FLORENCE LAKE, ISANTI COUNTY:
AQUATIC VEGETATION MANAGEMENT REPORT

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

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Project Details

Lake: Florence (DOW# 30003500)

Lake Surface Area: 135 acres

Littoral Area: 120 acres

County: Isanti County

Survey Type: Point-intercept

Date of Survey (most recent): April 26, 2011

Observer[s]: MN DNR, Invasive Species Program (ISP): Rich Rezanka and Chris Jurek (2011), Rich Rezanka and Steve Marod (2010), Rich Rezanka and Luke Peluso (2009) and Kelly LaFortune (2007)

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Report Details

C. Jurek. 2021. Florence Lake, Isanti County: 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 Florence Lake (DOW #30003500) occurred on April 26, 2011. The main purpose of this survey was to document the frequency and distribution of curly-leaf pondweed (*Potamogeton crispus*). In general, the aquatic plants were present throughout the lake to a maximum depth of 9 feet (95 percentile). Within the littoral zone (zone in lake from the 0-15 foot depth range), 51% of the points had native submersed taxa and 21% of the points had curly-leaf pondweed. The average number of native submersed taxa per sample point was 0.6. In total, four submersed taxa, one invasive taxa, and no floating-leaf taxa were observed during the April 2011 survey.

Lake Description

Florence Lake is a 135-acre lake located 2 miles southeast of Cambridge, MN in Isanti County. The lake has one invasive plant species: curly-leaf pondweed. The maximum depth of water in Florence Lake is 26 feet, and 89% 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, 2021), there is evidence of improving water clarity of approximately 2.5 feet per decade since 1990. The median water clarity is 2.95 feet lower than the watershed median (MPCA, 2021). Florence Lake is classified as a higher mesotrophic lake, based on its Trophic State Index (TSI) of approximately 48. Mesotrophic lakes are lakes with an intermediate level of productivity. These lakes are commonly clear water lakes with beds of submerged aquatic plants and medium levels of nutrients. For more information on water quality, go to Florence Lake water quality on the MPCA website: Water Quality Data at https://webapp.pca.state.mn.us/surface-water/impairment/30-0035-00.

Management History

Invasive aquatic plant management in Florence Lake has focused on curly-leaf pondweed. Between 2009 and 2011, curly- leaf pondweed was managed with an endothall herbicide at a lake-wide level (exceeding 15% of the littoral area) as part of a MN DNR pilot program. Since 2012, invasive aquatic plant control has varied among years, ranging from no management to

18.5 acres for herbicide use and 15 acres in 2018 for mechanical harvesting. Management has been organized by the Paul and Elin's Lake Association (Table 1). Management since 2007 has varied by year, although curly-leaf pondweed still persists in Florence Lake based on a 2020 lake-wide delineation by Isanti Soil and Water Conservation District (Appendix A). Annual management of curly- leaf pondweed is an option if recreational nuisances remain problematic.

Table 1 - Invasive Plant Management Summary. Characteristics and history of invasive plant management for Florence Lake, Isanti County (DOW#30003500). Total acres: 135, Littoral acres: 120, 15% of Littoral acres: 18). Abbreviations are as followed: curly-leaf pondweed (CLP). 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	Management	Licensed Commercial Applicator
2008	CLP	10.0	Herbicide (Endothall)	Lake Restoration
2009	CLP	50.0	Herbicide (Endothall)	Lake Restoration
2010	CLP	46.4	Herbicide (Endothall)	Lake Restoration
2011	CLP	31.0	Herbicide (Endothall)	Lake Restoration
2012	CLP	15.1	Herbicide (Endothall)	Lake Restoration
2013	CLP	18.5	Herbicide (Endothall)	Lake Restoration
2014	CLP	18.5	Herbicide (Endothall)	Lake Restoration
2015	CLP	17.1	Herbicide (Endothall)	Lake Restoration
2018	CLP	15.0	Mechanical Harvesting	Lake Aquatic Weed Removal
2021 (proposed)	CLP	15.5	Endothall	Lake Restoration

Survey Objectives

Point-intercept surveys was used to assess the distribution of aquatic plants in Florence Lake between 2007 and 2011. The primary purpose for this type of survey was to 1) determine the frequency and distribution of invasive aquatic plants, 2) develop baseline knowledge of the current plant community in a lake, and over time, 3) compare year to year variation in plant presence and spatial location. Moreover, these surveys inform the DNR and our partners on how aquatic plant communities change over time and enable us to evaluate possible responses to invasive aquatic plant management via herbicide or mechanical 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.

