BARNSTABLE PONDS:

LONG POND, MYSTIC LAKE & MIDDLE POND

Hydrilla Management Program

2017 Final Report

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SOLITUDE LAKE MANAGEMENT

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INTRODUCTION

Historically, hydrilla has been documented in Mystic Lake and Middle Pond in Marston Mills and Long Pond in Centerville, MA. Isolated patches of hydrilla were discovered within Mystic Lake and Long Pond in August 2015 and June 2016. Whole-lake treatment was conducted on Mystic Lake and Long Pond in 2016 and again in 2017.

The following report summarizes the 2017 Hydrilla Management Programs at Long Pond, Mystic Lake, and Middle Pond in Barnstable, MA. The report discusses results of the vegetation monitoring and chemical control tasks performed at all three waterbodies.

METHODOLOGY

Surveys

This year's monitoring program was the same as previous surveys performed at the Barnstable Ponds. For both early- and late-season surveys, the littoral zone of the waterbodies were systematically toured by boat, primarily to document the distribution of hydrilla, if present. Aquatic plants were identified using visual observation and a throw-rake, and enhanced with an underwater camera. A hand-held GPS unit was used to record reference points for the various documented vegetation species to assist with later location and vegetation assemblage mapping.

Any aquatic plant specimen requiring further identification was collected for additional, more detailed observation in the lab.

Hydrilla Tuber Monitoring

A post-hole digger ('corer') modified with longer handles was used to obtain all sediment core samples. The corer removes a consistent plug of sediment. In waterbodies 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 growth of hydrilla at these waterbodies, the cores are used primarily as an indicator of the presence/absence and general abundance of hydrilla reproductive structures present at each sampling site.

Sampling locations remained consistent from previous years - refer to the respective waterbody section for location maps. Ten sampling sites in Long Pond and three sampling sites in Mystic Lake were selected during the creation of the sampling program. At each sampling location, ten (10) replicate samples were collected using the corer.

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

Herbicide Application

Please refer to the relative Management Schedule sections for waterbody specifics.

PROGRAM OVERVIEW

Long Pond

Early-Season Survey

As with previous management years, an early-season survey was performed on June 8th in order to assess the extent of Hydrilla growth and management impacts from the previous management year on native macrophyte species. Vegetation composition and distribution was generally consistent with previous years (Table 1).

Table 1. Macrophyte Species at Long Pond – June 8, 2017	
Common Name	Latin Name
Needle Spikerush	*Eleocharis acicularis*
Common Waterweed	*Elodea canadensis*
Seven-angled Pipewort	*Eriocaulon aquaticum*
Pennywort	*Hydrocotyle sp.*
Quillwort	*Isoetes sp.* likely *I. tuckermanii*
Slender Watermilfoil	*Myriophyllum tenellum*
Ribbon-leaf Pondweed	*Potamogeton epihydrus*
Clasping-leaf Pondweed	*Potamogeton perfoliatus*
Robbin's Pondweed	*Potamogeton robbinsii*
Quill-leaved Sagittaria	*Sagittaria teres*
Sago Pondweed	*Stuckenia pectinata*
Little Floating Bladderwort	*Utricularia radiata*
Benthic Filamentous Algae	Various species

The vegetation assemblage was dominated by Robbin's pondweed, clasping-leaf pondweed, and Ribbon-leaf pondweed (Figure 1). All other species were found at trace and sparse densities throughout the littoral zone. Quill-leaved sagittaria was identified throughout the sandy shoreline of Long Pond. The species is often overlooked since the vegetated structure is primarily a low-growing basal rosette. A flowering stalk may occur, but only specific times of the growing season. No hydrilla was documented during the early-season survey of Long Pond.

