Lake Water Quality Program

Environmental Planning Initiatives

Aquatic Vegetation Mapping Report
Minnow Lake & Robinson Lake
2019-2020

Greater | Grand Sudbury
www.city.greatersudbury.on.ca

Overview

The City of Greater Sudbury is home to over 330 freshwater lakes, more than any other municipality in Canada. These lakes provide citizens and tourists with a vast array of recreational opportunities as well as providing a source of clean drinking water to a large portion of the municipality. Over the last few decades our local lakes have come under threat of aquatic invasive species, such as Eurasian Watermilfoil (*Myriophyllum spicatum*). There are currently 18 lakes within City of Sudbury boundaries that are impacted with the growth of Eurasian Watermilfoil, a fast growing and dense aquatic plant that has many negative effects on aquatic wildlife and recreational activities.

The City's Lake Water Quality Program has been involved in various education and awareness campaigns for aquatic invasive species for several years and continues to expand these efforts to ensure that residents are well-informed on this topic. In 2017, the Lake Water Quality Program revisited the original aquatic vegetation mapping program conducted on multiple lakes in the city in 2014 to gain a better understanding of the spread and impact of Eurasian Watermilfoil on local waterways. A new, more rigorous and robust sampling protocol was developed that results in mapping all aquatic plant species within the affected lakes. The protocol consists of systematic, quantitative and replicable sampling that allows the mapping and tracking of growth or declines of all aquatic plant species within the sampled lakes over time.

This sampling has continued in 2019 and 2020 with mapping being done on Minnow Lake in 2019 and Robinson Lake in 2020. The results of the sampling in 2019 on Minnow Lake revealed a total of 9 aquatic plant species within the lake. Muskgrass (*Chara spp.*) was the most frequent species in the lake, followed by Richardson's Pondweed (*Potamogeton richardsonii*). Eurasian Watermilfoil was only present at one of the 166 sampling locations. In 2020, staff conducted the aquatic plant mapping on Robinson Lake, which revealed a total of 12 aquatic plant species within the lake. Muskgrass was the most frequent species in the lake followed by the non-native Eurasian Watermilfoil and Slender Pondweed (*Potamogeton diversifolius*) respectively. This report provides details on the aquatic vegetation sampling efforts undertaken on these two lakes.

Methodology

The Lake Water Quality Program has based its aquatic vegetation sampling efforts on the baseline monitoring protocol developed by the Wisconsin Department of Natural Resources (Hauxwell et al, 2010). This protocol employs a point-intercept sampling design that overlays a number of geo-referenced points in a grid pattern over the lake to ensure that year over year results are comparable. The sampling protocol permits the assessment of all aquatic plant species as well as an estimation of species richness, frequency, abundance and maximum depth of colonization within the lake.

Aquatic Plant Distribution Maps

The protocol outlines the basic information needed to create an evenly distributed grid that is overlaid onto the lakes' littoral areas to ensure consistent mapping throughout the water body. The littoral areas of a lake are those where sunlight is able to penetrate down the sediment and, as a result, where the

most abundant plant growth is found. The sampling protocol defines the littoral area as occurring in 6 meters of water depth at most.

The sampling grid resolution was calculated from the following factors: 1) the lake's area in hectares, 2) the percentage of the lake's littoral area, and 3) the shoreline development factor or 'SDF'. The SDF is the ratio of the length of the shoreline to the circumference of a circle equal in area to that of the lake; it is not a measure of housing development on a given lake (Mikulyuketal et al, 2010). A higher SDF signals greater complexity of a given shoreline, which allows for increased development of the aquatic plant communities in the littoral area.

Following the protocol, the number of sampling locations on Minnow Lake and Robinson Lake were determined to be 166 points and 214 points, respectively. The number of sampling points was then used to create an evenly disturbed grid onto the littoral areas of each lake. Each point is geo-referenced using NAD83 UTM coordinates (see Appendix A – Coordinates).

Field Survey Techniques & Equipment

Field surveys for the aquatic vegetation mapping require relatively little equipment. Foremost is the rake sampler, which comes in many forms. The City uses the same rake sampler for each lake to ensure consistency. The rake sampler used is a 19-tine thatching rake with the head removed and secured to a 50' section of rope, see Figure 3. The thatching rake was selected for its double sided design, low cost and its ability to effectively remove and hold aquatic vegetation while sampling. A Garmin GPSMAP 64S handheld global positioning system, GPS, was used to navigate to each sampling location. The location reported by the GPS is accurate to within 15 meters and will generally have accuracy within 5 to 10 meters under normal conditions (Garmin Ltd. 2019).

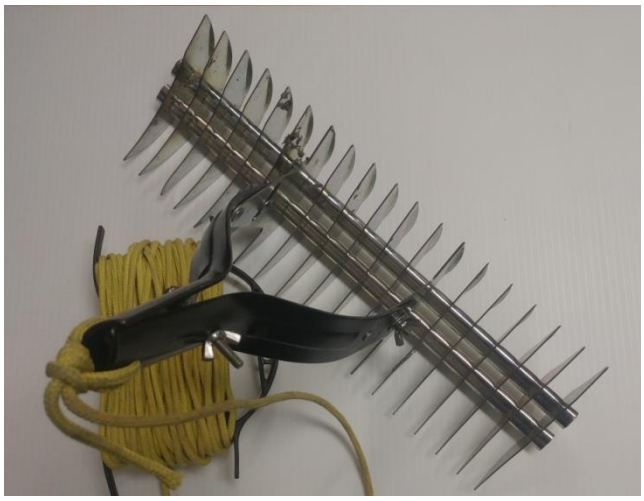

Figure 1. City of Greater Sudbury modified thatching rake used for aquatic vegetation sampling.

Aquatic vegetation sampling on Minnow Lake took place between Aug 20, 2019 and August 21, 2019 and Robinson Lake sampling took place between July 21, 2020 and July 24, 2020. The sampling period ensured that aquatic vegetation within the lake was near peak growth. At each sampling points, the rake was tossed into the water within 1-3 meters of the watercraft and dragged across the substrate before being pulled into the watercraft. Rake fullness was recorded for both lakes to help determine density of plant growth at each site with species being identified and recorded, along with the dominant species present. All Scientific named are based on the Integrated Taxonomic Information System. After each rake toss the watercraft was relocated to compensate for any movement that may have occurred. A total of three (3) rake tosses were completed at each sampling point to ensure an accurate representation of plant species at each site.

The results from each lake were inputted into GIS software and overlaid on satellite imagery to create a visualization of the extent of each species within the water body. Maps of the aquatic plant species found in Minnow Lake and Robinson Lake can be found in Appendix B and C respectively.

Results

Minnow Lake

A total of 166 points were sampled on Minnow Lake from which a total of 18 aquatic plant species were recorded. At each sampling point, the 'rake fullness' was estimated and the dominant species was noted, as long as dominance was clearly observable. The two most frequent species recorded were both native species: Muskgrass (*Chara* spp.) found at 85% of site followed by Richardson's Pondweed (*Potamogeton richardsonii*) found at 43% of sites. The non-native Eurasian Watermifoil (*Myriophyllum spicatum*) was only found at 1 sampling location or at 0.6% of sites. Table 1 below lists the aquatic plant species recorded and their frequency of occurrence.

Table 1. Aquatic plant species recorded in Minnow Lake in 2019.

Common Name	Scientific Name	Locations Present	% of Sampling Locations
Muskgrass/Stonewort	***Chara spp.***	**142**	**85.5%**
Richardson's Pondweed	***Potamogeton richardsonii***	**72**	**43.4%**
White Water-lily	*Nymphaea ordorata*	8	4.8%
Tapegrass	*Vallisneria americana*	6	3.6%
Sago Pondweed	*Stuckenia pectinata*	5	3.0%
Yellow Water-lily	*Nuphar lutea*	4	2.4%
Eurasian Water-milfoil (non-native)	***Myriophyllum spicatum***	**1**	**0.6%**
Slender Niad	*Najas Flexis*	1	0.6%

The presence/absence for each species on Minnow Lake was compiled and overlaid onto geo-referenced satellite imagery. Additionally, maps were created to show the dominant species at each sampling point (Figure 2), along with the density/fullness of the plant growth at each point (Figure 3). These data were then projected onto a map to show the total extent of each aquatic species throughout the lake. These maps can be found in Appendix B – Minnow Lake Vegetation Mapping Results.

The species information collected on Minnow Lake helps shed light on the extent of the growth of Eurasian Watermilfoil in the lake and whether this invasive aquatic plant is having a negative impact on the native aquatic plants within the lake. The results indicate that there is very little Eurasian Watermilfoil in Minnow Lake; the dominant plant species is the native Muskgrass.

