Aquatic Vegetation of Mound Lake
Todd County, Minnesota
(DOW 77-0007-00)
June 16, 2005

Mound Lake, June 16, 2005

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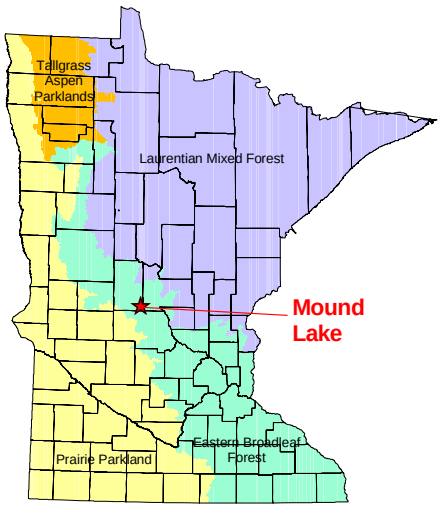
Summary

An aquatic vegetation survey of Mound Lake (77-0007-00), Todd County, Minnesota, was conducted on June 16, 2005. Plants were found distributed throughout the lake basin to a maximum depth of twenty-one feet, although most vegetation occurred in depths less than 16 feet. Twenty-one native aquatic plant species were identified, including 17 submerged, two floating-leaved and two free-floating species. Most plant species were restricted to water depths from shore to ten feet deep and the shore to five feet depth zone contained the highest number of species. The most frequently occurring plants were northern watermilfoil (*Myriophyllum sp.*), (found in 54 % of the sample sites), flatstem pondweed (*Potamogeton zosteriformis*) (40 %), narrowleaf pondweed group (*Potamogeton* sp.) (39%), and coontail (*Ceratophyllum demersum*) (26%). The non-native species, curly-leaf pondweed *(Potamogeton crispus)* has been present in Mound Lake for at least 20 years and in 2005 was found in only 8% of the sample sites. Relatively high water clarity and an abundant native plant community may help limit the abundance of this exotic in Mound Lake.

Introduction

Figure 1. Location of Mound Lake, Todd Co, MN (77-0007-00)

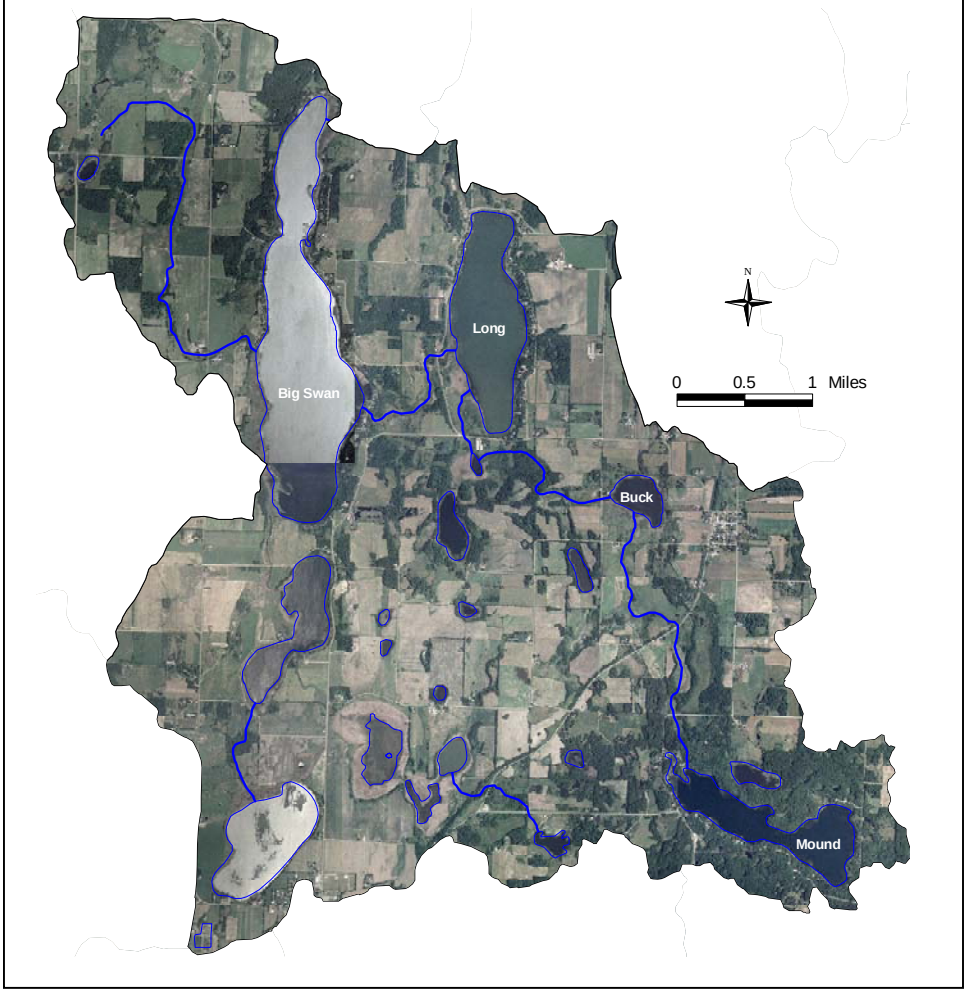


Survey Lake Description

Mound Lake (DOW 77-0007-00) is located about two miles south of the town of Burtrum in Todd County, Minnesota. It occurs within an ecological region known as the Eastern Broadleaf Forest Province, which is the transition zone between the western prairie region and the true forested region to the northeast (Fig. 1).

