

AQUATIC WEED CONTROL

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Several options, including hand removal, cultural, mechanical, biological, and chemical control techniques are available for the management of aquatic weeds. The applicator should choose the most environmentally acceptable and cost-effective alternative that is available for a particular weed problem. The particular management strategy to use in a given situation will depend on the intended use of the body of water, fish, and wildlife populations that may be impacted, type of environment in which the weed problem occurs, and the particular weed species of concern. Before selecting your management strategy, **be sure to have the weed(s) of concern identified by a qualified individual.**

Assistance in weed identification is available from the Cooperative Extension center in your county. Additional information on management techniques also may be obtained from the county Extension center; ask for AG-437, *Weed Management in Small Ponds*; AG-438, *Weed Control in Irrigation Water Supplies*; and AG-449, *Hydrilla, A Rapidly Spreading Aquatic Weed in North Carolina*. Information on pond construction, stocking, and general pond management may be found in AG-424, *Pond Management Guide*. Additional information may be found on the Aquatic Weed Management Web site:

<http://cropsci.ncsu.edu/aquaticweeds>

For the purpose of description and management, aquatic weeds may be grouped either on the basis of their botanical relationships or on the basis of their growth habits. Most plants in each group are managed similarly, with some exceptions.

TABLE 8-9A. AQUATIC WEED GROUPS — Grouping of Aquatic Plants on the Basis of Botanical Relationships

Category and Description	Examples
1. <i>Algae</i> — These plants may be either microscopic or visible to the naked eye, exist as single cells or occur in clusters or filaments containing many cells, and may be either free floating (planktonic) or attached to the soil, rocks, or vegetation. Filamentous algae may be unbranched, slightly or highly branched, or net-like. Some planktonic algae are mobile. Certain types of algae (macroalgae) may be large, very coarse, and resemble submersed vascular plants. Most algae (except macroalgae) usually require magnification to be identified accurately. Algae do not contain vascular (water conducting) tissues, consequently all chemicals used for algae control have only contact activity. Algae reproduce by cell division, fragmentation, and sexually by spores.	<p>Filamentous Algae Bluegreens or Cyanobacteria Giant <i>Lyngbya</i> Green algae <i>Oedogonium</i> <i>Hydrodictyon</i> (water net) <i>Spirogyra</i> <i>Pithophora</i></p> <p>Planktonic Algae Bluegreens or Cyanobacteria <i>Lyngbya</i> <i>Anabaena</i> <i>Oscillatoria</i> <i>Microcystis</i> Euglenoids (<i>Euglena</i>)</p> <p>Macroalgae Muskgrass (<i>Chara</i>) Stonewort (<i>Nitella</i>)</p>
2. <i>Mosses</i> — These plants are visible to the naked eye and resemble delicate, leafy submersed plants. The mosses lack vascular tissues or roots, but usually are attached to the soil. Mosses reproduce sexually by spore production.	<p><i>Fontinalis</i> <i>Sphagnum</i> (peat moss)</p>
3. <i>Ferns</i> — These plants are visible to the naked eye, either free floating or rooted to the bottom, occasionally forming loosely consolidated floating mats. Ferns have vascular tissues and reproduce by vegetative propagation and sexually by spores.	<p>Giant salvinia (<i>Salvinia molesta</i>) Mosquito fern (<i>Azolla</i> spp.) Water clover (<i>Marsilea quadrifolia</i>) Water spangles (<i>Salvinia minima</i>)</p>
4. <i>Vascular flowering plants</i> — These plants may be rooted or unrooted, free floating, submersed, floating-leaved, or emergent. Most reproduce vegetatively by means of rhizomes, stolons, and various other vegetative perennating structures including turions and tubers. Most also produce flowers and may set seeds. This group has a vascular system that shows varying degrees of development from rudimentary in the case of the duckweeds and submersed species to very complex and highly developed in emergent plants and includes annual and perennial herbaceous forms and several woody species.	<p>Bald cypress (<i>Taxodium distichum</i>) Bladderwort (<i>Utricularia</i> spp.) Bulrushes (<i>Scirpus</i> spp.) Cattail (<i>Typha</i> spp.) Duckweed (<i>Lemna</i> spp. and <i>Spirodela</i> spp.) Hydrilla (<i>Hydrilla verticillata</i>) Naiads (<i>Najas</i> spp.) Pondweeds (<i>Potamogeton</i> spp.) Rushes (<i>Juncus</i> spp.) Spikerushes (<i>Eleocharis</i> spp.) Waterhyacinth (<i>Eichhornia crassipes</i>) Watermilfoils (<i>Myriophyllum</i> spp.)</p>

