Aquatic Vegetation Surveys of

Little Boy Lake (DOW #11-0167-00)
and
Wabedo Lake (DOW #11-0171-00)

Cass County, Minnesota

2007

Channel between Wabedo and Little Boy lakes. 2007

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Summary

Aquatic vegetation surveys of Little Boy Lake (11-0167-00), Wabedo Lake (11-0171-00), and the connecting waterbody, Louise Lake (11-0573-00), Cass County, Minnesota, were conducted in July and August, 2007. The results of these surveys were combined with floating-leaf plant bed maps that were delineated from aerial photographs and bulrush beds that were mapped in the field in July and August, 2007.

A total of 38 aquatic plant taxa were recorded. About 308 acres of emergent and floating-leaf plants were mapped. Bulrush beds occurred along most shallow sandy shores and waterlilies and wild rice were common in protected bays. Submerged plants were found to a depth of 18 feet in Wabedo Lake and to 16 feet in Little Boy Lake. In both lakes, vegetation was most common from shore to the 10 feet depth where about 90 percent of the sample sites contained vegetation. Few plants occurred beyond the 15 feet depth.

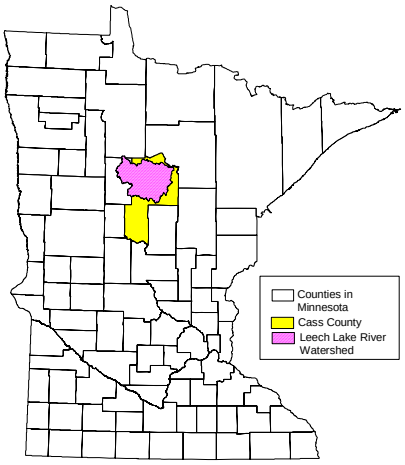
The large algae, muskgrass (*Chara* sp.) was the most frequently found submerged plant and occurred in one third of the sample sites. This low-growing plant is common in hardwater lakes of northern Minnesota. Other native submerged taxa included coontail (*Ceratophyllum demersum*), flat-stem pondweed (*Potamogeton zosteriformis*), northern watermilfoil (*Myriophyllum sibiricum*) and several broad-leaf pondweeds (*Potamogeton* spp.).

Little Boy Lake, 2007

Wabedo Lake, 2007

Introduction

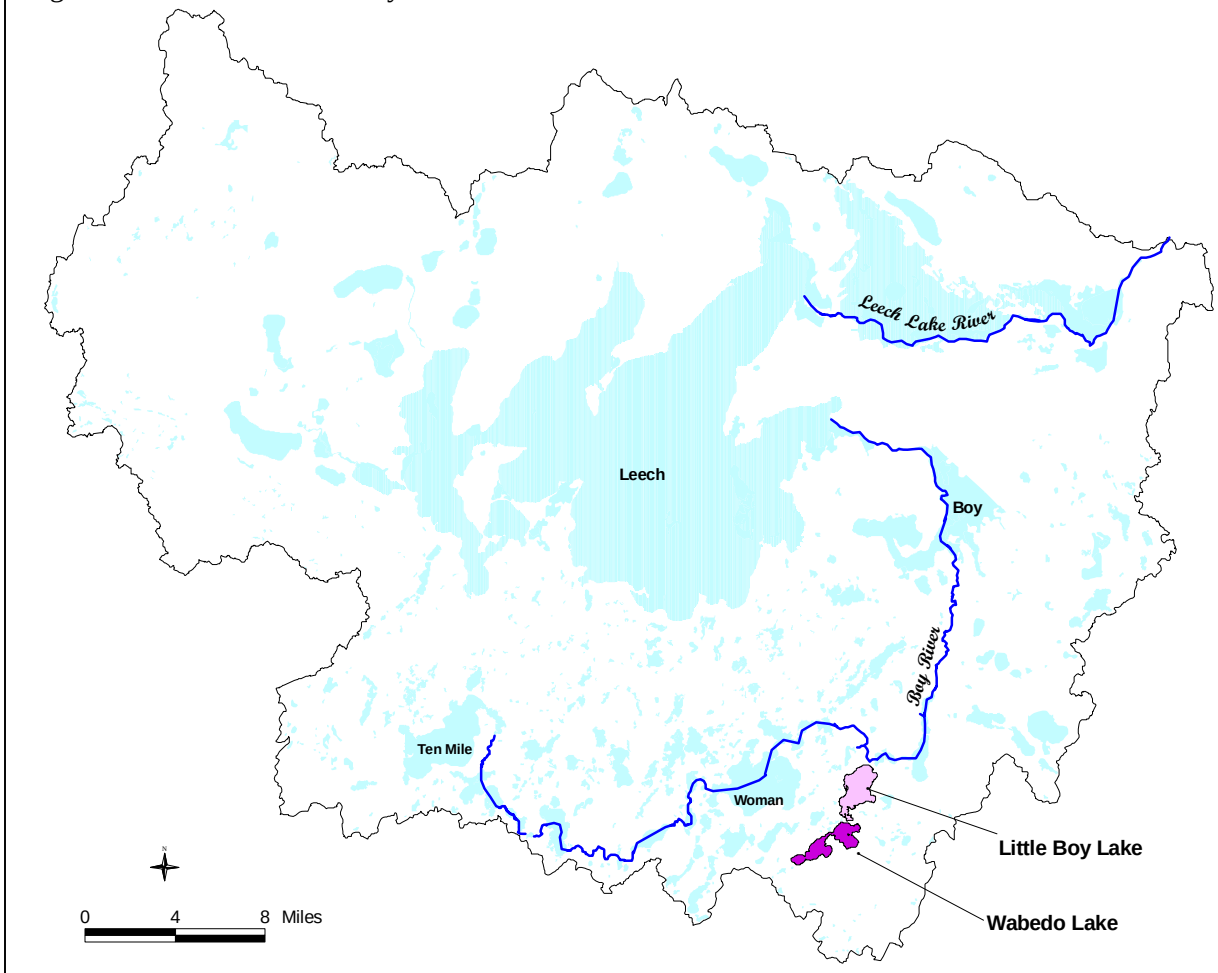
Figure 1. Leech Lake River Watershed and Cass County, MN



Little Boy Lake and Wabedo Lake are located within the Leech Lake River Watershed, in Cass County, north-central Minnesota (Figure 1). These lakes occur in the southeast corner of the watershed and are connected to the Boy River, which drains the watershed to the north (Figure 2). Water flows north from Wabedo into a navigable channel that connects to the southern end of Little Boy Lake. Flow leaves the north end of Little Boy and continues north through the Boy River that connects a series of lakes to Leech Lake and eventually to the Mississippi River via the Leech Lake River.

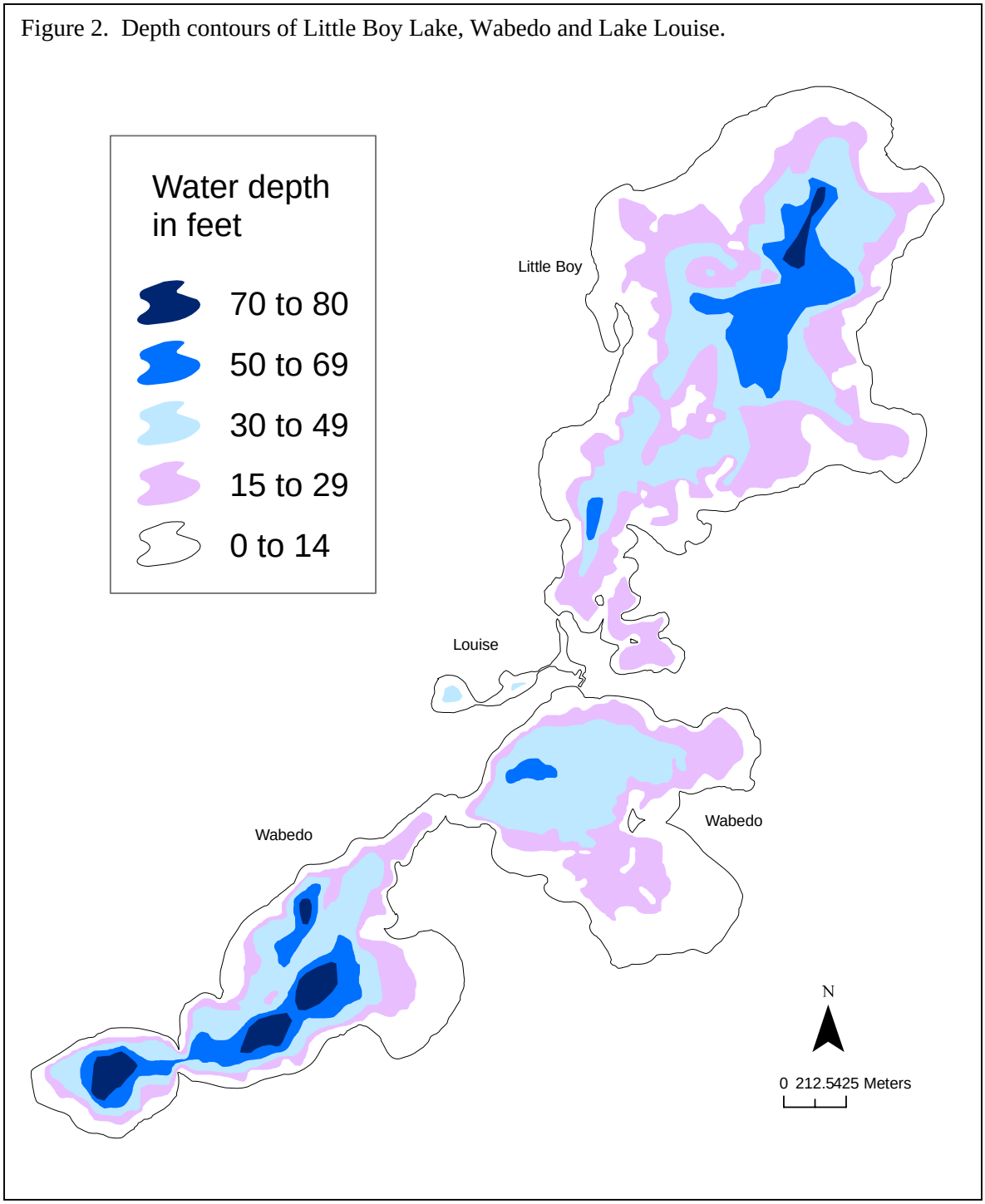
There are about 200 lakes in the Leech Lake River Watershed that are at least 50 acres in size. Little Boy is the 10th largest with a surface area of 1,372 acres and 11

