Tyler Lake Report 2015

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Aquatic Plant Survey Results:

Summary

Tyler Lake was surveyed by Northeast Aquatic Research (NEAR) for aquatic plants over two days: August 10 and 18, 2015. NEAR recorded aquatic plant species presence and densities at 157 waypoints throughout the littoral zone of the Lake. In general, aquatic plants grow out to a maximum of 12-feet deep, where at this point the bottom community shifts to a dense coverage of mattered cyanobacteria, or blue-green algae. We suspect that the floating purple cyanobacteria observed this season, came from these thick bottom mats in deeper water. The most common plant species were Robin's pondweed (*Potamogeton robinsii*) and White stemmed pondweed (*Potamogeton praelongus*). The invasive species Eurasian milfoil (*Mryiophyllum spicatum*) was present at lesser densities but at a comparable number of waypoints throughout the lake.

Description of Plant Community

Of the Lake's total 187-acre surface area, 105 acres are dominated by dense stands of aquatic plants, mostly native pondweed (*Potamogeton*) species. During the 2015 survey, aquatic plant growth reached the surface in water less than 5ft deep, and from 5-8.5ft, plants grew to just below the surface. From approximately 4-8ft the band of pondweed species covered nearly one-hundred percent of the bottom and growth extended upwards to fill much of the water column. Map 1, on page 4, shows the range of dense pondweed coverage in the Lake.

During this year's survey, the State listed special concern species Water marigold (*Bidens beckii*), was recorded at 11% of the GPS waypoints at varying densities. *Myriophyllum alternaflorum* was not found in 2015. The invasive plant Eurasian milfoil (*Myriophyllum spicatum*) was found at 56 of the waypoints, but was only recorded in high densities at 18 points. Corresponding to these waypoints and observed densities, there is one major bed of Eurasian milfoil, with at least four other smaller beds. Map 2 shows the scattered frequency of milfoil, while Map 3 depicts these areas with the densely growing beds that should be controlled. The potential Eurasian milfoil treatment areas total approximately 8 acres, pondweeds in these areas will also be affected by an herbicide treatment.

