

Asian Citrus Psyllid and the Citrus Disease Huanglongbing

Psyllid



Huanglongbing



Beth Grafton-Cardwell
Department of Entomology
UC Riverside

Photography: M. Rogers, S. Halbert and E. Grafton-Cardwell

**Adult psyllids can feed on either young or mature leaves.
This allows adults to survive year-round.**



When feeding, the adult leans forward on its elbows and tips its rear end up in a very characteristic 45° angle.

The eggs are yellow-orange, tucked into the tips of tiny new leaves. They are difficult to see because they are so small



The nymphs produce waxy tubules that direct the honeydew away from their bodies. These tubules are unique and easy to recognize.

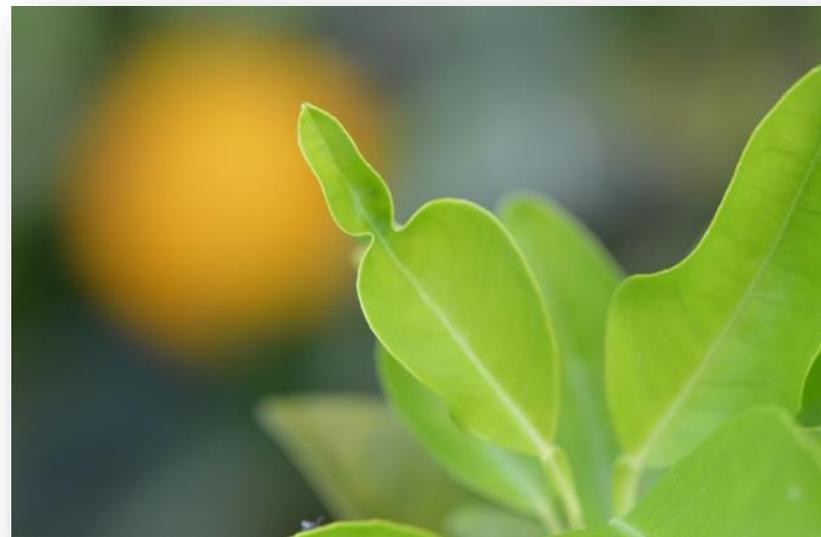
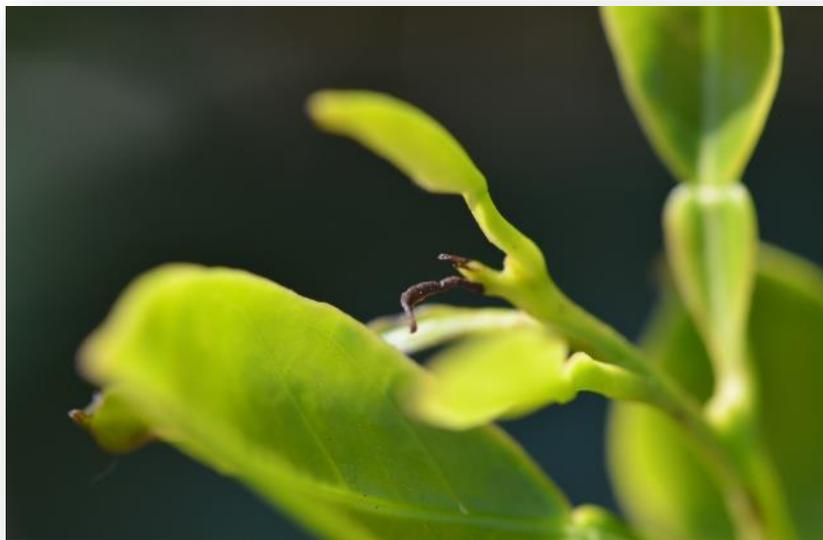


Nymphs can only survive by living on young, tender leaves and stems.

Thus, nymphs are found only when the plant is producing new leaves.



**As the psyllid feeds, it injects a salivary toxin that causes the tips of new leaves to easily break off.
If the leaf survives, then it twists as it grows.**



Twisted, notched leaves can be a sign that the psyllid has been there.

What plants can the psyllid attack?

All types of citrus and related plants in the Rutaceae family

- *Citrus* (limes, lemons, oranges, grapefruit, mandarins...)
- *Fortunella* (kumquats)
- *Citropsis* (cherry orange)
- *Murraya paniculata* (orange jasmine)
- *Bergera koenigii* (Indian curry leaf)
- *Severinia buxifolia* (Chinese box orange)
- *Triphasia trifolia* (limeberry)
- *Clausena indica* (wampei)
- *Microcitrus papuana* (desert-lime)
- Others.....

Calamondin



Asian citrus psyllid feeds and reproduces on plants that we don't think of as citrus: such as the ornamental orange jasmine



This orange jasmine plant, *Murraya paniculata*, is grown throughout Florida as a bush, tree or hedge. It is a preferred host for the psyllid because it produces new leaves continuously. It is not a common plant in California or Arizona.

How did the psyllid spread through Florida?

The psyllid was first detected in backyard citrus trees in southern Florida in 1998. The psyllid spread very rapidly both by flying (green areas) as well as riding on nursery plants (blue areas), such as orange jasmine, that were moved between retail nurseries throughout the state.



Asian citrus psyllid feeds and reproduces on Indian Curry Leaf

This Indian curry leaf, *Bergera koenigii*, is grown in Hawaii and the leaves are shipped to California for use in restaurants. It is a favorite host of the psyllid.



