Flint and Long Lake

2020 Aquatic Vegetation Management Update

Valparaiso Lakes Area Conservancy District
1805 Burlington Beach Road, Valparaiso, IN 46383

Submitted by:
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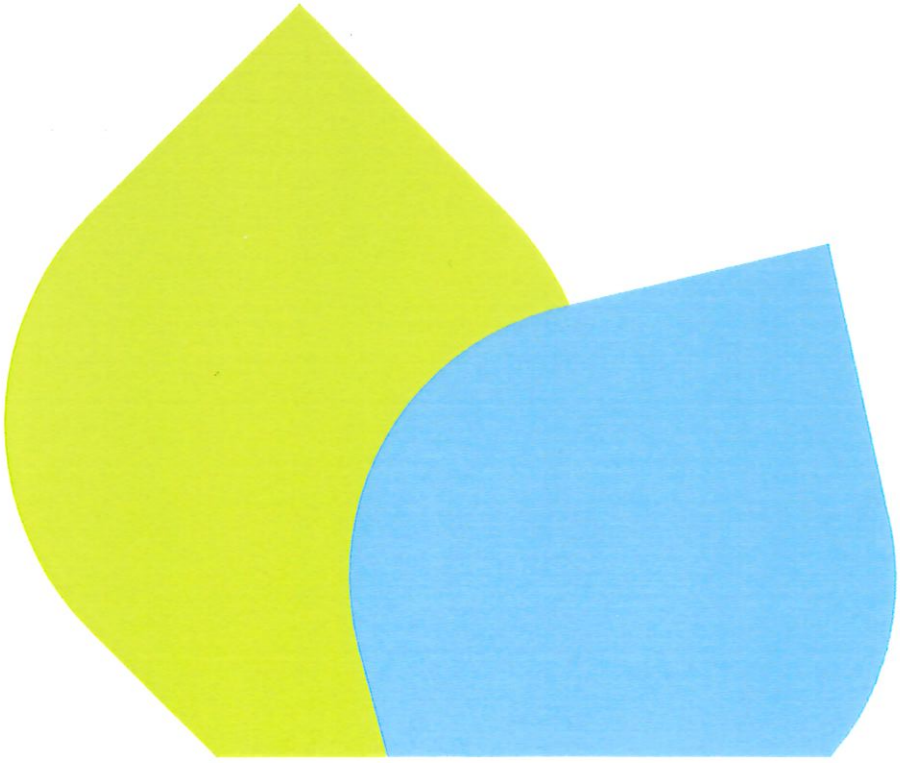

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Acknowledgements

Clarke Aquatic Services would like to thank the Indiana Department of Natural Resources Division of Fish and Wildlife's LARE Program for providing the funding and guidance on this project. Clarke Aquatic Services passion is to make communities around the world more livable, safe, and comfortable. Our goal is to help preserve and enhance lakes and ponds in an environmentally-friendly manner so lake property owners and lake communities can enjoy the recreational and aesthetic value of their waterways to the fullest. We would be remiss if we did not include a special thank you to the Valparaiso Lakes Area Conservancy District, along with Rod Edgell of the LARE program.

Thank you!

Executive Summary

Flint Lake is an 89-acre natural lake with a maximum depth of 70 ft. It is located north of Valparaiso Indiana southwest of Hwy 49 and Route 6. Flint Lake is one in a series of seven lakes. Currently, Flint Lake's main nuisance aquatic plant is curly-leaf pondweed (*Potamogeton crispus*), with small scattered beds of Eurasian watermilfoil (*Myriophyllum spicatum*). Long Lake, is 65 acres with a maximum depth of 26 ft and an average depth of 8 feet and connected to Flint Lake by a channel on the south end of the lake. Long Lake historically has Yellow water buttercup (*Ranunculus flabellaris*) present during the late summer Tier 2 survey. The Valparaiso Lakes Area Conservancy District (VLACD) was granted cost-share assistance from the Indiana DNR (INDNR) Lake and River Enhancement program (LARE). The initial Aquatic Vegetation Management Plan (AVMP) was completed in 2006 and established specific goals to reduce and control invasive plant life in Flint and Long Lakes while maintaining diverse and flourishing native plant population.

Clarke Aquatic Services (CAS) was contracted by the Valparaiso Lakes Area Conservancy District (VLACD) to complete aquatic vegetation sampling and to update the aquatic vegetation management plan (AVMP) in 2020. The primary invasive species found in Flint and Long Lakes has been curly-leaf pondweed, but in recent years, Eurasian watermilfoil has reached nuisance levels that have impacted navigation. In 2019, 15 acres of Eurasian watermilfoil was documented in Flint Lake, and 8 acres in Long Lake. In 2020, Eurasian watermilfoil was undetected within Flint Lake during the spring survey on May 14th, 2020. During the survey on Long Lake, 10 acres of Eurasian watermilfoil was observed. A second visual survey of Flint Lake on June 1, 2020 indicated no Eurasian watermilfoil was present. Flint Lake was not treated during the 2020 season.

In 2020 VLACD was awarded a $18,400 grant from the Lake and River Enhancement (LARE) program for selective Eurasian watermilfoil treatments, sampling, and plan update in 2020. An application of ProcellaCOR EC took place on May 29, 2020 for Long Lake treating 10 acres of Eurasian watermilfoil. A Tier 2 survey completed on August 19, 2020 found only 3 sites with curly-leaf pondweed and no sites containing Eurasian watermilfoil on Flint Lake. Long Lake had no documented invasive species during the Tier 2 survey.

Vegetation controls in 2020 met three out of four LARE objectives and goals of this update by limiting nuisance plant issues in high use areas and maintaining overall plant coverage throughout both bodies of water. A similar strategy is recommended for the 2021 season.

Problem Statement

Aquatic vegetation is an important component of lakes in Indiana. However, as a result of many factors, this vegetation can develop to a nuisance level. Nuisance aquatic vegetation, as used in this plan, describes plant growth that negatively impacts the present uses of the lake including fishing, boating, swimming, aesthetic, and lakefront property values. The primary invasive species within Flint and Long Lakes are Eurasian watermilfoil and curly-leaf pondweed (CLP).

Goals and Objectives

The vegetation management goals of the Flint and Long Lake Aquatic Vegetation Management Plan are:

- Maintain a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality, and is resistant to minor habitat disturbances and invasive species
- Direct efforts to preventing and controlling the negative impacts of aquatic invasive species
- Provide reasonable public recreational access while minimizing the negative impacts on plant and fish and wildlife resources

Specific management objectives had been developed for Flint and Long Lakes in past plans. Below are the plant management objectives for Flint and Long Lakes:

- Keep Eurasian watermilfoil below 10% occurrence in summer Tier 2 surveys
- Keep curly-leaf pondweed below 5% occurrence in summer Tier 2 surveys
- Maintain at least 8-10 native plants in the post treatment Tier 2 surveys
- Maintain a native diversity at least 0.6 to 0.7 in Tier 2 survey of Flint Lake

Plant Management History

Flint Lake is the largest lake within a chain of lakes just north of Valparaiso in Porter County, Indiana. The lake contains extensive shallow areas with 45% of the lake area being less than 10 feet deep. VLACD privately hired a contractor to treat small scale shoreline areas of invasive plants in 2005 and 2006. After that VLACD partnered with the LARE program, funding the completion of an Aquatic Vegetation Management Plan in 2006. The lake has been treated since for either or both Eurasian watermilfoil and curly-leaf pondweed from 2007 to present day, with the exception of 2008, 2009 and 2011. During these applications the Eurasian watermilfoil has been treated with Triclopyr and 2, 4-D, while curly-leaf pondweed has been treated with Diquat. The following table (Table 1.) details the date, size of application, target species, and approved chemical on Flint Lake. There is no record of past management completed on Long Lake prior to 2009 however aquatic vegetation sampling and plan updates have been completed since 2007, Table 2 outlines past treatment history of Long Lake.

