Information for pest management professionals and pesticide applicators

UC IPM

Green Bulletin

University of California
Agriculture and Natural Resources

Vol. 2 • No. 1 • November 2011

Natural Herbicides: Are They Effective?

The public's increasing demand for safe "green" products has resulted in many new environmentally friendly herbicides for controlling weeds in the garden and landscape. Information on the efficacy of these new products is limited. However, environmental awareness groups and public agencies are promoting them as a way to reduce the use of herbicides that have a greater potential to contaminate surface waters. Suppliers are beginning to more widely stock these "natural" herbicides, most of which contain essential oils or other natural plant extracts targeting weeds.

The majority of these "green" weed-control products are botanically-based oils (e.g., clove oil, eugenol, and *d*-limonene), soaps (e.g., pelargonic acid), or acetic acid that control weeds by destroying the leaf cuticle or causing cell leakage that rapidly leads to death. Unfortunately, because these herbicides kill only green parts of the plant they contact, they don't provide long-term control of weeds with extensive root systems or underground storage structures such as rhizomes, tubers, or bulbs. Thus many treated plants are able to recover. In contrast, some conventional herbicides such as glyphosate or 2,4-D are translocated to roots or underground storage structures to kill larger plants and perennial weeds.

C. A. Wilen, UC IPM

Figure 1. The effect of a plant essential oil-based herbicide on grass growth 1, 2, 14, 24, and 72 hours after application. However, the grass recovered in about two weeks.

These types of herbicides are applied after the weeds have emerged (postemergent) and have little or no soil residual activity. They don't control weed seedlings that germinate after application. They kill the plants by breaking down plant membranes and are considered contact or burndown herbicides. These herbicides are very fast acting (Figure 1), but to be most effective they must contact all or most of the aboveground plant tissue. It is especially important to spray the growing points, or else the plant will regrow. Grasses and perennial weeds are difficult to control for an extended period of time, because they have some or all of their growing points below ground.

However, in some cases, especially where annual weeds are small, these products may be appropriate. These herbicides are best used on small weeds and annual weeds or for controlling weeds in cracks and, in some cases, edging. They can be used for spot spraying, but care must be taken that the spray or drift doesn't contact desirable plants or else leaf spotting or death will occur.

Increasing the Odds

Keys for success when using these types of herbicides include:

- Good spray coverage;
- Application in warm weather (75° to 80°F);
- Surfactants, which can improve weed control;
- Treatment when weeds are small; and
- Repeated applications for larger weeds, in most instances.

Corn Gluten Meal

Another common natural herbicide is corn gluten meal (CGM). While the previously listed herbicides are postemergent types, CGM is sold as preemergent herbicide. Although being

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WHAT'S INSIDE ...

NPIC: A Good Source of Pesticide Information for Your Customers

Do your employees or customers ask you questions about the toxicity of the pesticides being applied to their property? Questions about pesticide toxicity are difficult to answer, and often the information available is not easy for nonscientists to understand and interpret.

The National Pesticide Information Center (NPIC), a cooperative project of the U.S. EPA and Oregon State University, is dedicated to providing science-based information about pesticides and pesticide-related topics to the general public. Its Web page at http://npic.orst.edu is the most comprehensive and reliable source of pesticide information for consumers in the United States.

NPIC also has a toll-free telephone number, 1-800-858-7378, which is staffed by experts who can answer pesticide-related questions in 170 different languages. Operating hours are 7:30 a.m. to 3:30 p.m. PST Monday through Friday.

The NPIC Web site has a wealth of information on many topics including pesticides and their impact on humans, pets, and the environment as well as procedures for safely using pesticides. There is a section on handling emergencies, and NPIC also asks users to report injuries or problems with pesticides directly through their toll-free phone system. For managing common home and garden pests, the site relies primarily on links to state resources including the University of California Statewide IPM Program's site, www.ipm.ucdavis.edu.

