

# DOUGLAS-FIR BEETLE



## State Forester Forum

The most important bark beetle enemy of Douglas-fir, locally known as red fir, is the Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins. It is found throughout the host range of this tree in North America. At low population levels the beetle maintains itself in windthrown or injured trees or in those infected by root disease. Under these conditions, attacked trees may be scattered throughout a stand or watershed. When epidemics occur, tree mortality can be wide spread killing thousands of apparently healthy trees. When this happens, beetle killed trees are usually found in groups ranging from just a few trees, upwards to one hundred or more.

In Idaho, Douglas-fir beetle outbreaks are usually initiated by catastrophic events, such as blowdown, or winter breakage. Trees weakened by fire also contribute to increasing beetle populations. The downed or weakened trees caused by these events are very attractive to this beetle, which attacks and builds up large populations. The following year, new generations emerge and attack susceptible standing trees in nearby stands. Once an outbreak has started, it normally lasts two to three years in that area, with the peak number of attacks occurring the year the beetles first emerge from the down material. If other factors such as defoliation caused by the feeding activity of larvae of the western spruce budworm or Douglas-fir tussock moth, drought, or fire have weakened additional trees, the beetle outbreak may be prolonged several years.

Damage in standing trees is greatest in dense stands of large, mature Douglas-fir, and where Douglas-fir is dominant.

### Indicators of Attack

Reddish brown boring dust (frass) caught in bark crevices or accumulating in small piles on down logs is the first evidence of attack by the Douglas-fir beetle. Wind and rain tend to remove the frass, especially from standing trees. For this reason, great care needs to be taken when examining standing trees for evidence of attacks. When one infested tree is located, it is very likely that there will be others in the area.

The foliage of attacked trees turns color, first fading to yellow, then sorrel and finally reddish brown. Discoloration may become evident by fall, but more commonly does not show up until winter or spring of the following year.

Resin sometimes exudes from attacks high up in the tree. This pitch will be seen streaming down the trunk for a few feet. The position of the pitching marks the upper limits of the successful attacks. Care needs to be taken to not confuse this pitch with that from broken branches or other wounds, or with the small globules of pitch that are very common on Douglas-fir bark.

### Description

The Douglas-fir beetle has four stages in its life cycle: egg, larva, pupa, and adult. The eggs are oval, pearly white, and the size of a pinhead. The larva is a yellowish-white, legless grub with a brown head. It grows to approximately 1/4 inch. The pupa is shiny white and resembles the adult, but its wing covers are folded around its abdomen. A new

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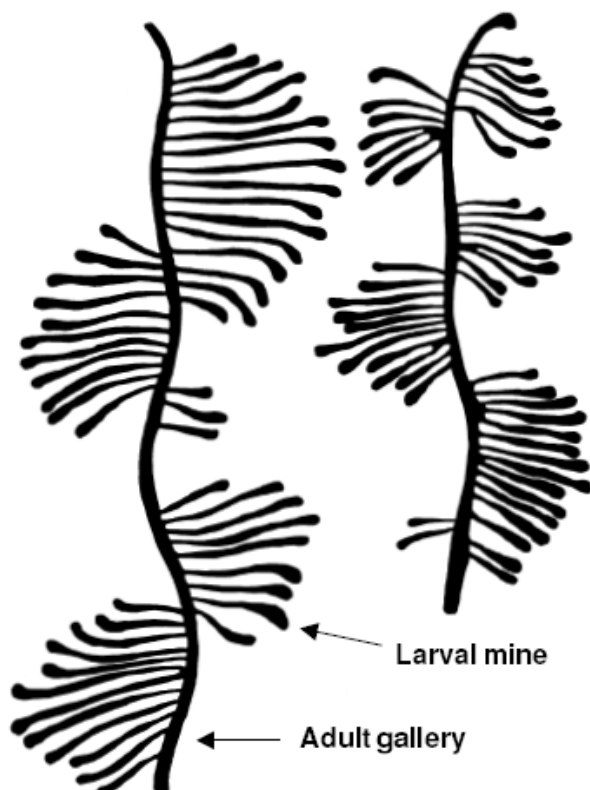
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(callow) adult is pale yellow, but turns dark reddish-brown before flying. The adults are cylindrical and approximately 3/16 of an inch long.

