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IDEAS

Saving the forest for the trees

Invasive species are decimating old-growth species that have survived for half a millennium. There are ways to stem the destruction before it's too late.

By David Orwig

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Two large dead beech trees (background) that died within the last few years from beech bark disease in a Pennsylvania forest studied by the author. In the foreground, two small dead beeches.
DAVID ORWIG

When I began studying old-growth forests 30 years ago, I was excited by the amazing longevity of the trees and the information they hold in their annual ring patterns, which I study for clues to past climate and more. Now the sobering truth is that many of these trees that have survived for 300 to 500 years could be killed in the next decade or so.

Because old-growth forests often represent the least disturbed portions of the land, with no visible evidence of cutting or agricultural clearing, these ancient trees seem permanent. Indeed, they are often legally protected from threats that made them rare to begin with. In New England, however, and all over the nation, they are silently being decimated by other threats: non-native insects and disease.

Introduced insects and disease have been around for centuries. But now more than 450 exotic pests and diseases are present in our forests [because of burgeoning global](#)

[trade](#). Hitching a ride in cargo containers within wood packing materials, hidden on branches, or in the soil of the billions of potted plants shipped to US ports yearly, exotic pests are making their way into Eastern forests with increasing regularity. While not all are damaging, every two to three years a new pest arrives that can be very destructive to our forests.

Recently, as I scrambled up a rocky slope in northern Pennsylvania to investigate an ancient woodland above a series of waterfalls, on both sides of the trail lay huge, downed corpses of recently fallen eastern hemlock trees. They had been killed off by the exotic hemlock woolly adelgid, an aphid-like insect. Adjacent to those were the standing, leafless spires of dead white ash trees, exterminated by another introduced pest, the emerald ash borer. Females of this beetle species from northeastern Asia lay eggs in bark crevices on ash trees. Larvae feed beneath the bark for up to two years, before they emerge as adults.



Dead and severely thinned hemlock crowns are a sign of damage done by the hemlock woolly adelgid in a Pennsylvania forest. DAVID ORWIG

Last year, my colleagues and I began a four-year [National Science Foundation grant](#) to investigate old-growth forests throughout the northeastern United States. Over and over, we saw landscapes ravaged by insects and disease. Upon visiting more than 20 locations across four Eastern states, it became apparent that these forests were being irrevocably altered in a very short period of time. Most forests we studied had lost at least one dominant tree species. Several had lost two (hemlock and beech), and one in southeastern Pennsylvania was in the process of losing three species (chestnut, oak, and hemlock) to introduced bugs and disease.

Our forests have likely never before experienced an onslaught from the pests they now face.

While trees commonly die from windstorms, ice damage, and fire, entire species are not typically eliminated. But because native trees often have no coevolved history with exotic pests and pathogens, they have no built-in resistance and, therefore,

succumb rapidly. The pace of tree decline and death is what is so strikingly different from the forest dynamics we see embedded in centuries of rings.

April was the first anniversary of [President Biden's executive order](#) mandating an inventory of old-growth forests on federal land. The order also calls for identifying the threats to these forests and developing policies to address them.

But more is needed to protect these trees: financial investment in their preservation, chemical treatments where it is not already too late, and measures to prevent future pests from taking hold.



The markings left by emerald ash borer larvae on an ash tree at Esopus Bend Nature Preserve in Saugerties, N.Y. MIKE GROLL

As a scientist, I am often asked “What can one person do?” about the many ecological crises we witness. Well, here is something we all can do this spring: Put out the welcome mat for native pollinators, birds, and other wildlife that are drawn to native plants and sourced from local nurseries. Save a tree. Buy local goods that didn’t have to cross multiple oceans to arrive, [possibly carrying stowaway pests](#). Plant native. Our old-growth forests depend on it.

David Orwig is a senior forest ecologist for Harvard University’s Harvard Forest.

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