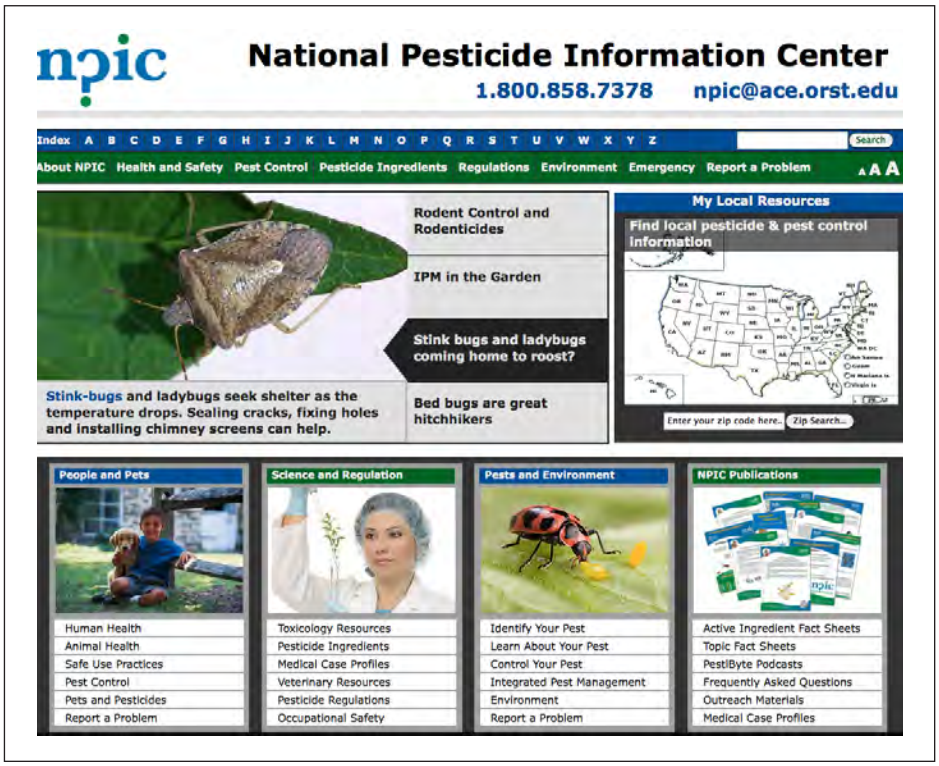
Probably the most useful and unique documents on the site are the Active Ingredient Fact Sheets. These fact sheets cover 38 common, home-use pesticide ingredients, including a few no longer registered.

> "NPIC's Web site is the most comprehensive and reliable source of pesticide information for consumers in the United States."

General fact sheets are written in simple language for the general public. Technical fact sheets provide similar information in a little more depth for people who want to know more about the ingredient's chemistry. All sheets explain what the chemical is, how it controls target pests, its acute and chronic toxicity to people, pets, and wildlife, and how long the pesticide is likely to persist in the environment. Each sheet has a list of references for more information. These are excellent documents to print out and provide to your customers or employees.

Take a look at this useful Web site and bookmark it on your computer for quick reference. It is frequently updated with new information and resources that can help you stay up to date.

—Mary Louise Flint, Ph.D., Associate Director for Urban and Community IPM and Extension Entomologist, mlflint@ucdavis.edu



Ask the Expert!

Q I have heard a lot about no-mow fineleaf fescues as a low maintenance, low input turf. Where can I find more information about these species?

A One of these species (*Festuca rubra*) is being used in the Sacramento demonstration discussed in Chuck Ingels' article on Pages 4 and 5 of this issue of *Green Bulletin*. You can find out more about fineleaf fescues by downloading the free publication *No-Mow Fineleaf Fescues for California Urban Landscapes*, UC ANR publication 8391 by Ali Harivandi, from the University of California ANR online catalog or on the UC IPM Web site at http://www.ipm.ucdavis.edu/TOOLS/TURF/ucpubs.html.

Q Are "green" weed-control products registered pesticides?

A Some are and some aren't. Weed control products containing many natural oils or food products as active ingredients may be exempt from registration from California and/or federal registration. These "exempt" products won't have a federal registration number on their label. However, many "exempt" products are still required to have a toxicity rating (CAUTION, WARNING, or DANGER) and appropriate precautionary language.

