

Mountain Pine Beetle

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Bark Beetle

Bark beetles are notorious for burrowing tunnels into the bark of infested trees where they lay eggs. About seven weeks later, the eggs hatch and the beetle larvae tunnel further into the tree, eating the interior of the trunk as they go. This feeding behavior leaves a characteristic pattern on the bark, shown in Figure 1, but also prevents the tree from distributing nutrients. Meanwhile, woodpeckers peck away the outer layer of bark in an attempt to eat the larvae. These factors combine to ultimately kill the infested tree in about a year. The larvae that survive the winter inside the infested tree will reemerge in the spring and spread to nearby trees, further killing forest growth.



Figure 1. Feeding pattern on inside bark of a tree infested by bark beetles

From: Woodson

Healthy trees are less susceptible to initial bark beetle infestation because they secrete a resin which floods beetle tunnels, pushing both beetles and eggs out of the tree. For this reason, bark beetles initially attack sick or dying trees. By removing older growth and allowing new plants to have greater access to sunlight and valuable nutrients, bark beetles are a valuable and natural part of the ecological cycle. However, if the population of bark beetles becomes too

large, the beetles are forced to burrow into healthier trees. At this point, bark beetles become a dangerous nuisance to the forest because even a healthy tree is eventually overcome by the sheer number of beetles.



Figure 2. Trees infested by bark beetles eventually turn reddish-brown from lack of nutrients

From: Hamilton

Although infested trees may die in as little as two weeks, the first outwardly visible signs of infestation often come much later in the form of dry, red needles. Some infested trees are shown above in Figure 2. More than just an eye-sore, these infested trees increase the chances of a severe fire by acting as fodder. The dead trees also greatly deplete timber supplies. During a single outbreak, more than one million trees comprising over one billion board feet of timber can be ravaged. Jim Girvan, one of the authors of a recent report regarding Canada's lumber industry, predicts the closure of 16 large mills in British Columbia by 2018 due to the reduction of sawlog-quality wood from beetle infestations. This reduction in lumber from Canada will have significant impacts on the U.S. lumber market as well.

Mountain Pine Beetle

In Colorado and other Western states, the Mountain Pine Beetle, a subspecies of the bark beetle, is a large concern. Native to pine trees in western North American

forests, pine beetles have already ravaged an estimated 17 million acres of forest service land as of May 2010. Based on the current spread of pine beetles, every large, mature lodgepole pine forest in Colorado and Southern Wyoming will be dead within three to five years.

Much of the devastation is a direct result of the growing pine beetle population which has reached epidemic proportions. Though many factors impact the seasonal pine beetle population, two of the most influential are temperature and moisture. Warm weather significantly increases the pine beetle population by accelerating the growth cycle. A growth cycle that takes about 10 weeks in cold weather is accelerated to just 2 weeks in warm weather. The rapid maturing of beetle larvae allows multiple generations of pine beetles to be produced each season. With each female pine beetle laying an estimated 60-75 eggs, more cycles lead to a rapidly expanding population.

Drought conditions also help increase pine beetle population. While pine beetles generally attack weaker trees, these trees do not offer as much food. Therefore, fewer pine beetles are able to survive and the population is limited. On the other hand, healthy trees have much more available food so once a brood of pine beetles is able to overcome the tree's natural defenses, the population of beetles can increase rapidly. As discussed, healthy trees are difficult to attack due to the secreted resin. However, when a tree experiences a decrease in available water, less resin is produced making it easier for pine beetles to burrow into the tree and lay eggs. Considering these two factors, warm droughts have a tendency to cause an explosion in pine beetle population which is what many theorize is contributing to the current pine beetle epidemic.

An additional threat posed specifically by pine beetles comes from the blue stain fungus. This fungus is carried in the mouths of mountain pine beetles and helps suppress

a tree's ability to produce the resin which defends the tree from beetle attacks. Blue stain fungus is so named due to the characteristic blue hue it leaves inside the infested tree as shown in Figure 3.



Figure 3. Blue stain fungus, carried in the mouths of Mountain Pine Beetles, helps beetles spread more quickly by suppressing resin production in healthy trees.

From: Billings

Prevention and Control

Prevention is the most effective method for controlling the spread of pine beetles because once a tree is infested, little can be done. Prevention on a small scale often consists of keeping trees pruned and irrigated to ensure healthy new growth, maintaining a variety of plants to prevent the spread of possible infestations, and early season chemical spraying to ward off attacking pine beetles. If a tree is attacked by pine beetles, it should be immediately removed from nearby trees, either by cutting and physically moving the tree, burning, or chipping. Though the infested tree cannot be saved, these methods prevent pine beetles from spreading to neighboring trees.

Large scale prevention of pine beetle infestation, like in national parks, is much more difficult because the sheer volume of trees makes the above methods expensive and time consuming. Furthermore, the density of old-growth trees creates an ideal habitat for pine beetles because the older trees have weaker defenses while the proximity of trees allows beetles to spread to new trees more easily.

Many forest experts recommend the use of prescribed burns and forest thinning as a means to prevent continued infestations. Prescribed burns remove large groves of decaying trees and discourage beetle attacks by creating a variety of tree generations. Rick Cables, the U.S. Forest Service's regional supervisor for Colorado, compared the current pine beetle epidemic to a human population comprised of 80 year olds. Many forests in Colorado are home to old growth which is far more susceptible to illness. Prescribed burns would help remove some of this older population, allowing young, healthy plants to grow and thereby create a more diverse forest population that is more resilient. Additionally, forest thinning has been deemed by many as an effective method for discouraging the spread of pine beetles in a region for similar reasons and because it makes the migration of beetles between trees more difficult

Concluding Remarks:

Like all bark beetles, Mountain Pine Beetles play an important and natural role in the ecological cycle. They help forests remain healthy by killing old, decaying trees. Cold winters, natural predators, and the secreted resin of healthy trees have historically kept the pine beetle population in check. Since 1996, however, the pine beetle population has exploded, causing beetles to attack healthy trees as well as weaker trees. Many forests throughout the western United States and portions of British Columbia have been struck hard by the pine beetle epidemic with billions of acres of quality lumber lost. Predictions indicate the absence of quality wood as a result of pine beetle infestations will contribute to the closure of several large lumber mills and significantly impact the lumber industry in both the United States and Canada.

Little can be done to save infested trees; pine beetle prevention is the most successful method for saving healthy trees. Finding sure methods of prevention and applying

those techniques on a large scale is one of the biggest challenges facing the lumber industry today. Controlled burns, chemical sprays, and forest thinning are a few of the methods already used across the West but the Mountain Pine Beetle continues to threaten millions of trees.

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