Insect outbreaks reduce wildfire severity

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Surprising new University of Vermont research finds that outbreaks by the mountain pine beetle and western spruce budworm can actually reduce wildfire severity. Credit: USFS

Forest scientists have found an unexpected 'silver lining' to the insect outbreaks that have ravaged millions of trees across western North America.

While insect outbreaks leave trees looking like matchsticks, a new University of Vermont-led study finds these hungry critters significantly reduce wildfire severity.

The findings contrast sharply with popular attitudes - and some U.S. forest policies - which connect tree-eating insects with increased wildfire activity.

"This is surprising," says UVM forest scientist Garrett Meigs, lead author of the study. "Forest fires and insect outbreaks have increased in recent decades, causing some people to link the two in their minds."

"Our findings clearly show that insect outbreaks can reduce burn severity," says Meigs, a researcher at UVM's Gund Institute and Rubenstein School of Environment and Natural Resources. "So there is a connection, but just not the way most people thought."

The study, by scientists at UVM and Oregon State University, is published in the journal *Environmental Research Letters*.

Largest study of its kind

Analyzing 81 fires over 25 years, the study is the largest to date on forest fire severity following insect outbreaks. Researchers focused on sites in Oregon and Washington State with past outbreaks by the mountain pine beetle or western spruce budworm, two of North America's most destructive insects.

Wildfires in areas that experienced greater insect damage in the past burned with significantly less severity, regardless of fire size, season or drought conditions. The researchers measured burn severity - or vegetation loss - using satellite imagery taken before and after each fire.

"There is huge concern that insect outbreaks and forest fires will continue to increase with climate change," says UVM forest ecology professor Bill Keeton, a study co-author. "These threats remain significant, but our study suggests that major insect outbreaks, contrary

to current thinking, can dampen future fire impacts - and we can use that knowledge to improve forest management."

Natural thinning effect

The researchers say the findings can be explained by "forest thinning," which occurs when insects kill some trees and leave others to survive. This lowers forest density, which reduces the amount of fuel available for subsequent fires.

The study builds on previous research by Meigs and colleagues, which found that insect outbreaks in the Pacific Northwest did not increase the likelihood of wildfires.

Forest policy applications

The results give new insights to communities and forest agencies dealing with the effects of insect outbreaks on forestry, tourism and recreation.

For example, the 2014 U.S. Farm Bill included fuel reduction provisions for forests with insects and diseases. The study suggests that forest managers may be able to factor in the natural "thinning effects" of insects into these efforts.

And while both insects reduced fire severity, each critter exhibited unique patterns that require different approaches by forest agencies.

"These findings will help forest managers to better prioritize restoration efforts designed to reduce fire risks," says Keeton, chair of UVM's Forestry Program.

Treasure trove of data

While previous studies explored a handful of fires for shorter periods, recently released satellite imagery and data enabled the researchers to analyze a much greater number of fires over longer periods. The team used advanced spatial statistical analyses to decipher insect-fire interactions in areas with past outbreaks of these two key insects.

"Together, these studies tell us that not only can insects reduce forest fire likelihood - they also reduce potential forest fire impacts," says Meigs, summarizing his two recent papers on fire risk and severity.

More information: Garrett W Meigs et al, Do insect outbreaks reduce the severity of subsequent forest fires?, *Environmental Research Letters* (2016). DOI: 10.1088/1748-9326/11/4/045008

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