TABLE 8-9B. AQUATIC WEED GROUPS — Grouping of Aquatic Plants on the Basis of Growth Habit

NOTE: Some species have growth habits that overlap and may be listed more than once.

Category and Description	Examples
<p>1. <i>Submersed plants</i> — Plants in this group grow beneath the surface of the water and may be rooted to the bottom or free floating, with or without roots. Flowers usually are produced above the surface of the water and occasionally may be supported by specialized floatation structures. Some species will produce emergent floral spikes that extend several inches above the surface of the water and are covered with bracts that resemble leaves. Submersed plants usually have poorly developed vascular systems and very limited structural tissue and depend on the water's buoyancy for support. Filamentous algae and macroalgae also could be considered submersed plants.</p>	<p>American elodea (<i>Elodea canadensis</i> and <i>E. nuttallii</i>) Bladderwort (<i>Utricularia</i> spp.) Brazilian elodea (<i>Egeria densa</i>) Brittle naiad (<i>Najas minor</i>) Coontail (<i>Ceratophyllum demersum</i>) Creeping rush (<i>Juncus repens</i>) Eurasian watermilfoil (<i>Myriophyllum spicatum</i>) Fanwort (<i>Cabomba caroliniana</i>) Hydrilla (<i>Hydrilla verticillata</i>) Parrotfeather (<i>Myriophyllum aquaticum</i>) Pondweeds (<i>Potamogeton</i> spp.) Proliferating spikerush (<i>Eleocharis baldwinii</i>) Southern naiad (<i>Najas guadalupensis</i>) Variable-leaf milfoil (<i>Myriophyllum heterophyllum</i>) Widgeongrass (<i>Ruppia maritima</i>) Wild celery (<i>Vallisneria americana</i>)</p>
<p>2. <i>Free-floating plants</i> — Plants in this group float on the surface of the water and may lie flat on the water or be raised well above the surface. These plants, with the exception of the duckweeds, watermeal, and mosquito ferns, have well-developed vascular systems and substantial supportive tissues. Most form true roots. Flowers extend above the surface of the water in the flowering plants.</p>	<p>Duckweeds (<i>Lemna</i> spp. and <i>Spirodela</i> spp.) Floating heart (<i>Nymphoides aquatica</i>) Frogbit (<i>Limnobium spongia</i>) Giant salvinia (<i>Salvinia molesta</i>) Mosquito fern (<i>Azolla caroliniana</i>) Waterhyacinth (<i>Eichhornia crassipes</i>) Waterlettuce (<i>Pistia stratiotes</i>)</p>
<p>3. <i>Floating leaf plants</i> — These plants are rooted in the bottom and have their leaves attached to long, tough stems that extend to the surface from depths up to 6 ft or more. The leaves float directly on the surface of the water. Mature leaves of some species may push well above the surface into an emergent position. Most of these plants have extensive root and rhizome systems and well-developed vascular systems and supportive tissues. Flowers float just above the surface or are extended well above the surface on a tough stem. A few nonvascular representatives.</p>	<p>American lotus (<i>Nelumbo lutea</i>) Fragrant waterlily (<i>Nymphaea odorata</i>) Illinois pondweed (<i>Potamogeton illinoensis</i>) Spatterdock (<i>Nuphar luteum</i>) Water clover (<i>Marsilea quadrifolia</i>) Watershield (<i>Brasenia schreber</i>)</p>
<p>4. <i>Emergent plants</i> — These plants grow rooted in the bottom with their leaves and green stems extending well above the surface of the water. A few species also may form floating mats. All have extensive root and rhizome systems and well-developed vascular systems and supportive tissues. Reproduction occurs vegetatively by rhizomes and stolons; floating mat-forming species also reproduce readily by stem fragmentation. Most flower prolifically and form many seeds.</p>	<p>Broadleaf Species Arrow arum (<i>Peltandra virginica</i>) Arrowhead (<i>Sagittaria</i> spp.) Asian spiderwort (<i>Murdannia keisak</i>) Frogbit (<i>Limnobium spongia</i>) Lizard's tail (<i>Saururus cernuus</i>) Pickernelweed (<i>Pondederia cordata</i>) Smartweeds (<i>Polygonum</i> spp.)</p> <p>Mat-forming Broadleaf Species Alligatorweed (<i>Alternanthera philoxeroides</i>) Creeping waterprimrose (<i>Ludwigia hexapetala</i>) Water pennywort (<i>Hydrocotyle</i> spp.) Water willow (<i>Justicia americana</i>)</p> <p>Sedges, Rushes, Spikerushes, and Grasses Bulrush (<i>Scirpus</i> spp.) Cattail (<i>Typha</i> spp.) Common reed (<i>Phragmites australis</i>) Flat sedge (<i>Carex</i> spp.) Foursquare (<i>Eleocharis quadrangulata</i>) Maidencane (<i>Panicum hemitomon</i>) Rushes (<i>Juncus</i> spp.) Sedge (<i>Cyperus</i> spp.) Soft rush (<i>Juncus effusus</i>) Softstem bulrush (<i>Scirpus validus</i>) Southern wildrice (<i>Zizaniopsis miliacea</i>) Spikerushes (<i>Eleocharis</i> spp.) Threesquare bulrush (<i>Scirpus americanus</i>) Torpedograss (<i>Panicum repens</i>) Water paspalum (<i>Paspalum repens</i>) Woolgrass (<i>Scirpus cyperinus</i>)</p> <p>Other Common Species Bur-reed (<i>Sparganium americanum</i>) Scouring rush (<i>Equisetum hymale</i>)</p>
<p>5. <i>Woody plants</i> — These are obligate, aquatic species of trees usually growing totally flooded or in saturated soils, but occasionally occur in upland areas (usually planted there). Some form systems of "knees" to provide aeration for the root systems. They are deciduous, dropping leaves in the autumn, and are rarely if ever vegetative during winter months.</p>	<p>Bald cypress (<i>Taxodium distichum</i>) Pond cypress (<i>Taxodium ascendens</i>) Tupelo (<i>Nyssa aquatica</i>)</p>

