

Barnstable Ponds Report: Long Pond, Mystic Lake & Middle Pond

2022 Hydrilla Monitoring and Management Program



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2022 Hydrilla Monitoring and Management Program

Management History

Hydrilla (*Hydrilla verticillata*) has been documented in Mystic Lake and Middle Pond in Marston Mills and Long Pond in Centerville, MA since its discovery at the ponds – 2001 for Long Pond and 2013 for the Mystic Lake and Middle Pond system. Annual management began in 2002 and continued for Long Pond until a 2-season span (2013-2014) of no active hydrilla growth was observed and management was deemed unnecessary. With persistent monitoring, isolated patches of hydrilla were discovered late in 2015, endorsing whole-lake treatment for Long Pond through 2016 - 2018. Due to permitting issues no treatments were performed at Long Pond in 2019. Herbicide applications were reinstated in 2020 in Long Pond. Benthic barriers and hand-pulling were initially used in Mystic Lake and Middle Pond before the addition of whole-lake treatment in 2016.

2022 Management Activity

In 2022, two visual surveys and one tuber sampling event was also performed. The results from each survey and sampling event are discussed further within this report.

Methodology

Plant Monitoring

The 2022 monitoring program was consistent with previous surveys performed at the Barnstable Ponds. For both early- and late-season surveys, the littoral zone of all waterbodies were systematically toured by boat, primarily to document any distribution of hydrilla. Aquatic plants were identified using visual observation, and a throw-rake. A hand-held GPS unit was used to record reference points for the various vegetation species, especially hydrilla, to assist with management allocation and vegetation assemblage mapping.

Hydrilla Tuber Monitoring

The previously used modified post-hole digger was used to obtain all sediment core samples. The corer removes a consistent plug of sediment per sample location. In water bodies of high density hydrilla growth, dimensions of the corer are often used to calculate tuber density across the sample area. However, due to the sparse, widely-scattered hydrilla growth at the Barnstable Ponds and the specific locations of the sample sites, the cores are primarily used as an indicator of the presence/absence and general abundance of hydrilla reproductive structures at each sampling site.

The tuber sampling locations for each of the waterbodies have remained consistent since the inception of the sampling program. Ten sampling sites in Long Pond and three in Mystic Lake (Figures 1 & 2). At each sampling location, ten (10) replicate samples were collected using the sampler.

Analysis of each replicate was conducted on-site using a sieve with a 0.4 cm metal mesh. All replicates are placed into the sieve and then gently shaken in the water to remove sediment particles from the sample. The remaining sediment and plant material is examined for hydrilla plants, tubers, and turions. If present, the tubers and/or turions are counted and documented for the sampling site.



Program Overview

Long Pond

Early-season Survey

An early-season survey was performed on July 7, 2022 by SŌLitude Biologists to assess the extent of hydrilla growth and document the dominant native macrophyte assemblage. Vegetation composition and distribution was generally consistent with previous years. Table 1 (below) lists the species observed during the pre-and post-management surveys (July & October).

Table 1: Aquatic vegetation observed in Long Pond in July and October 2022.

COMMON NAME	SCIENTIFIC NAME	July 7	October 19
Hydrilla (water thyme)	<i>Hydrilla verticillata</i>		X
Spikerush	<i>Eleocharis sp.</i>	X	X
Common waterweed	<i>Elodea canadensis</i>	X	
Quillwort	<i>Isoetes sp.</i>	X	X
Ribbon-leaf pondweed	<i>Potamogeton epihydrus</i>	X	X
Clasping-leaf pondweed	<i>Potamogeton perfoliatus</i>	X	X
Robbins' pondweed	<i>Potamogeton robbinsii</i>	X	X
Quill-leaved sagittaria	<i>Sagittaria teres</i>	X	X
Tapegrass	<i>Vallisneria americana</i>	X	X
Little floating bladderwort	<i>Utricularia radiata</i>	X	
Filamentous algae	N/A	X	X

During the survey on July 7th, growth of hydrilla was not observed and tuber sampling was not performed. Clasping-leaf pondweed was the most prominent species throughout Long Pond, followed by several other pondweeds, bladderworts, and emergent, shallow water plants. The other species were only seen at sparse densities and were observed growing alongside the pondweed sections on the map (Figure 3). Filamentous algae was observed in several patches around the pond in clouds throughout the water column.

