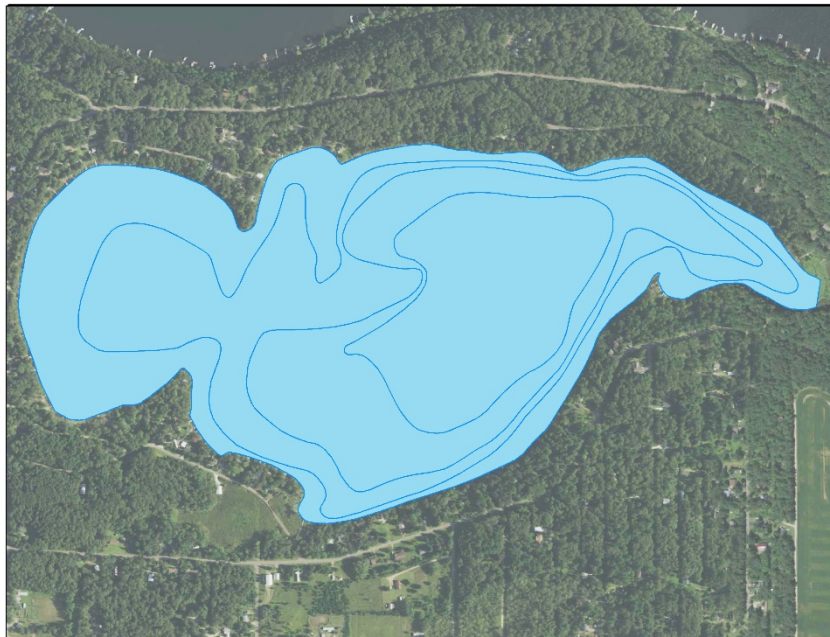

CROOKNECK LAKE, MORRISON COUNTY: 2020 AQUATIC VEGETATION MANAGEMENT REPORT

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



Prepared by:

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March 3, 2021

Project Details

Lake: Crookneck (DOW# 49013300)

Lake Surface Area: 183 acres

Littoral Area: 131 acres

County: Morrison County

Survey Type: Point-intercept

Date of Survey (most recent): June 20, 2020

Observer[s]: MN DNR, Invasive Species Program (ISP): Emelia Hauck Jacobs (MN DNR), Chris Jurek (MN DNR)

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Report Details

C. Jurek and E. Hauck Jacobs. 2021. Crookneck Lake, Morrison County: 2020 MN DNR Aquatic Vegetation Report. Minnesota Department of Natural Resources, Division of Ecological and Water Resources, Invasive Species Program, 1035 South Benton Drive, Sauk Rapids, MN 56379. 13 pp.

Summary

The most recent aquatic vegetation point-intercept survey of Crookneck Lake (DOW #49013300) occurred on June 20, 2020. Plants were present throughout the lake to a depth of 15 feet. Within the littoral zone (zone in lake from the 0-15 foot depth range), 90% of the points had native submersed taxa. The average number of native submersed taxa per sample point was 1.8. In total, thirteen submersed taxa, one invasive taxa, and one floating-leaf taxa were observed during the 2020 survey.

Lake Description

Crookneck Lake is a 183- acre lake located eight miles south of Motley, MN in Morrison County. The lake has one invasive plant species: curly-leaf pondweed (*Potamogeton crispus*). The maximum depth of water in Crookneck Lake is 22 feet, and 72% of the lake is classified as littoral (areas of water depth between 0 to 15 feet, where aquatic plants are most likely to grow). The mean water clarity during the summer of 2020 was 9 feet, although ranged from 4.7 to 14.5 feet (RMB Environmental Laboratories, Inc., 2021). According to surveys from the Minnesota Pollution Control Agency (MPCA, 2020), Crookneck Lake is classified as a higher mesotrophic lake, based on its Trophic State Index (TSI) of approximately 49. For more information on water quality, go to [Crookneck Lake water quality](https://webapp.pca.state.mn.us/surface-water/station/49-0133-00) on the MPCA website (<https://webapp.pca.state.mn.us/surface-water/station/49-0133-00>).

Management History

Invasive aquatic plant management in Crookneck Lake has focused on curly-leaf pondweed using an endothall herbicide. Past treatments have ranged from 2 to 19 acres. Eurasian watermilfoil is also managed by the Crookneck Lake Improvement District lake association since its discovery in 2018 (Table 1).

