

AQUATIC ENVIRONMENTS

CHEMICALS FOR TREATMENT OF PARASITES AND FISH DISEASES

James Shelton and Wesley Gerrin, Fisheries
Braxton Crews, Agriculture & Natural Resources Extension Agent

Trade names are provided for example purposes only. Trade name lists are not exhaustive and are not endorsements. Recommendations should be made based on active ingredients.

ACTIVE INGREDIENT	TRADE NAME EXAMPLES	USE CASES	PRODUCT APPLICATION RATE	RESTRICTIONS	SPECIAL CONSIDERATIONS
<i>Formalin</i>	Parasite-S	<ul style="list-style-type: none"> Control of external parasites on all finfish 	<ul style="list-style-type: none"> Tanks and raceways 170-250 ppm Earthen ponds 15-25 ppm 	None	Always check water temperature before applying and follow treatment instructions accordingly.
<i>Chloramine-T</i>	Halamid® Aqua	<ul style="list-style-type: none"> Freshwater Salmonids Control of mortality due to bacterial gill disease Walleye and freshwater warmwater finfish Control of mortality due to columnaris 	<ul style="list-style-type: none"> Freshwater Salmonids 12-20 ppm Walleye 10-20 ppm Freshwater warmwater finfish Up to 20 ppm 	None	Immersion treatments only. Make sure the system can be flush after application. Bypass biofilter in recirculating systems.
Hydrogen Peroxide	Perox-aid®	<ul style="list-style-type: none"> Freshwater Salmonids Control of <i>Gyrodactylus</i> spp. and mortality due to bacterial gill disease Freshwater finfish Control of mortality due to saprolegniasis and columnaris disease 	<ul style="list-style-type: none"> 50-100 ppm for 30-60 minutes per day. Check label for further information on specific rates. 	None	Immersion treatments only. Make sure the system can be flush after application. Bypass biofilter in recirculating systems.
Calcium hypochlorite		<ul style="list-style-type: none"> Use as a disinfectant for aquaculture facility equipment 	<ul style="list-style-type: none"> 10 ppm available chlorine 	None	Kills fish and some parasites. Remove fish from systems before treatment.
Hydrated Lime (Calcium Hydroxide)		<ul style="list-style-type: none"> Use as a pond sterilizer for cleaning fishponds before restocking 	<ul style="list-style-type: none"> 500 pounds per acre 	None	Kills most fish. Remove fish from systems before treatment. Use on a damp pond bottom without standing water.
Potassium Permanganate		<ul style="list-style-type: none"> Use as a disinfectant for ponds or aquaculture facilities 	<ul style="list-style-type: none"> Pond application 2 ppm 10-minute tank treatment 10 ppm 	None	Can be harmful to fish and algae. May cause oxygen depletion.
Sodium Chloride (Salt)	<i>Fish Haul-C</i>	<ul style="list-style-type: none"> Reduces stress in fish. Use as a fish hauling aid. 	<ul style="list-style-type: none"> Treatment rates can vary. Check label on product. 	None	Do not use iodized salt.

HERBICIDES FOR AQUATIC VEGETATION CONTROL

Trade names are provided for example purposes only. Trade name lists are not exhaustive and are not endorsements. Recommendations should be made based on active ingredients. This information is not a substitute for reading product labels.

