BARRIERS AND OPPORTUNITIES FOR WILDFIRE RISK REDUCTION TREATMENTS IN THE CARIBOO REGION OF BRITISH COLUMBIA

by

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Abstract

The state of wildfire risk and occurrence in Canada poses challenges for forests in British Columbia. These challenges are especially exigent for dry-belt forests in the province. In the Interior, Douglas-fir stands have long been neglected, with licensees across the region focused on salvage logging of lodgepole pine stands affected by mountain pine beetle. With the end of salvage logging in sight, Interior Douglas-fir stands will become an increasingly important source of timber supply in the area. But these stands have stagnated. They are over-dense and at risk for catastrophic losses from wildfire or another insect or disease outbreak.

This exploratory research focuses on identifying policies or economic factors that are the most constraining on forest managers in the region. To do so, qualitative case study research methods involving semi-structured interviews are used. These interviews were administered to forest professionals in decision-making positions for various actors in the region. Understanding the views of these decision-makers is one of the fundamental pieces of making sense of the on-the-ground effects of forest or environmental policies or regulations.

Then, using a framework of barriers to climate change adaptation developed by Ekstrom, Moser, and Torn (2011), potential barriers to solutions are discovered. Finally, the potential adaptation of a US tool called “stewardship contracting” to address issues, constraints, or barriers is analyzed.
Lay Summary

This study attempts to find potential barriers that might be present in the Cariboo Region of British Columbia when acting to reduce the risk of wildfire in Interior Douglas-fir forests. Using semi-structured interviews, the on-the-ground issues facing forest managers are compared to a framework of barriers to identify issues that may prevent action(s) to address wildfire risk from being taken in the study area. Then, a policy tool called “stewardship contracting” is assessed as a possible solution to some of the issues and barriers present in the region. This tool would allow the government of BC to trade the cost of work with the value of timber logged on public land.
Preface

This thesis is the original, unpublished, independent work by the author, Judah Melton. The fieldwork reported in Chapters 3-5 was covered by UBC BREB Certificate number H15-00817.
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<tr>
<td>BC</td>
<td>British Columbia</td>
</tr>
<tr>
<td>BCWS</td>
<td>British Columbia Wildfire Service</td>
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<tr>
<td>BEC (zones)</td>
<td>Biogeoclimatic (zones)</td>
</tr>
<tr>
<td>BLM</td>
<td>US Bureau of Land Management</td>
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<tr>
<td>CAD</td>
<td>Canadian dollar(s)</td>
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<tr>
<td>CCLUP</td>
<td>Cariboo-Chilcotin Land-Use Plan</td>
</tr>
<tr>
<td>CRIP</td>
<td>Community Resiliency Investment Program</td>
</tr>
<tr>
<td>FESBC</td>
<td>Forest Enhancement Society of British Columbia</td>
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<tr>
<td>FFT</td>
<td>Forests for Tomorrow</td>
</tr>
<tr>
<td>FLNRORD</td>
<td>BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development</td>
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<tr>
<td>FRPA</td>
<td>Forest and Range Practices Act</td>
</tr>
<tr>
<td>IDF</td>
<td>Interior Douglas-fir</td>
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<tr>
<td>SWPI</td>
<td>Strategic Wildfire Prevention Initiative</td>
</tr>
<tr>
<td>TSA</td>
<td>Timber supply analysis</td>
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<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>USD</td>
<td>US dollar(s)</td>
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<tr>
<td>USFS</td>
<td>United States Forest Service</td>
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In the December 2017 issue of the International Association of Wildland Fire’s monthly publication, “Wildfire”, Managing Editor Ron Steffens, a 35-year veteran Wildland Fire Analyst and Incident Commander for the US National Parks Service wrote:

“These stories will change us, the lives lost and houses burned, though it may take months or years for us as individuals, much less a profession, to absorb and act upon the change. We bear witness, assemble facts, ride herd on emotions and aftermath, and soon the resonance will surface, and we’ll change course to navigate this new geography.”

Though Steffens was speaking about the new mega-fire paradigm the world has found itself in, I think it is an apt metaphor for this journey I am on that culminates with the writing and defense of this thesis. Never in a million years could I have predicted the “emotions and aftermath” that I would ride since being accepted into the Faculty of Forestry at UBC.

I am fortunate for the access and support I have benefited of through this process, and throughout my life. So first, this thesis is dedicated to grad students everywhere who have faced those “emotions and aftermath”, both on and off campus, especially those with less access and privilege than I. Secondly, this thesis is dedicated to any who have lost property, pet, friend, or family to wildfire. I can’t imagine what it must be like to lose everything, lose a loved one, or to even have that threatened by a fire. If this thesis can, however indirectly, prevent that from happening once, then it has been worth the “emotions and aftermath.”
Chapter 1: Introduction

Wildfire risk is increasing all over the world. This is, in large part, due to the warming and drying conditions associated with climate change (Bowman, Murphy, & Cary, 2013; Flannigan et al., 2001; Flannigan, Logan, Amiro, Skinner, & Stocks, 2005; Hély, Flannigan, Bergeron, & McRae, 2001; Krawchuk, Moritz, Parisien, Van Dorn, & Hayhoe, 2009; Nitschke & Innes, 2008; Running, 2006; Tymstra, Flannigan, Armitage, & Logan, 2007; Westerling & Bryant, 2007; Westerling, Hidalgo, Cayan, & Swetnam, 2006; Wotton, Martell, & Logan, 2003).

This is true across Canada, where area burned has grown substantially, averaging an increase of over 33,500 ha per year for the past 60 years (Hanes et al., 2019). Large fires are also getting bigger, and both the start and end of the fires season have expanded by a week each year (Hanes et al., 2019; Wildfire Management Branch, 2014b).

Increasing frequency and size of wildfires has important implications for the wildland-urban interface. As we continue to increase industrial activities in the forest, and couple that with an increase in human settlement and infrastructure in the wildland-urban interface, there is an increased chance for economic losses from destroyed or damaged structures as well as water and air pollution as a result of fires. Population in rural and interface areas is on the rise across Canada (Nelson, Hotte, Mahoney, & Kova, 2014). This rise in population is supported by several studies (Attiwill & Adams, 2013; Flannigan, Krawchuk, de Groot, Wotton, & Gowman, 2009; Galiana-Martín, 2017; Wildfire Management Branch, 2016).

With an increase in interface areas due to population growth comes an increased chance for economic losses from destroyed or damaged structures, or water quality issues from runoff and sediment after fires. These issues make it ever more important to address wildfire risks and hazards in Canada. Doing so may require land managers and policy makers to look beyond
traditional management strategies, which may not remain effective in the face of the new paradigm of megafires (Flannigan et al., 2013).

Although there have been notable wildfires throughout Canada’s history, fire occurrence is on the rise, even in boreal forests which are typically wetter and colder than other, more fire-prone forested areas of the world (Tymstra et al., 2007). While large fires, those over 200 hectares, account for a relatively small portion of all fires in Canada, they typically represent more than 97% of area burned, according to Natural Resources Canada (2018). A string of large, destructive fires in the previous two decades have helped to illustrate the magnitude of the risks and potential impacts that mega-fires could have on both urban and rural landscapes. These include, but are not limited to: the 2003 Okanagan Fire; the 2009 Okanagan Lake fire; the 2010 Quebec wildfires; the Slave Lake and Richardson fires in Alberta in 2011; and the 2016 Fort MacMurray fire, which caused the evacuation of the entire city which has a population of more than 88,000 (Weber, 2017).

In 2017 and again in 2018, BC experienced its most destructive wildfire seasons in recorded history. On July 7th, 2017, a state of emergency was declared in BC. This was extended four times over the course of the summer, lasting a total of 69 days. During this period, 1,214 individual fires were recorded, burning approximately 1,159,000 hectares. The total cost of suppression and emergency relief efforts for the season exceeded $700 million CAD (Daniels, 2017).

It was surprising when the 2018 fire season immediately surpassed 2017 to become the most destructive fire season in BC history. In the summer of 2018, a similar period of dry, hot weather around the province and a series of lightning storms started hundreds of fires. By the time the season was finally over -- as of November 15, 2018 -- 2,092 fires had been recorded in
the province, burning 1,351,314 hectares of land and costing over 350 million CAD (Azpiri, 2018).

1.1 The effect of wildfires in British Columbia

Although 2017 and 2018 were the most destructive fire seasons in British Columbia, it is not surprising that such costly wildfire seasons happened. Data show that in the period between 2000-2009, wildfires in British Columbia were far more destructive than fires in the rest of Canada (Wotton, Nock, & Flannigan, 2010). This trend is expected to continue (Hanes et al., 2019). According to Westerling (2016), forests in the Northern Rocky Mountains of the US will be especially susceptible to fire due to warmer temperatures and earlier snowmelt in the spring. This increase will extend into BC’s Rocky Mountain forests, and other interior forests as well (Nitschke & Innes, 2008).

Likewise, Westerling’s (2016) results show that forests in the Pacific Northwest region of the US are seeing more of an increase, in both frequency and size of wildfires, than other regions. This is likely to be the case in the coastal forests of BC. The Coast Mountains, Georgia Basin, Southern Interior, Central Interior, and Southern Interior Mountains regions are all likely to see increases in monthly fire severity ratings during the summer months by the year 2080 (Haughian, Burton, Taylor, & Curry, 2012).

Additionally, a predicted four-degree increase in temperatures by 2080 will have the following effects on wildfires in the southern-interior of the province, where a large portion of the Interior Douglas-fir forest type (heretofore referred to as IDF) is located: an increase of average burned area per fire; an increase in fire severity by 40% in spring; 95% in summer; and 30% in autumn; an increase in fire season and frequency of fires by 30%; an increase in crown
fire ignition by 4%; an increase in severe fire behavior by 7%; and a decrease of 39% in the extent of fire free areas (Nitschke and Innes, 2008, as cited in Wildfire Management Branch, 2014a). These increases will also lead to an increase in the cost of fire response as well as losses to communities, natural resource values, and midterm timber supply. This will be especially true in dry forests in the interior of British Columbia (Wildfire Management Branch, 2014a, p. 23).

Research shows that certain areas of Canada’s timber supply will reach a high to extreme level of vulnerability sometime in the 2050s (Gauthier et al., 2015, p. 1439). What has not yet been studied, however, are potential ways to address timber supply vulnerability or how to best maximize and protect the future merchantability of the timber supply in dry-belt forests, while also protecting the resource and those that live among it from catastrophic wildfire.

Unfortunately, a century of fire suppression, a changing climate, and management decisions that lacked foresight, have led to stands that are overstocked. This has increased the likelihood of catastrophic wildfire and reduced both overall vigor of the stand, and merchantability of the timber. Not only is wildfire an economic issue due to potential loss of timber, but also due to the increasing cost of controlling a wildfire through suppression. This is true for many forested jurisdictions throughout the world, including Canada.

1.2 The cost of wildfire management in Canada

In Canada, while fixed costs such as salaries and infrastructure have remained relatively stable, variable and total costs have been constantly rising since the 1970s (Stocks & Martell, 2016). In a period from 1970 to 2010, the 10-year average annual national costs increased by 176% (Stocks, 2013) and has continued in the last decade (Hope, McKenney, Pedlar, Stocks, & Gauthier, 2016).
Figure 1.1 Yearly wildfire response costs in British Columbia (BC Wildfire Service, 2018)

A solution to rising costs associated with wildfires, an increase in the area of wildland-urban interface and increasing severity of wildfires necessitate a shift from suppression towards mitigation. A large part of this will come in the form of fuels reduction (Daniels, Gray, & Bowman, 2017), but in general, the focus should be on preventative measures (Moritz et al., 2014).

A combination of education and fuels reduction treatments can not only reduce, but minimize both the cost of management as well as direct and indirect socioeconomic losses after a wildfire (Butry, Prestemon, Abt, & Sutphen, 2010). Though their results are specific to Florida and they advise caution when applying their results to other regions, Gray et al. (2015) recommend that a similar combination of education and mitigation be attempted in at-risk areas. Several other studies confirm the positive benefits of thinning or fuels reduction programs (Agee & Lolley, 2006; Arkle & Pilliod, 2010; Boer, Sadler, Wittkuhn, McCaw, & Grierson, 2009; Stevens-Rumann, Prichard, Strand, & Morgan, 2016; Stevens-Rumann, Shive, Fulé, & Sieg, 2013; Sturtevant et al., 2009; Thompson, Vaillant, Haas, Gebert, & Stockmann, 2013). Any
attempt to address the increasing problems associated with mega-fires must consider fuels reduction treatments.

Unfortunately, fuels reduction treatments can be very expensive, especially when site-specific context like terrain, transport distance, and stand type are considered (BC Forest Practices Board, 2015). If this work is not being done, it may be due to several reasons: lack of information, differing priorities for those in charge, or gaps in current policy or programs. To develop policy solutions which address those gaps, BC could look towards other jurisdictions, such as the US for policy learning. For example, the US has a policy tool called “stewardship contracting” which is used to make fuel reduction treatments more economically viable. Because of the nature of context or site-specific issues in forest management, looking at problems and solutions from a specific region in BC may give a better understanding of how any potential tool may or may not fit the problem.

1.3 Cariboo case study

In BC, the interior region known as ‘the Cariboo’ is at an especially high risk of economic and environmental losses due to factors detailed above. The Cariboo is home to a large proportion of BC’s Interior Douglas-fir stands. In total, the Interior Douglas-Fir biogeoclimatic zone, hereafter abbreviated as IDF, makes up about 5% of the BC landscape (Day, 1996). Similarly, the Cariboo economic development region is home to 154,271 people, or approximately 4% of BC’s population, according to the most recent census data (Work BC, 2019). Though this may seem like only a small portion of the land base and population, the IDF is incredibly valuable for the people of BC, containing valuable timber, wildlife habitat, and
recreational opportunities. More importantly, the communities that reside inside this zone are dependent upon the forest for their livelihoods.

In recent years, BC has been dealing with massive losses in pine forests, primarily in the interior due to the mountain pine beetle epidemic (Corbett, Withey, Lantz, & Ochuodho, 2016). Though the peak of that epidemic has passed, the effects are still being felt. Primarily, the forest industry in the interior has spent much of the last one to two decades trying to mitigate losses to timber supply by harvesting as much of the affected pine as it feasibly can, referred to as salvage harvesting. This has not been the only effort to address the multitude of issues facing the province due to mountain pine beetle (The Government of British Columbia, 2006).

In fact, so much of the focus of BCs forest industry, FLNRORD, and even members of the public has been on responding to the mountain pine beetle epidemic, that in 2012 FLNRORD released a mid-term timber supply action plan titled “Beyond the Beetle” (BC Ministry of Forests Lands and Natural Resource Operations, 2012). Unfortunately, this focus on pine has meant that other stand types in the interior have been largely ignored, sitting all but un-managed over the last few decades. This is certainly true in the IDF stands in the southern interior of the province (Day & McWilliams, 2013).

As forest licensees in the Cariboo transition out of pine-beetle salvaging and into harvesting in the IDF, new approaches will need to be put into practice, including silvicultural systems not typically used in pine stands. Not only that, but because of a lack of presence by the industry in the IDF zone, as well as a century of fire suppression, many IDF stands have stagnated. They have become so dense that there is a lack of quality timber to be harvested and no room for it to develop in the future. This only serves as a further barrier to licensees’ desire to return to these stands. New tools need to be developed and put into practice in the IDF.
Communities in the Cariboo are at risk to not only the safety of the lives and homes due to the increasing risk of interface fires, but they are also at economic risk due to the mountain pine beetle and other factors affecting the current state of IDF stands. If these risks are not addressed, whether through current policies and programs or through other avenues and innovations, the potential for losses will likely increase.
1.4 Research objectives

The specific research objectives of this study can be summarized as follows:

1. Explore forest professionals’ views of the on-the-ground effects of policy, economics, and social factors on forest management and wildfire risk reduction in the Cariboo.

2. Identify potential barriers to wildfire mitigation efforts in the Cariboo using a framework for assessing barriers to climate change adaptation developed by Ekstrom, Moser, and Torn (2011).

3. Evaluate the potential adaptation of stewardship contracts from the US into BC as a tool to address deficiencies in current policy/programs and/or address issues or barriers discovered with objectives I and II.

This research project is primarily exploratory in nature (Given, 2008), due to a gap in the literature regarding barriers to wildfire mitigation in the dry-belt fir forests of interior BC. The results will add to the existing knowledge of potential policy tools to address wildfire risk and forest health in BC.
Chapter 2: Background

2.1 Forest governance and management in BC

The Cariboo Region, often referred to as “the Cariboo,” is approximately 70,000 km$^2$ and lies within the central interior of the province. The Cariboo is comprised of three separate forest districts: Quesnel in the north, the centrally located Cariboo-Chilcotin, and in the south, 100-Mile House. The two sections of the Cariboo-Chilcotin straddle the Fraser River, with the Cariboo to the east, and the Chilcotin to the west.

Figure 2.1 Location of the Cariboo Resource District in central BC, highlighted in red (FLNRORD, 2020)
2.1.1  Actors

The numerous actors in the Cariboo increase the complexity of an already complex situation. However, these actors may also increase economic, political, and social capital, which places the Cariboo in a unique position to serve as an ideal location to assess the feasibility of stewardship contracting as a tool to address both stand quality and wildfire risk in the IDF zone.

This complex governance framework provides context to the study described in the chapters that follow. Understanding what policies and actors govern forest management in the Cariboo is the key step towards developing solutions to any natural resource issues, including that of wildfires.

2.1.1.1  Government

Government actors with influence over forests in BC are typically limited to the provincial, and in some instances, local levels of government. In some areas, this might also include federal agencies. In Canada, the federal government’s control over forestry is limited to lands specified as under federal jurisdiction, such as National Parks or Indian Reserves (Watts & Tolland, 2005). In the Cariboo there is a military reserve west of Williams Lake called the Chilcotin Military Training Area (Government of British Columbia, n.d.-a), which is approximately 40,000 hectares in size. In 2017, the largest wildfire in BC history, the Plateau Fire, burned nearly 550,000 hectares of the Chilcotin Plateau (BC Wildfire Service, n.d.), including 15,000 hectares of the Chilcotin Military Training Area (Hilton, 2018).

One of the ways the province is divided regionally is by regional districts. The purpose of regional districts is to provide governance and services as well as a political and administrative framework. Regional districts also serve as the “local” government for rural residents (BC
In the context of provincial government, the Cariboo itself a regional district.

At the local level, government actors typically represent municipalities including the City of Williams Lake, the City of Quesnel, and the District of 100-Mile House. In the greater context of forest and wildfire management in the province, this level also includes the Union of BC Municipalities (UBCM).

According to their website, the UBCM “…was formed to provide a common voice for local government...” Since 2004, UBCM has funded and administered a group of programs called “the Strategic Wildfire Prevention Initiative” (Union of BC Municipalities, 2012). Management of the program is shared between UBCM, FLNRORD, and the First Nations’ Emergency Services Society (FNESS) (Union of BC Municipalities, 2017).

At the provincial level, government actors are primarily represented by FLNRORD. This ministry was formed in 2010 as part of a complete restructure of natural resource-related ministries by the former BC Premier, Gordon Campbell. FLNRORD has many different departments to manage or administer various elements of forests and forest resources. There are also branches of FLNRORD that act as their own separate entity within the ministry. In relation to wildfires or timber harvesting, two of these agencies are the BC Wildfire Service (BCWS), and BC Timber Sales (BCTS).

The BC Wildfire Service was formed in 1912. BCWS is directed to implement management of and response to wildfires in the provinces, to protect human lives and values, and help promote “sustainable, healthy, and resilient ecosystems (Government of British Columbia, n.d.-b). BCWS is the government organization responsible for the suppression of
wildfires in the province. However, there are private organizations that train and employ wildland firefighters as well.

### 2.1.1.2 Forest Enhancement Society of BC

In 2016, with an initial investment of $85 million CAD, the Government of BC created an organization called the Forest Enhancement Society of BC (FESBC). The three objectives of FESBC are: to promote stewardship of BC’s forests by addressing issues of forest health, insects and disease, wildfire, and climate change (Forest Enhancement Society of British Columbia, 2018). Though they no longer fund wildfire mitigation, FESBC is still note-worthy, as elements of its directive are in line with the uses for stewardship contracts in the US.

### 2.1.1.3 First Nations

It is important to note that the province of BC is home to around 200 First Nations in total (BC Assembly of First Nations, 2019; Province of British Columbia, 2019). All of these governments consider various areas of the province to be their traditional territories. But due to the way the province was settled by Europeans, many of these territories were taken over neither through treaty nor through conquest (Hunter, 2017). In the Cariboo region, there are many First Nations. This includes: the Esk’etemc, Xats’ull, T’exelceme, Toosey, Nazko, Tsideldel, Tl’etinqox, Tsilhqot’in (Yunesit’In?), Tsq’escen’, ?Esdilagh, Ulkatcho, Stswecem’c Xgat’tem, Xeni Gwet’in, Lhatko Dene, and Lhoosk’uz Dene (Government of British Columbia, 2019).

Starting in the 1990s, a series of legal battles over rights to and in the traditional territories of BC First Nations escalated. These court battles culminated with the 2014 Tsilhqot’in Decision by the BC Supreme Court, which granted title to the Tsilhqot’in First
Nation to a part of their traditional territory (Tsilhqot’in National Government, 2014). This has meant that for the past half-decade, more and more First Nations are considering their options for reclaiming control over their traditional lands, leading to some degree of uncertainty amongst First Nations, the forest industry, the government of BC and FLNRORD regarding major changes to BC’s system of forest governance. Not only that, but as the provincial government has increased its own efforts toward reconciliation with First Nations, they have also increased the amount and types of tenure available to First Nations. One result of all of this is that many First Nations now are tenure holders. In 2017 in BC, tenure held by First Nations amounted to 11.6 percent of all timber tenure types. In 2019, the BC government gave First Nations the ability to review tenure transfers (CBC News, 2019).

First Nations in the Cariboo hold several different types of tenure, with some Nations holding multiple tenures. For example, the Esk’etemc First Nation manages forest resources under a Woodlot Licence, a Community Forest Agreement, a First Nations Woodland Licence, and Non-Replaceable Forest Licences through an Esk’etemc-owned organization called Alkali Resource Management (Esk’etemc First Nation, n.d.).

