Floristic Quality Index of Aquatic Macrophytes Lower Eau Claire Lake – Douglas and Bayfield Counties, Wisconsin August 1-2, 2022

Species	Common Name	C
Bidens beckii	Water marigold	8
Brasenia schreberi	Watershield	6
Calla palustris	Wild calla	9
Carex comosa	Bottle brush sedge	5
Ceratophyllum demersum	Coontail	3
Chara sp.	Muskgrass	7
Dulichium arundinaceum	Three-way sedge	9
Elatine minima	Waterwort	9
Eleocharis acicularis	Needle spikerush	5
Eleocharis erythropoda	Bald spikerush	3
Eleocharis palustris	Creeping spikerush	6
Elodea canadensis	Common waterweed	3
Heteranthera dubia	Water star-grass	6
Isoetes echinospora	Spiny-spored quillwort	8
Lemna minor	Small duckweed	4
Lemna trisulca	Forked duckweed	6
Myriophyllum sibiricum	Northern water-milfoil	6
Najas flexilis	Slender naiad	6
Nitella sp.	Nitella	7
Nuphar variegata	Spatterdock	6
Nymphaea odorata	White water lily	6
Potamogeton amplifolius	Large-leaf pondweed	7
Potamogeton friesii	Fries' pondweed	8

Table 4 (continued): Floristic Quality Index of Aquatic Macrophytes Lower Eau Claire Lake – Douglas and Bayfield Counties, Wisconsin August 1-2, 2022

Species	Common Name	C
Potamogeton gramineus	Variable pondweed	7
Potamogeton illinoensis	Illinois pondweed	6
Potamogeton natans	Floating-leaf pondweed	5
Potamogeton praelongus	White-stem pondweed	8
Potamogeton pusillus	Small pondweed	7
Potamogeton richardsonii	Clasping-leaf pondweed	5
Potamogeton robbinsii	Fern pondweed	8
Potamogeton strictifolius	Stiff pondweed	8
Potamogeton zosteriformis	Flat-stem pondweed	6
Ranunculus aquatilis	White water crowfoot	8
Sagittaria cristata	Crested arrowhead	9
Sagittaria graminea	Grass-leaved arrowhead	9
Schoenoplectus acutus	Hardstem bulrush	6
Schoenoplectus subterminalis	Water bulrush	9
Stuckenia pectinata	Sago pondweed	3
Typha angustifolia	Narrow-leaved cattail	1
Typha latifolia	Broad-leaved cattail	1
Utricularia gibba	Creeping bladderwort	9
Utricularia intermedia	Flat-leaf bladderwort	9
Utricularia minor	Small bladderwort	10
Utricularia vulgaris	Common bladderwort	7
Vallisneria americana	Wild celery	6
N		**45**
Mean C		**6.4**
FQI		**43.2**

Filamentous Algae:

Filamentous algae are normally associated with excessive nutrients in the water column from such things as runoff, internal nutrient recycling, and failed septic systems. We found these algae at 24 points with a mean rake fullness of 1.25. These points were scattered throughout the entire lake suggesting the nutrients feeding this growth are not from a single source (Figure 10).

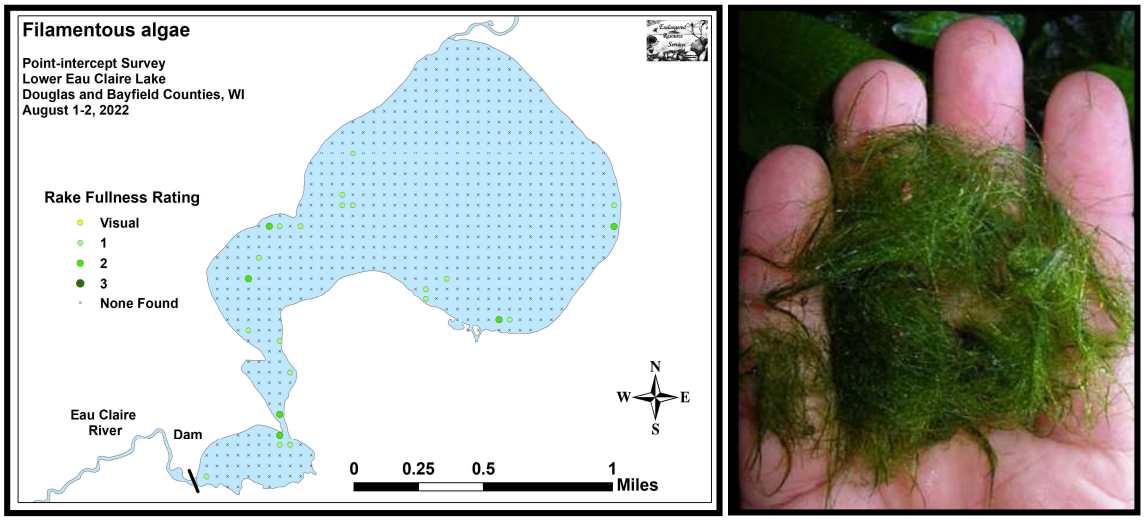


Figure 10: Filamentous Algae Density and Distribution

Late Summer Curly-leaf Pondweed:

Curly-leaf pondweed normally completes its annual life cycle by late June, and most plants have set turions and senesced by early July. In August, we found a single CLP plant at a single point (Figure 11) (Appendix VIII).

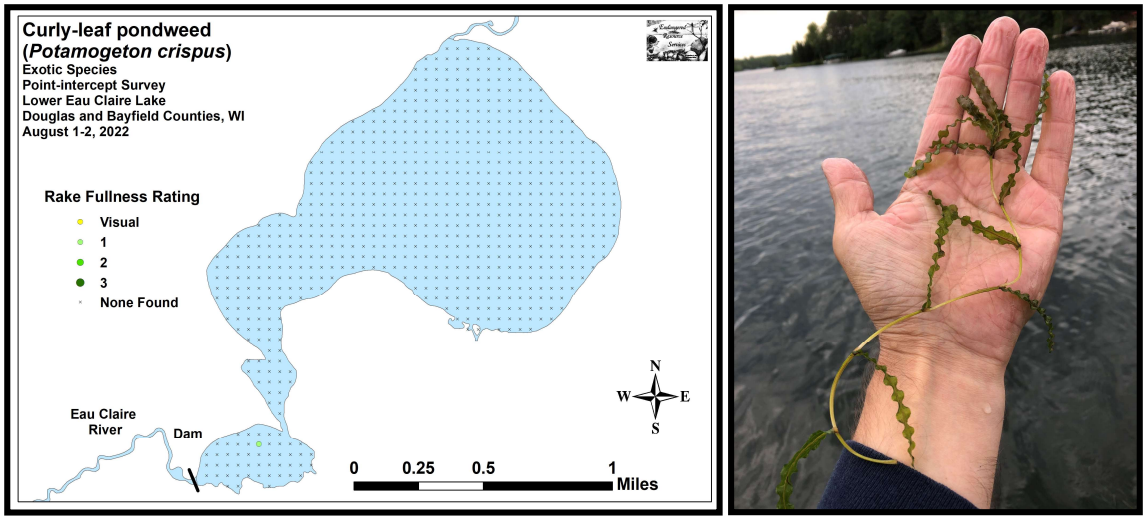


Figure 11: Late Summer Curly-leaf Pondweed Density and Distribution

Other Exotic Plant Species:

We did NOT find any evidence or Eurasian water-milfoil in Lower Eau Claire Lake during any of our surveys. However, in addition to Curly-leaf pondweed, we documented three other exotic species growing in or immediately adjacent to the lake: Purple loosestrife, Reed canary grass, and Narrow-leaved/Hybrid cattail.

Near the public landing by the dam, we found and removed several Purple loosestrife plants that were in bloom. This species was not seen anywhere else in the lake (Figure 12) (Appendix VIII).

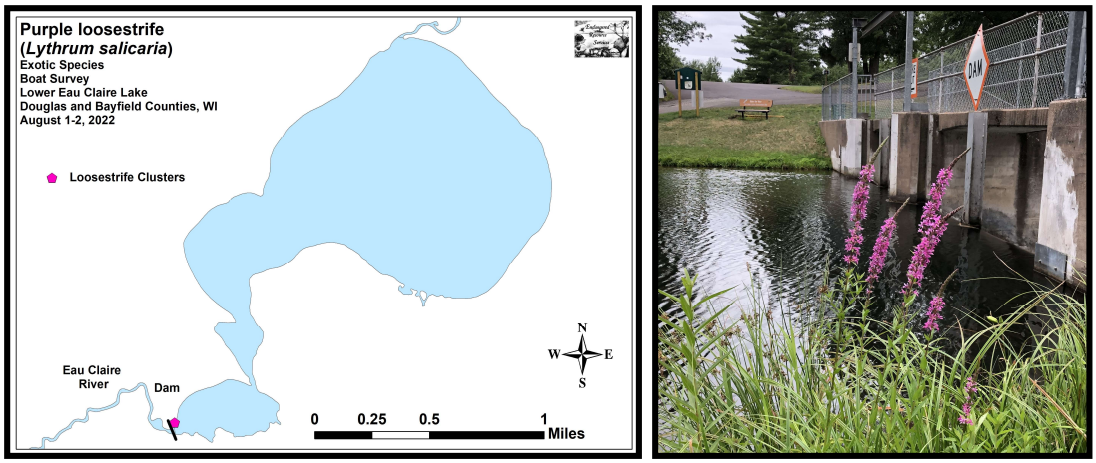


Figure 12: Purple Loosestrife Distribution and Inflorescence at Dam

Despite only being found at the boat landing, Reed canary grass is capable of being highly invasive. A ubiquitous plant in the state, there's likely little that can be done about it beyond maintaining native vegetation and minimizing shoreline disturbance (Figure 13) (Appendix VIII).

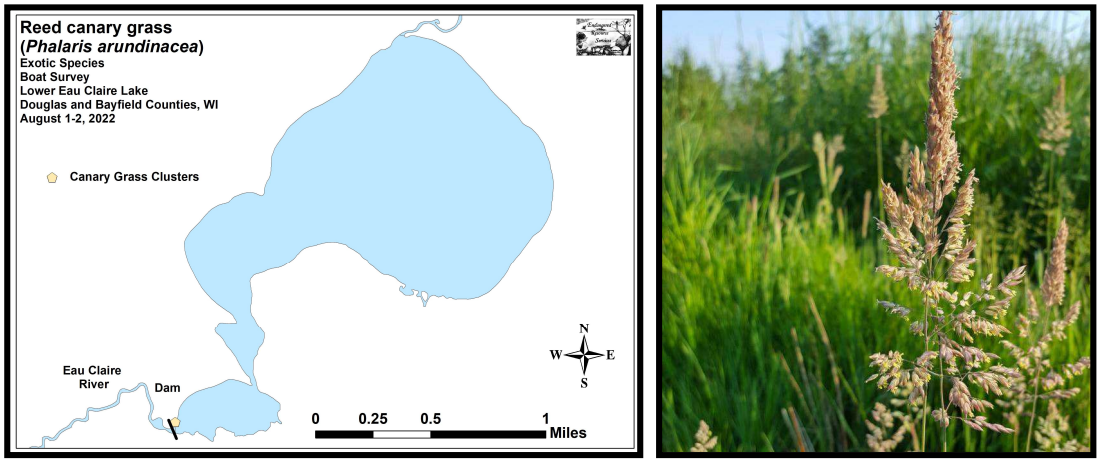


Figure 13: Reed Canary Grass Distribution and Inflorescence

Native to southern but not northern Wisconsin, Narrow-leaved cattail and its hybrids (*Typha* X *glauca*) with Broad-leaved cattail are becoming increasingly common in northern Wisconsin where they also tend to be invasive. On the south shore near the lake outlet, we found these cattails in the rake at three points with a mean rake fullness of 2.00. Most plants appeared to be pure Narrow-leaved cattail, but there were also scattered hybrids mixed in. Dense, nearly monotypic stands appeared to be expanding into the wetland to the south (Figure 14) (Appendix VIII).

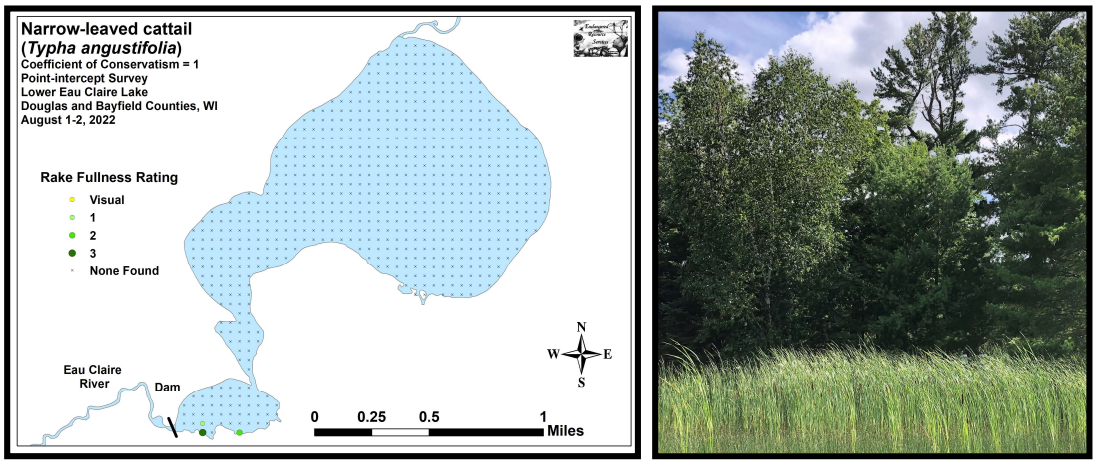


Figure 14: Narrow-leaved/Hybrid Cattail Density and Distribution and Typical Cluster

Besides having narrower leaves, the exotics can be told from our native cattails by having a relatively narrower and longer "hotdog-shaped" tan female cattail flower, whereas our native species tends to produce a fatter and shorter "bratwurst-shaped" dark chocolate colored female flower. Narrow-leaved cattail and its hybrids also have a male flower that is separated from the female flower by a thin green stem while the native Broad-leaved cattail has its male and female flowers connected (Figure 15) (Additional information on a sampling of aquatic exotic invasive plant species can be found in Appendix IX).

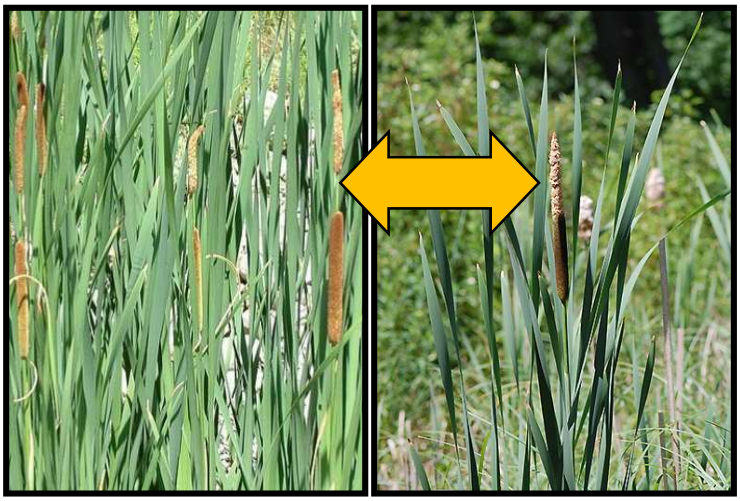


Figure 15: Exotic Hybrid and Native Broad-leaved Cattail Identification

DISCUSSION AND CONSIDERATIONS FOR MANAGEMENT:
Water Clarity, Nutrient Inputs, and the Role of Native Macrophytes:

Lower Eau Claire Lake is home to a healthy native plant community that is dominated by many high-value species that are sensitive to human disturbance. Like trees in a forest, a lake's plants are the basis of the aquatic ecosystem. They capture the sun's energy and turn it into usable food, "clean" the water of excess nutrients, and provide habitat for other organisms like aquatic invertebrates and the lake's fish populations. Because of this, preserving them is critical to maintaining the lake's overall health.

When phosphorus and nitrogen in a lake's water column increase to levels beyond what macrophytes can absorb, filamentous and floating algae tend to proliferate leading to declines in both water clarity and quality. Over the past 30+ years, water quality data collected by Lower Eau Claire Lake volunteers shows a history of consistently good clarity. This is probably not a coincidence. Rather, it is likely at least partially tied to the work done by conservation-minded people. Their native vegetation buffers along much of the lake's shoreline helps cut down on soil erosion and nutrient runoff into the lake which would otherwise promote algae growth and decrease clarity. Despite this positive news, even a small increase in nutrient inputs could negatively impact clarity. Because of this, residents should continually evaluate how their shoreline practices may be impacting the lake. Simple things like establishing a buffer strip of native vegetation along the lakeshore if one isn't already present (Figure 16), bagging grass clippings, eliminating fertilizer near the lake, collecting pet waste, disposing of ash from fire pits away from the lakeshore, maintaining septic systems, and avoiding stirring up sediments with motor start-ups in shallow water can all significantly reduce the amount of nutrients entering the lake's water column. Hopefully, a greater understanding of how even individual property owners can have lake-wide impacts will result in even more people taking appropriate conservation actions and thus ensure continued water clarity and quality for all.

Figure 16: Model Natural Shoreline on a Nearby Northwest Wisconsin Lake

Curly-leaf pondweed Management:

Curly-leaf pondweed currently plays a minor role in the Lower Eau Claire Lake ecosystem, and, even when present, it is seldom dense enough to cause significant navigation impairment. Hopefully, the "BAISS" harvesting program will be able to keep the CLP population in check while simultaneously having minimal impact on the lake's rich and diverse native plant community. As long as running the harvester remains a viable management option, it will likely continue to be the most environmentally friendly method of controlling CLP.

In the future, if suction harvesting is discontinued or if isn't possible to get to all of the CLP beds in the time available and the TOB considers chemical control, we strongly encourage a measured approach that is closely evaluated. CLP is an opportunistic species that can rapidly exploit disturbed areas. As herbicides eliminate native vegetation as well as the target species, it is possible that CLP could rapidly reestablish in the treatment areas and ultimately become worse rather than better.

Regardless of what, if any, future active management occurs on the lake, we remind lakeshore residents that they can help minimize CLP's opportunities to spread by maintaining the lake's native plants. To accomplish this, residents should refrain from removing rooted plants from the lake unless absolutely necessary as these barren patches of substrate not only release nutrients into the water column, but also give CLP a place to establish where it has a competitive advantage. Avoiding motor start-ups in water <5ft deep would also help limit CLP's spread by not clipping or uprooting vegetation. This would also work to keep nutrients out of the water column as the lake's soft sediments are easily stirred up by prop wash.

Exotic Cattail Management:

All of Wisconsin's cattails have wildlife value as many bird species nest in them, and muskrats and a variety of insects use them as food. Because Narrow-leaved cattail and its hybrids can be invasive along the shoreline to the point that they interfere with lake access, property owners may want to remove pioneering individuals before they become a bed. However, unless they are interfering with human activity, removing previously established stands is probably unnecessary and unlikely to be ecologically beneficial. Because cattail seeds are transported by the wind, the continued expansion of this species in northern Wisconsin is likely inevitable.

Purple Loosestrife Management:

Purple loosestrife can quickly expand into and come to dominate wetland areas. To prevent further infestation, residents and volunteers should watch for and remove plants in August and September when the bright fuchsia candle-shaped flower spikes are easily seen. Plants should be bagged and disposed of well away from any wetland. Also, because the plants have an extensive root system, care should be taken to remove the entire plant as even small root fragments can survive and produce new plants the following year. Currently, the infestation is not likely large enough to support a Galerucella beetle population, but this management strategy could be revisited in the future in the loosestrife population increases.

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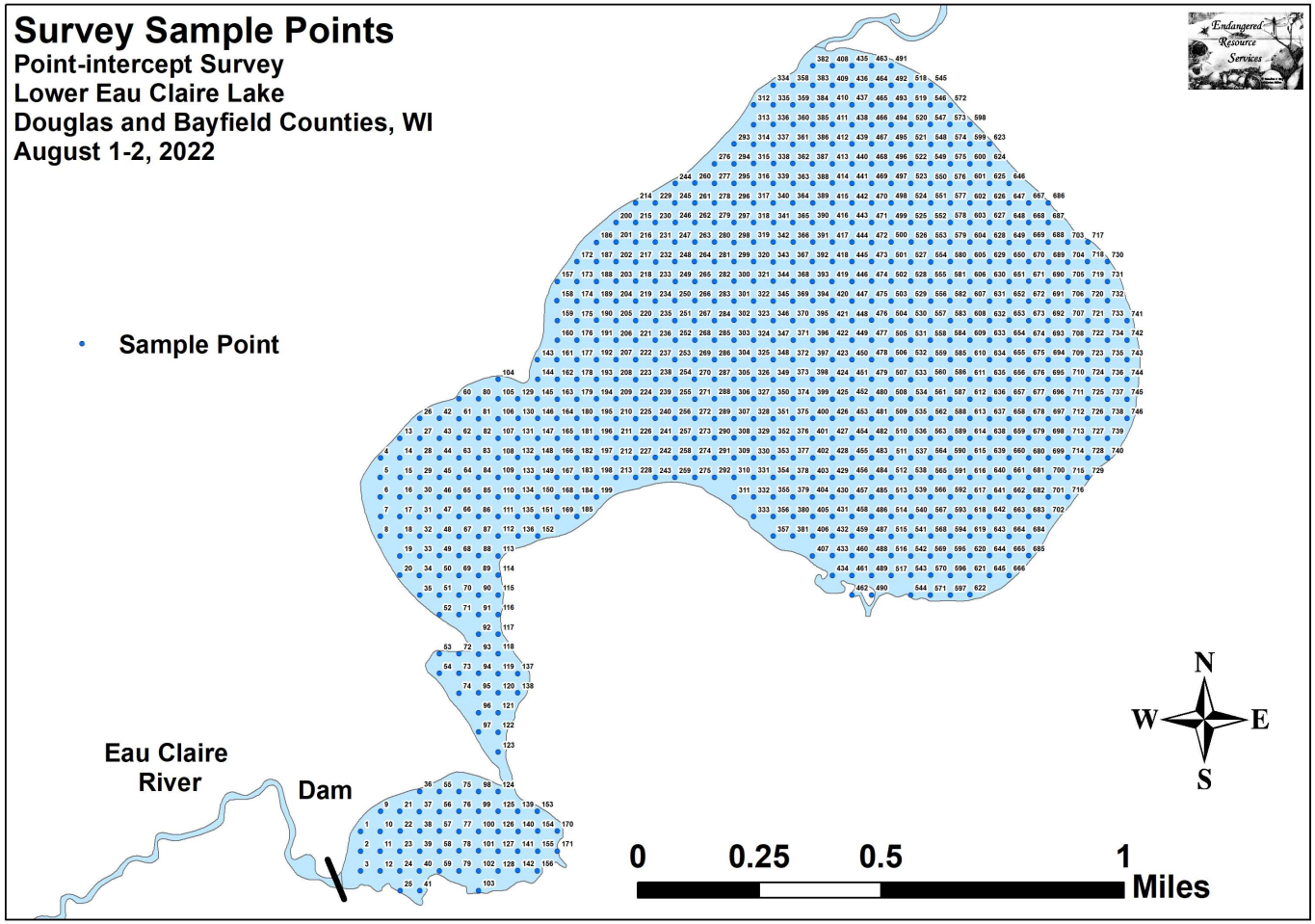
Appendix I: Point-intercept Survey Sample Points Map

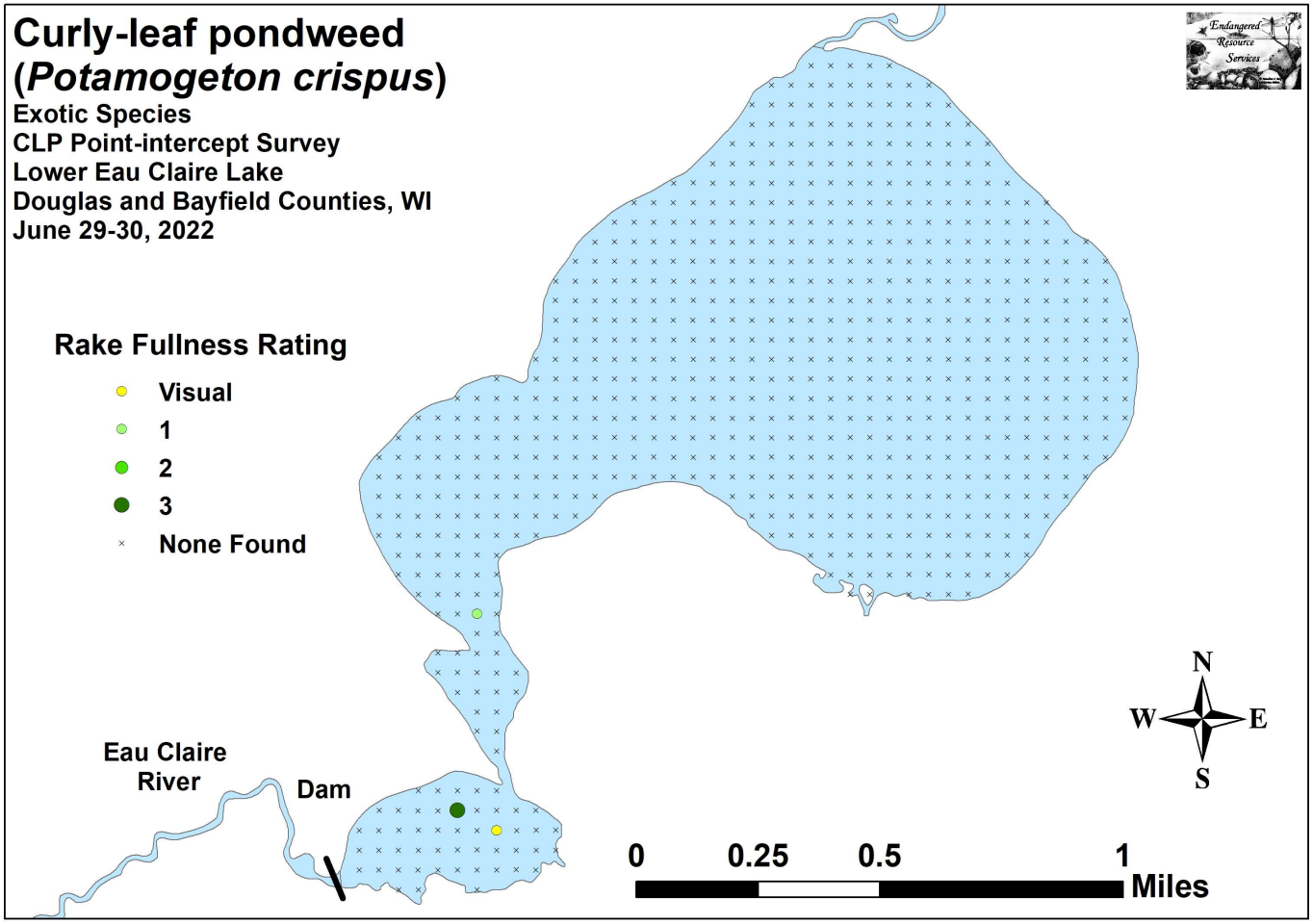

Survey Sample Points
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Sample Point
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

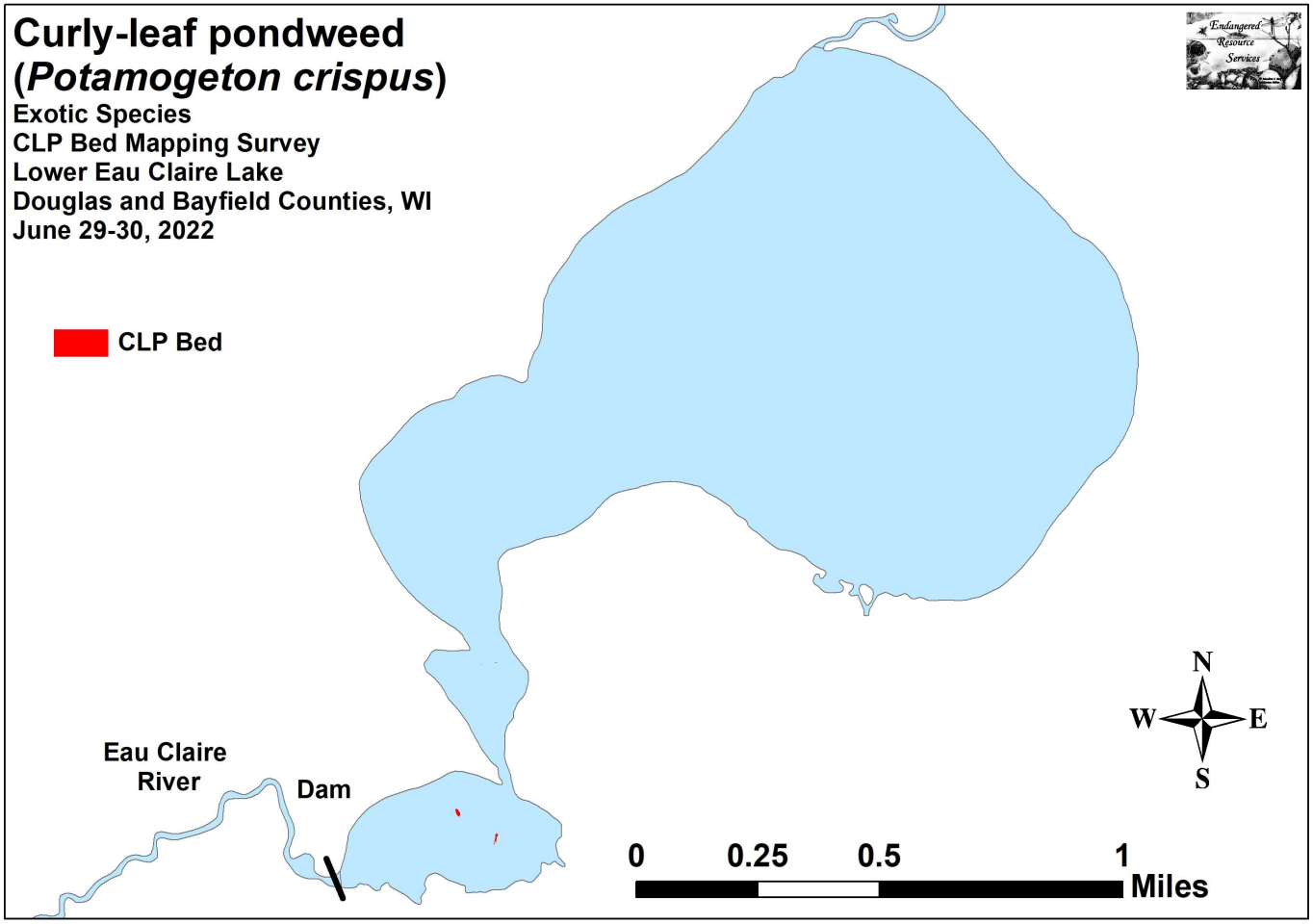
Appendix II: Boat and Vegetative Survey Datasheets

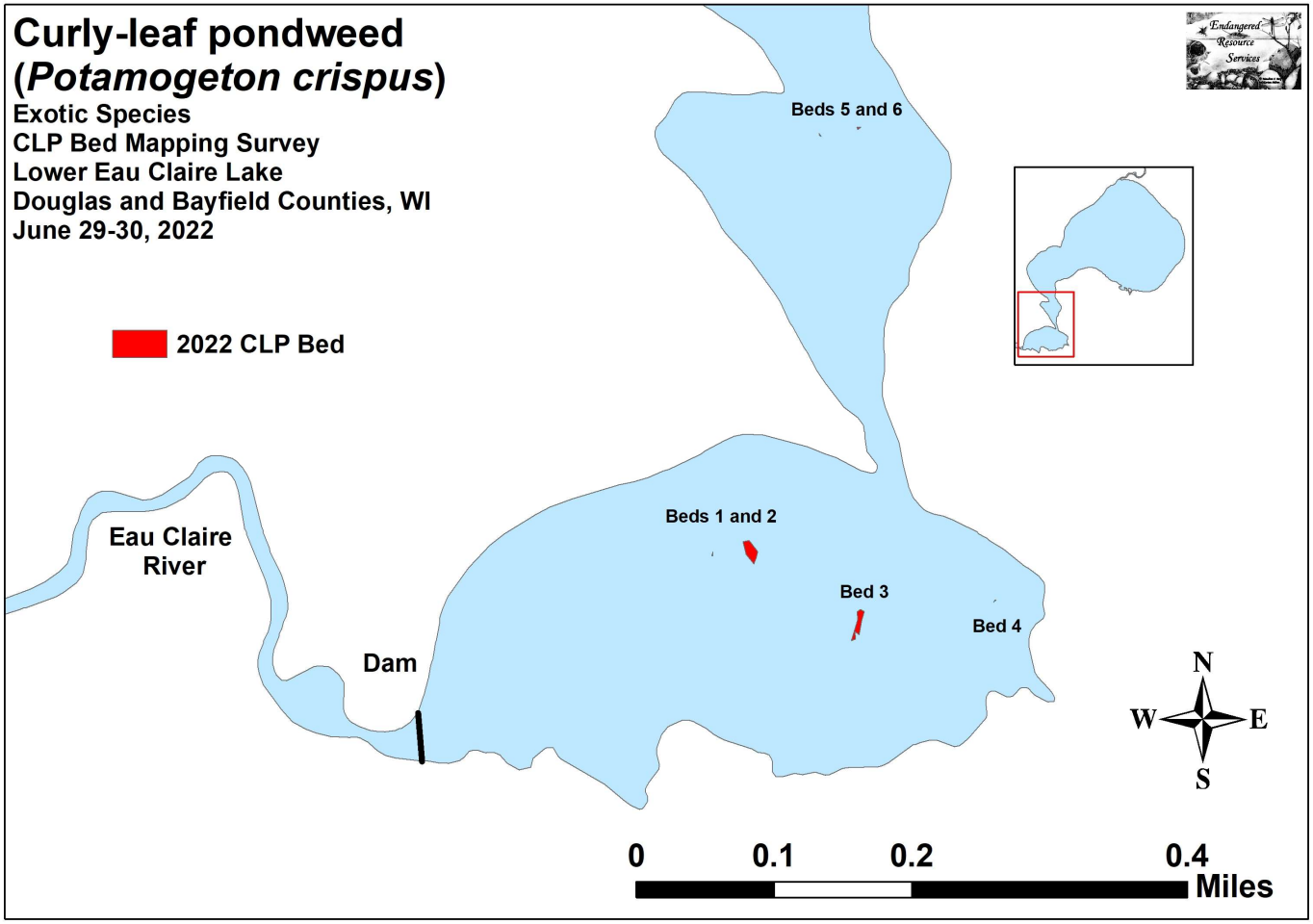
Boat Survey	
Lake Name	
Counties	
WBIC	
Date of Survey	
(mm/dd/yy)	
workers	
Nearest Point	**Species seen, habitat information**

Observers for this lake: names and hours worked by each:																										
Lake:									**WBIC**									**Counties**						**Date:**		
Site #	**Depth (ft)**	**Muck (M), Sand (S), Rock (R)**	**Rake pole (P) or rake rope (R)**	**Total Rake Fullness**	**EWM**	**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																									

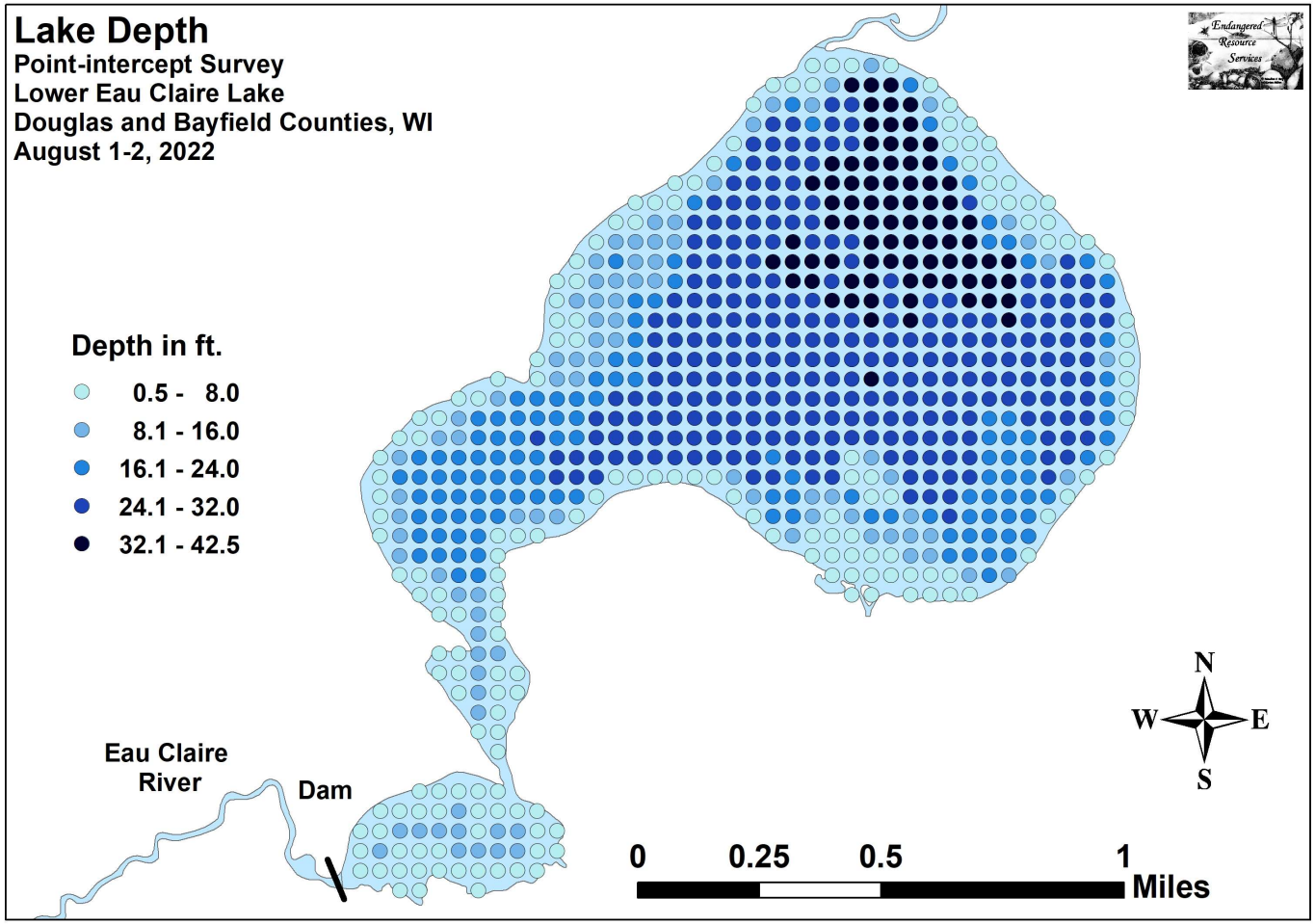
Appendix III: Early Season Curly-leaf Pondweed Density and Distribution, and CLP Bed Maps

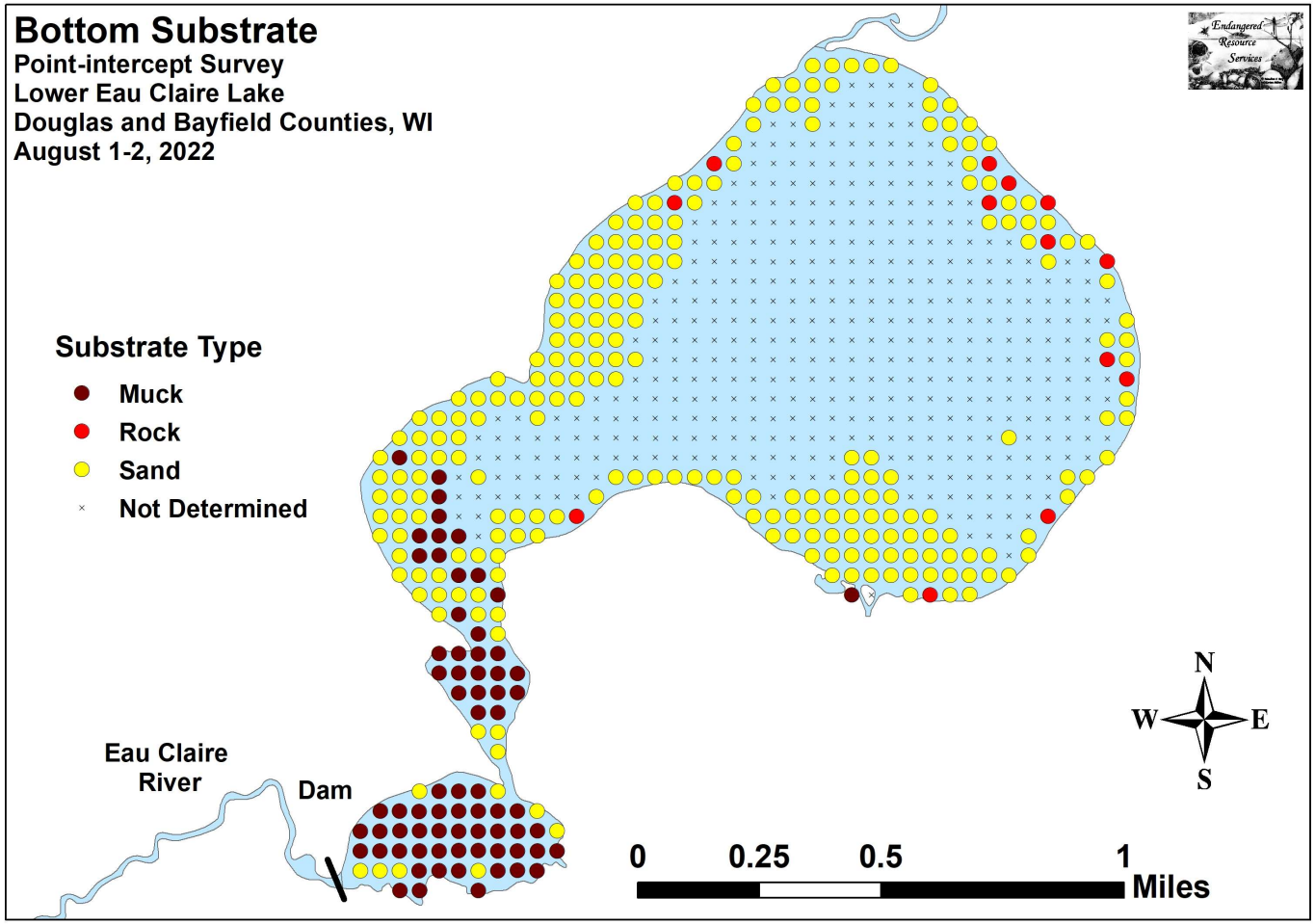

Curly-leaf pondweed
(Potamogeton crispus)
Exotic Species
CLP Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
June 29-30, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Curly-leaf pondweed
(Potamogeton crispus)
Exotic Species
CLP Bed Mapping Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
June 29-30, 2022
CLP Bed
Endangered Resource Services
N
W
E
S
Eau Claire River
Dam
0
0.25
0.5
1
Miles

