



Canadian Forest Service Atlantic Forestry Centre – Making a Difference

Impact Note No. 61

Beech leaf-mining weevil

Damage to the foliage of American beech (*Fagus grandifolia*) trees was observed as early as 2007 in the greater Halifax area of Nova Scotia. In August 2011, the problem was brought to the attention of Dr. Jon Sweeney – a research scientist with the Canadian Forest Service (CFS) in Fredericton, New Brunswick.

The damaged leaves had mines and shot holes but the insect that caused the damage was no longer present. No Canadian species causes this sort of damage in beech. However, a search of entomological literature led Sweeney and colleagues to suspect that the culprit was invasive and might be the beech leaf-mining weevil (*Orchestes fagi*) – a common pest of beech foliage in Europe.

To identify the species, Sweeney collected a large sample of leaves from underneath damaged beech trees. He reared the insects that were overwintering in these leaves under natural conditions until they emerged. Sweeney sent the emerged insects to a taxonomic expert at the Canadian Museum of Nature in Ottawa. There, Dr. Bob Anderson identified them as the beech leaf-mining weevil. These were the first records of this weevil in North America.

Description and life cycle

The adult weevil is black with golden hairs, has well-developed back legs and is about 2.5 millimetres (mm) long. It is also called the beech flea weevil because it can jump many times its own length because of its strong back legs. A weevil larva is shiny white, has a black head and can be up to 5 mm long.

In spring, the adult weevils emerge from their overwintering sites in cracks and crevices of bark and in leaf litter and moss under infested trees. Shortly after emerging, the female weevils lay eggs along the



Adult beech leaf-mining weevils

mid-rib of young beech leaves. After the larvae hatch, they begin feeding inside the beech leaves and form small tunnels as they move toward the leaf edge.

As they continue to feed, the larvae moult several times. When it finishes feeding, each larva forms a pupal case. The adult weevils emerge from the pupal cases in early summer and remain active until they enter overwintering sites in early fall.

Damage

Both the larvae and the adult weevils damage the leaves. As the name implies, the larvae of the beech leaf-mining weevils feed inside the leaf, creating tunnels and blotch mines. The irregularly shaped blotches give the foliage a dried and wilted appearance.

The adult weevils feed in spring before the eggs are laid and again later in the summer after the new generation has emerged. This combination of the larvae and the adult weevils eating the leaves creates a damage profile that is easily identified.

Differences in behaviour in native and foreign habitats

The feeding behaviour of the weevil in Nova Scotia is different than its behaviour in its native habitat. In Europe, adult weevils feed on several plant species in addition to beech trees (e.g. raspberry, blackberry, birch, cherry, apple).



Defoliation by beech leaf-mining weevil.

Feeding trials conducted in Nova Scotia to determine food preferences found that adult weevils did not feed on alternate hosts. This knowledge is important for fruit growers because there was concern that their crops would be threatened by this insect.

The CFS conducted a survey of overwintering sites for the weevil in the Halifax area in 2013. The survey showed that most weevils spent the winter under scales and in cracks of the bark of trees, including beech, spruce and red maple. It was noted that the rougher the bark was, the more

weevils were present. This finding suggests that firewood and timber transported from areas where the weevil occurs are likely to harbour adults and may contribute to the spread of outbreaks to new areas.

How serious a threat is the beech leaf-mining weevil?

CFS entomology technician Cory Hughes set up permanent plots in 2014 to determine the rate of beech tree mortality in areas where the weevil has been present for several years versus sites where it was not yet present.

Preliminary data indicates that beech trees are dying after many successive years of weevil infestation and repeated defoliation. In the sample plots in Halifax where the weevil has been established for 5 to 10 years, beech mortality increased from 18 percent in 2014 to 88 percent in 2015. However, mortality was negligible in plots located 30 to 35 kilometres outside Halifax where no weevils were detected in 2014.

Further evidence of the weevil's impact comes from several Halifax residents who have recently hired arborists to remove dead American beech trees from their properties.

This weevil is not the only serious exotic pest affecting American beech trees. Beech bark disease has been around for over a century. It has damaged and killed many beech trees in the forests and urban communities of eastern North America, but many have survived. The added mortality from repeated defoliation by the beech weevil may have a significant impact on American beech as well as the species associated with it.

The weevil is well established in Halifax and surrounding communities, as well as in Chester and Sydney in Nova Scotia. Surveys show that the affected areas are expanding. Some expansion is caused by natural means but the insect's range is also very likely expanding because of human transport of logs and firewood which, in infested areas, may contain hundreds of overwintering weevils.

What is being done to control the beech leaf-mining weevil?

The CFS, in collaboration with BioForest Technologies Inc., has been testing a stem-injected, environmentally friendly insecticide called TreeAzin® to control the weevil in high-value urban trees in Halifax. The insecticide kills the larvae, which reduces damage to foliage. Further tests are planned to determine if applying the product every year or every second year affects the mortality of beech trees.

It is uncertain how much damage the weevil will do in the natural forest where stem-injection is not a viable option. In Europe, where outbreaks are infrequent and last only one to two years, the weevil has many natural enemies, such as wasp parasitoids, that help keep weevil populations in check. However, very little parasitism of the weevil has been observed in Nova Scotia.

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