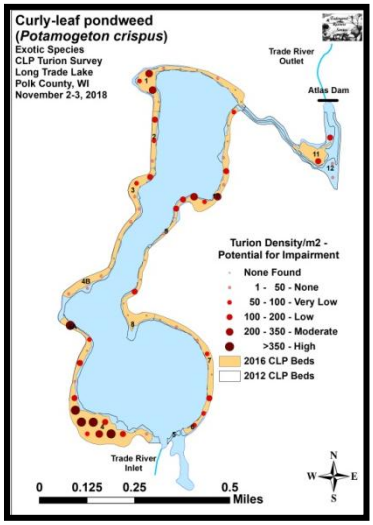
Curly-leaf pondweed (*Potamogeton crispus*)
Fall Turion Survey
Long Trade Lake - WBIC: 2640500
Polk County, Wisconsin

2018 CLP/EWM Final Treatment Areas



Fall 2018 CLP Turion Density and Distribution

Project Initiated by:

Round-Trade Lakes Improvement Association Inc., Lake Education and Planning Services, LLC, and the Wisconsin Department of Natural Resources

Sieve with turions (Berg 2013)

Survey Conducted by and Report Prepared by:

Endangered Resource Services, LLC
Matthew S. Berg, Research Biologist
St. Croix Falls, Wisconsin
November 2-3, 2018

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INTRODUCTION:

Long Trade Lake (WBIC 2640500) is a 150 acre drainage lake in northwest/north-central Polk County, Wisconsin in the Town of Laketown (T36N R18W S4 SE NE). It reaches a maximum depth of 13ft in two spots in the south basin and has an average depth of approximately 8ft. The lake is eutrophic bordering on hypereutrophic in nature with very poor water clarity. From 1986 to 2018, summer Secchi readings have ranged from 1.2-3.0ft with an average of 2.1ft (WDNR 2018). This poor water clarity produced a littoral zone that extended to approximately 6ft in 2018. The bottom substrate is primarily sand and gravel in the main basin with organic muck in sheltered bays (Miller et al. 1965).

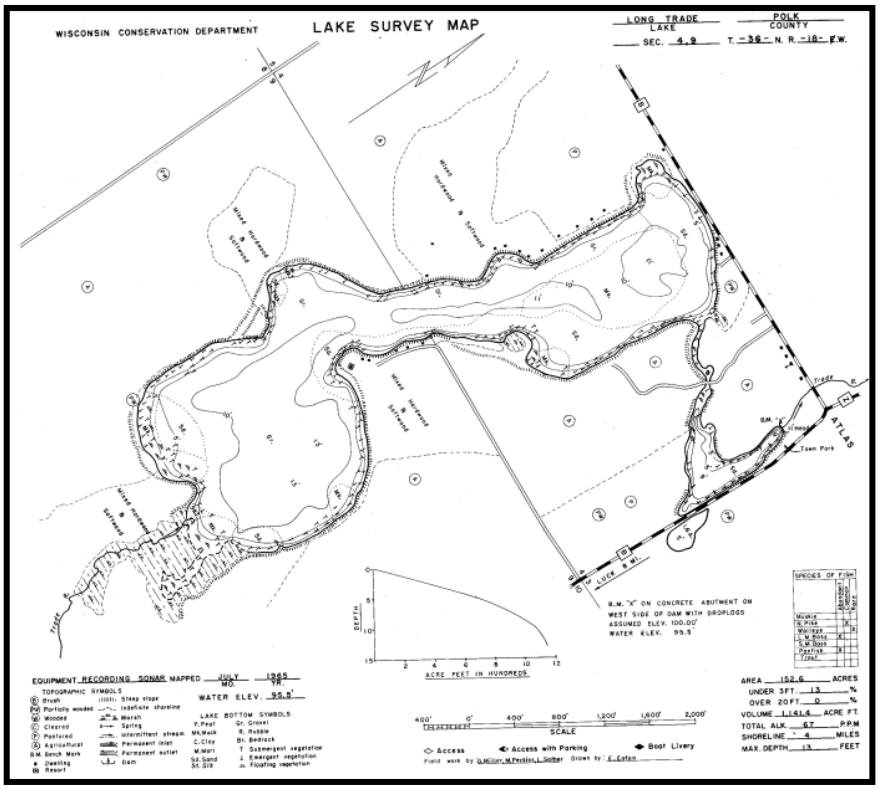

Figure 1: Long Trade Lake Bathymetric Map

BACKGROUND AND STUDY RATIONALE:

Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM), an exotic species that can be highly invasive, was first identified in Long Trade Lake by Wisconsin Department of Natural Resources (WDNR) biologists in 1995. Concerns about its expansion and generally high levels of aquatic vegetation coupled with poor water quality prompted the Round-Trade Lake Improvement Association, Inc. (RTLIA) to authorize a series of plant surveys on the lake in 2011 and 2012. These surveys established baseline data on the density and distribution of EWM and Curly-leaf pondweed (*Potamogeton crispus*) (CLP) - another invasive exotic species that dominates the lake's spring littoral zone. Following the development of a WDNR approved Aquatic Plant Management Plan (APMP) that outlined strategies to control both EWM and CLP, the Round-Trade Lake Improvement Association, Inc. (RTLIA) - under the direction of Dave Blumer (Lake Education and Planning Services, LLC - LEAPS) - began treating the lake with herbicides to control these species.

The 2016 follow-up Curly-leaf pondweed bed-mapping survey found CLP still dominated much of the lake's spring littoral zone. Because of this, treatment for both CLP and EWM occurred in 2016 and 2017, and plans for future treatments were written into the updated APMP. To help cover the costs associated with management, in 2018, the RTLIA applied for and was awarded a WDNR Aquatic Invasive Species control grant (ACEI21618). In May 2018, these funds were used to treat EWM and CLP in five areas totaling 6.80 acres (4.53% of the lake's surface area) (Figure 2). Posttreatment analysis suggested the application resulted in a significant reduction of both these species within the treatment areas. Despite this, CLP is still assumed to be present throughout much of the lake's littoral zone. To quantify where future treatments might be most effective, LEAPS requested a late fall survey to determine the level of latent CLP turions in the lake's substrate. These data will be used to help guide future management.

