

2021 Grand Lake, Stearns County 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: Grand (DOW# 73005500)

Lake Surface Area: 650 acres

Littoral Area: 233 acres

County: Stearns County

Survey Type: Point-intercept

Date of Survey (most recent): July 2, 2021

Surveyor[s]:

MN DNR, Invasive Species Program (ISP): Emelia Hauck Jacobs, Chris Jurek and Aliessa Bradford (2018)

AIS Consulting Services: Eric Fieldseth (2021, 2017)

MN DNR, Lake Ecology Unit (LEU): Donna Perleberg and Stephanie Simon (2011)

Blue Water Science (BWS): Steve McComas

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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 Grand Lake, Stearns County between 2010 and 2021. 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

Grand Lake is a 650 acre lake located six mile southeast of the town of Cold Spring in Stearns County, MN. The maximum depth of water in Grand Lake is 34 feet, and 36% of the lake is classified as littoral (areas of water depth between 0 to 15 feet, where aquatic plants are most likely to grow). According to the Minnesota Pollution Control Agency (MPCA), Grand Lake is classified as mesotrophic to eutrophic (fairly nutrient rich), based on its Trophic State Index (TSI) of approximately 52. 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 [Grand Lake's water quality data](https://cf.pca.state.mn.us/water/cmp/resultDetail.cfm?siteid=73-0055-00-204&path=wdip) on the MPCA website:

(<https://cf.pca.state.mn.us/water/cmp/resultDetail.cfm?siteid=73-0055-00-204&path=wdip>)

Management History

The lake has two invasive plant species: curly-leaf pondweed (*Potamogeton crispus*) and starry stonewort (*Nitellopsis obtusa*). Curly-leaf pondweed has been present in the lake since 1998. Starry stonewort was first reported in 2017 and was not found during the point-intercept survey. Invasive aquatic plant management in Grand Lake has focused on curly-leaf pondweed, using an endothall herbicide, where only partial-lake treatments have taken place. The most recent treatment was for curly-leaf pondweed in 2021, organized by the Grand Lake Improvement District (Table 1) was for 32 acres. Starry stonewort has been hand-pulled via

