

# **2013 Aquatic Management Program Report Foster's Pond Andover, Massachusetts**

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## **INTRODUCTION**

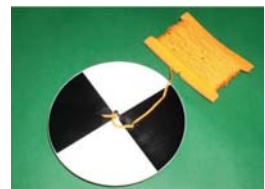
Active management of invasive fanwort (*Cabomba caroliniana*) growth was not planned for during the 2013 season. The whole-lake Sonar (fluridone) herbicide treatment program performed in 2011 provided good control and only a few scattered fanwort plants were noticed during the survey completed in August 2012. Nuisance-level control of fanwort was expected to last through the 2013 season.

Water quality sampling performed as part of the comprehensive August 2012 survey revealed elevated concentrations of phosphorus. This was consistent with prior sampling efforts and was undoubtedly fueling growth of nuisance bluegreen algae (cyanobacteria) blooms that were evident in the Main Pond, Mill Reservoir and the Outlet Cove during the mid-late summer months. Based on the severity and persistence of the algal bloom in 2012 and heightened awareness of potentially toxic cyanobacteria, the Foster's Pond Corporation (FPC) decided to routinely monitor and potentially treat nuisance algae during the 2013 season. Monitoring efforts commenced in the early summer. Algal bloom conditions were identified and confirmed in early July and one copper sulfate algaecide treatment was performed in mid-July.

The following report summarizes management activities performed during the 2013 season and provides recommendations for ongoing weed and algae management in 2014.

## **ALGAE MONITORING**

Water clarity and color provides for a rapid and relatively easy means of tracking algal densities. The FPC purchased a Secchi disk, which is recognized as the standard measure of water clarity. A Secchi disk is a four-quadrant black and white disk that is lowered into the water until it is no longer visible and then that depth is recorded. In most cases, greater than four (4) feet of water clarity is desired for swimming and other contact-recreation. Historically, Foster's Pond has often suffered from reduced water clarity,



likely caused by algal blooms. Even though water clarity readings of less than four feet were expected, it was decided that once Secchi disk readings dropped below five (5) feet, water samples would be collected and sent to Aquatic Control Technology (ACT) for algal identification and density counts by enumeration. The following Secchi disk readings were collected during the 2013 season:

**Table 1: Secchi Disk Readings**

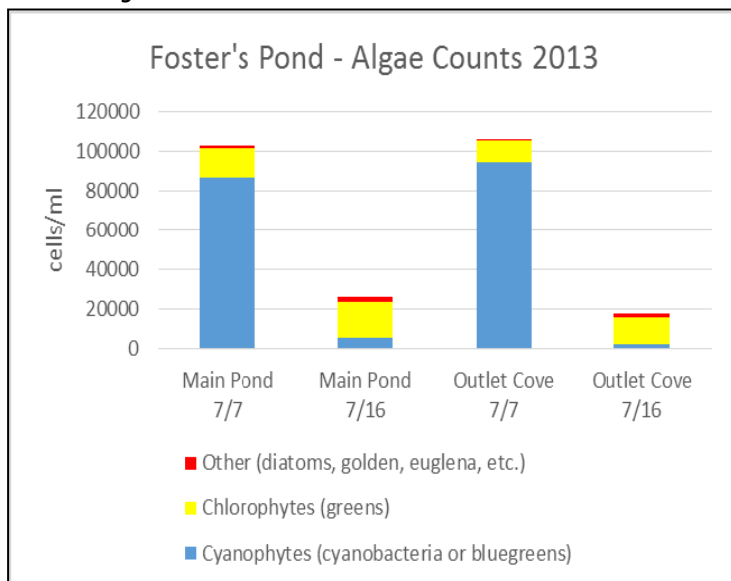
Date	Secchi Disk Depth (feet)		
	Main Pond	Mill Reservoir	Outlet Cove
6/1/13	---	---	5.25
6/8/13	5.5	---	---
6/17/13	4.0	4.0	---
6/21/13	---	---	3.6
7/12/13 (day of treatment)	2.0	2.8	2.3
7/16/13	3.4	4.0	3.3

