

Controlling Algae in Delaware Ponds

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Algae are a diverse group of rootless plants that are found in both salt and fresh water. They range from microscopic, single-celled plants to the large plants we know as seaweed or kelp. They have neither the leaves, stems, roots, nor the specialized systems that transport nutrients within the plants, we associate with higher plants. In freshwater ponds, the single-celled algae form the basis of the pond food chain. These single-celled plants called phytoplankton serve as food for the zooplankton, or microscopic animals, that in turn, are eaten by larger organisms such as pond fishes. It is when one or more forms of algae become overabundant (sometimes called algae blooms) that problems arise, notably water discoloration, foul odors, or unsightly mats of floating filamentous (thread-like) algae.

In contrast to the planktonic algae that can give water a green "paint" appearance, filamentous algae are clusters or strings of algal cells that clump and form mats that are sometimes buoyed up by gas bubbles or sink to the bottom of the pond, depending on the season of the year. Thick clumps of floating filamentous algae can severely hinder boating, fishing and swimming. *Chara*, another form of algae present in our area, resembles a typical branched aquatic plant, except that it lacks roots.

METHODS OF CONTROL

Herbicides

Copper Sulfate

Copper sulfate (CuSO_4) in either granulated or pulverized form often is used as an herbicide to control some species of planktonic and filamentous algae. It may be purchased from farm supply stores and does not require an applicator's license.

Applications should be made on warm, sunny mornings after the water temperature reaches 60°F. Under these conditions, algae are growing vigorously and will take up the maximum amount of copper. Different methods of application can be used depending on the size of the pond. A small pond can be treated by mixing one part of copper sulfate with nine parts water in a bucket and disbursing it (a coffee can or margarine tub will do) over the surface of the pond. Larger ponds will require either a backpack or hand-held pressure sprayer or a boat bailer using a small boat and motor. Copper sulfate is very corrosive to most metals, so it is not recommended for piston or roller-bearing pumps. Stainless steel, plastic and fiberglass are the best materials to use with copper sulfate. Carefully clean any metal surfaces exposed, including aluminum boats. Since the pulverized form goes into solution quicker, it is preferred for spraying.

Copper sulfate should be effective within a few days; however, control is not generally long lasting. More than three or four treatments per year are not recommended due to a possible build-up of toxic copper in the sediments. A dosage of CuSO_4 that has proven effective for algal control in most Delaware warmwater ponds of average alkalinity is 0.5 parts per million (ppm), equal to 1.3 lbs. per acre-ft of water. For example, a one-acre pond averaging 5 feet in depth contains 5 acre feet and would require 6.5 lbs. of copper sulfate for a

0.5 ppm treatment. Most warmwater fish will tolerate two to three times this dosage, but the more copper that is applied, the higher the risk to the fish from its toxic effects. Goldfish, koi, and coldwater fish such as trout are much less tolerant of copper sulfate so caution should be used when treating ponds with those fish present.

The effectiveness of CuSO_4 (and its safety for fish) also varies according to the pond water chemistry. A higher treatment rate may be needed for controlling algae in alkaline waters, which are defined as those exceeding 50 ppm total alkalinity as measured with a water test kit. Copper is more toxic to fish in waters of low alkalinity (less than 50 ppm), so if your pond has soft water, it is better to cut the recommended dosage in half and see what happens. Water temperature should exceed 60°F for effective treatment.

Waterfowl and domestic farm animals will not be affected by the dosage normally used for algae control. Pond water properly treated with CuSO_4 should be safe for irrigation purposes. Copper sulfate is relatively safe for humans to handle, although care should be taken to keep it out of your eyes when pouring or spraying.

A few forms of filamentous algae common in Delaware are resistant to copper sulfate. *Lyngbya*, the filamentous blue-green alga present in Griffith and Haven Lakes and others, is resistant, as is the filamentous green alga, *Pithophora*, found in Derby Pond and elsewhere.

