

# Iola Lake 2022 Point-Intercept Survey Summary Report with Statistical Analysis

# Submergent Aquatic Plant Survey

Cason & Associates completed a Point Intercept Aquatic plant survey on Iola Lake on July 18- 20 2022. At 228 of the 550 grid points (**Figure 1**) plotted across the lake aquatic plant samples were collected from a boat with a single rake pull or throw. At depths of 15 feet or less, a double rake head attached to a pole was used to collect a sample; a double rake head on a rope was used for depths greater than 15 feet. Plants were observed up to a depth of 12.4 feet (**Figure 2**). All plant samples collected were identified to genus and species whenever possible, and the information was recorded. Twenty-eight different aquatic plant species were observed during the survey (**Table 1**.). An abundance rating was also given for each species collected using criteria established by the WDNR. In addition to the plant data, water depths were also recorded for each location. Data collected was used to determine species composition, percent frequency and relative abundance.

# **Simpson Diversity Index**

To estimate the diversity of the aquatic plant community, the Simpson Diversity Index takes into account both the number of species identified (richness) and the distribution or relative abundance of each species. With the Simpson Diversity Index (D), 1 represents infinite diversity and 0 represents no diversity. That is, the bigger the value of D, the higher the diversity. Iola Lake was calculated to have a Simpson Diversity Index of 0.84.

# **Assessment of Floristic Quality Resources**

The plant data collected for Iola Lake was used to assess the *floristic quality* of the lake. The method used, assigns a value to each native plant species called a *Coefficient of Conservatism*. Coefficient values range from 0-10 and reflect a particular species' likelihood of occurring in a relatively undisturbed landscape. Species with low coefficient values, such as sago pondweed (*Stuckenia pectinata*) (C=3), are likely to be found in a variety of habitat types and can tolerate high levels of human disturbance. On the other hand, species with higher coefficient values, such as white-stem pondweed (*Potamogeton praelongus*) (C=8), are much more likely to be restricted to high quality natural areas. By averaging the coefficient values available for the submergent and emergent species found in the lake, a value was assigned to the lake. The average *Coefficient of Conservatism* value for lakes in Wisconsin is 6.0, Iola Lake's average was 6.28.

By utilizing the Coefficients of Conservatism for the plant species of Iola Lake, further assessment of floristic quality was made. By multiplying the average coefficient values for Iola Lake by the square root of the number of plant species found, a Floristic Quality Index (FQI) was calculated. The average for Wisconsin lakes is 22.2; Iola Lake has a FQI of 31.4. According to the U.S. Fish and Wildlife Service "The FQI is an indication of native vegetative quality for an area: generally, 1-19 indicates low vegetative quality; 20-35 indicates high vegetative quality and above 35 indicates "Natural Area" quality. Wetlands with a FQI of 20 or greater are considered high quality aquatic resources."





Figure 1. Point-Intercept survey grid provided by WDNR.





Figure 2. Maximum Depth of Plant Colonization



#### Table 1. Iola Lake Aquatic Plant Species Present during the 2022 survey.

		Plant type: floating		
		submergent	Frequency of	Sites
Species	Scientific Name	emergent	Occurence	Found
Variable-leaved milfoil	Myriophyllum heterophyllum	Submergent	19.2	146
Coontail	Ceratophyllum demersum	Submergent	15.0	114
Muskgrasses (Chara)	Chara sp.	Submergent	10.1	77
Nitella	Nitella sp.	Submergent	8.2	62
Common waterweed	Elodea canadensis	Submergent	8.0	61
White water lily	Nymphaea odorata	Floating Leaf	7.1	54
Illinois pondweed	Potamogeton illinoensis	Submergent	6.3	48
Curly-leaf pondweed	Potamogeton crispus	Submergent	4.6	35
Flat-stem pondweed	Potamogeton zosteriformis	Submergent	4.6	35
Eurasian water milfoil	Myriophyllum spicatum	Submergent	3.8	29
Spatterdock	Nuphar variegata	Floating Leaf	3.6	27
Large duckweed	Spirodela polyrhiza	Free Floating	1.7	13
Common bladderwort	Utricularia vulgaris	Free Floating	1.3	10
Filamentous algae	various	Free floating		10
Wild celery	Vallisneria americana	Submergent	1.2	9
Slender naiad	Najas flexilis	Submergent	0.9	7
White-stem pondweed	Potamogeton praelongus	Submergent	0.7	5
Floating-leaf pondweed	Potamogeton natans	Submergent	0.7	5
Sago pondweed	Stuckenia pectinata	Submergent	0.3	4
Forked duckweed	Lamna triscula	Free Floating	0.5	4
Small pondweed	Potamogeton pusillus	Submergent	0.5	4
Creeping bladderwort	Ultricularia gibba	Free floating	0.5	4
Water star-grass	Heteranthera dubia	Submergent	0.3	2
Variable pondweed	Potamogeton gramineus	Submergent	0.3	2
Large-leaf pondweed	Potamogeton amplifolius	Submergent	0.3	2
Fern pondweed	Potamogeton robbinsii	Submergent	0.3	2
Cattail	Typha sp.	Emergent	Visual	2
Fries' pondweed	Potamogeton friesii	Submergent	0.1	1
Common watermeal	Wolffia columbiana	Free floating	Visual	1

