

Draft

**Minnesota Dept. of Natural Resources
Division of Fish and Wildlife
Section of Fisheries**

**Aquatic vegetation point intercept surveys of South Center Lake
(13-0027), Chisago County, Minnesota**

May and August 2008

Area Fisheries Supervisor

Date

Regional Fisheries Supervisor

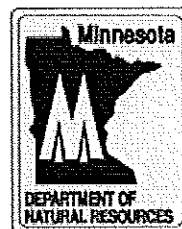
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(13-0027), Chisago County, Minnesota**

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Report by: Deb Sewell
Fisheries Management Specialist
Hinckley Area Fisheries Office



Introduction

South Center is a deep eutrophic lake that is part of a chain of medium to large lakes in southern Chisago County. The lake has several deep holes, with very sharp breaks but is also characterized by an extensive littoral area (67%). Much of the shoreline is developed with lake homes. South Center Lake receives heavy recreational pressure in the summer, and heavy angling pressure year round.

In 2007, South Center Lake was chosen as a sentinel lake for a new multi-partner long term monitoring project: Sustaining Lakes in a Changing Environment (SLICE). During the first four years of the project, which began in 2008, South Center and 23 other lakes throughout the state, representing a range of ecological conditions, will undergo intensive monitoring. Factors monitored will include water chemistry, water clarity, aquatic plant communities, fish populations, and invertebrates. From this four year pilot study, indicators will be identified that can be used to assess lakes' responses to environmental stressors.

Information about habitat and vegetation on South Center Lake can be found in Fisheries lake surveys dating back to 1942 (Table 1). However, it is difficult to draw conclusions about species diversity in surveys prior to 1995 since only the most prevalent species were listed, and species such as pondweeds were lumped together as one classification. The 1956 lake survey indicated that vegetation was abundant over 40% of the lake, growing to a depth of 10 feet. Aquatic plant control was practiced as early as 1955.

The non- native plant curlyleaf pondweed (*Potamogeton crispus*) has been in South Center Lake since at least 1969 (Table 1). Curlyleaf pondweed is a perennial submersed aquatic plant that was first noted in Minnesota around 1910 (Moyle and Hotchkiss 1945). Unlike most native submersed aquatic plants, curlyleaf pondweed plants sprout in the fall and grow slowly throughout the winter, even under thick ice and snow cover (Wehrmeister and Stuckey 1978). This strategy gives curlyleaf pondweed an advantage over native plants; by the time other species start growing in the spring, curlyleaf plants are large enough to block light penetration to the bottom. By late spring, curlyleaf pondweed can form dense mats which interfere with recreation. In mid-summer these dense mats senesce and die back, releasing nutrients that can contribute to undesirable algae blooms. Before curlyleaf pondweed plants die back, they form hardened stem tips called turions, which serve the function of vegetative reproduction. These turions sprout in the fall and begin the plant's life cycle again.

The SLICE work plan calls for South Center and the other sentinel lakes to be sampled for aquatic vegetation annually for four years. The 2008 sampling represents the first year of this study. This sampling will add to the understanding of annual variability in lake vegetation communities.

Methods

Point intercept surveys were conducted on South Center Lake in May and August of 2008. Methodology for the point intercept survey was developed by Madsen (1999) and modified by the Minnesota Department of Natural Resources (2008). A grid of sample points was generated

at a density of 0.7 points/acre. Past Secchi depth readings were used to determine the probable maximum depth of plant growth, and points were created out to the depth contour one meter beyond the maximum depth. Additional points were added to adequately sample shoreline areas. A field crew used a global positioning system (GPS) unit to navigate to each point. A double headed garden rake was thrown once to sample vegetation in an approximate 1 meter square area. If any species were visually observed but not sampled on the rake they were recorded separately on field forms. Depth was recorded using a depth finder or survey rod.

Results

Twenty species of aquatic plants were sampled in the two surveys. Plant species and frequencies from both surveys are listed in Table 2. Vegetation was much more widespread during the May survey than the August survey (92% vs 55% frequency). Curlyleaf pondweed was abundant and widespread during the May survey, occurring at 83 percent of sample points (Figure 2). Coontail was the most prevalent species in August, occurring at 42 percent of points (Figure 3).