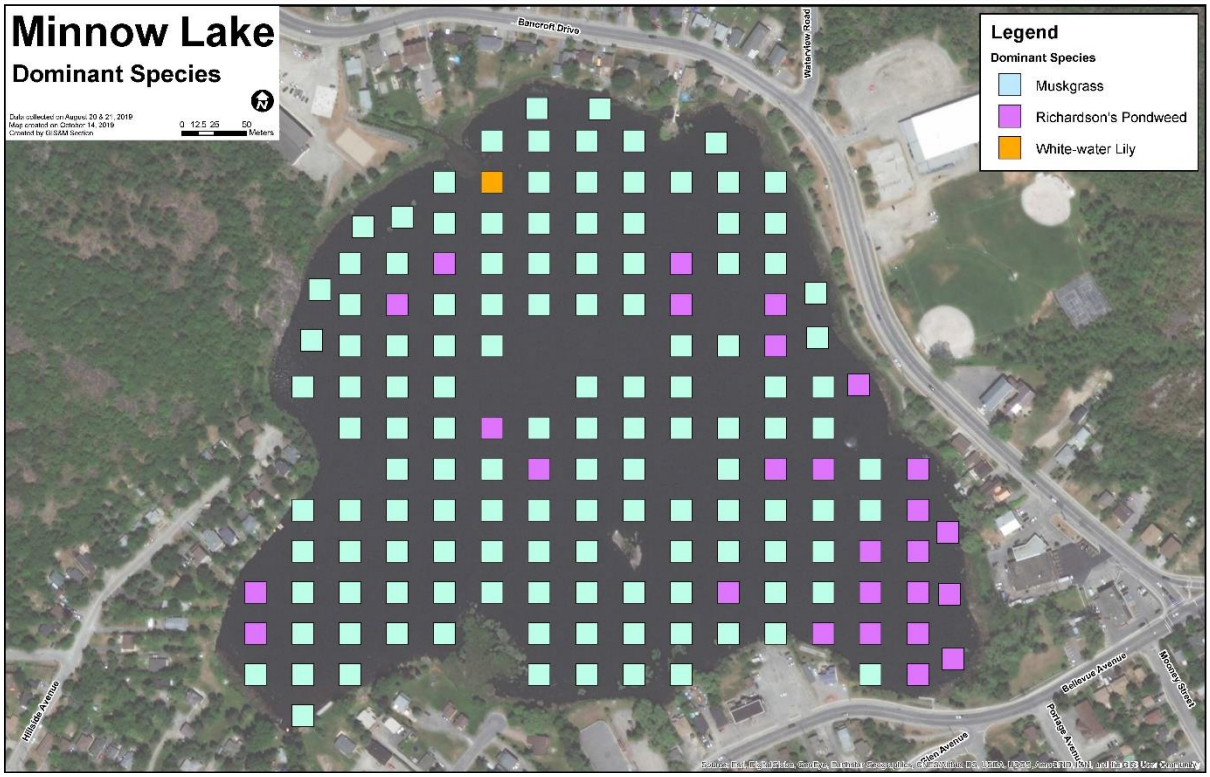

Figure 2. Minnow Lake Vegetation Dominant Species 2019 – Common Names

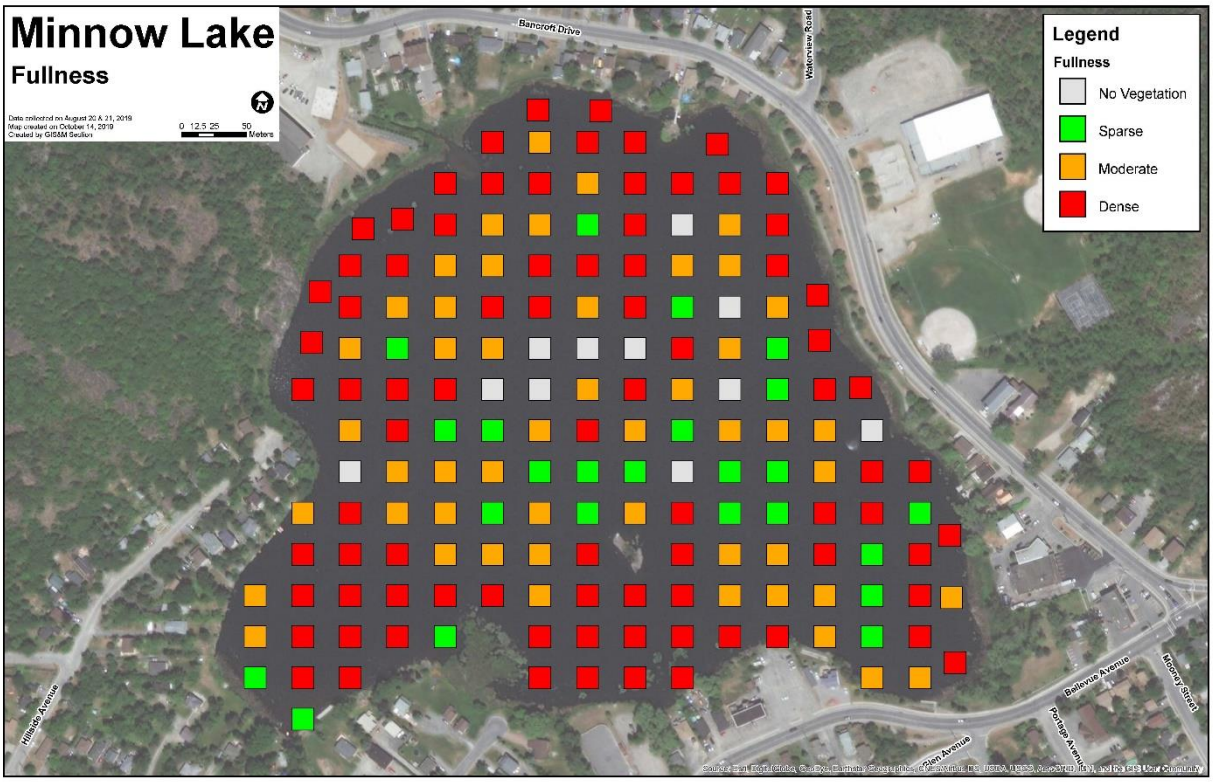

Figure 2. Minnow Lake Vegetation Fullness/Density - 2019

Robinson Lake

A total of 214 points were sampled in Robinson Lake in 2020. At each sampling point, the 'rake fullness' was estimated and the dominant species was noted, as long as dominance was clearly observable. A total of 12 aquatic plant species were recorded of which the following three species were most common: Muskgrass (*Chara* spp.) found at 42% of sites, Eurasian Watermilfoil (*Myriphyllum spicatum*) found at 25% of sites and Slender Pondweed (*Potamogeton diversifolius*) found at 20% of sites respectively. A list of the aquatic species recorded along with the total number of sampling points at which each was found is presented on Table 2.

Maps of the presence/absence for each species on Robinson Lake can be found in Appendix C – Robinson Lake Vegetation Mapping Results. Additionally, maps were created to show the dominant species at each sampling point (Figure 4), along with the density/fullness of the plant growth at each point (Figure 5).

