Aquatic Vegetation Survey of

Steamboat Lake (DOW #11-0504-00)

Cass and Hubbard Counties, Minnesota

2008

West end of Steamboat Lake. 2008

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Report by: Donna Perleberg and Stephanie Loso
Minnesota Department of Natural Resources
Division of Ecological Resources
1601 Minnesota Dr.
Brainerd, MN 56401
Phone: 218.833.8727
Email: donna.perleberg@dnr.state.mn.us

Lakewide sampling (2008): Donna Perleberg, Aquatic Plant Ecologist
Stephanie Loso, Aquatic Biologist
Mike Kobberdahl, Student Intern
Kevin Mortenson, Student Intern

Bulrush mapping (2008): Donna Perleberg, Stephanie Loso, MnDNR Division of Ecological Resources, Brainerd.

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Report review: Calub Shavlik, Fisheries Specialist, MnDNR Fish and Wildlife, Walker

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Summary

Aquatic vegetation surveys of Steamboat Lake (11-0504-00), Cass and Hubbard Counties, Minnesota, were conducted in August 2008. Surveys included a lakewide assessment of vegetation and water depths at over 600 sample stations, characterization of shoal substrate types, and mapping of emergent and floating-leaf plant beds.

The aquatic plant community of Steamboat Lake is similar to that found in other hardwater Cass County lakes. Thirty native aquatic plant species were found including seven emergent, three floating-leaved, three free-floating and 17 submerged species. Non-native aquatic plant species were not found.

Emergent and floating-leaved plants were generally restricted to depths of five feet and less. Within that depth zone, 34 percent of the survey sites contained at least one emergent or floating-leaf plant. Approximately 90 acres of bulrush (*Scirpus* sp.), 21 acres of wild rice (*Zizania palustris*) and one acre of waterlily beds (*Nymphaea odorata, Nuphar variegata)* were mapped.

Submerged plants occurred to a maximum depth of 19 feet but were most common in depths from shore to ten feet, where 95 percent of the sites contained vegetation. The most common submerged plant species were muskgrass (*Chara* sp.) (54% occurrence within the shore to 20 feet zone), greater bladderwort (*Utricularia vulgaris*) (24% occurrence), flat-stem pondweed (*Potamogeton zosteriformis*) (23% occurrence), coontail (*Ceratophyllum demersum*) (18% occurrence) and northern watermilfoil (*Myriophyllum sibiricum*) (14% occurrence).

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Introduction

Steamboat Lake is located on the border of Cass and Hubbard counties in north-central Minnesota (Figure 1). It lies in the northwest corner of the Leech Lake River Watershed and receives flow from inlets on the west and north sides of the lake. Steamboat River flows east through Steamboat Lake and then flows under State Highway 371 and into Steamboat Bay Lake. Steamboat River continues south and empties into Steamboat Bay of Leech Lake (Figure 2). The lake, river and bay names dates to Minnesota's logging era of the late 1890's and early 1900's when cut trees were transported across larger lakes by steamboats (Gardner and Moe 2004).

There are about 156 lakes in the Leech Lake River Watershed and about 250 lakes in Cass County that are at least 50 acres in size. Steamboat Lake is the

Figure 1. Location of Steamboat Lake, Cass and Hubbard Counties, MN.

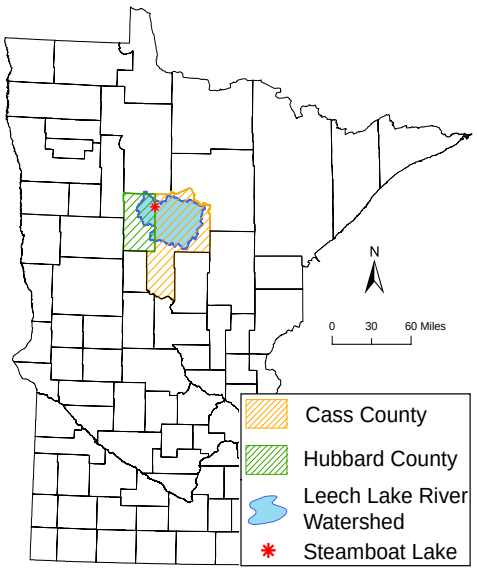
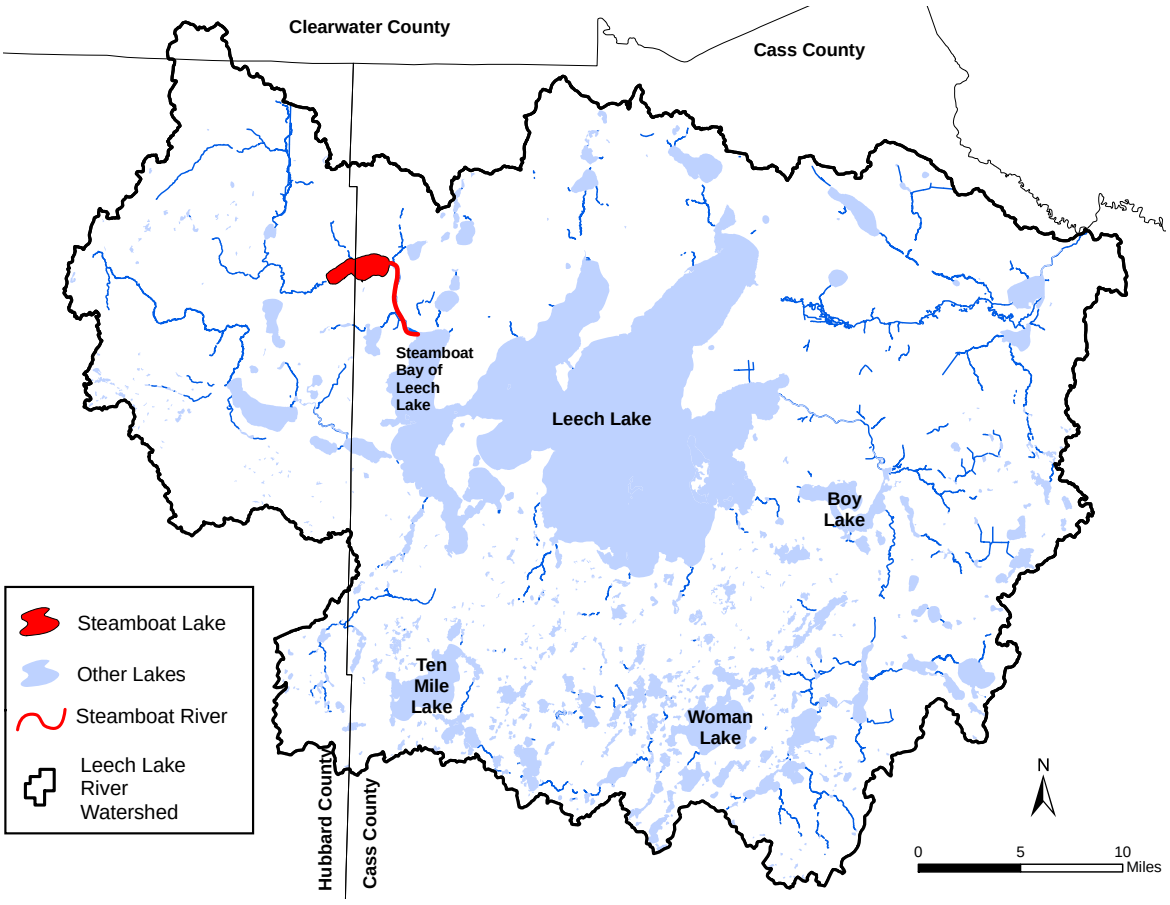


