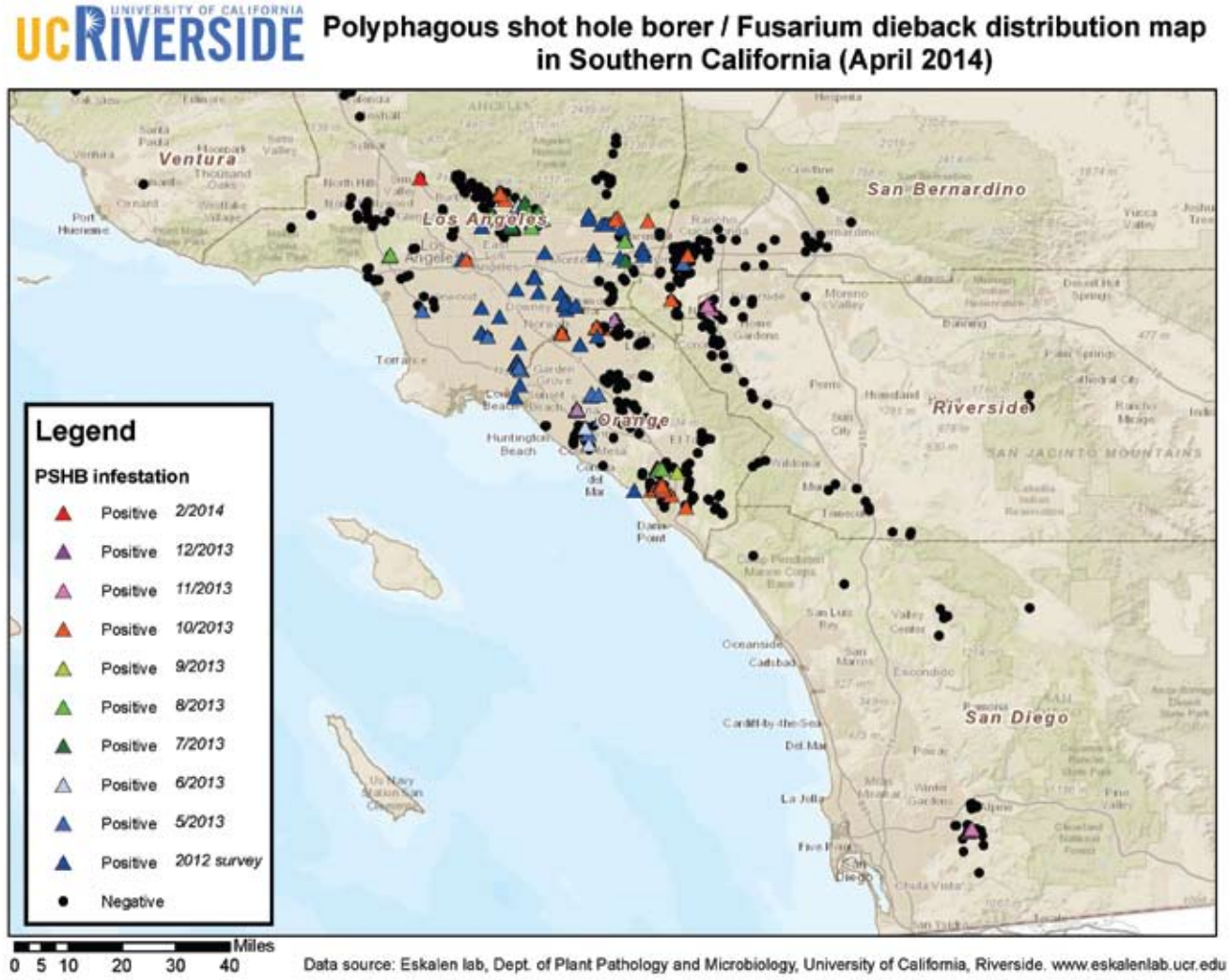

Polyphagous Shot Hole Borer and Fusarium Dieback Update

By Tim Spann
Research Project Manager

In the last issue of *From the Grove* a polyphagous shot hole borer (PSHB) find in a southern Orange County avocado grove was reported. Further testing of samples from the attacked tree did not detect the Fusarium fungus associated with PSHB, indicating that this was not a PSHB find. Most likely the tree was attacked by one of a number of bark beetles present in California, which feed on dead and dying trees.

This false positive only helps to reinforce how important it is for growers to monitor for any signs of this pest and contact your pest control advisor (PCA) or Dr. Akif Eskalen's lab for confirmation and not to rely solely on visual symptoms. To date, the only known commercial grove affected by PSHB remains the small organic grove in the Azusa area.

Also in the last issue we had just learned about a suspected PSHB find in Santa Cruz County. To date no additional specimens have been found in that area and the one specimen that was found has only been identified based on physical characteristics. Until additional specimens are found, genetic testing cannot be conducted to definitively prove that the Santa Cruz find is PSHB and not the physically identical tea shot hole borer.

PSHB Meeting with CDFA

Staff at the California Avocado Commission (CAC) has been working for the past several months to coordinate a meeting with officials from the California Department of Food and Agriculture (CDFA) and various stakeholder groups currently or potentially affected by PSHB. The meeting was held on Tuesday, May 27, and the outcomes of it will be covered in a future issue of *From the Grove*. The goal of the meeting was to engage with the numerous other stakeholders (e.g., nurserymen and landscapers; forest service; other agricultural commodities; city, state and national parks) and establish a PSHB working group or taskforce. This working group will then be tasked with coordinating outreach and education efforts so that a unified and consistent message is put out, and to identify research priorities and find potential funding sources.

