Under Fire: Improving Wildfire Prevention in BC's Wildland-Urban Interface

by

Sarah Carthy

B.B.A., Trent University, 2017

Project Submitted in Partial Fulfillment of the
Requirements for the Degree of
Master of Public Policy

in the
School of Public Policy
Faculty of Arts and Sciences

SIMON FRASER UNIVERSITY

Spring 2020

Approval

Name:	**Sarah Carthy**
Degree:	**Master of Public Policy**
Title:	**Under Fire: Improving Wildfire Prevention in BC's Wildland-Urban Interface**
Examining Committee:	**Chair:** Dominique Gross Professor, School of Public Policy, SFU
	Doug McArthur Senior Supervisor Professor
	Nancy Olewiler Internal Examiner Professor
Date Defended/Approved:	March 11, 2020

Ethics Statement

The author, whose name appears on the title page of this work, has obtained, for the research described in this work, either:

a. human research ethics approval from the Simon Fraser University Office of Research Ethics

or

b. advance approval of the animal care protocol from the University Animal Care Committee of Simon Fraser University

or has conducted the research

c. as a co-investigator, collaborator, or research assistant in a research project approved in advance.

A copy of the approval letter has been filed with the Theses Office of the University Library at the time of submission of this thesis or project.

The original application for approval and letter of approval are filed with the relevant offices. Inquiries may be directed to those authorities.

Simon Fraser University Library
Burnaby, British Columbia, Canada

Update Spring 2016

Abstract

The province of BC has experienced a rapid increase in wildfires, causing forest ecosystems to lose resiliency and requiring human intervention to restore affected landscapes. One area that is particularly prone to the destructive effects of wildfires in BC is the wildland-urban interface (WUI), which is the transition zone between wildland and human development. In the WUI, many communities are exposed to excessive wildfire risks and are underprepared for the threat of increasing wildfires. To understand the approach to wildfire prevention taken in WUI communities in BC, this paper uses a survey research methodology that collects opinions and perspectives on the barriers to taking preventative action. Following this, three policy options are identified that address the improvement of wildfire prevention and mitigation initiatives at the community level. Policy options are then analyzed using a set of evaluation criteria that propose a policy package as the recommended course of action.

Keywords: wildfire; wildland-urban interface; fire management; prevention; forest resiliency; climate change

Acknowledgements

I am sincerely thankful to those who have supported me throughout this research and my two years in the Public Policy program. In particular, I would like to thank my supervisor, Doug McArthur, for his thoughtful advice during this project. I will carry the guidance and knowledge he shared with me throughout my career as a policy analyst. I would also like to thank my cohort for a memorable two years, my colleagues for sharing their practical knowledge and experiences, and my family and friends back home for supporting me from across the country. Finally, I would like to thank each of my siblings: Jessica, for inspiring this idea and fighting for the trees; Jack, for challenging me in a debate every time I see him; and Rachel, for being a constant source of laughter and entertainment. I would not be here without you.

Table of Contents

List of Tables

List of Figures

List of Acronyms

ABCFP	Association of BC Forest Professionals
BCFSC	BC FireSmart Committee
BCWS	British Columbia Wildfire Service
CRI	Community Resiliency Investment
CWPP	Community Wildfire Protection Plan
FESBC	Forest Enhancement Society of BC
FLNRORD	Ministry of Forests, Lands, Natural Resource Operations & Rural Development
FNESSBC	First Nations' Emergency Services Society BC
SWPI	Strategic Wildfire Prevention Initiative
UBCM	Union of BC Municipalities
WUI	Wildland-Urban Interface

Executive Summary

The province of British Columbia (BC) has experienced a rapid increase in wildfires, with 2017 and 2018 being the two worst wildfire seasons on record. In response, the governments of BC and Canada have increased funding for wildfire prevention and mitigation initiatives in an effort to reduce suppression spending and improve forest resiliency. However, communities across the province, particularly those located in the transition zone between wildland and human development known as the wildland-urban interface (WUI), continue to be underprepared for the damage of increasing wildfires. This capstone identifies the barriers for wildfire prevention in communities in BC, with the goal of determining policy options that address the need for improved wildfire preparedness in the WUI and across the province.

This study uses a survey research methodology to gain an understanding of the approach to wildfire management taken in BC communities, as well as to collect opinions and perspectives on the barriers to taking preventative action. Representatives from 178 municipalities and regional districts were invited to complete the survey and respondents included Chief Administrative Offices (CAO), fire chiefs and fire service coordinators, and community and emergency services managers from each of the six regional fire centres. The survey methodology is supported by a jurisdictional review that identifies wildfire policies and programs in place across the province, as well as community perceptions toward wildfire risks, urgency, and the need for preventative action. Survey results indicate the specific barriers that prevent the implementation of effective wildfire prevention and mitigation policies at the municipal level.

Findings from the survey and secondary research methodology are then used to develop three options that address the policy problem that too many communities in BC's WUI are exposed to excessive risks from wildfires and are underprepared for the damage of increasing wildfires. The first option of increased coordination presents a strategy for further integration of the provincial government in municipal level wildfire prevention and mitigation, the second option of improved funding programs modernizes traditional funding models to better support community initiatives, and the third option of mandatory prevention requires that all communities implement a Community Wildfire Prevention Plan (CWPP) and become FireSmart. The options are evaluated using the following criteria: effectiveness, cost, equity, administrative ease, and stakeholder

acceptance. The results of the analysis find that improved funding programs and mandatory prevention are the two strongest options, leading to the recommendation that the provincial government implement a policy package. The improved funding model and mandatory prevention policy package is expected to increase municipal capacity for wildfire initiatives, improve overall preparedness for wildfires, and increase prevention and mitigation initiatives within communities in BC. While this recommendation will not prevent wildfires from occurring, it is designed to improve community resiliency and the ability of municipal level governments to protect residents, critical infrastructure, and surrounding natural landscapes from imminent wildfire threats in the WUI.

Chapter 1.

Introduction

The province of British Columbia (BC) has experienced a rapid increase in wildfires in recent years, with 2017 and 2018 being the two worst wildfire seasons on record. Burning more than 1.2M ha[1] in 2017 and 1.3M ha in 2018, wildfires in the province have had a significant impact on forest ecosystems and human development, as well as air quality and human health (BC Public Safety and Emergency Services, 2019d). While fires play an important role in forest diversity and renewal, rising wildfire rates have caused interior forests to lose resiliency, compromising the self-sustainability of forest ecosystems and requiring human intervention to restore affected landscapes (Nicholls & Ethier, 2018). One area that is particularly prone to the destructive effects of wildfires in BC is the wildland-urban interface (WUI), which is the transition zone between wildland and human development. In the WUI, wildfires of large magnitude have encroached on human development and affected various industries within the economy, including construction, tourism, agriculture and forestry (Wang and Strong, 2019).

In response to the rise in wildfires in BC, the provincial and federal governments have increased funding for wildfire prevention and mitigation initiatives in an effort to reduce suppression spending[2] and improve forest resiliency. Despite this, there has been less development in wildfire prevention and mitigation at the municipal level, with communities across the province implementing differing levels of policies and programs depending on a variety of factors, including their proximity to wildfire threats and administrative and financial resources. This has led to the policy problem that too many communities in BC's WUI are exposed to excessive risks from wildfires and are underprepared for the damage of increasing wildfires. To further understand the problem, this study outlines the context for wildfire management in BC and the gaps that exist in current prevention and mitigation policies. A survey research methodology is then used to identify and analyze three policy options: increased coordination between

[1] A hectare (ha) is a unit of area equal to 10,000 square meters.

[2] Suppression spending is all costs incurred by government to put out wildfires.

communities and the provincial government, improved funding programs, and mandatory prevention. Using a set of five evaluation criteria, an analysis of each policy option is conducted and ultimately comes to the conclusion that a policy package of improved funding programs and mandatory prevention is the recommended course of action.

This report is made up of three broad sections: Section one consists of Chapters 2 to 6 and provides background information that informs the policy problem. Within this section, Chapter 2 describes wildfire trends in WUI areas in BC. Chapter 3 builds on this by providing an overview of wildfire management and identifying the primary actors involved in policy and program implementation. It also includes a summary of existing wildfire prevention policies, costs, and funding programs. In Chapter 4, the findings of a jurisdictional review of community perceptions and participation in wildfire programs are presented to put things into a BC context and in Chapter 5, the literature is used to identify economic, social and environmental considerations that affect the implementation of wildfire prevention and mitigation initiatives. Chapter 6 describes the policy problem and parties of interest in further detail. Section two of this report includes Chapters 7 and 8 and provides an explanation and analysis of the findings from the survey research methodology. Finally, section three runs from Chapters 9 to 12 and conducts an analysis of three policy options. Within this section, Chapter 9 outlines the three policy options and evaluation criteria, which are analyzed in Chapter 10. Chapter 11 provides a recommendation, followed by a summary and conclusion in Chapter 12.

Chapter 2.

Wildland-Urban Interface (WUI)

Wildfires are a natural part of forest ecosystems and play an important role in the structure, growth and renewal of Canadian forests (Natural Resources Canada, 2019c). However, the current trajectory of climate change has resulted in an unsustainable rise in wildfire rates, negatively impacting natural and physical environments across BC. Along with this, the expansion of communities in the WUI, which is the transition zone between wildland and human development, has heightened the impact of wildfires on human life, property and infrastructure. This section provides a description of the WUI in BC, as well as information on wildfire risks and trends in WUI areas in various regions of the province.

BC has the third largest WUI in Canada by area, covering 5.5M ha, or 6.4% of the province's total land area (Johnston, 2016). Population growth has led to a trend toward increased development in WUI areas in BC, as individuals take advantage of the privacy, affordability, natural beauty, and recreational opportunities that come along with living on the edge of community boundaries. Although this trend is not new, when paired with increasing wildfire rates across the province, human settlement in the WUI adds a level of complexity to traditional techniques of wildfire management. To provide context, the cost of suppressing a wildfire in the WUI of BC is approximately 10 times the cost of suppressing a wildfire of similar size that does not encroach on human development. Along with this, upwards of 50% of wildfires are caused by human error, a percentage that is significantly higher in the WUI (Taylor, Stennes, Wang, Taudin-Chabot, 2006).

To address rising wildfire rates and high suppression costs, the province of BC has implemented initiatives targeted at improving wildfire management in the WUI. One initiative is the development of a set of WUI risk class maps that identify wildfire risks in the province and are intended to help communities with wildfire and risk management (BC Public Safety and Emergency Services, 2019h). Other initiatives include support for Community Wildfire Prevention Plans (CWPP), FireSmart, and fire and fuel management, which are further discussed in Chapter 3. Despite this, many communities continue to be underprepared for increasing wildfires and their level of action to prevent

wildfires is dependent on various factors, including their proximity to wildfire threats and administrative and financial resources. The following section of this paper explores current action in the area of wildfire prevention and mitigation in BC and identifies areas where communities in the province can be better prepared for increasing wildfires in the WUI.

