

Managing Mountain Pine Beetle (MPB) Attacking Urban And Shelterbelt Trees In Montana

- 1) Learn to recognize the signs and symptoms of MPB attack. Evaluate the degree of risk to pine trees on your property. Is the property close to an infested forest? Are there infested trees on your property or in the general area?
- 2) Practice prevention. Remove and destroy infested trees by June 1 before beetles emerge to attack nearby trees. Do not bring infested firewood onto your property. If the pine trees are at risk of attack keep them well watered.
- 3) If your pine trees are at risk, consider protecting them. Trees can be protected by spraying the trunks with an insecticide or by applying a repellent pheromone prior to July 1.
- 4) During the fall season evaluate MPB damage to your pine trees and develop a management plan that utilizes prevention and protection if necessary. The current infestation in Montana will likely last for at least another 3 to 5 more years.

Signs And Symptoms Of Mountain Pine Beetle Attack

In Montana beetles typically fly during July and August when they attack pine trees. All species of pine can be attacked, but native lodgepole and ponderosa pine, and introduced ornamental Scots pine are preferred hosts. Hundreds of the tiny beetles bore through the tree bark and lay eggs within the inner bark. The white grub-like larvae feed on the inside of the bark. Pitch tubes produced at beetle entry points, and boring dust that accumulates at the base of the tree, are some of the first signs of attack that become visible in August and September.

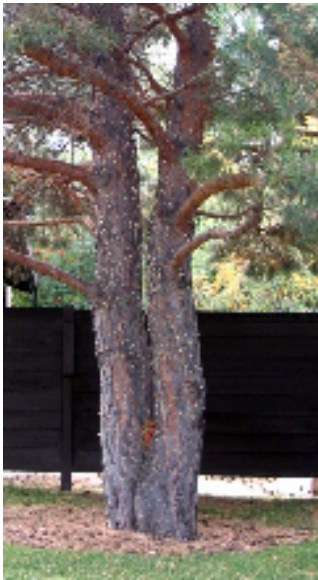


Figure 2 above: Scots pine tree mass attacked by thousands of beetles. At each entry point the tree exudes sap and pitch in an attempt to repel the beetle, producing distinctive “pitch tubes”. Each pitch tube represents a point of entry where a single beetle chewed through the bark.



Figure 3 above: Trees may not always produce pitch tubes, particularly drought stressed trees that have less sap. Boring dust at the base of the tree is another sign of infestation. As the adult beetles chew and construct galleries underneath the bark they push out the dust. With hundreds of beetles at work, boring dust accumulates at the base of the tree, looking something like sawdust. Boring dust is a sign of an active infestation.



Figure 4 above: Left, after boring through the bark, female beetles construct a vertical gallery underneath the bark. When a tree is attacked by hundreds of beetles, the inner bark is destroyed by their feeding activity (middle picture). After mating, female beetles lay eggs along the vertical gallery. The eggs hatch into small grub-like larvae (upper right) that feed in a horizontal direction. The smaller larval feeding galleries radiating out from the larger vertical gallery produced by the adults produces a characteristic pattern underneath the bark (lower right hand corner).

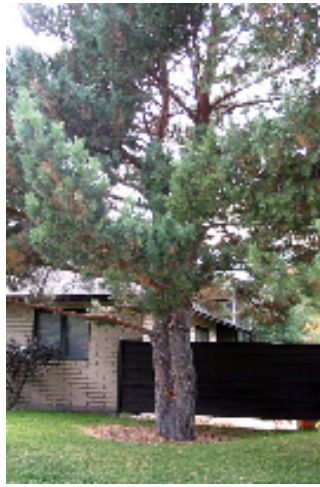


Figure 5 above.

As mountain pine beetles bore into a tree, they bring with them blue stain fungi that colonize the tree. The blue stain commonly seen on pinewood lumber or furniture is caused by blue stain fungi. The fungi invade the inner bark as well as the sapwood of the tree trunk. The picture above left is a cross section of pine tree with blue stain fungi growing towards the center. It is the combined action of the beetle feeding and the stain fungi that girdles and kills the tree. Although mass attacked trees will stay green over the winter (center picture) much like a Christmas tree, the damage has been done. The tree is girdled, and when temperatures rise in the spring, mass attacked trees will begin to turn yellow and die from lack of water and nutrients (right-side picture). Despite the snow on the ground, the picture above right was taken during April 2009.

Will My Urban Pine Tree Die?