ACTIVE INGREDIENT	TRADE NAME EXAMPLES	GENERAL USE CASES	PRODUCT APPLICATION RATE	SPECIAL CONSIDERATIONS
<i>Copper Sulfate</i>	Crystal Blue Copper Sulfate Smart Crystals	<ul style="list-style-type: none"> Algae Macroalgae 	<ul style="list-style-type: none"> Application rates are variable depending on species and range from 0.25-2.0 ppm. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> Copper sulfate can be toxic to fish at high concentrations and in low alkalinity water. Test alkalinity and carefully perform treatment calculations prior to use.
<i>Chelated Copper Compounds</i>	Cutrine®-Plus K-Tea® Captain Nautique® Argos®	<ul style="list-style-type: none"> Planktonic algae Filamentous algae Macroalgae 	<ul style="list-style-type: none"> Application rates are variable depending on species and density of growth and range from 0.2-1.0 ppm. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> Less toxic than copper sulfate. Can be mixed with Diquat and/or Flumioxazin to increase effectiveness against resistant algae.
	Cutrine®-Ultra	<ul style="list-style-type: none"> Planktonic algae Filamentous algae Macroalgae 	<ul style="list-style-type: none"> Application rates are variable depending on species and density of growth and range from 0.2-1.0 ppm. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> Stronger formulation than Cutrine®-Plus. Includes a surfactant for penetrating algal mats.
Diquat	Alligare Diquat herbicide Reward® Weedtrine®-D	<ul style="list-style-type: none"> Filamentous algae Floating weeds Submersed weeds 	<ul style="list-style-type: none"> Application rates are variable depending on water depth and density of growth and range from 0.25-2.0 gallons per surface acre. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> Diquat binds with sediment particles very quickly, so is ineffective in turbid water. Can be mixed with copper products to increase effectiveness against certain types of algae.
Flumioxazin	Clipper® Flumigard® SC	<ul style="list-style-type: none"> Filamentous algae Floating weeds Emergent weeds Submersed weeds 	<ul style="list-style-type: none"> Water Depth < 3 feet 6 ounces per acre Water Depth > 3 feet 12 ounces per acre 	<ul style="list-style-type: none"> Flumioxazin is ineffective in water with a pH greater than 8.5. Certain adjuvants can be used to adjust pH. Disperse in 50-100 gal/A A sinking adjuvant may be necessary in applications to deeper water
Fluridone	Sonar® Alligare Fluridone (Formulations of these herbicides include granular, slow-release, liquid, and ready-to-use).	<ul style="list-style-type: none"> Floating weeds Submersed weeds 	<ul style="list-style-type: none"> Application rates are variable depending on formulation. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> Requires long contact time. Residence time should be considered before use. Effective for whole-pond treatments.

ACTIVE INGREDIENT	TRADE NAME EXAMPLES	GENERAL USE CASES	PRODUCT APPLICATION RATE	SPECIAL CONSIDERATIONS
2, 4-D	Granular Formulations Navigate® Renovate® Max G (Includes Triclopyr)	<ul style="list-style-type: none"> Floating weeds Emergent weeds 	<ul style="list-style-type: none"> Application rates are variable depending on water depth and range from 0.25-5.0 ppm. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> Application rates are variable depending on water depth and range from 0.25-5.0 ppm. Check product label for further information on specific rates.
	Liquid Formulations Weedar® 64 AquaSweep® (Includes Triclopyr)	<ul style="list-style-type: none"> Emergent weeds Submerged weeds Water Hyacinth 	<ul style="list-style-type: none"> Application rates are variable depending on water depth and range from 2.0-4.0 ppm. Check product label for further information on specific rates. 	
Glyphosate	AquaNeat® Refuge™ Alligare Glyphosate 5.4 Rodeo®	<ul style="list-style-type: none"> Emergent weeds 	<ul style="list-style-type: none"> Application rates are variable depending on formulation. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> There are many formulations of Glyphosate for aquatic and terrestrial applications. Ensure that the formulation used is labeled for aquatic use.
Imazapyr	Habitat® Arsenal® Polaris®	<ul style="list-style-type: none"> Emergent weeds 	<ul style="list-style-type: none"> Application rates are variable depending on the species. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> Mix the directed amount of herbicide in 100 gallons of water per acre to improve coverage.
Imazamox	Clearcast® Imox®	<ul style="list-style-type: none"> Water Hyacinth and Salvinia Emergent weeds Some submersed weeds 	<ul style="list-style-type: none"> Application rates are variable depending on species and water depth. Check product label for further information on specific rates. 	
Carfentrazone	Stingray®	<ul style="list-style-type: none"> Select floating, emergent, and submersed weeds. Check label. 	<ul style="list-style-type: none"> Application rates are variable depending on the species. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> May be mixed with other herbicides to control plants not listed on product label.
Triclopyr	Renovate® 3	<ul style="list-style-type: none"> Select floating, emergent, and submersed weeds. Check label. 	<ul style="list-style-type: none"> Application rates are variable depending on water depth and range from 0.75-2.5 ppm. Check product label for further information on specific rates. 	
Bispyribac	Tradewind™	<ul style="list-style-type: none"> Select floating, emergent, and submersed weeds. Check label. 	<ul style="list-style-type: none"> Application rates are variable depending on water depth and density of growth and range from 20-45 ppb. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> Requires long contact times to be effective. Use in static water.
Topramezone	Oasis®	<ul style="list-style-type: none"> Select floating, emergent, and submersed weeds. Check label. 	<ul style="list-style-type: none"> Application rates are variable depending on water depth and density of growth and range from 5-50 ppb. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> Requires long contact times to be effective. Use in static water.

