
North Brown's Lake, Stearns County

2009- 2019 Aquatic Vegetation Management Report

Report by the Invasive Species Program - Division of Ecological and Water Resources
Minnesota Department of Natural Resources



Prepared by:

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Project Details

Lake: North Brown's (DOW# 73014700)

Lake Surface Area: 312.2 acres

Littoral Area: 124.5 acres

County: Stearns County

Survey Type: Point-intercept

Date of Survey (most recent): August 14, 2019

Surveyor[s]: MN DNR, Invasive Species Program (ISP): 2015: Courtney Millaway, Sarah Schmitt; 2014, 2013 and 2011: Nathan Olson; 2009: Terry Ebinger, Matt Swanson and Robert Ebinger and Aquatic Invasive Species Consulting Services: 2019: Eric Fieldseth

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Report Details

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Summary

The purpose of this report is to provide an overview of aquatic plant distribution and the management of invasive aquatic plants in North Brown's Lake, Stearns County between 2009 and 2019. Historical data on water quality, invasive aquatic plant management permits and point-intercept surveys are all summarized in this report. These summaries will guide future invasive aquatic plant control projects and can evaluate changes in native plant communities.

Lake Description

North Brown's Lake is a 312 acre lake located six miles south of Richmond in Stearns County, MN. The maximum depth of water in North Brown's Lake is 35 feet, and 40% of the lake is classified as littoral. According to the Minnesota Pollution Control Agency (MPCA), there is evidence of a degrading water clarity trend of 1.2 feet per decade in North Brown's Lake from 1973 to 2018. North Brown's Lake is classified as upper eutrophic to hypereutrophic (very nutrient rich), based on its Trophic State Index (TSI) of approximately 57.6. The three parameters that are factored into the trophic state index are total phosphorus (nutrients in the water), chlorophyll-a (measure of the amount of algae growing in the water) and Secchi depths (water transparency). For more information on water quality, go to [North Brown's Lake water quality data](https://cf.pca.state.mn.us/water/cmp/resultDetail.cfm?siteid=73-0147-00-101) on the MPCA website (<https://cf.pca.state.mn.us/water/cmp/resultDetail.cfm?siteid=73-0147-00-101>).

Management History

The lake has one invasive plant species: curly-leaf pondweed (*Potamogeton crispus*). Invasive aquatic plant management in North Brown's Lake has focused on curly-leaf pondweed (*Potamogeton crispus*), using an endothall herbicide. Between 2011 and 2015, whole lake treatments had occurred as part of a pilot project for lake-wide control of curly-leaf pondweed. Once the project was completed, the desired improvements in lake condition were not achieved. Although annual reductions in curly-leaf were obtained, a matching increase in a higher diversity of native plants was not observed and there was no improvements in water quality. Therefore, treatments were reduced the following years to 15% of the littoral area (18

acres). The most recent treatment was for curly-leaf pondweed in 2019 was organized by the North Brown’s Lake Association (Table 1). Generally, treatments are appropriate when there is dense curly-leaf pondweed and few to no native plants mixed in with the invasive species. Management should focus on reducing interference with recreational use caused by invasive aquatic plants. Pre-treatment survey data (i.e. point-intercept surveys or lake-wide delineations that can be repeatable), collected over time, would be a recommended course of action for analyzing plant abundance and distribution trends into the future.

Table 1-Invasive Plant Management Summary. Characteristics and history of partial lake invasive plant treatments for North Brown’s Lake, Stearns County (DOW#73014700), Total acres: 312.2, Littoral acres: 124.5, 15% of Littoral acres: 18). CLP is an abbreviation for curly-leaf pondweed. Note: Total acres permitted does not reflect the actual treatment or known acreage of the taxa in the lake.

| Date | Target Species | Total Acres Treated | Herbicide | Performed by |
|------|----------------|---------------------|-----------|------------------|
| 2011 | CLP | 94 | Endothall | Lake Restoration |
| 2012 | CLP | 91 | Endothall | Lake Restoration |
| 2013 | CLP | 91 | Endothall | n/a |
| 2014 | CLP | 91 | Endothall | Lake Restoration |
| 2015 | CLP | 91 | Endothall | Lake Restoration |
| 2016 | CLP | 19 | Endothall | PLM |
| 2017 | CLP | 18 | Endothall | Clarke |
| 2018 | CLP | 18 | Diquat | Lake Restoration |
| 2019 | CLP | 18 | Diquat | Lake Restoration |

Survey Objectives




Point-intercept surveys were used to assess the distribution of aquatic plants in North Brown’s Lake. The primary purpose for this type of survey is to 1) develop baseline knowledge of the current plant community in a lake, and over time, 2) compare year to year plant variation (in plant presence and spatial location), and 3) track changes in invasive aquatic plants. Moreover, this survey will help the DNR and our partners to monitor native plant communities and evaluate possible responses to invasive aquatic plant management via herbicide control. It is

important to note that distributions and occurrences of aquatic plants may vary from year to year due to natural variations (water clarity, snow cover, water temperatures, and natural fluctuation in plant species) or human induced alterations, such as, herbicide and shoreline management activities.