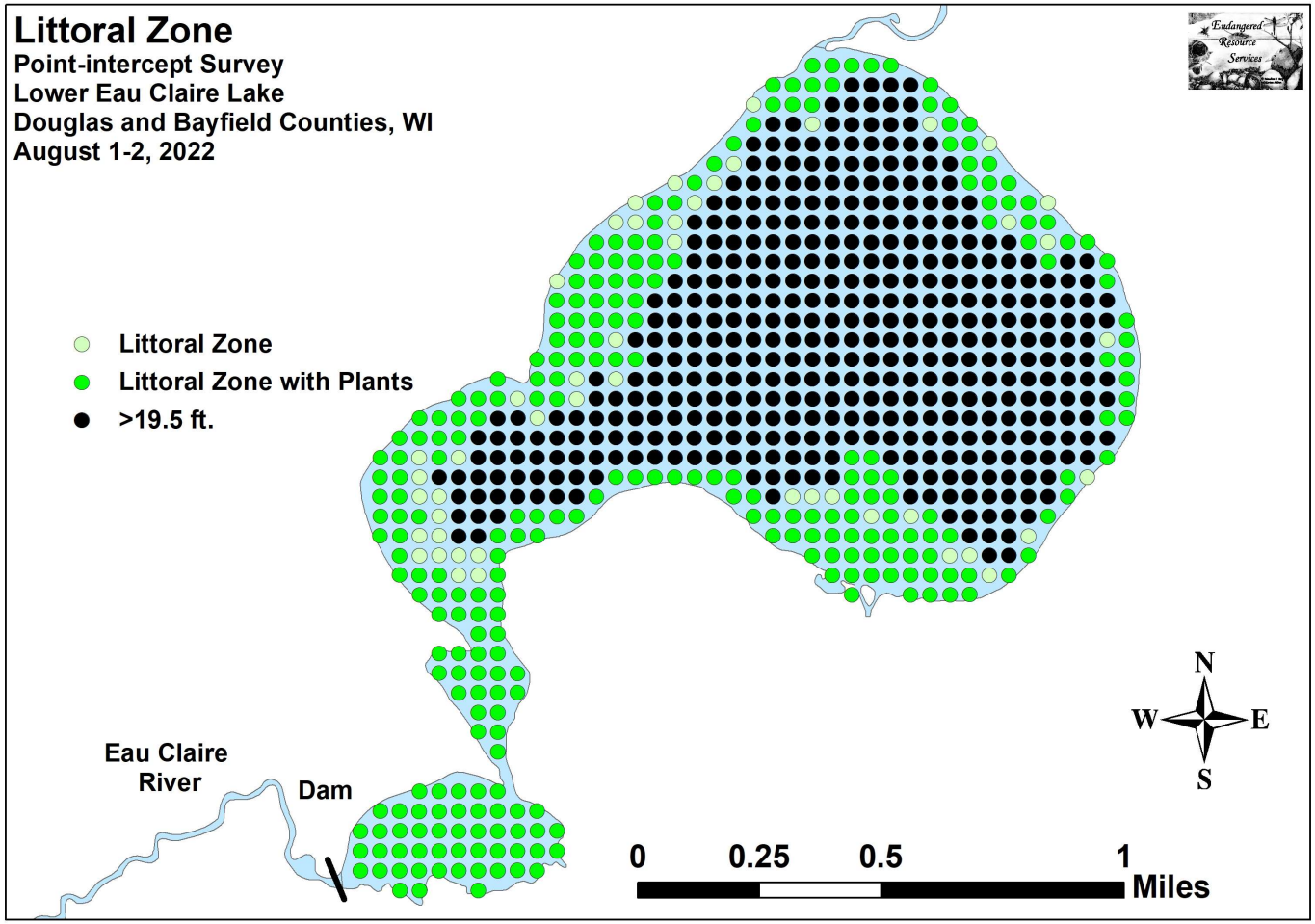

Curly-leaf pondweed
(Potamogeton crispus)
Exotic Species
CLP Bed Mapping Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
June 29-30, 2022
2022 CLP Bed
Beds 5 and 6
Beds 1 and 2
Bed 3
Bed 4
Eau Claire
River
Dam
N
W
E
S
0
0.1
0.2
0.4
Miles

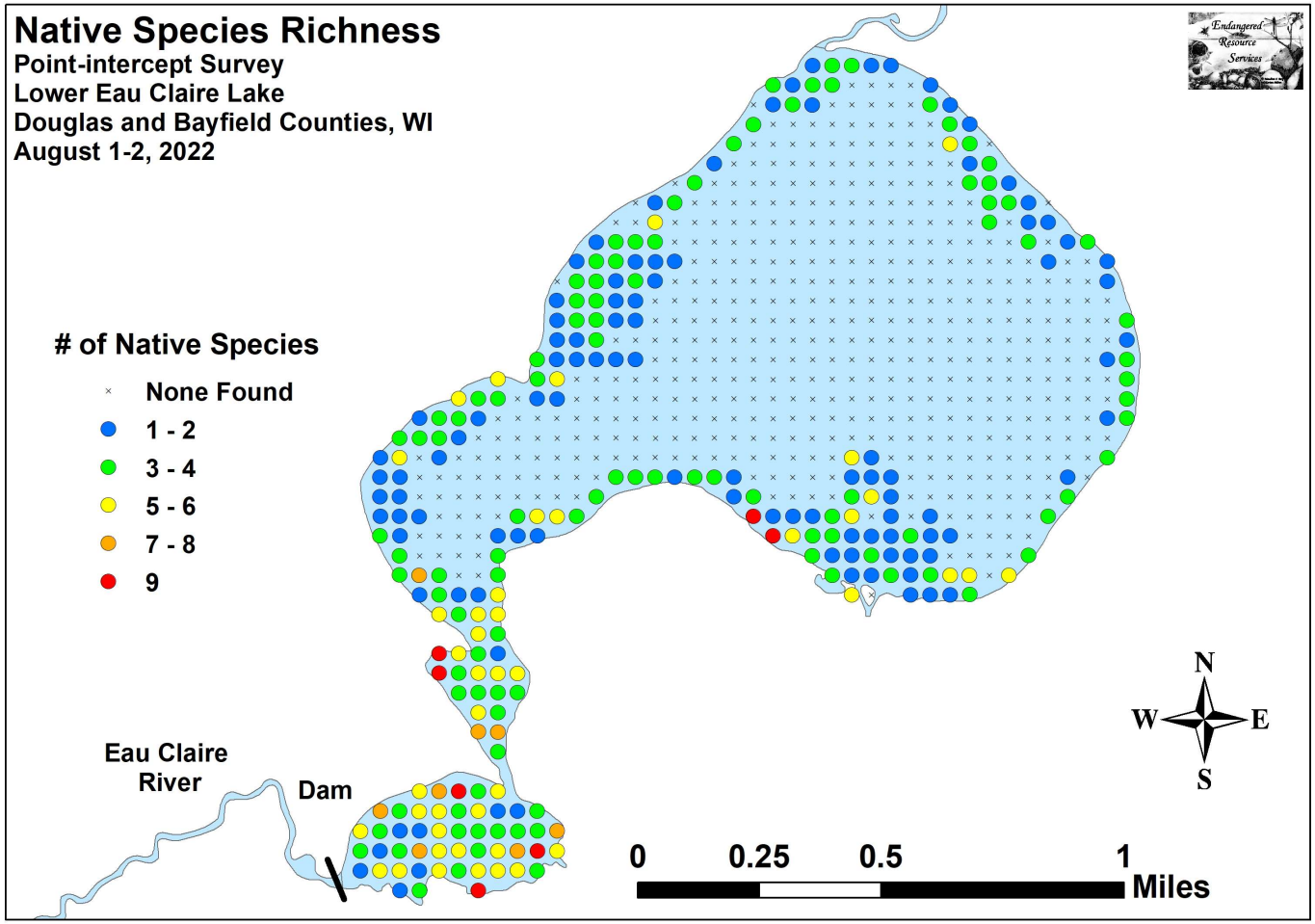
Appendix IV: Habitat Variable Maps

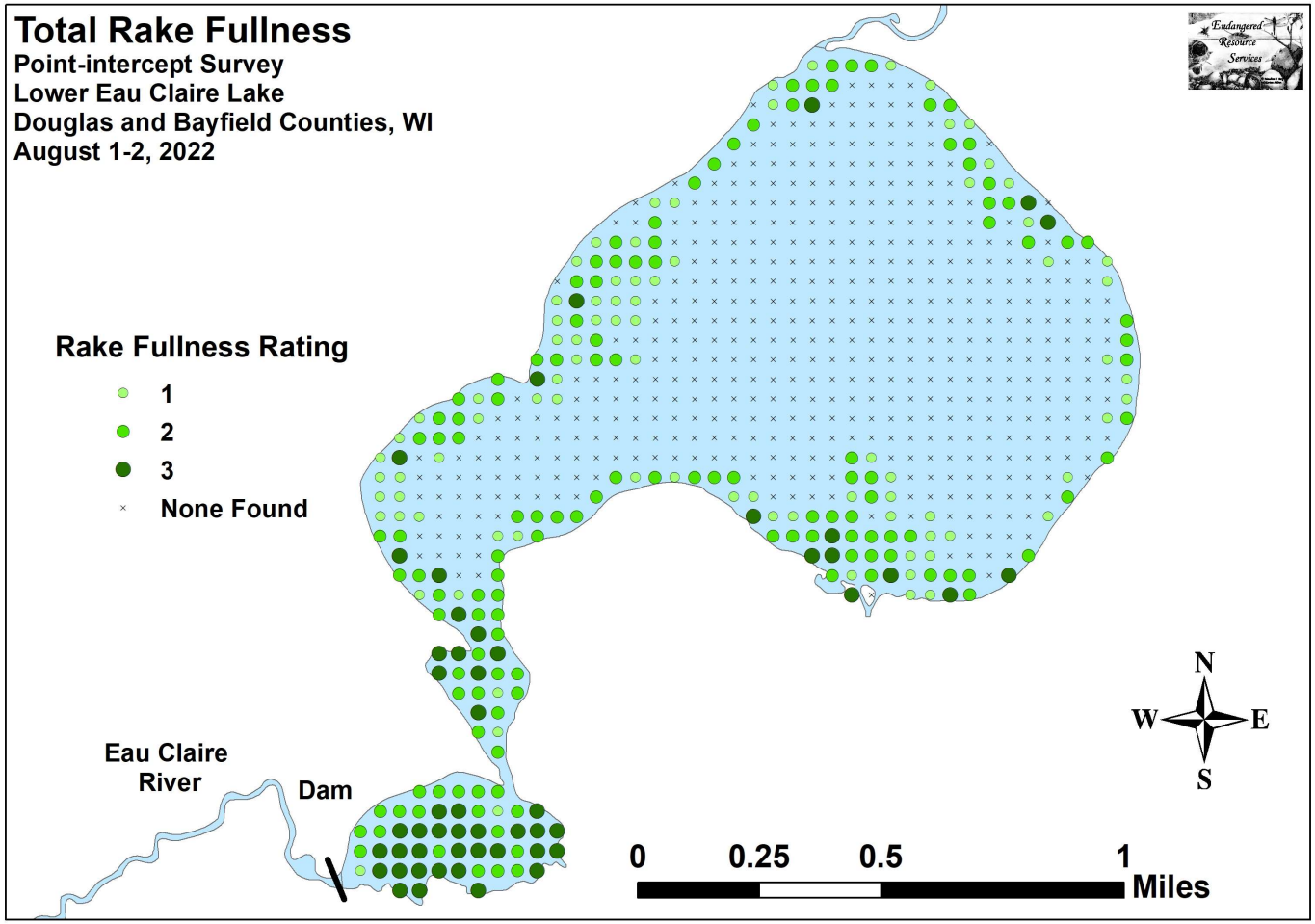

Lake Depth
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Depth in ft.
0.5 - 8.0
8.1 - 16.0
16.1 - 24.0
24.1 - 32.0
32.1 - 42.5
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Bottom Substrate
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Substrate Type
Muck
Rock
Sand
Not Determined
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

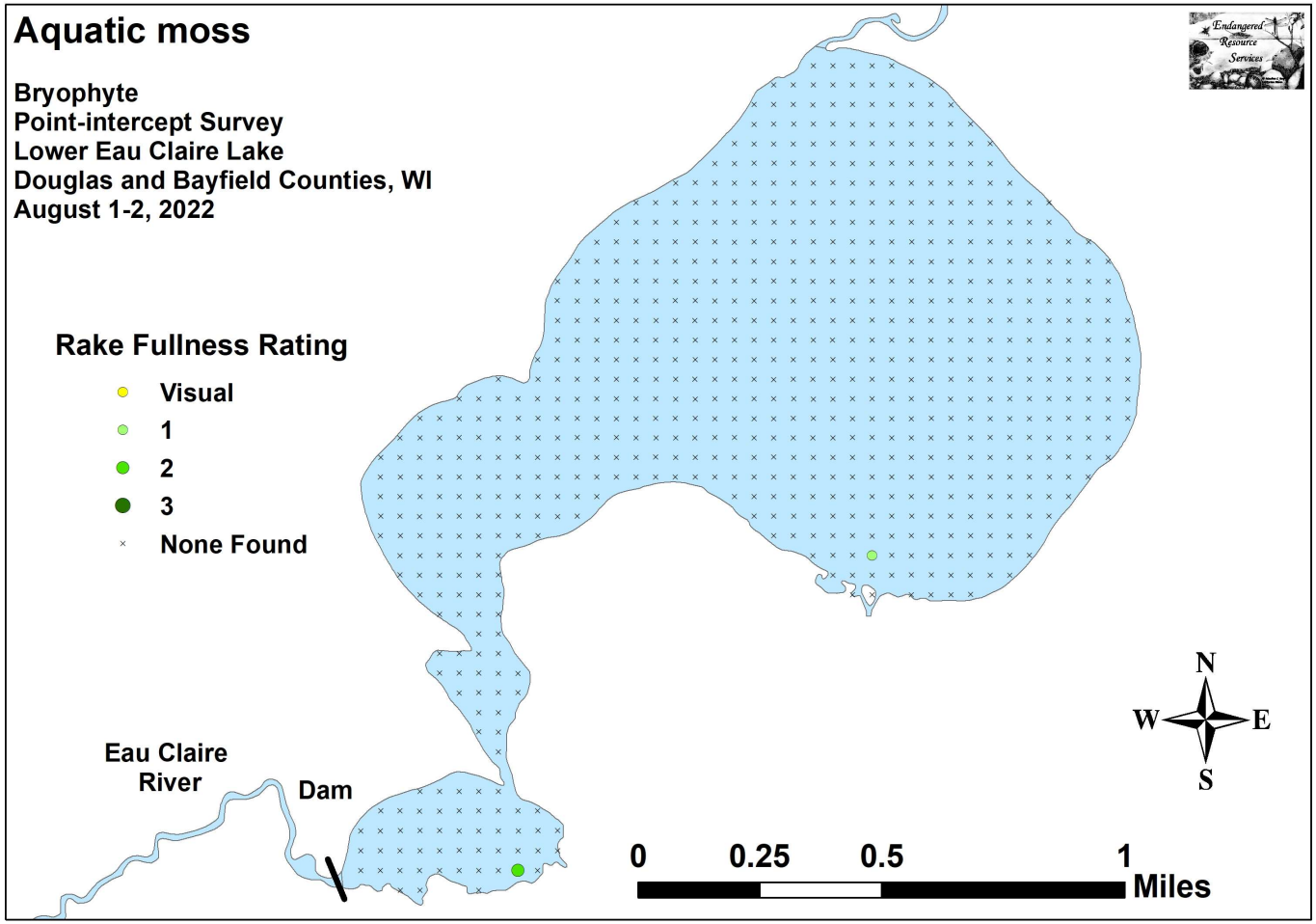
Appendix V: Littoral Zone, Native Species Richness, and Total Rake Fullness Maps

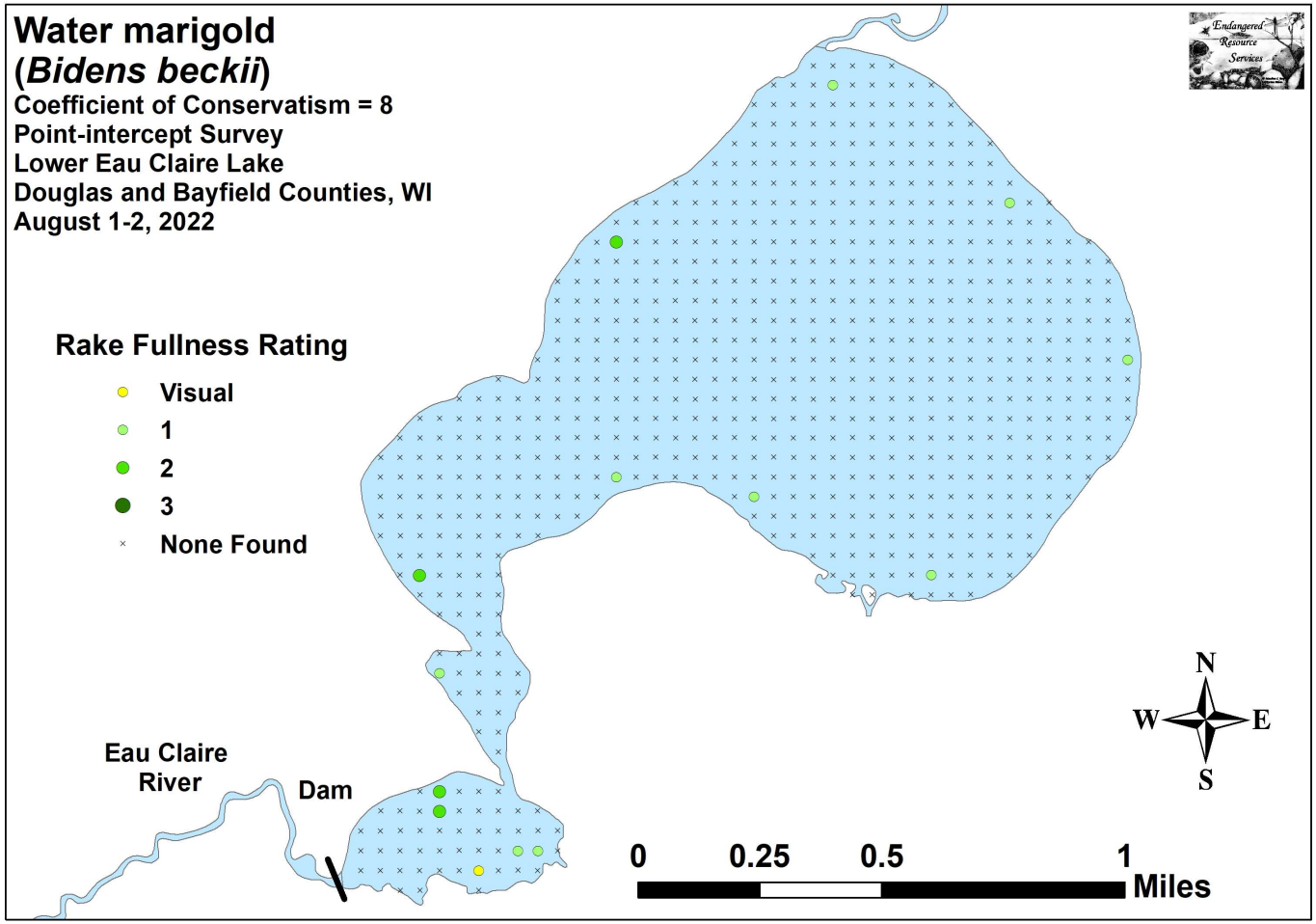

Littoral Zone
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Littoral Zone
Littoral Zone with Plants
>19.5 ft.
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

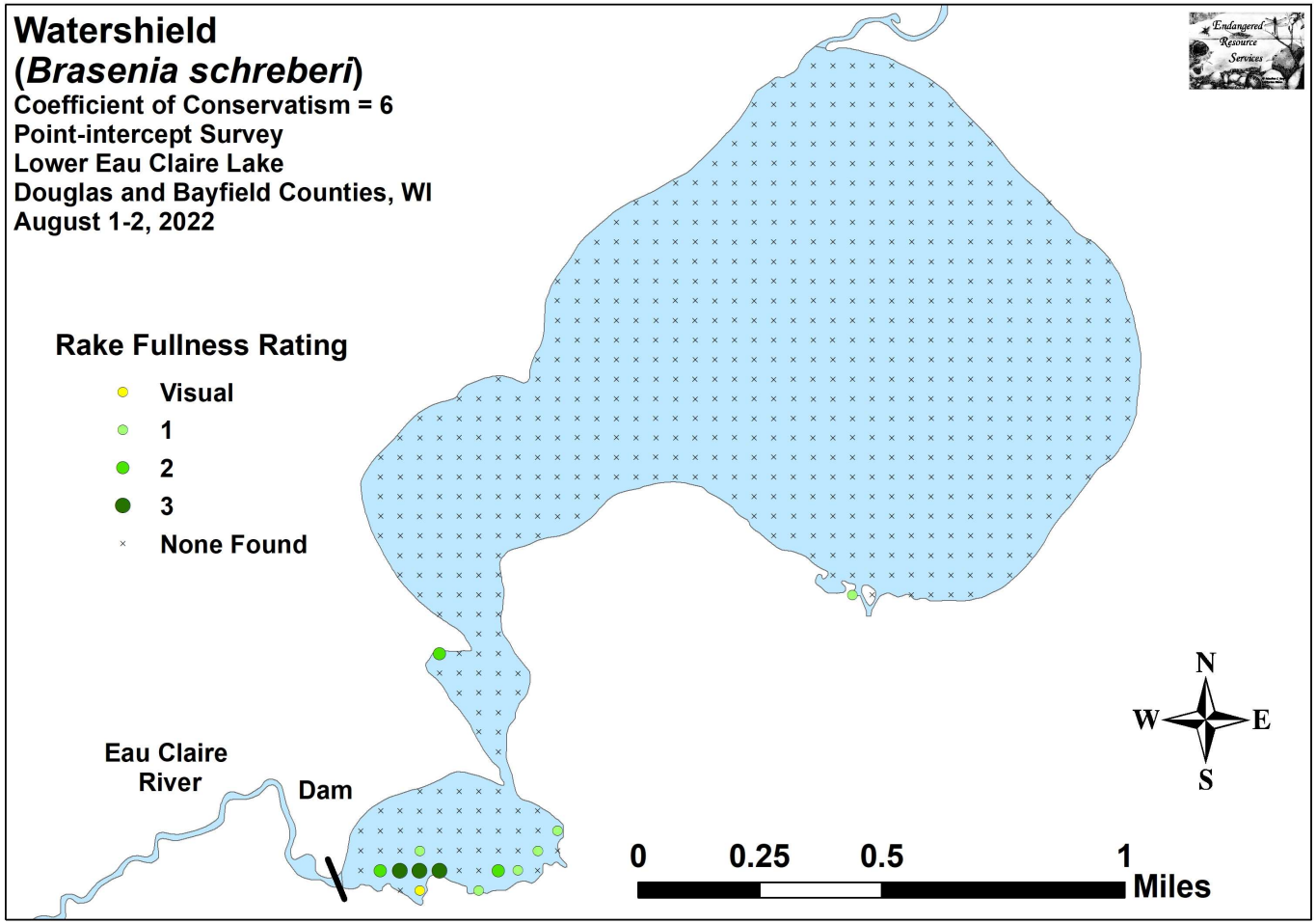

Native Species Richness
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
# of Native Species
None Found
1 - 2
3 - 4
5 - 6
7 - 8
9
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

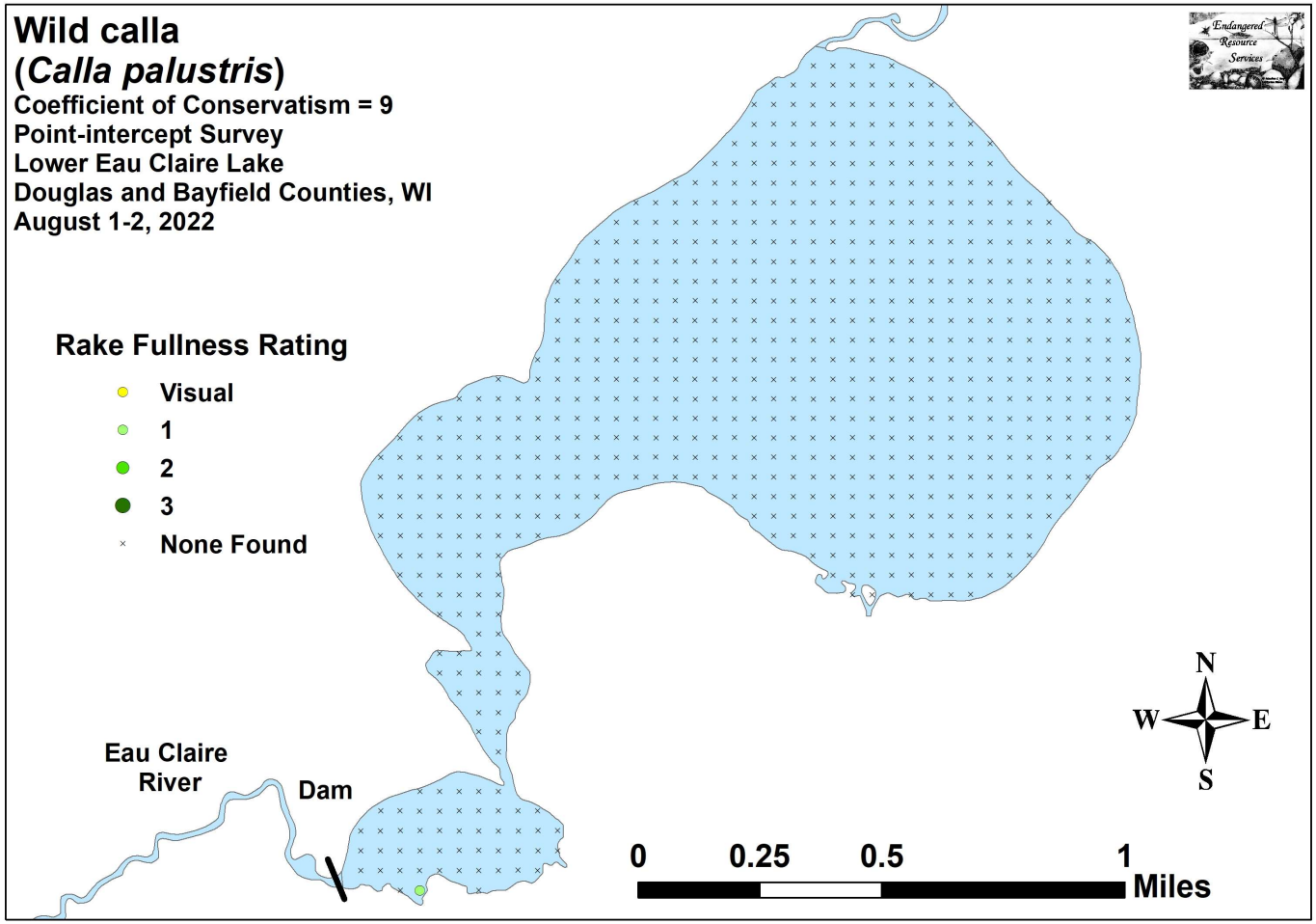

Total Rake Fullness
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

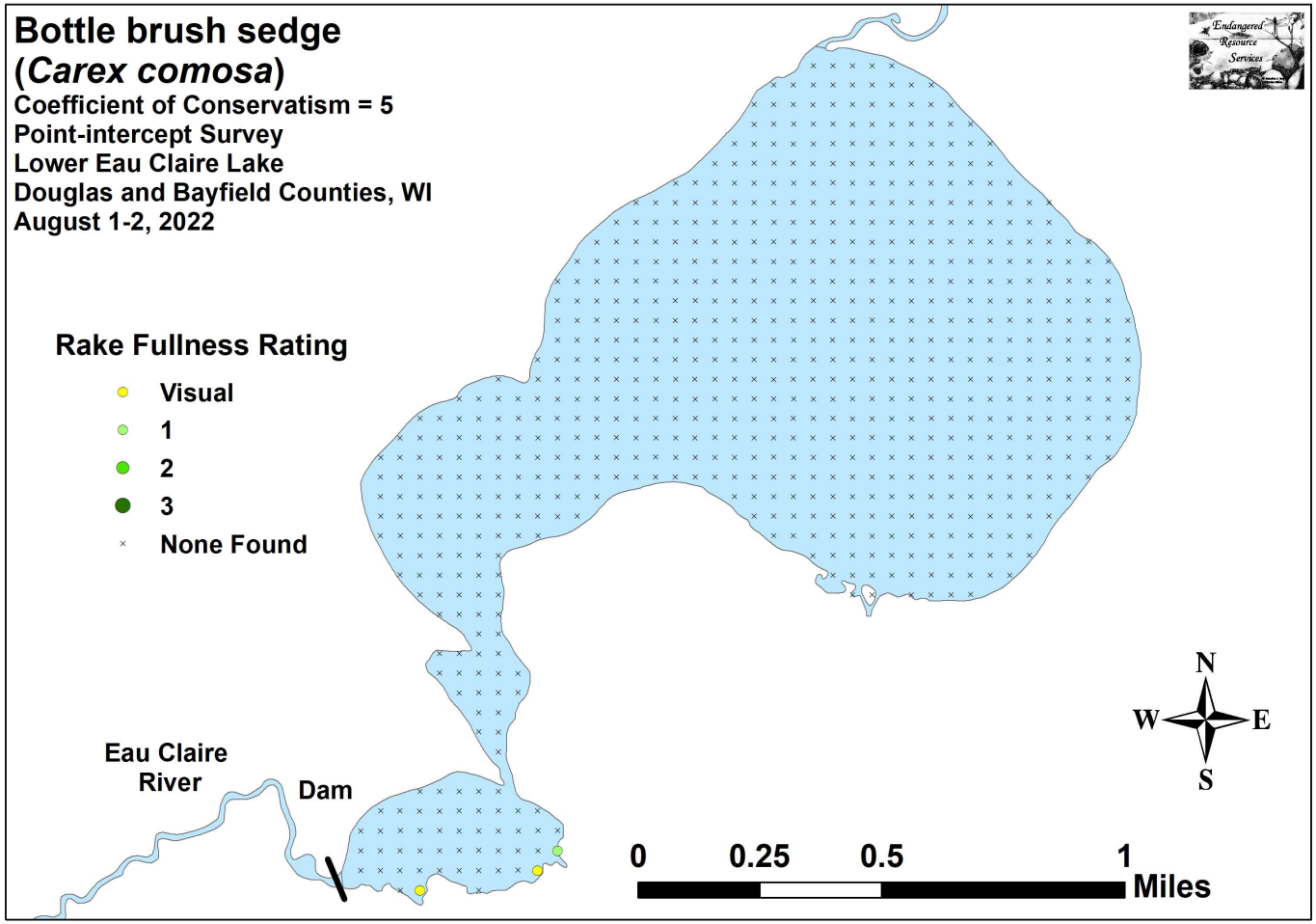
Appendix VI: Native Species Density and Distribution Maps

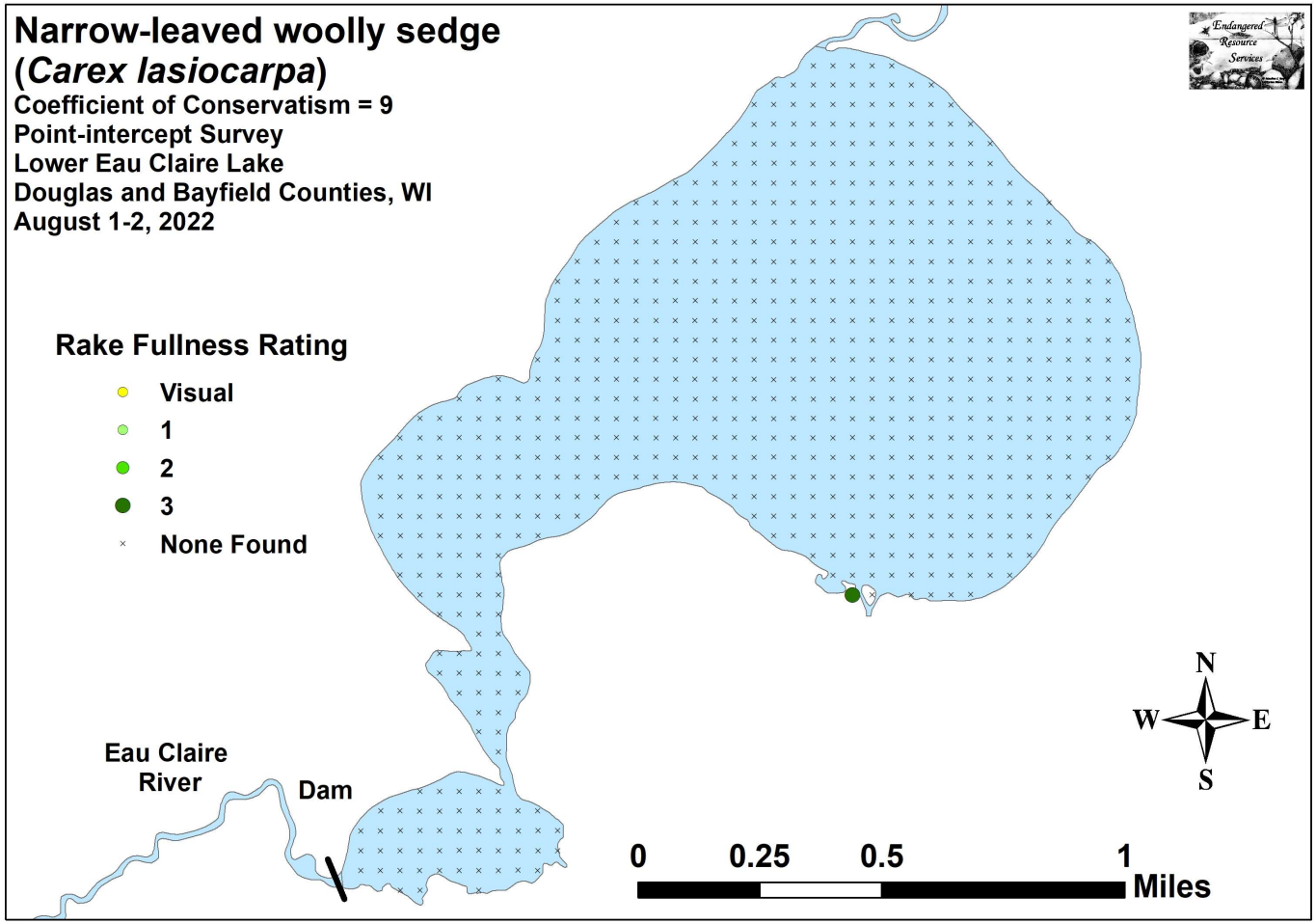

Aquatic moss
Bryophyte
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

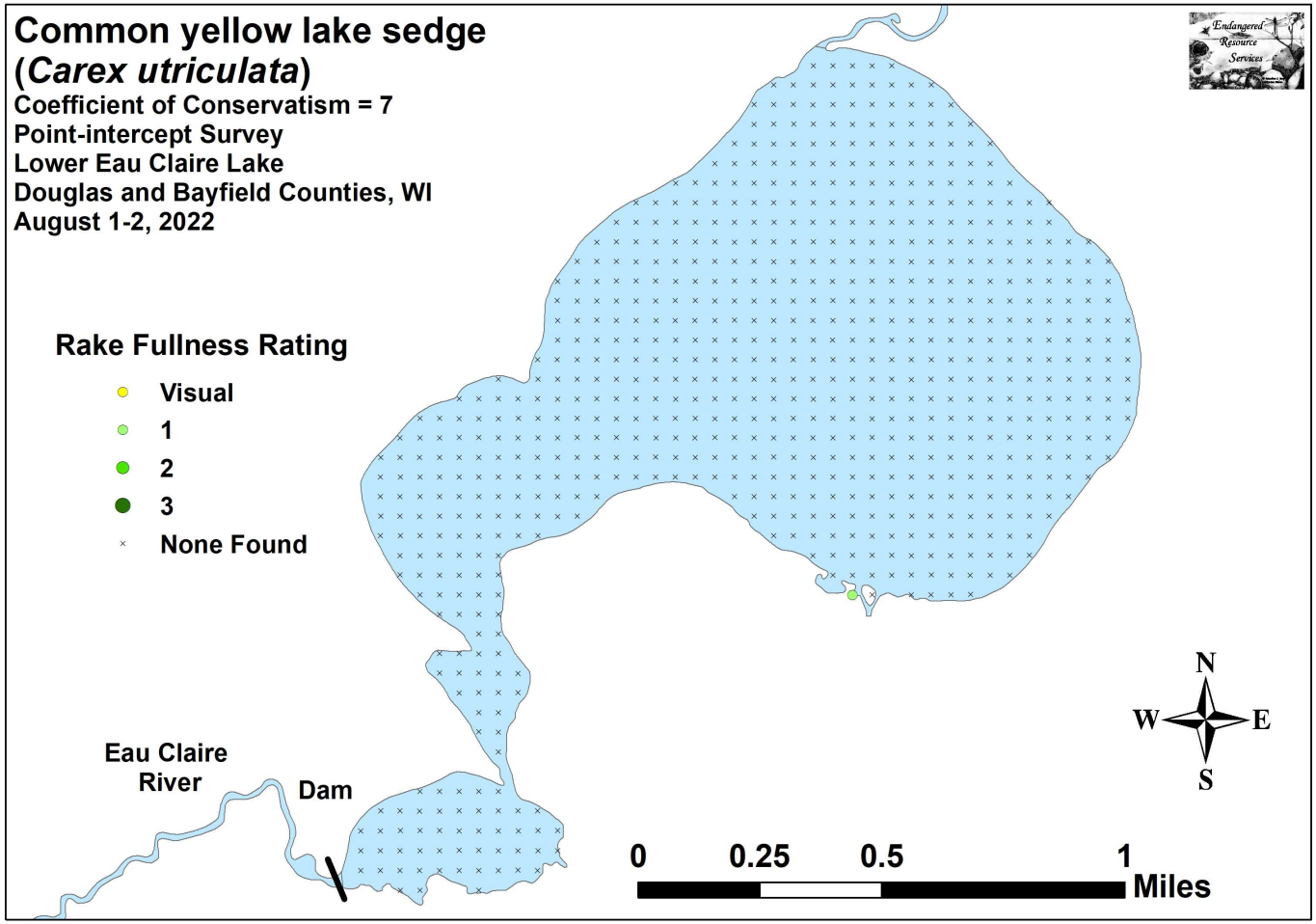

Water marigold
(Bidens beckii)
Coefficient of Conservatism = 8
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

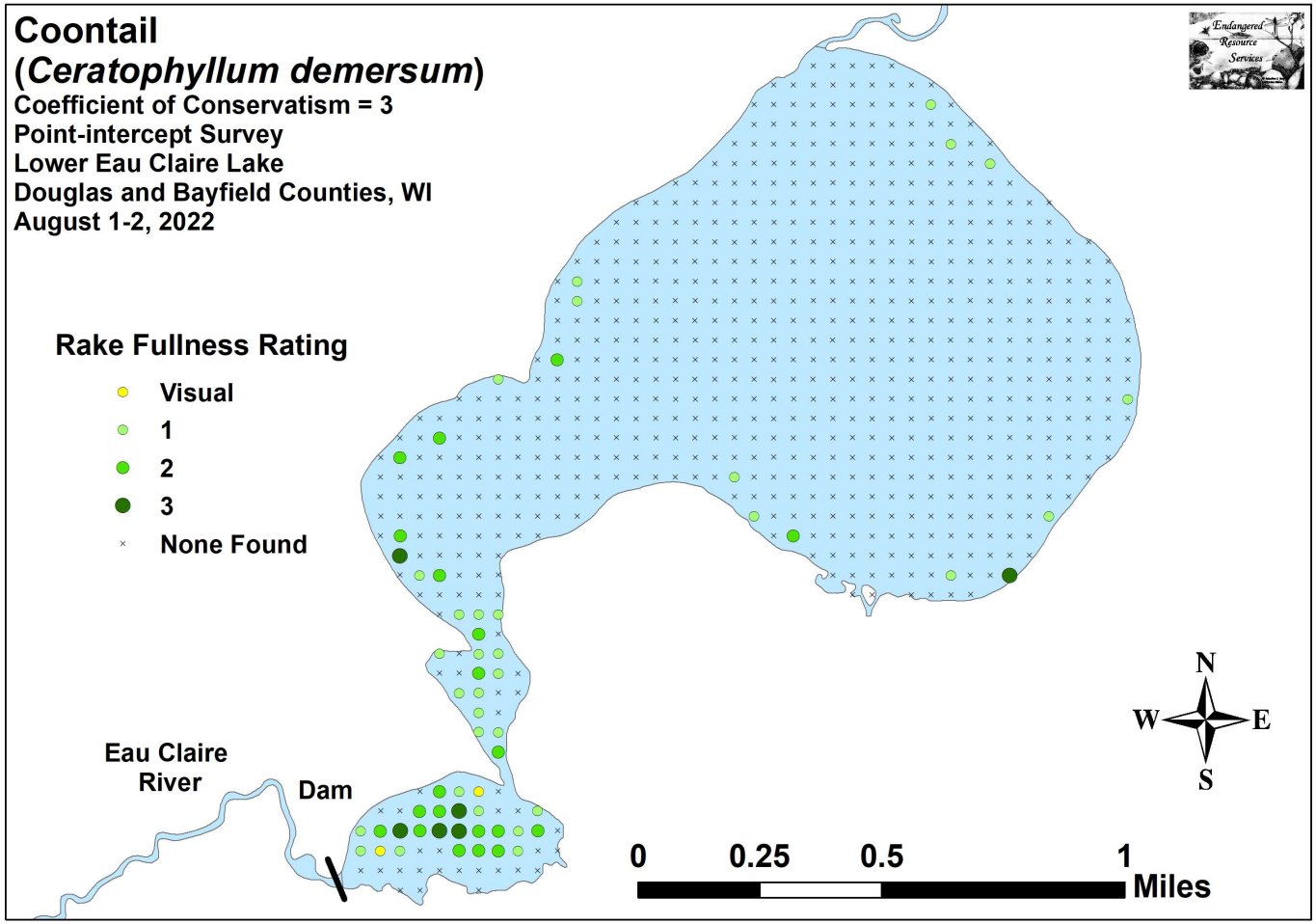

Watershield
(Brasenia schreberi)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

