

Eurasian Watermilfoil in Crooked Lake (WBIC# 02-0084)

Anoka County, MN

Spring Delineation Survey – May 30, 2013



Survey, Analysis, and Reporting by:

James A. Johnson – *Aquatic Ecologist, Freshwater Scientific Services, LLC*



Certified Lake Manager
www.NALMS.org

Funding Provided by:

Crooked Lake Area Association – Coon Rapids, MN

Prepared for the Crooked Lake Area Association – June 2013

Summary

Purpose of Survey

This survey was conducted to locate and delineate areas of Eurasian watermilfoil (*Myriophyllum spicatum*, henceforth referred to as EWM) in Crooked Lake (#02-0084) in the spring of 2013. The results of this survey will help to guide vegetation management planning (herbicide treatment areas) and will allow for more meaningful evaluation of the success of treatments by allowing comparisons of the current extent of spring EWM growth with that found in past and future surveys.

Summary of Findings

- 1) EWM was widespread in Crooked Lake, occurring in most areas shallower than 10 feet (~65 acres). Roughly half of this area (33 acres) was found to support moderate to dense growth of EWM (rake rating of 2 or greater) during the May 2013 delineation survey.
- 2) EWM plants found in the lake were generally small in nearshore areas (6 to 18 inches tall). However, in deeper areas, EWM was generally much taller (4-7 feet) and often grew to within 2 feet of the water surface. The densest EWM growth was typically found between the 4-ft and 8-ft contour.
- 3) Many of the littoral areas that did not support moderate to dense EWM were found to have dense growth of coontail (*Ceratophyllum demersum*) during the survey or supported dense muskgrass (*Chara* sp.) in recent years (*Chara* beds not yet established in 2013).

Survey & Analysis Methods

Spring Delineation Survey

Freshwater Scientific Services, LLC completed a lake-wide survey for EWM in Crooked Lake on May 30, 2013. During this survey, we navigated a meandering transect over the entire littoral region of the lake (≤ 15 ft deep). While navigating this transect path, we used a combination of surface observations (using polarized glasses), rake tosses, sonar readings, and an underwater video camera to locate and delineate areas of EWM growth. Sonar and visual assessments were conducted continuously, with subsequent rake tosses to assess EWM abundance at ~200 locations spread throughout the littoral region of the lake. At each of these locations, we conducted rake tosses to assess EWM abundance. We used a hand-held Garmin GPS unit (GPS-MAP78) to record each of the sampled locations, and documented water depth, EWM plant height, and EWM abundance (rake density rating; 1 to 4 scale as described below).

Rake Density Rating

1 = 1-25% rake head coverage

2 = 25-50%

3 = 50-75%

4 = 75-100%



We loaded the recorded sample locations, water depths, EWM plant heights, and rake densities into desktop GIS software and projected results over aerial imagery of Crooked Lake. We then delineated beds of EWM growth throughout the lake, producing delineations of (1) all EWM growth, and (2) areas that supported more abundant EWM (density rating ≥ 2). We then calculated the area, mean water depth, and mean EWM density within each of the delineated beds (using point data).



EWM Spring Delineation Survey May 30, 2013

Crooked Lake
Anoka County, MN
#02-0084

Surveyed Locations

-  Surveyed Path
-  Surveyed Points (rake tosses)