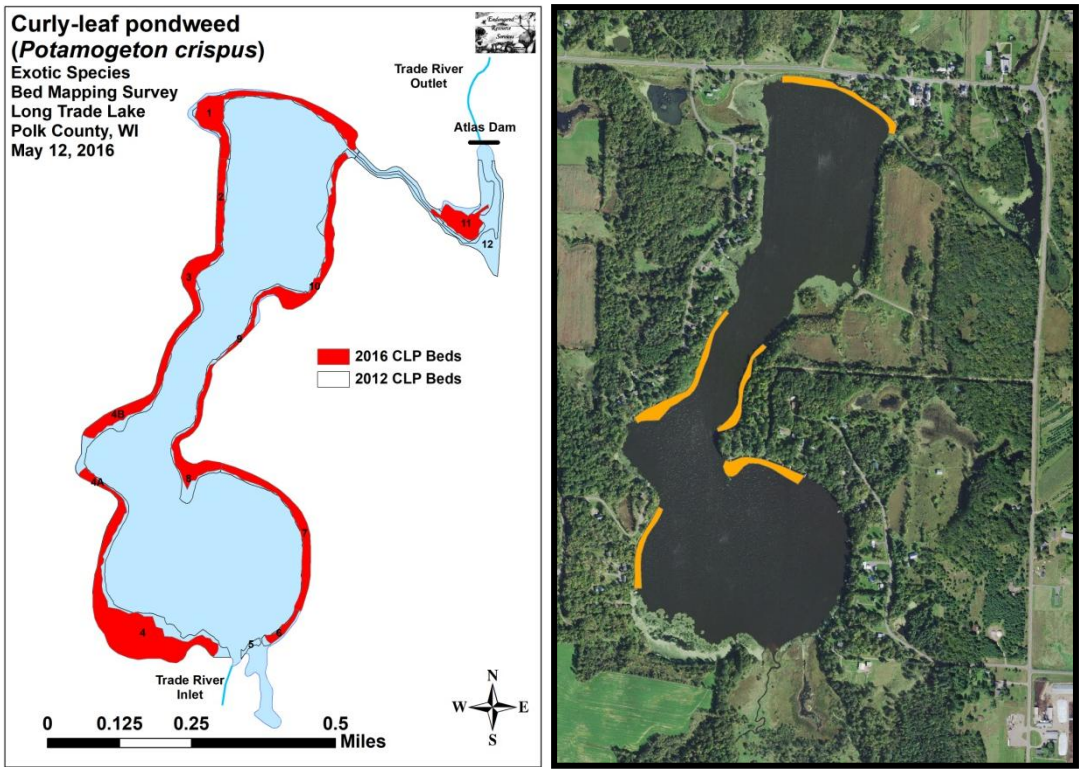

Figure 2: 2016 CLP Bed Map and 2018 CLP/EWM Treatment Areas

CLP LIFE HISTORY AND STUDY OBJECTIVES:

Although Curly-leaf pondweed occasionally reproduces by seed, the vast majority of plants resprout from stiff overwintering buds called turions that are normally produced in number by the plants prior to their late June/early July senescence (Figure 3). After the pinecone-like turions germinate in late fall or early winter, plants continue to grow slowly under the ice. Following ice out, growth accelerates, and plants rapidly canopy allowing them a competitive advantage over slower growing native species (Capers et al. 2005).

Figure 3: Germinating CLP Turion

Research suggests approximately 50% of turions germinate in a growing season while the rest remain dormant until the following growing season when another 50% will germinate (Johnson et al. 2012). Depending on the level of turions at a given location and knowing that latent turions may be able to survive for over 5 years in the sediment, it may take several years of control to exhaust the "turion bank" (R. Newman – U of M unpublished data).

Following the 2018 summer growing season, we conducted a fall turion survey. The goals of the survey were to determine the level of CLP turions within the lake's historic high density CLP areas; and, if there were any present, to predict whether their numbers suggested there would likely be enough to cause navigation issues in 2019. This report is the summary analysis of that survey conducted on November 2-3, 2018.

METHODS:

Fall Ponar Dredge Turion Survey:

Prior to initiating the current treatment program, Curly-leaf pondweed essentially covered the entire spring littoral zone. In 2012, we mapped 38.60 acres of Curly-leaf pondweed beds. Assuming this to be the maximum extent of the infestation, we used Hawth's Analysis Tools Extension to ArcGIS 9.3.1 to create survey points within these beds. Although the points were auto-generated as offset regular, we moved points into thin areas of the polygons where there were no points, and tried to spread points uniformly throughout these areas at regular intervals. The 75 point grid that was requested by LEAPS approximated to 1.94 points/acre (Figure 4) (Appendix I).

