BOUND BY FIRE

Adapting Urban Planning to Wildfire Challenges in Western Canada

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Acknowledgements

I would like to thank my supervisor Lisa Bornstein, for her interest, feedback, and support throughout this project. It is inspiring to work with someone who acknowledges the gravity of emergency management within urban planning practices.

I owe a special thank you to my parents for their unwavering support throughout this project. Your constant encouragement has always reminded me that I am on the right path. The interest and encouragement from my friends and family have profoundly supported me personally and motivated my research, reminding me of how personal this topic is to so many around me.

I owe my biggest thanks to all the trailblazing, courageous individuals working in the field of planning, fire and emergency management who agreed to be interviewed for this project. Your leadership, work and insights are inspiring profound advancements in our field. Special appreciation is extended to those on the front lines, and everyone contributing in various capacities to manage and mitigate the impacts of wildfires.

I also extend a heartfelt acknowledgment to all the places that have been threatened, and to those that have been lost since the commencement of this project. Having spent two years working in Lake Louise, and one in B ulkley Nechako , these regions hold a special place in my heart. The recent devastation in Jasper starkly illustrates the high stakes of this new era of wildfires, which jeopardize ecological stability, critical infrastructure, and cultural identities. These spaces are carriers of cultural and natural heritage, hotspots of ecological biodiversity as well as home to millions of human beings and countless other precious species.

Finally, I wish to acknowledge the countless Indigenous communities forced to evacuate due to wildfire threats in and around their territories. Despite being disproportionately affected by wildfires and resulting evacuations, their experiences often remain underrepresented in media and research. Although this research does not focus directly on these communities, it is crucial to recognize their profound resilience and to advocate for their essential role in shaping the future of wildfire risk management.

Abstract

Climate change is exacerbating the frequency and severity of natural disasters, presenting significant challenges to human settlements worldwide. In 2023, Canada has experienced its most destructive year of wildfires on record, with approximately 48 million acres of forest burned across the country. While wildfires have long been a part of Canada's reality, trends indicating increasingly destructive wildfire seasons suggest that fire should be expected at unprecedented scales. As urban expansion continues into areas of high wildfire risk, many Canadian local governments are faced with the dual challenge of planning for these events, and for the future of their communities within this context.

This supervised research report explores how the increase in number and intensity of wildfires is influencing practices of urban planning within affected cities and regions, particularly focused on cities of various scales in Western Canada. The study examines the current state of wildfire risk, the underlying factors driving its escalation, the mitigation strategies adopted by different local governments, and the challenges they encounter in implementation. The research highlights the innovative approaches adopted by local authorities to counter wildfire risk in an era essentially devoid of precedent. It also highlights the growing imperative of collaboration and engagement with stakeholders across all levels of government and civil society. The hope for this research is to provide a portrait of the current situation facing communities in high wildfire risk areas and to identify best practices prominent gaps or concerns that can guide future policy responses, as well as approaches to wildfire management both formally and informally.

Résumé

Les changements climatiques exacerbent la fréquence et la gravité des catastrophes naturelles, ce qui pose des problèmes considérables aux établissements humains à travers le monde. En 2023, le Canada a connu l'année la plus destructrice jamais enregistrée en matière d'incendies de forêt, avec environ 48 millions d'hectares de forêts brûlées dans tout le pays. Si les incendies de forêt font depuis longtemps partie de la réalité canadienne, les tendances indiquent des saisons d'incendies de plus en plus ravageuses alors que l'expansion urbaine se poursuit dans des zones à haut risque d'incendie. De nombreuses localités canadiennes sont donc confrontées au double défi de la planification face à ces catastrophes naturelles, mais aussi de l'avenir de leurs communautés. Ce projet de recherche explore donc l'évolution des pratiques de planification urbaine dans les villes et les régions touchées par cette augmentation en nombre et en intensité des feux de forêts, en se concentrant particulièrement sur des villes de différentes échelles de l'Ouest canadien.

Cette étude examine l'état actuel du risque d'incendie de forêt, les facteurs sous-jacents à son escalade, les stratégies d'atténuation adoptées par les différents gouvernements locaux et les défis qu'ils rencontrent dans la mise en œuvre de ces stratégies. L'étude met en évidence les approches innovantes adoptées par les autorités locales pour contrer le risque d'incendie de forêt à une époque essentiellement dépourvue de précédents. Elle met également en évidence l'impératif croissant de collaboration et d'engagement avec les parties prenantes à tous les niveaux du gouvernement et de la société civile. L'objectif de cette recherche est de dresser un portrait de la situation actuelle des communautés dans les zones à haut risque d'incendie de forêt et d'identifier les meilleures pratiques, les lacunes importantes ou les préoccupations qui peuvent guider les réponses politiques futures, ainsi que les approches de la gestion des incendies de forêt, à la fois formelles et informelles.

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Introduction

Canadian summers, traditionally heralded as a season of warmth, growth, and vitality, now increasingly carry a different connotation: the return of fire. In 2023, Canada experienced its most destructive year of wildfires on record, with over 48 million acres of forest burned - an area more than twice the size of Portugal (Milman, 2023). This reflects a much larger trend towards high intensity wildfire activity around the globe (Coogan et al., 2019). While wildfires have long been part of Canada's reality, the scale of destruction in 2023 marked a stark increase compared to previous seasons. It encompassed an area roughly seven times the annual average and saw an alarming surge of 170 percent compared to 2022 (Wallace-Wells, 2023) (See Figure 2). Since the 1970s, the average annual area burned in Canada has doubled, an indication that this recent fire behavior is not an anomaly. Instead, many researchers suggest it is an "indication of what the future holds", as "it appears that we are entering a new era of fire regimes with no historical analogue (i.e., "unknown unknowns") (Coogan et al., 2019).

This increase in fires has been attributed to several factors, among them increases in global temperatures; extended periods of "fire weather" characterized by severe drought, heat, and low humidity; changes in land use such as urban development; and historical fire management practices (Coogan et al., 2019; Jones et al., 2022; Natural Resources Canada, n.d.). Although these trends are experienced globally, one of the places where the increase in fires has been, and is projected to be, particularly pronounced is in the Western forests of North America (Jones et al., 2022; Natural Resources Canada, 2024b)

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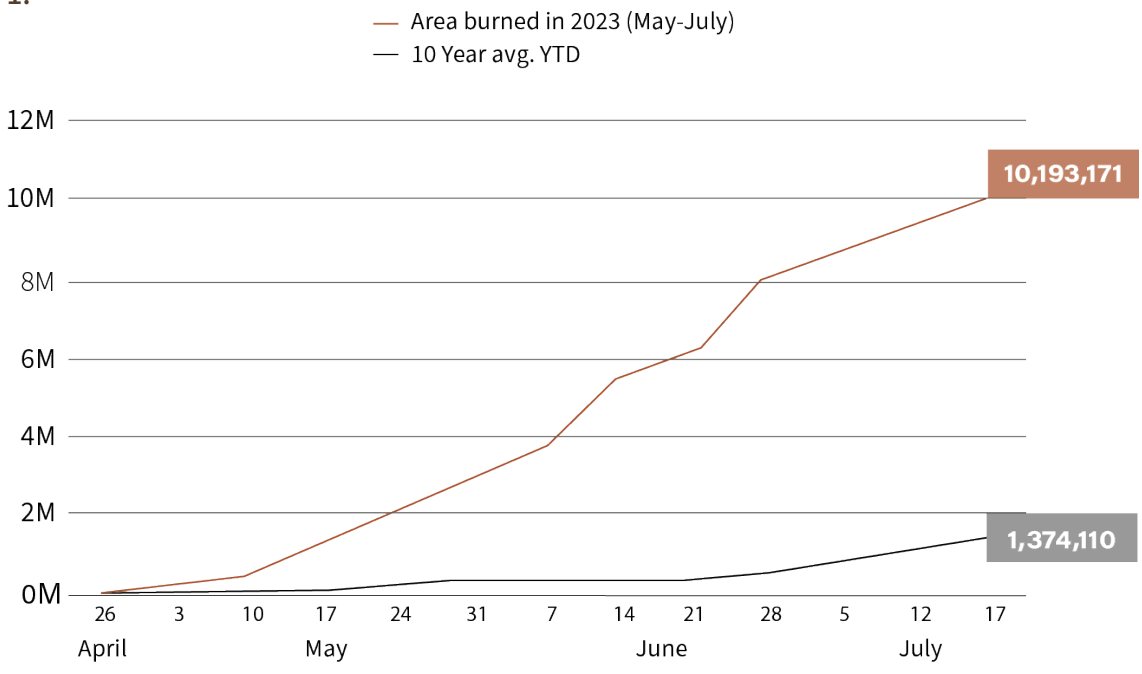


1.
Cumulative area burned by wildfires in Canada in 2023.

Sources: Natural Resources Canada, Canadian Interagency Forest Fire Center, https://www.statista.com/chart/30230/cumulative-area-burned-wildfires-canada-and-10-year-average/

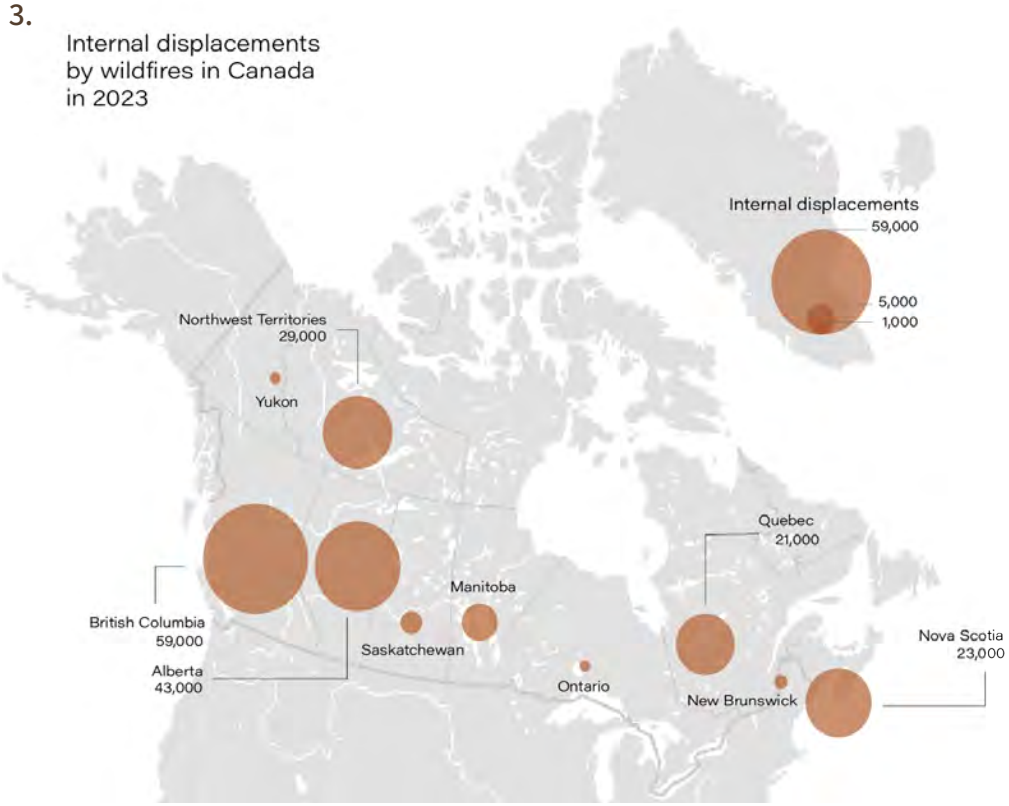
The consequences of such an increase in wildfires are profound, and include mass evacuations, public health crises, and the widespread destruction of valuable social and physical infrastructure. Until recently, urban areas have typically been spared from the most destructive impacts of these fires compared to their rural counterparts (Internal Monitoring Displacement Center (IMDC), 2024). This trend shifted in 2023 when smoke from wildfires led to the breaking of historical records for poor air quality in cities throughout North America and nearly half of Canada's wildfire-induced displacements occurred in urban areas (IMDC, 2024; Public Health Agency of Canada, 2023). Major evacuations include the McDougall fire which displaced over 45,000 people from the Kelowna region, and the evacuations of Yellowknife, the capital of the Northwest Territories over half of the territory's population (IMDC, 2024) (see Figures 3 and 4).

2.

2.
Yellowknife residents leave the city on Highway 3, the only highway in or out of the community, after an evacuation order was given due to approaching wildfires.

Sources: Pat Cane, CBC, https://www.cbc.ca/news/canada/north/nwt-wildfire-emergency-update-august-16-1.6938756 on data from governmental authorities, UN geospatial

3.



3.
Internal displacements due to wildfire proportionally shown across Canada 2023.

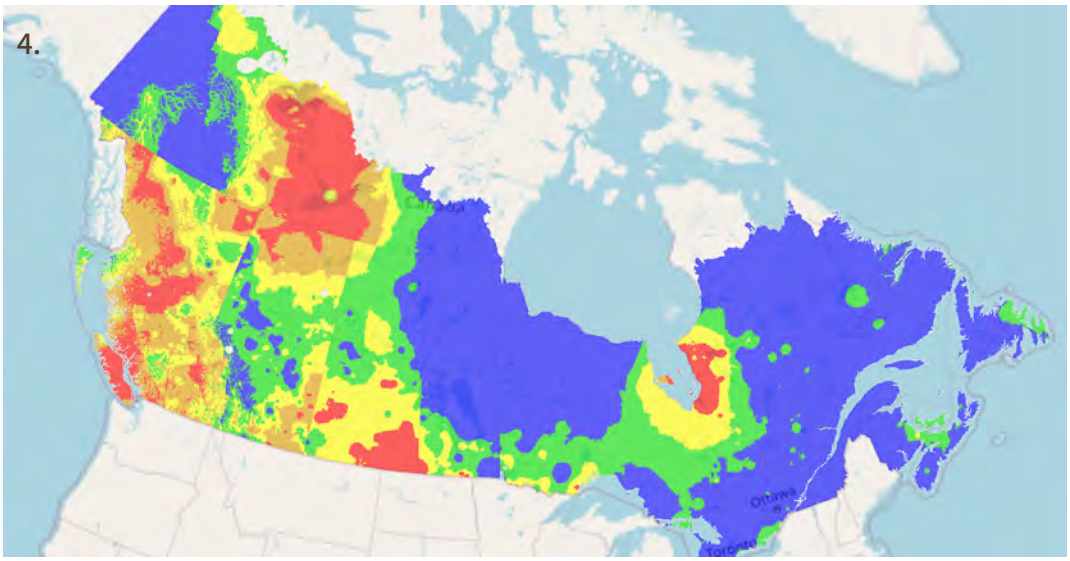
Sources: IDCM: Based on data from governmental authorities, UN geospatial

As such events become increasingly common, urban communities must confront the reality of shifting norms in wildfire behavior that challenge the efficacy of traditional management strategies. Yet little is known about how municipal managers and planners are addressing the changes in wildfire activity. Understanding how such new conditions are addressed by local officials and managers is one objective of this study.

The purpose of this study is to explore how the increasing number and intensity of wildfires are influencing urban planning practices within affected cities and regions, particularly focusing on settlements of various scales in Western Canada. This research aims to provide insights into the specific challenges faced by urban planners and to understand how they have been planning for, responding to, and adapting to the changing landscape of wildfire risk in urban, semi-urban, and rural municipalities. The findings include best practices for local governments at risk of wildfire and the identification of prominent gaps and concerns related to wildfire management. This research will help guide future policy responses and local approaches to wildfire management, both formally and informally.

To select the research locations, criteria included areas throughout Western Canada facing high wildfire risk, as indicated by a map provided by the Government of Canada in August 2024 (see Figure 5). The study focuses on two provinces, British Columbia and Alberta, and two territories, the Northwest Territories (NWT) and the Yukon, covering both jurisdictions directly affected by wildfires and those yet to experience such events. Local governments were chosen based on prior research identifying them as having experienced wildfires or participated in neighboring localities' fire response efforts.

While the research primarily focuses on municipalities, rural areas and smaller regional governments were added midway through the study. This inclusion was prompted by various participants identifying these areas as extremely high risk, highlighting a crucial perspective that often is overlooked.



4.
Map of wildfire risk across Canada as of July 16, 2023. The selection of study locations was partially chosen based on this information.

