Aquatic Vegetation of
Little Birch Lake
(DOW 77-0089-00)
Todd County, Minnesota

June 24 and 28, 2004

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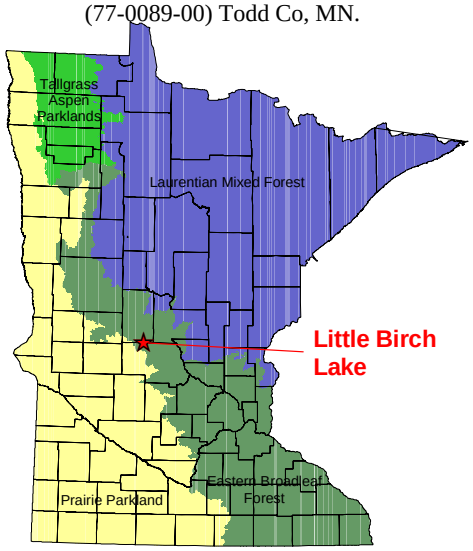
Summary

An aquatic vegetation survey of Little Birch Lake (77-0089-00), Todd County, Minnesota, was conducted on June 24 and 28, 2004. Twenty-seven native aquatic plant species were identified. Plants were found to a depth of 13 feet but most species were restricted to depths less than six feet. Hardstem bulrush (*Scirpus acutus*) was found in 28 percent of the sites and formed extensive beds in the shallow north end of the lake. Muskgrass (*Chara* sp.) dominated the submerged plant community and was found in 51 percent of the sites. Other common submerged species were coontail (*Ceratophyllum demersum)* (16 percent frequency), sago pondweed (*Stuckenia pectinata*) (11 percent), Illinois pondweed (*Potamogeton illinoensis*) (11 percent), Canada waterweed (*Elodea canadensis*) (11 percent) and northern watermilfoil (*Myriophyllum sibiricium*) (9 percent). Two non-native submerged species, curly-leaf pondweed *(Potamogeton crispus)* and Eurasian watermilfoil (*Myriophyllum spicatum*) were present in the lake but were not common.

Introduction

Figure 1. Location of Little Birch Lake (77-0089-00) Todd Co, MN.



Lake Description

Little Birch Lake (DOW 77-0023-00) is located about 13 miles southeast of the town of Long Prairie, Todd County, Minnesota. It occurs within the ecological region known as the Eastern Broadleaf Forest Province, which is the transition zone between the western prairie region and the true forest region to the northeast (Fig. 1).

Little Birch Lake is within the Sauk River Watershed and receives inflow from several unnamed streams. Little Birch Lake outlets to Adley Creek which then flows south to Sylvia Lake and then to the Sauk River; the Sauk River flows south and then east to the Mississippi River (Fig. 2). Within the Sauk River Watershed there are 50 lakes that are at least 100 acres in area and over half of these lakes contain at least one non-native aquatic plant species. Curly-leaf pondweed (*Potamogeton*

Figure 2. Non-native aquatic plants within the Sauk River Watershed that includes Little Birch Lake.

