

## *Dendroctonus ponderosae*

**Other scientific names:** *Dendroctonus monticolae* Hopkins

**Order and Family:** Coleoptera: Scolytidae

**Common names:** mountain pine beetle; bark beetle; Black Hills beetle

The mountain pine beetle, *Dendroctonus ponderosae* Hopkins, is the most destructive pest of mature pines in North America, lodgepole pine (*Pinus contorta*) in particular. Major outbreaks of this pest have been occurring in western regions of the United States and Canada causing the death of millions of trees. Local climatic changes and increased winter temperatures has exacerbated the problem.



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*Adult mountain pine beetle*

### DISTRIBUTION

**Native:** North America (Canada, Mexico, United States)

**Introduced:** No records to date

### IDENTIFICATION

Adult *D. ponderosae* are small, black, cylindrical beetles about the size of a grain of rice at 4 to 7.5 mm long. Larvae are legless, creamy-white with light brown heads and about 6 to 7 mm long when fully grown (Langor, 2003). Eggs are smooth, oval, white and translucent.

### HOSTS

Primary hosts of the mountain pine beetle are *Pinus contorta* and *P. ponderosa* but *P. albicaulis*, *P. contorta* var. *latifolia*, *P. lambertiana*, *P. monticola*, *P. nigra*, and *P. sylvestris* are also attacked. This pest has also been recorded on *P. aristata*, *P. balfouriana*, *P. coulteri*, *P. edulis*, *P. flexilis*, *P. monophylla* and other pines. *Pseudotsuga menziesii*, *Libocedrus decurrens*, *Abies* spp., *Larix* spp. and *Picea* spp. such as *Picea engelmannii* are occasionally attacked, particularly near infested pines. These hosts are not used for reproduction, however.

## BIOLOGY

Except for a few days during the summer when adults emerge and fly to new host trees, all life stages of the mountain pine beetle are spent under the bark of infested trees. Their life cycle is generally completed in one year although warmer temperatures can result in two generations per year and beetles in high altitudes and cool temperatures may require two years to complete the life cycle (Amman, McGregor and Dolph, 1990).

Female beetles making the first attacks release aggregating pheromones which attract males and other females until a mass attack overcomes the host tree. In mid-summer, adult females attack new host trees by boring through the bark to the sapwood. They construct vertical galleries in the phloem where, after the males join them, they mate and then deposit their eggs. The eggs hatch in 10 to 14 days although it may take longer in cool weather (Amman, McGregor and Dolph, 1990). Larvae feed outwards from the egg galleries on the phloem tissue of the host tree until early fall, overwinter, and continue feeding in the spring (Langor, 2003). Pupation takes place in late spring to early summer and the new beetles feed under the bark for a few days before emerging to fly and attack new host trees in the summer following the initial attack. Adult beetles introduce a blue-stain fungus into the sapwood of the tree that prevents the tree from repelling and killing the beetles with pitch flow (Langor, 2003).

## SYMPTOMS AND DAMAGE

Symptoms of attack by *Dendroctonus ponderosae* are first detectable only from the ground and require close examination of trees (Langor, 2003). Conspicuous pitch tubes, masses of red, amorphous resin mixed with bark and wood borings, are produced on the bark surface at the site of attack (Hagle, Gibson and Tunnock, 2003). Pitch tubes may be less obvious on trees suffering from severe drought stress prior to attack (Langor, 2003). Boring dust is also evident in bark crevices and around the base of infested trees.

Removal of the bark from infested trees reveals the characteristic symptoms of a vertical parent gallery with a slight J-like hook at the bottom and evenly spaced larval feeding galleries extending at right angles from the parent gallery (Unger, 1993). One or more life stages may also be present depending on the time since attack (Langor, 2003). The fungi transmitted by adult beetles produce a greyish-blue staining of the sapwood of the host tree which can be observed shortly after a successful attack (Langor, 2003). This fungi blocks the flow of water and nutrients throughout the tree which kills the host tree within a few weeks of successful attack (Langor, 2003).



