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SEWRPC Staff Memorandum

SURVEY OF STARRY STONEWORT POPULATION IN GENEVA LAKE, WALWORTH COUNTY, WISCONSIN

September 28, 2021

Geneva Lake (the Lake) is a 5,262-acre headwater lake located within U.S. Public Land Survey Township 2 North, Range 17 East; Township 1 North, Range 17 East; and Township 1 North, Range 16 East, all in Walworth County. The municipalities with jurisdiction of the Lake and its shorelines are the City of Lake Geneva, the Villages of Fontana-on-Geneva Lake and Williams Bay, and the Towns of Linn and Walworth. As the largest and deepest lake in Southeastern Wisconsin, the Lake is much beloved by residents and is a premiere recreational destination for visitors from across the Region and neighboring states. The Geneva Lake community has a long history of efforts by residents to protect and improve the Lake's utility. The very first lake organization in the State of Wisconsin was formed around Geneva Lake (the Lake) in 1898. Subsequently, other lake organizations were formed at the Lake to manage lake levels and water quality as evidenced by the formation of such groups as the Geneva Lake Association in 1935, the Geneva Lake Level Corporation, the Geneva Lake Environmental Agency (GLEA) in 1971, and the Geneva Lake Conservancy (Conservancy) in 1981.

On January 8, 2021, representatives of the GLEA, the Conservancy, and the Southeastern Wisconsin Regional Planning Commission (Commission) met via teleconference. At this meeting, GLEA and Conservancy representatives expressed concern over the presence and spread of starry stonewort (SSW) (*Nitellopsis obtusa*), an invasive macroalga, in the Lake as well as its potential impacts on the Lake's ecology. Meeting attendees agreed that it would be prudent to survey the Lake's launches to examine the current distribution of SSW within the Lake and document its abundance where observed. Commission staff further collaborated with the GLEA to develop appropriate sampling methods to survey areas of concern within the Lake. On March 18th, 2021, the Commission executed an agreement with the GLEA to survey the current spatial distribution of SSW at the Lake's launches in summer 2021 as well as investigate potential impacts of SSW on the native plant community. This survey was designed as a series of small, targeted point-intercept surveys (hereafter referred to as "sub-PI surveys") with a total of 815 points spread across twelve areas around the Lake (see Table 1 and Map 1). Eight of these areas were surveyed along point grids developed by Wisconsin Department of Natural Resources (WDNR) staff for 2018 sub-PI surveys of SSW, allowing the distribution of SSW to be directly contrasted to 2018 results. At Boca Mac, LLC and Chapin Road, point grids were developed by Commission staff in lieu of any available point grids from the WDNR. In Trinke Lagoon and the Trinke Lagoon Bay, Commission staff developed point grids in collaboration with GLEA staff to more thoroughly examine the spatial extent of known SSW populations.

STUDY BACKGROUND

Starry stonewort is a novel aquatic invasive macroalga species in Wisconsin. As a member of the Characeae family, SSW is related to native *Chara*, *Lychnothamnus*, *Nitella*, and *Tolypella* species, which have roughly similar characteristics and are found in many hardwater lakes across Wisconsin. Native to Eurasia, the first discovery of SSW in North America was in the St. Lawrence Seaway in 1978; it has since spread to

several northeastern and midwestern US states as well as southern Ontario.[1] First observed within Wisconsin in Little Muskego Lake during September 2014, SSW has since been found in 12 lakes in Southeastern Wisconsin.[2] Geneva Lake is the only lake in Walworth County with verified observations of SSW. In its native range, SSW has been shown to provide food and habitat for aquatic organisms as well as enhance lake water quality by reducing sediment suspension and acting as a phosphorus sink.[3] In invaded lakes, SSW can form dense beds, with reported maximum heights of 4 to 7 feet, outcompete both native and other invasive plant species, and cover fish spawning areas.[4,5,6] This species is capable of both sexual and asexual reproduction, which can occur through plant fragments as well as the star-shaped bulbils for which the species is named (see Figure 1).[7] Only male species have been observed in North America thus far, indicating that all spread has been through asexual reproduction. Bulbils may stay viable in lake sediment for several years, making it extremely difficult to eradicate SSW from a waterbody.

Table 1
2021 Geneva Lake Sub-Point-Intercept Survey for Starry Stonewort (*Nitellopsis Obtusa*)

Survey Area Name	Number of Points	Point Spacing (meters)
Abbey Lagoon	66	30
Abbey Springs	32	20
Boca Mac, LLC	51	30
Chapin Road	97	30
Gage Marine Launch	55	20
Fontana-on-Geneva Launch	53	30
Lake Geneva Launch	61	20
Lake Geneva Yacht Club	50	20
Linn Pier	42	20
Trinke Lagoon	33	15
Trinke Lagoon Bay ("colony area")	216	45
Williams Bay Launch	59	30

