

# A Point Intersect Aquatic Plant Survey on Geneva Lake, Walworth County, WI, July 2020

Conducted by Ontarra LLC.

For the Geneva Lake Environmental Agency

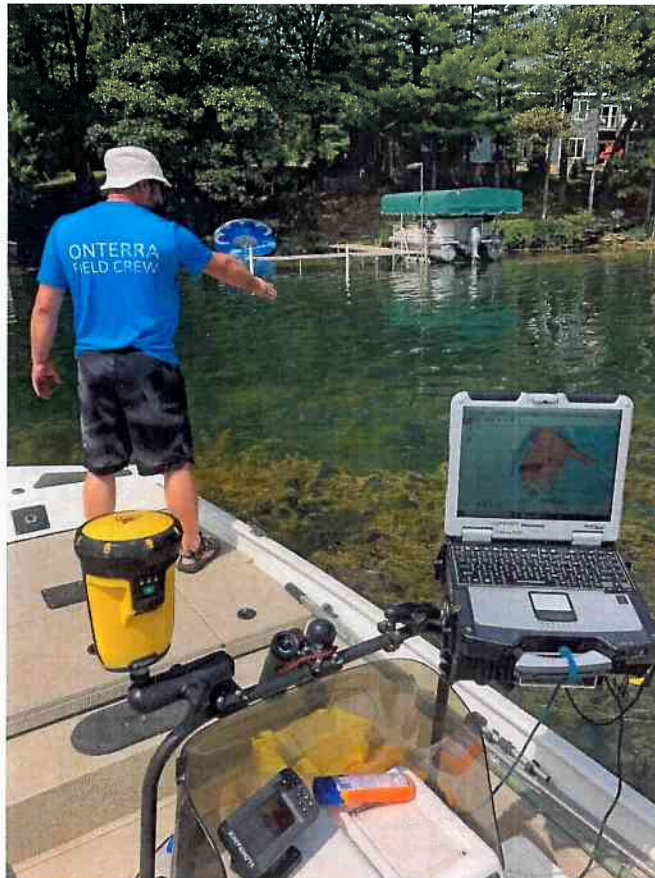


Photo Courtesy of Onterra

Report prepared by Theodore W. Peters, GLEA

November 2020.

This point intersect aquatic plant survey was funded by a WI Department of Natural Resources grant #AIRR-243-19

Table of Content

Background .....1

Geneva Lake Info .....1

The Survey .....2

    Geneva Lake’s Aquatic Plants.....3

    Trinke Lagoon Sub P.I. Survey.....5

Invasives .....5

Plant Community Assessment.....6

    Invasives.....6

    Rake Fullness.....7

    Diversity.....7

    Richness.....7

    Coefficient of Conservation.....7

    Floristic Quality Index.....8

Discussion.....9

References.....10

**List of Figures**

Figure 1, Geneva Lake Littoral Zone.....1

**List of Tables**

Table 1, Data comparison for the 2019 and 2020 Geneva Lake WI, aquatic plant surveys.....2

Table 2, The five most common aquatic plants found in a 2020 aquatic plant survey on Geneva Lake, WI.....4

Table 3, Coefficient of conservatism for plants found in Geneva Lake WI, summer 2020.....8

**List of Appendices**

Appendix A, Map of sample locations from the Geneva Lake, WI P.I. aquatic plant survey , 2020.....11

Appendix B, Map of sub P. I survey in Trinke Lagoon, Geneva Lake WI, 2020.....12

Appendix C, Listing of aquatic plants found in the 2019 and 2020 PI aquatic plant survey, Geneva Lake WI.....13

Appendix D, Number of sites with aquatic plant by depth (feet) in Geneva Lake WI, 2020.....14

Appendix E Comparison of littoral frequency of occurrence (%) for the 2015, 2019 and 2020 aquatic plant survey on Geneva Lake, WI.....15

Appendix F, Field survey data from the Geneva Lake, WI aquatic plant survey 2020. ....16

Table of Contents (cont.)

Appendix G, Common plants found in the 2020 aquatic plant survey, Geneva Lake, WI.....17  
Appendix F, Aquatic invasive plants known to exist in Geneva Lake, WI.....20

# Geneva Lake Aquatic Plant Survey July 2020 twp/glea January 2020.

## BACKGROUND

Aquatic plants are a vital part of a healthy lake. They provide habitat (i.e. food, cover, substrate, etc.) for other forms of aquatic and semi-aquatic organisms such as fish, insects, wildlife, and waterfowl. They dampen wave action and protect the shoreline from wave generated erosion. Aquatic plants also serve as a sink for nutrients. Aquatic plant management is important in assuring that a lake's aquatic plants do not interfere with recreation and the overall health of a lake. The first step in aquatic plant management is to know the composition and extent of the aquatic plant community.

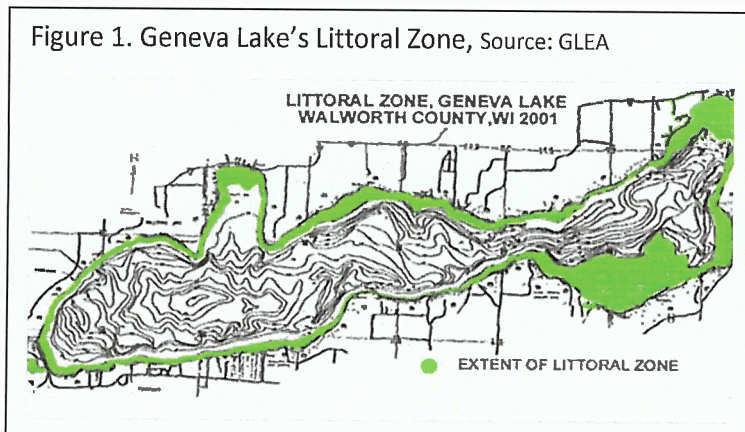
The Geneva Lake Environmental Agency hired Onterra LLC to conduct a lake-wide, point-intersect, (PI) aquatic plant survey on Geneva Lake during July 21, 22, 23, 2020. Although the survey focused on vascular plants some macro algae were also identified. Onterra had conducted a similar survey during the summer of 2019. The 2020 intersect grid was the same as used in 2015 and 2019. It was originally prepared by the WI Department of Natural Resources for the first survey conducted in 2015.