Chapter 3.

Wildfire Management in BC

In each Canadian province, wildfire management involves a multilevel governance approach. This section will identify the primary actors involved in wildfire management in BC, focusing specifically on the organizations and institutions at each level of government involved in wildfire prevention. It will also outline policies and programs intended to mitigate the impacts of wildfires, as well as the costs and funding programs associated with wildfire prevention and mitigation in the province of BC.

3.1. Overview of Wildfire Management in BC

Wildfire management in BC falls primarily under the jurisdiction of the provincial government, with support from the federal government to provide strategy, programming, and funding, and municipal governments to administer community level programming. In BC, wildfire prevention, mitigation and suppression are the responsibility of the BC Wildfire Service (BCWS). The BCWS is a branch of the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, and is mandated by the Government of BC to deliver effective wildfire management and emergency response support; protect lives and values at risk; and encourage sustainable, healthy and resilient ecosystems. The BCWS helps to prevent wildfires and support natural ecosystems by enforcing fire bans and restrictions, funding wildfire prevention initiatives, supporting FireSmart, and using fire and fuel management tools and techniques (BC Public Safety and Emergency Services, 2019f).

In addition to the BCWS, various additional provincial and federal government departments play a supportive role in wildfire mitigation and prevention efforts. At the provincial level, Emergency Management BC (EMBC) is the lead agency for all emergency management activities in the province. Under EMBC, the Office of the Fire Commissioner provides advice, guidance and support to members of the BC fire service (BC Public Safety and Emergency Services, 2019b). At the federal level, the Canadian Forest Service, which is part of Natural Resources Canada, plays an active role in conducting wildfire research and is a source for information on wildfires in Canada

(Natural Resources Canada, 2019a). In addition to this, various federal departments provide critical funding through government transfers and support wildfire related projects and programs through grants and contributions programs. There are also a number of public and private organizations, including the Canadian Interagency Forest Fire Centre, Canada Wildfire, and the Canadian Red Cross, that provide operational and financial support toward wildfire mitigation at both the provincial and federal level.

At the municipal level, local governments and First Nations have the responsibility to administer and enforce wildfire mitigation and prevention policies and are the first responders to wildfire threats. With funding from the provincial and federal governments, municipalities are encouraged to protect their surrounding natural environments by taking action to reduce wildfire risks and creating a Community Wildfire Protection Plan (CWPP) that identifies a plan to manage and mitigate wildfire impacts within each government's administrative boundaries (UBCM, 2018). In BC, each municipality's CWPP and overall approach to wildfire management is tailored to their geographic environment and proximity to the WUI. This is further explained in the following section, which provides insight into provincial and municipal level wildfire prevention initiatives in BC.

3.2. Wildfire Prevention Policies and Programs

There are a variety of policies and programs in place that are intended to mitigate the impacts of wildfires in the province. This section will provide detailed information on prevention and mitigation strategies at the federal, provincial and municipal government levels that fall under three main topic areas: fire and fuel management, the CWPP program, and FireSmart initiatives.

3.2.1. Fire and Fuel Management

One area of focus for wildfire prevention in BC is fire and fuel management. Fire and fuel management is a holistic approach to wildfire mitigation, whereby prescribed burning and other fuel reduction strategies are used to eliminate forest fuels and better manage wildfires (Association of BC Forest Professionals, 2013). The process behind fire and fuel management focuses on changing the structure of forests through thinning, pruning, cleaning up debris from the forest floor, and creating fuel breaks, and is tailored

to the unique geography and landscape of the targeted area (Forest Practices Board, 2015). Research on fuel management as a mitigation strategy for reducing wildfire risk in urban interface communities indicates that hazardous fuel reduction investments correlate with a reduction in area burned (Ager et al., 2014). Further, the fuel management tool of prescribed burning is a traditional practice used by Indigenous communities throughout the province, many of which are particularly impacted by the increase in wildfires in the WUI. This has led to the integration of fire and fuel management practices as part of the BCWS strategy to mitigate against the impacts of wildfires in BC.

Fire and fuel management is part of the overall mandate of the BCWS and is used to prevent catastrophic and out of control wildfires in WUI areas throughout the province. To determine how to implement fire and fuel management practices in a way that will assist communities with reducing wildfire risks and preparing for upcoming wildfires seasons, the BCWS developed the WUI Risk Class Framework in 2018 under the recommendation of an independent review of the BC government's disaster management response to wildfires and floods. The review, entitled *Addressing the New Normal: 21st Century Disaster Management* in British Columbia by George Abbott and Chief Maureen Chapman, recommended an increase in focus on fire and fuel management, as well as other wildfire prevention and mitigation activities (Chapman & Abbott, 2017). The resulting WUI Risk Class Framework indicates likelihood, consequence, and risk of wildfires within a defined area and can be used to increase community resiliency and tailor fire and fuel management efforts (BC Public Safety and Emergency Services, 2019h). Included within the WUI Risk Class Framework is a Provincial Strategic Threat Analysis (PSTA) with a Wildfire Threat Analysis component that assesses wildfire threats across the province. Through consultation with stakeholders, including local governments, private landowners and industry, the Wildfire Threat Analysis integrates local perspectives and provides fire management tools and techniques for resource managers and proponents to make their communities more fire-resilient (BC Public Safety and Emergency Services, 2019a). Along with the PSTA, the WUI Risk Class Framework includes a risk class assessment and mapping of structure density[3] to determine boundaries and characteristics of the WUI for wildfire management

[3] Structure density refers to the number of buildings within a given area. It is used to define boundaries and wildfire risks in WUI areas.

(BC Public Safety and Emergency Services, 2019h). Using data for provincial Crown land, WUI maps highlight fire patterns and level of wildfire risk throughout the province. While large areas of private land are not included in WUI maps, the WUI Risk Class Framework is an effective tool for CWPPs and other fire and fuel management efforts in BC.

3.2.2. Community Wildfire Protection Plan (CWPP)

The CWPP program is intended to help local governments identify wildfire risks that exist in their community and surrounding areas, and to develop a plan to address those risks (Regional District of Central Kootenay, 2019). Creating a CWPP helps communities prepare for, respond to, and recover from wildfires, and is an important step that municipalities can take to prepare their natural and built environments for future wildfires. Each community's CWPP should address WUI hazards and risks and make recommendations to lessen wildfire threats and must be approved by an accredited forestry professional[4]. A template for designing a CWPP is available through the Union of BC Municipalities (UBCM) and funding for CWPP development is available through the CRI program. Overall, having a CWPP is a valuable tool that helps local governments understand and prepare for wildfire threats in their community.

3.2.3. FireSmart

With a focus on wildfire education and prevention, FireSmart Canada is a national program aimed at engaging the public and increasing community wildfire resiliency. The program has 100 member organizations with representation from 10 provinces and territories and facilitates wildfire risk reduction and prevention initiatives across the country (FireSmart Canada, 2019). In BC, the BCWS introduced the BC FireSmart Committee (BCFSC)[5] in May 2017 to oversee the seven FireSmart disciplines and ensure a cohesive direction for wildfire preparedness, prevention and mitigation in

---

[4] Forest professionals must be accredited by the Association of BC Forest Professionals (ABCFP).

[5] The BCFSC is a committee initiated by the BCWS to integrate FireSmart in BC. The BCFSC consists of the BC Wildfire Service (BCWS), Office of the Fire Commissioner, Union of BC Municipalities (UBCM), Fire Chiefs' Association of BC, Emergency Management BC (EMBC), Forest Enhancement Society of BC (FESBC) and First Nations' Emergency Services Society of BC (FNESS).

the province. The seven disciplines of FireSmart are: legislation and planning, education, development considerations, vegetation management, emergency planning, cross training, and interagency cooperation (FireSmart BC, 2019).

To support wildfire resiliency in BC, FireSmart BC offers a range of tools and resources to individuals, local governments and First Nations with a vested interest in preparing for upcoming wildfire seasons. Both FireSmart BC and FireSmart Canada provide online resource libraries, as well as in-person workshops and events, and communities in BC can also apply for funding through the CRI program to develop and implement FireSmart initiatives that relate to any of the seven disciplines. At present, there are 62 communities across BC recognized as being FireSmart, meaning that they are taking actionable steps toward building a wildfire resilient community, and there are an increasing number of communities becoming FireSmart (FireSmart BC, 2019). In conjunction with other wildfire prevention and mitigation programs, FireSmart has helped to raise awareness and improve wildfire emergency management across the province.

3.3. Costs and Funding Programs

In order to further understand wildfire management in BC, it is important to know the various costs and funding programs associated with wildfires prevention, mitigation and suppression. This section will identify the primary costs and funding programs associated with wildfires and will review the Community Resiliency Investment (CRI) program and the Forest Enhancement Society BC (FESBC) in detail.

3.3.1. Wildfire Management Costs

With the drastic increase in wildfires in 2017 and 2018, the province of BC has incurred a rise in wildfire suppression costs. As a result, the Government of BC announced an increase in base funding for wildfire response from $64M to $101M annually in Budget 2019 (BC Ministry of Finance, 2019). Wildfire suppression costs in excess of the base funding amount are paid through statutory spending authority, which allows the Government of BC to provide additional funds necessary for fighting wildfires. To provide context, in 2017 and 2018 the province spent an additional $568M and $551M respectively through statutory spending authority to fight wildfires, allowed under the Wildfire Act (BC Ministry of Finance, 2018). Additional support was also provided

through transfers from the Government of Canada to provide financial assistance during wildfire recovery periods. As a result, high suppression costs have prompted the Government of BC to invest in funding programs intended to mitigate against the negative impacts of wildfires.

3.3.2. Community Resiliency Investment (CRI) Program

To address the rise in wildfire suppression costs and transition toward funding for prevention and mitigation, the Government of BC established the Community Resiliency Investment (CRI) program. Announced in Budget 2018, the program committed $50M in funding over three years to support local governments and First Nations in improving wildfire resiliency, which was later increased to $60M in 2019 (Government of BC, 2018). The program, which replaced the Strategic Wildfire Prevention Initiative (SWPI), provides a renewed commitment to wildfire mitigation and investment projects through funding to complete FireSmart initiatives, including fuel management activities on provincial Crown land and private land (BC Public Safety and Emergency Services, 2019g).

At present, there are two primary components to the CRI program: FireSmart Community Funding and Supports, which provides all local governments and First Nations in BC with funding for wildfire risk reduction and prevention activities; and High-value Assets and Critical Infrastructure Protection, which is in development but will focus on protecting provincially owned infrastructure (BC Public Safety and Emergency Services, 2019g). The funding in the CRI program is scaled based on differing levels of wildfire risk across the province, with up to $25,000 in funding for communities who demonstrate a lower wildfire risk and up to $150,000 in funding for communities who demonstrate a higher wildfire risk (UBCM, 2020). Previous recipients of the CRI program have dedicated funding toward vegetation and fuel management initiatives, education and planning, and FireSmart activities on private, Crown, and Indigenous land.