Source: SEWRPC

The first observation of SSW in Geneva Lake was during August 2018 in Trinke Lagoon on the southern shoreline of the Lake.[8] In October 2018, the WDNR and the GLEA performed a series of sub-PI surveys at boat launches across the Lake to examine the SSW distribution. No SSW was observed outside of Trinke Lagoon at that time. Chemical treatments (Cutrine Plus and Hydrothol combination) were applied in June and September 2019 to eliminate the SSW population in the Lagoon, but chemical concentrations did not maintain targeted effective levels.[9,10] In 2019, Onterra, LLC performed a full-lake aquatic plant point-intercept survey, which indicated that a population of SSW was present northeast of Trinke Lagoon in the main body of the Lake. A WDNR meander survey in 2019 also identified SSW at the Trinke Lagoon outlet. Onterra, LLC conducted another point-intercept survey in July 2020, which indicated that SSW was much more widespread within the first bay of Trinke Lagoon, with SSW observed at 24 out of 27 points. This survey also observed an SSW colony extending ~0.6 acres at point 1877, which is located nearly a half-mile northeast of the entrance to the Lagoon. Hand pulling of SSW was conducted in 2020 at the Trinke Lagoon outlet and at this SSW colony.

[1] *starrystonewort.org/maps.*

[2] *dnr.wi.gov/lakes/invasives/AISLists.aspx?species=STARRY_STONEW.*

[3] *For a more complete review of SSW ecology in its native and invasive range, see D.J. Larkin, A.K. Monfils, A. Boissezon, R.S. Sleith, P.M. Skawinski, C.H. Welling, B.C. Cahill, and K.G. Karol, "Biology, Ecology, and Management of Starry Stonewort (Nitellopsis obtusa; Characeae): A Red-listed Eurasian Green Alga Invasive in North America," Aquatic Botany 148: 15-24, 2018 as well as State of Michigan, Status and Strategy for Starry Stonewort (Nitellopsis obtusa (Desv. In Loisel.) J. Groves) Management, last updated December 2017 (www.michigan.gov/documents/invasives/egle-ais-nitellopsis-obtusa-strategy_708937_7.pdf).*

[4] *Ibid.*

[5] *dnr.wisconsin.gov/sites/default/files/topic/Invasives/Nitellopsis%20obtusa.pdf.*

[6] *G.D. Pullman and G. Crawford, "A Decade of Starry Stonewort in Michigan," Lakeline 36-42, 2010.*

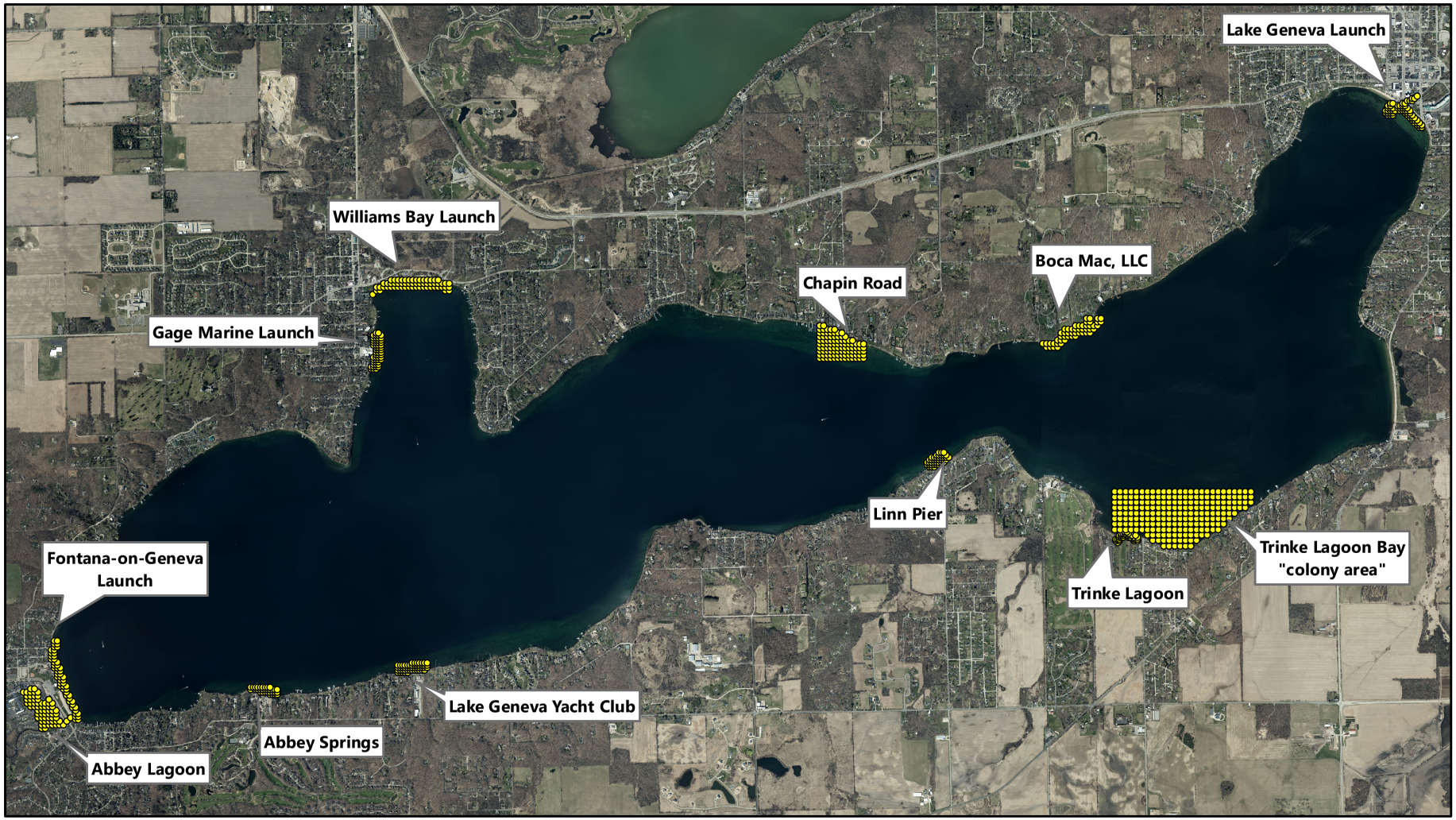
[7] *dnr.wisconsin.gov/topic/Invasives/fact/StarryStonewort.html.*

