

# Spruce Beetle

Windthrown trees can set up outbreaks

**Name and Description**—*Dendroctonus rufipennis* (Kirby) [Coleoptera: Curculionidae: Scolytinae]

Adult spruce beetles are dark brown to black, with reddish brown to black wing covers (fig. 1). Beetles are approximately 1/4 inch (6 mm) long. The rear margins of their wing covers are evenly rounded. Eggs are approximately 1/16 inch (1.5 mm) long and look like tiny pearls. Larvae are legless grubs and are approximately 1/4 inch (6 mm) long at full development. Pupae are creamy white, show some body features similar to adults, and are found in individual chambers at the end of larval galleries.



Figure 1. Spruce beetle adult. Photo: Steve Valley, Oregon Department of Agriculture.

**Hosts**—Engelmann and blue spruce, *Picea engelmannii* and *P. pungens*. During very large outbreaks, this beetle has also attacked lodgepole pine, though such occurrences are not common.

**Life Cycle**—A 2-year life cycle is most common, but 1- and 3-year generations have occurred. Adults emerge from May through July, depending on local factors that influence beetle development such as temperature, aspect, and elevation. The period of attack may last as long as 5–6 weeks. With a 2-year life cycle, brood spend their first winter as larvae and their second as adults.

Female beetles bore through the bark of trees (standing or fresh, cut or fallen) and deposit eggs on either side of constructed egg galleries. Egg galleries vary from a few to 12 inches (30 cm). Galleries are packed with frass. Larvae emerge from eggs and feed in phloem.

In the 2-year life cycle, the first winter is spent in the larval stage. Larvae develop into pupae in summer (approximately 1 year after initial attack). The second winter is spent as adult beetles. Some of these beetles exit and colonize the base of trees, where snow insulates them from extremely cold temperatures. Beetles emerge and colonize new hosts in spring/summer, 2 years after initial attack.

**Damage**—The spruce beetle, *Dendroctonus rufipennis*, is the most significant natural mortality agent of mature spruce. Outbreaks have occurred in spruce forests from Alaska to Arizona. Following a 1939 windthrow event, a very large spruce beetle outbreak that impacted thousands of acres and spanned more than a decade occurred on the White River and Grand Mesa National Forests and adjoining lands. Outbreaks cause extensive tree mortality (fig. 2) and can alter stand structure and composition. Average tree diameter, tree height, and stand density are all reduced following large outbreaks. As a result of the 1940s outbreak, many stands once dominated by mature Engelmann spruce are now dominated by subalpine fir.

The earliest sign of infestation is the presence of fine, bark-colored boring dust in bark crevices and around the base of standing trees. Pitch tubes may or may not be evident. Spruce beetles prefer down spruce to standing trees. On down (windthrown and cut) trees, spruce beetles commonly colonize the lower, well-shaded surfaces and may colonize the entire length of the trunk, typically



Figure 2. Spruce beetle activity in Engelmann spruce. Photo: A. Steven Munson, USDA Forest Service, Bugwood.org.

## Spruce Beetle - page 2

up to an 8-inch (20-cm) top. In standing trees, beetle activity is most common in the lower 30 ft (9 m) or so of the trunk. Strip attacks (attacks that impact only a portion of the tree's circumference) may be common, especially when beetle populations are small. Trees may live despite a strip attack, but such trees are often colonized again and killed in subsequent years.

Tree crowns typically remain green for up to a year after attack. By the second year, needles have faded and soon fall from the tree. The aerial "signature" of spruce beetle-infested spruce is not as striking or long-lasting as that of pine beetles in pines. Therefore, aerial detection of spruce beetle is extremely difficult. In the winter, infested trees are often easily identified by the abundance of bark flakes on the snow, which is evidence of feeding activity by woodpeckers.

Forest stands most susceptible to attack are located along drainage bottoms, have an average DBH of 16 inches (40 cm) or more, have a basal area of over 150 square ft per acre (34 square m per hectare) and have a canopy comprised of more than 65% spruce.

**Management**—Goals should be based on existing and desired forest conditions.

For endemic spruce beetle populations:

- From stand exam data, determine spruce beetle stand hazard ratings. Prioritize stand treatments to reduce susceptibility among moderate to high hazard stands.
- During stand treatments, minimize stump heights, maximize utilization of green spruce, cut green spruce cull logs into short lengths, and lop and scatter slash to maximize exposure to sunlight.
- Remove windthrown spruce before it is colonized by spruce beetles, or remove such trees after beetle colonization and before brood beetles develop and exit. If beetle response to recent windthrow is not known, conduct systematic sampling following beetle flight periods.

For growing spruce beetle populations:

- Registered insecticides can be applied to high-value trees to prevent beetle infestation.
- Identify and fell trap trees (large-diameter green spruce) into well-shaded areas. Trap trees cut in the fall before the beetle flight typically serve as optimal spruce beetle habitat. Do not remove limbs. Trap trees are often deployed in advance of larger-scale harvest operations and in combination with sanitation efforts to absorb beetles that might otherwise colonize green, standing trees. Remove infested trap trees in a timely manner.
- Remove spruce beetle infested trees. This can be accomplished in combination with beetle attack susceptibility reduction such as stand basal area reduction. These activities should be designed in order to minimize future windthrow potential.
- Following windthrow events, remove windthrown spruce after beetle colonization and before brood beetles develop and exit.
- Beetle-killed spruce may stand for decades, and many trees will remain viable for products such as house logs. Dead spruce can be salvaged to meet management objectives. Salvage activities alone do not influence spruce beetle populations.

For epidemic spruce beetle populations:

- Once spruce beetle populations reach epidemic proportions and impact large landscapes, it is not possible to stop such an occurrence with management activities. But certain management activities may still be successful at limited scales.

## Spruce Beetle - page 3

---

1. Holsten, E.H.; Their, R.W.; Munson, A.S.; Gibson, K.E. 1999. The spruce beetle. Forest Insect and Disease leaflet 127. Washington, DC: U.S. Department of Agriculture, Forest Service. 12 p.
2. Schmid, J.M. 1981. Spruce beetles in blowdown. Res. Note RM-411. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 5 p.
3. Schmid, J.M.; Frye, R.H. 1976. Stand ratings for spruce beetles. Res. Note RM-309. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 4 p.
4. Schmid, J.M.; Frye, R.H. 1977. Spruce beetle in the Rockies. Gen. Tech. Rep. RM-49. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 38 p.

