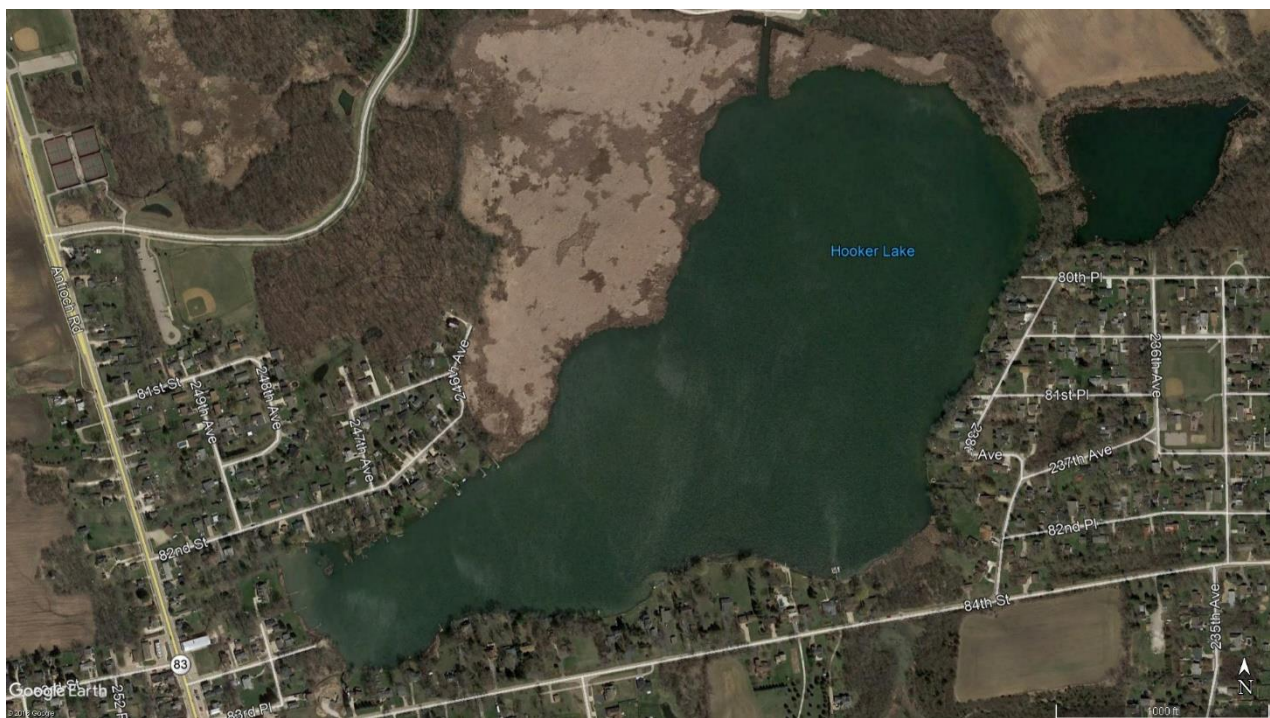


2023 Point-Intercept Survey Results

Hooker Lake



Prepared for:

