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

Sunny skies with a Caspian tern – Lower Eau Claire Lake – 6/21/23

Lower Eau Claire Lake aerial photo with 2023 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 showing "lasagna noodle" margins – 6/21/23

Survey Conducted by and Report Prepared by:

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June 21, 2023

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INTRODUCTION:

Lower Eau Claire Lake (WBIC 2741600) is a 784-acre stratified drainage lake located in southwestern Bayfield County, Wisconsin in the Town of Barnes (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 13.3ft (WDNR 2023). This very good clarity produced a littoral zone that reached approximately 20ft in 2023. 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).

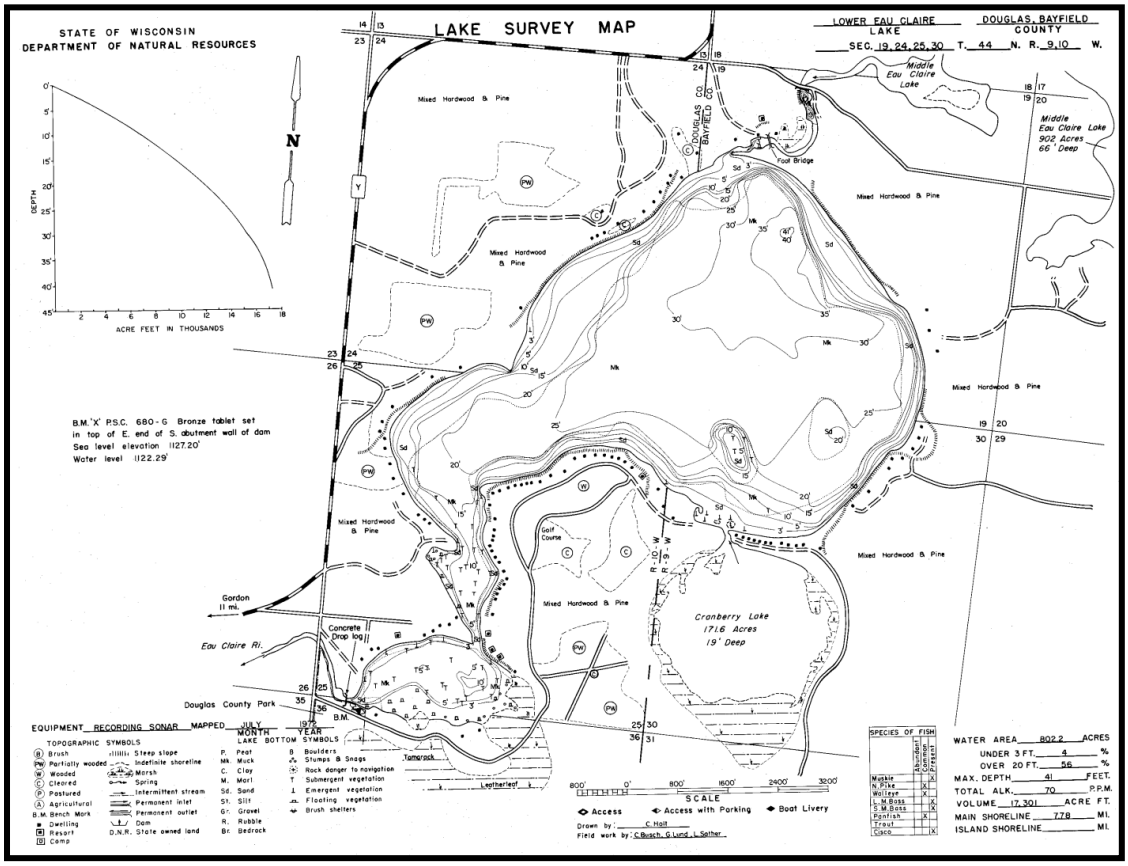


Figure 1: Lower Eau Claire Lake Bathymetric Map

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 again asked to conduct a follow-up bed mapping survey to assess the effectiveness of initial manual removal and to look for new areas with CLP. This report is the summary analysis of our June 21, 2023 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).

