

**Aquatic Vegetation of Detroit Lake  
(DOW 03-0381-00)  
Becker County, Minnesota  
“Final DRAFT”**

**July 19, 23, and 24, 2007**



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## **Acknowledgements**

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### **This report should be cited as:**

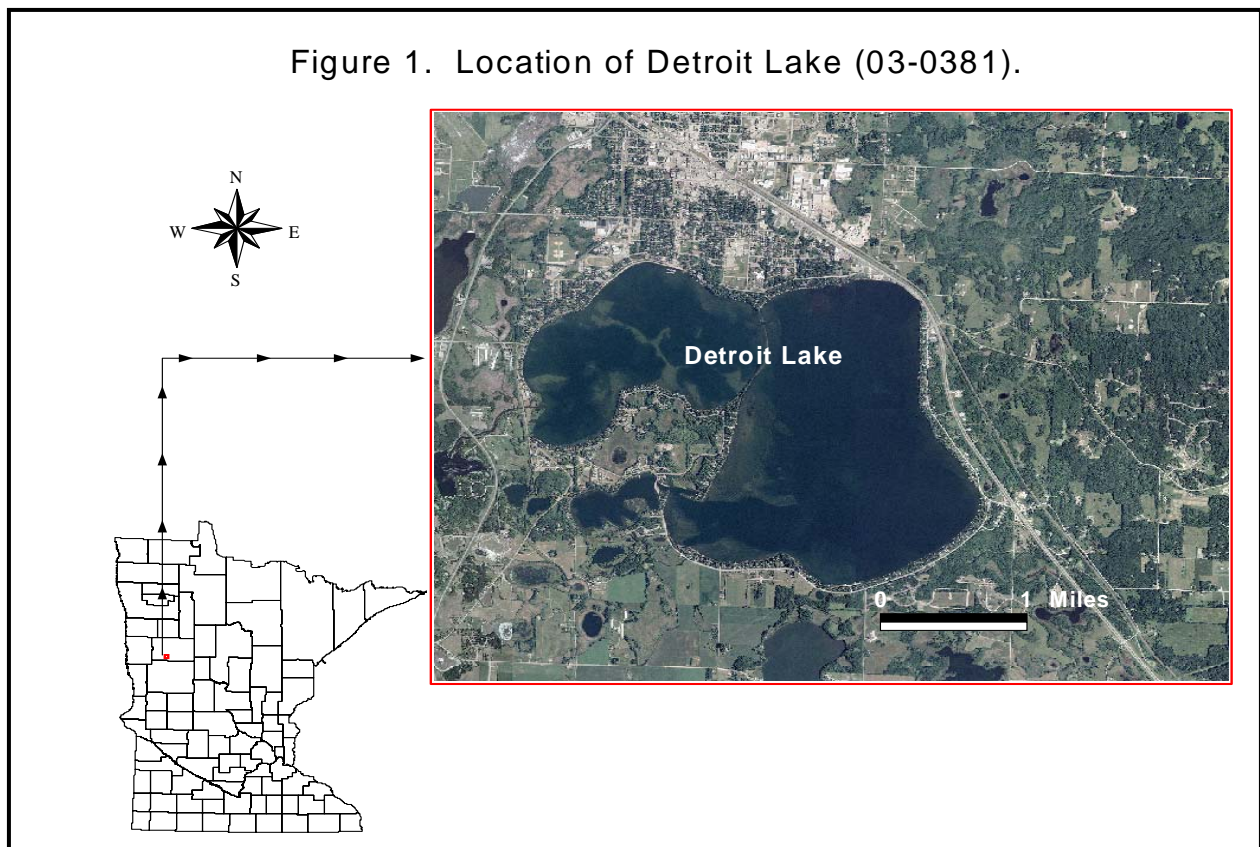
Swanson, D. 2008. Aquatic vegetation of Detroit lake (DOW 03-0381-00), Becker County, July 19, 23, and 24, 2007. Minnesota Department of Natural Resources, Ecological Resources Division, 1601 Minnesota Drive, Brainerd, MN 56401.

## Summary

Detroit Lake is a 3,083 acre lake located on the west side of Minnesota in Becker County (Figure 1.). DNR Ecological Resources invasive species field staff conducted a point-intercept vegetation survey of Detroit Lake in late July, 2007. Submerged aquatic plants were found in 97 % of the sites surveyed from the shore to a depth of 20 feet. A total of 25 native aquatic plant species were recorded. Common native aquatic species included greater bladderwort (*Utricularia vulgaris*), muskgrass (*Chara* spp.), northern water milfoil (*Myriophyllum sibiricum*), and sago pondweed (*Stuckenia pectinata*).