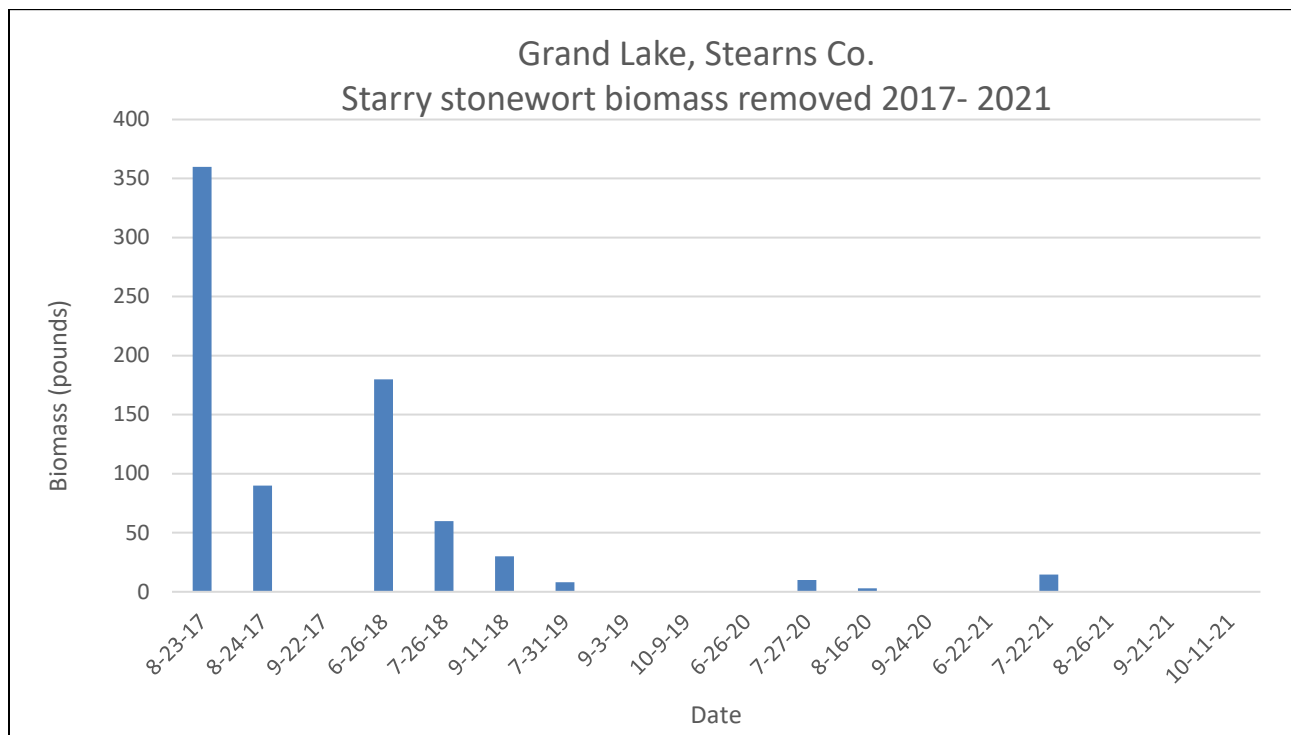
scuba divers over the past five years (Table 2) and has not increased or spread within the lake. Over time, the curly-leaf pondweed acreage has not changed, but continued success with reducing starry stonewort at the access has been achieved. Pre-treatment survey data (i.e. point-intercept surveys or 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 Grand Lake, Stearns County (DOW#73005500), Total acres: 650, Littoral acres: 233, 15% of Littoral acres: 35). CLP is an abbreviation for curly- leaf pondweed and SSW is an abbreviation for starry stonewort. *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
2003	CLP	10	Endothall	Lake Management
2004	CLP	25	Endothall	Lake Management
2005	CLP	25	Endothall	Lake Management
2006	CLP	28	Endothall	Lake Management
2007	CLP	28	Endothall	Lake Management
2008	CLP	30	Endothall	Lake Management
2009	CLP	30	Endothall	Lake Management
2010	CLP	31	Endothall	Lake Management
2011	CLP	31	Endothall	Lake Management
2012	CLP	44	Endothall	Lake Management
2013	CLP	33	Endothall	Lake Management
2014	CLP	33	Endothall	Lake Management
2015	CLP	28	Endothall	Lake Management
2016	CLP	33	Endothall	Lake Management
2017	CLP	33	Endothall	Lake Management
2018	CLP	33	Endothall	Lake Management
2019	CLP	32	Endothall	Lake Management

Date	Target Species	Total Acres Treated	Herbicide	Performed by
2020	CLP	32	Endothall	Lake Management
2021	CLP	32	Endothall	Lake Management
2017	SSW	1	Hand-pull (2x)	MN DNR
2018	SSW	1	Hand-pull (3x)	MN DNR
2019	SSW	1	Hand-pull (4x)	Steve McComas (BWS)
2020	SSW	1	Hand-pull (4x)	Steve McComas (BWS)
2021	SSW	1	Hand-pull (5x)	Steve McComas (BWS); AIS Consulting

Table 2 – Grand Lake, Stearns County Starry Stonewort Biomass Removal. Annual hand-pulling conducted in Grand Lake, Stearns County (DOW#73005500).






