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Controlling Filamentous Algae in Ponds

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The most common aquatic plant problem in Ohio is filamentous algae. Its presence can degrade water quality and recreational enjoyment. Excessive algae can cause oxygen depletion when it decomposes as a result of natural die-off or an algaecide application. This is often the cause of a fish kill, depending on how low oxygen levels get. Early and regular control measures will help reduce the problems associated with filamentous algae.

The Plant

Filamentous algae, also called "moss" or "pond scum," forms dense mats of hair-like strands. Its growth begins on submerged objects on the pond bottom. As it grows, algae produce oxygen that becomes entrapped by the denseness of the mat. This provides the buoyancy it needs to rise to the surface where it frequently covers large areas of the pond. Filamentous algae is often a persistent problem because it reproduces rapidly by fragments, spores, and cell division. Abundance is dependent on nutrient levels, particularly phosphorus, in the water. High levels of nutrients result in increased amounts of algae.

There are many species of filamentous algae, and microscopic examination is usually required to make an exact identification. However, some of the more common forms can be distinguished by their texture. *Spirogyra* is bright green and slimy to touch; *Cladophora* has a cottony feel; and *Pithophera* is often referred to as "horse hair" algae because its coarse texture resembles that of horse hair and it may feel like steel wool.

Mechanical Control

Filamentous algae can be controlled by physically removing large floating clumps with a rake. Mechanical removal is an ongoing activity during the growing season due to the algae's persistent fast growth. Algae that has been removed can be piled for composting or used in a garden as mulch.

Steepening the sides of a new pond to achieve a 3:1 slope will eliminate shallow water areas and prevent sunlight from reaching the bottom growing algae. A 3:1 slope simply means that for each additional 3 feet of distance from shore, the water has deepened by 1 foot. However, if an existing pond has filled in as a result of sedimentation or decaying vegetation, a dragline or dredge may be needed to adequately deepen the pond.

Biological Control

Biological control involves disrupting plant growth by modifying the aquatic environment, or it can mean introducing a living organism that is capable of controlling aquatic vegetation.

One method of biological control is maintaining fertility levels that encourage the development of "blooms" of microscopic (planktonic) plant and animal populations that reduce water clarity. Reduced clarity means less sunlight reaching the pond bottom, which in turn reduces growth of filamentous algae. This requires intense management because additional, well-timed fertilizer additions are often needed to maintain the blooms. The average pond owner may not be willing

to devote the time required to be successful with this technique. Also, high levels of planktonic plants and animals create "dingy" water that may not be acceptable to pond owners whose primary goal is swimming and/or aesthetics.

Another method of biological control is to reduce watershed or outside sources of nutrients that can cause increased growth of filamentous algae. Algae get their nutrients from the water, so minimizing nutrient levels is a worthwhile management activity. Common sources of unwanted nutrients are Canada geese, lawn fertilizer, domesticated animals, agricultural fertilizer, and even septic systems if located too close to a pond. The pond owner should make every effort to minimize the input of nutrients from these sources.

The addition of triploid white amur (grass carp) as a biological control measure may yield less than desirable results. Filamentous algae is not a preferred food of these vegetation-eating fish, but will be eaten in limited amounts if no other aquatic vegetation is present. If other aquatic plants such as pondweeds and coontail are readily available, the filamentous algae may be ignored and will continue to flourish.

Chemical Control

Pre-Application Considerations

Selecting a chemical to control filamentous algae is situation-specific and the pond owner needs to consider several factors. The most important factors are the water uses provided by the pond and any use restrictions associated with the products considered that could impact those uses. Reading the label is critical for not only learning the use restrictions, but also application recommendations and safety information. Chemical labels are legally binding, and any use contrary to what is written on the label is unlawful.

Applying the correct amount of chemical is crucial to successfully control algae. All product labels provide dosage or application rates, often as pounds or gallons per acre foot of water. For more information on calculating acre feet and other measurements, consult *Pond Measurements* (Ohio State University Extension Fact Sheet A-2), which is available from county offices of Ohio State University Extension or at http://ohioline.osu.edu.

Timing of chemical applications is another important consideration. Some algae species can reach nuisance levels in cold water just after ice-out. However, many algaecides work best in water warmer than 60°F, and use in colder water will yield less than desired results. Care must also be exercised once water temperatures exceed 70°F, especially in ponds where large amounts of algae are to be controlled. If the algae are so abundant that it covers more than 30% of the total pond surface, treating the entire pond may result in an oxygen depletion and fish kill. Factors that increase this hazard are hot weather, an extended period of overcast sky, increased algae abundance, and a shallow pond. When the hazard of a fish kill is a concern, do partial treatments of 25% of the pond's surface area every 14–17 days.

Algae reproduces rapidly, and it is common not to get season-long control with algaecides. Nearly all products provide 3–4 weeks of improvement and can provide longer control in ponds with lower nutrient levels. Retreatments are often necessary. Often, these retreatments can be spot treatments as algae mats reform. It is better to do numerous small scale retreatments rather than allowing the algae to cover large areas again. This reduces the risk of a fish kill as well as being cost-effective.