2.1.1.4 Licensees

In terms of percentage of Allowable Annual Cut (heretofore referred to as AAC), the major Forest Licence holders in the three TSAs in the Cariboo (Quesnel, Williams Lake, and 100-Mile) are West Fraser Timber Co. and Tolko Industries. A breakdown of AAC control is shown in Figure 2.2. West Fraser and Tolko hold most of their volume in replaceable forest licences, though Tolko holds non-replaceable licenses as well. The other three companies hold only non-replaceable forest licences.
As a response to the Softwood Lumber Dispute between Canada and the United States, in 2003, the province formed BC Timber Sales (BCTS). The primary mandate of BCTS is “to provide the cost and price benchmarks for timber harvested from public land in British Columbia” (BC Timber Sales, n.d.). BCTS is responsible for management of approximately 20 percent of the provincial AAC.

Aside from the TSA, there are also area-based license types of importance in the Cariboo. The first of these are Community Forest Agreements (CFA). There are seven CFAs in the region. These are the Williams Lake, Likely Xats’ull, Esk’eteme, Eniyud, Wells-Barkerville, 100-Mile, and Clinton and District Community Forests. There are also Woodlot licences spread throughout the region. These licenses are either awarded directly or through a competitive application.

Finally, the University of British Columbia manages several areas in the Williams Lake area as
the Alex Fraser Research Forest. Because these licensees hold area-based tenures, they could serve as test locations for stewardship contracting. Further discussion on area-based tenures versus volume-based tenures can be found in section 2.1.2.1.

2.1.1.5 Other industry and users

Beyond First Nations and major licensees, there are many local or regional wood users or processors. A few examples of these companies are: Pinnacle Renewable Energy, Atlantic Power, Norbord (Interex Forest Products), Ainsworth Energy, Cariboo Pulp and Paper, Quesnel River Pulp, and Reko Log Homes. Though a few of these companies do hold some types of tenure, they are primarily users of forest fibre and other forest products. Though this means they may have a smaller direct influence on policy than major tenure holders, they do have an influence on markets and diversity of forest products.

There are also various recreational user-groups in the area, representing public interests and values such as mountain biking, hunting, and hiking. Likewise, several non-profits operate in the region, representing many different interests or values. This includes groups such as the Fraser Basin Council, who advocate to “advance sustainability in the Fraser [River] Basin” (Fraser Basin Council, n.d.); the Union of BC Municipalities, who represent local governments (Union of BC Municipalities, 2012); and the BC Community Forest Association, who represent those who hold or are seeking community forest agreements (British Columbia Community Forest Association, n.d.); as well as others not mentioned previously like the BC Cattlemen’s Association, who advocate for the cattle industry in BC (BC Cattlemen’s Association, n.d.); or the Grasslands Conservation Council of BC, who advocate for grasslands conservation in BC (Grasslands Conservation Council of BC, n.d.).
A new type of challenge has begun to materialize for natural resource managers (Lockwood, Davidson, Curtis, Stratford, & Griffith, 2010). This emerging paradigm in natural resource management stems from diverse and competing views and values which emanate from issues that lack a single cause, have differing views on both problems and solutions, and intricate and overlapping institutional boundaries. In order to develop solutions for these problems, Lockwood et al. (2010) assert that “greater levels of integration, coordination, and attention to multi-scalar phenomena” (p. 987) are key components of effective solutions to wicked problems.

This emerging paradigm is evident in the Cariboo, where the Provincial and First Nations governments, environmental NGOs, forest industry, recreational user groups, and others have varying thoughts about what values are most important. As the population in parts of the Cariboo continues to grow, the range of values will increase. These actors also have varying beliefs as to both the primary cause of the new wildfire paradigm as well as the solution. Finally, this interwoven matrix of these users over a land base with a diverse set of natural resources is a prime example of the intricate and overlapping boundaries mentioned by Lockwood et al. (2010).

2.1.2 Policies

British Columbia’s forests are approximately ninety-six percent publicly owned. The jurisdiction of the land upon which these forests are located, called “Crown Land,” and the resources they contained, was granted to the provinces after Canadian Confederation in 1867. Of those lands, ninety-five percent are provincially managed and one percent federally managed. The remaining four percent of forested lands in British Columbia are privately owned. For
purposes of this study, when referring to “British Columbia’s forests,” it is assumed that the
publicly owned, provincially managed forests are being discussed, unless otherwise specified.

British Columbia’s forests are regulated by many different pieces of provincial
legislation. Of those, three acts are primarily responsible for matters that pertain to this study: the
Forest Act, the Forest and Range Practices Act, and the Wildfire Act. These three acts dictate
everything from allocation of rights and access, to responsibilities and consequences for those
working in the forests of BC, including, but not limited to responsibilities and liability for
wildfires as a result of forest activities.

2.1.2.1 The Forest Act

Originally passed in 1912, the Forest Act is the primary statute related to forest law in
British Columbia. The Forest Act has been revised several times since it was originally passed,
most notably in 1947, 1979, and 1982. The primary function of the law is to classify forest lands,
set the rate of logging, grant timber tenure rights and associated rules, and set regulations for the
forest industry. In other words, the Forest Act is the primary authority for allocation of forest
resources (Legislature of British Columbia, 1996). Through the Forest Act, rights to harvest
timber are granted through timber tenures. There are thirteen types of timber-harvesting tenures
available to companies, communities, First Nations, and/or individuals.

In broad terms, timber tenures are either volume-based or area-based. No tenure can be
renewed upon the end of its term, but some types of tenure are considered “replaceable.” In
essence, this means a new license will be issued, often with the exact same terms as the
previously held licence (Watts & Tolland, 2005). In the Cariboo, the major forest licensees are
granted tenure through a Forest Licence. There are also community forests, woodlots, Tree Farm Licences and a research forest in the area, as mentioned in section 2.1.1.4.

2.1.2.2 Forest and Range Practices Act

The Forest and Range Practices Act (FRPA) was passed in 2002 and fully enacted in 2005 (Legislature of British Columbia, 2002). It was designed as a complete replacement for the previous forestry practices legislation, the Forest Practices Code. FRPA was designed to move away from a strictly regulatory approach towards a “results-based” approach, shifting more responsibility to licensees. This also gave forest licensees greater ability to manage their tenure according to their own plans, provided they meet certain standards for a variety of values. Those values are: biodiversity, cultural heritage, fish/riparian, forage and associated plant communities, recreation, resource features, soils, timber, visual quality, water quality, and wildlife (The Government of British Columbia, 2003).

In 2019, BC’s Minister of Forests, Doug Donaldson, introduced changes to FRPA, beginning a process to seek input into changes to the law. According to a discussion paper released by FLNRORD in May of 2019, the proposed changes would have four major effects: “gain the public’s trust in forest management, introduce a framework for landscape-level forest planning, strengthen government oversight of forest and range practices, and create stronger links to other government initiatives” (BC Ministry of Forests Lands Natural Resource Operations and Rural Development, 2019, pp. 5-6).

Whether or not these changes will be successful is to be seen. According to the report, FLNRORD states that landscape-level planning will benefit British Columbia by “reducing forest losses associated with climate change and natural disturbance events such as wildfires,
insect infestations, droughts, and floods” (BC Ministry of Forests Lands Natural Resource Operations and Rural Development, 2019, p. 8).

The need for more integrated management at the landscape-level may stem, in part, from the unbalanced ratio of volume-based tenure to area-based tenure in the province. Licensees under volume-based tenures have little to no financial incentive to plan and take care of the land beyond their obligations under FRPA and other laws mentioned here.

**Government Action Regulation Orders**

One key part of FRPA which is relevant to this study is the “Government Actions Regulation” (GAR). Per FLNRORD’s website, the Government Actions Regulation “directs how the B.C. provincial government established land designations or stewardship measures for forest and range values” (The Government of British Columbia, n.d.-b). Through GAR, ministerial orders are issued regionally, which essentially designate areas of special consideration for one of the FRPA resource values. There are many GAR orders throughout the province, but two which are of significant note in this case, due to their specific application to the region and the IDF forest type.

### 2.1.2.3 Mule Deer Winter Range

One GAR order that has a major effect on forest management in the region addresses winter habitat for mule deer. The Cariboo region is home to a variety of wildlife. This includes mule deer, moose, black bears, lynx, marten, owl, and many species of fish. The region is also home to several species of wildlife listed as “at-risk” according to the Species at Risk Act of
Canada. These include grizzly bears, bighorn sheep, mountain caribou, and the prairie falcon (Forest Analysis and Inventory Branch MFLNRO, 2013).

Because of their importance as both a prey species for major wildlife predators in the region, as well as their importance as a desired species for hunting in the province, mule deer habitat is protected in the Cariboo. This is enabled through a GAR Order for Ungulate Winter Range, or Mule Deer Winter Range (MDWR).

In the Cariboo region, MDWR has been part of the Ministry’s conservation efforts since the mid-1990s, as part of the Cariboo-Chilcotin Land Use Plan. Originally established in 1994 under the Land Act and the Forest Practices Code and preserved under the Forest and Range Practices Act, The Cariboo-Chilcotin Land Use Plan (CCLUP) is a higher-level plan for forest and timber management issues in the Cariboo Region.

The CCLUP contains various definitions, objectives, and strategies related to regional forest management. It also contains direction for the management of wildlife habitat in the region, including the management of winter habitat for mule deer. According to the original executive summary by the Ministry of Forests in 1996, twelve different objectives for maintaining MDWR were identified as follows:

1. Development of Douglas-fir stands and regeneration
2. Promotion of uneven-aged, multi-layered stands of mature Douglas-fir
3. Conservation of suitable proportions of various crown closure habitats based on snowpack zones
4. Maintaining desired distribution of crown closure habitats within a winter range
5. Continuation of desired forest cover on microhabitats
6. Maintenance of winter range habitat on all aspects and slopes
7. Conservation of adequate thermal, security, and snow interception cover
8. Conservation of food supply/availability
9. Maintenance of appropriate spatial arrangement of habitat(s)
10. Minimization of stress from human activity such as design of roads and access
11. Conservation of all winter ranges for annual use of winter range
12. Maintenance of fencing that is safe for wildlife, “as outlined in the CCLUP” (p. 1-2).

This policy is quite prescriptive and may act as a constraint to activity in the forest, whether that be normal harvesting operations, or treatments to reduce the risk of wildfire or improve health of stands affected by disturbances. For example, reducing density in a stand in effort to reduce fuel loads may cause that stand to fall under required crown closure mentioned in number 4 above.

2.1.2.4 Old-Growth Management Areas

Another piece of the CCLUP that affects management decisions in the Cariboo are Old-Growth Management Areas (OGMAs). For the Interior Douglas-fir BEC zone and its associated variants, the following standards must be met in OGMAs: >250 years old, >13 percent old forest retention in both low and intermediate biodiversity emphasis areas, and >19 percent old forest retention in high biodiversity emphasis areas (The Government of British Columbia, 2004b).
2.1.2.5 Wildfire Act and Wildfire Regulation

In 2004 and 2005, the provincial government signed the Wildfire Act and Wildfire Regulation (Legislature of British Columbia, 2004) into law. These acts set regulations, requirements, and legal responsibility, province-wide, regarding wildfires. According to the Government of BC, the goal of these laws is to “specify responsibilities and obligations on: fire use, wildfire prevention, wildfire control, and rehabilitation” (The Government of British Columbia, n.d.-c). Effectively, the Wildfire Act describes various responsibilities and liability for fires for various forest users. It also sets regulations for activities such as open burning in the province, as well as penalties for failing to abide by the regulations and restrictions or for starting fires. The Wildfire Act does not contain specific language regarding wildfire mitigation efforts, strategy, or priorities; the only mentions of prevention are regarding aspects such as timing of industrial forest activity (Province of British Columbia, 2004).

2.1.3 Wildfire specific programs

There are several government-funded or administered programs related to wildfire. The first of these, Forests for Tomorrow (FFT), is a program that was established in 2005 through the Land Based Investment Strategy. FFT provides funding for reforestation of non-harvested areas affected by wildfire and/or mountain pine beetle outbreak (The Government of British Columbia, n.d.-a). The second, called the Strategic Wildfire Prevention Initiative, is a “suite of funding programs” administered by the UBCM and the First Nations’ Emergency Services Society (FNESS), but funded by the provincial government. The purpose of this initiative is to “support communities to mitigate risk from wildfire in the wildland urban interface” (UBCM, 2012).
In 2018, SWPI was transitioned into a new program called the Community Resiliency Investment Program. This made several important changes to SWPI, including removing the cost-sharing requirements that prevented some communities from participating (Government of British Columbia, 2018).

There is also a Canada-wide program called FireSmart -- however, this program is primarily intended at educating homeowners and communities, raising awareness about defensible spaces, and increasing communication and cooperation across various jurisdictions and ownership boundaries (FireSmart Canada, n.d.).

There are also specific forest tenures which are sometimes used as tools within the tenure system to address some specific types of issues, including wildfire: the Licence to Cut (LTC) and the Innovative Timber Sale Licence (ITSL). ITSLs are partnered with the Forests for Tomorrow program, meaning that in the context of wildfire, they are typically used post-fire for rehabilitation treatments (e.g. salvaging burnt trees and preparing soil for replanting).

The Licence to Cut is split into several different forms: Occupant Licence to Cut, Master Licence to Cut, Fibre Supply Licence to Cut, and Forestry Licence to Cut (FLTC).

Of these forms, the FLTC is the only one that explicitly deals with wildfire. FLTCs are a “form of tenure used to cover a wide range of purposes including small scale salvage to the removal of timber to protect a community from wildfire to harvesting under a pulpwood agreement” (The Government of British Columbia, 2014, p. 6).

These tenures and programs may influence wildfire risk in BC, they are either intended for restoration after a fire, or are too specific to use to address the landscape-level problems facing the province. For example, FLTCs are typically limited to projects that will remove 2000-5000 cubic meters of wood. Furthermore, FLTCs used for community wildfire protection must
be located within two kilometers from said community (The Government of British Columbia, 2014). While this is a great tool for certain situations, more mitigation efforts are needed, for instance, to prevent a large fire from outside a community from raining embers down on structures in the community. The two-kilometer boundary does not put enough distance between a community and the vast swaths of forest in the province.

The Forest Enhancement Program is the most recent addition to BCs wildfire management efforts and is administered by the Forest Enhancement Society of BC (FESBC). This program was announced at the end of 2015 and in the first two project intakes through 2016 had approved 44 projects at a total funding amount of 5.54 million dollars (Forest Enhancement Society of British Columbia, 2016). This organization is set up in such a way that it could potentially serve as the organization that would oversee a province-wide program like stewardship contracting if it were adapted to BC. Recently, the fuel treatment program administered by FESBC was cancelled and taken up by Resource Districts. Even with this change, there is still potential for FESBC to administer and monitor a program such as stewardship contracting.

2.1.4 Deficiencies in current wildfire-related policy and programs

The Forest and Range Practices Act (FRPA), the major law in BC regulating activities on forested land, contains only a few references to fire. First, it allows for exemption from Forest Stewardship Plan requirements when there is danger of "significant loss" due to fire. FRPA allows for a blanket exemption to be given to people who are assisting with fire control efforts. FRPA grants the authority to the Minister to allow for fire control or prevention operations regarding the harvest of timber. Finally, FRPA allows for government officials to enter any land
within 1 km of forest "to inspect for fire hazards if [there is reason] to believe that an activity... or condition exists on the land that might cause or produce a fire hazard" (FRPA 59(3)).

The Wildfire Act is, as its title suggests, a specific law related to wildfire. Much of this Act’s text is dedicated to laying out responsibilities, authority, and consequences regarding industry-caused or person-caused wildfire starts, open fire regulations, etc. The Wildfire Act’s Regulations section does have a section titled "Fire Hazard Assessment and Abatement." This part of the law, however, only sets out the regulations for assessing fire hazard, again, in industrial activities/settings, and abatement of potential hazards.

As mentioned previously, BC also has several programs dedicated to wildfire recovery and prevention. The first of these, Forests for Tomorrow, is reactionary, in that it does not provide funding or assistance for preventative measures. Instead, this program provides financial assistance for reforestation or measures that attempt to mitigate the effects of catastrophic loss to timber supply. It is not set up to address wildfire risk.

The second major government program for addressing wildfires in the province is called the Strategic Wildfire Prevention Initiative. This program supports communities via funding to mitigate wildfire risk in the wildland-urban interface. The problem with this program regarding the greater issue of wildfires in the province is in its definition of WUI areas. According to the SWPI program, the WUI is any area "within 2 km of a community where there is a minimum density of 6 structures per km." Setting the rest of the forest aside, and prioritizing community protection, 2 km is still quite a narrow range. Many professionals in the province have begun to speak out against these narrow definitions, including the BC Community Forest Association (BCCFA), who have recently begun to call for that definition to be expanded to 10km out from communities (British Columbia Community Forest Association, 2018).
With the transition from SWPI to CRIP, there is more flexibility in the distance from community. Likewise, CRIP is no longer a cost-sharing program. However, while CRIP projects are fully funded, they can only be used within municipalities.

As mentioned previously, there are a few types of tenure which contain language regarding wildfire or could potentially be used for fire mitigation or fuels reduction treatments: ITSLs and FLTCs. ITSLs have been shown by the province themselves to be un-economic. On their website, FLNRORD (2015) acknowledges that “when rehabilitation costs are included, some opportunities under this [ITSL] program will be uneconomical.”

As for FLTCs, these are typically tied to the FFT program. They are typically bounded by the definition that they are used for community protection, which, according to FLTC regulations is 5 km around a community. Not only is there a distance limitation, but these tenures are typically limited to a maximum of 5000 cubic meters of removed biomass.

There are other efforts in the province, such as FireSmart or the Fire Management Stocking Standards. FireSmart is a program geared at individual home or landowners. This Canada-wide program aims to assist members of the public or communities in the WUI how to properly defend their property, structures, infrastructure, and lives against interface wildfires. This is mostly done through education and outreach (FireSmart Canada, n.d.). The Fire Management Stocking Standards are site-specific tools that help forest licensees address fuel loading in forested stands. This is done through standards used “to promote the establishment of stands with suitable structural conditions that are fire resistant or resilient and that enhances suppression effectiveness at both the stand and forest level” (BC Ministry of Forests Lands and Natural Resource Operations, n.d., p. 1). A summary of the above-mentioned limitations in current policy and programs can be found in Table 2.1.
### Gaps in BC Wildfire Policy and Programs

<table>
<thead>
<tr>
<th>Policy/Program</th>
<th>Description</th>
<th>Limitations</th>
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| FRPA           | • Grants authorizations and allows for exemptions | • No landscape-level planning required  
• No consideration for fire/fuels in FRPA values |
| Wildfire Act & Regulation | • Gives government authority over fire prevention and control, incl. open fires  
• Liability and consequences for fire-related issues, including industrial "precautions" to help prevent accidental fire starts | • Lacks detail on wildfire mitigation/prevention responsibility after activity has ceased in a stand |
| Forests for Tomorrow | • Provides funding for reforestation and mitigation of impacts to timber supply after a wildfire | • Reactive program for catastrophic losses, focused on timber |
| Strategic Wildfire Prevention Initiative/Community Resiliency Investment Program | • Wildland-urban interface program designed with an emphasis on fuels management | • Distance to community may still be too restrictive  
• Max funding amount of $100,000 |
| Tenure: ITSILs and FLTC | • Tenure types that deal with very specific sets of circumstances to address gaps in the tenure system for timber harvesting | • "Uneconomical"  
• Limited volume and distance  
• Tied to Forests for Tomorrow and its limitations |
| Other: FireSmart | • Community-focused wildfire preparation/prevention program | • Voluntary program  
• May reduce risk in or to communities, doesn’t address the root causes of wildfire risk in the forest |

**Table 2.1 Current limitations in wildfire policy and programs**

Overall, the totality of wildfire specific policy and programs are primarily reactive, do not extended far enough out from the community to be effective, or only provide guidance on liability and consequences for wildfire-causing actions.

While these efforts can and do have a lasting impact on wildfire risk in the province, there is still much room for improvement. The biggest gaps in current policies and programs in BC are 1) Limited nature of WUI boundary definitions in the province; 2) cost of fuel reduction treatments; 3) Little to no priority for fuels reduction and other wildfire mitigation activities on
the landscape, especially when those types of actions may conflict with regulated values under FRPA when licensees have other values (such as timber) they are prioritizing.

Furthermore, non-wildfire specific policies, such as those establishing MDWR and OGMAs, create a complex web of constraints on forest operations, which may act as a barrier to addressing gaps in current policy. To address these gaps, as well as the challenges of record-setting wildfire seasons and issues of forest resilience in the interior, new policy will need to be written and new programs piloted and put into place across the province.

2.2 Policy learning

In a chapter about learning in public policy the Oxford Handbook of Public Policy, Richard Freeman discusses different perspectives on learning in public policy. In it, he quotes Richard Rose as saying “The process of lesson-drawing starts with scanning programmes in effect elsewhere, and ends with the prospective evaluation of what would happen if a programme in effect elsewhere were transferred here in future” (Rose, 1991, p.3 as cited in Freeman, 2009, p. 9).

This process of looking to policy in other jurisdictions often relies on “networks of practice”, that is, what Freeman describes as “people who do similar things, who are linked to each other in some way but do not necessarily know each other” (Freeman, 2009, p. 10). As a part of this process, many in BC have begun looking at other forested jurisdictions for inspiration on how to address issues here in the province.

A few factors should be taken into consideration when assessing if or how policies, programs, or tools from other jurisdictions could be adapted to BC. These include, but are not limited to, forest and land ownership; governance structure; and ecological similarities. One of
the most similar places to BC in regard to forest ecosystems, public ownership, and socio-economic factors is the western half of the United States.

2.2.1 Similarities to the western US

Though BC and the United States are ecologically diverse jurisdictions, some general comparisons can be drawn between the two, especially when looking specifically at the western half of the US. Both have a large proportion of forested land owned publicly: nearly 69 percent in the western US (USDA, 2001, p. 6), and about 95 percent in BC (BC Ministry of Forests Lands and Natural Resource Operations, 2006, p. 3). These jurisdictions share regions with similar plant and animal species, as well as climate.