The 2018 discovery of the nonnative, invasive, starry stonewort (SSW) (*Nitelopsis obtuse*) in the Trinke Lagoon, drove the need to conduct back-to-back surveys in 2019 and 2020. A meander survey of the lake's access sites conducted during the fall of 2018 did not find any other SSW in the lake at that time. Of concern was the possibility if starry stonewort spreading into or within the lake.

The 2019 survey discovered a bed of SSW approximately 0.6 ac in size and in 14 ft. of water, located in the southeastern portion of the lake ( N 42° 33' 35.80", W 88° 27' 22.72"). A simultaneous meander survey also found a small bed of SSW at the mouth of the lagoon where SSW was first found (N 42° 33' 31.52", W 88° 27' 47.54"). In 2020 a sub-PI survey was conducted in the Trinke Lagoon that included 28 sample points.

## GENEVA LAKE INFORMATION

Geneva Lake is a deep lake with a mean depth of 61 ft. and a maximum depth of 140 ft. It has a surface area of 5,262 ac. with 20.2 miles of shoreline. It is 7.6 miles in length (east to west) and varies in width from a half mile to two miles. <sup>(1)</sup>



A lake's littoral zone is that part of a lake near the shore area where the light can penetrate to the bottom allowing for plant growth. Excluding the three bays, Geneva Bay on the northeast end of the lake, Williams Bay on the northwest end of the lake and the Trinke flats, on the southeast end of the lake, the littoral zone is relatively narrow. Maximum depth of vegetation found in the 2020 study was 37 ft., which indirectly defines the maximum depth of the littoral zone.

### THE SURVEY

A total of 30 different aquatic plants were identified in Geneva Lake's 2020 aquatic plant survey, including a grouping of aquatic moss and filamentous algae (appendix A). The 2019 and the 2020 PI aquatic plant survey on Geneva Lake found conditions and plants to be similar (table 1). Although 28% more sites were visited in the 2020 survey (1,268 sample points), the number of sites with vegetation remained relatively the same with only a 3% increase (628 points with plants). Maximum depth of plants found in 2020 was 37 ft., five feet deeper than the 2019 survey. The average number of all species per site with vegetation in 2019 was 2.6 compared to 2.4 in 2020. The average number of native species per site with vegetation dropped slightly from 2.3 in 2019 to 2.1 in 2020.

Table 1 . Data comparison between 2019 and 2020 Geneva Lake, WI PI aquatic plant surveys.

Summary Statistics from 2019 and 2020 Aquatic Plant Point- Intersect Survey		
Geneva Lake WI, Source: GLEA and Onterra LLC.		
	2019	2020
Total number of sites visited	994	1268
Total number of sites with vegetation	607	628
Total number of sites shallower than maximum depth of plants	770	860
Frequency of occurrence at sites shallower than maximum depth of plants	78.83117	73.02326
Simpson Diversity Index	0.90315	0.900296
Maximum depth of plants (ft)**	32	37
Number of sites sampled using rake on Rope (R)	368	384
Number of sites sampled using rake on Pole (P)	446	495
Average number of all species per site (shallower than max depth)	2.019481	1.743023
Average number of all species per site (veg. sites only)	2.561779	2.384738
Average number of native species per site (shallower than max depth)	1.753247	1.548837
Average number of native species per site (veg. sites only)	2.257525	2.125997
Species Richness (Including algae and moss)	32	30
Species Richness (including visuals and algae and moss)	32	30

Plant density was evaluated on the fullness of the rake used to retrieve plants from the lake bottom. After the rake was pulled along the bottom it was brought up to the surface. The plants on the rake were identified, recorded, and quantified by the fullness of the rake. Rake fullness ranking ranged from 0 to 3 with zero representing no plants and 3 representing a full rake.

**Geneva Lake's Aquatic Plants:** Plants need light to photosynthesis or to grow. The extent of plant growth into deeper waters is dependent upon how deep light can penetrate the water. Geneva Lake's good water clarity allows for good light penetration into deeper waters than many southeastern Wisconsin lakes. Over the last 24 years, Geneva Lake's springtime, secchi disc readings (a measure of light penetration into the water) have ranged from 3.4 meters (11.2 ft.) to 8.9 ( 29.2 ft). meters and averaged 6.1 meters (20.0 meters). The average secchi disc reading for six growing season months in 2019 was 5.2 meters (17.1 ft.).

The maximum depth at which aquatic plants were found the 2020 Geneva Lake aquatic plant survey was 11.3 meters (37 ft.) where *Nitella* (*Nitella sp.*), a macro-alga, was found. *Nitella* was also found at 20 other sites in this survey at various depth. The most common depth with aquatic plants was 4.9 meters (16 ft.) at which 65% of sample sites had plants. The most common depths for the presence of aquatic plants ranged between 2.4 meters ( 8 ft.) and 4.9 meters (16 ft.) . Of interest is the sudden decrease in the number of sites with plants between 4.9 meters (16 ft.) and 5.2 meters (17 ft.), where the number of sites with plants dropped 68% from 65 sites to 21 sites. (appendix C).

Bottom type, sand, muck, or rock, is also influential in the type and number of plants to found in a lake. This aquatic plant survey included identifying bottom type. Sand was found to be the bottom type at 278 sites (54%), muck or soft bottom at 190 sites( 38%) and 27 sites (5%) with rock or hard bottom.

Two new species were identified in the 2020 survey that were not listed in the 2019 survey: forked duckweed (*Lemna triculca*) and small pondweed (*Potamogeton pusilius*). Forked duckweed has been observed on the lake for several years. It may have not been recorded or included in 2019 samples. Small pondweed may be a new species or just missed or missed ID in the past. Both species are not considered to be problematic species.

Several plants found in 2019 were not identified in the 2020 survey. This may not be too significant as the likelihood of hitting the exact same spot and having the plant hook hit the same plant from year to year is low, especially in a diverse population. Plant communities can change in a matter of a few years.

The five most common plants found in the 2020 survey were, wild celery (*Vallisneria americana*), coontail (*Ceratophyllum demersum*), ditch grass (*Ruppia cirrhosa*), forked duckweed (*Lemna trisulca*) and the non-native Eurasian watermilfoil (*Myriophyllum spicatum*) (table 2). The top three occurring aquatic plants found in the 2019 survey were 1) Coontail, 2) water celery and 3) ditch grass.

Table 2. The five most common aquatic plants found in a 2020 aquatic plant survey on Geneva Lake WI.

