Exploring wildfire preparedness, perceptions, and responses in Western Canada: insights from Valemount, British Columbia

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ABSTRACT

Climate change and decades of fire suppression are increasing the risk of wildfire in many rural and remote communities across Canada. Yet limited research has been done to better understand how these communities experience wildfire risk. For this research, conducted prior to the catastrophic wildfire season of 2023 in British Columbia (BC), we interviewed 20 key informants living in the village of Valemount in the Robson Valley, BC about their perceptions of wildfire risk, lived experiences, and management approaches. We further explored barriers to and opportunities for future wildfire management. Our findings show that despite the direct risk of wildfire impacting the village is increasing, participants mostly focused on the indirect impacts of wildfires such as power outages and the health effects of wildfire smoke. Previous experiences with these impacts, combined with a dependency on regionally managed power systems and limited transport infrastructure, were key catalysts for taking action within the village. However, several barriers, including a lack of community engagement in wildfire fighting, have impeded proactive wildfire management. Participants emphasized the need for increased support for local FireSmart™ initiatives and legislative changes to enable resident participation in fire suppression and to improve village preparedness. This study enhances our understanding of wildfire impacts on rural communities and outlines strategies to strengthen future wildfire management and resilience.

1. Introduction

The risks posed by wildfires are growing in the Canadian province of British Columbia (BC), threatening ecosystems (Masson-Delmotte et al., 2021), and human lives and livelihoods (Johnston et al, 2020). Climate-driven changes, including rising temperatures, prolonged droughts, and shifting precipitation patterns, are making fire-conducive weather more frequent and intense throughout the region, drying out the vegetation and increasing the landscape's susceptibility to ignition from both natural (e.g., lightning) and human sources (Kirchmeier-Young et al., 2019; Parisien et al., 2023). Furthermore, historical fire suppression and exclusion policies (Copes-Gerbitz et al., 2022a; Baron et al., 2022), along with forest management practices such as harvesting and replanting strategies (Hoffman et al., 2022a), and social-political factors (e.g., funding, expertise) (Copes-Gerbitz et al., 2022a) have allowed fuels – defined as both live and dead vegetation that can ignite and sustain a fire – to accumulate across the landscape. This has exacerbated the impact of extreme weather

and creating a complex wildfire reality that reactive suppression efforts alone cannot address (Tymstra et al., 2020).

Researchers, practitioners, and management agencies in BC, and elsewhere in Canada and beyond, have increasingly recognized the need to adopt new approaches to managing this new wildfire reality and reduce wildfire risks to communities, including increased use of prescribed fire, cultural burning practices, community participation in wildfire response, and proactive fuel mitigation (Filmon, 2004; Abbott and Chapman, 2018; Daniels et al., 2020; Hoffman et al., 2022). The newly adopted Emergency and Disaster Management Act, for example, demonstrates a clear effort to address the evolving nature of emergencies across the province, including the management of wildfire risks in communities (Emergency and Disaster Management Act, 2023). Enacting such new thinking on wildfire management, however, requires a comprehensive understanding of the social determinants of wildfire risk, including attention to public risk perceptions, attitudes, and wildfire responses (McCaffrey et al, 2013, 2015). Research of this nature is key to identifying appropriate pathways for increasing community resilience to wildfire.

Since the early 2000s, researchers in the Western United States, Europe, and Australia have emphasized the critical importance of integrating social determinants into wildfire planning and response strategies (McCaffrey et al., 2015). This research demonstrates that factors such as (dis)trust in government, access to financial resources, institutional support, gender, and other socio-economic and cultural characteristics significantly influence how individuals and communities perceive, experience, and respond to wildfires (Trainor et al., 2009; Paveglio et al., 2015; Santana et al., 2021). In other words, these social factors play a pivotal role in shaping the overall effectiveness of wildfire management. Although some determinants have been found to be consistent across regions, there is broad consensus that wildfire risk is fundamentally shaped by local conditions and community-specific dynamics, making it essential that wildfire management strategies be tailored to the unique cultural, political, and environmental contexts of each area (Paveglio et al., 2015; Garbis et al., 2023). To achieve this, localized research is necessary to explore how social factors manifest within specific communities and to inform community-centered approaches to wildfire management.

In Canada, much of the social science literature related to wildfires has similarly aimed to document, describe, and explain the impacts of wildfires and how people prepare, respond, and recover. The field has grown rapidly and has provided important insights into the social characteristics and processes driving wildfire risk and resilience at community level. For

example, a combination of remoteness, ethnicity, and socio-economic inequalities have been found to strongly influence the capacity of communities to manage, cope, and respond to both the indirect and direct impacts of wildfires (Dodd et al., 2018; Christianson et al., 2019; Tepley et al., 2022; McGee and Healey, 2022; Copes-Gerbitz et al., 2022a). Despite this, social research remains limited compared with efforts dedicated to understanding fire regimes, behaviour, and ecological processes (Wildfire Analytics, 2023). The Blueprint for Wildland Fire Science in Canada (2019-2029) recognizes the lack of social science research in the wildfire domain, and recommends conducting more field-based research in collaboration with communities (Sankey, 2018). Specific needs include understanding perceptions of wildfire risk and mitigation efforts, and the social-ecological aspects of wildfire risk and resilience of communities and individuals (Johnston et al., 2020).

Our paper responds to this call by identifying and characterizing how wildfires are experienced, understood, and responded to at a community level in Canada, examining perceptions of risk, preferred actions and approaches, and barriers to action. We use a case study of the village of Valemount (British Columbia) to develop an understanding of these dynamics within the broader context of wildfire management in the region. Our findings contribute to a growing literature on the human dimensions of wildfire in Canada (see (Dodd et al., 2018; Walker et al., 2021)) by providing important insights into the conditions that foster or limit local wildfire action, which in turn can be used to inform and facilitate adaptation efforts for reducing future wildfire risk in the country (Paveglio et al., 2016; Copes-Gerbitz et al., 2022a).

2. Materials and methods

2.a. Study area

The Village of Valemount is a small community of about 1,000 permanent residents, located on the western edge of the Canadian Rockies in the Robson Valley, within the Regional District of Fraser-Fort George in east-central British Columbia, Canada (Fig. 1). Three percent of its total population identify as First Nations, and nine percent as Métis (two of the three constitutionally recognized Indigenous groups in Canada) while 85% report having Scottish, English, Irish, or German ancestry (Statistics Canada, 2023). The village spans 517 hectares and lies within the territory of the Simpcw First Nation, a division of the Secwépemc (or Shuswap) Nation (Simpcw First Nation, 2024). It was established during the late 1920s, with the relocation of the Swift Creek railway station (Valemount Historic

Society, 1984). In 1962, Valemount was incorporated as a village municipality under the Municipal Act and since then has been responsible for providing water and sewer services, road maintenance, and emergency management to the community. For more than thirty years, the forestry sector was the backbone of Valemount's economy, but a combination of socio-political changes, notably driven by the drastic decline in the United States housing market, resulted in the withdrawal from the sector over the last decades and in the closure of the local sawmill in 2006 (Edenhoffer et al., 2013). Today, the economy of Valemount is largely based on accommodation and food services, retail trade, construction, and health care and social assistance (Statistics Canada, 2021). In recent years, the establishment of the Valemount Community Forest (VCF) – a long-term, area-based tenure granted to Indigenous and/or local communities – has also enhanced local manufacturing of wood products, contributing to the diversification of the community's economy (Valemount Community Forest, 2023). At the time this research was being undertaken, the community was facing significant housing challenges brought by the Trans Mountain Expansion Project, which is a significant infrastructure initiative consisting of the construction of a new oil pipeline system between Strathcona County (near Edmonton), Alberta, and Burnaby, BC (Transmountain, 2024). This project has led to a shortage of skilled labour and disrupted local services (The Rocky Mountain Goat, 2022). Its construction was completed in 2023 and two of the camp communities that provided accommodations to workers are now closed (Transmountain, 2023). The community is connected to the rest of the province through the Yellowhead Highway 5 and the Canada National Railway track (Fig. 1). It relies heavily on wood-burning stoves for heating during winter, and due to its geography, wood smoke pollution is prevalent in the community. As a result, Valemount ranks among the areas with the poorest winter air quality in BC (Village of Valemount, 2021).

