

## Mountain Pine Beetle Frequently Asked Questions



Boulder District  
5625 Ute Highway  
Longmont, CO 80503  
(303) 823-5774  
Fax: (303) 823-5768

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**1. Q: “How do Mountain Pine Beetles kill trees?”**

MPB feed primarily on the inner bark (phloem tissue). This has the same effect as girdling (peeling off the bark) of the tree. Damage caused by the feeding acts as an internal tourniquet cutting off the flow of nutrients from the needles to the other parts of the tree. As the damage progresses, sugars and other complex compounds cannot be translocated downward from the needles to nonphotosynthetic areas of the tree. The beetle can also introduce a bluestain fungus which grows into the wood (xylem). This fungus prevents water from being transported upward to the needles. Both of these factors contribute to the decline and death of colonized trees.

**2. “What caused the current MPB outbreak?”**

The current level of MPB mortality has resulted from a combination of natural factors including, but not limited to; weather impacted trees (drought, mostly), heavily infested mistletoe or root pathogens, mechanically damaged by construction or soil compaction, dense forest stands, and relatively large quantities of MPB. Human activities such as fire suppression, past forest management practices, and urbanization also have contributed to current conditions. These factors all influence the amount of water, light, and nutrients available to individual trees in the forest. Trees not receiving enough of these resources become stressed. MPB can detect stressed, susceptible trees and they respond by colonizing it.

**3. Q: “Where did the infestation in Colorado start?”**

MPB has always been present somewhere in Colorado. During low periods (called “endemics”) in their normal cycling, MPB would be found in stressed trees. Thus there is not an “epicenter” from which a statewide infestation started. Locally, the so-called “focus trees”, like a lightning strike or root disease tree, may be responsible for sustaining a population and “tiding it over” until general conditions to it’s liking allow a true outbreak involving large numbers of trees.

**4. Q: How do MPB select a susceptible host tree?”**

Stressed pine trees emit volatile compounds (turpenes). MPB have evolved to detect these compounds and use them to identify suitable host trees. Many insects communicate with other insects by emitting pheromones (chemical compounds that trigger a specific behavior). Once a bark beetle has located and colonized a susceptible host tree, it emits an aggregation pheromone that attracts other beetles. After enough bark beetles are attracted to that tree, beetles emit an anti-aggregation pheromone signaling them to locate another host tree. In this way, it is thought that bark beetles partition available food among the population.

**5. Q: “Does the pine beetle attack other types of trees?”**

MPB normally attacks ponderosa pine, lodgepole pine and limber pine in Colorado. Other species that have been attacked include Scots (=Scotch) pine, Austrian pine, and rarely, pinyon pine and Douglas-fir. Ornamental Scots, Austrian and perhaps other pines in situations where they are exposed to large numbers of emerging beetles, may be at risk (such as within a half-mile of sawmills, firewood dealers, etc.).

**6. Q: "How long is it between epidemic cycles?"**

There is no regular periodicity to high populations, but on average a given area of ponderosa or lodgepole pine might be expected to experience beetles every 10 to 50 years.

**7. Q: "Did the recent cold weather kill the beetles and end the epidemic?"**

If below the bark temperature reaches -4 F for a few days straight, the beetles may be killed. This usually requires outside-the-bark air temperature to be at or below about -30 F. We rarely get such conditions, even in the mountains, but they have occurred and high beetle populations have collapsed because of them. Abnormally cold weather in fall or spring can have an effect, but would have to be more severe than the brief early or late frosts we often experience in Colorado.

**8. Q: "As the beetles are attracted to fresh-cut wood, how close to flight time can I cut trees & still avoid drawing beetles to my property?"**

For small landowners: cutting should not be done during the actual flight period. (July 15 to September 15). It would be good to have a minimum of one month for any cuts to dry prior to flight and mid-May would be an even better cutoff. Often such dates are impractical.

For large landowners, the forest health or fire mitigation benefits of cutting ought to outweigh the increased risk of MPB infestations.

