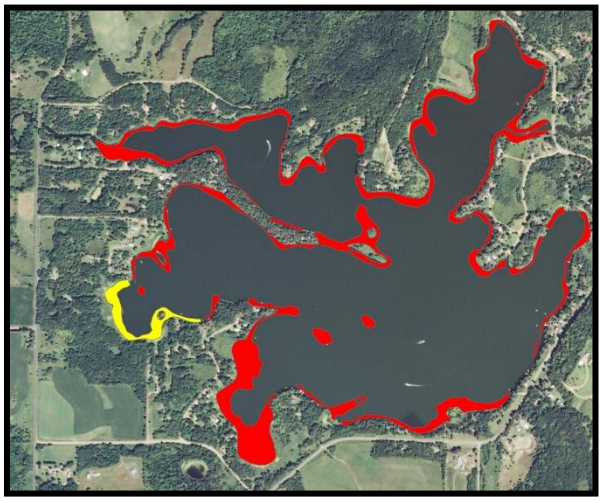
Curly-leaf Pondweed (*Potamogeton crispus*) Point Intercept and Bed Mapping Surveys Big Trade Lake - WBIC: 2638700 Burnett County, Wisconsin



2012 CLP Beds on Big Trade Lake

Curly-leaf pondweed (Berg 2012)

Project Sponsored by:
Round-Trade Lake Improvement Association, Inc., Short, Elliot, Hendrickson Inc., and the Wisconsin Department of Natural Resources

Canopied CLP at the Big Trade Inlet from Little Trade Lake

Survey Conducted by and Report Prepared by:
Endangered Resource Services, LLC
Matthew S. Berg, Research Biologist
St. Croix Falls, Wisconsin
May 9-10, and 21, 2012

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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 SW SW). It reaches a maximum depth of 39ft in the west-central bay and has an average depth of approximately 20ft. Big Trade Lake is eutrophic in nature with poor to very poor water clarity. From 1986 to 2012, summer Secchi readings have ranged from 2.6-6.1ft with an average of 4.0ft (WDNR 2012). The bottom substrate is predominately muck with scattered gravel and sandy areas primarily along the shoreline (Bush et al 1968).

Figure 1: Big Trade Lake Aerial Photo

In 2009, the Wisconsin Department of Natural Resources (WDNR) confirmed the presence of Eurasian water milfoil (*Myriophyllum spicatum*) in Little Trade Lake which is connected to Big Trade Lake via the Trade River channel. Although never found in Big Trade Lake, it is likely only a matter of time before boats or currents spread it downstream. In anticipation of this spread, the Round-Trade Lake Improvement Association, Inc. (RTLIA) began the process of developing an Aquatic Plant Management Plan (APMP) to guide future management. As the lake also has Curly-leaf pondweed (CLP) (*Potamogeton crispus*), another exotic invasive species, the RTLIA, Short, Elliot, Hendrickson, Inc. (SEH), and the WDNR commissioned CLP Point Intercept and Bed Mapping surveys prior to finalizing the lake's APMP. Using the WDNR statewide guidelines for conducting systematic point intercept macrophyte surveys, we sampled the lake's CLP on May 9 and 10, and mapped the lake's CLP beds on May 21, 2012. The goals of these surveys were to determine the extent and density of the lake's early season CLP infestation and to delineate the total acreage covered by CLP. This report represents the summary analysis of the data collected during these surveys and will be used by SEH to help develop an appropriate APMP with and for the RTLIA as they work to manage their resource moving forward.

METHODS:

Curly-leaf pondweed Density Survey:

Using a standard formula that takes into account the shoreline shape and distance, islands, water clarity, depth, and total acreage, Michelle Nault (WDNR) generated a 652 point sampling grid for Big Trade Lake (Appendix I). Using this grid, we completed a density survey where we recorded the level of CLP at each point in 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 in the rake, CLP was assigned a value of 1-3 as an estimation of abundance (Figure 2). We also documented visual sightings of CLP within six feet of the sample point. In addition to plant data, we recorded the lake depth using a hand held sonar (Vexilar LPS-1) and the bottom substrate (bottom type) when we could see it or reliably determine it with the rake.

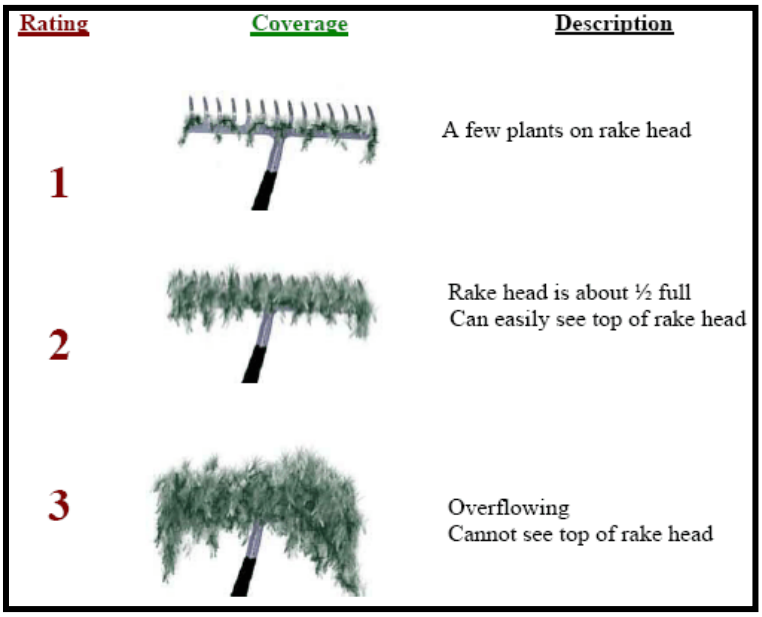

Figure 2: Rake Fullness Ratings (UWEX, 2010)

CLP Bed Mapping Survey:

Following the density survey, we used the resulting map coupled with a meandering shoreline survey to locate and map all significant beds of CLP on Big Trade Lake. We defined a bed based on the following two criteria: CLP plants made up greater than 50% of all aquatic plants in the area, and the CLP had canopied at the surface or was close enough to the surface that it would likely interfere with normal boat traffic. Areas that had a large amount of CLP, but were not canopied or were not dense enough to meet the "bed" criteria, were also mapped and identified as "high density CLP areas". Although not beds in 2012, these areas have the potential to form beds in the future.

