FOREST AND FIRE MANAGEMENT IN BC: TOWARD LANDSCAPE RESILIENCE

SPECIAL REPORT

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Forest Practices Board

BC'S INDEPENDENT WATCHDOG FOR SOUND FOREST AND RANGE PRACTICES

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CALL TO ACTION

The way forests and fire have been managed in BC over the last 100 years has increased the scale and intensity of current wildfires and decreased landscape resilience. In 2017, 2018, and 2021, BC experienced its 3 largest wildfire seasons in 102 years of recorded fire, climate, and weather history, affecting 3.4 million hectares of land.[i] If the way forests and fire are managed doesn't change, BC will face many more catastrophic wildfire seasons.

It is possible to reduce the potential for negative impacts from catastrophic wildfires. Land and fire managers need to practice landscape fire management (LFM) and proactively work together to restore the resilience of the landscape, or the ability of a landscape to resist changes and/or recover after disturbances like wildfire.

Bold and immediate action is required by the provincial government to align policies and programs across all levels of government with a vision of landscape resilience and human co-existence with fire. Before we can take advantage of the good work wildfire can accomplish in maintaining resilient ecosystems, we need to prepare the landscape to accept fire again. Integration of LFM in BC's land management framework will enable our land and fire managers to work together and significantly increase the pace and scale of management strategies designed to restore landscape resilience.

The Forest Practices Board's (the Board) mission is to encourage sound forest and range practices on public land. One of the priorities of the Board is encouraging forest and range policies and practices that are adapted to climate change and support ecological resilience, including the conservation of biodiversity and wildlife habitat. It is the Board's view that a vision and action plan for restoring landscape resilience and co-existing with fire is needed so that all parts of government work together toward a set of common goals. Integrating LFM as part of BC's land management framework would recognize the critical role of managed wildfire and prescribed burning (including cultural burning) in reducing the risk of damage from catastrophic wildfire in BC's ecosystems. LFM is an important step in managing for ecosystem health and landscape resilience.

Bold and immediate action is required by the provincial government to align policies and programs across all levels of government with a vision of landscape resilience and human co-existence with fire.

EXECUTIVE SUMMARY

Historically, people co-existed with fire on the landscape. Wildfire returned to certain landscapes frequently and, together with Indigenous fire stewardship, played an important role in maintaining resilient ecosystems.

Fire prevention, suppression and exclusion policies over the twentieth century resulted in a decline in the frequency of wildfires in some ecosystems. This "fire deficit" led to increased continuity and accumulation of live and dead fuels, which contribute to an increase in fire severity.[ii] Catastrophic wildfire can negatively impact social, ecological, and economic values, such as damage to infrastructure and private property, increased risk of poor air quality and flooding, loss of wildlife habitat, soil productivity, timber supply, and recreation opportunities. Furthermore, because wildfires emit large quantities of greenhouse gases, increases in wildfire scale and intensity make it even more challenging to meet BC's emission reduction goal.

Suppressing wildfires is expensive. The 2021 wildfire season had direct suppression costs of $800 million, with indirect costs potentially as high as $24 billion. Reducing wildfire risk also comes with a price tag. Since 2018, the Crown Land Wildfire Risk Reduction program and the Forest Enhancement Society of BC have spent an estimated [1] $72 million to carry out fuel reduction treatments on approximately 26 000 hectares within the wildland urban interface (WUI).[2] Currently, over 39 million hectares of public land in BC are at high or extreme threat of wildfire, yet provincial funding has been directed almost exclusively to public and private lands within the WUI. The Province cannot afford to maintain the status quo approach to reducing wildfire risks.

LFM is a way to proactively mitigate the risk of catastrophic wildfires on the broader landscape. It is a restoration approach to addressing forest fuel build-up and improving landscape resilience. In many landscapes, the first step in LFM will be designing strategies to contain or reduce the risk of catastrophic wildfires. The ultimate goal of LFM is to restore and maintain a wildfire-resilient mosaic of forest and non-forest conditions across a landscape, which can provide the values important to society today, habitat for native species, and resilient forests for future generations.

Achieving this paradigm shift toward landscape resilience and co-existing with fire will require a province-wide vision and action plan that aligns policies and programs across all levels of government, and integrates LFM into the land management framework in BC. It needs cross-jurisdictional collaboration and coordination to enable timely action at the scale necessary to make meaningful progress. This report calls on the provincial government to act now and lead BC's transition toward landscape resilience.

[1] BCWS and FESBC provided all figures related to the treatment area and costs; total expenditure is based on the reported average treatment cost.
[2] Wildland Urban Interface (WUI) – the forested areas within two kilometres of residential structures, businesses, or other built infrastructure.