Survey Objectives

A point-intercept survey was used to assess the distribution of aquatic plants in Crookneck 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 plant variation (in plant presence and spatial location). 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 of aquatic plants may vary from year to year due to effects such as differences in weather, as well as the effects from management efforts.

Table 1 - Invasive Plant Management Summary. Characteristics and history of partial lake invasive plant treatments for Crookneck Lake, Morrison County (DOW# 49013300). Total acres: 183, Littoral acres: 131, 15% of Littoral acres: 19.6 acres). Abbreviations are as followed: curly-leaf pondweed (CLP), Eurasian watermilfoil (EWM). Note: Total acres permitted does not reflect the actual treatment or known acreage of the taxa in the lake.

Date	Target Species	Total Acres Permitted	Herbicide	Licensed Commercial Applicator
2012	CLP	9.46	Endothall	PLM
2013	CLP	9.46	Endothall	PLM
2014	CLP	9.46	Endothall	PLM
2015	CLP	16	Endothall	PLM
2016	CLP	19	Endothall	PLM
2017	CLP	6.8	Endothall	PLM
2018	CLP	2	Endothall	PLM
2019	CLP	7	Diquat	PLM
2019	EWM	1.67	ProcellaCOR	PLM
2020	EWM	2	Florpyrauxife, n-benzyl, Triclopyr	PLM

Survey Methods

In 2020, MN DNR surveyors used a point-intercept survey method developed by John Madsen in “Aquatic Plant Control Technical Note MI-02, 1999”. Sampling points were placed 80 meters apart using a Geographic Information System. A total of 91 points within 15 feet were established on a grid (Figure 1). Plant samples were collected by throwing and dragging a double-sided rake along the lake bottom at each point. Frequencies of occurrence percentages

(i.e., how often a plant species was sampled in the lake) were calculated based on the littoral zone.

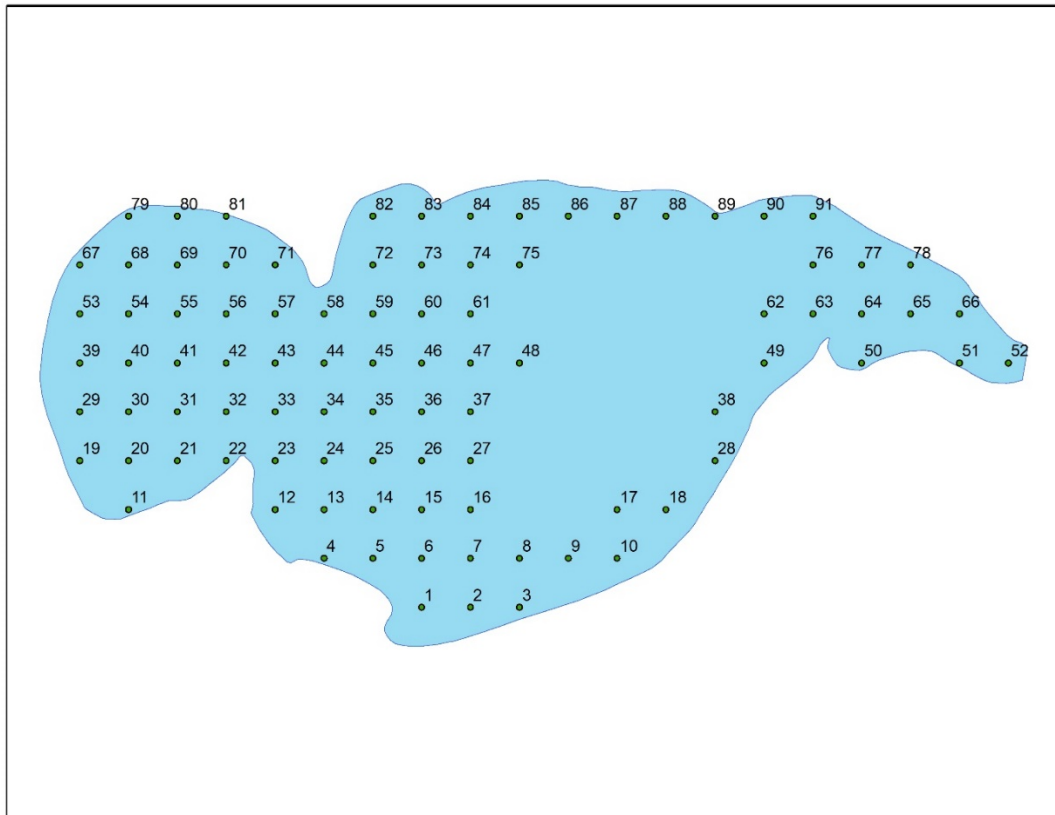


Figure 1 – Point-intercept Survey Grid. Point-intercept survey grid for Crookneck Lake, Morrison County (DOW# 49013300). Point-intercept survey included 91 points, 80 meters apart.