HERBICIDES FOR AQUATIC VEGETATION CONTROL

ACTIVE INGREDIENT	TRADE NAME EXAMPLES	GENERAL USE CASES	PRODUCT APPLICATION RATE	SPECIAL CONSIDERATIONS
Penoxsulam	Galleon® SC	<ul style="list-style-type: none"> Select floating, emergent, and submersed weeds. Check label. 	<ul style="list-style-type: none"> Application rates are variable depending on water depth and density of growth and range from 5-150 ppb. Check product label for further information on specific rates. 	
Sodium Carbonate Peroxyhydrate	PAK® 27 GreenClean® Phycomycin®	<ul style="list-style-type: none"> Algae 	<ul style="list-style-type: none"> Application rates are highly variable. Check product label for further information on specific rates. 	
Dyes and Colorants	Aquashade® Crystal Blue® Blue Vail™	<ul style="list-style-type: none"> Colors water to shade sunlight from the water column and control algae and submersed weeds. 	<ul style="list-style-type: none"> Application rates are highly variable. Check product label for further information on specific rates. 	<ul style="list-style-type: none"> Disrupts growth of healthy algal blooms that form the base of a pond food chain. Not a good option when fish growth is an objective.

HERBICIDES FOR AQUATIC VEGETATION CONTROL

GROUP	WEED	<i>copper</i>	<i>2,4-D</i>	<i>diquat</i>	<i>flumioxazin</i>	<i>fluridone</i>	<i>glyphosate</i>	<i>carfentrazone</i>	<i>triclopyr</i>	<i>imazapyr</i>	<i>imazamox</i>	<i>Penoxsulam</i>
Algae	Planktonic	E	P	P	G	P	P	NR		NR	NR	
	Filamentous	E	P	E	E	P	P	NR		NR	NR	
	Muskgrass (Chara spp.)	E	P	G	F	P	P	NR		NR	NR	
	Stonewort (Nitella spp.)	E	P	G	F	P	P	NR		NR	NR	
Floating Weeds	Bladderwort (Utricularia spp.)	P	G	E	E	E				NR	G	G
	Duckweeds (Lemna spp.)*	P	P	G	E	E	G	G	P	G		E
	Salvinia spp.*	G	P	G	E	E	G	G	P	P	E	E
	Mosquitofern (Azolla spp.)*			G	E	E		G				E
	Water Hyacinth (Pontederia crassipes)*	P	E	E	P	P	F	G	E	G	E	E
	Watermeal (Wolffia spp.)*	P	P	P	E	G	P	P		NR		G

