SWCA®
ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.®

Amherst Office
15 Research Drive
Amherst, Massachusetts 01002
Tel 413.256.0202 Fax 413.256.1092

January 14, 2019

Bonnie Reemsnyder
First Selectwoman
Town of Old Lyme, Connecticut
52 Lyme Street
Old Lyme, CT 06371

Re: Rogers Lake Post-treatment Vegetation Survey

Dear Ms. Reemsnyder:

SWCA Environmental Consultants (SWCA) is pleased to provide you with this report summarizing the results of the 2018 post-treatment botanical survey and vegetation assessment of Rogers Lake in Lyme and Old Lyme, Connecticut. SWCA collected data in June and October of 2018, and this report compares pre-treatment data collected in 2014 to the current conditions following three years of herbicide treatment at Rogers Lake. The data include, data for both invasive and native plant species observed in Rogers Lake. The results of this assessment can be utilized in the permit renewal application with CTDEEP to display treatment areas and reductions in invasive plant coverage within the lake, as well as for comparing native species populations pre and post-treatment.

If there are any questions regarding the data or the results of this assessment, please contact Scott Fisher at our office at 413-658-2056 or via email at sfisher@swca.com.

Sincerely,

Steve Johnson, Ph.D.
Senior Ecologist

Scott Fisher
Team Lead

OBJECTIVES AND METHODS

SPRING 2018 BOTANICAL SAMPLING

Using the general sampling methodology followed by All Habitat Services, LLC (All Habitat) in 2014, SWCA Senior Ecologist Dr. Steve Johnson conducted two days of aquatic plant sampling on June 5 and 6 of 2018. The primary objective of the sampling during this time period was to determine the current status and distribution of invasive species prior to 2018 treatments. It was noted at the time of sampling that most native species had not yet developed fully. SWCA collected samples around the lake and island perimeters in areas shallow enough to support dense aquatic vegetation. At each sample point, SWCA collected four samples, using a grappling hook attached to approximately 10 meters of rope. Samples were taken from four different directions to create a composite species list for each collection point. All sampled material was identified to species at the time of collection whenever possible. This included identification of all native, as well as invasive species collected.

In addition to collecting aquatic samples, SWCA also visually scanned shallow waters and recorded the presence of any other plant species observed at each point. When observed, invasive plant populations had a defined edge. SWCA also documented sampling location points, using GPS, to delineate significant patches of invasive plants. The information collected on the current distribution of invasive species was used to generate new proposed herbicide application areas focused on the main concentrations of invasive species and shared with the Town and applicator (SOLitude Lake Management) prior to the 2018 applications.

FALL BOTANICAL SURVEY

To supplement data on the current status of native species collected in June of 2018, SWCA returned to Rogers Lake on October 4, 2018. During this survey, SWCA focused efforts on the application areas suggested prior to the start of applications in 2015. These application areas were broken into eight distinct areas (Figure 1). SWCA visually scanned each of these areas for both native and invasive species, conducting a meander survey throughout each application area. SWCA also took samples using the grappling hook and rope method described above to determine the presence of plant species in areas were plants were not apparent from the surface. SWCA created species lists of all observed species for each application area by combining the data collected in June and October. We were also asked by the Lake Association to document any patches of Phragmites (*Phragmites australis*), and invasive grass species, that we observed along the lake shore.

RESULTS

INVASIVE SPECIES

The distribution and abundance of both *Myriophyllum heterophyllum* and *Cabomba caroliniana* appear to have reduced dramatically since 2014. *M. heterophyllum* is still the most abundant invasive species observed in the lake; however, this species appeared to be reduced to small, scattered patches and individual plants during the June surveys (Figure 2). The one exception to this is in Application Area 3, where a large dense patch of *M. heterophyllum* was documented extending throughout much of the application area. Cabomba also appeared to be greatly reduced by June of 2018 (Figure 3). Only a few individuals of this species were found rooted in four locations, two of which were within the proposed Application Areas of 2015. One additional aquatic invasive species was observed during the

June sampling: small populations of Curly Pondweed (*Potamogeton crispus*) were observed at four locations (Figure 4), three within Application Area 1 and one in Application Area 4.