Figure 2. Location of Steamboat Lake in Leech Lake River Watershed.



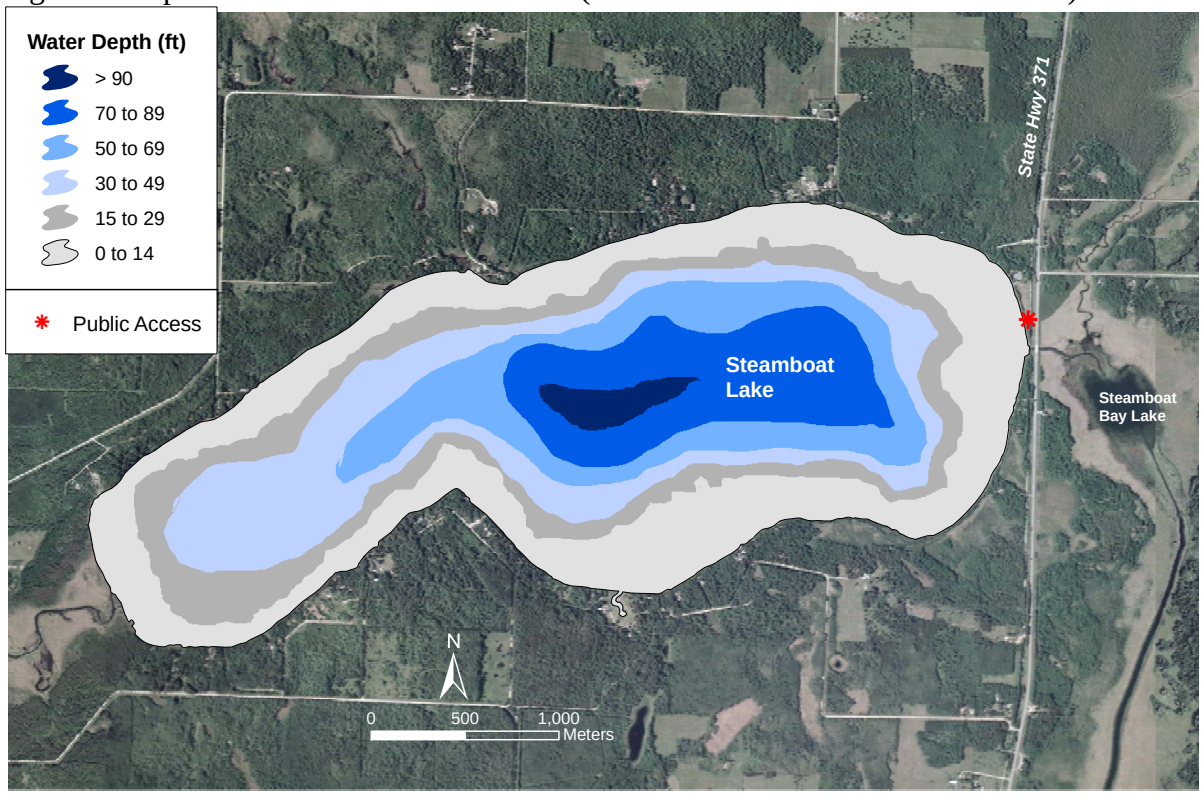
seventh largest lake in the watershed and the ninth largest lake in Cass County, with a surface area of 1,755 acres and 8.24 miles of shoreline.

Steamboat Lake has a single, elongated basin with an east-west orientation. The Cass County (east) portion of the lake is within the boundaries of the Leech Lake Nation Indian Reservation and the Chippewa National Forest but most of the shoreline is privately owned. The marshland at the inlet and a few upland tracts are under state ownership. A state-owned public access is located on the northeast corner of the lake off of State Highway 371 (Figure 3). The privately owned shoreline had been developed with residential homes and a private youth camp is located on the northeast shore.

Steamboat Lake has a maximum depth of 93 feet and about 30 percent of the lake basin is less than 15 feet in depth (Figure 3). This shallow area that rings the lake shoreline is referred to as the littoral zone. Rooted submerged plants are often common in the littoral zone if adequate sunlight reaches the lake bottom.

Steamboat Lake is a mesotrophic lake, or moderately nutrient enriched, with relatively high water clarity. The Secchi disc (Figure 4) 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. Between 2004 and 2007, summer water clarity, as measured by Secchi disc readings, was about 12 feet in Steamboat Lake (MPCA, 2008). 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 Secchi disk measurements alone, aquatic plants are expected to grow to

Figure 3. Depth contours of Steamboat Lake (15 feet contour is based on 2008 data).



about 18 feet in Steamboat Lake. Other factors that may influence the depth of plant growth include substrate type, wind fetch, and plant species composition.

Figure 4. Measuring Secchi Disc transparency

Previous vegetation surveys of Steamboat Lake found plants growing to depths of nine feet with abundant plant growth described on the west end of the lake (MnDNR Fisheries Lake Files). More than 13 different aquatic plant species have previously been recorded in these lakes including bulrush (*Scirpus* sp.), coontail (*Ceratophyllum demersum*), canada waterweed (*Elodea canadensis*), greater bladderwort (*Utricularia vulgaris*), muskgrass (*Chara sp.*), and clasping-leaf pondweed (*Potamogeton richardsonii*).

Objectives

The purpose of this vegetation survey was to provide a quantitative description of the 2008 plant population of Steamboat 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 species that occur in the lake
5. Estimate the abundance of common species
6. Develop distribution maps for the common species

Methods

Lakewide vegetation survey

Steamboat Lake was surveyed on August 13, 14, 18, 19, and 27, 2008. A point-intercept survey method was used and followed the methods described by Madsen (1999) and MnDNR (2008a). Survey waypoints were created using a Geographic Information System (GIS) computer program and downloaded into a handheld Global Positioning System (GPS) receiver.