BIOLOGICAL CONTROL OF AQUATIC WEEDS WITH TRIPLOID GRASS CARP

The triploid, sterile grass carp is the most cost-effective and environmentally acceptable method for control of many aquatic weeds in ponds and other small impoundments in North Carolina and should always be considered as a potential alternative **before** choosing another management strategy, particularly herbicides. Grass carp are effective on most **submersed weeds** and should be considered the best alternative for most weeds in this group. They generally are less effective on algae and weeds in the floating and emergent groups. Refer to the chart below for information on the relative effectiveness of grass carp for different weeds.

Grass carp are normally stocked at 15 fish per acre in small ponds. In larger ponds, they are usually stocked at 15 to 20 fish per **vegetated** acre. Large fish (minimum of 8 to 10 inches long)

should be stocked to prevent loss due to predation by large bass and wading birds. If the surface of the pond is **completely covered** with vegetation, some limited herbicide application or mechanical removal of weeds from a portion of the pond will be necessary before stocking to allow oxygen to reach the underlying water. Grass carp may be stocked at any time of the growing season, but best results are usually obtained by a late summer or fall stocking.

No permit is required to purchase up to 150 triploid grass carp. A permit from the Wildlife Resources Commission is required for larger stockings. Permits, a list of certified distributors, and additional information on stocking of the triploid grass carp may be obtained from the Wildlife Resources Commission at (919) 733-3633.

TABLE 8-10. BIOLOGICAL CONTROL OF AQUATIC WEEDS WITH TRIPLOID GRASS CARP

Weed	Relative Effectiveness	Comments
ALGAE Filamentous (green and bluegreen) and planktonic	Poor	High stocking rates (60 to 75 or more fish per acre) with small fish (4 to 6 in. size) are required to achieve temporary control; control usually decreases as fish grow larger and are unable to feed on the algae.
MACROALGAE Chara and Nitella	Good to Excellent	Chara usually is beneficial to fish and wildlife.
FLOATING AND FLOATING-LEAVED WEEDS Duckweeds, watermeal	Poor	Small fish at very high stocking rates (see filamentous algae above) may give control; larger fish at normal stocking rates usually are not effective.
Water ferns (Azolla and Salvinia)	Fair to Poor	
Alligatorweed, water lilies, water primrose, lotus, watershield, spatterdock, waterhyacinth	Poor	Grass carp may feed lightly on weeds in this group, but control is usually unacceptable.
EMERGENT AND MARGINAL WEEDS Cattails, rushes, common reed, bulrushes, pickerelweed, pennywort, arrowhead	Poor	Grass carp may feed lightly on weeds in this group, but control is usually unacceptable.
SUBMERSED WEEDS	Good to Excellent	Most rooted and free-floating submersed weeds in ponds are readily controlled with triploid grass carp; control may be poorer on the watermilfoils, particularly Eurasian waterfoil.

