

**Aquatic vegetation of Lower Cullen Lake
(ID# 18-0403-00) Crow Wing County, Minnesota
May 2007 and July 2009**

Bulrush bed on Lower Cullen Lake, May 2007.



Aquatic Vegetation of Lower Cullen Lake, May 2007 and July 2009

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Text that appears in [blue underline](#) is a hypertext link to a web page where additional information is provided. If you are connected to the Internet, you can click on the blue underlined text to link to those web pages.

This report should be cited as:

Perleberg, D. and S. Loso. 2009. Aquatic vegetation survey of Lower Cullen Lake, Crow Wing County, Minnesota, 2007 and 2009. Minnesota Department of Natural Resources, Ecological Resources Division, 1601 Minnesota Dr., Brainerd, MN 56401. 9 pp.

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Summary

Lower Cullen Lake supports abundant and diverse aquatic plant communities. A total of 27 native aquatic plant taxa were recorded including five emergent, two floating-leaved and 22 submerged plants. The non-native species, curly-leaf pondweed (*Potamogeton crispus*) was identified during both survey years.

Submerged plants were found to a depth of 20 feet in 2007 and to 17 feet in 2009 and in both years plant occurrence was sparse (<20%) beyond the depth of 15 feet.

In 2007 and 2009, the most common submerged plants were native taxa and included muskgrass (*Chara* sp.), northern watermilfoil (*Myriophyllum sibiricum*), coontail (*Ceratophyllum demersum*), flat-stem pondweed (*Potamogeton zosteriformis*). Several native species were present in greater frequency in 2009 and this is likely because the 2009 survey was conducted in July, during peak growth of native plants. One native species, Fries' pondweed (*Potamogeton friesii*) decreased in frequency from 25% in 2007 to 4% in 2009.

The non-native species, curly-leaf pondweed (*Potamogeton crispus*) was found at scattered locations in the lake in both years. It occurred with a frequency of 17% in May 2007 (during peak growth) and 6% in July 2009 (past peak growth). In both years it occurred to a depth of 13 feet and reached maximum growth in 6 to 10 feet depth zone in May 2007.

Introduction

Lower Cullen Lake is part of a chain of lakes in Crow Wing County, north-central Minnesota. It receives flow from Upper and Middle Cullen lakes and outlets to the Gull Lake chain of lakes. This 512 acre lake is classified as mesotrophic, or moderately nutrient enriched. It has a maximum depth of 39 feet and about 35% of the lake is shallow (less than 15 feet in depth). Water clarity is good with an average summer [Secchi disc](#) reading of 13 feet (MPCA, 2008).

All three lakes (Upper, Middle and Lower) in the Cullen Lake chain support diverse native plant communities. During a Spring 2007 vegetation survey of these lakes, a total of 39 native aquatic plant taxa were recorded, including 22 submerged taxa.

The non-native, submerged plant, curly-leaf pondweed (*Potamogeton crispus*) occurs in all three lakes but at relatively low frequency. In May and early June, 2007, it occurred with a frequency of 11% in Upper Cullen Lake, 1% in Middle Cullen Lake, and 17% in Lower Cullen Lake (Perleberg 2007). In 2009, the Cullen Lake Association arranged for herbicide application to known areas of curly-leaf pondweed in Lower Cullen Lake.

Objectives

The late May 2007 survey provides quantitative data on the curly-leaf pondweed population and native plants. The July 2009 survey provides additional data on native plants and can be used to assess potential impacts of the 2009 herbicide application on native plants. Because the July 2009 survey was conducted after curly-leaf pondweed naturally dies back, the data cannot be used to assess the effectiveness of the 2009 herbicide application.

Methods

A point-intercept vegetation survey of Lower Cullen Lake was conducted on May 24 and 30, 2007 and was repeated on July 29 and 30, 2009. Detailed methods are described in Perleberg, 2007. Survey points were spaced 65 meters apart, resulting in about one survey point per acre. During the 2007 survey, surveyors infrequently found vegetation beyond a depth of 15 feet and therefore sampled all survey points between shore and 20 feet and only a selected number of points in deeper water. A total of 273 sites were surveyed in 2007 and 271 sites were surveyed in 2009 (Figure 1). Only 244 sites were surveyed in both years and only those sites were used in frequency calculations.