The lake area between shore and the 25 feet water depth was surveyed. Survey points were placed in a grid pattern and spaced 65 meters (213 feet) apart, resulting in one survey point per acre. A total of 654 sites were surveyed in Steamboat Lake (Figure 5, Table 1). A large swim area is located adjacent to the private camp on the northeast shore and this area was not included in the survey.

Table 1. Sampling effort by water depth.

Water depth interval	Steamboat Lake
0 to 5	276
6 to 10	185
11 to 15	101
16 to 20	70
Sub-total	632
21 to 25	22
Total sample points	654

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Figure 5. 2008 vegetation survey sites on Steamboat Lake.

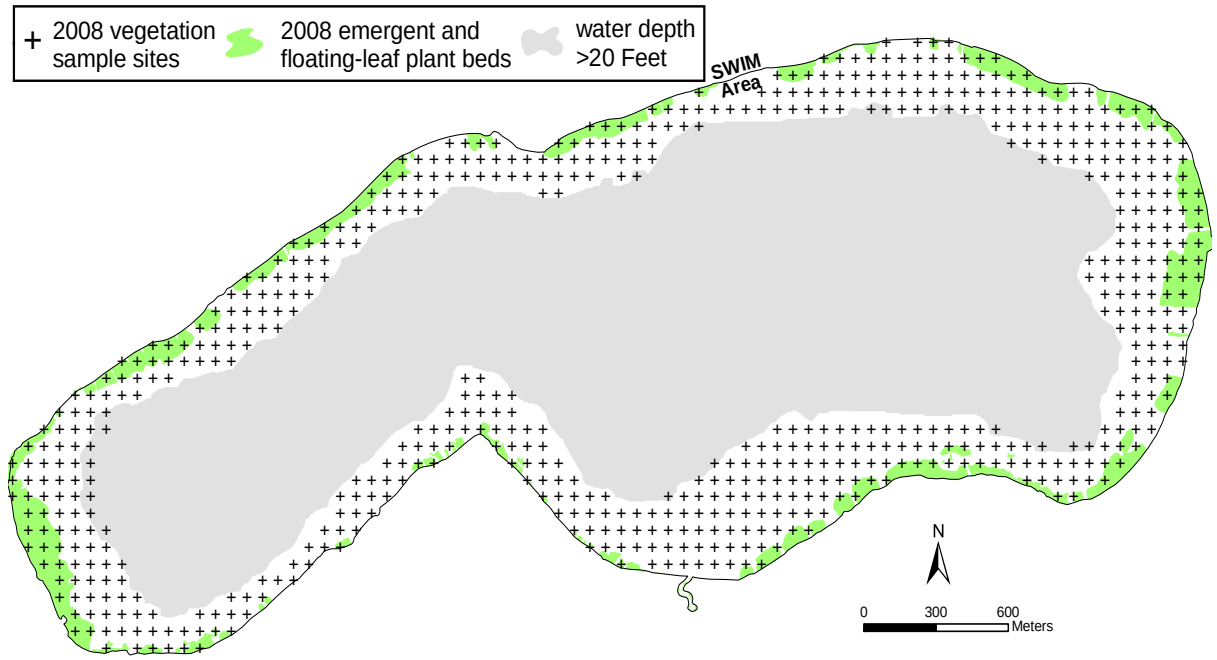

Figure 6. Sampling rake.

Two field crews, each consisting of two surveyors and one boat, conducted the survey. 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 seven feet and an electronic depth finder in depths greater than eight feet.

Surveyors recorded all plant species 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 6). Any additional plant species found outside of the sample sites were recorded as "present" in the lake. Plant identification and 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 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). Twenty-two sites occurred in water depth greater than 20 feet and were not included in the analysis.

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At each sample site where water depths was seven feet and less, surveyors described the bottom substrate using standard substrate classes (Table 2). If a mixture of substrate classes occurred at a site, surveyors recorded the most abundant class. Surveyors attempted to record a substrate description at the shore side of each row of points. If a sample site occurred near shore but in water depth greater than seven feet, surveyors collected depth and vegetation data and then motored into shallower water and recorded the substrate type adjacent to the actual survey point.

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

Mapping floating-leaf and emergent vegetation beds

Extensive beds of emergent and floating-leaf plant beds occur in Steamboat Lake. Field surveys to map floating-leaf and emergent vegetation were conducted in August 2008. Farm Service Administration (FSA) true color (2003-2004) aerial photographs were used to delineate floating-leaf plant beds and ground truthing was conducted to verify plant community composition within major beds. Bulrush (*Scirpus* spp.) plants are difficult to observe on aerial photographs and therefore, surveyors mapped bulrush beds in the field by motoring around the perimeter of major bulrush beds. Field data were uploaded to a computer and a GIS software program was used to calculate acreage.

Results

Shoal substrates

Steamboat Lake shoal substrates are primarily sand. Softer substrates like muck, silt, and marl were found primarily on the west side of the lake and in scattered locations along the north and south shores (Figure 7).

Distribution of aquatic plants

Aquatic plants occurred around the entire perimeter of the lake and were common from shore to the 15 feet depth contour (Figure 8). Emergent plant beds occurred along most shorelines and extended at least 100 meters (300 feet) lakeward in some areas. Submerged plants were found to a maximum depth of 19 feet and were most abundant in depth from shore to ten feet, where 95 percent of the sites contained plants. In depths greater than 15 feet, only three percent of the sites were vegetated (Figure 9).

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Figure 7. Shoal water substrate types of Steamboat lake.