[8] *Ted Peters, "Keeping it Blue: A Healthy Lake the Best Safeguard Against Invasive Species," Lake Geneva Regional News, May 2020.*

[9] *Personal communication between Ted Peters, GLEA, and Commission staff, July 2021.*

[10] *Nault, 2020, op. cit.*

Map 1
Sub-Point-Intercept Points for Geneva Lake Starry Stonewort Survey: July 2021



SUB-POINT-INTERCEPT POINT

N

0 1,050 2,100 4,200 Feet

Source: SEWRPC

SURVEY RESULTS

Commission staff worked with GLEA staff from July 20th to July 28th, 2021, to complete the sub-PI surveys across Geneva Lake. Some points were located on piers or in areas too shallow to be reached by boat and thus were not sampled. Fifteen points in the Chapin Road survey area were not sampled after agreement between Commission and GLEA staff that sampling these points was unnecessary due to their distance from the launch and the lack of SSW observations in the survey area. In Abbey Lagoon and Lake Geneva Launch, Commission staff sampled some points from piers and the shoreline to survey points where the piers were too dense to navigate the boat.

Figure 1
Starry Stonewort (*Nitellopsis Obtusa*)

Note: Note the small, star-shaped white bulbils.

Source: Paul Skawinski

Starry Stonewort Observations

Commission and GLEA staff observed SSW at 8 points within the Trinke Lagoon Bay ("colony area") and 19 points within Trinke Lagoon, for a total of 27 points (see Map 2). No bulbils were observed on any collected SSW specimens. All collected SSW specimens were placed into a trash bag and disposed of at the end of the survey. Starry stonewort was not observed at any other points or locations within the Lake, either through the sub-PI survey or through visual observations while traveling in and between the survey areas.

