

*Aquatic Vegetation Point Intercept Survey by the Invasive Species Program*  
Division of Ecological Resources  
Minnesota Department of Natural Resources

**Lake:** Eleventh Crow Wing

**DOW Number:** 29-0036-00

**Date of survey:** June 30, 2009

**County:** Hubbard

**Observer[s]:** Darrin Hoverson & Tim Randt

**Time - On Water:** 0830   **Off water:** 2000

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Author of report: Darrin Hoverson – Invasive Species Specialist

Date of report: January 15, 2010

## **Introduction**

Eleventh Crow Wing Lake (DOW 29-0036-00) is a relatively large, 752 acre lake located in eastern Hubbard County. The lake is moderately deep with a max depth of 81 feet and 169 littoral acres (22%) where it is shallow enough for sunlight to reach the bottom and grow plants. The lake is a popular recreational and fishing lake. The city of Akeley, Minnesota lies on the southeast shore and owns and operates a 24 site campground along this shoreline. The lake is also divided into an east and west basin by State Highway 64.

Eleventh Crow Wing sits atop the Crow Wing chain of lakes and flows southward into Tenth Crow Wing and the rest of the Crow Wing chain. The lake lies within the Crow Wing River major watershed and receives inflow from adjacent wetlands, groundwater, and small inflows surrounding the lake. The lake is considered a flow through lake and surface water outflow is through an outlet on the southwest shore of the lake.

Eleventh Crow Wing is classified as a mesotrophic lake with good to fair water clarity as measured by mean secchi depth reading of 13.2 feet and ranging between 8-19.5 feet during 1990 and 2006-2009 (RMB, 2009). In spring and late fall, water clarity can be high with readings of 19 feet. Increased phosphorus levels can contribute to algal abundance associated with a decrease in water clarity throughout the summer. Total phosphorus and chlorophyll-a (a value that provides a measure of the amount of algae in the water) are considered moderately low with mean values of 13.2 parts per billion (ppb) and 4.8 ppb respectively. Total phosphorus ranges 3-29 ppb following a seasonal pattern of increased levels following ice-out, lowest levels in June, and increased levels as the summer progresses. Chlorophyll-a ranges 1-9 ppb and increases throughout the summer in response to phosphorus increases.

## **Objectives of Survey**

This survey describes the aquatic plant community of Eleventh Crow Wing and includes:

- 1) Estimation of maximum depth of rooted vegetation
- 2) Record of aquatic plant species that were sampled
- 3) Estimation of abundance of species sampled
- 4) Distribution map for common aquatic plant species
- 5) Average number of species sampled per site

## Summary:

On June 30, 2009, 257 locations were surveyed for aquatic vegetation using a point-intercept survey method (Figure 1). Twenty-two native plant species were sampled using this method. One invasive species, curly leaf pondweed (*Potamogetan crispus*) was observed growing near shore but not sampled in the point-intercept survey. The weather was fair with clear skies, a temperature of 66° F, and winds from the northeast at 10-12 mph. Water clarity was 13 feet with a water temperature of 63° F.

