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

Canopied Curly-leaf pondweed – Lower Eau Claire Lake Outlet Bay – 6/15/24

Lower Eau Claire Lake aerial photo with 2024 CLP beds.

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 AIRR28724)

Curly-leaf pondweed in the outlet bay breaking free of the bottom – 6/15/24

Survey Conducted by and Report Prepared by:

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St. Croix Falls, Wisconsin
June 15, 2024

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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 over the last ten years averaging 12.9ft (WDNR 2024). This good to very good clarity produced a littoral zone that reached approximately 20ft in 2024. 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).

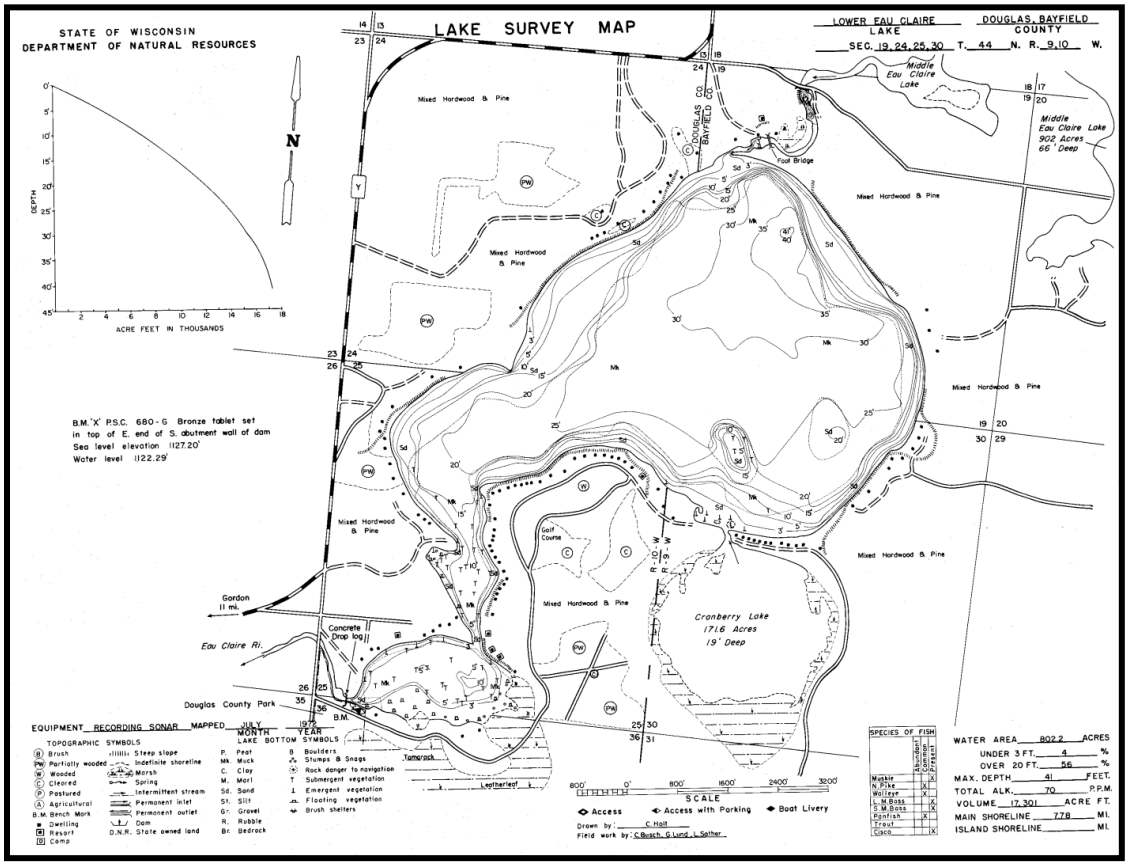

Figure 1: Lower Eau Claire Lake Bathymetric Map

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 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.

These surveys ultimately did locate Curly-leaf pondweed in the outlet bays. However, as CLP occurred at generally low levels within expansive beds of beneficial habitat-forming native vegetation, it was decided to limit control of CLP to manual removal by volunteers in 2022 with plans to begin suction harvesting using the "Barnes Aquatic Invasive Species Sucker" or BAISS thereafter. To help guide this management, we were asked to conduct follow-up bed mapping surveys in 2023 and 2024 to assess the effectiveness of initial removal efforts and to look for new areas with CLP. This report is the summary analysis of our June 15, 2024 survey.

METHODS:

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).

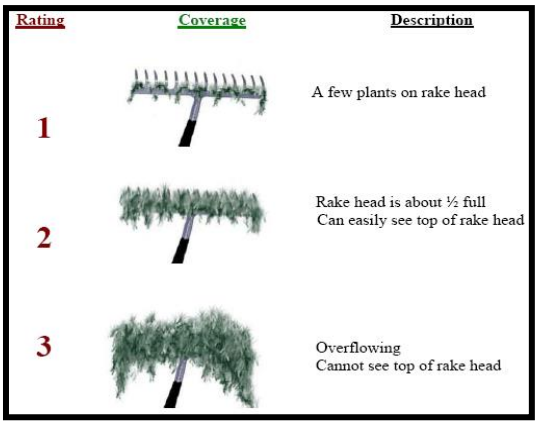

Figure 2: Rake Fullness Ratings (UWEX 2010)

RESULTS:

Summary of Past Curly-leaf Pondweed Bed Mapping Surveys:

During our original 2022 survey, we mapped six beds totaling 0.11 acre (0.01% of the lake's 784 acres) (Figure 3). Each of these beds were located in the outlet bays over organic and sandy muck (Figure 4) (Appendix I). The biggest, Beds 2 and 3, were 0.06 and 0.05 respectively with all others totaling <0.01 acre and amounting to little more than small collections of canopied plants (Table 1).

