COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF ALASKA FAIRBANKS
PMC-10067

Spruce Beetles

A Guide to Tree Management Options for Home and Woodlot Owners

Spruce beetles can be a very serious cause of tree mortality in the spruce forests of Alaska. They occur statewide, though historically, the majority of damage has occurred in Southcentral Alaska. Spruce beetles are always present in the environment, though their activity is not always noticed. Spruce beetles are not restricted to forest stands; high-value ornamental trees in yards or community settings are also susceptible to spruce beetle.

What do spruce beetles do?

Adult spruce beetles emerge from their host tree during early summer, usually between mid-May and July. This period is referred to as the adult flight period. Once they emerge, they seek out new hosts to attack in the surrounding area. Beetles prefer to attack the lower portions of the trunk, with the majority of attacks occurring within the first 15 feet.

Adults bore through the bark into the phloem, a layer of cells just inside the bark that carries sugars created in the needles to the roots of the tree for energy. Here, the female lays eggs in a tunnel, called a gallery, that is chewed parallel to the wood. When the eggs hatch, the larvae feed outward from the gallery, severing the phloem and disrupting the transport of sugars from the needles to the roots of the tree. The tree is killed when the phloem is severed around the entire circumference of the tree.

Does it matter what species of spruce I have on my property?

Spruce beetles prefer to attack white, Sitka and Lutz spruce (the hybrid cross Sitka x white), but they rarely attack black spruce. Spruce beetles can also attack ornamental spruce species such as Norway, Engelmann and Colorado blue spruce. Spruce beetles do not attack hardwood tree species like birch or cottonwood.

Does it matter how big my trees are?

Typically, spruce beetles attack trees larger than about 12 inches in diameter, though under certain circumstances they will attack trees as small as 4 inches in diameter. Large-diameter older trees are particularly susceptible, especially if they have been stressed by lack of water or mechanical damage to the bark or roots. Crowded tree stands can be stressed as a result of competition with other trees for water and nutrients, making them more susceptible to attack.

How do I determine if my trees have been attacked?

Trees that have been attacked by spruce beetles may exhibit the following signs and symptoms:

1. **Boring dust:** A fine, reddish-brown, sawdust-like dust that is produced by the beetles as they chew entrance holes into the bark. It accumulates in cracks and crevices of the bark and around the base of the tree.

2. **Pitch tubes:** Live attacked trees will usually exhibit globules of pitch at the site of a spruce beetle entrance hole as the tree attempts to "pitch out" the attacking beetle. The pitch can range from creamy white in color to reddish-brown and is often mixed with the boring dust.

3. **Needle color change:** Live attacked trees will start to exhibit a change in needle color the year following a spruce beetle attack. Needles typically change from green to yellow to reddish-brown before falling off the tree.

Keep in mind that evidence of a spruce beetle attack may not always be visible. Trees that are severely drought-stressed may not produce enough pitch for pitch tubes, or heavily infested trees may not exhibit needle color change before the needles drop. Inspect

your trees fully and if you are unsure, contact your local Extension office or a tree care professional for help with diagnosis.

How do spruce beetles affect trees?

Trees are typically killed within the first few weeks of a severe spruce beetle attack, but it may take a year or more for the needles to begin changing color and falling off. Trees that have been killed by spruce beetles are subject to advancing stem and root rot infection and being blown over or falling down. The length of time these dead trees have until they fall varies from site to site, depending on factors such as ground moisture and wind patterns. Dead trees become an increasing hazard to structures and people, and it is recommended that concerned landowners have their trees examined by a forester or tree care specialist.

Downed trees with bark on them can also serve as host material for spruce beetles and could lead to further infestation of healthy trees nearby.

What do I do with my trees?

First, examine your tree(s) to determine if there appears to be any spruce beetle activity as previously described. Then, use the following information as a guide for managing spruce beetles based on the tree conditions described below.

The tree appears unattacked

The tree has green needles. There is no reddish-brown boring dust present in the crevices of the bark, especially at eye level and below, or on the ground at the base of the tree. No pitch tubes are evident, especially at eye level or below, including at the base of the tree or along any above-ground roots. If the tree is unattacked, use the steps below to prevent an attack.

Maintain health and vigor of trees.

