

Chemical Control of Aquatic Weeds

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Aquatic plants are an important element of any aquatic ecosystem, whether it is a stream, pond, lake, or reservoir. Most naturally-occurring aquatic ecosystems have been impacted by human activity, resulting in increased nutrients or sediments from various land uses. Many more aquatic ecosystems have been created by human efforts through the construction of ponds, lakes, and reservoirs. One result of these artificially-created bodies of water is the development of aquatic plant communities. Excessive plant growth often interferes with the uses for which these water bodies were created. Recreation, (swimming, boating, fishing), aesthetic values, and domestic uses often necessitate the active management of aquatic vegetation. This management is accomplished with either preventative measures or control measures. Vegetation control may be accomplished with biological, mechanical, or chemical methods. The focus of this fact sheet is chemical control of aquatic plants with approved herbicides and algaecides. Pond owners will be most successful in managing aquatic vegetation by using a variety of methods, however. No single control strategy is likely to provide long-term satisfactory results.

Considerations in Using Aquatic Herbicides

Identify the Plant

Chemical control efforts will not be successful unless the aquatic plants to be controlled are properly identified. This can be accomplished several ways: 1. Review the picture guides of aquatic plants that are produced by many of the aquatic herbicide manufacturers, 2. Collect samples of the weeds and take them to your county Extension office for assistance in identification, 3. Collect samples and send them to: The Ohio State University, C. Wayne Ellett Plant and Pest and Diagnostic Clinic, 2021 Coffey Road, Columbus, OH 43210. Phone 614-292-5006. There is a nominal fee for identification and control recommendations (the clinic will bill you) or 4. Hire a commercial pesticide application firm to identify the weeds and make the proper herbicide/algaecide application.

When collecting plants for identification, every effort should be made to collect samples of each of the different kinds of plants present. Plant specimens should be covered with wet paper towels, placed in a sealed plastic bag, and then transported, shipped, or mailed.

Water uses

How the water in the pond or lake is used is an extremely important consideration in selecting an herbicide/algaecide. Many herbicides/algaecides require either waiting periods (hours or days) or total restrictions depending on whether the water is used for

domestic or agricultural purposes, irrigation, swimming, or fishing. Always consult the aquatic herbicide label on the container to determine what, if any, restrictions apply.

Application rate

The amount of herbicide to be applied varies with the product used. The application rate on the label is usually described on the basis of area (acres of water surface) or volume (acre-feet of water). In order to apply the proper amount, these characteristics of the pond or lake must be known (see Ohio State University Extension Fact Sheet A-2-98: *Pond Measurements*). If more than one herbicide will suit the pond owner's needs, the treatment cost should be calculated by determining the total amount of herbicide needed (application rate multiplied by area or volume of the pond), and then determining the cost of purchasing that amount of herbicide. The cost of a container of any herbicide should not be confused with the actual cost of the treatment.

Timing the Application

Proper timing of herbicide/algaecide applications is extremely important for both effective control and to avoid other potential problems. Timing involves knowing what the water temperature is, waiting until vigorous plant growth is present, but not waiting too late in the summer when an application results in large quantities of weeds decomposing (an oxygen-using process) and creating conditions conducive to a fish kill by suffocation. Some algaecides require minimum water temperatures of 60°F in order that there is enough biological activity in the plants for the material to be effective. Cattails are best controlled with an herbicide when they reach their most vigorous growth stage which corresponds to the beginning stages of seedhead (catkins) development. Unlike other herbicides that can be used as pre-emergents (applied prior to the germination of plant seeds or the regrowth of sprouts), aquatic herbicide use must be delayed until the plants are present and growing.

