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To cite this article: Kira M Hoffman *et al* 2022 *Environ. Res. Lett.* **17** 061001

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ENVIRONMENTAL RESEARCH
LETTERS

PERSPECTIVE

OPEN ACCESS

RECEIVED

21 December 2021

REVISED

13 May 2022

ACCEPTED FOR PUBLICATION

25 May 2022

PUBLISHED

7 June 2022

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Western Canada's new wildfire reality needs a new approach to fire management

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E-mail: kira.hoffman@ubc.ca**Keywords:** prescribed fire, controlled burning, cultural burning, Indigenous fire stewardship, wildfire mitigation, Western Canada

1. Introduction

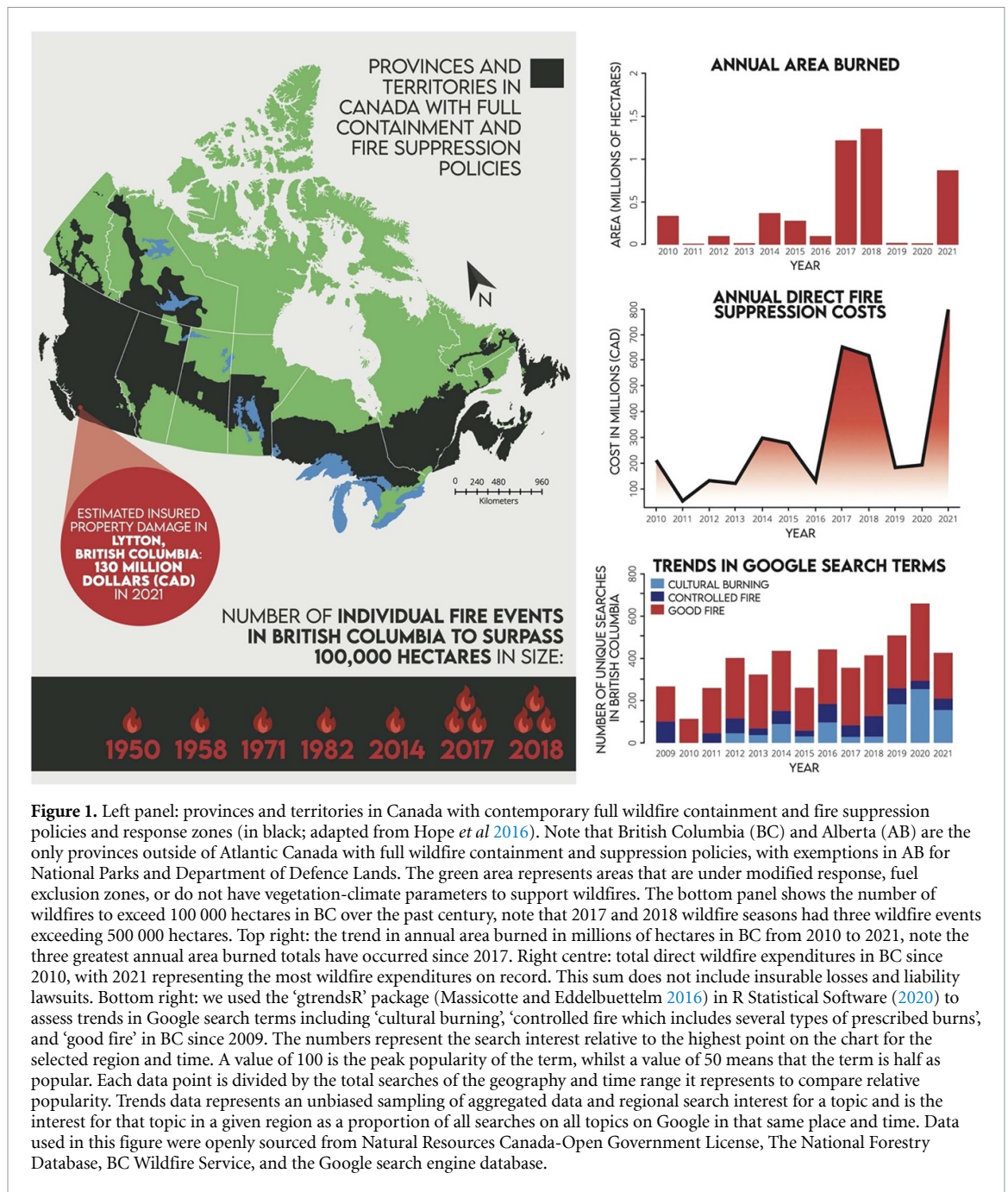
Wildfire seasons in Canada are changing. Recent uncharacteristically large and intense wildfires have exceeded abilities for fire suppression, highlighting the urgent need for improved methods and resource capacities to mitigate wildfire risk (Coogan *et al* 2019, Johnston *et al* 2020, Wang *et al* 2020). Although the overall number of wildfire events has decreased in Canada since the 1970s, the average annual area burned has doubled, with wildfire events exceeding 100 000 hectares in size becoming commonplace (figure 1).