Hooker Lake Management District

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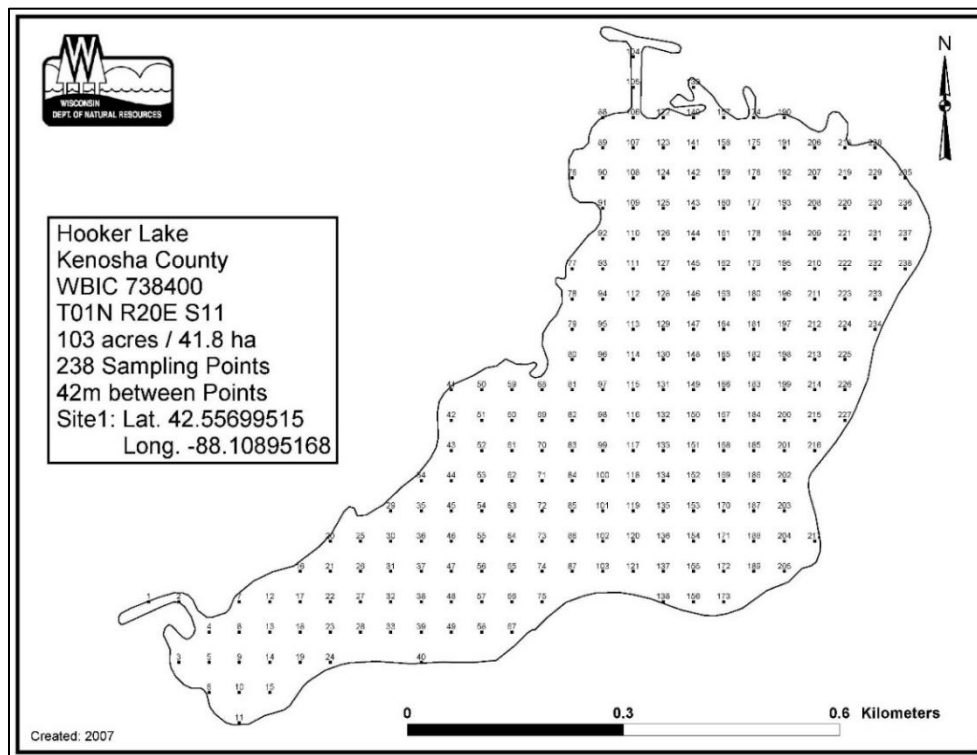
2023 HOOKER LAKE PLANT SURVEY RESULTS

The 2023 aquatic plant survey was requested by the Hooker Lake Management District as a tool to quantify ongoing longevity of the 2022 fluridone treatment and track changes in the plant community. It was conducted using some guidelines adopted by the WDNR for point-intercept survey methods. This method utilizes a grid system that considers the size and morphology of the lake. For the survey, the 238 WDNR established points (Figure 1) were transferred to a Garmin GPSMAP64 GPS unit before field sampling. At each established point, depth and substrate data at sites less than 15' deep were taken with a 15' graduated pole while sites over 15' deep were measured with a Humminbird sonar unit. Plant data was collected with a double headed rake on a 15' pole or a double headed rake on a rope. Data collection included depth, substrate type, species present, species density, overall rake density and any visuals of species located within a 6-foot radius of the boat. For emergent species, a visual was recorded for each point closest to shore. Ultimately, data was used to calculate frequency of occurrence, relative frequency of occurrence, average rake density, total sites with vegetation, maximum depth of plants, average native species per site, average of all species per site, species richness and floristic quality (FQI). It should be noted that our data is entered into a spreadsheet which takes visual observations into account.

Background

Plants were surveyed on July 27th, 2023 using 226 of the 238 pre-determined WDNR points (Figure 1). Twelve of these points were located either in too shallow of water, within large beds of cattails, or had an obstacle (dock). Twenty different species of plants were found covering approximately 39% of the Lake. On average, there were 2.34 native plant species found at each vegetated site.

Figure 1: Overview of 2023 Plant Sampling Points on Hooker Lake



SOURCE: WDNR (2007)

Plant Species

There were twenty different species of plants sampled during the 2023 Point-Intercept (PI) survey (Table 1). Species are listed from most to least frequent, including visual sightings. Data shown includes the overall frequency (percentage plant was found compared to all sites), relative frequency (percentage plant was found compared to vegetated sites), the average relative density rating (based on a scale of 1 for “least dense” and 3 for “most dense” at vegetated sites) and the C-Value (a numerical rating of 0-10 demonstrating a species’ ability to tolerate disturbance).

The five most common aquatic species within Hooker Lake based on relative frequency are Filamentous Algae (80.90%), Muskgrass (57.30%), Cattails (38.20%), Sago Pondweed (30.34%), and Water Star-grass (24.72%). There is a fair distribution of native plants, which includes three species listed as “high value” by the WDNR.