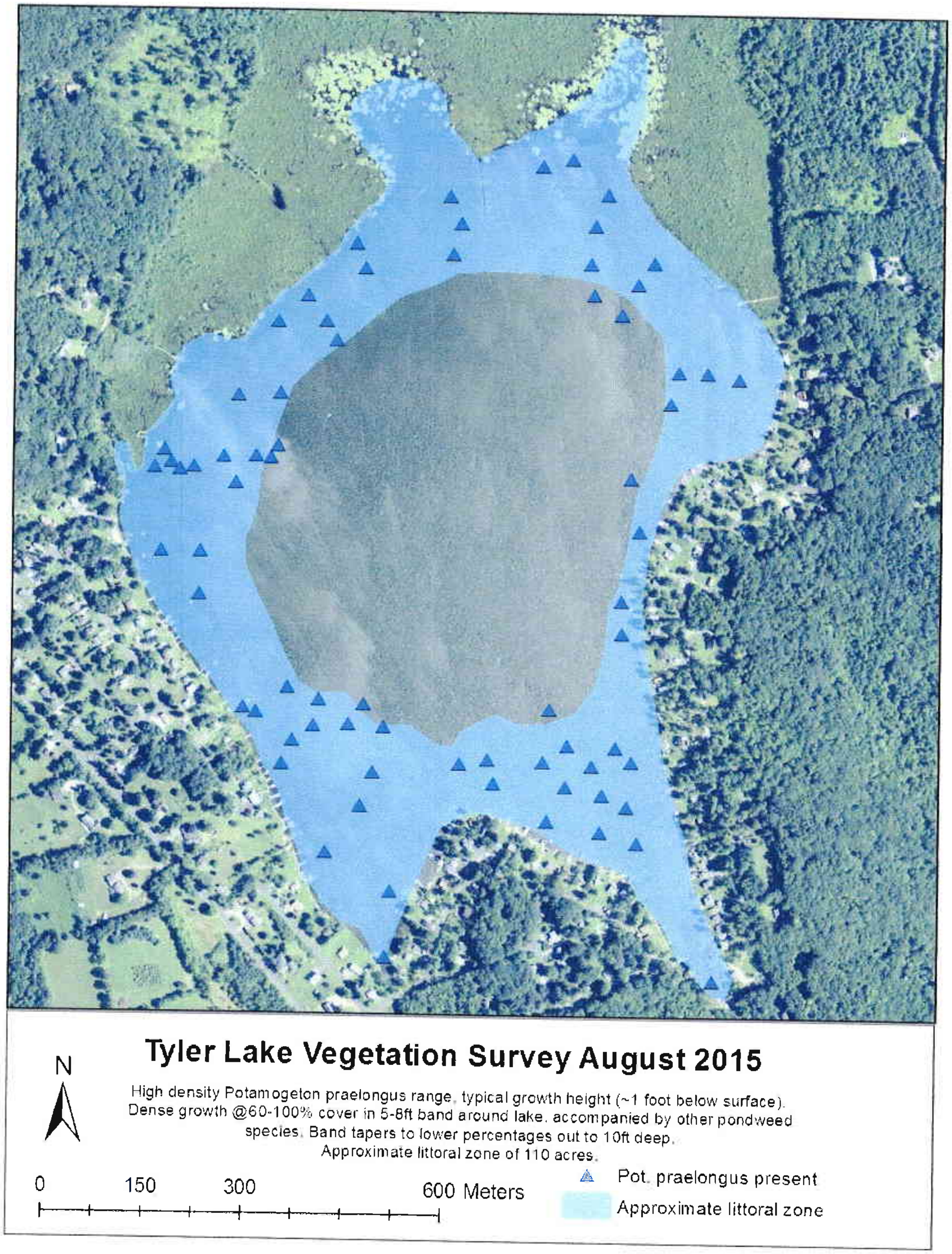
Ongoing Species Statistics

Table 1 lists the frequencies of each species as percent occurrence, as well as the average percent cover. The third column is an overall littoral zone total coverage value that is the product of the frequency and the average cover over the whole survey. Though there were a combined total of 41 species located from both the 2014 and 2015 surveys, species not included in Table 1 were only found at one or two waypoints. The State listed Endangered plant *Mryiophyllum alternaflorum* was not located in 2015. The invasive species Eurasian milfoil (*Myriophyllum spicatum*) is in red, and the other State protected plant, Water marigold (*Bidens beckii*), is listed in blue.