2020 Five Most Common Aquatic Plants Found in Geneva Lake WI. Source: Onterra LLC, GLEA					
Does not include filamentous algae and aquatic moss.					
Genus	species	common name	Occurance	Frequency of Occurance (%)	% of Population
<i>Vallisneria</i>	<i>americana</i>	Water celery	272	43.3	18.1
<i>Ceratophyllum</i>	<i>demersum</i>	Coontail	211	33.6	14.1
<i>Ruppia</i>	<i>cirrhosa</i>	Ditch grass	185	29.5	12.3
<i>Lemna</i>	<i>trisulca</i>	Forked duckweed	155	24.7	10.3
<i>Myriophyllum</i>	<i>spicatum</i>	Eurasian watermilfoil	146	23.2	9.73

Water Celery was found at 272 sites and represented 18.1% of the recorded aquatic plants, excluding filamentous algae and aquatic moss. It had a frequency of occurrence of 43.3% meaning at any given site there is a 43.3% chance of finding water celery. It is a very desirable aquatic plant with all parts of the plant being popular as food for waterfowl and fish. It is often called eel grass as it looks like large grass blades. It is generally a low growing plant and seldom reaches up to the surface of the water.

Coontail was found at 211 sites and represented 14.1% of the recorded aquatic plant community. There is a 33.6% chance of finding coontail at any given site. It can be a tall, much branching plant that grows to the surface. It is abundant in Wisconsin. Its fine, stiff leaves offer cover for a wide range of critters making it a good food source for fish and waterfowl. It has an exceptional ability to draw nutrients from the water and has been used in small ponds to reduce phosphorus levels.

Ditch grass was identified at 185 sites, represented 12.3% of the recorded aquatic plant community and a 29.5% chance of being located at any site. It is also a popular food source for waterfowl. It likes hard water lakes such as Geneva Lake. The state of Minnesota has classified it as one of the rarer aquatic plants in the state. *Ruppia cirrhosa* was listed as a special concern species in Minnesota in 1996. Earlier Geneva Lake plant surveys did not identify the presence of ditch grass. It may have been misidentified as a similar looking sago pondweed (*Stuckenia pectinate*).

Forked duckweed was found at 155 sites, represented 10.3% of the inventoried aquatic plant site and had a frequency of occurrence of 24.7%. It is a small, green, free-floating plant that is visual to the naked eye looking like tiny rowboats with small oars. As the name indicates, it also is a preferred waterfowl food.

Eurasian watermilfoil (*Myriophyllum spicatum*) was identified as the five most abundant plant in Geneva Lake. It is a non-native invasive plant that has several native relatives common to North American lakes. More discussion on Eurasian watermilfoil follows under Invasives.

**Trinke Lagoon Sub Point Intersect (PI) Survey:** During the 2020 lake-wide PI aquatic plant survey, a sub (smaller) PI grid was laid out in first bay of Trinke Lagoon and focused only on starry stonewort. Of the 28 points sampled, 24 had a positive identification of SSW (appendix B). This survey found that starry stonewort has expanded its range in the lagoon from a few isolated locations in the first bay, to an almost complete coverage of the first bay. It is unknown whether it has spread into the Trinke Lagoon's western two bays. A sub-PI survey is being planned for the complete lagoon in 2021. It will focus on identifying the extent of starry stonewort colonization within the whole Lagoon.

## INVASIVES

Three aquatic invasive plants have been confirmed as being present in Geneva Lake, Eurasian watermilfoil (*Myriophyllum spicatum*), curly leaf pondweed (*Potamogeton crispus*) and starry stonewort, (*Nitelopsis obtuse*). Eurasian watermilfoil and curly leaf pondweed are vascular plants. Starry stonewort is a macro alga.

Eurasian watermilfoil is an invasive that was identified in the Geneva Lake in a 1976 aquatic plant survey. The 2020 survey found it at 146 sites at an average rake density of 1.22 plants per rake pull. The 2020 survey lists it as the fifth most abundant plant in Geneva Lake. It has been known to crossbreed with native species and as a result it can be challenging to tell the difference between the hybrid, the native and the invasive species.

Eurasian watermilfoil has a much branching structure which allows it to form thick beds that are impassable for fish and can seriously interfere with recreation. It produces small flowers that rise above the water surface. Once seeds have been formed the stem can break apart and float to new rooting locations.

Curly leaf pondweed has also been identified in Geneva Lake in several past surveys. The 2020 survey found it at 21 sites with an average rake fullness of 1.0. Curly leaf is an early growing plant. It can complete its growing



season as early as August and can start dying back at that time. Plant surveys done in late summer may miss the full extent of curly leaf in a lake. It spreads primarily by turions or vegetative buds that sink to the bottom.

Starry stonewort (SSW) was initially found in the Trinke Lagoon in the fall of 2018. Consideration was given to dredging the lagoon with the hope of eradicating the plant. In the summer of 2019 it was found in two nearby locations in the lake. Once SSW was in the lake, SSW management strategy shifted to contain and control. Historically, SSW management has not been successful in eradicating established populations of SSW.

Starry stonewort is known to exist in the Trinke Lagoon and at two locations outside of Trinke Lagoon. One lake site is just outside Trinke Lagoon and the other is a quarter of a mile to the east of Trinke Lagoon.

Of the two lake sites, it was only found one site in the lake during the 2019 and 2020 PI survey. It was found at a rake fullness of 2 both years. It was also identified at another site outside the lagoon by the 2019 meander survey and confirmed by divers in 2020. SSW spreads vegetatively, primarily by starchy, star-shaped bulbils found on the plant's rootlike structures buried in the lake bottom.

## **PLANT COMMUNITY ASSESSMENT**

**Invasive Species:** An important evaluation tool for a plant community is the amount of native species vs invasive species. Also important is the condition and size of the invasive communities. If the invasive species is one of many species in a heterogeneous community, their impact on the lake is less significant than if they are the only plant in a homogeneous community.

Of the three invasive species documented in Geneva Lake by the 2020 PI aquatic plant survey, Eurasian watermilfoil was the most abundant, found 272 times and representing 18% of the aquatic plant population. A study by a George Williams College student found that areas of high human activity and plant community disturbance on Geneva Lake coincide with the presence of curly leaf pondweed and Eurasian watermilfoil <sup>(2)</sup>.

The second most abundant invasive, Curley leaf pondweed, was found at 21 sites and represented only 1.4% of the plant community. Curly leaf pondweed is an early growing plant and may have started dying back at the time of this survey.