Example:

In Lower Cullen Lake there were 244 samples sites in the 0-20 feet depth that were surveyed in 2007 and 2009.

In 2007, muskgrass (*Chara* sp.) occurred in 92 of those sites. Frequency = 38%

In 2009, muskgrass (*Chara* sp.) occurred in 117 of those sites. Frequency = 48%

Figure 1. Vegetation survey sites on Lower Cullen Lake, 2007 and 2009.

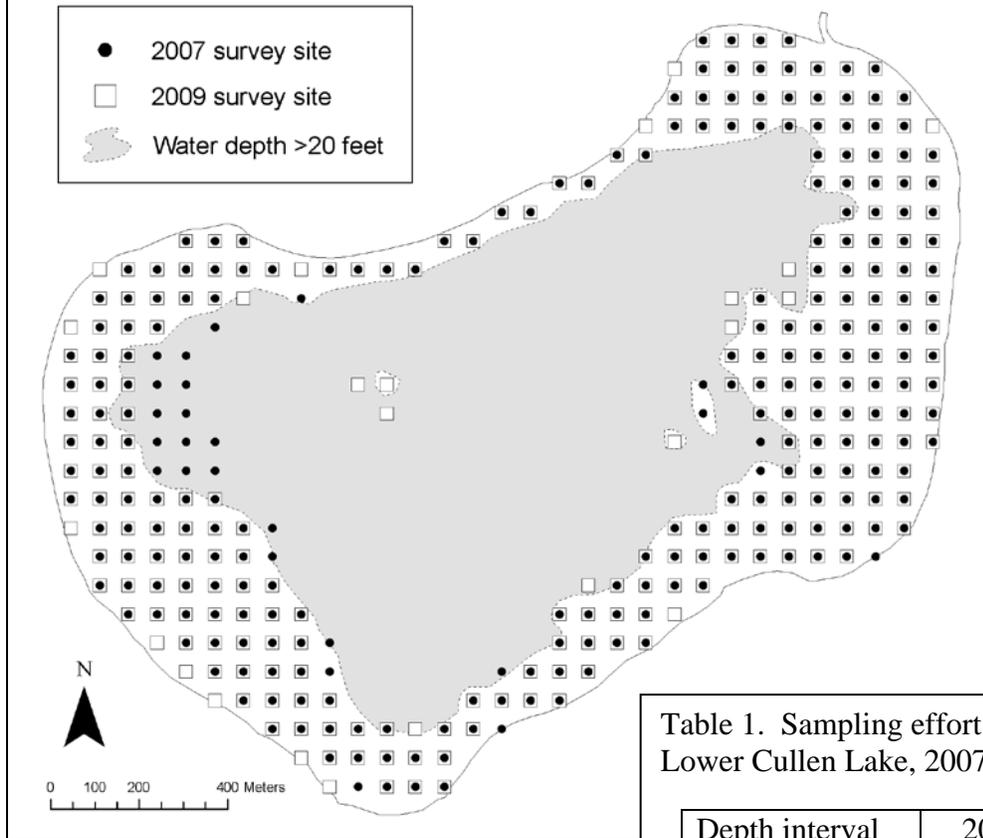


Table 1. Sampling effort by water depth, Lower Cullen Lake, 2007 and 2009.

Depth interval in feet	2007	2009
0 to 5	122	151
6 to 10	52	33
11 to 15	24	34
16 to 20	58	51
21 to 25	17	2
Total number of sample points	273	271

Results/ Discussion

Number and types of plants recorded

A total of 27 native aquatic plant taxa were recorded in Lower Cullen Lake including five emergent, two floating-leaved and 20 submerged plants (Table 2). Some taxa that were present at low frequencies were not located in both survey years; these taxa may likely have been present in both years but not detected due to low frequency. Water celery (*Vallisneria americana*) was not found in May 2007 and occurred in 12% of the 2009 sites (Table 2). Water celery exhibits a strong seasonal growth pattern with optimal growth in mid to late summer and likely had not yet begun growth when the May 2007 survey was conducted.

The non-native species, curly-leaf pondweed (*Potamogeton crispus*) was identified during both years.