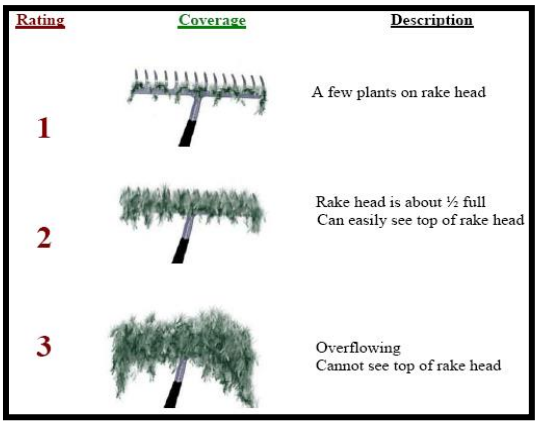


Figure 2: Rake Fullness Ratings (UWEX 2010)

RESULTS:

Summary of 2023 Curly-leaf Pondweed Bed Mapping Survey:

Ice out in 2023 was again 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. On June 21, 2023, we searched 19.6km (12.2 miles) of transects throughout the lake's visible littoral zone paying careful attention to all areas that were previously found to have CLP (Figure 3). We had mostly sunny skies and calm conditions that allowed us to see down in the water column approximately 7-8ft.

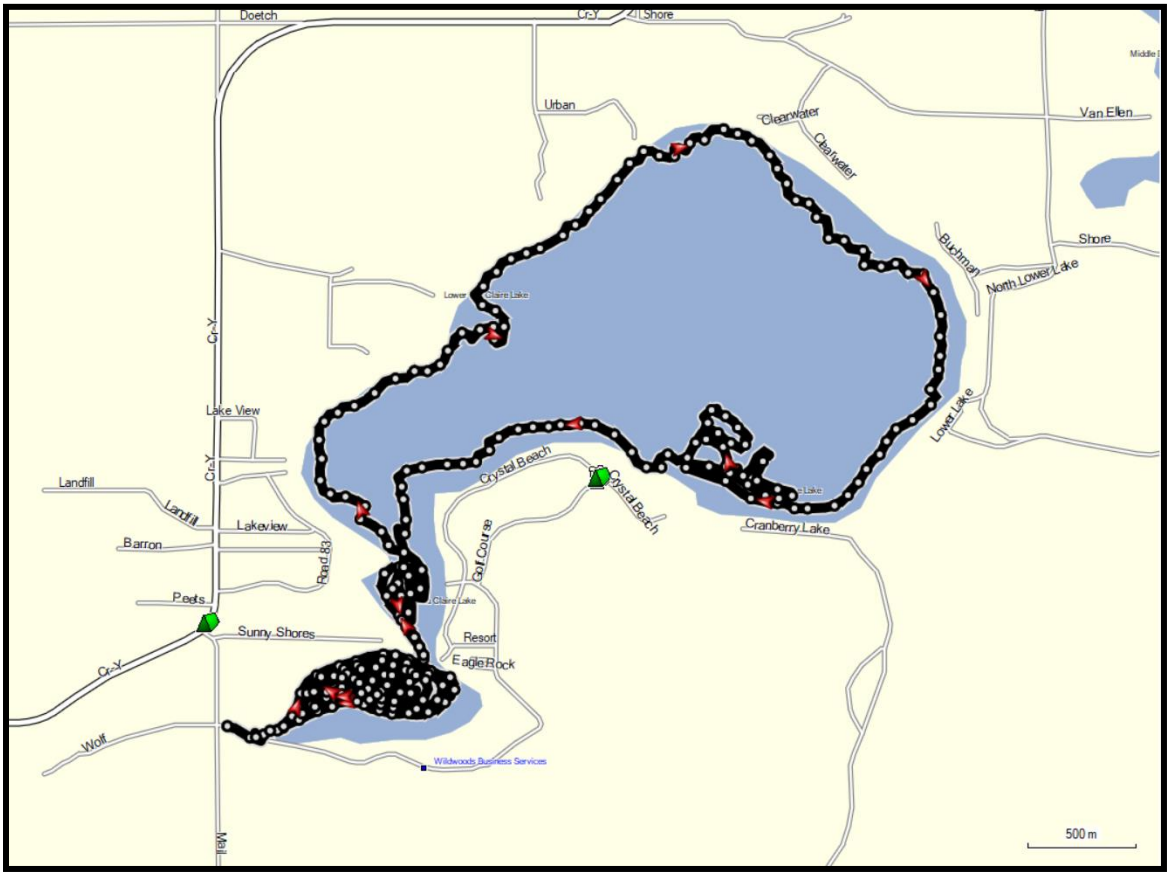