Table 1: Hooker Lake 2023 Plant Sampling Species Summary

Common Name	Scientific Name	Total Number of sites found (includes Visuals)	% Overall Frequency of Occurrence (Includes Visuals)	% Relative Frequency of Occurrence (Includes Visuals)	Average Density Rating	C-value
Filamentous Algae	n/a	72	31.86	80.90	1.06	n/a
Muskgrasses	Chara sp.	51	22.57	57.30	1.76	7
Cattail	Typha sp.	34	15.04	38.20	1.00	1
Sago pondweed*	Stuckenia pectinata	27	11.95	30.34	1.36	3
Water star-grass	Heteranthera dubia	22	9.73	24.72	1.20	6
Swamp loosestrife	Decodon verticillatus	21	9.29	23.60	V	n/a
Purple loosestrife**	Lythrum salicaria	20	8.85	22.47	V	Invasive
Orange Jewelweed	Impatiens capensis	18	7.96	20.22	V	n/a
Small duckweed	Lemna minor	9	3.98	10.11	1.00	4
White water lily	Nymphaea odorata	9	3.98	10.11	1.00	6
Coontail	Ceratophyllum demersum	4	1.77	4.49	1.00	3
Spatterdock	Nuphar variegata	3	1.33	3.37	V	6
Wild celery*	Vallisneria americana	3	1.33	3.37	V	6
Slender naiad	Najas flexilis	2	0.88	2.25	1.00	6
Common watermeal	Wolffia columbiana	1	0.44	1.12	V	5
Curly-leaf pondweed**	Potamogeton crispus	1	0.44	1.12	V	Invasive
Flat-stem pondweed	Potamogeton zosteriformis	1	0.44	1.12	V	6
Nitella	Nitella sp.	1	0.44	1.12	1.00	7
Southern naiad	Najas guadalupensis	1	0.44	1.12	1.00	8
Spiny naiad**	Najas marina	1	0.44	1.12	1.00	Invasive
White-stem pondweed*	Potamogeton praelongus	1	0.44	1.12	1.00	8

SOURCE: Lake and Pond Solutions LLC (2023)

* Species are considered “high value” plant species under Wisconsin Administrative Code NR 107

** Denotes non-native (exotic) species

% Overall Frequency The percentage a plant species was found compared to all sites sampled. It is calculated by taking the number of sites a species was found and dividing by the total number of *sampled points* on the lake.

% Relative Frequency The percentage a plant species was found compared to all sites with vegetation. It is calculated by taking the number of sites a species was found and dividing by the total number of *vegetated sites* on the lake.

Relative Average Density The average density of each plant species comparative to the number of sites where it was found. It is calculated by dividing the sum of the site densities (for that specific plant species) by the total number of sites where it was found

Table 2: Five Most Common Species Found in Hooker Lake 2023

2023 Survey		
Species	% Relative Frequency	C-Value
Filamentous Algae	80.90	n/a
Muskgrasses	57.30	7
Cattail	38.20	1
Sago pondweed	30.34	3
Water star-grass	24.72	6
Avg. C-Value of Top 5 Species = 4.25		
Floristic Quality of Top 5 Species = 8.50		

SOURCE: Lake and Pond Solutions LLC (2023)

