

## Northeast Aquatic Research

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# Lake Quassapaug 2018 Summary Report

December 14, 2018

## Water Quality Summary

### Secchi Disk Transparency

Two Secchi disk values were reported in 2018 by volunteer monitors. The May water clarity Secchi measurement was recorded as 5.0-meters, and the July clarity was 5.6-meters. All Secchi values from 2013 to 2018 are listed in the table below. Values in 2018 were similar to those recorded in 2013 and 2014, but were much worse than those recorded in 2016-2017.

Based on the very wide range of clarity readings from month to month, it appears that the lake responds dramatically to either internal or external sources of nutrients. However, no patterns are visible with just two months of clarity data over the last two years. The two blank dates (9/17/17 and 8/10/18) indicate that water sampling was conducted by volunteers for nutrient testing, but for some reason no Secchi values were reported to us.

Table 1: Lake Quassapaug 2013-2018 Secchi Disk Depths (meters)

Date	Secchi (m)		Date	Secchi (m)		Date	Secchi (m)
5/1/2013	5.4		4/29/2015	4.0		6/8/2017	7.4
8/2/2013	5.5		5/5/2015	3.5		8/30/2017	7.2
8/15/2013	5.0		5/21/2015	5.0		9/17/2017	
8/19/2013	5.5		5/29/2015	8.0		<b>5/21/2018</b>	<b>5.0</b>
9/8/2013	5.5		6/25/2015	6.5		<b>7/10/2018</b>	<b>5.6</b>
10/6/2013	6.3		7/31/2015	8.0		8/10/2018	
10/20/2013	5.0		9/16/2015	6.3			
4/21/2014	4.5		10/21/2015	6.3			
5/21/2014	5.0		4/20/2016	6.0			
6/18/2014	5.7		5/10/2016	6.0			
7/21/2014	4.5		8/5/2016	7.5			
8/29/2014	6.6		8/18/2016	7.5			
9/29/2014	8.0						
10/29/2014	9.0						

### Key things to monitor:

- April after ice-out clarity
- May to early June drastic changes in clarity over the month may indicate a "clear-water" phase related to zooplankton grazing
- October clarity (best clarity reading in 6 years was in October)

