

Lake John Vegetation Management Plan

1. Description of the lake and water quality

A. Lake Name: John

B. Lake Identification Number (DOW Number): 86-288

C. County: Wright

D. Acreage Total: 391

i. Type of estimate: Division of Waters or Planimetered .

E. Acreage Littoral: 353

F. Percentage Littoral: 90%

G. Classification of Lake: Natural Environment
 Recreational Development
 General Development

H. Water quality

i. Clarity as indicated by Secchi disk observations in feet or meters (MPCA website 2009).

For most recent year(2009), mean value: (May-Sept.):9.7', Range:7.0' – 12.5'
Number of Obs.: 14 (MPCA Website 2009 & See Appendix 1)

Trend: From 1998-2009 the average water clarity from June to September has fluctuated down and up a few times by 1-5 feet, Number of Obs.: 157 (MPCA Website 2009 & See Appendix 1)

ii. If available, concentration of total phosphorus (parts per billion – ppb).

From 2003-2009, mean value: 25.0, Range: 13-40, Number of Obs.: 28

Trend: Increasing from 2003 to 2007 then decreasing in 2008 and 2009, Number of Obs.: 28 (MPCA website 2009. All calculations are based on data collected between June and September).

iii. If available, concentration of Chlorophyll-a (parts per billion – ppb).

From 2003-2009, mean value: 9.4, Range: 2–17, Number of Obs.: 28

Trend: Increasing from 2003 to 2008 then decreasing in 2009, Number of Obs.: 28 (MPCA website 2009. All calculations are based on data collected between June and September).

Narrative (describe water quality concerns, quantify TSI): Lake John is in the North Central Hardwood Forests Ecoregion. Lakes in this region typically have Secchi disk readings from 4.9-10.5', total phosphorus levels from 23 to 50 ppb, and chlorophyll-a levels from 5 to 22 ppb. The Lake John averages calculated for each of these parameters fall well within the interquartile ranges for lakes in this ecoregion. The Carlson's Trophic State Index (TSI) is a common means for characterizing a lake's overall health and is one means available to evaluate the relationship between total phosphorus, chlorophyll-a, and Secchi disk readings in a lake and its overall productivity. The trophic state indexes for this lake ranged from 47 to 52, which is at the lower end of classic eutrophy. Hence, Lake John is classified as eutrophic by MPCA (MPCA website 2009).

2. Aquatic vegetation (requires survey of lake – Appendix 2 and 3)

A. Submersed aquatic vegetation

- i. Grows to a maximum depth of 15 feet (DNR Fish 8/15/06)
- ii. Plants at or near water surface to a depth of 5-10 feet (DNR Fish 8/15/06)
- iii. Number of native species present: 35
List of species, including scientific names and source of survey(s): See Appendix 2 and 3.
- iv. Number of non-native, invasive species present: 1
 - a. Eurasian watermilfoil present: No
 - 1. Year when Eurasian watermilfoil was confirmed in lake: NA
 - b. Curly-leaf pondweed present: Yes
 - 1. Year when Curly-leaf pondweed was confirmed in lake: 1980
 - 2. Grows to a depth of 10 feet
 - 3. Maximum depth at which matting occurs: 7 ft
 - 4. Area of curly-leaf pondweed that is matted on the water's surface: 11.6 acres (2006, see Appendix 4)
 - 5. Acres of matting as percentage of littoral acres: 2.3%

Note: The above information on curly-leaf pondweed is based on a gps survey of the lake on 6/9/06, by DNR Fisheries, Montrose, at the time of peak curly-leaf abundance.

B. Water lilies and watershield – floating-leaved aquatic vegetation

- i. Number of native species present: 2

List of species, including scientific names and source of survey(s): See Appendix 2, 3, and 5.

ii. Number of non-native, invasive species present: None

C. Emergent aquatic vegetation

i. Number of native species present: 13

List of species, including scientific names and source of survey(s): See Appendix 2, 3, and 5.

ii. Number of non-native, invasive species present: None

3. Public participation

A. Number of users of the lake to which notice of intent to plan was sent: All 137 property owners adjacent to Lake John get a copy of the President's annual January letter from the Lake John Association, Inc. Notice was given in the 2009 letter that development of a Lake Vegetation Management Plan (LVMP) had begun in cooperation with the MN DNR. Also, property owners attending the lake association's annual meeting in 2009 were informed again of the development of an LVMP and that a copy of the plan would be available to them before it would be finalized.

B. Number of meetings held to develop the plan and number of attendees at each meeting. A Lake Vegetation Management Plan Committee was developed with a total of nine committee members. These included Lake John Association members with one from each zone on the lake (Rodney Himmel, Jeff Gavin, Bruce Nystrom, Sue Raugust, Lee Custer, Denny Kugler, John Bergstrand, and Elaine Fleskes) and one representative from the MN DNR (Audrey Kuchinski). Two planning meetings were held with one in October of 2008 and the second in January of 2009. The average number of attendees at a meeting was seven. Since January of 2009, plan review and comments have been done via email.

C. Other means by which people were involved in development of the plan. An announcement through the Lake John Association President's annual January (2010) letter was made for folks interested in obtaining a copy of the plan to make a request to the lake association and that comments on the plan could be submitted in writing to the Little Falls DNR APM office within a defined two week comment period.

4. Problems to be addressed in this plan:

After MN DNR Fisheries Research identified the shallow vegetated areas along the West shoreline and the Northwest finger bay as sensitive areas, the Lake John Association in cooperation with MN DNR Fisheries APM determined that development of a Lake Vegetation Management Plan (LVMP) would aid in the protection of native submerged, floating leaf, and emergent aquatic plants in these areas and vegetated areas throughout Lake John. Aquatic plants are an essential component in most lake communities as they provide food and shelter for fish and wildlife, they improve water clarity and quality by utilizing nutrients

that would otherwise be available for algae, they protect shorelines from erosion, and they stabilize bottom sediment in the shallow shoal-water areas (areas where water is 1-5 feet deep). Maintaining or even improving the existing plant community in Lake John will be essential in sustaining the lakes overall quality.