Especially relevant to the Cariboo region in BC, there are many locations in the western US that have similar dry-belt ecosystems, such as ponderosa pine forests which stretch from BC all the way south into Mexico. Many of these forests in the US contain rural populations that are developing further into the forest, creating a complex overlap of jurisdiction, ownership, and risk.

Both BC and the western United States are seeing similar trends in wildfire activity, fire season length, and rising fire response costs, especially in dry forests in the western half of the country. The trend across the entire US between 2000 and 2012 is that fires over 400 hectares – classified as “large” fires – happened 556 percent more frequently than in the 1970s and early 1980s (Westerling, 2016). Mottek-Lucas et al. (2017) verifies this increase in wildfire risk in the western US specifically, stating that many fire-adapted forests in the western US are experiencing diminishing health and increasing risk of wildfires.
Many western states have experienced record-breaking wildfire seasons in the past decade, much like BC. In California, for example, at the end of 2017, in October, a month that typically lies outside of the fire season, 250 wildfires were started across the northern portion of the state. These fires were a major factor in that year becoming the most destructive and costliest fire season in California on record (Cal Fire, 2018). A string of fires in December of 2017 in the southern portion of the state, practically surrounded the Los Angeles metro area. The final quarter of the year 2017 in California forced the evacuation of over 230,000 people in the LA area, over 10,000 structures burned, the deaths of 44 people, hundreds injured or hospitalized as a direct result of the fires, and over $180 billion USD in overall costs (Cal Fire, 2018).

Finally, as with many forested jurisdictions, there is an overlap of governance, values, and stakeholders in both regions that increase the complexity of both problem and solution. So, to find potential policy tools to adapt to BC, a natural place to begin to look would be the western US. This is because this region of the US has a similar public ownership structure as mainland BC. The 12 states that make up this region of the US contain 34 million hectares of forest which is 93% federally managed (Nicholls et al., 2018, p. 1). Not only is the public ownership structure similar, this region has already been experiencing increased fires and costs related to fire suppression and mitigation. Likewise, managers and policymakers have been actively exploring ways to reduce those risks and costs.

Though most public forests in the western US are managed at the federal level and in BC at the provincial level, they still have a similar structure of forest management, where while ultimate control and authority for management of forests is held by the larger government, federal in the US and provincial in Canada, the day-to-day decision-making is done at a more regional level. Even with similarities, any attempt to adapt a tool into BC will need to address
these differences between jurisdictions as well, regardless of how similar or dissimilar they are to one another.

2.3 Stewardship contracting

There are several major efforts underway at the federal level in the US to address wildfire and other large-scale forest-related issues. For example, in 2009, the US Congress passed the Forest Landscape Restoration Act. This act started the Collaborative Forest Landscape Restoration Program, which is an effort to restore forest landscapes that have been affected by climate change, wildfire suppression, and other challenges to federal forests in the country (C. Schultz, Jedd, & Beam, 2012).

One tool in use in the US, not only in the west, but in every region of the country, is called “Stewardship End Results Contracting,” or stewardship contracting for short. This program was started through a pilot in the late 1990s, and has since been authorized twice, once after the pilot program ended through the Healthy Forests Restoration Act of 2003, for ten years, and again through the Agricultural Act of 2014 until 2023. Owing to the fact that stewardship contracting has been in use for more than two decades in the US, there has been time for the program to be studied, improved, and expanded in the US. This means some of the learning that comes from implementation (Freeman, 2009, p. 10) has already been accomplished in the US, and as such, is something BC could learn from as well.

This program has been successful in many regions of the US, including in the western half of the US. One of the most studied projects which used stewardship contracts is the White Mountain Stewardship Project, or WMSP for short, established in Arizona. The WMSP has had several positive effects on greater region of which it is a part. For example, the WMSP treated
around 20,000 hectares, and in the “…first five years [of the project], government funding of $30 million USD… generated $40 million USD in local investments, expenditures, and tax revenue” (Nicholls et al., 2018, p. 11).

This program has seen more than just economic benefit from the use of stewardship contracts. It has also had benefits to the forest. Stewardship contracts enable “…treatments [which] reduced the need to pile burn and lessened [the] impacts of the Wallow Fire” (Mottek Lucas et al., 2017, p. 553). The Wallow Fire was a major fire in Arizona and a small portion of New Mexico which burned nearly 220,000 hectares in 2011 (The Arizona Republic, 2014), similar in size to the Elephant Hill Fire in BC, at 191,865 hectares, in 2017 (BC Wildfire Service, n.d.).

This project is relevant to the BC context, especially the interior of BC in terms of the ecological, social, and economic contexts. For example, the region where the WMSP was located has a similar history of fire suppression, which “…has led to forests with 300-3000 trees per acre instead of 20-60 per acre” (United States Forest Service, 2004, p. 11). This is similar to areas in the interior of BC. Not only that, but the USFS note that the issues those overstocked forests face are often increased by other forces, such as insects and disease or drought (United States Forest Service, 2004). These are both similar to conditions seen across BC, but especially in the IDF.

The social context also parallels that of the BC interior. The WMSP is situated in an area that is “experiencing rapid expansion of the Wildland-Urban Interface…” (United States Forest Service, 2004, p. 12). Not only that, but just as BC has recently witnessed record-breaking fire season which have opened up a policy window, the WMSP area had recently had “severe fire seasons [which] helped convert the skeptical [members of the public]” (United States Forest Service, 2004, p. 12). Stewardship contracting is not explicitly designed to address social issues,
but there is always room for better communication/education from and between governments, industry, and the public.

Stewardship contracting can bring social benefits (The Pinchot Institute for Conservation, 2010, 2017c, 2017b). More discussion on the potential benefits of stewardship contracting, social or otherwise, can be found later in this chapter. While these effects may not translate directly to overcoming some of the social barriers in the interior of BC, increasing social capital could lead to more success in future efforts.

Finally, the economic contexts of these two areas are also similar, due to multiple factors, including: a declining forest industry and infrastructure; relatively poor, historically resource-dependent communities; “good transportation infrastructure” (United States Forest Service, 2004, p. 13); and an important recreation sector, which “is dependent on healthy forests” (United States Forest Service, 2004, p. 13).

When comparing the ecological, social, and economic similarities between BC and the context for the WMSP project it appears there is evidence that this tool could be used in BC to address marginal, fire-risk stands in the IDF. However, it is important to understand the details of the stewardship contracting program before deciding how to potentially adapt it to BC.

This program is primarily an economic tool that allows for the exchange of goods and services between the US Forest Service or US Bureau of Land Management and private contractors to achieve land management objectives that may not be feasible under traditional timber sale mechanisms. According to the law, projects can incorporate any of the following:

1. Road and trail maintenance or obliteration to restore or maintain water quality.
2. Soil productivity, habitat for wildlife and fisheries, or other resource values.
3. Setting of prescribed fires to improve the composition, structure, condition, and health of stands or to improve wildlife habitat.

4. Removing vegetation or other activities to promote healthy forest stands, reduce fire hazards, or achieve other land management objectives.

5. Watershed restoration and maintenance.

6. Restoration and maintenance of wildlife and fish.

7. Control of noxious and exotic weeds and reestablishing native plant species.

(Agricultural Act of 2014, sec. 8205).

Though the part of the policy tool which allows the trade of goods for services was the basis of this program, it is not the only feature of this program. The stewardship contracting legislation provides authority for eight different features which can be written into contracts to assist the US government in writing effective and efficient contracts and help address conflict with past policy. Table 2.2 lists the eight features authorized by the legislation that enable the use of stewardship contracts.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best Value</td>
<td>Contracts are awarded on criteria other than lowest cost. E.g. Contractor experience or prior performance.</td>
</tr>
<tr>
<td>Designation by Description</td>
<td>Tree selection without physical marking.</td>
</tr>
<tr>
<td>Designation by Prescription</td>
<td>Desired condition can be described, allowing for greater flexibility in planning and implementation of projects.</td>
</tr>
<tr>
<td>Exchange of Goods for Services</td>
<td>Goods, such as harvested timber, can be traded for services that might otherwise not be profitable.</td>
</tr>
<tr>
<td>Less Than Full and Open Competition</td>
<td>Allows for no-bid contracts in certain situations. E.g. Awarding contracts to Native American tribes in culturally significant areas.</td>
</tr>
<tr>
<td>Multiyear</td>
<td>Contracts can run for up to ten years in length.</td>
</tr>
<tr>
<td>Retention of Receipts</td>
<td>Any revenues from projects can be kept by the agency to pay for work in future program projects.</td>
</tr>
<tr>
<td>Widening Range of Eligible Contractors</td>
<td>Contracts can be awarded to non-traditional bidders such as Non-Governmental Organizations (NGOs), local governments, etc.</td>
</tr>
</tbody>
</table>

Table 2.2: Contracting features authorized under stewardship contracting legislation

Stewardship contracts are split into two different categories: Stewardship contracts and Stewardship Agreements. Stewardship contracts are further differentiated by three specific types of contracts: Integrated Resource Timber Contracts (IRTC), Integrated Resource Service Contracts (IRSC), and Stewardship Service Contracts. Likewise, Stewardship Agreements are also split into two types: Stand-alone Stewardship Agreements and Master Stewardship Agreements (MSAs) with Supplemental Project Amendments (SPAs). Table 2.3 provides detail regarding the differences between these five types of contracts.

<table>
<thead>
<tr>
<th>Type of Contract</th>
<th>Specific Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRTC</td>
<td>Value of goods &gt; value of services</td>
</tr>
<tr>
<td>IRSC</td>
<td>Value of goods &lt; value of services</td>
</tr>
<tr>
<td>Stewardship Service Contracts</td>
<td>No trade of goods for services, small or highly specialized projects without timber removal.</td>
</tr>
<tr>
<td>Stewardship Agreements</td>
<td>Trade of goods and services not required, require a partnership between a federal agency and a partner who is</td>
</tr>
</tbody>
</table>
required to provide 20% project match less the value of

timber.

| MSAs with SPAs          | Used for landscape-level projects where a partner may have multiple Stewardship Agreements. |

Table 2.3: Differences between various types of stewardship contracts

For the purposes of the situation in BC, the IRTC and IRSC would appear to be the more relevant types of contracts. IRSC allows for “…activities such as removing a mix of merchantable and sub-merchantable trees, they are paid the difference between the cost of removing the fiber and the receipts of merchantable timber removed… and can use appropriated moneys…”, whereas IRTCs are “…limited to paying for all services with revenue from wood fiber sales” (Mottek Lucas et al., 2017, p. 549).

Stewardship contracts are used in every region of the US, including many high fire risk forests in the western half of the country including states such as Washington, Colorado, Arizona, and Montana. During the first authorization of the program, between 2003 and 2013, the US Forest Service treated over 500,000 hectares under 1,793 contracts or agreements, and utilized over 28 million cubic meters of wood (Melton, 2016).

2.3.1 Lessons learned from 20 years of stewardship contracting in the US

In the U.S. a non-profit organization, called the Pinchot Institute for Conservation, has been conducting research focused on Stewardship End Result Contracting since the end of the pilot program in the early 2000s. After the pilot program, the U.S. government changed the language of the law from requiring “multiparty, project-level monitoring and evaluation” to requiring “programmatic monitoring of local and community benefits.” Part of that
programmatic monitoring has been carried out by the Pinchot Institute for every fiscal year since the program was officially written into U.S. law.

Through this monitoring program, the Pinchot Institute has surveyed both agency (USFS and BLM) and non-agency stakeholders and participants from numerous projects around the country. For instance, between 2014 and 2016 alone, the Pinchot Institute conducted 46 case-studies from projects (The Pinchot Institute for Conservation, 2017b). From those yearly reports, some opinions of other factors to consider regarding the use of stewardship contracting in British Columbia.

Though the specific context of the US system of laws and land management is quite different from that in Canada and British Columbia, understanding stewardship contracting-specific risks or threats, as well as potential benefits, could help identify issues that may arise when adapting the program to BC.

2.3.1.1 Risks and threats

Through monitoring of the program, the Pinchot Institute reports uncover a variety of potential risks or threats, specific to the stewardship contracting process, that are important to be aware of when considering how to adapt and implement a similar program in BC.

Perhaps unsurprisingly, resources and economics are always a major concern. The Pinchot Institute have several things to say regarding resources and stewardship contracts. For example, through their monitoring work, they point out that the size of projects which use stewardship contracts is a critical factor (The Pinchot Institute for Conservation, 2010). Likewise, budget uncertainty can threaten project timing and completion (The Pinchot Institute for Conservation, 2017c, p. 15).
However, not all the risks discovered by the Pinchot Institute are regarding financial resources. The effect of human resources, or social capital, on stewardship contracting is something that must be taken into consideration when implementing stewardship contracting to BC. For example, in a report from the 2016 fiscal year, the Pinchot Institute mentions that (agency) turnover can negatively affect relationships (The Pinchot Institute for Conservation, 2017c, p. 22).

According to a USFS handbook referenced by the Pinchot Institute (2014), “Collaboration must be a part of Stewardship Contracting project planning and continue throughout the life of the project.” They go on to say: “stewardship authorities that advance this include best value contracting. Sometimes, best-value criteria are explicitly used to award contracts to firms with a strong foothold in local communities” (Kittler, 2014).

Due to the varying local context regarding adaptive capacity, regional land use plans, and other site-specific issues, there is no way to completely prepare for hurdles that each contract or project may face. However, being aware of major issues such as those mentioned above, can give decision-makers notice for things that need to be planned for ahead of time, such as how to smoothly transition when someone leaves a position or otherwise exits the planning and management process.

2.3.1.2 Benefits

The monitoring carried out by the Pinchot Institute has also brought forward many secondary benefits to the use of stewardship contracts. In fact, some of the risks pointed to previously may be addressed with successive use of stewardship contracts. There appear to be two major areas that benefit from the use of stewardship contracts, according to the monitoring
reports: financial capital and social capital (Kittler, 2014; Pinchot Institute for Conservation, 2011; The Pinchot Institute for Conservation, 2017c, 2017b).

As it is the program’s intended focus, stewardship contracting is often useful in reconciling economic issues. Several of the law’s authorities can help land managers cover treatment costs, not only in the current project, but in many circumstances, in subsequent projects. Some of the quotes also provide further evidence of the positive effects some of the tools in the stewardship contracting authority can have on the financial aspect of projects.

One clear example of the benefits that stewardship contracting brings can been found in its primary authority, the exchange of goods for services. This authority is “… the most often used… and allows the agencies to offset the cost of service work by packaging stewardship work in a way that contractors bid on both a set of services and timber” (Kittler, 2014, p. 1). Secondary to the exchange of goods for services, the next biggest potential for economic benefit comes from the retention of receipts. According to the Pinchot Institute, this piece of the tool “…allows the agencies to use the proceeds of merchantable timber harvested during the project locally to advance additional stewardship activities. These funds are destined to support restoration activities locally and are not sent to the US Treasury, agency staffing, or county governments, as is the case with timber sales” (Kittler, 2014, p. 2). As mentioned previously, using proceeds from project to help fund future work will be critical to the success of treatments not only in the Cariboo, but in the event of a province-wide stewardship contracting program.

The Pinchot Institute also points to designation by prescription as providing tangible benefits due to it being “… very effective at reducing the prep-time and thus the cost of performing restoration treatments” (Kittler, 2014, p. 1). On its own, this may reduce only a small
amount of the planning and implementation cost of a project, but when combined with other parts of the tool, could mean projects which may at first seem too expensive can be carried out.

Social capital is often also improved after projects using stewardship contracting are carried out, according to the monitoring reports (The Pinchot Institute for Conservation, 2017b). This is important for two reasons: first, it makes the current project more likely to succeed. Second, the relationships and work done on one project may be maintained after and into successive projects.

There are also multiple direct effects on relationships and communication. First, relationships are strengthened. Second, the projects build mutual trust between actors, sometimes with opposing views. Finally, communication is improved between decision-makers, actors, stakeholders, and even the public (The Pinchot Institute for Conservation, 2017a, p. 40).

This increase in social capital isn’t limited to interpersonal relationships. In some cases, “…agencies gain trust in allowing outside groups to monitor stewardship projects” (Kittler, 2014, p. 2). In BC, this is especially relevant, as there may not be the necessary personnel in the provincial government to monitor projects. This task could be carried out by contractors themselves, or even members of the local public. In fact, non-agency (or in the BC context, ministry) participation is reported by the Pinchot Institute to “…bring capacity – technical expertise, local knowledge, human capital, and financial resources – augmenting agency capabilities” (Andrus, 2017, 37:39-38:20).

Beyond improvement of human resources, the social effects of stewardship contract projects can also lead to economic benefits. In a 2014 report, the Pinchot Institute mentions that “…non-agency participants provided funding in 40 percent of stewardship projects active from 2010–2012, with the majority of this match coming through stewardship agreements with non-
profits and other entities” (Kittler, 2014, p. 2). This type of participation and investment from outside government could be the single biggest social benefit to the province from the launch of a stewardship contracting program in BC.

If adapted to BC, a program similar to stewardship contracting could prove an effective way for the province to carry out projects that focus on values beyond timber, not just to prevent wildfire, but to protect and restore wildlife habitat, watersheds, and other ecosystem services that might not generate profits in the way a traditional timber license or tenure allows. If a stewardship contracting-type approach is adapted to BC, the policy could even be written in such a way as to address some of the constraints or challenges present in the Cariboo and the greater province.

2.4 Barriers to adaptation

In 1973, Rittel and Webber labeled planning problems as “wicked.” They explained that this did not mean that these problems were immoral, rather that they were much more complicated than traditional “scientific” problems. They argued that strictly natural science problems are “definable and separable and may have solutions that are findable” (Rittel & Webber, 1973, p. 160). In contrast, the problems of policy planning, they argued, “are ill-defined” and “rely upon… judgement for resolution” (p. 160).

Nearly 40 years later, Lockwood et al. (2010) expanded on this and stated that “wicked” environmental problems require “novel policy and institutional responses” (Lockwood, Davidson, Curtis, Stratford, & Griffith, 2010, p. 986). They stated that the need for novel responses is the result of intricate and often divisive issues that stem from “multiple problem causes, divergent problem perspectives and solution strategies, and fragmented institutional
settings” (2010, p. 986). According to van Bueren, Klijin, and Koppenja (2003, p. 194), “dealing with wicked problems is—to a large extent—a problem of interaction.” Thus, in order to best address problems related to natural resource management, understanding the interactions involved, especially the socio-economic or institutional context, is key to developing solutions to natural resource issues.

Wildfire is one of these wicked problems, because the issues associated with wildfires come from several different sources, management history, climate change, etc. There are also many different perspectives on how best to address these issues, and because of overlapping policies and jurisdiction/ownership, any solution will require the “novel policy and institutional responses” that Lockwood et al. call for.

Not only are the socio-economic interactions important in finding solutions to natural resource problems, but understanding, and thus sometimes overcoming, potential barriers can be critical to the success of the implementation of those solutions. Though the rise of mega-fires throughout the world is not completely the result of climate change, there is little doubt that climate change has already begun to have a great impact on many of the ecological systems in forests that impact fire weather, behavior, intensity, and season length. In order to better understand the potential barriers facing forest professionals in the Cariboo, a framework can be applied to the regional context to determine potential barriers that may be present.

Unfortunately, a gap currently exists in the research regarding barriers to wildfire risk reduction. Owing to the effect climate change has had, and is predicted to have on the prevalence, intensity, and severity in the future, a framework to understand barriers to climate change adaptation can be used in place of one specific to wildfire. In 2010, Ekstrom, Moser, and Torn published their final report on a project with the California Energy Commission titled
"Barriers to Adaptation: A Diagnostic Framework." This report was, in part, published in an article in December of 2010 in the Proceedings of the National Academy of Sciences in the United States of America (Moser & Ekstrom, 2010).

The report was the basis for another paper published by Ekstrom, Moser, and Torn, published the next year in 2011 (Ekstrom et al., 2011). In that paper, Ekstrom et al. lay out a three-part architecture for assessing barriers that may affect efforts for humans to adapt to climate change. According to Moser and Ekstrom (2010), their framework was developed to "target the process of planned adaptation and focuses on potentially challenging but malleable barriers" (p. 22026). The framework is comprised of three parts.

The first lays out the stages of a "rational approach to adaptation decision-making" (Moser & Ekstrom, 2010, p. 22027). This part of the framework breaks up the decision-making process into three phases: understanding, planning, and managing. These three phases are further broken down into sub-phases. The Understanding phase is divided into: detect problem, gather/use info, and (re)define problem. For the Planning phase, it is: Develop options, assess options, and select option(s). And finally, the Managing phase: implement option, monitor option and environment, and evaluate. These stages are visualized in Figure 2.3.
Figure 2.2 Phases (inside the circle) and subprocesses (in the boxes) of the adaptation process (Moser and Ekstrom, 2010)

Next, they "build on a framework proposed for the analysis of social-ecological systems" introduced by Anderies, Janssen, and Ostrom in 2004. To do this, Moser and Ekstrom look at "the actors, the larger context in which they act, and the object on which they act" (2010, p. 22027). In other words, they look at the interactions between: actors, both individual people, but also institutional actors such as governments, businesses, or other stakeholder organizations; the
"system of concern" (2010, p. 22028), the Interior Douglas-fir forests, for example; and the spatial, socio-economic, governance and ecological context.

Finally, a matrix, shown in Figure 2.4, is provided to help place the source of the barrier in both spatial and temporal proximity relative to actors which may influence the barrier in order to identify "possible points of intervention" (Moser & Ekstrom, 2010, p. 22030). Moser and Ekstrom point out that while overcoming all or any barriers is not a "must" in their view, that often actors in the decision-making process will want to try and overcome any barriers that arise, but they propose that adaptation processes may benefit from confronting barriers throughout each phase of the decision-making process. The temporal context is broken down into "contemporary" and "legacy", or present and past, respectively. On the other axis of the matrix is the spatial, either strictly physical or jurisdictional, context.

![Figure 2.4 - Opportunities for influence and intervention to overcome barriers (Moser and Ekstrom, 2010)](image-url)
This framework may be able to assist decision-makers in the Cariboo and policymakers in Victoria in developing tools or strategies to address issues in the IDF. In order to better understand potential barriers, this framework will be applied to the case study in the Cariboo, as mentioned in chapter 1.
Chapter 3: Methodology

Owing to the exploratory nature of the research objectives, an inductive type of inquiry was adopted for this study. Using this approach allowed for an open-ended approach to the research objectives and allowed the researcher to use observations from interviews and other interactions with the participants and apply them to larger generalizations about the current state of dry-belt forests in BC.

