Lake Water Quality Program

Strategic and Environmental Planning Initiatives

2024 Minnow Lake
Aquatic Vegetation Mapping Report

City of Greater Sudbury, 2026

Overview

The City of Greater Sudbury is home to over 330 freshwater lakes - more than any other municipality in Canada (City of Greater Sudbury, n.d.[a]). These lakes offer residents and tourists a wide range of recreational opportunities and serve as a vital source of drinking water for many lakeshore residents as well as contributing to the municipal water supply. Over the last few decades, local lakes have come under threat of several aquatic invasive species, notably, Eurasian Watermilfoil (EWM) - an aggressive, dense-growing aquatic plant that negatively effects aquatic ecosystems and recreational activities (Government of Ontario, 2018). Currently, EWM has been identified in 18 lakes within Greater Sudbury (City of Greater Sudbury, n.d.[b]).

The City of Greater Sudbury's Lake Water Quality Program has undertaken several education and awareness campaigns focused on aquatic invasive species, with efforts continuing to expand. In 2017, the Lake Water Quality Program repeated the aquatic vegetation mapping efforts originally conducted in 2014 on several local lakes to assess the spread and impact of EWM. This work introduced an updated, rigorous, sampling protocol designed to identify both native and invasive aquatic plant species. The protocol consists of systematic, quantitative, and replicable methods to monitor changes in aquatic plant species over time.

This report summarizes the results of the 2024 aquatic vegetation mapping survey for Minnow Lake and provides a comparison of the data collected during the 2019 survey.

Lake Description

Minnow Lake is located in McKim Township within the Ramsey Lake Watershed. It covers an area of approximately 20.9 hectares, with a shoreline perimeter of 2.1 kilometers, a maximum depth of three meters, and includes two islands - Romanet Island and Du Caillaud Island (City of Greater Sudbury, n.d.[c]; [d]). Shoreline development around the lake includes 42 residential lots, 7 commercial lots, and 1 institutional lot (City of Greater Sudbury, n.d. [e]).

The lake is surrounded by parks and trails that offer a variety of recreational opportunities. To the northwest, visitors can access two parks and the Oak Forest Trail. The northeast features the Carmichael Community Arena and Park, the Blueberry Hill Trail, and a scenic boardwalk. Along the southern shore, the Carmichael Playground provides residents with picturesque views of the lake. There are no public boat launches or designated swimming beaches on Minnow Lake (City of Greater Sudbury Maps, n.d [d]).

In July 2000, a fountain capable of spraying water 60 feet into the air was installed to help reduce weed and algae growth (Sudbury.com, 2012). This fountain remains operational today.

Since 2001, the City of Greater Sudbury has conducted annual spring phosphorus sampling on Minnow Lake through the Lake Partner Program to monitor its trophic status. The average spring total phosphorus concentration recorded between 2001 and 2024 (Figure 1) is 36.13 µg/L, classifying Minnow Lake as highly productive (eutrophic) (City of Greater Sudbury, n.d.[c]).

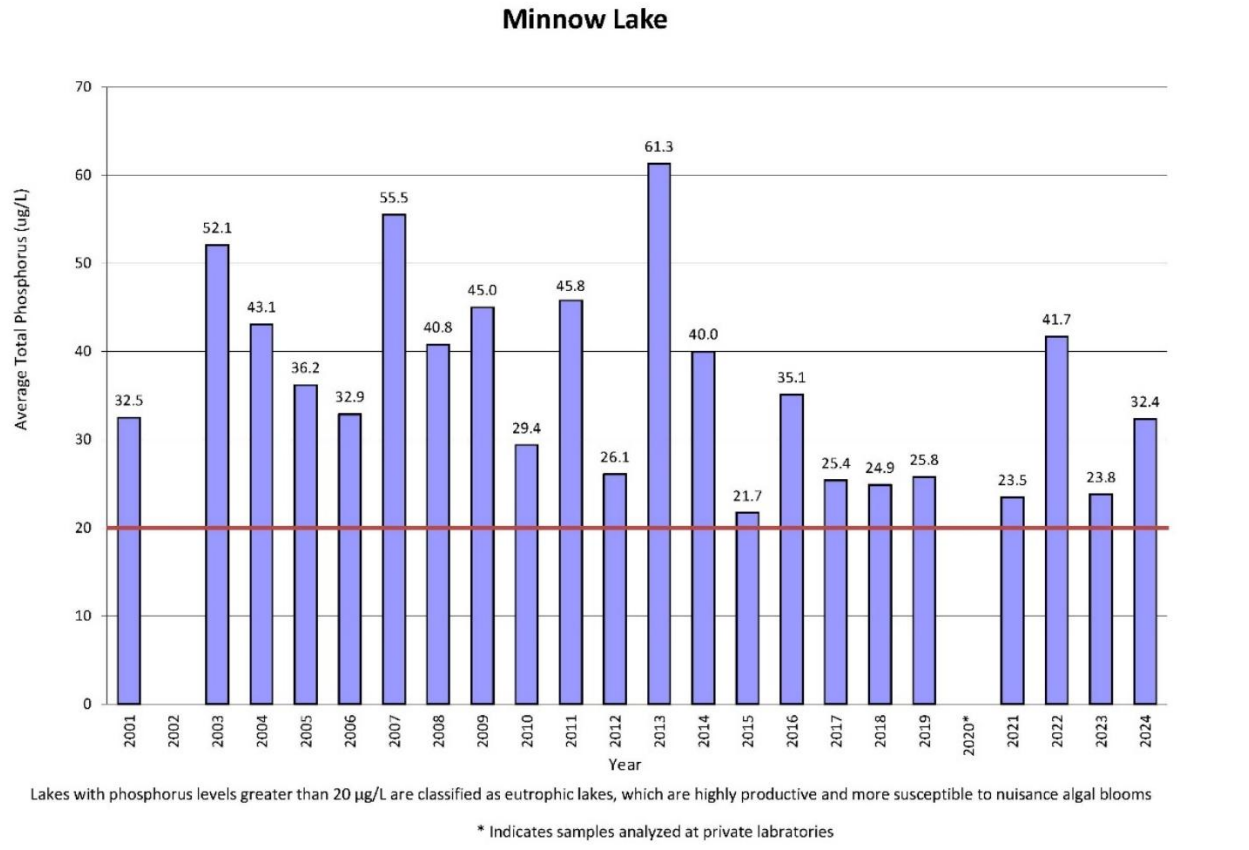

Figure 1. Total Phosphorus Concentrations in Minnow Lake Collected During Spring Turnover

Methodology

The Lake Water Quality Program 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 utilizes a point-intercept sampling design, which applies a grid of geo-referenced points across the lake to ensure consistency and comparability of results over time (Hauxwell *et al*., 2010). The approach enables a comprehensive assessment of all aquatic plant species and provides estimates of species richness, frequency, abundance, and maximum depth of colonization within the lake (Hauxwell *et al*., 2010).

Aquatic Plant Distribution Maps

The protocol outlined by Hauxwell et al., (2010) and Mikulyuk et al., (2010) described the essential steps needed to create an evenly distributed grid over the lakes' littoral zone to ensure consistent mapping across the water body. The littoral areas of a lake are those where sunlight penetrates down to 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 (Hauxwell *et al*., 2010).

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 (SDF).