### Temperature and Dissolved Oxygen

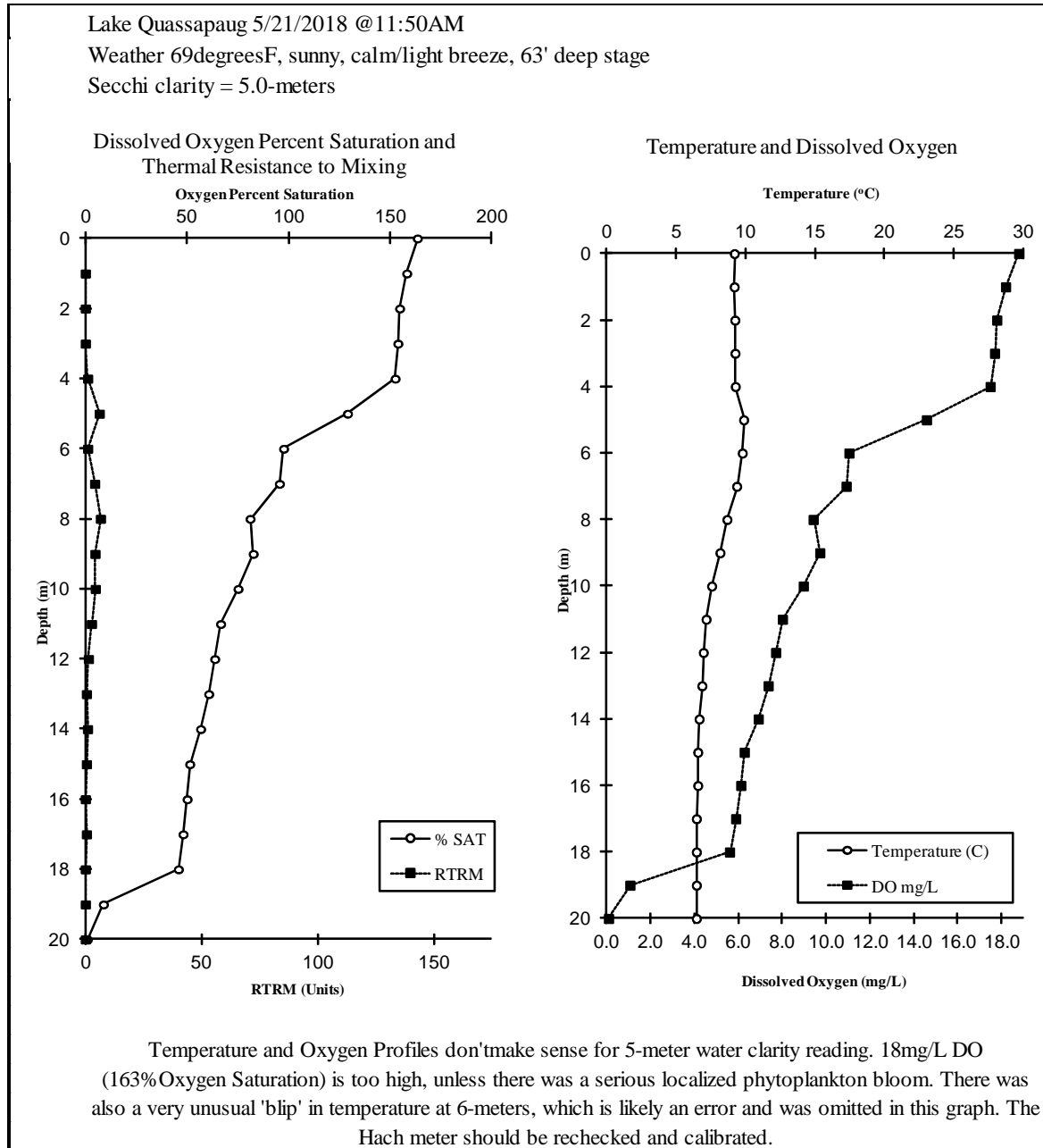
