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

Vegetation survey of South Lindstrom Lake (13-0028), Chisago County, Minnesota

Summer 2010

Area Fisheries Supervisor Date

Regional Fisheries Supervisor Date

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Introduction

South Lindstrom Lake is a 499 acre lake located at the town of Lindstrom, Minnesota, in the Sunrise River-Upper St. Croix River watershed. The lake has a maximum depth of 34 feet and a mean depth of 17 feet. 42% of the lake's surface area has a depth of less than 15 feet. Aquatic vegetation has been found at depths up to approximately 15 feet. The shoreline is heavily developed with mostly year round residences.

The Chisago chain of lakes, which also includes Chisago (13-0012), North Lindstrom (13-0035), North Center (13-0032), and South Center (13-0027) has a history of extreme water level fluctuations. These fluctuations are believed to be due to the lakes' reliance on precipitation more than groundwater recharge to maintain water levels. In 2010 water levels were at 40 year lows, but were similar to 2009 levels.

Historical information on aquatic vegetation can be found in Fisheries lake surveys dating back to 1942 (Table 1). However, methods were not standardized until the 1995 survey, so quantitative comparisons are not possible with earlier data. The level of identification also varies considerably among the surveys. Point intercept vegetation surveys, as described by Madsen (1999) and the Minnesota Department of Natural Resources (2008), are becoming the standard for vegetation sampling in Minnesota lakes.

Eurasian watermilfoil (*Myriophyllum spicatum*), an exotic invasive species, was first documented in South Lindstrom Lake in the fall of 2009. Eurasian watermilfoil has been present in nearby Green Lake since at least 1996, and was recently found in North Lindstrom, North Center, and South Center lakes.

The goal of this survey was to document and characterize the aquatic vegetation community in South Lindstrom Lake.

Methods

A point intercept vegetation survey was conducted on July 1 and July 7, 2010, using methodology described by Madsen (1999) and the Minnesota Department of Natural Resources (2008). Sample points were generated using ArcView GIS software to provide a density of approximately 0.7 points per acre in the portion of the lake with a depth of 15 feet or less. A Garmin GPSMap 298 GPS unit with color depth finder was used to navigate a boat to each sample point. Vegetation was observed on one side of the boat in an area approximately one meter square. A double headed garden rake was tossed once at each point to sample vegetation that could not be visually identified from the boat. The depth finder graph was used to determine the presence or absence of vegetation in deeper water.

Data was entered in the field on a laptop computer using the DNR Fisheries Lake Survey application.

Results and discussion

Flatstem pondweed (Potamogeton zosteriformis) and narrowleaf pondweed (Potamogeton sp.), two native species, were the most widely occurring submerged plant species in South Lindstrom Lake. Eurasian watermilfoil was found clustered in the northern bay of the lake, and at several scattered points around the lake(Figure 3). The native species northern watermilfoil was also present, occurring at 12.6% of sample points. In some lakes with both milfoil species present, the two will hybridize, forming a plant with characteristics intermediate between the two species. No hybrid milfoil was observed on South Lindstrom Lake. Curlyleaf pondweed was scattered around the littoral zone, but was already in stages of decay. This species normally forms surface mats around mid June, then dies back.

effects of low water shoreline sediment disturbance ? optional

The two main challenges associated with the management of invasive species such as Eurasian watermilfoil and curlyleaf pondweed are to minimize damage to native plants and to produce long term control. Although eradication of Eurasian watermilfoil is not a feasible goal once it is established in a lake, milfoil that is creating nuisance conditions can be managed by the careful use of herbicides, under permit from the DNR's Aquatic Plant Management program. Since 2004, pilot projects have been underway in Minnesota in an effort to determine whether long term control of Eurasian watermilfoil and curlyleaf pondweed can be achieved. There is not enough information yet to determine the long term effects of treatment for Eurasian watermilfoil or curlyleaf pondweed (Invasive Species Program 2010). While in most cases native aquatic plant populations have not been negatively affected by lakewide early season endothall treatments for curlyleaf pondweed, in some situations caution should be exercised in implementing a treatment program. These include eutrophic lakes with few species of native plants, and lakes where multiple herbicides are used to target both curlyleaf pondweed and Eurasian watermilfoil (Invasive Species Program 2010).