Survey Observations

In 2020, we found plants in Crookneck Lake in a range of water depth from 1 to 16 feet. Most plants were growing in the depth range between 4 and 10 feet. In the littoral zone, 90% of the surveyed points had submersed native vegetation (Table 2). In total, we found thirteen submersed taxa and one floating-leaf species during the survey (Table 3). Naiad species (*Najas sp.*) was the most commonly occurring plant, at 62% of all sites in the littoral zone (Figure 2), followed by Coontail (*Ceratophyllum demersum*, Figure 3), wild celery (*Vallisneria americana*, Figure 4) and whitestem pondweed (*Potamogeton praelongus*). Curly-leaf pondweed is the only invasive species and relatively sparse at 1% (Figure 5). Crookneck Lake has a diverse aquatic plant community with an average of 1.82 species per a sampling site (Figure 6).

Table 2 - Point-intercept Metrics. Summary of point-intercept metrics for Crookneck Lake, Morrison County (DOW# 49013300). Shaded values were calculated from littoral depth range (0-15 feet).

Metric	MAY 2005	JUNE 2020
Surveyor	MN DNR	MN DNR
Total # Points Sampled	.	85
Depth Range of Rooted Veg (ft.)	.	1 - 16
Max Depth of Growth (95%)	.	15
# Point in Max Depth Range	.	71
# Points in Littoral (0-15 feet)	376	71
% Points w/ Submersed Native Taxa	95	90
Mean Submersed Native Taxa/ Point	1.7	1.8
# Submersed Native Taxa	11	13
# Submersed Non-Native Taxa	1	1
% Points w/ Submersed Non- native Taxa	22	1

Table 3 - Plant Frequency of Occurrence. Percent frequency of occurrence for observed plant species within the littoral zone (0-15 feet) in Crookneck Lake, Morrison County (DOW# 49013300).

Taxonomic Name	Common Name	MAY 2005	JUNE 2014*	AUGUST 2016*	MAY 2017*	MAY 2018*	JULY 2020
SUBMERSED NON-NATIVE							
<i>Potamogeton crispus</i>	Curly-leaf pondweed	14	3	0	45	5	1
SUBMERSED NATIVE							
<i>Bidens beckii</i>	Water marigold	0	0	0	0	1	0
<i>Ceratophyllum demersum</i>	Coontail	66	71	62	24	53	55
<i>Chara</i> sp.	Muskgrass	10	3	2	3	3	4
<i>Elodea canadensis</i>	Canadian waterweed	0	15	13	6	13	6
<i>Heteranthera dubia</i>	Water star-grass	0	0	2	0	0	1
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	0	12	2	3	6	7
<i>Najas</i> sp.	Naiad species	69	57	58	33	66	62
<i>Potamogeton amplifolius</i>	Large leaf pondweed	3	15	0	0	0	0
<i>Potamogeton gramineus</i>	Grass-leaved pondweed	1	0	0	0	0	0
<i>Potamogeton illinoensis</i>	Illinois pondweed	2	2	0	0	2	3
<i>Potamogeton freisii</i>	Fries' pondweed	0	0	0	0	0	1
<i>Potamogeton praelongus</i>	Whitestem pondweed	1	0	4	0	14	14
<i>Potamogeton richardsonii</i>	Clasping-leaved pondweed	0	0	0	0	0	1
<i>Potamogeton zosteriformis</i>	Flatstem pondweed	1	18	0	0	0	0
<i>Potamogeton</i> sp.	Narrowleaf pondweed	0	1	0	0	0	3
<i>Utricularia</i> sp.	Bladderwort species	0	0	0	0	0	3
<i>Vallisneria americana</i>	Wild celery	4	4	15	0	0	21
FLOATING LEAF							
<i>Lemna trisulca</i>	Star Duckweed	7	8	6	0	7	1
<i>Nuphar variegata</i>	Yellow waterlily	3	2	6	0	2	4
<i>Nymphaea odorata</i>	White waterlily	2	7	4	0	0	0

