

Pike Lake - Curly Leaf Pondweed Project

Year 3 Report of Plant Survey Findings

for Pike Lake and the Turtle River

This report is a product of a WDNR Aquatic Invasive Species Grant (Early Detection & Response) awarded to:

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Submitted to:
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Introduction

The recent discovery of the aquatic invasive species (AIS) curly-leaf pondweed (*Potamogeton crispus*) in Pike Lake and the Turtle River (upstream of Pike Lake) motivated a group of Pike Lake stakeholders to organize around managing this aquatic nuisance plant. The group sought financial assistance for this undertaking from the Wisconsin Department of Natural Resources (WDNR) in the form of an AIS grant (Early Detection & Response). As an incipient organization, the Pike Lake group was not yet eligible for the grant but their upstream neighbor, the Rice Lake Association, acted as the sponsoring organization and received the grant. White Water Associates, Inc. was engaged to conduct biological surveys as part of the funded project on both Pike Lake and the Turtle River where it flows between the more upstream Rice Lake and Pike Lake. These surveys included (1) point-intercept aquatic plant surveys, (2) surveys for curly-leaf pondweed before and after hand-pulling conducted by volunteers, and (3) AIS survey. The project specifies that these surveys occur at various times over a three-year period (2020, 2021, and 2022). This document reports on the efforts of the third year (2022) activities by White Water Associates and discusses the status of the plant communities in the targeted Turtle River reach and Pike Lake.

Study Area

Pike Lake is located near the town of Mercer in Iron County, Wisconsin. It is one of several lakes that exist along the Turtle River. The portion of the Turtle River that was subject to our efforts is located from the river outlet at the southwest end of Rice Lake downstream to the inlet at the northeastern end of Pike Lake. Exhibit 1 is a topographic map of the area that includes Rice Lake, Pike Lake and the Turtle River. Pike Lake is a drainage lake of about 184 acres in surface area and with a maximum depth of 80 feet. Water transparency (Secchi depth) is typically about 7 or 8 feet. The stretch of the Turtle River that runs between Rice Lake and Pike Lake is about 2.6 miles and is generally less than 100 feet wide. It has a distinct current, but for the most part is flat water. There are three short stretches of rapids. It is most easily navigated by small watercraft such as a canoe, although larger motorized watercraft can navigate from Pike Lake about 0.5 mile upstream to the first set of rapids and in the area just downstream of Rice Lake where the river is more lacustrine in its character.

Methods

There were two specific surveys that we conducted on Pike Lake and the Turtle River in 2022: (1) post-treatment curly-leaf pondweed survey and (2) point-intercept aquatic plant survey.

In 2022, the pretreatment curly-leaf pondweed survey was conducted by Zach Wilson (Iron County Land and Water Conservation Department) and a group of volunteers during the interval of June 6 to June 9. Wilson and his crew carried out a thorough coverage meander search of the Pike Lake littoral zone and the Turtle River. All locations with curly-leaf pondweed present were characterized as to size of colony and location (GPS coordinates). This information was used by Wilson and the volunteer team during their curly-leaf pondweed hand-pulling efforts on the Turtle River and Pike Lake.

After the volunteer hand-pulling team completed a curly-leaf pondweed management bout on the Turtle River and Pike Lake, a White Water Associates team returned for the follow-up monitoring to document the efficacy of the treatment and identify areas that might warrant a return visit. This work was conducted June 22-24, 2022. Meander search was again conducted on the river and the lake littoral zone and locations of any finds were conveyed to Zach Wilson.

Surveys for all aquatic plants (native and non-native) were conducted on Pike Lake and the Turtle River using the WDNR point-intercept protocol and methodology. The White Water Associates team conducted this work June 22-24, 2022. This formal survey assessed the plant species composition on a grid of several hundred points distributed over the lake and river. Using latitude-longitude coordinates and a GPS unit, field staff navigated to the points and used a rake mounted on a pole or rope to sample plants. These plants were identified, recorded, and put into a dedicated spreadsheet for storage and data analysis. This systematic survey provides baseline plant community data about the lake and river. A similar survey was conducted in 2020 allowing evaluation of the dynamics of the plant communities over time.

