Aquatic Plant Community of Crooked Lake: 2017
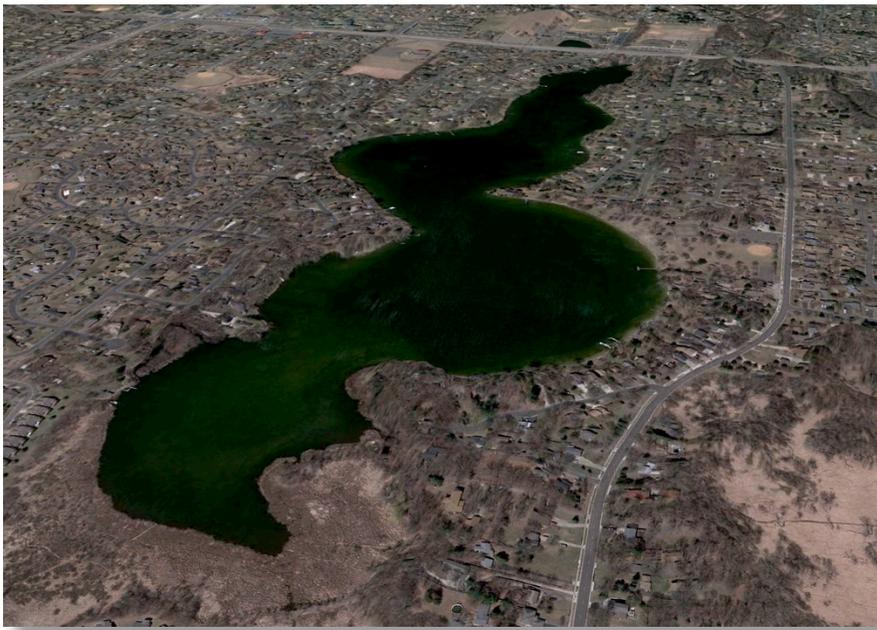## Anoka County, MN *(#02-0084)*

Surveyed August 14, 2017

Surveying, Analysis, and Reporting by:
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Certified Lake Manager
www.NALMS.org

Funded by:
Crooked Lake Area Association

Survey & Analysis Methods

Point-Intercept Aquatic Plant Survey

Freshwater Scientific Services conducted a lake-wide aquatic plant survey for Crooked Lake on August 14, 2017 using the point-intercept method described by Madsen (1999). This survey incorporated assessments at a total of 177 sample points (154 littoral; ≤15 ft) arranged in a uniform grid (45-m spacing; Figs 1 and 2). We generated these sample points using desktop GIS software to project a grid of points over an aerial image of the lake. We then loaded the selected sample locations onto a handheld GPS unit (Garmin GPSMAP-78) for navigation to each point while in the field.

At each designated sample location, we collected plants using a double-headed, 14-tine rake on a on a rope. For each rake sample, we dragged the rake over the lake bottom for approximately 5 ft before retrieving. Retrieved plants were piled on top of the rake head and assigned density scores from 1 to 4 based upon rake head coverage (Table 3) for each individual species and for all plants collectively.

We calculated the littoral frequency (≤15 ft, % occurrence) and littoral mean density score (plant abundance) for each encountered plant species (Table 1), as well as lake-wide and littoral plant community metrics (Table 2). We also used desktop GIS software to map the distribution and abundance of plants in the lake (pages 5–9). Additional species that were observed floating or growing in the vicinity of a sample point but not retrieved on the rake were given a rating of zero for that location. These "zero" species were noted as being present on the plant distribution maps (shown as an "X"), but "zero" ratings were excluded from calculations of plant community metrics and statistics (not treated as denoting presence). At each location, we also documented water depth and overall plant height.

Figure 1. Designated sample locations for the 2017 Crooked Lake plant survey. Darker shaded area >15 ft (based upon MDNR bathymetric map).