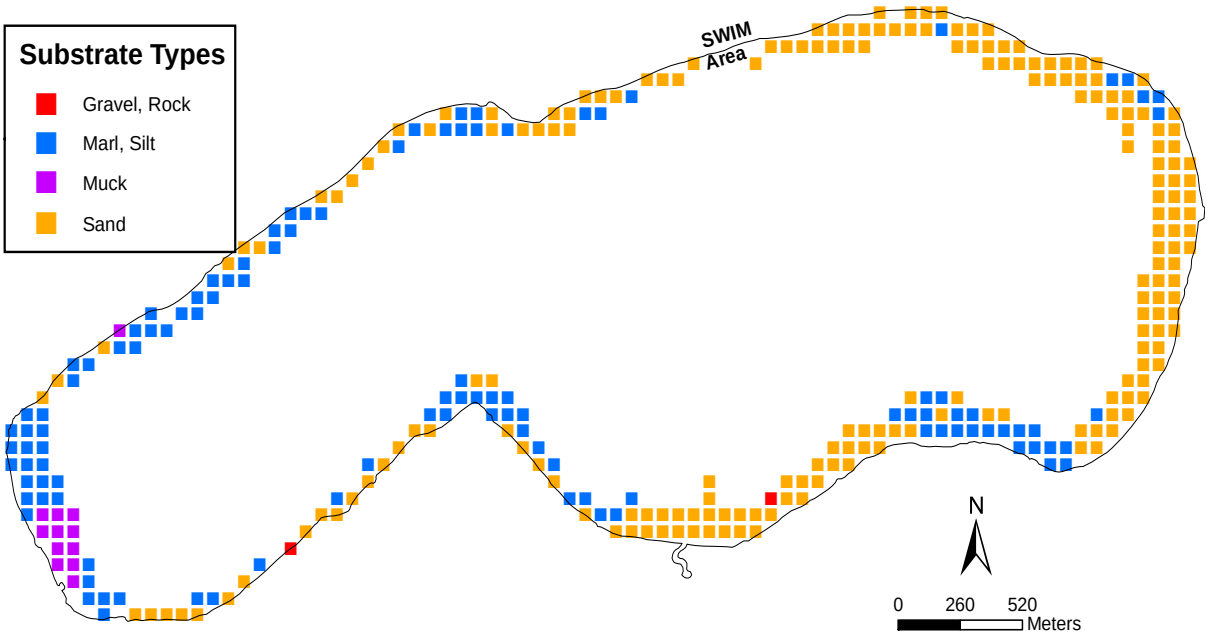


Figure 8. Distribution of aquatic plants in Steamboat Lake, 2008.

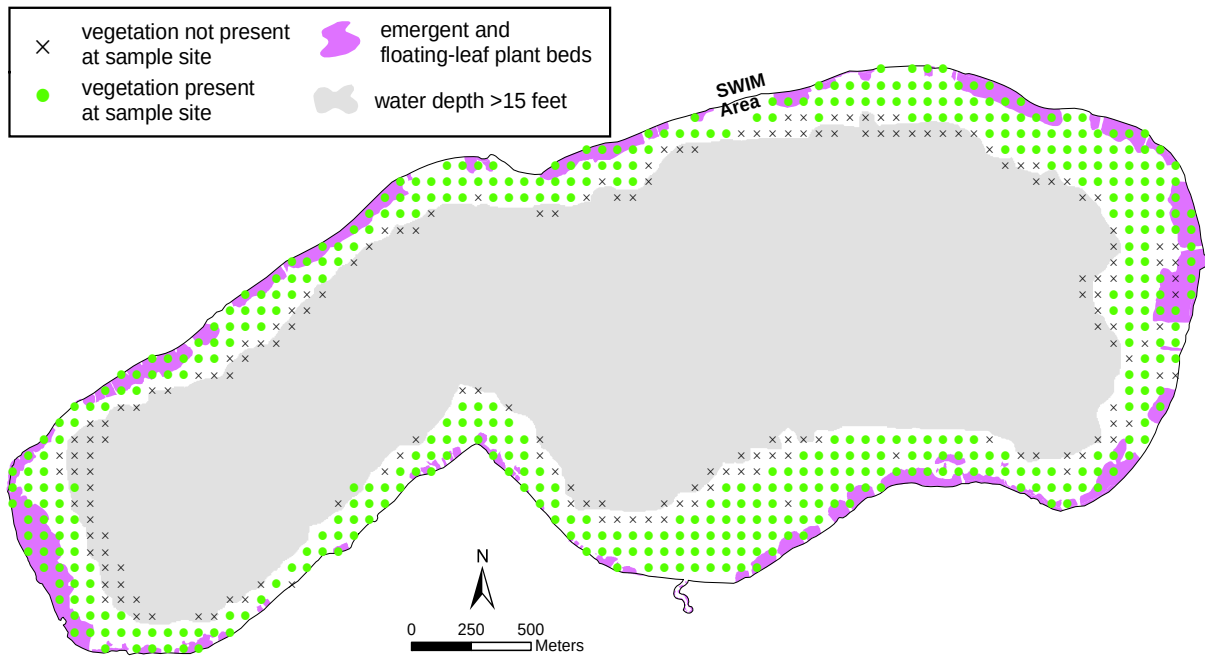
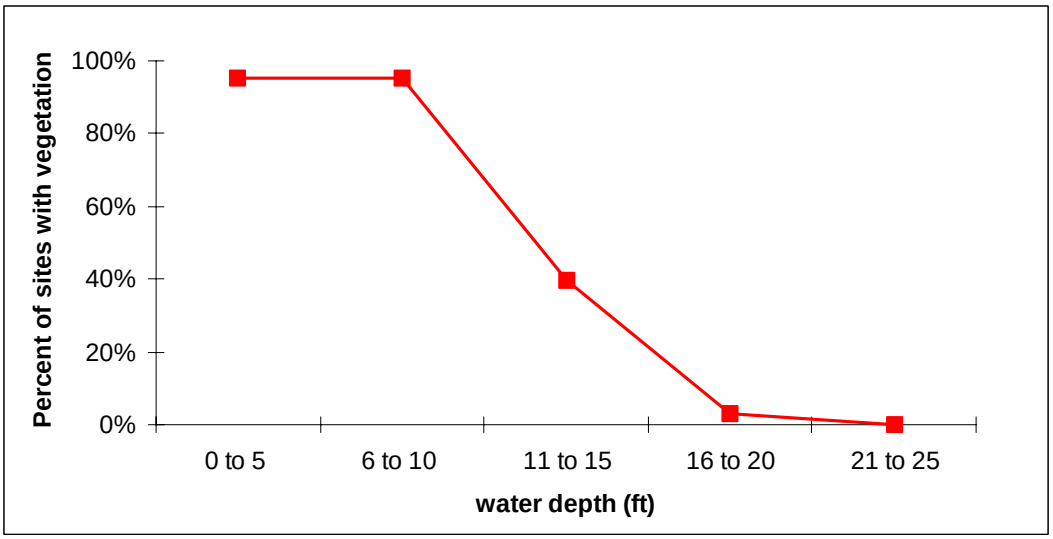


Figure. 9. Percent frequency of vegetation types by water depth interval.



Number of plant species recorded and distribution by water depth

A total of 30 native aquatic plant species were recorded in Steamboat Lake including seven emergent, three floating-leaved, 17 submerged and three free-floating species (Table 3).