Results: Curly-leaf Pondweed Surveys (Pre and Post hand-pulling)

During the 2022, 2021, and 2022 curly-leaf pondweed monitoring and hand-pulling efforts, communication of results of pre- and post- hand-pulling surveys between the White Water team and Zach Wilson has been efficient and timely allowing for thorough and effective hand-pulling management.

Results: Point-Intercept Plant Survey – Pike Lake

Results from the 2022 point-intercept plant survey for Pike Lake are summarized and presented in Exhibits 2, 3, and 4. For comparison purposes, Exhibit 2 also contains statistics from the 2020 point-intercept survey. In 2022, the maximum depth of rooted vegetation was 13.0 feet. Of the 699 sampling points on the lake, 151 were less than or equal to this depth and 45 of those points actually had rooted vegetation. The plant community is diverse with 29 species documented at the sampling points and an additional 4 species observed within six feet of the boat. The Simpson Diversity Index is high (0.95) indicating a diverse plant community. The Floristic Quality Index for Pike Lake (32.91) also indicates a good quality plant community (this value is higher than the median value for northern lakes). Exhibit 3 lists the aquatic plant species encountered at the sampling points in the 2022 Pike Lake aquatic plant survey along with their frequencies of occurrences and relative frequencies of occurrences. Exhibit 4 is a distribution of the relative frequency of plant species in the lake and this displays the pattern of frequencies typical of a healthy plant community.

A comparison of the summary statistics from the 2022 and 2020 aquatic plant surveys at Pike Lake reveals a stable, diverse and healthy plant community. The Simpson Diversity Index remains high and essentially unchanged. The total number of native plant species (the sum of those recorded at the sample points plus those observed within six feet of the sampling point) is comparable between the two survey years. The Floristic Quality Index is high and indicative of undisturbed conditions. Exhibit 4 shows a distribution of relative frequencies of plant species that is characteristic of a balanced plant community. As in 2020, the curly-leaf pondweed was of such low occurrence in Pike Lake in 2022 that it was not documented at any of the point-intercept sampling points.

Results: Point-Intercept Plant Survey – Turtle River

Results from the point-intercept plant survey for the Turtle River are summarized and presented in Exhibits 5, 6 and 7. For comparison, Exhibit 5 also presents statistics from the 2020 aquatic plant survey. The maximum depth of rooted vegetation in 2022 was 7.0 feet. Of the 154 sampling points visited on the river, 150 were less than or equal to this depth and 96 of those points actually had rooted vegetation. The plant community is diverse with 39 species collected at the sampling points and an additional 2 species observed within six feet of the sampling point (for a total number of species at 41). The Simpson Diversity Index is high (0.97) indicating a diverse plant community. The Floristic Quality Index for this stretch of the Turtle River (36.5) also