Trinke Lagoon

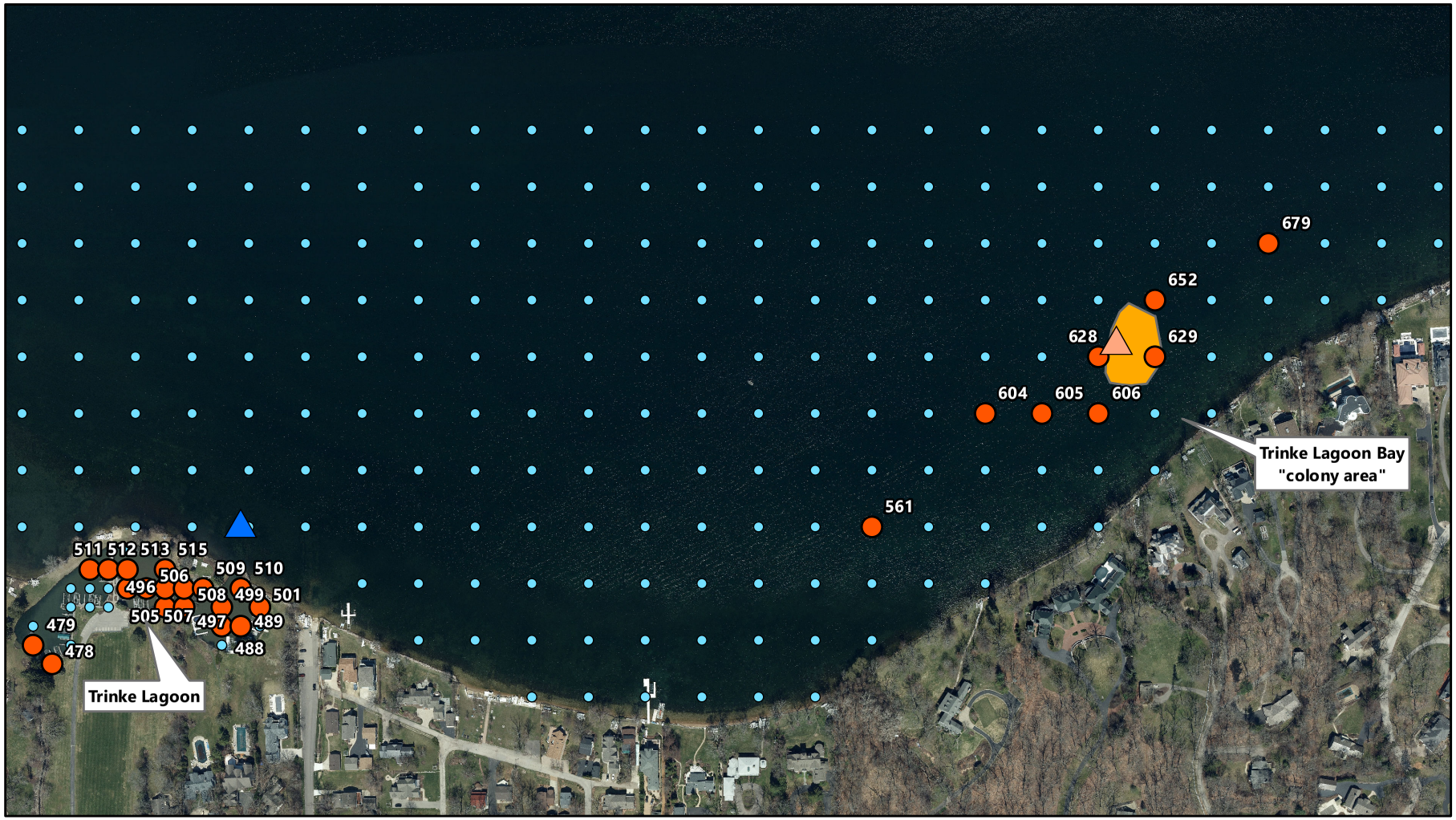
Within Trinke Lagoon, SSW was observed growing in depths of 3 to 6 feet and was frequently intermixed with several other species, including invasive Eurasian watermilfoil (EWM) (*Myriophyllum spicatum*) and curly-leaf pondweed (CLP) (*Potamogeton crispus*) as well as native coontail (*Ceratophyllum demersum*), elodea (*Elodea canadensis*, also known as Canadian waterweed), water stargrass (*Heteranthera dubia*), muskgrass (*Chara* spp.), and duckweeds (*Lemna* spp. and *Spirodela polyrhiza*). Water clarity throughout the Lagoon was poor, with turbid and brown-colored water, while the Lagoon sediment was predominantly muck. Rake fullness, a quantitative measure of species abundance based on coverage of rake tines, of SSW was generally low (rake fullness of 1), with only two points recorded as moderate (rake fullness of 2) (see Figure 2 for example). Starry stonewort was observed at every surveyed point in the eastern half of the Lagoon but was only observed at two points in the western half, at the southwestern corner (see Map 2). These observations are consistent with the 2020 sub-PI survey of Trinke Lagoon conducted by Onterra, LLC, which found SSW in 24 of 27 points within the eastern half of the Lagoon.

Trinke Lagoon Bay

In the Trinke Lagoon Bay "colony area", SSW was observed growing in a band stretching parallel to the shoreline (generally southwest to northeast) at depths of 11 to 14 feet. This band was roughly centered around the location where Onterra, LLC observed SSW in their 2019 and 2020 surveys (see Map 2), with 2021 observations northeast and southwest of the "colony area." Water clarity in the Bay was much greater than the Lagoon while the bottom sediment was sand or marl rather than organic muck. Unlike Trinke Lagoon, where SSW was observed to intermix with other species, most rake samples with SSW in the Bay only had SSW.[11] Rake fullness was low at points 561, 628, 652, and 679 while rake fullness was listed as low to moderate at points 604, 605, and 606 and moderate for point 629. Other species commonly observed in the Bay included EWM, forked duckweed (*Lemna trisulca*), eelgrass (*Vallisneria americana*), coontail, and Sago pondweed (*Stuckenia pectinata*).