In some cases pine trees can successfully repel beetle attacks, particularly if the tree was attacked by a smaller number of beetles, such as a “strip attack”. A strip attack occurs when only one side of the tree is attacked. In a forest setting, sacrificing a few trees for the benefit of the forest is acceptable. However, in an urban setting, homeowners and landowners do not want to cut down high value trees unless they are sure that they will die. Because some trees may remain green well into the spring before they die, it is not as simple as waiting for them to turn red. Predicting the fate of “strip attacked” trees is variable and difficult. First, the trees health can be monitored into the spring season. If attacked trees turns yellow during April and May they will not survive. Second, small 1” square pieces of bark can be cut from the trunk of attacked trees on the North, East, South and West sides. If the inner bark on three or more squares is damaged, the tree will most likely NOT survive. If two or more squares have healthy bark, tree has a CHANCE of surviving. These trees may benefit from extra watering in the spring. Healthy bark is white and moist, damaged bark is brown and “chewed up”, see Figure 4 above. However, if infested trees are not removed and destroyed by July 1, they present a risk to neighboring healthy pine trees (see prevention section below).

Is My Spruce Tree At Risk?

Pine trees are the preferred host of the mountain pine beetle and spruce are at low risk. Occasionally other conifer species such as spruce and fir can be attacked. In a forest this typically occurs when beetle populations are high and there are no other hosts available (all of the pine trees have been killed during the infestation). In urban environments spruce trees right beside a mass attacked pine tree have been attacked. These cases are likely “spill over” attacks, when too many beetles are attracted to the primary host and the beetles go to the next closest conifer. In the city of Great Falls approximately 1000 attacked trees were identified and only about 6-8 were spruce trees – *less than 1%* of the attacked trees were spruce. Overall the risk is low, but occasionally it can occur. Also be aware that different species of bark beetles can attack spruce and fir, such as the spruce and Douglas fir beetles.



Figure 6: Adult mountain pine beetles under the bark of a Scots pine tree. These are tiny beetles not much larger than a grain of rice.

Prevention

If your trees are at risk of attack, consider preventative measures. Well watered trees are able to produce more sap and may “pitch out” and repel the beetles, and are generally more able to recover from attacks. If you have infested trees on your property consider removing and destroying them prior to June 1. During July and August a new generation of beetles emerges from infested trees to look for new hosts to attack. Healthy pine trees that are close to infested trees are at much higher risk of attack. When infested trees are removed, the beetles underneath the bark must be destroyed by chipping, burning or burying the wood. Simply cutting and splitting the wood does not kill the beetles underneath the bark. Contact your local county agent or city forester to learn if your area has a designated disposal site.

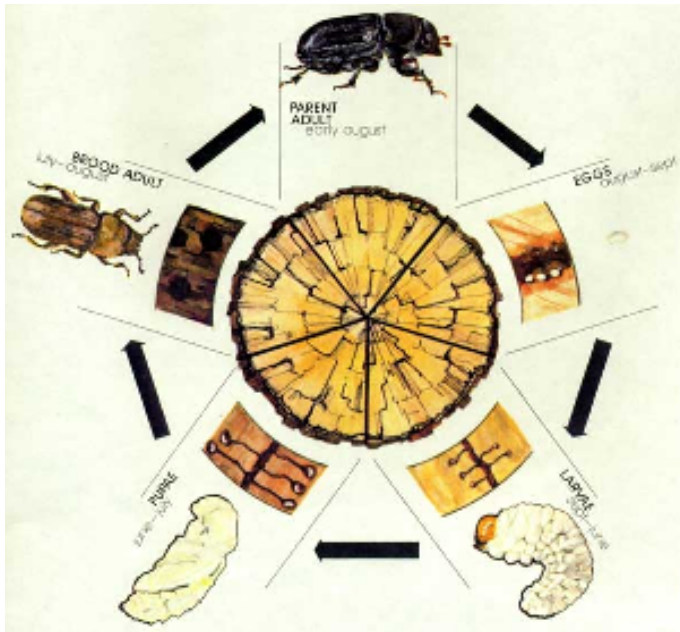


Figure 7: Mountain pine beetle life cycle.

Scientific Name: *Dendroctonus ponderosae*.

Hosts: Primarily lodgepole and ponderosa pines, but any pine species can be attacked. Introduced ornamental Scots pine is highly attractive to the beetle.

Most of its life cycle is spent underneath the tree bark where it typically takes one year to develop through egg, larva, pupa and adult stages.

Adult beetles fly during July and August attacking pine trees. Eggs hatch and larvae feed during the fall season. Immature larvae spend the winter underneath the bark. The following spring season larvae resume feeding and develop into pupae on the way to becoming the next generation of adult beetles that emerge during July and August.