Using a GPS unit, we recorded a string of waypoints that circled around the edges of the beds. We then uploaded these points into ArcMap 9.3.1, created bed shapefiles using the WDNR's Forestry Tools Extension, and determined the total acreage of the bed to the nearest hundredth of an acre.

RESULTS AND DISCUSSION:

Curly-leaf pondweed Density Survey:

We visited all 652 points on the lake and recorded depth data to help formulate the most accurate bathymetric map possible (Figure 3) (Appendix III). The lake has five separate basins that bottomed out at over 24ft+ with the deepest areas occurring south of Cedar Point and east of the lake's two central sunken islands. Numerous side bays tended to be shallower with depths in the 6-12ft range. Around and between the islands/sunken islands, sharp drop offs, shallow flats, and rocky saddles produced a rich underwater topography.

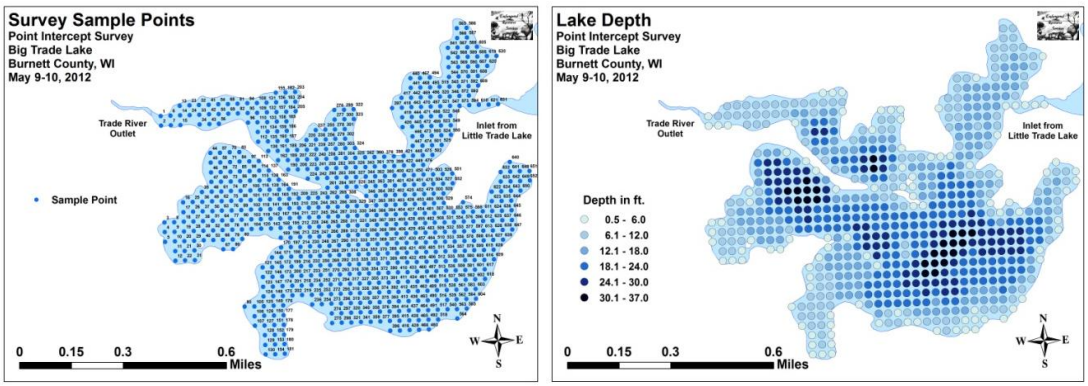

Figure 3: Sample Points and Lake Depth

During the survey, we were able to determine the bottom type at 265 points. We noted that the lake's numerous side bays were dominated by organic and sandy muck (Figure 4). Lakewide, these substrates were present at 78.1% of survey points. We documented smaller areas of sand (6.8%) and rock (15.1%) scattered along the shoreline, on exposed points, around the islands, over humps, saddles and sunken islands, and at the river inlet and outlet. Although the early spring littoral zone extended to 12ft (Figure 4), plant growth in most parts of the lake ended abruptly at 9.5ft (Appendix III).

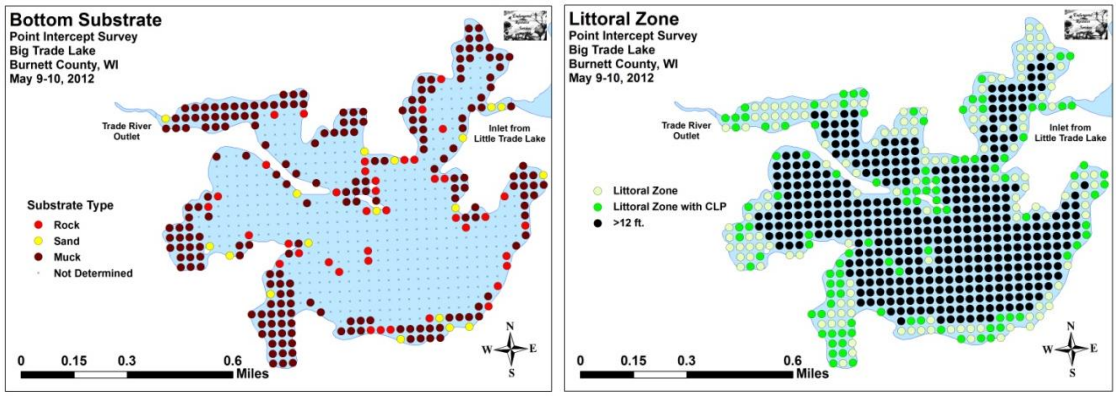

Figure 4: Bottom Substrate and Littoral Zone

We found CLP present in the rake at 107 locations, and it was recorded as a visual at 16 additional points (Figure 5) (Appendix IV). This extrapolated to CLP being present in approximately 16% of the lake. Of these points, 38 had a rake fullness rating of 3 and another 26 rated a 2 indicating 10% of the lake had a significant infestation. Although found throughout the littoral zone, CLP reached its highest densities in the lake's sheltered bays over thick organic muck bottoms in water 3-8ft deep (Figure 5) (Appendix IV).