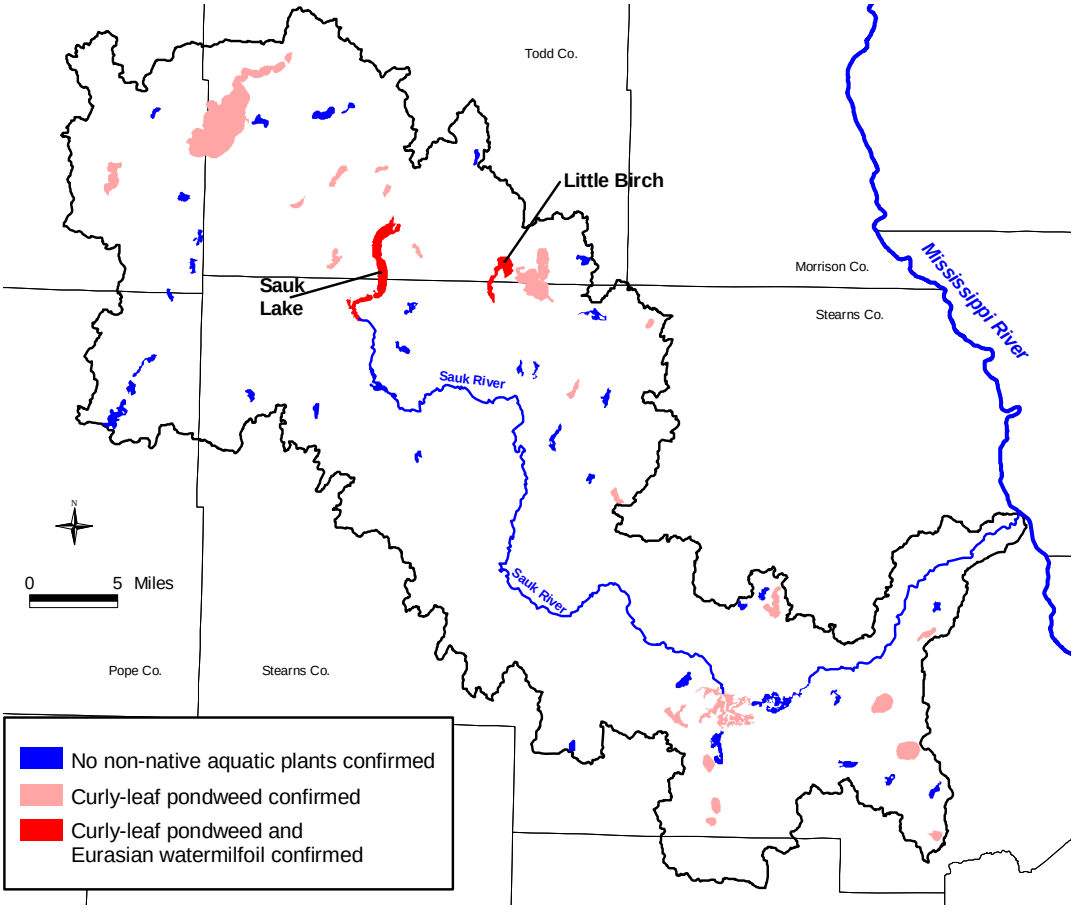
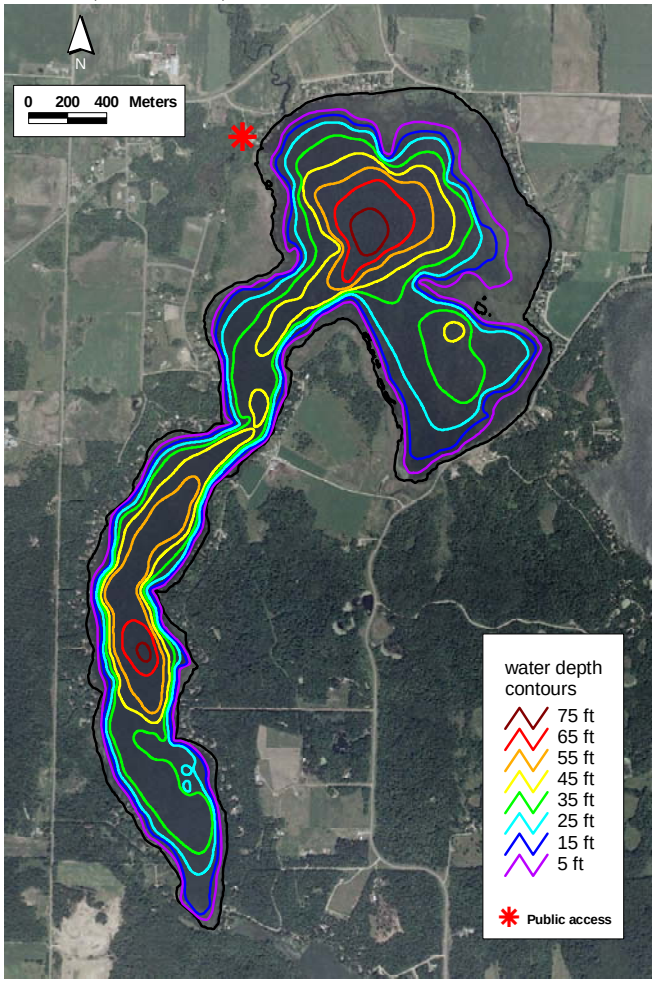


Figure 3. Water depth contours of Little Birch Lake (77-0089-00). source: MnDNR 1980.



crispus) has been recorded in at least 54 percent of these waterbodies and Eurasian watermilfoil (*Myriophyllum spicatum*) has been confirmed in two lakes, Sauk Lake and Little Birch (Fig. 2).

Prior to European settlement, the uplands of the Sauk River Watershed were predominantly forested with a mix of sugar maple, basswood and other hardwoods and some opening of tallgrass prairie. Today, uplands on the south end of the Litte Birch Lake remain primarily forested and land on the north end of the lake has been converted to agriculture (Fig. 3). The lake is heavily developed with residential homes and a public boat access is located on the northwest end of the lake.

Little Birch Lake has a surface area of about 838 acres and a maximum depth of 89 feet. Only 33 percent of the lake is shallow, with depths of 15 feet or less (Fig. 3). The major shallow zones occur at the north end of the lake and the extreme south tip and other shores have steep drop-offs with a narrow band of shallow water.

The lake is described as mesotrophic (moderate nutrients) with moderate water clarity as indicated by the 1994 to 2004 mean summer Secchi depth of 8.1 feet (MPCA 2004). Shoal substrates are mostly sand with minor components of gravel, rubble, muck and bolder (MnDNR Lake Files). The 1969 lake report noted that carp were beginning to become very abundant in the lake and mid-summer algal blooms are consistently noted in previous surveys (MnDNR Lake Files).

The MnDNR has previously conducted vegetation surveys of Little Birch Lake in 1948, 1969, 1981, and 1999. Historically, aquatic plants have been recorded to depths of 14 to 15 feet and the 1948 survey clarifies that most plants were found between depths of eight to 10 feet. Common native species included hardstem bulrush (*Scirpus acutus*), muskgrass (*Chara* sp.), coontail (*Ceratophyllum demersum*), Canada waterweed (*Elodea canadensis*), northern watermilfoil (*Myriophyllum sibiricum*), flatstem pondweed (*Potamogeton zosteriformis*) and narrow-leaf pondweed (*Potamogeton* sp.) (MnDNR Lake Files). The non-native species, Curly-

leaf pondweed (*Potamogeton crispus*) was reported in 1969 and Eurasian watermilfoil (*Myriophyllum spicatum*) was confirmed in 2003.

