

**Curly-leaf Pondweed (*Potamogeton crispus*)
Bed Mapping Survey
Big Trade Lake – WBIC: 2638700
Burnett County, Wisconsin**



Curly-leaf pondweed beds - 6/16/23



CLP plant showing "lasagna noodle" margins

Project Initiated by: Round-Trade Lakes Improvement Association Inc.,
Lake Education and Planning Services, LLC, and the
Wisconsin Department of Natural Resources (Grant AEPP70723)



Scattered nature of Curly-leaf pondweed in south-central bay - 6/16/23

Survey Conducted by and Report Prepared by:
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St. Croix Falls, Wisconsin
June 16, 2023

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INTRODUCTION:

Big Trade Lake (WBIC 2638700) is a 327-acre drainage lake in southwest/south-central Burnett County, Wisconsin in the Town of Trade Lake (T37N R18W S20/21 and 28/29). It reaches a maximum depth of 39ft in the west-central bay and has an average depth of approximately 20ft (Figure 1). The lake is eutrophic in nature with Secchi readings over the last ten years averaging 4.4ft (WDNR 2023). This poor to very poor water clarity produced a littoral zone that extended to approximately 12ft in 2023. The bottom substrate is predominately muck with scattered gravel and sandy areas along the shoreline and around the lake's exposed and sunken islands (Bush et al 1968).

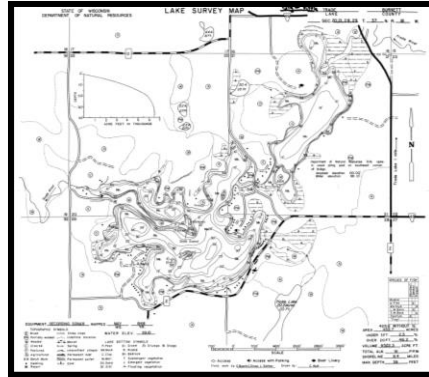


Figure 1: Big and Little Trade Lakes Bathymetric Map

BACKGROUND AND STUDY RATIONALE:

In 2009, the Wisconsin Department of Natural Resources (WDNR) confirmed the presence of Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM) in Little Trade Lake which is connected to Big Trade Lake via the Trade River Channel. In 2012, we observed EWM in the channel, and, by 2013, we found it had spread to Big Trade Lake's north-central bay with expansion into many other parts of the lake thereafter. Following the development of their WDNR approved Aquatic Plant Management Plan (APMP) that outlined strategies to control EWM and Curly-leaf pondweed (*Potamogeton crispus*) (CLP), another invasive exotic species that dominates the lake's spring littoral zone, the Round-Trade Lake Improvement Association, Inc. (RTLIA) began using manual removal and herbicide treatments to control these species.

Per WDNR expectations (Pamela Toshner/Alex Smith, WDNR – pers. comm.), whole-lake plant surveys on actively managed lakes are normally repeated every five to seven years to remain current. In anticipation of updating their plan in 2022, the RTLIA – under the direction of Dave Blumer (Lake Education and Planning Services, LLC - LEAPS) – applied for and receive a WDNR lake planning grant (LPL175421) to help cover the cost of surveys and to complete the new APMP. Prior to conducting these whole-lake surveys, treatment was suspended in 2021 with the expectation that some active management would likely resume in 2022. However, due to a variety of factors, it was ultimately decided not to chemically treat in 2022 or 2023 either. To help determine CLP levels after three years without active management, we were asked to complete an early-season CLP bed mapping survey. This report is the summary analysis of that field survey conducted on June 16, 2023.

METHODS:

Curly-leaf Pondweed Bed Mapping Survey:

During the survey, we searched the visible littoral zone of the lake and mapped all known beds of Curly-leaf pondweed. A “bed” was determined to be any area where we visually estimated that CLP made up >50% of the area’s plants and was generally continuous with clearly defined borders. 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 maximum 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).




<u>Rating</u>	<u>Coverage</u>	<u>Description</u>
1		A few plants on rake head
2		Rake head is about ½ full Can easily see top of rake head
3		Overflowing Cannot see top of rake head

Figure 2: Rake Fullness Ratings

RESULTS AND DISCUSSION:

Curly-leaf Pondweed Bed Mapping Survey:

Following a long winter with much above average snowfall, ice out in 2023 didn't occur on the Trade Lakes until late April; however, this was followed by a rapid warm-up that saw lake temperatures rocket into the 60's in only a few weeks. Presumably because of these unusual conditions, we found Curly-leaf pondweed on the lakes occurred at low levels relative to past surveys, and many of the plants that were present appeared stunted in growth (Figure 3). On June 16, 2023, we searched over 20km (12.4 miles) of transects throughout the lake's visible littoral zone. Collectively, we mapped 16 CLP beds that covered 32.23 acres (9.86% of the lake's surface area) (Figure 4) (Appendix I). This total was a 21.34-acre **(-39.84%) decline** from the 14 beds covering 53.57 acres (16.38% surface area) that we mapped in 2021 (Table 1). It was also a 14.65-acre **(-31.25%) decline** from the 17 beds on 46.88 acres (14.33% of the lake's surface area) mapped during the original survey in 2012. Only the 2016 survey, when we delineated 33 fragmented beds that covered 21.59 acres (6.60% surface area), had a lower total (Table 2).



**Figure 3: Curly-leaf Pondweed in the South-central Bay –
June 4, 2021 and June 16, 2023**

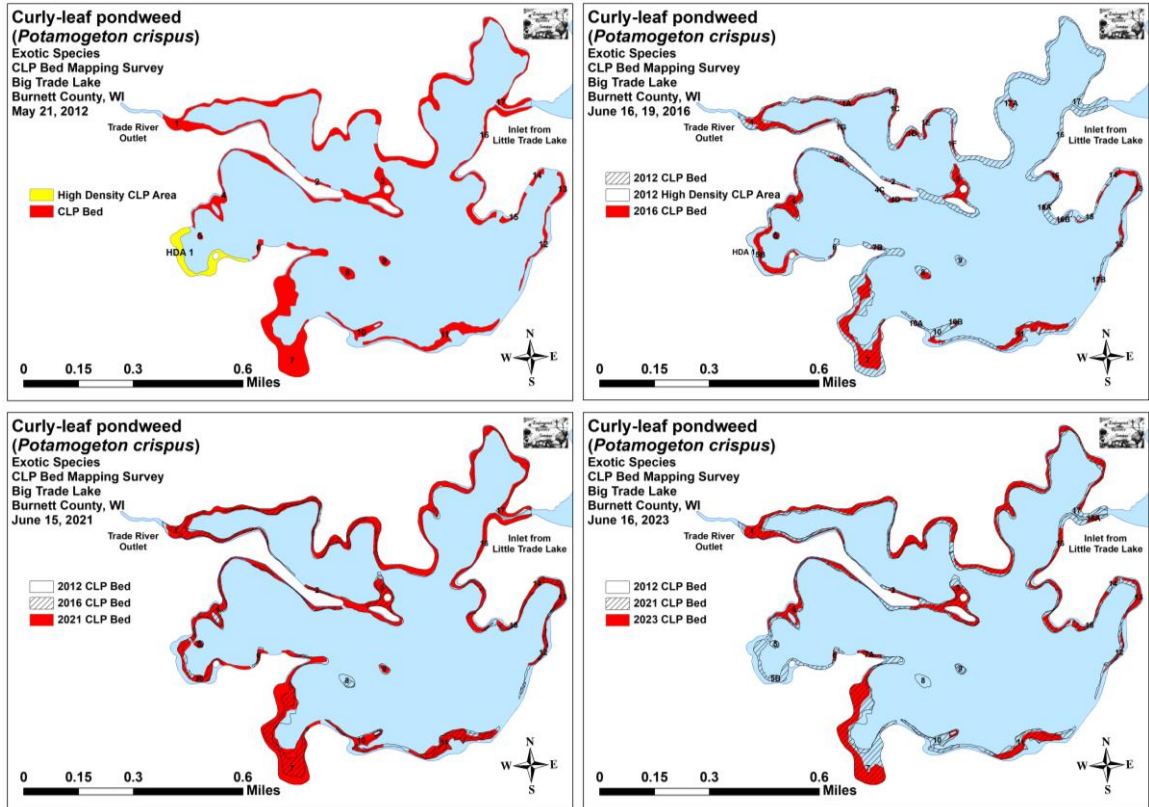


Figure 4: Spring 2012, 2016, 2021, and 2023 CLP Bed Maps

**Table 1: Spring Curly-leaf Pondweed Bed Mapping Summary
Big Trade Lake – Burnett County, Wisconsin
June 15, 2021 and June 16, 2023**

Bed Number	2023 Area in Acres	2021 Area in Acres	2021-2023 Change in Acreage	Rake Range; Mean Rake Fullness	Depth Range; Mean Depth	Canopied	Navigation Impairment	2023 Field Notes
1	7.11	9.75	-2.64	<<<1-2; 1	1-4; 3	Yes	Minor	Most of former bed dominated by EWM.
2	0.31	0	0.31	<<<1-2; 1	1-4; 3	Yes	Minor	Shoreline ribbon – CLP patchy.
3	2.88	3.91	-1.03	<<<1-3; 2	1-6; 4	Yes	Minor	Majority of bed around uninhabited islands.
4	2.33	3.95	-1.62	<<<1-2; <1	1-6; 4	Yes	None	Most of former bed dominated by EWM.
5	0	0.25	-0.25	<<<1	4-7; 6	-	None	Just a few scattered CLP plants.
5B	0	2.36	-2.36	<<<1	4-7; 6	-	None	Just a few scattered CLP plants.
6	0.12	0.31	-0.19	<<<1-2; 1	1-5; 5	Yes	Minor	CLP scattered among Spatterdock.
7 and 7A	7.09	11.70	-4.61	<<<1-3; <1	1-7; 5	Yes	None	Former bed mostly EWM – CLP patchy.
8	0	0	0	-	-	-	None	No CLP – former bed mat of EWM.
9	0	0.26	-0.26	-	-	-	None	No CLP – former bed mat of EWM.
10	0.16	1.90	-1.74	<<<1-3; 2	3-5; 4	Yes	Minor	Most of former bed dominated by EWM.
11	2.35	3.59	-1.24	<<<1-2; 1	1-7; 5	Yes	Minor	Area dominated by EWM – CLP in gaps.
12	0.36	0.81	-0.45	<<<1-3; <<1	1-6; 5	Yes	None	Barely a “high density area” – regular CLP.
13	0.92	0	0.92	<1-3; 2	1-6; 5	Yes	Minor	Mixed with EWM.
14	0.14	2.63	-2.49	<1-3; 2	1-6; 5	Yes	Minor	Narrow shoreline ribbon – mixed w/ EWM.
15	0.71	0	0.71	<1-3; 2	1-6; 5	Yes	Minor	Too narrow to be mod. – mixed w/ EWM.
16 and 16A	2.31	3.97	-1.66	<<<1-3; 1	1-5; 4	Yes	Minor	Most of former bed dominated by EWM.
17	5.43	8.18	-2.75	<<<1-3; 1	1-6; 4	Yes	Minor	Scattered dense EWM mixed in with CLP.
Total Acres	32.23	53.57	-21.34					

**Table 2: Historical Spring Curly-leaf Pondweed Bed Mapping Summary
Big Trade Lake – Burnett County, Wisconsin
May 21, 2012, June 16, 2016, June 15, 2021, and June 16, 2023**

Bed Number	2023 Area in Acres	2021 Area in Acres	2016 Area in Acres	2012 Area in Acres
1 (A-G)	7.11	9.75	4.99	7.95
2	0.31	0	0.15	0.31
3	2.88	3.91	1.61	3.56
4 (A-D)	2.33	3.95	2.40	3.65
5	0	0.25	0.18	0.15
5B	0	2.36	2.11	0
6	0.12	0.31	0.07	0.33
7 (A and B)	7.09	11.70	4.97	11.48
8	0	0	0.29	0.69
9	0	0.26	0	0.38
10 (A and B)	0.16	1.90	0.43	1.26
11	2.35	3.59	2.23	3.74
12 (A and B)	0.36	0.81	0.50	0.88
13	0.92	0	0.88	0.72
14	0.14	2.63	0.15	0.38
15	0.71	0	0.11	0.57
16 (A and B)	2.31	3.97	0.39	3.50
17	5.43	8.18	0.16	7.31
Total Acres	32.23	53.57	21.59	46.88

Descriptions of Past and Present Curly-leaf Pondweed Beds:

Bed 1 – Most of the shorelines in the northwest outlet bay had Curly-leaf pondweed, but it generally occurred at low density as Eurasian water-milfoil was increasingly dominant in the area . Even when CLP was present, the littoral zone in this area was so narrow that the bed wasn't likely to be more than a minor impairment to navigation.

Bed 2 - This area barely qualified as a bed as there were moderate amounts of Northern water milfoil (*Myriophyllum sibiricum*) mixed in. CLP were also only intermittently canopied, but it still made up over 50% of plants. This shoreline was rocky/sandy and heavily shaded by trees which made for generally poor CLP growing conditions, and most growth ended at the ends of docks creating minimal interference with boat traffic.

Bed 3 – CLP around the central wooded islands was only moderately dense. Boats seemed to be avoiding most of the area around and between the islands, but there were numerous prop trails over the saddle that connected the islands and the eastern tip of the Cedar Point Peninsula.

Bed 4 – Most of the former bed was dominated by EWM. CLP was still present, but it was probably better described as a “high density area”.

Beds 5 and 5A – We found almost no CLP in these former beds.

Beds 6 – This microbed was established along an uninhabited point where it mixed with Spatterdock (*Nuphar variegata*). Based on this, it's likely a non-issue regarding management.

Bed 7 – This bed wrapped around the point and extended into the shallow southwestern bay. Although CLP was present throughout, the majority of the bay was dominated by EWM.

Beds 8 and 9 – The sunken midlake islands were dominated by dense canopied EWM, and we didn't see any CLP anywhere.

Bed 10 – Most of this former bed was dominated by dense EWM. The only patch of continuous CLP was a microbed that occurred on the north end of the sunken island with a stand of Hardstem bulrush (*Schoenoplectus acutus*).

Bed 11 –This bed was also dominated by EWM. The only dense CLP occurred in patches between the EWM beds.

Beds 12-15 – This series of narrow beds stretched around the eastern shoreline and back to the east side public boat landing. Most areas had moderate CLP density, but the beds were so narrow that they were unlikely to be more than a minor navigation impairment.

Beds 16, 16A, and 17 – These narrow shoreline beds wrapped around the north-central bay and the lake inlet. None were dense or likely to cause significant navigation impairment. Like many other former beds, we found EWM seemed to be outcompeting CLP in this area – at least under this year's growing conditions.

CONSIDERATIONS FOR MANAGEMENT:

Curly-leaf pondweed levels in 2023 were the second lowest we have documented during any of our four bed mapping surveys on the lake dating back to 2012. Despite this, it's likely that high CLP levels that cause significant navigation impairment will return in years with less extreme spring growing condition. With this in mind, continuing to work to manage CLP in the most cost-effective manner possible, while simultaneously minimizing its impact on the lake's aquatic ecosystem will likely continue to be important goals for the lake association moving forward.

Ultimately, the RTLIA, LEAPS, and the WDNR will have to decide on what, if any, active management should occur in 2024. Similarly, how much monitoring will be needed in 2024, if any, is a conversation that needs to take place.

