

**Aquatic Vegetation Survey of
Farm Island Lake (DOW #01-0159-00)
Aitkin County, Minnesota
2009**

Farm Island Lake, June 2009.



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A note to readers:

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Summary

Farm Island Lake is a 2003 acre lake in north central Minnesota. A spring 2009 aquatic vegetation survey was conducted to assess the abundance and distribution of the non-native plant, curly-leaf pondweed (*Potamogeton crispus*). Information on native plants was also collected but may be incomplete because many native plants do not reach peak growth until mid to late summer. This lakewide assessment included vegetation and water depth sampling at 683 sample stations and a characterization of near shore substrates.

Submerged plants were common from shore to a depth of 15 feet, which includes about 40% of the lake. Within that depth zone, 49% of the sites contained vegetation. Plants were found to a depth of 17 feet but were sparse beyond the 15 feet depth with only 6% of the deeper sites containing plants.

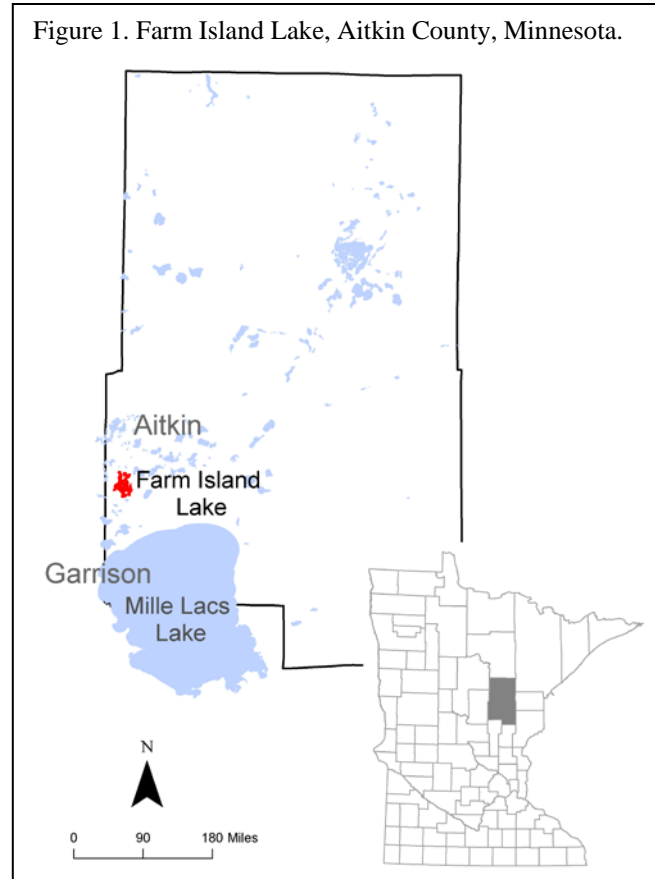
Curly-leaf pondweed was the most frequently occurring submerged plant species. Within the shore to 20 feet depth zone, it occurred in 16% of the sample sites. It was most frequent in the 11 to 15 feet depth zone, where it occurred in 42% of the sites. It was the dominant plant in depths greater than five feet and was the only plant found in depths greater than 15 feet. It was found at numerous locations around the lake and was most common in the northern bays.

As a group, native plants dominated Farm Island Lake and were most common in depths of ten feet and less. In sites that were vegetated, 63% contained only native plants. Twenty-six different native aquatic plant taxa were recorded including six emergent, two floating-leaved and 18 submerged. Native submerged plants included coontail (*Ceratophyllum demersum*), muskgrass (*Chara* sp.), star duckweed (*Lemna trisulca*) and several native pondweeds (*Potamogeton* spp.).

Introduction

Farm Island Lake is located between the towns of Aitkin and Garrison in Aitkin County, north central Minnesota. It is the 4th largest lake in the county with a surface area of 2,003 acres. The lake is irregular in outline with about 15 miles of shoreline and several islands. The lake's name refers to the largest island, Farm Island, which covers about 29 acres.

Farm Island Lake has a maximum depth of 56 feet and at least 40% of the lake basin is less than 15 feet in depth. The Ripple River flows into the lake on the east side and outlets to the southwest. It continues through several lakes before emptying into the Mississippi River in Aitkin. Farm Island Lake is described as mesotrophic (moderate nutrients) with good water clarity. In 2008, the average summer [Secchi disc](#) reading was 12 feet (MPCA, 2008).



Previous vegetation surveys of Farm Island Lake have described a relatively diverse native plant community with more than 30 kinds of lake plants. Emergent plants such as bulrush (*Scirpus* spp.), arrowhead (*Sagittaria* spp.), and wild rice (*Zizania palustris*) occur along shorelines and in shallow areas; native submerged plants commonly grow to depths of 10 to 12 feet and include coontail (*Ceratophyllum demersum*), wild celery (*Vallisneria americana*), native pondweeds (*Potamogeton* spp.) and northern watermilfoil (*Myriophyllum sibiricum*) (DNR Fisheries Lake Files). The non-native plant, curly-leaf pondweed (*Potamogeton crispus*) has been present in the lake since at least 1946 (DNR Fisheries Lake Files). Previous plant surveys of Farm Island Lake have focused on the native plant communities and have therefore been conducted in late summer, after most curly-leaf pondweed plants have died back for the year.