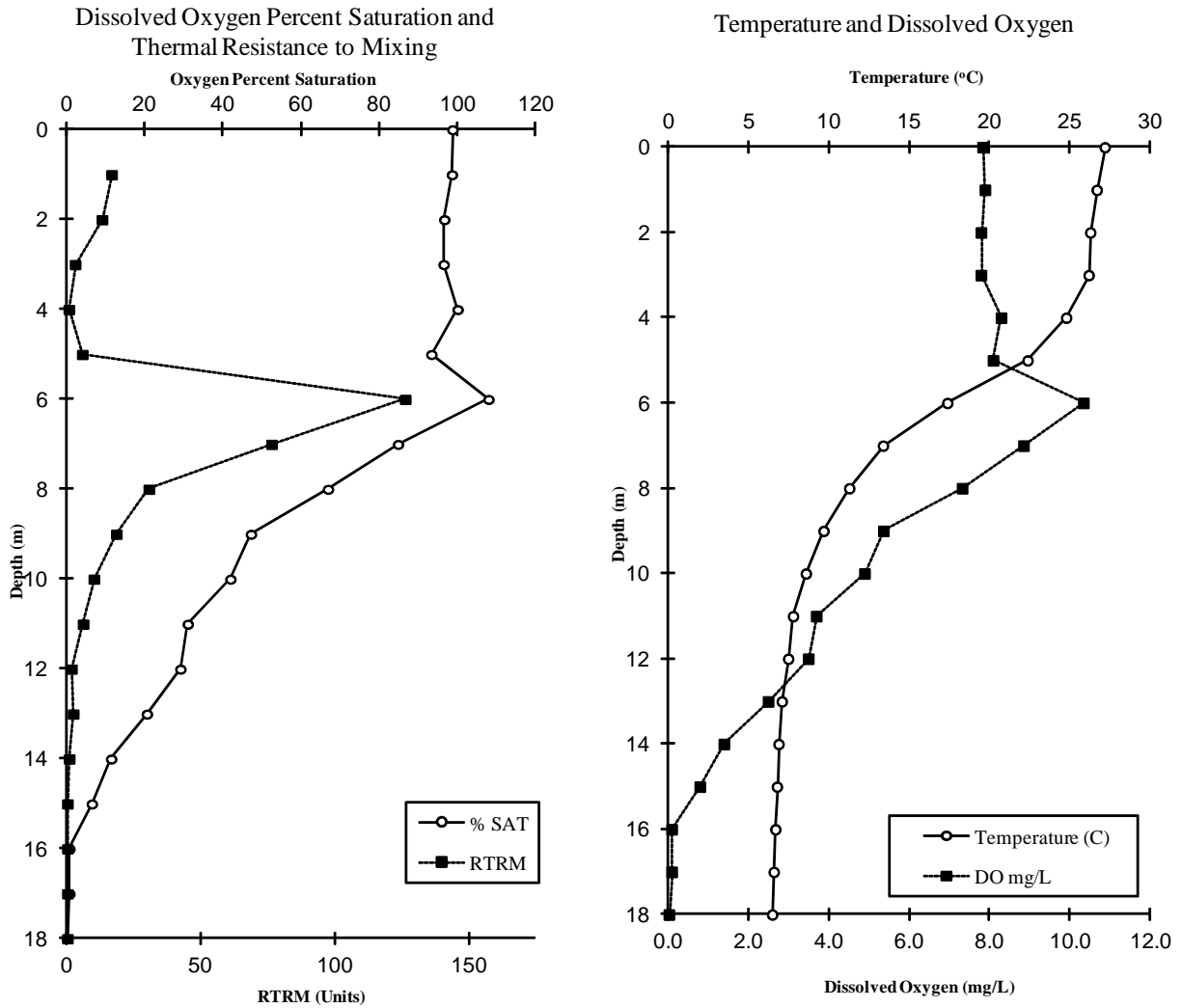