Table 1: Treatment History Flint Lake

Target Species	Year	Area treated (Acres)	Chemical Approved	Target concentration
Eurasian watermilfoil	5/28/2005	0.23	Unknown	Unknown
Eurasian watermilfoil	5/16/2006	0.23	Unknown	Unknown
Eurasian watermilfoil	6/6/2007	24.4	Triclopyr	1.0 - 1.75 PPM
Eurasian watermilfoil	6/1/2010	4.25	Triclopyr	1.0 - 1.75 PPM
Eurasian watermilfoil	6/6/2012	21	2, 4-D	2 PPM
Eurasian watermilfoil	7/12/2012	13.3	2, 4-D	2 PPM
Eurasian watermilfoil	8/8/2012	9.5	2, 4-D	2 PPM
Eurasian watermilfoil	6/4/2013	25.18	2, 4-D	2 PPM
Eurasian watermilfoil	6/3/2014	19.9	2, 4-D	2 PPM
Eurasian watermilfoil	6/15/2015	18.1	Triclopyr	1.75 PPM
Eurasian watermilfoil	6/7/2016	2.18	Triclopyr	1.75 PPM
Curly-leaf pondweed	5/2/2017	35	Diquat	2 Gal. Area, Concentration
Curly-leaf pondweed	2018	31.61	Diquat, Chelated Copper	1.5 Gal./Acre (Diquat) 0.5 Gal./Acre (Chelated Copper)
Eurasian watermilfoil	2019	16.93	Triclopyr	1.75ppm
Eurasian watermilfoil	2020	No Treatment		

Long Lake Treatment History 2009-2020.

Target Species	Year	Area Treated (Acres)	Chemical approved	Concentration
Eurasian watermilfoil	2009	3.5	Triclopyr	1.0-1.75 ppm
Eurasian watermilfoil	2012	4.5	Triclopyr	1.0-1.75 ppm
Eurasian watermilfoil	2013	7.75	Triclopyr	1.0-1.75 ppm
Eurasian watermilfoil	2015	4.6	Unknown	
Eurasian watermilfoil	2016	11.03	Triclopyr	1.0-1.75 ppm
Eurasian watermilfoil	2017	12.92	Triclopyr	1.0-1.75 ppm
Eurasian watermilfoil	2018	8	Triclopyr	1.0-1.75 ppm
Eurasian watermilfoil	2019	2	Triclopyr	1.0 ppm
Eurasian watermilfoil	2020	10	ProcellaCOR EC	3 PDU

On May 14, 2020 a pretreatment invasive survey was performed to confirm locations of Eurasian watermilfoil on both Flint and Long Lakes. The survey documented no Eurasian watermilfoil in Flint Lake and 10 acres in Long Lake. Treatment was completed on May 29, 2020 using ProcellaCOR EC. The treatment is outlined by area in Table 2 and illustrated in Figure 1.

Table 2. Eurasian watermilfoil Treatment Summary Long Lake May 29, 2020.

Area	Acres	Average Depth	PDUs/ac. Ft.
EWM1	1.1	5	3 (16.5)
EWM2	2.5	5	3 (37.5)
EWM3	3.8	5	3 (57)
EWM4	2.6	5	3 (39)

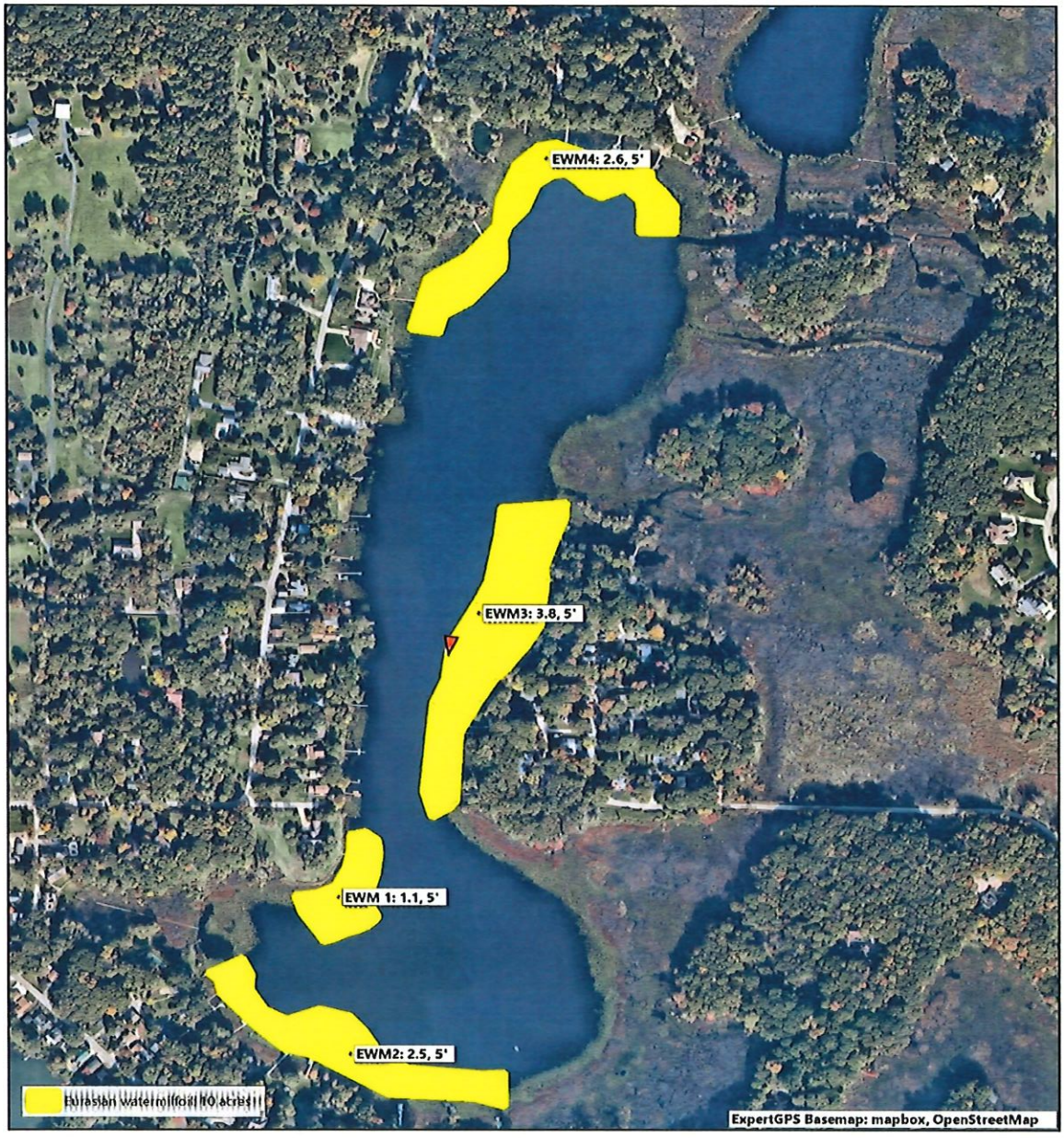

Figure 1. Long Lake Treatment Areas May 29, 2020.

