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Citrus Pests: Web Resources

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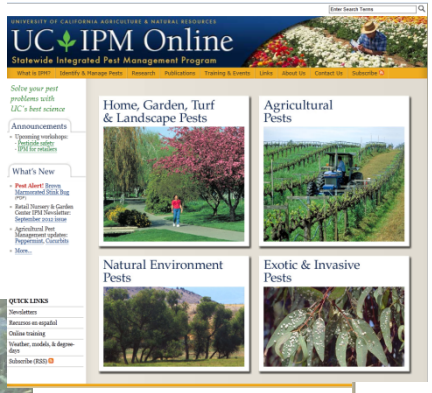
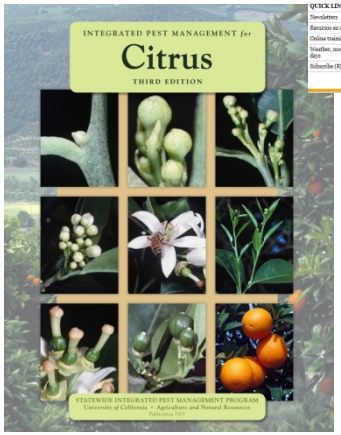
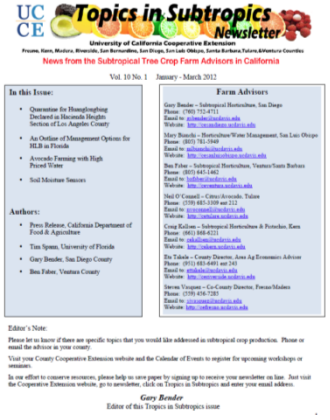
Dept of Entomology UC Riverside

and Director of Lindcove Research and Extension Center







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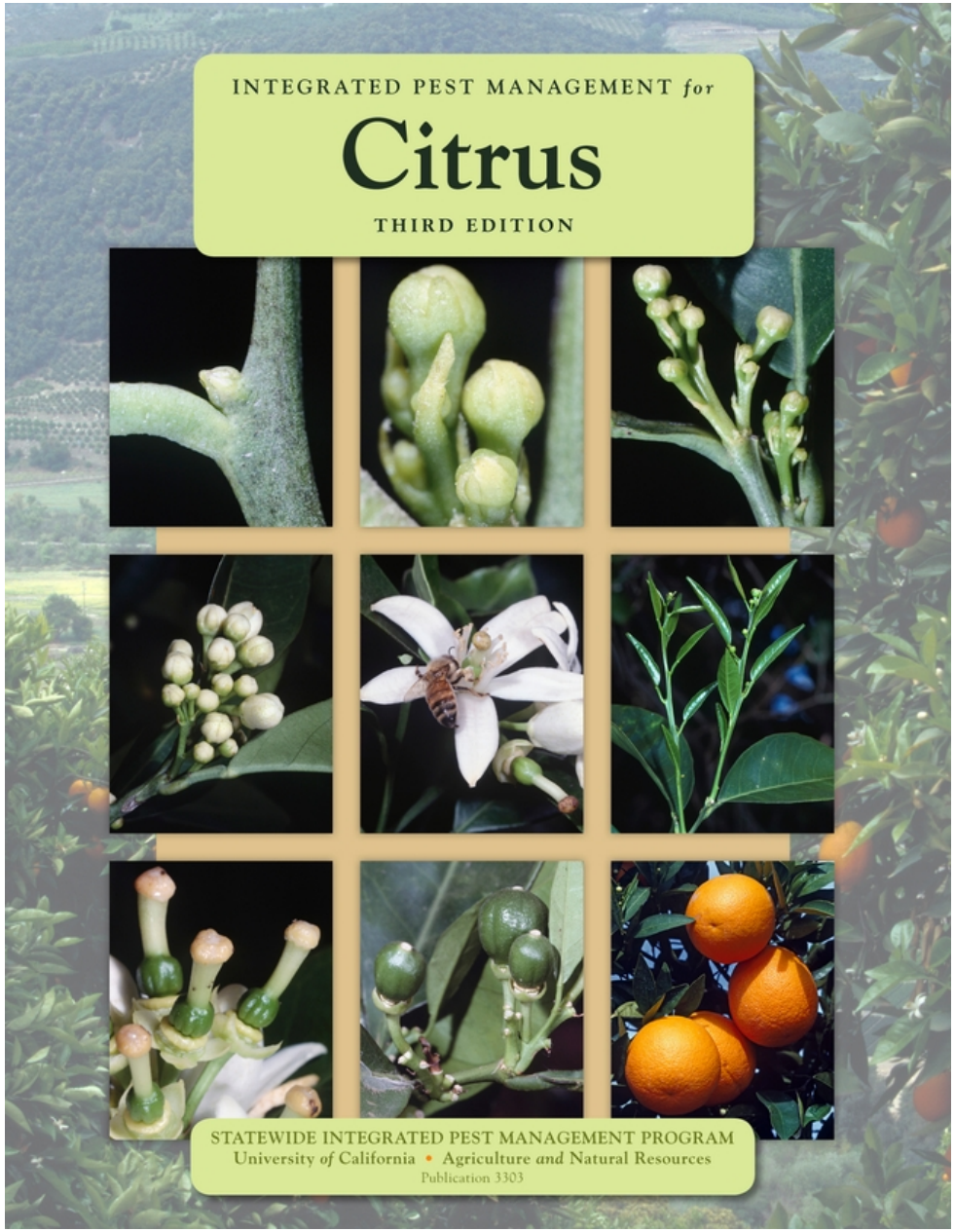