This study focused on a bounded system: the IDF forest type on Crown Land in the southern-to-central interior of BC. Specifically, the jurisdictional boundaries of the study area are defined as the Cariboo Resource Region. This study area was chosen due to the following key factors: a large presence of licensees, governments, public organizations, and overall population.

Though the institutions and actors that shape the research tend to be larger (i.e.: forestry corporations, provincial government, First Nations), using the views of the individual decision-makers in the bounded system of the study area provided an inside look at how the reality of the situation works at the site-level. It also used multiple sources of information: literature review, semi-structured interviews, and field/participant observation. As a result of these factors, the case-study method was selected as the best general approach (Creswell, 2007).

3.1 Data collection design

Data collection began with a literature review, forming the background of this study. This was not the only time the literature was explored, meaning the overall data collection and literature review was an iterative process. According to Raewyn-Bassett (2012), an iterative approach allows for greater flexibility in data collection and analysis, and gives the researcher a more comprehensive grasp of the research data.
The literature reviewed focused on policy and economics topics related to issues of forest restoration and wildfire prevention and includes academic literature; white papers; as well as some grey literature (research published outside traditional academic publications).

Some of this material came from government agencies, both in BC and the US, but also from non-profit research organizations such as the Pinchot Institute for Conservation, who have previously conducted research on stewardship contracting and landscape-scale restoration and wildfire prevention projects currently implemented in the US. Because these problems and potential solutions are quite new in the scope of forest management, most of this information came from sources from the early 2000s on. The review of the literature led to the development of expectant themes to be used in interviews (description follows).

Though relevant literature and observational field notes have been used, most of the data for this study came from semi-structured interviews. This method of data collection was chosen because the semi-structured interview allows for focused inquiry that is also flexible. This allowed the interviews to be directed but remain conversational in nature. The use of semi-structured interviews also allowed respondents to address issues or topics not directly covered in the interview schedule.

### 3.2 Development of interview schedule

An interview schedule was written to provide guidance during the semi-structured interviews. The questions for this interview schedule were written by the researcher using information learned during preliminary literature review and then assessed by an expert in the case study area and topic. The interview schedule originally consisted of approximately twenty
open-ended questions, leaving room for prompts or follow-up questions as necessary according to potential responses. The interview schedule can be found in Appendix A of this thesis.

The questions were framed to elicit responses specific to the study area, and in cases where respondents’ answers may have differed with different regional, ecological, socio-economic, or political bounds, follow-ups were prepared to help distinguish those responses from IDF-specific responses.

Based on a review of relevant literature, several key topic areas were used to organize the interview schedule. These consisted of several general areas. The first questions asked were introductory questions, topics designed to help situate the interviewee and their responses against other responses. In general, these questions discussed topics such as the participants’ current position and duties, previous experience in the province, and ways in which their performance is measured in their position. The second set of questions revolved around relevant regulations or policy and how those policies may or may not affect their work. After this, some questions about timber supply in the IDF were asked. The next set of questions were centered on wildfire and its effects on their work, timber supply, and other factors. The final set of questions focused on potential solutions to issues addressed during the interview. Particular attention was paid to tool in use in the United States called “stewardship contracting”, which is used to address similar issues of wildfire risk in interface areas and marginal stands in that country. The interview schedule was guided by the following overall themes: policy, economic, and social constraints to forestry work in the interior of the province.

3.3 Testing of interview schedule

A full pilot of the interview schedule was not carried out. The original schedule was reviewed by several experts in the field (including the research supervisor, a member of the
author’s research committee, and one study participant), and only minor adjustments were determined to be needed. This included a rewording of one question for clarity, another question for content, and the inclusion of a question in the introductory section of the interview.

3.4 Participant selection

Participants for the study were selected mainly using purposive sampling, specifically, expert sampling. However, due to the limited community size of the sample area, the sampling method could also be considered opportunistic. The initial participants were selected through availability sampling. They were mostly contacts passed on to the researcher from advisors or colleagues at the University of British Columbia. Even with a limited sample size and the use of sampling techniques listed above, participants were still selected per the criterion: participants must have worked or be working in a decision-making or planning capacity in forests in the Cariboo. Interviewees included mostly government employees and industry experts from both small-scale and large-scale industry stakeholders, but also included forest consultants and researchers. Several participants were suggested by initial contacts/participants, meaning there was a degree of snowball sampling as well. Snowball sampling is a method of sampling in qualitative research that usually occurs after a study begins when a researcher looks to participants to recommend other parties for participation in the study (Creswell, 2014).

3.5 Data collection and analysis

Three sources of data have been collected in this study. First, relevant literature, including laws or policies relevant to the issue were examined. Second, semi-structured interviews were administered. The final portion of data collection for this project was
observational data from notes taken or things learned during time spent in the field as part of a
Mitacs Accelerate internship in Williams Lake during April and May of 2016. This helped to
identify information that may have been missed from interviews and questionnaires, helped tailor
some of the specific questions for the interviews and questionnaire, and helped give an overall
better view of the work currently going on in the study area.

3.6 Conducting interviews

In total, fourteen interviews were administered. Thirteen of these interviews happened
during the period of April and May 2016, with the remaining interview occurring in October of
2016. All interviews but the October interview were undertaken in-person, with one of those
interviews carried out in two parts. The final interview was conducted over the phone. Also of
note: all interviews were one-on-one with one exception: one interview was carried out with
three interviewees at the same time. This was done due to participant scheduling constraints.

The initial proposal for this project aimed for 25 interviewees. However, due to
limitations in potential participants because of small community size, this number was not
achieved. In addition, as actual interviews were carried out, it became apparent that saturation of
new concepts would be reached rather quickly. This happened around the 12th interview, as
noted below.

In-person interviews were administered in a variety of locations: the offices of local
forestry professionals and government officials, the UBC Alex Fraser Research Forest office in
Williams Lake, and a coffee shop in Williams Lake. All interviews except two were audio
recorded. Hand notes were taken for the two interviews where audio recording was declined by
the interviewee.
One-on-one interviews ranged in duration from 29.5 minutes in length to 70.5 minutes in length. The three-person interview lasted for approximately 105 minutes. The average length of one-on-one interviews was just under 45 minutes. All interviews were administered from the same interview schedule with only minor differences in probes and follow-up questions.

3.7 Follow-up interviews

The original set of interviews were administered in 2016. Due to the successive, record-breaking fire seasons in BC in the two years that followed, a second round of interviews were added in order to assess any changes resulting from the 2017 and 2018 wildfire seasons. In addition, several questions were asked to gain a better understanding of some of the potential barriers which emerged upon analyzing interview transcripts through the lens of Moser and Ekstrom’s framework to diagnose barriers to adaptive management. For this set of interviews, the participant pool was original participants. Of the 14 original participants, 7 responded to requests for a follow-up interview. Of the 7 that did not respond, two had since retired, two were unreachable, and three simply did not respond. Five of these interviews were administered over the phone, one through Skype, and one in person.

3.8 Transcription of interviews

All audio-recorded interviews were transcribed verbatim for analysis. This method allowed for the capturing of both the spoken words of the participants as well as pauses, non-verbal utterances, laughter, and other sounds. This allowed for the most accurate representation of the participants thoughts and feelings to be used. There may still be some inherent bias in the interpretation of those thoughts and feelings by the researcher, and verbatim transcription helped
to eliminate as much of this source of bias as possible. For the interviews which were not audio-recorded, the researcher’s hand notes were used to pull specific quotes or general responses to questions asked in during the interview.

After transcription of interviews, copies of the transcriptions were provided to participants in order to improve the accuracy of the information. Though this also gave the potential for immediate follow-up questions, none were asked, and no clarifications were requested by participants.

3.9 Coding

In order to analyze data from transcripts, a process called “coding” was used. According to Saldaña (2013, p. 3), “a code […] is […] a word or short phrase that symbolically assigns […] essence-capturing […] attribute for a portion of […] data.” From the verbatim transcriptions from each interview, NVivo 11 software was used to code and analyze the thematic content of the interviews. This program was used due to its commonplace use in managing data and ideas, analyzing and visualizing data, and reporting from data in qualitative research (Bazeley & Jackson, 2013).

Specifically, two stages of coding were applied to the transcription data. At first, the data was analyzed using “open coding”. This approach requires a line-by-line examination of the data. According to Saldaña (2009, p. 81), this initial phase of coding “[…] is breaking down qualitative data into discrete parts, closely examining them, and comparing them for similarities and differences.” The second stage of coding used was “focused coding”. Charmaz (2006) classifies this stage of coding as more purposeful or intentional than initial or line-by-line coding. Taking the most common codes from initial coding, focused coding aims to “make the
most analytic sense [of initial codes] to categorize your data incisively and completely” (Charmaz, 2006, p. 58).

During analysis of interview transcripts, both expectant and emergent themes were identified. Expectant themes were those which were identified during design through literature review and prior knowledge of the topic by the researcher. These themes, in part, were addressed specifically during the interview process (policy and regulations, wildfire management and perceptions, and potential solutions). Emergent themes were those which were not necessarily anticipated before interviews were conducted. Themes were identified by sorting and combining common topics into broader categories referred to as nodes (Bazeley & Jackson, 2013).

Coding and analysis with NVivo software was only carried out on transcriptions from the first round of interviews. The second round of interviews were not used to assess themes, but instead to allow for participants to express any changes they experienced or perceived in regard to the 2017 and 2018 wildfire seasons in BC, or to allow for reaction to any of the findings from the first two phases of this project.

3.10 Validity and generalization in qualitative inquiry

The aim of qualitative research is to understand, interpret, and represent the views, interactions, and behaviors of participants and the events that occur to or around them (Creswell, 2013). A critical aspect of qualitative inquiry is the recognition that the researcher is a “key instrument” (Creswell, 2014, p. 185) of the research. A successful qualitative researcher acknowledges their own positionality, the positionality of study participants, and how the interaction between the two affects the outcomes of the research. In order to address these differences in positionality, and thus the inherent biases of the researcher and participants,
qualitative researchers employ various validation strategies (Creswell, 2014). According to Creswell (2014), qualitative researchers should employ at least two of eight validation strategies. This research used the following validation strategies to address threats to validity: triangulation, peer review, rich description, and clarification of biases.

In order to best understand potential validity threats in this project, it should be noted that the researcher holds a Constructivist worldview. According to Creswell (2013) this approach is typically qualitative in nature and necessitates an acknowledgement by the researcher that the researcher’s own experiences help mold interpretation of truth. Constructivists also hold the view that, while meaning emerges from personal experience, it is not inherent, but rather that meaning comes from interactions between others (Creswell, 2013).

The purpose of this study was to, in part, better understand how the participants view the issues associated with prevention of wildfire and forest management in the Cariboo and IDF. Situating this project within the Constructivist paradigm has allowed the researcher to interpret those views from those who are close to the problem and how certain aspects of the problem affect their decisions “on-the-ground”. It has also allowed the researcher to acknowledge that the interpretation may change from person to person, as each participant brings their own background and experiences into the research, and the analysis will inherently be shaped by those experiences as well as those of the researcher.

In addition to their Constructivist worldview, the background of the researcher should also be noted in order to help clarify the biases that the researcher brings to the study. The primary researcher in this study is an American who holds a BSc in forestry. They have a history of paid and volunteer work regarding land protection and stewardship, including with the United States Forest Service. Though they have wildland firefighter training, they have not previously
worked on a wildland fire crew. Prior to this study, they had only a basic understanding of forest management in British Columbia. Finally, a member of the primary researcher’s academic committee has spent much of their career working as a forest manager in the Cariboo.

Owing to the use of case study methodology, this study did not attempt to generalize beyond this study as part of a greater theory on the research objectives. This is especially important to note regarding the second research objective: assessing the feasibility of adapting stewardship contracting to BC. That is not to say that no generalization was used; internal generalization of results within the case study has been used to describe the overall views of forest managers in the Cariboo.

Responses and concepts reached saturation of new concepts after the 12th interview. According to Charmaz (2006, p. 113), saturation occurs when “gathering fresh data no longer sparks new theoretical insights.” Additionally, Charmaz (2006) states that small studies may allow the researcher to proclaim saturation at an earlier point than with studies with larger sample sizes or temporal/spatial boundaries. A study on data saturation by Guest, Bunce, and Johnson in 2006 concluded that new themes occur much less frequently after 12 interviews in a homogenous group (Guest, Bunce, & Johnson, 2006). Though interviewing additional decision-makers may have uncovered additional views or themes, reaching saturation from the selected participants was enough to satisfy the objectives of this research project.

3.11 Ethical considerations

All interviews were administered with prior and informed consent. A copy of the consent form can be found in Appendix B. Prior to data collection, a certificate of approval for minimal risk was obtained from the UBC Behavioral Research Ethics Board (UBC BREB Number H15-
00817). All identifying information has been omitted from interview transcripts; no company/organization affiliations or individual names have been used in any of the results produced in this study.
Chapter 4: Interview Findings

4.1 Semi-structured interview findings

Through coding and analysis of the semi-structured interview transcripts, as well as a review of the related literature, several themes emerged. The results are organized as follows:

1) Guiding themes: Because of the importance of forests and forest industry in the region, this study began by looking at the problem through themes of policy, economic, and/or social constraints to forest management.

2) Shared views: All aspects of natural resource management see conflicts between values. Identifying shared views and beliefs regarding the situation in the Cariboo will facilitate a better understanding of how the issues are defined.

3) Points of disagreement: Just as identifying areas of agreement can provide insights about potential solutions, identifying potential conflict at the beginning will serve as a starting point for identifying potential barriers to action.

4) Potential solutions: The goal of this research project is to assess the potential use of a “stewardship contract”-style tool to help address some of the issues at hand. However, stewardship contracting was not the only potential solution or tool discussed, and several options or ideas were brought up by many of the participants.

The following presents interviewee’s insights and experiences regarding the topics and questions posed during administration of the semi-structured interview schedule located in Appendix A of this thesis.
4.1.1 Guiding themes

As expected, both due to the interview schedule and the nature of conflicting values in natural resource management, socio-economic and policy constraints to forest management were repeatedly brought up by participants. Owing to the diverse range of values associated with forests and forest resources, any potential solution to the wildfire problem will need to address the social, economic, and environmental concerns of governments, industry, and the public. This may be best accomplished using multiple tools, instead of a catch-all solution, but that is why these themes are considered important.

Policy constraints

In the Cariboo, there are several policies or regulations that were persistently referenced by participants: Old-Growth Management Areas (OGMAs) and Mule Deer Winter Range (MDWR). Many interviewees mentioned these policies, more specifically MDWR, as being extremely constraining to forest management. As mentioned above, not all participants agreed on exactly how much of an effect MDWR has on on-the-ground action in the region. However, even those who didn’t believe it was a constraint still brought it up when discussing regional policy. Interviewee 1 had this to say:

You get all these south aspects that are good on fir in the IDF dk4 and they’re all constrained by MDWR. It’s a huge issue. [1]

Another participant agreed with this and went a step further:

Well the IDF has got the GAR orders for the Mule Deer Winter Range that are probably the most prescriptive of anything that we have provincially. [12]

So not only do some forest professionals believe that MDWR is a constraint in the region, but some hold the belief that MDWR is the most rigid regulation in the whole province.
Some participants went on to say that not only is MDWR an issue on its own, but that its parent document, the Cariboo-Chilcotin Land Use Plan (CCLUP), is itself a significant constraint.

The Land Use Order beyond MDWR has a significant impact. [2]

…all the considerations in the Land Use Plan… we’re constrained to the hilt. [7]

Anything in the CCLUP is pretty overriding for most things that I do. [5]

The Cariboo is the Las Vegas of constraints. [7]

Many of the participants that pointed to the CCLUP as being a constraint beyond MDWR left it in general terms as above. However, Interviewee 2 brought attention to OGMAs as well:

…placement of OGMAs and the restrictions on our ability to operate on those areas are a substantial barrier… [2]

Though the sample size was small, it did seem that there was a split between forest industry and government regarding the total effect that CCLUP regulations have on managers’ ability to “do more.”

These weren’t the only policy issues raised. Participants also suggested that BC’s tenure system is also a major factor to consider when weighing potential solutions. One participant said this:

Tenure overlaps are a significant issue… [2]

Another participant agreed, but added:

The three horsemen of our apocalypse: appraisals, tenure, and softwood lumber. [1]
Though softwood lumber was mentioned by a few participants before discussion of potential solutions, Interviewee 1 was the first to mention it as a potential constraint. During discussion of solutions at the end of the interview schedule, others mentioned the softwood lumber dispute with the US as a potential policy issue, especially regarding a program such as stewardship contracting.

**Economic constraints**

Though economic considerations aren’t as binding as policy considerations, economics can still dictate management options. Participants presented this in many ways, including in simple statements like:

The money just isn’t there. [7]

This is a statement that would likely cause disagreement between participants under certain conditions. As mentioned in chapter 2, there are several provincial funding programs related to wildfire and stand rehabilitation that forest managers and communities can draw from, so it could be argued that the money is there. What Interviewee 7 may have meant is how Interviewee 12 put it instead:

The economics has always been the short-term issue. [12]

This should not come as a surprise. At the end of the day, the historical goal of forest management in BC has always been at timber extraction for economic gain. As these next three quotes point out, this guiding principle means that costs that do not directly translate to an increase in extracted sawlog volume are not acceptable to industrial-scale licensees:
…that is an economic consideration that then keeps people away from doing full management within the area. [12]

So currently with the stumpage rate as it is, it’s still too expensive for us to do most of these treatments. [5]

…there’s no financial incentive to do pre-commercial thinning, under spacing, spacing of the previous harvest. [7]

Others drew attention to other aspects of work that affect the costs, and as such, any management that does not increase volume or efficiency of extraction.

Your shipping costs obviously become a significant part of it. [12]

…we have some of the highest log costs in British Columbia… [7]

Of course, any potential solution will need to consider all potential costs. As Interviewees 5 and 11 mentioned, economic factors like shipping costs, to stumpage, and so on need to be considered.

…I don’t think we’re getting low on timber supply in general, just the costs of accessing it are higher and the value of what we’ve been cutting is lower. [5]

…the other part of that is economics, right? If we’re switching into a totally different way of harvesting, you know, there’s got to be the operators and the volumes to sustain, you know, that type of industry and it’s definitely going to be a shift. [11]

What they are talking about, in part, is that because of the focus on pine beetle kill salvage logging, shifting into the IDF, where a more selective approach to harvesting is required, will mean an increase in the cost of extraction. The worse the state of IDF stands get, the more difficult, and costly, any work will be.
Social license

The final guiding theme in the interview schedule was that of social license. Social license is described as acceptance from the public for a company, industry, or action by a company or industry. In natural resources management, the need for social license and how it is defined can vary greatly depending on location, governance structure, and specific company or industry.

In the Cariboo, social license is important, but unlike other forested jurisdictions, BCs governance structure does not allow for the public or NGOs to directly intervene, as it happens in the US with lawsuits, for example. However, the historical importance of the forest industry in the province and the increasing expansion of communities into forested areas has meant that forest industry still has a desire to keep their social license in order to prevent another “War in the Woods”, a series of events in BC between the forest industry and activists and environmental non-governmental organizations during the early 1990s.

Discussions of social license and the effect that the public has or can have on activity in the forest came at various times during the interviews. For example, these next two participants brought attention to the idea that forest licensees in the Cariboo are still concerned with how the public views their companies and actions.

They’ve got other concerns that they want to ensure that they can keep their so-called social license. …but it’s also about maintaining their social credibility. [12]

The major licensees over the last decade and a half have really tried to distance themselves from the original social contract that was supposed to be embedded in the concept of a forest license…. And more and more what you hear from the major licensees is: ‘Hey, we just have quota. That’s it. That’s all the government’s work.’ [9]

One participant tied social license directly to fire mitigation treatments:
[The public] are very reactive to any sort of treatment that helps to improve the fire resiliency of the stand. And they don’t like it. [5]

One important thing to note about this quote is that this expert didn’t single out one type of potential treatment, such as thinning/spacing treatments to decrease density or prescribed burns to reduce fuel loading, but to any treatments at all. So even though the public cannot typically directly affect management decisions, social license is still considered important.

Interviewee 4 provided this sentiment that gives a potential reason for why social license can be difficult to obtain:

Because there is such a separation between [economic and environmental values], it’s very difficult to be able to find a common platform to which [the public] are all going to agree. [4]

The range of values that can be associated with forests and forest resources is an issue not only in social license, but as mentioned previously, with forest management in general. However, according to this next participant, it is not only diverse values that can make social license difficult to obtain.

… [the public] are not conscious of the complexity, but only recognize that at some point in time, people are going to come in and start harvesting in there and ‘Oh my god, this is going to screw up my life!’ [4]

Another participant agreed with this:

And because we’ve been in salvage mode for 10-15 years now, in the Cariboo, it’s created vast changes on the landscape. And there’s a perspective with the public there that we’re over harvesting. That we’re just… we’re ignoring all the rules. [10]

Finally, Interviewee 4 mentions this about how social license can be a challenge because of how certain groups frame the issues to better serve their interests:

Even when some of the elements of the Forest Enhancement Program sort of came out… immediately some environmental groups dropped right on top and said ‘Oh, that’s just an excuse to harvest all of the old-growth we have left.’ [4]
One participant expressed a need for more clear education of the public in order to avoid the type of thoughts expressed above.

So, it’s basically, I think, that one place to start is educating, you know, the public about where our economics are coming from and all the impacts. [11]

4.1.2 Commonality

The first theme that emerged was a set of agreements on the state of forest management in the region. Interviewees spoke of several factors that may affect any attempt to address wildfire risk in the region.

State of the IDF

The first point of agreement between participants was the general state of the Interior Douglas-fir stands in the Cariboo. Participants spoke to this in a few different ways, noting both the general state of the IDF, as well as providing some insight to why it is in such a state. For example, several interviewees pointed to the stand conditions or growing conditions of IDF stands in the Cariboo.

… you look at the fir stands that we’ve got and they’re a disaster… I’d say most of which are growing very sub-optimally. [1]

One interviewee pointed out that this is not news to professionals in the area, nor the provincial government, who have included the stand conditions in the IDF as in-need of addressing.