The SDF represents the ratio of the length of the shoreline to the circumference of a circle equal in area to that of the lake (Mikulyuk *et al*., 2010). It is **not** a measure of housing development but rather reflects shoreline complexity, which influences the diversity and extent of aquatic plant communities (Mikulyuk *et al*., 2010). A higher SDF indicates a greater complexity of a shoreline, which typically allows for increased development of the aquatic plant communities in the littoral area (Mikulyuk *et al*., 2010).

Applying the protocol, Minnow Lake required 166 sampling points (shown in Figure 2). The points were used to create an evenly distributed grid across the littoral zone. Each sampling location was geo-referenced using NAD83 UTM coordinates (see Appendix A – Coordinates).

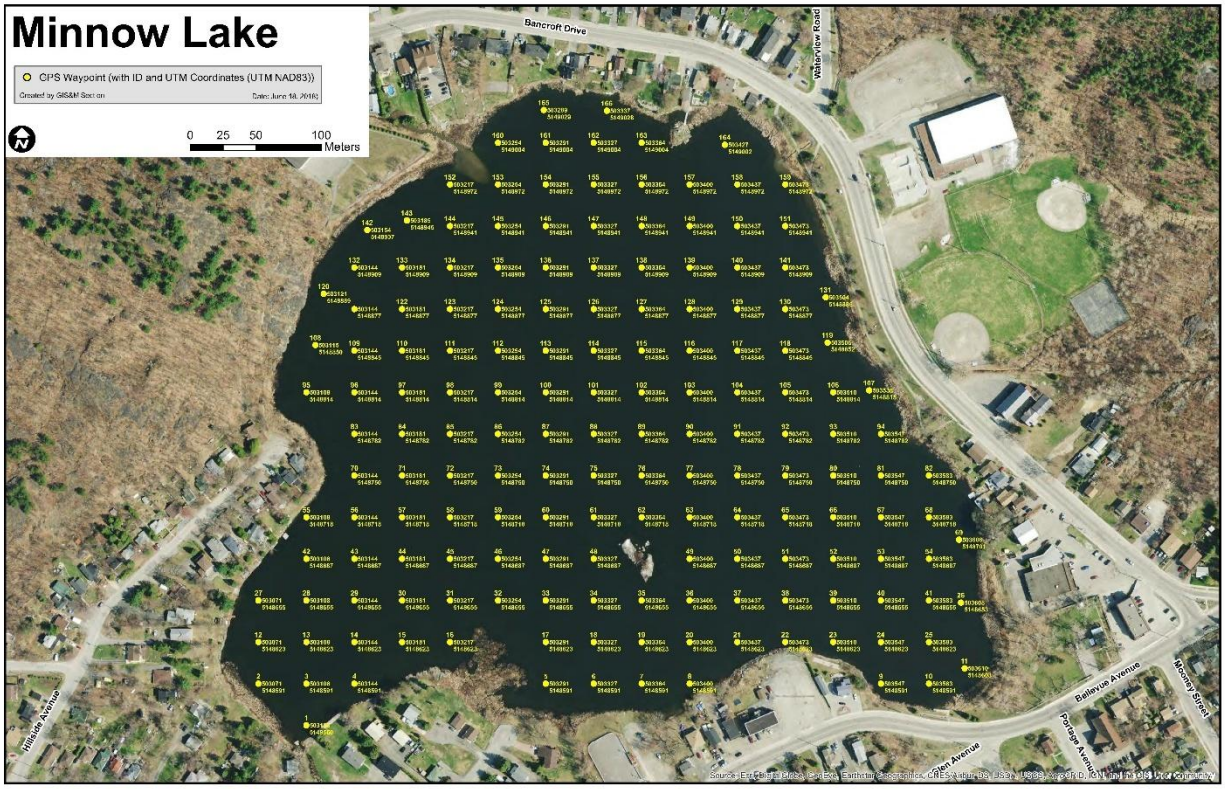

Figure 2. Sampling Locations on Minnow Lake

Field Equipment

Aquatic vegetation mapping requires minimal field equipment. The primary tool is a rake sampler, which is available in various designs. To maintain consistency across surveys, the City of Greater Sudbury used the same rake sampler for all lakes - a 19-tine thatching rake with the head detached and secured to a 50-foot rope (see Figure 3). This rake was selected for its double-sided design, cost-effectiveness, and ability to efficiently collect and retain aquatic vegetation during sampling.

Figure 3. Modified Thatching Rake Used by the City of Greater Sudbury for Aquatic Vegetation Sampling

A Garmin GPSMAP 64S handheld GPS unit 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).

Printed maps displaying sampling points and coordinates were used alongside the GPS for verification. Metallic permanent markers were employed to mark completed points for visibility on dark-colored maps.

A canoe was used to safely access sampling locations.

Data recording was supported by pre-printed tables containing coordinates, along with pencils, pens, and markers for documenting observations (2019 data were included in the tables).

Identification guides were also utilized to confirm species during sampling. Garbage bags were used to contain aquatic invasive species for proper disposal, while large freezer bags were used to transport plant samples to the office for pressing and accurate identification.

Field Survey

Aquatic vegetation sampling on Minnow Lake was conducted on August 23 and August 27, 2024, during peak growth conditions. At each sampling point, the rake was tossed into the water within 1–3 meters of the watercraft, dragged across the substrate, and retrieved. Rake fullness was recorded to estimate plant density, and all species were identified and documented, including the dominant species present. All scientific names follow the Integrated Taxonomic Information System (ITIS). After each toss, the canoe was repositioned to account for any drift. Three rake tosses were completed at each sampling point to ensure accurate representation of plant species.

Survey results were entered into GIS software and overlaid on satellite imagery to visualize species distribution within the lake. Maps of aquatic plant species observed in Minnow Lake are provided in Appendix B – 2019 Maps and Appendix C – 2024 Maps.

Results

A total of 166 points were sampled on Minnow Lake, documenting a total of eight aquatic plant species. At each sampling point, rake fullness was estimated, and the dominant species was recorded when clearly identifiable. The two most frequent observed species were native: Muskgrass (*Chara* spp.) present at 74.1% of sites, and Pondweed (*Potamogeton spp.*) found at 67.5% of sites. The invasive Eurasian Watermifoil (*Myriophyllum spicatum*) was found at 37 locations, representing 22.3% of sites. Coontail (*Ceratophyllum demersum*) was found at 49 locations (29.5%), a notable change as it was absent from the 2019 survey, suggesting either a recent introduction or previously missed. While the point-intercept method provides a consistent representation of the lake, some species may be missed due to their occurrence between sampling points or failure to adhere to the rake. Table 1 summarizes the species recorded and their frequency of occurrence.

Table 1. Recorded Aquatic Plant Species in Minnow Lake (2024)

Common Name	Scientific Name	Locations Present	% of Sampling Locations
Muskgrass	***Chara spp.***	123	74.1%
Yellow Waterlily	***Nuphar lutea***	11	6.6%
White Waterlily	***Nymphaea odorata***	16	9.6%
Eurasian Water Milfoil (invasive)	***Myriophyllum spicatum***	37	22.3%
Wild Celery/Tapegrass	***Vallisneria americana***	10	6.0%
Pondweed	***Potamogeton spp.***	112	67.5%
Sago Pondweed	***Stuckenia pectinata***	1	0.6%
Coontail (new)	***Ceratophyllum demersum***	49	29.5%

Species presence/absence data were compiled and overlaid onto geo-referenced satellite imagery using ESRI ArcGIS. Maps were created to illustrate dominant species at each sampling point (Figure 4), plant density (rake fullness) at each location (Figure 5), and the overall distribution of each species throughout the lake (Appendix C). Visual observations of species not captured by the rake were also incorporated into the overall data and are shown in Figure 6.