5. Goals for management of aquatic plants

Goal A. Protect high quality communities of native emergent, floating-leaf and submerged aquatic plants.

Measurable Outcome: Maintain a no net loss in area as documented by the 2006 delineation mapping of cattail, yellow and white water lily (Appendix 5). Maintain a no net loss or a maximum loss of 10 percent in the percent frequencies documented by the 2006 point intercept survey for native submersed plants (Appendix 3). (Note: This is a laudable goal, but may be hard to measure).

Goal B. Restore or enhance shoreline habitat

Goal C: Restore or enhance lake water quality

6. Actions to achieve goals

Goal A. Protect high quality communities of native emergent, floating-leaf and submerged aquatic plants.

Strategy a. Develop and implement an informational and educational program related to native and non-native aquatic plant management for lake landowners and lake users.

Action 1. Continue to schedule aquatic plant identification sessions for lakeshore landowners. The Lake John Association will initiate the scheduling of these sessions with the MN DNR Fisheries APM Office. In August of 2009, an aquatic plant ID session was conducted by MN DNR Fisheries APM on Lake John. Those present included: Charlie Nuernberg, Bruce Bartels, Rich Myers, Elaine Fleskes, Rodney Himmel, Bruce Nystrom, Sue Raugust, and Denny Kugler.

Action 2. Provide addresses for websites containing information on identification and management of native and non-native aquatic plants.

Action 3. Provide information via the President's annual January letter and/or at the DNR public access to lake landowners and lake users on the negative impacts caused by extensive boat use in shallow vegetated areas along the West shoreline and in Northwest finger bay as well as the importance of avoiding these areas whenever possible or limiting boat speed to no wake when near or in these areas. This action is not a restriction, but simply an educational tool and it is not enforceable.

Action 4. Continue to provide information at the DNR access regarding boating practices that minimize the risk of transferring non-native invasive aquatic plants to or from Lake John.

Action 5. The Lake John Association will consult with the Little Falls APM Office or the Montrose Area Fisheries Office and work together to identify key areas of placement of marker buoys or signs that inform boat operators of the importance of bulrush beds. Before proceeding with buoy or sign purchase and placement, approval must be granted by the local sheriff's office. The informational stickers can be provided by DNR Fisheries-APM while all other expenses will be the responsibility of the association. Buoy/sign installation and removal each season will be the responsibility of the association. To prevent any navigational hazards to snowmobile or ATV users, the markers must be promptly removed by September 30th each year. The Lake John Association will also provide information to property owners about these areas and current DNR restrictions on activities that destroy emergent aquatic plants like bulrush and cattails via the President's annual January letter and the association's annual meeting. Posting of these areas is an educational tool and is not enforceable.

Strategy b. Adopt alternative standards that are more limited than those in the current APM rule to protect native emergent, floating leaf and submerged aquatic plants. The alternative standards listed below will guide the issuance of APM permits and apply to the entire shoreline on Lake John including the documented sensitive areas along the West shoreline and Northwest finger bay (See Appendix 6). If the alternative standards listed below do not provide the necessary protection of plant bio-mass in the documented sensitive areas along the West shoreline and Northwest finger bay, then more limited standards will have to be put in place in these specific areas.

Action 1. The maximum area that may be permitted for native submersed vegetation control will be 50 feet along the shoreline or one-half the total length of the owner's shoreline, whichever is less. The total area may not exceed 2500 square feet. In areas where chara (a plant highly important for maintaining water clarity and providing quality fish habitat especially for intolerant minnow species present) is present, the allowed area of control and location will be determined on a case by case basis, but will not exceed the above standard set for the lake.

Action 2. The maximum area that may be permitted for native floating leaf vegetation control will be a 15-foot wide channel that extends to open water by the most direct route.

Action 3. Permit applications for the control of native rooted emergent vegetation will be reviewed on a case-by-case basis. Placing a permanent or removable dock over the top of emergent vegetation will be the typical method recommended to gain access.

Goal B. Restore or enhance lakeshore habitat.

Action 1. The Lake John Association will continue to schedule presentations with MN DNR Shoreline Habitat Restoration staff or Wright County Soil and Water Conservation Services over the duration of this plan to educate property owners about shoreline restoration and rain gardens and seek out willing landowners to participate in shoreline restoration projects and/or rain garden installation. In 2009, a presentation on shoreline restoration was given at the annual meeting by Wright County SWCD.

Action 2. The Lake John Association will provide information on shoreline restoration and include links to websites, purchase the DNR CD "Restore your Shore" and make available to association members for check out, and encourage lakeshore owners to borrow or purchase this CD.

Action 3. Encourage property owners interested in shoreline restoration projects to apply for grant monies, in coordination with the Lake John Association or the local SWCD office acting as the project lead, available through the DNR's Shoreline Habitat Restoration Grant Program. For more information go to <http://www.dnr.state.mn.us/grants/habitat/shoreland.html>

Action 4. Seek property owners that desire to restore their shoreline to a natural native state. Work towards restoration of a total of 500 linear feet of shoreline by the end date of this five year plan. The total restoration area can be made up of small areas over many properties. Areas may include the upland zone, transitional zone and aquatic zone. MN DNR Fisheries is available to provide technical guidance upon request from the Lake John Association.

Action 5. Explore the idea of waterlily bed restoration in the Northwest finger bay adjacent to developed and undeveloped properties. If this is found to be a reasonable restoration effort the Lake John Association will seek willing landowners to participate in waterlily planting projects adjacent to their shoreline. MN DNR Fisheries is available to provide technical guidance upon request from the Lake John Association. Success of planting can be monitored by the number of surviving plants and by an increase in total area.

Goal C: Restore or enhance lake water quality

Action 1. The Lake John Association will continue to plant bulrushes adjacent to willing landowners property. In June of 2009, members of the Lake John Association purchased and planted 360 bulrush transplants in shallow offshore areas along the West shore. Success of planting can be monitored by the number of surviving plants and by an increase in total area.

Action 2. The Lake John Association will continue to monitor the levels of phosphorus and chlorophyll-a by collecting a minimum of four samples each summer (June to September) and send the samples for testing to a certified water testing lab approved by MPCA.