Have a question? E-mail it to ucipm@ucdavis.edu.

Natural Herbicides ... continued

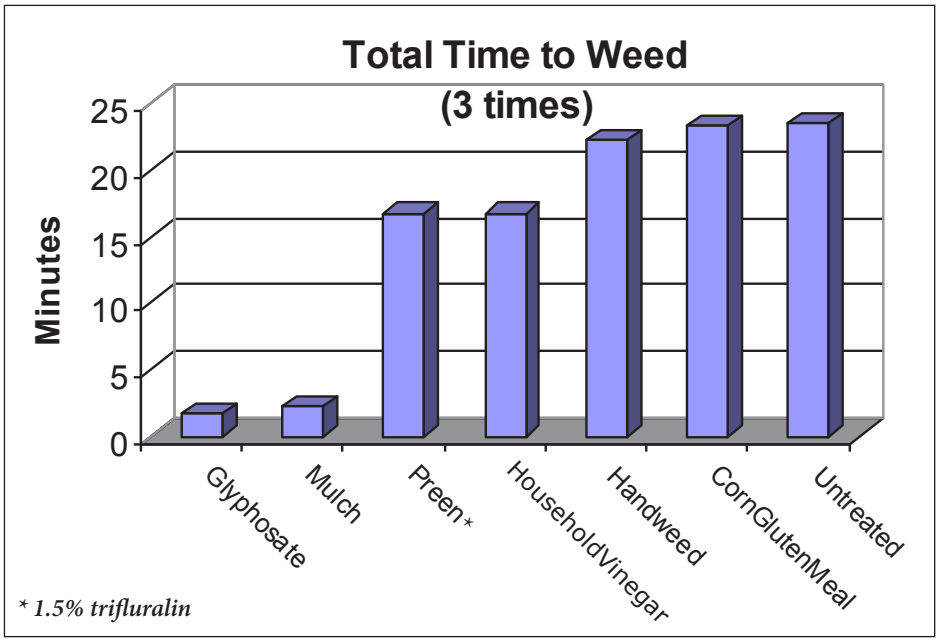


Figure 2. Time needed to weed landscape beds treated with various products and methods.

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widely touted as an effective herbicide that will control seedlings as they geminate, we have conducted numerous tests with this product and haven't been able to get results that justify its use as an effective preemergent herbicide. For example, there were no differences in the time needed to remove weeds from plots treated with CGM than from plants that were handweeded or from plots that were not subjected to any other treatment (Figure 2).

So the question is: Are natural herbicides safe and effective? If used as part of an integrated pest management program, the contact herbicides fit very well. Also, the applicator or PCA should know that he or she won't get the same kind of long-term weed control as products containing glyphosate (e.g., Roundup). However, activity will be similar to that achieved by diquat (e.g., Reward). The user should also be aware that many of the plant based or "natural" products can cause skin irritation, eye, or lung problems. Eye protection and gloves as well as any other label requirements should be worn when using them even if listed as exempt products. Note that some of the acetic acid products can be quite hazardous to handle.

Trade Names

Examples of **plant essential oil-based herbicides** include WeedZap, Matratec, Greenlight Organic Spot Weeder, Bioganic Broadleaf Killer, EcoSmart Weed and Grass Killer, and Greenmatch EX.

Examples of **orange oil (*d*-limonene) based herbicides** include Avenger, Worry Free Weed and Grass Killer, and Greenmatch Burndown.

Examples of **acetic acid-based herbicides** include Weed Pharm (Signal word: Danger), Grotek Elimaweed Weed and Grass Killer, and Fleischmann's Vinegar Weed Control (Signal word: Danger; this is not the same as food-use vinegar.) **Note:** The acetic acid concentration for herbicidal use should be about 10 to 20%. Household (food-use) vinegar is about 5% acetic acid and isn't effective for controlling most weeds.