Aquatic Plant Community Characterization

Aquatic vegetation sampling is a must to create an effective aquatic vegetation management plan. Sampling provides useful and important data that allows lake managers to identify and locate areas of nuisance and/or beneficial native submersed vegetation throughout the waterbody. It also allows for annual monitoring to create a proactive plan if any changes occur in the plant community. Monitoring also evaluates the effectiveness of management and treatment techniques from season to season. In 2020, invasive species mapping surveys and Tier 2 surveys were completed on Flint and Long Lakes.

Methods

The Tier 2 survey fulfills the following objectives:

1. To document the distribution and abundance of submersed aquatic vegetation
2. To compare present distribution and abundance with past distribution and abundance within select areas and at a lake-wide scale

The Tier 2 survey in 2020 followed the Tier 2 survey protocol issued by the IDNR LARE program in 2018. Once a site was reached, the boat was slowed to a stop and the coordinates were recorded on a hand-held GPS unit and later downloaded into mapping software. A depth measurement was taken by dropping a two-headed standard sampling rake that was attached to a rope marked off in 1-foot increments. An additional ten feet of rope was released, and the boat was reversed at minimum operating speed for a distance of ten feet. Once the rake is retrieved the individual species are placed on the rake and the abundance on the rake is scored with either a 0 (no plants retrieved), 1 (1-19% of rake teeth filled), 3 (20-99% of rake teeth filled), or 5 (100% of rake teeth filled) (IDNR 2018).

Tier 2 Sampling Results

A tier 2 survey was completed on August 19th, 2020. Secchi depth was 3 ft 8 inches on Flint Lake and 5 ft 11 inches on Long Lake. Plants were present at 24 of the 40 sites on Flint and 10 species were collected, of which 9 were native (Figure 2). Plants were present at 33 of the 40 sites on Long Lake and 12 species were collected (Figure 3). Curly-leaf pondweed (Figure 4) was the only invasive species collected and found at 3 different sites in Flint Lake. The results of the August 2020 Tier 2 survey for Flint Lake can be found in Table 3. All 12 species of plants that were collected at Long Lake were native plants. The results for Long Lake Tier 2 survey can be found in Table 4.

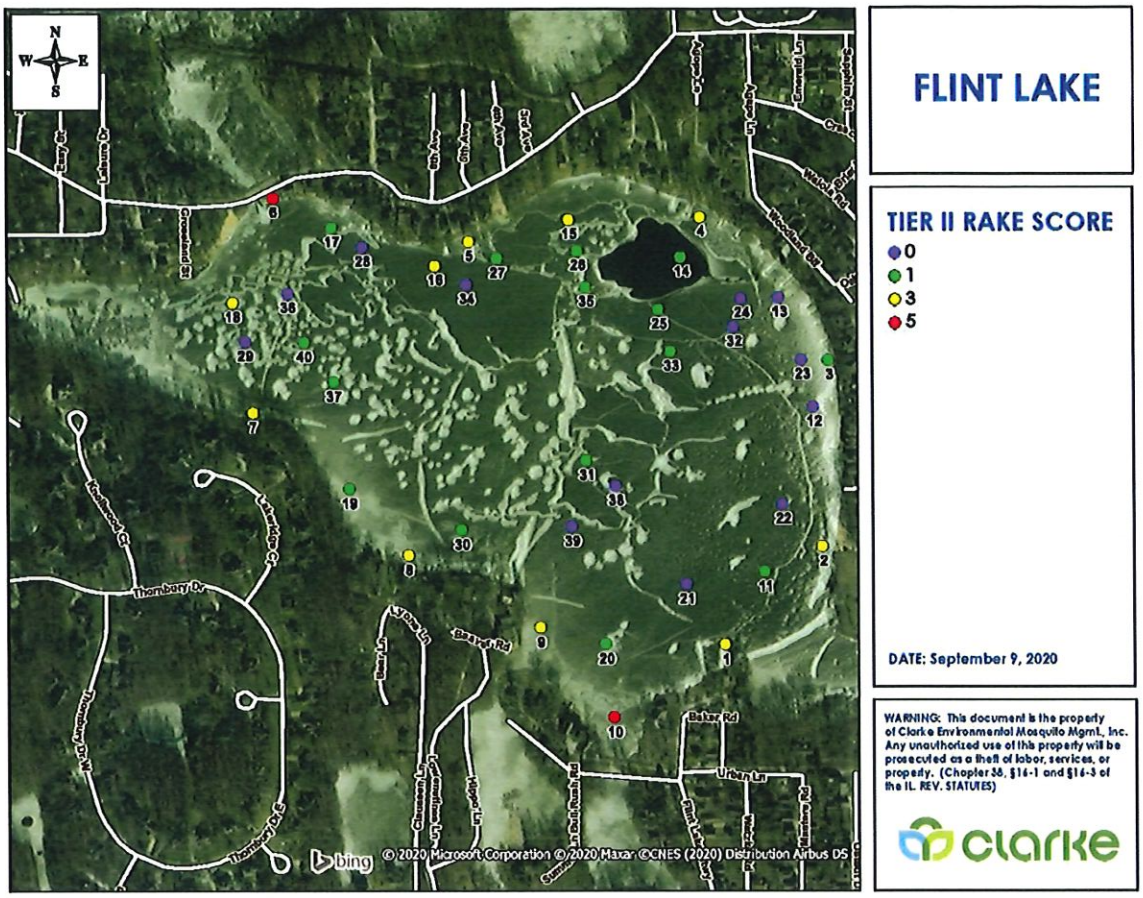

Figure 2. Flint Lake Tier 2 Sampling Locations August 19, 2020.

Figure 3. Long Lake Tier 2 Sampling Locations August 19, 2020.

Figure 4. Flint Lake CLP Distribution August 19, 2020.

Table 3. Flint Lake 2020 Tier 2 Sampling Results.

Occurrence and Abundance of Submersed Aquatic Plants in Flint Lake.

County:	Porter	Secchi (ft):	3'8"	Mean species/site:	1.38
Date:	8/19/2020	Sites with plants:	24	SE Mean species/site:	0.23
Littoral Depth (ft):	18.2	Sites with native plants:	24	Mean native species/site:	1.30
Littoral Sites:	33	Number of species:	10	SE Mean natives/site:	0.22
Total Sites:	40	Number of native species:	9	Species diversity:	0.80
		Maximum species/site:	4	Native species diversity:	0.78

All Depths	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Coontail	50.0	50.0	35.0	15.0	0.0	16.0
Eelgrass	22.5	77.5	22.5	0.0	0.0	4.5
Chara	17.5	82.5	10.0	7.5	0.0	6.5
Richardson's pondweed	12.5	87.5	2.5	10.0	0.0	6.5
Illinois pondweed	10.0	90.0	10.0	0.0	0.0	2.0
Curly-leaf pondweed	7.5	92.5	7.5	0.0	0.0	1.5
Small pondweed	7.5	92.5	7.5	0.0	0.0	1.5
Nitella	5.0	95.0	2.5	2.5	0.0	2.0
Flat-stemmed pondweed	2.5	97.5	2.5	0.0	0.0	0.5
Leafy pondweed	2.5	97.5	2.5	0.0	0.0	0.5

Occurrence and Abundance of Submersed Aquatic Plants in Flint Lake.

