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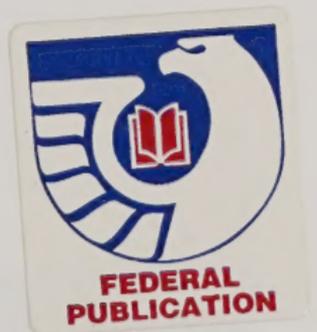
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Engraver Beetles in Alaskan Forests

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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. Most are similar in size, coloration, and habitats. Therefore engravers are treated here as a group. Engraver beetles, not usually considered primary tree killers, 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 breed abundantly in tops of trees killed by spruce beetles, and they are commonly mistaken for spruce beetles. In most years, engraver beetles infest widely scattered individual trees or groups of 10 trees or less. Periodically during warm, dry summers after mild winters, engraver beetle populations build to such proportions that standing live trees are killed over large areas. Border or residual trees can be infested within one to two years after clearcutting or thinning of forest stands. Trees partially damaged by fire, snow, ice, porcupines, and windthrow can also be infested in the interval after initial damage.

High populations of engraver beetles caused white spruce mortality on 16,000 acres near Fairbanks, Alaska, in 1986. High populations have also occurred in river-bottom spruce stands of interior Alaska, particularly those periodically flooded along the Yukon, Porcupine, Chandalar, and Tanana Rivers (Figure 1). *Ips*-caused spruce mortality is becoming more common in south-central Alaska, especially on the Kenai Peninsula.



Figure 1. *Ips*-caused tree mortality along Tanana River.

Characteristics of Beetle Attack

The first evidence of engraver beetle attack is fine, dry, yellow-red boring dust in bark crevices on standing trees (Figure 2). 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.

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 as one month after attack in interior Alaska (cover photo). By the end of the summer,

foliage fades and most needles have dropped; in years after attack, trees look silver-gray and may remain that way for many years.

Life History

Engraver beetles normally have a 1-year life cycle, passing through four distinct stages: egg, larva, pupa, and adult. Adult beetles emerge from the forest floor or host material where they overwinter and attack fresh host material. Time of emergence depends on temperature; flight may occur 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 3). These egg galleries are kept clear of boring dust by the adults' forcing the boring dust out of the entrance hole. This characteristic distinguishes engraver beetle galleries from those of spruce and other bark beetles.



Figure 2. *Engraver beetle boring dust.*



Figure 3. *Engraver beetle egg galleries radiating out from the nuptial chamber.*

Eggs are laid along the sides of the galleries and hatch into white grub-like larvae that feed in the phloem tissue perpendicular to the egg gallery. Larvae pass through four distinct growth stages, which result in widening the feeding gallery. Larval feeding severs the phloem tissue, and the tree dies because the phloem tissue is necessary for the downward movement to the roots of nutrients produced during photosynthesis in the foliage. On completion of feeding, the larvae enlarge the feeding gallery to form a chamber where they pupate and transform into adults by late July. New adults of some engraver species bore through the bark and leave the tree to overwinter in duff and litter on the forest floor. With other species, new engraver adults overwinter in the host material in which they developed.

Adults are small (0.3–0.6 cm long), cylindrical, reddish-brown to black beetles (Figure 4). The head is not visible when the insect is viewed from above, unlike the spruce beetle whose head is quite visible. A distinguishing characteristic of all engraver species, but not spruce beetles, is the pronounced declivity on the posterior end of

the beetle, which has 3–6 pairs of spines along the margin (Figure 5).

Guidelines for Reducing Engraver Beetle Attacks

Various activities that disturb the environment and stress the spruce trees contribute to attacks by engraver beetles. Such attacks may be prevented or reduced by following these guidelines:

- ❖ 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 wild-fire should be harvested immediately after the fire, if the fire occurs in early spring; otherwise, harvest before the next period of beetle flight.
- ❖ Slash from logging and thinning operations should be destroyed.
- ❖ Timber harvests should be scheduled after the beetle flight period but not within 3 months of the next flight period.
- ❖ Infested firewood should not be stacked or stored in areas surrounded by live trees.



Figure 4. *Adult engraver beetle.*



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Figure 5. *Spruce beetle* (left) and (1) *adult engraver* showing declivity on posterior end (note head is not visible); and (3) *side view of engraver declivity and spines*.

- ❖ Mechanical damage to standing trees should be avoided, and excess soil should not be placed on top or removed from the area over the root zone.
- ❖ 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.
- ❖ Trees infested and killed by engraver beetles will not be reattacked but may be simultaneously attacked by wood boring beetles.

CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife—if they are not handled or applied properly. Use all pesticides selectively and carefully. Since approved uses of a pesticide may change frequently, it is important to check the label for current approved and legal use. Follow recommended practices for the disposal of surplus pesticides and pesticide containers. Mention of a pesticide in this publication does not constitute a recommendation for use by the USDA, nor does it imply registration of a product under Federal Insecticide, Fungicide, and Rodenticide Act, as amended. Mention of a proprietary product does not constitute an endorsement by the USDA.

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Additional information on this insect can be obtained from your local USDA Cooperative Extension Service office, Alaska State Forestry office, or from:

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