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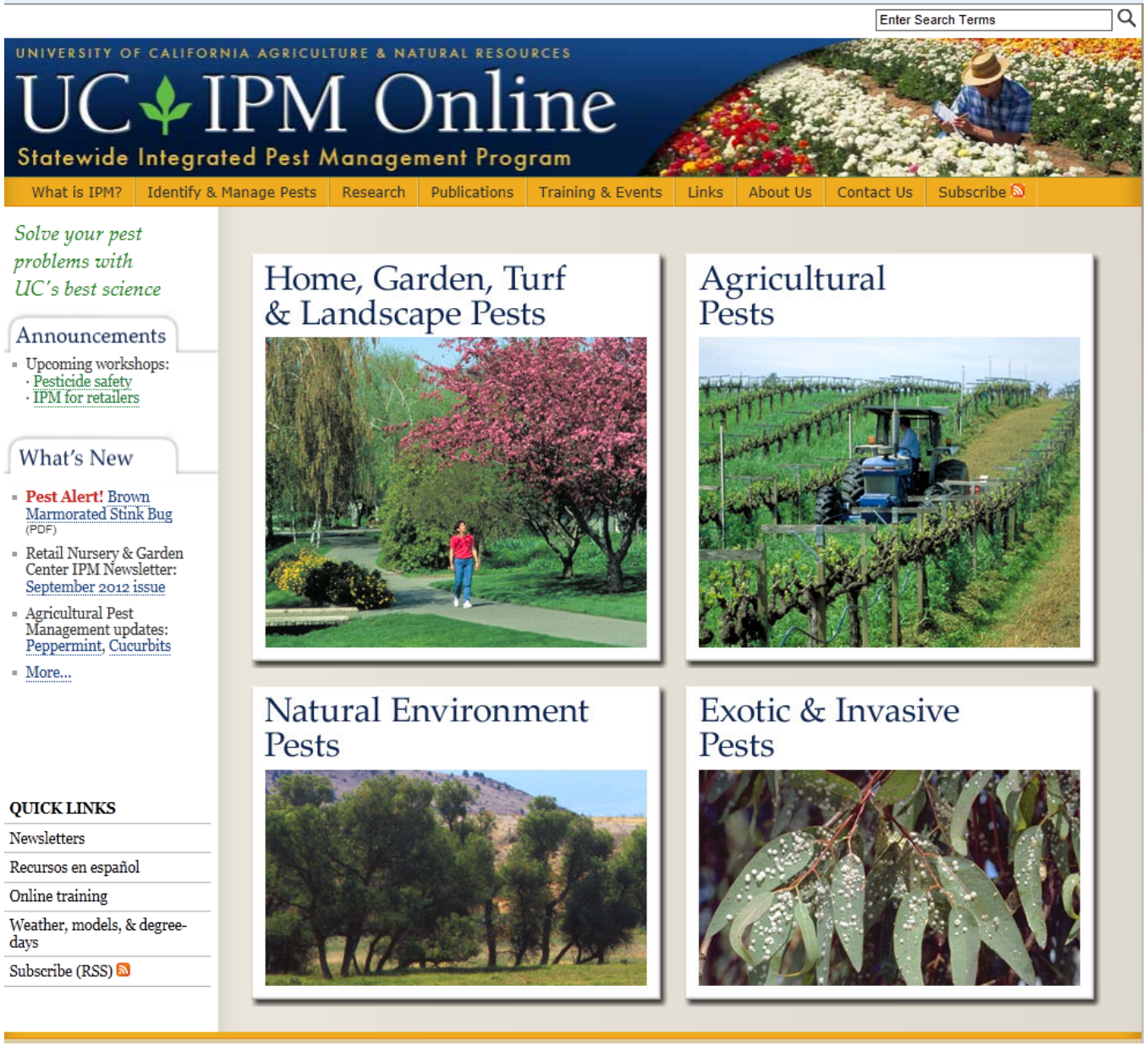

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PRINT

Agricultural pests

Information about managing pests, including University of California's official guidelines for monitoring pests and using pesticides and nonpesticide alternatives for managing insect, mite, nematode, weed, and disease pests.

Index by crop

A – C · D – O · P – Z

☑ *Includes Year-Round IPM Program, with annual checklist.*

- Alfalfa ☑
- Almond ☑
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- Apricot ☑
- Artichoke
- Asparagus ☑
- Avocado ☑
- Barley (see Small Grains)
- Beans (see Dry Bean)
- Bermudagrass Seed Production
- Blackberry (see Caneberries)
- Broccoli (see Cole Crops)
- Brussels Sprouts (see Cole Crops)
- Cabbage (see Cole Crops)
- Caneberries (Blackberry, Raspberry) **(UPDATES)**
- Carrot
- Cauliflower (see Cole Crops)
- Celery
- Cherry ☑
- Citrus ☑ **(UPDATES)**
- Cole Crops

UNIVERSITY OF CALIFORNIA AGRICULTURE & NATURAL RESOURCES

UC IPM Online

Statewide Integrated Pest Management Program

How to Manage Pests

All crops

Citrus

Provisional Treatment Guidelines

- Diaprepes Root Weevil
- Asian Citrus Psyllid

Year-Round IPM Program

Tells you what you should be doing throughout the year in an overall IPM program. Includes Year-Round IPM Program Annual Checklist. **Forms and Photo ID Pages**

Year-Round IPM Program for Citrus (9/08)

- Prebloom
- Bloom
- Petal fall
- Fruit development
- Fall

UC IPM Pest Management Guidelines

University of California's official guidelines for pest monitoring techniques, pesticides, and nonpesticide alternatives for managing pests in agriculture, floriculture, and commercial turf. More

| **Authors & credits** | **All crops** | **Download PDF** | **Recent updates** |

General Pesticide Information

- Cultural and Other Practices that Affect Pests (9/08)
- Timings for Key Cultural and Management Practices (9/08)
- When to Monitor Pests and Natural Enemies (9/08)
- Mandatory Intervals Between Application, Reentry, and Harvest, and Hazards to Bees (6/12)
- Selectivity of Insecticides and Miticides (6/12)
- Spray Coverage (9/08)
- Precautions for Using Petroleum Oil Sprays (10/09)
- General Properties of Fungicides Used in Citrus (9/08)

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- Anthracnose (9/08)
- Armillaria Root Rot (9/08)
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- Botrytis Diseases And Disorders (9/08)

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Damage
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Citrus (Central Valley)

Year-Round IPM Program

(Reviewed 1/08, updated 9/08)

These practices are recommended for a monitoring-based IPM program that reduces water and air quality problems related to pesticide use. Links take you to information on how to monitor pests, forms to use, and management practices. Track your progress through the year with the annual checklist form.

Water quality becomes impaired when pesticides move off-site and into water. Air quality becomes impaired when volatile organic compounds (VOCs) move into the atmosphere. Each time a pesticide application is considered, review the Pesticide Application Checklist at the bottom of this page for information on how to minimize air and water quality problems.