The 2019 survey assessed the presence and extent of Eurasian Watermilfoil along with the native vegetation. Data collected in 2024 indicate an increase in EWM, from one location in 2019 to 37 locations in 2024. Despite this expansion, native vegetation remains dominant across Minnow Lake, including a possible species introduction (Coontail).

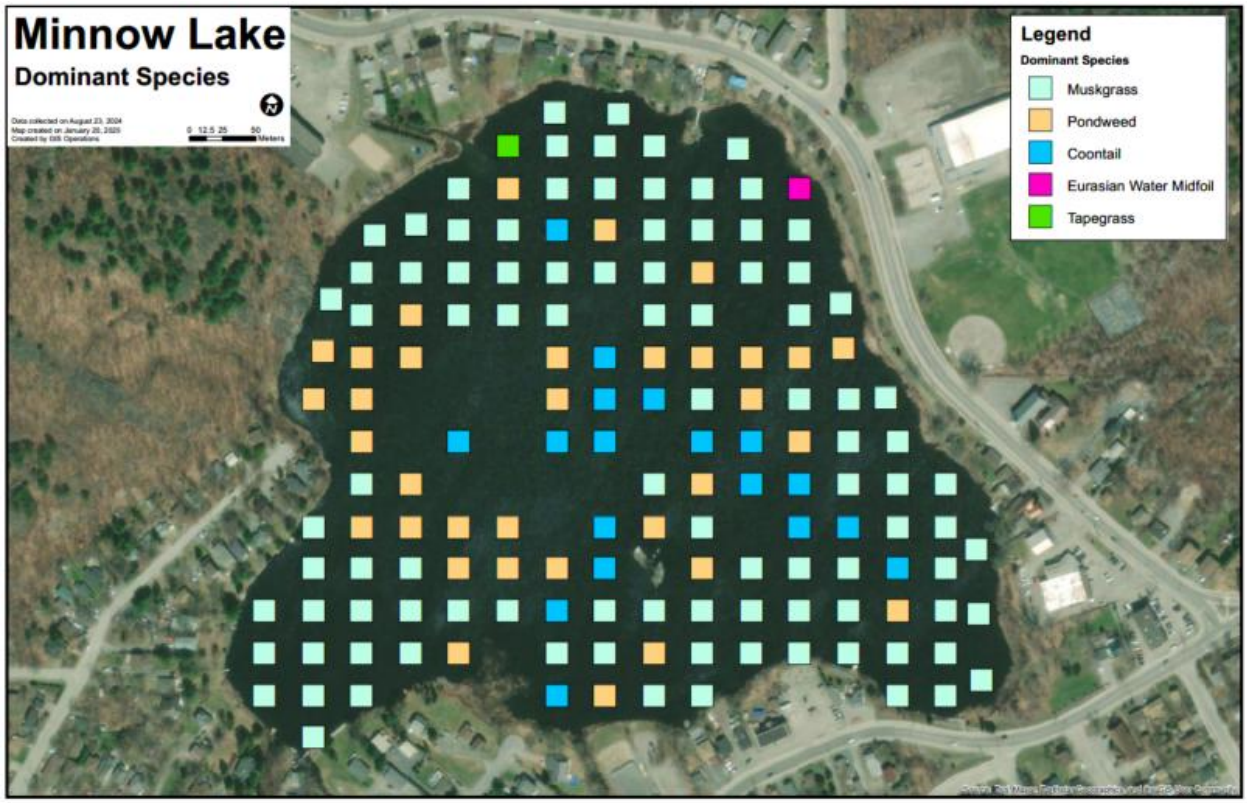

Figure 4. Locations of Dominant Aquatic Plant Species in Minnow Lake

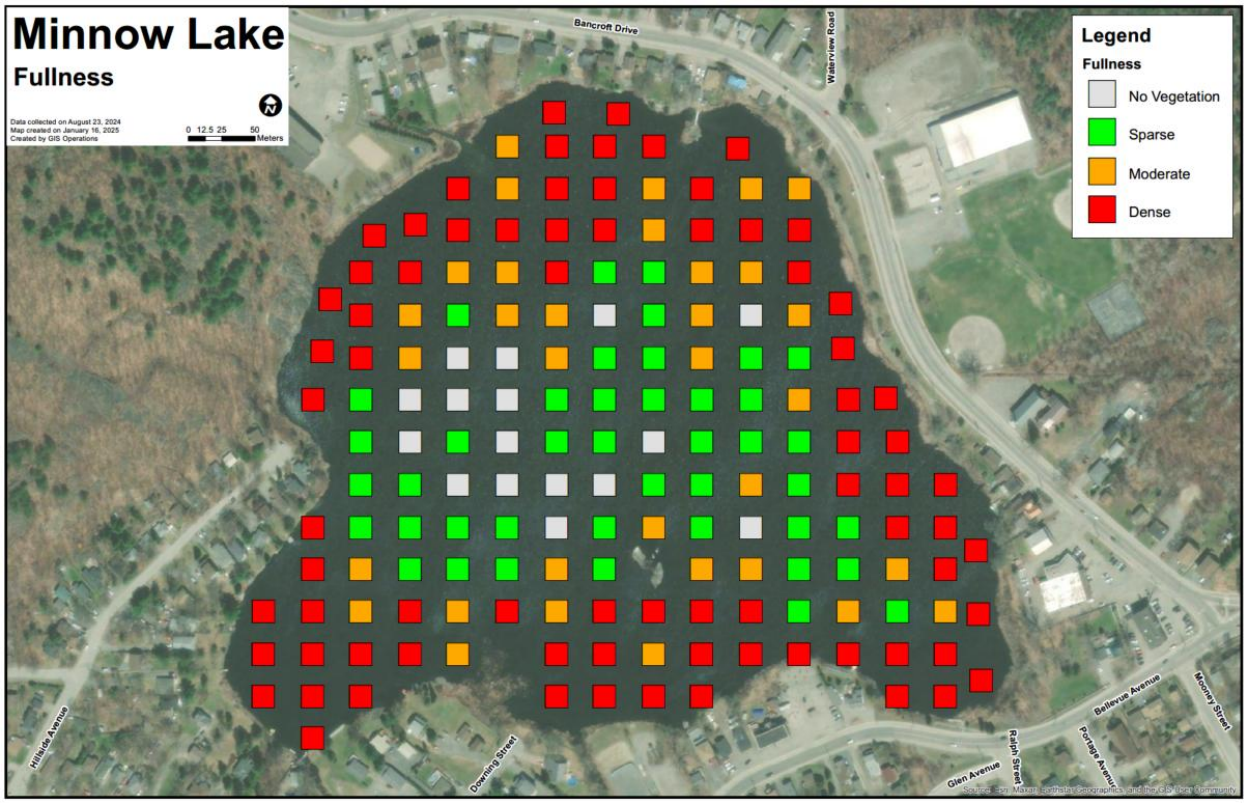

Figure 5. Rake Fullness Recorded at Sampling Locations on Minnow Lake

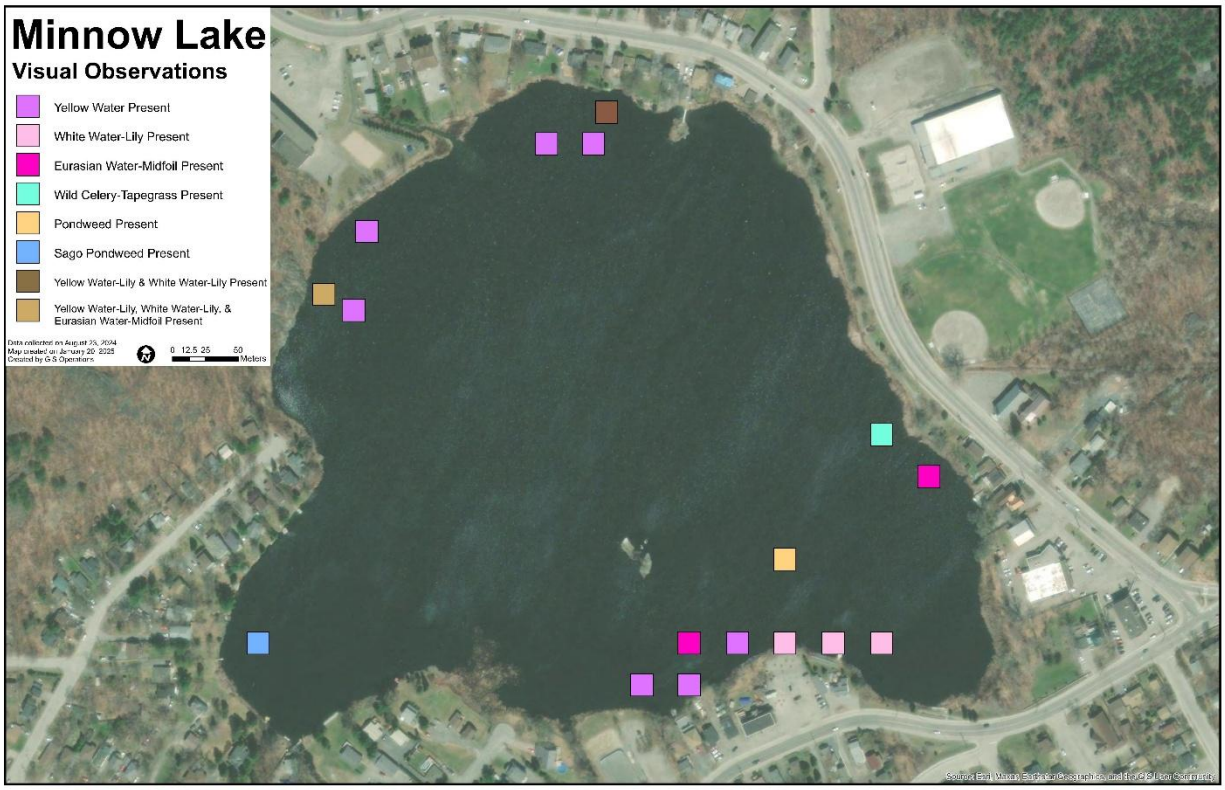

Figure 6. Visual Observations of Aquatic Vegetation Seen in the Lake - NOT Captured in the Rake

Conclusion

The 2024 aquatic vegetation survey of Minnow Lake identified eight plant species, with Muskgrass (*Chara* spp.) and Pondweed (*Potamogeton* spp.) being the most frequently observed. Eurasian Watermilfoil (*Myriophyllum spicatum*), an invasive species, was detected at 37 of the 166 sampling locations—an increase from 2019 when it was found at only one location. While Eurasian Watermilfoil showed expansion over the five-year period, it was dominant at only one sampling point. Native vegetation continues to prevail across the lake, with Coontail (*Ceratophyllum demersum*), a native species absent in 2019, now established at 49 locations.

Although native species remain dominant, the increase in Eurasian Watermilfoil highlights the potential for continued spread and ecological impact. Ongoing monitoring of Minnow Lake will be maintained, alongside continued education and outreach efforts to inform residents and lake users about the risks of further spreading Eurasian Watermilfoil through fragmentation. Additional emphasis will be placed on preventing the transfer of this invasive species to other waterbodies.

References

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Appendix A

Coordinates

Minnow Lake - GPS Coordinates

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)
1	503108	5148560
2	503071	5148591
3	503108	5148591
4	503144	5148591
5	503291	5148591
6	503327	5148591
7	503364	5148591
8	503400	5148591
9	503547	5148591
10	503583	5148591
11	503610	5148603
12	503071	5148623
13	503108	5148623
14	503144	5148623
15	503181	5148623
16	503217	5148623
17	503291	5148623
18	503327	5148623
19	503364	5148623
20	503400	5148623
21	503437	5148623
22	503473	5148623
23	503510	5148623
24	503547	5148623
25	503583	5148623
26	503608	5148653
27	503071	5148655
28	503108	5148655
29	503144	5148655
30	503181	5148655
