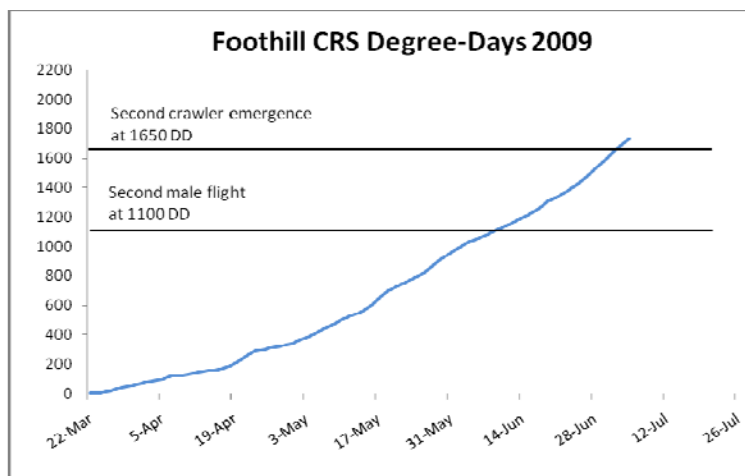




UC Kearney Agricultural Research Center
<http://citrusent.uckac.edu>

California Red Scale – Second Crawlers Starting

For California red scale development, the southern citrus growing regions of the San Joaquin Valley are accumulating 25 to 35 degree–days per day, while the northern part of Tulare County along with Fresno and Madera counties are accumulating 20 to 30 degree–days per day. This seemingly small difference can accelerate red scale development in the warmer areas by several weeks once the third generation arrives. At the Lindcove Research and Extension Center, the threshold for the start of the second crawler emergence occurred during the week of July 6. Timing for the organophosphate insecticides (Lorsban and Supracide), carbamate insecticides (Sevin) and insecticidal oils is most effective at the onset of crawler emergence through the end of the first instar. The insect growth regulators Applaud and Esteem perform best as the scale tries to molt from the first to the second instar. Growers choosing to use Movento need to give it several weeks for uptake, and so it probably should be applied prior to crawler emergence. Since it is active against all scale stages, timing may turn out to be unimportant. Movento MRLs have not yet been established and so do not send Movento treated fruit to international markets.



California Red Scale crawler

Predicted California Red Scale Development

California Red Scale Lower Developmental Threshold: 53°F

Current DD accumulated from the biofix - Kern: 1940 DD, Tulare: 1890 DD, Fresno: 1780 DD

	1st male flight (observed)	1st gen. crawlers (observed)	2nd male flight (observed)	2nd gen. crawlers (observed)	3rd male flight (predicted)	3rd gen. crawlers	4th male flight	4th gen. crawlers	5th male flight
Estimated Degree Days	Biofix	550 DD	1100 DD	1650 DD	2200 DD	2750 DD	3300 DD	3850 DD	4400 DD
Kern	March 23	May 11	June 8	July 6	August 3				
Tulare	March 23	May 11	June 8	July 6	August 3				
Fresno	March 30	May 18	June 15	July 13	August 10				

*Aphytis melinus* waspClear *Aphytis* egg on scale bodyTwo *Aphytis* larvae on scale body

Aphytis Release Programs: If you are releasing *Aphytis* wasps for California red scale control, then you should avoid spraying insecticides for red scale or other pests that would directly or indirectly harm the wasps. You should rely on *Aphytis* alone. All insecticides, no matter how selective, can have an effect. The broad spectrum insecticides that directly kill the wasps include the organophosphates (Lorsban, Supracide, malathion), carbamates (Sevin, Lannate), pyrethroids (Baythroid, Danitol) and foliar neonicotinoids (Assail, Alias, Provado, Nuprid, Couraze). Oils kill adult wasps but only last a short time and so they are thought to be selective and OK to use with an *Aphytis* release program. However, they have an indirect negative effect in that they tend to kill the young stages of California red scale, throwing off the age distribution of the scale population and causing periods when there are none of the large 3rd instar scales available that *Aphytis* prefers to lay its eggs on. Thus, oil treatments should be used only rarely in an *Aphytis* release program. Admire Pro (or other systemic imidacloprid products) would appear to be soft on beneficials because they are applied to the soil. However, the imidacloprid is taken up into the scales feeding on the tree and that can poison the parasites trying to attack them. Imidacloprid also tends to work better on scale infesting fruit compared to twigs. So imidacloprid treatments shift the distribution of the scale to the interior wood of the tree. *Aphytis* doesn't attack scales on wood inside the tree very well, so these treatments can make *Aphytis*' job more difficult.

