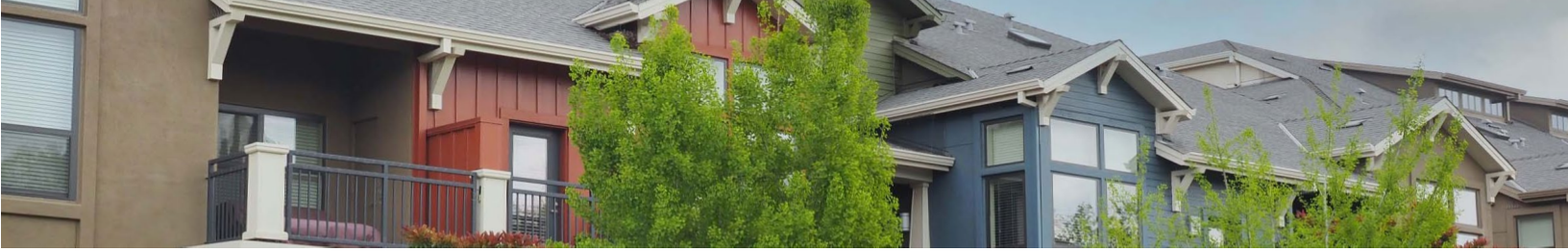

Green Bulletin

A newsletter for landscape and structural pest management professionals

In this issue:

Organic herbicides
p.1

New surface water course
p.6

Ask the Expert!
Meetings & Workshops
p.7

Revised ***Pest Notes***
p.8

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Produced by the Urban & Community IPM Team of the University of California Statewide Integrated Pest Management Program, with partial funding from the USDA NIFA CPPM Extension Implementation Program.

Organic Herbicides for Weed Control in Urban Landscapes

Weed management in landscaped areas can be challenging. Weeds may need to be controlled for public safety, fire reduction, aesthetics, and elimination of harborage for other pests. While many nonchemical options for controlling weeds exist—such as physical removal with tools, steam, flame or steam devices, grazing animals, and others—there are some situations that may require the application of herbicides.

For decades, glyphosate has been a common active ingredient used to control weeds in both agricultural and nonagricultural settings. However, there has been significant public concern about the use of glyphosate and other herbicides due to their potential effect on water quality, public health, and non-target species. Because of this ongoing issue, many practitioners have been considering organically-acceptable herbicides (see "Ask the Expert" on page 7) as alternative solutions. While some information exists on how organic herbicides work, there is little research on their efficacy in urban landscapes.

K Windbiel-Rojas, UC IPM

Figure 1. Burndown activity can be seen quickly after application of many contact organic herbicides.
DAT = days after treatment.

Glyphosate vs. Organic Herbicides

Concerns about the potential risks of glyphosate have led to increased use restrictions, including outright professional or municipal use bans in some California cities, counties, school districts, and other sites. Professional landscape managers and other pest management practitioners who aim to reduce or eliminate

continued on page 2

Organic Herbicides, continued

glyphosate from their IPM programs are therefore seeking alternative products to control weeds.

Organic and alternative herbicides seem like simple substitutes since treatments may not require new application equipment or knowledge. However, knowing the differences in modes of action among glyphosate, organic herbicides, and other alternatives is important to ensure weed management goals are reached.

Organic herbicides may not have the same qualities and performance practitioners have become accustomed to seeing with glyphosate and other conventional herbicide products. For instance, organic herbicides work on contact as opposed to glyphosate, which moves through the entire plant. These organic contact herbicides are most effective at higher temperatures (80°F and higher) and in full sun. Since they work on contact, they are applied after emergence and work best on small annual weeds. For larger or perennial weeds, organic herbicides generally will only damage or burn the top growth of the weed and, after a couple of weeks, the weeds regrow. From the data presented below, regular repeated applications of these products may still be useful tools within an overall IPM program.

The research presented here was designed to address the need for glyphosate alternatives by providing information about organic herbicide efficacy. These trials build on previous work by other researchers examining organic and alternative herbicides in non-agricultural settings (see references).