Survey Methods

MN DNR surveyors used a point-intercept survey method developed by John Madsen in “Aquatic Plant Control Technical Note MI-02, 1999”. During the most recent survey, sampling points were placed 65 meters apart using a Geographic Information System (Figure 1). Up to 129 points were sampled until plants were not detected on the rake. Plant samples were collected by throwing and dragging a double-sided rake along the lake bottom at each point. All plant taxa (submerged, floating-leaf, emergent and free floating) were recorded to species or genera during the survey following Crow and Hellquist (2000). Plant samples were assessed on the boat to determine species presence-absence and abundance. The abundance rake rating are as follows: 1: sparse, 2: common/ frequent/ occasional, and 3: abundant/matted (Table 2). Frequencies of occurrence percentages (i.e., how often a plant species was sampled in the lake) were calculated based on the littoral zone. Maximum depths were calculated at the 95th percentile for all vegetated sampling points.

Table 2- Quantitative rake abundance ranking (0-3) used to estimate plant abundance for each species based on rake coverage and/or visual observation (MN DNR). A zero (0) ranking indicates no target plants were retrieved or observed in a sample.

| Abundance Ranking | Rake Coverage | Description |
|-------------------|-------------------------------------------------------------------------------------|--------------------------------------------------|
| 1 |  | Sparse; plants covering <25% of the rake head |
| 2 |  | Common; plants covering 25%-75% of the rake head |
| 3 |  | Abundant; plants covering >75% of the rake head |