**9. Q: "When will the beetles fly this year?"**

In Colorado, the normal flight period (defined as when beetles leave infested trees and attack green trees) in ponderosa pine forests is July 20th thru September 10th. For lodgepole pine forests it is about July 10th thru September 1st. Rarely does this vary much because of the insulating properties of the thick bark on mature trees which MPB normally attacks.

**10. Q: "How far do the beetles fly?"**

Upon leaving their "childhood" tree, beetles usually only fly as far as required to find another suitable tree to attack. The tree chosen for attack may be right next to the old one, or may be up to about a mile away. One mile is considered a safe distance to segregate infested logs from susceptible trees.

MPB flights in excess of 5 miles have been documented, but probably involve strong winds. Infestations that occur in areas more than this distance from an infestation almost always involve some human assistance usually in the form of infested firewood into a new area.

**11. Q: "Can you tell me where the beetles that killed my tree came from? (Which direction do beetles fly in relation to wind direction?)"**

Beetles normally fly upwind toward a source of attractant pheromones. In Colorado winds vary with the terrain, time of day, and direction of weather fronts. In other words, they are very unpredictable. If prevailing winds are strong enough, it is conceivable flying beetles could be carried downwind, regardless of pheromone sources they would prefer to locate. It is not possible to determine where beetles came from, short of experimental application of chemical markers prior to flight and retrieval following flight.

**12. Q: "What are the early signs bark beetles have colonized a tree?"**

Fading of the needle color is the primary early sign of colonization by bark beetles. The needles fade from dark green to pale green to straw yellow to a rusty red. The progression from green to red will take several months. Other signs are pitch tubes, boring dust, and galleries (tunnels under the bark). Pitch (resin) is the tree's only natural defense against bark beetles. Beetles colonizing relatively healthy trees will usually create pitch tubes where the beetle entered the tree. If the tube is connected with a tunnel that

continues into the bark, then that beetle successfully entered the tree. Fine boring dust is sometimes visible and caused by bark beetles chewing the bark to enter the tree. During initial colonization, the boring dust is bright red. To inspect for galleries, you can remove a portion of the bark with an axe. Galleries should be visible within the bark and may contain larvae, pupae, and/or adult beetles on recently killed trees. One or all of these signs or symptoms may be present.

**13. Q: “Are pitch tubes an indication of a successful attack?” (“How many pitch tubes indicate a tree will die?”)**

Not all pitch tubes look alike. People experienced in detecting MPB trees can look at the shape, pattern, color and pitch tube features and say with 75% certainty whether an attack was successful or not. For most people, however, the message conveyed by seeing pitch tubes should be “beetles visited the tree”. Nothing more, nothing less. The presence of pitch tubes should be combined with other external symptoms of attack (boring dust, woodpeckering and foliage discoloration) and internal symptoms (beetle eggs, larvae, pupae or adults plus galleries and bluestaining) to decide whether the tree can safely be identified as a successfully-attacked MPB tree.

There is no number of pitch tubes which signifies a successful attack. Large, moist trees with 100’s of pitch tubes may survive (although it is not likely). Also, some very dry trees produce no pitch tubes after being successfully attacked.

Generalities about pitch tubes:

- They occur wherever a pair of beetles attacks a reasonably moist, live tree (usually the trunk from the ground up to where it narrows to 6 inches in diameter).
- Reddish pitch tubes are more likely to indicate successful attack than white ones. Pitch tubes with lots of tan or reddish-brown boring dust incorporated into the pitch are more likely to be associated with successful attacks.
- If pitch tubes are noted only at the very base of the tree (i.e. no higher than 3 feet or so), they were probably the result of red turpentine beetle (*Dendroctonus valens*), not MPB.