Management Schedule

Due to contractual delays and cyanobacteria bloom conditions the initial treatment at Long Pond did not occur until August 12. At that time, Sonar One pellets were broadcast throughout the pond littoral zone at a dose of approximately 5 ppb. FasTest samples were collected in early September to determine the need for a booster application. The results of that testing indicated an average fluridone concentration of 3.6 ppb (3.6 ppb West; 3.9 ppb Middle; 3.4 ppb East). Based on these results, the ongoing drought conditions, and the need to keep concentration below 5 ppb the booster application was scheduled for October 7. Sonar One pellets were again applied at a dose of 5 ppb. In advance of each scheduled treatment, an email was sent to all project stakeholders and the shoreline was posted with signs warning of the impending treatment and the temporary water-use restrictions. In accordance with the USEPA label, the use of pond water was restricted for a 30 day period for irrigation purposes. The Sonar One (fluridone) herbicide was applied via bow-mounted spreader on an aluminum skiff. A handheld GPS unit was used to ensure the herbicide was evenly applied within the designated area(s). The public boat ramp on Piney Point Dr was used as the base of operations for each treatment.



Late Season Survey & Tuber Sampling

A final vegetation survey was conducted on October 19th. The native vegetation composition in October was similar to the July findings (Table 1).

Growth in the littoral zone was dominated by three native species: clasping-leaf, Robbins', and ribbon-leaf pondweeds. Clasping-leaf pondweed was the dominant plant during the October survey, while Robbins' and ribbon-leaf pondweed were only slightly less abundant. Much of the bottom of the pond was covered in patches of quill-leaved arrowhead. Filamentous algae mats were visible around the shoreline of the pond and throughout the water column. See Figure 4 for late-season native species distribution.

Late season tuber sampling was performed on the same day as the post-management survey. Table 2 lists the number of tubers collected at each tuber sampling site. Figure 1 shows the tuber sampling sites within Long Pond.

Table 2. Tuber occurrences at Long Pond from years 2017-2022.

Point ID	2017 Total	2018 Total	2019 Total	2020 Total	2021 Total	2022 Total
156	Not present	Not present	Not present	Not present	Not present	Not present
157	Not present	Not present	Not present	Not present	Not present	Not present
158	Not present	Not present	Not present	10	Not present	Not present
159	Not present	Not present	Not present	1	Not present	Not present
160	Not present	Not present	Not present	15	8	92
161	Not present	Not present	Not present	4	Not present	6
163	Not present	Not present	Not present	18	5	Not present
164	Not present	Not present	Not present	Not present	3	Not present
165	Present	Present	Not present	Not present	1	14
166	Present	Present	Not present	Not present	Not present	53

These tuber quantities indicate an increase from prior years and suggestive of effective hydrilla propagation. The current dosing limitations coupled with recent program interruptions associated with cyanobacteria growth, have impaired the efficacy of the treatment program and its ability to prevent hydrilla reproduction. Fortunately the distribution of the tubers seems to be limited to just a few locations that have historically harbored some of the highest hydrilla abundance. Modifications to the treatment approach will be required in 2023 to ensure effective reproductive prevention.

Summary

- Based on the early season survey results, the emergence of active hydrilla growth remains later in the growing season than most invasive aquatic species in the Northeast.
- The shoreline littoral areas continue to be dominated by abundant native aquatic plant growth, consisting of a rich variety of species.
- Tuber sampling indicates an increase over prior years and successful hydrilla reproduction. Management program modifications will be necessary in 2023 to account for the treatment restrictions imposed by state listed species and cyanobacteria blooms.
- Despite later hydrilla emergence early treatment will be required in order to establish a lethal fluridone concentration (>3.0 ppb) prior to the portion of the growing season that has increased



potential for elevated cyanobacteria levels. Although this earlier and longer fluridone exposure will improve hydrilla control efficacy, it may result in some additional seasonal suppression of the native plant growth.