Starry stonewort (SSW) is a new invasive aquatic plant first discovered in the fall of 2018. To date it has only been identified at two locations in the Geneva Lake. Both locations are close to where it was first identified in

the Trinke Lagoon. At one location it is part of a heterogeneous plant community and is in five to six feet of water. The other location to the east is in 14 ft. of water and is a homogeneous plant bed of starry stonewort, 0.6 ac. in size. The smaller heterogeneous bed that contains some SSWs was not discovered in the PI aquatic plant survey but in the 2019 meander aquatic plant survey. It was again documented in 2020.

Overall aquatic invasive species in Geneva Lake have not been a problem or threat to the plant community. Milfoil and curly leaf have been in the lake for many years and have not reach a lake-wide nuisance level. SSW is new to the lake and its impact on the overall health of the plant community is not yet known. Concern does exist over the future of SSW in Geneva Lake.

**Rake Fullness:** The rake fullness for each plant was recorded for each time the rake was retrieved. Rake fullness was ranked 0 for nothing on the rank, to 3 for a full rake. The individual plant rake fullness for each species as recorded at each site was averaged to give an average lake-wide rake fullness for each species. All plants inventoried in 2020 averaged a rake fullness of between 1 and 2. SSW had the highest average rake fullness of 2.0. SSW was found at only one location which is believed to be a homogenous bed of SSW. The average rake fullness for all plants, including SSW the 2020 study was 1.2.

**Diversity:** There are several ways of evaluating a plant community's diversity. The Simpson Diversity Index evaluates the number of species relative to the total number of plants in the community and ranks the population between 0 and 1. The closer to 1, the more diverse and subsequently the more likely the community is to adapt to changes in the environment without significant changes to the community. A value of 0 would indicate no diversity. Based upon the data collected in the 2020 aquatic plant survey, Geneva Lake's Simpson Diversity index value was 0.900296.

**Richness:** Species richness is another way of evaluating the diversity of a community by simply counting the number of species found in the community. The more bio-diverse the community is the more stable and resistant to change the community may be. Not including the filamentous algae and aquatic moss found in the 2020 survey, Geneva Lake has a species richness of 28. The Wisconsin statewide median species richness for lakes is 19 <sup>(2)</sup>

**Coefficient of Conservatism:** Biologists have used a "Coefficient of Conservatism" (C) value to represent the susceptibility of a species to disturbance. "C" values range from 0 to 10. The higher the "C" value assigned to a plant the more sensitive it is to changes in its environment.

Geneva Lake’s aquatic plants have a range of “C” values from 0, for non-native invasive species, to a high of 8 for five other species<sup>(5)</sup>. The average C value for all aquatic plant identified in this survey was 5.6 with a median value of 6.0. The median “C” value for lakes in Wisconsin was found to be 6.3<sup>(2)</sup>.

Table 3. Coefficient of Conservatism for aquatic plants found in Geneva Lake, WI, summer of 2020.

Coefficient of Conservatism for aquatic plants found in Geneva Lake, WI Summer 2020.			
C value =Coefficient of Conservatism.			
Genus	species	common name	C value
Ceratophyllum	demersum	Coontail	3
Chara	spp.	Muskgrass	7*
Elodea	canadensis	Common waterweed	3
Heteranthera	dubia	Water stargrass	6
Lemna	trisolca	Forked duckweed	6
Myriophyllum	spicatum	Eurasian watermilfoil	0
Myriophyllum	sibiricum	Northern watermilfoil	6
Najas	guadalupensis	Southern Naiad	7
Najas	flexilis	Slender naiad	6
Nitella	spp.	Stonewort	7*
Nitellopsis	obtusa	Starry stonewort	0
Potamogeton	natans	Floating pondweed	5
Potamogeton	praelongus	White stem pondweed	8
Potamogeton	crispus	Curly leaf pondweed	0
Potamogeton	zosteriformis	Flat-stem pondweed	6
Potamogeton	friesii	Fries pondweed	8
Potamogeton	illinoensis	Illinois pondweed	6
Potamogeton	foliosus	Leafy pondweed	6
Potamogeton	nodosus	Longleaf pondweed	7
Potamogeton	pusillus	Small pondweed	7
Potamogeton	strictifolius	Stiff pondweed	8
Potamogeton	gramineus	Variable pondweed	7
Ranunculus	aquatilis	White water crowfoot	8
Ruppia	cirrhosa	Ditch grass	8
Stuckenia	pectinata	Sago pondweed	3
Tolypella	intricata	Birds nest stonewort	
Utricularia	vulgaris	Bladderwort	7*
Vallisneria	americana	Water celery	6

Source: Aquatic Plants of the Upper Midwest, Paul M. Skawinski ISBN 978-0-692-28095-9  
 \* Source: Onterra, LLC.

No C values could be found for Birds nest stonewort (*Tolypella intricata*). It is a macro-alga and consider a desirable plant. Based upon its limited distribution and the quality of the environment it has been found in, It is proposed that Bird’s nest stonewort’s “C” value would at least exceed the average value of 5.6 and may be higher.

**Floristic Quality Index (FQI):** Floristic quality index (FQI) combines a plant community’s coefficient of conservatism with the species richness. It evaluates not only how sensitive the community’s plants are to change, but it also looks at the richness or diversity of the community. Floristic quality can be calculated for the community looking only at the native species (native FQI) and it can be calculated for the full community

(full FQI) including the invasive species. The higher the floristic quality the more desirable the plant community. Generally 1-19 indicates low vegetative quality; 20-35 indicates high vegetative quality and above 35 indicates “Natural Area” quality<sup>(3)</sup>

Geneva Lake’s native FQI was calculated to be 30.0. The Wisconsin state median FQI is 27.2<sup>(1)</sup>. Geneva Lake’s full FQI was calculated to be 28.2. The further apart the native FQI and the full FQI values are the more influenced the plant community is by invasive species.

**DISCUSSION:** Geneva Lake has a diverse and healthy plant community. As with all inland lakes it is being threatened by changes in water quality and invasive species of all types. Yet, with its inherent assimilative capacity and a bit of help from lake users and residents, it can maintain good water quality and a healthy plant community. A healthy aquatic plant community is the best ally in controlling aquatic invasive species. Chemical treatments, invasive species and human activities have caused, and will continue to cause, changes in the bottom community, including the plant communities. Wise shoreland land use that maintains the ecological integrity of the littoral zone is vital in keeping a healthy lake and plant community. The littoral zone is a lake's lifeline. A healthy littoral zone is vital to a healthy lake.