Objectives

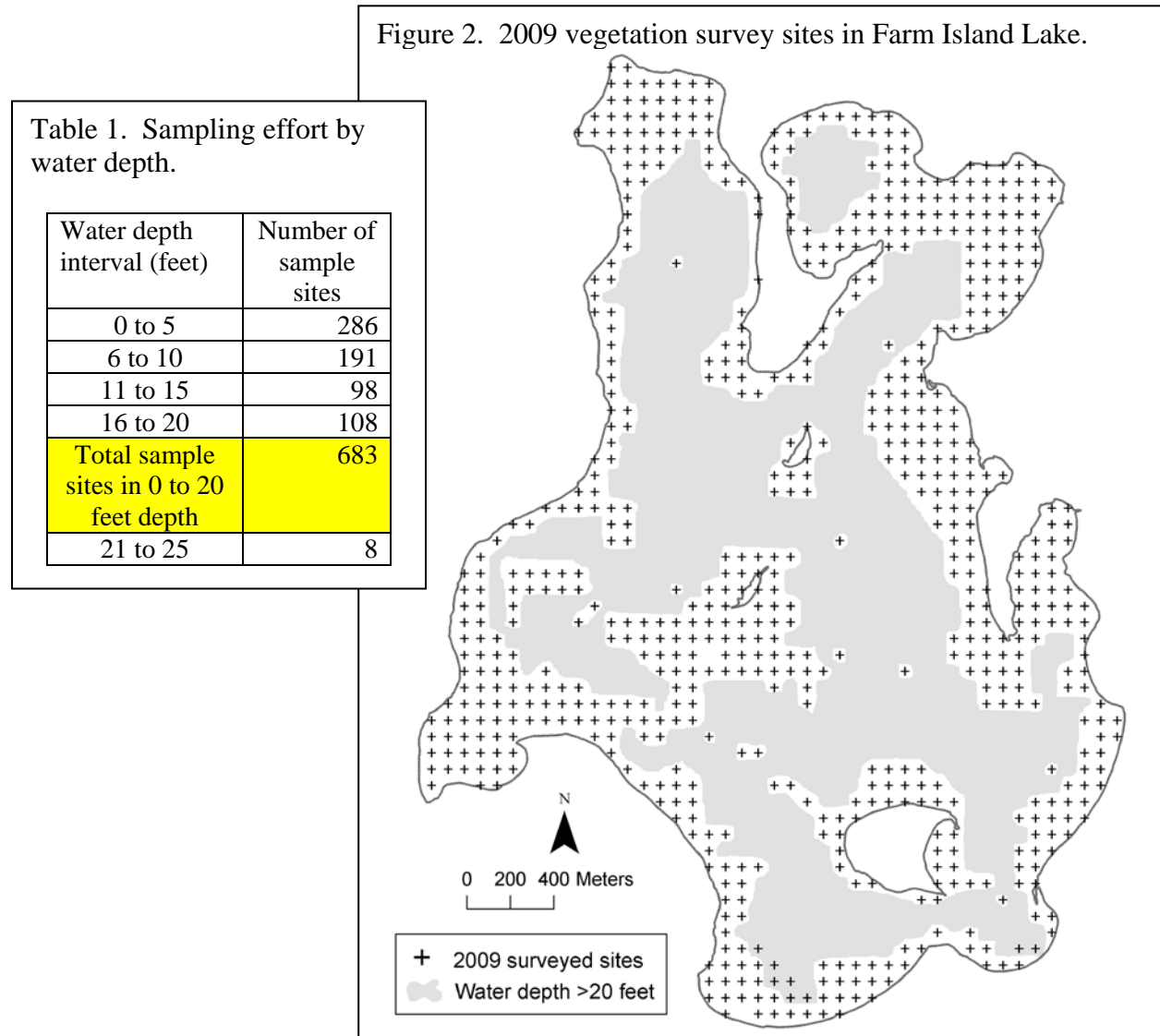
This survey provides a quantitative description of the 2009 curly-leaf pondweed population in Farm Island Lake. Information on native plants was also collected but may be incomplete because many native plants do not reach peak growth until mid to late summer. Objectives included:

1. Describe the shoal sediments of the lake
2. Estimate the maximum depth of rooted vegetation
3. Estimate the percent of the lake occupied by rooted vegetation
4. Record the aquatic plant species that occur in the lake
5. Estimate the abundance of curly-leaf pondweed and common native plant species
6. Develop distribution maps for curly-leaf pondweed and native plants

Methods

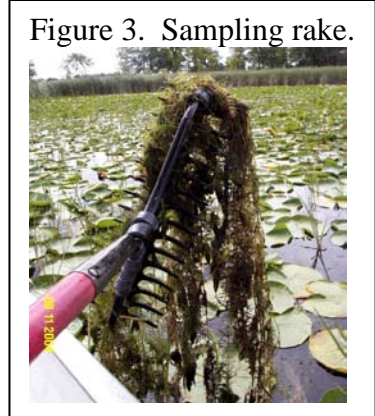
Farm Island Lake was surveyed on May 26-28 and June 1-2, 2009. A point-intercept survey method was used and followed the methods described by Madsen (1999). Survey waypoints were created using a Geographic Information System (GIS) computer program and downloaded into a handheld Global Positioning System (GPS) receiver. Survey points were placed across the entire lake and spaced 75 meters (246 feet) apart.

The survey was conducted by boat and surveyors sampled 683 sites within the shore to 20 feet depth zone (Figure 2, Table 1). Surveyors sampled some sites in the 21 to 25 feet depth zone but found no vegetation beyond the 17 feet depth.