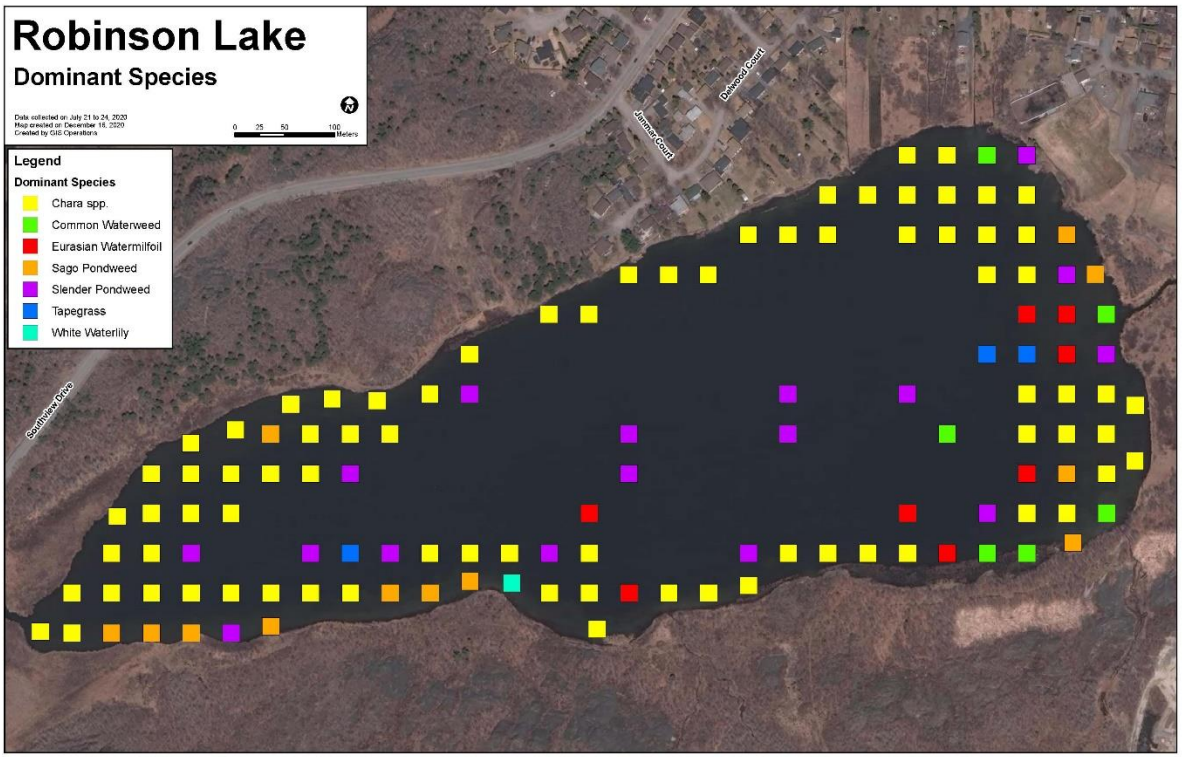

Figure 4. Robinson Lake Vegetation Dominant Species 2020 – Common Names

The species information collected on Robinson Lake will serve as a baseline for comparisons with future aquatic plant surveys in the lake and will assist in determining if Eurasian Water-milfoil is having a negative impact on the native aquatic species within the lake. Data collected in 2020 show that at 75% of sampling locations, native species were the only species recorded. Where the non-native Eurasian Watermilfoil was present, it was the dominant species at only 4% of sites on the lake. Additionally, 22% of the sampling points contained a mixture of both native aquatic species and the invasive Eurasian Watermilfoil; at 44% of sampling points no aquatic plant growth was recorded; at 32% of the sampling points only native species occurred and at only 2% of the sampling points Eurasian Watermilfoil grew exclusively (Table 3).

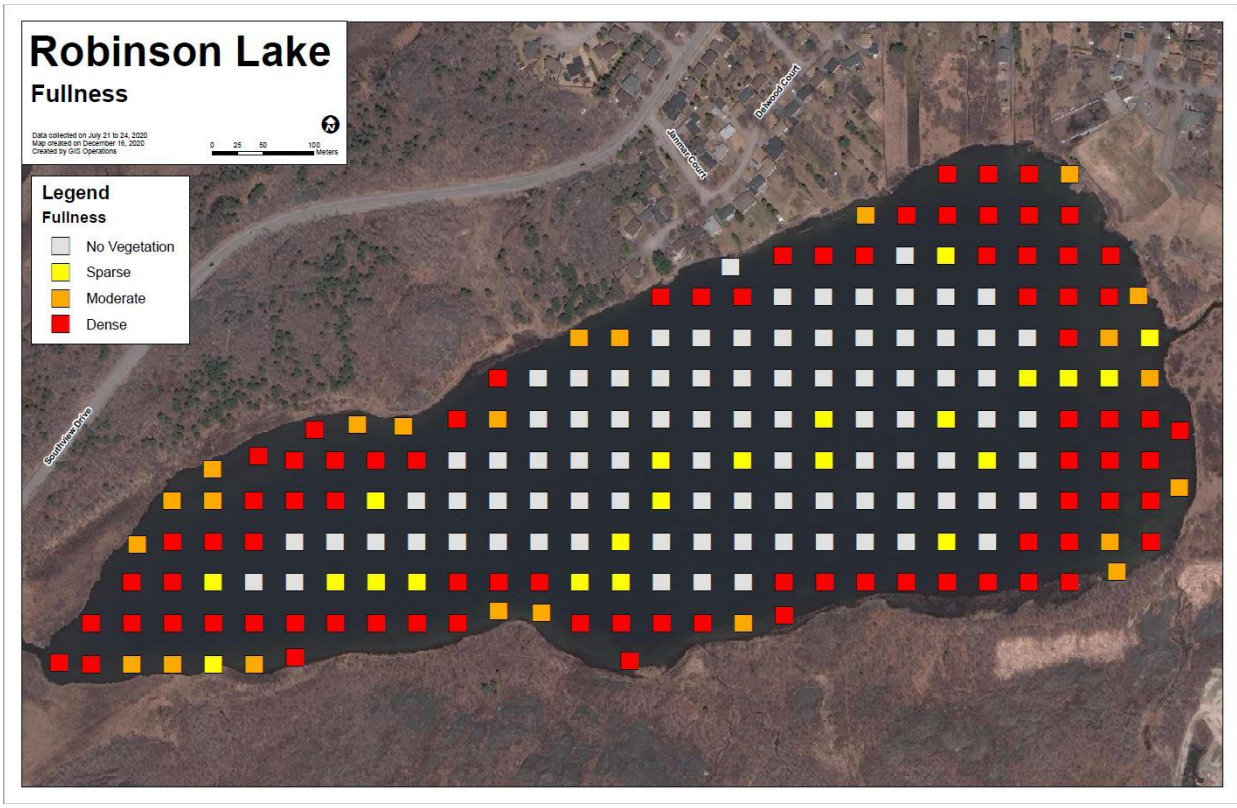

Figure 4. Robinson Lake Vegetation Fullness/Density 2020

Table 2. Frequency of aquatic plant species recorded in Robinson Lake in 2020.

Common Name	Scientific Name	Locations Present	% of Sampling Locations
Muskgrass	***Chara spp.***	**90**	**42%**
Eurasian Water Milfoil (non native)	***Myriophyllum spicatum***	**54**	**25%**
Slender Pondweed	***Potamogeton diversifolius***	**43**	**20%**
Common Waterweed	*Elodea canadensis*	35	16%
Sago Pondweed	*Stuckenia pectinata*	33	15%
Wild Celery/Tapegrass	*Vallisneria americana*	13	6%
Northern snail-seed pondweed	*Potamogeton spirillus*	4	2%
White Waterlily	*Nymphaea ordorata*	5	2%
Arrowhead	*Sagittaria latifolia*	2	1%
Slender Niad	*Najas Flexis*	2	1%
Yellow Waterlily	*Nuphar lutea*	2	1%
Northern Water Milfoil	*Myriophylum sibiricum*	1	0.5%

Table 3. Composition of native and invasive aquatic vegetation in Robinson Lake in 2020.

	Eurasian Watermilfoil Only	Native Species Only	Mixture of Eurasian Watermilfoil & Native Species	No Vegetation Present
# of sampling points	5	74	49	86
% of Sites on Lake	2.34%	34.58%	22.90%	40.19%

Conclusion

The 2019 and 2020 aquatic vegetation mapping project on Minnow Lake and Robinson Lake has created a robust baseline for monitoring aquatic plant populations within these two area lakes. The data collected through this mapping project have helped in understanding the current extent of Eurasian Watermilfoil in Minnow and Robinson Lake and have provided information regarding species richness within these water bodies.

Most revealing is the very small percentage of sampling locations on Minnow Lake where Eurasian Watermilfoil was recorded. On Robinson Lake the number of locations where monoculture stands of exclusively Eurasian Watermilfoil is present is below 3%, while locations with a mixture of non-native Eurasian Watermilfoil along with native plants is below 23% and just over 34% of sites contain native species only. These results show that, although the Eurasian Watermilfoil is present within these water bodies, this invasive species does not appear to have established a significant presence within Minnow Lake and there are few widespread monospecific stands within Robinson Lake.

These initial aquatic vegetation mapping surveys will serve as a baseline for future mapping efforts to reveal the dynamics of growth or decline of both Eurasian Watermilfoil and native aquatic plants in these lakes. Aquatic vegetation mapping will continue on other lakes that are affected by Eurasian Watermilfoil to serve as baselines for monitoring aquatic plant species within City lakes.

Sources

Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010. Madison, Wisconsin, USA

Garmin Ltd. “GPS Accuracy.”GPS Accuracy, 2019, support.garmin.com/en-CA/?faq=aZc8RezeAb9LjCDpJplTY7.

Mikulyuk A, Hauxwell J, Rassmussen P, Knight S, Wagner KI, Nault ME, Ridgely D. 2010. Testing a methodology for assessing plant communities in temperate inland lakes. Lake Reserv Manage 26:54–62.