*Survey by RMB Laboratories

Comparison to previous surveys

In addition to the point-intercept surveys conducted by the Invasive Species Program in 2005 and 2020, RMB Laboratories conducted surveys in 2014, 2016, 2017, and 2018. The most commonly found plants across all years were naiads and coontail. Over the 15 year period from 2005 to 2020, the percent of submersed native taxa declined from 95% to 90% while the mean submersed native taxa per point remained between 1.7 and 1.8. It will be helpful to continue monitoring the aquatic plant community in this lake, especially to see how zebra mussels that were discovered in 2018 may change the water clarity; therefore plant growth may increase.

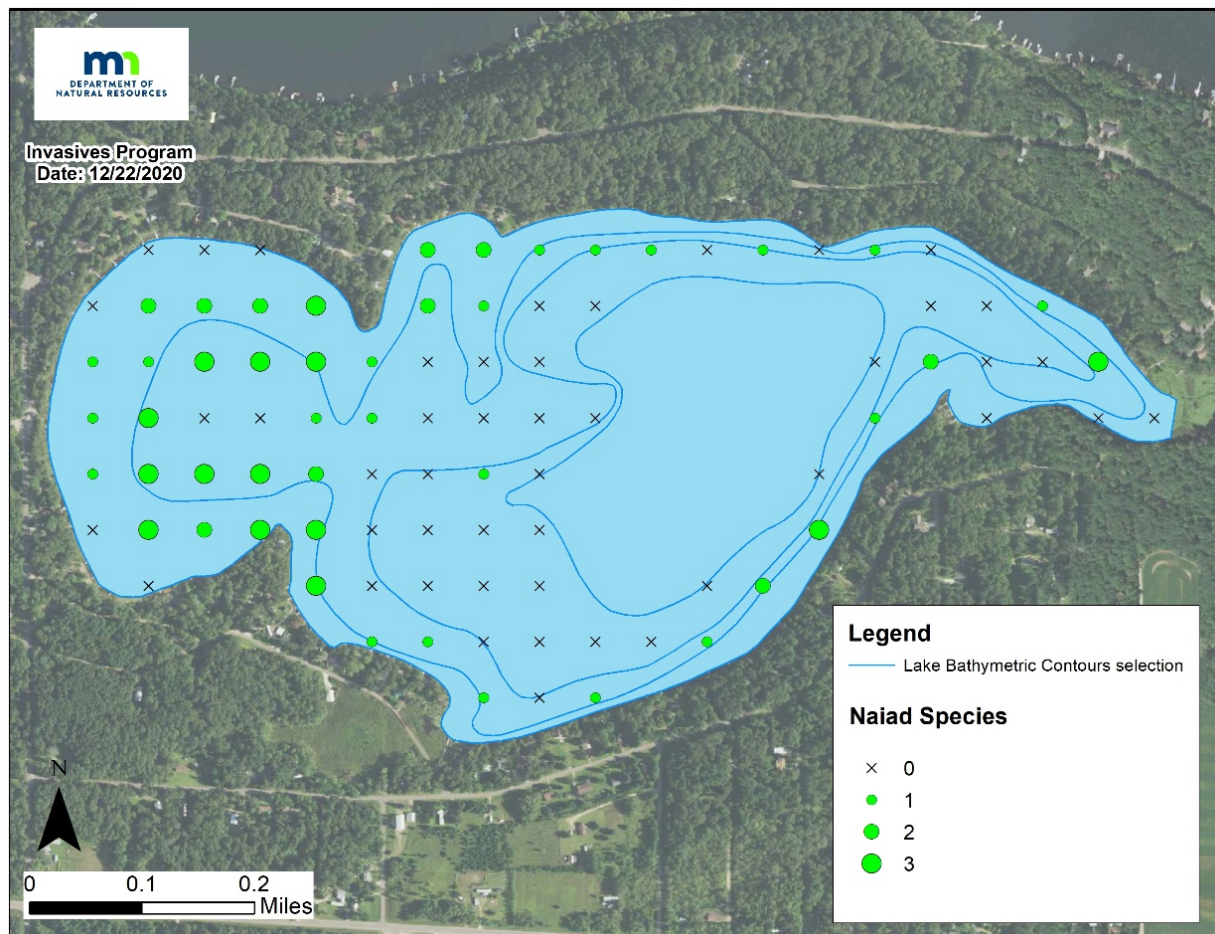


Figure 2 – 2020 Naiad species Distribution. Plant distribution from the 2020 point-intercept survey for Naiad species in Crookneck Lake, Morrison County (DOW# 49013300). Densities ranged from 0 to 3 at each point, with 3 indicating dense plant presence and 0 indicating no plants.