Since its launch, the CRI program has provided funding to more than 120 local governments and First Nations under the FireSmart Community Funding and Supports component of the program (UBCM, 2019). This funding is administered by UBCM, First Nations' Emergency Services Society BC (FNESSBC) and FESBC, who each work with the Ministry of Forests, Lands, Natural Resource Operations and Rural Development

(FLNRORD) and are represented by the BCWS. In addition to providing funding for FireSmart initiatives, which help to build wildfire resiliency in communities in BC and across Canada, the CRI program provides funding for communities to develop their CWPPs and improve wildfire resiliency.

3.3.3. Forest Enhancement Society BC (FESBC)

Along with direct funding provided by the BC government, FESBC is a crown corporation with the mandate to enhance environmental and resource stewardship in BC and mitigate the impacts of wildfires (Forestry Enhancement Society BC, 2019). Formed in 2016 with $85M in initial funding from the Government of BC, the FESBC gives funding to third parties and has five forestry related priorities, one being to prevent and mitigate the impacts of forest fires. Providing funding for various wildfire risk reduction projects in the province, the FESBC works closely with the BC government. In its first year of operation, the FESBC allocated $28.6M to 91 projects, including fuel management treatments to reduce wildfire risks, wildfire habitat rehabilitation work, and harvest treatments (Forestry Enhancement Society BC, 2018). While the organization is new and has not reported on the success of funded projects, it provides valuable funding to wildfire mitigation and prevention in BC and has committed to doing so in 2020 and 2021.

Chapter 4.

Review of Jurisdictions in BC

While a range of policies and programs exist to mitigate the impacts of wildfires in communities across BC, participation in wildfire prevention initiatives from region to region is inconsistent. This section will begin to explore the gaps in preventative action across the province by providing an overview of wildfire initiatives and describing community perceptions on wildfire prevention in BC. Following, Chapter 5 will explore the economic, social, and environmental considerations that influence community level action to prevent wildfires in the province.

4.1. Overview of Community Wildfire Initiatives

After two destructive wildfire seasons in 2017 and 2018, there is a strong consensus at all levels of government that wildfire prevention and mitigation efforts should be a priority for communities in BC, particularly those along the WUI. According to the aforementioned Abbott and Chapman (2017) disaster management review, the province has made little progress to enhance community safety from wildfires since 2003, when a previous review by Gary Filmon was released (Chapman & Abbott, 2017). At the community level, there has been some action to mitigate against the impacts of wildfires, however, resources that provide summary information on wildfire prevention in BC have not been made publicly available and likely change on an ongoing basis. Along with this, while CWPPs are recognized as a valuable tool for wildfire prevention and many are available online, their contents may not reflect the actions a community has taken to mitigate the impacts of wildfires. In 2018, the BC Auditor General reported that 80 communities had CWPPs but had not done on-the-ground fuel mitigation, and approximately 49% of communities with a CWPP have not completed operational treatments (Chapman & Abbott, 2017). This suggests that having a CWPP does not necessarily mean that a community has undertaken any prevention initiatives. Nevertheless, prescribed burns and other fuel management strategies have increased in recent years and communities in BC are accepting of using fire as a tool for fuel management, seeing it as essential to forest ecosystems (Daniels, Hagerman, & Ravensbergen, 2018).

Looking at FireSmart, there has been increased participation in recent years. At present, 62 communities in BC are recognized as FireSmart, with representation from five fire centres (FireSmart, 2019). The Southeast and Kamloops centres, who were significantly affected in the 2017 and 2018 fire seasons, make up the largest percentage of FireSmart recognized communities. It is also important to note that many communities who are not recognized as being FireSmart indicated that they access FireSmart resources or have implemented FireSmart related initiatives in their communities.

Additionally, communities across BC have undertaken numerous preventative initiatives, either in conjunction with or in lieu of a CWPP of FireSmart program. These include identifying wildfire threats and WUI risk class, conducting prescribed burns and fuel treatments, educating residents in the WUI, improving inter-agency co-operation, and increasing capacity and management for wildfires, among other initiatives. Further, many communities that have CWPPs have made them publicly available online, providing information on their community's wildfire projects and plans, as well their CWPP goals.

4.2. Community Perceptions and Participation

Past research on wildfire emergency preparedness has indicated that communities in BC perceive that there is an important need for preventative initiatives that help communities prepare for wildfires. In a report by researchers in the Faculty of Forestry at the University of British Columbia, entitled *Wildfire Prevention and Fuels Management in the Wildland-Urban Interface: BC Community Perceptions* (Daniels, Hagerman, & Ravensbergen, 2018), principal investigators conducted a survey to better understand community views on wildfire plans and actions. Surveying 77 respondents across the province prior to the 2017 wildfire season, the report found that 67% of communities had developed a CWPP, 55% had participated in the FireSmart program, and 55% had developed a fuel management prescription[6] (Daniels, Hagerman, & Ravensbergen, 2018). The report also indicated that communities with populations between 5,000 and 50,000 have the highest rates of CWPP development and communities with populations under 5,000 and First Nations communities and reserves have lower levels of participation (Daniels, Hagerman, & Ravensbergen, 2018). As

[6] Percentages are from 66 survey respondents.

summary statistics on the numbers of communities with a CWPP or who undertake other fuel management initiatives are not made publicly available, findings from this report are significant in the understanding of the barriers to undertaking wildfire prevention and mitigation in BC.

In this survey, respondents were also asked a number of questions related to wildfire risk and urgency for action, the importance of preparedness, how they feel their community will be affected, and their support for wildfire prevention and fuels management. Indicating that 69% of respondents found their fuel hazard and wildfire risk to be high or severe and 96% of respondents perceive their community to be at a very high risk of wildfires, the survey shows that wildfires are a concern for communities in BC (Daniels, Hagerman, & Ravensbergen, 2018). With respondents divided into six regional fire centres[7], the survey reported that the Kamloops region ranked wildfire prevention as significantly more urgent (95%) than the Southeast region (80%) and the Coastal region (75%), with input from the Northwest, Cariboo, and Prince George regions needing further investigation (Daniels, Hagerman, & Ravensbergen, 2018). Further, communities with a CWPP ranked wildfire prevention in the WUI as the most urgent issue facing their community, while communities without one ranked it as the second most urgent issue behind economic development. Regardless of whether or not they have a CWPP, respondents indicated a high level of concern about the potential effects of wildfire on their communities, regions, and assets (Daniels, Hagerman, & Ravensbergen, 2018). Overall, this survey and the resulting report have provided a wealth of findings that are valuable for this project and have helped to understand community participation in wildfire prevention, perception of wildfire risks, and urgency for action.

[7] The six regional fire centres are Northwest, Caribou, Prince George, Coastal, Kamloops, and Southeast. A map depicting the fire centres in BC is included in Appendix C.

Chapter 5.

Economic, Environmental and Social Considerations

When evaluating wildfire policies and programs, it is important to consider the broad economic, social, and environmental considerations that influence wildfire policy at all levels of government. In the province of BC, the heightened intensity of natural disturbances resulting from climate change is expected to have a direct impact on individuals and communities, threatening human safety and health, as well as the economic viability of various industries (Krishnaswamy, Simmons & Joseph, 2012). This chapter will outline key considerations for wildfire policy and program development from the literature, focusing on threats to the environment, threats to communities and infrastructure, and impacts on First Nation communities.

5.1. Environmental Threats

Research evaluating the potential impacts of climate change on forest ecosystems in Canada indicates that natural environments will become more conducive to wildfires as a result of increased climate variability (Wotton, Flannigan and Marshall, 2017). This is due to higher fuel dryness that can lead to escalated fire ignition and escaped fires, and thus a rise in wildfires and suppression resources demanded (Wotton, Flannigan and Marshall, 2017). In BC, the link between climate change and extreme wildfires is expected to have significant consequences on the province's vast natural environments and resource-based industries, requiring consideration from all levels of government involved in wildfire policy in the province (Kirchmeier-Young, et al., 2018).

It is also important to acknowledge that wildfires are a contributor to climate change, emitting carbon dioxide and perpetuating a circular relationship between wildfires and climate change. Affecting both climate and air quality, wildfires release a substantial amount of greenhouse gasses, organic materials, and other toxic pollutants into the atmosphere (National Oceanic and Atmospheric Administration, 2019). This leads to irreversible impacts on the environment, damaging the natural role of forests to remove carbon dioxide in the air. It also has an effect on resource dependent industries,

such as forestry and agriculture, by reducing timber supply and harming crops, soil, and vegetation growth. Overall, the negative implications of wildfires on forests ecosystems and surrounding communities emphasizes the importance of mitigating the impacts of wildfires through preventative initiatives.

5.2. Threats to Individual Health and Critical Infrastructure

Along with the influence of climate change and wildfire threats to the natural environment in BC, threats to individual health and infrastructure are an important consideration in the development of wildfire prevention and mitigation. In recent years, the province has seen rapid expansion along the WUI as a result of a growing population and urban sprawl, increasing the impact that interface fires will have on communities in BC. This expansion along the WUI has the potential to cause further damage to critical infrastructure, including buildings, energy systems, and other public and private physical assets, which would involve additional suppression costs and resources. Further, it has also led to adverse health effects for individuals living within WUI communities that have experienced wildfires. When consumed, particles from wildfire smoke can lead to wheezing, coughing, sore eyes and throats, and shortness of breath, which can progress to chronic and acute respiratory and cardiovascular health outcomes. Vulnerable populations, including children, elderly, and those with pre-existing respiratory issues, are most likely to be affected by smoke inhalation (US Climate Health Alliance, 2020). With the growth of the WUI and increasing wildfire rates, the number of individuals facing adverse health effects from wildfires will continue to rise.

5.3. Impact on First Nation Communities

First Nation communities are disproportionately affected by the rise in wildfires in BC. As many communities are located in rural and remote locations in the WUI, First Nations hold a strong cultural and economic connection to the natural environment, which makes them more vulnerable to the negative consequences of wildfires (Krishnaswamy, Simmons & Joseph, 2012). Further, First Nation communities often lack the important infrastructure and resources necessary for the suppression of out of control wildfires, leading them to rely on provincial and federal support in emergency situations. This was evident during the catastrophic wildfire seasons in 2017 and 2018

when the Union of British Columbia Indian Chiefs called on the Governments of BC and Canada to provide immediate and ongoing support for First Nations in BC struggling to protect their members, homes, and infrastructure from ongoing wildfires (Union of British Columbia Indian Chiefs, 2018). It also led the Tsilhqot'in National Government to call for improved coordination and partnership with the government, who made 33 recommendations for supporting emergency management and response in Indigenous communities in BC, which included strengthening and enhancing collaborative enforcement efforts, developing clear financial arrangements, and piloting Indigenous-led forest fuel reduction practices (Verhaeghe, Feltes & Stacey, 2019).

