Mitchell Lake, Sherburne County
2022 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: Mitchell (DOW# 71008100)

Lake Surface Area: 169.5 acres

Littoral Area: 90.4 acres

County: Sherburne County

Survey Type: Point-intercept

Date of Survey (most recent): June 13, 2022

Observer[s]: <u>MN DNR, Invasive Species Program</u> (ISP): Chris Jurek and Emelia Hauck Jacobs (2022), Chris Jurek, Emelia Hauck Jacobs, Emelia Holman (2019); Chris Jurek and Courtney Millaway (2013) and Rich Rezanka and Luke Peluso (2009). <u>MN DNR, Lake Ecology Unit (LEU):</u> Donna Perleberg and Zach Van Dyne (2010)

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Report Details

C. Jurek and E. Hauck Jacobs. 2022. Mitchell Lake, Sherburne County: 2022 MN DNR Aquatic Vegetation Management Report. Minnesota Department of Natural Resources, Division of Ecological and Water Resources, Invasive Species Program, 1035 South Benton Drive, Sauk Rapids, MN 56379. 17 pp.

Summary

The purpose of this report is to provide an overview of aquatic plant distribution and the management of invasive aquatic plants in Mitchell Lake, Sherburne County between 2009 and 2022. 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

Mitchell Lake is a 169.5 acre lake located in the City of Big Lake, Sherburne County, MN. The maximum depth of water in Mitchell Lake is 33 feet, and 53% of the lake is classified as littoral (areas of water depth between 0 to 15 feet, where aquatic plants are most likely to grow). Water clarity during the summer averaged 9.3 feet in 2021. According to surveys from the Minnesota Pollution Control Agency (MPCA, 2021), Mitchell Lake is classified as mesotrophic lake, based on its Trophic State Index (TSI) of approximately 46. Mesotrophic lakes are lakes with an intermediate level of productivity and are typically clear water lakes with some summer algal blooms. 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 Mitchell Lake's water quality data on the MPCA website: (https://cf.pca.state.mn.us/water/cmp/resultDetail.cfm?siteid=71-0081-00-203)

Management History

Invasive aquatic plant management in Mitchell Lake has focused on curly-leaf pondweed (*Potamogeton crispus*) using an endothall herbicide and auxin-mimic herbicide on Eurasian watermilfoil (*Myriophyllum spicatum*). The most recent treatment for curly-leaf pondweed was for 7 acres in 2015, organized by the City of Big Lake (Table 1). Past treatments have ranged from 2 to 20 acres. The most recent treatment for Eurasian watermilfoil was in 2022 for 9.2 acres. 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 Mitchell Lake, Sherburne County (DOW#71008100), total acres: 169.5, Littoral acres: 90.4, 15% of Littoral acres: 13.5). Abbreviations are as followed: curly-leaf pondweed (CLP) and Eurasian watermilfoil (EWM). Note: Total acres permitted does not reflect the actual treatment or known acreage of the taxa in the lake. Acreage is rounded to the nearest whole number.

Date	Target Species	Total Acres Permitted	Herbicide	Licensed Commercial Applicator
2010	EWM	5	Auxin-mimic	Lake Restoration
2011	EWM	17	Auxin-mimic	Lake Restoration
2012	EWM	19	Auxin-mimic	Lake Restoration
2013	EWM	1	Auxin-mimic	Lake Restoration
2014	EWM	<1	Auxin-mimic	Lake Restoration
2015	EWM	8	Auxin-mimic	Lake Restoration
2016	EWM	10	Auxin-mimic	Lake Restoration
2017	EWM	9	Auxin-mimic	Lake Restoration
2018	EWM	12	Auxin-mimic	Lake Restoration
2019	EWM	13	Auxin-mimic	Lake Restoration
2020	EWM	6.9	2, 4-D	Lake Restoration
2021	EWM	7	Auxin-mimic	Lake Restoration
2022	EWM	9.2	Auxin-mimic	Lake Restoration
2009	CLP	20	Endothall	Lake Restoration
2010	CLP	15	Endothall	Lake Restoration
2011	CLP	14	Endothall	Lake Restoration
2013	CLP	2	Endothall	Lake Restoration
2014	CLP	7	Endothall	Lake Restoration
2015	CLP	7	Endothall	Lake Restoration

Survey Objectives

A point-intercept survey was used to assess the distribution of aquatic plants in Mitchell 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 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

We used a point-intercept survey method developed by John Madsen in "Aquatic Plant Control Technical Note MI-02, 1999". Sampling points were placed 65 meters apart using a Geographic Information System. Actual sampling points varied by depth of rooted vegetation and surveyor. The most recent survey was comprised of 154 points on a grid (Figure 1). 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.