Ice out in 2023 was late, but, following a rapid warm-up, lake temperatures shot into the 60's in only a few weeks. Presumably because of this, we found Curly-leaf pondweed on most lakes was stunted in growth, and we noted plants were falling over and dying earlier than usual on several other lakes we work on further south. Because of this, we decided to survey earlier than we had in 2022. Ultimately, we located seven beds covering 0.75 acre (0.10% of the lake's surface area) (Figure 3) (Appendix I) with all of them occurring in the outlet bay (Figure 4). This was a 0.64-acre (+582%) increase compared to 2022 (Table 1). Elsewhere on the lake, we saw no evidence of CLP, and test raking in the area formerly covered by Beds 5 and 6 in the channel connecting the lake's outlet bay with the main lake failed to produce any plants.

Summary of 2024 Curly-leaf Pondweed Bed Mapping Survey:

The winter of 2023-24 was one of the shortest and warmest on record with little snowfall and late ice-on/early ice-off. This was followed by a prolonged cool spring that appeared to favor Curly-leaf pondweed growth as we found record levels and densities on the majority of lakes we surveyed. On June 15, 2024, we searched 21.2km (13.2 miles) of transects throughout the lake's visible littoral zone paying careful attention to all areas that were previously found to have CLP (Figure 5). We had mostly sunny skies and relatively calm conditions that allowed us to see down in the water column approximately 7-8ft.

Although we again saw no evidence of CLP in the main lake (Figure 3), we were surprised and disappointed to find dense canopied CLP covered significant portions of the outlet bay. We also found Bed 6 had reformed in the narrows between the main lake and the outlet bay (Figure 4) (Appendix I). Collectively, we mapped 15 beds covering 3.69 acres (0.47% of the lake's surface area). This was a 2.94-acre (+392%) increase compared to our 2023 totals, and a 3.58-acre increase (3,255%) relative to our 2022 survey (Table 1).