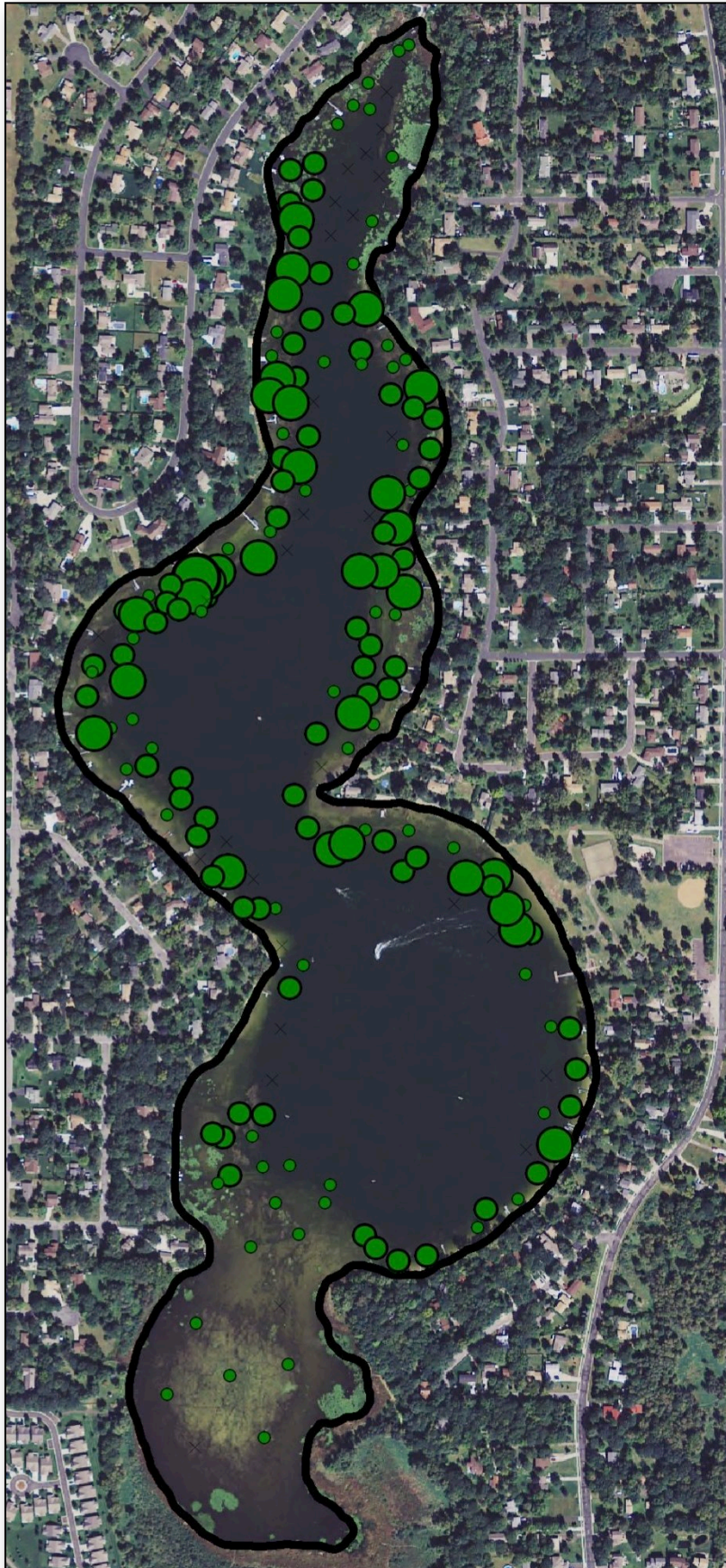
See Table 1 for detailed point descriptions (by number)



Surveyed: May 30, 2013
Surveyor: J.A. Johnson
Affiliation: Freshwater Sci. Serv.
Methods: Visual, Rake, Sonar, Camera
Analyses by: J.A. Johnson

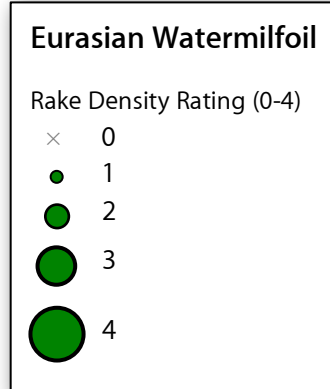
Map produced for the
Crooked Lake Area Association by:





EWM Spring Delineation Survey May 30, 2013

Crooked Lake
Anoka County, MN
#02-0084



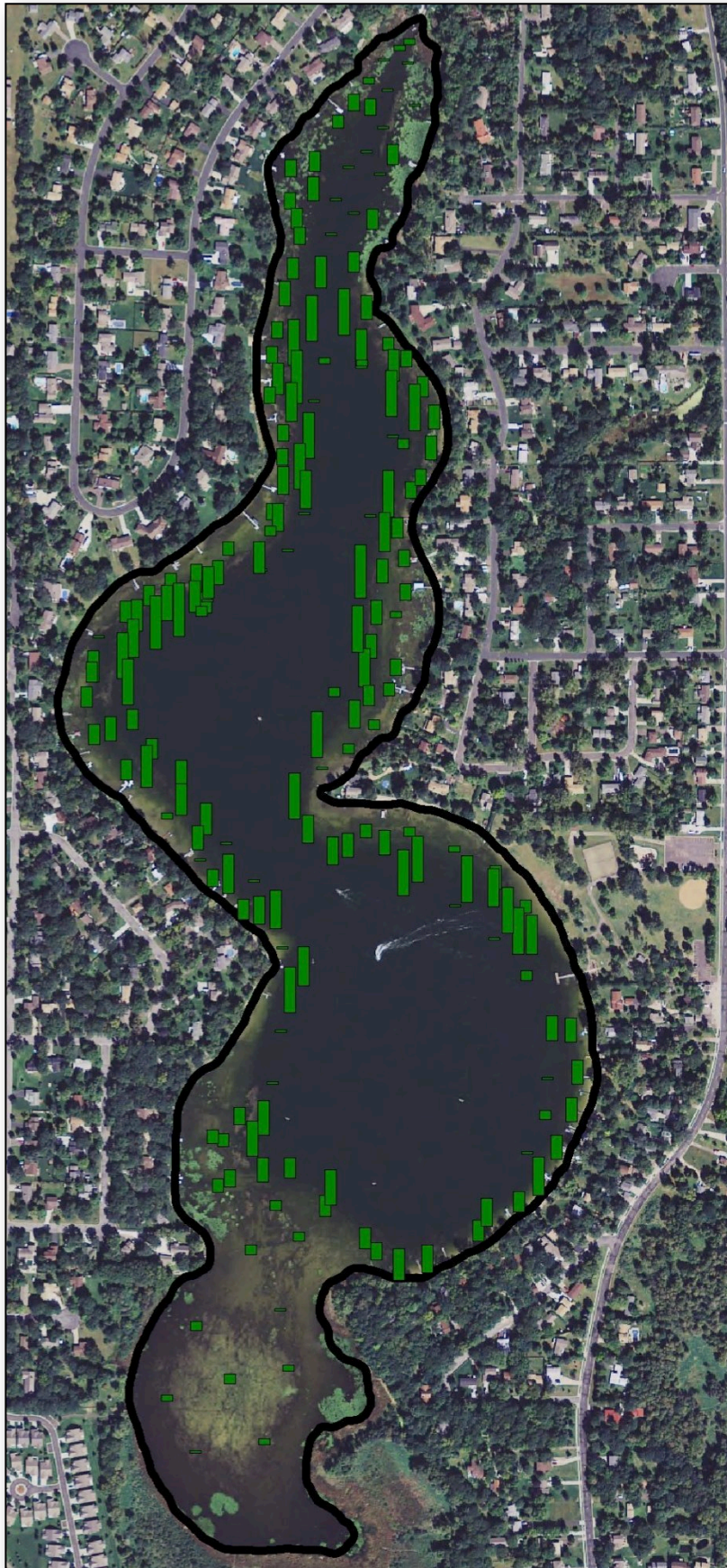
0 500 ft



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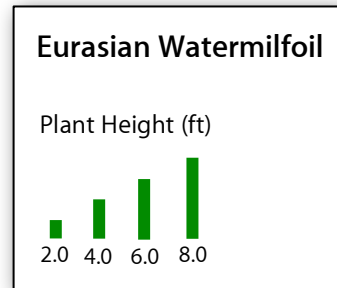
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Scientific Services, LLC