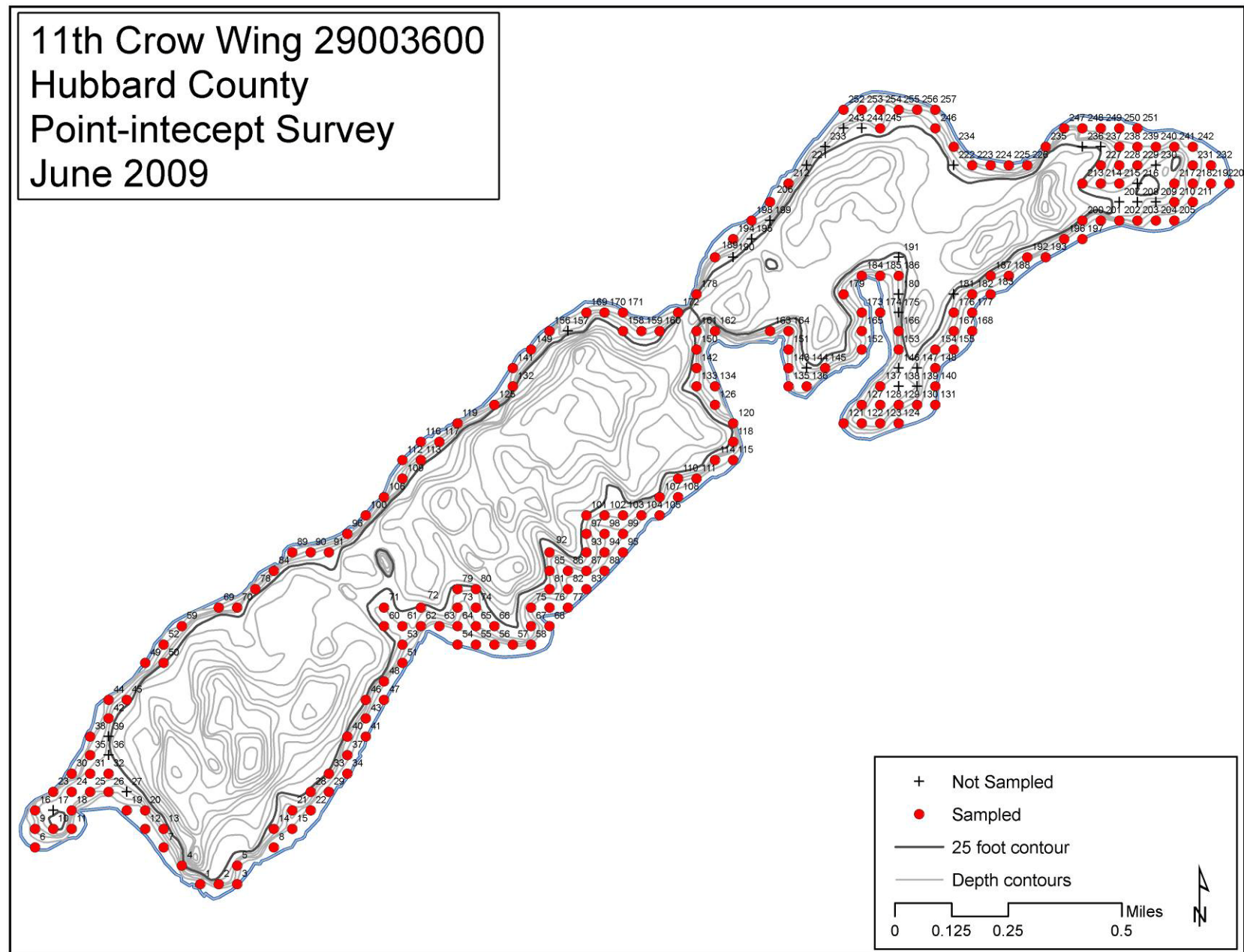
Seven submersed native species were sampled at frequencies of 15% or more in depths of 15 feet or less. Muskgrass (*Chara spp.*) was sampled at 58% of locations, flat-stem pondweed (*Potamogetan zosteriformis*) at 39%, small pondweed (*Potamogeton zosteriformis*) at 29%, coontail (*Ceratophyllum demersum*) at 28%, northern watermilfoil (*Myriophyllum sibiricum*) at 21%, floating-leaf pondweed (*Potamogeton natans*) at 15%, and clasping-leaf pondweed (*Potamogeton rishardsonii*) at 15% (Figure 3, 4, and 5, and Table 1).

Sampling occurred to a maximum depth of 26 feet. No plants were found to be growing beyond 23 feet. Plant abundance was greatest in the first 10 feet of water, had a small reduction in depths 11-15 feet, and as depths increased the presences of vegetation decreased and became less dense (Figure 6). Of the 257 locations on the grid, 225 were sampled, and 180 were in 15 feet or less.

The average number of native plants, emergent and submersed per rake sample was 2.98 for depths of 15 feet or less and 2.63 for all locations sampled. The average number of just native submersed plants per rake sample was 2.61 for depths of 15 feet or less and 2.33 for all locations sampled. Ten was the maximum number of species sampled at one location while values of 1 through 6 species were sampled regularly (Figure 7).

