

Aquatic Weeds (Weed Control in Ponds and Lakes)

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The use of pesticides in aquatic environments is quite restricted because these areas provide water for irrigation, recreation, and domestic uses. The recommendations in this section use the herbicide's common name. In the state of Virginia, there are over 100 different trade names for glyphosate and 2,4-D. Only those specifically labeled for aquatics may be used. It is important that chemicals used in these areas be applied strictly in accordance with label directions, as the label is the federal law.

Treatment of aquatic weeds should take place in the spring as the weeds begin active growth. It is important to adhere to this application suggestion, even if an infestation is small. Later in the season, weed density and maturity make control more difficult. Sampling the lake bottom in the late spring or early summer in areas heavily infested the year before should show when the growth begins. The treatment of dense weed growth can result in oxygen depletion during the decomposition of the dead plants. Severe oxygen depletion can cause a fish kill. Many times it may be necessary to treat only 1/3 to 1/2 of the impoundment at a time.

Recommendations for aquatic applications are based on rate per surface area, rate per acre foot, or parts per million (ppm). An acre foot is 1 acre of water 1 foot deep. For a pond with a gradual slope, acre feet may be determined approximately by multiplying 1/2 the depth at the deepest point, times the surface area. A pond with 1 surface acre and a gradual slope to a 10-foot depth at the deepest point would contain approximately 5 acre feet of water. It is important to get as accurate an estimate as possible. An acre foot of water weighs 2,700,000 pounds, therefore it will require 2.7 pounds of active ingredient to achieve 1 ppm.

There is a quick reference table at the end of this section with water-use restrictions after herbicide application. These restrictions must be followed. Where more than one herbicide is suggested for a specific aquatic weed, please refer to the herbicide information table to find a suitable product. For biological control of aquatic weeds with triploid sterile grass carp, please refer to the last paragraph in this section.

Table 7.19 - Relative Effectiveness of Aquatic Herbicides Recommended for Control of Selected Weeds

Aquatic Plant	endothall		2,4-D		fluridone	gly-phosate	triclopyr	imazapyr	carfentra-zone	
	copper	diquat	aqua-thol	hydro-thol						granular
Algae										
Chara, Nitella	G	G		G						
Filamentous	G	G		G						
Planktonic	G									
Submersed Weeds										
Bladderwort		G	P	P-F	F		E		P	
Coontail		E	E	E	G		E		G	
Curly leaf pondweed		F	G				G			
Elodea (Brazilian)	F	E	E	P	G		G			
Fanwort							F			
Hydrilla	F	F-E ¹	E	E	G		E			
Leafy sago pondweed		G	G				G			
Naiads							G			
Parrotfeather		G	E	E	G		F-G		F-E	G
Pondweeds		G	E	E			E			

E = excellent, G = good, F = fair, P = poor

¹Copper sulfate, copper complex, or copper carbonate may be added to improve hydrilla, Eurasian watermilfoil, and watermeal control with diquat.

Table 7.19 - Relative Effectiveness of Aquatic Herbicides Recommended for Control of Selected Weeds (cont.)

Aquatic Plant	endothall		2,4-D		fluridone	gly-phosate	triclopyr	imazapyr	carfentra-zone		
	copper	diquat	aqua-thol	hydro-thol						granular	liquid
Small (slender) Naiad		E	E	E			E				
Southern Naiad		G	P				P-G				
Watermilfoil (Eurasian)		G-E ¹	E	E	E		G-E	G-E		G	
Floating Plants											
Duckweed	P	G	P		P	F	E		P	G	G
Giant Duckweed		G	P		P		G			G	
Giant Salvinia	P	E	F				E	G		G	
Mosquito fern (Azolla)		G-E			F		G-E				E
Water hyacinth	F	G			G-E	E	F	G	G	G	F-G
Watermeal (<i>Wolffia</i> spp.)		P-F ¹					F				
Emerged Plants											
Bull Rush							P	G	F	G	
Cattail		G			F		F	E	F	E	
Phragmites (comm. reed)								G	F	E	
Purple loosestrife									G-E	G-E	
Spatterdock					F	F	G	E	F	E	
Water primrose		G				G		E	G		
Water/marsh pennywort		F				G		G	G		
Waterlily					G		G	E	G	E	
Watershield		F			E		F-E	E	E	E	

E = excellent, G = good, F = fair, P = poor

¹Copper sulfate, copper complex, or copper carbonate may be added to improve hydrilla, Eurasian watermilfoil, and watermeal control with diquat.

Table 7.20 - Herbicide Information. IT IS IMPORTANT TO ALWAYS READ AND FOLLOW THE HERBICIDE LABEL.

