



# Invasive Shot-Hole Borers + Fusarium Dieback A Devastating Threat to California Trees



Willows in a San Diego creek devastated by ISHB.



ISHB galleries in castor bean wood.

Two exotic, invasive beetles are causing increasingly extensive damage to Southern California's urban trees, native and riparian forests, and avocado groves. Thousands of severely affected trees have died or been removed in both natural and landscaped areas.

## The Beetles

### Invasive Shot-Hole Borers (ISHB)

ISHB refers to the Polyphagous Shot-Hole Borer and Kuroshio Shot-Hole Borer, two closely related, physically identical beetles. How they arrived in California is uncertain, but scientists believe they most likely originated in Southeast Asia. ISHB was first discovered in Los Angeles in 2012 and has now spread to Orange, San Diego, Riverside, San Bernardino, Ventura, Santa Barbara, and San Luis Obispo Counties.

## The Disease

### Fusarium Dieback

Both beetles carry a type of Fusarium fungus that causes disease in susceptible trees.

## Damage

The beetles tunnel into trees to lay their eggs and introduce the fungus that causes Fusarium Dieback. The disease disrupts the flow of water and nutrients that the tree needs to survive, while the beetles' tunneling activity also weakens the tree's trunk and branches. After repeated attacks, the beetle/disease complex can cause branch dieback and tree mortality.

## Trees at Risk

The beetles attack landscape, agricultural, riparian, and native trees. Common trees like sycamore, cottonwood, willow, valley and Engelmann oak, avocado, white alder, and box elder appear to be especially susceptible. See the list of reproductive host trees (trees that support beetle reproduction and are susceptible to the disease) at [www.pshb.org](http://www.pshb.org).

## Impact

ISHB are attacking dozens of tree species found throughout Southern California, many of which are native to the region and common on private properties; municipal, county, state, and federal public lands; and tribal lands.

Tree decline and death can result in:

- Public safety hazards due to falling limbs, increased fire danger, and increased flood risk due to blockages of water ways
- Decreased property value
- Increased air and noise pollution
- Habitat loss for endangered birds and other wildlife
- Loss of ecosystem services, including cooling, water filtration, and carbon sequestration

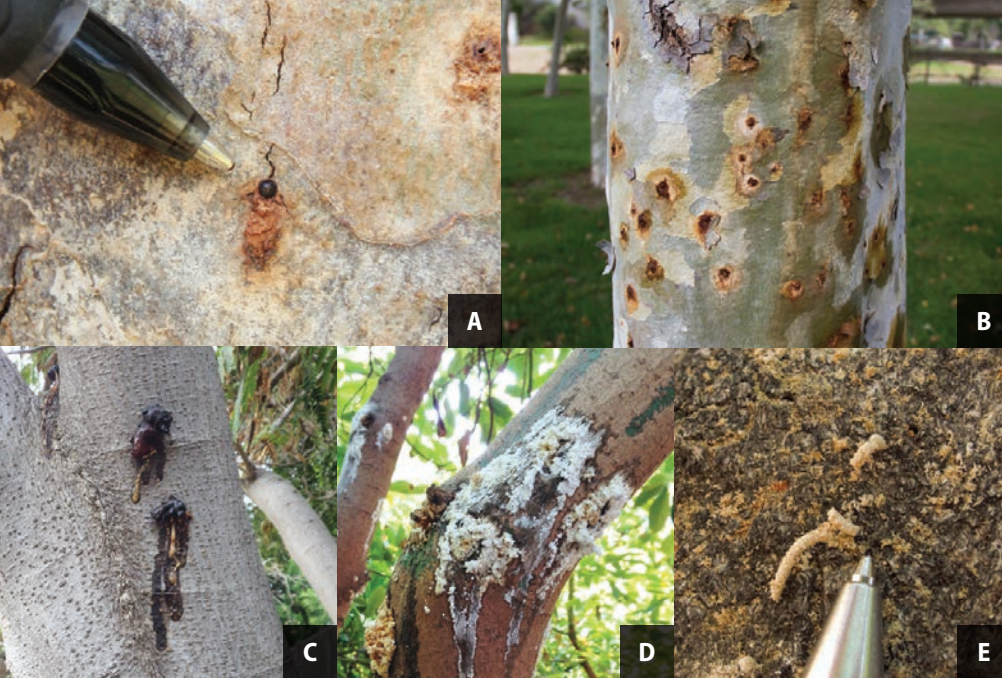


ISHB galleries in a box elder branch.



