

Bark Beetles

Bark beetles are one of the most destructive insects in western coniferous forests. It has been estimated that 90 percent of insect-caused tree mortality and more than 60 percent of the total insect-caused loss of wood growth in the United States is due to bark beetles. In the Southwest, bark beetle killed trees were scattered over more than 2 million acres between 2001 and 2003.

The Southwest has a large complex of bark beetles composed of many genera and species. Frequently, several species are found attacking the same host tree and, therefore, it may be difficult to discern what species initiated the attack. Although species of *Dendroctonus* are the most notorious tree killers in the western United States, *Ips* species also play a very important role in pine forests of the Southwest.

Bark beetles derive their name from their habit of living and mining between the bark and wood of trees and shrubs. Adults excavate egg galleries in bark phloem. All bark beetle life stages are spent in the phloem, inner bark and bark, except when adults leave the tree in which they developed to fly to new host material. Bark beetles feed on the phloem during adult and larval stages.

Most bark beetles are considered secondary mortality agents because they prefer weakened host material. However, during environmental conditions favorable for beetle development, populations may build up rapidly and successfully attack healthy trees. Most bark beetles have a symbiotic relationship with blue-stain fungi. The blue stain fungi can completely penetrate the sapwood within a year. The fungi occlude the outer conducting tissues in the xylem that halts upward water translocation. This action, plus that of the bark beetle feeding, causes the death of a host tree.

Bark beetles produce chemical compounds called pheromones that are used to communicate with other beetles. Aggregation pheromones cause beetles to congregate in certain

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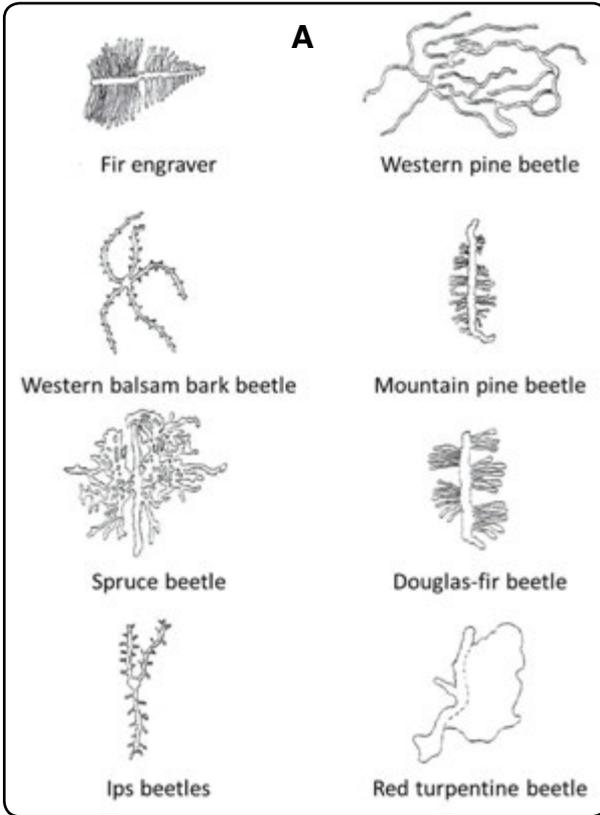
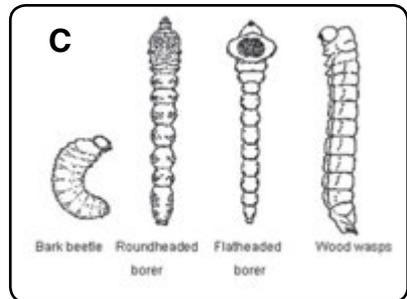
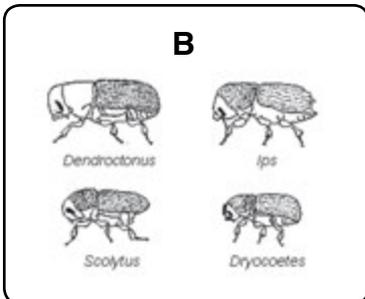


Figure 83. Bark beetle gallery patterns (a), adult beetles (b), and larvae (c) compared with woodborer larvae.



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Figure 84. Life stages of bark beetles (adult, pupa, larva).



Figure 85. Adult Arizona five-spined ips (top) and western pine beetle (bottom). Note differences in the elytral declivity between the species.



Figure 86. Exit holes of bark beetles emerging from ponderosa pine.

areas and mass-attack trees. Anti-aggregation pheromones cause beetles to disperse to neighboring trees or other areas. Pheromones of many bark beetles have been identified and synthetically produced. Both aggregation and anti-aggregation pheromones have been effective to mitigate impacts caused by some bark beetles in the western United States.

Crowns of successfully attacked trees turn from green to yellow to reddish brown. This color

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Figure 87. Small rust-colored pitch tubes are a sign that trees have been attacked by bark beetles.



Figure 88. Boring dust in branch crotches, bark crevices or around the base of trees is a sign that trees have been successfully attacked by bark beetles.



Figure 89. Blue stain fungi introduced during bark beetle attacks on conifers occurs in the sapwood.

change, an indication of a dying tree, may occur from a month to more than 2 years after successful attack depending on the temperature, moisture conditions, and density of beetles in the tree. Close inspection of infested tree trunks will show either small globules of resin, small holes through the bark, or reddish boring dust in bark crevices and around the tree base. The removal of bark from infested trees will reveal two types of galleries, egg and larval.

Egg galleries constructed by adult beetles are rather uniform in width. Larval galleries depart at right angles from egg galleries and increase in size as the young grow.

References: 24, 25, 41, 116