7. Responsibilities:

The following chart indicates the **principal party** responsible for the implementation of the goals and action of this plan. While both parties will work towards these goals, neither will be held legally responsible if goals are not met.

<u>Goal & Action</u>	<u>DNR</u>	<u>LJA</u>
Goal Aa Action 1	X	X
Goal Aa Action 2	X	X
Goal Aa Action 3	X	X
Goal Aa Action 4	X	X
Goal Aa Action 5	X	X
Goal Ab Action 1	X	
Goal Ab Action 2	X	
Goal Ab Action 3	X	
Goal B Action 1	X	X
Goal B Action 2		X
Goal B Action 3	X	X
Goal B Action 4	X	X
Goal B Action 5	X	X
Goal C Action 1	X	X
Goal C Action 2		X

8. Monitoring:

The Lake John Association will explore hiring a private consultant to conduct a point intercept vegetation survey in 2014 (unless otherwise agreed to by MN DNR Fisheries) to assist in the evaluation of Goal A in this plan. The provided coordinates in Appendix 7 are to be used and the sampling protocol outlined in Appendix 8 is to be followed. Also, to assist in the evaluation of Goal A in this plan, waterlily beds will again be delineated at some point during 2010 or 2011 by MN DNR Fisheries APM.

9. Signatures

This Lake Vegetation Management Plan is in effect for 5 years from date last signature is obtained.

DNR Approval

Submitted By: Audrey Kuchinski

Title: Fisheries Specialist Intermediate-Aquatic Plant Management

Date: 1/15/2010

Paul Duedrich
Paul Duedrich, Area Fisheries Approval

7/7/10

Date

Dave McCormack
Dave McCormack, Regional Fisheries Approval

6/24/10

Date

Jan Shaw Wolff
Jan Wolff, Regional Ecological Resources Approval

7/3/10

Date

I affirm that I am an authorized representative of John Lake Association and acknowledge full participation in the development and implementation of this lake vegetation management plan.

Elaine J. Hestey, Chairperson
Cooperator's Signature and Title

6/24/10

Date

Either party may terminate participation in this plan at any time, with or without cause, upon 30 days' written notice to the other party. Adjustments to this LVMP may be made following review in any year by mutual agreement.

Distribution of approved LVMP

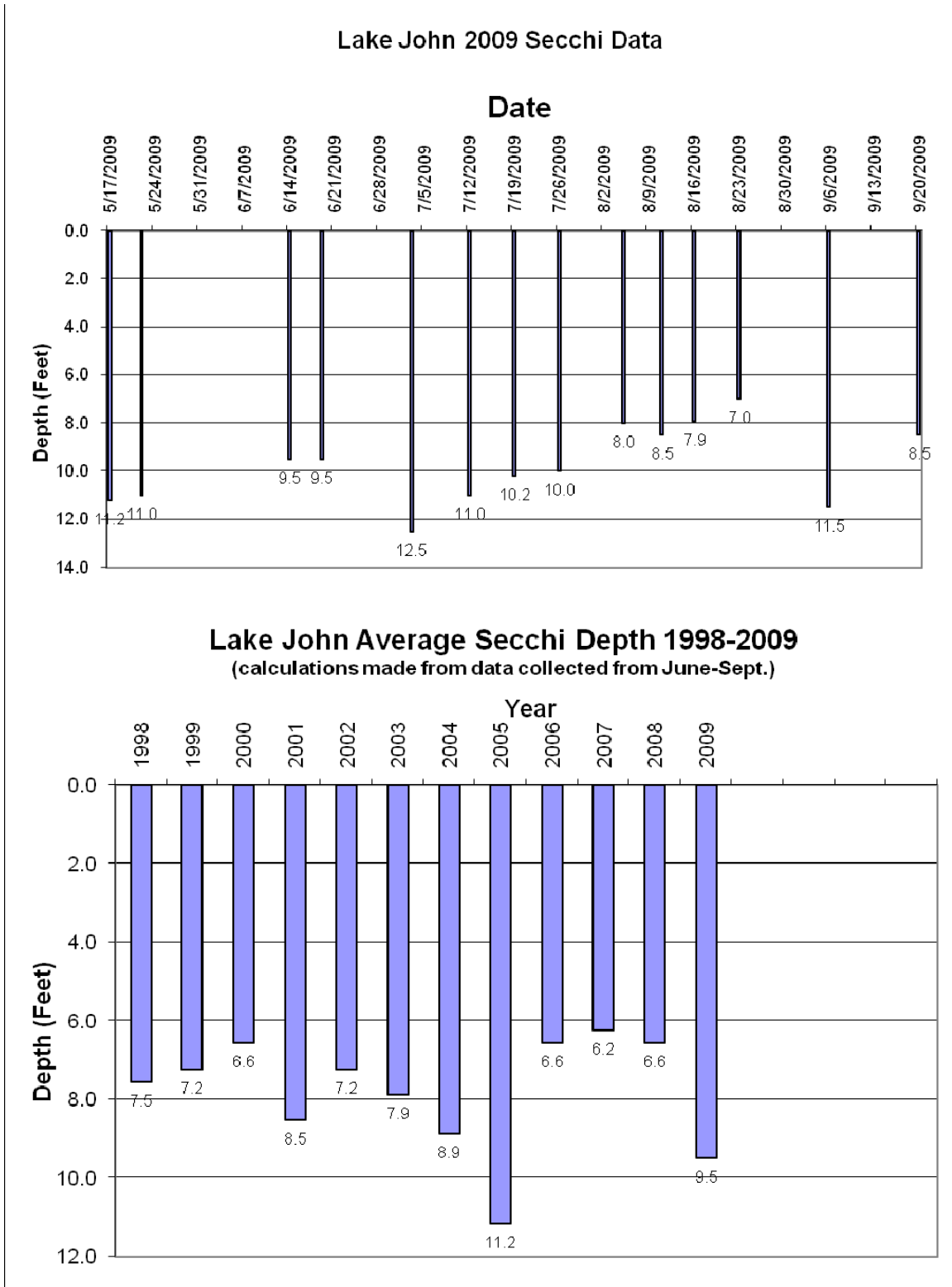
1. All John Lake property owners
2. MN DNR Area Fisheries Office-Montrose
3. MN DNR Regional Fisheries-APM Office in Little Falls