References

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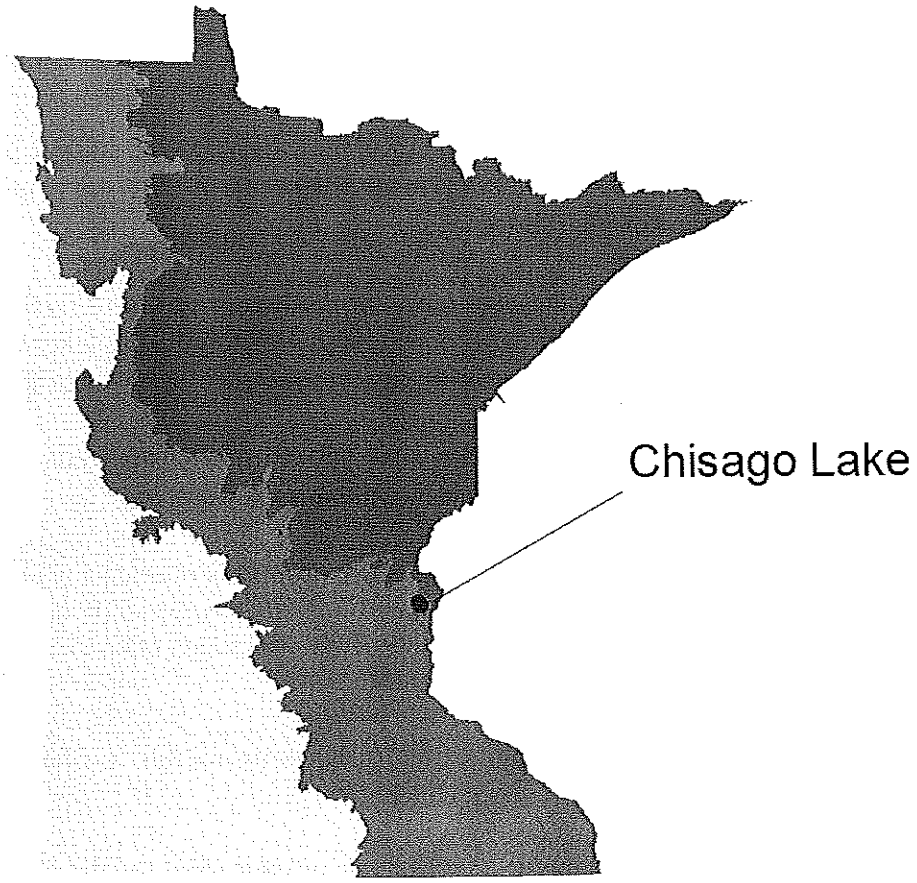

Figure 1. Location of South Lindstrom Lake, Chisago County, Minnesota.