31	503217	5148655
32	503254	5148655

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)
33	503291	5148655
34	503327	5148655
35	503364	5148655
36	503400	5148655
37	503437	5148655
38	503473	5148655
39	503510	5148655
40	503547	5148655
41	503583	5148655
42	503108	5148687
43	503144	5148687
44	503181	5148687
45	503217	5148687
46	503254	5148687
47	503291	5148687
48	503327	5148687
49	503400	5148687
50	503437	5148687
51	503473	5148687
52	503510	5148687
53	503547	5148687
54	503583	5148687
55	503108	5148718
56	503144	5148718
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58	503217	5148718
59	503254	5148718
60	503291	5148718
61	503327	5148718
62	503364	5148718
63	503400	5148718
64	503437	5148718

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)
65	503473	5148718
66	503510	5148718
67	503547	5148718
68	503583	5148718
69	503606	5148701
70	503144	5148750
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73	503254	5148750
74	503291	5148750
75	503327	5148750
76	503364	5148750
77	503400	5148750
78	503437	5148750
79	503473	5148750
80	503510	5148750
81	503547	5148750
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83	503144	5148782
84	503181	5148782
85	503217	5148782
86	503254	5148782
87	503291	5148782
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89	503364	5148782
90	503400	5148782
91	503437	5148782
92	503473	5148782
93	503510	5148782
94	503547	5148782
95	503108	5148814
96	503144	5148814

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)
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98	503217	5148814
99	503254	5148814
100	503291	5148814
101	503327	5148814
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122	503181	5148877
123	503217	5148877
124	503254	5148877
125	503291	5148877
126	503327	5148877
127	503364	5148877
128	503400	5148877

ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)
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ID	UTM NAD83 (Easting)	UTM NAD83 (Northing)
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162	503327	5149004
163	503364	5149004
164	503427	5149002
165	503289	5149029
166	503337	5149028

Minnow Lake

GPS Waypoint (with ID and UTM Coordinates (UTM NAD83))

Created by GIS&M Section

Date: June 18, 2018)

0 25 50 100 Meters

Bancroft Drive

Waterview Road

Hillside Avenue

Bellevue Avenue

Mooney Street

Portage Avenue

Glen Avenue

1 503108 5148560
2 503071 5148591
3 503108 5148591
4 503144 5148591
5 503291 5148591
6 503327 5148591
7 503364 5148591
8 503400 5148591
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166 503337 5149028