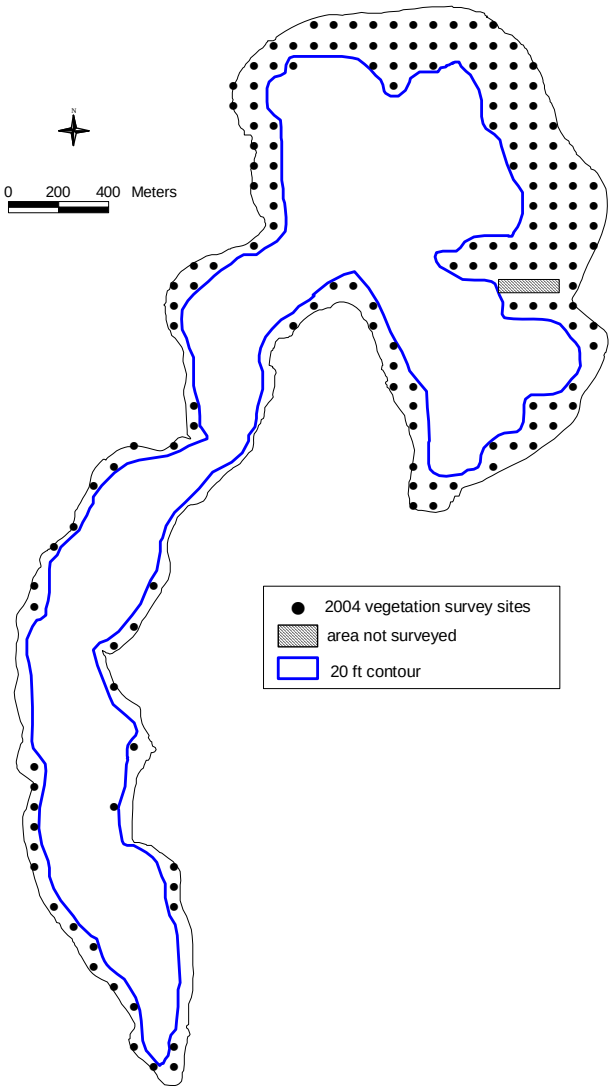
MnDNR Fisheries staff mapped the boundaries of major emergent plant beds in 1999. A GPS and a motorboat were used to map bulrush stands in the field. Cattail beds were mapped in a GIS using 1999 color infrared aerial photographs.

Vegetation Survey Objectives

The purpose of 2004 vegetation survey of Little Birch 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 distribution maps for the common species

Figure 4. 2004 vegetation survey points on Little Birch Lake (77-0089-00)



Methods

A Point-Intercept vegetation survey of Little Birch Lake was conducted on June 24 and 28, 2004 following the methods described by Madsen (1999).

A Geographic Information System (GIS) was used to generate sample points across the lake surface in a 80 meter by 80 meter grid. Survey waypoints were created and downloaded into a Global Positioning System (GPS) receiver. In the field, surveyors sampled to a depth of 20 feet for at total of 169 sample sites (Fig. 4). A shoal area, approximately 250 meters in length, on the east shore, was not surveyed to avoid disturbing the bulrush and other vegetation in this shallow area.

The 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 eight feet and an electronic depth finder in water depths greater than eight feet. The surveyors

Figure 5. Sampling rake

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 sites. Frequency was calculated for the entire area from shore to 20 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.