Trials included mostly organically acceptable materials as well as selected non-organic but naturally-derived products.

Table 1. Herbicide active ingredients, application rates, organic status, and cost for products used in Sacramento experiments.

Product name	Active Ingredients	Signal Word	Organic?	Price/ 2.5 gal	Rate used in trials	Price/ 1000 ft^2
Avenger AG	70% d-limonene	Caution	Yes	$225	6%	$6.20
AXXE	40% ammonium nonanoate	Warning	Yes	$245	10%	$11.25
Burnout II*	24% citric acid, 8% clove oil	Danger	Yes	$100	25%	$11.41
Fiesta	26.52% iron HEDTA	Caution	No	$170	4%	$3.12
Finale	11.33% glufosinate-ammonium	Warning	No	$240	1%	$1.10
FinalSan-O*	22% ammoniated soap of fatty acids	Warning	Yes	$81	17%	$6.29
FireWorxx	44% caprylic acid, 36% capric acid	Caution	No	$122 (1 gal)	6%	$8.40
Nature's Wisdom	20% acetic acid	Danger	Yes	$51 (1 gal)	Full	$58.55
Ranger Pro	41% glyphosate	Caution	No	$115	1%	$0.53
Scythe	57% pelargonic acid, 3% fatty acids	Warning	No	$190	6%	$5.23
Suppress + BioLink	47% caprylic acid, 32% capric acid + 50% citric acid (acidifier)	Warning	Yes	$257	6% + 1%	$5.45
Weed Rot	10% citric acid; 4% sodium lauryl sulfate	Caution	Yes	$156	18.75%	$21.19
Weed Zap	45% clove oil, 45% cinnamon oil	Caution	Yes	$175	6%	$4.81

Cost was calculated in July 2022. Prices vary by distributor and market fluctuation.
*Product has changed or no longer sold. For these, price is from 2019 when product was obtained for this research.

