

WILDFIRE SMOKE

Topic: As wildfire size, frequency, and distribution expands, a pattern we have seen over the last 10 years, both in Canada and beyond our borders, urban and rural residents are experiencing increased levels of smoke during the fire season.

Background: According to the National Forestry Database, over 8,000 wildfires occur in Canada yearly, with an average of 2.1 million hectares of forest burned.¹ In some years, large fires produce prolonged periods of smoky conditions. More and more people are living in areas prone to wildfires and their smoke.

Fires occur in both rural and urban areas containing combustible vegetation. As wildfire moves across forests and grasslands, it consumes vegetation, infrastructure, and almost anything in its path. The amount of smoke produced from the fire depends on the weather, the fire's temperature, the distance the smoke has travelled, or the types of fuels and their moisture condition.

A wildland fire's fuel is defined as "the combustible biomass found in forests".² Fuels range from needles and small twigs (fine fuels) to larger fuels including fallen trees and logs. Fuel management involves "the modification of a forest structure to reduce forest fuel accumulations available in a wildfire."³ Forests that are dry and dying along with an irregular fuel load in the forests, and extended periods of dry weather are factors that can lead to wildfires.

Exposure to wildfire smoke has been shown to have severe negative health consequences both in the short and long term.^{4,5} Wildfire smoke is composed of a complex mixture of fine particulate matter (PM2.5) and gases, such as carbon monoxide, nitrogen oxides, and volatile organic compounds. Among all the pollutants in wildfire smoke, small particulate matter that is 2.5 millionths of a meter or less in a diameter (PM2.5) is the most serious threat to human health. Wildfire smoke

can increase the level of PM2.5 to where concentration can last for hours, days, or weeks.⁶

Current Status: Inhaling smoke from wildfires can have immediate negative health impacts, including: stinging eyes, coughing, shortness of breath, chest pain, and headaches.⁷ During smoke events there are significant spikes in calls to doctors, clinics, and ambulances, surges in visits to hospital emergency rooms and clinics, and significant increases in medical prescriptions, inhalers and other lung drugs.

As wildfire smoke can seep inside homes through openings such as windows, doors, vents, and air intakes, individuals can still be susceptible to the effects of wildfire smoke even when not outdoors. Air purifiers are recommended to reduce the fine particles that are produced by wildfire smoke. These units are designed for a single room, drawing in air and removing the particles.⁸



A controlled burn on the east slopes of the Rocky Mountains (Alberta)

While health impacts are the most significant in the provinces/communities where the wildfire occurs, the impact of the smoke can also be found in other urban centres, provinces, and even other countries far from the fire, due to the smoke traveling by wind.

Key Considerations: It is important to note that forest types differ and not all forest types are as likely to burn. For instance, broadleaf trees (i.e., maple, oak, and birch) are less likely to support fires than conifer trees (i.e., fire, pine, and spruce). As well, only 3% of wildfires are defined as “very large and uncontrolled.” These 3% of wildfires are responsible for 97% of the burned areas of forests.⁹

Climate change will increase the three major factors influencing wildfire which are: “having dry fuel to burn, frequent lightning strikes that start fires, and dry, wind weather that fans the flames.”¹⁰

Climate change creates a vicious cycle: temperatures rise, which melts snow earlier (winter snowpack melts up to 4 weeks sooner than in past decades), forests stay drier for longer periods of time creating conditions to ignite and spread fire, and fires become larger and more devastating.

As climate change increases, a recent study predicted that in Western Canada the number of dry, windy days that allow fires to start and spread will increase by 50%.¹¹ In Eastern Canada, the rises will be even more severe with a 200-300% increase in weather that enables forest fires.¹²

Not only is wildfire smoke spreading from rural to urban areas, but more and more Canadians are living, working, and spending leisure time in forests, thus increasing potential exposure to wildfire smoke.

According to Public Safety Canada, human-caused fires represent 55% of all wildfires.¹³ Canadians have a responsibility to take precautions to prevent wildfires, whether they are visiting or residing near a forested area. Organizations such as FireSmart Canada (a program with the Canadian Interagency Forest Fire Centre) have implemented programs to teach Canadians about wildfire prevention, mitigation, and preparedness.

Options: Fire management is a key part of reducing wildfires, and by extension, wildfire smoke. Fire management is defined by Natural Resource Canada as “the process for planning, preventing, and fighting fires to protect people, property, and the forest resource.

It also involves fire to attain forestry, wildlife, and land-use objectives.”¹⁴

Carefully planned and executed prescribed burning is a prime example of a fire management technique that can be used to limit the intensity of natural wildfires. A prescribed fire is defined as “the planned and controlled application of fire to a specific land area.”¹⁵ While at first glance it may seem counterintuitive and damaging, prescribed fire plays a role in achieving air quality.

In British Columbia for example, decades of wildfire suppression have led to a build-up of forest fuels, trees intruding onto grasslands, and ‘in-filing’ more trees into open woodlands, thereby increasing the risk of wildfires.¹⁶ Prescribed fires remove the risk factors that can lead to massive wildfires and burn only during times of good venting of smoke and short duration of burns.

Amongst Indigenous communities, the practice of cultural burning is being used as a method of fire stewardship. While similar to prescribed burning, cultural burning is defined as “using fire on the landscape to achieve certain cultural objectives such as sustaining diverse animal life and plants that serve as medicines or food.”¹⁷ These burns are generally low-intensity and small in scale, and can help ensure healthy ecosystems, while managing the risk of wildfires.

Fuel management has also shown to be an effective forest fire management tool. Through treatment tactics such as mulching, chipping, clearcutting, or harvesting, the fuel needed to carry a fire can be reduced.

It is important to note that wildfire workers are exposed to a number of inhalation irritants including carbon monoxide, aldehydes, particulate matter, as well as various carcinogens. The side effects of exposure to these irritants include headaches, fatigue, nausea, and respiratory distress. Additionally, one long-term health effect is a higher risk of developing cardiovascular disease. It is critical that workers have increased precautions in place while conducting their work, including personal protection and respiratory protection equipment (i.e., facepiece respirators).

Conclusions: Across Canada and beyond our borders, more and more people are experiencing the impact of wildfire smoke. The profile of this issue has grown and is placing forest management fully in the national and international spotlight. As climate change intensifies, wildfires and the impact of wildfire smoke will continue to dominate conversation, not only in forestry circles but amongst the general public. The smoke is a health risk, not just an inconvenience. Fire and fuel management, and responsible forest management can reduce the conditions that produce prolonged periods of smoke.



Forest fire (British Columbia)



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Footnotes:

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