Figure 2. Sampling effort (number of locations sampled) within successive 3-ft depth zones
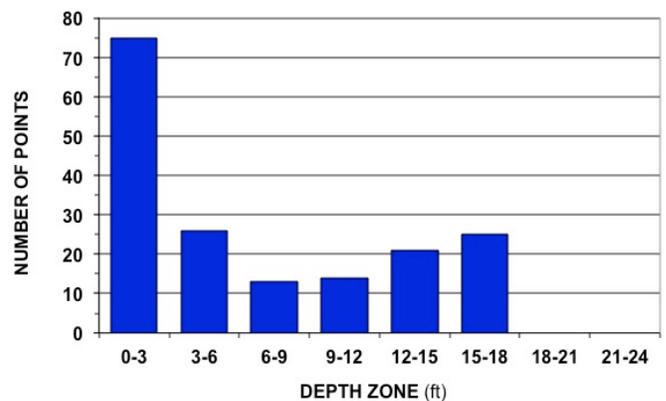
Results

Statistical Summary of Findings

Table 1. Littoral frequency (% occurrence) and abundance (mean density score) of plant species found in Crooked Lake (Anoka Co., MN) during the Aug 14, 2017 survey. *% Occurrence* and *Mean Density* (0-4 scale) were calculated using all littoral points (water depth ≤15 ft). Plant taxa that were observed growing in the lake but not retrieved in any rake samples are noted as being present (P).

PLANT TAXA	COMMON NAME	% OCCURRENCE		MEAN DENSITY	
		2016	2017	2016	2017
ALL TAXA (combined)		**72**	**73**	**2.5**	**2.1**
SUBMERSED TAXA					
Myriophyllum spicatum *	Eurasian watermilfoil	60	1	0.9	<0.1
Ceratophyllum demersum	Coontail	50	25	0.8	0.3
Chara sp.	Muskgrass	41	42	1.0	1.0
Potamogeton illinoensis	Illinois pondweed	29	38	0.3	0.7
Stuckenia pectinata	Sago pondweed	17	38	0.2	0.4
Najas guadalupensis	Southern naiad	6	3	0.1	<0.1
Eleocharis acicularis	Needle spikerush	1	1	<0.1	<0.1
Potamogeton crispus *	Curly-leaf pondweed	1	16	<0.1	0.2
Potamogeton pusillus	Small pondweed	1	5	<0.1	<0.1
Zosterella dubia	Water stargrass	1	5	<0.1	0.1
Najas flexilis	Slender naiad	–	6	–	0.1
Utricularia vulgaris	Common bladderwort	–	3	–	<0.1
Potamogeton gramineus	Variable pondweed	–	P	–	–
Potamogeton zosteriformis	Flat-stem pondweed	–	2	–	<0.1
FLOATING TAXA					
Nymphaea odorata	White waterlily	17	22	0.2	0.2
Lemna minor	Small duckweed	13	5	0.1	0.1
Spirodela polyrhiza	Large Duckweed	7	2	0.1	<0.1
Wolffia columbiana	Common watermeal	4	2	<0.1	<0.1
Nuphar variegata	Spatterdock	1	P	<0.1	–
Lemna trisulca	Star duckweed	–	1	–	<0.1
EMERGENT TAXA					
Typha sp.	Cattail	2	1	<0.1	<0.1
Schoenoplectus acutus	Hard-stem Bulrush	P	P	–	–

* Invasive, non-native species

Table 2. Summary of Crooked Lake plant community metrics from the Aug 14, 2017 survey.

CROOKED LAKE

WHOLE-LAKE METRICS	2016	2017
Lake Area (acres)	116	116
Total Points Sampled	179	177
Vegetated Area (acres)	80	70
Area with Veg. to Surface (acres)	36	24
Max Depth of Growth (95%)	14.0 ft	12.5 ft
Native Submersed Taxa	10	12
Native Floating/Emergent Taxa	7	8
Non-Native Submersed Taxa	2	2

LITTORAL METRICS	2016	2017
Littoral Area (≤15 ft, acres)	84	85
Littoral Points Sampled	151	154
% Littoral Points Vegetated	95%	82%
Mean Plant Height	2.7 ft	1.4 ft
% of Max Littoral Biovolume	52%	34%
Mean Native Taxa / Point	1.5	2.0
Simpson's Diversity	0.85	0.87
Floristic Quality (FQI)	17.9	22.0
AMCI Score (Nichols et al. 2000)	47	51

Table 3. Overview of rake density scores used to document plant abundance

Density Score	Rake Coverage	Description
1		Only a few plants retrieved
2		Full length of rake head covered, but tines only partially covered
3		Plants completely cover the rake head and tines
4		Enough plants to cover rake head and tines multiple times