Other native plants sampled included: common bladderwort (*Utricularia vulgaris.*), narrow-leaf pondweed (*Potamogeton spp.*), Illinois pondweed (*Potamogeton illinoensis*), variable pondweed (*Potamogeton gramineus*), large-leaf pondweed (*Potamogeton amplifolius*), yellow water lily (*Nuphar variegata*), white water lily (*Nymphaea odorata*), Canada waterweed (*Elodea canadensis*), bushy pondweed (*Najas flexilis*), sago pondweed (*Stuckenia pectinata*), water marigold (*Megalodonata beckii*), star duckweed (*Lemna trisulca*), hardstem bulrush (*Schoenoplectus acutus*), common arrowhead (*Sagittaria latifolia*), and cattail (*Typha spp.*), (Table 1). In many areas around the lake dense mats of native aquatic plants, primarily chara were observed covering the lake bottom. Other areas of the lake had abundant beds of submersed, emergent, and floating leaf species growing together (Figures 8 & 9).

Curly-leaf pondweed (CLP) was not sampled using the point-intercept survey method but was found at multiple locations on the lake. These locations were along the north shore between points 212 and 254 (Figures 10). The majority of the CLP observed was found in small pockets adjacent to shore in relatively shallow waters.



**Figure 1. Point-intercept survey locations on Eleventh Crow Wing, Hubbard County, June 30, 2009.**

## Methods:

The point-intercept survey followed methodology described by Madsen (1999). Geographic Information System (GIS) software was used to generate sample points across the lake surface in a 65 meter by 65 meter grid, resulting in a total of 257 potential survey points. In the field, no depths greater than 26 feet were sampled since vegetation was not found beyond 23 feet. A Global Positioning System (GPS) unit was used to navigate the boat to each sample point. Water depths at each site were recorded in 1-foot increments using an electronic depth finder.

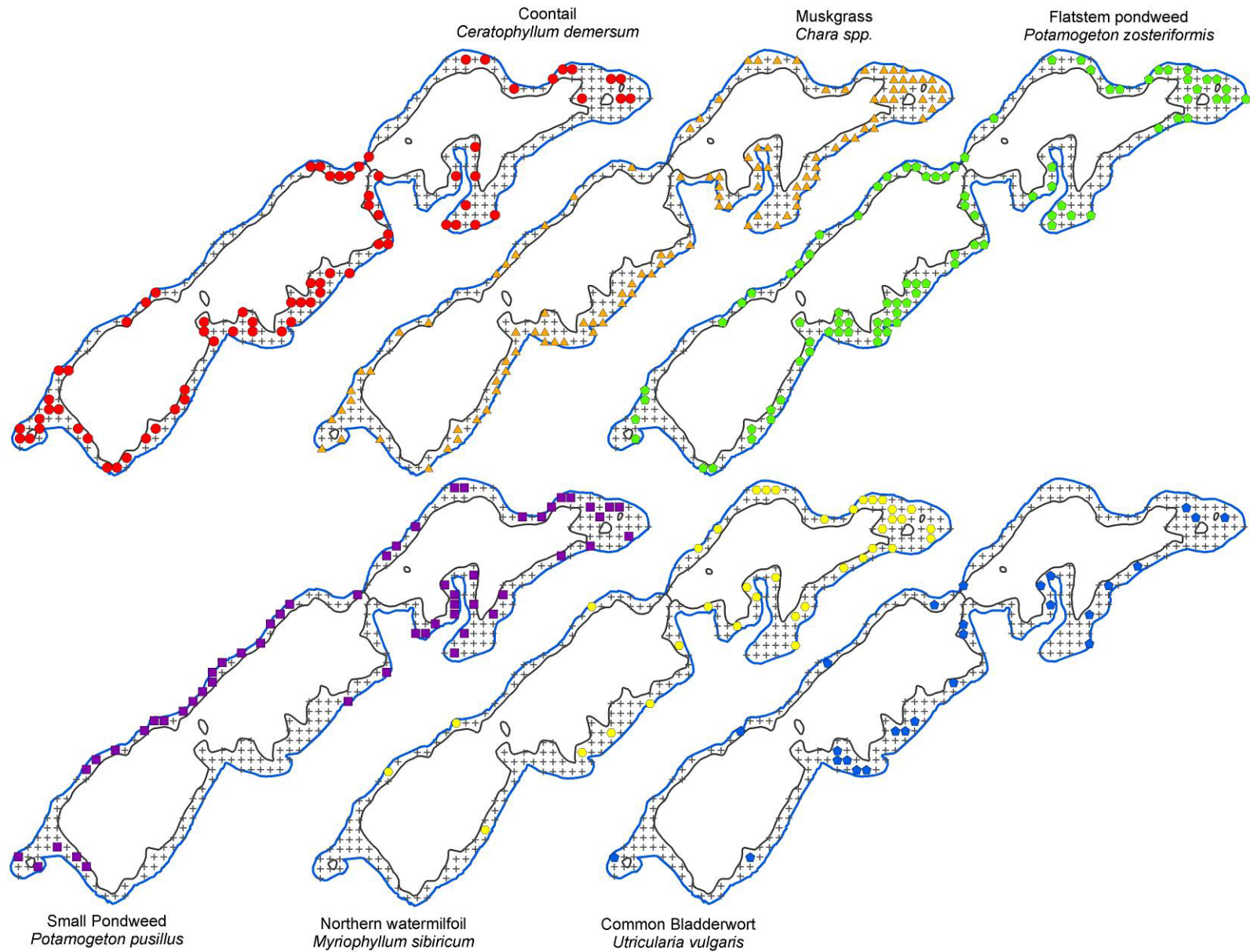
All plant species found within a one square meter sample site at the pre-designated side of the boat were recorded. A double-headed, weighted garden rake, attached to a rope (Figure 2) was used to survey vegetation not visible from the surface. Nomenclature followed Crow and Hellquist (2000).