## Life History and Habits

The Douglas-fir beetle has one generation per year. Depending on site and temperature, the overwintering adults emerge from April through June. They fly to new host trees where they initiate attacks by boring through the bark to the surface of the wood. As they tunnel into the tree, the beetles produce a chemical scent (pheromone) that attracts more beetles, overcoming any resistance the tree may have. There they excavate tunnels or galleries approximately 8 to 12 inches long. These galleries run parallel with the grain of the wood and are packed with boring frass. The eggs are laid in groups of 10 to 36 that alternate from side to side along the gallery. (Figure 1)

Figure 1. Douglas-Fir Beetle Galleries



The eggs hatch in 1 to 3 weeks depending on temperature. The newly hatched larvae feed outward from the egg gallery through the inner bark (phloem). When fully grown, the larvae chew out pupal cells, where the change to the adult stage takes place. Broods remain in the tree overwintering mainly as adults. The feeding activity of the beetle larvae girdles the tree, leading to its eventual death.

## Management Options

### 1. CLEANING UP WINDTHROW

Since Douglas-fir beetle outbreaks are normally initiated by catastrophic events that cause a lot of downed trees, timely salvage of down or severely weakened Douglas-fir is a primary tool in preventing Douglas-fir beetle outbreaks. Salvage needs to be accomplished either before the beetles attack, or before they can emerge the following spring. If trees are



Each egg is laid in an individual niche.

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hauled out of the woods with beetles in them, they should be processed prior to beetle flight.

## 2. REMOVING INFESTED TREES

When attacks have already occurred, searching out and removing standing green or faded infested trees will also help reduce or prevent further damage in that area. Care needs to be taken to identify all infested trees, as they can be difficult to find. Look for the reddish boring dust in the bark crevices and/or the pitch streaming high in the tree as aids in identifying attacked trees.

## 3. SILVICULTURAL MANIPULATION OF STANDS

Generally, Douglas-fir stands grow for a long time without suffering losses to bark beetles. A few trees may be lost, especially where the trees are attacked by root disease, but overall damages are not usually great. Damage can become significant in mature stands where the trees are large, old, dense, and pure to Douglas-fir. Stands with these conditions are always at high risk of being attacked by the Douglas-fir beetle. Catastrophic events in these sites are usually the trigger that starts an outbreak. When this happens, the beetles build up populations in the downed trees and subsequently attack highly susceptible stands. Therefore, reducing the susceptibility factors prior to a catastrophe is the best loss prevention tool.

Stand susceptibility is based on average stand conditions. Those factors that contribute to susceptibility include:

Average age: equal to or greater than 120 years; high susceptibility (mature or over mature trees, 90-100 years for N. Idaho)

Average size: equal to or greater than 18" dbh; high susceptibility

Stand density: stocking 80 - 120% of normal; high susceptibility (> 160 ft <sup>2</sup>/acre for N. Idaho; better sites will sustain more trees than poor sites)

Percent host in stand: equal to or greater than 50% DF; high susceptibility

Reducing the risk of attack by the Douglas-fir beetle is best accomplished by reducing the high risk associated with these stand conditions through harvest cuts. This can often be accomplished through a commercial thinning, leaving vigorous, phenotypically superior trees. The thinned stands have less moisture stress and less shade on the stems, two factors that are involved in the susceptibility of dense Douglas-fir stands. This is not an appropriate practice when root disease is present in a stand as it may contribute to increased damage by the disease. Thus, a survey to determine the presence or absence and extent of root disease would be important when contemplating thinning Douglas-fir stands.

