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Woodland Health

A column focusing on topics that might limit the health, vigor and productivity of our private or public woodlands

COORDINATED BY MARK WHITMORE

Big Changes from Little Bugs

BY GARY M. LOVETT

By now most forest owners in New York are probably aware of the litany of introduced pests and diseases that have affected our forests. Our area has been through the wringer, starting with chestnut blight in the early 1900s, adding Dutch elm disease, gypsy moth, dogwood anthracnose later in the 20th century, and now the emerald ash borer, beech bark disease and hemlock woolly adelgid. Waiting in the wings are the Asian longhorned beetle, possibly *Phytophthora ramorum* (which causes the "Sudden Oak Death" disease) and who knows what else? As we walk through our forests, we can see the death of trees caused by these pests and diseases, but what are the effects on the forest ecosystem beyond what we can easily observe?

The short-term effects of these outbreaks are easy to imagine. As the trees die, the forest temporarily loses productivity until new trees take over the canopy in place of those that are lost. If just a few trees within a mixed species forest die, this canopy replacement may take only a few years, but if a large, single-species stand dies, it may take decades before the productivity recovers. During this period the trees are not taking up their usual quota of nutrients from the soil, and critical nutrients such as nitrogen may be lost from the site into the groundwater. Storage of carbon in the forest will also be reduced. Carbon storage is an important process in this day and age when we are relying on forests to soak up some of the carbon dioxide we release from burning fossil fuels.

The canopy opening produces more light in the understory, which can produce a pulse of growth in regenerating trees, shrubs, and the herbs of the forest floor. Unfortunately, as has been shown recently for hemlocks killed by the woolly adelgid in the Pennsylvania's Delaware Water Gap, this canopy opening can also provide an inviting entry point for some nasty invasive plants such as Japanese stiltgrass, garlic mustard, and Japanese barberry. If the trees are near a stream, as hemlocks often are, the canopy opening can cause more light and higher temperatures in the stream, which can change the nature of the stream itself and reduce its attractiveness to coldwater species like brook trout.

The forest will generally recover from these impacts of tree death and loss of canopy cover within at most a few decades, because whenever a tree dies in the forest there is always a competing tree waiting to take its place in the canopy. The longer term effects of the pest invasion, then, reside in the nature of the trees that take over. I study forests for a living, but if you asked me to tell you what species will dominate our forests 50 years from now, I would be hard pressed to predict. It depends on which of our existing pests and diseases do the most damage in the coming decades, and what new ones are introduced to the forest in this period.

The shift in tree species composition is slow and subtle, maybe even invisible for someone who doesn't know their trees very well. But the long-term species changes can have major ramifications for forest ecosystems. Some of them will be obvious for those who harvest their forest—if valuable species like sugar maple and red oak are replaced by less valuable species, your forests are worth less. Others may be less obvious, but are nonetheless important. Tree species are unique in many different ways, so changing the species changes the character of the forest.

As an example, hemlocks killed by the woolly adelgid are being replaced by black birch in many areas. This will likely cause an increase in productivity, because hemlocks grow slowly and birches grow fast. If what you want from your forest is biomass production, this may be a good thing. But the tree species shift will also decrease the buildup of the forest floor, reduce soil carbon storage, open up the understory for shrub and sapling growth, decrease the abundance of large trees, decrease important deer yarding areas, and decrease abundance of some songbirds, like the black-throated green warbler, that use hemlocks for habitat. This is not to mention the human aesthetic response—being in a mature hemlock stand has a cool, quiet, dark, almost cathedral-like feeling that black birch will never be able to replicate.

Another more subtle example comes

The white fuzz on the bottom this hemlock twig is produced by the hemlock woolly adelgid, an insect that was introduced from Asia and is devastating eastern hemlock trees.

Wooden pallets and dunnage used in international shipping can harbor wood-boring insects that may escape to damage our forests.

from the beech bark disease. Our research in the Catskills shows that, over time, the growth reduction and death of beech caused by the bark disease has been accompanied by an increase in sugar maple. Some forest owners will cheer this news, because sugar maple is a much more valuable species than beech. And I've never had a craving for beech syrup on my pancakes.

But there are other important differences between these species. Sugar maple produces easily decomposed leaf litter that does not build up a duff the way beech does. Sugar maple forests also retain less atmospheric nitrogen pollution than do beech forests. When we burn fossil fuels in our cars, homes, and power plants, we release nitrogen into the atmosphere. This nitrogen rains down on forests, and some of it eventually may wash into streams and lakes, where it is a pollutant. However, forests do us the favor of retaining some of this nitrogen in the trees and soil, reducing the pollutant load to the streams, and beech forests do this better than maple forests.

Also, in much of New York State beech is the most important hard mast species, meaning that it produces large nuts that are an important food source for all sorts of animals, including turkeys, chipmunks, bears, and even some larger songbirds. Beech is not going to disappear from the forest, but the larger trees are all but gone due to the disease, and these large trees produced the most copious crops of beech nuts.

It seems to me, as a forest ecologist, that the introduction and transport of nonnative insects and diseases is the most serious and urgent threat facing our forests. This threat doesn't get nearly as much press as climate change and acid rain, but is causing billions of dollars of damage to our forests right now and will cost hundreds of billions more in the future. The only way to slow down this importation is through federal regulations, but this is not even on the radar screen of most congressional representatives, because they rarely hear from their constituents about it. Why? I think it is because most people feel helpless in the face of this problem, as if this is something that just happens and we have to live with it. But this problem is caused by people and can be solved by people.

The main pathways of introduction of these pests are through careless importation of live plant material by the horticultural trade and wood packing material used in shipping containers, and tighter regulation of those industries would go a long way to solving the problem and forestalling the next major outbreak. The industries involved complain that tighter regulations would lead to trade restrictions, lost jobs, costlier products, etc. But look at it this way—all the profits engendered by our lax importation regulations go to the importers, while all the risk is borne by the general public, and particularly by forest owners. Is this fair? Help educate your federal representatives and senators about this issue, and maybe, when they hear from enough of us, something will get done.

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