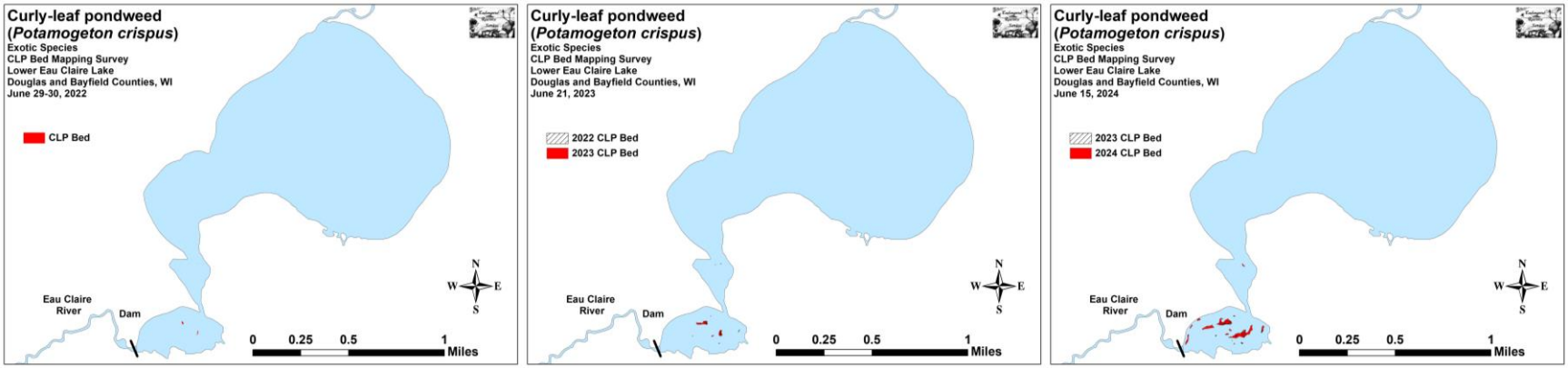

Figure 3: Lower Eau Claire Lake Curly-leaf Pondweed Beds – 2022, 2023, and 2024

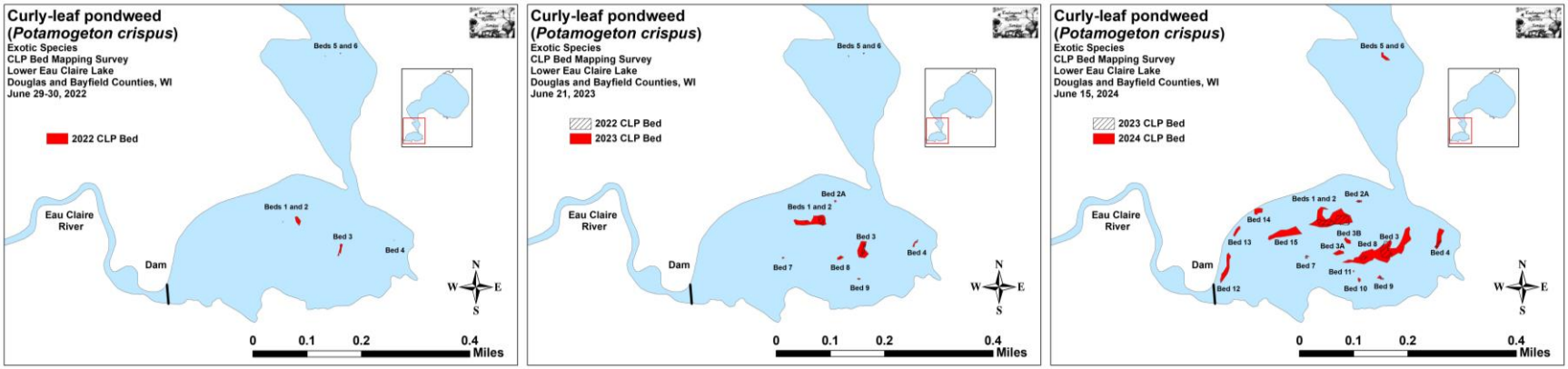

Figure 4: Outlet Bay - Lower Eau Claire Lake
Curly-leaf pondweed Beds – 2022, 2023, and 2024

Table 1: Curly-leaf Pondweed Bed Summary
Lower Eau Claire Lake – Douglas and Bayfield Counties, Wisconsin
June 29-30, 2022, June 21, 2023, and June 15, 2024

Bed Number	2024 Acreage	2023 Acreage	2022 Acreage	2023-24 Change in Area	Depth Range and Mean Depth	Est. Range and Mean Rake-full	Canopied	Navigation Impairment	2024 Field Notes
1	0.99	0.42	<0.01	0.57	5-9; 6	<<<1-3; 2	Yes	Moderate	Canopied mat in nav. channel.
2	Merged	Merged	0.06	-	5-9; 6	<<<1-3; 2	Yes	Moderate	Merged with Bed 1.
2A	0.02	0.01	0	0.01	5-7; 6	<<<1-1; <1	Yes	None	Narrow open ribbon.
3	1.48	0.26	0.05	1.23	7-14; 10	<<<1-3; 3	Yes	Severe	Dense canopied mat.
3A	0.07	0	0	0.07	7-9; 8	2-3; 2	Yes	Minor	Too narrow to be mod. impair.
3B	0.05	0	0	0.05	9-11; 10	2-3; 2	Yes	Minor	Too narrow to be mod. impair.
4	0.19	0.02	<0.01	0.17	2-5; 4	<<<1-3; 2	Yes	Minor	Narrow bed in Spatterdock.
5	0.06	0	<0.01	0.06	9-10; 10	1-3; 2	Near	Minor	Microbed in narrows.
6	Merged	0	<0.01	-	9-10; 10	1-3; 2	Near	Minor	Merged with Bed 5.
7	0.01	0.01	0	0	3-6; 5	<<<1-3; 2	Yes	None	Microbed w/ satellite plants.
8	Merged	0.03	0	-	7-14; 10	<<<1-3; 3	Yes	Severe	Merged with Bed 3.
9	0.02	0.01	0	0.01	2-4; 3	<<<1-3; 1	Yes	Minor	Open bed in Spatterdock.
10	0.02	0	0	0.02	3-6; 5	2-3; 3	Yes	None	Dense microbed.
11	<0.01	0	0	<0.01	5-7; 6	2-3; 3	Yes	None	Dense microbed.
12	0.22	0	0	0.22	4-7; 5	<<<1-2; 1	Yes	Minor	Collection of microbeds.
13	0.06	0	0	0.06	3-5; 4	<<<1-3; 2	Yes	Minor	Too narrow to be mod. impair.
14	0.09	0	0	0.09	3-6; 4	<<<1-3; 2	Yes	Minor	Too narrow to be mod. impair.
15	0.42	0	0	0.42	7-10; 8	<<<1-3; 2	Yes	Moderate	Nearly cont. dense microbeds.
Total Acres	**3.69**	**0.75**	**0.11**	**+2.94**					

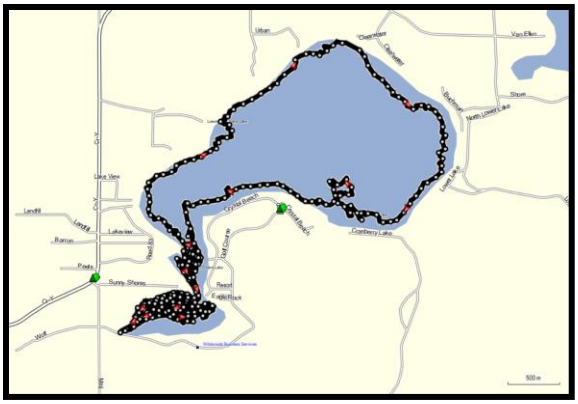

Figure 5: June 15, 2024 Littoral Zone CLP Survey Transects

Descriptions of Past and Present Curly-leaf Pondweed Beds:

Beds 1, 2, and 15 – Beds 1 and 2 were again merged to form one of the worst areas on the lake, and Bed 15 was essentially a downstream continuation. They occurred just north of the main navigation channel leading away from the public boat landing, and we noted they would have likely been at least a moderate impairment if motored directly through as we observed prop-trails and uprooted plants throughout the entirety of the area.