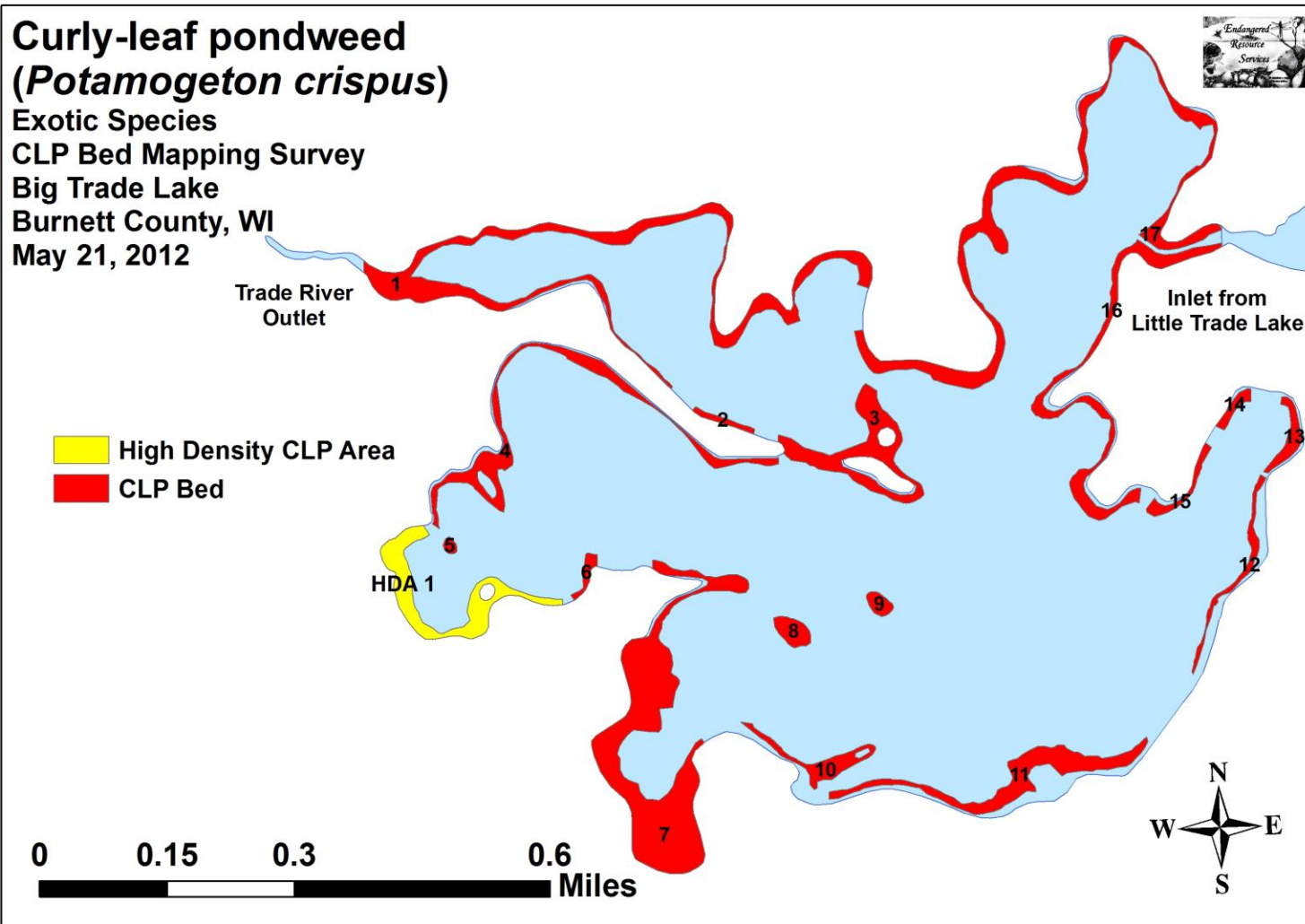
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Appendix I: Spring 2012, 2016, 2021, and 2023 CLP Bed Maps

Curly-leaf pondweed (*Potamogeton crispus*)

Exotic Species
CLP Bed Mapping Survey
Big Trade Lake
Burnett County, WI
May 21, 2012

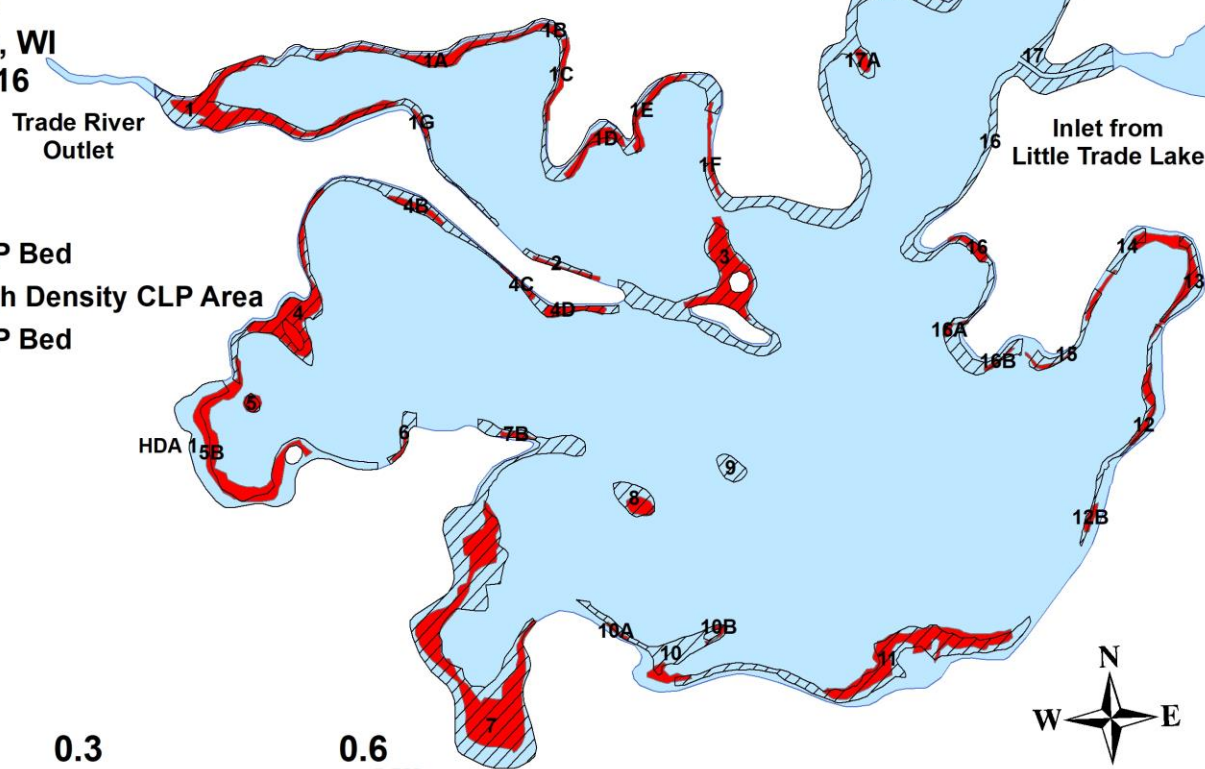


Curly-leaf pondweed (*Potamogeton crispus*)

Exotic Species
CLP Bed Mapping Survey
Big Trade Lake
Burnett County, WI
June 16, 19, 2016



-  2012 CLP Bed
-  2012 High Density CLP Area
-  2016 CLP Bed



Curly-leaf pondweed (*Potamogeton crispus*)

Exotic Species
CLP Bed Mapping Survey
Big Trade Lake
Burnett County, WI
June 15, 2021



- 2012 CLP Bed
- 2016 CLP Bed
- 2021 CLP Bed

Trade River
Outlet

Inlet from
Little Trade Lake

0 0.15 0.3 0.6 Miles

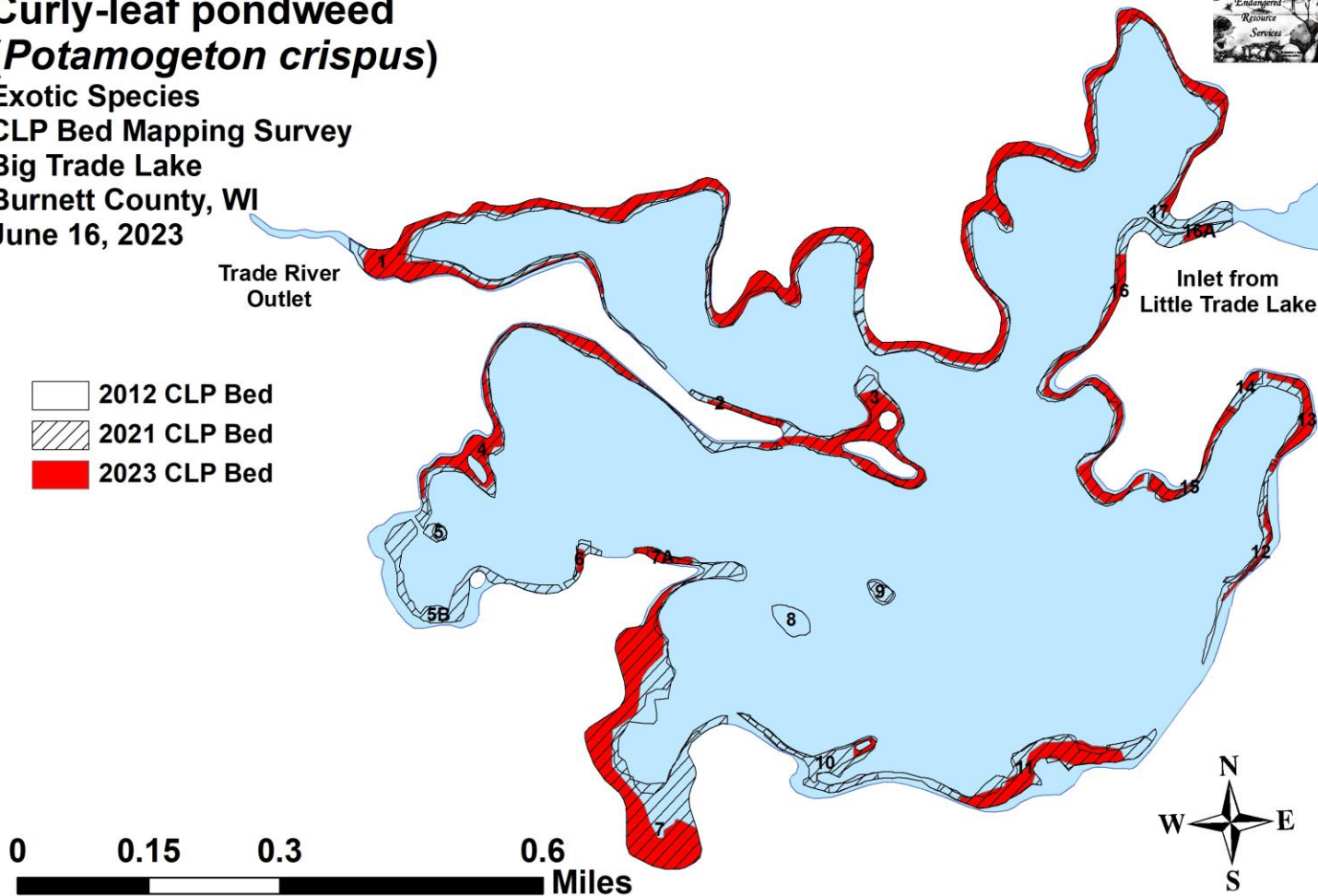


Curly-leaf pondweed (*Potamogeton crispus*)

Exotic Species
CLP Bed Mapping Survey
Big Trade Lake
Burnett County, WI
June 16, 2023



- 2012 CLP Bed
- 2021 CLP Bed
- 2023 CLP Bed



**Curly-leaf Pondweed (*Potamogeton crispus*)
Bed Mapping Survey
Little Trade Lake – WBIC: 2639300
Burnett County, Wisconsin**



Low-density Curly-leaf pondweed in the northwest bay - 6/16/23



Curly-leaf pondweed beds - 6/16/23

Project Initiated by: Round-Trade Lakes Improvement Association Inc.,
Lake Education and Planning Services, LLC, and the
Wisconsin Department of Natural Resources (Grant AEPP70723)



Scattered nature of Curly-leaf pondweed in west-central bay - 6/16/23

Survey Conducted by and Report Prepared by:
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INTRODUCTION:

Little Trade Lake (WBIC 2639300) is a 126-acre drainage lake in southwest/south-central Burnett County, Wisconsin in the Town of Trade Lake (T37N R18W S21). It reaches a maximum depth of 19ft in the central basin and has an average depth of approximately 9ft (the WDNR's stated depth average of 15ft combined depth data from Big Trade and Little Trade Lakes) (WDNR 2023). The lake is eutrophic in nature with Secchi readings over the last ten years averaging 3.4ft (WDNR 2023). This very poor water clarity produced a littoral zone that extended to approximately 9ft in 2023. The bottom substrate is predominately organic muck with scattered gravel and sandy areas along the shoreline and around the island (Bush et al. 1968).

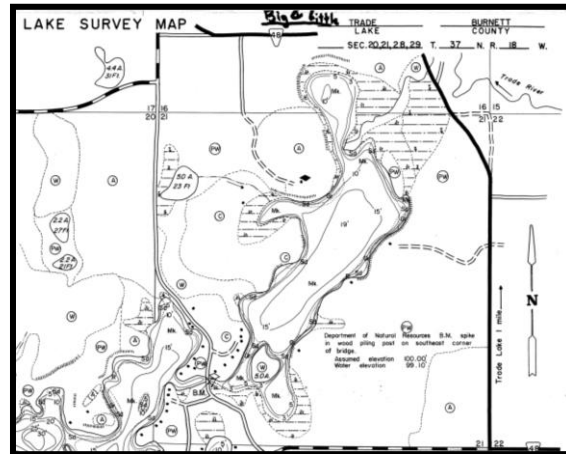


Figure 1: Little Trade Lake Bathymetric Map

BACKGROUND AND STUDY RATIONALE:

In 2009, the Wisconsin Department of Natural Resources (WDNR) confirmed the presence of Eurasian water-milfoil (EWM) (*Myriophyllum spicatum*) in Little Trade Lake. Following the development of a WDNR approved Aquatic Plant Management Plan (APMP) that outlined strategies to control EWM and Curly-leaf pondweed (*Potamogeton crispus*) (CLP), another invasive exotic species that dominates the lake's spring littoral zone, the Round-Trade Lake Improvement Association, Inc. (RTLIA) began using manual removal and herbicide treatments to control these species.

Per WDNR expectations (Pamela Toshner/Alex Smith, WDNR – pers. comm.), whole-lake plant surveys on actively managed lakes are normally repeated every five to seven years to remain current. In anticipation of updating their plan in 2022, the RTLIA – under the direction of Dave Blumer (Lake Education and Planning Services, LLC - LEAPS) – applied for and receive a WDNR lake planning grant (LPL175421) to help cover the cost of surveys and to complete the new APMP. Prior to conducting these whole-lake surveys, treatment was suspended in 2021 with the expectation that some active management would likely resume in 2022. However, due to a variety of factors, it was ultimately decided not to chemically treat in 2022 or 2023 either. To help determine CLP levels after three years without active management, we were asked to complete an early-season CLP bed mapping survey. This report is the summary analysis of that field survey conducted on June 16, 2023.

METHODS:

Curly-leaf Pondweed Bed Mapping Survey:

During the survey, we searched the visible littoral zone of the lake and mapped all known beds of Curly-leaf pondweed. A “bed” was determined to be any area where we visually estimated that CLP made up >50% of the area’s plants and was generally continuous with clearly defined borders. 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 maximum 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).




<u>Rating</u>	<u>Coverage</u>	<u>Description</u>
1		A few plants on rake head
2		Rake head is about ½ full Can easily see top of rake head
3		Overflowing Cannot see top of rake head

Figure 2: Rake Fullness Ratings

RESULTS AND DISCUSSION:

Curly-leaf Pondweed Bed Mapping Survey:

Following a long winter with much above average snowfall, ice out in 2023 didn't occur on the Trade Lakes until late April; however, this was followed by a rapid warm-up that saw lake temperatures rocket into the 60's in only a few weeks. Presumably because of these unusual conditions, we found Curly-leaf pondweed on the lakes occurred at low levels relative to past surveys, and many of the plants that were present appeared stunted in growth (Figure 3). On June 16, 2023, we searched over 10km (6.2 miles) of transects throughout the lake's visible littoral zone. Collectively, we mapped 10 CLP beds that covered 24.63 acres (19.54% of the lake's surface area) (Figure 4) (Appendix I). This total was a 22.42-acre (-47.65%) decline from the single continuous lakewide bed covering 47.05 acres (37.34% surface area) that we mapped in 2021 (Table 1). It was also a 17.71-acre (-41.83%) decline from the nine beds on 42.34 acres (33.60% of the lake's surface area) mapped in 2016; and 25.01 acres (-50.38%) lower than the peak of 49.64 acres (39.39% surface area) in a single giant bed in 2012.