The greatest density and diversity of plants remains in the eastern basin, especially since it is the largest contiguous area of littoral zone. Native growth persists despite repeated treatment. Consequently, the eastern basin is where the majority of hydrilla has been documented throughout the ongoing management program. Also consistent with prior survey years, macrophyte growth is confined to the edges of the middle and western basins. Plant growth in these areas is consistently less diverse, supporting sparse density growth of: Robbin's pondweed, ribbon-leaf pondweed, quillwort, pipewort, clasping-leaf pondweed. Emergent species were also noted: American bur-reed (*Sparganium americanum*), arrowhead (*Sagittaria latifolia*), pickerelweed (*Pontederia cordata*), and various rush species.

The patch of low watermilfoil (*Myriophyllum humile*) in the eastern basin from the 2016 season was not observed during the early-season survey. However, another native milfoil species was noted – slender watermilfoil – on the northern shoreline of the middle and western basins.

2017 Management Schedule

While no vegetative hydrilla growth was documented at the time of the June survey, tubers were noted at two locations within Long Pond. Considering the reemergence of hydrilla in 2016, and the persistence of tubers in June 2017, a treatment program was conducted. The initial treatment of Long Pond was performed on July 18th with an 18-foot work skiff equipped with a gas-powered blower system.

The lake shoreline was posted with signs warning of the treatment and the subsequent temporary water-use restrictions. In accordance with the USEPA label, the use of pond water was restricted for a period of 30 days for irrigation purposes.

Treatment was performed targeting historical hydrilla locations, including the sampling locations containing tubers. The boat was equipped with a WAAS GPS to ensure that the herbicide was evenly applied throughout the pond. FasTESTs and a follow up treatment were performed on September 7th to help maintain adequate Sonar concentration.

Post-Management Survey

A final vegetation survey was conducted on October 17th. Fall vegetation composition was similar to the June findings (Table 2). No vegetative hydrilla growth was observed, and the littoral zone was dominated by clasping-leaf pondweed and Robbin's pondweed.

Table 2. Macrophyte Species at Long Pond – October 17, 2017

Common Name	Latin Name
Needle Spikerush	*Eleocharis acicularis*
Seven-angled Pipewort	*Eriocaulon aquaticum*
Pennywort	*Hydrocotyle sp.*
Quillwort	*Isoetes sp.* likely *I. tuckermanii*
Clasping-leaf Pondweed	*Potamogeton perfoliatus*
Robbin's Pondweed	*Potamogeton robbinsii*
Quill-leaved Sagittaria	*Sagittaria teres*
Little Floating Bladderwort	*Utricularia radiata*
Common Bladderwort	*Utricularia vulgaris*
Benthic Filamentous Algae	Various species

Species richness and diversity remained greatest in the eastern basin, where the moderate density native plant growth was already dying back – typical of fall conditions. Aquatic plant growth in the middle portion and western basin remained dominated by low-density growth of quillwort and clasping-leaf pondweed. Filamentous algae was growing consistently throughout the pond benthos, especially in the eastern basin. The observed prevalence of this growth was likely the combination of normal late season conditions, low water levels from minimal precipitation, and mildly elevated nutrient levels associated with the additional macrophyte die-off resulting from the Sonar treatment program.

Hydrilla Tuber Sampling

Tuber and turion sampling was performed at Long Pond in conjunction with the early- and late- season surveys performed in 2017. Pre-management tuber sampling occurred on June 7th and post-management sampling occurred on October 17th. While no vascular hydrilla growth was documented, tubers were noted at two locations within the Long Pond – Points 165 and 166 – during the pre-management tuber sampling. No tubers or turions were

collected in the areas that contained 2016 hydrilla growth, or during the post-management sampling.

Figure 2 – 2017 Long Pond Tuber Sampling Locations

Summary

- No vegetative hydrilla growth was documented in Long Pond throughout the 2017 season; although, viable tubers were observed during the June pre-treatment sampling event.
- Hydrilla tubers were noted at sites 165 and 166 on June 7, 2017.
- The littoral zone was dominated by various pondweed species during both early- and late-season surveys.
- The presence of quill-leaved sagittaria is likely not newly established, and should be monitored in following seasons along with the presence of pennywort.
- Filamentous and microscopic algae blooms were documented throughout the 2017 season.