Figure 1: May 21, 2018 Lake Quassapaug Profile Data

Lake Quassapaug 7/10/2018 @11:15AM  
 Weather 81degreesF, sunny, calm/light breeze, 54' deep stage  
 Secchi clarity = 5.6-meters



Temperature and Oxygen profiles do not indicate a problem with the meter on this date, meaning that either there was a malfunctioning in May or that there was a severe surface algae bloom in May that needs to be investigated further. Dissolved Oxygen maintains ~100% saturation from surface down to 5.5-meters, where there is then a spike, likely related to a deep-water phytoplankton bloom at the top of the thermocline. From that point oxygen drops steeply and the lake is anoxic below ~15-meters.

Figure 2: July 10, 2018 Lake Quassapaug Profile Data

## Nutrient Testing Results

Samples A-C, and 1-7 are inlet samples collected by LQA resident volunteers on August 4, 2018. To our knowledge there were no GPS waypoints taken to mark exactly where these samples were collected. Description of sample locations is as follows:

- 1 - Across from Calvert
- 2 - Across from Croce
- 3 - Across from yellow house that is left to Ostrander. Tutolo? #37?
- 4 - Across from Holmes
- 5 - Retention Pond at bottom of Sandy Beach Rd.
- 6 - Flow down next to Sandy Beach Rd. hill on Halpert side
- 7 - Flow down next to Sandy Beach Rd. hill on Whittemore side
- A - Across from yellow house - #36?
- B - Across from Tutolo
- C - Across from Ostrander
- D - Across from area left of Ostrander

While these descriptions may make sense to the resident volunteers, GPS points are needed in order to keep track of samples over time. Please also note what time the samples were taken in field notes, including if it was towards the beginning, middle, or end of the storm..

Table 2, below shows results from all stormwater and in-lake water samples collected by volunteers in 2018.

**Table 2: Volunteer Sampling Results 2018 (NSS=No Sample Sent; ppb)**

FIELD ID	Date	Type	TN	TP
Quassapaug Sample A	8/4/2018	Storm	1988	98
Quassapaug Sample B	8/4/2018	Storm	3828	331
Quassapaug Sample C	8/4/2018	Storm	1981	373
Quassapaug Sample 1	8/4/2018	Storm	1881	576
Quassapaug Sample 3	8/4/2018	Storm	7235	404
Quassapaug Sample 4	8/4/2018	Storm	2724	602
Quassapaug Sample 5	8/4/2018	Storm	2342	306
Quassapaug Sample 6	8/4/2018	Storm	1487	396
Quassapaug Sample 7	8/4/2018	Storm	1008	193
Quassapaug St 1 5 t	7/10/2018	Lake	NSS	7
Quassapaug St 1 25 ft	7/10/2018	Lake	NSS	10
Quassapaug St 1 50 ft	7/10/2018	Lake	NSS	33
Quassapaug St 1 60 ft ?	5/21/2018 ?	Lake	NSS	6

The darker the shade of red, the higher (worse) the nutrient value for inlets.