Mystic Lake & Middle Pond

Early-season Survey

A pre-management survey was performed on July 7th, 2022 by SŌLitude Biologists to assess the extent of hydrilla growth and native vegetation assemblage. Macrophyte composition and distribution was generally consistent with previous years (Table 3).

Table 3: Aquatic vegetation present at Mystic/Middle Pond in July & October.

COMMON NAME	SCIENTIFIC NAME	July 7	October 20/27
Spikerush	<i>Eleocharis sp.</i>		X
Yellow waterlily	<i>Nuphar variegata</i>	X	X
Ribbon-leaf pondweed	<i>Potamogeton epihydrus</i>	X	X
Clasping-leaf pondweed	<i>Potamogeton perfoliatus</i>	X	X
Robbins' pondweed	<i>Potamogeton robbinsii</i>	X	X
Quill-leaved arrowhead	<i>Sagittaria teres</i>	X	X
Tapegrass	<i>Vallisneria sp.</i>	X	X
Filamentous algae	N/A	X	X
Bur-reed	<i>Sparganium sp.</i>	X	X

The plant assemblages in both Mystic Lake and Middle Pond were relatively similar and consistent with previously documented conditions. Vegetation growth, when present, was confined to the immediate shoreline due to the depth contours (see Figure 5 for early-season vegetation survey results). Vegetation species within Mystic and Middle Lake include several pondweed species, quillwort, and several shallow-water species (arrowhead, spikerush, and bur-reed). The vegetation was few and far between, and occurred mostly in sparse patches around the shoreline. The pondweed species tended to grow alongside the patches of arrowhead, and bur-reed is an emergent plant species, so it grew along the shoreline in shallow water. The water clarity during the survey was excellent, allowing for very good visibility down to the lake's sediment.

2022 Management Schedule

Based on historical hydrilla emergence the initial treatment of Mystic Lake and Middle Pond was scheduled for July 14; however, due to some contractual delays the treatment was postponed until July 19. A dose of approximately 8 ppb of Sonar One was applied to the littoral areas using a small aluminum skiff equipped with an air-blower spreader unit. The Sonar one pellets were distributed evenly across the designated treatment zone (<10ft. depth contour). As in prior years a small 5-acre area in Middle Pond near the connection to Mystic Lake was also treated with Sonar One pellets, targeting a dose of 20 ppb.

Using the release curve of Sonar One pellet and the natural degradation rate of fluridone, a booster application was scheduled for August 12. This follow treatment was intended to augment the remaining in-lake fluridone concentrations to ensure that greater than 3.0 ppb was maintained for more than 30 days. A dose of 5 ppb of Sonar One was again applied to the shoreline sections of Mystic Lake. Another 20



ppb of Sonar One was also applied to the 5.0 acre area in Middle Pond. FasTest samples were collected from Mystic Lake approximately 50 days after the initial treatment and the average remaining fluridone concentration was 2.3 ppb. Given that the target concentration exposure time (CET) was achieved and no viable hydrilla was observed, no additional treatments were scheduled. The limited rainfall experienced during the summer of 2022 enhanced our ability to maintain fluoride concentrations in the lake. Prior to each treatment, the lake shoreline was posted with signs warning of the temporary water-use restrictions. In accordance with the USEPA label, the use of pond water was restricted for a 30 day period for irrigation purposes.

Late-season Survey & Tuber Sampling

SŌLitude Biologists performed a late-season survey on October 20 at Middle Pond and returned to Mystic Lake on October 27th. The reason for the return was the inability to access Mystic Lake with the trailered 14-foot boat used for the Middle Pond survey due to water level in the central channel between basins, and also substantial wind activity. The second sampling date was completed with a 10 foot john boat with a gas-powered motor and direct boat access to Mystic Lake. Macrophyte composition and distribution was generally consistent with the early-season survey (Table 4).