County:	Porter	Secchi (ft):	3'8"	Mean species/site:	3.30
Date:	8/19/2020	Sites with plants:	10	SE Mean species/site:	0.26
Littoral Depth (ft):	18.2	Sites with native plants:	10	Mean native species/site:	3.10
Littoral Sites:	10	Number of species:	9	SE Mean natives/site:	0.35
Total Sites:	10	Number of native species:	8	Species diversity:	0.83
		Maximum species/site:	4	Native species diversity:	0.81

Depths: 0 to 5 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Coontail	90.0	10.0	50.0	40.0	0.0	34.0
Eelgrass	70.0	30.0	70.0	0.0	0.0	14.0
Richardson's pondweed	50.0	50.0	10.0	40.0	0.0	26.0
Chara	40.0	60.0	10.0	30.0	0.0	20.0
Curly-leaf pondweed	20.0	80.0	20.0	0.0	0.0	4.0
Illinois pondweed	20.0	80.0	20.0	0.0	0.0	4.0
Nitella	20.0	80.0	10.0	10.0	0.0	8.0
Flat-stemmed pondweed	10.0	90.0	10.0	0.0	0.0	2.0
Leafy pondweed	10.0	90.0	10.0	0.0	0.0	2.0

Occurrence and Abundance of Submersed Aquatic Plants in Flint Lake.

County:	Porter	Secchi (ft):	3'8"	Mean species/site:	1.40
Date:	8/19/2020	Sites with plants:	8	SE Mean species/site:	0.34
Littoral Depth (ft):	18.2	Sites with native plants:	8	Mean native species/site:	1.30
Littoral Sites:	10	Number of species:	6	SE Mean natives/site:	0.33
Total Sites:	10	Number of native species:	5	Species diversity:	0.74
		Maximum species/site:	3	Native species diversity:	0.71

Depths: 5 to 10 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Coontail	60.0	40.0	40.0	20.0	0.0	20.0
Chara	20.0	80.0	20.0	0.0	0.0	4.0
Eelgrass	20.0	80.0	20.0	0.0	0.0	4.0
Small pondweed	20.0	80.0	20.0	0.0	0.0	4.0
Curly-leaf pondweed	10.0	90.0	10.0	0.0	0.0	2.0
Illinois pondweed	10.0	90.0	10.0	0.0	0.0	2.0

Occurrence and Abundance of Submersed Aquatic Plants in Flint Lake.

County:	Porter	Secchi (ft):	3'8"	Mean species/site:	0.50
Date:	8/19/2020	Sites with plants:	4	SE Mean species/site:	0.22
Littoral Depth (ft):	18.2	Sites with native plants:	4	Mean native species/site:	0.50
Littoral Sites:	10	Number of species:	2	SE Mean natives/site:	0.22
Total Sites:	10	Number of native species:	2	Species diversity:	0.32
		Maximum species/site:	2	Native species diversity:	0.32

Depths: 10 to 15 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Coontail	40.0	60.0	40.0	0.0	0.0	8.0
Small pondweed	10.0	90.0	10.0	0.0	0.0	2.0

Occurrence and Abundance of Submersed Aquatic Plants in Flint Lake.

County:	Porter	Secchi (ft):	3'8"	Mean species/site:	0.43
Date:	8/19/2020	Sites with plants:	2	SE Mean species/site:	0.30
Littoral Depth (ft):	18.2	Sites with native plants:	2	Mean native species/site:	0.43
Littoral Sites:	3	Number of species:	3	SE Mean natives/site:	0.30
Total Sites:	7	Number of native species:	3	Species diversity:	0.67
		Maximum species/site:	2	Native species diversity:	0.67

Depths: 15 to 20 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Chara	14.3	85.7	14.3	0.0	0.0	2.9
Coontail	14.3	85.7	14.3	0.0	0.0	2.9
Illinois pondweed	14.3	85.7	14.3	0.0	0.0	2.9

Table 4. Long Lake 2020 Tier 2 Sampling Results.

Occurrence and Abundance of Submersed Aquatic Plants in Long Lake

County:	Porter	Secchi (ft):	5'11"	Mean species/site:	2.28
Date:	8/19/2020	Sites with plants:	33	SE Mean species/site:	0.28
Littoral Depth (ft):	23.0	Sites with native plants:	33	Mean native species/site:	2.28
Littoral Sites:	40	Number of species:	12	SE Mean natives/site:	0.28
Total Sites:	40	Number of native species:	12	Species diversity:	0.83
		Maximum species/site:	6	Native species diversity:	0.83

All Depths	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Coontail	60.0	40.0	50.0	10.0	0.0	16.0
Flat-stemmed pondweed	57.5	42.5	17.5	27.5	12.5	32.5
Illinois pondweed	35.0	65.0	22.5	12.5	0.0	12.0
Bladderwort	17.5	82.5	17.5	0.0	0.0	3.5
Eelgrass	10.0	90.0	10.0	0.0	0.0	2.0
Large-leaved pondweed	10.0	90.0	10.0	0.0	0.0	2.0
Richardson's pondweed	10.0	90.0	5.0	5.0	0.0	4.0
Small pondweed	10.0	90.0	7.5	2.5	0.0	3.0
Canada waterweed	7.5	92.5	7.5	0.0	0.0	1.5
Nitella	5.0	95.0	2.5	2.5	0.0	2.0
American pondweed	2.5	97.5	2.5	0.0	0.0	0.5
Sago pondweed	2.5	97.5	2.5	0.0	0.0	0.5

Occurrence and Abundance of Submersed Aquatic Plants in Long Lake

County:	Porter	Secchi (ft):	5'11"	Mean species/site:	4.30
Date:	8/19/2020	Sites with plants:	10	SE Mean species/site:	0.42
Littoral Depth (ft):	23.0	Sites with native plants:	10	Mean native species/site:	4.30
Littoral Sites:	10	Number of species:	11	SE Mean natives/site:	0.42
Total Sites:	10	Number of native species:	11	Species diversity:	0.87
		Maximum species/site:	6	Native species diversity:	0.87

Depths: 0 to 5 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Coontail	80.0	20.0	40.0	40.0	0.0	32.0
Flat-stemmed pondweed	80.0	20.0	20.0	40.0	20.0	48.0
Illinois pondweed	70.0	30.0	30.0	40.0	0.0	30.0
Richardson's pondweed	40.0	60.0	20.0	20.0	0.0	16.0
Bladderwort	30.0	70.0	30.0	0.0	0.0	6.0
Eelgrass	30.0	70.0	30.0	0.0	0.0	6.0
Canada waterweed	30.0	70.0	30.0	0.0	0.0	6.0
Large-leaved pondweed	20.0	80.0	20.0	0.0	0.0	4.0
Nitella	20.0	80.0	10.0	10.0	0.0	8.0
Small pondweed	20.0	80.0	10.0	10.0	0.0	8.0
American pondweed	10.0	90.0	10.0	0.0	0.0	2.0

Occurrence and Abundance of Submersed Aquatic Plants in Long Lake

County:	Porter	Secchi (ft):	5'11"	Mean species/site:	3.00
Date:	8/19/2020	Sites with plants:	10	SE Mean species/site:	0.30
Littoral Depth (ft):	23.0	Sites with native plants:	10	Mean native species/site:	3.00
Littoral Sites:	10	Number of species:	7	SE Mean natives/site:	0.30
Total Sites:	10	Number of native species:	7	Species diversity:	0.78
		Maximum species/site:	5	Native species diversity:	0.78

Depths: 5 to 10 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Flat-stemmed pondweed	100.0	0.0	10.0	60.0	30.0	68.0
Coontail	70.0	30.0	70.0	0.0	0.0	14.0
Illinois pondweed	50.0	50.0	40.0	10.0	0.0	14.0
Bladderwort	40.0	60.0	40.0	0.0	0.0	8.0
Large-leaved pondweed	20.0	80.0	20.0	0.0	0.0	4.0
Eelgrass	10.0	90.0	10.0	0.0	0.0	2.0
Small pondweed	10.0	90.0	10.0	0.0	0.0	2.0