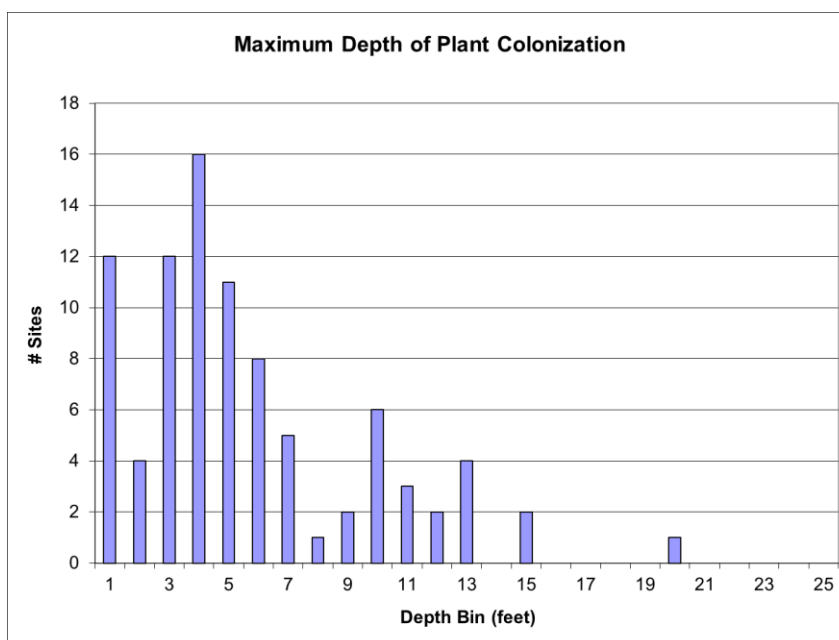
Table 3: 2018 - 2023 Hooker Lake PI Survey Statistics

Summary Statistics (Including Visuals)	2018 Survey (8-15-18)	2019 Survey (8-1-19)	2020 Survey (7-23-20)	2021 Survey (7-22-21)	2023 Survey (7-27-23)
Total Number of Sites with Vegetation/All Sites Sampled	90/235 (38.3%)	87/233 (37.3%)	101/231 (43.7%)	133/234 (56.8%)	89/226 (39.4%)
Maximum Depth of Plants	11.0'	10.5'	21.0'	18.0'	20.0'
Species Richness	16	20	22	21	20
Average Number of All Species per Vegetated Site	3.69	4.07	2.93	3.18	2.48
Average Number of Native Species per Vegetated Site	3.08	3.53	2.59	2.34	2.34
Simpson Diversity Index	0.91	0.92	0.85	0.85	0.88
Average C-Value	5.08	5.19	5.26	5.00	5.47
Floristic Quality	17.61	20.75	22.94	20.00	21.17

SOURCE: Lake and Pond Solutions LLC (2023)

Depth of plant colonization was recorded (Table 4). The deepest sampled plant was in 20.0 feet of water. The clear majority however was in the three to six-foot depth range, accounting for more than 52% of the vegetated sample sites.

