

USE OF COPPER SULFATE IN PONDS WITH FISH

Copper sulfate is a contact herbicide recommended for algae control. If improperly used, copper can be toxic to fish by interfering with gill function. Trout and koi are particularly sensitive to copper. However, most fish kills associated with copper sulfate treatments are related to oxygen depletions due to the decomposition of dead plant material or a massive phytoplankton kill.

The effectiveness and safety of copper sulfate treatments are mostly determined by water alkalinity. In water with an alkalinity below 40 ppm (mg/l), the amount of copper sulfate needed to control algae can be toxic to fish. Copper sulfate treatments at water alkalinities below 20 ppm are extremely risky and should be avoided. Low alkalinity water is considered "soft" water and

can be very common in Arkansas fish ponds, especially watershed ponds. In high alkalinity water (>250-300 ppm), copper sulfate quickly binds with carbonate and precipitates out and, as a result, is not effective for algae control.

The toxicity of copper sulfate to fish also increases as water temperatures increase. It is best to try and avoid copper sulfate treatments during the summer months. In most cases, do not treat more than one-third to one-half of the pond at a time.

To calculate a copper sulfate treatment, you will need to know your pond's alkalinity, surface area and depth. A good starting "Recommended Dose Rate" for copper sulfate is typically 0.5 to 1.0 ppm. To calculate a pond's volume, multiply the acreage by the average depth.

In suitable water, the effective copper sulfate dosage can be calculated using the following formula:

$$\text{Maximum Safe Dose in ppm} = \text{Total Alkalinity (ppm)} / 100$$

$$\begin{aligned} \text{Amount copper sulfate needed (lbs)} = \\ \text{Max Safe Dose} \times \text{Recommended Dose Rate (ppm)} \\ \times \text{Volume (in acre*ft)} \times 2.72 \end{aligned}$$

To make a copper sulfate solution, mix 1½ lb of copper sulfate crystals with 1 gal of water.

For water testing and further recommendations, contact your county extension office or one of the UAPB Aquaculture/Fisheries extension specialists.

ALGAE CONTROL

Weed	Herbicide and Formulation	Amount of Formulation	Active Ingredient Concentration	Method of Application and Comments
ALGAE Blue-green	Copper Sulfate (99%)	0.67-5.4 lb/acre*ft	0.25-2 ppm	<ul style="list-style-type: none"> • Copper is toxic to fish. Please refer to “Use of Copper Sulfate in Ponds with Fish” in this section for more details and correct dose calculation. • Use can lead to dissolved oxygen problems when applied to ponds with water temperatures above 85°F. • To make a copper sulfate solution, mix 1½ pounds of copper sulfate crystals with 1 gallon of water.
	Copper Sulfate (Copper-Z 6/2 (23.7%))	2.8-22.5 lb/acre*ft	0.25-2.0 ppm	<ul style="list-style-type: none"> • Copper is toxic to fish. Formulation contains zinc. • Please refer to “Use of Copper Sulfate in Ponds with Fish” in this section.
	Copper Solution (Various)	See label.	See label.	K-Tea can be tank mixed with diquat and Komeen. Please refer to “Use of Copper Sulfate in Ponds with Fish” in this section.
	Sodium Carbonate Peroxy-hydrate (GreenClean, Pak 27, Phycomycin, TerraCyte)	See label.	0.3-10.2 ppm hydrogen peroxide	SCP converts to hydrogen peroxide when applied to water, and that is the compound that causes plant death. Active ingredient concentration based on hydrogen peroxide concentration that evolves from product application.
ALGAE Filamentous and Planktonic	Copper Sulfate (99%)	0.67-5.4 lb/acre*ft	0.25-2 ppm	<ul style="list-style-type: none"> • Copper is toxic to fish. Please refer to “Use of Copper Sulfate in Ponds with Fish” in this section for more details and correct dose calculation. • Use can lead to dissolved oxygen problems when applied to ponds with water temperatures above 85°F. • To make a copper sulfate solution, mix 1½ pounds copper sulfate crystals with 1 gallon of water.
	Copper Sulfate Copper-Z 6/2 (23.7%)	2.8-22.5 lb/acre*ft	0.25-2 ppm	<ul style="list-style-type: none"> • Copper is toxic to fish. Formulation contains zinc. • Please refer to “Use of Copper Sulfate in Ponds with Fish” in this section.
	Copper Solution (Various)	See label.	See label.	K-Tea can be tank mixed with diquat and Komeen. Please refer to “Use of Copper Sulfate in Ponds with Fish” in this section.
	Copper Complexes (Captain, Cutrine Plus, Cutrine Plus Granular, AlgaePro)	See label.	See label.	If treated water is potable, rate cannot exceed 1 ppm. Can be mixed with diquat. Dilute with water in ratio of at least 9:1 and apply uniformly. See previous warning about copper toxicity to fish. Copper complexes are reported to be less toxic to fish in low alkalinity ponds due to the binding of the copper molecule to a carbonate ion.
	Diquat (Reward, Weedtrine-D, Littora)	See label.	0.7-1.5 ppm (Reward & Littora) 0.5-1.5 ppm (Weedtrine-D)	Suppression only of certain filamentous algae (Pithophora and Spirogyra). Should be tank mixed with algaecide for enhanced control.
	Endothall (Hydrothol 191, Hydrothol 191 Granular)	See label.	0.05-1.5 ppm	May be mixed with copper sulfate, 1 gallon plus 5 pounds per surface acre. Toxic to fish. Generally, rate of 0.05-0.3 ppm is effective. If rate higher than 0.3 ppm, should be applied by commercial applicator only.
	Sodium Carbonate Peroxy-hydrate (GreenClean, Pak 27, Phycomycin, TerraCyte)	See label.	0.3-10.2 ppm hydrogen peroxide	SCP converts to hydrogen peroxide when applied to water, and that is the compound that causes plant death. Active ingredient concentration based on hydrogen peroxide concentration that evolves from product application.
	Flumioxazin (Clipper)	6-12 oz/acre surface spray	na	Surface Application. Buffer solution to pH less than 7.0. Application in morning may enhance effectiveness. Active ingredient breaks down rapidly at pH above 8.5 (see label).