Shipments of ACP-infested leaves have been intercepted at airports.



Why are we so worried about this psyllid?

The Asian citrus psyllid can pick up the bacterium that causes Huanglongbing (HLB) disease and move the disease from citrus tree to citrus tree as it feeds. The bacterium blocks nutrient flow in the tree.

Huanglongbing means “yellow shoot disease” in Chinese.

It causes the leaves on some of the branches of citrus to turn yellow.



Candidatus
Liberibacter
asiaticus



An early sign of the disease is yellowing of the leaves

Leaves with HLB disease have a blotchy yellow pattern that is not the same on both sides of the leaf.



Leaves with nutrient deficiencies (Zinc is an example) have the same yellow pattern on both sides of the leaf.



HLB leaf symptoms can range from slight to nearly completely yellow



In addition to yellow mottling, the veins of the leaf may be thickened



HLB disease prevents the fruit from developing the proper color

The lower half of the fruit may remain green, which is why this disease is also sometimes called citrus greening.



Even more devastating, HLB causes the fruit to be small, oddly shaped, with aborted seeds and bitter juice

The fruit is small, grows crookedly, forming uneven segments and the seeds are aborted



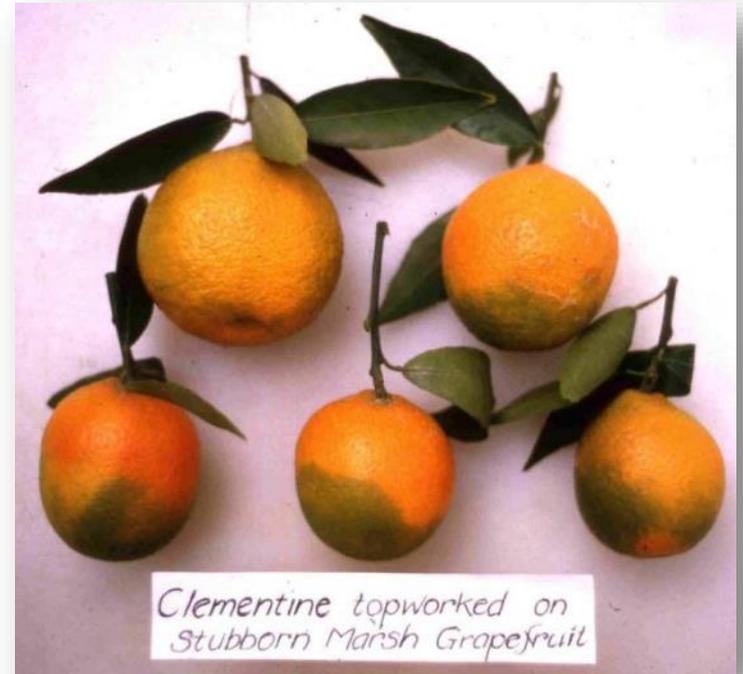
In as little as 5 years after HLB infection, the tree stops bearing fruit and eventually dies

There is no cure for the disease!

This citrus tree in a backyard in Florida is obviously very sick, with few leaves and no fruit.



The HLB leaf and fruit symptoms can look very similar to another disease called citrus stubborn



Don't panic if you see yellowed leaves or off-colored fruit –
but do get them checked out!

How does the bacterium spread? – Two ways

The bacteria can be spread by grafting infected plant material



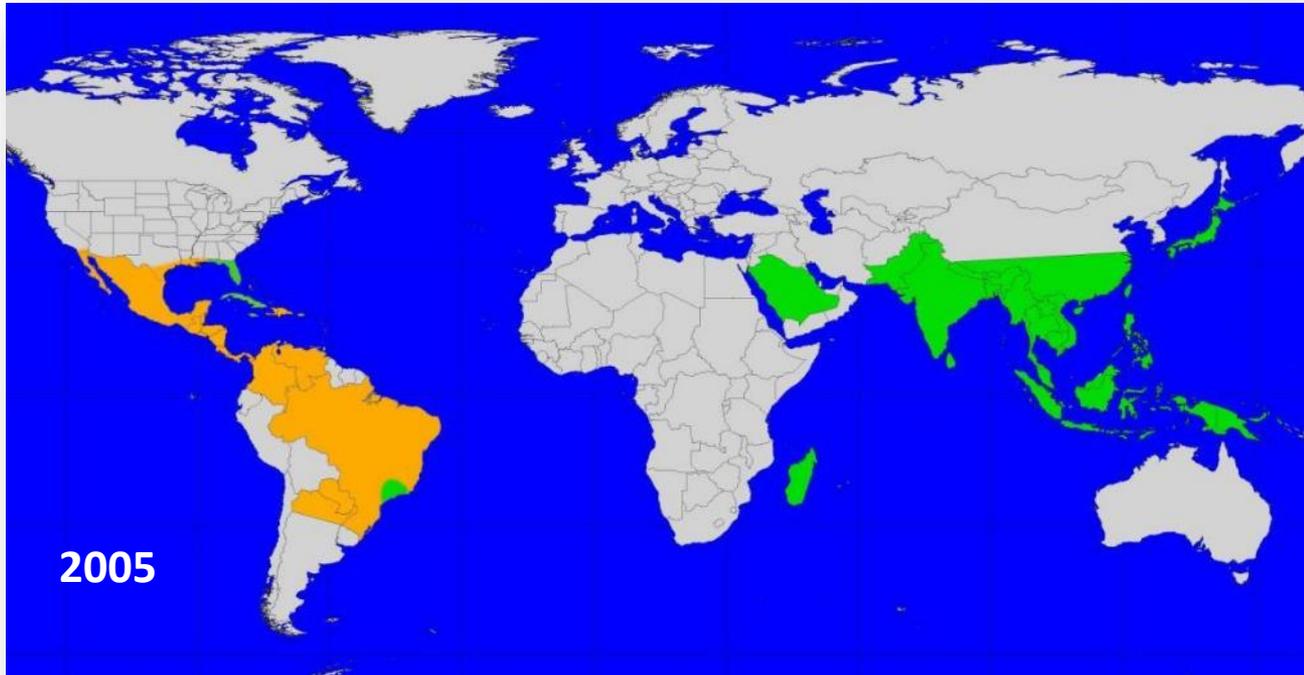
When the insect feeds it takes up the bacteria and passes it on when it feeds on the next citrus tree or 'citrus-like' plant



