

Products for pesticide mitigation outreach

Joyce Strand, with Cheryl Wilen, Darren Haver, Jay Gan,
Mary Louise Flint, Cheryl Reynolds, and Scott Parker



What is the problem?

- *Monitoring studies show pesticide contamination of urban streams and other water ways*

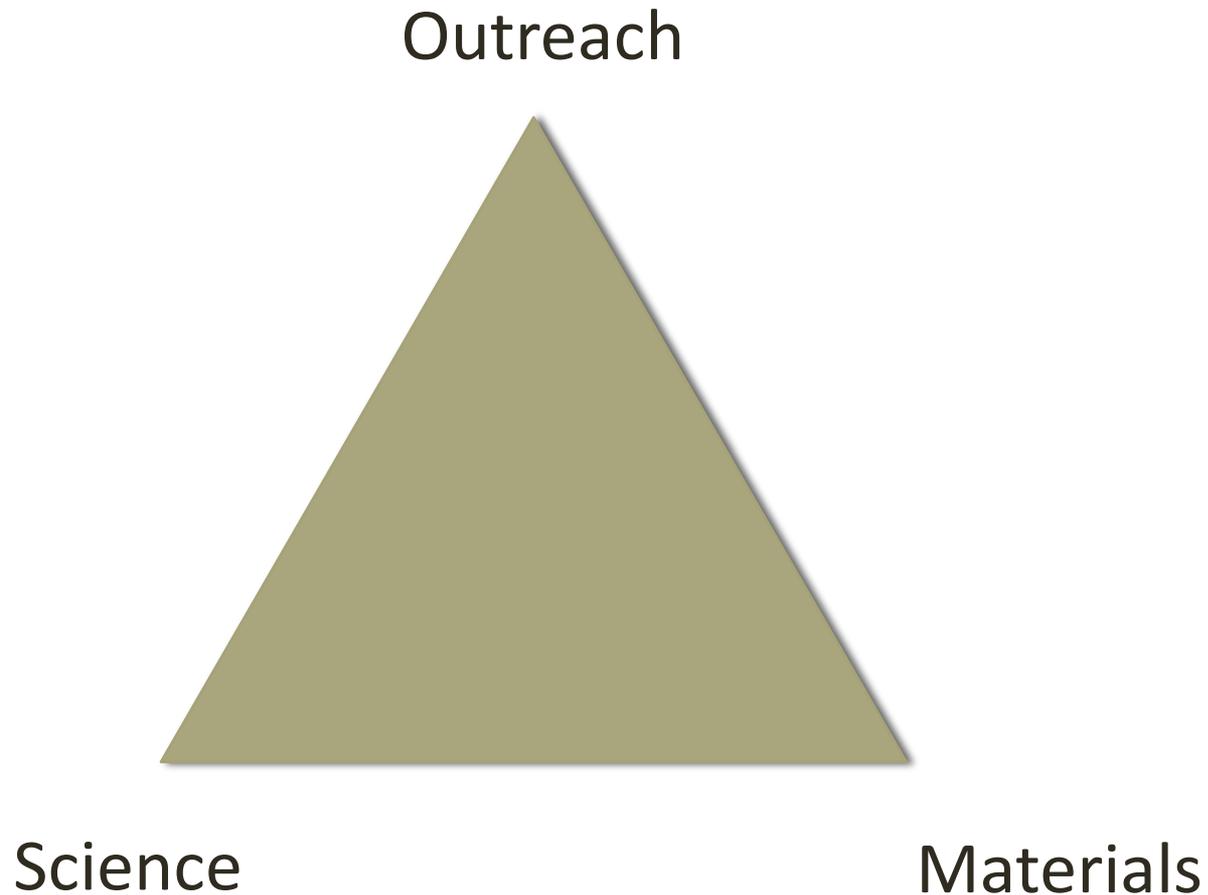
What is the problem?

- Diverse groups use pesticides
 - Professional
 - Unlicensed persons
- Diverse pest problems and pesticide products
 - Indoor and outdoor pests
 - Pesticides, complex restrictions
 - Formulations
 - Different toxicities and runoff potentials

What is the problem?