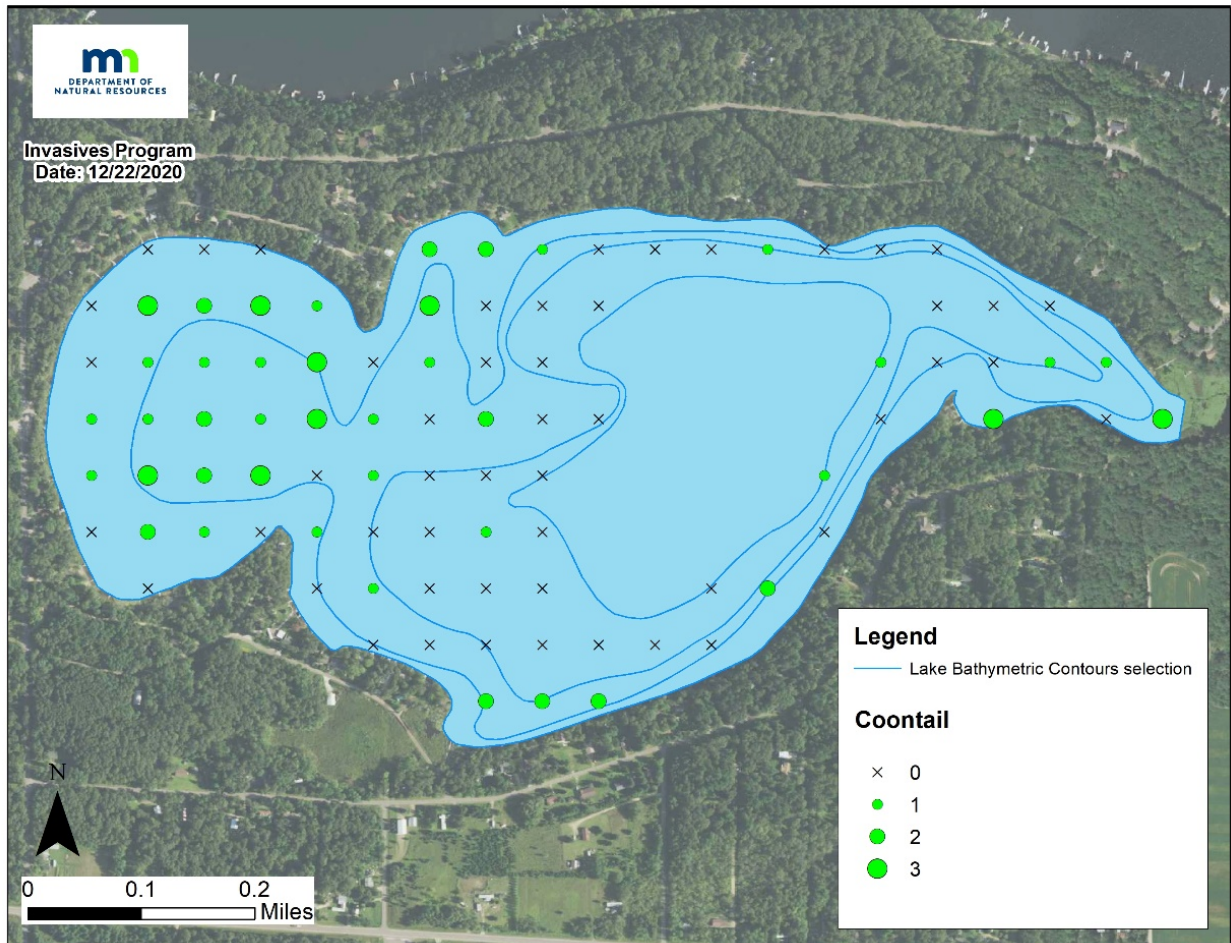


Figure 3 – 2020 Coontail Distribution. Plant distribution from the 2020 point-intercept survey for Coontail in Crookneck Lake, Morrison County (DOW# 49013300). Densities ranged from 0 to 3 at each point, with 3 indicating dense plant presence and 0 indicating no plants.