Croooked Lake – Aquatic Plant Community

All Vegetation

Density (1-4)

x No plants
· 1
· 2
· 3
· 4

Darker shaded area >15ft

N
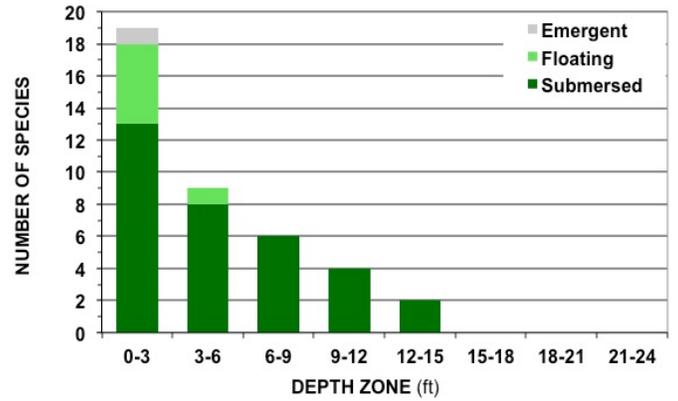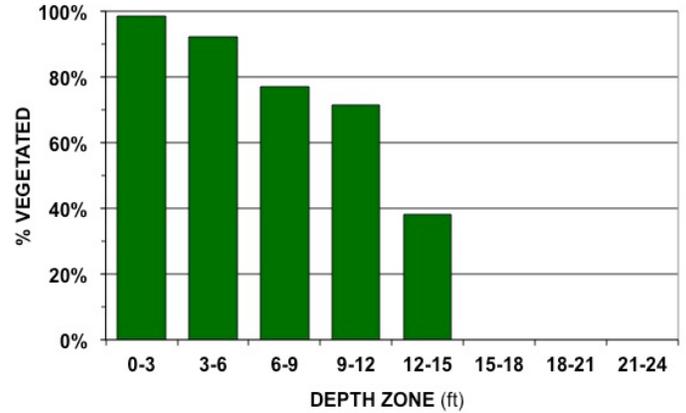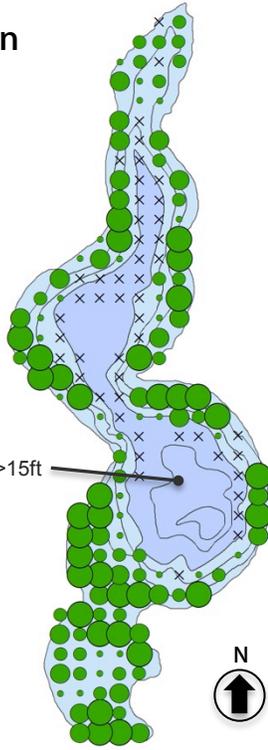
Native Plant Diversity

Number of Native Species per point

x None
· 1-2
· 3-4
· 5-6
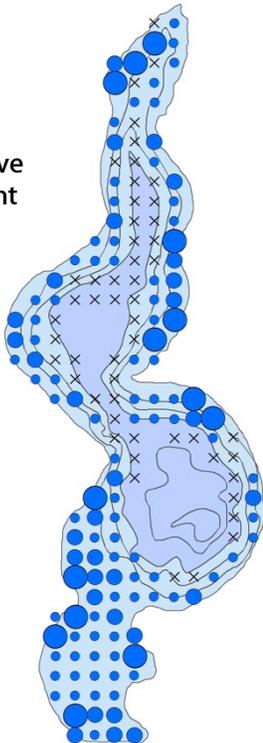
Surveyed: Aug 14, 2017
Methods: Rake, Sonar, Depth Rod
Surveyor: JA Johnson

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Crooked Lake – Invasive Aquatic Plants

Eurasian Watermilfoil

Density (1-4)