(Continued on page 141)

ALGAE CONTROL [cont.]

Weed	Herbicide and Formulation	Amount of Formulation	Active Ingredient Concentration	Method of Application and Comments
ALGAE Chara, nitella	Copper Sulfate (99%)	4.0-5.4 lb/acre*ft	1.5-2.0 ppm	<ul style="list-style-type: none"> Copper is toxic to fish. Please refer to "Use of Copper Sulfate in Ponds with Fish" in this section for more details and correct dose calculation. Use can lead to dissolved oxygen problems when applied to ponds with water temperatures above 85°F. To make a copper sulfate solution, mix 1½ pounds of copper sulfate crystals with 1 gallon of water.
	Copper Sulfate (Copper-Z 6/2 (23.7%))	16.3-22.5 lb/acre*ft	1.5-2.0 ppm	<ul style="list-style-type: none"> Copper is toxic to fish. Formulation contains zinc. Please refer to "Use of Copper Sulfate in Ponds with Fish."
	Copper Solution (various)	See label.	See label	K-Tea can be tank mixed with diquat and Komeen. See previous warning about copper toxicity to fish.
	Copper Complexes (Captain, Cutrine Plus, Cutrine Plus Granular, AlgaePro)	See label.	See label.	If treated water is potable, rate cannot exceed 1 ppm. Can be mixed with diquat. Dilute with water in ration of at least 9:1 and apply uniformly.
	Endothall (Hydrothol 191, Hydrothol 191 Granular)	See label.	0.05-1.5 ppm	May be mixed with copper sulfate, 1 gallon plus 5 pounds per surface acre. Toxic to fish. Generally, rate of 0.05-0.3 ppm is effective. If rate higher than 0.3 ppm, should be applied by commercial applicator only.