- Variety of use areas
 - Hard surfaces
 - Bare soil
 - Landscape plants, varying density
 - Pesticide behavior question
- Outreach information
 - Retailers
 - Customers at point of sale
 - Professionals
 - Residents

What is the solution?



Prior work

Wilens team DPR project

Development of Outreach Materials for Mitigating Pesticide Runoff in Urban Environments

Prototype products

- Newsletter
- Online training for retail nursery staff
- Pesticide Quick tip cards
- Pesticide database
- Videos
- Web site

Approach

- **Technical team**

- Cheryl Wilen—IPM
- Darren Haver—Water quality
- Mary Louise Flint—IPM
- Jay Gan—Environmental toxicology

- **Advisory team**

- Cynthia Havstad, Stopwaste.org
- Gina Purin, Marin Co.
- Naresh Duggal, Santa Clara Co.
- Nita Davidson, DPR
- Nan Singhasemanon, DPR

- **Project staff**

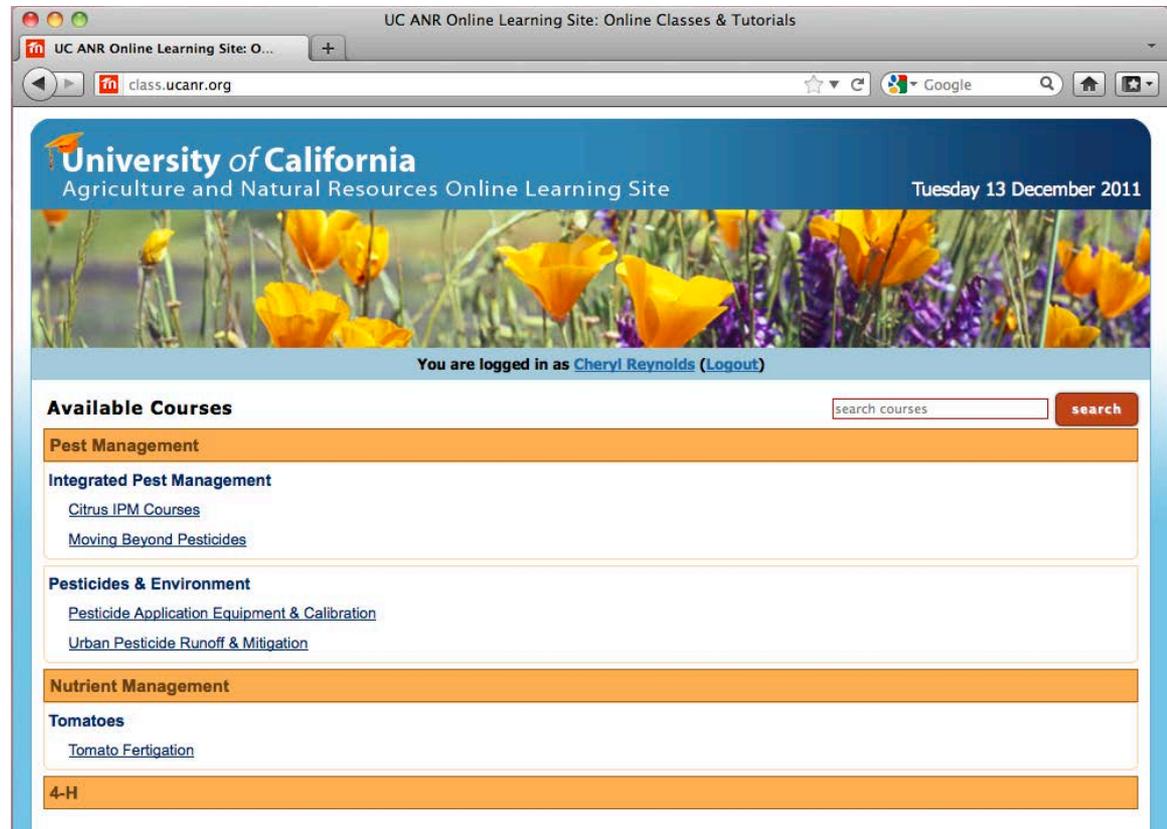
- Scott Parker
- Cheryl Reynolds
- Joyce Strand