Figure 3: June 21, 2023 Littoral Zone CLP Survey Transects

Ultimately, we located seven beds covering 0.75 acre (0.10% of the lake's surface area) (Figure 4) (Appendix I) with all of them occurring in the outlet bay (Figure 5). This was a 0.64-acre (+582%) increase compared to the six beds totaling 0.11 acre that we mapped in 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.

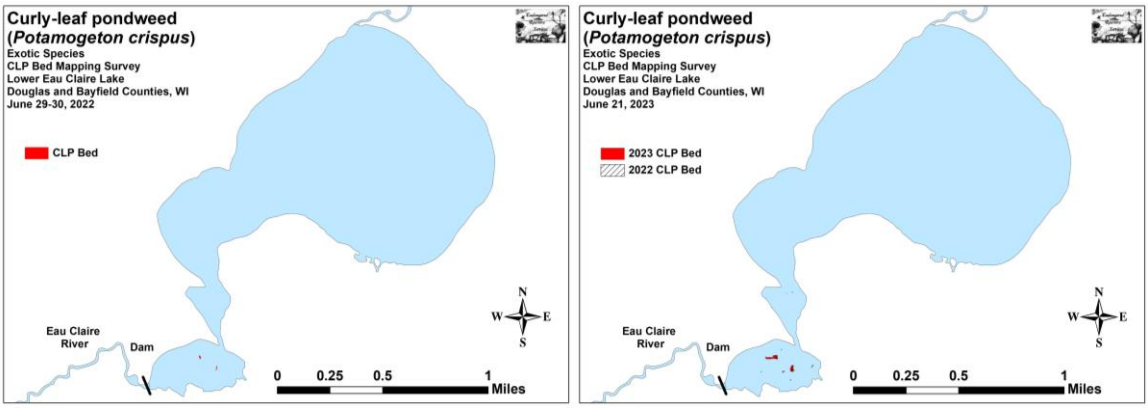


Figure 4: Lower Eau Claire Lake CLP Beds – 2022 and 2023

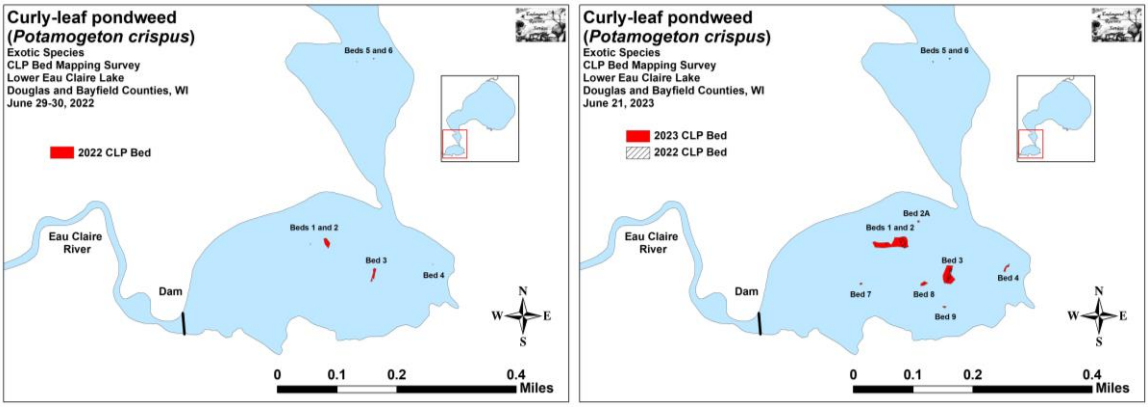


Figure 5: Figure 3: Outlet Bay - Lower Eau Claire Lake Curly-leaf pondweed Beds – 2022 and 2023

