Integrating Indigenous-Led Recovery in BC Wildfire Management

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Abstract

Over the past ten years, British Columbia has experienced increasingly severe wildfires due to climate change factors such as warmer-than-average temperatures, decreased snowpack, and low soil moisture. While Canadian emergency management practices are highly regarded, there exists a critical gap in integrating local Indigenous knowledge into wildfire recovery strategies. Indigenous communities in BC have long practiced land stewardship and fire management through traditional ecological knowledge (TEK), providing profound understanding of sustainable wildfire mitigation and recovery. However, centralized management structures and limited partnerships with Indigenous groups impede the adoption of these practices into mainstream disaster risk reduction. This capstone research paper examines how emergency management in BC can incorporate Indigenous knowledge to enhance their wildfire recovery strategies. By employing a pragmatic research approach, the study employs a qualitative, secondary research methodology analyzing case studies, policy documents, and expert insights from Indigenous-led fire management initiatives in BC, Australia, and North America to identify adaptable and culturally respectful solutions that foster long-term resilience and sustainability. The key findings reveal systemic challenges such as worldview conflicts, governance fragmentation, and a lack of Indigenous-authored literature. On the contrary, successful models like Australia's WALFA project and the Tsilhqot'in Fire Management Program demonstrate effective collaborations. Further, the recommendations include co-governance frameworks, legislative reforms, and Indigenous-led research initiatives. Thus, by centering Indigenous sovereignty and knowledge, this research advocates for a paradigm shift from suppression to stewardship, fostering resilience and reconciliation.

Keywords: Indigenous knowledge, wildfire recovery, British Columbia, cultural burning, co-governance

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Introduction

In the span of last ten years, it is evident how British Columbia has been detrimentally affected by wildfires majorly due to warmer-than-average temperatures, decreased levels of snowpack and low soil moisture indicating signs of climate change. Copes-Gerbitz et al. (2022a, p. 3) for their article for *Frontiers in Forests and Global Change,* highlight the devastating impact of wildfires in British Columbia between 1998 and 2021, noting that they "forced the evacuation of over 125,000 people, burned over 5.7 million hectares, and cost more than $5 billion (CAD; adjusted for inflation to 2020) in direct suppression alone". The wildfire seasons of 2017, 2018, and 2021 were particularly destructive, causing lasting environmental and social impacts (Abbott & Chapman, 2018, as cited in, Copes-Gerbitz et al., 2022b). These extreme fires typically occur on the hottest, driest, and windiest days, making them difficult to control (Hanes et al., 2019; Wang et al., 2017, 2023). The impact of climate change has made these conditions more frequent, as seen during BC's severe 2023 wildfire season.

The Canadian emergency management system is regarded as highly effective, assuming their integration of advanced technology and adherence to internationally recognized best practices in disaster mitigation and suppression. However, there still remains significant scope to promote and integrate local indigenous knowledge into wildfire recovery strategies, considering the impact wildfires have on the large number of Indigenous and First Nation groups in British Columbia. Historically, the colonial mindset and policies has sidelined Indigenous fire stewardship, leading to a decline in traditional practices that once were crucial in managing fire adapted landscapes (Christianson, 2015, p. 191). Since the inception of the *Bush Fire Act* in 1874, British Columbia became the first Canadian province to criminalize the cultural burning practices and levied fines against the Indigenous practitioners of traditional fire stewardship (Government of British Columbia, 2022). Further, Christianson (2015) notes that this colonial policy framework not only marginalized Indigenous fire

stewardship but also reshaped the society's notions of fire, framing it solely as a destructive force rather than a regenerative tool (p. 191).

However, lately, the researchers in North America and around the world agree that Indigenous knowledge plays a crucial role in managing wildfires sustainably and highlight that the modern fire management often overlooks traditional methods like regenerative burning and seasonal fire cycles (Christianson et al., 2022, p. 258). Even Nikolakis and Roberts (2022, p. 2) mention about "a paradigm shift" that is happening towards proactive, localized methods like controlled burns and thinning out vegetation. The colonial approach of solely suppressing fires has shown its limits in areas prone to wildfires because, although the total global area burned has decreased over the past twenty years, there have been more instances of highly destructive fires recently (Nikolakis and Roberts, 2022, p. 2). Hence, integration of Indigenous knowledge with Western techniques can immensely contribute to disaster risk reduction methodologies as Indigenous communities, who have historically practiced land stewardship and fire management through Traditional Ecological Knowledge (TEK), offer valuable insights into sustainable wildfire mitigation and recovery.

Although there are many potential benefits of incorporating Indigenous-led wildfire recovery into mainstream emergency management, there still remains a gap due to BC's centralized wildfire governance structure which has historically concentrated the decision-making authority in federal or provincial government agencies, consequently limiting collaboration with Indigenous communities (Nikolakis and Roberts, 2022, p. 3). This lack of integration hampers efforts to create effective, sustainable disaster risk reduction strategies. Therefore, the research problem centers on the need to increase integration of Indigenous knowledge into BC's emergency management system to enhance Disaster Risk Reduction and support Indigenous-led wildfire recovery strategies.