Geneva Lake has five municipal launches and numerous private launches that offer lake access to thousands of boats each year. These boat access sites can also be the access sites for aquatic invasive species. A strong boaters education effort to include an active Clean Boats and Clean Waters inspection and education program at all lake access points will limit the transport of aquatic invasive species.

Enforcement of aquatic invasive rules is also a must. Boats should not be launched or removed from Geneva Lake unless the boat and trailer is clean. Bilge water, bait water and bait should not be transferred from one lake to another. Boat cleaning stations should be offered at each municipal launch site. If at minimum, a long-handled broom and some designated cleaning and disposal areas for bait and plants should be provided at each launch.

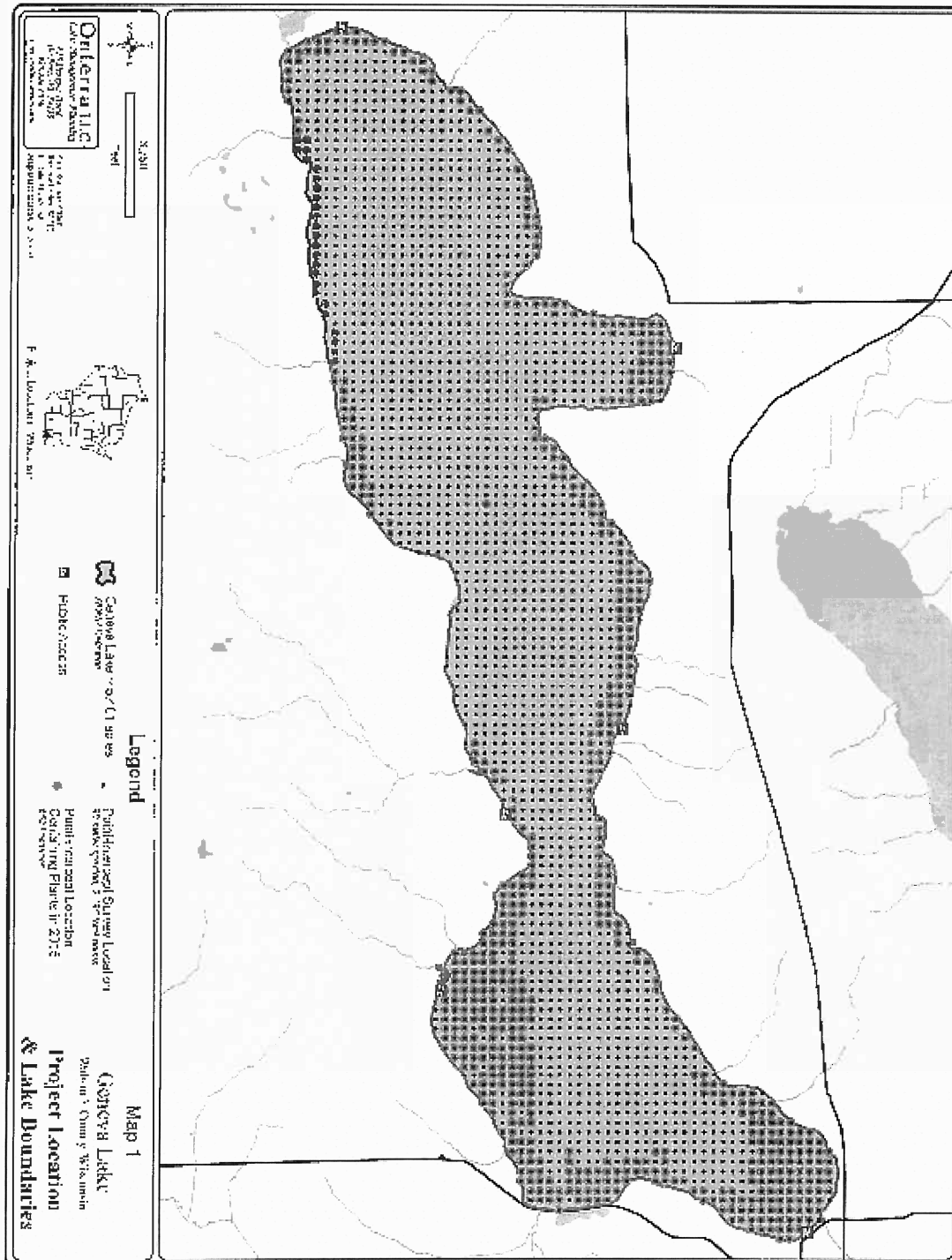
A new aquatic plant management plan is due. This plan should focus on protecting the native plants and the existing quality of the aquatic plant community. It is also anticipated a new aquatic plant community will be a vital part of a new overall lake management plan.

Aquatic plant management can offer science-based strategies for the protection of the Geneva Lake's plant community. They must be developed in the context of what is best for the whole lake, including benthic (bottom) species, fish, plants, shoreline stabilization, invasive control and overall littoral integrity. To be successful there must be a commitment to uniform aquatic plant management strategies by the whole Geneva Lake community.