A GPS unit was used to navigate the boat to each sample point. One side of the boat was designated as the sampling area. At each site, water depth was recorded in one-foot increments using a measured stick in water depths less than seven feet and an electronic depth finder in depths greater than seven feet.

Surveyors recorded all plant taxa found within a one square meter sample site at the pre-designated side of the boat. A double-headed, weighted garden rake, attached to a rope was used to survey vegetation not visible from the surface (Figure 3). Plant identification and nomenclature followed MnTaxa (2009).



Frequency of occurrence was calculated for each taxon as the number of sites in which taxa occurred divided by the total number of sample sites in the 0 to 20 feet depth zone (See example). Frequency of occurrence was also calculated within each of the four depth zones (Table 1).

Example:

In Farm Island Lake there were 683 samples sites in the 0-20 feet zone.
 Coontail (*Ceratophyllum demersum*) occurred in 68 sites.
 Coontail frequency in 0-20 feet zone = $(68/683) * 100 = 10\%$

Surveyors described bottom substrate at each sample site where water depth was seven feet and less. Standard substrate classes were used (Table 2) and if several substrate types occurred at a site, surveyors recorded the most common type.

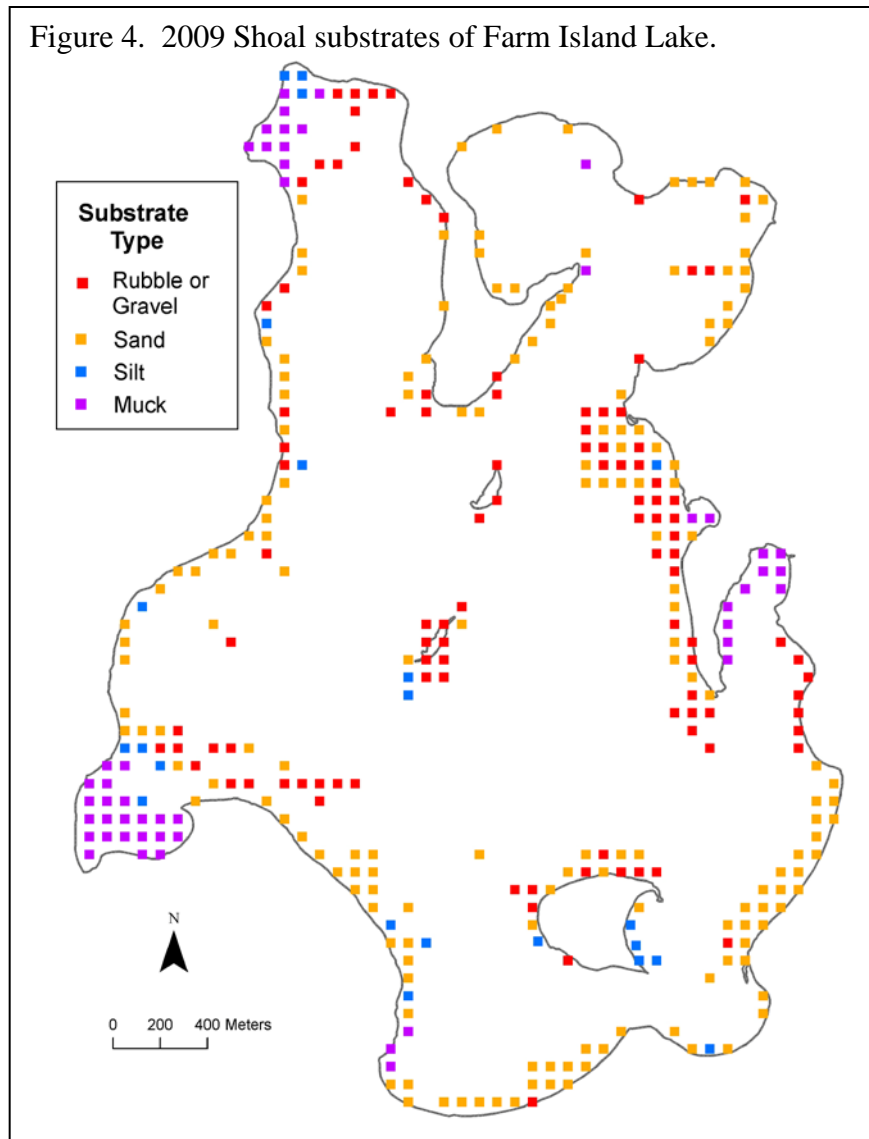
Table 2. Substrate classes

muck	decomposed organic material
marl	calcareous material
silt	fine material with little grittiness
sand	diameter less than 1/8 inch
gravel	diameter 1/8 to 3 inches
rubble	diameter 3 to 10 inches
boulder	diameter over 10 inches

Results

Shoal substrates

The shoal substrates of Farm Island Lake were primarily hard substrates of sand, gravel and rubble. Softer substrates of silt and muck were found in shallow bays (Figure 4).



Distribution of aquatic plants

Vegetation occurred to a depth of 17 feet but was sparse in depths greater than 15 feet. Within the 0-15 feet depth zone (which includes about 40% of the lake), 49% of the sites contained vegetation. Beyond the 15 feet depth, only 6% of the sites contained plants. The broadest bands of vegetation were in the northern bays and the southwest bay, where plant beds extended lakeward 300 to 500 meters (1,000 to 1,600 feet) (Figure 5). Along shorelines with steeper drop-offs, plant beds were often limited to narrow shallow zones within 75 meters (250 feet) of shore.