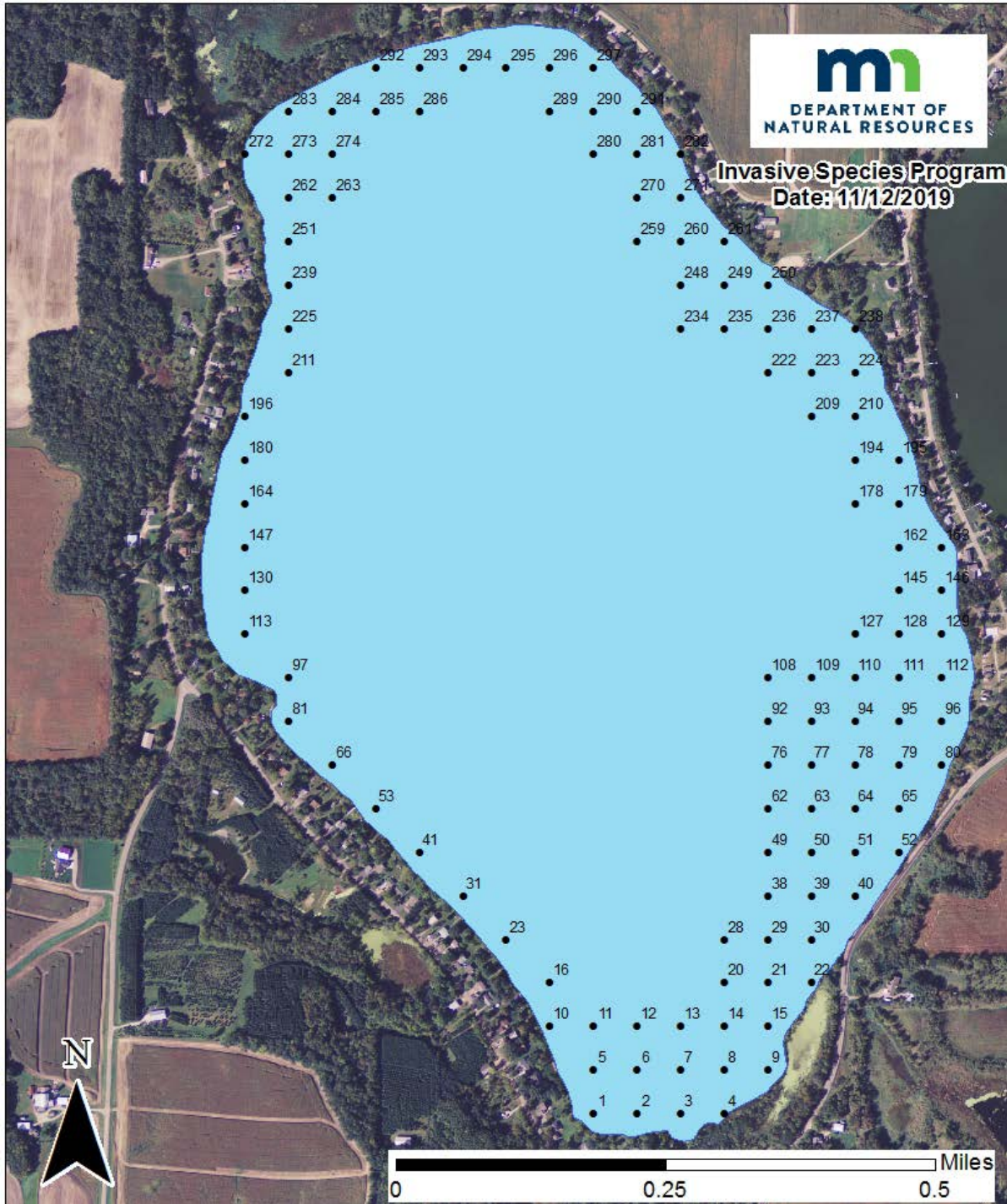


Figure 1 – MN DNR Point-intercept Survey Grid. Point-intercept survey grid for North Brown's Lake, Stearns County (DOW#73014700).

Survey Observations

The most recent aquatic vegetation point-intercept survey of North Brown’s Lake (DOW #73014700) occurred on August 14, 2015 by MN DNR. Plants were rooted to a maximum depth (95%) of 9.3 feet, with depths ranging from 2 to 13.7 feet. However, it was very rare to find any rooted plants deeper than 9 feet. In the littoral zone (water depth from 0 to 15 feet, where aquatic plants are likely to be found), 77% of the points had submersed native vegetation (Table 3) with a mean submersed native taxa per point of 1.6. Lake has up to 8 submersed native taxa (Table 4) and one non-native submerged taxa (curly-leaf pondweed), comprising of 7% of the littoral area. In 2019, a point-intercept survey was conducted by a third party surveyor and the data is displayed in Tables 3 and 4.

Table 3 - Point-intercept Metrics. Summary of point-intercept metrics for North Brown’s Lake, Stearns County (DOW#73014700). Shaded values were calculated from littoral depth range (0-15 feet). (*) reflects an early season survey when curly-leaf pondweed is more abundant then late summer surveys.

| Metric | MAY 2009* | APRIL 2011* | JULY 2011 | MAY 2013* | JULY 2014 | AUG 2015 | AUG 2019 |
|----------------------------------------|--------------|----------------|--------------|--------------|--------------|-------------|-------------|
| Surveyor | MN DNR | MN DNR | MN DNR | MN DNR | MN DNR | MN DNR | Fieldseth |
| Point spacing | 100m | Random | 100m | Random | 65m | 65m | 50m |
| Total # Points Sampled | 125 | 111 | 129 | 86 | 110 | 110 | 271 |
| Depth Range of Rooted Veg (ft.) | 0-13 | 3- 12 | 2- 13 | 2- 10 | 0- 15 | 2- 14 | n/a |
| Max Depth of Growth (95%) | 13 | 10 | 10 | 9 | 7.7 | 9.3 | 9.5 |
| # Vegetated Points in Max Depth Range | 48 | 81 | 59 | 65 | 59 | 81 | 175 |
| # Points in Littoral (0-15 feet) | n/a | 111 | 123 | 86 | 110 | 110 | 218 |
| % Points w/ Submersed Native Taxa | n/a | 24 | 50 | 44 | 57 | 77 | 68 |
| % Points w/ Submersed Non- native Taxa | n/a | 74 | 10 | 63 | 1 | 7 | 6 |
| Mean Submersed Native Taxa/ Point | n/a | 0.3 | 0.8 | 0.6 | 0.9 | 1.6 | 0.9 |
| # Submersed Native Taxa | 4 | 2 | 8 | 2 | 5 | 8 | 9 |
| # Submersed Non-Native Taxa | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Based on the 2015 point-intercept survey, the native plant community within the littoral area in North Brown’s Lake was primarily dominated by coontail (*Ceratophyllum demersum*) at 68% of all sites in the littoral zone (Figure 2), followed by Canadian waterweed (*Elodea Canadensis*; Figure 3) and northern watermilfoil (*Myriophyllum sibiricum*; Figure 4). These aquatic plants are central to a healthy fish population, offering shelter and providing food and habitat to wildlife.

The distribution of curly- leaf pondweed, the only invasive aquatic plant in this lake, is displayed in Figure 5. North Brown’s Lake has a relatively poor aquatic plant community. Figure 6 displays its species richness distribution in the lake.

Comparison to previous years

Aquatic plant surveys on North Brown’s Lake occurred in 2009, 2011, 2013, 2014, and 2015 by MN DNR and in 2019 by AIS Consulting (Fieldseth). When comparing survey years, it is important to note when the survey was conducted. For example, curly- leaf pondweed peak abundance is June, although for most native aquatic plants, mid to late summer is the best time to evaluate native aquatic plant communities. Overall, there have been an increase in coontail (*Ceratophyllum demersum*) and Canadian waterweed (*Elodea canadensis*) between 2009 and 2015. In recent years, coontail remains the most dominant species, although declines in both northern watermilfoil and Canadian waterweed occurred. Unfortunately, historic lake-wide treatments have not improved water clarity or increased the diversity of aquatic plants in the lake.