Improving wildfire response in First Nation communities is also on the radar of the Government of BC. In the Chapman and Abbott report, the traditional relationship between Indigenous people and their lands, territories, and resources was a key consideration in the development of recommendations for wildfire mitigation strategies. Specifically, in the "What We Heard" section of the report, public feedback highlighted the deep importance of including Indigenous knowledge and tradition within wildfire mitigation and prevention efforts. During the engagement process with First Nation communities, input relating to wildfire prevention and mitigation indicated that there is an insufficient level of funding to support prevention and emergency preparedness in the province. Identifying that there are jurisdictional issues relating to who is chiefly responsible for wildfire prevention and mitigation in First Nation communities, Indigenous engagement also indicated that there is a lack of coordination between levels of government and that traditional practices, namely prescribed burning, are underutilized in wildfire prevention initiatives (Chapman & Abbott, 2017).

Chapter 6.

Policy Problem and Parties of Interest

The policy problem is that too many communities in BC's WUI are exposed to excessive risks from wildfires and are underprepared for the damage of increasing wildfires. While there is a wealth of resources and funding programs in place to support wildfire prevention and mitigation in BC, local governments and First Nations are ultimately responsible for implementing wildfire related initiatives in their communities. This creates a challenge of inconsistency in wildfire prevention across the province, with some regions taking significant action, and others, specifically those with fewer resources, being underprepared and relying heavily on wildfire suppression from the province.

Wildfires are a current issue in the province of BC. With climate change trends leading to a steady rise in temperature and climate variability, the frequency of wildfires is expected to increase over the 21st century (Natural Resources Canada, 2019b). This has led to an increase in costs for wildfire suppression in the provincial budget, the implementation of new funding programs, and the commissioning of the Chapman and Abbott report, all of which indicate that the problem is of interest and relevance in BC. In addition, municipal governments have faced added pressure to take their own preventative measures to mitigate against the spread of wildfires in the WUI, with provincial programs, including the CRI program and funding from FESBC, to provide financial support for initiatives at the local level.

The primary stakeholders for consideration are local governments and First Nations in BC. As the focus of this research is to evaluate current policies that have led to inconsistent levels of action within the province, both local governments and First Nations are responsible for program development and implementation and are directly affected by provincial wildfire policy. The Government of BC is also a key stakeholder in this study, as they are the principle regulator of wildfire legislation, policy, and funding programs. They are also responsible for wildfire suppression and are accountable for all costs relating to wildfire prevention, mitigation, and suppression, with support from the federal government in emergency situations. Other stakeholders include households and

businesses in the WUI, as well as the construction, tourism, forestry, agriculture and other resource-based industries, all of which may be affected by the increase in magnitude of wildfires in BC.

Chapter 7.

Analytical Methodology

This study uses a survey methodology to analyze the problem and identify policy options that support increased forest resiliency in BC's WUI. The survey methodology is used to determine the barriers to wildfire mitigation and forest protection in jurisdictions within BC. This chapter will outline the methodology used to conduct the survey, providing details on survey design, response, and limitations.

7.1. Survey Respondents

In order to undertake primary research on the barriers of implementing wildfire mitigation and prevention initiatives at the municipal level in BC, an online questionnaire was distributed to Chief Administrative Officers (CAO) working in local governments across the province. To obtain a range of perspectives on wildfire policies and programs, representatives from 178 municipalities and regional districts in BC were invited to complete the questionnaire. As wildfire initiatives vary across each municipality, collecting information from communities across BC helped to inform how different characteristics of a municipality, including size, geographic location and resources, influence level of investment into wildfire mitigation and prevention programs in their community. It also helped to provide insight into the effectiveness of provincial level policies, as well as perceived regulatory gaps that could be filled to improve wildfire prevention in BC.

The survey was completed by 34 individuals working at the municipal government level in BC, including 17 CAOs, 10 fire chiefs or fire service coordinators, and seven general managers of either community services or emergency services. Representation was obtained from each of the six regional fire centres in the province (number of respondents in brackets): Northwest (3), Caribou (1), Prince George (3), Coastal (13)[8], Kamloops (6), and Southeast (8). A list of survey respondents is available

[8] Two representatives from the Sunshine Coast Regional District, within the Coastal Fire Centre jurisdiction, completed the survey. In Chapter 8, qualitative responses from each individual respondent will be used and are combined where necessary to provide summary statistics.

in Appendix B and a detailed description of each of the six regional fire centres is available in Appendix C. Although there was a larger number of respondents from the Coastal, Kamloops and Southeast fire centres, respondents from the three northern fire centres, Northwest, Caribou and Prince George, represent larger jurisdictions. For this reason, responses from all jurisdictions and fire centres will be given equal weight in the analysis of the survey responses in Chapter 8.

7.2. Survey Design

The main objective of the survey was to gain a firsthand understanding of the approach to wildfire management taken in BC communities, as well as to collect opinions and perspectives on the barriers to taking preventative action. Respondents were also asked to provide recommendations on how the province of BC can support communities to improve their wildfire prevention and mitigation efforts. A complete list of survey questions is included in Appendix A.

The first component of the survey was designed to obtain a fulsome understanding of community engagement with provincially recognized policies and programs. Survey questions relating to this were targeted toward each community's approach to wildfire management and were divided into three main sections: CWPP, FireSmart, and fire and fuel management. For the questions relating to CWPP and FireSmart, respondents were asked to indicate whether or not the preventative initiative is in place, and if not, why the community has not implemented it. For the questions relating to fire and fuel management, respondents were asked if their community uses fire and fuel management as an approach to mitigate the impacts of wildfires, and if yes, to provide a description of the approaches used. All respondents who indicated that they did not have a CWPP or were not FireSmart provided tangible reasons why and all respondents who indicated that their community uses fire and fuel management provided a description of the approaches used. This reflects a high degree of engagement with the survey, with all respondents providing valuable information that can be used to understand their community's perspective and approach to wildfire prevention and mitigation.

The main objective of the latter half of the survey questions was to determine how municipalities in BC feel about the provincial government's approach to wildfire

management. Here, respondents were asked to provide suggestions of actions that the provincial government could take to improve wildfire prevention in their community, as well as to indicate additional measures that the provincial government could take to help their community be more prepared for wildfires. Respondents were also given the opportunity to provide general comments or perspectives on wildfire management at the municipal, provincial, or federal level. This component of the survey provided a range of perspectives and recommendations that inform the policy options in this report.

7.3. Limitations

It is important to note that there are some limitations associated with the survey component of this report. The first is that the survey was sent only to representatives from municipalities, meaning that First Nations communities were not included. Ideally, a report that addresses wildfire prevention and mitigation in BC, a province with many First Nations communities, should consult with Indigenous peoples and incorporate their responses throughout the design and analysis of each policy option. However, the decision was made to focus specifically on municipal government perspectives and approaches to wildfire management. To supplement the lack of Indigenous perspectives in the methodology, reports and recommendations from previous reports were considered in Chapters 9, 10 and 11.

The second limitation is that only 34 respondents completed the survey, providing perspectives that are unique to the communities they represent. This reflects a 21% response rate and survey respondents were likely those with a vested interest in wildfire prevention, indicating a degree of sample bias. Ideally, a report of this nature would include viewpoints from all municipalities in BC. A third limitation is that respondents likely did not provide a comprehensive answer to each of the questions that were asked and may have generalized or excluded pieces information that would have been valuable in this study. Finally, respondents ranged from CAOs to fire chiefs to general managers. While this provided a range of perspectives, answers likely varied based on knowledge and the proximity of their work to wildfire management.

Chapter 8.

Survey Analysis

In this chapter, findings from the survey research methodology are analyzed and presented to provide an understanding of community perceptions toward wildfire prevention and mitigation. The chapter is broken into three sections: community-based wildfire initiatives, barriers to wildfire prevention in BC, and summary of findings. Outcomes from the survey analysis will be used to inform the development and analysis of policy options in Chapters 9 and 10.

8.1. Community-Based Wildfire Prevention Initiatives

One intention of the survey was to identify the wildfire prevention and mitigation initiatives in place in communities across BC. The reason behind this was to determine the level of community engagement with existing programs and gain a clearer understanding of the barriers against implementing provincially led initiatives within communities. Figure 8.1 provides an overview of the number of communities represented in the survey that have a CWPP, are FireSmart, or use fire and fuel management as a tool for prevention.

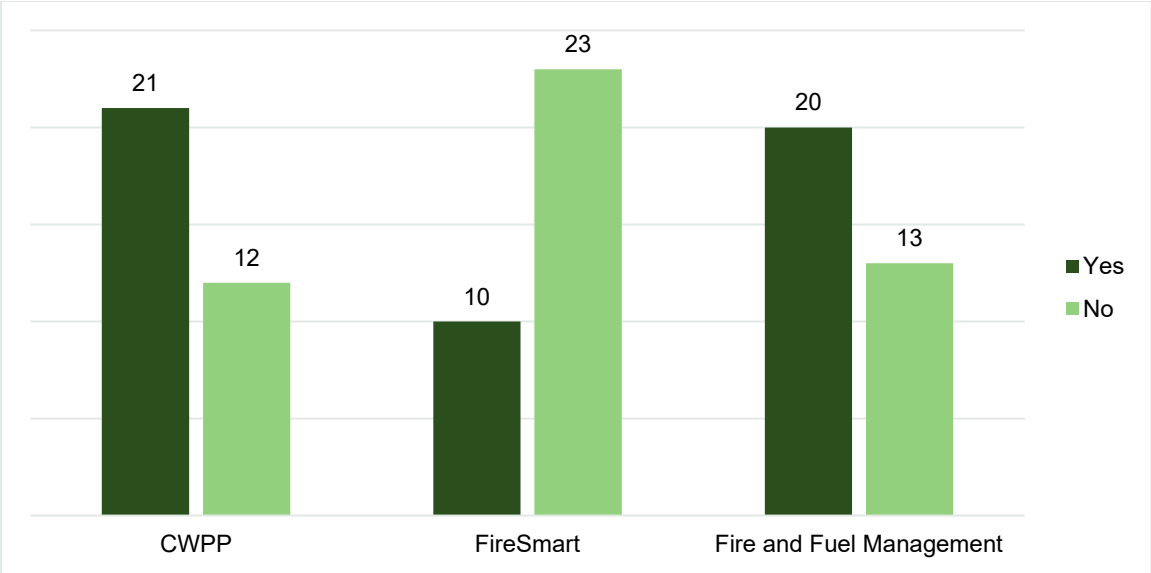

Figure 8.1 Number of Communities with a CWPP, FireSmart and Fire and Fuel Management

This graph reflects that the majority of communities have implemented either a CWPP or fire and fuel management initiative, while fewer than half of communities are recognized as FireSmart. It is also important to note that all three initiatives are in place in nine of the communities included within the survey, while eight communities have none of the three and the remaining 16 communities have one or two. The following three subsections will analyze the questions relating to community-based wildfire prevention initiatives in further detail.