On 7/7/13 FPC collected water samples from several locations in the pond and shipped them to ACT for microscopic analysis. Samples were collected before and after the 7/12/13 treatment. Results of the pre and post-treatment sampling is summarized below:

**Table 2: Algae Count Data**

Algal Division	Description	Main Pond 7/7 pre-treatment (cells/ml)	Main Pond 7/16 post-treatment (cells/ml)	Outlet Cove 7/7 pre-treatment (cells/ml)	Outlet Cove 7/16 post-treatment (cells/ml)	Mill Reservoir 7/16 post-treatment (cells/ml)
<b>Cyanophytes</b>	(cyanobacteria or bluegreens)	86,580	5920	94,720	2220	740
<b>Chlorophytes</b>	(greens)	14,990	18,100	10,590	13,650	8360
<b>Other</b>	(diatoms, golden, euglena, etc.)	1030	2210	880	1930	460
<b>TOTAL</b>		102,600	26,230	106,190	17,800	9560
<b>cyanophytes % of total</b>		84%	23%	89%	12%	8%

**Chart 1: Algae Count Data**



The water samples were viewed under a microscope for taxa-level identification and cell density was estimated through enumeration using a Sedgewick-Rafter counting cell.

The 7/7/13 samples had elevated levels of cyanobacteria, which accounted for more than 80% of the algal composition. The dominant taxa was *Anabaena* and lesser amounts of *Aphanizomenon* were also present. Both are common bloom forming cyano-bacteria that have been associated with cyano-toxins. Fortunately, they typically respond favorably to copper sulfate algaecide treatments. Post-treatment samples were collected four days after the algaecide

treatment. By that time there had been more than a 90% reduction in the cyanobacteria cell density compared to pre-treatment levels. It is also interesting to note that neither *Anabaena* or *Aphanizomenon* were found in the post-treatment samples.

In contrast, the estimated cell density of Chlorophytes (green algae) remained relatively unchanged. Several of the Chlorophyta taxa are less responsive to copper sulfate algicide. There were an average of ten dominant Chlorophyta taxa in the pre-treatment samples and this was reduced to six dominant taxa in post-treatment samples.

**Table 3: Temperature/Dissolved Oxygen Profile**

Depth (M)	Temperature (°C)	Dissolved Oxygen (mg/L)
Surface	26.6	9.17
1	26.0	8.53
2	25.9	7.93
2.5	20.5	1.65
3.0	19.6	0.82

The temperature/dissolved oxygen profile measured at the deep hole location in the Main Pond showed that the water was saturated with oxygen in the upper portion of the water column, but oxygen concentrations dropped off rapidly as the depth increased. This is similar to results that were documented at Foster's Pond in the past and is commonly seen in lakes that are experiencing algal blooms.

There was ample oxygen through the upper 2 meters of the water column for the copper sulfate treatment to be conducted safely without adverse impact to fish and other aquatic organisms.

#### **ALGAECIDE TREATMENT SUMMARY**

Once elevated levels of cyanobacteria were confirmed in the 7/7/13 samples, FPC opted to proceed with the copper sulfate algicide treatment. A treatment date of 7/12/13 was selected. The required pre-treatment notifications were completed by FPC and shoreline access points around the pond were posted with signs that warned of the pending treatment and that swimming in Foster's Pond would be prohibited until the following day, 7/13/13.

The treatment was performed as scheduled on 7/12/13 by ACT's licensed aquatic applicators. The treatment was conducted in accordance with the written protocol prepared on 5/27/13, conditions of the DEP License to Apply Chemicals and the copper sulfate product label instructions. Treatment was limited to areas where algal densities were problematic including:

- Main Pond – 41 acres, entire shoreline, no-treatment occurred in the deepest portion in the center of the basin or in the shallow cove areas located along the southern shoreline
- Mill Reservoir – 4 acres, northern half of the basin along the developed shoreline
- Outlet Cove and Channel – 15 acres, no treatment within 250 feet of the outlet