The landscape of Valemount is characterised by its unique location between the Rocky Mountains, the Monashee Mountains, and the Cariboo Mountains. Elevations range from 720 to 3,500 m above sea level (MASL) and the topography varies from broad alluvial plains fans and river plains at lower elevations to steep rocky valley cliff slopes and glaciers in high mountainous areas. There are four different biogeoclimatic zones in the area, including Interior Cedar (Hemlock), Engleman Spruce (Subalpine Fir), Sub-Boreal Spruce, and Alpine Tundra (Meidinger and Pojar, 1991). The climate is continental and strongly influenced by the topography of the area. At lower elevations, average monthly temperature range from 16ºC in July to -7ºC in December; the total annual precipitation is 428 mm, with the highest

rainfall in July ($\bar{x}$=55 mm) and highest snowfall in January ($\bar{x}$=45 cm) (Government of Canada, 2023). In higher elevations, the climate becomes wetter and cooler, where the total annual precipitation is 665 mm, and the highest snowfall is in January with an average of 117.5 cm (Columbia Basin Rural Development Institute, 2021). Climate change is projected to increase both annual average temperatures and precipitation and reduce the number of total frost days across the region over the next century (Climate Data Canada, 2023). Recent changes to climate and weather patterns have resulted in the expansion of bark beetle populations throughout the region, causing widespread mortality of mature lodgepole pines from 2002 to 2012 (Meidinger and Pojar, 1991; Ministry of Forests Lands and Natural Resource Operations, 2013).

Based on historical wildfire data from 1917 to 2023, there were only small, scattered wildfires near Valemount since it was established in the first half of the 20th century (Fig. 1). Reflecting broader trends across the Robson Valley, both the frequency and size of wildfires in Valemount have steadily declined over time, with half of the total ignitions caused by humans while the other half were caused by lighting. However, human activities have caused the majority of wildfires in the first half of the 20th century, arguably to expand the community and the forestry sector; in recent decades, lighting has caused most of the recorded wildfires. In the last decade, only two wildfires that burned 100 ha in total ignited in the area near Valemount (within 10 km); none had imminently threatened the community. According to official records, no wildfire evacuation orders and alerts were issued for the community. Despite this, the threat of wildfire in Valemount has been rated as medium to high by BC's Wildfire Service due to its proximity to highly flammable vegetation and structure density (BC Wildfire Service, 2021). This risk is similarly increasing with climate change, which is leading to a warmer and drier landscape and to a subsequent increase in extreme fire-conducive weather conditions (Columbia Basin Climate Source, 2021; Parisien et al., 2023). Furthermore, the cumulative impacts of insect outbreaks, human land-use practices (e.g., tourism, logging, urban development), and decades of successful fire exclusion, combined with the suppression of Indigenous cultural burning practices, has led to an increase in the likelihood of large, high-intensity wildfires across BC (Parisien et al., 2023). Indigenous fire practices have been widely used in this region of Western Canada since time immemorial (including within Simpcw First Nation territory) to support a diverse range of cultural purposes (Parminter et al, 2023). However, since the creation of the Ministry of Forests in 1912, colonial governments in BC (despite resistance from Indigenous

communities) have systematically suppressed and excluded fire from the landscape, resulting in a dangerous accumulation of fuels, increased wildfire risk, and diminished forest resilience in Valemount and across the province (Copes-Gerbitz et al., 2022b).

We have selected the village of Valemount as our case study location for several reasons: 1) the research team had already established relationships with community partners in the Robson Valley through previous research projects in the region, which facilitated the data collection process (Whitehead, 2023); 2) the village is primarily non-Indigenous, allowing us to focus on a demographic that has been generally underrepresented in wildfire studies; and 3) compared to other regions in British Columbia, the area surrounding Valemount has historically experienced smaller and less frequent wildfire events (BC Wildfire Service, 2021). Together, these factors made Valemount a suitable site for examining localized wildfire risk and community resilience in a rural, non-Indigenous context – an area that increasingly requires more focused research (Johnston et al., 2020).

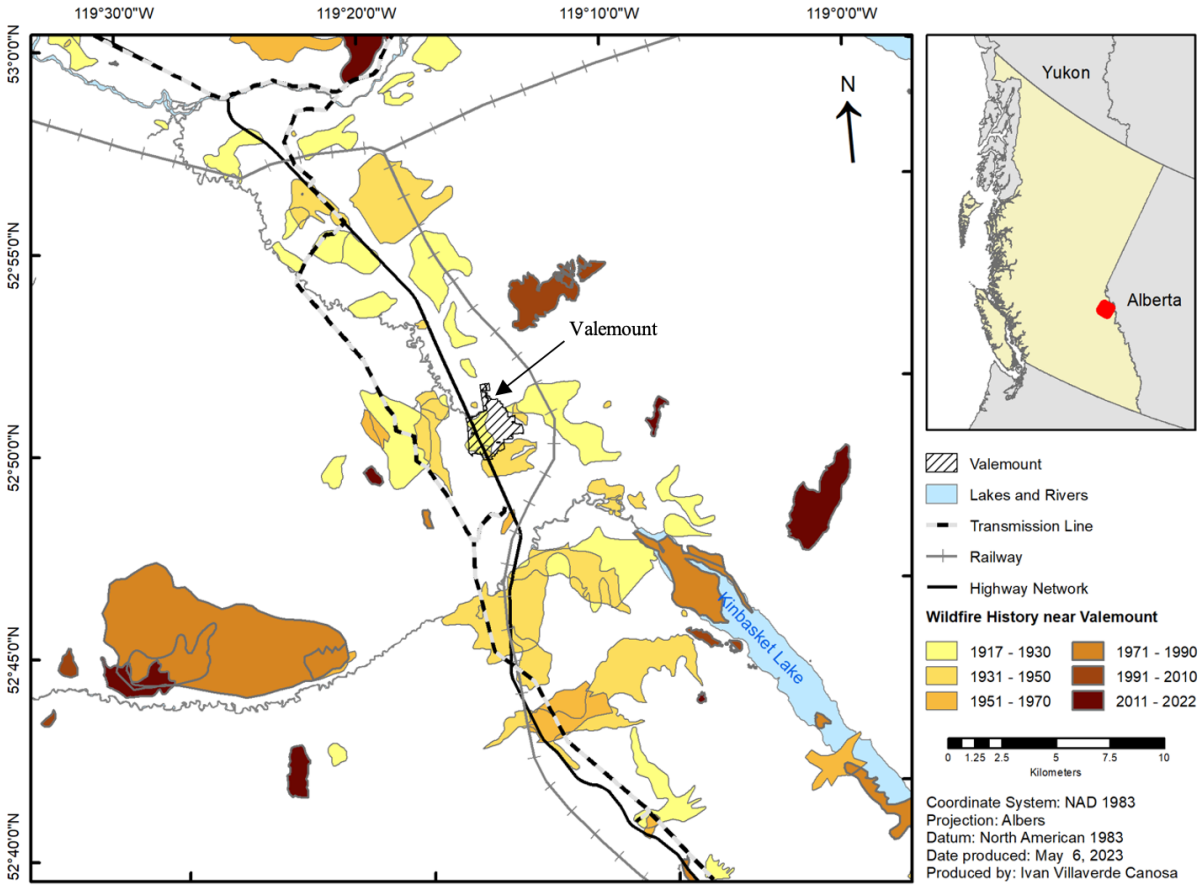

Fig. 1. Map of Valemount, BC. Graduated color scheme represents different fire years, with the darkest brown representing fires that have occurred since 2011. Fire perimeter data is from the BC Wildfire Service (https://catalogue.data.gov.bc.ca/dataset/fire-perimeters-