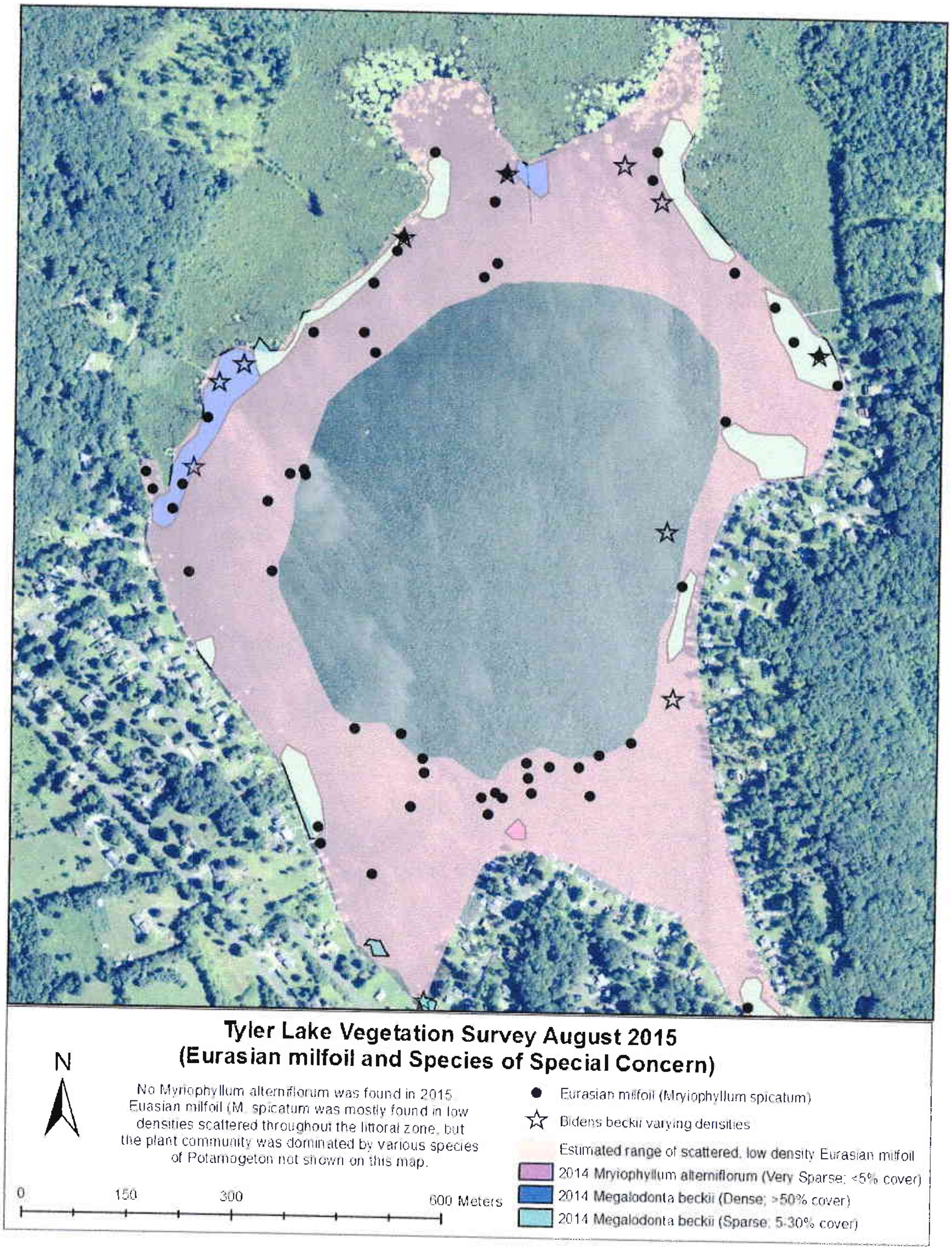
Table 1: Aquatic Plant Survey Results

	Species	% Occurrence	AVG %Cover	Total %Cover
1	*Potamogeton robbinsii*	47.1	81.5	38.4
2	*Potamogeton praelongus*	47.1	67.4	31.8
3	*Myriophyllum spicatum*	35.7	37.9	13.5
4	*Potamogeton zosteriformis*	21.7	54.0	11.7
5	*Najas flexilus*	13.4	64.2	8.6
6	*Potamogeton amplifolius*	15.9	52.0	8.3
7	*Valisneria americanum*	15.3	47.5	7.3
8	*Elodea canadensis*	14.0	50.5	7.1
9	*Ceratophyllum demersum*	14.0	40.7	5.7
10	*Nuphar variegata*	10.2	55.0	5.6
11	*Bidens beckii*	11.5	43.3	5.0
12	*Emergent Sparganium*	3.2	80.0	2.5
13	*Potamogeton perfoliatus*	13.4	15.2	2.0
14	*Pondeterea cordata*	5.1	30.0	1.5
15	*Potamogeton bicupulatis*	1.9	80.0	1.5
16	*Nymphaea odorata*	2.5	47.5	1.2
17	*Nitella sp.*	2.5	26.0	0.7
18	*Utricularia vulgaris*	1.9	18.3	0.4
19	*Ranunculus sp.*	1.3	22.5	0.3
20	*Chara sp.*	1.3	20.0	0.3
21	*Potamogeton sp.*	0.6	10.0	0.1
22	*Polygonum*	0.6	5.0	0.03
23	*Sagittaria graminea*	0.6	3.0	0.02
24	*Brasenia schreberi*	0.6	3.0	0.02