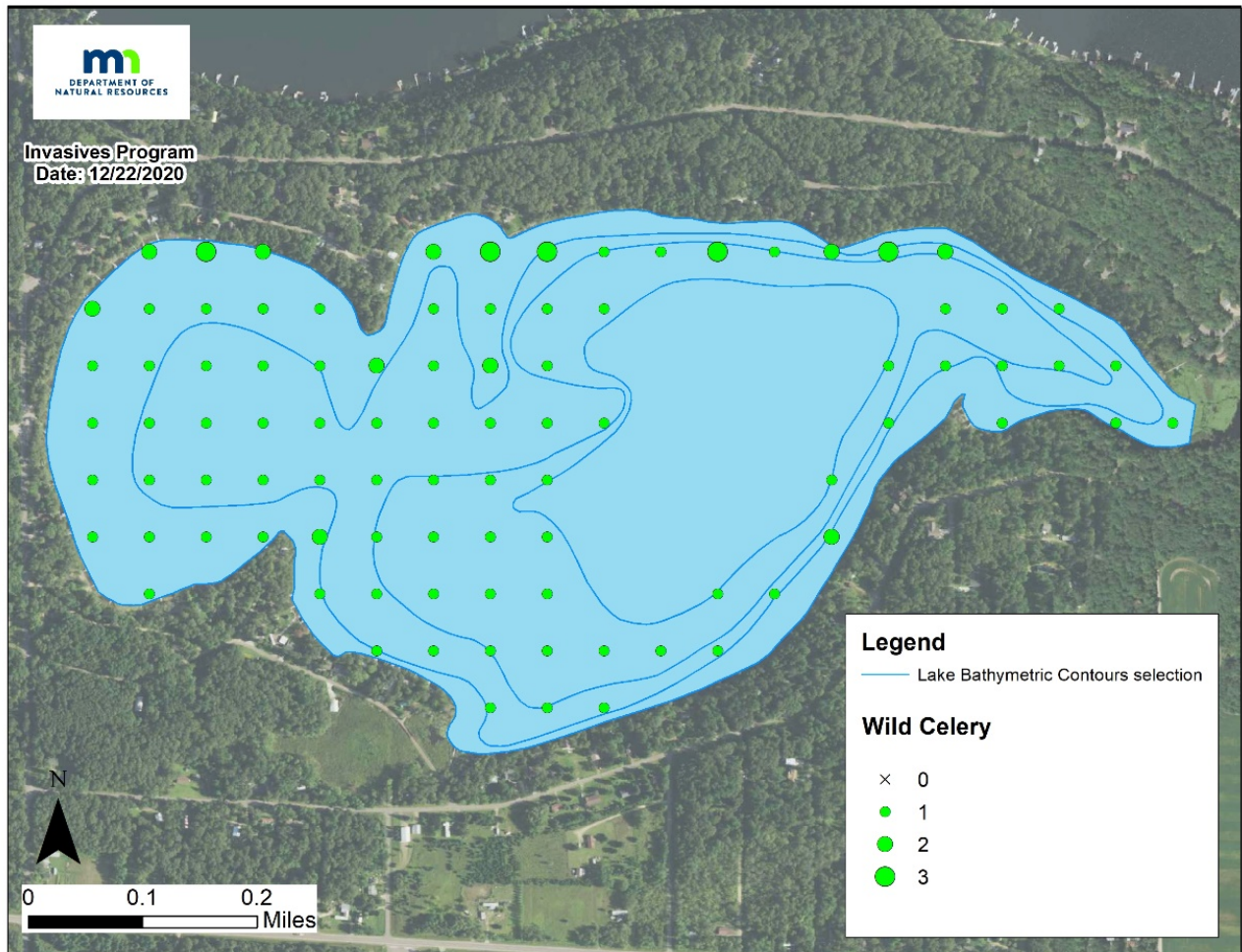


Figure 4 – 2020 Wild Celery Distribution. Plant distribution from the 2020 point-intercept survey for Wild Celery in Crookneck Lake, Morrison County (DOW# 49013300). Densities ranged from 0 to 3 at each point, with 3 indicating dense plant presence and 0 indicating no plants.