196 historical). Additional data layers, including the highway network, lakes and rivers, railway,
197 and transmission lines, are from the BC Data Catalogue (https://catalogue.data.gov.bc.ca)
198
199 *2.b. Conceptual framework*
200 We use the integrated risk-resilience framework of Canosa et al (2024) to identify and
201 characterize how wildfires are experienced, understood, and responded to at community
202 level. The framework conceptualizes *risk* as a function of hazard, exposure, social and
203 contextual vulnerability, and *resilience* as a function of coping, adaptive, and transformative
204 capacities (see Table 1 for definitions). The framework integrates the concepts of risk and
205 resilience into the disaster risk reduction cycle to better understand the human-fire-climate
206 interdependencies and interactions over different spatial and temporal scales; each of these
207 concepts were previously conceptualized and applied separately, overlooking critical
208 opportunities to strengthen response strategies and limiting the understanding of long-term
209 systemic drivers. The framework was developed based on scholarship aimed at reducing
210 vulnerability, enhancing resilience, and managing risks associated with climate and
211 environmental hazards, including research in disaster risk reduction, wildfire social science
212 and ecology, and climate change adaptation. By embedding risk and resilience into the
213 disaster risk reduction cycle, the framework helps explain why communities are at risk, how
214 they prepare for, cope with, and respond to wildfires, and how past wildfire experiences
215 shape future preparedness.

216 Table 1. Key terms used in Canosa et al's framework.

Terms	**Description**	**References**
Risk	Potential for adverse consequences for human or ecological systems. It results from the dynamic interactions between hazard, exposure, and vulnerability of the affected system. It can also result from responses not achieving the intended objective(s), or from potential trade-offs or negative side-effects.	(Simpson et al., 2021; Begum et al., 2022)
Resilience	Describes the capacity of individuals, communities, and systems to respond in the face of stress and shocks. It is a function of the combined result of coping, adaptive, and transformative capacities, which in turn lead to persistence, incremental adjustments, or	(Brown, 2015; Ford et al., 2020)

	transformational responses in the face of environmental change	
Hazard	Occurrence of natural or human-induced (wildfire) events that may have adverse or beneficial effects on a system, including, amongst others, loss of life, injury, loss of infrastructure, or increased habitat regeneration.	(Field et al., 2012; Pachauri et al., 2014)
Exposure	Presence of people, livelihoods, species or ecosystems, environmental services and resources, infrastructure, or economic, social, or cultural assets in places where hazard events (i.e. wildfires) may occur.	(Meybeck et al., 2019; Masson-Delmotte et al., 2021)
Vulnerability	The propensity or predisposition to be adversely affected by a hazard. It is a component of risk and is based upon a system's sensitivity or susceptibility to harm and lack of capacity to cope.	(Gallopín, 2006; UNISDR, 2015)

217

218 *2.c. Data collection*

219 We conducted semi-structured interviews (n=20) with key informants to collect
220 qualitative data on community risk and resilience to wildfires. Interviews were based on one
221 questionnaire (see supplementary materials) to ensure that major topic areas were covered
222 and to increase the consistency across interviews. The questionnaire was comprised of both
223 closed and open choice questions to allow participants to elaborate on the issues that they
224 viewed as most important. The interviewer (i.e., the lead author) used this questionnaire as an
225 interview guide to verbally pose questions to the participants. It inquired about the
226 participant's biographical data; perceptions of wildfire risk; perceived changes in wildfire
227 activity; experienced impacts; levels of support and preferences for current wildfire
228 management approaches; barriers and facilitators to respond to wildfires; and compound
229 impacts on wildfire risk and resilience. Each inquiry category formed an initial list of seven
230 deductive codes that were later used for content analysis (see data analysis section). The
231 questionnaire and its categories were developed by the research team and structured based on
232 the key concepts and assumptions of the conceptual framework.

233 A combination of purposive and snowball sampling techniques was used to select
234 participants (Gill, 2020). Key informants with previous knowledge or experience on wildfire
235 management in the community were selected to participate; our purposive sample included

local government officials, foresters and land managers, business owners, and private-sector fire practitioners. These informants were then asked to recommend other participants. While the majority of informants were from or working in the study site, several interviews were also completed with relevant experts from Vancouver and Vernon (two cities in the same province). These interviews were conducted to gain a deeper understanding on the topics identified through local informants. Additionally, we interviewed individuals affiliated with or employed by the Simpcw First Nation, who historically occupied the Valemount/Tête Jaune Cache area until their forced relocation to Chu Chua (200 km south of Valemount) in 1916 (Simpcw First Nation, 2024). The Simpcw First Nation holds timber interests, hunting territories, and significant cultural values in the Robson Valley. The lead author purposively selected multiple informants with different socioeconomic backgrounds and roles to avoid recruiting like-minded people. All interviews were conducted by the same researcher in English and were audio recorded.

Fieldwork in Valemount was carried out in September – October 2022. During this time, sixteen face-to-face interviews were conducted with key informants in the community. From October to December 2022, four additional interviews were conducted online; the interviews typically lasted between 30 minutes and an hour and a half. This study prioritized the equal inclusion of different groups to ensure that a variety of contexts and roles was represented (Table 2). Informed oral or written consent was obtained from all participants, and study protocols were approved by the University of Leeds (AREA 21-166).

Table 2. Summary of participants.

Participant's affiliation	**Valemount**	**Simpcw First Nation**	**Province**
Local government officials and emergency coordinators	6 (4 males; 2 female) Lived in Valemount for an average of 42 years	1 (1 male; 0 female) Residence outside of Valemount	0
Foresters and land managers	2 (1 male, 1 female) Lived in Valemount for an average of 42 years	1* (1 male; 0 female) Residence outside of Valemount	0
Business managers	4 (1 male; 3 females)	0	0

	Lived in Valemount for an average of 22 years		
Private-sector fire practitioners	1 (1 male; 0 female) Lived In Valemount for 37 years	0	0
Community organizations	2 (1 male; 1 female) Lived in Valemount for an average of 30 years	1* (1 female) Residence outside of Valemount	0
Experts	0	0	2 (2 males; 0 female) Residence outside of Valemount

**These participants do not represent the official views of the Simpcw First Nation.*

2.d. Data analysis

Audio recordings from each interview were transcribed and analyzed by the lead author using both manifest (explicit) and latent (implicit) content analysis (Berg, 2001; Bengtsson, 2016). Responses were initially coded according to the predefined categories included in the questionnaire, capturing both direct content, such as property damage and management strategies, and implicit meaning derived from tone and narrative style. The process for categorizing participants' responses was guided by the conceptual framework, which provided theoretical definitions, contextual understanding, and criteria for determining when a response related to a specific category. While the coding process initially started deductively, an inductive approach was also used to identify emerging themes, refine existing categories, and develop new ones. For example, when analyzing responses related to wildfire impacts, we conducted an inductive analysis to identify recurring patterns within that category (e.g., health impacts, forestry damage), remaining alert to the emergence of additional categories that consistently appeared in participants' responses. This combined approach ultimately enhanced understanding of participants' perceptions of wildfire risk and resilience. All transcripts were analyzed using NVivo 11, and selected quotations were lightly edited for clarity without changing their meaning. The research team collaboratively reviewed the findings and interpretations, which were then shared with participants for validation. Each participant was contacted after the interview and again after the selection of quotations, with the opportunity to provide feedback, clarification, or corrections. No participants requested changes or submitted additional comments.

