Delaware Division of Fish and Wildlife

Controlling Algae in Delaware Ponds

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 we associate with vascular plants.

Floating mats of filamentous algae

In freshwater ponds, single-celled algae form the basis of the pond food chain. These single-celled plants called phytoplankton serve as food for zooplankton (microscopic animals) that in turn, are eaten by larger organisms such as crayfish, frogs and fish. Problems arise when one or more forms of algae become overabundant (sometimes called algae blooms) and cause water discoloration, foul odors, or floating mats.

Filamentous algae (threadlike strands) 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. Thick clumps of floating filamentous algae can severely hinder boating, fishing and swimming.

Chara, often mistaken for a rooted plant, is a specialized form of green algae that has stem-like and leaf-like structures but lacks roots. It can also be distinguished from rooted aquatic plants by the 'rough or grainy' texture of its branches and musty, almost garlic-like odor.

METHODS OF CONTROL

CHEMICAL

Copper Sulfate

Copper sulfate ($CuSO_4$) in either granulated or pulverized form is a chemical often used to control some species of planktonic and filamentous algae. It is typically available for purchase at farm supply stores. It does not require a certified pesticide applicator's license to apply it to water bodies in Delaware.

Applications should be made on warm, sunny mornings after the water temperature reaches 60^0F (~16°C). 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 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. Since the pulverized form goes into solution quicker, it is preferred for spraying.

A dosage of $CuSO_4$ that has proven effective for algal control in most Delaware warm water ponds of average alkalinity is 0.5 parts per million (ppm) which equals 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. The application should be effective within a few days; however is not generally long lasting. No more than three treatments per year should be applied due to the possible build-up of toxic copper in the sediments. Also, it should not be used to control *Lyngbya* and *Pithophora* which have shown some resistance to the effects of copper sulfate in Delaware.

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.

Cautions:

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.

Most warm water fish will tolerate two to three times the recommended dosage, but the more copper that is applied, the higher the risk of 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. Also copper sulfate can be toxic to aquatic invertebrates such as crayfish.

The effectiveness of CuSO4 (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^{O}F for effective treatment.

Other Copper chemicals

Several brands contain organic complexes of copper 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.

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.

General Precautions for chemical applications:

If more than 50 percent of the pond is covered with algae, only half of the pond should be treated at a time, with a period of 10 to 14 days between treatments. This will minimize the potential for a fish kill. As the algae dies, oxygen is used up in the process of decomposition and can cause the oxygen level in the water 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 735-8654 or 739=9914, 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 and Wildlife at the above numbers.

MECHANICAL

This method requires physical removal of the plant material either by hand or with specialized equipment. In small ponds, algal mats can be raked to the pond edge and removed. The algae that is removed should be disposed of or composted in an area not directly connected to the pond so that it is not inadvertently reintroduced. Although this method is labor intensive, it results in the removal of nutrients that were bound up in the algae cells.

BIOLOGICAL

Triploid (sterile) Grass carp C*tenopharyngodon idella* are a species of plant-eating fish that can be effective at controlling some species of algae. They are long-lived and can provide multiple years of control from a single stocking although it can take up to 18 months to achieve the desired control. A permit from the Division of Fish and Wildlife is required to possess Grass Carp in Delaware and the pond must meet the policy criteria which includes: inability to escape into nearby water bodies, the target plant species must cover at least 40% of the pond, and the algae species must be one that can be controlled by Grass Carp. In addition, Grass Carp are not permitted for use in stormwater management basins, areas known to contain rare plants or animals, or any designated natural area.

NUTRIENT INACTIVATION

Several relatively new products claim to control algae by 'binding with' or 'deactivating' nutrients that fuel 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 or bentonite clay 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. Typically effects are not permanent and it must be applied more than once to reduce algae growth. Also, alum must be used carefully because overtreatment can cause a dramatic decrease in pH and impact fish.

The Division of Fish and Wildlife does not employ these products in state managed ponds to control algae, thus effectiveness has not been independently tested. These products may be costly or labor intensive to apply. Pond owners are encouraged to thoroughly research these products prior to expending any resources. It may be beneficial to find out if the distributor or manufacturer will guarantee results when used according to manufacturer's specifications. As with other chemical applications, 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 Department 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 Delaware Department of Agriculture (739-4811).

WATER COLORANTS

Water soluble colorants are chemicals that are added to the water to reduce the ability of sunlight to penetrate the water column, and thus control the growth of aquatic plants. These products are most effective in ponds that either lack flow or have very low flow. Growing plants produce oxygen, thus reducing growth may also reduce the amount of oxygen available in the water. Overuse or improper use of water colorants can lead to dissolved oxygen levels that are too low to support aquatic life. These products may also turn the water an unnatural color.

BARLEY STRAW

If conditions are right, barley straw can be successful at controlling some species of planktonic, single-celled algae (primarily species of blue-green algae). As it decomposes, barley straw releases a chemical that inhibits the growth of algae. The existing algae is not killed, but the new growth of algae cells is minimized. It is less effective at controlling filamentous algae, in very muddy ponds, or in water that lacks sufficient oxygen to facilitate the

decomposition process. No adverse effects to fish or aquatic invertebrates have been noted by those researching the use of Barley Straw in ponds to control algae growth.

The application rate is two bales of barley straw per acre of pond surface area. The bales of straw can be staked to the pond bottom as long as part of it remains above the water surface. It may be more effective to package the straw loosely into a wire cage or into a sack and then stake it to the bottom. It is best to apply the straw early in the growing season (early spring or April in Delaware). This will allow the straw to begin decomposing before the algae has an opportunity to build-up. It can take 1-2 weeks to become effective at 68°F (20°C) and up to 8 weeks if the water temperature is 50°F (10°C). It is important that Barley Straw is used, other types of straw haven not proven to be effective.

NUTRIENT MANAGEMENT

Since algae growth is facilitated by the presence of dissolved nutrients such as nitrates and phosphates, one way of controlling algae is to limit the amount of nutrients that enter the pond via stormwater run-off. Landowners can reduce the inflow of nutrients and sediments by implementing Best Management Practices (BMPs) on their property and within the community (see "*Best Management Practices for small ponds*" and "Livable Lawns" www.delawarelivablelawns.org). BMPs include measures such as fencing off livestock, preventing septic tank leakage, reducing the use of fertilizers on the lawn, and planting a vegetated buffer strip around the pond to filter out nutrients and sediments. Changes brought about by nutrient control are likely to be slow, but can result in long-term benefits. As long as excess nutrients are available they will continually recycle and fuel algae growth.

A vegetative buffer comprised of trees, shrubs, wild flowers and other herbaceous vegetation is aesthetically pleasing, provides wildlife habitat, and is important for good water quality.