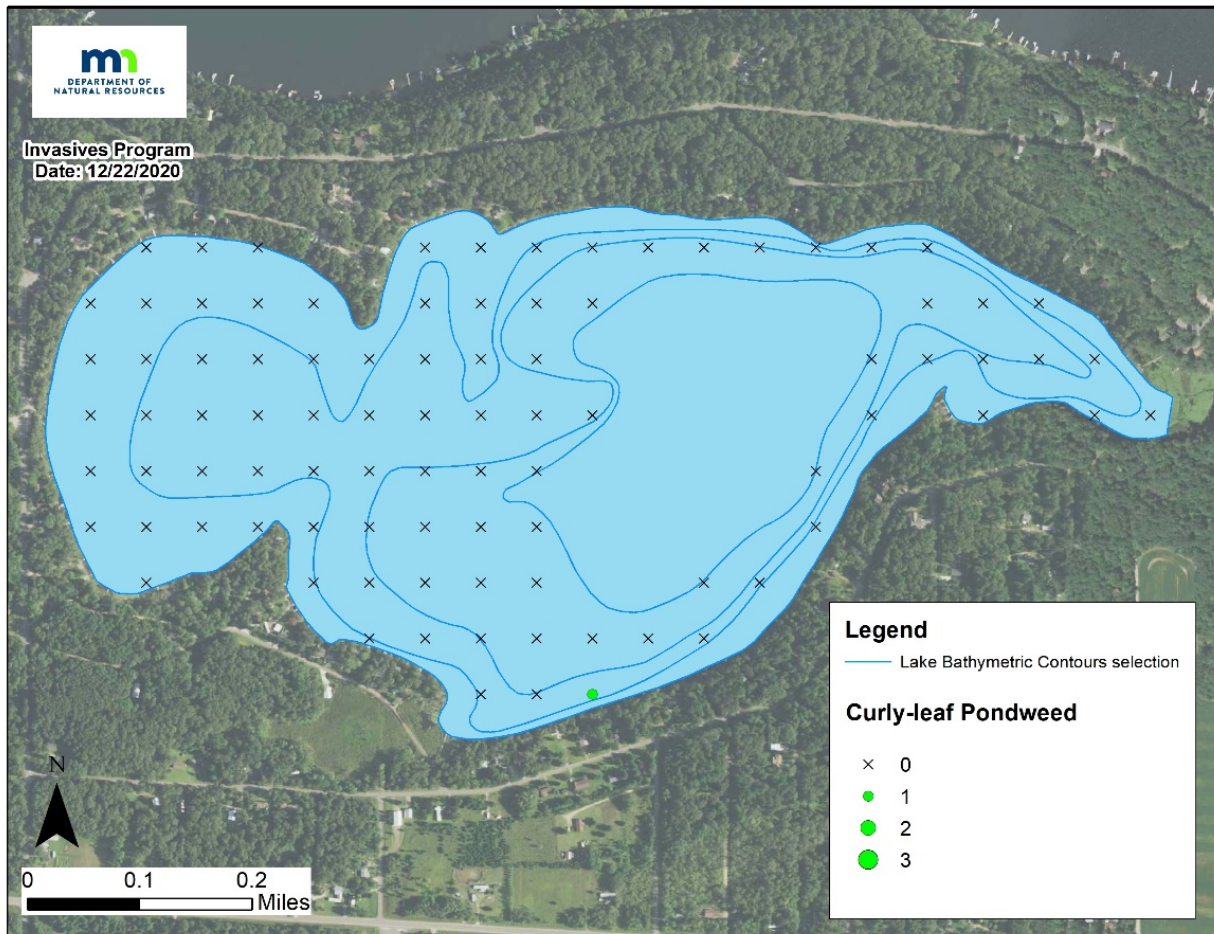


Figure 5 – 2020 Curly-leaf pondweed Distribution. Plant distribution from the 2020 point-intercept survey for Curly-leaf pondweed in Crookneck Lake, Morrison County (DOW# 49013300). Densities ranged from 0 to 3 at each point, with 3 indicating dense plant presence and 0 indicating no plants.