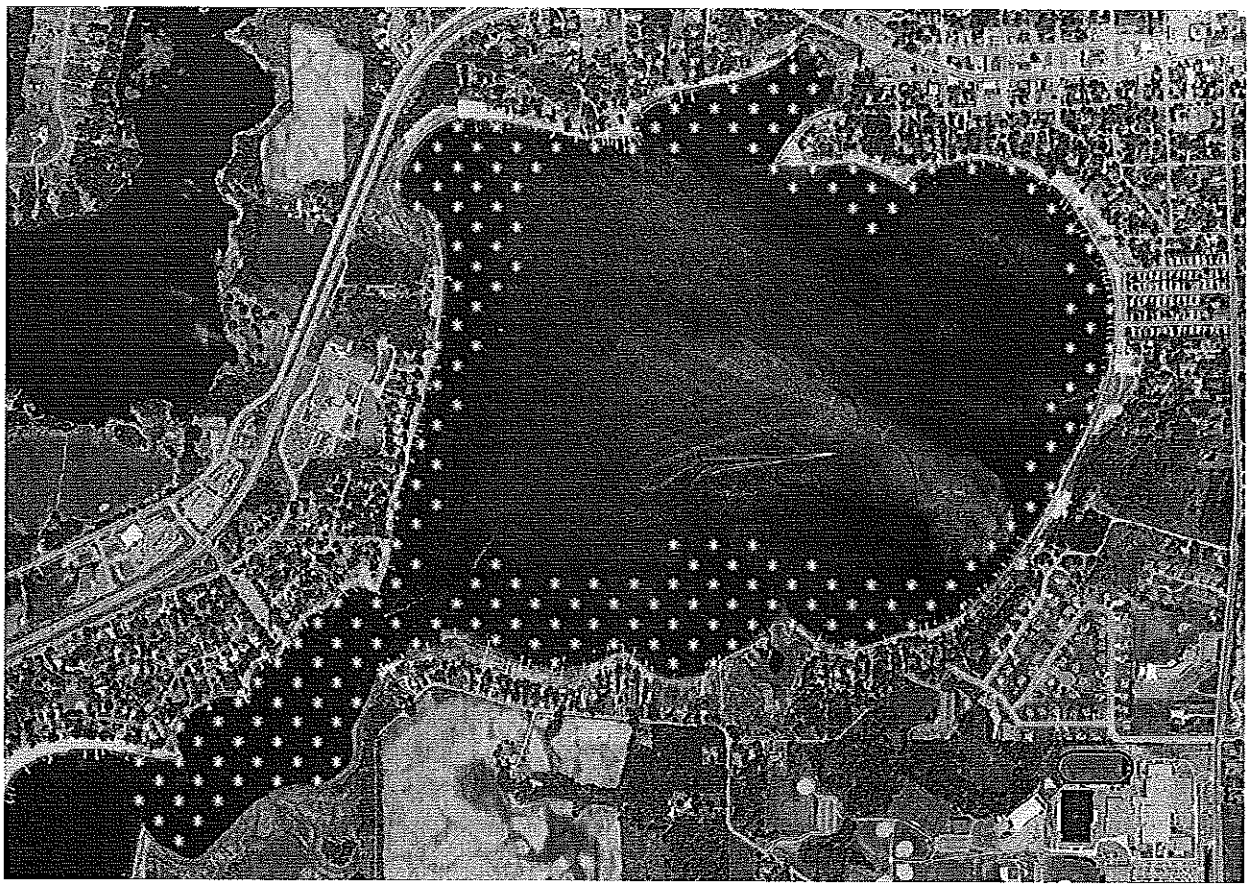

Figure 2. Grid of points that were sampled during the vegetation survey on South Lindstrom Lake.

Figure 3. Points where Eurasian watermilfoil was sampled in 2010.