[11] *Only exceptions to this trend were points 561 and 606, where SSW was intermixed with native and invasive species, such as EWM, eelgrass, Sago pondweed, and forked duckweed.*

Map 2
Starry Stonewort Observations in Geneva Lake: 2019-2021



Source: Onterra LLC, WDNR, and SEWRPC

Commission staff attached a GoPro HERO7 action camera to a 15-foot sampling rake to examine the SSW growth along the lake bottom via underwater video. At point 561, SSW was observed growing intermixed with other species, including EWM, eelgrass, forked duckweed, and Sago pondweed (see Map 2 and Figure 3). Additionally, areas of lake bottom sediment were visible at point 561 that have not yet been colonized by SSW or any other species. Commission staff were unable to measure the SSW height near point 561, but the SSW beds appeared to be generally shorter than the adjacent strands of EWM, eelgrass, and Sago pondweed. At most other points with SSW in the Bay, SSW appeared to be growing largely as a dense, monocultural mat along the lake bottom, accompanied only by sparse growth of EWM, coontail, and forked duckweed (see Figure 4). Periphyton was observed growing along the SSW strands while clumps of filamentous algae were observed on the top of the mats. The SSW mats appear to be dense enough to limit light to the lake bottom; beds of forked duckweed and strands of EWM were also observed to cause light limitations (see Figure 5). Despite the lack of vertical structure for cover, small fish were observed swimming amongst the SSW beds. Zebra mussels (*Dreissena polymorpha*) were observed growing on top of SSW beds as well as on many other species in the Lake (see Figure 6).

While Commission staff did not observe SSW in the channel between Trinke Lagoon and the Trinke Lagoon Bay, as WDNR did in 2019, an SSW hand-pulling crew employed by the GLEA observed it in this location during their pre-treatment reconnaissance in July 2021.[12] Commission staff observed SSW in 2021 at points extending beyond the single point-intercept point and approximate colony area that Onterra, LLC delineated based on their 2020 survey (see Map 2). The 2021 observations were found to the northeast and southwest of the 2020 observations but at the same depth ranges as the 2020 observations. These results may suggest that while SSW does appear to have expanded its range in the Lake, it may be limited to a low-light environment where it faces less competitive pressure from established native and invasive species.

Other Species Observed

A list of all species observed was also recorded for all survey areas (see Table 2).[13] The species observed were largely consistent with the species found in the 2020 full point-intercept survey of the Lake conducted by Onterra, LLC.[14] Commission staff observed 31 species in 2021, including the three invasive species, combined across all survey areas. This total count of species, referred to as species richness, is more than double the Regional lake average of 15 species; this is particularly remarkable given that Commission staff did not survey the entire Lake and thus should be considered a testament to the Lake's diverse aquatic plant community. Eurasian watermilfoil, muskgrasses, and Sago pondweed were observed in every survey area while eelgrass, coontail, spiral ditch-grass (*Ruppia cirrhosa*), and Fries' pondweed (*Potamogeton friesii*) were observed in every survey area except for Abbey Lagoon, Chapin Road, and Trinke Lagoon. While many of the species observed can be commonly found in the Region's lakes, spiral ditch-grass and birds' nest algae (*Tolypella intricata*) are less commonly observed and are another indication of the Lake's healthy and diverse aquatic plant community.

Aquatic Plants as Lake Health Indicator

Aquatic plant metrics, such as the floristic quality index (FQI) and the mean conservatism (C) value, can be useful for evaluating lake health. In hard water lakes, such as those common in Southeastern Wisconsin, species richness generally increases with water clarity and decreases with nutrient enrichment.[15] The FQI is an assessment metric used to evaluate how closely a lake's aquatic plant community matches that of undisturbed, pre-settlement conditions.[16] To formulate this metric, Wisconsin aquatic plant species were assigned C values on a scale from zero to ten that reflect the likelihood that each species occurs

[12] *Personal communication between GLEA and Commission staff, July 2021.*

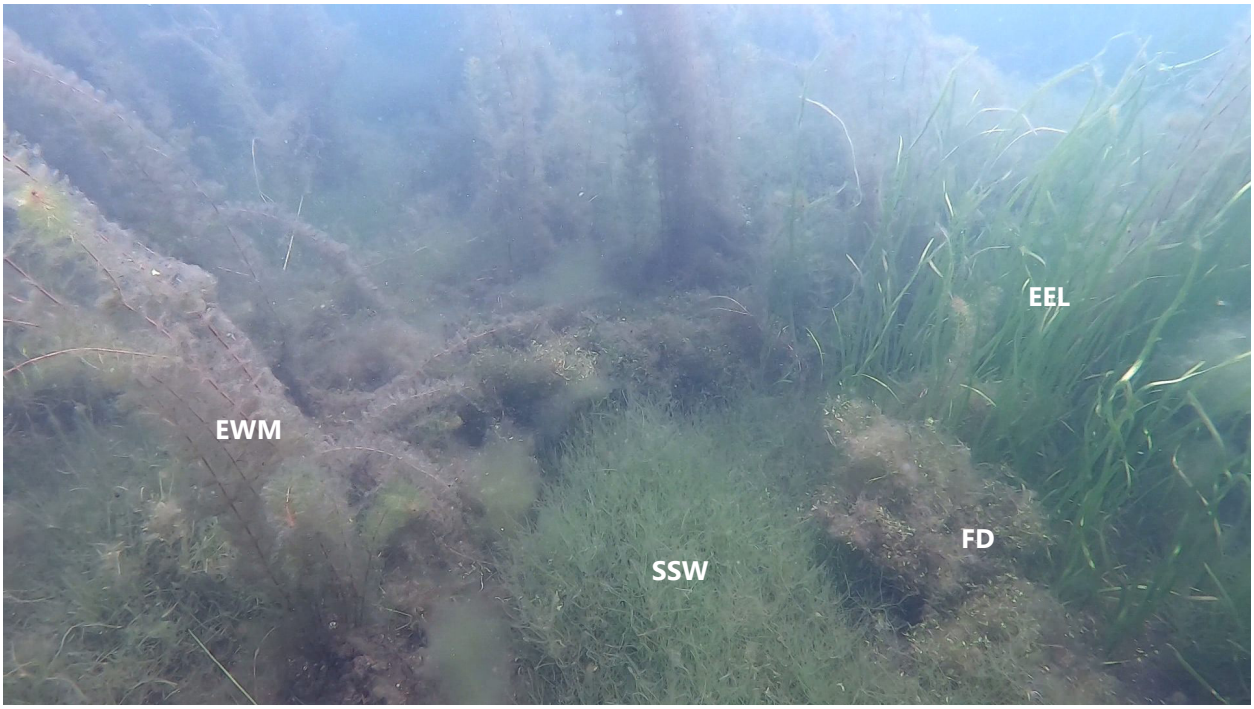
[13] *In addition to the species listed for Trinke Lagoon, Commission staff also noted two wetland invasive species, purple loosestrife (Lythrum salicaria) and aquatic forget-me-not (Myosotis scorpoides), growing along the northwestern shore of the Lagoon.*