The sub-watershed that includes Mound Lake is primarily agricultural land, however the uplands immediately surrounding Mound Lake remain forested with deciduous trees (Fig. 2). There is no direct inlet to the lake and flow leaves through a stream on the northwest end which runs north to Buck Lake. Flow continues northeast to Long Lake and then west to Big Swan Lake.

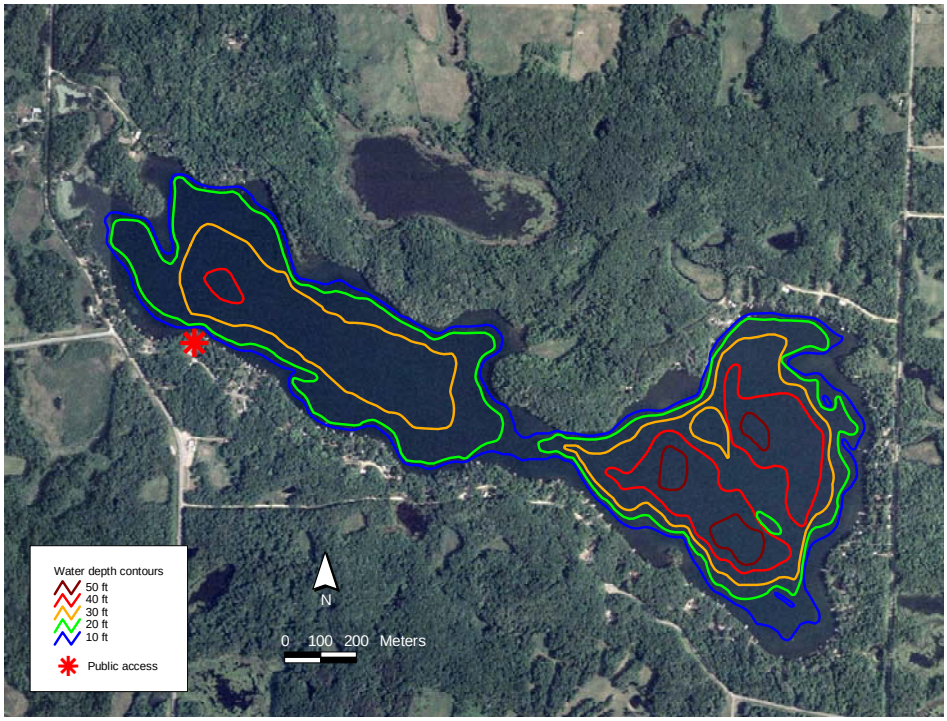
Figure 2. Landuse within subwatershed containing Mound Lake (77-0007-00). Photo Source: Farm Service Admin. 2003.



Mound Lake has a surface area of 273 acres and a maximum depth of about 57 feet. The lake has a narrow shallow zone and nearly 70 percent of the lake is deeper than 15 feet (Fig. 3).

The lake is described as mesotrophic (moderate nutrients) with high water clarity as indicated by the mean summer Secchi depth between 1991 and 2004 of 15.4 feet (MPCA 2004).

Figure 3. Water depth contours of Mound Lake (77-0007-00). Photo: Farm Service Admin 2003



Vegetation Survey Objectives

The purpose of the 2005 survey of Mound Lake was to describe the current aquatic plant community including:

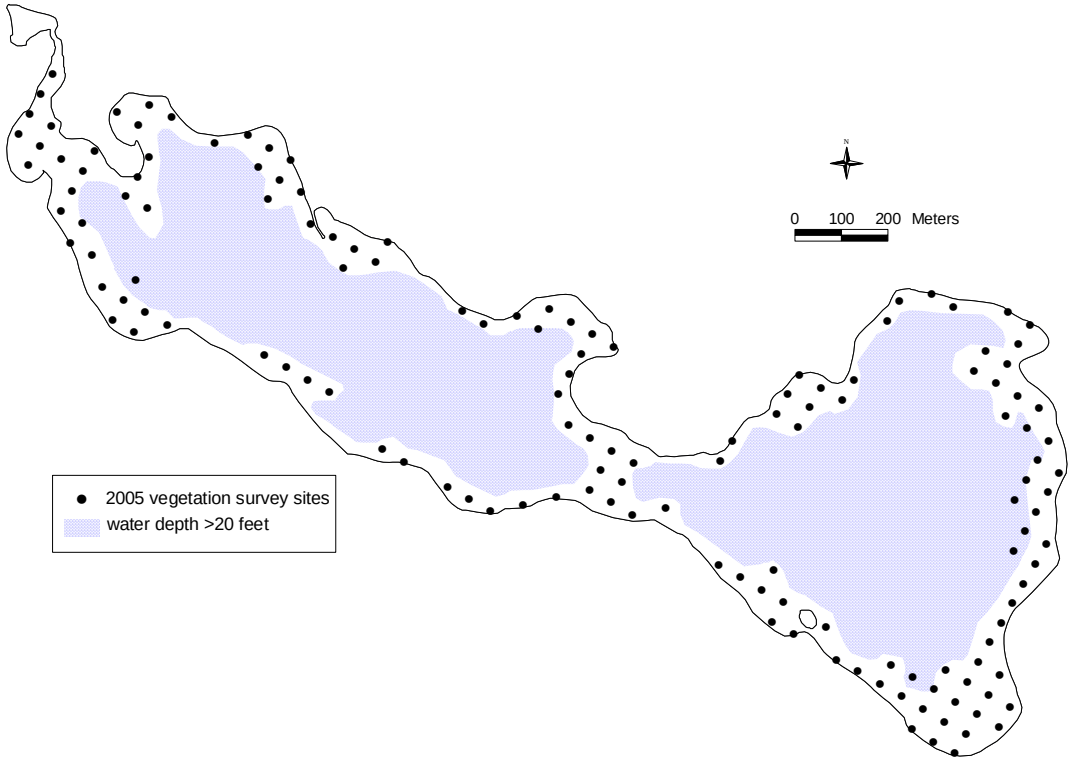
1) Estimate the maximum depth of rooted vegetation
2) Estimate the percent of the lake occupied by rooted vegetation
3) Record the aquatic plant species that occur in the lake
4) Estimate frequencies of occurrence of individual species
5) Develop maps of the distribution of the common species

