



## New Restrictions on Pyrethroid Insecticide Applications Protect Urban Surface Waters

**O**n July 19, California's Department of Pesticide Regulation (DPR) introduced new regulations for pyrethroid insecticide applications made in outdoor nonagricultural settings (California Code of Regulations, Title 3, Division 6, Sections 6000, 6970, and 6972: [http://www.cdpr.ca.gov/docs/legbills/calcode/chapter\\_.htm](http://www.cdpr.ca.gov/docs/legbills/calcode/chapter_.htm)). The United States Environmental Protection Agency (EPA) has proposed similar restrictions within pyrethroid label updates that are expected to go into effect nationwide in 2016. These new regulations apply to any person making pest control applications for hire in any structural, residential, industrial, or institutional site.

The main goal of this new set of laws is to protect urban surface waters from contamination by pyrethroid insecticides. Although some people might expect agricultural pesticide applications to be the largest contributor to surface and groundwater contamination, recent investigations by the University of California and DPR have shown that surface waters fed by urban runoff may contain a concentration of monitored pesticides up to three times higher than those fed by agricultural runoff. Pyrethroids are a special concern because they are very widely used and highly

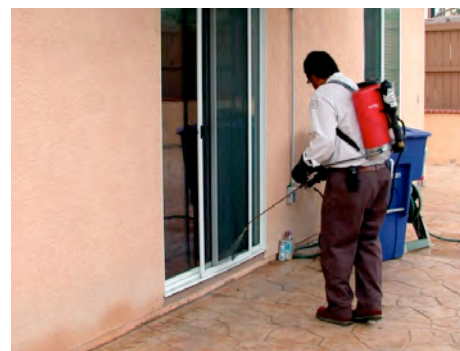
toxic to indicator species representing the small arthropods that make up the base of the aquatic food web. The new regulations address applications of 17 different active ingredients (Table 1; see Page 3) during rain, to standing water, to areas in close proximity to surface waters, and to horizontal and vertical impervious surfaces.

Applications are now strictly prohibited to:

- Any site during precipitation, except to the underside of eaves;
- Any surface with visible standing water (puddles) or within 25 feet of aquatic habitat located downhill from the application site; and
- Sewers, storm drains, curbside gutters, drainage grates, French drains, or dry creek beds at any time.

Preconstruction termiticide applications to soil within 25 feet of an aquatic habitat or within 10 feet of a storm drain system located downhill from the application site are also prohibited. Prior to precipitation events, such termiticide applications must be covered with a waterproof covering or a poured concrete slab.

Additionally, pyrethroid applications to impervious surfaces such as driveways, sidewalks, walls, foundations, fencing, doors, and windows have been restricted. These kinds of applications deposit pesticides as a surface film where they can easily be washed off during rain or other runoff events. Both horizontal and vertical impervious surfaces can now be treated using only spot treatments of less than 2 square feet, pin stream applica-



J. Klotz, UCR emeritus

*Figure 1. Perimeter sprays of 17 different pyrethroid insecticides have been restricted with DPR's new regulations. Band sprays to horizontal impervious surfaces and to doors and windows, as shown in this image, are now strictly prohibited, while band sprays to vertical impervious surfaces, such as walls, are still allowed within 2 feet of the grade level.*

tions 1 inch or less wide, or crack-and-crevice applications made to areas such as expansion joints or openings between different elements of construction.

Traditional perimeter-band treatments of pyrethroids can still be used up to 2 feet abovegrade to vertical impervious surfaces and up to 3 feet from walls to pervious surfaces such as soil, mulch, or gravel (Figure 1). However, perimeter band treatments to horizontal impervious surfaces (such as walkways or patios) and to windows and doors are now prohibited. Broadcast applications to pervious landscape elements such as lawns or planting beds aren't allowed within 2 feet of a horizontal impervious surface. Granular applications of pyrethroids are allowed on pervious landscape surfaces adjacent to horizontal impervious surfaces, but all

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# New Beetle, Disease Complex Threatens Trees