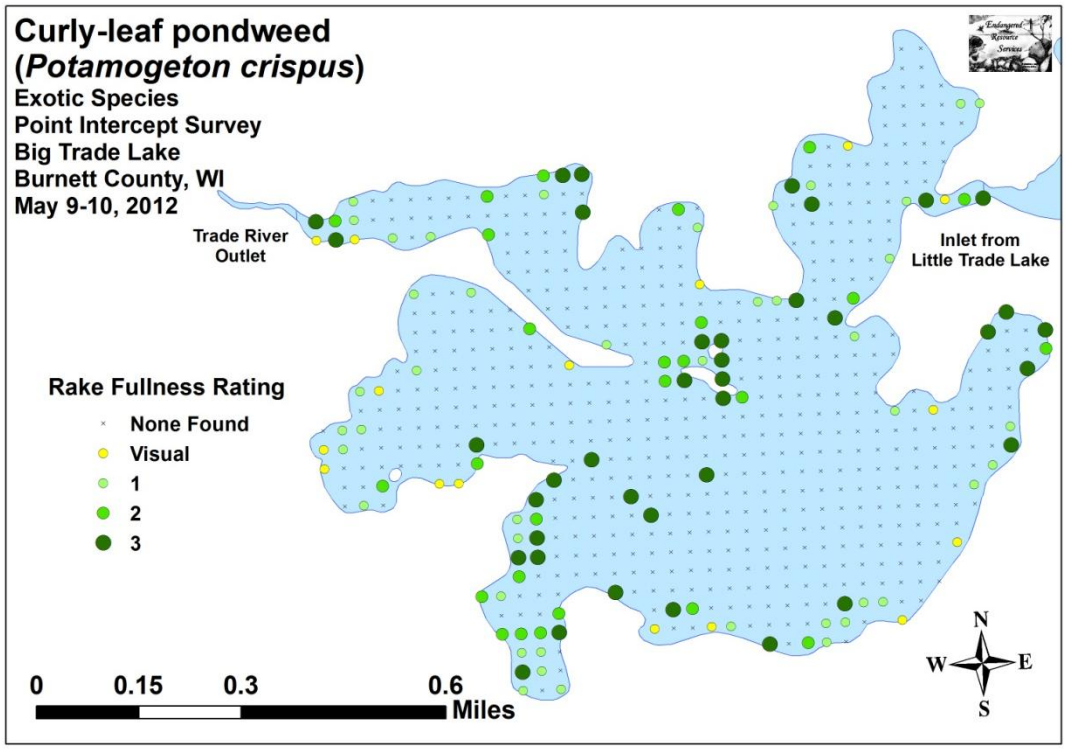

Figure 5: CLP Distribution and Density – May 9-10, 2012

CLP Bed Mapping Survey:

On May 21th, we found that, with the exception of expansive beds of Hardstem bulrush (*Schoenoplectus acutus*) that lined much of the shoreline, most of the lake's littoral zone was dominated by canopied beds of Curly-leaf pondweed. Within the beds, native plants were generally rare with the exception of Coontail (*Ceratophyllum demersum*), Northern water milfoil (*Myriophyllum sibiricum*), and White water lily (*Nymphaea odorata*). These species were also largely restricted to water <5ft deep (Figure 6) (Appendix V).

Based on differences in CLP density and gaps along the shore where the beds fragmented or disappeared altogether over rocky substrate, we divided the lake into 17 separate beds. They ranged in size from 0.15 acre (Bed 5 in the middle of the west-central bay) to 11.48 acres (Bed 7 in the southwest bay). Collectively, they covered 46.88 acres or 14.3% of the lake's 327 total acres (Table 1). An additional high density area added 3.54 acres to this total (Table 2). Fortunately, most of the beds that were adjacent to residences were relatively narrow. Although an inconvenience, most property owners likely would require no more than one or two prop clears to access open water.

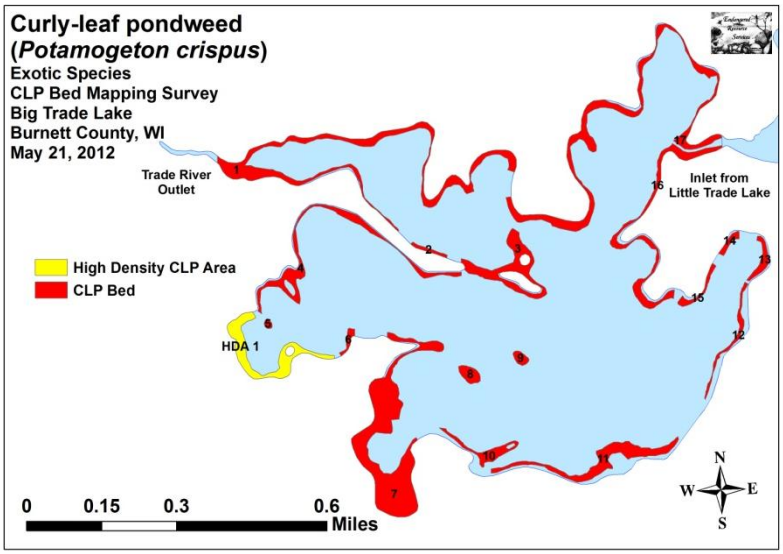

Figure 6: Big Trade Lake CLP Beds – May 21, 2012

Table 1: CLP Bed Summary
Big Trade Lake, Burnett Co. May 21, 2012

Bed Number	Acreage	Mean Rake Fullness
1	7.95	1-3
2	0.31	1-2
3	3.57	2-3
4	3.65	1-3
5	0.15	3
6	0.33	3
7	11.48	2-3
8	0.70	3
9	0.38	3
10	1.26	1-3
11	3.74	1-3
12	0.88	1-3
13	0.72	1-3
14	0.38	1-3
15	0.57	1-3
16	3.50	1-3
17	7.31	1-3
Total Acres	**46.88**	

Table 2: CLP High Density Areas Summary
Big Trade Lake, Burnett Co. May 21, 2012

HDA Number	Acreage	Mean Rake Fullness
1	3.54	<1-2
Total Acres	**3.54**	

Description of CLP Beds and High Density Area:

Bed 1 – Dominating both shorelines of the northwest bay all the way to the lake outlet, Bed 1 was canopied throughout (Figure 7). It was especially thick near the northwest public boat landing. The bed was nearly monotypic on the outer edge, but mixed with Coontail and White water lily near the shore. On the southern shoreline, it became fragmentary over sandy/rocky substrate before breaking up all together as we move east.

Figure 7: Bed 1 – Northwest Boat Landing at Trade River Outlet

Bed 2 – This area barely qualified as a bed as there were moderate amounts of Northern water milfoil mixed in. Plants were also only intermittently canopied, but CLP still made up over 50% of plants. This shoreline was rocky/sandy and heavily shaded by trees which seemed to make for poor CLP growing conditions. Most plant growth ended right at the ends of docks creating minimal interference with boat traffic.