Firewood

Care should be taken when firewood is cut and transported. The beetles can continue to develop under the bark of infested firewood and emerge to attack nearby pine trees. Standing dead pine trees that are completely grey-brown typically do not have living bark beetles. Trees attacked during the fall season harbor beetles until the end of August of the following year. Pine trees that are red during July and August may contain beetles. Trees cut for firewood can be inspected by removing some bark with an axe. Sign of old abandoned galleries is fine as long as there are no adult or larval beetles present (Figures 1 and 4).

Protection

Prevention is helpful but alone it may not be enough. High value urban pine trees can be protected from attack using a repellent pheromone (verbenone) or by spraying the tree trunks with an insecticide.

Verbenone

Mountain pine beetles produce attractive and repellent pheromone chemicals when attacking pine trees. The first beetles to attack produce an aggregation pheromone that attracts other beetles in the area to “mass attack” and overcome the host tree’s defenses. When the tree is full the beetles begin producing an anti-aggregation pheromone that prevents too many beetles from attacking the same tree. The anti-aggregation pheromone, called verbenone, is sold commercially. Verbenone is sold as a liquid pouch that is attached to the tree trunk, as the verbenone evaporates beetles in the area can smell it and they are repelled.

Two verbenone pouches should be attached to each high value pine tree, on the north facing side of the tree trunk about six feet high. The pouches should not be placed on top of each other, they should be spaced a few inches apart, one on the northeast side and one on the northwest side. The north side of the tree is cooler and prevents rapid evaporation of the pheromone. Commercial packaging may provide instructions for different regions in North America. In Montana MPB typically flies during July and August.

For best effectiveness verbenone pouches should be applied at the end of June, before July 1.



Figure 8: The repellent pheromone verbenone is sold as liquid pouches that are attached to the tree trunk. In forests verbenone is spaced and applied in a grid pattern. In urban settings, high value pine trees are protected by applying two pouches per tree at the end of June, before the first of July.

USDA Forest service research has found that two pouches of verbenone applied to each pine tree at the end of June protected 80% or more of the trees that were treated (see “verbenone report” link). Please note that these recommendations are for protecting small numbers of high value trees. Recommendations for deploying verbenone in forest and woodlot settings are based on numbers of pouches per acre of forest, please refer to the DNRC Forestry Division website (<http://dnrc.mt.gov/forestry/Assistance/Pests/mtnpinebeetle.asp>).



Verbenone is now sold at retail stores in Montana.

Verbenone is available at retail stores in Montana or directly through two companies in Vancouver British Columbia:

Phero Tech, Inc.
7572 Progress Way Box 50008,
Delta, B. C. Canada V4G 1E9
Phone: 604-940-9944
<http://www.pherotech.com>

Synergy Semiochemical Corp.
South Slope RPO
Burnaby, B. C. Canada V5J 5G3
Phone: 604-454-1121
<http://www.semiochemical.com>

Insecticides

Verbenone is non toxic and only affects the mountain pine beetle. It is easy to apply. However, it is not as effective as insecticides sprayed onto the tree trunk. Tree trunks need to be *covered thoroughly on all sides*, from ground level up to a stem diameter of about 4-5 inches. Trees can be treated from April through to the end of June. Several insecticides are available for controlling MPB: SevinXLR (agricultural/forest use), SevinSL (urban use), Astro and Onyx. All are 95-100% effective in protecting pine trees from MPB attack during the same year of application. Sevin can provide two years of protection, the year of application and the following year. Protection during the second year may be more variable, but applying Sevin once every two years may be more cost effective particularly for larger numbers of trees.

Trees must be sprayed protectively, before the beetles fly and attack. Spraying trees after they have been attacked will not save them. Beetles come into contact with and ingest the insecticide when boring through the bark. Previous studies have found that systemic insecticides are not effective against bark beetles. Registered pesticide applicators are recommended; when using an insecticide carefully follow the label instructions.

Summary

Is some sort of action necessary? This is not an easy question, it relates to the degree of risk and the potential consequence. In urban environments it is difficult to predict where the beetles may turn up. However, after the beetles have mass attacked a tree, the damage has been done and there are no reliable treatments to save it. The decision is really a balance between the risk that your trees will be attacked and killed and the cost of taking action to protect them without ever knowing whether they will be attacked.

Risk: How did the beetles find their way from forests to isolated shelter belts in 2008? Beetles can fly considerable distances, but they may also be aided by prevailing winds. Future occurrences in urban environments are difficult to predict. We do know that the mountain pine beetle infestation will continue for several more years in the surrounding pine forests. If your or your neighbor's trees were attacked in 2008, it is reasonable to think that the trees are at risk again during the summer of 2009. Mountain pine beetles live in forests, the closer your location is to an infested forest, particularly if it is downwind, the greater the risk.