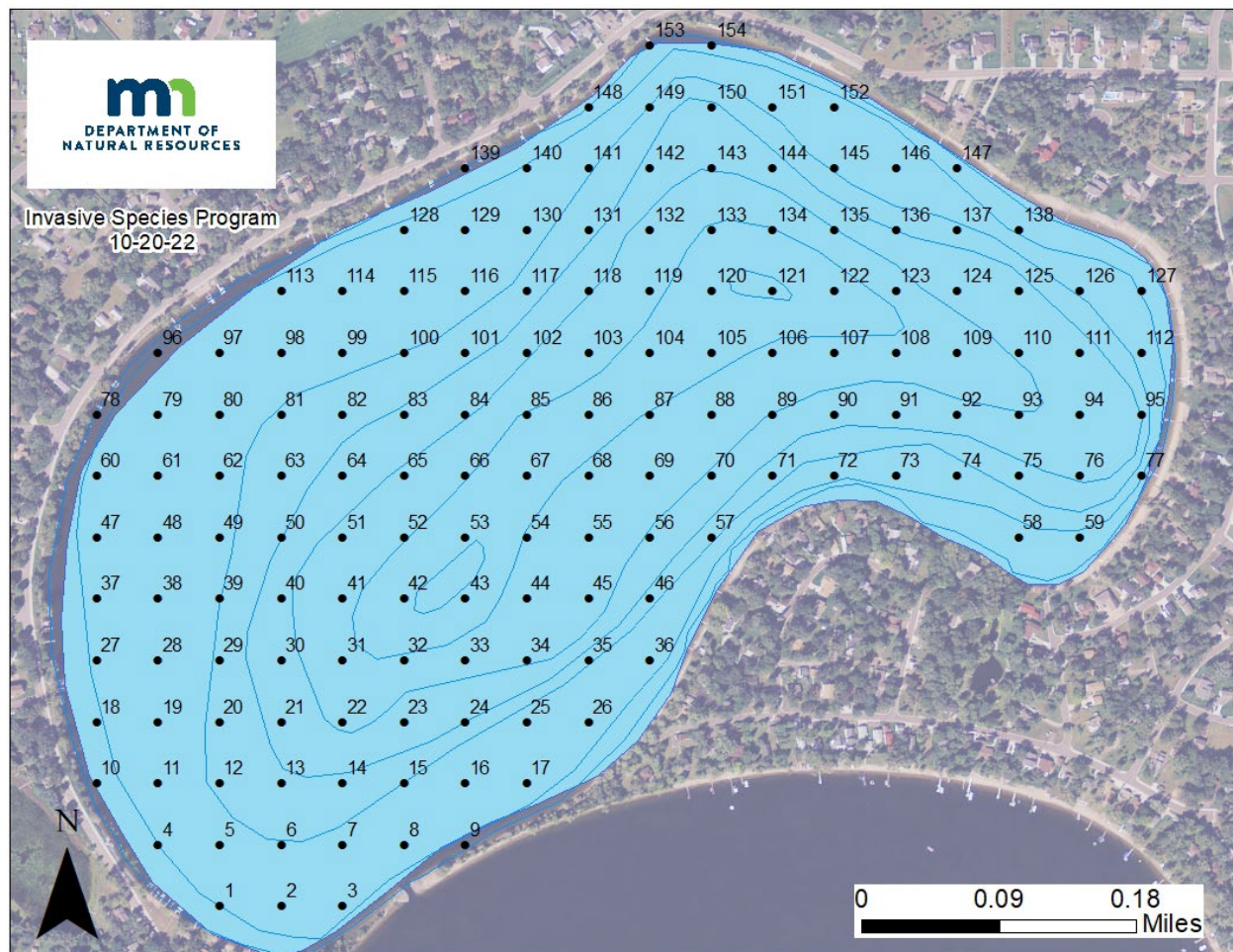| Abundance Ranking	Rake Coverage	Description
1		Sparse; plants covering <25% of the rake head
2		Common; plants covering 25%-75% of the rake head
3		Abundant; plants covering >75% of the rake head

Figure 1 – Point-intercept Survey Grid. Point-intercept survey grid for Mitchell Lake, Sherburne County (DOW#71008100). Point-intercept survey included 99 points, 65 meters apart.

Survey Observations

The most recent aquatic vegetation point-intercept survey of Mitchell Lake (DOW #71008100) occurred on June 15, 2022. Plants were rooted to a maximum depth (95%) of 18 feet, although most plants were growing in depths between 2.0 to 20.0 feet. In the littoral zone (water depth from 0 to 15 feet, where aquatic plants are likely to be found), 96% of the points had submersed native vegetation (Table 3) with a mean submersed native taxa per point of 3.2. Mitchell Lake has up to 14 submersed native taxa (Table 4) and two non-native submerged taxa (curly-leaf pondweed and Eurasian watermilfoil), comprising of 40% of the littoral area.

Table 3 - Point-intercept Metrics. Summary of point-intercept metrics for Mitchell Lake, Sherburne County (DOW#71008100). Shaded values were calculated from littoral depth range (0-15 feet).

