








Mountain Pine Beetle
Dendroctonus ponderosae



MOUNTAIN PINE BEETLE




General	Order: Coleoptera Family: Curculionidae
Impacts	<p>Mountain Pine Beetle is a bark beetle that attacks pine trees. The beetles feed under the bark. Beetles carry the spores of the blue-stain fungus in their mouths and trees become infected as the beetles feed. The resulting damage disrupts the flow of water and nutrients and causes the trees to die.</p> <p>Beetle populations fluctuate from low level endemic populations to wide-spread epidemic levels with an estimated 8-to-20-year interval. Maintaining the health of the forest depends on proper thinning and including a mixed stand of types and ages of trees.</p>

SYMPTOMS

<p>Fading</p> <p>Late Spring to early Summer</p> <p>Foliage starts to fade to yellowish green/reddish throughout the entire tree crown about 8-10 months after the trees are attacked. The trees eventually turn reddish.</p>		<p>Pitch Tubes</p> <p>Late Summer through Spring</p> <p>Trees increase sap flow as a defense to try to fight off infestation. Pitch tubes develop and can be seen on the trunks of trees.</p> <p>Sometimes the tree can expel the adult beetle early in an attack.</p>	 
<p>Blue-stain Fungus</p> <p>Beginning in Fall</p> <p>The fungus forms spores in the pupal chambers. The new adults feed on the spores and carry the fungus with them as they move into new host trees. The fungus moves into the inner bark and sapwood. The vessels that move food and water within the tree become clogged and the tree dies.</p>		<p>Galleries</p> <p>Late Summer to Spring</p> <p>The female creates a vertical gallery as she feeds and moves upwards. She lays eggs in galleries and as eggs hatch the larvae begin to feed and form new galleries at right angles to the main gallery.</p>	

LIFECYCLE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Egg												
Larvae												
Pupae												
Adult												

Egg		Late July to early Fall	Females lay eggs in galleries perpendicular to her vertical gallery. Eggs hatch about 10-14 days later.
Larvae		Fall to early Summer	Larva hatch from the eggs in early fall. They feed under the bark throughout the winter and spring. in galleries at right angles moving away from the vertical gallery.
Pupae		June to July	Larvae transform into pupae in June-July. Adults emerge from the pupae and exit the tree.
Adult		Late June to mid-Sept	New adults fly and infest new trees. Females excrete an aggregating pheromone that attracts males and other females. Females and males pair up and mate in nuptial chambers under the bark.

CONTROL

Note: These control methods focus on trees infested with MPB. These trees have green needles but also have signs of infestation (frass, pitch tubes, blue-stain, etc.). **Trees that turned red last season no longer are a threat of spreading the beetle.**

Timing	Notes
October 1 st through April 15 th	<p>Option 1 - Solar (No Plastic) - Trees must be cut and logs stacked by April 15th</p> <ol style="list-style-type: none"> 1. Cut infested trees down. The remaining stump height should not exceed six (6) inches measured from the side next to the highest ground, except when this is not practicable. 2. Remove limbs and scatter, chip or masticate. 3. Cut trunk into lengths four (4) feet long or shorter. 4. Find the sunniest location possible on your property and stack logs no more than one log high. 5. Logs must be turned every 30 days to allow all sides to be heated.

CONTROL

October 1st through May 15th

Option 2 - Solar with Clear Plastic - *Logs must be covered by May 15th*

1. Cut infested trees down. The remaining stump height should not exceed six (6) inches measured from the side next to the highest ground, except when this is not practicable.
2. Remove limbs and scatter, chip or masticate.
3. Cut trunk into lengths four (4) feet long or shorter.
4. Find the sunniest location possible on your property and stack logs no more than one log high.
5. Dig a trench around the stack of logs.
6. Cover the logs with a tarp of clear plastic of at least six (6) mil. thickness. Do not use black plastic.
7. Seal around the base of the stack with soil. Repair any rips.
8. The plastic should remain in place for at least three months – or longer. Dispose of the plastic properly.

October 1st through June 15th

Option 3 – Debarking - *Must be completed by June 15th*

1. Cut infested trees down. The remaining stump height should not exceed six (6) inches measured from the side next to the highest ground, except when this is not practicable.
2. Remove limbs and scatter, chip or masticate.
3. Remove the bark using a chainsaw attachment, draw knife or ax, etc.
4. Bark removal will be easier if the trees are felled and allowed to age for a short time.

Note: Moving infested wood spreads the beetle. Infested wood should not be moved from the property until treatment is completed and all stages of the beetle have been eliminated.