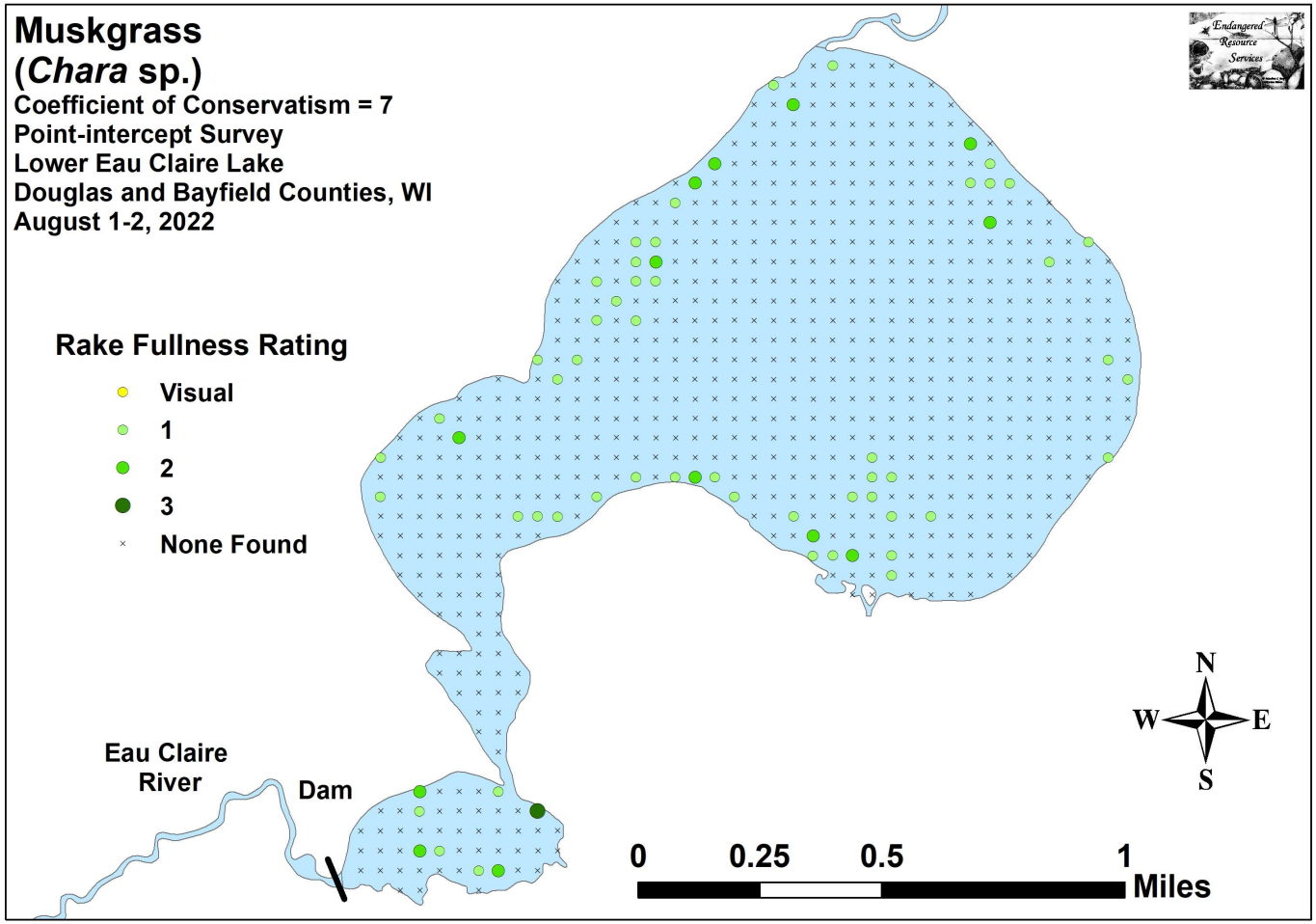

Wild calla
(Calla palustris)
Coefficient of Conservatism = 9
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

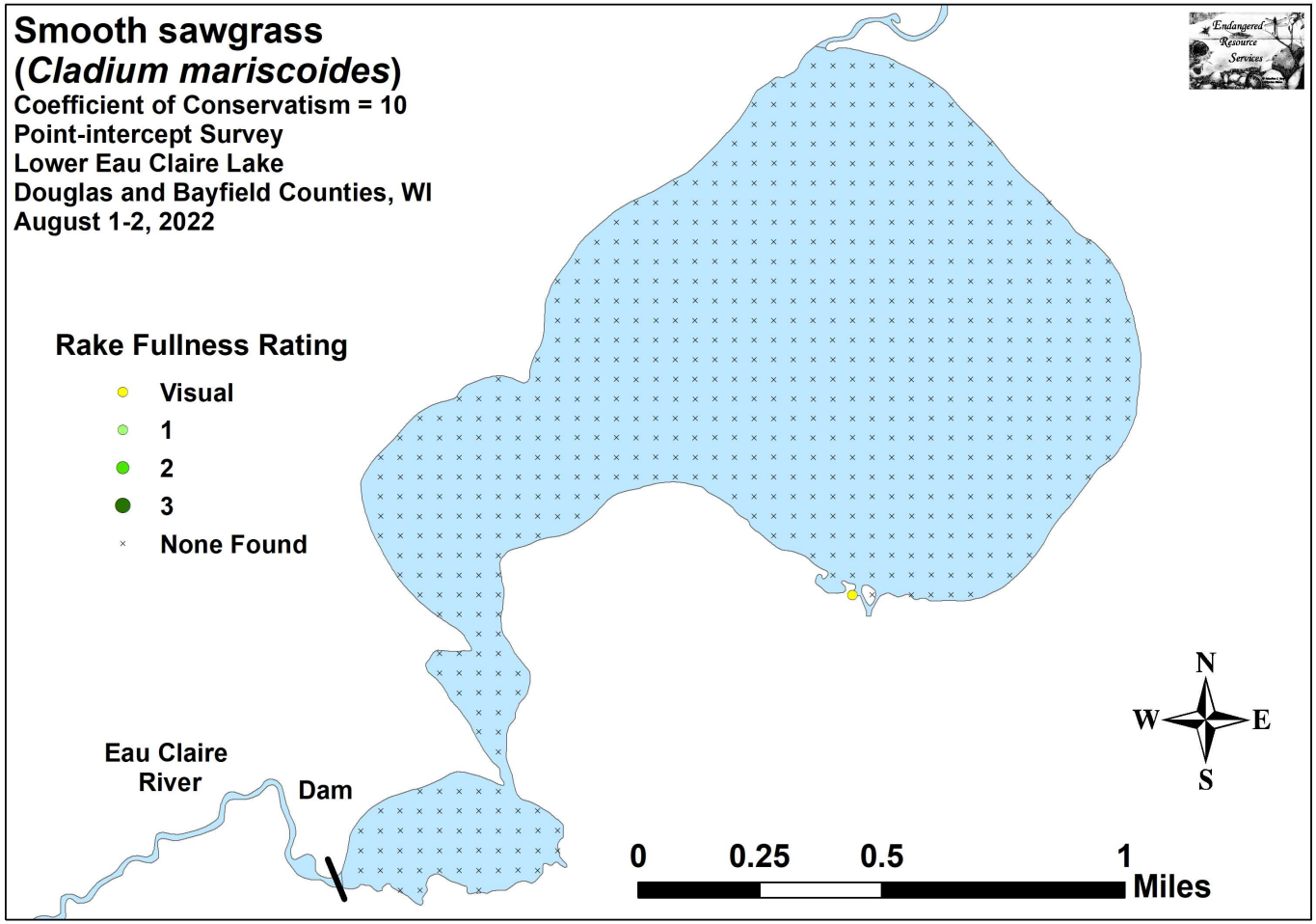

Bottle brush sedge
(Carex comosa)
Coefficient of Conservatism = 5
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

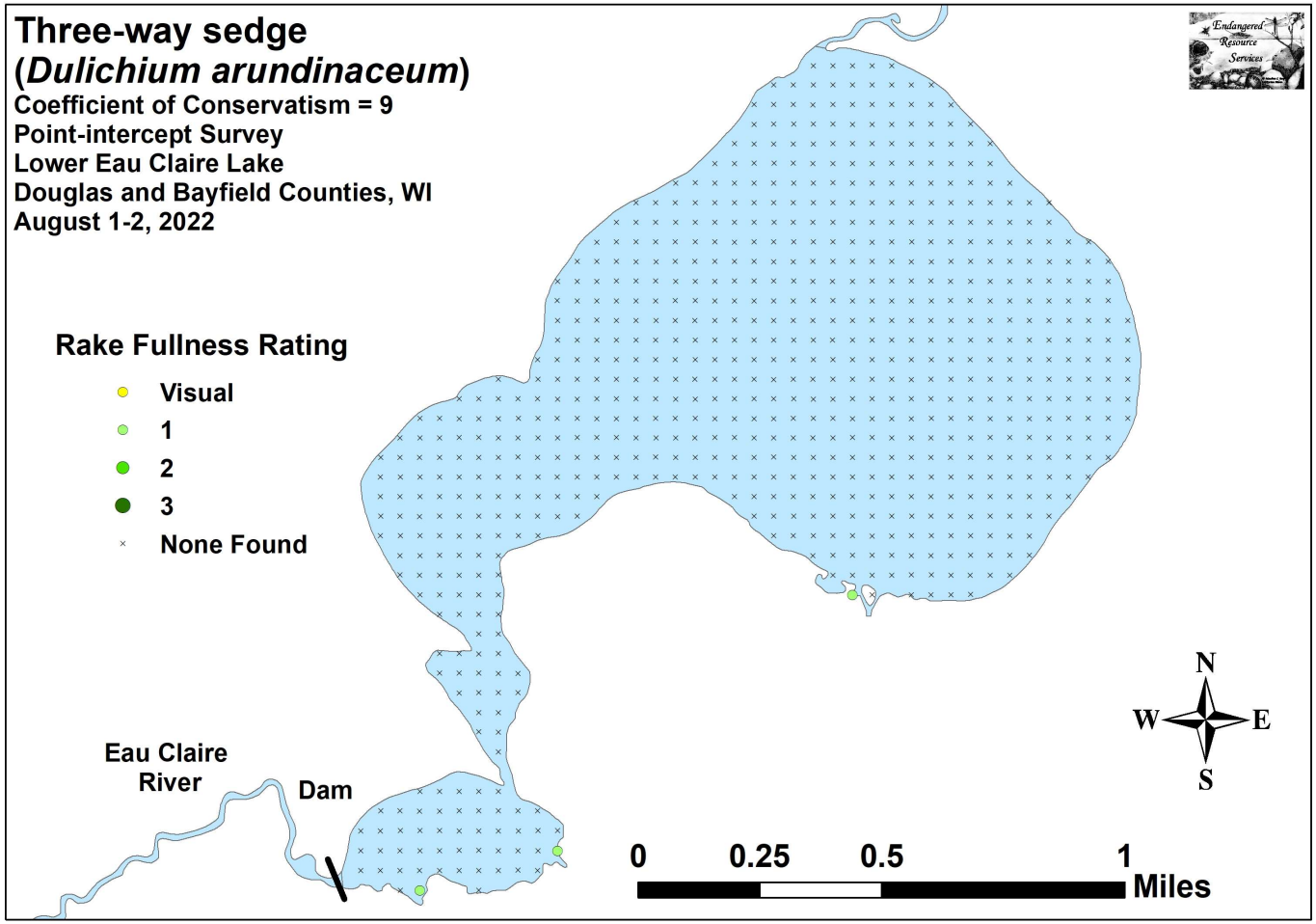

Narrow-leaved woolly sedge
(Carex lasiocarpa)
Coefficient of Conservatism = 9
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

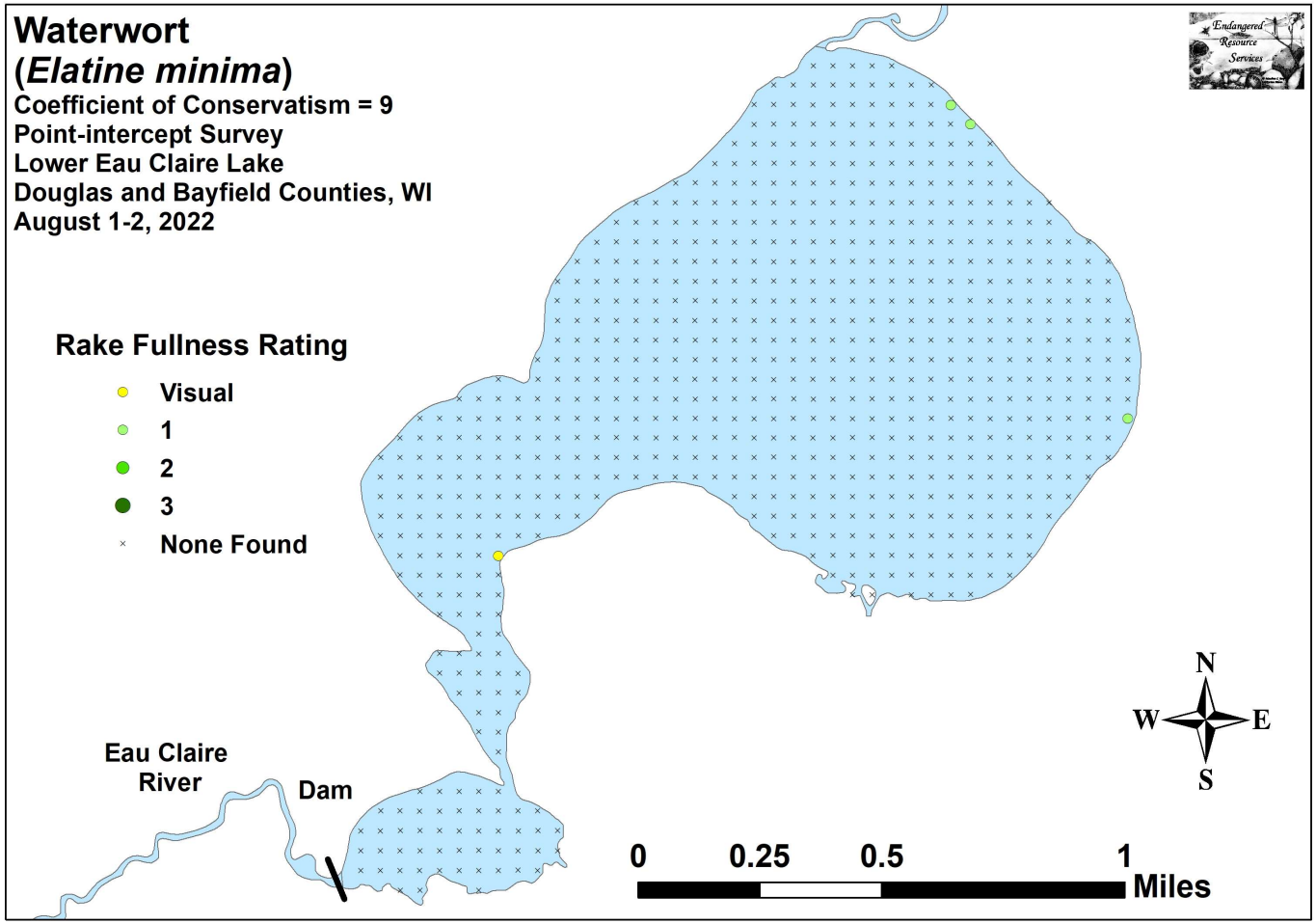

Common yellow lake sedge
(*Carex utriculata*)
Coefficient of Conservatism = 7
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

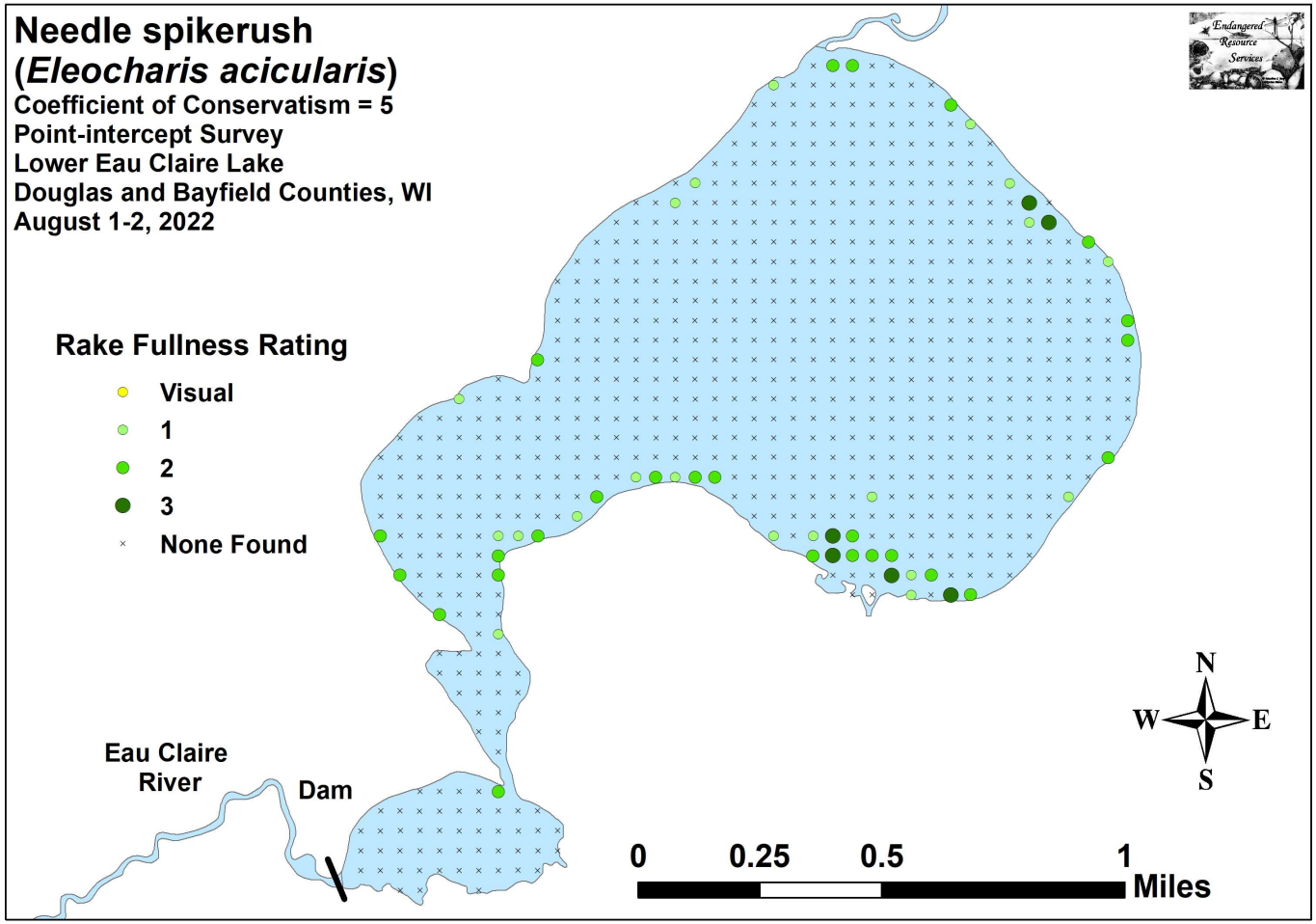

Coontail
(Ceratophyllum demersum)
Coefficient of Conservatism = 3
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

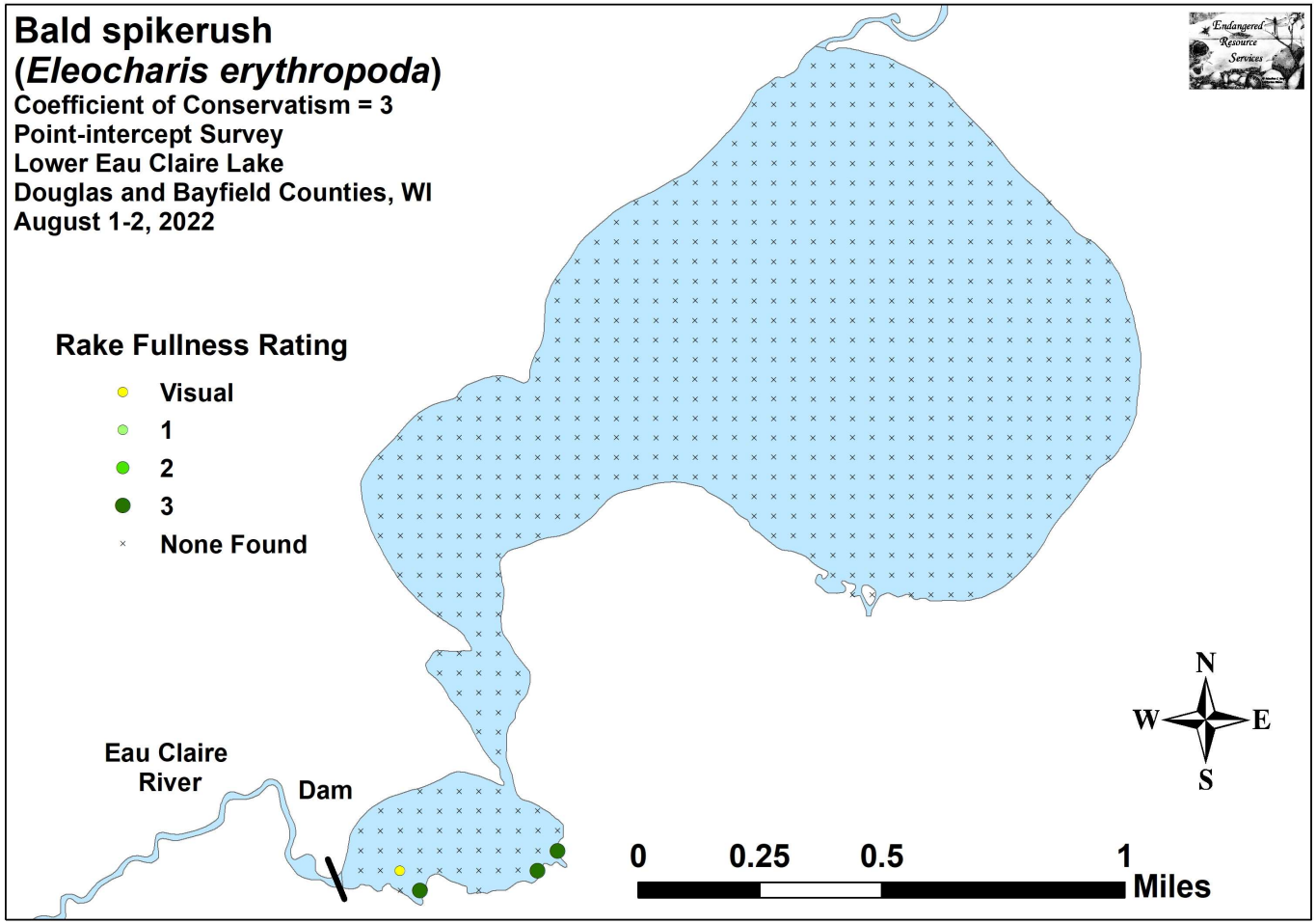

Muskgrass
(Chara sp.)
Coefficient of Conservatism = 7
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

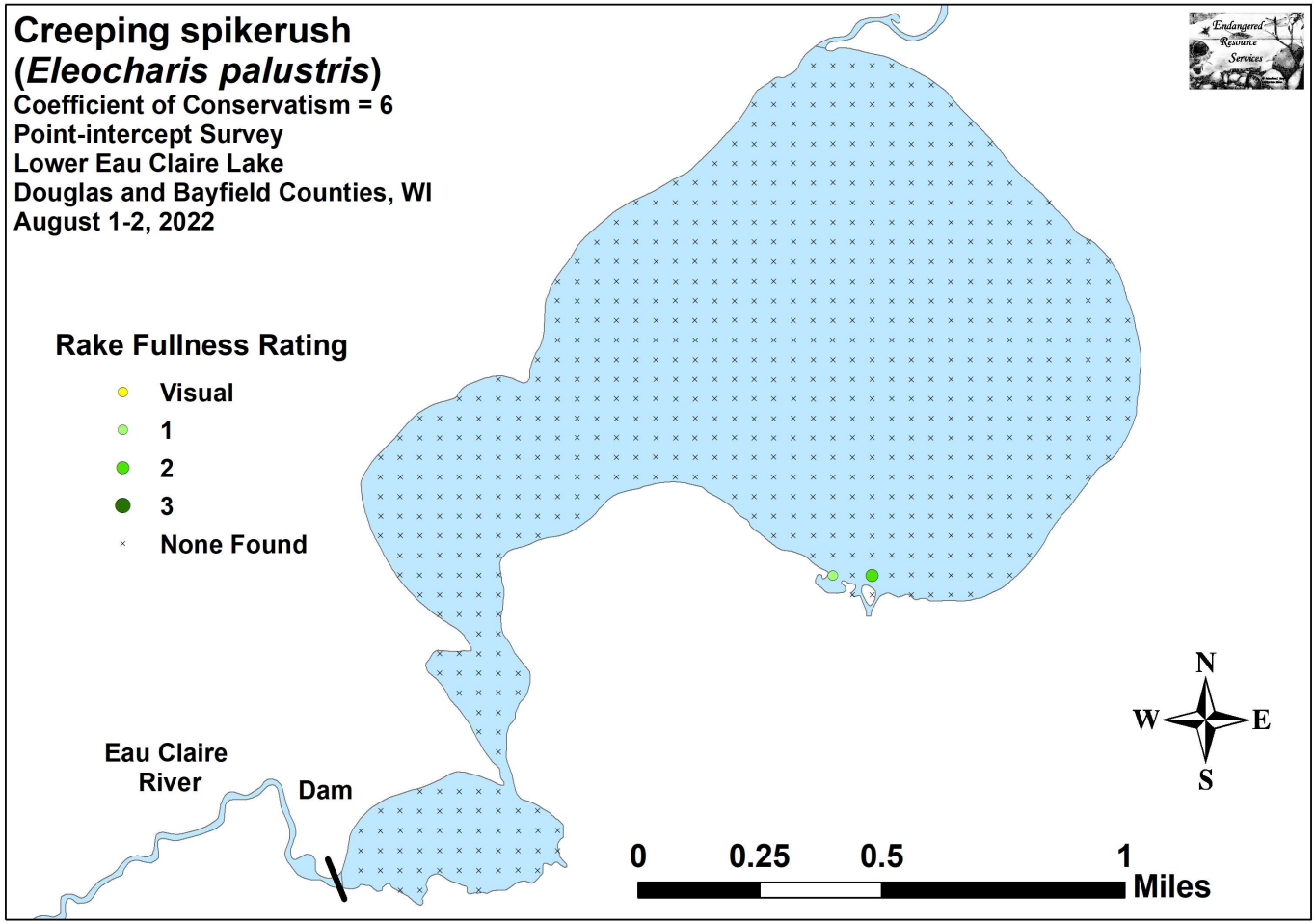

Smooth sawgrass
(Cladium mariscoides)
Coefficient of Conservatism = 10
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Three-way sedge
(Dulichium arundinaceum)
Coefficient of Conservatism = 9
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Waterwort
(Elatine minima)
Coefficient of Conservatism = 9
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Needle spikerush
(Eleocharis acicularis)
Coefficient of Conservatism = 5
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Bald spikerush
(Eleocharis erythropoda)
Coefficient of Conservatism = 3
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Creeping spikerush
(Eleocharis palustris)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
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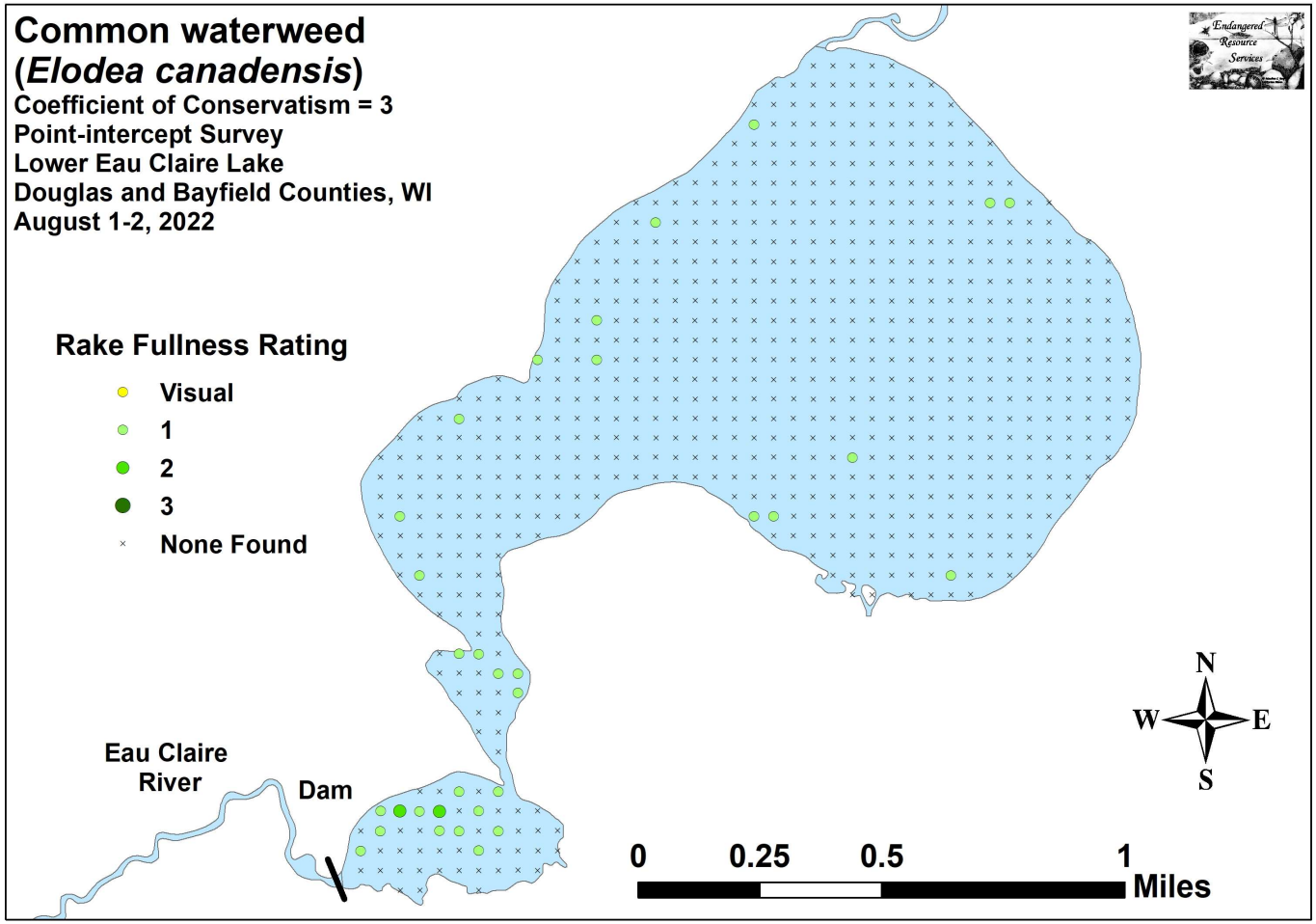
0.25
0.5
1
Miles


Common waterweed
(Elodea canadensis)
Coefficient of Conservatism = 3
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
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None Found
Eau Claire River
Dam
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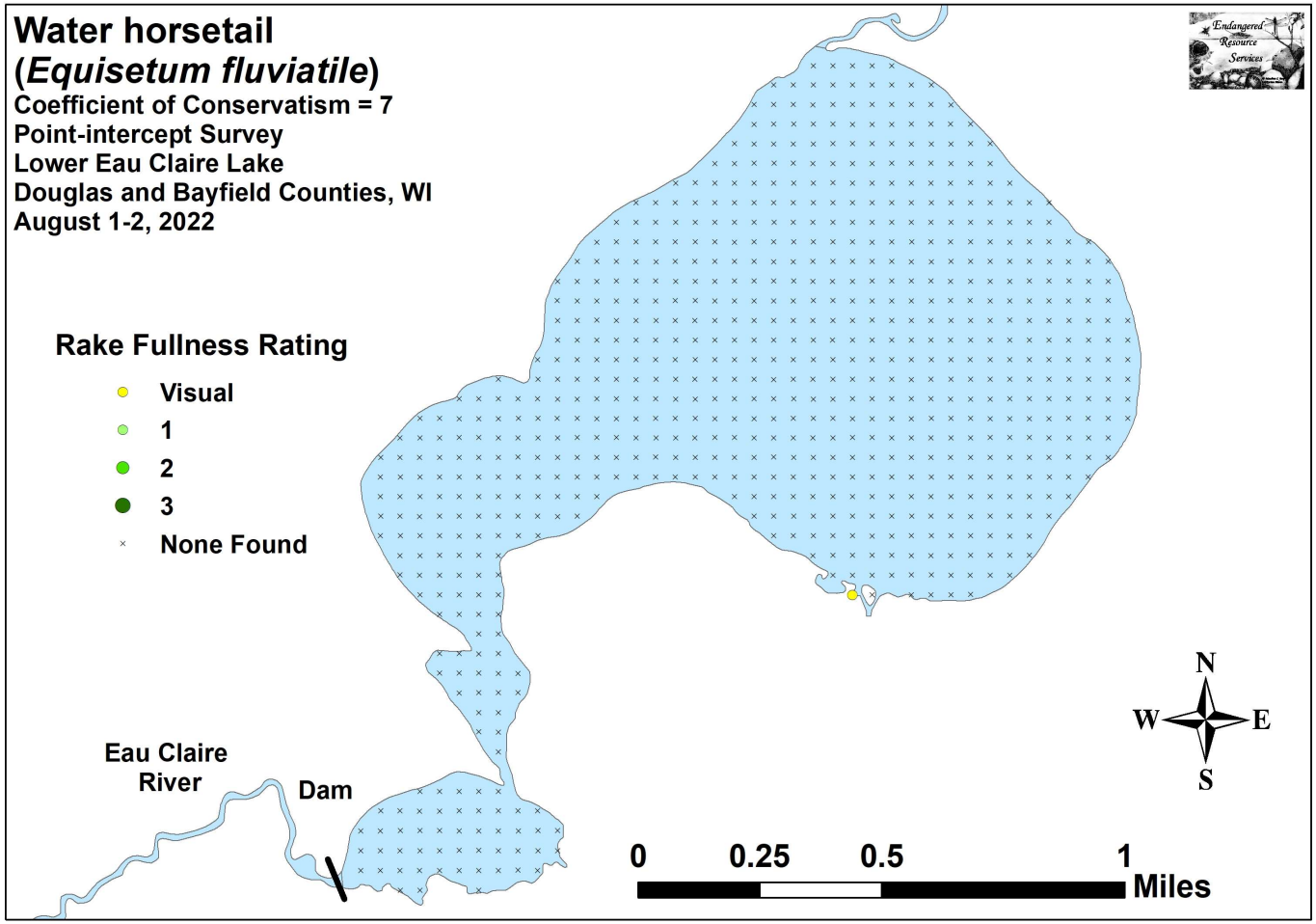
Miles


Water horsetail
(Equisetum fluviatile)
Coefficient of Conservatism = 7
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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0.5
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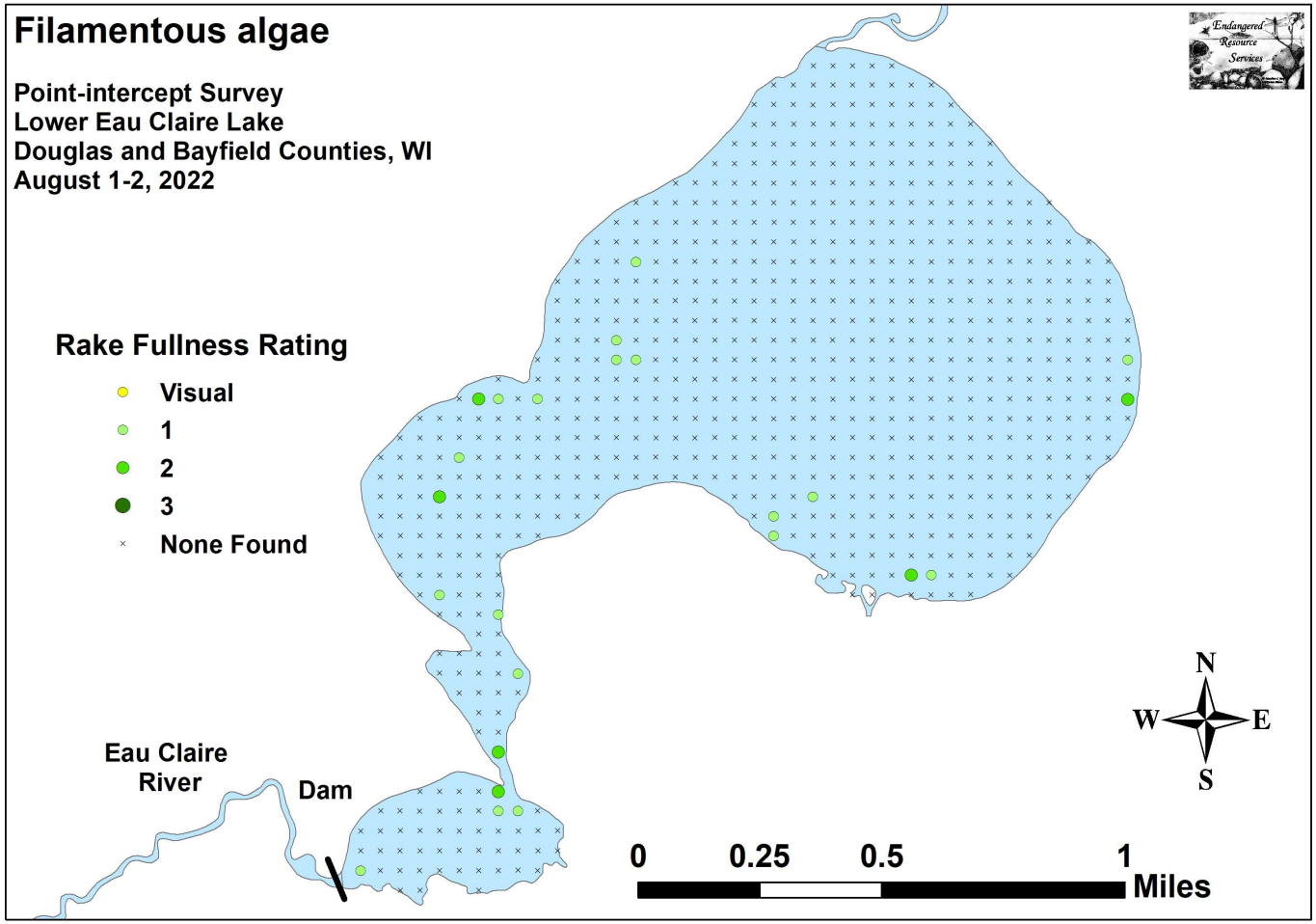
Miles


Filamentous algae
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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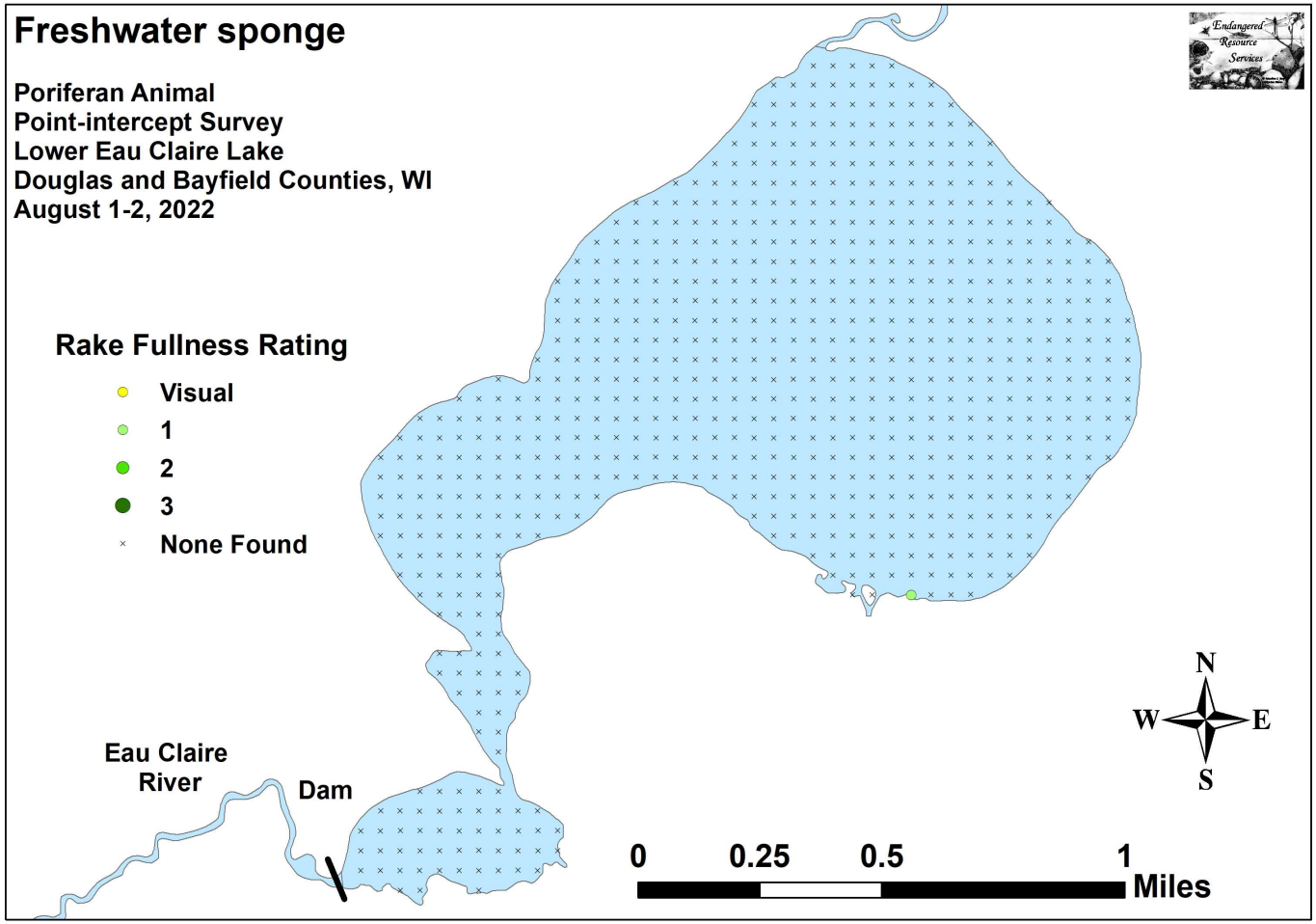
Miles