Approach

1. Review prototypes
 - Scientific accuracy
 - Design and usability
 - Suitability for the audience
 - Professional
 - Master Gardeners
 - Residents
 - Retail
2. Revise and create new, final products
3. Outreach

Professionals

- Online training modules
- Newsletter
- Database of risks to water quality



The screenshot shows a web browser window with the title "UC ANR Online Learning Site: Online Classes & Tutorials". The address bar displays "class.ucanr.org". The page header features the "University of California" logo and the text "Agriculture and Natural Resources Online Learning Site" on the left, and the date "Tuesday 13 December 2011" on the right. Below the header is a banner image of yellow and purple flowers. A notification bar indicates the user is logged in as "Cheryl Reynolds" with a "Logout" link. The main content area is titled "Available Courses" and includes a search bar with the text "search courses" and a "search" button. The courses are listed in several categories, each with a sub-header and a list of course titles:

- Pest Management**
- Integrated Pest Management**
 - [Citrus IPM Courses](#)
 - [Moving Beyond Pesticides](#)
- Pesticides & Environment**
 - [Pesticide Application Equipment & Calibration](#)
 - [Urban Pesticide Runoff & Mitigation](#)
- Nutrient Management**
- Tomatoes**
 - [Tomato Fertigation](#)
- 4-H**

Online Training

- Basic Course (4 CEU from DPR)
 - IPM and reducing use of the most toxic pesticides
 - Pesticide properties
 - Impact on water quality
 - Ways to mitigate urban runoff
 - Mitigating the effects of bifenthrin and fipronil
 - Herbicides and water quality
- Pesticide application equipment and calibration (1.5 CEU from DPR)

What happens after pesticides enter a storm drain?

- Pesticides flow through pipes directly into creeks, rivers, and oceans
- Pesticides can kill aquatic plants and animals



Remember: Whenever something goes into a storm drain, it travels directly to a water body.

What is calibration?

Calibration: Adjustments you make to application equipment and the procedures you must follow so you know you're applying the correct amount of pesticide to a treatment area.

Importance of the label

- ✦ Lists amount of product required to control specific pests
- ✦ Using less can lead to an ineffective treatment, waste time and money, and pest resistance
- ✦ Never use more than the label recommends
- ✦ Using more can injure your plant, waste materials, affect natural enemies, the public, and environment, and increase the risk that pesticides move off site in runoff or leach into groundwater



You are legally responsible for all pesticides that you apply. If you make an application that causes injury or damage, you'll be liable and may be subject to fines, jail sentences, and loss of your applicator certificate or license

Why is all this important?

The properties of an herbicide, soil type, and environmental conditions all need to be taken into account in order to determine the risk of an herbicide to water bodies

Herbicide properties

- Help you understand what the risk is of an herbicide moving off site

Soil type

- Determines how an herbicide might move

Environmental conditions

- Determine the availability of water to help herbicides move

- Highly water-soluble herbicides leach into soil more easily than non water-soluble herbicides
- High chance of leaching if you apply it on sandy soil
- Greater chance for leaching if it rains or if you overwater after application

Soil type	Outcome
Sandy	 <p>Allows more leaching than clay</p>
Clay soils	 <p>Increase adsorption of herbicide and pesticides may break down before they leach; can lead to runoff</p>

Calibration Module - Final Test

Question 7 of 15 ▾

Point Value: 10

You have a sprayer with 6 nozzles on a boom. You collect 80 fl oz in 30 seconds. What is the output in gallons/min? (1 gallon = 128 fl oz)

- 96 gal/min
- 37.5 gal/min
- 1.25 gal/min
- 170 gal/min

Score so far: 50 points out of 60

SUBMIT

Choose pesticides that are safe for the environment

Know how a pesticide behaves in the environment after application.