3. Results

3.a. Exposure: perceptions of risk and changes in wildfire activity

When asked about the risks facing Valemount, wildfires were perceived as one of the most urgent issues by interview participants, alongside wood burning, silica dust, train derailment, landslides, avalanches, labour shortages, and lack of housing. Many local participants attributed the increased risk of wildfires to the age and type of forest surrounding Valemount, the proximity of the train line and community infrastructure (including recreation and tourism areas) to flammable vegetation, the mountain pine beetle, and the higher ignition potential due to an influx of tourists and pipeline workers in nearby forests. Weather-related factors (such as heat waves, dry lightning, droughts, etc.) were not consistently mentioned in these discussions, although some participants acknowledged the role of the region's geography and climate, as well as prevailing winds from Kinbasket Lake, in exacerbating wildfire risk. Other less frequently discussed factors included the natural role of fire in the landscape. Interestingly, the natural role of fire in the landscape was only considered to affect the exposure of the community by local foresters, land managers, and one elected official. As one male forester participant indicated:

"It happens every year. Wildfire at this latitude in the boreal or montane forest type are a permanent part of the forest, right? It's an evolved part of the ecosystem. There's a fire within several kilometres of town every single year. The question is whether or not it will grow to become anything significant."

In addition to explaining why the village is at risk, participants also discussed how fuel treatments (i.e., prescribed burns, selective cutting and ladder fuel removal) that have been recently conducted by Valemount's Community Forest have aided in reducing the village's exposure to wildfire. These treatments were considered beneficial in reducing the fuels around the community by most participants, regardless of their profession, gender, and socioeconomic background, although some participants highlighted that more prevention work was needed (see section 'Resilience'). Other wildfire prevention initiatives that were discussed during interviews included FireSmart™ initiatives – a national program that helps Canadians increase neighbourhood resilience to wildfire (FireSmart, 2023) – which were seen by local elected officials and emergency coordinators as an effective tool to educate the public about the risks of wildfire. These initiatives primarily involved sharing tips on how to

FireSmart your property through the local newspaper and the village council's website. As one male emergency coordinator indicated:

"Education is a big key too [referring to FireSmart™]. I've seen proof of it in the fire service. When I started 25 years ago, probably 90% of our calls were structured chimney fires, and through education and in only a decade, we've got that down to probably maybe 10% of our calls. So, you know, as people get educated then they start thinking about these things."

Furthermore, many participants, but not all, perceived changes in wildfire activity in the last 30 years, particularly in the frequency and severity of wildfires. Increased aridity, climate-related changes (specifically increased temperatures and less frequent precipitation), and fuel build-up due to fire suppression activities were commonly reported by participants at both local and provincial levels. Participants who did not perceive any change explained that this was due to either not having witnessed wildfires in the area or recognizing the annual variability between seasons. One male participant that was not certain about seeing an increase in wildfire activity in the region attributed this to the media's role in communicating wildfire events.

"I don't know if there's actually an increase or if we just hear about it more because of the ability to share news. You know, your news feed, you know, what you search on Google, what I search, is going to give us both different feeds. So, I don't know. I can't say for certain that there's more fires, but it appears like there is, for sure. I mean, if you don't get the numbers from 15 years ago to now, there seems like there's definitely a lot more fire, but whether it's a fact or not like… I'd have to look into it more for sure. Seems like there's bigger ones, if there's not more, there're definitely bigger."

Despite diverging perceptions, many participants recognized the inevitably of wildfire in the landscape and considered that living in the region meant living alongside wildfires. As one emergency service coordinator described:

"People live here because there is mountains and trees, so I don't think you can get rid of all the risks. We're always going to be in the fire interface here. That's the reasons for being for this town."

3.b. Vulnerability: community strengths and weaknesses

For many participants, the egress of the community – that is, the means by which people can exit a location in the event of an emergency – featured prominently in discussions about

the vulnerability of the community. However, responses varied considerably here, particularly between local decision-makers, emergency coordinators, and foresters and land managers; notably, there were no discernible patterns solely based on gender or socioeconomic background. On the one hand, emergency coordinators viewed having only two ways of leaving the village (either north towards Tête Jaune Cache or south towards Kamloops) as an important factor increasing the vulnerability of the village. This factor was also mentioned by the two experts that were consulted at the provincial level, who recognized the difficulties that communities with one road in and out face, for example, when issuing evacuation alerts and orders. As one male expert explained:

"Some of these communities can be remote, and so […] vulnerabilities around one road in one road out. And that at times can certainly impact when alerts and orders are issued. For example, if there's any risk in the route, having to be closed or… that certainly impacts the speed in which the evacuation orders are given for obvious reasons."

Contrarily, one male elected official disagreed with this view and discussed how Valemount's local airstrip could be used to facilitate a potential evacuation of the community in the event of a wildfire. Similarly, another male participant directly involved with forestry discussed how Valemount's immediate access to the Kinbasket Reservoir would facilitate any evacuation effort issued for the village.

"But even there (referring to the egress of the community), […] we have 3 highways into this valley. There are towns up north which are dead end and we have an airport, so the military will be flying in groceries, right? So yeah, and that doesn't even include the lake. If we have to barge up a bunch of stuff from Revelstoke… So I'm not […] sensationally concerned."

In addition to the egress, the village's limited power infrastructure was recognized as increasing its vulnerability to wildfires, particularly to the indirect impacts of wildfires. Participants explained that because most of their power is delivered via a single transmission line that comes from the city of Kamloops, wildfires in-between these places can result in power outages and disrupt the energy supply to the community. As one female business owner commented:

"Part of our concerns are any major fire that happened between Kamloops and here. We're at the end of a 320-kilometer-long extension cord, so anything happens at that end, it takes out our power."

Another male elected official cited:

"It's not just locally impacts, but regionally, as we're at the end of a 320-kilometer extension cord called the transmission line, and so a fire anywhere between here and Kamloops, nearer, around, in proximity to electrical infrastructure means power goes out there."

Wildfire-caused power outages were identified by many local participants of all genders, including male and female elected officials, emergency coordinators, business owners, and members affiliated with community organizations, as a growing concern. Given that a significant number of residents rely on freezers to store food, participants acknowledged that any disruption to the community's power supply can lead to food degradation, thereby worsening food security. Additionally, participants recognized that many administrative buildings rely on out-of-community power, acknowledging that any power disruptions negatively impact essential community services, including emergency response. As one male elected official explained when asked about the potential impacts of power outages:

"Depending on the time of year, that means food degradation. It might mean things like this building [referring to the municipal building] doesn't have backup power; it's also our emergency operations centre."

Interestingly, only one male participant affiliated with a community organization acknowledged that vulnerability to wildfire-caused power outages varies between groups. He explained that many residents are not significantly reliant on external power to obtain food, and therefore can survive for extended periods of time, contrasting with people whose lifestyle relies more on store-bought products:

"As we do raise our own chickens, we raise our own beef, I have large gardens every summer, own cold storage room… We are in a position because of our lifestyle where we can go weeks on end without a trip to the grocery store. If there's no grocery store open because there's no power, and there's no coolers and stuff like that, we can survive quite a long time on our own because where we get our food from. Somebody in this village not the same scenario at all, right? So, I mean, there's not that many people that I know that live in Valemount that have, you know, an extensive supply of food. It's convenience to go to the grocery store, and when you need something, go get it. But I mean, I'm sure everybody will last for a week or two, but beyond that, I don't think there would be a lot of people in the village that would."

