Aquatic Vegetation Survey of

Florida Lake (ID #34-0217-00)

Kandiyohi County, Minnesota

2009

Florida Lake, July 2009.

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Summary

Florida Lake is a 674 acre, moderately productive lake in south central Minnesota. A 2009 aquatic vegetation survey was conducted to assess the abundance and distribution of the lake vegetation. This lakewide assessment included vegetation and water depth sampling at 305 sample stations and a characterization of near shore substrates.

Submerged plants were found to a depth of 25 feet but in depths greater than 15 feet, only 3% of the sites contained plants. Within the 0 to 20 feet depth zone, 73% of the sites contained vegetation.

A total of 19 aquatic plant taxa were recorded including 2 floating-leaved and 17 submerged taxa. Macroalgae were the most common plant type found and with 62% of sites contained at least one macroalgae. Muskgrass (*Chara* sp.) was the most common macroalgae and dominated the water depths from 0 to 15 feet. Annual plants were found in 20% of the sites and perennials occurred in 22%.

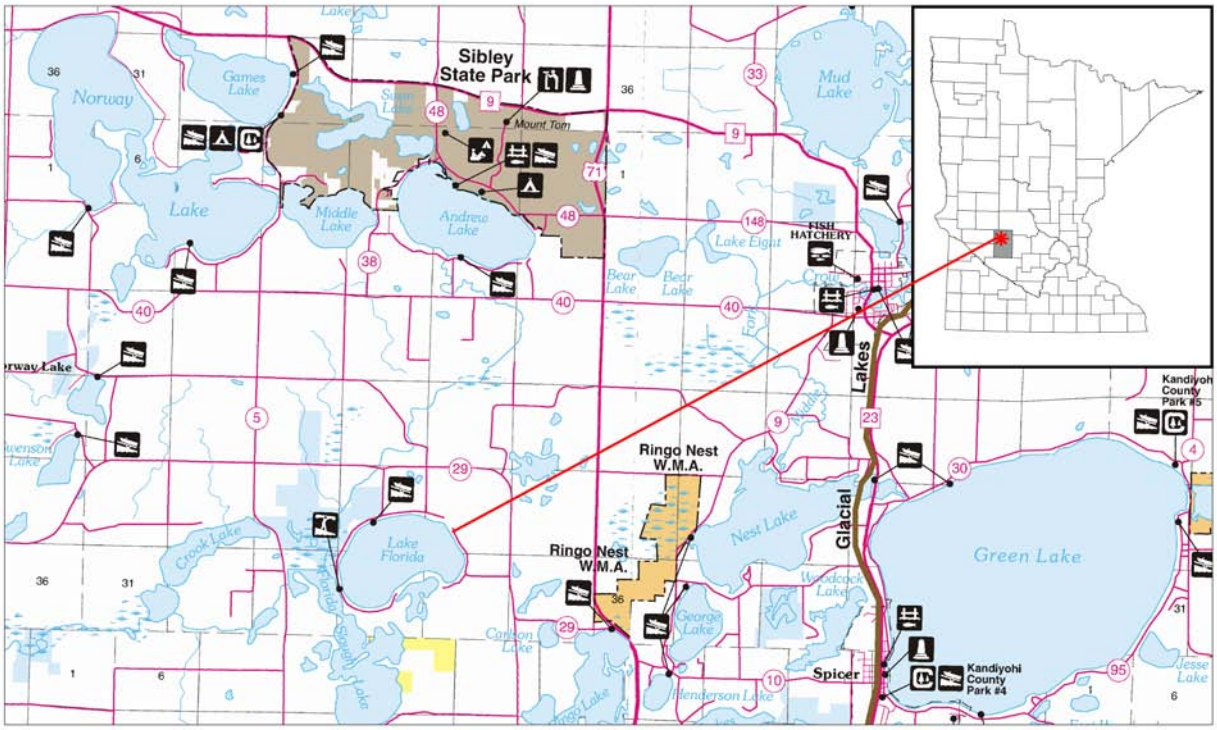
Two rare, submerged species, widgeon grass (*Ruppia cirrhosa*) and spiny naiad (*Najas marina*) were documented for the first time in the lake.

