

# 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 that 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 publication is intended to assist you in selecting products that 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 pesticides, are labeled 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 that 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/l).

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

<b>Toxicity rating</b>	<b>96 hour LC50</b>
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 (*Ictalurus punctatus*), can be used to determine the potential toxicity to fish of using these compounds around water bodies and to select products that 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 chemical and length of exposure.

Therefore, in many situations, 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 that 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 percent 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.

**Parts per million:** A concentration of one part per million (mg/l) is equal to: 2.72 pounds per acre foot, 0.0038 grams per gallon, 1.303 quarts per acre foot, 0.134 ounces per 1,000 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:

$$V = A \times L \times 43,560 \text{ where:}$$

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

$$= A \times D \text{ where:}$$

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 labeled 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 that will reduce drift.
- Delay chemical applications in the vicinity of fish ponds until wind is blowing away from the pond.
- Use chemicals that 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 ensure 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, P.O. Box 1506, Columbia, Missouri 65205-1506.

Information Center, National Fisheries.

Contaminant Research Center, Route 2, 4200 New Haven Road, Columbia, Missouri 65201.

University of Missouri Cooperative Extension.

**Table 1. Herbicides and their relative acute toxicities to bluegill.**

<p><b>Extremely toxic</b> (less than 0.1 ppm): ethalfluralin (Sonalin®); fluchloralin (Basalin®); profluralin (Tolban®)</p>
<p><b>Highly toxic</b> (0.1-1.0 ppm): 2,4-D butoxyethanol ester; 2,4-D propylene, 2,4-D/2,4,5-T (18%/19%); acrolein (Magnacide H®); bensulide (Prefar®, Betasan®); bromoxynil (Buctril®); butachlor (Machete®); diclofop methyl (Hoelon®); endothall; ether ester; glycol butyl; sodium azide (Smite®); trefmid; triclopyr (Garlon®); trifluralin (Treflan®, Trilin®)</p>
<p><b>Moderately toxic</b> (1-10 ppm): 2,4-D; dodecyl/tetradodecyl amine salt; 2,4-DB; acetochlor; alachlor (Lasso®); ametryn (Evik®); azide potassium; benozyl propethyl; bifenox (Modown®); butylate (Sutan®); CDAA (Randex®); chlorflurenol; copper ethylenediamine complex (Komeen®); Dead X®; dichlobenil (Casoron®); diethatyl ethyl (Antor®); dinitramine; diuron (Karmax®, others); endothall; copper salt; Endothall 282®; ethofumesate (Nortron®); flamprop-methyl (Mataven®); glyphosate (Roundup®, Rodeo®, others); MCPB; merphos; methazole (Probe®); naphthalic (Protect®); anhydride (Advantage®); propachlor (Ramrod®); propanil (Stam®, Stampede®); silvex; terbutryn (Igran®); thiobencarb (Bolero®); triallate (Fargo®); vernolate (Vernam®, Reward®)</p>
<p><b>Slightly toxic</b> (10-100 ppm): 2,4-D/2,4,5-T (24%/28%); 2,4-D/2,4,5-T (30%/28%); 2,4,5-Ttriethylamine salt; acifluorfen (Blazer®, Tackle®); atrazine; bromacil (Hyvar®, Krovar®, others); cacodylic acids; chloramben (Amiben®); chlorpropham (Furloe®); cyanazine (Bladex®); cyometrinil (Concep®); cyprazine (Outfox®); desmedipham (Betanex®); diallate (Avadex®); diphenamide (Enide®); EPTC (Eptam®, Eradicane®, others); fenac (Fenatrol®, others); fluometuron (Cotoran®, Meturon®); fluridone (Sonar®, Brake®); linuron MCPA dimethyl amine salt (Lorox®, Linex®, others); nitralin (Planavin®); norea (Herban®); paraquat (Gramoxone Super®); picloram (Tordon®); prometon (Pramitol®); prometryn (Caparol®, Cotton Pro®, Chem-Hoe®); silvex butoxyethanol ester; simazine (Princep®, Aquazine®); sodium arsenite</p>

**Table 2. Insecticides and their relative acute toxicities to bluegill.**

<b>Extremely toxic</b> (less than 0.1 ppm): Akton, Aldicarb, Aldrin, Allethrin racemic mix, Amdro, Azinphos-methyl, Benzene hexachloride, Bomyl, Carbofuran, Carbophenothion, Chlordane, Chlordane Trans, Chlordane-HCS-3260, Chlorfenvinphos, Chlorpyrifos, Chlordane CIS, Chlordecone, Crotoxyphos, D-Trans allethrin, DDT, 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, Terpene polychlorinates, Toxaphene
<b>Highly toxic</b> (0.1-1.0 ppm): Coumaphos, Crotoxyphos, DDE, Diazinon, Dichlorvos, Disulfoton, DNOC, EPN, Ethion, Methiocarb, Methomyl, Methyl trithion, Parathion, Phosalone, Phosmet, Phoxim, SD 7438, Tepp, Tetrachlorvinphos, Trichloronate
<b>Moderately toxic</b> (1-10 ppm): Aminocarb, Carbaryl, Crufomate, Dichlofenthion, Dimethoate, Fenitrothion, Fenthion, Methoprene, Methyl parathion, Mexacarbate, Naled, Oxamyl, Phosphamidon, Propoxur, Ronnel, SD 16898, SD 17250, Temephos, Trichlorfon.
<b>Slightly toxic</b> (10-100 ppm): Acephate, Apholate, Bacillus thuringiensis, Chlodimedform, Cryolite, Dicrotophos, Diflubenzuron, Landrin, Monocrotophos, Oxydemeton-methyl, Ryania.

**Table 3. Fungicides and their relative acute toxicities to bluegill.**

<b>Extremely toxic</b> (less than 0.1 ppm): Captafol, Dinocap, Folpet.
<b>Highly toxic</b> (0.1-1.0 ppm): Anilazine, Captan.
<b>Moderately toxic</b> (1-10 ppm): Benomyl.
<b>Slightly toxic</b> (10-100 ppm): Correx, Fenaminosulf, Hexachlorobenzene, Lime Sulfur.

**Table 4. Herbicides and their relative acute toxicities to channel catfish.**

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

**Table 5. Insecticides and their relative acute toxicities to channel catfish.**

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

**Table 6. Fungicides and their relative acute toxicities to channel catfish.**

<b>Extremely toxic</b> (less than 0.1 ppm): Benlate, Captafol, Captan
<b>Highly toxic</b> (0.1-1.0 ppm): Anilazine, Dithianon, Folpet, Thiram
<b>Moderately toxic</b> (1-10 ppm): Cycloheximide, Dithane M-45
<b>Slightly toxic</b> (10-100 ppm): Apron, Bayleton, Hexachlorobenzene, Metalaxyl

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