The total acreage treated was 60 acres or half of the reported surface area of Foster's Pond. In addition to the no-treatment areas described above, no treatment occurred in the Dug Pond basin or in the wetland area located between Mill Reservoir and the Main Pond/Channel. The dose of copper sulfate applied was calculated on the upper five feet of the water column, which resulted in 300 acre-feet of water. A dose of 0.3 ppm or 240 pounds of copper sulfate was applied. Copper sulfate was dissolved in 50 gallon mixing tanks on board a conventional boat and was applied using a calibrated venturi educator system and a surface spray using fan-pattern nozzles. GPS was used on the spray boat to ensure an even application of the diluted copper sulfate solution throughout the designated treatment areas. Treatment was completed in approximately three hours.

Four days after the copper sulfate treatment, an ACT Biologist inspected Foster's Pond and collected an additional set of water samples for microscopic analysis. Water clarity had already improved by 1-2 feet in the treated basins

and the water color had changed from bright green to a darker brown hue. No adverse impacts from the treated were observed during the 7/16/13 inspection or were reported by FPC following the treatment.

## **SUMMARY AND ONGOING MANAGEMENT RECOMMENDATIONS**

Management efforts at Foster's Pond in 2013 focused on actively monitoring water clarity and performing a single copper sulfate algaecide treatment on 7/12/13 to control a cyanobacteria bloom. The treatment was very effective, providing complete control of the dominant cyanobacteria within four days of the treatment.

### Algae Management

A similar algae monitoring and treatment program is recommended for the 2014 season. Elevated phosphorus concentrations have been routinely documented in Foster's Pond. Phosphorus is usually the limiting nutrient in freshwater ponds and lakes and excess concentrations favor the growth of bloom-forming cyanobacteria. It is expected that Foster's Pond receives external phosphorus loading from non-point sources within the watershed, as well as internal sources from the considerable accumulation of mucky bottom sediment in the pond itself and in adjacent wetland areas. Efforts to reduce phosphorus inputs from the watershed should continue in earnest, but effectively managing the external and internal sources of phosphorus are probably not economically feasible considering the size of the watershed and the characteristics of the pond itself.

Water quality monitoring should continue on a routine basis by FPC. Weekly or biweekly sampling should commence in May and continue through September. If water clarity drops below 4-5 feet, this should serve as a trigger to collect water samples for microscopic algal analysis. Treatment with copper sulfate should be considered if cyanobacteria densities are approaching or exceeding 70,000 cells/ml. The same copper sulfate treatment protocol used in 2013 is recommended for the 2014 season. In addition to water clarity and algae monitoring, we would recommend that water samples be collected to analyze for phosphorus concentrations. This should be done during the month of August to be consistent with past sampling efforts.

### Invasive Aquatic Plant Management

Fanwort continues to be the most problematic invasive aquatic plant in Foster's Pond. A whole-lake Sonar (fluridone) herbicide treatment program targeting fanwort control was performed in 2011. In 2012, only scattered regrowth of fanwort was seen in the shallow wetland area between the Mill Reservoir and Azalea Road Basin. Scattered fanwort was seen in the same location during ACT's 2013 visits to Foster's Pond. Floating fanwort fragments were also seen in the outlet channel. Fanwort growth was not observed in any other location due to the limited water clarity at the time of the visits.

Spiny naiad (*Najas minor*) was identified in two locations in late 2009 by Geosyntec. Spot-treatment of two localized areas with Reward (diquat) herbicide was completed in 2010 and any regrowth was likely controlled by the whole-lake Sonar herbicide treatment in 2011. No spiny naiad has been seen in the pond or reported since 2010.

Brazilian elodea (*Egeria densa*) has been present in the Dug Pond basin in past years, but it has never been documented in Foster's Pond proper. The population was most recently managed by spot-treatment with Reward (diquat) herbicide in 2011. None was found during the 2012 survey.

Additional recovery of fanwort and possibly the other two invasive species is expected to occur during the 2014 season. Based on the limited distribution seen in 2012 and 2013, we do not expect that active in-pond management will be required during the 2014 season, but a mid-late summer survey should be considered to document the presence and distribution of fanwort and other invasive species and to help formulate management plans for 2015.