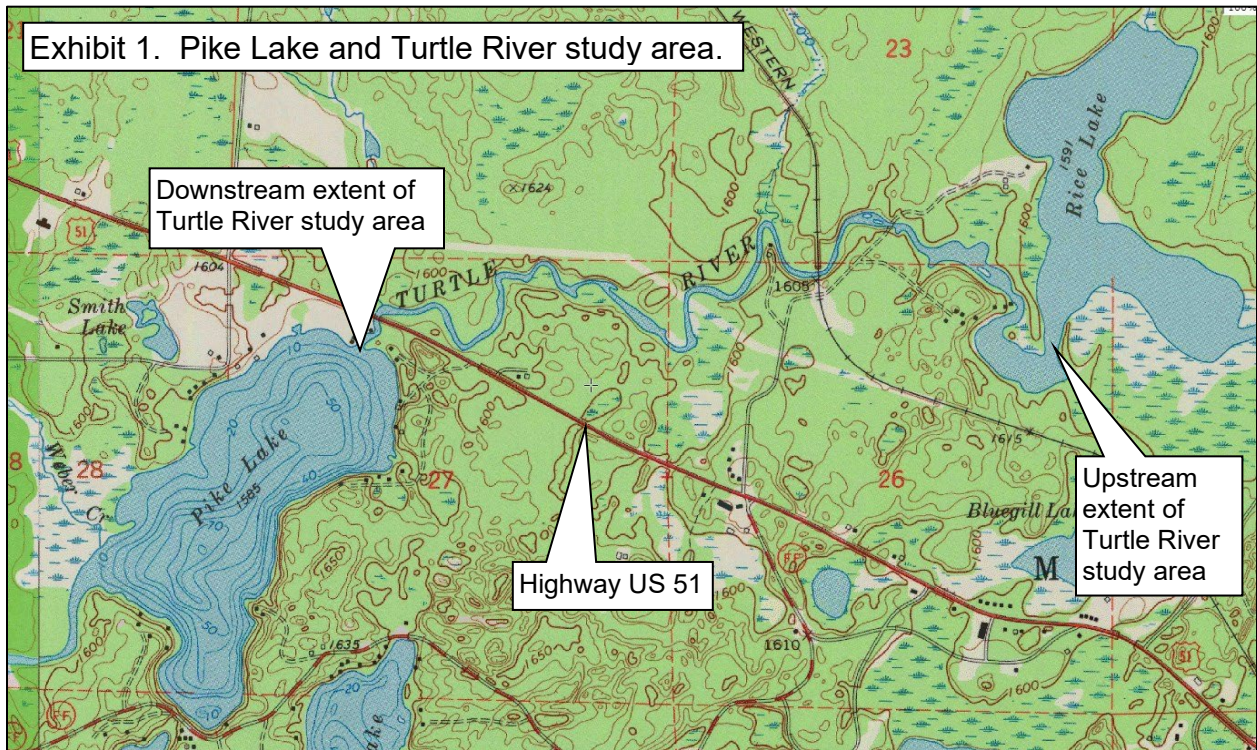
indicates a good quality plant community. Exhibit 6 lists the aquatic plant species encountered during the 2022 aquatic plant survey of the Turtle River along with frequencies of occurrences and relative frequencies of occurrences. Exhibit 7 is a distribution of the relative frequency of plant species in the river and this displays the pattern of frequencies typical of a healthy plant community. It should be noted that curly-leaf pondweed had a relative frequency of 0.4% in 2022. This value is more than an order of magnitude lower than we measured in 2020 (4.8%) and indicates the effectiveness of the hand-pulling management of this aquatic invasive species.

A comparison of the summary statistics from the 2022 and 2020 aquatic plant surveys at the Turtle River reveals a stable, diverse and healthy plant community. The Simpson Diversity Index remains high and unchanged since 2020. When considering both the species collected at the sampling points and the visuals (those observed within six feet of the boat), the number of native plant species is high and similar between the two survey years. The Floristic Quality Index is high and indicative of a plant community undisturbed by humans. The distribution of relative frequencies of plant species (Exhibit 7) is characteristic of a balanced plant community. As stated in the previous paragraph, the occurrence of curly-leaf pondweed is much less than measured in 2020 and indicates the hand-pulling effort is effective and provides impetus for continuing this low impact management approach.

Exhibits

Exhibits 1 through 7 are provided on the following pages of this report. A complete list of exhibits is provided in the *Table of Contents*.

Exhibit 1. Pike Lake and Turtle River study area.



Downstream extent of Turtle River study area

Highway US 51

Upstream extent of Turtle River study area

Exhibit 2. General statistics for the 2022 and 2020 Pike Lake aquatic plant surveys.

