Western Montana Forest Insects & Diseases

A GUIDE TO IDENTIFICATION AND MITIGATION



The Montana Department of Natural Resources & Conservation

Ponderosa Pine Diseases

Ponderosa pine is susceptible to various diseases affecting foliage in the crown. Common diseases include diplodia, elytroderma and western gall rust. Symptoms can be similar and multiple diseases commonly occur in a single tree. Generally, diseases cause branch and tip dieback but do not kill the tree. Ongoing, severe infection can compromise tree vigor.

Diplodia

Diplodia shoot and tip blight is a fungus that infects ponderosa pine and is spread by rain splash and wind. Infections rarely cause mortality but can lead to the death of individual branches. Latent infections can be dormant until triggered by drought stress or hail injury.

Identification:

- Dead branches appearing as orange patches of foliage in tree crown.
- Grey needles remain attached to the branch after death.
- Patches of orange needles.



Diplodia in ponderosa pine tip

Elytroderma:

Elytroderma needle cast is a fungus that causes branch deformities, needle discoloration, and needle loss in ponderosa pine.

Identification:

- Curved clusters of needles, often with accumulations of dead needles.
- Red-orange needles with green at the base.
- Thin, black spores at base of needles.



Elytroderma in ponderosa pine

Ponderosa Pine Diseases

Western Gall Rust:

Western gall rust infects ponderosa and lodgepole pines, creating round swellings on branches or distortions on the main stem. Infections on the main stem known as a “hip canker” can be a weak point. Individual, infected branches eventually die and cumulatively reduce overall tree vigor.

Identification:

- Round swellings/galls on branches.
- Bright orange spores on galls in spring.
- Dead branches, visible from a distance as orange or brown needles.
- Flared cankers on main stem, commonly referred to as “hip cankers”.



Sporulating western gall rust on pine



Hip canker caused by western gall rust

Management:

- Thin stands to reduce competition and promote individual tree vigor.
- Favor a diversity of non-susceptible tree species such as Douglas-fir and western larch, especially in areas where ponderosa pine diseases are chronic and severe.
- Do not fertilize; excess nitrogen can exacerbate infections.

Mountain & Western Pine Beetle

Mountain pine beetle and western pine beetle are two different species of bark beetle that attack ponderosa pine in western Montana. Mountain pine beetle also attacks other pine species, including lodgepole. Bark beetles mass attack by sending a chemical message that rallies additional beetles to overwhelm a single tree. They bore under the bark where they lay eggs, and then larvae excavate distinct galleries as they feed. Within a year, larvae develop into adults and attack new trees. Trees generally die within a year of a successful attack.



Mountain pine beetle gallery

Identification:

- Masses of pitch ("pitch tubes") may be present at the entry holes but accumulations of boring dust in bark crevices are the most reliable indicator of infestation.
- Presence of white larvae (1/4") or brown adult beetles, approximately the size of a grain of cooked rice.
- Crowns of infested trees may be green, and usually turn red after beetles have emerged from the tree.
- Mountain pine beetle make long, vertical galleries; western pine beetle galleries are circuitous.



Western pine beetle gallery

Management:

- Thin dense stands prior to a beetle outbreak to promote vigorous, well-spaced trees that are less vulnerable to attack.
- Identify and remove beetle-infested trees. Look for boring dust and pitch tubes, particularly in trees with green crowns.
- Do not leave infested wood on site. Beetles will continue development, even in firewood, and emerge the next year to attack nearby trees.
- Diversify the age and size classes of pine in stand. If possible, diversify tree species as well.
- Verbenone is a commercially available repellent that only deters mountain pine beetle. Following all label instructions, apply capsules throughout high value stands or on individual trees by July 1 to deter beetles emerging mid-July.

Red Turpentine Beetle

Red turpentine beetle preferentially attacks ponderosa and lodgepole pines that are fire-scorched, diseased or injured. Red turpentine beetles can occur with other bark beetle species within a single tree. They generally do not kill trees and only infest the lower six feet of the tree.

