

Information and Resources

The Impact of Pesticides on Water Quality

What is a watershed and why is it important?

- A watershed is an area of land that drains into a common body of water.
- Water moves from high to low elevations after rainfall, snowmelt, or irrigation.
- Rain, melting snow, and irrigation water from a watershed travel over land, into groundwater, and into streams, creeks, rivers, lakes, or oceans.
- Actions we take on land can affect water quality downstream within our watershed.

Aquatic Food Pyramid

- At the bottom of the food pyramid are phytoplankton, algae, and other plants.
- Primary consumers are tiny invertebrates, feeding on algae or other plants. They, along with phytoplankton and plants, are most affected by pesticides in the waterways.
- Secondary consumers, such as fish, feed on the primary consumers.
- Tertiary consumers, such as birds and mammals, feed on fish.
- There is a potential for pesticides to accumulate in the upper food chain.

How do pesticides get into water resources?

- Pesticides applied to landscapes can be carried in irrigation or rainwater and wash into gutters, through storm drains, and eventually to creeks, rivers, or oceans.
- Pesticides can get into water when people dump pesticides or clean out pesticide equipment near gutters that run into storm drains. These activities are illegal.

Examples of least-toxic insecticides

- *Bacillus thuringiensis*, or Bt, a bacterial disease of certain insects
- Insecticidal oils including petroleum or mineral oils and plant-based oils such as neem
- Insecticidal soaps

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What are some harmful pesticides for aquatic organisms?

Insecticides are most likely to injure aquatic invertebrates and fish

- Organophosphates (e.g., malathion, diazinon, chlorpyrifos)
 - Diazinon and chlorpyrifos pose risks to children and are no longer registered for most urban and home and garden uses.
 - Residues of diazinon and chlorpyrifos can still be found in waterways at levels toxic to aquatic invertebrates.
 - Other organophosphates including malathion, disulfoton, and acephate pose moderate to low water quality risks.
- Pyrethroids (e.g., bifenthrin, cypermethrin, permethrin, cyfluthrin, and deltamethrin)
 - Common residential products used for ants; lawn, garden and landscape care; and structural pests
 - Persist in the environment
 - Not likely to move in the dissolved form
 - Easily attach to soil particles and wash into waterways
 - Found in sediment and water samples in urban waterways
 - Very toxic to aquatic organisms
- Fipronil
 - Used for termite and ant control
 - Very toxic to crustaceans
 - In the environment, breaks down to products more toxic than fipronil
- Imidacloprid
 - Used on turfgrass and ornamental plants for sucking insects
 - Persists in the environment, doesn't adsorb well to soils so may quickly move through some soil types
 - Although toxic to aquatic invertebrates, imidacloprid does not readily move with water

Fungicides

- Chlorothalonil
 - Broad-spectrum fungicide for many plant diseases in turf, ornamentals, vegetables, and fruit trees
 - Persists in the environment
 - Very toxic to fish and aquatic organisms

Herbicides

- Dissolve in water and move in runoff or attach to soil particles.
- Most herbicides are toxic to algae and plants; some are acutely toxic to aquatic invertebrates at high concentrations
 - Glyphosate
 - Moderately persistent in soil and strongly adsorbs to soil
 - Degrades into more toxic product than glyphosate
 - 2,4-D
 - Soluble in water, doesn't adsorb to soil, and degrades quickly
 - Some formulations are highly toxic to fish
 - Oxadiazon
 - Not very water soluble, strongly adsorbs to soil
 - Highly toxic to fish and aquatic insects

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Key resources:

Find your county extension office

- University of California Department of Agricultural and Natural Resources (http://ucanr.edu/County_Offices/)
- National Pesticide Information Center (<http://npic.orst.edu/countyext.htm>)

Pest identification and management methods

- UC Statewide IPM Program (www.ipm.ucanr.edu/)
- UC Weed Research and Information Center (<http://wric.ucdavis.edu>)

Information about pesticide products and safety

- California Department of Pesticide Regulation (www.cdpr.ca.gov/)
- U.S. Environmental Protection Agency (<http://www.epa.gov/pesticides/>)
- USDA Agricultural Research Service (www.ars.usda.gov)
- National Pesticide Information Center (<http://npic.orst.edu/gen.htm>)
- Pesticides and Urban Water Quality (<http://www.ipm.ucanr.edu/WATER/U/index.html>)
- WaterTOX water-related risks of pesticides (<http://www.ipm.ucanr.edu/TOX/simplewatertox.html>)
- EXTOKNET (<http://extoknet.orst.edu/>)
- Pesticide Wise (www.pw.ucr.edu)

Publications – pesticide information is applicable to all types of application, not just agriculture

- Pesticide Choice: Best Management Practices (BMP) for Protecting Surface Water Quality in Agriculture (<http://anrcatalog.ucanr.edu/Items/8161.aspx>)
- Protecting Surface Water from Sediment-Associated Pesticides in Furrow-Irrigated Crops (<http://anrcatalog.ucanr.edu/Items/8403.aspx>)