TABLE 8-11. CHEMICAL CONTROL OF AQUATIC PLANTS

Weed	Herbicide and Formulation	Amount of Formulation	Active Ingredient Rate or Concentration	Precautions and Remarks*
ALGAE, blue-green	copper sulfate (Bluestone)	3.4 to 6.8 lb/acre ft	0.5 to 1 ppm	Apply crystals or powder at early stage of growth by any method to give rapid and uniform dispersion. For best results, apply on a clear day. Do not apply to muddy water. Warning: Copper is toxic to fish.
ALGAE, filamentous and planktonic	copper complex (various)	0.6 gal/acre ft	0.2 ppm	Dilute with water in ratio of at least 9-to-1 and apply uniformly. For best results, apply on a clear day and break up floating mats of filamentous algae before treatment. Warning: Copper is toxic to fish.
	copper sulfate (Bluestone)	3.4 to 6.8 lb/acre ft	0.5 to 1 ppm	Same as under Algae, blue-green. For best results break up floating mats of filamentous algae before treatment. Warning: Copper is toxic to fish.
	diquat (Reward) 2 lb/gal	see label	0.5 to 1.5 ppm	For certain filamentous algae— <i>Pithophora</i> spp. and <i>Spirogyra</i> spp. Check label for application instructions. For best results, break up floating mats before treatment.
ALGAE, macro, chara, nitella	copper complex (Cutrine-Plus Granular) 3.7 G (Cutrine-Plus) 0.9 lb/gal (K-Tea) 0.8 lb/gal (Aquatrine) 0.9 lb/gal	60 lb/surface acre 1.2 gal/acre ft 1.7 to 3.4 gal/acre ft 1.2 gal/acre ft	2.2 lb/acre 0.4 ppm 0.5 to 1.0 ppm 0.4 ppm	Distribute granular formulation evenly over infested area when plants are young. If chara is in water less than 3 ft deep or growth is near the surface, the liquid formulation may be used. Dilute with water in ratio of at least 9-to-1 and apply uniformly. Warning: Copper is toxic to fish.
FLOATING WEEDS (except watermeal)	diquat (Reward) 2 lb/gal	0.5 to 0.75 gal/surface acre 1 gal/surface acre	1 to 1.5 lb/acre 2 lb/acre	Weeds controlled: pennywort, salvinia, waterhyacinth, waterlettuce. Apply in a spray volume of 150 to 200 gal of water per acre plus 1 pt nonionic surfactant. For duckweed control — apply in a spray volume of 50 to 150 gal of water per acre. Take care to cover all plants on water and damp marginal areas. Will require retreatment. A nonionic surfactant at 0.5% by volume will be needed.
	fluridone (Avast!) (Sonar) 4 AS	Ponds: 0.16 to 1 qt/acre	0.16 to 1 lb/acre	See label for specific weeds controlled. For duckweed, apply as surface spray in 5 to 100 gal of water. Take care to cover all plants on water and damp marginal areas. Do not use treated water for irrigation for 7 to 30 days. See label for irrigation precautions. Warning: 30 days may be insufficient restriction if applied to small ponds and pond water will be used to irrigate very sensitive crops, such as tobacco, tomatoes, or peppers.
FLOATING WEEDS (except duckweed, Azolla, Salvinia, or watermeal)	glyphosate (Aqua Neat) 5.4 lb/gal (AquaPro) 5.4 lb/gal (AquaMaster) 5.4 lb/gal (Eagre) 5.4 lb/gal (Rodeo) 5.4 lb/gal	1.25%		For control of waterlilies, spatterdock, and lotus, apply as foliar spray on a <i>calm</i> day when there is little to no wave action. Vegetation must be on or above the surface for treatment to be effective. A nonionic surfactant (e.g. Cide-Kick or Induce) is required with Rodeo. If applying from a boat, take care not to create waves that may wash the herbicide off floating leaves.