Note: This program covers major pests of citrus grown in California's Central Valley. For information on additional pests or other locations, consult the Citrus Pest Management Guidelines, IPM for Citrus manual, or your local farm advisor.

| Print annual IPM checklist (PDF)| Citrus Pest Management Guidelines | Forms and Photo ID pages |

- Young trees and new groves
- Prebloom
- Bloom
- Petal fall
- Fruit development
- Fall: preharvest through harvest
- Pesticide application checklist

Prebloom (January through March)

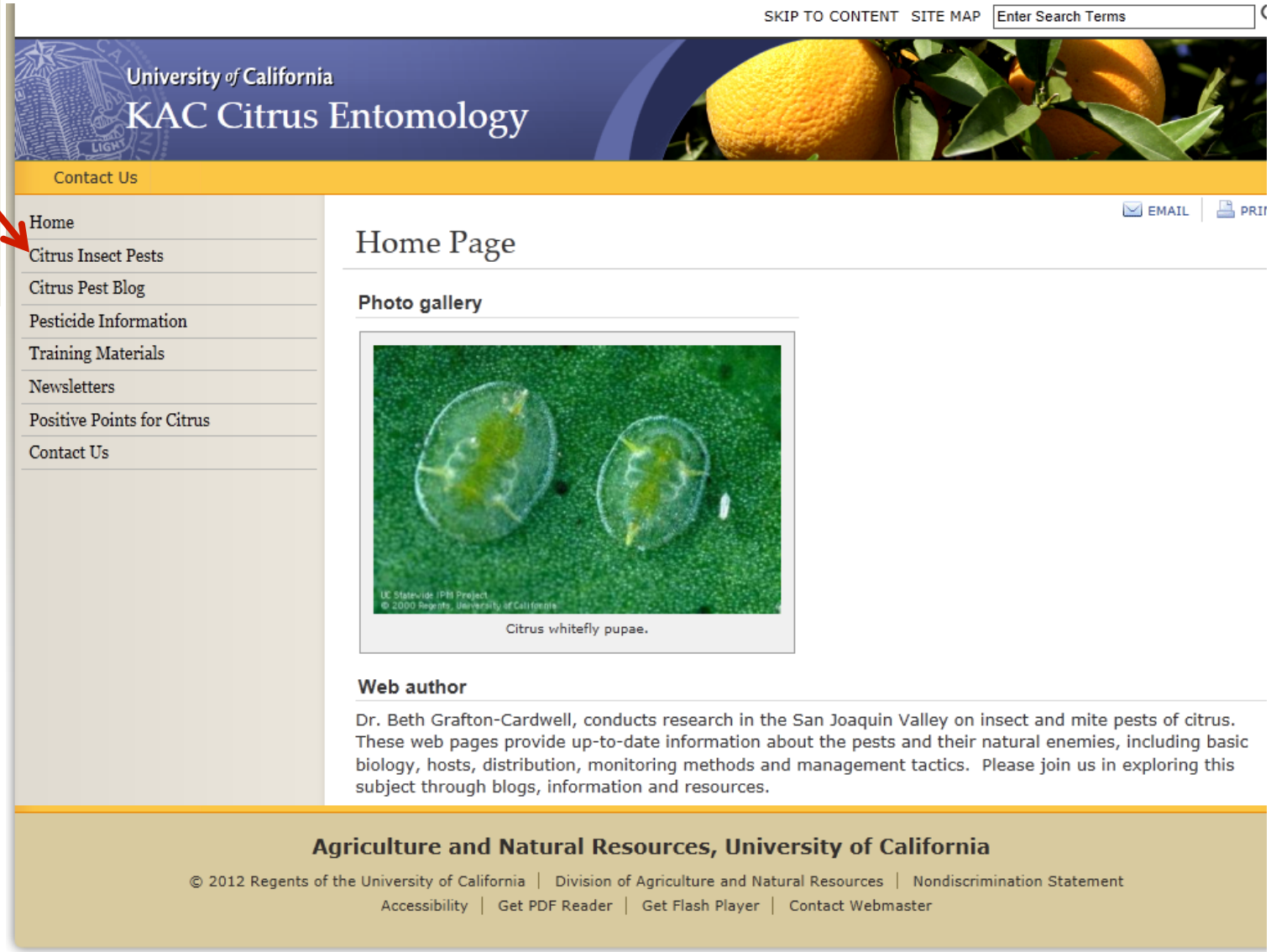
Special issues of concern related to environmental quality: Drift and runoff.

What should you be doing during this period?
Monitor California red scale males using pheromone-baited sticky traps (March through October), plus additional methods depending on the situation. • Keep records (example red scale monitoring form PDF.) • Learn to distinguish male scales from scale parasites and other important insects caught in sticky traps. • Release *Aphytis melinus* if biological control is compatible with the overall management program.
Look for spider mites and other mites. • Monitor leaves for citrus red mite (February through June). • Keep records (example citrus red mite monitoring form PDF). • Look for natural enemies, especially *Euseius tularensis*. Manage if needed according to Citrus Pest Management Guidelines.
Look for cottony cushion scale and predatory vedalia beetles (March through July). • Collect and relocate vedalia to cottony cushion scale-infested orchards if vedalia have not arrived by the end of March.
Look for other pests and their damage to fruit or damage to leaves and twigs, especially: • European earwig (March through June) • Forktailed bush katydid (March through June)

Kearney Ag Center Citrus Entomology

www.ucanr.org/sites/KACcitrusentomology

Citrus thrips
Asian citrus psyllid
California red scale
Citrus leafminer
Citrus peelminer
Cottony cushion scale
Fuller rose beetle



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News from the Subtropical Tree Crop Farm Advisors in California

Vol. 10 No. 1 January - March 2012

In this Issue:

Authors:

- Press Release, California Department of Food & Agriculture
- Tim Spann, University of Florida
- Gary Bender, San Diego County
- Ben Faber, Ventura County

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Editor's Note:

Please let us know if there are specific topics that you would like addressed in subtropical crop production. Phone or email the advisor in your county.

Visit your County Cooperative Extension website and the Calendar of Events to register for upcoming workshops or seminars.

In our effort to conserve resources, please help us save paper by signing up to receive your newsletter on line. Just visit the Cooperative Extension website, go to newsletter, click on Tropics in Subtropics and enter your email address.

