Thousand Cankers Disease of Black Walnut
A New Pest May Threaten Texas Walnut Trees

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A new pest complex could pose a major threat to walnut trees (*Juglans* spp.) in Texas. The black walnut twig beetle (*Pityophthorus juglandis*) and a *Penicillium*-like fungus (*Geosmithia*) team together to cause what is termed "thousand cankers disease." This disease complex, although not yet detected in Texas, is killing large numbers of eastern black walnuts in various western states. The beetles will feed on walnut trees and in the process transmit spores of the fungus to the tree initiating infection. At each location where a beetle feeds on the tree, the fungus will form a canker. After literally thousands of beetle attacks, the cankers will become so numerous that the tree will decline and die. The cankers rather than the beetles kill the tree. Cankers are not evident on the exterior bark of the tree and initial attacks by the beetle are extremely difficult to detect. Trees that have been infected will exhibit signs of decline, dieback, thinning, chlorosis, and mortality. By the time the tree expresses visible symptoms, it has probably been under attack for some time. This "decline-to-mortality" process may be rapid or take several years.

There are at least three species of native walnuts in Texas (http://aggie-horticulture.tamu.edu/ornamentals/natives/tamuhort.html, Benny Simpson's Native Texas Trees). This includes eastern black walnut (*Juglans nigra*), one of the most valued trees in North America for high quality furniture and veneer. Eastern black walnut also has been planted in many areas of Texas (and other states), outside its native range.

The walnut twig beetle is native to North America, being originally described in 1928 based on specimens collected in Grant County, New Mexico. The primary range of the beetle has been listed as New Mexico, Arizona, and Chihuahua, Mexico, and this range coincides roughly with the distribution of Arizona walnut (*Juglans major*). During the past 10 years, an unusual decline of eastern black walnut (*Juglans nigra*) has been observed in several western states. These eastern black walnuts are planted, occurring mostly in urban areas and rural farmsteads and other plantings and have generally grown very well. Interestingly, the insect-fungus complex has been associated with Arizona walnut for many years, but it causes very little damage to this tree.

The first published record of eastern black walnut mortality associated with the walnut twig beetle was in northern New Mexico where large numbers of mature eastern black walnut died in 2001. However, eastern black walnut mortality from undetermined cause occurred in the early 1990s in Utah and records of the beetle from Utah date to 1988. Similar widespread decline of eastern black walnut has been reported in Idaho, Oregon, Washington, and Colorado during the past 10-15 years (Figure 1). In those communities where the insect has been detected, the majority of eastern black walnut has since died. Prior to these recent reports, walnut twig beetle was not associated with any significant *Juglans* mortality.

Eastern black walnut is apparently highly susceptible to the beetle/fungus complex and attacked trees almost always succumb and die. Trees in some Colorado cities, including Boulder, Colorado Springs and Denver, seem to have been hit particularly hard. Experts surmise that every eastern black walnut tree in these cities will eventually be eliminated.

There appears to be a range in susceptibility of *Juglans* species to the *Geosmithia* fungus. As mentioned, eastern black walnut is very susceptible, while Arizona walnut and little walnut (*J. microcarpa*) develop more restricted cankers. The susceptibility of *Juglans* and related hosts (e.g., *Carya* spp. -- pecan and hickory) to thousand cankers disease will be evaluated in future studies.

