

Risk of beetle outbreaks rise, along with temperature, in the warming West

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The potential for outbreaks of spruce and mountain pine beetles in western North America's forests is likely to increase significantly in the coming decades, according to a study conducted by USDA Forest Service researchers and their colleagues. Their findings, published in the September issue of the journal *BioScience*, represent the first comprehensive synthesis of the effects of climate change on bark beetles.

"Native <u>bark beetles</u> are responsible for the death of billions of coniferous trees across millions of acres of forests ranging from Mexico to Alaska," said Barbara Bentz, research entomologist with the Forest Service's Rocky Mountain Research Station and lead author of the study. "Our study begins to explain how their populations respond to the climatic changes being projected by the Intergovernmental Panel on Climate Change."

In the study, Bentz and her colleagues synthesized what is currently known about the effects of climate change on several species of bark beetles that cause extensive, landscape-scale tree mortality in North America. They then used a combination of models to analyze the likely response of and generate case studies for two specific species—the spruce beetle and mountain pine beetle.

"Our models suggest that climatic changes on the order of what is expected would increase the population success of both spruce beetle and mountain pine beetle throughout much of their range, although there



is considerable variability," said Chris Fettig, a research entomologist with the Pacific Southwest Research Station and a coauthor of the study. "Bark beetles are influenced directly by shifts in temperature, which affect developmental timing and temperature-induced mortality, and indirectly, through climatic effects on the species associated with beetles and their <u>host trees</u>."

One effect the study detected is the likelihood, in a warming climate, of a substantial increase in areas of spruce forest dominated by spruce beetles that reproduce annually rather than every two years, as is common today. Annual reproduction of the beetle can contribute significantly to population growth and the occurrence of outbreaks.

In addition, the study's models also helped to address concerns about the potential for mountain pine beetles to expand their range across forests of central Canada into the central and Eastern United States. The researchers found that, without adaptation to warming temperatures, the likelihood of this occurring is low to moderate throughout this century.

"Understanding how bark beetle populations will be affected under different climate scenarios in different regions is key to developing appropriate management strategies in North American forests," Bentz said.

Provided by USDA Forest Service

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