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Balsam Woolly Adelgid

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Balsam woolly adelgid on subalpine fir (*Abies lasiocarpa*).

Photo by David Beckman, Idaho Department of Lands.

Introduced pests have long been the source of epidemic outbreaks of both insects and diseases of forest trees. Over the years the trees of North America have been besieged by white pine blister rust, gypsy moth, Dutch elm disease, and chestnut blight. One of these introduced species of pests that has long caused mortality in the true firs of Idaho is the balsam woolly adelgid (*Adelges piceae*).

Balsam woolly adelgid (BWA) was introduced to eastern North Amer-

ica from Europe at the turn of the 20th century, and have spread throughout the United States and Canada. First reports of balsam woolly adelgid in the west were made around 1929. Balsam woolly adelgid was first found in Idaho in 1983 at one urban site in Coeur d'Alene, and five forested sites east of Moscow in Latah County. Since then, BWA has spread throughout much of the state.

True firs are the only known hosts of BWA, with a range of susceptibility. European species such

as silver fir (*Abies alba*) are able to support large populations and remain relatively unharmed, while North American species of fir, such as subalpine fir (*Abies lasiocarpa*), are highly susceptible and die readily. Most mortality has been in forested environments, but damage is also common in urban areas. In other parts of the west (coastal Oregon and Washington), grand fir (*Abies grandis*) is highly susceptible; however in Idaho, BWA rarely causes mortality in grand fir. Asian firs are intermediate in susceptibility and Douglas-fir (*Pseudotsuga menziesii*), not being a true fir, is not susceptible at all.

In some areas of the west, BWA is highly destructive and has caused significant mortality to large tracts of native Pacific, grand, and subalpine fir to the point that, in some areas, firs are slowly being eliminated from the ecosystem. As with many other pests, BWA can be found in association with other insects and diseases attacking subalpine fir. This complex includes BWA, western balsam bark beetle, and *Armillaria* root rot, and is known as the "SAF complex". Damage caused by these agents look similar from afar, and can easily be confused.

Life cycle.

Balsam woolly adelgid are part of a group of insects that are closely related to aphids. Probably the most significant aspect of the balsam woolly adelgid's success in North America is that the entire population of this species of pest is



Balsam woolly adelgid has a white waxy covering that looks woolly.

Photo by Robert L. Anderson, USDA Forest Service.

female. Balsam woolly adelgid reproduces parthenogenetically, meaning there is no mating or fertilization; it only takes one to form a new colony. There are between two and four generations of adelgids per growing season, depending on locality and elevation. In the

mountainous areas of the west, two generations are most common.

Activity begins in April when overwintering nymphs begin development. These nymphs are about 1/32nd inches long, amber colored, flattened, and fringed with whitish wax. Nymphs develop through three instars and mature sexually to begin laying eggs around June. As the nymphs mature to adults they produce a wax-like covering that resembles wool. Adults and eggs are protected by this waxy, woolly layer covering them. Adults are approximately 1/16th inches long and wingless. They are purple to black in color under their white woolly layer and remain attached to the tree by their deeply penetrating mouth parts for their entire adult lives.

Eggs begin hatching in June into active, amber-colored crawlers, the only stage of the life-cycle in which this pest is mobile. Their small size allows crawlers to travel great distances, being transferred from tree to tree by wind, rain, animals and humans. In forest situations wind dispersal is thought to be the principal means of transfer from one host tree to another.

Once a crawler has found a suitable site, it sinks its long, sucking mouth parts into the outer bark and begins sucking sap from the tree. Crawlers transform into a flattened, wax-fringed resting stage known as neosistens. In colder areas of its range this is the only stage that will survive winter temperatures and thus overwinters in this

stage. In the non-overwintering generations, the neosistens stage can last from two to eight weeks. Following the neosistens stage are two forms that closely resemble adults, followed by the final adult stage of the life-cycle. This latter part of the cycle, which includes the two pre-adult and adult stage, are called the sistentes. By late September, the second generation of adults begins to lay eggs and do so as late as mid- November.



Gouting.

Photo by William M. Ciesla, Forest Health Management International.

“gouting”, of twigs and branches. Gouting appears as stunting of the terminal growth as well as distinct swellings around the buds and branch nodes. Larger and older trees or overcrowded stands are usually attacked first, though all sizes of trees are vulnerable.

Feeding can be concentrated on the stems or in the crowns. In the West, stem attacks are more common on the best sites and crown attacks more common on poorer sites. BWAs can also concentrate their attack in heavy, mass infestations along the trunk of a host tree, with 100 to 200 adelgids per square inch of bark surface. The stems of trees under heavy attack form reddish, irregular growth rings, which disrupt water conduction to

Damage.

Balsam woolly adelgid feed on the stems, branches, and twigs of their host species. During feeding they inject a growth substance into the outer bark which causes abnormal cell division resulting in swelling, or



Trunk attack.

Photo by Jerald E. Dewey, USDA Forest Service.

the crown and often results in mortality within two to three years of attack. With crown attacks, trees decline over a number of years and growth is slowed. Old needles drop and are not replaced by new ones, and cone and seed production is greatly reduced.

Control.



Biological control of BWA by the predacious Syrphid fly .

Photo by Steven Katovich, USDA Forest Service.

There are several predators of the balsam woolly adelgid, including ladybird beetles, syrphid fly larvae, and green lacewings. Though predators are often present, they have not been able to achieve economic levels of control. Systemic chemical control is feasible in home landscape and other urban settings, but not across large tracts of forestland.

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For more information about BWA and SAF Complex you can go to:

USDA Forest Service Forest Insect and Disease Leaflet 118: Balsam Woolly Adelgid at:

<http://www.fs.fed.us/r6/nr/fid/fidls/fidl-118.pdf>

Idaho Department of Lands Management Guide for Balsam Woolly Adelgid at:

http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5187218.pdf

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Balsam woolly adelgid outbreak.

Photo: Robert L. Anderson, USDA Forest Service.