Gary Bender
Editor of this Tropics in Subtropics issue

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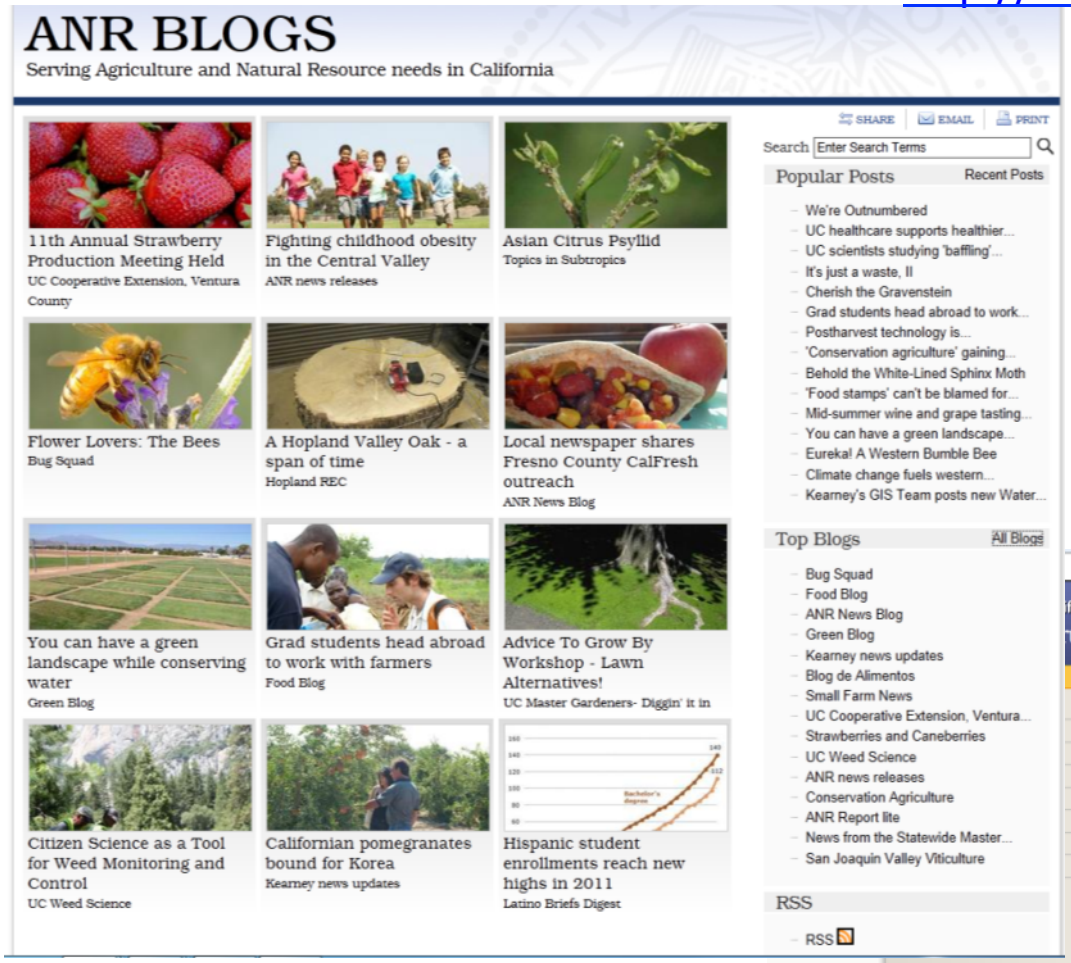

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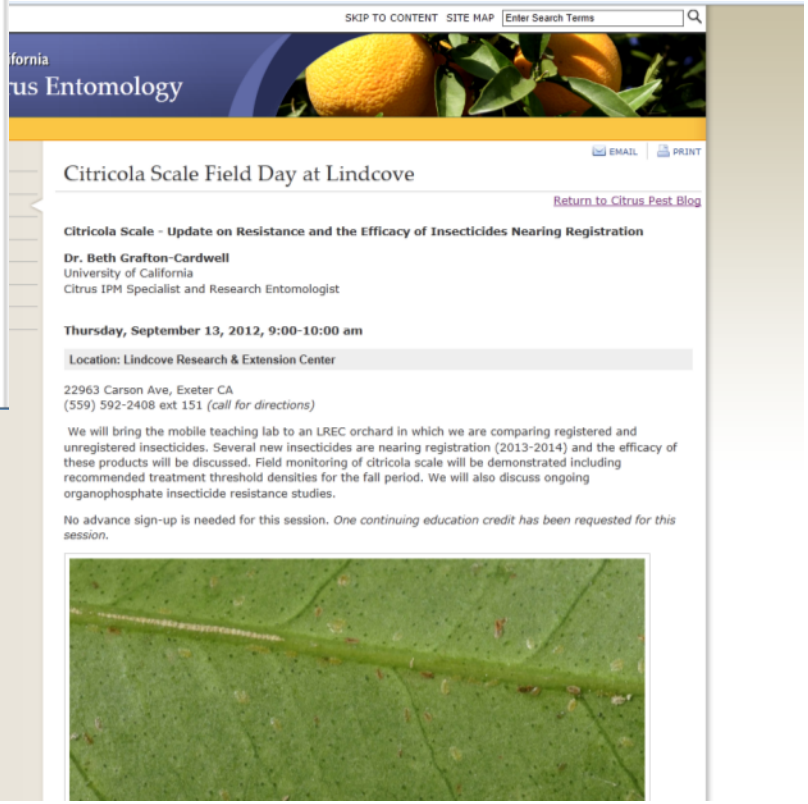

<u>Blogs</u>

Citrus Bugs

Topics in Subtropics

Lindcove Research and Extension Center News

ANR Publication 21529 - $4

Life Stages of California Red Scale and Its Parasitoids

Lisa D. Forster
Robert F. Luck
and Elizabeth E. Grafton-Cardwell

Figure 1. Scale infested fruit

CALIFORNIA RED SCALE, *Aonidiella aurantii* (Mask.) (fig. 1), is a major pest of citrus that growers have traditionally controlled with insecticides. Populations of California red scale developed resistance to organophosphate and carbamate insecticides in South Africa, Australia and Israel in the 1970s and in California in the 1990s, and these broad spectrum insecticides are losing their effectiveness. An alternate approach to chemical control of California red scale is augmentative biological control as part of an integrated pest management (IPM) approach. Growers can release the insectary-reared parasitoid wasp *Aphytis melinus* DeBach from February through November to augment the native *Aphytis* populations that attack and reduce armored scale populations. This approach can suppress armored scale densities below economic injury levels. In years when biological control is less effective, selective narrow range petroleum oil sprays can be used to help reduce scale numbers. This leaflet gives some background that will help growers evaluate the effectiveness of natural enemies of California red scale through knowledge of the scale life cycle, the stages of scale that are attacked by parasites and predators, and the signs of parasitism.

Figure 2. Inverted female scale with crawlers

California Red Scale—General Phenology

FEEDING AND DORMANT LIFE STAGES

California red scale start out as mobile **crawlers*** (fig. 2). Crawlers remain mobile only long enough to find a suitable location on a leaf, fruit, or branch to settle on and begin feeding. From this stage onward, all life stages are immobile except for the adult males (fig. 3).

