

Pine Beetles in the Okanagan and Similkameen

What are Pine Beetles?

Pine beetles are a part of a larger group of bark beetles which live under the bark of trees. There are over 15 species of bark beetles in British Columbia. Typically each species of tree is associated with one or more specific beetles. In the Okanagan-Similkameen regions, the most common bark beetles are the western pine beetle and the mountain pine beetle.

The western pine beetle (*Dendroctonus brevicomis*) is associated with the ponderosa pine. In this region, their population numbers are at natural levels. It is the mountain pine beetle (*Dendroctonus ponderosae*) that has reached epidemic levels in BC. The mountain pine beetle is associated with lodgepole pine, ponderosa pine and western white pine and, under epidemic levels, will attack most other pine trees including ornamentals. In a pine beetle-infested ponderosa pine, you will sometimes find both mountain pine beetles and western pine beetles.



Ron Long, Bugwood

Mountain pine beetles are the size of a grain of rice








E. Vallery, Bugwood

Western pine beetle under magnification




Pine beetles are small, cylinder-shaped, hard shelled beetles, about the size of a grain of rice. They attack and usually kill mature trees by drilling through the bark and laying eggs. The eggs then hatch and begin eating the phloem—the layer between the bark and wood of a tree where the tree's nutrients (sugars) are transported. When a tree has been heavily attacked by beetles, the food supply to the roots is cut off and the tree dies. Pine beetles further harm the tree by introducing a "blue stain" fungus which can block the tree's water transport system.

Natural Role of the Pine Beetle

Why are pine beetles important in nature?

-  Pine beetles are a part of nature; they evolved here together with the trees they feed upon.
-  Like wildfires, pine beetles act as natural disturbances and create forest openings. This is important because disturbances create a variety of habitat types in the forest.
-  Pine beetles are eaten by woodpeckers, small birds, and other insects.
-  By killing trees, pine beetles create wildlife trees which then become homes for cavity-nesting birds and other wildlife.
-  Other insects are drawn to these weakened trees, which further increases food availability for other species.

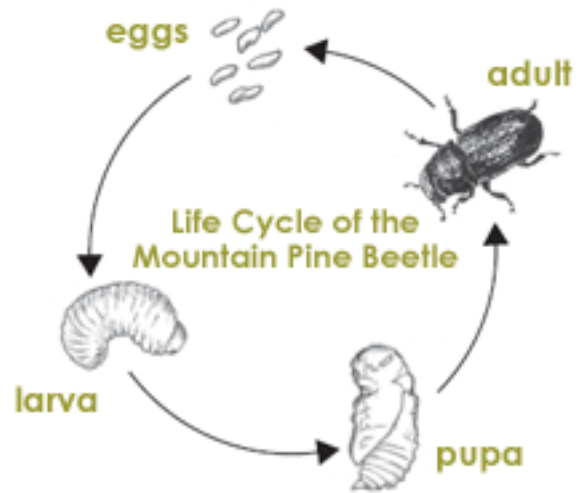
What has caused the beetle epidemic?

-  Decades of fire suppression (putting out or preventing forest fires) and replanting clearcuts with lodgepole pine has created the perfect type of forests for mountain pine beetle.
-  Beetles are not killed during the winter because temperatures have not dropped beneath -40°C for extended periods.
-  Drought conditions during the last few years have stressed the trees. This makes them susceptible to attack, and creates favourable breeding conditions for beetles.

