



Balsam Woolly Adelgid

HISTORY

Balsam woolly adelgid (BWA, *Adelges piceae*) is an insect most Christmas Tree Growers across Nova Scotia are all too familiar with. True firs (*Abies* spp.) with top kill, distorted growth, gouting, and overall decline in health and appearance have likely fallen victim to this insect. Balsam woolly adelgid is an invasive pest that was introduced from Europe to eastern Canada in the early 1900's. It was later found in western Canada in 1929 and in the southeastern United States in the mid 1950's. It is assumed that this invasive pest was introduced to North America by infested nursery stock. BWA has the potential to cause significant damage to young and mature fir trees if left unmanaged. Christmas tree lots are particularly susceptible to this insect due to lack of diversity, presence of mature seed trees within lots and mature fir surrounding lot boundaries.

HOSTS, DISTRIBUTION & SUSCEPTIBILITY

True firs are the only known hosts of this pest, although some firs display resistance. Balsam woolly adelgid is native to Europe but is an introduced pest in North America. BWA can be found in fir across Canada and into the United States. European species have the ability to support large populations of BWA but display minimal symptoms while fir native to North America can suffer detrimental effects. Listed below are fir species and their susceptibility to BWA rated from highly sensitive to resistant:

- European firs – RESISTANT
- Asian firs – INTERMEDIATE SENSITIVITY
- North American firs – HIGHLY SENSITIVE

North American fir species such as White fir (*A. concolor*), Noble fir (*A. procera*), and Shasta fir (*A. magnifica*) have displayed resistance in natural stands but are more susceptible to adelgid in exotic or non-native plantings.

IDENTIFICATION

Balsam woolly adelgid is an extremely small insect measuring 1 mm in the adult stage. Adelgids are oblong and wingless and possess piercing/sucking mouthparts. Adults are purple-black in color and produce a white waxy “wool” that covers the body and acts as protection to the insect and its eggs. One female can produce 100 – 250 eggs that are laid under the wool-like coating. Amber colored crawlers hatch from the eggs. Crawlers are the only stage that the insects are capable of direct movement or dispersal and are approximately 4 mm in length. Once hatched, crawlers will seek a feeding site which is most often roughened areas of bark, branch and twig nodes and the base of buds. Once attaching to a feeding site, the adelgid flattens, gets a waxy coating and enters the resting stage. This transformation is known as neosistens and is the only stage in the insect’s life cycle that can survive winter temperatures. After the neosistens stage, the adelgid transforms into two immature forms that closely resemble an adult. The adult stage of the insect is referred to as the sistentes. There is a rare stage of adelgid that occurs in Europe and the Maritime provinces. This stage is known as progrediens and in one form is wingless, and in another is winged. BWA is predominantly spread by wind and in some cases animals.



A - <https://www.flickr.com/photos/sanmartin/31434461584>

B & C - <https://fieldguide.mt.gov/speciesDetail.aspx?elcode=IIHOM21020>

LIFE CYCLE

The life cycle of balsam woolly adelgid consists of the egg stage, three nymphal instar stages and the adult stage. BWA populations are composed entirely of females and produce 2 to 4 generations a year depending on climate, location, and elevation. In Nova Scotia, adelgid typically produces two generations annually. Adelgids that overwintered on trees begin spring development in late April or early May. BWA will develop into the adult stage by the end of June. After developing into adults, adelgids will begin an egg-laying period that typically lasts 6 weeks. Eggs can hatch within 1 to 2 weeks, and crawlers will settle into feeding sites and transform into the resting neosistens stage that can last 2 to 8 weeks. In late September into October, adults of the second generation will become plentiful. Egg-laying will commence until mid-November.

Month of Year	J	F	M	A	M	J	J	A	S	O	N	D
Nymph Stages												
Adult stage												
Egg Stage												
Crawler												
Generation	1 st									2 nd		

© 2022 CHRISTMAS TREE COUNCIL OF NOVA SCOTIA | PERENNIA FOOD & AGRICULTURE INC.

info@ctcns.com | 1-855-672-2572 | www.ctcns.com | www.perennia.ca



A & C- <https://tidcf.nrcan.gc.ca/en/insects/factsheet/5314> B- Photo by Lienna Hoeg, Christmas Tree Specialist: Perennia Food & Agriculture D-https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_043667.pdf

SIGNS AND SYMPTOMS

There are two types of attacks by the adelgid insect that can affect fir trees – twig attack and stem attack. Twig attack is the most common type of infestation. Twig attacks are easy to spot on mature fir trees, and display gouting/swelling of branch nodes and around buds, top-curl, and stunted growth. Gouting occurs on the fastest growing parts of the crown. Stunted growth and gouting result in a distinctive “fiddle-shaped” crown. Trees with symptoms of twig attack often decline slowly and persistently for up to 10 years or more. Twig attacks also predispose trees to wood destroying fungi. See figure A for symptoms of a twig attack.