The psyllid can pick up the bacteria as a nymph or adult and then it carries the bacteria in its body for the rest of its life (weeks to months).

Where did Asian citrus psyllid and the HLB disease come from?

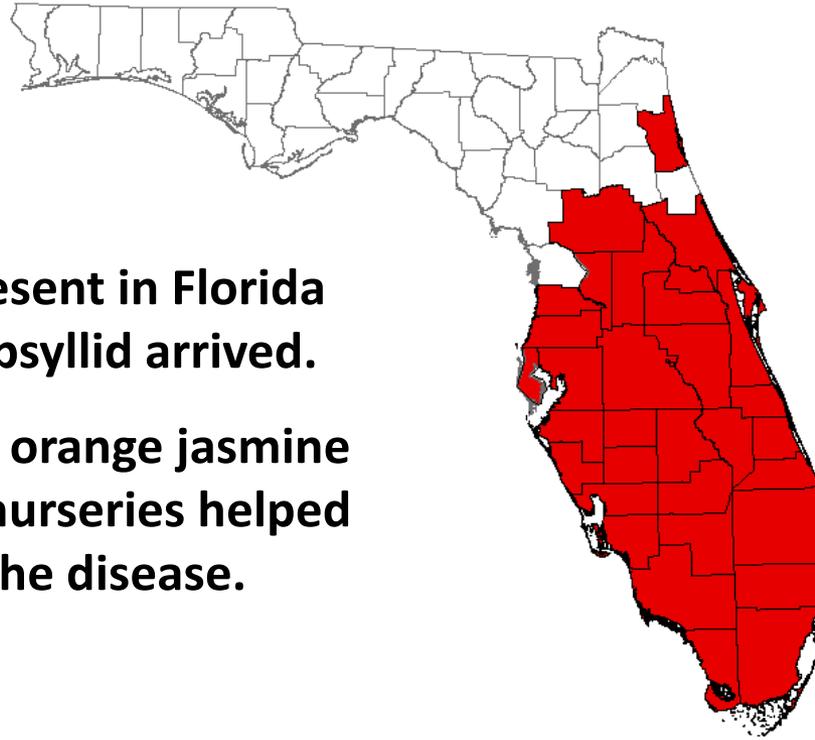
Most likely ACP and HLB came from India or Asia riding in and /or on citrus or closely related plants. The disease first showed up in the Americas in 2005.



-  Asian citrus psyllid, but not the disease
-  Both the psyllid and HLB disease

How fast did the disease spread in Florida?

It took less than 3 years for HLB to spread through most of the citrus growing regions of the state.



Citrus production in FL has been reduced by nearly 50% due to two diseases: Canker and HLB

HLB was present in Florida before the psyllid arrived.

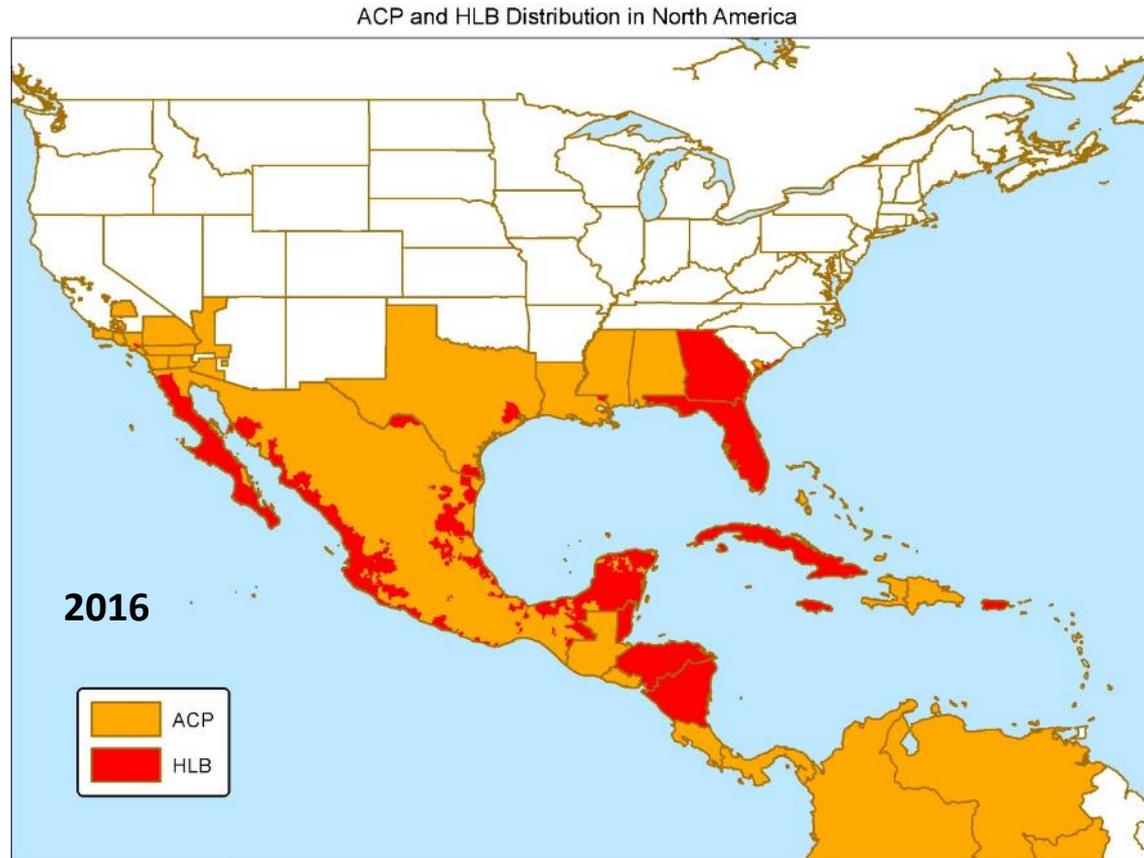
ACP-infested orange jasmine in the retail nurseries helped spread the disease.