Retreatments

Regrowth of aquatic plants during the growing season is frequently a problem for the pond owner who is using aquatic herbicides. Regrowth, or what appears to be regrowth, may be simply the late-season development of other plant species not previously noticed, the result of improper herbicide/algaecide application, or the natural ability for the plant to reproduce throughout the growing season (e.g., algae). Retreatments at the same rate as the initial treatment and during the same growing season may be financially and environmentally unwise. Aquatic herbicides are expensive, therefore every effort should be made by the pond owner to control as many of the treatment variables as possible (proper weed identification, application, and timing). Some herbicides may be present in the water for long periods of time, and retreatments could result in a high level of chemicals. Copper, the active ingredient in several algaecides (e.g., copper sulfate, Cutrine), is not biodegradable. Therefore, overuse of algaecides will hasten the accumulation of copper in the pond bottom. Pond owners who expect to eradicate weeds

from their ponds with frequent applications of herbicides/algaecides have unrealistic expectations of both the chemicals and the pond ecosystem.

Precautions in Using Aquatic Herbicides

Downstream use of pond discharge

Ponds which have a periodic or constant discharge should not be treated with an herbicide/algaecide that will negatively impact the downstream uses of the water. Consult the label on the chemical container for information about pond discharges.

Oxygen depletion from decomposition

Aquatic vegetation that is killed with an herbicide/algaecide will decompose in the pond. Decomposition is an oxygen-using process and the source of oxygen is that which is dissolved in the water. Fish require sufficient dissolved oxygen, otherwise they will suffocate. When aquatic vegetation has accumulated to the point at which massive amounts are present, the decomposition that occurs after an herbicide/algaecide application could result in oxygen demand so great that there is not enough to sustain fish life, and a fish kill may occur due to suffocation. This problem can be avoided if chemical weed control efforts are carried out before there is a large accumulation of vegetation.

Read the label

Water use restrictions may be present-All aquatic herbicides and algaecides that are available for use have been approved by the U.S. EPA. That approval is based on extensive research and testing by the product developer. Through the process of product development, review, and approval, significant safety factors are incorporated into the directions for use, and these are contained in the label on the product. Always read and follow the label directions exactly. Pay particular attention to any water use restrictions. The restrictions, if present, are waiting periods (hours, days, or weeks) before the water can be used for the indicated purpose. These waiting periods provide an additional margin of human health and environmental safety.

Stay away from "look-alikes"

The active ingredients that are used in some of the labeled and US EPA-approved aquatic herbicides are sometimes formulated into other products with different uses. Do not use materials that are not labeled for aquatic uses even though the active ingredient may be the same. Unless the product is labeled for aquatic use, the label will not contain the proper information necessary for safe use in a pond or lake. For example, there are many products that contain glyphosate (e.g., Roundup), but the only glyphosate-based product that is labeled for use in ponds is Rodeo.

Aquatic Herbicides Approved for Use

AquaKleen (2,4-D)

While 2,4-D is widely used to control many species of terrestrial plants, it has a more limited use on aquatic plants. It is most often used to control water-lilies and watermilfoil. Because of significant water use restrictions, it is not widely used.

Aquathol (potassium salt of endothall)

This herbicide is produced as a liquid (Aquathol K) or granule (Aquathol). It is a contact herbicide that will control a wide range of submerged aquatic plants. It will not control algae (filamentous, chara). Aquathol is biodegradable and is rapidly broken down by microbial activity.

Copper sulfate (copper sulfate pentahydrate)

This is one of the earliest-known materials for aquatic weed control. It has been used since 1904 to treat water for algae control. It is still widely used because it can be used in potable drinking water supplies (ponds, lakes, reservoirs). Copper sulfate is only used for algae control. There are no restrictions on the use of water treated with copper sulfate, however, a 24-hour waiting period is advised to allow for the metallic smell from the treated water to dissipate. It is a contact herbicide that must be applied directly to floating mats of algae or dissolved throughout the pond to control algae that is still attached to the pond bottom. Copper sulfate is inactivated when it chemically bonds with soil, inorganic ions, and organic matter, and the copper sulfate is removed from the water column when these particles settle to the bottom.