Examples of **soap (potassium salts of fatty acids) based herbicides** include Scythe, Safer Moss and Algae Killer, Earthtone 4n1 Weed Control RTU, and Safer Fast Acting Weed and Grass Killer.

Combination products include Burn-out II (clove oil plus citric acid).

—Cheryl Wilen, UC IPM South Coast Area Advisor, cawilen@ucdavis.edu

Alternative Turf Demonstration Project

Many agencies, landscape managers, and property owners are interested in planting drought tolerant turf species. These alternative species may not only reduce water consumption but may save energy and money as well as reduce greenhouse gas emissions. However, these species can have drawbacks as well, such as high installation costs or dormancy periods in summer or winter when the turf turns brown and unsightly.

The Sacramento County Department of Water Resources, as part of its River-Friendly Landscaping program, received a grant from the U.S. Environmental Protection Agency (EPA) to test potential low water-use turf species to see which perform well with less water and which require less mowing. Included in the study to determine their potential as turf are a standard tall fescue/bluegrass mix, buffalograss, and two species of sedge under different irrigation levels as well as six native grass species.

Site Location and Design

The site is located at Florin Creek Park in Sacramento. It was developed and is maintained by UC Cooperative Extension Sacramento County in collaboration with the Southgate Recreation and Park District and UC Master Gardeners. A 4-foot fence surrounds the site, and plots are labeled so the species can be viewed anytime. The plots are being managed organically, so no herbicides or pesticides are being applied. Large numbers of annual weeds were hand pulled in the first few months, especially in plots that were slow to fill in, but very few weeds grew in sodded plots.

At this site, three plots each of the three different species were planted in September 2010. Each is watered at 80%, 60%, and 40% ETo (evapotranspiration); all plots were watered every four days during the summer using Hunter MP Rotator nozzles. The species were:

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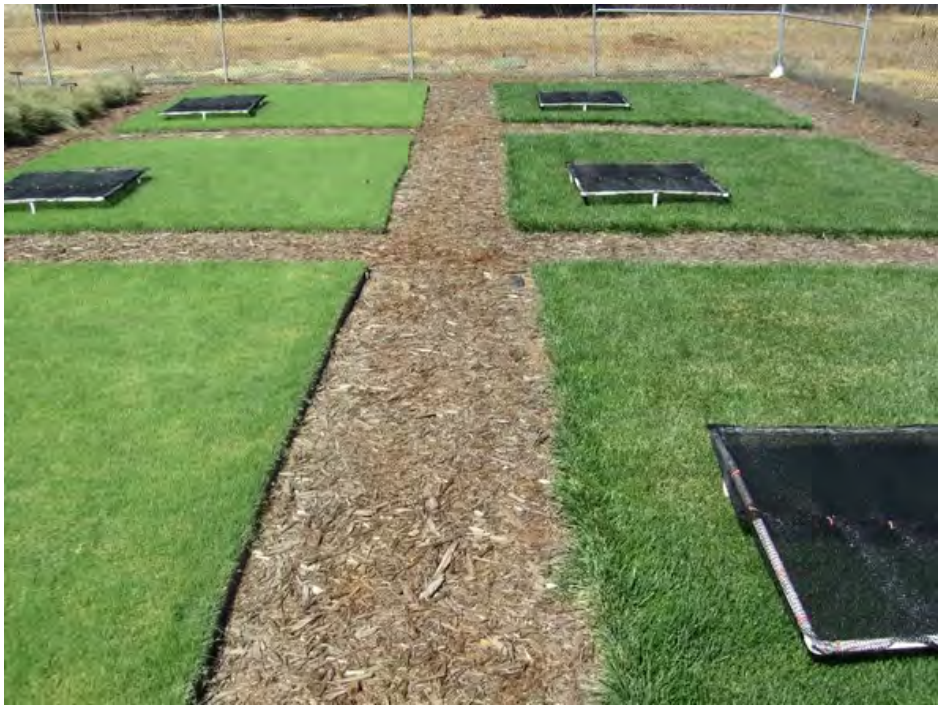
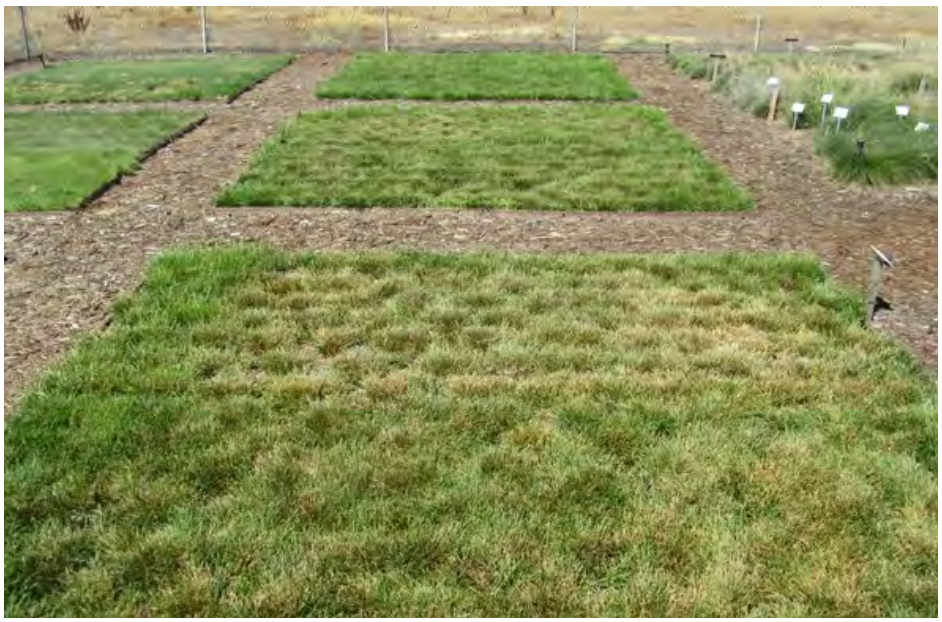