Appendix A

Coordinates

Minnow Lake Waypoints 1/2

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)	Date Sampled
1	503108	5148560	20-Aug-19
2	503071	5148591	20-Aug-19
3	503108	5148591	20-Aug-19
4	503144	5148591	20-Aug-19
5	503291	5148591	20-Aug-19
6	503327	5148591	20-Aug-19
7	503364	5148591	20-Aug-19
8	503400	5148591	20-Aug-19
9	503547	5148591	20-Aug-19
10	503583	5148591	20-Aug-19
11	503610	5148603	20-Aug-19
12	503071	5148623	20-Aug-19
13	503108	5148623	20-Aug-19
14	503144	5148623	20-Aug-19
15	503181	5148623	20-Aug-19
16	503217	5148623	20-Aug-19
17	503291	5148623	20-Aug-19
18	503327	5148623	20-Aug-19
19	503364	5148623	20-Aug-19
20	503400	5148623	20-Aug-19
21	503437	5148623	20-Aug-19
22	503473	5148623	20-Aug-19
23	503510	5148623	20-Aug-19
24	503547	5148623	20-Aug-19
25	503583	5148623	20-Aug-19
26	503608	5148653	20-Aug-19
27	503071	5148655	20-Aug-19
28	503108	5148655	20-Aug-19
29	503144	5148655	20-Aug-19
30	503181	5148655	20-Aug-19
31	503217	5148655	20-Aug-19
32	503254	5148655	20-Aug-19
33	503291	5148655	20-Aug-19
34	503327	5148655	20-Aug-19
35	503364	5148655	20-Aug-19
36	503400	5148655	20-Aug-19
37	503437	5148655	20-Aug-19
38	503473	5148655	20-Aug-19
39	503510	5148655	20-Aug-19
40	503547	5148655	20-Aug-19
41	503583	5148655	20-Aug-19
42	503108	5148687	20-Aug-19
43	503144	5148687	20-Aug-19
44	503181	5148687	20-Aug-19
45	503217	5148687	20-Aug-19
46	503254	5148687	20-Aug-19
47	503291	5148687	20-Aug-19
48	503327	5148687	20-Aug-19
49	503400	5148687	20-Aug-19
50	503437	5148687	20-Aug-19

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)	Date Sampled
51	503473	5148687	20-Aug-19
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54	503583	5148687	20-Aug-19
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56	503144	5148718	20-Aug-19
57	503181	5148718	20-Aug-19
58	503217	5148718	20-Aug-19
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60	503291	5148718	21-Aug-19
61	503327	5148718	21-Aug-19
62	503364	5148718	21-Aug-19
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81	503547	5148750	21-Aug-19
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96	503144	5148814	21-Aug-19
97	503181	5148814	21-Aug-19
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99	503254	5148814	21-Aug-19
100	503291	5148814	21-Aug-19

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)	Date Sampled
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102	503364	5148814	21-Aug-19
103	503400	5148814	21-Aug-19
104	503437	5148814	21-Aug-19
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147	503327	5148941	21-Aug-19
148	503364	5148941	21-Aug-19
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150	503437	5148941	21-Aug-19

Minnow Lake Waypoints 2/2

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)	Date Sampled
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157	503400	5148972	21-Aug-19
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159	503473	5148972	21-Aug-19
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162	503327	5149004	21-Aug-19
163	503364	5149004	21-Aug-19
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165	503289	5149029	21-Aug-19
166	503337	5149028	21-Aug-19

Robinson Lake Waypoints 1/2

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)	Date Sampled
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6	497226	5144488	21/07/2020
7	497266	5144495	21/07/2020
8	497066	5144528	21/07/2020
9	497106	5144528	21/07/2020
10	497146	5144528	21/07/2020
11	497186	5144528	21/07/2020
12	497226	5144528	21/07/2020
13	497266	5144528	21/07/2020
14	497306	5144528	21/07/2020
15	497346	5144528	21/07/2020
16	497386	5144528	21/07/2020
17	497426	5144528	21/07/2020
18	497466	5144540	21/07/2020
19	497509	5144538	21/07/2020
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21	497586	5144528	21/07/2020
22	497626	5144528	21/07/2020
23	497666	5144528	21/07/2020
24	497706	5144528	21/07/2020
25	497746	5144535	21/07/2020
26	497106	5144568	21/07/2020
27	497146	5144568	21/07/2020
28	497186	5144568	21/07/2020
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63	497626	5144608	23/07/2020
64	497666	5144608	23/07/2020
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76	497146	5144648	23/07/2020
77	497186	5144648	23/07/2020
78	497226	5144648	23/07/2020
79	497266	5144648	23/07/2020
80	497306	5144648	23/07/2020
81	497346	5144648	23/07/2020
82	497386	5144648	23/07/2020
83	497426	5144648	23/07/2020
84	497466	5144648	23/07/2020
85	497506	5144648	23/07/2020
86	497546	5144648	23/07/2020
87	497586	5144648	23/07/2020
88	497626	5144648	23/07/2020
89	497666	5144648	23/07/2020
90	497706	5144648	23/07/2020
91	497746	5144648	23/07/2020
92	497786	5144648	23/07/2020
93	497826	5144648	23/07/2020
94	497866	5144648	23/07/2020
95	497906	5144648	23/07/2020
96	497946	5144648	23/07/2020
97	497986	5144648	23/07/2020
98	498026	5144648	23/07/2020
99	498066	5144648	23/07/2020
100	498106	5144648	23/07/2020

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)	Date Sampled
101	497186	5144679	23/07/2020
102	497231	5144692	23/07/2020
103	497266	5144688	23/07/2020
104	497306	5144688	23/07/2020
105	497346	5144688	23/07/2020
106	497386	5144688	23/07/2020
107	497426	5144688	23/07/2020
108	497466	5144688	23/07/2020
109	497506	5144688	23/07/2020
110	497546	5144688	23/07/2020
111	497586	5144688	23/07/2020
112	497626	5144688	23/07/2020
113	497666	5144688	23/07/2020
114	497706	5144688	23/07/2020
115	497746	5144688	23/07/2020
116	497786	5144688	23/07/2020
117	497826	5144688	23/07/2020
118	497866	5144688	23/07/2020
119	497906	5144688	23/07/2020
120	497946	5144688	23/07/2020
121	497986	5144688	23/07/2020
122	498026	5144688	23/07/2020
123	498066	5144688	23/07/2020
124	498106	5144688	23/07/2020
125	498135	5144661	23/07/2020
126	497287	5144717	23/07/2020
127	497328	5144723	23/07/2020
128	497374	5144721	23/07/2020
129	497426	5144728	23/07/2020
130	497466	5144728	23/07/2020
131	497506	5144728	23/07/2020
132	497546	5144728	23/07/2020
133	497586	5144728	23/07/2020
134	497626	5144728	23/07/2020
135	497666	5144728	23/07/2020
136	497706	5144728	23/07/2020
137	497746	5144728	23/07/2020
138	497786	5144728	23/07/2020
139	497826	5144728	23/07/2020
140	497866	5144728	23/07/2020
141	497906	5144728	23/07/2020
142	497946	5144728	23/07/2020
143	497986	5144728	23/07/2020
144	498026	5144728	23/07/2020
145	498066	5144728	23/07/2020
146	498106	5144728	23/07/2020
147	498135	5144716	23/07/2020
148	497466	5144768	23/07/2020
149	497506	5144768	23/07/2020
150	497546	5144768	23/07/2020

Robinson Lake Waypoints 2/2

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)	Date Sampled
151	497586	5144768	23/07/2020
152	497626	5144768	23/07/2020
153	497666	5144768	23/07/2020
154	497706	5144768	23/07/2020
155	497746	5144768	23/07/2020
156	497786	5144768	23/07/2020
157	497826	5144768	23/07/2020
158	497866	5144768	23/07/2020
159	497906	5144768	23/07/2020
160	497946	5144768	23/07/2020
161	497986	5144768	23/07/2020
162	498026	5144768	23/07/2020
163	498066	5144768	23/07/2020
164	498106	5144768	23/07/2020
165	497546	5144808	23/07/2020
166	497586	5144808	23/07/2020
167	497626	5144808	23/07/2020
168	497666	5144808	23/07/2020
169	497706	5144808	23/07/2020
170	497746	5144808	23/07/2020
171	497786	5144808	23/07/2020
172	497826	5144808	23/07/2020
173	497866	5144808	23/07/2020
174	497906	5144808	23/07/2020
175	497946	5144808	23/07/2020
176	497986	5144808	23/07/2020
177	498026	5144808	23/07/2020
178	498066	5144808	23/07/2020
179	498106	5144808	23/07/2020
180	497626	5144848	23/07/2020
181	497666	5144848	23/07/2020
182	497706	5144848	23/07/2020
183	497746	5144848	23/07/2020
184	497786	5144848	23/07/2020
185	497826	5144848	23/07/2020
186	497866	5144848	23/07/2020
187	497906	5144848	23/07/2020
188	497946	5144848	23/07/2020
189	497986	5144848	23/07/2020
190	498026	5144848	23/07/2020
191	498066	5144848	23/07/2020
192	498095	5144848	23/07/2020
193	497746	5144888	23/07/2020
194	497786	5144888	24/07/2020
195	497826	5144888	24/07/2020
196	497866	5144888	24/07/2020
197	497906	5144888	24/07/2020
198	497946	5144888	24/07/2020
199	497986	5144888	24/07/2020
200	498026	5144888	24/07/2020