Based on the results of our June assessment, SWCA created a map depicting suggested application areas for 2018. Six individual application areas were suggested (Figure 5), focusing on the greatest observed concentrations of invasive plants within the 2015 Application Areas. During the October survey, SWCA reassessed invasive plant species within these areas and found that *M. heterophyllum* appeared to have been reduced still further. Only two small patches were observed in Application Area 1, and only scattered individual plants were observed along the northern shore of the island associated with Area 4 (Figure 6). The large population of *M. heterophyllum* observed in Area 3 during the June assessment was reduced dramatically. No plants were observed within the previously documented population, and only one small patch was observed nearby (Figure 7). In the northwest end of the lake, only two small patches of *M. heterophyllum* were observed in 2018 (Figure 8). One patch was located in Area 6, west of a larger population that had been observed in June, but now appeared to be eradicated. It should be noted that SWCA found a native species of *Myriophyllum*, Lowly Watermilfoil (*M. humile*), along the shoreline of the southern edge of Area 6. The second patch of *M. heterophyllum* observed in October in this general area was in Area 7. This patch had presumably been overlooked during our June assessment. No *M. heterophyllum* was observed in Area 8 during our October survey, although scattered plants were observed at seven locations within this Area in June (Figure 9).

No *Potamogeton crispus* or rooted Cabomba was observed during our October survey; however, the scattered nature of these two species makes them difficult to detect during a one day survey covering such a large area. Three small patches of *Phragmites* were observed during our October survey, one in Area 1, one in Area 3, and one in Area 8 (Figure 6, 7, and 9). The patches in Areas 1 and 7 contained 10-20 stems each, while the patch in Area 3 was approximately 30 square meters in size.

NATIVE SPECIES

In total, 29 plant species were observed within the 2015 Application Areas during the 2018 surveys (Table 1), twenty-four of which were native species. Three additional native species, Ribbon-leaf Pondweed (*Potamogeton epihydrus*) Purple Bladderwort (*Utricularia purpurea*), and Small Floating Bladderwort (*Utricularia radiata*), was observed outside of the treatment areas, for a total of 27 native species and 32 total species observed. This compares well with the lake-wide results of the All Habitat survey results of 2014 which documented 27 species, 25 of which were native. Based on mapping provided by All Habitat, 17 of the 27 species observed in 2014 were observed within 2015 Application Areas (Table 2).

Four native species observed in 2014 were not observed during 2018: Nuttall's Waterweed (*Elodea nuttallii*), Water Lobelia (*Lobelia dortmanna*), Common Naiad (*Najas flexilis*), and Tape Grass *(Vallisneria americana*). Of these, only *V. americana* was observed within application areas (Areas 3, 4, 7 and 8). In contrast, eight additional species (five native) were observed in 2018: Variable Water Starwort (*Callitriche heterophylla*), Water Willow (*Decodon verticillatus*), Yellow Iris (*Iris pseudacorus*), Swamp Candles (*Lysimachia terrestris*), Lowly Watermilfoil, False Waterpepper (*Persicaria hydropiperoides*), Phragmites, and Curly Pondweed. Six other species observed in 2014 but not within application areas, were observed within application areas in 2018. It should be noted that one species identified in 2014 as *Ludwigia lacustris* was likely *L. palustris*. *L. x lacustris* is a rare hybrid between *L. brevipes* and *L. palustris* that is known from Connecticut and Rhode Island, although *L. brevipes* is not known to occur in Connecticut.

In general, species diversity appears to have increased within the eight application areas. An increase in species was observed in seven of the eight areas. The one exception was Area 3 which had 13 species observed in 2014 and 12 species in 2018. The greatest species diversity observed in 2018 was in Area 1, with 18 observed species. We believe this is due in part to the variety of habitats available within this area; however, it should be noted that to some extent diversity is also correlated with the size of the area. This was the area with the second greatest diversity observed in 2014 when 11 species were recorded. The area with the highest diversity in 2014 was Area 3 with 13 species. SWCA did note an apparent decrease in Guadalupe Naiad (*Najas guadalupensis*). This species was observed in large dense mats in several locations by All Habitat in 2014 and during freshwater mussel surveys conducted by SWCA on October 6-7, 2015. In 2018, only a few scattered plants of *N. guadalupensis* were observed in one application area (Area 5) and at two locations in the northeast corner of the lake.

Table 1. Plant species observed in 2018 within the Herbicide Application Areas.

