



TREES & SHRUBS

Mountain Pine Beetle

no. 5.528

by D.A. Leatherman¹

Quick Facts...

Mountain pine beetles (MPB) are the most important insect pest of Colorado's pine forests. MPB often kill large numbers of trees annually during outbreaks.

Trees that are not growing vigorously due to old age, crowding, poor growing conditions, drought, fire or mechanical damage, root disease and other causes are most likely to be attacked.

For a long-term remedy, thin susceptible stands. Leave well-spaced, healthy trees.

For short-term controls, spray, cover, burn or peel attacked trees to kill the beetles. Preventive sprays can protect green, unattacked trees.

Mountain pine beetle (MPB), *Dendroctonus ponderosae*, is native to the forests of western North America. Periodic outbreaks of the insect, previously called the Black Hills beetle or Rocky Mountain pine beetle, can result in losses of millions of trees. Outbreaks develop irrespective of property lines, being equally evident in wilderness areas, mountain subdivisions and back yards. Even windbreak or landscape pines many miles from the mountains can succumb to beetles imported in infested firewood.

Mountain pine beetles develop in pines, particularly ponderosa, lodgepole, Scotch and limber pine. Bristlecone and pinyon pine are less commonly attacked. During early stages of an outbreak, attacks are limited largely to trees under stress from injury, poor site conditions, fire damage, overcrowding, root disease or old age. However, as beetle populations increase, MPB attacks may involve most large trees in the outbreak area.

A related insect, the Douglas-fir beetle (*D. pseudotsugae*), occasionally damages Douglas-fir. Most often, outbreaks are associated with previous injury by fire or western spruce budworm. (See fact sheet 5.543, *Western Spruce Budworms*). Spruce beetle (*D. rufipennis*) is a pest of Engelmann and Colorado blue spruce in Colorado. Injured pines also can be attacked by the red turpentine beetle (*D. valens*).

Mountain pine beetles and related bark beetles in the genus *Dendroctonus* can be distinguished from other large bark beetles in pines by the shape of the hind wing cover (Figure 1, top). In side view, it is gradually curved. The wing cover of *Ips* or engraver beetles, another common group of bark beetles attacking conifers, is sharply spined (Figure 1, bottom).

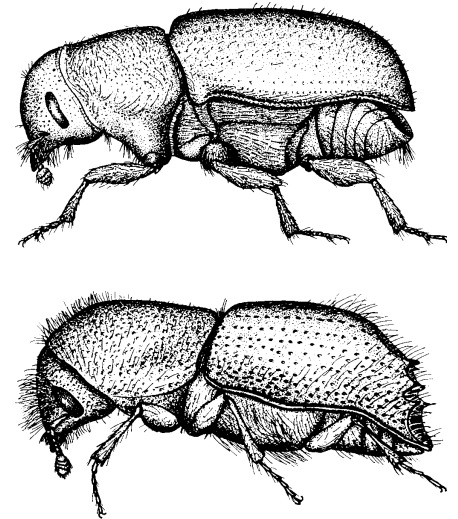


Figure 1: Adult *Dendroctonus* (top) versus *Ips* (bottom). Note gradually curved wing of *Dendroctonus*. Actual size of *Dendroctonus* from 1/8 to 1/3 inch, *Ips* 1/3 to 1/4 inch.

Signs and Symptoms of MPB Attack

- Popcorn-shaped masses of resin, called "pitch tubes," on the trunk where beetle tunneling begins. Pitch tubes may be brown, pink or white (Figures 2 and 6).



Figure 2: "Pitch tubes" indicating trunk attacks by MPB. Success of the attacks is confirmed by looking under the bark with a hatchet for beetles, their tunnels and/or bluestaining.

Figure 4: Mountain area infested by MPB, showing three years of mortality. Old, dead trees are gray; newly killed trees are straw yellow or orange. Some trees may also be infested but do not turn color until nine months or so under attack.



Figure 6: Not all pitch tubes indicate successful attacks. Note the beetle trapped in this large pitch tube. If the majority of tubes look like this, the tree may have survived the current year's attack.

- Boring dust in bark crevices and on the ground immediately adjacent to the tree base.
- Evidence of woodpecker feeding on trunk. Patches of bark are removed and bark flakes lie on the ground or snow below tree.
- Foliage turning yellowish to reddish throughout the entire tree crown. This usually occurs eight to 10 months after a successful MPB attack.
- Presence of live MPB (eggs, larvae, pupae and/or adults) as well as galleries under bark. This is the most certain indicator of infestation. A hatchet for removal of bark is needed to check trees correctly (Figures 3, 5 and 8).
- Bluestained sapwood (Figure 9). Check at more than one point around the tree's circumference.