Identification:

- Masses of red-orange pitch in lower six feet of main bole of tree.
- Chamber engraved under bark (different from the distinct galleries carved by other bark beetles).
- Generations can overlap with presence of brown adult beetles or small white larvae, both approximately 1/4 inch long.
- Crowns of infested trees remain green.
- Presence of reddish-brown boring dust at the base of tree.



Pitch tubes created by red turpentine beetle attacks



Red turpentine beetle pitch tubes

Management:

- Avoid tree damage, particularly fire scorch, mechanical injury and soil compaction.
- Thin stands to reduce competition and promote individual tree vigor.

Pine Engraver Beetle (Ips)

Pine engraver beetles (also known by their Latin name, Ips) attack pine trees, particularly lodgepole and ponderosa. They primarily inhabit fresh slash and logs, but offspring can emerge to attack surrounding trees. Pine engravers can kill small diameter trees and cause top kill in larger trees.

Pine engraver beetle habitat is created when pine slash, logs, or wind-throw accumulates in the winter-spring and retains enough moisture to support beetles into the spring-summer. Branches and debris less than three inches in diameter are too small for beetle development. Therefore, chipping, mulching, and lop and scatter techniques do not pose a significant problem.

Identification:

- Red-brown boring dust on or underneath infested slash (or logs).
- Distinct multi-branched galleries with NO boring dust within gallery.
- Presence of brown adult beetles approximately the size of a grain of cooked rice, or presence of small white larvae less than 1/4 inch.



Distinct galleries created by pine engravers



Boring dust accumulated on infested logs

Management:

- Create pine slash ONLY during September-December, if possible.
- Inspect slash piles, log decks and wind-thrown trees for infestation.
- Chip, burn or remove infested material.
- If available, use an excavator or similar equipment to combine slash into large piles. The interior of large piles retain moisture and effectively draw offspring deeper into material, thus limiting spread into surrounding forests.

Douglas-fir Beetle

Douglas-fir beetle targets mature, fire-scorched, diseased, drought-stressed, wind-thrown or otherwise compromised Douglas-fir. Other bark beetles can attack smaller trees but rarely cause widespread damage. Adults attack Douglas-fir in mid-May, bore into the inner bark and lay eggs. Larvae take one year to develop into adults which then emerge and attack new trees the following spring.



Red crown after infestation

Identification:

- Reddish-brown boring dust accumulating in bark crevices.
- Distinct vertical galleries etched into inner bark.
- Presence of white larvae about 1/4 inch long or brown adult beetles that are approximately the size of a grain of cooked rice.
- Crowns of infested trees may be green, but turn red after the beetles emerge.
- Streaming pitch is NOT a reliable indicator of attack in Douglas-fir.



Boring dust accumulating at base of infested tree



Douglas-fir beetle galleries

Management:

- Thin stands to reduce competition and promote individual tree health.
- Identify and remove beetle-infested trees. Infested trees may have green crowns and appear healthy.
- Remove or destroy infested material. Beetles will continue to develop in logs and firewood. If left on site, beetles can emerge the following spring to attack surrounding trees.
- Preemptively remove wind-thrown, fire-scorched or mature trees to limit brood material.
- Methyl-cyclo-hexanone (MCH) is a commercially available repellant that can repel Douglas-fir beetle attacks. Following all label instructions, apply MCH pheromone capsules in stands or on individual trees by April 15.

Douglas-fir slash (debris from thinning or logging) does not typically attract bark beetles and therefore does not require special management. During drought years, some engraver beetles can infest and emerge from piles, but damage to surrounding forests is generally limited.

Wood Borers

Wood borers include a group of metallic and longhorn beetles that attack dead and dying trees. These beetles indicate underlying tree stress and are often associated with drought, extreme heat, soil compaction, densely stocked stands and other insect or disease outbreaks.