**14. Q: “If I see bluestain, the tree has Mountain Pine Beetle for certain, right?”**

Not necessarily. While MPB is overwhelmingly the most common source of bluestain found in large diameter ponderosa and lodgepole pine trunkwood, other bark beetles, and even some other types of insects and mites, can be responsible for vectoring bluestain fungi. Included in this group are ips beetles, twig beetles, red turpentine beetle, and other pine-infesting beetles in the genus *Dendroctonus* (such as roundheaded pine beetle-*D. adjunctus*, larger Mexican pine beetle-*D. approximatus*, western pine beetle-*D. brevicornis*). Wood borers in the families Cerambycidae and Buprestidae may inadvertently carry spores of bluestain fungi, as many insects and mites that occur secondarily in beetle-killed trees. The appearance of blue stained wood on two opposite sides of a tree in conjunction with MPB galleries and beetles is the best indicator of a successful MPB attack.

**15. Q: “How do I decide whether I should have my trees preventively sprayed? (Which trees are most susceptible?)”**

First, there should be a local threat of MPB attack. It makes little sense to “immunize” trees against a threat that doesn’t exist at present. A good rule of thumb is that if red, beetle-killed trees exist within sight of the trees being considered for treatment, a threat exists. Second, the trees being considered should be big enough to be attacked. That is, they should be at least 8 inches in diameter at eye level. Smaller trees are occasionally attacked, but preventively spraying 6 or 7-inch trees is not worth the low risk of attack.

Thirdly, the trees being considered should be of high-value. Fourth, how much does the owner want to spend and what price has been quoted?

**16. Q: “Does preventive spraying harm the birds?”**

We should never say never when it comes to pesticides, but evidence over the past 20 + years suggests that the materials approved for this purpose have negligible impact on birds when applied the way the label stipulates. Preventive sprays are applied to the lower 30 feet of the trunk. The architecture of pines allows this area to be treated with minimal spray reaching the branches and foliage (where birds—nuthatches, creepers, woodpeckers & other cavity-nesters aside—would be more apt to nest and forage for food). The trunks of preventively sprayed trees do not harbor bark beetles, so birds which eat them occur there infrequently. On the other hand, let’s face it: no pesticide is going to do any bird good.

**17. Q: “Do I need to leave the area when they come to spray my trees?”**

You do not need to leave. If you are in the house when spraying is occurring, close the windows and turn off the air conditioning or other devices that draw in outside air. During non-rainy weather, preventive spray dries within two hours of application. After this time, normal activity can resume. Just to be safe, children and pets should be kept out of the area for this period. Anyone with chemical allergies or sensitivity should consult with his/her physician prior to arranging for spraying. Ask the company doing the work to provide a label or Material Safety Sheet for the chemical they intend to use.

**18. Q: “How late can I preventively spray?”**

Preventive spraying should be completed well before the expected start of flight. Our usual date for having this done is July 1<sup>st</sup>. With flight commencing as early as July 15, this gives two weeks leeway. As stated above, as long as beetle flight is still going on and the tree to be protected is still unattacked, it could be performed. Obviously, the longer into the flight period one waits, the greater the chance spraying will not be done in time. Also, the cost must be weighed against the risk of attack. For example, if we say the flight is usually over by mid-September, what is our advice to a homeowner who wonders about spraying on September 3<sup>rd</sup>? Chances are if the tree has made it to this date unattacked it will be OK. But a very slight risk still exists because a few beetles are still flying. In such a case, the homeowner must make the call. If the tree is very valuable, then they may want to spray. Preventive spray is quite effective for one year.

**19. Q: “Is permethrin (Astro) as good as carbaryl (Sevin XLR)?”**

Testing by US Forest Service research personnel indicate that it is effective and long lasting. In terms of its track record in Colorado, perhaps the jury is still out. This is simply because permethrin has not been used to treat huge numbers of trees over a number of years, the way carbaryl has. Permethrin is fully legal and has been used for this purpose for about 5 years. Indirect measures of effectiveness, such as “call backs” from unsatisfied customers, seem to be about as low as with carbaryl. There have been a few cases of spraying failures where permethrin was used, but it is tough to know if these are actual chemical failures or faulty application. Until further evidence surfaces, CSFS recommends both permethrin and carbaryl for the purpose of MPB prevention. Both can be applied anytime between the onset of warm weather in late spring and beetle flight in mid-summer (usual cutoff date is July 15, but could continue into the normal flight period as long as preceded by a check to see that the tree to be sprayed has not been attacked AND the date indicates more beetle flight could be expected (flight usually ends by mid-September).

