Pine engraver beetles invade the Sonoran Desert

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Summary: The pine engraver beetle (*Ips calligraphus ponderosae*) is found typically at higher elevations in the bark of native ponderosa pine trees (*Pinus ponderosa*). Stressed pine trees are vulnerable to beetle attack and once infested decline rapidly and die. In 2014, the beetles were found for the first time to be established in the Tucson metropolitan area, at an atypical low elevation, infesting and killing non-native Aleppo (*Pinus halepensis*) and Afghan (*Pinus eldarica*) pines. Beetle description, life cycle at higher elevations, and some management tips on how to dispose of dead trees, and manage live trees with the goal of limiting further spread of the beetle are presented. Currently the life cycle of the beetles in their new, low elevation habitat is not known and therefore effective management practices are still under development.

Introduction

The phrase "pine engraver beetle" refers to 11 species of insects in the *Ips* genus that live in the inner bark of pine trees and can cause rapid decline and death of pine trees. Typically, they are found at higher elevations between 4200 to 9000 feet. The distribution of the western subspecies of the six-spined engraver, *Ips calligraphus ponderosae* (Swaine), has previously only been found at higher elevations in Arizona and other southwestern states (USDA Forest Service 1983). In 2014 these insects were detected at about 2400 feet, in Tucson, infesting non-native Aleppo (*Pinus halepensis*) and Afghan (*Pinus eldarica*) pines. The six-spined engraver is the only species detected, so far, in Tucson. This is the first time these native bark beetles have been found in non-native pines in the Sonoran Desert (Arizona State Forestry Division 2014).

Figure 3. A. Canopy appearance after infestation. B. Red boring dust in the bark fissures. C. Exit holes from larvae moving to other trees.

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Photo courtesy of Arizona Department of Agriculture

Figure 1. *Ips calligraphus* showing "scoop" (elytral declivity) with spines in rear of beetle.

Figure 2. After mating, females create x or y shaped galleries in the bark that follow the grain of the wood. Females lay eggs along the edges of the gallery and larvae create galleries that branch horizontally from the female gallery.

Beetle Description

It is the largest beetle of its genus in the southwest (1/4 "). It has characteristic *Ips* deep "scoop" (declivity) on the rear. Spines are located at the edge of the declivity (Fig. 1). The declivity is used to push the dust out of the exit holes.

Beetle Life Cycle

Beetles usually infect thick-barked fissured main trunk . At high elevations, beetles fly to new trees in spring. A male beetle entering the bark releases a pheremone to attract females. Engraver beetles can produce multiple generations per year at higher elevations . With warmer temperatures in Tucson, beetles may generate year-round.

Beetle Hosts

The six-spined engraver usually infests ponderosa pine (*Pinus ponderosa*). In Tucson hosts include Aleppo (*P. halepensis*) and Eldarica (*P. eldarica*) pines though other potential hosts may include Chir (*P. roxburghii*) and Canary Island (*P. canariensis*) pines.

Beetle Damage and Signs of Infestation

Infected trees have needles that fade from green, to straw color, and then to reddish orange (Fig. 3A) Individual large branches may die progressively, but once the crown turns orange, the tree cannot be saved. Boring dust, created by beetle activity, will be present in bark fissures at the base of the tree, or on branch crotches of infested trees (Fig. 3B). Galleries on the underside of the bark and on the wood surface are definitive proof that beetles are, or have been, present (Fig. 2). Exit holes (1/8" to 1/4") on the outer bark indicate adult beetles have left the tree (Fig. 3C).

Discovery in Tucson

The first affected trees were brought to the attention of the Pima County Extension Agent by local arborists. Once the beetles were discovered, the Arizona State Forestry Division was notified to verify the identification and develop a plan to survey pines in the area. A random sample of trees on four sides of the Tucson metropolitan area were inspected for beetle damage and presence. Since the ornamental pines growing in Tucson are among the largest tree species , they were easy to spot by driving around town. Pines that exhibited the discolored needles were approached and, with permission from the owners, were examined up close for the signs and symptoms of the beetles including: presence of boring dust, exit holes, and galleries beneath the bark. Over a period of a few weeks enough trees were examined to determine that the beetles were established throughout the city and neighboring communities.

Management Options

Bark beetles target pines stressed by abiotic or biotic problems. In the Tucson area, they have generally been found in trees that were improperly watered, struck by lightning, or damaged by construction. Monitoring tree health is needed to slow the spread of the beetles and protect existing healthy trees.

Irrigation: The best treatment is prevention of beetle attacks by slow, deep (2-3'), and infrequent watering. Install and maintain irrigation systems or use a soaker hose placed around the drip line of the tree. Continue irrigating until the monsoon rains are well underway. If a tree has already turned straw or red colored throughout the crown, irrigation will no longer help.

Firewood: Presumably, the beetles have been introduced to Tucson through the transportation of infested, green *Pinus ponderosa* firewood from higher elevations. If pine firewood is harvested from the forest, collect dry (over 1 year old) wood. If green firewood is harvested, place it in a sunny site away from live trees and completely cover it with clear, heavy plastic until it is dry.

Pesticides: Pesticides with active ingredients including carbaryl, bifenthrin or permethrin have been proven effective in ponderosa pines at higher elevations. At higher elevations, timing of treatments can be targeted for pre- or post-flight in the spring or fall. In the new low desert environment, however, the life cycle of the beetle is unclear, therefore optimum timing and efficacy of pesticides is unknown. All parts of the pine tree must be treated, including large branches, and this can be expensive. Cost, effectiveness, practicality and non-target organisms must be assessed before considering pesticide treatment

Dead Trees: Dead or dying trees infested with the pine engraver beetle should be removed as soon as possible and the wood promptly disposed of at a landfill. These trees should not be shredded and used for mulch nor should they be cut up and stored for firewood.