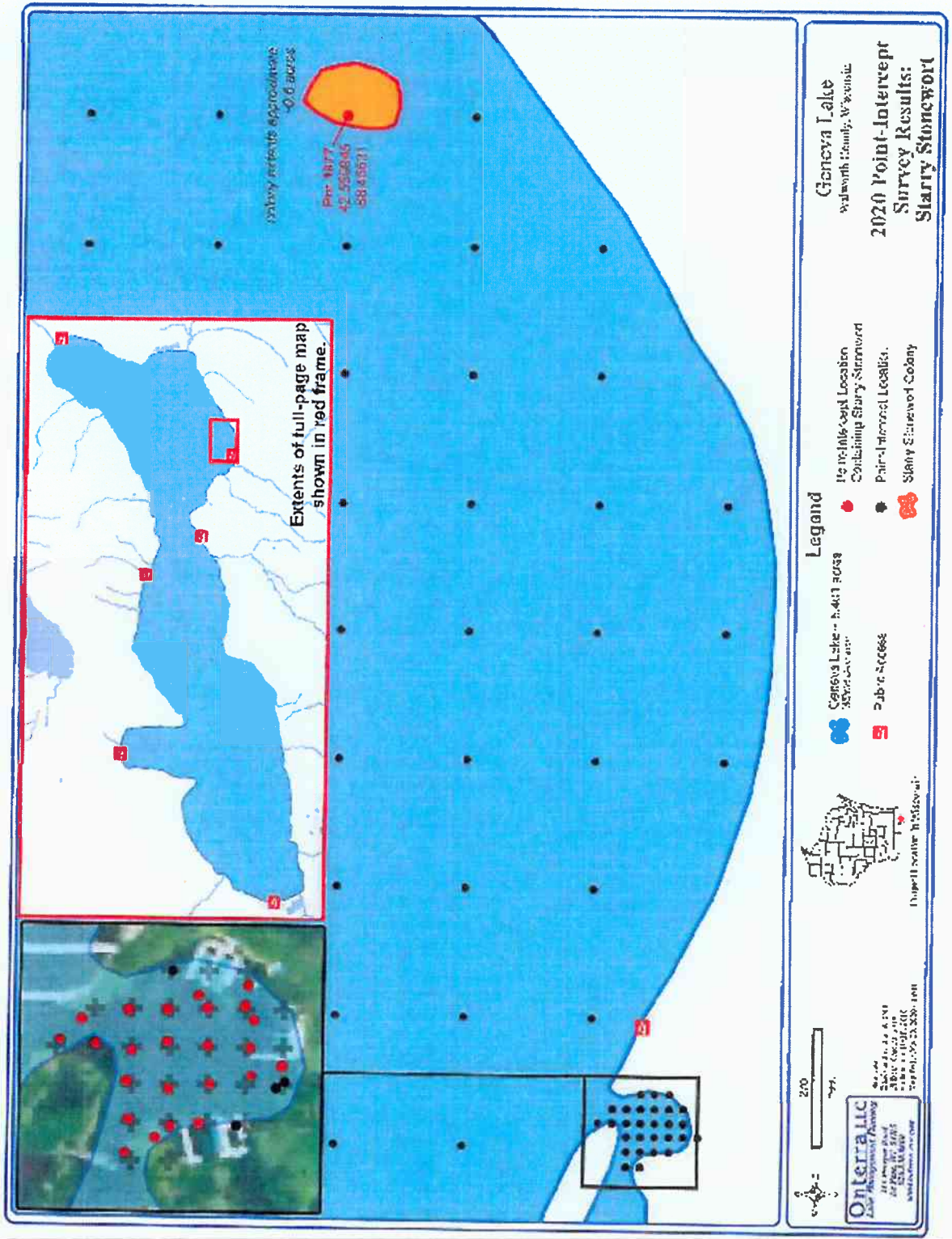
**REFERENCES:**

1. SEWRPC, Community Assistance Planning Report NO. 66, 2<sup>nd</sup> Edition, May 2008.
2. Hoyman, T., Butterfield, B., Henrigillis, E., Heath, E., Onterra, LLC, Aquatic Plant Management Plan, Sturgeon Bay WI. Dec 2019, Unpublished.
3. McCarney, N. \*, Boniak, R\*, Peters, T.W.\*\*, \*George Williams College of Aurora University, \*\* Geneva Lake Environmental Agency, Geneva Lake Invasive Aquatic Macrophytes, \* Presented as a Poster at the 2016 Wisconsin Lakes Conference.
4. U. S. Fish and Wildlife Service, Midwest Endangered Species Assessment, Floristic Quality Assessment. Viewed at <https://www.fws.gov/midwest/endangered/section7/s7process/plants/FQA.html>
5. Skawinski, P.M., Aquatic Plants of the Upper Midwest, 2<sup>nd</sup> Edition, ISBN 978-0-692-28095-9 Printed in Wisconsin USA.

Appendix A. Map of sample locations from the Geneva Lake, WI. point intersect aquatic plant survey, 2020.  
 Source: Onterra LLC.



Appendix B. Map of Sub PI Survey done on Trinke Lagoon, Geneva Lake WI July 2020 .Source: Onterra LLC.



Appendix C. Listing of aquatic plants found in the 2019 and 2020 Point Intersect aquatic plant survey on Geneva Lake, WI. Source: GLEA

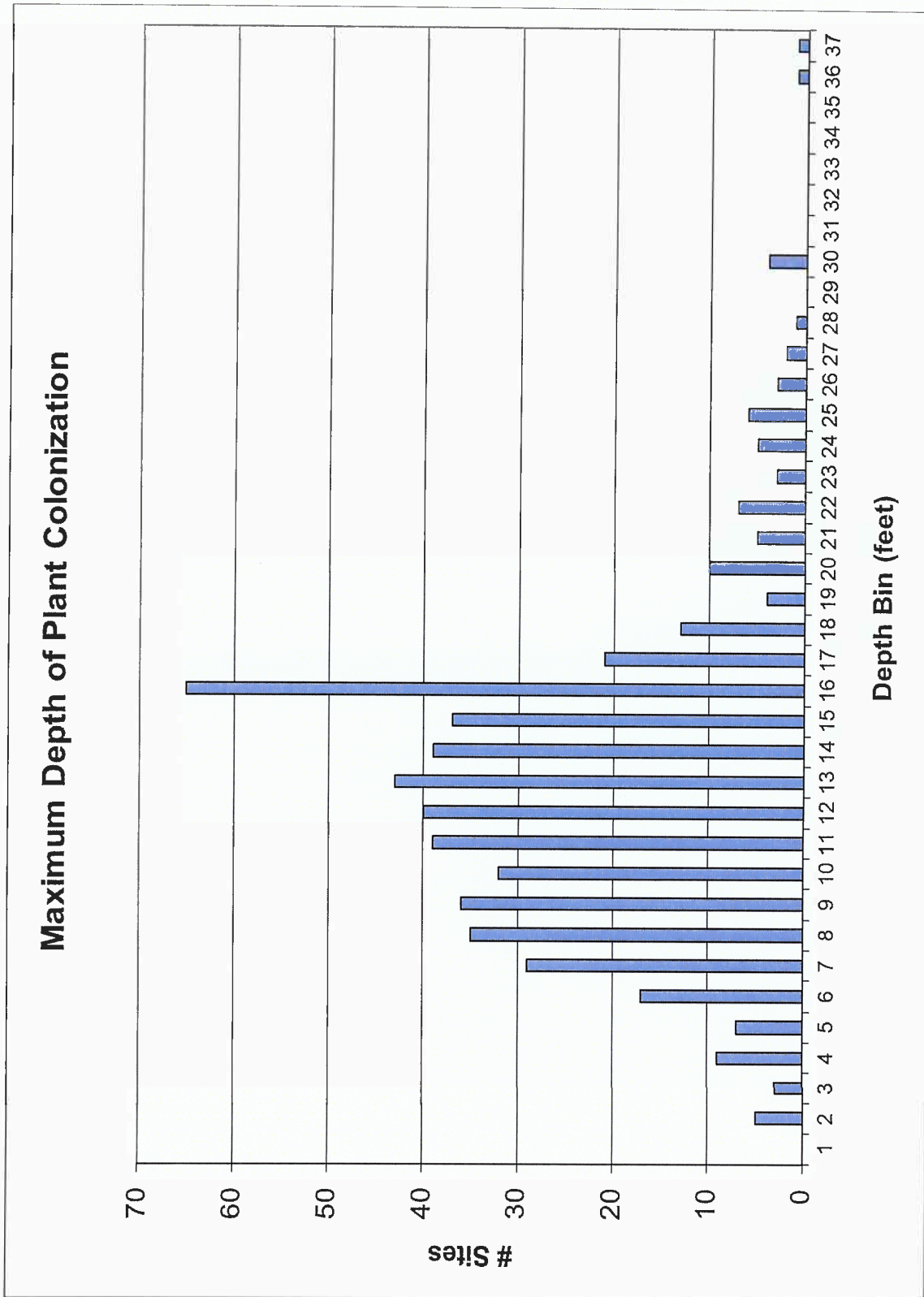
**Aquatic Plants Found in 2019 and 2020, Using the Point Intersect Surveys, Geneva Lake, Walworth County WI**