Methods of release In the San Joaquin Valley: you should be releasing 5,000 wasps per acre every two weeks from early March through October to achieve good levels of parasitism by September. Now is the time to start sampling fruit every 30 days to 1) determine what percentage of fruit have noticeable scale, and 2) what percentage of the 2nd and 3rd instar females are parasitized. You can use a hand lens or microscope to see *Aphytis* eggs, larvae and pupae under the cap of the scale and *Comperiella* wasp pupae through the cap of the scale. Expect to see the percentage of infested fruit increase from August through September, but also expect to see the percent parasitism increase during that period.

*Aphytis* pupa and meconial pellets*Comperiella bifasciata* wasp*Comperiella* pupa visible through the scale body

California red scale training events

Two important meetings coming up that will discuss various aspects of California red scale Management:

**August 26, Wednesday from 8:30–10:30 am with the mobile laboratory
Shafter Research and Extension Center**

Craig Kallsen, David Haviland and Beth Grafton–Cardwell

Monitoring and Management of California red scale: focus on trapping and hand lens identification of stages and parasitism and a discussion of management tactics.

**September 24, Thursday from 8:00 to 4:00 pm in the conference building
Lindcove Research and Extension Center**

Beth Grafton–Cardwell

Detailed workshop on the life stages of California red scale and its parasites: using microscopes to study the nitty gritty details of scale and parasite stages. Class size will be limited to 25 students. Sign up with Anita Hunt 559–592–2408 ext 151.

Asian Citrus Psyllid and Huanglongbing Update

Asian citrus psyllid has been found in San Diego and Imperial Counties starting in June of 2008. All of Mexico is considered infested and that is where the CA infestation has come from. APHIS and CDFA are working on both sides of the border treating all citrus and related hosts in homeowner backyards with foliar cyfluthrin (a pyrethroid) and systemic imidacloprid (a neonicotinoid). This combined action has been very successful in that psyllids have not been found since treatment where these applications have occurred.

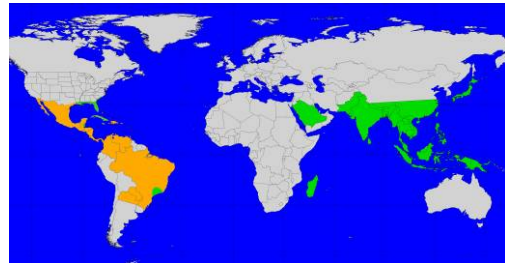
The few citrus growers that have found psyllids have applied the same two insecticides and have been equally successful in reducing numbers to undetectable levels. It remains to be seen if the pest is eradicated. A seasonal spray program for growers is in development and the UC Guidelines list the insecticides that are available and effective for psyllid control in citrus groves.

www.ipm.ucdavis.edu/EXOTIC/diaphorinacitri.html

Helpful ACP HLB web sites:

www.californiacitrusthreat.org (pictures and contacts)

www.cdfa.ca.gov/phpps/acp/ (quarantine information, pictures, videos, links)



Orange is psyllid only. Green is psyllid plus HLB disease. In North America, HLB is now found in parts of Cuba, Florida, Louisiana, S. Carolina, Georgia, Belize and Mexico.

Huanglongbing Alert! The deadly HLB bacterial disease that Asian citrus psyllid can transmit has been found in Belize and the eastern Yucatan area of Mexico. This raises the risk and concern for California citrus, as the bacteria could work its way across Mexico in the bodies of psyllids as they move the disease from tree to tree when they feed.