X In vicinity
· 1
· 2
● 3
● 4

Darker shaded area >15ft
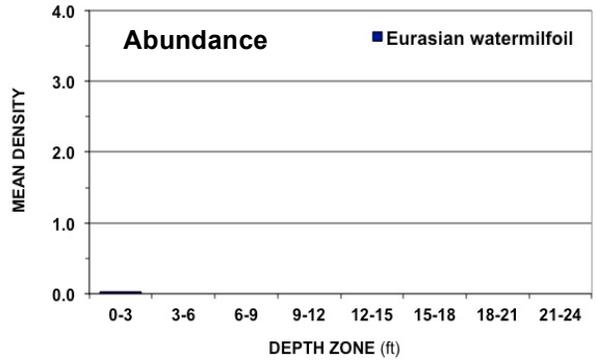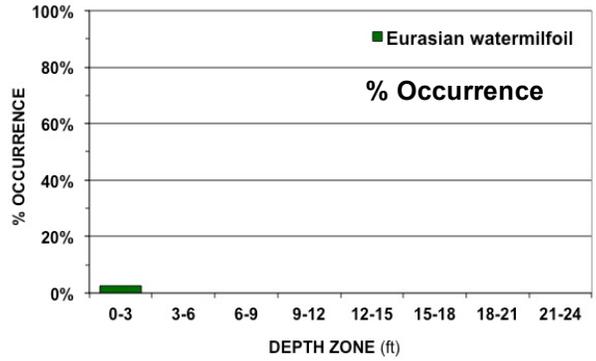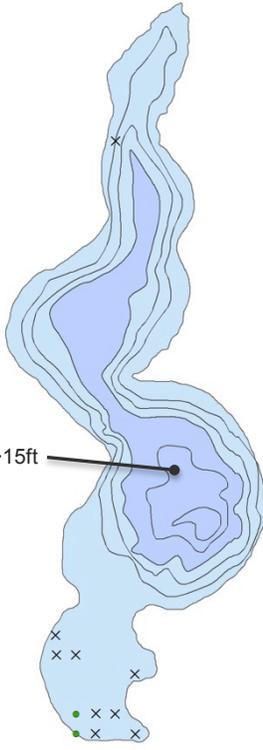
Curlyleaf Pondweed

Density (1-4)
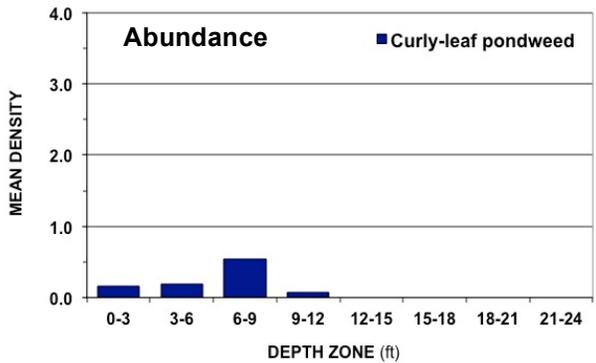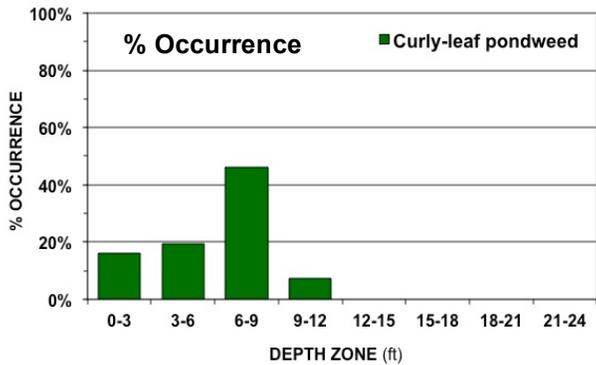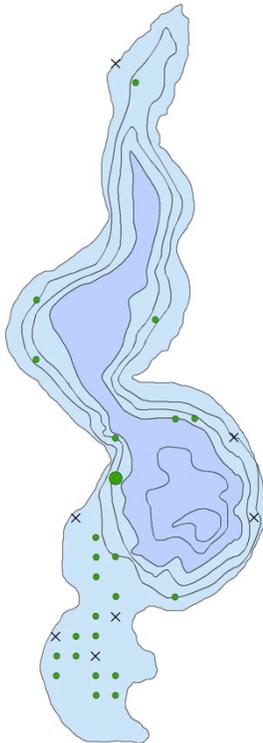
X In vicinity
· 1
· 2
· 3
● 4