Methods

A Point-Intercept vegetation survey of Mound Lake was conducted on June 16, 2005 following the methodology described by Madsen (1999). A Geographic Information System (GIS) was used to generate sample points across the lake surface in a 50 meter by 50 meter grid. In the field, surveyors decided not to sample in depths greater than 25 feet because vegetation was sparse beyond the 20 foot depth. As a result, 146 sites were actually sampled and 140 of those sites occurred within the zone from shore to the 20 feet depth (Fig. 4).

After the survey points were generated in the GIS, they were uploaded into a Global Positioning System (GPS) unit, which 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 eight feet and an electronic depth

Figure 4. 2004 vegetation survey sites on Mound Lake, Todd Co. (77-0007-00)



finder in water depths greater than eight feet. The surveyors recorded all plant species found within a one meter squared sample site at the pre-designated side of the boat. A double-headed, weighted garden rake (Fig. 5), attached to a rope was used to survey vegetation not visible from the surface. If non-native species such as curly-leaf pondweed (*Potamogeton crispus*) were present at a site, surveyors recorded whether or not the plants formed surface mats at that site.

Nomenclature followed Crow and Hellquist (2000). Voucher specimens were collected for most plant species and are stored at the MnDNR in Brainerd.

Data were entered into a Microsoft Access database and 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 the entire sampled area (0-25 feet) and 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 and 21 to 25 feet.

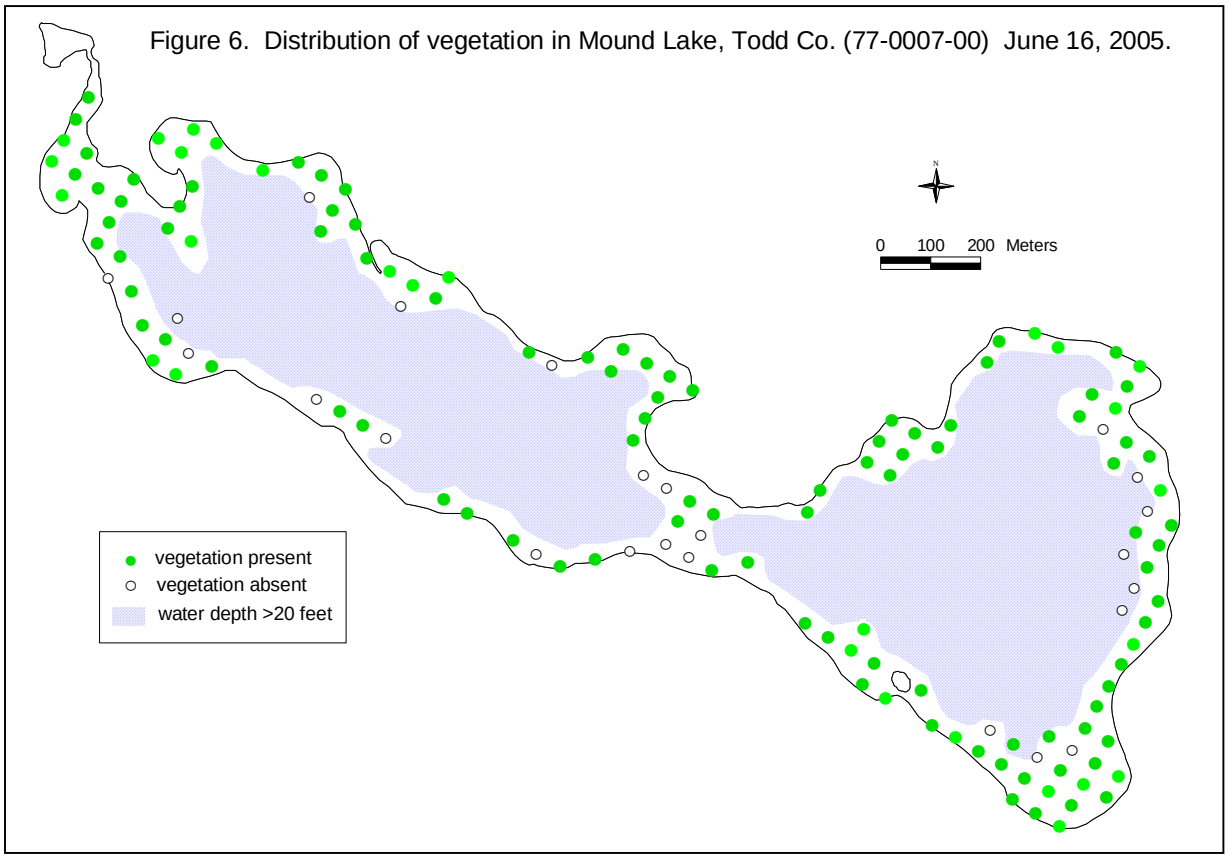
<u>Example:</u>
There were 145 sample sites within the shore to 25 feet zone.
Northern milfoil was found in 78 of those sites.
Frequency of northern milfoil = (78 / 145)*100 = 54%