Discussion

Aquatic plants serve many ecosystem functions including primary production, stabilizing sediments, maintaining water clarity, and providing habitat for zooplankton, macroinvertebrates, and numerous fish species (Valley et al. 2004). Development of shoreline can lead to significant losses of aquatic vegetation, especially emergent and floatingleaf species (Radomski 2006, Radomski and Goeman 2001). The effects of small areas of vegetation loss are cumulative over the entire lake.

The two main challenges associated with the management of curlyleaf pondweed are to minimize damage to native plants and to produce long term control. Recent research into the control of curlyleaf pondweed has focused on treating in early spring, before turions have formed. Early spring treatments with low rates of endothall based herbicides such as Aquathol K have been successful in reducing nuisance growths of curlyleaf pondweed and increasing native plant growth in Minnesota lakes (Skogerboe et al. 2008). The MN DNR protocol for large scale treatment of curlyleaf pondweed calls for low rate applications of endothall as Aquathol K when water temperatures are between 50-60 F and rising (MN DNR 2008). While curlyleaf pondweed can present problems for the native plant community, water quality, and recreation, any treatment method should be approached with extreme caution; all potential long term effects on water chemistry and plant and animal communities must be considered and weighed against any potential short term benefits of aquatic plant control.

References

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Figure 1. Grid of points sampled during the 2008 vegetation point intercept surveys on South Center Lake.



Figure 2. Survey points, shown in red, that had curlyleaf pondweed during the May 2008 vegetation point intercept survey on South Center Lake.



Figure 3. Survey points, shown in red, that contained coontail, the most abundant aquatic vegetation species during the August point intercept survey on South Center Lake.

Table 1. List of aquatic plant species that have been recorded in South Center Lake

Common name	Scientific name	Survey years
Emergent species (13 total)		
Blue flag iris	<i>Iris versicolor</i>	F, G
Broad leaved arrowhead	<i>Sagittaria latifolia</i>	B, C, D, E, F
Cattail	<i>Typha latifolia</i>	A, B, C, D, E, F, G, H
Giant burreed	<i>Sparganium eurycarpum</i>	F
Hardstem bulrush	<i>Scirpus acutus</i>	A, B, C, D, E, F
Needlerush	<i>Eleocharis accicularis</i>	F
Purple loosestrife	<i>Lythrum salicaria</i>	F, G
River bulrush	<i>Scirpus fluviatilis</i>	F, G
Rushes	<i>Juncus sp.</i>	F
Sedge	<i>Carex or Cyperaceae</i>	B, F, G
Softstem bulrush	<i>Scirpus validus</i>	F
Water smartweed	<i>Polygonum amphibium</i>	D, E
Wool grass	<i>Scirpus cyperinus</i>	F
Submerged and floating leaf species (26 total)		
Bushy pondweed	<i>Najas flexilis</i>	F, G, H
Canada waterweed	<i>Elodea canadensis</i>	A, B, C, D, E, F, G, H
Claspingleaf pondweed	<i>Potamogeton Richardsonii</i>	F, G, H
Coontail	<i>Ceratophyllum demersum</i>	A, D, E, F, G, H
Curlyleaf pondweed	<i>Potamogeton crispus</i>	C, E, F, G, H
Filamentous algae		F, H
Flatstem pondweed	<i>Potamogeton zosteriformis</i>	E, F, G, H
Floatingleaf pondweed	<i>Potamogeton natans</i>	C, E
Greater bladderwort	<i>Utricularia vulgaris</i>	F
Greater duckweed	<i>Spirodela polyrhiza</i>	F
Largeleaf pondweed	<i>Potamogeton amplifolius</i>	C, F
Leafy pondweed	<i>Potamogeton foliosus</i>	F
Lesser duckweed	<i>Lemma minor</i>	D, F, G, H
Muskgrass	<i>Chara sp.</i>	B, C, H
Narrowleaf pondweed	<i>Potamogeton sp.</i>	G, H
Northern watermilfoil	<i>Myriophyllum sibiricum (exalbescens)</i>	D, E, F, G, H
Robbins' pondweed	<i>Potamogeton Robbinsii</i>	H
Sago pondweed	<i>Stuckenia pectinata</i>	H
Variable pondweed	<i>Potamogeton gramineus</i>	F
Water meal	<i>Wolffia sp.</i>	F, G, H
White water buttercup	<i>Ranunculus sp.</i>	H
White waterlily	<i>Nymphaea tuberosa</i>	D, E, F, G, H
Whitestem pondweed	<i>Potamogeton praelongus</i>	A, H
Wild celery	<i>Vallisneria americana</i>	C, F, H
Yellow water starwort	<i>Zosterella dubia</i>	A
Yellow waterlily	<i>Nuphar variegatum</i>	A, E, F, G, H