FLOATING WEED CONTROL

Weed	Herbicide and Formulation	Trade Name	Amount of Formulation	Active Ingredient or Concentration	Method of Application and Comments
FLOATING WEEDS Watermeal, Azolla	Fluridone	Sonar AS, Avast SC, Whitecap SC, Fluridone 41.7%, 4 lb ai/gal	1.0-7.7 oz/acre*ft	10-90 ppb (see label)	Use Lake rate for water bodies over 5 surface acres. Do not apply as a spot treatment. Needs minimum of 45 days of contact. May require 30 to 90 days to achieve weed control. May be mixed with other herbicides and algaecides. Greater potential for crop injury if treated water is applied to crops grown on low organic and sandy soil. Thirty days may be insufficient restriction if pond water will be used to irrigate sensitive crops, such as tomatoes or peppers.
		Sonar SRP, Sonar PR, Sonar Q, Avast SRP 5%, 0.05 lb ai/lb	0.9-5 lb/acre*ft	10-90 ppb (see label)	
	Diquat	Reward, Littora 37.3%, 2 lb/gal	1-2 gal/surface acre (Reward)	0.74-1.47 ppm 2-4 lb ai/acre	
		Weedtrine-D 8.53%, 0.4 lb/gal	0.5-2.0 gal/surface acre (Littora)	0.37-1.47 ppm 1-4 lb ai/acre	
	Carfentrazone	Stingray 21.3%, 1.9 lb ai/gal	5-10 gal/acre	0.74-1.47 ppm 2-4 lb ai/acre	
		13.5 oz/acre	0.2 lb ai/acre	For best results, use a methylated seed oil or non-ionic surfactant. Dirty or muddy water for spray mixtures will reduce effectiveness. May be tank mixed with other herbicides (2,4-D, diquat, glyphosate, triclopyr or imazapyr). Thorough wetting of foliage essential for maximum effectiveness.	

(Continued on page 142)

FLOATING WEED CONTROL [cont.]

Weed	Herbicide and Formulation	Trade Name	Amount of Formulation	Active Ingredient or Concentration	Method of Application and Comments
FLOATING WEEDS Watermeal, Azolla [cont.]	Penoxsulam	Galleon 21.7%, 2 lb ai/gal	2-5.6 oz/acre for foliar application	0.03125-0.0875 lb ai/acre	Use of surfactant required for best results. Surfactant should <u>not</u> be organosilicone surfactant. Apply only to actively growing weeds.
	Bispyribac-sodium	Tradewind 80% soluble powder	1-2 oz/acre foliar application	0.8-1.6 oz ai/acre	For Azolla. Higher rate for more mature/denser vegetation. Minimum of 30 gal water/acre to ensure coverage. No more than 8 oz/year. May be tank mixed with 2,4-D, diquat, or other approved herbicide. Mix with non-ionic surfactant.
FLOATING WEEDS (except watermeal and Azolla)	Imazapyr	Habitat 28.7%, 2 lb/gal Aquapier 27.8%, 2 lb/gal	1-3 pt/acre	0.09-0.28 ppm 0.25-0.75 lb ai/acre	Mix with 100 gal water to ensure complete coverage. Will not control plants completely or mostly submerged. Do not treat more than one-half of pond surface area in a single operation. Do not exceed 6 pt/acre (1.5 ppb ai/acre). Do not use on food crops. Do not apply within ½ mile upstream of active potable water intake. Can be mixed with glyphosate. Use of spreader-sticker adjuvants will improve results.
	2,4-D	Various and numerous	Various and numerous	Various and numerous. Formulations can be liquid or granular; ester, amine or acid. This impacts the amount of active ingredient that is applied and method.	<ul style="list-style-type: none"> • A pH higher than 8 reduces effectiveness. • Do not apply to more than one-half of water body at a time. • Do not apply to open water. • If weed mass is dense, it may be appropriate to treat only a portion of the mass. Apply along shore first to allow fish to move to untreated areas. Do not apply in same area more than twice/year. Due to local restrictions, use of 2,4-D may be prohibited at certain times of the year. • It has been reported that 2,4-D is more effective if applied after dark. • Please consult label thoroughly due to numerous formulations.
	Glyphosate	Rodeo, AquaPro, Aqua Neat, AquaMaster, Shore-Klear, Glypro 53.8%, 4 lb ai/gal	4-6 pt/acre or 0.75-2.0% solution for high-volume spraying	Up to 3 lb ai/acre	Use of non-ionic surfactant is recommended or required, depending on formulation; read label. Vegetation must be on or above the surface for treatment to be effective. If applying by boat, take care to not create waves that may wash the herbicide off floating leaves. Rainfall within 6 hours may reduce effectiveness.
	Diquat	Reward, Littora 37.3%, 2 lb/gal	0.5-0.75 gal/acre (water hyacinth, water lettuce, salvinia) 1-2 gal/acre (duckweed, bladderwort)	1-1.5 lb ai/acre 2-4 lb ai/acre	<ul style="list-style-type: none"> • Do not treat more than one-third to one-half of pond at a time. Wait 14 days between treatments. Do not apply directly to water. Application to muddy water may reduce effectiveness. Follow dilution and surfactant recommendations. • Do not tank mix with penoxsulam.
		Weedtrine-D 8.53%, 0.4 lb/gal	2.5-3.75 gal/acre (water hyacinth, water lettuce, salvinia) 5-10 gal/acre (duckweed, bladderwort)	1-1.5 lb ai/acre 2-4 lb ai/acre	
	Fluridone	Sonar AS, Avast SC, Whitecap SC, Fluridone 41.7%, 4 lb ai/gal	1.0-7.7 oz/acre*ft	10-90 ppb (see label)	Good to excellent control of duckweed, salvinia and bladderwort, poor control of water hyacinth and water lettuce. Use Lake rate for water bodies over 5 surface acres. Do not apply as a spot treatment. Needs minimum of 45 days of contact. May require 30-90 days to achieve weed control. May be mixed with other herbicides and algaecides. Greater potential for crop injury if treated water is applied to crops grown on low organic and sandy soil. Thirty days may be insufficient restriction if pond water will be used to irrigate sensitive crops, such as tomatoes or peppers.
		Sonar SRP, Sonar PR, Sonar Q, Avast SRP 5%, 0.05 lb ai/lb	0.9-5 lb/acre*ft	10-90 ppb (see label)	