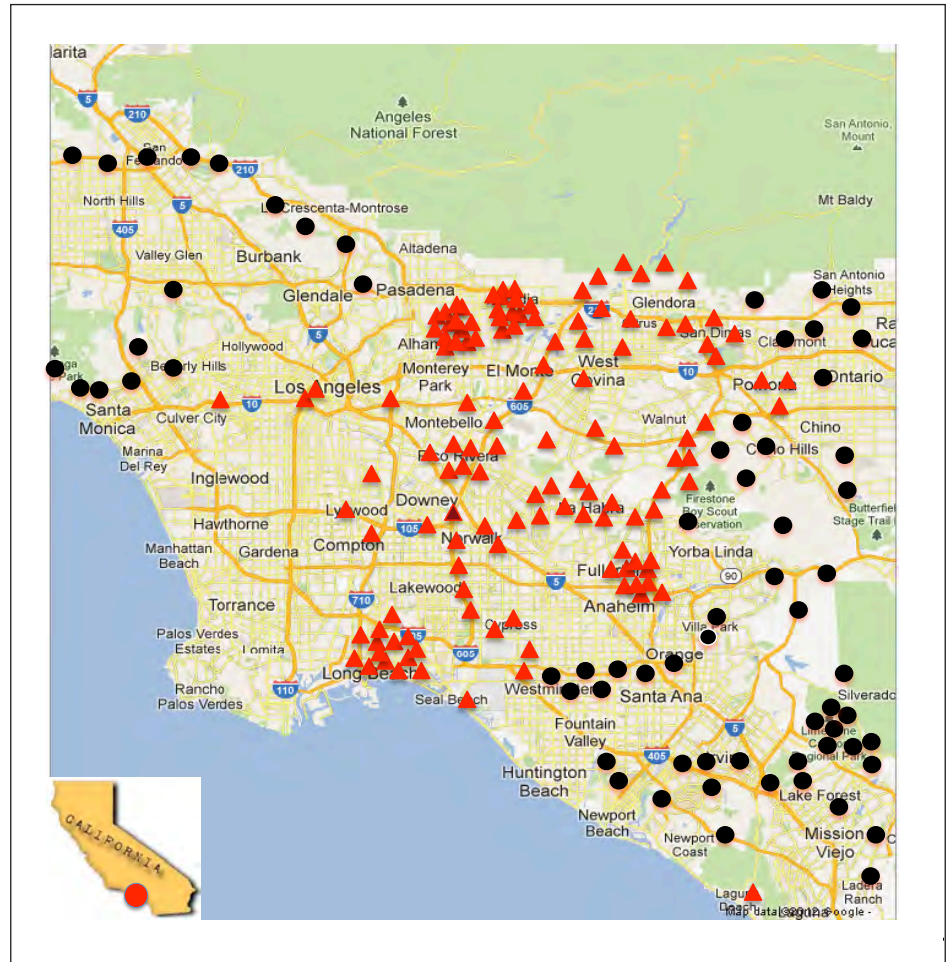
**A** new beetle/disease complex that causes Fusarium dieback on avocado and landscape trees has recently been detected in Southern California (Figure 1). The disease is caused by a new, yet unnamed Fusarium species that forms a symbiotic relationship with a recently discovered exotic ambrosia beetle, *Euwallacea* species. The beetle, called the polyphagous shot hole borer (PSHB), is very small and difficult to see. Females are black and 1.75 to 2.5 millimeters long (Figure 2).

The beetle and fungus have a symbiotic relationship. When the beetle burrows into the tree, it inoculates the host plant with the fungus, which is carried in its mouthparts in structures called mycangia. The fungus attacks the vascular tissue of the tree, which brings water and nutrients from the roots to the rest of the tree, eventually causing branch dieback. The beetle larvae live in galleries within the tree and feed on the fungus.

Fusarium dieback symptoms on trees include a small entry hole surrounded by wet discoloration of the outer bark (Figure 3), or gumming, white powdery exudate, and frass. Oozing sap may be present on trunks (Figure 4), and cross sections of affected branches may show vascular discoloration (Figure 5).

The PSHB beetles may attack more than 100 tree species, but the beetles are able to reproduce in only a smaller number of these trees. Known suitable hosts of the both the PSHB and fungus are box elder, avocado, castor bean, English oak, coast live oak, silk tree, liquidambar (American sweetgum), California sycamore, coral, Titoki, Chinese holly, black bean, palo verde, blue palo verde, camelia, Japanese maple, and big leaf maple.

So far the disease complex has been found on ornamentals including box elder, coast live oak, liquidambar, and California sycamore in Los Angeles and Orange counties, but it is likely the problem will spread (Figure 1). Surveys in the Huntington Botanical Garden and Los Angeles Arboretum have shown many affected trees within these



A. Eskalen, UCR

**Figure 1.** Recent distribution of the polyphagous shot hole borer beetle/Fusarium disease complex in Southern California as of October 2012. Positive findings are indicated by a red triangle and negative findings by a black circle.