The central research question guiding this study is – "How can emergency management in British Columbia support and integrate Indigenous knowledge to enhance wildfire recovery strategies?"

To address this overarching question, the research explores the following sub-questions:

- How Indigenous knowledge and practices in BC are relevant to wildfire management and recovery?
- What are the barriers in implementing the Indigenous knowledge and practices in BC's wildfire management?
- What best practices from global Indigenous-government collaborations (e.g., North America, Australia) can be applied to BC?

This study adopts a pragmatic research approach, emphasizing practical, adaptable, and culturally respectful solutions. It examines the colonial perspective on Indigenous fire management, the challenges in integrating Indigenous knowledge and practices into BC's wildfire management, and successful Indigenous-led fire management strategies and policy collaborations in BC and internationally, particularly in Australia and North America. Therefore, by analyzing case studies, policy documents, and expert insights, the research aims to promote long-term resilience and sustainability and supports the growing effort of advocating for Indigenous leadership in disaster management. It explores practical ways to include Indigenous knowledge in BC's emergency response system and offers recommendations for policymakers, emergency planners, and Indigenous communities.

Literature Review

Several themes emerged from the analysis of the literature providing insight on the indigenous fire management, traditional ecological knowledge (TEK), and ways to integrate Indigenous and Western scientific approaches in wildfire resilience and environmental management in Canada, USA and Australia. The key themes include but are not limited to, the transition from colonial to inclusive fire governance, the role of indigenous knowledge in fire and disaster management, challenges in implementing indigenous-led governance and necessity for proactive and adaptive fire management.

Transition from Colonial to Inclusive Fire Governance

Some of the selected articles emphasize the historical evolution of fire governance in British Columbia, particularly the shift from colonial, reactive policies to more inclusive, proactive approaches that incorporate Indigenous knowledge. For instance, Copes-Gerbitz et al. (2022b) outline five phases of fire governance in BC, emphasizing a major shift since 2017 towards a model of "coexisting with fire." Similarly, Daniels et al. (2024) reinforce this idea, arguing that fire governance must evolve toward Indigenous-led wildfire stewardship. Again, Copes-Gerbitz et al. (2023) in their other article titled- '*The contribution of Indigenous stewardship to a historical mixed-severity fire regime in British Columbia, Canada*', provide historical evidence showing that Indigenous fire stewardship previously played a critical role in managing BC's forests, but was disrupted by colonial fire suppression policies.

The Role of Traditional Ecological Indicators in Fire and Disaster Management

Another major theme is the recognition of the Traditional Ecological Indicators, such as seasonal changes, animal migrations, and blooming of plants, which are deeply rooted in Indigenous fire management practices. The understanding of such indicators can contribute in disaster risk reduction, particularly in fire management. Christianson et al. (2022, p. 263) in their article titled, "*Centering Indigenous Voices: The Role of Fire in the Boreal Forest of North America*" describe how Indigenous communities in the boreal forest region use these indicators to determine the best times for controlled burns, reducing fuel loads and preventing high-severity wildfires. While citing Henry Lewis's 1984 study and Theresa Ferguson's studies in the 1970s on fire use by the Dene and Woodland Cree in northern Alberta, Christianson et al. (2022, p. 262-263) highlight how these communities were highly knowledgeable about seasonality, timing, fuel conditions, relative humidity, wind, other general weather conditions, slope steepness, and natural fire breaks as they related to burning. For instance, the meadow burning with low-intensity burns every few years was best conducted in the spring season while the snow still covered the forest edge.

Armatas et al. (2016, p. 16) in their article for the journal, *Ecology and Society,* argue that traditional phenological knowledge (TPK) offers valuable insights into adaptive management for climate and can be integrated with the prescribed fire, similar to indigenous burning, which can maintain species abundance and habitat diversity at a community scale. Similarly, Eisenberg et al. (2019) provide empirical evidence from Waterton Lakes National Park, Alberta, showing that prescribed burning informed by Indigenous ecological indicators contribute to greater ecosystem resilience by diminishing the number of invasive species in the area contributing to climate change (p. 5).

Challenges in Implementing Indigenous-Led Governance

Although integrating indigenous fire management into modern wildfire strategies have benefits, the concept faces major barriers. The practical and institutional challenges are discussed by Nikolakis and Roberts (2022, p. 6) in their article titled, "*Wildfire Governance in a Changing World: Insights for Policy Learning and Policy Transfer*", as they point out that wildfire governance in BC is fragmented among federal, provincial, local, and Indigenous governments, making it difficult to collaborate due to such power dynamics. Likewise, Copes-Gerbitz et al. (2022b), Nikolakis and Roberts (2022, p. 7) and Christianson, A. (2015, p. 191) acknowledge that while government policies now recognize Indigenous perspectives, implementation remains slow due to bureaucratic barriers, including colonial policies of European settlers that historically criminalized and prohibited Indigenous burning practices as fires were considered destructive to the timber supply and dangerous to communities, leading to the loss of critical knowledge.