[14] *Personal communication between Onterra, LLC; GLEA; and WDNR staff from July 29, 2019. Shared with Commission staff in December 2020.*

[15] *Vestergaard, O. and Sand-Jensen, K, "Alkalinity and Trophic State Regulate Aquatic Plant Distribution in Danish Lakes," Aquatic Botany 67, 2000.*

[16] *Nichols, S., "Floristic Quality Assessment of Wisconsin Lake Plant Communities with Example Applications," Lake and Reservoir Management 15(2), 1999.*

Figure 3
Starry Stonewort Intermixed with Other Species in Geneva Lake: July 2021



Note: The starry stonewort bed is at the bottom center of the image (labeled as "SSW") while Eurasian watermilfoil (labeled as "EWM"), eelgrass (labeled as "EEL"), forked duckweed (labeled as "FD") can be observed growing around the bed.

Source: SEWRPC

Figure 4
Starry Stonewort Monoculture in Geneva Lake: July 2021

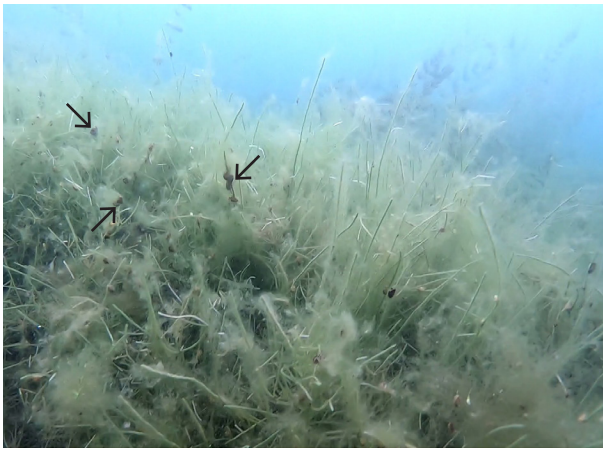
Source: SEWRPC

Figure 5
Starry Stonewort Bed Light Limitations in Geneva Lake: July 2021

Source: SEWRPC

in undisturbed habitat. These values were assigned based on the species substrate preference, tolerance of water turbidity, water drawdown tolerance, rooting strength, and primary reproductive means. Native "sensitive" species that are intolerant of ecological disturbance receive high C values, while natives that are disturbance tolerant receive low C values. Invasive species are not included in the calculation of FQI or mean C value. A lake's FQI is calculated as the average C value of species identified in the lake, divided by the square root of species richness (not including invasive species). Mean C value, calculated as the average C value of the species observed, is a useful metric to compare communities with differing species richness.

Figure 6
Zebra Mussels (*Dreissena polymorpha*) on Starry Stonewort Bed in Geneva Lake: July 2021



Source: SEWRPC

Commission staff calculated the species richness, FQI, and mean C values for each survey area (see Table 2). Trinke Lagoon Bay had the highest species richness of any survey area, but this was likely influenced by having many more survey points than the other areas. Trinke Lagoon Bay also had the highest FQI (26.0) of any survey area, which is partially a function of having the highest species richness but also indicates the diversity of sensitive species present in this area. Although this area is only a small portion of the Lake, the species richness and FQI values for the Trinke Lagoon Bay are higher than the average values (species richness of 15 and FQI of 20) for entire lakes within the Region. Chapin Road, Linn Pier, and Trinke Lagoon Bay had the highest mean C values of all survey areas, indicating that these communities have the greatest proportion of native species intolerant of ecological disturbance. However, it should be noted that unlike Chapin Road and Linn Pier, Trinke Lagoon Bay had more points and greater abundance of EWM, which the FQI and mean C values do not take in account and may indicate that this survey area may be more disturbed than these models show. Trinke Lagoon had the lowest mean C value of any survey area as the native species present in this community, such as coontail, duckweeds, elodea, and Sago pondweed, are much more tolerant of ecological disturbance.