Mystic Lake & Middle Pond

Early-season Survey

A pre-management survey was performed on June 8th, the same day as the Long Pond vegetation survey. Vegetation composition and distribution was generally consistent with previous management years.

Table 3. Macrophyte Species at Mystic Lake & Middle Pond – June 8, 2017	
Common Name	Latin Name
Needle Spikerush	*Eleocharis acicularis*
Seven-angled Pipewort	*Eriocaulon aquaticum*
Small Waterwort	*Elatine minima*
Quillwort	*Isoetes sp.* likely *I. tuckermanii*
Water Lobelia	*Lobelia dortmanna*
Clasping-leaf Pondweed	*Potamogeton perfoliatus*
Robbin's Pondweed	*Potamogeton robbinsii*
Stonewort	*Nitella sp.*
Ribbonleaf Pondweed	*Potamogeton epihydrus*
White Waterlily	*Nymphaea odorata*
Yellow Waterlily	Nuphar variegata

The vegetation assemblage was dominated by common waterweed and clasping-leaf pondweed, along with dense mat-growth of small waterwort, water lobelia, and quillwort around the sandy perimeters of the waterbodies (Figure 3).

The extent of littoral zone remains consistent with previous years, where the vegetation growth (if any) is generally confined to the immediate shoreline. In Middle Lake, vegetation extends to roughly 75-100' feet from shore to depths of 10-12 feet. The northwestern shoreline of Mystic Lake maintains the highest vegetation density, consisting low-growing mat species: small waterwort, water lobelia, and quillwort. A filamentous algae bloom was noted in the northwestern portion of Mystic Lake (pictured to right). Moderate to dense areas of common waterweed growth were present, and sparse patches of clasping-leaf pondweed were growing around the island and the access channel between the two lakes. No hydrilla growth was found within either Mystic Lake or Middle Pond at the time of the survey.

2017 Management Schedule

Considering the reemergence of hydrilla in 2016, initial treatment of the Mystic Lake was performed on June 26th, which also included a small section within Middle Pond near

the access channel between the two waterbodies. Sonar One pellets were applied using a electric powered rotary spreader system. The treatment boat was also equipped with a WAAS GPS to ensure that the herbicide was evenly applied to the designated treatment area.

On the day of treatment all of Mystic Lake and the treated are of Middle Pond were posted with signs warning of the herbicide treatment and the subsequent temporary water-use restrictions. In accordance with the USEPA label, the use of lake water for irrigation was restricted for a period of 30 days.

One follow-up treatment was performed at Mystic Lake on August 2th to help maintain Sonar concentration.

Post-Management Survey

The post-management survey was performed on September 27th using an underwater camera and throw-rake to enhance visual methods. The native vegetation assemblage remained relative unchanged from the early-season survey (Table 4).

Table 4. Macrophyte Species at Mystic Lake & Middle Pond – June 8, 2017

Common Name	Latin Name
Small Waterwort	*Elatine minima*
Needle Spikerush	*Eleocharis acicularis*
Common Waterweed	*Elodea canadensis*
Seven-angled Pipewort	*Eriocaulon aquaticum*
Quillwort	*Isoetes sp.* likely *I. tuckermanii*
Yellow Waterlily	*Nuphar variegata*
White Waterlily	*Nymphaea odorata*
Snailseed Pondweed	*Potamogeton bicupulatus*
Clasping-leaf Pondweed	*Potamogeton perfoliatus*
Small Pondweed	*Potamogeton pusillus*
Robbin's Pondweed	*Potamogeton robbinsii*
Tapegrass	*Vallisneria americana*
Benthic Filamentous Algae	Various

As with previous years, notable changes occurred in native plant maturity and distribution, especially with clasping-leaf pondweed, tapegrass, waterlilies and common waterweed. Few areas of thin-leaf pondweed (*Potamogeton* sp. likely *P. pusillus*) were noted along the southeastern shorelines of both lakes. The mat of low-growing aquatic plants still covered the immediate shoreline - water lobelia, small waterwort, and quillwort – and appeared to have minor impacts from the treatment. Some pipewort (*Eriocaulon* sp.) was also noted growing sporadically along the shorelines of both waterbodies.