Figure 3: Curly-leaf Pondweed in the Northwest Bay – June 15, 2021 and June 16, 2023

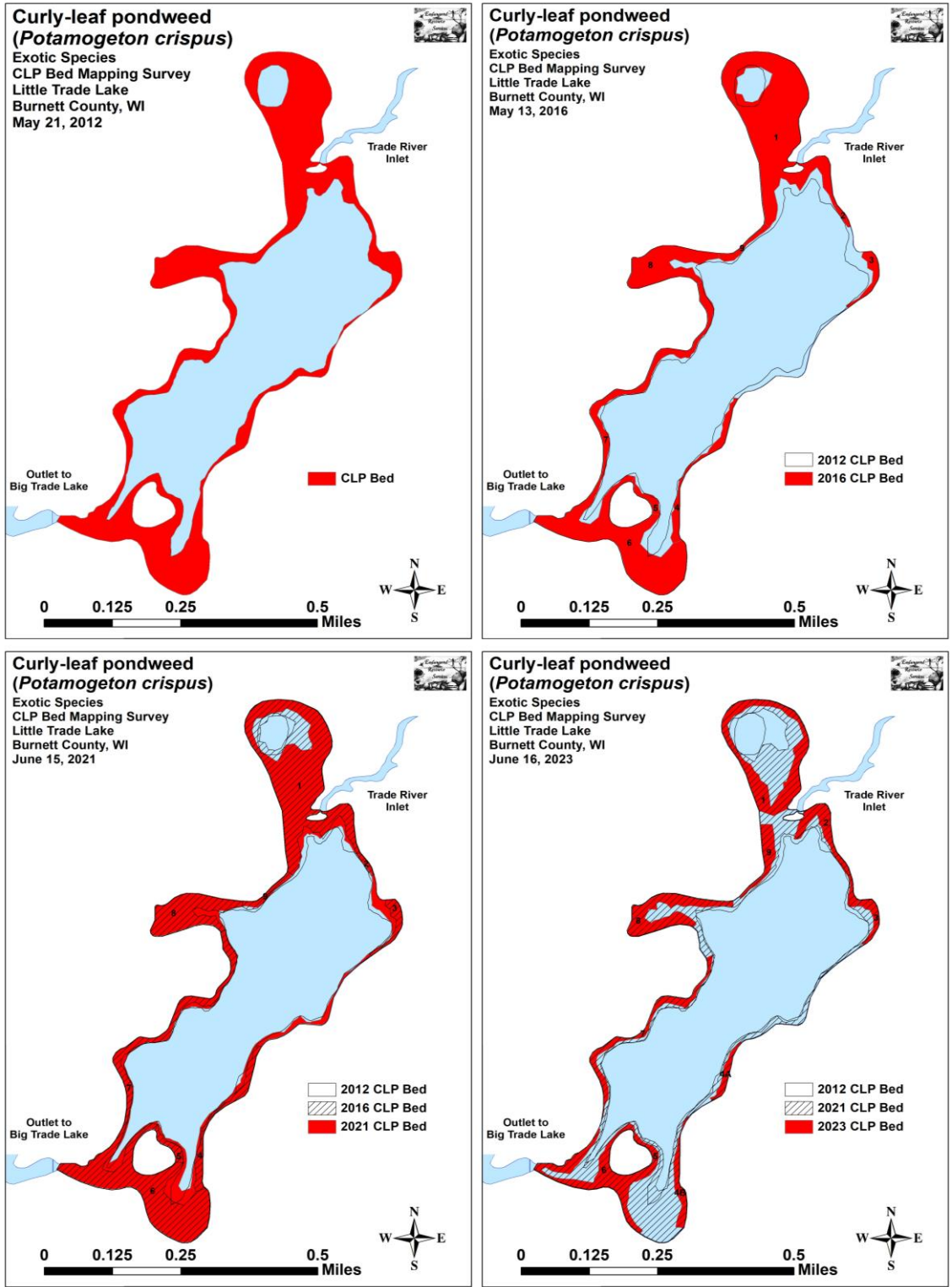


Figure 4: Spring 2012, 2016, 2021, and 2023 CLP Bed Maps

**Table 1: Spring Curly-leaf Pondweed Bed Mapping Summary
Little Trade Lake – Burnett County, Wisconsin
June 15, 2021 and June 16, 2023**

Bed Number	2023 Area in Acres	2021 Area in Acres	2021-2023 Change in Acreage	Rake Range; Mean Rake Fullness	Depth Range; Mean Depth	Canopied	Navigation Impairment	2023 Field Notes
1	5.82	-	-	<<<<1-2; <1	1-4; 3	Yes	None	Canopied Coontail dominated – more HDA.
2	2.46	-	-	<<<<1-3; 1	1-4; 3	Yes	Minor	Mixed with EWM – series of CLP patches.
3	0.82	-	-	<<<<1-1; 1	1-4; 3	Yes	Minor	Shoreline ribbon mixed with Spatterdock.
4 (A and B)	2.12	-	-	<<<<1-2; 1	1-5; 4	Yes	Minor	Mixed with EWM and Spatterdock.
5	0.48	-	-	<<<<1-3; 1	2-6; 4	Yes	Minor	Shoreline ribbon mixed with Spatterdock.
6	5.17	-	-	<<<<1-3; 2	1-6; 4	Yes	Moderate	Prop trails throughout, but patchy.
7	2.34	-	-	<<<<1-3; 2	1-6; 4	Yes	Minor	Mixed with EWM/too narrow to be mod.
8	3.98	-	-	<<<<1-3; 2	1-6; 4	Yes	Minor	Mixed with EWM/too narrow to be mod.
9	1.46	-	-	<<<<1-2; 1	1-6; 3	Yes	Minor	Very patchy – mixed with native species.
Total Acres	24.63	47.05	-22.42					

Descriptions of Past and Present Curly-leaf Pondweed Beds:

Bed 1 – The northwest bay was dominated by canopied Coontail (*Ceratophyllum demersum*) interspersed with patches of Curly-leaf pondweed. This made it more of a “high CLP density area” than a true bed. Although the Coontail was likely causing at least minor impairment, the CLP was not. This was a radical change from 2021 when CLP grew so densely that the bay was almost unnavigable.

Beds 2 and 3 – The narrow strip of CLP along the shorelines east of the river inlet and in the northeast bay were patchy and mixed with Eurasian water-milfoil. Because there are no residences in this area, it is likely a low management priority.

Bed 4 (A and B) – Although Bed 4 ran along a shoreline with continuous residences, the narrowness of the bed and its fragmented nature likely meant it was only a minor navigation impairment if at all.

Bed 5 – This bed north of the island was generally low density as it was established over sand and rock and often occurred interspersed with Spatterdock (*Nuphar variegata*). We also noted significant patches of EWM in this area.

Bed 6 – Historically, a continuous canopied mat of CLP covered the area south of the island and in the outlet to Big Trade Lake. During our 2023, this was the worst bed on the lake and seemed likely to be at least a moderate impairment to navigation as we observed prop-trails throughout the area. Despite this, continuous boat traffic was keeping reasonable channels open on both the east and west sides of the island.

Bed 7 – The narrowness of the bed along this developed shoreline likely meant CLP was only a minor navigation issue.

Bed 8 – In 2021, we found CLP formed a solid canopied mat in the west-central finger bay that was likely a severe impairment to navigation. However, in 2023, plants were only scattered and seldom appeared likely to cause more than a minor impairment.

Bed 9 – The narrowness of the bed along this mostly undeveloped shoreline likely meant CLP was a non-issue. In general, the bed in this area was patchy as CLP was mixed with both EWM and native species.

CONSIDERATIONS FOR MANAGEMENT:

Curly-leaf pondweed levels in 2023 were the lowest we have documented during any of our four bed mapping surveys on the lake dating back to 2012. Despite this, it's likely that high CLP levels that cause significant navigation impairment will return in years with less extreme spring growing condition. With this in mind, continuing to work to manage CLP in the most cost-effective manner possible, while simultaneously minimizing its impact on the lake's aquatic ecosystem will likely continue to be important goals for the lake association moving forward.

Ultimately, the RTLIA, LEAPS, and the WDNR will have to decide on what, if any, active management should occur in 2024. Similarly, how much monitoring will be needed in 2024, if any, is a conversation that needs to take place.

LITERATURE CITED

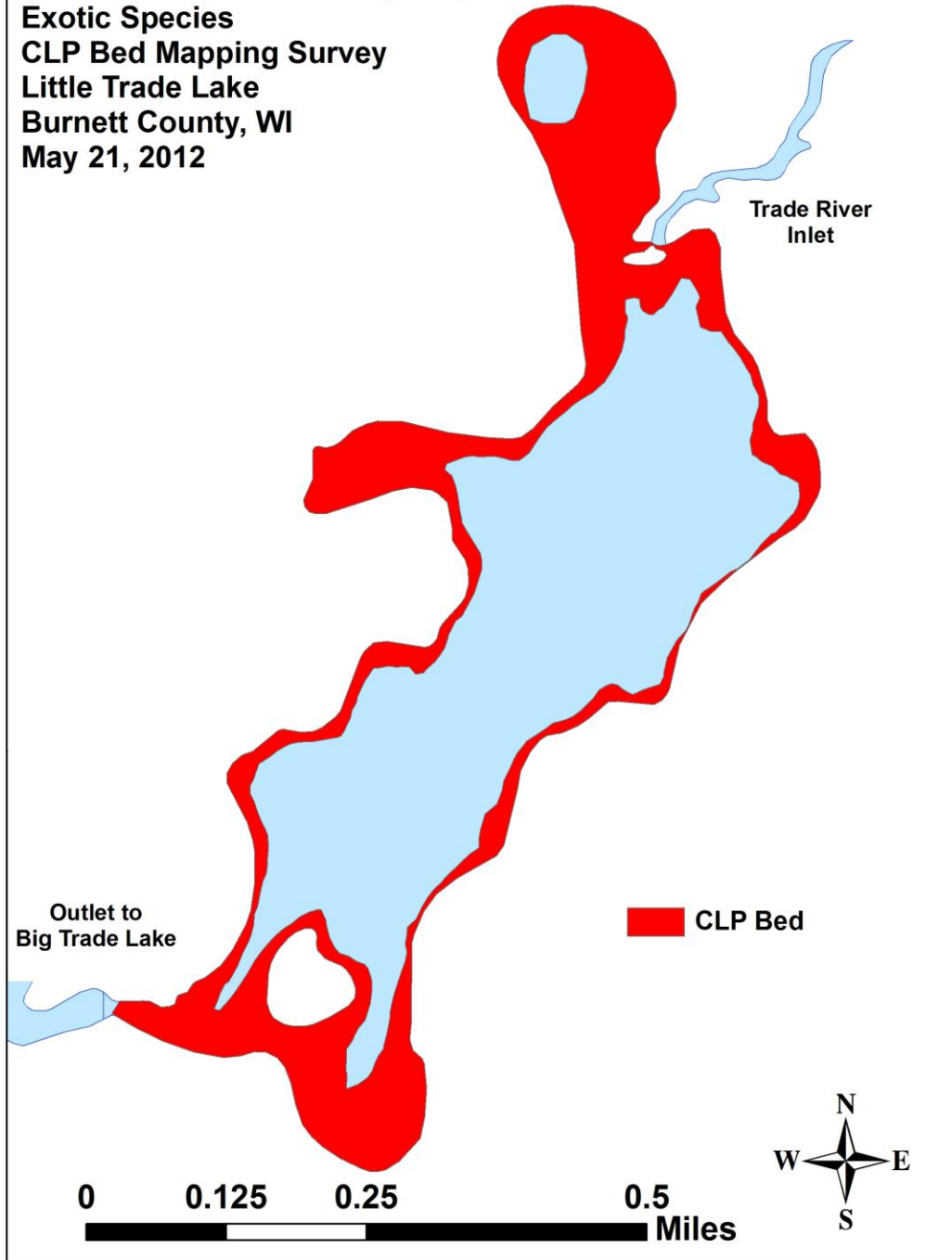
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Appendix I: Spring 2012, 2016, 2021, and 2023 CLP Bed Maps

Curly-leaf pondweed (*Potamogeton crispus*)



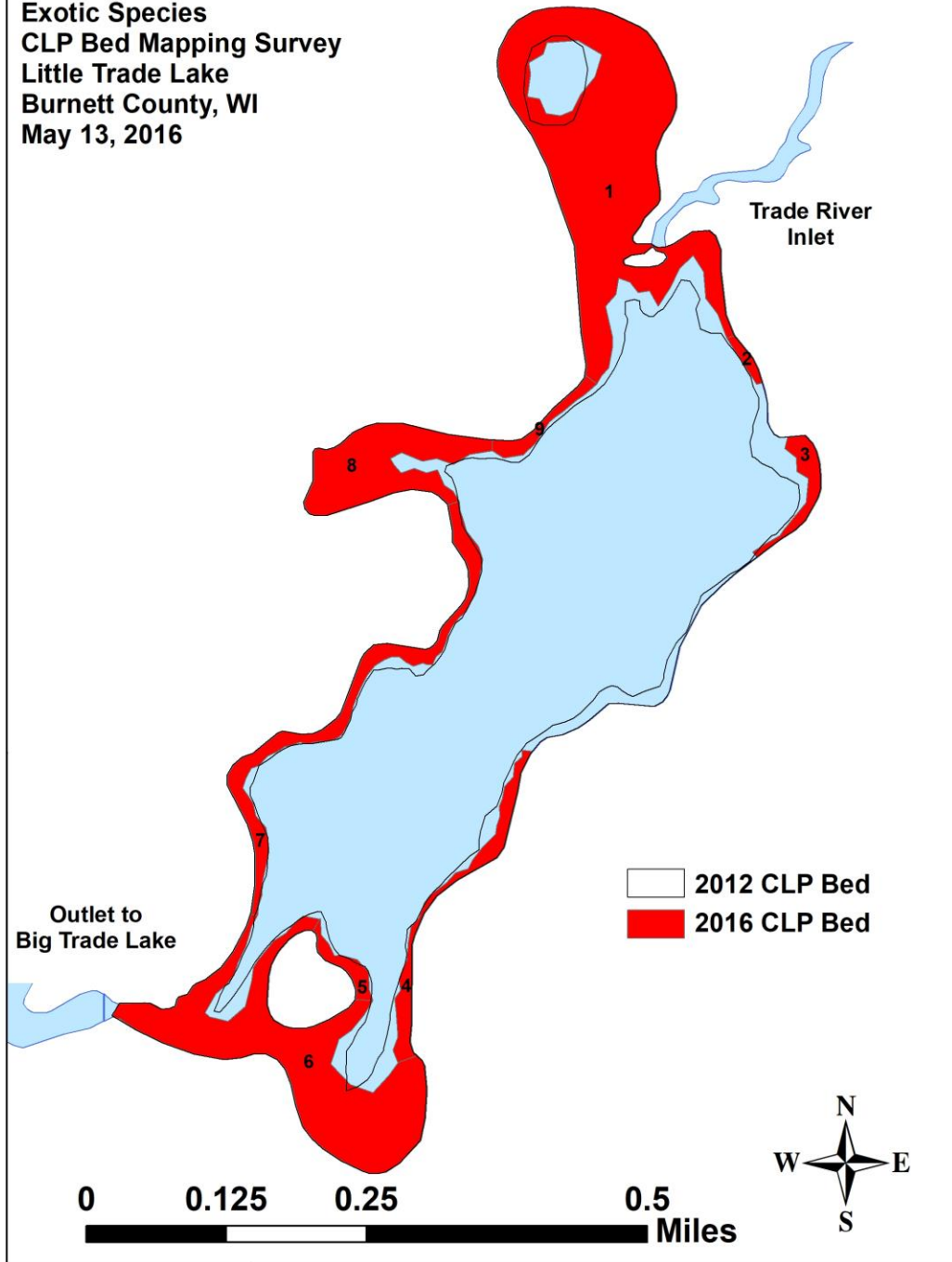
Exotic Species
CLP Bed Mapping Survey
Little Trade Lake
Burnett County, WI
May 21, 2012