Appendix B

2019 Maps

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

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

Legend

Dominant Species

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

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

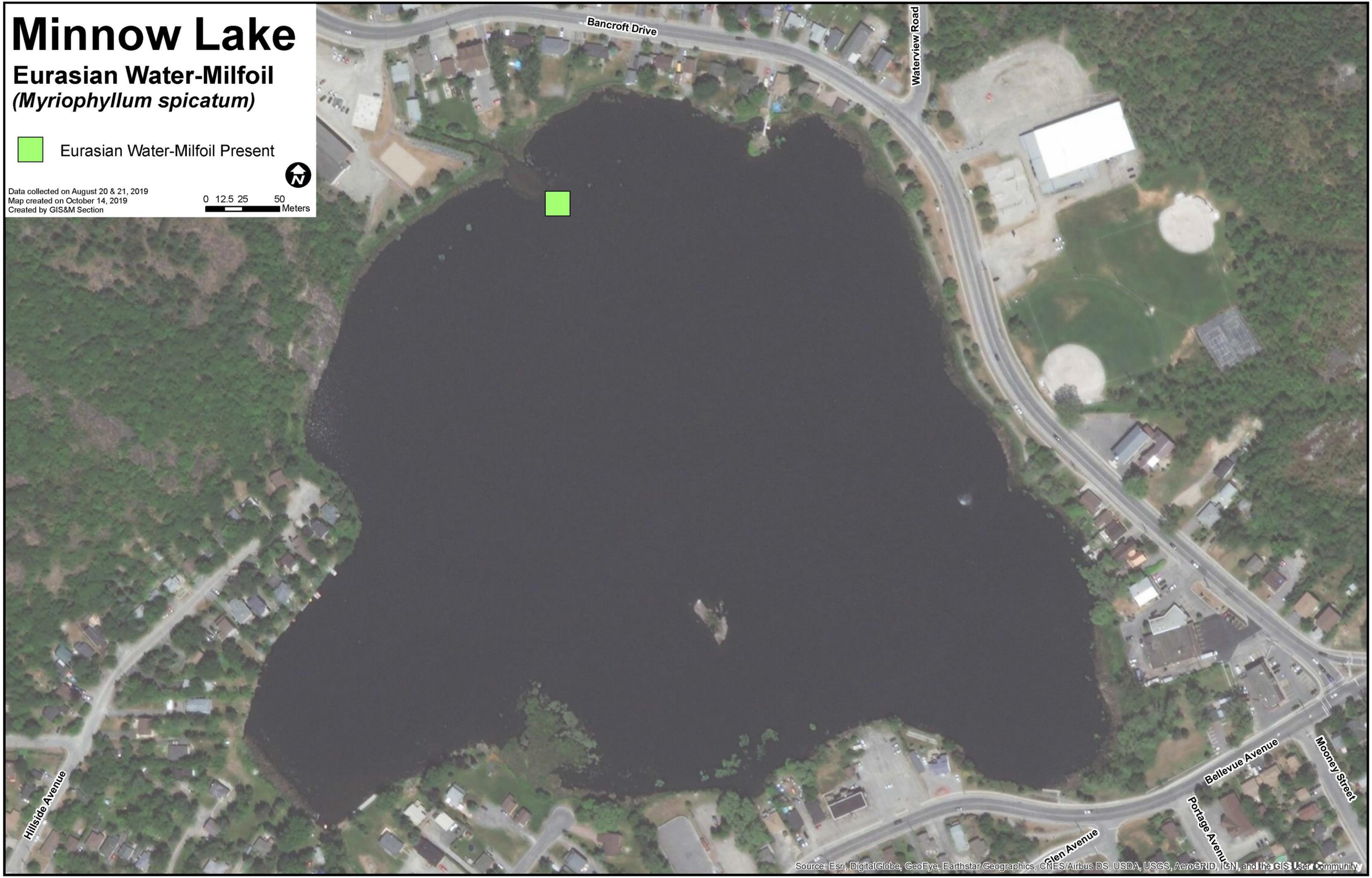
Minnow Lake

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