**20. Q: “How much does it cost to have a tree preventively sprayed?”**

This varies by the company, the distance of the trees from the contractor’s base, the number of trees to be sprayed, and the size of the trees. However, an average susceptible pine (14” in diameter and 45 feet tall) should cost in the range of \$10 to \$25. Trees need to be treated only once per year [treatments for minor bark beetles like ips and twig beetles which have more than one generation per year and which can attack branches in the outer tree crown, may require two treatments per year (April and July)].

**21. Q: “Can I apply preventive spray myself?”**

Yes. You will need to spray high enough (30 feet or to 6-inches in diameter, whichever comes first). You will need to spray all sides of the trunk and be sure to ensure your safety against falls and inadvertent spraying. All of the above can and have been accomplished by using a step ladder, a small pump-up hand sprayer, goggles, gloves, hat and perhaps an apron.

**22. Q: “Can I do something to save my tree once it has been mass-attacked?”**

Essentially, no. There is no chemical that can be injected into the tree to kill the recently entrenched beetles because the beetles disrupt the tree’s very system of “pipes” required to distribute the chemical.

**23. Q: “What are the natural enemies of Mountain Pine Beetle & why d don’t they keep it in check?”**

Mountain pine beetles are preyed upon and parasitized by a host of other organisms. Woodpeckers are perhaps the primary group, with Hairy, Downy and Three-toed woodpeckers being the most important species. (The Northern Flicker, which is a common large species of woodpecker in Colorado, feeds primarily on ants.) Among the insects, clerid beetles, ostomid or bark-gnawing beetles, darkling beetles, colydiid beetles, Medetera flies, robber flies, ichneumonid wasps, braconid wasps, and aulacid wasps are among the most important predators and parasitoids. Some of these specialize in capturing adult bark beetles outside the tree; others seek and destroy larvae within the galleries. Also many of the wood-boring beetles share the inner bark area with bark beetles and, as such, outcompete bark beetles for phloem and/or consume larvae in their path.

These organisms regulate populations during endemic periods and are often very much responsible for contributing to the end of epidemics. But when host tree conditions are right for large bark beetle population build-ups, natural enemies just don’t seem able to prevent an outbreak as we would sometimes like. It takes them several seasons to respond and achieve limiting numbers. By their nature birds are often territorial. This limits their density, particularly during the nesting season. During winter, woodpeckers may occur in higher than normal numbers within infested areas and assert effective population controls.

**24. Q: “What is the status of Lindane & Dursban?”**

Lindane is no longer being used within the US. The re-registration process required by the EPA at the time was too costly for the manufacturer to justify in light of recent sales. Certain labels (Prentox-20 Lindane and Isotox Lindane) are legal to use and, if located, could be applied against MPB in Colorado. All indications are that most existing stocks have been used up and will not be available for treatments after 2000.

Certain formulations of Dursban (Chlorpyrifos) allow its use on bark beetles. Thus, it would technically be legal to use against MPB. It is commonly used for bark beetle control in other parts of the US (for example, against southern pine beetle in the Southeast). However, research conducted to date does not

indicate its effectiveness against MPB in Colorado. As such, CSFS is reluctant to recommend it at this time.

**25. Q: “Do infested logs that have been sprayed need to be covered with plastic?”**

If the entire bark surface was sprayed to the point of runoff with a material approved for spraying infested logs (i.e. certain formulations of Lindane, or perhaps Dursban), then the wood does NOT need to be covered to enhance the killing efficiency. The normal mode of death for beetles under the bark of sprayed trees is for them to attempt emergence, bore through the sprayed bark, and ingest chemicals in the process. Some beetles also die under the bark before emerging by way of vapors, but this is not the primary way surface sprays work. Thus, covering does not really boost the effectiveness of properly preformed spraying. If there is incomplete bark coverage from spraying, covering would entrap a few of the individuals that emerged thru the unsprayed bark. But remember, the MPB is fully capable of chewing through plastic. Some do, some don't. We are not sure what is going on when people find beetles under the plastic. The beetles obviously made it out of the log but failed to escape the plastic. It appears that either the plastic is taut enough to prevent beetles from getting leverage on the plastic when trying to chew out, or temperatures under the plastic were raised to lethal levels immediately following beetle emergence.