In the past decade Canada has experienced numerous wildfires at the extremes of historical variability, destroying or seriously damaging human communities, wildlife habitat, and natural resources (Tymstra *et al* 2020, Hagmann *et al* 2021). This trend coincides with a steady increase in direct fire suppression costs, averaging \$1 billion yr⁻¹ since 2014—a threshold that was not predicted to occur until the latter half of the 21st century (Hope *et al* 2016). Direct suppression costs are only a fraction of total fire costs, and indirect wildfire costs (such as impacts to watersheds, ecosystems, infrastructure, individuals, and the local and national economies) are estimated to be two to thirty times total suppression costs (Dale 2009).

The six most impactful wildfire events in Canadian history—based on area burned, suppression costs, and the number of people evacuated—all occurred in western Canada during the last decade (figure 1, Canadian Council of Forest Ministers (2020)). These uncontrollable wildfire incidents include the 2011 Slave Lake fire in northern Alberta

(AB), which destroyed 500 properties with insured damages exceeding 700 million dollars (Natural Resources Canada 2020). In 2014, wildfires burned 3.5 million hectares in the Northwest Territories, the second largest area burned in a single fire season in Canada. In 2016, the Horse River fire drove 88 000 people from Fort McMurray, AB, the largest wildfire evacuation in Canadian history. At an estimated 9 billion dollars in direct and indirect damages; at the time, this fire was the costliest disaster in Canadian history (Johnston *et al* 2020). In 2017, British Columbia (BC) experienced its greatest annual area burned in a century (1.22 million hectares), which was quickly surpassed by another record year in 2018 (1.35 million hectares).

The 2021 wildfires in BC set several new records. The wildfire season started a month earlier than average, following three days of record setting temperatures reaching almost 50° C. This 'heat dome' catalysed a series of wildfires, including one that burned 90% of the community of Lytton, BC, resulting in the loss of two lives. The 2021 wildfire season became the third largest annual area burned in BC, with the most expensive suppression price tag of any BC wildfire season at 800 million dollars. In a disturbance cascade, these wildfires contributed to the devastating landslides and floods that inundated portions of southern BC in the fall of 2021, which have now superseded the costs of the 2016 Horse River wildfire, setting a new record for Canada's costliest disaster. The analyses presented in this perspective focus primarily on BC, the province expected to be at highest risk of future extreme wildfire events in Canada (Jain *et al* 2022).