Table 4 - Plant Frequency of Occurrence. Percent frequency of occurrence for observed plant species within the littoral zone (0-15 feet) in North Brown's Lake, Stearns County (DOW#73014700).(*) reflects an early season survey when curly-leaf pondweed is more abundant than late summer surveys. (^) indicates sampling was random and not in a point-intercept grid.

| Taxonomic Name | Common Name | MAY 2009* | APRIL 2011*^ | JULY 2011 | MAY 2013*^ | JULY 2014 | AUG 2015 | AUG 2019 |
|---------------------------------|--------------------------|--------------|-----------------|--------------|---------------|--------------|-------------|-------------|
| Surveyor | | MN DNR | MN DNR | MN DNR | MN DNR | MN DNR | MN DNR | Fieldseth |
| SUBMERSED NON-NATIVE | | | | | | | | |
| <i>Potamogeton crispus</i> | curly-leaf pondweed | 38 | 74 | 10 | 63 | 1 | 7 | 6 |
| SUBMERSED NATIVE | | | | | | | | |
| <i>Ceratophyllum demersum</i> | coontail | 19 | 24 | 47 | 33 | 55 | 68 | 67 |
| <i>Chara sp.</i> | muskgrass | 10 | 0 | 0 | 0 | 0 | 2 | 0 |
| <i>Elodea canadensis</i> | Canadian waterweed | 0 | 2 | 15 | 31 | 14 | 50 | 1 |
| <i>Heteranthera dubia</i> | water star-grass | 0 | 0 | 5 | 0 | 0 | 9 | 3 |
| <i>Myriophyllum sibiricum</i> | northern watermilfoil | 2 | 0 | 2 | 0 | 9 | 23 | 7 |
| <i>Najas sp.</i> | naiad species | 0 | 0 | 0 | 0 | 0 | 5 | 3 |
| <i>Nitella sp.</i> | native nitella species | 0 | 0 | 0 | 0 | 1 | 0 | <1 |
| <i>Potamogeton praelongus</i> | whitestem pondweed | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| <i>Potamogeton richardsonii</i> | clasping-leaved pondweed | 4 | 0 | <1 | 0 | 0 | 0 | 0 |
| <i>Potamogeton spp.</i> | narrow-leaf pondweed | 0 | 0 | 0 | 0 | 0 | 0 | <1 |
| <i>Stuckenia pectinata</i> | sago pondweed | 0 | 0 | 7 | 0 | 5 | 5 | 6 |
| <i>Vallisneria americana</i> | wild celery | 0 | 0 | <1 | 0 | 0 | 3 | 2 |
| FLOATING-LEAF NATIVE | | | | | | | | |
| <i>Lemna sp.</i> | duckweed species | 0 | 0 | 2 | 0 | 0 | 0 | 1 |
| EMERGENT | | | | | | | | |
| <i>Typha sp.</i> | cattail | P | n/a | n/a | n/a | n/a | n/a | n/a |