*Words in bold are important terminology needed for identification of scale and parasite stages.

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Publication #21529
Photos by L. Forster and M. Badgley • Graphics by G. Conville

ANR Publication 8051 - free

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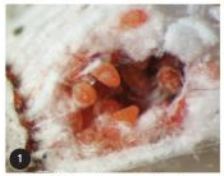
PUBLICATION 8051

Stages of the Cottony Cushion Scale *(Icerya purchasi)* and its Natural Enemy, the Vedalia Beetle *(Rodolia cardinalis)*

BETH GRAFTON-CARDWELL is IPM Specialist and Research Entomologist, Department of Entomology, University of California, Riverside, and is stationed at the Kearney Agricultural Center in Parlier.

Stages of the Cottony Cushion Scale *(Icerya purchasi)*

Cottony cushion scale life cycle is 3 months.



200 to 400 red eggs inside the egg sac of the female scale (7 days to hatch)

First instar crawler; note the black legs and antennae (1 week)

First instar nymphs settled down and producing a cottony substance (2 to 3 weeks)

Second instar nymph emerging from the white molt shell

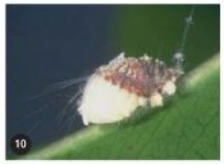
Second instar nymph underside Note the thread-like feeding tube (stylet) attached to the leaf.

Second instar nymph The amount of cottony substance increases with age. (2 to 3 weeks)

Third instar nymph emerging from the white molt shell

Third instar nymph Note the long hairs grouped in tufts. (2 to 3 weeks)

Young female (4 weeks until egg production)



Adult female The more cottony material she has, the more eggs inside her egg sac.

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ANR Publication 8090 - free

ANR Publication 8521 - free

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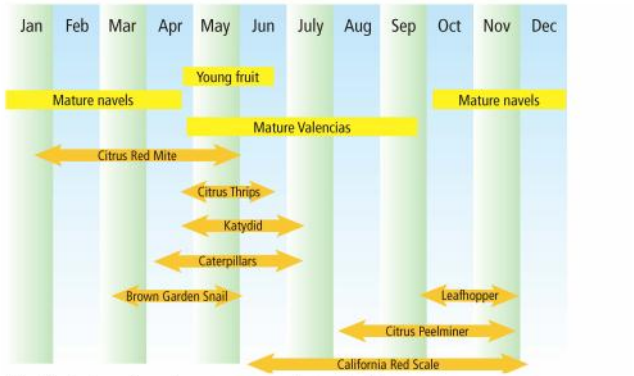
PUBLICATION 8090

Photographic Guide to Citrus Fruit Scarring

ELIZABETH E. GRAFTON-CARDWELL, UC Cooperative Extension IPM Specialist and Research Entomologist, UC Riverside; **NEIL V. O'CONNELL,** UCCE Farm Advisor, Tulare County; **CRAIG E. KALLSEN,** UCCE Farm Advisor, Kern County; and **JOSEPH G. MORSE,** Professor of Entomology and Entomologist, UC Riverside. Photography by Jack Kelly Clark, Elizabeth E. Grafton-Cardwell, Craig E. Kallsen, and Alan A. Urena.

Scarring of the rind of citrus fruit can prompt packinghouse operators to downgrade the fruit from *fancy* to *choice* or even *juice*. If you as the grower can recognize the different types of scars you can differentiate between symptoms that indicate biological (e.g., insect, mite, disease, or snail), mechanical (e.g., equipment, hail, or wind rubbing), or chemical (e.g., phytotoxic burn) damage. Once you know the causal agent you can take steps to reduce injury to future crops. Orchards should be carefully monitored when fruit are small, the stage at which damage is most likely to occur. As soon as you observe signs of damage, make an immediate search for possible sources of the damage. It is much harder to determine the cause of fruit damage toward the end of the season because the insects or other causal agents are no longer present in the orchard and many types of injuries are by then similar in appearance.

Most citrus fruit scarring occurs in spring (April through June) when fruit are first developing on the tree. The rind tissue is very tender and easily damaged at this time. If damage is severe, the fruit will often fall off of the tree, either at the time of damage or during June fruit drop. If the damage is less severe, the fruit will remain on the tree and continue to grow, and the scarring will become noticeable. Some of the more common types of fruit damage seen in citrus groves are shown on the pages that follow.



Periods of major damage from various pests to young and mature citrus fruit.

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Publication 8321 • April 2008

Citrus Leafminer and Citrus Peelminer

ELIZABETH E. GRAFTON-CARDWELL, University of California, Riverside, and UC Kearney Agricultural Center; **KRIS E. GODFREY,** California Department of Food and Agriculture, Sacramento; **DAVID H. HEADRICK,** Cal Poly San Luis Obispo; **PEGGY A. MAUK,** UC Cooperative Extension, Riverside; **JORGE E. PEÑA,** University of Florida, Homestead

Two closely related species of moths can cause problems for California citrus growers: citrus leafminer (*Phyllocnistis citrella* Stainton) and citrus peelminer (*Marmara gulosa* Guillén and Davis) (Lepidoptera: Gracillariidae). Damage by both pest species is caused by the larval stage of a 2-mm sized moth (microlepidopteran). Knowing which moth is present within a grove is important because their life cycles, the damage they cause, and therefore their management programs differ.

CITRUS LEAFMINER

The citrus leafminer (CLM) is native to Asia and can be found throughout Asia, Taiwan, southern Japan, the Philippines, Indonesia, and New Guinea, as well as Australia, South Africa, parts of West and East Africa, the Mediterranean area of Europe, and from Saudi Arabia to India (Heppner 1995). CLM can also be found throughout the Caribbean Islands, Central America, Mexico, and South America (Ruíz and Blanco 1994; Bermudez et al. 2004; Hoy and Jessey 2004). In the United States, CLM was first found in southern Florida in 1993 (Heppner 1993). Since that time it has spread throughout the citrus-growing regions of Florida and into Louisiana and Texas (Johnson et al. 1998; Legaspi et al. 1999). In 2000, CLM was first discovered in Imperial County, California; it is widely assumed that it migrated from Mexico. Since then, it has slowly spread westward and northward into California citrus-producing areas.