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 ten feet and less (Figure 10). Only eight submerged species occurred in depths greater than ten feet and only one species occurred in depths greater than 15 feet.

Figure 10. Number of plant species found at each water depth interval.

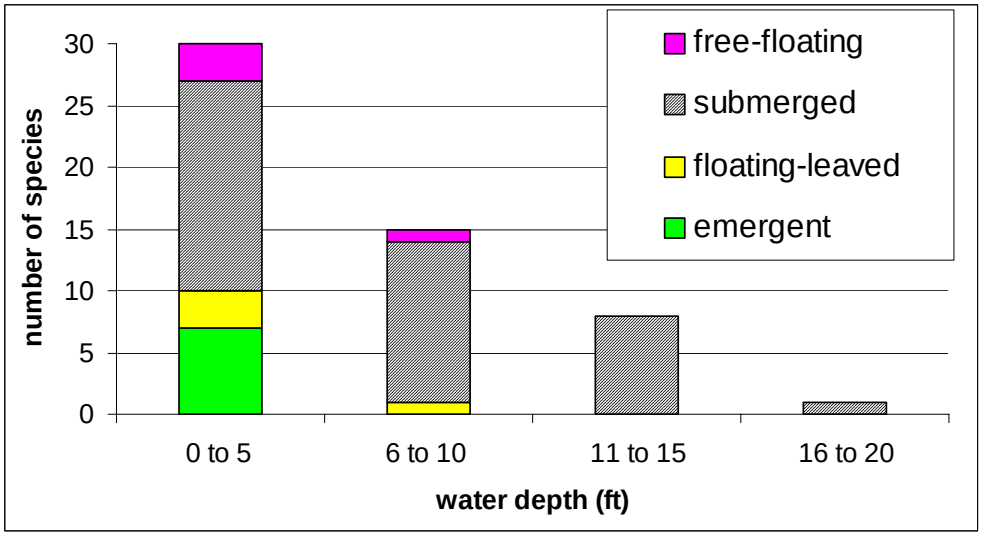


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Table 3. Frequency of aquatic plants in Steamboat Lake Point-intercept survey, August 2008.

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

632 sample sites

Life Form		Common Name	Scientific Name	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 may or may not be anchored to the lake bottom.	Large Algae	Muskgrass	*Chara sp.*	54
	Dissected-leaf rooted plants	Greater bladderwort	*Utricularia vulgaris*	24
		Coontail	*Ceratophyllum demersum*	18
		Northern water milfoil	*Myriophyllum sibiricum*	14
		Marestail	*Hippuris vulgaris*	<1
		White water buttercup	*Ranunculus aquatilis*	<1
	Grass-leaf rooted plants	Flat-stem pondweed	*Potamogeton zosteriformis*	23
		Wild celery	*Vallisneria americana*	<1
	Small-leaf rooted plants	Bushy pondweed	*Najas flexilis**	6
		Canada waterweed	*Elodea canadensis*	5
		Fries pondweed	*Potamogeton freisii*	3
		Narrow-leaf pondweed	*Potamogeton sp.***	<1
		Sago pondweed	*Stuckenia pectinata*	<1
	Broad-leaf rooted plants ("cabbage")	White-stem pondweed	*Potamogeton praelongus*	5
		Illinois pondweed	*Potamogeton illinoensis*	2
		Clasping-leaf pondweed	*Potamogeton richardsonii*	1
		Large-leaf pondweed	*Potamogeton amplifolius*	<1
	Moss	Water moss	*Not identified to genus*	<1
FREE-FLOATING These plants drift freely with the water current and are often found floating near or on the water surface.		Star duckweed	*Lemna trisulca*	3
		Lesser duckweed	*Lemna minor*	<1
		Greater duckweed	*Spirodela polyrhiza*	present
FLOATING These plants are rooted in the lake bottom and have leaves that float on the water surface.		Yellow waterlily	*Nuphar variegata*	4
		Floating leaf pondweed	*Potamogeton natans*	2
		White waterlily	*Nymphaea odorata*	<1
EMERGENT These plants extend well above the water surface and are usually found in shallow water, near shore.		Hardstem bulrush	*Scirpus acutus*	11
		Wild rice	*Zizania palustris*	2
		Broadleaf arrowhead	*Sagittaria latifolia*	<1
		Giant burreed	*Sparganium eurycarpum*	<1
		Narrow-leaf Cattail	*Typha angustifolia*	<1
		Giant cane	*Phragmites australis*	Present
		Horsetail	*Equisetum* sp.	Present

*may have included some specimens of *Najas guadalupensis.*

**Some specimens of "narrow-leaved pondweeds" were positively identified as *Potamogeton freisii* (Fries pondweed). However, it is not known whether other "look-a-like" narrow-leaf pondweed species occurred in the lake. Therefore, a separate group of "unidentified narrow-leaf pondweeds" (*Potamogeton* sp.) are reported here but not counted in species tally.

"Present" indicates species was found in lake but did not occur within one of the 632 sample sites.

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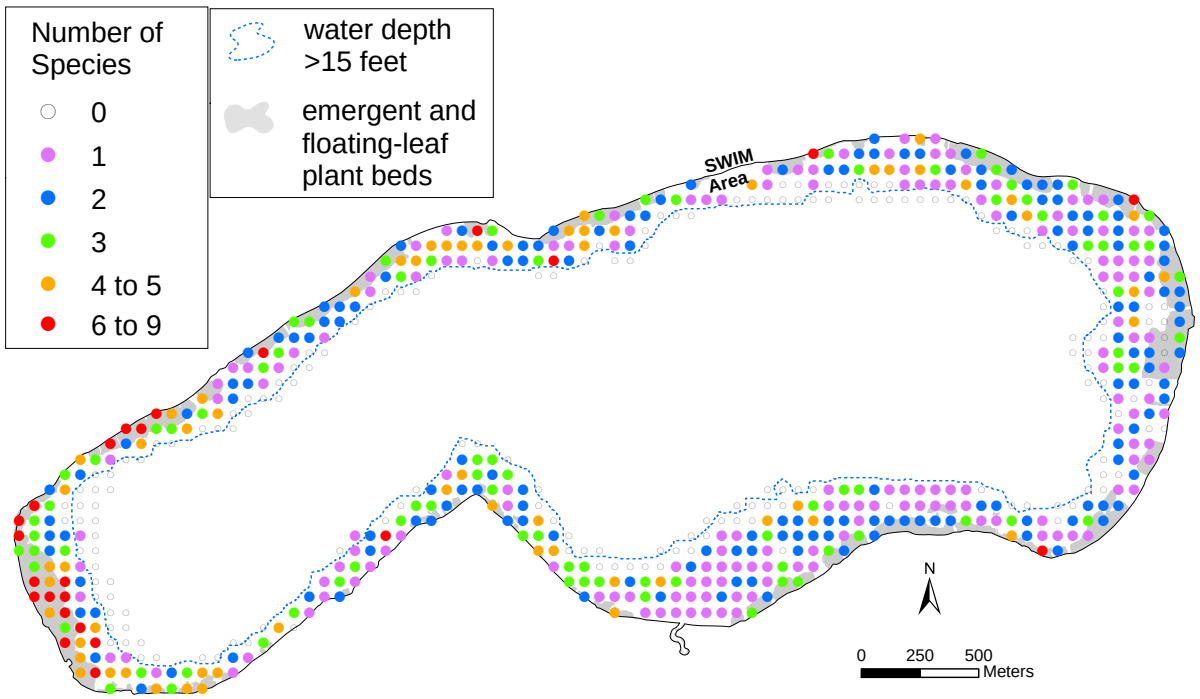
The number of plant species found at each one square meter sample site ranged from zero to nine, with a mean of two species per site. Sites with the highest number of species occurred on the west shore, in shallow water and within mixed beds of emergent, floating-leaved and submerged plants (Figure 11). In water depths greater than 10 feet, most sites contained either no plants or only one species.