Aquatic Vegetation of Lower Cullen Lake, May 2007 and July 2009

Life Form	Common Name	Scientific Name	Frequency of occurrence (N=244)		
			2007	2009	
SUBMERGED	Muskgrass	<i>Chara</i> sp.	38	48	
	Northern watermilfoil	<i>Myriophyllum sibiricum</i>	28	22	
	Coontail	<i>Ceratophyllum demersum</i>	27	30	
	Fries' pondweed	<i>Potamogeton friesii</i> ¹	25	4	
	Flat-stem pondweed	<i>Potamogeton zosteriformis</i>	20	18	
	Curly-leaf pondweed	<i>Potamogeton crispus</i>	17	6	
	Broad-leaf pondweeds	White-stem pondweed	<i>Potamogeton praelongus</i>	11	10
		Illinois pondweed	<i>Potamogeton illinoensis</i>	5	6
		Large-leaf pondweed	<i>Potamogeton amplifolius</i>	3	2
		Clasping-leaf pondweed	<i>Potamogeton richardsonii</i>	2	12
		Variable pondweed	<i>Potamogeton gramineus</i>	1	1
	Canada waterweed	<i>Elodea canadensis</i>	7	10	
	Water stargrass	<i>Zosterella dubia</i>	6	3	
	White water buttercup	<i>Ranunculus aquatilis</i>	1	3	
	Sago pondweed	<i>Stuckenia pectinata</i>	1	11	
	Water moss	Not identified to genus	1	--	
	Bushy pondweed	<i>Najas flexilis</i>	<1	8	
	Robbin's pondweed	<i>Potamogeton robbinsii</i>	<1	--	
	Water marigold	<i>Megaladonta beckii</i>	<1	2	
	Water celery	<i>Vallisneria americana</i>	--	12	
Stonewort	<i>Nitella</i> sp.	--	1		
FLOATING	White waterlily	<i>Nymphaea odorata</i>	1	1	
	Yellow waterlily	<i>Nuphar variegata</i>	<1	2	
Emergent	Bulrush	<i>Schoenoplectus acutus</i> ²	7	11	
	Wild Rice	<i>Zizania palustris</i>	4	5	
	Needlegrass	<i>Eleocharis</i> sp.	2	1	
	Arrowhead	<i>Sagittaria latifolia</i>	<1	--	
	Burreed	<i>Sparganium</i> sp.	<1	<1	

Frequency of occurrence = percent of sample sites within the shore to 20 ft water depth zone in which a species occurred.
 --- = not recorded during survey

¹*Potamogeton Friesii* was positively identified but there may have been one or more additional "narrow-leaf" pondweed species present that were grouped with this species.

²*Schoenoplectus acutus* was positively identified but there may have been one or more additional "bulrush" species present that were grouped with this species

Plant abundance and distribution

In both years, submerged plants were most frequent in the 0 to 15 feet depth zone, where at least 90% of the sites contained plants. Submerged plants were found to a maximum depth of 20 feet in 2007 and to 17 feet in 2009 (Figure 3). However, in both years, within the depth zone of 16 to 20 feet, less than 20% of the sites contained plants.

Figure 2. Vegetated sites on Lower Cullen Lake, 2007 and 2009. Emergent plant beds mapped in 2003 by DNR Brainerd Area Fisheries staff.