In a few occasions participants recognized the challenges that certain individuals, some with pre-existing health problems, face during wildfires. Business owners, elected officials, and emergency services coordinators from both Valemount and the Simpcw First Nation explained why some residents were more vulnerable than others. Elders, young children, and individuals with lung problems featured prominently in their interviews, with participants worrying about the impacts of wildfires on them. A lack of critical health facilities, fully insulated houses, and air conditioning, and limited financial resources were some of the underlying determinants identified by participants as increasing the sensitivity of these groups to the impacts of wildfires, particularly in relation to evacuation orders and smoke events. As one female business owner cited:

"In Valemount, we don't have the care facility, so we don't have the in-house resident patients, but we do have the seniors, what do we do for them? And we rely on volunteers to get them out, because not all of them have families… […] And yes, they are in town, but they are much vulnerable population, so their anxiety around the what-ifs… I can hop in my truck and leave."

Although many discussions focused on the sensitivity of the village to wildfire, participants also spoke about its strengths. For instance, a local elected official, an emergency coordinator, and a forest manager discussed the role of the Trans Mountain extension project in relation to the village's wildfire preparedness and response. Although some recognized the negative impacts that the project caused on the local housing market, many participants acknowledged the unique opportunity that the project offered and spoke about how Trans Mountain's resources (e.g., equipment, personnel) could be used to improve the response of the village in the event of a potential wildfire event. As a male elected official explained:

"I would see [the expansion project] as a positive aspect to have all of those kind of workers in the area, right, because they could help and assist during the emergency."

Similarly, participants from both Valemount and the Simpcw First Nation identified strong village networks and the presence of community members with deep local knowledge and expertise as notable strengths. Village networks were identified to facilitate the sharing of knowledge, food, and equipment (i.e., freezers) between residents during emergency times, while local knowledge and expertise included the presence of loggers within the community, with many recognising this as a key component of coping capacity. As one local male emergency coordinator explained:

438 “We are fortunate here though, in that this was a logging town, so there are quite a few
439 fire contractors here that are quite familiar with fire and how to deal with it right away. And a
440 lot of them don’t even wait for the authorities to ask them.”

441 For these participants, familiarity with local infrastructure, geographical features, and
442 wildfires constituted critical aspects for enhancing the capacity to deal with wildfire events,
443 mostly by foresters and emergency coordinators.

444 *3.c. Hazard: impacts and lived experiences of wildfires*

445 The impacts of distant wildfires were described by almost all local participants, regardless
446 of their affiliation, gender, or socioeconomic background. Most descriptions related to the
447 McLure wildfire, which burned near the community of Barriere almost 280 km south of
448 Valemount in 2003, and the impacts that it had on the community’s power and fuel supply.
449 One female participant described:

450 “In 2003, there was the fire in Barriere that took out the power transmission line, and this
451 full corridor was affected for four weeks, with no power, you know. It was a dry season and
452 lots of lighting. Everybody was on edge. Where do we go? You’ve got no access to fuel.
453 You’ve got three towns over who has no access to fuel. Everybody is on the highway”

454 Several local participants also spoke about how dense smoke over the last few years was
455 affecting the village's economy and well-being. They noted significant reduction in visibility
456 because of wildfires burning in other parts of BC and even the United States. They worried
457 that prolonged exposure to smoke and reduced visibility would reduce the natural appeal of
458 the village and negatively impact the tourism sector in the future. This perception featured
459 prominently in discussions with female business owners and some local elected officials
460 (both male and female).

461 “The smoke alone in the past three or four years has had negative impacts. One could say
462 if this keeps happening every summer, right, we may lose the type of summer tourism appeal,
463 right, because it's no longer a nice experience. We had one summer… I forget which year…
464 four or five years ago, for 2-3 weeks you could not see a mountain peak, so why would
465 somebody travel through the area, right? That's all what we can really offer: it’s the beautiful
466 landscape, but if it's covered by smoke…”

467 Some local participants also described the impacts that smoke was having on their
468 physical activity and well-being, including reduced time outdoors and physical symptoms
469 such as difficulty to breath. These participants recognized, however, that health and well-

being impacts from smoke pollution were present all-year-round because of the community's woodstove burning during winter, which led some to admit that they were already used to living in a poor air quality environment; this was the most common sentiment among all the local participants when discussing the impacts of wildfire smoke. One female involved with the Indigenous community and one male expert also recognized the mental health impacts of wildfires: they noted the emotional and psychological toll that the last few wildfire seasons had on communities, explaining how they were a source of uncertainty, anxiety, and stress:

"We had a pretty bad wildfire season last summer [referring to the 2021 wildfire season], right? It was pretty horrible. […] What it does psychologically to a community and to the province shouldn't be underlined because living on edge like that for that length of time is stressful. It has a serious impact on the community and on mental health […]. I don't know how to articulate it better than that, but I think that the impacts of those seasons and seeing all of that and witnessing and being in the middle of those kinds of summer, those kinds of moments, are hard. […] The stress of every day, worrying about the animals, and worrying about all these other components. Again, not very articulate but something that, you know, two months of that, three months of that, it's very wearying on a person and the community."

Some participants also recognized the effects that distant wildfires have had on the village's response capacity. A local male emergency coordinator and an expert explained how wildfires in other regions of BC have led to the relocation of critical wildfire personnel, reducing the amount of resources available to respond to wildfires within the community. The local emergency coordinator illustrated this while discussing the involvement of local wildfire personnel in responding to the 2003 Barriere wildfire:

"Several of us from the Structural Fire Department went to work on that [referring to the 2003 Barriere wildfire], and there were even some logging contractors from here that went to work on that. So that took resources out of Valemount, right, to work somewhere else, and that increases the risk to Valemount itself, because now we have even fewer resources left, right?" […] Quite often, our forest firefighters can end up getting sent to other areas through the summer, firefighting, and we're left without it, because I think as a whole our risk might be high here but our incidents are low compared to other jurisdictions"

Although participants mostly focused on indirect impacts of wildfire, some foresters, land managers, and business owners of all genders and socioeconomic backgrounds also talked about the direct impacts of wildfires on local logging operations. Most mentioned impacts

were caused by the Hugh Allen wildfire, which burned in 2018 at the shores of the Kinbasket Lake 60 km southeast of Valemount. This wildfire caused significant damage to forestry equipment, soil condition, forest resources and revenues. One local female business owner explained:

"I think it was 2018, there was a fire on the east side of Kinbasket lake in Valemount, and it was a 5000 ha and there was an active logging operation going on. They lost all of their equipment; they lost all the revenue they would've gotten from logs that they got out (...) on the land… You have wildlife impacts… A friend had a trapper's cabin there; he lost that… like it was massive. And the (…) equipment alone, we're talking over a million dollars, and that's someone's livelihood."

These participants also mentioned the destruction of trapping cabins and holiday trailers nearby the community but there was little recognition of the cascading impacts of wildfire (e.g., landslides, flooding) among the participants.

3.d. Resilience: responses, barriers, and proposed solutions

Many participants, particularly local elected officials and emergency service coordinators, highlighted responses targeted at addressing the indirect impacts of wildfires. The purchase and use of generators in public buildings were mentioned by several participants – both female and male – as a key measure that was adopted to cope with power outages. They recognized the importance of using generators to allow local officials to continue providing services such as water supply and sewage treatment to the community in the event of a wildfire. Other participants, also referred to the use of generators but in relation to the residences' food supply. They attributed the purchase and use of generators to the impacts of the 2003 Barriere wildfire on Valemount's food security. As one local female business owner mentioned:

"After that [referring to the 2003 wildfires], we did purchase a generator. Now we have a couple, so that we can plug in fridges."