Bed 2A – This bed expanded its area, but we found it was much less dense than in 2023 – potentially due to management. Because of its small size and distance from the main navigation channel, it is likely a low management priority.

Beds 3 and 8 – Similar to Beds 1 and 2, these two areas had merged to become a single superbed south of the main navigation channel. They were likely at least a moderate and potentially a severe impairment to navigation as the formed a dense canopied mat throughout the majority of the delineated area.

Beds 4, 9, 10, and 11 – The majority of these beds were growing near or among Spatterdock (*Nuphar variegata*) lilypads in areas that are unlikely to have significant boat traffic due to their shallow depths and the stumps found throughout the area. Because of this, they are likely the lowest priority for management.

Beds 5 and 6 – These deepwater beds had reappeared and merge in the narrows north of the outlet bay. Although the bed occurred in the navigation channel, it was subcanopy and not likely to be more than a minor impairment.

Beds 3A, 3B, and 7 – Although canopied, these downstream microbeds was likely not more than a minor impairment despite occurring in the middle of the navigation channel. Because we found uprooted 10ft tall CLP throughout the area, it is possible and perhaps likely there would have been a continuous bed extending across the majority of the outlet bay if it wasn't for the regular boat traffic going to and from the landing.

Beds 12, 13, and 14 - These three north shoreline beds formed a nearly continuous ribbon. Due to their narrowness, they likely weren't more than a minor impairment.

DISCUSSION AND CONSIDERATIONS FOR MANAGEMENT:

Although Curly-leaf pondweed currently covers a low percentage of Lower Eau Claire Lake's surface area, the significant uptick in acreage we documented in 2024 likely meant the "BAISS" harvesting program was not able to remove the majority of CLP plants. This also likely meant that CLP was causing at least a minor, and, in some areas, a moderate or severe impairment for watercraft trying to navigate through the beds with these uprooted plants further spreading turions.

Lower Eau Claire Lake continues to have a rich and diverse native plant community, and suction harvesting is likely the most environmentally friendly method of controlling Curly-leaf pondweed as it targets the CLP while leaving native plants in place. If suction harvesting is discontinued in the future or if it 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 in the years following treatment – an outcome we have seen in many other systems over the years.

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.