Curly-leaf pondweed (*Potamogeton crispus*)



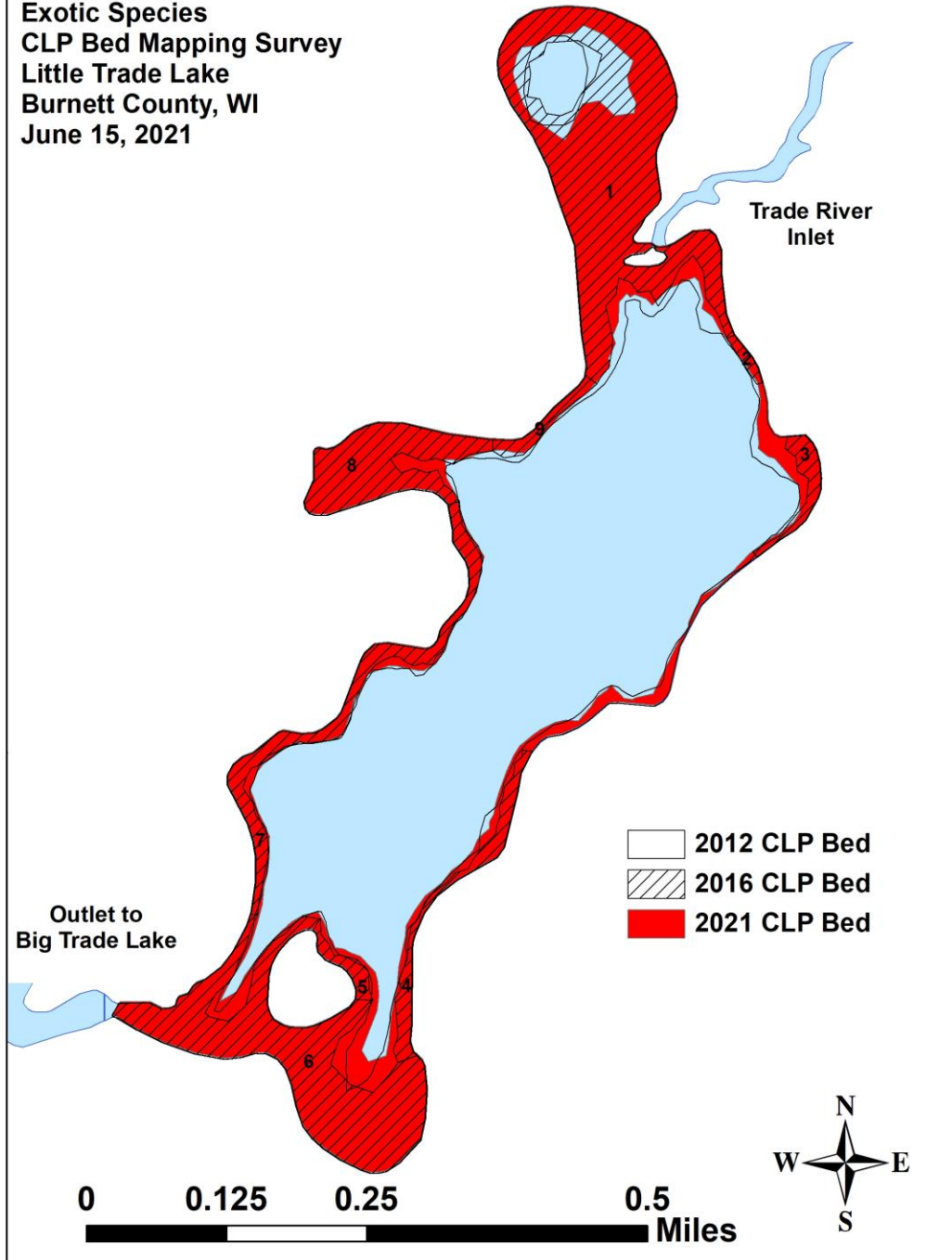
Exotic Species
CLP Bed Mapping Survey
Little Trade Lake
Burnett County, WI
May 13, 2016



Curly-leaf pondweed (*Potamogeton crispus*)



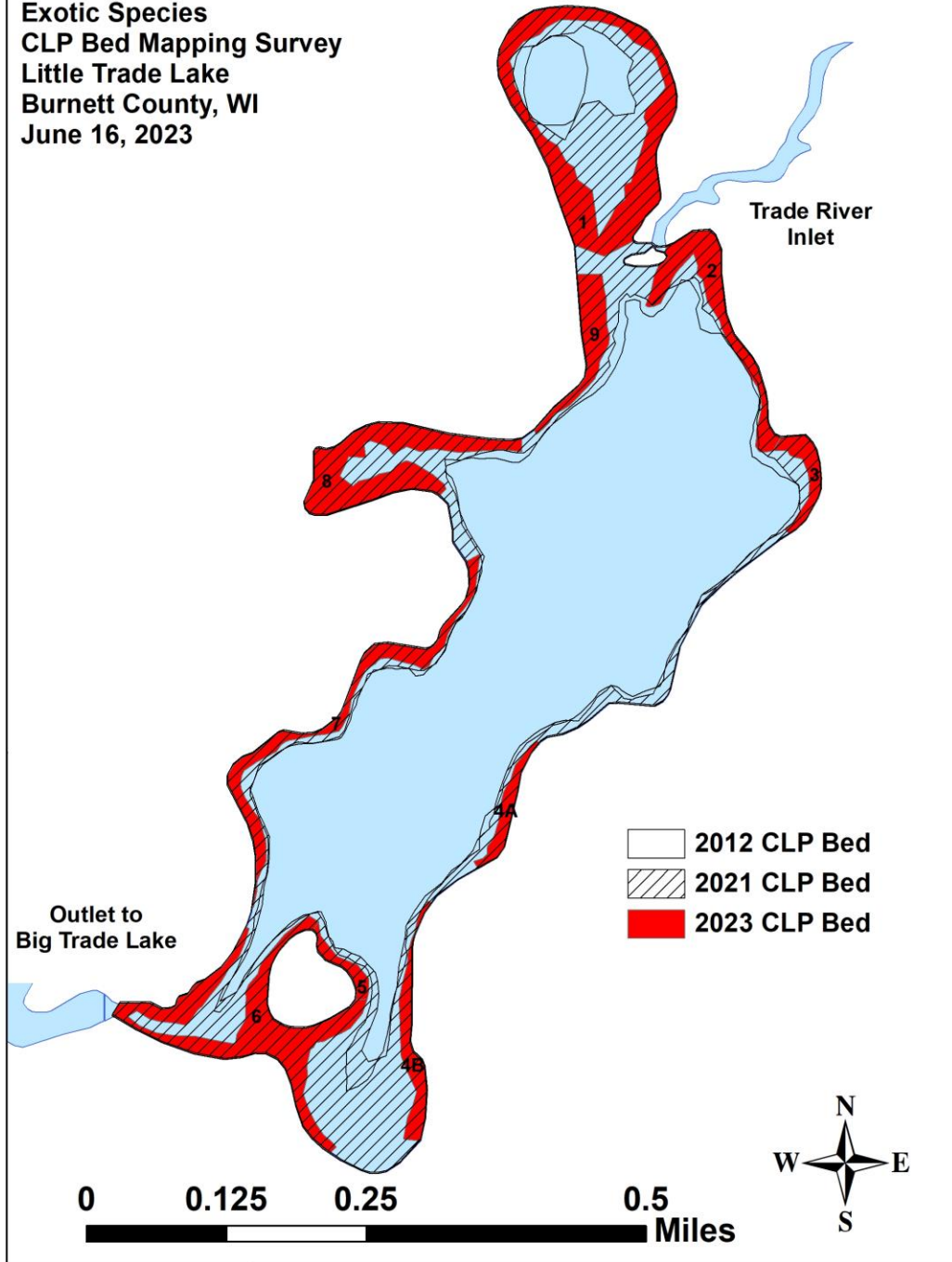
Exotic Species
CLP Bed Mapping Survey
Little Trade Lake
Burnett County, WI
June 15, 2021



Curly-leaf pondweed (*Potamogeton crispus*)



Exotic Species
CLP Bed Mapping Survey
Little Trade Lake
Burnett County, WI
June 16, 2023



**Eurasian Water-milfoil (*Myriophyllum spicatum*)
Late Summer Bed Mapping Survey
Big Trade Lake – WBIC: 2638700
Burnett County, Wisconsin**



Eurasian water-milfoil beds - 9/1/23



Merging canopied EWM clusters - 9/1/23

Project Initiated by: Round-Trade Lakes Improvement Association Inc.,
Lake Education and Planning Services, LLC, and the
Wisconsin Department of Natural Resources (Grant AEPP70723)



Pioneer EWM clusters in the southeast bay - 9/1/23

Survey Conducted by and Report Prepared by:
Endangered Resource Services, LLC
Matthew S. Berg, Research Biologist
St. Croix Falls, Wisconsin
September 1, 2023

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INTRODUCTION:

Big Trade Lake (WBIC 2638700) is a 327-acre drainage lake in southwest/south-central Burnett County, Wisconsin in the Town of Trade Lake (T37N R18W S20/21 and 28/29). It reaches a maximum depth of 39ft in the west-central bay and has an average depth of approximately 20ft (Figure 1). The lake is eutrophic in nature with Secchi readings over the last ten years averaging 4.4ft (WDNR 2023). This poor to very poor water clarity produced a littoral zone that extended to approximately 12ft in 2023. The bottom substrate is predominately muck with scattered gravel and sandy areas along the shoreline and around the lake's exposed and sunken islands (Bush et al 1968).

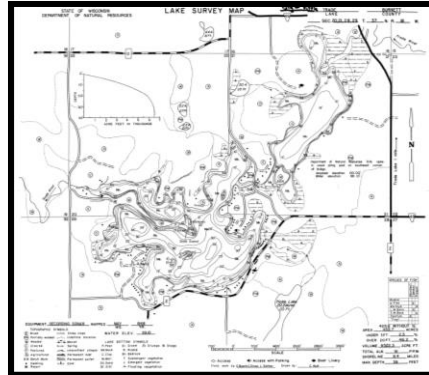


Figure 1: Big and Little Trade Lakes Bathymetric Map

BACKGROUND AND STUDY RATIONALE:

In 2009, the Wisconsin Department of Natural Resources (WDNR) confirmed the presence of Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM) in Little Trade Lake which is connected to Big Trade Lake via the Trade River Channel. In 2012, we observed EWM in the channel, and, by 2013, we found it had spread to Big Trade Lake's north-central bay with expansion into many other parts of the lake thereafter. Following the development of their WDNR approved Aquatic Plant Management Plan (APMP) that outlined strategies to control EWM and Curly-leaf pondweed (*Potamogeton crispus*) (CLP), another invasive exotic species that dominates the lake's spring littoral zone, the Round-Trade Lake Improvement Association, Inc. (RTLIA) began using manual removal and herbicide treatments to control these species.

Per WDNR expectations (Pamela Toshner/Alex Smith, WDNR – pers. comm.), whole-lake plant surveys on actively managed lakes are normally repeated every five to seven years to remain current. In anticipation of updating their plan in 2022, the RTLIA – under the direction of Dave Blumer (Lake Education and Planning Services, LLC - LEAPS) – applied for and receive a WDNR lake planning grant (LPL175421) to help cover the cost of surveys and to complete the new APMP. Prior to conducting these whole-lake surveys, treatment was suspended in 2021 with the expectation that some active management would likely resume in 2022. However, due to a variety of factors, it was ultimately decided not to chemically treat in 2022 or 2023 either. To help determine EWM levels after three years without active management, we were asked to complete a late-summer EWM bed mapping survey. This report is the summary analysis of that field survey conducted on September 1, 2023.

METHODS:

Late Summer Eurasian Water-milfoil Bed Mapping:

During the survey, we searched the visible littoral zone of the lake and mapped all known beds of Eurasian water-milfoil. A “bed” was determined to be any area where we visually estimated that EWM made up >50% of the area’s plants and was generally continuous with clearly defined borders. 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 maximum 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).




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

Figure 2: Rake Fullness Ratings

RESULTS AND DISCUSSION:

Late Summer Eurasian Water-milfoil Bed Mapping Survey:

On September 1, 2023, we searched 19.9km (12.4 miles) of transects throughout the lake's visible littoral zone (Figure 3). Collectively, we mapped 49 Eurasian water-milfoil beds that covered 18.35 acres (5.61% of the lake's surface area) (Figure 4) (Appendix I). This total was a 7.49-acre (+68.97%) increase from the 42 beds covering 10.86 acres (3.32% surface area) we found in 2021 (Table 1). It was also a +443% increase over the 27 beds covering 3.38 acres (1.03% of the lake's surface area) that we mapped in late August 2020 following the last chemical treatment; and it represented the highest total of any of our historical bed mapping surveys (Table 2).