Figure 5. Distribution of aquatic plants in Farm Island Lake, 2009.

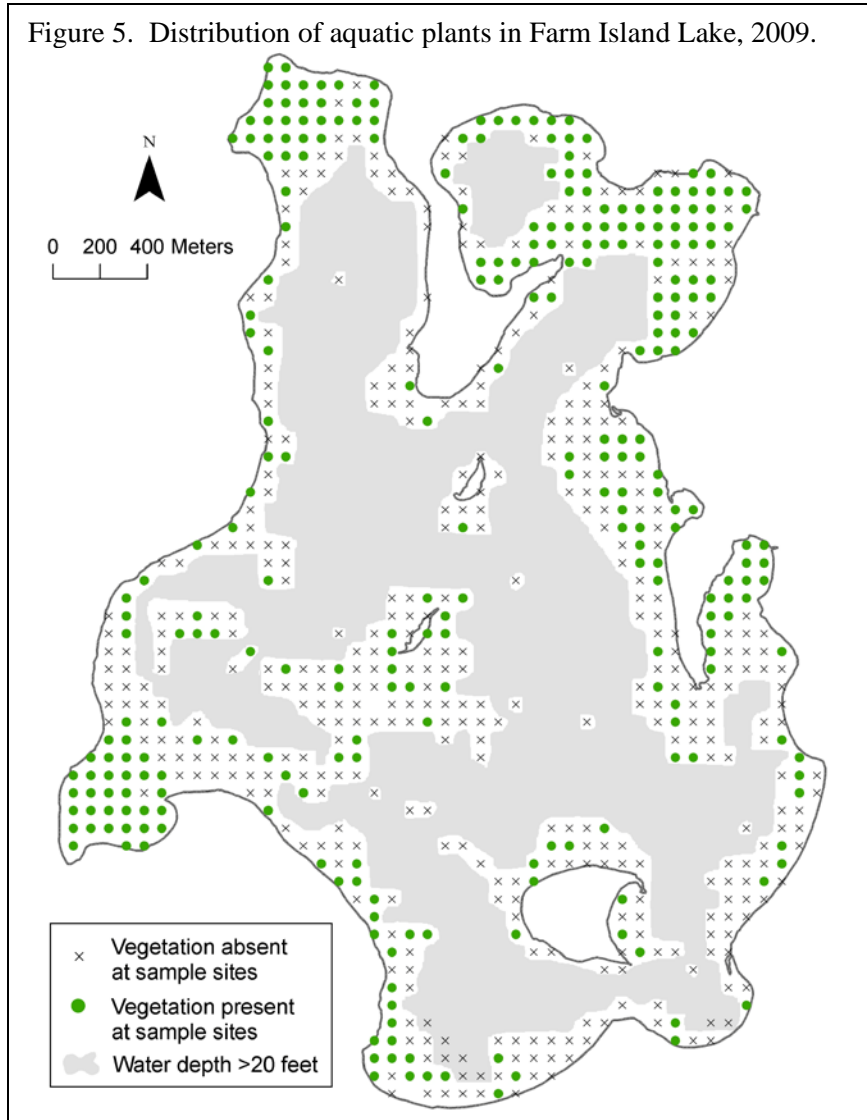
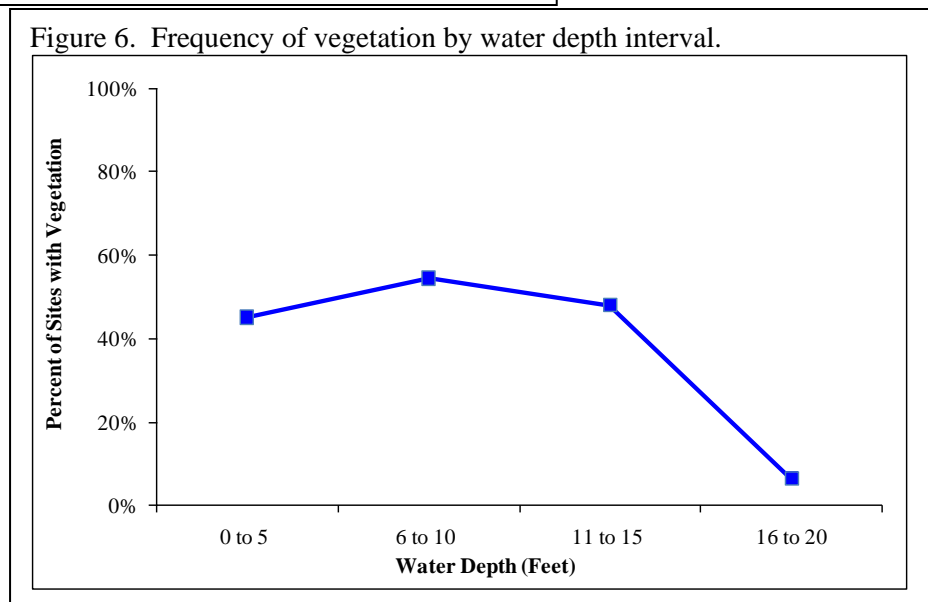


Figure 6. Frequency of vegetation by water depth interval.



