Introduction to Bark Beetles

Bark beetles are the most destructive insects in western coniferous forests. It has been estimated that 90% of insect-caused tree mortality and more than 60% of the total insect-caused loss of wood growth in the United States is due to bark beetles.

The Rocky Mountain Region 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 significant tree killers in the western United States, other bark beetle species also play important roles in the conifer forests of the Rocky Mountain Region (fig. 1).

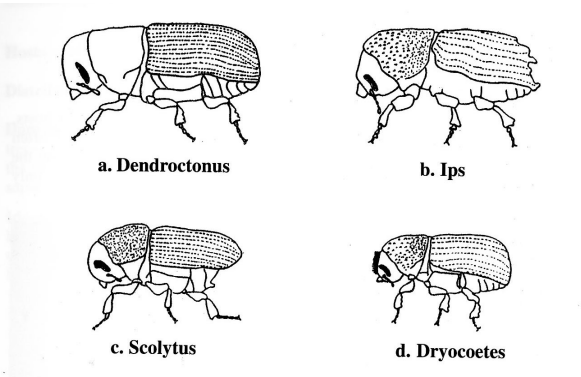

Figure 1. Adult bark beetles (from Hagle and others 2003).

General Features—Bark beetles derive their name because they live and develop in the bark and wood of trees and shrubs. Adults excavate egg galleries in living bark (phloem). All bark beetle life stages are spent in the phloem, inner bark, and bark, except when adults leave the tree they developed in to fly to new host trees. Bark beetles feed on the phloem of their host trees during adult and larval stages.

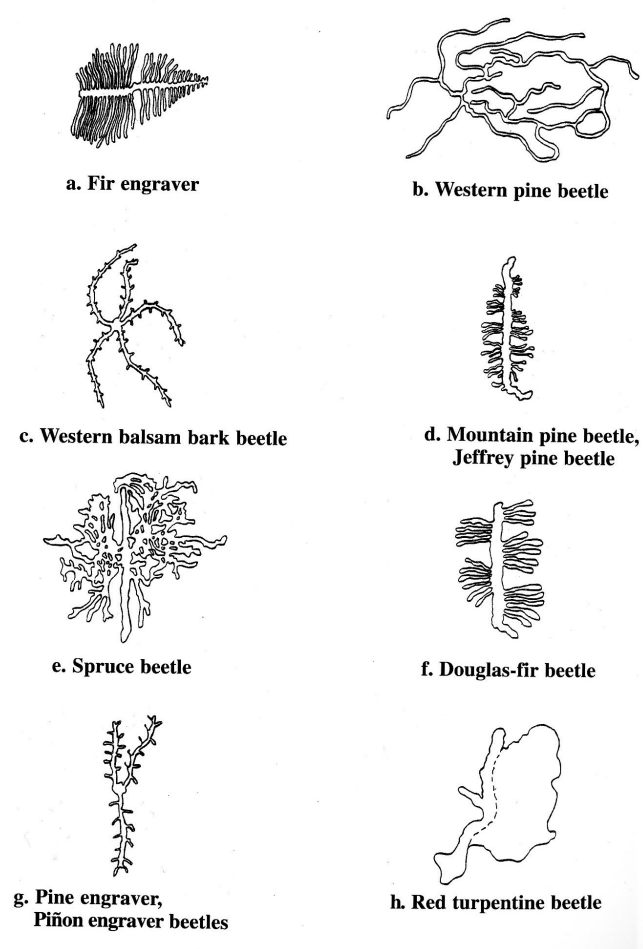

Figure 2. Bark beetle gallery patterns (from Hagle and others 2003).

Crowns of successfully attacked trees turn from green to yellow to reddish brown. This color 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 (pitch tubes), 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 (fig. 2). 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.

Life Cycle—Bark beetles have four stages of development during their life: egg, larva, pupa, and adult. All stages are found under the bark. The small, white eggs are in niches along the sides of the egg gallery. Larvae are small, white grubs with distinct heads and no legs (fig. 3a). They are C-shaped and are found in the feeding galleries off the sides of the egg gallery. The pupae are found in small chambers at the end of the feeding galleries.

Many bark beetles prefer weakened host trees, however, during environmental conditions favorable for beetle development, populations may build up rapidly and successfully attack healthy trees. Most bark bee-

tles have a symbiotic relationship with blue-stain fungi. The blue stain fungi can completely penetrate the sapwood within a year. The fungi invade the living tissues in sapwood—the ray parenchyma and epithelial cells of resin canals—and cause the death of the sapwood. This action, plus the bark beetle feeding, causes the death of a host tree.

Many bark beetles produce chemical compounds called pheromones that are used to communicate with other beetles. Aggregation pheromones cause beetles to congregate in certain areas and mass-attack trees. Anti-aggregation pheromones cause beetles to disperse to neighboring trees or other areas.

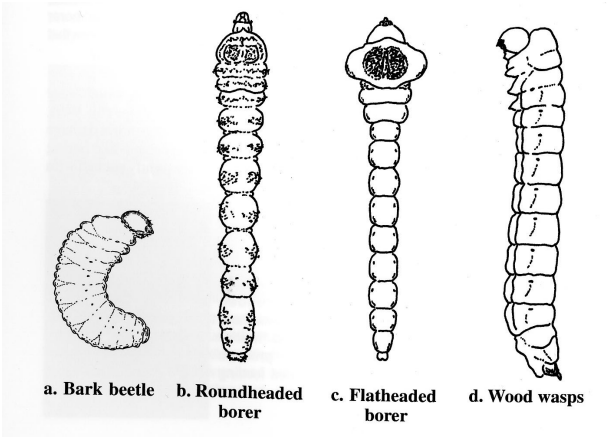

Figure 3. Larval bark beetle compared to larvae of other common boring insects (from Hagle and others 2003).

1. Hagle, S.K.; Gibson, K.E.; Tunnock, S. 2003. Field guide to disease and insect pests of northern and central Rocky Mountain conifers. Report R1-03-08. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Region. 67 p.