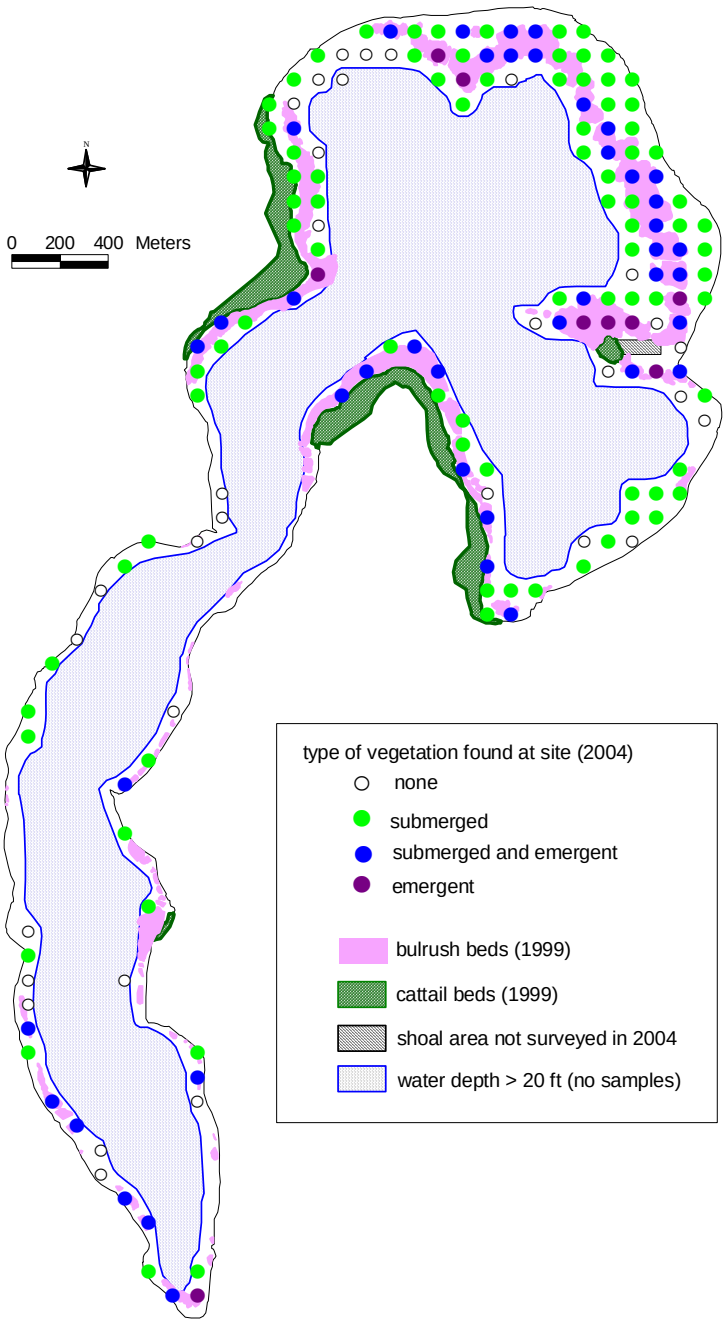
Example:
In Little Birch Lake there were 169 samples sites in the zone from shore to the 20 feet depth. Coontail occurred in 27 of those sites.
Frequency of coontail in the shore to 20 ft zone of Little Birch Lake = 27/169 (*100) = 16%

Results

Percent of sites with vegetation and maximum depth of vegetation

Within the zone from shore to 20 feet, 60 percent of the sites 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, attached to a rope (Fig. 5) was used to survey vegetation not visible from the surface. Nomenclature followed Crow and Hellquist (2000). Voucher specimens were collected for most plant species and are stored at the MnDNR in Brainerd.

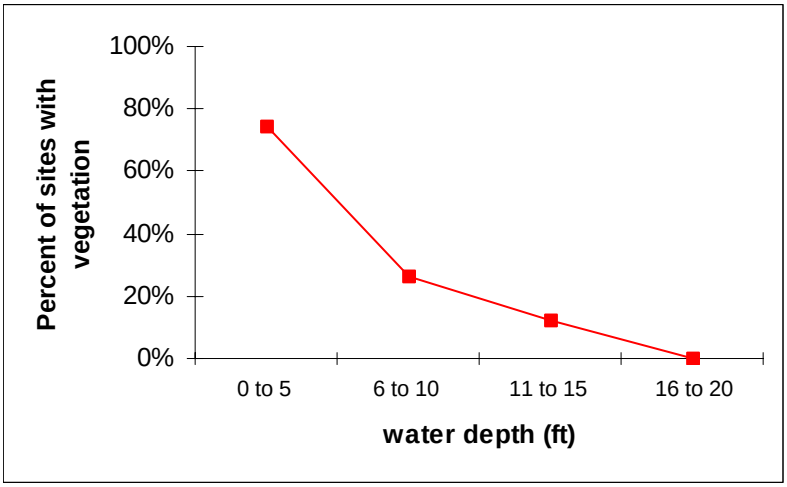
Figure 6. Distribution of aquatic vegetation in Little Birch Lake (77-0089-00). June 24, 28, 2004.



contained vegetation and plants were concentrated in the north end of the lake (Fig. 6).

Vegetation was found to a maximum depth of 13 feet and plants were most abundant in the zone from shore to a depth of five feet where 74 percent of the sites were vegetated (Fig. 7). In depth from 11 to 15 feet, only 13 percent of the sites contained vegetation.

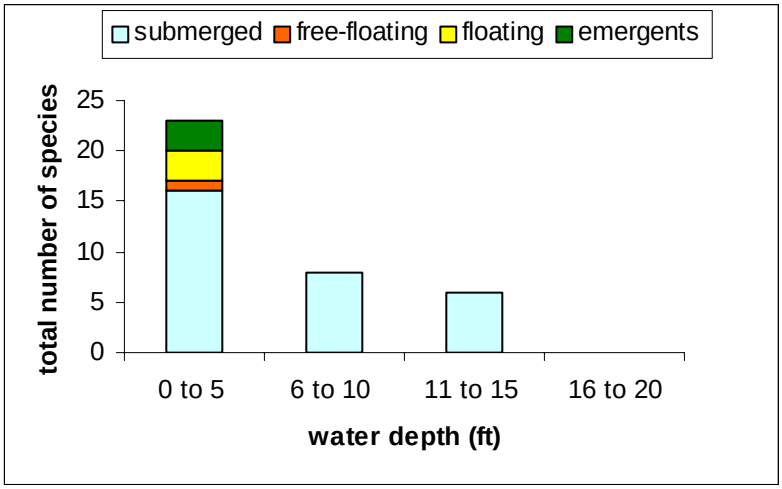
Figure 7. Frequency of vegetation vs. water depth, Little Birch Lake (77-0089-00), June 24, 28, 2004



Number of species recorded

A total of 27 native aquatic plant species were recorded in Little Birch Lake including three emergent, three floating-leaved, three free-floating and 18 submerged species (Table 1). Two non-native submerged species, Curly-leaf pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (*Myriophyllum spicatum*) were also found.