The presence of SSW in the communities with one of the highest and the lowest mean C values in the Lake indicates its ability to persist in areas with potentially low to high ecological disturbance. However, its presence in both areas may also be an indication that it has found a niche in low-light environments in the Lake, as the amount of light reaching the bottom of shallow areas of turbid water may be similar to deep areas of clear water. Further study evaluating the light levels reaching the lake bottom in both SSW habitats may provide better understanding of SSW's ecological niche in the Lake and consequently where it could spread.

IMPLICATIONS FOR MANAGEMENT

Starry stonewort is a notoriously difficult invasive species to control. Numerous treatments have been attempted in Southeastern Wisconsin lakes, including chemical treatment, hand pulling, diver assisted suction harvesting (DASH), dredging, and water level drawdowns, but no Wisconsin lake has yet been successful in completely eradicating its SSW population.[17] While some of these treatments have resulted in temporary reductions, SSW populations have been able to recover and sometimes even exceed their pre-treatment levels. Consequently, published WDNR guidance on managing SSW focuses on monitoring the population and preventing its spread to other waterbodies while more effective management techniques are researched and evaluated.[18] The GLEA, Conservancy, WDNR, and other organizations are already actively involved in preventing spread of invasive species to and from the Lake through participation in the Clean

[17] *M. Nault, Wisconsin Department of Natural Resources, "Monitoring and Management of Starry Stonewort (Nitellopsis obtusa) in Wisconsin Lakes," Starry Stonewort Collaborative Webinar, June 2020. starrystonewort.org/wp-content/uploads/sites/17/2020/06/SSW-Mgmt-in-WI_JUNE-9-2020_Collaborative.pdf.*

[18] *Permitting Guidance for Starry Stonewort Management, Wisconsin Department of Natural Resources, March 2021. See dnr.wisconsin.gov/sites/default/files/topic/Wastewater/SSWPermittingGuidance2021_PublicReview.pdf for more information.*

Table 2
Species Observed in Each Geneva Lake Sub-Point-Intercept Survey Area: July 20-28, 2021

Species Name	Survey Area Name											
	Abbey Lagoon	Abbey Springs	Boca Mac, LLC	Chapin Road	Gage Marine Launch	Fontana-on-Geneva Launch	Lake Geneva Launch	Lake Geneva Yacht Club	Linn Pier	Trinke Lagoon	Trinke Lagoon Bay ("colony area")	Williams Bay Launch
Nitellopsis obtusa, Starry Stonewort										X	X	
Myriophyllum spicatum, Eurasian Watermilfoil	X	X	X	X	X	X	X	X	X	X	X	X
Potamogeton crispus, Curly-leaf Pondweed						X				X	X	X
Ceratophyllum demersum, Coontail	X	X	X		X	X	X	X	X	X	X	X
Chara spp., Muskgrasses	X	X	X	X	X	X	X	X	X	X	X	X
Elodea canadensis, Common Waterweed	X					X	X	X		X	X	X
Heteranthera dubia, Water Stargrass	X	X	X			X	X	X		X	X	X
Lemna minor, Lesser Duckweed	X						X			X		
Lemna trisulca, Forked Duckweed			X		X		X	X		X	X	X
Myriophyllum verticillatum, Whorled Watermilfoil	X									X		
Najas flexilis, Slender Naiad				X		X						
Najas guadalupensis, Southern Naiad											X	
Nitella spp., Stoneworts	X											
Nuphar variegata, Spatterdock										X		
Potamogeton friesii, Fries' Pondweed		X	X	X	X	X	X	X	X		X	X
Potamogeton gramineus, Variable-Leaf Pondweed					X		X				X	X
Potamogeton illinoensis, Illinois Pondweed				X								
Potamogeton natans, Floating-Leaf Pondweed		X						X				

Table continued on next page.

Table 2 (Continued)