Table 1. Aquatic herbicides labeled for control of common aquatic plants in Ohio.									
KEY:									
x = use									
p = partial control, as indicated by manufacturer									
- = no control or unknown									
Aquatic Plant		Herbicide/Algaecide							
Common Name	Scientific Name	AquaKleen, Navigate	Aquathol	Copper Sulfate	AlgaePro, Cutrine	Diquat, Reward	Hydrothol 1191	Rodeo	Sonar
EMERGENT PLANTS									
Arrowhead	<i>Sagittaria</i> spp.	-	-	-	-	-	-	x	-
Bulrush	<i>Scirpus</i> spp.	x	-	-	-	x	-	x	-
Cattails	<i>Typha</i> spp.	-	-	-	-	x	-	x	p
Pickerelweed	<i>Pontederi</i>	-	-	-	-	x	-	x	-

	<i>a cordata</i>								
Purple loosestrife	<i>Lythrum salicaria</i>	-	-	-	-	-	-	x	-
Smartweeds	<i>Polygonum spp</i>	-	-	-	-	-	-	x	-
Spike-rush	<i>Eleocharis spp.</i>	-	-	-	-	x	-	x	p
Willow	<i>Salix spp.</i>	-	-	-	-	-	-	x	-
FREE-FLOATING PLANTS									
Algae - filamentous	various	-	-	x	x	some species	x	-	-
Algae - planktonic	various	-	-	-	x	-	-	-	-
Duckweed	<i>Lemna minor</i>	-	-	-	-	x	-	-	x
Water-meal	<i>Wolffia columbiana</i>	-	-	-	-	-	-	-	p
SUBMERGED ROOTED PLANTS WITH FLOATING LEAVES									
American lotus	<i>Nelumbo lutea</i>	-	-	-	-	-	-	x	-
Pondweeds									
American pondweed	<i>Potamogeton nodosus</i>	-	x	-	-	x	x	-	x
Curlyleaf pondweed	<i>Potamogeton crispus</i>	-	x	-	-	x	x	-	x
Floating pondweed	<i>Potamogeton natans</i>	-	x	-	-	x	x	-	x
Large-leaved pondweed	<i>Potamogeton amplifolius</i>	-	x	-	-	x	x	-	x
Leafy pondweed	<i>Potamogeton foliosus</i>	-	-	-	-	x	x	-	x
Sago pondweed	<i>Potamogeton pectinatus</i>	-	x	-	-	x	x	-	x
Small	<i>Potamogeton</i>	-	x	-	-	x	x	-	x

pondweed	<i>on pusillus</i>								
Water-lilly									
White water-lilly	<i>Nymphaea tuberosa</i>	p	-	-	-	-	-	-	x
Yellow water-lilly, Spatterdock	<i>Nuphar</i> spp.	p	-	-	-	-	-	x	x
Water-shield	<i>Brasenia schreberi</i>	p	-	-	-	-	-	x	x
SUBMERGED PLANTS									
Bladderwort	<i>Utricularia</i> spp.	p	-	-	-	x	x	-	x
Cabomba/Fanwort	<i>Cabomba caroliniana</i>	-	-	-	-	-	-	-	x
Chara	<i>Chara</i> spp.	-	-	-	x	-	x	-	-
Coontail	<i>Ceratophyllum demersum</i>	p	x	-	-	x	x	-	x
Eel-grass, tape-grass	<i>Vallisneria spiralis</i>	-	-	-	-	-	x	-	-
Watermilfoil	<i>Myriophyllum</i> spp.	x	x	-	-	x	x	-	x
Elodea, waterweed	<i>Elodea canadensis</i>	-	-	-	-	x	x	-	x
Horned pondweed	<i>Zannichellia palustris</i>	-	-	-	-	-	x	-	-
Hydrilla	<i>Hydrilla verticillata</i>	-	x	-	-	x	-	-	x
Naiad	<i>Najas</i> spp.	-	x	-	-	x	x	-	x
Nitella	<i>Nitella</i> spp.	-	-	-	x	-	-	-	-

Citrine, AlgaePro, and others (copper chelates)

Citrine and AlgaePro are algaecides whose active ingredient, copper, is contained within an organic molecule. This prevents the copper from precipitating out of the water, and thus should provide longer-lasting results than copper sulfate. When the organic molecule eventually breaks down, the copper ion settles to the pond bottom and is inactivated. Citrine is manufactured in both a liquid and granule formulation, while Algae Pro is formulated only as a liquid. They are primarily used for algae control (filamentous and chara), although some submerged plants are susceptible. Like copper sulfate, there are no water use restrictions.