G. Arakelian, LA County

**Figure 2.** Female adult polyphagous shot hole borer.



A. Eskalen, UCR

**Figure 3.** Damage to coast live oak showing borer holes surrounded by necrosis and exudate caused by the Fusarium fungus.

plant collections. Among the most seriously attacked are box elder, coast live oak, and English oak. Avocado trees are also an important host, and the disease complex poses a serious threat to the avocado industry.

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## New Beetle, Disease Complex ... continued

If you find small entry holes on tree trunks or branches surrounded by wet spots or by gumming, white powdery exudate, and frass, scrape off the bark layer around the infected area to see the canker (discolored wood). Then follow the gallery to look for the beetle. It is important that you not move infested tree wood out of the infested area. Look for other hosts—castor bean, box elder, and coast live oak—showing symptoms of the beetle or disease. Because the beetle tends to colonize both live and newly dead wood, chip the dead wood within the infested area and cover with a tarp for at least a week to prevent further beetle colonization. Finally, sterilize tools to prevent the spread of the disease.

If you suspect you have found the PSHB or seen symptoms of *Fusarium* dieback on trees that you manage, contact your local farm advisor, county agricultural commissioner's office, or UC Riverside's



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Figure 4. Affected American sweet gum tree, showing oozing sap on trunk.



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Figure 5. Cross section of killed coastal live oak showing injury to the vascular system.

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## New Pyrethroid Restrictions ... continued

granules must be swept off these surfaces back into the treatment area.

Not only will these new restrictions reduce the amount of pyrethroid insecticides that run off into surface waters, they will also drastically reduce the total amount of pyrethroid insecticides applied in urban areas. These reductions will have benefits because pyrethroids are highly toxic to beneficial arthropods such as natural enemies and pollinators. Additionally, excessive use of pyrethroid insecticides has led to resistance in populations of key structural pests such as ants, cockroaches, and bed bugs.

For more information about how these new restrictions may alter the IPM tactics available to you, see the information and videos developed by the Pyrethroid Working Group in alliance with the Pest Control Operators of California at <http://www.pwg2pmp.com/>.

—Andrew Sutherland, UC Statewide IPM Program, San Francisco Bay Area, [amsutherland@ucanr.edu](mailto:amsutherland@ucanr.edu)

Table 1. New Regulations Affecting Applications of Pyrethroid Insecticides.\*

Active ingredient	Some common trade names**
beta-cyfluthrin	some Bayer Advanced products
bifenthrin	Talstar, Allectus, Wisdom, Bisect
bioallethrin	various Wasp and Hornet Killer products
cyfluthrin	Tempo, some Bayer Advanced products
cypermethrin	Demon, Cynoff
deltamethrin	Deltagard, some Enforcer products, Ultratec
esfenvalerate	some Ortho Bug-B-Gone products
fenpropathrin	Tame
gamma-cyhalothrin	some Spectracide products, Optimate
lambda-cyhalothrin	Cyonara, Demand, Scimitar
permethrin	some Enforcer products, Permanone, Astro
phenothrin	Ace, Raid House and Garden Bug Killer
prallethrin	Black Flag Wasps Hornets Yellowjackets Scorpions
resmethrin	Orthonex, Prentox, Rosepride Systemic
S-bioallethrin	Ultratec
tau-fluvalinate	Mavrik, some Bayer Advanced products
tetramethrin	Ortho Hornet & Wasp Killer

\* Subject to EPA's Nonagricultural Outdoor Labeling Notification of 2009 and DPR's July 19 regulations regarding nonagricultural applications.

\*\* Containing these active ingredients and registered for landscape or structural use in California.

# What Are Those Bugs in the Alyssum?

A colorful new stink bug has been showing up in landscapes and farms in Southern California. It is *Bagrada hilaris*, also known as the Bagrada bug or painted bug, and is believed to be native to Africa. It feeds on plants in the mustard family (Brassicaceae), which includes cole crops, mustards, and radishes. In landscapes and gardens, a preferred host is sweet alyssum, also a member of the Brassicaceae, and Bagrada bugs have been devouring it.