Species Name	Survey Area Name											
	Abbey Lagoon	Abbey Springs	Boca Mac, LLC	Chapin Road	Gage Marine Launch	Fontana-on-Geneva Launch	Lake Geneva Launch	Lake Geneva Yacht Club	Linn Pier	Trinke Lagoon	Trinke Lagoon Bay ("colony area")	Williams Bay Launch
Potamogeton nodosus, Long-Leaf Pondweed		X		X		X	X		X		X	X
Potamogeton richardsonii, Clasping-Leaf Pondweed			X									
Potamogeton zosteriformis, Flat-Stem Pondweed		X	X		X	X	X	X			X	X
Ranunculus aquatilis, White Water Crowfoot		X	X					X	X		X	
Ruppia cirrhosa, Spiral Ditch-Grass		X	X	X	X	X	X	X	X		X	X
Sagittaria sp., Arrowhead						X						
Spirodela polyrhiza, Greater Duckweed										X		
Stuckenia pectinata, Sago Pondweed	X	X	X	X	X	X	X	X	X	X	X	X
Tolypella intricata, Birds' Nest Algae			X								X	
Utricularia minor, Small Bladderwort											X	
Utricularia vulgaris, Common Bladderwort			X	X	X			X			X	
Vallisneria americana, Eelgrass	X	X	X	X	X	X	X	X	X		X	X
Fissidens spp. and *Fontinalis* spp., Aquatic Moss							X			X		
Total Species Observed	10	12	14	10	11	14	15	14	9	14	20	14
Mean Conservatism (C) Value[a]	5.6	6.1	5.9	6.4	6.1	5.7	5.7	5.9	6.3	5.1	6.3	5.8
Floristic Quality Index (FQI)[b]	16.7	20.2	20.5	19.3	19.3	19.0	20.5	21.1	17.8	16.1	26.0	20.2

Note: Species in red text are designated as nonnative and invasive aquatic plant species pursuant to section NR 109.07 of the *Wisconsin Administrative Code*.

[a] *Wisconsin aquatic plant species were assigned C values on a scale from zero to ten that reflect the likelihood that each species occurs in undisturbed habitat. These values were assigned based on the species substrate preference, tolerance of water turbidity, water drawdown tolerance, rooting strength, and primary reproductive means. Native "sensitive" species that are intolerant of ecological disturbance receive high C values, while natives that are disturbance tolerant receive low C values. Invasive species are not included in the calculation of FQI or mean C value.*

[b] *A lake's FQI is calculated as the average C value of species identified in the lake, divided by the square root of species richness (not including invasive species). Mean C value, calculated as the average C value of the species observed, is a useful metric to compare communities with differing species richness*

Source: SEWRPC

Boats, Clean Waters program and by purchasing a portable watercraft cleaning station that rotates between the Lake's launches throughout the summer.[19]

As previously discussed in this memorandum, the GLEA and others have utilized several management techniques to reduce SSW in Geneva Lake and limit its spread to other areas. The techniques have been employed with the hope that widespread removal of SSW beds may allow other species to establish in the newly barren lake sediment as well as reduce the number of SSW propagules spread to other areas of the Lake. However, the treated SSW populations seem to recover the following year as indicated by the presence of SSW in areas that were hand pulled in the previous year. Mechanical management techniques, such as harvesting, hand pulling, or DASH, could facilitate further spread of SSW by creating and dispersing SSW fragments from which new populations can establish. Both mechanical and chemical management techniques can also negatively affect established native plant species, potentially facilitating spread of SSW through reduced competitive pressure, and these activities may not be permitted by WDNR.[20,21] Consequently, the most effective way to combat the spread of SSW within the Lake may be to continue fostering a healthy and diverse native aquatic plant community. A more diverse population that can establish early and dense growth may limit establishment by SSW, which doesn't attain peak biomass until late summer. Furthermore, greater species richness improves the chances that one of the species will fill similar ecological niches as SSW, such as potentially competing in low-light environments, and thus limit its growth potential.

The GLEA, Conservancy, and other entities should continue to monitor the SSW population in the Lake to better understand how the population is reacting to treatment and whether it is colonizing new areas and/or habitats within the Lake. The GLEA employed a dive team to conduct SSW hand pulling in the Trinke Lagoon Bay area immediately following the Commission's July 2021 survey – a follow-up study should be conducted to see if the denuded area is repopulated with SSW again and whether hand pulling is an effective treatment for reducing the SSW population. Similarly, Trinke Lagoon was scheduled for maintenance dredging this summer, which would remove SSW and the other species in the Lagoon – a follow-up study in the Lagoon would also be useful to evaluate if the denuded area is populated with SSW and other species again. Continued monitoring can also help Lake managers, residents, and users decide if the SSW is forming a nuisance population (e.g., impeding navigation by matting at surface) or a population that is detrimental to overall Lake health (e.g., outcompeting native species and/or covering fish spawning beds). The GLEA, Conservancy, and other entities interested in Lake management should also stay abreast of recent research on the ecology and management of SSW and collaborate with WDNR to study the population within the Lake.[22]

[19] *For more information, see the GLEA website at www.genevalakemanagement.com.*

[20] *Larkin et al., 2018, op. cit.*

[21] *WDNR Permitting Guidance, 2021, op. cit.*

[22] *Several recent presentations and publications on SSW ecology and management are compiled at the following locations: Starry Stonewort Collaborative (starrystonewort.org/publications), Minnesota Aquatic Invasive Species Research Center (www.maisrc.umn.edu/starrystonewort-research), and the University of Wisconsin - Stevens Point Extension Lakes program (www.uwsp.edu/cnr-ap/UWEXLakes/Pages/programs/clmn/StarryStonewortClearinghouse.aspx).*