

# Study finds more spending on fire suppression may lead to bigger fires

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The "firefighting trap" is a term often used by business managers to describe a shortsighted cycle of problem-solving: dealing with "fires," or problems, as they arise, but failing to address the underlying cause, thereby increasing the chance that the same problem will crop up in the future.

Researchers at MIT's Engineering Systems Division have now looked at the original inspiration for this "quick-fix" management strategy: firefighting itself. They combined regional fire data, such as the number of fires and the amount of land burned per year, with interviews conducted with fire managers, policymakers, and academics to draw up

a model illustrating the relationships that contribute to forest-[fire management](#).

Much like in business, they found fire management can fall into the firefighting trap: Energy and resources are spent mostly on [fire suppression](#)—putting out fires in the moment—while less attention is devoted to fire prevention, such as clearing brush and building fire lanes during the off-season.

In particular, the team identified a factor that exacerbates the firefighting trap: instinctive, automatic reactions to particularly damaging fire seasons. They found that after severe fires, policymakers—driven by public pressure—funnel more funds into fire suppression for the next season. While this may put people temporarily at ease, this attention to fire suppression may undermine prevention efforts. The result, counterintuitively, is even worse fires the following season, due to the buildup of fire-prone materials such as dried tinder and dead trees.

"We've done the analysis and found that this political effect is a regular thing, and you have to figure out how to break the cycle," says Richard de Neufville, a professor of civil and environmental engineering and engineering systems at MIT.

De Neufville and graduate student Ross Collins describe their model in a paper published in the *Journal of Environmental Management*.

## **Portugal's fires as a case study**

The model is based on fire-management practices in Portugal, and is part of a project sponsored by the MIT Portugal Program. The country has historically had a severe fire problem—as well as a large stake in managing fires, since a significant fraction of the country's exports come

from the timber industry.

Between 1980 and 2010, the number of fires in the country increased from 4,000 to 35,000 per year. During this period, the amount of land burned rose, on average, from 180,000 acres to 375,000 acres per year nationwide.

De Neufville points out that the impact of [forest fires](#) in Portugal is quite serious, considering that most fires occur close to populated regions.

"You have to think about it as fires that occur, for example, in the middle of the Berkeley Hills, versus the middle of Wyoming," de Neufville says. "There's a lot of housing around where fires occur, so politically it's very salient."

## **Breaking the system**

Through annual forest-fire data and interviews with fire-management officials in Portugal, Collins drew up a model comprising a physical component, outlining major factors involved in a forest's natural process of growth, decay, burning, and renewal; and a political component, illustrating factors that contribute to fire-management policy, such as suppression and prevention budgets and yearly fire expenditures.

The team ran simulations of fire-management strategy over 150 years, using data from 1900, and making projections through the year 2050. They found that initially, a policy of fire suppression seemed preferable to one of fire prevention—that is, devoting more resources to putting out fires led to less area burned overall.

But after 50 years or so, a fire-suppression policy appears to result in more burned land and more fires per year than a prevention policy—which, according to Collins, "kind of hums along at a stable

level of area burned."

The team's results highlight the dangers of investing too heavily in fire-suppression measures, such as stocking up on firefighting resources right after a major fire. Without adequate prevention measures, forest debris can build up, fueling a bigger, more devastating fire the next time around.

Collins says the existing model is specific to Portugal, as most of the relationships incorporated in the model are based on information from that country. However, he adds that the model's basic structure may be applied to fire management in other regions, such as southern Europe and the United States—fire-prone areas that have tended to rely on fire suppression.

"This knee-jerk reaction—whether in forest fires, product development, or plant maintenance—exists in many contexts," Collins says. "To what extent it's undermining long-term performance is going to vary. To get an idea of how it's having an impact on the United States would require further research."

Mark Beighley, former director of the Office of Wildland Fire Coordination for the U.S. Department of the Interior, says a similar firefighting trap exists in the United States.

"We're seeing bigger fires, and longer fire seasons, and more houses and communities threatened than ever before because they're out there in the path of the fires," Beighley says. "The need is so great to protect communities that there's very little left for prevention. And that's a cycle that will take some pain to break."

The team's model, he says, may help U.S. policymakers grasp the "reinforcing loop" of politics, budgets, and fire management. "If we

looked at this together, we can start to talk about making some trade-offs," Beighley says.

For now, the team is presenting its results to government officials in Portugal, as well as contacting newspapers there in an effort to raise awareness for a more balanced approach to fire management. An advantage of the model, Collins says, is that it is relatively straightforward, consisting of "general insights that are easily digestible by policy communities." But changing a deeply entrenched system, he acknowledges, will not be an easy task.

"A lot of people have an understanding of the merits of [fire](#) prevention," Collins says. "But they're operating within this connected, physical/political system. Our model is a 10,000-foot view, looking at how things are operating. But it's tough for any one agent or manager to break what's going on in this system."

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