

May 27, 2013

Mr. Stephen E. Cotton, President
Foster's Pond Corporation
19 Pomeroy Road
Andover, MA 01810

Re: Recommended Treatment Protocol for Copper Sulfate Algicide Treatment of Cyanobacteria (Bluegreen Algae) in Foster's Pond

Dear Mr. Cotton:

During late August 2012, there was bloom of microscopic algae on Foster's Pond that was confirmed to be cyanobacteria (bluegreen algae). Public health officials recommended imposing a swimming advisory due to the potential algal-toxin production by the cyanobacteria. In our 2012 report, we discussed water quality conditions that favor algal-bloom conditions and available treatment options. We understand that the Foster's Pond Corporation is planning to regularly monitor water clarity and wants to treat with copper sulfate algicide, should nuisance algal bloom conditions develop. The following is a recommended treatment plan for treatment with copper sulfate algicide.

INTRODUCTION AND MANAGEMENT HISTORY

Foster's Pond is an impounded waterbody with a surface area of approximately 120 acres, a reported maximum water depth of 15 feet and a mean water depth of 7 feet. It supports growth of invasive aquatic plants, dominated by fanwort (*Cabomba caroliniana*), that have been managed through whole-lake Sonar (fluridone) herbicide treatments performed during the 2005 and 2011 seasons, as well as some maintenance spot-treatments performed in 2006, 2007 and 2010.

Reduced water clarity has been common in Foster's Pond due to algae, suspended sediment and dissolved material (e.g. tannins) from the extensive adjacent wetland areas. However, over the past few years there appears to be an increase in the frequency and severity of algal blooms and the presence of cyanobacteria. Late summer Secchi disk clarity readings averaged above 1.5 meters between 2004 and 2009, but since 2010 algal bloom conditions have developed by mid-late summer resulting in Secchi disk readings less than 1.0 meter.

Water quality sampling data collected over the years has shown that several sections of Foster's Pond suffer from elevated phosphorus concentrations. Phosphorus is usually the "limiting-nutrient" in freshwater systems. Lakes and ponds are often considered to be eutrophic (nutrient-rich) if total phosphorus concentrations exceed 0.025 mg/l. In 2004 a sample collected by ACT from the Main Pond had a phosphorus concentration of 0.22 mg/l. In 2009, Geosyntec found phosphorus concentrations of 0.46 mg/l in the Main Pond, 0.035 mg/l in the Outlet Cove and 0.027 mg/l in Mill Reservoir. In 2012, ACT found phosphorus concentrations of 0.04 mg/l in the Main Pond and Mill Reservoir and 0.06 mg/l in the Outlet Cove. In-water phosphorus concentrations likely fluctuate considerably throughout the year, but there has been a trend towards elevated concentrations that are fueling nuisance algal blooms. The phosphorus is likely entering through stormwater runoff and is being internally recycled from the nutrient-rich bottom sediments.



More extensive testing would be needed to determine if in-lake nutrient reduction measures such as phosphorus precipitation/inactivation treatments (alum treatments) can provide a cost-effective reduction in phosphorus concentrations and the resulting algae growth. However, the FPC has been advised that such testing is likely to prove inconclusive, and that alum treatments would far exceed the cost of copper sulfate. Accordingly, given the public safety considerations, the FPC would like to be prepared to treat with copper sulfate algaecide if algae, specifically cyanobacteria, are approaching bloom conditions.

ALGAECIDE TREATMENT PROGRAM

Copper has been used as an algaecide for more than 60 years and it remains the most commonly used algaecide in freshwater systems. The most common formulation is copper sulfate pentahydrate ($\text{CuSO}_4 \times 5 \text{H}_2\text{O}$). Low doses of copper sulfate (0.3 ppm as copper sulfate or 0.075 ppm as copper) are typically used to control free-floating or planktonic algae in Massachusetts lakes and ponds. There are no water use restrictions associated with copper-based algaecides. ACT treats several direct, potable (drinking) water reservoirs, including Lake Cochichewick and a number of recreation waterbodies in the Commonwealth with these algaecides, on an annual basis. The concentrated algaecides are first diluted with pond water and are then sprayed throughout the pond area. The application rate is generally 0.3 ppm Cu or less for algae control. If applied, treatment will not exceed 50% of the pond volume.