FLOATING WEEDS watermeal	fluridone (Avast!) (Sonar) 4 AS	Ponds: 1 to 1.5 qt/acre	1 lb/acre	Use the <i>maximum</i> labelled rate for the average depth of your pond. Do not apply when there is substantial outflow from the pond. Do not apply as a spot treatment. Apply as a surface spray in 5 to 100 gal of water. Take care to cover all plants on water and damp marginal areas. Apply most of the treatment to the mass of watermeal when it is blown up to the end of the pond away from the outflow. Do not use treated water for irrigation for 7 to 30 days. See label for irrigation precautions. Warning: 30 days may be insufficient restriction if pond water will be used to irrigate very sensitive crops, such as tobacco, tomatoes, or peppers.
EMERGENT, MARGINAL, AND DITCHBANK WEEDS	2,4-D granular (Navigate) 20 G (2,4-D Gran 20) 20 G (Weedtrine II)	150 to 200 lb/surface acre	30 to 40 lb/acre	Weeds controlled: arrowhead, bulrush, creeping waterprimrose, pickerelweed, smartweed, spatterdock, waterchestnut, waterlily, watershield. Rate depends upon species and depth of water. Check label. Apply early, when weeds are actively growing, with a rotary seeder. Spatterdock may require retreatment.
	diquat (Reward) 2 lb/gal (Weedtrine) 0.4 lb/gal	1 gal/surface acre	2 lb/acre	For control of cattails in ponds or lakes. For top kill, apply in 100 gal of water per acre with 0.25% to 0.5% nonionic surfactant. Apply before flowering for best results. Retreat as needed.
	diuron (Karmex 80 WP)	20 lb/acre	16 lb/acre	Apply only when water is not in ditch. Herbicide must be fixed in soil before irrigating from ditch. See label for instructions. Warning: Do not apply into water.
	glyphosate (AquaMaster) 5.4 lb/gal (Aqua Neat) 5.4 lb/gal (AquaPro) 5.4 lb/gal (Eagre) 5.4 lb/gal (Rodeo) 5.4 lb/gal	see label		Rates vary according to target species. Retreatment of alligatorweed is necessary. Aquatic-approved nonionic surfactant (e.g. Cide-Kick or Induce) required with Rodeo. Note: The use of very hard water or water containing high concentrations of iron to prepare spray solutions may result in reduced efficacy of glyphosate.
	2,4-D amine (Weedar 64) 3.8 lb ae/gal	0.5 to 1 gal/acre	2 to 4 lb/acre	Thorough wetting of foliage is essential. Apply in 100 to 400 gal of water per acre. Use low pressure, large nozzle and spray thickener. For use on nonirrigation ditchbanks only. Do not apply to water.
SUBMERSED WEEDS**	imazapyr (Arsenal) 2 lb/gal	0.25 to 0.50 gal/acre	0.5 to 1 lb/acre	For use on nonirrigation ditchbanks only.
	diquat (Reward) 2 lb/gal	1 to 2 gal/surface acre	2 to 4 lb/acre	Weeds controlled: bladderwort, coontail, elodea, naiads, pondweeds. 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. Not effective in muddy water.
	endothall (Aquathol K) 4.2 lb/gal (Aquathol Granular) 10G (Aquathol Super K) 63 G	0.3 to 2.6 gal/acre ft 13 to 108 lb/acre ft 2.2 to 17.6 lb/acre ft	0.5 to 4 ppm	Weeds controlled: bass weed, bur reed, coontail, hydrilla (Aquathol K only), pondweeds, watermilfoil, water star grass. Rate depends upon weed species and type of treatment. Spot or marginal treatments require higher rates. Aquathol Granular is especially useful for spot or marginal treatments.

