

**Northeast Aquatic Research**



# **Lake Waramaug 2019 Treatment Report**

**Prepared for the Lake Waramaug Task Force**



**December 2019**

## Introduction

Lake Waramaug contains the invasive species *Potamogeton crispus* (curly-leaf pondweed) and over the past 13 years, suction harvesting efforts have been undertaken to remove the species from the lake.

Northeast Aquatic Research (NEAR) conducted two aquatic plant surveys of Lake Waramaug in 2019. The whole-lake pre-treatment survey was conducted on May 31. The survey consisted of creating waypoints throughout the entire littoral zone of the lake and revisiting all waypoints curly-leaf pondweed had been found in previous years (**Map 1**). This survey utilized a combination of visual assessments, hand-raking in shallow water, grappling rake tosses, and depth-soundings to view plants growing in deep water.

Between mid-May and early July, New England Aquatic Services used suction harvesting to remove all known curly-leaf plants from the lake.

The post-treatment survey was conducted on July 24. This survey involved revisiting all locations where curly-leaf plants had been removed from the lake, to search for any plants that had been missed by the harvesters or had regrown from turions or fragments post-removal.

## Lake Waramaug Aquatic Plant Survey Results

During the May pre-treatment survey, curly-leaf pondweed was present at 10 waypoints (**Map 2, Table 1**). The highest concentration of curly-leaf beds was in the northeastern portion of the lake, in Sucker Brook Cove, with a handful of other beds scattered around the shoreline of the lake. There was noticeably less curly-leaf in 2019 compared to recent years' pre-treatment surveys (see historical curly-leaf pondweed maps in appendix). In 2018, and previous years, curly-leaf has consistently been found in the north-eastern bay and along the eastern shoreline of the lake. In 2019, no curly-leaf was found in this bay.

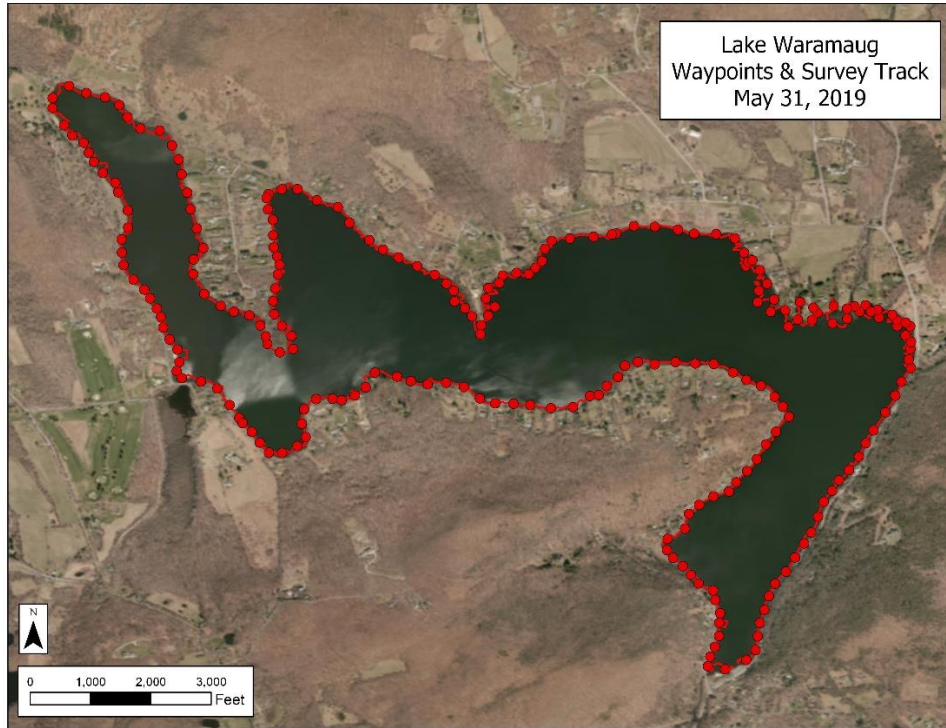
16 native aquatic plant species were also found in the lake during the pre-treatment survey. Of these, *Potamogeton robbinsii* (Robbins' pondweed) was the most abundant, as well as the only dominant species, meaning it was present at greater than 20% occurrence (**Table 2, Map 3**). It was growing along large portions of the lake's shoreline, mainly at medium to high density. *Ceratophyllum demersum* and *Potamogeton amplifolius* were the only two other species in the lake present at greater than 10% frequency (**Map 4, Map 5**).

