What To Look For On The Outside of The Tree

Detection of the early stages of an attack requires close examination of the bark in the spring and early summer. The first sign that a tree has been recently attacked is reddish-brown boring dust on the bark at or near the entrance holes of the beetles (Photo 2). Wind and rain remove most of this over time but small amounts can still be seen on the top "ledges" of bark scales or in vertical cracks. There are no pitch tubes but clear resin from attacks higher up the bole sometimes stream down the trunk. If you think you have Douglas-fir beetle attacking trees in your location, please contact your local Ministry of Forests, Lands and Natural Resource Operations District Office.

Photo 2. Douglas-fir beetle boring dust

The tunnelling of adults and larvae eventually girdles the tree and, along with an associated blue stain fungus, results in the tree's death. Several months after a tree is successfully infested, its foliage becomes discoloured (Photo 3).

The needles will often not change color in the first year of attack. First the needles turn pale yellow-green, then reddish-brown by the early spring of the following year after attack, and finally red. Progression of foliage discoloration depends on seasonal weather, locality, date and intensity of attack, and elevation. The red foliage thins out over the summer and fall the year after attack but can remain on the tree for a

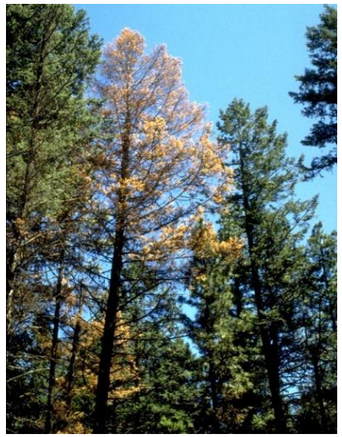

Photo 3. Douglas-fir foliage turning colour after attack

second year. Occasionally small round white "ponch" fungi form on the outer bark on trees the year after attack.

If you were to remove the thick bark of a Douglas-fir tree attacked in the current year, the following life stages of the beetle would be visible depending on the time of year. Eggs are elliptical, pearly white, and 1 to 1.2 mm long (Photo 4).

The larva is a legless white grub with a pale brown head and is about 6 mm long when mature (Photo 5). The pupa is white to light tan, approx. 6 mm long and has undeveloped wings and legs. The adult is a brown to blackish-brown beetle with reddish wing covers and is 4 - 7 mm long (Photo 4).

Photo 4. Douglas-fir beetle adult and eggs

Photo 5. Douglas-fir beetle larvae

Beetle Life Cycle

The Douglas-fir beetle has one generation per year. Most newly emerged mature adults fly and attack susceptible trees and other host material in the spring when daytime temperatures exceed 18° C. This major flight period usually occurs in May and June. Attacking female adults chew through the outer bark into the inner bark, elongate a vertical "egg gallery" (Photo 6) and, after mating, deposit 10-36 eggs in small notches on both sides of the egg gallery.

Eggs hatch in about 2 weeks and the young larvae tunnel away from the egg gallery. These larval "mines" increase in width as larvae molt and grow through four stages. Larvae feed in the inner bark for 2-3 months, enter the pupal stage, and a few

Photo 6. Beetle egg and larval galleries

weeks later become young adults. The latter overwinter and in the spring bore a circular hole through the outer bark in order to fly away and attack new trees. When there is a late spring, eggs are laid late and the resulting larvae overwinter. The next year newly mature adults don't fly until August. So in any given year, about 85% of beetles fly in the spring and the remaining 15% fly in late summer.

What's Under The Bark

Confirmation that the damage is due to Douglas-fir beetle may be obtained by removing the thick outer bark with an axe and observing the typical gallery systems inside the inner bark (Photo 6). The vertical egg galleries made by the attacking parent adults are parallel to the grain of the wood, usually with a slight hook or curve at the entrance points. They are normally 20 - 25 cm long but may be 75 cm and 5 - 6 cm wide. The larval galleries diverge from the egg galleries at right angles and then form fan-like groupings on alternate sides of the egg galleries. Most of the egg galleries and all of the larval galleries are packed with boring dust. As larval galleries elongate,

they often disappear from the inner surface of the bark since the larvae bore deeper into the inner bark. Larvae then excavate a circular “pupal cell” at the end of the larval galleries. After a few weeks, newly mature adults can be found in the latter locations before they emerge to attack new trees. On downed trees, egg galleries tend to be denser and success rate is higher on the shaded undersides.

