Silver Fir Beetle & Fir Root Bark Beetle

Darci Carlson¹ and Iral Ragenovich²

Two species of native bark beetles in the genus *Pseudohylesinus*; the silver fir beetle, *P. sericeus* (Mannerheim), and the fir root bark beetle, *P. granulatus* (LeConte), (Figure 1) are known to kill true firs along the Pacific coast and inland Pacific Northwest. These beetles usually attack windthrown, felled or injured trees. Pole and sapling size trees in dense stands and suppressed understory trees are most susceptible to attack. They are active every year causing scattered mortality in individual trees or small groups of trees, and are often found together or in conjunction with other true fir bark beetles.

Outbreaks are rare; however a large outbreak of these two species occurred between 1947 and 1955 with Oregon and Washington bearing the brunt of the infestation. By 1955, when the outbreak concluded, more than 528 million board feet of Pacific silver fir (*Abies amabilis*) had been killed on more than a million acres. More recently, from 1994-1997, an outbreak of fir root bark beetles (possibly in conjunction with silver fir beetles) near Vancouver, BC, killed a few hundred silver firs after a blowdown event.

**Range**

Silver fir beetle has been confirmed in BC, AK, WA, OR, ID, and CA. The range of the silver fir beetle extends from the southern portion of the Alaskan peninsula (near Sitka) and western British Columbia (as far west

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¹Forest Entomologist, USDA Forest Service, Forest Health Protection, Pacific Northwest Region, Wenatchee, WA; ²Regional Forest Entomologist, USDA Forest Service, Forest Health Protection, Pacific Northwest Region, Portland, OR.

*Figure 1. Pseudohylesinus granulatus, the fir root bark beetle (top) and Pseudohylesinus sericeus, the silver fir beetle (bottom).*
as the island of Haida Gwaii), south to
the Santa Cruz Mountains in central
California, and east to the Cascade
Mountains.

Fir root bark beetle has been
confirmed in BC, AK, WA, OR, ID,
MT, and CA. The range of the fir root
bark beetle extends from the southern
Alaskan peninsula (near Juneau) and
western British Columbia to the Giant
Forest in Sequoia National Park in
south central California, and as far
east as the western edge of Montana.

Host Trees

Pacific silver fir is the most common
host, and the only species so far to
host serious epidemics (Figure 2);
however, both beetle species have
also been recorded on grand fir (Abies
grandis), white fir (Abies concolor),
California red fir (Abies magnifica),
subalpine fir (Abies lasiocarpa),
noble fir (Abies procera), Douglas-fir
(Pseudotsuga menziesii), and western
hemlock (Tsuga heterophylla). Fir
root bark beetle has been collected
from ponderosa pine (Pinus
ponderosae) and silver fir beetle has
been collected from Sitka spruce
(Picea sitchensis).

Evidence of Attack

The entrance holes made by these
beetles are inconspicuous because
they normally occur in bark crevices
and under bark scales, mosses, or
lichens. Close inspection will reveal
small amounts of reddish boring
dust beneath fresh attack sites. Most
attacks occur between May and
August. Abundant attacks by these
beetles can cause a ring of boring dust
to accumulate around the base of the
tree. This ring of boring dust can be

Figure 2. Pacific silver fir mortality attributed to Pseudohylesinus species on the Mt. Hood National Forest, Oregon.
seen from a distance of 10-15 feet, but can be washed away by the first rain.

The most noticeable evidence of a successful beetle attack is a change in foliage color. The foliage of trees killed by these beetles usually first turns yellow, then bright red-orange, finally fading to a dull red-brown. These dead needles often remain on the tree for up to two years after death. However, during periods of unseasonable warm weather, the needles sometimes die and fall quickly without noticeably changing color. Yellow and bright red-orange crowns indicate freshly killed trees that often contain larvae (Figure 3). Dull red-brown trees are older, and usually only contain galleries as evidence of beetle attack.

**Physical Description**

The two species are very similar in appearance, differing mainly in their size. On average, fir root bark beetle is 4.0-6.5 mm long (.16-.26 in), compared to about 2.4-3.9 mm (.09-.15 in) for silver fir beetle (Figures 1 and 4). Both species are stout, oval beetles covered with brown and gray scales that give them a patchy appearance (see top beetle in Figure 4). When the scales are rubbed off the beetles have a minutely roughened, shinier, dark reddish-brown to black appearance. The pronotums are distinctly narrower.
until the end of October the beetles concentrate their boring and feeding at the bases of host trees, where they hibernate through the winter. In late May to early June of the following year, these overwintering beetles emerge and make “brood attacks” by constructing galleries and laying eggs in niches along the galleries (Figure 6). In late July or early August, some of these overwintering adults reemerge, construct more galleries, and lay a second batch of eggs. Externally, the feeding attacks and the brood attacks appear the same. The only way to tell them apart is to remove a section of the bark to determine whether galleries are present or not.