Large patches of filamentous algae were present in two of the lake's coves and along the eastern shore of the Arrow Point peninsula (**Map 6**). Filamentous algae is an indicator of elevated nutrient concentrations and lake eutrophication.

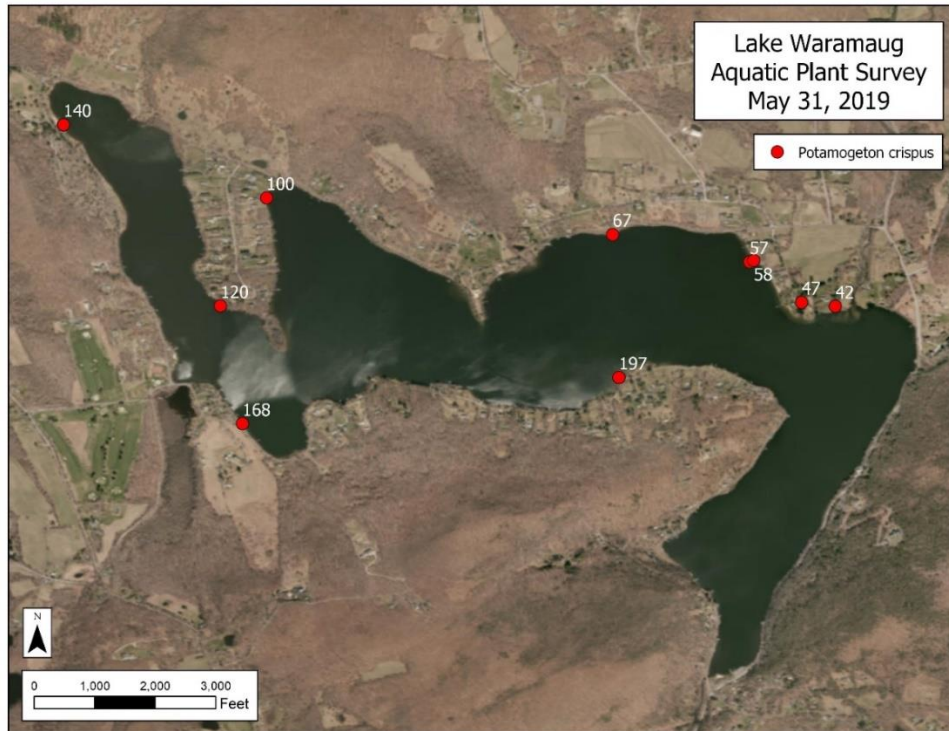
During the July 24 post-treatment survey, 2 weeks following completion of the suction harvesting operation, no curly-leaf pondweed was found in the lake.

During the 2018 post-treatment survey, NEAR found a large patch of the invasive species *Trapa natans* (water chestnut) on the delta in the northeast corner of the lake (**Map 7**). These plants were pulled immediately by New England Environmental Services. No water chestnut was found in the lake in 2019.