	2022 Value	2020 Value
Total number of sites on the point-intercept grid	699	699
Total number of sites visited (<i>Total number of sites where the boat stopped at a sampling point, even if much too deep to have plants</i>)	190	287
Total number of sites with vegetation (<i>Total number of sites where at least one plant was found</i>)	45	28
Total number of sites shallower than maximum depth of plants (<i>Number of sites where depth was less than or equal to the maximum depth where plants were found. This value is used for Frequency of occurrence at sites shallower than maximum depth of plants.</i>)	151	95
Frequency of occurrence at sites shallower than maximum depth of plants (<i>Number of times a species was seen divided by the total number of sites shallower than maximum depth of plants.</i>)	29.80	29.47
Simpson Diversity Index (<i>A nonparametric estimator of community heterogeneity. It is based on Relative Frequency and thus is not sensitive to whether all sampled sites (including non-vegetated sites) are included. The closer the Simpson Diversity Index is to 1, the more diverse the community.</i>)	0.95	0.92
Maximum depth of plants (ft) (<i>The depth of the deepest site sampled at which vegetation was present.</i>)	13	7.5
Number of sites sampled using rake on Rope (R)	15	15
Number of sites sampled using rake on Pole (P)	172	163
Average number of all species per site (shallower than max depth) (<i>Total number of species collected. Does not include visual sightings.</i>)	0.53	0.51
Average number of all species per site (veg. sites only) (<i>Total number of species collected including visual sightings.</i>)	1.8	1.7
Average number of native species per site (shallower than max depth)	0.53	0.51
Average number of native species per site (veg. sites only)	1.8	1.7
Species Richness (<i>Total number of species documented at sampled sites</i>)	29	17
Species Richness (including visuals) (<i>Total number of species documented at sampled sites and seen in the vicinity of sample sites</i>)	33	28
Floristic Quality Index (FQI) (<i>A metric that evaluates the closeness that the plant community is to that of undisturbed conditions.</i>)	32.91	26.25

Exhibit 3. Plant species recorded and distribution statistics for the 2022 Pike Lake aquatic plant survey.

Common name	Scientific name	Frequency of occurrence within vegetated areas (%)	Frequency of occurrence at sites shallower than maximum depth of plants (%)	Relative frequency (%)	Number of sites where species found	Number of visual sightings	Average rake fullness
Bur-reed	<i>Sparganium sp.</i>	17.8	5.3	9.87654321	8	7	1.0
Clasping-leaf pondweed	<i>Potamogeton richardsonii</i>	15.6	4.6	8.64197531	7	15	1.0
Wild celery	<i>Vallisneria americana</i>	15.6	4.6	8.64197531	7	4	1.0
Water marigold	<i>Bidens beckii (formerly Megalodonta)</i>	11.1	3.3	6.17283951	5	1	1.0
Freshwater sponge		11.1	3.3		5		1.0
Variable pondweed	<i>Potamogeton gramineus</i>	8.9	2.6	4.9382716	4	2	1.0
Flat-stem pondweed	<i>Potamogeton zosteriformis</i>	8.9	2.6	4.9382716	4	1	1.0
Hardstem bulrush	<i>Schoenoplectus acutus</i>	8.9	2.6	4.9382716	4	9	1.0
Creeping spikerush	<i>Eleocharis palustris</i>	6.7	2.0	3.7037037	3	12	1.0
Common waterweed	<i>Elodea canadensis</i>	6.7	2.0	3.7037037	3	2	1.0
Slender waterweed	<i>Elodea nuttallii</i>	6.7	2.0	3.7037037	3	1	1.0
Large-leaf pondweed	<i>Potamogeton amplifolius</i>	6.7	2.0	3.7037037	3	8	1.0
Leafy pondweed	<i>Potamogeton foliosus</i>	6.7	2.0	3.7037037	3	1	1.0
Fern pondweed	<i>Potamogeton robbinsii</i>	6.7	2.0	3.7037037	3	1	1.0
Muskgrasses	<i>Chara sp.</i>	4.4	1.3	2.4691358	2		1.0
Water horsetail	<i>Equisetum fluviatile</i>	4.4	1.3	2.4691358	2	8	1.0
Northern water-milfoil	<i>Myriophyllum sibiricum</i>	4.4	1.3	2.4691358	2		1.0
Nitella	<i>Nitella sp.</i>	4.4	1.3	2.4691358	2		1.0
Spatterdock	<i>Nuphar variegata</i>	4.4	1.3	2.4691358	2	8	1.0
White water lily	<i>Nymphaea odorata</i>	4.4	1.3	2.4691358	2	15	1.0
White-stem pondweed	<i>Potamogeton praelongus</i>	4.4	1.3	2.4691358	2		1.0
Common bladderwort	<i>Utricularia vulgaris</i>	4.4	1.3	2.4691358	2	3	1.0