Literature Cited:

Madsen, J. D. 1999. Point intercept and line intercept methods for aquatic plant management.. *APCRP Technical Notes Collection* (TN APCR-M1-02). U.S. Army Engineer Research and Development Center, Vicksburg, MS.
www.us.army.mil/el/aqua

MPCA, 2009. Minnesota Pollution Control Agency Website. Citizen Lake Monitoring Program and Lake Water Quality Assessment Program.
<http://www.pca.state.mn.us/water/clmp/clmpSearchResult.cfm?lakeid=86-0288>
<http://www.pca.state.mn.us/water/clmp/lowrReadFull.cfm?lakeid=86-0288>

Appendix 1. Average secchi depth for Lake John 2009 and from 1998 to 2009. Source MPCA website 2009.



Appendix 2. (pages 10 and 11). Documented history of aquatic vegetation species composition in Lake John, Wright County. Data collected by the Minnesota Department of Natural Resources, Section of Fisheries.

Common Name	Scientific Name ¹	August 15 2006	July 28 2006	1991	1980	1961
Swamp milkweed	<i>Asclepias incarnata</i>	X				
Sedge group	<i>Carex sp.</i>					X
Coontail	<i>Ceratophyllum demersum</i>	X	X	X	X	X
Muskgrass group	<i>Chara sp.</i>	X	X	X	X	X
Chufa nut grass	<i>Cyperus esculentus</i>	X		X		
Needlerush	<i>Eleocharis acicularis</i>			X		
Spikerush group	<i>Eleocharis sp.</i>	X		X		
Canada waterweed	<i>Elodea canadensis</i>	X	X	X		
Horsetail group	<i>Equisetum sp.</i>	X				
Mud plantain group	<i>Heteranthera sp.</i>	X				
Jewelweed	<i>Impatiens capensis</i>	X		X		
Blue flag	<i>Iris versicolor</i>	X		X		X
Lesser duckweed	<i>Lemna minor</i>	X		X		
Star duckweed	<i>Lemna trisulca</i>	X				
Northern watermilfoil	<i>Myriophyllum sibiricum</i>	X	X	X	X	X
Bushy pondweed	<i>Najas flexilis</i>	X	X	X		X
Stonewort group	<i>Nitella sp.</i>		X			
Yellow water lily	<i>Nuphar luteum variegatum</i>	X	X	X	X	X
White water lily	<i>Nymphaea odorata</i>	X	X	X	X	X
Largeleaf pondweed	<i>Potamogeton amplifolius</i>	X	X	X		X
Curlyleaf pondweed (I)	<i>Potamogeton crispus</i>	X	X	X	X	
Fries' pondweed	<i>Potamogeton friesii</i>					X
Variable pondweed	<i>Potamogeton gramineus</i>			X		
Illinois pondweed	<i>Potamogeton illinoensis</i>	X	X			
Floating-leaf pondweed	<i>Potamogeton natans</i>	X	X	X		
Sago pondweed	<i>Potamogeton pectinatus</i>	X	X	X		X
White-stem pondweed	<i>Potamogeton praelongus</i>		X			
Small pondweed	<i>Potamogeton pusillus</i>		X			

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Common Name	Scientific Name ¹	August 15 2006	July 28 2006	1991	1980	1961
Claspingleaf pondweed	<i>Potamogeton richardsonii</i>	X		X		X
Narrowleaf pondweed group	<i>Potamogeton sp.</i>	X			X	
Sheathed pondweed	<i>Potamogeton vaginatus</i>					X
Flatstem pondweed	<i>Potamogeton zosterformis</i>	X	X	X	X	X
White water buttercup group	<i>Ranunculus sp.</i>		X			
Arrowhead group	<i>Sagittaria sp.</i>	X		X	X	
Stiff wapato	<i>Sagittaria rigida</i>			X		
Bulrush group	<i>Scirpus sp.</i>	X		X	X	X
Wool grass	<i>Scirpus cyperinus</i>	X				
Softstem bulrush	<i>Scirpus validus</i>			X		
Skullcap	<i>Scutellaria lateriflora</i>	X				
Floating burreed	<i>Sparganium fluctuans</i>					X
Greater duckweed	<i>Spirodela polyrhiza</i>					X
Cattail group	<i>Typha sp.</i>	X			X	
Common cattail	<i>Typha latifolia</i>				X	
Bladderwort group	<i>Utricularia sp.</i>	X				
Greater bladderwort	<i>Utricularia vulgaris</i>			X		
Greater bladderwort	<i>Utricularia vulgaris</i>		X			X
Wild celery	<i>Valisneria americana</i>	X	X	X		
Wild rice	<i>Zizania palustris</i>	X		X		X
Water stargrass	<i>Zosterella dubia</i>		X			

¹ Crow, G.E. and C.B. Hellquist. 2000. Aquatic and wetland plants of Northeastern North America. Vol. 1-2. The University of Wisconsin Press, Madison.