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

Bed Number	2023 Acreage	2022 Acreage	2022-23 Change in Area	Depth Range and Mean Depth	Est. Range and Mean Rake-full	Canopied	Navigation Impairment	2023 Field Notes
1	0.42	<0.01	0.36	7-10; 8	<<<1-3; 2	Near	Minor	No CLP plants found.
2	Merged	0.06	0	7-10; 8	<<<1-3; 2	Near	Minor	Merged with Bed 1.
2A	0.01	0	0.01	8-10; 9	2-3; 3	Near	Minor	Dense microbed.
3	0.26	0.05	0.21	8-10; 9	2-3; 3	Near	Moderate	Too small to be severe.
4	0.02	<0.01	0.02	2-4; 3	<<<1-3; 1	Yes	Minor	Open bed in Spatterdock.
5	0	<0.01	-<0.01	-	-	-	None	No CLP plants found.
6	0	<0.01	-<0.01	-	-	-	None	No CLP plants found.
7	0.01	0	0.01	5-6; 5	2-3; 2	Yes	None	Microbed.
8	0.03	0	0.03	8-10; 9	2-3; 3	Near	Minor	Most well below canopy.
9	0.01	0	0.01	2-4; 3	<<<1-3; 1	Yes	Minor	Open bed in Spatterdock.
Total Acres	**0.75**	**0.11**	**+0.64**					

Descriptions of Past and Present Curly-leaf Pondweed Beds:

Beds 1 and 2 – These two beds merged to form the worst area on the lake, and they covered more than half of the total area we delineated. Although not a significant navigation impairment as the bed was subcanopy, it occurred just off to the side of the main navigation channel leading away from the public boat landing. We noted plants were especially dense and grew continuously on the eastern end, but the bed declined in density and became fragmented on the west side.

Bed 2A – This dense microbed occurred just northeast of Beds 1 and 2. Because of its small size, it is likely a low management priority although its proximity to the other beds would make it easy to remove at the same time assuming suction harvesting occurs there.

Beds 3 and 8 – These two areas were the second worst on the lake and grew just southeast of the main navigation channel leading away from the landing. Bed 3 was especially dense, and we found plants were nearing canopy. Conversely, Bed 8 was well below canopy, and, because of this, likely not a significant impairment to navigation. For management purposes, these two areas should likely be viewed as continuous as it's probable there are scattered plants between them.

Beds 4 and 9 – We found these low-density microbeds growing among Spatterdock (*Nuphar variegata*) lilypads in areas that are unlikely to have boat traffic due to the shallow depth and stumps. Because of this, they are likely the lowest priority for management.

Beds 5 and 6 – Despite test raking in these former beds, we found no evidence of CLP in the narrows north of the outlet bay.

Bed 7 – Although canopied, this downstream microbed was likely a non-issue in regard to navigation due to its small size. However, it would also likely take minimum effort to remove it.

DISCUSSION AND CONSIDERATIONS FOR 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.