The only reason to cover properly treated wood would be to serve as a barrier between the wood and children, pets, or wildlife. Remember to clean up the plastic before it becomes forest litter.

**26. Q: “Can I burn Lindane treated wood in my fireplace?”**

The standard recommendation received from the EPA is that treated wood should be stored outside for at least 3 months prior to burning. Burning should take place in a well-vented fireplace. As a precaution, wear gloves when handling wood and do not let children play in or on the wood. Preferably store the wood uncovered.

**27. Q: “Does solar treatment really work?”**

Yes, but only if it is done correctly. It can be done either with or without plastic. **Limbs do not need to be treated.**

If plastic is used, use a type that is clear and at least 6 mils thick. The logs should not be stacked on each other. The treatment need to be installed so that the logs receive at least two months, preferably three, of warm weather under the plastic prior to flight. This means getting the logs cut, oriented and covered by May 1<sup>st</sup>. Watering the logs prior to covering and sealing the edges with soil will help promote moth growth. Seal all holes and rips with duct tape.

Without plastic, the logs need to be limbed and bucked into 8-foot pieces or less and placed in a sunny location in a one log-high arrangement. They need the full three months of warm weather (that is, in place by May 1<sup>st</sup>). The logs need to be rolled once after one month of solar treatment and then again after another month (i.e. place them out on May 1<sup>st</sup>, roll them one-third of a turn on June 1<sup>st</sup>, and roll them again for one-third of a turn on July 1<sup>st</sup>).

Techniques to avoid: do not stack the wood more than one log high; do not leave rips in the plastic unsealed; do not expect this to work if only a few weeks remain between treatment and flight; do not pile limbs or other slash on top of the plastic to hold it down; don't forget to roll uncovered logs; do not attempt this in a shady location or on a north-facing, steep slope; do not add a “No-Pest” strip under the plastic for additional killing power (this has been tried and proved ineffective); do not use black plastic

(the plastic get good and hot but the logs don't); do not use plastic that is old or otherwise prone to rapid breakdown under exposure to ultraviolet light.

**28. Q: “What about the Pest Control Act? (How much is the County going to bill me?)”**

Colorado’s Pest Control Act provides a mechanism for a local community to declare a certain insect, such as MPB but not limited to MPB, a “pest” and provides a legal means to arrive at compliance to accepted procedures for cleaning up the problem. The enforcement of the act is vested in County Government. Under the Act, a citizen living within an area designated by the county can file a complaint about pest conditions on another property. The county can do necessary work and bill the owner up to the amount of \$5000. In the event that a county is asked to take action against a citizen who can not afford the needed actions, the law allows for exceptions to be worked out. Also, the law is not really designed for citizens to force beetle control actions on neighboring large ranches or public lands, where other actions such as forest management and salvage harvests might be more appropriate. But there is always the possibility that it will be tested in this way.

**29. Q: “Does carrying infested wood on truck spread it along the route?”**

Research shows that beetles do not emerge and infest trees along a haul route.

**30. Q: “Will the Government come and take care of my trees for me?”**

The days of massive government direct control programs, where state and federal crews identified, cut and treated large numbers of beetle-infested trees on private land are probably over. That does not mean government assistance does not exist, however. At this time, help from forestry agencies is limited to technical assistance up to the point of cutting and treating infested trees. CSFS policy is to help in any way we can to assist landowners in understanding the beetle, make informed decisions, identify infested trees, and get them treated themselves or with contractors. We will serve as a liaison with the USFS, neighbors, cutting and spraying contractors and suppliers of treatment materials. Printed material is available from CSFS and the CSU Cooperative Extension Service. CSFS will provide training upon request in all aspects of MPB biology, prevention and treatment. Group instruction will be given preference over individuals, simply because of the sheer number of people making requests. CSFS and private consultants are available to write forest management plans that can provide long term resistance from epidemic attacks. When in doubt about beetles and what is available in the way of help, contact your local office of CSFS.