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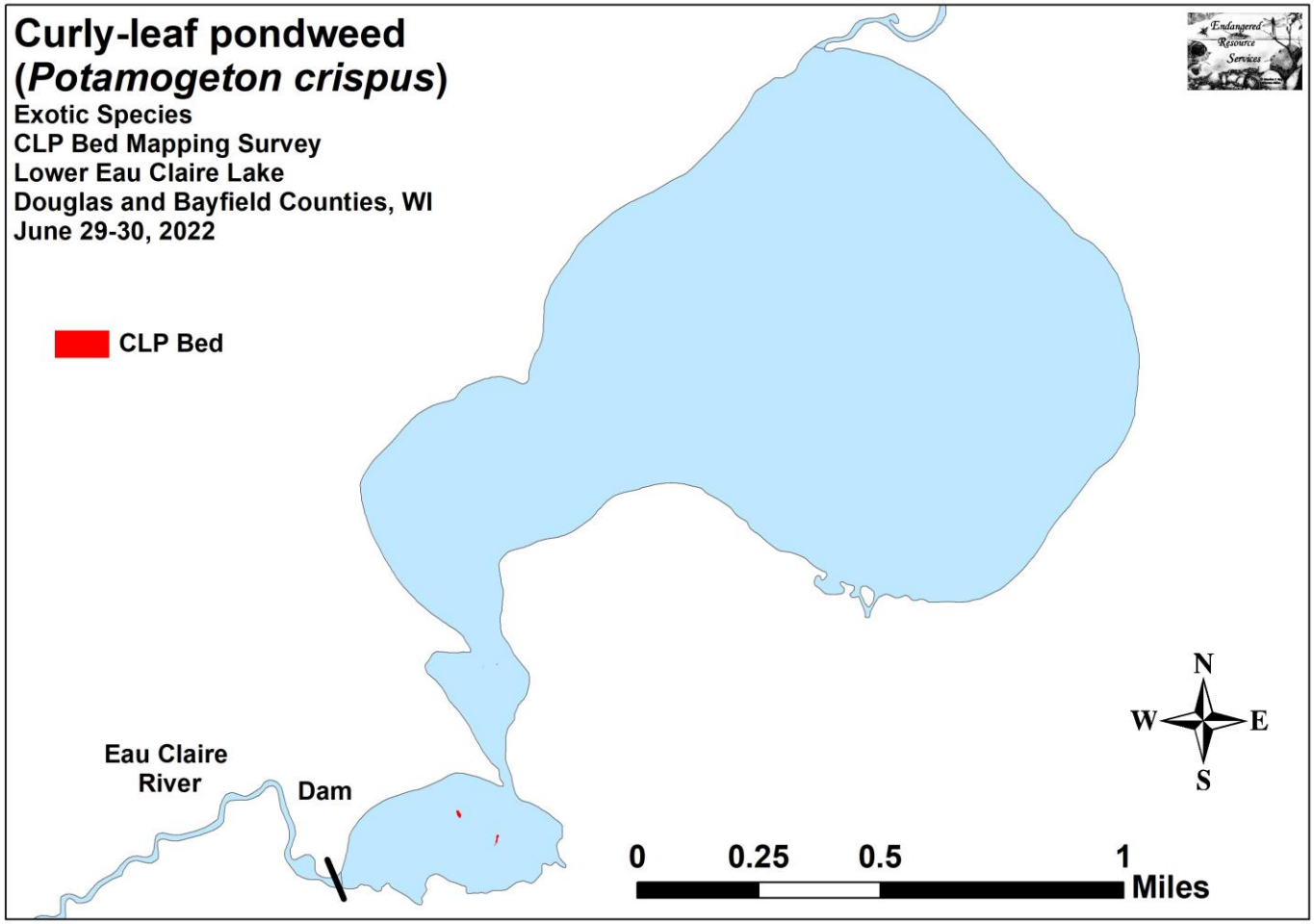
Appendix I: 2022, 2023, and 2024 June Curly-leaf Pondweed Bed Maps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Exotic Species