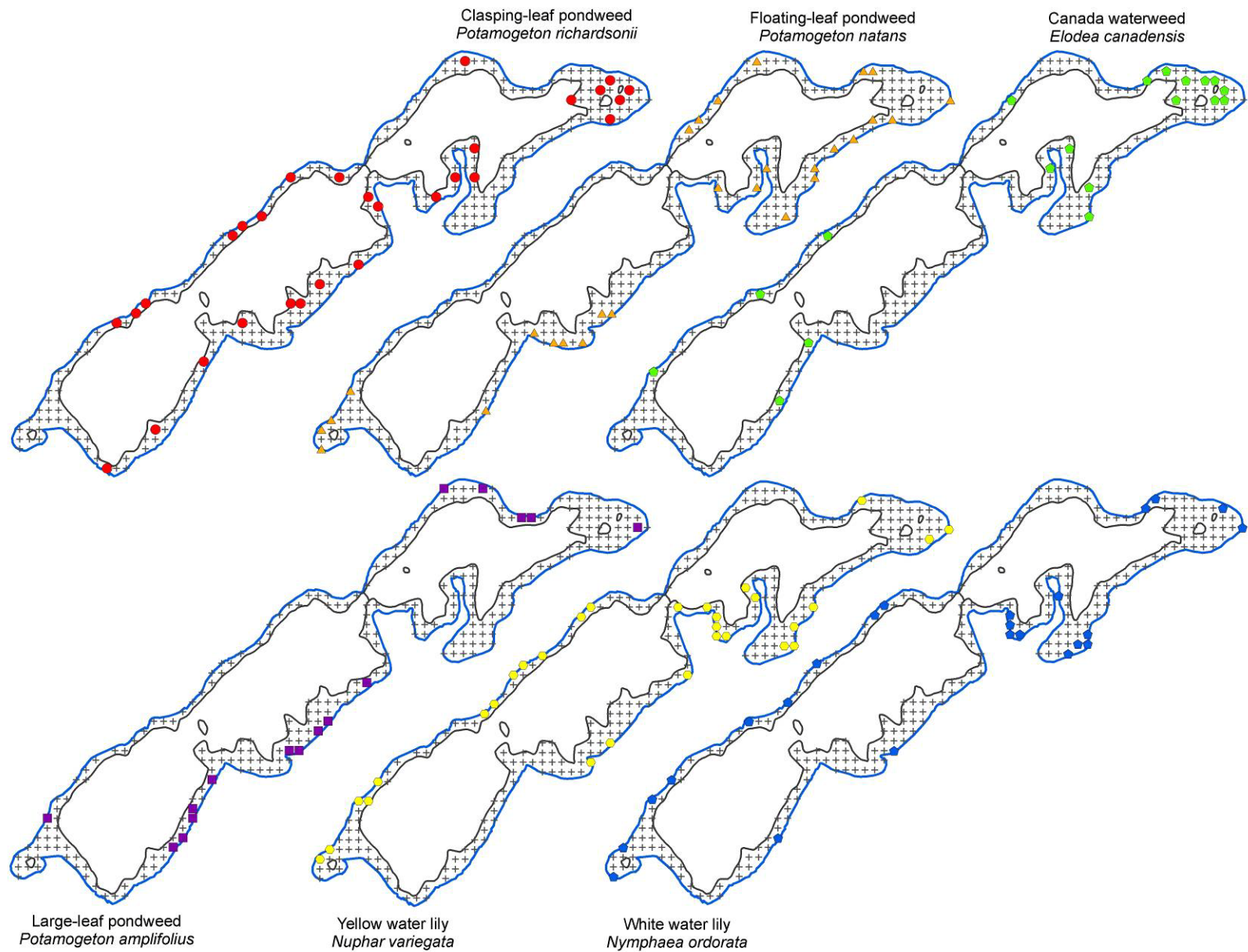
**Figure 2. Double-headed, weighted garden rake, attached to a rope used to survey aquatic vegetation.**