**Map 1.** May 2019 survey waypoints and track.



**Map 2.** May/Pre-treatment 2019 *Potamogeton crispus* locations in Lake Waramaug.



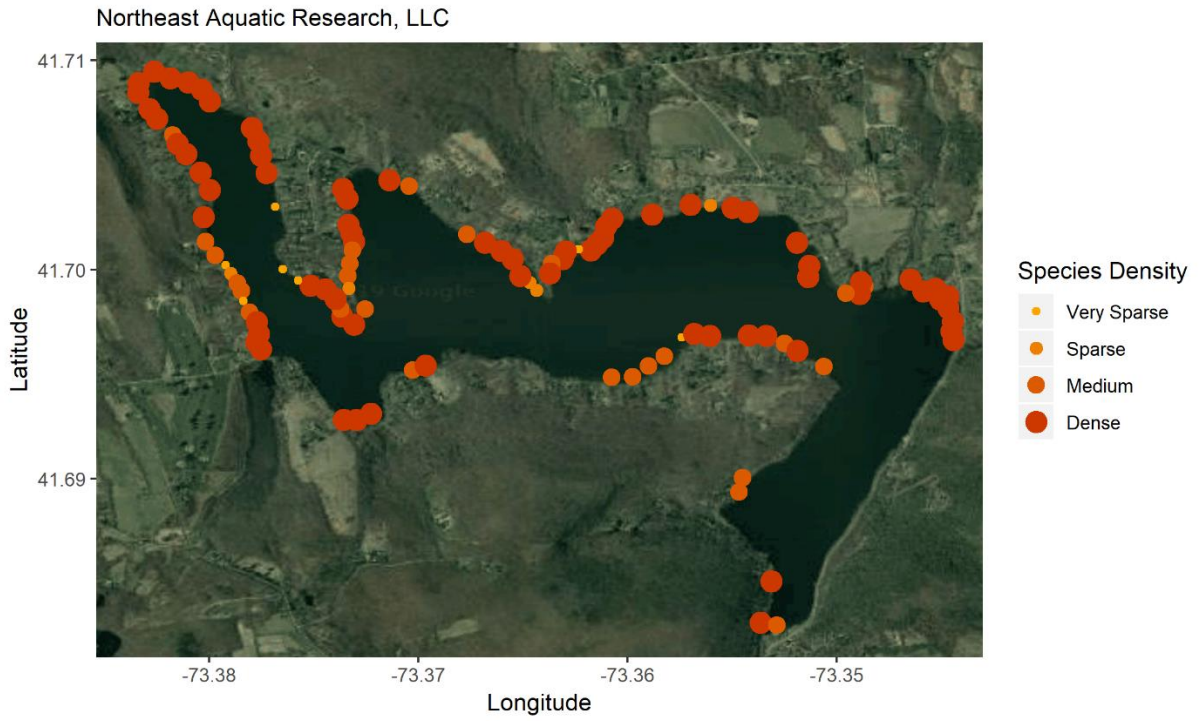
**Table 1.** *Potamogeton crispus* waypoints and patch descriptions.

Waypoint	Depth	Density	Notes
42	3.9	Very Sparse	5 plants
47	2.4	Dense	~70 plants
57	1.1	Moderate	1 clump (3ft x 3ft)
58	1.1	Dense	6x6ft patch
67	5	Very Sparse	~8 plants
100	1.8	Very Sparse	1 plant
120	4	Very Sparse	1 large plant
140	1.9	Sparse	30+ plants
168	2.7	Very Sparse	1 plant
197	1.7	Very Sparse	5 plants