Figure 1. Location of Little Boy and Wabedo Lakes in Leech Lake River Watershed.



miles of shoreline. Wabedo Lake ranks 15th in size with a surface area of 1,185 acres and ten shoreline miles. The waterbody between the two lakes is about 33 acres in area and includes a navigable channel and a basin known as Louise Lake (Figure 2). Wabedo Lake has two distinct basins: a southwest basin with a maximum depth of 95 feet and a northeast basin with a maximum depth of 50 feet. Little Boy Lake has a maximum depth of 74 feet. About 65 percent of Louise Lake and 45 percent of Little Boy and Wabedo lakes are shallow with water depths of 20 feet or less (Figure 2).

Figure 2. Depth contours of Little Boy Lake, Wabedo and Lake Louise.



Residential homes occur on both lakes but forested land use, combined with numerous wetlands in the watershed, may help minimize phosphorus loading to these lakes. Little Boy Lake is described as mesotrophic, or moderately nutrient enriched. The southwest bay of Wabedo is mesotrophic but the northeast bay is slightly more nutrient rich and is described as eutrophic. Water chemistry data are limited but both lakes have moderately hardwater with recorded alkalinity levels of 123-138 ppm (MnDNR Lake Files).

Figure 3. Measuring Secchi Disc transparency

The Secchi disc (Figure 3) transparency measures the depth to which a person can see into the lake and provides a rough estimate of the light penetration into the water column. Water clarity fluctuates throughout the season and between years. Between 1997 and 2006, mean Secchi disc transparency measurements were about nine feet in Little Boy Lake and about ten feet in both bays of Wabedo (MPCA 2007). As a general rule, sunlight can penetrate to a depth of two times the Secchi depth and aquatic plants can grow to a depth of one and half times the Secchi depth.

Based on these Secchi disk measurements alone, aquatic plants are expected to grow to about 14 or 15 feet in these lakes. Other factors that may influence the depth of plant growth include substrate type, wind fetch, and plant species composition.

Previous vegetation surveys of Little Boy Lake found plants growing to depths of 15 to 21 feet with abundant plant growth described in the west and southeast bays (MnDNR Fisheries Lake Files, 1955, 1976, 1993 and 2005). In Wabedo Lake, plants have been recorded to depths of 16 to18 feet (MnDNR Fisheries Lake Files, 1993 and 2005). More than 25 different aquatic plant taxa have previously been recorded in these lakes including bulrush (*Scirpus* spp.), wild rice (*Zizania aquatica*), waterlilies (*Nymphaea odorata* and *Nuphar variegata*), muskgrass (*Chara* sp.), coontail (*Ceratophyllum demersum*), Canada waterweed (*Elodea canadensis*), northern watermilfoil (*Myriophyllum* sp.), bladderwort (*Utricularia vulgaris*), and a variety of pondweeds (*Potamogeton* spp.).

Objectives

The purpose of this vegetation survey was to provide a quantitative description of the 2007 plant population of Little Boy Lake and Wabedo Lake. Specific 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 taxa that occur in the lake
5. Estimate the abundance of common taxa
6. Develop distribution maps for the common taxa

Methods

Mapping floating-leaf and emergent vegetation beds

Many of the near-shore, shallow areas of Little Boy and Wabedo lakes contain extensive beds of emergent and floating-leaf vegetation. To avoid damage to these plant beds, surveyors did not motor into these sites. Aerial photographs were used to delineate beds of emergent and floating-leaved vegetation. Ground truthing was conducted to verify plant community composition within major beds. Surveyors mapped bulrush beds in the field by motoring around the lakeside perimeter of major bulrush beds. Field surveys to map floating-leaf and emergent vegetation were conducted in August 2007.

Lakewide vegetation survey

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 Global Positioning System (GPS) receiver. On Little Boy and Wabedo lakes, survey points were spaced 65 meters apart, resulting in about one survey point per acre (Figure 4). Survey points were placed closer (30 meters) on Lake Louise to ensure that sufficient sample points were included in the vegetated zone. Wabedo Lake was surveyed on June 27-29, Little Boy Lake on July 3, 5 and 11, and Louise Lake on August 9, 2007. Within the vegetated zone from shore a depth of 20 feet depth, 1172 points were surveyed (Table 1).

The surveys were conducted by two field crews, each consisting of one boat and two surveyors. In the field, surveyors infrequently found vegetation beyond a depth of 15 feet and therefore sampled all survey points between shore and 20 feet. 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 depths greater than eight feet. The 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 5). At each sample site where water depths was seven feet and less, surveyors described the bottom substrate using standard substrate classes (Table 2).

Plant identification and nomenclature followed Crow and Hellquist (2000). Voucher specimens were collected for most plant taxa and are stored at the MnDNR in Brainerd. Data were entered into a Microsoft Access database and frequency of occurrence was calculated for each taxa as the number of sites in which a taxa occurred divided by the total number of sample 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 four depth zones for analysis (Table 1).

In August, surveyors re-visited shorelines of Little Boy and Wabedo lakes to search for additional plant taxa that may have been overlooked during the Point-Intercept survey (Figure 6). Any additional plant taxa found were recorded.

Figure 4. 2007 vegetation survey sites on Little Boy, Wabedo and Louise lakes.

Table 1. Sampling effort by water depth.

Water depth interval	Number of Sample Points			
	Little Boy	Wabedo	Louise	Total
0 to 5	250	247	46	543
6 to 10	122	80	11	213
11 to 15	97	89	10	196
16 to 20	108	94	18	220
subtotal	577	526	85	1172
21 to 25	2	13	0	15
26 to 30	0	16	0	16
Total sample points	579	539	85	1203