I = invasive species

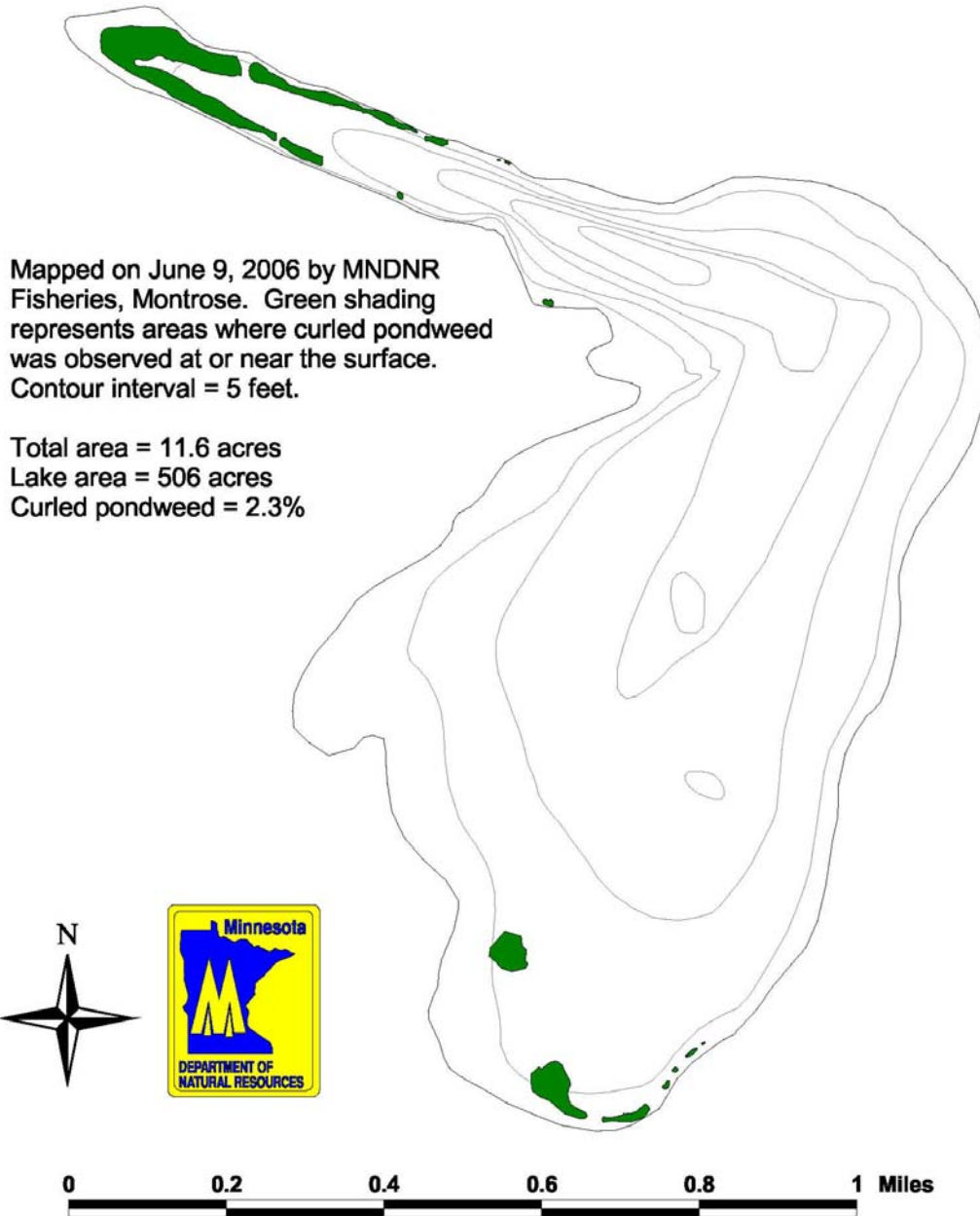
**Appendix 3. Aquatic plants of Lake John, Wright County (86-0288-00).
 Point intercept survey, July 28, 2006. MN DNR, Fisheries Research.**

Frequency calculated for zone from shore to 15 feet depth
 Frequency = percent of sites in which species occurred
 152 sample sites from shore to 15 feet depth

Life Forms	Common Name	Scientific Name	Voucher	% 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 rooted or anchored to the lake bottom.	Coontail	<i>Ceratophyllum demersum</i>		63.8
	Flatstem pondweed	<i>Potamogeton zosteriformis</i>		48.0
	Milfoil group native	<i>Myriophyllum spp.</i>		26.3
	Greater bladderwort	<i>Utricularia vulgaris</i>		23.0
	Muskgrass	<i>Chara sp.</i>		18.4
	Wild celery	<i>Vallisneria americana</i>		15.8
	Illinois pondweed	<i>Potamogeton illinoensis</i>		9.2
	Bushy pondweed	<i>Najas flexilis</i>		9.2
	Canada Waterweed	<i>Elodea canadensis</i>		8.6
	White water buttercup	<i>Ranunculus longirostris</i>		7.2
	White-stem pondweed	<i>Potamogeton praelongus</i>		7.2
	Sago pondweed	<i>Stuckenia pectinata</i>		5.3
	Curly-leaf pondweed	<i>Potamogeton crispus</i>		3.9
	Largeleaf pondweed	<i>Potamogeton amplifolius</i>		3.3
	Small pondweed	<i>Potamogeton pusillus</i>		2.6
	Stonewort group	<i>Nitella sp.</i>		2.0
	Water stargrass	<i>Zosterella dubia</i>		2.0
FREE-FLOATING These plants float on the water and drift with water currents.	Not sampled in this survey			
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 group	<i>Nuphar sp.</i>		15.1
EMERGENT These plants extend well above the water surface and are usually found in shallow water, near shore.	Not sampled in this survey			

Appendix 4.