Spruce beetles prefer to attack weaker trees or ones that have fallen down, so maintaining the health and vigor of your trees is important. Tree care practices such as watering and fertilizing early in the growing season will help develop and maintain healthy trees. Removal of weakened or damaged trees and downed trees with bark on them may need to be considered to protect the health of other trees on the property. Removed material should be processed using the guidelines in the following sections.

Be careful about accidentally importing the beetles to your home or lot.

Firewood or logs brought to your property may be a source of future infestation. Beetles can develop through different life stages under the bark and may emerge and attack other trees in the immediate area. Removing the bark and burning it will help ensure limited impact from spruce beetle-infested firewood or logs.

Do not damage the trees.

Be careful not to damage the trees on your lot during any construction, landscaping or tree management activities since damaged trees are more susceptible to infestation.

Thinning forest stands may reduce competition for water and nutrients by your desired trees.

Optimum stocking for tree vigor is dependent upon tree species, age and size, and growing site conditions. Select trees for removal based on evidence of physical damage, insect damage and tree form. Contact the Alaska Division of Forestry for more information. When thinning stands, process the material as described below to reduce host material in the stand. Avoid thinning trees during the adult flight period of May-July.

Prune lower branches for fully crowned trees.

Pruning should be done in the fall or winter and the branches removed from the site. Research has shown that pruning the lower branches of the tree can reduce the risk of infestation as a result of changing the environmental conditions in this portion of the tree. Avoid pruning trees during the adult flight period of May-July.

Apply a registered insecticide to prevent spruce beetle attacks.

Insecticides can be used to protect trees from spruce beetle attack. Insecticides are **preventive only** because of the nature and location of spruce beetle damage. There are two ways to apply insecticides for spruce beetle prevention. The first is by **spraying**. Spraying should be done in spring by early May in order to protect the tree prior to the beetles' emergence and adult flight period. Two active ingredients are registered and effective as sprays for spruce beetle: *carbaryl* and *permethrin*. These active ingredients may be sold under several trade names for different uses. Sprays should be applied to the trunk of the tree from

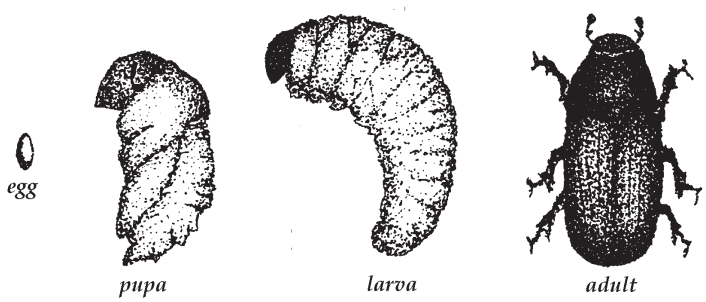
the ground up until the tree is 5 inches in diameter. If that height cannot be reached, applications should be made to at least the first 25 feet of the trunk. In this case, know that beetles may attack above the spray line.

The second way to apply insecticides is by **injection**. New product formulations and application technology allow for the direct injection of insecticides into a tree to control spruce beetles. Active ingredients registered for injection for spruce beetle control are *emamectin benzoate* and *abamectin*. These active ingredients may also be sold under several trade names for different uses. Studies on the use of these products are beginning in Alaska to determine the correct timing for our growing conditions. Recent work in other spruce beetle systems indicates that emamectin benzoate needs to be applied approximately 12 months before a trees is attacked by beetles for it to be fully protected. This is because of time needed to move the product within the tree. We hope to have more specific timing recommendations for Alaska soon. Injection applications should be made low on the trunk to maximize transport of the insecticide upward through the tree.

If you choose to use an insecticide, be sure that the product you purchase is registered for your specific use. Some products may be registered for ornamental trees or forest settings or both. **Be sure to read and follow all label directions. The label is the law!**

Due to the cost of application equipment and protective gear, it may be more economical to hire a certified pesticide applicator.

If you have any questions about any aspect of the use of insecticides for spruce beetle control, contact your local Extension office.



Life cycle of the spruce bark beetle.

The tree appears to be attacked

See the varying descriptions below.

Tree has green needles and evidence of pitch tubes and/or boring dust is present on the bark.

The tree was attacked within the past year. One or a few beetle attack sites on the bark doesn't mean that the tree will die immediately, but an initial attack may mean that the tree will experience a larger attack the following year. An attacked tree may also harbor a source population that will further infest the area in the following years. A careful assessment of the existing damage and treatment alternatives by a qualified professional may be needed. Surviving attacked trees should be cared for to increase their vigor by watering during the growing season and fertilizing. Preventive measures should be considered for surrounding unattacked trees.