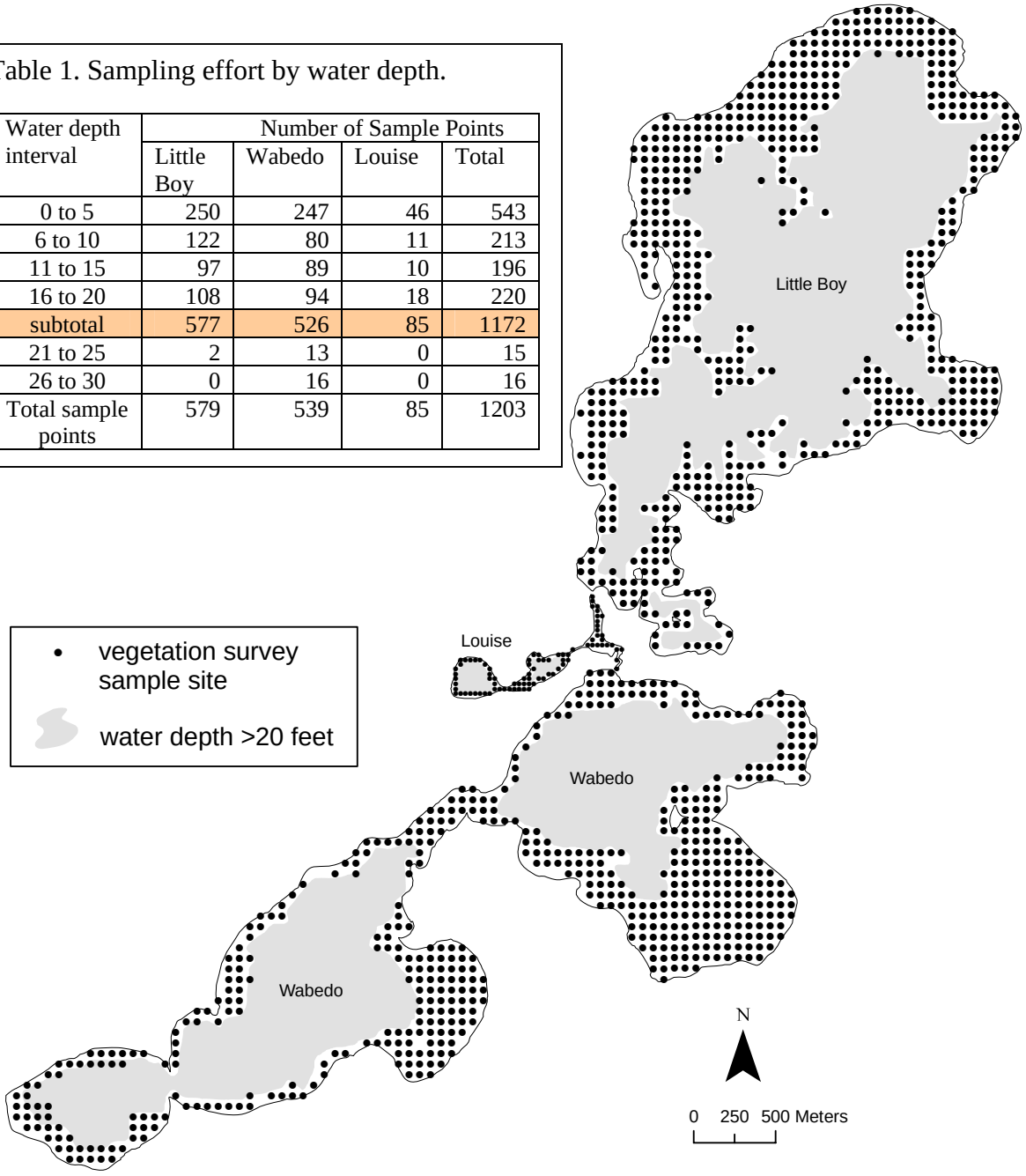


Figure 5. Sampling rake.

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

Figure 6. Additional shoreline surveys of Little Boy Lake, August 2007

Example:

In Little Boy Lake there were 577 samples sites in the zone from shore to the 20 feet depth.

Muskgrass (Chara sp.) occurred in 189 of those sites.

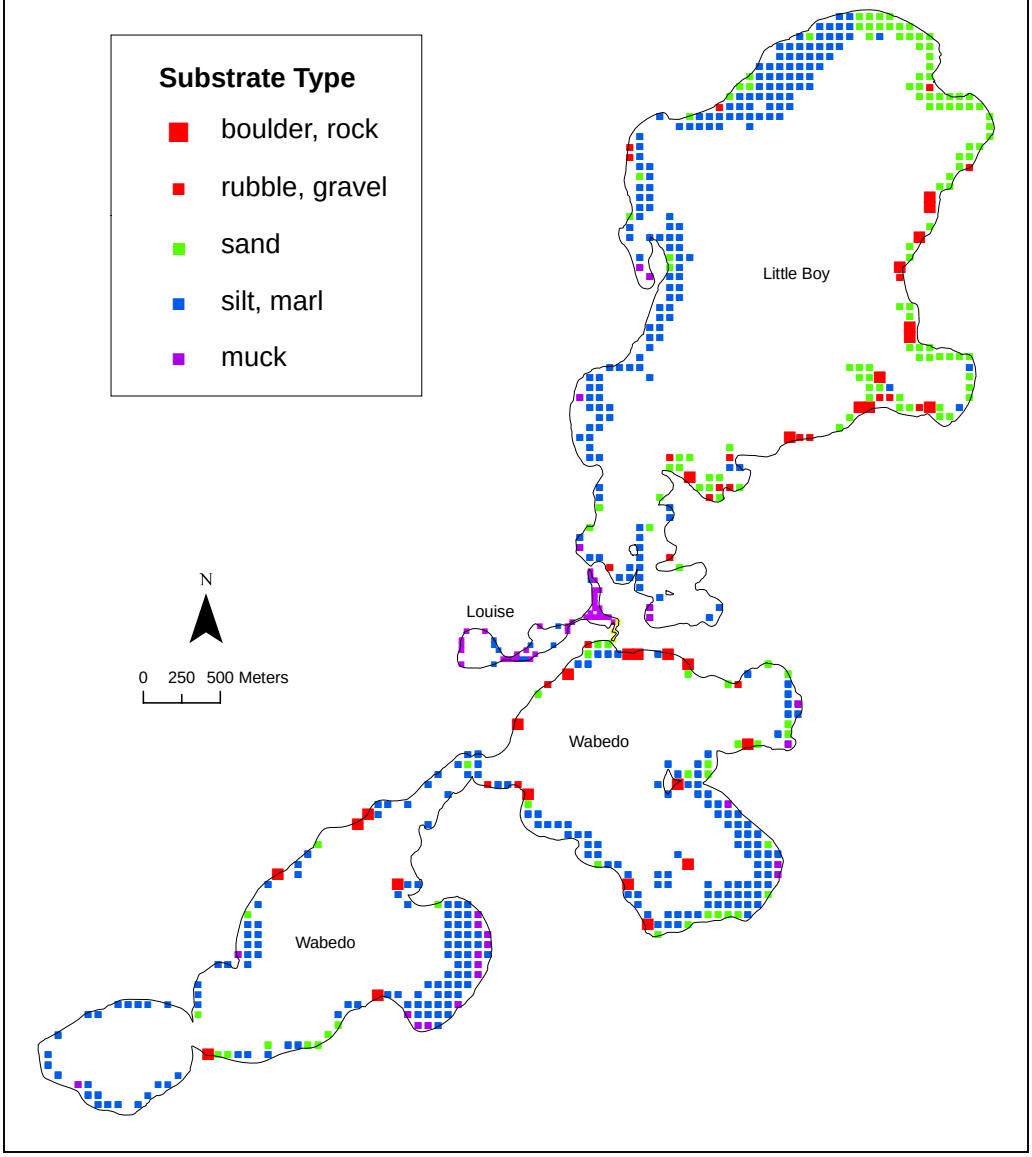
Frequency of Muskgrass in the shore to 20 feet depth zone = 189/577 (*100) = 33 %

Results

Shoal substrates

Sandy shores with scattered boulders and rocks occurred along the entire east side of Little Boy Lake while the west shore contained mostly silt (Figure 7). Shoal bottom types in Wabedo Lake included sand and boulders along some shores but silt and muck dominated the broad shallow eastern bays. The channel between the two lakes was primarily muck bottom.

Figure 7. Shoal water sediments of Little Boy, Wabedo and Louise Lakes, 2007.



Number and types of plants recorded

A total of 38 aquatic plant taxa were recorded in these lakes including nine emergent, five floating-leaved, four free-floating and 20 submerged plants (Table 3). Submerged plants included large algae and numerous flowering plants.

Table 3. Frequency of aquatic plants in Little Boy, Wabedo and Louise Lakes Point-intercept survey, 2007.

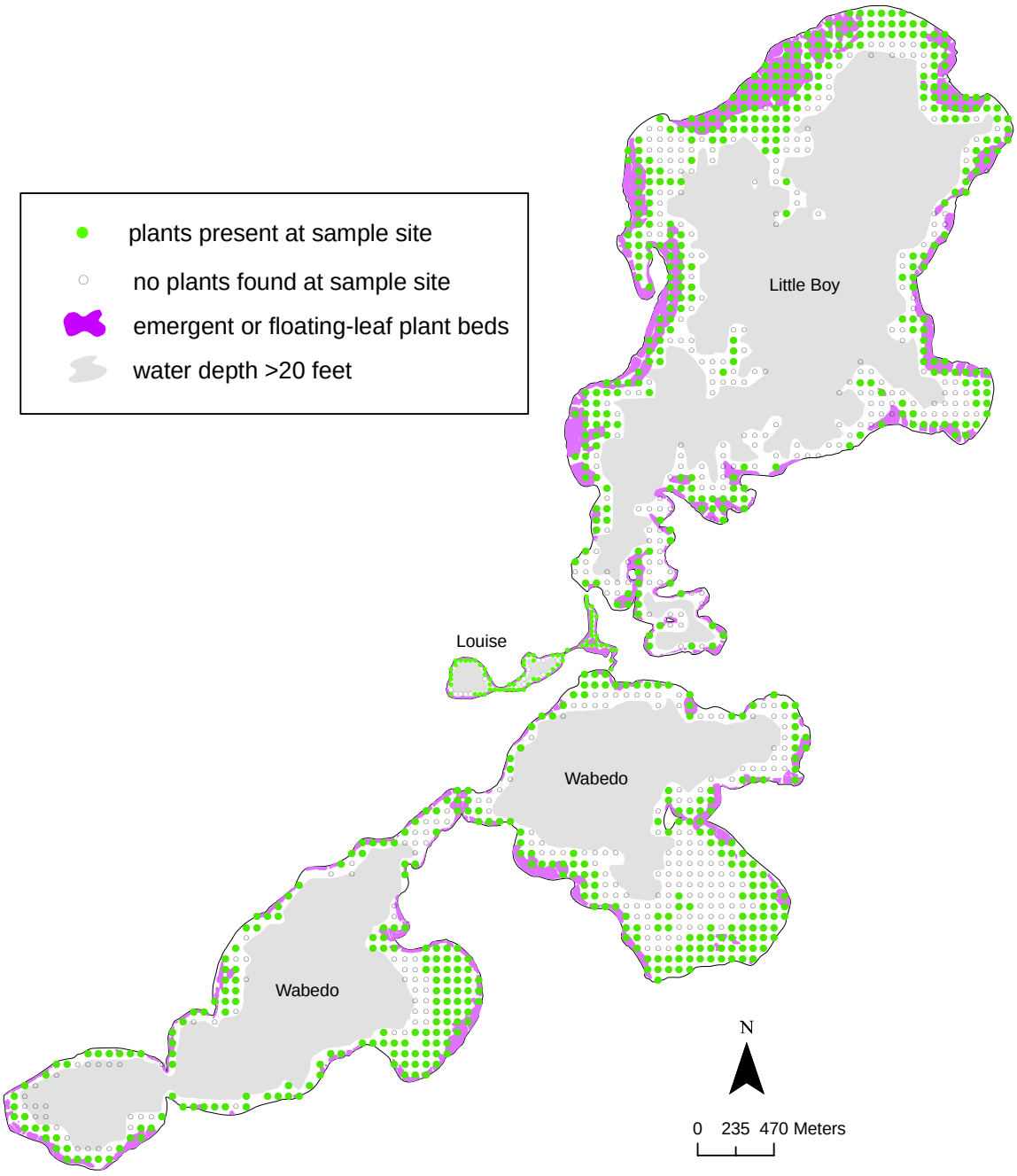
* Frequency is the percent of sample sites in which a plant taxon occurred in the shore to 20 ft water depth.
"Present" indicates plant taxa was found outside of sample site
"---" indicates plant taxa was not found in lake