Occurrence and Abundance of Submersed Aquatic Plants in Long Lake

County:	Porter	Secchi (ft):	5'11"	Mean species/site:	1.20
Date:	8/19/2020	Sites with plants:	8	SE Mean species/site:	0.25
Littoral Depth (ft):	23.0	Sites with native plants:	8	Mean native species/site:	1.20
Littoral Sites:	10	Number of species:	3	SE Mean natives/site:	0.25
Total Sites:	10	Number of native species:	3	Species diversity:	0.54
		Maximum species/site:	2	Native species diversity:	0.54

Depths: 10 to 15 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Coontail	70.0	30.0	70.0	0.0	0.0	14.0
Flat-stemmed pondweed	40.0	60.0	30.0	10.0	0.0	12.0
Illinois pondweed	10.0	90.0	10.0	0.0	0.0	2.0

Occurrence and Abundance of Submersed Aquatic Plants in Long Lake

County:	Porter	Secchi (ft):	5'11"	Mean species/site:	0.71
Date:	8/19/2020	Sites with plants:	4	SE Mean species/site:	0.29
Littoral Depth (ft):	23.0	Sites with native plants:	4	Mean native species/site:	0.71
Littoral Sites:	7	Number of species:	4	SE Mean natives/site:	0.29
Total Sites:	7	Number of native species:	4	Species diversity:	0.72
		Maximum species/site:	2	Native species diversity:	0.72

Depths: 15 to 20 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Coontail	28.6	71.4	28.6	0.0	0.0	5.7
Flat-stemmed pondweed	14.3	85.7	14.3	0.0	0.0	2.9
Illinois pondweed	14.3	85.7	14.3	0.0	0.0	2.9
Small pondweed	14.3	85.7	14.3	0.0	0.0	2.9

Occurrence and Abundance of Submersed Aquatic Plants in Long Lake			
County: Porter	Secchi (ft): 5'11"	Mean species/site: 0.71	
Date: 8/19/2020	Sites with plants: 4	SE Mean species/site: 0.29	
Littoral Depth (ft): 23.0	Sites with native plants: 4	Mean native species/site: 0.71	
Littoral Sites: 7	Number of species: 4	SE Mean natives/site: 0.29	
Total Sites: 7	Number of native species: 4	Species diversity: 0.72	
	Maximum species/site: 2	Native species diversity: 0.72	

Depths: 15 to 20 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Coontail	28.6	71.4	28.6	0.0	0.0	5.7
Flat-stemmed pondweed	14.3	85.7	14.3	0.0	0.0	2.9
Illinois pondweed	14.3	85.7	14.3	0.0	0.0	2.9
Small pondweed	14.3	85.7	14.3	0.0	0.0	2.9

Occurrence and Abundance of Submersed Aquatic Plants in Long Lake			
County: Porter	Secchi (ft): 5'11"	Mean species/site: 0.33	
Date: 8/19/2020	Sites with plants: 1	SE Mean species/site: 0.33	
Littoral Depth (ft): 23.0	Sites with native plants: 1	Mean native species/site: 0.33	
Littoral Sites: 3	Number of species: 1	SE Mean natives/site: 0.33	
Total Sites: 3	Number of native species: 1	Species diversity: 0.00	
	Maximum species/site: 1	Native species diversity: 0.00	

Depths: 20 to 25 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Sago pondweed	33.3	66.7	33.3	0.0	0.0	6.7

Plant Sampling Discussion

A summer Tier II survey provides quantifiable data and allows managers to track trends in vegetation over time. A survey was completed on August 19, 2020 and found no sites with EWM in Flint Lake and Long Lake. Curly-leaf pondweed was found at 3 locations in Flint Lake and was absent in Long Lake. Table 5 compares surveys completed from 2013-2020 for Flint Lake. Table 6 compares surveys for Long Lake. Depths broken down in 5-foot increments can be found in the Appendix. Eurasian watermilfoil occurrence has been zero for the last 2 years. The number of native species in Flint Lake increased from 6 to 9 from last year. Long Lake had a total of 12 native species collected in 2020. Illinois pondweed was detected during the Tier 2 survey for Flint Lake for the first time since 2014. The number of sites with plants increased from 18 to 24 since 2019. Coontail increased slightly since 2019, from 40.0% to 50.0% frequency of occurrence. Eelgrass has also increased in frequency of occurrence since 2019 from 12.5% to 22.5%. in 2020, all objectives of the plant management plan were met, except curly-leaf pondweed occurrence in Flint Lake.

- Keep Eurasian watermilfoil below 10% occurrence in summer Tier 2 surveys – Flint and Long 0% in 2020
- Keep curly-leaf pondweed below 5% occurrence in summer Tier 2 surveys – Flint 7.5% and Long 0% in 2020
- Maintain at least 8-10 native plants in the post treatment Tier 2 surveys – Flint 9 and Long 12 in 2020
- Maintain a native diversity at least 0.6 to 0.7 in Tier 2 survey – Flint 0.78 and Long 0.83 in 2020

Table 5. Flint Lake Tier 2 Data from 2013-2020.

Flint Lake Multi-year Vegetation Survey Presentation										
Surveyor:	IDNR	LPB	IDNR	LPB	LPB	LPB	Clarke	Clarke	LPB	Clarke
Date:	2013	8/8/2013	2014	8/8/2014	8/8/2015	8/8/2016	8/2/2017	8/14/2018	7/30/2019	8/19/2020
Total Sites:	40	38	40	40	40	40	40	40	40	40
Secchi:	3	3.8	4	3	2.5	4.5	9.3	6.3	3	3.8
Number of native species:	7	7	9	5	6	7	7	9	6	9
Sites with plants:	n/a	32	n/a	23	18	25	26	24	18	24
Sites with native species:	n/a	32	n/a	23	17	25	26	24	18	24
Littoral depth (ft):	18	10	18	12	12	10	23	23	8	18.2
Species diversity:	0.73	0.8	0.79	0.73	0.77	0.86	0.8	0.85	0.64	0.80
native species diversity:	n/a	0.7	n/a	0.67	0.74	0.83	0.76	0.83	0.64	0.78
Mean native species/site:	1.6	1.4	1.7	0.83	0.73	1.03	1.65	1.58	0.73	1.30
Species Frequency of Occurrence – All Depths										
Coontail	80.0	67.9	67.5	37.5	17.5	20.0	22.5	35.0	40.0	50.0
Eurasian watermilfoil	5.0	12.2	20.0	10.0	0.0	7.5	2.5	27.5	0.0	0.0
Eelgrass	27.5	31.6	32.5	17.5	20	17.5	22.5	27.5	12.5	22.5
Northern watermilfoil	12.5	2.6	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flat-stemmed pondweed	2.5	0.0	5.0	0.0	2.5	0.0	0.0	7.5	5.0	2.5
Chara	17.5	26.3	35.0	15.0	25.0	25.0	65.0	25.0	5.0	17.5
Leafy pondweed	0.0	2.6	7.5	0.0	0.0	0.0	5.0	0.0	0.0	2.5
Slender naiad	0.0	2.6	7.5	0.0	0.0	0.0	0.0	5.0	0.0	0.0
Richardson's pondweed	0.0	13.2	0.0	5.0	5.0	15.0	15.0	0.0	5.0	12.5
Illinois pondweed	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0
Canada waterweed	0.0	0.0	2.5	0.0	0.0	5.0	0.0	0.0	0.0	0.0
Common bladderwort	0.0	2.6	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0
Southern naiad	7.5	0.0	10.0	2.5	0.0	15	0.0	0.0	0.0	0.0
Curly-leaf pondweed	5.0	0.0	0.0	0.0	5.0	7.5	20.0	2.5	0.0	7.5
Small Pondweed	12.5	0.0	0.0	0.0	0.0	0.0	32.5	0.0	0.0	7.5
Clasping-leaf pondweed	0.0	0.0	0.0	0.0	0.0	5.0	0.0	17.5	0.0	0.0

Northern naiad	0.0	0.0	0.0	0.0	0.0	0.0	2.5	35	0.0	0.0
American pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0
Starry stonewort	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0
Nitella	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00.0	0.0	5.0

Table 6. Multiyear data presentation for Long Lake.