Two non-native aquatic species were found during this survey: flowering rush (*Butomus umbellatus*), and curly leaf pondweed (*Potamogeton crispus*). Flowering rush occurred in 10 percent of the sites surveyed. The zone surveyed from zero to five feet had a 21 percent occurrence of flowering rush while the zone from six to ten feet only had a one percent occurrence.

Curly leaf pondweed occurred in one percent of the sites. The presence of curly leaf pondweed is difficult to determine in July and August. Curly leaf pondweed is a perennial plant that acts like an annual plant. Plant growth begins when turions sprout in late summer to early fall. Curly leaf pondweed is alive under the ice during winter, grows at an increased rate during spring, and dies in mid to late June. Consequently, curly-leaf plants often are not present in Minnesota lakes during July.



## Introduction

Detroit Lake (03-0381) is located within the city limits of Detroit Lakes in Becker County (Figure 1). Detroit Lake is classified as being within the North-Central Hardwood Forest Ecoregion (MPCA 2007a). Detroit Lake is located between the Red River Valley Ecoregion and the Northern Lakes and Forests Ecoregion.

Detroit Lake is part of the Pelican River watershed, which is located within the Otter Tail watershed, and is part the larger Red River basin. The Pelican River flows into the main basin of Detroit Lake on the north shore and flows out on the south shore of Little Detroit Lake. The Pelican River flowage continues through a number of lakes including Muskrat Lake, Sallie Lake, Melissa Lake, Mill Lake, Buck Lake, Little Pelican Lake, Pelican Lake, Lizzie Lake, and further downstream into the Otter Tail River.

Detroit Lake's shoreline is highly developed with nearly 600 homes on the shoreline, a number of resorts, motels, marinas, and condominiums (Huberty 2006). The swimming beach on the northwest side of the lake is highly utilized by area residents and visitors. Public access sites are located at the swimming beach and on the south side of the lake.

Detroit Lake is classified as eutrophic by the MN Pollution Control Agency based on water quality data that were collected between 1997 and 2006 (MPCA 2007b). Water clarity readings are being monitored by the Minnesota Pollution Control Agency's citizen lake monitoring program. Detroit Lake Secchi disk readings over the past ten years have varied from an average of 9.1 feet in 1997 to an average of 5.9 feet in 2007.

Historical surveys of Detroit Lake describe abundant emergent and submerged aquatic plant communities (MN DNR Fisheries Lake Files). Emergent species included hardstem bulrush (*Scirpus acutus*), cattail (*Typha* spp.), and arrowhead (*Sagittaria* spp.). Floating leaf plants included yellow waterlily (*Nuphar variegatum*) and floating leaf pondweed (*Potamogeton natans* L). Submerged vegetation species included coontail (*Ceratophyllum demersum*), bushy pondweed (*Najas flexilis*), sago pondweed, and greater bladderwort.

Invasive species that occur in the lake are curly leaf pondweed, flowering rush, and purple loosestrife (*Lythrum salicaria*) (MN DNR Fisheries Lake Files).

Nomenclature follows: **Hellquist and Crow 1999 and DNR Natural Heritage Program.**

## Vegetation Survey Objectives

The purpose of vegetation survey of Detroit Lake was to describe the current aquatic plant community including:

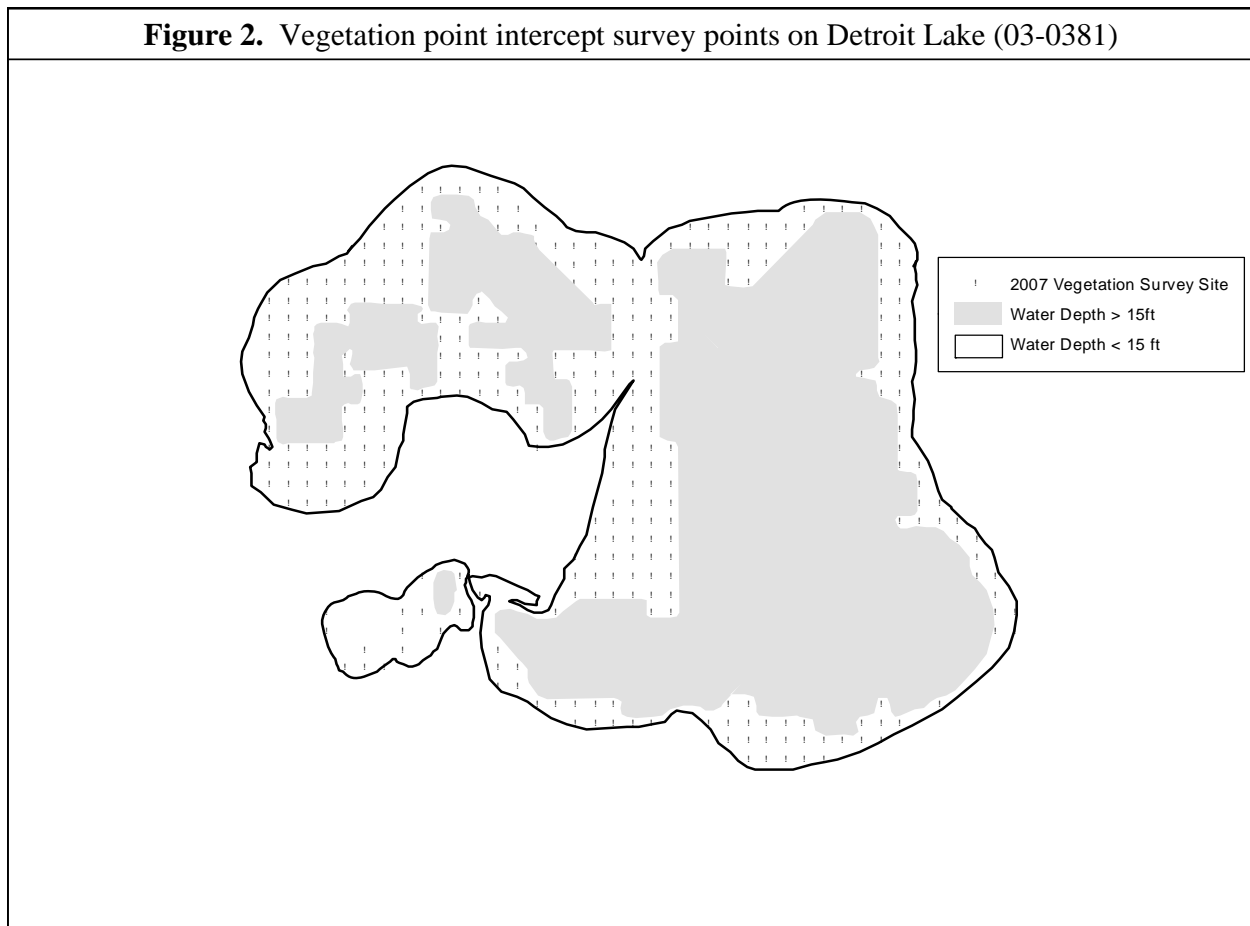
- 1) Estimate the maximum depth of rooted vegetation
- 2) Estimate the percent of the lake area occupied by rooted vegetation
- 3) Record the aquatic plant species that occur in the lake
- 4) Estimate frequencies of occurrence of individual species

- 5) Develop distribution maps for the common species

## Methods

### Aquatic Vegetation Survey Methods

DNR Ecological Services invasive species unit field staff conducted a point-intercept vegetation survey of Detroit Lake on July 19, 23, and 24, 2007. The survey followed the methods described by Madsen (1999). Survey waypoints were created and downloaded in a Global Positioning System (GPS) receiver. An existing sampling grid from a prior vegetation survey was used in the 2007 survey. The waypoints were spaced 125 meters apart throughout the lake. All survey points between shore and 15 feet were sampled. A small number of waypoints extended to a maximum depth of 22 feet but no vegetation was found beyond 19 feet in depth. A total of 346 sample points were sampled in 2007 on Detroit Lake (Figure 2).



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 five feet and an electronic depth finder in depths greater than five feet. The surveyors recorded all plant species found within a one meter squared sample site at the pre-designated side of the boat. A double-headed garden rake attached to a rope was used to survey vegetation not visible from the surface (Figure 3). Data were entered into an Excel database. 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.

**Example:** In Detroit Lake there were 346 sample sites in the zone from shore to 20 feet. Bladderwort occurred at 115 sample sites. Frequency of bladderwort from the shore to the 20 foot zone of Detroit Lake is calculated as follows:  $115/346=33\%$ .

Frequency was calculated for all plant species from shore to 20 feet. The sampling points were grouped by water depth and separated into four depth zones for analysis: zero to five feet, six to ten feet, 11 to 15 feet, and 16 to 20 feet (Table 1).

**Figure 3.** Double-headed garden rake attached to a 50 foot rope.



## Results

### Number of species recorded

A total of 24 native aquatic plant species were recorded in Detroit Lake, including three emergent, one floating leaf, two free floating and 20 submerged species (Table 2). Two non-native species flowering rush and curly leaf pondweed were recorded. A rare aquatic plant, widgeon grass (*Ruppia occidentalis*) was located in the lake.