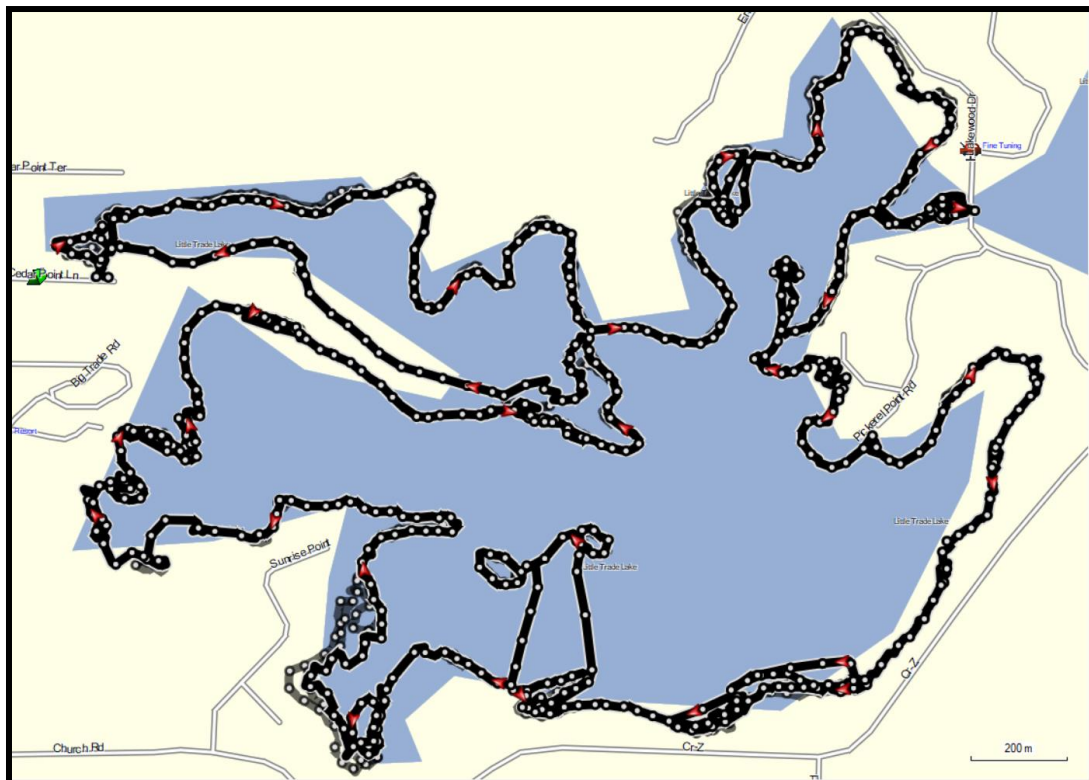


Figure 3: September 1, 2023 EWM Littoral Zone Survey – GPS Tracks

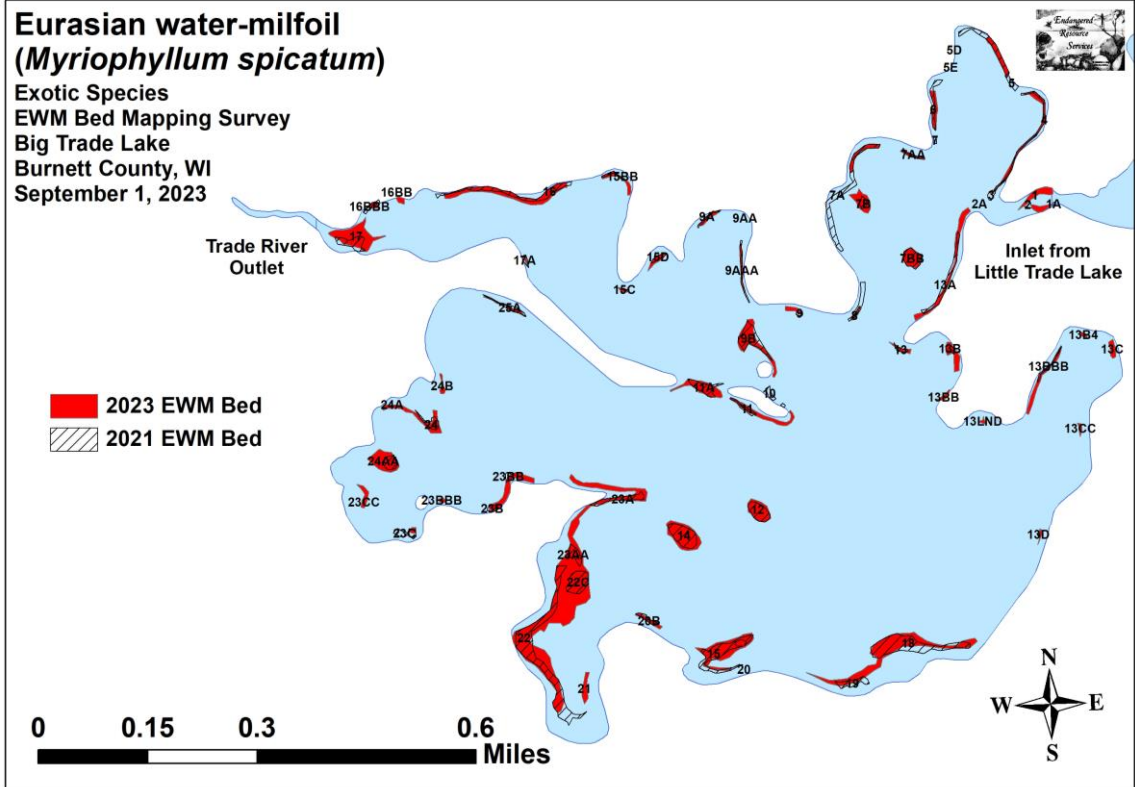
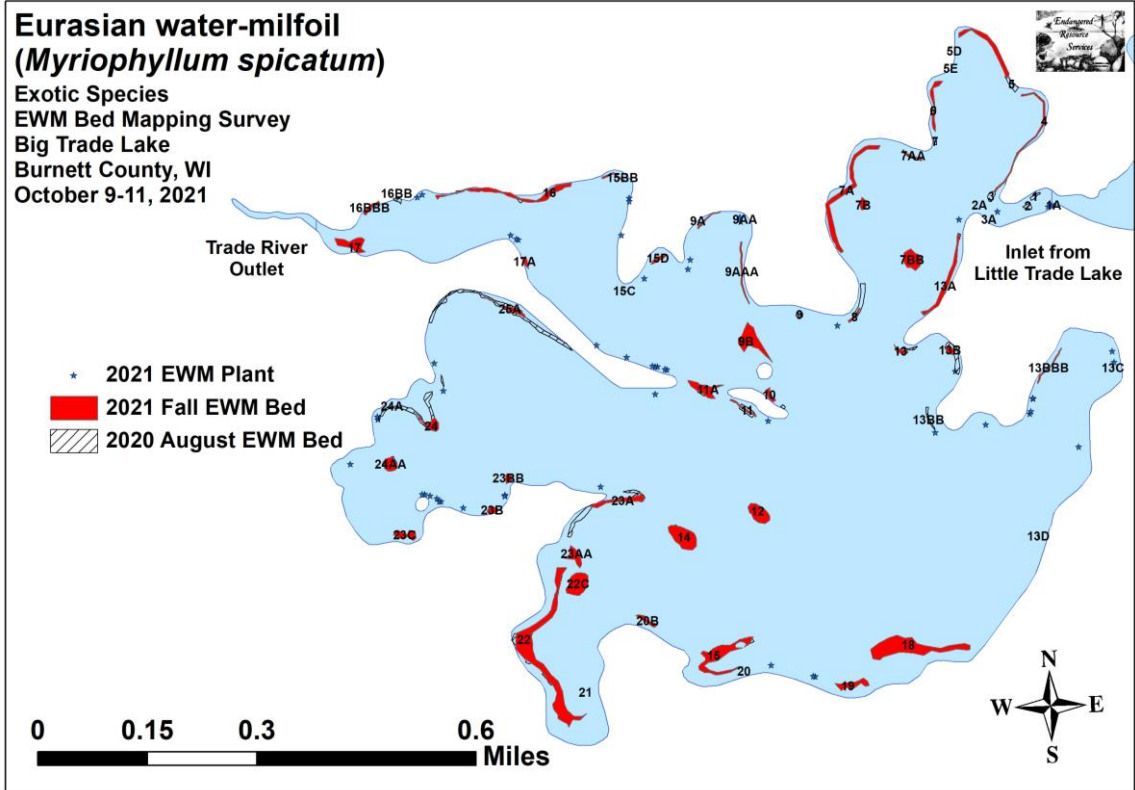


Figure 4: Fall 2021 and Late Summer 2023 EWM Bed Maps

**Table 1: Late Summer and Fall Eurasian Water-milfoil Bed Mapping Summary
Big Trade Lake – Burnett County, Wisconsin – October 9-11, 2021 and September 1, 2023**

Bed Number	2023 Area in Acres	2021 Area in Acres	2021-2023 Change in Acreage	Rake Range; Mean Rake Fullness	Depth Range; Mean Depth	Canopied	Navigation Impairment	2023 Field Notes
1A	0.11	0	0.11	<<<1-3; 1	2-5; 3	Yes	Minor	Bed adjacent to main navigation channel.
1 and 2	0.22	0	0.22	<<<1-3; 2	2-5; 3	Yes	Moderate	Bed adjacent to main navigation channel.
2A	0	0	0	-	-	-	-	No EWM seen
3 and 3A	Merged	-	-	<<<1-3; 1	2-5; 4	Yes	Minor	Merged with Bed 4.
4	0.39	0.23	0.16	<<<1-3; 1	2-5; 4	Yes	Minor	Open shoreline ribbon.
5 (A-C)	0.22	0.34	-0.12	<<<1-3; 1	2-5; 4	Yes	Minor	Open shoreline ribbon.
5D/5E	0	0	0	-	-	Yes	-	No EWM seen
6	0.19	0.17	0.02	<<<1-3; 1	2-5; 4	Yes	Minor	Open shoreline ribbon.
7AA	0.08	0.04	0.04	<<<1-2; <1	2-5; 4	Yes	None	Open shoreline ribbon.
7	0	0	0	-	-	-	-	No EWM seen
7A	0.18	0.66	-0.48	<<<1-2; <1	2-5; 4	Yes	None	Reduced shoreline ribbon.
7B	0.30	0.07	0.23	2-3; 3	4-8; 6	Yes	Severe	Dense canopied mat on point.
7BB	0.32	0.32	0	2-3; 3	5-9; 7	Yes	Severe	Canopied mat in path to Little Trade Channel.
8	0.04	0.04	0	<<1-2; 1	2-5; 4	Yes	None	Narrow shoreline ribbon.
9	0.08	0	0.08	<<1-2; 1	2-5; 4	Yes	None	Narrow shoreline ribbon.
9AA/AAA	0.11	0.11	0	<<<1-2; 1	2-5; 4	Yes	None	Narrow ribbon along shoreline/among docks
9A	0.10	0.05	0.05	<<<1-2; <1	2-5; 4	Yes	None	Nearly continuous shoreline ribbon.
9B	0.62	0.48	0.14	<<1-3; 3	2-7; 5	Yes	Moderate	Canopied mat – prop trails throughout the bed.
10	0	0.07	-0.07	-	-	-	-	No EWM seen
11A	0.45	0.27	0.18	1-3; 2	4-7; 6	Yes	Moderate	Most plants over saddle prop-clipped.
11	0.34	0.06	0.28	<<<1-3; 2	2-6; 4	Yes	Minor	Narrow shoreline ribbon.
12	0.43	0.34	0.09	2-3; 3	4-9; 6	Yes	Severe	Solid canopied mat; fragments everywhere
13A	0.51	0.34	0.17	<<<1-3; 2	1-5; 4	Yes	Minor	Thickening; especially near docks.
13	0.07	0.05	0.02	<1-3; 2	2-5; 4	Yes	Minor	Too narrow to be moderate/mixed with NWM.
13B and 13BB	0.27	0.06	0.21	<1-3; 2	2-5; 4	Yes	Minor	Too narrow to be moderate/mixed with NWM.
13LND	0.02	0	0.02	<<<1-3; 1	2-6; 4	Yes	Minor	Prop trails in clusters at Pickerel Pt. Landing.
13BBB	0.28	0.06	0.22	<<<1-3; 2	1-5; 4	Yes	Minor	Shoreline ribbon – too narrow to be moderate.
13B4	0.03	0	0.03	<<<1-3; 2	1-5; 4	Yes	Minor	Too narrow to be mod. – worst area by docks.
13C	0.10	0	0.10	<1-3; 2	1-5; 4	Yes	Minor	Too narrow to be moderate.
13CC	0.04	0	0.04	<1-3; 2	3-7; 5	Yes	Minor	Narrow shoreline ribbon.

**Table 1 (continued): Late Summer and Fall Eurasian Water-milfoil Bed Mapping Summary
Big Trade Lake – Burnett County, Wisconsin – October 9-11, 2021 and September 1, 2023**

Bed Number	2023 Area in Acres	2021 Area in Acres	2021-2023 Change in Acreage	Rake Range; Mean Rake Fullness	Depth Range; Mean Depth	Canopied	Navigation Impairment	2023 Field Notes
13D	0.02	0.01	0.01	<1-3; 2	3-7; 5	Yes	Minor	Narrow shoreline ribbon.
14	0.79	0.55	0.24	2-3; 3	4-9; 6	Yes	Severe	Canopied mat on sunken rock island.
15	0.96	0.66	0.30	<<<1-3; 3	2-9; 7	Yes	Severe	Dense canopied mat in and around bulrushes.
15BB	0.15	0.05	0.10	<<<1-3; <1	1-5; 3	Yes	None	Open nearly continuous shoreline ribbon.
15C	0.04	0.01	0.03	1-3; 3	2-5; 4	Yes	Minor	Too small to be sig. impairment/microbed.
15D	0.10	0.06	0.04	<<<1-2; 1	4-6; 5	Yes	Minor	Too small to be sig. impairment/microbed.
16	0.88	0.50	0.38	<<<1-3; 1	1-6; 4	Yes	Minor	Shoreline ribbon.
16BB	0.05	0.00	0.05	<<<1-3; 1	1-6; 4	Yes	Minor	Shoreline microbed.
16BBB	0.05	0.07	-0.02	<<<1-3; 1	1-6; 4	Yes	Minor	Shoreline microbed.
17	0.85	0.30	0.55	<<<1-3; 1	1-6; 4	Yes	Minor	Prop-clipped plants leading away from landing.
17A	0.02	0.04	-0.02	<<<1-2; 1	2-5; 4	Yes	Minor	Shoreline microbed.
18	1.70	1.41	0.29	1-3; 3	2-8; 6	Yes	Severe	Canopied mat over most of area.
19	Merged	-	-	1-3; 3	2-8; 6	Yes	Severe	Merged with Bed 18.
20	Merged	-	-	<<<1-3; 3	2-9; 7	Yes	Severe	Merged with Bed 15.
20B	0.11	0.09	0.02	1-3; 2	3-6; 5	Yes	Minor	Too narrow to be moderate – worse by docks.
21	0.16	0	0.16	<1-3; 2	3-6; 5	Yes	Minor	Patchy narrow strip.
22A/B and 23	5.28	2.64	2.64	<<<1-3; 2	2-9; 7	Yes	Moderate	Dense small beds merging and taking over bay.
22C	Merged	-	-	2-3; 3	5-8; 6	Yes	Severe	Solid canopied mat – Merged with Bed 22.
23AA	Merged	-	-	2-3; 3	4-8; 6	Yes	Severe	Solid canopied mat – Merged with Bed 22.
23A	Merged	-	-	<<<1-3; 2	2-6; 4	Yes	Minor	Merged with Bed 22.
23B and 23BB	0.41	0.12	0.29	<<<1-3; 2	2-6; 5	Yes	Minor	Too narrow to be moderate – shoreline ribbon.
23BBB	0.02	0	0.02	1-3; 3	2-6; 4	Yes	Minor	Dense microbed around dock.
23C and 23CC	0.16	0.16	0.00	<<<1-3; 1	1-8; 5	Near	Minor	Open deepwater bed merging with shoreline flat.
24 and 24A	0.41	0.15	0.26	<<1-3; 3	2-9; 5	Yes	Moderate	Too narrow to be severe.
24AA	0.54	0.18	0.36	1-3; 3	3-8; 6	Yes	Severe	Solid canopied mat in this deepwater bed.
24B	0.06	0	0.06	2-3; 3	4-8; 7	Yes	Moderate	Too narrow to be severe.
25 and 25A	0.10	0.12	-0.02	<<<1-3; 1	2-6; 4	Yes	Minor	Narrow open shoreline ribbon.
Total Acres	18.35	10.86	+7.49					

**Table 2: Historical Late Summer/Fall Eurasian Water-milfoil Bed Mapping Summary
Big Trade Lake – Burnett County, Wisconsin – 2012-2021 and 2023**

Bed Number	2023 Area in Acres	2021 Area in Acres	2020 Area in Acres	2019 Area in Acres	2018 Area in Acres	2017 Area in Acres	2016 Area in Acres	2015 Area in Acres	2014 Area in Acres	2013 Area in Acres	2012 Area in Acres
1A	0.11	0	0	0	0	0	0	0.01	<0.01	0	0
1 and 2	0.22	0	0	0	0	0	0	0.12	0.03	0.07	0.02
2A	0	0	0	0.01	0	<0.01	0	<0.01	0	0	0
3 and 3A	Merged	0	0	0.01	0	0.07	0.03	0	0.06	0.03	0
4	0.39	0.23	0	0	0	0.11	0.08	0	<0.01	<0.01	0
5 (A-C)	0.22	0.34	0	0.04	0	0.10	<0.01	0	0.08	<0.01	0
5D/5E	0	0	0	0	0	0.01	0	0	0	0	0
6	0.19	0.17	0	0	<0.01	0.02	0.01	0.03	0.03	0	0
7AA	0.08	0.04	0.03	0.02	0.01	0	0	0	0	0	0
7	0	0	0	0	0.01	0.08	0.01	0	0.02	0	0
7A	0.18	0.66	0	0	0	0.72	0	0	0	0	0
7B	0.30	0.07	0	0	<0.01	0	0	0	0	0	0
7BB	0.32	0.32	0	0	0	0	0	0	0	0	0
8	0.04	0.04	0	0	0	0	<0.01	0.03	0.16	0	0
9	0.08	0	0	0.01	<0.01	0	0.01	0.01	0.03	0	0
9AA/AAA	0.11	0.11	0	0	<0.01	0	0	0	0	0	0
9A	0.10	0.05	0	0	0	0.02	0	0	0	0	0
9B	0.62	0.48	0	0	0.17	0	0.26	0	0	0	0
10	0	0.07	0	0	0	0.03	0.01	0	0.01	0	0
11A	0.45	0.27	0.11	<0.01	0.08	0.07	<0.01	0	0	0	0
11	0.34	0.06	0	0	0	0.15	0.17	0.19	0.10	0	0
12	0.43	0.34	0.06	0	0.10	0.22	0.18	0.15	0.01	0	0
13A	0.51	0.34	0.02	0.07	0.07	0	0.03	0	0	0	0
13	0.07	0.05	0.04	0	0.03	0	0	0	<0.01	0	0
13B and 13BB	0.27	0.06	0.26	0.12	0.06	0.02	0.01	0	0	0	0
13LND	0.02	0	0	0	0	0	0	0	0	0	0
13BBB	0.28	0.06	0	0	0	0	0	0	0	0	0
13B4	0.03	0	0	0	0	0	0	0	0	0	0
13C	0.10	0	<0.01	0	0	<0.01	0	0	0	0	0
13CC	0.04	0	0	0	0	0	0	0	0	0	0