John Lake (86-288) 2006 Curled Pondweed Distribution

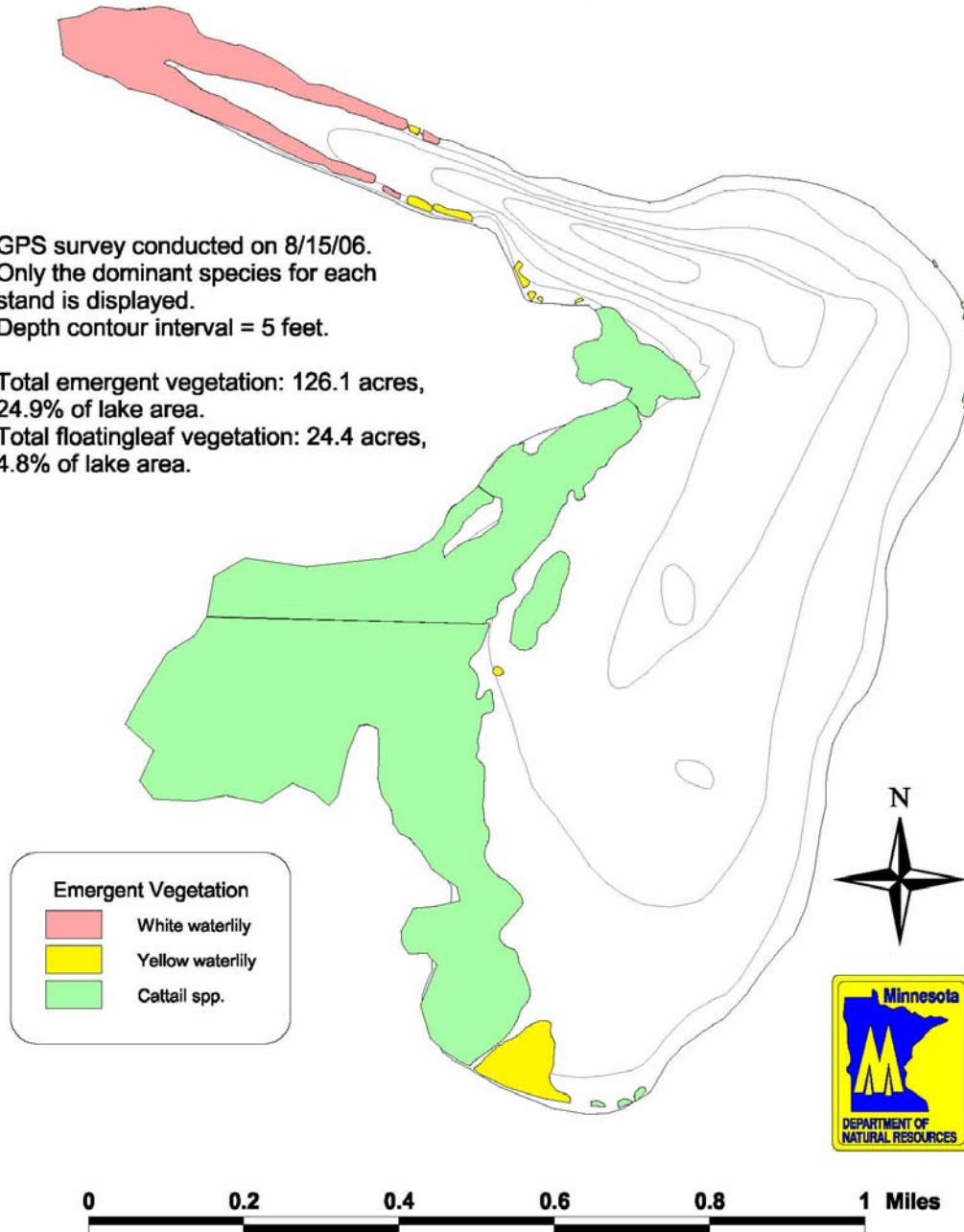


Appendix 5.

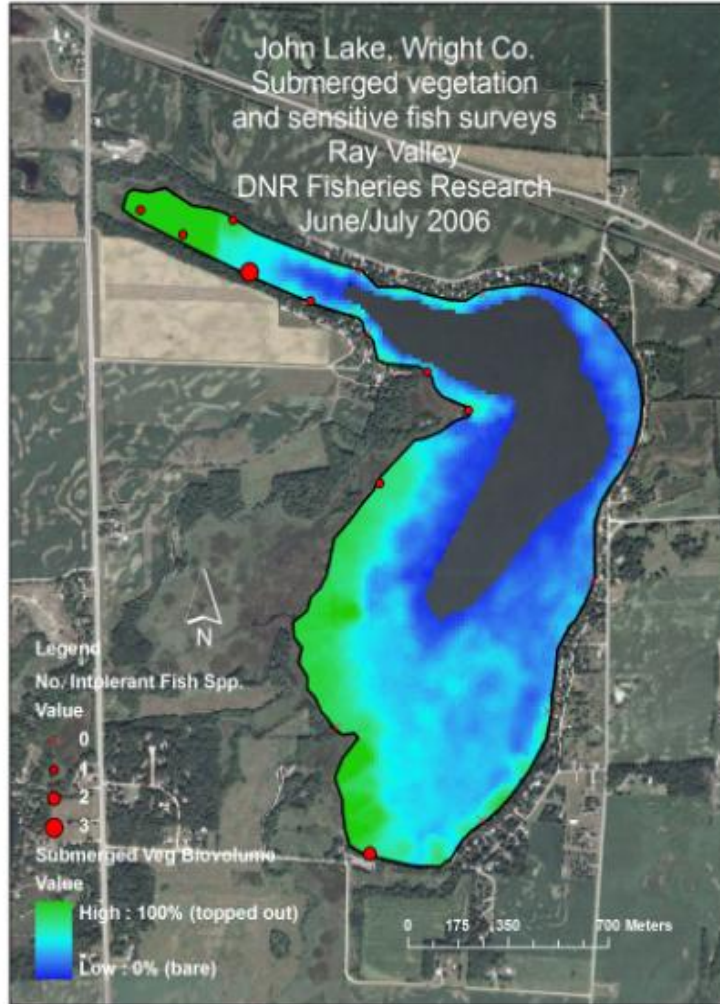
John Lake (86-288) 2006 Emergent and Floatingleaf Vegetation

GPS survey conducted on 8/15/06.
Only the dominant species for each
stand is displayed.
Depth contour interval = 5 feet.

Total emergent vegetation: 126.1 acres,
24.9% of lake area.
Total floatingleaf vegetation: 24.4 acres,
4.8% of lake area.



Appendix 6. Sensitive areas along the West shoreline and Northwest finger bay as indicated by the presence of a high percentage of plant cover and intolerant fish species.



Appendix 7. Point intercept plant survey coordinates (UTM, NAD 83, Zone 15) and map. For an electronic copy of coordinates please contact the MN DNR APM office in Little Falls.