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)	Date Sampled
201	498066	5144888	24/07/2020
202	497826	5144928	24/07/2020
203	497866	5144928	24/07/2020
204	497906	5144928	24/07/2020
205	497946	5144928	24/07/2020
206	497986	5144928	24/07/2020
207	498026	5144928	24/07/2020
208	497906	5144968	24/07/2020
209	497946	5144968	24/07/2020
210	497986	5144968	24/07/2020
211	498026	5144968	24/07/2020
212	498073	5144579	23/07/2020
213	497595	5144491	23/07/2020
214	497694	5144877	24/07/2020

Appendix B

Minnow Lake Vegetation Mapping Results

Minnow Lake

Fullness

Data collected on August 20 & 21, 2019
Map created on October 14, 2019
Created by GIS&M Section

0 12.5 25 50
Meters

Bancroft Drive
Waterview Road
Hillside Avenue
Glen Avenue
Portage Avenue
Bellevue Avenue
Mooney Street

Legend

Fullness

- No Vegetation
- Sparse
- Moderate
- Dense

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Minnow Lake

Dominant Species

Data collected on August 20 & 21, 2019
Map created on October 14, 2019
Created by GIS&M Section

0 12.5 25 50
Meters

Legend

Dominant Species

- Muskgrass
- Richardson's Pondweed
- White-water Lily

Bancroft Drive
Waterview Road
Hillside Avenue
Bellevue Avenue
Mooney Street
Portage Avenue
Glen Avenue

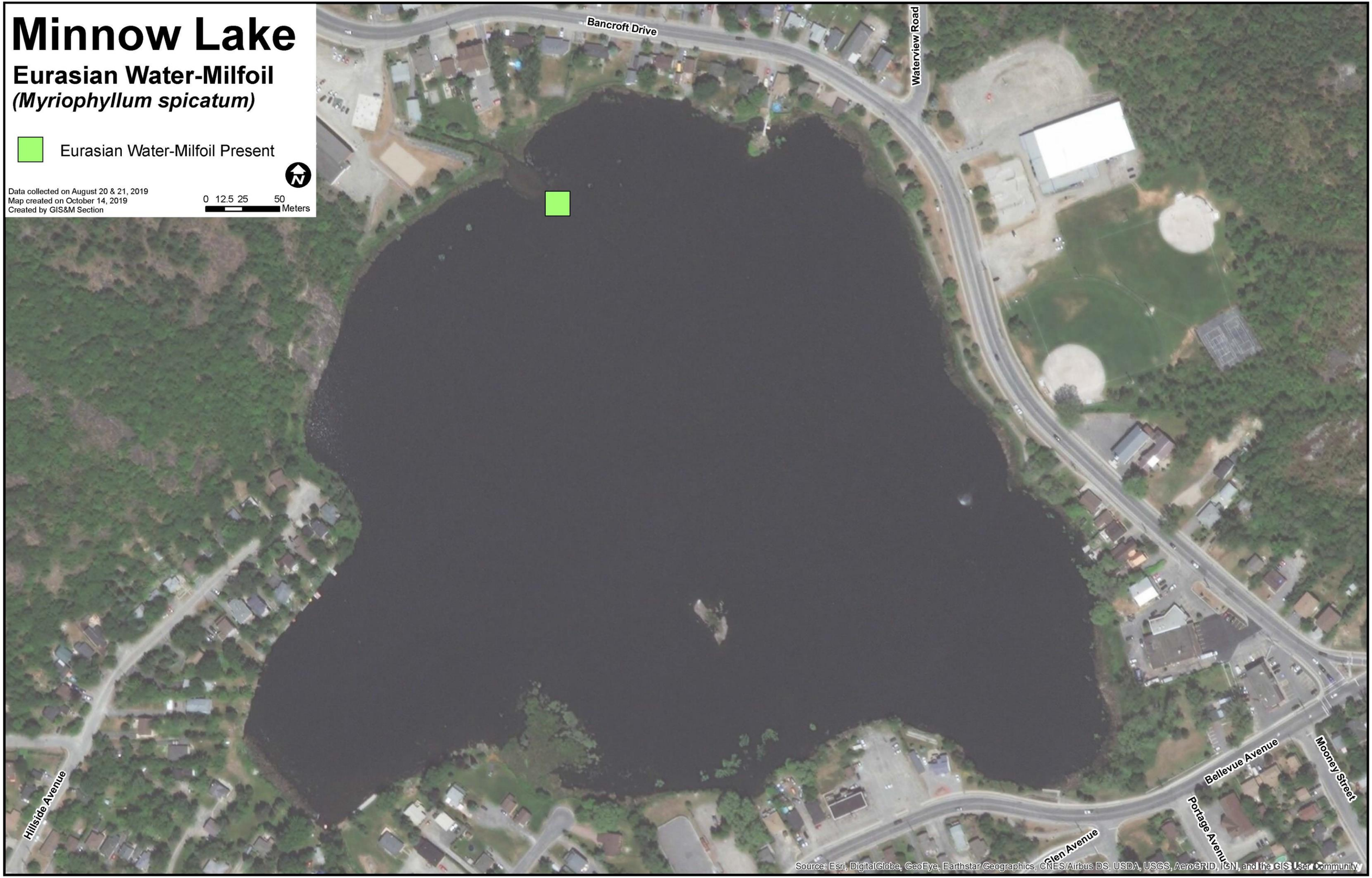
Minnow Lake

Eurasian Water-Milfoil
(Myriophyllum spicatum)

Eurasian Water-Milfoil Present

Data collected on August 20 & 21, 2019
Map created on October 14, 2019
Created by GIS&M Section

0 12.5 25 50
Meters



Minnow Lake

Richardson's Pondweed
(Potamogeton richardsonii)

Richardson's Pondweed Present

Data collected on August 20 & 21, 2019
Map created on October 14, 2019
Created by GIS&M Section

0 12.5 25 50
Meters

Bancroft Drive
Waterview Road
Hillside Avenue
Glen Avenue
Portage Avenue
Bellevue Avenue
Mooney Street

Minnow Lake

Muskgrass

(Chara spp.)

Muskgrass Present

Data collected on August 20 & 21, 2019
Map created on October 14, 2019
Created by GIS&M Section

0 12.5 25 50
Meters

Bancroft Drive
Waterview Road
Hillside Avenue
Glen Avenue
Portage Avenue
Bellevue Avenue
Mooney Street