Sources: Natural Resources Canada, https://cwfis.cfs.nrcan.gc.ca/

Initially, 20 different local governments were contacted via email and LinkedIn, and 10 agreed to participate in the study. Subsequently, 17 individuals were approached for interviews, some through outreach efforts and others through established connections. In total, 17 interviews were conducted, involving professionals from 10 different governments, including 2 First Nations governments, 3 regional planning departments, and 5 municipalities (see Figure 6). The interviewees represented three key professional categories: urban planners, emergency managers, and wildfire specialists. A table of the participants, their locations and their roles are detailed in the Appendix (See Table A1). Transcriptions and hand notes were taken during each interview, and thematic analysis was performed to identify challenges, recommendations, and successful strategies.

This supervised research report (SRP) is divided into five chapters. This introduction presents the challenge investigated, the research objective and methodology, and the structure of the report. Chapter 2 contextualizes the growing wildfire risk by examining its historical trajectory, detailing how climate change, historical fire management practices and evolving settlement patterns have collectively contributed to the present landscape of heightened risk with unprecedented impacts. This chapter will also explore the various impacts of growing wildfire risk. Chapter 3 details various strategies and tools used by planners to manage wildfire risks, including land use planning, public education, and collaboration. Chapter 4 discusses some of the main challenges faced by local governments in implementing these strategies. Chapter 5 provides an analysis of the results and a comparison of the various study areas based on distinct characteristics (Urban, Urban Remote, Non Urban and Non Urban Remote). The final chapter summarizes the findings and their implications for future wildfire management and urban planning, providing a set of recommendations for both local governments and higher levels of government.

5.
Map of locations where local government staff were interviewed.

Sources: Clare Milliken, Google Maps

02

Wildfires as an urban risk and a challenge to city managers

The introduction of this report outlined the reality of wildfires as an urgent challenge, particularly emphasizing their increasing relevance to urban areas in Western Canada. Chapter 2 addresses critical aspects of the escalating wildfire challenges in Western Canada, drawing on academic literature, government and non-government reports, and the interviews conducted for this study. The first section of this chapter examines the factors contributing to heightened wildfire risk in the Canadian context, including the impacts of climate change, historic fire management practices, and human settlement in fire-prone regions. The second section describes the increases in wildfire risk in Western Canada. The third section explores the economic, social, and environmental impacts of these wildfires on communities and the broader landscape. The final section identifies, based on a synthesis of literature, four challenges municipal authorities face in adapting to a new landscape of wildfire risk. Material is drawn from academic literature, government plans and reports, and interviews with urban planners, emergency planners, and wildfire specialists in Alberta, The Yukon, The Northwest Territories, and British Columbia.

WILDFIRE RISK AND ITS CONTIBUTING FACTORS

Three factors are identified as key drivers of growing wildfire risk in Western Canada: drought, heat, and storms associated with climate change; reliance on fire management approaches that have disrupted historic cycles of burn and regrowth; and settlement patterns that place humans in proximity to fire-susceptible lands.

7. Smoke from the 2023 Canadian wildfires covering the city of NYC .

Sources: The Brooklyn Eagle

Climate Change

Climate change is driving a fundamental shift in temperatures and atmospheric moisture levels, resulting in increasingly warm and dry conditions that heighten the risk of wildfires. Research analysing trends over the last 50 years confirms that Canadian fire seasons are now burning hotter, for longer periods of time and burning larger areas of land (Wotton et al., 2017). Increasing temperatures have led to extended, warmer spring and summer seasons as well as mild winter seasons with reduced snow cover (Shingler, 2023). This lack of moisture leaves soil and vegetation vulnerable to heightened wildfire risk, resulting in easier ignition and more intense fires (Environmental Protection Agency, n.d.). According to Jones (2022), future climate projections indicate a continous increase in lightning strikes that start fires and to the dry, windy weather that spread it. Additionally, climate change has facilitated the spread of invasive species like the pine beetle in Canada's Western provinces, causing mass amounts of tree fatalities and turning vast forested areas into highly flammable fuel for wildfires (Woo et al., 2024).

As these high temperatures and weather conditions considered unusual for Western Canada become the norm, municipalities are faced with the reality that wildfires will increasingly occur outside of typical seasonal boundaries (Coogan et al., 2019). A planner from Banff highlighted the impact of climate change on weather patterns, stating, "May is usually a really secure time to do a burn, and this was just one of those really dry Mays. It is not uncommon to have snow on the ground in May, and this May I think it was something like 22 degrees. With climate change, we're seeing some of our assumptions around when it's safe and when it's not get changed on us." In 2023, throughout two of Canada's most fire-prone provinces, nearly 150 fires from the previous season persisted beneath snow-covered ground, raising concerns that many of these fires may resurface and flare up again (Environmental Protection Agency, n.d.). These new conditions are both indicative of severe upcoming seasons and a warning that wildfires are becoming a year-round threat.

Local governments across all interviewed regions report abnormal weather patterns compared to historic norms. Their concerns revolve around increased temperatures leading to reduced snowfall and drought conditions. A planner from Kimberly expressed alarm, stating, "our snowpack is very, very, very low this year, and there is a lot of concern around that water retention." Similarly, an emergency planner from Prince George emphasized her concerns, remarking, "right now, our forests are extremely dry, and we have gotten very little snow over this last winter so far. I mean, we're still not finished with winter, but we're concerned about where that's going to take us in the summer." These sentiments were echoed across the entire study area, as staff expressed their fears around what they observed as a glaring increase in conditions conducive to fire.

Fire Management Practices

Alongside the changing climate conditions, forest management practices have also significantly contributed to the frequency and intensity of wildfires. Widespread adoption

of fire suppression techniques over the last century have disrupted natural cycles indigenous to the region, which use periodic fire as a component of regeneration (Copes-Gerbitz et al., 2021). Past fire suppression efforts have led to the build-up of vegetation and deadwood, creating a significant fuel load within forest ecosystems that can exacerbate fire outbreaks (Copes-Gerbitz et al., 2021). Consequentially, in this context, when fires occur, they burn with heightened heat and speed (Public Safety Canada, 2024). Banff, a city nestled within one of Canada's National Parks, provides an example of the dangers that arise from centuries of fire suppression and park protection. Their Emergency Manager explains, "Banff National Park is one of the most protected forests in the country. That is unnatural to wildfire behavior… everyone in the wildfire world knows that our protection of the forest has had massively unintended consequences when these fires hit. It's bad, the forest around our town. It's going to be a big one." Recognizing the limitations of fire suppression, more recent forest management approaches are increasingly prioritizing a coexistence with fire (Hoffman et al., 2022). This shift has seen the resurgence of both prescribed burns - fires that are intentionally ignited under controlled conditions to achieve specific ecological, forest management, or hazard reduction objectives and cultural burns (Parks Canada, 2023). Cultural burns, conducted by Indigenous communities, are traditional practices that use fire to manage land, enhance biodiversity, and maintain ecological balance (Copes-Gerbitz et al., 2021). A planner from Prince George has noted the regenerative qualities of these controlled fires, as evidenced by the post-fire return of wildlife, such as deer, and the thriving of certain species of mushrooms, like morels. In contrast, modern high intensity wildfires, due to both changing weather patterns and accumulated biomass, often burn too intensely to support such natural ecological processes (Agbeshie et al., 2022). A Buckley Nechako planner says these wildfires no longer play their traditionally regenerative role, explaining, "because there's so much fuel, so much debris on the ground, the fires burn so hot that they don't really provide for that natural process. They just disintegrate everything."

Development in the Wildland Urban Interface

In addition to the influence of changing weather conditions and historical fire suppression practices, the recent surge in urban wildfires is closely linked to the expansion of urban areas into the Wildland-Urban Interface (WUI). The WUI, defined as where urban development meets wildland areas, are zones of heightened wildfire risk (FireSmart Canada, 2024). Continuous population growth and urban sprawl have expanded residential areas into regions surrounded by forests and dense vegetation (Hughes & Simak, n.d.). This expansion contributes to fires through both ignition sources and the structures built, which serve as significant fuel (Newman et al., 2013). As of 2021, approximately 13% of the Canadian population lives within the WUI (Erni et al., 2021). As these interface communities become more prevalent, the number of people at risk of encountering and inadvertently exacerbating wildfire threats increases (Gonzalez-Mathiesen & March, 2018).

Development trends in most Canadian regions fail to reflect the heightened wildfire risk in the WUI. Many urban and semi-urban settlements are experiencing rapid expansion (Erni et al., 2021). Significant settlement in the WUI is evident in most areas reviewed in this SRP, with many interviewees expressing concerns about ongoing development in these zones. Although some local government planners advocate limiting this expansion, such efforts often face resistance due to systems prioritizing growth and norms favoring sprawl.

Canada's ongoing housing crisis and the urgent demand for rapid housing delivery add complexity to the development issue. The need for housing solutions makes it challenging to resist development in high-risk zones like the WUI (Erni et al., 2021; Popovich & Plumer, 2022; Stueck, 2023). Interviewees consistently highlighted the challenges posed by housing shortages, particularly in rapidly growing urban areas. One government official from the Yukon explains, "the planning departments' work plan gets really driven by housing. That's always their pressure point." This pressure often leads to residential development permits being allocated in the WUI. Limited land availability further drives WUI growth, as municipalities struggle to secure suitable sites for housing within existing built areas. A planner from Banff explains, "we're making planning decisions that are based on maximizing the last amount of land parcels available to us so that moves density out to the fringe and that moves people into the interface zone. He further comments "we've put a lot of housing in places that we probably would rather not because we're constrained by administrative geography."

In summary, the growing wildfire risk in Western Canada is driven by three main factors: climate change-induced drought and heat, historical fire management practices disrupting natural burn cycles, and the expansion of human settlements into the Wildland-Urban Interface (WUI). These factors collectively contribute to more frequent and severe wildfires, placing increasing numbers of people and ecosystems at risk. The following section explores how this convergence of factors is affecting areas in Western Canada, an area of the country where wildfire activity and its impacts have been especially pronounced.

8.
The McDougall Creek Wildfire seen burning in West Kelowna on Aug. 18, 2023. This fire jumped Lake Okanagan.

Sources: Ben Nelms, CBC, https://www.cbc.ca/news/canada/british-columbia/what-you-need-to-know-about-bc-wildfires-

WILDFIRE RISK IN WESTERN CANADA

The threats, experiences and impacts of increased wildfire activity in Canada have been most pronounced in the country's Western regions (Parisien et al., 2023). Fire regime changes are most prevalent here, primarily due to prolonged periods of drought and dry conditions, as well as more extreme histories of suppression-based wildfire management policies compared to the rest of the country (Erni et al., 2024; Hoffman et al., 2022). British Columbia, in particular, has endured four catastrophic major wildfire seasons in the past seven years, burning more than the past 50 years of wildfires combined (See Figure 10). The scale of this devastation to human and ecological communities has positioned the region as a "global hotspot for catastrophic wildfire losses," alongside areas such as Australia, the western United States, and the Mediterranean Basin (Parisien et al., 2023)

The impacts of these wildfires on human populations and urban areas are particularly significant in British Columbia, which has a proportionately higher density of populations in Wildland-Urban Interface (WUI) areas and has experienced the greatest increase in evacuation frequency over the last two decades (Tepley et al., 2022). Yet new wildfire behaviors, such as fires jumping natural fire breaks like rivers and lakes, are challenging conventional understandings of fire risk to urban and non-urban communities in many other western regions (Wallace-Wells, 2023) (See Figure 9). Notable incidents include the 2016 Fort McMurray fire, which jumped the Athabasca River, and the 2023 fires that leaped over the Northwest Territories (NWT) Mackenzie River. The latter, at its widest, spans a kilometer and a half, larger than most man-made fire breaks (Thompson, 2024).

Research indicates that these trends will continue to worsen, along with similar increases in neighboring areas containing carbon-rich boreal forests (Parisien et al., 2023). This year, several regions, including northeastern British Columbia, northern Alberta, south-central NWT, and northern Quebec, have been identified as high-risk areas by the Canada's Emergency Preparedness Minister (Blake, 2024). Recent climate trends confirm these projections. In 2024, Canada experienced its warmest winter on record, with temperatures significantly above average (Shingler, 2023).

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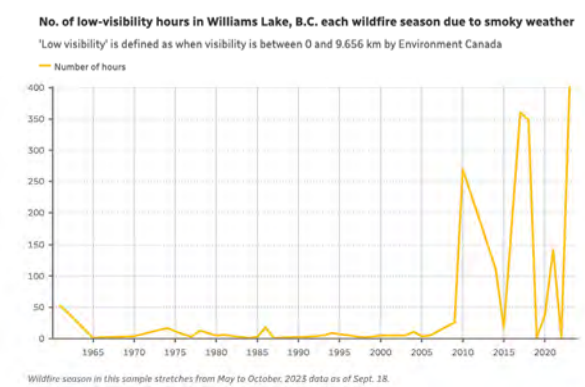

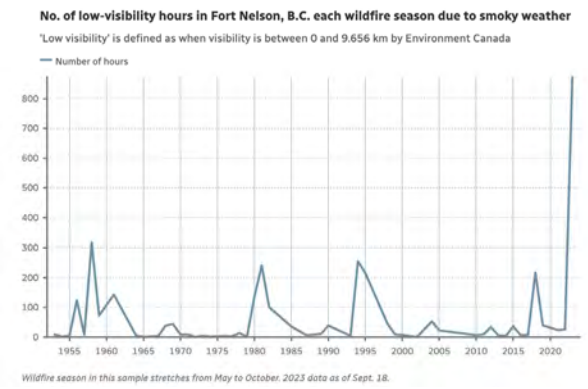

9.
Graphs indicating the drastic rise in low-visibility days across various B.C. towns.

Sources: CBC, https://www.cbc.ca/news/canada/british-columbia/smoke-canada-british-columbia-1.7003948

Exceptional and extreme drought conditions persist across southern Alberta, central and northern BC, and southern NWT, creating ideal conditions for intense wildfires. As of mid-July 2024, there are over 500 active wildfires burning across the west, with the majority in Alberta and BC (Canada Wildfires: Unfavourable Weather Conditions Fueling Nearly 500 Blazes across B.C., Alberta, 2024) (See Figure 11). The Canadian Minister of Emergency Preparedness recently warned of "what has become an alarming but somewhat predictable trend of hot, dry summers that present the perfect conditions for intense fires. (Carey, 2024)"

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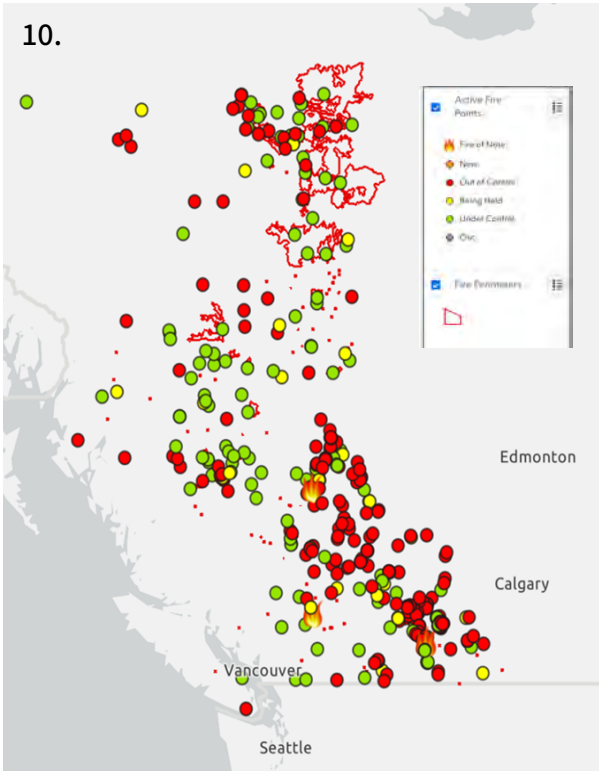


The increasing wildfire risk has profound and wide-reaching impacts. The following section will explore some of these impacts in detail, focusing on how wildfires affect human populations, as well as the built and natural environments they depend on.

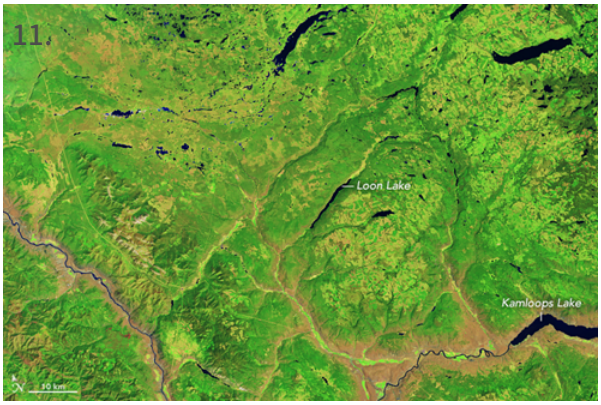
WILDFIRES AND THEIR IMPACTS

Wildfires impacts on humans include (a) harm to their lives, livelihoods, and health; and (b) damage to infrastructure, services, and the ecosystems that support human well-being. While costs are varied—including socio-cultural, developmental, psychological, and financial, the section below focuses on environmental, health, and economic costs.