GROUP	WEED	copper	2,4-D	diquat	flumioxazin	fluridone	glyphosate	carfentrazone	triclopyr	imazapyr	imazamox	Penoxsulam
Emerged Weeds	² Alders (Alnus spp.)	P	E	F		P	E				G	
	Alligatorweed (Alternanthera philoxeroides)*	P	F	P	E	G	E	F	G	G	E	
	American lotus (Nelumbo lutea)	P	E	P		F	G		G	G	G	G
	Arrow Arum (Peltandra virginica)	P	E	G	G	NR	E				G	
	² Buttonbush (Cephalanthus occidentalis)	P	E	F	G	P	G			G	G	
	Cattails (Typha spp.)	P	G	G		F	E		F	E	E	
	Floating Heart (Nymphoides peltata)		E			E	G		E		G	G
	Water Lilies (Nymphaea spp.)	P	E	P	F	E	E		G	E	E	G
	Frogbit (Hydrocharis laevigata)	P	E	E	E				E	E	E	
	² Maidencane (Panicum hemitomon)	P	P	F		F	E					
	² Pickerelweed (Pontederia cordata)	P	G	G		P	F			E	E	
	² Rushes (Juncus spp.)	P	F	F	P	P	G			G	G	G
	² Sedges (Carex spp.)	P	F	F	P	P	G			G	G	G
	Slender Spikerush (Eleocharis sp.)	P	P	G	G	G	P				G	
	Smartweed (Polygonum spp.)	P	E	F	P	F	E		E	E	E	G
	Spatterdock (Nuphar advena)	P	E	P		E	E		E	E	E	G
	Southern Watergrass (Luziola fluitans)	P	P	P		G	E			E		
	Torpedograss (Panicum repens)*	P	P	P		F	G		P	E	E	
	Lemon Bacopa (Bacopa caroliniana)*			G		G				G		
	Watershield (Brasenia schreberi)*	P	E	P	G	G	G			P	E	
Water Taro (Colocasia esculenta)*		G						G				

HERBICIDES FOR AQUATIC VEGETATION CONTROL

GROUP	WEED	copper	2,4-D	diquat	flumioxazin	fluridone	glyphosate	carfentrazone	triclopyr	imazapyr	imazamox	Penoxsulam
	Water Pennywort (Hydrocotyle spp.)*	P	G	G	E	P	G		G	E		G
	Water Primrose (Ludwigia spp.)	P	E	F	G	F	E	F	E	E	E	
	² Water Willow (Justicia americana)	P	E	F		P	E		E	E	G	
Submersed Weeds	Variable -leaf Watermilfoil (Myriophyllum heterophyllum)	P	G	E	E	E	P	E	G	NR	G	E
	Coontail (Ceratophyllum demersum)	P	P	G	E	E	P			NR	G	
	Brazilian Waterweed (Egeria densa)*	P	P	E	E	E	P			NR		G
	Common Waterweed (Elodea canadensis)	P	E	E	E	E	P		E	NR		G
	Eurasian Watermilfoil (Myriophyllum spicatum)*	P	F	G	E	E	P	G	E	NR	G	E
	Fanwort (Cabomba caroliniana)	F	P	G	E	E	P			NR		G
	Hydrilla verticillate*	P	F	E	E	E	P			NR	G	E
	Southern Naiad (Najas guadalupensis)	P	E	E	F	F	F		E	NR		G
	Parrotfeather (Myriophyllum aquaticum)*	F	E	E	E	E	NR		E	G1	G	G
	Pondweed (Potamogeton spp.)	P	P	G	E	E	P	NR		G1	G	G
	² Eelgrass (Vallisneria americana)	NR	NR	F	NR	NR	NR	NR		NR	NR	
	Widgeon Grass (Ruppia maritima)	E		G							G	

¹Imazapyr is not labeled for application to submerged weeds, but it is labeled for a draw down application. It should be noted that there is a 120-day irrigation restriction on imazapyr. For questions, contact your local county extension agent.