The egg galleries of both species cut transversely across the grain of the wood (Figure 6). In successful attacks the length of the gallery ranges from 1–7 inches for both

Life History & Habits

The life cycles of the two beetles are very similar. In northwestern Washington both beetles require approximately 24 months to complete their life cycle. In warmer climates at a lower elevation, they may reach adulthood within a year. Adult beetles bore into living phloem between the bark and sapwood.

There are two types of attacks. New adult beetles emerge between August and early September and make “feeding attacks” on host trees. At this time they do not construct galleries (tunnels in the phloem) or lay eggs (Figure 5). From late September

Figure 5. Bark removed to reveal feeding attack (arrow) on inner bark – no brood produced.
beetles, with an average of 2.6 inches. As the adults construct the gallery, eggs are laid in niches along the sides. In 10-14 days larvae hatch and begin larval galleries perpendicular to the parental gallery, along the grain of the wood. In the beginning larval galleries are parallel to each other, but as the larvae grow the paths begin to wander, especially when the population is dense. The larval stage (Figure 7A) lasts 12-14 months, depending on when the eggs were laid. Larval development stops during cold weather. Both the larval stage and the overlapping generation of adults hibernate through the winter and resume activities in the spring. The following July, when larvae have matured, they construct pupal cells within the inner bark. If the bark is thin the cells may extend slightly into the wood. Larvae that have transformed into pupae (Figure 7B) emerge as adults 2-3 weeks later. When they emerge in August, the two year life cycle is complete.

Each of the two species attacks a different portion of the tree. The smaller silver fir beetle attacks all along the bole, but primarily occurs in the upper portion of the bole and the branches. It has been found attacking branches that are only 1 inch in diameter.

The larger fir root bark beetle usually attacks the basal portion of the bole and the roots of the tree. It has been observed from a few inches below the ground line up to a height of 15 feet on the bole.

Usually more than a year is required for a mature tree to be killed. A tree can experience top-kill in one year, and additional sections of the tree can be killed in subsequent years. Strip or patch-killing often occurs so that the tree is not girdled in a single year. In some cases, strip attacks heal over completely, leaving scars that can later be identified. However, recurrent attacks over a period of years usually overcome the tree.

Infection by fungi often accompanies beetle attack. A brown-staining

Figure 6. Transverse egg galleries and vertical larval mines from a successful brood attack by Pseudohylesinus species.
fungus, *Ophiostoma subannulatum* (Livingston & Davidson), is often found in association with the silver fir beetle and fir root bark beetle, and is believed to aid in killing the tree. Bark beetle feeding scars on live trees may allow other fungi, such as the root rotting fungi *Armillaria ostoyae* (Romagnes) Herink and *Phellinus werii* (Murrill) Gilbertson, to infect live grand fir roots and spread these diseases. *Armillaria* was present to some degree at the base of all the beetle-killed silver fir trees in a 1954 study in a Skagit County, WA, outbreak. Armillaria root disease and silver fir beetles were linked to the damage and mortality of silver fir trees on 650,000 acres in 1955.

The large outbreak that occurred from 1947-1955 was associated with drought. Weather records show that average temperatures were higher than normal, and precipitation was below normal, from 1942 through 1954. It was determined that unseasonably hot, dry summers initiated the outbreak.

Silver fir beetles and fir root bark beetles have also been associated with tree-killing in areas defoliated by sawflies (*Neodiprion* sp.). A study near Kelsey Bay, BC, found that trees that were severely defoliated by sawflies were highly susceptible to successful attack by bark beetles. *Pseudohylesinus* species have also been linked to balsam woolly adelgid damaged trees over a 146,000 acre area in the Pacific Northwest. A study in coastal Oregon found that silver fir beetles will attack fresh western hemlock logging slash in recently thinned areas.

**Management**

Both beetles are associated with windthrown, injured, or weakened trees. However, on occasion, they can cause significant mortality. Young, vigorous trees appear to be resistant. Forest management practices that maintain tree vigor could minimize impacts from these beetles. When feasible, removing windthrown trees can minimize the impact from these bark beetles.

**Assistance**

Private landowners can get more information from county extension agents, state forestry departments, or state agriculture departments. Federal resource managers should
contact Forest Health Protection, USDA Forest Service (www.fs.usda.gov/goto/foresthealth/). This publication and other Forest Insect and Disease Leaflets can be found at www.fs.usda.gov/goto/fhp/fidls.

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References


Pesticide-Information Disclaimer

This page is not part of the original publication.

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This USDA Forest Service Forest Insect & Disease Leaflet (FIDL) contains useful and pertinent information on forest insect and (or) disease biology, identification, life cycles, hosts, distribution, and potential management options.

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