Diquat, Reward (diquat dibromide)

These herbicides are formulated as liquids and are applied directly to the pond surface to control submerged weeds, or mixed with water and a surfactant to control cattails. They will quickly bond to suspended soil particles, and therefore should not be used in turbid (muddy) waters. The herbicide is removed from the water by adsorbing (bonding) to plant material and suspended sediments which eventually settle to the bottom.

Hydrothol 191 (amine salt of endothall)

This is a different chemical formulation of the active ingredient in Aquathol, and has different uses. Hydrothol is manufactured as a liquid and granule. In addition to a number of submerged weeds that are controlled, Hydrothol will also control several species of filamentous algae and chara. Like Aquathol, Hydrothol is rapidly degraded through microbial activity.

Table 2. Summary of Water Use Restrictions and Waiting Periods, in days.								
	HUMAN USES			ANIMAL USES		IRRIGATION USES		
Herbicide/Algaecide	Drinking	Swimming	Fish consumption	Lactating	Meat	Turf	Forage	Food crops
AlgaePro	0	0	0	0	0	0	0	0
AquaKleen	---Do not apply to waters used for irrigation, agricultural sprays, watering dairy animals, or domestic water supplies.---							
Aquathol K	7-25	0	3	7-25	7-25	7-25	7-25	7-25
Aquathol Granular	7	0	3	7	7	7	7	7
Copper sulfate	0	0	0	0	0	0	0	0
Citrine	0	0	0	0	0	0	0	0
Diquat	14	1	0	14	14	14	14	14
Hydrothol 191	7-25	0	3	7-25	7-25	7-	7-25	7-25

						25		
Navigate	---Do not apply to waters used for irrigation, agricultural sprays, watering dairy animals, or domestic water supplies.---							
Reward	1-3	0	0	1	1	1-3	1-3	5
Rodeo	Note 1	0	0	0	0	0	0	0
Sonar	Note 2	0	0	0	0	30	30	30
Notes: 1. Do not apply within 1/2-mile of a potable water intake. 2. Do not apply within 1/4-mile of a potable water intake.								

Navigate (2,4-D)

This is the same material as Aqua-Kleen. See the description above.

Rodeo (glyphosate)

Although there are many glyphosate-based products available (e.g., Round-Up), this is the only one labelled and approved for use in aquatic environments. Formulated as a liquid, Rodeo is mixed with water and a surfactant and then sprayed directly on emergent shoreline vegetation. Rodeo is a systemic that will be absorbed through the leaves and then moved throughout the plant, including the roots. Do not apply when rain is likely within six hours.

Sonar (fluridone)

This herbicide is available as a liquid or slow release pellet. It will control a broad range of submerged and floating aquatic plants, and some emergent plants. It is particularly effective for duckweed and watermilfoil control. When applied at reduced rates, Sonar can be used to selectively control undesirable, nonnative species. In 30-90 days after application, the target weeds will be controlled, often for the entire season.

Disclaimer

This publication contains pesticide recommendations that are subject to change at any time. These recommendations are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. Due to constantly changing labels and product registration, some of the recommendations given in this publication may no longer be legal by the time you read them. If any information in these recommendations disagrees with the label, the recommendation must be disregarded. No endorsement is intended for products mentioned, nor is criticism meant for products not mentioned. The author and Ohio State University Extension assume no liability resulting from the use of these recommendations.