Environmental impacts

The environmental impacts of high-intensity wildfires in Canada are profound, significantly altering ecosystems, climate, and the distribution of biodiversity at both local and global scales (Wang et al., 2024) (See Figures 12 and 13) . Unlike low-intensity fires, which can improve nutrient quality, intense heat from increasingly common high-intensity fires can destroy soil quality, resulting in

11.



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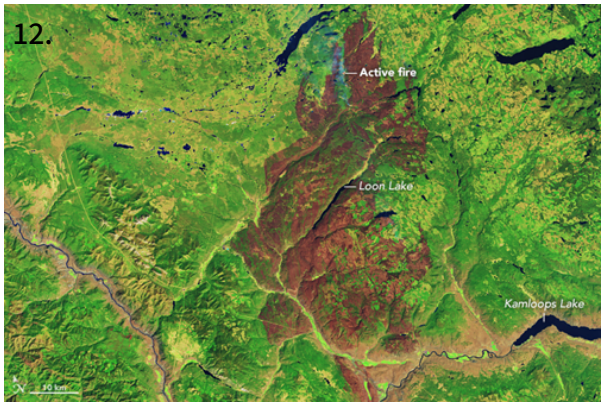

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Map of wildfires in Western Canada as of July 23, 2024.

Sources: BC Wildfire Service, https://wildfiresituation.nrs.gov.bc.ca/map

11.
This before image taken on July 5, 2017, shows the area near Ashcroft, B.C., before the Elephant Hill fire.

Sources: Joshua Stevens , The Narwhal, https://thenarwhal.ca/bc-forest-fires-restoration-secwepemc/

12.
This after image shows the damage caused by Elephant Hill fire. It was taken on August 22, 2017 and captured the burn scar on the landscape.

Photo: Joshua Stevens, The Narwhal, https://thenarwhal.ca/bc-forest-fires-

significant nutrient loss and reduced water retention capacity (Coogan et al., 2019). This, in turn, negatively impacts forest regeneration and watershed health, leading to long-term ecological damage and increased vulnerability to future wildfires (Agbeshie et al., 2022).

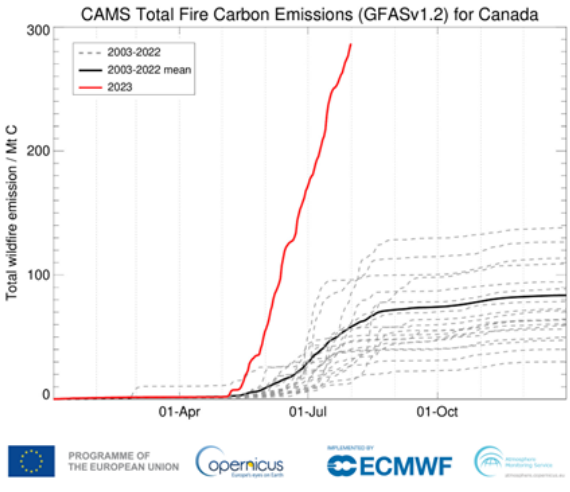
Wildfires are also expected to significantly alter forests and biodiversity, accelerating the transition of mixed wood and conifer forests to deciduous woodlands and grasslands (Coogan et al., 2019). This shift will impact the availability of timber, carbon storage, and water supply (Parisien et al., 2023). While some species will benefit from post-wildfire habitats, others, like the boreal woodland caribou, will face severe habitat loss (Barber et al., 2018) (See Figure 14). Additionally, these impacts may predispose vegetation to invasive insects, disease and drought (Coogan et al., 2019).

In terms of water security, wildfires disrupt surface hydrology and aquatic ecosystems, leading to water contamination from excess nutrients, sediments, and heavy metals (Coogan et al., 2019) . This can strain drinking-water treatment processes and increase the risk of treatment failures. Additionally, postfire flash floods and debris flows pose significant risks. In the long term, increased wildfire activity and extreme weather events may threaten the capacity of watersheds to provide sufficient, high-quality freshwater to communities and ecosystems (Coogan et al., 2019).

At a global scale, the burning of biomass during wildfires significantly contributes to atmospheric carbon dioxide levels, exacerbating climate change and creating a feedback loop that increases the likelihood and intensity of future fires (Wang et al., 2024). Notably, the wildfires that Canada experienced in 2023 produced the highest carbon emissions on record for the country, accounting for 23% of the world's total carbon emissions (Bohn, 2023) (See Figure 15).

13.

14.



13.
Morels growing in the aftermath of a wildfire. This image illustrates the types of natural regrowth that commonly occur after a fire. However, the increasing frequency of fires that burn too hot and too intensely is hindering these regenerative processes.

Photo: Lobby Studio, The Narwhal, https://thenarwhal.ca/bc-forest-fires-restoration-secwepemc/

14.
GFASV1.2 daily total cumulative estimated carbon emissions for Canada since 1 January (red line shows 2023 up to 1 August, thick black line shows 2003-2022 mean, and grey dashed lines show the other years in the dataset).

Sources: Copernicus Atmosphere Monitoring Service, https://atmosphere.copernicus.eu/2023-canada-wildfires-emissions-have-already-doubled-previous-annual-record

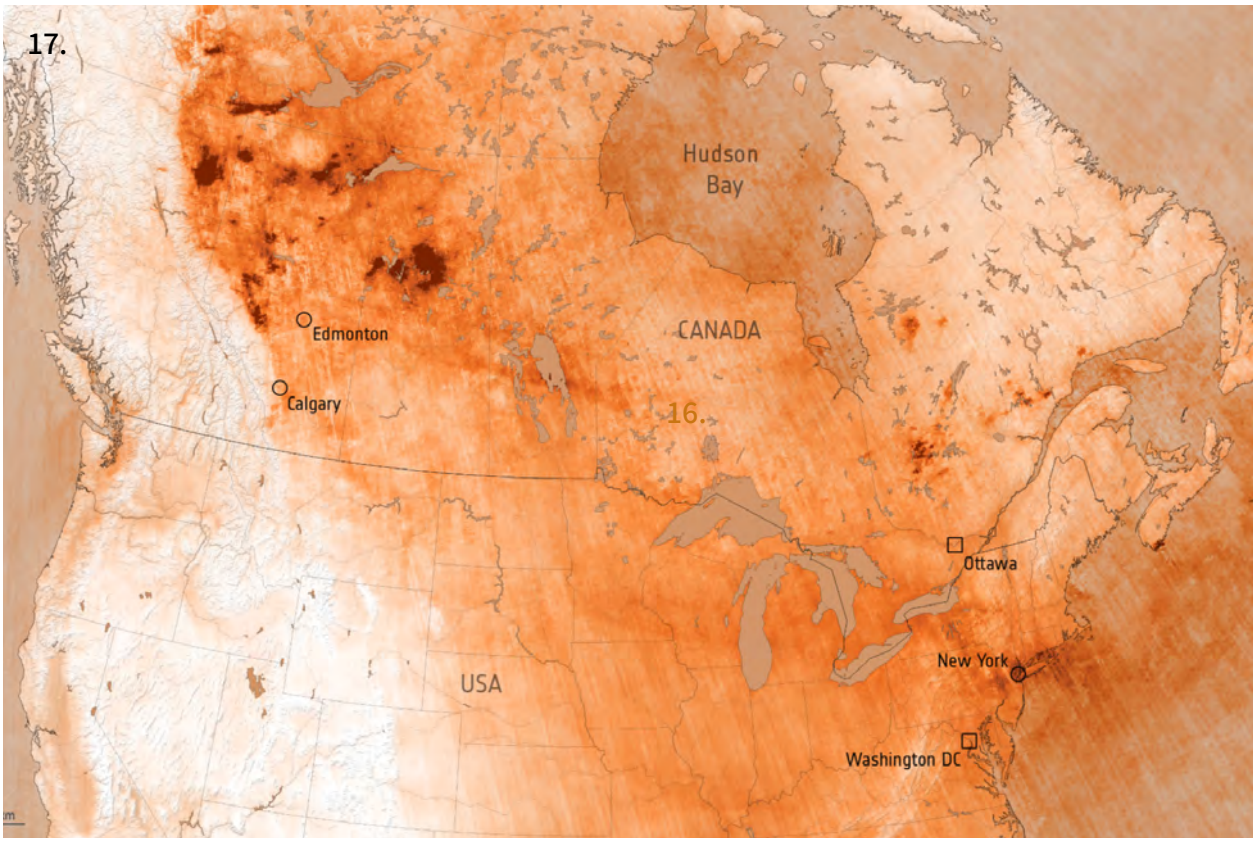
Health impacts

Changing wildfire behavior poses significant threats to human health and safety, both directly through fire contact and indirectly through high levels of pollution from wildfire smoke. Wildfire smoke can travel vast distances, as evidenced when smoke from Northern Quebec blanketed New York City, temporarily giving it the world's worst air quality (Hauser & Moses, 2023) (See Figure 15, 16 and 17). Immediate risks include exacerbation of respiratory conditions due to smoke exposure and, in severe cases, fatalities for those directly in the fire's path. Vulnerable groups, such as older adults, residents of low-income areas, and individuals with asthma, chronic obstructive pulmonary disease (COPD), heart disease, and other chronic conditions, are particularly at risk (Cleland, 2023). Poor air quality also forces people to avoid outdoor

16.

Beyond the physical health impacts, both the literature and interviews highlight the profound effects of recent wildfire events on mental health and emotional well-being. Anxiety leading up to wildfires, the trauma of displacement, and the loss of personal belongings contribute to psychological challenges for affected individuals and

17.



15.
Map showing the distribution of poor air quality conditions from May 1st – June 13th, across both Canada and the United States due to the 2023 wildfires.

Source: European Space Agency, https://www.esa.int/ESA_Multimedia/Images/2023/06/Carbon_monoxide_from_fires_in_Canada

16.
Smoke from Quebec's wildfires blankets New York City, triggering alerts for world's worst air quality.

Source: Jennifer Peltz, PBS, https://www.pbs.org/newshour/world/photos-skies-over-canada-and-u-s-darkened-by-hazardous-wildfire-

17. Smoke covering the city of Yellowknife during the 2023 fires.

Sources: Angela Gzowski The Globe and Mail, https://www.theglobeandmail.com/canada/alberta/article-yellowknife-on-alert-with-fire-nearing-citys-edge-bc-could-see-blazes/

communities (Eisenman & Galway, 2022). A planner from the city of Prince George, reflecting on the toll of the 2018 wildfires on community morale, remarked, "there was a lot of fatigue within our community… it was just like, whoa, this can't be the new normal for us. And it's taken us several years to sort of get back to people willing to volunteer, willing to be like, 'oh yeah, we need to do this,' as opposed to, 'please don't let it be another bad wildfire season.'" Interviewees also expressed concerns for the well-being of their staff and community facing burnout working in high-pressure emergency situations for dramatically increased periods of time. A planner from Buckley Nechako said, "I am concerned with responses happening year after year and the longevity of people. How can they sustain that?". This increase in fear, stress, and fatigue is both a product of extreme weather events such as wildfires and a major factor compromising the ability of communities to remain resilient in the face of such fires (Erni et al., 2024).

Economic impacts

Economic costs associated with wildfires have been consistently growing at an alarming rate. The annual national cost of wildland fire protection has exceeded $1 billion for six of the last ten years, with costs consistently rising by about $150 million per decade since 1970 (Natural Resources Canada, 2024b). Experts predict that these costs could exceed $1.4 billion per year by the end of the century (Public Safety Canada, 2024). This rise accounts for direct response and recovery costs such as damage to property, evacuations, and suppression costs as well as indirect costs such as business closure and unemployment (Erni et al., 2021).

Wildfires in Canada have proven capable of causing extensive damage, with individual fires sometimes leading to the destruction of hundreds or thousands of buildings and incurring multi-billion CAD costs in direct and indirect damages. The 2016 Fort McMurray Wildfire alone cost the Canadian government more than $7 billion, marking it as the nation's largest evacuation and most expensive natural disaster to date (Austen, 2023). Erni et al., (2021) highlight that wildfire impacts are influenced by both local fire exposure and community characteristics, including asset types and population distribution. Southern regions with higher population densities and more infrastructure are highly vulnerable to severe damage

even from lower intensity fires. In contrast, northern regions, although less populated and built-up, suffer significant damage due to extensive land burns and impacts on critical industrial sites and services (Erni et al., 2021).

Beyond immediate destruction, wildfires significantly disrupt industries and infrastructure, leading to profound economic impacts at multiple levels. Critical infrastructure in remote boreal forests, such as hydroelectric plants and mining operations, is particularly vulnerable. For instance, the 2016 Horse River wildfire near Fort McMurray temporarily halted local oil and gas production, severely impacting Canada's GDP (MNP LLP, 2017). Similarly, a 2013 fire in Quebec's James Bay region disrupted major power lines, causing widespread outag-es that affected Montreal's subway and key institutions over 1000 km away (Quebec Forest Fire Causes Widespread Blackouts for a 2nd Day, 2013). Manufacturing halts and fire-related road closures disrupt production and transportation, with significant impacts on national and occasionally global supply chains (DePillis, 2023). Recent fire seasons have caused contractions across agriculture, mining, oil, tourism, and recreation sectors (Kane, 2023). Additionally, wildfires strain healthcare systems, with increased respiratory issues from smoke exposure raising costs for insurers, public services, and households (Shingler, 2023).

As fires increasingly threaten urban areas and the large concentrations of valuable private properties within and around them, the costs incurred by insurance companies continue to grow. Wildfires have been responsible for two of the country's most expensive insurance payouts to date (Global News, 2024). The Fort McMurray wildfires alone cost the insurance industry about 4.4 billion Canadian dollars, while 2023 fires in BC's Okanagan and Shuswap regions caused over $720 million in damage (Matassa-Fung, 2024).

The impact of this is reflected in rising home and mortgage insurance premiums in areas of high wildfire and other environmental risks. According to Statistics Canada, premiums have risen by an average of 33 percent over a five-year period from 2018 to 2023 (Kshatri, 2024). Many planners expressed concern about insurance companies limiting or eliminating cov-erage, citing policy shifts in high-risk areas such as California. A government official from the Yukon worries, "In Quebec, recent discussions about discontinuing flood insurance coverage have been on my radar. I'm scared this is going to happen here, which builds the narrative of the cost of inaction."

These fears are supported by a growing body of research warning of the significant implications of a withdrawal or reduction of insurance coverage not only for property owners but for entire communities in high-risk areas. Without insurance coverage, Miller and Carriere (2024) explain that people rely on disaster assistance from federal, provincial, or territorial agencies or face bearing the costs alone for property damage, loss, displacement, livelihood disruption, and other financial strains related to floods or other disasters. Frank et al. (2021) suggest that both outcomes are problematic. They observe that, on one hand, "climate change drives an increasing frequency and

severity of disasters," potentially leading to financial ruin for uninsured homeowners. On the other hand, certain policies may protect individuals, businesses, and local governments from the financial impact of their choices, a concept known as "moral hazard" (Frank et al., 2021, p. 3). Normally, the later groups make decisions to reduce their risk from natural disasters. However, if they expect others to cover the costs, they might take more risks and shift those costs to others.

The tendency of governments to invest heavily in such direct response and recovery efforts, rather than in planning and prevention, has been criticized for being more costly both economically and socially (Exell, 2023; UN Environment, 2022). Despite a UN report advocating for a 'Fire Ready Formula' that allocates two-thirds of spending to planning, prevention, preparedness, and recovery, planning currently receives less than one percent of expenditures (Miller & Carriere, 2024). Rising wildfire costs highlight the consequences of underinvesting in proactive measures. A planner from Sparwood argues that "it's easier to justify spending a couple $100,000 a year on prescribed burns" compared to "$10 million a day of lost economic activity from an evacuation." The Canadian government's National Adaptation Strategy echoes this sentiment, stating that "reducing disaster risks through proactive adaptation is more economical than response and rebuilding." The strategy further highlights that "every dollar spent saves up to fifteen dollars" and generates "significant benefits" (Public Safety Canada, 2024, p. iii).

Calls for strategic funding for climate adaptation and disaster risk reduction are frequent in news articles and statements from local officials, indicating the need to shift from a reactive to a proactive stance in addressing the escalating threat of wildfires. However, despite inclusion in high-level plans and widespread political support for preventive measures, the pace of action often does not match the urgency required. The recent evacuations of Yellowknife illustrate this disparity, as the city was forced to rely on its own resources for essential preparations (Public Safety Canada., 2024). Additionally, communities often face delays in reimbursement for emergency costs, impacting their ability to effectively meet es-sential needs, especially in smaller and resource-limited areas (Erni et al., 2021).