Common name	Scientific name	Frequency of occurrence within vegetated areas (%)	Frequency of occurrence at sites shallower than maximum depth of plants (%)	Relative frequency (%)	Number of sites where species found	Number of visual sightings	Average rake fullness
Filamentous algae		4.4	1.3		2		1.0
Watershield	<i>Brasenia schreberi</i>	2.2	0.7	1.2345679	1	6	1.0
Coontail	<i>Ceratophyllum demersum</i>	2.2	0.7	1.2345679	1		1.0
Needle spikerush	<i>Eleocharis acicularis</i>	2.2	0.7	1.2345679	1	1	1.0
Marsh purslane	<i>Ludwigia palustris</i>	2.2	0.7	1.2345679	1		1.0
Various-leaved water-milfoil	<i>Myriophyllum heterophyllum</i>	2.2	0.7	1.2345679	1		1.0
Alpine pondweed	<i>Potamogeton alpinus</i>	2.2	0.7	1.2345679	1		1.0
White water crowfoot	<i>Ranunculus aquatilis</i>	2.2	0.7	1.2345679	1		1.0
	<i>Ludwigia Sp.</i>	2.2	0.7	1.2345679	1		1.0
Curly-leaf pondweed	<i>Potamogeton crispus</i>				Visual	1	
Arrowhead	<i>Sagittaria sp.</i>				Visual	1	
Water bulrush	<i>Schoenoplectus subterminalis</i>				Visual	2	
Broad-leaved cattail	<i>Typha latifolia</i>				Visual	1	

