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Fish and agricultural chemicals: Safeguarding your pond

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There are about 300,000 ponds and reservoirs on private lands in Missouri as well as numerous miles of streams and rivers that flow through them.

These water bodies serve a variety of uses, such as fishing, swimming and water for livestock.

Some areas are also now being used to rear fish for domestic use or for sale.

For example, cage culture of channel catfish is a new use of Missouri ponds.

The use of these waters for domestic and commercial activities is beneficial for all Missouri residents.

Unfortunately, these water bodies are also susceptible to chemical contamination from agricultural activities such as accidental spills, drainage from washing and cleaning of spray equipment and pesticide containers, drift from spraying operations or runoff from newly treated fields.

An inspection of drainage areas will indicate which croplands have the greatest potential for runoff and contamination of water.

When possible, crops should be planted on these lands which will require little or no pest control.

If this is not feasible, then the least toxic pesticide needed to treat the crop should be the product of choice.

This document is intended to assist you in selecting products which are least likely to have adverse effects on your fish ponds.

If you are unsure of which products to use or have other questions or need on-site assistance, contact your local extension agent.

Several pesticides including algicides, herbicides and piscicides, are labelled for pest control in ponds and waterways. These products have been tested and cleared for use near or in aquatic environments.

However, proper handling and use of pesticides in aquatic areas is especially critical. Accidental spills or overdoses can kill fish, or cause other damage to their habitat which will lead to reductions in the fish population.

Acute toxicity is not the only way pesticide use can result in a fish kill.

In addition to acute toxic effects, secondary effects of pesticide use can also cause fish kills.

For example, herbicide treatment of large areas of weeds can cause oxygen depletion as dead weeds decompose and can result in fish kills by suffocation.

Therefore, only one-third to one-half of dense weed beds should be treated at one time to minimize the possibility of fish loss.

Relative toxicity

The acute toxicity of a chemical to fish is usually expressed as 96 hr LC50 in parts per million (ppm or mg/1).

The relative acute toxicity of chemicals to fish can be categorized as follows:

Toxicity rating	96 hour LC50
Slightly toxic	10-100 ppm
Moderately toxic	1-10 ppm
Highly toxic	0.1-1.0 ppm
Extremely toxic	less than 0.1 ppm

The six tables, which give relative acute toxicity of some herbicides, insecticides and fungicides to bluegill sunfish (*Lepomis macrochirus*) and channel catfish (*Ictalurus punctatus*), can be used to determine the potential toxicity to fish of using these compounds around water bodies and to select products which are less likely to cause problems.

The values are derived from laboratory studies and are given only as a guideline and not as absolute values of the toxicity of the chemicals to bluegill or channel catfish.

Factors influencing the toxicity of chemicals to fish are age, size, and health of the fish; water quality parameters such as temperature, pH, dissolved oxygen, and turbidity; amount and kind of aquatic vegetation present; concentration and formulation of chemi-

cal and length of exposure.

In many situations, therefore, the actual amount of chemical that will kill fish in a specific body of water may be more or less than the LC50 values given in this publication.

Nevertheless, the tables can help you select products which are least likely to have adverse effects on water bodies susceptible to damage resulting from pesticide use.

Definitions

Acute Toxicity: Chemical is lethal to fish, usually within 96 hours or less.

LC50: The concentration of a chemical estimated to be lethal to 50% of the test organisms (fish) after 96 hours of exposure.

The larger the value of the 96 hour LC50, the less toxic the chemical is to fish; the smaller the number, the more toxic it is.

Part per million: A concentration of one part per million (mg/1) is equal to:

2.72 pounds per acre-foot, 0.0038 grams per gallon, 1.303 quarts per acre-foot, 0.134 ounces per 1000 gallons, 2 jiggers of Vermouth in a tank car of gin.

Acre-feet (A ft): 325,850 gallons, 43,560 cubic feet or 2,718,144 pounds of water.

One acre-foot equals the volume of water that has an area of 1 surface acre and a depth of 1 foot.