This chapter has documented the rise in wildfire risks, underlying climatic, fire management, and settlement dynamics, and selected costs of current approaches to wildfire management. It points to possible practices that could factor into reductions in wildfire risk, better responsiveness when fires occur, and, over the medium to long-term, improved resilience of forest and human landscapes. Various spheres of possible action are indicated, from the proactive preventative measures cited immediately above to better forest management to restrictions on urban development along the interface of wildlands and urban settlement. Important first, however, is understanding of how those responsible are facing the challenges of managing urban settlements and wildfires in Western Canada. Chapter 3 reports on their practices.

03

What is being done

Under new wildfire conditions, municipal authorities in Western Canada are grappling with how to plan and prepare for future fire events. Comments from urban planners and emergency staff in the region indicate some of the challenges.

We're seeing fire behavior that's unprecedented. Climate change is aggravating and making predictability really a tough thing.

– Emergency manager, Banff

To base decisions on any kind of evidence is hard because we don't know what really, what the nature of the risk is even though it's modeled.

– Government Official, Yukon

We're all dealing with events like we have never seen before, and so the plans that were written 10, 15, 25 years ago don't actually allow us to account for the severity of what we're actually seeing.

– Emergency manager, Prince George

In such comments, planners and emergency managers emphasize the increasing difficulty in predicting fire behavior, the limited usefulness of models based on historic fire and rainfall patterns, and the need to integrate wildfire risk into updated plans and planning frameworks.

How municipal authorities are grappling with what is now the new normal – the wildfires unprecedented up until now in their intensity, range, frequency, seasonal spread, and human impacts – is an important starting point for research and policy. As shown in the previous chapter, wildfire risks are inextricably linked to human settlement patterns and land use decisions. Prevention and response when fires occur also falls upon municipal (as well as regional) actors. This chapter describes their actions and concerns.

The following questions provide a basis for the discussion:

- *How have urban planning and land use policies evolved to address wildfire risk reduction and prevention in high-risk areas of Western Canada? How effective have these policies been in their implementation and enforcement?*

- *How do urban planners involve local communities in wildfire risk mitigation and planning processes? What strategies are being used to increase public awareness and preparedness for wildfires?*

- *How do local governments collaborate with each other, higher levels of government, and other stakeholders to develop and implement effective wildfire response plans and risk strategies?*

- *What challenges do small municipalities face in building the necessary capacity for effective wildfire management, and what measures are they taking to overcome these challenges?*

An important resource for many municipalities is The FireSmart Canada program, which plays a crucial role in wildfire risk management in

Canada. This national program, launched in 1990, focuses on education and awareness surrounding risk of wildfire damage to homes, communities, and landscapes (Matassa-Fung, 2024). As the threat of wildfire has increased, so too has the program's popularity, leading governments at various levels to promote and integrate it into formal policy and planning endeavors. Serving as a valuable resource for homeowners, municipalities, and planners, FireSmart provides standardized guidelines and strategies specifically designed to reduce vulnerability to wildfires. Key components include home and property assessments, which offer tools and checklists for homeowners to identify fire hazards and implement safety measures to reduce wildfire risk; workshops and informational sessions to educate communities about wildfire risks and mitigation strategies; and assistance for communities in developing emergency response plans and evacuation procedures to enhance preparedness and safety during wildfire events.

This chapter is divided into five sections. The first section, this introduction, establishes the scope of discussion and introduces the FireSmart Canada program. Section two focuses on external, or public-facing, actions and regulations aimed at mitigating wildfire risk and enhancing community resilience. This includes identifying and formally integrating risk into plans, addressing risk through regulatory change, and promoting education and outreach. The third section explores internal organizational mechanisms and collaborative efforts, such as emergency preparedness, internal learning processes, regional partnerships, and various types of collaboration with upper levels of government.

PUBLIC FACING ACTIONS TO MANAGE WILDFIRE RISK

Public-facing initiatives undertaken to manage wildfire risk are those that directed towards the public to enhance responsibility, awareness, and preparedness to wildfire hazards. Of concern are how municipalities (a) identify wildfire risk and integrate it into their public policies and plans, (b) use various regulatory tools to mitigate wildfire risk (including development permits, landscaping requirements, and zoning and by-law changes), (c) approach public education (e.g., whether through FireSmart initiatives or incentive programs aimed at individual property owners), and (d) engage with volunteers and community advocates in wildfire risk management.

Identifying and Formally Integrating Wildfire Risk

Every government interviewed had developed a wildfire plan or had specific sections within their Official Community Plans (OCPs) that address wildfire risk. Several interviewees emphasized that the rapidly changing nature of risks has made past plans - some dating back up to 15 years - insufficient in addressing the new and evolving conditions. As explained by a regional planner in the district of Kimberly, "how much wildfire policy there is at all varies a lot between those official community plans and some of that is due to the nature of the area that they do cover and then some of that is just due to when they were drafted as this has become more prevalent in a lot of plans over

time." Consequently, many local governments are in the process of drafting new and updated OCPs. The degree to which wildfire-related action points in plans had been pursued or achieved varied; interviewees indicated that progress depended on factors such as the will of the council, pressure from the public, the availability of funding, and the capacity of departments. For example, in places such as Whitehorse and Kelowna, worries about the additional capacity needed to distribute additional permits or manage additional regulations have led to slow implementation.

These planning documents guide local governments in directing their mitigation efforts and placing critical infrastructure and housing projects based on identifying high-risk areas and vulnerable infrastructure. Many local governments have developed better understandings of risk through mapping territories according to various risk levels. In Kelowna, maps combine components of wildfire behavior, features at risk, risk of ignition, and suppression constraints to detail overall wildfire risk across the territory. Similarly, in Banff, risk zones have been created to direct development and manage risk effectively. These zones, often likened to a "fried egg model" by planners, categorize areas into low, medium, and high-risk zones, with the highest risk typically on the periphery, known as the interface zone (See Figure 18).

Banff's director of planning explains that these maps are regularly used "to influence decisions within our land use bylaws about the types of materials you could use on buildings or the types of landscaping in certain areas." Additionally, the maps help influence the placement of critical infrastructure such buildings and transportation routes related

18.
Screenshot from conversation with Banff Planner indicating areas the city has identified for development given wildfire risks.

Source: Interview, Banff

to evacuation and highlight areas to prioritize for development. Despite strategic planning and risk mapping, practical challenges such as land shortages and housing needs force local governments to develop in high-risk areas. In reference to a new development on the edge of town, they explain, "you can see these fire breaks are some small tactical level interventions to deal with that, but at the end of the day, Middle Spring is at the edge of town, and the reason we built up there is because it was the last piece of land that we could just secure for housing at that time."

In many communities, wildfire plans incorporate hazard maps, risk assessments, and action points for prevention, preparedness, response, and recovery. These plans often include policy recommendations and suggestions for amendments to existing zoning bylaws, such as incorporating fire-smart building and landscaping requirements. Despite having clear plans of action, implementing these strategies is often difficult. One municipal planner explained,

"One thing that I thought would be beneficial would be if we advanced the zoning amendments that are needed to support fire smart. Yet, those efforts have kind of stalled due to concerns over housing affordability and streamlining development permits… "

-Municipal Planner, Anonymous

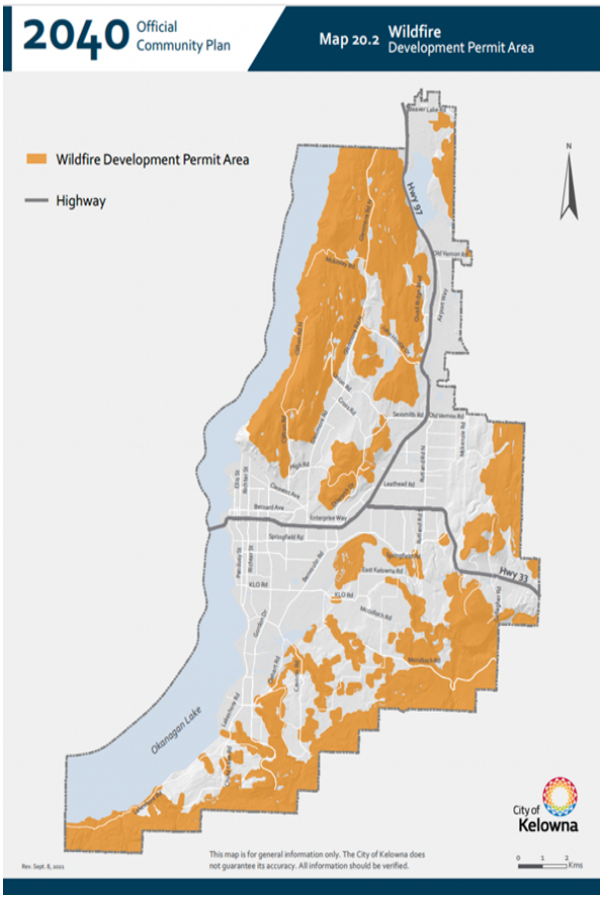
Thus, while many local governments have either distinct or integrated community plans considering and addressing wildfire risk, the extent to which local policies reflect these plans can vary significantly.

Regulatory Efforts

The impact of development on wildfire risk is widely acknowledged in local plans, and various policy tools are used to address and mitigate this risk throughout the development process. Development permits are a key tool, identified by participants as essential in managing potential tensions between land development and wildfire risk. These permits, issued by municipalities, govern various aspects of land development, including zoning, building codes, and environmental considerations. Property owners must obtain these permits prior to development, committing to comply with specific requirements outlined in the application process.

All interviewed municipalities consider development permits a key regulatory tool in addressing wildfire risk, though their application varies across study areas. Certain municipalities, such as Kelowna and Kimberley, have implemented Wildfire Development Permit Areas (DPAs) to directly address wildfire risk (See Figure 19). In these high-risk zones, proposed developments must undergo thorough risk assessments conducted by forest management professionals. These assessments evaluate site-specific vulnerabilities and prescribe wildfire mitigation measures, which are integrated into development plans as part of the permit application process. A planner from Kelowna explains, "We are very focused on requiring a wildfire assessment at the time of development and making sure that the development applicant or owner carries out that wildfire assessment. We will hold a bond or an amount of money under a performance security to make sure that work gets done."

19.



In contrast, cities like Whitehorse and Grande Prairie do not require special wildfire development permits (DPAs). The development permit process is instead used to educate homeowners on best practices and, in some cases, negotiate the terms of development. Prince George, has identified wildfire development permit areas through their 2011 OCP, primarily for internal use "to identify those wildfire development permit areas that would inform property owners and residents of which sites would need that extra step prior to a building permit being issued for their site." In both approaches, recommendations typically cover aspects such as building materials, defensible space, landscaping, and access and egress requirements to ensure safe evacuation and access for emergency vehicles and firefighting equipment. These assessments are integral to the permit approval process, ensuring that proposed developments incorporate adequate wildfire mitigation strategies before permits are granted.

One aspect of development that holds significant importance to planners, and over which they exert considerable influence, is the placement and provision of access and egress routes. This aspect was consistently emphasized in discussions, with one of the primary criticisms of previous large-scale wildfire evacuations being the failure of existing access routes. Planners are working to ensure that more routes are required in new developments and are prioritizing developments in areas located close to existing access routes. Some municipalities, such as Banff, have mentioned utilizing new technologies that allow for evacuation simulations under different scenarios to ensure the most effective placement of access and egress routes. As public infrastructure, these elements are comparatively easier for planners to influence.

However, despite their importance, development permits are applied differently across the various study areas and have significant limitations in mitigating wildfire risks. These permits apply only to specific types of new development and do not address the vulnerabilities of existing properties, which constitute much of the built form. Additionally, the permits lose much of their influence following their issuance, and capacity limits mean enforcing details of development plans remains inconsistent and costly. Finally, in rural and slow-growth areas with low levels

19.
Screenshot taken from Kelowna's official community plan highlighting the area selected for Wildfire Development Permits

Source: Kelowna Official Community Plan

of new development, permits are not seen or used as a legitimate way to mitigate wildfire risk. These challenges will be further discussed in chapter 4.

In addition to building influence throughout the development process, many local governments are re-evaluating traditional policies that contribute to wildfire risk. Across these localities, there is recognition of the limitations and potential drawbacks of policies such as the "one tree for one tree" mandate, which requires the replacement of every tree cut with a new one. While some have removed the mandate altogether, others are exploring less politically contentious strategies. For instance, instead of replanting coniferous trees, which are highly flammable, with similar species, efforts are underway to replace them with less combustible deciduous trees. In Banff, where the preservation of classical wooden structures has long been a cornerstone of heritage protection efforts, there have been initiatives to permit alternative materials in high-risk areas. These examples demonstrate attempts by local governments to adapt traditional and culturally significant policies to the changing realities of wildfire risk.

While common challenges prompt similar responses, the diversity of local circumstances often necessitates innovative and context-specific solutions. In the Kimberley region, a popular tourist destination, challenges arise concerning fire safety and accountability among short-term visitors. To heighten guest awareness and hold property owners accountable, Kimberley has modified its short-term rental bylaws, placing the onus on property owners to effectively communicate fire safety regulations to guests staying in their accommodations. Meanwhile, as a resource hub for surrounding regions, Grande Prairie faces pressures to accommodate large numbers of evacuees following wildfires in nearby areas. In acknowledgment of this role and the growing need for flexibility in emergency situations, recent amendments to zoning bylaws in Grande Prairie allow for the use of large community spaces like arenas to shelter evacuees for extended periods of time. These pragmatic strategies highlight the necessity of flexibility amidst the slower pace of large-scale regulatory change, enabling local governments to address immediate needs while navigating long-term solutions.

Engagement, Education and Outreach

Local governments have identified education as an invaluable component of wildfire risk management, used in conjunction with and inseparable from regulatory measures. Planners and city employees consistently highlight the significance of risk communication throughout the development process. A wildfire specialist from Kelowna stressed the necessity of residents being "armed with the correct information to know that their decision is potentially setting them up for additional risk," explaining that "as a city, it is our job to help increase awareness." Similarly, Kimberly's director of planning noted the positive impact of education over enforcement during the permit process, stating, "usually if you have a chance to communicate that risk to people, they'll make the right decision and do something that's more cost-efficient and less risky." This approach underscores

the belief that informed individuals are better equipped to make decisions that enhance wildfire resilience and community safety.

Beyond the development process, local governments across Canada emphasize the importance of education and outreach in wildfire risk mitigation. This commitment is demonstrated by larger municipalities such as Whitehorse, Kelowna, and Banff, each of which have hired FireSmart coordinators. These coordinators, primarily funded by higher levels of government, play a crucial role in educating property owners, conducting risk assessments, and implementing measures to reduce wildfire risks. Significant investments in FireSmart education also include organizing FireSmart Forums in Banff and Prince George, where demonstrations of FireSmart principles in structures and landscaping underscore their effectiveness in mitigating wildfire risk (See Figure 20).

Effectively managing public perception and concerns around wildfires is a critical aspect of planners' communication efforts, with differing experiences across local governments highlighting various strategies. An emergency planner in Buckley Nechako emphasized the importance of balanced messaging to prevent oversaturation or desensitization among residents, stating, "once a week is enough… otherwise people will get tired of looking at it, become complacent." Similarly,the director of planning in Banff expressed concerns about overcommunication of wildfire risk, fearing that it might lead to residents becoming desensitized. In contrast, there is also a concern that overcommunication might escalate residents' fears and overshadow other important municipal issues and risks, as noted by a planner in Banff who worries that constantly highlighting wildfire risk could "suck the oxygen out of" other critical concerns. Prince George's planner provided another perspective by highlighting the distinction between seeking input and informing the community. In the context of a prescribed burn, the planner noted, "the decision has been made… we're not changing our minds, we're

20.
Example of a FireSmart education initative where two buildings, one applying FireSmart building practices and the other not, are burned side by side to highlight the impact of FireSmarting.

Sources:: FireSmart Canada , https://firesmartbc.ca/community-forum/

just letting you know what's about to happen." These differing strategies highlight the complex nature of communication in wildfire management, where planners must balance keeping the public informed and engaged without causing complacency or undue alarm.