Figure 8. Number and types of species found at each depth zone. Little Birch Lake (77-0089-00), June 24, 28, 2004



Emergent and floating-leaf plants

The highest number of plant species was found in the zone from shore to a depth of five feet, where all species were found (Fig. 8). Emergent, floating-leaf and free-floating species were confined to this shallow zone and often co-occurred with submerged species (Fig. 6). Within this depth zone, 56 percent of the sites contained at least one floating-leaf or emergent species. Bulrush (*Scirpus acutus*) was the most common emergent plant and was found in 38 percent of the sites between shore and the five feet depth (Fig 9). Yellow waterlily (*Nuphar variegata*) was the most frequently occurring floating-leaf plant and was found in 20 percent of the sites in that zone (Fig 9). Bulrush and yellow waterlily were primarily found in the shallow areas of the north end of the lake (Fig. 10).

Submerged plants – native

Submerged plants were found at all depth zones to a maximum depth of 13 feet but most submerged species were found in depths less than six feet (Fig. 8). The most frequently

Table 1. Aquatic Plants of Little Birch, Todd County (77-0089-00) 2004

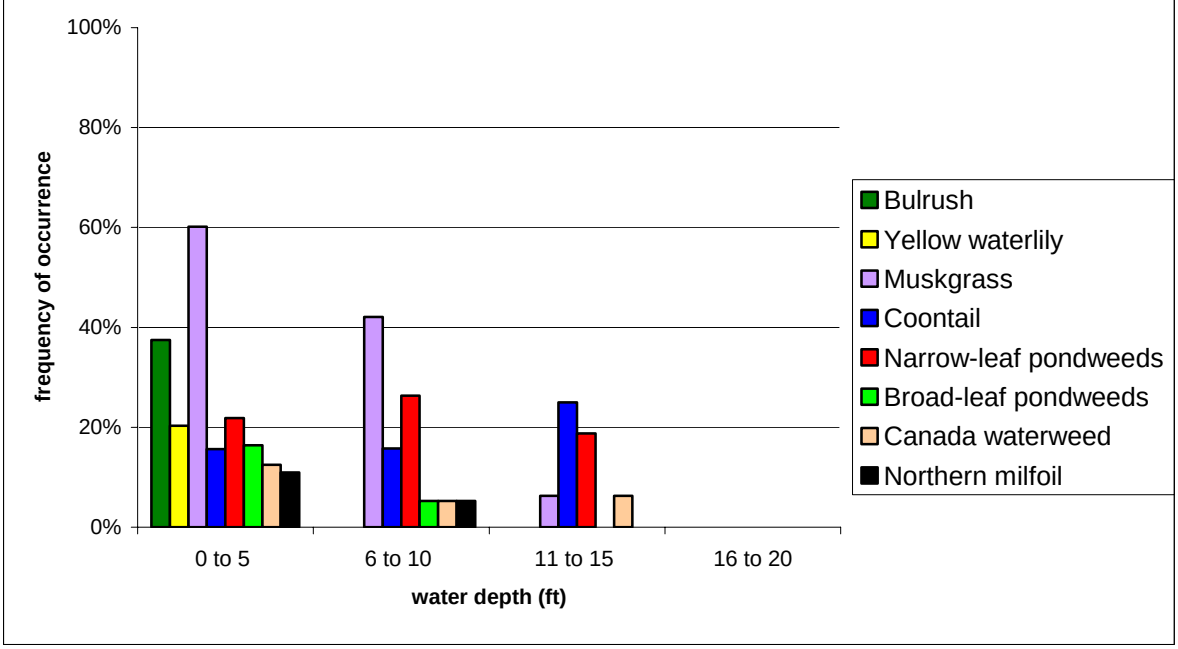
Frequency calculated for zone from shore to 20 feet depth
Frequency = percent of sites in which species occurred
169 sample sites