ANR Publication 8131 - free

PUBLICATION 8131

Diaprepes Root Weevil

ELIZABETH E. GRAFTON-CARDWELL, University of California, Riverside, and Kearney Agriculture Center, Parlier; **KRIS GODFREY,** California Department of Food and Agriculture, Sacramento; **JORGE E. PEÑA,** University of Florida Tropical Research and Education Center, Homestead; **CLAYTON W. MCCOY,** University of Florida, Citrus Research and Education Center, Lake Alfred; **ROBERT F. LUCK,** University of California, Riverside. Photographs by **R. DUNCAN, E. GRAFTON-CARDWELL,** and **I. JACKSON.**

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Diaprepes root weevil, *Diaprepes abbreviatus* (L.) (Coleoptera: Curculionidae), is a large, colorful weevil, 3/8 to 3/4 inch (10 to 19 mm) long, with numerous forms, or morphs, ranging from gray to yellow to orange and black (fig. 1). This weevil is native to the Caribbean region. It was accidentally introduced into central and south Florida in 1964 in an ornamental plant shipment from Puerto Rico (Woodruff 1968). Since then, it has spread throughout Florida, where it sometimes causes serious damage to citrus trees. In addition, it poses a threat to many ornamental plants and a number of other agronomic crops such as papayas and sweet potatoes. In 2000, Diaprepes became established in a mature citrus grove in the Rio Grande Valley of Texas (Skaria and French 2001) (fig. 2). Diaprepes has been intercepted a number of times in California since 1974 in shipments of plants, in truck trailers, and in the cargo holds of aircraft. The weevils found in these interceptions were destroyed. However, the risk of introduction and establishment of this weevil in California is high because it can survive and reproduce on many host plant species and because of the high volume of host plants brought into California.

HOST PLANTS

Diaprepes root weevil feeds on more than 270 species of plants from 59 plant families (Simpson et al. 1996). Some of the more common hosts are citrus (all varieties), peanut, sorghum, guinea corn, corn, Surinam cherry, dragon tree, sweet potato, sugarcane, panicum grasses, coffee weed (sesbania), and Brazilian pepper. Because of its broad host range, the Diaprepes root weevil poses a great threat to citrus and ornamental plant industries in California.

Figure 1. Diaprepes root weevil adults vary in color and striations.

Figure 2. Current distribution of Diaprepes root weevil. Note population in South Texas.

ANR Publication 8205 - free

PUBLICATION 8205

Asian Citrus Psyllid

ELIZABETH E. GRAFTON-CARDWELL, University of California, Riverside, and UC Kearney Agricultural Center, Parlier; **KRIS E. GODFREY,** California Department of Food and Agriculture, Sacramento; **MICHAEL E. ROGERS,** University of Florida Citrus Research and Education Center, Lake Alfred; **CARL C. CHILDERS,** University of Florida Citrus Research and Education Center, Lake Alfred; and **PHILIP A. STANSLY,** University of Florida Southwest Florida Research and Education Center, Immokalee

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The Asian citrus psyllid, *Diaphorina citri* Kuwayama (Homoptera: Psyllidae) (fig. 1) is a pest of citrus and close relatives of citrus. Asian citrus psyllid damages plants directly through its feeding activities. New shoot growth that is heavily infested by psyllids does not expand and develop normally and is more susceptible to breaking off. While direct damage is serious, there is even greater concern that the psyllid is an efficient vector of the bacterium that causes the economically devastating disease citrus greening, or Huanglongbing.

Asian citrus psyllid is found in tropical and subtropical Asia, Afghanistan, Saudi Arabia, Reunion, Mauritius, parts of South and Central America, Mexico, and the Caribbean (fig. 2). In the United States, Asian citrus psyllid was first found in Palm Beach County, Florida, in June 1998 in backyard plantings of *Murraya paniculata* (orange jasmine) (fig. 3). By 2001, it had spread to 31 counties in Florida, with much of the spread due to movement of infested nursery plants (Halbert et al. 2002). In the spring of 2001, Asian citrus psyllid was accidentally introduced into the Rio Grande Valley of Texas on potted nursery stock (orange jasmine) from Florida (French et al. 2001). The Asian citrus psyllid could invade California at any time, with most likely sources of infestation being Florida, Mexico, or Asia. There were 170 interceptions of Asian citrus psyllid at U.S. ports on plant material (primarily *Murraya* and citrus) from Asia from 1985 to 2003.

Figure 1. Asian citrus psyllid adult and nymphs. Photo by M. E. Rogers.

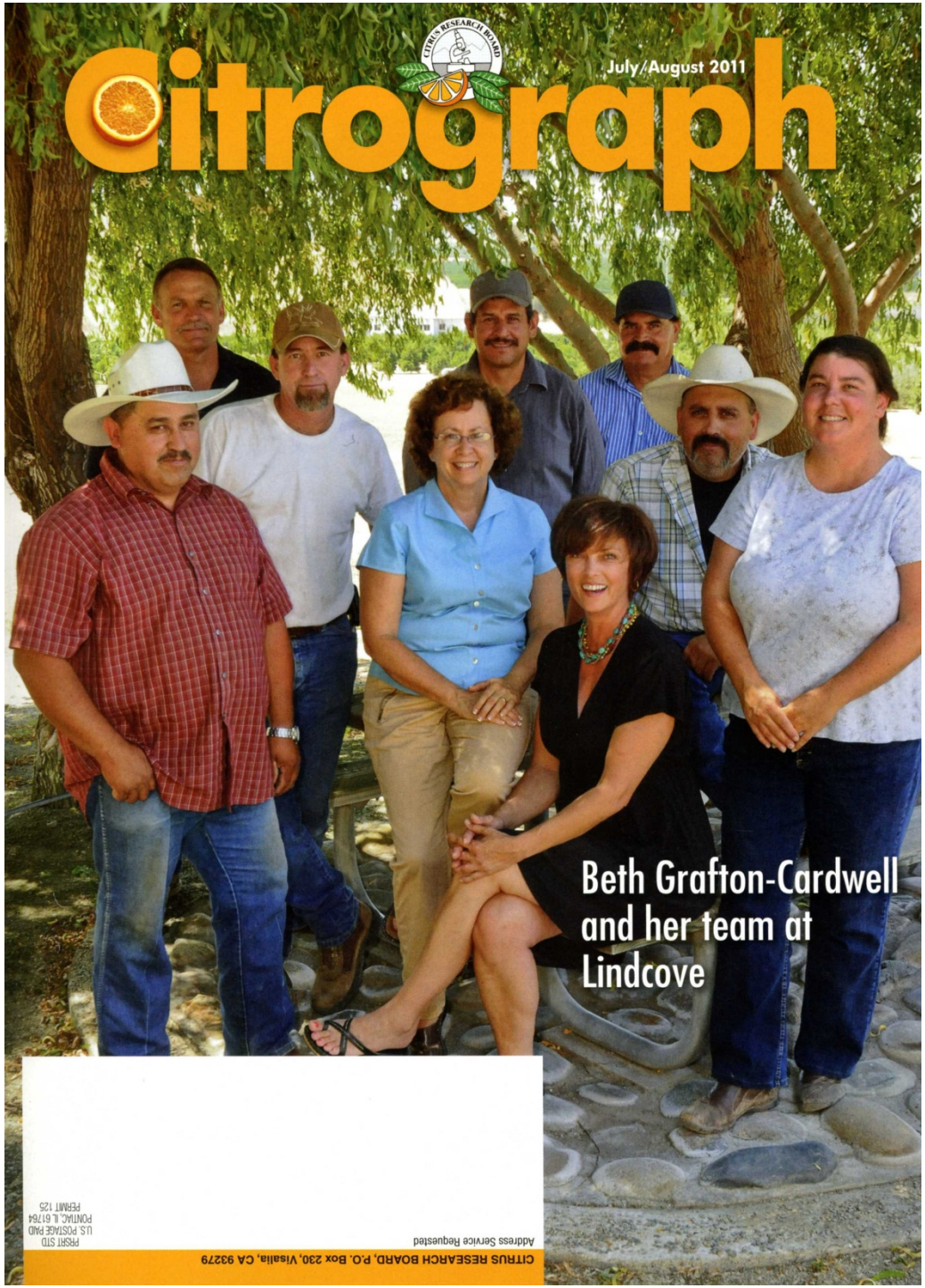
Figure 2. Worldwide distribution of Asian citrus psyllid alone (orange) and the psyllid in combination with the Asian form of greening disease (green). Illustration by G. H. Montez.