LITERATURE CITED

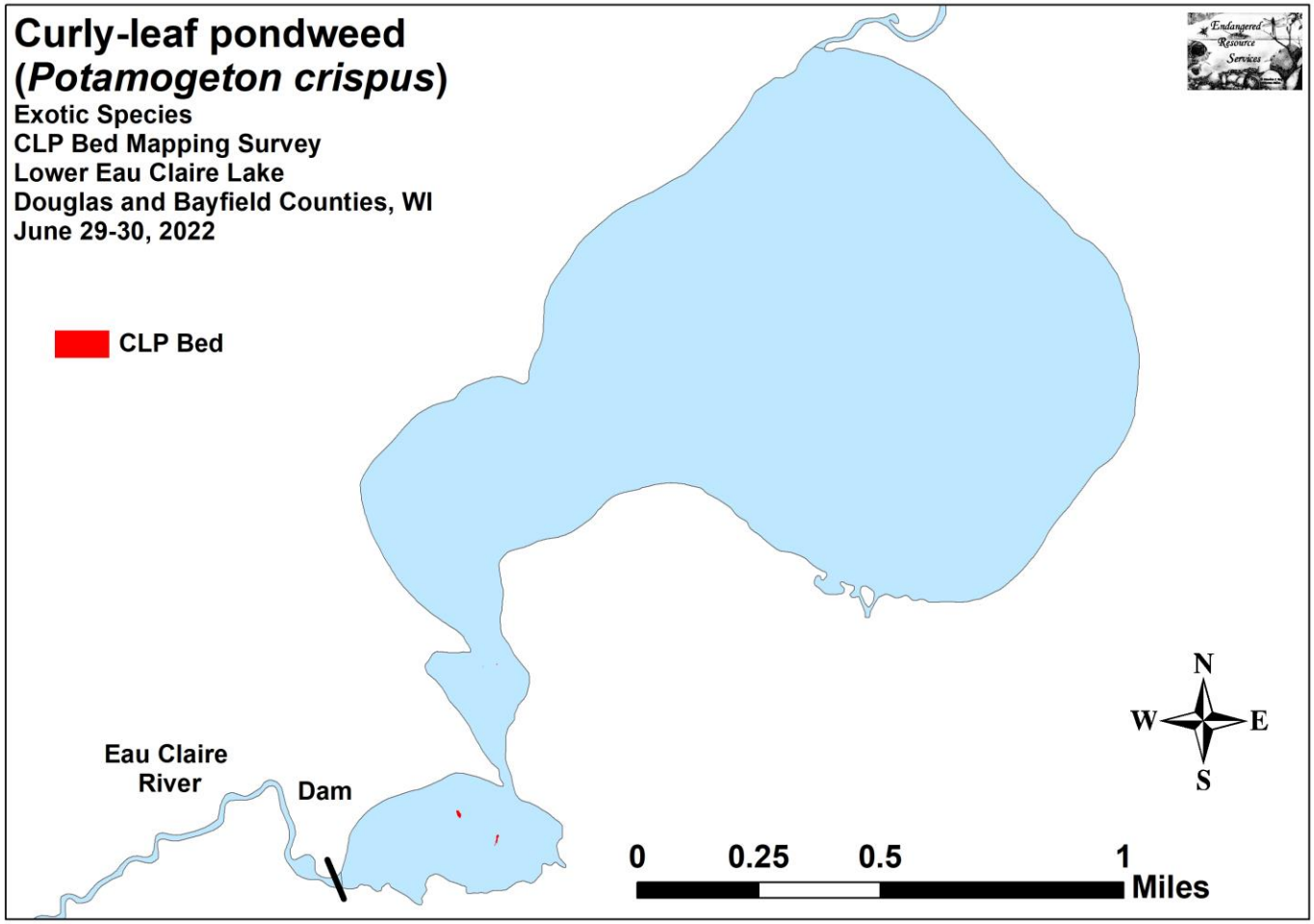
Holt, C., C. Busch, G. Lund, and L. Sather. [online]. 1972. Lower Eau Claire Lake Map. Available from: https://apps.dnr.wi.gov/doclink/lakes_maps/2741600a.pdf (2023, December).

UWEX Lakes Program. [online]. 2010. Aquatic Plant Management in Wisconsin. Available from http://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/ecology/aquaticplants/default.aspx (2023, December).

WDNR. [online]. 2023. Wisconsin Lake Citizen Monitoring Data for Lower Eau Claire Lake Douglas and Bayfield Counties. Available from https://dnr-wisconsin.shinyapps.io/WaterExplorer/?stationid=043037 (2023, December).

WDNR. [online]. 2023. Wisconsin Lakes Information – Lower Eau Claire Lake. https://apps.dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2741600 (2023, December).