Metric	AUG 2009	AUG 2010	SEPT 2013	JUNE 2019	JUNE 2022
Surveyor	MN DNR (ISP)	MN DNR (LEU)	MN DNR (ISP)	MN DNR (ISP)	MN DNR (ISP)
Total # Points Sampled	96	149	102	99	117
Depth Range of Rooted Veg (ft.)	2.0-18.0	2.0-18.0	1.8-16.9	3.5- 17	2-20
Max Depth of Growth (95%)	18	n/a	15	17	18
# of Vegetated Points in Max Depth Range	84	90	90	83	107
# Points in Littoral (0-15 feet)	91	97	94	83	85
% Points w/ Submersed Native Taxa	96	94	96	93	96
Mean Submersed Native Taxa/ Point	2.0	3.0	2.6	2.4	3.2
# Submersed Native Taxa	11	16	11	15	14
# Submersed Non-Native Taxa	1	1	0	2	2
% Points w/ Submersed Non- native Taxa	2	1	0	47	40

Based on the 2022 point-intercept survey, the native plant community within the littoral area in Mitchell Lake was primarily dominated by narrow-leaf pondweeds (*Potamogeton* spp.; Figure 2), followed by coontail (*Ceratophyllum demersum*; Figure 3), northern watermilfoil (*Myriophyllum sibiricum*; Figure 4) and curly-leaf pondweed (*Potamogeton crispus*; Figure 5). The invasive aquatic plants surveyed in the lake were curly-leaf pondweed (34%) and Eurasian watermilfoil (14%; Figure 6). In general, aquatic plants are central to a healthy fish population, offering shelter and providing food and habitat to wildlife. Mitchell Lake has a variety of native

aquatic plants with an average of 3.2 species per a sampling site. Figure 7 displays the spatial distribution and species richness (# of species per sample point) of all native submersed species from the most recent point-intercept survey. Mitchell Lake has very few emergent and floating- leaf plants due to shoreline development. It would be recommended to restore the shoreline to prevent continued shoreline erosion, provide better habitat and food sources for wildlife, including waterfowl. Plants also absorb nutrients and reduce algae, thereby improving water quality.

Comparison to previous years

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. Over time, the submersed native plant community has remained constant with over 90% of the littoral area vegetated. Over the past 10 years, both sago pondweed (*Stuckenia pectinata*) and naiads (*Najas* sp.) had decreased. Increases in both curly- leaf pondweed and Eurasian watermilfoil (Figure 6) have been observed over this same time period, with 40% of the sampling sites in the littoral area occupied with an invasive aquatic plant in 2022. Overall, the native aquatic plant community is most dominant in Mitchell Lake with invasive aquatic plants coexisting among native aquatic plants.

Table 4 - Plant Frequency of Occurrence. Percent frequency of occurrence for observed plant species within the littoral zone (0-15 feet) in Mitchell Lake, Sherburne County (DOW#71008100).

Taxonomic Name	Common Name	AUG 2009	AUG 2010	SEPT 2013	JUNE 2019	JUNE 2022
MN DNR Surveyors		(ISP)	(LEU)	(ISP)	(ISP)	(ISP)
SUBMERSED NON-NATIVE						
Myriophyllum spicatum	Eurasian watermilfoil	0	1	0	17	14
Potamogeton crispus	curly-leaf pondweed	2	0	0	39	34
SUBMERSED NATIVE						
Potamogen friesii	Fries' pondweed	0	0	0	0	6
Bidens beckii	water marigold	1	5	2	0	2
Chara spp.	muskgrass	14	34	40	48	32
Ceratophyllum demersum	coontail	49	54	58	43	54
Elodea canadensis	Canadian waterweed	3	7	0	1	0
Heteranthera dubia	water star-grass	0	7	0	1	4
Myriophyllum sibiricum	northern watermilfoil	48	49	58	18	54
Nitella spp.	nitella species	1	1	0	12	19
Najas spp.	naiad species	37	59	18	7	4
Potamogeton gramineus	variable pondweed	0	7	0	1	9
Potamogeton illinoensis	Illinois pondweed	0	9	27	17	13
Potamogeton praelongus	white-stem pondweed	7	8	7	6	15
Potamogeton richardsonii	clasping-leaved pondweed	2	3	11	10	27
Potamogeton spp.	narrow-leaf pondweed	0	0	0	60	67
Stuckenia pectinata	sago pondweed	24	29	24	7	0
Potamogeton zosteriformis	flat-stemmed pondweed	11	0	2	1	11
Utricularia vulgaris	common bladderwort	0	0	0	4	0
Vallisneria americana	water celery	0	15	18	0	0
EMERGENT						
Sagittaria spp.	arrowhead	0	2	0	0	0