INTRODUCTION

The Board Chair may make a special report about a matter they consider to be in the public interest. This special report addresses the urgent need for provincial leadership to develop a vision for landscape resilience and co-existing with wildfire in BC. Wildfire risk affects every person and sector in some way. BC must restore landscape resilience, which will require alignment and integration of actions across all of government.

In developing this report, the Board interviewed over thirty experts from BC, Alberta, and the U.S. Pacific Northwest, including forestry and fire practitioners, social scientists and experts in fire ecology, fire behaviour, fire and forest modelling, and Indigenous fire stewardship. This report does not evaluate past forest practices or management decisions. Rather, it identifies priority outcomes required to enable a paradigm shift toward managing for landscape resilience.

People value forests for many reasons. Forest ecosystems provide clean air and water, economic and recreation opportunities, carbon sinks and storage, habitats for native species, and support for cultural values, along with other benefits. For all these reasons, the twentieth century's fire and forest management policies aimed to protect and conserve forests by emphasizing fire prevention, suppression, and exclusion. These policies have resulted in an increase in densely forested area on BC's landscapes and an increase in the amount and distribution of forest fuels.

Today, climate change is compounding the wildfire threat posed by the increased amount and distribution of forest fuels. The fire season is getting longer, the risk of ignitions is higher, and areas are burning more severely when wildfire does occur.

The consequences of catastrophic wildfires are far-reaching, from negative impacts on human health from wildfire smoke and the high costs of fire suppression, to the negative impacts on biodiversity and ecosystem health.

All levels of government, including Indigenous governments, municipalities, provincial agencies, and land managers, have been working to reduce the risk of negative impacts from wildfire on communities. Wildfire risk reduction treatments have occurred in the WUI, but little has been done on the broader landscape. It is the broader landscape that provides the ecosystem services valued by people. Without healthy, resilient ecosystems, our landscapes will continue to experience catastrophic wildfires and the negative impacts associated with them.

There is an urgent need to shift forest and fire management policies, objectives, and practices toward co-existing with fire on the landscape. Restoring landscape resilience is required, and the first step toward that is to introduce LFM into the land management framework in BC.

Restoring landscape resilience so that people can co-exist with fire on the landscape will require a vision and leadership from government that spans jurisdictional boundaries and election cycles. The Board is calling for a vision and action plan to align the actions of government and enable the pace and scale of action necessary to restore landscape resilience in BC.

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THE CURRENT SITUATION

The way we have managed forests and fire has impacted the scale, intensity, and severity of current wildfires. For most of the twentieth century, forest management policy excluded Indigenous fire stewardship, emphasizing fire prevention and suppression, livestock grazing, and wood production to meet the demands of a growing society.[iii] In general, these policies have contributed to increases in the amount and distribution of forest fuel across the landscape.

Wildfire effects are becoming more severe due to ongoing wildfire suppression, lengthening wildfire seasons, and the increased likelihood of extreme fire weather. [3][iv] The increasingly negative impacts that large and catastrophic wildfires have on economic, social, climatic, and ecological values will be a major challenge facing our society over the next century.

The BC Wildfire Service (BCWS) is tasked with coordinating the provincial government's response to wildfire in BC. The BCWS uses a system referred to as the Resource Sharing Wildfire Allocation Protocol (RSWAP) for prioritizing its response to wildfires when valuable assets are at risk. The BCWS resources are first directed towards protection of human welfare, safety, and property. According to the Ministry of Forest's 2023-2026 Service Plan,[v] provincial risk reduction and wildfire management activities will continue to be directed primarily to the WUI.

This focus on the WUI is well-intended to protect human welfare, safety, and property, but little has been done to reduce wildfire risk across the broader landscape. If the people of BC want to co-exist with fire, there is an urgent need to act now at a pace and scale that will achieve landscape resilience.

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[3] The four weather elements needed to calculate fire weather indices are rain, temperature, relative humidity, and wind speed.

THE IMPACT OF FOREST AND FIRE MANAGEMENT POLICIES

Historically, fire played an important role in ecosystem functions in much of BC and was a key factor in maintaining landscape resilience. Under moderate climatic conditions, wildfires were influenced by interactions between site, stand, and landscape-level factors such as surface fuel condition, tree densities, distribution of successional stages of forests, and the patchwork mosaic of forest and non-forest conditions across a landscape. Understanding the natural variability of each unique landscape and the mechanisms responsible for that variability is key to restoring broad landscape resistance to catastrophic wildfires and resilience in the face of climate change.[vi]

Much of the vegetated landscape of BC was shaped by wildfire, affecting the species that persist in certain ecosystems and the heterogeneity of the landscape.[vii] For example, before suppression policies were implemented, wildfire returned to many landscapes quite frequently, either burning off surface fuels and maintaining a stand structure that was resistant through fire or randomly burning irregular patches across an area, creating diverse landscapes that were resilient to larger scale fires.