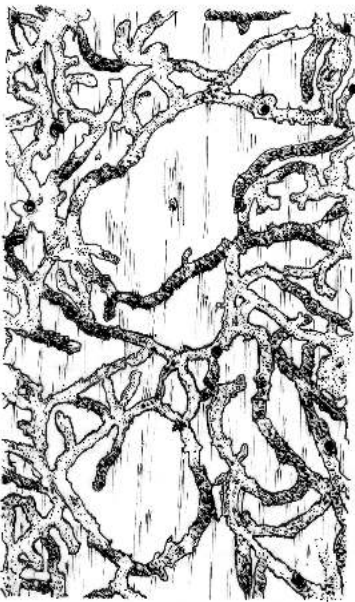
Pine Beetle Life Cycle

The pine beetle's life cycle beneath the bark of a host tree is generally one year long. They only leave a tree for a brief period of flight to search for the next tree to attack. Pine beetles have unpredictable flight patterns because they are influenced by wind and terrain. Beetles often disperse within a 2 km radius into nearby forests but, with the correct wind conditions, could travel as far as 100 km. The adult beetle locates a suitable tree during flight. Once the beetle has successfully attacked a tree it releases an aggregation pheromone (chemical odour) that lets other beetles know that the tree is vulnerable. This results in a mass attack which overcomes the natural defence of the tree.

Mountain and western pine beetles have similar life cycles. The adult female bores through the bark to the layer between the bark and the wood. This layer is called the phloem. Once there, the adult female will travel vertically up and down the tree, eating the phloem and laying eggs. When the eggs hatch, the larvae also eat the phloem and travel along it. The chambers that the adult and larva create under the bark are referred to as galleries.

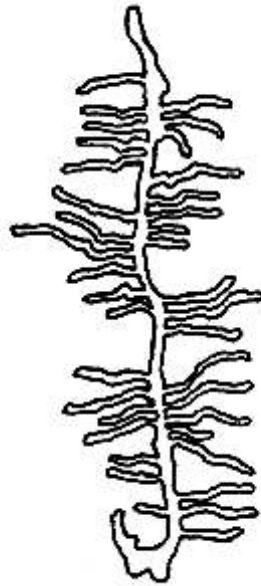


A simplified version of the western and mountain pine beetle life cycle



BC Ministry of Forests

Western pine beetle gallery



BC Ministry of Forests

Mountain pine beetle gallery

The best way to tell the difference between a mountain and western pine beetle is by the shape of its gallery. The female mountain pine beetle tunnels vertically up the trunk of the tree and lays eggs on either side of the gallery. Once the eggs hatch, the larvae eat the phloem away from the main gallery (perpendicular) creating a distinctive pattern under the bark. By comparison, the western pine beetles adults and larvae create mazes of winding "S" shaped egg galleries that have no distinct pattern.

The larvae spend the winter in the tree and emerge in spring as adults. In the Okanagan-Similkameen, adult western pine beetles can lay their eggs and fly between 2 and 3 times a year. This means that one adult female beetle can produce multiple generations of beetles in one year. The mountain pine beetle usually flies once a year but a second flight can occur during particularly warm and dry seasonal conditions. Both western and mountain pine beetles emerge and fly early in the Okanagan-Similkameen, beginning in April. Mountain pine beetle flights usually finish by August, but second flights have occurred as late as October. Flights of western pine beetle (which fly 2 to 3 times a year) usually last until September-October.

Identifying Pine Beetle Infested Trees

It is important to be able to identify trees that have been infested by pine beetles so that you can manage them properly and potentially reduce the risk of further infestation. The following signs will help you identify ponderosa pine attacked by pine beetles:

Frass - The first sign of pine beetle infestation is the presence of frass (sawdust and insect droppings) left behind from adult beetles entering the tree. The frass is a reddish-brown, fine sawdust. Small amounts of frass will gather in the cracks of bark immediately below the beetle's entry point. Frass may be more common on the north side of the tree. Western pine beetles are known to attack at mid-height on the trunk so frass may be difficult to see. Mountain pine beetle will attack the lower trunk, which makes frass easier to detect.



K Gibson, Bugwood

Reddish pitch tubes usually indicate that the beetle was successful at penetrating the tree's bark



D Blackfoot, Bugwood

White pitch tubes usually indicate the tree was successful at keeping the beetle out

Pitch Tubes – Pitch tubes are a result of the tree's natural defence against the beetle. The tree produces resin (sap) and attempts to force the beetle out the hole through which it entered. Pitch tubes are small (6 to 13 mm diameter) globules of yellow to reddish-brown resin and are visible on the outer bark of the tree. Ponderosa pine trees produce pitch tubes for both western pine beetle and mountain pine beetle, although the pitch tubes are far less noticeable from western pine beetles. Note that water-stressed trees may not produce pitch or pitch tubes at all. When a healthy tree is successful in defending itself from an attack, there may be a small visible number of large (25 mm) white pitch tubes.