? This date only had one sample, likely because the other two bottles were not labeled clearly.

For reference, in-lake Total Phosphorus (TP) concentrations below 10ug/L are considered good; concentrations below 15ug/L are considered okay; bottom-water concentrations tend to be elevated during summer.

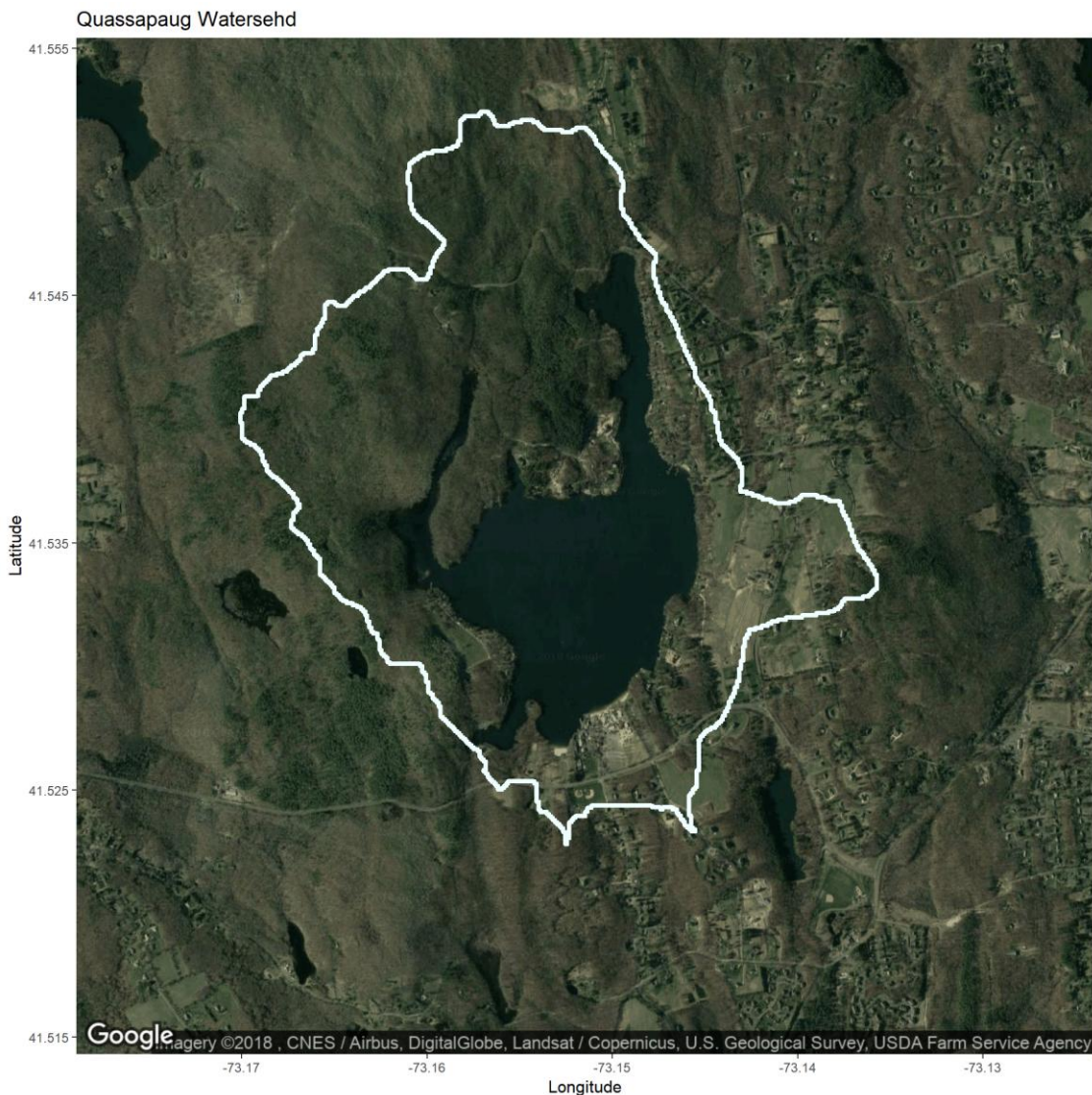
**We really can't stress enough the importance of spring, mid-summer, and late fall sampling.**