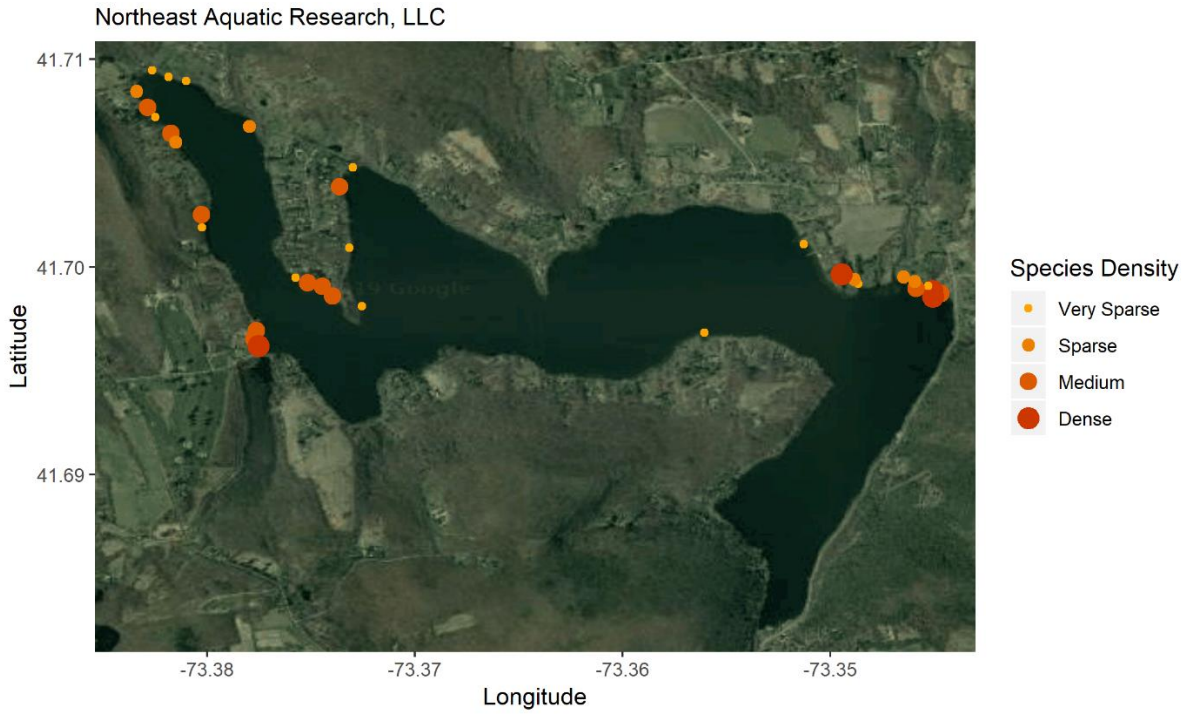
**Table 2.** 2019 pre -treatment survey vegetation data.

<b>Scientific Name</b>	<b>% Frequency</b>	<b>Avg. Density</b>
<i>Potamogeton robbinsii</i>	50.2	76.3
<i>Ceratophyllum demersum</i>	15.2	30.3
<i>Potamogeton amplifolius</i>	14.3	22
<i>Elodea nuttallii</i>	7.8	40.6
<i>Potamogeton perfoliatus</i>	6.5	58
<i>Filamentous algae</i>	4.3	68.8
<i>Potamogeton crispus</i>	4.3	19.2
<i>Sagittaria graminea</i>	3.9	23.9
<i>Eleocharis acicularis</i>	1.7	40
<i>Nymphaea odorata</i>	1.3	12.3
<i>Phragmites</i>	0.9	NA
<i>Elodea canadensis</i>	0.4	5
<i>Najas flexilis</i>	0.4	10
<i>Nuphar variegata</i>	0.4	60
<i>Polygonum sp.</i>	0.4	30
<i>Potamogeton bicupulatus</i>	0.4	NA
<i>Potamogeton epihydrus</i>	0.4	60
<i>Potamogeton gramineus</i>	0.4	30
<i>Sparganium fluctuens</i>	0.4	10
Typha	0.4	NA
Yellow iris	0.4	NA