Citrus Peelminer – Fourth Flight

The third flight of citrus peelminer occurred during the week of June 29 and pummelo and grapefruit growers began to see tiny mines appear on the fruit shortly after that. The fourth flight of citrus peelminer is predicted to occur the week of July 20. Egg laying and mining damage to pummelo and grapefruit can continue during that flight. The susceptible orange varieties (TI, Atwood, Fukomoto) may be attacked during the fourth or fifth flight (expected middle of August). See our website for degree day updates:

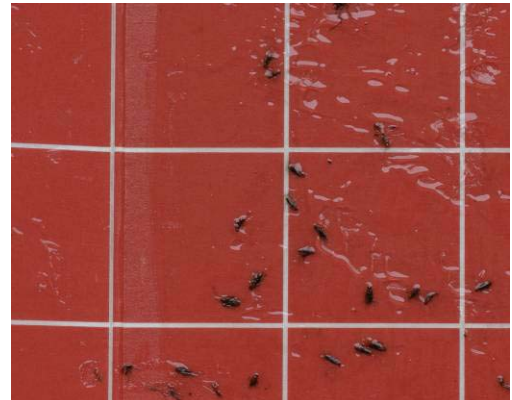
<http://citrusent.uckac.edu/PeelminerDDcurrent.htm>

Once the peelminer infestation starts, it is best to treat once a month for two to three months with a mixture of Micromite for the eggs and a broad spectrum pyrethroid or OP for the adults and larvae. These treatments may only reduce the percentage of mining by about 50%, because it is very difficult to achieve good coverage of the rapidly growing fruit inside the canopy that they like to deposit their eggs on. Since pesticides are only partially effective, we don't recommend treatment unless your orchard has a chronic problem with peelminer. Control recommendations can be found in the UC IPM guidelines:

www.ipm.ucdavis.edu/PMG/r107303111.html

For more information on peelminer and to learn to recognize live and dead larvae, see our new ANR publication 8321: Citrus leafminer and citrus peelminer

<http://anrcatalog.ucdavis.edu/pdf/8321.pdf>



A citrus peelminer pheromone has been developed; however, it seems to only work well in catching the moths on these sticky traps at the very beginning and the end of the season. So we use pheromones to establish the biofix at the beginning of the season and then use degree days to predict when the flights will happen.

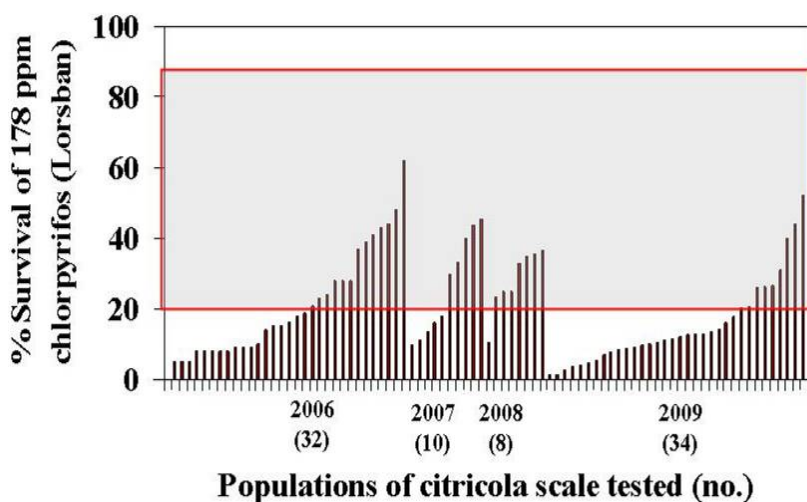
Degree day units and predicted flights of citrus peelminer

	1st male flight (observed)	2nd male flight (observed)	3rd male flight (observed)	4th male flight (expected)	5th male flight (expected)	6th male flight	7th male flight	8th male flight
Estimated Degree Days	biofix	580 DD	1160 DD	1740 DD	2420 DD	3000 DD	3580 DD	4160 DD
Host Plant	Willow/oleanders Stems	Walnut Stems	Pummelo grapefruit	Pummelo grapefruit susceptible oranges	Pummelo grapefruit susceptible oranges	Oranges	Oranges	Oranges
Tulare	April 7	May 26	June 29	July 20	Aug 11			

Citricola Scale

In July and August, citricola scale females have died off and all that remains are the tiny 1st instar nymphs on the undersides of citrus leaves. The summer heat kills many of them (brown and dried), but many will survive (yellow and translucent).