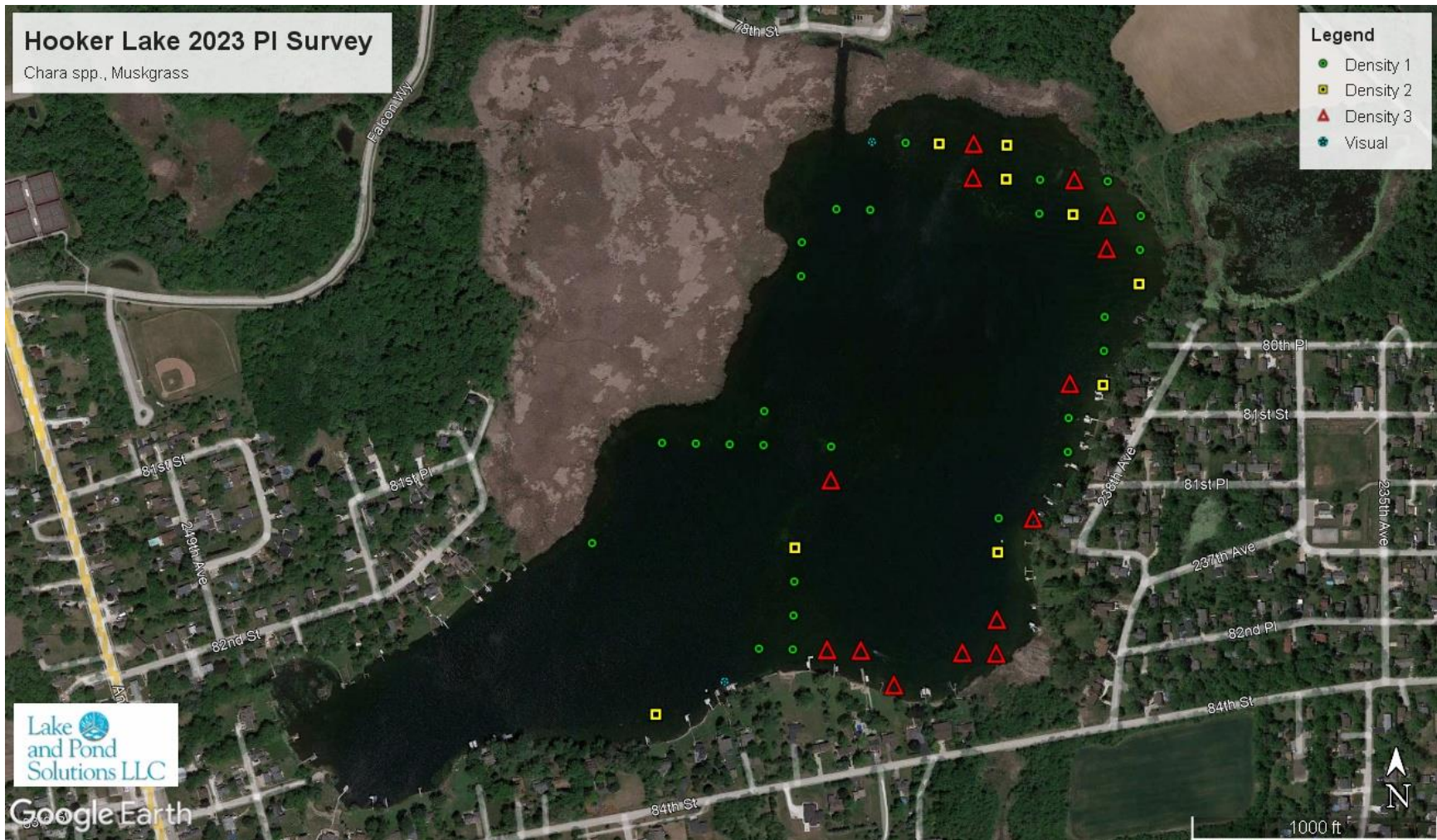
Table 4: Hooker Lake 2023 Depth of Plant Colonization



SOURCE: Lake and Pond Solutions LLC (2023)