Figure 11. Number of plant species at each sample site, Steamboat Lake, 2008.



Emergent and floating-leaf plants

Approximately 116 acres of emergent and floating-leaf plant beds were mapped. Within the shore to five feet depth zone, 34 percent of the survey sites contained at least one emergent or floating-leaf plant. Major plant bed types included bulrush, bulrush mixed with waterlilies and other species, and wild rice (Figure 12). Wild rice and waterlilies were often associated with soft substrates and bulrush was more typically found on hard substrates.

Hard-stem bulrush (*Scirpus acutus*) was the most common emergent in Steamboat Lake and was found in 11 percent of the sites (Table 3). It was found between shore and the five feet depth and within that zone, it occurred in 24 percent of the sample sites. Bulrush was typically found in sand substrates. About 90 acres of bulrush beds were mapped in this lake and some beds extended nearly 1,000 meters (3,300 feet) along shore and more than 100 meters (330 feet) lakeward (Figure 12).

Bulrush (Figure 13) is a perennial emergent that may occur from shore to water depth of about six feet and its stem may extend several feet above the water surface. It may grow in pure stands

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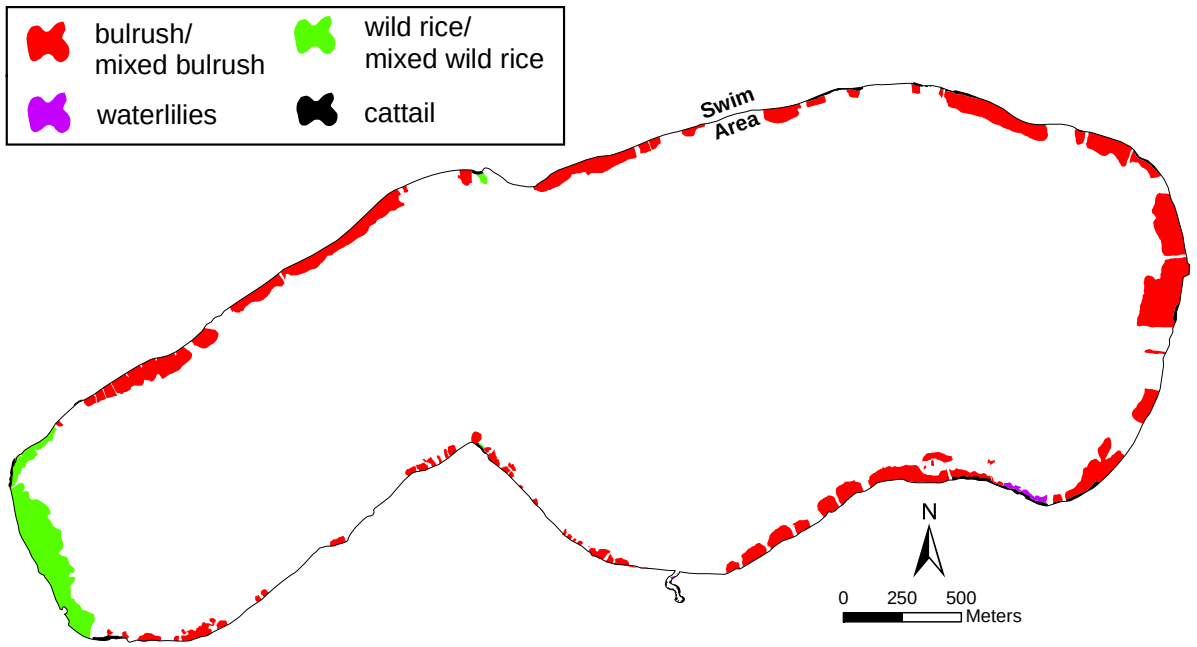
Figure 12. Major emergent and floating- leaf plant beds 2008.



or with other emergents and waterlilies. Bulrush spreads by rhizomes and regeneration is most successful on very shallow sites. Restoration of bulrush beds can be very difficult, making established bed particularly unique and valuable.

Figure13. Emergent bulrush (*Scirpus*) beds in Steamboat Lake, 2008.

Wild rice (*Zizania palustris*) (Figure 14) was found in two percent of all survey sites (Table 3) and in four percent of sites in the shore to five feet depth zone. It frequently co-occurred with bulrush, waterlilies or other emergent vegetation. Wild rice prefers soft substrates (Lee 1986, Nichols 1999) and generally requires moving water for growth (MnDNR 2008b). In Steamboat Lake, 21 acres of wild rice were mapped and it was concentrated at the west end of the lake where there is inflow from Steamboat River. It was also abundant in Steamboat Bay Lake and Steamboat River.

Figure 14. Wild rice (*Zizania palustris*) Steamboat Lake, 2008.

Wild rice is an annual plant that germinates each year from seed that fell to the lake

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bottom in the previous fall. The plant begins growth underwater and then forms a floating-leaf stage before becoming fully emergent. Wild rice is susceptible to disturbance because it is weakly rooted to the lake bottom. In addition to its ecological value as habitat and food for wildlife, wild rice has important cultural and economic values in Minnesota (MnDNR 2008b). This valuable plant is increasingly threatened by factors such as lakeshore development and increased water recreational use (MnDNR 2008b).

Figure 15. Mixed bed of wild rice and waterlilies in Steamboat Lake, 2008.