Life Forms	Common Name	Scientific Name	Voucher	Frequency
SUBMERGED -ANCHORED 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 anchored to the lake bottom.	Muskgrass	*Chara sp.*	x	51
	Coontail	*Ceratophyllum demersum*	x	16
	Sago pondweed	*Stuckenia pectinata*		11
	Illinois pondweed	*Potamogeton illinoensis*		11
	Waterweed group	*Elodea sp.*		11
	Native milfoil – unk	*Myriophyllum sp.*	x	9
	Flatstem pondweed	*Potamogeton zosteriformis*		8
	Bushy pondweed	*Najas flexilis*	x	7
	Wild celery	*Vallisneria americana*		6
	Greater bladderwort	*Utricularia vulgaris*	x	6
	Curly-leaf pondweed	*Potamogeton crispus*		5
	Clasping leaf pondweed	*Potamogeton richardsonii*		3
	Narrow-leaf pondweed	*Potamogeton sp.*		3
	White water buttercup	*Ranunculus sp.*	x	3
	Largeleaf pondweed	*Potamogeton amplifolius*		1
	Marestail	*Hippuris vulgaris*	x	1
	American brooklime	*Veronica americana*	x	present*
	White-stem pondweed	*Potamogeton praelongus*	x	present
	Variable pondweed	*Potamogeton graminues*	x	present
	Unknown1			1
	Unknown2			1
	Eurasian watermilfoil	*Myriophyllum spicatum*		present
FREE-FLOATING These plants float on the water and drift with water currents.	Star duckweed	*Lemna trisulca*		2
	Greater duckweed	*Spirodela polyrhiza*		1
	Lesser duckweed	*Lemna minor*	x	present
FLOATING These plants are rooted in the lake bottom and have leaves that float on the water surface. Many have colorful flowers that extend above the water	Yellow waterlily	*Nuphar variegata*		15
	White waterlily	*Nymphaea odorata*		5
	Floating leaf pondweed	*Potamogeton natans*		1
EMERGENT These plants extend well above the water surface and are usually found in shallow water, near shore.	Bulrush	*Scirpus sp.*		28
	Wild Rice	*Zizania palustris*		2
	Cattail	*Typha sp*		1

* present indicates plant was found during survey but did not occur within a specific sample site.

**Potamogeton freisii was identified in the lake but it is not known whether all narrowleaf pondweeds found were P. freisii. Therefore, Potamogeton sp. was recorded in the database.

Figure 9. Frequency of common aquatic plant species vs. water depth.
Little Birch Lake (77-0089-00), June 24, 28, 2004



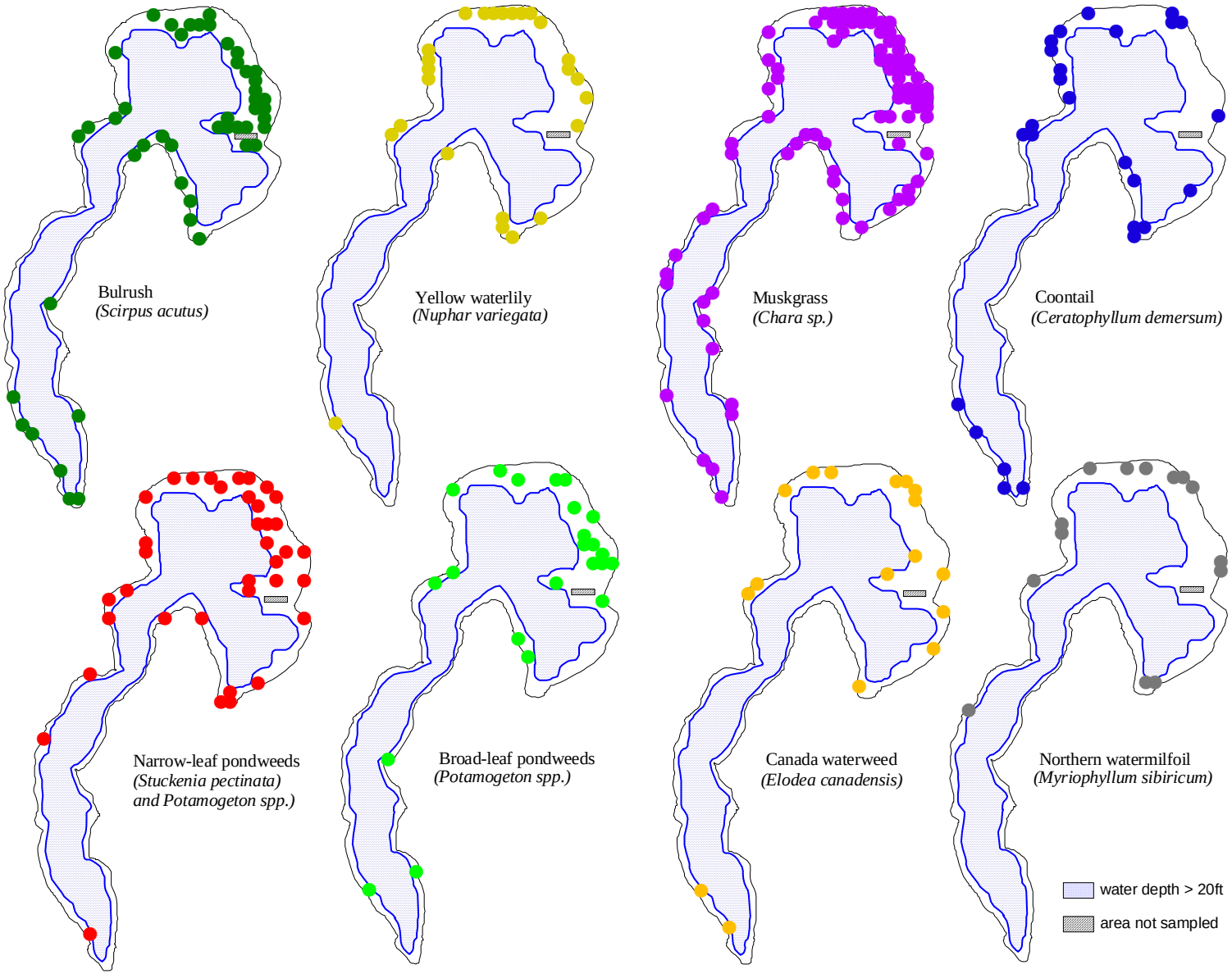
occurring submerged species were muskgrass (*Chara* sp.), coontail (*Ceratophyllum demersum*), sago pondweed (*Stuckenia pectinata*), Canada waterweed (*Elodea canadensis*), Illinois pondweed (*Potamogeton illinoensis*), and northern watermilfoil (*Myriophyllum sibiricum*).