Moreover, with respect to accreditation and training, Hoffman et al. (2022, p. 472) emphasize the fact that Canada does not have ample applied wildfire science programs at all educational levels and none of them adequately addresses 'cultural burning'. They also present the view of Indigenous Peoples who reject the need for certification from colonial institutions to fulfill their traditional fire stewardship roles. Hoffman et al. further illustrates this problem with the case of British Columbia where the

provincial wildfire management agency certifies burn bosses but restricts eligibility to its own personnel. Such policies indicate how the government authorities maintain their authority by restricting certification processes instead of aiming to foster Indigenous leadership in wildfire management.

Similarly, Armatas et al. (2016, p. 16) talks about the implantation challenges of adaptive fire management including institutional and legal constraints that leads to reluctant and timid decision-making, insufficient collaboration between scientists, stakeholders, and policymakers, as well as limited financial resources and time for proper execution. Lastly, observing the Aboriginal fire techniques in Kakadu National Park, Australia, Mazzocchi et al. (2018, p. 29) reminds about the philosophical and practical barriers that must be addressed to ensure successful intercultural collaboration.

Need for Proactive and Adaptive Fire Management

Collectively, these studies argue that fire management should be proactive and informed by both scientific and Indigenous approaches to reduce risks and enhance ecological resilience. Daniels et al. (2024) emphasize that BC must transition toward a paradigm of coexisting with wildfire, rather than attempting to eliminate it. To achieve this, Daniels et al. (2024, p. 13) in their article for *Canadian Journal for Forest Research*, outlined six strategies aiming to transform wildfire management in British Columbia by shifting from reactive suppression approaches to proactive and sustainable approaches that enhance community resilience and ecosystem's health. The six strategies include, diversified wildfire management and indigenous fire stewardship, enhancing local capacity for wildfire response and mitigation, proactive wildfire risk reduction at multiple scales, ecosystem-based landscape fire management, transforming wildfire governance and strengthening partnerships and expanding expertise, education, and capacity building.

Also, Copes-Gerbitz et al. (2023) show that Indigenous fire stewardship historically maintained ecological balance and reduced wildfire severity. Similarly, Nikolakis and Roberts (2022, p. 7) discusses

about the “wildfire paradox,” in which the fire suppression approaches have led to more destructive outcome. Nikolakis and Roberts also highlighted how the “wildfire paradox” brings awareness:

> This “wildfire paradox,” where fire suppression has led to more destructive wildfires, brings awareness to the fact that Indigenous peoples across North America (and in many parts of the world) burned the landscape at strategic times and for a variety of purposes, like reducing dead biomass and promoting new vegetation growth (Lepofsky & Lertzman, 2008). These practices created good grazing for ungulates, promoted hunting and gathering, cleaned the landscape, and reduced wild fire risk (Clarkson et al., 2017; Lake & Christianson, 2019; Lewis et al., 2018; Mistry et al., 2016; Yibarbuk et al., 2001).

Lastly, Armatas et al. (2016, p. 16) suggest that adaptive management strategies incorporating Indigenous knowledge can help communities respond more effectively to changing climate and wildfire patterns.

Research Design and Methodology

This research employed a qualitative research approach by examining secondary research methods. The primary techniques include- literature review of academic publications, government reports, and policy documents along with case study analysis of successful collaborations between Indigenous communities and government agencies in emergency management in North America and Australia.

The rationale behind opting for a qualitative approach is that it allows for a deeper understanding of Indigenous perspectives, which are often underrepresented in statistical data. Further, analyzing international case studies ensures that the lessons are systematically reviewed and contextualized for wildfire-prone areas of BC. Further, since it is secondary research, it eliminates major ethical concerns linked with primary data collection. However, during the course of this research, careful consideration was be given to the respectful representation of Indigenous knowledge and practices.

Moving on, the research for the relevant literature commenced by searching the following key terms and their synonyms like- "Indigenous knowledge" AND "wildfire management", "Traditional ecological knowledge" AND "indigenous wildfire response" and "Cultural burning" AND "fire stewardship".

Since these searches produced a large number of results, so to narrow the focus to the primary research question, additional filters and keywords were applied, such as "BC First Nations" AND "prescribed burning" AND "Canada", "Indigenous-led fire management" AND "wildfire resilience BC" and "Indigenous wildfire knowledge application" AND "BC wildfire management".

Searches were conducted using the JIBC Library system and Google Scholar, resulting in an initial pool of over 20,000 articles related to the research topic, on both the platforms. The search was then refined using inclusion and exclusion criteria.