Host Susceptibility and Attack Pattern

The Douglas-fir beetle prefers hosts such as freshly felled trees, windfall, slash, stumps, overmature and decadent trees, or stems damaged by logging activity, fire or lightning. Host material over 20 cm in diameter is preferred but beetles occasionally attack material of smaller diameter such as freshly cut firewood having some intact bark. Trees are usually not attacked above a top diameter of 15-20 cm but other secondary bark beetles can be found there. Where susceptible trees are abundant, beetles can quickly become epidemic and kill adjacent otherwise healthy green timber. Consequently, groups of killed trees may be found surrounding previously attacked windfall, decked logs or firewood, or other damaged trees.

In endemic situations, beetle damage occurs in small scattered groups of trees. The size of these groups and intensity of attacks are reflections of both the amounts of suitable host material and the population levels in the stands. Around homes, Douglas-fir weakened by a sudden change in environmental conditions (e.g., tree felling, root or stem damage from excavation, drainage alteration, etc . .) may become susceptible to attack.

Control

The following recommendations are either preventative or remedial measures. Although they both reduce the risk of beetle damage, the timing of these actions changes when trees or material are already infested.

All infested standing trees or decked wood should be sanitation harvested and processed, or bucked up and promptly burned, or burned as firewood by late April before beetles emerge. Removal of red-topped trees from which the beetles have already emerged may salvage the fibre but does not reduce the beetle population.

Keep Douglas-fir stands healthy by harvesting stressed or damaged trees, particularly those in which Douglas-fir beetle is becoming active or threatening.

Avoid mechanical damage to the stems and roots of residual Douglas-fir.

All “long-butts”, slash over 20 cm in diameter and high stumps should be cut to short lengths. If infested, long butts and slash should be burned or chipped and high stumps peeled well ahead of the beetle flight to kill developing broods.

Residual tops left on site should be kept smaller than 20 cm diameter and, if not burned, scattered on the ground for maximum sun exposure

Firewood from live Douglas-fir should be cut no sooner than late August and split and dried as soon as possible so it is not attractive to beetles the following spring. Any firewood cut from infested logs should be burned before the next beetle flight. Roads, trails and other rights-of-way should be constructed if possible after August to lessen the risk of fresh slash.

Douglas-fir beetle prefers to attack felled trees over standing ones. It may be practical to pre-fell one or more large diameter Douglas-fir in the shade on your property before beetles emerge in the spring to serve as “trap trees”. One well placed large-diameter Douglas-fir trap tree can absorb enough attacking beetles to save about 10 other trees from being attacked. Such trap trees can be felled such that they are either easily extracted and processed or bucked up for firewood after the flight. After these trap trees absorb beetles by mid-August, it is critical that they be processed to remove the bark or be bucked up for firewood to be used up before broods mature. When conducting such operations, always check surrounding trees for any “spillover attacks” which may require felling and utilization along with the trap trees.

Where sanitation harvesting and/or trap trees are not possible, cluster of funnel traps with attractant lures may be deployed in order to mop up flying beetles (Photo 7).* It is highly recommended that the Ministry of Forests, Lands, and Natural Resource Operations District Office is consulted with prior to using funnel traps due to spill over concerns.

Photo 7. A cluster of funnel traps baited with lures

Homeowners may benefit by attaching beetle repellents (MCH) to individual trees in order to deter beetle attacks. This works best when beetle populations are still low*.

*Contact your Ministry of Forests, Lands, and Natural Resource Operations District Office in Prince George at 250-614-7400 or email Forests.PrinceGeorgeDistrictOffice@gov.bc.ca for advice on these particular tactics and any other questions you might have on forest pest management.

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Photo credits:
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BRITISH COLUMBIA
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Douglas-fir Beetle
A Threat to Local Forests & Homeowner Trees

Photo 1. Douglas-fir beetle outbreak

The Douglas-fir beetle, (Dendroctonus pseudotsugae Hopk.) infests and kills Douglas-fir throughout its range in British Columbia and the western U.S. and Mexico. Damage has been most extensive in the B.C. interior including, occasionally, forests surrounding your property.

Douglas-fir beetles normally kill small groups of trees but, during outbreaks, 100 tree groups are commonly attacked (Photo 1).

Outbreaks typically last from 2 to 4 years. Those of longest duration coincide with periods of drought. At low (or endemic) levels, beetles infest scattered trees, including windfalls, fresh stumps, slash and firewood, and trees damaged mechanically and by fire scorch. Where susceptible trees have been killed and other material have been attacked, beetle populations can build up rapidly and kill adjacent green, standing trees.