And each one of the silviculture strategies identifies the IDF as having an over-dense understory layer [12]
However, that doesn’t mean anything is being done yet. One participant suggested that a broad, landscape-level approach could help bring those stands back into a more desired state.

…we need to have a big program where we get them all cleaned up and growing properly. [1]

There also seemed to be some agreement among participants regarding the reasons for this decline in stand quality in the IDF.

For us it’s a challenge, because a big chunk of [the Cariboo] is the IDF. It hasn’t been managed for so many years. [6]

We’ve suppressed disturbance, and we’ve not operated, nor have we treated in a way that maintained the proper ecological function of our dry-belt fir. [4]

In general, you drive around, and you see our forests are looking a little sad right now…and they were intended to be strongholds, old growth examples. I do see them looking a little degraded. [3]

As with all the points of agreement that follow, this comes as little surprise to those with prior knowledge of forests in the interior of the province. There is also agreement among the participants that something needs to be done in the IDF, regardless of natural threats to the resource such as wildfire.

The big issue with fir stands is… two-fold: The first one is ‘are you going to keep it fir?’… The other piece is essentially there’s a big frost problem with regeneration of Douglas-fir in the dry-belt. [9]

**Need for fuels reduction**

Not only did participants generally agree on the state of the IDF, there was also agreement on the urgent need for fuels reduction treatments in the region. When asked if the province was collectively doing enough to mitigate the risk of wildfire in the IDF, interviewee 12 said:
There’s probably always more you can do. You know, thinning and things that you should do a heck of a lot more than we’re doing. [12]

Another participant felt similar:

At the end of the day, if we don’t log the stands they’re going to burn and when they’re on fire it’s too late. [7]

The one difference between these two responses is the specific language about the work to be done. Interviewee 12 uses the word ‘thinning,’ whereas Interviewee 7 uses the word ‘logging’. This shows that among various groups of forest professionals, that even when there is agreement, those professionals are always looking at problems through a specific lens, with a specific bias. Another participant stated this in a broader fashion:

We’ve got a significant problem in what exists as fuels on our land-base. And we’re just not managing to meet those ends. [4]

Again, these slight differences in language may come down to the current position and past experiences of the participants, but there is clear agreement that IDF stands need a reduction in biomass, whether that is through thinning, logging, or more active management.

Shared responsibility with government leadership

One question asked to all participants was ‘whose responsibility is wildfire risk mitigation?’ This question received the least divergence in responses. It quickly became clear that forest professionals from every participant group view wildfire as a shared responsibility.

If we’re going to live in the forest, we have to be prepared. [3]

That being said, many participants also indicated that the provincial government does bear some additional responsibility in the form of leadership, whether that leadership come in the
form of education, funding, regulation, or actual, on-the-ground action. One participant put it this way:

I think it’s everybody. I think we really do need some clear, government direction and demonstration that this is how you do it, this is what we need to achieve, this is what it needs to look like in the future… [3]

In other words, while the responsibility rests with everyone in the province, the government needs to “kick-start” the process of addressing these issues, both financially as well as institutionally.

Interviewee 2 expressed a similar thought:

Everyone’s. It’s a public obligation. It’s a government obligation. It’s a private landowner’s obligation. And it’s a forest industry’s obligation… It has been the history of government initiatives that has brought us to the condition we’re in… So, on all those fronts, I think government holds a principle responsibility. [2]

In other words, according to this participant, because the current state is the result of the entire history of government policy, action, inaction, and so on, the government inherently holds a larger part of the responsibility.

Other participants put it in more simple terms:

I think the government has to take the lead on it… [1]

I mean, there has to be the will for the government to say, ‘This is what we have to do and we’re on it.’ [6]

I think government should start the process and fund it and then try to provide incentives… [8]

It should be noted that this question was not intended to place blame for the conditions, but to assess who forest professionals believe should take the lead in any effort to address these issues.
**Province not doing enough**

After discussing responsibility, the interviewees were asked whether the provincial government was doing enough, first, to mitigate wildfire. Most responses to this, such as the following statements from three different participants, were short and to the point:

- Not by any means. [7]
- Not yet. [4]
- They’re doing what they can. [13]

However, another participant wasn’t certain how to answer the question, and decided to rephrase their answer in more positive terms:

- I don’t know if I can answer that one. I can tell you my personal feeling… I think the province would be well-advised to do more. [3]

The responses given by these two participants were much more succinct:

- I’d give them… a sixty percent. [2]
- No. [5]

These concise responses are worth noting, because they show a clearly held belief by the two respondents on the Province’s current efforts to address the problems in the IDF. These responses, unlike many of the others, did not take much thought to give.

The second part of this question was if the province was doing enough to educate the public or industry about the risk of wildfire in the province. Though there wasn’t agreement on exactly how much further the provincial government needed to go to “do enough.” Some participants felt that the provincial government was making an attempt, and that if that attempt was falling short, it might not necessarily be all the fault of the government.

- I think [they] are trying to do it, but whether it lands on the right ears at the right times is a good question. [4]
Well… I don’t [think the province is doing enough to address issues of wildfire risk]. Is the province doing enough to deal with any issue? Probably not. But they have a limited amount of resources and they’re human like the rest of us. They can only do so much. So, I’m not going to blame them because ‘Yeah, you guys should be doing a lot more, for goodness sakes.’ [8]

**Need for a landscape-level focus**

From discussions on responsibility came several comments linking a lack of landscape-level focus from the government on Crown Land to issues beyond just those directly related to wildfire. Two different participants expressed similar thoughts:

…and we need to do things on the landscape level as opposed to this constant niggling about every hectare, almost every tree… [7]

If you’re just trying to protect one block at a time, trying to do fuel and fire protection, I don’t… It has to be a landscape thing. You can’t plan that. [6]

One participant noted that this not only causes problems on the land, but on paper, in the budgets of forest companies and stakeholders:

We’re having to wait for government financial programs which are virtually job creation. They’re not linked to… any continuum or overarching strategy. [7]

Multiple participants expressed belief that this change in approach is on the way.

We’re just on the cusp of people understanding that there are different options that we can pursue at the landscape level… [12]

What we will be seeing is more and more of a focus… on being able to articulate the outcomes we want… at the landscape scale, rather than broad, sub-regional scale. [4]

I like the landscape-level planning that the wildfire folks are starting. I think that’s important in that context. [9]
So, there is some landscape-leveling planning that is occurring… [10]

These answers hold implications for forestry-related issues beyond the risk of wildfire. Everything from wildlife habitat, to watershed protection, and recreational impacts on natural resources can benefit from a landscape-level perspective (Hodder et al., 2010). In the Cariboo, a landscape-level approach could allow forest managers to better work together towards common goals.

**Regional plans need updating**

Not only did participants mention the lack of a landscape-level approach to forest management in BC, but that the larger, regional plans need revisiting. One participant had this to say:

> [The restrictions in the Land Use Order] were made in an era of, I wouldn’t call it altruism, but they were made for values other than forest management and they are not necessarily to the best interest of the forest. [7]

They added to that:

> Every plan needs to be rebuilt after a certain period of time because it becomes outdated, the values that it was based on change. [7]

The CCLUP was first written in 1994. Though there have been updates and amendments to specific sections of the plan, the last major revisions took place in 2010 (Ministry of Agriculture and Lands-Integrated Land Management Bureau, 2011). Since that time, populations have grown, the pine beetle epidemic hit its peak, we have a better understanding of the potential effects of a changing climate, and we have entered an era of mega-fires. There was a general agreement among participants that these plans need to be re-written with these new realities in mind.
4.1.3 Disagreement

Owing to the diverse range of values and beliefs regarding the use and management of natural resources, it comes as no surprise that there was disagreement amongst participants about several topics. The following were the topics that brought about the greatest variability in responses.

Biggest threat(s) to timber supply

The first topic to bring disagreement between interviewees was regarding threats to timber supply in the Cariboo region. Because all but one of the interviews were carried out after the start of the Fort McMurray wildfire in 2016, it was thought that this type of focusing event might sway the responses to this question towards wildfire. However, when asked what they believed to be the biggest threat to timber supply in the Cariboo, responses ranged from insects and disease to economics and wildfire.

The answer that was brought up the most regarding biggest threats to timber supply was forest pests. Though predictions from 2015 show the mountain pine-beetle outbreak being over by 2020, and data showing that “the worst year of observed red-attack” in the province was 2005, nearly thirteen years ago, participants still largely felt that pine beetle, or the effects of the outbreak, posed the biggest threat to timber supply (Province of British Columbia, 2016).

Mountain pine beetle is still the biggest threat. [3]

Pine beetle. [13]
Coming of the end of the mountain pine beetle is the immediate threat. The next immediate threat is failure to perform well in the dry-belt. [2]

It should be noted that not all participants that mentioned insects and disease specified mountain pine beetle. For example, one participant responded to this question simply:

Insects and disease. [1]

It is the author’s belief that those who didn’t specify mountain pine beetle were likely looking towards the current and potential future state of other pests in the region, namely the Douglas-fir beetle, *Dendroctonus pseudotsugae*, whose populations in the Cariboo are increasing (Buxton & Maclauchlan, 2016). One participant was a little more explicit about it:

But again, currently with the fir bark beetle it’s… you can come up with as many great ideas as you want, and wonderful thoughts and ‘Gee, wouldn’t this be great?’ But the reality is: you look out the window and go ‘Holy shit.’ [8]

Beyond insects and disease: wildfire, economics, and previous annual allowable cut decisions made by the province were all brought up by various participants, in answers such as these:

I do think our AAC was set too high in the last AAC. And if we continue to pretend that we can harvest that much then that is a bigger threat to our long-term timber supply than anything else. [5]

I would say declining timber supply is the major issue in the Cariboo… Timber supply review says the volume is there, but those out on the ground searching for it, trying to meet the criteria of TSR aren’t able to do it anymore. [10]

I’d say economics, again… but secondary, I’d say risk of fire. [12]

Some even looked further out than current forest health issues to address the threat of climate change:
Well, particularly if you’re thinking about the dry-belt fir… one of the biggest questions in my mind in the long-term is going to be the impact on tree growth, productivity, acclimation to environmental conditions as a result of climate change. [9]

**Effect of CCLUP/MDWR**

From the literature review, field notes, and participant observation prior to the administration of the interviews, it was understood that many forest professionals in the region viewed the regulation regarding the protection of habitat for mule deer (Mule Deer Winter Range) and the plan in which the regulation is contained, the Cariboo-Chilcotin Land-Use Plan, as being quite restrictive to licensees’ ability to operate in the region. As mentioned in Chapter 2, this is because of its prescriptive nature that limits forest activity by containing very specific language about spatial and other stand characteristics.

The restrictions also mean that south-facing or warmer parts of a stand such as on a ridge, are harvested at a different rate than cooler stands in order to maintain values important to mule deer (Day, 1997). This not only limits forest activity in spatial context, but it may also increase planning and other costs. Several participants agreed with this.

I mean, you can’t harvest in Mule Deer Winter Range because it costs too much. [7]

The GAR Orders in the Land Use Order are the most… restrictive. [3]

In terms of Mule Deer Winter Range, I would agree with your assertion that it’s probably the most restrictive where there’s still a contribution to the long-term harvest. [10]

However, not all participants believed that this was the case. For example:

The order isn’t your enemy. The current condition is your enemy. [4]
At several points during the interview, one participant commented that instead of looking at things like MDWR as constraints, foresters should look at them as opportunities. They explained their thinking as such:

We haven’t used the full toolbox of our legislation and haven’t recognized the latitude it actually provides us… In MDWR, if the orders can be viewed as a statement of desired condition, that there is a whole suite of innovative opportunities in being able to manage towards that end. And if you’re going to be outside the parameters of the order for a while… you can use exemption permissions. [4]

Some participants expressed both sides of the issue in response to questions about MDWR.

…when you’re discussing IDF, its, yeah, mule deer is probably the biggest thing you have to deal with. I mean, OGMAs are everywhere so we’re already used to that. So, mule deer is the big one…. [6]

Interviewee 6 almost immediately followed that up with:

I don’t think it’s that big of a deal, really, to operate in MDWR. As long as we follow what we’re doing. It’s pretty much set out what you can and can’t do, but it is difficult to, you know, put the practice on the ground. [6]

In 2019, FLNRORD began an process to “revitalize” the interior forest industry and to look at taking a more landscape-level approach to some of the issues in the Interior (Office of the BC Premier, 2019). There has been some talk of whether that will include an update or overhaul to the CCLUP. That process, however, has just begun and no changes have been made yet.

Who does the work

Regardless of how fuels or wildfire risk in general are reduced, regardless of where the money comes from, there will need to be a physical, on-the-ground presence by some company, group, organization, or government body who will be able to not only write plans for stands, but also carry out that work.
The layering of privileges, or rights, depending on whether they’re tenured, or common-law, or constitutional, can create an awful lot of complications in regards to ‘Whose job is this anyway?’ …it may be another one of these ‘tragedy of the commons’ case perspective: it’s the people’s forest, but then who is actually looking after it practicably? [4]

This is at the centre of the bigger question of how to we reduce the risk of wildfire in the province. It is the “people’s forest,” as Interviewee 4 said, but it is managed and regulated by the government, harvested by industry, necessary for wildlife, and recreation, and watershed protection. By and large, participants couldn’t agree on who should do the physical work it will take to address the bigger issues facing the region. There also was not much evidence to the larger groups of participants having a shared view on this. In other words, industry participants didn’t seem to have a stronger opinion than FLNRORD participants.

**Industry’s ability or willingness to participate**

Though there were no direct questions regarding the forest industry’s willingness or ability to participate in efforts to reduce fuels and thin/space IDF stands to improve their quality, several participants discussed this point in answers to various questions. One participant was one of several to bring this up:

So no, it’s nothing the present licensees can do unless you’re in the tenure system where you’re responsible for certain aspects on the land base. [7]

They were not the only one to point out differences between how industry operates on volume-based tenures versus how they operate on area-based tenures. One participant shared this anecdote:

I can remember one company raising the argument… just protesting… not a decision [by the District Manager], but the consideration of what planting densities should be. ‘I can’t get it like this!’ And then someone raised in the back of the audience: ‘Well you do it on
your TFL!’ …it’s this intensely competitive world out there… What can anybody get away with becomes the new norm and everything spirals downward. [4]

This is an important point because it calls to attention yet another aspect of forest management in BC that needs to be addressed: that volume-based licensees not only have no incentive to ensure the long-term quality of harvested stands, but that there may well be incentive to do the opposite. Another participant agreed with this, by saying:

…it’s very difficult to get anybody to think… beyond the free-growing date, if they don’t have any future in that stand, or in that forest. [3]

Like other themes mentioned previously in this chapter, this may not come as a complete surprise to those familiar with industrial forestry in BC, but as one participant pointed out, this is because industrial-scale licensees’ principal concern is their bottom-line.

…we’re coming from a mental model of lowest delivered log cost as being the goal. [2]

Money wasn’t the only issue some participants pointed to as evidence of the industry’s lack of ability to participate in efforts:

I’m not trying to dis [licensee]… but their whole planning department is young… There’s no expertise. [1]

Is private industry going to raise a pile of money and put it into stand treatments and fertilization and that kind of stuff? They haven’t. They didn’t before all this stuff particularly. [9]

And the other thing that is the major barrier here, which I don’t think a lot of people talk about is that industry does not like to cooperate here. They are not painted into enough of a corner where they need to cooperate… And there seems to be… bold-headedness, where there is a product that could be available, but we don’t want to get involved in that, or that’s somebody I don’t like, or our company philosophy is to not support a competitor, even if it makes economic sense for our company for a short period. [10]
There was a sense from non-industry participants of a shared belief that if the government holds primary responsibility for efforts to reduce the risk of wildfire in the province due to their history of policy and action, then perhaps the industry should also then bear additional responsibility for their role in the current state. However, not all non-industry participants stated this explicitly.

**Use of prescribed burning**

It was believed that there would be a diverse range of opinions on the use of prescribed burning as a tool to reduce fuels and reduce the risk of wildfire on the landscape. Academics in Canada, such as Lori Daniels at UBC, have begun to speak up on the importance of prescribed burning for both the land and the economy (Eckford, n.d.). However, as the quotes below corroborate, many forest professionals in the Cariboo aren’t convinced that the economic and environmental consequences are enough to justify an increase in prescribed burns.

Well, it’s really hard to contemplate that we would leave useable biomass to just turn into carbon dioxide and ash, eh? [4]

…from my own personal perspective, I hate the thought of burning it in the bush. [3]

These two interviewees were expressing two of the major reasons forest professionals in BC may be opposed to increasing the use of prescribed burns to combat wildfire: first, that burning those fuels adds to already problematic levels of CO2 released due to forest industry; and second, because that biomass could be potentially used for economic gain. Those are not the only reasons, if they are the most prevalent. As this participant pointed out, there are other factors to consider:

In my experience, it’s difficult and expensive. [2]
This feeling was backed up by a sentiment expressed by a forest professional during a tour of their management area during the spring of 2016. During a discussion about their own use of prescribed burning, they commented:

I really wish it were easier for my crew to use prescribed burns in our treatments. It’s too hard to get permits. [14]

Of course, these “negative” views of increasing the use of prescribed burning weren’t the only expressed during semi-structured interviews. One participant expressed this when discussing the use of prescribed burning to restore IDF stands to a more desired state:

That’s the cheapest way to get rid of it. [3]

The literature shows that prescribed burning can be an extremely effective tool in the fight against wildfire (Agee & Lolley, 2006; Arkle & Pilliod, 2010; Boer et al., 2009; Stevens-Rumann et al., 2016, 2013; Sturtevant et al., 2009; Thompson et al., 2013). However, as these participants have noted, there are potential trade-offs that need to be taken into consideration.

4.1.4 Potential solutions and tools

The last part of the interview schedule focused on potential solutions to the wildfire problem. Discussion stemming from those questions are shared here as important factors to consider before developing new policies or tools to address wildfire risk in the Cariboo and BC.

Complexity

The first factor to consider when weighing solutions is complexity. These responses were, for the most part, specific to the Cariboo or IDF, but that is not to say that a province-wide
solution would not also need to address the intricate nature of the values, resources, uses, stakeholders, and so on, in BC.

A few participants used different language to allude to the complexity of the situation:

So, it’s been kind of an ongoing struggle to identify and to find a solution. [12]

…we get a lot of tough stuff, I think. And so, we have to make decisions that best balance the objectives. [3]

Interviewee 3 pointed out the fundamental goal of forest management that aims to be “sustainable”, as is the case in BC, and that is to attempt to weigh the values and objectives and use experience and knowledge to balance them. A different participant went so far as to list varying values or activities taking place on their tenure:

…we butt up against the community, we butt up against a major transmission line… we have a cell tower… we have a legally designated network of mountain bike trails. We have a range tenure holder… a trapper… and a ton of kind of, un-regulated, un-controlled recreation activity, which brings dumping, and firewood cutting, and hunting… [2]

Though the goal is to try and balance all the varying values on the landscape, the reality is that this is not always possible. This complexity must be taken into consideration, especially regarding treatments in the WUI, as one participant pointed out:

You know, the complexity…like it’s just, it’s building on what we’ve already had to deal with, you know, having a big salvage thing, but now we’re getting closer to town. [11]

**Multi-faceted, innovation solution necessary**

The complexity of the situation will necessitate a complex solution or set of solutions. This fact was discussed by many of the participants going beyond just the complexity of the problem and specifying this need for innovation and diversity in approach regarding potential solutions. Interviewee 12 put this in context of the landscape:
[The IDF] needs the full meal deal, the full picture management and we can’t really piecemeal it… you’re managing the entire forest and all of its parts… [12]

Other participants spoke of the need for a diverse range of financial contributions

We’ve got this massive task in front of us. We need to invite investments of all shapes and forms… if we were able to invite investment in forest stewardship… maybe there is an angle that allows us to then start inviting other investments into our forest base. Not just merely going out and planting a bunch of trees… you could reach out to another whole bank of financial donors… [4]

Interviewee 4, when discussing what they believed to be small steps towards a solution also had this to say:

But it’s still doing something useful and maybe it provides just a measure of offset, and something we do with the pricing system is another measure of offset. And then maybe we do something with those dividends that creates another measure of offset… [4]

This approach of viewing an effective solution as having many separate parts is incredibly important, according to these participants, but some are wary of constraints limiting innovation by certain actors:

We are encouraged to be somewhat innovative and maybe… lean towards… have bias towards more of a social conscience, even if it costs money, but we can’t go too far because, again… that market basis for our timber pricing system. [9]

**Urgency of solution**

The final factor to consider, according to participants, is the speed and efficiency at which any solution or solutions can be developed and implemented. This study was carried out before the 2017 fire season in BC, the worst on record prior to 2018. Over 65,000 people were evacuated from their homes during the season (Duran, 2017), which would seem to corroborate these statements made in regard to urgency. Though participants were given the chance to verify, change, or add to their responses, this was also done before the 2017 fire season. It is likely that
more participants would consider urgency an important factor to consider in light of what occurred in 2017.

Some of the comments related to timing were simple, such as these:

The time to act is now. [3]

…as a matter of fact, that’s probably one of the reasons that jumps to mind as to why it’s important to get this done sooner rather than later. [12]

In this area, more than any other… we’ve put the vast majority of our residential areas in high-risk areas, just because of people’s preference. And we’re eventually going to have to answer for that. [10]

The reasons given as to why a timely response is needed weren’t all directly related to the risk of fire itself. Some comments, such as the following addressed the need to use focusing events as a springboard to action.

People tend to get anxious about something for as long as that thing shows up on TV and in two weeks later, they’re forgetting about it. [4]

…people have short memories and we’re destined to repeat our mistakes if we don’t really dwell on doing a better job. [3]

Some participants hinted at the slow pace of change within institutions as large as the forest industry or the provincial government.

I worry that the large ship that is that process just doesn’t quite turn fast enough. And by the time it does get turned, you know, within ten years that might all be gone. [4]

There was a lot of tense moments during interviews where participants got quite animated and used very colorful language to describe their fear at how quickly things could get much worse for the industry. For example, one participant said this:
But my biggest fear is that we’re not actually going to get anywhere. And our kids are going to wind up with a shit-ass, useless forest. Which is almost now. That’s all I have to say. [1]

Clearly there is a belief among forest professionals in the Cariboo that agrees with the Chinese proverb brought up by one of the participants that says: “The best time to plant a tree was 20 years ago. The second-best time is now.”