Bed 3 – CLP in this area was extremely dense and difficult to navigate through as the bed was a solid rake fullness of 3 throughout. 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 (Figure 8).

Bed 4 – This long shoreline bed was nearly monotypic and canopied, but it was often narrow because of the sharp drop-off from the shoreline. However, the bed was likely a nuisance for people accessing the many docks on the south shoreline of the Cedar Point Resort (Figure 9). On the small sunken island in the middle of the southwest corner of the bed, a stand of Hardstem bulrush over rock almost entire excluded CLP and provided excellent fish habitat.

Figure 8: Bed 3 – Cedar Point Saddle and Central Islands

Figure 9: Bed 4 - South Shoreline of Cedar Point Resort

Bed 5 – Covering only 0.15 acres, Bed 5 was the smallest in the lake. It was monotypic, extremely dense, and canopied; however, it was also easily avoided (Figure 10).

High Density Area 1 – A small stream entered the lake in this area, and there was a beaver lodge with swimming channels to it scattered throughout the bay. We also noted bladderworts (*Utricularia* spp.) growing among other natives like Coontail, Flat-stem pondweed (*Potamogeton zosteriformis*), and Northern water milfoil. This suggests the water may be more acidic/less suitable for CLP than elsewhere on the lake. Although the CLP in the area was canopied, it usually grew in patchy clusters separated by large gaps rather than in solid beds.

Figure 10: Bed 5 and HDA 1 in the West-central Bay

Beds 6 – Bed 6 was narrow, monotypic, canopied, and extremely dense. However, we noted that most of the shoreline it covered was uninhabited which likely makes it a low management priority.

Bed 7 – This bed wrapped around the point and dominated the shallow southwestern bay. On the outer edge, it was monotypic, but fragmentary. Closer to shore, it was denser, but also mixed with Coontail and White water lily. For the residents in the area, it was likely a moderate to major inconvenience when accessing their docks; especially those residents on the western shoreline of the bay who had to power through >50yrds of canopied plants.

Beds 8 and 9– These beds were established over the sunken midlake islands. They were nearly monotypic, canopied, and dense. During our time on the lake, we noticed many people used them for panfishing. For this reason, at least in these locations, CLP's thick early season habitat may be considered more of a positive than a negative (Figure 11).

Figure 11: Beds 8 and 9 – Midlake Sunken Islands

Bed 10 – This bed ribboned along the shoreline before extending out over a saddle and around a shallow sunken island with a stand of Hardstem bulrush in the middle of it (Figure 12). Although it was canopied throughout and nearly monotypic, most people seemed to know to avoid it as there were only a few prop trails running through it. Like Beds 8 and 9, this area was heavily utilized by people panfishing, and we had to "wait our turn" to map the bed.

Figure 12: Bed 10 – South-central Bay

Bed 11 –Bed 11 snaked along the shoreline before extending out to the north along a broad, gently-sloping flat. Plants were canopied to 7ft of water, and this was one of the worst areas on the lake in regards to interfering with residents accessing their properties. On the inner edge of the bed, plants became very fragmented before largely disappearing altogether along the sandy southern and southeastern shorelines.

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 rake fullness ratings from 2-3 although there were a few areas where plants were not this dense. Other than CLP, there was little else growing in these areas this early in the season. The one exception to this was the far ends of the northeast bay where we found moderate amounts of Coontail, and scattered White water lilies.

Beds 16 and 17 – Both of these narrow shoreline beds had very dense canopied CLP on their outer boarders, but scattered patches of Northern water milfoil, Coontail, and White water lily along most of their inner boarders. Rocky points in both beds were dominated by beds of Hardstem bulrush which, as it did throughout the lake, seemed to exclude CLP. We noted the beds were especially thick in the inlet from Little Trade Lake (Figure 13). Navigation through the area was extremely difficult, and there were numerous prop trails where, after getting off course, boats were forced to chop their way back into the very narrow navigable opening running down the middle of the channel.