Freshwater sponge
Poriferan Animal
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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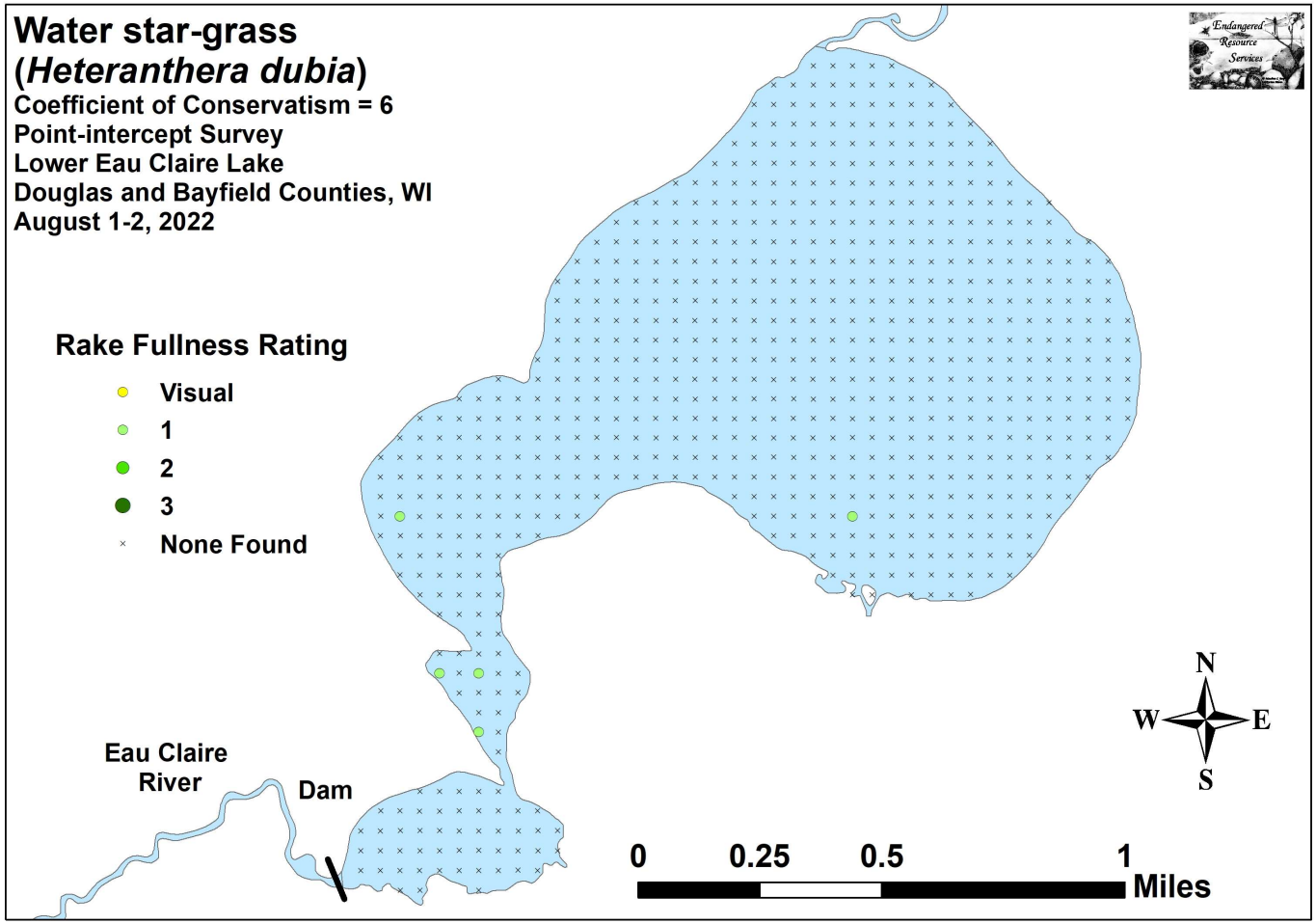
Miles


Water star-grass
(Heteranthera dubia)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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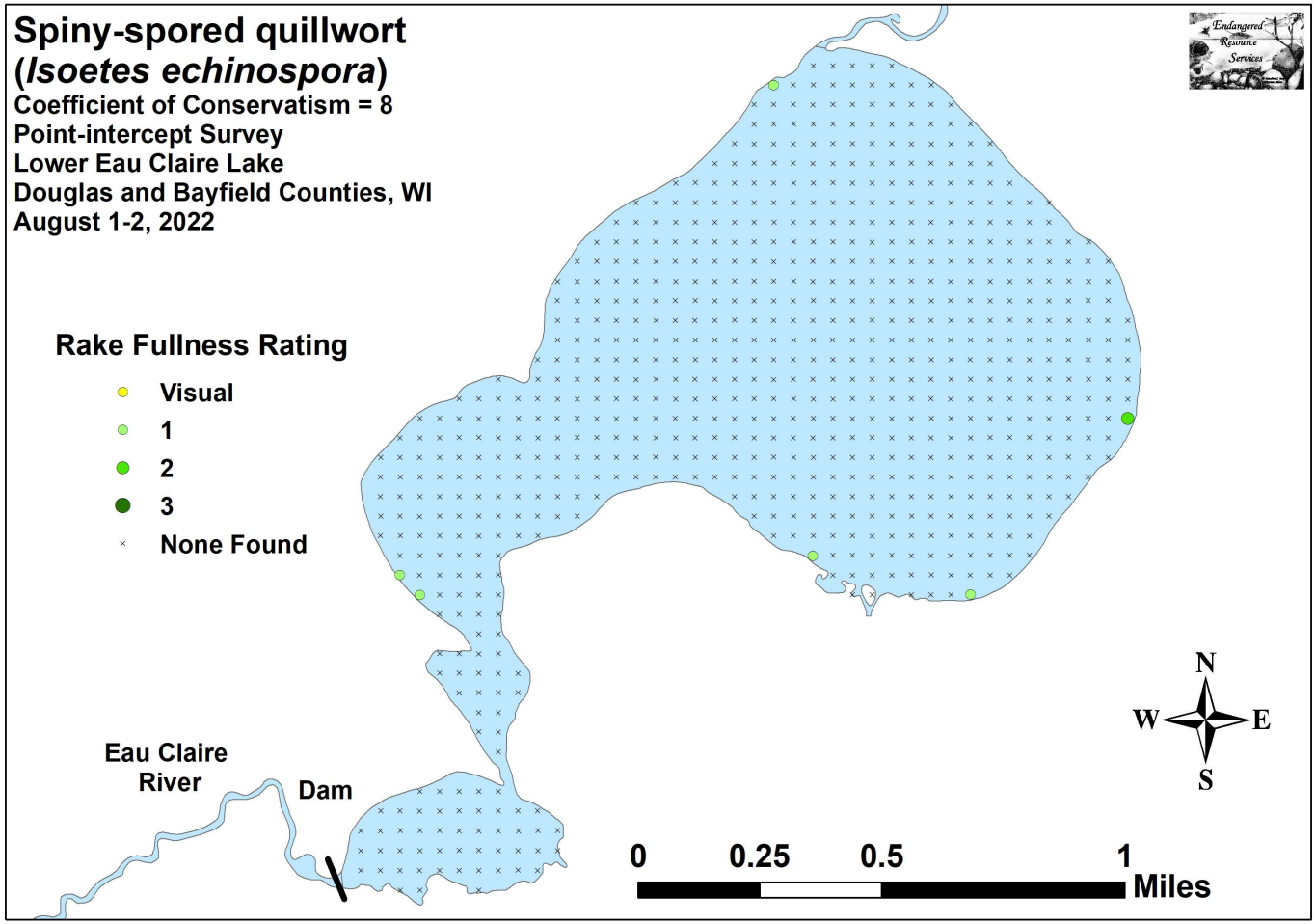
Miles


Spiny-spored quillwort
(Isoetes echinospora)
Coefficient of Conservatism = 8
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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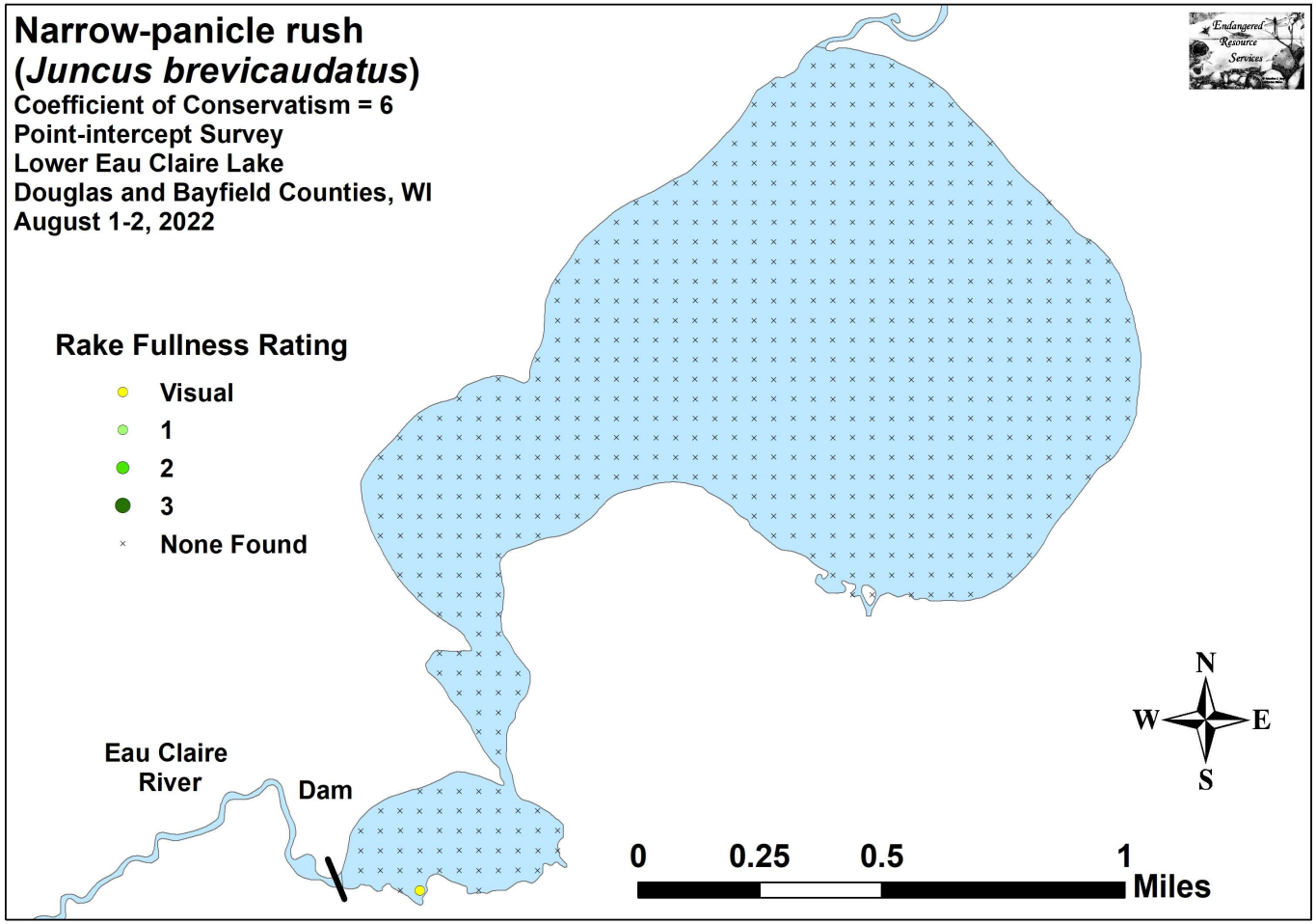
Miles


Narrow-panicle rush
(Juncus brevicaudatus)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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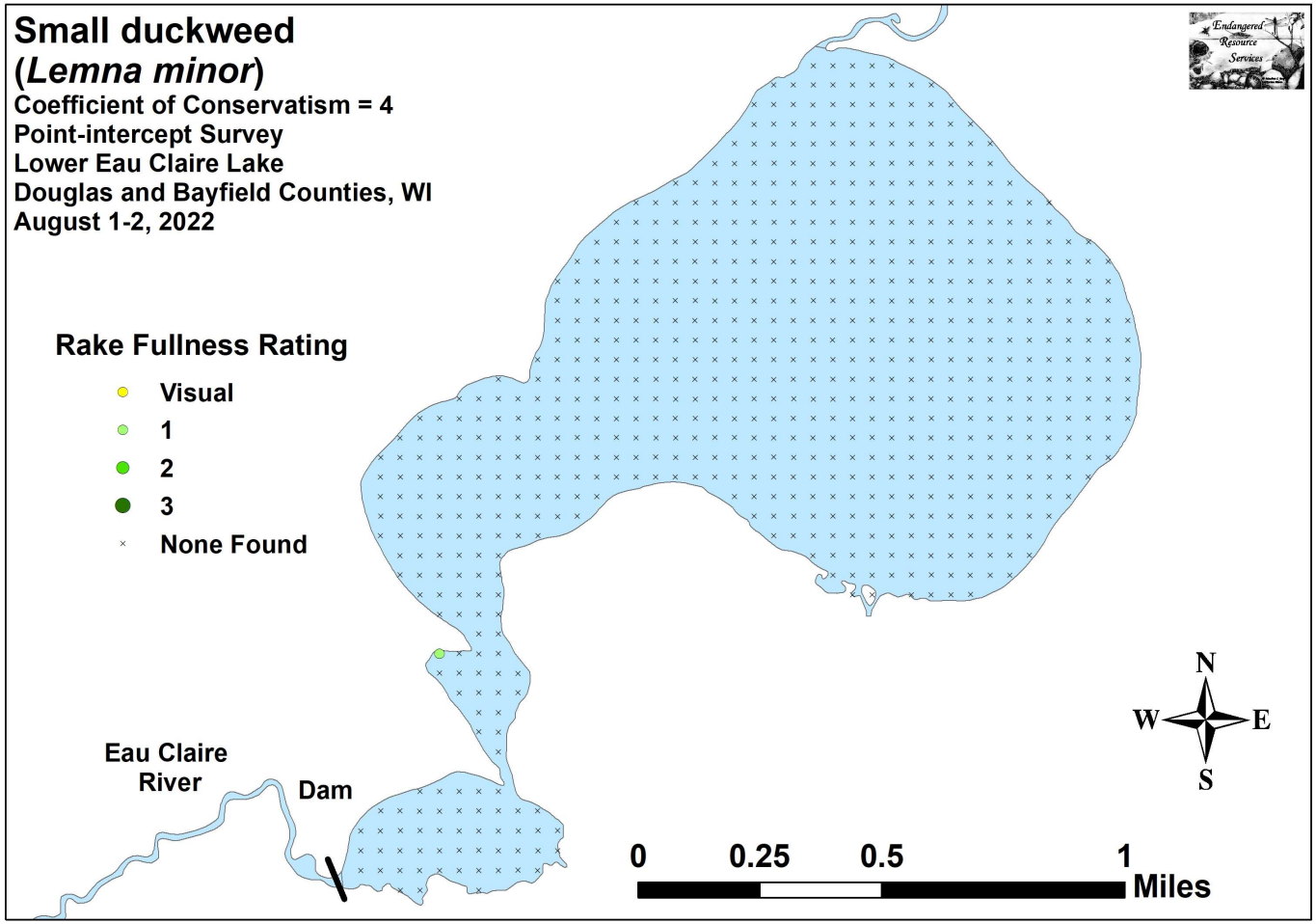
Miles


Small duckweed
(Lemna minor)
Coefficient of Conservatism = 4
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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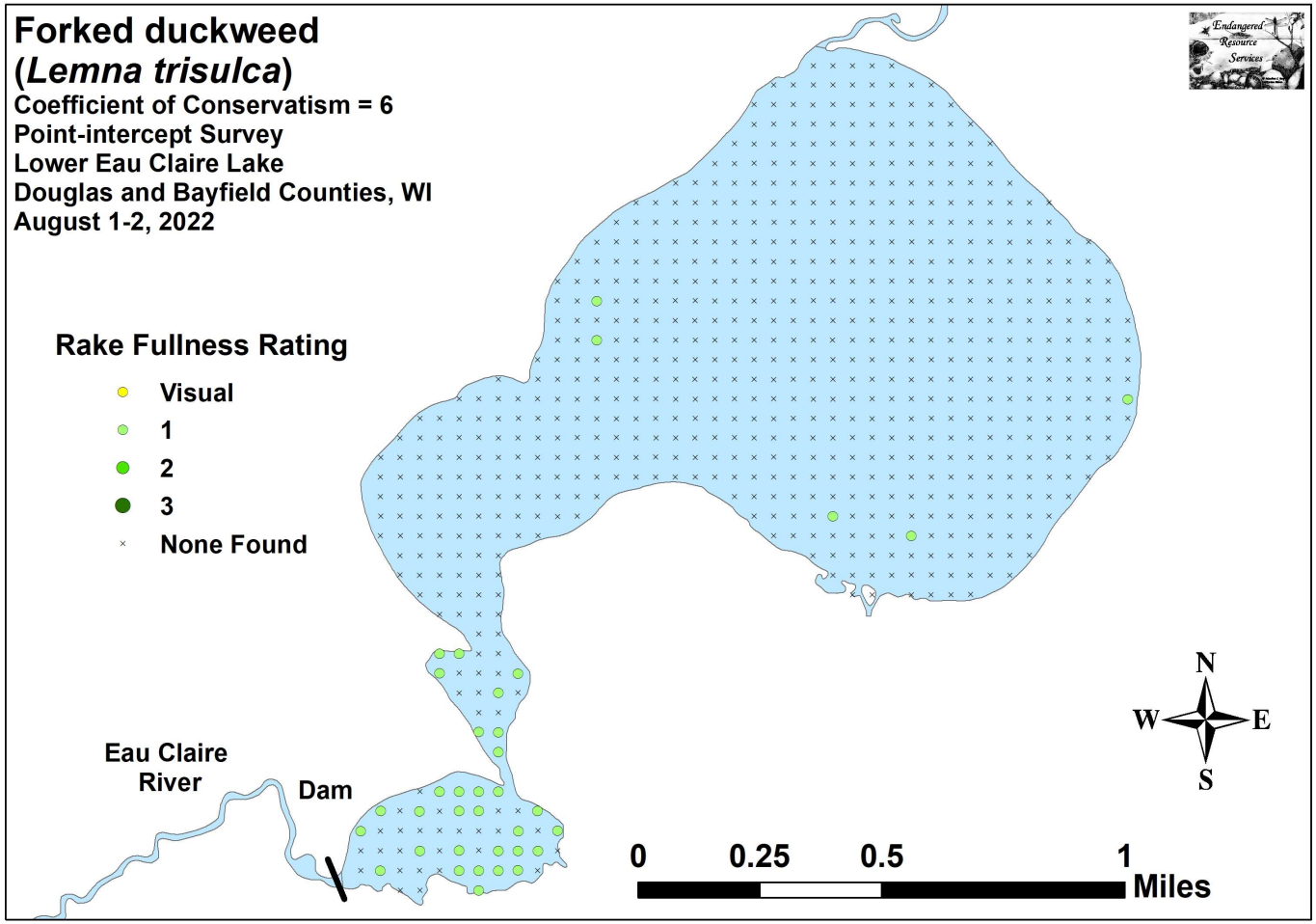
Miles


Forked duckweed
(Lemna trisulca)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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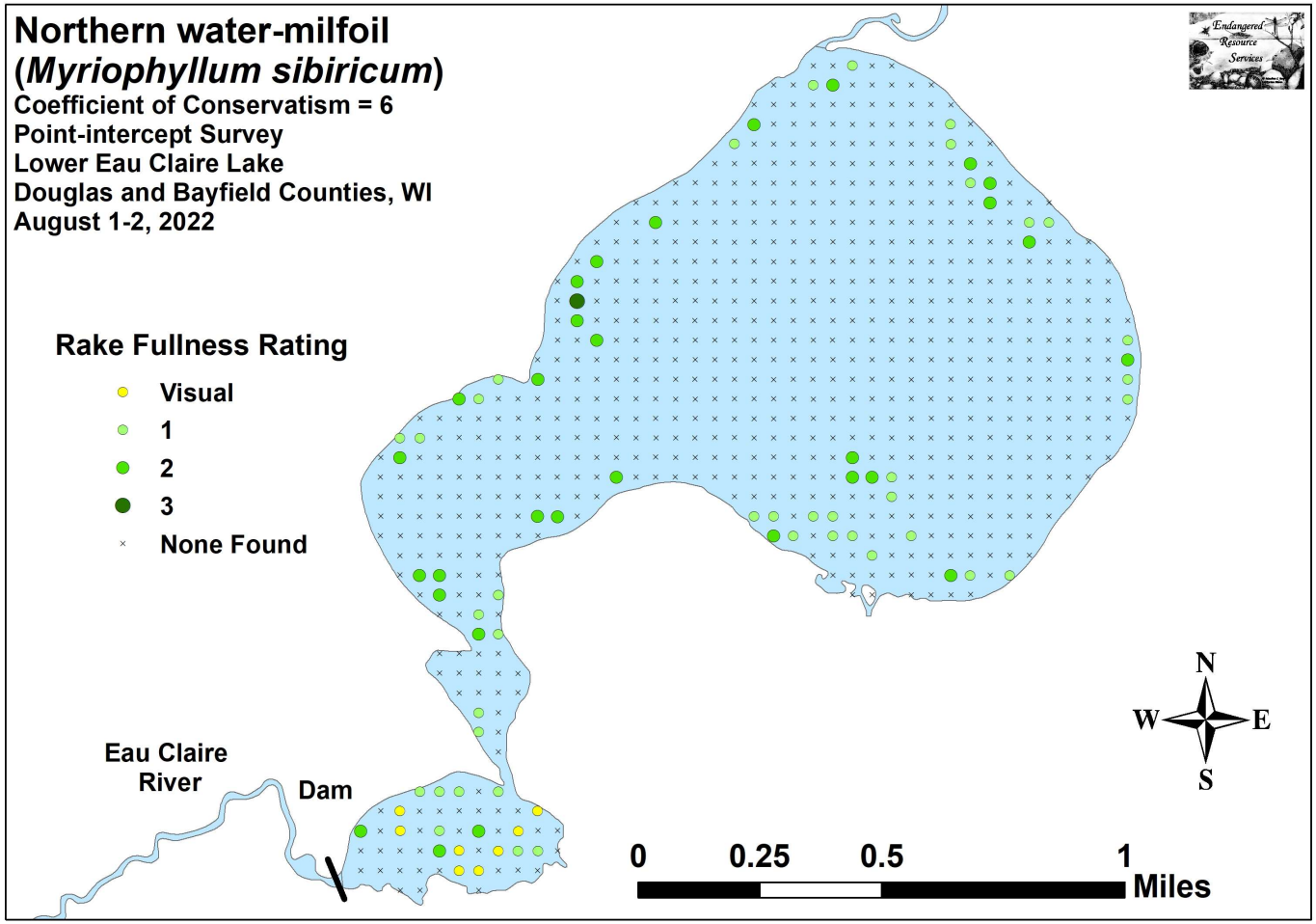
Miles


Northern water-milfoil
(Myriophyllum sibiricum)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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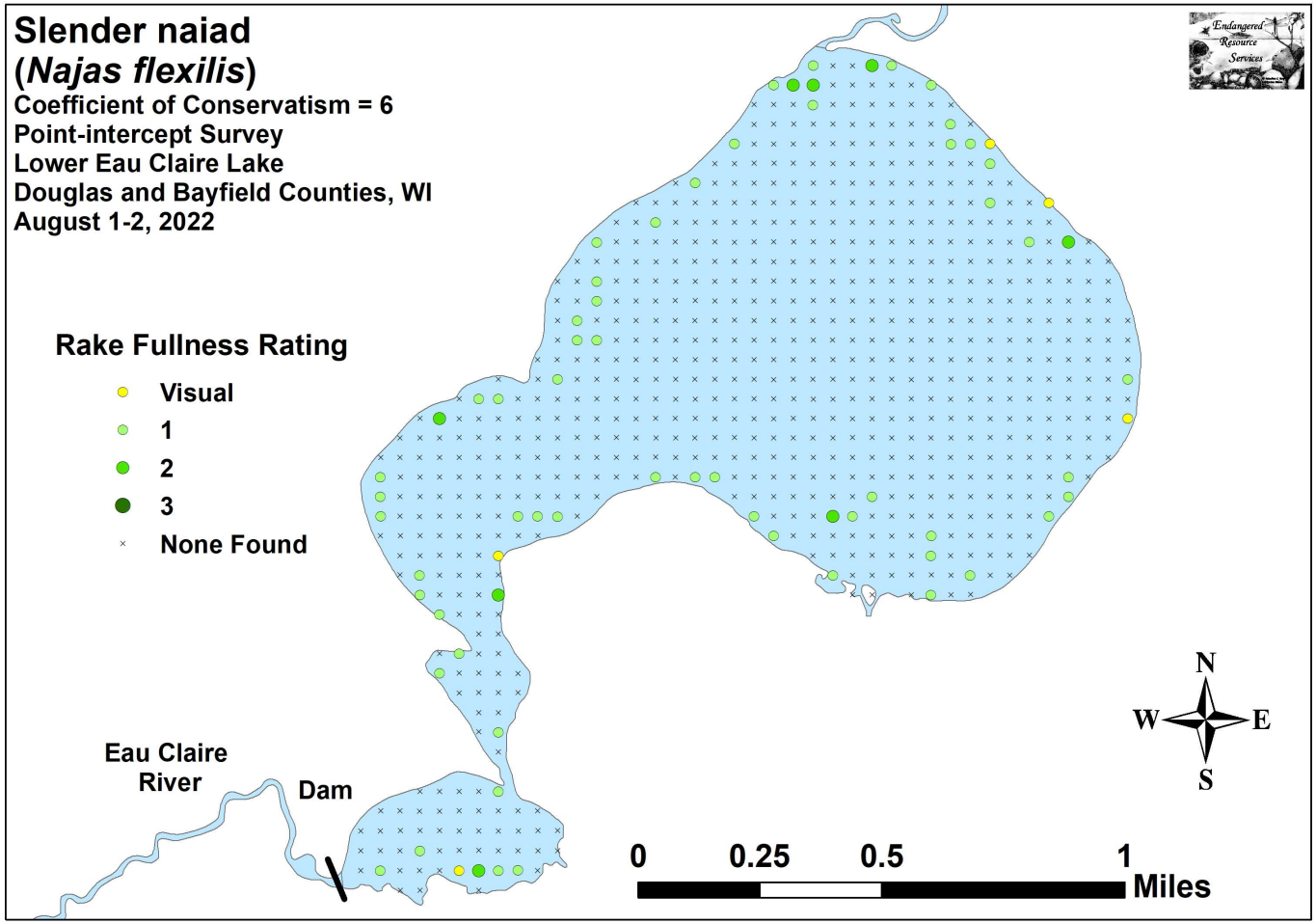
Miles


Slender naiad
(Najas flexilis)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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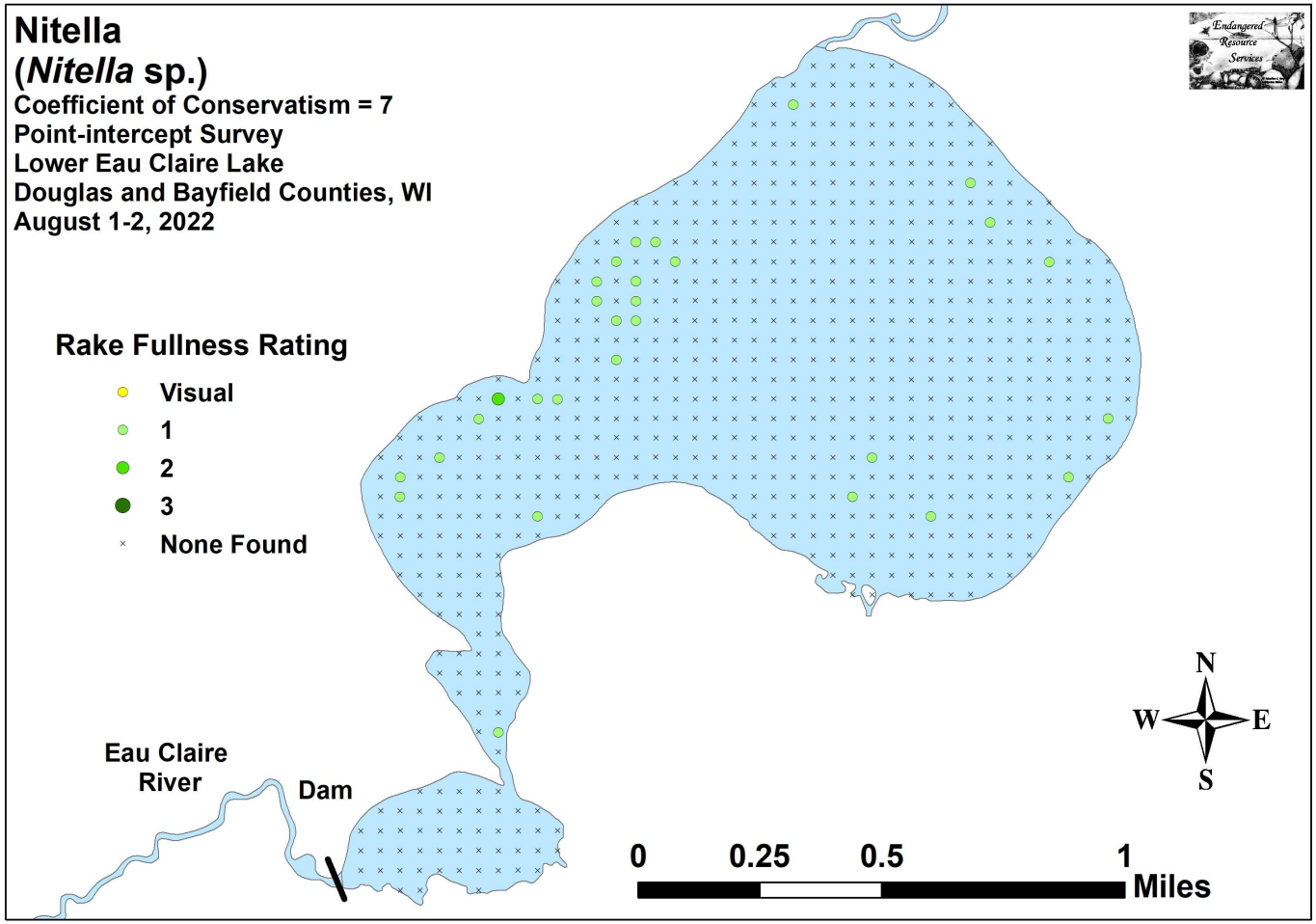
Miles


Nitella
(*Nitella* sp.)
Coefficient of Conservatism = 7
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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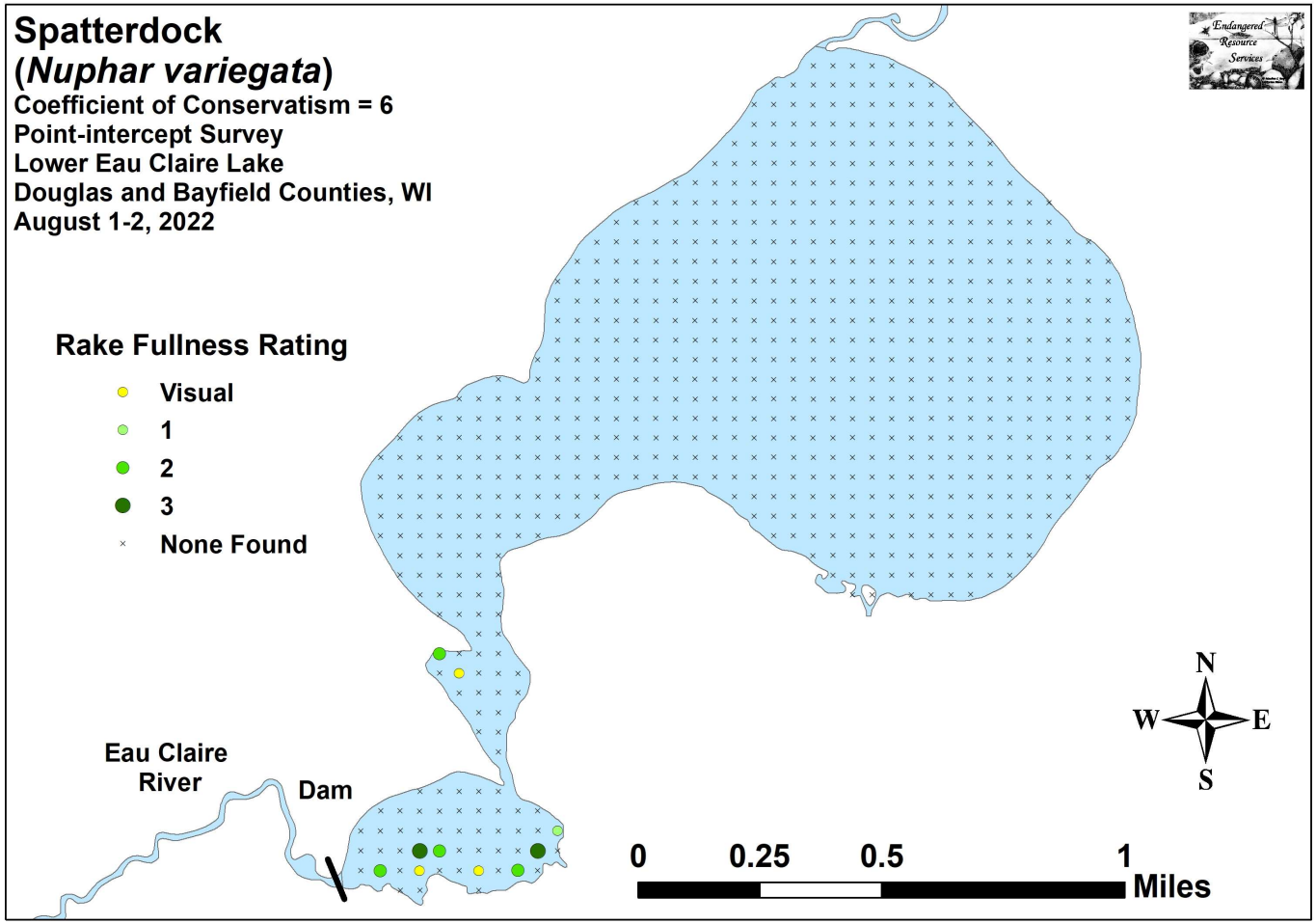
Miles


Spatterdock
(Nuphar variegata)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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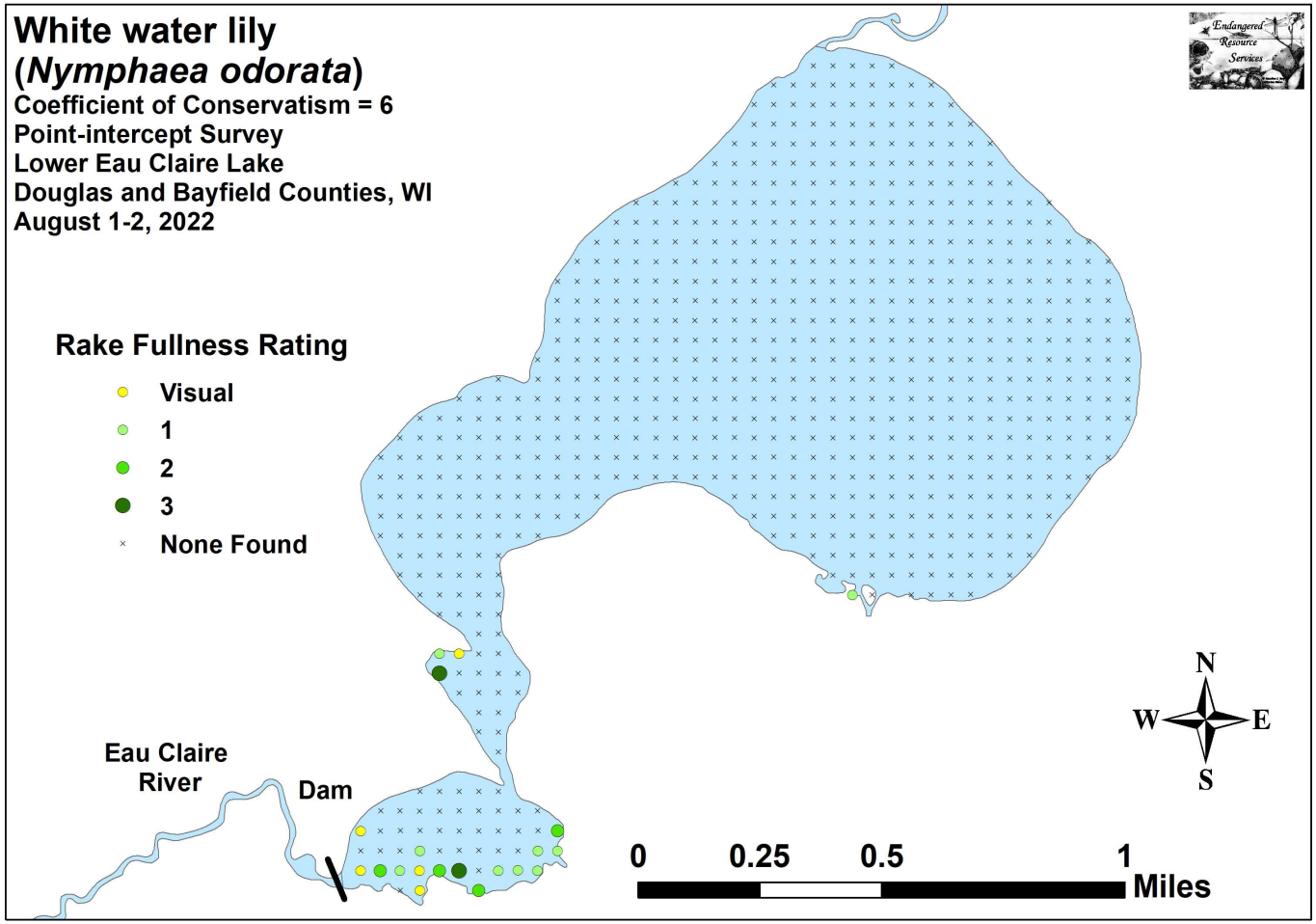
Miles


White water lily
(Nymphaea odorata)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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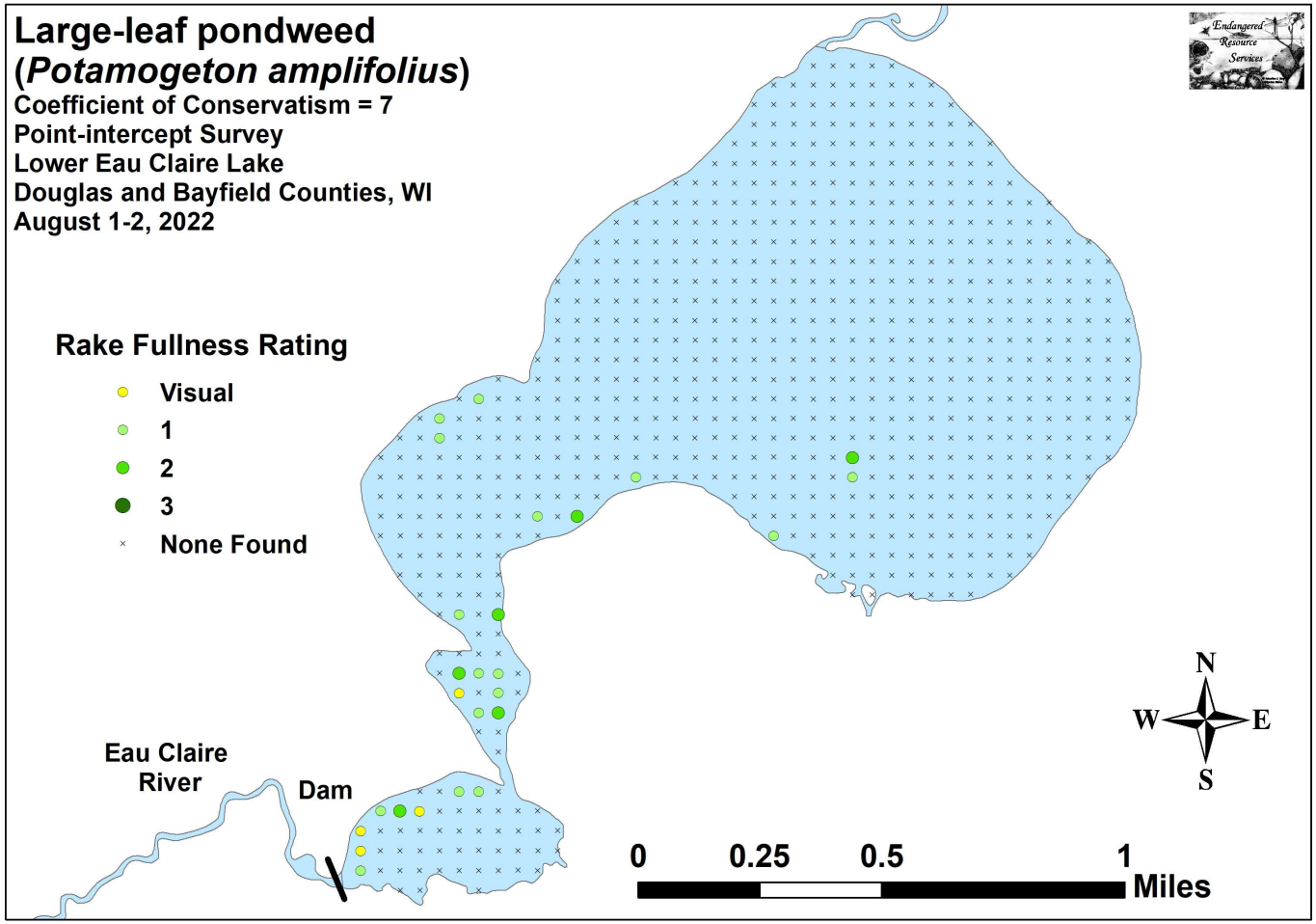
Miles