(Continued on page 143)

FLOATING WEED CONTROL [cont.]

Weed	Herbicide and Formulation	Trade Name	Amount of Formulation	Active Ingredient or Concentration	Method of Application and Comments
FLOATING WEEDS (except water-meal and Azolla) [cont.]	Triclopyr	Renovate 3, Ecotriclopyr 3 SL 44.4%, 3 lb ai/gal	0.5-2 gal/acre	1.5-6 lb ai/acre	Apply when plants are actively growing. Use higher rate when the weed mass is dense. Thoroughly wet all foliage. Use of non-ionic surfactant is recommended.
	Imazamox	Clearcast 12.1%, 1 lb ai/gal	32-64 oz/acre, as a broadcast treatment. Can use up to a 5% solution for spot treatment.	0.25-0.5 lb ai/acre	<ul style="list-style-type: none"> A surfactant should be used. A glyphosate herbicide can be added for quicker brownout. Imazamox can be applied to the water targeting emergent vegetation. Rate is 50-500 ppb, 17-173 oz product/acre*ft.
	Carfentrazone	Stingray 21.3%, 1.9 lb ai/gal	3.4-13.5 oz/acre	0.05-0.2 lb ai/acre	For best results, use a methylated seed oil or non-ionic surfactant. Dirty or muddy water for spray mixtures will reduce effectiveness. May be tank mixed with other herbicides (2,4-D, diquat, glyphosate, triclopyr or imazapyr). Thorough wetting of foliage essential for maximum effectiveness.
	Penoxsulam	Galleon 21.7%, 2 lb ai/gal	2-5.6 oz/acre for foliar application	0.03125-0.0875 lb ai/acre	<ul style="list-style-type: none"> Use of surfactant required for best results. Surfactant should <u>not</u> be organo-silicone surfactant. Apply only to actively growing weeds. Do not tank mix with diquat.
	Flumioxazin	Clipper 51% granule	6-12 oz/surface acre foliar application or 0.53-2.1 lbs/acre*ft	3.06-6.12 oz ai/surface acre or 100-400 ppb	Target plant will determine whether to make a surface or subsurface application (check label). Tank mix with water having pH of 5-7. Buffer spray solution to pH less than 7. Use non-ionic surfactant with at least an 80% ai (perform jar test to determine compatibility). Treat up to one-half of the pond at a time and wait 10-14 days before treating the remaining area. Do not retreat same section within 28 days. For subsurface application, application in early morning might enhance effectiveness due to rapid breakdown of product in water with pH 8.5 or greater. May be tank mixed with other approved herbicides.
Bispyribac-sodium	Tradewind 80% soluble powder	1-2 oz/acre foliar application	0.8-1.6 oz ai/acre	Higher rate for more mature/denser vegetation. Minimum of 30 gal water/acre to ensure coverage. No more than 8 oz/year. May be tank mixed with 2,4-D, diquat, or other approved herbicide. Mix with non-ionic surfactant.	