Three key points:

- ✦ How the pesticide interacts with soil and water
- ✦ How the pesticide moves through the environment and its potential to get into water
- ✦ How the pesticide impacts water quality



Information and Resources

Practices for Mitigating Urban Pesticide Runoff

Ten practices that will help reduce the offsite movement of pesticides and avoid their negative impact on the environment:

1. **Do not use a pesticide if it is not necessary.**
 - Correctly ID the pest and make sure a pest, and not a problem
 - Consider alternative management methods
 - Pest - resistant plants, pruning, mulches, traps
 - Seal entryways, remove food sources, eliminate clutter
 - Water, fertilize, and prune plants appropriately
 - Encourage natural enemies
2. **Check the weather before applying a pesticide to avoid**
 - Spray when wind is less than 10 mph
 - Don't apply when rain is expected
3. **Read the label.**
 - Check the active ingredient(s) and consider its potential
 - Follow the directions and make sure the target pest is present
 - Use the product at the recommended rate
4. **Choose an effective pesticide that poses the least risk to**
 - All pyrethroids, fipronil, and some organophosphates are toxic to aquatic species
 - Use alternative insecticides such as *Bacillus thuringiensis*, neem oil, or insecticidal soaps

Information and Resources

Practices for Mitigating Urban Pesticide Runoff

6. **Adapt pesticide application methods to account for site-specific conditions.**
 - Don't apply pesticides over drains and near sloped areas
 - Delay irrigation after application
 - Leave an untreated buffer between the treated area and water bodies
7. **Verify that irrigation will not lead to runoff.**
 - Use drip irrigation, microsprinklers, or weather-based irrigation controllers to reduce weed pressure, disease and insect problems
 - Split irrigation time into several short run times if you have hard surfaces

Newsletter

Information for pest management professionals and pesticide applicators

University of California
Agriculture and Natural Resources

Vol. 1 • No. 7a • March 2011

Don't Let Your Pesticides Go Down the Drain

Information for pest management professionals and pesticide applicators

University of California
Agriculture and Natural Resources

Vol. 1 • No. 1 • June 2010

UC IPM Resources for Urban Pest Management Professionals

This issue of the *UC IPM Green Bulletin* is available on the IPM Web site at www.ipm.ucdavis.edu.

Information for pest management professionals and pesticide applicators

University of California
Agriculture and Natural Resources

Vol. 1 • No. 2 • July 2010

Efficacy of Argentine Ant Treatments

Information for pest management professionals and pesticide applicators

University of California
Agriculture and Natural Resources

Vol. 1 • No. 3 • August 2010

URBAN ENVIRONMENTS : Pesticide Applications to Hard Surfaces

Flying over a city, one easily can see just how much of the land consists of impervious surfaces such as roofs, sidewalks, driveways, parking lots, and streets. Impervious surfaces don't let water or other liquids pass through; instead, the liquid runs off. Most of these impervious surfaces are directly connected to storm drains and flood control channels where they quickly carry runoff to a body of water such as a river, a lake, or an ocean. Connecting impervious surfaces in this fashion has increased the movement of pollutants—including pesticides—in storm runoff and runoff from irrigation, car washing, and the cleaning of hard surfaces (Fig. 1).

This article gives an overview of the potential pollution issues from applying pesticides to various types of surfaces found in the landscape.

Concrete Increases Problems

Historically, most of the hard surfaces in an urban landscape have been made from concrete and asphalt. Very little

In the July issue of *UC IPM Green Bulletin*,...



Figure 1. Runoff from various outdoor activities in a residential neighborhood carrying nutrients and pesticides.



Figure 2. Flagstone walkway with flagstone.

Information for pest management professionals and pesticide applicators

University of California
Agriculture and Natural Resources

Vol. 1 • No. 4 • September 2010

Diagnosing Lawn Disorders

The most common lawn complaint among homeowners is likely dead or brown patches on turf. This problem seems simple enough, but finding the cause of dead spots can be very challenging. Dozens of different factors can be involved.

Many people tend to blame dead patches on insects or plant pathogens, but in many cases the more likely cause is improper management practices, or abiotic factors, rather than living pests.

A first step in diagnosing lawn problems is to review the history of the lawn including recent applications of fertilizer, herbicides, and other pesticides and to examine how water is being applied. Very common causes of damaged grass are fertilizer burn, herbicide



Brown spots in lawns can be caused by many factors, so careful diagnosis is required. Damage includes (clockwise from upper left) dog urine, masked chaffer (white grubs), Pythium blight, and fertilizer burn.

patches in shade, in areas of high traffic, or on slopes or uneven areas where mowing regularly scalps the grass could be clues that turf is not

Information for pest management professionals and pesticide applicators

University of California
Agriculture and Natural Resources

Vol. 1 • No. 6 • February 2011

Ways to Calibrate Spray Application Equipment

Supplies for Calibrations

- Buckets and a measuring container with markings in inches;
- A stopwatch;
- A tape measure and stakes to mark out the test area; and
- A calculator.