EWM Spring Delineation Survey May 30, 2013

Crooked Lake
Anoka County, MN
#02-0084



0 500 ft



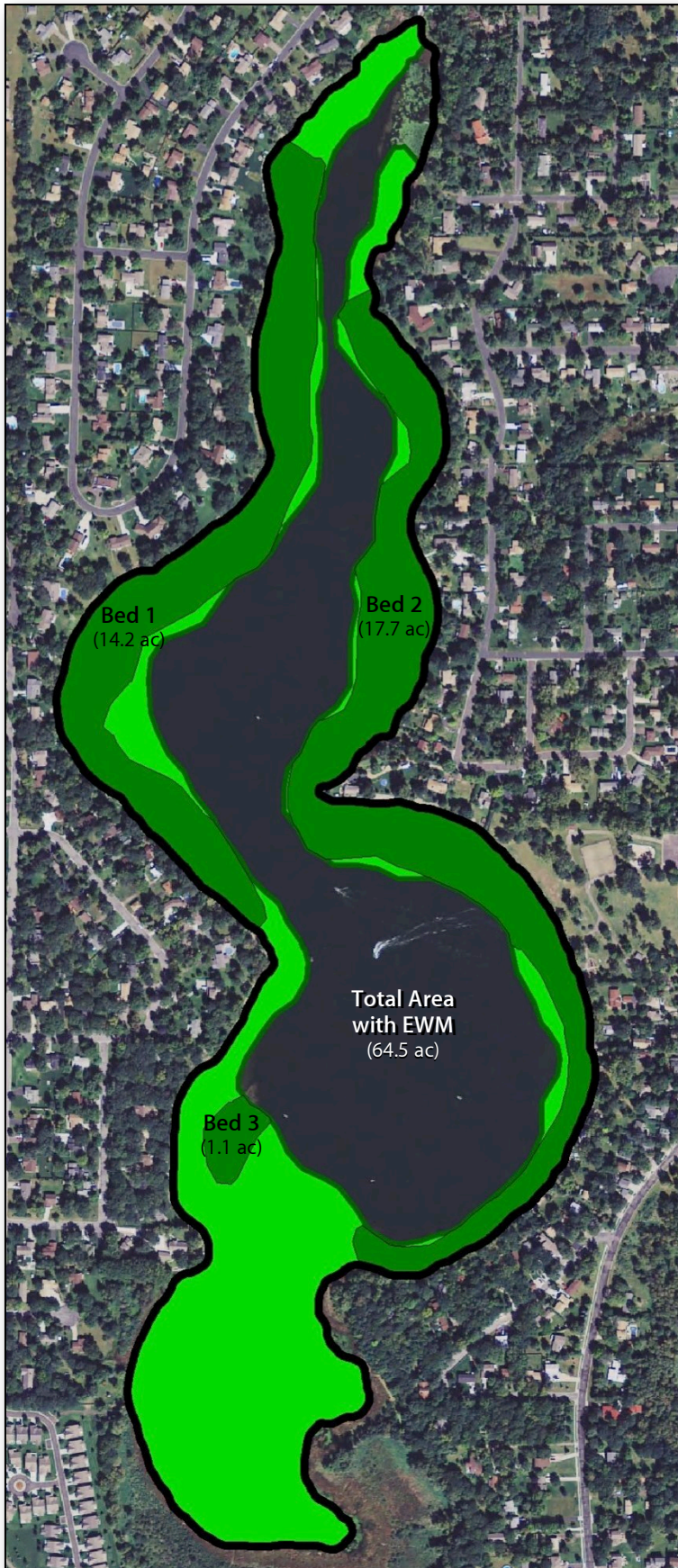
Surveyed: May 30, 2013
Surveyor: J.A. Johnson
Affiliation: Freshwater Sci. Serv.
Methods: Visual, Rake, Sonar, Camera
Analyses by: J.A. Johnson

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EWM Spring Delineation Survey May 30, 2013

Crooked Lake
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EWM Bed Delineation

-  Low Density EWM
(rake density = 1)
-  Moderate to Dense EWM
(density rating ≥ 2)

See Table 2 for detailed descriptions of each designated bed



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Map produced for the
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Table 1. GPS coordinates and measurements for surveyed points (Crooked Lake; May 30, 2013)

