

Mountain Pine Beetle (*Dendroctonus ponderosae*)

Hosts

The mountain pine beetle is a native bark beetle that can attack and kill all species of pines found in Idaho, as well as many non-native pine species. In Idaho, affected timber species include lodgepole pine, ponderosa pine, and western white pine. At higher elevations, whitebark and limber pines are also attacked. Large-diameter trees are preferred, and attacked trees are usually ≥ 8 " in diameter.

Distribution

Mountain pine beetle is found throughout Idaho wherever hosts occur.

Life Cycle

Mountain pine beetle typically requires one year to complete its life cycle, but development may take longer at cool, high-elevation sites. Adult beetles (Figure 1) fly in mid to late summer to locate and colonize new host trees. Attacking beetles produce aggregation pheromones that attract additional beetles to mass-attack, which helps the beetles overwhelm tree defenses. In successful attacks, adult beetles bore through the bark, mate, and females lay eggs along vertical J-shaped galleries constructed in the phloem (Figure 2). After egg hatch, larvae feed and develop under the bark at temperature-dependent rates. In a one-year life cycle, winter is usually passed in the larval stage and mature larvae pupate to become new adults the following summer. New adults then chew through the bark and fly off to search for new host trees.

Damage

Larval feeding in the phloem interrupts water and nutrient transport and girdles the tree. Beetles also introduce mutualistic 'blue stain' fungi (Figure 3), which hastens host tree mortality by obstructing the flow of resin and other resources in the sapwood. Sapwood decay fungi are introduced as well, resulting in increasing volume loss over time after the tree has been killed. Mountain pine beetle populations often exist at low levels, causing individual tree and small group mortality. However, large-scale outbreaks can occur given favorable climate conditions and abundant suitable hosts.

Recognition

Signs of mountain pine beetle attack include reddish boring dust (frass) in bark crevices and around the base of the tree (Figure 4), and pitch tubes where defensive resin is produced at attack sites (Figure 5). Vertical, often J-shaped galleries (Figure 2) that are packed with frass can be found beneath the bark of attacked trees. Needles typically fade from green to red the following season after attack. Sapwood decay fruiting bodies, known as pouch fungus (Figure 6), may appear on the bark 1-3 years after the tree has died.



Figure 1. Mountain pine beetle adult



Figure 2. Vertical J-shaped galleries and developing larvae beneath the bark



Figure 3. Blue stain fungi in pine sapwood



Figure 4. Boring dust (frass) on ponderosa pine bark

Mountain Pine Beetle Management

Identify Hazard Mountain pine beetle outbreaks most often develop in even-aged dense stands of large-diameter pine. Dense lodgepole pine stands >80 years old with an average diameter of >8 inches, and dense second-growth ponderosa pine stands are considered to be especially susceptible.

Silviculture Thinning high-hazard stands to increase tree spacing reduces susceptibility to mountain pine beetle. Basal area (BA) is a measure of stand density and is the cumulative area (in ft²) of the cross section of all trees in an acre of forest (at 4.5 ft above the ground). Thinning stands to BAs <80 ft²/acre, and/or spacing trees >13 ft apart have proven effective for reducing mortality, but recommendations can change for different host species. Creating multiple age and size classes of trees can also reduce losses by limiting the number of susceptible large-diameter hosts on the landscape at a given time. Susceptible trees can also be selectively removed to reduce the potential for attacks.

Sanitation & Salvage Removing currently-infested trees prior to beetle emergence can reduce local beetle populations. Recently-attacked trees that contain live beetles typically have green to yellowish-green crowns into the fall, and fade to red within the year. Infested material should be removed or destroyed before beetle emergence, which can occur as early as June. Beetles have usually already left trees with red crowns in late summer, and harvesting these previously-infested trees will not affect mountain pine beetle populations. Beetle-killed trees can be salvaged, although the blue-stained sapwood may reduce the value of the logs. Timely salvage of beetle-killed trees is important to mitigate volume losses due to sapwood decay caused by pouch fungus.

Insecticides Insecticidal bark sprays can provide short-term protection for individual, high-value trees, but are too expensive for entire stands. Bark sprays must be applied preventatively and cannot save a tree once it is infested. Protection of larger trees may be challenging due to the difficulty of achieving full coverage of the trunk (to a 6" diameter top), and the use of insecticides is prohibited in some areas. Forest health professionals can assist in determining an appropriate and effective treatment plan.

Anti-aggregation Pheromones To prevent overcrowding, mountain pine beetles naturally release anti-aggregation pheromones to repel additional attacks on fully-occupied trees. Verbenone is a mountain pine beetle anti-aggregation pheromone that has been synthesized and is commercially available in several formulations. Slow-release verbenone pouches can be stapled in pairs to the north side of individual trees or applied at a rate of 30 pouches per acre throughout a stand, and provide protection for one season. Verbenone is also available in a biodegradable paste that can be applied directly to the bark with a caulking gun. Both formulations provide only short-term protection, and do not guarantee that a tree or stand will not be attacked. The efficacy of verbenone is reduced in high-density stands and when mountain pine beetle population densities are already high. *Seek advice from a forest entomologist or consulting forester when considering mountain pine beetle management with verbenone.*

Summary Preventative strategies can reduce tree mortality due to mountain pine beetle, but once successfully attacked, trees cannot be saved. Stands thinned to a basal area below 80ft²/acre are generally considered to be less susceptible to attack. However, once a large-scale outbreak is underway, the efficacy of thinning, sanitation harvests, and verbenone for preventing additional mountain pine beetle attacks is greatly reduced.

For more information:

US Forest Service Management Guide: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5187520.pdf

US Forest Service Forest Insect & Disease Leaflet: https://www.fs.fed.us/rm/pubs_other/rmrs_2009_gibson_k002.pdf

US Forest Service verbenone publication: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5373188.pdf

IDL Forest Health web page: <https://www.idl.idaho.gov/forestry/insects-and-disease>



Figure 5. Mountain pine beetle pitch tubes
Photo: Whitney Cranshaw



Figure 6. Cross section of pouch fungus conk growing on a beetle-killed tree