**Table 2 (continued): Historical Late Summer/Fall Eurasian Water-milfoil Bed Mapping Summary
Big Trade Lake – Burnett County, Wisconsin – 2012-2021 and 2023**

Bed Number	2023 Area in Acres	2021 Area in Acres	2020 Area in Acres	2019 Area in Acres	2018 Area in Acres	2017 Area in Acres	2016 Area in Acres	2015 Area in Acres	2014 Area in Acres	2013 Area in Acres	2012 Area in Acres
13D	0.02	0.01	0	0	0	0	0	0	0	0	0
14	0.79	0.55	0.26	0	0.20	0.32	0.42	0.03	0	0	0
15	0.96	0.66	0.16	0.07	0.07	0.10	0.08	0.04	0	0	0
15BB	0.15	0.05	0	0.03	0	0	0	0	0	0	0
15C	0.04	0.01	0	0	0	0	0	0	0	0	0
15D	0.10	0.06	0	0	0	0	0	0	0	0	0
16	0.88	0.50	0.02	0.16	0.14	0.06	<0.01	0	0	0	0
16BB	0.05	0.00	0.03	0.01	0	0	0	0	0	0	0
16BBB	0.05	0.07	0	0	0	0	0	0	0	0	0
17	0.85	0.30	0	0	0.33	0.12	<0.01	0	0	0	0
17A	0.02	0.04	0	0	0	0	0	0	0	0	0
18	1.70	1.21	0.13	0.62	0.01	0.58	0	0	0	0	0
19	Merged	0.20	0	0.28	0	0.04	0	0	0	0	0
20	Merged	0	0	0	0	0.04	0	0	0	0	0
20B	0.11	0.09	0.02	0	0	0	0	0	0	0	0
21	0.16	0	0	0	0	<0.01	0	0	0	0	0
22A/B and 23	5.28	1.77	0.60	0.03	<0.01	0.06	0	0	0	0	0
22C	Merged	0.45	0.42	0.04	<0.01	0	0	0	0	0	0
23AA	Merged	0.18	0.01	0	0	0	0	0	0	0	0
23A	Merged	0.24	0.42	0.04	<0.01	0	0	0	0	0	0
23B and 23BB	0.41	0.06	0	0	0	0	0	0	0	0	0
23BBB	0.02	0.06	0.01	0	0	0	0	0	0	0	0
23C and 23CC	0.16	0.16	0	0	0	0	0	0	0	0	0
24 and 24A	0.41	0.15	0.40	0.03	0.03	0.03	0	0	0	0	0
24AA	0.54	0.18	0.14	0	0	0	0	0	0	0	0
24B	0.06	0	0	0	0	0	0	0	0	0	0
25 and 25A	0.10	0.12	0.65	0.02	0	0.02	0	0	0	0	0
Total Acres	18.35	10.86	3.38	1.57	1.34	2.97	1.33	0.62	0.60	0.17	0.06

Descriptions of Past and Present Eurasian Water-milfoil Beds:

Beds 1, 1A, 2, 2A, 3, and 3A – The channel downstream from the bridge had narrow, but generally dense beds of Eurasian water-milfoil on both sides of the channel. Near the lake inlet, we again saw only a handful of clusters and individual plants.

Beds 4, 5, 5A-5E, 6, and 7 – A narrow ribbon of EWM was again established around the majority of the north-central bay likely creating a minor impairment for residents.

Beds 7A, 7AA, and 8 – Inexplicably, EWM in the western side bay in the greater north-central bay was much reduced compared to 2021. The majority of Beds 7A and 8 had only scattered plants, and, even when present, EWM formed only a narrow ribbon of low-density plants along the immediate shoreline.

Beds 7B and 7BB – These two monotypic beds were established on rock humps in the middle of the north-central bay. Each had prop-trails cut through them; especially 7BB which was directly in the path of the natural route to get to the channel that leads to Little Trade Lake.

Beds 9, 9A, 9AA, and 9AAA – EWM clusters and plants were regularly encountered around the bay where they were filling in among docks and along the shoreline.

Bed 9B – The bed formed a canopied mat and was likely a moderate impairment to navigation as it was full of prop-trails.

Beds 10 and 11 – EWM again formed a ribbon-shaped bed along the narrow littoral zone on the south shoreline of the southern forested island. However, for no obvious reason, we saw no EWM in the area formerly covered by Bed 10 on the north shoreline of this island.

Bed 11A – A moderately dense bed was established on the saddle between the southern forested island and the western point. We noted many of the plants in this main navigation area were prop-clipped.

Bed 12 – “Kid Rock” was covered by a solid canopied mat of EWM, and there were prop-clipped plants and fragments throughout the area.

Bed 13A – EWM on the eastern shoreline of the north-central bay downstream from the Trade River Inlet had merged into a single bed that was nearly continuous along the entire shoreline. The bed formed a narrow strip that was often inshore from the ends of docks. Because of this, the bed was likely not more than a minor impairment.

Beds 13, 13B, 13BB, and 13LND – EWM beds in and around these highly developed bays showed considerable expansion since 2021. Based on prop-trails, they were also likely causing at least minor impairment despite being relatively narrow. This was especially true out from the public landing on Pickerel Point. All of these beds were mixed with significant amounts of Northern water-milfoil (*Myriophyllum sibiricum*).

Beds 13BBB, 13C, and 13D – Eurasian water-milfoil also showed considerable expansion in the lake’s far northeast bay. Most beds were still low to moderate density, but each was now likely causing at least minor impairment.

Bed 14 – Similar to “Kid Rock” (Bed 12), the western midlake sunken island was again covered by a dense canopied mat of EWM.

Beds 15 and 20 – EWM completely surrounded the Hardstem bulrush (*Schoenoplectus acutus*) stand on the small sunken island along the south shoreline midlake. It formed a nearly continuous canopied mat that was actively fragmenting. The bed had also spread into the bay to the southwest and back to the east in the area formerly occupied by Bed 20.

Beds 15C-16BBB – Scattered small EWM beds continued to establish and merge along the north shoreline leading to the Trade River Outlet. Most of them occurred near docks in areas likely to cause at least minor impairment for incoming/outgoing boat traffic.

Bed 17 – The bed in front of the western public boat landing was full of prop-clipped plants as people were forced to navigate through it to access open water.

Bed 17A – This small bed had established on the north shoreline of Cedar Point. Due to its small size, it was likely a non-issue in regards to navigation.

Beds 18 and 19 – These two beds in the southeast bay had merged into a single large mat of EWM. On the outer edge, it was nearly monotypic and extended to the edge of the visible littoral zone. On the inshore side, the bed became mixed with natives and was much more fragmented.

Bed 20B – This narrow bed was established along the end of a dock and radiated out along the shore within a large bed of Hardstem bulrush. Despite its moderate density, the bed’s overall narrowness likely meant it wasn’t more than a minor impairment.

Beds 21, 22, 22C, 22D, 23AA, and 23A – EWM in the lake’s southwest bay continued to expand. Near the shoreline, dense clusters and microbeds had merged into a nearly continuous mat. In deeper water, Beds 22C and 23AA had also merged to form a dense canopied mat. The overall bed had expanded to the north, swallowed Bed 23A, and now stretched around the rocky point.

Beds 23B, 23BB, 23BBB, 23C, 23CC, 24, 24A, 24AA, and 25 – EWM in the lake’s west-central bay was patchy and variable with some beds undergoing significant expansion while others had almost disappeared. Although several were dense, the small size and natural channels around likely meant most weren’t more than a minor impairment.

Bed 25A – The narrow littoral zone along the south shoreline of Cedar Point supported nearly continuous clusters of plants in 2020. This was another area where, for whatever reason, the 2021 and 2023 surveys found EWM had experienced a significant pullback and was only found in the core of the area we originally mapped in 2020.

CONSIDERATIONS FOR MANAGEMENT:

Even with the significant expansion we documented in 2023, Eurasian water-milfoil continues to occupy a relatively low percentage of the lake's surface area. Unfortunately, it is widely-established making eradication an unrealistic expectation. With this in mind, continuing to work to manage it in the most cost-effective manner possible, while simultaneously minimizing its impact on the lake's aquatic ecosystem will likely continue to be important goals for the lake association moving forward.

Ultimately, the RTLIA, LEAPS, and the WDNR will have to decide on what, if any, active management should occur in 2024. Similarly, how much monitoring will be needed in 2024, if any, is a conversation that needs to take place.

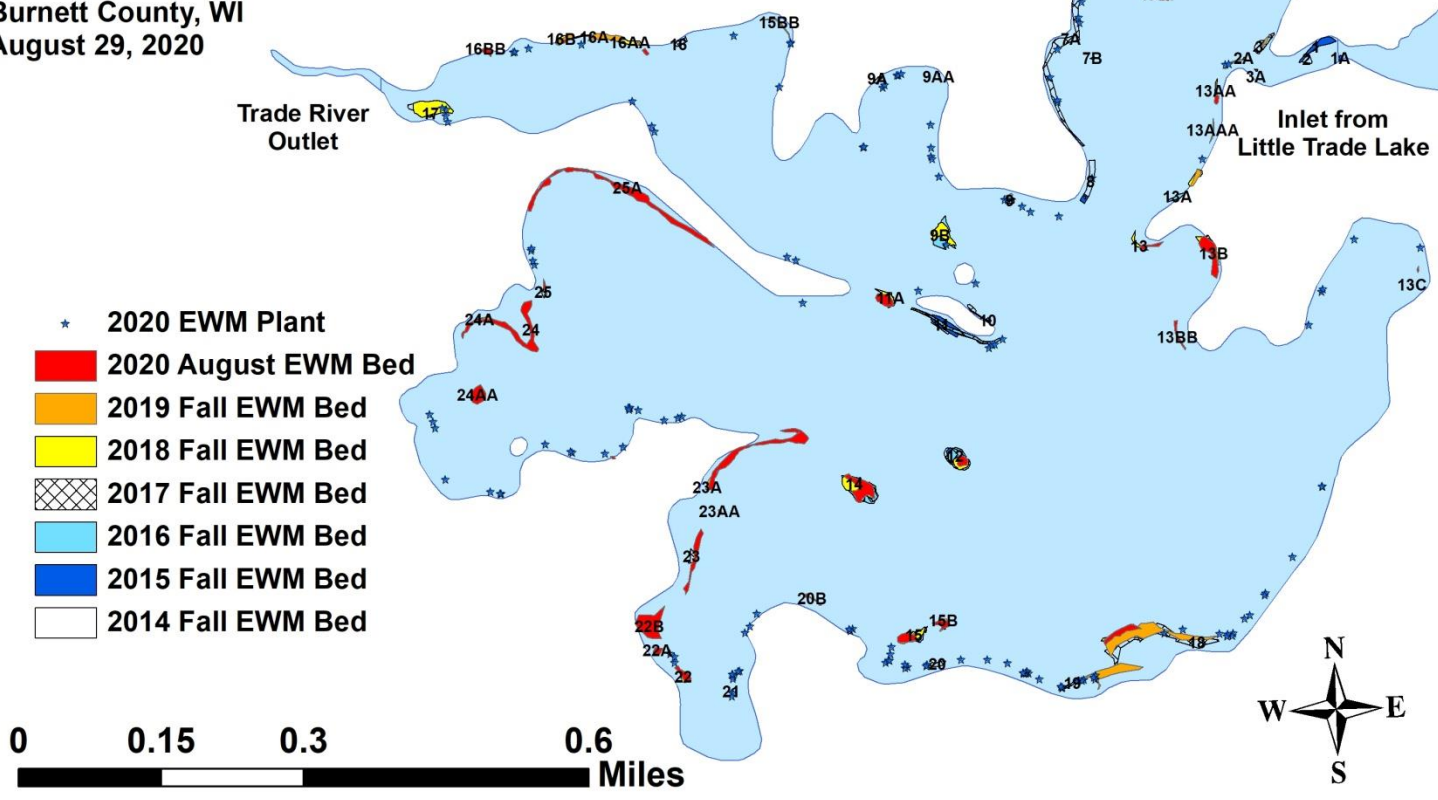
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Appendix I: Late Summer and Fall 2020, 2021, and 2023 EWM Bed Maps

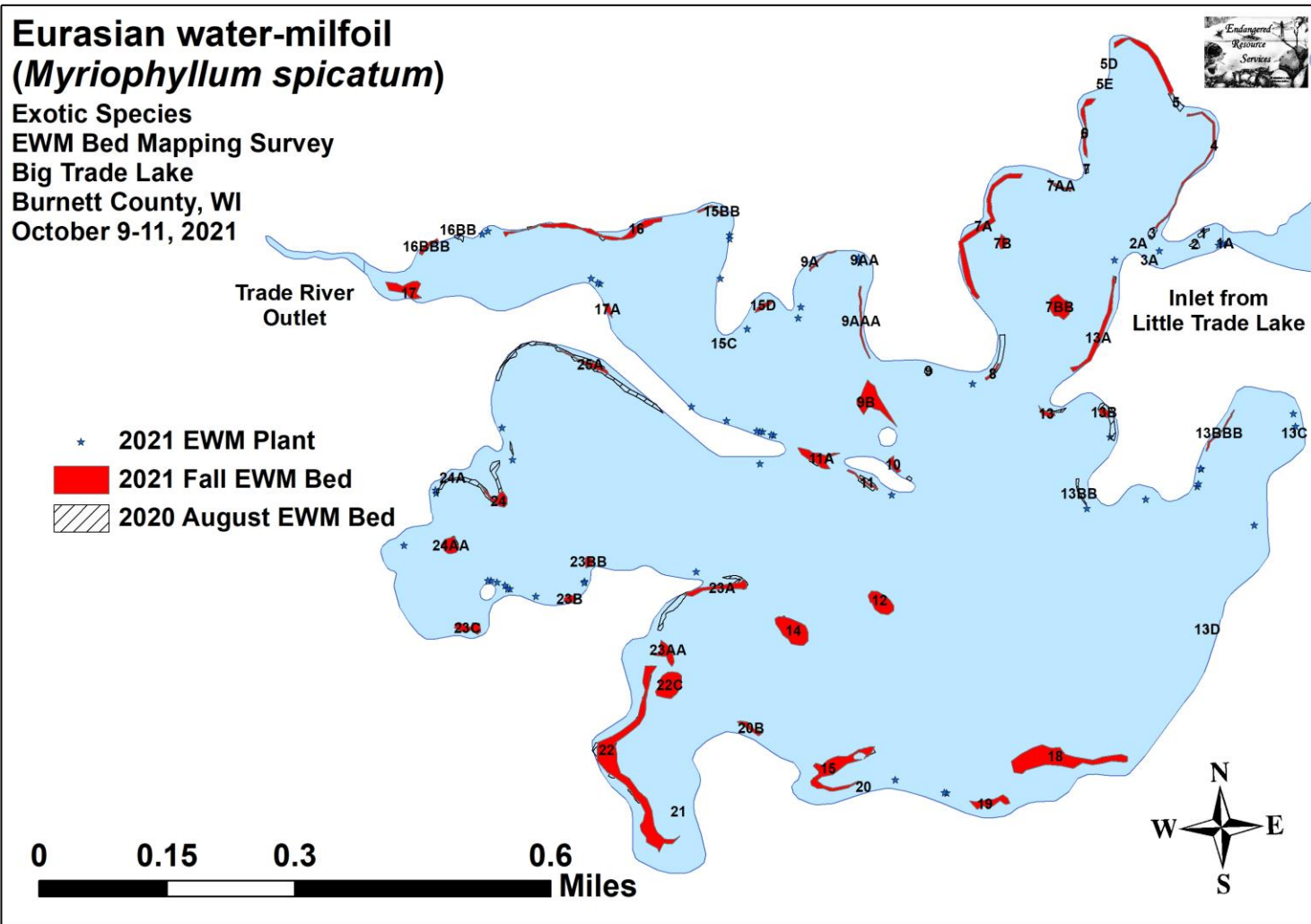
Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic Species
EWM Bed Mapping Survey
Big Trade Lake
Burnett County, WI
August 29, 2020