Figure 13: Beds 16 and 17 – Inlet from Little Trade Lake

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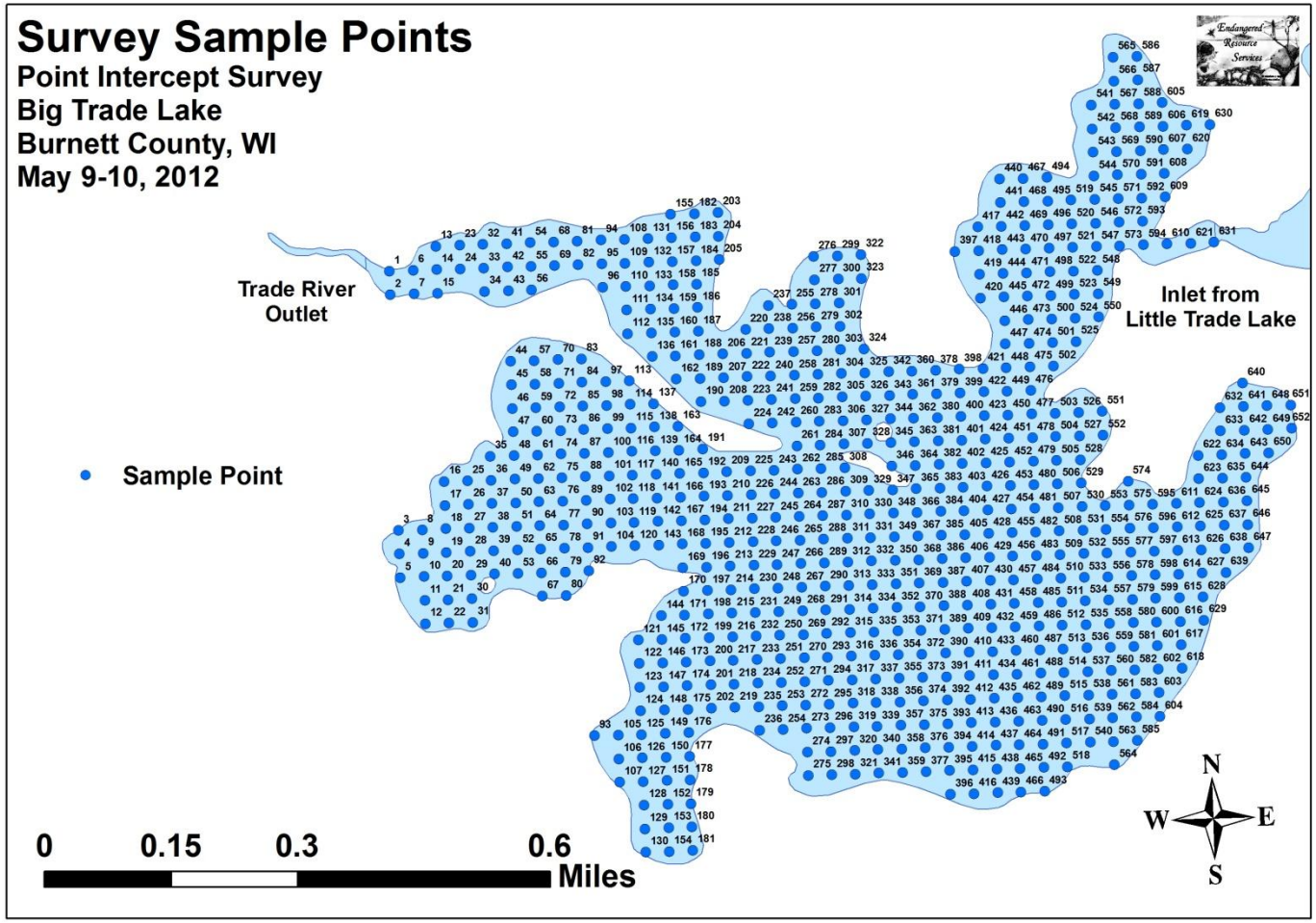
WDNR. [online]. 2012. Big Trade Lake Citizen Lake Monitoring Water Quality Database. Available from http://dnr.wi.gov/lakes/waterquality/Station.aspx?id=073056 (2012, October).

Appendix I: Big Trade Lake Map with Survey Sample Points


Survey Sample Points
Point Intercept Survey
Big Trade Lake
Burnett County, WI
May 9-10, 2012
Trade River Outlet
Inlet from Little Trade Lake
Sample Point
0
0.15
0.3
0.6
Miles
N
W
E
S

