

**Northeast Aquatic Research**



# **Lake Waramaug 2022 Invasive Species Report**

**Prepared for the Lake Waramaug Task Force**



**January 2023**

## Introduction

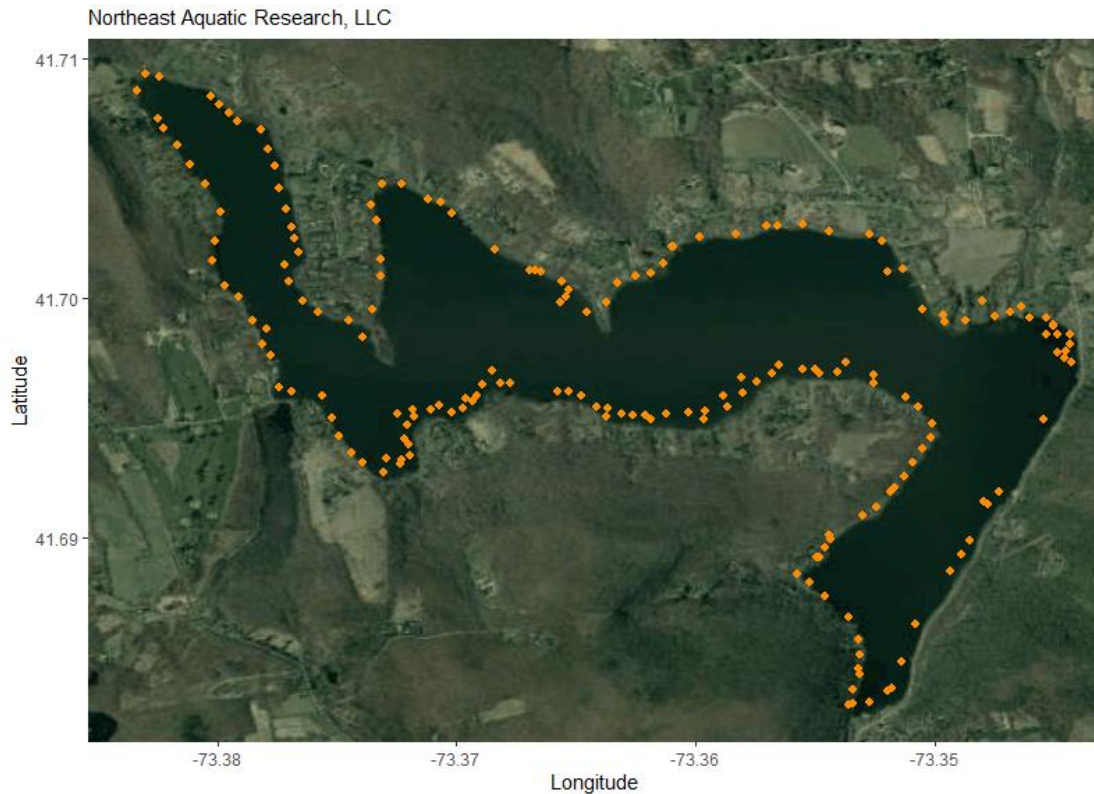
In May 2022, NEAR conducted a full lake survey, recording the presence and abundance of all aquatic plant species in the lake. This was the first survey in several years during which we recorded all aquatic plant species in the lake. In recent years, NEAR has surveyed only for the invasive *Potamogeton crispus* (curly-leaf pondweed) and searched for the invasive *Trapa natans* (water chestnut).

The 2022 survey covered the entire littoral zone of the lake, using meander methodology (**Map 1**). The littoral zone was surveyed in a zig-zag pattern to search for plants in both the shallow and deeper environments. The shoreline areas were thoroughly searched, as this is where invasive species have been previously located. The survey utilized a combination of strategies to thoroughly and accurately document the aquatic plant population. A high-resolution down-imaging SONAR device (depth sounder) provided a constant image of the water column beneath the boat and was able to demonstrate the difference between native pondweeds and invasive milfoil. The image is of high enough resolution to differentiate plants from other objects such as rocks and stumps, and it also shows when nothing is present.