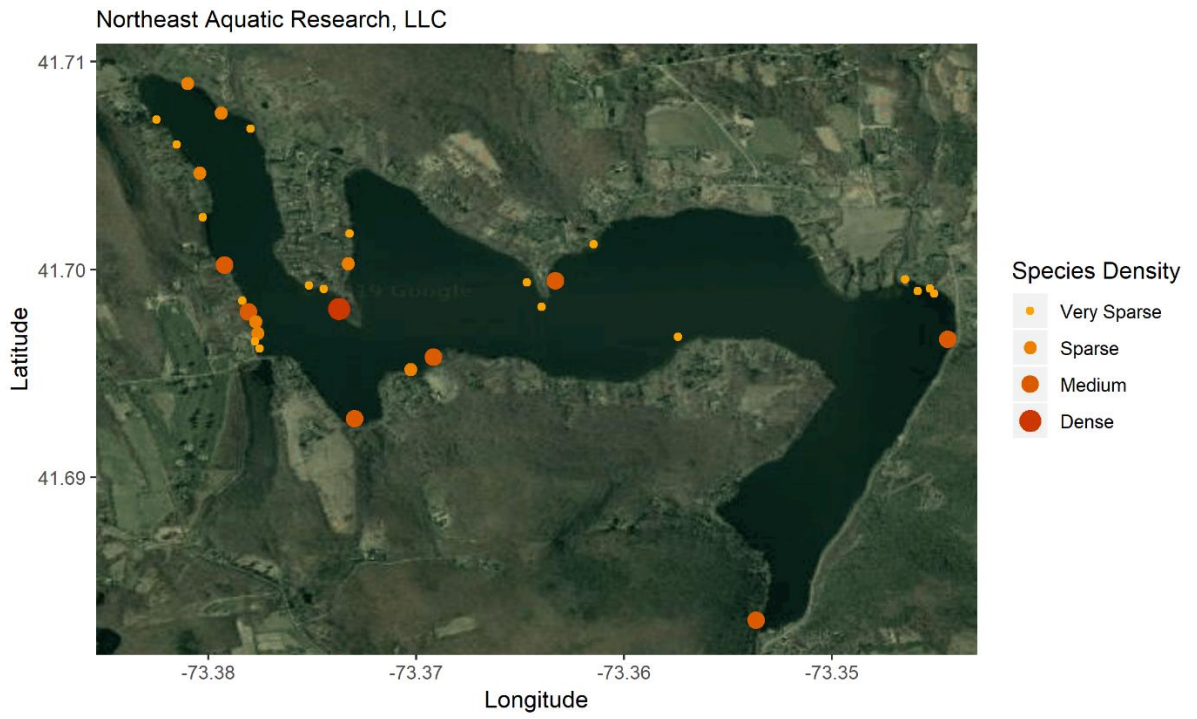
**Map 3.** Locations and density of *Potamogeton robbinsii* during May 2019 survey.



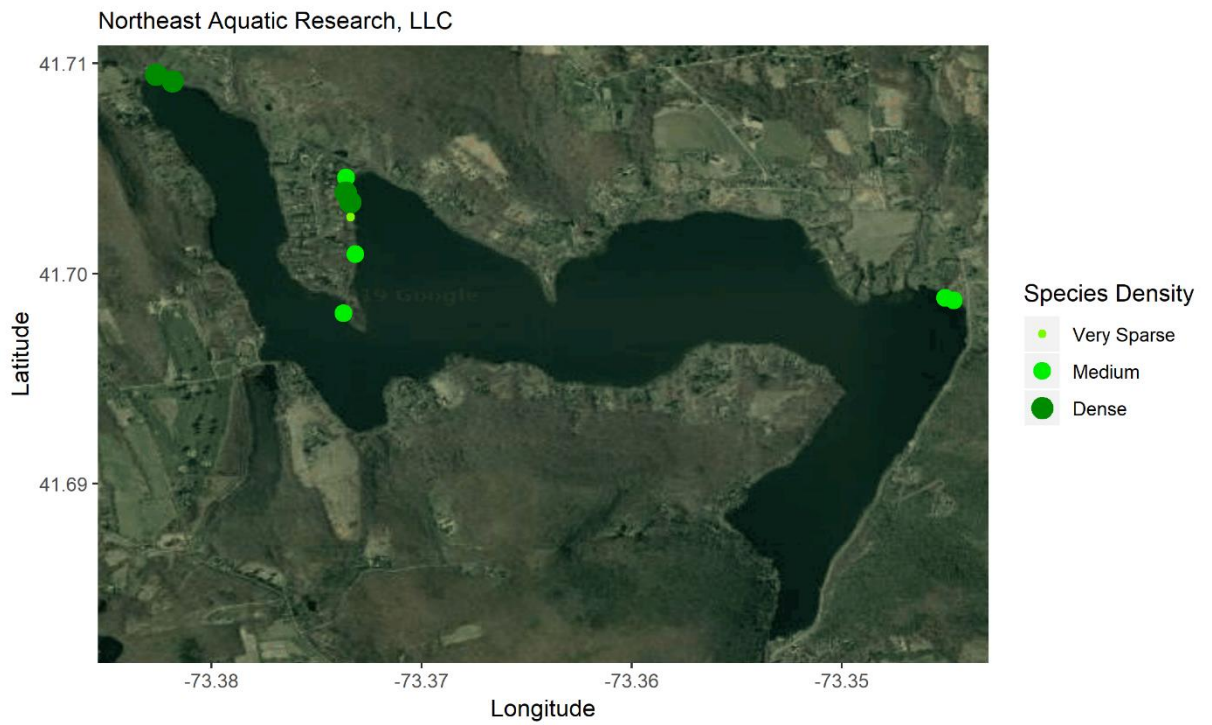
**Map 4.** Locations and density of *Ceratophyllum demersum* during May 2019 survey.