The non-native, submerged species, curly-leaf pondweed (*Potamogeton crispus*) was present in 8% of the sample sites. The non-native, submerged plant, Eurasian watermilfoil, (*Myriophyllum spicatum*) occurred in 1% of the site.

Introduction

Florida Lake is located about 5 miles northeast of the town of Spicer in Kandiyohi County, south central Minnesota. Within the immediate lake watershed, about 60% of the land use is characterized as pasture/open or urban, which is slightly higher above typical percentages for lakes in this region of the state (Klang et al. 1997). Florida Lake outlets to Shakopee Creek but depending on lake and creek water levels, runoff from Shakopee Creek will flow over the lake outlet dam (Klang et al. 1997). The lake also receives inflow from several marsh areas. The lake is described as mesotrophic (moderate nutrients), with good water clarity and good water quality compared to other lakes in the region (Klang et al. 1998). In 2008, the average summer Secchi disc reading was 10 feet (MPCA, 2008).

Figure 1. Florida Lake, Kandiyohi County, MN. MN (PRIM) Public Recreation Information Map



Florida Lake is 674 acres in area and primarily round in outline with about four miles of shoreline. Florida Lake has a maximum depth of 40 feet and about 40% of the lake basin is less than 15 feet in depth. Because of its shallowness, it does not thermally stratify during the summer (Klang et al. 1998).

Previous vegetation surveys of Florida Lake have described a healthy native plant community with a moderate amount of submerged vegetation. But, the lack of emergent and near-shore submerged vegetation, partially because of residential development around the lake, is a concern (Klang et al. 1998). The non-native plant, curly-leaf pondweed (*Potamogeton crispus*) has been present in the lake since at least 1987 (DNR Fisheries Lake Files). The non-native plant, Eurasian watermilfoil (*Myriophyllum spicatum*) was found in the lake in 2009, making Florida

Lake the 3rd lake in the county where this invasive has been documented. Eurasian watermilfoil also occurs in nearby Green Lake and Norway Lake.

Objectives

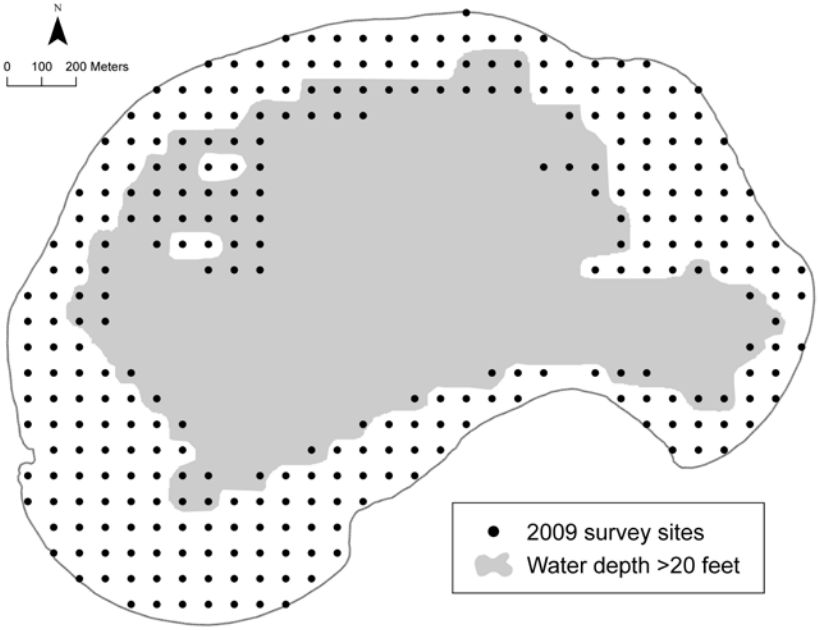
This survey provides a quantitative description of the 2009 plant population in Florida Lake. Objectives included:

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 plant species
6. Develop distribution maps for common plants

Methods

Florida Lake was surveyed on July 29, 2009. A point-intercept survey method was used and followed the methods described by Madsen (1999). Survey waypoints were created using a Geographic Information System (GIS) computer program and downloaded into a handheld Global Positioning System (GPS) receiver. Survey points were placed across the entire lake and spaced 75 meters (246 feet) apart.

Figure 2. 2009 vegetation survey sites in Florida Lake.