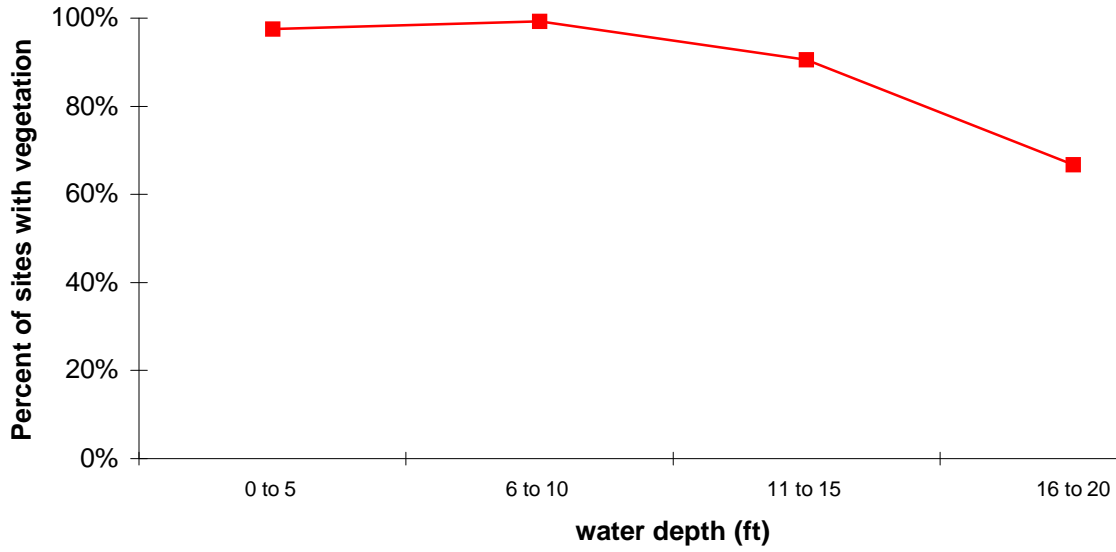
### Occurrence of different plant life forms by water depth

The highest number of aquatic plant species was located in the zone from shore to a depth of five feet, where all but three species were found.

Emergent and floating-leaved species were restricted to depth of seven feet or less while submerged, loosely anchored species were found to a depth of 19 feet. Submerged vegetation species were found growing to a maximum depth of 19 feet. Vegetation was most abundant from the 2-foot contour to the 14-foot contour (Figure 4). Only two species of submerged and loosely anchored aquatic plants: flatstem pondweed and coontail, and one macroscopic algae: muskgrass were present from the 16-foot contour to the 19-foot contour.

**Figure 4.** Plant sites with vegetation vs. depth on Detroit Lake, July 2007.

Plant frequency vs. water depth  
Detroit Lake, Becker Co. (03-0381-00)  
July 19, 23, & 24, 2007





**Table 2.** Aquatic Plants of Detroit Lake (03-081-00) Becker County, July 19, 23, and 24, 2007.

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

			Detroit Lake 346 samples
Life Form	Common Name	Scientific Name	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 often rooted or anchored to the lake bottom.	Muskgrass	<i>Chara sp.</i>	82
	Northern watermilfoil	<i>Myriophyllum sibiricum</i>	24
	Sago pondweed	<i>Stuckenia pectinata</i>	22
	Flat-stem pondweed	<i>Potamogeton zosteriformis</i>	16
	Bushy pondweed	<i>Najas flexilis</i>	16
	Narrowleaf pondweed	<i>Potamogeton sp.</i>	9
	Illinois pondweed	<i>Potamogeton illinoensis</i>	9
	Whitestem pondweed	<i>Potamogeton praelongus</i>	9
	Clasping-leaf pondweed	<i>Potamogeton richardsonii</i>	9
	Canada waterweed	<i>Elodea canadensis</i>	6
	Variable pondweed	<i>Potamogeton gramineus</i>	5
	Wild celery	<i>Vallisneria Americana</i>	4
	Large leaf pondweed	<i>Potamogeton amplifolius</i>	3
	White water buttercup	<i>Ranunculus longirostris</i>	2
	Curly leaf pondweed	<i>Potamogeton crispus</i>	1
	Fries pondweed	<i>Potamogeton friesii</i>	1
Stonewort	<i>Nitella sp.</i>	<1	
Widgeon grass	<i>Ruppia cirryhosa (v)</i>	<1	
SUBMERGED-LOOSELY ANCHORED These plants do not have true roots. They may attach to sediments by basal ends or float freely in the water column.	Greater Bladderwort	<i>Utricularia vulgaris</i>	33
	Coontail	<i>Ceratophyllum demersum</i>	19
FREE-FLOATING These plants float on the water and drift with water currents.	Water moss	<i>Not identified to species</i>	8
	Star duckweed	<i>Lemna trisulca</i>	3
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	<i>Nuphar variegata</i>	2
EMERGENT These plants extend well above the water surface and are usually found in shallow water, near shore.	Flowering Rush	<i>Butomus umbellatus</i>	10
	Hardstem bulrush	<i>Scirpus acutus</i>	1
	Giant Cane	<i>Phragmites australis</i>	<1