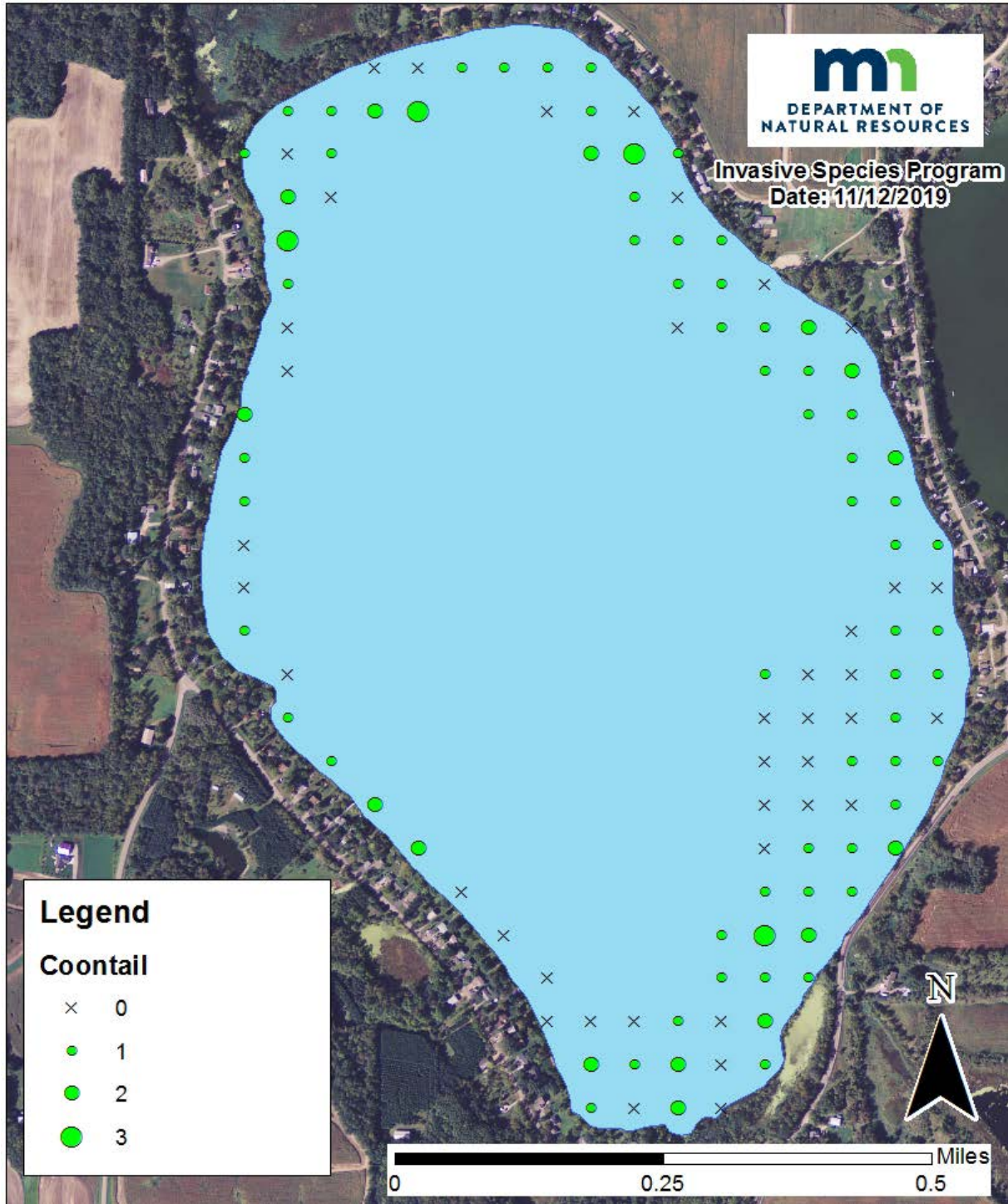


Figure 2 – Coontail Distribution. Distribution from the 2015 point-intercept survey for coontail in North Brown’s Lake, Stearns County (DOW#73014700).