Life History and Habits

Mountain pine beetle has a one-year life cycle in Colorado. In late summer, adults leave the dead, yellow- to red-needled trees in which they developed. Females seek out living, green trees that they attack by tunneling under the bark. Coordinated mass attacks by many beetles are common. If successful, each beetle pair mates, forms a vertical tunnel (egg gallery) under the bark and produces about 75 eggs. Following egg hatch, larvae (grubs) tunnel away from the egg gallery, producing a characteristic feeding pattern.



Figure 3: Top view of adult MPB (actual size, 1/8 to 1/3 inch).

MPB larvae spend the winter under the bark. They continue to feed in the spring and transform into pupae in June and July. Emergence of new adults can begin in early July and continue through September. However, the great majority of beetles exit trees during late July (lodgepole pine) and mid-August (ponderosa pine).

A key part of this cycle is the ability of MPB (and other bark beetles) to transmit bluestain fungi. Spores of these fungi contaminate the bodies of adult beetles and are introduced into the tree during attack. Fungi grow within the tree and, together with bark beetle feeding, weaken it. This mutual network of beetle galleries and bluestain fungi disrupts defenses within the tree and rapidly kills it. The fungi give a blue-gray appearance to the sapwood.

Infested Trees

- Once MPB infests a tree, nothing practical can be done to save that tree.
- Under epidemic or outbreak conditions, enough beetles can emerge from an infested tree to kill about two same-sized trees the following year.
- *Ips* and related beetles that emerge early in summer often are mistaken for mountain pine beetle, leading to early reports that



Figure 5: Larva of MPB (actual size, 1/8 to 1/4 inch). They are found under the bark in tunnels.



Figure 7: Checking beneath the bark for MPB. This attack was successful (note tunnels and stain).



Figure 9: Cut tree killed by MPB, showing the characteristic blue-staining pattern.



Figure 11: The appearance of a forest thinned to help prevent MPB. This can also improve mountain views and reduce fire hazard.

“MPB is flying.” Be sure to properly identify the beetles you find associated with your trees.

- Trees from which MPB have already emerged (look for numerous round, pitch-free exit holes in bark) do not need to be treated.
- The direction and spread rate of a beetle infestation is impossible to predict. However, attacked trees usually are adjacent to or near previously killed trees.

Control

Natural controls of mountain pine beetle include woodpeckers and insects such as clerid beetles that feed on adults and larvae under the bark. Extreme cold temperatures also can reduce MPB populations. However, during outbreaks these natural controls often fail to prevent additional attacks.

Logs infested with MPB can be treated in various ways to kill developing beetles before they emerge as adults in summer. Logs may be burned, preferably in the fireplace, to kill the larvae under bark. They could also be debarked, killed, buried under 8 inches of soil, or chipped.

In some cases, hauling infested logs to “safe sites” a mile or more from susceptible tree hosts also is practiced. Following beetle emergence, wood can be used without threat to other trees.

Chemical control options for MPB have been greatly limited in recent years. At present, there are no labeled pesticides for use on MPB.

Solar treatments that raise the underbark temperature to lethal levels (110 degrees F or more) are now being tried as a means of reducing beetle populations in infested logs. Such treatments can be performed with or without plastic. Key points to remember: place logs in a location that receives several hours of direct sunlight each day, do not stack logs on top of each other, and allow a minimum of two months of warm weather. If plastic is not used, the logs need to be rolled every three weeks or so. About one third of the log is treated with each orientation. If plastic is used, it should be clear. Water the logs prior to covering. Seal the edges with soil and repair rips with duct tape. Contact a forester for more details on solar treatments.

Prevention

Certain formulations of carbaryl (Sevin and others) and permethrin (Astro, Dagnet and others) are registered for use to prevent attacks on individual trees. These sprays are applied to living green trees in early summer to kill or deter attacking beetles. This preventive spray is quite effective through one MPB flight (one year).



Figure 8: Characteristic tunnels (galleries) of mountain pine beetle made by the adults and larvae. The underbark area looks like this in late spring. Bluestained wood is caused by fungi the beetles introduce.



Figure 10: Large, uninfested pine being preventively sprayed. This protects high-value trees and should be done annually between April 1 and July 1.

Another method of prevention involves forest management. In general, the MPB likes forests that are old and dense. Thinning out excess trees reduces forest density, lessens fire hazard and improves individual tree vigor. Most mature Colorado forests have about twice as many trees as forests more resistant to MPB. Get help from a forester with this option.

Safety

Always carefully read and follow all label precautions before applying insecticides for MPB prevention.

Related Fact Sheets

5.543, *Western spruce budworms*

Also contact the Colorado State Forest Service for fact sheets related to specific aspects of the mountain pine beetles.



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