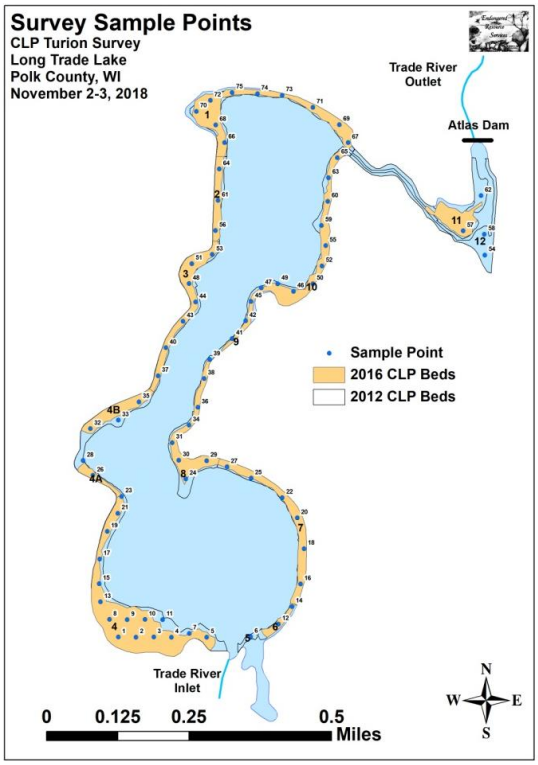

Figure 4: Turion Survey Sample Points

During the surveys, we located each point with a handheld mapping GPS unit (Garmin 76CSx) and used a Petite Ponar dredge with a 0.0232m^2 (36in^2) sample area to take a bottom sediment grab from each side of the boat at each location. These samples were then rinsed in a fine sieve to separate out the sediment (Figure 5). Samples with high numbers of turions or significant amounts of detritus were bagged for later analysis; at which time we discarded all rotten turions, tallied all live turions, and multiplied the combined total live turions from the two samples by 21.53 to estimate turions/m^2 at each location. This value gives an idea of how many CLP plants will germinate in an area during the 2019 growing season.

Figure 5: Ponar Grab and Turion Sieving

DATA ANALYSIS:

We entered all data collected into an Excel spreadsheet and used standard formulas in the data analysis tool pack to calculate the following:

Total number of points sampled: This value is the total number of points on the lake within each study area. We took **two** Ponar samples at each point.

Total number of live turions: This value includes all live turions found at all sites within a study area.

Total number of points with live turions: This number includes all survey sites that had at least one turion in **either** of the Ponar samples taken at the site.

Frequency of occurrence: The frequency of turions is generally reported as a percentage of occurrences at all sample points. The value is used to extrapolate coverage within the study area. For example, if 20% of all sample sites have turions, it suggests that 20% of the study area will have at least some Curly-leaf pondweed coverage the following year.

Points at or above nuisance level: This value gives the number of survey sites within the study area that were above the predicted nuisance threshold (Figure 6). Research suggests that when the turion density is at or above 200/m^2, the following year's CLP growth has the potential to at least moderately impair navigation (Johnson et al. 2012).

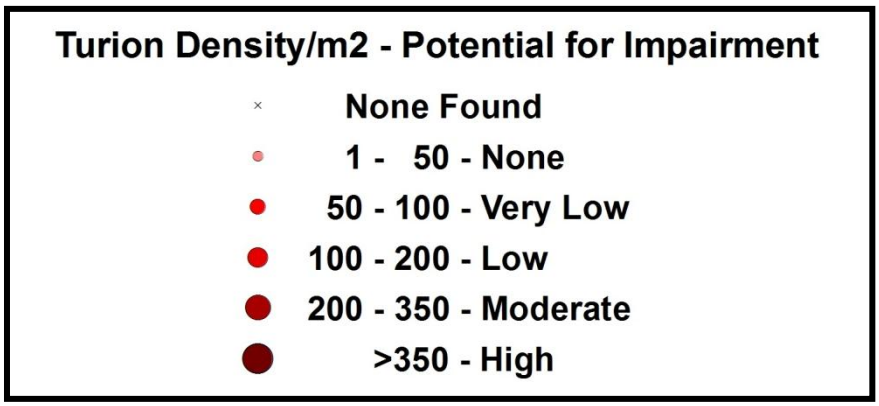

Figure 6: Predicted Navigation Impairment Based on Turion Density

Percent nuisance level: The percentage of nuisance points divided by the total number of survey points can be extrapolated to determine what percent of the study area has the potential to have at least moderate navigation impairment during the next growing season.

Mean turions/m^2: This value is the average number of turions/m^2 when pooling the data from all survey sites regardless of whether or not they had turions present.

Standard deviation of turions/m^2: This value tells us how far apart the data is from the mean. A low standard deviation suggests most points have a turion density that was similar to the mean, while a high value suggests there was greater variability in turion density within the sample area (Table 1).