Species Richness: 26 Species Richness (with visuals): 28 Simpson Diversity Index (D): 0.9 Floristic Quality Index (FQI): 31.4 Avg. Coefficient of Conservatism (C): 6.28

The following maps show the distribution of invasive species (Figure 3 & 4) and the seven most abundant plant species in Iola Lake (Figures 5-11).





Figure 3. Distribution of Eurasian Watermilfoil in Iola Lake.

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Figure 4. Distribution of Curly-leaf pondweed in Iola Lake.

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Figure 5. Distribution of Variable-leaved Milfoil in Iola Lake.

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Figure 6. Distribution of Coontail in Iola Lake.

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Figure 7. Distribution of Muskgrass (Chara) in Iola Lake.

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Figure 8. Distribution of Nitella in Iola Lake.

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Figure 9. Distribution of Common Waterweed in Iola Lake.

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Figure 10. Distribution of White water lily in Iola Lake.

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Figure 11. Distribution of Illinois pondweed in Iola Lake.

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## **Trends in the Aquatic Plant Community**

The relative frequency of occurrence of species found on Iola lake are listed for each year that Point-Intercept surveys were conducted (2006, 2014, 2017, & 2022, **Table 2**). Differences in species richness from year to year are likely due to variable observer biases and accessibility barriers to certain portions of the lake (**Figure 12**). Statistical analyses were performed on the relative frequency of occurrence data from 2017 to 2022. A chi-square analysis was used to identify statistically significant differences among species and indicate both significant increases and decreases (**Table 3**). As for aquatic invasive species, both Eurasian watermilfoil and Curly-leaf pondweed have each significantly increased in their relative frequency of occurrence in Iola Lake (**Table 3**). Native aquatic plant species that experienced an increase in relative frequency of occurrence during the last five years include: Variable-leaved Watermilfoil, White Water Lily, Flatstem Pondweed, and Spatterdock (**Table 3**). Native species that experienced a decrease in relative frequency of occurrence during the last five year include: Muskgrasses, Common Waterweed, Sago Pondweed, Fries' Pondweed, Whorled Watermilfoil, Southern naiad, Turion Duckweed, and Narrow-leaved Pondweed (**Table 3**).