At each waypoint, a 14-tine double-sided garden rake attached to a 10m rope was used to collect specimens of all species at that point. In areas where plant growth was obviously very dense, a long-handled rake was used to identify and estimate density of plants growing beneath canopy species. When plants are extremely dense, the throw-rake is less efficient at picking up uncommon species because it fills up rapidly on the rake-toss. The water depth and plant density were recorded at each waypoint.

Species density was determined using a combination of visual density determination based on what is visible from the surface, the down-imaging SONAR images of the plants as the boat passes above, and the weed-rake tosses. When possible, all three methods of estimating the percent cover are used at each waypoint, and the resulting estimate is recorded on the datasheet.

Map 1. Waypoints created during May 2022 aquatic plant survey of Lake Waramaug.



## Survey Results

During the May 2022 aquatic plant survey, 19 aquatic plant species were found in the lake, along with filamentous algae and *Lyngbya wollei* (cyanobacteria mat) (**Table 1**). Filamentous algae was very abundant, present at 57% of survey waypoints, present in scattered patches along much of the lake's shoreline (**Map 2**). In addition, four aquatic plant species were dominant, meaning they were present at  $\geq 20\%$  frequency (**Map 3**). All four of these species, *Potamogeton robbinsii* (Robbin's pondweed), *Potamogeton amplifolius* (Large-leaf pondweed), *Elodea nuttallii* (Nuttall's waterweed), and *Ceratophyllum demersum* (Coontail) are native to Connecticut. *Potamogeton robbinsii* and *Elodea nuttallii* are low lying plants that provide good cover on the lake bottom and rarely present a nuisance in terms of recreation. *Potamogeton amplifolius* and *Ceratophyllum demersum* can reach the surface and grow in dense beds but again, these species rarely impede recreation, particularly in a lake as large as Waramaug, where most boat traffic is contained to the deeper waters.

During the May survey, curly-leaf pondweed plants were found in five locations along the lake's northern shoreline (**Map 4, Table 2**). No plants were found in the western State Park arm, or along the southern shore.

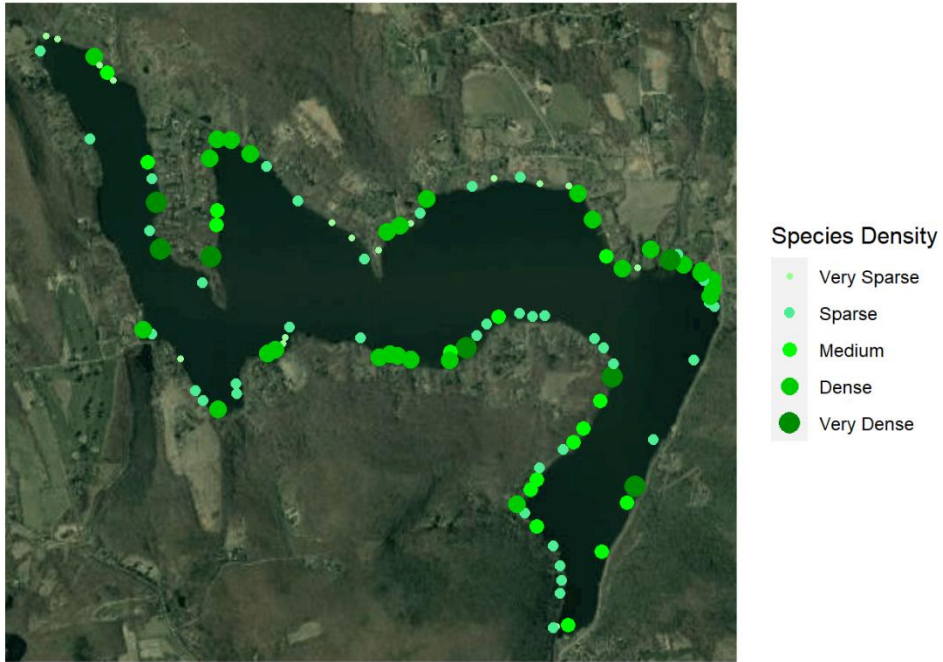
No other invasive species were found in the lake. Water chestnut, which was recorded in the lake in 2021, was not found this year despite thorough searching, particularly in the area where it has been found in the past.

Table 1. Aquatic plant species found in Lake Waramaug during the May 2022 aquatic plant survey. Red text denotes invasive species.