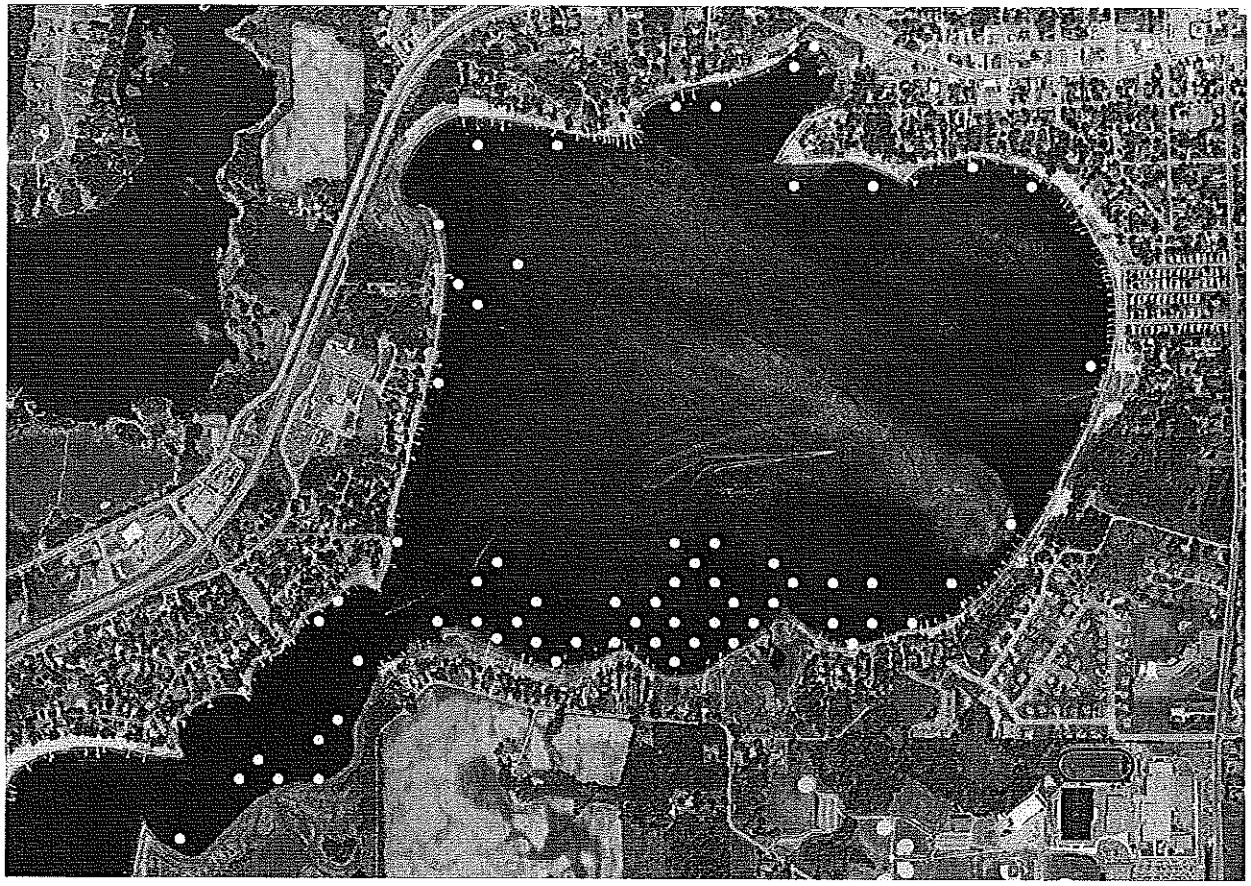

Figure 4. Points where curlyleaf pondweed was sampled in 2010

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

Common name	Scientific name	Survey years
Emergent species (13 total)		
Blue flag iris	*Iris versicolor*	
Broad leaved arrowhead	*Sagittaria latifolia*	B, C
Broad leaved cattail	*Typha latifolia*	A, B, C, E
Chufa nut grass	*Cyperus sp.*	F
Hardstem bulrush	*Scirpus acutus*	A, B, C, E
Narrow leaved cattail	*Typha angustifolia*	G
Needlerush	*Eleocharis acicularis*	H
Rushes	*Juncus sp.*	F, G
Sedge	*Carex or Cyperaceae*	B, C, F, G
Softstem bulrush	*Scirpus validus*	A, B, C, F, G
Spikerush	*Eleocharis sp.*	F, G
Water smartweed	*Polygonum amphibium*	D, E, F, G
Wool grass	*Scirpus cyperinus*	
Submerged and floating leaf species (22 total)		
Bushy pondweed	*Najas flexilis*	F, G, H
Canada waterweed	*Elodea canadensis*	A, B, E, F, G
Claspingleaf pondweed	*Potamogeton Richardsonii*	G
Coontail	*Ceratophyllum demersum*	B, C, D, E, F, G, H
Curlyleaf pondweed	*Potamogeton crispus*	C, E, F, G, H
Eurasian watermilfoil	*Myriophyllum spicatum*	H
Filamentous algae		F, G
Flatstem pondweed	*Potamogeton zosteriformis*	A, C, F, G, H
Floatingleaf burreed	*Sparganium fluctuans*	E
Greater bladderwort	*Utricularia vulgaris*	F, G
Greater duckweed	*Spirodela polyrhiza*	F
Largeleaf pondweed	*Potamogeton amplifolius*	G, H
Lesser duckweed	*Lemna minor*	F
Little yellow waterlily	*Nuphar microphyllum*	F
Muskgrass	*Chara sp.*	C
Narrowleaf pondweed	*Potamogeton sp.*	F, G, H
Northern watermilfoil	*Myriophyllum sibiricum (exalbescens)*	C, D, E, F, G, H
Pondweed (unspecified)	*Potamogeton sp.*	B, D
Robbins' pondweed	*Potamogeton Robbinsii*	C, F, G, H
Sago pondweed	*Stuckenia pectinata*	C, G, H
Small pondweed	*Potamogeton pusillus*	A
White waterlily	*Nymphaea tuberosa*	C, F, G
Wild celery	*Vallisneria americana*	C, G, H
Yellow waterlily	*Nuphar variegatum*	F, G

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) 2010 Fisheries vegetation point intercept survey

Table 2. Aquatic plants found in South Lindstrom Lake during the 2010 survey

type	Common name	Scientific name	Frequency (%)
submerged	flatstem pondweed	*Potamogeton zosteriformis*	51.3
	narrowleaf pondweed	*Potamogeton sp.*	47.7
	curlyleaf pondweed	*Potamogeton crispus*	32.7
	northern watermilfoil	*Myriophyllum sibiricum*	12.6
	Eurasian watermilfoil	*Myriophyllum spicatum*	7.5
	bushy pondweed	*Najas flexilis*	4.0
	Robbins' pondweed	*Potamogeton Robbinsii*	4.0
	sago pondweed	*Stuckenia pectinata*	3.0
	coontail	*Ceratophyllum demersum*	1.0
	largeleaf pondweed	*Potamogeton amplifolius*	1.0
	water celery	*Vallisneria americana*	1.0
	needle rush	*Eleocharis acicularis*	0.5

average species diversity at points = 1.7 (range 0-4)