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Lower Eau Claire Lake
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June 29-30, 2022
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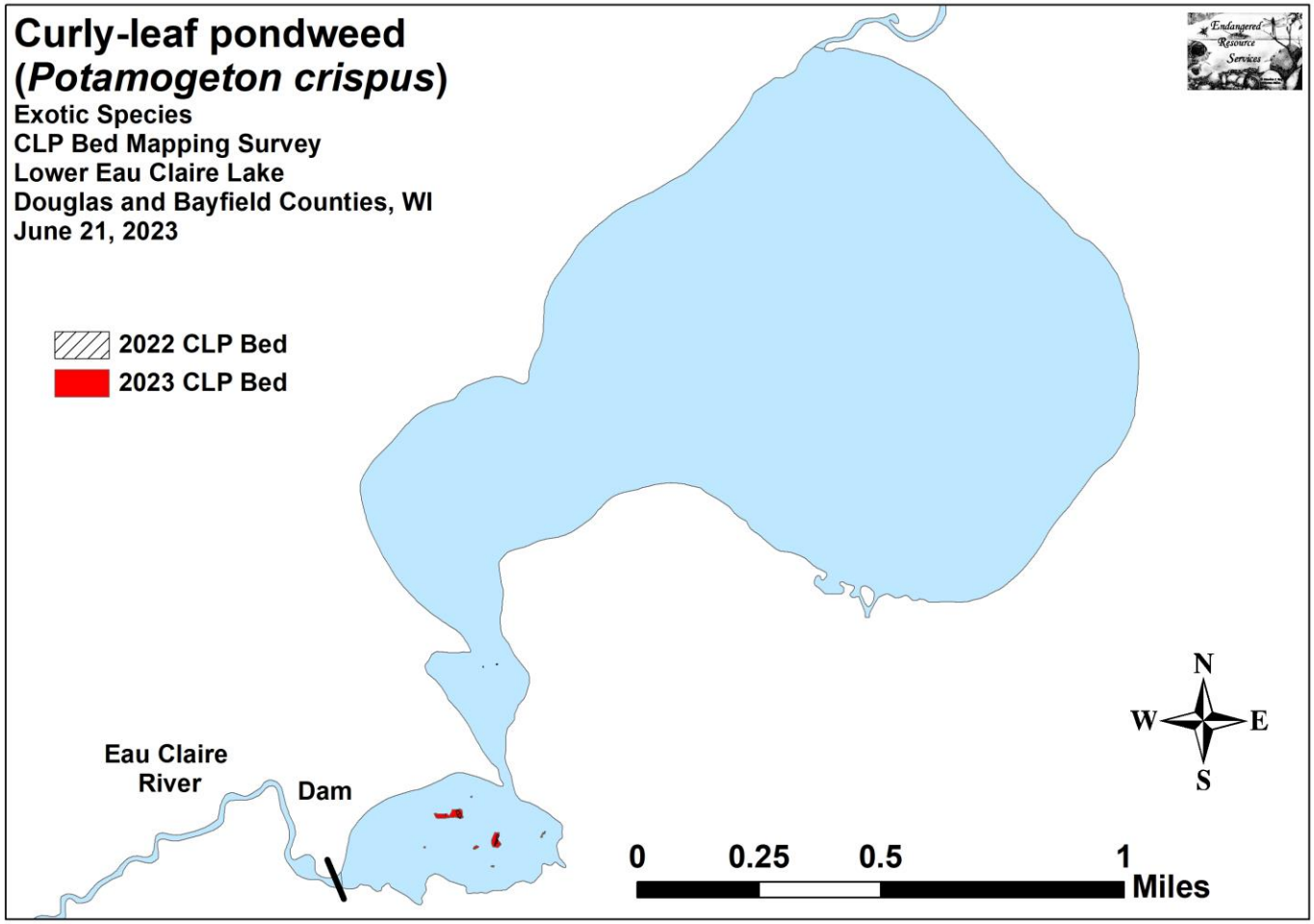