Minnow Lake

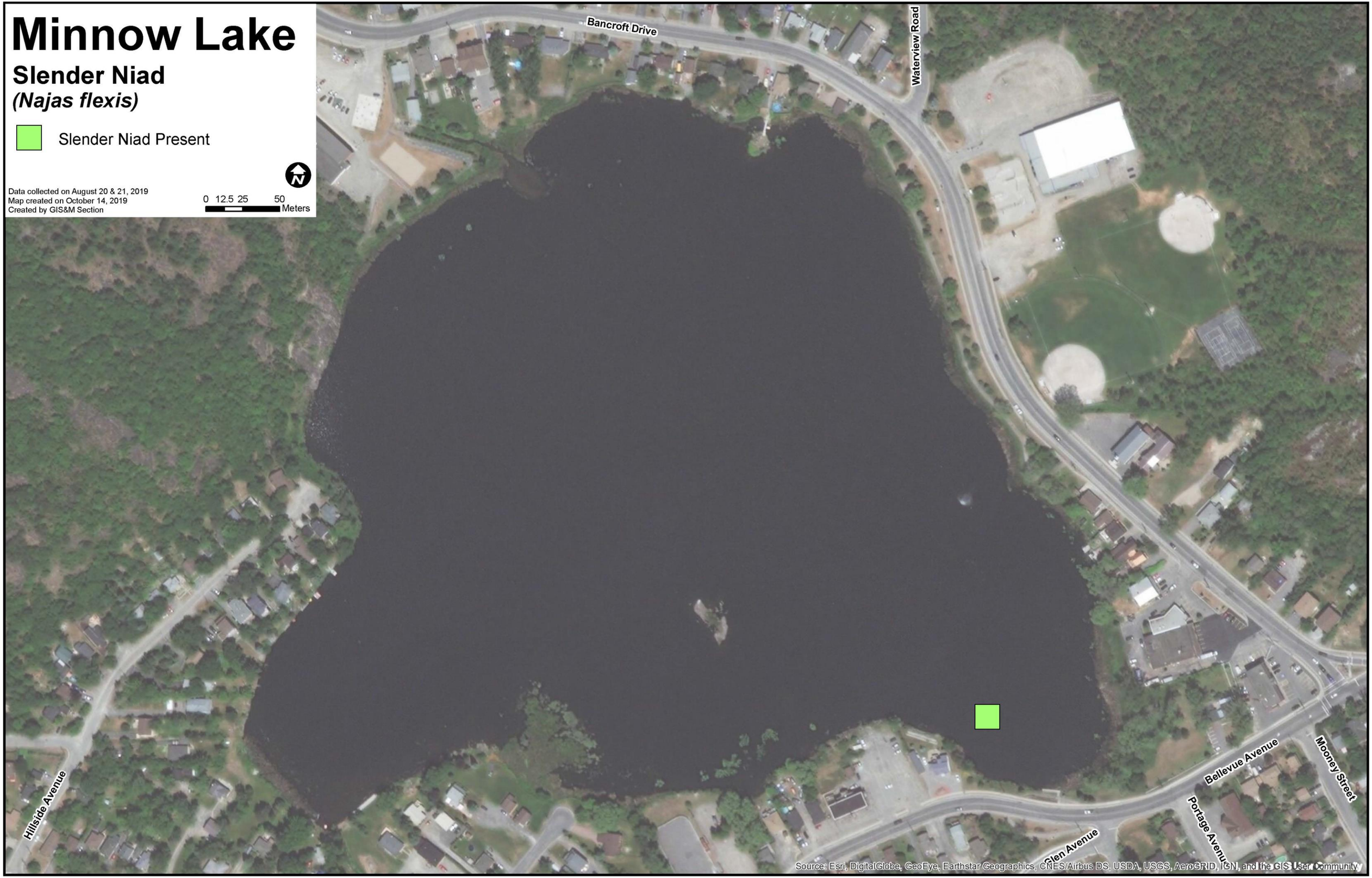
Slender Niad

(Najas flexis)

Slender Niad Present

Data collected on August 20 & 21, 2019
Map created on October 14, 2019
Created by GIS&M Section

0 12.5 25 50
Meters



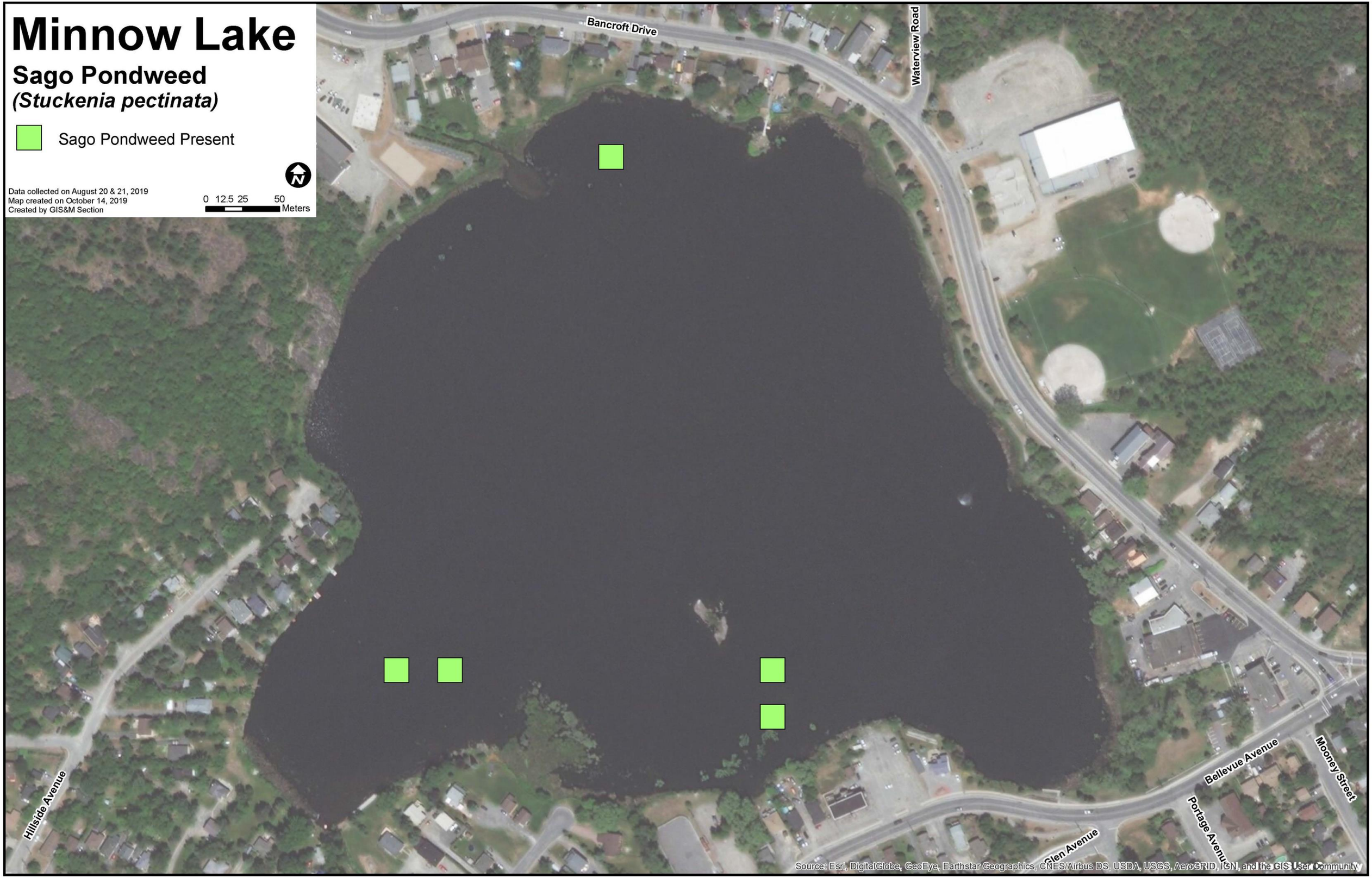
Minnow Lake

Sago Pondweed
(Stuckenia pectinata)

Sago Pondweed Present

Data collected on August 20 & 21, 2019
Map created on October 14, 2019
Created by GIS&M Section

0 12.5 25 50
Meters



Minnow Lake

White Water-Lily

(Nymphaea ordorata)

White Water-Lily Present

Data collected on August 20 & 21, 2019
Map created on October 14, 2019
Created by GIS&M Section

0 12.5 25 50
Meters

Bancroft Drive
Waterview Road
Hillside Avenue
Glen Avenue
Portage Avenue
Bellevue Avenue
Mooney Street

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Minnow Lake

Wild Celery/Tapegrass
(Vallisneria americana)

Wild Celery/Tapegrass Present

Data collected on August 20 & 21, 2019
Map created on October 14, 2019
Created by GIS&M Section

0 12.5 25 50
Meters

Bancroft Drive
Waterview Road
Hillside Avenue
Glen Avenue
Portage Avenue
Bellevue Avenue
Mooney Street

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Minnow Lake

Yellow Water-Lily

(Nuphar lutea)

Yellow Water-Lily Present

Data collected on August 20 & 21, 2019
Map created on October 14, 2019
Created by GIS&M Section

0 12.5 25 50
Meters

Bancroft Drive
Waterview Road
Hillside Avenue
Glen Avenue
Portage Avenue
Bellevue Avenue
Mooney Street

Appendix C

Robinson Lake Vegetation Mapping Results

Robinson Lake

Fullness

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters

Legend

Fullness

- No Vegetation
- Sparse
- Moderate
- Dense

Janmar Court

Delwood Court

Southview Drive

Robinson Lake

Dominant Species

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters

Legend

Dominant Species

- Chara spp.
- Common Waterweed
- Eurasian Watermilfoil
- Sago Pondweed
- Slender Pondweed
- Tapegrass
- White Waterlily