V = voucher specimen collected

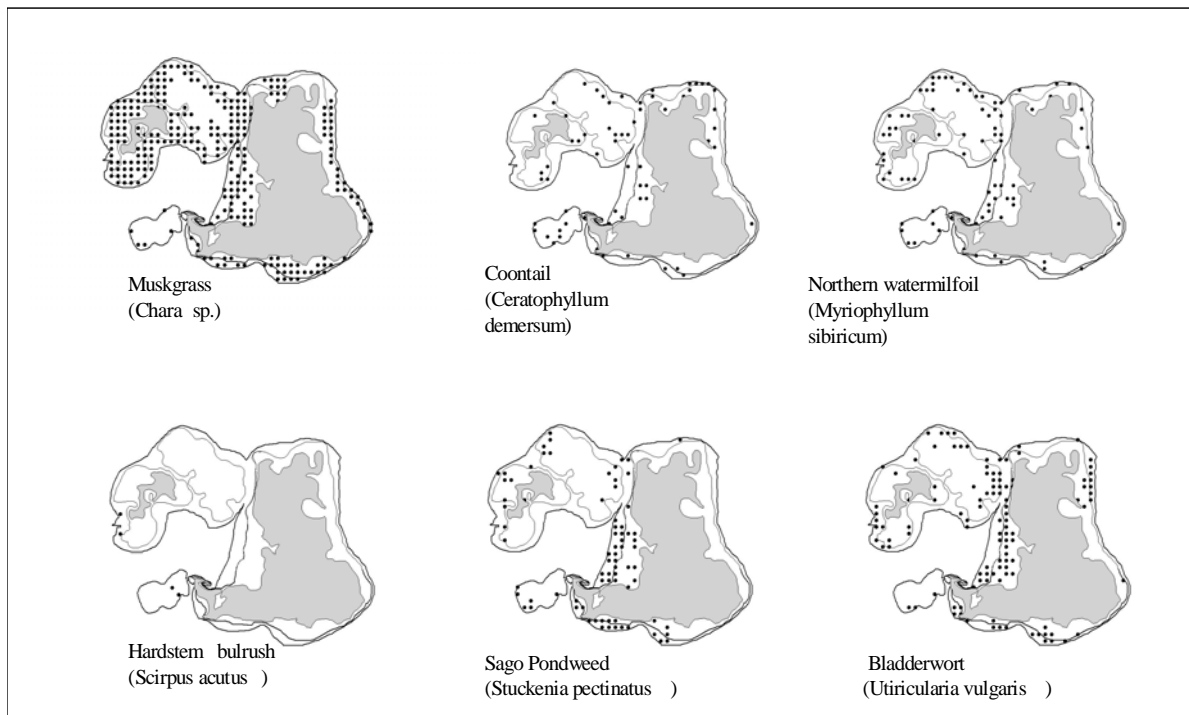
Highlight = non-native species

## Common native aquatic plant species

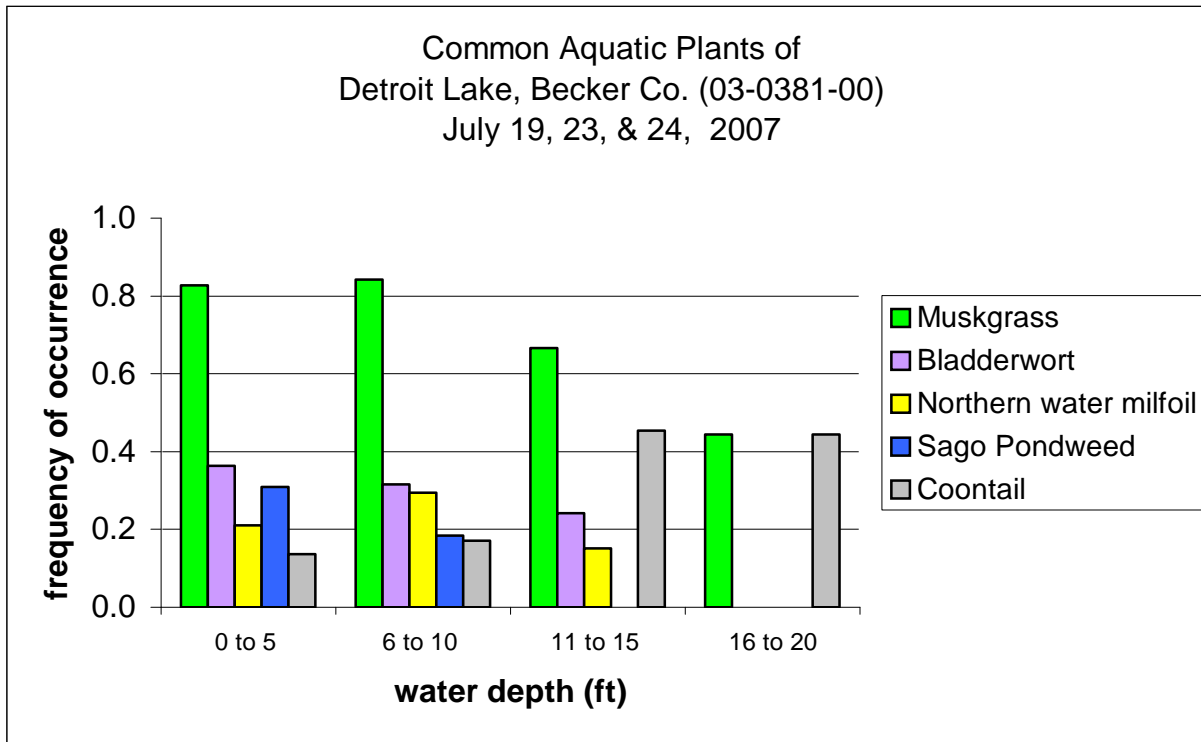
The most frequently occurring native species in these lakes included muskgrass, bladderwort, northern water milfoil, sago pondweed, and coontail. The non-native species, flowering rush and curly leaf pondweed were not as common as the native species.

Muskgrass was the species most frequently found in the Detroit Lake vegetation survey. Muskgrass is a major component of the Detroit Lake aquatic plant community, where it occurred in 81 percent of the sample sites (Table 2, Figure 5). It was the most frequently occurring species at all water depths (Figure 6). Muskgrass is a submerged, macroscopic algae that is common in many hard water Minnesota lakes. It has a characteristic musky odor. Muskgrass can form dense growths on the lake bottom even though it does not have true stems or roots. Muskgrass is able to adapt to a variety of sediments and depths. It stabilizes lake bottom sediments and provides fish habitat.

**Figure 5.** Distribution of common plants in Detroit Lake, July 19, 23, & 24, 2007



**Figure 6.** The five most common aquatic plants species found, July 2007.



Greater bladderwort was common in Detroit Lake with a frequency of 33 percent (Table 2, Figure 5). It was found in depths of 15 feet and less (Figure 6). Bladderwort is a carnivorous plant that utilizes very small bladders as traps to catch organisms as water fleas and mosquito larvae. The small yellow flowers of this plant emerge at the water surface and look similar to a snapdragon. The plant provides food and cover for fish and invertebrates.