Survey	Aquatic Control	Aquatic Control	Aquatic Control	Cardno JFNew	LPB	LPB	Aquatic Control	LPB	Clarke
Date	2007	2008	2009	7/26/2012	8/8/2013	8/16/2017	8/15/2018	7/30/2019	8/19/20
Sample Sites	40	40	40	40	47	40	40	40	40
Secchi (ft)	9.5	99	11	10	3.8	11	10	8	5.11
Littoral Depth	17	17	20	19	12	14	21	14	23
Species (N)	8	7	14	10	10	10	11	8	12
Native Species (N)	7	7	13	10	9	9	10	7	12
Species/Site (Max)	5	6	7	7	6	5	6	5	6
Species/Site (Mean)	1.95	1.98	2.47	2.30	2.64	1.63	2.05	1.68	2.28
# Sites with Plants	28	30	31	34	40	25	33	25	33
Native Species/Site (Mean)	1.75	1.98	2.43	2.30	2.60	1.58	1.95	1.45	2.28
# Sites with Native Plants	28	30	31	34	40	25	33	25	33
Species Diversity	0.78	0.76	0.81	0.80	0.80	0.76	0.79	0.82	0.83
Native Species Diversity	0.74	0.76	0.81	0.80	0.80	0.74	0.77	0.79	0.83
Species Frequency of Occurrence – All Depths									
Species	2007	2008	2009	7/26/2012	8/8/2013	8/16/2017	8/15/2018	7/30/2019	8/19/20
Richardson's pondweed	7.5	17.5	7.5	35.0	23.4	10.0	17.5	17.5	10.0
Chara	0.0	0.0	5.0	0.0	4.3	0.0	2.5	0.0	0.0
Coontail	65.0	75.0	70.0	82.5	78.7	60.0	70.0	52.5	60.0
Eelgrass	17.5	25.0	32.5	7.5	0.0	0.0	7.5	5.0	10.0
Elodea	2.5	0.0	7.5	0.02.5	27.50.0	0.0	0.0	0.0	0.0
Eurasian watermilfoil	20	0.0	5.0	0.0	36.2	5.0	10.0	22.5	0.0
Flat-stemmed pondweed	47.5	47.5	60.0	57.5	31.9	47.5	52.5	27.5	57.5
Variable watermilfoil	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0

Leafy pondweed	0.0	0.0	0.0	7.5	0.0	0.0	0.0	0.0	0.0
Naiad	0.0	5.0	5.0	0.0	0.0	5.0	7.5	7.5	0.0
Northern watermilfoil	0.0	2.5	5.0	2.5	0.0	0.0	0.0	0.0	0.0
Water stargrass	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0
Bladderwort	32.5	25.0	40.0	20.0	55.3	20.0	22.5	17.5	17.5
Illinois pondweed	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	35.0
American pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5	2.5
Canada waterweed	0.0	0.0	0.0	5.0	17.0	7.5	5.0	0.0	7.5
Large-leaved pondweed	0.0	0.0	2.5	7.5	10.6	5.0	7.5	0.0	10.0
Variable pondweed	2.5	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0
White-stemmed pondweed	0.0	0.0	0.0	5.0	2.1	0.0	0.0	0.0	0.0
Yellow water buttercup	0.0	0.0	0.0	0.0	0.0	6.4	2.5	0.0	0.0
Nitella	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
Sago pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
Small pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0

Plant Management Discussion and Action Plan

For the 2020 season up to 16 acres of Eurasian watermilfoil was expected at Flint Lake. After multiple inspections, no EWM could be detected at Flint Lake. Long Lake had 10 acres of EWM that was treated using ProcellaCOR EC. While some growth of curly-leaf pondweed later in the season was detected in Flint Lake, it did not reach nuisance levels which is to be expected in the summer. It is recommended that the Valparaiso Lakes Area Conservancy District monitor early season curly-leaf conditions that may impair navigation early in the spring. It is our recommendation that VLACD apply to LARE for $10,000 to treat 10 acres of Eurasian watermilfoil in both Flint and Long using ProcellaCOR EC, and $4,000 for an Aquatic Vegetation Management Plan update with surveys for both Flint and Long Lakes. The total LARE Grant if awarded would be $11,200 (Table7). A copy of this grant application is in the Appendix.

Table 7. Proposed VLACD plant management budget for 2021.

Plant Management Action Plan	Estimated Cost
Invasive Surveys (3), Tier 2 survey (August) and Plan Update (Nov)	$4,000
Up to 10 acres Long Lake EWM treatment with 3.0 PDUs ProcellaCOR	$5,000
Up to 10 acres Flint Lake EWM treatment with 3.0 PDUs ProcellaCOR	$5,000
Total	$14,000
Total LARE Grant if Awarded	$11,200

Public Involvement

A public meeting was held for the VLACD on October 21, 2020. This meeting was created to gain public opinion and support. Residents around the lake area were surveyed to gain insight to their history and needs. There were six completed questionnaires. The results from the survey are below in Table 8.

Table 8. 2020 Flint and Long Lakes Public Use Survey.

2020 Flint and Long Lake Public Use Survey		
Are you a lake property owner?	4-Yes	2-No
Are you currently a member of your lake association?	3-Yes	3- No
How many watercrafts do you currently have registered in Indiana?	0 - 2 1 – 3 2 – 1 3 or more - 0	
Do you have a current Indiana Fishing License?	3- Yes	3- No
How many years have you been at the lake?	5 or less – 0 5-10 – 0 Over 10 years –5	
How do you use the lake?	Boating – 6 Swimming –5 Fishing – 3 Irrigation - 0 Drinking water –2 Other – 0	
Do you have aquatic plants at your shoreline in nuisance quantities?	3-Yes	3- No
Do you donate funding towards aquatic plant control?	3-Yes	3-No
Do aquatic plants interfere with your use or enjoyment of the lake?	3-Yes	3- No
Do you support efforts to control invasive plants on the lake?	6- Yes	- No
Are you aware that LARE funds can only be used for controlling invasive plants, not native plants?	6 -Yes	-No
Mark any of these you think are problems on your lake:	 Too many aquatic plants Dredging needed Other Lack of speed enforcement Too many watercraft use the lake Fish population problem Not enough aquatic plants Poor water quality Too much fishing	 3 1 3 1 2 3 2
Please add any additional comments: Hand harvesting should be favored over herbicide. Mechanical removal reduce eutrophication. Support efforts to control invasive plants without chemicals The too many aquatic plants to invasive. Dredging possibly on ditch and wetlands that drain into Flint Lake Flint lake residents usually intervene successfully. Happy with reduced milfoil problem.		