(Continued on page 144)

EMERGENT WEED CONTROL

Weed	Herbicide and Formulation	Trade Name	Amount of Formulation	Active Ingredient Rate or Concentration	Method of Application and Comments
EMERGENT WEEDS	2,4-D	Various and numerous	Various and numerous	Various and numerous. Formulations can be liquid or granular; ester, amine or acid. This impacts the amount of active ingredient that is applied and method.	<ul style="list-style-type: none"> • Rate depends on species and water depth of emergent plant. For hard to control weeds, repeat application after 30 days. • Apply early in season when weeds are small and growing actively before the bud stage. Apply when biennial and perennial species are in the seedling stage and before flower stalks appear. For hard to control weeds, repeat application after 30 days. • For liquid formulations, thorough wetting of foliage is essential for maximum control. • A pH higher than 8 reduces effectiveness. Do not treat more than one-half pond at a time. Do not apply within 600 to 2,400 feet of a potable water intake, depending on treatment rate. • Due to local restrictions, use of 2,4-D may be prohibited at certain times of the year. • It has been reported that 2,4-D is more effective if applied after dark. • Please consult label thoroughly due to numerous formulations.
	Diquat	Reward 37.3%, 2 lb ai/gal	1-2 gal/acre	2-4 lb ai/acre	Apply 50-150 gallons of water plus the labeled rate of a 75% or greater non-ionic surfactant per acre for full coverage and thorough weed contact. For best results, apply before flowering (cattail). Repeat as needed. Do not apply directly to water. Do not tank mix with penoxsulam.
		Littora 37.3%, 2 lb ai/gal	0.5-2 gal/acre	1-4 lb ai/acre	<ul style="list-style-type: none"> • For broadcast treatment, include sufficient carrier along with 1-2 qt/acre of wetting agent. For spot treatment, apply 0.5 gal/100 gal water with wetting agent as 1 qt-1 gal/100 gal water. For cattail, use 2 gal/100 gal water. Repeat as necessary. • Do not tank mix with penoxsulam.
		Weedtrine-D 8.53%, 0.4 lb/gal	5-10 gal/acre	2-4 lb ai/acre	<ul style="list-style-type: none"> • Dilute 5 oz Weedtrine/gal water. Add 1 oz nonionic surfactant/10 gal water. • Do not tank mix with penoxsulam.
	Glyphosate	Rodeo, AquaPro, Aqua Neat, Aqua-Master, Shore-Klear, Glypro 53.8%, 4 lb ai/gal	4-6 pt/acre or 0.75-2.0% solution for high-volume spraying	Up to 3 lb ai/acre	Use of non-ionic surfactant is recommended or required, depending on formulation; read label (2 or more qt/100 gal water). Vegetation must be on or above the surface for treatment to be effective. If applying by boat, take care to not create waves that may wash the herbicide off floating leaves. Rainfall within 6 hours may reduce effectiveness.
	Imazapyr	Habitat, Ecomazapyr 28.7%, 2 lb/gal Aquapier 27.8%, 2 lb/gal	1-3 pt/acre	0.25-0.75 lb ai/acre	Mix with 100 gal water to ensure complete coverage. Will not control plants completely or mostly submerged. Do not treat more than one-half of pond surface area in a single operation. Do not exceed 6 pt/acre (1.5 ppb ai/acre). Do not use on food crops. Do not apply within ½ mile upstream of active potable water intake. Can be mixed with glyphosate. Use of spreader-sticker adjuvants will improve results.
	Triclopyr	Renovate 3, Ecotriclopyr 3 SL 44.4%, 3 lb ai/gal	0.5-2 gal/acre	1.5-6 lb ai/acre	Apply when plants are actively growing. Use higher rate when the weed mass is dense. Thoroughly wet all foliage. Use of non-ionic surfactant is recommended.
		Renovate OTF 10%	27-67 lb/acre*ft	1.0-2.5 ppm ai/acre*ft 2.7-6.7 lb ai/acre*ft	<ul style="list-style-type: none"> • Do not exceed 2.5 ppm ai triclopyr per year. • Apply when plants are actively growing. Can repeat treatments as long as 2.5 ppm annual limit not exceeded. • Results can be unsatisfactory if pond has high water exchange.