C. A. Ingels, UCCE Sacramento

Figure 1. UC Verde buffalograss (above, left) and tall fescue blend (above, right), with shading trial also underway. Top plots 80%, middle plots 60%, and lower plots 40% ETo. UC Verde in 40% ETo grew less but showed little stress, whereas tall fescue shows severe stress, especially in a patch (far left), which was later hand watered to prevent death.



C. A. Ingels, UCCE Sacramento

Figure 2. Carex plots in early September, with field sedge (*Carex praegracilis*) in the upper portion of each plot and dune sedge (*Carex pansa*) in the lower portion. Top plot 80%, middle plot 60%, and lower plot 40% ETo. Field sedge in even the 80% ETo plot showed some late summer dormancy.

Alternative Turf ... continued

- Tall fescue/bluegrass (*Festuca arundinacea*/*Poa pratensis*), sodded;
- UC Verde buffalograss (*Buchloe dactyloides*), planted as plugs; and
- Split plots of field sedge (*Carex praegracilis*) and dune sedge (*Carex pansa*), planted as liners.

Also included are three split plots of California native grass species:

- Seashore bentgrass (*Agrostis pallens*);
- Hall's bentgrass (*Agrostis hallii*);
- Molate red fescue (*Festuca rubra*);
- Tufted hairgrass (*Deschampsia caespitosa*);
- Junegrass (*Koeleria macrantha*); and
- Blue grama (*Bouteloua gracilis*), tall and short varieties.

A "meadow" was also included, in which three well-adapted native grass species and at least one plant of each species used in the mowed turf plots were allowed to grow to full size.

Results to Date

The irrigation treatments began Aug. 1, only after the *Carex* plots had moderately filled in. Not surprisingly, late summer clipping weights of all three turf species were greatest with 80% ETo, intermediate with 60%, and lowest with 40%.

The **tall fescue** blend is frequently used, because it tolerates some traffic and is dark green year-round. In the 40% ETo tall fescue plot, severe water stress appeared by mid-August in a large patch (Figure 1); we hand watered the patch so the UC Verde and *Carex* plots could still receive 40% ETo, showing how sensitive tall fescue is to drought stress.