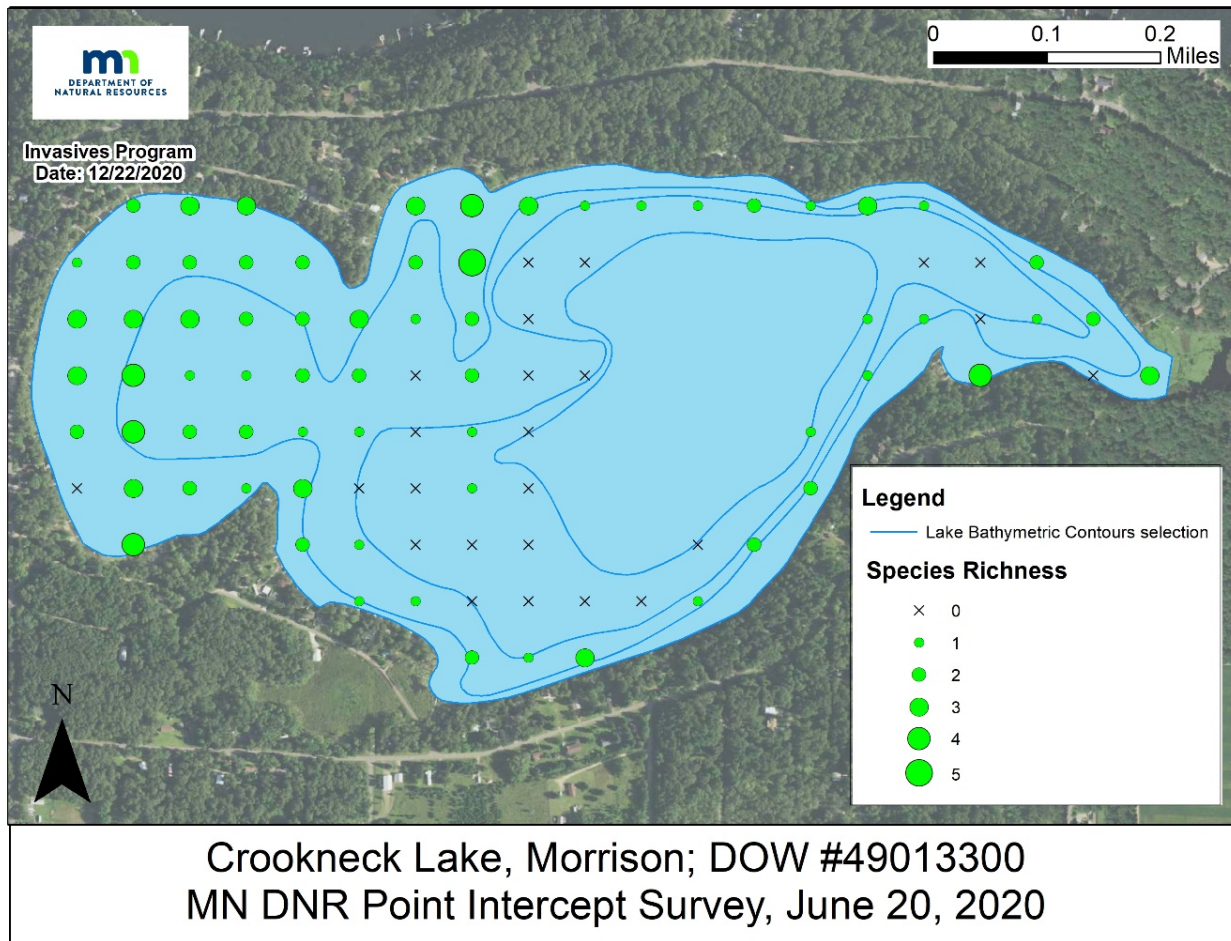


Figure 6 – Number of species per site. Maps of number of species from the 2020 point-intercept survey in Crookneck Lake, Morrison County (DOW# 49013300).

Literature Cited

- Crow G, Hellquist C. 2000a. Aquatic and wetland plants of northeastern North America. Vol. 1. Pteridophytes, Gymnosperms and Angiosperms: Dicotyledons. University of Wisconsin Press, Madison, WI. 480 pp.
- Crow G, Hellquist C. 2000b. Aquatic and wetland plants of northeastern North America. Vol. 2. Angiosperms: Monocotyledons. University of Wisconsin Press, Madison, WI. 400 pp.
- Madsen J. 1999. Point and line intercept methods for aquatic plant management. APCRP Technical Notes Collection (TN APCRP-M1-02), U.S. Army Engineer Research and Development Center, Vicksburg, MS. 16 pp.