8.1.1. Community Wildfire Protection Plan (CWPP)

Creating a CWPP is an important step that municipalities can take to prepare their natural and built environments for future wildfires. Despite this, many communities across the province have not established a CWPP. In the survey for this study, the 12 respondents who indicated that they do not have a CWPP were asked to describe some of the reasons why they do not have one. This produced a range of responses that helped to provide valuable insights into the barriers for creating a CWPP, which are synthesized in Table 8.1.

Table 8.1 Barriers for Creating a CWPP

Regional Fire Centre	Reason for no CWPP	Additional Comments
Northwest (2/3)[9]	- Lack of capacity - Public land is recognized as FireSmart	- One community indicated that creating a CWPP is a priority for 2020
Caribou (1/1)	- Some sections are covered by a CWPP, but not all	N/A
Prince George (2/3)	- Majority of land is Crown land, which the municipality has no jurisdiction over - Time and money	- One community has yet to receive a response from their funding application
Coastal (4/11)	- Limited risk and exposure to wildfires - Wet, mild climates	- One community is in the process of developing a CWPP
Kamloops (2/6)	- Not enough staff, too many higher priorities	- One community is in the process of developing a CWPP
Southeast (1/8)	- Not an efficient use of time and resources	N/A

[9] This reflects the number of communities that do not have a CWPP (and therefore completed this question) out of the total number of communities that completed the survey within the specified regional fire centre.

This table reflects that the most common barriers for not having a CWPP are not enough staff, time, and money, as well as an overall lack of capacity to create a plan. In this section, several respondents elaborated on their answer to convey that they are in the process of creating a CWPP or would like to create one in the near future. Additionally, some communities indicated that they do not have a CWPP because it is not a priority for their community. For these communities, the perception of being at a lower risk of experiencing wildfires was the main factor for not having a CWPP. This is particularly true for communities in the Coastal fire centre, with the majority of communities in this region indicating that mild, wet climates and limited risk of wildfires were reasons for not having a CWPP. On the other hand, only one community in the Southeast fire centre who completed this survey did not have a CWPP, suggesting that it is a higher priority for communities in this area who are at a higher risk of wildfires.

8.1.2. FireSmart

As described in section 3.2, FireSmart is a national program with the aim of increasing wildfire preparedness in communities across Canada. Recognizing communities that are taking actionable steps toward improving wildfire resiliency, there are 62 communities in BC that are FireSmart. In the survey for this study, respondents were asked to indicate whether or not their community is recognized as FireSmart, and if not, they were asked to describe some of the reasons why. Table 8.2 provides a summary of the reasons why communities have not taken the necessary steps to become FireSmart, offering insight into the factors that influence implementing the program.

Table 8.2 Barriers for Becoming FireSmart

Regional Fire Centre	Reason for not being FireSmart	Additional Comments
Northwest (1/3)[10]	- Majority of land is Crown land, with residents scattered throughout	- The community applied for CRI funding and if approved will be hiring a FireSmart educator
Caribou (1/1)	- Insufficient resources	- The regional district represented is made up of many small and rural communities
Prince George (3/3)	- Too few staff - Elected officials have not supported treating Crown land	- Two communities have offered several FireSmart workshops and provide free FireSmart assessments
Coastal (8/11)	- Urban environment - Structural challenges to meeting FireSmart goals - Emphasis on planning for disasters other than wildfires - No dedicated staff and lack of training - Less of a threat of wildfires	- One community has neighbourhoods that are recognized as FireSmart and is working to expand - One regional district offers FireSmart activities and training for communities
Kamloops (4/6)	- Too few staff with too many other high priorities	- One community is waiting to have their CWPP completed - One community is working toward being FireSmart
Southeast (5/8)	- Too large of a geographical area - Not enough funding and resources	- One community indicated that only private land is not FireSmart

Findings from this section suggest that becoming recognized as FireSmart is a lower priority for communities in BC, with fewer than one third of respondents representing areas that are FireSmart. When asked to describe reasons for not being FireSmart, respondents cited a range of factors that affected their decision to implement the program. These include too few staff, insufficient funding and resources, too large of a geographical area, and less of a threat of wildfires, among other factors. In addition to this, several communities and regional districts are taking advantage of the program but have not taken the necessary steps to become recognized as FireSmart. Many also indicated that the community or regional district they represent is working toward becoming FireSmart or is expanding related activities and training. Overall, there is clear

[10] This reflects the number of communities that are not FireSmart (and therefore completed this question) out of the total number of communities that completed the survey within the specified regional fire centre.

uptake and interest in the FireSmart program, however, being recognized is less of a priority and is administratively burdensome for some communities.

8.1.3. Fire and Fuel Management

The third community-based prevention initiative that was incorporated into the survey was fire and fuel management. Broadly encompassing the use of prescribed burning and other fuel management tactics, this section of the survey asked respondents to indicate if they use fire and fuel management as an approach to mitigate the impacts of wildfires, and if so, what methods they use. All 20 communities who indicated that they use some form of fire and fuel management provided a description of their approach, which generally includes:

- Thinning and ground fuel removal of trees and brush
- Operational prescriptions and treatments
- Requiring property owners to remove woody debris
- Fire mitigation on municipal and crown lands to protect village boundaries and critical infrastructure
- BC Hydro transmission line clearing in interface areas
- Utilizing a CWPP to complete several prescriptions and a few fuel treatments projects
- Conducting a full assessment of fuel loads
- Completing fuel treatments
- Undertaking projects that received funding from the CRI and SWPI grant programs

This section revealed that each community or regional district that uses fire and fuel management to mitigate the impacts of wildfires uses an approach that is tailored to its own unique environment. With responses varying in detail, there was a clear theme that communities who have received financial assistance from provincially funded programs have been able to initiate fire and fuel management practices to a larger degree. Also of note, nine of the 13 respondents who indicated that they use fire and fuel management have a CWPP. This suggests that there is a correlation between having a CWPP and completing preventative burning initiatives. The findings of this section provide

information on the range of fire and fuel mitigation initiatives that a community can take to prepare for future wildfires and alludes to the factors that influence wildfire prevention efforts.

8.2. Community Perspectives of Wildfire Prevention in BC

The latter half of the survey questions for this study focused on identifying additional measures that can be taken to improve wildfire prevention and mitigation across BC. In this section, respondents were asked to provide specific examples of actions at the provincial level that would help improve wildfire prevention in their community. They were also asked to explain more generally what additional tools would help their community to be more prepared for wildfires and were given the opportunity to provide additional comments and perspectives on wildfire management in BC. Responses from this section were integral to the development of the three policy options presented in Chapter 9.

With all 34 respondents providing examples of how the Government of BC can help individual communities to improve wildfire preparedness, the survey produced a range of suggestions and recommendations that address the policy problem that too many communities in BC's WUI are exposed to excessive risks from wildfires and are underprepared for the damage of increasing wildfires. The most common example was to increase funding for prevention and mitigation initiatives. Citing issues with funding programs, including that there is not enough money available and current programs involve strict application deadlines and requirements, there was a clear belief that increasing and improving funding programs would help communities in BC to improve wildfire prevention and mitigation. Along with this, several respondents indicated that they do not have enough staff and financial resources to apply for funding, suggesting that some communities are at a greater disadvantage for receiving funding from provincial programs.

In addition to insufficient funding and resources, many respondents provided answers that aligned with a theme that the provincial government is too "hands-off" in its approach to wildfire management. There was a general feeling that the province should be working more closely with municipal governments to design wildfire related programs and policies, especially given that many communities in the WUI are surrounded by

Crown land, which falls under the jurisdiction of the provincial government. Specific examples of how this could be done included improved fuel management on Crown land, provincially organized education sessions, further integration of the BCWS with local fire services, and further support for FireSmart related initiatives. Additionally, more general comments on improving wildfire prevention and mitigation in BC communities included a province-wide ban on recreational fires, empowering private landowners to conduct fuel treatments, improving training and equipment for municipal fire fighters, and increasing the emphasis on public education and awareness.

8.3. Summary of Findings

The survey research methodology used for this study offers insight into current wildfire prevention policies and programs that are used in subsequent sections to address the policy problem and develop alternative solutions. Generally, results reflect that communities are engaged with current programs, but see room for improvement. Findings from this survey suggest that communities in BC see wildfire prevention and mitigation as a priority and believe that the provincial government should be doing more to support municipal efforts by way of additional funding, improved education and awareness, increased coordination, and more resources overall.

Chapter 9.

Policy Options and Criteria for Evaluation

This chapter will outline the three policy options that address the policy problem of too many communities in BC's WUI being exposed to excessive risks from wildfires. It will also provide a description of the criteria and measures used to analyze each policy option in Chapter 10.

9.1. Policy Options

Despite numerous initiatives at all levels of government, communities in BC's WUI continue to be underprepared for the damage of increasing wildfires. Reports in recent years, namely the Abbott and Chapman (2017) report on disaster management in BC, have recommended action to improve community resiliency and prepare communities for the projected increase in natural disasters. The options in this section will build on recommendations relating to wildfire prevention and mitigation made in past reports, incorporating the findings from the survey research methodology and addressing gaps in action at the community level. While there is a wealth of wildfire management programs, policies and initiatives that communities can take to improve wildfire prevention in their community, this report will focus on three policy options. Each option will be directed toward the provincial government and will focus on wildfire prevention and mitigation in BC communities.

9.1.1. Option 1: Increased Coordination Between Communities and the Provincial Government

The first option for consideration is increasing coordination between local communities and the provincial government. Building on current wildfire management structures in place, this option would involve further integration of the BCWS within communities in BC to facilitate increased collaboration across the two levels of government. At present, the BCWS is responsible for wildfire prevention, mitigation and suppression on Crown and private land and "gives high priority to fuel management and wildfire suppression in interface areas where communities and forests come together"

(Public Safety and Emergency Services, 2019g). This policy option would increase the current responsibility of the BCWS and require them to manage wildfire prevention and mitigation initiatives within communities to ensure there is no disconnect in areas where public lands are interspersed with private and Crown lands. It would involve additional personnel to undertake new initiatives in collaboration with communities, to a greater extent than they currently do. While local fire services would still have the primary responsibility of conducting fuel treatments and other prevention activities and there would be no change to funding programs, communities would have a higher level of support from the provincial government.

Oversight from the provincial government would be dependent on the needs of communities. For communities with low wildfire risks who are not located in the WUI, interaction between the two levels of government would be minimal. For communities with a high risk of experiencing the detrimental impacts of wildfires and who are integrated with Crown and private land, the provincial government would need to provide a higher level of support, helping communities to navigate funding programs, supporting the development and implementation of CWPP and FireSmart programs, and conducting fire and fuel treatments in collaboration with municipal fire services.