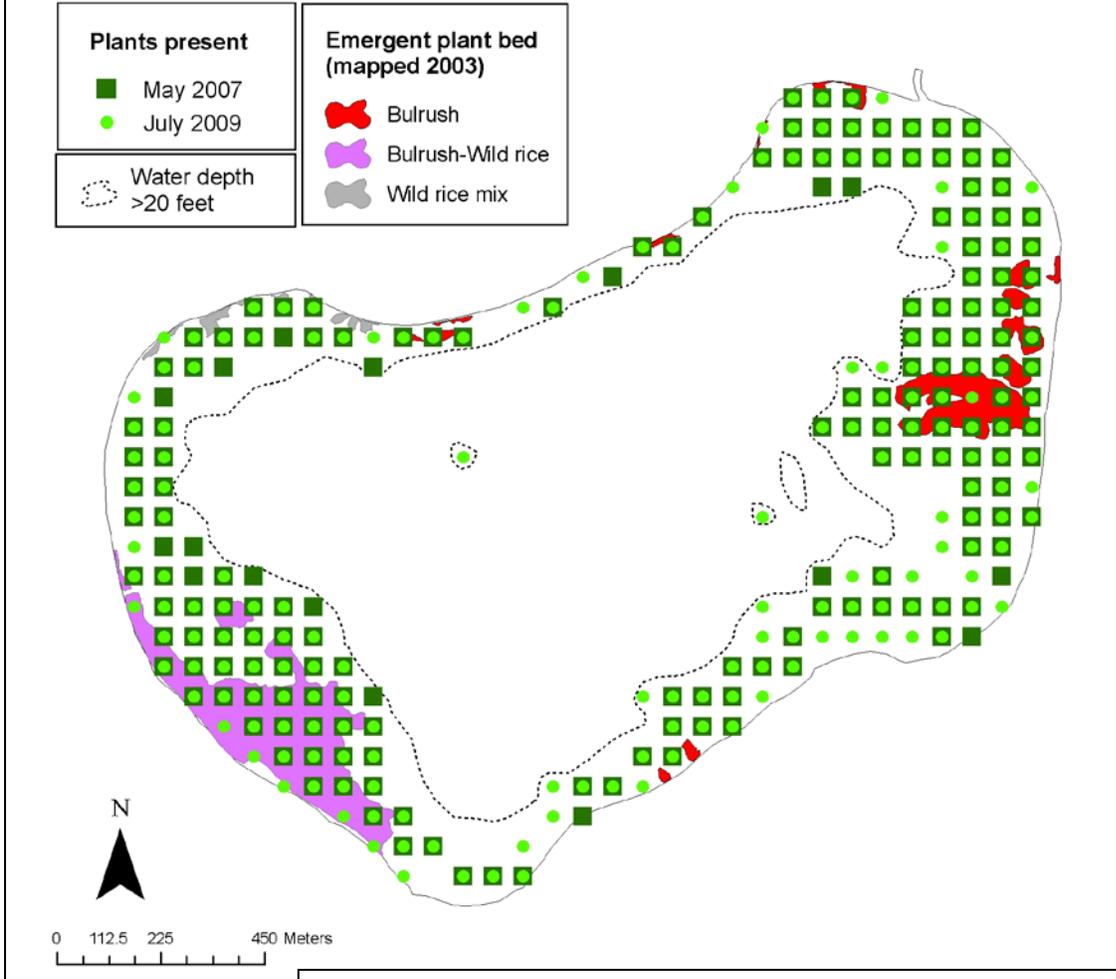
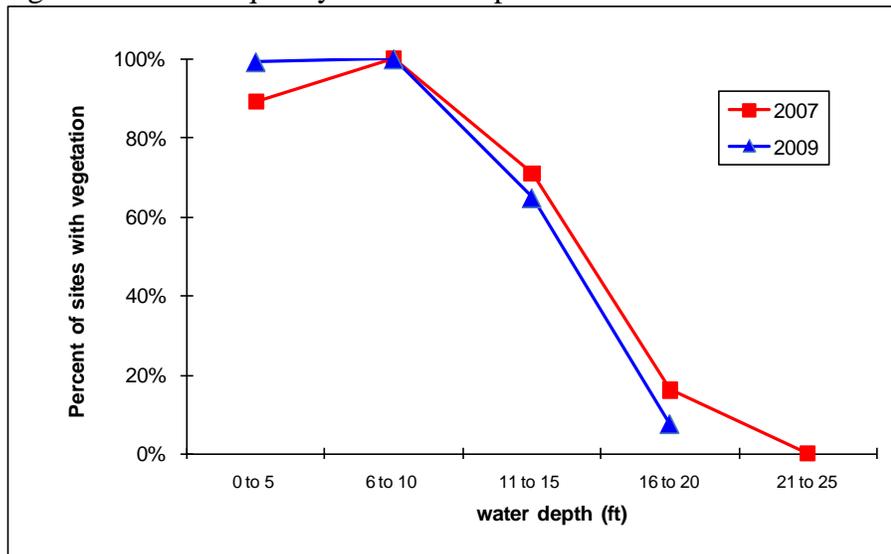