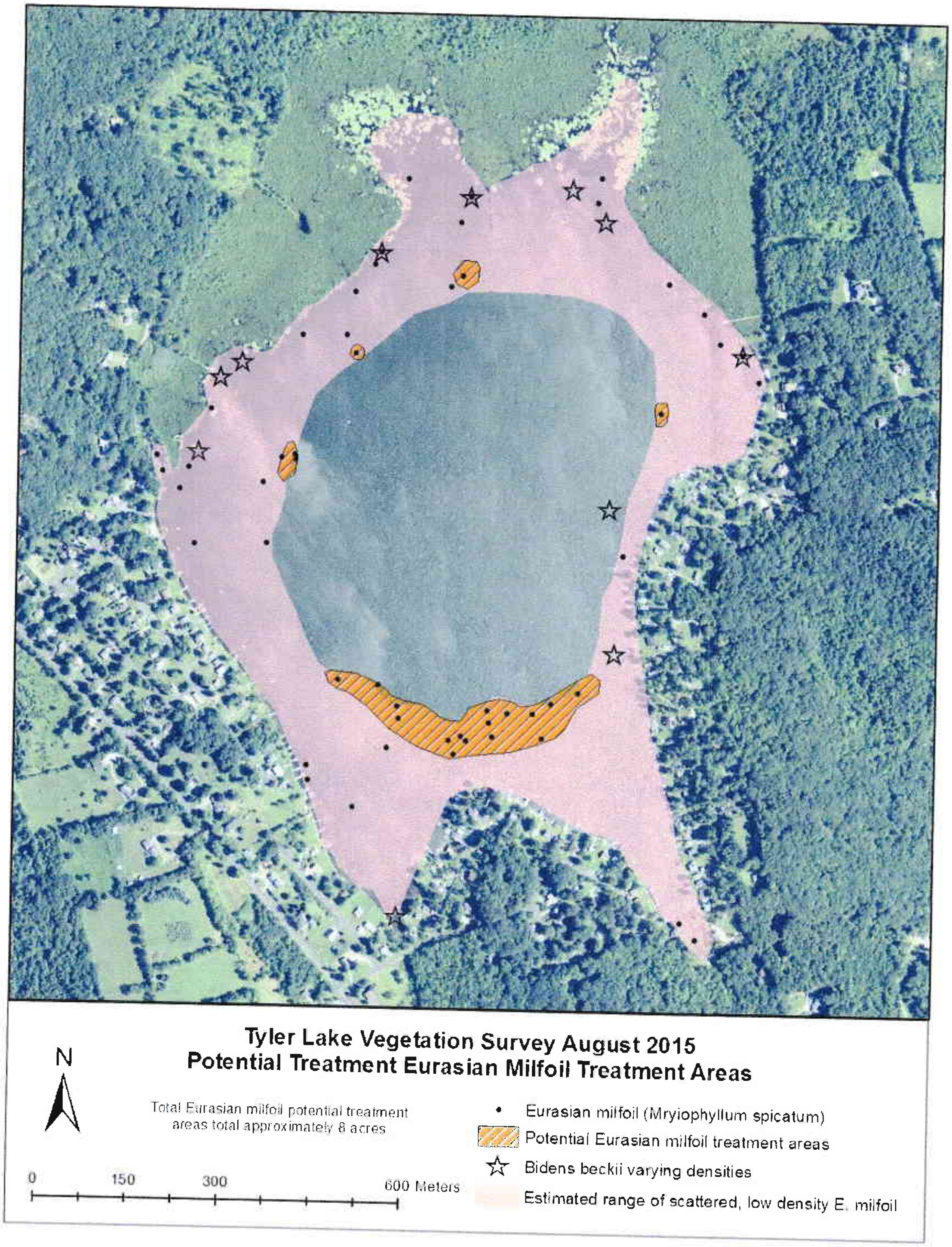
Map 1: Pondweed range, August 2015



Map 2: Invasive Eurasian milfoil and rare State listed plant coverage



Map 3: Dense Eurasian milfoil, potential herbicide treatment areas



Water Quality Summary Results:

Nutrient Sampling

Water quality sampling at Tyler Lake in 2015 was extremely limited. Samples were collected by volunteers on July 13 and August 9, 2015. The July samples were analyzed for Total Phosphorus (TP) and the August samples were analyzed for TP and Total Nitrogen (TN). Table 2 lists the laboratory results for each of the samples, including those from the 2014 sampling date. The August samples are highlighted in red because there was confusion as to the depths from which these samples were actually taken. Fifty parts per billion (ppb) TP at 2-meters depth is an extraordinarily high value that does not make sense. The July 13th results, however, demonstrate that there is still a relatively high amount of phosphorus in the Lake during the summer at 20ppb. TN values for 2014 and 2015 were both high.

Into the future, it is important to collect samples from consistent depths to allow for better comparison and a greater understanding of lake nutrient fluctuations. Additionally, the CT DEEP bathymetric map of Tyler Lake does not have any locations with 8-meters of depth; they consider the deepest area to be just over 6-meters. This inconsistency needs clarification.

Table 2: Total Phosphorus and Nitrogen Results in parts per billion (ppb)

Total Phosphorus (ppb)			
Depth(m)	9/3/2014	7/13/2015	8/9/2015*
1	15	20	
2			50*
3	22	24	
4			33*
6	60	54	
8			206*

Total Nitrogen (ppb)			
Depth(m)	9/3/2014	7/13/2015	8/9/2015*
1	321	-	
2			538*
3	293	-	
4			420*
6	441	-	
8			1240*

Water Clarity and Dissolved Oxygen/Temperature Profiles