Species	Scientific Name	% Relative Frequency of Occurrence 2022	% Relative Frequency of Occurrence 2017	% Relative Frequency of Occurrence 2014	% Relative Frequency of Occurrence 2006
Coontail	Ceratophyllum demersum	15.0	13.1	19.4	50
Muskgrasses (Chara)	Chara sp.	10.1	13.7	10.7	12.2
Needle spikerush	Eleocharis acicularis	Absent	Absent	0.1	Absent
Spikerush	Eleocharis palustris	Absent	Absent	Absent	0.1
Common waterweed	Elodea canadensis	8.0	16.7	7.1	3.9
Water star-grass	Heteranthera dubia	0.3	0.3	0.2	0.9
Northern blue flag	Iris versicolor	Absent	Absent	Absent	0.1
Small duckweed	Lemna minor	Absent	Absent	4.9	Absent
Least duckweed	Lemna perpusilla	Absent	Absent	0.2	Absent
Forked duckweed	Lemna triscula	0.5	Absent	0.1	Absent
Turion duckweed	Lemna turionifera	Absent	1.8	Absent	Absent
Purple loosestrife	Lythrum salicaria	Absent	Absent	0.9	Absent
Variable-leaved milfoil	Myriophyllum heterophyllum	19.2	14.9	0.6	16.8
Northern watermilfoil	Myriophyllum sibiricum	Absent	0.4	0.9	0.1
Eurasian water milfoil	Myriophyllum spicatum	3.8	0.9	0.3	3.5
Whorled milfoil	Myriophyllum verticulatum	Absent	2.4	6.0	0.1
Slender naiad	Najas flexilis	0.9	0.4	Absent	1.1
Southern naiad	Najas guadalupensis	Absent	3.7	3.9	Absent
Nitella	Nitella sp.	8.2	8.3	16.7	Absent
Spatterdock	Nuphar variegata	3.6	1.5	3.5	10.5
White water lily	Nymphaea odorata	7.1	4.0	4.8	9.2
Reed canary grass	Phalaris arundinacea	Absent	Absent	1.0	Absent
Water smartweed	Polygonum amphibium	Absent	Absent	0.1	Absent

Table 2. Iola Lake aquatic plant species present by year and relative frequency of occurrence.



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Large-leaf pondweed	Potamogeton amplifolius	0.3	Absent	0.3	0.2
Berchtold's pondweed	Potamogeton berchtoldii	Absent	0.3	Absent	Absent
Curly-leaf pondweed	Potamogeton crispus	4.6	0.6	0.8	Absent
Leafy Pondweed	Potamogeton foliosus	Absent	Absent	Absent	0.1
Fries' pondweed	Potamogeton friesii	0.1	1.0	0.5	Absent
Variable pondweed	Potamogeton gramineus	0.3	Absent	1.5	Absent
Illinois pondweed	Potamogeton illinoensis	6.3	5.8	4.7	9.8
Floating-leaf pondweed	Potamogeton natans	0.7	0.6	0.9	0.4
White-stem pondweed	Potamogeton praelongus	0.7	1.0	0.3	3.4
Small pondweed	Potamogeton pusillus	0.5	Absent	0.5	Absent
Fern pondweed	Potamogeton robbinsii	0.3	Absent	Absent	Absent
Stiff pondweed	Potamogeton strictifolus	Absent	1.2	Absent	Absent
Flat-stem pondweed	Potamogeton zosteriformis	4.6	1.0	0.6	0.6
White water crowfoot	Ranunculus aquatillis	Absent	Absent	0.3	0.1
Hardstem bulrush	Schoenoplectus acutus	Absent	Absent	Absent	0.1
Common threesquare	Schoenoplectus pungens	Absent	Absent	Absent	0.1
Softstem bulrush	Schoenoplectus tabemaemontani	Absent	Absent	0.3	Absent
Grass-leaved arrowhead	Sagitteria graminea	Absent	Absent	0.3	Absent
Broadleaf arrowhead	Sagitteria latifolia	Absent	Absent	0.1	0.1
Bur-reed	Sparganium emersum	Absent	Absent	0.6	0.1
Large duckweed	Spirodela polyrhiza	1.7	1.2	Visual	Absent
Sago pondweed	Stuckenia pectinata	0.3	2.1	2.5	9.3
Cattail	Typha sp.	Visual	0.1	0.3	0.9
Creeping bladderwort	Ultricularia gibba	0.5	Absent	Absent	Absent
Small bladderwort	Ultricularia minor	Absent	0.1	0.3	Absent
Common bladderwort	Utricularia vulgaris	1.3	0.9	3.0	3.5
Wild celery	Vallisneria americana	1.2	1.3	0.3	8.1
Filamentous algae	various	Visual	0.1	Visual	Absent
Common watermeal	Wolffia columbiana	Visual	0.1	0.1	Absent
Southern Wild rice	Zizania palustris	Absent	Absent	0.1	Absent



## 2022

Number of samples points: 228 Species Richness: 26 Species Richness (with visuals): 28 Simpson Diversity Index (D): 0.90 Floristic Quality Index (FQI): 31.4 Avg. Coefficient of Conservatism (C): 6.28

#### 2017

Number of samples points: 201 Species Richness: 30 Species Richness (with visuals): 30 Simpson Diversity Index (D): 0.90

## 2014

Number of samples points: 386 Species Richness: 41 Species Richness (with visuals): 42 Simpson Diversity Index (D): 0.90 Floristic Quality Index (FQI): 37.47 Avg. Coefficient of Conservatism (C): 6.08

### 2006

Number of samples points: 249 Species Richness: 28 Species Richness (with visuals): 28 Simpson Diversity Index (D): 0.91

Figure 12: A year by year summary of the number of PI points which were sampled, the species richness observed via rake pulls, species richness including visual observations, the Simpson Diversity index (D) value, the Floristic Quality Index value (FQI), as well as the average coefficient of conservatism (C) value.