Scientific Name	Frequency (%)	Avg. Density
<i>Filamentous algae</i>	57	47
<i>Potamogeton robbinsii</i>	43	43
<i>Potamogeton amplifolius</i>	33	43
<i>Elodea nuttallii</i>	28	24
<i>Ceratophyllum demersum</i>	20	23
<i>Potamogeton perfoliatus</i>	14	39
<i>Sagittaria graminea</i>	13	23
<i>Lyngbya wollei</i>	4	38
<i>Eleocharis acicularis</i>	4	13
<i>Potamogeton epihydrus</i>	3	23
<i>Polygonum sp</i>	3	16
<i>Potamogeton crispus</i>	3	5
<i>Vallisneria americana</i>	3	24
<i>Zosterella dubia</i>	3	7
<i>Nymphaea odorata</i>	2	20
<i>Nuphar variegata</i>	2	40
<i>Potamogeton gramineus</i>	2	22
<i>Nitella sp</i>	1	8
<i>Ludwigia palustris</i>	1	10
<i>Pontederia cordata</i>	1	NA
<i>Potamogeton bicupulatus</i>	1	5

Map 2. Locations of Filamentous algae during May 2022 survey.

5-31-22 Waramaug: Filamentous algae  
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Map 3. Locations of dominant species during the May 2022 survey.

5-31-22 Waramaug: Robbins' pondweed (*Potamogeton robbinsii*)  
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5-31-22 Waramaug: Largeleaf pondweed (*Potamogeton amplifolius*)

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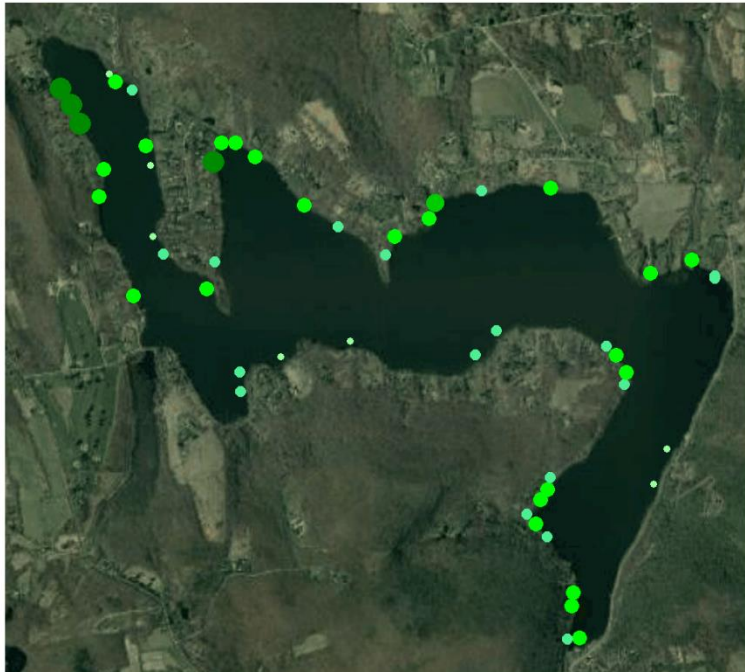


Species Density

- Very Sparse
- Sparse
- Medium
- Dense
- Very Dense

5-31-22 Waramaug: Nuttall's waterweed (*Elodea nuttallii*)