4.1.5 Specific solutions

The final set of questions during semi-structured interviews were specific to solutions to wildfire risk in the interior. The only tool that was written into the interview schedule was stewardship contracting. However, during this portion of the interviews—and at other various times throughout the interviews—other potential solutions or tools were brought up by some of the participants. Many of the participants felt as though some kind of economic incentive would be necessary to perform any work, while others felt a market-based solution would work best. For example:

…perhaps it could be the development of a better market for [biomass]. [5]

They then explained that this could potentially come in the form of a co-op to help maintain “waste wood” markets.

Other participants felt changes to the tenure and licensing system were needed first and foremost. In some circles in BC, the debate on volume versus area-based tenures have been around for a long time. This was still discussed often and by interviewees from all sectors. Interviewee 7 raised the idea of an overhaul of the TSAs to something more in line with BEC Zones:
…the picture I had in my mind [was] that we had a separate TSA for just the stand types, because [the IDF and the rest of the TSA] aren’t compatible stand types. They are totally different. [7]

Interviewee 7 also felt as though the best way to incentivize fuels reduction treatments would be to tie it to carbon sequestration.

…the only Holy Grail that I see is carbon. If we can make a buck or sell carbon sequestration through harvested wood products… [7]

**Stewardship contracting**

Finally, stewardship contracts were discussed. Some participants had previous knowledge of this tool, either from their own experience, or from a presentation given by the author at a 2-day workshop centered on silvicultural strategies in the IDF at Thompson Rivers University in Williams Lake in April of 2016 and hosted by the UBC Alex Fraser Research Forest. Those who had no prior knowledge of stewardship contracts were given a short explanation about their history and use in the US.

Every participant was open to the idea of adapting stewardship contracts, but many felt they would need more details about how they would work in BC. Specifically, some wanted to know where the money would come from and felt that any money coming from the government to carry out work could be viewed by the US as “subsidies” and cause further tension in the softwood lumber dispute.

One participant felt that stewardship contracts could work well in some areas:

I think there’s certainly places where [stewardship contracts] would be the best tool for getting some of these stands managed appropriately…[5]

They went on to add that the Forest Enhancement Society of BC would be well-organized to handle the administration and management of stewardship contracts in BC.
Many of the participants felt that there would be room in the TSA to include stewardship contracts, but also felt some caution would be needed in determining what types of volume, saw-log vs. pulp-wood for example, were available to stewardship contractors.

Several participants agreed that the area surrounding Williams Lake would be a prime location to test stewardship contracting out. One participant had this to say:

I think the one thing that remains important is the immediate area… is well-poised to handle the biomass that’s going to come out of stewardship contracting… Because we’ve got a 65-megawatt generator and a pellet plant. Both of those could have quite a bit of joy in using the material, the fibre that results. [2]

But, they felt that the logistics would need to be addressed:

There is a barrier in the logistics. We don’t have a… we’ve got one chipper in town that’s big enough to handle that kind of work. We also started into a biomass delivery venture, back in 2008, that didn’t go very well. The logistics, in my opinion, were not properly conceived. So, scattered piles of biomass weren’t available because they were using grinders that were too big. So the mobilization cost killed them. Hourly operating costs in the 300-dollar range, because of fuel consumption. [2]

They also acknowledged that some values would need to change before these markets could take off:

…we still have a mindset that biomass is a waste product. So, the slash is going to get burned, so it doesn’t matter if I throw my broken pin into it, or my oil barrels, or my dirty rags or whatever. So, we have to get away from the mindset that biomass is waste. [2]

Another participant had similar concerns about the details:

…firstly, you’d have to figure out what you want to do. How much it was going to cost you. And you’d probably be so staggered by the amount of how much you’re going to do and how much it’s going to cost, you might go ‘Holy smokes, do we dare even propose to do this?’ [8]

However, there was still belief from many participants that this type of approach could work in BC:

Well we’re already doing… I mean, we’ve made economics out of very low-volume stands… if you’ve heard of the Forests for Tomorrow program? I mean, we can model
the same sort of thing that you can couple economics being able to get some value. [They get] a little break from [the] structure of timber valuing or whatever, to encourage that type of work. [11]

You know, I could see that happening in certain designated areas, say around the communities… Basically a subsidy for commercial thinning, if you want to call it that way. [9]

I had this vision of US thinning as, you know, going in and taking out these little trees here and there. And what they were doing was full-sized feller-buncher going in and, I think, mostly ponderosa pine, maybe some Douglas-fir… But the intensity of the harvest? I was like ‘this is thinning?’ (laughs) And what it looked like to me is exactly what we are doing today… the amount of volume removed, or stem removal I should say… was much higher than I ever thought I would see… So maybe what they’re calling thinning isn’t actually thinning, per se, but it was a real perspective change. It was the first time where I said: ‘We could do that here.’ [10]

There are a diverse range of issues and concerns discussed by participants in the first round of interviews. Ranging from specific concerns about the use of prescribed fire to more broad thoughts about leadership and responsibility, these themes paint a picture of the on-the-ground situation faced by government and industry in the Cariboo.
4.2 Second round of interviews

The second round of interviews were intended to gather some additional thoughts regarding a few of the specific barriers discovered during analysis of the first round. Additionally, questions were asked regarding changes to thoughts, direction from leadership, or work duties that arose as a direct response or reaction to the record-breaking 2017 and 2018 wildfire seasons in British Columbia.

The questions related to these topics were asked to all second-round participants. However, questions specific to each participant and their specific jobs, as well as follow-up questions, varied between each participant. These questions were asked either for more context-specific responses regarding the interview schedule questions, or to gather some more detailed information regarding the adaptation of stewardship contracting.

Due to the nature of the reasoning behind follow-up interviews and the limited participation, these interviews were not analyzed through NVivo for themes. Rather, these interviews were intended to: give a better understanding of some of the potential barriers, provide further evidence of themes and barriers, and/or to place some of the participants thoughts in context of the two major wildfire seasons in BC that followed the original interviews. Quotes from this second round of interviews are included in the discussion that follows.
Chapter 5: Discussion

This exploratory research attempted to deduce the views of experts in the Cariboo regarding the on-the-ground effects of policy, economics, and social factors on forest management as well as wildfire risk in the interior. Using these views and the themes which emerged during analysis of interview transcripts, as well as a framework developed by Ekstrom et al., potential barriers to change were identified. Using the framework, interview themes were compared to potential barriers in each of the phases and subphases of adaptive action. This chapter will discuss the themes and barriers from the first two objectives to determine the potential adaptation of stewardship contracting to address problems, constraints, or barriers discovered in previous phases of this research.

5.1 Objective 1: Semi-structured interviews and on-the-ground effects of policy, economics, and social license

The first objective of this research was to gain a better understanding of the effects of policy, economics, and social factors through the eyes of forest professionals in the Cariboo. This was done not only to inform the process of identifying barriers, but also because of the importance of experiential knowledge in decision-making (Fazey, Fazey, Salisbury, Lindenmayer, & Dovers, 2006).

It was expected that many professionals would view MDWR as being a constraint to management efforts in the IDF, as this was something brought up by industry professionals in the past. As mentioned in the findings, one participant thought MDWR was the most constraining policy in the entire province. Of course, one statement does not necessarily make that a fact, but
at the very least indicates a real barrier of communication and understanding is present in the Cariboo regarding how wildlife management affects forest management.

More research is needed to determine exactly how MDWR might affect overall IDF health and wildfire risk management. One advance in that area has been recently made. In 2017, a thesis written by Marc-Antoine Leclerc in 2017 at the University of British Columbia concluded that “widespread application of MDWRM [MDWR Management] resulted in… low fire risk” (p. ii). However, this also resulted in a “homogenized landscape”, and other potentially undesirable “consequences for other ecological processes” (Leclerc, 2017, p. iii).

This type of research will be invaluable to both the region and the province moving forward because it provides evidence to clarify greater questions regarding quantitative effects on resource management. Because problem definition is critical to development of solutions that fit with said problem, identifying aspects of this issue which require better understanding will be key moving forward.

In general, most participants believe a landscape-level approach is sorely needed in the province. Not just for wildfire, but for forest management in general. Not only that, but many participants believed that a complete rewrite of the Cariboo-Chilcotin Land Use Plan is long overdue. Landscape-scale planning for wildfire mitigation is incredibly important, especially in the IDF where there is such a large proportion of volume-based tenure. Overlapping tenure, communities that are pushing further into the forest, and wildfire risk that can cross those need a larger scale solution than is currently present in the region or the province.

Some of the points raised by participants regarding solutions to the wildfire problem aren’t relevant to the third research objective, determining if and how stewardship contracting could be adapted to BC. Though these are still important factors to consider, for example, when
it comes to implementation, urgency of solution is still important, but is separate from assessing stewardship contracting’s ability to work in BC.

A similar conclusion can be drawn about the need for a multi-faceted solution. Stewardship contracting is not likely to address all the factors that have brought the province to the current state of megafires. For example, stewardship contract will likely not be a tool used on private land, or in urban settings. Similarly, stewardship contracts may or may not fit into or alongside certain types of tenure. So, while stewardship contracting may be a tool to address economic concerns, it may have little effect on something like social license.

5.2 Objective 2: Barriers to adaptive action in the Cariboo

5.2.1 Barriers of understanding

Though there was agreement about many of the issues facing the region’s forests, lots of disagreement regarding the fine details shows that the major barrier in the Understanding phase in the Cariboo is regarding problem definition. This is a critical phase of the policy development process and thus critical to address. Problem definition leads the process of solution development and provides the lens through which potential solutions are compared and assessed (Rochefort & Cobb, 1993). If the problems in the Cariboo are incorrectly defined, then it is likely that the wrong solutions will be developed and potentially implemented.

There was agreement by participants that wildfire risk is a major threat to many values in the Cariboo, but the details of the problem(s) and interplay of contributing factors often caused disagreement. For example, there was disagreement regarding the effect(s) of OGMAs on licensee’s ability to manage timber or wildfire risk. Similarly, there was disagreement on the biggest threat to timber supply in the region. According to Ekstrom et al. these issues would be
considered barriers of ‘level of agreement or consensus’, as well as ‘defining the problem’. Both barriers are important in the understanding phase, especially during the subphase of information gathering and use.

Participants in the second round of interviews were asked a set of questions regarding problem definition and clear messages from professionals to the public in order to better understand challenges regarding problem definition in the context of the Cariboo. When asked during the second round of interviews if there was a clear problem definition, Interviewee 3 responded:

That's a really good question... I don't think we have a clear definition right now. I think people are reeling because there's... this problem is coming from so many different directions. But I don't think there's, like I said, there's not a common understanding of what we need to do. [3]

And this wasn’t the only participant who had an opinion regarding this barrier. To the same question, Interviewee 5 had this to say:

I think that's a really hard thing to do, is to make it a clear message that's accurate. Because it's too complex of a problem to fit into a one-liner. And the public love the one-liners. So, I mean, obviously 'Fire is the new normal' is one that's just become common language, in this case. And that's especially where it comes back to my comment about not being able to simplify the public message. Because it's, it is so complex with so many different layers to it. And it's just unfortunate to me that our media covers things in a way that they want a one-liner and they don't want to get into those discussions about complexity. So, it's really hard to deliver a message to the population, as a whole, in terms of the things we weighed when we consider what treatments should be and where they should be. [5]

Likewise, during the second round of interviews, one participant highlighted the importance of how that problem definition or other uses of information was communicated to the general public:
We need to recognize that for what it is and what the risks and vulnerabilities are in not being able to undertake very deliberate communication and engagement activities to educate and build that platform for an effective dialogue. [4]

Though the interviews did indicate a barrier regarding level of agreement or consensus on the details of the problem(s) in the region, the 2017 and 2018 fire seasons that followed initial data collection for this study have shifted both the professional and public perception of wildfire risk across the province. Changes to policy and programs discussed in chapter two of this thesis indicate that decision-makers have begun to move beyond the phase of understanding and into the phases of planning and management.

5.2.2 Barriers of planning

In general, BC is in the planning phase in regard to taking action to address wildfire risk across the province, though programs which are already in place are in the management phase. The issues which may be barriers in the planning phase are all surrounding disagreements about how to best address the challenges in the Cariboo. For example, issues of spatial scale of planning in the province and outdated regional land use and other plans were raised by many participants, regardless of what sector of the forest industry they were involved in. However, there wasn’t always agreement as to what role spatial scale should play in overall planning of forest management in the region. The use of prescribed fire as a management tool was also a source of disagreement when discussing potential options to address fuel loading and stand densities in the region, especially in the IDF. Ekstrom et al. would refer to these issues as barriers related to ‘level of agreement on goals, criteria, or options.’
5.2.3 Cross-cutting barriers

The rest of the barriers linked to themes from the interviews can be considered cross-cutting barriers. These barriers transcend phases and can slow or halt progress at any stage of the adaptation or action process and often appear in multiple phases. Many of these barriers are related to themes or issues that were known prior to interviews. For instance, it was widely understood that economics or financial resources were a limiting factor in the desire and ability to address fuel loading, not only in the Cariboo, but across the province. Ekstrom et al. refer to this as the cross-cutting barrier of resources.

Figuring out how to pay for treatments in marginal stands is a major question facing BC. The lack of financial resources at any stage of this process can make a potentially successful action fail. As one participant pointed out during the second round of interviews:

When you realize there's $2 billion worth of work to be done, and you can't just pull that out of the government coffers you have to think about different approaches. [4]

Resources, especially financial, are obviously important to the issue at hand, but other barriers can also affect the process at any phase. For example, the cross-cutting issue of leadership was one that emerged upon analysis of the first round of interviews. While all the participants agreed that reduction of risk of catastrophic wildfire was a shared responsibility between government, industry, First Nations, and the general public, many also believed that because of the nature of BCs public ownership of forests that the provincial government needs to take a leadership role in addressing the problems at hand.

Similar to this, the shared belief that the provincial government is not currently doing enough to address these issues can also be a cross-cutting issue not only of leadership, but of participation as well. Likewise, the themes of who does the work and the industry’s willingness
to participate could be considered cross-cutting issues of participation according to Ekstrom et al.’s framework.

The disagreement surrounding how constraining policies like MDWR and OGMAs are affect both the understanding and the planning phases, and as such would be cross-cutting barriers of ‘information and communication’ according to Ekstrom et al.

Finally, the issue of social license could be a cross-cutting issue of information and communication as well, or it could be considered a cross-cutting issue of cultural cognition. Though the cross-cutting issue of cultural cognition came up only a few times in the first round of interviews, this barrier was discussed by many second-round participants:

Well, our style of delivery has changed so much in our lifetimes, from everybody sitting around and watching the six o'clock news, where they actually have a discussion about the complexity to headlines on Facebook. So, yeah, it's really hard to get complete information at this point. [5]

…you can see how you get this infusion of those uninformed, with those who are relatively more informed. And if you can create that level playing field through effective communication, education, and engagement, then all that disturbance should go away, hopefully. Maybe I’m pie in the sky. But optimistically, you create a much better platform for the required shifts and required measure of enterprise to take place. [4]

5.2.4 Summary of barriers and challenges facing the Cariboo

The major barriers and themes tied to them which are present in the Cariboo can be broken down into a few categories. It seems the most prevalent barriers, regardless of phase, are those related to information, communication, and resources. While not limited to these three types of barriers, the major themes which seem to have the prospect to slow or prevent action to address wildfire risk in the Cariboo are those of: government vs. industry responsibility or participation; stand-scale or patch-scale vs. landscape-scale; and economic vs uneconomic approaches. All three of these issues have the potential to act as barriers in nearly every phase of
the adaptation process, but likely have the strongest effect during the planning phase, where the Cariboo and the Province are currently situated in the overall process of addressing wildfire risk.

In the Cariboo, likely due to the proportion of volume-based tenure, these issues are especially salient. In the TSA, major licensees have no incentive to manage stands beyond what is required by law. These requirements are essentially limited to replanting a stand and monitoring it until it reaches a “free-to-grow” state. Reaching this state, however, does not guarantee a stand will continue to grow, un-monitored, and end with desired conditions long-term (Mitchell et al., 2017). This has resulted in both the industry and government shying away from taking on additional responsibility for the state of stands in the Cariboo with those in industry claiming that they are following the law and doing what is required. This would leave primary responsibility with the government, as they are the land managers of a publicly owned resource.

Similarly, the volume-based tenure approach means that there is little landscape-scale planning that goes on across the TSA. Licensees focus on the stands they are planning to harvest or have recently harvested, and until very recently, there was no one looking at the bigger picture. As evidenced by some of the major fires that have occurred recently in the Cariboo, the Elephant Hill Fire of 2017, for instance, wildfires occur over large portions of the land base and must be planned for or managed at a similar scale.

Finally, the barrier of resources is evident in the Cariboo regarding how to pay for treatments. In a volume-based system, there is little to no incentive for licensees to commit resources, financial or otherwise, towards stands that they may not get to harvest in the future. Likewise, the government may be concerned that any extra incentive provided will result in
increased efforts by the US to label these incentives as “subsidies” in the softwood lumber dispute.

While a complete overhaul of the tenure system in BC is unlikely, a closer look needs to be taken at how the TSAs operate and what effect they have on the Province’s ability to address issues relating to climate change, wildfire risk, and other large-scale changes currently taking place not only in BC, but in Canada and other forested jurisdictions.

5.2.5 Overcoming barriers

According to Ekstrom et al. (2011), overcoming potential barriers is not an intrinsically ‘good’ thing. With this in mind, they state that “overcoming barriers [should] not [be] viewed as a normative ‘must’” (2011, p. 53). Competing values and goals between governments, various stakeholders, and the general public mean that overcoming a barrier from one perspective may have a negative effect on a value someone else views as important.

Ekstrom et al. offer a blueprint to diagnose potential places to intervene in the process in order to overcome barriers that may arise throughout the process. This is accomplished by determining an actor’s proximity to the barrier in both space (or jurisdiction) and time. Ekstrom et al. provide a matrix to visualize potential intervention points, shown in Figure 2.5.

Ekstrom et al. use the terms ‘remote’ and ‘proximate’ to distinguish between spatial proximities, and ‘contemporary’ and ‘legacy’ to distinguish between temporal proximities. So in terms of location relative to the actor, ‘remote’ and ‘legacy’ indicate spatial or temporal proximities that are out of the actor’s “sphere of influence” (2011, p. 54).

The barriers discovered in the understanding phase consisted mainly of those regarding agreement upon information or definitions. If stewardship contracting is to be adapted into BC,
these details will need to be addressed by involved parties. Some agreement will need to be reached regarding how the problem is framed, what the management priorities are, and on other details of the situation in the region or province.

Likewise, in the planning phase, many of the barriers identified deal with agreement on aspects like goals, criteria, and options. Adapting stewardship contracting into the province will necessitate some changes to the language of the law to fit into BC's system. Agreement on the goals of such a program will allow decision-makers to tailor this approach to the specific values in the Cariboo.

As mentioned previously, barriers in the management phase were not explicitly addressed in this research, because this specific adaptation process has not yet reached that phase. However, it is still important to anticipate some of the potential barriers that might arise after implementation, in order to recognize and intervene if or when they do arise. The most obvious barriers during the management phase deal with resources. A major part of this is economic resources, that is, how will the program be paid for and what will be the best economic solution to utilization of removed material. That being said, there may also be other resources, such as social capital, that may play a role in the success or failure of stewardship contracting in BC.

Finally, the cross-cutting barriers identified during analysis may be the most important to be aware of, as by definition they can influence any or all phases of adaptation. These barriers touch on some of the major components of adaptive capacity: things like social resources, financial resources, and leadership.

In discussing intervention, Ekstrom et al. (2011) point out that intervention isn’t always as easy as simply “building adaptive capacity” (2011, p. 56). They state that having more resources, in general, is beneficial, but understanding or asking when those resources are
available, to whom they are available, and for what purposes, is often a much more valuable piece of the puzzle. For example, having more money to fund on-the-ground actions, but not to monitor conditions after those actions, is not going to guarantee successful implementation.

5.3 Objective 3: Stewardship contracting in BC

5.3.1 Stewardship contracting as a bundle of tools

During literature review for this study, a phone call was made to Wade Salverson, the stewardship [contracting] coordinator and biomass forester for the US Bureau of Land Management. Many topics regarding the development and implementation of the program in the US were discussed, but Mr. Salverson was quick to highlight that stewardship contracting was and is an economic tool, first and foremost. The answer to the growing wildfire problem will not lie in an economic tool alone, but it does help address one of the primary questions with wildfire risk mitigation: how will we pay for it?

This isn’t the only question facing decision-makers in the province. Other, non-economic barriers exist to implementation of a program like stewardship contract. Though stewardship contracting is considered an economic tool, there are components of the authorizing legislation in the US that could influence other aspects of forest management, namely environmental quality and social license.

There are eight different “features” included in the stewardship contracting authority/legislation. These eight features of the stewardship contracting tool, and their descriptions, which come from a report written by the USFS, are as follows:

1) Best value contracting: Factors other than cost must be considered when choosing contractors
2) *Designation by description*: Allows for trees for harvest to be selected by contractor without the need for individual tree marking.

3) *Designation by prescription*: Contracts can describe desired conditions at the end of the project, allowing the contractor the ability to be flexible in how they go about achieving the end result.

4) *Less than full and open competition*: Allows for the awarding of sole-source contracts in certain situations, as with Native American tribes being selected for work in areas with tribal significance.

5) *Multiyear contracting*: Stewardship contracts and agreements can be written for up to ten-years in duration.

6) *Retention of receipts*: Revenues from projects where value exceeds service work can be kept and used to pay for work in other projects.

7) *Trading goods for services*: Allows the performance of service work (fuels reduction or stand spacing/thinning) to offset stumpage or other money owed for timber removed from the forest.

8) *Widening range of eligible contractors*: Allows non-traditional bidders (NPOs, local governments, etc.) to be awarded contracts (The Pinchot Institute for Conservation, 2017a).

