



UI Extension Forestry Information Series II

Insects & Diseases No. 21

Douglas-fir Bark Beetle and Secondary Mortality in Douglas-fir

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In the insect and disease world, last years' weather and forest health conditions greatly affect this year's potential for outbreaks. Trees weakened by overstocking, drought, wind storms and wildland fires are less able to fend off attacks, allowing epidemic-sized populations of insects or pathogens to grow and cause widespread tree mortality. A strong wind event in late November 2015 and heavy snow toppled many trees throughout Idaho, causing widespread stress.

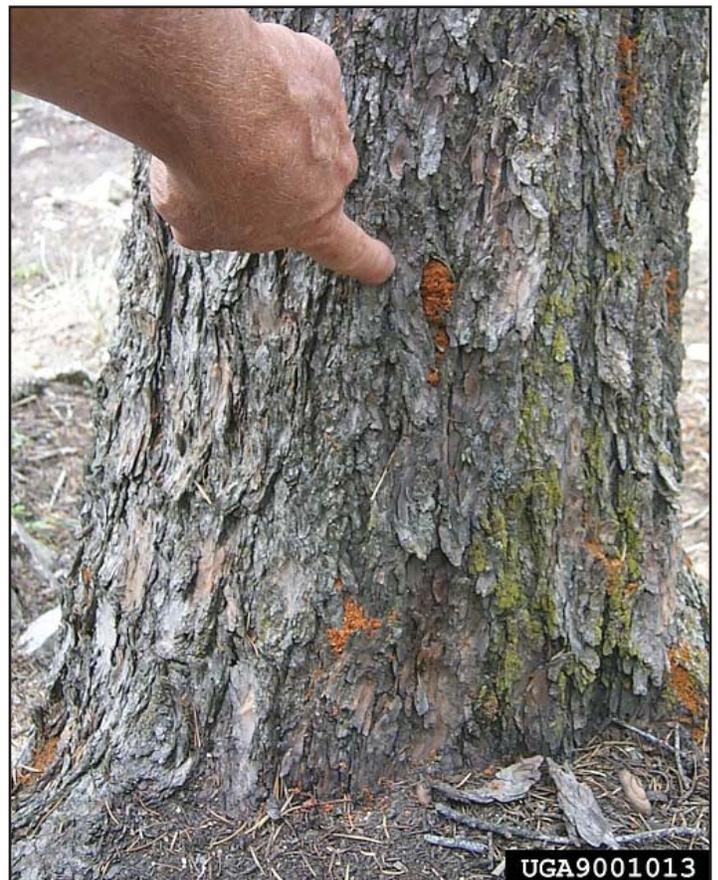
The Douglas-fir beetle (*Dendroctonus pseudotsugae*) infests Douglas-fir (DF) throughout its natural range. Adults and larvae feed in phloem layer of inner bark, killing trees by girdling them. Low populations of Douglas-fir beetle (DFB) are maintained in wind thrown or injured DF trees scattered throughout the landscape.

Life cycle of Douglas-fir beetle

The four-stage life cycle begins when adult DF bark beetles lay small, oval, white eggs in galleries excavated just under the bark. Yellow-white, legless larvae with brown heads hatch and start feeding on phloem; it is this feeding activity that girdles the tree, leading to its eventual death. At stage three, pupa develop that resemble shiny white adults with wing covers wrapped around the abdomen. Adults are approximately ¼ inch long, cylindrical, and reddish-brown. There is one generation per year.

Sometime between mid-April to early June beetles overwintering adults emerge and fly to new trees; beetles that overwintered as larvae attack in midsummer. Females land on new host trees and initiate attacks by boring through the bark, sending out aggregation pheromones as they tunnel into the

tree. This chemical scent attracts more DF beetles where, working together, they overcoming host tree resistance. Shortly after a successful attack, male beetles produce an anti-aggregative pheromone (MCH), which regulates the number of attacks in the host tree by directing additional beetles away to find other hosts.



Often the first sign of an attack is red-orange boring dust (frass) that collects in bark crevice.

Photo by Doug Page, USFS/BLM, Bugwood.org

Outbreaks regularly start in green blow down after wind or heavy snow events, or in scorched trees after a fire, where populations can build up rapidly. Beetles then move to standing healthy trees. Often the first sign of an attack is red-orange boring dust (*frass*) that collects in bark crevices and in small piles under downed logs. Newly infested standing trees will have boring dust on stems but green crowns. Foliage can begin to fade as early as that fall, but more commonly during the late winter and spring following the attack, eventually turning the entire crown red-brown.

Once an outbreak has started, it normally lasts two to three years. Additional factors, such as damage from western spruce budworm or Douglas-fir tussock

moth, can prolong outbreaks. The greatest damage usually centers in dense stands of large, mature, standing DF and where DF is the dominant species in the stand.

What is different this year?

Usually, Douglas-fir trees less than 12 inches DBH are seldom attacked by bark beetles. This year, landowners began seeing mortality in understory, intermediate and seed tree, as well as saw timber-sized Douglas-fir. Upon investigation, scientists found *Scolytus monticolae*, a secondary bark beetle species with no common name. Infestations are probably drought related and have been found throughout northern Idaho from Bonners Ferry to the Clearwater



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The presence of Douglas-fir beetle (*Dendroctonus pseudotsugae*) can be identified by their signature galleries etched just under the bark.

Photo by W.M. Ciesla, Forest Health Management International, Bugwood.org



Outbreaks of secondary damage to smaller-sizes of Douglas-fir can be identified by the galleries of *Scolytus monticolae*, a secondary bark beetle species with no common name.

Photo by Tom Ekberg, Idaho Department of Lands



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River valley. These beetles are much smaller than DFB and have a distinctive gallery pattern. Damage tends to be worse on marginal sites with thin or rocky soils and on the edges of cuts facing south, and populations are found mostly in intermediate-sized trees left after harvest. Damage is expected to decrease due to better soil moisture conditions during 2016.

Management recommendations

Forest insect and disease outbreaks are mainly managed by thinning. Too many trees in a stand will not have enough light, water and nutrients to support vigorous growth, resulting in stress. Thinning trees to reduce the number of trees competing for limited resources increases the health and resiliency of the remaining trees, which allow them to fend off threats without our intervention. Thinning dense, over-crowded stands of mature Douglas-fir greatly decreases stress and chances of successful DFB infestations.

Regardless of the species of beetle involved, following recommended management practices can significantly reduce risk of attack.

- Monitor forest health by looking for red-brown boring dust; do not limit monitoring to older DF trees as younger, smaller trees may be under attack from secondary beetles.
- Harvest standing green or fading infested trees and clean up wind throw of all sizes before beetles emerge the following spring; recently fallen DF trees eight inches or larger and DF stems 12 inches or larger can harbor DF beetles for up to a year after being killed.
- Solarize or debark infested trees being transported off site for firewood use to prevent spreading beetles to new locations.
- Protect live, standing trees and prevent buildup of DF beetle populations in down material by using synthetic anti-aggregation pheromone (MCH). The product is packaged in small plastic dispensers with a recommended dosage of 30 dispensers/acre evenly placed throughout the treated area or two per tree for individual tree protection. Applications must be made prior to beetle flight in the spring.

Monitoring forest health and thinning stands to decrease moisture stress are important forest management practices. By locating and treating small areas of bark beetles and other insect and disease problems you can significantly decrease your chances of outbreaks and increase the resiliency of your forestlands.

Special thanks to Tom Ekberg, Idaho Department of Lands, for his review of this article.