The inclusion criteria focused on the articles published in the last 10 years (2014–2024) to ensure recent developments. These articles reflect upon Indigenous communities in British Columbia affected by wildfires, as well as emergency management professionals and government officials involved in wildfire management and recovery efforts. Second, the studies concentrated on Indigenous knowledge and wildfire management in North America and Australia, with particular emphasis on Canada and British Columbia. Third, the search was narrowed down to the peer-reviewed journal articles and case studies discussing cultural burning, application of Indigenous-led wildfire response, and BC's wildfire management frameworks. Lastly, studies employing qualitative, quantitative, or mixed-method approaches to analyze Indigenous fire stewardship and wildfire resilience were included.

The exclusion criteria eliminated the studies outside of North America and Australia. Next, the articles published before 2014 were ruled out, unless they were foundational to the topic. Lastly, removal of studies focusing more on climate change rather than indigenous-led wildfire management while scanning through the research titles.

The initial search returned approximately 21,000 results on Google Scholar and nearly 272 results on JIBC Library, which were further refined by adjusting keywords and applying inclusion/exclusion criteria mentioned in Table A2 in Appendix A. The refined research helped in narrowing down the focus on nearly 45 articles. From the 45 articles, 15–20 articles were selected for further review and analysis based on their abstract and relevance to the research question.

Moreover, to assess the reliability, accuracy, and validity of the sources used in this research, priority was given in selecting peer-reviewed journals such as the *International Journal of Wildland Fire*, *Ecology and Society*, *Canadian Journal of Forest Research*, and *Risk, Hazards & Crisis in Public Policy*, etc. Additionally, the research includes works authored by established scholars and practitioners relating to the fields of indigenous wildfire stewardship, environmental resilience, forest disturbance, climate change, and fire ecology.

Therefore, by applying the above criteria, efforts are made to ensure that the findings in the research are credible while being relevant to the research topic and problem.

Findings

The findings from the analysis of the selected articles and literature have identifies some common yet critical concerns which obstructs the integration of Indigenous knowledge into contemporary wildfire management:

Lack of Literature on Indigenous Knowledge

One of the recurring issue noticeable among the literature is the scarcity of documented Indigenous knowledge about the burning regimes. In their article titled, '*Opportunities to utilize traditional phenological knowledge to support adaptive management of social-ecological systems vulnerable to changes in climate and fire regimes*', Armatas et al. (2016) explores the Traditional Phenological Knowledge (TPK) and highlight that it is a relatively new term, and its documentation is

sparse in scholarly literature. They note that TPK is often provided in Indigenous stories, myths, and cultural practices, making it difficult to extract and analyze using Western scientific frameworks (p. 7).

Moreover, Nikolakis and Roberts (2020, p. 3) discuss how the majority of the available literature analyzed in their study by utilizing peer review and the use of the English language, are framed through a Western lens. This perspective often shapes the way research is conducted and presented, potentially marginalizing Indigenous knowledge and approaches.

Similarly, Christianson et al. (2015, p. 191) notices that even though 80% of Indigenous communities in Canada are located in wildfire-prone forested areas, there are significantly low number of social science studies and research on contemporary application of Indigenous wildfire approaches in Canada. This research gap is not only evident in Canada but also extends to the United States and Australia, where studies on Indigenous fire stewardship have remained limited since 2000.

However, Christianson et al. (2015, p. 194) also points out that this scarcity is not due to any disinterest but rather the ethical and logistic challenges the researchers face while conducting primary research with the Indigenous communities. They further mention that “many Indigenous communities have developed strict ethical guidelines for researchers who want to conduct research in their community because of a history of inappropriate and insensitive research being conducted ‘on’ Indigenous people (Smith 1999)”. Christianson et al. (2015) concludes that while these approaches can be time-consuming and resource-intensive for a researcher or government institutes, they are essential for building trust and ensuring that the research is culturally appropriate and beneficial to the community.

Worldview Conflicts between Indigenous and Western Knowledge

Another major challenge that hampers the integration of Indigenous knowledge into modern wildfire management is the underlying conflict between the Indigenous and Western worldviews. Many articles mention how the Western wildfire managers view their knowledge as superior as it follows a

scientific criterion and perceive Indigenous practices as ‘primitive’ or less scientific (Mazzocchi, 2018, p. 24).

Similarly, it has been observed that many colonial views have wrongly established Indigenous people being careless with fire, leaving campfires unattended or burning land recklessly. These misconceptions have been used to justify excluding Indigenous practices from modern fire management (Christianson et al., 2022, p. 263). Further, the Indigenous Ecological Knowledge (IEK) is frequently perceived as supplementary information rather than a legitimate and technical approach to fire management. This perception reinforces the marginalization of Indigenous fire practitioners, whose expertise is often dismissed in favor of agency-credentialed personnel (Hoffman et al., 2022, p. 466).