			Frequency of occurrence		
Life Forms	**Common Name**	**Scientific Name**	**L. Boy N=577**	**Wabedo N=526**	**Louise N=85**
SUBMERGED These plants grow primarily under the water surface. Upper leaves may float near the surface and flowers may extend above the surface. Plants may or may not be anchored to the lake bottom.	Muskgrass	*Chara sp.*	33	32	27
	Stonewort	*Nitella sp.*	<1	---	---
	Flat-stem pondweed	*Potamogeton zosteriformis*	15	26	18
	Coontail	*Ceratophyllum demersum*	11	27	36
	Northern water milfoil	*Myriophyllum sibiricum*	6	14	5
	Canada waterweed	*Elodea canadensis*	4	17	6
	Clasping-leaf pondweed	*Potamogeton richardsonii*	3	6	4
	White-stem pondweed	*Potamogeton praelongus*	3	3	---
	Large-leaf pondweed	*Potamogeton amplifolius*	2	5	4
	Variable pondweed	*Potamogeton gramineus*	2	---	---
	Illinois pondweed	*Potamogeton illinoensis*	2	1	1
	Sago pondweed	*Stuckenia pectinata*	3	---	1
	Fries pondweed	*Potamogeton freisii*	2	2	4
	Narrow-leaf pondweed	*Potamogeton sp.*	2	1	5
	Water stargrass	*Zosterella dubia*	3	1	1
	Wild celery	*Vallisneria americana*	3	2	5
	Bushy pondweed	*Najas flexilis*	3	3	33
	Water marigold	*Megalodonta beckii*	present	1	---
	Ribbon pondweed	*Potamogeton epihydrus*	---	---	present
	Pipewort	*Eriocaulon aquaticum*	---	---	present
FREE-FLOATING These plants float on the water and drift with water currents.	Greater bladderwort	*Utricularia vulgaris*	5	2	11
	Greater duckweed	*Spirodela polyrhiza*	<1	---	27
	Star duckweed	*Lemna trisulca*	<1	6	9
	Lesser duckweed	*Lemna minor*	<1	---	---
FLOATING These plants are rooted in the lake bottom and have leaves that float on the water surface.	Yellow waterlily	*Nuphar variegata*	4	7	15
	White waterlily	*Nymphaea odorata*	2	3	31
	Floating leaf pondweed	*Potamogeton natans*	1	<1	4
	Floating-leaf burreed	*Sparganium sp.*	present	present	---
	Water smartweed	*Polygonum amphibium*	---	present	---
EMERGENT These plants extend well above the water surface and are usually found in shallow water, near shore.	Bulrush	*Scirpus spp.*	19	6	2
	Wild Rice	*Zizania palustris*	4	1	38
	Arrowhead	*Sagittaria spp.*	1	1	1
	Narrowleaf Cattail	*Typha sp.*	1	--	1
	Broadleaf cattail	*Typha latifolia*	present		
	Burreed	*Sparganium eurycarpum*	1	<1	---
	Spikerush	*Eleocharis sp.*	<1	---	---
	Giant cane	*Phragmites australis*	present	present	---
	Three-way sedge	*Dulichium arundinaceum*	present	---	---

Distribution of aquatic plants

Aquatic plants occurred around the entire perimeter of each lake and in some areas extended lakeward as much as 280 meters (900 feet), (Figure 8). Approximately 308 acres of emergent and floating-leaf beds were mapped and the largest beds occurred along the west and northeast shores of Little Boy Lake. Submerged plants occurred along shore as well as offshore shallow areas. The vegetated zone extended from shore to about the 15 feet depth. This area includes about 845 acres or about one-third of the lakes. Within this area, nearly 80 percent of the survey sites contained vegetation.

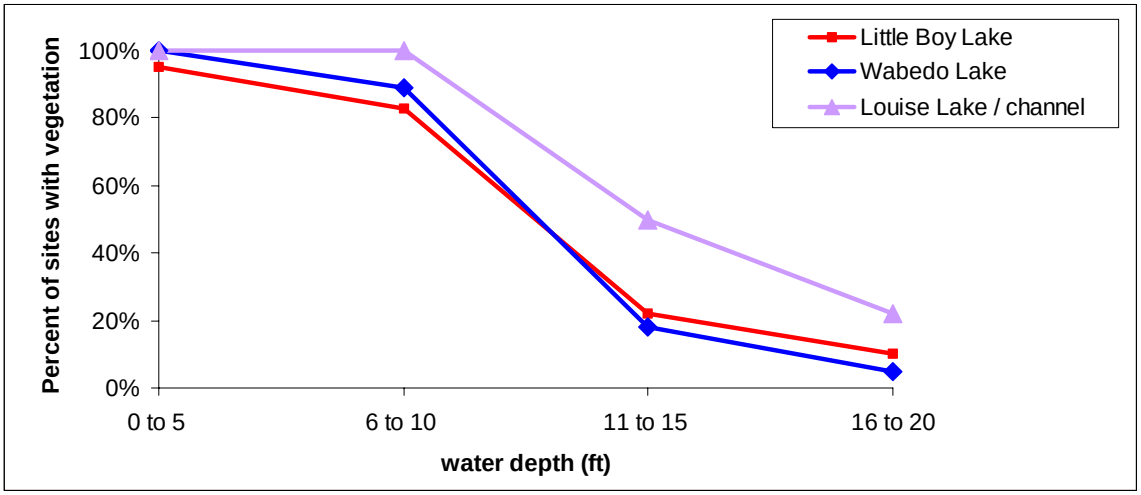
Figure 8. Distribution of aquatic plants in Little Boy, Wabedo and Louise lakes, 2007.



Distribution of plant types by water depth

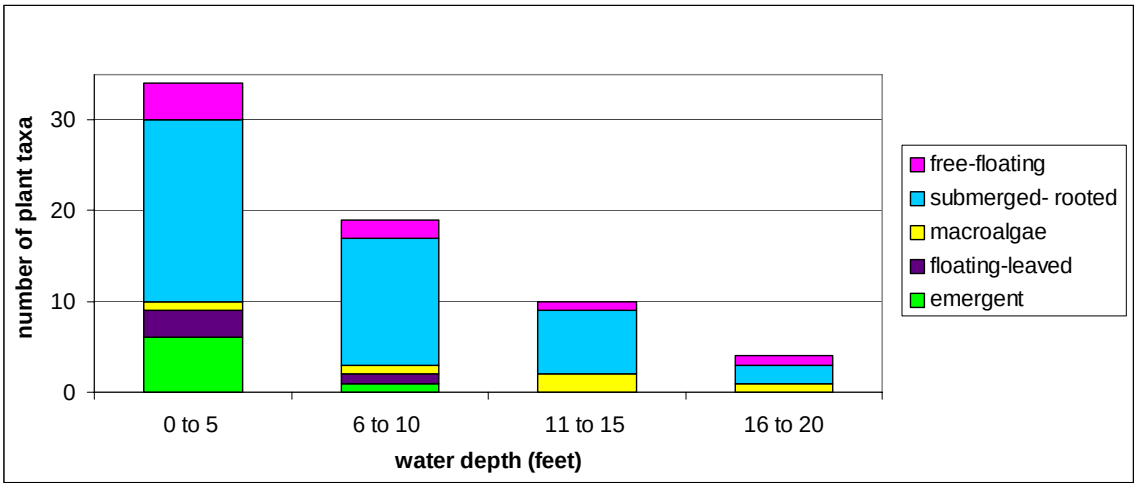
Percent of vegetated sites decreased with increasing water depth (Figure 9). Plants were found to a maximum depth of 19 feet in Lake Louise, 18 feet in Wabedo, and 16 feet in Little Boy, but beyond depths of 15 feet, only one or two sites in each lake contained vegetation. Plant occurrence was greatest in water depths of five feet and less where 98 percent of all sites contained vegetation. Beyond the five feet depth, plant occurrence in Lake Louise was slightly higher than the larger lakes but a decreasing trend in vegetation with depth was seen in all lakes.

