



Ponderosa Pine Bark Beetles in the Prescott Area

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Introduction

Just like drought, pine bark beetles are a natural occurrence in the Prescott area. Bark beetles typically attack physiologically stressed trees. This stress can be caused by lack of water, lightning, compaction, septic systems, mechanical damage caused by construction or blasting, fire, or other factors. Overly dense timber stands also contribute to individual tree stress. Trees in dense stands compete more intensely for available moisture, light, and soil nutrients.

New Mexico and Arizona experienced a significant bark beetle outbreak during 2002. Seven years of drought and dense timber stands created conditions highly favorable for these insects. In the Prescott area during 2002, bark beetles were active during mid-April and continued to colonize trees through October. It is unknown how many bark beetle flights (generations) occurred during that time period, but in localized areas, 50-80% mortality was noted (Figure 1).



Figure 1. Bark beetle mortality in Ponderosa pine near Crown King, Arizona.

Bark Beetle Species

In Prescott's Ponderosa pine stands, two genera are common. These are the pine engraver (*Ips* spp.) (Figure 2) and red turpentine beetle (*Dendroctonus valens*). Pine engravers are the most common group in the Prescott area and typically begin their colonization on the upper



Figure 2. Arizona five-spined pine engraver (*Ips lecontei*).

portion of Ponderosa pines. Occasionally, pine engravers kill only the top of the tree. More often, other bark beetle species colonize the tree in concert with the pine engraver. The red turpentine beetle is often one of these secondary species. However, other *Dendroctonus* species may also be present.

Evidence of Infestation

When bark beetles colonize a Ponderosa pine, needle color at the tree top fades from a rich green to a straw color, to light brown, and then to a reddish. Red boring dust may also be noticeable in the bark/branch crevices and/or the base of the tree. Pitch tubes (globules of pitch and boring dust) may also be visible (Figure 3). Increased woodpecker activity may also indicate beetle activity within a tree.

Life History

Bark beetles usually become active in April and early May. Adults emerge from previously infested trees, slash, or firewood where they overwintered. The adult beetles prefer freshly cut green trees and slash, but when conditions are right, they will attack live trees. Once a tree is selected, an aggregation pheromone (chemical attractant) is released by the beetles thereby attracting more beetles to the tree. Once the tree has been suitably colonized an anti-aggregation pheromone is released sending the signal to move to another tree.



Figure 3. Pitch tube and boring dust from *Ips*.

Adult beetles chew through the bark and excavate a chamber in the moist tissue beneath. The opposite sex enters the chamber and mating occurs. Female beetles then excavate egg galleries under the bark and eggs are laid in niches along the lateral walls (Figure 4).



Figure 4. *Ips* galleries in a mature Ponderosa pine.

After hatching, larvae bore away from the egg gallery at right angles. They molt three or four times and then construct a pupal cell either in the phloem or bark. Adults develop from pupae in about one week and emerge by boring out of the bark. After emergence, adult beetles fly and attack freshly cut material or susceptible trees and start the next generation. Under normal conditions, bark beetles may produce three or four generations per year.

The adult and larval galleries disrupt phloem activity (inner bark where sugars and other compounds are transported from the leaves downward). The beetles may also infect the tree with blue stain fungus that clogs the water conducting tissues. The tree is essentially dead following a successful attack by bark beetles, even though the foliage may still be green.

Vigorous, healthy trees have active resin duct systems which provide a natural defense against bark beetles. When a beetle bores into a healthy tree, resin exudes through the wound and can prevent the beetle's entry. When bark beetle populations are high, particularly around an active outbreak, trees may be attacked by so many beetles that even healthy trees succumb.

Prevention and Control

Once a tree has been successfully colonized by bark beetles, it cannot be saved. Infested trees should be removed as soon as possible to protect surrounding trees from attack by emerging beetles. Slash should be taken off site. Chipped slash material may attract beetles to the area putting remaining nearby live trees at a greater risk of colonization.

Covering piles of infested material with clear plastic is often recommended to prevent beetles from migrating to adjacent trees. However, this author has seen few wood piles covered correctly and many that were covered incorrectly. If a decision is made to cover infested material, it should be: (1) stacked in direct sunlight, (2) covered with heavy (at least 4 mils thick), clear plastic sheeting, (3) loosely wrapped to minimize a beetle's ability to chew through the plastic, (4) sealed at the base by digging a trench and burying the edges, and (5) piled material should be no larger than 4 x 4 x 4 feet (1/2 cord). When done correctly, this method creates a greenhouse effect, raising the temperature under the plastic up to 160°F. After three weeks of sunny weather, any remaining beetles should be dead.

No chemical compounds are recommended for control of pine bark beetles in colonized trees. This includes systemics and injection-type materials.

Where water is available, tree vigor can be maintained through deep, infrequent irrigation. This method is only recommended for high value trees and on sites where trees are not too dense. During drought periods, irrigation should start three to four weeks after the soil has dried in spring and continue until the monsoon begins. Black soaker hoses placed at the drip line are an inexpensive and practical means to irrigate.

Insecticide pretreatments are available but should only be applied to large trees by a certified applicator. Pretreatments are only effective prior to colonization. Insecticides must be used with caution and in compliance with the label instructions. Pesticides used improperly can be injurious to humans, animals, and the environment. The application of preventive sprays can be expensive, especially for large ponderosa pines that require high-pressure sprayers or the use of equipment to elevate the applicator. However, the cost of removing large, beetle-killed trees, that will eventually pose a safety hazard, can be more expensive.

As a precaution, currently infested pines should be cut and treated as soon as possible to reduce the risk of beetles emerging from an infested tree and attacking adjacent, high-value trees. This is most effective where bark beetle populations and tree losses are not exceedingly high. If beetles have already emerged from a tree, its removal will have no effect on the overall beetle population.

Thinning overly dense stands can increase individual tree vigor provided the remaining trees are healthy. This is an excellent long-term strategy to prevent future bark beetle damage. Plan thinning treatments in the fall after most beetles have completed their flight period. If thinning is done in the spring and early summer, slash removal is necessary and critical.