Resource efficiency is a significant consideration in the decision to invest in education and outreach. A planner from Buckley Nechako explained, "If we incur a huge expense to highly regulate one out of every fifty households, you're not really addressing the problem, but you're also depleting your staffing capacity. Creating a new (FireSmart) position promotes FireSmart principles more effectively than regulating a very limited percentage of households." Another planner from Prince George suggested that such extensive monitoring "isn't a good use of taxpayer dollars." These statements align with other interviews from both larger and smaller local governments, illustrating a preference for investing in education and outreach over enforcement measures from a cost perspective.

To mitigate obstacles such as cost and reluctance among residents in implementing risk reduction measures, various regions have introduced initiatives aimed at lowering these barriers. Some initiatives aim to reduce the costs involved in transitioning to safer practices. In Banff, for instance, the municipality has rolled out a range of incentive programs, including subsidies for roof replacement, free tree replacements that replace flammable deciduous trees with less combustible coniferous varieties, and access to roof sprinklers. Others focus on easing the burden of actions and collectivizing efforts to reduce the individual load. Kelowna has introduced a successful community chipping program to facilitate the clearance of excess brush and vegetation on private properties. This initiative not only offers homeowners a convenient solution for debris management but also provides access to equipment that may otherwise be inaccessible. While other local governments are considering similar programs, there are mixed opinions on the viability and worthiness of investing in equipment and transportation costs.

Evident from the research is the importance of civic involvement in wildfire risk management efforts, both to mitigate physical risks and to foster trust and community resilience. Recognizing limited government resources, several local governments have proactively engaged residents as volunteers in various aspects of WRM efforts. In smaller regional areas like Buckley Nechako, community members assist during emergency procedures and forest management activities, enhancing emergency response effectiveness and fostering community trust. An emergency planner from the region explains, "it's a trusted face that's telling you the information and giving you the order or the alert. They're telling you what's happening in their community. It makes a big difference, and it's a model that we would like to expand." This approach ensures that residents receive critical information from familiar faces, increasing compliance and cooperation during wildfire events, particularly in communities where residents have been skeptical of emergency orders.

Similarly, in the small municipality of Sparwood, residents participate in forest management practices, contributing to prescriptions and thinning efforts, which not only engages the community but also builds advocates for ongoing risk reduction efforts. A planner explains, "you have the community come out and help and then they start to know what to look for and you've got built-in advocates." This involvement helps ease the capacity burden on municipalities while educating citizens through the volunteer process.

Mitigating wildfire risk on private property is attracting attention from private actors such as insurance companies, some of which are now providing grants to municipalities to support education and engagement efforts. A planner highlighted a new program led by the Wawanesa Mutual Insurance Fund in Whitehorse, which is proactively offering six grants, each worth $15,000, to assist communities in their wildfire mitigation endeavors (Wawanesa Insurance, 2022). These grants, in collaboration with the Institute for Catastrophic Loss Reduction (ICLR) and FireSmart Canada, are specifically tailored to fund mitigation activities aligned with FireSmart Canada's principles. The involvement of insurance companies signifies a shift towards more proactive risk management, where private sector incentives are aligned with public safety goals. The same planner explained, "they are worried about losing clients because of not having the ability to provide insurance because the risk is too high." This type of action is seen by a government official from the Yukon as a "good first step" towards engaging private sector involvement in community wildfire risk reduction.

INTERNAL ACTIONS TO MANAGE WILDFIRE RISK

This section explores the internal measures—actions and strategies implemented within the local government itself - to manage wildfire risk and enhance preparedness. Interviews indicate a growing emphasis on emergency preparedness that includes organizational and systemic changes within institutions and a process of learning from past emergencies. Additionally, collaborations emerge as a major theme, with those interviewed pointing to partnerships among different departments of local government, intergovernmental cooperation across various levels of administration, and inter-regional collaboration across jurisdictions.

Emergency preparedness

Interviews emphasized the importance of emergency planning and preparation within and across local governments. Banff's emergency manager explains: "since 2011 there have been so many incidents... the number of humans that have physically been a part of a response, from frontline all the way up to strategic coordination, has gone straight up". As a result, "those lessons learned are really permeating across the levels", as many local governments prioritize efforts in emergency planning and response that aim to enhance their capacity during crises.

Local governments emphasize individual emergency training and coordinate preparedness efforts to improve overall readiness, addressing internal coordination challenges and role uncertainty. The Incident

Command System (ICS) stands out as a widely adopted framework, offering standardized procedures for managing emergencies. Planners across the study area have reported a recent increase in emergency training within their departments. A planner from Sparwood says "I've got two Emergency Management courses that I'm doing this year. And that's something that my organization places a high priority on." Some local governments, like Grande Prairie, have begun involving planners in coordinated internal training sessions on ICS, along with collaborative exercises with neighboring local governments. Additionally, there has been an increase in positions explicitly dealing with emergencies across other local governments. While larger municipalities such as Banff have started hiring full-time emergency planners, smaller municipalities and more remote regions often lack the financial capacity to support these positions. Buckley Nechako's emergency manager explains, "we're very lucky here to have the people working for us that we have. That's not common throughout the province." These examples highlight that while emergency preparedness is becoming increasingly common across the study area, there are notable disparities in resources and capacities among different local governments that challenge such implementation.

Responding to internal emergencies and providing support during regional emergencies has contributed to a range of learnings for local governments. As a planner from Prince George emphasizes, "every single event has something different that it presents to you, and you need to think outside of the box regularly." As local governments confront new challenges without precedent, norms of transparency and collaboration have allowed for the efficient transfer of knowledge amongst communities. Buckley Nechako's emergency manager emphasizes, "we share every single thing we create… if someone else has an idea that could make our program a little bit better, I'm all for it. I don't think I am the expert. I'm learning every single day, and if you are in Emergency Management, I sure hope you are too." This mindset of flexibility and innovative thinking is promoted amongst all planners engaged in emergency positions.

The rapid rise in emergencies is necessitating innovative approaches to unprecedented problems and facilitating rapid learning within the field of emergency planning and preparedness. Prince George, Northern BC's largest city, is at the forefront of this effort, accommodating and strategizing for displaced individuals from surrounding communities facing wildfire evacuation orders. The Emergency Operations Center remained active for 139 days last year, emphasizing the severity of the region's emergency and the need for the city's proactive stance. Collaborating with provincial authorities, Prince George aims to formalize and streamline their hosting procedures to establish a centralized setup capable of sustaining operations throughout the wildfire season. Banff is also at the forefront of emergency preparedness, adopting innovative evacuation modeling programs to determine efficient routes and scenarios based on various fire conditions and evacuation parameters. These exercises, involving cross-departmental collaboration, enable tailored evacuation plans, optimized routes, and reduced response times. These examples illustrate the

diverse responses to local emergencies being led by emergency departments, attempting to carve out new norms and develop best practices for future emergency management.

Inter-departmental learning and collaboration

Collaboration among different departments has been both a critical aspect and a consequence of an increase in emergency preparedness. The integration of wildfire risk into broader community plans and policies has necessitated cooperation across various departments, each contributing diverse skill sets and knowledge bases to address emerging challenges and gaps in expertise. While many local governments have designated specific positions focused on wildfire risk, considerable uncertainty persists regarding which departments or individuals possess the expertise and capacity necessary to effectively manage these portfolios. The allocation of wildfire responsibilities appears somewhat arbitrary, often based on the qualifications and available capacity of certain departments. This uncertainty is particularly evident in areas where planners are involved, leading to questions about their qualifications and the adequacy of their expertise in addressing the complexities of wildfire management.

Despite these structural challenges, many planners have adapted and incorporated fire knowledge into their work, integrating elements of climate and environmental science into planning processes and decision-making, particularly those directly engaged in wildfire portfolios. A former government official from the Yukon reflects on her involvement in drafting the city's wildfire strategy, noting how having the knowledge about fire science was a mind-expanding experience: "I never would have thought that as an urban planner you would have to know about fires and what causes fires… and what are the climatic or environmental conditions that affect fire". Other planners have reported new understandings of fire approved building materials and design standards that allow them to "communicate with residents and help build the case for the ecological principles of fire management". Interviewees suggest that planners possess an adaptable skill set suited for rapid change. A planner from Banff notes that their generalist nature is advantageous as "wildfire risk occupies a lot of different genres". Planners excel at "the ability to see the big picture and communicate trade-offs effectively", skills that have become increasingly important in an age of climate emergency.

Inter-municipal collaboration and partnerships for risk management

Amidst extreme conditions and limitations in capacity, local governments are adopting broader, regional strategies for wildfire management. Partnerships, both formal regional planning and informal arrangements, were evident in all the communities studied. Interviewees observed that these partnerships bolster coordination, knowledge transfer, and resource pooling. They highlighted that this enables local governments to both receive and offer mutual assistance, engaging in vital response efforts for other areas, such as fire suppression and the provision of shelter and care for evacuees. Across the study area, various local

21. The Fraser Basin Roundtable conducting a meeting.

Sources: Fraser Basin Counxil:, https://www.fraserbasin.bc.ca/Prince_George_Community_Wildfire_Roundtable.html

planning mechanisms to facilitate more effective coordination. At the provincial level, legislative provisions, such as those found in the BC Emergency Disaster Management Act, recognize the importance of regional cooperation in effective emergency response and resource management. This act allows municipalities to form unified entities during emergencies by enabling the creation of regional emergency management plans and coordination centers (Emergency and (Emergency and Disaster Management Act, 2023). These regional systems play a dual role in enhancing capacity and facilitating coordination to prevent exacerbating challenges and competition over resources.

For example, in Alberta, Banff's establishment of a regional Emergency Management bylaw with the town of Canmore has led to the creation of a joint agency and advisory committee "to identify regional hazards, risks, and vulnerabilities" (Bow Valley Regional Emergency Management Bylaw, 2023; Ellis, 2023). According to Canmore's director of Emergency Management, "activation would occur when the municipal resources are either likely to be overwhelmed and stretched to capacity, or responses and resources needed are the same or similar" (Ellis, 2023). Banff's Emergency Management explains the goal of pooling resources and sharing responsibilities is "to address common challenges without exacerbating each other's issues." This legislation exemplifies the growing trend towards regional cooperation and planning, driven by the recognition of shared risks and the necessity for larger scale coordination.

In addition to formal legislative collaboration, various local governments have adopted regional planning systems to facilitate coordination and assistance. For instance, the Grande Prairie Regional Emergency Partnership enables municipal employees from five jurisdictions to "work together,

share resources, and coordinate responses to large-scale emergencies" by participating in continuous joint emergency training and planning exercises (Grande Prairie, 2024). Similarly, mutual aid agreements, such as the ones used between Sparwood and nearby Crowsnest Pass, promote reciprocal aid during emergencies, particularly "assistance with the suppression of fire" (Mutual Aid Fire Protection Agreement, 2013). A planner explains that this "fosters camaraderie and openness within all emergency services." Though the latter system focuses solely on response rather than planning, both examples illustrate the recognized growing importance of coordination in addressing wildfire risk across local governments of all sizes.

The acknowledgment of shared risks also has prompted informal collaborative efforts to manage risk. New regional platforms, such as the Fraser Basin Council roundtable, bring together diverse stakeholders, including industry representatives, fire smart advocates, and government officials, to exchange insights and expertise (See Figure 21). According to various planners, some of the benefits of these new bodies include the sharing of knowledge, resources and expertise that can inform future practices as well as contributing to regional relationships that come in use during times of need. According to an emergency manager from Prince George, these collaborative approaches are particularly beneficial for smaller municipalities with limited resources and expertise, where "a single planner may oversee various aspects of emergency management".

This shift towards regional thinking and informal regional planning is particularly apparent in remote communities characterised by large land bases and limited capacity. One planner noted, 'being in the North put us on alert last year and that was a new thing… we worked incredibly closely with everyone around us'. Cities like Prince George and Grande Prairie are hubs for services and resources in remote northern regions. When wildfires occur and evacuations are necessary, these cities face significant pressure to accommodate large influxes of evacuees. Their proximity to affected areas and concentration of services make them essential in providing support during emergencies. Prince George's emergency planner explains, 'we don't formally have a regional plan, but we think regionally, and we try to make sure that we're looping each other in so that we know what's happening as a region. I think that's a future iteration of what's going to happen as we move forward and plan for future years".

In the regional context, relationship building, and interpersonal networks play a key role in boosting community resilience and coordinating emergency efforts. A planner from Buckley Nechako explains, "I have always been open to supporting anyone who wants assistance during a response, and that's coming to fruition". They further emphasizes the value of regular meetings with counterparts over coffee as vital opportunities to establish and nurture relationships crucial during emergencies. These informal meetings help to foster trust and lay the groundwork for collaborative responses and resource-sharing arrangements when crises arise. Referring to their relationship with the emergency department of Prince George, they emphasizes, "because we know each other,

I know I can rely on her judgement on what needs to be done if we're in an emergency". Similarly, Banff's emergency planner attributes the municipality's practices of regional collaboration to interpersonal relationships, stating, "there are a bunch of us who actually have not only on paper relationships... and so those are really who we know to phone." These networks of support are proving to be critical components of emergency management across the study area, enabling swift and coordinated responses, particularly as formal mechanisms continue to evolve.

Coordination with upper levels of government

The nature of wildfires is that they do not abide by jurisdictional boundaries, requiring coordination and collaboration at higher levels than has been traditionally organized. Historically, forestry and wildfire management has been a provincial or territorial responsibility. However, the increasing encroachment of fires into urban areas necessitates collaborations with municipalities. This Banff's emergency planner highlights the lack of unified command observed during the Fort McMurray incident as "an example of what we don't want to do anymore." They explain, "it's becoming more common for provincial wildfire agencies to unify with municipalities." Unified command, a function of the Incident Command System (ICS), allows agencies with jurisdictional responsibilities to bring together representatives to jointly manage response efforts.

For example, in British Columbia, the BC Wildfire Service has adopted the unified command approach to coordinate with local governments during wildfire events. This ensures that municipal resources and knowledge are integrated into the provincial response strategy, enhancing overall effectiveness. Similarly, Alberta's wildfire management incorporates unified command structures, especially in areas where wildfires threaten urban centers, ensuring seamless collaboration between provincial and local authorities.

This shift towards closer collaboration between provincial and local governments reflects the evolving nature of wildfire management and the imperative of coordinated response efforts. This transition, however, faces numerous challenges, including differences in operational protocols, resource allocation, and communication systems, which are further discussed in Chapter 4.

22.
Wildfire in Jasper 2024. The municipality has been activley requesting Unified Command to enable effective coordination during the fires.

Sources:: City News Calgary, https://calgary.citynews.ca/2024/07/25/alberta-jasper-canada-unified-wildfire-command/

04

Barriers to urban wildfire risk reduction and response

This chapter discuss shared challenges faced by local governments as they attempt to better address wildfire risk. Four primary challenges emerge from the interviews with planners and emergency managers in the 10 local governments studied: resistance to change among residents and within local government; legislative gaps; resource limitations; and new coordination needs (especially those linked to emerging partnerships where stakeholder approaches are not yet aligned). According to the interviewees, such issues impede local governments' ability to take needed action. Each issue is described further below.

RESISTANCE TO CHANGE

In the realm of wildfire mitigation, the imperative for effective action is clear. Yet, despite growing acknowledgment of the risks, communities face significant hurdles in translating awareness into tangible change. Interviewees describe residents' resistance to change, divergent opinions on responsibility, and internal resistance within local governments. This section explores how these patterns hinder individual and institutional responses to wildfire risk. Across many communities grappling with wildfire risk, there's a growing awareness of the dangers and the urgent need for action, as illustrated in the comments of various planners:

I think everyone who lives in the town of Banff understands that we're in a National Park and appreciates the value of why parks is trying to do things like prescribed burns.

-Planner, Banff

You know, when we do bring in policy from a planning perspective, a lot of times there is quite a lot of pushback, you know, regardless of what the policy is and there's sort of always two sides. Whereas I don't really see a lot of the two-sided arguments in relation to wildfire policy. It just seems like it's understood that it's good and needed.

– Planner, Kimberly

When Yellowknife was threatened this summer, that really hit home for a lot of people here because it's there's sort of like our sister city in a way.

– Government Official, Yukon

However, despite this acknowledgment, the public response to wildfire mitigation efforts is not uniformly positive. Another planner noted:

I mean the public response that I've seen is pretty mixed. There are people who are very grateful for everything that was done. And then

there's people who are just very angry about it… about being evacuated or having access to their properties restricted during the wildfire.

