

Aquatic Weed Control in Private and Public Waters

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Aquatic weeds in ponds or lakes can be controlled by physical removal, biological control, or herbicides. The method, or combination of methods, used will depend on factors such as target weeds, non target plants, and what the water is used for. Physical removal can be accomplished manually or with machinery. It is time consuming, expensive and normally used alone if other methods are not feasible. However, a certain amount of physical removal may be necessary in combination with the use of biological control and herbicides.

Biological control is an option for certain aquatic weeds. The major advantages are ease of application and no concern over damage to plants irrigated with treated water. Triploid grass carp can control many submerged vascular aquatic weeds. Grass carp are usually used to control all vegetation in a pond, rather than selectively controlling certain vegetation. Replacement stocking of grass carp is necessary when fish are lost. A permit is required to stock grass carp, and only triploid fish can be legally used in SC. Tilapia are stocked in the spring and control most algae species. The concern with tilapia is that they are tropical animals and usually die during cold winters thereby requiring an annual stocking. Tilapia are legal for use in SC. The South Carolina Department of Natural Resources (SC DNR) now requires a free of charge permit prior to stocking tilapia and triploid grass carp for aquatic weed control in SC. A permit can be obtained from SC DNR at 803-734-3891 or from registered dealers in SC. The short permit can be FAXed (803-734-4748) for a rapid turn around. Check with your Department of Natural Resources to determine if grass carp and tilapia are legal to stock and if a permit is required in your state.

Diquat, endothall, glyphosate, fluridone, triclopyr, copper, sodium carbonate Peroxyhydrate, 2,4-D, carfentrazone, imazapyr, penoxsulam and imazamox compounds can be used safely in ponds used as irrigation sources if the manufacturer's label directions are followed. Certain waiting periods may be required before using water for irrigation after the herbicide is applied, while in some cases waiting periods are not required. Various chemicals have different product formulations; only aquatic labeled pesticides and surfactants/adjuvants may be used in aquatic applications, by law. ***Labels change frequently; refer to the current herbicide label for specific application information. Never exceed the rates recommended on label of the specific product applied. The label is the law.***



Amount of Formulation for Application

Herbicide	Rate*
Aquathol	0.3 to 2.6 gal/acre foot of 4.2 L or 13 to 108 lb of 10G/acre foot or 2.2 to 22.0 lb of 63G/acre foot.
Hydrothol	0.3 to 3.4 gal/acre foot of 2L or 11 to 136 lb of 11G/acre foot.
Diquat	1 to 2 gal/surface acre of 2L.
2,4-D	1 to 2 gal/surface acre of 3.8 L or 150 to 200 lb of 20G/surface acre.
Copper Compounds	0.6 to 3.4 gal of Chelated Copper/acre foot or 0.1 to 0.5 ppm elemental copper.
Fluridone	0.25 to 0.5 gal/surface acre. Check with Company rep for exact rates.
Glyphosate	4.5 to 7.5 pt/surface acre of 5.4L.
Triclopyr	2 to 8 quarts per surface acre of 3L.
Sodium Carbonate Peroxyhydrate	3 to 170 pounds per acre-foot of 50G.
Imazapyr	2 to 6 pints per acre.
Carfentrazone	3.4 to 13.5 fl. oz. per surface acre for floating vegetation - 0.286 gal/acre foot for submerged
Penoxsulam	10 to 150 ppb; Not to exceed 150 ppb per growing season. Follow label for specific rates.
Imazamox	32 to 64 fl. oz. per surface acre broadcast foliar application. 50 to 500 ppb in water treatment

