Preparing Wisconsin's Forests For Beech Bark Disease

June 2008

Beech bark disease is currently impacting American beech (*Fagus grandifolia*) in Michigan and eastern North America, and is expected to arrive in Wisconsin within the next 10 years. The disease occurs when a tree is infested with a 'scale' insect (beech scale, *Cryptococcus fagisuga*), and then colonized by a *Nectria* fungus. Beech scale was accidentally introduced from Europe into Nova Scotia, Canada around 1890. By the 1930s, the scale and an associated *Nectria* fungus were killing trees in eastern Canada and Maine. The disease has continued to spread, and is now found as far south as Tennessee and North Carolina (Figure 1). It was discovered in Michigan in 2000. Beech scale and beech bark disease have not been found in Wisconsin as of June 2008.

Scale are tiny insects (0.5 to 1 mm) related to aphids (Figure 2). Like aphids, they have a long tube-like mouthpart called a 'stylet' that is inserted into the tree to feed. Adults lay eggs during the summer and the eggs hatch in the fall. The immatures are blown by the wind and are also moved by birds and people transporting infested firewood. Once the young scale find a suitable location on a beech tree, they insert their stylet into the tree and begin feeding. They lose their legs, become covered with a woolly wax, and remain there for the rest of their lives. They overwinter in this stage, and become adults in the spring.

In Wisconsin, beech is only found in eastern counties near Lake Michigan. Beech typically occurs as a component of the sugar maple-beech-birch forest type, of which there is 2.3 million acres in Wisconsin. There are an estimated 17 million beech (sapling-sized and larger), and beech volume is estimated at 34 million cubic feet. In Wisconsin, beech comprises 0.15% of all trees greater than 1" in diameter and 0.17% of all timber volume. Beech is a minor commercial species, but its nuts are highly valued by wildlife.

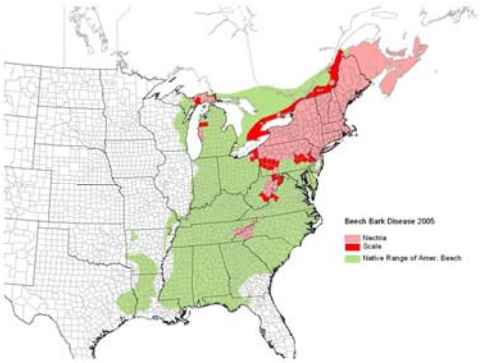

Fig. 1. Map of beech bark disease distribution.

Fig. 2. Beech scale nymph.

Beech Bark Disease and Wisconsin:

Beech scale and beech bark disease have not been found in Wisconsin as of February 2008. Beech bark disease is well established in the Upper Peninsula of Michigan and is quickly moving westward from the initial infestation site. In 2006 the scale was found near Munising, Michigan, placing the

scale approximately 75 miles from Wisconsin. If the scale continues to spread rapidly across the Upper Peninsula, the insect will likely be in Wisconsin within the next 10 years.

Disease Symptoms:

Initially, a tree is lightly colonized by the scale, but as the scale reproduce, the entire trunk of the tree may become covered within 2 or 3 years (Figure 3). **Be on the lookout for beech trees covered in white wool. Report suspect trees or stands to the local DNR office or to DNR Forest Health staff**.

After the scale is well established on a tree, the *Nectria* fungi use the insect's feeding wounds as entry points into the tree. Disease symptoms take several years to appear. The fungus kills the living tissue beneath the outer bark, and on some trees a brown sap is produced at dead spots. A canker (sunken region of dead tissue) develops since the surrounding living tissue continues to grow, and the result is a roughened appearance of the bark (Figure 4).

Fig. 3. Beech scale in Michigan.

Fig. 4. Cankered tree.

When the disease first establishes, about half of the large beech trees typically die. However, dead beech can be a valuable wildlife tree. Diseased trees may also remain alive but have low vigor. Decay fungi and wood-boring insects can also colonize the diseased trees and physically weaken the wood so that the tree breaks during a strong wind.

The remaining forest usually contains some surviving large beech and many small beech. The small trees are frequently disfigured because beech scale and another scale insect, *Xylococculus betulae*, attack the trees and create wounds for the *Nectria* fungi to enter. Sugar maple often responds to the gaps created by the death of large beech.

In forest stands there is no practical control option other than sanitation and salvage of dead or diseased trees. In recreational areas, trees with heavy scale infestations are a safety hazard and should be removed since strong winds may cause them to snap. Small ornamental trees may be sprayed with insecticide or physically scrubbed to remove the scale in an early-stage infestation.

A small percentage of trees (1% of less) are resistant to the scale and do not develop disease symptoms even in heavily infected stands. Therefore, breeding resistant trees is a possible long-term management option. Studies have shown that resistant trees have significantly lower levels of nitrogen than susceptible trees. Resistant European beech have also been found to have more tough sclerophyll cells in their bark than susceptible trees. These characteristics likely make the bark chemistry and/or

texture less suitable for the scale. Anecdotal observations also suggest that trees with large lichen patches tend to have less scale buildup.

Management Options:

Because beech is a very minor component of the overall forest in Wisconsin, there are no special recommendations for its management in preparation for the arrival of beech bark disease. However, when marking a stand for thinning during the next regularly-scheduled entry, consider beech vigor and bark texture in the order of removal. Typically, this would mean that beech with low vigor and/or rough bark would be harvested. Retain the vigorous trees with smooth bark, and keep the stand adequately stocked.

Don't remove all of the beech, because some trees are resistant to the disease and will continue to provide wildlife and timber benefits.

Be aware that emerald ash borer threatens ash that establish in openings. Thus, encourage the regeneration of other species such as oak, birch, maple, or conifers in stand openings through natural or artificial means (For silvicultural options for ash in Wisconsin, please refer to a WI DNR publication, titled "Preparing Wisconsin's Forests for the Emerald Ash Borer"). Oak and other mast-producing species may be particularly suitable as substitutes for the loss of beech nuts. Also consider the amount of deer browsing when selecting species to regenerate.

When harvesting, try to avoid damaging the root systems of the trees. Beech sprouts in response to root injury and a stand could become more susceptible to beech bark disease in the long term. Also consider the potential for sunscald or other injury to the residual beech in the stand.

Financial considerations and management objectives will affect the suitability of these recommendations. Management guidelines may change over time due to changing disease distribution and new research findings. The advice of a professional forester is recommended.

Photo credits:
Fig. 1 – USDA Forest Service
Fig. 2 – Joseph O'Brien, USDA Forest Service, from www.forestryimages.org
Fig. 3 – Bill McNee, Wisconsin DNR
Fig. 4 – Bill McNee, Wisconsin DNR