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Species Density

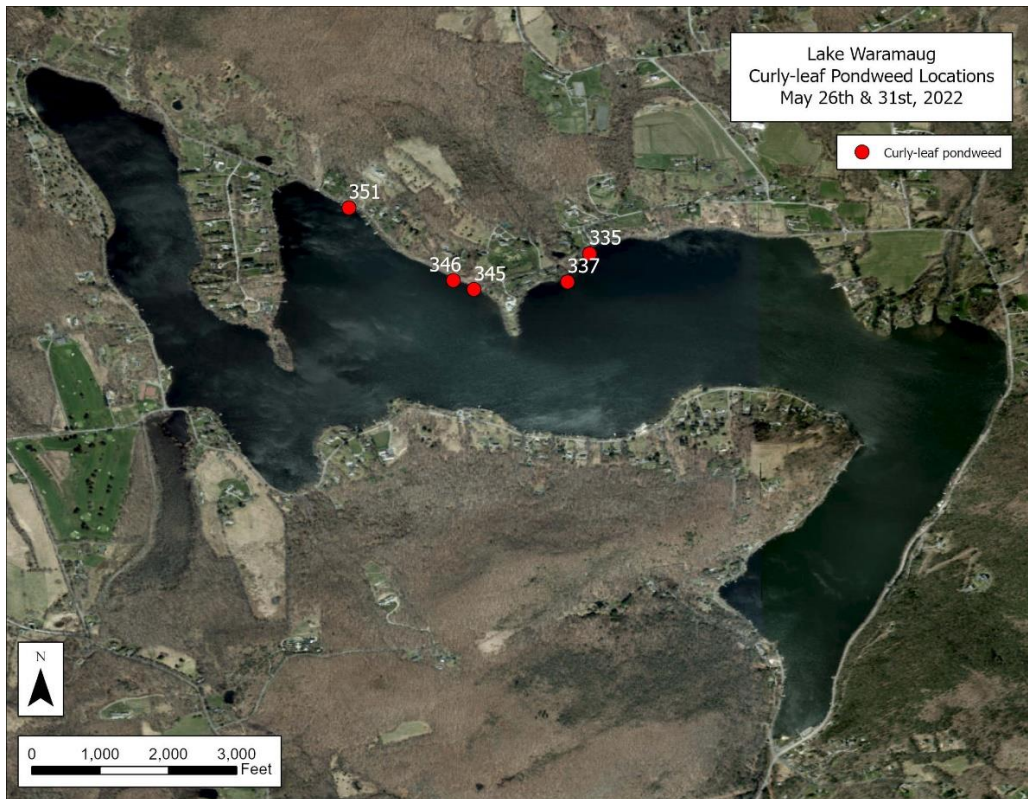
- Very Sparse
- Sparse
- Medium
- Dense
- Very Dense

5-31-22 Waramaug: Coontail (*Ceratophyllum demersum*)

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Map 4. Locations of *Potamogeton crispus* during May 2022 survey.



**Table 2.** May 31<sup>st</sup>, 2022-pre-removal curly-leaf pondweed waypoints and descriptions.

Waypoint	Density	Latitude	Longitude	Notes
335	very sparse	41.70215998	-73.360995	pulled one plant
337	very sparse	41.70103303	-73.36187703	8 plants
345	very sparse	41.700726	-73.36562399	2 plants
346	very sparse	41.70108701	-73.36645497	8 plants
351	very sparse	41.70400601	-73.37063997	2 plants

## Recommendations

Conduct an invasive species investigation in late May or early June 2023 to search for curly-leaf pondweed and water chestnut, and any other new invasive species infestations.

Any curly-leaf pondweed that is found during the early-summer survey should be removed immediately via Diver Assisted Suction Harvesting (DASH). A post-removal survey should be conducted approximately one month after the plant removal to search for plants that were missed and any new growth or regrowth.

Full surveys of all aquatic plant species in the lake should be conducted every other year.

Filamentous algae was abundant during the 2022 survey, suggesting elevated nutrient concentrations in the lake. Elevated nutrient concentrations can lead to frequent algae/cyanobacteria blooms and increased plant growth. Please let us know if NEAR's services are required for water quality monitoring, identifying nutrient sources, and/or providing recommendations for reducing the lake's nutrient load to improve lake condition.