During the survey, sparse tubers were collected. Native vegetation was similar to that found during the early-season survey, but growth was more abundant and higher in the water column than the July survey. See Figure 2 for tuber sampling sites within Mystic Lake and Middle Pond, and Figure 6 for late-season vegetation survey results.

Table 4: Tuber occurrences at Mystic Lake and Middle Pond over the years of 2018-2022.

Point ID	2017 Total	2018 Total	2019 Total	2020 Total	2021 Total	2022 Total
167	Not present	Not present	Not present	Not present	Not present	Not present
168	Not present	Not present	Not present	Not present	Not present	32
169	Not present	Not present	Not present	Not present	Not present	36

Summary

- Sparse hydrilla tubers were collected during the post-management survey.
- Benthic filamentous algae was prominent across both basins at the time of the late-season survey.
- Mystic Lake and Middle Pond native vegetation assemblages appear relatively unchanged.

Management Recommendations

Hydrilla growth continues to be identified in Long Pond and Mystic Lake, and therefore active management should be continued in 2023. Given the propensity for problematic levels of algae growth in Long Pond and Mystic Lake/Middle Pond during the mid to late July period, we suggest moving the initial Sonar application forward about 2-3 weeks to ensure that a concentration of fluridone is present at the first onset of active hydrilla growth. This will allow a concentration of fluridone to be present in the water when the plants emerge, subjecting them to the chemical at their most vulnerable state of growth. In addition to the earlier start to the program we think that it would also be valuable to establish a procedure for the regular sharing of available cyanobacteria sampling so that we can adjust treatment timing accordingly to avoid delays in booster applications.



While only sparse hydrilla tubers were documented in Mystic Lake, monitoring and treatment is still recommended. Hydrilla tubers are reproductive bodies that can remain dormant for 5+ years before sprouting. Given the limitations of the tuber sampling methodology, a lack of tubers does not necessarily indicate that these hydrilla reproductive bodies are not present in the pond system. There is a margin of error with sampling sites, as it cannot be expected to sample the exact same area of each point year after year. Based on our experiences over the years at Long Pond, Mystic Lake, and Middle Pond, it is likely that both tubers and active hydrilla growth can go undetected due to the size and scattered nature of this infestation. In order to maintain long-term control and prevent spread of hydrilla growth, we recommend continued monitoring and treatments.

We hope that you find this information helpful in making your pond and lake management decisions. If you have any questions, please contact our office. Thank you for your collaboration this season, and we look forward to working with you again next year.



FIGURE 1: Tuber sampling locations
Long Pond



Long Pond
Barnstable, MA



1:4,007

Long Pond

0 100 200 400
Feet

Legend

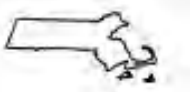
● Tuber Sampling Points

Map Date: 1/3/2023
File: LongPd22_1
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 2: Tuber sampling locations
Mystic Lake/Middle Pond



Mystic Lake/
Middle Pond
Barnstable,
MA



1:6,041

Mystic Lake/Middle Pond

0 187.5 375 750
Feet



Map Date: 1/3/2023
File: MysticMiddle22_2
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 3: Early season vegetation survey
Long Pond