Number and types of plants recorded

Twenty-six native aquatic plant taxa were recorded in Farm Island Lake including six emergent, two floating-leaved and 18 submerged taxa (Table 3). One non-native submerged plant, curly-leaf pondweed (*Potamogeton crispus*), was documented during the survey.

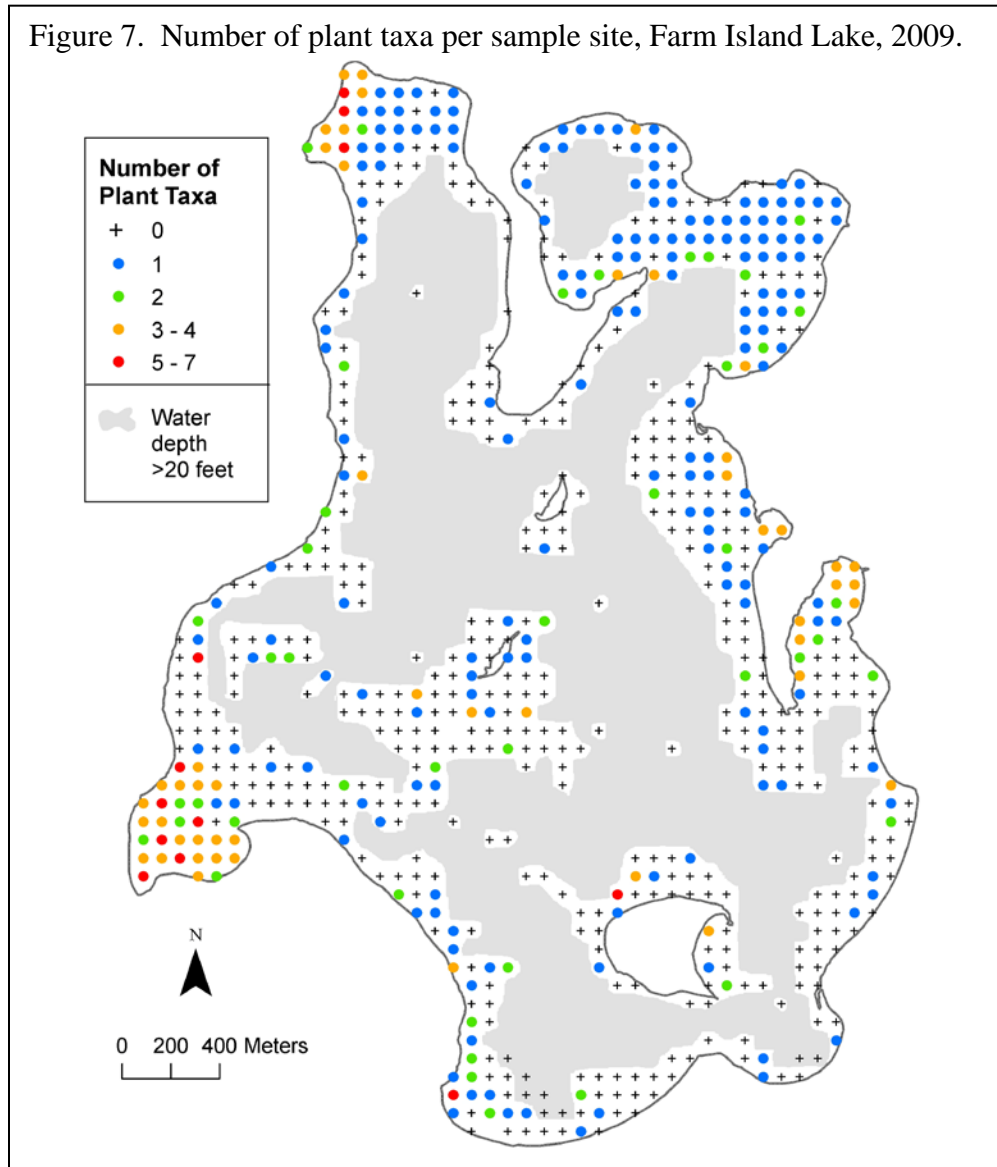
Table 3. Frequency of aquatic plants in Farm Island Lake Point-intercept survey, June 2009.

(Frequency is the percent of sample sites in which a plant taxon occurred in the 0-20 ft water depth.)

Life Form		Common Name	Scientific Name	Frequency N=683
SUBMERGED Plants grow primarily under water surface. Upper leaves may float near the surface and flowers may extend above the surface. Some species may also form floating leaves. Plants may or may not be anchored to the lake bottom.	Non-native	Curly-leaf pondweed	<i>Potamogeton crispus</i>	16
	Native	Coontail	<i>Ceratophyllum demersum</i>	10
		Muskgrass	<i>Chara</i> sp.	8
		Star duckweed	<i>Lemna trisulca</i>	7
		White-stem pondweed	<i>Potamogeton praelongus</i>	6
		Robbins pondweed	<i>Potamogeton robbinsii</i>	5
		Flat-stem pondweed	<i>Potamogeton zosteriformis</i>	3
		Northern water milfoil	<i>Myriophyllum sibiricum</i>	2
		White water buttercup	<i>Ranunculus aquatilis</i>	2
		Canada waterweed	<i>Elodea canadensis</i>	2
		Water marigold	<i>Megaladonta beckii</i>	1
		Greater bladderwort	<i>Utricularia vulgaris</i>	1
		Illinois pondweed	<i>Potamogeton illinoensis</i>	1
		Large-leaf pondweed	<i>Potamogeton amplifolius</i>	1
		Clasping-leaf pondweed	<i>Potamogeton richardsonii</i>	<1
		Water star-grass	<i>Zosterella dubia</i>	<1
		Narrow-leaf pondweed	<i>Potamogeton</i> sp.	<1
		Stonewort	<i>Nitella</i> sp.	<1
Watermoss	Not identified to genus	Present		
FLOATING Plants are rooted in lake bottom with leaves that float on water surface.		White waterlily	<i>Nymphaea odorata</i>	<1
		Yellow waterlily	<i>Nuphar variegata</i>	<1
EMERGENT Plants extend well above the water surface and are usually found in shallow water, near shore.		Wild rice	<i>Zizania palustris</i>	2
		Hard-stem bulrush	<i>Scirpus acutus</i>	1
		Needle grass	<i>Eleocharis acicularis</i>	<1
		Spikerush	<i>Eleocharis</i> sp.	<1
		Burreed	<i>Sparganium</i> sp.	<1
		Cattail	<i>Typha</i> sp.	Present