Frequency of occurrence was calculated for each species as the number of sites in which a species occurred divided by the total number of sample sites. Frequency was calculated for all sampled locations and for those sites 15 feet or less. The average number of native submersed plants per rake sample was calculated as the total number of plants sampled divided by the number of sample locations.

Sampling points were also grouped by water depth and separated into five depth zones for analysis: 0 to 5 feet, and 6 to 10 feet, 11 to 15 feet, 16 to 20 feet, 21 to 25 feet, and 21+.



**Figure 3. Distribution of common native aquatic plant species in Eleventh Crow Wing Lake, June 30, 2009.**



**Figure 4. Distribution of common native aquatic plant species in Eleventh Crow Wing Lake, June 30, 2009.**

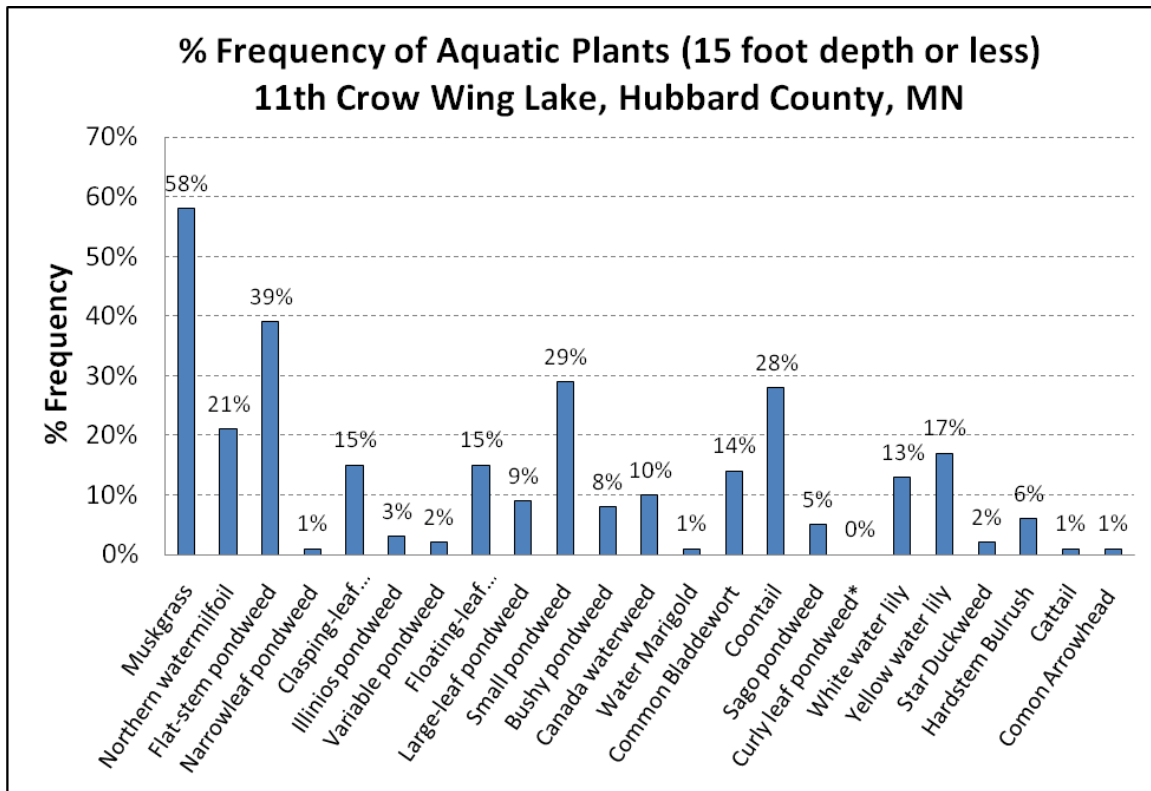


Figure 5. Frequency of occurrence for aquatic plant species in depths of 15 foot or less.