It is best to do three times and average the results. If you use a different container that holds 1/2 gallon, you would spray 1,000 gallons of water to cover 1,000 square feet.

Other factors that affect calibration include:

- The nozzle type and spray pattern.
- The spray pressure.
- The operator's speed.
- The terrain.
- The wind speed and direction.
- The temperature and humidity.
- The type of pesticide.
- The type of equipment.
- The type of surface.
- The type of crop.
- The type of pest.
- The type of weather.
- The type of operator.
- The type of equipment.
- The type of surface.
- The type of crop.
- The type of pest.
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- The type of operator.



Photo of a molehill in a lawn.

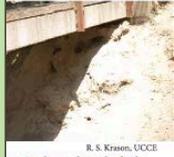


Photo of a molehill in a lawn.

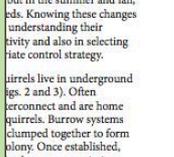


Photo of a molehill in a lawn.

Photos by D. L. Howe, UC Davis

How to Manage Pests

Compare Risks of Pesticide Active Ingredients

| [More Pests](#) | [About Risk Comparisons](#) |

Snails and Slugs

This table compares potential hazards of pesticides mentioned in the UC IPM Pest Note for [Snails and Slugs](#).

- This table does not include all pesticides registered for this purpose, only those included in the Pest Note.
- These pesticides vary in efficacy.
- Be aware that pesticides are often not necessary and nonchemical controls may be as effective.
- Please see the text of the Pest Note for complete information on management.

Click on the active ingredient name for more details of that pesticide

Pesticide Active Ingredient	Potential Hazard ¹ to					Notes
	Water quality ² (aquatic wildlife)	Natural enemies (beneficials)	Honeybees ³	People and Other Mammals		
				Acute ⁴	Long Term ⁵	
Bordeaux mixture	 VH	 L	 L	 M	Not listed	
Carbaryl	 M	 MH	 VH	 M	Not listed	
Iron phosphate	—	 L	 L	 VL	Not listed	
Metaldehyde	 L	 LH	 L	 M	Not listed	
Tribasic copper sulfate	 VH	—	 L	 M	Not listed	

For more information on toxicity of pesticides go to the [National Pesticide Information Center](#).

- 1 Potential Hazard Rating: VL=Very low, L=Low, LM=Low to Moderate, M=Moderate, LH=Low to High, MH=Moderate to High, H=High, VH=Very High, N=None, NKR=No Known Risk, —=No data
- 2 Water quality ratings from [Pesticide Choice: Best Management Practice \(BMP\) for Protecting Surface Water Quality in Agriculture](#), ANR Publication 8161, or the USDA-NRCS WIN-PST database—see [Pesticides: Water-Related Toxicology of Active Ingredients](#).
- 3 Honeybee ratings are: (Very High) I-Do not apply to blooming plants; (High) II-Apply only during late evening; (Moderate) III-Apply only during late evening, night, or early morning; and (Low) IV-Apply at any time with reasonable safety to bees. For more information, see [How to Reduce Bee Poisoning From Pesticides](#) (164 KB, PDF), Pacific Northwest Extension Publication PNW591.
- 4 Acute oral [toxicity](#) ratings for people and other mammals based on LD50 and US EPA Acute Toxicity Ratings system: H = Highly Toxic (LD50 <50), M = Moderately Toxic (LD50: 50-500), L = Slightly Toxic (LD50: 500-5000), VL = Not Acutely Toxic (LD50 >5000)
- 5 Long term ratings indicate whether the active ingredient is on the [California Prop 65](#) list, which indicates if materials are known to cause cancer or reproductive toxicity, or whether the [US EPA](#) has classified the pesticide as "likely to be carcinogenic to humans", "Group B-Probably Human Carcinogen", or "Group C-Possible Human Carcinogen."