Figure 3. Plant frequency vs. water depth

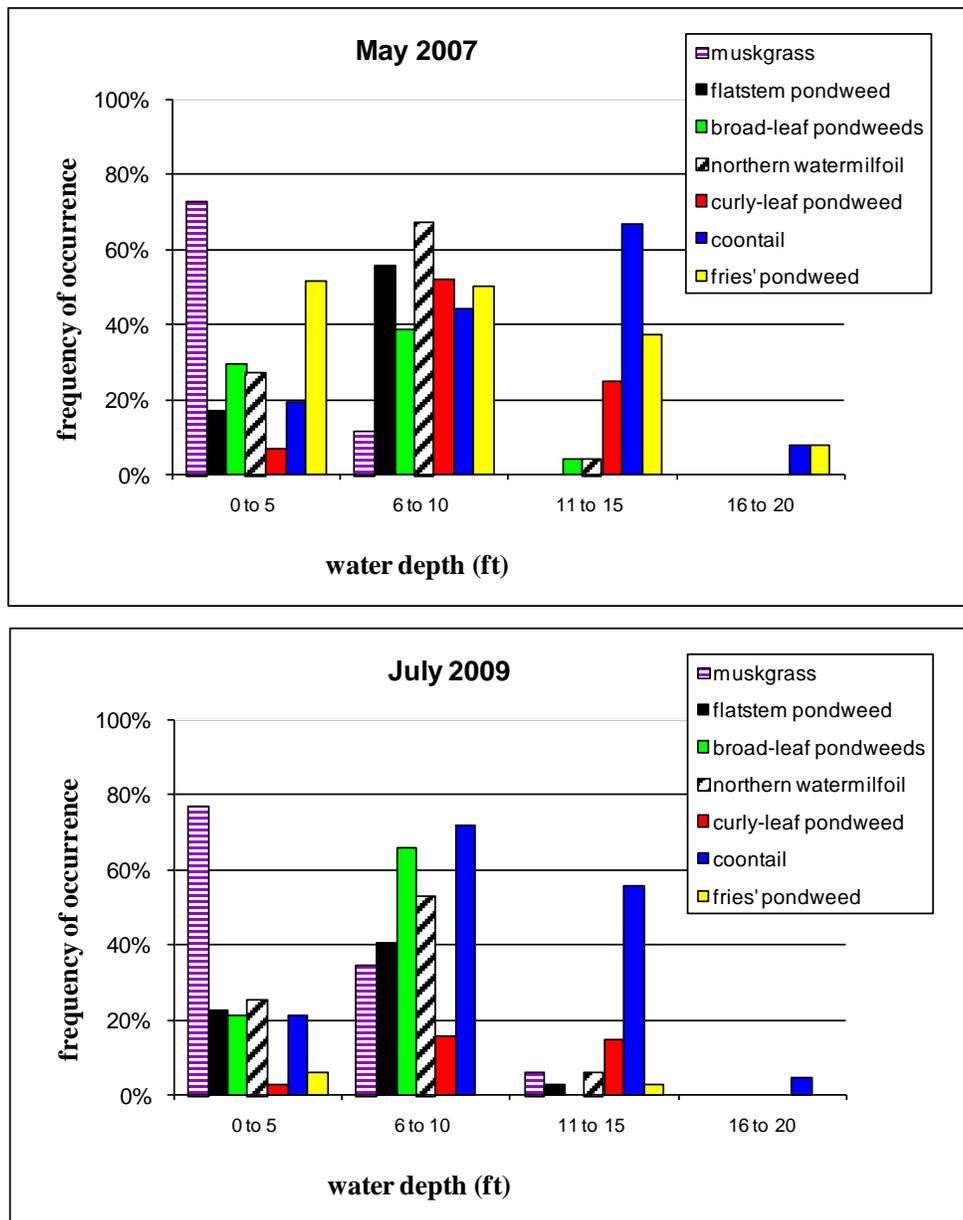


Common native submerged species

There were four native plants that were common (occurring in at least 15% of the sites) in both 2007 and 2009: muskgrass (*Chara* sp.) northern watermilfoil (*Myriophyllum sibiricum*), coontail (*Ceratophyllum demersum*), and flat-stem pondweed (*Potamogeton zosteriformis*) (Table 2). Muskgrass dominated the shallow (0-5 feet) depth zone and coontail was the most common plant in depths greater than 10 feet (Figure 4).