Table 3: Results of chi-square analysis of percent frequency of occurrence survey data from the 2017 and 2022 Point-Intercept surveys of Iola Lake. Species are organized by 2022 percent frequency, with the highest frequency first. Green rows indicate significant increase and red rows indicate significant decrease in plant occurrence from 2017-2022. Invasive species are indicated with red text.

Common Name	Scientific Name	Percent Frequency		Significant	Increase (I) or
		2017	2022	Change	Decrease (D)
Variable-leaved Watermilfoil	Myriophyllum heterophyllum	14.9	19.2	**	I
Coontail	Ceratophyllum demersum	13.1	15	n.s.	I
Muskgrasses	Chara	13.7	10.1	*	D
Nitella	Nitella	8.3	8.2	n.s.	D
Common Waterweed	Elodea canadensis	16.7	8	***	D
White Water Lily	Nymphaea odorata	4	7.1	**	I
Illinois Pondweed	Potamogeton illinoensis	5.8	6.3	n.s.	I
Curly-leaf Pondweed	Potamogeton crispus	0.6	4.6	***	l. I
Flatstem Pondweed	Potamogeton zosteriformis	1	4.6	***	I
Eurasian Watermilfoil	Myriophyllum spicatum	0.9	3.8	***	l I
Spatterdock	Nuphar variegata	1.5	3.6	*	I
Giant Duckweed	Spirodela polyrhiza	1.2	1.7	n.s.	I
Common Bladderwort	Utricularia vulgaris	0.9	1.3	n.s.	I
Wild Celery	Vallisneria americana	1.3	1.2	n.s.	D
Slender naiad	Najas flexis	0.4	0.9	n.s.	I
Floating-Leaf Pondweed	Potamogeton natans	0.6	0.7	n.s.	I
Star Duckweed	Lemna triscula	0	0.5	n.s.	I
Small Pondweed	Potamogeton pusillus	0.3	0.5	n.s.	I
Creeping Bladderwort	Utricularia gibba	0	0.5	n.s.	I
Water Star-grass	Heteranthera dubia	0.3	0.3	n.s.	D
Large-Leaf Pondweed	Potamogeton amplifolius	0	0.3	n.s.	I
Variable-Leaved Pondweed	Potamogeton gramineus	0	0.3	n.s.	I
Fern-Leaf Pondweed	Potamogeton robbinsii	0	0.3	n.s.	I
Sago Pondweed	Stuckenia pectinata	2.1	0.3	***	D
Fries' Pondweed	Potamogeton friesii	1	0.1	*	D
Northern Watermilfoil	Myriophyllum sibiricum	0.4	0	n.s.	D
Whorled Watermilfoil	Myriophyllum vertidillatum	2.4	0	***	D
Southern naiad	Najas guadalupensis	3.7	0	***	D
White Stem Pondweed	Potamogeton praelongus	1	0	n.s.	D
Cattail	Typha	0.1	0	n.s.	D
Water Meal	Wolffla spp	0.1	0	n.s.	D
Aquatic Moss	Aquatic Moss	0.6	0	*	D
Filimentous algae	Filamentous algae	0.1	0	*	I
Turion Duckweed	Lemna turionifera	1.8	0	***	D
Narrow-Leaved Pondweed	Potamogeton scrictifolius	1.2	0	**	D
Cypress-like Sedge	Carex pseudocyperus	0.1	0	n.s.	D
Small Bladderwort	Utricularia minor	0.1	0	n.s.	D
*significant change ( $\alpha = 0.05$ ), ** more significant change ( $\alpha = 0.01$ ), *** most significant change ( $\alpha = 0.001$ )					



#### Resources

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