Muskgrass (*Chara* sp.) was the most frequent species in Little Birch Lake, where it was found in 51 percent of the sample sites (Table 1). It dominated the zone from shore to a depth of 10 feet (Fig. 9). Muskgrass is a submerged, macroscopic algae that is common in many hardwater Minnesota lakes. It is named for its 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 Little Birch Lake, muskgrass occurred around the entire shore, including sites where no other species were found (Fig. 10).

Coontail (*Ceratophyllum demersum*) occurred in 16 percent of the sample sites (Table 1). Coontail is the most common submerged flowering plant in the state. This perennial grows entirely submerged and is adapted to a broad range of lake conditions, including turbid water. It is often found growing in deeper water than other native species because it is more tolerant of low light conditions. In Little Birch Lake, coontail occurred at all depth zones to a maximum of 13 feet and it was the most common species found in depths greater than 10 feet (Fig 9). Coontail was scattered around the lake (Fig. 10).

Narrow-leaf pondweeds (*Stuckenia pectinata*, *Potamogeton zosteriformis*, *Potamogeton* sp., and *Potamogeton natans*) were present in 21 percent of the sites (Fig. 9) and occurred mainly in the

Figure 10. Distribution of common plant species in Little Birch Lake (77-0089-00), June 24, 28, 2004



north end of the lake (Fig. 10). Sago pondweed (*Stuckenia pectinata*) was the most common and occurred with a frequency of 11 percent (Table 1). As with coontail, sago pondweed is tolerant of lower light levels and was one of the few species found beyond the 10 feet depth (Fig. 9).

Broad-leaf pondweeds (*Potamogeton amplifolius, P. illlinoensis, P. richarsonii, P. praelongus, P. gramineus*) are sometimes referred to as "cabbage" plants because of their broad underwater leaves. These plants were found in 13 percent of the sites and Illinois pondweed (*P. illinoensis*) was the most common, occurring in 11 percent of the sites (Table 1). Most broad-leaf pondweeds prefer clear water and high light levels and in Little Birch Lake, they were well distributed around the lake (Fig. 10) but were most common in depths less than six feet (Fig. 9).

Canada waterweed (*Elodea canadenis*) had a frequency of 11 percent (Table 1). This submerged perennial prefers soft substrates and is tolerant of turbidity. In Little Birch Lake it occurred to a depth of 13 feet (Fig 9) and often co-occurred with coontail and sago pondweed (Fig. 10).

Northern watermilfoil (*Myriophyllum sibiricum*) was found in nine percent of the sites (Table 1) and occurred to a depth of seven feet (Fig. 9). This native milfoil closely resembles the non-native Eurasian watermilfoil in appearance but the native milfoil is not as tolerant of turbidity as is the non-native milfoil.

All other native species were found in less than 9 percent of the sample sites (Table 1) and were found in depths less than six feet.

Several unique native submerged species were located in Little Birch Lake including marestail (*Hippuris vulgaris*) (Fig. 11) and American brooklime (*Veronica americana*) (Fig. 12). Both species are often associated with cold water streams or springs and neither species was common in the lake.

Figure 11. Marestail (*Hippuris vulgaris*)

Figure 12. American brooklime (*Veronica americana*)

Submerged plants – non-native

Curly-leaf pondweed (*Potamogeton crispus*) occurred in only five percent of the sites (Table 1) and was found in water depths of two to four feet in both the north and southwest ends of the lake (Fig. 13).

Eurasian watermilfoil (*Myriophyllum spicatum*) was not found in any of the sample sites but was