Lorsban is the most commonly used insecticide for citricola scale control. Because organophosphates have been used for many many years, we suspect that resistance to chlorpyrifos has developed. To determine how many locations are affected by a resistance problem, we have been collecting citricola scale leaves from many different orchards, treating them with 178 ppm Lorsban and then checking to see if the scales live or die. The figure below shows the response of scales during 2006–2009 collections. We are finding that about 41% of the populations have more than 20% survival of this concentration of Lorsban (see figure below). We still have more research to do, but we think that what growers see with these resistant populations is a shorter length of residual control with the chemical. That is, instead of a Lorsban application suppressing a scale population for 3–5 years, they only achieve control for 1–2 years.



The citricola scale on the left is dead, the one on the right is alive and the one in the middle is unhealthy.

Alternatives to chlorpyrifos?

Yes there are. Assail and Applaud work well to reduce citricola scale densities. They tend to reduce citricola scale for 1–2 years and work better on low populations. Thus, monitoring should be conducted every year and treatments applied at the threshold of 0.5 nymphs per leaf to stay on top of the populations. Admire can also have a suppressive effect, although it only lasts one season. Oil is the only insecticide available for organic growers, and often multiple applications are needed every year to keep citricola densities under control.



See this UC IPM web site for sampling and treatment details:

www.ipm.ucdavis.edu/PMG/r107301511.html

Citrus Leafminer

Citrus leafminer has been gradually increasing in numbers in the San Joaquin Valley during 2007–2009 (see below that each year at Lindcove, the total numbers of moths per month have increased). It was especially obvious this May and June when we had cooler than normal weather and prolonged flush. When the leaves harden off in citrus orchards, then it is difficult for citrus leafminer eggs to hatch and develop into larvae. At this time of year, avoid practices that would produce a flush and give leafminer a chance to grow. Leaf damage is only a concern in nurseries, newly planted citrus and coastal lemons with multiple crops.

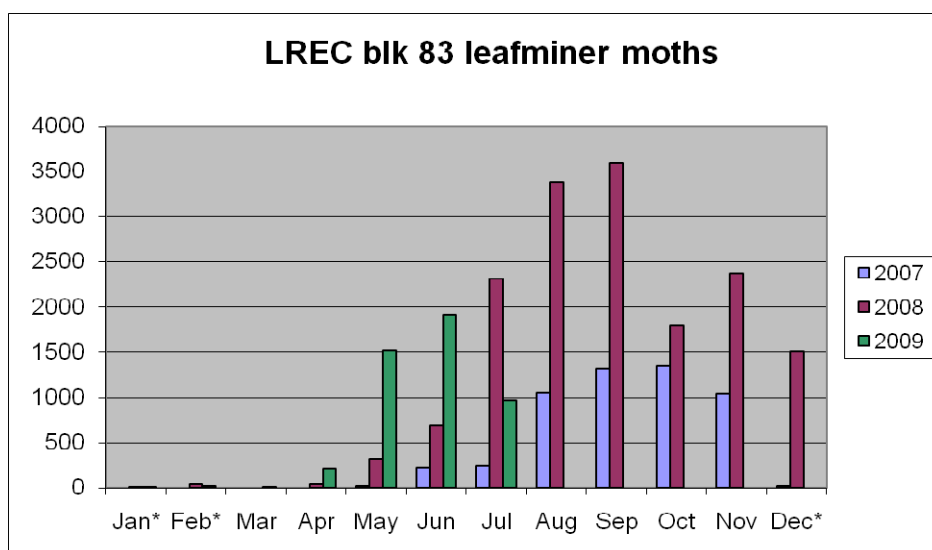
The citrus leafminer pheromone is very effective in catching moths, as you can see by the figure below. We are studying it in greenhouses and field trials to see if we can use it to prevent moths from finding each other and mating and so reduce their numbers. We are also screening a wide variety of new insecticides and there are several that are very effective. Lisa Forster in Bob Luck's lab at UC Riverside continues to send us *Cirrospilus* parasites for release in peelminer orchards – which should also help to reduce leafminer populations.



Leafminer larva mining a leaf



Leafminer moths on a pheromone trap



The Citrus IPM Newsletter is published by the University of California Citrus Entomology Laboratory at the Kearney Agricultural Research Center.

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