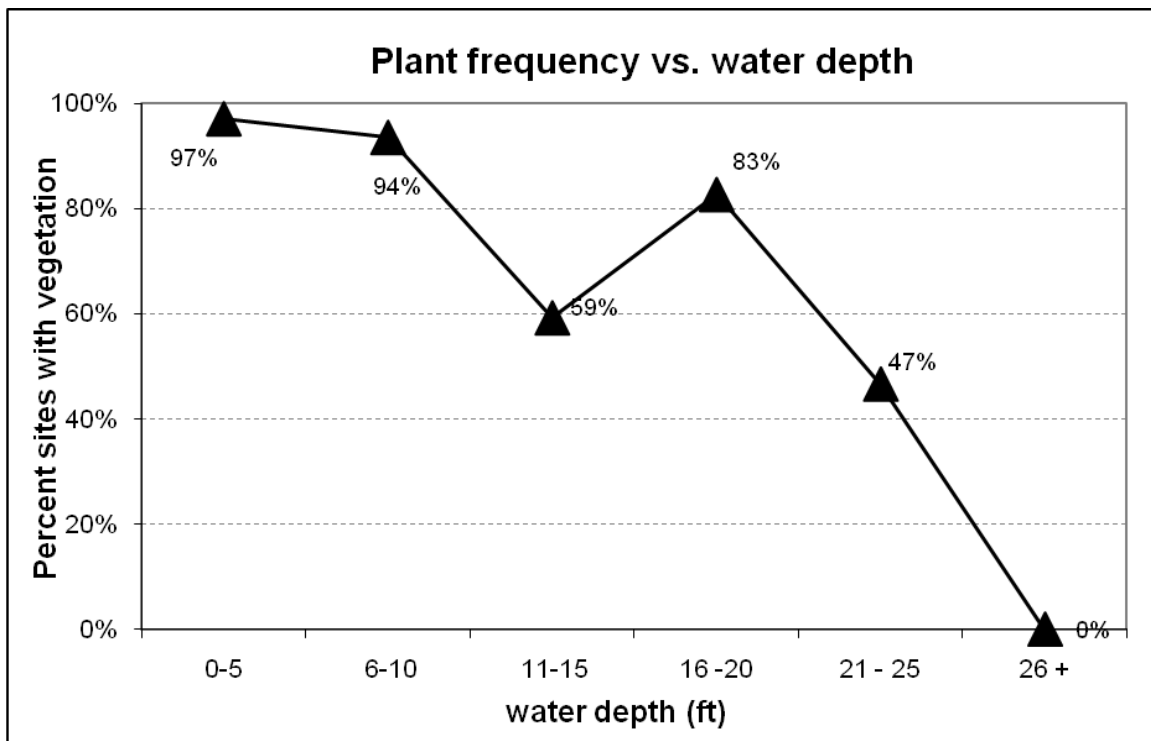
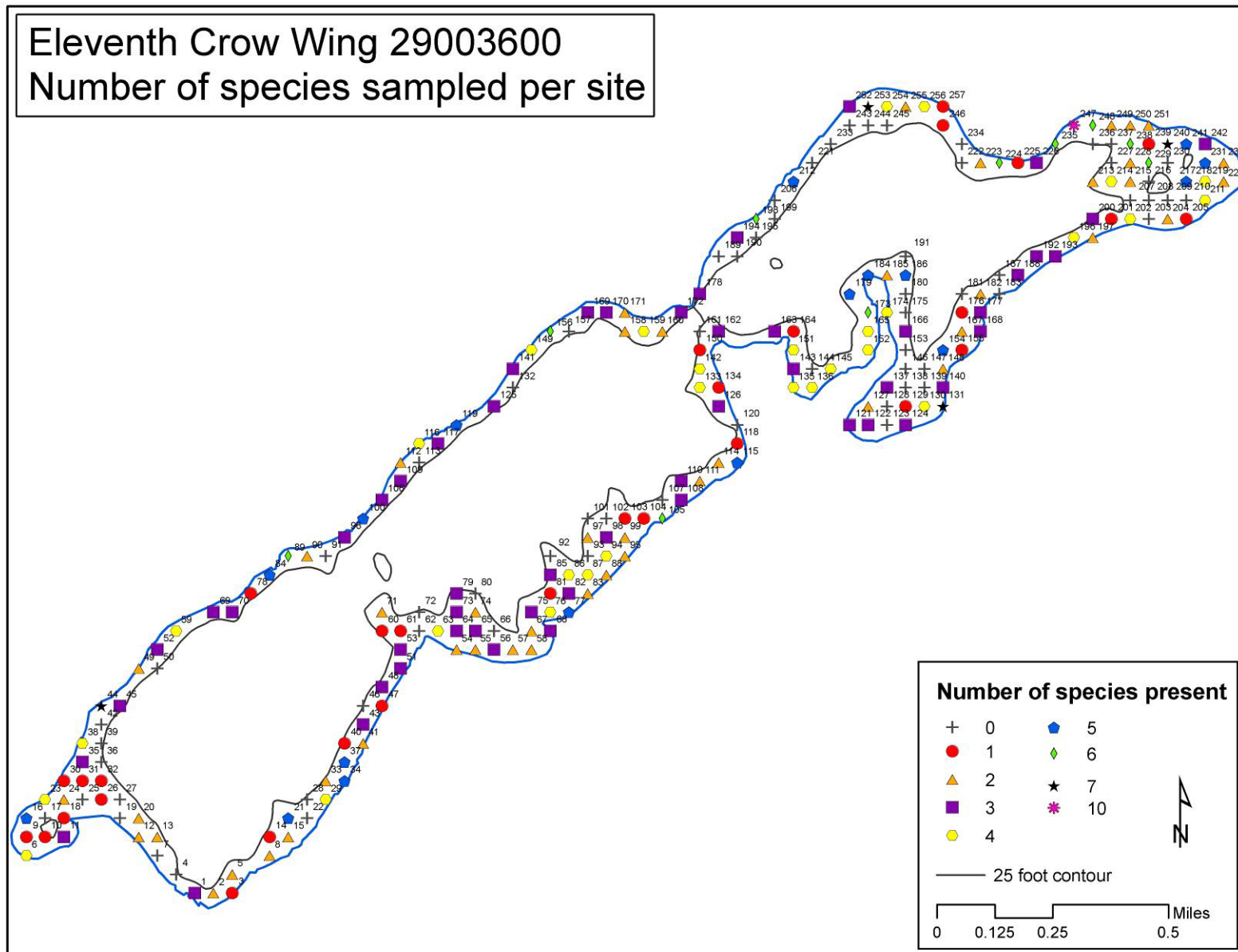


Figure 6. Frequency of vegetation vs. water depth, Eleventh Crow Wing, MN.