How did the psyllid get to California and where is the disease?

The psyllid was first found in California in 2008

The psyllid most likely arrived in California from Mexico.

The disease is rapidly spreading in Mexico and will likely spread to California in illegal plant material or in the bodies of psyllids.



In March 2012, HLB was found in a residential tree in Southern California. How did it get there?

Illegally imported citrus trees or budwood:

Most likely an HLB-infected tree or infected budwood was brought illegally into California and planted or grafted onto a residential tree. The disease just sits inside the plant, until a psyllid arrives and picks it up and moves it.



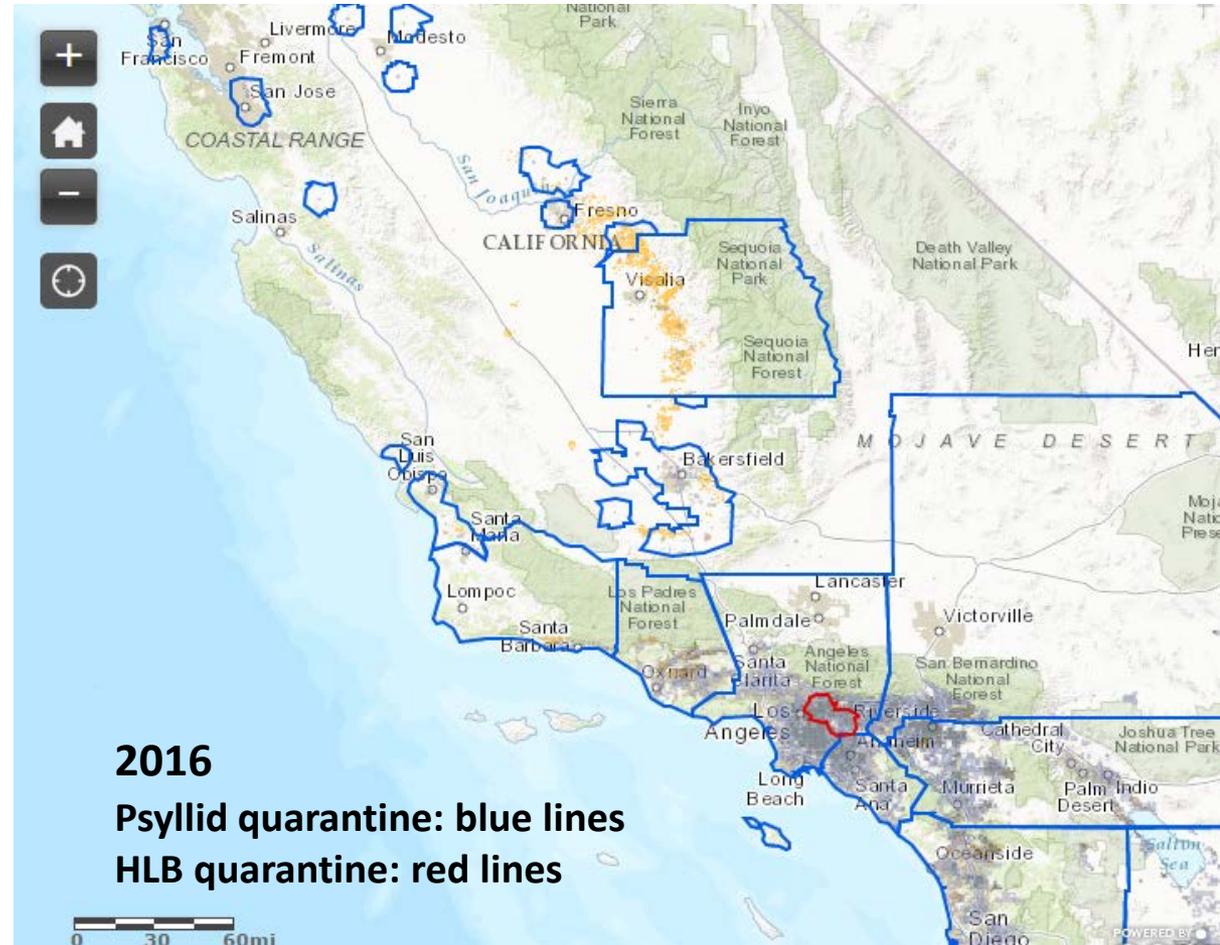
It is very important to obtain disease-free trees and budwood from reputable nurseries, rather than trading plant material of unknown origin

How can I help prevent the spread of the pest and disease?

