The Spruce Beetle in Alaska's Forests

Richard Werner, Entomologist. Revised by Jim Kruse, Forest Entomologist and Nicholas Lisuzzo Biological Science Technician,USDA Forest Service, Alaska Region, State and Private Forestry.

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

Forest Health Protection
State and Private Forestry
USDA Forest Service
3700 Airport Way
Fairbanks, Alaska 99709
Phone: (907) 374-3758

Forest Health Protection
State and Private Forestry
USDA Forest Service
161 East 1st Avenue
Anchorage, Alaska 99501
Phone: (907) 743-9453

Forest Health Protection
State and Private Forestry
USDA Forest Service
11175 Auke Lake Way
Juneau, Alaska 99801
Phone: (907) 586-8883

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The spruce beetle (*Dendroctonus rufipennis*) is a bark beetle that attacks white, Lutz and Sitka spruce trees throughout their range in Alaska. Bark beetles kill trees by boring through the bark, then feeding and breeding in the phloem, the thin layer of soft living tissue directly beneath the bark. The phloem is vital to trees, as it transports food manufactured in the needles down to the roots. If damage to the phloem is extensive, the tree can become effectively girdled and die.

Small populations of bark beetles are always present in spruce forests. Most of the time, the number of beetles is kept low by predators, habitat availability and weather patterns, but when conditions are right, spruce beetles may suddenly increase to epidemic numbers. The right conditions include an abundance of breeding material accompanied by an extremely dry summer. Beetles attack and breed in fresh windthrown trees, felled trees, injured trees and large diameter logging slash. When the beetle population outgrows the supply of dead and injured trees, they move into nearby living trees, particularly mature stands of Lutz, Sitka, and white spruce.

More than 2.3 million acres of spruce forests have been infested in Alaska in the last 10 years with an estimated 30 million trees killed per year at the peak of the outbreak.

Signs That Beetles are Present

Entrance holes are usually found in the roots (both exposed and underground) and lower fifteen feet of the trunk. Globules of resin or pitch tubes at the entrance hole into the bark are a sign of spruce beetle attack. Early detection requires close examination of trees from early June to mid-July. Beetles that attack healthy, vigorous trees are usually trapped in a mass of resin and "pitched out" of the entrance hole.

A change in foliage color is another indication of spruce beetle attack. Needles begin to fade from dark green to pale yellowish-green following attack. In some cases, needle discoloration may not be noticeable until one year after the attack and sometimes not until after the beetles have left the tree. One year after intiial attack needles will start to drop by mid-summer and the tree will begin to turn reddish-brown. Three to five years following attack, the trees appear silvery-gray and remain that way for many years.

Life History

In Alaska the spruce beetle's life cycle can be one or two years long. Adult beetles emerge from infested trees from mid-May to mid-June, and their flight to fresh host materials lasts until mid-July. When the female beetle finds a suitable host, she bores into the bark and constructs an egg gallery in the phloem parallel to the wood grain and usually above the entrance hole. After mating occurs, the female lays whitish-yellow eggs in clusters on either side of the gallery. Eggs hatch into white grub-like larvae

Figure 1. An adult spruce beetle and a spruce beetle larva found in a gallery.

which feed in the phloem perpendicular to the egg gallery. Larvae do not enter the wood but may score the outer surface.

One-year life cycle beetles develop from egg to pupae the first summer. New adults spend the winter under the bark at the base of the infested tree. Two-year life cycle beetles spend the first winter as larvae beneath the bark. In spring they resume development and eventually transform into white pupae for a short time and then to adult beetles. The adults then migrate to the base of the dead or dying tree where they overwinter.

Guidelines for Reducing Beetle Infestation

Various activities which disturb the environment of spruce contribute to spruce beetle attack and epidemic outbreaks. These activities include timber harvest; land clearing related to road, seismic line, pipeline, powerline, or building construction; severe winds which cause windthrown trees, and wildfire.

Spruce beetle attacks may be prevented or reduced by following these guidelines:

Proper Management of Spruce Forests

1. Maintain spruce stands in a healthy and vigorous condition by removing overmature, slow-growing, diseased, injured, and dying trees.

2. Remove damaged or windthrown trees from spruce stands under management.

3. Establish a stand rotation age (harvest age) of less than 100 years.

4. Timber sale size and orientation of cutting areas are important in creating stands that can with- stand high winds. Leave-strips between clearcut or shelterwood cutting areas should be more than 100 feet wide. Timber sales should not be located along ridgetops where shallow-rooted spruce are highly susceptible to high wind.

Figure 2. Spruce beetle larvae

Timber Harvest

1. Overmature, slow-growing trees should be removed from forest stands as they are highly susceptible to spruce beetle attack.

2. Windthrown trees, particularly in recently logged areas, should be removed.

3. All logs cut after March should be removed and utilized prior to beetle flight the following May. Logs cut during the summer months should be removed shortly after cutting.

4. All slash and cull logs four inches in diameter and larger should be disposed of by burning, burying, chipping, or peeling.

5. Stumps should be cut as low as possible.

6. Whole tree logging will eliminate most of the breeding material usually left in the forest and concentrate it at the logging landing where it can be destroyed.

Rights-of-Way Construction

1. Timber along rights-of-way for roads, seismic lines, pipelines, and power lines should be cut in the fall and the logs utilized before the next spring. Slash should be treated as described earlier. Trees next to the right-of-way should be examined for beetle attacks in late summer following cutting. If trees are infested, they should be removed.

2. Care should be taken to avoid scarring trunks with mechanical equipment, severing roots, altering drainage patterns, or severely compacting the soil.

Home Construction

1. Trees removed for home construction should be properly disposed of or utilized. If stockpiled for firewood or used for construction, the bolts or logs should be peeled. Mechanical damage to standing trees should be avoided and damaged areas should be cleaned with a knife and allowed to heal over.

2. Excess soil should not be placed on top of or removed from the area over the root zone. Trees breathe to some degree through the roots and the addition or removal of soil can cause suffocation.

3. Avoid soil compaction around the base of trees and do not surface these areas with rock, concrete, or asphalt. Sewage drainage fields should be located away from trees because excess water can create stress conditions in adjacent trees.

4. Insecticides can be used to protect live trees from beetle attack. Water solutions of chemicals should be applied with a pressurized sprayer to the trunks of trees before beetle flight. Your local Alaska Cooperative Extension office can provide additional information. Observe all precautions and restrictions when using pesticides.

Figure 3. A spruce beetle caught in the resin of a spruce tree. The resin is produced to defend the tree against attack by insects

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.