Injury Symptoms Associated with the Polyphagous Shot Hole Borer, *Euwallacea* sp., and Fusarium Dieback, *Fusarium euwallaceae*

The polyphagous shot hole borer, *Euwallacea* sp., and Fusarium dieback, *Fusarium euwallaceae*, are a new insect-disease complex causing injury and mortality to numerous native and ornamental hardwood trees and shrubs in southern California. The ambrosia beetle has a wide host range and can complete development in >20 species, including avocado, *Persea americana*, bigleaf maple, *Acer macrophyllum*, California box elder, *Acer negundo* var. *californicum*, California sycamore, *Platanus racemosa*, coast live oak, *Quercus agrifolia*, castorbean, *Ricinus communis*, red willow, *Salix laevigata*, and white alder, *Alnus rhombifolia*.

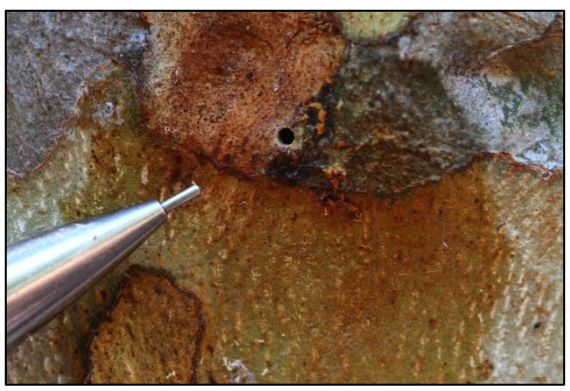
The adult female of the polyphagous shot hole borer is about 2.6 mm long. Males are smaller in size than the females and flightless.

Castorbean was split to show the ambrosia beetle larvae and the dark-colored symbiotic fungi in the wood.

Pupae and larvae are white in color and restricted to the galleries.

Injury symptoms associated with the new insect-disease complex include small round adult entry/exit holes; fine white- to tan-colored boring dust; staining, gummosis, or sugaring on the bark exterior near entry holes; and crown and branch dieback. The ambrosia beetle can attack all size classes of hosts (ranging in size from 5−81 cm diameter at breast height.)

Ambrosia beetle attacks are initiated by the females and common along the main stem and larger branches. The adult creates an entry/exit hole that are approximately 0.85 mm in diameter.



Beetle attacks appear as wet red-colored staining on California sycamore.

Initial attacks are usually identified by bark staining and discoloration on several hosts, including coast live oak pictured above.

High levels of attack from the polyphagous shot hole borer on castorbean.

The ambrosia beetle feeds on the symbiotic fungi not the wood, so females expel boring dust from the tree. Boring dust can be found around the entry holes, in bark cracks, at the base of tree, and caught in spider webs along the main stem.

Fine white boring dust expelled by the females along the stem of red willow.

Boring dust can resemble toothpick- and string-like projections protruding from the entrance holes.

Boring dust can be found on surrounding vegetation, in adjacent spider webs, and at the base of severely attacked trees.

Polyphagous shot hole borer attacks frequently cause bark staining and discoloration. A gumming and sugaring response associated with ambrosia beetle attacks are not common on native trees, but often seen on ornamental trees in the urban areas.

White- to brownish-colored bark discoloration is common with new ambrosia beetle attacks on red willow.

The polyphagous shot hole borer can attack red willow at high densities.

New ambrosia beetle attacks often appear as dark-colored wet staining on white alder.

Ambrosia beetle attacks are typically red in color on California sycamore.

Adult females construct branching galleries that can penetrate into the wood approximately 8 cm. The symbiotic fungi stain the galleries a brown to blackish color.

Branching galleries of the polyphagous shot hole borer seen in the main stem of castorbean.

Castorbean split longitudinally to show the dark-colored ambrosia beetle galleries.

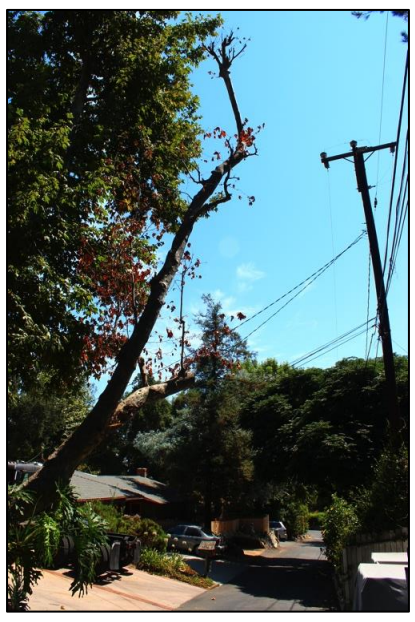
A cross-section of California box elder showing ambrosia beetle galleries. The dark color of the galleries fade as the wood dries.

Basal sprouting and crown and branch dieback are common when ambrosia beetle attacks reach high densities. Tree mortality and stem failure may occur when high-levels of injury are present.

Basal sprouting is common after severe injury from this insect-disease complex on white alder.

Repeated ambrosia beetle attacks caused severe crown dieback of red willow.

Castorbean (pictured above) and California box elder are frequently killed first in a forest stand.



The insect-disease complex killed California sycamore in the urban area of Los Angeles County.

Additional information about this pest complex can be found at www.cisr.ucr.edu.

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