There are currently numerous issues of high importance facing California's agricultural commodities and allied industries and CAC is grateful to CDFA Secretary Karen Ross and her staff for helping us to coordinate this effort. We believe this will be a tremendous help in the fight against PSHB.

Infested Area Did Not Expand in Spring

Since the last PSHB survey map was produced in December the infested area has not expanded. The most recent distribution map from April 2014 shows that a significant area of eastern Orange County and western Riverside and San Bernardino counties have been surveyed with no new positive finds. In addition, extensive surveying around the El Cajon find, including nearby commercial groves, in San Diego County has not uncovered any spread beyond the Sycuan Golf and Tennis Resort.

Although the outer boundary of the infested area has not expanded, the beetle and pathogen continue to spread within the infested area. CAC-funded surveying is primarily focused on monitoring the boundaries of the infestation, particularly in areas near commercial avocado groves, so we do not have good data on how many new trees are being attacked within the infested area. The abundance of PSHB host species in the southern California's urban forest is likely helping to slow the expansion of the overall infested area. However, once the host species in the infested area have been exhausted there may be increased pressure on avocado groves near the infestation perimeter.

For now, the lack of spread is good news for California's avocado industry in a year already full of challenges: drought and early-season heat and winds. However, growers in Los Angeles, Orange, San Diego, Riverside and San Bernardino counties need to continue to be vigilant. CAC has worked closely with University of California (UC) Riverside researchers to update information sheets (in English and Spanish) and these can be downloaded at www.CaliforniaAvocadoGrowers.com or from Dr. Akif Eskalen's website (http://eskalenlab.ucr.edu/). Hard copies can also be obtained by contacting CAC or Akif.

As a reminder, if you suspect that PSHB may be attacking your trees please contact your PCA or Akif Eskalen (951-827-3499 or akif.eskalen@ucr.edu) immediately.

New invasive beetle/disease complex on California avocado and landscape trees: Polyphagous Shot Hole Borer (*Euwallacea* sp.) and Fusarium dieback (*Fusarium euwallaceae*)

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Status: Recently a new beetle/fungal complex was detected on avocado and other host plants in Los Angeles, Orange and San Bernardino Counties. The two fungal species are *Fusarium euwallaceae* and *Graphium* sp., which form a symbiotic relationship with a recently discovered beetle that is commonly known as the polyphagous shot hole borer (PSHB, *Euwallacea* sp.) (Fig. A). Together, they cause the disease Fusarium dieback (FD). When the beetle burrows into the tree, it inoculates the host plant with the fungus (Fig. D), which is carried in its mouthparts in a structure called mycangia. The fungus attacks the vascular tissue of the tree, blocking the transport of water and nutrients from the roots to the rest of the tree, and eventually causing branch dieback. The beetle larvae live in galleries within the tree and feed on the fungus. FD has been observed on more than 110 different plant species in California, including many species common in urban landscapes and on such agriculturally important species as avocado, olive and persimmon.

Symptoms: Each host species shows different symptoms depending on the response to infection. Sycamore, box elder, maple, red willow, and castor bean are good trees to search for signs and symptoms of the beetle, as it tends to prefer to infest these hosts first. Depending on the tree species attacked, PSHB injury can be identified either by staining, gumming, or a white-sugar exudate on the outer bark in association with a single beetle entry hole.

The beetle: An exotic ambrosia beetle (*Euwallacea* sp.) is very small and hard to see. At the advanced stage of infestation, there are often many entry/exit holes on the tree (Fig. E-F). Females are black and about 1.8 – 2.5 mm (0.07-0.1 inch) long (Fig. A-B (right)); males are brown colored and about 1.5 mm (0.05 inch) long (Fig. B ((left)). The entry/exit hole is about 0.85 mm (0.033 inch).

Known Hosts: The following is a selective list from over 110 hosts: Box elder (*Acer negundo*), castor bean (*Ricinus communis*), avocado (*Persea americana*), coast live oak (*Quercus agrifolia*), English oak (*Q. robur*), valley oak (*Q. lobata*), California sycamore (*Platanus racemosa*), big leaf maple (*Acer macrophyllum*), Japanese maple (*A. palmatum*), red willow (*Salix laevigata*), goldenrain (*Koelreuteria paniculata*), olive (*Olea europaea*), persimmon (*Diospyros sp.*), silk tree (*Albizia julibrissin*), American sweet gum (*Liquidambar styraciflua*), coral tree (*Erythrina corallodendon*), weeping willow (*Salix babylonica*), blue palo verde (*Parkinsonia florida*), palo verde (*Parkinsonia floridium*), tortuosa (*Salix matsudana*), white alder (*Alnus rhombifolia*).

What to do:
-Look for a single entry/exit hole surrounded by wet discoloration of the outer bark
-Scrape off the bark layer around the infected area to look for brown discolored necrosis caused by the fungus.
-Follow the gallery to look for the beetle (may or may not be present).
-Avoid movement of infested firewood and chipping material out of infested area.
-Look for other hosts (Castor bean, sycamore, maple, coast live oak, goldenrain, liquidambar) showing symptoms of the beetle/disease.
-Sterilize tools to prevent to spread of the disease with either 25% household bleach, Lysol® cleaning solution, or 70% ethyl alcohol.

Who to contact if you find the problem:
If you suspect that you have found this beetle or seen symptoms of the Fusarium dieback on your tree please contact either your local farm advisor, pest control advisor, county Ag Commissioner office or Dr. Akif Eskalen by either phone 951-827-3499 or email at akif.eskalen@ucr.edu . For more information visit www.eskalenlab.ucr.edu .