However, in reality the Indigenous knowledge is deeply connected to the land, culture, and spirituality. Indigenous communities see fire as a tool for maintaining balance in ecosystems, not just as a threat to be controlled. They use controlled burns to reduce wildfire risks, promote biodiversity and maintain healthy ecosystems by eliminating the invasive species. While discussing whether the 2017 Kenow wildfire in Waterton Lakes National Park, AB, can be described as "catastrophic," Eisenberg et al. (2019, p. 10) acknowledge that they may not necessarily be catastrophic from a plant community as prescribed burns can help maintain native plant communities adapted to the full range of fire effects. They further indicate that prescribed burns, combined with wildfire, can help sustain native grasses, particularly in landscapes prone to extreme fire, and that high-severity burns are necessary for effective grassland restoration.

Barriers to Implementation

The findings from Hoffman et al. (2022) research titled as “*The right to burn: barriers and opportunities for Indigenous-led fire stewardship in Canada*” revealed major significant barriers which comes in way of implementation of Indigenous fire stewardship in British Columbia and Canada. The first barrier deals with perceptions, authority and jurisdiction. The second barrier involves governance

and laws related to fire management processes due to which the Indigenous fire practitioners face a power imbalance their knowledge is seen less legitimate than that of government-certified personnel, leading to the exclusion of Indigenous voices in decision-making. The third barrier relates to accessing the necessary accreditation and training to conduct cultural burns. The fourth barrier talks about liabilities and insurance because in many regions of Canada, the cultural burning is considered to increase legal and financial risks due to historical and ongoing colonial policies. As a result of such one-dimensional policies, the Indigenous communities have often been criminalized, fined, and jailed for burning within their territories, creating a legacy of fear and mistrust. To avoid this, the Indigenous communities have to secure liability insurance to practice conducting cultural burns. Lastly, the fifth barrier deals with financial capacity and resources.

Global Best Practices

Another key finding from the research which covers one of the sub-questions related to research problem are the successful Indigenous-led fire management strategies learned from case studies from Australia and North America. For instance, Mazzocchi et al. (2018) cites Australia's 'Collaborative Fire Management Programs', where Indigenous fire stewardship reduced wildfire risks., hinting how BC could adapt similar co-governance models.

Another global example from northern Australia is provided by the research of Russell-Smith et al. (2013) which is about the 'community savanna-burning methodology', resulting out of a successful collaboration between multinational companies, Australian Government and the Aboriginal communities. The *West Arnhem Land Fire Abatement Project* (WALFA), launched in 2005, is an example of Indigenous-led fire management. Operating entirely on Aboriginal lands, the WALFA combines traditional Indigenous fire practices, like controlled burning early in the dry season, to prevent big wildfires, simultaneously, tracking down how much greenhouse gas is reduced. WALFA works as a

voluntary program but was able to secure a 17-year agreement with a multinational energy corporation and received formal endorsement from the Australian Government for its accounting methodology.

Within seven years of its inception, the project was able to reduce greenhouse gas emissions by 37.7% compared to the average emissions recorded in the past 10 years before the project started. In addition, the project also delivers social, biodiversity, and long-term biomass sequestration benefits. This project shows that when Indigenous knowledge is combined with Western science and strong partnerships, fire management can be more effective and sustainable. By learning from WALFA, British Columbia could to create similar programs, and harness the Indigenous knowledge of wildfire prevention efforts while also creating jobs and protecting nature.

Similar to Australia's WALFA project, Nikolakis and Roberts (2022, p. 13-15) talks about the Tsilhqot'in Fire Management (IFM) Pilot Program is a successful collaboration between the Yunesit'in and Xeni Gwet'in First Nations (members of the Tsilhqot'in National Government) and the Gathering Voices Society. This Pilot Program was Initiated after the devastating 2017 and 2018 wildfires, revitalizing traditional Indigenous fire practices to mitigate wildfire risk, like studying phenological indicators, such as the blooming of saskatoon berries, with modern fire management practices, resulting in a reduction of 40% high-severity fires in managed areas from 2018–2020. This program also helped in restoring ecosystems and addressing climate threats in the Cariboo-Chilcotin region of British Columbia.

The research by Butler and Goldstein (2010), discusses about the U.S. Fire Learning Network (FLN) has also played a key role in shaping specific fire management objectives, such as the establishment of prescribed burn targets. For example, in one forest management plan informed by the FLN, the objective was set to burn an average of 120,000 acres annually across all community types within the forest. Notably, the plan emphasized that one-third of these burns should occur during the growing season. This approach reflects a shift towards more proactive and ecologically informed fire management, aiming to restore fire-adapted ecosystems and reduce the risk of high-intensity wildfires.

