Polyphagus Shot Hole Borer (PSHB), Kuroshio Shot Hole Borer (KSHB) and related Fusarium Dieback

The appearance of both Polyphagous and Kuroshio Shot Hole Borers (SHB) in southern California has created a complex issue. PSHB was first detected in California in 2003 at Whittier Narrows Recreation Area in Los Angeles County and it was identified as Tea Shot Hole Borer, which has a limited number of hosts and has been established in Florida and Hawaii for a number of years where it has not been reported to cause much damage. In 2012 the beetles we have here were reported attacking backyard avocado trees, which is not something you would expect from TSHB. Scientists at UC Riverside conducted molecular analyses of the mitochondrial DNA and revealed that the beetle we have is a species that is genetically distinct from Tea Shot Hole Borer, even though it looks exactly the same. This species has been tentatively named Polyphagous Shot Hole Borer. By 2015, it had been found to attack over 348 species of trees. Additionally, it is now established in Los Angeles, Orange, Riverside, and Ventura counties. Similar beetles have been found in San Diego County and molecular analysis has revealed that this population is distinct from both TSHB and PSHB. This third species has been tentatively named Kuroshio Shot Hole Borer. KSHB has killed numerous willows in the Tijuana River basin, derogating the riparian habitat and both of these species pose an imminent threat to the critical habitat of numerous threatened and endangered species.

SHB carry several fungi in their bodies in specialized structures called mycangia. Female beetles bore into trees and inoculate them with these fungi. The beetles lay eggs in the trees and the grubs that hatch feed on the fungi. The beetles have a predominantly female sex ratio and the few males that are born inseminate all of their sisters before they leave their galleries. Thus, the species does not use sex pheromones like many other insects. Furthermore, they can complete multiple generations in these galleries before dispersing.

PSHB is also established in Israel where it spreads at a rate of about 12 miles per year naturally. In Israel, just as we've experienced, there are no good insecticidal or biocontrol strategies which have been successful. There are no sex pheromones which serve as attractants for detection. With the aggregation lures that are available you can catch beetles in traps when there are lots of them in an area. However, they are not effective at catching beetles where there is a low population density.

CDFA has reviewed the possibility of implementing a quarantine. A quarantine's sole purpose is to prevent the artificial spread of the targeted pest. To minimize natural spread from the quarantine area there is generally an eradication, suppression or control component. Based upon the known biology of SHB, we do not think that quarantine restrictions will be an effective method to mitigate the artificial spread of the SHB for the following reasons:

1. No comprehensive official statewide SHB survey has been completed;
2. The complete host range is still unknown;
3. The ability to accurately delimit the extent of the infested area using the detection technology currently available is unlikely to achieve that goal in a cost effective manner;
4. A quarantine would have to apply to all host material including woody ornamental nursery stock, firewood, and green waste in order to ensure that all potential pathways for artificial spread were addressed. Quarantine restrictions against firewood are generally not cost effective and do not prevent artificial spread because it is frequently moved by homeowners and;
5. A quarantine is unlikely to effectively prevent the movement of host material inside the regulated area and since the SHB can spread long distances on its own, the infested area will

continue to expand thus nullifying any perceived long term benefit to areas of California currently not known to be infested.

After careful consideration CDFA recommends the most effective strategies to address the potential impacts of SHB and the Fusarium species it vectors are as follows:

1. Research on the basic biology of the disease/vector complex in order to develop better detection methods and control or eradication methods and;
2. Public outreach.

In order to facilitate these strategies, CDFA has approved Specialty Crop Block Grants and supported federal Farm Bill funding. CDFA coordinated a statewide, multi-commodity group meeting to increase awareness and coordination on SHB issues and continues to participate in coordination efforts including efforts to submit a 2016 Farm Bill proposal, which ultimately was not submitted due to the lack of consensus. CDFA is a founding member of the California Firewood Taskforce that raises awareness of firewood as a pathway that can artificially move SHB and other invasive species through the "Buy It Where You Burn It" multi-agency educational campaign. We also provide information to California nurseries and county agricultural commissioners on the best management practices and nursery stock cleanliness protocols to prevent the movement of SHB via infested nursery stock.

Additionally, USDA's New Pest Advisory Group (NPAG) report on SHB also recommends critical research and public outreach.
https://www.aphis.usda.gov/plant_health/cphst/npag/downloads/Euwallacea_fornicatusNPAG_LT.pdf

We are committed to continuing to work with the State Board of Food and Agriculture, University of California Cooperative Extension, state and local stakeholders to develop a shared understanding of the issues and strategies for addressing them.