Large-leaf pondweed
(Potamogeton amplifolius)
Coefficient of Conservatism = 7
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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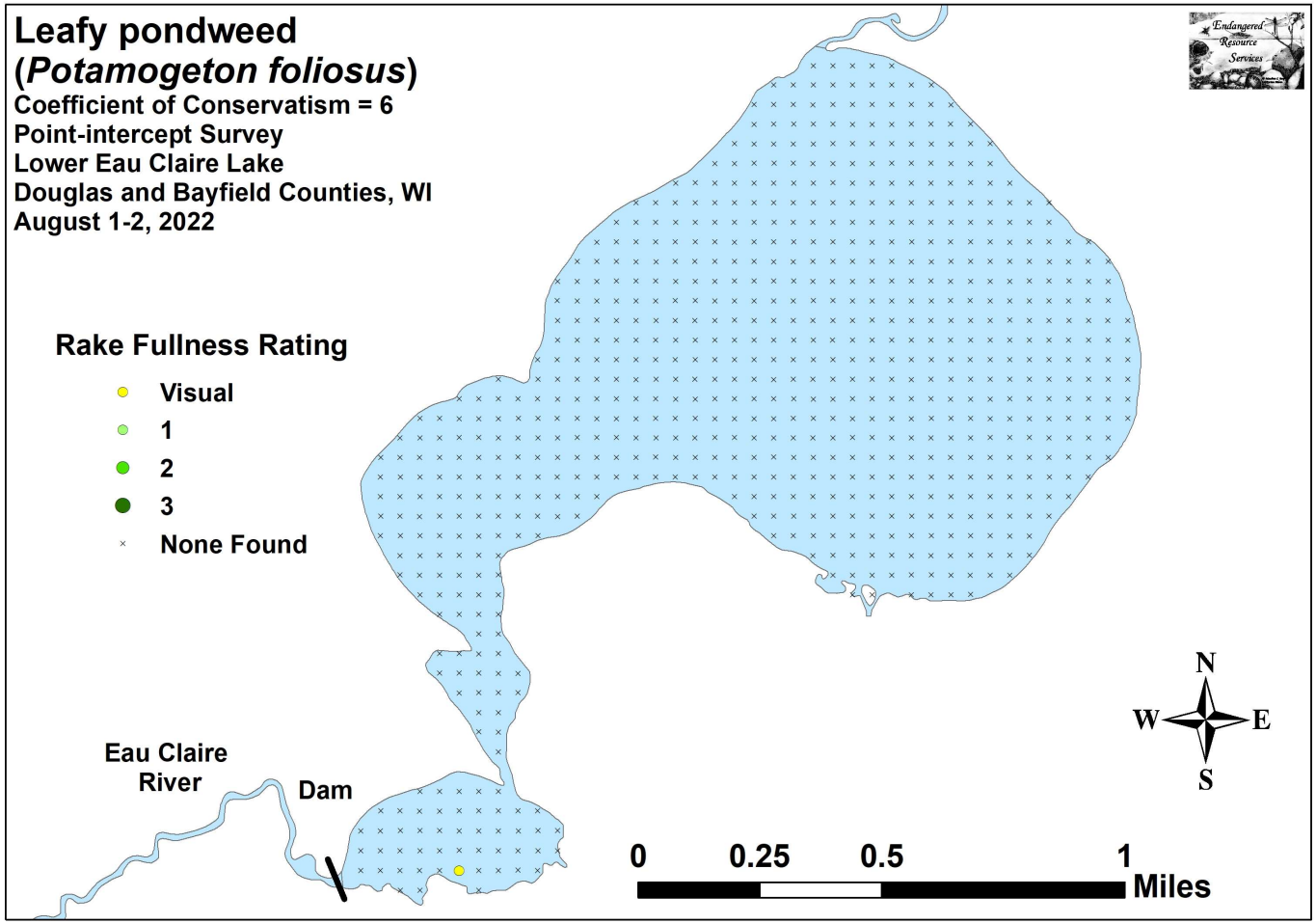
Miles


Leafy pondweed
(Potamogeton foliosus)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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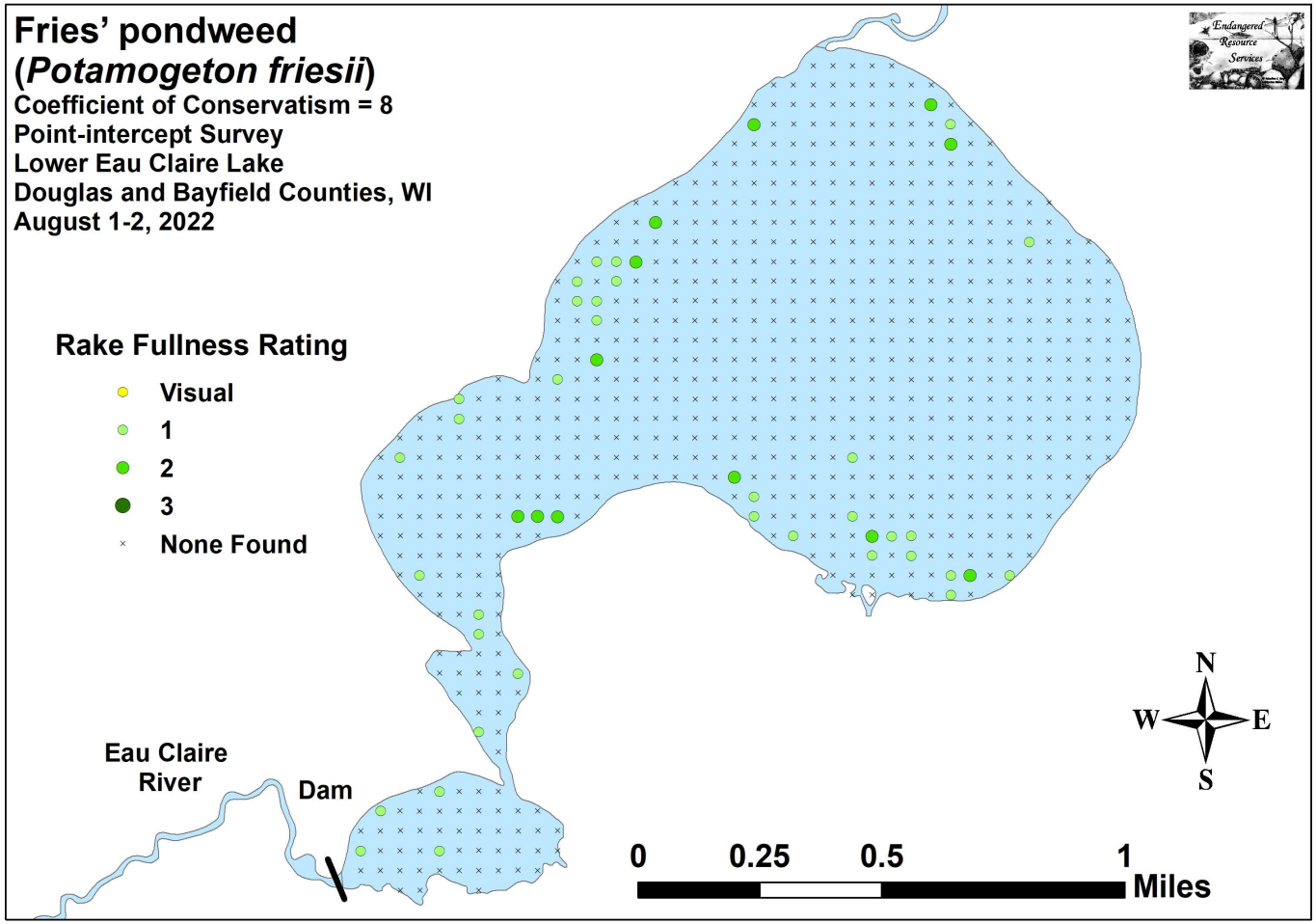
Miles


Fries' pondweed
(Potamogeton friesii)
Coefficient of Conservatism = 8
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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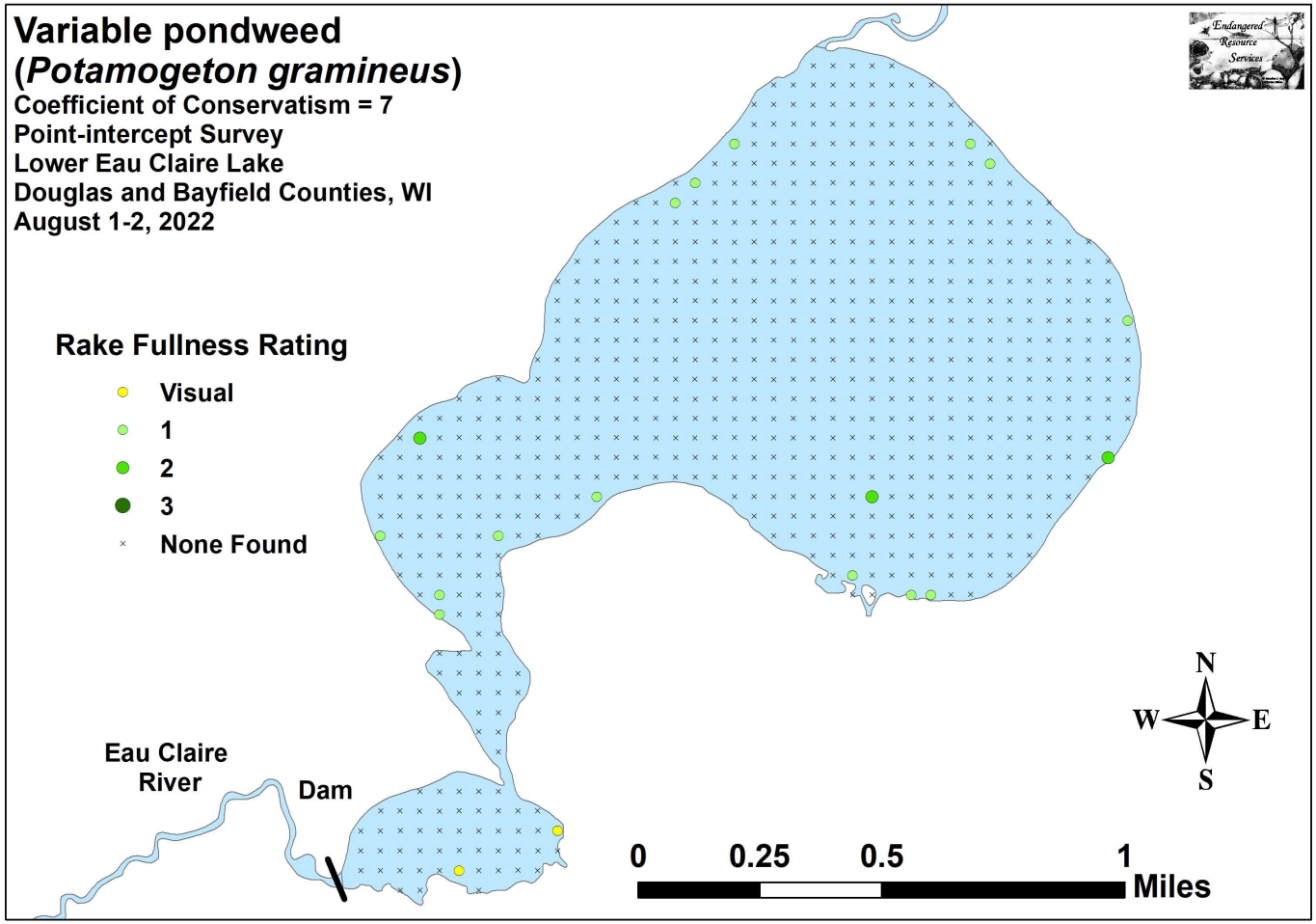
Miles


Variable pondweed
(Potamogeton gramineus)
Coefficient of Conservatism = 7
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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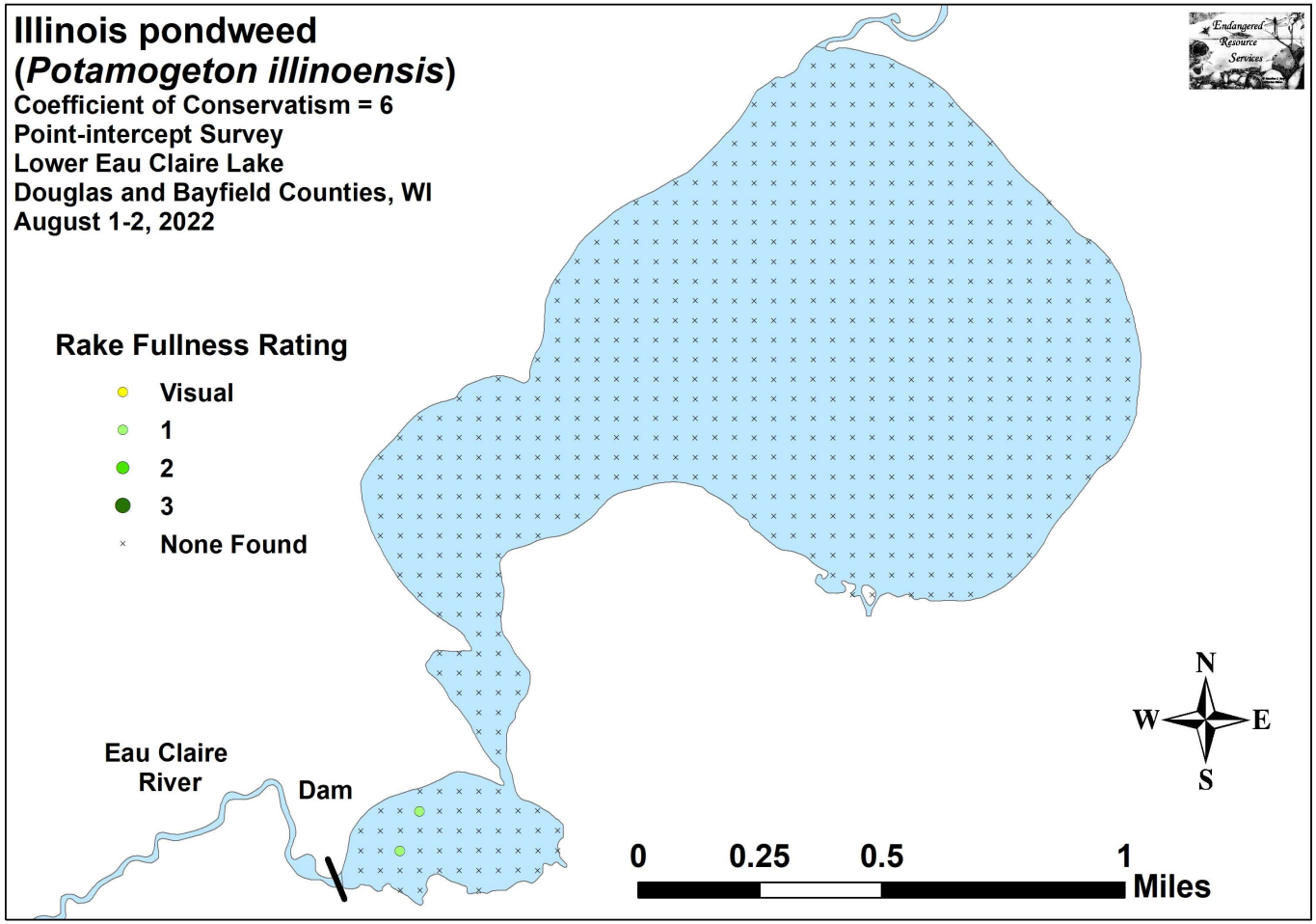
Miles


Illinois pondweed
(Potamogeton illinoensis)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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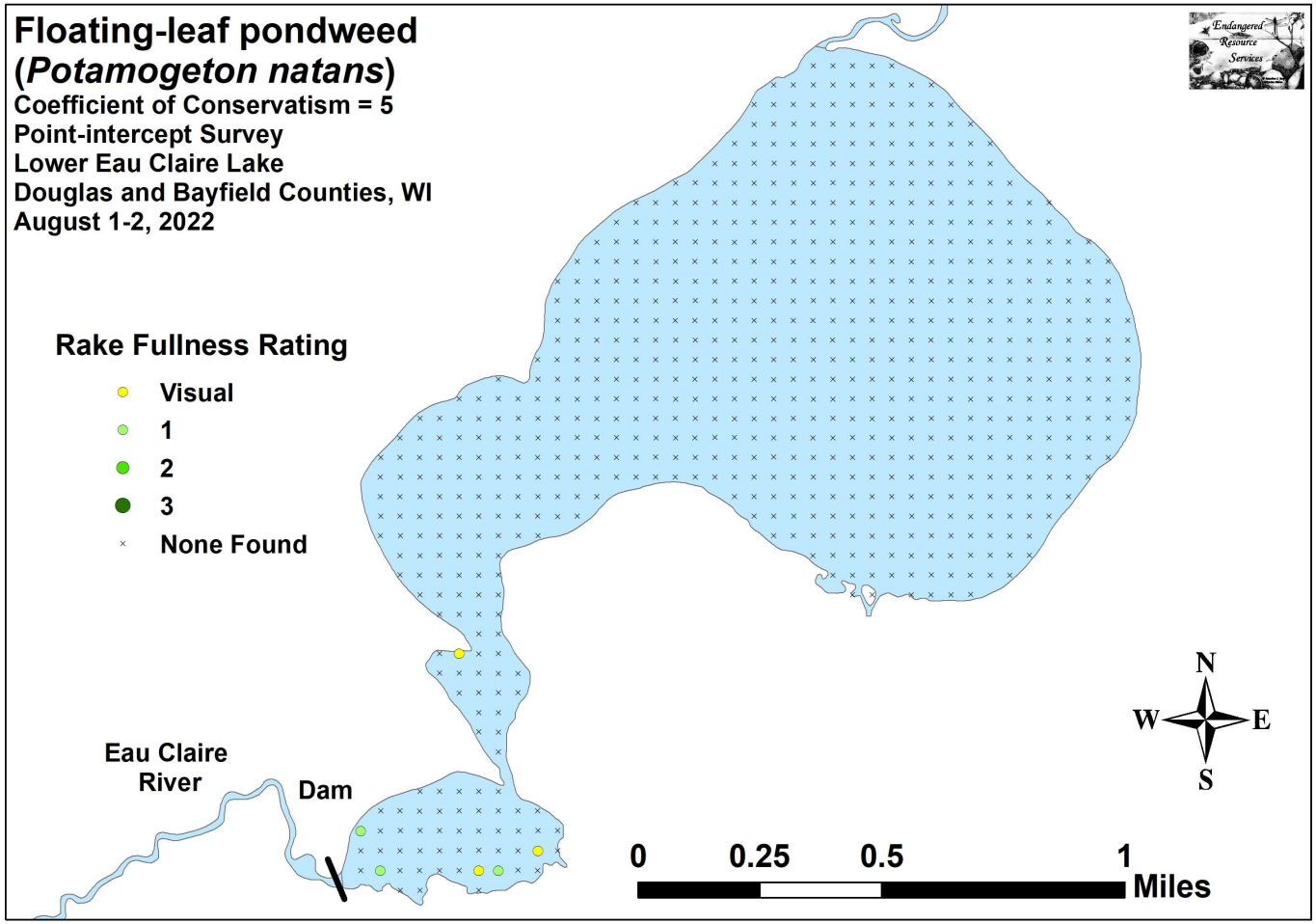
Miles


Floating-leaf pondweed
(Potamogeton natans)
Coefficient of Conservatism = 5
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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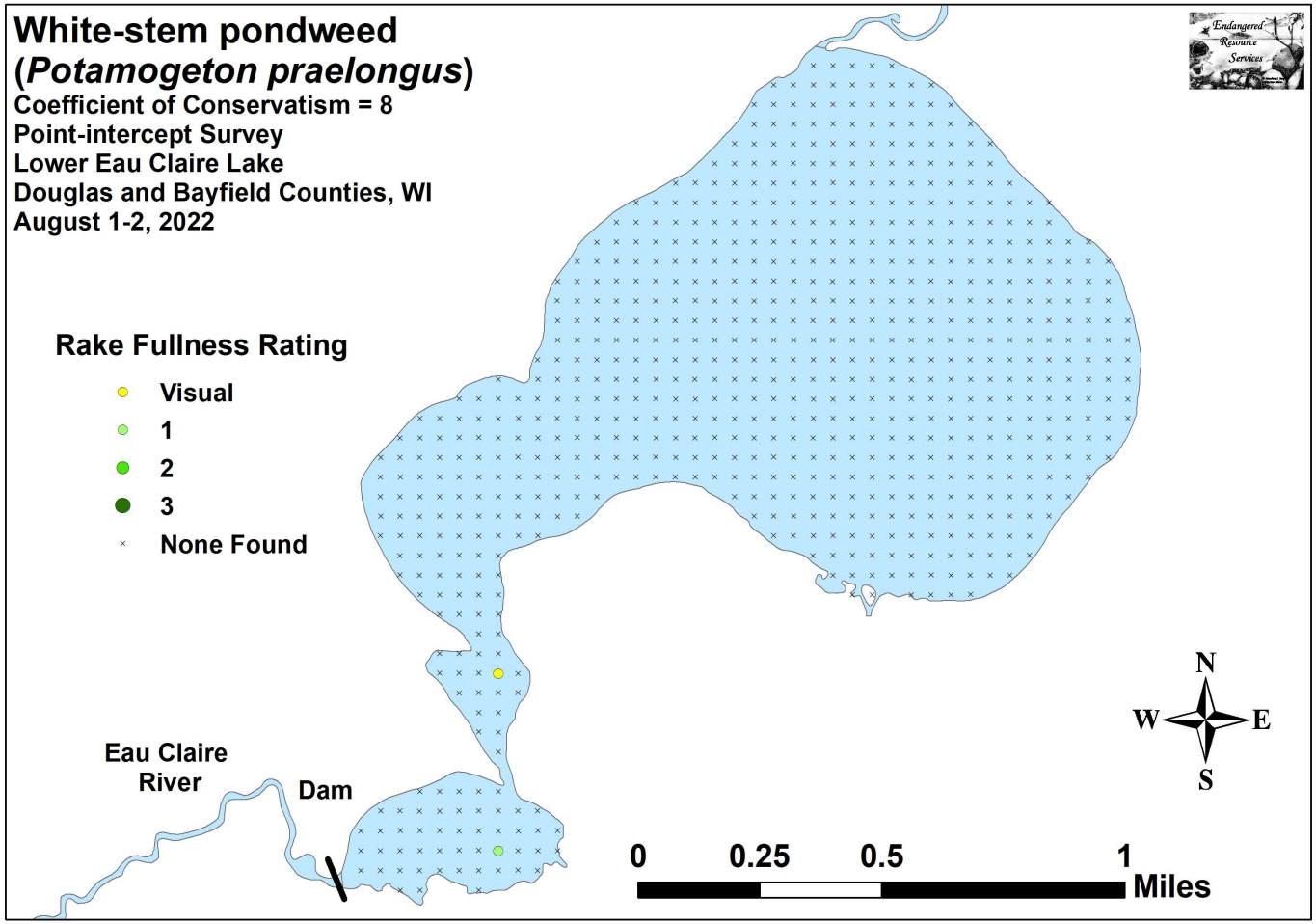
Miles


White-stem pondweed
(Potamogeton praelongus)
Coefficient of Conservatism = 8
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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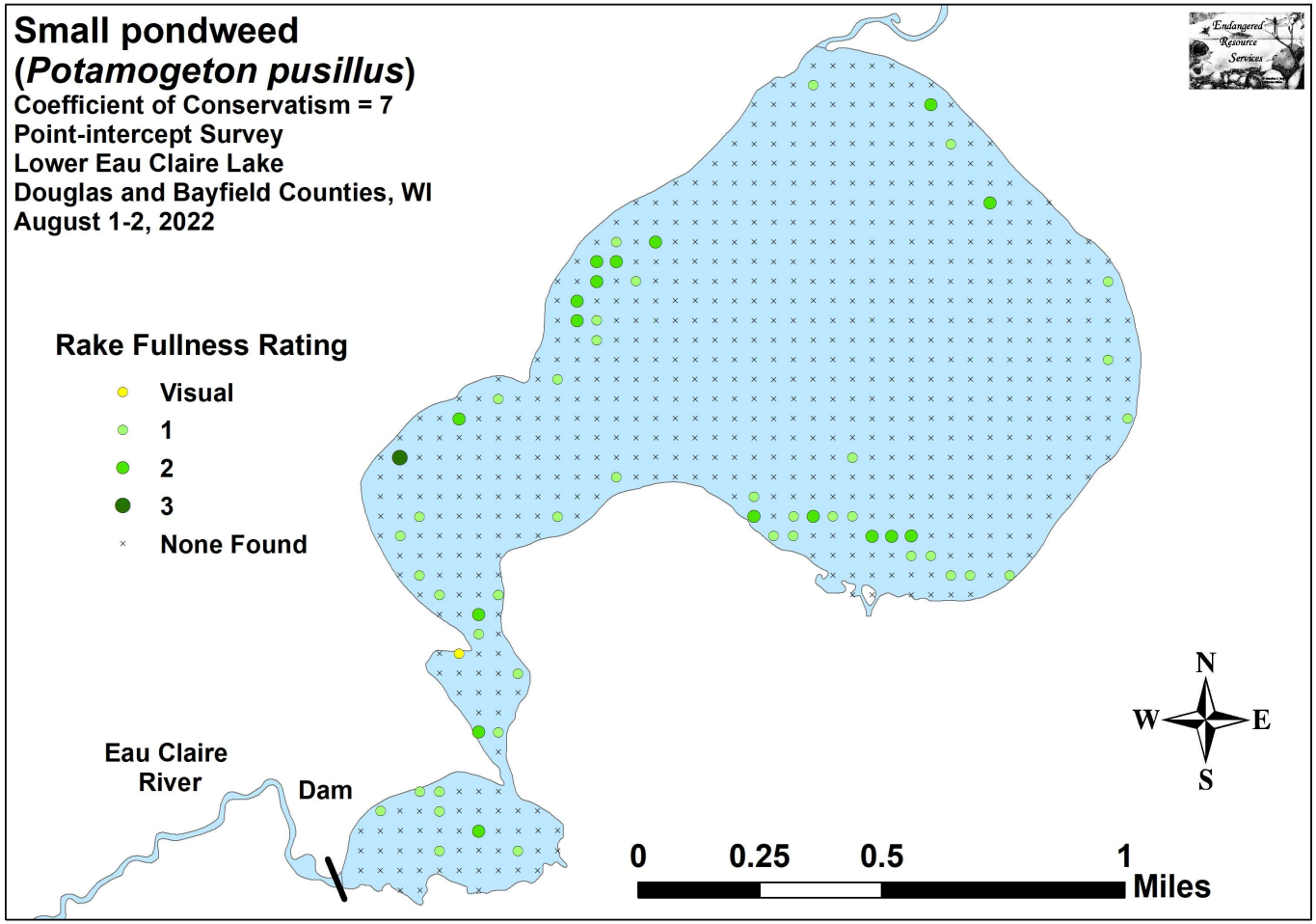
Miles


Small pondweed
(Potamogeton pusillus)
Coefficient of Conservatism = 7
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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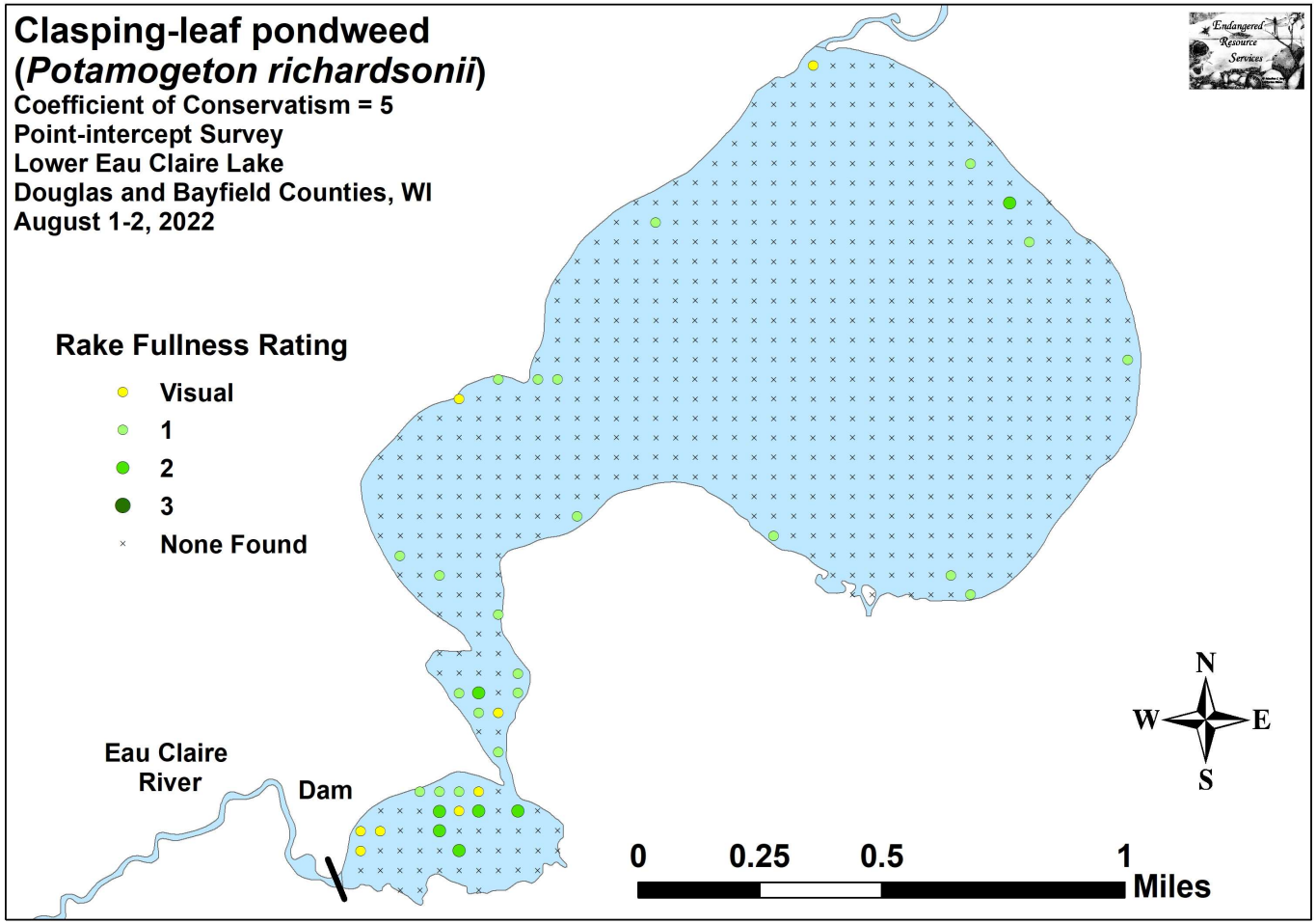
Miles


Clasping-leaf pondweed
(Potamogeton richardsonii)
Coefficient of Conservatism = 5
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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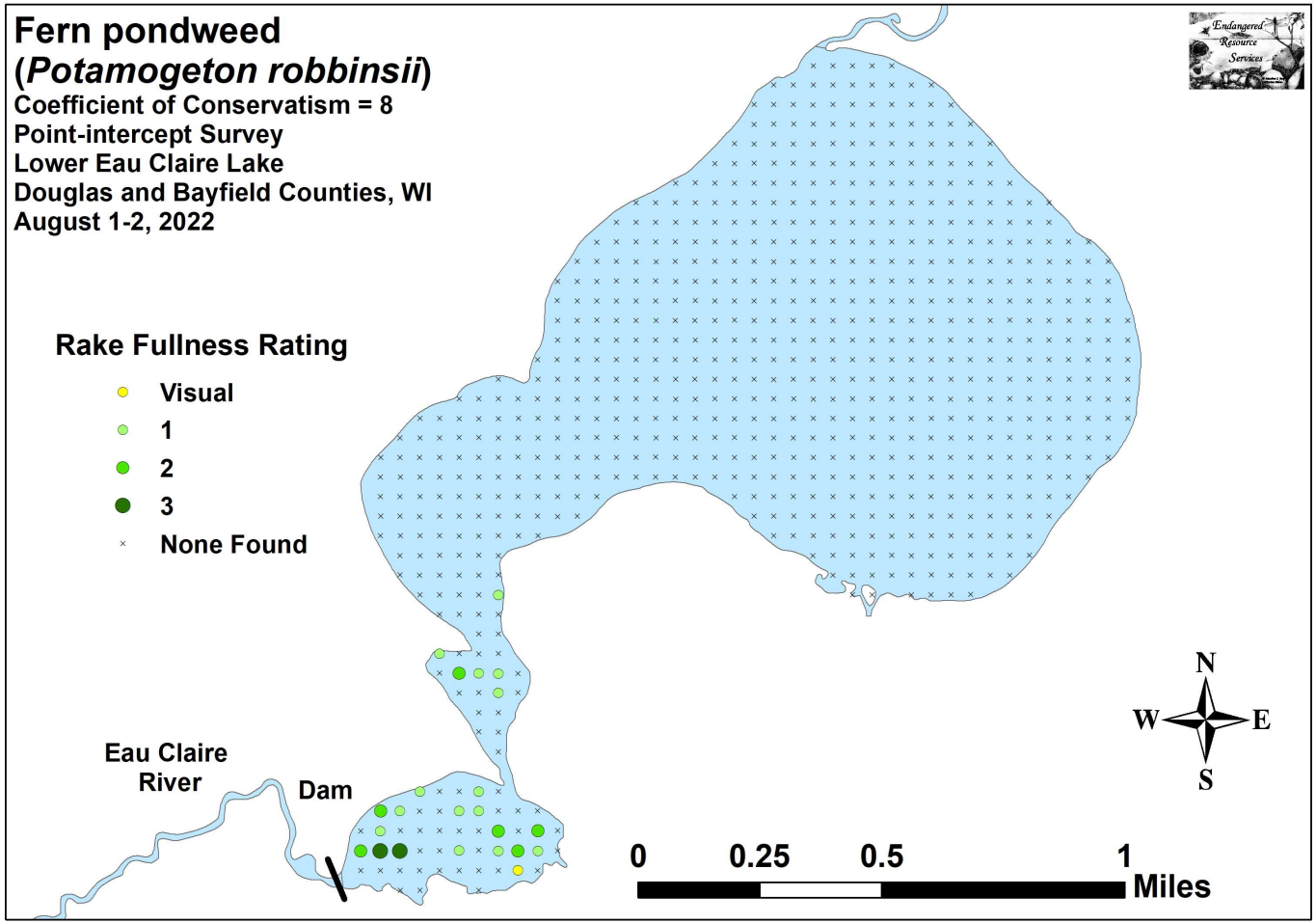
Miles


Fern pondweed
(Potamogeton robbinsii)
Coefficient of Conservatism = 8
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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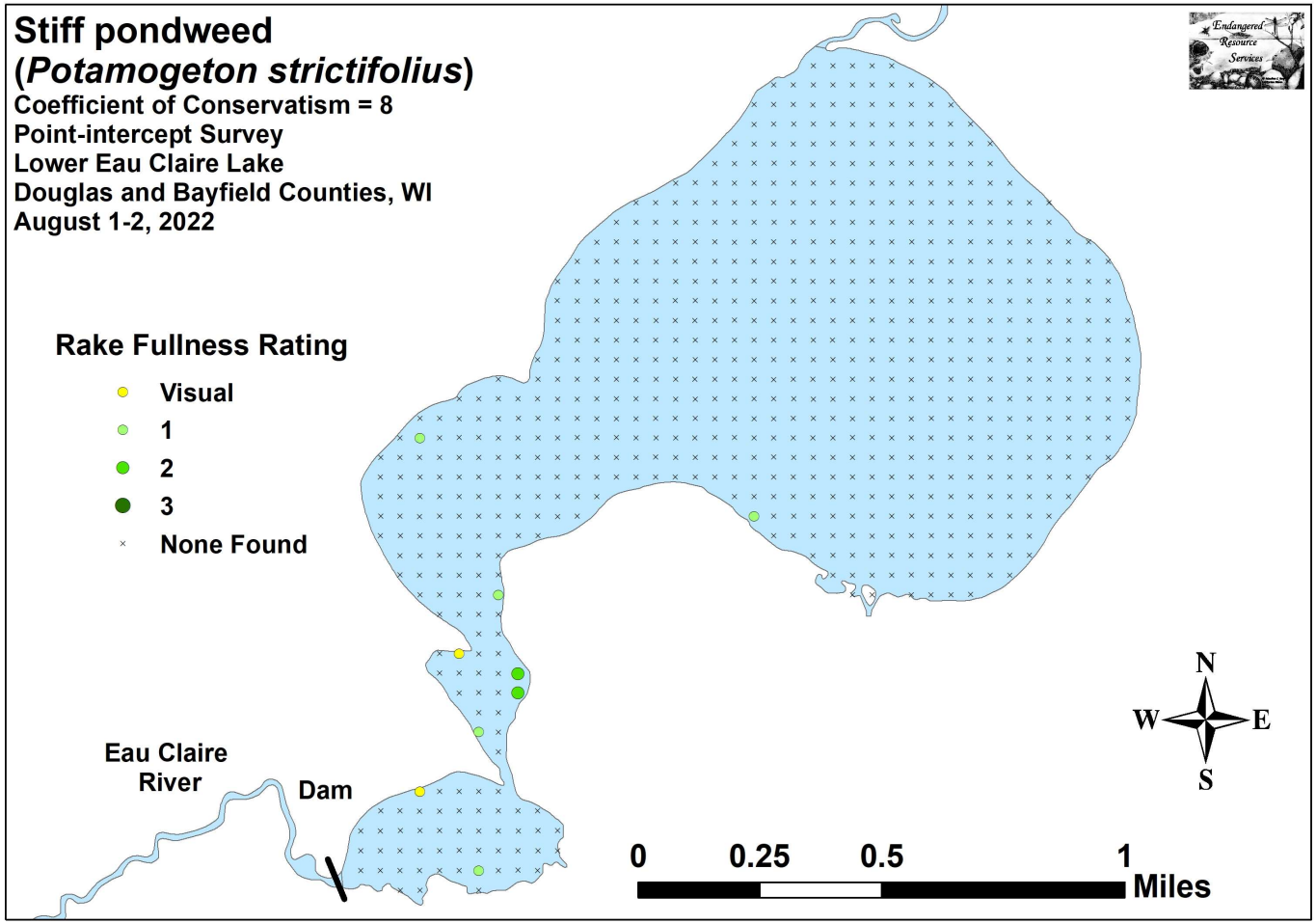
Miles


Stiff pondweed
(Potamogeton strictifolius)
Coefficient of Conservatism = 8
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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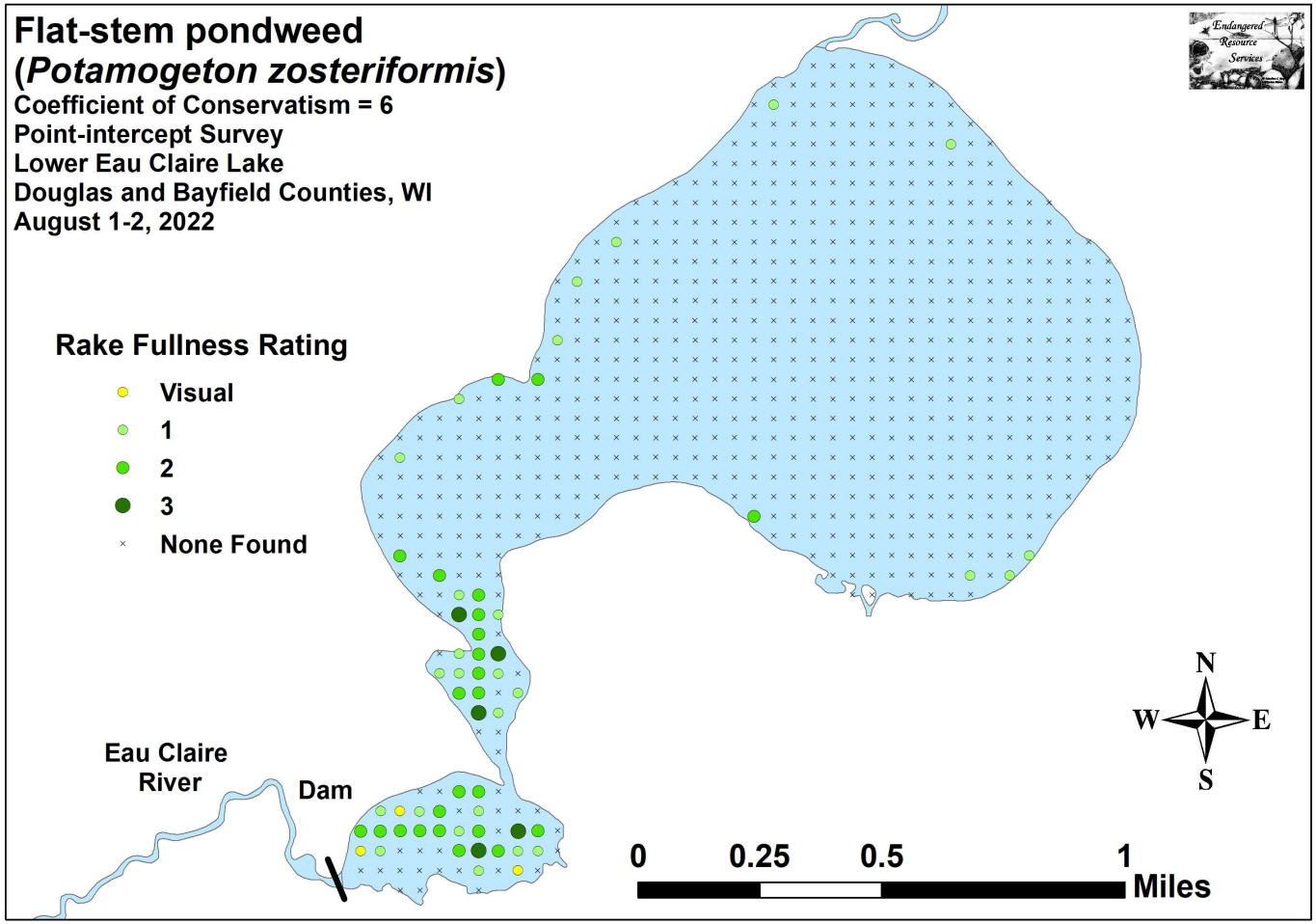
Miles