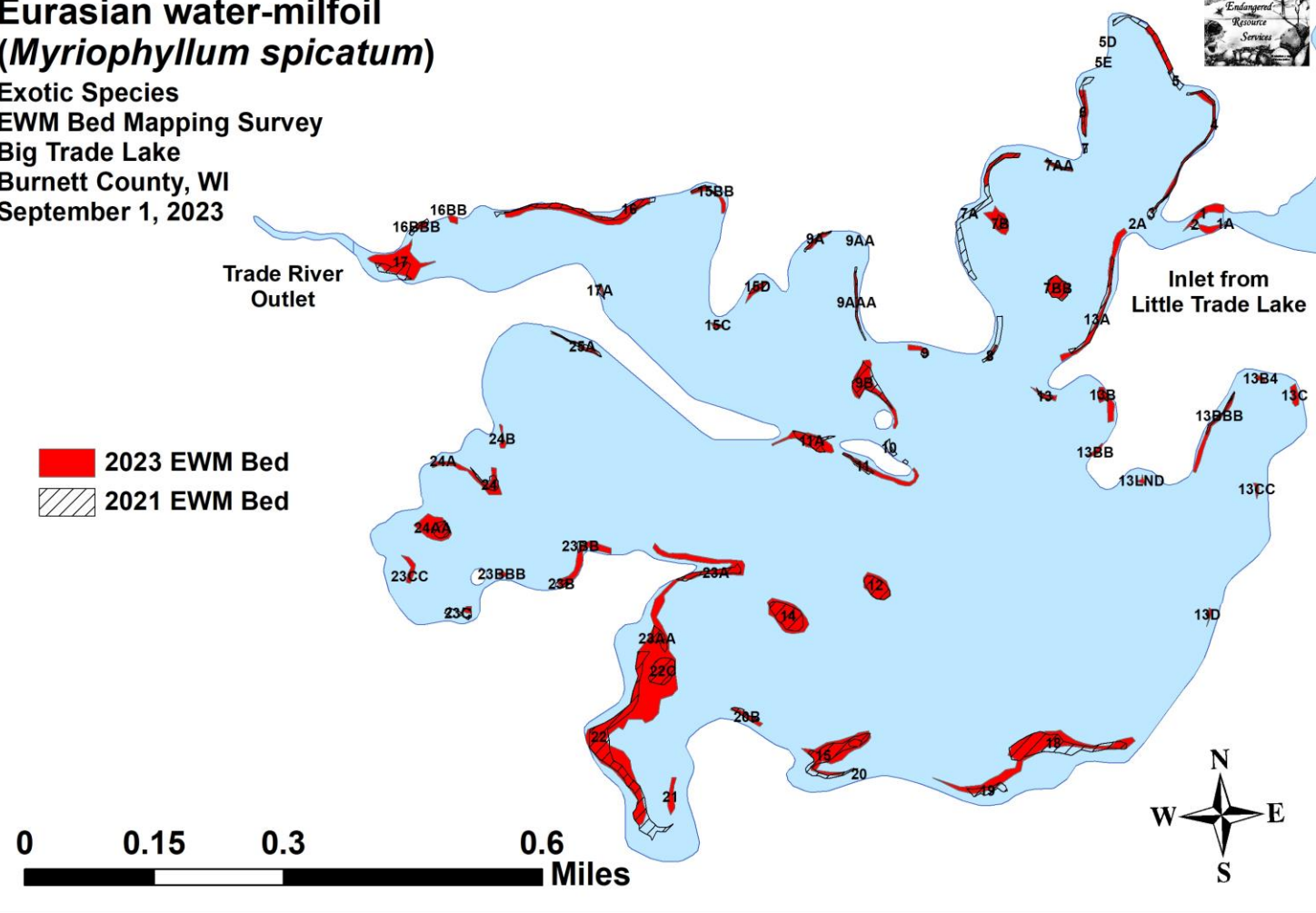
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October 9-11, 2021



Eurasian water-milfoil (*Myriophyllum spicatum*)

Exotic Species
EWM Bed Mapping Survey
Big Trade Lake
Burnett County, WI
September 1, 2023



**Eurasian Water-milfoil (*Myriophyllum spicatum*)
Late Summer Bed Mapping Survey
Little Trade Lake – WBIC: 2639300
Burnett County, Wisconsin**



Canopied EWM in an area raked clean of native vegetation - 9/1/23



Eurasian water-milfoil beds 9/1/23

Project Initiated by: Round-Trade Lakes Improvement Association Inc.,
Lake Education and Planning Services, LLC, and the
Wisconsin Department of Natural Resources (Grant AEPP70723)



Mat of canopied EWM in a water "thruster" outwash - 9/1/23

Survey Conducted by and Report Prepared by:
Endangered Resource Services, LLC
Matthew S. Berg, Research Biologist
St. Croix Falls, Wisconsin
September 1, 2023

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INTRODUCTION:

Little Trade Lake (WBIC 2639300) is a 126-acre drainage lake in southwest/south-central Burnett County, Wisconsin in the Town of Trade Lake (T37N R18W S21). It reaches a maximum depth of 19ft in the central basin and has an average depth of approximately 9ft (the DNR's stated depth average of 15ft combined depth data from Big Trade and Little Trade Lakes) (WDNR 2023). The lake is eutrophic in nature with Secchi readings over the last ten years averaging 3.4ft (WDNR 2023). This very poor water clarity produced a littoral zone that extended to approximately 9ft in 2023. The bottom substrate is predominately organic muck with scattered gravel and sandy areas along the shoreline and around the island (Bush et al. 1968).

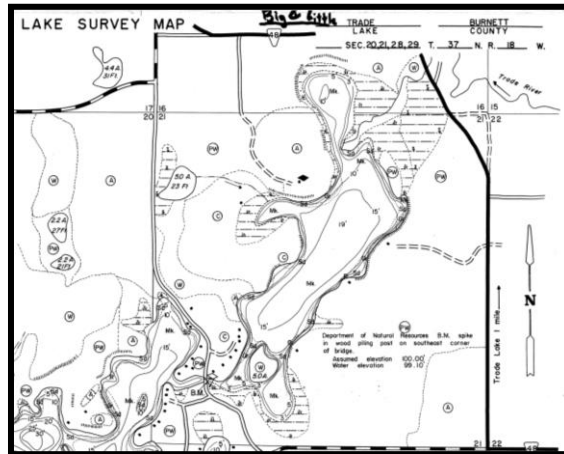


Figure 1: Little Trade Lake Bathymetric Map

BACKGROUND AND STUDY RATIONALE:

In 2009, the Wisconsin Department of Natural Resources (WDNR) confirmed the presence of Eurasian water-milfoil (EWM) (*Myriophyllum spicatum*) in Little Trade Lake. Following the development of a WDNR approved Aquatic Plant Management Plan (APMP) that outlined strategies to control EWM and Curly-leaf pondweed (*Potamogeton crispus*) (CLP), another invasive exotic species that dominates the lake's spring littoral zone, the Round-Trade Lake Improvement Association, Inc. (RTLIA) began using manual removal and herbicide treatments to control these species.

Per WDNR expectations (Pamela Toshner/Alex Smith, WDNR – pers. comm.), whole-lake plant surveys on actively managed lakes are normally repeated every five to seven years to remain current. In anticipation of updating their plan in 2022, the RTLIA – under the direction of Dave Blumer (Lake Education and Planning Services, LLC - LEAPS) – applied for and receive a WDNR lake planning grant (LPL175421) to help cover the cost of surveys and to complete the new APMP. In anticipation of conducting these whole-lake surveys, treatment was suspended in 2021 with the expectation that some active management would likely resume in 2022. However, due to a variety of factors, it was ultimately decided not to chemically treat in 2022 or 2023. To help determine EWM levels after three years without active management, we were asked to complete a late-summer EWM bed mapping survey. This report is the summary analysis of that field survey conducted on September 1, 2023.

METHODS:

Late Summer Eurasian Water-milfoil Bed Mapping:

During the survey, we searched the visible littoral zone of the lake and mapped all known beds of EWM. A “bed” was determined to be any area where we visually estimated that EWM made up >50% of the area’s plants and was generally continuous with clearly defined borders. 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 maximum 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).




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

Figure 2: Rake Fullness Ratings

RESULTS AND DISCUSSION:

Late Summer Eurasian Water-milfoil Bed Mapping Survey:

On September 1, 2023, we searched 8.1km (5.0 miles) of transects throughout the lake's visible littoral zone (Figure 3). Collectively, we mapped 19 Eurasian water-milfoil beds that covered 3.02 acres (2.40% of the lake's surface area) (Figure 4) (Appendix I). This total was a **+172.07% increase** from the ten beds covering 1.11 acres (0.88% surface area) we mapped in 2021 (Table 1). It was also a +1,787% increase from the four microbeds covering 0.16 acre (0.12% of the lake's surface area) that we mapped in late August 2020 following the last chemical treatment that left EWM at undetectable levels in June. It was, however, still lower than the peak of 4.65 acres (3.69% coverage) in 2013 (Table 2).

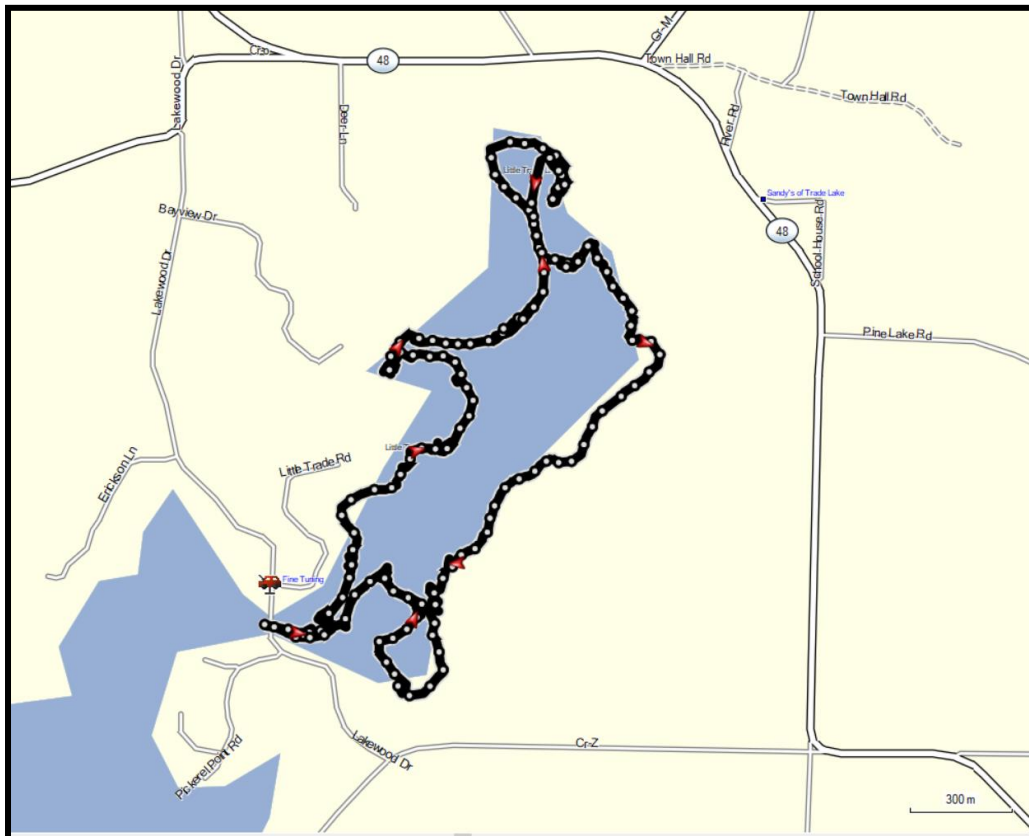


Figure 3: September 1, 2023 EWM Littoral Zone Survey – GPS Tracks

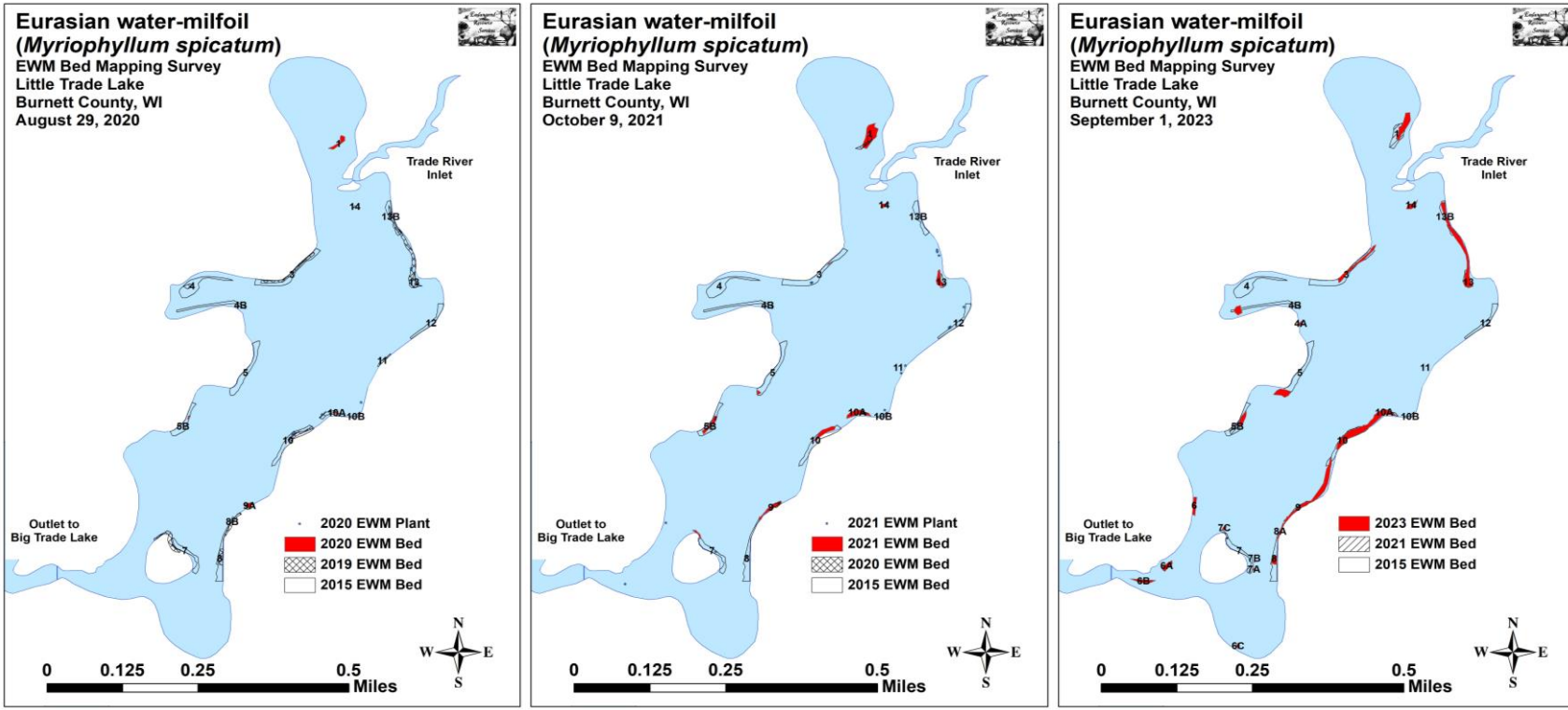


Figure 4: Late Summer 2020, Fall 2021, and Late Summer 2023 EWM Bed Maps

**Table 1: Late Summer and Fall Eurasian Water-milfoil Bed Mapping Summary
Little Trade Lake – Burnett County, Wisconsin - October 9, 2021 and September 1, 2023**