The survey was conducted by boat and surveyors sampled 281 sites within the shore to 25 feet depth zone (Figure 2, Table 1). Surveyors found sparse vegetation beyond the 15 feet depth and therefore only sampled a subset of sites in the 26 to 30 feet depth zone.

A GPS unit was used to navigate the boat to each sample point. One side of the boat was designated as the sampling area. At each site, water depth was recorded in one-foot increments using a measured stick in water

Table 1. Sampling effort by water depth.

Water depth interval (feet)	Number of sample sites
0 to 5	42
6 to 10	103
11 to 15	51
16 to 20	33
21 to 25	52
26 to 30	24
total	305

depths less than seven feet and an electronic depth finder in depths greater than 7 feet.

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

Figure 3. Sampling rake.

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

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

Table 2. Substrate classes

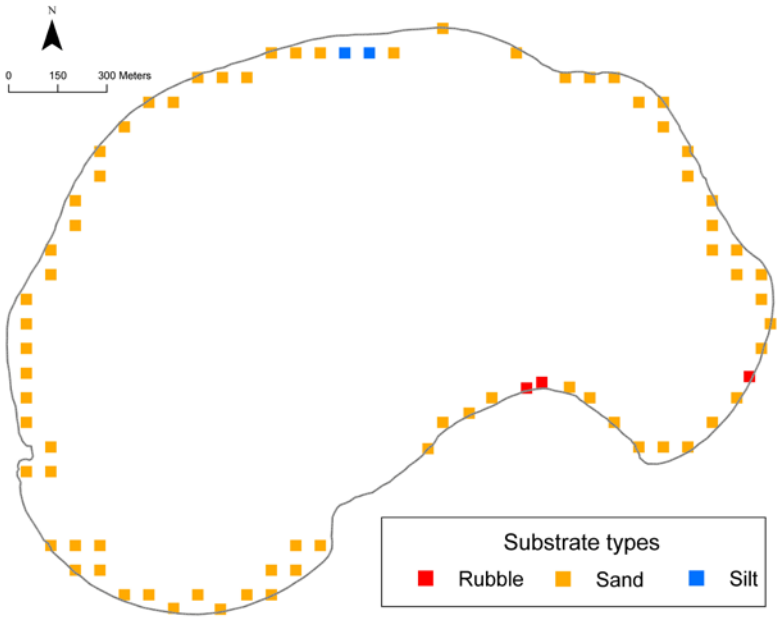
muck	decomposed organic material
marl	calcareous material
silt	fine material with little grittiness
sand	diameter less than 1/8 inch
gravel	diameter 1/8 to 3 inches
rubble	diameter 3 to 10 inches
boulder	diameter over 10 inches

Results

Shoal substrates

The shoal substrates of Florida Lake were primarily sand with scattered areas of rubble (Figure 4). Silt bottom type was found in a few sites with water depths of 6 feet.

Figure 4. 2009 Shoal substrates of Florida Lake.



Number and types of plants recorded

A total of 19 aquatic plant taxa were recorded in Florida Lake including 2 floating-leaved and 17 submerged taxa (Table 3). Submerged plants included large algae, or macroalgae, and rooted flowering plants. Both annual and perennial submerged plants occurred in the lake. Two of the submerged species, spiny naiad (*Najas marina*) and widgeon grass (*Ruppia cirrhosa*) are listed as rare, species of Special Concern, in Minnesota. The non-native submerged plants, curly-leaf pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (*Myriophyllum spicatum*), were documented during the survey.

Table 3. Frequency of aquatic plants in Florida Lake Point-intercept survey, July 2009.