Point ID	Lat	Long	Water Depth (ft)	EWM Plant Height (ft)	EWM Density (rake, 0-4)
1	45.218520	-93.341874	2.7	0.5	1
2	45.218457	-93.342012	3.0	0.5	1
3	45.218337	-93.342230	2.2	0.0	0
4	45.218131	-93.342449	1.9	0.5	1
5	45.218036	-93.342183	4.4	0.0	0
6	45.217660	-93.342240	4.8	0.0	0
7	45.217420	-93.342474	4.2	0.0	0
8	45.217259	-93.342733	4.8	0.0	0
9	45.216933	-93.342909	6.4	0.0	0
10	45.216592	-93.342974	6.4	0.0	0
11	45.216208	-93.343119	7.0	4.0	2
12	45.215743	-93.343236	10.8	6.0	2
13	45.215321	-93.343054	14.5	0.5	1
14	45.215442	-93.342537	9.5	5.0	2
15	45.215491	-93.342149	3.3	1.5	1
16	45.215855	-93.342467	4.3	3.0	3
17	45.215810	-93.342781	10.0	6.0	2
18	45.216311	-93.342649	3.8	2.5	1
19	45.216738	-93.342381	3.2	2.5	1
20	45.217190	-93.342280	3.4	0.0	0
21	45.217390	-93.342099	2.5	2.5	1
22	45.217885	-93.341792	2.1	0.0	0
23	45.218304	-93.341893	3.2	0.0	0
24	45.217909	-93.342654	2.4	2.0	1
25	45.217718	-93.342877	2.6	1.5	1
26	45.217317	-93.343210	3.0	2.5	2
27	45.217248	-93.343549	2.5	2.0	2
28	45.216920	-93.343556	2.5	2.0	2
29	45.216745	-93.343457	2.7	2.5	3
30	45.217045	-93.343229	3.5	3.0	2
31	45.216573	-93.343420	3.2	2.0	2
32	45.216244	-93.343505	3.2	2.5	3
33	45.215992	-93.343626	3.3	3.0	3
34	45.215625	-93.343732	3.2	2.0	1
35	45.215380	-93.343802	3.7	2.0	1
36	45.215504	-93.343499	8.0	6.0	2
37	45.215154	-93.343449	10.0	7.0	2
38	45.215140	-93.343715	5.0	4.0	3
39	45.214973	-93.343829	3.0	2.0	3
40	45.214905	-93.343524	7.0	5.0	3
41	45.214920	-93.343202	13.1	0.0	0
42	45.214573	-93.343278	11.5	6.0	2
43	45.214598	-93.343644	2.3	2.0	1
44	45.214354	-93.343648	2.6	2.0	2
45	45.214263	-93.343403	9.5	6.0	3
46	45.214028	-93.343319	10.5	5.0	1
47	45.214115	-93.343635	4.5	3.5	2
48	45.213807	-93.343797	2.5	2.0	1
49	45.213746	-93.343707	4.1	3.5	2
50	45.213785	-93.343336	11.0	0.0	0

Eurasian Watermilfoil in Crooked Lake, Anoka Co. (MN) – May 2013

Point ID	Lat	Long	Water Depth (ft)	EWM Plant Height (ft)	EWM Density (rake, 0-4)
51	45.213419	-93.343571	11.1	0.0	0
52	45.213612	-93.343819	4.1	1.0	1
53	45.213220	-93.343934	10.1	0.0	0
54	45.213344	-93.343973	5.0	4.0	3
55	45.213437	-93.344404	2.5	1.5	1
56	45.213195	-93.344560	4.5	3.0	3
57	45.212946	-93.344721	10.5	4.0	2
58	45.213096	-93.344691	4.5	4.0	3
59	45.213139	-93.344861	3.5	3.5	4
60	45.212951	-93.344882	9.0	4.0	3
61	45.213065	-93.345225	3.5	3.0	2
62	45.212963	-93.345538	2.8	2.5	1
63	45.212799	-93.345860	2.9	2.5	2
64	45.212549	-93.346245	2.5	0.0	0
65	45.212764	-93.345706	4.5	4.0	3
66	45.212888	-93.345273	6.2	4.5	2
67	45.212821	-93.345111	9.5	7.0	2
68	45.212691	-93.345434	9.8	7.0	2
69	45.212533	-93.345754	9.6	5.0	1
70	45.212359	-93.345908	9.5	6.0	2
71	45.212804	-93.344790	14.5	1.0	1
72	45.212908	-93.344700	12.8	0.0	0
73	45.212097	-93.345829	9.8	6.0	3
74	45.211720	-93.345756	11.8	2.5	1
75	45.211429	-93.345478	10.0	2.5	1
76	45.211117	-93.345064	10.0	5.0	2
77	45.210723	-93.344715	10.3	4.0	2
78	45.210483	-93.344418	11.3	0.0	0
79	45.210111	-93.344026	11.6	0.0	0
80	45.209821	-93.343715	10.5	5.0	1
81	45.209812	-93.343950	5.2	3.5	2
82	45.210179	-93.344388	6.4	5.0	3
83	45.210539	-93.344831	3.9	3.0	2
84	45.210920	-93.345066	5.5	4.0	2
85	45.211249	-93.345558	7.6	5.5	2
86	45.211625	-93.346074	7.2	3.0	1
87	45.212250	-93.346322	5.4	4.0	2
88	45.212191	-93.346336	3.3	2.5	1
89	45.211946	-93.346412	2.7	2.5	2
90	45.211565	-93.346299	2.6	2.5	3
91	45.211215	-93.345848	3.2	2.5	1
92	45.210757	-93.345263	2.2	0.5	1
93	45.210312	-93.344790	2.3	0.0	0
94	45.210136	-93.344616	2.6	2.0	2
95	45.209823	-93.344170	2.9	2.5	2
96	45.209441	-93.343620	2.8	0.0	0
97	45.209254	-93.343315	10.6	5.0	1
98	45.209016	-93.343508	10.5	6.0	2
99	45.208604	-93.343638	12.3	0.0	0
100	45.208084	-93.343750	10.5	0.0	0
101	45.207735	-93.343873	6.5	4.5	2
102	45.207529	-93.344036	5.1	4.5	1
103	45.207215	-93.343883	4.5	3.0	1
104	45.206858	-93.343703	3.1	1.0	1