Common Name	Scientific Name	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8	# of Areas
Water Shield	*Brasenia schreberi*	X		X	X					3
Fanwort*	*Cabomba caroliniana*	X					X		X	3
Variable Water Starwort	*Callitriche heterophylla*	X								1
Coontail	*Ceratophyllum demersum*	X								1
Water Willow	*Decodon verticillatus*	X								1
Lesser Waterwort	*Elatine minima*	X				X	X			3
Little Spikerush	*Eleocharis acicularis*	X	X	X	X	X	X	X	X	8
Golden Pert	*Gratiola aurea*				X				X	2
Yellow Iris*	*Iris pseudacorus*	X								1
Water Purslane	*Ludwigia palustris*	X	X	X	X			X		5
Swamp Candles	*Lysimachia terrestris*			X						1
Variable Watermilfoil*	*Myriophyllum heterophyllum*	X		X	X		X	X	X	6
Lowly Watermilfoil	*Myriophyllum humile*						X			1
Guadalupe Naiad	*Najas guadalupensis*					X				1
Yellow Waterlily	*Nuphar variegata*	X		X	X		X	X	X	6
White Waterlily	*Nymphaea odorata*	X	X	X	X	X	X	X	X	8
False Waterpepper	*Persicaria hydropiperoides*		X					X	X	3
Phragmites*	*Phragmites australis*			X					X	2
Pickerel Weed	*Pontederia cordata*	X	X	X	X		X	X	X	7
Big-leaved Pondweed	*Potamogeton amplifolius*	X								1
Curly Pondweed*	*Potamogeton crispus*	X								1
Floating Pondweed	*Potamogeton natans*	X		X	X			X	X	5
Robbins Pondweed	*Potamogeton robbinsii*		X	X	X	X	X		X	6
Grass-leaf Arrowhead	*Sagittaria graminea*	X			X			X		3
Burreed	*Sparganium sp.*							X		1
Twin-scaped Bladderwort	*Utricularia geminiscapa*		X							1
Humped Bladderwort	*Utricularia gibba*			X						1
Great Bladderwort	*Utricularia macrorhiza*	X								1
Small Floating Bladderwort	*Utricularia radiata*				X				X	2
Total Species		18	7	12	12	5	9	10	12	

* = Invasive

Table 2. Plant species observed in 2014 within the Herbicide Application Areas.

Common Name	Scientific Name	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8	# of Areas
Water Shield	*Brasenia schreberi*	X	X	X	X	X	X	X		7
Fanwort	*Cabomba caroliniana*	X	X	X	X				X	5
Golden Pert	*Gratiola aurea*		X							1
Variable Watermilfoil	*Myriophyllum heterophyllum*	X	X	X	X	X	X	X	X	8
Guadalupe Naiad	*Najas guadalupensis*	X		X	X	X				4
Yellow Waterlily	*Nuphar variegata*	X		X	X		X	X	X	6
White Waterlily	*Nymphaea odorata*	X	X	X	X	X		X	X	7
Pickerel Weed	*Pontederia cordata*	X		X						2
Big-leaved Pondweed	*Potamogeton amplifolius*	X								1
Floating Pondweed	*Potamogeton natans*			X						1
Robbins Pondweed	*Potamogeton robbinsii*			X	X				X	3
Grass-leaf Arrowhead	*Sagittaria graminea*		X	X						2
Twin-scaped Bladderwort	*Utricularia geminiscapa*	X		X	X					3
Humped Bladderwort	*Utricularia gibba*	X		X						2
Great Bladderwort	*Utricularia macrorhiza*	X								1
Small Floating Bladderwort	*Utricularia radiata*							X		1
Tape Grass	*Vallisneria americana*			X	X			X	X	4
Total Species		11	6	13	9	4	3	6	6	

SUMMARY AND CONCLUSIONS

In 2018, SWCA conducted three days of botanical assessments and surveys on Rogers Lake in Lyme and Old Lyme, Connecticut. The objective of these studies was to collect data on the post-treatment status of both native and invasive aquatic and wetland plants observed within the lake. Herbicide treatments for aquatic invasive plant species have been conducted in 2015, 2016, 2017, and 2018. SWCA completed two days of botanical sampling throughout the lake, following the methods used by All Habitat in 2014 in June of 2018, and a full day of botanical surveys for native and invasive species within the eight 2015 application areas was completed in October. The data collected in 2018 was then compared to that collected in 2014 to determine what effect treatments have had on invasive, as well as native, species in the lake.

There appears to have been a dramatic reduction in the abundance of *Myriophyllum heterophyllum* and *Cabomba caroliniana*, the two most prevalent invasive species (targets) observed in 2014. One large patch of *M. heterophyllum* observed in Area 3 in the spring of 2018 initially indicated an increase in this species at this location; however, this species was almost entirely absent from the area when revisited in October (post 2018 treatment). The overall reduction of these two invasive species indicates that the chemical treatments have been highly effective in managing these targeted species.

Native species diversity appears to have increased within seven of the eight application areas. Changes in species diversity ranged from -1 to 7 species, with an average increase of 3.25 species per area. This indicates that native species populations have been maintained throughout four years of chemical treatment for invasive species, and in fact may be increasing to some extent. However, it should be noted that one native species, *N. guadalupensis*, appears to be less abundant in 2018 than observed in 2014 and 2015, and may have been impacted by the treatments. While we cannot rule out the possibility that the treatments have had some impact on native species abundance, we believe that the apparent increase in native species diversity suggests that native species may be reacting favorably to the increase in available habitat afforded by the reduction in invasive species.