Survey Objectives

Point-intercept surveys were used to assess the distribution of aquatic plants in Grand 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

The most recent survey, surveyors used a point-intercept survey method developed by John Madsen in “Aquatic Plant Control Technical Note MI-02, 1999”. Sampling points were placed 75 meters apart using a Geographic Information System. The survey was comprised of 219 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 3). 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 3- 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

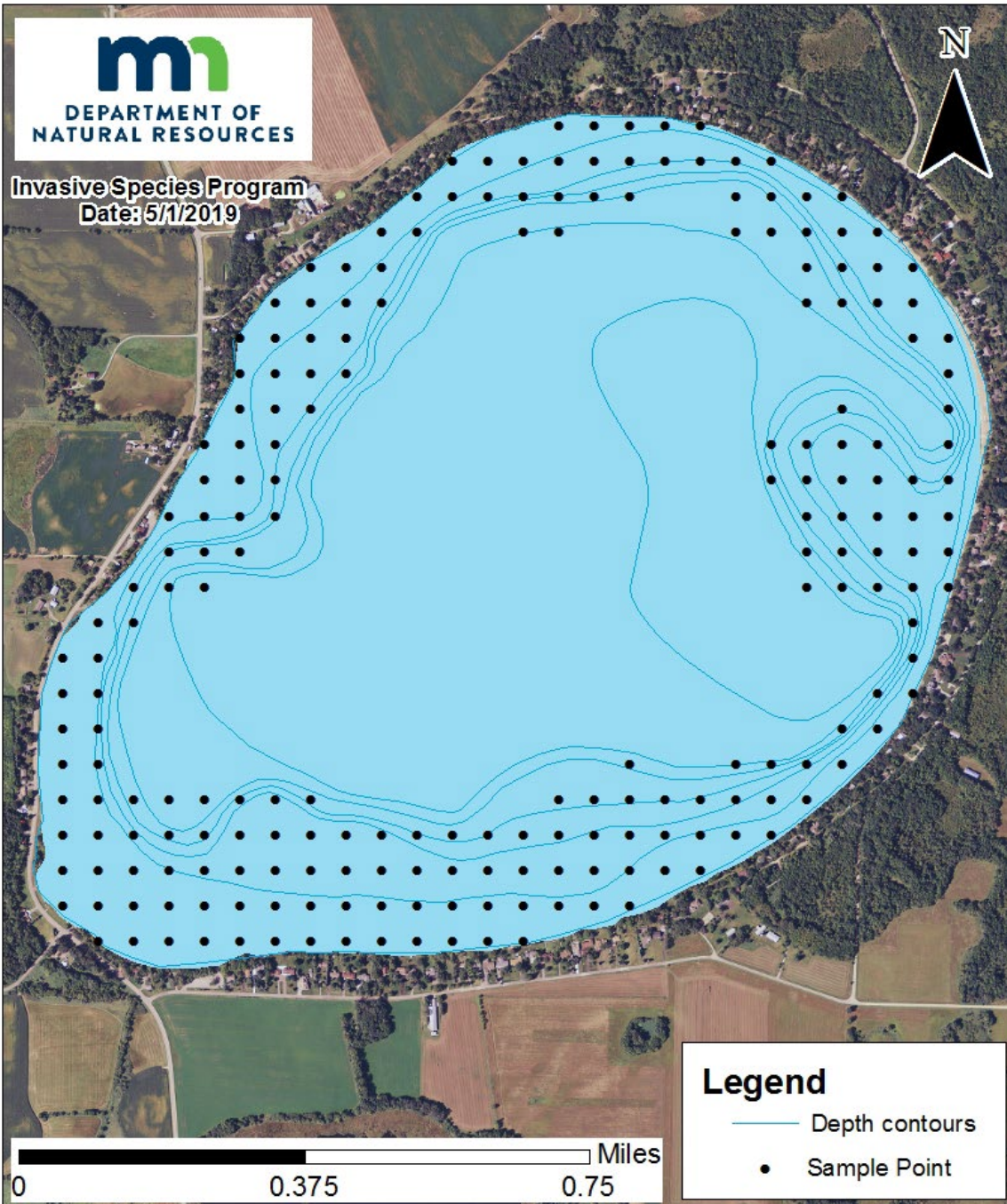


Figure 1 – Point-intercept Survey Grid. Point-intercept survey grid for Grand Lake, Stearns County (DOW#73005500). The points were 75 meters apart, totaling 207 points.