Inert Dyes (Aquashade, Aquashadow, Aquatic Blue, SePRO Blue, Solaron Blue, Crystal Blue, Bio Black)

Inert dyes can be used to control filamentous algae. The color they turn the water, usually blue, reduces sunlight penetration, which in turn reduces growth of algae. These dyes are not effective in water less than 2 feet deep. Algae that are already floating on the water surface will not be controlled with the dyes. Application is very easy and should occur early in the growing season, preferably in March. Inert dyes are not recommended for use in ponds with considerable water exchange during a rain. The influx of rainwater dilutes the dye as "colored" water leaves the pond through the overflow device. Most inert dyes are labeled for all water uses except domestic drinking water supplies. It is advisable that swimming not occur until the dye has completely dispersed throughout the pond.

Sodium Carbonate Peroxyhydrate (GreenClean, Phycomycin)

This is a fast-acting algaecide with results noticeable within several hours in the form of algae discoloration from green to a whitish or cream color. Its mode of action is oxidation, producing 100 times its volume of oxygen

as it eliminates chlorophyll in the immediate application area. It completely biodegrades into naturally occurring compounds, and is nontoxic to aquatic life if used as specified by the manufacturer. There are no water use restrictions. Sodium carbonate peroxyhydrate is very corrosive and should not come in contact with other pesticides, cleaners, or other oxidizing agents.

Copper Sulfate (numerous trade names)

Most species of algae can be controlled with low concentrations of copper sulfate. It is available in crystalline nuggets the size of rock salt or as finely ground "snow" grade. Whichever type is purchased, best results are obtained by dissolving the copper sulfate in water and spraying it directly on floating algae mats or on the water surface above submerged algae. Snow grade copper sulfate dissolves more easily than crystal nuggets. Because copper is corrosive to galvanized metal, mixing and application equipment should be made of plastic or stainless steel.

Plastic garden sprayers (2–5 gallons) work well in treating ponds less than an acre in size. For larger ponds or when spray equipment is not available, the required amount of crystal nuggets can be placed in a burlap bag. The bag is towed from a boat through the water until all of the crystals have been dissolved in the area to be treated.

There are no water-use restrictions associated with the use of copper sulfate. When applied at the proper rate, the water may be used immediately for swimming, drinking, fishing, irrigation, and watering livestock. However, since copper sulfate has a metallic odor, pond owners may want to suspend drinking, swimming, and watering livestock for a day.

Copper sulfate applied at recommended rates is often lethal to various trout species, ornamental goldfish (particularly koi), and white amur. This is particularly true in low alkaline water or soft water (less 50 parts per million of hardness). It is recommended that alternative algaecides be used in ponds containing these sensitive fish species. Copper sulfate applied at recommended rates can be lethal to fish eggs and some species of newly hatched fish fry. Recommended rates of copper sulfate can kill the eggs and fry of largemouth bass and bluegills. It use during the spawning season of these species is discouraged. The presence of male largemouth bass and bluegills guarding saucer-shaped nests in shallow water is a good indicator of spawning activity.

Copper Chelate (Cutrine Plus, Cutrine Ultra, Clearigate, K-tea, Algimycin, Komeen, Nautique, Captain)

Copper is also available in a chelated, or buffered, formulation, which is manufactured as a liquid or granule. This provides some advantages during application. The liquid form needs only to be mixed with water and sprayed over the pond surface; there are no crystals to dissolve. The granular formulation consists of clay or organic granules impregnated with copper chelate. As the granule breaks down, the copper is released into the water. This formulation is especially useful when spot treatment is desirable. There are no water-use restrictions associated with either formulation of copper chelate. Copper chelate products are less toxic to fish, but should be used cautiously in the presence of trout or ornamental goldfish.

A number of the chelated copper products have surfactants/penetrants added to them that enhance their efficacy in controlling problematic algae, such as those with thick cell walls or gelatinous coatings. These surfactants are labeled for use in aquatic ecosystems and are safe to aquatic life. If you choose to add a surfactant on your own, it must be labeled for use in aquatic ecosystems.

Diquat Dibromide (Reward, Weedtrine-D)

This is a contact herbicide that will control some, but not all, species of filamentous algae. It is applied by pouring directly from the container or by diluting with water and injecting below the water surface with a sprayer. For best results, it should be applied before algae growth reaches the surface. Diquat dibromide should not be used in muddy water because the active ingredient becomes deactivated. There are water-use restrictions associated with these diquat products.

Endothall Amine Salts (Hydrothol 191)

The amine salt formulation of endothall is labeled for algae control. It is available as a liquid or granular formulation. It is a contact herbicide and is most effective in waters 65°F and above. Fish are extremely sensitive to this active ingredient. To reduce the potential for killing fish, start applications at the shoreline and move outward so that fish can escape from treated areas. There are water-use restrictions associated with endothall and liquid formulations can cause skin burns.