Crooked Lake – Native Aquatic Plants

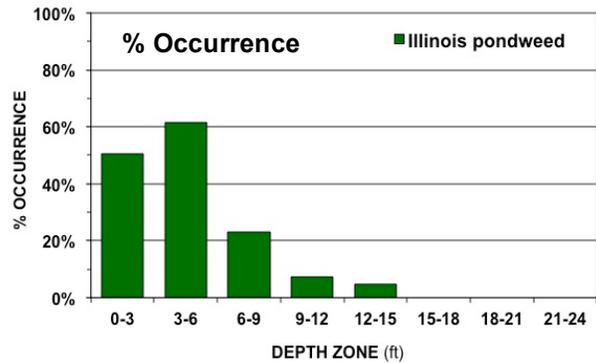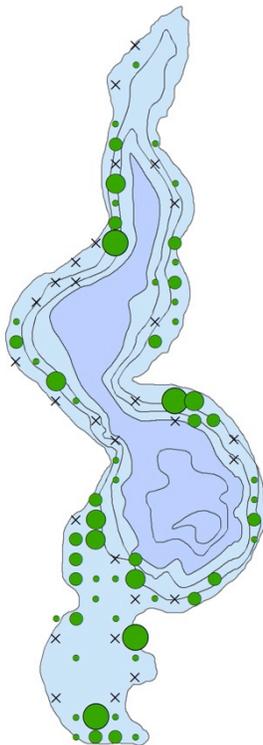## Muskgrass (Chara)

Density (1-4)
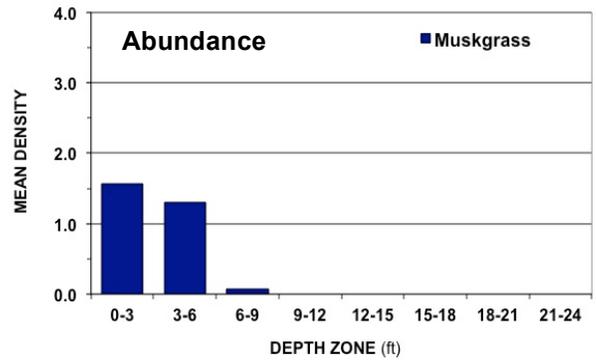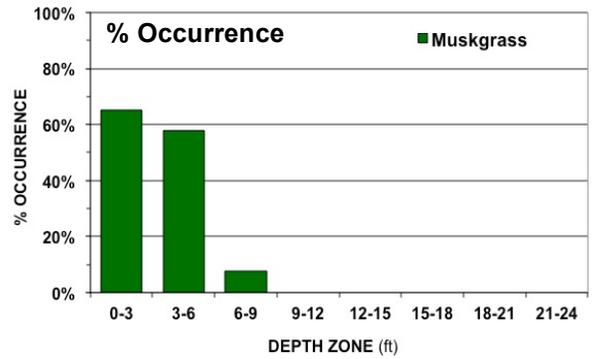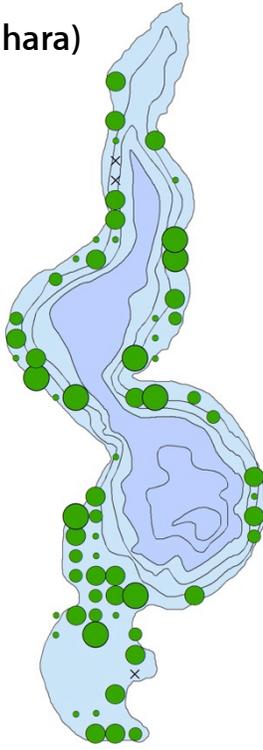
- X   In vicinity
- ·   1
- •   2
- ●   3
- ⬤   4

