



## Science can map a solution to a fast-burning problem

Wildfires such as those that hit Canada last month are a growing worry, writes **Marc-André Parisien**, but risk-assessment models can limit future damage.

Rain has fallen on the explosive wildfire that ripped through the Fort McMurray region of Canada last month, but the inferno is likely to burn until the snow falls later in the year. The raging fire was a true force of nature. It sent out embers that skipped natural barriers such as the Athabasca River, hundreds of metres wide, and created its own weather system: pyrocumulus clouds that generated lightning, which ignited another fire some 30 kilometres away. The fire was unstoppable.

Unfortunately, the largest residential community in the Canadian boreal forest was in its way, and the resulting scenes of devastation drew attention from around the world. The fire is projected to be the costliest natural disaster in the nation's modern history. A repeat of last month's scenes is unacceptable, so what can be done? One thing is certain: there is now a tacit understanding among all Canadians that something must change.

Science has the tools to drive that change. Canada and other fire-prone regions should develop new maps of fire risk and use them to guide development and mitigation efforts. Similar maps are already produced around the world for areas prone to flooding and earthquakes, and it is unfortunate that so little has been done so far to measure wildfire risk. This is especially true across Canada, where hundreds of communities embed themselves in one of the most flammable places on Earth.

Wildfire spreads through a boreal forest with a speed and intensity not seen in other landscapes. But a fire's impact depends on factors that we can measure. With data on fire ignitions, weather, vegetation and topography, we can build models to demonstrate how we expect a region to burn should it catch fire. These can show two things that are important to guide policy: the probability of burning, and the likely fire intensity. The first shows the chances of a fire taking hold, and the second indicates how severe the consequences will be.

These maps show which areas, if they ignite, will burn at such a high temperature that attempts to fight the fire will never succeed. The only option is to evacuate, or not to live there in the first place. The maps can also identify parts of the forest where, because of the nature of the landscape and flora, fire would be easier to prevent and tackle. This knowledge can be used to allocate money and effort to places where mitigation is more likely to work.

A range of possible policies can minimize fire risk. Wood shingles used to build houses can be replaced by metal and asphalt; vents and gaps that can admit embers can be blocked; and flammable landscape can be reduced. Some houses burned down in Fort McMurray because homeowners had planted conifer trees and shrubs — a poor

choice, given that conifers burn much more readily than do deciduous trees in this part of the world. The surrounding forests can be managed too. Prescribed burning of vegetation and other measures can set up effective firebreaks.

This is not always easy or popular. I lived in one of these communities as a child. Many people make a conscious decision to live in the forest and don't want to see it altered. To fell trees and mandate the type of shrubbery they are allowed to plant can feel like a violation. But using fire-risk maps can sometimes show that the most effective intervention might be a few kilometres upstream of the prevailing wind. Fire management does not always require changes on people's doorsteps. Indeed, the recent blaze started as four separate fires — and it was the one that started the farthest from the town that caused the greatest damage.

After the Fort McMurray fire, our team at the Canadian Forest Service went back and produced fire-risk maps for the region. They, correctly, showed that a fire in the area was likely to take hold, and that when it did it would be unstoppable.

We need to set up a systematic framework to construct more of these maps. In Canada, this would demand a partnership between the federal government and provinces and municipalities that directly manage boreal wildlands. In other countries, similar partnerships could be formed to great benefit. We would also need to consult and engage with the people who live and work in the forest. It would not be cheap, but a Canada-wide framework to assess wildfire risk would still

be a fraction of the cost of a major fire incident. The good news is that we already have much of the data, as well as the tools and the expertise.

Continued human expansion into the Canadian boreal forest for natural-resource extraction and housing is inevitable. It is too late for Fort McMurray, but risk-assessment maps can guide this new development and direct it to low-risk areas. Some of these places are obvious: new settlements could take advantage of natural firebreaks such as large lakes to help shield them. Other preferable areas could be more surprising and would be identified only with the help of these maps; for example, landscape and vegetation in such areas might combine in unusual ways to reduce risk.

In a warmer and drier future climate, more fires are expected. We need to use our knowledge of boreal fire dynamics to find better ways to live and work safely in this hazardous environment. ■

**Marc-André Parisien** is a fire researcher with the Canadian Forest Service in Edmonton, Canada.  
e-mail: marc-andre.parisien@canada.ca

SETTING UP A  
**NATIONWIDE**  
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