Plant Species	Common Name		
		2019	2020
<i>Ceratophyllum demersum</i> (L.)	Coontail	x	x
<i>Chara* spp.</i>	Muskgrass	x	x
<i>Drepanocladus</i>	Aquatic moss		x
<i>Eleocharis acicularis</i>	Needle spikerush	x	
<i>Elodea canadensis</i> (Michx.)	Common waterweed	x	x
filamentous algae*	filamentous algae		x
<i>Lemna troulca</i>	Forked duckweed		x
<i>Heteranthera dubia</i>	Water stargrass	x	x
<i>Lemna triscula</i>	Forked duckweed	x	x
<i>Myriophyllum heterophyllum</i> (Michx.)	Variable milfoil	x	
<i>Myriophyllum sibiricum</i>		x	x
<i>Myriophyllum spicatum**</i> (L.)	Eurasian water milfoil	x	x
<i>Myriophyllum spicatum</i> (M. sibiricum x sibiricum)	Eurasian watermilfoil Hybrid	x	
<i>Najas flexilis</i> (Willd.)	Naiad	x	x
<i>Najas guadalupensis</i>	Southern naiad	x	x
<i>Nitella flexilis*</i>	Nitella	x	x
<i>Nitelopsis obtusa**</i>	starry stonewort	x	x
<i>Potamogeton amplifolius</i> (Tuckerman)	Large leaf pondweed	x	
<i>Potamogeton crispus**</i> (L.)	Curly leaf pondweed	x	x
<i>Potamogeton foliosus</i>	Leafy pondweed	x	x
<i>Potamogeton friesii</i> (Rupr.)	Fries pondweed	x	x

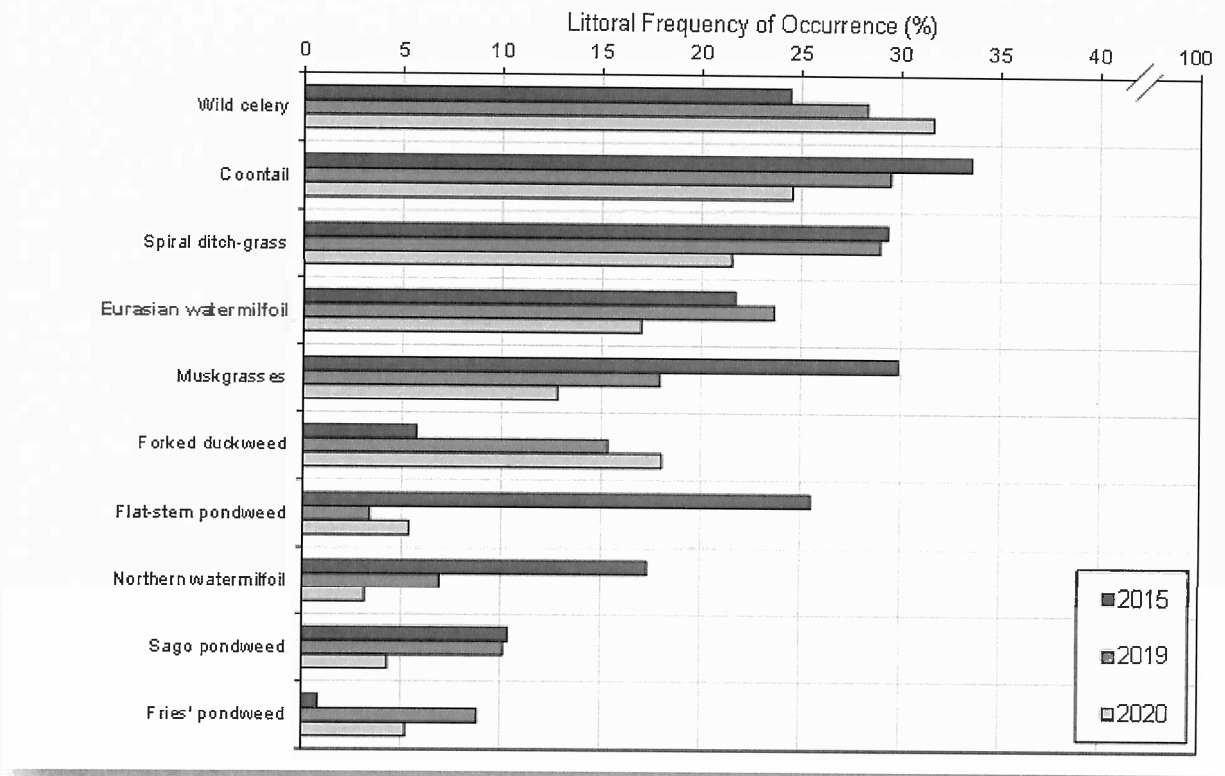
Plant Species	Common Name		
		2019	2020
<i>Potamogeton gramineus</i> (L.)	Variable pondweed	x	x
<i>Potamogeton illinoensis</i> (Morang.)	Illinois pondweed	x	x
<i>Potamogeton nodosus</i> (Poret.)	River pondweed	x	x
<i>Potamogeton natans</i> (L.)	Floating leaf pondweed	x	x
<i>Potamogeton praelongus</i> (Wulfen)	White stem pondweed	x	x
<i>Potamogeton pusillus</i>	Small pondweed		x
<i>Potamogeton richardsonii</i> (Ar. Bennett)	Richardsons pondweed	x	
<i>Potamogeton robinsonii</i> (Dakes)	Fern pondweed	x	
<i>Potamogeton strictifolius</i>	Stiff pondweed	x	x
<i>Potamogeton X undulatus**</i>	Curly leaf X white-stem pondweed	x	
<i>Potamogeton zosteriformis</i> (Fem.)	Narrow leaf pondweed	x	x
<i>Ranunculus aquatilis</i>	White water crowfoot	x	x
<i>Ruppia cirrhosa</i>	Wigeon grass	x	x
<i>Stuckenia pectinata</i>	Sago pondweed, Sago	x	x
<i>Tolypella intricata*</i>	BNS, Birds nest stonewort	x	x
<i>Utricularia vulgaris</i> (L.)	Bladderwort	x	x
<i>Vallisneria americana</i> (L.)	Water celery	x	x
* an algae	** non native		
Source: Onterra LLC.			