Appendix II: Vegetative Survey Data Sheet

Observers for this lake: names and hours worked by each:																										
Lake:									WBIC									County						Date:	
Site #	Depth (ft)	Muck (M), Sand (S), Rock (R)	Rake pole (P) or rake rope (R)	Total Rake Fullness	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																									
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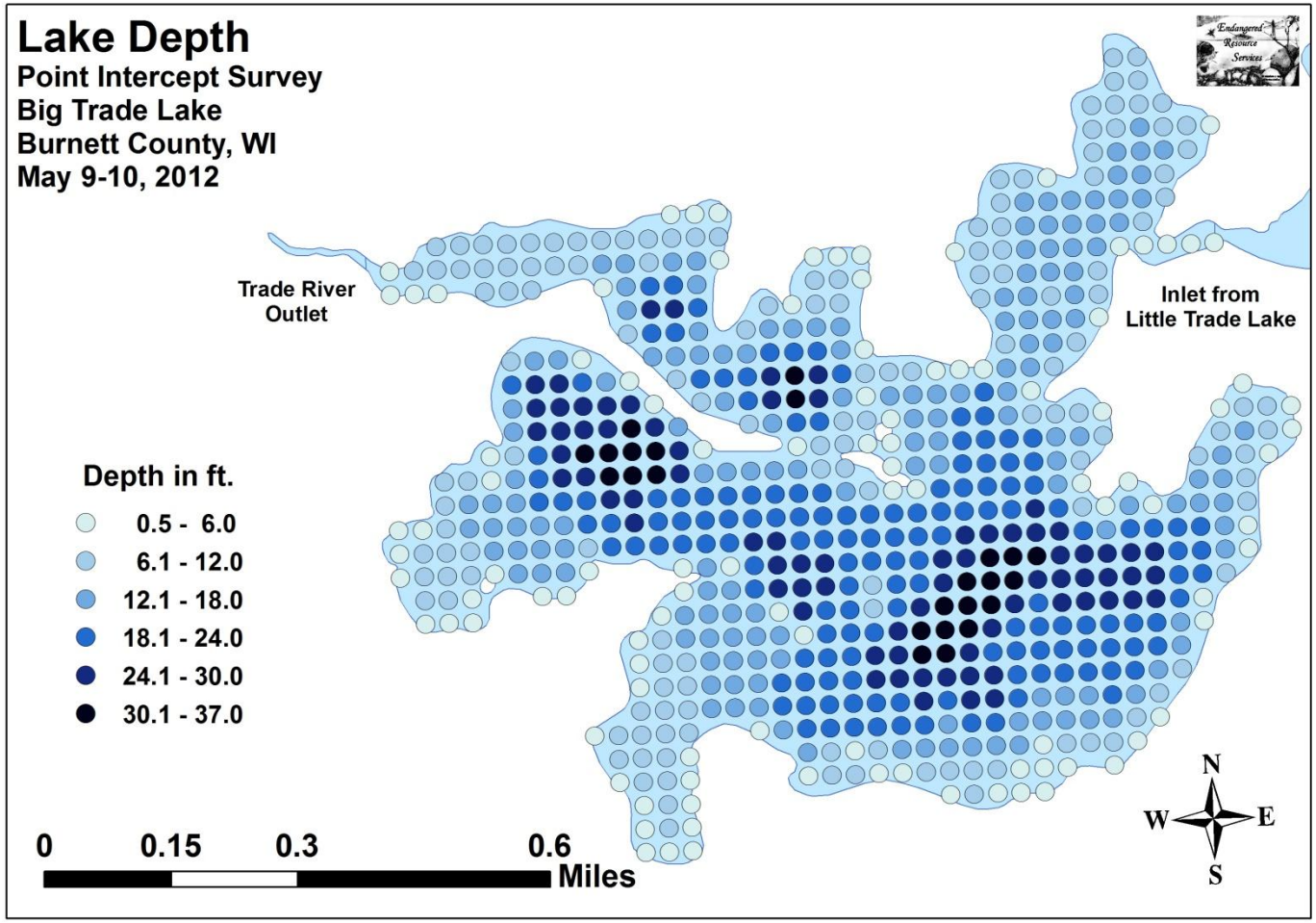
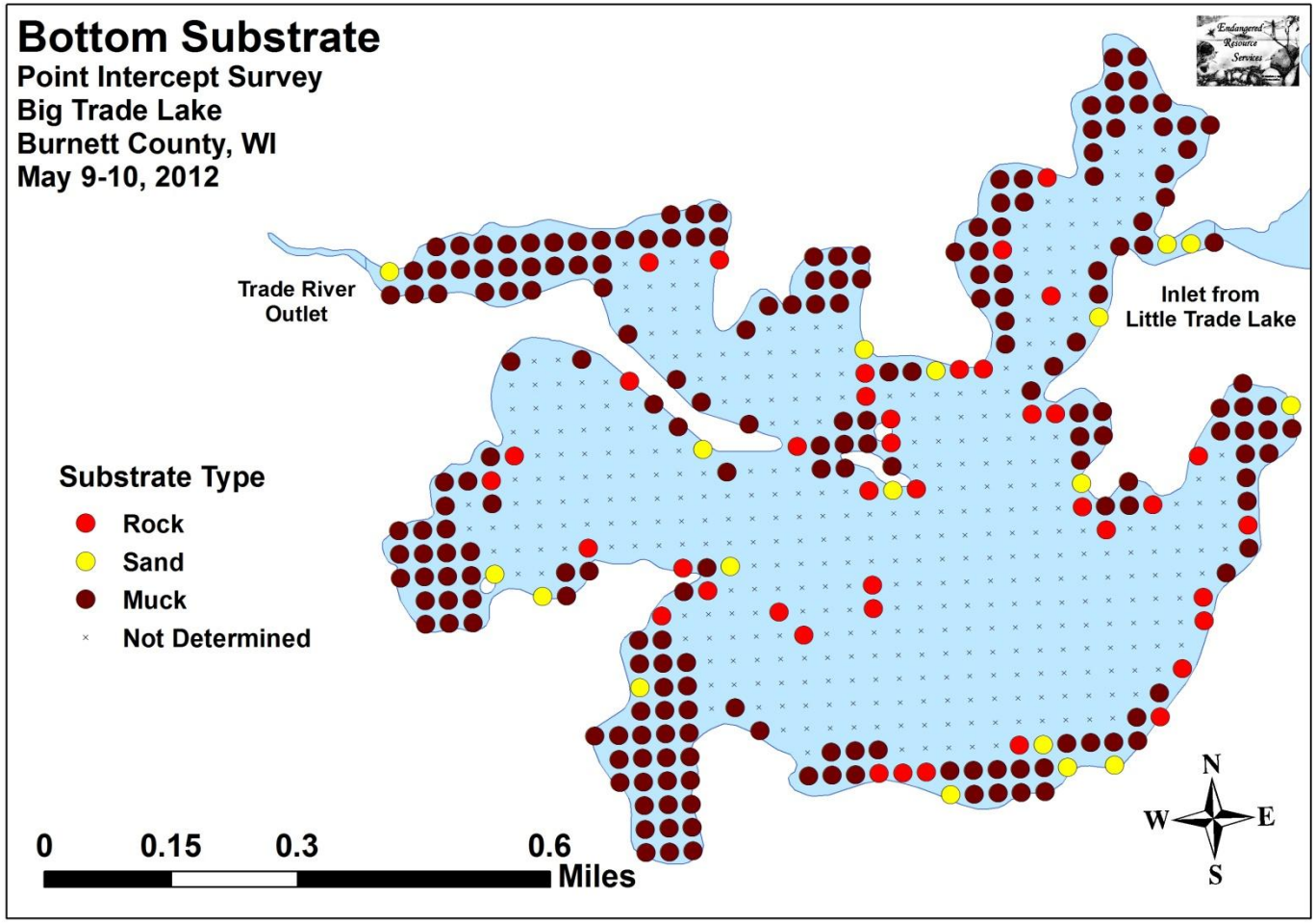
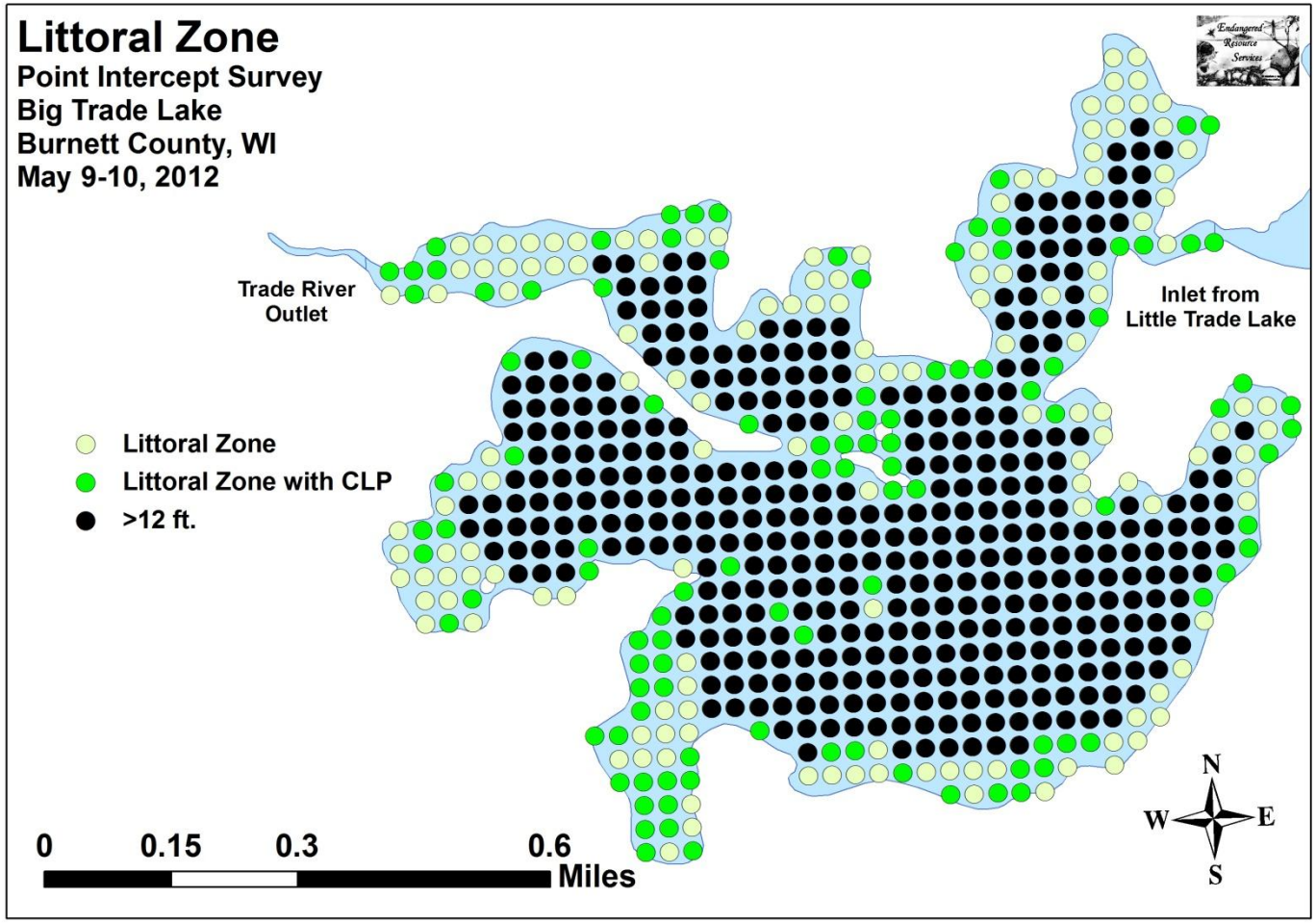
19																									
20																									