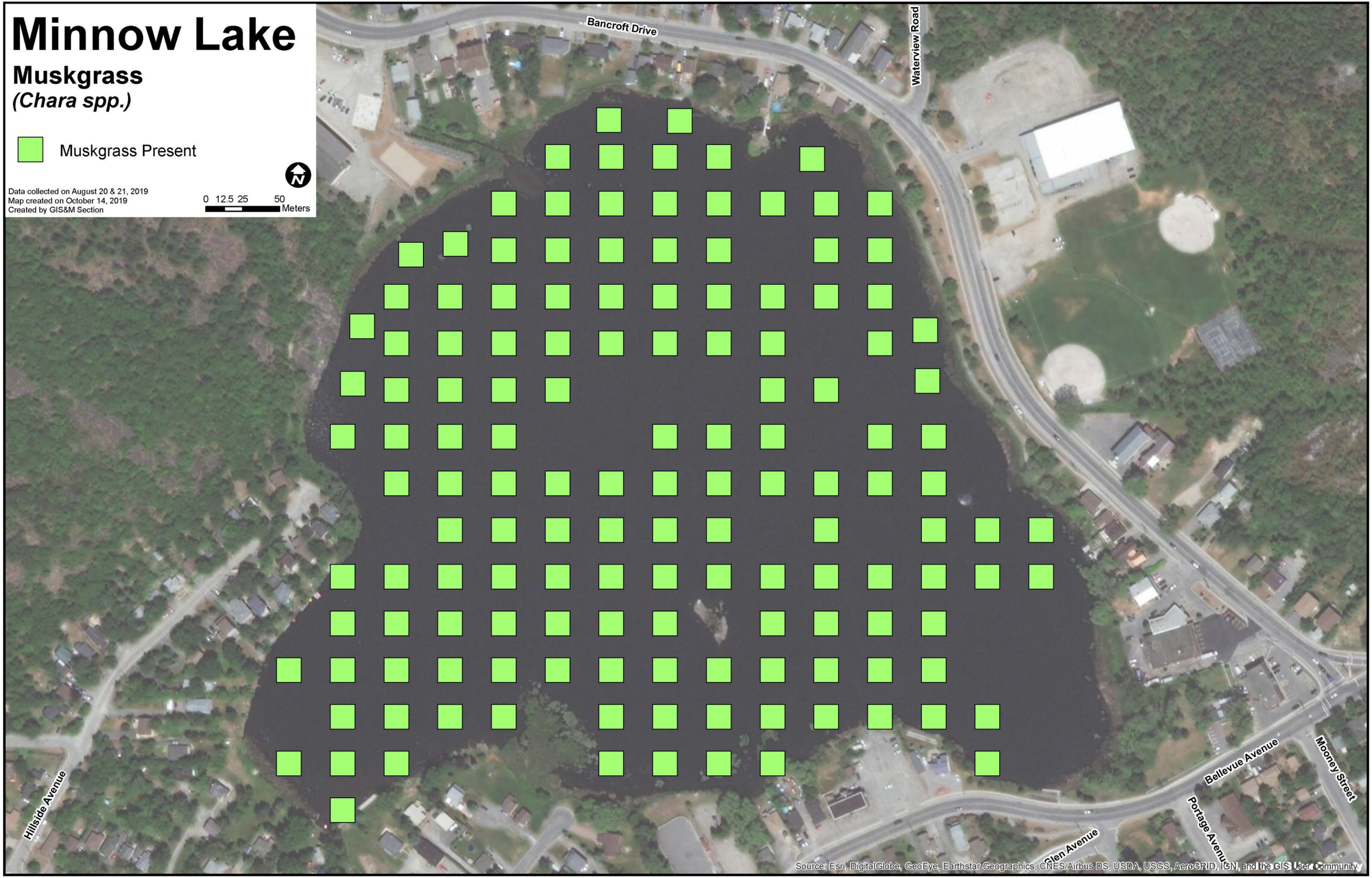
Muskgrass

(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



Minnow Lake

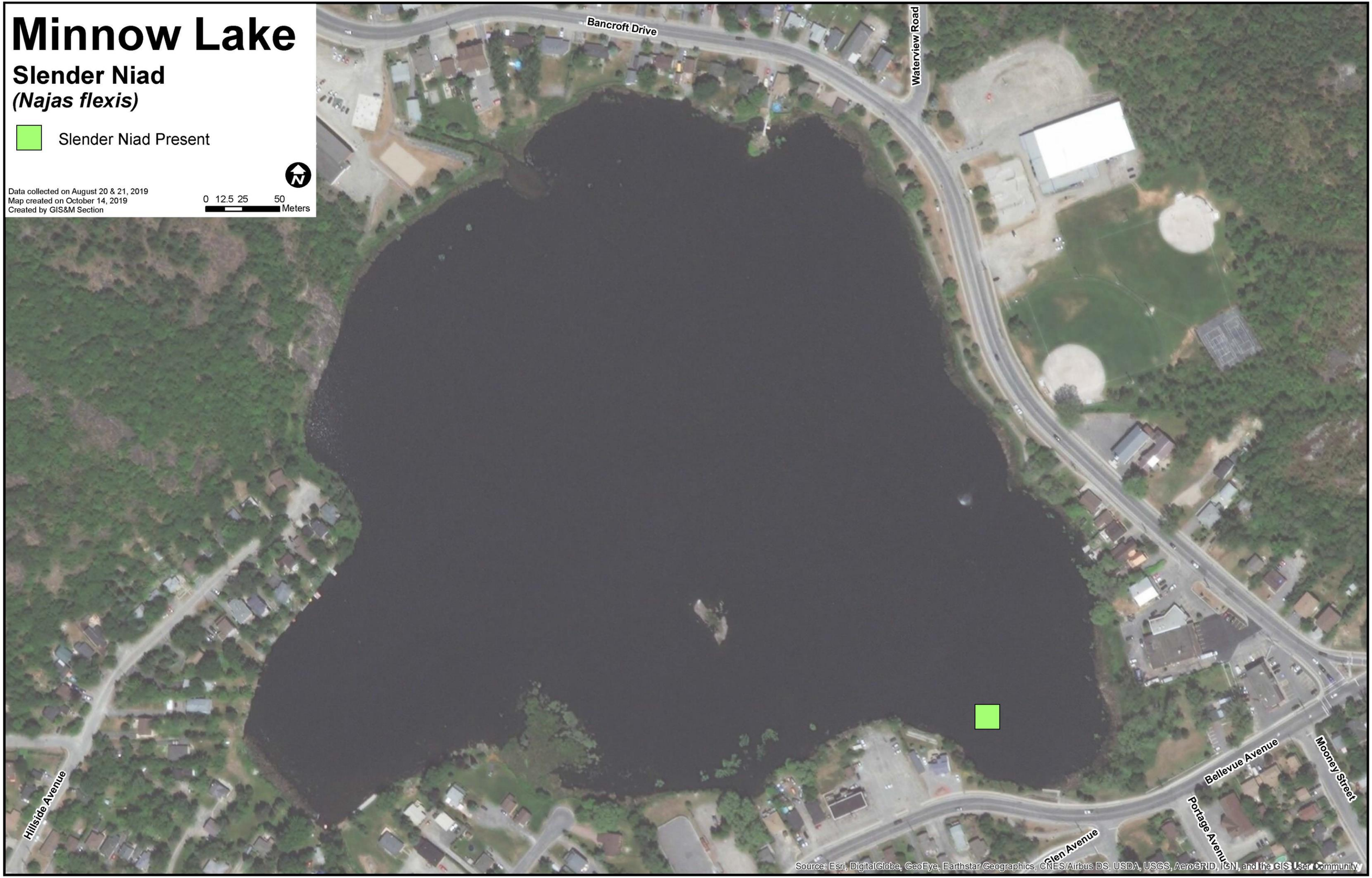
Slender Niad

(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



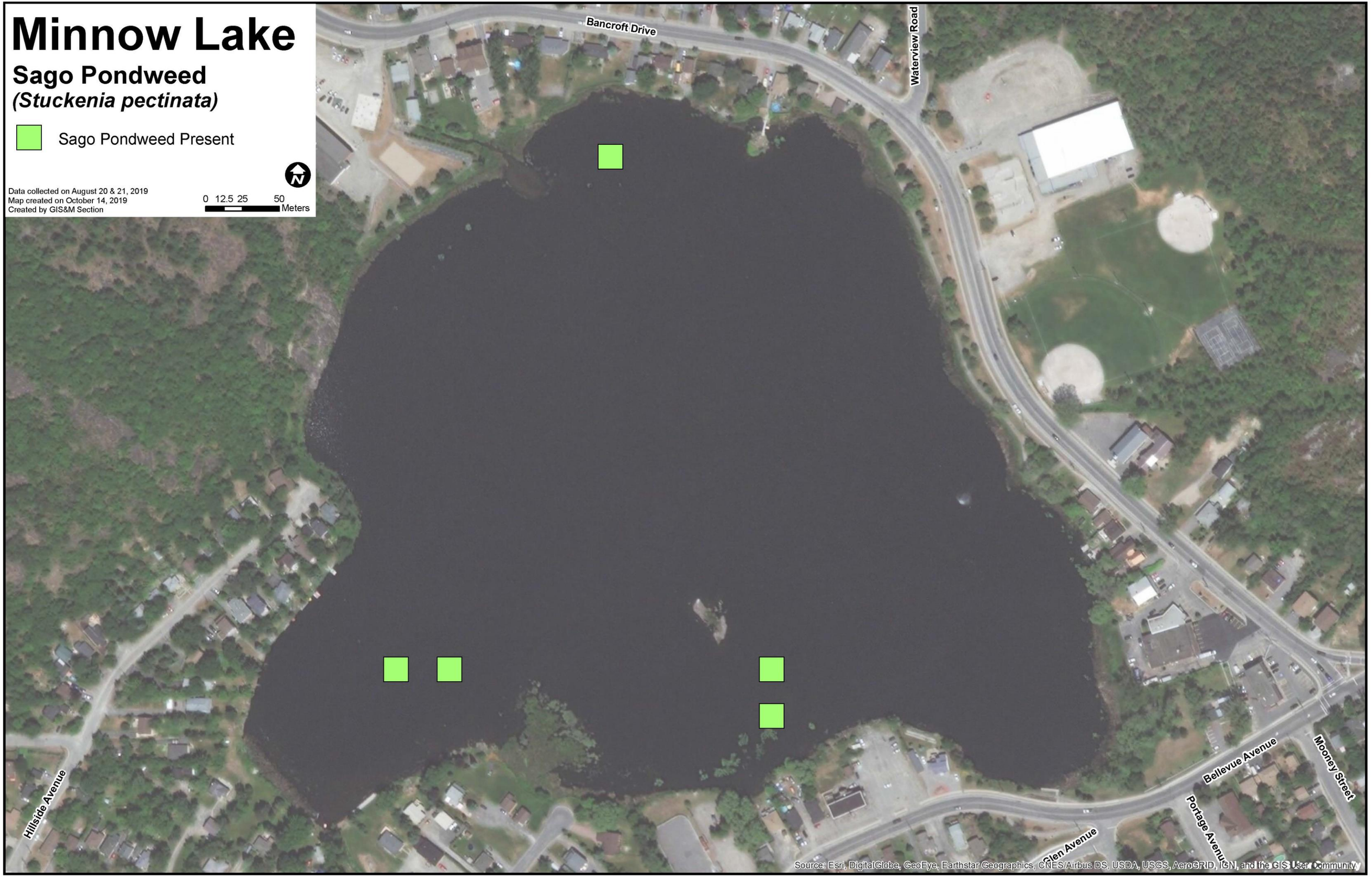
Minnow Lake

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

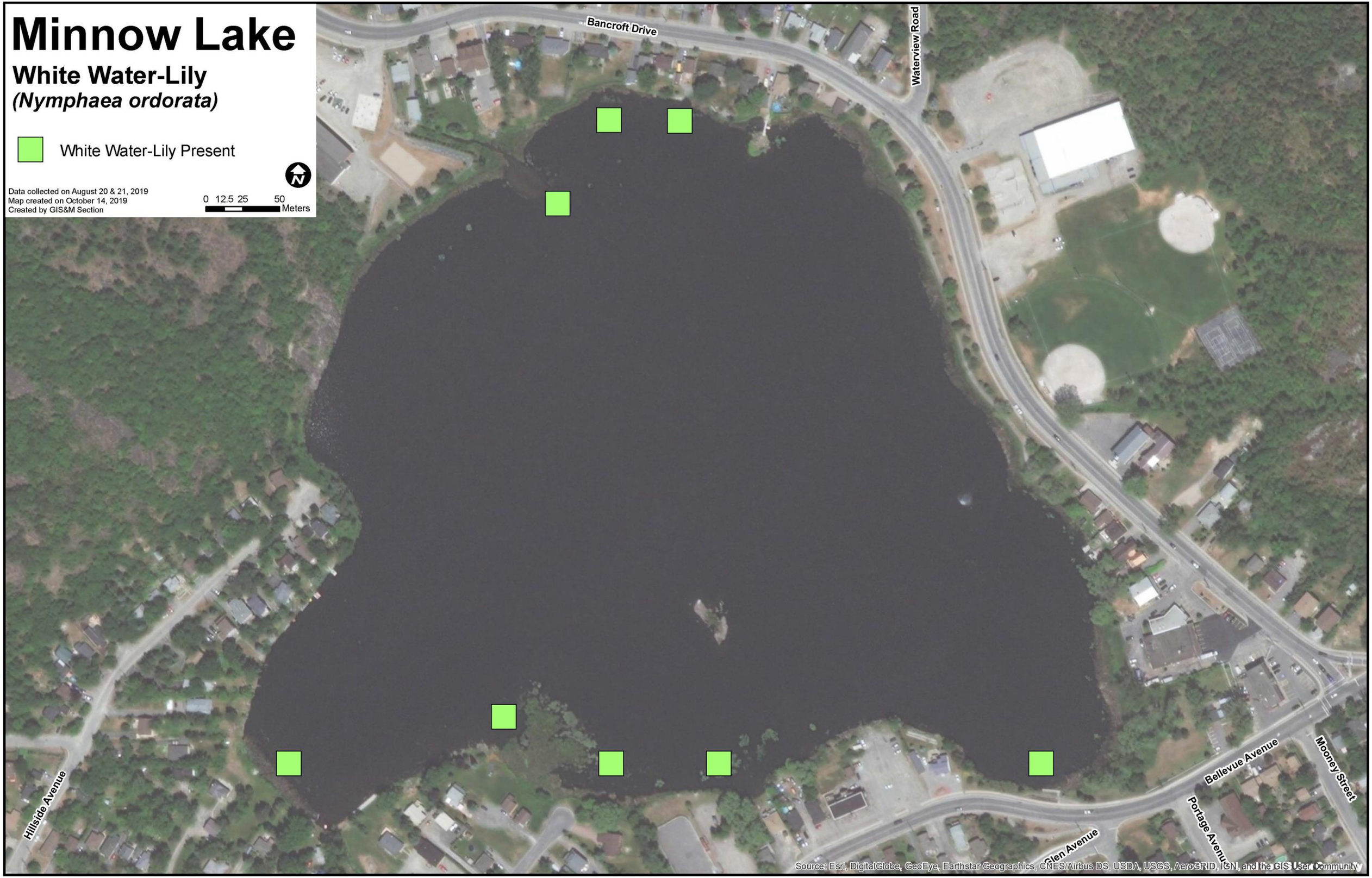