Life Form			Common Name	Scientific Name	Frequency N=230
Submerged Macroalgae			Muskgrass	*Chara* sp.	61
			Stonewort	*Nitella* sp.	2
Submerged Rooted Plants	Monocots	Annuals	Bushy pondweed	*Najas* sp.	14
			Spiny naiad***	*Najas marina*	2
			Widgeon grass***	*Ruppia cirrhosa*	8
			Horned pondweed	*Zannichellia palustris*	4
		Perennials	Sago pondweed	*Stuckenia pectinata*	8
			Narrow-leaf pondweeds	*Potamogeton friesii, P. hillii, P. foliosus*	7
			Curly-leaf pondweed**	*Potamogeton crispus*	8
			Flat-stem pondweed	*Potamogeton zosteriformis*	2
			Clasping-leaf pondweed	*Potamogeton richardsonii*	1
			Canada waterweed	*Elodea canadensis*	<1
			Needlegrass*	*Eleocharis acicularis*	<1
	Dicots	Perennials	Northern water milfoil	*Myriophyllum sibiricum*	4
			Eurasian watermilfoil**	*Myriophyllum spicatum*	1
			Coontail	*Ceratophyllum demersum*	2
			Greater bladderwort	*Utricularia vulgaris*	1
FLOATING			White waterlily	*Potamogeton natans*	<1
			Yellow waterlily	*Nuphar variegata*	present

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

Present = found during survey, but not in survey sites