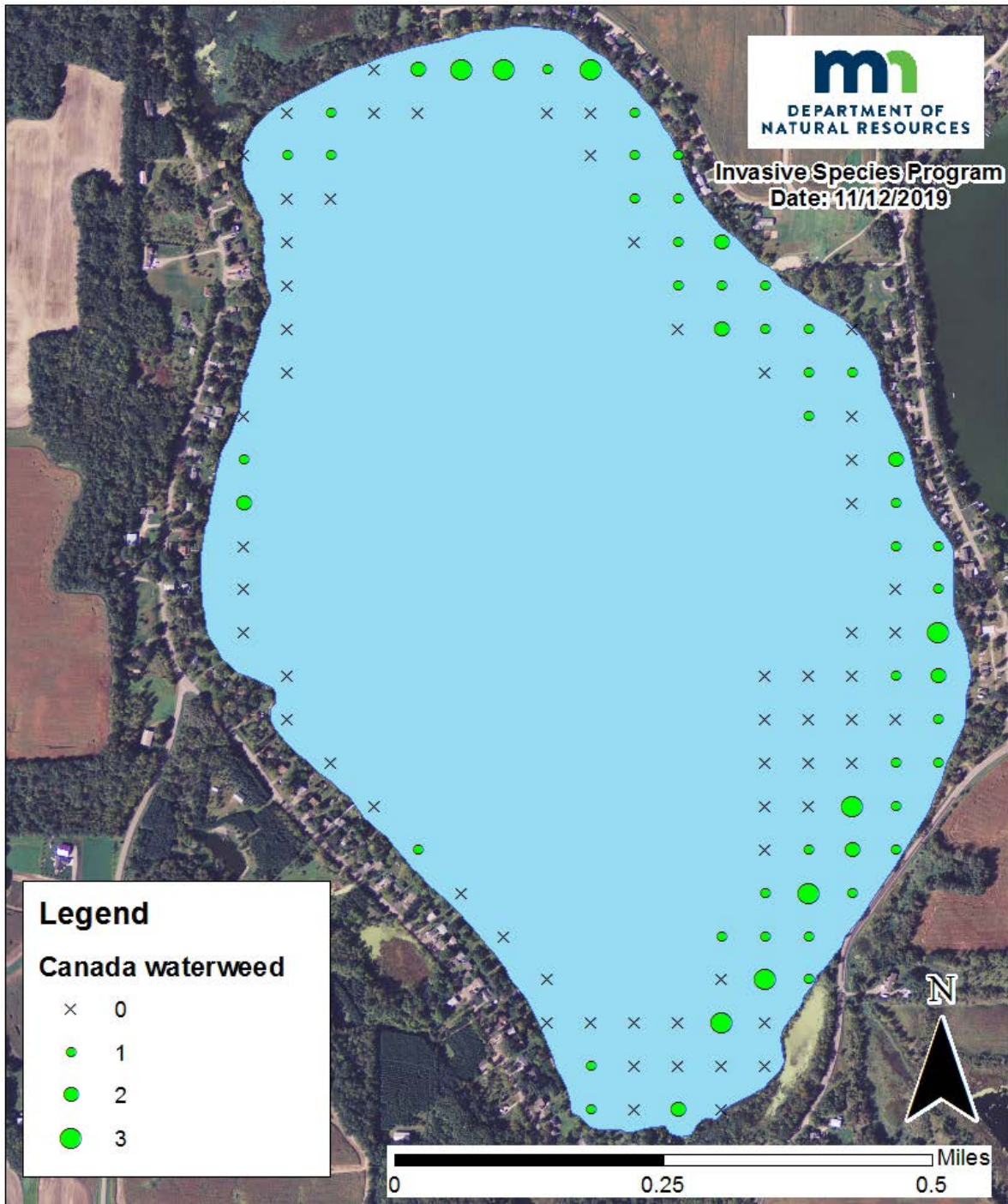


Figure 3 – Canadian waterweed Distribution. Distribution from the 2015 point-intercept survey for Canadian waterweed in North Brown’s Lake, Stearns County (DOW#73014700).