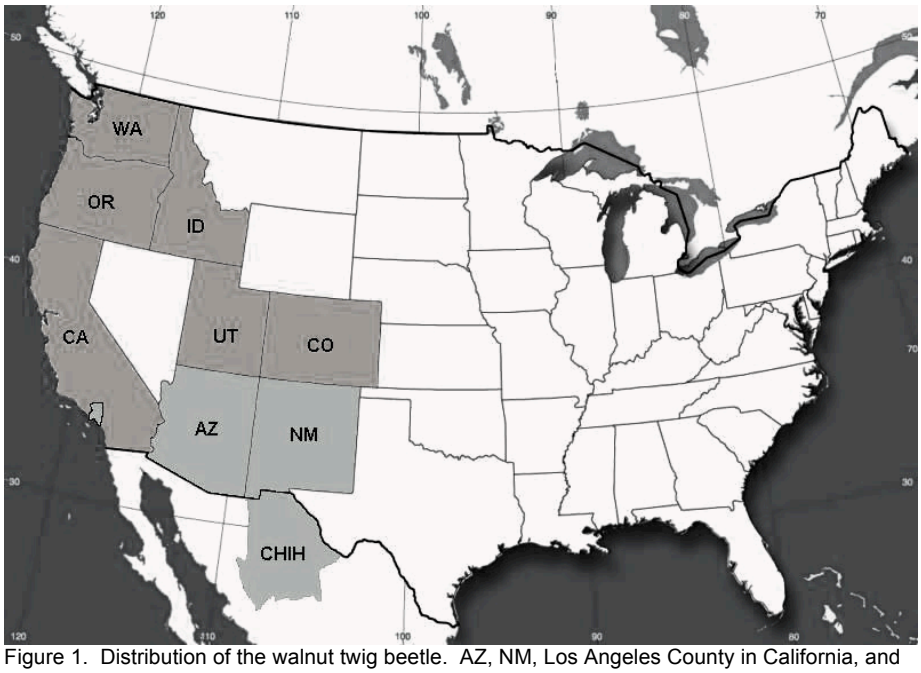

Figure 1. Distribution of the walnut twig beetle. AZ, NM, Los Angeles County in California, and Chihuahua, Mexico recorded the presence of the beetle prior to 1992. Gray states recorded the beetle's presence after 1998.

The walnut twig beetle is a minute (1.5-1.9 mm, about 1/16"), yellowish-brown bark beetle. It can be readily distinguished from other members of the genus *Pityophthorus* by the 4 to 6 concentric rows of asperities (dot-like "bumps") on the prothorax (left end of the beetle in the figure below), usually broken and overlapping at the median line (Figure 2).

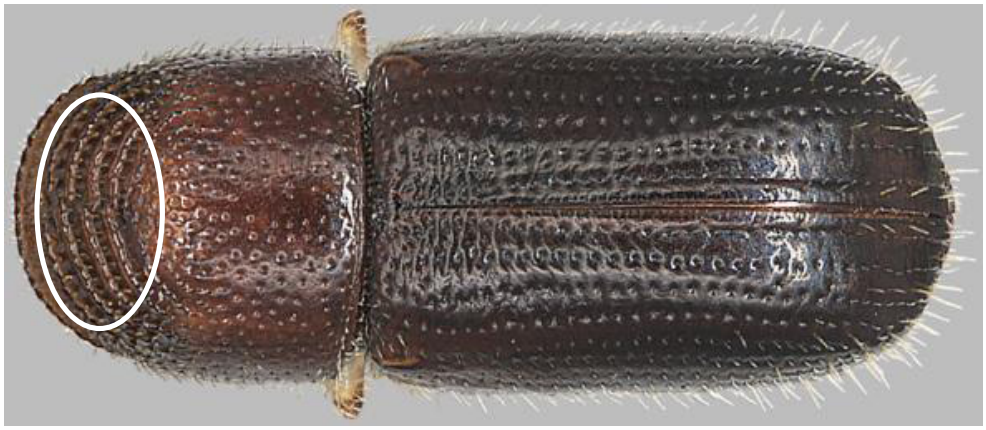

Figure 2. Walnut twig beetle, top view. Note the concentric rows of asperites (dot-like bumps) on the prothorax (white oval), which distinguish this bark beetle from other species of *Pityophthorus*. Photograph by Jim LaBonte, Oregon Department of Agriculture.

Despite the twig beetle's common name, attacks by adult *P. juglandis* and larval development in eastern black walnut rarely occur in twigs. Instead, the beetles prefer to attack and lay eggs in branches about 1" in diameter or larger. Very large branches and even the trunk can be colonized during advanced stages of thousand cankers disease.

The beetles spend the winter as adults sheltered within cavities excavated in the bark of the trunk. Adults resume activity by late April and most fly to branches to mate and initiate new tunnels for egg galleries. During tunneling, the *Geosmithia* fungus is introduced. Larvae feed for 4-6 weeks under the bark in meandering tunnels that run perpendicular to the egg gallery (Figure 3) and pupate at the end of the tunnel.

Figure 3. Walnut twig beetle adult and larval galleries under the bark of a large branch.

Adults emerge to produce a second generation in early summer. Peak flight activity of adults occurs from mid-July through late August and declines in the fall as temperatures cool.

Two different types of cankers have been observed on declining walnut trees. Initially, small, diffuse, dark brown to black cankers will form where beetles attack. These multiple cankers eventually coalesce to produce girdling, resulting in branch dieback (Figure 4). The number of cankers that are formed on branches and the trunk is enormous; hence the name thousand cankers to describe the disease.