²These plants are generally considered beneficial due to the ecological services they provide, including bank erosion control, nutrient uptake, and aesthetic value. They also can discourage growth of more problematic plants. Care should be taken when eliminating these plants.

*These plants are either non-native, grow aggressively, or both. They may require integrated management strategies that involve multiple control methods.

BIOLOGICAL CONTROLS FOR AQUATIC VEGETATION

Biological control is an important part of an integrated pest management plan that involves the use of a living organism to control a specific pest. Grass Carp (*Ctenopharyngodon idella*) are useful for aquatic vegetation control and are a popular management option in Georgia ponds. In Georgia, only sterile triploid Grass Carp may be stocked to prevent accidental release and establishment of reproducing populations in natural waterways. Grass Carp feeding preferences for common aquatic vegetation types are shown in the table below.

HIGH	MODERATE	LOW
<ul style="list-style-type: none"> • Chara • Nitella • Naiad • Hydrilla • Elodea • Pondweed • Egeria 	<ul style="list-style-type: none"> • Bladderwort • Duckweed • Watermeal • Fanwort • Water Ferns • Pennywort 	<ul style="list-style-type: none"> • Alligatorweed • Coontail • Eelgrass • Watermilfoil • Torpedograss • Water Primrose
No Measurable Control Expected		
<ul style="list-style-type: none"> • Sedges • Rushes • Maidencane • Parrot Feather • Spatterdock • Water Hyacinth 	<ul style="list-style-type: none"> • Watershield • American Lotus • Arrowhead • Buttonbush • Cattails • Frog's-Bit • Filamentous Algae 	<ul style="list-style-type: none"> • Pickerelweed • Slender Spikerush • Smartweed • Water Willow • Southern Watergrass • Salvinia

Grass carp stocking rates are dependent on feeding preferences, aggressiveness of the plant, and the relative density of vegetation to be controlled and typically range from 5-20 per acre. Stocking rates can also be adjusted depending on frequency of restocking. Combining biological control with chemical control is often required to achieve desired results with plants that grow aggressively (bold in table above for plants that can be controlled with Grass Carp). See the table below for examples of stocking rates. Initially stocking at a higher rate may be required for dense infestations of aggressive plants, but more frequent restocking may allow for restocking at lower rates.

FEEDING PREFERENCE	RESTOCK EVERY 3 YEARS		RESTOCK EVERY 5-7 YEARS	
	INVASIVE/AGGRESSIVE	NON-INVASIVE/AGGRESSIVE	INVASIVE/AGGRESSIVE	NON-INVASIVE/AGGRESSIVE
High	10-15 per acre	5-10 per acre	15-20 per acre	5-10 per acre
Moderate	10-15 per acre	5-10 per acre	15-20 per acre	10-15 per acre
Low	10-15 per acre	5-10 per acre	15-20 per acre	15-20 per acre

FISH KILL DIAGNOSTICS

This section provides guidelines for submitting samples of fish tissue for diagnostic services to confirm diseases, parasites, insecticides, or other chemicals. Guidelines are also provided for water quality and algae sample submission in fish kill cases where disease is not suspected.

DISEASES AND PARASITES IN FISH TISSUE

Fish tissue samples for disease or parasite confirmation can be submitted to the University of Georgia Veterinary Diagnostic Laboratory, which has locations in Athens and Tifton.

- Diagnostic labs do not accept live fish, but fish should be euthanized as close to submission as possible for the best results.
- Fish that are already deceased should be submitted in plastic bags without water.
- If samples are being shipped, they should be packed in insulated shipping containers with ice packs. Samples should never be frozen and should be as fresh as possible.

- If more than one specimen is available, 1-2 specimens may be submitted in 10% formalin along with the fresh specimen. A cut should be made in the abdominal cavity to facilitate formalin penetration.
- Samples should either be dropped off in person or shipped by the fastest means possible.