*Symptoms of attack by the mountain pine beetle: pitch tubes, galleries and blue-stain*

During the fall and winter after attack, woodpeckers often feed on bark and wood-boring insects on infested trees. Bark stripped from the tree trunk, particularly in thin-barked hosts such as lodgepole pine, and piles of bark fragments accumulated on the ground at the base of trees are evidence of woodpecker foraging (Hagle, Gibson and Tunnock, 2003; Langor, 2003).

Foliage symptoms are generally not obvious until shortly before the mature adults fly from the tree in the summer following attack.



*Red foliage colour indicative of attack by the mountain pine beetle*

The needles of infested trees first turn a faint yellow and then a bright red, which can be mapped in aerial overview surveys (Langor, 2003). Foliage fades to a dull red or reddish-brown in the second year following attack. Three or four years after the initial attack, very little foliage will remain on the host tree.

In addition to the death of trees and forests, outbreaks of *D. ponderosae* upset harvesting plans, reduce the aesthetic values in recreational areas, and increase fire hazard.

Since the first recorded infestations in 1913 in the Okanagan and Merritt areas of Canada, major infestations have occurred regularly killing over 500 million trees by the early 1990s. The current outbreak began to intensify in the northern part of British Columbia's Tweedsmuir Provincial Park in 1993 (CFS, 2007). Successive years of mild winters have allowed the beetle population to grow and spread further each year through the lodgepole pine forests making the current outbreak the largest ever recorded in North America. The large numbers of dead and dying trees have also increased the risk of wildfires. It has been predicted that if the beetle continues to spread at its current rate, as much as 80 percent of mature pine will be dead by 2013 (CFS, 2007).

### **DISPERSAL AND INTRODUCTION PATHWAYS**

Bark beetles are strong fliers with the ability to migrate long distances. The most common pathway of introduction into new areas is through transport of untreated sawn wood and wood packaging materials with bark on them. If wood is debarked, there is no possibility of introducing bark beetles.

### **CONTROL MEASURES**

The options available for controlling *Dendroctonus ponderosae* depend somewhat on the size of the outbreak, the age of the stand, the size of host trees, and the site conditions. Current approaches to the present outbreak include preventative management to reduce tree, stand and landscape susceptibility and direct control strategies such as logging infested and dead trees (Langor, 2003).

Silvicultural control measures, such as thinning stands, patch cutting, selective harvesting and salvage logging, are the most efficient (Amman, McGregor and Dolph, 1990; Langor, 2003). Some other direct control measures include felling and burning trees and debarking.

To provide a temporary control measure that slows infestations, insecticides are available. However if beetle outbreaks are large, chemical control is not cost effective (Amman, McGregor and Dolph, 1990; Langor, 2003). Preventive spraying can help protect individual high-value trees.

Baiting and trapping with synthetic beetle attractants can help manipulate and monitor small outbreaks by localizing infestations and preventing spread into susceptible stands (Amman, McGregor and Dolph, 1990).



*Silvicultural measures used to control the mountain pine beetle include thinning and felling of infested trees*

Natural enemies of this pest species include woodpeckers, nematodes, predaceous insects, such as *Enoclerus sphegeus*, *Laphria gilva*, *Lonchaea* sp., *Medetera aldrichii*, *Temnochila chlorodia*, *Thanasimus undatulus* and *Xylophagus* sp., and parasitic insects, such as *Coeloides dendroctoni*, *Dinotiscus burkei* and *Roptrocercus eccoptogastri* (Bellows, Meisenbacher and Reardon, 1998). These natural enemies are likely most important in limiting or controlling the pest at low populations; during outbreaks, they appear less able to exert sufficient limits on the population.

*Dendroctonus ponderosae* is an A1 quarantine pest for EPPO and member countries are recommended to prohibit the import of *Pinus* commodities from countries where the pest occurs, and optionally also bark of pines (EPPO/CABI, 1997). If bark is imported, then it is recommended that it be heat-treated or fermented and pine wood from such countries should be debarked, kiln-dried or treated.