Delwood Court

Janmar Court

Southview Drive

Robinson Lake

Arrowhead

(Sagittaria latifolia)

Arrowhead Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters

Robinson Lake

Common Pondweed

(Elodea canadensis)

Common Pondweed Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters

Jannar Court

Delwood Court

Southview Drive

Robinson Lake

Eurasian Water-Milfoil

(Myriophyllum spicatum)

Eurasian Water-Milfoil Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters

Jannar Court

Delwood Court

Southview Drive

Robinson Lake

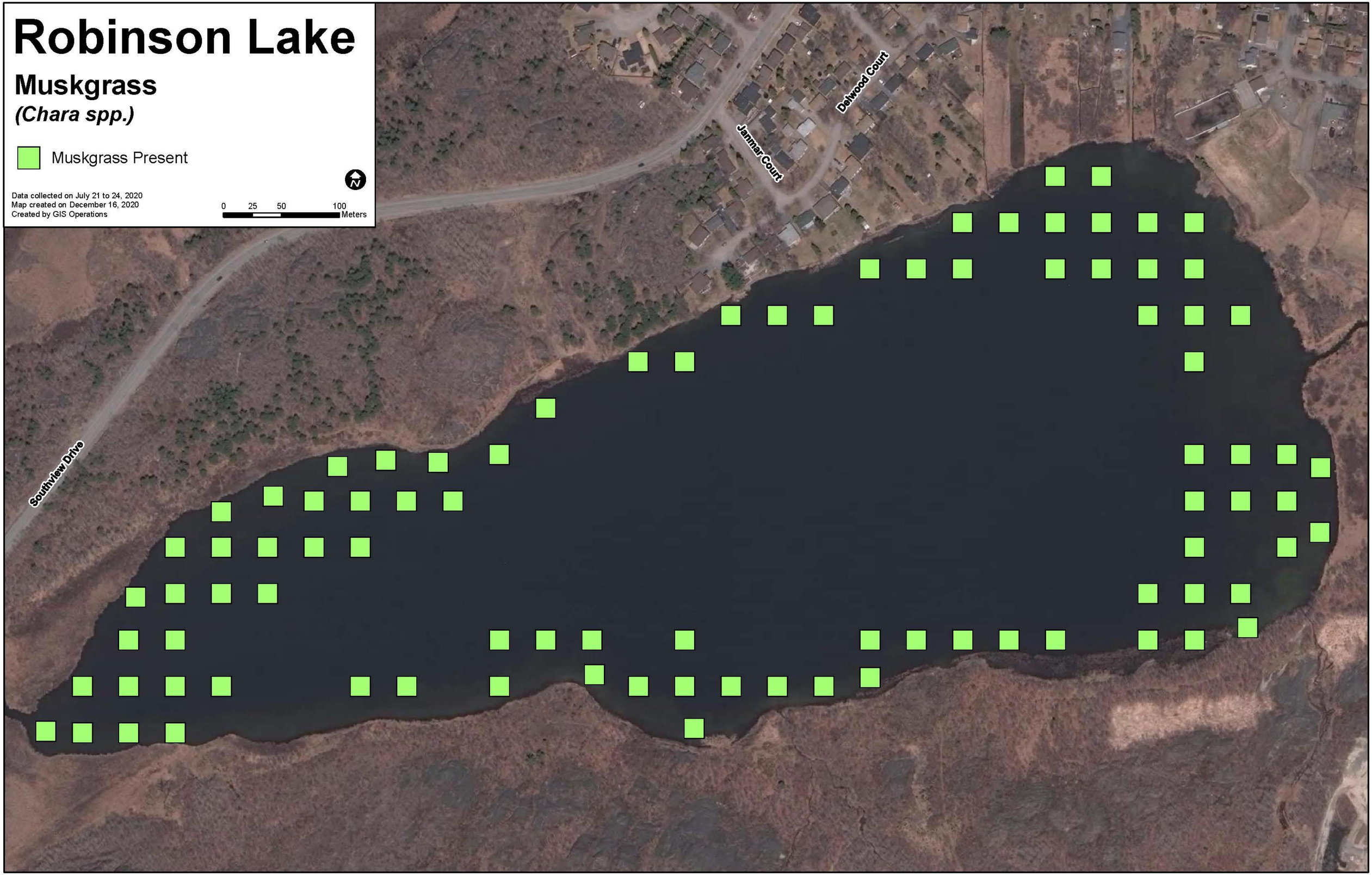
Muskgrass

(Chara spp.)

Muskgrass Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters



Robinson Lake

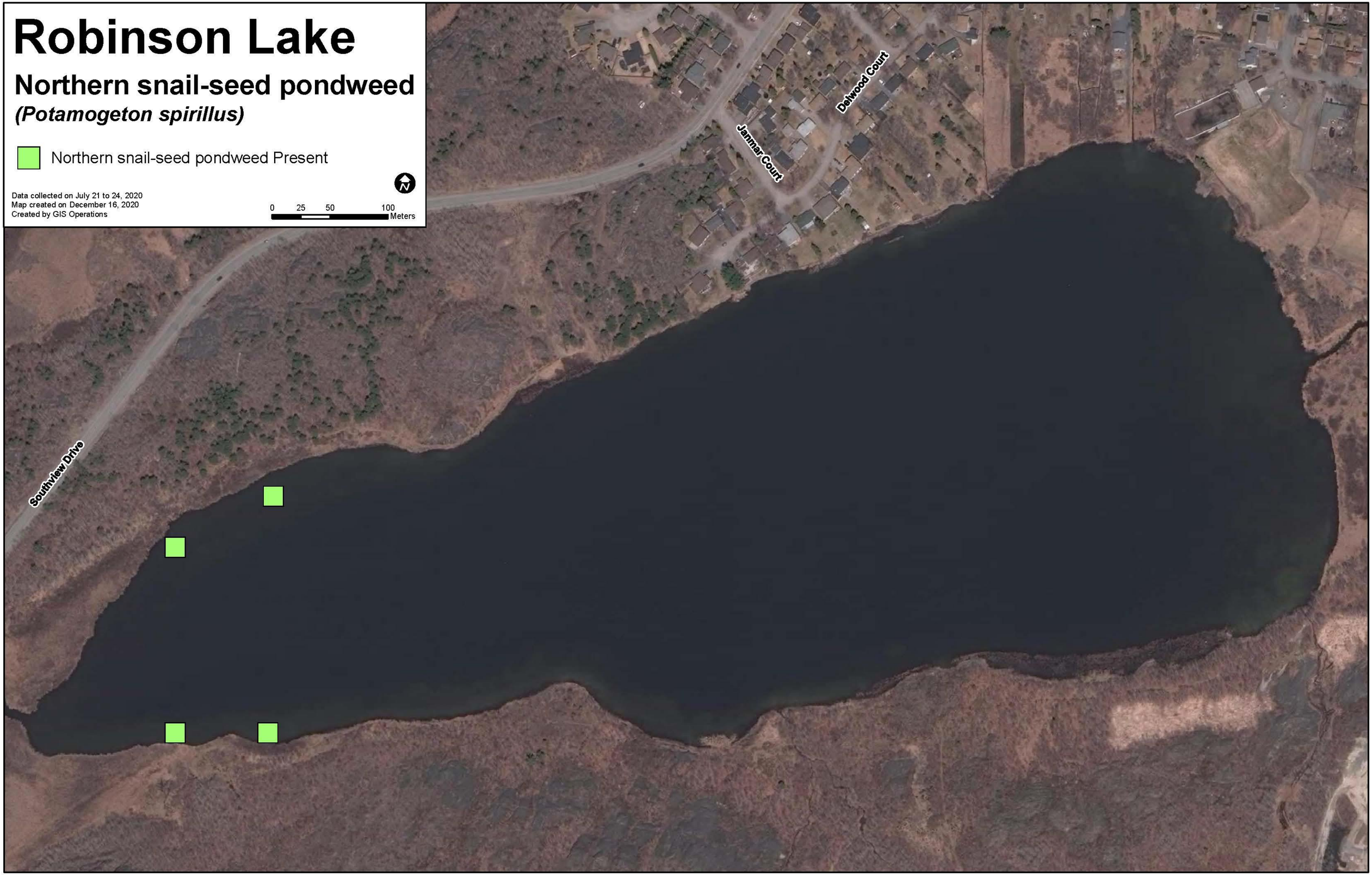
Northern snail-seed pondweed

(Potamogeton spirillus)

Northern snail-seed pondweed Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100
Meters



Robinson Lake

Northern Water-Milfoil

(Myriophylum sibiricum)