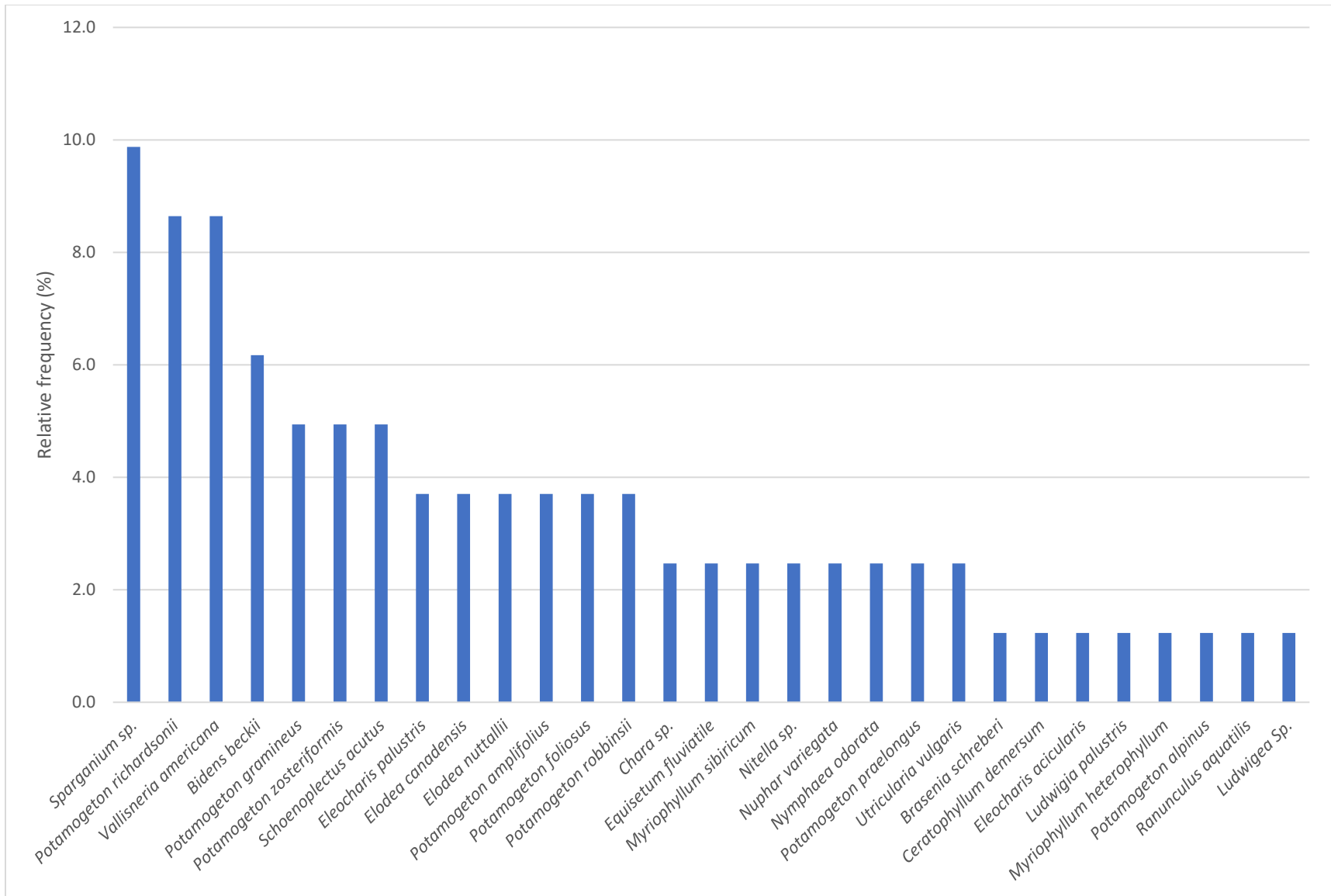


Exhibit 4. Pike Lake aquatic plant occurrences for 2022 point-intercept survey data

Exhibit 5. General statistics for the 2022 and 2020 Turtle River aquatic plant surveys.

	2022 Value	2020 Value
Total number of sites on the point-intercept grid	206	206
Total number of sites visited <i>(Total number of sites where the boat stopped at a sampling point, even if much too deep to have plants)</i>	154	183
Total number of sites with vegetation <i>(Total number of sites where at least one plant was found)</i>	96	85
Total number of sites shallower than maximum depth of plants <i>(Number of sites where depth was less than or equal to the maximum depth where plants were found. This value is used for Frequency of occurrence at sites shallower than maximum depth of plants.)</i>	150	176
Frequency of occurrence at sites shallower than maximum depth of plants <i>(Number of times a species was seen divided by the total number of sites shallower than maximum depth of plants.)</i>	64	48.3
Simpson Diversity Index <i>(A nonparametric estimator of community heterogeneity. It is based on Relative Frequency and thus is not sensitive to whether all sampled sites (including non-vegetated sites) are included. The closer the Simpson Diversity Index is to 1, the more diverse the community.)</i>	0.92	0.93
Maximum depth of plants (ft) <i>(The depth of the deepest site sampled at which vegetation was present.)</i>	7	6
Number of sites sampled using rake on Rope (R)	0	0
Number of sites sampled using rake on Pole (P)	154	183
Average number of all species per site (shallower than max depth) <i>(Total number of species collected. Does not include visual sightings.)</i>	1.67	1.31
Average number of all species per site (veg. sites only) <i>(Total number of species collected including visual sightings.)</i>	2.60	2.72
Average number of native species per site (shallower than max depth)	1.66	1.25
Average number of native species per site (veg. sites only)	2.62	2.65
Species Richness <i>(Total number of species documented at sampled sites)</i>	35	25
Species Richness (including visuals) <i>(Total number of species documented at sampled sites and seen in the vicinity of sample sites)</i>	41	39
Floristic Quality Index (FQI) <i>(A metric that evaluates the closeness that the plant community is to that of undisturbed conditions.)</i>	36.46	28.2

Exhibit 6. Plant species recorded and distribution statistics for the 2022 Turtle River aquatic plant survey.