Survey Methods

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 65 meters apart using a Geographic Information System. A total of 124 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.

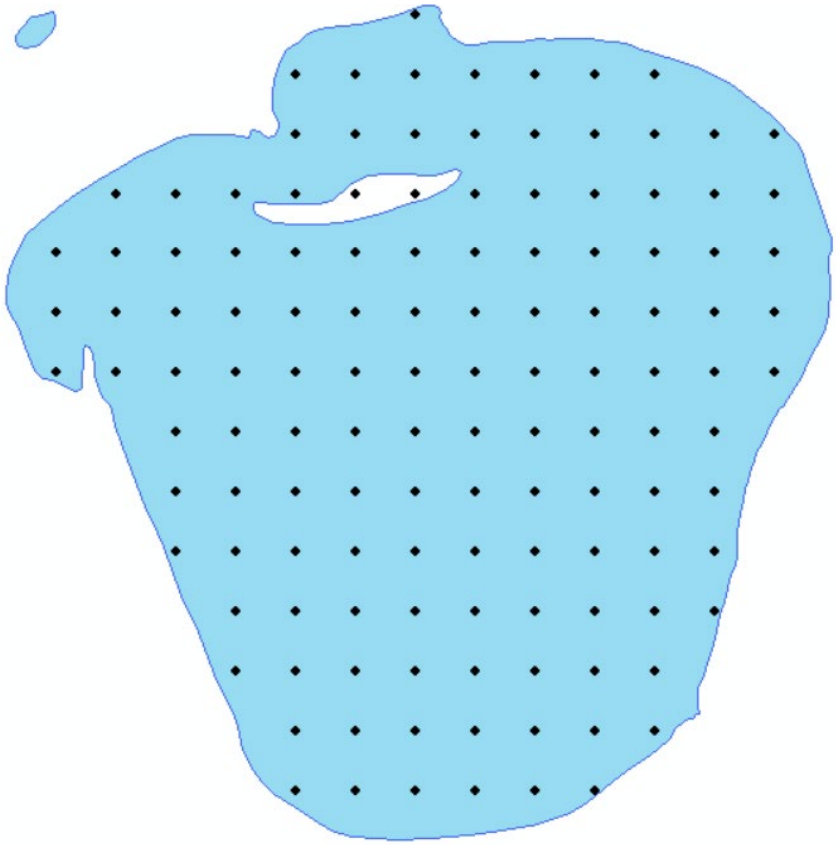


Figure 1 – Point-intercept Survey Grid. Point-intercept survey grid for Florence Lake, Isanti County (DOW# 30003500).

Survey Observations

During the most current aquatic plant survey on April 2011, we found aquatic plants in Florence Lake ranging in water depth from 2 to 10 feet. In the littoral zone, 51% of the surveyed points had submersed native vegetation (Table 2). In total, we found 4 submersed taxa and no floating-leaf species during the survey (Table 3). Coontail (*Ceratophyllum demersum*, Figure 2) was the most commonly occurring plant at 31% of all sites in the littoral zone followed by Canadian waterweed (*Elodea Canadensis*; Figure 3) and curly-leaf pondweed (Figure 4). Florence Lake has a low diversity of aquatic plants with an average of 0.6 species per a sampling site. Overall, this survey provided a summary of curly-leaf pondweed frequency of occurrence, but may underrepresent native aquatic plants because of the timing of the survey did not include native aquatic plants during their peak abundance during mid to late summer.