Flat-stem pondweed
(Potamogeton zosteriformis)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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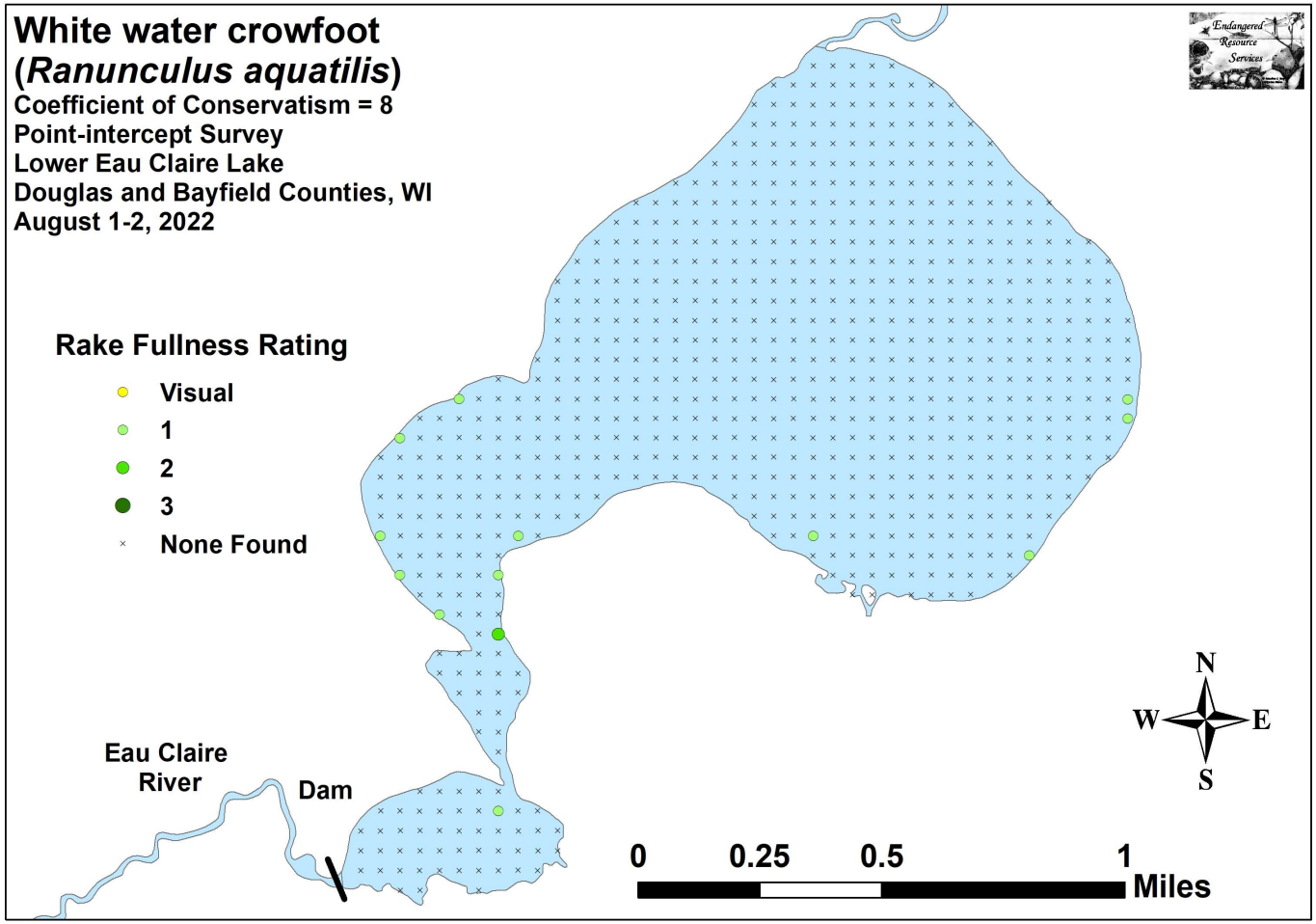
Miles


White water crowfoot
(Ranunculus aquatilis)
Coefficient of Conservatism = 8
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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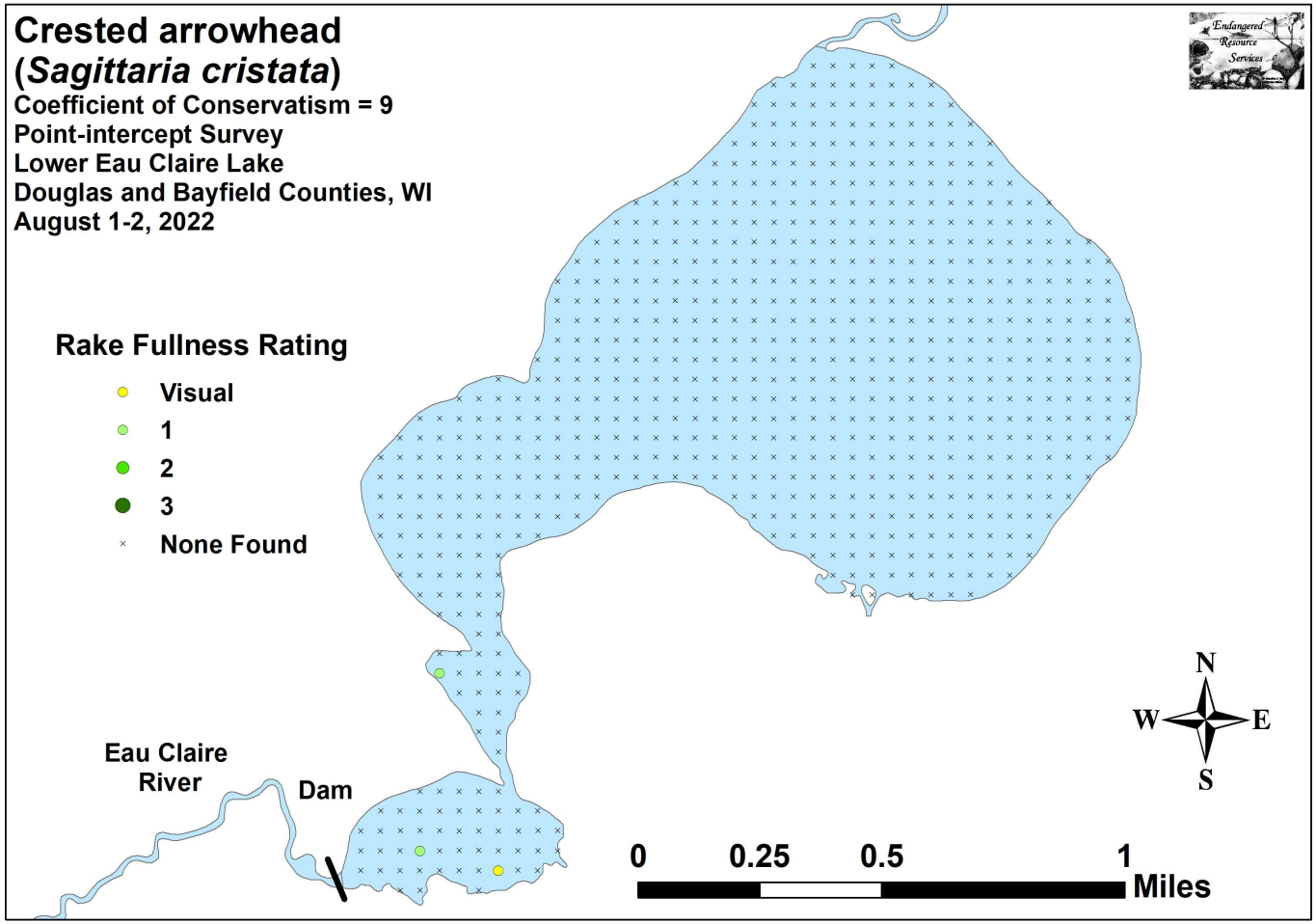
Miles


Crested arrowhead
(Sagittaria cristata)
Coefficient of Conservatism = 9
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
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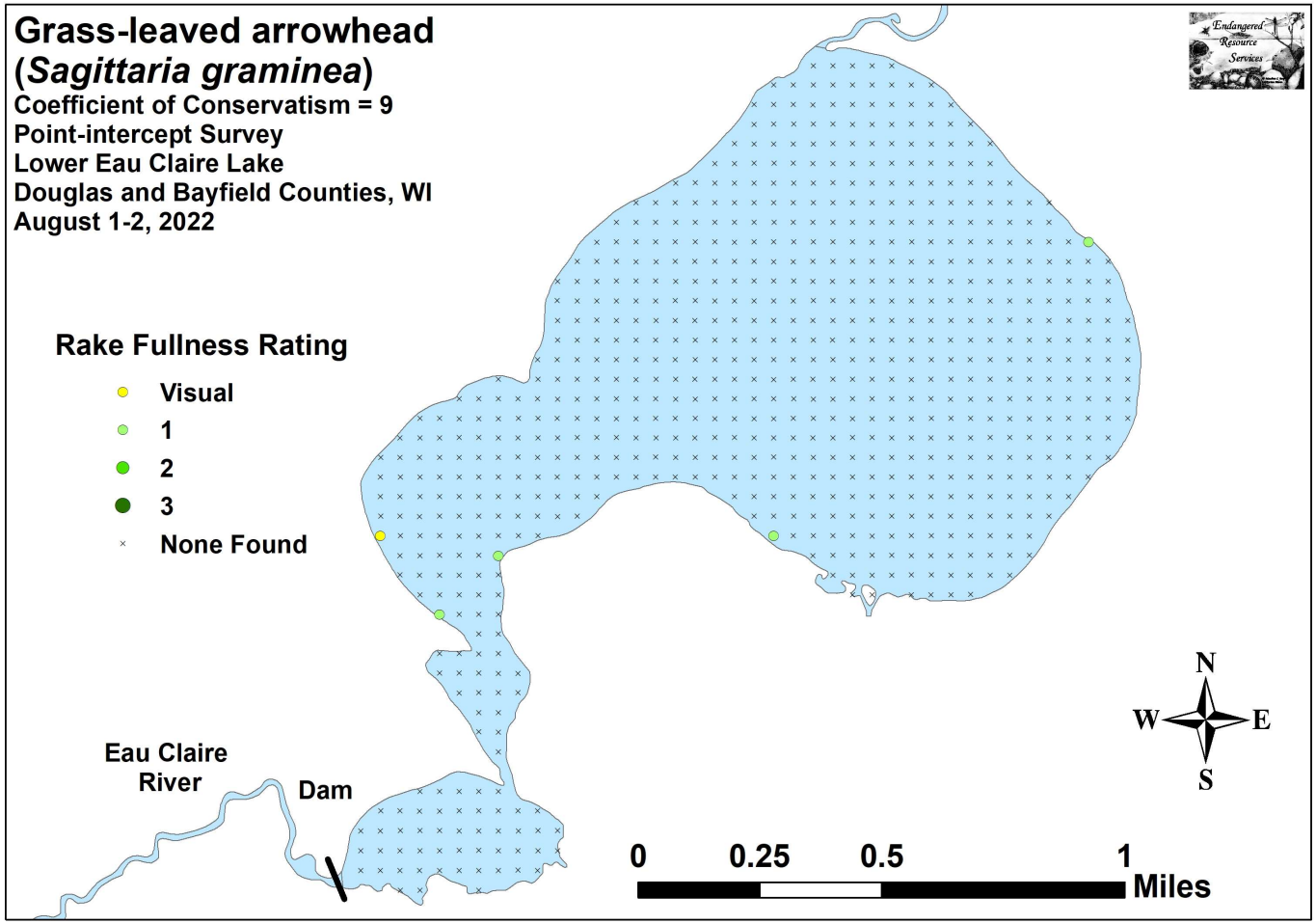
Miles


Grass-leaved arrowhead
(Sagittaria graminea)
Coefficient of Conservatism = 9
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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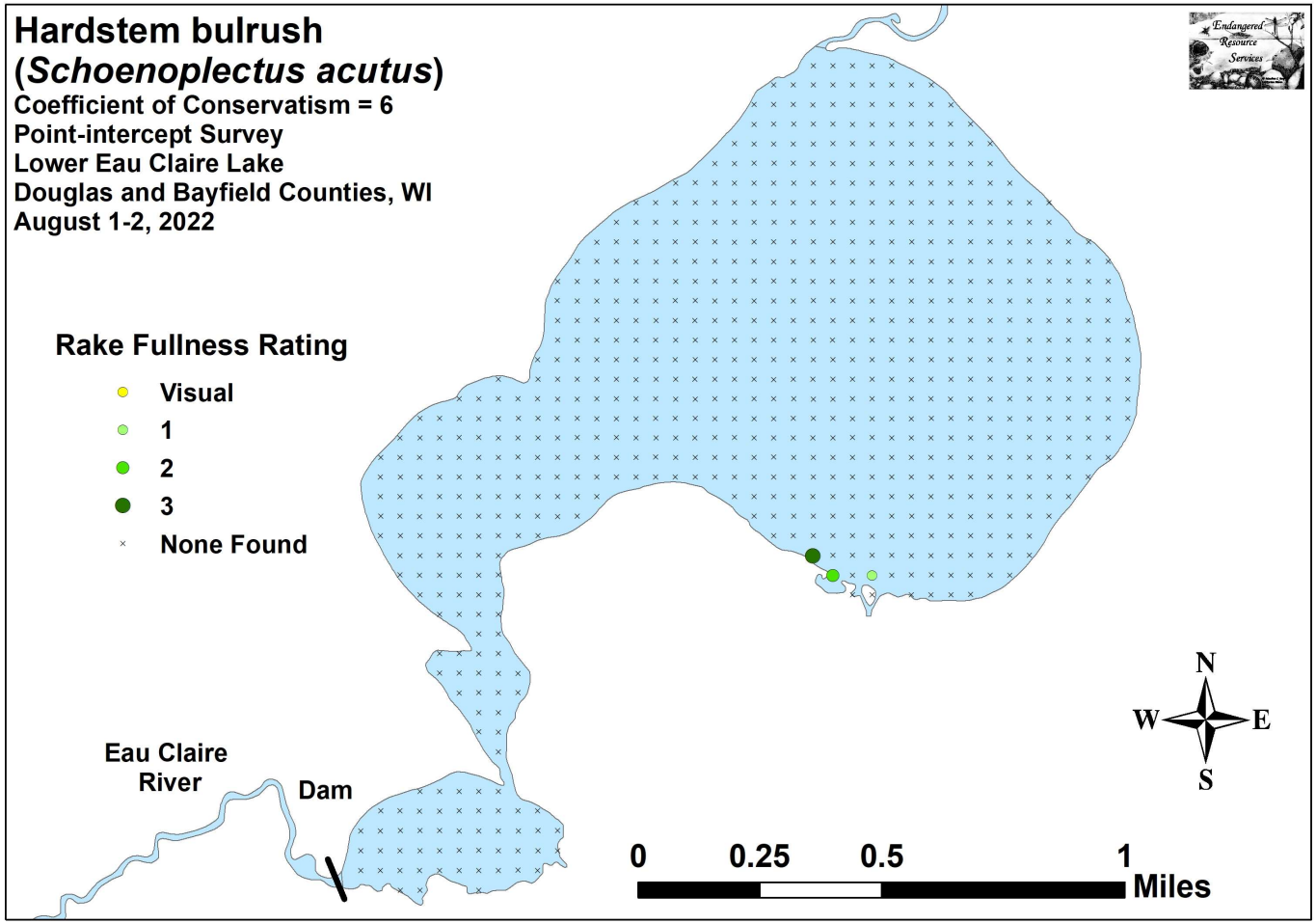
Miles


Hardstem bulrush
(Schoenoplectus acutus)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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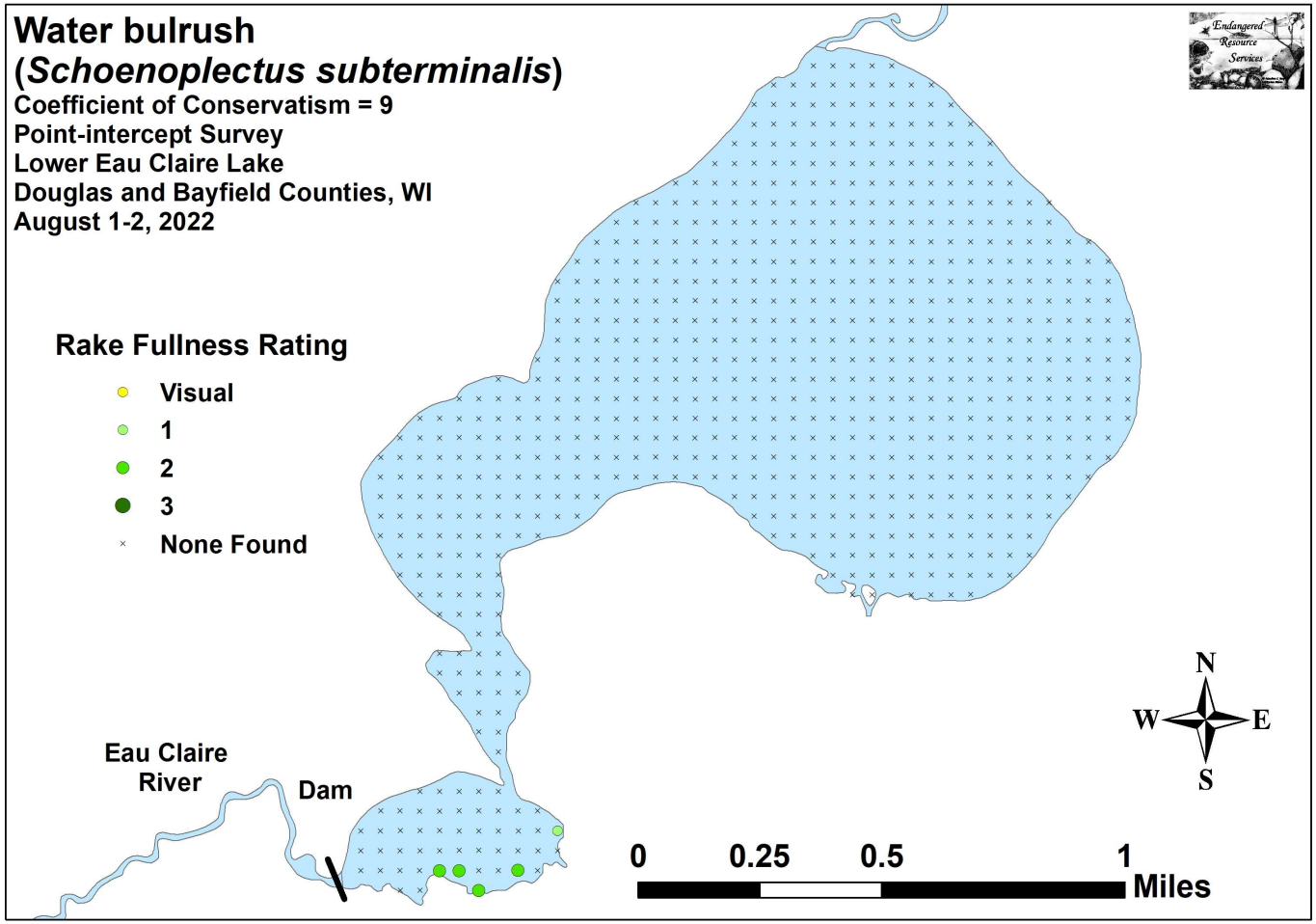
Miles


Water bulrush
(Schoenoplectus subterminalis)
Coefficient of Conservatism = 9
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
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None Found
Eau Claire River
Dam
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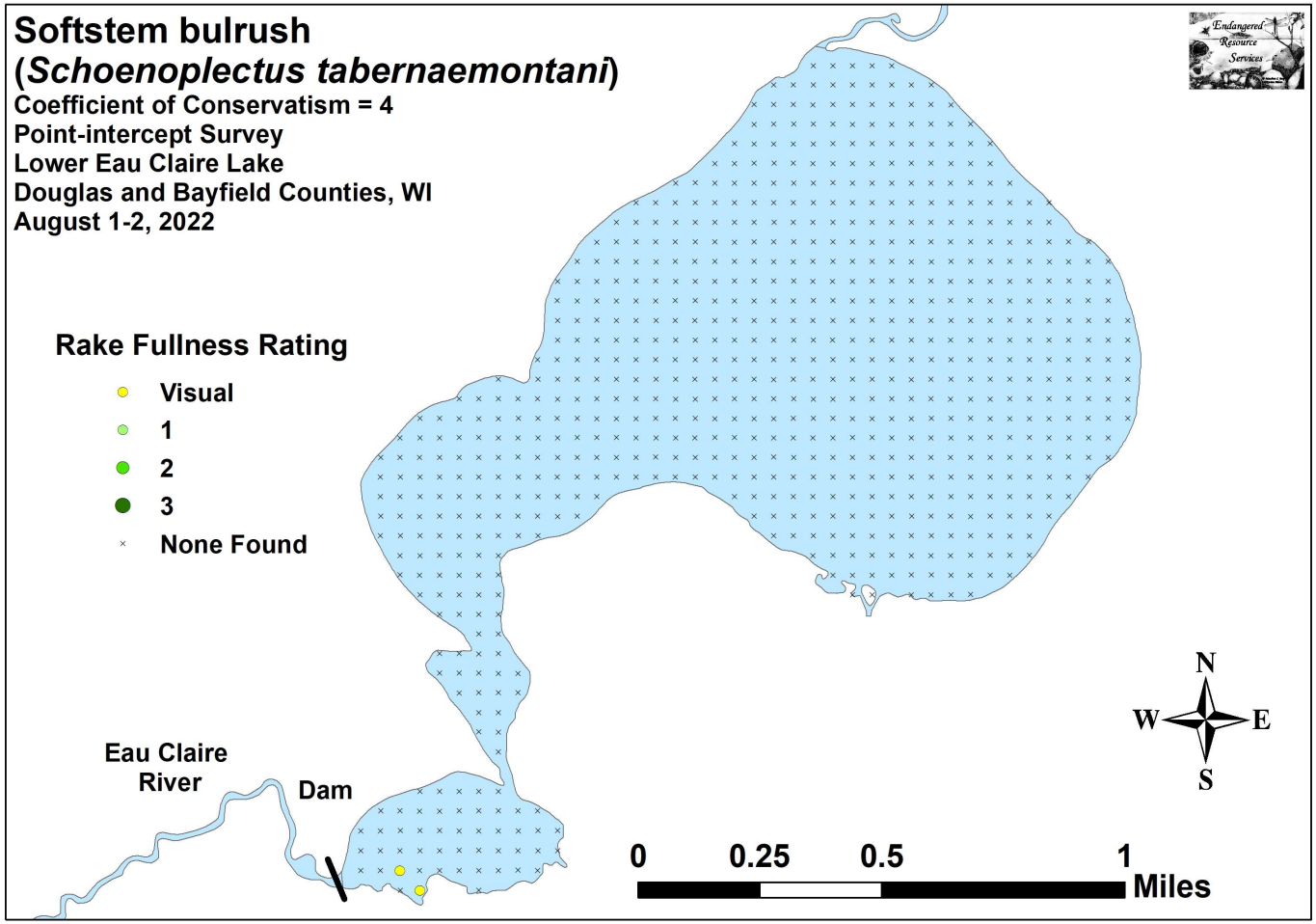
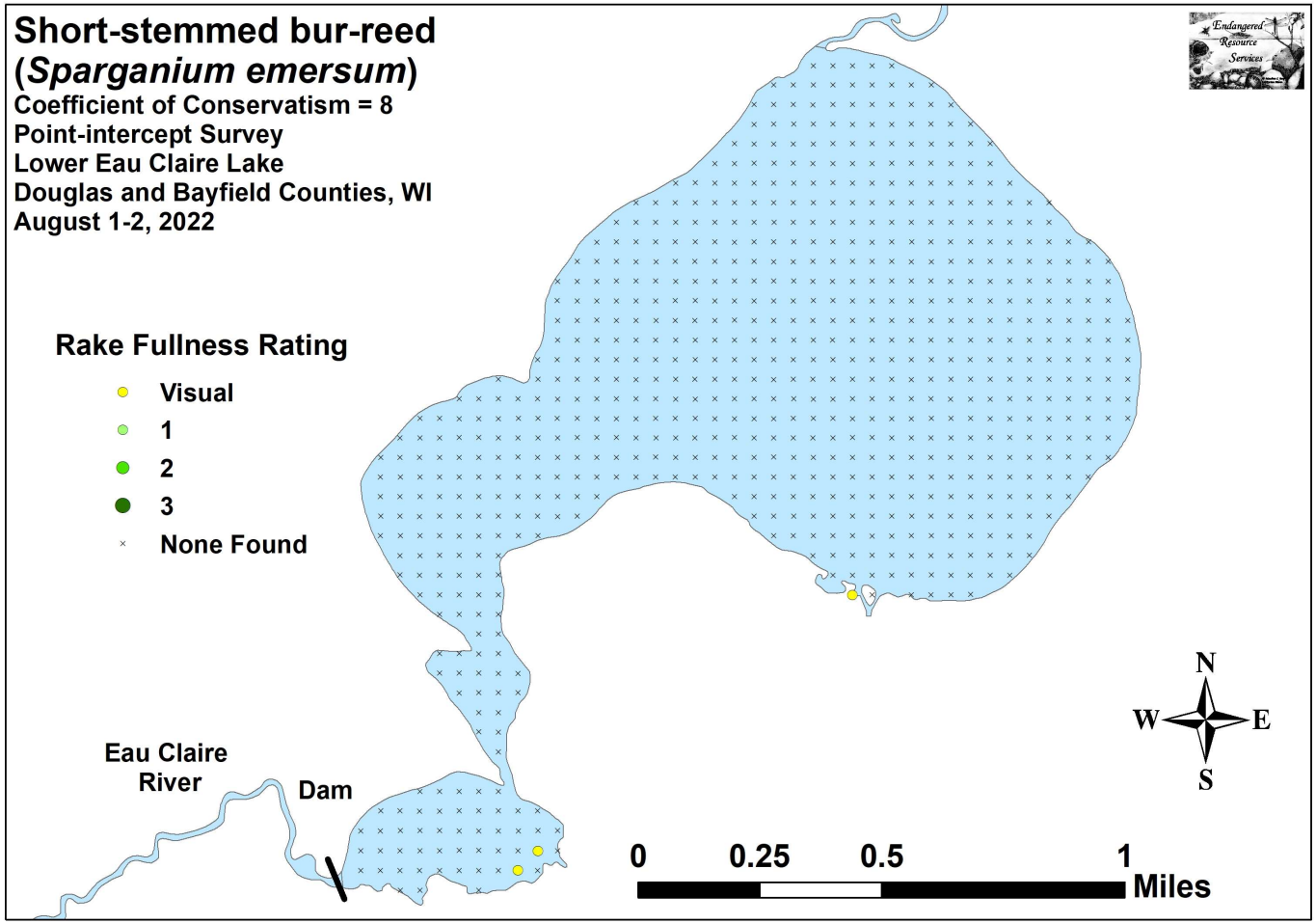
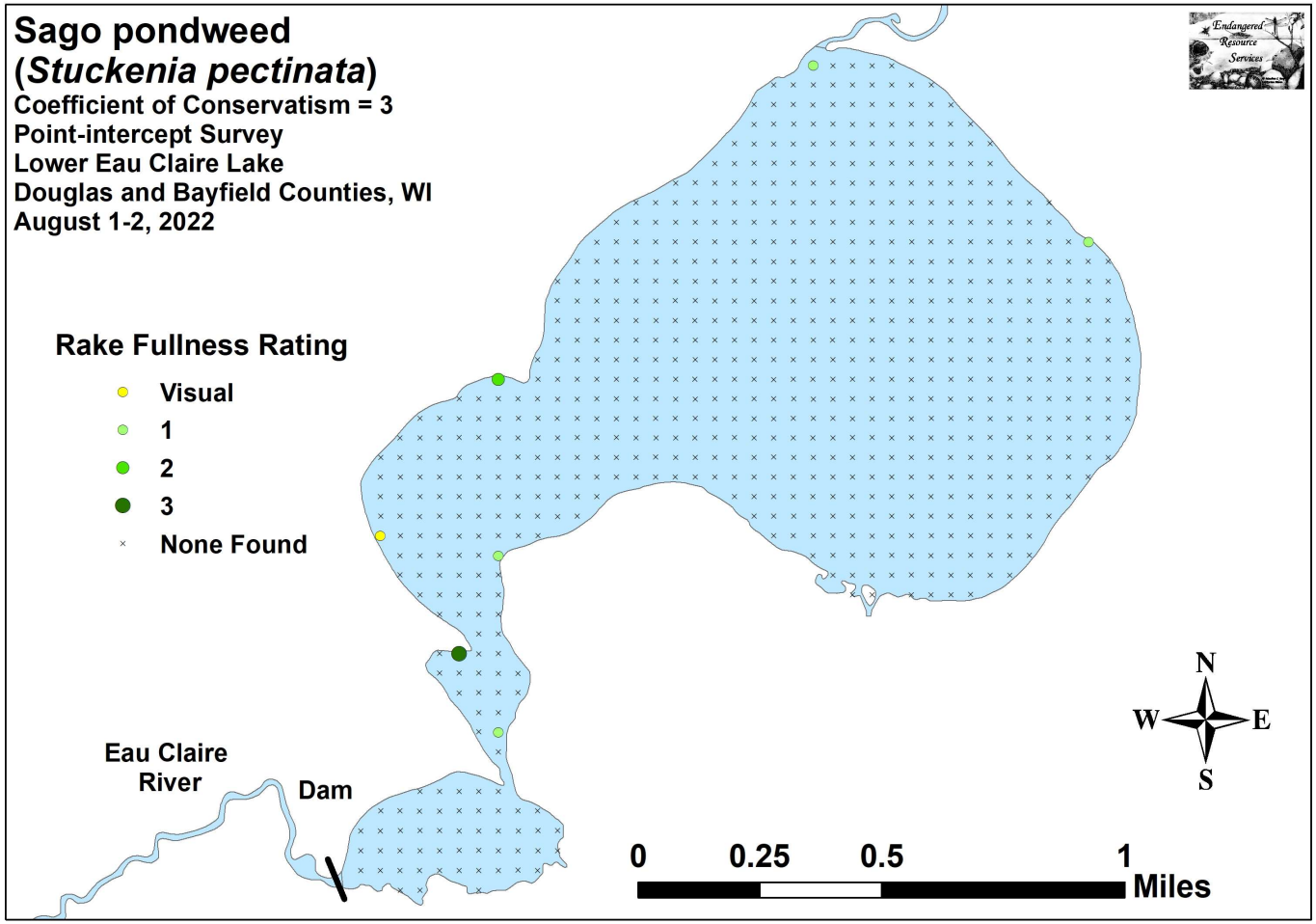
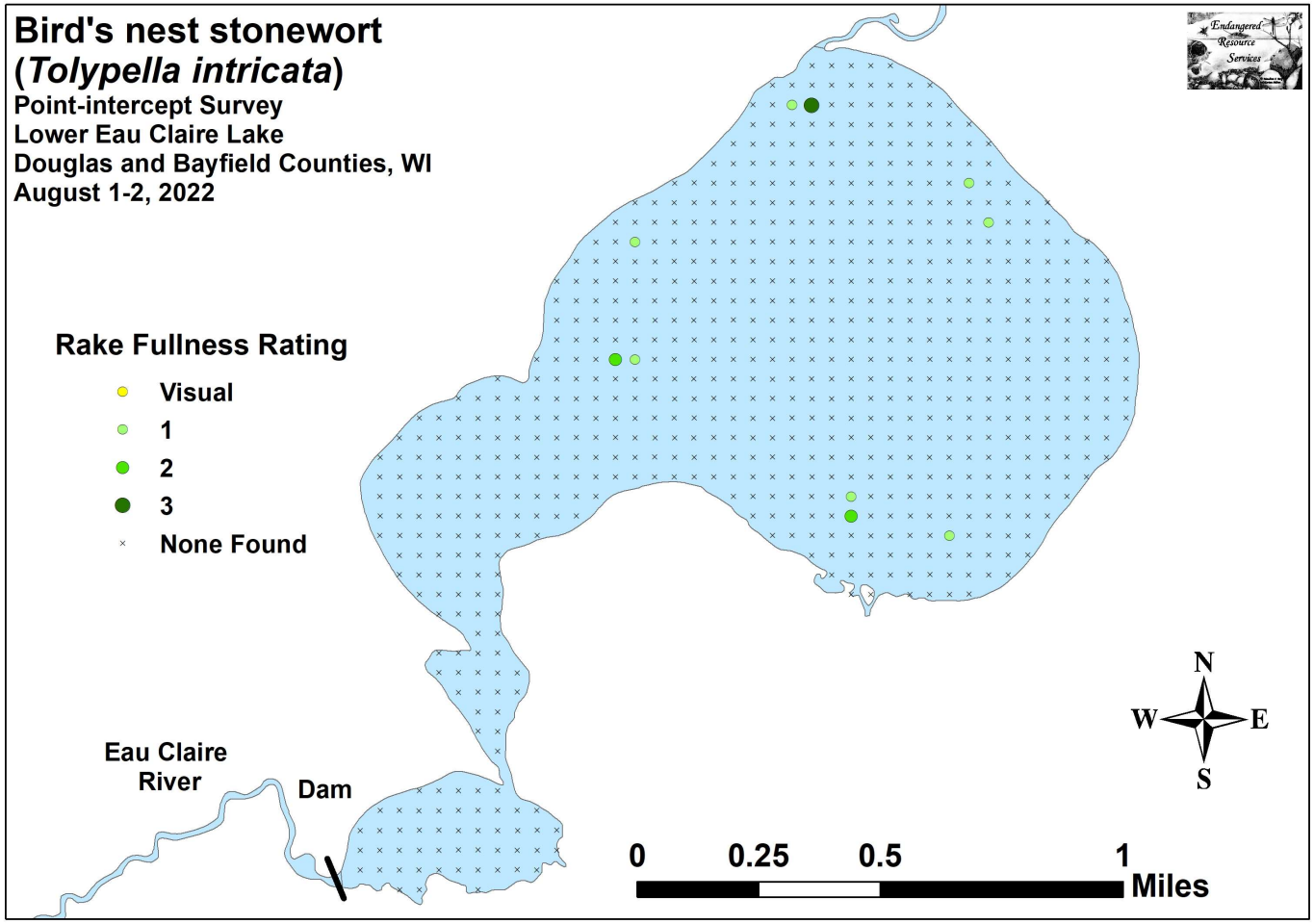
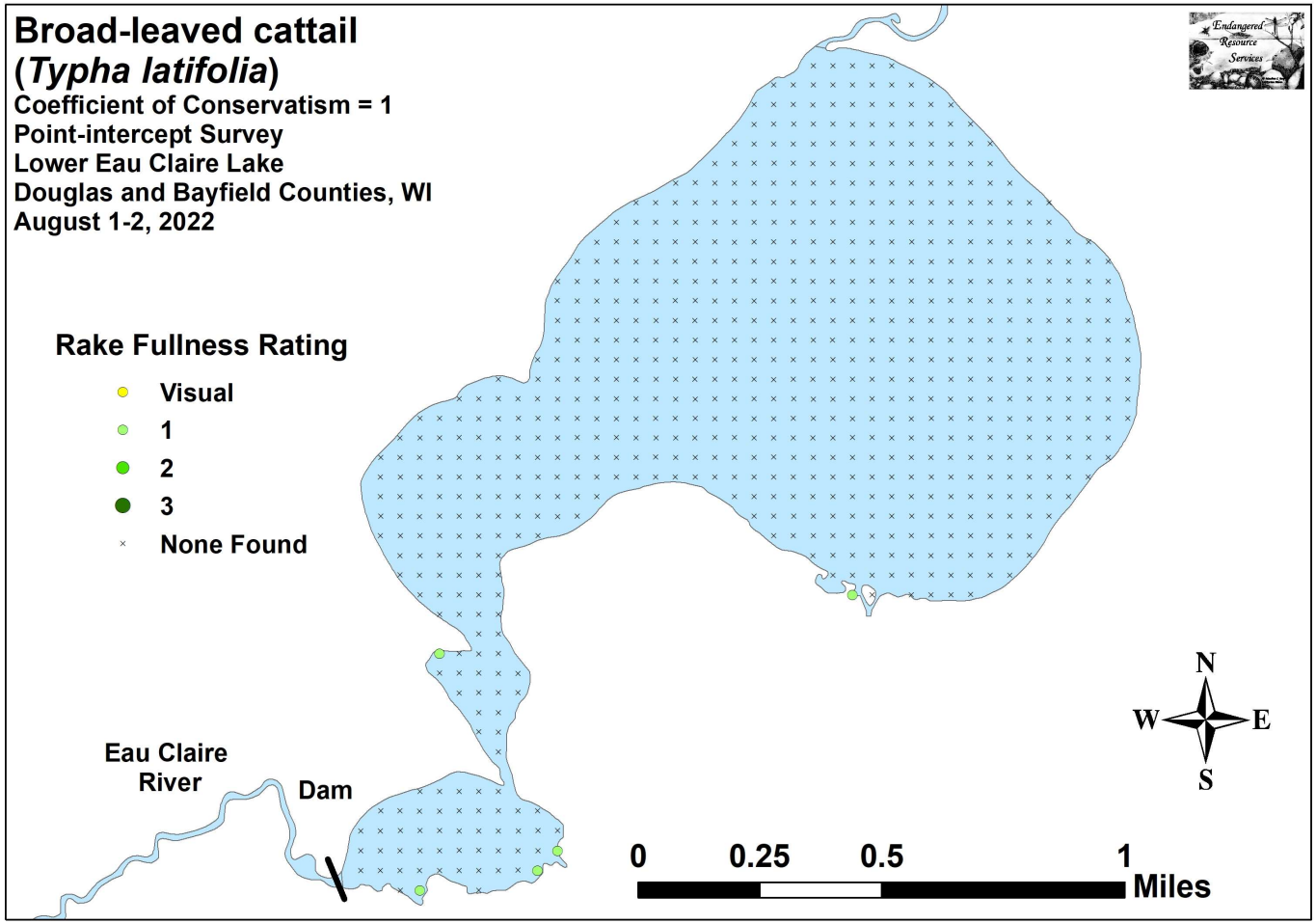
1
Miles