Northern Water-Milfoil Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters

Robinson Lake

Slender Niad

(Najas Flexis)

Slender Niad Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters

Robinson Lake

Sago Pondweed

(Stuckenia pectinata)

Sago Pondweed Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters

Jannar Court

Delwood Court

Southview Drive

Robinson Lake

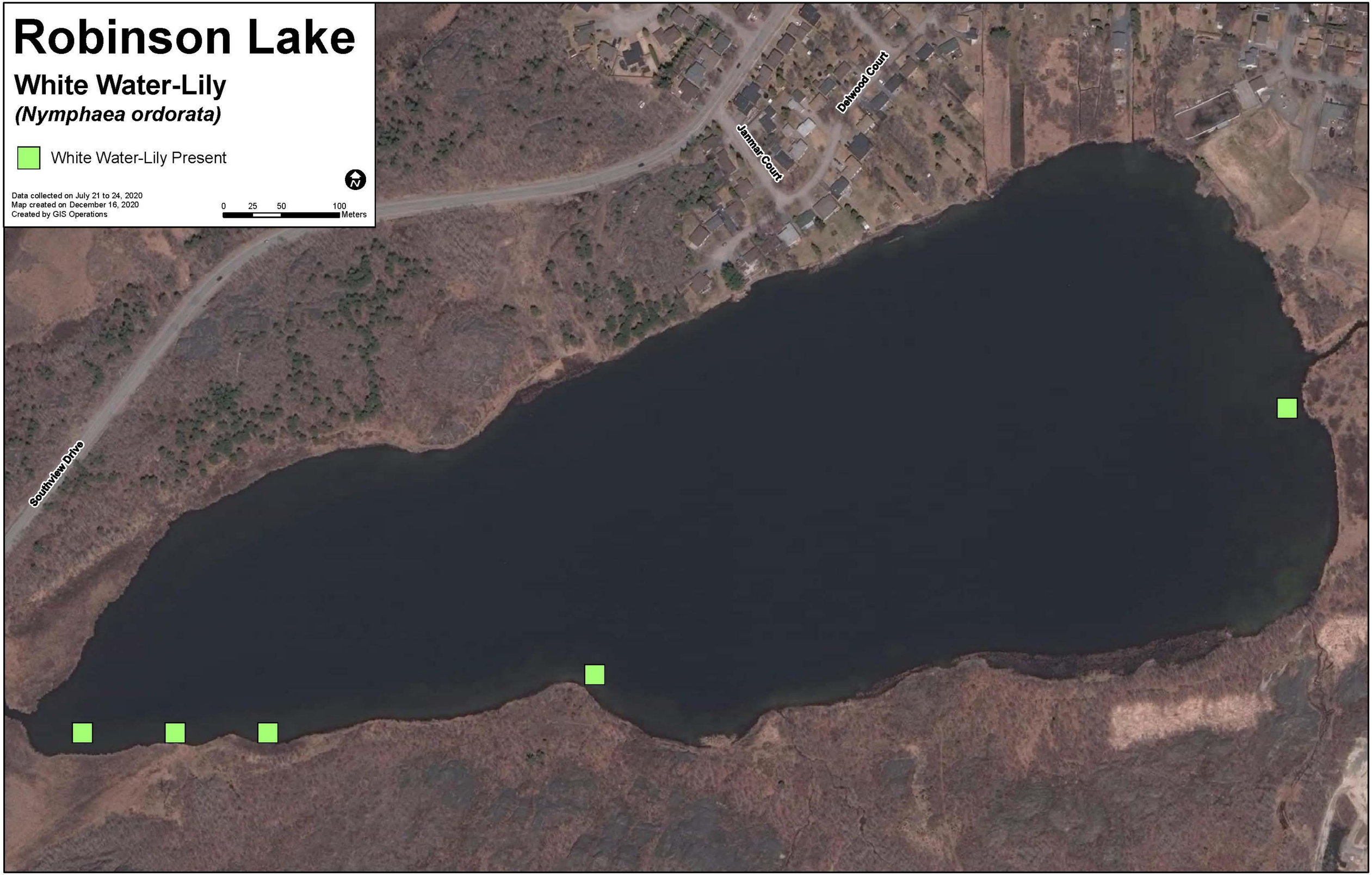
White Water-Lily

(Nymphaea ordorata)

White Water-Lily Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters



Robinson Lake

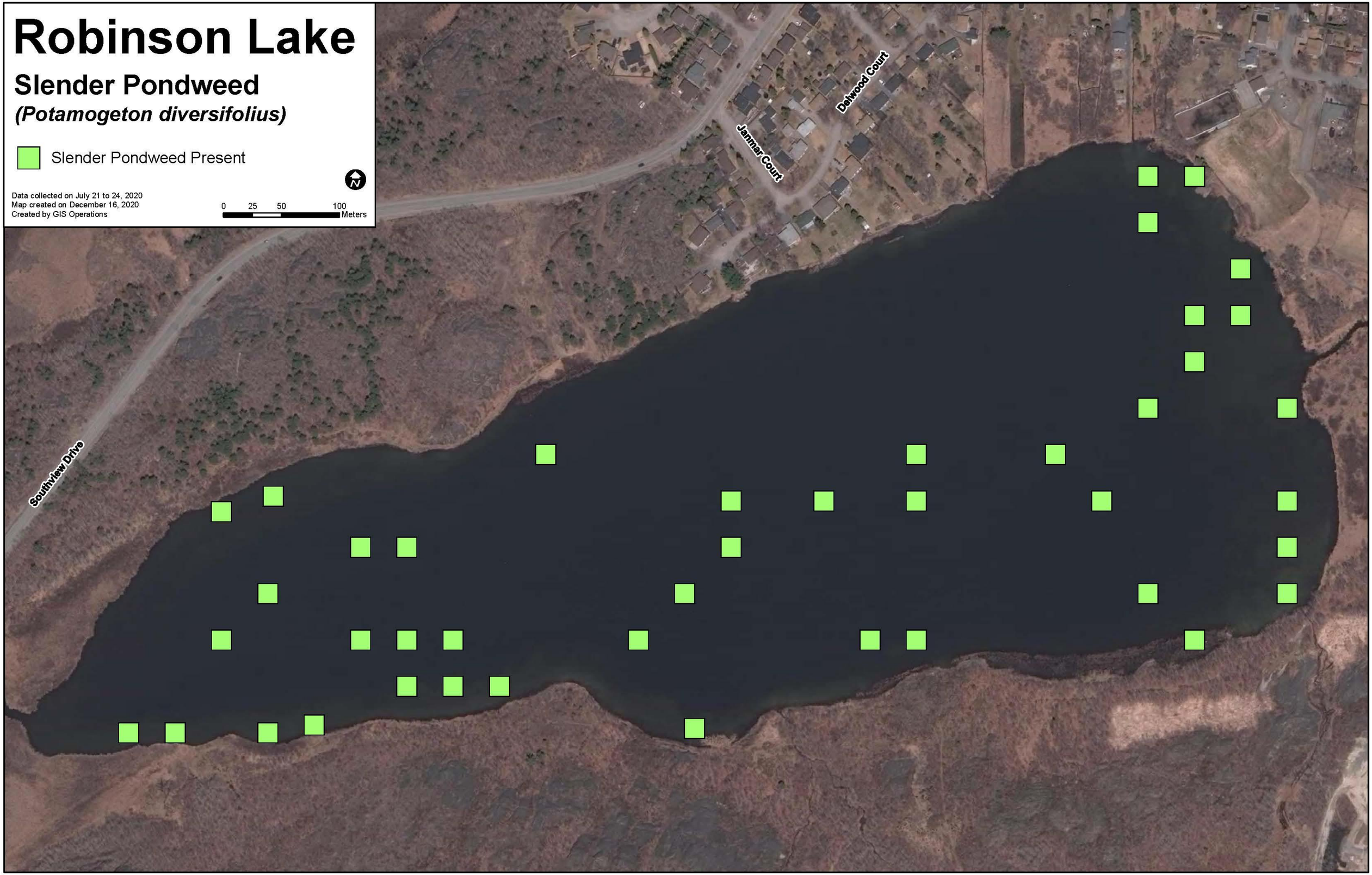
Slender Pondweed

(Potamogeton diversifolius)

Slender Pondweed Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters



Robinson Lake

Yellow Water-Lily

(Nuphar lutea)

Yellow Water-Lily Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters

Robinson Lake

Wild Celery/Tapegrass

(Vallisneria americana)

Wild Celery/Tapegrass Present

Data collected on July 21 to 24, 2020
Map created on December 16, 2020
Created by GIS Operations

0 25 50 100 Meters