Figure. 9. Percent frequency of vegetation types by water depth interval.



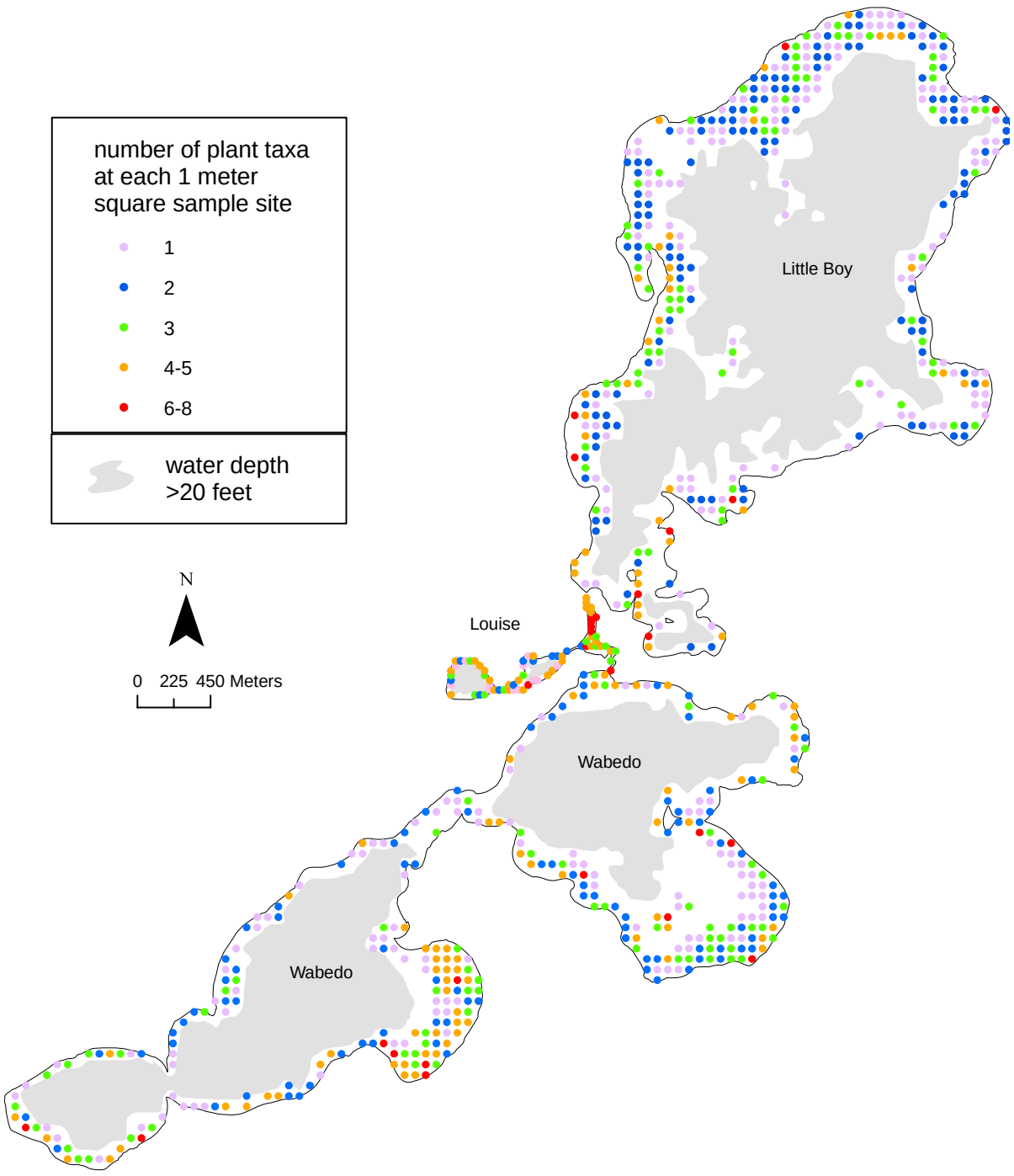
The shore to five feet depth zone also contained the highest number of plant taxa (Figure 10). Most emergent plant and floating-leaf plants occurred in water depths of five feet and less and most rooted submerged plants were restricted to depths of 15 feet and less. Only four taxa occurred in depths greater than 15 feet: a free-floating duckweed (*Lemna trisculca*), a large algae (*Chara* sp.), a weakly rooted submerged plant, coontail (*Ceratophyllum demersum*) and a submerged narrow-leaf pondweed (*Potamogeton* sp.).

Figure. 10. Number of taxa found at each water depth interval.



The number of plant taxa found at each one square meter sample site ranged from zero to eight. Sites with the highest number of taxa occurred near shore, within mixed beds of emergent, floating-leaved and submerged plants such as the channel leading from Lake Louise to Little Boy Lake and the east bay of the south Wabedo basin (Figure 11). In water depths greater than ten feet, most sites contained fewer than three taxa.

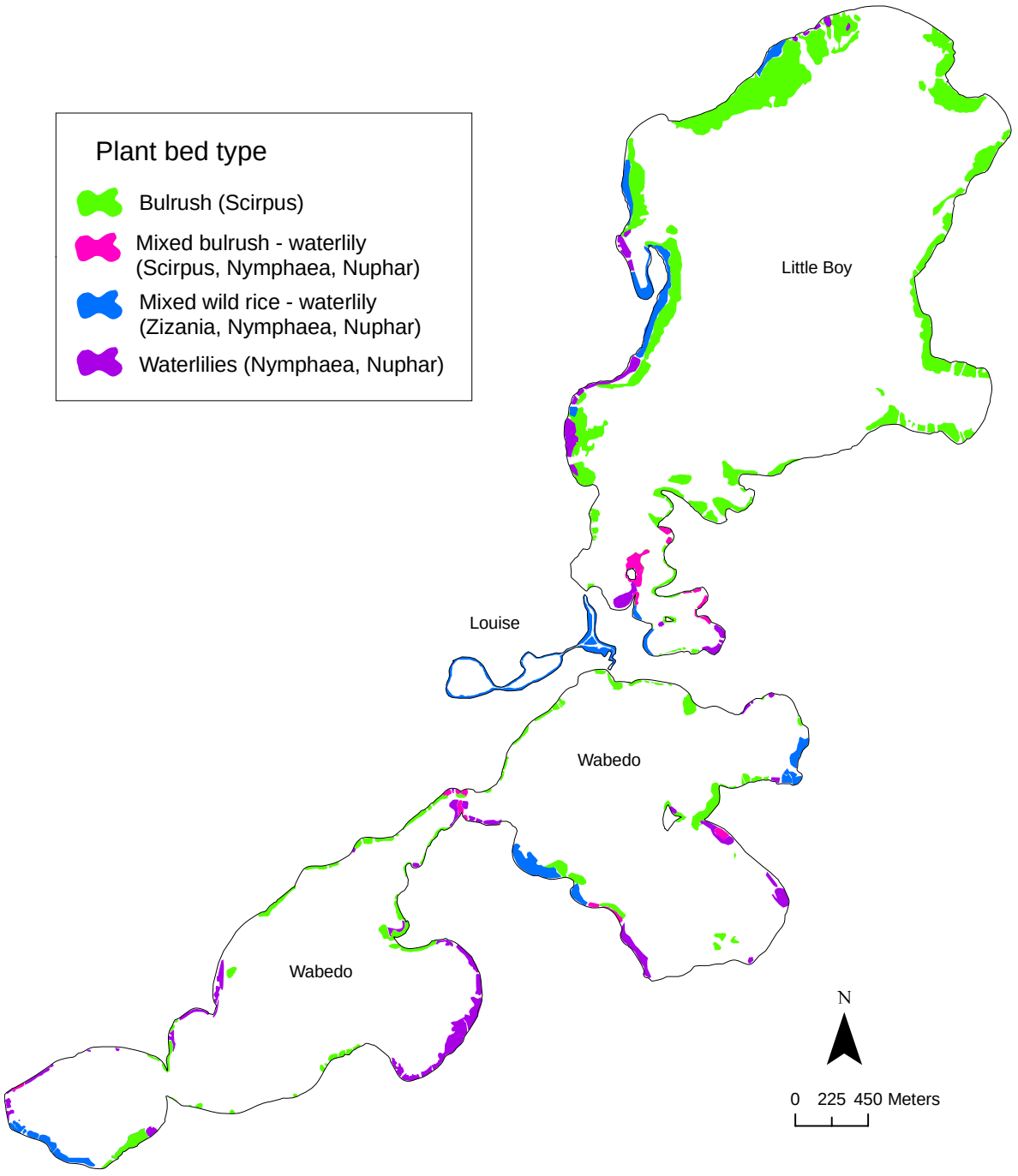
Figure 11. Number of plant taxa at each sample site in Little Boy, Wabedo and Louise lakes, 2007



Emergent and floating-leaf plant beds

Approximately 308 acres of emergent and floating-leaf plant beds were mapped with about 202 acres in Little Boy Lake, 94 acres in Wabedo Lake and 12 acres in Louise Lake (Figure 12). Major plant bed types included bulrush, wild rice, waterlilies and mixed beds.