(Continued on page 145)

EMERGENT WEED CONTROL [cont.]

Weed	Herbicide and Formulation	Trade Name	Amount of Formulation	Active Ingredient or Concentration	Method of Application and Comments
EMERGENT WEEDS [cont.]	Imazamox	Clearcast 12.1%, 1 lb ai/gal	16-64 oz/acre, as a broadcast treatment. Can use up to a 5% solution for spot treatment.	0.125-0.5 lb ai/acre	<ul style="list-style-type: none"> A surfactant should be used. A glyphosate herbicide can be added for quicker brownout. Imazamox can be applied to the water targeting emergent vegetation. Rate is 17 to 173 oz product/acre*ft (50-500 ppb).
	Carfentrazone	Stingray 21.3%, 1.9 lb ai/gal	3.4-13.5 oz/acre	0.05-0.2 lb ai/acre	For best results, use a methylated seed oil or non-ionic surfactant. Dirty or muddy water for spray mixtures will reduce effectiveness. May be tank mixed with other herbicides (2,4-D, diquat, glyphosate, triclopyr or imazapyr). Thorough wetting of foliage essential for maximum effectiveness.
	Penoxsulam	Galleon 21.7%, 2 lb ai/gal	2-5.6 oz/acre for foliar application	0.03125-0.0875 lb ai/acre	<ul style="list-style-type: none"> Use of surfactant required for best results. Surfactant should <u>not</u> be organosilicone surfactant. Apply only to actively growing weeds. Can be applied as a pre-emergent at rates of 5.6-11.2 oz/acre. Do not tank mix with diquat.
	Flumioxazin	Clipper 51% granule	6-12 oz/acre foliar application	3.06-6.12 oz ai/surface acre	Tank mix with water having a pH of 5-7. Buffer spray solution to pH less than 7. Use non-ionic surfactant with at least an 80% ai (perform jar test to determine compatibility). Apply in 5-10 gal of water/acre to ensure coverage. Treat up to one-half of the pond at a time and wait 10-14 days before treating remaining area. Do not retreat same section within 28 days. May be tank mixed with 2,4-D, diquat, or other approved aquatic herbicide.
	Bispyribac-sodium	Tradewind 80% soluble powder	1-2 oz/acre foliar application	0.8-1.6 oz ai/acre	Higher rate for more mature/denser vegetation. Minimum of 30 gal water/acre to ensure coverage. No more than 8 oz/year. May be tank mixed with 2,4-D, diquat, or other approved herbicide. Mix with non-ionic surfactant.

SUBMERSED WEED CONTROL

Weed	Herbicide and Formulation	Trade Name	Amount of Formulation	Active Ingredient or Concentration	Method of Application and Comments
SUBMERSED WEEDS	Copper solution	Komeen 8%, 0.8 lb ai/gal	1.7-3.3 gal/acre*ft	0.5-1.0 ppm	Copper is toxic to fish. Can be tank mixed with endothall, diquat or fluridone.
	Copper complexes (chelated)	Captain 15.9%, 9.1% copper 0.91 lb ai/gal	1.2-3 gal/acre*ft	0.4-1.0 ppm	Labeled for hydrilla. Can be tank mixed with diquat.
	2,4-D	Various and numerous	Various and numerous	Various and numerous. Formulations can be liquid or granular; ester, amine or acid. This impacts the amount of active ingredient that is applied and method.	pH higher than 8 reduces effectiveness. Do not treat more than half pond at a time. Do not apply within 600 to 2,400 feet of a potable water intake, depending on treatment rate.
	Diquat	Reward, Littora 37.3%, 2 lb/gal	0.125-0.5 gal/acre*ft	0.09-0.37 ppm 0.25-1 lb ai/acre*ft	<ul style="list-style-type: none"> Do not treat more than one-third to one-half of pond at a time. Wait 14 days between treatments. Do not apply directly to water. Application to muddy water may reduce effectiveness. Labels have rates as gal/surface acre assuming a 4-foot average pond depth.
		Weedtrine-D 8.53%, 0.4 lb/gal	1.25-2.5 gal/acre*ft (Weedtrine-D)	0.18-0.37 ppm 0.5-1 lb ai/acre*ft	

(Continued on page 146)

SUBMERSED WEED CONTROL [cont.]