Illinois Pondweed

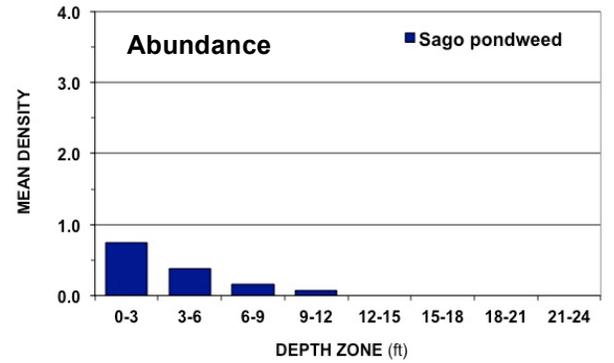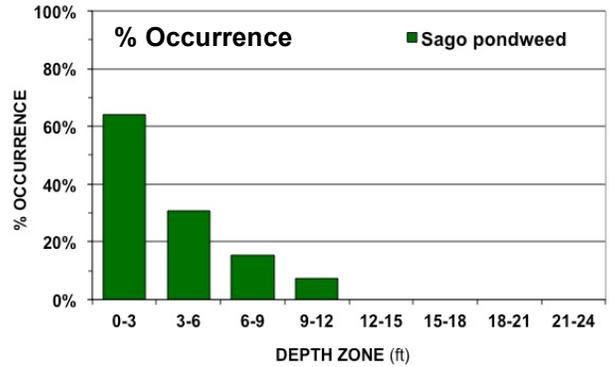**Density** (1-4)
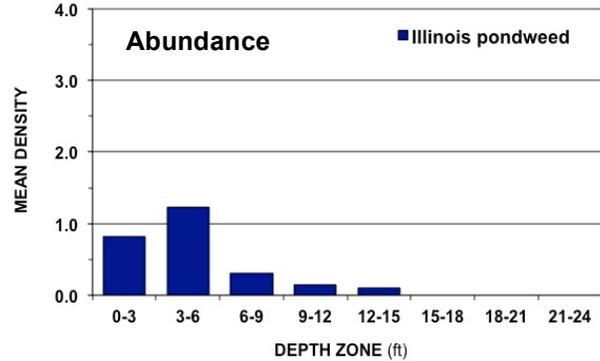
- X   In vicinity
- ·   1
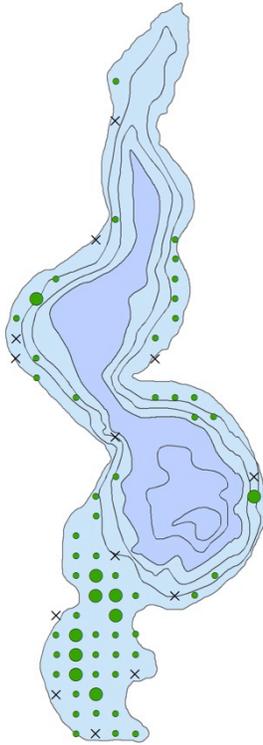- •   2
- ●   3
- ⬤   4

Crooked Lake – Native Aquatic Plants
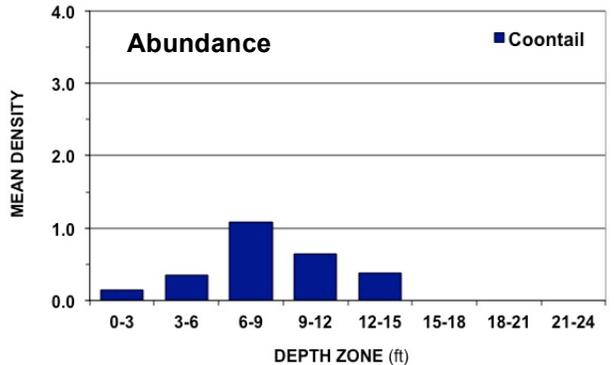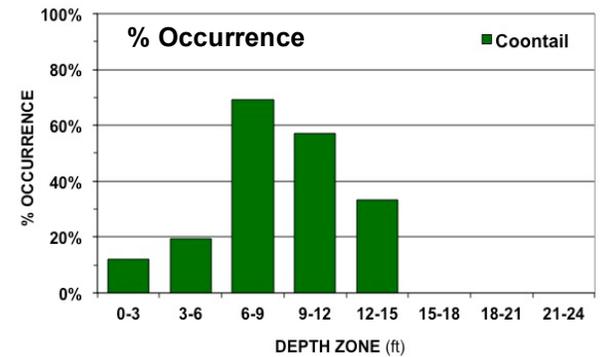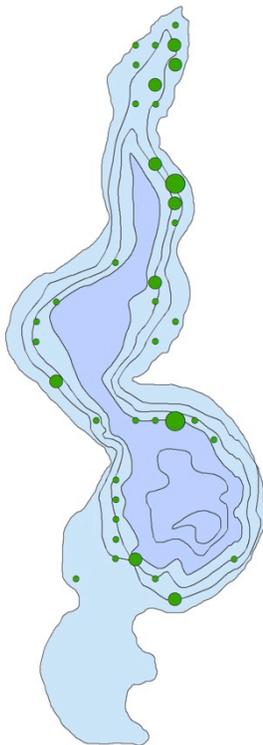
Sago Pondweed

Density (1-4)

X   In vicinity

·   1

●   2

●   3

⬤   4

Coontail

Density (1-4)

X   In vicinity

·   1

●   2

●   3

⬤   4

Crooked Lake – Native Aquatic Plants

White
Waterlily

Density (1-4)
× In vicinity
• 1
• 2
• 3
• 4

Water
Stargrass

Small
Pondweed

Southern
Naiad

Density (1-4)
× In vicinity
• 1
• 2
• 3
• 4

Flat-Stem
Pondweed

Hardstem
Bulrush