Copper-Resistant Algae

One form of filamentous algae, *Pithophora*, can be especially troublesome because it is resistant to normal applications of copper compounds. Although it is not widespread in Ohio, occurrence in Ohio is increasing each year. If, after a normal treatment with a copper-based algaecide, there is algae remaining that does not appear to be affected, it may be *Pithophora*. Positive identification can be made by sending a sample to the C. Wayne Ellett Plant and Pest Diagnostic Clinic at The Ohio State University. Samples can be submitted directly to the clinic or through county offices of Ohio State University Extension.

Pithophora is extremely difficult to control. Its unique cell wall structure and the tight clumping of filaments inhibit penetration by copper compounds. Additionally, large numbers of resilient spore-like bodies, called akinetes, germinate and provide a continuous source of new plants. Partial, short-term control can usually be achieved with either of the following herbicide mixtures:

Mixture	Ratio	Application Rate of Mixture
Copper chelate liquid and diquat dibromide	1:1	2 gallons per acre-foot
Copper chelate liquid and endothall amine salt liquid	2:1	1 gallon per acre-foot

Additionally, Cide-Kick, a nonionic spray surfactant, should be added to the mixture at the rate of 1–2 gallons per surface-acre of water. This material acts as a cell wall penetrant to increase the effectiveness of the mixtures.

Table 1. Aquatic algaecides for filamentous algae control (except Pithophora) and water use restrictions. Always check labels for additional or updated restrictions.

Chemical Name	Waiting Period Before Water Used For:					
	Human			*Animal*	*Irrigation*	
	Drinking	Swimming	Fish Consumption	Drinking	Turf	Food Crops
Copper chelate (many types)	0 days	0 days	0 days	0 days	0 days	0 days
Copper sulfate	0 days (note 1)	0 days (note 1)	0 days	0 days (note 1)	0 days	0 days
Diquat dibromide (notes 2 and 3)	1–5 days	0 days	0 days	1–5 days	1–5 days	5 days
Endothall amine salt (note 4)	7–25 days	24 hours	0 days	7–25 days	7–25 days	7–25 days
Inert dye	Not permitted	24 hours (note 5)	0 days	0 days	0 days	0 days
Sodium carbonate peroxyhydrate	0 days	0 days	0 days	0 days	0 days	0 days

Notes:
1—No required waiting period. 24-hour waiting period recommended to allow for dissipation of metallic odor.
2—Controls some species of filamentous algae: Spirogyra and Pithophora.
3—Actual waiting period dependent on commercial product used and application rate.
4—Actual waiting period dependent on application rate.
5—Wait for complete dispersal before swimming.

Safety

Critically important safety information is on all federally approved pesticide labels and should be read carefully prior to any application. By law, copies of the applied product's label must be in the possession of the applicator at the application site at the time of application. This is easily accomplished by having the product container with you by the pond as the application is made.

The label will provide information on protective clothing and equipment that should be worn, potential physical and chemical hazards to the applicator, and proper storage of any unused product. Additionally, the label provides medical information on required steps should exposure to a product occur.

Disposal of pesticide containers should occur as follows:

Empty liquid containers must be triple rinsed with the rinse water being added to the spray tank prior to application. If no spray tank is used, the rinse water should be applied to the pond being treated. After application, spray tanks should also be triple rinsed with rinse water being applied to the pond. Empty bags that contained dry formulations of aquatic pesticide products should be rinsed with the rinse water being applied to the pond. All containers or bags should be rendered unusable, either by puncturing the containers or cutting up the bags.

Additional Pond Management Information

Placing Artificial Fish Attractors in Ponds and Reservoirs, Ohio State University Extension Fact Sheet A-1.
Pond Measurements, Ohio State University Extension Fact Sheet A-2.
Chemical Control of Aquatic Plants, Ohio State University Extension Fact Sheet A-4.
Muddy Water in Ponds, Ohio State University Extension Fact Sheet A-6.
Understanding Pond Stratification, Ohio State University Extension Fact Sheet A-7.
Winter and Summer Fish Kills in Ponds, Ohio State University Extension Fact Sheet A-8.
Planktonic Algae in Ponds, Ohio State University Extension Fact Sheet A-9.
Fish Species Selection for Pond Stocking, Ohio State University Extension Fact Sheet A-10.
Cattail Management, Ohio State University Extension Fact Sheet A-11.
Algae Control with Barley Straw, Ohio State University Extension Fact Sheet A-12.
Notifying the Ohio EPA Prior to Applying Aquatic Herbicides in Ponds, Ohio State University Extension Fact Sheet A-13.
Duckweed and Watermeal: Prevention and Control, Ohio State University Extension Fact Sheet A-14.
When to Apply Aquatic Herbicides, Ohio State University Fact Sheet A-15.
Dyes and Aquatic Plant Management, Ohio State University Extension Fact Sheet A-16.
Benefits and Disadvantages of Aquatic Plants in Ponds, Ohio State University Extension Fact Sheet A-17.
Ohio Pond Management, Ohio State University Extension Bulletin 374

Visit your county office of Ohio State University Extension for copies of these resources or go to http://ohioline.osu.edu.