Northern watermilfoil was common in Detroit Lake with a frequency of 24 percent (Table 2, Figure 5). Northern watermilfoil is a submerged plant with five to 11 pairs of thread-like leaflets on each leaf. The leaves typically are arranged in whorls of four or five around the stem. The plant also has a flowering spike, which emerges from the water in mid to late summer. Winter buds are produced in early fall and remain dormant until spring. Northern watermilfoil provides food for waterfowl and habitat for invertebrates and fish.

Sago pondweed was also common in Detroit Lake, occurring with a frequency of 23 percent (Table 2, Figure 5). Sago pondweed is a submerged perennial plant with very thin leaves, which originate from a sheath. Sago pondweed is an excellent food source for waterfowl. The plant also provides habitat for fish and invertebrates.

Coontail was slightly less common than sago pondweed in Detroit Lake with a frequency of 19 percent (Table 2, Figure 5). It occurred at all water depths sampled and was most frequent in the 11 to 20 feet depth zone (Figure 6). Coontail is a loosely anchored or freely floating submerged perennial plant with whorled leaves that are fork shaped and have small teeth along one edge.

The tips of the leaf branches form a dense cone or coontail appearance. Coontail provides habitat for invertebrates, which in turn are a food source for a number of species including fish and waterfowl.

Hardstem bulrush was the most common native emergent aquatic plant found on the Detroit Lake plant survey, growing out to a maximum depth of four feet. Hardstem bulrush is an emergent perennial plant that provides food and shelter for waterfowl and spawning habitat for a number of fish species including largemouth bass, bluegills, and crappies. Hardstem bulrush also protects shorelines from erosion, stabilizes bottom sediments, and utilizes nutrients.