* Narrow-leaf pondweeds may include several species of *Potamogeton*, including *P. foliosus* and *P. strictifolius.* Surveyors used this group to record narrow-leaf pondweed (*Potamogeton* sp.) that were not identified to the species level. Sampling depths by year: 2009 and 2022: (15 feet); 2010: (25 feet); 2013 and 2019: (20 feet)
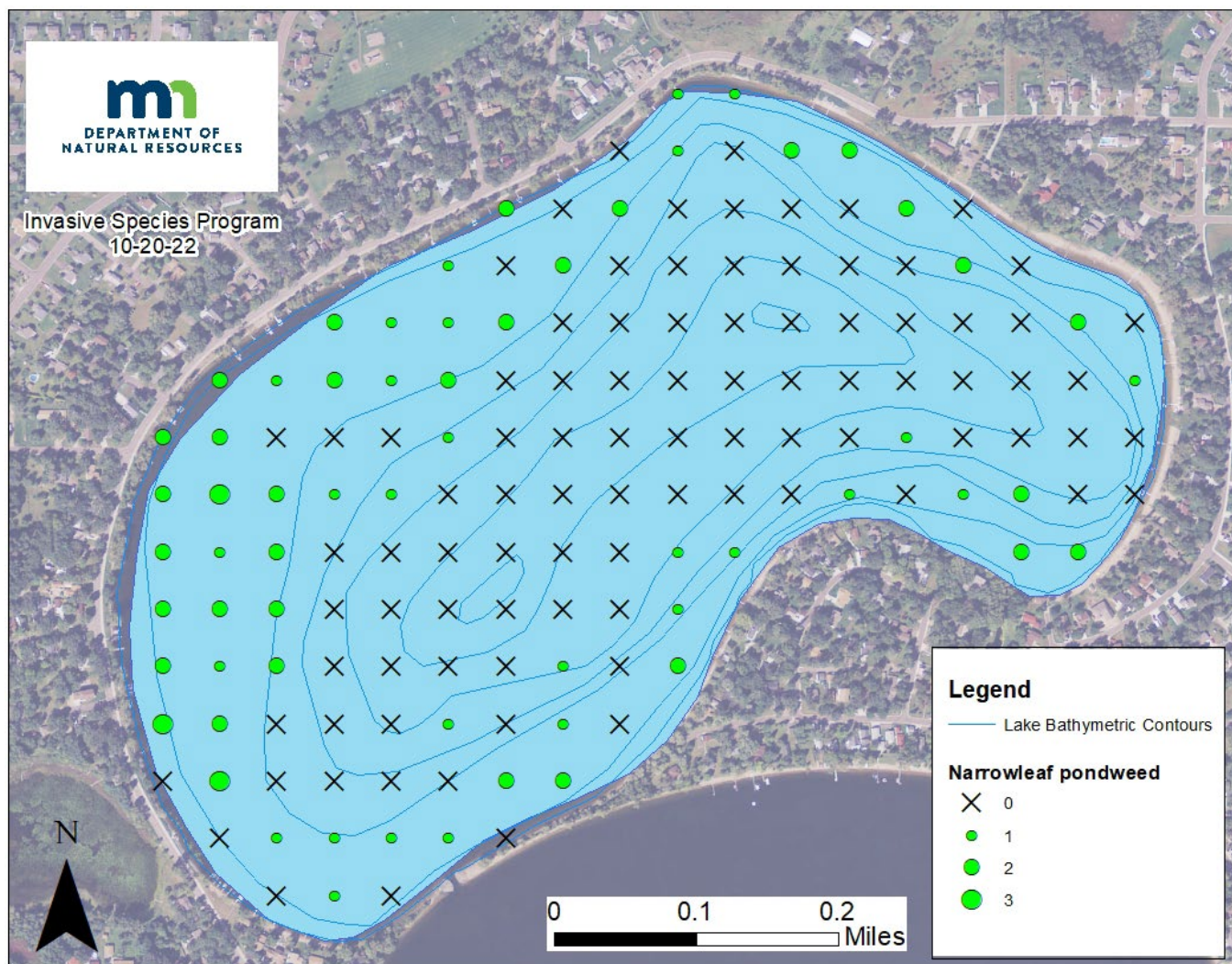
Figure 2 – Narrow-leaf pondweed Distribution. Plant distribution from the 2022 point-intercept survey for narrow-leaf pondweed in