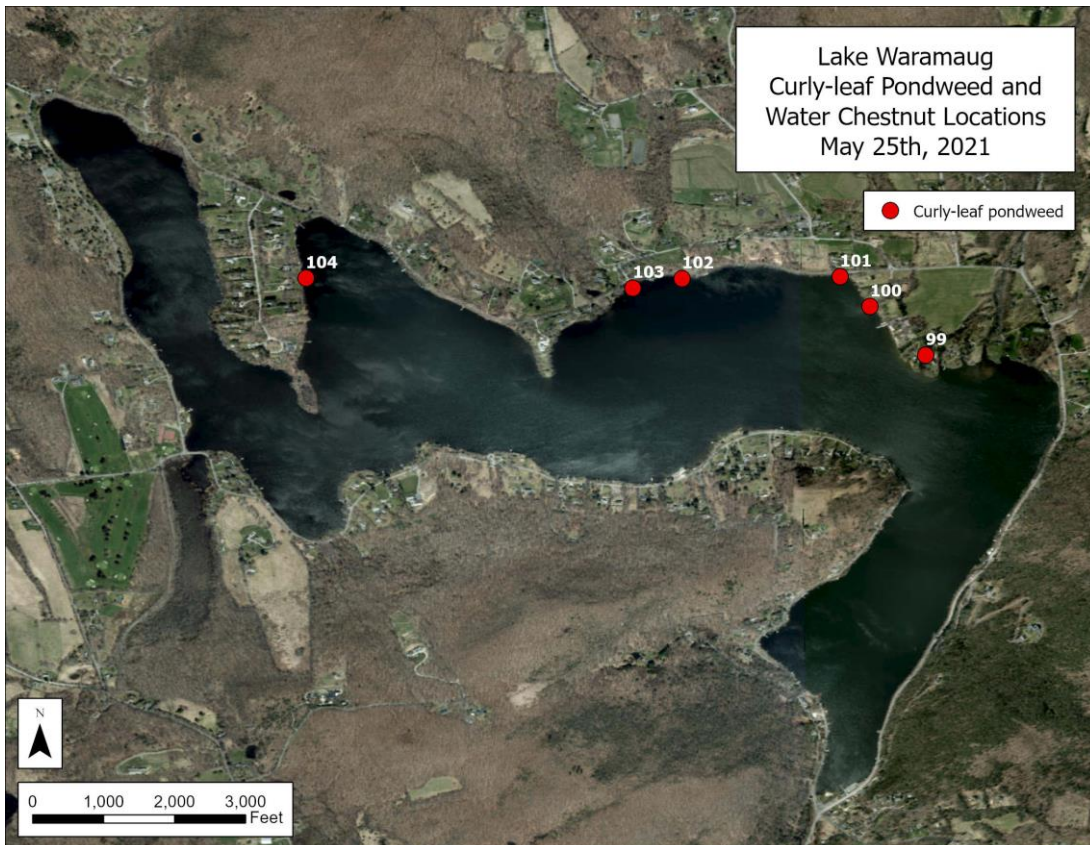


## Appendix

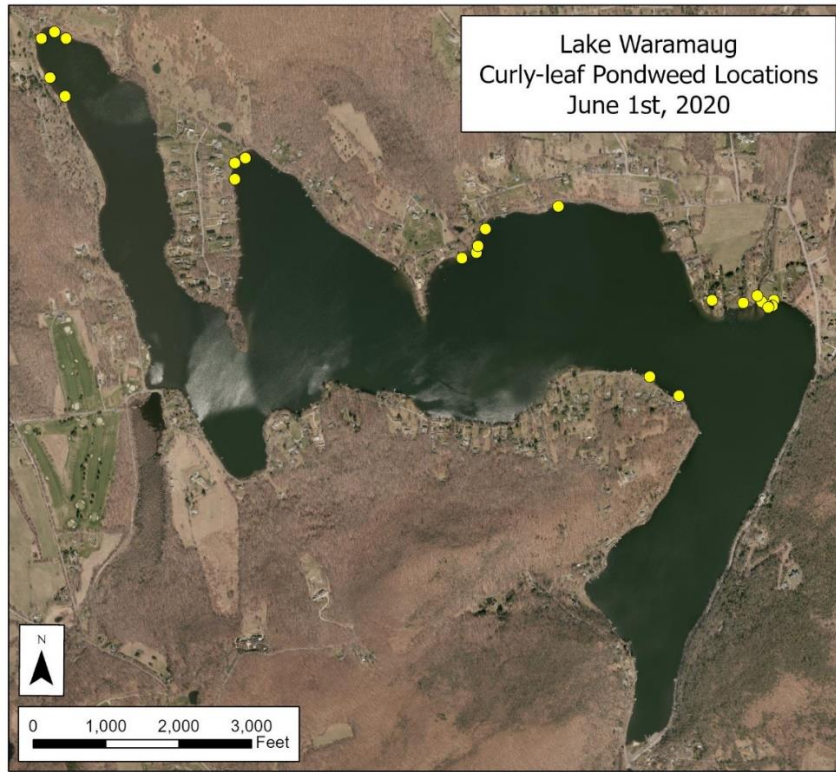
**Table 2.** Spring/pre-removal aquatic plant survey dates, and number of locations where curly-leaf pondweed were found 2008 – 2021.