Stem attack occurs during cases of mass infestation. BWA will populate the main stem of the tree and can reach population densities of 100 to 200 adelgids per square inch of infested bark. Symptoms display differently in stem attacks compared to twig attacks. Foliage of trees affected by stem attack will often turn yellow then a deep red or brown. This symptom can also be characteristic of root rots and ant infestations, so be sure to check for other signs of BWA. This symptom is characteristic for Balsam fir (*Abies balsamea*) infested with balsam woolly adelgid attacking the main bole. Stem attacks can result in tree death in as little as 2 to 3 years after heavy infestation. In Nova Scotia, twig attacks occur more frequently in coastal areas while stem attacks are more abundant inland. It is noted that Bracted fir (*Abies balsamea* var. *phanerolepis*) typically have gout/twig infestation while Fraser fir (*Abies fraseri*) are more prone to stem attacks. See figure B for symptoms of a stem infestation.

Both twig and stem infestations are a result of the adelgid feeding on the host. While feeding, the adelgid injects a saliva into the bark. This substance affects hormone production within the tree and vastly disrupts cell division and development. This abnormal cell growth results in swelling/gouting at bud and branch nodes. Overtime, trees will experience needle drop on older needles and a drastic reduction in cone and seed production. In stem attacks, abnormal cell growth results in a disruption of water conduction within the tree, leading to top-kill and long-term tree decline.

Symptoms:

Visible year-round but are most prominent in early spring to late summer during flushing and active growth.

Monitor:

Scout for this pest in early spring to late fall. Search common areas for adelgid to occur (stem & crown) and watch for symptoms (stunted growth, gouting, top kill, etc.).

LOT SCOUTING & MONITORING

Month of year	J	F	M	A	M	J	J	A	S	O	N	D
Symptoms												
Monitor												
Manage												

MANAGEMENT

Cultural: Remove infected trees from Christmas tree lots during the winter months while adelgids are dormant to minimize spread. Reduce populations by burning infected trees. If burning is not an option, wrap infected trees with tarp before removal and moving to limit distribution of this insect. Reduce tree stress by thinning overstocked lots, increase tree vigor by liming and fertilization and by planting tolerant/resistant varieties. Stands composed of more than 40% fir with trees more than 40 years old are most susceptible. Reduce balsam woolly adelgid pressure by removing mature seed trees, managing species composition of lot boundaries, and removing infected trees surrounding lots.

Chemical: If infestation is severe, chemical intervention may be necessary. Atlus Insecticide (product number: 33176) is the only product registered for use in Canada for BWA in Christmas trees. Atlus is an insecticide that is applied via foliar application. In Christmas trees, Atlus can be used to treat balsam woolly adelgid and aphids. Apply at a rate of 1000mL/ha and a spray volume of 1000 – 1200 L/ha. Begin application when crawlers are present at bud break. Uniform coverage of the crop is required for optimum control. Spray crop until wet but not dripping. Implement a buffer zone of 5 m when working near waterways. It may be necessary to repeat applications, but do not exceed the maximum amount of 2000 mL of product per hectare annually. Minimum treatment interval is 7 days, and the restricted entry interval (REI) is 12 hours after application. When using any pesticide products, ensure to follow label instructions with regard to application rates and product safety.



https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_043667.pdf

Resources:

- https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_043667.pdf
- <https://tidcf.nrcan.gc.ca/en/insects/factsheet/5314>
- <https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops/plant-health/insects-and-plant-diseases/nursery-and-ornamentals/balsam-woolly-adelgid>
- https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/3006/3006-1452/ENTO-434.pdf
- <https://novascotia.ca/natr/forestprotection/foresthealth/sheets/bwa.asp>
- https://pr-rp.hc-sc.gc.ca/l_1/view_label?p_ukid=267638603
- <https://www.flickr.com/photos/sanmartin/31434461584>
- <https://fieldguide.mt.gov/speciesDetail.aspx?elcode=IIHOM21020>

© 2022 CHRISTMAS TREE COUNCIL OF NOVA SCOTIA | PERENNIA FOOD & AGRICULTURE INC.

info@ctcns.com | 1-855-672-2572 | www.ctcns.com | www.perennia.ca