Over the last century, fire prevention and suppression policy has resulted in a decline in fire frequency. Today, many landscapes are in a "fire deficit" as the time between fires has been lengthened, interrupting the cycle of periodic disturbance. As a result, the amount of coniferous forest area and the amount of dead woody material in the forest have increased; areas of deciduous forests, meadows, grasslands, and sparsely treed woodlands have diminished, contributing to an increased amount and continuity of available fuels across the landscape (see Figure 1). This shift from a mosaic landscape to a more homogenous one has increased the vulnerability of landscapes to uncharacteristically large, high-severity wildfire (catastrophic wildfire).[viii]

RESISTANCE, RESILIENCE AND RESTORATION*

Resistance *refers to the capacity for an ecosystem to resist the impacts of disturbances without undergoing significant change. For example, wildfire can burn through a resistant forest without significantly altering its structure, composition or function. The structure and composition of a low-density forest dominated by fire-tolerant trees is perpetuated by frequent, low- to moderate-severity fire as it repeatedly and patchily consumes fuels and regeneration.*

Resilience *is the capacity of an ecosystem to recover to essentially the same community composition and ecosystem structure and function after being impacted or modified by a disturbance. For example, a resilient forest can recover to an approximation of its pre-disturbance state, following a wildfire that was severe enough to significantly alter its structure, composition or function. Resistance is often considered to be one aspect of ecosystem resilience.*

Restoration *includes activities that assist ecosystems in the recovery of resilience when they have been degraded, damaged, or destroyed and that enhance the capacity of an ecosystem to adapt to change. Ecological restoration focuses on re-establishing ecosystem functions by modifying or managing the composition, structure, spatial arrangement and processes necessary to make ecosystems ecologically functional and resilient to disturbances expected under current and future conditions.*

* Franklin, J.F., et al. 2013. Restoration of dry forests in eastern Oregon: a field guide. The Nature Conservancy, Portland, OR. 202p

Figure 1. Landscape comparison after almost a century of fire suppression in Washington State (PHOTO CREDIT: JOHN MARSHALL PHOTOGRAPHY)

Forest management approaches have also influenced the pattern and distribution of forest fuels. A tendency for clearcut silviculture systems and reforestation to well-stocked, even-aged conifer plantations, the suppression of deciduous species, extensive salvage harvesting, and the elimination of post-harvest broadcast burning have all contributed to increased homogeneity of the landscape and continuity of forest fuels. The patterns of forest succession and fuel conditions are what drive the patterns of future fire behaviour and severity. Large homogeneous patches of forest are more likely to lead to large and severe wildfires.

The BCWS publishes the Provincial Strategic Threat Analysis (PSTA),[ix] offering land managers a tool to consistently assess potential wildfire threats. The 2021 PSTA indicates that 45 percent (39 million hectares) of public land in BC is at high or extreme threat of wildfire, and 28 percent is at moderate threat (see Figure 2).