Common name	Scientific name	Frequency of occurrence within vegetated areas (%)	Frequency of occurrence at sites shallower than maximum depth of plants (%)	Relative frequency (%)	Number of sites where species found	Number of visual sightings	Average rake fullness (including visual)
Bur-reed	<i>Sparganium sp.</i>	33.3	21.3	12.8	32	25	1.0
Various-leaved water-milfoil	<i>Myriophyllum heterophyllum</i>	29.2	18.7	11.2	28	6	1.0
Wild celery	<i>Vallisneria americana</i>	29.2	18.7	11.2	28	35	1.0
Fern pondweed	<i>Potamogeton robbinsii</i>	24.0	15.3	9.2	23	1	1.2
Common bladderwort	<i>Utricularia vulgaris</i>	22.9	14.7	8.8	22	14	1.0
Freshwater sponge		18.8	12.0		18	1	1.0
Northern water-milfoil	<i>Myriophyllum sibiricum</i>	18.8	12.0	7.2	18	2	1.0
White water lily	<i>Nymphaea odorata</i>	18.8	12.0	7.2	18	34	1.0
Coontail	<i>Ceratophyllum demersum</i>	14.6	9.3	5.6	14		1.0
Common waterweed	<i>Elodea canadensis</i>	10.4	6.7	4	10	7	1.1
	<i>Sparganium sp erect</i>	7.3	4.7	2.8	7	13	1.0
Clasping-leaf pondweed	<i>Potamogeton richardsonii</i>	6.3	4.0	2.4	6	13	1.0
Water marigold	<i>Bidens beckii</i> (formerly <i>Megalodonta</i>)	5.2	3.3	2	5	2	1.0
Leafy pondweed	<i>Potamogeton foliosus</i>	4.2	2.7	1.6	4	3	1.0
Flat-stem pondweed	<i>Potamogeton zosteriformis</i>	4.2	2.7	1.6	4	9	1.0
Whorled water-milfoil	<i>Myriophyllum verticillatum</i>	3.1	2.0	1.2	3	4	1.0
Slender naiad	<i>Najas flexilis</i>	3.1	2.0	1.2	3	2	1.0
Spatterdock	<i>Nuphar variegata</i>	3.1	2.0	1.2	3	8	1.3
Aquatic moss		2.1	1.3		2		1.0
Needle spikerush	<i>Eleocharis acicularis</i>	2.1	1.3	0.8	2	3	1.0
Small pondweed	<i>Potamogeton pusillus</i>	2.1	1.3	0.8	2	5	1.0
White water crowfoot	<i>Ranunculus aquatilis</i>	2.1	1.3	0.8	2		1.0

Common name	Scientific name	Frequency of occurrence within vegetated areas (%)	Frequency of occurrence at sites shallower than maximum depth of plants (%)	Relative frequency (%)	Number of sites where species found	Number of visual sightings	Average rake fullness (including visual)
Creeping bladderwort	<i>Utricularia gibba</i>	2.1	1.3	0.8	2		1.0
Watershield	<i>Brasenia schreberi</i>	1.0	0.7	0.4	1	12	1.0
Muskgrasses	<i>Chara sp.</i>	1.0	0.7	0.4	1		1.0
Creeping spikerush	<i>Eleocharis palustris</i>	1.0	0.7	0.4	1	1	1.0
Slender waterweed	<i>Elodea nuttallii</i>	1.0	0.7	0.4	1		1.0
Filamentous algae		1.0	0.7		1		1.0
Water star-grass	<i>Heteranthera dubia</i>	1.0	0.7	0.4	1		1.0
Forked duckweed	<i>Lemna trisulca</i>	1.0	0.7	0.4	1		1.0
Pickerelweed	<i>Pontederia cordata</i>	1.0	0.7	0.4	1	13	1.0
Large-leaf pondweed	<i>Potamogeton amplifolius</i>	1.0	0.7	0.4	1	4	1.0
Curly-leaf pondweed	<i>Potamogeton crispus</i>	1.0	0.7	0.4	1	6	1.0
White-stem pondweed	<i>Potamogeton praelongus</i>	1.0	0.7	0.4	1		1.0
Common arrowhead	<i>Sagittaria latifolia</i>	1.0	0.7	0.4	1	3	1.0
Arrowhead	<i>Sagittaria sp.</i>	1.0	0.7	0.4	1	4	1.0
Flat-leaf bladderwort	<i>Utricularia intermedia</i>	1.0	0.7	0.4	1		1.0
Small bladderwort	<i>Utricularia minor</i>	1.0	0.7	0.4	1	1	1.0
	<i>Carex utriculata</i>				Visual	4	
Three-way sedge	<i>Dulichium arundinaceum</i>				Visual	1	
Water horsetail	<i>Equisetum fluviatile</i>				Visual	4	
Small duckweed	<i>Lemna minor</i>				Visual	1	
Reed canary grass	<i>Phalaris arundinacea</i>				Visual	1	
Hardstem bulrush	<i>Schoenoplectus acutus</i>				Visual	1	