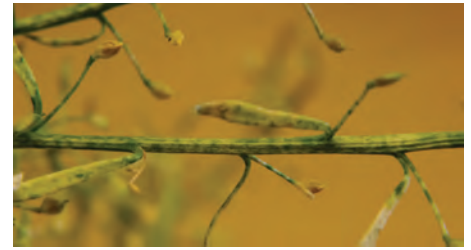
The bug feeds on leaves, stems, flowers, and seeds causing stippling, wilting, and stunting. While the plants are green, feeding damage on the leaves and stems results in wilting and eventual scorching or bleaching of tissues (Figure 1). However, these insects prefer dried seeds to fresh foliage, since the nutrition obtained from seeds allows the Bagrada bug to reproduce.

The adult Bagrada bug superficially resembles another common stink bug, the harlequin bug, *Murgantia histrionica*, as both have the typical stink bug shield shape and similar coloring (Figure 2). The Bagrada bug is much smaller however ( $\frac{3}{16}$  of an inch vs. about  $\frac{1}{2}$  inch long) and has different markings; the Bagrada bug is primarily black with orange and white markings, while the harlequin bug is primarily orange with black markings. The underside of the Bagrada bug can vary in color from almost black to nearly cream. Adults are typically found in tandem mating pairs, locked together end to end (Figure 3).

Eggs are laid in the soil or on leaves and are creamy white, turning orange as they age. Newly hatched nymphs are bright red with reddish-brown heads and thorax. Newly molted nymphs also appear bright red or orange (Figure 4). Nymphs gradually

become darker with striking orange and white markings and develop wing pads as they progress through five instars (Figure 5). Multiple generations per year are possible depending on environmental temperatures.

Bagrada bug first was found in Los Angeles in June 2008, but it has rapidly spread to all the Southern California



J. Rodstein, UCR

Figure 1. Bagrada bug damage on this alyssum has resulted in stippling.



T. Perring Lab, UCR

Figure 2. Adult stage of harlequin bug (left) and Bagrada bug (right).



J. Palumbo, U of Arizona

Figure 3. Adult bagrada bugs mating.



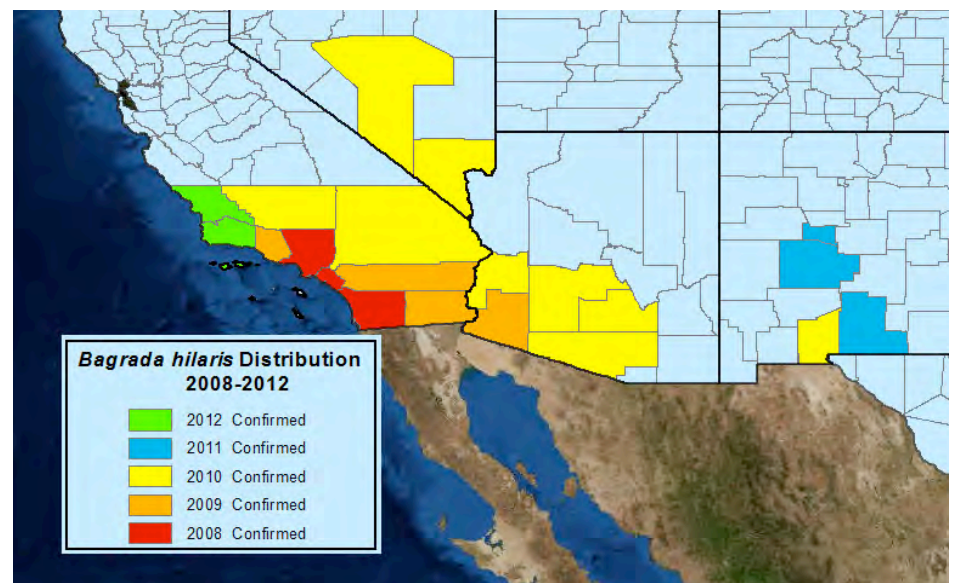
T. Perring Lab, UCR

Figure 4. Early instar nymphs of Bagrada bug on dried sweet alyssum.



T. Perring Lab, UCR

Figure 5. Close up of a mature fourth-instar Bagrada bug nymph and newly molted fifth-instar nymph with wing pads.



T. Perring Lab, UCR

Figure 6. Geographic distribution of Bagrada hilaris in the southwestern United States, by county, from 2008 to 2012.