*This plant may also grow as an emergent plant along mudflats.
**non native to Minnesota
***rare species in Minnesota

Example:
In Florida Lake there were 230 samples sites in the 0-20 feet zone.
Muskgrass (*Chara* sp.) occurred in 140 sites.
Muskgrass frequency in 0-20 feet zone = (140/230)*100 = 61%

Distribution of aquatic plants

Submerged plants were found to a depth of 25 feet but in depths greater than 15 feet, only 2 sites contained plants (Figure 5). Within the 0-20 feet depth zone (which includes about 40% of the lake), 73% of the sites contained vegetation.

The broadest bands of vegetation were in the southwest end of the lake, where plant beds extended lakeward 300 meters (1,000 feet) (Figure 6). Along shorelines with steeper drop-offs, the vegetation zone was limited to narrow shallow zones within 50 to 100 meters (150 to 250 feet) from shore. Scattered plants were also found on off-shore, shallow sandbars.

Figure 5. Frequency of vegetation by water depth interval.

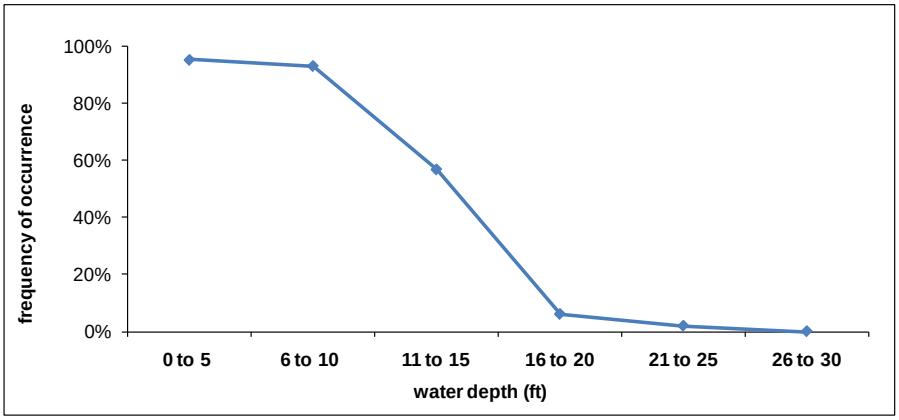
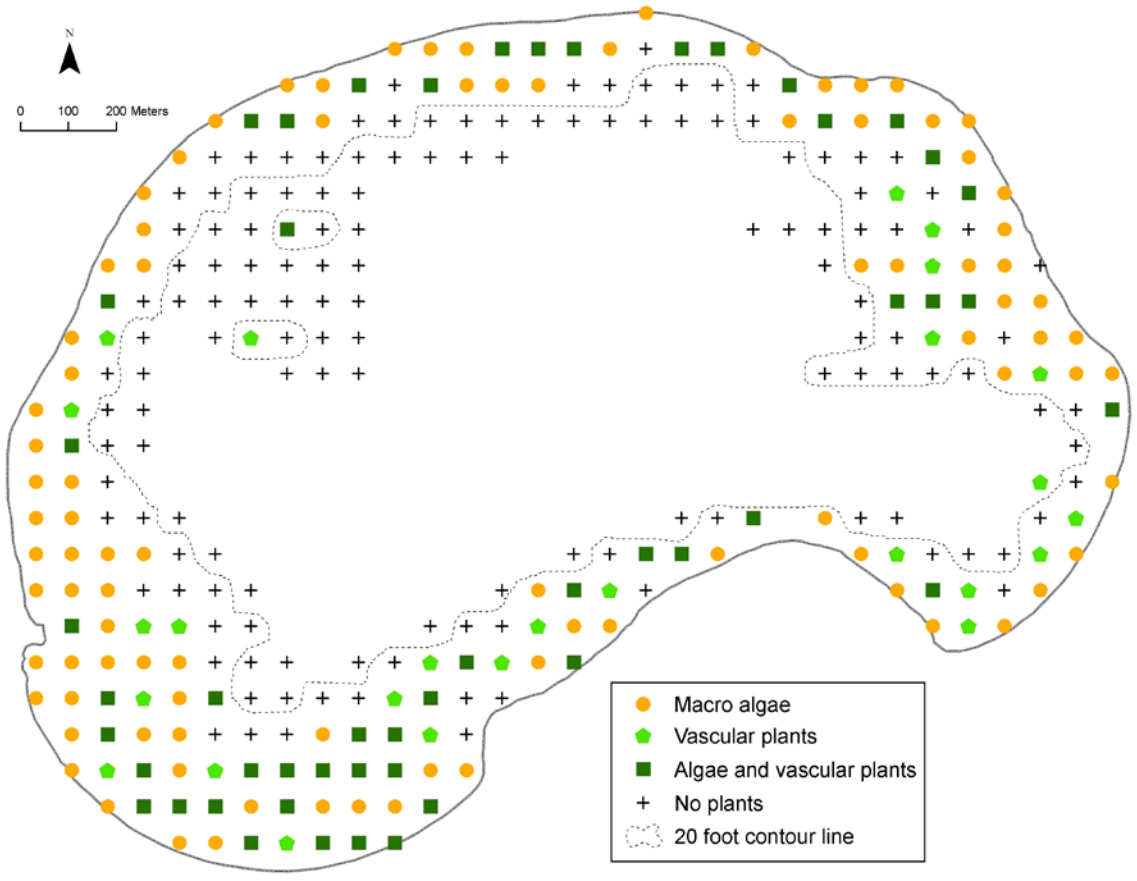


