March 2015

Our Changing Forest (Part 1)

by Claudia Knab-Vispo

When I drive through our beautiful landscape or look at it from Sunset Rock or the top of Harvey Mountain, the mosaic of fields and forests seems so perfect and everlasting. Yet, if we walk into the woods, the frequent encounter with crumbling stone walls and rusting barbed wire remind us that, not so long ago, our landscape must have looked very different. Less than a century ago, the landscape was much more open, and pastures, hay meadows, and crop fields could have been seen where we now find seemingly eternal forests. Go back four hundred years to before major European settlement, and the historical records tell us that forest most likely covered more area throughout the Northeast than even today. However, if you went back further, let's say 12,000 years, when the land in our region had just emerged from under the glaciers, you wouldn't find any forest at all.

And not only did the total amount of forest change, the types of trees in the forest have not been constant over time either. A nifty technique to learn about changes in vegetation during prehistoric times is the study of pollen in the undisturbed sediments of old wetlands, such as bogs or kettle ponds which formed right after the last ice age. Pollen grains are tiny, durable, and have species-specific shapes and/or surface structures. This makes it possible to distinguish, for example, an oak pollen grain from that of a pine. As pollen grains get blown into the wetland from the surrounding forests, they sink to the bottom and are deposited in the sediments in the order in which they arrive. Early pollen is found below pollen which arrived later. By carefully retrieving a column of sediment and comparing the proportion of pollen grains of different tree species found at different depths, scientists can reconstruct the changes in tree species composition in the surrounding forests over time. An additional technique, called carbon dating, allows one to determine the age of each sediment layer and the enclosed pollen grains.

The combined pollen record from various water bodies in our region indicates a long and on-going sequence of forest change as various tree species returned from their southern Ice Age haunts with different speed and enthusiasm. Spruce was the first tree to become common in our area after the glaciers receded. Subsequently, the forests were dominated briefly by Pine and Birch, and for the last 8000 years, by Oak, which was accompanied by Pine, Birch, Hemlock, Beech, and by slowly increasing amounts of Maple. During the last 1000 years, Chestnut made its return and was becoming a fairly common tree.

Since European settlement, the tree composition has continued to change as some species were selectively cut for timber, charcoal, and bark, and others were decimated by newly introduced pests and diseases. One of the most poignant changes during that period is the disappearance of adult American Chestnut trees due to Chestnut Blight. Curiously, Chestnut does persist as root stock continues to sprout new saplings, resulting in Chestnut as a small understory tree in some areas. However, these small trees usually succumb to the blight before reaching reproductive size, and the few trees that manage to flower never seem to set viable seeds because of lack of cross-pollination. More recently, American Beech has been infected by beech bark disease. This also causes adult trees to die back. Their roots then sprout dense shrub-like thickets of small Beech. White Oak has declined substantially, because it tended to grow on some of the best agricultural soils, and because it is a preferred timber species. Red Oak has continued to be a common species, in spite of its currently high value as a timber tree. It is often found in older, post-agricultural forests. Both Red and Sugar Maple have become more common over the last few centuries and are still increasing. For example, we often see abandoned conifer plantations turning into Sugar Maple stands and many Red Oak-dominated forests have more Sugar Maple than Red Oak saplings in the understory, suggesting that Sugar Maple might eventually come to dominate the canopy. That said, Sugar Maple could easily be threatened by a local infestation of the invasive Asian Longhorned Beetle, and is one of the species predicted to suffer from the warming climate and to "withdraw" north and to higher elevations if current climate trends persist.

Amidst all these changes, magnificent stands of Hemlock trees have persisted in inaccessible locations on steep slopes, even though Hemlock had been cut elsewhere for charcoal and tanning bark until the beginning of the last century. Hemlocks are slow in colonizing abandoned agricultural land, because their seedlings establish best on rotting wood under the protective cover of a shading canopy. Therefore, the presence of Hemlocks indicates a relatively undisturbed forest. In our area, Hemlocks often delineate forest areas that have never been cleared for agriculture, whose soils have never been homogenized by the plow, and therefore represent ecological conditions that are very different from those in the more common post-agricultural forests.

Although my mind knows all the facts about the ever-changing forest cover and composition throughout geological and historical time, my heart still senses something awe-inspiring and eternal when I walk through a stand of majestic Hemlock trees. Yet change is now entering this realm too, as a tiny insect, the Hemlock Woolly Adelgid, spreads throughout our County and begins to damage our beloved Hemlocks. In the next column, we will explore the fate of Hemlock in more detail.…

Conrad Vispo from the Farmscape Ecology Program and pollen specialist Dorothy Peteet from the Lamont-Doherty Earth Observatory at Columbia University are taking a sample of the sediment in Shaker Swamp on a cold February day.