ISHB attacks on Mexican sycamore.

Authors: Monica Dimson<sup>1</sup>; John Kabashima, Ph.D.<sup>1</sup>; Akif Eskalen, Ph.D.<sup>2</sup>; Janis Gonzales<sup>1</sup> (<sup>1</sup>UC Cooperative Extension, <sup>2</sup>UC Riverside) All images provided by these authors.



## How You Can Help

Join local, state, and federal efforts to contain this damaging pest. Non-native insects and diseases that can kill large numbers of trees are often transported long distances by firewood or branches that have been trimmed from infested trees. Once they arrive in a new location, they can infest and kill other trees. Below are a few ways that you can help to contain this pest:

### Don't Move Firewood

Please use locally sourced firewood to help slow the spread of non-native pests like the invasive shot-hole borers.

- Buy firewood where you will burn it
- Purchase and use wood from local sources for both home heating and outdoor recreation
- Leave wood at home when visiting a park or taking a camping, hunting, or RV trip
- Buy only what you need and always burn responsibly

### Take Care of Green Waste

The beetles can survive in cut wood for weeks or even months. Dispose of infested wood properly to avoid spreading the beetle to other areas (see [www.pshb.org](http://www.pshb.org) for more details):

- Chip infested wood whenever possible
- Chips and logs should either be: composted, solarized, kiln-dried, used as landfill Alternative Daily Cover, or burned at a biogeneration facility
- Chips that are not solarized, composted, or kiln-dried may **only** be used as mulch in ISHB heavily infested areas
- Wrap or cover infested wood during transport
- Disinfect tools and equipment after trimming infested trees

## What to Look For

Look for these signs of attack:

1. **Entry-holes to the beetle galleries.** Perfectly round and less than 1 mm wide (use the tip of a ball-point pen for scale) (A, on California sycamore).
2. **Tree symptoms.** Dark, wet staining (B, on sycamore); thick gumming (C, on silk tree); white, powdery exudate (D, on avocado); and/or frass (resembles fine sawdust) (E, on black mission fig). Symptoms are unique to each tree species. See more photos and descriptions of beetle attacks at [www.pshb.org](http://www.pshb.org).
3. **Dieback.** Dead branches with wilting leaves may be a sign of severe infection by the Fusarium Dieback disease.

## What's Being Done?

Researchers are actively looking for solutions to control this new beetle/disease complex. Experiments by UC Riverside are investigating pesticide efficacy, detection methods, and natural predators or parasites (biocontrol). While there is no known method that offers complete control at this time, multiple surveys are being conducted to monitor the infestation. UC has also collaborated with various agencies and stakeholders to increase awareness and outreach and to identify research funding needs.

## Stay Informed

Subscribe to our email list to receive announcements on the latest ISHB news and information.

[www.pshb.org](http://www.pshb.org)

[www.eskalenlab.ucr.edu](http://www.eskalenlab.ucr.edu)

### Authors

Monica Dimson<sup>1</sup>; John Kabashima, Ph.D.<sup>1</sup>; Akif Eskalen, Ph.D.<sup>2</sup>; Janis Gonzales<sup>1</sup>

<sup>1</sup>UC Cooperative Extension, <sup>2</sup>UC Riverside

All images provided by these authors.



Monitoring trap used to detect ISHB.



Box elder logs full of ISHB tunnels and beetles.