AQUATIC CONTROL TECHNOLOGY, INC.
POND AND LAKE MANAGEMENT SPECIALISTS

February 11, 2010

Natural Heritage Endangered Species Program
c/o Ms. Marea Gabriel
One Rabbit Hill
Westborough, MA 01581

Re: Oldham Pond Algae Control Options (DEP file #'s 175-0571; 056-0872; NHESP file # 09-26729)

Dear Ms. Gabriel:

The Pembroke Watershed Association would like to explore possible algae control alternatives with NHESP prior to moving forward with the required Wetlands Protection Act permitting process. Per your request, we are providing a brief overview of possible alternative algae control options for consideration by NHESP.

Oldham Pond supports problematic microscopic algae blooms throughout the course of the growing season. This past year (2009) elevated algae production began as early as late May and worsened throughout the summer months until cell densities reached approximately 50,000 cells/ml in late September. These elevated levels of microscopic algae growth, which were dominated by blue-green algae species, can have negative impacts on the aquatic ecosystem as a result of dissolved oxygen fluctuations, production of bio-toxins, and/or reduced water clarity. In an effort to control nuisance algae blooms and maintain a more balanced level of microscopic algae growth, treatment with copper sulfate was originally proposed. Following the confirmation of the eastern pondmussel in Oldham Pond, , NHESP prohibited the use of copper sulfate, as proposed, due to concerns over possible toxicity to the rare mussels. Because we feel that the mitigation of nuisance microscopic algae blooms is important to the overall ecology and use of the pond, we are providing the following alternative algae control approaches for consideration.

Option 1 – Partial Pond Treatment with Chelated Copper Algaecides (i.e. Cutrine Ultra)
Based on reports from members of the Pembroke watershed Association and other residents around the pond, elevated algae production is believed to begin in the shallower water area to the west of the mid-pond island (an area where the fewest eastern pondmussels were collected during the 2009 survey). As result, we propose to increase the number of algae sampling locations around the pond in hopes of better understanding and/or identifying a specific area of the pond that first experiences accelerated growth of microscopic algae. With this data we could potentially target a specific partial pond treatment area of 1/3 of the pond or less. The reduction in the size of the treatment area would effectively reduce the overall copper dose to the system, thereby, lowering the potential toxic effects of the treatment to non-target organisms.

The use of an organically chelated copper algaecide rather than copper sulfate may further reduce the potential toxicity to invertebrates and other non-target organisms. "When applied to water, copper sulfate disassociates rapidly to release cupric ions (Cu+2), the form of copper that is responsible for most toxicity. However, cupric ions are very reactive, and they don't persist in the water very long. They rapidly bind with soluble anions such as hydroxide (OH–), carbonate (CO3– –), dissolved organic carbon (DOC) such as humic and fulvic acids, and other substances which work to remove ionic copper from the water column and mitigate toxicity. The soluble organic chelated complexes work differently. Because they are soluble, the chelated copper complex remains in the water column for a longer period of time. Cupric ions are slowly released into the water as the organic ligands are degraded by microbial metabolism. As a result, chelated copper compounds exhibit lower toxicity to fish and most invertebrates than copper sulfate" (NYSDEC 2005).

Reducing the size of the treatment area through algae density monitoring at multiple locations in the pond and the use of chelated copper products should provide an additional margin of safety to the eastern pondmussel; thereby, reducing the risk of an unwanted "take".

Option 2 – Mix of Chelated Copper and Peroxide Algaecide (Cutrine Ultra & Phycomycin)
Again using increased in-pond algae monitoring to potentially identify specific partial pond treatment areas to suppress bloom conditions, we would consider treatment of algae with a combination of low dose chelated copper and Phycomycin (sodium carbonate peroxyhydrate). Phycomycin, when in the presence of water, breaks down into hydrogen peroxide and sodium carbonate. The hydrogen peroxide oxidizes and thus kills the targeted algae. After contact, the hydrogen peroxide quickly breaks down harmlessly into water and oxygen (USEPA 2002). The purported synergistic effects of using the chelated copper and peroxide algaecides together will allow for lower use rates of each product that should reduce the level of toxicity to the mussels. Information on sodium carbonate peroyhydrate provided on the US EPA website suggests that Phycomycin has low toxicity to aquatic life.

Option 3 – Treatment with Peroxide Algaecide (Phycomycin)
Although Phycomycin has not received full MA registration yet, it is our understanding that the Department of Agriculture is in the process of reviewing the state registration application and that full registration is likely soon. Phycomycin has reportedly shown good effectiveness on blue-green algae species particularly when applied prior to full bloom conditions. The properties of this compound results in quick activity on the targeted algae and rapid breakdown to its natural components in the aquatic environment. As a result, the potential for acute and/or chronic effects on the resident eastern pondmussels are unlikely.

Despite past nutrient abatement efforts and continued watershed investigation to identify possible external nutrient load point sources, nuisance algae blooms persist in Oldham Pond. These microscopic algae blooms are dominated by blue-green algae, specifically *Microcystis*, which have the potential to produce toxins that could jeopardize human health and the mussels themselves. For these reasons we feel that judicious algae control at Oldham Pond is essential to maintaining a more balanced microscopic algae population for the enhancement of the pond's overall habitat value.

We therefore request that NHESP consider these options for use at Oldham Pond, with the understanding that "doing nothing" in this case may pose an equal or greater risk to the survival of the eastern Pondmussel as the proposed management activities. The first option (chelated copper algaecides) is preferred on the basis of known efficacy and cost-effectiveness. The third option (peroxide algaecides) are relatively new to the industry; unproven on large lake systems in the Northeast; and at the recommended use rates on the product labels they will cost at least 5-10 fold that of a comparable chelated copper algaecide treatment, which would not be sustainable as an ongoing maintenance control strategy.

If you have any questions or require additional information to complete your review of these alternative management options please do not hesitate to contact our office. Also, if you think it would be helpful, we would be interested in arranging a meeting with NHESP staff to discuss these options and possibly others in greater detail.

Sincerely,

Aquatic Control Technology, Inc.

Keith Gazaille
Senior Biologist

LITERATURE CITED

- Sanford, Steven J. "Natural Resource Guidance for the Review of Aquatic Herbicide Permit Applications" Memorandum to Regional Supervisors of Natural Resources – NY DEC, Albany, NY. 7 March 2005.

- United States. Department of Environmental Protection – Biopesticides & Pollution Prevention Division. Sodium Carbonate Peroxyhydrate (128860) Fact Sheet. Issued September 2002. Accessed 5 February 2010 <www.epa.gov/pesticides/biopesticides/ingredients/factsheets/factsheet_128860.htm>.