Long Pond
Barnstable, MA



1:4,007

Long Pond

0 100 200 400
Feet

Legend

- Quill-leaved sagittaria
- Hydrilla
- Pondweed species

Map Date: 1/3/2023
File: LongPd22_3
Prepared by: KV
Office: Shrewsbury, MA

FIGURE 4: Late-season vegetation survey
Long Pond



Long Pond
Barnstable, MA



1:4,007

Long Pond

0 100 200 400
Feet

Legend

- Hydrilla
- Pondweed species
- Quill-leaved sagittaria

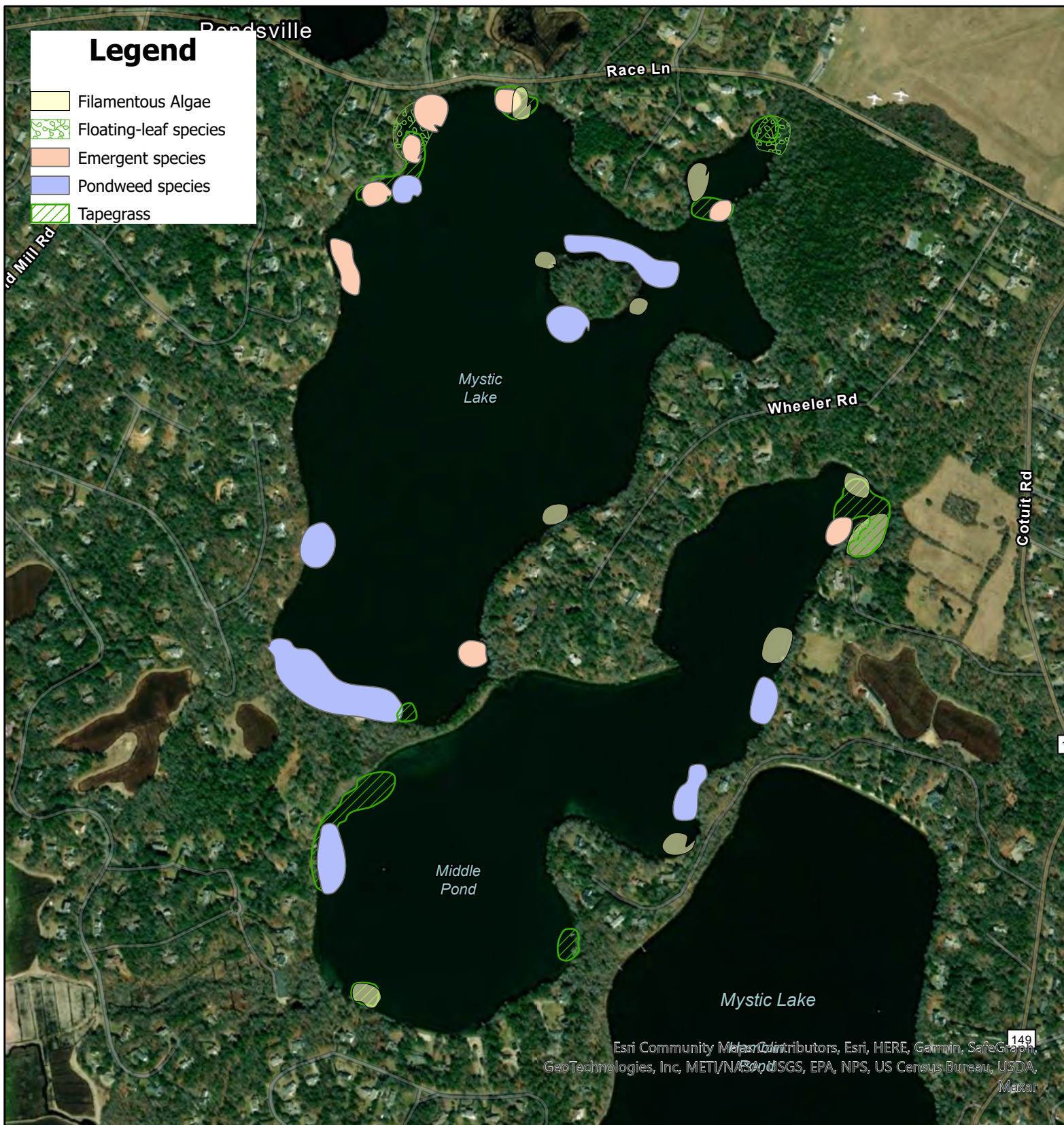
Map Date: 1/3/2023

File: LongPd22_4

Prepared by: KV

Office: Shrewsbury, MA

FIGURE 5: Early and Late-season vegetation surveys
Mystic Lake/Middle Pond



**Mystic Lake/
 Middle Pond**
 Barnstable,
 MA



Mystic Lake/Middle Pond

0 295 590 1,180
 Feet



1:9,440

Map Date: 1/3/2023
 File: MysticMiddle22_5
 Prepared by: KV
 Office: Shrewsbury, MA