Organic Herbicides, continued

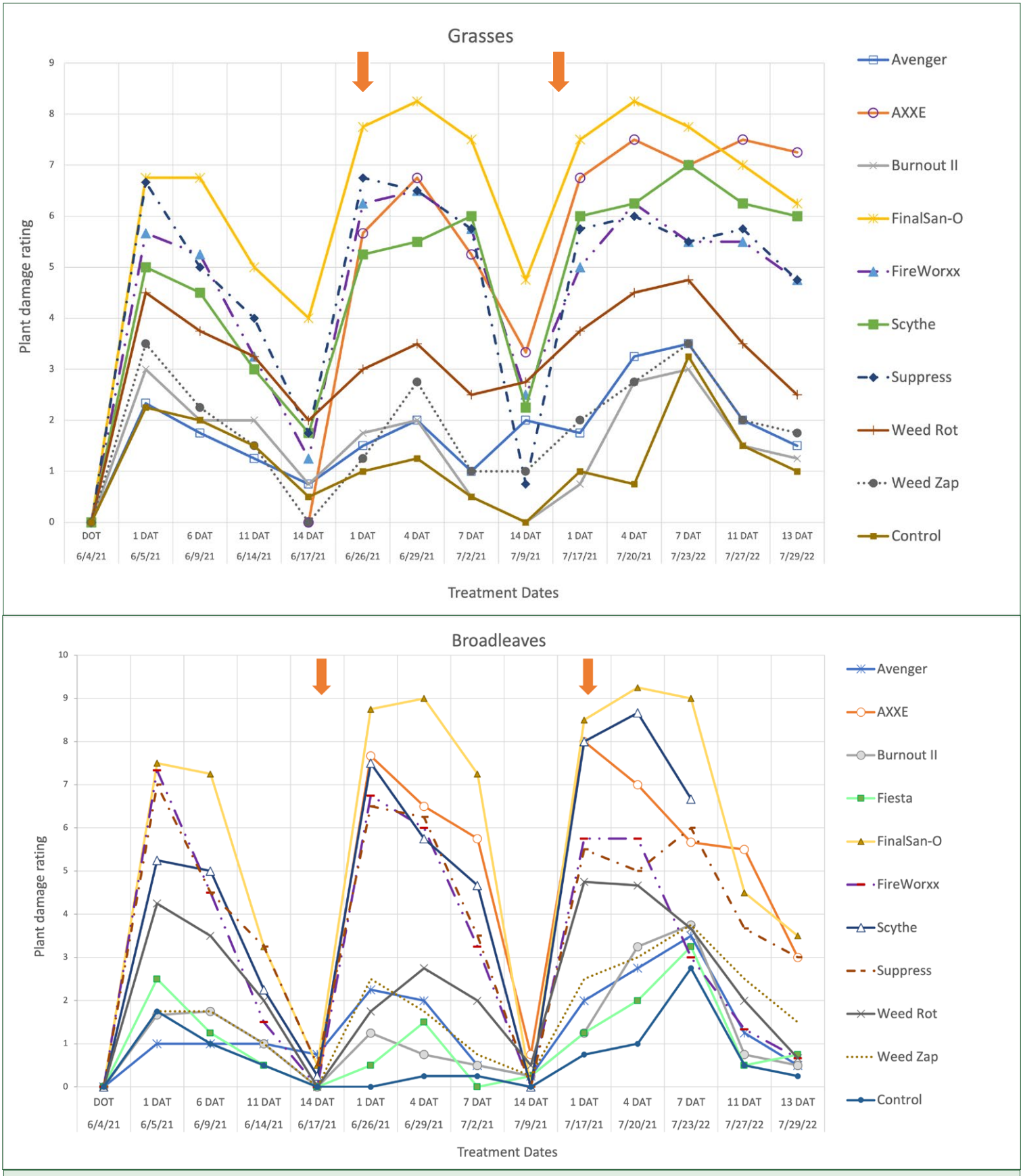

Figure 2. Visual rating of phytotoxicity to grasses (A) and broadleaves (B) from herbicides used in the Sacramento trial. Arrows indicate second and third repeat applications after the initial treatment.

Organic Herbicides, continued

Experiments were performed on the campus of the California State University, Sacramento (CSUS) in summer months of 2019 and 2021. The research site received little foot traffic, was regularly irrigated, mowed, and largely shaded underneath trees for most of the day. Weeds present at the site were a mixture of broadleaves, grasses, and sedge with predominant species being broadleaf plantain (*Plantago major*), dandelion (*Taraxacum officinale*), wild strawberry (*Fragaria vesca*), bermudagrass (*Cynodon dactylon*), and clovers (*Trifolium* spp.).

Slightly different products were used between the 2 research years. There were 10 or 11 herbicide treatments along with an untreated control (Table 1). All organic products in the experiment are post-emergent, nonselective, contact herbicides except for the iron HEDTA product (Fiesta), which is selective for broadleaves only. Weed damage was rated by visual inspection using an index (scale) from 0 (no observable plant injury) to 10 (complete plant injury above ground). This damage is referred to as burndown (Figure 1).

Preliminary Results

Many products showed rapid plant damage on both grasses and broadleaves on the first day after treatment (DAT). Figure 2 shows results from the 2021 trial, which included results similar to those observed in 2019 and other trials. It was observed that by 3 DAT, ammoniated soap of fatty acids, pelargonic acid + fatty acids, ammonium nonanoate, and caprylic acid + capric acid showed the best control of both grasses (A) and broadleaf (B) weeds in the plots. Products containing citric acid + clove oil, d-limonene, and clove oil + cinnamon oil did not perform well in this trial even after a second treatment.

The iron HEDTA product targets broadleaf weeds only, so it is not included in the chart illustrating grass weed control. Acetic acid (Danger signal word) was not included in the 2021 experiments due to the risk of application to bystanders at CSUS. One product containing acetic acid is included in Table 1 for cost comparison of various alternative herbicide products.