Figure 3. *Murraya paniculata*, orange jasmine. Photo by E. E. Grafton-Cardwell.

Citrograph

www.citrusresearch.org/citrograph

Statewide news and information for citrus growers and PCAs



Ag and Natural Resources Online Learning Site: Citrus IPM Modules

http://class.ucanr.org – Free continuing education units!

California red scale

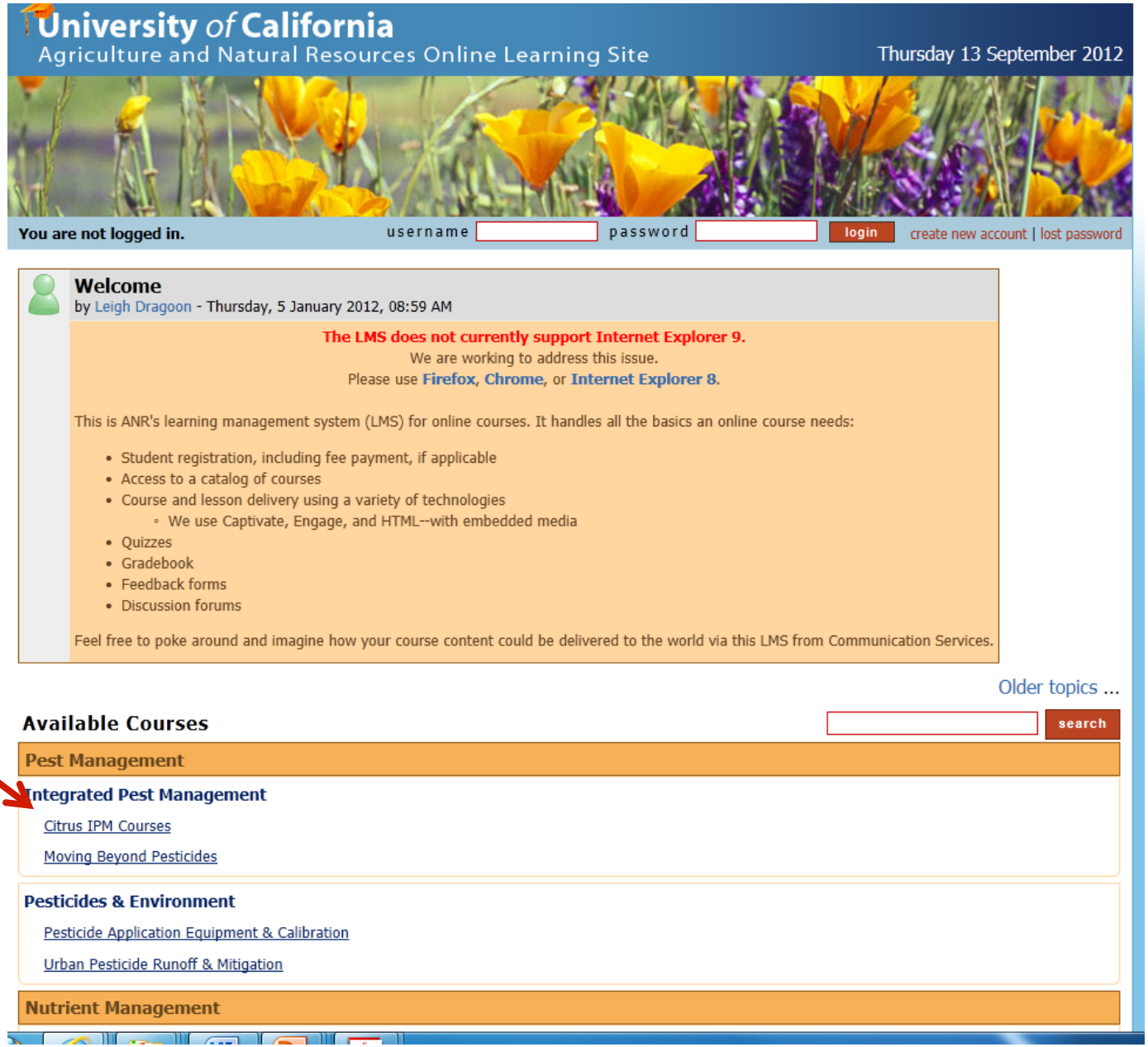
Citricola scale

Citrus red mite

Cottony cushion scale

Katydid

Citrus peelminer



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You **must** complete this survey to receive CAL DPR credit for completing these tutorials:

cal dpr course registration

Topic Outline

Citrus IPM Courses

The Citrus IPM course consists of modules for each of the key pests of California citrus and their associated natural enemies. Each module provides text, photos, and videos of the lifecycle, behavior, and management of the pest. The coursework will improve your pest and natural enemy recognition, teach sampling methods and thresholds for treatment and provide a management strategy. Each module is followed by a quiz to test your understanding of the materials.