Table 2 - Point-intercept Metrics. Summary of point-intercept metrics for Florence Lake, Isanti County (DOW#30003500). Shaded values were calculated from littoral depth range (0-15 feet).

Metric	MAY 2007	AUG 2007	AUG 2009	AUG 2010	APRIL 2011
Surveyor	MN DNR	MN DNR	MN DNR	MN DNR	MN DNR
Total # Points Sampled	129	131	96	111	124
Max Depth of Growth (95%)	10.5	9	8	14	9
# Points in Littoral (0-15 feet)	129	131	96	111	124
% Points w/ Submersed Native Taxa	90	87	71	87	51
Mean Submersed Native Taxa/ Point	2.0	1.7	1.5	1.9	0.6
# Submersed Native Taxa	8	10	10	14	4
# Submersed Non-Native Taxa	1	0	1	1	1
% Points w/ Submersed Non- native Taxa	70	0	4	3	21

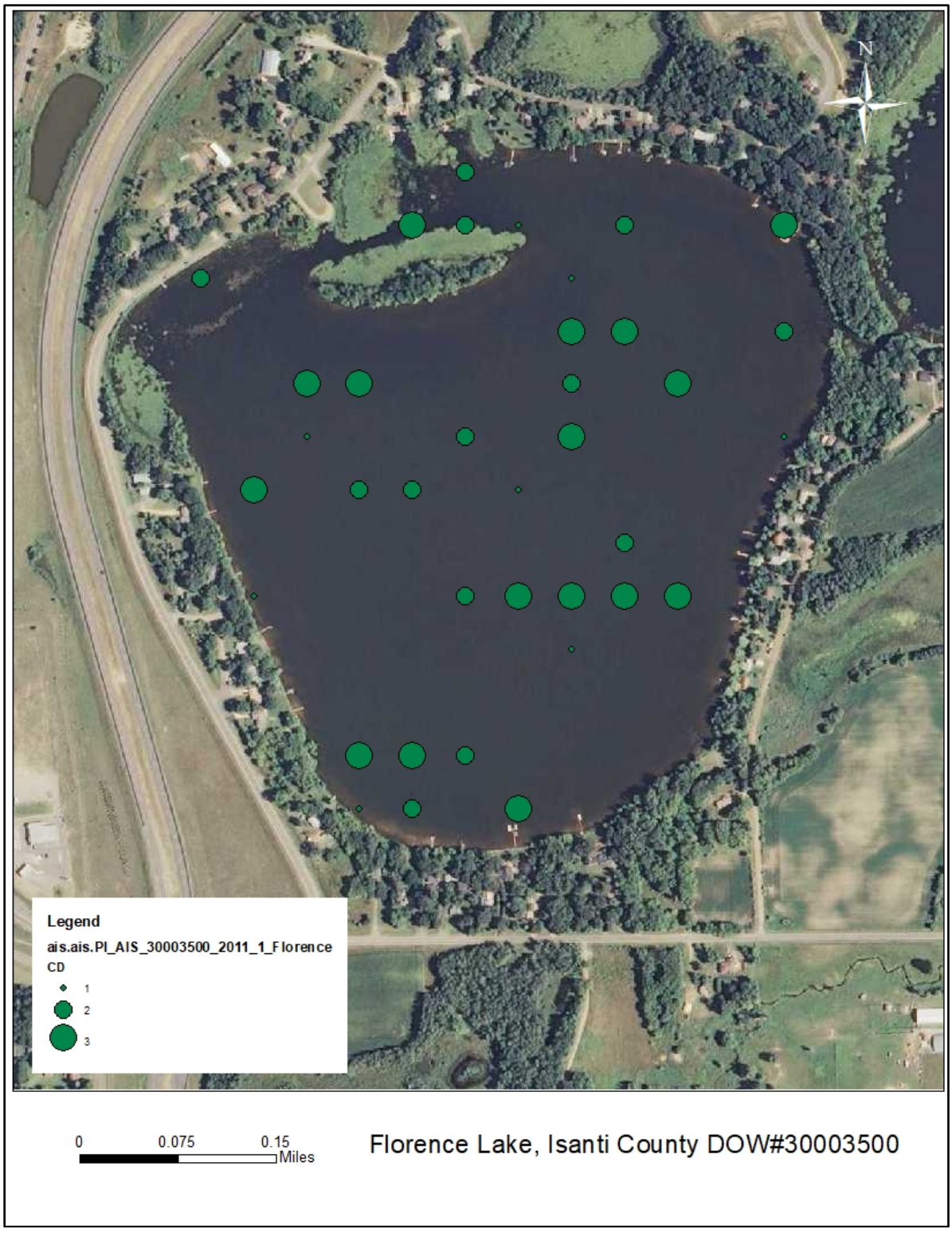


Figure 2- Coontail Distribution in Florence Lake, Isanti County. Plant distribution from the April 2011 point-intercept survey for Florence Lake, Isanti County (DOW#30003500). Densities ranged from 0 to 3 at each point, with 3 indicating dense plant presence and 0 indicating no plants.