TABLE 8-11. CHEMICAL CONTROL OF AQUATIC PLANTS

Weed	Herbicide and Formulation	Amount of Formulation	Active Ingredient Rate or Concentration	Precautions and Remarks*
SUBMERSED WEEDS** (continued)	fluridone (Avast!) (Sonar) AS	Ponds: 0.16 to 1 qt/acre Lakes: 0.2 to 4 qt/acre Canals: 2 qt/acre	0.16 to 1 lb/acre 0.2 to 4 lb/acre 2 lb/acre	Do not use water for irrigation for 7 to 30 days. See label for specific irrigation precautions. Application to canals should be made only if water flow can be restricted. Warning: 30 days may be insufficient restriction if applied to small ponds and pond water will be used to irrigate very sensitive crops, such as tobacco, tomatoes, or peppers.
	(Avast! SRP) (Sonar SRP)	Ponds: 3.2 to 30 lb/acre Lakes: 4 to 80 lb/acre Canals: 40 lb/acre Rivers: 40 lb/acre	0.16 to 1.5 lb/acre 0.2 to 4 lb/acre 2 lb/acre 2 lb/acre	
	2, 4-D granular (Navigate) 20 G	100 to 200 lb/ surface acre	20 to 40 lb/acre	Rate depends upon weed to be controlled and depth of water. Check labels for species and rates. Apply uniformly with a rotary seeder.

* Also see comments for specific herbicides under "Labeled Sites and Restrictions."

** Grass carp give the most cost-effective control on the majority of the weeds in this group and should be given consideration *before* using herbicides. Contact the Wildlife Resources Commission at (919) 733-3633 for information. A permit is required to purchase more than 150 grass carp or for stocking in impoundments larger than 10 acres. Grass carp usually are **not effective** on filamentous algae, duckweed, watermeal, or any of the plants in the emerged and marginal group.

TABLE 8-12. WAITING PERIOD (IN DAYS) BEFORE USING WATER AFTER APPLICATION OF HERBICIDES FOR AQUATIC WEED CONTROL

Herbicide	Irrigation	Fish Consumption	Watering Livestock	Swimming
copper (Copper sulfate pentahydrate, including Bluestone and EarthTec; and complexed copper formulations, including Algae-Pro, Captain, Clearigate, Cutrine-Plus, Cutrine-Plus Granular, K-Tea, Komeen, etc.)	NR ¹	NR	NR	NR
diquat (Reward)	3 to 5 ²	NR	1	NR
endothall (Aquathol K) (Aquathol granular) (Aquathol Super K) (Hydrothol 191) (Hydrothol 191 granular)	7 to 25 7 7 14 7	3 3 3 3 3	7 to 25 14 NR 14 14	NR 1 NR 1 1
fluridone (Avast!) (Avast! SRP) (Sonar 4AS) (Sonar SRP)	7 to 30 ³	NR	NR	NR
glyphosate (AquaMaster) (Aqua Neat) (AquaPro) (Eagre) (Rodeo)	NR	NR	NR	NR
2,4-D (various formulations and manufacturers) ⁴	—	—	—	—