Mitchell Lake, Sherburne County (DOW#71008100). Densities ranged from 0 to 3 at each point, with 3 indicating dense plant presence and 0 indicating no plants.
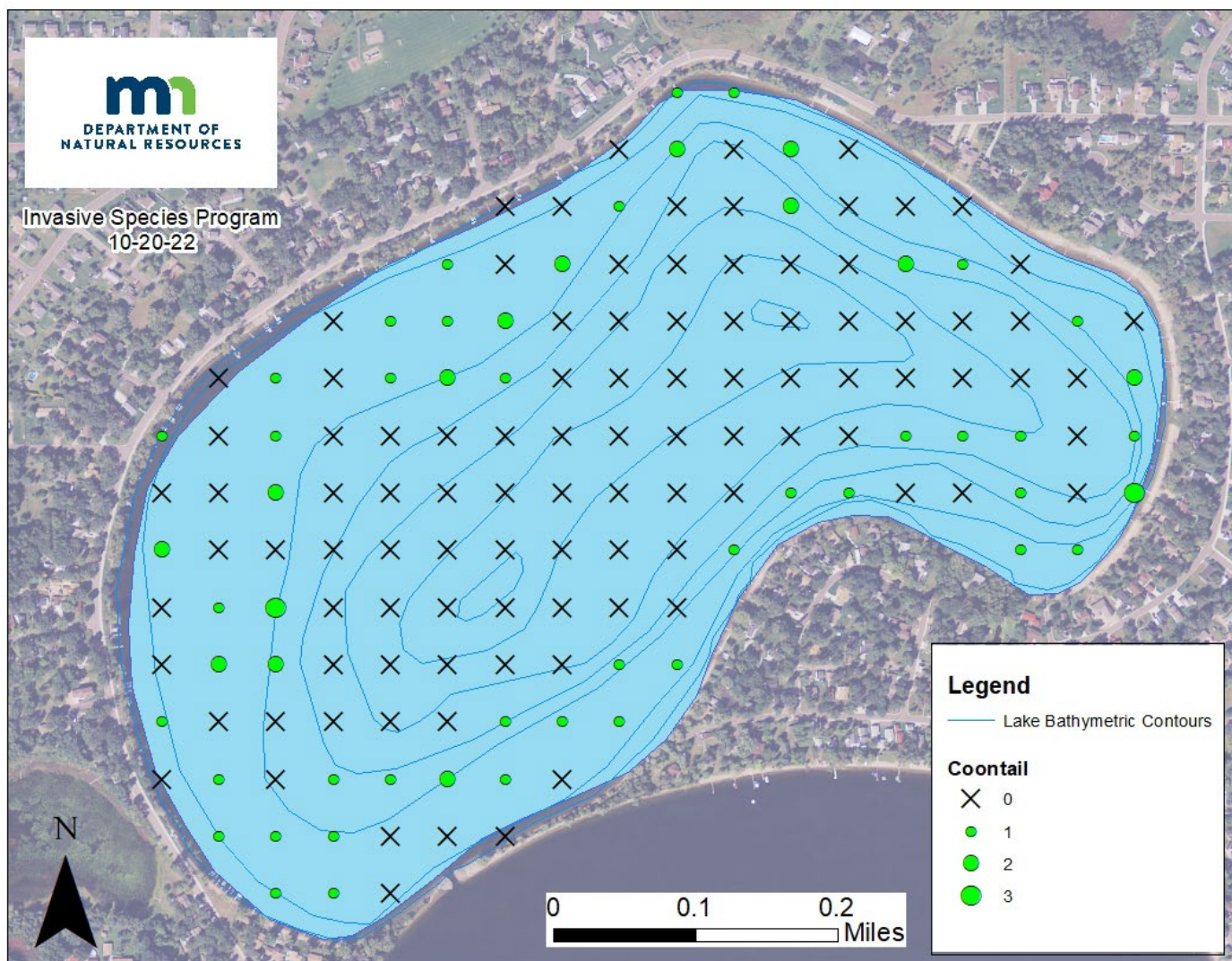
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Figure 3 – Coontail Distribution. Plant distribution from the 2022 point-intercept survey for coontail in Mitchell Lake, Sherburne County (DOW#71008100). Densities ranged from 0 to 3 at each point, with 3 indicating dense plant presence and 0 indicating no plants.