Participants explained how generators played a critical role in powering freezers and storing food during wildfire-caused power outages; these freezers were regularly shared with neighbours to support the community's response to emergencies.

Many participants that mentioned the use of generators also highlighted the importance of other critical infrastructure in coping with the indirect impacts of wildfires. These included nearby Independent Power Producers (IPPs) or non-utility generators (NUG), which could

generate enough power for parts of the community. However, their shortcomings were also recognized:

"We do have the ability for backup with the independent power producers, but you know, that takes time and depends on the time of year too, whether there's good water flow to generate enough."

Participants also spoke about the use of advisories and alerts to help cope with the indirect impacts of wildfire smoke. Some of them cited using an app to monitor the air quality whenever it becomes smoky: they would use it to decide whether they would personally avoid engaging in any outdoor activities or remain indoors. However, the participants predominantly focused on the limitations of the alerts rather than on their benefits. One female participant from Valemount explained:

"They [referring to the alerts] come to me through my phone. I think it's an app now. They usually get them though my weather app I think, yeah. But I mean, they are not that useful to be honest. They usually don't come until it's been smoky for three days, so by then you are like 'yeah, I know.'."

Another male participant from Valemount shared a similar sentiment:

"I'm not really sure what the alerts are for to be honest, because when they kick in, it's so obvious. It's smoky already."

Delays in reporting on air quality were attributed to the lack of a weather station within the community. One local male elected official explained that because of this, and despite the presence of small stations within the community, their air quality index had to be based on the data from the community of McBride 80 km from Valemount, therefore resulting in inappropriate smoke advisories and burning recommendations for Valemount. This led to some interviewees to mention that many results will say that the air quality is clear, when the community disagrees.

Despite the above-mentioned shortcomings, most local participants accepted smoke as a reality – a consequence of wildfires that cannot be changed or controlled where they live. This stoic acceptance of smoke was particularly common among local decision makers, female business owners, and members involved with community organizations. They all acknowledged the lack of specific plans and strategies to cope with wildfire smoke. They nevertheless mentioned closing windows and remaining indoors as the main to respond to

degraded air quality, although some also recognized the limited effectiveness of these actions: For example, as one male emergency coordinator cited:

"We just continue on. You know, the little old lady might stay home, but you know, they're still breathing the same air as we are. It's not like we have ultra-airtight houses here. Nobody can afford that around here."

Concerns about how the community responds to wildfire smoke were also raised by one expert that were consulted at the provincial level who indicated that "closing your window is not an option" and highlighted the lack of proper air conditioning as a contributing factor inhibiting communities' coping capacity. But most local participants did not see further alternatives for reducing the impacts of degraded air quality. Solutions were proposed by only two participants, both elected officials, who saw the need to (1) implement localized and accurate smoke monitoring and (2) create shelters to host people when air quality is considerably degraded.

Some local participants, both Indigenous and non-Indigenous, also referred to the resiliency of the community to the direct impacts of wildfires. Local emergency coordinators, elected officials, business owners, and community organization representatives highlighted the emergency operations centre (EOC), the local emergency plan, the proximity to the Robson Valley Fire Zone base, and the adoption of FireSmart™ educational and awareness campaigns in the community. The rationale for why these measures were adopted was not considered by most participants; only one of them representing the First Nation indicated that they have started an Indigenous initial attack crew, which is a specialized team trained to respond rapidly to wildfires at their earliest stages, as a response to the impacts of the 2021 wildfire season. This participant, however, noted that the Indigenous crew would only respond to a wildfire near the Simpcw community of Chu Chua and not Valemount, as it lies outside the crew's designated response area. Participants nevertheless explained how the implementation of these measures improved the preparedness to the direct impacts of potential future wildfires, by allowing them, for instance, to establish evacuation routes and send evacuation notices. As one local emergency coordinator indicated when asked about the preparedness of the community:

"We have a plan in place. We haven't had to have a huge emergency, like obviously the one I'm thinking of is where everybody went to Prince George, right? We haven't had that kind of an emergency, but we have the plans in place."

Another local female participant from Valemount mentioned:

"We have a fire base right in town. We have an initial attack crew […] who could go to a fire within minutes if there was one close. And there is also a helicopter base right out of town."

Participants recognized that socio-political factors limit progress in improving resilience to wildfires. Both Indigenous and non-Indigenous participants, irrespective of gender or socioeconomic background, indicated a lack of resources at the community level as a major barrier to action, which included both financial and human constraints. Financial barriers primarily revolved around the municipality's inability to implement additional wildfire prevention practices and programs, including FireSmart™, and the purchase of additional infrastructure. Human barriers included a lack of personnel dedicated to wildfire prevention and response, as well as challenges in recruiting and retaining individuals for positions related to wildfires. As one local female official discussed:

"Municipalities don't have money to send people, you know. I mean, maybe they'd be funded for handout booklets or something, but to go and offer to do an assessment… We don't have the funds to do that as far as I know. And so, there may be more if, you know, I mean, if they go around and see that there's somebody has firewood banked up against the house, you know, maybe rather than singling them out, they could, you know, say we're in your neighbourhood and we noticed or, you know, this type of thing."

Similarly, one local emergency coordinator shared:

"I think the big point here is that if it's anything beyond, you know, like a small fire, we're evacuating anyway. We just don't have the resources within our town to manage a big fire. So, once it gets beyond a certain level, we're leaving, and we're asking people to leave, not asking them, we're telling them that they need to leave so. […] The fire department itself has a capacity to protect 10 homes, I think […]. So, we have pumps and sprinklers and all that kind of stuff on the trailer to be able to protect up to 10 homes. There's, you know, considerably more than that within the interface, especially on the east side."

Another barrier that emerged in interviews included a lack of readily accessible information during wildfire events, which was highlighted mostly by female business owners and by one of the experts. In the words of one local female business owner:

"Nowhere […] do they have visible, readily available signage or updates. They have these emergency centres… Oh, you can go talk to the mayor at the community hall – nobody

knew that. The tourist passing through town or checking out the hotels, they didn't know that. The community members didn't know that. You know, sure, they talk about their handful of volunteer firemen and have them go knocking on doors, saying: "are you okay?". We are asking ten, twenty people to canvass an entire neighbourhood? […] They are not telling the information out to people, and so by the time we have to act, we'd be a little to late. […] So, I don't think that they are communicating out to the public clearly enough, because if something was to happen, the residents would have to act quickly, and it's more than someone driving town, every street, with a bullhorn saying "evacuate, evacuate"."

This concern was in stark contrast with what some local elected officials spoke about during interviews. They recognized the use social media or other institutional sites to promote multiple wildfire prevention measures to the village but cited a lack of education and awareness of community members as limiting the adoption of measures, including FireSmart™. When asked about the level of preparedness of Valemount, one local emergency coordinator explained:

"Well, we put out lots of information. Whether they read it or not, whether they go… I find, personally, I find people to be a bit complacent in that they think that local government is going to take care of it, which we, I mean, we do, we have that obligation, but people also need to be prepared as well, and we try to put it out as much as we can. We put it on our web page. We put it in the paper. We have training sessions. We put it out there and whether people… I guess there's no way of knowing if they're taking it on, you know, unless you went house to house and ask them."

Some participants attributed this to how priorities and concerns shift throughout the year, particularly during winter. As one male elected official cited:

"I know some people are very aware, you know, and probably more so depending on the season and how our weather is like. You know, with an extended hot spell, I mean, people start thinking about it a little more."