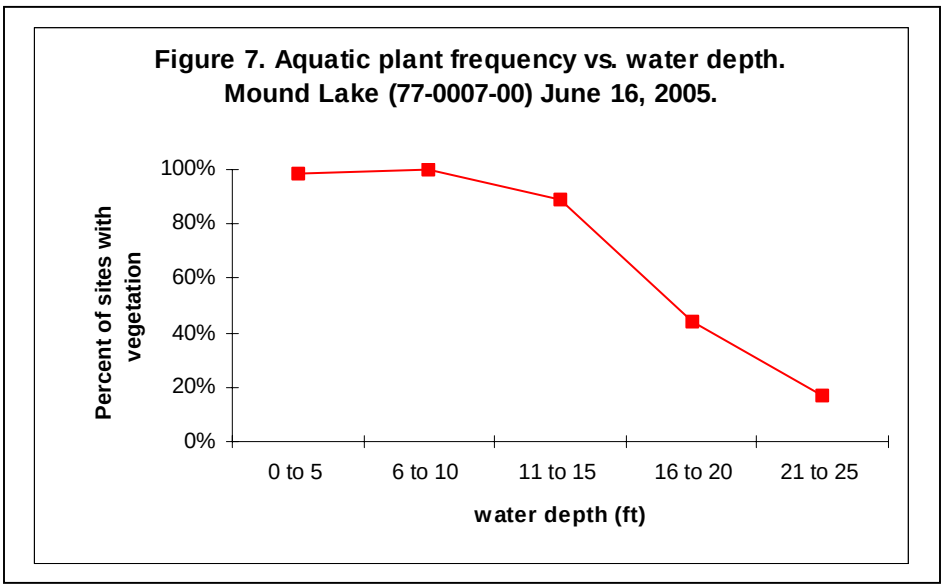
Figure 5. Rake used to sample vegetation.

Results

Distribution of vegetation by water depth

In Mound Lake, aquatic plants were found in 84 percent of the sampled sites (Fig. 6) to a maximum depth of 21 feet. Plant abundance varied with water depth and vegetation was most common in depths less than 11 feet where nearly 100 percent of the sites were vegetated (Fig. 7).





Types of aquatic plants found

Twenty-one native species of aquatic plant species were identified during the survey, including 17 submerged, two free-floating, and two floating-leaved species (Table 1). No in-lake emergent plants such as bulrush were found and shoreline emergents were not recorded. One non-native submersed species, curly-leaf pondweed (*Potamogeton crispus*) was found during the survey.

Table 1. Aquatic Plants of Mound Lake, Todd County (DOW 77-0007-00)
June 16, 2005

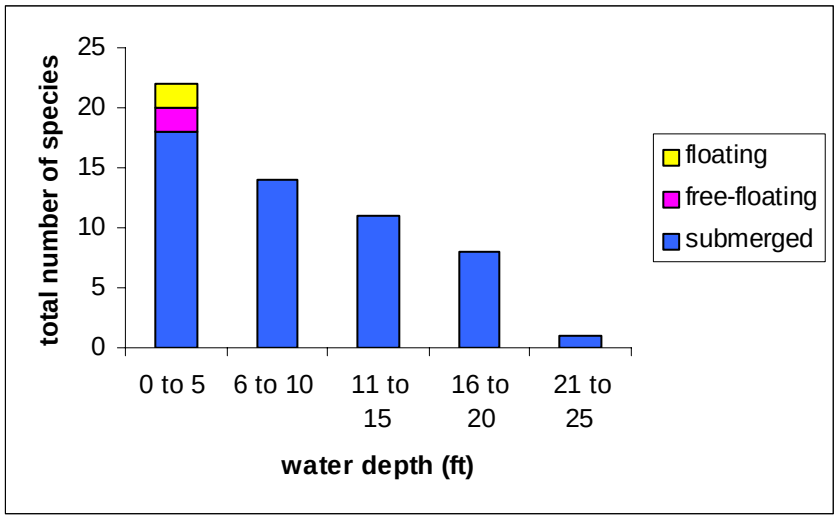
Frequency calculated for vegetated zone (shore to 25 feet depth)
Frequency = percent of sites in which species occurred
145 sample sites