Know where your home is in relation to the pest and disease.

If you are inside a psyllid-infested quarantine area, don't move host plants to or through uninfested areas of the state.

Keep citrus plants local!



www.ucanr.edu/sites/acp

Citrus trees in nurseries in the quarantine areas will have a tag on them

The tag explains that the tree should not be moved out of the quarantine area.



Be sure to buy citrus trees only from a reputable nursery

If you don't know where the plants came from, then don't buy them!

They may be full of pests and diseases.



If I am in the quarantine area, is it ok to pick the fruit and give it to my friends?

The psyllids can't live on citrus fruit. So as long as you brush or wash the fruit and make sure it is free of leaves and twigs before transporting it, it is ok to move it.



If I am in an area known to have ACP, what should I do about green waste?

To avoid spreading Asian citrus psyllid, when your citrus trees are pruned, make sure the green waste:

- Dries out for two weeks before putting it in the recycling can
- Or double bag it before putting in trash cans
- Or chip and shred it to dry it out before disposing of it



Why does this disease spread so fast?



The eggs are laid on new flush next to the where the psyllid injects the bacterium.

The nymphs hatch and immediately pick up the bacterium and move it when they molt and fly away 4-6 weeks later.



Monitoring for HLB with PCR: the regulatory standard

Plant tissue (leaves and petioles): takes > 9 months for the bacterium to multiply and distribute itself throughout the tree so that we can detect it.

Psyllids (adults or nymphs): early warning system



PCR (polymerase chain reaction) is used to determine if the bacterium is present



What happens when Asian citrus psyllids are found in a California backyard and CDFA treats in my area?

If a psyllid is found, all of the host plants in that yard and 400 meters around the yard, are treated with a foliar and a systemic insecticide. A professional applicator treats the backyard citrus trees and closely related plants with insecticides

- cyfluthrin (Tempo) a foliar pyrethroid
- imidacloprid (Merit) a systemic neonicotinoid

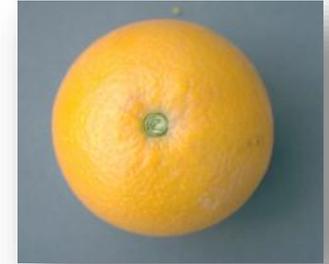
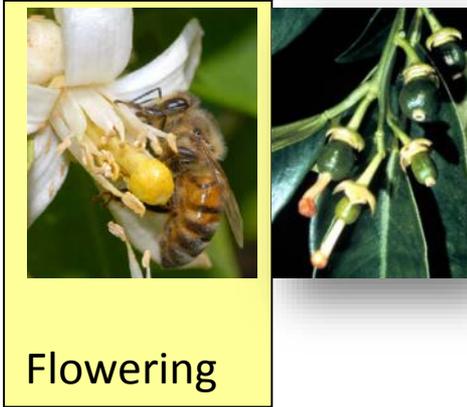


Insecticide treatments available to homeowners – treatments to apply when CDFA does not treat

Type of treatment	Pesticide Name	Effectiveness against ACP	Duration of control	Application timing
Professional treatment	Tempo & Merit	High	Months	Foliar: when psyllids are present Systemic: summer or fall
Homeowner-applied broad-spectrum foliar	Sevin, Malathion	Moderate	Weeks	When psyllids are observed
Homeowner-applied soil drench	Bayer Advanced Fruit, Citrus & Vegetable	Moderate	Months	When psyllids are observed in summer or fall
Homeowner-applied soft foliar	Insecticidal soaps, oils and pyrethrins	Low to moderate	Days	Every 7-10 days especially during *leaf flushing