Figure 12. Major emergent and floating-leaf beds



Hard-stem bulrush (*Scirpus acutus*) beds were the most common type in Little Boy Lake (Figure 13). About 163 acres of bulrush beds were mapped in this lake and some beds extended nearly 1,000 meters along shore and as much as 250 meters lakeward (Figure 12). Bulrush was found in 44 percent of the sample sites between shore and the five feet depth and usually occurred in sand. In Wabedo Lake, about 40 acres of bulrush beds were mapped and 12 percent of the shallow survey sites (shore to five feet depth) contained bulrush.

Figure 13. Emergent bulrush (*Scirpus*) beds in Little Boy Lake, 2007.

Waterlily beds, or mixed beds of waterlilies and emergents, covered about 54 acres in Wabedo Lake, 39 acres in Little Boy Lake, and 12 acres in Lake Louise (Figure 12). Other emergent plants found included Wild rice (*Zizania palustris*) (Figure 14), giant burreed (*Sparganium eurycarpum*) (Figure 15), arrowhead (*Sagittaria* sp.) (Figure 16), and spikerush (*Eleocharis* sp.).

Figure 14. Wild rice (*Zizania palustris*).

Figure 15. Burreed (*Sparganium eurycarpum*).

Figure 6. Arrowhead (*Sagittaria latifolia*).

Common floating-leaf plants included yellow waterlily (*Nuphar variegata*) (Figure 17), white waterlily (*Nymphaea odorata*) (Figure 18), floating-leaf pondweed (*Potamogeton natans*) (Figure 19) and floating-leaf burreed (*Sparganium* sp.). Waterlily beds often contained wild rice, scattered bulrush plants, and submerged plants (Figure 20). Waterlily beds were usually associated with muck sediments.

Figure 17. Yellow waterlily (*Nuphar variegata*)

Figure 18. White waterlily (*Nymphaea odorata*)

Figure 19. Floating-leaf pondweed (*Potamogeton natans*)

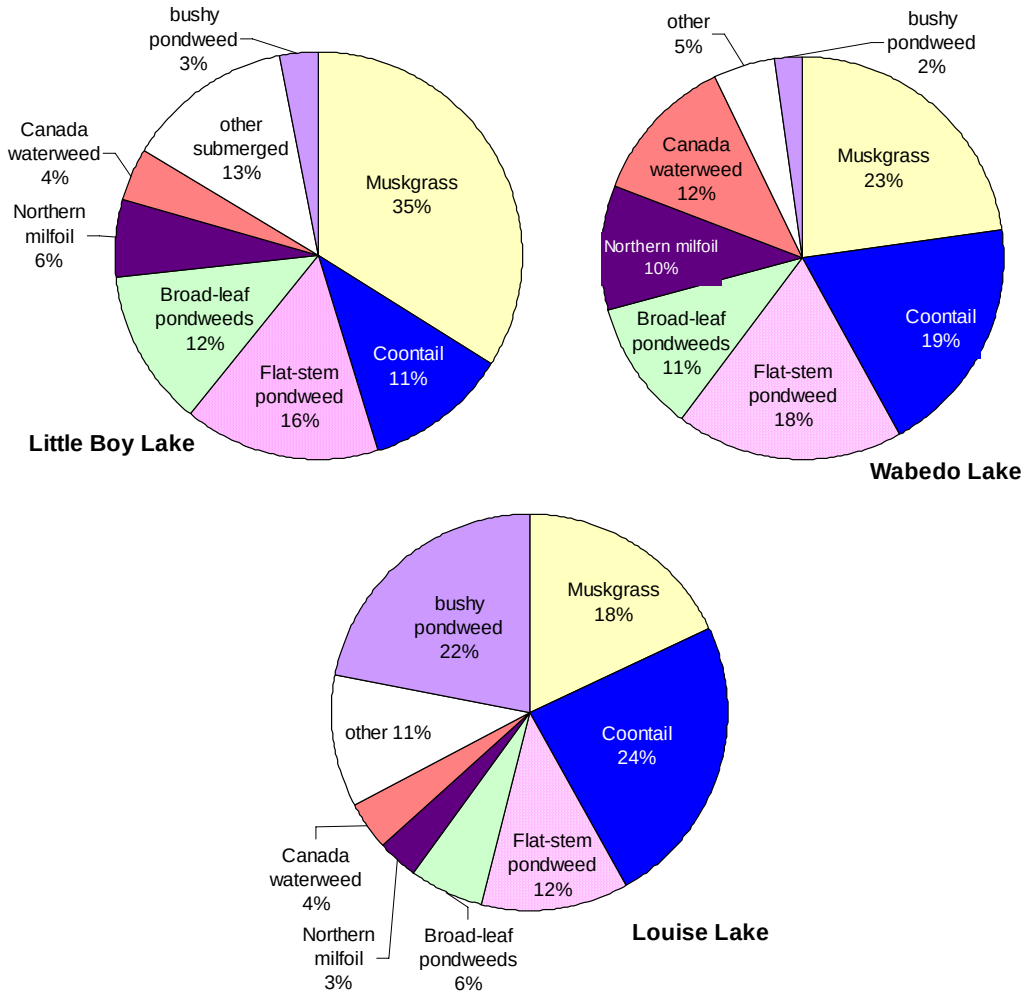
Emergent and floating-leaf aquatic plants (Figure 20) offer food, cover and nesting material for waterfowl, marsh birds and muskrats, and provide shelter and shade for insects and young fish, and amphibians. The root systems of emergent and floating-leaf plants act to stabilize the lake bottom and beds of these plants help buffer the shoreline from wave action.

Figure 20. Mixed Floating-leaf and emergent plant bed in Little Boy Lake

Submerged plants

Within the shore to 20 feet depth zone, submerged plants occurred in 78 percent of the Lake Louise sites, 65 percent of the Wabedo Lake sites and 57 percent of the Little Boy Lake sites. A mixture of submerged plant types were found and the most commonly occurring taxa were muskgrass (*Chara* sp.), coontail (*Ceratophyllum demersum*), flat-stem pondweed (*Potamogeton zosteriformis*), broad-leaf pondweeds (*Potamogeton* spp.), Canada waterweed (*Elodea canadensis*) and northern watermilfoil (*Myriophyllum sibiricum*). These taxa accounted for at least 85 percent of the plant occurrences in Little Boy and Wabedo Lakes (Figure 21). Louise Lake also included bushy pondweed (*Najas flexilis*) as one of the most important submerged species.

Figure 21. Composition of submerged plant community in Little Boy, Wabedo, and Louise lakes, 2007.



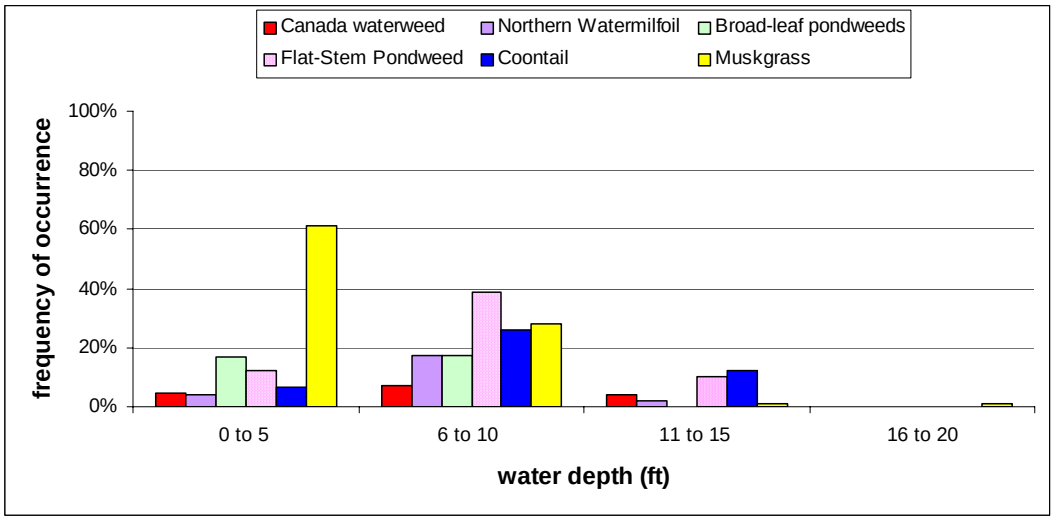
Muskgrass (*Chara* sp.) (Figure 22) was the most common submerged plant in Little Boy and Wabedo Lakes, occurring in 33% and 32% of the sites, respectively (Table 3). This macroscopic, or large, algae is common in many hard water Minnesota lakes. It has a brittle texture and a characteristic "musky" 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.

Figure 22. Bed of Muskgrass (*Chara* sp.)

Muskgrass was most often found in depths less than eight feet and was the most common submerged plant found in depths less than five feet (Figure 23). Muskgrass was widespread around the vegetated zones of each lake (Figure 24) and could be found growing in thick beds with no other vegetation and in other areas it co-occurred within mixed beds of pondweeds and other submerged plants. In Little Boy Lake, muskgrass was common within the extensive bulrush stands along the west shore.