Impacts Specific to the Wetlands Protection Act using Copper¹

- Protection of public and private water supply – Benefit (used to control algae)
- Protection of groundwater supply – Neutral (no significant interaction)
- Flood control - Neutral (no significant interaction)
- Storm damage prevention – Neutral (no significant interaction)
- Prevention of pollution - Generally neutral (no significant interaction), but could be a detriment if algae/plant die-off causes low oxygen at the bottom of the lake or causes release of taste and odor compounds or toxins

Detailed information on copper can be found at the Massachusetts Department of Conservation and Recreation, Lakes and Ponds Program website. There are links under the Publications tab to the "Generic Environmental Impact Report for Eutrophication and Lake Management in Massachusetts" and the "Practical Guide to Lake Management in Massachusetts."

<<http://www.mass.gov/dcr/waterSupply/lakepond/publications.htm>>

Additional information can be found at the Massachusetts Department of Agricultural Resources website:

<<http://www.mass.gov/agr/pesticides/water/Aquatic/Herbicides.htm>>

<<http://www.mass.gov/eea/docs/agr/pesticides/aquatic/copper.pdf>>

Application Methodology:

Treatments will be performed by MA Commercially Certified aquatic applicators. Treatments will be performed from either an Airboat or conventional spray boat powered by an outboard motor. Copper sulfate is dissolved with lake water in a mixing tank on the spray boat. The diluted solution is then usually applied as a surface spray through fan-pattern nozzles. Transects or passes are then made usually 100 feet apart. GPS navigation is used to insure that an even application is made throughout the designated treatment areas.

Treatment Timing:

Timing of the initial application will be determined by in-lake conditions. FPC will begin monitoring water clarity regularly using a Secchi disk. If water clarity drops below 5 feet (1.5 meters) and/or there is a visible surface scum of cyanobacteria, then samples will be collected and sent to ACT for microscopic analysis. If elevated cyanobacteria concentrations are confirmed, then a treatment will likely be scheduled.

Treatment Areas:

Based on past observations, the Main Pond and Outlet Cove sections of Foster's Pond and the most likely areas that will be targeted with an algacide application. The maximum total area treated during any single application will be one-half of the waterbody or 60 acres. If additional treatment is required, a follow-up application will be scheduled one to two weeks after the initial application in accordance with the product label directions and conditions of the annual DEP License to Apply Chemicals.

Notification and Water Use Restrictions:

Although no restrictions on swimming, fishing or other recreational activities are required by the product label following treatment with copper sulfate, we recommend closing the pond to all uses on the day of treatment. Accordingly, prior to all treatments, the shorelines of areas to be treated will be posted with signs that warn of the temporary water use restrictions.

Additional Permits:

This treatment program is subject to the existing Order of Conditions (DEP File # 090-0535). Aquatic Control will prepare and file for a site-specific License to Apply Chemicals (BRP WM 04), which is issued by DEP annually on a project-specific basis. Pursuant to Special Condition 12.19, a copy of this License will be provided to the Conservation Commission prior to treatment.

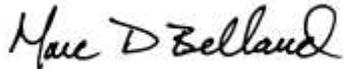
¹ Commonwealth of Massachusetts Executive Office of Environmental Affairs. *Practical Guide to Lake Management*: 2004. 122 p.

We trust that this information will address most of the questions raised about the proposed spot-treatment with copper sulfate algaecide.

Please do not hesitate to contact our office if you have questions or require additional information.

Sincerely,

AQUATIC CONTROL TECHNOLOGY



Marc Bellaud
President/Aquatic Biologist