Spruce Beetle — Biology

A brief synopsis of the spruce beetle's life history is as follows:

- Adult females emerge when ambient air temperature exceeds approximately 16° C, find new suitable host material, and emit aggregating pheromones to initiate mass attack.
- Males join the females and each pair construct an egg gallery under the bark, parallel to the grain.
- The sapwood is inoculated with spores of a blue stain fungus as the egg gallery is built.
- Eggs are laid and hatch into larvae which feed on the phloem in feeding channels constructed at right angles to the egg gallery.
- After four instars, larvae pupate and develop into adults under the bark.
- Young adults pick up blue stain fungal spores while in the pupal chamber.

The bark beetle species have similar life cycles, progressing from egg through four larval instars to pupa and finally to adult. However, differences in these beetles' timing and duration affect the selection and application of management tools.

The components of the spruce beetle's life cycle are summarized in the following table. The timing of life-cycle events for any species of bark beetle will vary from year to year and from location to location due to variations in climate and local weather.

Event	Spruce Beetle
Main adult flight	May through June
Host preference	Windfall/slash; or living trees
Normal life cycle	Two years[a]
Overwintering stage	Larvae and adult[b]

From top: Adult spruce beetle, larvae, and woodpecker bark scaling of an attacked tree.

a) The length of the spruce beetle life cycle depends on the rate of heat accumulation. In warm summers, spruce beetle can complete its life cycle in one year. The duration of the life cycle affects the assessment of risk and hazard of damage.

b) Spruce beetle must overwinter as an adult before emerging to attack new host material. In the normal life cycle of two years, spruce beetle overwinters as a larva in the first year and as an adult in the second.

The action of the larval feeding in the phloem and fungal colonization of the sapwood completely blocks all translocation tissues and kills the infested tree. In some cases only one side of a tree will be successfully attacked (strip attack); this tree will survive unless living portions are re-attacked in subsequent years.

Damage Symptoms

Adults construct long galleries in the phloem. Light brown to red-brown boring dust will be present on the bark or around the base of infested trees. Pitch tubes are rarely formed by resin flowing out of the entrance holes made by attacking beetles.

Sometimes flaking of the bark by woodpeckers is a sign of infestation. Fading of the foliage to a yellowish-green is usually not noticeable until 18 months or longer following attack, particularly on rich sites. By the second autumn, most of the needles have usually turned brown and are shed by the following spring. Green needles on the ground or on the leaves of ground cover beneath infested trees may appear before any evidence is visible in the crown itself.

Damage

Spruce beetles normally infest downed trees or logging debris, but when beetle populations are large, they will attack and kill living trees, causing widespread damage. Large-diameter, mature spruce species are attacked, including Engelmann, white, Sitka and (rarely) black spruce.

Trees are killed when the flow of food and water between the roots and needles is blocked by a combination of feeding larvae and dead sapwood cells killed by the blue-stain fungi carried by the spruce beetle adults.

Trees fade to yellowish-green and then grey within a year following an attack.

Secondary Damage

Attacks by secondary bark beetles may produce boring dust in bark crevices. Ips beetle species — sometimes known as engraver beetles — can be distinguished by the gallery patterns and the lack of frass in galleries. The adult ips beetle differs from the spruce beetle in that it has a rear concave depression lined with spines. Spruce beetle larvae can be distinguished from most other Dendroctonus species by the presence of two anal shields.