Identification:

- Boring dust accumulating in bark crevices of main stem.
- White larvae greater than 3/4 inch, sometimes with flattened head.
- Winding galleries greater than 1/4 inch wide and packed with boring dust.
- Woodpeckers flaking main stem to feed on larvae under bark.



Wood borer larva



Metallic wood borer adult



Bark of wood borer-infested tree flaked off by woodpeckers

Management:

Thin stands to promote vigor in residual trees.

Dwarf Mistletoes

Dwarf mistletoes are parasitic plants, each associated with a conifer species in Montana: larch, limber pine, lodgepole pine and Douglas-fir. The plants cause bushy growths ("witches' brooms") that appear lush and healthy whereas the rest of the tree may be depleted of water and nutrients. Severe, ongoing infestations can cause top-kill or whole tree mortality.



Characteristic brooming pattern of dwarf mistletoe

Identification:

- Bushy growths on branches.
- Small plants growing on infected branches, often originating from swollen area.



Dwarf mistletoe plant



Dwarf mistletoe plant close-up

Management:

- Promote non-host tree species. Note that each dwarf mistletoe species infects specific tree species. Shift stand composition to non-host species.
- Clear a buffer strip of all host trees at least 30 feet from any infected tree(s).
- If regenerating stand to susceptible species, remove infected trees from overstory within 7-10 years.

Western Spruce Budworm

Western spruce budworm feeds on the needles of Douglas-fir, grand fir, subalpine fir, spruce and western larch. Outbreaks are most severe on warm, dry sites with dense, multi-layered canopies of host trees. Subsequent years of defoliation can cause branch dieback and top kill.

Identification:

- Smooth brown caterpillars with pairs of cream-colored dots along back.
- Small, copper-colored moths flying in August.
- Chewed needles bound together by silk on branch tips and terminal leader.



Western spruce budworm defoliation damage



Feeding damage



Western spruce budworm pupal case

Management:

- Thin stands to reduce competition. Defoliation may still occur but trees will be more likely to rebound after outbreak.
- Create a single layer canopy to interrupt dispersal of caterpillars from canopy to understory.
- Promote non-host species such as pine.

Douglas-fir Tussock Moth

Douglas-fir tussock moth periodically outbreak in localized regions of Missoula, Plains, Flathead Lake, Kalispell, and Columbia Falls. The caterpillars feed on the needles, often defoliating the entire tree. Understory trees can be killed within one year of severe defoliation.

Identification:

- Hairy caterpillars with distinct tussocks along back.
- Grey, hairy pupal cases persistent on main stem of trees and at branch nodes.
- Pupal cases may also be attached to buildings, outdoor furniture and other structures.



Douglas-fir tussock moth caterpillar



Douglas-fir tussock moth pupal case and egg mass

Management:

- Thin stands to reduce competition and promote individual tree vigor. Defoliation may still occur but trees will be more likely to rebound if they are not compromised by stress.
- Promote non-host species such as pine and western larch.
- Insecticides may be useful for short-term control of high-value trees. A licensed pesticide applicator is encouraged.
- Viruses naturally develop in moth populations and typically control outbreaks within three years.

Additional Resources

DNRC Forest Pest Management Program

This publication offers an introduction to the most common forest insects and diseases landowners encounter in the region. A greater diversity of organisms and more detailed information on identification and management can be found here: dnrc.mt.gov/forestry/forest-management/forest-insects-and-diseases

Contact Your Local DNRC Service Forester

Service foresters offer assistance with a variety of forest management topics including forest stewardship and hazard fuel reduction: dnrc.mt.gov/forestry/forest-management/DNRC-service-foresters

Additional Forest Management Information

Visit mtforestinfo.org for landowner resources on forest ecology, forest health, timber harvesting, ways to reduce your wildfire risk, and more.

The Montana Department of Natural Resources & Conservation

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