



Bark Beetles

O & T Guide [O-#03]

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Although New Mexico bark beetle adults are small, rarely exceeding 1/3 inch in length, they are very capable of killing even the largest host trees with a mass assault, girdling them or inoculating them with certain lethal pathogens. Some species routinely attack the trunks and major limbs of their host trees, other bark beetle species mine the twigs of their hosts, pruning and weakening trees and facilitating the attack of other tree pests. While many devastating species of bark beetles are associated with New Mexico conifers, other species favor broadleaf trees and can be equally damaging.

Scientifically: Bark beetles belong to the insect order Coleoptera and the family Scolytidae.

Metamorphosis: Complete

Mouth Parts: Chewing (larvae and adults)

Pest Stages: Larvae and adults.

Typical Life Cycle: Adult bark beetles are strong fliers and are highly receptive to scents produced by damaged or stressed host trees as well as communication pheromones produced by other members of their species. The first beetles to attack a potential host tree may be repelled or killed by resins in the bark if that portion of the tree is still relatively healthy. If the tree is too weak to “pitch out” the beetles, infestation proceeds and even more bark mining beetles are attracted to infest the host. In extreme cases where bark beetle populations are exceedingly high, the defenses of even healthy, live host trees can be overwhelmed.

In monogamous species such as the Douglas fir beetle, *Dendroctonus pseudotsugae*, the female bores the initial gallery into the host tree, releases pheromones attractive to her species and accepts one male as her mate.



Adult “engraver beetle” in the genus *Ips*. The head is on the left; note the “scooped out” area rimmed by short spines on the rear of the beetle, a common feature for members of this genus. Photo: USDA Forest Service Archives, USDA Forest Service, www.forestryimages.org

In polygamous species such as the pinyon bark beetle, *Ips confusus*, the male bores a short nuptial chamber into the host’s bark, releases pheromones attractive to his species and mates with 2-3 females. Each female bores her own egg gallery through the live bark at angles to the nuptial chamber.

Many, if not all, bark beetle species transport spores of tree fungi that further weaken the host, clogging its vascular system and sometimes killing it before the bark beetles do. Tree fungi transported by conifer-infesting bark beetles in New Mexico are called either “blue stain” or “brown stain” fungi for the colors that streak and down grade the wood

after it is infested. The smaller European bark beetle, *Scolytus multistriatus*, transports the fungus responsible for Dutch elm disease, a lethal pathogen for American elm. Although the beetle has been confirmed in New Mexico elms, the disease has not (yet).



Introduced by bark beetles, blue stain fungus has been growing in the vascular system of this Douglas fir tree. Photo: Sandy Kegley, USDA Forest Service, www.forestryimages.org

As the female bark beetle chews her gallery, depositing eggs at intervals on either side, the male usually accompanies her, clearing the gallery behind her and pushing the boring dust out the entry hole, evidence of bark beetle infestation. After hatching, each larva bores its own tunnel through the phloem; together these radiate outward at near right angles to the female's egg gallery, creating a feather-like or lacey pattern on the inner bark. Multiple egg and larval galleries produced by mass attacks on host trees can quickly intersect all of the vascular tissue in the live bark, eliminating movement of photosynthates downward from the foliage as well as movement of water and nutrients upward from the roots. Larval tunneling further spreads the vascular fungi introduced into the host by the adult bark beetles. As the larvae molt, feed and continue tunneling away from the egg gallery, the mines become larger and frass filled. Mature larvae pupate at the ends of their tunnels. Upon emerging as adults, the beetles may remain under the host bark for some time, even the remainder of the winter, before chewing an emergence hole through the bark or exiting via a crack in the bark.



(Left) Larval galleries of the pinyon bark beetle, *Ips confusus*. Photo: William M. Ciesla, Forest Health Management International, www.forestryimages.org. (Right) Larval galleries of the Douglas fir bark beetle, *Dendroctonus pseudotsugae*. Photo: Mark McGregor, USDA Forest Service, www.forestryimages.org

Patterns formed under the bark by the adults and boring larvae generally are characteristic of each bark beetle species affecting that host. Dying and dead host trees often are infested by other wood boring, scavenging insects including metallic wood boring beetles, long horned beetles and others.

Some bark beetle species have only one generation annually, especially at higher elevations. Others may complete two to four generations per year. Reproductive activity usually is minimal in the winter.

Description of Life Stages:

Egg: off-white, oval, and tiny, eggs are found only in the female's egg gallery in the live bark of the host tree.

Larvae: Larvae are legless, white, multi-segmented, ¼ inch long or less at maturity, C-shaped, with yellowish-brown head capsule and chewing jaws.

Pupa: Generally found near the end of each larval gallery, each pupa resembles an off-

white, quiescent, non-feeding “mummy” of the adult it will become. At maturity, pupae are dark brown to black.



Larvae of Douglas fir bark beetle, *Dendroctonus pseudotsugae*. The legless, C-shaped, wrinkled white larvae are slightly larger than rice grains at maturity. They mine the live bark of host trees. Photo: Malcolm Furniss, , www.forestryimages.org

Adult: After emerging from the pupa, the young adult beetle may remain temporarily inactive under the bark of the host or it may leave the host tree by chewing a hole through the bark or emerging through a crack in the bark. Adults are cylindrical beetles with short, knobbed antennae and heads not easily visible from above; most are dark brown or black.