The 2018 stormwater samples were all very high. In fact, any Total Nitrogen (TN) value greater than 1000 ppb is troublesome; values greater than 2000ppb likely point to septic pollution. More information on the collection locations is necessary and volunteers should use GoogleMaps to mark exact sampling locations. Further discussion is warranted and fecal coliform testing may be necessary in these locations. It is unknown if the high Total Phosphorus (TP) is a result of erosion and suspended sediment, or dissolved orthophosphate.

**REVIEW FROM 2017 WATERSHED RESULTS:**

1. End of Tyler Cove Inflow - 2016: 2ug/L, 2017: 4ug/L
  - Very low TP, very good overall water quality
2. Big Cove Inflow (aka North end of Big Cove) - 2016: 14ug/L, 2017: 7ug/L
  - Low and very low TP, good overall water quality
3. Tyler Cove Road (aka Outflow to Lake from Tyler Cove Road) - 2016: 435ug/L, 2017: 165ug/L
  - Very high TP, both years bad storm-water runoff quality

The Lake Quassapaug watershed was delineated to be **1,190-acres**, based only on topographic Digital Elevation Model Raster Data (Map 1, below). This watershed boundary needs to be verified in the field, but should be used for future watershed management and stormwater monitoring.

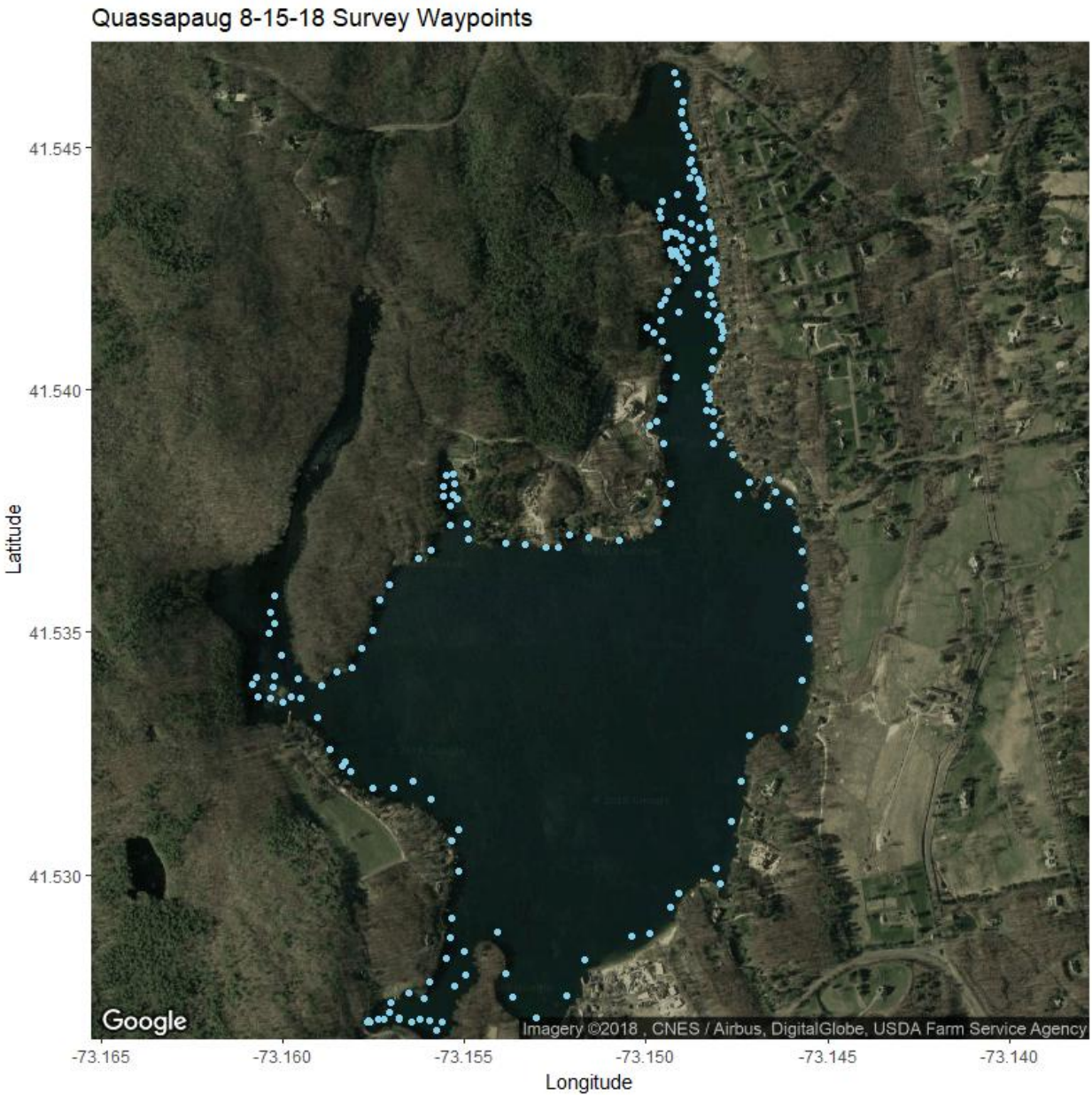


# Aquatic Plants

## Invasive Species Survey Results

The 2018 post- suction harvesting aquatic plant survey at Lake Quassapaug was conducted on 8/15/18. All survey waypoints are shown below in Map 2. No waypoints were made in the very upper sections of the northern coves because they were inaccessible due to dense lily growth. Though it is important to note that we were able to access much farther into the Tyler Cove arm than in years past.