***Acre foot** = 1 surface acre of water (43,560 ft²) 1 foot deep.



Effectiveness of Herbicides for Aquatic Weed Control

Weed	Copper complexes Copper sulfate	2,4-D	Diquat (Reward)	Endothol Aquathol K & G	Endothol Hydrothol G & 191	Fluridone	Glyphosate	Sodium Carbonate Peroxhydrate	Trichlopyr	Imazapyr	Carfentrazone	Penoxsulam	Imazamox
Algae													
Filamentous	E	P	P	-	G	P	P	E	-	-	-	-	-
Planktonic	E	P	G	-	G	P	P	E	-	-	-	-	-
Branched (Chara)	E	P	G	-	G	P	P	P	-	-	-	-	-
Nitella	E	P	G	-	G	P	P	P	-	-	-	-	-
Floating plants													
Bladderwort	P	P	E	-	-	E	-	P	-	-	-	-	G
Duckweeds	P	G-1	G	P	P	E	P	P	-	E	E	E	-
Water hyacinth	P	E	E	-	-	P	G	P	E	E	E	E	E
Watermeal	P	P	P	-	-	G	P	P	-	-	G	G	-
Submersed plants													
Broadleaf watermilfoil	P	-	E	E	E	E	P	P	E	-	G	E	-
Coontail	P	G	E	E	E	E	P	P	-	-	-	-	-
Egeria	P	P	G	F	F	E	P	P	-	-	-	E	-
Elodea	P	-	E	F	F	E	P	P	-	-	-	E	-
Eurasian millfoil	P	E	E	E	E	E	P	P	E	-	E	E	F
Fanwort	P	F	G	E	E	E	P	P	-	-	-	-	-
Hydrilla	F-2	P	G	G	G	E	P	P	-	-	-	E	F
Naiads	P	F	E	E	E	E	P	P	-	-	-	G	-
Parrotfeather	P	E	E	E	E	-	F	P	F	E	E	G	G
Pondweeds (Potamogeton)	P	P	G	E	E	E	P	P	-	-	-	E	G

Effectiveness of Herbicides for Aquatic Weed Control - Continued

Weed	Copper complexes Copper sulfate	2,4-D	Diquat (Reward)	Endothol Aquatol K & G	Endothol Hydrothol G & 191	Fluridone	Glyphosate	Sodium Carbonate Peroxhydrate	Trichlopyr	Imazapyr	Carfentrazone	Penoxsulam	Imazamox
Emergent plants													
Alders	P	E	F	P	P	P	E	P	-	-	-	-	-
Alligatorweed	P	F	P	P	P	G	E	P	E	E	G	G	G
American lotus	P	E	P	P	P	F	G	P	E	E	-	-	F
Arrowhead	P	E	G	G	G	-	E	P	-	E	-	G	-
Buttonbush	P	E	F	P	P	P	G	P	-	E	-	-	-
Cattails	P	G	G	P	P	F	E	P	-	E	-	-	E
Common reed	P	P	P	P	P	P	G	P	-	E	-	-	F-G
Fragrant & white waterlily	P	E	P	P	P	E	E	P	E	E	-	-	G
Frogbit	P	E	E	-	-	-	-	P	E	E	-	-	E
Grasses, most	P	P	P	P	P	P	G	P	-	E	-	-	F
Maidencane	P	P	F	-	-	F	E	P	-	E	-	-	-
Pickerelweed	P	G	G	-	-	P	F	P	E	E	-	G	E
Pond-edge annuals	P	-	G	-	-	E	E	P	-	E	-	-	-
Rush	P	P	F	P	P	F	E	P	-	E	-	-	-
Sedges and rushes	P	F	F	P	P	P	G	P	-	E	-	-	-
Slender spikerush	P	-	G	-	-	G	P	P	-	-	-	G	F
Smartweed	P	E	F	-	-	F	E	P	E	E	-	G	G
Spatterdock	P	E	P	P	P	E	G-E	P	E	E	-	-	G
Southern watergrass	P	P	-	-	-	G	E	P	-	-	-	-	-
Torpedograss	P	P	P	-	-	F	G	P	-	E	-	-	-
Watershield	P	E	P	-	-	G	G	P	-	-	-	-	G
Water pennywort	P	G	G	P	P	P	G	P	E	E	-	E	E
Water primrose	P	E	F	-	-	F	E	P	E	E	G	-	F
Willows	P	E	F	P	P	P	E	P	-	E	-	-	-

E=excellent control (90 to 100%); G=good control (80 to 89%); F=fair control (70 to 79%); P=poor control (<70%). A blank space indicates weed response is not known.

¹Ester formulations only.

²Copper complex only.