Present = found during survey, but not in survey sites

The number of plant taxa found at each one square meter sample site ranged from zero to seven. Shallow areas of protected bays contained the highest number of plant taxa. In depths greater than 5 feet, most sites contained fewer than two plant taxa (Figure 7).



Curly-leaf pondweed

The most commonly sampled plant in Farm Island Lake was [curly-leaf pondweed](#) (*Potamogeton crispus*) (Figure 8). This is a non-native, submerged plant that has been present in Minnesota since at least 1910 (Moyle and Hotchkiss 1945) and is now found in more than 700 Minnesota lakes (Invasive Species Program 2008). Like many native submerged plants, it is perennial but has a unique life cycle that may provide a

Figure 8. Curly-leaf pondweed

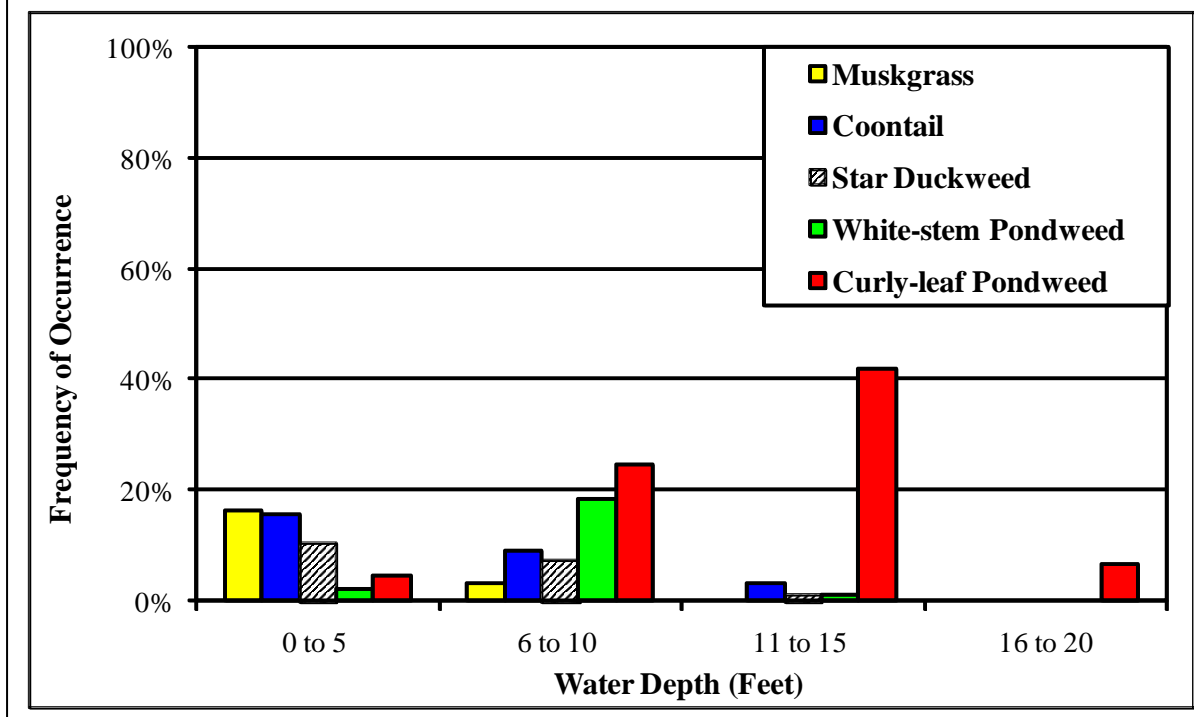


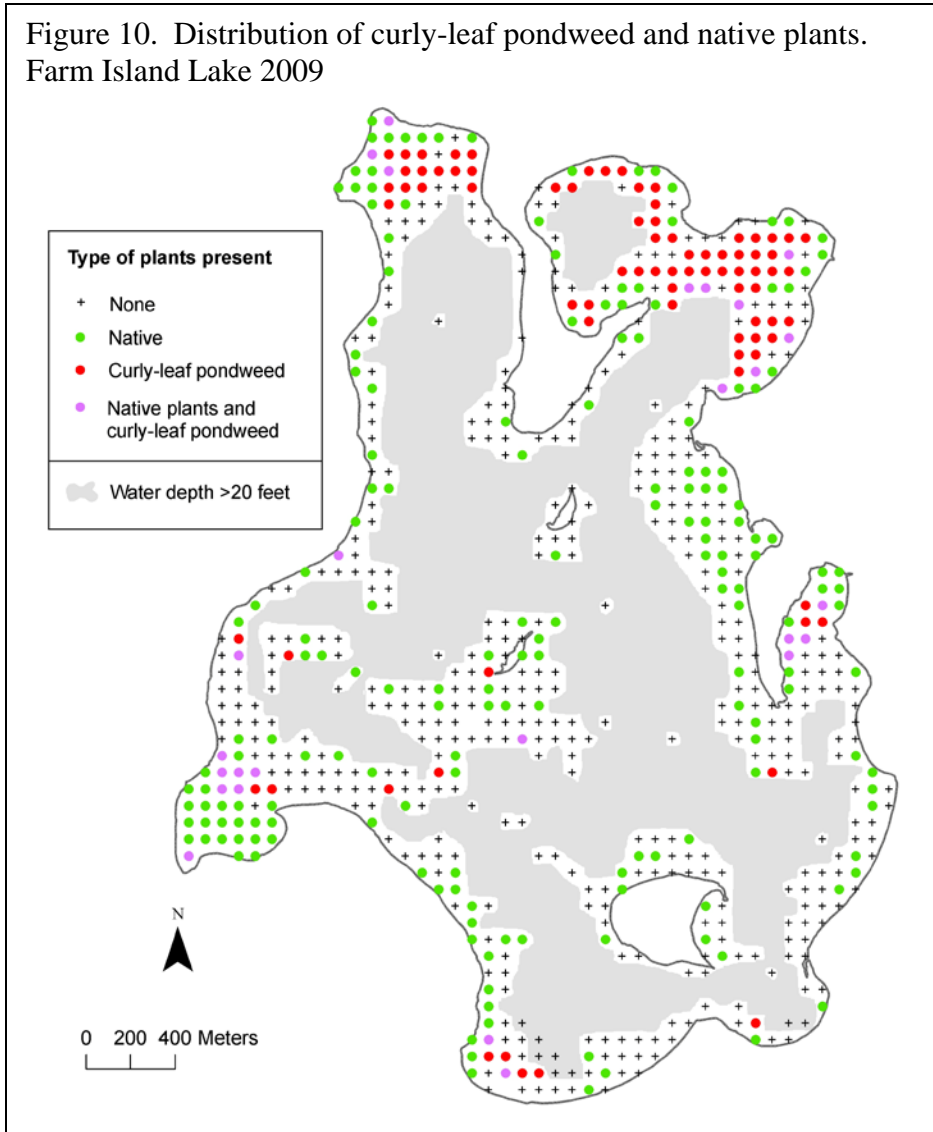
competitive advantage over native species. Curly-leaf pondweed is actually dormant during late summer and begins new growth in early fall. Winter foliage is produced and continues to grow under ice (Wehrmeister and Stuckey 1978). Curly-leaf reaches its maximum growth in May and June, when water temperatures are still too low for most native plant growth. In late spring and early summer, curly-leaf plants form structures called “turions” which are hardened stem tips that break off and fall to the substrate. Turions remain dormant through the summer and germinate into new plants in early fall (Catling and Dobson 1985).