Side view of a smaller European elm bark beetle, *Scolytus multistriatus*. The head is on the left; note the “scooped out” area on the underside of the abdomen. Photo: Pest and Diseases Image Library, , www.forestryimages.org

Some of the tiniest twig beetles are about 1/10 inch long. Most common New Mexico bark beetles are about ¼ inch long, but none exceed 1/3 inch. Viewed from the side, adult *Dendroctonus*, *Phloeosinus* and *Hylesinus* have smoothly rounded wing covers and abdomens. Viewed from the side, the abdomens of *Scolytus* are “scooped out” from below while the wing covers of *Ips* are “scooped out” from above.



Adult “cedar” bark beetle, *Phloeosinus* sp., a common pest of native junipers. Photo: E. Richard Hoebeke, Cornell University, www.forestryimages.org

Habitat and Hosts: Host preferences by different bark beetle species are fairly specific; some attack only pines while others are restricted to spruce, fir, Douglas fir or other host conifers. Some *Scolytus* species attack distressed fruit or shade trees. *Scolytus multistriatus*, the smaller European elm bark beetle, focuses on elm. While it damages and can kill Siberian elms and related species, it and its associated hitchhiking pathogen, Dutch elm disease, are a lethal combination for American elm. Together these two pests have eliminated most stands of American elm across the northern states of the U.S. The banded elm bark beetle, *Scolytus schevyrewi*, is an Asiatic species accidentally introduced into the U.S. possibly in the 1980s or 1990s; it

was confirmed in Clovis from specimens collected from dying elms in 1998. It also is known to occur in other New Mexico counties. *Tomicus piniperda*, an exotic and highly destructive pine beetle from Western Europe, invaded the U.S. in the 1980s but is not yet known to occur in New Mexico.



Adult *Hylesinus* sp., an ash twig borer; actual size is about 1/5 inch long. Photo: Daniel Adam, Office National des Forêts - France, www.forestryimages.org

Of the twig-boring bark beetles, several are common in New Mexico. Several species of *Phloeosinus* are known as “cypress bark beetles” because their primary hosts are species of *Cupressus* (Arizona cypress), *Juniperus* (various species of juniper) and similar cedar-like conifers. They reproduce in the trunk and larger branches of the host, sometimes killing injured and weakened trees. At least two species of *Phloeosinus* may be vectors of the cypress-killing fungus *Coryneum cardinale*. Newly emerged adults also mine and kill twigs, often making ornamental trees unsightly.

Ash twig beetles, *Hylesinus* spp., have been attacking twigs of most ash cultivars in New Mexico since at least the 1980s. Adults bore into the leaf buds or leaf scars on twigs, killing the twig from the entry point to the terminal. Successive infestations by these beetles create dramatic and cumulative losses in tree canopy as well as buildup of unsightly dead wood. This insect and the lilac borer, a wood-boring caterpillar, have severely decimated ash tree

stands in Northern New Mexico, a situation that continues to spread in the state.

Damage: Typical symptoms of bark beetle activity in a coniferous forest include “fading foliage” that may be faded green, yellowish, red or eventually brown, accumulations of reddish brown frass and bark bits, hardened, yellowish pitch tubes on the trunk and BB-sized emergence holes. Sometimes a single tree in a stand is affected; at other times, a cluster of adjacent trees of the same species will have symptoms of bark beetle infestation. Not all symptoms may be present, obvious or long lasting on a tree. Occasionally, infested trees will show extensive woodpecker damage. Dead bark may loosen or be pried off the tree to reveal the galleries or various stages of the insects themselves.

Relatively few bark beetles and their developing progeny in a tree can girdle and kill the host. Sometimes pest pressure is so extreme that the defenses of even healthy host trees are overwhelmed by attacking bark beetles and the tree is killed before showing obvious symptoms of distress.

IPM Notes: The health and pest infestation levels of New Mexico’s forests impact survival of many landscape conifers, particularly when urban and suburban trees are planted near the same species growing in the wild. Despite the best efforts of landscapers and homeowners, many trees, particularly conifers, are not planted on the best sites, nor are they adequately maintained, setting the stage for bark beetle infestation. In addition, wind damage, physical injuries and soil compaction make trees attractive to bark beetles. This is especially true for trees affected by construction or location of trees along roadways and parking areas. While not fool-proof, the best defense against bark beetles begins with maintenance of a healthy, actively growing, non-stressed tree.

Recent transplants and trees stressed for whatever reason can be protected from bark beetles with topical applications of labeled insecticides. These treatments should be

applied at least to the trunk and major limbs of each tree according to label specifications and prior to the first flights of bark beetles in early spring. While some systemic insecticides are labeled for bark beetle control, these products may not be translocated adequately in the tree to kill bark beetles and their larvae. Also, beetle damage to live bark may be more extensive than first estimated. Live bark damaged by bark beetle tunneling will not “heal” or resume functioning even if the pests are killed. No pesticide is currently labeled for control of tree-killing fungi carried by many bark beetles.

Corrective pruning or tree removal should be done in the winter when bark beetle flight activity is minimal. Promptly dispose of pruned branches or limbs, foliage and bark away from live, healthy trees. Logging slash as well as fresh mulch made from recently cut trees may be highly attractive to flying bark

beetles until these materials dry and are weathered. Never stack firewood near or beneath valued landscape trees, whether they are conifers or broadleaf species. Instead, locate firewood piles in parts of the yard receiving the most hours of daily sunlight. Keep the stacks relatively low and loose. Cover each stack with colorless landscape plastic, anchoring all edges securely with soil. Allow the covered firewood to bake in the sun over the summer, venting and drying it prior to use in the fireplace or wood stove.

A variety of beneficial insects and nematodes are natural enemies of bark beetles and their immature stages, suppressing populations of these pests. However, wind storms, fire and drought can stress large numbers of trees in an area; in these situations, bark beetles can reproduce and disperse much more efficiently than any or all of their natural enemies together.