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An Epidemic with Global Consequences

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An Epidemic with Global Consequences

Although East Coast residents may be little aware of the devastation being caused by the tiny mountain pine beetle, lodgepole pines over thousands of square kilometers in the mountainous West have turned red and gray, a result of attacks by *Dendroctonus ponderosae*. A more vivid, large-scale ecological disruption accelerated by climate change would be hard to find.

Not all attacks are successful—the mountain pine beetle depicted on the cover of *BioScience* was killed by the tree it attacked. Under the right conditions, however, enough of the invading insects succeed in colonizing trees' tissues to kill their hosts and produce progeny, thus feeding outbreaks that destroy the majority of susceptible trees in an area and change forest structure for decades.

What constitutes the right conditions for an outbreak is complicated, as Kenneth F. Raffa and colleagues make clear in the article that starts on p. 501. Various species besides pine and beetle—notably, fungi—play important roles. Chemical signals manipulate both hosts and invaders.

Forest structure and tree health are critical to whether an outbreak expands: vigorous fire suppression can leave forests more vulnerable, and drought and higher temperatures increase the likelihood of spread. Unsurprisingly, then, outbreaks have become larger and more widespread. Within the United States, the beetles have ravaged lodgepole pines in Colorado and Wyoming, and they are spreading; the National Park Service closed campgrounds in the Rockies this spring because of fears that trees killed by beetles would topple.

The outbreak under way in British Columbia, however, dwarfs US experience, being an order of magnitude larger than any recorded previously. Werner A. Kurz and his coauthors, writing in April in *Nature,* calculate that the Canadian outbreak has converted the affected forest from a small carbon sink to a large net carbon source. At the peak of the outbreak—about now—carbon dioxide emissions from decomposing trees may be 75 percent as large as those produced annually from forest fires throughout Canada before 1999.

The calculations hint at a positive feedback: warming might make forests susceptible to infestations, and carbon dioxide from the felled trees might contribute to future warming. As mild winters become more common, the beetle may spread northward into the boreal forest, and thence eastward. Other bark beetles also cause much destruction—and they too may benefit from recent warming.

In light of these developments, the US administration's proposal to cut—by 7 percent—the 2009 budgets of the Forest Service and the Agricultural Research Service, both of which fall within the Department of Agriculture, seems misguided. Cuts in the Forest Service's budgets in recent years mean that temporary employees who collect long-term data are already losing their jobs. The current and potential consequences of beetle eruptions—not to mention the global food price crisis—make research at the Department of Agriculture a compelling candidate for budget protection.

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