In general, most weeds began to regrow or recover about 2 weeks after treatment. Multiple successive

Table 2. Considerations when using conventional glyphosate products or a nonselective organic alternative.

Consideration	Conventional glyphosate products	Organic nonselective herbicides
Mode of action	Systemic	Contact
Signal word	Caution	Variable depending on product: Caution, Warning, or Danger
Personal Protective Equipment (PPE)	California minimum PPE (long-sleeved shirt, long pants, shoes plus socks, protective eyewear, & chemical-resistant gloves)	Variable depending on product, may include: California minimum PPE, chemical-resistant footwear, coveralls, or respirator
Rate of observable weed injury	Visible injury in 4 to 10 days	Visible injury in hours to days
Reapplication frequency for broadcast spray	Lower reapplication frequency	Higher reapplication frequency
Active ingredient volume	Lower volume of active ingredient	Higher volume of active ingredient
Cost per application area	Lower cost per application area	Higher cost per application area

Organic Herbicides, continued

treatments were made after regrowth was observed (around 3 weeks). Efficacy of most products had declined and weeds once again showed regrowth 17 days after the second treatment (Figure 2).

Some of the organic herbicides tested exhibited quick results, with immediate burndown of contacted weeds observed within an hour or two. the majority of plant damage was observed between 1 DAT and 7 DAT. However, most weeds also completely regrew from the base or roots 2 to 3 weeks after each application.

Considerations When Using Organic Herbicides

Urban landscape professionals need to consider the differences among conventional herbicides, organic herbicides, and other alternative herbicides (Table 2). Switching from glyphosate-containing products to organic herbicides will require a reallocation of resources to accommodate for more frequent applications, lower dilutions, and higher application volumes.

Resource shifts may include increased labor costs due to more frequent applications, possible increased supplies costs due to additional personal protective equipment (PPE) required, increased training required for handling of more acutely toxic products (those with Signal Words other than Caution), and higher herbicide product acquisition costs (Table 2).

What's Next?

We know from pesticide use reports gathered from the California Department of Pesticide Regulation that herbicides are applied year-round under various temperatures and conditions. Therefore, practitioners need information about how well these products work in different conditions; such as across a range of temperatures, with varied weed species, in the presence of clouds or a canopy cover, and other factors. UC Cooperative Extension will continue to investigate these variables and will share findings via articles, workshops, seminars, and other extension methods.

—Karey Windbiel-Rojas,
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Statewide IPM and UCCE Capitol Corridor
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Wilen CA. 2018. UC IPM *Pest Notes: Weed Management in Landscapes*. UC ANR Publication 7441. Oakland, CA.

Neal J, Senesac A. 2018. *Are there alternatives to glyphosate for weed control in landscapes?* North Carolina State University Publications.

Acknowledgements

The author would like to thank the California State University, Sacramento for the use of their property for these trials.

All pesticide products mentioned have been reviewed by the UC Office of Pesticide Information and Coordination and are current at the time of publication.

Always read and carefully follow all precautions and safety instructions provided on the pesticide container label, as well as any other regulations regarding the use of pesticides. Not following label directions, even if they conflict with information provided herein, is a violation of state and federal law.

No endorsements of named products are intended, nor is criticism implied of products not mentioned.