## 4. TRAP TREES

The use of trap trees is a practice that can be used any time we suspect that there might be Douglas-fir beetles in the area. Trap trees can be either cut and left in place or standing trees can be baited with synthetic attractant pheromones. This work needs to be done in the very early spring before beetle flight. When the beetles do fly, they attack the baited or felled trees. Either of these techniques will contain beetles at or near the site. To assure that the use of trap trees is effective, the trap trees must be removed before the beetles emerge to attack standing green trees the next spring.

If felled trees are used, they should be cut in groups of 3 to 5 trees and should be a minimum of 15 inches in diameter, preferably larger. These trees should be felled into the shade as much as possible, as when they are felled into the sun, they do not serve nearly as well as an attractant to the beetles. If possible,

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it is good to leave them until the middle of July, then they should be hauled away for processing. They can be left on the site longer if necessary but definitely should be removed from the woods before snow in the fall.

## 5. TIMING OF HARVEST

Another technique that has proven useful in managing beetle populations is to conduct the harvest activities, specifically the felling of trees, in the spring of the year before beetle flight (usually early to mid May). This, in effect, provides a large supply of trap trees that attract and hold the beetles, keeping them from dispersing to other sites. Again, the removal of these trees has to be accomplished before beetles would fly the following spring.

## 6. INSECT MANIPULATION BY PHEROMONE BAITING

When harvesting is contemplated in Douglas-fir stands, pheromone baits can be used to stimulate attacks of trees in a specific area that will then be cut and the logs hauled to mills for processing. This removes the beetles from the area and has been shown to be an effective tool in helping to maintain beetle populations at low levels. These attractant baits can be used in small clearcuts, right-of-way cuts, or in any other situation where the forester can be assured that the attacked trees will be removed before flight the following spring. Since the beetles that are attracted to these baited trees almost always spill over and make attacks in adjacent unbaited trees, great care has to be taken in using the baits so that the beetles do not attack trees designated to be left on the site.

## 7. PREVENTING ATTACK WITH MCH ANTIAGGREGATIVE PHEROMONE

A short time after the Douglas-fir beetle attacks a tree, it produces an antiaggregative pheromone (MCH) to regulate the number of attacks in the host tree. Synthetic formulations

of MCH have proven very effective in preventing attack of the Douglas-fir beetle in windthrown trees. A 1984 Idaho Department of Lands/USDA Forest Service pilot project reduced attacks in windthrow by approximately 96 percent. When windthrow cannot be salvaged, the application of MCH will prevent build up of beetle populations in the down material and protect live, standing trees. Recent work has also shown that MCH can be used to protect standing green trees. The MCH is contained in small plastic dispensers deployed at regular intervals throughout the stand to be protected. The recommended dosage is 30 dispensers/acre evenly placed throughout the treated area, or 4/tree for individual tree protection. Application must be made prior to beetle flight in the spring.