Paula Rodriguez de la Vega

Larva within the gallery

Galleries – Once frass and pitch tubes are discovered, use a sharp hatchet and peel away the bark directly under the frass or pitch tubes. The galleries will be visible on the underside of the bark and the trunk of the tree. If the beetles are still in the tree then beetles, larvae, or eggs may be visible in the galleries.



USDA, Bugwood

Western pine beetle galleries



Lorraine MacLauchlan



Lorraine MacLauchlan



Exit Holes – When the adult beetles emerge from the tree they leave small exit holes (~2.4mm in diameter). The holes are clean and round, and there is usually no frass or pitch visible.

Woodpeckers – Woodpeckers eat pine beetle adults and larvae, so increased woodpecker activity could indicate that beetles are present. Woodpeckers will either be seen or heard peeling the bark from the tree to get at the beetles and larvae.

Blue Staining - Pine beetles carry a fungus which also attacks the tree and stains the wood blue. The lumber industry calls this 'denim wood'.



L Robinson, Bugwood

Needle Discoloration - The tree dies because the pine beetles and blue stain fungus have blocked the tree's ability to transport food and water. During this process the tree's needles start to change color; this usually indicates the tree is dead. The needles will first fade to a pale yellow. At this point, the pine beetles may still be present in the tree. Eventually the needles will turn red or straw colour and fall off the branches, but by this time, the beetles are long gone. Note that ponderosa pines usually shed older needles in fall, which results in small patches of red on otherwise healthy branches. This is normal and should not be mistaken for discoloration from pine beetle attack, which affects all the needles of the tree.



Paula Rodriguez de la Vega

Notice the woodpecker in the centre of the photo



USDA, Bugwood

Wildlife Note: Dead ponderosa pine trees are very valuable to wildlife. They provide nesting sites, food and shelter to over 50 species of birds and mammals. If your ponderosa pine trees have died due to pine beetles, and if it is safe to leave some of them standing, we encourage you to leave them. Beetle killed trees do not stand as long as most wildlife trees due to weakening from fungi so it is best to top them if necessary.

What Can You Do to Prevent Pine Beetle Attack?

It is anticipated that most of the ponderosa pine will succumb to mountain pine beetle attack in the next few years. Landowners can approach the situation from a stand management perspective, as identified below, but it may ultimately come down to focusing efforts to prevent beetle attack on only selected trees that are most cherished.

Healthy Trees are Happy Trees

Healthy ponderosa pine trees are in the best position to fight off attacking pine beetles. Avoid damaging root systems, heavy pruning (especially during the growing months), or causing mechanical damage. Drought conditions can make even healthy trees susceptible to attack. Watering prized trees during dry summer months can also help reduce the risk of pine beetle attack; however, be careful not to over-water.

Thinning

Thinning dense, crowded stands of ponderosa pine reduces competition for light, water and nutrients. If the remaining trees are healthy, thinning will increase their resistance to pine beetle attack. Pruning damaged or diseased limbs can also be effective. Keep in mind that ponderosa pine forests are designed to be open and park-like. Therefore, at a minimum, thin trees so that the branches of each tree do not touch (50-200 trees per hectare). Thinning also reduces the risk of wildfires, which protects your home and property.

When looking for weakened trees to thin, look for young trees that are crowding the mature trees or trees with mechanical damage (wounds) from human activities. Retaining some younger trees is recommended to provide a new generation, if the mature trees are lost to pine beetle attack.



Paula Rodriguez de la Vega

All thinning and pruning should be done in the winter so that fresh sap does not attract pine beetles.