Several participants mentioned the difficulties in involving community members in wildfire response. Particularly local foresters, land managers, private-sector fire practitioners, and business owners of all genders and socioeconomic backgrounds expressed frustration with how wildfire management shifted from a community-based approach to a more regulated and bureaucratic wildfire fighting. Additional training requirements, increased regulations to use heavy equipment, and stricter safety regulations were cited as regulatory

and policy barriers. Many participants also recognized the critical role that local knowledge and expertise play at the time of wildfire prevention and response, yet regretted the lack of significant local involvement that currently exists in wildfire management practices. As one local private fire contractor explained when discussing wildfire response in the province:

"There is a massive resentment in the private industry in BC with how much money spent on – not just out-of-province – but even out-of-country resources. Because you have like loggers, many of whom were even on fire crews when they were younger, sitting there [watching wildfires burn], thinking like 'What the hell'?"

Reflecting on all of these challenges, participants suggested several actions that could be adopted to reduce wildfire risk and improve wildfire response. Almost all participants mentioned the need to: 1) increase the uptake of FireSmart™ measures and initiatives at the village level, either through increased funding, personnel, or improved education and community outreach efforts; 2) expand the use prescribed and cultural burning practices, selective logging, and tree thinning to remove fuel around the community; 3) transition to year-round employment of firefighting staff rather than seasonal positions; and 4) create a unified command structure involving the province, the Regional District, the municipality, and the Simpcw First Nation. Some participants also recommended the adoption of backup power plans for every new gas station and fuel distribution centre within the community to stabilise its power system, as well as create emergency boards and marquees to disseminate crucial updates and instructions to ensure residents are well-informed during wildfires.

4. Discussion

Our research showed that although Valemount faces a growing direct threat from wildfires, participants were more concerned about its indirect impacts, particularly those related to power outages and air pollution. This concern, largely shaped by past wildfire experiences, reliance on regionally managed power infrastructure, limited local agency, and a cultural acceptance of smoke as inevitable, led the community to adopt various measures such as using generators and increasing reliance on smoke advisories and alerts. While these strategies have helped Valemount manage recent wildfire events, participants acknowledged that they remain insufficient, noting that wildfire management continues to be constrained by challenges including limited financial assistance and declining community involvement in response efforts. Together, these findings contribute to a growing body of literature by illustrating how indirect wildfire impacts can cascade across regions, how communities are

adapting to these effects, and the challenges they face, reinforcing calls for enhanced cross-boundary cooperation among local councils, utility companies, Indigenous councils, and provincial governments (Ager et al., 2018; Nowell et al., 2022; Hamilton et al., 2023). Particularly, the research complements earlier studies on the teleconnected nature of risk, where vulnerabilities extend beyond geographic boundaries and are linked across scales through economic markets and flows of resources, people, and information (Adger et al., 2009; Eakin et al., 2009). While research exploring these dynamics is increasing, empirical studies documenting them have generally remained limited (Thomas et al., 2022).

Using Canosa et al.'s conceptual framework (2024) in this research proved to be a particularly valuable tool for examining the teleconnected nature of risk and for guiding our findings in Valemount. As this was the first empirical application of the framework to a case study, it clearly demonstrated its potential to investigate risk and resilience across multiple timelines, including the periods before, during, and after a wildfire, while also capturing the direct, indirect, and cascading impacts of such events. Most existing studies on wildfire risk and resilience have addressed these dimensions separately and at fixed points in time, limiting the practical value of their findings for stakeholders (Naylor et al., 2020). By applying the framework, however, we were able to characterize both the smoke-related and power outage impacts on Valemount and connect each of these to specific resilience-building elements, which would have been overlooked if we had not considered the dynamics playing out at greater scales and in other locations. For example, the presence of strong community networks played a critical role in reducing the effects of wildfire-related power outages, offering a potential focus point to strengthen Valemount's ability to respond to future wildfire-related power outages. Our framework makes it possible to identify and address specific vulnerabilities in relation to particular impacts and responses, ultimately supporting a more integrated and context-sensitive understanding of wildfire resilience.

Before contextualizing each finding, it is important to acknowledge that the sampling procedures and methods used in our study may have produced different results if applied to other socioeconomic groups or settings, such as different communities, regions, or countries. Our research primarily focused on participants in decision-making roles, whose responses were likely shaped by their institutional environments, including specific responsibilities and levels of government influence. Including members of the general public might have led to different conclusions, as their experiences and perceptions of wildfire risk often differ from

725 those in positions of power. Risk and resilience are fundamentally a social construct shaped
726 by the dynamic interplay of sociocultural, political, and economic factors that vary across
727 places and communities (McCaffrey et al., 2015). Furthermore, risk and resilience are time-
728 sensitive; our findings might have differed if the study had been conducted after the 2023
729 wildfire season in British Columbia. Informal consultations with individuals from both the
730 Regional District and the Village of Valemount, conducted after the completion of this
731 research, revealed that the wildfire seasons of 2023 and 2024 prompted several key
732 developments: the formation of an Emergency Planning Working Group, the awarding of a
733 grant for a community wildfire resilience plan, and the hiring of a FireSmart™ coordinator to
734 enhance public education efforts. Future research should revisit wildfire risk and resilience in
735 Valemount to assess how the 2023/2024 fire season influenced the community's experiences
736 and to examine how perceptions of risk and resilience evolve over time. Despite these
737 complexities, our findings still provide important insights that are relevant for other
738 communities and for the broader climate change adaptation and disaster risk reduction
739 efforts.

740 *4.a. Teleconnected wildfire risk: power outages*

741 One of our key findings is that Valemount's dependency on regionally managed
742 infrastructure has rendered it highly susceptible to power outages caused by distant wildfires.
743 Participants recognized that the community is highly reliant on this infrastructure and that
744 any disruption to the power supply challenges the ability of its members to store food and
745 benefit from essential services. Research elsewhere has identified rural, under-resourced
746 communities, and certain social groups, including those using electricity-dependent medical
747 equipment, as particularly sensitive to power outages (Andresen et al., 2023; Do et al., 2023).
748 It has also recognized how climate-related impacts, including wildfire, can disrupt critical
749 junctures in infrastructure systems (also known as "chokepoints") and lead to systematic
750 consequences along them, such as reduced route accessibility and interrupted flows of
751 commodities (Bailey and Wellesley, 2017; Pearce et al., 2020; Debortoli et al., 2023). Few
752 studies have, however, evaluated how power outages impact communities in a wildfire
753 context, and the understanding of the impacts of wildfires on the provincial electrical system
754 has generally been limited in BC and Canada more broadly (Pearce et al., 2020; Clark and
755 Kanduth, 2021). Therefore, our results contribute to the literature on power outages and
756 corroborate that communities with 1) limited power infrastructure and 2) food systems

dependent on electrical power are vulnerable to wildfire-caused power outages. They also highlight that strong sense of community and mutual support are key to address the impacts of power outages, both factors that are well known in the wildfire, climate change adaptation (CCA), and disaster risk reduction (DRR) literature (McCaffrey, 2015; Fletcher et al., 2020).