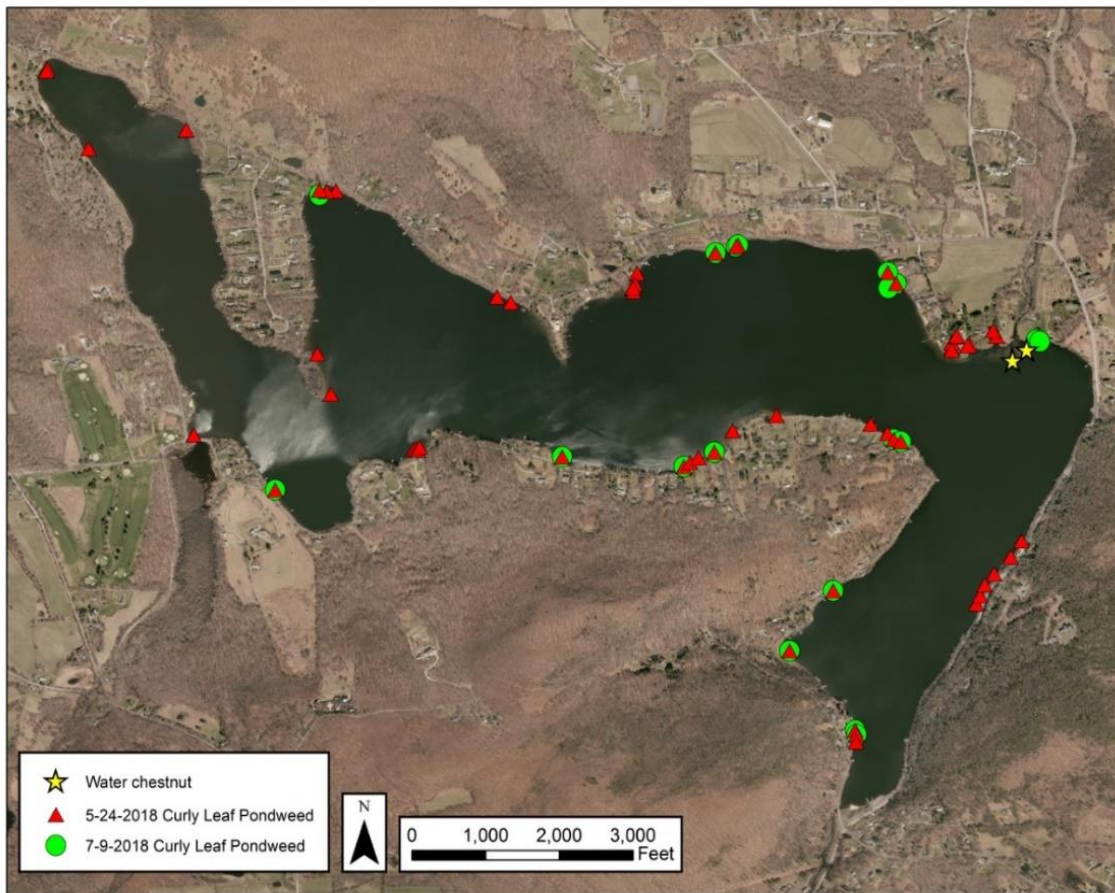
**Map 5.** Locations and density of *Potamogeton amplifolius* during May 2019 survey.



**Map 6.** Locations and density of filamentous algae during May 2019 survey.



**Map 7.** Curly-leaf pondweed and water chestnut locations during 2018 surveys.



## Recommendations

The results of the 2019 pre- and post-treatment surveys suggest that the yearly suction-harvesting efforts are beginning to effectively reduce the amount of curly-leaf pondweed in Lake Waramaug. Curly-leaf plants release turions (winter buds) that form a dense seed bank over the years and can support new plant growth in future years. The annual removal of curly-leaf plants from the lake is diminishing this seed bank.