Literature Cited

IDNR 2018. Aquatic Vegetation Survey Protocol. IN Department of Natural Resources. Division of Fish & Wildlife, Indianapolis, IN

Appendix

Field Data Sheets

Flint Lake

WPT	Depth	Rake score	Curly-leaf pondweed	Fil. Algae	Chara	Richardson's pondweed	Coontail	Eelgrass	Canada waterweed	Flat-stemmed pondweed	Leafy pondweed	Nitella	Illinois pondweed	American pondweed	Small pondweed
1	2.9	3			3	1		1					1		
2	4.5	3					1	1							
3	1.5	1			1		1	1							
4	2	3				3	1	1				1			
5	2	3				3	1	1							
6	3	5				3	3					3	1		
7	3.2	3		P			3	1		1	1				
8	3.1	3			3	3	3	1							
9	3.1	3	1	P			3								
10	1.1	5	1	P	3		1								
11	9.3	1	1				1								
12	8	0													
13	8.8	0													
14	8.2	1					1								1
15	7.8	3					3								
16	5.2	3			1			1					1		
17	8.5	1					1								
18	8.5	3					3								
19	7.8	1		P	1										
20	8.5	1					1	1							1
21	13	0													
22	13.1	0													
23	13.1	0													
24	13	0													
25	14.9	1					1								
26	13.4	1					1								
27	11.5	1					1								
28	15	0													
29	12.3	0													
30	13.9	1					1								1
31	19.3	1		P											
32	18.5	0													
33	18.2	1					1						1		
34	18.2	0													
35	18	1			1										
36	19.9	0													
37	19	1		P											
38	23	0													
39	20.5	0													
40	24.1	1		P											

Long Lake

WPT	Depth	Rake score	Fil. Algae	Richardson's pondweed	Coontail	Eelgrass	Canada waterweed	Flat-stemmed pondweed	Sago pondweed	Nitella	Bladderwort	Illinois pondweed	American pondweed	Small pondweed	Large-leaved pondweed	Robbins pondweed
1	4.9	5	1		1			5				1				
2	5	5			1			5								
3	5	5		3			1	3			1					
4	2.5	5				1		3		3		1		1	1	
5	3.9	5		1	3	1				1		3		3		
6	2	5		3	3		1					1	1			
7	4.3	5	3	1	3			3			1				1	
8	4.1	5			1			1			1	3				
9	4.9	5			3			3				3				
10	4	5			1	1	1	1				3				
11	8.5	5			1			5							1	
12	7	5			1			5			1			1	1	
13	7.8	3	1					3				1				
14	7	5			1			5				1				
15	6.2	3			1			3				1				
16	5.8	5						3			1	3				
17	6	5				1		3			1	1				
18	9.8	3			1			3								
19	9.8	3			1			3			1					
20	9.2	3			1			1								
21	14.6	1										1				
22	15	0														
23	14.5	0														
24	13	1	1		1			1								
25	15	1			1			1								
26	12.1	1			1			1								
27	10.9	3			1			3								
28	14	1			1											
29	14.8	1			1											
30	14	1			1											
31	17	1						1								
32	20	0														
33	16.1	0														
34	19.3	1			1											
35	15.9	1			1											
36	18.1	1										1		1		
37	17.5	0														
38	20.1	0														
39	23	1							1							
40	21.6	0														

Multi-year Data Sheet Flint Lake (Depths: 0 to 5 ft. and 5 to 10 ft.)

Species Frequency of Occurrence - 0 to 5 ft. depths										
Surveyor:	IDNR	LPB	IDNR	LPB	LPB	LPB	Clarke	Clarke	LPB	Clarke
Date:	2013	8/8/13	2014	8/8/14	8/8/15	8/8/16	8/2/17	8/14/2018	7/30/2019	819/2020
Eelgrass	90.9	38.5	80.0	43.8	31.3	35.3	70.0	87.5	30.0	70.0
Coontail	90.9	61.5	80.0	62.5	25.0	23.5	40.0	62.5	80.0	90.0
Chara	63.6	38.5	90	31.3	43.8	41.2	100	87.5	20.0	40.0
Eurasian watermilfoil	9.1	19.2	50.0	25.0	0	17.6	10.0	25.0	0.0	0.0
Northern watermilfoil	36.4	3.8	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Richardson's Pondweed	0.0	19.2	0.0	12.5	12.5	35.3	50.0	0	20.0	50.0
Illinois pondweed	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0
Flat-stemmed Pondweed	9.1	0.0	10	0.0	0.0	0.0	0.0	37.5	10	10.0
Leafy Pondweed	0.0	0.0	3.8	20.0	0.0	0.0	10	0.0	0.0	10.0
Canada Waterweed	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Common Bladderwort	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Naiad	18.2	0.0	10.0	0.0	0.0	29.4	0.0	0.0	0.0	0.0
Curly-leaf Pondweed	0.0	0.0	0.0	0.0	6.3	11.8	70	12.5	0.0	20.0
Small Pondweed	18.2	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
Clasping-leaf Pondweed	0.0	0.0	0.0	0.0	0.0	11.8	0.0	75.0	0.0	0.0
Northern naiad	0.0	0.0	0.0	0.0	0.0	0.0	10.0	75.0	10.0	0.0
Starry stonewort	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0
Nitella	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0

Species Frequency of Occurrence - 5 to 10 ft. depths										
Surveyor:	IDNR	LPB	IDNR	LPB	LPB	LPB	Clarke	Clarke	LPB	Clarke
Date:	2013	8/8/13	2014	8/8/14	8/8/15	8/8/16	8/2/17	8/14/2018	7/30/2019	819/2020
Coontail	100	66.7	100	36.4	18.2	30.8	20.0	55.6	72.7	60.0
Eurasian watermilfoil	11.1	0.0	30	0.0	0.0	0.0	0.0	11.1	0.0	0.0
Northern Watermilfoil	11.1	0.0	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eel Grass	11.1	33.3	50.0	0.0	18.2	7.7	20.0	44.4	18.2	20.0
Flat-stemmed Pondweed	0.0	0.0	10.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0
Slender Naiad	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0
Chara	0.0	0.0	50.0	8.3	9.1	23.1	100	22.2	0.0	20.0
Southern Naiad	11.1	0.0	20.0	8.3	0.0	7.7	0.0	0.0	0.0	0.0
Curly-leaf Pondweed	11.1	0.0	0.0	0.0	9.1	7.7	10.0	0.0	0.0	10.0
Canada Waterweed	0.0	0.0	0.0	0.0	0.0	15.4	0	0.0	0.0	0.0
Small Pondweed	33.0	0.0	0.0	0.0	0.0	0.0	70.0	0.0	0.0	20.0
Richardson's Pondweed	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
Leafy Pondweed	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
Illinois pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0

Multi-year Data Sheet (Depths: 10 to 15, 15 to 20, and 20 to 25 ft.)

