



Forest Health Note

Balsam Woolly Adelgid (*Adelges piceae*)

Hosts:

Sub-alpine fir and Pacific silver fir are frequently attacked by balsam woolly adelgid (BWA) throughout their natural range. Grand fir is susceptible to damaging infestation in the lowland valleys of western Oregon and occasionally at other sites. Adelgid infestations can develop in off-site plantings of noble fir, white fir, and red fir, but these species growing in their native range suffer no damage. Among ornamental trees, Fraser, balsam, and cork bark fir are very susceptible to damage.

Importance:

The balsam woolly adelgid is a European insect that first appeared in Oregon in the 1920s. By the 1950s and 1960s 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 type in Oregon and tree mortality has subsided to lower levels. The long-term impacts of adelgid infestations have been substantial and include eliminating grand fir at low elevations in the Willamette Valley and the disappearance of sub-alpine fir from some high elevation areas where it is an important pioneer tree species (Figure 1). In addition, foresters have become reluctant to plant Pacific silver fir because of its susceptibility to adelgid damage.

by adventitious branching. When active BWA infestations produce gouts, the tree's production of new foliage and reproductive structures (cones) can be dramatically reduced.

Once formed, gouts persist on branches and provide a record of past infestation. The crown of a tree affected by gouting slowly declines and may become susceptible to attack by other pests.



Photo: Ladd Livingston, IDL, Bugwood.org

Figure 2: Branch tip gouting on subalpine fir from balsam woolly adelgid infestation.

Look For:

The two external symptoms of balsam woolly adelgid infestation are gouting at the ends of branch tips (Figure 2) and stem infections characterized by white woolly tufts covering the bark on the main stem (Figure 3).

Gouting

Gouts are found on the terminal growth and the nodes and buds of lateral branches. Often the form of gouted branches is distorted



Photo: Jerald Dewey, USDA FS, Bugwood

Figure 3: Balsam woolly adelgid stem attack on subalpine fir.

Photo: Dave Beckman, IDL, Bugwood.org



Figure 1: Subalpine fir mortality from balsam woolly adelgid attacks in northeast Oregon.



Stem Attacks

Although the adult balsam woolly adelgid is only 1-mm in length and difficult to see with the naked eye, the white waxy material secreted by the insect makes infestations on the bark easily detectable by casual observation. Stem attacks are aggregations of adelgids feeding on thin bark portions of the tree's main bole.

The tree reacts to BWA feeding by producing a "compression like wood" in the outer ring of sapwood (Figure 4). This abnormal wood is poor at conducting water. Adelgid feeding also disrupts the functioning of the phloem tissue that transports food to the roots. Stem infestations can produce a rapid decline in the vigor of the tree's crown and eventual death.



Figure 4: A red colored band of sapwood (abnormal wood) produced by trees in response to balsam woolly adelgid stem attacks.

Infestation Characteristics:

In North America, BWA populations are composed entirely of females and reproduction is parthenogenetic. Except for the crawler stage, BWA remains in one location on the tree sucking nutrients from the phloem. The balsam woolly adelgid 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.

Because the BWA population is composed of all females and has two or more generations a year, adelgid numbers

can increase dramatically when conditions are favorable. A factor favoring adelgid survival and increased damage is warmer than average summer temperatures. True fir species are most vulnerable to BWA infestations when growing at the lower ends of their elevation ranges where milder temperatures occur.

Control On Forestland:

Natural

Because there were no effective native predators for BWA, six were introduced from Europe before 1970 and became established in Oregon. The effectiveness of these introduced predators in controlling BWA populations is unknown. Weather in the form of cold winters can affect BWA survival. Under very cold conditions, only adelgids beneath the snowline may survive.

Silvicultural

- √ Harvest true fir infested by BWA and plant non-host trees appropriate for the site.
- √ Discriminate against BWA-infested fir when thinning mixed stands.
- √ True fir cone collections should be restricted to trees with no symptoms of BWA infestation. Trees without symptoms may be more tolerant or even resistant to BWA attacks.

Control for Ornamental Trees:

Replacement of badly infested ornamental true fir with a non-host species is recommended. Control of BWA with insecticides is difficult and requires thorough spraying of the tree with a high-pressure sprayer. Insecticide treatments should be made in the early spring at or near budbreak. The following insecticides are registered for controlling BWA infestations:

imidacloprid
endosulfan

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