Life Forms	Common Name	Scientific Name	Voucher	Frequency
SUBMERGED These plants grow primarily under the water surface. Upper leaves may float near the surface and flowers may extend above the surface. Plants are rooted or loosely anchored to the lake bottom.	Northern water milfoil	*Myriophyllum sp.**	x	0.54
	Flatstem pondweed	*Potamogeton zosteriformis*	x	0.40
	Narrow-leaf pondweed	*Potamogeton sp.***	x	0.39
	Coontail	*Ceratophyllum demersum*	x	0.31
	Muskgrass	*Chara sp.*	x	0.26
	White-stem pondweed	*Potamogeton praelongus*	x	0.13
	Robbins' pondweed	*Potamogeton robbinsii*	x	0.12
	White water buttercup	*Ranunculus sp.*	x	0.09
	Curly-leaf pondweed	*Potamogeton crispus*	x	0.08
	Illinois pondweed	*Potamogeton illinoensis*		0.08
	Water stargrass	*Zosterella dubia*	x	0.08
	Water marigold	*Megaladonta beckii*	x	0.06
	Canada waterweed	*Elodea canadensis*	x	0.03
	Clasping-leaf pondweed	*Potamogeton richardsonii*		0.03
	Variable pondweed	*Potamogeton gramineus*		0.01
	Stonewort	*Nitella sp.*		0.01
	Sago pondweed	*Stuckenia pectinata*	x	0.01
	Wild celery	*Vallisneria americana*		0.01
FREE-FLOATING These plants float on the water and drift with water currents.	Star duckweed	*Lemna trisulca*	x	0.03
	Lesser duckweed	*Lemna minor*		0.01
FLOATING These plants are rooted in the lake bottom and have leaves that float on the water surface.	Yellow waterlily	*Nuphar variegata*		0.04
	Floating leaf pondweed	*Potamogeton natans*	x	0.03

* either *Myriophyllum sibiricum or Myriophyllum exalbescens*
**include Potamogeton freisii

The water depth zone from shore to five feet contained the most species (Fig. 8). Floating and free-floating-leaved plants were restricted to this shallow depth zone. Most submerged species were found within the shore to five feet and the six to ten feet zones but as water depth increased, fewer species were located. Eight species were found in depths greater than 15 feet and only one species occurred in depths greater than 20 feet.

Figure 8. Total number and types of species at each water depth interval. Mound Lake (77-0007-00) June 16, 2005.



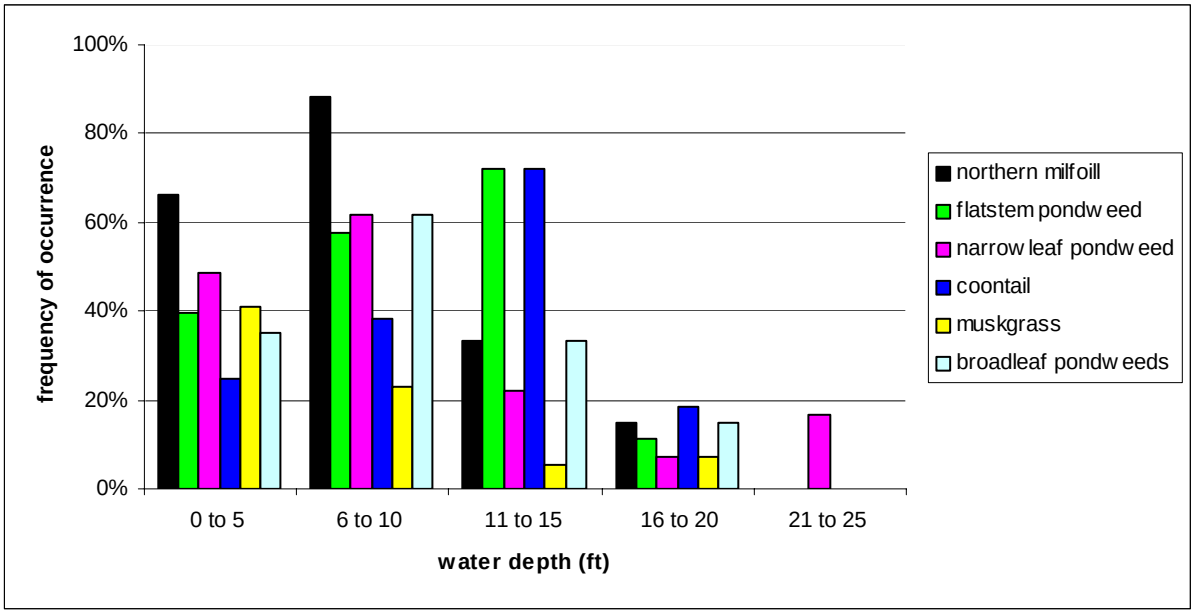
Common native species

These four most common plants found in Mound Lake were native submerged species: northern watermilfoil (*Myriophyllum sp.*), flat-stem pondweed (*Potamogeton zosteriformis*), narrow-leaf pondweed (*Potamogeton* sp.), and coontail (*Ceratophyllum demersum*).