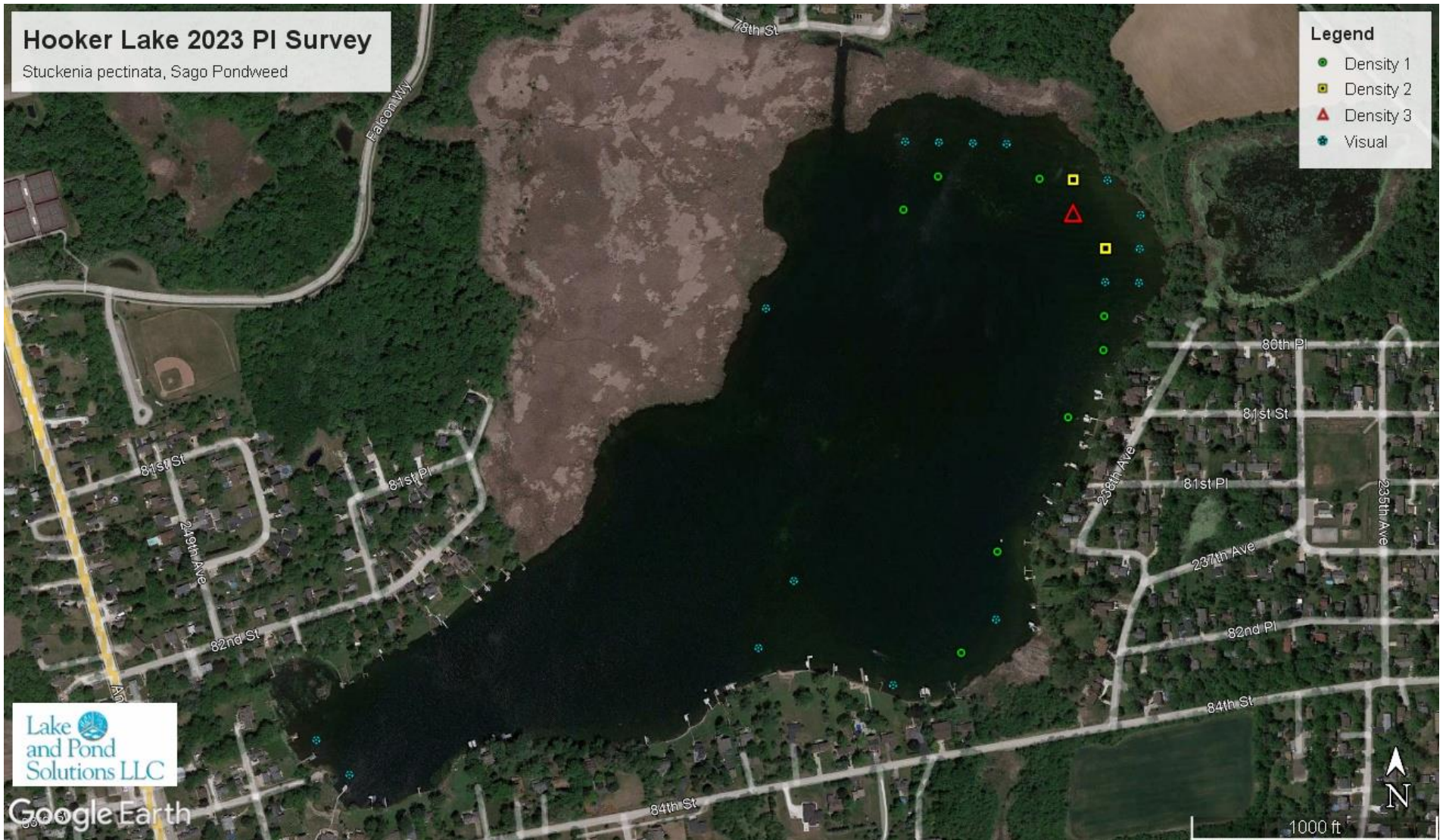
Figure 2 – **Error! Reference source not found.** show the distribution and densities of the top seven native species along with the three non-native species found in Hooker Lake in 2023 (arranged from most to least frequent distribution). We intentionally omitted maps for algae (1st), cattails (3rd), swamp loosestrife (6th), orange jewelweed (8th) and small duckweed (9th) since they are emergent or floating species.