Athens Veterinary Diagnostic Lab

College of Veterinary Medicine
DW Brooks Drive Room 501
Athens, GA 30602
(706) 542-5568

Tifton Veterinary Diagnostic Lab

43 Brighton Road
Tifton, GA 31793
(229) 386-3340

WATER CHEMISTRY

Water chemistry samples can be submitted to the University of Georgia Agricultural and Environmental Services Laboratory (AESL) located in Athens. The AESL has several water tests that can help determine potential causes of fish stress.

COMMON WATER QUALITY TESTS

- Fishpond general water quality (W34C): Includes a variety of chemical constituents. Tests alkalinity and hardness and calculates lime requirement.
 - Requires a 125 mL plastic container.
- Pond water quality and algal testing kit (W34D): Includes the same chemical tests as W34C, with an additional analysis for harmful algae. If toxin-producing algae are present, an algal toxin test is performed.
 - Kits contain 3 plastic bottles with one bottle containing Lugol solution.
- Priority pollutants (W41): Includes common heavy

metals that could be harmful in high concentrations.

- Proper Sampling Techniques
- Samples should be collected from multiple locations in the pond and combined into one sample.
- Samples should be collected at least 6 inches below the water surface and at least 1 foot above the bottom.
- Samples should not be contaminated with sediment or plant material.
- Contact the AESL or your local county extension agent for further information about collecting and submitting samples or for assistance with interpretation of results.

Agricultural and Environmental Services Lab

2400 College Station Road
Athens, GA 30602
706-542-5350

AQUATIC VEGETATION CONTROL POST-TREATMENT WATER USE RESTRICTIONS

James Shelton and Wesley Gerrin, Fisheries
Braxton Crews, Agriculture &
Natural Resources Extension Agent

NUMBER OF DAYS AFTER TREATMENT UNTIL WATER IS SUITABLE FOR SPECIFIC USE

Post-treatment water use restrictions often depend on treatment rate and are shown as a day range in this table. Check product labels for restrictions specific to the applicable treatment rate.

ACTIVE INGREDIENT	TRADE NAME EXAMPLES	HUMAN			LIVESTOCK WATERING		IRRIGATION		AG. SPRAYS
		Drinking	Swimming	Fish Consumption	Dairy	Livestock	Turfgrass	Row Crops	
<i>Copper Sulfate</i>	Crystal Blue Copper Sulfate Smart Crystals	0	0	0	0	0	0	0	0
<i>Chelated Copper</i>	Citrine®-Plus	0	0	0	0	0	0	0	0
	K-Tea®	0	0	0	0	0	0	0	0
	Captain	0	0	0	0	0	0	0	0
	Nautique®	0	0	0	0	0	0	0	0
	Argos®	0	0	0	0	0	0	0	0
<i>Diquat</i>	Alligare Diquat Herbicide	1-3	0	0	1	1	1-3	5	5
	Reward®	1-3	0	0	1	1	1-3	5	5
	Weedtrine®-D	1-3	0	0	1	1	1-3	5	5
<i>Flumioxazin</i>	Clipper®	0	0	0	0	0	1-3	5	5
	Flumigard® SC	0	0	0	0	0	1-3	5	5
<i>Fluridone</i>	Sonar®	0	0	0	0	0	7-30	7-30	7-30
	Alligare Fluridone	0	0	0	0	0	7-30	7-30	7-30
<i>2, 4-D</i>	Navigate®	21	1	0	0	0	0-7 ¹	0-7 ¹	0-7 ¹
	Renovate® Max G	21	0	0	0	0	0-120 ²	0-120 ²	0-120 ²
	Weedar® 64	21	1	0	0	0	0-7 ¹	0-7 ¹	0-7 ¹
	AquaSweep®	21	0	0	0	0	0-120 ²	0-120 ²	0-120 ²
<i>Glyphosate</i>	AquaNeat®	0	0	0	0	0	0	0	0
	RefugeTM	0	0	0	0	0	0	0	0
	Alligare Glyphosate 5.4	0	0	0	0	0	0	0	0
	Rodeo®	0	0	0	0	0	0	0	0
<i>Imazapyr</i>	Habitat®	½ mile ³	0	0	0	0	120	120	0
	Arsenal®	½ mile ³	0	0	0	0	120	120	0
	Polaris®	½ mile ³	0	0	0	0	120	120	0
<i>Imazamox</i>	Clearcast®	<50 ppb	0	0	0	0	<50 ppb	<50 ppb	0
	Imox®	<50 ppb	0	0	0	0	<50 ppb	<50 ppb	0
<i>Triclopyr</i>	Renovate®	<0.4 ppm	0	0	0	0	120	120	0
<i>Carfentrazone</i>	Stingray®	0-1	0	0	0-1	0-1	0-14	0-14	0-14
<i>Bispyribac</i>	TradewindTM	0	0	0	0	0	<1 ppb	<1 ppb	<1 ppb
<i>Topramezone</i>	Oasis®	<45 ppb	<50 ppb	<50 ppb	<50 ppb	<50 ppb	<1 ppb	<1 ppb	<1 ppb
<i>Penoxsulam</i>	Galleon® SC	0.1 ppm	0	0	0	0	<1 ppb	<1 ppb	<1 ppb