Waterlily beds, or mixed beds of waterlilies and emergents, covered about five acres in Steamboat Lake, along the southeast shore (Figure 12). Floating-leaf plants within these beds included yellow waterlily (*Nuphar variegata*), white waterlily (*Nymphaea odorata*), and floating-leaf pondweed (*Potamogeton natans*). Waterlily beds often contained wild rice, scattered bulrush plants, and submerged plants.

Submerged plants

Submerged plants occurred in 75 percent of the Steamboat Lake sites between the shore to 20 feet depth and were common to a depth of 15 feet. A mixture of submerged plant types was found including species that were weakly anchored to the lake bottom as well as strongly rooted perennials. Submerged plants included large algae, grass-leaved plants, finely dissected-leaved plants and broad-leaved plants.

Muskgrass (*Chara* sp.) (Figure 16) was the most common submerged plant in Steamboat Lake. It occurred in 54 percent of the sites (Table 3) and was found around the entire perimeter of the lake except in areas of muck (Figure 17). Muskgrass grew to a depth of 14 feet but was most frequently found in the shore to ten feet depth zone where it was the dominant species (Figure 18). Muskgrass could be found growing in thick beds with no other vegetation and in other areas it co-occurred within mixed beds.

Figure 16. Muskgrass (*Chara* sp.)
Photo: Vic Ramey ©2001 Univ. Florida

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 species 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.

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Figure 17. Distribution of common submerged species in Steamboat Lake, 2008.

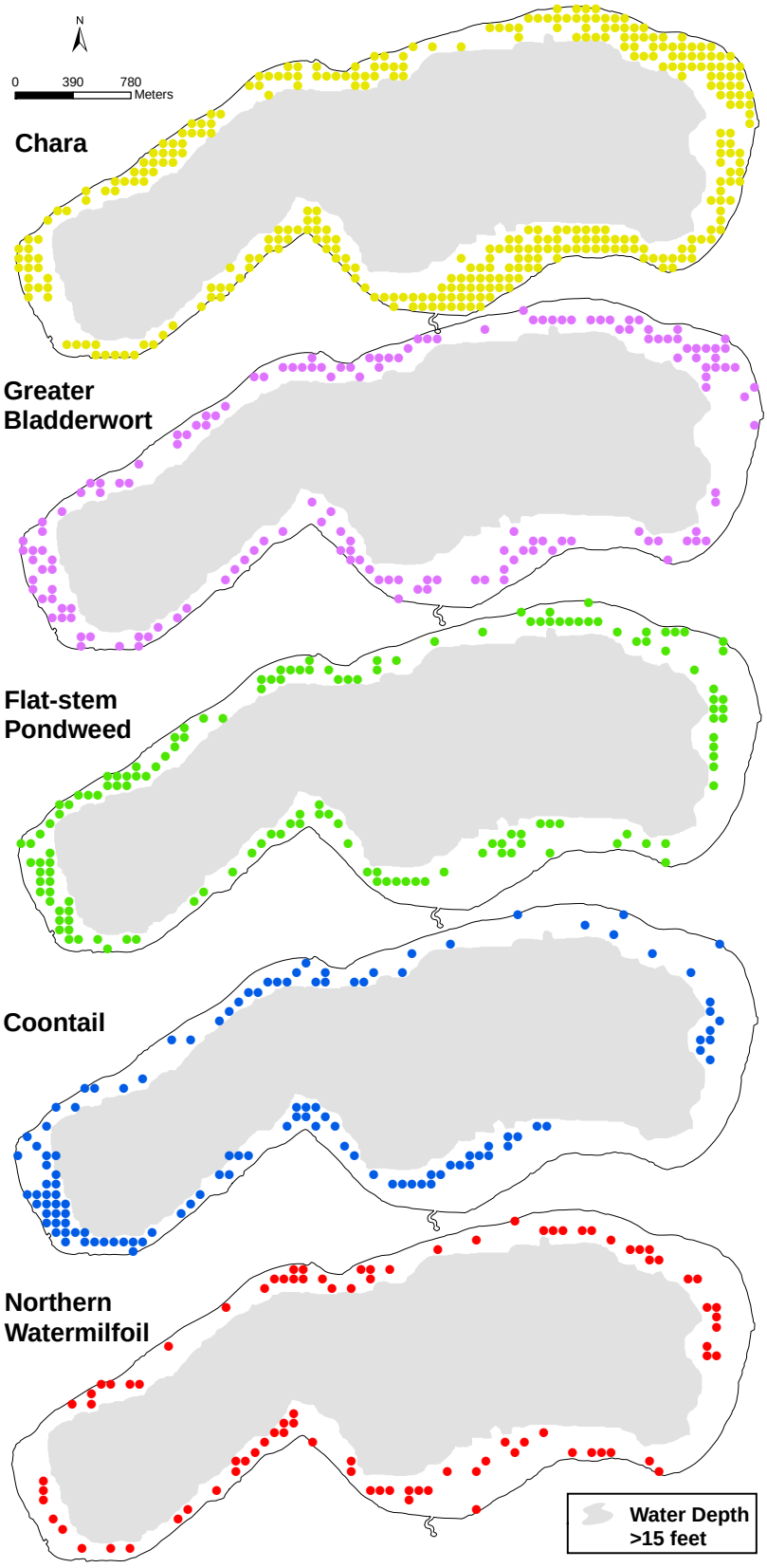
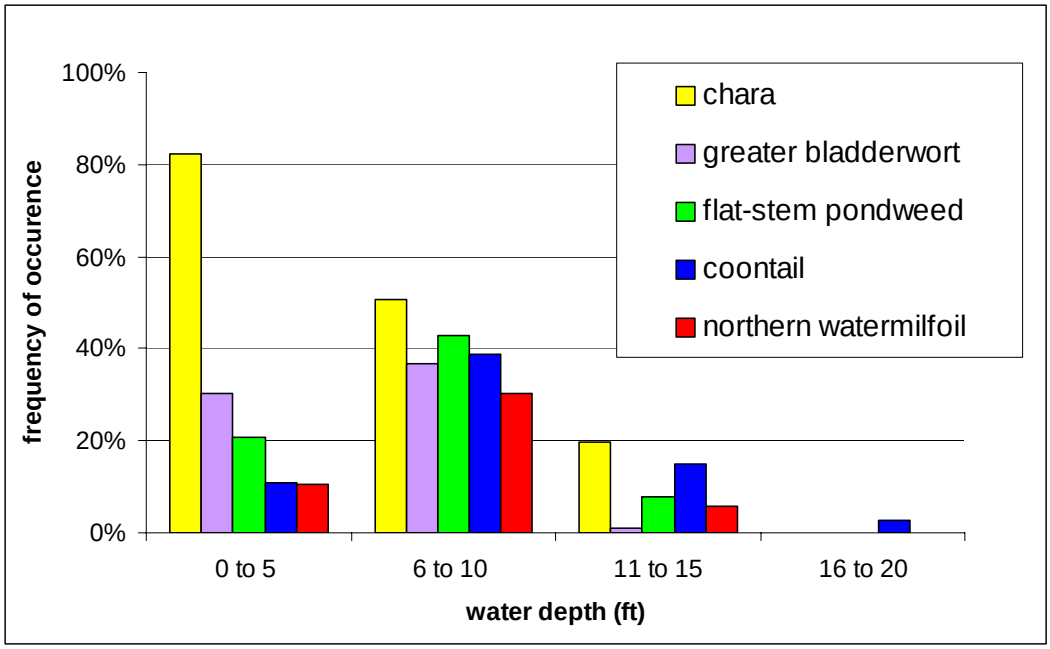