A) 1942 Fisheries lake survey; B) 1956 Fisheries lake survey; C) 1969 Fisheries lake survey; D) 1975 Fisheries lake survey; E) 1985 Fisheries lake survey; F) 1995 Fisheries lake survey; G) 2005 Fisheries lake survey; H) 2008 SLICE vegetation sampling

Table 2. Percent frequency of occurrence of aquatic plant species sampled at depths of 15 ft or less, during point-intercept surveys in May and August in South Center Lake, Chisago County, MN (N = 414). Ninety percent of all plants sampled occurred in depths less than 10.3 feet during the spring surveys and 6.7 feet during the summer surveys.

Survey Date	Common Name	Species Name	Growth Form	Frequency (%)
5/24/2008	All rooted plants			91.8
	Curly-leaf pondweed*	<i>Potamogeton crispus</i>	Submersed	82.9
	Filamentous algae			19.7
	Coontail	<i>Ceratophyllum demersum</i>	Submersed	19.4
	Robbins' pondweed	<i>Potamogeton robbinsii</i>	Submersed	4.0
	Yellow waterlily	<i>Nuphar sp.</i>	Floating	3.6
	Muskgrass	<i>Chara sp.</i>	Submersed	1.9
	Northern watermilfoil	<i>Myriophyllum sibiricum</i>	Submersed	0.9
	Canada waterweed	<i>Elodea canadensis</i>	Submersed	0.7
	Lesser duckweed	<i>Lemna minor</i>	Free-floating	0.7
	Cattail	<i>Typha sp.</i>	Emergent	0.5
	8/12/2008	All rooted plants		
Coontail		<i>Ceratophyllum demersum</i>	Submersed	41.8
Northern watermilfoil		<i>Myriophyllum sibiricum</i>	Submersed	9.4
White waterlily		<i>Nymphaea sp.</i>	Floating	8.9
Robbins' pondweed		<i>Potamogeton robbinsii</i>	Submersed	8.0
Curly-leaf pondweed*		<i>Potamogeton crispus</i>	Submersed	7.5
Bushy pondweed		<i>Najas flexilis</i>	Submersed	5.6
Filamentous algae				4.6
Canada waterweed		<i>Elodea canadensis</i>	Submersed	4.3
Flat-stem pondweed		<i>Potamogeton zosteriformis</i>	Submersed	3.4
Clasping-leaf pondweed		<i>Potamogeton richardsonii</i>	Submersed	3.1
Lesser duckweed		<i>Lemna minor</i>	Free-floating	2.7
Narrow-leaf pondweed		<i>Potamogeton spp.</i>	Submersed	1.4
Watermeal		<i>Wolffia sp.</i>	Free-floating	1.0
Sago pondweed		<i>Potamogeton pectinatus</i>	Submersed	0.7
Yellow waterlily		<i>Nuphar sp.</i>	Floating	0.5
White-stem pondweed		<i>Potamogeton praelongus</i>	Submersed	0.5
Cattail		<i>Typha sp.</i>	Emergent	0.5
Wild celery		<i>Vallisneria americana</i>	Submersed	0.5
White water buttercup		<i>Ranunculus sp.</i>	Submersed	0.2