Site Number	XCOORD	YCOORD
1	407611	5013555
2	407699	5013531
3	407787	5013508
4	407853	5013399
5	407876	5013484
6	407942	5013376
7	407964	5013460
8	408030	5013352
9	408053	5013437
10	408118	5013328
11	408207	5013304
12	408295	5013281
13	408384	5013257
14	408177	5012132
15	408200	5012217
16	408449	5013149
17	408472	5013233
18	408220	5011939
19	408243	5012024
20	408265	5012109
21	408288	5012193
22	408311	5012278
23	408333	5012363
24	408356	5012447
25	408379	5012532
26	408515	5013040
27	408538	5013125
28	408560	5013210
29	408286	5011831
30	408308	5011916
31	408331	5012000
32	408354	5012085
33	408376	5012170
34	408399	5012254
35	408422	5012339
36	408445	5012424
37	408467	5012508
38	408490	5012593
39	408513	5012678

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40	408603	5013017
41	408626	5013101
42	408649	5013186
43	408306	5011553
44	408329	5011638
45	408351	5011722
46	408374	5011807
47	408397	5011892
48	408419	5011977
49	408442	5012061
50	408465	5012146
51	408488	5012231
52	408510	5012315
53	408533	5012400
54	408556	5012485
55	408578	5012569
56	408601	5012654
57	408624	5012739
58	408669	5012908
59	408692	5012993
60	408715	5013078
61	408737	5013162
62	408372	5011445
63	408394	5011529
64	408417	5011614
65	408440	5011699
66	408462	5011783
67	408485	5011868
68	408508	5011953
69	408531	5012038
70	408553	5012122
71	408576	5012207
72	408599	5012292
73	408621	5012376
74	408644	5012461
75	408667	5012546
76	408689	5012630
77	408712	5012715
78	408735	5012800
79	408758	5012885
80	408780	5012969
81	408803	5013054
82	408826	5013139

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83	408848	5013223
84	408460	5011421
85	408483	5011506
86	408505	5011590
87	408528	5011675
88	408551	5011760
89	408574	5011844
90	408596	5011929
91	408619	5012014
92	408642	5012099
93	408664	5012183
94	408687	5012268
95	408710	5012353
96	408732	5012437
97	408755	5012522
98	408778	5012607
99	408801	5012691
100	408823	5012776
101	408846	5012861
102	408869	5012946
103	408891	5013030
104	408914	5013115
105	408937	5013200
106	408959	5013284
107	408549	5011397
108	408571	5011482
109	408594	5011567
110	408617	5011651
111	408639	5011736
112	408662	5011821
113	408685	5011905
114	408707	5011990
115	408730	5012075
116	408753	5012160
117	408775	5012244
118	408798	5012329
119	408821	5012414
120	408844	5012498
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122	408889	5012668
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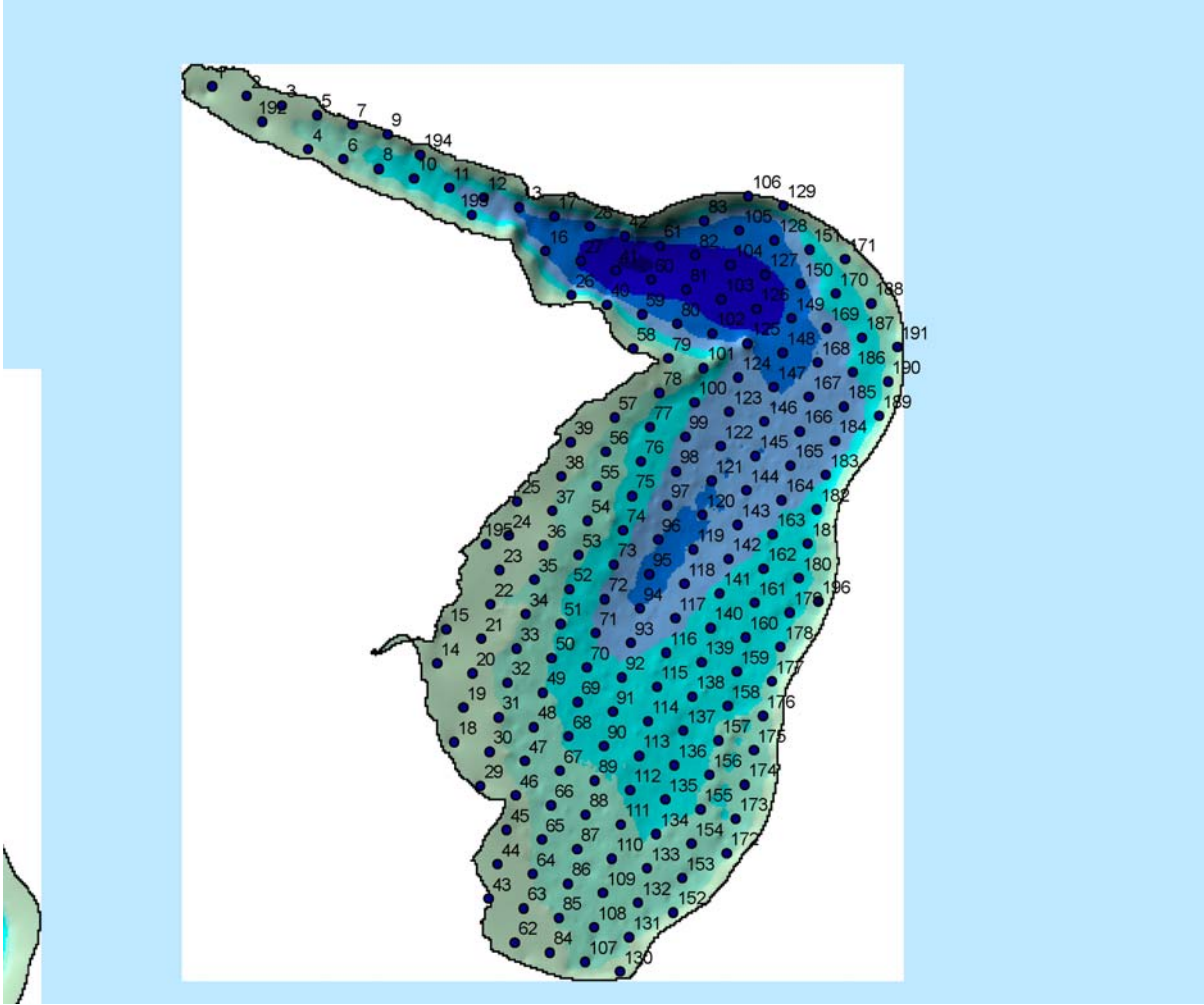
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126	408980	5013007
127	409002	5013091
128	409025	5013176
129	409048	5013261
130	408637	5011374
131	408660	5011458
132	408682	5011543
133	408705	5011628
134	408728	5011712
135	408750	5011797
136	408773	5011882
137	408796	5011967
138	408818	5012051
139	408841	5012136
140	408864	5012221
141	408887	5012305
142	408909	5012390
143	408932	5012475
144	408955	5012559
145	408977	5012644
146	409000	5012729
147	409023	5012814
148	409045	5012898
149	409068	5012983
150	409091	5013068
151	409114	5013152
152	408771	5011519
153	408793	5011604
154	408816	5011689
155	408839	5011773
156	408861	5011858
157	408884	5011943
158	408907	5012028
159	408930	5012112
160	408952	5012197
161	408975	5012282
162	408998	5012366
163	409020	5012451
164	409043	5012536
165	409066	5012620
166	409088	5012705
167	409111	5012790
168	409134	5012875