Calculations

Acre-feet of water is determined by multiplying the surface area of the pond (in acres) by the average depth in feet.

Surface area is determined by multiplying the length by the width.

The volume of a ditch or canal is defined as:

V = A x L x 43,560 where:

V = volume in acre-feet

A = cross section area of channel in square feet

L = length of channel in feet

The volume of a pond or lake is defined as:

V = A x D where:

V = volume in acre-feet

A = area of water surface in acres

D = average depth in feet

Precautions

Be sure to read and follow label instructions before using any chemical.

If you are not sure about applying chemicals to fields adjacent or close to fish ponds, contact your local extension agent for specific information.

In addition, the following recommendations should help reduce potential toxicity problems in ponds and lakes:

- Be especially careful when applying pesticides labelled for use in aquatic environments.
- Never treat more than one-third to one-half of a weed infestation at a time. When chemical applications are made by ground or aerial equipment in the immediate vicinity of water, use low pressure and a spray rate to produce large droplets to minimize drift.
- Use any other operating practices which will reduce drift.
- Delay chemical applications in the vicinity of fish ponds until wind is blowing away from the pond.
- Use chemicals which are least toxic to fish when applying chemicals close to ponds.
- When possible, plant crops that require little or no insect control close to fish ponds.
- Check equipment regularly to insure good operating condition.
- Aerial applicators should not fly over fish ponds empty or loaded with pesticides.
- Avoid use of span sprayers close to ponds.
- Use products according to the label.
- Empty pesticide containers should not be discarded into waterways.

Sources of information

The toxicity values given in Tables 1 through 6 are taken mainly from:

Manual of Acute Toxicity: Interpretation and data base for 410 chemicals and 66 species of freshwater animals by F.L. Mayer, Jr. and M.R. Ellersieck, U.S. Department of the Interior, Fish and Wildlife Service, Resource Publication 160, Washington, D.C., 579 pp., 1986.

Herbicide Handbook, 5th edition, Weed Society of America, Champaign, Illinois, 515 pp., 1983. Agricultural chemical toxicity to selected aquatic animals: bluegill, channel catfish, rainbow trout, crawfish, and freshwater shrimp.

Cooperative Extension Service Publication 1455, Mississippi State University, Mississippi State, Mississippi 39762

Other contacts for information include:

Missouri Department of Conservation
District Fishery Biologists
U.S. Fish and Wildlife Service
Contaminant Biologist
PO Box 1506, Columbia, Missouri
65205-1506
Information Center, National Fisheries
Contaminant Research Center
Route 2, 4200 New Haven Road, Columbia
Missouri 65201
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Table 1. Herbicides: Relative acute toxicities to bluegill.

Extremely Toxic <0.1 ppm		Highly Toxic 0.1-1.0 ppm		Moderately Toxic 1-10 ppm		Slightly Toxic 10-100 ppm	
Common Name	Trade Name	Common Name	Trade Name	Common Name	Trade Name	Common Name	Trade Name
ethalfluralin	Sonalan	2,4-D butoxyethanol ester		2,4-D	several	2,4-D/2,4,5-T (24%/28)	
fluchloralin	Basalin			dodecyl / tetradodecyl amine salt		2,4-D/2,4,5-T (30%/28%)	--
		2,4-D propylene	--	2,4-DB	several	2,4,5-T triethylamine salt	
		2,4-D/2,4,5-T (18%/19%)		acetochlor	--	acifluorfen	Blazer,Tackle
profluralin	Tolban	acrolein	Magnacide H	alachlor	Lasso		
		bensulide	Prefar, Betasan	ametryn	Evik	atrazine	several
		bromoxynil	Buctril	azide potassium		bromacil	Hyvar, Krovar, others
		butachlor	Machete	§ benzoyl propethyl		cacodylic acids	several
				bifenox	Modown	chloramben	Amiben
		diclofop methyl	Hoelon	butylate	Sutan	chlorpropham	Furloe
		endothall	several	CDAA	Randox	cyanazine	Bladex
		ether ester		chlorflurenol	several	cyometrinil	Concep
				Copper ethylenediamine complex	Komeen (Komeen)		
		glycol butyl	--	--	Dead X	cyprazine	Outfox
		sodium azide	Smite	dichlobenil	Casoron	desmedipham	Betanex
		trefmid		diethatyl ethyl	Antor	diallate	Avadex
		triclopyr	Garlon	dinitramine	--	diphenamide	Enide
		trifluralin	Treflan, Trilin	diuron	Karmex, others	EPTC	Eptam, Eradicane, others
				endothall copper salt	--	fenac	Fenatrol, others