Species Frequency of Occurrence - 10 to 15 ft. depths										
Surveyor:	IDNR	LPB	IDNR	LPB	LPB	LPB	Clarke	Clarke	LPB	Clarke
Date:	2013	8/8/13	2014	8/8/14	8/8/15	8/8/16	8/2/17	8/14/2018	7/30/2019	819/2020
Coontail	60.0	0.0	70.0	33.3	9.1	0	30.0	23.1	0.0	40.0
Eurasian watermilfoil	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0
Chara	0.0	0.0	0.0	0.0	9.1	0.0	40.0	7.7	0.0	0.0
Eel Grass	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0
Leafy Pondweed	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southern Naiad	0.0	0.0	10..0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Small Pondweed	0.0	0.0	0.0	0.0	0.0	0.0	40.0	0.0	0.0	10.0
Northern naiad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.4	0.0	0.0
Species Frequency of Occurrence - 15 to 20 ft. depths										
Surveyor:	IDNR	LPB	IDNR	LPB	LPB	LPB	Clarke	Clarke	LPB	Clarke
Date:	2013	8/8/13	2014	8/8/14	8/8/15	8/8/16	8/2/17	8/14/2018	7/30/2019	819/2020
Coontail	70.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	14.3
Chara	0.0	0.0	0.0	0.0	0.0	0.0	14.3	0.0	0.0	14.3
Eurasian watermilfoil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	0.0
Northern naiad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0
Illinois pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3
Species Frequency of Occurrence - 20 to 25 ft. depths										
Surveyor:	IDNR	LPB	IDNR	LPB	LPB	LPB	Clarke	Clarke	LPB	Clarke
Date:	2013	8/8/13	2014	8/8/14	8/8/15	8/8/16	8/2/17	8/14/2018	7/30/2019	819/2020
Small Pondweed	0	0	0	0	0	0	33.3	0.0	0.0	0.0
Chara	0	0	0	0	0	0	33.3	0.0	0.0	0.0

Multi-year Data Sheet Long Lake (Depths: 0 to 5 ft.)

Survey	Aquatic Control	Aquatic Control	Aquatic Control	Cardno JFNew	LPB	LPB	Aquatic Control	LPB	Clarke
Date	2007	2008	2009	7/26/12	8/8/13	8/16/17	8/15/18	7/30/19	8/19/20
Coontail	87.5	100	100	100	100	90	90	90	80.0
Eurasian watermilfoil	87.5	0.0	20.0	0.0	71.4	0.0	0.0	40.0	0.0
Common bladderwort	62.5	54.5	90.0	27.3	71.4	40.0	30.0	20.0	30.0
Eelgrass	50.0	72.7	70.0	27.3	0.0	0.0	20.0	20.0	30.0
Flat-stemmed pondweed	50.0	81.8	100	81.8	28.6	90.0	60.0	50.0	80.0
Richardson's pondweed	25.0	54.5	30.0	90.9	57.1	20.0	40.0	60.0	40.0
Canada waterweed	12.5	0.0	20.0	9.1	57.1	20.0	0.0	0.0	30.0
Variable pondweed	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Slender Naiad	0.0	18.2	20.0	0.0	0.0	0.0	20.0	20.0	0.0
Water stargrass	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0
Chara	0.0	0.0	20.0	0.0	14.3	0.0	10.0	0.0	0.0
Large-leaved pondweed	0.0	0.0	10.0	18.2	14.3	20.0	20.0	0.0	20.0
Leafy pondweed	0.0	0.0	0.0	18.2	0.0	0.0	0.0	0.0	0.0
Yellow water buttercup	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
Illinois pondweed	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	70.0
Southern naiad	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
Clasping leaf pondweed	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
American pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	10.0
White-stemmed pondweed	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0
Nitella	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0
Small pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0

Long Lake Species Frequency of Occurrence 5-10 ft., 10-15 ft., 15-20 ft., 20-25 ft.

Species Frequency of Occurrence Depth 5-10 ft.									
Survey	Aquatic Control	Aquatic Control	Aquatic Control	Cardno JFNew	LPB	LPB	Aquatic Control	LPB	Clarke
Date	2007	2008	2009	7/26/12	8/8/13	8/16/17	8/15/18	7/30/19	8/19/20
Coontail	100	100	100	100	90.0	100	100	90.0	70.0
Eurasian watermilfoil	9.1	0.0	0.0	0.0	40.0	10.0	10.0	50.0	0.0
Common bladderwort	72.7	33.3	77.8	45.5	63.3	20.0	50.0	50.0	40.0
Eelgrass	27.3	33.3	44.4	0.0	0.0	0.0	0.0	0.0	10.0
Flat-stemmed pondweed	81.8	66.7	77.8	81.8	36.7	70.0	80.0	50.0	100
Richardson's pondweed	9.1	16.7	0.0	27.3	23.3	10.0	20.0	10.0	0.0
Canada waterweed	0.0	0.0	11.1	9.1	13.3	10.0	0.0	0.0	0.0
Chara	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0
Large-leaved pondweed	0.0	0.0	0.0	9.1	13.3	0.0	0.0	0.0	20.0
Leafy pondweed	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0
White-stemmed pondweed	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0
Northern watermilfoil	0.0	16.7	22.2	9.1	0.0	0.0	0.0	0.0	0.0
Variable watermilfoil	0.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0
Filamentous algae	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0
American pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	0.0
Southern naiad	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
Yellow water buttercup	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
Illinois pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0
Small pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0
Species Frequency of Occurrence 10-15 ft									
Coontail	53.8	90.9	63.6	75.0	60.0	45.5	80.0	27.3	70.0
Eurasian watermilfoil	0.0	0.0	0.0	0.0	0.0	9.1	20.0	0.0	0.0
Common bladderwort	0.0	18.2	0.0	0.0	40.0	18.2	0.0	0.0	0.0
Eelgrass	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0
Flat-stemmed pondweed	46.2	54.5	54.5	25.0	40.0	27.3	40.0	9.1	40.0
Richardson's pondweed	0.0	0.0	0.0	8.3	0.0	0.0	10.0	0.0	0.0
Canada waterweed	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0
Variable pondweed	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0
Slender naiad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0
Large- leaved pondweed	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0
Illinois pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0
Species Frequency of Occurrence 15-20 ft									
Coontail	12.5	25.0	20.0	50.0	0.0	0.0	14.3	0.0	28.6
Eurasian watermilfoil	0.0	0.0	0.0	0.0	0.0	0.0	14.3	0.0	0.0
Common bladderwort	0.0	0.0	0.0	0.0	0.0	0.0	14.3	0.0	0.0
Eelgrass	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
Flat-stemmed pondweed	0.0	0.0	10.0	50.0	0.0	0.0	28.6	0.0	14.3
Slender naiad	0.0	0.0	0.0	0.0	0.0	0.0	14.3	0.0	0.0
Filamentous algae	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0
Illinois pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3
Small pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3

Species Frequency of Occurrence 20-25 ft									
Flat-stemmed pondweed	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0
Sago pondweed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3
Filamentous algae	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0

List of Aquatic Plant Names

Common Name	*Scientific Name*
American pondweed	*Potamogeton nodosus*
Canada Waterweed	*Elodea canadensis*
Chara	*Chara Spp.*
Clasping leaf Pondweed	*Potamogeton perfoilatus*
Common Bladderwort	*Utricularia macrorhiza*
Coontail	*Ceratophyllum demersum*
CURLY-LEAF PONDWEED	*POTAMOGETON CRISPUS*
Eel Grass	*Vallisneria americana*
EURASIAN WATERMILFOIL	*MYRIOPHYLLUM SPICATUM*
Flat-stemmed Pondweed	*Potamogeton zosteriformis*
Illinois Pondweed	*Potamogeton illinoensis*
Leafy Pondweed	*Potamogeton foliosus*
Northern Naiad	*Najas gracillima*
Northern Watermilfoil	*Myriophyllum sibiricum*
Nitella	*Nitella flexilis*
Richardson's Pondweed	*Potamogeton richardsonii*
Sago pondweed	*Stuckenia pectinata*
Slender Naiad	*Najas flexilis*
Small Pondweed	*Potamogeton pusillus*
Southern Naiad	*Najas guadalupensis*
STARRY STONEWORT	*Nitellopsis obtusa*

***The scientific and common names of NON-NATIVE species are shown in ALL CAPITAL LETTERS.