### **Non-native aquatic plant species**

Native species were more frequently observed than non-native species. Flowering rush (Figures 7, 8, 9) was present at 10 percent of the sample sites from the shore to the 20-foot contour (Table 2, see Figure 10). Flowering rush was in 21 percent of the sample sites from the shoreline to the five-foot contour and only one percent of the sample sites from the six to the ten-foot contour.

**Figure 7.** Flowering Rush plants along the shoreline of Detroit Lake, July 2007.





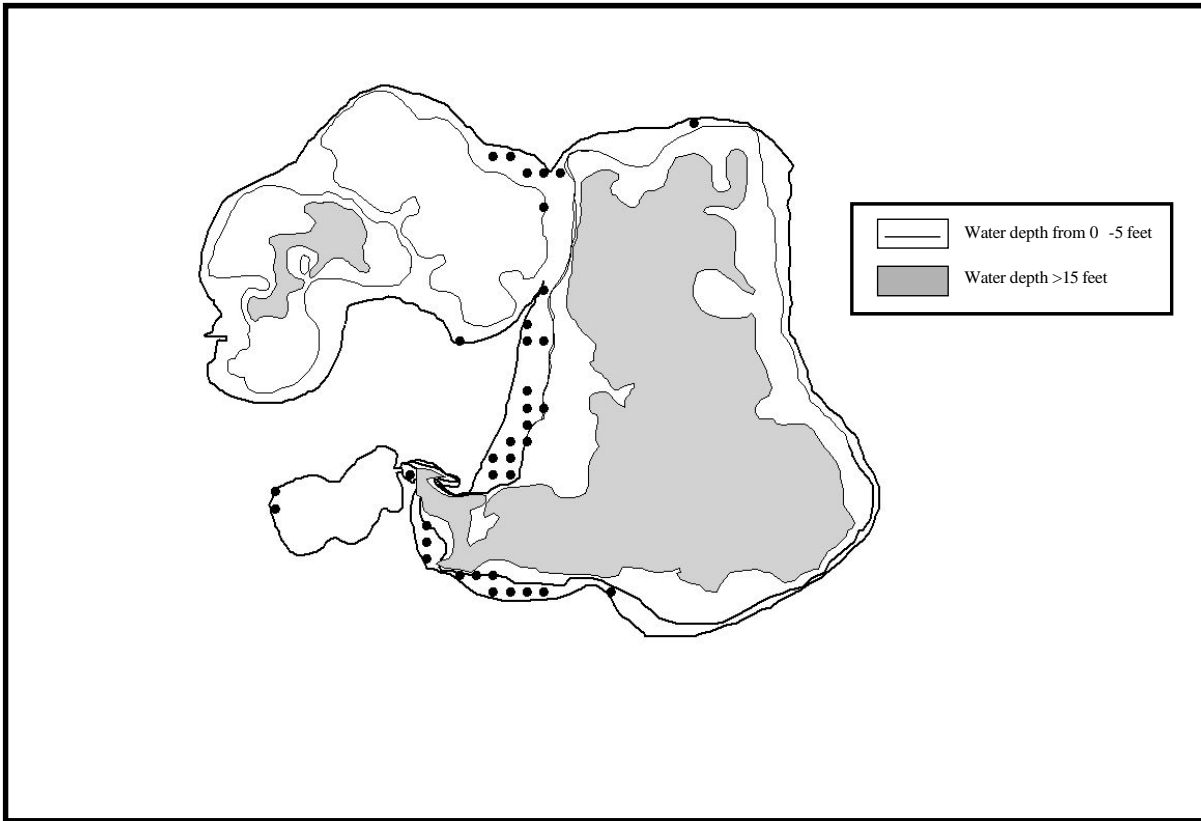
**Figure 8.** Flowering Rush, Detroit Lake, July 2007.



**Figure 9.** Flowering Rush in one to four feet of water, Detroit Lake, July 2007.



**Figure 10.** Detroit Lake 2007 way point sites where flowering rush was present.



Curly leaf pondweed was present at one percent of the sample sites (Table 2). This July survey did not accurately determine the abundance of curly leaf pondweed, since the plant typically dies back in mid to late June and then begins new growth from turions in late August to early September (Figure 11).