A second canker type may occur on black walnut trees in advanced stages of decline. These cankers are much larger than branch cankers and often extend more than 6 feet from the ground and into the lower branches. They may encompass more than half the circumference of the trunk. Trunk cankers are not visible unless some bark is removed, but a dark brown to black stain on the bark surface or in bark cracks often indicates the presence of a canker. The inner bark and cambium below the bark surface on the canker face will be macerated, water-soaked, and stained dark brown to black. The walnut twig beetle and the fungus are often found in the macerated bark.

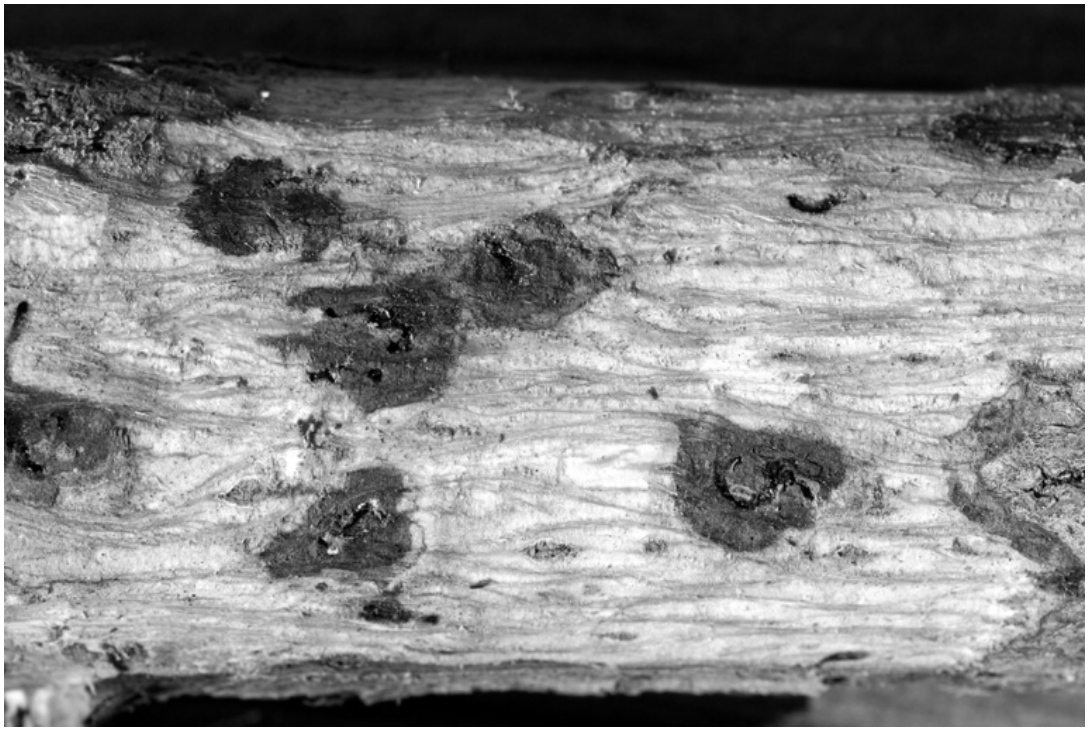

Figure 4. Attacks by the walnut twig beetle and the resulting canker (dark areas) caused by *Geosmithia* fungus. Photo provided by Whitney Cranshaw, Colorado State University.

Effective controls for thousand cankers disease have not yet been developed. Control methods await a better understanding of the biology of the walnut twig beetle and the canker-producing fungus. Control is also made difficult since it appears that most, if not all, walnut twig beetles carry the *Geosmithia* fungus.

Likely pathways for this beetle-fungus complex to enter Texas are through the movement of infected logs, wood, firewood, and wood packing material. Natural spread is possible through planted and natural populations of eastern black walnut. To keep this potential pest at bay, Texas should consider restricting the importation of black walnut wood that has the bark attached from states where 1,000 cankers disease has been documented.

If anyone finds dying walnut trees anywhere in Texas and suspects that this insect-fungus complex may be involved, please contact Joe Pase (jpase@tfs.tamu.edu, 936-639-8170) or Ron Billings (rbillings@tfs.tamu.edu, 979-458-6650) with the Texas Forest Service in Lufkin and College Station, respectively.

Adapted from information provided by Colorado State University (http://www.ext.colostate.edu/pubs/insect/0812_alert.pdf) and Dale Starkey, USDA Forest Service, Forest Health Protection, Pineville, LA.

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