### **Useful links:**

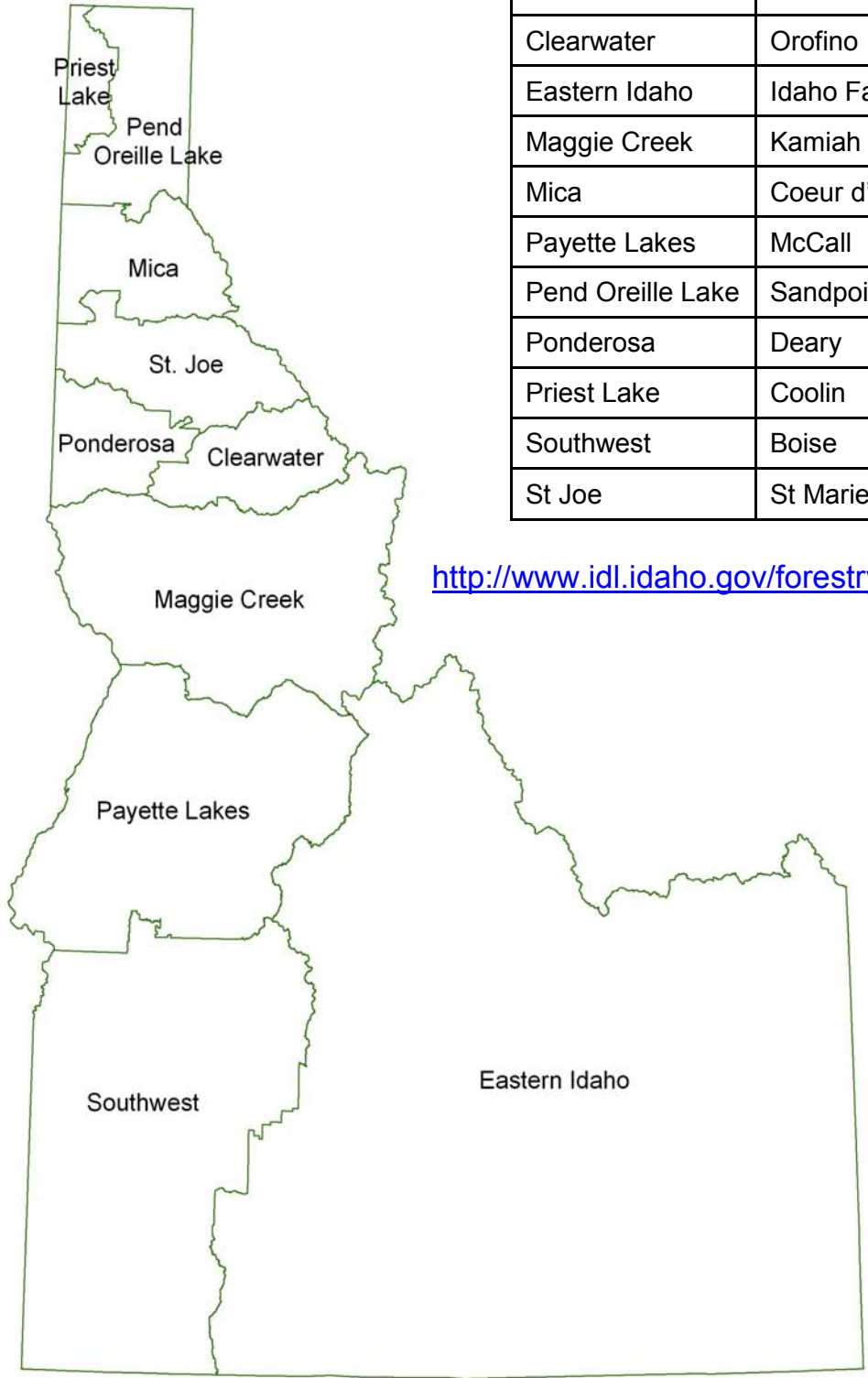
[Forest Insect and Disease Leaflet](#)

[USFS Region 1 Field Guide](#)

[USFS Region 1 Management Guide](#)



**FOR MORE INFORMATION CONTACT  
ANY IDAHO DEPARTMENT OF LANDS  
PRIVATE FORESTRY SPECIALIST**



Area	Office Location	Phone
Clearwater	Orofino	(208) 476-4587
Eastern Idaho	Idaho Falls	(208) 525-7167
Maggie Creek	Kamiah	(208) 935-2141
Mica	Coeur d'Alene	(208) 769-1577
Payette Lakes	McCall	(208) 634-7125
Pend Oreille Lake	Sandpoint	(208) 263-5104
Ponderosa	Deary	(208) 877-1121
Priest Lake	Coolin	(208) 443-2516
Southwest	Boise	(208) 334-3488
St Joe	St Maries	(208) 245-4551

<http://www.idl.idaho.gov/forestry/forest-health/index.html>