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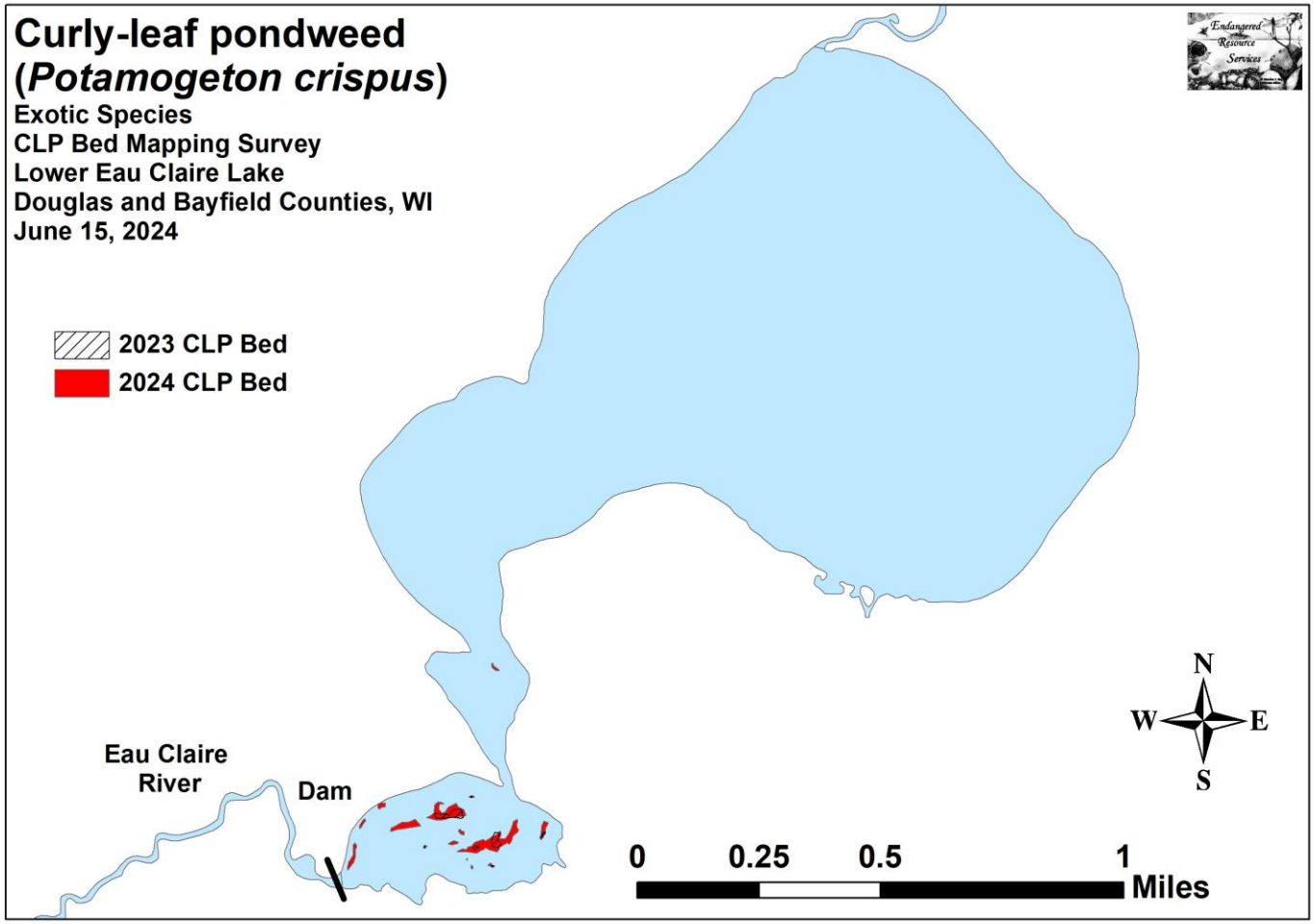
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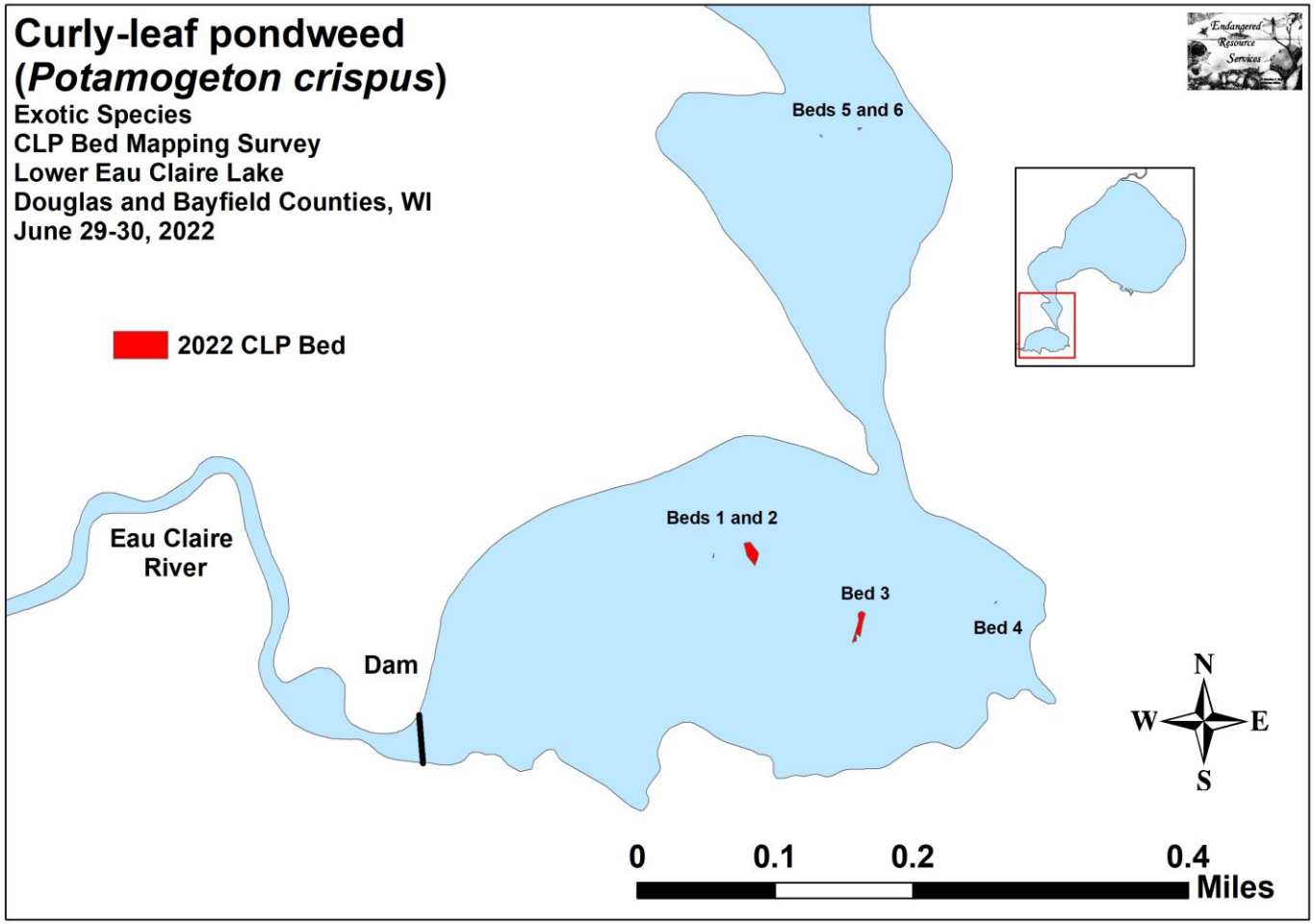
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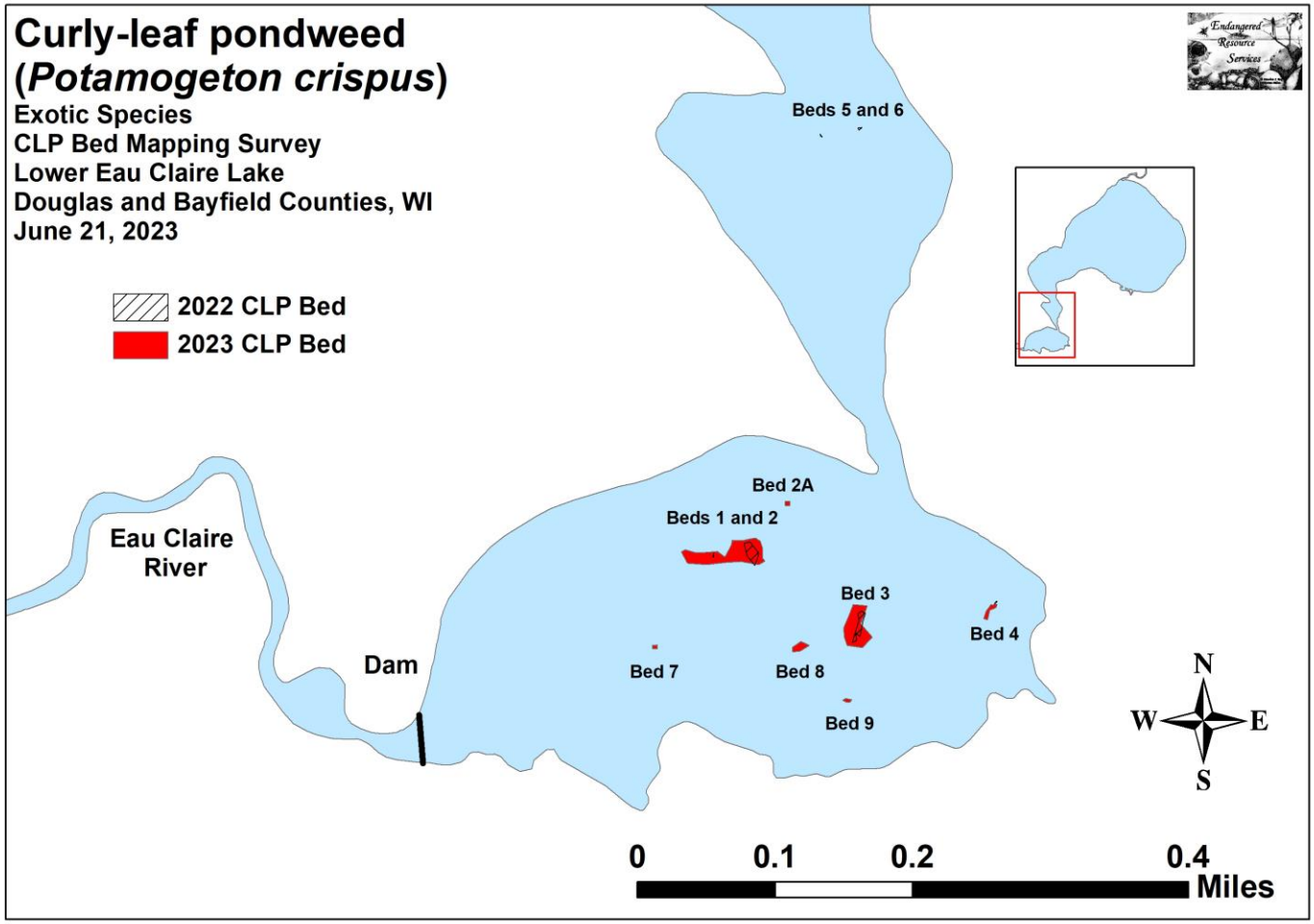