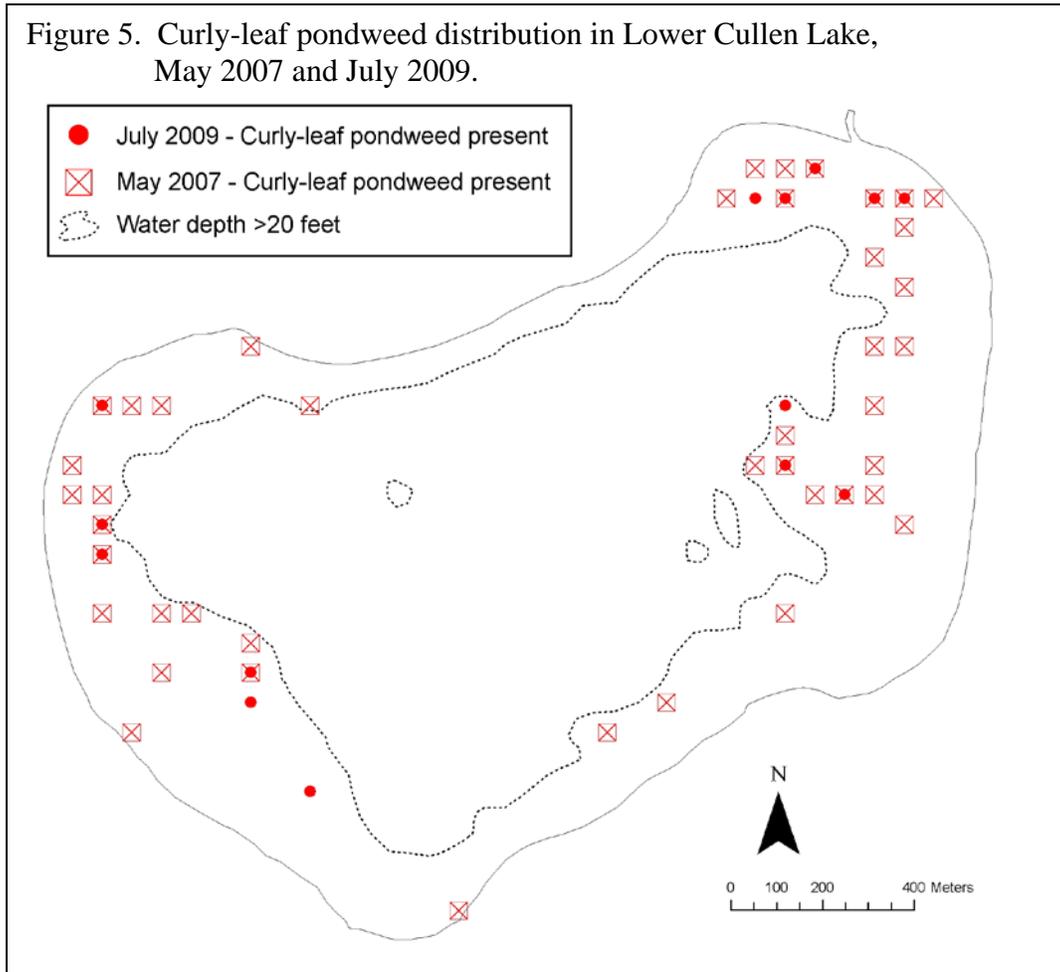
Fries' pondweed (*Potamogeton friesii*) was frequent in 2007 and was found in 25% of the sites. However, by 2009, it was present in only 4% of the sites (Table 2).

Figure 4. Frequency of common plants by water depth interval.



Curly-leaf pondweed

In May 2007, curly-leaf pondweed (*Potamogeton crispus*) occurred in 17% of the sites (Figure 5) and was most frequent in the 6 to 10 feet depth zone (Figure 4). By the late July 2009 survey, curly-leaf pondweed was found in 6% of the sites (Figure 5) but it is not known whether this decline was due to natural die-back or because of the July herbicide application. Monitoring during the spring is necessary to track changes in the curly-leaf population.



Literature Cited

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 October 2009)

Perleberg, D. 2007. Aquatic vegetation surveys of Upper Cullen, Middle Cullen and Lower Cullen Lakes, Crow Wing County, Minnesota, 2007. Minnesota Department of Natural Resources, Ecological Resources Division, 1601 Minnesota Dr., Brainerd, MN 56401. 22 pp.