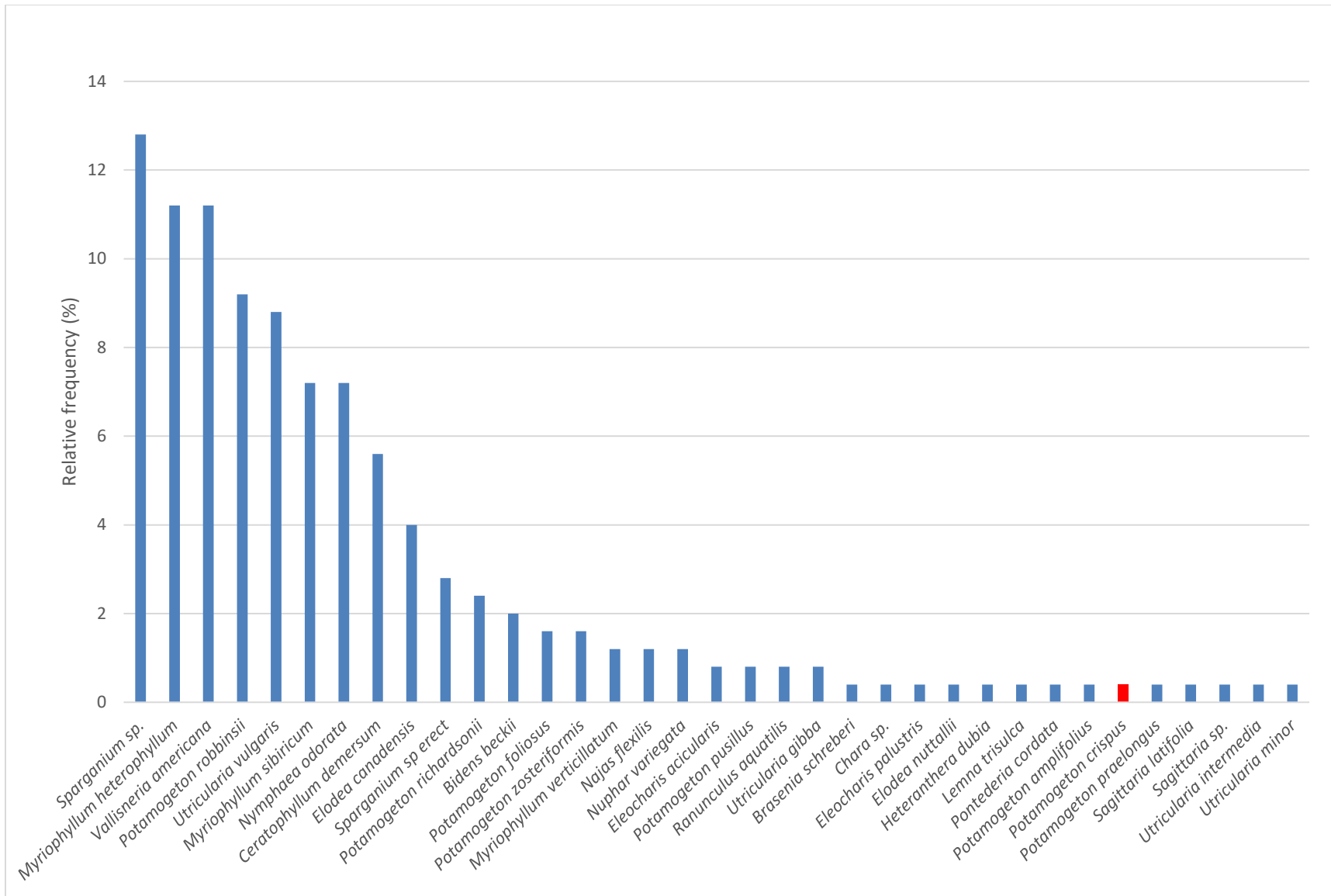


Exhibit 7. Turtle River aquatic plant occurrences for 2022 point-intercept survey data