Middle Pond appeared to support higher species richness than Mystic Lake. Tapegrass and Robbin's Pondweed were only present in Middle Pond.

Some small patches of benthic filamentous algae were noted in Mystic Lake, near the southern shore and northeastern cove. No hydrilla was found in either waterbody.

Hydrilla Tuber Sampling

Sampling for hydrilla tubers and turions was performed on June 7th and October 17th, in relation to the early- and late-season surveys. As with previous years, no Hydrilla tubers or turions were present within the sample areas. Notably, many (30+) spikerush tubers were found at Site 167, which can look similar to Hydrilla tubers. The sampling site is densely covered with low-growing macrophytes – small waterwort, water lobelia, and quillwort – which may help prevent the reemergence of hydrilla.

Figure 4 – 2017 Mystic Lake Tuber Sampling Locations

Summary

- No Hydrilla was documented within Mystic Lake and Middle Pond throughout the 2017 season.
- No Hydrilla tubers and turions were discovered during either sampling sessions
- Filamentous algae blooms were present early season within the northeastern coves of Mystic Lake.
- The mat of low-growing macrophytes within the immediate shoreline may be helping prevent the reemergence of hydrilla.

MANAGEMENT RECOMMENDATIONS

Vegetative growth of hydrilla was not observed in Mystic Lake, Middle Pond, or Long Pond, however tubers were found at two locations in Long Pond during the early-season sampling. While no tubers were documented during the late-season sampling, we recommend maintaining the current program schedule. Somewhat like seeds, tubers are reproductive bodies that can remain dormant for 5+ years before sprouting. The lack of tubers during the fall sampling does not denote the eradication of hydrilla.

The monitoring program should be maintained and used to document changes in the vegetation assemblage throughout the season, in addition to helping determine the scope of future management. As with previous Sonar treatment programs at Mystic Lake, Middle Pond, and Long Pond, we recommend an initial Sonar application of approximately 10 ppb at the onset of widespread hydrilla growth (late June). A Sonar concentration of greater than 5 ppb should then be maintained for a period of 40-60 days by performing low dose booster applications.

We further recommend performing only a single tuber and turion sampling, rather than the samplings that occur in both spring and fall. One sampling should be sufficient to obtain an understanding of hydrilla growth and density.

Filamentous and microscopic algae blooms were a notable concern for Long Pond throughout the 2017 season. Algae monitoring and future management is suggested in order to determine the algae population within the waterbodies, especially within Long Pond. Various management options can be used to prevent unhealthy blooms from occurring, ultimately helping maintain balance within the water column. Given the potential detrimental impacts associated with unbalanced algae growth, we recommend continuing to monitor algae growth densities and being prepared to respond with active management in the event problematic conditions develop. We hope that you find this information helpful in making your pond management decisions. If you have any questions or need anything further, please contact our office.