Although no curly-leaf plants were found in the lake during the 2019 post-treatment survey, it is likely that new plants will sprout from the seed bank in the spring of 2020. Ultimately, continued annual surveying and removal efforts can lead to complete eradication of curly-leaf pondweed from Lake Waramaug.

Filamentous algae is an indicator of elevated nutrient concentrations in the lake water. Nutrients may be entering the lake via inlets or seeps in the areas where filamentous algae is present. A watershed investigation to locate all inlet streams and test for nutrient concentrations in the inlets would be a valuable step towards reducing nutrient concentrations in the lake.

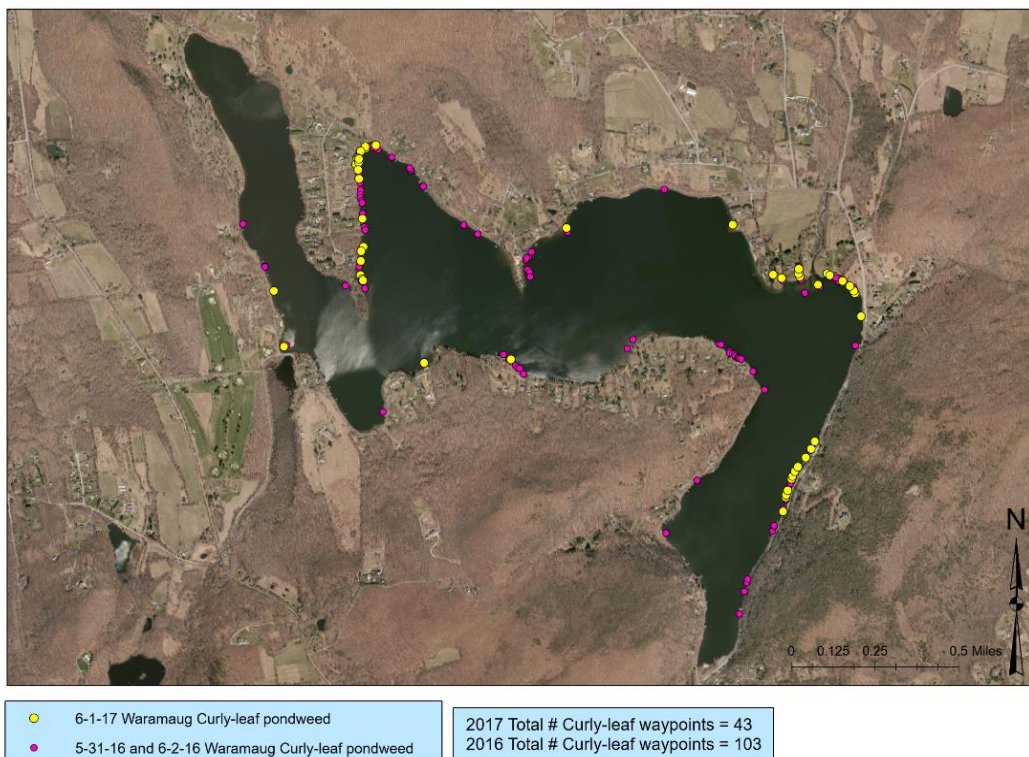


# Appendix

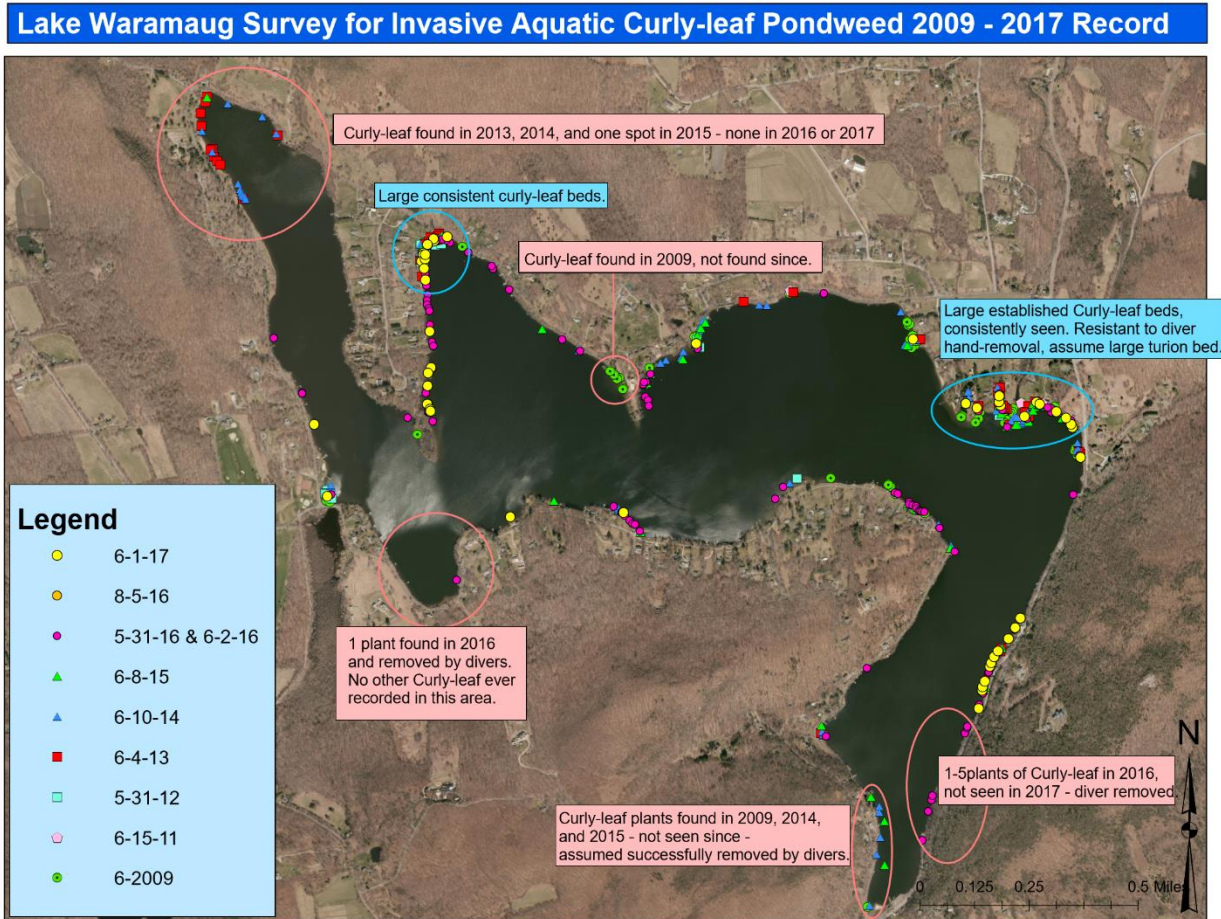
Table 3. Aquatic plant survey dates, 2007 – 2019.

Date	Map #	Number of curly leaf locations
2019 – May 31 and July 24	2	10
2018 – May 24 and May 25	7	63
2017 – June 1	8	50
2016 – May 31 and June 2	8	104
2015 – June 8	9	48
2014 – June 10	9	120
2013 – September 13	9	5
2013 – June 4	9	33
2012 – May 30, and May 31	9	19
2011 – June 15	9	5
2010 – June 7, 8, and 9	9	45
2009 – May 21, June 16, and June 25	9	16
2008 – June 18, July 2 (first spring curly-leaf survey)	10	5
2007 – August 17, and August 20 (last summer survey)	~	~

Map 8. Locations of Curly-leaf Pondweed plants found in Lake Waramaug during 2016 and 2017 surveys.



**Map 9.** Locations of Curly-leaf Pondweed plants found in Lake Waramaug during aquatic plant surveys, 2009 – 2017.



**Map 10.** Lake Waramaug showing sites where curly-leaf pondweed was observed during June 18, and July 2, 2008 surveys.