White Water-Lily

(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



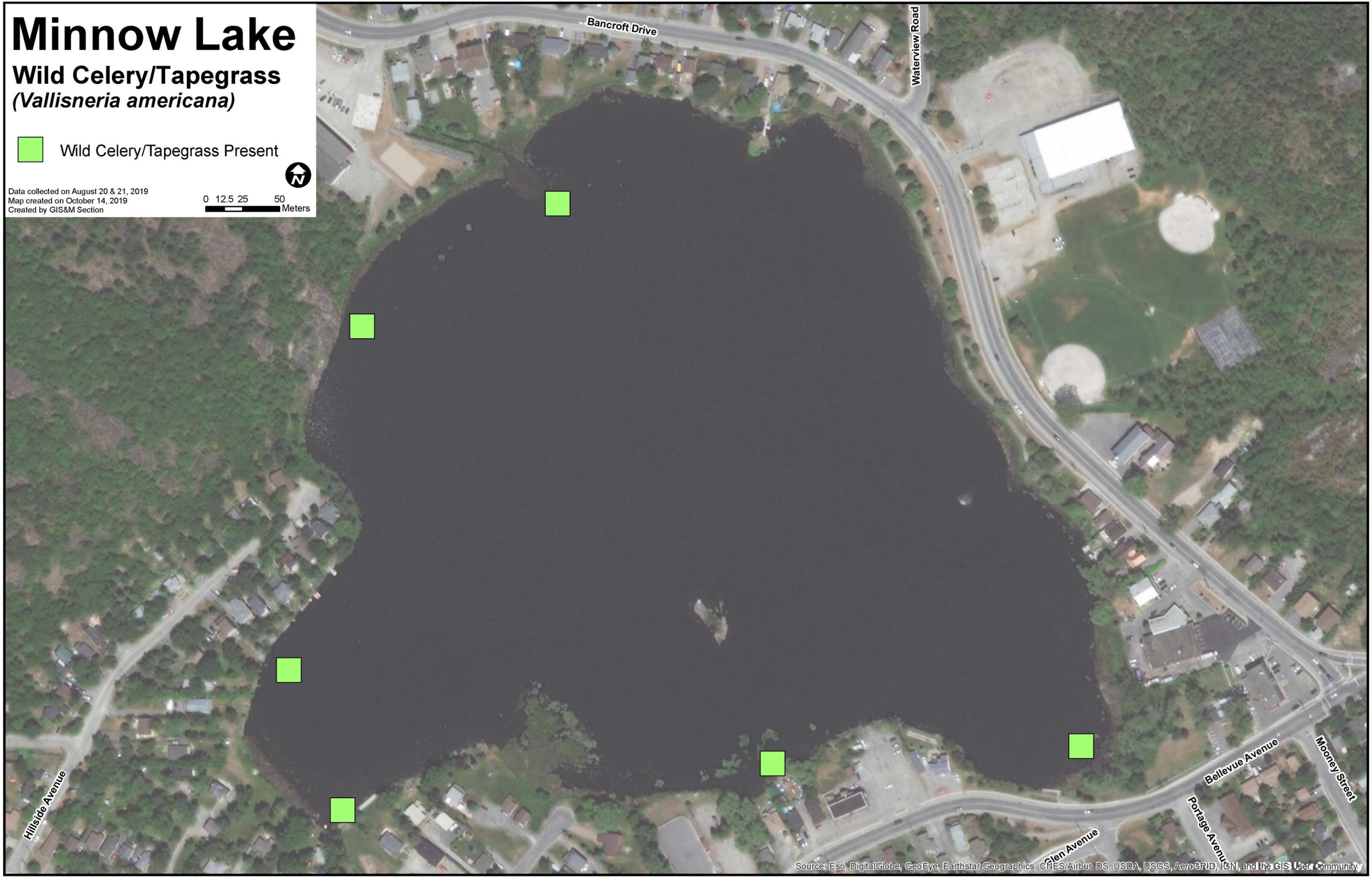
Minnow Lake

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



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

2024 Maps

Minnow Lake

Fullness

Data collected on August 23, 2024
Map created on January 16, 2025
Created by GIS Operations