– Planner, Grande Prairie

Generally, this acknowledgment of the need for proactive risk mitigation policy has not translated into widespread acceptance of personal responsibility for risk among citizens, especially regarding private property. A planner from Kelowna explained, "I think there's confusion. When people think of FireSmart, they think of government action for fuel abatement. They don't actually think of personal responsibilities." Similarly, a planner from Buckley Nechako emphasized that "it's not an issue of communication and getting the message out there but in getting residents to actually pay attention, incur the costs, and do the work." A fire specialist explains that in communities like Kelowna, a fire specialist explains,

It still seems that people just are extremely reluctant to take personal responsibility for {risk management}. I think there's two pieces to it. One learned helplessness. When you have repeated fires, people think, it's going to happen anyways, so why bother? I'll just rely on insurance… The other piece is… a strong reliance on the municipality doing fuel mitigation and management on city property.

-Wildfire Specialist, Kelowna

Despite widespread acknowledgment of the need for change, communities' deep attachment to their natural environments and landscapes presents a significant challenge to the social and political acceptability of wildfire risk mitigation efforts. Many residents are drawn to living amidst nature in forested areas, where outdoor activities are integral parts of their recreational lifestyle (See Figure 23). Different planners explain:

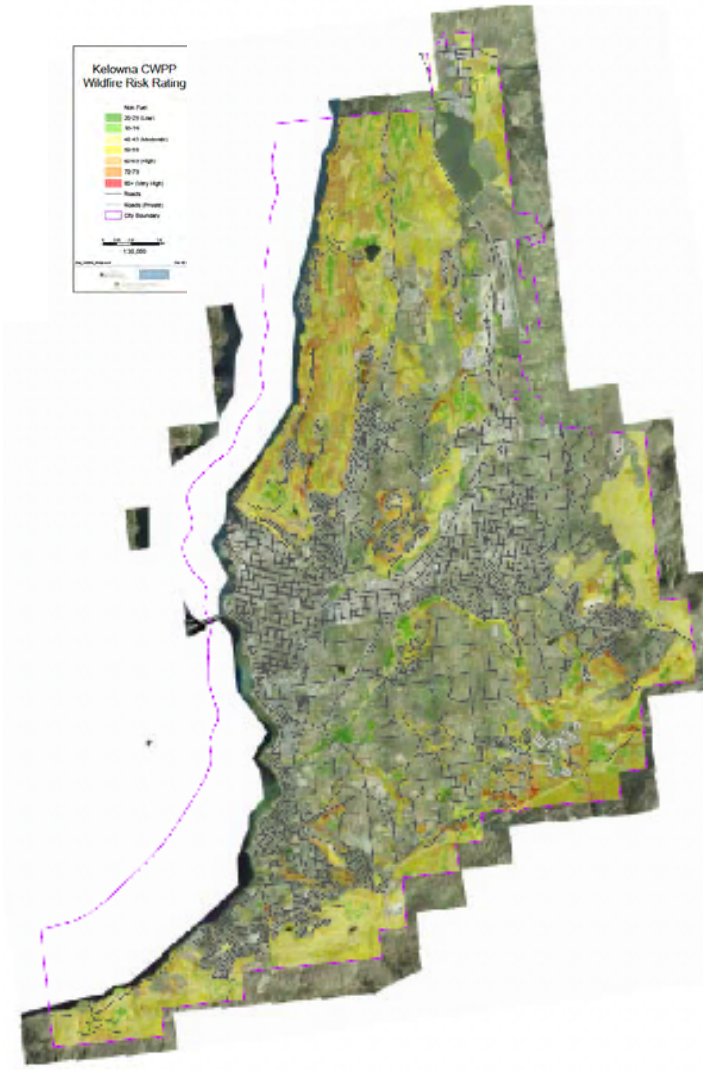
You know, people want to live out in nature.

– Emergency planner, Prince George

FireSmart practices are a hard sell partly because everybody loves to live near the forest and it's hard to grow things here… it's just a lifestyle thing.

– Planner, Yukon

23.



23.
Map of wildfire risk from Kelownas Community Wildfire Protection Plan. This shows areas of highest risk at the edges where new housing is desirable and still being developed.

Sources: Community WildFire Protection Plan, Kelowna, 2011

The challenge is feedback coming from our public that they want to have more green added to the cityscape. So, a challenge is to retain green spaces and trails but at the same time mitigate fire risk.

– Planner, Prince George

Risk mitigation in wildfire-prone areas frequently necessitates clearing large areas of forest, leading to tensions between preserving natural and culturally significant spaces and reducing wildfire risk. This tension is evident in the public opposition to changes made to a popular bike trail in Prince George, following a prescribed burn that transformed the once-forested terrain into an open landscape. As one planner noted, "Sometimes the users of this space are understandably short-sighted… We've upset hikers and bikers, but we've potentially saved numerous homes and infrastructure." This case highlights the challenges local governments face in balancing land use decisions with risk mitigation. These decisions involve navigating complex trade-offs between immediate public discontent and the long-term benefits of protecting human settlements from evolving fire threats.

Decisions regarding wildfire risk mitigation are often complex and not always supported within local governments. Departments with different priorities or insufficient wildfire education frequently face internal silos and structural barriers that hinder the adoption of innovative approaches. Planning departments, in particular, struggle with these issues as they often prioritize growth and traditional low-density development models. A planner from Kimberly highlighted this challenge: "There is a whole system in place to just make it easy to create new single-unit dwellings… that's the way communities have been doing stuff for decades and it's just way too easy to make it happen." An emergency planner from Prince George observed, "There's a lot of old thinking and entrenched modalities… It's sometimes just too difficult to change, or at least that's the perception." These common experiences highlight the difficulties of implementing new practices within entrenched systems.

More broadly, many planners have stressed the need to revaluate the outdated norms, policies, and practices within local governments that no longer align with current objectives. For instance, reducing emissions by increasing and protecting the tree canopy is a traditionally popular objective in municipal and higher-level plans. However, many planners highlighted the paradox in this approach, as it may inadvertently contribute fuel to fires, worsening emissions. Planners from Prince George and Kelowna are advocating for the removal of local tree replacement mandates, which require the planting of a new tree for each one removed, recognizing the need to adapt strategies to current climate realities.

Kelowna's fire specialist highlights the impracticality of blanket approaches, emphasizing the importance of tailoring strategies to local ecological conditions. Addressing these conflicts requires setting realistic goals and revising policies to account for the unique challenges posed by wildfire risk in each community. Continuing with the canopy issue, she emphasizes that "the 30% [canopy cover increase] that is getting pushed at that urban forestry level, that's not realistic here. … for irrigation reasons and

for fuel mitigation reasons."

Similarly, in Banff, the municipality faces unique challenges due to its location surrounded by national forest, where conservation restrictions limit their ability to implement fuel mitigation measures outside their boundaries. The emergency manager warns that "Parks (Canada) is going to have to look at exceptions within their system and say we will agree to change this forest more significantly than we will others." Such comments suggest that uniform solutions are often impractical and, in many cases, increasingly dangerous, the diverse needs of local governments demand flexibility.

Many interviewees noted a gradual trend towards increased internal collaboration, yet they also recognized the tendency for staff to become entrenched in their roles or maintain traditional approaches. Traditional approaches may relate to spatial relations. For example, a former government official from the Yukon, pointed to the difficulty of shifting long-established settlement patterns, as follows:

> *How do you reverse a trend when your settlement patterns have been long established? You don't have those opportunities to choose where development happens or where you're going to situate some of your new infrastructure.*
>
> -Government Official, Yukon

Others point to work culture and practices. For instance, a planner from Kimberly observed that "if [staff] don't recognize…the need for change," they "get locked into their roles"; they further note that learning about change is "hard" and "stressful", so some people continue "doing stuff the way they've always done it." They suggest that mandatory training programs could facilitate shifts by providing education and awareness on climate risk, resiliency, and emergency management, equipping stakeholders with the knowledge and skills needed to embrace change and effectively address emerging challenges. In practice, these changes, they urge, may need to be facilitated or mandated at a higher level.

This section has explored how resistance to change presents a significant challenge to many local governments. Key themes include the reluctance of residents to take personal responsibility, mixed public responses, internal silos within governments, and competing priorities that conflict with wildfire mitigation measures. The following section will look at the different limits to local legislative authority and how this impacts effective wildfire management.

LEGISLATIVE GAPS

In the pursuit of effective wildfire mitigation, the legislative authority of local governments plays a crucial role. However, significant constraints within their legislative powers limit their ability to address wildfire risks comprehensively. Respondents have highlighted how these limitations, particularly in land use and building regulations, can undermine local efforts. This section explores these specific legislative gaps, including the lack of enforcement capabilities during the development process, challenges in managing legacy properties, and the constraints on implementing fire-smart principles in building codes.

Respondents have identified the legislative powers of local governments, and their limitations, as significant constraints on municipal capacity to address wildfire risk. A government official from the Yukon highlighted this frustration while reflecting on her experience drafting the city's Community Wildfire Protection Plan, noting that "a lot of things are out of the city's jurisdiction." Similarly, a Kelowna fire specialist remarked, "a lot of this work is considered provincial jurisdiction… they feel they need the capacity to do that." These limitations, particularly in the realm of land use, can undermine efforts to regulate risk effectively at the local level.

Despite the significant impact of land use planning on wildfire risk mitigation, respondents reiterated that planning departments have limited influence over the development process and minimal ability to target and mitigate risk on private property. Planners explain that development permits, commonly used to identify and mitigate risk in new developments, are limited to the time of development and lack follow-up mechanisms for compliance once issued. As a planner from Prince George explains, "a local government's capacity and ability to delve into what can happen on a site is, I think, limited in certain respects". The municipalities influence is "primarily limited to that time of doing the development application, getting them to recognize what they need to do on a particular piece of property". Post issuance of a permit, "the city doesn't often have to enforce covenant requirements unless a complaint is made… we're not out there inspecting".

Legacy properties, which make up the bulk of many communities, often fall outside the scope of current regulatory mandates. As one planner from Kimberly notes, "there's a lot of properties that are 10 - 150 years old that don't have that scrutiny brought to them." While local authorities have some influence during the initial development phase, this authority diminishes after permits are issued, except for specific renovations or expansions that require new permits. However, another planner from Kimberly explains, "in most cases, renovations wouldn't need a permit, so there might not be any sort of check-in with the local government, which can lead to problems over a longer time frame." This limitation results in "less opportunity to intervene or intercept at the key points of those decisions to make changes to existing properties." These interviews highlight the lack of tools available to planners for ensuring effective risk mitigation throughout various phases of development, particularly concerning legacy properties.

When it comes to various strategies, such as enhancing building codes to demand fire-resistant materials and adopting fire-smart landscaping, local governments can merely suggest best practices. A regional planner from Buckley Nechako explains, "It would be nice to put in some bylaws regarding building materials and fire-smart principles into the actual design of the building… that would be a straightforward, cost-effective way to deal with it." Another planner from Grande Prairie warns that "whenever something is a guideline, it's kind of meaningless… if you actually want to achieve something, it needs to be a very specific requirement that you can enforce." A fire specialist from Kelowna suggests that until the provincial building code incorporates fire-

smart principles, there will be a "gap between basic and best practice." These quotes reflect the frustration among planners and specialists about the current limitations in enforcing fire-smart practices through regulatory means.

This section outlined the legislative challenges planners face in pursuing effective wildfire risk mitigation policies. Many identified solutions fall outside municipal or local jurisdiction, relying instead on regulatory changes at the provincial level. Additionally, planners have limited tools to influence or regulate properties after a development permit is issued, leaving properties developed before the application of FireSmart recommendations and those altered post-permit vulnerable to wildfire risks.

RESOURCE CONSTRAINTS

Effective wildfire management requires substantial resources, yet local governments frequently struggle with limitations in human, financial, and physical capacities. Across various regions, interviewees have highlighted how these constraints impede their ability to manage increased responsibilities brought on by rising wildfire emergencies. This section looks at the specific challenges posed by resource shortages, examining how these limitations affect the preparedness, response, and recovery efforts of local governments. Responding to recent wildfire seasons has demanded a massive number of resources from local governments and highlighted the existing disparities they face. One emergency manager from Banff explained the lack of available personnel to fight fires, stating that "all the contracted structural protection folks in Alberta were stretched incredibly thin this summer because they were contracted up in Yellowknife." They added that in addition to more staff, "there simply needs to be more equipment to protect municipal structures." In other areas, certain desirable bylaws remain unimplemented due to challenges in monitoring them post-implementation. A planner from Prince George emphasized the impracticality of extensive regulatory enforcement due to resource limitations, stating, "It's the resource piece. What team of people are going house to house? We're only a town of 75,000… I don't think it's a good use of taxpayer dollars." This inability to enforce regulations not only undermines policy effectiveness but also erodes trust in local government. As a planner from Kimberly observed, "we could put the policy in place, but if it's only on paper, it's not going to be effective... and that can also lead to a degradation of trust in the local government."

This issue is particularly acute in rural or remote regions, where the scale of required forest management exceeds local capacities. A planner from Buckley Nechako highlighted the impracticality of implementing wildfire mitigation measures across their 77,000 kilometers of interface area, explaining, "It's doable around a high-density municipal population, but the practicality of doing it around a low-density rural population of our size is not feasible." In Sparwood, a planner echoed this concern, identifying the scarcity of labor as an impediment to effective wildfire risk mitigation efforts. He said, "Even if you have the money, there's also a limited amount of human capacity to do the work we need to do." He highlighted the impact of the current labor market, stressing, "I'm not sure if you've looked

at the job pages recently, but there's more vacancies than you think." These concerns about labour shortages have been especially prevalent within smaller non-urban areas, and urban areas that are remote, such as Whitehorse.

24.

Despite these local needs, upper-level support has been limited. An emergency manager in Buckley Nechako expressed frustration at the province's failure to address the issue, observing, "I've seen them manning up their staff like crazy. And I'm going, you know you need more staff. How do you not know we need more staff, right? And how do we manage that? Because the costs aren't going down." Kelowna's wildfire specialist echoed these concerns, noting the strain caused by provincial directives and the lack of accompanying enforcement resources. They emphasized, "the province really likes to work for a really long time on grand plans and documents… they want to tell us to enforce those things, but the money does not often come with that enforcement responsibility."

Even when funding is available, stringent conditions often complicate the ability to access it and compromise the freedom of local governments to apply it as they see fit. A planner from Buckley Nechako highlighted the stringent conditions attached to provincial funding, stating, "The condition of getting the funding is you basically have to do it exactly the way the province wants you to do it. And they control every aspect of what's in the plan. But actually executing the plan is downloaded to local governments. To me, it's such an inefficient process. I think for it to be more effective, the province needs to just take it on and do it." These insights reflect a broader sentiment among local officials that provincial support is often inadequate or misaligned with the practical realities of implementing wildfire mitigation strategies at the local level.

Insufficient and unreliable funding at the provincial level limits the ability of local governments to implement long-term actions and positions. A planner from Tłı̨chǫ Government stressed the need for federal support, stating, "The federal government should be giving more money, running more funding programs that deal with Emergency Management... you need to have the stuff ready and a plan for mobilizing additional resources, additional people if you need... ideally, it would all be kind of mapped out ahead of time, and you would have that capacity ahead of time or at least have that capacity that you could draw on as needed."

Similarly, in Buckley Nechako, the local government grapples with the challenge of conducting increased consultation [mandated by the provincial government]

24. Map highlighting the region of Bulkley Nechako to show the signifigant amount of terrain the regional government is responsible for managing.

Sources: Clare Milliken, Google Maps

with nearby Indigenous communities on wildfire risk reduction efforts, despite having very limited resources to support the increased workload. Their emergency planner explains, “There is some funding that they’ve thrown at us, and I’ll say it that way because typical of the province, it looks like it’s one-time funding… there is no way you can do one-time engagement with First Nations because they’re constantly evolving and changing.” Both quotes highlight the broader issue of how one-time or limited funding falls short in addressing ongoing and evolving needs.

Short-term funding is particularly difficult for Northern communities, which face challenges in hiring and retaining staff members. In Whitehorse, the territory of Yukon has funded a two-year FireSmart coordinator position, but practical constraints significantly reduced this period. One official noted, “It was funding for two years, but it took some while to hire. So, a year and a half.” This limited duration is compounded by the high staff turnover rates in the north, as another official commented, “is [staff turnover] something that in the north happens a lot.”

The capacity of local governments and their staff members to sustain operations amid extreme conditions was a consistent concern of emergency planners throughout the interviews. Both Buckley Nechako and Prince George reported burnout and mental health issues among staff, volunteers, and residents following previous fire seasons that kept them on constant alert. A planner from Buckley Nechako highlighted the toll on personnel, stating, “I am concerned with responses happening year after year and the longevity of people. How can they sustain that? It interrupts almost all our business operations because we have to pull staff from so many areas.” They further emphasized the importance of mental health, noting, “It’s really important to us that people are well cared for and well looked after during the stress in an emergency operation center… people being in the right frame of mind to be in there is important.” Despite these commitments to mental health, the escalating frequency of emergencies, coupled with limited upper-level support, is placing unprecedented pressure and strain on individuals, departments, and the overall operational capacity of local governments.