### 5.3.2 Individual feature effect on economic, environmental, and social aspects of forest management

Though somewhat subjective, some assumptions can be made regarding each of these features and what effect they may have on various aspects of the issue, through the lens of what
is often referred to as the three pillars of sustainability. Each of these features and the effects tied to them in the following table are discussed below. Figure 5.1 shows each of these parts of stewardship contracting and how they might affect or address concerns regarding: economics, environmental quality, and social license and the potential tradeoffs.

<table>
<thead>
<tr>
<th>Contract features</th>
<th>Economic</th>
<th>Environmental</th>
<th>Social</th>
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</thead>
<tbody>
<tr>
<td>Best value</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Designation by description</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Designation by prescription</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Less than full and open competition</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Multi-year contracting</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Retention of receipts</td>
<td>++</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Trading goods for services</td>
<td>+</td>
<td>+</td>
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</tr>
<tr>
<td>Widening the range of eligible contractors</td>
<td>+</td>
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</tbody>
</table>

Figure 5.1 - Features of stewardship contracts and their effects on Economics, Environment, and Social License in the Cariboo
5.3.2.1 Best value

The best value component could be seen as having a negative impact on economics, a positive impact on environmental quality, and either a positive or negative impact on social license, depending on which values are most important to the individual.

While not necessarily a given, because best value is specifically written to prevent awarding contracts strictly based on the lowest cost, this feature will potentially have a negative effect on economics of treatments. This may be countered through the best value tool. One of the ways that the best value tool is used in the US is to award contracts to contractors who have demonstrated success with similar projects. Having experience and prior success with this type of work could ultimately mean that the work is completed faster or more efficiently, negating the negative effect that not using lowest cost awarding might have.

For a similar reason as to why best value may have an indirect positive effect on the economics, best value may also have a positive effect on environmental quality. If contracts are awarded to experienced and successful contractors, this will likely make the chances of success higher, meaning increased environmental quality for whatever the desired end result, or value in focus of the contract is.

Finally, best value may have either a positive or negative effect on social license. This could happen, for instance, if a contract is awarded to a competitor outside the local area. Some members of the public might view this as a negative, if they put more weight on the benefit a contract may bring to the local economy as opposed to proven success or some other factor.
5.3.2.2 Designation by description and prescription

These two pieces of the tool are quite similar and as such, their effects on economics, environment, and social license will be discussed together. These features allow for greater flexibility in the on-the-ground operations of treatments by removing the need for detailed contracts to be written or trees to be marked as leave or take trees, respectively. This will have a positive effect on economics by removing the cost of labour for planning the treatments at the individual tree level as well as the cost for having someone go into the stand to mark trees.

These also will likely have a positive effect on the environmental quality of the stands after treatments because the flexibility allowed should, in theory, mean that the work can be done more efficiently and with less entries into the stand with people or equipment. Though there is a chance for mistakes to be made, especially regarding the designation by prescription feature, by allowing the contractor to make decisions that might lead to corners being cut. However, when combined with the best value piece, a contractor that can show success in previous projects would likely be trusted to make the right decisions as to how to achieve the desired result without having to have the trees painted or marked.

Finally, these two parts of the program may have a negative effect on social license. This is due to the fact that some members of the public may accuse contractors of being too aggressive with their selection, or not conscious enough of things like wildlife habitat and so on. But this may be reduced the longer the program is in effect, as members of the public see end results and see successful projects completed and the benefits they bring to their communities.
5.3.2.3 Less than full and open competition

It is challenging to predict how this feature will affect economics, environmental quality, and social license. Similar to the best value feature, this feature could potentially limit competition for contracts, and as such, the lowest cost contractor may not be selected. Similarly, this may mean that a more successful contractor may not be selected, in order to give the contract to a more local contractor.

However, the effect that this feature may have on social license could outweigh the potential negative effects on economics and the environment. This is because this feature could be used to award contracts to local First Nations, allowing the tool to assist FLNRORD and the BC Government in their efforts towards reconciliation. This doesn’t guarantee that everyone will see this type of contract as a positive, but because of the BC Government’s legal and social duty of consultation with First Nations in certain decisions made on their traditional territories, thus this tool will likely have an overall positive effect on social license.

During the second round of interviews, one participant expressed their belief that the government and First Nations’ interests are aligned in the Cariboo regarding efforts to address the problems facing their forests:

As a mechanism of reconciliation and restitution, we've got an opportunity here to be able to re-examine our land management, where the indigenous communities are fused with government, as the land manager. That exercise allows us to examine the condition of our ecosystems and determine what it is we actually want to deliver out there. And then overarching principle of all of that, and we've been certainly advised by First Nations, you know, consistently on this is that they want healthy, resilient ecosystems. The provisional interest is exactly the same. [4]
5.3.2.4 Multi-year contracting

While multi-year contracts would allow for better overall planning due to the increase in time allowed to complete contracts, this would also mean more time for projects to come upon challenges. An economic recession, for instance, could lead to contractors going under or unable to finish contracts. Changes in the government, as during major provincial election years, could mean changes in budgets that effect the forestry sector. Longer contracts could also risk wildfire or insects and disease outbreaks which reduce value in stands already at the lower end of merchantability.

Longer contracts would likely have a positive result on environmental quality. This is because contractors would have more chances to adapt to changing conditions, or plan treatments better to reduce impact on the stands. This would also allow for strategic use of prescribed fire, as there would be more opportunity to take advantage of favourable weather conditions.

Multi-year contracting would also give more time for relationship building and increasing of social capital, having a positive effect on social license. The relationships built during one contract would carry forward to other projects in the area, building trust with the local public for the work being carried out.

5.3.2.5 Retention of receipts

This feature may have the greatest positive effect on economics. When receipts are retained by the Provincial Government, any money gained can be applied to future projects, instead of just back into the province’s general fund, it will be much easier to balance the economics for future projects. Because of this, this feature will likely also have a positive effect on environmental quality, by securing funds for future projects, allowing more total area to be
treated each year. Finally, this feature will likely not have a positive or negative effect on social license. Because this change is only in where the money goes, the general public likely will not be affected.

### 5.3.2.6 Trading goods for services

As this is the main economic tool of the program, this will have a major positive effect on economics of projects. However, due to the nature of the stumpage system, this tool could conflict with current policy. Similar to retention of receipts, there may need to be amendments made to current laws in order to allow this part of the program to work in the province.

Because this tool is designed to address the economic constraints that have prevented these types of treatments to be done, using it to improve those stands will obviously have a positive effect on environmental quality of the stands.

Finally, this tool may have a negative effect on social license. The reason for this is that sometimes this type of work, where sawlogs are used to help supplement the cost of treatment of marginal stands, are viewed by members of the public and often by environmental non-governmental organizations as being nothing more than an excuse to extract timber. This was confirmed by multiple participants during the second round of interviews:

> Well, here's an example like, our... the town of 100-Mile, like the village they bought some private land and they basically clear cut it. like 60 hectares, right in town. I know, it sounds shocking, but that's what they did. Under the guise of fire management, okay. But the thing is, it didn't need to be that. Like, it was, it was a very poor decision, to do that, because the public was really upset. [11]

And subsequent, you get this sense that all we're doing here is creating excuses to be able to continue to revisit this forest management demon on our ecosystems. "How dare you go out there and compromise old growth, and habitat, and watersheds, and caribou by using this as a reason for doing more forestry activity!" We still even surprisingly, have
some of the environmental groups and social networks, etc., they're still sort of suggesting that this is simply a timber grab. That will be politically and socially counterproductive, if that in some way doesn't become more exposed to the practical reality of what's happening to us. [4]

5.3.2.7  **Widening the range of eligible contractors**

Much like the best value and less than full and open competition tools, this feature will affect competition for contracts. In the US, expanding contractor eligibility was necessary to allow certain non-traditional groups to bid for contracts in the US federal system which were not previously eligible. This is due to certain pieces of legislation in the US and as such, this piece of the tool may not be necessary as part of an adaptation of the program to BC.

5.3.3  **Potential effects in BC**

As noted in chapter one, there are limitations in policy and programs aimed at addressing wildfire risk or fuel loading in the province. These deficiencies, listed in Table 2.1, show the need for other tools to address wildfire risk and forest health in places not covered by current policy or programs.

**Economics**

Each of these pieces of stewardship contracting legislation in the US can work to address some of the issues in the Cariboo. Owing to the fact that financial resources will be one of the biggest constraints to implementation and administration of such a program in BC, possibly the most important effects to consider with adapting this program to BC are those that affect financial resources.
The major component of stewardship contracting legislation is the trading of goods for services. In order to offer some financial incentive to companies or organizations that have the capacity to carry out management actions such as fuels reduction, allowing the work to offset costs such as stumpage could be a major step in balance the issue of economics.

Of course, the economic issues won’t be addressed through this alone. Another piece of the legislation that may have a tremendous impact on the economic aspect of this problem is the retention of receipts. In BC, funds gained by the government on stumpage go into the province’s general fund. By allowing money gained from stewardship contracting projects to be put directly towards future work, issues of funding can be minimized.

Likewise, both the designation by prescription and designation by description pieces of the program can have a positive effect on the financial aspect of these projects. Designation by prescription allows for flexibility in how a contractor reaches the desired state or end result of the project, which saves time and money in planning. Similarly, designation by description saves contractors the time and money spent on marking trees for removal.

The last piece of the legislation that may have a positive effect on the financial issues at hand is widening the range of eligible contractors. The effects of this piece may be less direct than the previously discussed pieces of the program, but the tradeoff is that this piece may have positive benefits for other aspects, such as social license. This part of the tool allows contracts to be awarded outside of the typical forest industry system by opening bidding to non-profit organizations, local governments, or other non-traditional licensees. Because these groups are typically less focused on earning profits on the work, there is less of a need to weight the economic balance in favor of profits. The indirect benefit of awarding contracts to these
organizations, especially local governments, is that it may bring members of the public on-board with the projects, saving time, and potentially money, on efforts to secure social license.

However, it should be noted that a few of the tools may have a negative or neutral effect on the economics. First, less than full and open competition may wind up excluding contractors that have a better capacity for the work, meaning they could do the work cheaper, from certain projects. The tradeoff here is that this tool is typically used in special circumstances. For example, when there is a project that takes place in an area with particularly significant cultural resources of Native Americans in the US. Again, this could work in favor of social license in many communities, especially First Nations, in BC.

The effect on economics by the allowing for multi-year contracts will impact economics, but it is difficult to say exactly how. On the one hand, allowing multiyear contracts will likely mean a bigger investment up front. On the other hand, allowing multiyear projects will allow contractors to plan ahead, potentially saving money in the long term.

The final tool, best value contracting, could have the biggest negative effect on the economics. Typically, contracts are awarded according to lowest cost. However, stewardship contracts are awarded according to best value, meaning other factors besides cost must be considered, such as a contractor’s ties to a local community, or experience -- particularly success in previous contracts. This means that costs of projects may not be as low as possible.

According to one participant, a change in approach shouldn’t just stop at how we implement the work on the ground, but that we must also change the way we look at the economics altogether:

One of the problems, and this may be one of the most taxing at this point, is [how] we undertake our tenure and revenues approaches... the policy around that, is focused on value in our timber assets in terms of dimension lumber. What that does not recognize is
the costs associated with undertaking stewardship-related activities. It's always been a prevalent issue with us that we tried to be able to find solutions to, but there's never been the will to actually adjust those tenure and revenue policies, timber pricing policies, to be blunt, to be able to recognize that, "hey, if you really want to create an incentive for the forest sector to be involved in recovering the proper ecological structure and function of the forest, you got to recognize the cost that they would bear in doing so." [4]

This change won’t happen with merely the adaptation of stewardship contracting, but it does provide opportunities to showcase the multiple benefits to the environment and the economics and use that as a way to shift the collective consciousness surrounding public forests.

So, as an economic tool, stewardship contracting could provide real benefit to the situation in the Cariboo. However, there may be potential for these tools to address other issues, such as the policy or social constraints.

**Environment**

Though not a direct objective of this research, the effects of stewardship contracting on general environmental quality may be an aspect of interest to certain actors or stakeholders. It could be argued that the economic-specific authorities could help promote an improvement in environmental quality by reducing the cost of projects, allowing more projects to be completed, more efficiently, in the future.

If contracts are awarded on best value, that may mean that a contractor that has had success in the past may be awarded subsequent contracts. As they gain more experience with these types of projects, especially in different eco-regional contexts, the likelihood of success of future projects may be increased. Similarly, the authority which allows for non-traditional contractors could lead to non-profit groups bringing in diverse environmental experts to improve projects.
Another piece of the legislation that may have a positive effect on environmental quality is the multiyear contracts. Allowing projects to have longer durations could mean that there is time to monitor and adapt to changes in knowledge, policy, or practices. It doesn’t guarantee this, however, so the positive aspect of this strand of the tool is not for certain.

Social

It is difficult to say how all the tools in the stewardship contracting legislation will affect social constraints. On the one hand, widening the range of eligible contractors could mean that there is more local engagement, especially if a contract is awarded to a local government. On the other hand, if a contract were awarded to an environmental non-governmental organization, some members of the local community might view that as negative because of varying values held by different members of the public. Similar to this provision, having less than full and open competition may lead to some members of the public viewing the process as unfair.

Policy

While the economic effects of stewardship contracting may be relatively easy to understand, the implications for policy constraints such as MDWR are not as easy to deduce. As an economic tool, some pieces of stewardship contracting are specific to costs: best value, the exchange of goods for services, and retention of receipts. So, these pieces will likely have a neutral or negligible effect on policy constraints.

One way that stewardship contracting authority may help address policy constraints is in the designation by prescription piece of the tool. As mentioned in the previous chapter, one interview participant had this to say about the effect of MDWR on forest management: “…[it]
can be viewed as a statement of desired condition… [and then] there is a whole suite of innovative opportunities in being able to manage towards that end…” [4]. What this participant is describing is designation by prescription. By managing for the end result, MDWR targets can be reached without the need to feel constrained about how to get to that end.

Each individual tool of the stewardship contracting program has separate effects on the feasibility or success of fuels reduction or stand improvement treatments. The strictly economic tools could be the key to allowing much more area to be treated in BC every year by providing a funding mechanism to incentivize industry or other groups to take on the work. Other tools will allow the BC government to fulfill social contracts with First Nations as well as allow more local involvement in forest management and activities.

Though stewardship contracting is not a magic solution to all the issues facing the interior, when looking at all the potential benefits it could bring to economics, environmental quality, and social license, it is clear that adapting stewardship contracting to BC could help address multiple objectives and address multiple aspects of the problems in the Cariboo and the IDF.

5.3.3.1 Recommendations of the Abbott-Chapman Report

After the record-setting 2017 wildfire and flood seasons in BC, the provincial government commissioned an independent review to offer recommendations for how to prevent, prepare for, and better respond to similar natural disasters in the province (Abbott & Chapman, 2018). This report, colloquially referred to as the “Abbott-Chapman Report” after the co-chairs of the committee, George Abbott and Chief Maureen Chapman, laid out one hundred and eight recommendations for the province to address following the fires and floods of 2017.
These recommendations covered four categories related to: emergency management; preparedness and planning; prevention and mitigation; response and recovery. If stewardship contracting is adapted to BC, it could help the province act on some of the recommendations of the committee responsible for the report. These recommendations were varied, but several recommendations could be satisfied by a stewardship contracting-type approach here in BC.

The following recommendations could be put into action through adaptation of stewardship contracting to BC:

67 – “Create mechanisms to encourage fire prevention activities such as thinning, biomass utilization, targeted grazing and alternate species and densities.” (2018, p. 95)

71 – “Encourage existing licensees to participate in risk reduction and treatment of interface areas by addressing existing disincentives and creating opportunities through statute, regulation or other mechanisms.” (2018, p. 96)

75 – “BC increase the use of traditional and prescribed burning as a tool to reduce the risk associated with landscape and local-level hazards, and to regenerate ecosystems.” (2018, pp. 96–97)

80 – “To increase the resiliency of BC’s ecosystems and communities against climate change, BC establish a predictable and stable revenue stream to provide enhanced investment in prevention and preparedness. BC consider a new carbon tax revenue stream as a source of funds.” (2018, p. 98)

Stewardship contracting is a tool to promote thinning of hazard fuels, so it satisfies recommendation 67. It functions as an economic tool which creates opportunities for licensees or others to participate in treatments through its economic components. Owing to this, this type of approach satisfies recommendation 71. Stewardship contracting won’t directly mean more prescribed burning, it could indirectly lead to an increased use of fire through the “non-economic” pieces of the stewardship contracting tool. For example, the widening range of contractors in BC may mean more First Nations crews, many of which would likely incorporate
traditional burning into their prescriptions. Finally, as evidenced by projects like the White Mountain Stewardship Project, the use of stewardship contracts often improves ecosystem resiliency, strengthens community relationships, and provides for better, more consistent funding for stewardship projects (Abrams & Burns, 2007; Mottek Lucas et al., 2017). These are only the directly related recommendations. It is possible that other recommendations in the Abbott-Chapman Report, such as those regarding communication, could also be addressed indirectly through some of the other benefits of stewardship contracting as discussed in section 2.3.1.2.

5.3.4 Changes to stewardship contracting after the pilot program

A few details of the program have been updated or added in the years when the legislative authority containing stewardship contracting has been updated. This includes changes less relevant to a BC context, such as the program being extended from the US Forest Service to the Bureau of Land Management or allowing an unlimited number of projects -- essentially rolling the program out nationally (K. Mattor, 2013).

The two major changes that may offer some guidance to a potential BC stewardship contracting program are: removal (clarification) of timber as a legitimate element of land management under stewardship contracting, and the inclusion of programmatic monitoring of local and community benefits of the program and projects. The first is potentially important due to the language contained in FRPA regarding objectives not “unduly limiting” timber supply in the province. The second is important as it serves as a reminder of the importance and the costs of monitoring a program like this to ensure it is bringing benefits to project areas and communities.
These changes are relevant to the potential adaptation of this program to BC for multiple reasons. First, the clarification that timber is not a legitimate value for stewardship contracts is important because of the way FRPA is worded. In that law, certain non-timber objectives are included for their environmental, social, or cultural values. However, these objectives are only important so far as they do not “unduly reduce the supply of timber from BC’s forests” (The Government of British Columbia, 2004a).

For stewardship contracting to be successful at reducing the risk of wildfire, it will be necessary for timber supply to take a back seat to other values in project areas. This may not be a concern in the IDF, where proper spacing will not only reduce the risk of wildfire, but will also lead to healthier, more resilient, and more productive stands. There may be a policy conflict between FRPA and a potential stewardship contracting program that will need to be addressed before any contracts are written or awarded.

Fortunately, the provincial government is currently exploring ways to change or improve FRPA regarding fire and other disturbance. During the second round of interviews, one participant spoke more about this:

But with the changes to FRPA they're asking the question: ‘should we have fire and climate changes as values?’ Well, it's tricky to call them values, they're more lenses, they are more ways that you have look at how you're going to maintain whatever other values... But the thing that FRPA needs is a way of, of hierarchically identifying what values trump what other values and that's where I think both climate change and fire risk are meant to provide guidance. [12]

These changes may present an opportunity to be written in such a way that a stewardship contracting-type approach would not be constrained by FRPA.

The second change is notable because of the importance of monitoring in adaptive management in forestry. Especially in the face of the potential effects of climate change on
forests, it will be important to monitor the work in order to adapt to changing conditions. Canada has previously led international efforts to develop a “framework of criteria and indicators for monitoring and reporting on progress in sustainable forest management” (Natural Resources Canada, 2019), giving even more weight behind the importance of monitoring the program if adapted to BC.
5.4 Specific implementation constraints

According to the literature review as well as analysis of semi-structured interviews, there are a few constraints that may need to be addressed before a stewardship contracting program could be implemented in BC.

**Biomass**

One major issue facing not only the success of a stewardship contracting approach, but to any fuel reduction treatments, or treatments in marginal stands, is the issue of biomass transportation and utilization.

First, there may be situations in which the distance from the forest to processing or market is so great that there will be a net loss in financial resources. Distance between a contract site and processing facility had a positive influence on both biomass utilization and stewardship contracting use, approximately 40 minutes or 40 km, varying according to place and circumstance (Nielsen-Pincus, Charnley, & Moseley, 2013, p. 576).

Planning on how to address this may be more difficult in BC. This is due to that fact that in the US, these losses are covered by federal funding. In BC, because of provincial control of forest resources, there may not be federal involvement, and thus, may not be federal funding. More importantly, any injection of capital into the program by the provincial government could be seen by the US as subsidies and result in retaliation through courts as part of the softwood lumber dispute.

Even in cases where the transport of removed material isn’t cost prohibitive, there still may be an issue with the processing and marketing of removed material. The type of biomass that will likely need to be removed, especially from IDF stands, to improve health and reduce
risk of wildfire, will be much smaller diameter than most of the regional mills can process. There
are some opportunities for processing of this material in Williams Lake, discussed later in this
chapter, but it is unclear yet whether those avenues will be enough.

A 2018 study on biomass utilization in the western US concluded that there were several
persistent factors preventing biomass utilization from becoming ubiquitous. First, biomass is a
“more dispersed resource” (Nicholls et al., 2018, p. 2). Second, “economic feasibility, [which]
depends on different harvesting systems needed based on ecological and spatial parameters and
on forest productivity” (Nicholls et al., 2018, p. 2). And finally, they point out that there is “great
regional variability in volumes of harvest residues generated” using data from 2006 showing that
“Pacific coastal forests were found to produce approximately six times the volume of biomass as
in the Rocky Mtn. region” (Nicholls et al., 2018, p. 2).