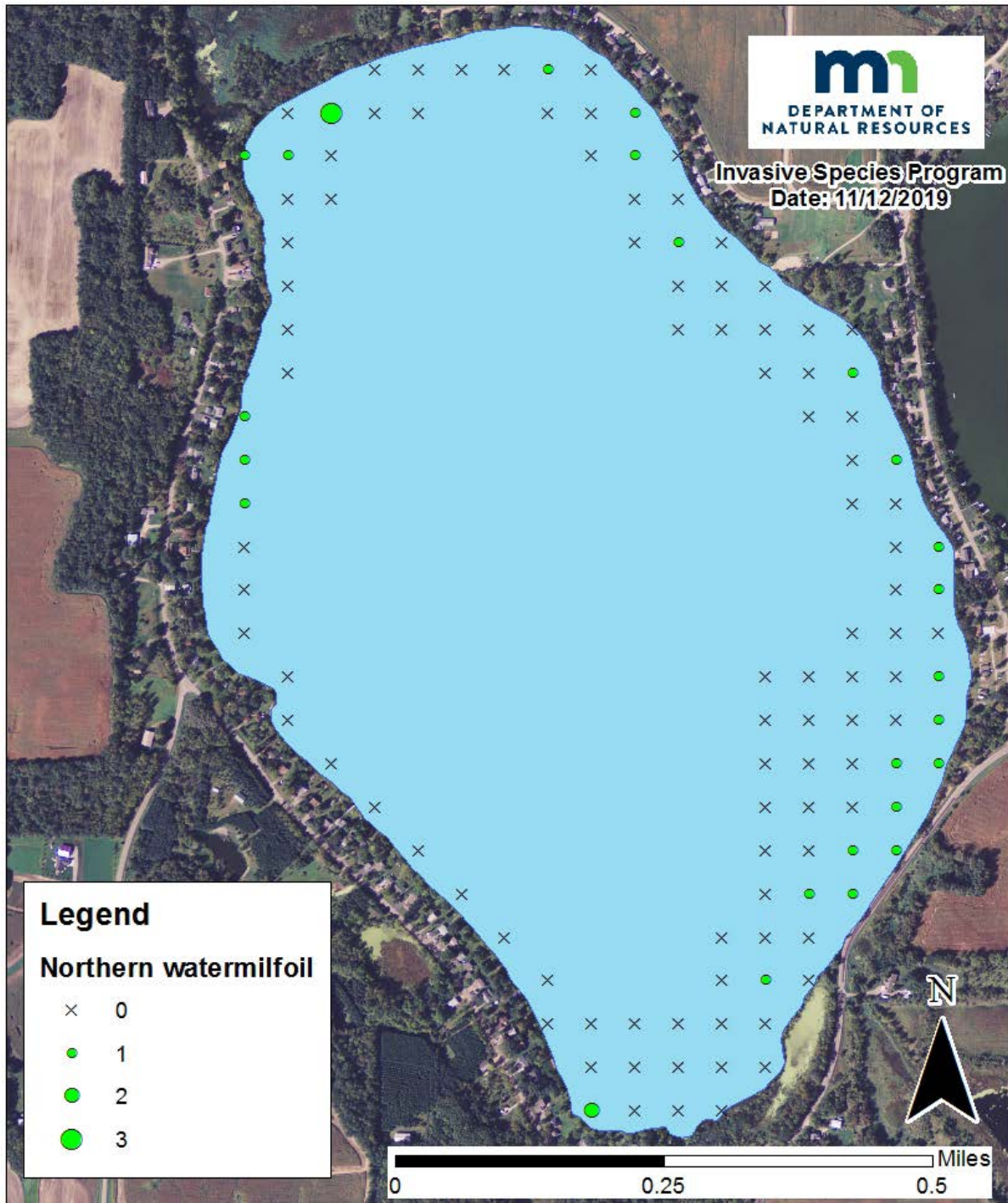


Figure 4 – Northern watermilfoil Distribution. Distribution from the 2015 point-intercept survey for northern watermilfoil in North Brown’s Lake, Stearns County (DOW#73014700).

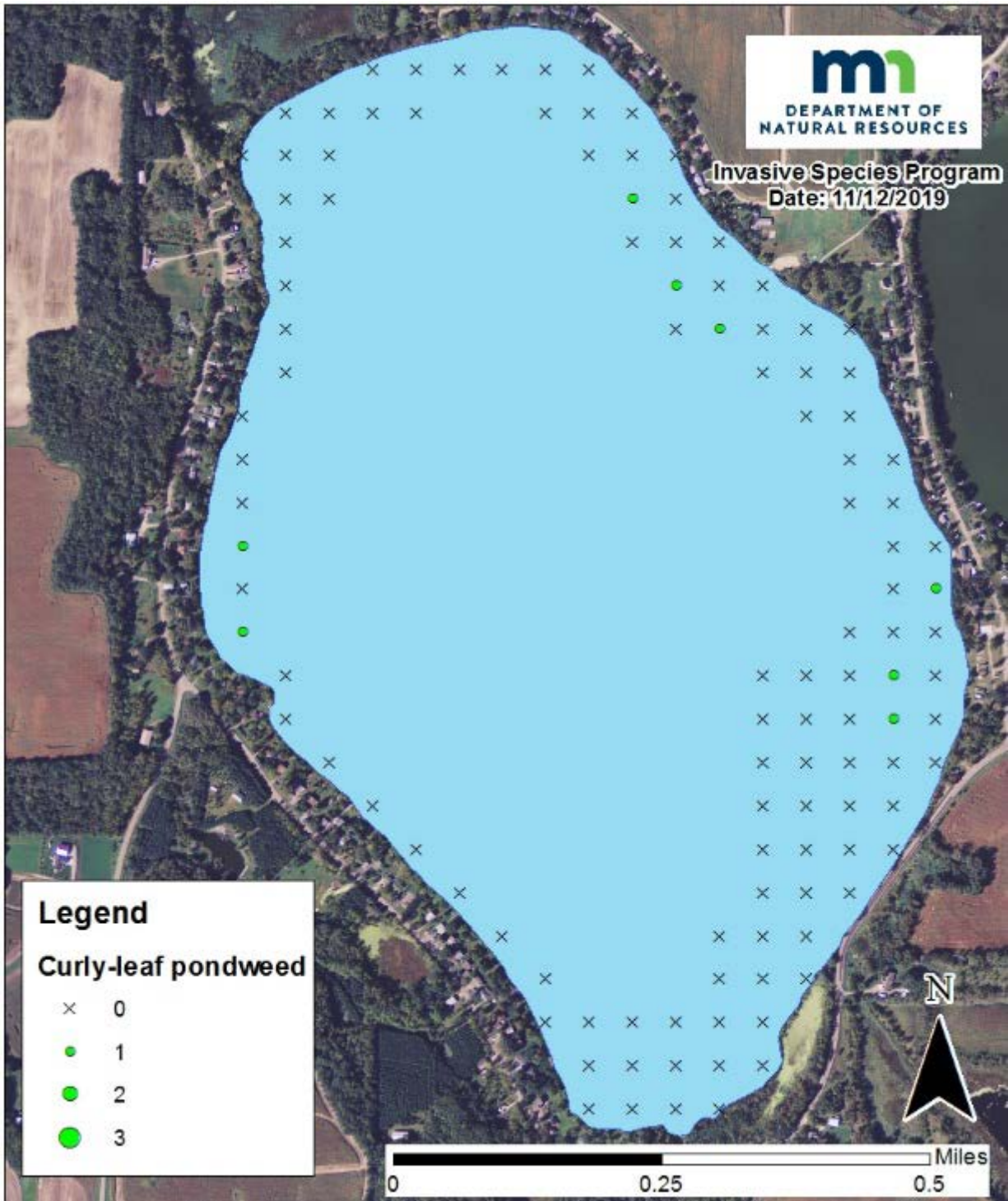


Figure 5 – Curly-leaf pondweed Distribution. Distribution from the 2015 point-intercept survey for curly-leaf pondweed in North Brown’s Lake, Stearns County (DOW#73014700).