Within each course there are study chapters. You must view all pages in all chapters before you are allowed to take the test. You must finish the test in one sitting.

News forum

California Red Scale Course

Study Chapters

- 1 - CRS Lifecycle
- 2 - Damage to Citrus
- 3 - Key Parasites
- 4 - Other Natural Enemies
- 5 - Scale Monitoring
- 6 - Managing Scale - Insecticides
- 7 - Managing Scale with Natural Enemies

Take Test

- California Red Scale Test

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California Red Scale and its Natural Enemies

A study of the biology and management

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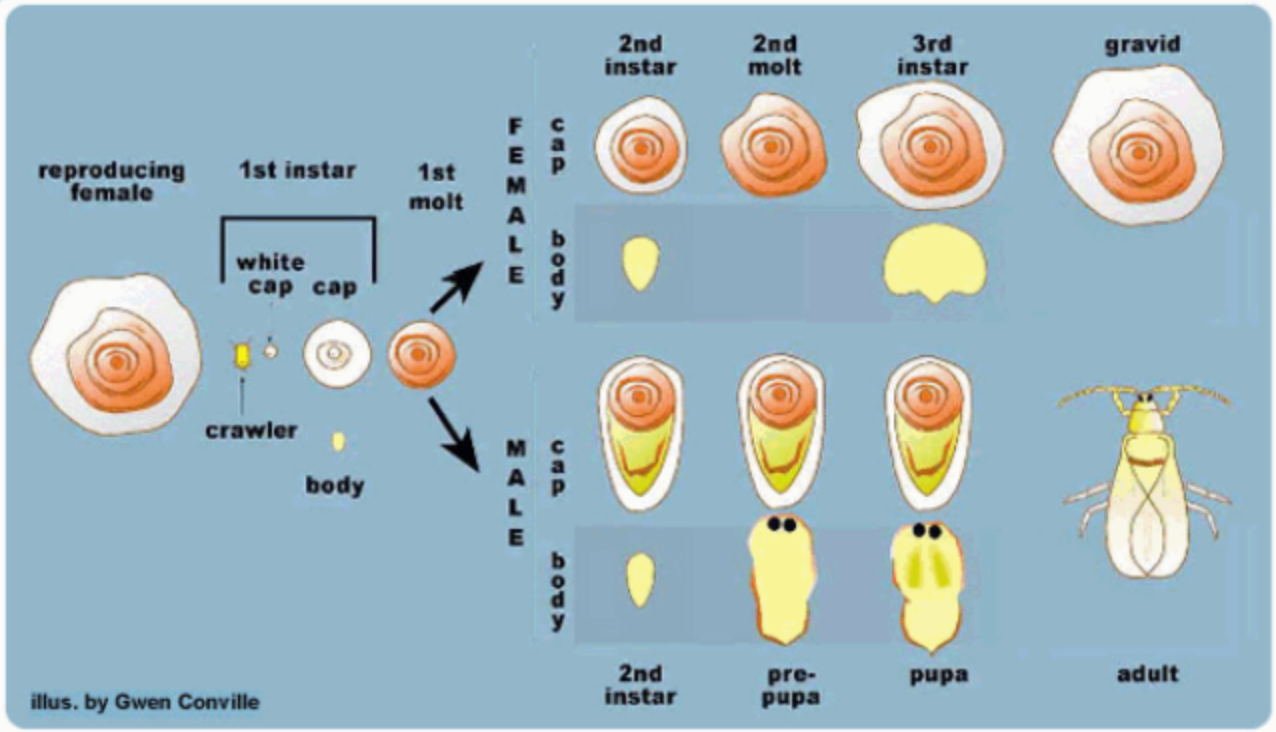
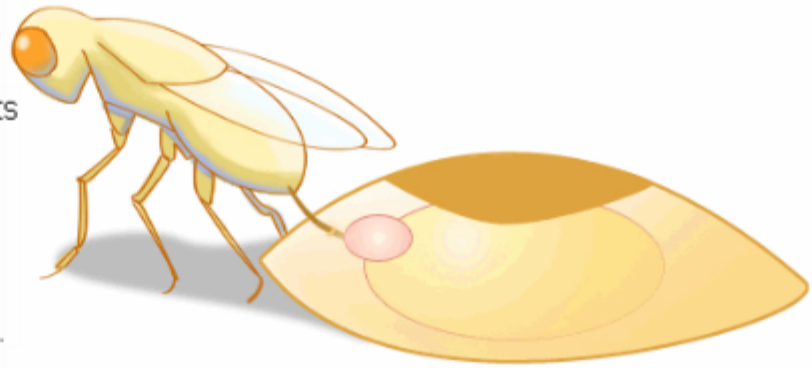


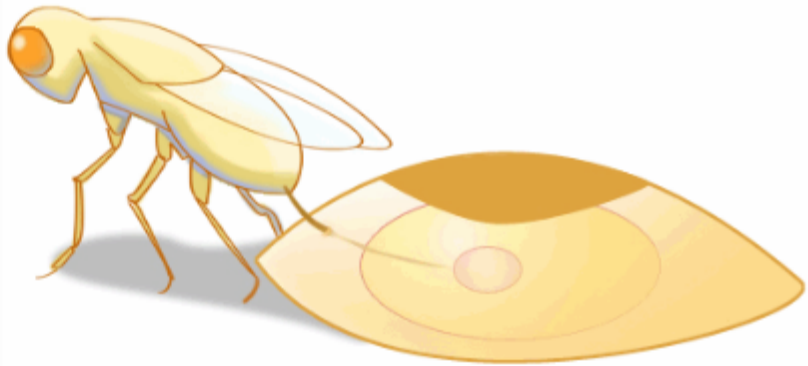
California red scale has a rather odd lifecycle, in that the males and females look very different when they become adults. We will go through each of the stages, but notice from this picture that the females remain round, while males change into a winged form. This entire lifecycle takes about 6 weeks to complete.

Crawlers are small enough to be carried from tree to tree by breezes and that is probably the way that most of them get around. However, as you can see, they have quite a bit of walking power.

Aphytis is an **ectoparasite**, which means it deposits its egg on the exterior of the scale's body.
Comperiella is an **endoparasite**, which means it deposits its egg on the inside of the scale's body.

Both parasites insert their needle-like ovipositor through the gray skirt of the scale to deposit an egg.





CaliforniaRedScale

Question 3 of 20

Point Value: 10

Click on the scale which is a third instar female scale.

Score so far: 20 points out of 20

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