FIGURE 1: EARLY-SEASON VEGETATION SURVEY
June 8, 2017

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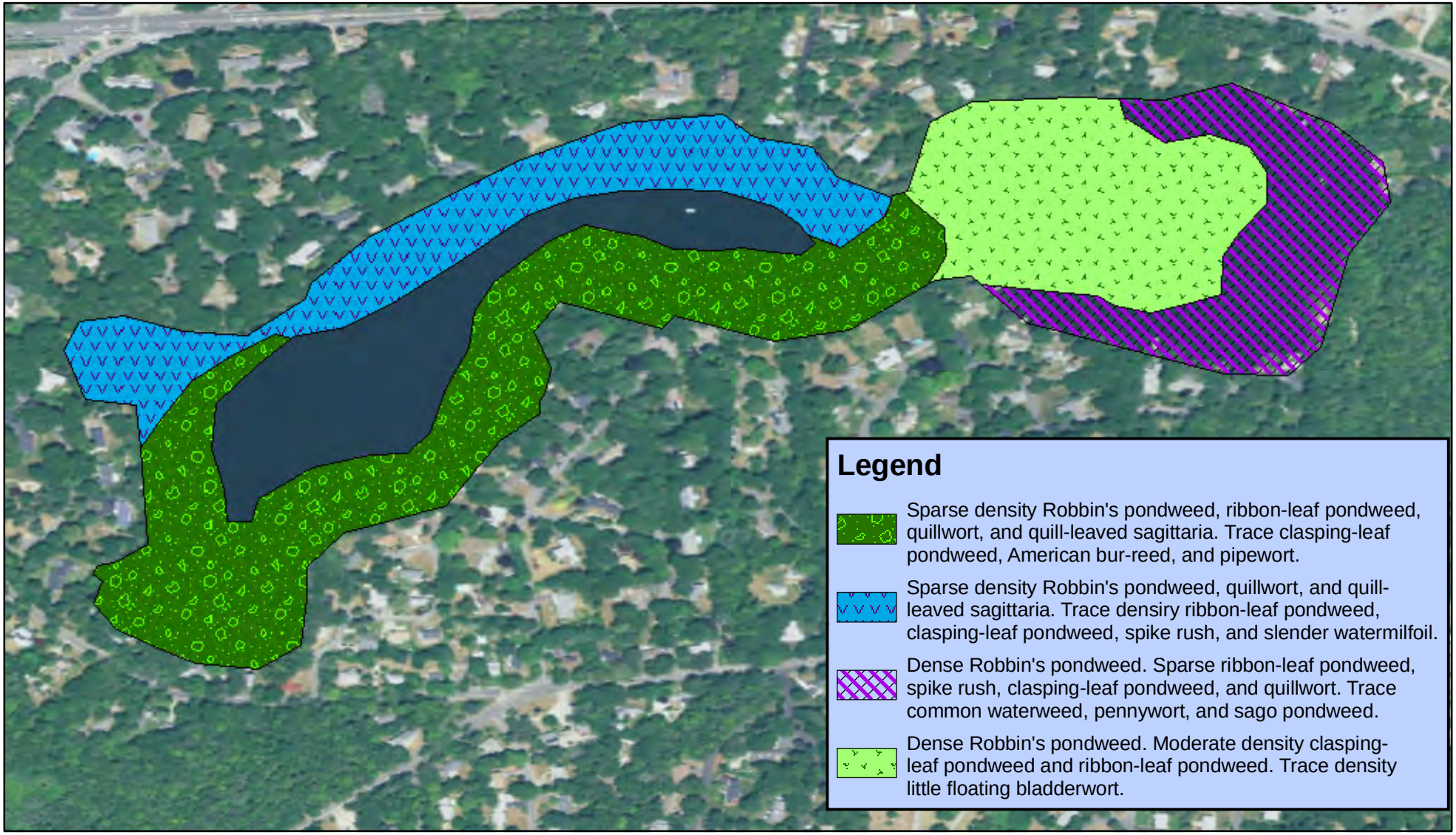