Even in the smaller context of the Cariboo, participants acknowledge the effect that these
variations can have:

Yeah, and depending on where you are on the landscape, you're going to... your
treatments are going to be different. And it is going to be more costly for you right in the
interface. And you can't light a match to try and do an under burn right off the bat, you
have to do those costly treatments. That's where maybe you spend the money. That's
where you do the intensive treatment. But you farther out you can sort of do more area
for less cost and maybe not have the Cadillac version, if you will, right? [03]

Finally, after processing, the markets for these products might need to be better
developed or supported before the full value of removed wood is realized. However, during the
second round of interviews, Interviewee 2 had this to say regarding biomass markets in the
Cariboo:

There's better market now for OSB in 100-Mile, so [a licensee] can get a pulp log down
to 100-Mile as well, which is also helpful, and they brought their price up so you're not
losing money on the prospect. [2]
Other Implementation Constraints

There may also be some policy constraints to implementation of stewardship contracts. The interaction of these policies is complex and lays a web of different regulations and requirements across the province. The result is viewed by many professionals in the Cariboo as being too complex to experiment with various silvicultural treatments that could help address both IDF health and wildfire risk, such as pre-commercial thinning. Interviewee 2, for example, had this to say about one district in the region:

I can't speak to the whole interior. I think here in the Cariboo, we've definitely got a stronger sense of just getting it done, we gotta start on this and get out of the way. But... It's still not universal. I was talking to a fellow who's [a] forestry manager... and he was saying he can't get any traction with the 100-Mile District to actually get projects implemented. Part of the problem is he's got... the community's got Old Growth Management Areas placed right behind him, right on the edge of the community. And there is no appetite for permitting in Old Growth Management Areas. So we still got... still got some problems. [2]

As mentioned, stewardship contracting has typically been viewed as an economic tool only. In BC, if this program is to be adapted, there will need to be extra authority granted to the program to ensure it doesn’t conflict with already enacted policy.

One major issue that may have a major effect on the adaptation of stewardship contracting to British Columbia is the amount of volume-based tenure in the province. During interviews, many industry participants stated that one of their biggest issues with long-term investment in forest stands is the lack of guaranteed return. This, they explained, was primarily due to the volume-based tenures they hold. This was agreed by other participants during the second round of interviews:

Well that's exactly the problem right now, is that you might see a potential that a major licensee is going "well, I'm not going to get the benefit out of undertaking this treatment." Well, some of that steam can be taken away by the proper cost recognition we talked about earlier. It’s being able to get them comfortable enough to start actually corporately
investing in it and going a few steps even farther. If we were if we were able to somehow or another get back towards... away from volume-based and more to area-based, it would probably change that dynamic. [4]

One potential way to address this without a complete overhaul of the tenure system would be including language in a contract that guarantees that treated blocks are reserved for harvest by the licensee or contractor that does the work.

Interviewee 4, during the second round of interviews, suggested changing how we look at the economics altogether:

But we can't expect that the forest sector is going to go in there and say, "Well, I'm going to lose $35 a cubic meter because I've got to do that." You simply can't expect them to lose money doing it. But we got to be able to figure out a way in which we can recognize the cost of having to deal with the slash loads, the small diameter wood, that material which is essentially marginal to non-economic. Recognize that, "hey, look, we can probably harvest down to about 50 cubic meters per hectare," leaving some excellent volume out there as our growing potential, as representing that resilient ecosystem. But you gotta get rid of the rest of the stuff somehow. Some of that commercial, some of it just plain excess biomass. So one of the concepts we will continue to talk about in terms of a policy revitalization is recognizing that while the province wants to be able to gather revenue from the utilization of those forest assets and they characterize it in terms of sawlogs, we got to change that around right now to recognizing that forgone revenue, in terms of recognizing the cost of dealing with these slash loads, etc., is actually an investment in ecological and ecosystem restoration. [4]

**More on Implementation**

The research on stewardship contracting, hazardous fuels reduction treatments, and biomass utilization in the US give clues on other factors that can influence the success of these forest management actions. In addition to the Pinchot Institute studies mentioned in the first chapter, these studies can provide BC with extra evidence for how to implement a program like stewardship contracting.
In their study on the WMSP, Mottek Lucas *et al.* (2017) underline the importance of fibre supply and markets in the success of large-scale projects using stewardship contracts. According to that study, the partnerships developed between the USFS, contractors, and the local forest products industry were “vital for implementing a forest fuels reduction program” (Mottek Lucas *et al.*, 2017, p. 549). Similarly, they also state “…the most salient factor… is the ability to guarantee a steady stream [of fibre] that will provide the assurances needed for industry to make large capital investments” (Mottek Lucas *et al.*, 2017, p. 556).

A previous study on forest health, wildfire risk, and stewardship contracting, D’Ambrosio (2013) provides similar recommendations based on the data, going so far as to suggest that the US government should enact policies requiring the purchase of forest biomass products. By doing so, she believes that the US government can “…positively impact an untenable situation that, at least in part, its past wildland fire suppression policies helped create” (D’Ambrosio, 2013, p. 163). This statement could easily be applied to BC and the BC provincial government. A similar law is already in place in BC with the Wood First Act, which requires “…the use of wood as the primary building material in all provincially funded buildings” (Legislature of British Columbia, 2009). A similar use of legislation may give biomass markets the boost they need.

In a 2018 study on socioeconomic constraints to biomass removal for fire risk reduction, Nicholls *et al.* note that there is a difference between “normal silvicultural treatments” and “hazard fuel thinning” but point out that “common denominator is the challenge of finding long-term, economically viable markets” (Nicholls *et al.*, 2018, p. 2). These studies make it clear that simply adapting stewardship contracting into BC will not be enough to ensure the success of the program and the completion of treatments and projects. If BC is to be successful in this type of
work, there will need to be a concerted effort by government and industry to support a healthy market for biomass and its associated byproducts.

In their study on stewardship contracting, Moseley and Charnley (2014) note that policy conflict can stall implementation of new policies and programs. This is one area that will need special attention, due to the nature of GAR Orders like MDWR. In those areas, stewardship contracts may need extra authority to allow projects to go forward.

As seen in the discussion of Ekstrom et al.’s barriers, communication is incredibly important to the success of adaptation actions. This sentiment is echoed by Schultz, Moseley, Mattor, McIntyre, and Ellison in their 2017 study on a 2012 change in US budget structure to support these types of restoration efforts. In that study, Schultz et al. point out the difficulty in sharing the benefits of “integrated restoration work… because it requires speaking to the quality and efficacy of work on a landscape, over time, across resource areas” (C. A. Schultz, Moseley, Mattor, McIntyre, & Ellison, 2017, p. 12).

These efforts must go beyond simply improving communication between the province and the industry. Schultz et al. (2017) assert that a shift away from “past traditional conversations about accomplishments and efficiency” must begin with the land manager, saying “[The USFS] will have to develop strategies to communicate this increased effectiveness to partners and political overseers…” (p. 12).

The need for a similar shift here in BC regarding restoration efforts was brought up by a participant during the second round of interviews:

You must have a different fiscal model to be able to [incentivize industry to act]. That almost seems to be one of the most prevalent issues that's in the way. We already have the legislative change, what can we do to be able to bring... like maybe characterize it as stewardship contracting and say, where it is that the land... the provincial land manager,
which represents the indigenous communities and [FLNRORD] says, "We need these outcomes," And then this fiscal model becomes applicable to those areas. [4]

5.5 Williams Lake as a pilot area

If stewardship contracting is to be adapted to, and be successful in, British Columbia, a pilot program may be an effective way to test its usefulness. It is the opinion of the author, as well as some of the interview participants, that the Williams Lake area would be an ideal location for this program.

Figure 5.2 Map of the IDF BEC zone in BC and the City of Williams Lake

Several factors lead to this conclusion. First is Williams Lake’s proximity to the IDF. Figure 5.2 shows a map of the IDF with Williams Lake highlighted. But there are other towns
located in the IDF, such as 100-Mile House. However, not only is Williams Lake a much bigger community – over 10,000 people in the city limits alone compared to 100-Mile House’s less than 2,000 (Statistics Canada, 2017) – it has more companies and infrastructure to maximize utilization of biomass from fuels reduction treatments.

Part of the reason there is so much infrastructure in Williams Lake is the presence of major licensees and their mills. These licensees bring jobs, which in turn bring people, which brings more businesses to the area. This kind of social capital is necessary for the success of any major change in approach to the problems in the region. One study showed that “…proximity to sawmills and biomass facilities has a significant influence on the number of acres treated for hazardous fuels reduction… and on the number of acres treated in the WUI” (Nielsen-Pincus et al., 2013, p. 576). While not all of this may have been strictly because of stewardship contract use, it is a major tool used all over the US for fuels reduction treatments.

Another factor that points to Williams Lake as being an ideal pilot location is that it is situated along two major provincial highways, 20 and 97, the latter of which is the main north-south route through the province. Because of this, Williams Lake also has a high amount of interface areas both in the city limits, as well as in the form of rural housing and development that is continuing to grow in the greater Cariboo region. This means that Williams Lake itself is a high priority area for mitigation treatments.

Nielsen-Pincus, Charnley, and Moseley (2013) concluded that this type of infrastructure is key to success in fuels reduction treatment programs, stating that “distance to infrastructure matters for hazardous fuels reduction, that transportation costs are important as an economic constraint in the production of forest-based products and energy, and that transportation costs are a critical factor bearing on the ability to harness market forces in hazardous fuels reduction”
This makes Williams Lake particularly appealing for the pilot of this type of program.

Not only does the increase in population and development have implications for mitigation priority, but the risk of wildfire in the area is quite high. This combination of typical high-to-extreme risk coupled with expanding wildland-urban interface areas means the risk in the Williams Lake area extends beyond the risk of loss of timber volume. Homes, businesses, and infrastructure are all at risk of being affected by wildfire.

Beyond project like these, one participant suggested a gap in treatment regimes that stewardship contracting may be able to fill:

In the timber supply area where the licensees kind of pick things over and find the best opportunities to accomplish on a net, you know, a net profit, there's going to be the guts and feathers left and the district's going to have to deal with those. So I'm imagining stewardship contracting as a tool for the district to deal with all the hectares that the licensees won't take on. [2]

Finally, according to Interviewee 3 during the second round of interviews, the Cariboo Region has been home to a large amount of collaboration relative to other regions in the province. Nearly all these collaborative groups and projects are collaborating across the spectrum of landowners, managers, and stewards; from First Nations, to ministry employees, and the forest industry. In their study on the WMSP, Mottek Lucas et al. (2017) assert that the success of that project was because “[it] was built on a legacy of prior collaboration” (p. 550). Based on its history of previous collaboration, Williams Lake again would appear to be an ideal location to pilot an adapted version of the stewardship contract program in BC.

However, it isn’t just its history of previous collaboration that makes Williams Lake an ideal pilot location. Provincial and First Nations governments and industry have already begun trying to put treatments on the landscape in cooperative projects. Some of this, though not all, is
through FESBC-funded projects. When asked about shifting BC’s forest management to a more landscape-level focus, Interviewee 4 had this to say about increased collaboration in the Cariboo:

Well, I think we're actually driving that bus right now. And we're working at means to be able to bring others along. We've got some community leads that are right here with us on those matters and are helping to build out a community of dialogue, which is creating the strong platform for that to occur. I think we are well established. [4]

And even in areas where there isn’t the same level of collaboration or even agreement, there may be opportunities for synergy between some of the many competing values on the land base in the region. Stewardship contracting in the US is no longer just a tool to address fuel loading. It is now also used for multiple values such as wildlife habitat improvement, watershed quality and protection, and insect/disease resilience improvement.

In the US, these synergies often strengthen projects which attempt to take on multiple values in one project. In their study ‘Contextual Factors Influencing Collaboration Levels and Outcomes in National Forest Stewardship Contracting’, Mattor and Cheng (2015) conclude that:

“By identifying a greater number of community and forest objectives and leveraging resources with partners the high-collaboration forests were able to accomplish a greater number of mutually agreed on project outputs and outcomes. The higher [the] number of stewardship objectives… had a critical role in achieving the policy intentions of stewardship contracting” (p. 740).

If the same holds true in the Cariboo/BC context, a stewardship contracting type of approach could prove incredibly beneficial beyond just issues of wildfire risk and overall stand health in the IDF.
5.5.1 Looking beyond the Cariboo

As seen during the 2017 and 2018 wildfire seasons, the Cariboo is not the only region of the problems with real problems to address in the fight against catastrophic wildfire. Kamloops, the Okanagan, and even places in northern BC have all see incredibly destructive wildfires in recent memory. Many of the challenges in these areas will be similar to the Cariboo, but regional differences in ecology, Land-Use Plans, wildlife management priorities, and differences in human resources will necessitate a thorough analysis of the various regional priorities, strengths, and deficiencies before enacting a province-wide stewardship contracting program.

The issues present in the Cariboo may be present in other regions in the province. Any effort to address wildfire risk is likely to be constrained by similar barriers or by some of the contrasting themes revealed in the Cariboo: government vs. industry responsibility or participation; economic vs uneconomic approaches; and stand-scale or patch-scale vs. landscape-scale.

In the US, stewardship contracts are used on federally managed forest land. In Canada, the provincial ownership of natural resources will necessitate a slightly different approach, not only in the jurisdiction and administration of stewardship contracts, but also with their funding. If stewardship contracting was adopted Canada-wide, federal funding could be used to increase the amount of work or size of projects being carried out.

5.6 Limitations

This study is only the first stage of determining if a stewardship contract-type approach could be successful in reducing the risk of wildfire or improving stand conditions in the IDF in BC. The exploratory nature of this study was limited in several ways. First, interview
participants were limited to those working in or near Williams Lake, including 100-Mile House. Because these issues can be very site-specific, a set of participants in a different region, whether in the interior or otherwise, could pose different barriers to such a system.

This study was also primarily focused on “major” licensees, those that hold a majority of the volume-based tenure in the Cariboo, as well as provincial Ministry employees in the region. This means that First Nations, members of the public, regional or municipal government, smaller licensees, and other tenure holders are under-represented in this study.

This study began around the same time that the BC government announced the newly formed Forest Enhancement Society of BC. In the time since, projects funded through FESBC have begun. If any of these projects are considered successful, they could serve as pilots for a wider stewardship contracting-type program. However, it is still too soon to completely understand the outcomes of these projects and the totality of their potential implications for the adaptation of a stewardship contracting program in BC.

5.7 Implications and further research

Some further questions will need answering before this tool can be adapted: who will perform the work: the Ministry of Forests, Lands, Natural Resource Operations and Rural Development; BC Wildfire Service; or private licensees? How can a balance between goods and services be achieved to make this type of work economically feasible? How can the industry best utilize materials removed in these treatments? What are the repercussions of having a program like this be funded entirely by the government, especially regarding the softwood lumber dispute with the US? Is there a way to invite investment from outside of government? Even with answers to these questions, more remain.
Participants in the second round of interviews were all quick to point out the opportunity that the 2017 and 2018 fire seasons have provided to move BC forests to a healthy, more fire resilient state:

Well, I know when we did the public rollout of the community wildfire protection plan, we announced that was going to be a public... an opportunity for the public to review the maps and was like an open house before the presentation of the plan to counsel. And I would have, a year ago, I would have thought we've done pretty good if we had 20 people come out. We had about 80 people come out. And a lot of them were looking for help on fire smart treatments. [2]

So there's really a, you know, tangible concern amongst the residents. Three years ago, the ministry went to them and suggested this some kind of risk reduction occur from some of the fires in the adjacent area. And then, it wasn't close enough to hold for them to recognize their risk. Last year's fires seem to heighten that awareness. And so with the public meeting that we had last time they were on board, at least somewhat on board. Now obviously the devils in the details on how we do the logging and what it looks like, and all that... [12]

So there becomes this opportunity wide open now for us to change the narrative on how we manage our land base, but also the change the narrative on what potentially constitutes our economic foundations. [4]

The policy window opened by two record-breaking fire seasons which saw so many evacuated and smoke hanging over much of the province for weeks at a time must be taken advantage of, this was agreed upon many in the second round and summed up well by

Interviewee 4:

And what that's doing now is keeping that window of narrative opportunity to be able to build the public's understanding, pretty much wide open. But we've got to purposely step through that and be able to effectively communicate the kinds of things we're seeing, provide the explanations, relate that to our history of forest management, and then use that platform to be able to bring the public along in how it is we must adjust our practice towards healthy ecosystems. Also, you know, targeting that to recognize that our focus on dimension lumber and pulp wood might not necessarily have left us in a situation where we are capable of being able to undertake the kind of treatment regimes that give us healthy ecosystems versus simply producing lumber and pulp. [04]
5.8 Conclusion

The Cariboo region of British Columbia, or more specifically, the IDF stands in that region, faces threats to the forests, communities and the people who live, work, and play within them. This research looked at how policy, economics, and social factors affect the forest industry’s ability to manage for some of those threats. While there was agreement on the need to address the issues at hand, there was not always agreement in the best way to move forward.

With a better understanding of the experiential knowledge of some of the Cariboo’s decision-makers in industry and government, this research then identified potential barriers to adaption using the framework developed by Ekstrom et al (2011). Barriers in the understanding and planning phases, as well as cross-cutting barriers, point to a need for a more holistic approach to ensure there is shared knowledge of the issues and well as a shared problem definition.

Finally, the use of stewardship contracting to address some of the issues and barriers identified with the first two objectives was assessed. While primarily developed as an economic tool, some of the authorities or functions of the program could be written in BC in a way that will almost certainly directly address some of the specific issues as well as indirectly improve some aspects of general forest management such as social capital and adaptive capacity.

Though this study was limited by the sample size of the Williams Lake community of decision-makers in government and industry, it can still serve as a good indication of the current situation in the Cariboo and help jump-start an effort to better understand, define, and plan to address the state of the IDF. If a program like stewardship contracting is to be adapted to BC to
address these issues, the Forest Enhancement Society may already be organized in such a way that they would be a centralized way to administer, fund, and select projects for such a program.

While stewardship contracting is not a one-size-fits-all solution to issues surrounding wildfire risk and stand health in the IDF, it could serve as one piece of a solution that is multi-faceted and will require a multi-faceted response.
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Appendices

Appendix A - Initial interview schedule

Initial Interview Schedule

*Introduction and Background*

- What is your name, position, and what organization do you work for?
- What kind of tenure do you operate on?
- Describe your duties
- How long have you been in your current position?
- What are your management objectives? What performance criteria are most important in how you are evaluated?
- What challenges do you see as the biggest your organization is facing in the short term? Long term?

*Wildfire*

- On a scale of 1-5 (1, not worried at all; 5, very concerned), How worried are you about present wildfire risk:
  - In the region
  - Around your home
  - As it relates to your job
- Whose responsibility is wildfire mitigation?
- How motivated are you to reduce the risk of wildfire? (1-5)
- What changes have you perceived in the last 5-10 years in regards to wildfire policy?
What role does wildfire mitigation/fuels reduction play in your management or planning decisions?

Has your position/have your duties changed at all since the Wildfire Act was passed?

Constraints/policy/econ/social

What policies/regulations/standards affect your site prescriptions the most?

What is the biggest threat to timber supply in the Cariboo?

Is the provincial government doing enough to mitigate wildfire?
  - What about education?

Are licensees doing enough to mitigate wildfire?
  - What about education?

Is your organization doing enough to mitigate?
  - Educate?

Stewardship contracting

Do you know about stewardship contracting in the US?
  - (Explain/clarify)

Is there space in this TSA for stewardship contracts that generate logs?

If these types of contracts were placed in your operating area, would that be a positive or negative change? (Or how would it affect your organization/your job)?

Could you justify to your supervisor higher logging costs now for better/increased future production (in a stand)?

Anything not covered that you want to share or discuss
Appendix B - Interview consent form

Interview Consent Form
Informed Consent - Interview

Interview Participant in Research Project about Barriers to Successful Forest Restoration

Principal Investigator

Harry Nelson, Assistant Professor, Faculty of Forestry, UBC

Primary Contact

Judah Melton, MSc Candidate, Dept. of Forest Resources Management, UBC

Sponsor

This study is funded in part by Mitacs Canada.

Purpose

The purpose of this research project is to explore potential barriers—economic, policy, or institutional—to successful restoration of unhealthy or stagnant forest stands in the Interior Douglas-fir (IDF) Biogeoclimatic zone. This portion of the study focuses on general perceptions of the work, policies, and practices that occur in the IDF as well as perceptions about forests in the province as a whole.
This study hopes to gain a better understanding of the issues that face the forestry industry in dry interior forests in British Columbia as a first step in finding strategies to better manage those forests.

**Study Procedures**

You are asked to be an interview participant in this study. Interview participants will engage in an interview with the researcher, Judah Melton. Interviews will range from approximately 30 minutes to an hour in length, and will be open-ended. This means that the interviewer will have a set of guiding questions and themes regarding perceptions, feelings, and experiences working in the IDF, or in British Columbia in general, but your interview will not be explicitly dictated by these questions. You may discuss any aspect of your experience that you wish. You are also free to refuse to answer any of the questions, especially for answers you are either unsure of, have no experience with, or do not feel comfortable answering. You may also stop the interview at any time.

With your permission, the interview will be audiotaped. You are free to request the recording be paused at anytime. The interviewer may also take handwritten notes. Upon your request, you will be provided with a copy of the audiotaped interview. Besides the researcher and his research supervisor, Harry Nelson, you will be the only person with access to the recording.

**Potential Risks**

There are no known risks to participation in this study. However, if you are not comfortable responding to any of the questions or discussing any topic in this study, you are not required to do so.

**Potential Benefits**

Participants may benefit by enhancing their understanding or appreciation for their own work, how certain policies may affect that work, or forest health in general.

**Remuneration/Compensation**

No compensation will be provided for your time. However, upon request you will be provided with copies of the audio recording/transcript of your interview, or a copy of the final Mitacs Canada report at the completion of this project.

**Confidentiality**

Information obtained from your interview may be used in the researcher’s Master’s thesis.
The researcher and research supervisor, Dr. Harry Nelson, are the only two individuals with access to your interview files, which will be kept in a locked room when not in use. Your name, or any personal identifying information, will not be used or disclosed during or after this study.

Contact for Information about the Study

If you have any questions or desire further information with respect to this project, you may contact: Harry Nelson, Assistant Professor, UBC Faculty of Forestry.

Contact for Concerns or Complaints about the Study

If you have any concerns or complaints about your rights as a research participant and/or your experience while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Services at 604-822-8598 or by e-mailing RSJR@org.ubc.ca or call toll free 1-877-822-8598.

Consent

Your participation in this study is voluntary and you may refuse to participate or withdraw from this study at any time without jeopardy to your future relationship with UBC, Mitacs Canada, or West Fraser. You will be presented with this consent form to read and sign. Willing participants will be asked to give written consent.

Please circle "yes" or "no" in response to the following statement:

YES  NO  I agree to be audiotaped during my interview

Your signature below indicates that you have received a copy of this consent form for your own records and that you consent to participate in an interview as part of this research project.

Printed Name

Signature

Phone Number (Optional)

Address (Optional)

4/22/15

Version 2

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