CONTROL – LARGER PROPERTIES

<i>Timing</i>	<i>Notes</i>
October 1 st through June 1 st	<p>Mastication</p> <ol style="list-style-type: none"> 1. Mastication uses specialized heavy equipment to shred, chop, or chunk vegetative materials. The resulting biomass is left onsite. 2. Mastication may be an option on accessible properties. Not appropriate on slopes greater than 35-55%. 3. Mastication will cause soil disturbance and may result in noxious weed encroachment. List A and B noxious weeds are required to be controlled; List C and Watch List species are recommended to be controlled. 4. Thick layers of masticated materials may inhibit growth of desirable vegetation. 5. During MPB outbreaks, mastication is best done October to June 1st
October 1 st through June 1 st	<p>Chipping</p> <ol style="list-style-type: none"> 1. Cut infested trees down. The remaining stump height should not exceed six (6) inches measured from the side next to the highest ground, except when this is not practicable. 2. Trees should be immediately chipped onsite. Moving cut logs with live MPB is prohibited. Once chipped, the chips may be hauled offsite. 3. Chips left on site should not exceed a depth of 4 inches. Landowners should review their property insurance requirements which may differ..

CONTROL – LARGER PROPERTIES

October 1st through June 15th

Burying

1. Cut infested trees down. The remaining stump height should not exceed six (6) inches measured from the side next to the highest ground, except when this is not practicable.
2. Logs with live MPB can be buried under at least 8 inches of soil. Ensure that there are no gaps or openings.
3. If disturbing more than 0.5 acres, contact the Jeffco Planning and Zoning office to see if a Grading Permit is necessary. <https://www.jeffco.us/3978/Engineering-and-Earthwork#disturbance>
4. Disturbance will most likely result in noxious weed encroachment. List A and B noxious weeds are required to be controlled; List C and Watch List species are recommended to be controlled.
5. Reseeding disturbed sites with native grasses and forbs is recommended to prevent erosion.
6. Burying should occur between October and June 15th

Note: Moving infected wood spreads the beetle. Infested wood should not be moved from the property until treatment is completed and all stages of the beetle have been eliminated.

PREVENTATIVE TREATMENT

Note: These treatments are preventative and focus on trees not yet infested.

<i>Technique</i>	<i>Timing</i>	<i>Method</i>
Forest Health	Anytime. During outbreaks, cutting is best between October to June 15 th	<p>Creating and maintaining a healthy forest will make it more resilient to insect pests and wildfire. Healthy forests are less attractive for beetles to attack and are more likely to repel attacks at low levels.</p> <p>Preventative activities to promote tree health and diversity include:</p> <ul style="list-style-type: none"> • Thinning dense stands to reduce competition for resources • Establishing a multi-aged stand • Creating a mixed-species forest <p>Bark beetles are attracted to the volatiles released by cut wood so avoiding cutting 1 month before and during flight is recommended.</p> <p>Landowners may want to consult with a professional forester for help in developing a forest management plan.</p>
Insecticide	<p>Early spring – May to June 15th</p> <p>Carbaryl (Sevin and others)</p> <p>Permethrin (Astro, Dagnet and others)</p> <p>Bifenthrin (Onyx)</p>	<p>High value trees can be treated with insecticide. The entire trunk needs to be treated to a height where the tree's diameter is 4-6 inches. Under heavy beetle pressure, it may be necessary to treat higher into the tree.</p> <p>It is not recommended to treat large swaths of trees.</p> <p>Insecticides are applied to living green trees to kill or deter attacking beetles. This preventive spray is generally effective through one MPB flight (one year).</p> <p>There is no chemical treatment available for treating cut logs.</p>
	Injectable Emamectin benzoate	Not currently recommended. This method is not yet proven to provide protection on pines in our region. Studies are ongoing.
Pheromone	Deploy late May to June 15 th Verbenone	<p>An anti-aggregate pheromone used to repel adult beetles before they burrow into trees. DOES NOT KILL THE BEETLES. Must be used according to the registered label.</p> <p>Effectiveness is greatly reduced during times of high populations. Packets are stapled to the trunks of trees and remain active for 90-120 days. The number of packets and the dispersal pattern will depend on the individual site. Best used as part of an integrated management approach including maintaining a healthy forest and removal-treatment of infested trees.</p>

Use all chemicals according to the manufacturer's label. The label will provide specific instructions including allowed sites, application methods, rates, storage, re-entry requirements and personal protective equipment. No specific recommendation or endorsement is made or implied by listing the above methods or products.

RESOURCES

CSFS - <https://csfs.colostate.edu/forest-management/common-forest-insects-diseases/mountain-pine-beetle/>

USFS - https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5299324.pdf

Negron, Jose & Cain, Bob. (2018). Mountain Pine Beetle in Colorado: A Story of Changing Forests. *Journal of Forestry*. 117. 10.1093/jofore/fvy032.

www.researchgate.net/publication/328408878_Mountain_Pine_Beetle_in_Colorado_A_Story_of_Changing_Forests

PHOTO CREDITS

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Pupa and Trees - USDA Forest Service - Region 2 - Rocky Mountain Region, USDA Forest Service, Bugwood.org