**31. Q: “Do pine beetles bite or otherwise hurt you? (Why do they have those really long antennae? Is that a pine beetle I hear munching in a tree?)”**

Mountain pine beetles are harmless to people. The insects with the really long antennae, or heard munching in the wood pile, are called longhorned wood borers (family Cerambycidae). There are several species of these that might be expected in association with MPB. The most common ones are called “pine sawyers” and are in the genus *Monochamus*. They are also sometimes mistaken for an exotic pest of deciduous trees from China (recently in the news causing problems in Chicago and New York) called the Asian Longhorn Beetle (*Anoplophora glabripennis*). Pine sawyers and other conifer-feeding borers come in as part of the natural decomposition process after MPB and are called “secondary” attackers. They make conspicuous sounds in wood piles, chew fairly large holes in the wood and produce large amounts of “sawdust” under infested logs. They have jaws that are strong enough to pinch but essentially are also harmless.

**32 Q: "How can we protect the remaining ponderosa pines on our property?"**

Un-colonized trees can be protected using tree methods: 1) deep infrequent irrigation; 2) application of preventative insecticides; and 3) thinning of the stand.

**33. Q: "Are thinned and healthy trees still at risk?"**

Yes. If populations of MPB become so great, no tree is 100% safe from colonization. Deep infrequent irrigation, stand thinning, removing colonized material, and preventative pesticide applications simply increase the probability that any given tree will survive an outbreak.

**34. Q: "Will all the MPB damaged trees presently in the forest make it vulnerable to fire next year?"**

Yes. The dried red needles are a serious fire risk. If a fire were to reach the crowns of a continuous stand of dead trees, it would spread quickly. Crown fires spread very quickly and are much more difficult to suppress than ground fires. The dead, beetle-killed wood is a heavy fuel and once ignited, it would burn very hot. Once these fire conditions occur, a fire creates its own weather system spreading quickly as firebrands are carried upward in the convection column and fall a long distance creating new spot fires. A crown fire in our beetle-killed timber would be catastrophic.

Eventually the needles will fall to the ground and the initial risk will be reduced. However, the trees will begin breaking apart and increase the fuel load on the forest floor. This can create a fuel ladder, increasing the risk of a fire going from the ground into the tree crowns. Again, crown fire could result. The amount of energy in the heavy branches and tree trunks would increase fire intensity and again be very dangerous and difficult to suppress.

**35. Q: "Will soil erosion be a problem in the forest after all the damaged trees are removed?"**

In most areas, the grasses, shrubs, and residual trees should provide enough ground cover to prevent accelerated soil erosion. Where there are enough large areas of bare ground, seeding with native grasses will most effectively prevent excess erosion. These should be seeded in June. Irrigation during the first growing season will increase success of grass seeding.

**36. Q: "What will be the long-term impacts of a MPB outbreak?"**

The risk of catastrophic wildfire is increased in areas where MPB killed trees are not removed (see question 34). Other long-term impacts are largely unknown. However, potential negative impacts could be: loss of soil due to accelerated erosion; increases of invasive plant species in response to disturbance; decreases in real estate value on properties where tree losses were very high.

The disturbance caused by bark beetle mortality will undoubtedly change vegetation characteristics. Many of these changes could be perceived as beneficial to the impacted ecosystems. A significant reduction in woody species will likely be accompanied by an increase in native herbaceous species such as grasses and forbs. These species have reduced water consumptions and are desirable forage for wildlife. In addition, grasses have fibrous root systems that stabilize soil and aid in soil development. The reduced water consumption could also result in increased water yields from impacted watersheds. This increase in water yield could potentially help recharge local and regional aquifers. Other potential ecosystem benefits will certainly be recognized over time.