Eurasian Watermilfoil in Crooked Lake, Anoka Co. (MN) – May 2013

Point ID	Lat	Long	Water Depth (ft)	EWM Plant Height (ft)	EWM Density (rake, 0-4)
105	45.206546	-93.343363	2.2	1.0	1
106	45.206857	-93.342999	4.2	2.5	1
107	45.207040	-93.342920	8.2	4.5	1
108	45.207235	-93.343503	8.5	2.5	1
109	45.207751	-93.344217	3.5	2.0	2
110	45.207511	-93.344444	2.6	1.5	2
111	45.207127	-93.344353	3.1	2.0	2
112	45.207054	-93.344522	2.7	1.5	1
113	45.207544	-93.344594	2.4	1.5	2
114	45.205815	-93.343629	2.3	0.0	0
115	45.205232	-93.343513	2.5	0.5	1
116	45.204494	-93.343849	2.4	0.5	1
117	45.204389	-93.344820	2.5	0.0	0
118	45.204925	-93.345231	2.5	0.5	1
119	45.205647	-93.344817	2.2	1.0	1
120	45.205116	-93.344338	2.6	1.0	1
121	45.206414	-93.344043	2.5	1.0	1
122	45.206534	-93.342435	3.2	2.5	2
123	45.206403	-93.342272	2.9	2.0	2
124	45.206273	-93.341954	4.3	4.0	2
125	45.206330	-93.341543	4.2	3.5	2
126	45.206615	-93.340822	3.2	2.5	1
127	45.206908	-93.340250	3.3	2.5	1
128	45.207164	-93.339974	6.5	5.0	2
129	45.207451	-93.339724	3.5	3.0	3
130	45.207830	-93.339513	3.6	3.0	2
131	45.208208	-93.339423	3.3	3.0	2
132	45.208627	-93.339530	4.5	3.0	2
133	45.208645	-93.339793	8.2	3.0	1
134	45.208141	-93.339852	8.7	0.0	0
135	45.207775	-93.339884	10.3	1.0	1
136	45.207394	-93.340135	12.5	0.0	0
137	45.206796	-93.340710	8.0	3.5	2
138	45.209169	-93.340157	11.3	1.0	1
139	45.209541	-93.340617	12.8	0.0	0
140	45.209869	-93.341169	12.4	0.0	0
141	45.210198	-93.341908	9.6	6.0	2
142	45.210415	-93.342916	5.0	3.5	3
143	45.210613	-93.342439	2.5	1.5	1
144	45.210607	-93.341826	2.5	1.0	1
145	45.210436	-93.341187	2.7	0.5	1
146	45.210151	-93.340603	3.2	3.0	3
147	45.209862	-93.340175	3.6	1.5	1
148	45.209580	-93.340085	7.0	5.0	2
149	45.209618	-93.340282	8.3	6.0	3
150	45.209827	-93.340425	7.5	6.0	3
151	45.210050	-93.340630	5.1	5.0	2
152	45.210135	-93.341008	7.1	6.0	3
153	45.210334	-93.341703	7.0	6.0	2
154	45.210496	-93.342181	3.3	3.0	2
155	45.210470	-93.342695	3.5	3.0	3
156	45.210632	-93.343262	4.7	3.5	2
157	45.210959	-93.343453	7.4	6.0	2