9.1.2. Option 2: Improved Funding Programs

A reoccurring issue and barrier for communities interested in implementing wildfire prevention is financial resources. This policy option would require the provincial government to improve funding programs by increasing the number of grants available, providing funding directly to prevention and mitigation, and reducing application requirements. Building on the current CRI program, ongoing funding would be made available for projects that span longer than one year and retroactive funding would be available to continue initiatives that have been beneficial in the past. Increased support from the provincial government would also be made available for communities whose projects do not meet funding requirements. Funding amounts would remain the same, at up to $25,000 per year for applicants with a lower wildfire risk and up to $150,000 per year for applicants with a higher risk (UBCM, 2020). Communities would need to have a

CWPP to apply for funding and have their projects approved by an accredited forestry professional[11].

Additional grant funding would also be made available for communities with no capacity to develop a CWPP, FireSmart, or other fire and fuel management initiative, allowing them to design prevention and mitigation initiatives and apply for additional funding from the province to execute plans. This funding would be available under the CRI funding program and would be administered by the FLNRORD to ensure that communities with less resources are able to improve prevention and mitigation. Under this program, the same funding amounts of $25,000 per year for applicants with a lower wildfire risk and up to $150,000 per year for applicants with a higher risk would also be made available specifically for communities with no prevention and mitigation plans in place.

9.1.3. Option 3: Mandatory Prevention

To ensure that BC communities in the WUI are taking necessary action to prepare for wildfire threats, the third policy option for consideration is mandatory wildfire prevention at the community level. This would involve mandating that each municipality in the province develop and implement a CWPP and participate in the FireSmart program. As part of the CWPP, municipalities would be required to assess their level of wildfire risk and specify the actions they will take to mitigate the impacts of wildfires. Using the template provided by the provincial government, the mandatory CWPP would need to be approved by BCWS to ensure that it is complete and to assess any additional funding and resource requirements for prescribed prevention and mitigation initiatives under the plan (UBCM, 2018). Along with developing a CWPP, all communities in the province would be required to become FireSmart, meaning that they are taking the necessary steps to build a wildfire resilient community. To be recognized as FireSmart, communities would need to complete an application and be approved by the BC FireSmart Committee (BCFSC).

The primary responsibility of mandating wildfire prevention would be assigned to FLNRORD, with support from other government departments and organizations where

[11] Forest professionals must be accredited by the Association of BC Forest Professionals (ABCFP).

necessary. For both CWPP and FireSmart, current processes would be maintained and there would be no sizable changes to programming, other than making it mandatory that all communities participate. For communities that do not meet the requirements of either program, there would be no significant penalty. However, FLNRORD and the BCWS would need to work with communities who have not met the requirement on an ad-hoc basis to assist with CWPP and FireSmart development. To ensure plans are current and prevention and mitigation initiatives are taking place, communities would also be required to update their plans and renew their certifications annually.

9.2. Evaluation Criteria

To evaluate each policy option, a range of objectives, criteria and measures were developed that address the policy problem at hand. Described in detail in Table 9.1, the evaluation criteria will be used in the policy analysis section of this report to conduct a detailed comparison of the three policy options, as well as to identify the strengths, weaknesses, and trade-offs of each option. All objectives are weighted equally and objectives with two criteria will be divided by two and are denoted by a (/2) in the bottom right corner of the index box, ensuring that all objectives receive a total ranking out of three.

Table 9.1. Criteria and Measures

Objective	Criteria	Measures	Index
Effectiveness	Reduction of wildfire risks to WUI communities	Ability of the policy option to improve wildfire prevention in WUI communities	1 = Negative/ no change 2 = Moderate change/ potential for positive change 3 = Positive change
Cost	Impact on municipal and provincial budgets	Initial and ongoing costs required to fund the policy option	1 = Significant cost to government 2 = Moderate cost to government 3 = Minimal cost to government
Equity	Distributional equity	Impact of policy option on poor communities relative to wealthy communities	1 = Significant difference 2 = Some difference 3 = No difference (/2)
	Improved preparedness in poor communities	Ability of policy option to improve wildfire outcomes for poor communities that have historically been underprepared	1 = Negative/ no impact 2 = Moderate impact/ potential for positive impact 3 = Positive impact (/2)
Administrative Ease	Ease of implementation	Feasibility of policy option under current management structures	1 = High complexity 2 = Moderate complexity 3 = Low complexity
Stakeholder Acceptance	Acceptance from stakeholders	Support of policy from the provincial government and municipalities in BC	1 = Low support 2 = Neutral support 3 = High support

9.2.1. Effectiveness

The key objective for the evaluation of policy options within this report is effectiveness. As discussed throughout Chapters 2 and 3 of this report, there are a variety of organizations and institutions involved in wildfire prevention and mitigation. Despite this, there continues to be an increase in wildfires and a gap in effective prevention and mitigation programs, giving rise to the policy problem that too many communities in BC's WUI are exposed to excessive risks from wildfires and are

underprepared for the damage of increasing wildfires. The criterion for this objective is the reduction of wildfire risks to WUI communities in the province, which is measured by the ability of the policy option to improve wildfire prevention by reducing the impacts on community and health and safety and environmental degradation to forest ecosystems. The three rankings for this criterion are negative/no change (1), moderate impact/potential for positive change (2), and positive change (3), with each reflecting the policy option's hypothesized level of improvement to the effectiveness of wildfire prevention and mitigation initiatives.

9.2.2. Cost

An important consideration in the evaluation of policy options that address wildfire prevention and mitigation is cost. As each policy option is targeted toward both municipalities and the provincial government, the criterion for the cost objective is the ability of the policy option to reduce wildfire risks relative to resources spent. This will be measured by the initial and ongoing costs required to fund the policy option at the two levels of government and the rankings for this criterion are significant cost to government (1), moderate cost to government (2), and minimal cost to government (3). As exact costs for each policy are unknown, costs for each option will be hypothesized and assigned a rank to reflect the degree of cost effectiveness at each level of government.

9.2.3. Equity

Wildfire prevention and mitigation efforts at the municipal level rely heavily on community resources, leading to inconsistencies in implementation across the province. This is given consideration under the equity objective, which is divided into two key criteria. The first, distributional equity, is measured by the impact of policy option on poor communities relative to wealthy communities, and the second, improved preparedness in poor communities, is measured by the ability of policy option to improve wildfire outcomes for poor communities that have historically been underprepared. Each criterion is ranked using its own index. Distributional equity is ranked based on whether the policy will have a significant difference (1), some difference (2), or no difference (3) on poor communities relative to wealthy communities and improved preparedness in poor communities is ranked base on the likelihood of the policy to have a negative/no impact (1), moderate impact/potential for positive impact (2), or positive impact (3).

9.2.4. Administrative Ease

As discussed in Chapter 3, institutions at all levels of government are involved in administration of wildfire prevention and mitigation programming in BC. The administrative ease objective evaluates the capacity of all actors involved to implement each policy. The criterion for this objective is ease of implementation, which is measured by the feasibility of implementation under current management structures. The three rankings for this criterion are high complexity (1), moderate complexity (2), and low complexity (3), and are assigned based on the estimated administrative burden of each option.

9.2.5. Stakeholder Acceptance

An important consideration for the implementation of wildfire prevention and mitigation policies is the overall support from two of the main stakeholders: the provincial government and municipalities in the province. This leads to the final objective for the evaluation of policy options of stakeholder acceptance. The criterion for this objective is the acceptability of the policy option and is measured by the support of the policy from the provincial government and municipalities in BC. Each option will be ranked based on the probability of receiving low support (1), neutral support (2), or high support (3), and will be determined using findings from the survey and secondary research on community perceptions and engagement with existing wildfire policies and programs.

Chapter 10.

Analysis of Policy Options

This chapter provides a detailed analysis of the three policy options that address the problem that too many communities in BC's WUI are exposed to excessive risks from wildfires and are underprepared for the damage of increasing wildfires.

10.1. Analysis of Policy Option 1: Increased Coordination Between Communities and the Provincial Government

For the primary objective of effectiveness, this policy option is expected to lead to moderate change in the reduction of risks in WUI communities. Through increased coordination between communities and the provincial government, there is potential for further improvements to wildfire prevention and mitigation across the province, which would help preserve the health of individuals, critical infrastructure, and the environment. This option also allows for increase protection where communities and Crown land meet. Based on this, the option is given the ranking of 3/3 for its ability to improve wildfire prevention in the WUI.

For cost, increasing coordination will result in higher costs for the provincial government, with potential for higher costs for municipal governments in BC. In the short term, the BCWS under FLNRORD would need to reallocate and hire additional staff to work with municipal governments. To meet expectations and improve prevention and mitigation on Crown, private, and public land, the two levels of government would also need additional resources, including tools, equipment, and labour, resulting in higher costs. For this reason, the policy option will result in significant initial and ongoing costs that are not guaranteed to improve preparedness, leading to the ranking of 1/3 for cost effectiveness.

For the distributional equity criteria, there is some difference in the impact of the policy option on communities with less resources and communities with more resources. While co-operation would occur between all municipalities, additional attention is given to those in greater support. This leads to the rank of 2/3 for distributional equity. For the criteria of improved preparedness in poor communities, the policy option ranks high. This

policy option is designed to support communities with less resources to dedicate toward wildfire prevention and mitigation and who are at a higher risk of experiencing the detrimental impacts of wildfires. This criterion ranks 3/3 for its ability to improve wildfire outcomes for poor communities that have historically been underprepared. Overall, the equity objective receives a total rank of 2.5/3.

This policy option ranks low for administrative ease. Under current management structures, there is a high degree of complexity associated with further integration and coordination between the two levels of government. This is due to the fact that the policy option requires change to the current model and the degree of implementation and coordination would need to be tailored to each individual community. The ranking for the administrative ease objective is 1/3.

For the final objective, stakeholder acceptance, the policy option ranks in the middle for its support from the provincial government and municipalities in BC. This is based on the policy option receiving high support from municipalities and low support from the provincial government. The option addresses findings from the survey that indicate the need for additional support to improve wildfire prevention and mitigation is in the interest of municipalities, however, it comes at a higher cost and administrative burden to the provincial government. This leads to a ranking of 2/3 for the stakeholder acceptance objective.

10.2. Analysis of Policy Option 2: Improved Funding Programs

For effectiveness, this policy option is expected to lead to positive change in communities with low resources and financial need, with potential to reduce risks in WUI communities and support community and environmental health and safety. Improving funding programs would increase the capacity for communities to implement prevention and mitigation initiatives that address wildfire threats and reduce the complexity of the application process. While it is not guaranteed that communities will access the additional funding for new projects and there is expected to be no change in communities who already have the financial resources to implement prevention initiatives, findings from the survey methodology indicate that financial resources are a key barrier for many communities in reducing wildfire risks. For this reason, the reduction

of wildfire risks to WUI communities and overall engagement with additional funding is not expected to lead to improved preparedness and the ranking for this objective is 2/3.