Northern watermilfoil (either *Myriophyllum sibiricum or Myriophyllum exalbescens*) (Fig. 9) is a rooted, perennial submerged plant with finely dissected leaves. It may reach the water surface, particularly in depths less than ten feet and its flower stalk extends above the water surface. It spreads primarily by stem fragments and overwinters by hardy rootstalks and winter buds. Northern watermilfoil is not tolerant of turbidity and grows best in clear water lakes. For information on how to distinguish this native plant from the non-native, Eurasian watermilfoil: identification. Northern watermilfoil was the most frequently occurring plant in Mound Lake, occurring in 54 percent of the sample sites (Table 1). This species was most common in water depths

Figure 9. Mixed bed of Northern watermilfoil and flatstem pondweed in Mound Lake (77-0007-00) June 16, 2005.

Figure 10. Frequency of common plant species at different water depth intervals. Mound Lake (77-0007-00) June 16, 2005.



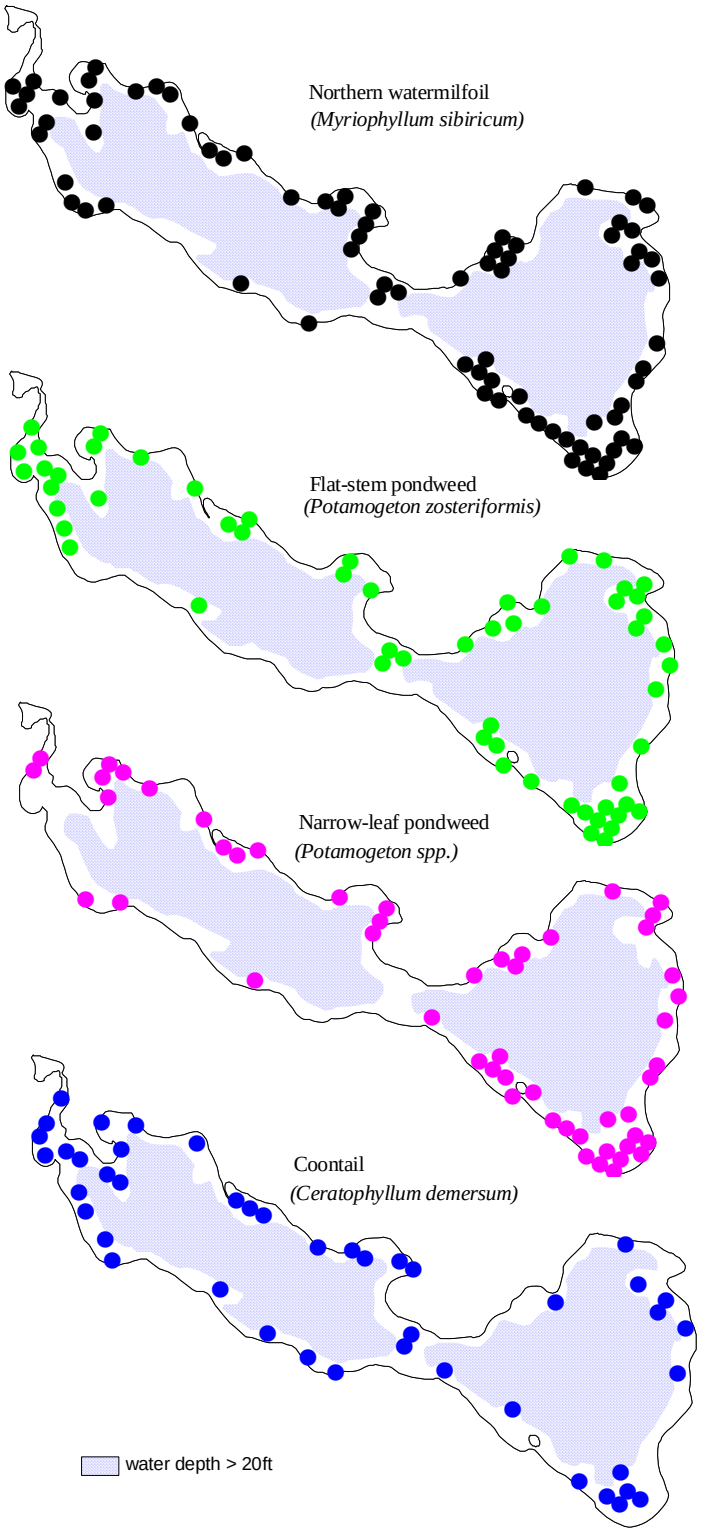
less than 16 feet and reached its maximum abundance between depths of six and ten feet, where it was the most abundant species (Fig. 10).

Flat-stem pondweed (*Potamogeton zosteriformis*) is a rooted, perennial submerged plant with flattened, grass-like leaves. Depending on water clarity and depth, it may reach the water surface in areas of lakes and its flower stalk may extend above the water. Like northern watermilfoil, it overwinters by rhizome and winter buds. It does not grow well in turbid lakes. In Mound Lake, it was found in 40 percent of the sites surveyed in 2005 (Table 1, Fig. 11), occurring most frequently in the water depths up to fifteen feet (Fig 10).