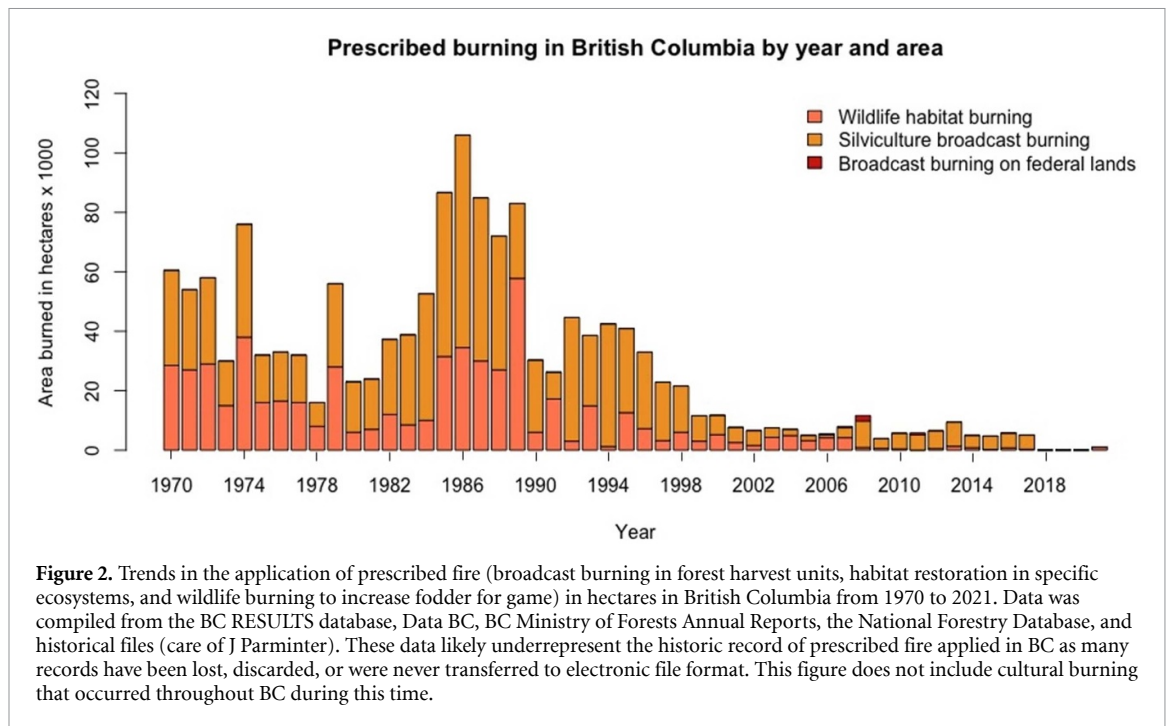


1.1. Multiple contributing and compounding factors

The secondary impacts of wildfire are numerous and costly. Significant health impacts caused by smoke and stress are superimposed on the costs of evacuation, losses of property, impacts on infrastructure, as well as ecological and economic losses (Holm *et al* 2021). Critically, wildfires disproportionately affect remote and forested Indigenous communities in Canada and Indigenous peoples are 33% more likely to evacuate from a wildfire (McGee 2021). Many Indigenous communities face significant capacity restrictions and financial barriers to effectively engage in wildfire risk and hazard mitigation (Hoffman *et al* 2022). We are only beginning to understand the

physical health impacts of smoke and other environmental hazards on wildland firefighters, a tremendous cost for their efforts to protect people and communities (Navarro *et al* 2019). Emergency first responders, including wildland firefighters, also suffer increased rates of mental health issues, including post-traumatic stress disorder and suicide following destructive wildfires (Stanley *et al* 2018).

Multiple factors have converged, yielding Canada's new wildfire reality. Climate change is driving warmer and drier summers and longer fire seasons—conditions more conducive to wildfire ignition and spread (McWethy *et al* 2019). But equally important is the condition of the forests. Over the last century, Canada has implemented widespread fire



exclusion policies across fire-dependent landscapes. Although many provinces have adapted policies to support modified response—including managed wildfires—particularly in parks and protected areas, BC and AB have a long legacy of highly aggressive fire suppression mandates (figure 1, Hope *et al* 2016, Tymstra *et al* 2020). The accumulation of large amounts of dry and dead fuel—a direct result of over 100 years of fire exclusion, cumulative disturbances, and forest management practices—is intensifying wildfire behaviour, putting firefighters and the communities they protect at greater risk (Coogan *et al* 2019, 2021). Funding for preventive approaches to wildfire remains a small fraction of direct suppression costs (in many places <10%) and although fire suppression budgets continue to grow, preventative wildfire budgets remain the same and are inadequate to support initiatives proposed by vulnerable communities (Copes-Gerbitz *et al* 2022). Simultaneously, populations are growing and the resultant communities are contributing to the wildland-urban interface problem, with many housing developments seemingly oblivious to wildfire risk (Tymstra *et al* 2020).

Of all natural disasters, we believe that solutions to wildfire are the most complex and have proven the most challenging to deploy. While the frightening and destructive impacts of wildfires dominate news headlines, fire can also be beneficial, maintaining the diversity and resilience of landscapes (Coogan *et al* 2021, Hoffman *et al* 2021). Equally under-reported and undervalued is the role of fire as a fundamental Indigenous cultural practice (Lake and Christianson 2020). This conundrum is known as the ‘double fire paradox’: the consequence of attempting to exclude fire is increasing the occurrence of extreme

wildfires, which can be resolved by returning the appropriate type of fire (which can be highly variable depending on forest type) to landscapes. Canada’s predominant fire suppression approach often disregards preventative, longer-term strategies that involve fuels management—forest thinning, fuel removal, and proactive use of fire.