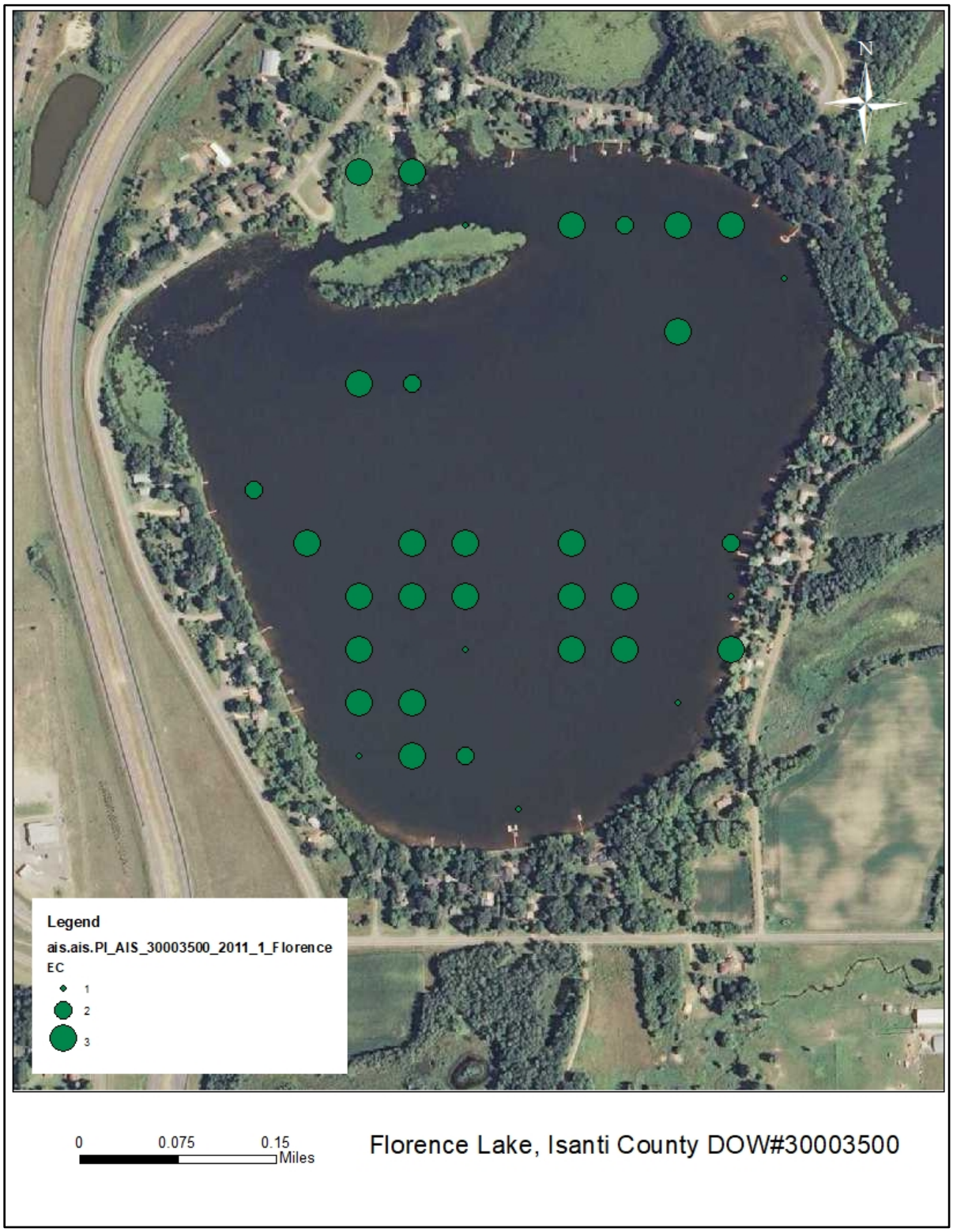


Figure 3- Canadian waterweed (Elodea) Distribution in Florence Lake, Isanti County. Plant distribution from the April 2011 point-intercept survey for Florence Lake, Isanti County (DOW#30003500). Densities ranged from 0 to 3 at each point, with 3 indicating dense plant presence and 0 indicating no plants.