Survey Observations

The most recent aquatic vegetation point-intercept survey of Grand Lake (DOW #73005500) occurred on 2 July 2021 by AIS consulting (Fieldseth, 2021). Plants were rooted to a maximum depth of 20 feet. In the littoral zone (water depths from 0 to 15 feet, where aquatic plants are likely to be found), 94% of the points were vegetated (Table 3). Among all surveys of Grand Lake, there were a total of 18 submersed native taxa (Table 4) and two non-native submerged taxa (curly- leaf pondweed and starry stonewort).

Table 3- Point-intercept Metrics. Summary of point-intercept survey metrics for Grand Lake, Stearns County (DOW#73005500). Shaded values were calculated from littoral depth range (0-15 feet).

Metric	JULY/AUG 2010	AUG 2017	AUG 2018	JULY 2021
Surveyor	MN DNR- LEU	Fieldseth	MN DNR- ISP	Fieldseth
Total # Points Sampled	202	213	207	219
Depth Range of Rooted Veg (ft.)	NA	1.0- 16.5	1.5 – 23.0	0-20
Max Depth of Growth (95%)	NA	16.5	16.5	219
# Points in Littoral (0-15 feet)	172	171	168	159
% Points w/ Submersed Native Taxa	74	91	90	82
% Points w/ Submersed Non- native Taxa	7	6	22	27
Mean Submersed Native Taxa/ Point	1.3	1.6	1.8	1.2
# Submersed Native Taxa	16	15	18	17

Based on the 2021 point-intercept survey, the native plant community within the littoral area in Grand Lake was primarily dominated by muskgrass (*Chara* sp.) at 47.8% (Figure 2), followed by curly-leaf pondweed (37.1%; Figures 3 & 4), coontail (*Ceretophyllum demersum*) at 33.3% (Figure 5), Fries pondweed (*Potamogeton friesii*, 13.8%) and northern watermilfoil (*Myriophyllum sibiricum*, 9.4%). These aquatic plants are central to a healthy fish population, offering shelter and providing food and habitat to wildlife. In total, there are 18 submersed taxa, one floating-leaf taxa [(yellow waterlilies (*Nuphar variegata*))], two emergent taxa [(wild rice (*Zizania palustris*) and bulrushes (*Schoenoplectus* sp.)] and one free- floating taxa (star duckweed, *Lemna triscula*) during the survey. Both floating-leaf and emergent plants are

especially good at preventing shoreline erosion, habitat and providing food sources for waterfowl. Plants also absorb nutrients and reduce algae, thereby improving water quality. Figure 6 displays the spatial distribution and species richness (# of species per sample point) of all native submersed species from the most recent point-intercept survey.

Comparison to previous years

Aquatic plant surveys have occurred since 1949 on Grand Lake, Stearns County. Although the most recent point-intercept surveys were conducted in 2021 (AIS Consulting Services), 2018 (MN DNR), 2017 (AIS Consulting Services) and 2010 (MN DNR). 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. Among the survey years, the most dominant native plant species (muskgrass, coontail and curly-leaf pondweed) had remained consistent.

Table 4 - Plant Frequency Occurrence. Percent frequency of occurrence for observed plant species within the littoral zone (0-15 feet) in Grand Lake, Stearns County (DOW#73005500). Percent frequency is rounded to the nearest whole number. A species that is present indicates its presence in the lake, but not surveyed during point-intercept survey.

