

HERBICIDES
THE CAUSE OF AMPHIBIAN DECLINE
 By Ravin Thomasson
 Wildlife and Fisheries Science
 University of Tennessee, Knoxville

Control, Estradiol, Ethynyl-E2, DES, DDT, Estrogen + Tamoxifen

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WHAT IS A HERBICIDE?

- Pesticide is any substance or mixture of substances intended for:
 - preventing
 - destroying
 - repelling
 - mitigating any pest.
- Herbicides are chemicals used to manipulate or control undesirable vegetation. (USEPA)
- Nonpoint pollution from runoff

Crop	Approximate Application (Millions of acres)
Corn	85
Soybean	75
Rice	15
Wheat	10
Cotton	5
Tobacco	2
Pastureland	1
Sorghum	1
Alfalfa	1
Other	1

WHERE ARE THEY USED?

- First widely used in the 1940's in:
 - Row-crop farming
 - Forest management
 - Invasive plant control
 - Grassland management
 - Suburban and urban areas
 - Water bodies to control aquatic plants
- Herbicides were applied to 97 percent of the corn acreage in the United States in 2005, with a total of 76,470,000 acres of corn planted received herbicide application (Harris, 2006).

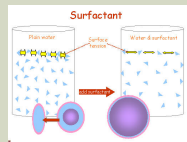
HOW THEY WORK ON PLANTS/APPLIED?

- Herbicides can:
 - inhibit cell division
 - Photosynthesis
 - Amino acid production
 - Mimicking hormones that regulate plant growth
 - Causing deformities in new growth
- Application:
 - spraying onto foliage
 - applying to soils
 - applying directly to aquatic systems



SURFACTANTS

- Surfactants (polyethoxylated tallow amine or POEA): are the most toxic agent in herbicides
- Is a compound that allows the liquid herbicide such as glyphosate to stick to the surface of plants by lowering the surface tension
- Prevents the chemical from forming into droplets and rolling off leaves when sprayed
- Some of these surfactants are serious irritants, toxic to fish, and can themselves contain contaminants which are carcinogenic to humans.



WHAT HAPPENS TO AMPHIBIANS?

- Herbicides:
 - Damage to DNA
 - Reduce resistance to parasites
 - Gender manipulation
 - Interfere with hormones and enzymes
 - delayed metamorphosis
 - Immune suppression
 - outright mortality
 - Liver damage can lead to increases in liver granulocytes and melanomacrophages this can lead the organ damage (Rose et al. 1999)

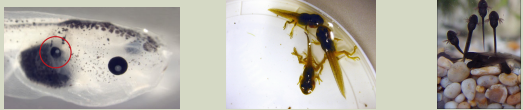


The widely used weedkiller atrazine has been found to disrupt growth in tadpoles during the phase in which organs are formed. Top left: an untreated tadpole; top right and below: those exposed to atrazine. Photos: Courtesy of Kelly A. McLaughlin



WHAT HAPPENS TO AMPHIBIANS?

- **Surfactants:**
 - Reduction in the gill branchial cartilage
 - craniofacial and mouth deformities
 - Eye abnormalities
 - Tail deformities
 - Abnormal gonadal development
- Tadpoles exposed to concentrations as low as 1.5 mg a.e./L showed reduction in the gill branchial cartilage, which would result in reduced ability of the tadpoles to breath (Tyler 1997; Lajmanovich et al. 2003).




WHAT CAN BE DONE?

- Reduce herbicide use
- Decreases in pH of water bodies
- Lower temperature
- pH-lower pH lower mortality rate in some species, higher pH higher mortality (Relyea)
- As noted by past authors, this means that the toxicity of these herbicide formulations are of particular concern in wetlands on the upper end of the naturally occurring pH range (Chen et al. 2004, Edgington et al. 2004). (Relyea)

HERBICIDES - THE CAUSE OF AMPHIBIAN DEATH

- Used worldwide
- Growing human pollution
- Monopoly of large companies
- KILLS AMPHIBIANS



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