The foliage of curly-leaf pondweed does provide some fish and wildlife habitat, but it may also create problems in some lakes, or in areas of some lakes. During its peak growth in spring, curly-leaf may reach the water surface at certain depths and create dense mats. These dense growths may compete with native vegetation and can also cause problems for recreational lake users.

In Farm Island Lake, curly-leaf pondweed was found in 16% of the survey sites (Table 3). It was found in water depths from two to 17 feet and was most frequent in the 11 to 15 feet depth zone, where it occurred in 42% of the sites (Figure 9). It was the dominant plant in depths greater than five feet and was the only plant found in depths greater than 15 feet. At 12% of the sites, curly-leaf pondweed was the only plant found; it was found at numerous locations around the lake and was most common in the northern bays (Figure 10).

Figure 9. Frequency of common plants by water depth interval. Farm Island, Spring 2009.

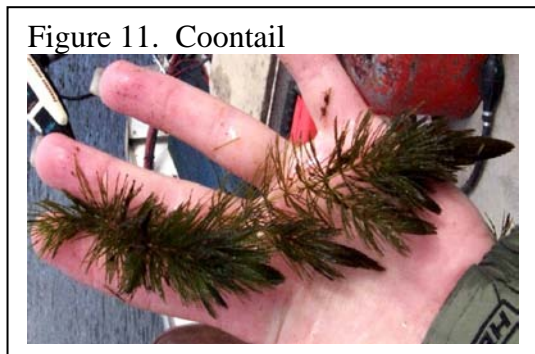




Native submerged plants

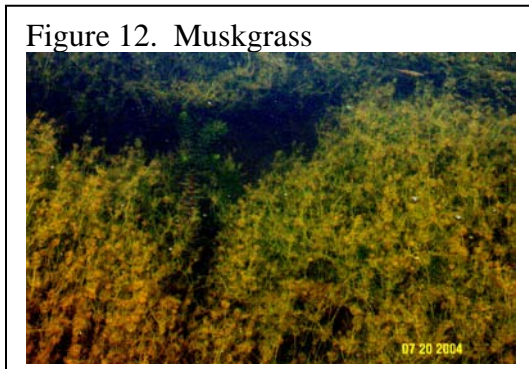
As a group, native plants dominated Farm Island Lake. Thirty percent of all of the survey sites contained at least one native plant. In sites that were vegetated, 63% contained only native plants (Figure 10). Native plants occurred around the entire perimeter of the lake but were generally restricted to depths less than 11 feet (Figure 9).