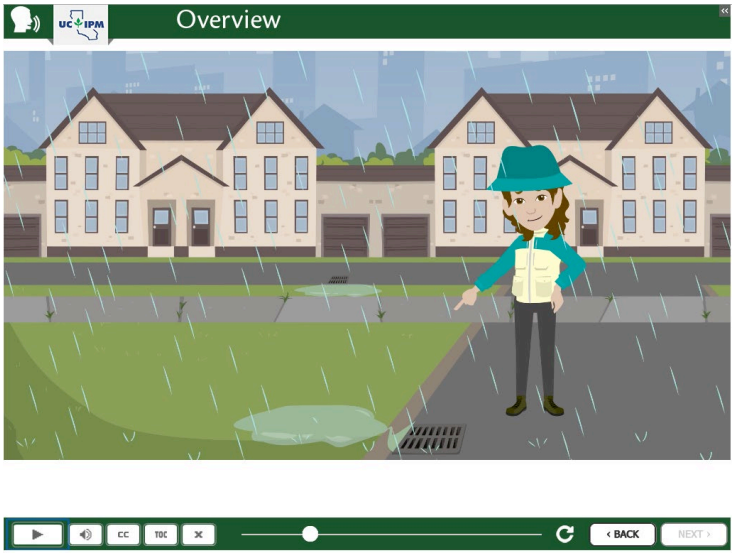
Pyrethroids, Fipronil, and Surface Water Protection: New Online Course

If you are a pest management professional working primarily in structural pest control or landscape maintenance, this free online course is for you!

Developed by pest management experts from the California Department of Pesticide Regulation and the University of California, UC IPM's new online course *Urban Pyrethroid and Fipronil Use: Runoff and Surface Water Protection* presents information on the Surface Water Protection Regulations found in Title 3 of the California Code of Regulations sections 6970 and 6972. These regulations were put into place to prevent pesticide runoff into California waterways and to reduce surface water contamination from pyrethroid insecticide use.

In the course, you'll learn about the types of pesticide applications that are allowed under the regulations as well as application types that are prohibited and also application types that are exempt. The course takes a close look at pyrethroids, particularly bifenthrin because of its high use in urban areas, high detection in surface waters, and high toxicity to aquatic organisms.

Fipronil, another commonly used ingredient in structural and landscape products, is addressed in the course as well because it has similar water-quality concerns as the pyrethroids. Specific label restrictions of bifenthrin and fipronil products in California are also discussed.



The *Urban Pyrethroid and Fipronil Use: Runoff and Surface Water Protection* course has been approved by DPR for 1.5 hour of Laws and Regulations continuing education units (CEUs) and by the Structural Pest Control Board (SPCB) for 1.5 hours of Rules and Regulations.

Visit the UC IPM Online Training page to see this and other courses of interest: ipm.ucanr.edu/training/.

Looking for something new?

UC ANR is recruiting for two pest management positions:

Pesticide Safety Education Program Coordinator Academic Coordinator II

Location: UC ANR - Davis

Apply by March 6, 2023

ucanr.edu/About/Jobs/?jobnum=2420

Urban IPM Area Advisor Applied Research and Extension (Capitol Corridor Area)

County Locations: Sacramento, Solano, Yolo

Apply by March 1, 2023

ucanr.edu/About/Jobs/?jobnum=2397

To see other UC ANR jobs, visit ucanr.edu/About/Jobs.

Ask the Expert!

Q: Do I need to wear personal protective equipment (PPE) when using organic pesticides (including herbicides)? Since they are natural, aren't they safe?

A: It's important to wear the proper PPE when using all pesticides, including organic pesticides.

Organic herbicides and other pesticides are derived from natural ingredients such as plants, oils, acids, fatty acids, minerals, and microorganisms. But they are still pesticides. Many, but not all organic pesticides are less toxic than synthetic products, but that does not make them automatically "safe" for the environment, nontarget organisms, pets, or people. Even if the active ingredients come from a natural source, they can still burn or irritate your skin and eyes. They could also damage wildlife and desirable plants. And the active ingredients, while naturally derived, are at much higher concentrations than typically found in nature. This is what makes them useful as pesticides. They are designed to kill or damage the target pest.

All pesticide labels, both synthetic and natural, include signal words that specify the toxicity of the product. CAUTION means low toxicity, WARNING means moderately toxic, and DANGER means highly toxic. California law states the minimum PPE required according to the signal word. Stay safe by paying attention to the signal word. Always read the label before use and use the PPE required by law.