Other Copper Algaecides

Several brands of herbicides containing organic complexes of copper are available in liquid form. The advantage of these complexes is that the copper precipitates out slower and controls algae longer than copper sulfate. Also, these products are safer to use in fish ponds as they are less toxic to fish than copper sulfate. The principal drawback is their expense and the fact that they cannot be used where the pH is less than 6. There are a number of copper complexes that can be obtained from agricultural chemical suppliers. Most contain 7-9 percent elemental copper, which is the active ingredient. With this in mind you can shop around for the best price.

Other Herbicides

Diquat dibromide is effective on a few of the types of algae (such as *Pithophora*) that are resistant to copper sulfate. It is the active ingredient in several herbicides.

HERBICIDE PRECAUTIONS

If more than 50 percent of the pond is covered with algae, only half should be treated at a time, with a period of 10 to 14 days between treatments so that rapid plant decay will not reduce the oxygen content of the water to a level too low to maintain fish life.

As with all pesticide use, pay particular attention to the label directions and **observe all the recommended cautions**. If you have any doubt as to what type of treatment you should use, seek professional assistance. Division of Fish and Wildlife biologists, who can be reached at 739-9914 or 653-2887, will provide this advice as time allows. Other sources of information are the U.S. Natural Resources Conservation Service or your county agricultural extension agent. Questions about herbicide labeling and restrictions should be directed to the State Department of Agriculture's pesticide supervisor (739-4811). There are also private firms in the Mid-Atlantic area that specialize in aquatic weed control. If you are having difficulty in finding a contractor, you can contact the Division of Fish & Wildlife at the above numbers.

Other Methods

MECHANICAL

In small ponds, algal mats can be raked to the pond edge and removed. Although labor intensive, this has the advantage of removing those nutrients bound up in the algae. The material can then be composted. There are also coloring agents that can be added to the pond water to shade or lessen the amount of sunlight available to aquatic plants, thereby deterring algae growth.

BIOLOGICAL

A sterile form of the grass carp (*Ctenopharyngodon idella*) can be effective in controlling a few types of algae. Possession requires a permit from the Division of Fish & Wildlife and is subject to several criteria: no chance of escapement, plant species on grass carp food list, and > 40% plant coverage of pond surface. No grass carp are permitted for stormwater management basins, areas known to contain rare plants or animals, or any designated natural area. This fish does not control all plant species, but is a useful option under some conditions.

NUTRIENT MANAGEMENT

Since algae respond to the presence of dissolved nutrients such as nitrates and phosphates, one way of controlling algae is to limit the amount of nutrients that enter a pond. Some steps a landowner can take include fencing livestock out of the pond and planting vegetated buffer strips around the pond to prevent runoff of fertilizers and other nutrients. Septic tank leakage is another nutrient source that can be prevented. Changes brought about by nutrient control are likely to be slow; however, because once nutrients are present in a pond, they continually recycle through the food chain.

NUTRIENT INACTIVATION

Several relatively new products profess algal control capabilities by tying up or deactivating nutrients needed to support algae growth. Some of these provide a culture media for beneficial bacterial that out-compete the algae for available nutrients, thus limiting algae growth. Others inoculate the waters directly with bacterial cultures that tie up the nutrients. Another method is adding aluminum sulfate (alum) to the pond water to chemically bind up the phosphorus needed for algae growth.

The Division of Fish and Wildlife has relatively little experience with these new methods but will provide advice when requested. Our limited experience with one compound supporting the growth of beneficial bacteria proved that it was labor intensive to apply (an application was needed every two weeks in the growing season) and the results were mixed. We therefore urge anyone interested in trying one of these newer techniques to exercise an abundance of caution and skepticism. See if the distributor or manufacturer will guarantee results when used according to manufacturer's specifications. Be especially careful with alum, as it can be toxic to fish if your pond has poor buffering capacity. As with traditional herbicides, adding any compound to waters that directly or indirectly link to public waters may be a violation of state water quality regulations or be subject to Dept. of Agriculture permitting for aquatic pesticide use. If you have any doubts as to whether a particular compound has an EPA-approved label for aquatic use, check first with the Dept. of Agriculture (739-4811).

Additional information available: "Barley straw for algae control" and "Best Management Practices for small ponds".