UC Verde buffalograss grows similarly to bermudagrass but is less invasive and spreads by stolons, not rhizomes. Like bermudagrass it turns brown and goes dormant in cold winter areas. Its flowers produce very little pollen. It is best planted in May so stolons can quickly fill in and weed growth is reduced. Our September planting at 12-inch spacing resulted in some initial growth, but dormancy quickly set in; the first mowing occurred in early June. In August, clipping weights were slightly lower than those of tall fescue in the 80% ETo plots, the same in the 60% plots, and higher in the 40% plots. Clipping weights in the 80% and 60% ETo plots are nearly identical, showing why warm-season turf is typically watered at 60% ETo. No plant stress is visible in the 40% plot (Figure 1).

Sedges (*Carex* species) aren't grasses, but several species can be used to create an excellent turf. They are generally considered very drought tolerant and can be mowed periodically or left unmowed. In our demonstration plot, the *Carex* liners were planted 9 inches apart and have largely filled in; however, small gaps between plants remain because rhizome growth is fairly slow. Closer planting would have helped, but the costs would be higher. Field sedge grows taller and faster than dune sedge, resulting in nearly double the clipping weights. In the wet winter and spring of 2011, field sedge had greater rust disease than dune sedge. Patches of *Carex*, especially field sedge, went dormant in late July even in the 80% ETo plot. Field sedge plants in the 40% ETo plot went fully dormant and partially brown, whereas dune sedge was still mostly green (Figure 2). Late summer clipping weights of all *Carex* plots were far less than spring weights.

So far, the most promising **native grasses** include Seashore bentgrass, Molate red fescue, and tufted hairgrass. Although their spring clipping weights were similar to those of tall fescue, they are semi-dormant and not fully green in summer. Irrigation was reduced to 60% ETo for a period in summer, and these species became unsightly (Figure 3) until restored to 80% ETo. Blue grama makes a beautiful warm-season turf and is drought tolerant, but it is fully dormant in winter in the Central Valley. The dwarf variety (unnamed) produces about half the biomass as the tall variety (Hachita).

C. A. Ingels, UCCE Sacramento

Figure 3. Tufted hairgrass (top, left) with characteristic light green color and darker Molate fescue (top, right), late May. With 60% ETo applied in late summer, both species showed signs of stress (bottom), and subsequent watering improved the color.

Conclusions

UC Verde buffalograss is one of the most promising species for reducing water use. We plan to spray one plot with biodegradable green dye in December to see if we can overcome the aesthetic drawback caused by winter dormancy. *Carex* is also promising, especially dune sedge, which produces less growth and less rust than field sedge, and the mowed turf is less stiff than field sedge. Several native grasses look promising but all have at least some dormant or semidormant period. Summer and winter dormancy are less of an issue in coastal areas. This project is scheduled to continue through 2012, and we expect to learn much more about these species during the next year.

For more information on these alternative turf species, photos, and regular updates on the results of our demonstration plots, visit http://UCANR.org/turfproject.

—Chuck Ingels, County Director and Environmental Horticulture Advisor, UC Cooperative Extension, Sacramento County, caingels@ucdavis.edu

UC IPM Offers New Free Online Courses

If you find yourself needing a few CEUs to renew your DPR QAL, QAC, or PCA license as the calendar year draws to a close, consider taking one of UC IPM's online continuing education courses.

UC IPM recently posted a series of courses on pesticide application methods and preventing pesticide runoff in urban areas. These courses are free and designed specifically for pest management professionals who work in landscapes and structural situations.

Pesticide Application Equipment and Calibration for professionals working in turf and landscapes was released in October and approved for 1.5 CE units from DPR in the Other category. The training gives an overview of many types of pesticide application equipment and provides a step-by-step approach to calibrating each to help you apply the correct amount of pesticide to a treatment area.

Included are modules on calibrating liquid application equipment, calibrating dry application equipment, dealing with active ingredient and percentage solutions, and determining rates for soil injection as well as drenching and tree injection.