Weed	Herbicide and Formulation	Trade Name	Amount of Formulation	Active Ingredient or Concentration	Method of Application and Comments
SUBMERSED WEEDS [cont.]	Endothal	Aquathol K 40.3%, 4.23 lb ai/gal	0.3-3.2 gal/acre*ft	0.5-5 ppm	If plant infestation is heavy, treat section 5 to 7 days apart.
		Aquathol Super K 63%	2.2-22 lb/acre*ft	1.3-13.5 lbs ai/acre*ft	Not for use in brackish or salt water.
		Hydrothol 191 53%, 2 lb ai/gal	0.7-4 gal/acre*ft	0.5-3 ppm	Toxic to fish in doses higher than 0.3 ppm. Do not treat more than one-tenth of pond or lake with doses in excess of 1 ppm.
		Hydrothol 191 Granular 11.2%	27-162 lb/acre*ft	1.4-8 lb ai/acre*ft	
	Fluridone	Sonar AS, Avast SC, Whitecap SC, Fluridone 41.7%, 4 lb ai/gal	1.0-7.7 oz/acre*ft	10-90 ppb (see label)	Use Lake rate for water bodies over 5 surface acres. Do not apply as a spot treatment. Needs minimum of 45 days of contact. May require 30-90 days to achieve weed control. May be mixed with other herbicides and algaecides. Greater potential for crop injury if treated water is applied to crops grown on low organic and sandy soil.
		Sonar SRP, Sonar PR, Sonar Q, Avast SRP 5%	0.9-5 lb/acre*ft	10-90 ppb (see label)	
	Triclopyr	Renovate 3, Ecotriclopyr 3 SL 44.4%, 3 lb ai/gal	0.7-2.3 gal/acre*ft (Renovate 3) 0.5-2.0 gal/acre (Ecotriclopyr 3 SL)	0.75-2.5 ppm 2-6.8 lb ai/acre*ft	Setbacks from potable water intake based on amount of area treated and rate used. Can be tank mixed with 2,4-D amine.
		Renovate OTF 14%	14-67 lb/acre*ft	0.5-2.5 ppm 2-6.8 lb ai/acre*ft	Setbacks from potable water intake based on amount of area treated and rate used.
	Imazamox	Clearcast 12.1%, 1 lb ai/gal	17-173 oz/acre*ft	50-500 ppb	Do not exceed 500 ppb (173 oz/acre*ft) for water application or 2 qt/acre for foliar application. Spot application can use 5% rate.
	Carfentrazone	Stingray 21.3%, 1.9 lb ai/gal	36.6 oz/acre*ft	200 ppb 0.5434 lb ai/acre*ft	Inject below the surface or use suitable polymer to rapidly sink spray mixture. Do not apply within ¼ mile of potable water intake. Treatment of dense weed mats may result in oxygen loss from dead weed decomposition.
Penoxsulam	Galleon 21.7%, 2 lb ai/gal	0.9-26.1 oz/acre*ft	5-150 ppb	Single application rate 25-75 ppb. Sum of all applications must not exceed 150 ppb per year.	
Flumioxazin	Clipper 51% granule	0.53-2.1 lbs/acre*ft	100-400 ppb	Tank mix with water having a pH of 5-7. Apply to actively growing plants in water with pH less than 8.5. Product breaks down rapidly at pH over 8.5. Best results might be obtained by treating in the morning. For water bodies deeper than 7 ft, do not apply more than 14.8 lbs of product/surface acre. May be tank mixed with other aquatic herbicides.	
Bispyribac-sodium	Tradewind 80% soluble powder	1.1-2.4 oz/acre*ft	20-45 ppb initial concentration	For optimum control, repeat applications 60-90 days to maintain desired concentration (not to exceed Pop). Do not reapply within 14 days. No more than 4 applications/year. Tradewind can be tank mixed with other approved herbicides for enhanced Hydrilla control.	

- It is always legal to use less than the minimum rate. Effectiveness may be decreased, but if used early in the growing season, results might be satisfactory.
- Efforts have been made to include all trade names for a given active ingredient, but some may have not been listed.