RESULTS AND DISCUSSION:

We counted a total of 344 Curly-leaf pondweed turions at 51 of 75 survey points (68.0% coverage) (Table 1). Of these, ten points (13.3% coverage/19.6% of points with turions) exceeded the expected "nuisance level" of 200/m^2, and 33 points (44.0% coverage/64.7% of points with turions) topped 50 turions/m^2 meaning they have at least some potential for navigation impairment in 2019 (Figure 7) (Appendix II).

The high standard deviation of 159.58 turions/m^2 was more than 50% greater than the overall mean density of 98.74 turions/m^2 which suggests there will be significant variability throughout the study area in the future. Specifically, we noted that most of the 2018 treatment areas will likely experience low to no impairment in 2019, while Bed 1 in the northwest bay, Beds 4 and 4A in the southwest bays, and Bed 10 near the public boat landing will likely all have moderate to severe impairment.

Table 1: CLP Turion Survey - Summary Statistics
Long Trade Lake, Polk County
November 2-3, 2018

Summary Statistics:

Total number of points sampled	75
Total live turions	344
Total # of points with live turions	51
Frequency of occurrence (in percent)	68.0
Number of points at or above nuisance level (+200/m^2)	10
% nuisance level	13.3
Maximum turions/m^2	883
Mean turions/m^2	98.74
Standard deviation/m^2	159.58

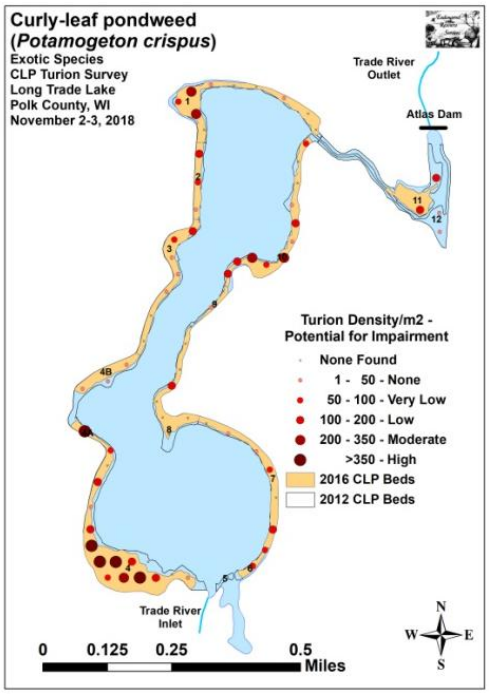

Figure 7: 2018 Fall CLP Turion Survey Density and Distribution

CONSIDERATIONS FOR FUTURE MANAGMENT:

The 2018 turion survey found there will again be Curly-leaf pondweed throughout much of Long Trade Lake in 2019. Ultimately, the results of the 2019 pretreatment survey coupled with the level of CLP growth the board is comfortable with will determine how much, if any, of the lake is actively managed.