Date of Survey	Map #	Number of curly leaf locations
2022 – May 26 & 31	5	5
2021 – May 25	6	6
2020 – June 1	7	24
2019 – May 31	8	10
2018 – May 24 and May 25	9	63
2017 – June 1	10	50
2016 – May 31 and June 2	10	104
2015 – June 8	10	48
2014 – June 10	10	120
2013 – June 4	10	33
2012 – May 30, and May 31	10	19
2011 – June 15	10	5
2010 – June 7, 8, and 9	10	45
2009 – May 21, June 16, and June 25	10	16
2008 – June 18, July 2 (first spring curly-leaf survey)	11	5

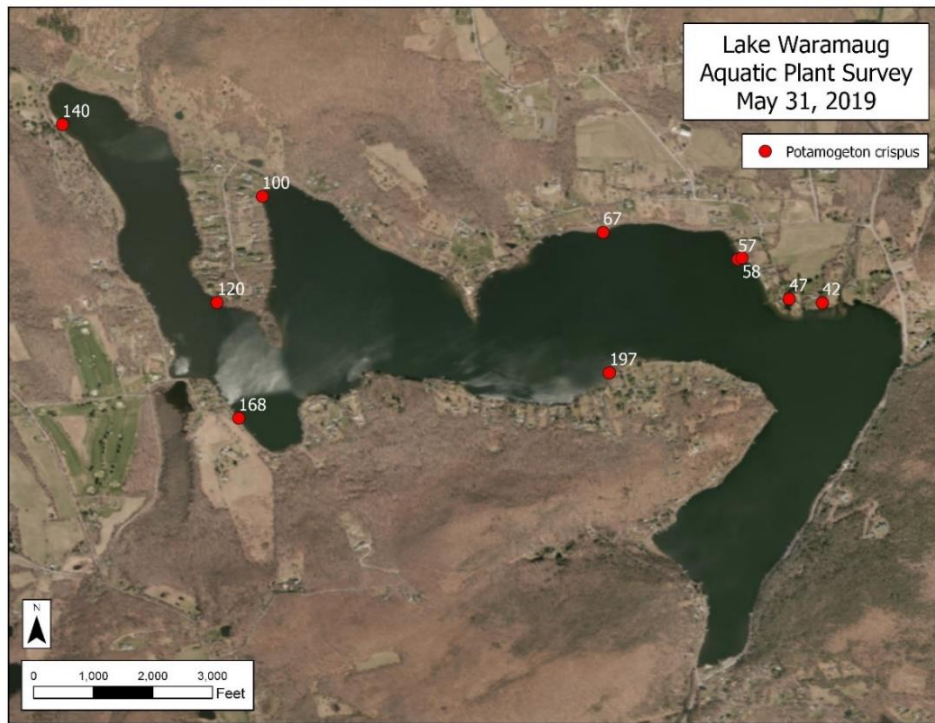
**Map 5.** Locations of Curly-leaf Pondweed plants found in Lake Waramaug during May 2021 survey.