Figure 18. Frequency of common plants by water depth interval. Steamboat Lake, August 2008.



Greater bladderwort *(Utricularia vulgaris)* was found in 24 percent of Steamboat Lake sites (Table 3) and occurred around the lake except for the east shore (Figure 17). In Steamboat Lake it was most common in six to ten feet depth zone (Figure 18) and often co-occurred with muskgrass.

Figure 19. flowers of Greater bladderwort. (*Utricularia vulgaris*)

Greater bladderwort (Figure 19) is an entirely submerged plant except during bloom when its small, showy yellow flower extends above the water. Bladderwort often floats freely in the water column and is tolerant of turbid water. It reproduces by fragments and winter buds that can float to new areas of the lake. This plant has finely dissected leave with small "bladders" that trap invertebrates. It is Minnesota's version of a "Venus flytrap" and feeds on the nitrogen it obtains from insects.

Flat-stem pondweed (*Potamogeton zosteriformis*) was found in 23 percent of the survey sites (Table 3) and was most common in depths of six to ten feet (Figure 18).

Figure 20. Flat-stem pondweed (*Potamogeton zosteriformis*)

Flat-stem pondweed (Figure 20) is a perennial plant

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that is anchored to the lake bottom by underground rhizomes. It 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.

Coontail (*Ceratophyllum demersum*) occurred in 18 percent of the survey sites (Table 3) and was the only plant found in depths than greater than 15 feet. It was found throughout the lake except for the southeast corner (Figure 17) and it was most frequent in the six to ten feet zone (Figure 18).

Figure 21. Coontail (*Ceratophyllum demersum*)

Coontail (Figure 21) 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.

Northern watermilfoil (*Myriophyllum sibiricum*) occurred in 14 percent of the survey sites (Table 3) and was mostly found within the six to ten feet depth zone (Figures 17, 18).

Figure 22. Northern watermilfoil (*Myriophyllum sibiricum*)

Northern watermilfoil (Figure 22) 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. For information on how to distinguish this native plant from the non-native, Eurasian watermilfoil: identification.

All other submerged species occurred in less than ten percent of the sample sites and were most common in depths less than 11 feet. Several submerged species are plants that do not grow in turbid water and their presence in Steamboat Lake is indicative of its relatively clear water. One example is marestail (*Hippuris vulgaris*). Marestail was found in the lake but not within any survey sites. Marestail is submerged plant that can emerge above the water in shallow depths (Figure 23).

Figure 23. Marestail (*Hippuris vulgaris*).

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This plant is native in Minnesota but not commonly found. It is often associated with cold-water streams or springs and may be present in Steamboat Lake because the river flowage through the lake provides the habitat conditions required for their growth. This species is also present in areas of Leech Lake. Its presence in Steamboat Lake indicates relatively good water clarity.

A second "clear-water" species found in Steamboat Lake is white-stem pondweed (*Potamogeton praelongus*) (Figure 24). This is a broadleaf plant that is sometimes called "cabbage" by anglers. This species is not tolerant of turbidity (Nichols, 1999) and is often one of the first species to decline if water clarity declines. Whitestem pondweed was found in five percent of the sample sites (Table 3) and was most common in depths of six to ten feet.

Figure 24. White-stem pondweed (*Potamogeton praelongus*)
Photo: ©2006 Wm. Dean Taylor

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 Steamboat Lake 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. Aquatic plants offer food, cover and nesting material for waterfowl, marsh birds and muskrats, and provide shelter and shade for insects and fish, and amphibians. Aquatic plants release oxygen into the lake and take up nutrients that might otherwise be available for algae. The root systems of emergent and floating-leaf plants protect shorelines against erosion by buffering the wave action and by holding soil in place. (Click here for more information on: value of aquatic plants).

The aquatic plant community of Steamboat Lake is similar to that found in other hardwater Cass County lakes. A review of past vegetation surveys of Steamboat Lake indicates that the general aquatic plant community has not likely changed in recent years. In all survey years, a relatively high number of native plants have been recorded and rooted plants remain well distributed throughout the shallow zones. Data collected in 2008 can be used to monitor finer-scale changes that may occur, such as an increase in a particular species or a change in the depths at which individual species 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.

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- 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 Steamboat Lake but if they invade, 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 wild rice (*Zizania palustris*) 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, 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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Literature Cited

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

Gardner, D. and R. Moe. 2004. Minnesota Treasures: stories behind the State's historic places. Minnesota Historical Society Press. 296 pp.

Lee, P. F. 1986. Ecological relationships of wild rice, *Zizania aquatica*. 4. Environmental regions within a wild rice lake. Canadian Journal Botany 64:2037-2044.

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

MnDNR. 2008a. Minnesota's Sensitive Lakeshore Identification Manual: a conservation strategy for Minnesota lakeshores (version 1). Division of Ecological Resources, Minnesota Department of Natural Resources.

MnDNR. 2008b. Natural wild rice in Minnesota. A wild rice study document submitted to the Minnesota Legislature by the Minnesota Department of Natural Resources, February 15, 2008. 117 pp. http://files.dnr.state.mn.us/fish_wildlife/legislativereports/20080215_wildricestudy.pdf

MnDNR Fisheries Lake Files. Minnesota Department of Natural Resources. Division of Fish and Wildlife, Section of Fisheries, Lake Survey Program. 500 Lafayette Rd., St. Paul, MN 55155.

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 November 2008)

Nichols, S.A. 1999. Distribution and habitat descriptions of Wisconsin lake plants. Wisconsin Geological and Natural History Survey. Bulletin 96. Madison. 266 pp.

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