0 12.5 25 50
Meters

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

Legend

Fullness

- No Vegetation
- Sparse
- Moderate
- Dense

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Minnow Lake

Dominant Species

Data collected on August 23, 2024
Map created on January 20, 2025
Created by GIS Operations

0 12.5 25 50
Meters

Legend

Dominant Species

- Muskgrass
- Pondweed
- Coontail
- Eurasian Water Midfoil
- Tapegrass

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

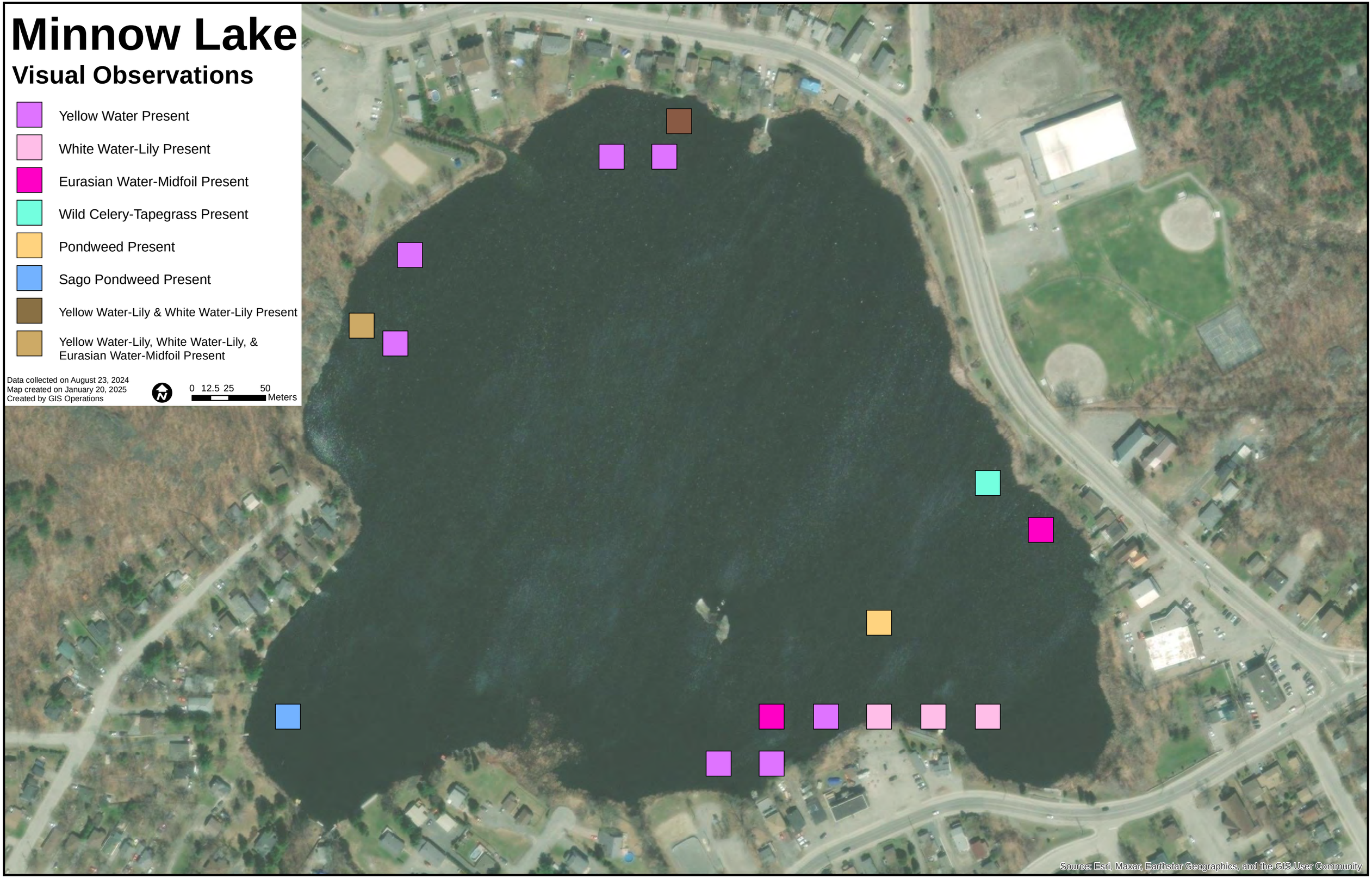
Minnow Lake

Visual Observations

- Yellow Water Present
- White Water-Lily Present
- Eurasian Water-Midfoil Present
- Wild Celery-Tapegrass Present
- Pondweed Present
- Sago Pondweed Present
- Yellow Water-Lily & White Water-Lily Present
- Yellow Water-Lily, White Water-Lily, & Eurasian Water-Midfoil Present

Data collected on August 23, 2024
Map created on January 20, 2025
Created by GIS Operations

0 12.5 25 50
Meters



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Minnow Lake

Muskgrass
(Chara spp.)

Muskgrass Present

Data collected on August 23, 2024
Map created on January 16, 2025
Created by GIS Operations

0 12.5 25 50
Meters

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Minnow Lake

Yellow Water-Lily
(Nuphar lutea)

Yellow Water-Lily Present

Data collected on August 23, 2024
Map created on January 16, 2025
Created by GIS Operations

0 12.5 25 50
Meters

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

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Minnow Lake

White Water-Lily
(Nymphaea ordorata)

White Water-Lily Present

Data collected on August 23, 2024
Map created on January 16, 2025
Created by GIS Operations

0 12.5 25 50
Meters

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Minnow Lake

Eurasian Water-Milfoil
(Myriophyllum spicatum)

Eurasian Water-Milfoil Present

Data collected on August 23, 2024
Map created on January 16, 2025
Created by GIS Operations

0 12.5 25 50
Meters

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

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Minnow Lake

Wild Celery/Tapegrass
(Vallisneria americana)

Wild Celery/Tapegrass Present

Data collected on August 23, 2024
Map created on January 16, 2025
Created by GIS Operations

0 12.5 25 50
Meters

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

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Minnow Lake

Pondweed
(Potamogeton spp.)

Pondweed Present

Data collected on August 23, 2024
Map created on January 16, 2025
Created by GIS Operations

0 12.5 25 50
Meters

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

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Minnow Lake

Sago Pondweed
(Stuckenia pectinata)

Sago Pondweed Present

Data collected on August 23, 2024
Map created on January 16, 2025
Created by GIS Operations

0 12.5 25 50
Meters

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

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Minnow Lake

Coontail

(Ceratophyllum demersum)

Coontail Present

Data collected on August 23, 2024
Map created on January 16, 2025
Created by GIS Operations

0 12.5 25 50
Meters

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