Figure 2: Hooker Lake Muskgrass (*Chara spp.*) Distribution



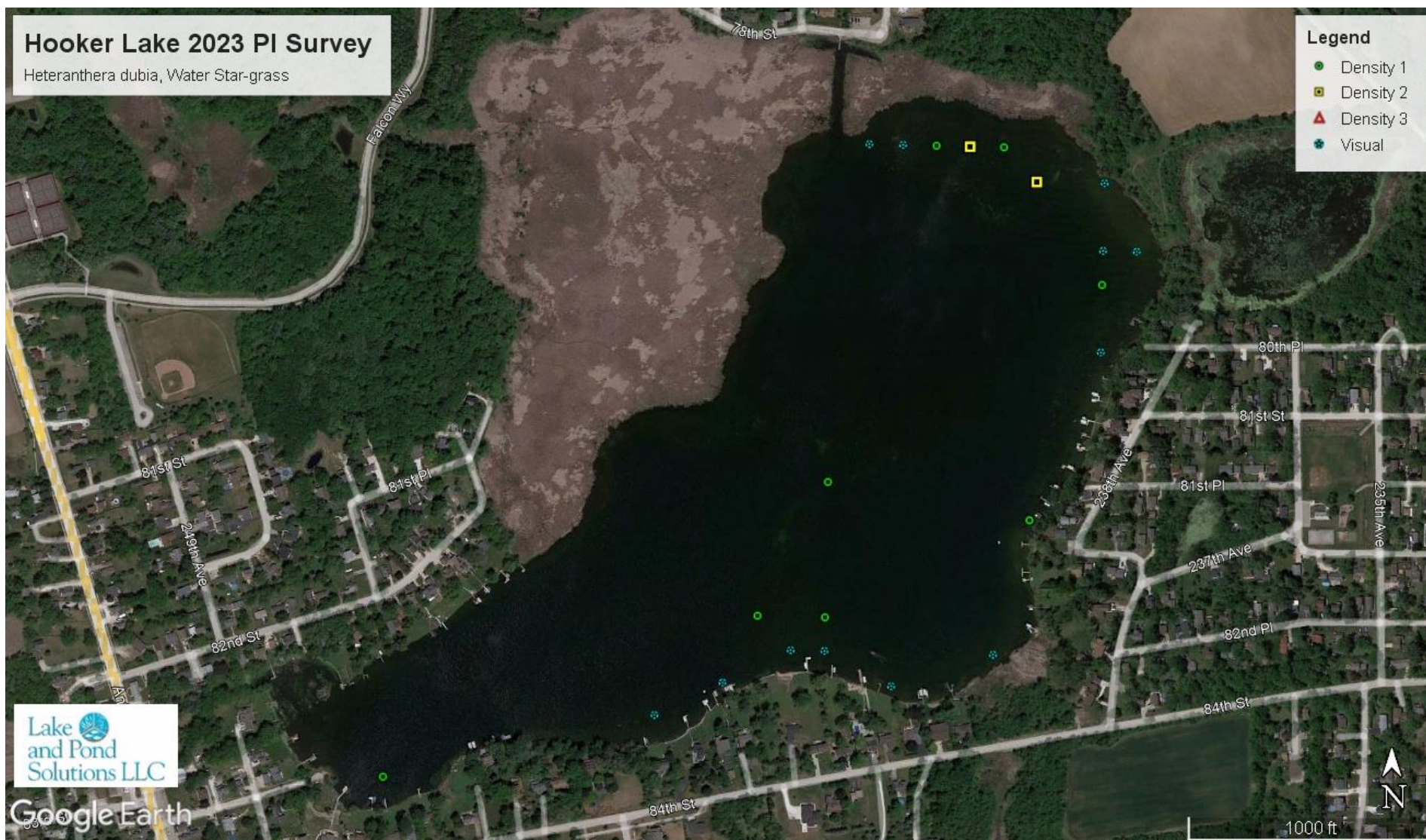
SOURCE: Lake and Pond Solutions LLC (2023)

Figure 3: Hooker Lake Sago Pondweed Distribution



SOURCE: Lake and Pond Solutions LLC (2023)

Figure 4: Hooker Lake Water Star-Grass Distribution



SOURCE: Lake and Pond Solutions LLC (2023)

Figure 5: Hooker Lake Purple Loosestrife (INVASIVE) Distribution



SOURCE: Lake and Pond Solutions LLC (2023)

Figure 6: Hooker Lake White Water Lily Distribution



SOURCE: Lake and Pond Solutions LLC (2023)

Figure 7: Hooker Lake Coontail Distribution



SOURCE: Lake and Pond Solutions LLC (2023)

Figure 8: Hooker Lake Spatterdock Distribution



SOURCE: Lake and Pond Solutions LLC (2023)

Figure 9: Hooker Lake Wild Celery Distribution



SOURCE: Lake and Pond Solutions LLC (2023)

Figure 10: Hooker Lake Curly-leaf Pondweed (INVASIVE) Distribution



SOURCE: Lake and Pond Solutions LLC (2023)

Figure 11: Hooker Lake Spiny Naiad (INVASIVE) Distribution



SOURCE: Lake and Pond Solutions LLC (2023)

Floristic Quality Assessment

Floristic Quality is a rapid assessment metric designed to evaluate the closeness that the flora of an area is to that of undisturbed conditions.¹ It can be used to:

- Identify natural areas
- Compare the quality of different sites or different locations within a single site
- Monitor long-term floristic trends and/or habitat restoration efforts