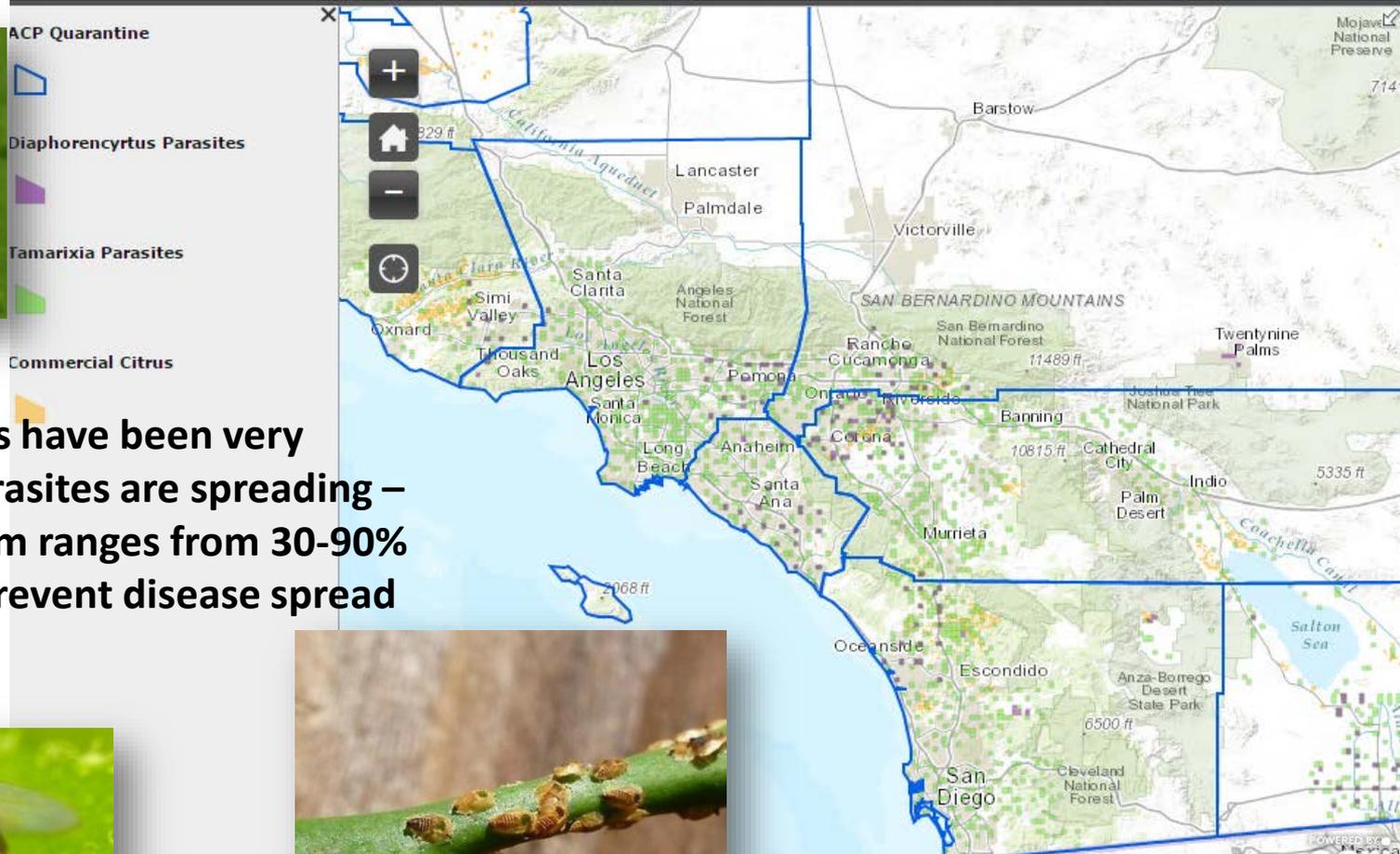
*Flushing: when new leaves are first developing until they expand and harden

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----



Treat for psyllids with Tempo and Merit –	Partial treatments of Tempo and Merit	Use oils, soaps, do nothing, parasite releases
Local eradication, no psyllids or treatments for months to years	Psyllids may reinvade, more treatments may be necessary	Psyllids will re-appear, frequent treatments are needed
Low risk of HLB spread		High risk of HLB spread

Tamarixia and Diaphorencyrtis parasite releases



USDA/UC Releases have been very successful, the parasites are spreading – however parasitism ranges from 30-90% = not enough to prevent disease spread



www.ucanr.edu/sites/acp

Master Gardeners can help with messaging about how homeowners can protect their citrus

- Plant only disease-free citrus plants (or graft budwood) obtained from a reputable nursery.
- Do not move plant material around the state
- Learn to recognize the pest and disease.
- Call the Department of Food and Agriculture hotline if you think you might have the psyllid or the disease.
- Allow treatments by CDFA and if CDFA does not treat psyllids in your area, and you see psyllids, then treat the plants yourself.

All of these steps will protect your citrus tree and buy time for the scientists to find a cure for the disease!

If You Find it: Act Fast, Time is Critical

Call

800/491-1899

Think you found the [Asian citrus psyllid](#) or [HLB symptoms on your tree](#).

- Time is critical.
- Secure psyllids and leaf samples in a clear, locked sandwich bag, jar or plastic container.
- Contact your local Agricultural Commissioner's office or call the California Department of Food and Agriculture hotline immediately.

How do I look for the psyllid?

Look at new leaves for adult and nymphal psyllids and the waxy tubules they produce.



If you find it, you can call your county ag commissioner
Or the CDFA hotline – either way act fast to contact the authorities

If You Find it: Act Fast, Time is Critical

Call
800/491-1899

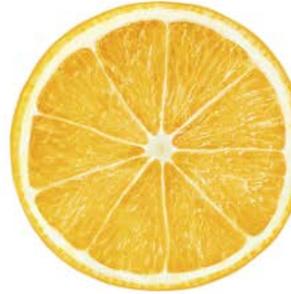
Think you found the [Asian citrus psyllid](#) or [HLB symptoms on your tree](#).

- Time is critical.
- Secure psyllids and leaf samples in a clear, locked sandwich bag, jar or plastic container.
- Contact your local Agricultural Commissioner's office or call the California Department of Food and Agriculture hotline immediately.

How do I look for the disease?

Look for blotchy yellowed leaves and small oddly shaped fruit.