1. If the crop area is labeled for direct treatment with 2,4-D, the water may be used for irrigation or mixing sprays at any time following treatment. If the crop area is not labeled for direct treatment with 2,4-D the water should not be used for irrigation or mixing sprays until 7 days after treatment.
2. If the crop area is labeled for direct treatment with Triclopyr and 2,4-D, the water may be used for irrigation or mixing sprays at any time following treatment. If the crop area is not labeled for direct treatment with Triclopyr and 2,4-D the water should not be used for irrigation or mixing sprays until 120 days after treatment.
3. Imazapyr cannot be applied less than ½ mile from a potable water intake.

CALCULATING PESTICIDE CONCENTRATIONS IN AQUATIC SITUATIONS¹

James Shelton and Wesley Gerrin, Fisheries

Braxton Crews, Agriculture & Natural Resources Extension Agent

Depending on the chemical, pesticides are applied as a surface acre, bottom acre-foot or total water volume treatment. Total water volume treatments are expressed on a part per million by weight (ppmw) basis. Water volume can be measured in gallons, cubic yards, cubic feet, etc.; however, the most commonly used unit of

water volume measurement is acre-feet. The following formula may be used to determine the amount of pesticide formulation required to obtain a desired final concentration (ppmw) in the water of a pond or lake on an acre-feet basis:

$$\text{Concentration based on part per million by weight (ppmw) amount of formulation} = \frac{A \times D \times CF \times ECC}{I}$$

A = area of the water surface in acres (Use precise measurement or measure from aerial photos).

D = average depth of the pond or lake in feet.

CF = 2.72 lb/acre foot. The Conversion Factor (CF) when total water volume is expressed on an acre-feet basis.

2.72 lb of a pesticide per acre-foot of water is equal to one ppmw.

ECC = Effective Chemical Concentration of the active ingredient of a pesticide needed in the water to achieve control of the pest.

I = The total amount of active ingredient divided by the total amount of active and inert ingredients. Liquid products usually list the amount of active ingredients as pounds per gallon. For such products:

$$I = \frac{\text{pounds of active ingredients}}{\text{one (1) gallon}}$$

Non-liquid formulations usually list active ingredients as a percentage of the total formulation. For non-liquid formulations:

$$I = \frac{\text{percent active ingredients}}{100\%}$$

The following formula may be used to determine the amount of pesticide formulation on a surface acre basis.

Amount of pesticide formulation per surface acre.

$$\text{Amount of formulation} = (\text{Surface acres}) \times (\text{Broadcast formulation})$$

¹ For additional information, refer to UGA Extension Bulletin 866 – “Using Chemicals in Pond Management.”