Urban Pesticide Runoff and Mitigation was released in early 2011 and contains several modules grouped into three components, each available for one Other CE credit:

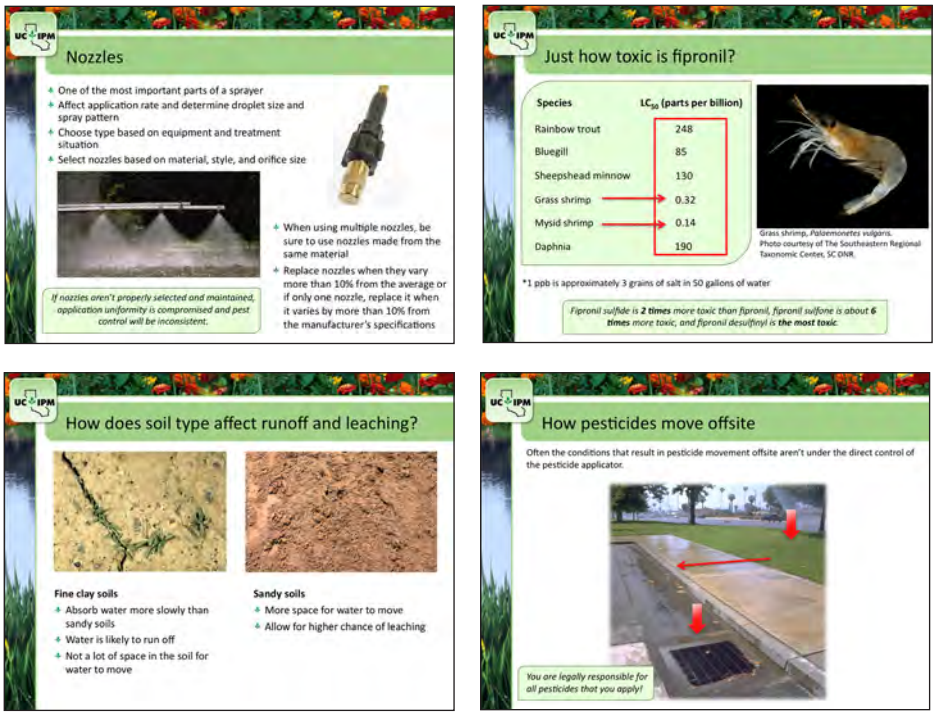


Figure 1. Sample screens from available courses.

- *IPM—A Solution for Reducing Pesticides/Water Quality: Pesticide Properties* teaches basic IPM principles, discusses when a pesticide is really necessary, and explains the various properties of pesticides and how they influence pesticide movement in the environment.
- *The Impact of Pesticides on Water Quality/Mitigating Urban Pesticide Runoff* goes through the different ways pesticides get into our waterways and gives practical steps in reducing pesticide movement from the site of application.
- *Water Quality and Mitigation: Bifenthrin and Fipronil* teaches about two important insecticides that are being detected in California waterways and gives some practical solutions for reducing their movement or mitigating their effects.

An additional component, *Herbicides and Water Quality,* has just been released, but CEUs won't be available until early 2012. This module provides general information about herbicides—how they are classified, how they work, and what properties affect runoff and leaching. The module draws attention to several herbicides commonly detected in urban waterways, lists steps to choosing the best herbicide for a given situation, and gives practical solutions for reducing herbicide use. Also discussed are alternative weed management methods, in addition to tips on applying herbicides in a way that minimizes runoff and leaching while protecting water quality.

Each of these courses is narrated and features hundreds of color photographs and drawings to illustrate key concepts. Quizzes throughout the narrated modules reinforce learning. Users must view all screens in each module and pass a final online test before receiving a certificate of completion.

Handouts highlighting the key points of each course, including example calculations for the calibration course, are also available on the UC IPM Web site.

To view these courses and the supplemental training material, go to http://www.ipm.ucdavis.edu/training/.

—Cheryl Reynolds, Interactive Learning Developer, creynolds@ucdavis.edu

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Produced by the University of California Statewide IPM Program with partial funding from the USDA NIFA EIPM Coordination Program. To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products not mentioned.