The finding that generators are used to address power outages is also noteworthy. Interviewees reported the purchasing generators to power key buildings to provide essential services, and freezers to ensure food safety during power outages. While this finding corroborates that hazards can open a window of opportunity to build resilience (Labossière and McGee, 2017), it also raises concerns about the long-term viability of using generators to address power outages. Prior research has shown that use of backup generators can result in carbon monoxide (CO) poisoning, with children and people with limited English proficiency facing greater risk exposure and health impacts (Klinger et al., 2014; Andresen et al., 2023). Backup generators also have high operating costs and are susceptible to both fuel shortages from road closures and volatile fuel prices, which can pose challenges for low-income people (Canada Energy Regulator, 2018). Embracing community-scale renewable energy projects (geothermal, wind, and solar) could help reduce dependency on the provincial electrical grid and mitigate the adverse impacts of wildfire-related outages (Daley, 2016; de Coninck et al., 2018). Utility companies and policymakers could also enhance and redesign critical electrical infrastructure to ensure functionality during wildfires, for example by using microgrids or increasing network redundancy by connecting Valemount's power grid to Prince George (Yang et al., 2022; Whitehead, 2023, Mullen, 2023). This solution could complement existing wildfire mitigation actions (e.g., prescribed burns, thinning, etc.) and reduce the impacts of geographically distant wildfires on communities.

4.b. Teleconnected wildfire risk: smoke pollution

The findings also provide insights into how communities experience, prepare for, and respond to wildfire-related smoke events. Our research revealed that recent smoke events have significantly reduced visibility around the community and are a growing concern for our interview participants because of the long-term impacts that repeated smoke events can have on the local tourism sector, and the physical and mental well-being of individuals. These findings echo the results of earlier research elsewhere, which has reported negative impacts of wildfire smoke on both the economy and public health (Haider et al., 2019; McGee and

788 Healey, 2022; Garbis et al., 2023). These impacts highlight the need to further improve public
789 health preparedness to wildfire-related smoke events (Webster, 2023).

790 Our study found that most participants were not actively preparing for wildfire smoke
791 events because of their lack of perceived agency and cultural acceptance of smoke as a fact of
792 life. While these barriers have been found in earlier research (D'Antoni et al., 2017; Hamilton
793 et al., 2018; Santana et al., 2021), evidence of the factors influencing smoke-related
794 behaviours has remained limited in Canada. Our research thus offers important insights for
795 governance processes at both provincial and national levels to help decision-makers develop
796 smoke-related strategies. For instance, our participants acknowledged the need to improve the
797 community's data monitoring infrastructure so they can obtain locally relevant, timely,
798 accurate, and reliable information about smoke, which is known to facilitate local decision
799 making (Steelman and McCaffrey, 2013; Maguet, 2018; Maguet, 2019). Some participants
800 also recognized that smoke advisories and alerts were of limited use, questioning the
801 effectiveness of current provincial and national systems – an issue that has been documented
802 since the 1990s (Stieb et al., 1996). These shortcomings demonstrate that more needs to be
803 done to empower communities and better prepare them for future wildfire smoke events
804 (D'Evelyn et al., 2023).

805 *4.c. Building resilience to the direct impacts of wildfire*

806 While the indirect impacts of wildfire featured prominently in our interviews, our results
807 also provide information on the sources of risk and resilience to the direct impacts of wildfire.
808 Participants recognized the immediate threat that wildfires pose to the community and
809 reported adoption of several initiatives to address it. These initiatives, such as the use of roof
810 sprinklers or the development of a community wildfire plan, have been adopted by many
811 communities across BC (Labossière and McGee, 2017). But the initiatives implemented by
812 the Community Forest are particularly noteworthy and demonstrates the leading role that
813 these organizations play in proactively managing wildfires (Labossière and McGee, 2017;
814 Devisscher et al., 2021). These initiatives, which included prescribed burns and selective
815 cutting, were considered effective for managing the risk of wildfires, both now and in the
816 future. This finding aligns with one of the few studies from British Columbia that also
817 reported these practices to be effective and broadly supported by communities, underscoring
818 the critical role of Community Forests in advancing proactive wildfire management across
819 scales in BC (Copes-Gerbitz et al., 2022a).

FireSmart™ education and awareness campaigns were also identified as important initiatives during our interviews. However, both local elected officials and emergency coordinators noted that despite ongoing efforts to disseminate information through the local newspaper and the village's official website, limited public awareness continued to impede the adoption of FireSmart™ practices throughout the village. Although this study did not examine the general public's views on the incentives and barriers to adopting FireSmart™, research from other parts of Canada has reported similarly low levels of uptake. Commonly identified barriers include financial constraints and a low perception of wildfire risk (Asfaw et al., 2022; Ergibi et al., 2020). These challenges were also observed in other areas of the broader Valemount region, where Whitehead et al. (2023) found that a lack of trust in wildfire practitioners, particularly in rural parts of the Robson Valley, posed a significant obstacle to the implementation of FireSmart™ measures. Further research is therefore needed to gain a clearer understanding of how community members in Valemount perceive FireSmart™ and to identify the main factors influencing its adoption. Until such research is conducted, however, our findings suggest a continued need to improve how information related to FireSmart™ is communicated to residents and address existing barriers. One promising approach may be the appointment by the Village of a trusted local FireSmart™ representative who can develop strong relationships within the village and act as a liaison between residents and policymakers. This strategy has already demonstrated potential in promoting the adoption of FireSmart™ practices in other communities across the region (Whitehead et al., 2023).

Our research also revealed several socio-political barriers that limit community engagement with proactive wildfire approaches in Valemount. Participants reported that they are unable to implement additional wildfire prevention practices and programs (including FireSmart™) and purchase additional infrastructure because of limited funds. They also highlighted difficulties in recruiting and retaining people dedicated for wildfire issues and felt there was a significant lack of local involvement in wildfire response – an aspect that, while not strictly proactive, can hinder the future implementation of measures such as prescribed burning and forest thinning (Platt et al., 2022). Similar challenges have been reported in other studies from BC, Canada, and North America, where researchers consistently found that rural areas like Valemount face greater challenges than urban centers, largely because the latter typically have better access to financial resources, stronger communication networks, and more effective firefighting services (Trainor et al., 2009; Paveglio et al., 2015; Copes-Gerbitz

et al., 2022a; Morris J. Wosk Centre for Dialogue, 2023). Our findings reinforce that financial, social, and policy barriers remain major obstacles for many rural communities in North America, and support calls to address them to help communities minimize the impacts of future wildfires, particularly in the face of increasing climate-driven changes (Dickson-Hoyle et al., 2024). B.C.'s new Emergency and Disaster Management Act (2023) offers some promise in addressing some of these challenges and helping to mitigate the impacts of wildfires at the community level. However, it remains to be seen whether this legislation will meaningfully shape how rural communities experience wildfires across the province, and more importantly, whether it can effectively respond to the specific challenges identified in this research. Future work should explore these questions and empirically evaluate the outcomes of the new legislative framework on the ground.

5. Conclusion

Through key informant interviews we have examined how the village of Valemount, BC experiences and responds to wildfire. Our research revealed that wildfires not only create an immediate safety threat to lives and livelihoods, but also pose important cascading risks. Our results evidenced how a village with limited power infrastructure and grid-dependency is highly susceptible to power outages caused by distant wildfires, and revealed important financial and social, and policy barriers limiting local engagement in proactive wildfire management. We indicate why the use of generators is inadequate to cope with power outages and explored potential ways for improving community preparedness to the indirect impacts of wildfire. The research also highlights how cultural attitudes associated with people's lifestyles and perceived lack of control influence decisions to prepare and respond to wildfire smoke. We demonstrate that cooperation across jurisdictions and organizations is critical to collectively address wildfire risk and manage the indirect impacts of wildfires, including power outages and smoke. While this research introduces findings from one village in BC, we believe that the insights presented throughout this study have relevance to localities that have similar structures and characteristics. Future research is necessary to develop more insights into the cascading, indirect implications of wildfires in different settings, and explore how these are shaped by social and environmental factors. This research would help develop more concrete understandings of how wildfires impact communities across jurisdictions and better inform policies that would help communities co-exist with wildfire and other natural hazards.

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Data Availability Statement.

Due to privacy and ethical concerns, neither the data nor the source of the data can be made available.

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