With lake and pond management it is crucial to record the water clarity, or Secchi disk transparency. This Secchi value is dependent on light penetration, and is affected by phytoplankton and suspended sediments in the water column. Thus, clearer waterbodies will have the more desirable greater Secchi transparency values. Volunteers monitored transparency throughout the 2014 and 2015 seasons; results are shown in Table 3. The greatest water clarity measurement of the two years was 2.6-meters. While Secchi depths are typically worse in the summer months, all measurements are subpar. A water clarity of less than 2-meters is usually associated with heavy algal blooms and nutrient-rich water. Volunteers should continue to monitor water transparency on a monthly basis from April to November.

Table 3: Secchi Disk (SD) depth - Water clarity (meters)

Date	SD (m)
7/6/2014	2.6
7/19/2014	1.8
8/16/2014	2.0
8/24/2014	2.1
8/31/2014	2.2
5/30/2015	2.0
7/13/2015	1.8
8/8/2015	1.8
9/19/2015	2.0

Resident volunteers at Tyler Lake also recorded temperature and dissolved oxygen in the water column. Table 4 lists the profiles from July, August and September 2015. The May profile was measured in feet (instead of meters) and is not a good comparison to the other months so was not included in this report. All profiles, however, contain very useful information to gain a better understanding of lake dynamics.

In the spring, a pond will generally be uniform in temperature from the surface to the bottom. As the season progresses from spring into summer the temperatures warm, and the lake becomes stratified with warmer waters overlaying cooler deeper water. This effect is more apparent in deep lakes, but based on the volunteer monitoring profile results, it appears that Tyler Lake does stratify.

