



Beech Scale

INTRODUCTION

The non-native beech scale (*Cryptococcus fagisuga*) is a sap-sucking pest of American beech (*Fagus grandifolia*). Wounds in American beech caused by the bark scale insects as they feed can be invaded by two fungi, the native *Neonectria ditissima* and the non-native *N. faginata*. Together, the scale and fungi cause beech bark disease, which has killed thousands of beech trees in eastern Canada.

The beech scale was introduced to Halifax, Nova Scotia in the late 1800s and has since spread throughout eastern Canada. Nymphs of the scale produce a wax (called wool) that covers them while they feed. This wool makes the nymphs highly conspicuous when they occur at high density on the bark of the lower bole of infested trees (Figure 1). By itself, beech scale causes only minor damage to beech trees, though feeding does remove nutrients from the tree and can structurally weaken the wood. More significant damage is caused when the insect inserts its mouthparts through the bark and into woody tissue. This causes small cracks in the tree's bark that the fungi are able to use to enter and infect the tree. Infection by the fungi causes bark cankers (Figure 2) when the tree attempts to wall off the fungus, which also causes weakening of the woody tissues. The fungi also cause conspicuous yellow (*N. ditissima*) or red (*N. faginata*) fruiting bodies to appear on the bark, and fluid to ooze from freshly cankered sites (Figure 2).

Beech, a moderately long-lived species that prefers drier upland sites, is an important tree ecologically and as a source of wood products. Beech was used extensively in the furniture, flooring and railroad industries. Beech nuts are an important food source for several animal species in hardwood forests that lack other nut producing trees. Dead trees are colonized readily by insects, which provide food for a variety of bird species. Rotting trees also provide shelter for several animal species.



Figure 1. White woolly tufts indicating the presence of beech scale. Dark spots indicating infection by the fungus (*Neonectria ditissima*), which invades beech scale feeding locations and results in bark cankers.

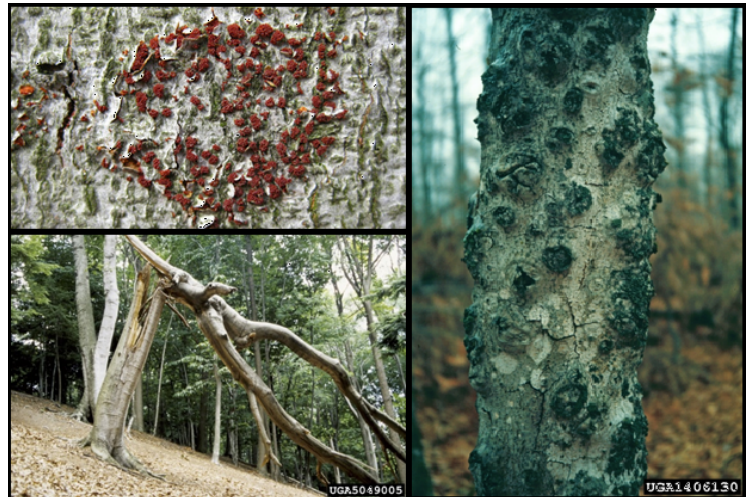


Figure 2. Symptoms of infestation of American beech by beech scale and the fungi, *Neonectria ditissima* and *N. faginata*, that cause beech bark disease. Top left: New canker showing red fruiting bodies of *N. faginata*; Right: Old beech bark cankers caused by invasion of *N. faginata* in beech bark. Bottom left: "Beech snap" resulting from wind stress on wood tissue weakened by the scale and the fungus.

LIFE CYCLE

Beech scale populations are all-female and have one generation per year, consisting of an egg, nymphal and adult stages. Eggs are laid from June through September and yellowish first instar nymphs, called crawlers, hatch within 25 days. The crawlers are the only mobile stage of the insect and they readily disperse on wind to distant hosts. Once a crawler settles and begins feeding on a beech tree, it becomes immobile. Soon after they settle, crawlers molt to their second stage where they become legless and covered by wool. In spring, second stage nymphs molt to the adult stage, which is yellowish and 0.5 - 1 mm in length.

DAMAGE AND NUISANCE

Beech scale causes only minor damage to host trees, but major damage can occur when the tree is invaded by the two *Neonectria* fungi and the tree is impacted by beech bark disease. Trees weakened by the disease may have sparse crowns with small yellowish leaves. Cankers are the most obvious sign of infestation by the disease complex (Fig. 2) and cause significant mortality within a stand, often approaching 100% of mature, large diameter trees. Smaller trees vary in their susceptibility to beech bark disease. Mortality can be as low as 50%, with the surviving trees having varied levels of cankering. These survivors may persist in the stand for many years. However, survivors may still be heavily cankered which can cause reduced growth and increase the susceptibility to "beech snap" during wind events (Fig. 2). Infested trees represent a high risk when near property or places where people often frequent. Profuse beech sprouting in stands where the older trees have died creates dense stands of beech, called beech thickets. These thickets exclude other tree species and the regenerating beech are highly susceptible to reinfestation once they reach a suitable size for the scale (Figure 3). Since the scale can be easily dispersed by wind, scale infestations can spread at rates of 5-8 km per year. Because scale damage initiates the infection by the fungi, the spread of the disease is due to the build-up and spread of scale populations.



Figure 3. Beech thickets occur when older trees are damaged or killed. The root systems of these trees produce copious sprouts that exclude the regeneration of other tree species. If parent trees were susceptible to beech bark disease, the beech thicket will be as susceptible.

NATURAL CONTROL

Some natural enemies impact beech scale, but they are largely ineffective at reducing scale populations. Extreme cold temperatures (e.g., -37°C) that occur for two or more days may kill the insect but, unless this is consistent year to year, will only delay the build up and dispersal of scale populations. Approximately 1% of American beech trees are resistant to the scale, the fungi, or all three organisms.

WHAT CAN I DO?

Beech management should focus on cost effective, landscape-level measures such as the preservation, propagation and planting of trees resistant to the disease or the removal of heavily damaged trees. Removal of damaged trees reduces the basal area of susceptible beech in the stand, and a removal program should also include the treatment of stumps with herbicides to kill regenerating sprouts and prevent the emergence of beech thickets. Sprouts that are allowed to regenerate from disease susceptible trees will eventually become as susceptible to the disease as their parent tree once they reach a suitable size for infestation. Under-planting affected stands with resistant beech seedlings is a viable restoration strategy in sites where beech was formerly dominant. Local forestry professionals may provide assistance with developing an ecologically sound beech management plan. Contact the Canadian Food Inspection Agency (CFIA) prior to moving beech wood as this material may be subject to restriction of movement within Canada. When using herbicides, it is essential to follow all manufacturer's instructions and all local regulations during application.

REFERENCES

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PHOTO CREDITS

Figure 1: J. O'Brien, USDA Forest Service, www.Bugwood.org; Figure 2, top left: <http://www.invadingspecies.com/beech-bark-disease/>); Figure 2, bottom left: J. O'Brien, USDA Forest Service, www.Bugwood.org; Figure 2, right: USDA Forest Service – North Central Research Station www.Bugwood.org; Figure 3: P. Smallidge, Cornell University.

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