**Figure 7. Species of aquatic plants, emergent and submersed sampled per location on Eleventh Crow Wing, June 30, 2009.**

**Table 1. Aquatic Plants surveyed from Eleventh Crow Wing (DOW 29-0036-00) Hubbard County, June 30, 2009.**

			15 ft or less		all sampled	
Life Form	Common Name	Scientific Name	Freq. (%)	Count	Freq. (%)	Count
<b>SUMBMERGED - ANCHORED -</b> These plants grow primarily under the water surface. Upper leaves may float near the surface and flowers may extend above the surface. Plants are often rooted or anchored to the lake bottom.	Muskgrass	<i>Chara. spp.</i>	58%	105	49%	111
	Northern watermilfoil	<i>Myriophyllum sibiricum</i>	21%	37	16%	37
	Flat-stem pondweed	<i>Potamogeton zosteriformis</i>	39%	71	40%	89
	Narrowleaf pondweed	<i>Potamogeton spp.</i>	1%	2	1%	2
	Clasping-leaf pondweeed	<i>Potamogeton richardsonii</i>	15%	27	13%	29
	Illinois pondweed	<i>Potamogeton illinoensis</i>	3%	6	3%	6
	Variable pondweed	<i>Potamogeton gramineus</i>	2%	3	1%	3
	Floating-leaf pondweed	<i>Potamogeton natans</i>	15%	27	12%	27
	Large-leaf pondweed	<i>Potamogeton amplifolius</i>	9%	16	7%	16
	Small pondweed	<i>Potamogeton pusillus</i>	29%	52	24%	55
	Bushy pondweed	<i>Najas flexilis</i>	8%	14	7%	15
	Canada waterweed	<i>Elodea canadensis</i>	10%	18	8%	19
	Water Marigold	<i>Megalodonata beckii</i>	1%	1	1%	1
	Common Bladdewort	<i>Utricularia vulgaris</i>	14%	26	12%	27
	Coontail	<i>Ceratophyllum demersum</i>	28%	51	32%	73
	Sago pondweed	<i>Stuckenia pectinata</i>	5%	9	4%	9
	Curly leaf pondweed*	<i>Potamogeton crispus</i>	0%	0	0%	0
<b>FLOATING - LEAF -</b> These plants leaves float on the water and are anchored to the lake bottom.	White water lily	<i>Nymphaea odorata</i>	13%	24	11%	24
	Yellow water lily	<i>Nuphar variegata</i>	17%	30	13%	30
<b>FREE- FLOATING -</b> These plants cab float on the water and drift with water currents.	Star Duckweed	<i>Lemna trisulca</i>	2%	4	2%	4
<b>EMERGENT -</b> These plants extend well above the water surface and are usually found in shallow water, near shore.	Hardstem Bulrush	<i>Schoenoplectus acutus</i>	6%	11	5%	11
	Cattail	<i>Typha spp.</i>	1%	1	1%	1
	Comon Arrowhead	<i>Sagittaria latifolia</i>	1%	2	1%	2
	Total number of sites		--	180	--	225



**Figure 8. Native vegetation along east shore of east basin.**



**Figure 9. Native vegetation along north shore of west basin.**



**Figure 10. Curly-leaf pondweed adjacent along north shore of east basin (near site 252).**

## Literature Cited

Crow, G.E. and C.B. Hellquist. 2000. Aquatic and wetland plants of Northeastern North America. 2 volumes. The University of Wisconsin Press.

Madsen, J. D. 1999. Point intercept 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. [www.wes.army.mil/el/aqua](http://www.wes.army.mil/el/aqua)

RMB Laboratories. 2009. Eleventh Crow Wing (DOW 29003600) Lake Monitoring Program Summary Information. Retrieved January 15, 2010, from RMB website: <http://www.rmbel.info/Reports/ReportsQuery.aspx>