# Using Solar Tents to Inactivate Invasive Weed Seeds

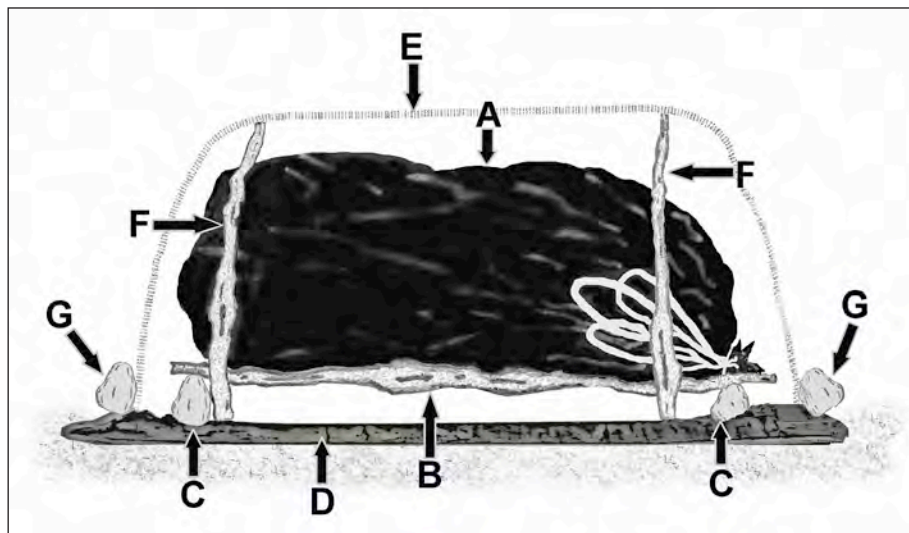
In the backyard or in the wild, roguing (selectively pulling or cutting weed plants) and herbicide spot treatments can help prevent small patches of invasive weeds from becoming large infestations. However, herbicide applications may be of little value where senescent plants have already set seeds, because the dead “skeleton” plants may bear dormant but living seeds, which can initiate new infestations.

In the past, such plants may have been removed by stacking and burning them. However, under present conditions, burn permits are difficult to come by. Landfill disposal is another option, but transporting seed-bearing plants may spread the seeds, making the problem worse instead of better. Deep burial of plant material on-site is another option, if feasible.

A simple solar tent process may be used to destroy limited quantities of rogued plant propagative materials on-site. The tents are inexpensive, disposable, don't involve applications of herbicides, and have been successfully tested in several areas of California.

The process involves three steps. First, collect the plant material during warm months of the year in black trash bags. Second, place the bags, containing a quart or two of water to hydrate the seeds (this is essential!) on a makeshift platform to provide airspace between the bags and the ground. Finally, cover with a tent made from a sheet of clear plastic film, anchored firmly to the ground (Figure 1).

Except in cold areas or where it is persistently cloudy or foggy, the diurnal accumulated heat within the tents



Graphic by Cynthia Stapleton, adapted from *Jour. of Pest Sci.* 85:17-21

*Figure 1. Diagram of suggested solar tent construction: (a) a closed black-plastic trash bag, e.g., 40-gallon volume, containing targeted plant material and 1 pint to 1 quart of water for a free-moisture presence; (b) an interior framework of woody plant shoots sitting on (c) rocks to elevate the trash bag above the soil surface and to allow heat to surround the target; (d) a sheet of black plastic film on the soil surface to assist with heat accumulation and to prevent the escape of propagative material onto the soil; (e) a clear plastic sheet supported by (f) hoops of woody plant shoots to form a tent over the treatment bag; and (g) exterior rocks, logs, or so forth to seal the edges of the tent canopy to minimize heat loss and to prevent the escape of propagative material.*

(up to 158°F, or higher) should inactivate propagative materials within a few days. Seeds encased in protective pods or other structures may require additional heating time. They can then be disposed of without worries of further spread.

For more information, visit the UC solarization Web site at <http://ucanr.org/sites/Solarization/>.

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## Bugs in the Alyssum ... continued

counties and is expected to move northward in the state as temperatures and host food plants permit. It is also a pest in southern parts of Arizona, Nevada, and New Mexico, and its geographic distribution has increased dramatically within a very short time (Figure 6).

There is very little information on managing the *Bagrada* bug in landscapes. While its preferred host range is limited, it will feed on a variety of plants to survive, including many grasses and legumes. Landscapers or home gardeners may choose to plant alternatives to alyssum that aren't in the Brassicaceae family, but this may not completely eliminate the threat.