**Map 6.** Locations of Curly-leaf Pondweed plants found in Lake Waramaug during June 2020 survey.

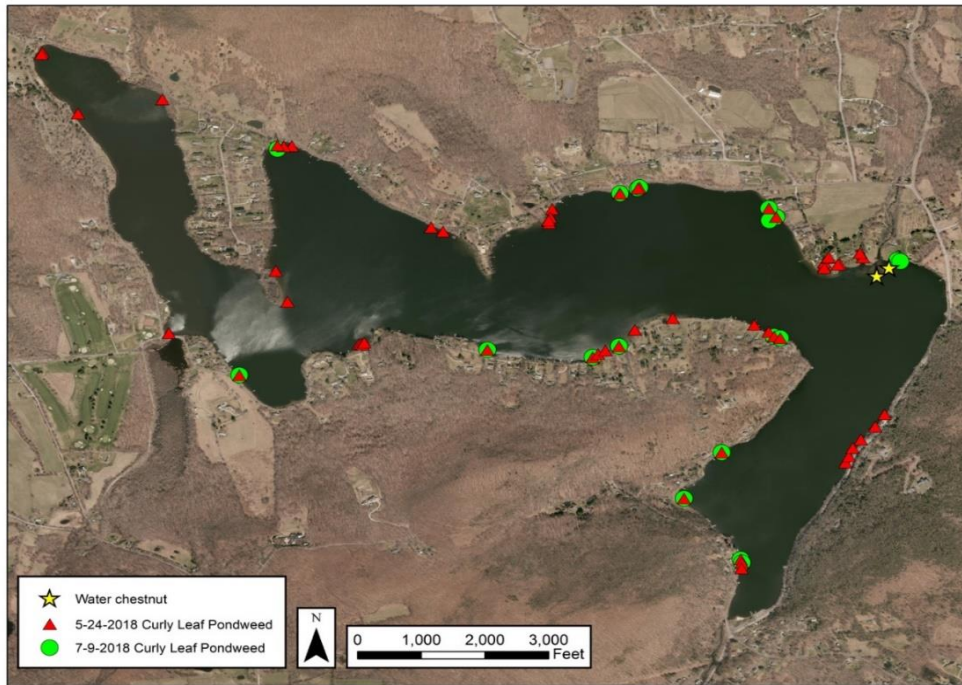


**Map 7.** Locations of Curly-leaf Pondweed plants found in Lake Waramaug during May 2019 survey.

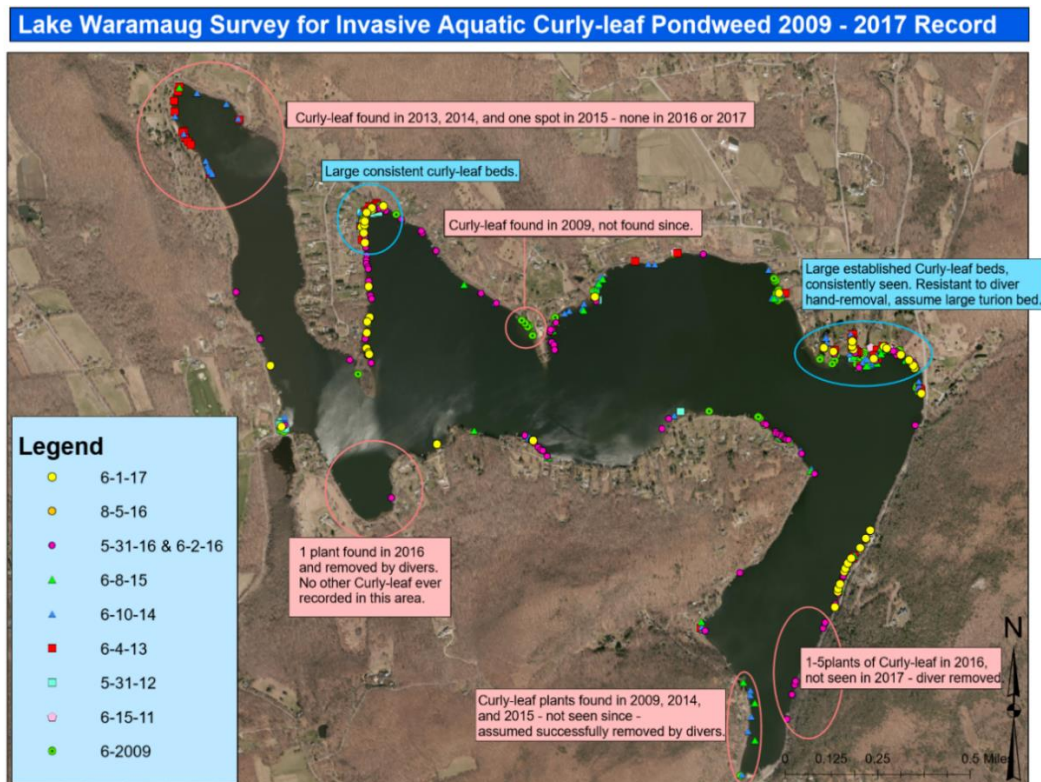




**Map 8.** Locations of Curly-leaf Pondweed and Water chestnut during 2018 surveys.



**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.