By setting clear, science-based targets and incorporating seasonal burning strategies, the FLN demonstrates how collaborative networks can drive innovative and adaptive fire management practices. Therefore, British Columbia could adopt similar strategies, integrating Indigenous knowledge and seasonal burning practices to enhance ecosystem resilience and reduce wildfire risks.

Strengths and Weaknesses of Research

The strengths includes that the research successfully identified and analyzed a wide range of academic articles, providing basis for understanding the integration of Indigenous knowledge into wildfire management. The inclusion of case studies from North America and Australia added valuable global perspectives. The research effectively identified key barriers to integration which are critical for understanding the complexities of implementing Indigenous-led strategies in Western wildfire management.

As for the weaknesses, a major aspect was that the research primarily relied on academic and government sources, which may not fully represent the perspectives of Indigenous communities and possibly increasing the risk of portrayal of traditional Indigenous knowledge from a Western lens. Even the analysis of the literature review suggested about the underrepresentation of Indigenous-authored research in this cause.

The use of peer-reviewed journals and case studies provided credible and relevant data. The inclusion of recent studies (2014–2024) worked well for the research as it ensured that the research was up-to-date with current trends and developments in wildfire management. However, the reliance on secondary data limited the depth of the research. Additionally, the exclusion of literature focusing on climate change to narrow the focus, may have omitted valuable insights into how Indigenous fire management practices impact climate change. Thus, future research should prioritize the inclusion of Indigenous voices, ensuring that their perspectives are central to the study and not just a tool within the Western research framework. In future a more detailed discussion on ethical research practices,

including engagement of Indigenous communities and their consent, should be conducted to ensure that the research is culturally appropriate and beneficial to Indigenous communities.

Discussion

The results highlight both the potential and the challenges of integrating Indigenous knowledge into contemporary wildfire management in British Columbia. By synthesizing the results, several original insights and conclusions emerge, offering a pathway for more inclusive and effective wildfire recovery strategies.

Reconceptualizing Fire Management: From Suppression to Stewardship

The Indigenous communities consider fire sacred due to its life-giving force (Christianson et al.,2022). They believe that fire can “clean” the land and later that land is used to promote agricultural and subsistence practices However, after colonialization, the European settlers’ government criminalized and prohibited Indigenous burning practices as they considered that fires were destructive to the timber supply and dangerous to communities. The settler government and the Europeans were skeptical about the ‘carefree’ burning practices of the Indigenous communities and instead invested in fire suppression which causes more harm to the forests by allowing fuel loads (vegetation or dead organic matter) to accumulate, resulting in wildfire. Hoffman et al. (2022) discusses how nearly a century of fire suppression and timber-focused forest management has led to the accumulation of flammable fuels in the forest area, making it difficult for economically struggling Indigenous communities to re-engage in cultural burning (p. 475). Based on the results, it is important to note that the Indigenous knowledge works and is effective, but it is often ignored or misunderstood because it doesn’t fit into the Western standards of scientific knowledge. Overcoming this barrier is the key to create better, more inclusive wildfire management strategies.

The BC wildfire management should embrace the Indigenous worldview by adopting practices such as Traditional Phenological Knowledge (TPK) and Indigenous Ecological Knowledge (IEK) which

utilizes seasonal indicators from the environment to mitigate destructive wildfires. This insight directly addresses the first sub-question by identifying the specific Indigenous practices relevant to BC, such as cultural burning and phenological indicators, and emphasizing their potential to enhance wildfire recovery and resilience.

Addressing Barriers by Policy & Governance Reforms

The research resulted in the identification of significant barriers to implementing Indigenous knowledge in BC's wildfire management, including worldview conflicts, governance issues, and systemic marginalization. Moving forward, policy reforms must acknowledge Indigenous rights to self-determination in land and fire management. British Columbia, for instance, could establish legal frameworks that recognize Indigenous-led burning as an authorized and protected practice, reducing bureaucratic and legal obstacles. Co-management models, where Indigenous fire practitioners hold equal authority alongside government agencies, should be developed to ensure that Indigenous leadership is embedded within wildfire governance structures (Hoffman et al. 2022, p. 472).

Learning from Global Best Practices: A Path Forward for British Columbia

The case studies from Australia's West Arnhem Land Fire Abatement Project (WALFA) and the Tsilhqot'in Fire Management Pilot Program provide powerful examples of how Indigenous-led fire stewardship can be successfully implemented. A key takeaway is that long-term collaboration, financial investment, and mutual respect between Indigenous communities, government agencies, and private stakeholders are necessary for sustainable wildfire management.

Bridging the Knowledge Gap

One of the most crucial findings of this research is the lack of extensive academic documentation on Indigenous fire knowledge. This highlights a critical need for decolonizing research methodologies to ensure that Indigenous perspectives are not only included but also lead the discourse. Moreover, future research must prioritize Indigenous-authored scholarship and direct engagement with

Indigenous fire practitioners as this traditional knowledge is not just an alternative for Western sciences but is time-tested, ecological solution that is essential in the face of increasing wildfire risks due to climate change.