Map 2: Lake Quassapaug 2018 All Survey Waypoints

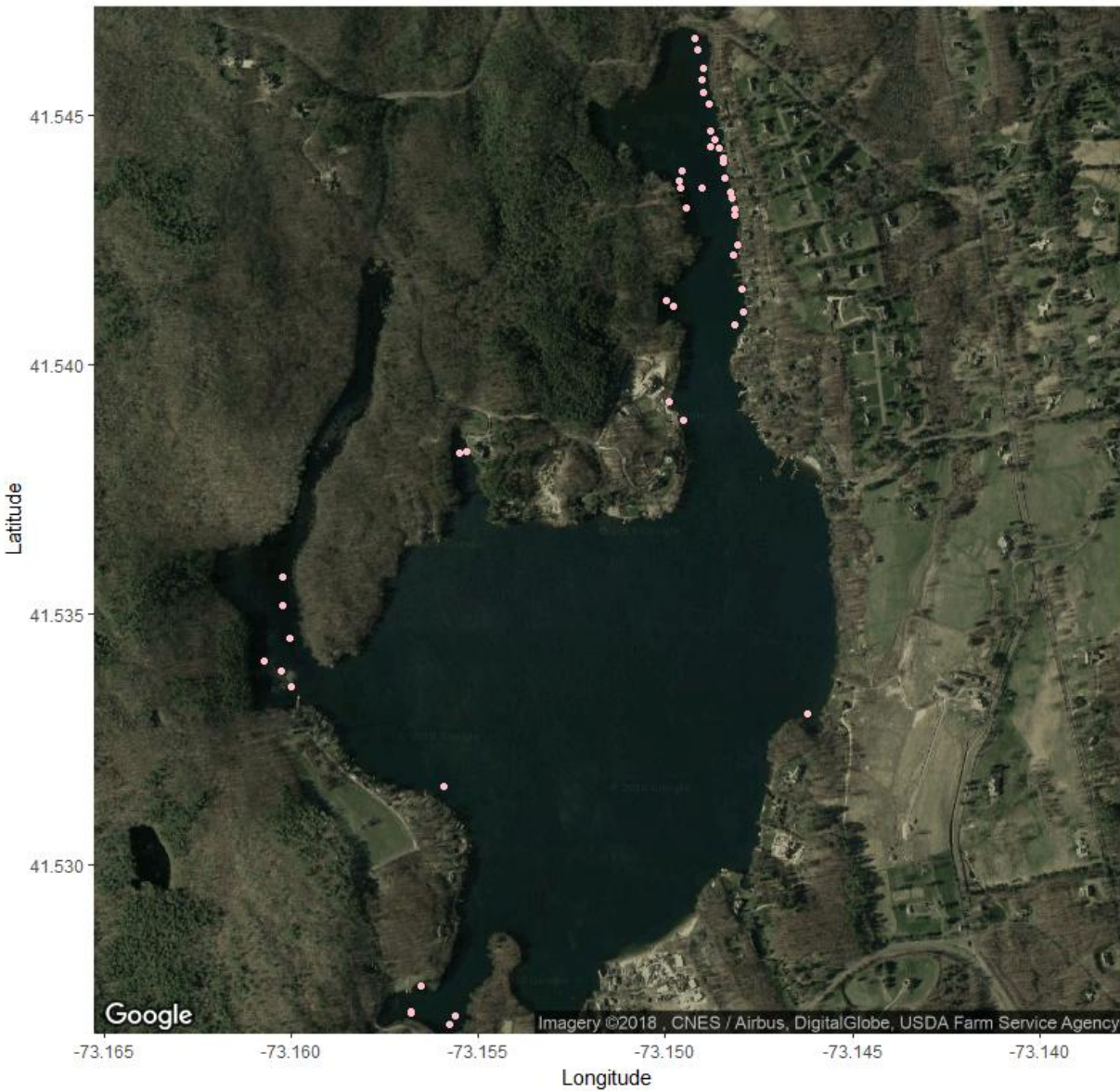


## Variable Milfoil

Invasive Variable milfoil (*Myriophyllum heterophyllum*) was located at 46 of the total survey waypoints. Waypoints where Variable milfoil was found are shown in Map 3, below.



Quassapaug 8-15-18 Variable milfoil (*Myriophyllum heterophyllum*) locations



While the locations and general area of invasive Variable milfoil coverage seems to have remained similar from year to year, the average density at these locations was somewhat reduced in 2018. This reduction in density is most visible in the channels in Tyler and Big Cove. Table 3, shows Variable milfoil presence (% occurrence), average % cover (density), and overall littoral zone coverage (overall %) results from aquatic plant surveys conducted from 2013 to 2018.

**Table 3: Variable milfoil survey statistics 2013-2018**

<b>Variable milfoil (<i>Myriophyllum heterophyllum</i>)</b>					
<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
%occur	%occur	%occur	%occur	%occur	%occur
38	39	34	31	29	34
AVG%	AVG%	AVG%	AVG%	AVG%	AVG%
	59	68	56	66	33.0
Overall%	Overall%	Overall%	Overall%	Overall%	Overall%
	23	23	17	19	11
		*Boxed uses same waypoints			

While invasive Eurasian milfoil has historically been found at low densities in multiple coves, none was found in 2018. This is the first year where no Eurasian milfoil was found, and it may be because the plants were successfully removed by divers earlier in the season. The 2019 season will determine if these plants continue to regrow after hand removal.

### Management Recommendations

Based on this year's water quality sampling results, the aquatic plant survey results, and several management conversations with LQA board members, our primary recommendations are to:

- 1.) Increase volunteer in-lake monitoring to monthly sampling. Take samples at **1, 6, 10, and 18-meters**. If the water sampling cable line is not marked in meters, we can provide one for you. If an 18-meter sample is not possible, take the deep sample 0.5m off of the lake bottom and indicate the exact depth on the sample bottle. Please also have us inspect and calibrate the temperature/dissolved oxygen meter before March 2019.
- 3.) Continue suction harvesting program while minimizing fragments with the use of the floating barrier across coves. Continue to prioritize removal of Eurasian milfoil, if any is seen in 2019. If any homeowner individually contracts with a Hydro-raking company for large-scale lily removal projects, please keep track of these efforts and encourage residents to work in unison with the LQA. Hydro-raking should be permitted through the Town Inland-Wetlands Commission.
- 4.) If volunteers continue to collect stormwater samples, they must follow the NEAR protocol and mark all sites with a GPS coordinate (using GoogleMaps is appropriate).
- 5.) Never allow the stocking of Alewife; these fish are known to increase algae blooms via predation on zooplankton. The zooplankton data collected on 7/11/18 by ECI is not enough information to interpret the overall zooplankton population in the lake. Monthly sampling, at minimum, is required. If LQA wishes to have zooplankton monitoring added to their program, please let us know, as we also offer these services.