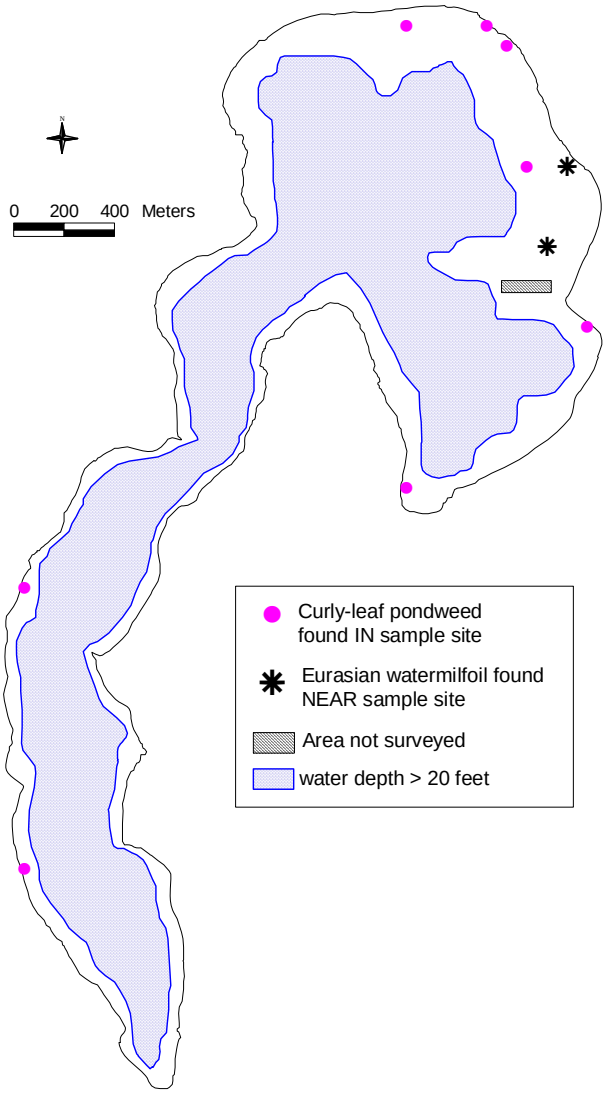


Fig. 13. Distribution of non-native species in Little Birch Lake (77-0089-00), June 24,28, 2005.

recorded near two of the sample sites in the north bay (Fig. 13). The depth at these sites ranged from three to five feet.

Discussion

Little Birch Lake include a diversity of native plant species that provides critical habitat for fish and invertebrates, buffer the shorelines from wave action, and stabilizes sediments and utilizes nutrients that would otherwise be available for algae. (Click here for more information on: value of aquatic plants).

The limited amount of shallow water restricts most vegetation growth to the north end of the lake. Further, mid-summer algal blooms prevent most aquatic plants from growing beyond the five feet depth. Species that are tolerant of turbidity are able to grow in depths up to 13 feet.

While two non-native species have been confirmed in the lake, neither was abundant during the June 2005 survey. Curly-leaf pondweed has been present in Minnesota for at least 100 years (Moyle and Hotchkiss 1945) and in many lakes it has become the dominant species (Invasive Species Program 2005). Curly-leaf pondweed has a unique life cycle that may provide a competitive advantage over native species. It 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). During its peak growth in spring, curly-leaf may reach the water surface at certain depths and create dense mats.

Records indicate that curly-leaf may have been present in Little Birch Lake for as many as 35 years, yet has not become abundant. By comparison, it also occurs in Big Swan Lake (Todd County) where it was found in 64 percent of the sample sites during a June 2004 survey (Perleberg 2005). It is possible that curly-leaf was more abundant in Little Birch Lake in May

and early June, prior to the June 24 and 28, 2005 survey. However, it was still growing in other area lakes during late June and dead plant fragments were not found in Little Birch Lake. Factors that may contribute to the lack of dominance by curly-leaf may include: 1) the presence and abundance of a number of native submerged species that can adequately compete with curly-leaf, and 2) the moderately high water clarity. For more information on management of curly-leaf pondweed see page 51 in this report: MnDNR Invasive Species Annual Report.

Eurasian watermilfoil is a more recent invader in Little Birch Lake and it is more difficult to predict how it may impact the lake. During the 2004 survey, it was not a common species. However, areas containing this species have previously been treated with an aquatic herbicide in an effort to control its growth. In general, Eurasian milfoil is expected to grow in areas that support other vegetation, such as the shallow north end of the lake.

Monitoring changes in aquatic plant community

The types and amounts of aquatic vegetation that occur within a lake are influenced by a variety of factors including water clarity and water chemistry. Monitoring change in the aquatic plant community can be helpful in determining whether changes in the lake water quality are occurring and for estimating the quality of vegetation habitat available for fish and wildlife communities. Data from the 2004 vegetation survey can also be used to monitor annual changes in the native and non-native plant species composition. In general, factors that may lead to change in native and non-native aquatic plant communities include:

- Change in water clarity
  If water clarity in Little Birch Lake increases, submerged vegetation may be more common at depths greater than 10 feet.
- Snow and ice 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, especially if there is little snow cover and sunlight reaches the lake bottom. In years following low snow cover, and/or a reduced ice-over period, 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.
- Natural fluctuation in plant species.
  Many submerged plants are perennial and regrow in similar locations each year. However, a few species such as wild rice (*Zizania aquatica*) and bushy pondweed (*Najas flexilis*) are annuals and are dependant on the previous years seed set for regeneration.
- Aquatic plant management activities
  Humans can impact aquatic plant communities directly by destroying vegetation with herbicide or by mechanical means. For information on the laws pertaining to aquatic plant management: MnDNR APM Program. Motorboat activity in vegetated areas can be particularly harmful for species such as wild rice. Shoreline and watershed development can also indirectly influence aquatic plant growth if it results in changes to the overall water quality and clarity. 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.

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