Point ID	Lat	Long	Water Depth (ft)	EWM Plant Height (ft)	EWM Density (rake, 0-4)
158	45.211238	-93.343067	2.7	0.0	0
159	45.211434	-93.342690	2.3	1.0	1
160	45.211679	-93.342333	2.4	1.0	1
161	45.212030	-93.342127	2.2	1.5	2
162	45.212253	-93.342025	2.6	2.0	2
163	45.212782	-93.342036	2.4	0.5	1
164	45.213006	-93.341895	2.2	2.0	3
165	45.213343	-93.341918	2.5	2.0	2
166	45.213648	-93.342015	2.7	2.5	3
167	45.214030	-93.341827	2.8	2.0	1
168	45.214158	-93.341684	2.6	2.0	2
169	45.214452	-93.341538	3.2	3.0	2
170	45.214760	-93.341495	3.0	3.0	2
171	45.215066	-93.341663	2.2	2.5	3
172	45.215348	-93.341895	3.3	2.0	1
173	45.215278	-93.342073	5.2	4.0	1
174	45.214858	-93.341780	7.0	6.0	2
175	45.214490	-93.341939	11.5	1.0	1
176	45.213992	-93.342142	9.6	6.0	3
177	45.213607	-93.342199	5.7	5.0	2
178	45.213215	-93.342230	4.0	3.0	3
179	45.212804	-93.342309	4.1	3.0	1
180	45.212466	-93.342385	3.8	3.0	2
181	45.212250	-93.342480	8.3	5.0	2
182	45.211971	-93.342406	3.5	2.5	2
183	45.211780	-93.342607	3.7	3.5	3
184	45.211576	-93.343143	7.5	6.0	2
185	45.212003	-93.342895	10.3	1.0	1
186	45.212636	-93.342573	9.8	6.0	2
187	45.213215	-93.342529	10.1	7.0	3
188	45.213772	-93.342403	12.7	0.0	0
189	45.214568	-93.342082	13.4	0.0	0
190	45.214994	-93.342109	10.8	6.0	2
191	45.215302	-93.342522	11.2	0.5	1
192	45.216798	-93.342650	6.5	0.0	0
193	45.217866	-93.342424	4.2	2.0	1

Table 2. Details for delineated beds of moderate to dense Eurasian watermilfoil (EWM) and lakewide EWM growth in Crooked Lake (May 30, 2013). See page 7 for map of delineated beds.

Bed ID	Area (acres)	Mean Water Depth (ft)	Mean EWM Height (ft)	Mean EWM Density (rake, 0-4)
1	14.2	5.2	3.3	2.0
2	17.7	4.8	3.3	2.0
3	1.1	3.7	2.5	1.7
All 3 Beds	33.0	4.9	3.3	2.0
Lakewide	64.5	5.7	2.6	1.5

Online Resources & Contacts

Minnesota Administrative Rules for Aquatic Plant Management

<https://www.revisor.mn.gov/rules/?id=6280>

Minnesota DNR – Aquatic Plant Management Regulations & Permit Application Forms

<http://www.dnr.state.mn.us/shorelandmgmt/apg/regulations.html>

Estimated Cost of Herbicides (MDNR)

<http://files.dnr.state.mn.us/assistance/backyard/shorelandmgmt/apg/pests.pdf>

List of Herbicide Retailers and Applicators in MN

http://files.dnr.state.mn.us/assistance/backyard/shorelandmgmt/apg/companies_selling_approved_aquatic_herbicides.pdf

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