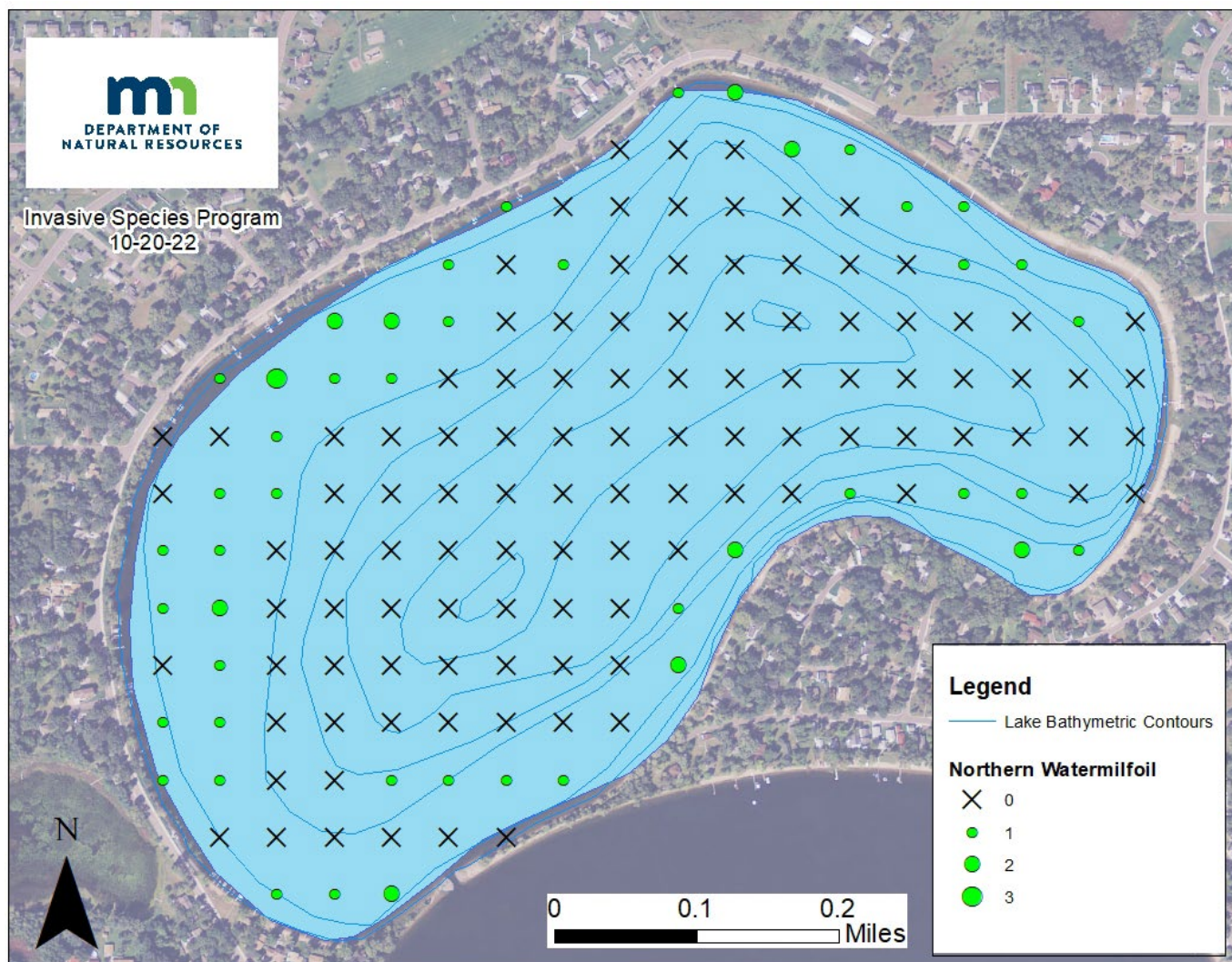
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Figure 4 – Northern watermilfoil Distribution. Plant distribution from the 2022 point-intercept survey for northern watermilfoil in Mitchell Lake, Sherburne County (DOW#71008100). Densities ranged from 0 to 3 at each point, with 3 indicating dense plant presence and 0 indicating no plants.
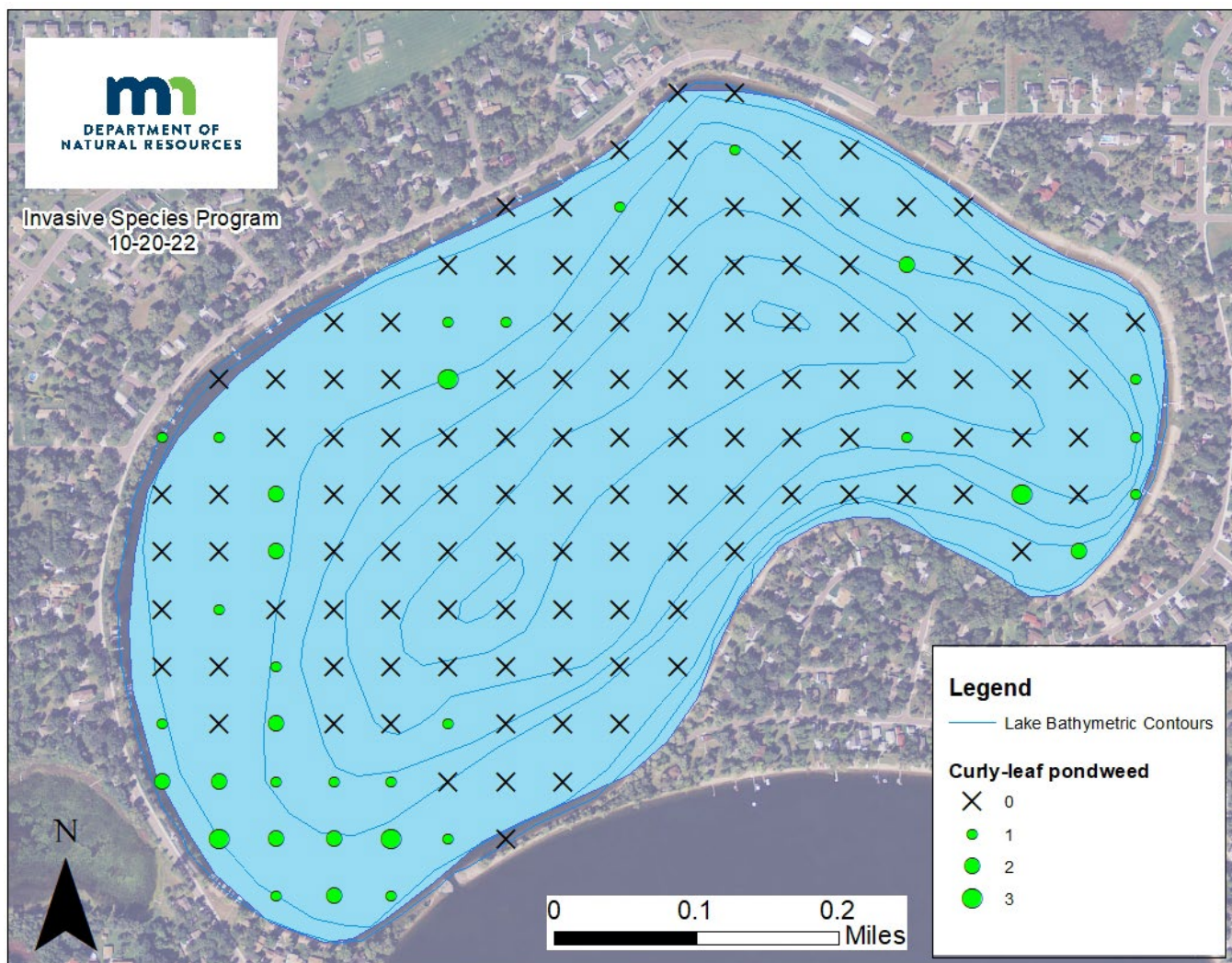