This section highlighted the labour, financial and equiptment constraints faced by local governments across the study area. The next section will examine how new demands for coordination have challenged effective management.

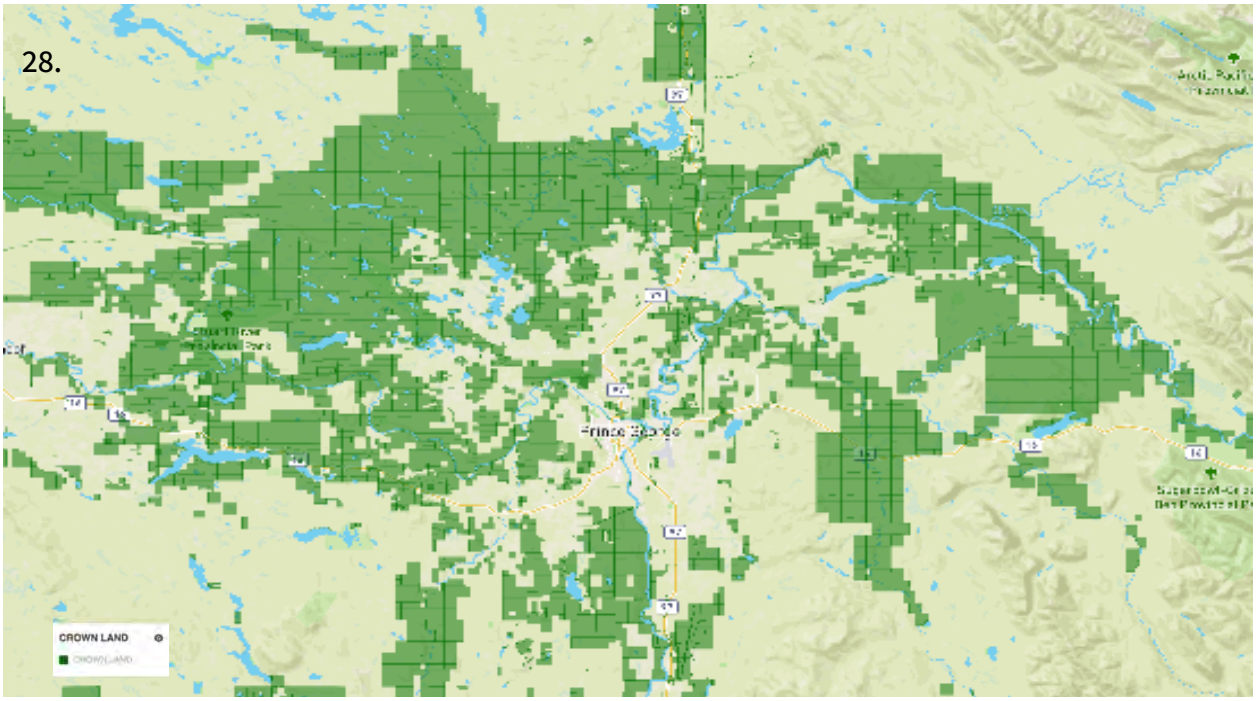
COORDINATION

In the pursuit of effective wildfire mitigation, collaboration and coordination among various stakeholders are indispensable. However, navigating the complexities of intergovernmental relationships, differing communication styles, and diverse organizational struc-tures poses significant challenges. This section explores the obstacles encountered in both collaboration and coordination efforts, highlighting the barriers that hinder the successful integration of actions and strategies across multiple levels of governance and sectors.

Many municipalities, such as Whitehorse, Prince George, and Yellowknife, are surrounded by crown land or First Nations territories, and their own territories are often interspersed with these lands (See Figure 25). This overlap often complicates efforts to conduct prescribed burns and other land management activities due to the need for coordination between multiple jurisdictions, variations in regulations, and logistical challenges.

Provincial jurisdictions, including forest fire and forest management, increasingly operate within municipal spaces, necessitating greater coordination across boundaries. Clear communication is essential for effective wildfire risk mitigation, especially regarding fuel management projects, where prescribed burns may be mistaken for wildfires, causing confusion and alarm. According to interviewees from various municipalities, these challenges are particularly pronounced when projects are undertaken by provincial or federal authorities on crown land adjacent to or within municipal boundaries.

For instance, in Banff, a federally led burn, which was improperly advertised, was recently mistaken by residents for a real fire threat. Reflecting on the incident, Banff's planner recounted receiving a panicked call from a family member, highlighting the communication gap: "They didn't know about the event, and that just hit home to me that there was a communication gap—something we can easily improve on." Similarly, in Prince George, a planner suggested a coordinated approach in creating buffer zones to inform residents during projects. They suggest that by leveraging their demographic data, local governments could serve as resources for provincial entities in these cases. As wildfires encroach upon densely populated areas, effective and transparent public communication becomes critical not only to mitigate impacts on health and safety but also to inform residents about projects and emergencies.



25. Map highlighting the Crown Land within and aorund Prince George. These complex ownership arrangements complicate fire management efforts and require new relationships and levels of coordination.

Sources: Crown Land Map.ca, https://www.crownlandmap.ca/

The increasing frequency of evacuations highlights the imperative for coordinated efforts to ensure informed decision-making, optimal resource allocation, and the safe movement of people. Interviewees noted that, despite evacuations being mandated by provincial or territorial entities, their execution primarily falls within the responsibility of municipal authorities. This arrangement has led to coordination challenges, particularly when clear plans are not effectively communicated prior to or during emergencies. This was evident during Yellowknife's recent historic evacuation, where initial ambiguity in decision-making and overlapping jurisdiction among politicians led to confusion among the public and media. A planner from Tlicho government explained, "initially before the evacuation happened, there were some media articles asking them, what's the plan? And they told people they had one, but they didn't share it or anything." This lack of clarity caused frustration and raised accountability concerns.

Efforts to foster collaboration must involve local actors in higher-level decision-making and ensure their awareness of local needs and experiences. As emphasized by a planner, "municipalities and the communities, they are the ones on the ground. They're also the ones that are going to be impacted by the wildfire and they have the most knowledge at a local scale about what sort of stuff might work for mitigation." Many interviewees advocated for improved communication, information sharing, and increased participation of local stakeholders in decision-making processes. However, amidst these efforts, challenges arise from differences in communication styles and organizational cultures. For instance, a government official from the Yukon reflected on the difficulties encountered when attempting to collaborate with the provincial government, stating, "We've tried to do campaigns with them, but it's always challenging...two different governments that communicate in different ways." This disparity in communication approaches can impede effective collaboration efforts and opportunities.

While regional collaboration has proven effective in certain areas for wildfire risk mitigation, it remains a significant weakness in others. In Kimberly, for instance, apart from their regional growth strategy, the absence of joint planning processes hampers effective coordination. A planner noted, "There's some recognition from the province and legislation, but not great guidance or firm expectations set, I guess, and same within the communities." Mandating collaboration at a higher level, possibly through provincial directives, could be necessary to address these challenges and foster more effective coordination among stakeholders.

This chapter has outlined four common challenges faced by local governments across the study area: resistance to change, legislative gaps, resource constraints, and coordination challenges. These challenges complicate efforts to implement and enforce measures that have been identified in the literature, local policies, and plans, as well as throughout interviews, as important for wildfire risk mitigation. The following section provides an analysis of how these challenges, along with the approaches to wildfire management described in chapter 2, manifest across different areas.


05

Discussion

This discussion and analysis highlight how the diverse challenges and strategies compare across different types of areas affected by wildfires in Canada (see Appendix A for a detailed classification of regions and cities). The areas are divided into urban and non-urban areas, with additional considerations for remote and growing regions.

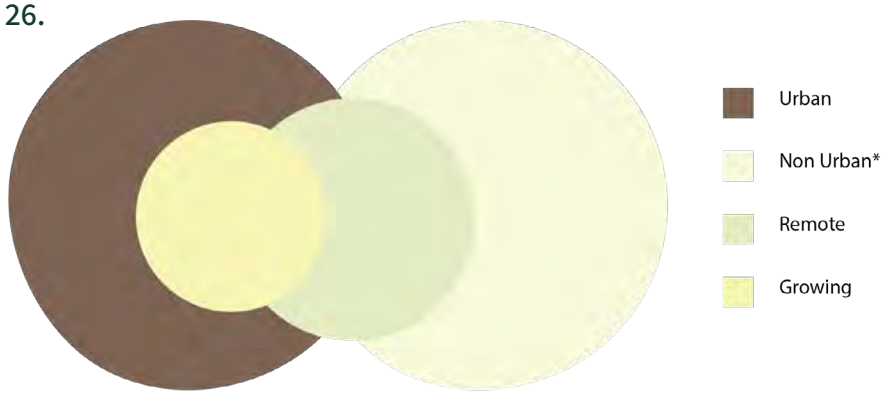
The following section outlines the specific characteristics and vulnerabilities of each classification of area. It then provides an overview of the three main themes that emerged from the research—land use planning, education and outreach, and collaboration—along with their implications for wildfire management across local governments in the study area.

It is important to note that the remote and growing classifications are not entirely distinct but rather add an extra layer of complexity to the existing challenges faced by urban and non-urban areas. For instance, remote urban areas share the challenges of high population density and extensive infrastructure but also face unique difficulties related to geographical isolation and land ownership. Similarly, growing urban areas must balance develop-ment with wildfire risk, adding to the baseline challenges of urban regions.

This Venn diagram illustrates the overlap and unique aspects of various spatial classifications in the study area (See Figure 26). The classifications include Urban, Non-Urban, Remote, and Growing regions. Each circle represents one of these classifications, highlighting both the commonalities and distinct challenges faced by each. For example, urban areas can be located in areas that are remote or non-remote. The diagram helps visualize the added complexity these overlapping classifications bring to wildfire management strategies. See Appendix, Figure A3 for a list of the local governments and their respective classifications.

26.
Venn Diagram of Spatial Classifications and their Characteristics.

26.



The table below summarizes the vulnerabilities and corresponding strategies for wildfire management across different spatial classifications.

31..

Category	Vulnerabilities	Strategies
Urban Areas	• High population density • Extensive infrastructure • Costly damage to homes and businesses • Need for coordinated evacuations • Siloed departmental operations • Lack of personal preparedness among residents • Vulnerable populations (homeless)	• Interdepartmental collaboration, new wildfire related positions and departments • Additions and amendments to zoning, bylaw, community plans • Development permits as an interface to influence terms of development • Extensive public education, programs, incentives for FireSmart implementation • Updated community plans, wildfire plans, integration of advanced technology for risk identification
Remote Urban Areas	• Geographical isolation • Logistical stress in evacuations • Delayed response times • Fragmented land ownership • Dual responsibilities as service hubs	• Regional planning across urban areas and with smaller regional governments • Increased engagement with surrounding regions and indigenous communities • Big investments in emergency preparedness
Non-Urban Areas	• Resource constraints • Extensive land management • Less connected populations • High levels of vulnerability (uninsured populations, indigenous groups) • Valuable industrial infrastructure and economy	• Building local capacity through community engagement • Strengthening coordination with provincial and federal governments for forest management • Informal and formal regional planning (joint plans, working groups, relationship building with larger urban centers) • Flexibility and adaptability between staff and across departments • Efficient decision making
Remote Non- Urban Areas	• Frequent and complex evacuations • Neighbouring high risk levels complicate availability of resources and support • Uninsured homes • Strong cultural preference for independence • Proximity to WUI • Logistical complexity during evacuations	• Community education through citizen involvement in risk mitigation measures • Coordinated planning with larger urban areas

27.
Vulnerabilities and Strategies across Different Classifications

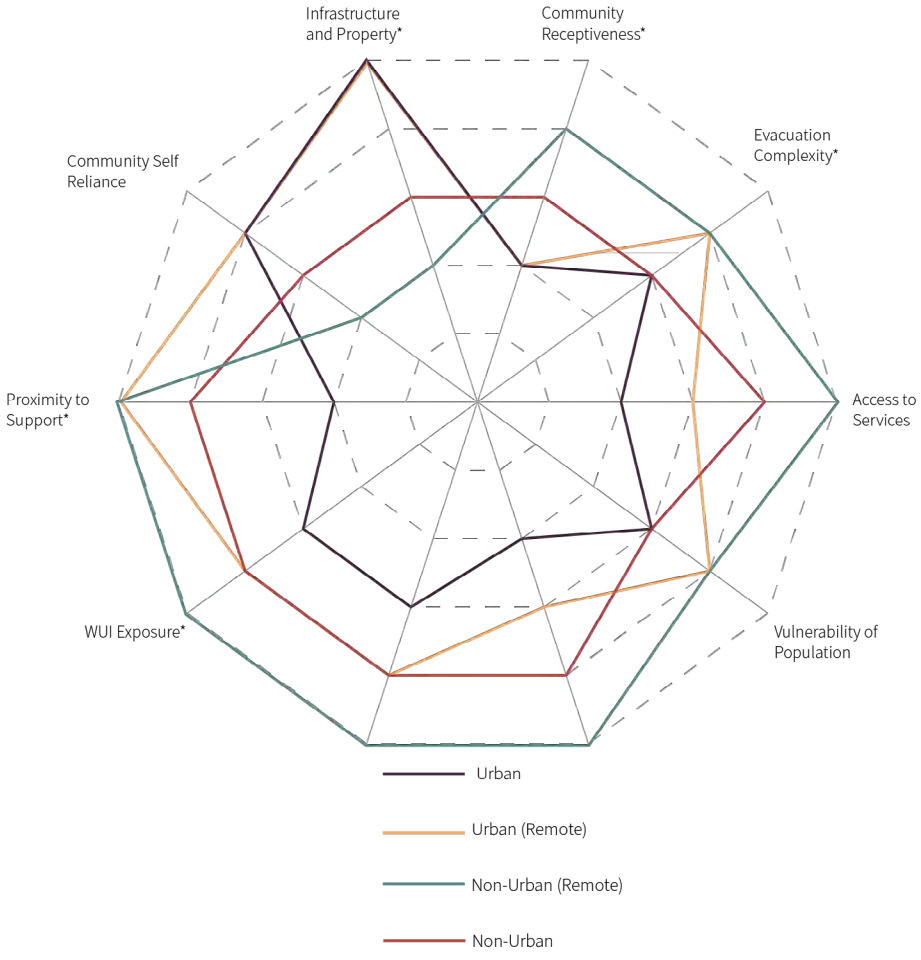
Figure 28 provides a detailed analysis of vulnerability across four spatial classifications within the study area: Urban, Remote Urban, Non-Urban, and Remote Non-Urban. This diagram, developed from existing literature and interview data, uses ten factors to evaluate vulnerability: Infrastructure and Property, Community Receptiveness, Evacuation Complexity, Access to Services, Vulnerability of Population, Local Expertise, Resource Availability, WUI Exposure, Proximity to Support, and Community Self-Reliance. Each factor is plotted along a separate axis, with the extent of vulnerability indicated by the distance from the center.

For clarity, consider the differences between Non-Urban Remote and Urban Remote areas. Non-Urban Remote areas typically show limited extension towards the center on the 'Infrastructure and Property' axis, indicating a lack of critical infrastructure. However, they often extend further from the center on the 'Resource Availability' axis, reflecting significant challenges in accessing resources. Conversely, Urban Remote areas typically have more access to critical infrastructure, as indicated by their greater extension towards the outer perimeter on the 'Infrastructure and Property' axis. However, they may exhibit a closer proximity to the center on the 'Resource Availability' axis, signifying better availability of resources.

Detailed explanations of the chosen factors and their descriptions can be found in the Appendix (see A1).

28. Spider Diagram of Vulnerability across Four Spatial Classifications

28.



Land use planning

The existing literature highlights the significant impact of land use planning and development on increasing both the risk and severity of wildfires (Bihari et al., 2012; Erni et al., 2024; Hughes & Simak, 2019; Mockrin et al., 2020; Newman et al., 2013; Paveglio, 2021). Development in the Wildland Urban Interface (WUI)—areas where human-made structures and infrastructure are in or adjacent to areas prone to wildfires—has necessitated multiple strategies by local governments to address and mitigate these risks.