For any area (lake in this case), floristic quality (I) equals the average coefficient of conservatism (C-value) times the square root of the number of native species (\sqrt{N}). A C-value was assigned to 128 aquatic plants, compared to regional studies and reviewed by a number of biologists familiar with Wisconsin lake plants². They range from 0 to 10 with 10 being assigned to species most sensitive to disturbance. These final C-values were used in calculating the Floristic Quality for Hooker Lake. Table 5 summarizes the C-values compared to the Southeast Till Plain (STP) average, Wisconsin average and 75th percentile numbers. The STP average categorizes the lakes in the southeast corner of the state. Table 6 shows each individual plant species found in the lake along with the associated C-value, average C-value throughout the lake, and overall Floristic Quality.

The floristic quality within Hooker Lake has rebounded slightly from the last survey and is the second highest value in the past six seasons. The elimination of Eurasian water-milfoil has allowed the native species with C-Values over 5 to increase from eight to ten since the last survey.

Table 5: Floristic Quality Comparison

	2018	2019	2020	2021	2023	STP AVERAGE	WI AVERAGE	WI 75th PERCENTILE
Avg. C-Value	5.08	5.19	5.26	5.00	5.47	5.60	6.00	6.90
# of natives (N)	12	16	19	16	15	14	13	20
Floristic Quality	17.61	20.75	22.94	20.00	21.17	20.9	22.2	27.5

SOURCE: Lake and Pond Solutions LLC (2023)

¹ Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th Edition. The Morton Arboretum. Lisle, IL. 921 pp.

² Nichols, SA. 1999. Floristic Quality Assessment of Wisconsin Lake Plant Communities with Example Applications. *Journal of Lake and Reservoir Management*, 15(2):133-141.

Table 6: Hooker Lake Overall Floristic Quality

Common Name	Scientific Name	Total Number of Sites Found (Includes Visuals)	C-Value
Filamentous Algae	n/a	72	n/a
Muskgrasses	Chara sp.	51	7
Cattail	Typha sp.	34	1
Sago pondweed	Stuckenia pectinata	27	3
Water star-grass	Heteranthera dubia	22	6
Swamp loosestrife	Decodon verticillatus	21	n/a
Purple loosestrife	Lythrum salicaria	20	Invasive
Orange Jewelweed	Impatiens capensis	18	n/a
Small duckweed	Lemna minor	9	4
White water lily	Nymphaea odorata	9	6
Coontail	Ceratophyllum demersum	4	3
Spatterdock	Nuphar variegata	3	6
Wild celery	Vallisneria americana	3	6
Slender naiad	Najas flexilis	2	6
Common watermeal	Wolffia columbiana	1	5
Curly-leaf pondweed	Potamogeton crispus	1	Invasive
Flat-stem pondweed	Potamogeton zosteriformis	1	6
Nitella	Nitella sp.	1	7
Southern naiad	Najas guadalupensis	1	8
Spiny naiad	Najas marina	1	Invasive
White-stem pondweed	Potamogeton praelongus	1	8
AVG C-VALUE = 5.47			
FLORISTIC QUALITY = 21.17			

SOURCE: Lake and Pond Solutions LLC (2023)

Summary

Eurasian water-milfoil had swelled to 85 sites in 2021 but was not found this year after the whole lake fluridone treatment in 2022. The native plant community remained consistent with 17 native species present and an average of 2.34 native species per site, but there was a decline in the percentage of vegetation in the lake (39.4% versus 56.8% in 2021). One of the largest changes was coontail which declined from 91.73% frequency in 2021 to only 4.49% this year. In response, filamentous algae, muskgrass, and sago pondweed all saw significant increases (23-48%).

Without a survey in 2022, it is difficult to know how much the community has rebounded since the fluridone treatment. The reduction in growth this year could be a function of the fluridone treatment but it could also be due to the unusual weather conditions impacting the plant community. The fact is there are still typical numbers of native species that are higher quality than they have been in the past, albeit at lower densities. It will be important to monitor the

plant community next year to document further changes and determine if fluridone or another product like ProcellaCOR may be better suited for milfoil control in the future.

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