Current Efforts to Integrate Indigenous Knowledge

The BC government has recently taken steps to recognize and support cultural burning through initiatives such as the *Cultural and Prescribed Fire Program*, which partners with Indigenous communities and the First Nations Emergency Services Society (FNESS) to revitalize traditional fire practices (BC Wildfire Service, 2022). Cultural burning, as described by the BC Wildfire Service, is a traditional land management practice that has been used by Indigenous peoples for millennia. It serves multiple purposes, including ecological restoration, wildlife habitat enhancement, and the promotion of traditional foods and medicinal plants (BC Wildfire Service, 2022). Similarly, a significant milestone in 2024 was the inaugural of *Kootenay ?a-kinguku Prescribed Fire Training Exchange* (TREX), co-hosted with the Ktunaxa Nation's ?aqam community and the FNESS. This program trained 33 practitioners across 13 agencies, emphasizing Indigenous-led fire management and cross-cultural knowledge sharing (Government of British Columbia, 2024, p. 8). Later, to address wildfire risk and to combine community safety goals with hands-on training, the Moir Park Prescribed Burn in Cranbrook utilized TREX participants (p. 10). Additionally, in 2024, 23 of 48 projects of each of B.C.'s six regional Fire Centres were delivered with First Nations, and 21 burn plans were co-developed, reflecting growing partnerships (Government of Canada, 2024, p. 11).

George Campbell, a Wildfire Technician and member of the Lytton First Nation, emphasizes that cultural burning is not just about fuel reduction but about enhancing the landscape and reconnecting with cultural heritage (BC Wildfire Service, 2022). Campbell describes when he participated in cultural burns aimed at increasing habitat for elk, whose numbers were dwindling in the area. After burning 80 hectares, the forest rejuvenated, grasses grew back, and the elk population increased (BC Wildfire

Service, 2022). This example demonstrates the ecological benefits of cultural burning and its potential to restore ecosystems while supporting wildlife.

However, the challenges remain, including the need to address historical barriers, such as the *Bush Fire Act* of 1874, which criminalized cultural burning and contributed to the loss of traditional fire keeping knowledge (BC Wildfire Service, 2022). Moving forward, it is essential for the BC government to further build on these initiatives by fostering partnerships between Indigenous communities, government agencies, and academic institutions to create a more inclusive and effective wildfire management framework.

Recommendations

The study reveals substantial gaps in disaster resilience and wildfire management, particularly concerning the erasure of Indigenous fire stewardship from academic, policy, and operational frameworks. To address these gaps, the BC Wildfire Services and the Government of BC should consider the following recommendations:

Expanding Indigenous-Led Fire Management Initiatives

Nikolakis and Roberts (2022) observes that Indigenous Fire Management (IMF) is being advocated as a method to restore fire to the landscape and rightly mentions that “IFM mitigates destructive wildfire by bringing the right fire, to the right place at the right time" (p. 2). Unlike the Western suppression-centric or reactive approaches, IMF prioritize landscape resilience through low-intensity burns that mimic natural fire cycles, reducing the likelihood of catastrophic wildfires (BC Wildfire Service, 2022).

Therefore, to yield the benefits of proactive fire and decentralized fire management, the BC government should continue to support initiatives like the *Cultural and Prescribed Fire Program* and should expand TREX programs, which builds partnership with Indigenous communities to revitalize traditional fire practices (BC Wildfire Service, 2022 and Government of British Columbia, 2024). This

includes providing funding for training programs and resources for Indigenous fire practitioners. Additionally, the BC government should create advisory boards or committees that include Indigenous leaders, firekeepers, and elders to guide wildfire management policies and practices. Moreover, the success of partnerships between the BC Wildfire Service and Indigenous communities, such as the Lytton First Nation and the Tsilhqot'in Fire Management (IFM) Pilot Program, demonstrates the potential for such collaborations.

Promoting Global Knowledge-Sharing and Decentralized Fire Governance

The BC wildfire management can explore the potential for knowledge-sharing partnerships between Indigenous communities in the province and other regions, such as Australia and the United States, where Indigenous fire management has been successfully integrated. For instance, the co-management model of Australia's Kakadu National Park partnership, illustrates how equitable power-sharing between Indigenous communities and government agencies can foster sustainable fire management (Mazzocchi et al., 2018).

Further in BC, initiatives towards decentralizing fire governance should be promoted as demonstrated by the amendments made to the *Wildfire Act (2004)* in 2023 which empower the First Nations to lead burns without bureaucratic delays, centering Indigenous sovereignty in land management (BC Wildfire Service, 2024, p. 3). These legislative changes align with on-the-ground projects like the *Flat Rock Prescribed Burn*, where the Elders of the Williams Lake First Nation guided site assessments to preserve culturally significant archaeological sites (e.g., pit houses) while simultaneously reducing ladder fuels and restoring fire-adapted ecosystems (Government of Canada, 2024, p. 6). Such initiatives focus on establishing co-governance boards with equal Indigenous representation, ensuring that Indigenous voices shape wildfire strategies while integrating knowledge-sharing.