Softstem bulrush
(Schoenoplectus tabernaemontani)
Coefficient of Conservatism = 4
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Short-stemmed bur-reed
(Sparganium emersum)
Coefficient of Conservatism = 8
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Sago pondweed
(Stuckenia pectinata)
Coefficient of Conservatism = 3
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Bird's nest stonewort
(Tolypella intricata)
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Broad-leaved cattail
(Typha latifolia)
Coefficient of Conservatism = 1
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
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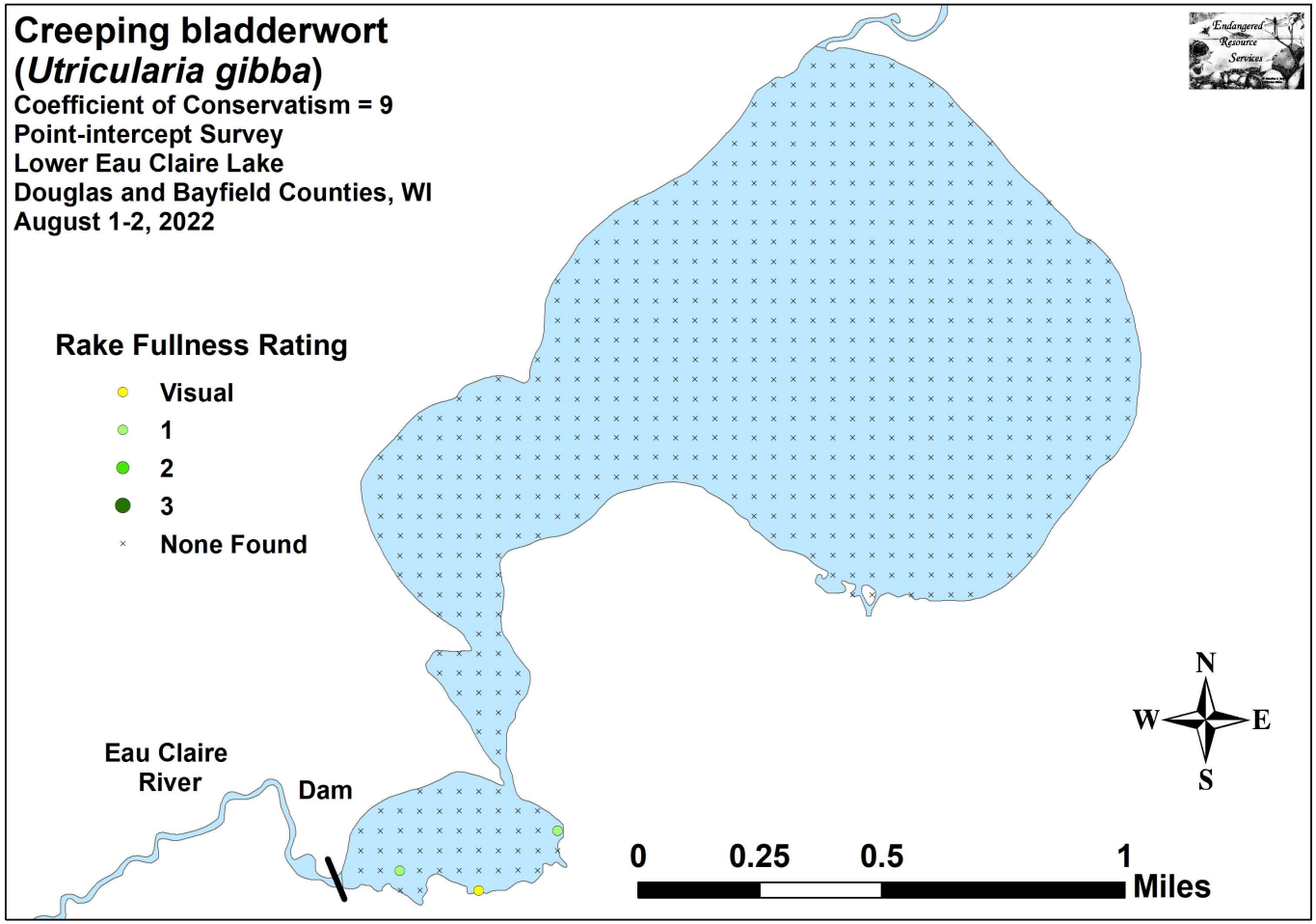
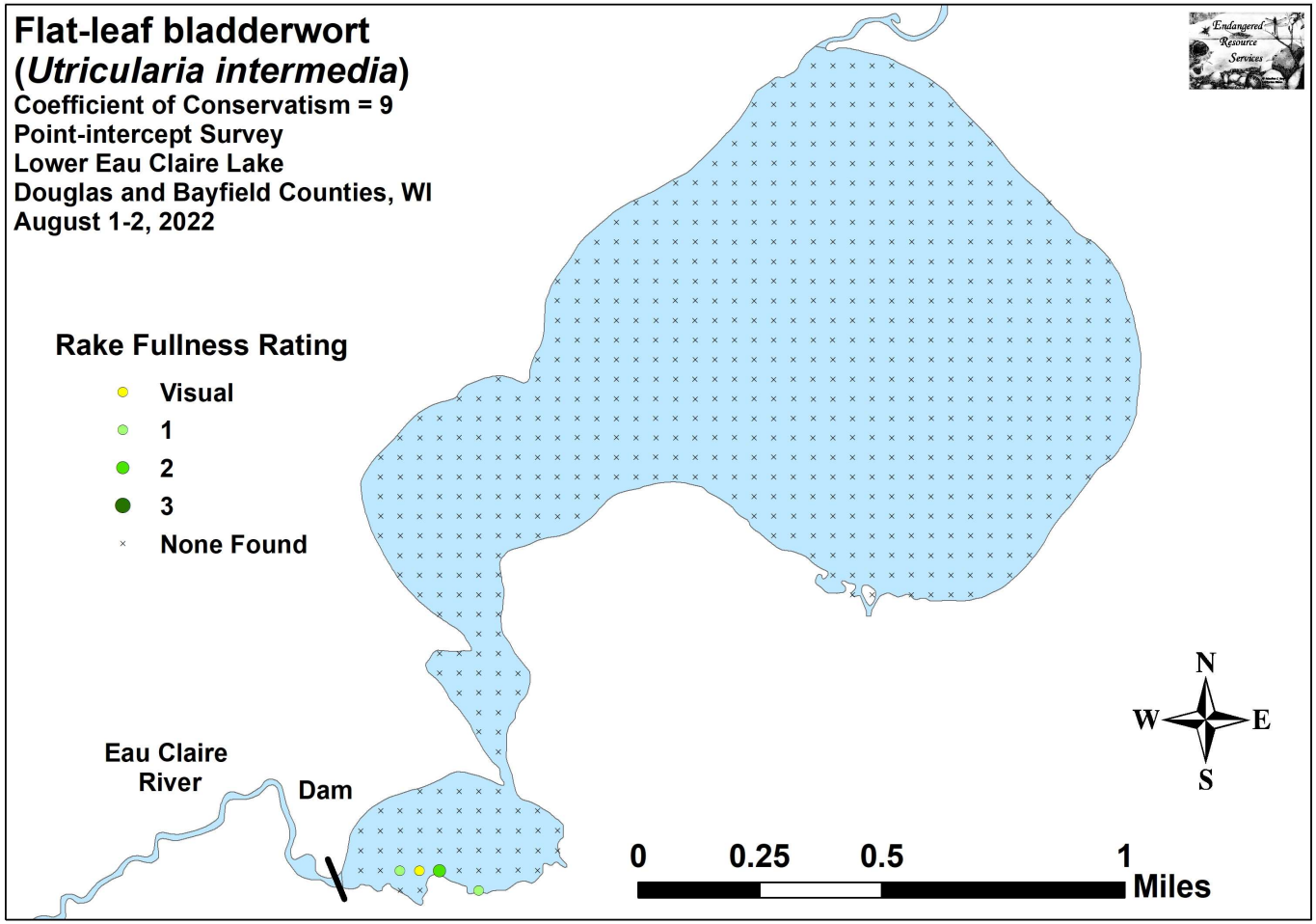
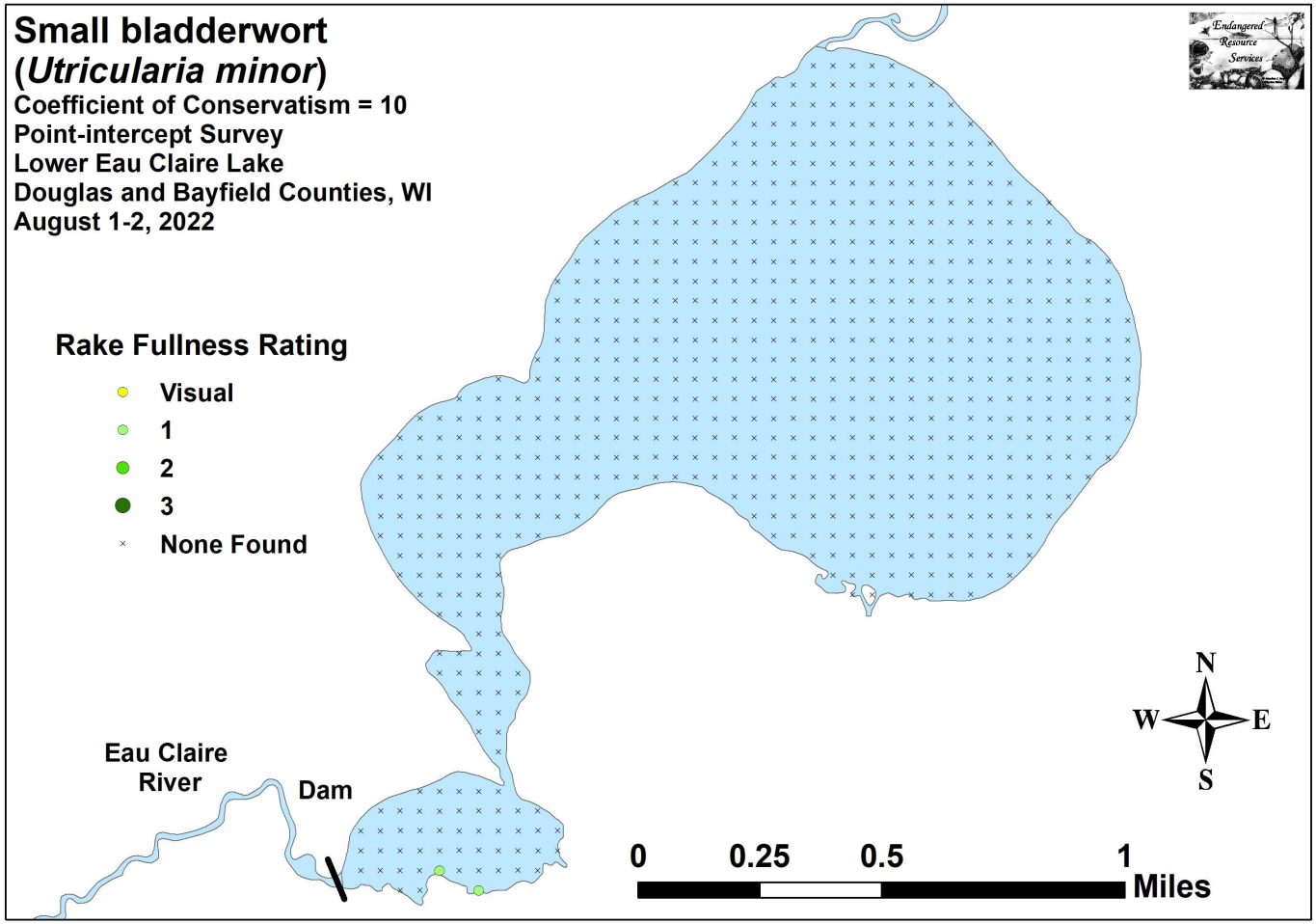
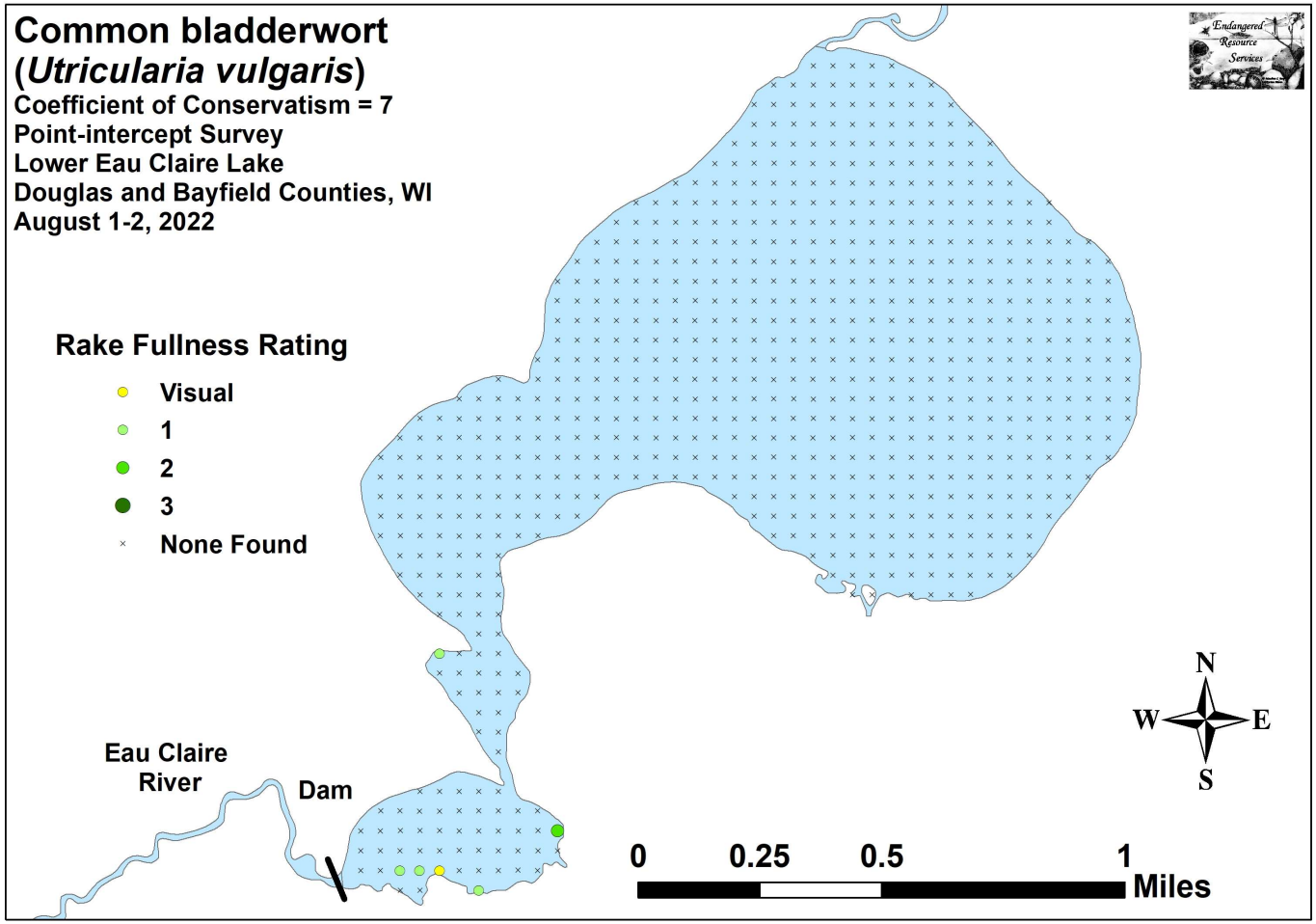
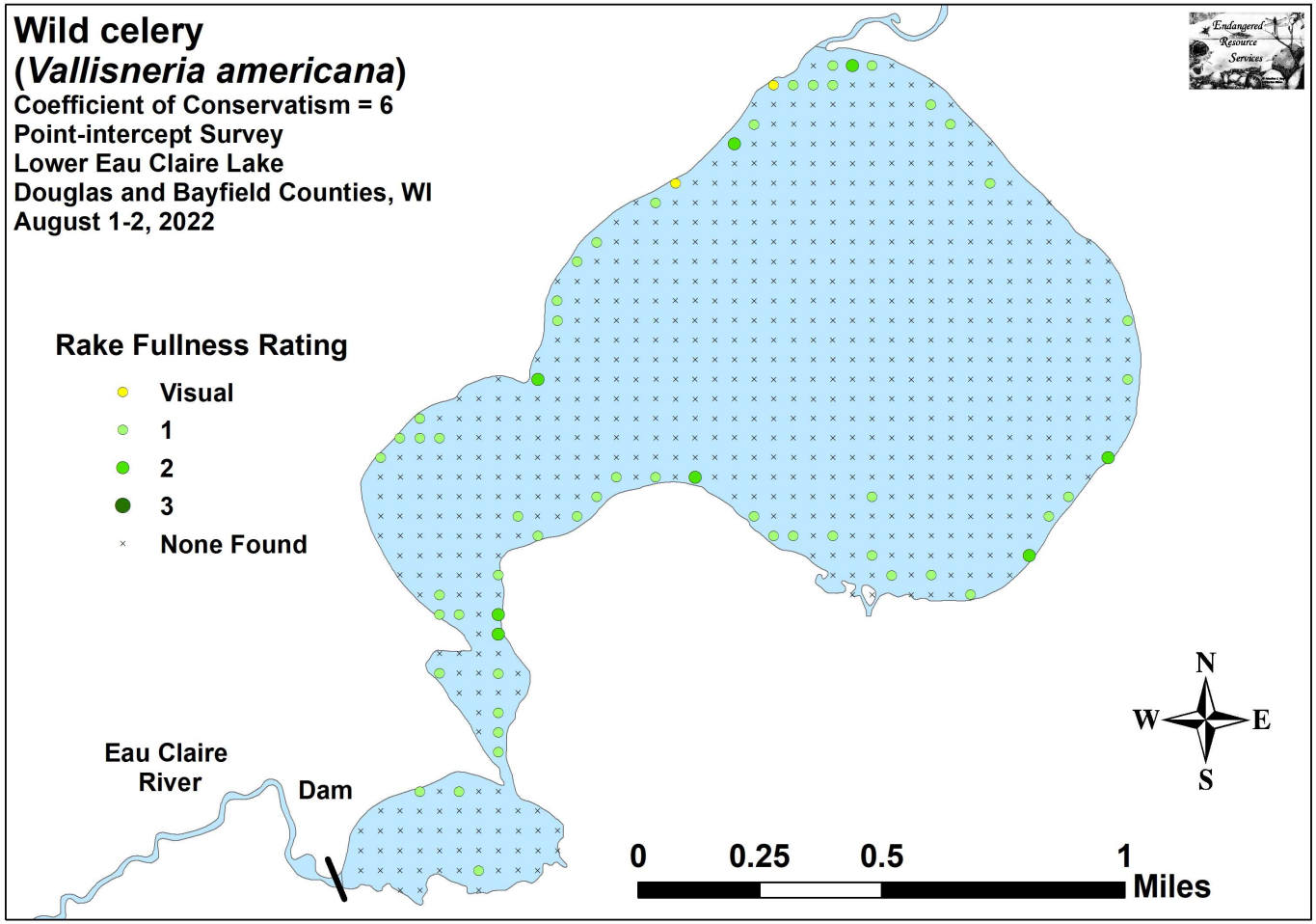
S
0
0.25
0.5
1
Miles


Creeping bladderwort
(Utricularia gibba)
Coefficient of Conservatism = 9
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Flat-leaf bladderwort
(Utricularia intermedia)
Coefficient of Conservatism = 9
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Small bladderwort
(Utricularia minor)
Coefficient of Conservatism = 10
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Common bladderwort
(Utricularia vulgaris)
Coefficient of Conservatism = 7
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Wild celery
(Vallisneria americana)
Coefficient of Conservatism = 6
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Endangered Resource Services
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

Appendix VII: Lower Eau Claire and Cranberry Lakes Plant Species Accounts

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: Aquatic moss
Specimen Location: Cranberry Lake; N46.26045°, W91.54440°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-102
Habitat/Distribution: Found in water 0.5-1.5 meters deep over organic and sandy muck. Rare; scattered locations among muck bogs.
Common Associates: (*Brasenia schreberi*) Watershield, (*Eleocharis acicularis*) Needle spikerush, (*Nuphar variegata*) Spatterdock, (*Nymphaea odorata*) White water lily, (*Schoenoplectus subterminalis*) Water bulrush, (*Vallisneria americana*) Wild celery

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Bidens beckii)* **Water marigold**
Specimen Location: Cranberry Lake; N46.26656°, W91.54509°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-103
Habitat/Distribution: Found in water 0.5-3.5 meters deep over organic and sandy muck. Relatively common; scattered locations throughout both lakes.
Common Associates: (*Lemna trisulca*) Forked duckweed, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Potamogeton pusillus*) Small pondweed, (*Potamogeton richardsonii*) Clasping-leaf pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed, (*Vallisneria americana*) Wild celery

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Brasenia schreberi*) **Watershield**
Specimen Location: Cranberry Lake; N46.26006 °, W91.54595°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-104
Habitat/Distribution: Found in water <1.0 meter deep over sand and muck substrates. Common throughout Cranberry; largely restricted to the narrows and outlet bay in LEC.
Common Associates: (*Lemna trisulca*) Forked duckweed, (*Nuphar variegata*) Spatterdock, (*Nymphaea odorata*) White water lily, (*Sparganium emersum*) Short-stemmed bur-reed, (*Utricularia vulgaris*) Common bladderwort

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Calamagrostis canadensis*) **Bluejoint**
Specimen Location: Cranberry Lake; N46.26445°, W91.54088°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-105
Habitat/Distribution: Sand and sandy muck at the immediate shoreline of both lakes.
Common Associates: (*Myrica gale*) Sweet gale

County/State: Douglas County, Wisconsin **Date:** 8/1/22
Species: (*Calla palustris*) **Wild calla**
Specimen Location: Lower Eau Claire Lake; N46.25849°, W91.56545°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-106
Habitat/Distribution: Found at the shoreline in <0.25m of water over sandy and organic muck. Rare; a few clusters were seen on bog margins in the outlet bay.
Common Associates: (*Carex comosa*) Bottle brush sedge, (*Dulichium arundinaceum*) Three-way sedge, (*Eleocharis erythropoda*) Bald spikerush, (*Schoenoplectus tabernaemontani*) Softstem bulrush, (*Typha latifolia*) Broad-leaved cattail

County/State: Douglas County, Wisconsin **Date:** 8/1/22
Species: (*Carex comosa*) **Bottle brush sedge**
Specimen Location: Lower Eau Claire Lake; N46.25849°, W91.56545°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-107
Habitat/Distribution: Found at the shoreline in <0.25m of water over organic muck. Rare; a few clusters were seen on bog margins in the outlet bay.
Common Associates: (*Calla palustris*) Wild calla, (*Dulichium arundinaceum*) Three-way sedge, (*Eleocharis erythropoda*) Bald spikerush, (*Nymphaea odorata*) White water lily, (*Typha latifolia*) Broad-leaved cattail

County/State: Douglas County, Wisconsin **Date:** 8/1/22
Species: (*Carex lacustris*) **Lake sedge**
Specimen Location: Lower Eau Claire Lake; N46.26900°, W91.56744°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-108
Habitat/Distribution: Found at the shoreline in <0.25m of water over sand and sandy muck. Only seen at the point.
Common Associates: (*Carex scoparia*) Broom sedge, (*Sparganium americanum*) American bur-reed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Carex lasiocarpa*) **Narrow-leaved woolly sedge**
Specimen Location: Cranberry Lake; N46.26545°, W91.54714°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-109
Habitat/Distribution: Found at the shoreline in <0.25m of water over sand and organic muck. Scattered in adjacent wetlands, on bogs, and in sheltered bays.
Common Associates: (*Bidens beckii)* Water marigold, (*Najas flexilis*) Slender naiad, (*Nymphaea odorata*) White water lily, (*Schoenoplectus acutus*) Hardstem bulrush, (*Typha latifolia*) Broad-leaved cattail

County/State: Douglas County, Wisconsin **Date:** 8/1/22
Species: (*Carex scoparia*) **Broom sedge**
Specimen Location: Lower Eau Claire Lake; N46.26900°, W91.56744°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-110
Habitat/Distribution: Rare; only seen at the point. Clusters of plants were found at the shoreline over sand.
Common Associates: (*Carex lacustris*) Lake sedge, (*Sparganium americanum*) American bur-reed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Carex utriculata*) **Common yellow lake sedge**
Specimen Location: Cranberry Lake; N46.26656°, W91.54509°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-111
Habitat/Distribution: Found in <0.25m of water over sand and sandy muck. Scattered on sheltered sand flats and in adjacent wetlands.
Common Associates: (*Equisetum fluviatile*) Water horsetail, (*Phragmites australis americanus*) Common reed, (*Schoenoplectus acutus*) Hardstem bulrush

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Ceratophyllum demersum*) **Coontail**
Specimen Location: Cranberry Lake; N46.26009°, W91.54439°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-112
Habitat/Distribution: Found throughout the littoral zone over organic and sandy muck. Common throughout both lakes; especially over nutrient-rich muck.
Common Associates: (*Lemna trisulca*) Forked duckweed, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Potamogeton richardsonii*) Clasping-leaf pondweed, (*Potamogeton robbinsii*) Fern pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Chara* sp.) **Muskgrass**
Specimen Location: Cranberry Lake; N46.26112°, W91.54754°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-113
Habitat/Distribution: Multiple species found in a variety of habitats. Common and widespread throughout both lakes.
Common Associates: (*Eleocharis acicularis*) Needle spikerush, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Najas flexilis*) Slender naiad, (*Nitella* sp.) Nitella, (*Tolypella intricata*) Bird's nest stonewort, (*Vallisneria americana*) Wild celery

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Cladium mariscoides*) **Smooth sawgrass**
Specimen Location: Cranberry Lake; N46.26654°, W91.54613°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-114
Habitat/Distribution: Found in water <0.5 meter deep over sand and sandy muck. Scattered among other emergents on both sides of the Cranberry Channel.
Common Associates: (*Carex utriculata*) Common yellow lake sedge, (*Phragmites australis americanus*) Common reed, (*Schoenoplectus acutus*) Hardstem bulrush, (*Schoenoplectus torreyi*) Torrey's three-square bulrush

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Dulichium arundinaceum*) **Three-way sedge**
Specimen Location: Cranberry Lake; N46.26009°, W91.54439°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-115
Habitat/Distribution: Found in water <0.25 meter deep over firm sand and muck. Uncommon; most beds were found near bogs.
Common Associates: (*Brasenia schreberi*) Watershield, (*Carex comosa*) Bottle brush sedge, (*Eleocharis erythropoda*) Bald spikerush, (*Nymphaea odorata*) White water lily, (*Typha latifolia*) Broad-leaved cattail

County/State: Douglas County, Wisconsin **Date:** 8/1/22
Species: (*Elatine minima*) **Waterwort**
Specimen Location: Lower Eau Claire Lake; N46.27253°, W91.56585°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-116
Habitat/Distribution: Found in water <0.5 meter deep over sand. Rare; a few patches were found on the lake's most pristine shorelines.
Common Associates: (*Eleocharis acicularis*) Needle spikerush, *Isoetes echinospora*) Spiny spored quillwort, (*Najas flexilis*) Slender naiad, (*Ranunculus aquatilis*) White water crowfoot

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Eleocharis acicularis*) **Needle spikerush**
Specimen Location: Cranberry Lake; N46.26085°, W91.54078°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-117
Habitat/Distribution: Found in water <1.5 meters deep over sand. Also found growing as an emergent on muck bogs. Common and widespread.
Common Associates: (*Chara* sp.) Muskgrass, (*Eleocharis palustris*) Creeping spikerush, (*Najas flexilis*) Slender naiad

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Eleocharis erythropoda*) **Bald spikerush**
Specimen Location: Cranberry Lake; N46.26009°, W91.54439°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-118
Habitat/Distribution: Found at the shoreline in <0.25m of water over organic muck. Relatively common on bog margins of both lakes.
Common Associates: (*Brasenia schreberi*) Watershield, (*Nymphaea odorata*) White water lily, (*Schoenoplectus tabernaemontani*) Softstem bulrush

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Eleocharis palustris*) **Creeping spikerush**
Specimen Location: Cranberry Lake; N46.26085°, W91.54078°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-119
Habitat/Distribution: Found in water <0.5 meter deep over firm sand and muck. Uncommon; primarily found on shallow sand flats on either side of the Cranberry Channel.
Common Associates: (*Chara* sp.) Muskgrass, (*Eleocharis acicularis*) Needle spikerush, (*Equisetum fluviatile*) Water horsetail, (*Najas flexilis*) Slender naiad, (*Schoenoplectus acutus*) Hardstem bulrush

County/State: Douglas County, Wisconsin **Date:** 8/1/22
Species: (*Elodea canadensis*) **Common waterweed**
Specimen Location: Lower Eau Claire Lake; N46.26084°, W91.56467°
Also found in Cranberry Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-120
Habitat/Distribution: Found in water 1-6 meters deep over sand and muck. Scattered throughout – becoming common in the outlet bay of LEC.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Potamogeton friesii*) Fries' pondweed, (*Potamogeton pusillus*) Small pondweed, (*Potamogeton richardsonii*) Clasping-leaf pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Equisetum fluviatile*) **Water horsetail**
Specimen Location: Cranberry Lake; N46.26656°, W91.54509°
Also found in Lower Eau Claire Lake
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-121
Habitat/Distribution: Found in water <0.5 meter deep over firm sand and muck. Uncommon; primarily found on shallow sand flats on either side of the Cranberry Channel.
Common Associates: (*Carex utriculata*) Common yellow lake sedge, (*Eleocharis palustris*) Creeping spikerush, (*Phragmites australis americanus*) Common reed, (*Schoenoplectus acutus*) Hardstem bulrush

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Glyceria borealis*) **Northern manna grass**
Specimen Location: Cranberry Lake; N46.26049°, W91.54129°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-122
Habitat/Distribution: Found in water <1.0 meter deep over sand. Rare; a few plants were found at the point along the creek inlet.
Common Associates: Aquatic moss, (*Chara* sp.) Muskgrass, (*Eleocharis acicularis*) Needle spikerush, (*Potamogeton gramineus*) Variable pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Heteranthera dubia*) **Water star-grass**
Specimen Location: Lower Eau Claire Lake; N46.26928°, W91.54635°
Also found on Cranberry Lake
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-123
Habitat/Distribution: Found in water <4.5 meters deep over sand and muck. Uncommon, but widespread throughout both lakes.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Najas flexilis*) Slender naiad, (*Nymphaea odorata*) White water lily, (*Potamogeton pusillus*) Small pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Iris versicolor*) **Northern blue flag**
Specimen Location: Cranberry Lake; N46.26445°, W91.54088°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-124
Habitat/Distribution: Found on firm muck at the immediate shoreline. Scattered clusters occurred on bog edges.
Common Associates: (*Carex lasiocarpa*) Narrow-leaved woolly sedge, (*Carex utriculata*) Common yellow lake sedge

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Isoetes echinospora*) **Spiny-spored quillwort**
Specimen Location: Lower Eau Claire Lake; N46.26866°, W91.54887°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-125
Habitat/Distribution: Found in water <1.5 meters deep over sand and gravel. Uncommon on pristine shorelines.
Common Associates: (*Chara* sp.) Muskgrass, (*Eleocharis acicularis*) Needle spikerush, (*Najas flexilis*) Slender naiad, (*Ranunculus aquatilis*) White water crowfoot, (*Vallisneria americana*) Wild celery

County/State: Douglas County, Wisconsin **Date:** 8/1/22
Species: (*Juncus brevicaudatus*) **Narrow-panicle rush**
Specimen Location: Lower Eau Claire Lake; N46.25849°, W91.56545°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-126
Habitat/Distribution: Rare; a few scattered individuals were found in water <0.25 meter deep over muck at the immediate shoreline and on floating bogs.
Common Associates: (*Brasenia schreberi*) Watershield, (*Calla palustris*) Wild calla, (*Eleocharis erythropoda*) Bald spikerush, (*Nymphaea odorata*) White water lily, (*Schoenoplectus tabernaemontani*) Softstem bulrush

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Juncus canadensis*) **Canada rush**
Specimen Location: Cranberry Lake; N46.26656°, W91.54509°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-127
Habitat/Distribution: Rare; a few scattered individuals were found over firm muck at the immediate shoreline on bog edges.
Common Associates: (*Carex lasiocarpa*) Narrow-leaved woolly sedge, (*Carex utriculata*) Common yellow lake sedge

County/State: Douglas County, Wisconsin **Date:** 8/2/22
Species: (*Juncus effusus*) **Common rush**
Specimen Location: Lower Eau Claire Lake; N46.25883°, W91.56948°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-128
Habitat/Distribution: Rare; a few scattered individuals were found along the north shoreline at the dam.
Common Associates: (*Lythrum salicaria*) Purple loosestrife, (*Phalaris arundinacea*) Reed canary grass

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Lemna minor*) **Small duckweed**
Specimen Location: Cranberry Lake; N46.26656°, W91.54509°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-129
Habitat/Distribution: Rare; scattered individuals were found among floating-leaf species in the far ends of bays with organic muck.
Common Associates: (*Brasenia schreberi*) Watershield, (*Nymphaea odorata*) White water lily, (*Spirodela polyrhiza*) Large duckweed

County/State: Douglas County, Wisconsin **Date:** 6/29/22
Species: (*Lemna trisulca*) **Forked duckweed**
Specimen Location: Lower Eau Claire Lake; N46.26553°, W91.56396°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-130
Habitat/Distribution: Found in water <5.0 meters deep over sand and muck. Scattered locations throughout – becoming common in the outlet bay.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Najas flexilis*) Slender naiad, (*Nymphaea odorata*) White water lily, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Douglas County, Wisconsin **Date:** 8/2/22
Species: (*Lythrum salicaria*) **Purple loosestrife**
Specimen Location: Lower Eau Claire Lake; N46.25883°, W91.56948°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-131
Habitat/Distribution: Rare; a few scattered individuals were found along the north shoreline at the dam.
Common Associates: (*Juncus effusus*) Common rush, (*Phalaris arundinacea*) Reed canary grass

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Myosotis scorpioides*) **Common forget-me-not**
Specimen Location: Cranberry Lake; N46.26085°, W91.54078°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-132
Habitat/Distribution: Rare; a single large bed occurred in <0.25m of water over soft organic muck in a cold-water seep along a shaded shoreline.
Common Associates: (*Eleocharis erythropoda*) Bald spikerush, (*Potamogeton alpinus*) Alpine pondweed

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Myrica gale*) **Sweet gale**
Specimen Location: Cranberry Lake; N46.26545°, W91.54714°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-133
Habitat/Distribution: Scattered shoreline locations throughout the system over sand and sandy muck.
Common Associates: (*Calamagrostis canadensis*) Bluejoint

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Myriophyllum sibiricum*) **Northern water-milfoil**
Specimen Location: Cranberry Lake; N46.26043°, W91.54544°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-134
Habitat/Distribution: Found in water <6.0 meters deep over sand and muck. A dominant species throughout LEC, but only scattered on Cranberry.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Najas flexilis*) Slender naiad, (*Potamogeton friesii*) Fries' pondweed, (*Potamogeton pusillus*) Small pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Myriophyllum verticillatum*) **Whorled water-milfoil**
Specimen Location: Cranberry Lake; N46.26043°, W91.54544°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-135
Habitat/Distribution: Found in water <0.5 meter deep over muck. Uncommon; scattered along the south shoreline among floating bog mats.
Common Associates: (*Chara* sp.) Muskgrass, (*Najas flexilis*) Slender naiad, (*Nymphaea odorata*) White water lily, (*Utricularia intermedia*) Flat-leaf bladderwort, (*Utricularia vulgaris*) Common bladderwort

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Najas flexilis*) **Slender naiad**
Specimen Location: Cranberry Lake; N46.26547°, W91.54558°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-136
Habitat/Distribution: Found in water <2.5 meters deep over muck, marl, and sand. A dominant species throughout; especially on Cranberry.
Common Associates: (*Chara* sp.) Muskgrass, (*Nymphaea odorata*) White water lily, (*Potamogeton amplifolius*) Large-leaf pondweed, (*Potamogeton friesii*) Fries' pondweed, (*Potamogeton pusillus*) Small pondweed

County/State: Douglas County, Wisconsin **Date:** 6/29/22
Species: (*Nitella* sp.) **Nitella**
Specimen Location: Lower Eau Claire Lake; N46.27137°, W91.56497°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-137
Habitat/Distribution: Found in water 2.0-6.5 meters deep over sand. Common and widespread scattered among other Charophytes.
Common Associates: (*Chara* sp.) Muskgrass, (*Najas flexilis*) Slender naiad, (*Potamogeton pusillus*) Small pondweed, (*Tolypella intricata*) Bird's nest stonewort

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Nuphar variegata*) **Spatterdock**
Specimen Location: Cranberry Lake; N46.26006 °, W91.54595°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-138
Habitat/Distribution: Found in water <1.5 meters deep over muck and sand. Relatively common throughout Cranberry, but largely restricted to the narrows and outlet bay on LEC.
Common Associates: (*Brasenia schreberi*) Watershield, (*Lemna trisulca*) Forked duckweed, (*Nymphaea odorata*) White water lily, (*Potamogeton robbinsii*) Fern pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Nymphaea odorata*) **White water lily**
Specimen Location: Cranberry Lake; N46.26006 °, W91.54595°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-139
Habitat/Distribution: Found in water <1.5 meters deep over sandy and organic muck. Common throughout Cranberry, but largely restricted to the narrows and outlet bay on LEC.
Common Associates: (*Brasenia schreberi*) Watershield, (*Lemna trisulca*) Forked duckweed, (*Najas flexilis*) Slender naiad, (*Nuphar variegata*) Spatterdock, (*Utricularia vulgaris*) Common bladderwort

County/State: Douglas County, Wisconsin **Date:** 8/2/22
Species: (*Phalaris arundinacea*) **Reed canary grass**
Specimen Location: Lower Eau Claire Lake; N46.25883°, W91.56948°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-140
Habitat/Distribution: Rare; a few scattered individuals were found along the north shoreline at the dam.
Common Associates: (*Juncus effusus*) Common rush, (*Lythrum salicaria*) Purple loosestrife

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Phragmites australis americanus*) **Common reed**
Specimen Location: Cranberry Lake; N46.26656°, W91.54509°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-141
Habitat/Distribution: Found in water <0.5 meter deep over sand. A single large bed was located on the north shoreline. Culms were red and leaf sheaths were detached confirming subspecies.
Common Associates: (*Carex utriculata*) Common yellow lake sedge, (*Equisetum fluviatile*) Water horsetail, (*Schoenoplectus acutus*) Hardstem bulrush

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Polygonum amphibium*) **Water smartweed**
Specimen Location: Cranberry Lake; N46.26085°, W91.54078°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-142
Habitat/Distribution: Found in water <1.0 meter deep over firm sand and muck. Uncommon; a few beds were located in the west bay.
Common Associates: (*Brasenia schreberi*) Watershield, (*Dulichium arundinaceum*) Three-way sedge, (*Nuphar variegata*) Spatterdock, (*Nymphaea odorata*) White water lily

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton alpinus*) **Alpine pondweed**
Specimen Location: Cranberry Lake; N46.26043°, W91.54544°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-143
Habitat/Distribution: Found in water <0.5 meter deep over soft organic muck. Uncommon; scattered plants located next to muck bogs and spring inlets.
Common Associates: (*Brasenia schreberi*) Watershield, (*Chara* sp.) Muskgrass, (*Nymphaea odorata*) White water lily, (*Potamogeton robbinsii*) Fern pondweed, (*Utricularia vulgaris*) Common bladderwort

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton amplifolius*) **Large-leaf pondweed**
Specimen Location: Cranberry Lake; N46.26045°, W91.54440°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-144
Habitat/Distribution: Found in water from 1-3.5 meters deep over organic and sandy muck. Relatively common throughout Cranberry, but largely restricted to the narrows and outlet bay on LEC.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Najas flexilis*) Slender naiad, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Potamogeton richardsonii*) Clasping-leaf pondweed, (*Potamogeton robbinsii*) Fern pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Douglas County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton crispus*) **Curly-leaf pondweed**
Specimen Location: Lower Eau Claire Lake; N46.26671°, W91.56315°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-145
Habitat/Distribution: Found in water 2-3 meters deep over muck. Restricted to the narrows and the outlet bay.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Potamogeton richardsonii*) Clasping-leaf pondweed, (*Potamogeton robbinsii*) Fern pondweed

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Potamogeton epihydrus*) **Ribbon-leaf pondweed**
Specimen Location: Cranberry Lake; N46.26761°, W91.54700°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-146
Habitat/Distribution: Found in water <1 meter deep over muck. Rare; scattered patches occurred among muck bogs on both lakes.
Common Associates: (*Nuphar variegata*) Spatterdock, (*Nymphaea odorata*) White water lily, (*Potamogeton robbinsii*) Fern pondweed, (*Sagittaria cristata*) Crested arrowhead

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton foliosus*) **Leafy pondweed**
Specimen Location: Cranberry Lake; N46.26043°, W91.54544°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-147
Habitat/Distribution: Found in water <1 meter deep over muck. Rare; scattered clusters were found among floating muck bogs on both lakes.
Common Associates: (*Chara* sp.) Muskgrass, (*Elodea canadensis*) Common waterweed, (*Potamogeton robbinsii*) Fern pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Potamogeton friesii*) **Fries' pondweed**
Specimen Location: Lower Eau Claire Lake; N46.26024°, W91.56634°
Also found on Cranberry Lake
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-148
Habitat/Distribution: Found in water from 2-6m deep over muck and sand. Common and widespread on LEC; especially around the main basin. Uncommon, but widely scattered on Cranberry.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Potamogeton pusillus*) Small pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton gramineus*) **Variable pondweed**
Specimen Location: Cranberry Lake; N46.26656°, W91.54509°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-149
Habitat/Distribution: Found in water <2.0 meters deep over firm substrates. Relatively common scattered throughout both lakes.
Common Associates: (*Chara* sp.) Muskgrass, (*Eleocharis acicularis*) Needle spikerush, (*Najas flexilis*) Slender naiad, (*Vallisneria americana*) Wild celery

County/State: Douglas County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton illinoensis*) **Illinois pondweed**
Specimen Location: Lower Eau Claire Lake; N46.26084°, W91.56467°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-150
Habitat/Distribution: Found in water from 2.0-2.5 meters deep over muck. Rare; only seen in the outlet bay.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Chara* sp.) Muskgrass, (*Elodea canadensis*) Common waterweed, (*Potamogeton robbinsii*) Fern pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton natans*) **Floating-leaf pondweed**
Specimen Location: Cranberry Lake; N46.26545°, W91.54714°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-151
Habitat/Distribution: Found in water <2.0 meters deep over organic and marly muck and sand. Largely restricted to bog margins.
Common Associates: (*Brasenia schreberi*) Watershield, (*Lemna trisulca*) Forked duckweed, (*Najas flexilis*) Slender naiad, (*Nymphaea odorata*) White water lily, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton praelongus*) **White-stem pondweed**
Specimen Location: Cranberry Lake; N46.26026°, W91.56466°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-152
Habitat/Distribution: Found in water from 1.5-3.5m over muck. Rare; restricted to the deepest parts of Cranberry and the narrows and outlet bay on Lower Eau Claire.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Chara* sp.) Muskgrass, (*Elodea canadensis*) Common waterweed, (*Potamogeton robbinsii*) Fern pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton pusillus*) **Small pondweed**
Specimen Location: Cranberry Lake; N46.26043°, W91.54544°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-153
Habitat/Distribution: Found in water from 1-6m deep over sand and muck. Common and widespread on both lakes.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Nymphaea odorata*) White water lily, (*Potamogeton friesii*) Fries' pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton richardsonii*) **Clasping-leaf pondweed**
Specimen Location: Cranberry Lake; N46.26335°, W91.54293°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-154
Habitat/Distribution: Found in water from 1-4m deep over muck and sand. Common and widespread on both lakes.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Elodea canadensis*) Common waterweed, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton robbinsii*) **Fern pondweed**
Specimen Location: Cranberry Lake; N46.26043°, W91.54544°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-155
Habitat/Distribution: Found in water <3.5 meters deep in muck and sand. A dominant species on Cranberry and abundant in the outlet bay on LEC.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Najas flexilis*) Slender naiad, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Potamogeton strictifolius*) **Stiff pondweed**
Specimen Location: Cranberry Lake; N46.26445°, W91.54088°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-156
Habitat/Distribution: Found in water from 1-2 meters deep over primarily marly muck and sand. Uncommon in both lakes.
Common Associates: (*Lemna trisulca*) Forked duckweed, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Najas flexilis*) Slender naiad, (*Potamogeton pusillus*) Small pondweed, (*Potamogeton zosteriformis*) Flat-stem pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Potamogeton zosteriformis*) **Flat-stem pondweed**
Specimen Location: Cranberry Lake; N46.26043°, W91.54544°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-157
Habitat/Distribution: Found in water from 0.5-5 meters deep over muck and sand. Scattered in Cranberry and abundant in the narrows and outlet bay of LEC.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Elodea canadensis*) Common waterweed, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Potamogeton pusillus*) Small pondweed

County/State: Douglas County, Wisconsin **Date:** 6/29/22
Species: (*Ranunculus aquatilis*) **White water crowfoot**
Specimen Location: Lower Eau Claire Lake; N46.26900°, W91.56744°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-158
Habitat/Distribution: Found in water from 0.5-2.5 meters deep over sand and sandy muck. Relatively common throughout.
Common Associates: (*Eleocharis acicularis*) Needle spikerush, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Vallisneria americana*) Wild celery

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Sagittaria cristata*) **Crested arrowhead**
Specimen Location: Cranberry Lake; N46.26546°, W91.54662°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-159
Habitat/Distribution: Found in water <1 meter deep over muck. Uncommon over sandy muck and around muck bogs.
Common Associates: (*Chara* sp.) Muskgrass, (*Lemna trisulca*) Forked duckweed, (*Najas flexilis*) Slender naiad, (*Nymphaea odorata*) White water lily, (*Potamogeton robbinsii*) Fern pondweed

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Sagittaria graminea*) **Grass-leaved arrowhead**
Specimen Location: Lower Eau Claire Lake; N46.26923°, W91.55057°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-160
Habitat/Distribution: Found in water <2.0 meters deep over sand. Scattered locations; usually along pristine shorelines.
Common Associates: (*Elatine minima*) Waterwort, (*Eleocharis acicularis*) Needle spikerush, (*Najas flexilis*) Slender naiad, (*Stuckenia pectinata*) Sago pondweed, (*Vallisneria americana*) Wild celery

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Sagittaria latifolia*) **Common arrowhead**
Specimen Location: Cranberry Lake; N46.26009°, W91.54439°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-161
Habitat/Distribution: Found in water <0.25 meter deep over firm organic muck. Scattered locations on bog margins.
Common Associates: (*Brasenia schreberi*) Watershield, (*Nuphar variegata*) Spatterdock, (*Nymphaea odorata*) White water lily, (*Schoenoplectus subterminalis*) Water bulrush, (*Utricularia minor*) Small bladderwort, (*Utricularia vulgaris*) Common bladderwort

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Schoenoplectus acutus*) **Hardstem bulrush**
Specimen Location: Cranberry Lake; N46.26545°, W91.54714°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-162
Habitat/Distribution: Found in water <1 meter deep over firm sand and gravel. A dominant emergent along the margins of both lakes.
Common Associates: (*Carex utriculata*) Common yellow lake sedge, (*Dulichium arundinaceum*) Three-way sedge, (*Eleocharis palustris*) Creeping spikerush, (*Equisetum fluviatile*) Water horsetail

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Schoenoplectus pungens*) **Three-square bulrush**
Specimen Location: Lower Eau Claire Lake; N46.26753°, W91.54631°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-163
Habitat/Distribution: Found in water <0.5 meter deep over sand and sandy muck. Rare; only plants seen were at the point.
Common Associates: (*Brasenia schreberi*) Watershield, (*Carex utriculata*) Common yellow lake sedge, (*Dulichium arundinaceum*) Three-way sedge, (*Eleocharis palustris*) Creeping spikerush, (*Equisetum fluviatile*) Water horsetail, (*Schoenoplectus acutus*) Hardstem bulrush