Narrow leaf pondweed (*Potamogeton* sp.) is a rooted, perennial submerged plant with small, thin leaves. Leaves grow entirely below the water surface but flowers extend above the water. This plant also overwinters as rhizomes and winter buds. There are several different types of pondweeds that are included in this general group and without fruit or flowers they are difficult to distinguish. In Mound Lake, Freis' pondweed (*Potamogeton freisii*) was positively identified but there may be additional narrow-leaf pondweed species present in the lake. Narrow-leaf pondweeds were found in 39 percent of the sample sites in Mound Lake (Table 1). This was the only plant found beyond the 20 feet water depth and it was most common in depths from six to ten feet (Fig. 10).

Coontail (*Ceratophyllum demersum*) grows entirely submerged and is adapted to a broad range of lake conditions, including turbid water. Coontail is perennial and can overwinter as a green plant under the ice and then begins new growth early in the spring. It is loosely rooted to the lake bottom and spreads primarily by stem fragmentation. In Mound Lake it occurred in 31 percent of the sites (Table 1). It was most common in depths of 11 to 15 feet (Fig. 10).

Figure 11. Distribution of common plant species in Mound Lake (77-0007-00)

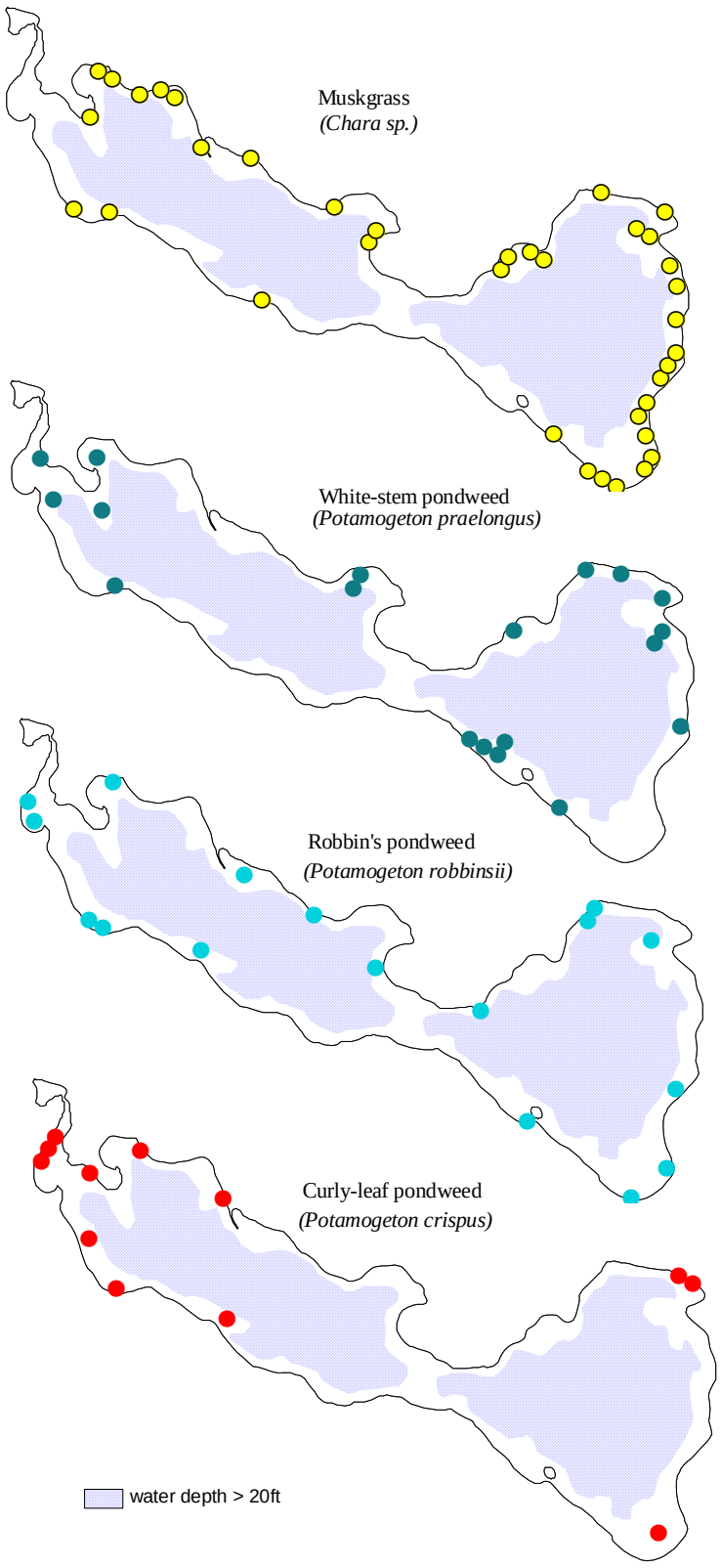


The four most common submerged species had widespread distributions in Mound Lake (Fig. 11). Concentrations of these species were found at the west and east ends of the lake as well as shallow areas on the north and south shores.

Other common, native submerged species were muskgrass (*Chara* sp.), whitestem pondweed (*Potamogeton praelongus*) and Robbin's pondweed (*Potamogeton robbinssi*). All other species occurred in less than ten percent of the sample sites (Table 1).