Appendix I: 2022 and 2023 June Curly-leaf Pondweed Bed Maps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Exotic Species
CLP Bed Mapping Survey
Lower Eau Claire Lake
Douglas and Bayfield Counties, WI
June 29-30, 2022
CLP Bed
Endangered Resource Services
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S
Eau Claire River
Dam
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0.25
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1
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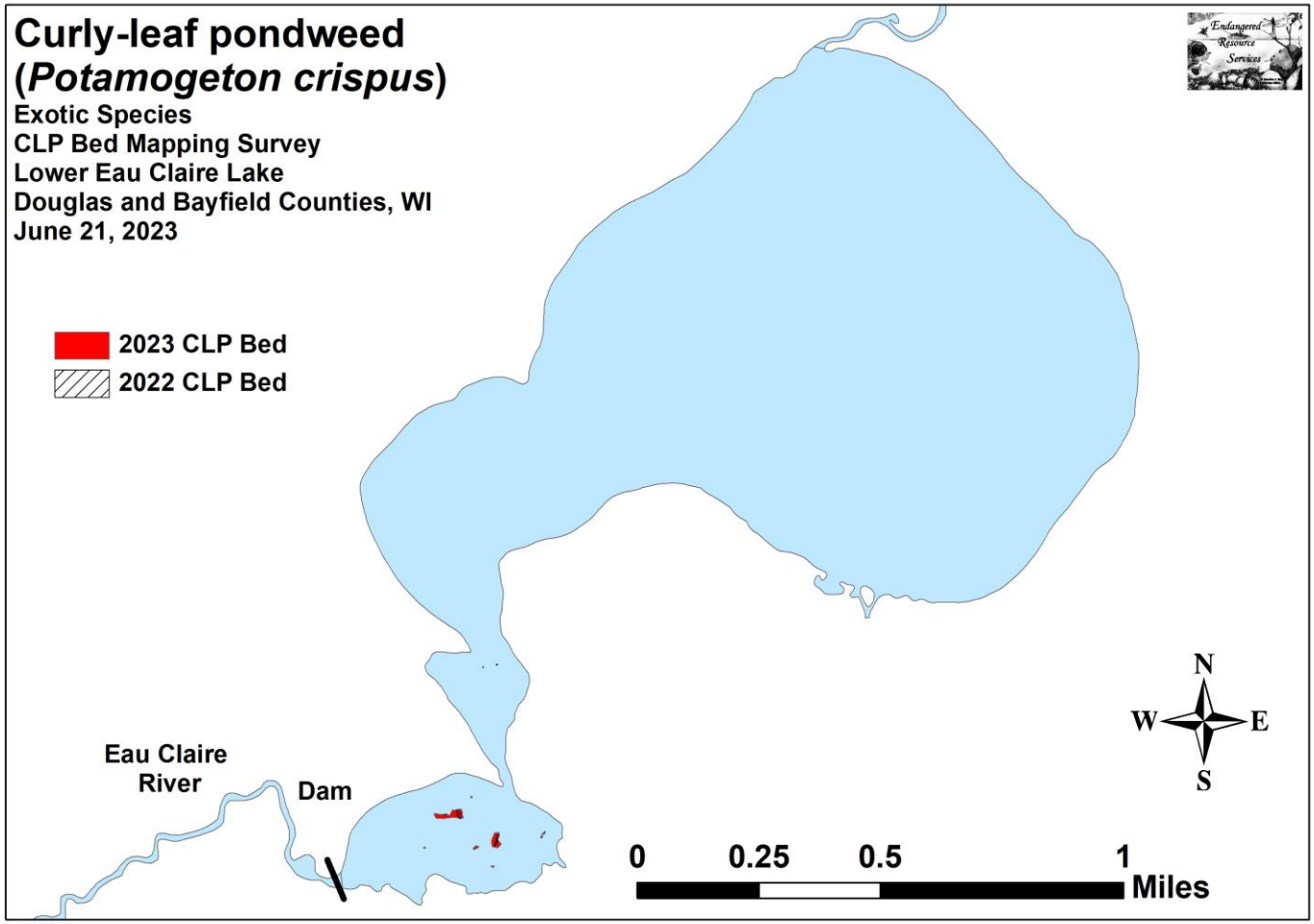
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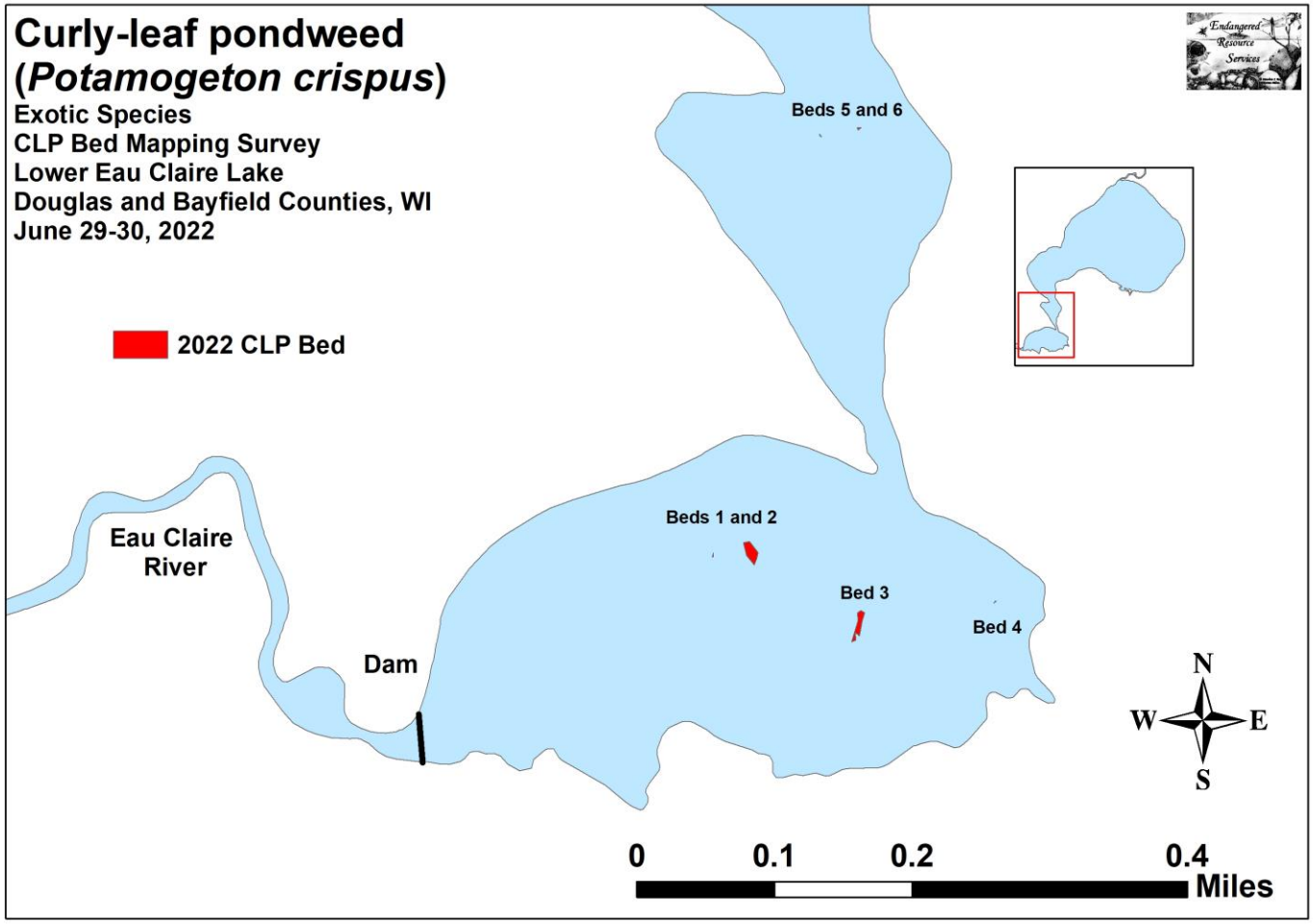
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2022 CLP Bed