Figure 5 – Curly-leaf pondweed Distribution. Plant distribution from the 2022 point-intercept survey for curly-leaf pondweed in Mitchell Lake, Sherburne County (DOW#71008100). Densities ranged from 0 to 3 at each point, with 3 indicating dense plant presence and 0 indicating no plants.
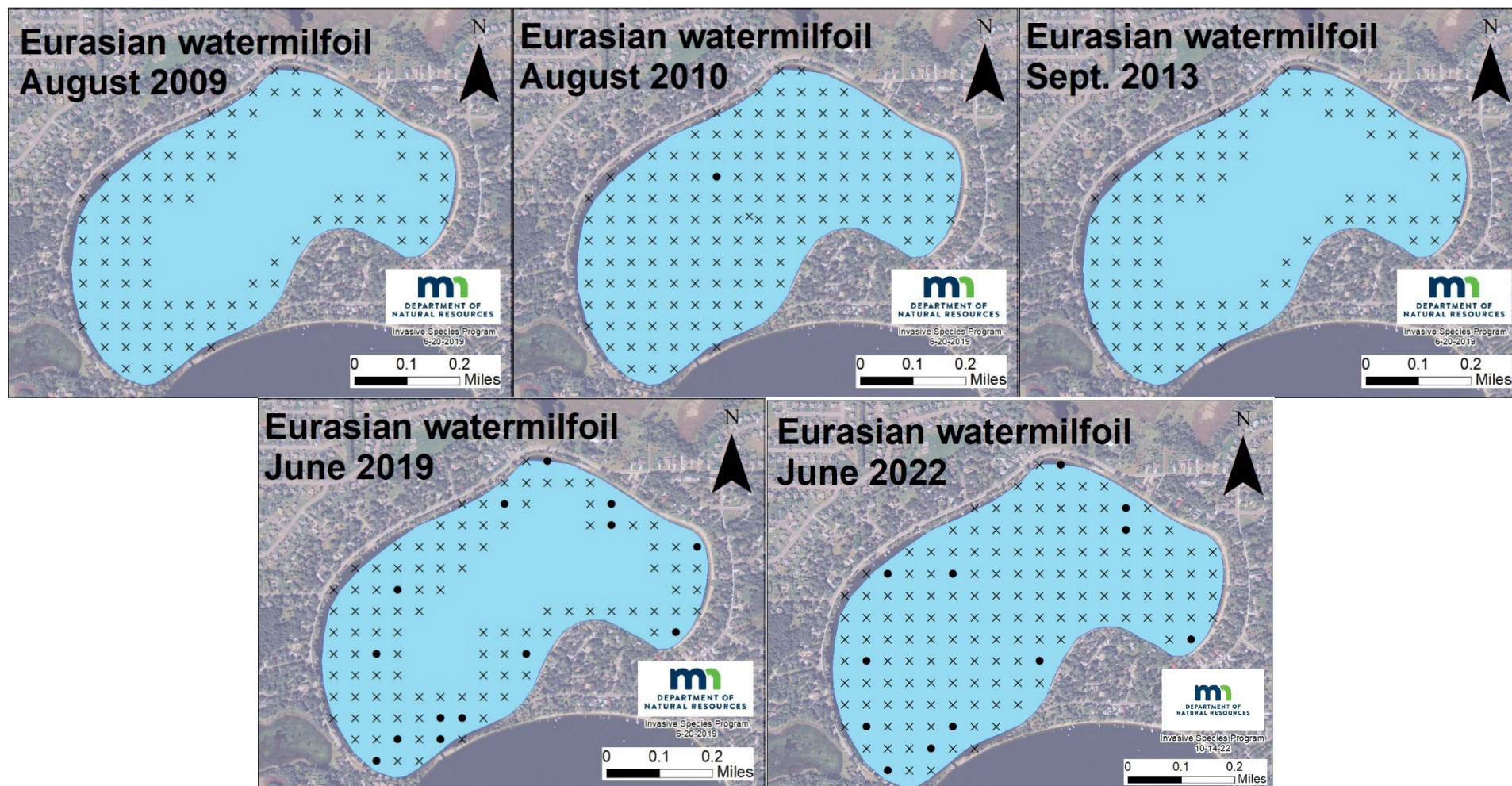
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Figure 6 – Eurasian watermilfoil Distribution. Eurasian watermilfoil distribution maps from the 2009, 2010, 2013, 2019, and 2022 point-intercept surveys in Mitchell Lake, Sherburne County (DOW#71008100). An "X" indicates that no Eurasian watermilfoil was present and a black circle indicates that Eurasian watermilfoil was present.
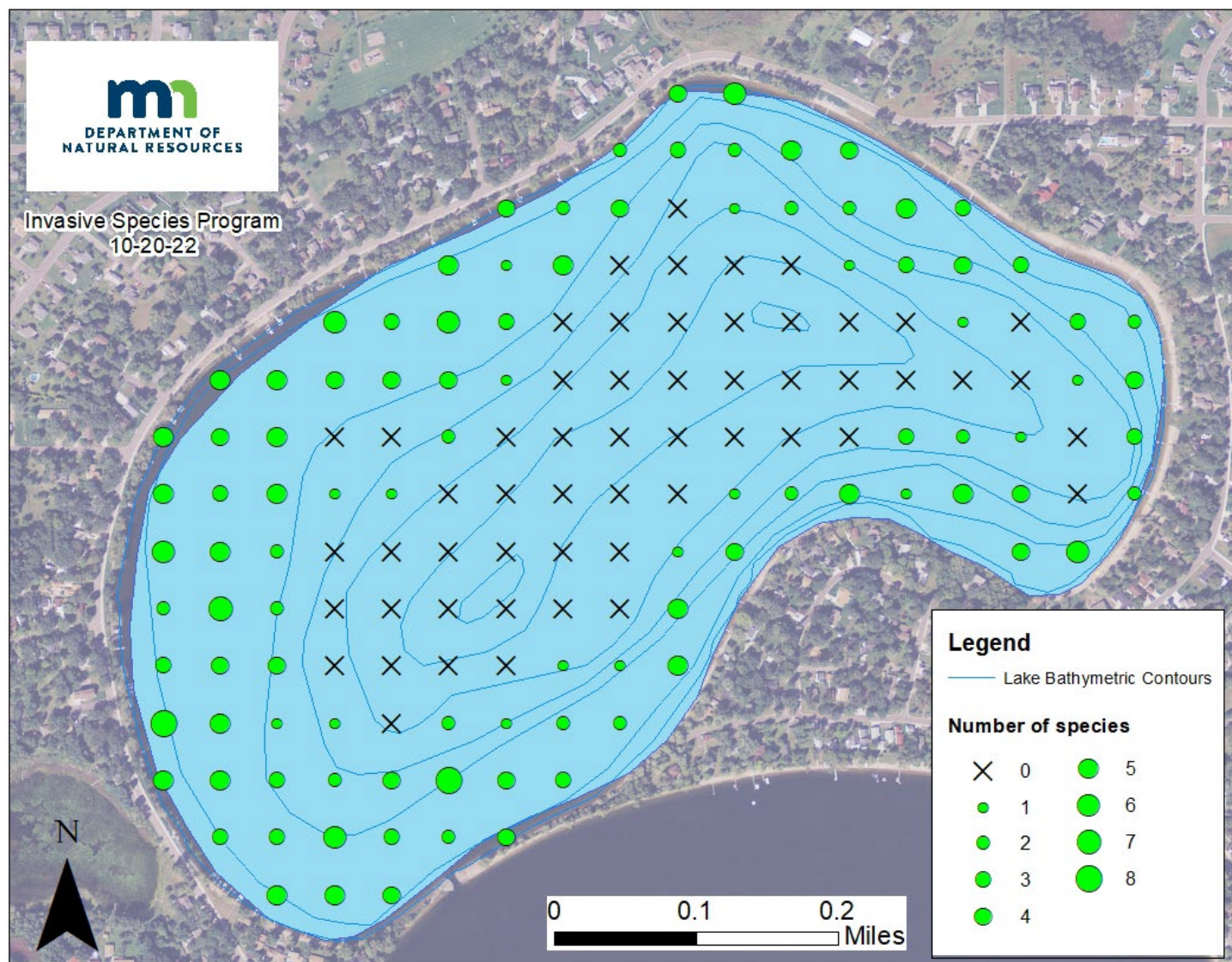
Figure 7 – Species Richness Distribution. Number of species per a sampling point from the 2022 point-intercept survey in Mitchell Lake, Sherburne County (DOW#71008100).

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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.

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.