Muskgrass (*Chara* sp.) is a macroscopic, or large, algae that is common in many hardwater Minnesota lakes. It has brittle texture and a characteristic "musky" odor. Because this species 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 species to invade open areas of lake bottom where it can act as a sediment stabilizer. In Mound Lake, muskgrass was found in 26 percent of the survey sites (Table 1) and was most common in water depths up to five feet (Fig 10.) Muskgrass was mostly found along the east and north shores of Mound Lake (Fig. 12).

Figure 12. Distribution of common plant species in Mound Lake (77-0007-00)



Broadleaf pondweeds, often called "cabbage" plants were another important group of submerged plants in the lake. In Mound Lake, this group includes white-stem pondweed (*P. praelongus*), Robbin's pondweed (*P. robbinssi*), Illinois pondweed (P. illinoenis) and claspingleaf (P. richardsonii). Whitestem and Robbin's were the most abundant broadleaf pondweeds and were found in 13 and 12 percent of the sample sites, respectively (Table 1). White-stem pondweed and Robbin's pondweed often grow in deeper water than other species and in Mound Lake they occurred to a maximum depth of 17 feet and were most abundant in depths of six to ten feet (Fig. 10). Both species were found scattered around the shoreline (Fig. 12).

Non-native submerged species

Curly-leaf pondweed (*Potamogeton crispus*) is a non-native submerged species that was confirmed in Mound Lake during a 1985 survey (MnDNR Fisheries Lake Files) but may have been present in the lake earlier than this date. This species has been present in Minnesota since at least 1910 (Moyle and Hotchkiss 1945) and is now found in at least 700 Minnesota lakes (Invasive Species Program 2005). It is closely related to native pondweeds, such as whitestem, flatstem, robbins and clasping-leaf, but it has a unique life cycle which, in some lakes, gives it a 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).

In Mound Lake, curly-leaf pondweed occurred in only eight percent of the sample sites (Table 1) and was found in depths from two to 14 feet. It was found in the west end of the lake and at isolated locations on the east end (Fig. 12). Surveyors did not find any area where the plant formed dense surface mats.

Discussion

Clear water allows for aquatic plants to grow to depths of about 20 feet in Mound Lake, but there is only a limited area of the lake where water is shallow enough for plant growth. The lake supports a relatively diverse plant community and areas with intact aquatic vegetation communities represent valuable fish habitat, and should be protected. The different submerged plant life forms, such as broad-leaved pondweeds, grass-like plants, and species with finely-dissected leaves, provide diverse structure for invertebrates and fish. Several of the submerged species found in Mound Lake require high water clarity for growth and are not found in lakes with high turbidity.

While the non-native species, curly-leaf pondweed, is present in Mound Lake, it was found in only eight percent of the sample sites and is not an important part of the lake plant community. As a comparison, in nearby Big Swan Lake curly-leaf was found in 65 percent of the sample sites in 2004 (Perleberg, unpublished). Factors that may help limit curly-leaf growth in Mound Lake include the abundance of native plant species and the relatively intact shoreland buffer zone, which in turn helps maintain high water clarity required by many of the native plant species.

The 2005 vegetation survey gives a "snapshot" of Mound Lake plant community. Data collected during the 2005 survey can be compared to future quantitative surveys of Mound Lake to better estimate how the plant community may be changing. Monitoring changes in aquatic plant communities can help reflect changes in the overall water quality of the lake and watershed.

In general, factors that may lead to change in native and non-native aquatic plant communities include:

- **Change in water clarity**
  Light availability is a significant factor limiting plant distribution and abundance. The amount of light available to submersed aquatic plants is typically dependent on both water clarity and depth. Excess nutrients, such as elevated phosphorus levels, often result in nuisance algal levels that contribute to decreased water clarity. If Mound Lake water clarity decreases, some native submerged plant species may decline.
- **Snow cover**

Curly-leaf pondweed, in particular, may fluctuate in abundance in response to snow cover. Many native submerged plants also have the ability to grow under the ice, particulary if there is little snow cover and sunlight reaches the lake bottom. In years following low snow cover, curly-leaf and some native submerged plants may increase in abundance.

- **Water temperatures / length of growing season**
  In years with cool spring temperatures, submerged plants may be less abundant than in years with early springs and prolonged warm summer days.
- **Aquatic plant management activities**
  Herbicide and mechanical control of aquatic plants can directly impact the aquatic plant community. Monitoring these control activities can help insure that non-target species are not negatively impacted.
- **Shoreland management activities**
  In order to maintain the relatively good water quality that promotes a healthy aquatic plant community, efforts should be made to minimize disturbance to the aquatic environment through the use of shoreline best management practices. These include minimizing activities that contribute to eutrophication (high-nutrient lake with poor water quality due to nuisance algal blooms) such as fertilizing lawns and malfunctioning septic systems, both of which add nutrients to a lake. A strip of shoreline vegetation provides a buffer zone between the lake and developed residential areas. Benefits include minimizing soil erosion from wave action while the plants uptake excess nutrients that may otherwise flow into the lake. Information on restoring shoreland buffer zones can be found at: lakescaping and shoreline restoration.

Mound Lake, Todd Co., Mn (77-0007-00) June 16, 2005

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