Appendix D. Number of sites with aquatic plant by depth (feet) in Geneva Lake WI, 2020. Source: Onterra LLC.



Appendix E. Comparison of Littoral Frequency of Occurrence (%) for 2015, 2019 and 2020 PI Aquatic Plant Surveys. Source: Onterra LLC.



Appendix F. Field Survey data from the Geneva Lake, WI aquatic plant survey 2020.

Geneva Lake	Myriophyllum spicatum	23.25	3.34	33.00	17.52	1.11	6.21	24.68	4.30	0.64	4.30	3.18	5.89	7.17	1.11	0.16
Walworth		16.98	2.44	24.53	12.79	0.81	4.53	18.02	3.14	0.47	3.14	2.33	4.30	5.23	0.81	0.12
758300		9.7	1.4	14.1	7.3	0.5	2.6	10.3	1.8	0.3	1.8	1.3	2.5	3.0	0.5	0.1
7/21/2020, 7/22/2020, 7/23/2020		0.01	0.00	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<b>INDIVIDUAL SPECIES STATS:</b>															
	Frequency of occurrence within vegetated areas (%)															
	Frequency of occurrence at sites shallower than maximum depth of plants															
	Relative Frequency (%)															
	Relative Frequency (squared)															
	Number of sites where species found															
	Average Rare Fullness															
	#visual sightings															
	present (visual or collected)	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present
Geneva Lake	Potamogeton nodosus	0.16	1.43	0.32	0.16	8.28	7.32	3.18	5.89	0.96	43.31	29.45	0.16	1.75	0.16	10.67
Walworth		0.12	1.05	0.23	0.12	6.05	5.35	2.33	4.30	0.70	31.63	21.51	0.12	1.28	0.12	7.79
758300		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	12.3	0.00	0.00	0.00	0.00
7/21/2020, 7/22/2020, 7/23/2020		1	9	2	1	52	46	20	37	6	272	185	1	11	1	67
	<b>INDIVIDUAL SPECIES STATS:</b>															
	Frequency of occurrence within vegetated areas (%)															
	Frequency of occurrence at sites shallower than maximum depth of plants															
	Relative Frequency (%)															
	Relative Frequency (squared)															
	Number of sites where species found															
	Average Rare Fullness															
	#visual sightings															
	present (visual or collected)	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present
Geneva Lake	Potamogeton foliosus															
Walworth																
758300																
7/21/2020, 7/22/2020, 7/23/2020																
	<b>INDIVIDUAL SPECIES STATS:</b>															
	Frequency of occurrence within vegetated areas (%)															
	Frequency of occurrence at sites shallower than maximum depth of plants															
	Relative Frequency (%)															
	Relative Frequency (squared)															
	Number of sites where species found															
	Average Rare Fullness															
	#visual sightings															
	present (visual or collected)	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present
Geneva Lake	Najas guadalupensis															
Walworth																
758300																
7/21/2020, 7/22/2020, 7/23/2020																
	<b>INDIVIDUAL SPECIES STATS:</b>															
	Frequency of occurrence within vegetated areas (%)															
	Frequency of occurrence at sites shallower than maximum depth of plants															
	Relative Frequency (%)															
	Relative Frequency (squared)															
	Number of sites where species found															
	Average Rare Fullness															
	#visual sightings															
	present (visual or collected)	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present
Geneva Lake	Stuckenia pectinata															
Walworth																
758300																
7/21/2020, 7/22/2020, 7/23/2020																
	<b>INDIVIDUAL SPECIES STATS:</b>															
	Frequency of occurrence within vegetated areas (%)															
	Frequency of occurrence at sites shallower than maximum depth of plants															
	Relative Frequency (%)															
	Relative Frequency (squared)															
	Number of sites where species found															
	Average Rare Fullness															
	#visual sightings															
	present (visual or collected)	present	present	present	present	present	present	present	present	present	present	present	present	present	present	present

Appendix G. Common aquatic plants found in the 2020 PI aquatic plant survey on Geneva Lake WI.



Wild celery (*Vallisneria americana*),



Coontail (*Ceratophyllum demersum*)

Appendix G (cont). Common plants found in the 2020 PI aquatic plant survey on Geneva Lake WI. (cont.)



Ditch grass (*Ruppia cirrhosa*)



forked duckweed (*Lemna trisulca*)

Appendix G (cont.) Common plants found in the 2020 PI aquatic plant survey on Geneva Lake WI. (cont.)



Eurasian Watermilfoil (*Myriophyllum spicatum*) **Invasive**

Appendix H. Aquatic invasive plants known to exist in Geneva Lake. 2020



**INVASIVE, NOT NATIVE, Eurasian Watermilfoil (*Myriophyllum spicatum*) RESTRICTED IN WISCONSIN**



**INVASIVE, NOT NATIVE, Curley Leaf Pondweed (*Potamogeton crispus*) RESTRICTED IN WISCONSIN**



**INVASIVE, NOT NATIVE, Starry stonewort (*Niteliopsis obtuse*) PROHIBITED IN WISCONSIN**