Long Pond
Centerville, MA

Long Pond

1:5,500

0 112.5 225 450 675 900 Feet

N

Map Date: 7/19/2017
Prepared by: BNA
Office: Shrewsbury, MA

FIGURE 3: EARLY-SEASON VEGETATION SURVEY
June 8, 2017

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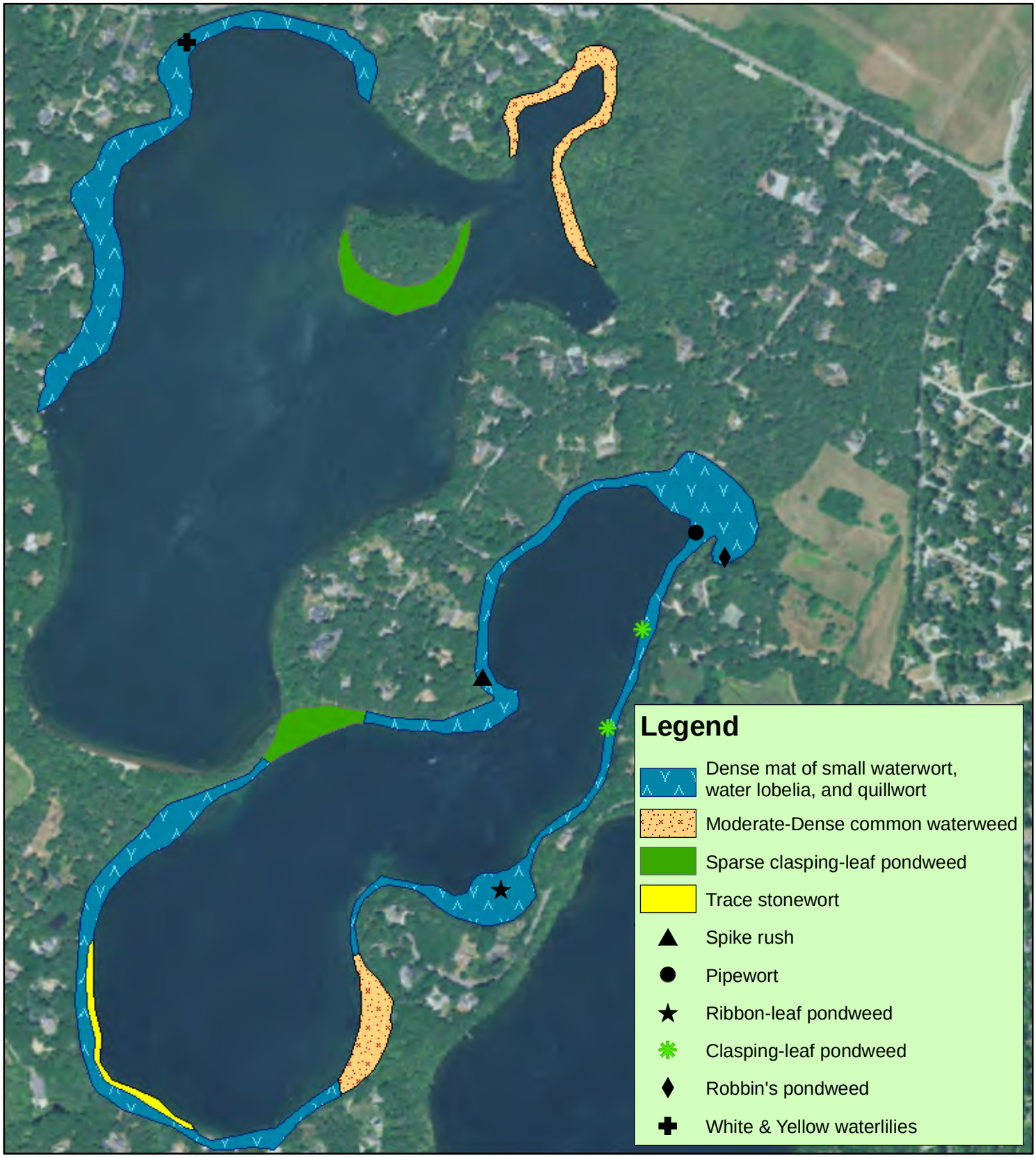

Middle Pond & Mystic Lake
Barnstable, MA

Middle Pond & Mystic Lake

0 610 1,220 Feet

N

1:8,100

Map Date: 7/21/17
Prepared by: BNA
Office: SHREWSBURY, MA