¹ NR = No restrictions

² Water use restrictions of 3 days apply to irrigation of turf and nonfood crops; the five-day restriction is for food crops (including tobacco) and preparation of agricultural sprays.

³ Water-use restrictions for irrigation vary with formulation. See label for precautions. A 30-day restriction may be insufficient if applied to small ponds intended for irrigation of very sensitive crops, such as tobacco.

⁴ Water use restrictions vary by formulation and manufacturer. In general, if water is used for irrigating sensitive crops, 2,4-D should not be used. Turfgrasses are generally tolerant to low concentrations of 2,4-D. Also, many 2,4-D formulations are NOT labelled for aquatic use. Read the label before purchasing and/or use.

POND DYES

Pond dyes may be used to prevent the growth of filamentous algae and submersed macrophyte vegetation. Pond dyes are not herbicides and do not kill aquatic plants. They function by blocking light penetration to the bottom of the pond. The use of a pond dye in aquacultural ponds usually is not recommended, as they tend to inhibit phytoplankton productivity that is needed to produce oxygen and provide food for zooplankton, which are the major food of fry and the smaller juvenile fishes. Application rates usually are about one part per million or 1 gallon per acre

for a pond averaging 4 feet deep (i.e., 1 gallon per 4 acre-feet of water) for algae and most submersed weeds. For hydrilla, the rate needs to be doubled, due to its ability to grow at very low light levels. Several of the available pond dyes are registered by the EPA for aquatic weed control. Others are marketed only as water colorants, but are less expensive and will function similarly to those dyes that have EPA registration. Pond dyes *should not be applied to drinking water supplies or to streams or any body of water where there is any substantial outflow.*

TABLE 8-13. POND DYES

Examples of Pond Dyes	EPA Registered
Admiral Liquid Aquashade Aquashadow True Blue	Yes Yes No—colorant only No—colorant only

TABLE 8-14. EFFECTIVENESS OF HERBICIDES RECOMMENDED FOR CONTROL OF WEEDS COMMONLY FOUND IN N.C. PONDS

	endothall		diquat	2, 4-D	copper compounds	fluridone	glyphosate
	Aquathol	Hydrothol					
FILAMENTOUS ALGAE	NR	E	E	NR	G	NR	NR
FLOATING PLANTS							
Duckweed	NR	NR	G	P	P	E	NR
Watermeal	NR	NR	P	NR	NR	G	NR
Alligatorweed	NR	NR	NR	P	NR	F	G
Creeping waterprimrose	NR	NR	NR	E	NR	ID	E
Waterhyacinth	NR	NR	G	E	NR	F	G
EMERSED PLANTS							
American lotus	NR	NR	NR	G	NR	G	E
Cattail	NR	NR	F	F	NR	G	E
Common reed	NR	NR	NR	NR	NR	NR	G
Fragrant waterlily	NR	NR	NR	G	NR	G	E
Rush	NR	NR	NR	P	NR	NR	G
Spadderdock	NR	NR	NR	P	NR	G	E
Waterpennywort	NR	NR	F	G	NR	G	E
Most grasses	NR	NR	F	P	NR	F	E
SUBMERSED PLANTS							
Bladderwort	P	P	G	P	NR	E	NR
Brazilian elodea	P	P	E	NR	F	E	NR
Coontail	E	E	E	G	NR	E	NR
Hydrilla	E	E	E	NR	F	E	NR
Parrotsfeather	E	E	G	E	NR	E	NR
Pondweed	E	E	E	NR	NR	E	NR
Proliferating spikerush	NR	NR	NR	NR	NR	E	NR
Brittle naiad	E	E	E	NR	NR	E	NR
Southern naiad	P	P	P	NR	NR	G	NR
Variable leaf milfoil	E	E	E	E	NR	G	NR