Bed Number	2023 Area in Acres	2021 Area in Acres	2021-2023 Change in Acreage	Rake Range; Mean Rake Fullness	Depth Range; Mean Depth	Canopied	Navigation Impairment	2023 Field Notes
1	0.26	0.37	-0.11	<<<1-3; 2	2-5; 3	Yes	Moderate	Mixed with Coontail and filamentous.
1A	0	0	0	-	-	-	-	No EWM seen.
2	0	0	0	-	-	-	-	No EWM seen.
3	0.21	0.01	0.20	<1-3; 2	1-4; 2	Yes	Minor	Narrow shoreline ribbon.
4	0	0	0	-	-	-	-	No EWM seen.
4A and 4B	0.11	0	0.11	<<<1-3; 1	1-4; 3	Yes	Minor	EWM in area cleared by “thrusters”.
5 and 5A	0.16	0.02	0.14	<1-3; 2	1-4; 3	Yes	Minor	Bed in area raked clean by resident.
5B	0.09	0.10	-0.01	1-3; 2	1-4; 2	Yes	Minor	Too close to shore to be moderate.
6	0.09	0	0.09	<1-3; 2	2-4; 2	Yes	Minor	EWM recolonizing raked area.
6A and 6B	0.18	0	0.18	<<<1-3; 1	2-3; 2	Yes	Minor	Ribbon along navigation channel.
6C	0.02	0	0.02	<<1-2; 1	1-5; 3	Yes	Minor	EWM in area cleared by “thruster”.
7 (A/B/C)	0.03	0.03	0.00	<<1-3; 2	1-4; 3	Yes	Minor	Dense microbeds around island.
8 (A and B)	0.11	0	0.11	<<<1-2; 2	1-6; 4	Yes	Minor	Reestablishing in raked area.
9 and 9A	0.47	0.12	0.35	<1-3; 2	1-6; 3	Yes	Moderate	Canopied mat among docks.
10	0.63	0.15	0.31	<1-3; 2	1-6; 3	Yes	Moderate	Mixed with Spatterdock/White water lily.
10A	Merged	0.17	-	-	-	-	-	Merged with Bed 10.
10B	0	0	0	-	-	-	-	No EWM seen.
11	0	0	0	-	-	-	-	No EWM seen.
12	0	0	0	-	-	-	-	No EWM seen.
12B	0	0	0	-	-	-	-	No EWM seen.
12C	0	0	0	-	-	-	-	No EWM seen.
13	0.58	0.11	0.47	<<<1-3; 1	2-5; 3	Yes	Minor	Mixed with Spatterdock and Coontail.
13B	Merged	0	0	-	-	-	-	Merged with Bed 13.
14	0.07	0.03	0.04	<<<1-3; 1	2-5; 3	Yes	Minor	Mixed with Spatterdock and Coontail.
Total Acres	3.02	1.11	+1.91					

**Table 2: Historical Late-summer/Fall Eurasian Water-milfoil Bed Mapping Summary
Little Trade Lake – Burnett County, Wisconsin
2012-2021 and 2023**

Bed Number	2023 Area in Acres	2021 Area in Acres	2020 Area in Acres	2019 Area in Acres	2018 Area in Acres	2017 Area in Acres	2016 Area in Acres	2015 Area in Acres	2014 Area in Acres	2013 Area in Acres	2012 Area in Acres
1	0.26	0.37	0.10	0	0.93	0	0.06	0	3.84	4.61	2.16
1A	0	0	0	0	0.18	0.04	0	0	0	0	0
2	0	0	0	0	0	0	0.02	0	Merged	Merged	Merged
3	0.21	0.01	0	0.22	0	0	0	0.65	0.23	0.03	0
4	0	0	0	0.04	0.06	0.07	0	0.58	0	0	0
4A and 4B	0.11	0	0	0	0	0.07	0	0.26	0	0	0
5 and 5A	0.16	0.02	0	0	0	0.01	0	0.52	0	0	0
5B	0.09	0.10	<0.01	<0.01	0.02	0.07	0	0.33	0	0	0
6	0.09	0	0	0	0	0	0	0	0	0	0
6A and 6B	0.18	0	0	0	0	0	0	0	0	0	0
6C	0.02	0	0	0	0	0	0	0	0	0	0
7 (A/B/C)	0.03	0.03	0	0.22	0.06	0.04	0.02	0.31	0	0	0
8 (A and B)	0.11	0	0	0.19	0	0.10	0	0.42	0	0	0
9 and 9A	0.47	0.12	0.04	0.07	0	0.01	0	0	0	0	0
10	0.63	0.15	0	0.11	0.05	0.05	0	0.51	0	0	0
10A	Merged	0.17	0.02	0.15	0	0.10	0.11	0	0	0	0
10B	0	0	0	0	0	0	0	0.05	0	0	0
11	0	0	0	0.05	0	0	0.01	0	0	0	0
12	0	0	0	0	0	0	0	0.26	0	0	0
12B	0	0	0	0	0	0	0	0	0	0	0.02
12C	0	0	0	0	0	0	0	0	0	<0.01	0.08
13	0.58	0.11	0	0.53	0.10	0.27	0.05	0.08	0.14	<0.01	0
13B	Merged	0	0	Merged	0	0.16	0.02	0.26	0	0	0
14	0.07	0.03	0	0.01	0	0.10	0.05	0	0.10	<0.01	0.31
Total Acres	3.02	1.11	0.16	1.59	1.40	1.09	0.34	4.23	4.32	4.65	2.57

Descriptions of Past and Present Eurasian Water-milfoil Beds:

Bed 1 – Eurasian water-milfoil formed a moderately dense canopied mat along with dense Coontail (*Ceratophyllum demersum*) and filamentous algae near the river inlet in the north bay.

Beds 1A and 2 – We saw no evidence of EWM anywhere along the north bay's northern shoreline. We also didn't find any EWM in the entrance to the north bay.

Bed 3 – EWM formed a moderately dense but narrow ribbon along the northwest shoreline.

Beds 4, 4A, and 4B – We didn't see any EWM along the north shoreline of the lake's western midlake bay, but two small dense microbeds had established in the outwash of water "thrusters" that residents had installed on the bay's southern shoreline (see report cover).

Beds 5 and 6 – Residents in these areas had rake removed all the native vegetation – primarily White water lily (*Nymphae odorata*). This barren substrate was then colonized by dense beds of EWM.

Bed 5B – This small bed was established on an uninhabited shoreline likely making it a non-issue for navigation.

Beds 6A and 6B – These small beds formed a nearly continuous ribbon of plant along the edge of the navigation channel.

Bed 6C – This small bed in the south bay was established in the outwash of another water "thruster" that had cleared the native vegetation from the area.

Beds 7A, 7B, and 7C – These three microbeds were established around the north shore of the island.

Beds 8 and 8A – Bed 8 was growing in an area that a resident had raked clean of native vegetation, while Bed 8A was more of a "high density area" with regular, but not continuous EWM.

Bed 9 – Most of this bed formed a dense canopied mat among the docks on this newly developed shoreline. On the north end, the density was slightly lower as it mixed with White water lily and Spatterdock (*Nuphar variegata*). Collectively, it was again the worst area on the lake.

Bed 10 – EWM was established among the Spatterdock and White water lily, and plants were moderately dense. However, they grew in a narrow band which likely limited the beds impact on navigation.

Bed 10A – This bed expanded significantly since 2021, and we found it had merged with Bed 10. We again noted large amounts of Northern water-milfoil (*Myriophyllum sibiricum*) mixed in with the Eurasian water-milfoil in this area.

Beds 10B, 11 and 12 – We saw no evidence of EWM along the northeast shoreline.

Beds 13 and 13B – EWM was firmly reestablished on the northeast point, and a narrow strip of almost continuous plants extended to the north along the shoreline.

Bed 14 – This bed was established southeast of the north bay entrance on the sandy flat. It was moderately dense and mixed with canopied Coontail and Spatterdock.

CONSIDERATIONS FOR MANAGEMENT:

Even with the significant expansion we documented in 2023, Eurasian water-milfoil continues to occupy a relatively low percentage of the lake's surface area. Unfortunately, it is widely-established making eradication an unrealistic expectation. With this in mind, continuing to work to manage it in the most cost-effective manner possible, while simultaneously minimizing its impact on the lake's aquatic ecosystem will likely continue to be important goals for the lake association moving forward.

Ultimately, the RTLIA, LEAPS, and the WDNR will have to decide on what, if any, active management should occur in 2024. Similarly, how much monitoring will be needed in 2024, if any, is a conversation that needs to take place.

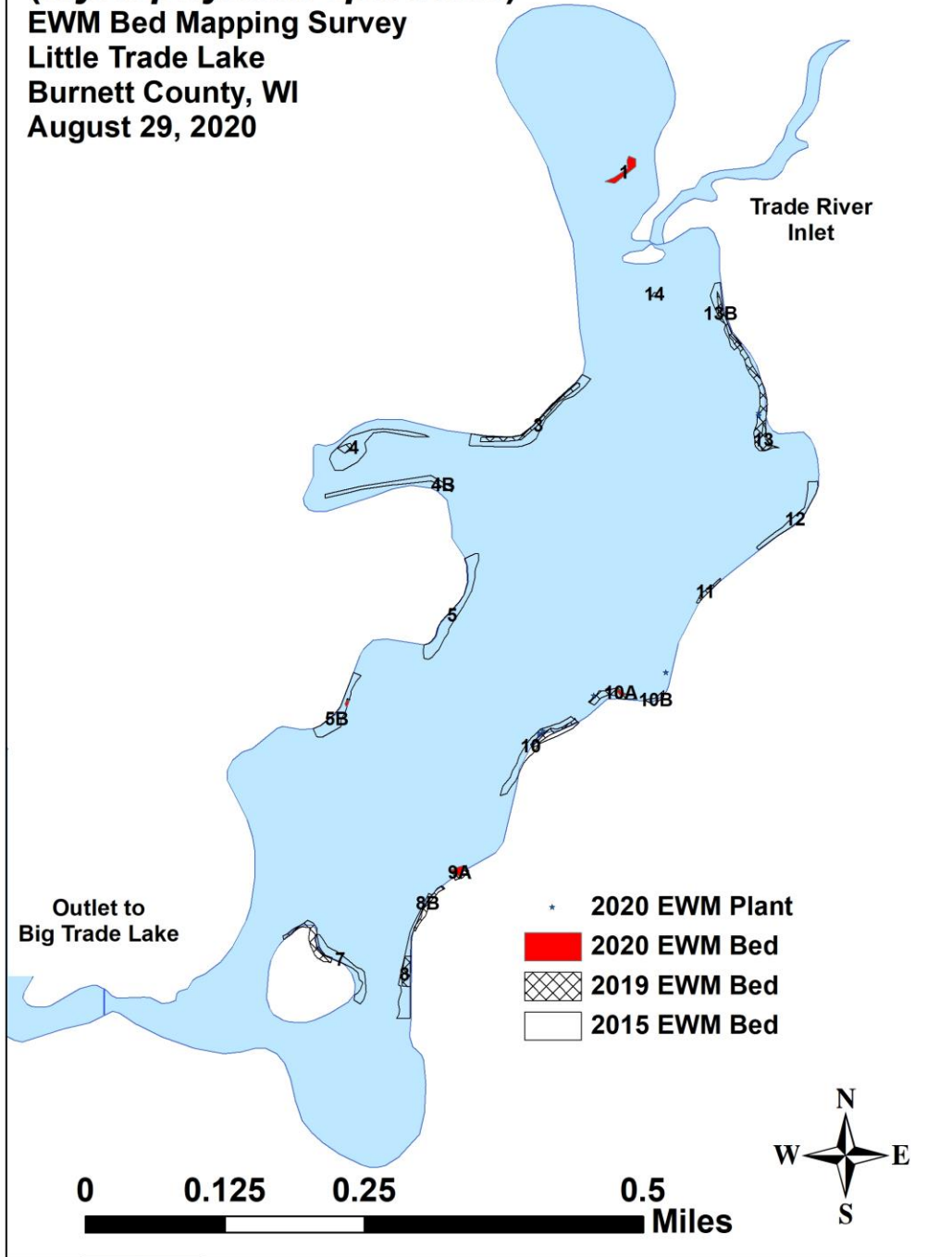
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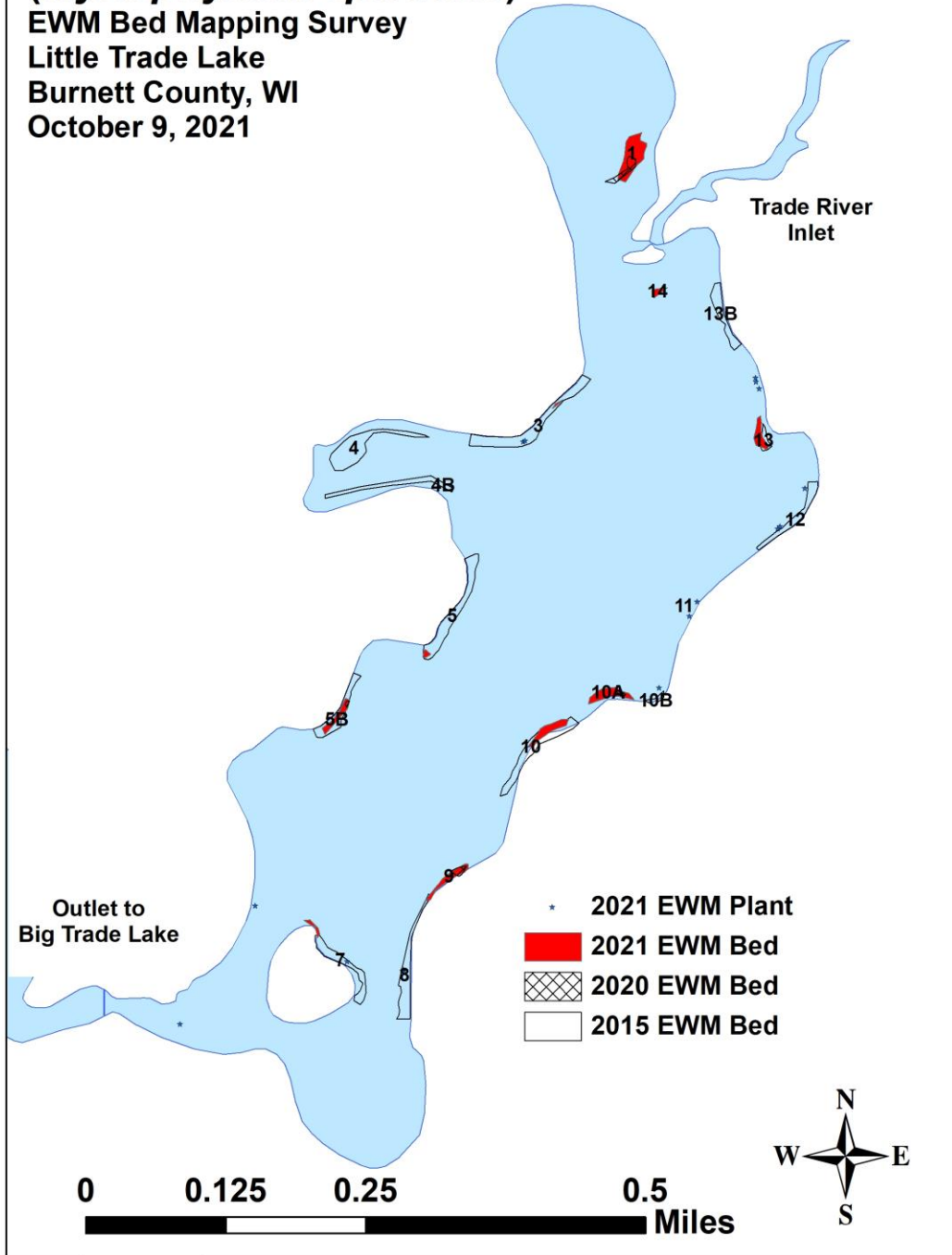
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EWM Bed Mapping Survey
Little Trade Lake
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