Taxonomic Name	Common Name	JULY/AUG 2010	AUG 2017	AUG 2018	JULY 2021
Surveyor		MN DNR-LEU	Fieldseth	MN DNR-ISP	Fieldseth
SUBMERSED NON-NATIVE					
<i>Potamogeton crispus</i>	curly-leaf pondweed	7	6	22	37
<i>Nitellopsis obtusa</i>	starry stonewort	0	Present	Present	Present
SUBMERSED NATIVE					
<i>Ceratophyllum demersum</i>	coontail	28	38	45	33
<i>Chara</i> sp.	muskgrass	47	52	52	48
<i>Elodea canadensis</i>	Canada waterweed	1	1	2	1
<i>Myriophyllum sibiricum</i>	northern watermilfoil	8	4	2	9
<i>Najas</i> sp.	naiad species	14	6	11	0
<i>Nitella</i> sp.	native stonewort species	0	7	5	1
<i>Potamogeton friesii</i>	Fries' pondweed	7	0	8	14
<i>Potamogeton gramineus</i>	variable pondweed	1	4	7	4
<i>Potamogeton illinoensis</i>	Illinois pondweed	1	1	1	3
<i>Potamogeton praelongus</i>	white-stem pondweed	4	4	8	4
<i>Potamogeton richardsonii</i>	clasping-leaved pondweed	4	8	10	9
<i>Potamogeton</i> spp.	narrow-leaved pondweed	6	8	5	7
<i>Potamogeton zosteriformis</i>	flat-stemmed pondweed	9	14	10	5
<i>Ranunculus</i> sp.	water crowfoot	2	1	5	4
<i>Stuckenia pectinata</i>	sago pondweed	3	9	4	8
<i>Utricularia</i> sp.	bladderwort species	1	0	2	1
<i>Vallisneria americana</i>	wild celery	2	1	2	1
EMERGENT					
<i>Schoenoplectus pungens</i>	three-square bulrush	1	0	0	0
<i>Schoenoplectus</i> sp.	bulrush species	3	1	1	Present
<i>Typha</i> sp.	cattail species	1	0	0	0
<i>Zizania palustris</i>	wild rice	4	2	5	3

Taxonomic Name	Common Name	JULY/AUG 2010	AUG 2017	AUG 2018	JULY 2021
Surveyor		MN DNR-LEU	Fieldseth	MN DNR-ISP	Fieldseth
FLOATING LEAF					
<i>Nuphar variegata</i>	yellow waterlily	4	1	2	2
FREE-FLOATING					
<i>Lemna triscula</i>	star duckweed	10	4	15	6

Chara (*Chara sp.*)

