



Conifer Adelgids

Forest Health Fact Sheet

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Adelgid adults secrete a white, woolly covering

Adelgids are sap-sucking insects similar to aphids but they feed only on conifers. Feeding by these insects can result in growths called galls. Adelgids cause mainly cosmetic damage, although chronic infestations can reduce tree growth, alter form or result in mortality. Two major adelgids in Oregon are the established exotic, Balsam woolly adelgid (BWA; *Adelges piceae*), and the native Cooley spruce gall (CSG; *Adelges coolyi*). BWA is a major pest in the Willamette Valley and Cascades where it has contributed to the long-term decline of several fir species. CSG is mainly a pest of ornamental trees, nursery stock and Christmas trees.

Balsam woolly adelgid hosts

- Subalpine, Pacific silver, grand, balsam, cork bark and ornamental Fraser fir

Cooley spruce gall hosts

- Douglas-fir; Sitka, Englemann, white and Colorado blue spruce

BWA Biology

The **balsam woolly adelgid** is a European insect that first appeared in Oregon in the 1920's. By the 1950's and 1960's, dramatic outbreaks of BWA occurred in the Cascades and caused true fir mortality over thousands of acres. Since then, this insect has spread over much of the fir species in Oregon. The long-term impacts of adelgid infestations have been substantial. Grand fir has been almost eliminated from low elevations in the Willamette Valley and subalpine fir is disappearing from some high elevation areas where it is an important pioneer tree species. In addition, foresters have become reluctant to plant Pacific silver fir because of its susceptibility to adelgid damage.

In North America, BWA populations are composed entirely of females and reproduction is parthenogenetic (asexual). Except for the crawler stage, BWA remains in one location on the tree, sucking nutrients from the

phloem. BWA is flightless and long distance spread is dependent on the crawler stage (the only mobile stage of this insect) being carried by the wind to new locations. BWA populations in Oregon are composed of all females and have two or more generations a year, therefore adelgid numbers can increase dramatically when conditions are favorable. Warmer than average summer temperatures are favorable for adelgid survival and development. True fir growing at the lower ends of their elevation ranges where milder temperatures occur are most vulnerable to BWA infestations.

BWA Damage

The two external symptoms of BWA infestations are gouting at the ends of branch tips, and stem infections from white, woolly adults attacking the main stem.

Grouting

Grouts are found on the terminal growth and the nodes and buds of lateral branches. Often the form of grouted branches is distorted by adventitious branching. When active BWA infestations produce gouts, the tree's production of new foliage and reproductive structures (cones) can be dramatically reduced. Gouts persist on branches and provide a record of past infestation. The crown of a tree affected by gouting (narrow crowns or curled tops) slowly declines and may become susceptible to attack by other pests.

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BWA galls on grand fir

Stem Attacks

Stem attacks are aggregations of adults feeding on thin bark portions of the tree's main bole. Trees react to BWA feeding by producing tissues similar to compression wood in the outer ring of sapwood. This abnormal wood conducts water poorly. Adelgid feeding also disrupts transport of food by phloem tissue to the roots. Stem infestations can produce rapid decline in the vigor of a tree's crown and eventually result in death within a few years.

Chronic attacks can cause needles to shed, which unveils lichens naturally growing in the crown that give these infested trees a dark purplish hue.

CSG Biology

The **Cooley spruce gall** has a very complicated life cycle that requires two different hosts and can produce several generations a year or take up to 2 years to develop. There are forms of this insect that appear only on spruce, only on Douglas-fir, or on both hosts. A common infestation pattern on both Douglas-fir and spruce is that hatched adelgid (crawlers) migrate from older foliage to new flushes of growth in the spring. In May and June, recently hatched adelgids appear as tiny black spots on the new flushes of Douglas-fir foliage. A hand lens is required to see any details on the crawler stage. On spruce, adelgids migrate to new flushes of foliage and feed near the base of needles, which stimulates gall formation.

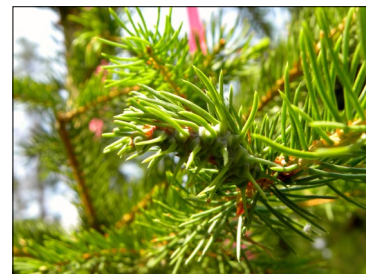
CSG Damage

Severe infestations cause distorted, bent needles, and yellow spots at the point of adelgid feeding. Damaged needles may be shed prematurely. Attacks may also kill the tips of branches and stunt or deform trees. Galls are produced on spruce but not on Douglas-fir. Cone-like galls form at the tips of spruce branches during June and

Management highlights

- Harvest infested trees
- Collect cones from and plant resistant and tolerant trees
- Plant host species only within their range on good sites
- Switch to site-appropriate, non-host species

July. Initially galls are a green or a purplish color and have needles projecting from the surface. Galls gradually enlarge, dry and split open, releasing winged adults. Old galls turn brown and may persist on trees for several years.



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CSG gall on Engelmann spruce

Management

Natural: Cold winters (~10°F days) and natural predators can affect adelgid survival. There were no known effective native predators for BWA, but by 1970 six different species were introduced from Europe and established in Oregon. So far, these introduced predators have not proven their efficacy for BWA control.

Silvicultural: Harvest (or remove during thinning) infested trees and plant site-appropriate, non-host trees. Collect cones from resistant or asymptomatic trees.

Chemical: Control of adelgids with insecticides is difficult and requires thorough spraying of the tree with a high-pressure sprayer or successful uptake of soil injections. Insecticide treatments should be made in the early spring or near bud break.

When using pesticides, always read and follow the label

More information:

Oregon Dept. of Forestry, Forest Health
<http://tinyurl.com/odf-foresthealth>
2600 State St. Bldg. D, Salem, OR 97310
503-945-7200

Other references:

USFS Forest Health Protection
www.fs.usda.gov/goto/fhp/fidls

OSU Forestry Extension
<http://extensionweb.forestry.oregonstate.edu/>