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Beds 1 and 2
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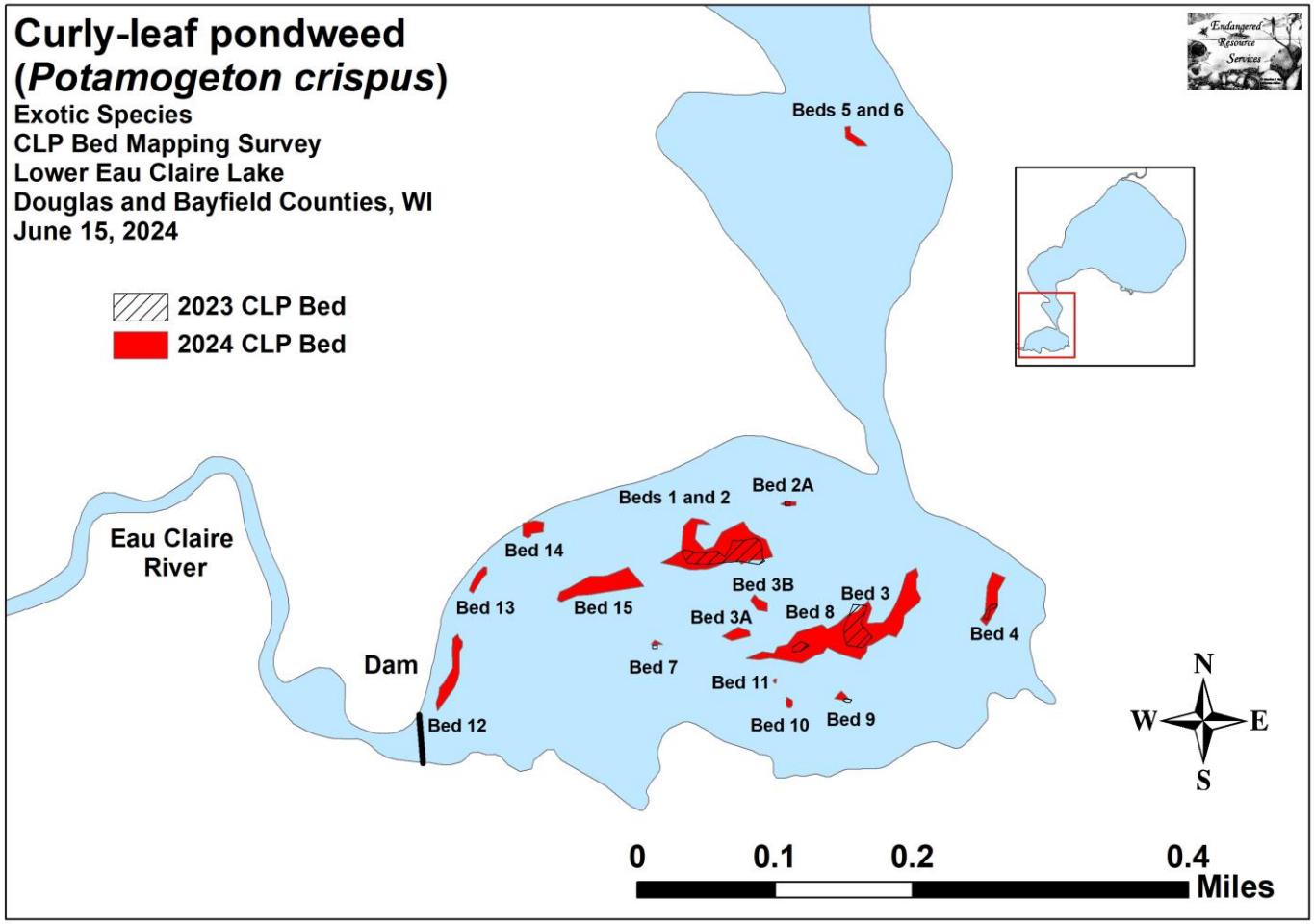
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