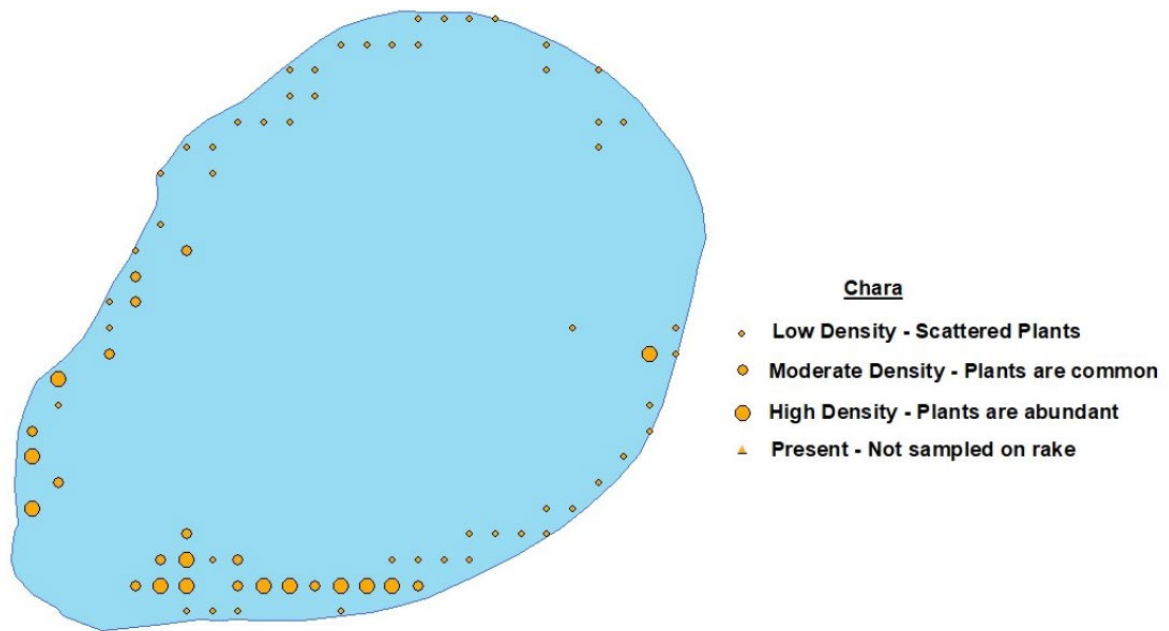


Figure 2 – Muskgrass Distribution. Distribution from the 2021 point-intercept survey for muskgrass in Grand Lake, Stearns County (DOW#73005500). Map source: AIS Consulting (Fieldseth).