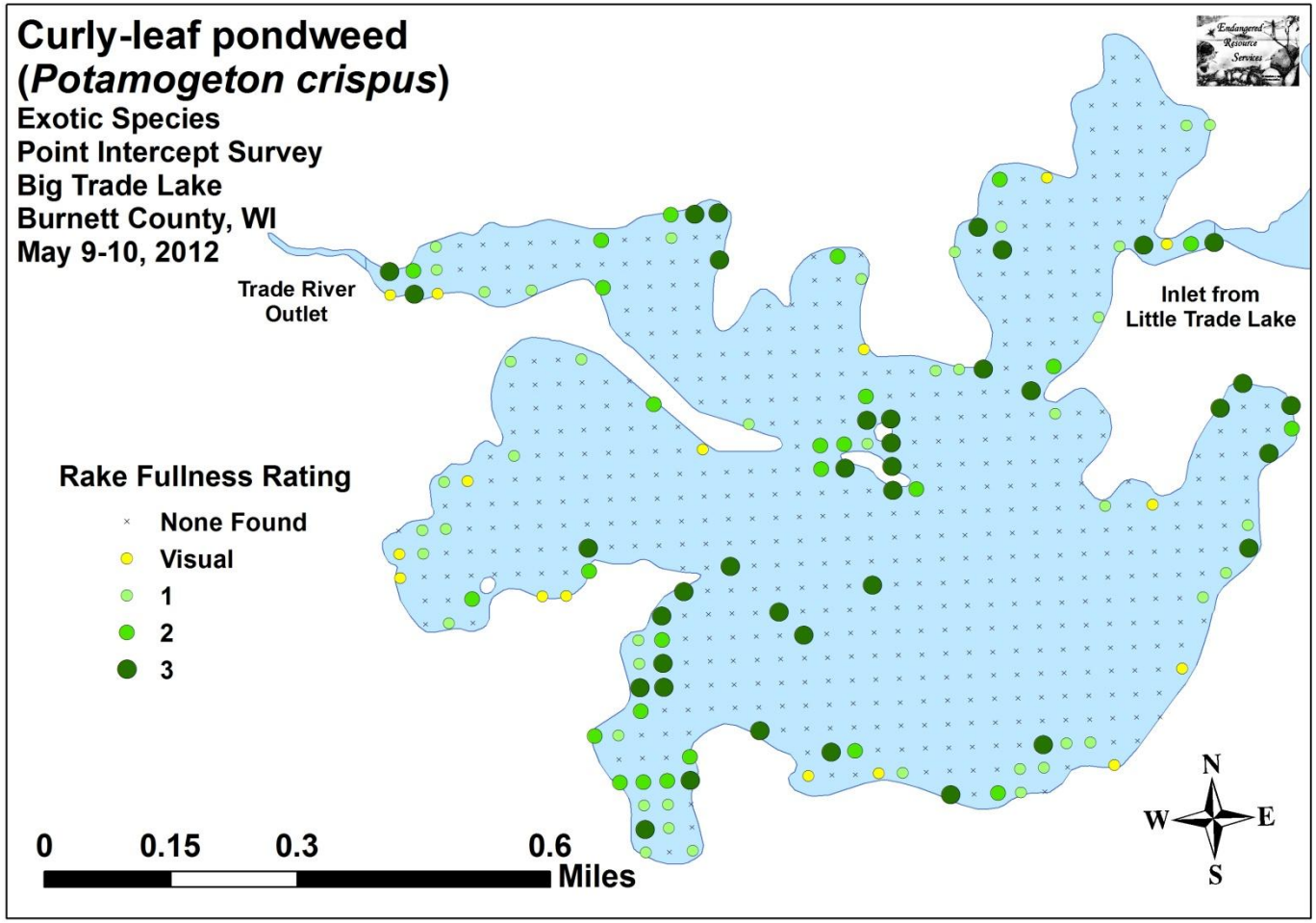
Appendix III: Habitat Variable Maps


Lake Depth
Point Intercept Survey
Big Trade Lake
Burnett County, WI
May 9-10, 2012
Endangered Resource Services
Trade River Outlet
Inlet from Little Trade Lake
Depth in ft.
0.5 - 6.0
6.1 - 12.0
12.1 - 18.0
18.1 - 24.0
24.1 - 30.0
30.1 - 37.0
N
W
E
S
0
0.15
0.3
0.6
Miles