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169	409157	5012959
170	409179	5013044
171	409202	5013129
172	408905	5011665
173	408927	5011750
174	408950	5011834
175	408973	5011919
176	408995	5012004
177	409018	5012089
178	409041	5012173
179	409063	5012258
180	409086	5012343
181	409109	5012427
182	409131	5012512
183	409154	5012597
184	409177	5012681
185	409200	5012766
186	409222	5012851
187	409245	5012936
188	409268	5013020
189	409288	5012742
190	409311	5012827
191	409333	5012912
192	407738	5013467
193	408263	5013238
194	408133	5013386
195	408299	5012426
196	409135	5012285

Appendix 7 (con't). Point intercept plant survey map with labeled survey points.



Appendix 8. Point intercept plant survey methods and considerations.

Plant surveys:

1. Frequency and timing of surveys: One point intercept survey following methods described by Madson (1999) shall be done in late July of 2014.
2. Point-intercept sampling method
This method requires that a regular grid of sample points be created over an orthorectified map or aerial photo of the lake. The MN DNR has created a sampling grid for John Lake for the survey and will provide it as an electronic file to the surveyor (the coordinates are also listed in Appendix 7). These established sample points are to be used for each survey conducted. Once the surveyor loads the established points into a GPS unit, they will use this to navigate their boat to each point on the lake. All sampling should be done when wind velocity is at or less than 10 mph in the area being sampled. Secchi disk transparency should be collected in the deepest part of the lake each day survey work is done.

At each of the points, the surveyors should measure the water depth (using an electronic depth finder for depths greater than 8 feet, or a depth stick for depths less than 8 feet) and throw the rake (made of two weighted metal garden rake heads tied together on the end of a rope that is at least 25' in length) about 10 feet from the boat. One side of the boat should be designated as the sample area. The rake is then allowed to sink to the bottom and allowed to cover a 1 square meter sample area before it is retrieved. If possible, the 1 meter square sample site also should be visually observed for plants not present on the rake. All plant species on the rake or visually observed should be recorded. All plants should be identified to species if possible, and to genus if not. At each sample point record: the sample point number, the sample point depth, the plant species observed, and if plants are matted or not matted at the water surface.

Surveyors do not have to sample in depths that are more than one inter-point distance deeper than the deepest recorded vegetation, but they must do at least one interval deeper than where vegetation was found.

One voucher specimen of each species found should be collected. Press and mount specimens and label pressed samples with a standard herbarium label. Instruction on how to press an aquatic plant or assistance with plant identification is available from the Minnesota Department of Natural Resources contact.

Report the frequency of occurrence of each species found in the survey and the combined frequency of: native submersed aquatic plants, all submersed aquatic plants, and all species found. Frequency of occurrence can be calculated for each species (or combined taxa) as the number of sites in which a species occurred divided by the total number of sample sites where plants occurred. Frequency can be calculated for the entire area from the shore to 15 feet or to 20 feet (if plants are occurring in the 16-20 foot zone) and sampling points can also be grouped by water depth and separated into five depth zones for analysis: 0 to 5 feet, 6 to 10 feet, 11 to 15 feet, and 16 to 20 feet. For example: In John Lake there were 152 sample sites in

the zone from shore to 15 feet depth. If coontail occurred in 97 of those sites. Frequency of coontail in the shore to 15 foot zone of John Lake = $97/152(*100)=63.8\%$. Do not include sample points that were deeper than the maximum depth where plants were found. Report the average number of submersed native species at each sample point, and the average number of all submersed species at each sample point. A standard error should be reported with these averages. Also, report the observed maximum depth of vegetation growth.

Electronic Data

Provide electronic copies of all original raw data including those at which no plants were found. This can be in a database or spreadsheet format. Raw data must include, in addition to the observed result: the date of observation, name of observer, designated sample point number, GPS coordinates of observation, depth of location, and any other comments. All data must include units of measure. For example, is depth measured in feet or in meters?

When choosing someone to do these types of surveys, consider these key skills needed by anyone who does this work.

1. Ability to identify common and rare aquatic plants to species.
2. Knowledge of design of sampling schemes and statistical analysis.
3. Ability to enter or load the sampling coordinates into a GPS unit for later sampling.
4. Ability to use a boat and GPS to navigate to sampling locations.
5. Ability to record data accurately, both on the lake, and in the lab.
6. Ability to report results in a clear and accurate manner. Including summaries of data and raw data.

Key equipment needed by anyone who does this work

1. Boat.
2. Aquatic plant grapple (two weighted rake heads tied together on the end of a rope).
3. Depth finder.
4. GPS unit that has options for the same coordinate and datum system that the DNR utilizes (UTM, NAD 83, Zone 15).
5. Secchi disk.
6. Field data sheets.
7. Computer, word processing and spreadsheet software to summarize and tabulate data with the ability to e-mail to the appropriate DNR contact.
8. Plant press (if necessary).
9. Depth pole e.g. stadia rod.