For cost, improving current funding programs is expected to result in minimal cost to both the municipal and provincial governments. This is due to the fact that funding amounts for prevention and mitigation initiatives will remain the same and grants for communities with insufficient capacity will make use of underused funds in under the CRI program. For the municipal government, this policy option will lead to improved access to funding and reduced cost for communities with less capacity to implement prevention and mitigation programming. Further, this policy option has the potential to lead to a reduction in suppression costs for the provincial in the long-term, making it a worthwhile investment. This leads to a ranking of 3/3 for the cost objective.

This policy option is projected to have no difference for communities with low resources relative to communities with sufficient resources. Improving the funding model for the CRI program and offering additional funding for communities wishing to apply is designed to make funding more accessible for all communities. For this reason, the distributional equity criterion received a 3/3. For the improved preparedness criterion, the policy option also receives a score of 3/3, as it is projected to improve wildfire outcomes for poor communities that have historically been underprepared. Overall, this objective receives a total score of 3/3.

For the administrative ease objective, the policy option has low complexity when measuring feasibility under current management structures. This is due to the policy option requiring minimal administrative changes to the current CRI funding program, with all changes designed to improve the current model and make it easier for communities to apply for funding. While the new grant funding available through FLNRORD would require some additional resources from the provincial government, overall complexity is low. This leads to the ranking of 3/3 for the administrative ease objective.

The final objective, stakeholder acceptance, is estimated to receive neutral support from communities in BC. Through the survey methodology, perspectives from respondents indicated that communities see insufficient financial resources as a key barrier for implementing wildfire prevention and mitigation initiatives. However, there was also a theme that increasing funding is only part of the solution and there are a multitude

of barriers that prevent further action to protect against future wildfires. This leads to the ranking of 2/3 for the stakeholder acceptance of the policy option.

10.3. Analysis of Policy Option 3: Mandatory Prevention

For effectiveness, this policy option ranks high and is expected to have a positive effect on the reduction of risks in WUI communities. Through developing a CWPP and becoming FireSmart, communities in the province will be required to ensure that they are taking action to prevent and mitigate against the impacts of wildfires. This will certify that they have assessed their level of wildfire risk and developed a plan for mitigating the impacts of future wildfires, leading to a positive impact on community preparedness for wildfire events and increasing the resiliency of critical infrastructure. In addition to this, the option requires that all communities have a plan to prepare land for future wildfires using fuel treatments and other vegetation management strategies. For these reasons, this policy option receives a score of 3/3 for effectiveness.

In terms of cost, mandatory prevention will result in higher costs for both the provincial government and municipal governments in BC. For this reason, the policy option will result in significant initial costs, as well as obligatory ongoing costs. However, the costs associated with this option are expected to translate into positive change to wildfire preparedness, and the option is given the ranking of 2/3.

For the distributional equity criteria, there is no difference in the impact of the policy option across communities within the province. All municipalities must meet the minimum standards set by the provincial government by creating a CWPP and completing the necessary requirements for becoming FireSmart. This leads to the rank of 3/3 for distributional equity. For the criteria of improved preparedness in poor communities, the policy option ranks in the middle for having a minimal impact on improving wildfire outcomes for poor communities that have historically been underprepared. This is based on the expectation that communities with less resources will continue to have a lower ability to implement prevention and mitigation initiatives under a CWPP and will have a larger degree of difficulty meeting legislative requirements. For this reason, the criterion ranks 2/3 for its ability to moderately improve wildfire outcomes for poor communities that have historically been underprepared. Overall, the equity objective receives a total rank of 2.5/3.

This policy option ranks low on the index for administrative ease. Overall, a mandatory requirement policy would create additional administrative burden for FLNRORD, the Ministry overseeing the creation of CWPP and ensuring all communities are FireSmart. FLNRORD would also need to expand current approval systems in place and develop a strategy for compliance and enforcement. Further, as explained in the ranking for the equity objective, communities with less resources who have historically been underprepared will have a difficult time meeting the mandatory requirements with no additional support from the province. This leads to the ranking of 1/3 for the administrative ease objective.

For the final objective, stakeholder acceptance, the policy option ranks in the middle for its support from the provincial government and municipalities in BC. While both the CWPP and FireSmart are regarded as effective programs that support the prevention and mitigation of wildfires in the province, mandatory prevention would increase pressure on both levels of government to meet the new requirements. For this reason, the policy is expected to receive varying levels of support across municipalities and the provincial government, and overall support for the option is neutral. This leads to a ranking of 2/3 for the stakeholder acceptance objective.

Table 10.1. Table of Results

Objective	Option 1: Increased Coordination	Option 2: Improved Funding Programs	Option 3: Mandatory Prevention
Effectiveness	3	2	3
Cost	1	3	2
Equity: Distributional equity (/2)	2	3	3
Equity: Improved preparedness in poor communities (/2)	3	3	2
Equity Total (/2)	2.5	3	2.5
Administrative Ease	1	3	1
Stakeholder Acceptance	2	2	2
TOTAL	9.5	13	10.5

Chapter 11.

Recommendation

Through the analysis of each policy option proposed in this paper, the first recommendation is the implementation of the improved funding models policy option. Scoring a 3 in the cost, equity, and administrative ease criteria and receiving no scores of 1, this policy option resulted in a higher score than the two alternative policy options when addressing the policy problem that too many communities in BC's WUI are exposed to excessive risks from wildfires and are underprepared for the damage of increasing wildfires. It also addresses the finding from the survey methodology that insufficient financial resources are a primary barrier for wildfire prevention and mitigation in the province. Along with this option, the third policy option of mandatory prevention also scored well against the evaluation criteria, receiving the second highest score and presenting a more radical regulatory approach for mitigating against the impacts of increasing wildfires in BC. For this reason, it is recommended that the provincial government implement a policy package of improved funding programs and mandatory prevention.

Requiring that each municipality in BC implement a CWPP and take necessary action to become FireSmart, the mandatory prevention policy option would ensure that communities, particularly those in the WUI, are aware of the wildfire risks associated with their geographic location and are taking targeted action to prepare for increasing wildfires. Implemented alongside the policy option of improved funding models, municipal governments would be supported with additional resources needed to fund CWPP and FireSmart initiatives, as well as funding to implement associated fire and fuel management prescriptions targeted toward their communities. The improved funding model and mandatory prevention policy package would increase municipal capacity for wildfire initiatives, improve overall preparedness for wildfires, and increase prevention and mitigation initiatives within communities in BC. Overall, the recommended policies would not prevent wildfires from occurring, but would improve community resiliency and the ability of municipal level governments to protect residents, critical infrastructure, and surrounding natural landscapes from imminent wildfire threats in the WUI.

Chapter 12.

Conclusion

The trajectory of urban sprawl and development in the WUI will lead to negative impacts from increasing wildfires in the province of BC. For this reason, it is imperative that further action in the areas of wildfire prevention and mitigation be taken at all levels of government to improve community preparedness and decrease the damage incurred by wildfires. As this is a current issue that is being investigated by various researches, organizations, and government institutions, this paper builds on findings from recent work to identify the gaps perceived by communities and propose three potential policy options that address the problem that too many communities in BC's WUI are underprepared for excessive risks from wildfires. A review of current wildfire trends in the WUI and a detailed overview of current wildfire prevention policies and programs at each level of government provide a basis for understanding the current policy landscape for wildfire management in the province. Building on this, a review of community perceptions and engagement with wildfire initiatives in jurisdiction in BC, as well as a survey to understand existing gaps in wildfire prevention and mitigation, identify that there is need for further action to support community wildfire initiatives.

The results of the methodology and analysis indicate that there are a variety of barriers in the way of implementing wildfire prevention and mitigation initiatives in communities in BC. While each proposed policy option presents a strategy for improving wildfire preparedness at the municipal level, responding to the trajectory of increasing wildfires and other natural disasters will require a multifaceted approach that spans beyond community level mitigation. In the meantime, ensuring that communities in WUI areas that are prone to the detrimental impacts of wildfires are prepared and are taking preventative action should be a primary objective at all levels of government.

References

Ager, A., Day, M., Mchugh, C., Short, K., Gilbertson-Day, J., Finney, M., & Calkin, D. (2014). Wildfire exposure and fuel management on western US national forests. Journal of Environmental Management, 145, 54-70. Retrieved from https://doi.org/10.1016/j.jenvman.2014.05.035

Association of BC Forest Professionals. (May 2013). Interim Guidelines – Fire and Fuel Management. Retrieved from https://member.abcfp.ca/web/Files/policies/Fire_Fuel_Management-Interim_Guidelines.pdf

BC Ministry of Finance. (February 2018). BC Budget 2018. Government of BC. Retrieved from https://bcbudget.gov.bc.ca/2018/bfp/2018_Budget_and_Fiscal_Plan.pdf

BC Ministry of Finance. (February 2019). BC Budget 2019. Retrieved from https://www.bcbudget.gov.bc.ca/2019/download.htm

BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development. (April 2019). Impacts of 2018 Fires on Forests and Timber Supply in British Columbia. Government of BC. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/impacts_of_2018_fires.pdf

BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development. (2019). Government's Action Plan: Responding to Wildfire and Flood Risks – April 30, 2019 Update. Government of BC. Retrieved from https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/abbott-chapman_action_plan_update_april_30_2019.pdf

BC Public Safety and Emergency Services. (2019a). 2019 Update: Provincial Strategic Threat Analysis (PSTA). Government of BC. Retrieved from https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/vegetation-and-fuel-management/fire-fuel-management/psta

BC Public Safety and Emergency Services. (2019b). Emergency Management. Government of BC. Retrieved from https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/emergency-management-bc

BC Public Safety and Emergency Services. (2019c). Fire Centres. Government of BC. Retrieved from https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-response/fire-centres

BC Public Safety and Emergency Services. (2019d). Wildfire Averages. Government of BC. Retrieved from https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-statistics/wildfire-averages

BC Public Safety and Emergency Services. (2019e). Wildfire Causes. Government of BC. Retrieved from https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-response/fire-characteristics/causes

BC Public Safety and Emergency Services. (2019f). Wildfire Governance. Government of BC. Retrieved from https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/governance

BC Public Safety and Emergency Services. (2019g). Wildfire Prevention. Government of BC. Retrieved from https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention

BC Public Safety and Emergency Services. (2019h). Wildland Urban Interface Risk Class Maps. Government of BC. Retrieved from https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/vegetation-and-fuel-management/fire-fuel-management/wui-risk-class-maps

California Department of Forestry and Fire Protection. (2019). CAL FIRE Community Fire Prevention Grants. California Government Operations Agency. https://www.fire.ca.gov/media/8470/fy-2018-19-community-fire-prevention-grant-recipients.pdf