Table 1 (continued). Herbicides: Relative acute toxicities to bluegill.

Extremely Toxic <0.1 ppm		Highly Toxic 0.1-1.0 ppm		Moderately Toxic 1-10 ppm		Slightly Toxic 10-100 ppm	
Common Name	Trade Name	Common Name	Trade Name	Common Name	Trade Name	Common Name	Trade Name
				--	Endotoall 282	fluometuron	Cotoran, Meturon
				ethofumesate	Nortron	fluridone	Sonar, Brake
				flamprop-methyl	Mataven		
				glyphosate	Roundup, Rodeo, others	linuron	Lorox, Linex, several
						MCPA dimethyl amine salt	
				MCPB	several		
				merphos	--	nitralin	Planavin
				methazole	Probe	norea	Herban
				naphthalic	Protect	paraquat	Gramoxone Super
				anhydride	Advantage		
				propachlor	Ramrod	picloram	Tordon
				propanil	Stam, Stampede	prometon	Pramitol
				silvex	several	prometryn	Caparol, Cotton Pro
				terbutryn	Igran	propham	Chem-Hoe
				thiobencarb	Bolero	silvex butoxyethanol ester	--
				triallate	Fargo	simazine	Princep, Aquazine
				vernolate	Vernam, Reward	sodium arsenite	--

Table 2. Insecticides: Relative acute toxicities to bluegill.

Extremely Toxic ≤0.1 ppm	Highly Toxic 0.1-1.0 ppm	Moderately Toxic 1-10 ppm	Slightly Toxic 10-100 ppm
Akton	Coumaphos	Aminocarb	Acephate
Aldicarb	Crotoxyphos	Carbaryl	Apholate
Aldrin	DDE	Crufomate	Bacillus thuringiensis
Allethrin racemic mix	Diazinon	Dichlofenthion	Chlodimedform
Amdro	Dichlorvos	Dimethoate	Cryolite
Azinphos-methyl	Disulfoton	Fenitrothion	Dicrotophos
Benzene Hexachloride	DNOC	Fenthion	Diflubenzuron
Bomyl	EPN	Methoprene	Landrin
Carbofuran	Ethion	Methyl parathion	Monocrotophos
Carbophenothion	Methiocarb	Mexacarbate	Oxydemeton-methyl
Chlordane	Methomyl	Naled	Ryania
Chlordane Trans	Methyl trithion	Oxamyl	
Chlordane-HCS-3260	Parathion	Phosphamidon	
Chlorfenvinphos	Phosalone	Propoxur	
Chlorpyrifos	Phosmet	Ronnel	
Chlordane CIS	Phoxim	SD 16898	
Chlordecone	SD 7438	SD 17250	
Crotoxyphos	Tepp	Temephos	
D-Trans Allethrin	Tetrachlorvinphos	Trichlorfon	
DDT	Trichloronate		
Dieldrin			
Dilan			
Dimethrin			
Dioxation			
Endosulfan			
Endrin			
Ethylan			
Fensulfothion			
Fenvalerate			
Fonofos			
Heptachlor			
Leptophos			
Lindane			
Malathion			
Methiodathion			
Methoxychlor			
Mevinphos			
Ortho 11775			
Oxythioquinox			
Parathion dithioate analogue			
Permethrin			
Phorate			
Profenofos			
Pyrethrum			
Resmethrin			
Rotenone			
Ru-11679			
S-Bioallethrin			
Terbofos			
Terpine Polychlorinates			
Toxaphene			

Table 3. Fungicides: Relative acute toxicities to bluegill.