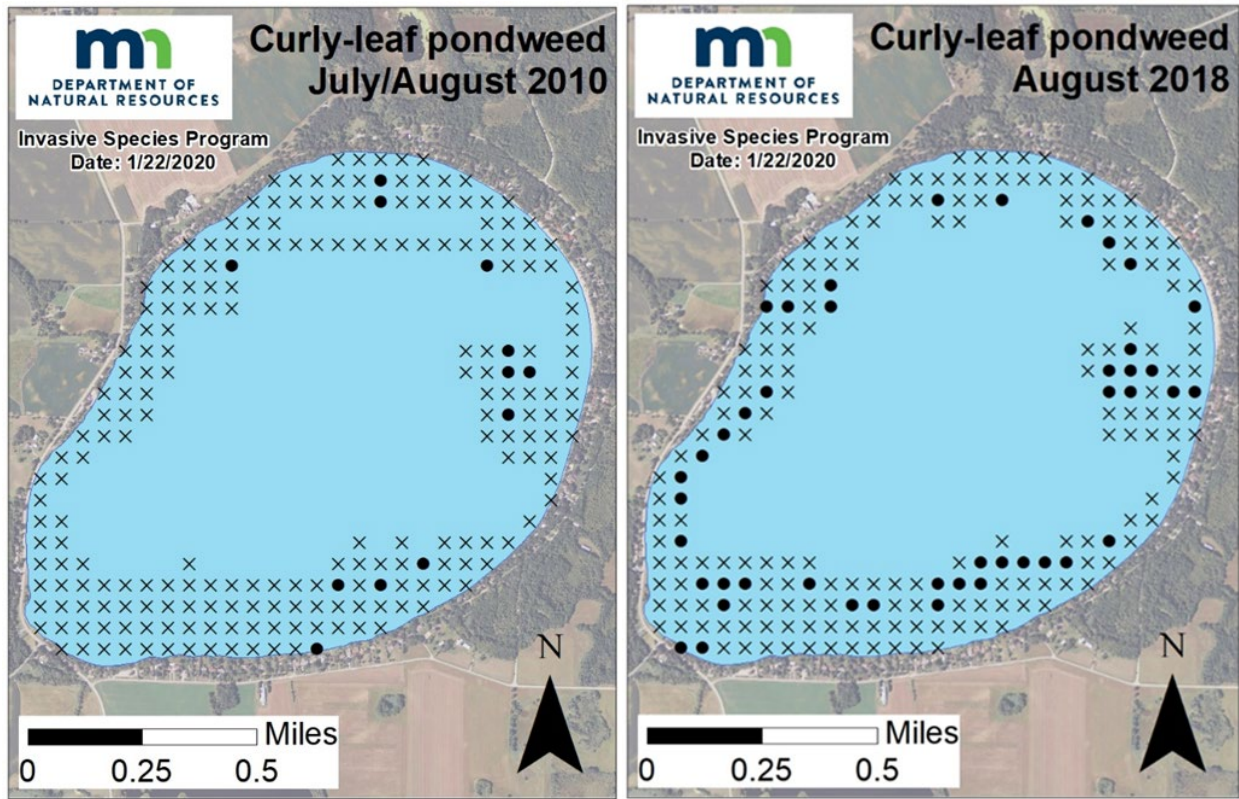


Figure 3 – Curly-leaf pondweed Distribution. Distribution from the 2010 and 2018 point-intercept surveys for curly-leaf pondweed in Grand Lake, Stearns County (DOW#73005500). An “X” indicates that no curly-leaf pondweed was present and a black circle indicates that curly-leaf pondweed was present.

Curlyleaf Pondweed (*Potamogeton crispus*)

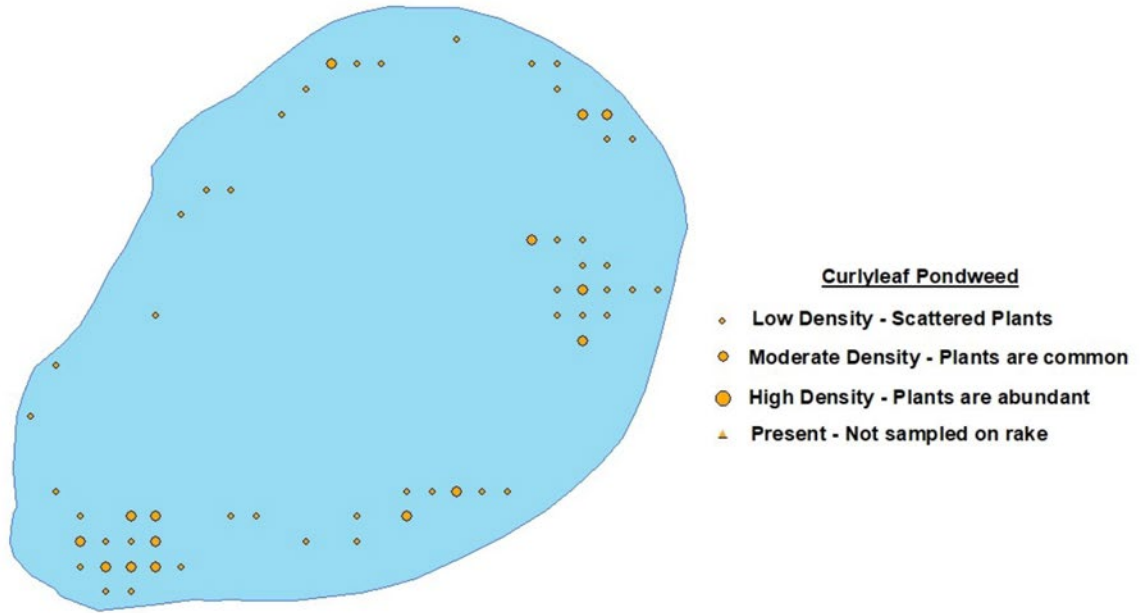


Figure 4 – 2021 Curly-leaf pondweed Distribution. Distribution of curly-leaf pondweed in Grand Lake, Stearns County (DOW#73005500). Map source: AIS Consulting (Fieldseth).

Coontail (*Ceratophyllum demersum*)