If the tree has been heavily attacked, it should be removed and processed before the following May in order to prevent further infestation of surrounding trees.

Tree has faded yellow or bright red needles and evidence of pitch tubes and/or boring dust is still present on the bark.

The tree was attacked last season. Evidence of spruce beetle life stages is easy to find under the bark. Bark is relatively easy to peel and may exhibit evidence of woodpecker activity. These trees may be the source of new infestations for the present season and possibly the next since beetles can have either a one- or a two-year life cycle. Remove these trees before May and debark or otherwise process the trees immediately upon felling.

Tree has no needles remaining on twigs and there is evidence of prior beetle attacks.

The tree was attacked last season or before and may still have evidence of prior beetle attacks, such as pitch tubes on the bark. Adult emergence holes are also present on the bark; they are approximately ⅛ inch in diameter. Many smaller holes may begin to appear in the bark as a result of secondary pests moving into the tree. Beetle larvae may not be present under the bark, although there may be some adults. Large portions of the bark may be removed by woodpecker activity. These trees may harbor source populations for the next season's infestation. Remove a section of the bark to determine if adult beetles are

present. If adults are present, fell the tree prior to mid-May and debark or otherwise process the tree immediately upon felling.

Tree has no needles, branches appear "droopy" and tree color appears silver-gray.
These trees have been attacked at least three or more seasons ago. They will generally have loose bark with evidence of bark beetle activity on the undersides of the bark. These trees will have no spruce beetles remaining under the bark although other insects and wood decomposers may be present. You may choose to fell the tree for firewood or other uses or leave the tree standing for wildlife habitat. Depending on soil moisture, the presence of root rot and wind patterns, these trees may have only five or more years before they will be at risk of falling down. If they could endanger people or property, they should be removed.

Removing and processing trees

Trees that need to be removed, whether they are living or have been attacked by spruce beetles, should be processed to eliminate spruce beetle habitat. Once the tree is felled, process the material by splitting, debarking or chipping the material. Stumps should not extend above the ground and should be debarked down to 2 inches below the ground or mechanically ground down.

If splitting the wood for firewood, burn material with bark before the following spring. Wood without bark can be stored longer for later use. Stack firewood loosely to encourage air movement and rapid drying. Do not stack spruce firewood near living spruce trees.

Processing should be done soon after the tree is down and ideally before the flight period from mid-May to July.

Dead trees and fire concerns

The link between beetle-killed trees and wildfire is complex and there are often many factors involved that can make generalizations difficult. A dead tree that is closer to a structure than one and a half times its height should be removed to reduce risk of fire or falling. Pruning off dead branches from the lower portion of trees can reduce the risk of fire moving up the tree. For more information on wildfire, contact the Alaska Division of Forestry.

Is there anything I can do to prevent future outbreaks of bark beetles on my property?

Maintaining a mixture of native tree species and age classes is a good approach to maintaining a healthy and pest-resilient forest area. Landowners and homeowners should be cautious about leaving fresh spruce firewood on their property and especially about stacking it against or near living spruce trees. Spruce firewood with bark can bring beetles onto your property if the wood is infested. If bringing in spruce firewood, store only enough for a single winter's use or debark the material for longer-term storage.

For more information on managing spruce beetles, contact your local Cooperative Extension Service.

For more information

"Spruce Beetle in Alaska's Forests," www.alaskaspruce-beetle.org

"What's Bugging Alaska's Forests? Spruce Bark Beetle Facts and Figures," Alaska Department of Natural Resources, Division of Forestry, http://forestry.alaska.gov/insects/sprucebarkbeetle.htm

Forest and Grassland Health, "Spruce Beetle," U. S. Forest Service, www.fs.usda.gov/detailfull/r10/forest-grasslandhealth/?cid=FSEPRD536861&width=full

www.uaf.edu/ces or 1-877-520-5211

Jessie Moan, Extension Integrated Pest Management Technician. Originally prepared by Lois Bettini, former Extension entomologist.

Published by the University of Alaska Fairbanks Cooperative Extension Service in cooperation with the United States Department of Agriculture. The University of Alaska is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: www.alaska.edu/nondiscrimination

4-92/LB/5-18

Revised May 2018