New England Botanical Club- Minutes of the 992nd Meeting

7 November 2003 Jennifer Forman, Recording Secretary

The 765th meeting of the New England Botanical Club, being the 992nd since its original organization, was held on Friday, November 7, 2003, in the Lecture Room of the Fairchild Biochemistry Building, Divinity Avenue, Cambridge MA. There were 41 members and guests in attendance.

President Paul Somers called the meeting to order, and announced one new club member. Several future overnight club trips were discussed. Following discussion of proposed overnight club trips and gossip, Art Gilman introduced the night's speaker, Dave Houston. Dave, now retired, was a Principal Plant Pathologist at the Center for Forest Health Research, part of the USDA Forest Service's Northeastern Forest Experiment Station. The title of his talk was "Beech-bark disease and its effects on the northern forest." His research on beech bark disease spans three decades, beginning in the 1960s.

Dave began by describing several interesting characteristics of beech trees (*Fagus* spp.). They have amazing longevity (400+ years), reproduce both sexually (they are prolific seeders) and asexually (by root suckers), and can tolerate deep shade, allowing them to grow for years in the forest understory, until a gap in the canopy allows them to thrive. Beech trees also have atypical bark, with only a thin layer of dead cells surrounding the inner living bark and cambium. This lack of a protective rhytidome barrier makes the bark of beech trees more susceptible to mechanical, fire or insect damage.

Beech bark disease (BBD) is caused by a combination of two organisms: the beech scale insect (*Cryptococcus fagisuga*), and fungi from the genus *Nectria* (principally *N. galligena*, also *N. coccinia* var. *faginata*). The first North American appearance of the beech scale insect was around 1890 in Nova Scotia, where it was introduced via imports of European beech trees. Over the next several decades the scale spread north, then west and south; multiple introductions are suspected. They can now be found throughout northeastern US, west to Michigan, and south as far as North Carolina. The scale insects are tiny, and are all female, reproducing parthenogenetically. The nymphs are mobile, seeking out bark fissures and callus tissue from which they can feed, using a long, probing stylet. Once established, the scale insects can increase rapidly, secreting a waxy "wool" that can cover the outside of the tree when conditions are favorable.

Injury to beech bark by scale insects is a necessary precedent to infection by *Nectria* fungi. While *N. galligena* is native, and may be present in a forest before the scale insects invade, *N. coccinia* var. *faginata* was introduced, and always follows the scale into a new habitat. Reproduction is both asexual and sexual. Red perithecia, the sexual fruiting bodies, produce ascospores, the primary infective propagules. Dave noted that scale infestation and subsequent fungal infection is often most abundant on the north-facing side of a tree.

The initial wave of the disease, where up to 80% of large, mature beech can be killed, is termed the "killing front." Following this is an "aftermath stage," where the disease affects young trees of root sprout and seedling origin. Such trees are not killed quickly as were their progenitors, and accumulate cankers and defects over time. In a study done to quantify the damage to beech trees in aftermath forests, a regional pattern of canker development was found. The pattern was correlated with cold winters and wet falls, which served to reduce scale populations. Diseased trees often exhibit bizarre bark patterns, as cankers develop, and in turn, become refuges for further infestation and infection. After the talk concluded, curious attendees were able to view samples of infected trees.

Researchers are now focused on the potential exploitation of BBD-resistant beech. In one case, trees initially thought to be resistant were actually being protected by crustose lichens that encased the trunk and prevented scale insects from feeding. During the search for resistant phenotypes, Dave uncovered a curious phenomenon: semi-circles of trees that were all BBD-resistant. Though it was suspected that these trees were clones produced by root suckering, isozyme analysis showed that the trees, while unique, shared a single parent. It turned out that the agents responsible for this pattern were blue jays. A blue jay, which can tuck up to 14 seeds from a single beech tree in its throat, will cache the seeds in a semi-circle. Seeds that are not recovered may become founding populations, and when they reproduce by root sprouts, groups of resistant trees can result.

While Dave was hoping to spend the greater part of his retirement "shepherding resistant genotypes into the forest," the work to develop BBD-resistant beech trees has been difficult. Researchers have been unable to vegetatively propagate beech, and it is difficult to conduct control pollinations between desired genotypes. Dave concluded his talk by noting that the rising demand by foresters and arboreta for resistant trees will spur research over the next few years, and will hopefully yield successful results.