Canopy gaps help Eastern hemlock outlast invasive insect

September 18 2023, by Tracey Peake

Credit: Pixabay/CC0 Public Domain

A new study finds that creating physical gaps in the forest canopy gives Eastern hemlocks more access to resources and help those trees withstand infestation by an invasive insect. The approach adds another

tool to the toolkit that foresters can use to protect these trees.

The paper is published in the journal *Forest Ecology and Management.*

Eastern hemlocks are an ecologically important tree species found from eastern Canada to the Great Lakes states and south along the entire Appalachian mountain range. The hemlock woolly adelgid—an invasive insect that was introduced to North America 70 years ago and has spread along the East Coast—can kill a hemlock tree in as little as four years.

"An integrated pest management strategy is the best approach in cases like this," says Robert Jetton, associate professor of forest health at North Carolina State University and study co-author. "Integrated pest management utilizes multiple tactics to combat insect pests and can include chemical insecticides, seed preservation, biological control, and silviculture, or managing the surrounding forest.

"This study focused on silviculture. Is there a way to actively manage a forest to improve the health of Eastern hemlocks?"

The study began in 2017. Jetton and colleagues from the U.S. Department of Agriculture selected 105 Eastern hemlock trees in national and state forests along the Appalachians from Maryland to Georgia. They created small or large canopy gaps around the trees by either felling or girdling the competing trees. Felling is cutting down the tree outright, while girdling refers to killing the tree by removing its access to nutrients, but not cutting it down.

The gaps around the hemlocks ranged in size from .05 to .15 acre. Small gaps were created by felling or girdling any competing tree that overlapped the hemlock's outermost branches, or dripline. For large gaps, they created a radius around the hemlock that was equal to the dripline plus 25% of the average tree height in the stand.

For comparison, the researchers also monitored a control group that consisted of hemlocks that didn't have canopy gaps created around them.

The researchers collected data on the trees every six months from late 2017 through early 2021. One tree had died (due to another tree falling on it), but overall, even though all of the "canopy gap" trees in the study were infested with woolly adelgid, their health had substantially improved. By comparison, the health of the control trees continued to decline.

"The major benefit of the treatment is that the trees' crown health improved, especially in areas where we did the large fell," Jetton says. "Crown health refers to the tree's foliage—its color and density. With all four gap treatments, we saw that the trees continued to produce new shoot growth annually, though this effect was greatest in the large fells. This is good news because woolly adelgids feed on branch tips, so one of the first effects of infestation is that the tree stops producing new growth."

While the treatment's effectiveness varied by region—it was more effective in the southernmost sites (North Carolina, Georgia and Tennessee)—the researchers believe the results are encouraging.

"The canopy gaps give the trees better access to resources like water and nutrients that help them deal with the adelgid," Jetton says. "While it doesn't cause the adelgid population to decrease, it may be giving trees the ability to 'outgrow' the insect's impact, at least temporarily."

The study is ongoing, and the researchers plan to focus next on stands of hemlocks, rather than single trees.

"Our study was conducted in forests where hemlocks occurred under a canopy of primarily hardwood trees, which lose their leaves in fall and

winter," says Albert Mayfield, entomologist with the USDA Forest Service and study co-author. "So, the response of hemlocks to canopy gaps might be different in pure hemlock forests, where there is more year-round shade. But our sites were very typical of the southern Appalachian forests, where hemlock trees are usually mixed with hardwood trees."

"We see silviculture as part of the overall pest management strategy," says Jetton. "Hopefully it will benefit biological control efforts by allowing the adelgid's predators to establish populations, and it may decrease our use of chemicals. But the bottom line is this study shows silviculture is another tool in the toolkit to increase the survival rate of Eastern hemlocks."

Albert Mayfield of the USDA Forest Service is corresponding author. NC State research associate Andy Whittier, and USDA Forest Service members Bryan Mudder, Tara Keyser, and James Rhea, also contributed to the work.

More information: Albert E. Mayfield III et al, Silvicultural canopy gaps improve health and growth of eastern hemlocks infested with Adelges tsugae in the southern Appalachian Mountains, *Forest Ecology and Management* (2023). DOI: 10.1016/j.foreco.2023.121374

Provided by North Carolina State University

Citation: Canopy gaps help Eastern hemlock outlast invasive insect (2023, September 18) retrieved 12 May 2024 from https://phys.org/news/2023-09-canopy-gaps-eastern-hemlock-outlast.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private

study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.