Extremely Toxic <0.1 ppm	Highly Toxic 0.1-1.0 ppm	Moderately Toxic 1-10 ppm	Slightly Toxic 10-100 ppm
Captafol	Anilazine	Benomyl	Correx
Dinocap	Captan		Fenaminosulf
Folpet			Hexachlorobenzene
			Lime Sulfur

Table 4. Herbicides: Relative acute toxicities to channel catfish.

Extremely Toxic <0.1 ppm		Highly Toxic 0.1-1.0 ppm		Moderately Toxic 1-10 ppm		Slightly Toxic 10-100 ppm	
Common Name	Trade Name	Common Name	Trade Name	Common Name	Trade Name	Common Name	Trade Name
bromoxynil	Buctril	2,4-D (BEE)	Weedar 64, others	2,4-D DTA	--	2,4-D(DMA)	Several
		chloroxuron	Tenoran				
			DEF			acifluorfen	Blazer, Tackle
		endothall	Hydrothall 191, others	merphos	Folex	fluometuron	Cotoran, Meturon
		fluchloralin	Basalin	chlorbromuron	--		
		fluometuron	Cotoran, Meturon	flamprop-methyl	Mataven	cyanazine	Bladex
		fluorodifen	several	linuron	Lorox, Linex	dichlorprop	Weedone 170
		pendimethalin	Prowl	metolachlor	Dual	fluridone	Sonar, Braker
		propachlor	Ramrod	picloram	Tordon	glyphosate	Roundup, Rodeo
				propanil	Stam, Stampede	molinate	Ordram
				terbutryn	Igran	monuron TCA	Urox
				thiobencarb	Bolero	MSMA	several
			triallate	Fargo			
				trifluralin	Treflan, Trilin, others	paraquat	Gramoxone Super
						silvex	several
						sulfometuron methyl	Oust

Table 5. Insecticides: Relative acute toxicities to channel catfish.

Extremely Toxic <0.1 ppm	Highly Toxic 0.1-1.0 ppm	Moderately Toxic 1-10 ppm	Slightly Toxic 10-100 ppm
Aldrin	Akton	Abate	Altosid
Ambush	Amdro	Aminocarb	Bidrin
Attac	BHC	Baygon	Carbaryl
Belt	Carbofuran	Baytex 46%	Chlordimeform
Chlordane	Chlorpyrifos	Bolstar 6 EC	Diflubenzuron
Chrysron	Co-Rol	Ciodrin	Dimecron
Curacron	Comite	Crotoxyphos	Dimilin
D-Trans allethrin	Dibrom	Cytion	Metasystox-R
Dieldrin	Dicofol	DEF	Phosphamidon
Endosulfan	Dipterex	Demeton	Ryania
Endrin	Dursban	Dichlofenthion	Vydate L
Fenvalerate	Dylos	Dicrotophos	Zectran
Flucythrinate	EPN	Disulfoton	
Heptachlor	Jodfenphos	Entex	
Lindane	Kepone	Ethion	
Marlate	Lanate	Ethyl parathion	
Permethrin	Neguvon	Fenitrothion	
Pyrethrins	Nudrin	Guthion	
Rotenone	Phorate	Imidan	
Resmethrin	Proxol	Korlan	
Toxaphene		Malathion	
		Mesural	
		Methyl parathion	
		Methyl trithion	
		Mexacarbate	
		Monocrotophos	
		Phosmet	
		Terbufos	
		Tiguvon	
		Trithion	
		Trolene	
		Viozene	

Table 6. Fungicides: Relative acute toxicities to channel catfish.

Extremely Toxic <0.1 ppm	Highly Toxic 0.1-1.0 ppm	Moderately Toxic 1-10 ppm	Slightly Toxic 10-100 ppm
Benlate	Anilazine	Cycloheximide	Apron
Captafol	Dithianon	Dithane M-45	Bayleton
Captan	Folpet		Hexachlorobenzene
Correx	Thiram		Metalaxyl

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