Indigenous Voices in Research Framework

Based on the research, one of the most significant barriers to advance integration efforts is the lack of academic documentation on IFM from Indigenous perspectives. However, this gap is not due to disinterest but stems from ethical and logistical challenges, such as Indigenous communities' justified skepticism toward extractive research practices (Christianson et al., 2015, p. 194).

To address this, decolonizing research methodologies must be prioritized, centering Indigenous-authored scholarship and direct partnerships with fire practitioners. Furthermore, dedicated grants and Indigenous-led research funding must be established to lead studies on fire stewardship. Funding should prioritize projects co-designed with Indigenous communities, ensuring alignment with their cultural protocols, priorities, and intellectual property rights. Moreover, academic journals and institutions should recognize and publish Indigenous knowledge systems (e.g., oral histories, seasonal fire calendars, place-based practices) as valid forms of scholarship. Indigenous fire practitioners should be supported to publish on their terms, using storytelling, maps, or multimedia. Moreover, a curriculum reform must be established to integrate Indigenous fire ecology into university programs, wildfire training courses, and certification curricula. The academic institutions should partner with Indigenous elders and practitioners as co-instructors to teach regenerative burning techniques and historical fire regimes. Also, the academic journals should promote success stories, such as the *Flat Rock Prescribed Burn*, to demonstrate the efficacy of Indigenous-led approaches.

Beyond Integration

The current integration efforts taken by the Government of BC and the BC Wildfire Services often confine the Indigenous involvement as a reconciliation initiative of inclusion within the existing Western frameworks. In other words, the collaboration remains a gesture of reconciliation rather than a fundamental shift in governance. True equity requires decentralizing decision-making authority to Indigenous communities. If the goal is true co-governance and sovereignty in wildfire management, then efforts must move beyond mere "integration" and toward equitable partnerships where Indigenous

communities have decision-making power, not just an advisory role. For instance, the 2023 *Wildfire Act* amendments which enables First Nations to bypass bureaucratic burn approvals are a step towards the right direction, but they must be paired with Indigenous-led oversight bodies that govern fire management at regional and provincial levels. Without redistributing power, Indigenous knowledge remains a tool within a colonial framework, not a sovereign practice.

Conclusion

The journey toward integrating Indigenous knowledge into British Columbia's wildfire recovery strategies is not merely a technical patch for a colonial-legacy system but a golden opportunity to advance reconciliation and reimagine land stewardship through inclusivity. For decades, colonial policies have silenced Indigenous voices, dismissed native knowledge and practices like Traditional Ecological Knowledge cultural burning, which sustained ecosystems for millennia. Yet, as the devastation by wildfire intensifies due to environmental changes, the wisdom of Indigenous fire stewardship which is deeply rooted in reciprocity, observation, and respect for natural cycles and land, offers a sustainable alternative which fire suppression alone is unable to provide.

This research highlights that successful integration requires more than mere token inclusion or participation. It demands dismantling colonial structures that perpetuate power imbalances and embracing Indigenous sovereignty over land and fire. Success stories like Australia's WALFA project and the Tsilhqot'in Fire Management Program prove that when Indigenous communities lead, ecosystems thrive, risks diminish, and cultural heritage is revitalized. These models remind us that wildfire resilience is not just about managing flames but restoring relationships between people, policies, and the land. Moving forward, British Columbia must prioritize actionable approach in future research by incorporating required legislative reforms, co-governance frameworks, and funding for Indigenous-led research. Similarly, it is crucial to center Indigenous voices in academics, policy, and on-the-ground fire management.

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Appendix A

Table A-

Search Methodology and Literature Review Process

Database/Source	Search Terms	Initial Search Results	Revised Search Terms	Revised Search Results	Reason for Revision
JIBC Library –	"Indigenous knowledge or traditional knowledge or indigenous ways of knowing" AND "wildfire management or wildfire prevention" AND "British Columbia"	277 results	"Indigenous fire management" AND "cultural burning" AND "British Columbia wildfire management"	12 revised results	- Focused on fire-specific Indigenous practices - Selected article titles targeted at North American and Australian case studies - Research published in the last 10 years (2014–2024) - Added the limit to full text availability and Scholarly (Peer Reviewed) Journals

Google Scholar	"Indigenous fire stewardship" AND "wildfire mitigation" AND “integrating indigenous knowledge” AND “indigenous fire management”	22,100 results	"Indigenous wildfire knowledge" AND "prescribed burning" AND "British Columbia Wildfire Practices"	33	- Targeted Canadian, North American and Australian case studies - Research published in the last 10 years (2014–2024) - Eliminated case studies focusing on climate change