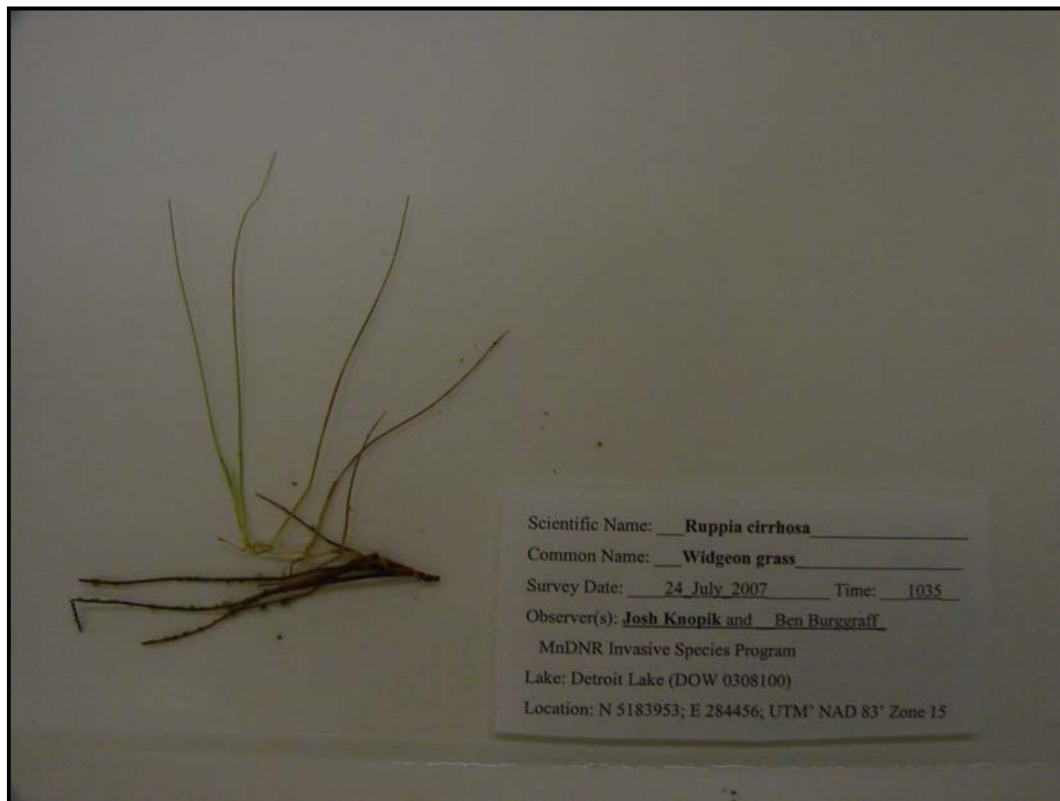


**Figure 11.** Curly leaf pondweed turion found on north shore of Detroit Lake during the plant survey on July 19, 2007.



## Rare Aquatic Plant Species

**Figure 12.** Widgeon grass pressed specimen collected in Detroit Lake on July 24, 2007.



Widgeon grass (*Ruppia occidentalis*) was first identified in Detroit Lakes in 1995 and was found in less than one percent of the sites during the 2007 survey. Widgeon grass (*Ruppia maritima*) was found at one sample point on the south side of Big Detroit Lake (Figure 12). Widgeon grass is an aquatic plant that is classified in Minnesota as a rare species of “special concern”. Widgeon grass is found in alkaline lakes on the western side of Minnesota. Widgeon grass provides food for waterfowl and is used for habitat restoration. (Kantrud 1991).

## Discussion

Detroit Lake has a diverse native aquatic plant community. Native aquatic vegetation stabilizes sediments, prevents shoreline erosion, utilizes nutrients, and provides habitat for invertebrates, fish, and wildlife.

Flowering rush is a non-native aquatic plant species that has been in the lake since the 1970’s. Flowering Rush is not common in Minnesota. It is currently known to exist in six Minnesota counties and about 14 water bodies (MNDNR Ecological Resources, 2006). This plant was likely introduced into some of our Minnesota water bodies because of the bright purple flower it produces in mid to late summer (Figure 5). Detroit Lake may have one of the denser stands of

flowering rush in Minnesota (Figure 6). Lake residents, the Pelican River Watershed District, and DNR personnel are concerned that flowering rush is not only a recreational nuisance but has the potential to out compete native emergent aquatic plants as hardstem bulrush and cattail.

### **Monitoring changes in the aquatic plant community**

Monitoring change in the aquatic plant community is important in order to determine the quality of fish and wildlife habitat and the condition of the native plant community. The data from the July 2007 vegetation survey report can be used to monitor both changes that may take place to specific native aquatic plant species and the already established invasive aquatic plant species. Monitoring to assess the condition of curly leaf pondweed should be conducted in late May or in June, before the plant senesces.

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