Upcoming Meetings & Workshops
(CEU opportunities)

Vertebrate Pest Council (VPC) Off Cycle Seminars

Escondido Feb 28, 2023

Sacramento March 2, 2023

Register at target-specialty.com/current-events

West Coast Rodent Academy

Irvine, CA, March 15-17

ucanr.edu/sites/WCRA/

UC Riverside Urban Pest Management Conference

Riverside, CA, March 28, 2023

ucanr.edu/sites/ucrurbanpest/Conferences/UCR_UPMC_2023/?calitem=546852

New & Revised *Pest Notes*

Visit UC IPM's *Pest Notes* web page for these and many more titles

Botryosphaeria Canker

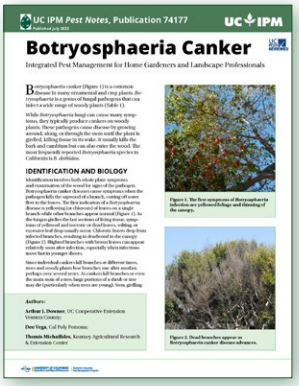
Botryosphaeria canker is a common fungal disease of trees and other woody plants worsened during drought. Managing Botryosphaeria canker relies on keeping plants healthy so that they can resist the infection. For more information, see the new publication *Pest Notes: Botryosphaeria Canker* by UCCE Advisor Jim Downer and plant pathologists Dee Vega, Cal Poly Pomona and Themis Michailides, Kearney Agricultural Research and Extension Center.
Online at
ipm.ucanr.edu/home-and-landscape/botryosphaeria-canker/

Eucalyptus Redgum Lerp Psyllid

The redgum lerp psyllid is the most common psyllid that damages eucalyptus trees in California. For details on its biology and management, see the newly revised and expanded *Pest Notes: Eucalyptus Redgum Lerp Psyllid,* by entomologists Timothy D. Paine, UC Riverside; Kent M. Daane, UC Berkeley; Steve H. Dreistadt, UC IPM; and Raymond J. Gill, California Department of Food and Agriculture.
Online at
ipm.ucanr.edu/home-and-landscape/eucalyptus-redgum-lerp-psyllid/

Dallisgrass

Dallisgrass is a common perennial weed that grows in uneven clumps in lawns that can create a tripping hazard. Mowing doesn't control the weed's spread so clumps must be dug out. For more details about the biology of dallisgrass, management methods, and extensive information about herbicides, see the newly updated *Pest Notes: Dallisgrass*, authored by UC Cooperative Extension emeritus advisors Michelle LeStrange and John A. Roncoroni.
Online at
ipm.ucanr.edu/home-and-landscape/dallisgrass/


UC IPM *Pest Notes*, Publication 74177 UC IPM
Botryosphaeria Canker
Integrated Pest Management for Home Gardeners and Landscape Professionals
IDENTIFICATION AND BIOLOGY

UC IPM *Pest Notes*, Publication 7447 UC IPM
Rabbits
Integrated Pest Management for Home Gardeners and Landscape Professionals
IDENTIFICATION AND BIOLOGY

Rabbits

Wild rabbits in California will devour garden vegetables as well as tree bark, flowers, most green vegetation, and even drip irrigation tubing. UC Davis Wildlife Specialist Roger Baldwin has revised *Pest Notes: Rabbits* and included more detailed management methods for jackrabbits, cottontails, and other wild rabbits. Directions for building a rabbit fence, the most effective, long-term management choice, is included.
Online at
ipm.ucanr.edu/home-and-landscape/rabbits/

Wild Blackberries

Wild blackberries can be highly competitive, smothering existing plants with their dense stands. In urban landscapes, blackberry brambles create habitat and food for rats and other pests. The newly revised *Pest Notes: Wild Blackberries*, authored by UC Cooperative Extension advisor Scott Oneto and emeritus UC Davis weed scientist Joe DiTomaso, includes cultural and updated chemical management information.

Online at
ipm.ucanr.edu/home-and-landscape/wild-blackberries/

For more information about managing pests, contact your University of California Cooperative Extension office, or visit the UC IPM website at ipm.ucanr.edu.

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