Figure 6. Distribution of aquatic plants in Florida Lake, 2009



The number of plant taxa found at each one square meter sample site ranged from 0 to 6 but most sites contained only one plant taxon. The highest number of plant types was found in 6 to 10 feet depth zone where the mean number of plant taxa per site was two.

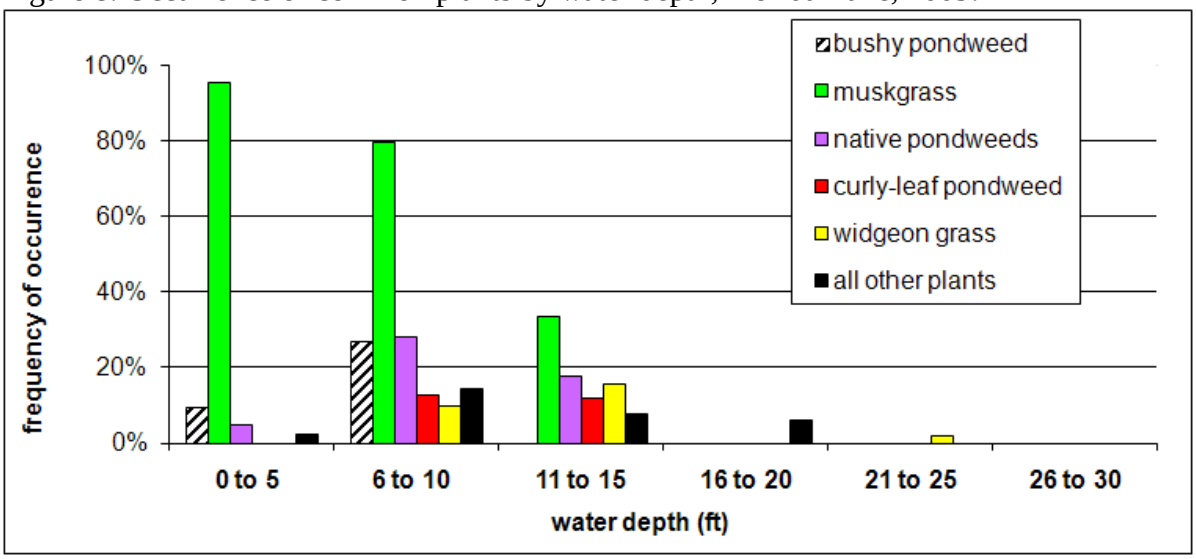
Macroalgae

Macroalgae are multi-celled plants that lack true roots, stems or leaves. Unlike microscopic algae that float freely in the water column, macroalgae resemble larger plants and often form low-growing mats on the lake bottom. Macroalgae dominated the plant community of Florida Lake. Within the 0 to 20 feet depth zone, most (62%) of all sites contained macroalgae and 40% of these sites contained only macroalgae (Figure 6).

Figure 7. Muskgrass

Muskgrass (*Chara* sp.) is a macroscopic algae that 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 (Figure 7). 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. Muskgrass was the most frequently occurring plant in Florida Lake (Table 3). It was found in the 0 to 15 feet depth zone where it occurred in 61% of the site (Figure 8).

Figure 8. Occurrence of common plants by water depth, Florida Lake, 2009.



Annual rooted plants

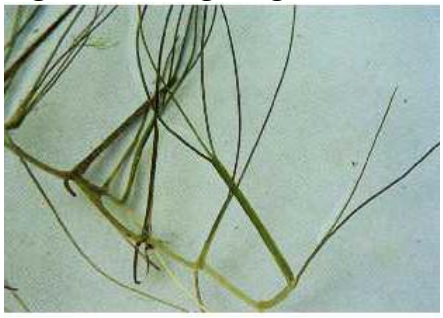
Several annual, rooted, submerged plants were found in Florida Lake. These plants regrow each year from seed set in the previous summer. In Florida Lake, 22% of the sites (0 to 20 feet) contained at least one annual plant.

Bushy pondweed (*Najas* sp.) is a low-growing submerged plant (Figure 9). The seeds and foliage of this plant are an important duck food and beds of this plant provide good fish cover. In the 0 to 20 feet depth zone, bushy pondweed was found in 14% of the sample sites (Table 3) but it was restricted to depths of 10 feet and less (Figure 8).

Figure 9. Bushy pondweed

Widgeon grass (*Ruppia cirrhosa*) is one of the "grass-leaved" plants that occur in Florida Lake. This submerged plant has elongated, fine leaves (Figure 10) that may grow nearly 2 feet in length. This plant's name refers to its importance as a waterfowl food source. Widgeon grass is designated as a rare, Special Concern, species in Minnesota because of its limited distribution in the state. This plant is restricted to western Minnesota lakes with high alkalinity, high conductivity and high pH. This plant often grows as an annual, resprouting from seed each year. Therefore, the actual distribution of widgeon grass within a lake may vary widely from year to year, depending on seed set and distribution in the previous year. Widgeon grass occurred in 8% of the sites in the 0 to 20 feet depth zone (Table 3). It was the only plant found in depths greater than 20 feet, where it occurred with a frequency of 2% (Figure 8).

Figure 10. Widgeon grass



Edward G. Voss. USDA NRCS. 1992. *Western wetland flora: Field office guide to plant species*. West Region, Sacramento. Courtesy of USDA NRCS Wetland Science Institute.

Spiny naiad (*Najas marina*), was confirmed for the first time in Florida Lake (Figure 11). Spiny naiad is related to the common plant, bushy pondweed that was also found in these lakes. Both species are annuals and grow each spring from seed. Spiny naiad is usually found in very alkaline lakes of western Minnesota and is listed as a Special Concern species in the state because of its unique habitat requirements. In Florida Lake, it occurred in only 2% of the sample sites (0 to 20 feet) but in other western Minnesota lakes it occurs quite frequently. Like the other annual plants in Florida Lake, the abundance of spiny naiad may fluctuate widely between years.