Figure 23. Frequency of common submerged species by water depth.

Little Boy Lake, 2007



Wabedo Lake, 2007

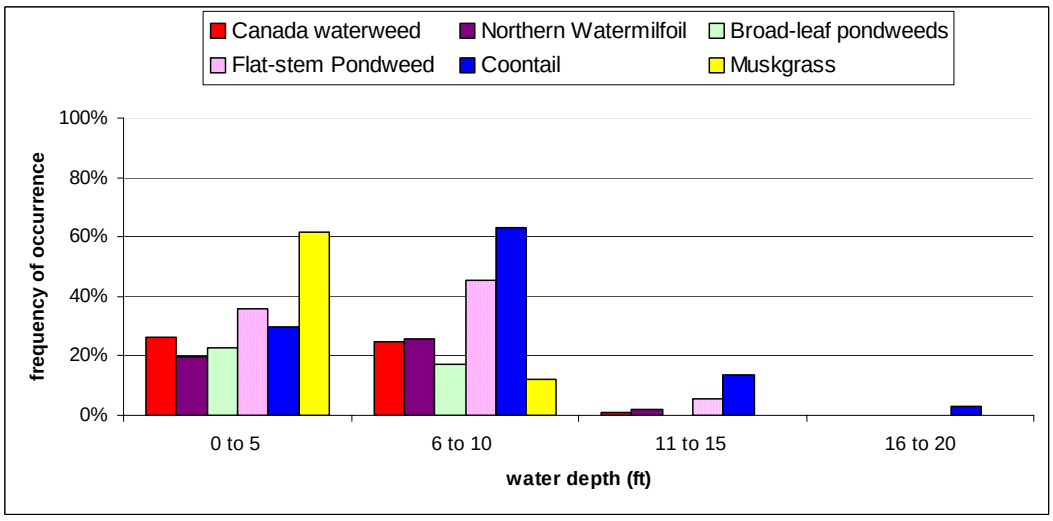


Figure 24. Distribution of common submerged species in Little Boy, Wabedo and Louise Lakes, 2007.

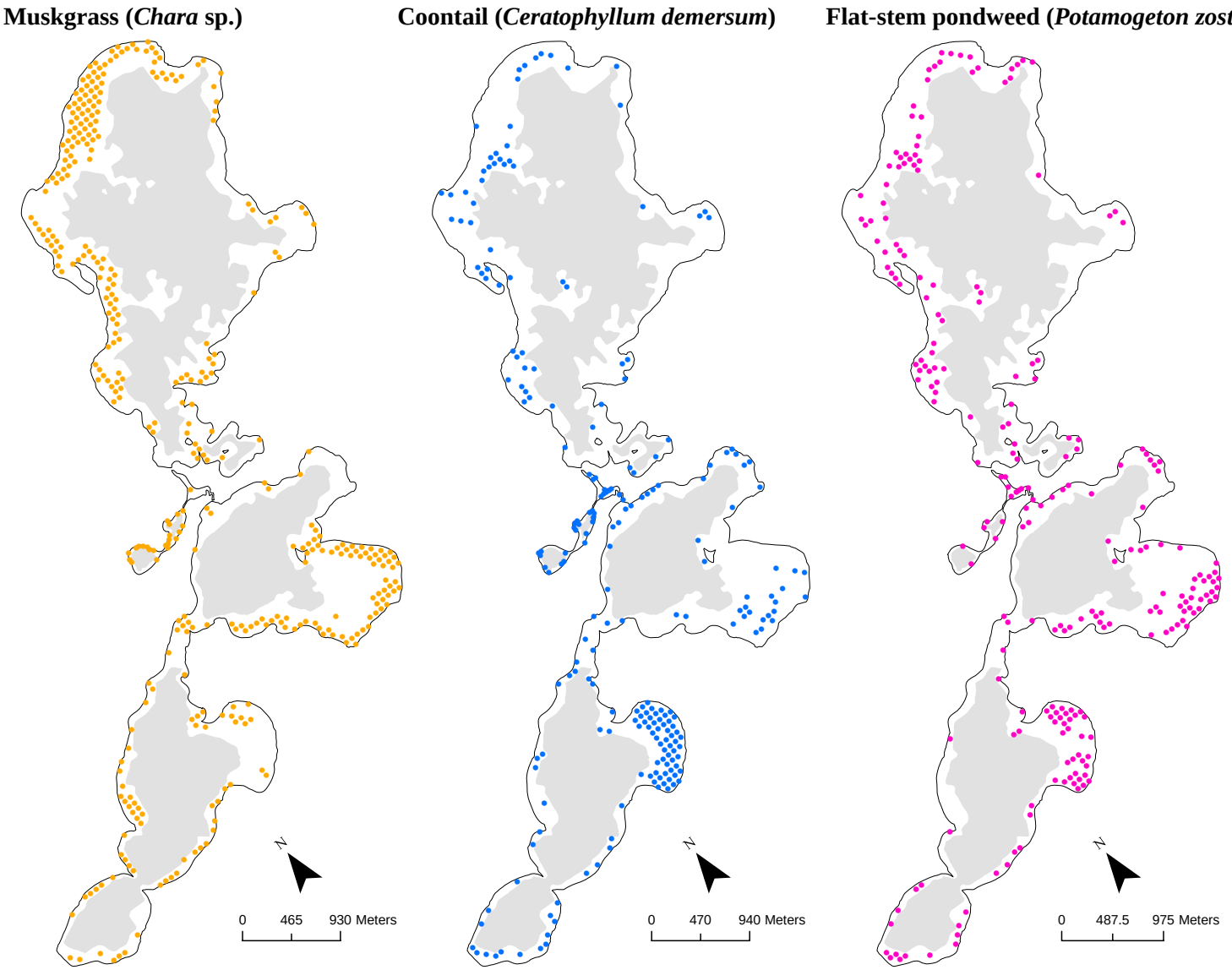
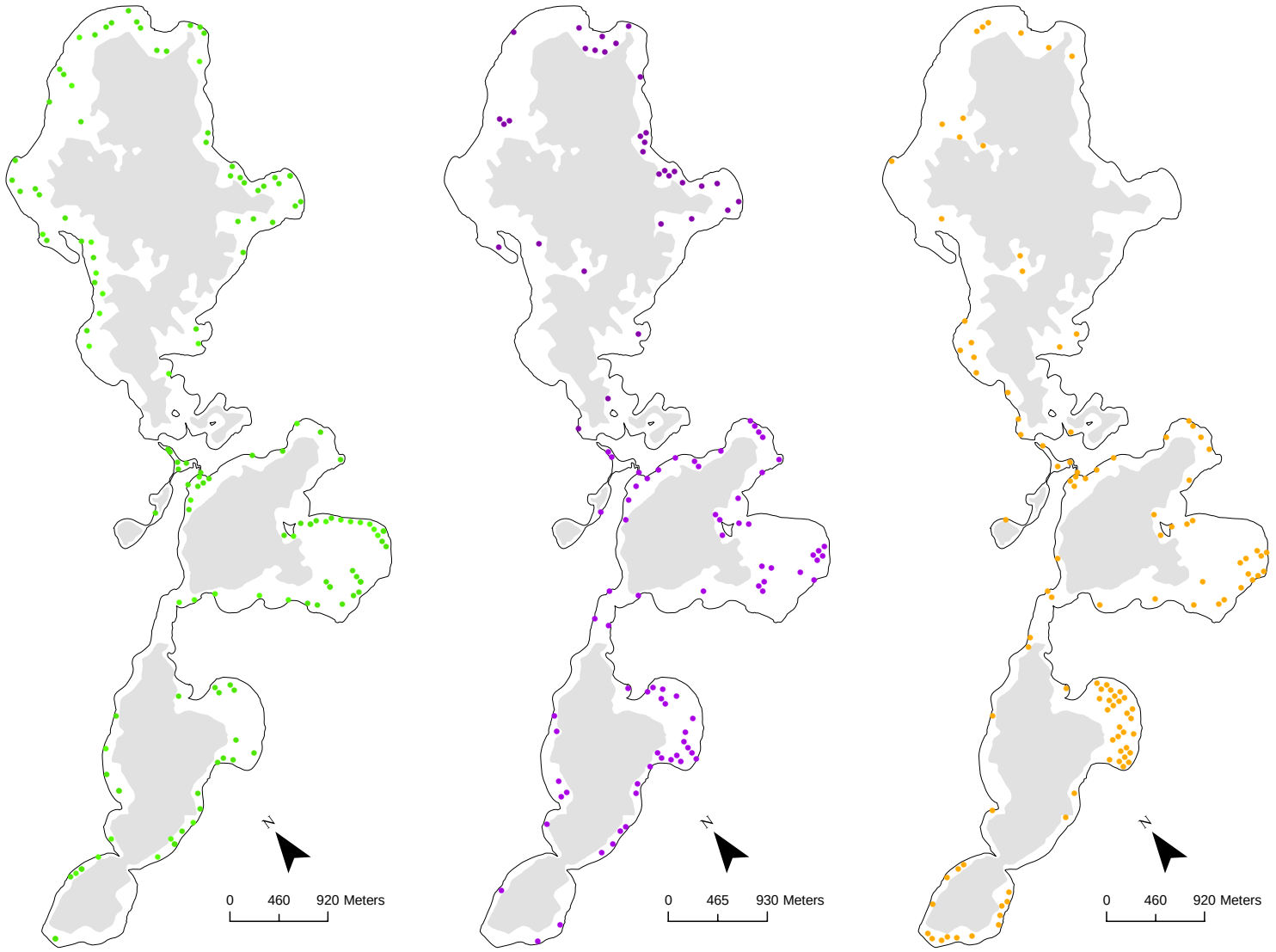


Figure 25. Distribution of common submerged species in Little Boy, Wabedo and Louise Lakes, 2007.