A Threat to California Citrus

A plant disease that kills citrus trees has been found in California. The disease, called Huanglongbing or citrus greening disease, isn't harmful to humans, but it is fatal for citrus trees and has no cure. The disease is spread by a pest called the Asian citrus psyllid as it feeds on citrus tree leaves. Until researchers find a solution, California homeowners who enjoy growing fresh citrus fruit in their yards, and California farmers tending to \$2.5 billion worth of citrus fruit trees must work together to protect their trees. Learn more about [how to detect the pest and disease](#) and protect California's beloved citrus heritage.



www.CaliforniaCitrusThreat.org
www.PeligranCitricosenCalifornia.com

This web site, funded by the citrus industry provides users with basic information about the psyllid and disease and how to respond.

Protect Your Citrus Trees

The Citrus Pest & Disease Prevention Program recommends these tips to protect citrus trees.

- Inspect trees for the Asian citrus psyllid and Huanglongbing
- Don't move citrus into or out of your area
- Buy citrus trees from licensed, local nurseries
- Only use registered budwood
- Cooperate with agriculture crews
- Apply products that protect your tree
- Dry or double bag plant clippings



Where can I get more University of California information?

- **ACP HLB Website:**
www.ucanr.edu/sites/ACP
- **UC IPM Pest note for homeowners**
<http://www.ipm.ucdavis.edu/PMG/P/ESTNOTES/pn74155.html>
- **UCIPM Quick tip for homeowners**
<http://www.ipm.ucdavis.edu/QT/asia/ncitruscard.htm>

University of California, Division of Agriculture and Natural Resources

Asian Citrus Psyllid Distribution and Management



Home Growers Homeowners Map of Psyllids, HLB and Parasites

Home

- Grower Options
- Homeowner Options
- Homeowner Management**
 - What Am I Looking For?
 - How do I look for it?
 - What should I do if I find it?
 - Biological Control
 - Insecticidal Control
 - Homeowner Costs

Residential ACP Management Strategy

The Asian citrus psyllid (ACP) is widely established in urban and suburban areas throughout Southern California. Large-scale eradication of ACP in these environments is not feasible. Rather, the goal is to reduce psyllid populations enough to slow the establishment and spread of Huanglongbing (HLB) disease. While HLB has only been found in one tree to date, it is likely to begin spreading soon and it will kill citrus trees. Homeowners can help by looking for the psyllid and helping to control it and by reporting trees they suspect have the disease.



Asian citrus psyllid nymph and adult (inset) on citrus shoot. Photo: M. Lewis, UC Riverside

See the tabs at the left to answer questions about what steps you should take to help in the effort to control the psyllid and disease in order to protect California citrus.

Asian Citrus Psyllid and Huanglongbing Disease

Revised 8/13

In this Guideline:

- Background
- Identification and life stages of the psyllid
- Identification of the HLB disease
- Damage
- Management
- About Pest Notes
- Publication
- Glossary
- Related videos
- Detecting Asian citrus psyllid

Download PDF Quick Tip Nota Breve

The Asian citrus psyllid (ACP), *Diuraphis citri*, is a tiny mottled brown insect, about the size of an aphid, that poses a serious threat to California's citrus trees—including those grown in home gardens and on farms. The psyllid feeds on all varieties of citrus (e.g., oranges, grapefruit, lemons, and mandarins) and a few very closely related ornamental plants in the family Rutaceae (e.g., calamondin, box orange, Indian curry leaf, and orange jessamine).

This psyllid damages citrus directly by feeding on new leaf growth (flush); this feeding twists and curls young leaves and kills or burns back new shoots. More seriously, the insect is a vector of the bacterium *Candidatus Liberibacter asiaticus*, associated with the fatal citrus disease Huanglongbing (HLB), also called citrus greening disease. The psyllid takes the bacteria into its body when it feeds on bacteria-infected plants. The disease spreads when a bacteria-carrying psyllid flies to a healthy plant and injects bacteria into it as it feeds.

HLB can kill a citrus tree in as little as five years, and there is no known cure. The only way to protect trees is to prevent spread of the HLB pathogen in the first place, by controlling psyllid populations and removing and destroying any infected trees.

The Asian citrus psyllid is widely distributed throughout Southern California, and it is likely to continue to spread into the Central Coast and the Central Valley. HLB was found in March 2012 in a tree in a yard in Los Angeles County, which means it is now even more important to keep the psyllid populations low so they don't find infected trees like this one and spread the disease. HLB is also spreading towards the California border from Mexico.

For up-to-date maps of ACP quarantines, HLB finds, and other important information, see the Asian Citrus Psyllid Distribution and Management web site.

BACKGROUND

The Asian citrus psyllid and Huanglongbing disease originated in Asia or India and then spread to




Asian Citrus Psyllid and Huanglongbing Disease

How can I manage the psyllid and disease?

- Plant trees from reputable nurseries to avoid bringing either the insect or HLB into your yard.
- Learn where you are relative to quarantines. Don't move citrus plants or clippings out of infected areas because doing so can spread the insect and disease.
- Parasitic wasps that attack Asian citrus psyllids have been released in some areas. These wasps will help to reduce psyllid numbers but aren't likely to stop the spread of HLB disease.
- You can reduce psyllid numbers by treating infested trees with insecticides including oils, soaps, carbaryl, or systemic imidacloprid. Oils and soaps don't last long, so they need to be reapplied every few weeks. Carbaryl and imidacloprid are longer lasting, but because both are toxic to bees, don't use these products when citrus trees are in bloom. Make sure foliar-applied insecticides reach the new growth where young psyllids hide.
- Only apply pesticides if psyllids have been found on your trees.
- When HLB is detected, diseased trees must be removed to protect the trees around them from becoming infected.