[Coontail](#) (*Ceratophyllum demersum*) (Figure 11) was the most commonly sampled native plant and occurred in 10% of the sample sites (Table 3). Coontail grows entirely submerged and its roots are only loosely anchored to the lake bottom. It is adapted to a broad range of lake conditions and is tolerant of higher turbidity and can grow in muck

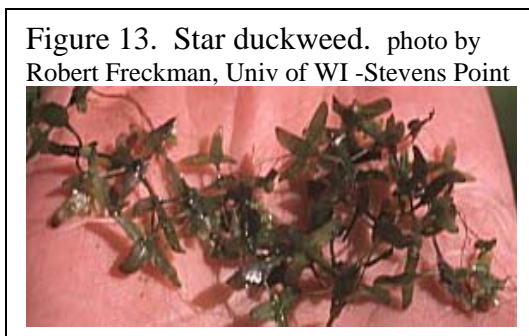


substrates. Coontail is perennial and can over winter as a green plant under the ice and then begins new growth early in the spring, spreading primarily by stem fragmentation. The finely divided leaves of this plant provide a home for insects valuable as fish food.

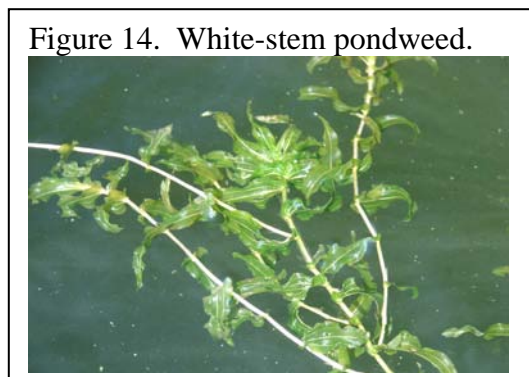
[Muskgrass](#) (*Chara* sp.) (Figure 12) occurred in 8% of the sites and was the most common plant in the 0 to 5 feet depth. This macroscopic, or large, algae is common in many hard water Minnesota lakes. It has a brittle texture and a characteristic “musky” odor. Because muskgrass does not form true stems, it is a low-growing plant, often found entirely beneath the water surface where it may form low “carpets” on the lake bottom. Muskgrass is adapted to variety of substrates and is often the first taxa to colonize open areas of lake bottom where it can act as a sediment stabilizer. Beds of muskgrass can provide important fish spawning and nesting habitat.



[Star duckweed](#) (*Lemna trisulca*) (Figure 13) often occurs submerged near the lake bottom but it does not anchor to the substrate and can float freely with the current. Star duckweed was found in 7% (Table 3) of all survey sites in Farm Island Lake and was most common from 0 to 5 feet depth zone (Figure 9).



[White-stem pondweed](#) (*Potamogeton praelongus*), (Figure 14), is one of several species that are often called “cabbage” plants by anglers. The leaves are lance to oval shaped and clasp the stem and the leaf tips are boat shaped. The fruits of pondweeds are a favorite duck food and the broad leaves provide food and shelter for fish. White-stem pondweed is an indicator of good water clarity in lakes. In Farm Island Lake white-stem pondweed was the most common broad-leaf pondweed and was found in 6% of all survey sites (Table 3). White-stem pondweed was found most frequently in the 6 to 10 feet depth zone (Figure 9).



Several plant species found in previous summer surveys of Farm Island Lake were not located during the early spring 2009 survey. These plants likely still occur in the lake but were not observed in 2009 because they had not yet germinated and/or reached maturity.

For more information:

on the values of aquatic plants: [Value of aquatic plants](#)

on curly-leaf pondweed: [DNR Invasive Species Annual Report](#) (see pg. 63)

Literature Cited

- Catling, P. M. and I. Dobson. 1985. The biology of Canadian weeds. 69. *Potamogeton crispus* L. Canadian Journal of Plant Science 65:655-668.
- 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
- MnTaxa. 2009. Minnesota State checklist of vascular plants. Minnesota Department of Natural Resources, Division of Ecological Resources, St. Paul.
- MnDNR Invasive Species Program. 2008. Invasive Species of Aquatic Plants and Wild Animals in Minnesota: Annual Report for 2004. Minnesota Department of Natural Resources, St. Paul, MN. http://www.dnr.state.mn.us/eco/pubs_invasives.html
- MnDNR Fisheries Lake Files. Farm Island Lake, Aitkin County, MN, ID# 01015900. Vegetation surveys conducted in August 1946, July 1957, September 1970 survey, August 1980 survey. 500 Lafayette Rd., St. Paul, MN.
- MPCA. 2008. Minnesota Pollution Control Agency. St. Paul, MN. Lake Water Quality Assessment Program. Lake Water Quality Data Search website: <http://www.pca.state.mn.us/water/lkwqSearch.cfm> (accessed June 2009)
- Moyle, J. B. and N. Hotchkiss. 1945. The aquatic and marsh vegetation of Minnesota and its value to waterfowl. Minnesota Department of Conservation. Technical Bulletin 3. 122 pp.
- Wehrmeister and Stuckey. 1978. The life history of *Potamogeton crispus* with emphasis on its reproductive biology. Ohio Journal of Science. 78 (April program and abstract) supplement: 16.