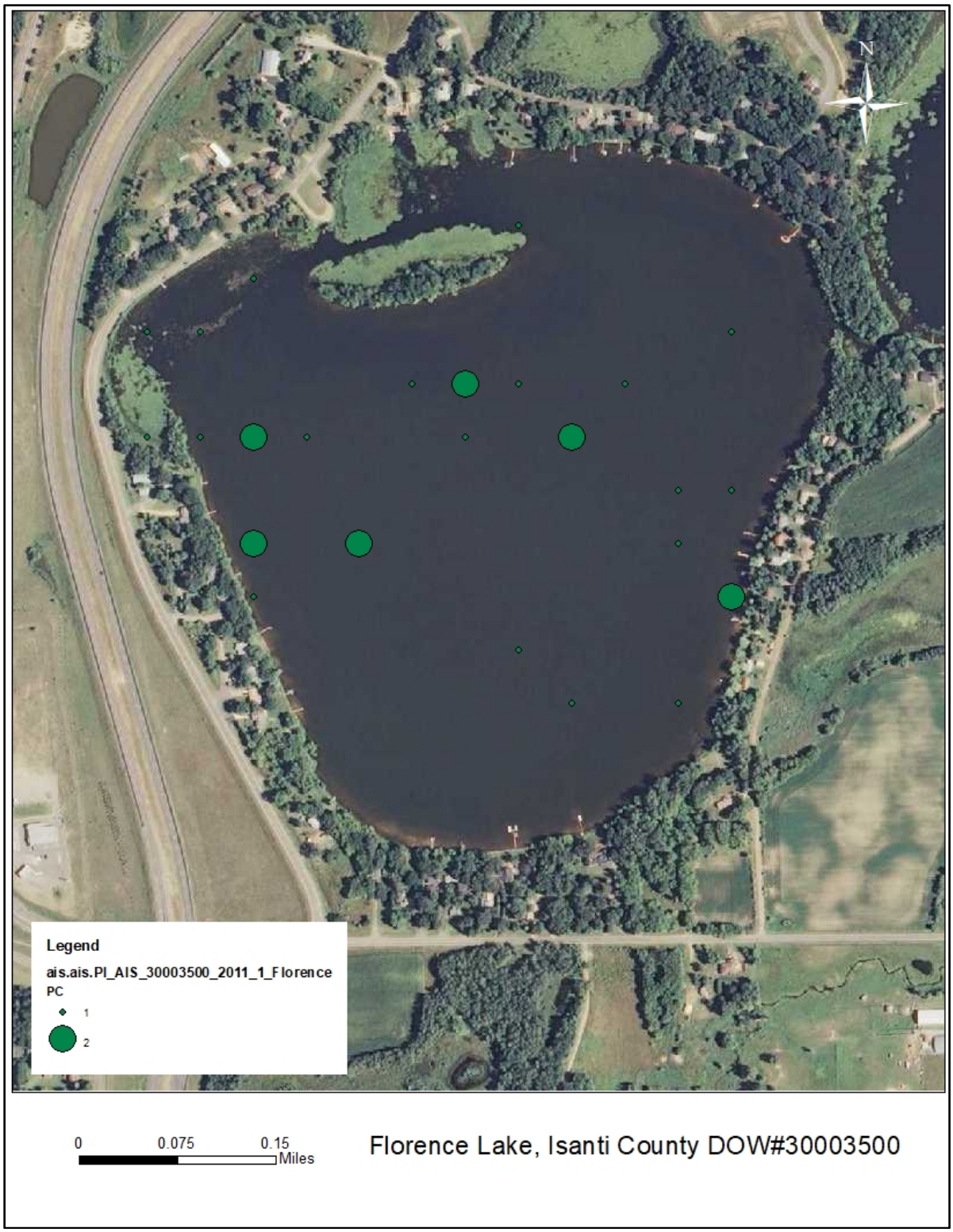


Figure 4- Curly-leaf pondweed Distribution in Florence Lake, Isanti County. Plant distribution from the April 2011 point-intercept survey for Florence Lake, Isanti County (DOW#30003500). Densities ranged from 0 to 3 at each point, with 3 indicating dense plant presence and 0 indicating no plants.

Table 3 - Plant Frequency of Occurrence. Percent frequency of occurrence for observed plant species in Florence Lake, Isanti County (DOW#30003500) with the littoral zone (Note: *Species frequencies were calculated based on points sampled that were less than the maximum depth where plants were found).

