

Engraver Beetles in Alaska

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Engraver Beetles in Alaskan Forests

Engraver beetles (*Ips* spp.) are bark beetles that attack white, Lutz, black, and Sitka spruce throughout Alaska. There are a number of species of engraver beetles in Alaska, the most common and destructive being the northern spruce engraver *Ips perturbatus* (Eichhoff). Most species are similar in size, coloration, and habitats, and can be difficult to distinguish from each other. Engraver beetles are not usually considered primary tree killers. They commonly attack and colonize trees severely weakened by fire, periodic flooding, drought, logging, stand thinning, construction activity, ice and snow damage, and wind. Windthrown trees and logging slash are preferred for breeding. Engraver beetles will also breed in tops of trees killed by spruce beetles. In most years, engraver beetles infest individual trees or groups of 10 trees or less. During warm, dry summers following mild winters, engraver beetle populations build to such proportions that live trees are killed over large areas. Edge or residual trees can be infested within one to two years after clearcutting or thinning of forest stands. Similarly, trees along fire perimeters damaged by smoke or fire may be susceptible for years following fires. Engraver beetles also commonly attack and kill mature trees in the vicinity of recent land clearings (e.g. house building, utility right-of-ways, construction projects etc.), or land use changes that cause whole or partial covering of roots or soil compaction (e.g. new/resurfaced driveway, new fill, vehicular traffic or item storage).

High populations of engraver beetles caused white spruce mortality on 43,000 acres along the south side of the Brooks Range, and in the McGrath area in 2008. High populations are common in river-bottom spruce stands of interior Alaska, particularly those periodically

flooded along the Yukon, Porcupine, Chandalar, and Tanana Rivers.

Characteristics of Beetle Attack

The first evidence of engraver beetle attack is fine, dry, yellow-red boring dust in bark crevices (Figure 1). Boring dust is commonly found in distinct piles marking the location of individual beetle attacks on logging slash or windthrow. Pitch-tubes are rarely formed. Engraver beetle boring dust may be mistaken for that of the spruce beetle. Spruce beetle boring dust, however, is coarser, somewhat pitchy, reddish-orange, associated with pitch tubes, and commonly found on the lower sides and bottoms of felled trees, or in the butts of large spruce in the Interior.

Engraver beetle-infested trees are often sought by woodpeckers. Pieces of bark removed by pecking activity accumulate on the ground beneath the trees and are especially noticeable on the snow in winter. A change in foliage color is another indication of engraver beetle attack on standing trees. Needles begin to fade from dark green to pale yellowish-green to red as early



Figure 1. Engraver beetle boring dust accumulated at the base of a damaged spruce tree.

as one month after attack in Interior Alaska. In mid-summer, engraver beetle infested trees are orange in the upper half of the bole as the tree dries out. By the end of the summer, most needles have dropped. Years after attack, trees appear silver-gray and may remain that way for many years.

Life History

Engraver beetles develop through four distinct stages: egg, larva, pupa, and adult within a single year. Adult beetles emerge from the forest floor where they overwinter and attack fresh host material. Time to emergence depends on temperature. Beetle flight occurs from early May to late June. Male beetles initiate attacks, and after boring through the outer bark, construct a nuptial chamber in the inner bark (phloem) next to the sapwood. Two to six females join the male, and mating takes place in the nuptial chamber. Each female then constructs her own egg gallery, which radiates out from the nuptial chamber (Figure 2). Boring dust is forced out of the egg galleries and through the entrance holes by the adults.

Eggs are laid along the sides of the galleries and from them hatch white grub-like larvae that feed in the phloem tissue perpendicular to the egg gallery. Larvae develop through four distinct growth stages, which result in widening the feeding gallery. Larval feeding severs the phloem tissue, and the tree dies from girdling: denying downward movement of nutrients produced during photosynthesis in the foliage to the roots. Mature larvae enlarge the feeding gallery to form a chamber where they pupate. Adults emerge during July. New adults of northern spruce engraver bore through the bark and exit the tree to overwinter in duff and litter on the forest floor (Figure 3). Engraver adults of some species overwinter in the host material in which they developed, much like spruce beetle.



Figure 2. Engraver beetle egg galleries radiating from the nuptial chamber.

Adults are small (0.3-0.6 cm long), cylindrical, reddish-brown to black beetles. The head is not visible when the insect is viewed from above, unlike the spruce beetle in which case the head is quite visible. A distinguishing characteristic of all engraver species, but not spruce beetles, is the pronounced declivity (dish-shaped indentation) on the posterior (rear) end of the beetle that is lined with 3-6 pairs of spines along the margin (Figure 4).

Management Recommendations

- Spruce stands should be maintained in a healthy and vigorous condition through proper silvicultural management, which includes removal of over-mature, densely grown, diseased, and dying spruce.
- Damaged and windthrown trees should be removed from spruce stands or homeowners' properties. Trees should be used or destroyed by burning, chipping, or burying.
- Partially burned trees in the fringe area of a wildfire should be harvested immediately after the fire if the fire occurs in early spring; otherwise, harvest during the late summer, fall or winter.
- Timber harvests should be scheduled

after July and before February. This ensures that all breeding material produced during the harvest is at least three months old by the time of the beetles flight, rendering it less suitable than fresh material.

- Infested wood should not be stacked or stored in areas surrounded by live trees. Freshly cut spruce should have the bark removed and/or be spilt for rapid drying as soon as possible following harvest.
- Cull logs, tops, and slash greater than 4 inches in diameter should be limbed and cut into short lengths. The material should then be processed or stacked. Some judgment will need to be used as to the best way to promote rapid drying of the material at a given site, but splitting and stacking firewood allows for sufficient air flow to dry wood, yet deny sufficient material for bark beetles to reproduce successfully.
- Insecticides can be used to protect high-value trees from beetle attack. Water solutions of chemicals should be applied with a pressurized sprayer to the lower 20 feet of trunks of standing trees before beetle flight in early May. The entire trunk of felled trees should be treated or processed as rapidly as possible.



Figure 3. Exit holes left behind by engraver beetles. The adults leave the log to find places to overwinter in the duff. In the spring they emerge and search for new logs or trees for mating and raising their brood.



Figure 4. Adult engraver beetle.

Cover Photo: Engraver beetles caused this tree mortality at a construction site near Manley, AK as a result of leaving untreated material on site, and cutting outside of the recommended harvest timeframe.

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