1.2. Mitigation

Prescribed fire is the intentional use of controlled burning to manage fuels and landscapes, and cultural burning is the intentional use of fire by Indigenous peoples to achieve cultural objectives. When used safely, prescribed fire and cultural burning are effective fuel reduction tools, providing significant benefits to fire-dependent ecosystems, wildlife, and human communities (Dickson-Hoyle *et al* 2021). But fighting fire with fire is also one of the most controversial and underutilized wildfire mitigation technique (Kolden 2019). For example, the use of prescribed fire in BC has fallen dramatically in recent decades (figure 2), despite substantive research revealing long-term positive effects (Weber and Taylor 1992). Nevertheless, a query of the search terms ‘cultural burning’, ‘controlled fire’, and ‘good fire’, in BC since 2009 revealed that the public is becoming increasingly interested in learning about other ways of managing and living with fire (figure 1).

Wildfire management agencies across Canada are beginning to show a renewed interest in the application of prescribed fire and cultural burning to reduce wildfire risk. But although Indigenous peoples have maintained fire stewardship practices and continue to be keepers of fire knowledge, western-trained scientists and resource managers often remain sceptical of,

or unfamiliar with, Indigenous fire knowledge, which has been consistently devalued by wildfire management agencies (Dickson-Hoyle *et al* 2021, Hoffman *et al* 2022). Importantly, prescribed burning is distinct from cultural burning, primarily in the burn objectives, techniques used to burn, and who is conducting the burn. Indigenous knowledge is not a ‘thing’ that can be captured and appropriated into plans by agencies to inform wildfire management (Hoffman *et al* 2022).

We believe that wildfire planning, mitigation, and prevention needs to be decentralized, with Indigenous Nations and Indigenous communities empowered to lead and engage in wildfire management that aligns with cultural and ecological values. Overcoming existing systematic barriers will require educating the public on risk reduction techniques, enhancing technical training across cultures and areas of expertise, and collaborating with communities and regional districts on wildfire mitigation. In 2019, the Province of BC became the first jurisdiction in Canada to implement the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Under UNDRIP, BC has committed to respect traditional cultural expressions, science, and knowledge, thus transforming how fire and forest statutes are interpreted (Hoffman *et al* 2022).

Fire suppression will remain critical to protecting lives, communities, and infrastructure on a subset of the landscape, and we must recognize and support the first responders who put themselves in harm’s way to protect lives and property. However, deciding where and when to suppress wildfires versus managing wildfires by monitoring their spread and impacts and intended fire regimes will be key to living more safely with fire now and in the future.

2. Conclusions

As large, high-severity wildfires become more commonplace, it is clear that Canada needs to evolve its approach to managing wildfire. This will mean transforming wildfire policies that reflect both the best available science, practical ‘boots on the ground’ experience, and millennia of Indigenous knowledge (Dickson-Hoyle *et al* 2021). Full containment fire suppression tactics are often impractical, unsustainable, and ecologically detrimental in fire-prone landscapes (McWethy *et al* 2019). We believe that the reluctance of decision makers to apply prescribed fire and support Indigenous-led cultural burning, which at a landscape-scale can expand suppression tactics and greatly improve suppression success, stems from a perceived lack of public understanding and lack of experienced personnel, along with largely unfounded fears of fire escape and air pollution. This undermines millennia of Indigenous knowledge and

the wealth of place-based experience Indigenous and non-Indigenous fire practitioners bring to mitigating wildfire risk.

As we face the challenges posed by Canada’s new wildfire reality, increasing the use of prescribed fire and supporting Indigenous-led cultural burning will reduce wildfire risk to communities while enhancing the health of forest and grassland ecosystems across the broader land base.

Data availability statement

The data generated and/or analysed during the current study are not publicly available for legal/ethical reasons but are available from the corresponding author on reasonable request.

Acknowledgments

This research was supported by funds from the Natural Sciences and Engineering Research Council (Postdoctoral Fellowship; K M Hoffman) and the British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development, BC Wildfire Service through its membership with the Canadian Partnership for Wildland Fire Science.

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