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Iron phosphate	—	 L	 L	 VL	Not listed	
Metaldehyde	 L	 LH	 L	 M	Not listed	
Tribasic copper sulfate	 VH	—	 L	 M	Not listed	

Water Quality Rating²

- Overall runoff risk rating: **Very High**
- Source: *Pesticide Choice: Best Management Practice for Protecting Surface Water Quality in Agriculture*. UC ANR Publication 8161.

Impact on Natural Enemies

- Overall toxicity rating: **No information**

Impact on Honeybees³

- Toxicity category: **IV - Apply at any time with reasonable safety to bees**

Pests for which it is mentioned in Pest Notes

Peach Leaf Curl • Snails and Slugs

Application Tips

Must be applied as a protectant before the fungi arrive and begin the infection. May be used as dormant sprays or in the spring. Do not mix fixed coppers with other pesticides as plant injury can result.

Precautions and Safety Equipment

Minimize your exposure to pesticides. Avoid contact with eyes. Wear eye protection, long pants, a long-sleeved shirt, and a hat that can be washed after each use. Always read label of individual product for additional directions.

Always check the label before purchasing or applying a pesticide product for a specific pest on a specific plant to be sure it can be applied. Follow label directions precisely.

WARNING ON THE USE OF CHEMICALS

Example home, garden or landscape use products⁶

Lilly Miller Microcop Fungicide

Pesticide impacts on water

Comparisons of pesticide risks

Many of UC & ANR's Pest Note publications compare risks to water quality, natural enemies, bees, and people. Click the **Compare Risks** button in any of the following Pest Notes.

Insects & Other Arthropods		Weeds	Plant Diseases
<ul style="list-style-type: none">• Ants• Aphids• Bark Beetles• Clearwinged Moths• Codling Moth• Eucalyptus Redgum Lerp Psyllid• Fruittree Leafroller• Lawn Insects	<ul style="list-style-type: none">• Psyllids• Scales• Snails and Slugs• Spiders• Spider Mites• Thrips• Whiteflies	<ul style="list-style-type: none">• Bermudagrass• Crabgrass• Creeping Woodsorrel and Bermuda Buttercup• Nutsedge• Spotted Spurge• Weed Management in Lawns	<ul style="list-style-type: none">• Peach Leaf Curl• Powdery Mildew on Fruits and Berries• Powdery Mildew on Ornamentals• Powdery Mildew on Vegetables

How to Manage Pests

Pests in Gardens and Landscapes

Snails and Slugs

Revised 11/09

[PDF to print](#)

[Quick Tip](#)

[Nota Breve](#)

In this Guideline:

- [Identification and biology](#)
- [Damage](#)
- [Management](#)
- [About Pest Notes](#)
- [Publication](#)
- [Glossary](#)

Snails and slugs are among the most bothersome pests in California gardens. It was introduced from France. A particularly troublesome snail is the [white garden snail](#), *Thebaeus* *palustris* (formerly *Helix* *palustris*). It is common in San Diego County but has been found in Los Angeles County.

Several species of slugs also cause damage including the [garden slug](#) (*L. valentiana*), the [tawny slug](#) (*L.* *gagates*), and the [reticulated slug](#) (*L. reticulatum*, formerly *Agriolimax* *reticulatus*).



Sprinkle baits in areas that snails and slugs regularly frequent such as garden beds. Placing baits repeatedly in the same areas maximizes control, because they are attracted to food source sites. Never pile bait in mounds or clumps, especially those that are hazardous, because piling makes bait attractive to pets and children. Avoid watering or sprinkling. Thick, liquid baits might persist better when it is rainy or during heavy irrigation.

The timing of any baiting is critical; baiting is less effective during very hot or very cold weather. The year, because snails and slugs are less active during these periods. To promote snail activity, and apply the bait in the late afternoon or evening. Water sprinklers, close to walls and fences, or in other moist and protected areas that snails and slugs cross to get from sheltered areas to the garden.

[WARNING ON THE USE OF CHEMICALS](#)

ACTIVE INGREDIENTS >>>
Compare risks >>>

REFERENCES

Garden Chemicals & Water Quality

Home and garden pesticides and fertilizers are polluting California's waterways. Problems occur when people dump garden chemicals down drains or when chemical residues wash into gutters, storm drains, and streams by rain, garden watering, or cleaning up with the garden hose. Garden chemicals not only threaten aquatic life; they also can affect the quality of our drinking water. Follow these tips to keep our rivers, creeks, and oceans clean.