Repellents

Pheromone repellent is a chemical odour designed to protect individual trees. Both the western pine beetle and the mountain pine beetle use a special pheromone to signal to other beetles that the tree is full. Pine beetles in flight recognize this “no vacancy” pheromone and move on to another tree. The pheromone is called “Verbenone” and is now available in local garden centres and hardware stores. Verbenone comes in pouches and can be attached to the north side of tree trunks between 3 and 5 metres high. Two pouches per tree are thought to be more effective than one. For best results attach one pouch in mid-May and the second in mid-to late July, leaving the first pouch on the tree. If you can afford it, two pouches can be attached at a time. Verbenone costs approximately \$15 per pouch. Pheromones have had mixed results, with successes in Kelowna and failures in Kamloops. Generally, pheromone treatment alone will not be enough to prevent beetle attack and should be used with other preventative methods such as tree wrapping.



Brytten Steed, US Forest Service

Tree Wrapping

Tree wrapping is a technique that has been used to protect prized trees in the central and north Okanagan. Fibreglass insect screen (the same screen that is used on screen doors) is used to wrap the trunk of trees. Pine beetles cannot chew through the screen and therefore move on to another tree. Before wrapping a tree, the lower branches must be pruned. The fabric is then wrapped vertically to a height of 10 metres when possible. Vertical wrapping seems to work best because it reduces the potential access point to one seam. The seam is sealed with silicone caulking and then stapled to the tree leaving some room for tree growth. The screen is relatively inexpensive; however, it can be difficult to apply because of the logistics of wrapping the higher parts of the trunk. The screen should last for several years, if installed properly. There are several local professionals who offer tree wrapping services.



Blain Stewart



Lisa Nielsen



Blain Stewart

Combining two prevention methods, wrapping and repellents, is more effective

Spraying

“Sevin” is a commercial pesticide and will work on mountain and western pine beetles. It is important to note that Sevin is a non-discriminate pesticide and will kill or harm other species such as other insects, birds, and even humans. There are concerns about associated environmental risks and drift while spraying. Sevin will kill beetles as they emerge or enter trees. It is applied before the first flights in April. When applying the product, follow the label directions exactly and spray the tree until it is dripping. Sevin is effective for 3 months to 2 years depending on weather conditions. The product can only be used on private land. It is recommended that landowners consult professional help before using Sevin because of safety and health reasons. The SOS Stewardship Program does not recommend the use of this pesticide.

Pheromone Trapping

The forest industry uses pheromone beetle trapping, which is intended to attract and trap the beetles. This technique should only be conducted by foresters under strict operating conditions. Pheromone traps attract beetles to the site and thus traps require rigorous monitoring and prompt follow-up silvicultural procedures. Only landowners with no other options should seek out this treatment.

Professional Help

Many of these techniques can be done privately with the guidance provided above. However, for those who want professional help, most services are provided by local arborists or tree-care workers. Consult your local yellow pages under the “Tree Service” section. The following pest management services provide spraying and pheromone services as well: www.pine-bug.com, www.pheroteck.com, www.techmist.com. The SOS Stewardship Program offers free pine beetle consultations to landowners living in rural areas.



Paula Rodriguez de la Vega

Community Involvement

Beetle management is a community effort. Get together with your neighbours and discuss your options as soon as possible. The more people who get involved, the greater the chances your trees will remain alive.

Recommended websites:

Ministry of Forests mountain pine beetle site: http://www.for.gov.bc.ca/HFP/mountain_pine_beetle

Regional District of Okanagan Similkameen beetle information:

<http://www.rdos.bc.ca/index.php?id=513>

City of Penticton pine beetle information: <http://www.penticton.ca/events/default.asp#beetle>

City of Kelowna pine beetle information: <http://www.kelowna.ca/CM/Page1077.aspx>

Ministry of Forests fire protection: <http://bcwildfire.ca/>

Supported by:



South Okanagan
Similkameen
CONSERVATION
PROGRAM

For more information, please contact:

South Okanagan-Similkameen (SOS) Stewardship Program

TLC The Land Conservancy of BC

#201-262 Main Street, Penticton, BC, V2A 5B2

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Visit www.conservancy.bc.ca/sosstewardship

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