Key: NR = Not Recommended
 ID = Insufficient Data
 P = Poor
 F = Fair
 G = Good
 E = Excellent

Continued

TABLE 8-15. LABELED SITES AND RESTRICTIONS

Herbicide and Formulation	Labeled Sites	Restrictions
copper-complex (Cutrine-Plus) 0.9 lb/gal (Cutrine-Plus) 3.7 G (K-Tea) 0.8 lb/gal (Aquatrine) 0.9 lb/gal copper sulfate (Bluestone)	potable water reservoirs, farm and fish ponds, lakes, golf course water hazards, fish hatcheries	No restrictions on use of treated water. Check tolerance of crop to copper applied in irrigation water. Trout are very susceptible to copper. Toxicity to other fish increases with decreasing hardness of water.
diquat (Reward) 2 lb/gal	lakes, still ponds, ditches, laterals, waterways	Do not use treated water for irrigation of food crops, preparation of agricultural sprays, or for drinking for 5 days after application. Turf and nonfood crops may be irrigated 3 days after treatment. Do not use water for livestock for one day after treatment.
diuron (Karmex 80 WP)	dry irrigation and drainage ditches	Apply only when water is not in ditch. For irrigation ditches apply only during noncrop season and when ditch is not in use. Do not treat any ditch into which the roots of trees or other desirable plants may extend. Do not apply to water.
endothall (Aquathol K) 4.2 lb/gal (Aquathol Granular) 10 G	irrigation and drainage canals, ponds, lakes	Do not use fish for food or feed within 3 days of treatment. Waiting period for irrigation, preparing sprays for food crops, livestock watering, or domestic purposes is from 7 to 25 days, depending upon rate applied. Check label. Treated water may be used for sprinkling bentgrass immediately.
fluridone (Avast! 4 AS or SRP) (Sonar 4 AS or SRP)	lakes, ponds, canals	Treated ponds may not be used for irrigation for 7 to 30 days. See label for irrigation precautions. ¹
glyphosate (AquaMaster) (AquaNet) (AquaPro) (Eagre) (Rodeo) 5.4 lb/gal	all bodies of fresh water and all types of aquatic sites	Should not be applied in any estuarine areas or rice levees when flood water is present or within 0.5 mile upstream of potable intakes.
imazapyr (Arsenal) 2 lb/gal	nonirrigation ditchbanks	Do not apply into or over water. Do not use where total vegetation control will cause bank erosion.
2, 4-D amine (Weedar 64) 3.8 lb a.i./gal	quiescent or slow-moving waters	Delay the use of treated waters for irrigation and domestic purposes for 3 weeks after application or until water does not contain greater than 0.1 ppm 2,4-D acid. Do not treat irrigation ditches where water will be used for overhead irrigation of susceptible crops.
2,4-D granular (Navigate) 20 G	ponds and lakes	Do not apply to water used for irrigation, agricultural sprays, watering dairy animals, or domestic water supplies.

¹ Water use restrictions for irrigation vary with formulation. See label for precautions. A 30-day restriction may be insufficient if applied to small ponds intended for irrigation of very sensitive crops such as tobacco, tomatoes, or peppers.

These recommendations apply only to North Carolina. They may not be appropriate for conditions in other states and may not comply with laws and regulations outside of North Carolina. These recommendations are current as of August 2001. Individuals who use agricultural chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage regulations and examine a current product label before applying any chemical. For assistance, contact your county Cooperative Extension Service agent. The use of brand names and any mention or listing of commercial products or services in this publication does not imply endorsement by the North Carolina Cooperative Extension Service nor discrimination against similar products or services not mentioned.

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