LITERATURE CITED

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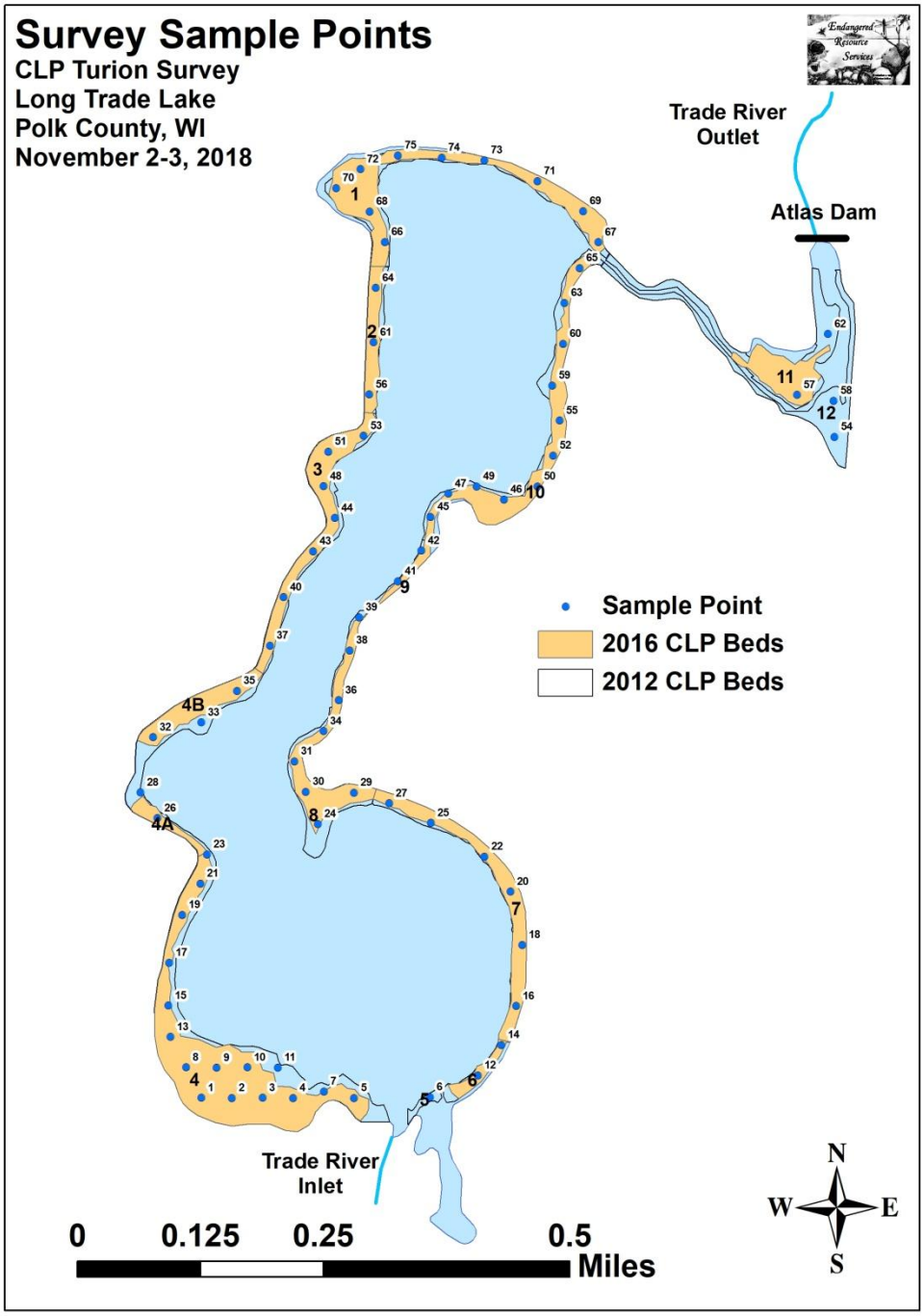
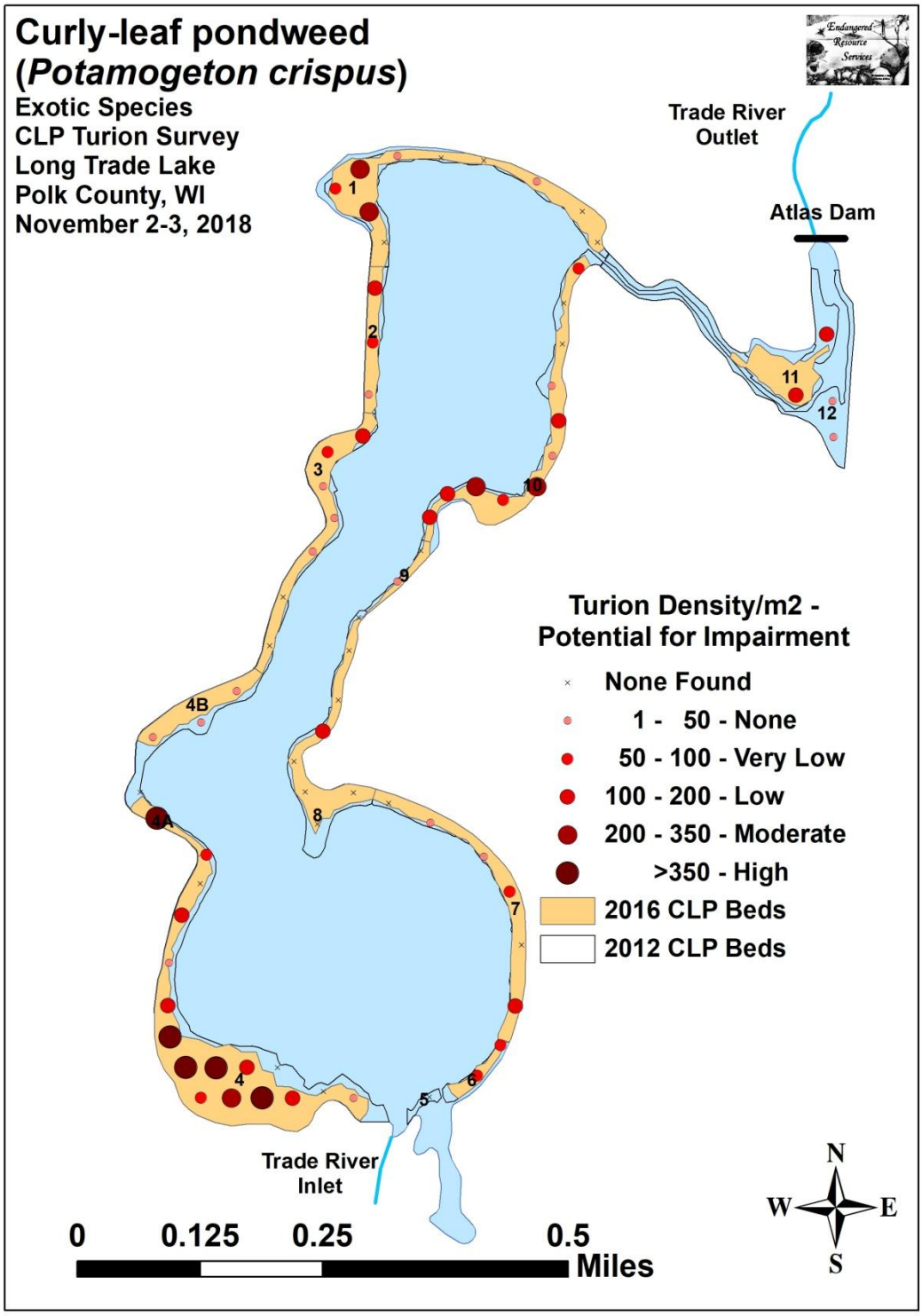
Appendix I: Turion Survey Sample Points


Survey Sample Points
CLP Turion Survey
Long Trade Lake
Polk County, WI
November 2-3, 2018
Trade River Outlet
Atlas Dam
Sample Point
2016 CLP Beds
2012 CLP Beds
Trade River Inlet
0 0.125 0.25 0.5
Miles
N
W
E
S

Appendix II: 2018 Fall CLP Turion Density and Distribution


Curly-leaf pondweed
(Potamogeton crispus)
Exotic Species
CLP Turion Survey
Long Trade Lake
Polk County, WI
November 2-3, 2018
Endangered Resource Services
Trade River Outlet
Atlas Dam
Trade River Inlet
1
2
3
4
4A
4B
5
6
7
8
9
10
11
12
Turion Density/m2 - Potential for Impairment
None Found
1 - 50 - None
50 - 100 - Very Low
100 - 200 - Low
200 - 350 - Moderate
>350 - High
2016 CLP Beds
2012 CLP Beds
0
0.125
0.25
0.5
Miles
N
W
E
S