Coontail (*Ceratophyllum demersum*) (Figure 26) accounted for 24% of the submerged plant occurrence in Lake Louise, 19% in Wabedo and 11% in Little Boy Lake (Figure 21). It was the most frequently occurring submerged plant in Lake Louise, where it was found in more than one-third of the sample sites (Table 3).

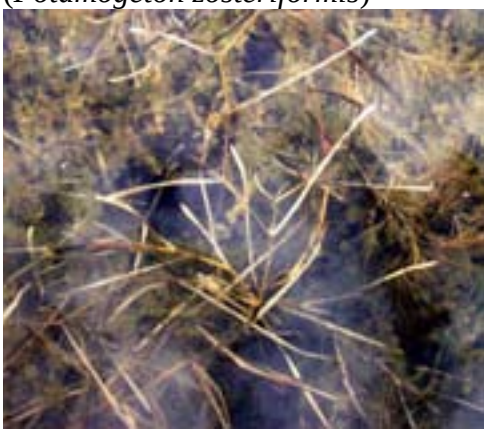
Figure 26. Coontail (*Ceratophyllum demersum*)

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. Areas where it was common contained muck substrates: Lake Louise and the east bay of south basin of Wabedo Lake (Figure 24). It was one of only four taxa to occur in depths beyond 15 feet and was the most common plant in these deeper zones (Figure 23).

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.

Flat-stem pondweed (*Potamogeton zosteriformis*) (Figure 27) made up about 15 percent of the submerged plant community in each lake (Figure 21). It was more frequently found in Wabedo Lake (26 percent of sites) than in Little Boy (15 percent of sites) and was widespread in both lakes (Figure 24).

Figure 27. Flat-stem pondweed (*Potamogeton zosteriformis*)



Flat-stem pondweed is a perennial plant that is anchored to the lake bottom by underground rhizomes. It was found to a depth of 13 feet in Wabedo Lake and to 14 feet in Little Boy Lake but was most common in depths of ten feet and less (Figure 23).

Flat-stem pondweed is named for its flattened, grass-like leaves. Depending on water clarity and depth, these plants may reach the water surface and may produce flowers that extend above the water. These pondweeds are anchored to the lake bottom by rhizomes and overwinter by winter buds.

Figure 28. A broad-leaf pondweed or "cabbage" (*Potamogeton amplifolius*) with cigar-shaped fruit

Broadleaf pondweeds in Long Lake include large-leaf pondweed (*Potamogeton amplifolius*) (Figure 28), variable pondweed (*P. gramineus*), Illinois pondweed (*P. illinoensis)*, white-stem pondweed (*P. praelongus*), and clasping-leaf pondweed (*P.*

richardsonii). These rooted, perennial plants with wide leaves are often called "cabbage" plants by anglers. The fruits of pondweeds are a favorite duck food and the broad leaves provide food and shelter for fish. These plants are primarily submerged but many will form floating leaves in shallower water.

Broad-leaf pondweeds made up about 10 percent of the Wabedo and Little Boy lakes plant communities and were less common in Lake Louise (Figure 21). Broad-leaf pondweeds usually occurred together with other submerged plants in mixed beds (Figure 25). Most of these species are not tolerant of turbidity and prefer clear water lakes. In these study lakes, broad-leaf pondweeds were restricted to depths less than 11 feet (Figure 23).

Northern watermilfoil (*Myriophyllum sibiricum)* (Figure 29) 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 over winters by hardy rootstalks and winter buds. Northern watermilfoil is not tolerant of turbidity and grows best in clear water lakes. This native plant provides fish shelter and insect habitat.

Figure 29. Northern watermilfoil. (*Myriophyllum sibiricum*)

Northern watermilfoil did occur in all three lakes (Figure 25) but was most commonly found in Wabedo Lake where it occurred in 14 percent of sample sites (Table 3).

Canada waterweed (*Elodea canadensis*) (Fig. 30) is perennial submerged species that is widespread throughout Minnesota because, like coontail, it is adapted to a variety of conditions. It is tolerant of low light and prefers soft substrates. This species can over winter as an evergreen plant and spreads primarily by fragments. The branching stems of this plant can form thick underwater plant beds that are valuable habitat for a variety of fish and invertebrates.

Figure 30. Canada waterweed (*Elodea canadensis*) (photo by Vic Ramey, U of Florida)

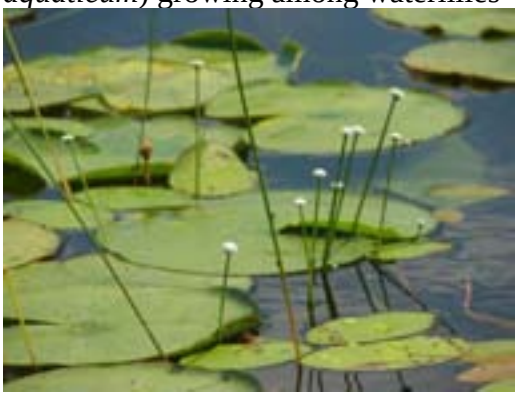
Canada waterweed occurred in all three lakes (Figure 25) but was most common in Wabedo Lake where soft sediments were more prevalent.

Unique Plants

Several unique aquatic plants were found during these surveys. A few plants were found only in Louise Lake and include pipewort (*Eriocaulon aquaticum*) and ribbon-leaf pondweed (*Potamogeton epihydrus*). Both of these species inhabit waters of low alkalinity, or soft-water lakes, of northeastern Minnesota. They are uncommonly found because of their unique habitat requirements. Pipewort is a submerged plant but produces a flower that emerges above the water

(Figure 31). Ribbon-leaf pondweed is closely related to the other pondweeds found in these lakes and is intermediate in appearance between flat-stem pondweed and broad-leaf pondweeds. Ribbon-leaf pondweed is a submerged plant that will form floating leaves. Both pipewort and ribbon-leaf pondweed were found within the shallow, protected bays of Lake Louise.

Figure 31. Pipewort (*Eriocaulon aquaticum*) growing among waterlilies



Discussion

The types and amounts of aquatic vegetation that occur within a lake are influenced by a variety of factors including water clarity, water chemistry, depth, substrate type and wave activity. The water clarity of Little Boy and Wabedo lakes is sufficiently high to allow aquatic plant growth to a depth of about 15 feet but available light beyond that depth is not sufficient for most rooted plants. The diversity of substrate types provides for a mixed habitat of bulrush beds along sandy shores and waterlily and wild rice beds in softer sediments. The abundant and diverse native aquatic plant communities found in these lakes provides critical fish and wildlife habitat and other lake benefits. (Click here for more information on: value of aquatic plants).

A review of past vegetation surveys of these lakes indicates that the general aquatic plant community has not likely changed greatly in these lakes. In all survey years, a relatively high number of native plants have been recorded and rooted plants remain well distributed throughout the bays. Data collected in 2007 can be used to monitor finer-scale changes that may occur, such as an increase in a particular taxa or a change in the depths at which individual taxa occur. 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.

In general, factors that may lead to change in the aquatic plant communities include:

- Change in water clarity
  If water clarity decreases, submerged vegetation may be restricted to shallower water.
- Change in water level
  Many aquatic plants are adaptable to water level fluctuations and in low water years, aquatic plants may expand in distribution. The extent and duration of these distribution changes can be difficult to predict.
- Snow and ice cover
  Many submerged plants 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, some 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.

- Invasive species
  Non-native submerged species have **not** been documented in these lakes but if they invade the lake, they may directly or indirectly impact the native plant community. Non-native plant species, such as Eurasian watermilfoil (*Myriophyllum spicatum*) or curly-leaf pondweed (*Potamogeton crispus*) may form dense surface mats that may shade out native plants. The impact of these invasive species varies among lakes but the presence of a healthy native plant community may help mitigate the harmful effects of these exotics.
- Natural fluctuation in plant species abundance
  Many submerged plants are perennial and regrow in similar locations each year. However, a few species such as bushy pondweed (*Najas flexilis*) and wild rice (*Zizania palustris*) are annuals and are dependant on the previous years seed set for regeneration. Bushy pondweed was not commonly found during the 2007 survey and may not have fully germinated until later in the summer. Previous vegetation surveys of these lakes, conducted in late July, have reported bushy pondweed top be widespread throughout the shallow zone.

- 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, click here: MnDNR APM Program or contact your local DNR office. Motorboat activity in vegetated areas can be particularly harmful for species such as bulrush and 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. Limiting these types of activities can help protect native aquatic plant species.

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