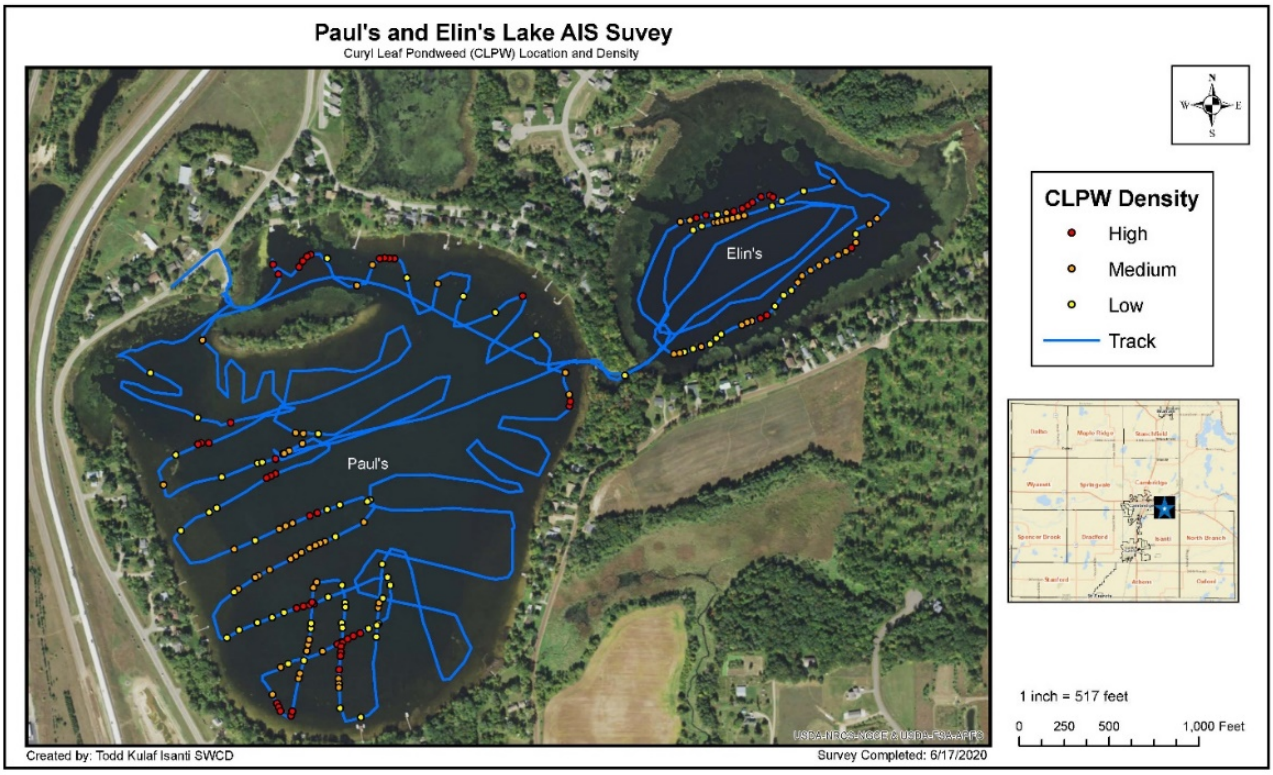
Taxonomic Name	Common Name	MAY 2007*	AUG 2007	AUG 2009	AUG 2010	APRIL 2011
SUBMERSED NON-NATIVE						
Potamogeton crispus	Curly-leaf pondweed	70	0	4	3	21
SUBMERSED NATIVE						
Ceratophyllum demersum	Coontail	68	78	70	51	31
Chara sp.	Muskgrass	8	5	8	18	0
Elodea canadensis	Canadian waterweed	24	17	20	34	29
Heteranthera dubia	Water star-grass	0	0	0	14	0
Myriophyllum sibiricum	Northern watermilfoil	36	45	3	1	0
Nitella sp.	Nitella species	0	0	1	3	0
Najas sp.	Naiad species	0	11	28	15	0
Potamogeton amplifolius	Large leaved pondweed	1	2	0	0	0
Potamogeton illinoensis	Illinois pondweed	0	0	0	0	1
Potamogeton friesii	Fries' pondweed	0	20	0	0	0
Potamogeton praelongus	Whitestem pondweed	0	0	1	1	0
Potamogeton richardsonii	Clasping-leaved pondweed	0	1	0	7	0
Potamogeton robbinsii	Robbin's pondweed	0	0	4	0	0
Potamogeton sp.	Narrow-leaved pondweed	31	0	1	7	0
Potamogeton zosteriformis	Flat-stemmed pondweed	0	0	11	0	0
Ranunculus sp.	Buttercup	15	2	0	0	0
Stuckenia pectinata	Sago pondweed	0	2	6	10	0
Utricularia sp.	Bladderwort species	0	0	0	1	0
Vallisneria americana	Wild celery	0	0	0	14	1
EMERGENT						
Schoenoplectus sp.	Bulrush species	1	1	0	0	0
Typha sp.	Cattail species	1	1	0	0	0
FLOATING LEAF						
Nymphaea odorata	White waterlily	5	5	3	6	0
Nuphar variegata	Yellow waterlily	1	1	1	3	0

Comparison among years

Among all point-intercept surveys conducted between 2007 and 2011, there were a total of 19 submerged native aquatic plants, one invasive aquatic plant, two emergent aquatic plants and two floating-leaf aquatic plants recorded. Purple loosestrife, an invasive emergent aquatic plant is also present along the shoreline but was not recorded during these surveys.

When comparing surveys, it is important to compare the spring surveys; when curly- leaf pondweed is at its peak abundance vs the summer surveys; when curly-leaf pondweed has senesced and native aquatic plants are at peak abundance. To summarize, the percent of points with submerged native taxa decreased between the spring of 2007 and 2011 from 90% to 51%, the mean submersed native taxa per a point dropped from 2.0 to 0.6 and the total native taxa species from 8 to 4. During the same period, there was a 36% decrease in northern watermilfoil and 37% decrease in coontail and a 49% decrease in curly-leaf pondweed. Surveys conducted in August show a greater abundance of native plants than the spring survey. It is recommended to monitor this lake in the future to track changes with aquatic plant communities.

Appendix A



Curly- leaf pondweed Delineation. June 2020 Curly- leaf pondweed delineation by Isanti Soil and Water Conservation District for Florence Lake, Isanti County (DOW# 30003500).

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