Beds 5 and 6
Beds 1 and 2
Bed 3
Bed 4
Eau Claire River
Dam
N
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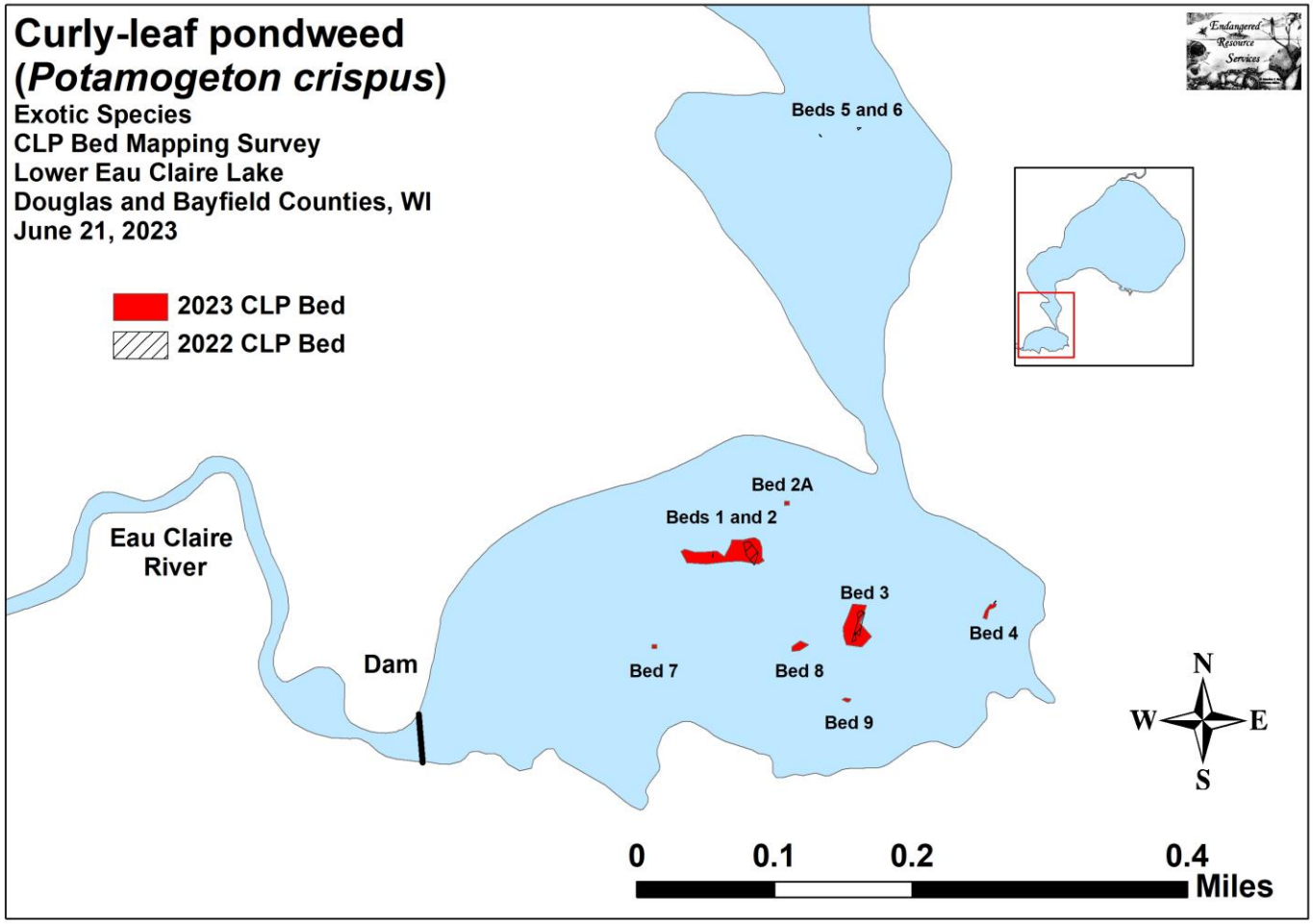
Miles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Bed 2A
Beds 1 and 2
Eau Claire River
Dam
Bed 3
Bed 4
Bed 7
Bed 8
Bed 9
N
W
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