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Schoenoplectus subterminalis*) **Water bulrush**
Specimen Location: Cranberry Lake; N46.26399°, W91.54866°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-164
Habitat/Distribution: Found in water <0.5 meter deep over muck. Common on and around muck bogs.
Common Associates: (*Brasenia schreberi*) Watershield, (*Nymphaea odorata*) White water lily, (*Utricularia intermedia*) Flat-leaf bladderwort, (*Utricularia minor*) Small bladderwort, (*Utricularia vulgaris*) Common bladderwort

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Schoenoplectus tabernaemontani*) **Softstem bulrush**
Specimen Location: Cranberry Lake; N46.26047°, W91.54233°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-165
Habitat/Distribution: Found in water <0.5 meter deep over organic muck. Uncommon scattered on and around bogs margins.
Common Associates: (*Brasenia schreberi*) Watershield, (*Dulichium arundinaceum*) Three-way sedge, (*Eleocharis erythropoda*) Bald spikerush, (*Nymphaea odorata*) White water lily

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Schoenoplectus torreyi*) **Torrey's three-square bulrush**
Specimen Location: Cranberry Lake; N46.26654°, W91.54613°
Also found in Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-166
Habitat/Distribution: Found in water <0.5 meter deep over sand and sandy muck. Scattered locations on either side of channel leading to/from Cranberry Lake.
Common Associates: (*Brasenia schreberi*) Watershield, (*Carex utriculata*) Common yellow lake sedge, (*Dulichium arundinaceum*) Three-way sedge, (*Eleocharis palustris*) Creeping spikerush, (*Equisetum fluviatile*) Water horsetail, (*Schoenoplectus acutus*) Hardstem bulrush

County/State: Douglas County, Wisconsin **Date:** 8/1/22
Species: (*Sparganium americanum*) **American bur-reed**
Specimen Location: Lower Eau Claire Lake; N46.26900°, W91.56744°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-167
Habitat/Distribution: Rare; only seen at the point. Clusters of plants were found at the shoreline over sand.
Common Associates: (*Carex lacustris*) Lake sedge, (*Carex scoparia*) Broom sedge

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Sparganium angustifolium*) **Narrow-leaved bur-reed**
Specimen Location: Cranberry Lake; N46.26507°, W91.54869°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-168
Habitat/Distribution: Found in water <0.5 meter deep over muck. Rare; a few clusters were found over marly muck.
Common Associates: (*Elodea canadensis*) Common waterweed, (*Najas flexilis*) Slender naiad, (*Vallisneria americana*) Wild celery

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Sparganium emersum*) **Short-stemmed bur-reed**
Specimen Location: Cranberry Lake; N46.26006 °, W91.54595°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-169
Habitat/Distribution: Found in water <1 meter deep over muck. Uncommon; scattered among muck bogs in both lakes.
Common Associates: (*Brasenia schreberi*) Watershield, (*Nuphar variegata*) Spatterdock, (*Nymphaea odorata*) White water lily, (*Potamogeton foliosus*) Leafy pondweed

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Sparganium fluctuans*) **Floating-leaf bur-reed**
Specimen Location: Cranberry Lake; N46.26445°, W91.54088°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-170
Habitat/Distribution: Found in water <1 meter deep over firm muck. Rare; a few plants were found at the point – not seen anywhere else.
Common Associates: (*Elodea canadensis*) Common waterweed, (*Najas flexilis*) Slender naiad, (*Vallisneria americana*) Wild celery

County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Sparganium natans*) **Small bur-reed**
Specimen Location: Cranberry Lake; N46.26006°, W91.54647°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-171
Habitat/Distribution: Found in water <0.5 meter deep over muck. Plants were regularly encountered among floating muck bogs on both lakes.
Common Associates: (*Brasenia schreberi*) Watershield, (*Najas flexilis*) Slender naiad, (*Nymphaea odorata*) White water lily, (*Utricularia intermedia*) Flat-leaf bladderwort, (*Utricularia vulgaris*) Common bladderwort

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Spirodela polyrhiza*) **Large duckweed**
Specimen Location: Cranberry Lake; N46.26656°, W91.54509°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-172
Habitat/Distribution: Rare; a few individuals were found among floating-leaf species on the south shoreline around floating muck bogs.
Common Associates: (*Lemna minor*) Small duckweed, (*Nymphaea odorata*) White water lily, (*Potamogeton natans*) Floating-leaf pondweed

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Stuckenia pectinata*) **Sago pondweed**
Specimen Location: Cranberry Lake; N46.26043°, W91.54544°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-173
Habitat/Distribution: Scattered locations in water <2 meters deep over sand and sandy muck on LEC. Only seek in the creek inlet on Cranberry.
Common Associates: (*Eleocharis acicularis*) Needle spikerush, (*Najas flexilis*) Slender naiad, (*Sagittaria graminea*) Grass-leaved arrowhead

County/State: Douglas County, Wisconsin **Date:** 8/1/22
Species: (*Tolypella intricata*) **Birds nest stonewort**
Specimen Location: Lower Eau Claire Lake; N46.27440°, W91.55747°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-174
Habitat/Distribution: Found in 3-6 meters over sand. Relatively common scattered around the littoral edge adjacent to sharp drop-offs into deep water.
Common Associates: (*Chara* sp.) Muskgrass, (*Nitella* sp.) Nitella

County/State: Douglas County, Wisconsin **Date:** 6/29/22
Species: (*Typha angustifolia*) **Narrow-leaved cattail**
Specimen Location: Lower Eau Claire Lake; N46.25849°, W91.56545°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-175
Habitat/Distribution: Found in water <0.5 meter deep over firm muck. Several large beds were located on the south shoreline of the outlet bay.
Common Associates: (*Brasenia schreberi*) Watershield, (*Nymphaea odorata*) White water lily, (*Utricularia gibba*) Creeping bladderwort, (*Utricularia intermedia*) Flat-leaf bladderwort, (*Utricularia vulgaris*) Common bladderwort

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Typha latifolia*) **Broad-leaved cattail**
Specimen Location: Cranberry Lake; N46.26545°, W91.54714°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-176
Habitat/Distribution: Found in water <0.5 meter deep over nutrient-rich muck. Scattered on bogs.
Common Associates: (*Brasenia schreberi*) Watershield, (*Dulichium arundinaceum*) Three-way sedge, (*Eleocharis erythropoda*) Bald spikerush, (*Nymphaea odorata*) White water lily

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Utricularia gibba*) **Creeping bladderwort**
Specimen Location: Cranberry Lake; N46.26043°, W91.54544°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-177
Habitat/Distribution: Found in water <1.0 meter deep over muck. Relatively common among muck bogs entangled in other vegetation.
Common Associates: (*Brasenia schreberi*) Watershield, (*Nuphar variegata*) Spatterdock, (*Nymphaea odorata*) White water lily, (*Utricularia intermedia*) Flat-leaf bladderwort, (*Utricularia minor*) Small bladderwort, (*Utricularia vulgaris*) Common bladderwort

County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Utricularia intermedia*) **Flat-leaf bladderwort**
Specimen Location: Cranberry Lake; N46.26006 °, W91.54595°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-178
Habitat/Distribution: Found in water <1.0 meter deep over muck.
Relatively common among muck bogs on both lakes.
Common Associates: (*Brasenia schreberi*) Watershield, (*Nymphaea odorata*) White water lily, (*Schoenoplectus subterminalis*) Water bulrush, (*Utricularia vulgaris*) Common bladderwort

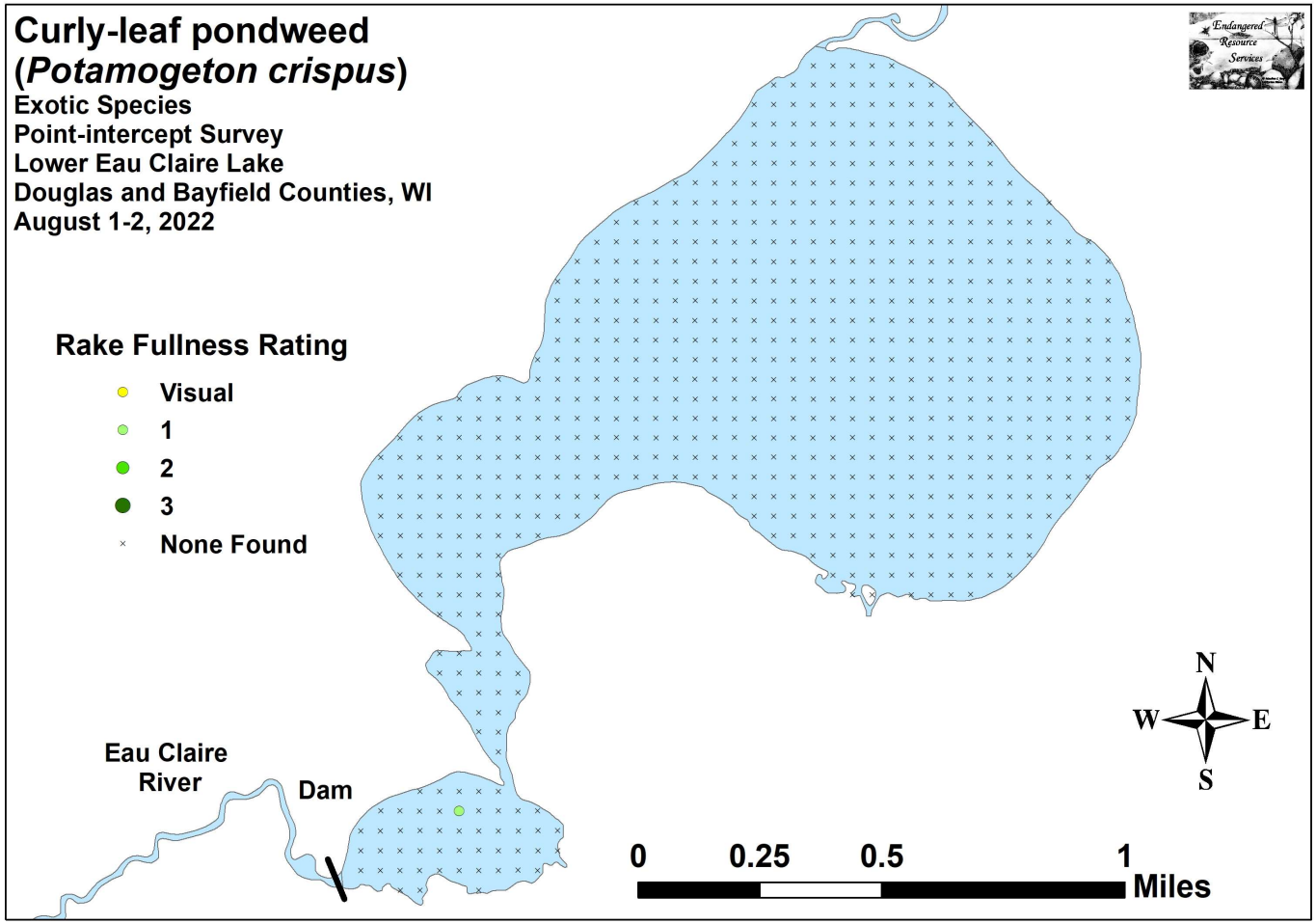
County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Utricularia minor*) **Small bladderwort**
Specimen Location: Cranberry Lake; N46.26006 °, W91.54595°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-179
Habitat/Distribution: Found in water <1.0 meter deep over muck.
Relatively common among muck bogs on both lakes.
Common Associates: (*Brasenia schreberi*) Watershield, (*Najas flexilis*) Slender naiad, (*Nymphaea odorata*) White water lily, (*Schoenoplectus subterminalis*) Water bulrush, (*Utricularia intermedia*) Flat-leaf bladderwort, (*Utricularia vulgaris*) Common bladderwort

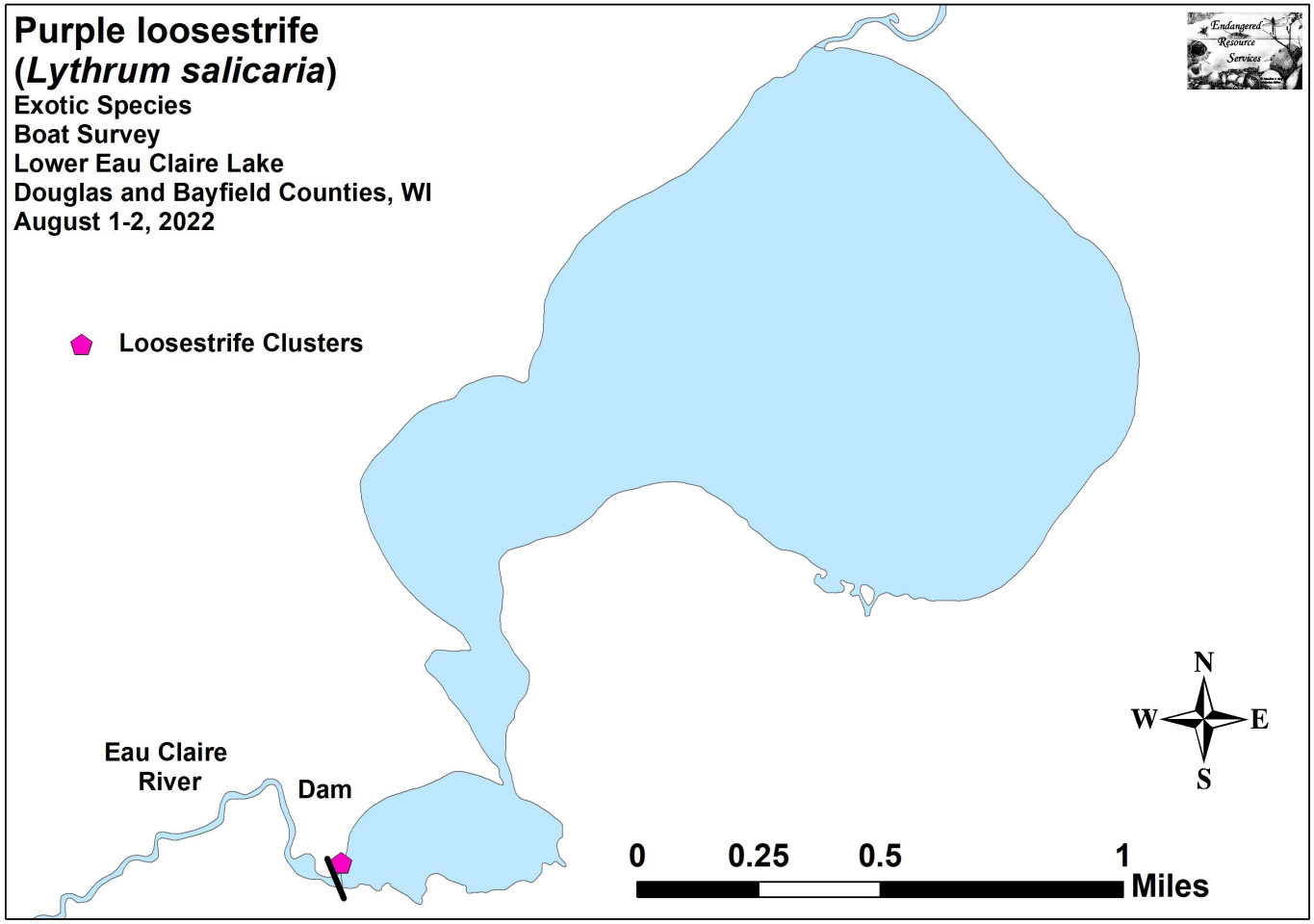
County/State: Bayfield County, Wisconsin **Date:** 8/1/22
Species: (*Utricularia vulgaris*) **Common bladderwort**
Specimen Location: Cranberry Lake; N46.26006 °, W91.54595°
Also found on Lower Eau Claire Lake.
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-180
Habitat/Distribution: Found in water <1.0 meter deep over muck. Relatively common among muck bogs on both lakes.
Common Associates: (*Brasenia schreberi*) Watershield, (*Najas flexilis*) Slender naiad, (*Nymphaea odorata*) White water lily, (*Schoenoplectus subterminalis*) Water bulrush, (*Utricularia intermedia*) Flat-leaf bladderwort, (*Utricularia minor*) Small bladderwort

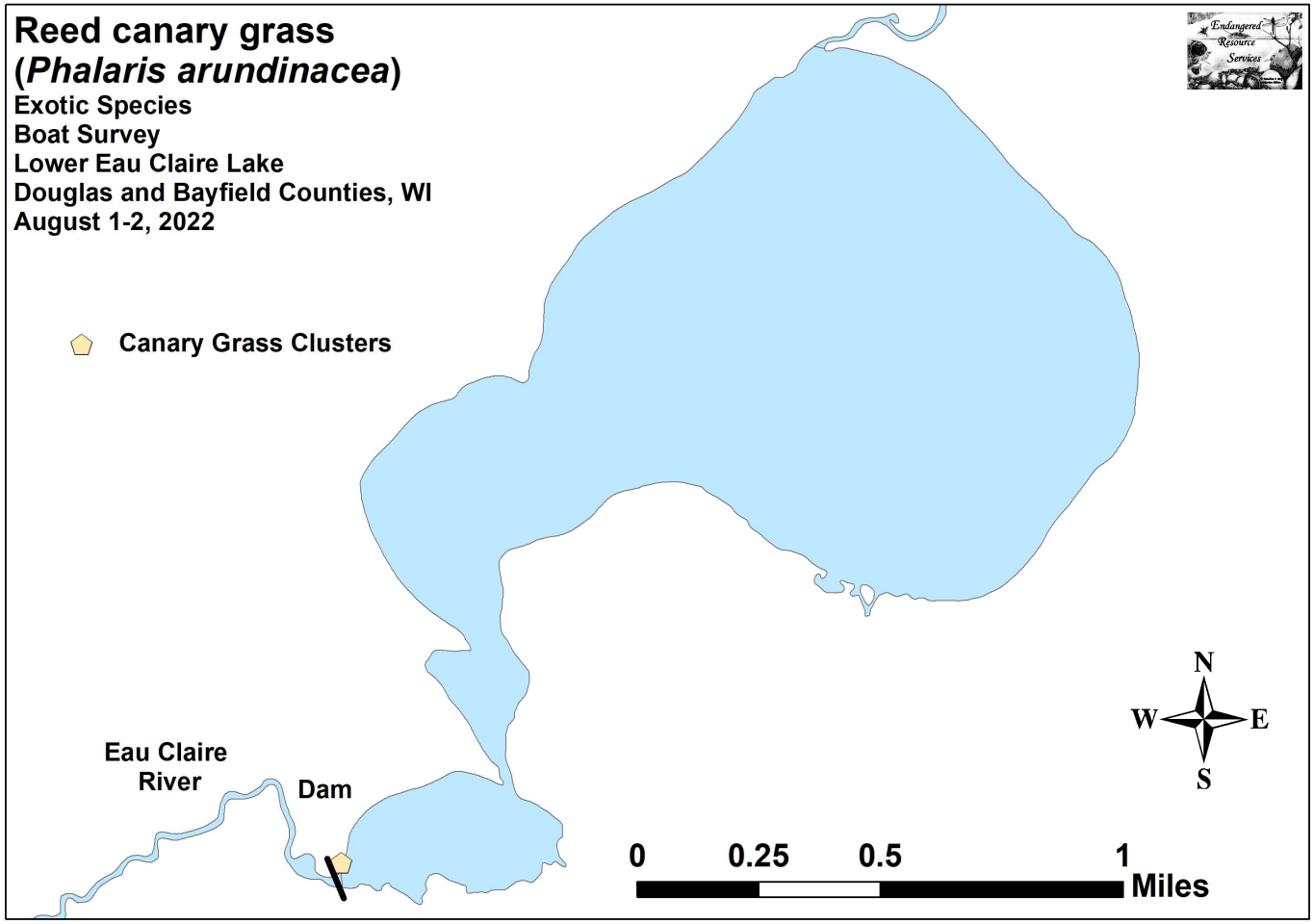
County/State: Douglas County, Wisconsin **Date:** 8/1/22
Species: (*Vallisneria americana*) **Wild celery**
Specimen Location: Lower Eau Claire Lake; N46.26084°, W91.56467°
Also found on Cranberry Lake
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-181
Habitat/Distribution: Found in water <4.0 meters deep over sand and sandy muck. Common throughout both lakes.
Common Associates: (*Ceratophyllum demersum*) Coontail, (*Myriophyllum sibiricum*) Northern water-milfoil, (*Najas flexilis*) Slender naiad

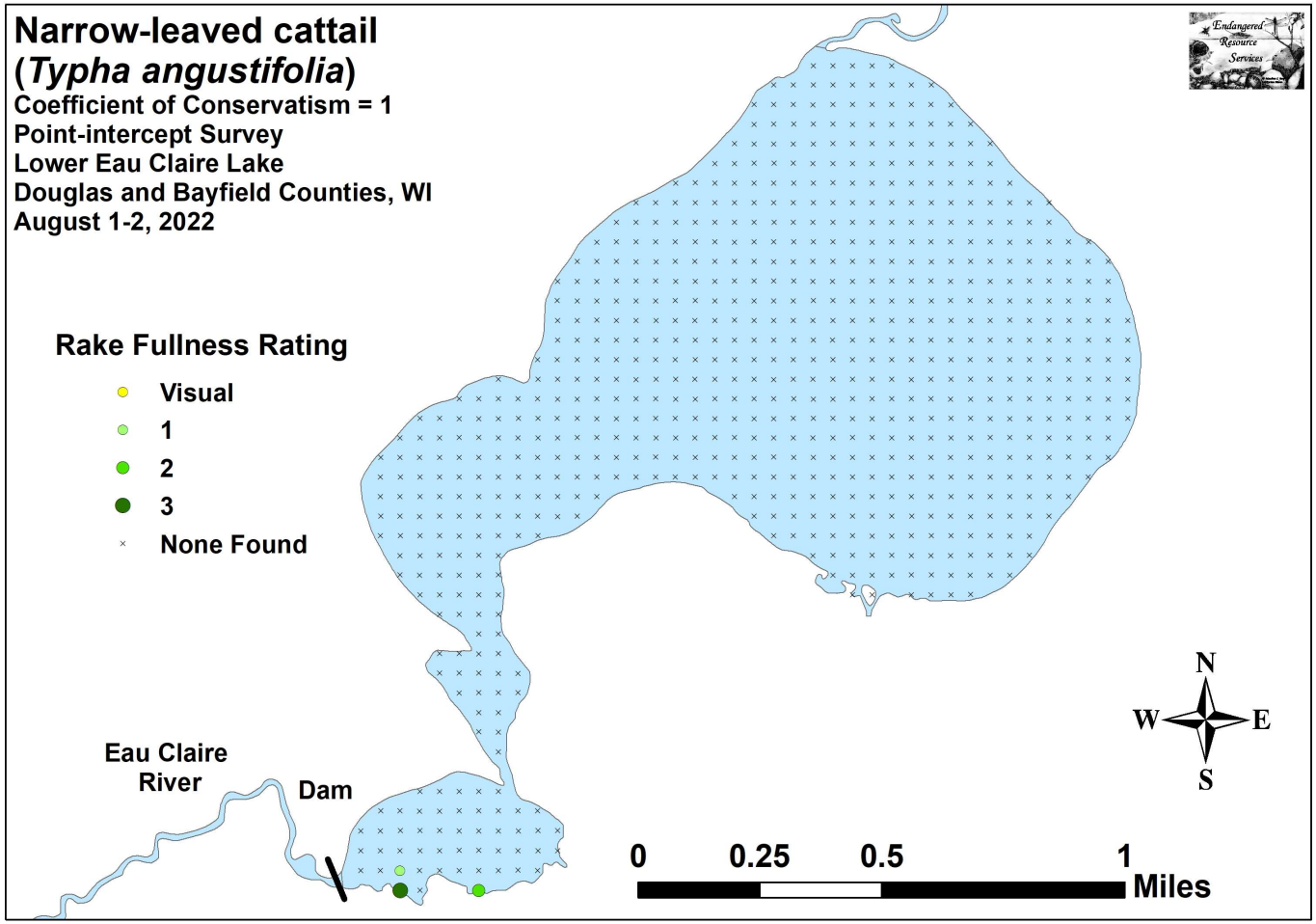
County/State: Bayfield County, Wisconsin **Date:** 6/29/22
Species: (*Zizania palustris*) **Northern wild rice**
Specimen Location: Cranberry Lake; N46.26083°, W91.54234°
Collected/Identified by: Matthew S. Berg Col. #: MSB-2022-182
Habitat/Distribution: Found in water <0.5 meter deep over muck. Uncommon; perhaps a few 100 plants scattered near the point just west of the creek inlet. Not seen anywhere else in the system.
Common Associates: (*Brasenia schreberi*) Watershield, (*Elodea canadensis*) Common waterweed, (*Najas flexilis*) Slender naiad, (*Potamogeton robbinsii*) Fern pondweed

Appendix VIII: Curly-leaf Pondweed and Other Exotic Species Density and Distribution Maps


Curly-leaf pondweed
(Potamogeton crispus)
Exotic Species
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Purple loosestrife
(Lythrum salicaria)
Exotic Species
Boat Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Loosestrife Clusters
Endangered Resource Services
N
W
E
S
Eau Claire River
Dam
0
0.25
0.5
1
Miles


Reed canary grass
(*Phalaris arundinacea*)
Exotic Species
Boat Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Canary Grass Clusters
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles


Narrow-leaved cattail
(Typha angustifolia)
Coefficient of Conservatism = 1
Point-intercept Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
August 1-2, 2022
Rake Fullness Rating
Visual
1
2
3
None Found
Eau Claire River
Dam
N
W
E
S
0
0.25
0.5
1
Miles

Appendix IX: Aquatic Exotic Invasive Plant Species Information

Eurasian Water-milfoil

DESCRIPTION: Eurasian water-milfoil is a submersed aquatic plant native to Europe, Asia, and northern Africa. It is the only non-native milfoil in Wisconsin. Like the native milfoils, the Eurasian variety has slender stems whorled by submersed feathery leaves and tiny flowers produced above the water surface. The flowers are located in the axils of the floral bracts, and are either four-petaled or without petals. The leaves are threadlike, typically uniform in diameter, and aggregated into a submersed terminal spike. The stem thickens below the inflorescence and doubles its width further down, often curving to lie parallel with the water surface. The fruits are four-jointed nut-like bodies. Without flowers or fruits, Eurasian water-milfoil is nearly impossible to distinguish from Northern water-milfoil. Eurasian water-milfoil has 9-21 pairs of leaflets per leaf, while Northern milfoil typically has 7-11 pairs of leaflets. Coontail is often mistaken for the milfoils, but does not have individual leaflets.

DISTRIBUTION AND HABITAT: Eurasian milfoil first arrived in Wisconsin in the 1960's. During the 1980's, it began to move from several counties in southern Wisconsin to lakes and waterways in the northern half of the state. As of 1993, Eurasian water-milfoil was common in 39 Wisconsin counties (54%) and at least 75 of its lakes, including shallow bays in Lakes Michigan and Superior and Mississippi River pools.

Eurasian water-milfoil grows best in fertile, fine-textured, inorganic sediments. In less productive lakes, it is restricted to areas of nutrient-rich sediments. It has a history of becoming dominant in eutrophic, nutrient-rich lakes, although this pattern is not universal. It is an opportunistic species that prefers highly disturbed lake beds, lakes receiving nitrogen and phosphorous-laden runoff, and heavily used lakes. Optimal growth occurs in alkaline systems with a high concentration of dissolved inorganic carbon. High water temperatures promote multiple periods of flowering and fragmentation.

LIFE HISTORY AND EFFECTS OF INVASION: Unlike many other plants, Eurasian water-milfoil does not rely on seed for reproduction. Its seeds germinate poorly under natural conditions. It reproduces vegetatively by fragmentation, allowing it to disperse over long distances. The plant produces fragments after fruiting once or twice during the summer. These shoots may then be carried downstream by water currents or inadvertently picked up by boaters. Milfoil is readily dispersed by boats, motors, trailers, bilges, live wells, or bait buckets, and can stay alive for weeks if kept moist.

Once established in an aquatic community, milfoil reproduces from shoot fragments and stolons (runners that creep along the lake bed). As an opportunistic species, Eurasian water-milfoil is adapted for rapid growth early in spring. Stolons, lower stems, and roots persist over winter and store the carbohydrates that help milfoil claim the water column early in spring, photosynthesize, divide, and form a dense leaf canopy that shades out native aquatic plants. Its ability to spread rapidly by fragmentation and effectively block out sunlight needed for native plant growth often results in monotypic stands. Monotypic stands of Eurasian water-milfoil provide only a single habitat, and threaten the integrity of aquatic communities in a number of ways; for example, dense stands disrupt predator-prey relationships by fencing out larger fish, and reducing the number of nutrient-rich native plants available for waterfowl.

Dense stands of Eurasian water-milfoil also inhibit recreational uses like swimming, boating, and fishing. Some stands have been dense enough to obstruct industrial and power generation water intakes. The visual impact that greets the lake user on milfoil-dominated lakes is the flat yellow-green of matted vegetation, often prompting the perception that the lake is "infested" or "dead". Cycling of nutrients from sediments to the water column by Eurasian water-milfoil may lead to deteriorating water quality and algae blooms of infested lakes. (Taken in its entirety from WDNR, 2010 http://www.dnr.state.wi.us/invasives/fact/milfoil.htm)

Curly-leaf pondweed

DESCRIPTION: Curly-leaf pondweed is an invasive aquatic perennial that is native to Eurasia, Africa, and Australia. It was accidentally introduced to United States waters in the mid-1880s by hobbyists who used it as an aquarium plant. The leaves are reddish-green, oblong, and about 3 inches long, with distinct wavy edges that are finely toothed. The stem of the plant is flat, reddish-brown and grows from 1 to 3 feet long. The plant usually drops to the lake bottom by early July.

DISTRIBUTION AND HABITAT: Curly-leaf pondweed is commonly found in alkaline and high nutrient waters, preferring soft substrate and shallow water depths. It tolerates low light and low water temperatures. It has been reported in all states but Maine.

LIFE HISTORY AND EFFECTS OF INVASION: Curly-leaf pondweed spreads through burr-like winter buds (turions), which are moved among waterways. These plants can also reproduce by seed, but this plays a relatively small role compared to the vegetative reproduction through turions. New plants form under the ice in winter, making curly-leaf pondweed one of the first nuisance aquatic plants to emerge in the spring.

It becomes invasive in some areas because of its tolerance for low light and low water temperatures. These tolerances allow it to get a head start on and out compete native plants in the spring. In mid-summer, when most aquatic plants are growing, curly-leaf pondweed plants are dying off. Plant die-offs may result in a critical loss of dissolved oxygen. Furthermore, the decaying plants can increase nutrients which contribute to algal blooms, as well as create unpleasant stinking messes on beaches. Curly-leaf pondweed forms surface mats that interfere with aquatic recreation. (Taken in its entirety from WDNR, 2010 http://www.dnr.state.wi.us/invasives/fact/curlyleaf_pondweed.htm)

Reed canary grass

DESCRIPTION: Reed canary grass is a large, coarse grass that reaches 2 to 9 feet in height. It has an erect, hairless stem with gradually tapering leaf blades 3 1/2 to 10 inches long and 1/4 to 3/4 inch in width. Blades are flat and have a rough texture on both surfaces. The lead ligule is membranous and long. The compact panicles are erect or slightly spreading (depending on the plant's reproductive stage), and range from 3 to 16 inches long with branches 2 to 12 inches in length. Single flowers occur in dense clusters in May to mid-June. They are green to purple at first and change to beige over time. This grass is one of the first to sprout in spring, and forms a thick rhizome system that dominates the subsurface soil. Seeds are shiny brown in color.

Both Eurasian and native ecotypes of reed canary grass are thought to exist in the U.S. The Eurasian variety is considered more aggressive, but no reliable method exists to tell the ecotypes apart. It is believed that the vast majority of our reed canary grass is derived from the Eurasian ecotype. Agricultural cultivars of the grass are widely planted.

Reed canary grass also resembles non-native orchard grass (*Dactylis glomerata*), but can be distinguished by its wider blades, narrower, more pointed inflorescence, and the lack of hairs on glumes and lemmas (the spikelet scales). Additionally, blue-joint grass (*Calamagrostis canadensis*) may be mistaken for reed canary in areas where orchard grass is rare, especially in the spring. The highly transparent ligule on reed canary grass is helpful in distinguishing it from the others. Ensure positive identification before attempting control.

DISTRIBUTION AND HABITAT: Reed canary grass is a cool-season, sod-forming, perennial wetland grass native to temperate regions of Europe, Asia, and North America. The Eurasian ecotype has been selected for its vigor and has been planted throughout the U.S. since the 1800's for forage and erosion control. It has become naturalized in much of the northern half of the U.S., and is still being planted on steep slopes and banks of ponds and created wetlands.

Reed canary grass can grow on dry soils in upland habitats and in the partial shade of oak woodlands, but does best on fertile, moist organic soils in full sun. This species can invade most types of wetlands, including marshes, wet prairies, sedge meadows, fens, stream banks, and seasonally wet areas; it also grows in disturbed areas such as berms and spoil piles.

LIFE HISTORY AND EFFECTS OF INVASION: Reed canary grass reproduces by seed or creeping rhizomes. It spreads aggressively. The plant produces leaves and flower stalks for 5 to 7 weeks after germination in early spring, then spreads laterally. Growth peaks in mid-June and declines in mid-August. A second growth spurt occurs in the fall. The shoots collapse in mid to late summer, forming a dense, impenetrable mat of stems and leaves. The seeds ripen in late June and shatter when ripe. Seeds may be dispersed from one wetland to another by waterways, animals, humans, or machines.

This species prefers disturbed areas, but can easily move into native wetlands. Reed canary grass can invade a disturbed wetland in less than twelve years. Invasion is associated with disturbances including ditching of wetlands, stream channelization, deforestation of swamp forests, sedimentation, and intentional planting. The difficulty of selective control makes reed canary grass invasion of particular concern. Over time, it forms large, monotypic stands that harbor few other plant species and are subsequently of little use to wildlife. Once established, reed canary grass dominates an area by building up a tremendous seed bank that can eventually erupt, germinate, and recolonize treated sites. (Taken in its entirety from WDNR, 2010 http://www.dnr.state.wi.us/invasives/fact/reed_canary.htm)

Purple loosestrife
(Photo Courtesy Brian M. Collins)

DESCRIPTION: Purple loosestrife is a perennial herb 3-7 feet tall with a dense bushy growth of 1-50 stems. The stems, which range from green to purple, die back each year. Showy flowers vary from purple to magenta, possess 5-6 petals aggregated into numerous long spikes, and bloom from August to September. Leaves are opposite, nearly linear, and attached to four-sided stems without stalks. It has a large, woody taproot with fibrous rhizomes that form a dense mat.

This species may be confused with the native wing-angled loosestrife (*Lythrum alatum*) found in moist prairies or wet meadows. The latter has a winged, square stem and solitary paired flowers in the leaf axils. It is generally a smaller plant than the Eurasian loosestrife.

By law, purple loosestrife is a nuisance species in Wisconsin. It is illegal to sell, distribute, or cultivate the plants or seeds, including any of its cultivars.

DISTRIBUTION AND HABITAT: Purple loosestrife is a wetland herb that was introduced as a garden perennial from Europe during the 1800's. It is still promoted by some horticulturists for its beauty as a landscape plant, and by beekeepers for its nectar-producing capability. Currently, about 24 states have laws prohibiting its importation or distribution because of its aggressively invasive characteristics. It has since extended its range to include most temperate parts of the United States and Canada. The plant's reproductive success across North America can be attributed to its wide tolerance of physical and chemical conditions characteristic of disturbed habitats, and its ability to reproduce prolifically by both seed dispersal and vegetative propagation. The absence of natural predators, like European species of herbivorous beetles that feed on the plant's roots and leaves, also contributes to its proliferation in North America

LIFE HISTORY AND EFFECTS OF INVASION: Purple loosestrife can germinate successfully on substrates with a wide range of pH. Optimum substrates for growth are moist soils of neutral to slightly acidic pH, but it can exist in a wide range of soil types. Most seedling establishment occurs in late spring and early summer when temperatures are high.

Purple loosestrife spreads mainly by seed, but it can also spread vegetatively from root or stem segments. A single stalk can produce from 100,000 to 300,000 seeds per year. Seed survival is up to 60-70%, resulting in an extensive seed bank. Mature plants with up to 50 shoots grow over 2 meters high and produce more than two million seeds a year. Germination is restricted to open, wet soils and requires high temperatures, but seeds remain viable in the soil for many years. Even seeds submerged in water can live for approximately 20 months. Most of the seeds fall near the parent plant, but water, animals, boats, and humans can transport the seeds long distances. Vegetative spread through local perturbation is also characteristic of loosestrife; clipped, trampled, or buried stems of established plants may produce shoots and roots. Plants may be quite large and several years old before they begin flowering. It is often very difficult to locate non-flowering plants, so monitoring for new invasions should be done at the beginning of the flowering period in mid-summer.

Any sunny or partly shaded wetland is susceptible to purple loosestrife invasion. Vegetative disturbances such as water drawdown or exposed soil accelerate the process by providing ideal conditions for seed germination. Invasion usually begins with a few pioneering plants that build up a large seed bank in the soil for several years. When the right disturbance occurs, loosestrife can spread rapidly, eventually taking over the entire wetland. The plant can also make morphological adjustments to accommodate changes in the immediate environment; for example, a decrease in light level will trigger a change in leaf morphology. The plant's ability to adjust to a wide range of environmental conditions gives it a competitive advantage; coupled with its reproductive strategy, purple loosestrife tends to create monotypic stands that reduce biotic diversity.

Purple loosestrife displaces native wetland vegetation and degrades wildlife habitat. As native vegetation is displaced, rare plants are often the first species to disappear. Eventually, purple loosestrife can overrun wetlands thousands of acres in size, and almost entirely eliminate the open water habitat. The plant can also be detrimental to recreation by choking waterways. (Taken in its entirety from WDNR, 2010 http://www.dnr.state.wi.us/invasives/fact/loosestrife.htm)

Appendix X: Glossary of Biological Terms (Adapted from UWEX 2010)

Aquatic:
organisms that live in or frequent water.

Cultural Eutrophication:
accelerated eutrophication that occurs as a result of human activities in the watershed that increase nutrient loads in runoff water that drains into lakes.

Dissolved Oxygen (DO):
the amount of free oxygen absorbed by the water and available to aquatic organisms for respiration; amount of oxygen dissolved in a certain amount of water at a particular temperature and pressure, often expressed as a concentration in parts of oxygen per million parts of water.

Diversity:
number and evenness of species in a particular community or habitat.

Drainage lakes:
Lakes fed primarily by streams and with outlets into streams or rivers. They are more subject to surface runoff problems but generally have shorter residence times than seepage lakes. Watershed protection is usually needed to manage lake water quality.

Ecosystem:
a system formed by the interaction of a community of organisms with each other and with the chemical and physical factors making up their environment.

Eutrophication:
the process by which lakes and streams are enriched by nutrients, and the resulting increase in plant and algae growth. This process includes physical, chemical, and biological changes that take place after a lake receives inputs for plant nutrients--mostly nitrates and phosphates--from natural erosion and runoff from the surrounding land basin. The extent to which this process has occurred is reflected in a lake's trophic classification: oligotrophic (nutrient poor), mesotrophic (moderately productive), and eutrophic (very productive and fertile).

Exotic:
a non-native species of plant or animal that has been introduced.

Habitat:
the place where an organism lives that provides an organism's needs for water, food, and shelter. It includes all living and non-living components with which the organism interacts.

Limnology:
the study of inland lakes and waters.

Littoral:

the near shore shallow water zone of a lake, where aquatic plants grow.

Macrophytes:

Refers to higher (multi-celled) plants growing in or near water. Macrophytes are beneficial to lakes because they produce oxygen and provide substrate for fish habitat and aquatic insects. Overabundance of such plants, especially problem species, is related to shallow water depth and high nutrient levels.

Nutrients:

elements or substances such as nitrogen and phosphorus that are necessary for plant growth. Large amounts of these substances can become a nuisance by promoting excessive aquatic plant growth.

Organic Matter:

elements or material containing carbon, a basic component of all living matter.

Photosynthesis:

the process by which green plants convert carbon dioxide (CO2) dissolved in water to sugar and oxygen using sunlight for energy. Photosynthesis is essential in producing a lake's food base, and is an important source of oxygen for many lakes.

Phytoplankton:

microscopic plants found in the water. Algae or one-celled (phytoplankton) or multicellular plants either suspended in water (Plankton) or attached to rocks and other substrates (periphyton). Their abundance, as measured by the amount of chlorophyll a (green pigment) in an open water sample, is commonly used to classify the trophic status of a lake. Numerous species occur. Algae are an essential part of the lake ecosystem and provides the food base for most lake organisms, including fish. Phytoplankton populations vary widely from day to day, as life cycles are short.

Plankton:

small plant organisms (phytoplankton and nanoplankton) and animal organisms (zooplankton) that float or swim weakly though the water.

ppm:

parts per million; units per equivalent million units; equal to milligrams per liter (mg/l)

Richness:

number of species in a particular community or habitat.

Rooted Aquatic Plants:

(macrophytes) Refers to higher (multi-celled) plants growing in or near water. Macrophytes are beneficial to lakes because they produce oxygen and provide substrate for fish habitat and aquatic insects. Overabundance of such plants, especially problem species, is related to shallow water depth and high nutrient levels.

Runoff:

water that flows over the surface of the land because the ground surface is impermeable or unable to absorb the water.

Secchi Disc:

An 8-inch diameter plate with alternating quadrants painted black and white that is used to measure water clarity (light penetration). The disc is lowered into water until it disappears from view. It is then raised until just visible. An average of the two depths, taken from the shaded side of the boat, is recorded as the Secchi disc reading. For best results, the readings should be taken on sunny, calm days.

Seepage lakes:

Lakes without a significant inlet or outlet, fed by rainfall and groundwater. Seepage lakes lose water through evaporation and groundwater moving on a down gradient. Lakes with little groundwater inflow tend to be naturally acidic and most susceptible to the effects of acid rain. Seepage lakes often have long, residence times. and lake levels fluctuate with local groundwater levels. Water quality is affected by groundwater quality and the use of land on the shoreline.

Turbidity:

degree to which light is blocked because water is muddy or cloudy.

Watershed:

the land area draining into a specific stream, river, lake or other body of water. These areas are divided by ridges of high land.

Zooplankton:

Microscopic or barely visible animals that eat algae. These suspended plankton are an important component of the lake food chain and ecosystem. For many fish, they are the primary source of food.

Appendix XI: Raw Data Spreadsheet

LowerEauClaireLakeWBIC2741600CLPPISurvey629-30,2022MBergERSLLC.xlsx

LowerEauClaireLakeWBIC2741600PISurvey81-2,2022MBergERSLLC.xlsx