Stink bugs are difficult to manage with insecticides, and repeat applications are often necessary. For organic growers, research suggests that Pyganic, an organically approved pyrethrum extract, may be effective against adults, while Azahar, an azadirachtin product, and an insecticidal soap, Concern, were most effective against nymphs.

For more information about the *Bagrada* bug, visit the UC Riverside Center for Invasive Species Research Web site at [http://civr.ucr.edu/bagrada\\_bug.html](http://civr.ucr.edu/bagrada_bug.html).

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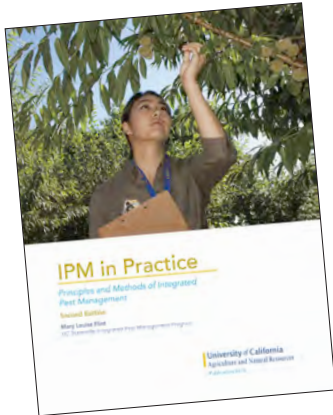
## Just Released: *IPM in Practice, 2nd ed.*

**I** *PM in Practice* is a comprehensive guide for setting up IPM programs in all types of situations. This book features IPM strategies for weed, insect, pathogen, nematode, and vertebrate pests and provides specific information about how to set up sampling and monitoring programs in the field. It has been newly revised to reflect new developments and

technologies, updated information about policies and regulations, new information about invasive pest control and pesticide resistance, and more. The manual draws on the knowledge of dozens of experts within the University of California, public agencies, and private practice, and contains the most up-to-date and accurate information.

Featuring more than 160 color photos and 100 hand-drawn color illustrations, this manual is the official study guide for individuals preparing for the California Department of Pesticide Regulation's Pest Control Adviser exam.

More information about this manual is available at [http://www.ipm.ucdavis.edu/IPMPROJECT/ADS/manual\\_ipminpractice.html](http://www.ipm.ucdavis.edu/IPMPROJECT/ADS/manual_ipminpractice.html).



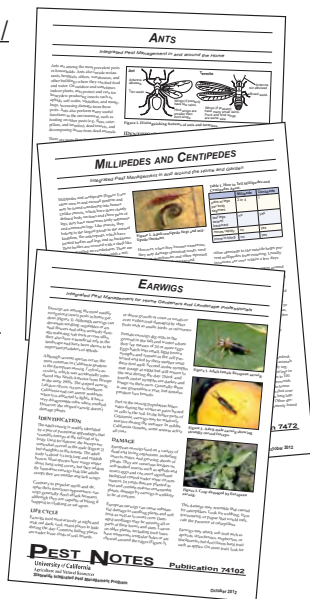
## Revised Resources

**U** C IPM recently updated three titles in its Pest Notes series of publications about home, garden, and landscape pests.

*Ants*, <http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7411.html>, are the most prevalent household pest in California. In this publication you'll find information including numerous photos, videos, and an identification key.

*Earwigs*, <http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74102.html>, and *Millipedes and Centipedes*, <http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7472.html> detail management tips as well as the beneficial side of these "pests."

To access more than 150 other titles, visit UC IPM's Pest Notes Web page, <http://www.ipm.ucdavis.edu/PDF/PESTNOTES/index.html>.



## Ask the Expert!

**Q** Do the new regulations regarding pyrethroid insecticide applications apply to applications I might make around my own home?

**A** No. These regulations only apply to professionals making applications for hire. They don't apply to homeowners making applications around their own homes. When applying pesticides around your home, follow label directions. The U.S. EPA is currently reviewing labels for all the pyrethroids, so label language for these products may change in the near future.

**Q** How does the *Bagrada* bug differ from another new invasive stink bug I've been hearing about—the brown marmorated stink bug?

**A** The brown marmorated stink bug (BMSB) has a similar shield shape but is brownish and lacks the distinctive orange, white, and black markings of the *Bagrada* bug. It is also slightly larger. BMSB has a much wider host range than the *Bagrada* bug, which feeds primarily on plants in the mustard family (Brassicaceae).



D. Shetlar, Ohio State U

*Brown marmorated stink bug.*

BMSB is particularly fond of fruit, including tree fruits and grapes, as well as corn, beans, and other vegetables. Although it has been reported in Los Angeles and several other counties in California, BMSB has not yet become as widespread and abundant as the *Bagrada* bug has in Southern California.



G. Arakelian, LA County

*Bagrada bugs.*

Have a question?  
E-mail it to  
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