What can you do to protect water quality?

- ✦ **Limit pesticide use.** Use nonchemical methods or least-toxic pesticides wherever possible. Ask a UC Master Gardener for help with pest problems.
- ✦ **Avoid using pyrethroid insecticides.** These products, which include bifenthrin, cypermethrin, and permethrin, are among the most toxic to aquatic animals.
- ✦ **Control ants** by reducing food sources, excluding them from homes, and using baits in containers, instead of spraying. **Don't use insecticides for lawn insects** unless you are sure insects are causing the damage.

Reduce runoff by making your landscape water efficient!

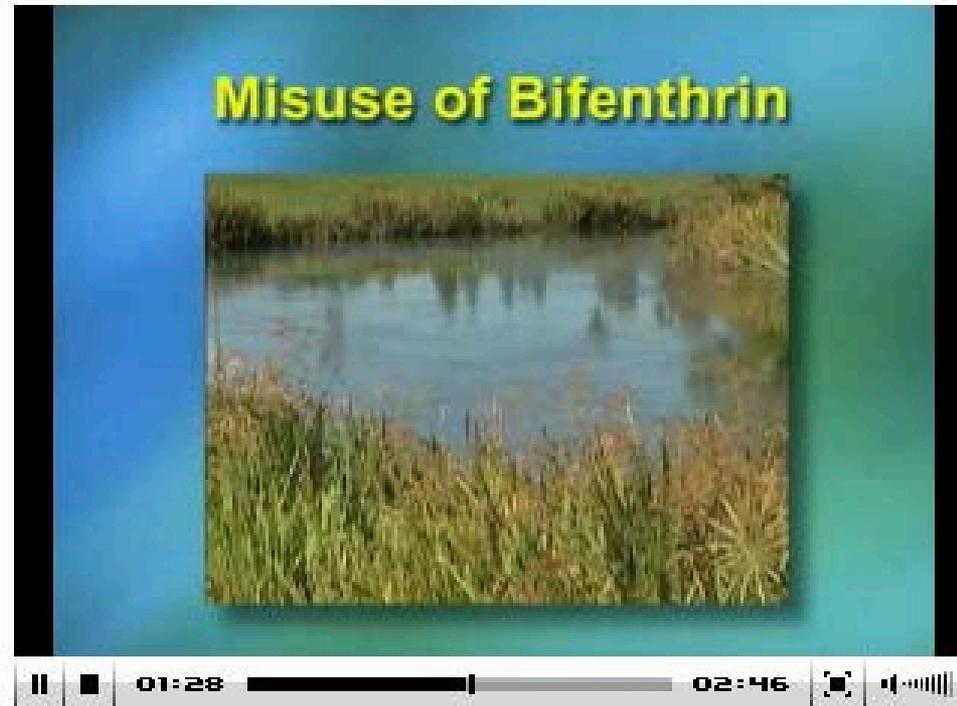
- ✦ **Reduce your landscape's need for water.** Choose water-efficient plants and garden designs.
- ✦ **Minimize runoff by using mulches** in beds and permeable materials for walkways and driveways. Aerate and add organic matter such as compost to heavy or compacted soils. Install terraces or other features on slopes to keep water on site.
- ✦ **Check and maintain your irrigation system,** so water does not run off your landscape onto hard surfaces and into gutters.
- ✦ **Improve watering efficiency and distribution** by using equipment such as drip irrigation, soaker hoses, and "smart" irrigation controllers and rotor heads.





Videos

- Imidacloprid
- Cyfluthrin
- Bifenthrin
- Fipronil



Quick summary of how to use bifenthrin with leafy environment.

Video by UC ANR.