Waiting Period (Days) Before Using Water After Application of Herbicides for Aquatic Weed Control

Common Name	Trade Name	Irrigation	Fish Consumption	Watering Livestock	Swimming
Copper	Crystalline copper sulfate and various liquid organic copper complexes	NR ¹	NR	NR	NR
2,4-D	Various formulations and manufacturers ²	Water use restrictions vary by formulation and manufacturer. Certain labels allow irrigation if an approved chemical assay has reached acceptable levels. A few labels allow irrigation with specific waiting periods. Certain labels may allow irrigation on established turf, immediately. CHECK INDIVIDUAL LABEL.			
Diquat	Reward	1 to 3 ³	NR	1	NR
	Weedtrine D	5	NR	5	NR
Endothall	Aquathol K	7 to 25	NR	7 to 25	NR
	Aquathol granular	7 to 25	NR	7 to 25	NR
	Aquathol Super K	7 to 25	NR	7 to 25	NR
	Hydrothol 191	7 to 25	NR	7 to 25	NR
	Hydrothol 191 granular	7 to 25	NR	7 to 25	NR
Fluridone	Avast, Sonar AS, Sonar SRP, Sonar PR, Sonar Q	7-30+	NR	NR	NR
Glyphosate	Rodeo, AquaNeat, AquaMaster, AquaPro	NR	NR	NR	NR
Sodium Carbonate Peroxyhydrate	Green Clean, Pak 27, Phycomycin	NR	NR	NR	NR
Triclopyr	Renovate	120 ⁴		NR ⁵	NR
Imazapyr	Habitat	120	NR	NR	NR
Carfentrazone	Stingray	0-14 ⁶	NR	0 to 1	NR0
Penoxsulam	Galleon	<30 ppb Turf <1 ppb Others	NR	NR	NR
Imazamox	Clearcast	See note 7	NR	NR	NR

¹NR = No restrictions.

²Most formulations do not permit application to ponds used for irrigation or for watering dairy cattle.

³Three days for irrigation of turf and nonfood crops; five days for irrigation of food crops (including tobacco) or for preparation of agricultural sprays.

⁴No restriction for established grasses and assay to reduce restriction time.

⁵14 day restriction on grazing site and growing. Season grazing restriction on lactating livestock after irrigating pasture.

⁶1 day if <20% of surface acreage is treated. 14 days if >than 20% is treated. Certified lab test of <5 ppb.

⁷DO NOT use treated water for greenhouses, nurseries or hydroponics – bioassay for canola, onions, potatoes or sugar beets – other crops 1 day

Common Aquatic Plants Consumed by Grass Carp¹

Plants in order of common name preference

hydrilla 1	hygrophila 9	maidencane ² (<i>Panicum</i>) 16
chara (muskgrass) 2	cattail 10	parrot feather 16
pondweeds (<i>Potamogeton</i>) 3	torpedograss 10	know grass (<i>Paspalum</i>) 17
bushy pondweed (Southern naiad) 4	salvinia 10	water hyacinth 17
elodea 5	water-aloë (<i>Stratiotes</i>) 11	giant bulrush ² 18
watermeal 6	watercress 12	water lettuce 18
duckweeds 7	torpedograss 13	soft-stem bulrush ² 19
water-fern (<i>Azolla</i>) 7	Eurasian watermilfoil 14	water lilies 19
coontail 8	eel grass (<i>Vallisneria</i>) 15	

1 Adapted from "Grass Carp - A Fish for Biological Management of Hydrilla and Other Aquatic Weeds in Florida" by David L. Sutton and Vernon V. Vandiver, Jr., University of Florida IFAS, Bulletin 867; and from "Managing Aquatic Vegetation With Grass Carp - A Guide For Water Resource Managers" edited by John R. Cassani, American Fisheries Society, Bethesda, Maryland.

2 Young, succulent, underwater shoots are preferred.

Some plants have the same number, which means grass carp like them equally.

Aquatic Plant Management Internet References

Applying Aquatic Herbicides. Category 5 Aquatic Pest Control - Extension Pesticide Safety Education Program, Clemson University
<http://entweb.clemson.edu/pesticid/Category/Cat05.htm>

AQUAPLANT – A Pond Manager Diagnostic Tool – Texas AgriLife Extension Service, Texas A&M University
<http://aquaplant.tamu.edu/>

Aquatic Plant Control Research Program – U.S. Army Corps of Engineers
<http://el.ercdc.usace.army.mil/aqua/>

Aquatic Plant Information System
<http://el.ercdc.usace.army.mil/aqua/apis/apishelp.htm>

Center for Aquatic and Invasive Plants – University of Florida, IFAS
<http://plants.ifas.ufl.edu/>