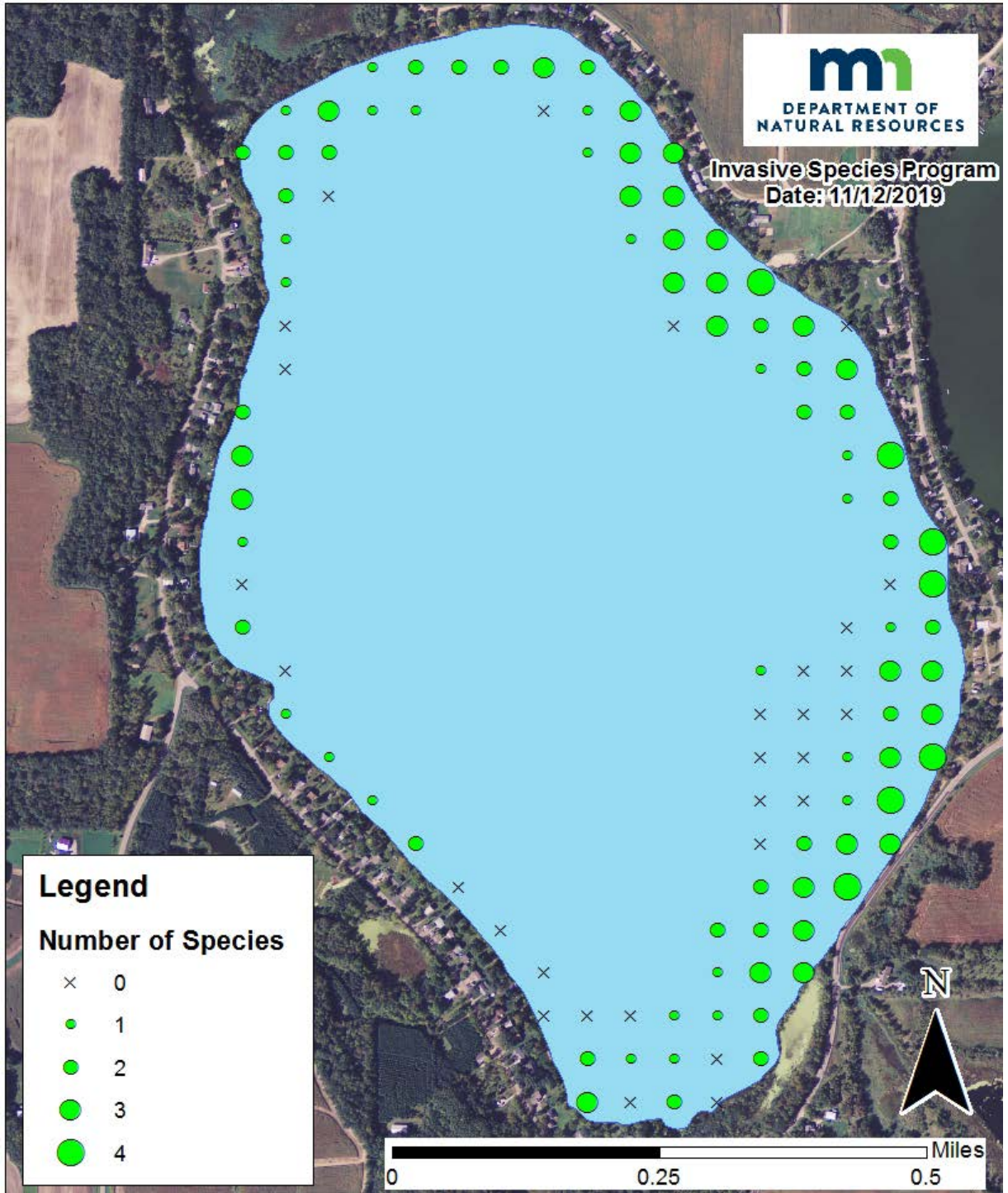


Figure 6 –Species Richness Distribution. Number of species per a sampling point based on the 2015 point-intercept survey in North Brown’s Lake, Stearns County (DOW#73014700).

Literature Cited

Crow, G.E. and C.B. Hellquist. (2000). *Aquatic and wetland plants of Northeastern North America*. (Vols. 1 & 2). Madison, WI: The University of Wisconsin Press.

Fieldseth, Eric. (2019). North Brown's Lake Aquatic Plant Point-intercept Survey: August 14, 2019. Aquatic Invasive Species Consulting Services.

Madsen, J. (1999). *Point-intercept and line intercept methods for aquatic macrophytes management*. APCRP Technical Notes Collection (TN APCRP-M1-02). Vicksburg, MS: U.S. Army Engineer Research and Development Center.