HOME

MORE ABOUT PESTICIDES

[Pesticide information](#)

[Resources for professional pesticide applicators](#)

ON THIS SITE

[What is IPM?](#)

[Home & landscape pests](#)

[Agricultural pests](#)

[Natural environment pests](#)

[Exotic & invasive pests](#)

[Weed gallery](#)

[Natural enemies gallery](#)

[Weather, models & degree-days](#)

[Pesticide information](#)

[Research](#)

[Publications](#)

[Events & workshops](#)

[Online training](#)

[Links](#)

[About us](#)

[Contact us](#)

Pesticides in homes & landscapes

Pesticides must be used correctly to keep people, pets, and the environment safe. Find links here to information about the safe and effective use of pesticides recommended for homes, gardens, landscapes and lawns, plus possible problems that can occur from mis-use.

Pesticides are one way to manage pests, but they may not be needed, or can be more effective when combined with nonchemical methods. To find out how to safely and effectively manage a specific pest, see [Home & Landscape Pests](#).

Safe and effective use

- [Pesticides: safe and effective use](#)
- [Hiring a pest control company](#)
- [Information about specific pesticides](#)

Pesticides and the environment

- [Pesticides and water quality](#)
- [Mitigating environmental effects of pesticides in urban areas](#)
- [Research and reports about water quality](#)

More resources

- [National Pesticide Information Center \(NPIC\): Science-based information about pesticide characteristics](#)
- [Research related to urban pesticide use](#)
- [Online training](#)



HOME**SEARCH****ON THIS SITE**[What is IPM?](#)[Home & landscape pests](#)[Agricultural pests](#)[Natural environment pests](#)[Exotic & invasive pests](#)[Weed gallery](#)[Natural enemies gallery](#)[Weather, models & degree-days](#)[Pesticide information](#)[Research](#)[Publications](#)[Events & workshops](#)[Online training](#)[Links](#)[About us](#)[Contact us](#)**Resources****Pesticides and Water Quality**[More information](#)**Mitigating Environmental Effects of Pesticides in Urban Areas**

Pesticides are toxic chemicals that kill pests but have the potential to harm the environment, especially our waterways. Poor pesticide application practices can result in runoff from the surfaces that are sprayed.

You can reduce pesticide runoff by

- [Understanding how pesticides work](#)
- [Knowing how to use them properly](#)
- [Taking action to offset their risk of contaminating water bodies](#)

The following publications and online tools can help you learn how to prevent and mitigate pesticide runoff in urban environments.

[What is the problem?](#) [What can I do to help?](#) **Quick Tips on Pesticides**

These very short publications describe uses of specific pesticide active ingredients, the risks associated with them, and how to reduce the risks.

- | | | |
|--|--|--|
| • Less Toxic Insecticides | • Chlorothalonil | • Glyphosate |
| • Safe Use and Disposal of Pesticides | • Cyfluthrin Video  | • Imidacloprid Video  |
| • Garden Chemicals and Water Quality | • Cypermethrin | • Malathion |
| • 2,4-D | • Fipronil | • Permethrin |
| • Bifenthrin Video  | | |

Outreach

- Other extenders: UC advisors, Master Gardeners, agencies, organizations
- Landscape pest management professionals
- Structural pest management professionals
- Nursery and garden center personnel
- Applicators
- Consumers
- Students

Outreach

- **Integrate into UC IPM Web site**
- **UC urban horticulture advisors and master gardeners**
 - Training and workgroups
- **Continuing Education Presentations**
 - Structural Pest Control Board
 - PAPA
 - Ant PMA workshops
 - Green Gardener training
 - CAPCA
- **Notices**

Outreach

- **Green Bulletin**
 - To 471 agencies, organizations, individuals by e-mail, RSS
 - 3,000 downloads
- **Online modules:** 130 completed
- **Pesticide risks database:** 19,000 accesses
 - Pest Notes views: 618,000
- **Pesticide cards:** working with Southern California company
- **Videos**

Future work

- “Advertise”
- Pesticide active ingredient pads
 - Southern California pest management firm
- Videos: identify best ways to use
- Continue Green Bulletin
- Complete the pesticide AI risks database for all Pest Notes
- New Ant, Flea, Cockroach Pest Notes for professionals

What about retail garden centers?

- Help retailers better inform shoppers about IPM, pesticides, and choices
- UC IPM Retail Advisory Committee
- Specialized training workshops
- Online training: IPM, pesticides
- UC IPM Retail Portal, IPM News for garden centers
- IPM Advocates program