Herbicide	Remarks
2,4-D	Rate depends on species and depth of water. Do not apply to water to be used for irrigation, agricultural sprays, watering dairy animals, or domestic water supplies. Average water temperature should be around 65°F at the time of treatment. Avoid drift to susceptible plants.
Aquashade, many dye products are available.	A blue dye that reduces light penetration in water for up to six weeks may be used to reduce filamentous algae growth in ponds, ornamental ponds or fountains, commercial fish ponds, and lakes. There must be little or no flow out of the pond. Additional applications are made to maintain acceptable shade. Aquashade is not effective when weed growth nears the surface.
carfentrazone	Rates vary according to target species. Retreatment of some plants may be required. Methylated seed oil or nonionic surfactant recommended for application on floating plants.
copper complex, copper sulfate, other copper products	For optimum control, spray over surface when algae first become visible. Expect temporary control. Repeat treatments are often necessary. Do not use copper sulfate in trout ponds. Hard water requires more copper sulfate than soft water. The copper complex formulation does not precipitate as fast as copper sulfate and usually provides more effective control results. Dilute copper complex with 9 parts of water and spray the surface. Break up the floating mats of filamentous algae before treatment. Water temperature should be about 60°F. Apply on a clear day. Corrosive to spray equipment. Water may be used immediately for swimming, fishing, irrigation, and potable water. Do not use copper complex in water containing trout if the carbonate hardness of the water does not exceed 50 ppm, as it may cause fish kill. Excessive rates may also cause fish kill. When treating chara or nitella, treat only 1/3 to 1/2 of pond at one time. Allow 7 to 14 days between applications.
diquat	Apply uniformly over the surface or inject below water surface. For submersed weeds, apply early in season by pouring directly into water in strips 40 ft apart. Later in season, as weeds reach surface, pour in strips 20 ft apart or inject a dilute solution. Avoid stirring the bottom mud. Retreatment may be necessary if regrowth occurs from underground vegetative parts. Diquat may be fatal if swallowed, inhaled, or absorbed through skin. Copper is sometimes added to improve hydrilla or watermeal control with diquat. Be sure to follow the label. When controlling cattail, thoroughly wet the blooms.
endothal, potassium salt	Granular materials are preferred for spot treatment or treating marginal areas of a pond. Water temperature should be 65°F or above. If areas of heavy vegetation are treated, treat in sections 5 to 7 days apart to prevent fish kill by oxygen depletion during vegetation decay. POISONOUS – follow label for safe handling. Rate will be dependent on most difficult weed to control in the pond.
fluridone	Apply uniformly over the surface. Use the maximum labeled rate for the average depth of your pond. Do not apply when there is substantial outflow from the pond. Effects on plant will be gradual from 30 to 90 days for complete response. One treatment/year does not work as a spot treatment in small areas.
glyphosate	Glyphosate efficacy may be reduced if very hard water containing high concentrations of iron is used to prepare spray solutions. Vegetation must be on or above the surface for treatment to be effective. For floating or emersed weeds, apply to wet foliage above water but do not spray to run off. If applying from a boat, take care not to create waves that may wash the herbicide off floating leaves. Apply in 20.0 gal of water/A as a broadcast spray. Apply to actively growing cattail at the early- to full-bloom stage of growth. Apply when spatterdock, water lily, and water shield are in full bloom
imazapyr	Rates vary according to target species. Retreatment of some plants may be required. The addition of a nonionic surfactant is recommended. When controlling Phragmites, apply to green foliage after complete leaf elongation. Complete coverage is necessary.
triclopyr	Rates vary according to target species. The addition of a nonionic surfactant is recommended. When controlling purple loosestrife, apply to actively growing foliage at flowering. Follow-up spot treatments may be necessary.

Table 7.21 - Water-use Restrictions after Aquatic Herbicide Applications

Aquatic Herbicide	Water Use Restriction (days)				
	Irrigation	Fishing	Swimming	Livestock	Potable
copper sulfate	0 ¹	0	0	0	0
copper complex	0	0	0	0	0
carfentrazone	1-14	0	0	0-1	
diquat	2-5	0	1	1-5	3-5
endothall					
Aquathol K	7-25	3	1	7-25	7-25
Aquathol G	7	3	1	7-25	7-25
Hydrothol 191	7	0	1	14	7-25
fluridone	30	0	0	0	**
glyphosate	0	0	0	0	**
2,4-D	**	**	**	**	**
triclopyr	120	0	0	0	**
imazapyr	120	0	0	0	**

¹0 = no restriction

** Varies, refer to label before use.

Table 7.22 - Herbicide Trade Names (See specific label for use.)

Common Name	Aquatic Trade Names
copper ¹	Komeen, Nautique, Captain, Clearigate, Cutrine Plus, Cutrine Ultra, and K-Tea
carfentrazone	Stingray
diquat	Reward, Weedtrine-D and Eliminator
endothall inorganic salts	Aquathol K and Aquathol Super K
endothall amine salts	Hydrothol 191 and Hydrothol Granular
fluridone	Sonar and Avast!
glyphosate	various trade names and formulations
2,4-D	various trade names and formulations
triclopyr	Renovate 3 and Garlon 3A
imazapyr	Habitat

¹Copper products may be formulated as copper sulfate pentahydrate, copper complexes, or copper carbonate.

Biological Control

With biological control, natural enemies are released to feed on aquatic weedy vegetation. Fish have been important in aquatic weed control. Triploid sterile grass carp have become the fish of choice for several weeds. Naiad, fanwort, hydrilla, coontail, various pondweeds, bladderwort, elodea, and chara are species usually controlled with the triploid sterile grass carp. Plants that are not preferred by the grass carp and, therefore, are not controlled very well include emergent tough or woody stem species such as cattail, waterlily, and rush. Filamentous algae, watermilfoil, Nitella, and watershield are not controlled very well.

Only the triploid sterile grass carp may be introduced into Virginia waters for aquatic weed control. A permit must be obtained from the Virginia Department of Game and Inland Fisheries. An application may be obtained by a request via telephone (804) 367-8629 or through the Web (<http://www.dgif.state.va.us/forms/PERM/PERM-001.pdf>). The application will not be processed without a detailed map(s) of the area. Application must also include the type of weeds and the percent of area covered, size (acres), primary use of the pond, number of fish required, and means for containment of the fish. The application requires a \$10 fee and a few weeks for granting approval. These fish may be stocked in relatively small impoundments where they can be readily contained. After receiving a permit, there are locations approved by the Department of Game and Inland Fisheries to purchase guaranteed triploid sterile grass carp.

Triploid sterile grass carp about 10 inches long are stocked in ponds at approximately 7 to 15/acre. A fisheries biologist may visit the site before issuing a permit.