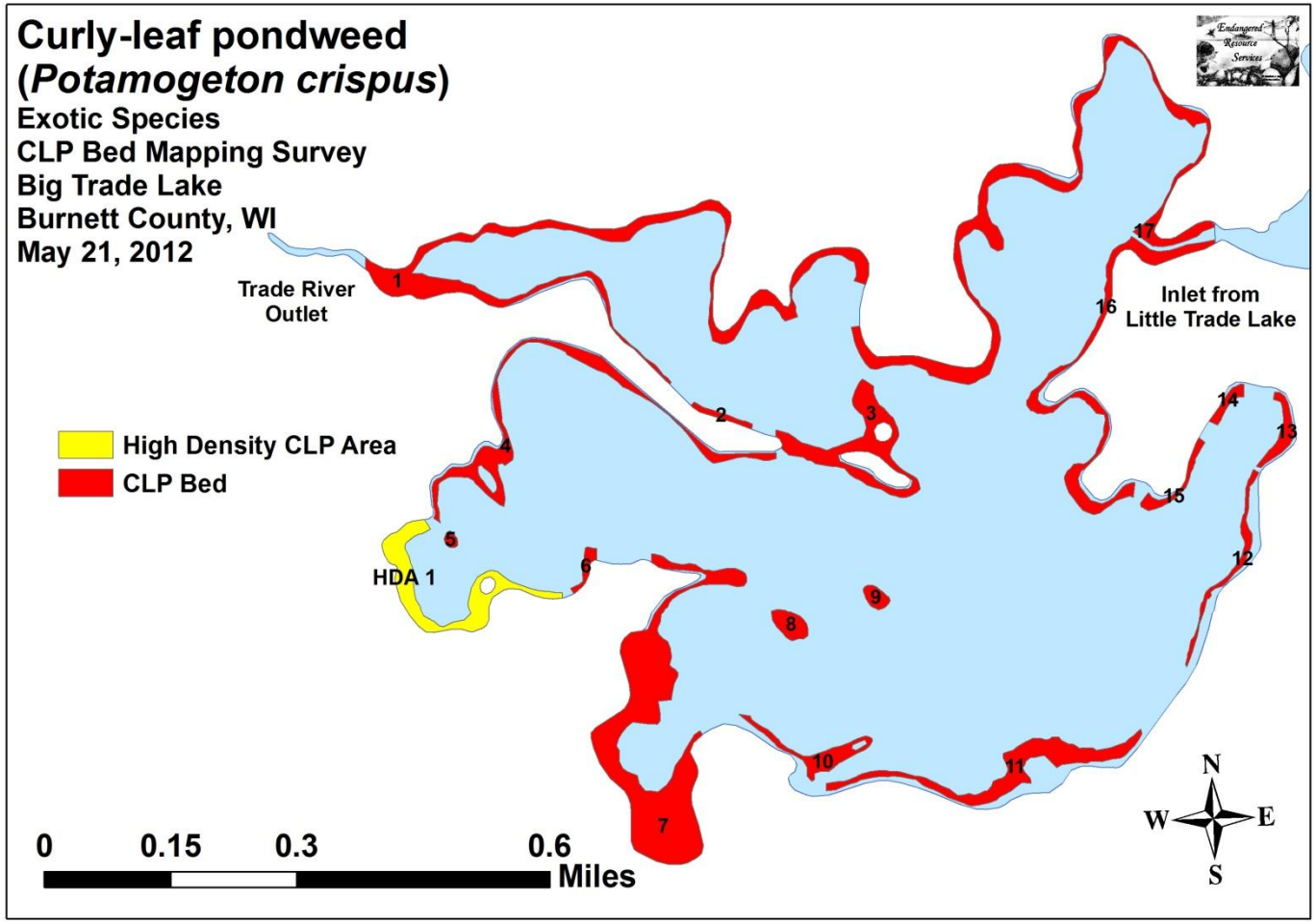

Bottom Substrate
Point Intercept Survey
Big Trade Lake
Burnett County, WI
May 9-10, 2012
Trade River Outlet
Inlet from Little Trade Lake
Substrate Type
Rock
Sand
Muck
Not Determined
0
0.15
0.3
0.6
Miles
N
W
E
S


Littoral Zone
Point Intercept Survey
Big Trade Lake
Burnett County, WI
May 9-10, 2012
Endangered Resource Services
Trade River Outlet
Inlet from Little Trade Lake
Littoral Zone
Littoral Zone with CLP
>12 ft.
N
W
E
S
0
0.15
0.3
0.6
Miles

Appendix IV: May Curly-leaf Pondweed Distribution and Density


Curly-leaf pondweed
(Potamogeton crispus)
Exotic Species
Point Intercept Survey
Big Trade Lake
Burnett County, WI
May 9-10, 2012
Trade River Outlet
Inlet from Little Trade Lake
Rake Fullness Rating
None Found
Visual
1
2
3
0
0.15
0.3
0.6
Miles
N
W
E
S

Appendix V: May Curly-leaf Pondweed Bed Map


Curly-leaf pondweed
(Potamogeton crispus)
Exotic Species
CLP Bed Mapping Survey
Big Trade Lake
Burnett County, WI
May 21, 2012
Trade River Outlet
Inlet from Little Trade Lake
HDA 1
High Density CLP Area
CLP Bed
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
0
0.15
0.3
0.6
Miles
N
W
E
S