Table 4: Dissolved Oxygen and Temperature profiles

	7/13/2015		8/8/2015		9/19/2015	
Depth (m)	Temp (C)	DO (mg/L)	Temp (C)	DO (mg/L)	Temp (C)	DO (mg/L)
0	25.3	9.15	25.7	8.9	26.8	8.7
1	25	9.1	25.5	8.7	25.6	8.61
2	24.9	9.1	25.3	8.74	23.2	9.54
3	24.1	8.84	24.5	8.09	21.7	7.92
4	22.3	6.2	22.3	6.2	20.7	***1.15***
5	19.7	***0.48***	19.7	***0.48***	19.2	***0.09***
6	17.3	***0.11***	17.4	***0.14***	19.1	***0.06***
7	16.9	***0.06***	17.2	***0.11***	18.2	***0..05***
8	16.2	***0.04***	17	***0.05***	17	***0.04***

The dissolved oxygen in a lake is essential to aerobic respiration of aquatic organisms. The amount of oxygen dissolved into the water column will cycle throughout the year. At the surface of the lake, the water is in direct contact with the air, and atmospheric oxygen is dissolved into the water as a result of wind mixing and surface turbulence. As water mixing takes place, the dissolved oxygen is circulated throughout the water column. However, decomposition of rooted aquatic plants and algae requires dissolved oxygen (Biological Oxygen Demand) and can deplete the oxygen levels in the deeper waters. This phenomena is visible in the Table 4, above, as DO drops below 1mg/L at 5-meters depth.

Recommendations:

Aquatic Plants

Based on the 2015 aquatic plant survey results, there is approximately 8 acres of dense Eurasian milfoil that can be treated with aquatic herbicides. Diquat is a fast-acting contact herbicide registered for use in lakes by the Environmental Protection Agency (EPA) and the State of Connecticut Department of Energy and Environmental Protection (DEEP). Diquat is designed to chemically disrupt the plants cell membranes and interfere with their photosynthetic processes. Down-stream water uses may preclude either all herbicides, or limit usable herbicides to those registered for drinking water. This needs to be determined first.

A treatment may only be conducted by a State licensed professional herbicide applicator and typically costs around $200-$300 per acre, depending on necessary dosages. At this price quote, the total recommended treatment for next season would cost in the range of $1,600-2,400. Diquat is nonselective so native species in the areas of treatment will also be temporarily affected. There are no EPA swimming restrictions or restrictions on eating fish from water treated by this herbicide; extensive testing by the EPA has determined there to be negligible human health concerns and Diquat is widely used in CT to control invasive milfoil. Such an application would qualify for State invasive species grant funding and a permit from the DEEP is necessary prior to treatment.

Based on direct field observations during the survey, and also from conversations with Tyler Lake residents, the native pondweeds seem to be another concern. Nuisance growth of *Potamogeton* species can also be controlled with aquatic herbicides, but is not recommended at this time. Eurasian milfoil should be the primary concern in this situation and pondweed control will become a part of the overall ongoing lake management.

Water Quality

In terms of the water quality sampling, we must stress the importance of nutrient chemistry in understanding the lake system. Volunteer monitoring is a wonderful way for residents to get more involved in managing their lake, yet there are limitations in using this type of data. Monthly sampling is recommended and if volunteer monitors wish to continue, an 'on-the-water' training program must be conducted prior to the start of the 2016 season. Making sound lake management decisions into the future requires more than one sampling per year and is something that can be discussed moving forward.

The floating purple cyanobacteria clumps that were visible across the lake this season were identified as toxin producing species and likely came from the matted benthic cyanobacteria mats observed in greater than 12ft of water. Harmful cyanobacteria in Tyler Lake is a concern to recreational users and should be monitored more closely in the 2016 season.

Overall, Tyler Lake has an overabundance of aquatic plants and has had issues with potentially harmful cyanobacteria. A watershed investigation, as well as increased monitoring of lake dynamics will allow for better management decisions into the future.