California Department of Forestry and Fire Protection. (February 2019). Community Wildfire Prevention & Mitigation Report. California Government Operations Agency. https://www.fire.ca.gov/media/5584/45-day-report-final

Chapman, M., Abbott, G., & British Columbia. (2018). Addressing the new normal: 21st century disaster management in British Columbia. BC Flood and Wildfire Review. Retrieved from http://www.llbc.leg.bc.ca/public/pubdocs/bcdocs2018/686064/bc-flood-and-wildfire-review-21st-century-disaster-management-in-bc-web.pdf

Daniels, L. D., Hagerman, S. M., & Ravensbergen, S. L. (May 2018). Wildfire Prevention and Fuels Management in the Wildland-Urban Interface: BC Community Perceptions. Report to the Union of BC Municipalities, First Nations' Emergency Services Society, BC Community Forest Association and BC Wildfire Service. Retrieved from https://ses.sites.olt.ubc.ca/files/2018/05/Community-Wildfire-Prevention-Summary-Report-May-20181.pdf

FireSmart BC. (2019). Recognized FireSmart Communities in BC. Retrieved from https://firesmartbc.ca/

FireSmart Canada. (2019). What is FireSmart. Retrieved from https://firesmartcanada.ca/what-is-firesmart/

First Nations' Emergency Services Society of BC. (2019). About the First Nations' Emergency Services Society of British Columbia Retrieved from https://www.fness.bc.ca/about

Forestry Enhancement Society of BC. (2019). About FESBC. Retrieved from https://fesbc.ca/about-the-fesbc.html

Forest Practices Board. (May 2015). Fuel Management in the Wildland Urban Interface – Update. Retrieved from https://www.bcfpb.ca/wp-content/uploads/2016/04/SIR43-Fuel-Management-Update.pdf

Johnston, L. (2016). Mapping Canadian Wildland Fire Interface Areas. University of Alberta. https://73c61686-1630-4745-842c-cf3169c8dadc.filesusr.com/ugd/90df79_debd2ac69e364605a78626fea71d4188.pdf

Johnston, L. & Flannigan, M. (2018). Mapping Canadian wildland fire interface areas. International Journal of Wildland Fire, 27, 1–14. https://doi.org/10.1071/WF16221

Krishnaswamy, A., Simmons, E., & Joseph, L. 2012. Increasing the resilience of British Columbia's rural communities to natural disturbances and climate change. BC Journal of Ecosystems and Management, 13(1), 1-15. http://jem.forrex.org/index.php/jem/article/viewFile/164/115

Lafortezza, R., Tanentzap, A., Elia, M., John, R., Sanesi, G., & Chen, J. (2015). Prioritizing fuel management in urban interfaces threatened by wildfires. Ecological Indicators, 48, 342-347. http://dx.doi.org/10.1016/j.ecolind.2014.08.034

National Oceanic and Atmospheric Administration. (2019). United States Department of Commerce. Retrieved from https://www.esrl.noaa.gov/csd/factsheets/csdWildfiresFIREX.pdf

Natural Resources Canada. (2019a). About the Canadian Forest Service. Government of Canada. Retrieved from https://www.nrcan.gc.ca/our-natural-resources/forests-forestry/about-canadian-forest-service/17545

Natural Resources Canada. (2019b). Climate Change and Fire. Government of Canada. Retrieved from https://www.nrcan.gc.ca/our-natural-resources/forests-forestry/wildland-fires-insects-disturban/climate-change-fire/13155

Natural Resources Canada. (June 2019c). Fire Ecology. Government of Canada. Retrieved from https://www.nrcan.gc.ca/our-natural-resources/forests-forestry/wildland-fires-insects-disturban/forest-fires/fire-ecology/13149

Nicholls, D. & Ethier, T. (January 19, 2018). Post-Natural Disturbance Forest Retention Guidance: 2017 Wildfires. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. Retrieved from https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/2017_fire_report_revised.pdf

Regional District of Central Kootenay. (October 2019). Community Wildfire Protection Plans (CWPP). Retrieved from https://rdck.ca/EN/main/services/emergency-management/community-wildfire-protection-plans.html

Taylor, S. W., Stennes, B., Wang, S. & Taudin-Chabot, P. (2006). Integrating Canadian Wildland Fire Management Policy and Institutions: Sustaining Natural Resources, Communities and Ecosystems. In Hirsch, K.G. & Fuglem, P., *Canadian Wildland Fire Strategy: Background, Synthesis, Analysis, and Perspectives* (pp. 3-26). Canadian Council of Forest Ministers.

Thompson, M. P., Haas, J. R., Gilbertson-Day, J. W., Scott, J. H., Langowski, P., Bowne, E. & Calkin, D. E. (September 2014). Development and application of a geospatial wildfire exposure and risk calculation tool. Environmental Modelling and Software, 63, 61-72. Retrieved from http://dx.doi.org/10.1016/j.envsoft.2014.09.018

UBCM. (August 2018). Community Wildfire Protection Plan Template. Retrieved from www.ubcm.ca-swpi-2017-update-cwpp-program-guide

UBCM. (2019). Community Resiliency Investment. Retrieved from https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment.html

UBCM. (2020). 2020 Community Resiliency Investment Program: Program & Application Guide. Retrieved from https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2020-program-guide.pdf

Union of British Columbia Indian Chiefs. (August 2018). BC First Nations being devastated by Wildfire Season of 2018, immediate resources needed. Retrieved from https://www.ubcic.bc.ca/bc_first_nations_being_devastated_by_wildfire_2018to

US Climate Health Alliance. (2020). Wildfires and Public Health: A View from the Front Lines. Retrieved from http://usclimateandhealthalliance.org/wildfires-public-health-view-front-lines/

Verhaeghe, C., Feltes, E. & Stacey, J. (April 2019). The Fire Awakened Us: Tsilhqot'in Report – 2017 Wildfires. Tsilhqot'in National Government. http://www.tsilhqotin.ca/Portals/0/PDFs/2019_TheFiresAwakenedUs.pdf

Wang, J. & Strong, K. (May 29, 2019). British Columbia's forest fires, 2018. Statistics Canada. Retrieved from https://www150.statcan.gc.ca/n1/pub/16-508-x/16-508-x2019002-eng.htm

Wotton, B. M., Flannigan, M. D. & Marshall, G. A. (August 2017). Potential climate change impacts on fire intensity and key wildfire suppression thresholds in Canada. Environmental Research Letters, 12, 1-9. https://doi.org/10.1088/1748-9326/aa7e6e

Appendix A.

Survey Questions

Page 1:

Why should you take part in this study?

The following survey is part of a graduate student's capstone project at Simon Fraser University's School of Public Policy. The study seeks to identify the gaps between current policy and what is needed to reduce the impacts of wildfires on the wildland-urban interface. You are invited to participate in this study as a senior member of local government in BC. Your participation in this survey will contribute to the value of the study and is greatly appreciated.

Study Procedures

The following survey includes 12 questions and should take you approximately 10 minutes to complete.

Voluntary Participation

Your participation is voluntary. You have the right to decline participation in this study.

Confidentiality

Your confidentiality will be respected. Information that discloses your identity will not be released without your consent and your confidentiality will be maintained to the fullest extent. If you choose to provide consent, your name may be used within the study and your response may be quoted. If you choose to remain anonymous, your identity will not be released.

Survey responses will be stored on the SurveyMonkey server, which is hosted in Canada, and will be deleted following the completion of the research project (April 2020). Only the principal investigator will have access to your survey responses.

Potential benefits and risks of the study

Information gleaned from your participation in this study will support the research of wildfire activity and prevention in BC. There are no foreseeable risks to you participating in this study. Please let the researcher know at any time if you have any concerns.

Withdrawal

If you decide to participate, you may still choose to withdraw from the study at any time prior to submitting your survey responses. If you choose to participate and then decide to withdraw at a later time, all data collected during your participation will be destroyed.

Study Results

The results of this survey will be used as part of a capstone report for the student's Master of Public Policy degree.

Contact for information about the study

Principal Investigator: Sarah Carthy
Email: […]

Contact for complaints

If you have any concerns about your rights as a research participant and/or your experiences while participating in this study, you may contact Dr. Jeffrey Toward, Director, Office of Research Ethics […]

Consent

By clicking "YES", I consent to participate in this study by completing the following survey. I acknowledge that I may exit the survey at any time and withdraw my participation prior to submitting the survey.

Page 2:

1. Name:
2. Title:
3. Municipality:

Page 3:

1. Does your community have a Community Wildfire Protection Plan (CWPP)? (Yes/No)

    - Conditional question: If no, please describe some of the reasons why your community does not have a Community Wildfire Protection Plan (CWPP). (Text)

2. Is your community FireSmart? (Yes/No)

    - Conditional question: If no, please describe some of the reasons why your community is not FireSmart. (Text)

3. Does your community use fire and fuel management as an approach to mitigate the impacts of wildfires? (Yes/No)

    - Conditional question: If yes, please provide a description of the approaches used. (Text)

4. What other wildfire prevention initiatives are in place in your community? (Text)

5. What gaps do you see in current policy and the provincial government's approach to wildfire management in BC, if any? (Text)

6. What actions at the provincial level would help improve wildfire prevention in your, community, if any?

7. What approaches would you recommend to improve wildfire prevention in BC, if any? (Text)

8. What additional measures would you suggest that would help your community improve prevention initiatives? (Text)

9. Do you have any additional comments or perspectives you would like to add? (Text)

Appendix B.

Survey Respondents

Northwest	Caribou	Prince George	Coastal	Kamloops	Southeast
• CAO, Village of Burns Lake • CAO, District of New Hazelton • Director of Protective Services, Regional District of Bulkley-Nechako	• CAO, Cariboo Regional District	• CAO, Regional District of Fraser-Fort George • CAO, Village of Fraser Lake • General Manager, Emergency Services, Peace River Regional District	• CAO, Village of Zeballos • CAO, Village of Harrison Hot Springs • CAO, Squamish-Lillooet Regional District • CAO, Town of Port McNeill • Fire Chief, City of Surrey • Fire Chief, District of North Vancouver • Fire Chief, City of Langford • Fire Risk Manager, Town of Lake Cowichan • Fire Services Coordinator, Cowichan Valley Regional District • General Manager, Regional District of Nanaimo • Area Director, Sunshine Coast Regional District • Manager of Protective Services, Sunshine Coast Regional District • Fire Chief, Coquitlam	• CAO, Village of Cache Creek • CAO, Village of Chase • Emergency Program Coordinator, Town of Oliver • Fire Chief, District of Barriere • Fie Chief, West Kelowna • General Manager of Community Services, Regional District of Okanagan-Similkameen	• CAO, Nelson • CAO, Village of Radium Hot Springs • CAO, RDEK • CAO, Creston • CAO, Village of Montrose • CAO, Silverton • General Manger of Community Services, RDCK • Manager, Slocan Valley

Appendix C.

Fire Centres

Source: BC Public Safety and Emergency Services, 2019c