One of the primary tools employed by urban planners in the study area is the development permit, which theoretically allows for significant influence over where and how development occurs. However, within our study area, the practical application of these permits reveals several limitations. While planners acknowledge the importance of these permits, many local governments feel they have not been effectively utilized to restrict or control the location of new developments. Instead, development permits are often used to negotiate the terms of a development project, including specific measures to mitigate wildfire risks. For instance, these negotiations might result in recommendations for fire-resistant building materials, defensible space requirements, and specific landscaping guidelines aimed at reducing fuel loads around structures.

Despite the recognition of these tools' potential to lower wildfire risk significantly, enforcement remains inconsistent. Planners across the study area admitted that while the tools exist, their practical impact is often limited by factors such as lack of jurisdiction to strengthen existing building codes, pressure to accommodate growth in high-risk areas, and a lack of resources to inspect and enforce regulations that are put in place.

Urban areas within the study area, characterized by higher population densities and ongoing development pressures, are more likely to leverage development permits as a proactive tool for wildfire risk mitigation. In these settings, particularly in growing urban areas like Kelowna and Whitehorse, development often targets the peripheries where land is more available and affordable. These areas tend to be at higher risk for wildfires. This urban growth at the edges creates a crucial opportunity for planners to intervene and impose stricter land use controls to mitigate wildfire risks effectively. Additionally, many local governments of urban areas have been exploring various changes to local bylaws and regulations. They also have a much larger capacity for high-level planning compared to rural counterparts, allowing them to identify risks and target specific areas for mitigation, despite not always having the resources or jurisdiction to implement all necessary measures effectively.

In contrast, non-urban and rural areas face different challenges. These regions typically experience lower development rates, which reduces opportunities for proactive wildfire risk mitigation through the development process. Planners from regions such as Yellowknife, Whitehorse, and Buckley Nechako highlighted that the prevalence of self-built and renovated homes without permits in rural areas complicates efforts to

manage and mitigate wildfire risks through official planning channels. Additionally, these regions often encounter other barriers to effective wildfire risk management, such as limited resources and logistical difficulties. Overall, while the strategies and tools for wildfire risk mitigation through land use planning are well-documented, their effectiveness is contingent upon consistent enforcement, community buy-in, and adaptation to the unique challenges of urban and non-urban set-tings. These insights provide a foundation for understanding the critical role of education and outreach in wildfire risk management.

Education and Outreach

Within the study area, local governments have focused on influence through public education and outreach regarding wildfire management, primarily due to the limits of their jurisdiction and significant resource shortages. Public education includes a range of activities, such as the development process, social media and public communication, community events, programs designed to lower barriers to risk mitigation, and activism through resi-dent involvement. In all settings, education efforts aim to inform citizens about their indi-vidual risks and instill a personal sense of accountability for wildfire risk management. The goal is to foster an informed population that understands the importance of mitigation efforts, emergency plans, and the status of surrounding events, ensuring a safe, efficient, and coordinated response during wildfires.

However, the approaches and effectiveness of these educational programs vary significant-ly between urban and non-urban areas, as well as between remote and growing regions. The study reveals that rural residents tend to resist government intervention, while urban populations face the challenge of dependence on municipal services. This contrast high-lights the need for tailored educational approaches based on local contexts. Urban areas typically benefit from a larger pool of resources, allowing for more developed educational programs. These regions receive investments from higher levels of government for large-scale FireSmart campaigns and, in some cases, permanent positions dedicated to wildfire education. This focus on education is crucial in densely populated areas where information sharing is less costly and more effective than individual enforcement efforts. For instance, in Kelowna, community wood chipping programs have facilitated fuel reduction efforts by providing residents with accessible means to manage their vegetation. Growing urban areas also leverage the development process to educate homeowners about wildfire risks, ensuring that educational initiatives are integrated into new developments. In Banff, for example, educational initiatives are embedded in the development process to inform new homeowners about best practices for wildfire resilience.

In contrast, non-urban areas face different challenges and opportunities. These regions often receive far less support from higher levels of government despite their high risk, significantly impacting their ability to fund initiatives found in urban areas. Here, the sparse population and vast land areas make consistent and effective outreach a challenge, and programs requiring shared equipment might be challenging to justify in less dense

populations due to logistical difficulties. Additionally, residents in these regions tend to be more critical of regulations, making the success of such measures highly dependent on trust in the government. As a result, education in non-urban areas often involves direct citizen involvement in risk mitigation and response efforts. For example, in Buckley Nechako, residents actively participate in emergency evacuations and setting up barricades, ensuring that evacuees receive information from trusted community members. This hands-on approach not only fosters a sense of community responsibility but also enhances the effectiveness of emergency responses.

Collaboration

Collaboration among local governments, regional authorities, and community organizations is essential for effective wildfire risk management. Interdepartmental collaboration within local governments is a response to the growing need for a holistic approach to contemporary climate risks. In cities such as Banff and Whitehorse, these collaborations have led to the development of comprehensive community and emergency plans that integrate interdisciplinary knowledge and perspectives. Such integration is increasingly critical for urban planners, who must consider factors like weather and climate patterns, as well as emergency safety protocols, in their land use and development decisions. The relationships built through these collaborations, strengthened by emergency training involving all staff members, prove critical for effective communication and coordination during emergencies.

In urban areas, where local governments are larger and more specialized, internal collaboration emerges as a more recent and thus more challenging dynamic. Despite being equipped with a high level and diversity of expertise, the bureaucratic and specialized nature of the work in these large organizations can create silos that hinder collaboration. Conversely, within smaller and more regional governments, this form of collaboration is often embedded within the organizational structure, as small staff teams regularly rely on one another for help and expertise. Yet small governments, often limited in their capacity, lack the resources needed for this type of high-level planning. Thus, while interdepartmental collaboration is increasingly a component of all government approaches to wildfire management, its implementation can be more complex, and face resistance in larger, specialized organizations and resource-limited in smaller governments.

Regional collaboration has been critical for pooling resources, sharing knowledge, and ensuring effective coordination and support during emergency responses. Partnerships such as those formed between Prince George and surrounding regions have facilitated the growth of relationships and support structures that improve the ability of those involved to plan, respond, and recover from emergencies. New regional bodies, like the round tables seen across Northern British Columbia, are not only bridging gaps in knowledge and local expertise but also encouraging new ways of organizing and thinking about shared risk. These collaborations enhance internal capacity, particularly in areas where resources are limited, and capacity cannot be built up

internally.

While regional collaboration is a component across all categories of locality, it is the most developed and useful in rural and remote areas suffering from high levels of risk and low capacity. These areas, often lacking essential services and located far from them, rely on support from neighboring regions and larger cities. Consequently, remote urban areas, due to their unique positioning, are highly engaged in regional collaborations. Cities like Prince George and Whitehorse have become critical service hubs and refuges for surrounding populations. Their planning scope extends beyond their boundaries to include these areas. This approach has become necessary both for supporting populations in need and ensuring the provision of services and order within the cities during crises. In more central cities such as Kimberly, Kelowna, and Banff, regional collaboration addresses coordination challenges rather than filling gaps in capacity.

Upper-level coordination has emerged as a critical component in wildfire management. This level of coordination is crucial for addressing the challenges posed by wildfires, which often transcend local boundaries and require a unified response. National, provincial, and territorial collaborations with local governments are becoming necessary as different levels of government attempt to navigate new shared spaces and domains that previously existed in relative separation. For example, in British Columbia and the Yukon, both wildfire and emergency services are provincially/territorially operated. As the threat to urban areas increases, these provincial/territorial agencies are being forced to work together with municipal and regional governments. These collaborations are also necessary to effectively coordinate forest management efforts beyond local boundaries and jurisdictions. In Banff, most forest management efforts, along with recent proposals for new evacuation routes, take place on federal land (Banff National Park), requiring the municipality to depend on Parks Canada for clearance of any new infrastructure that passes through park territory.

For many urban municipalities, this increase in coilaboration with upper levels of government has been a challenge. Urban municipalities like Kimberley, Banff, Prince George, and Whitehorse have engaged in coordinated controlled burns on crown land, involving federal, provincial, and territorial agencies. These efforts are crucial for managing the fragmented land ownership common in urban areas, particularly remote ones like Whitehorse and Yellowknife, where significant portions of land are federally owned or indigenous territories. Effective communication between different levels of government is essential not only for conducting these mitigation efforts but also for ensuring that the population is informed and prepared. This often requires significant coordination, which has been a challenge for many local governments.

In contrast, non-urban and rural areas face distinct challenges that also necessitate upper-level coordination. These regions often grapple with extensive land bases that are highly vulnerable due to almost all housing being situated in the Wildland-Urban Interface (WUI). Coupled with limited resources, this makes upper-level governmental support

for forest management essential. Despite the high wildfire risks these areas encounter, investments from higher levels of government are often inconsistent or limited compared to their urban counterparts, leading to significant gaps in preparedness and response capabilities. This neglect exacerbates their vulnerabilities and hinders effective wildfire management.

Based on these findings, the following section will propose recommendations for both local governments and higher levels of government to enhance wildfire management strategies across different regions.

06

Conclusion and Reccomendations

The wildfire management landscape in Canada is complex and varied, requiring tailored strategies for urban, remote urban, non-urban, and remote non-urban areas. Urban areas, with their dense populations and extensive infrastructure, need to focus on coordinated evacuation planning, interdepartmental collaboration, and strict land use policies. Remote urban areas must address the additional complexities of geographical isolation and fragmented land ownership through regional planning and increased collaboration with Indigenous communities and federal agencies. Non-urban areas, facing resource constraints and vast landscapes, benefit from building local capacity through community engagement and support initiatives. Remote non-urban areas, frequently dealing with complex evacuations and cultural resistance, need to build relationships with larger urban centers and collaborate with each other to share resources and best practices.

Vulnerability to wildfires varies across these different contexts, with remoteness amplifying these vulnerabilities due to isolation, limited resources, and complex land ownership issues. The interconnectedness and mutual dependence between urban and rural areas highlight the necessity for coordinated and comprehensive wildfire management strategies that address the needs of both.

Central to this challenge is the integration of wildfire risk into planning practices at all levels of governance. Institutional reforms are necessary, but equally important is the engagement and education of individual citizens. Empowering residents with knowledge of emergency protocols and their roles in risk mitigation is essential. Governments must strengthen regulatory measures and enforcement mechanisms to ensure accountability for risk management efforts. Standardized policies and strategies, informed by local knowledge and experience, can relieve the burden on local governments while respecting their need for localized solutions.

The transboundary nature of wildfires underscores the necessity of collaboration across jurisdictions and stakeholders. Governments, private landowners, and regional authorities must coordinate efforts to mitigate risks effectively.

Achieving these objectives hinges on increased and sustained financial support for local governments. This funding must be directed at planning efforts and targeted towards addressing challenges that stretch their capacity and limit their ability to respond effectively to wildfires. Provincial and federal authorities play an indispensable role in establishing and maintaining essential infrastructure and initiatives related to wildfire risk management. Supporting both urban and non-urban communities through increased

funding, targeted forest management initiatives, and strategies to build and support partnerships regionally—particularly with service rich urban centers—is essential. This approach aims to bridge the gap in capacity and resources between rural and urban areas, ensuring that all local governments are prepared to respond effectively to emergencies.

Given the varied challenges faced by urban, remote urban, non-urban, and remote non-urban areas, certain shared strategies and overarching recommendations emerge from the research as crucial for effective wildfire management across all regions.

The following six recommendations are divided into two sets: those tailored for local governments; and those for upper levels of government, encompassing relevant federal, provincial, and territorial agencies.

For local governments

1. Increase efforts to strengthen internal and regional collaboration by fostering robust cooperation across all departments and with neighboring regions. These relationships enable the efficient transfer of resources, expertise, and best practices. This can involve broad training efforts, inter-departmental collaboration on future community and emergency plans, and joint initiatives such as regional wildfire councils and inter-municipal agreements.

2. Develop clear, efficient, and consistent communication channels to enhance government accountability and ensure residents understand their personal risks and civic responsibilities in mitigating these risks. This involves sharing information about public risk management activities, including prescribed burns, evacuation plans, and the status of fire events, as well as educational initiatives and programs targeting individual risk management.

3. Acknowledge, identify, and manage risks involved in Wildland-Urban Interface (WUI) to prevent high-risk development and more safely accommodate growth. This will require a more integrated and risk-informed approach to land use planning that aims to limit or re-strict development in vulnerable areas. New approaches to growth could explore and pro-mote higher-density development in safer locations such as infill lots.

For policy makers at the National, Provincial, and Territorial level

1. Strengthen higher-level regulations and policy frameworks to incorporate FireSmart principles. This includes integrating FireSmart requirements into provincial and territorial building codes, enabling local governments to enforce stricter standards. Additionally, it could involve developing adaptable guidelines and best practices at a higher level to provide a blueprint for local governments while allowing flexibility to address unique local challenges.

2. Foster a unified and collaborative approach to wildfire management across all government levels, recognizing the crucial role of local governments and local knowledge. This should involve increasing local actors' participation in higher-level decision-making, establishing unified planning efforts, and creating decision-making bodies that include federal, provincial/territorial, and local government representatives.

3. Increase funding and provide tailored support that acknowledges and responds to the diverse vulnerabilities of local governments and communities. This involves equitable funding distribution between urban and non-urban areas as well as the provision of resources beyond financial aid, including expertise and effort from provincial, territorial, and federal

Above all, all levels of government and the communities they support, must acknowledge that reverting to the old status quo is not an option; instead, they must adapt to and embrace a new normal. This adaptation poses significant challenges as both our settlements and the ideals upon which they have been built represent a different world. The long-standing impacts of past investments are not easily adjustable. Therefore, the new normal is currently unpredictable and constantly evolving, necessitating local governments to embrace change and flexibility. By integrating risk management into planning practices, fostering collaboration, investing in education, and securing sustained financial support, communities can enhance their resilience and adaptability to the increasing threat of wildfires. Successfully navigating this transition will demand widespread accountability, endurance, compassion, and innovation from all sectors of society.

Appendix

Annex 1: Chosen vulnerability factor table.

Vulnerability Factor	Reasoning	Sources (if any)
Infrastructure and Property	The value of property and infrastructure at risk. In urban areas, this includes the amount and value of property, critical services, and public infrastructure. In non-urban areas, high-value industry or natural resources may be at risk.	(Erni et al., 2024)x
Community Receptiveness	The degree to which residents support or resist wildfire risk mitigation measures.	(Mockrin et al., 2020)
Evacuation Complexity	Influenced by factors such as location, remoteness, existing transportation infrastructure, and emergency plans.	(Erni et al., 2021)
Access to Services	The availability and accessibility of essential services, such as healthcare, firefighting, and emergency response.	
Vulnerability of Population	Factors contributing to population vulnerability, such as income levels, age, health, and socio-economic status. For example, Yellowknife's evacuation faced challenges related to displacing large homeless populations, while remote Indigenous communities may face unique vulnerabilities.	(Erni et al., 2021)

Local Expertise	Typically related to the size and capacity of local government. Larger governments often have more specialized staff, increasing their ability to handle wildfire situations effectively.	
Resource Availability	The availability of resources necessary for wildfire mitigation and response, including financial resources, equipment, and personnel.	
WUI Exposure	The extent of land or area located within the Wildland-Urban Interface (WUI), where human development meets undeveloped wildland, increasing wildfire risk.	(Erni et al., 2021)
Proximity to Support	The ease of accessing external support during emergencies, considering both the geographic remoteness of the community and its integration within larger support networks.	(Erni et al., 2021)
Community Self Reliance	The preparedness and capacity of the population to respond independently to emergencies, including emergency preparation, and ability to independently evacuate.	

Annex 2: List of locations, participants and roles

Participant #	Location	Role
Participant 1	Banff	Emergency Manager
Participant 2	Banff	Wildfire Specialist
Participant 3	Sparwood	Director of Planning
Participant 4	Kimberly	Director of Planning
Participant 5	Kimberly	Urban Planner
Participant 6	Prince George	Emergency Manager
Participant 7	Prince George	Director of Planning
Participant 8	Whitehorse	Former Government Official
Participant 9	Whitehorse	Government Official
Participant 10	Tlicho Government	Urban Planner
Participant 11	Buckley Nekacho	Emergency Manager
Participant 12	Buckley Nekacho	Urban Planner
Participant 13	Kelowna	Wildfire Specialist
Participant 14	Kelowna	Urban Planner
Participant 15	Grande Prairie	Director of Planning

Annex 3: List of locations and classifications

Banff	Urban
Kimberly	Urban
Whitehorse	Urban Remote
Prince George	Urban Remote
Kelowna	Urban
Tlicho Government	Non-Urban Remote
Grande Prairie	Urban Remote
Sparwood	Non-Urban
Kimberly Regional Government	Non-Urban
Buckley Nechako	Non-Urban Remote

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