Figure 11. Spiny naiad

Photo by Paul Skawinksi 2009. Courtesy of Robert W. Freckmann Herbarium, UW-Stevens Point

Perennial submerged plants

Pondweeds (*Potamogeton* spp. and *Stuckenia* spp.) are rooted perennial plants and their rhizomes may form mats on the lake bottom that help consolidate soil (Arber 1920). These underwater plants have opposite, entire leaves and form "cigar-shaped" flowers that emerge above the water surface. Many pondweed species over-winter as hardy rhizomes while other species produce tubers, specialized winter buds, or remain "evergreen" under the ice. Seeds and tubers of pondweeds are an important source of waterfowl food. The foliage of pondweeds provides food

for a variety of marsh birds, shore birds and wildlife and provides shelter, shade and spawning sites for a range of fish species (Borman et al. 2001). Pondweeds inhabit a wide range of aquatic sites and species vary in their water chemistry and substrate preferences and tolerance to turbidity. There are more than 20 species of pondweeds in Minnesota and they vary in leaf shapes and sizes. Several native pondweeds occur in Florida Lake (Table 3). Within the 0 to 20 feet depth zone, 20% of the sites contained at least one native, perennial plant.

Narrow-leaf pondweeds (Figure 12) are rooted, perennial submerged plants with small, thin leaves. Leaves grow entirely below the water surface but flowers extend above the water. This plant also over winters as rhizomes and winter buds. There are several different types of pondweeds that are included in this general group and without fruit or flowers they are difficult to distinguish. In Florida Lake, four different species were identified: sago pondweed (*Stuckenia pectinata*), fries' pondweed (*Potamogeton friesii*), hill's pondweed (*P. hillii*), and leafy pondweed (*P. foliosus*). At least 15% of the sample sites contained at least one narrow-leaf pondweed (Table 3).

Figure 12. Narrow-leaf pondweed.

Clasping-leaf pondweed (*Potamogeton richardsonii*) is a broad-leaf pondweed found in Florida Lake. Broad-leaf pondweeds are sometimes called "cabbage" by anglers because of their wide leaves. The foliage of this plant provides cover for fish and its fruits are valuable waterfowl food. Clasping-leaf pondweed forms only submerged leaves (Figure 13). This plant was found in 1% of the survey sites (0 to 20 feet) and occurred in depths less than 10 feet.

Figure 13. Clasping-leaf pondweed with waterlilies.

Curly-leaf pondweed (*Potamogeton crispus*; Figure 14) resembles clasping-leaf pondweed but it is not native to Minnesota. This submerged plant that has been present in the state since at least 1910 (Moyle and Hotchkiss 1945) and is now found in more than 700 Minnesota lakes (Invasive Species Program 2008). Like many native submerged plants, it is perennial but has a unique life cycle that may provide a competitive advantage over native species. Curly-leaf pondweed is actually dormant during late summer and begins new growth in early fall. Winter foliage is produced and continues to grow under ice (Wehrmeister and Stuckey 1978). Curly-leaf reaches its maximum growth in May and June, when water temperatures are still too low for most native plant growth. In late spring and early summer, curly-leaf plants form structures called "turions" which are hardened stem tips that break off and fall to the substrate. Turions remain dormant through the summer and germinate into new plants in early fall (Catling and Dobson 1985).

Figure 14. Curly-leaf pondweed.

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

Curly-leaf pondweed was found in 8% of the sites (0 to 20 feet) during the August survey of Florida Lake. Its frequency may be higher during its peak growth period in May and June.

Northern watermilfoil (*Myriophyllum sibiricum*) is a native, submerged, rooted plant with finely divided, feather-shaped leaves (Figure 15). Particularly in depths less than 10 feet, this plant may reach the water surface and its flower stalk will extend 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 (Nichols 1999). In Florida Lake, northern watermilfoil was found to a depth of 12 feet of water. Within the 0 to 20 feet depth zone, it was present in 4% of the sample sites (Table 3).

Figure 15. Northern watermilfoil

Eurasian watermilfoil (*Myriophyllum spicatum*; Figure 16) closely resembles northern watermilfoil but it is not native to Minnesota. Eurasian watermilfoil is adapted to survive in lower light levels than many native aquatic plants but still requires adequate light for growth. In Florida Lake it was found to a depth of 11 feet. Within the 0 to 20 feet depth zone, it was found at only three (1%) of the sample sites.

Figure 16. Eurasian watermilfoil

For more information:

on the values of aquatic plants: Value of aquatic plants
on curly-leaf pondweed and Eurasian watermilfoil: DNR Invasive Species Annual Report

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