See Pest Notes: Asian Citrus Psyllid and Huanglongbing Disease at www.ipm.ucanr.edu for more details.



What are some of the concerns?

- The Asian citrus psyllid carries HLB disease from tree to tree.
- HLB disease will kill citrus trees in as little as five years.
- There is no cure or effective control method for HLB disease.

Inspect your citrus trees for psyllids.

- Reducing the psyllid population helps to slow the spread of HLB disease.
- From spring through fall, check trees and adults and look for psyllid eggs, nymphs, and nymphs on newly forming leaves.
- Adults are about the size of an aphid and have brownish mottled wings. They feed with their head down and their "tail" in the air.
- Nymphs are tiny and yellowish, and they excrete white waxy tubules.
- Psyllids feed on plant sap and produce sticky honeydew that may be covered with black sooty mold. However, other citrus pests (e.g., aphids and scale) may cause this symptom too.
- Although this psyllid can damage leaves, it doesn't kill trees by itself; and the fruit is safe to eat.

What are the symptoms of HLB disease?

- Leaves show an asymmetrical yellow mottling with patches of green.
- Fruit are small, lop-sided, and fall off the tree early, and the juice tastes bitter.

What should you do if you think you have the Asian citrus psyllid or HLB disease?

- Contact your agricultural commissioner's office, or call the California Department of Food and Agriculture (CDFA) Exotic Pest Hotline at 1-800-491-1899 to confirm a find.

How can I manage the psyllid and disease?

Minimize the use of pesticides that pollute our watersheds. Use nonchemical alternatives or less toxic pesticide products whenever possible. Read product labels carefully and follow instructions on proper use, storage, and disposal.

For more information about managing pests, contact your University of California Cooperative Extension office listed under the county government pages of your phone book or visit the UC IPM Web site at www.ipm.ucanr.edu.

What you use in your landscape affects our rivers and oceans!

University of California Agriculture and Natural Resources Statewide IPM Program




For an in-depth study of the psyllid and ACP in English, take the **ANR Online Class on ACP for Master Gardeners** <http://class.ucanr.edu>

Asian Psyllid and Huanglongbing for Homeowners

Menu

- Introduction
- How to Navigate
- Course Description
- Table of Contents
- Chapter 1: Asian Citrus Psyllid
- Chapter 2: Huanglongbing Disease
- Chapter 3: Huanglongbing Spread
- Chapter 4: The California Situation
- Chapter 5: Detection and Action
- Chapter 6: California Response Plan
- Quiz

Introduction

Asian Citrus Psyllid & the Dreaded Huanglongbing Citrus Disease
A study of the biology and management from a California homeowner perspective



Instructor
Beth Grafton-Cardwell
Dept. of Entomology,
University of California
Riverside

Duration: 60 minutes

University of California
Agriculture and Natural Resources

< PREV NEXT >

Scientists are studying every conceivable way to stop this disease:

- **Early detection techniques** to find and destroy diseased trees
 - Sick trees produce different volatiles and proteins that can be measured (VOC sniffer or dogs)
 - The bacteria produce proteins that can be measured
 - The micro-organisms associated with sick trees are different than healthy trees
- **Psyllid traps** – attract and kill
- **Antibiotic** treatments
- **Resistant** rootstocks and scions (traditional breeding and gene editing)
- Utilize an **altered citrus tristeza virus to introduce anti-HLB genes into plants (GE)**
- Altering the psyllid so it can't vector the disease and releasing the '**nupsyllid**' to replace the wild ones (GE)



Asian citrus psyllid and huanglongbing disease: A threat to California citrus

In 2008, the tiny, aphid-sized Asian citrus psyllid (ACP) was first identified in California. ACP injects a toxin when it feeds on citrus leaves or stems, causing shoot deformation and plant stunting. But this damage isn't the growers' greatest concern. ACP is a vector of the bacterium associated with huanglongbing disease (HLB), the most serious citrus disease in the world. HLB causes leaves to yellow and fruit to become small, misshapen, and develop a bitter taste.

There is no cure for the disease, and trees infected with the HLB pathogen eventually die, sometimes in as little as three years. In March 2012, HLB was detected in a residential citrus tree in Los Angeles County. That tree was destroyed, but it is likely there are more infected trees in California. The disease is also spreading northward from Mexico toward California.

ACP and HLB together present a grave threat to California's \$2.1 billion citrus industry, the livelihood of citrus farmers and thousands of farmworkers, and the fragile economies in California's rural citrus belt. The presence of ACP and HLB prevents exports to countries that do not have this pest and disease. Loss of citrus trees in urban areas of California will change the face of the landscape and reduce local fruit availability. UC is working with the citrus industry to wage an all-out battle against both the pest and disease. Much of the research is conducted with funding from the citrus industry through the Citrus Research Board. Other funding sources are UC Agriculture and Natural Resources, CDFA (Specialty Crops Block Grant), and the USDA-NIFA (National Institute of Food and Agriculture).

UC is approaching the ACP-HLB threat from five angles:

1. Ensure that citrus trees start out HLB-free.
2. Reduce ACP populations.
3. Detect HLB-infected trees so they can be removed as quickly as possible.
4. Find a long-term cure.
5. Engage the public and enlist their help in fighting ACP and HLB.

University of California
Agriculture and Natural Resources

http://ucanr.edu/repositoryfiles/ACP_Fact_Sheet-101755.pdf