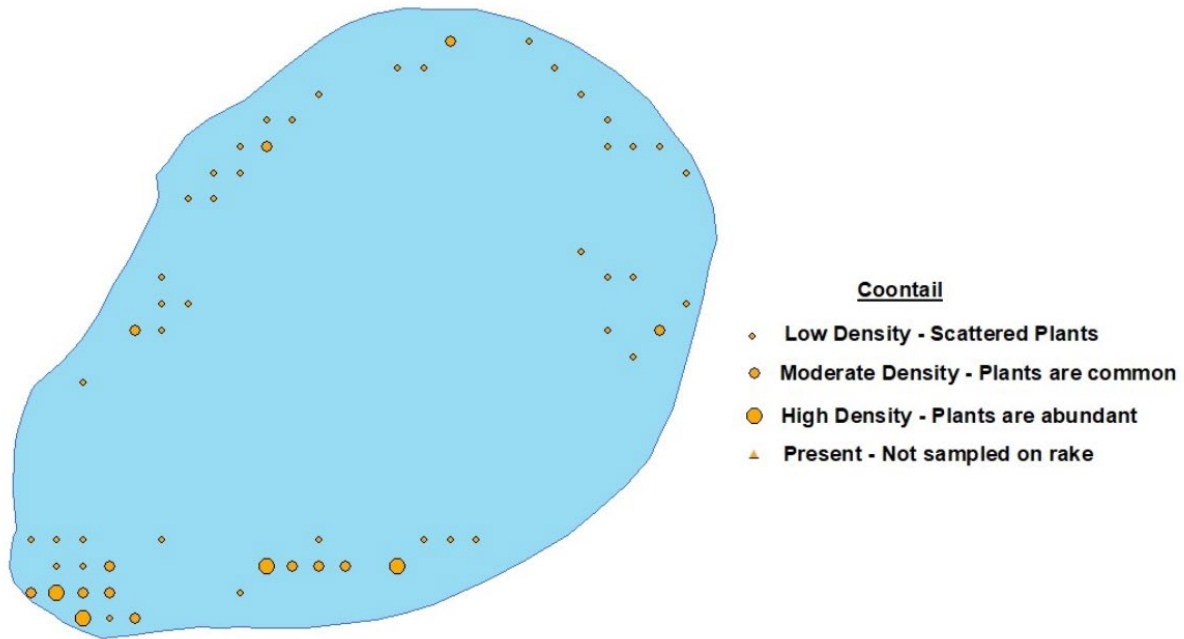
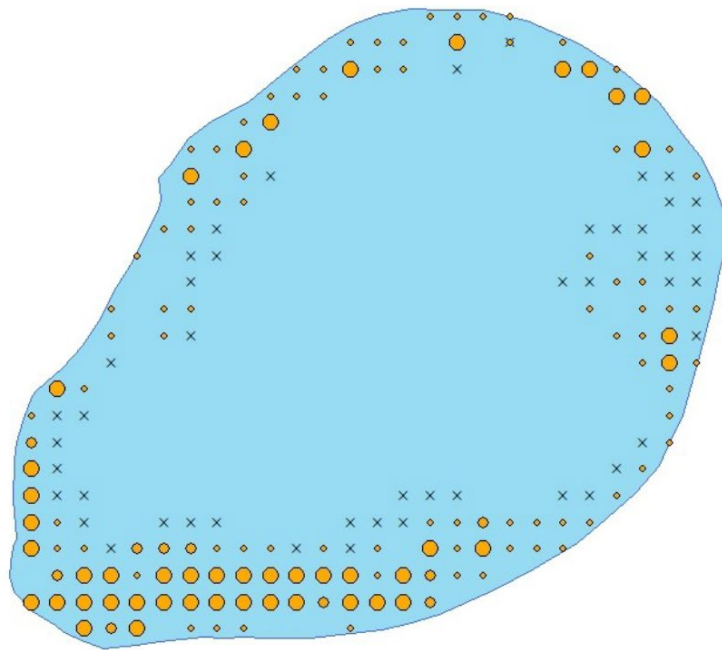


Figure 5 – Coontail Distribution. Distribution from the 2018 point-intercept survey for coontail in Grand Lake, Stearns County (DOW#73005500). Map source: AIS Consulting (Fieldseth).



Overall Vegetation Density

- ◊ Low Density - Scattered Plants
- Moderate Density - Plants are common
- High Density - Plants are abundant
- ▲ Present - Not sampled on rake
- × No vegetation present

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, E. 2021. Grand Lake Point-intercept Survey July 2, 2021. AIS Consulting Services. 19pp.
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- 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.
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