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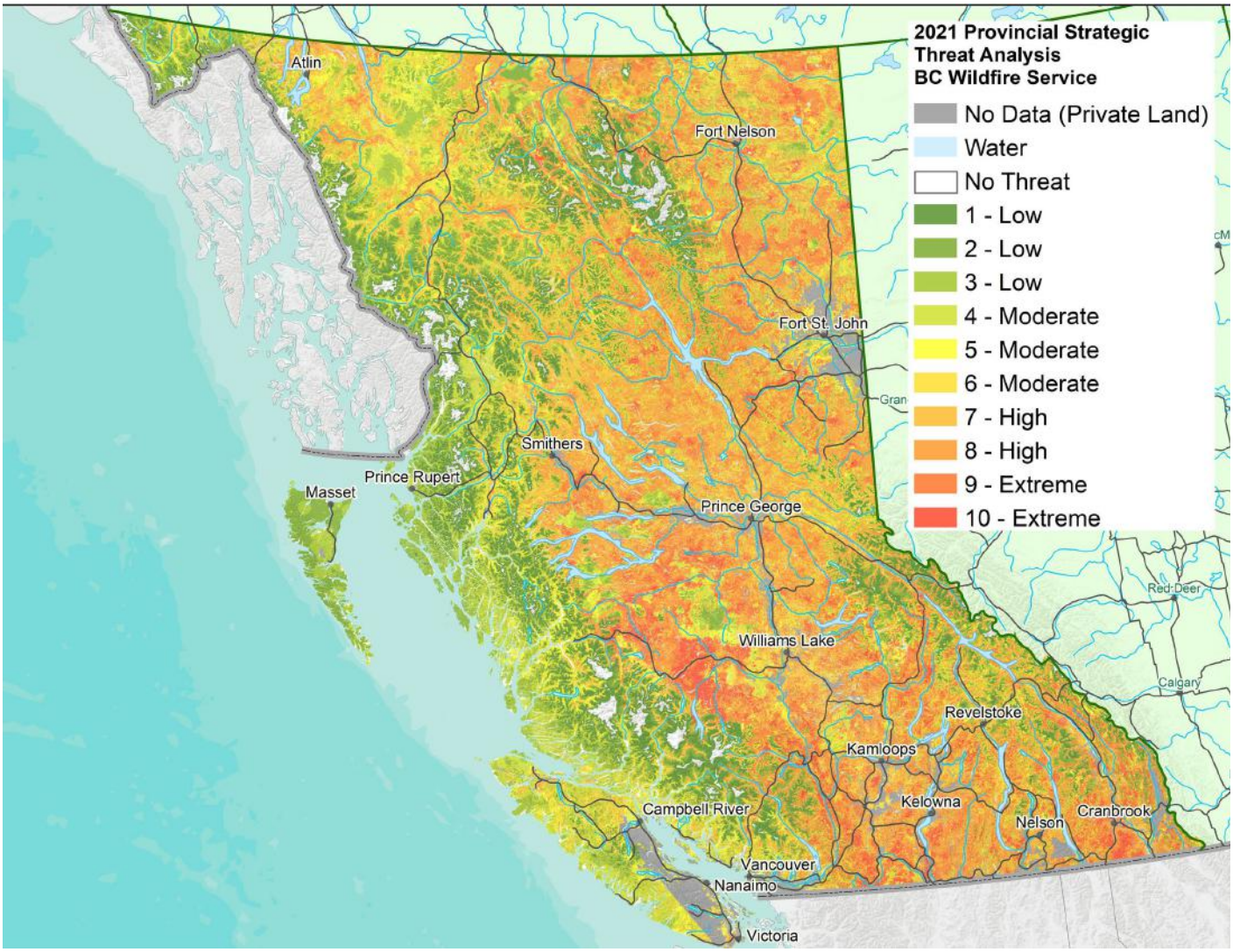

Figure 2. 2021 PSTA Wildfire Threat Map

EXCLUSION OF INDIGENOUS FIRE STEWARDSHIP

Over the past century, policies of fire suppression and exclusion imposed by provincial governments interrupted Indigenous fire stewardship.[x] A recent study in the Territory of the T'exelc (Williams Lake First Nation) provides compelling evidence linking early colonization to the collapse of the fire frequency. [xi] Indigenous oral histories support this. The exclusion of Indigenous fire stewardship changed the landscape, deeply affecting Indigenous livelihoods.

Indigenous communities are frequently at high risk from wildfire because they are often situated in isolated, remote locations, in landscapes prone to wildfire.[xii] The spatial and temporal diversity of Indigenous fire stewardship reduced the likelihood of future catastrophic wildfires [xiii] and increased levels of biodiversity.[xiv] Throughout their history, many Indigenous peoples used fire as a tool to manage their lands to achieve a variety of cultural and ecological objectives. Cultural burning was generally applied during low-risk conditions, such as in early spring or late fall. Cultural objectives included increasing the abundance of preferred resources such as berries, medicines, forage, and game species, promoting desired landscape conditions such as fuel breaks near communities, and contributing to a symbolic and sacred relationship from which humans and nature benefited from fire.

COMPOUNDING IMPACTS

Climate change is increasing the likelihood of wildfire ignitions in all parts of BC. The *BC Wildland Fire Management Strategy* reported that the wildfire season has been increasing by one to two days per year since 1980 and that climate models indicate that by 2050, summers throughout the province will likely warm by an average of two to three degrees Celsius. A recent study indicates that summers in the Northern Hemisphere are projected to last about half of the year by 2100, reducing the length of winter and shoulder seasons in the process. [xv]

While vulnerabilities to climate change are best assessed at a regional level, the frequency of extreme fire weather is increasing across BC. Comparing "30-yr climate norms" with current and future climate projections highlights alarming trends in fire weather. Throughout much of BC, during the most recent decade (2011-2021), we have seen lower precipitation during the fire season (April 1 to September 30) coupled with an increase in warm days [4] compared to climate norms [5] (1981-2010). These trends contribute to increases in the number of high and extreme fire danger days, adding up to a longer fire season. [xvi]

BC's *Provincial Climate Risk Assessment* ranked catastrophic wildfire as the highest risk event resulting from expected changes in climate by 2050. According to the assessment, projected changes in precipitation and temperature may increase the chance of annual wildfire occurrence from 10 to 50 percent. In Western Canada, research shows significant increases between 1980 and 2014 in areas severely burned due to climate change. [xvii]

These climatic trends compound the significant challenge faced by land managers in BC.

WHAT IS A FIRE REGIME?

A fire regime describes the characteristic attributes of wildfire on a landscape – including distributions of size, severity, and frequency – over space and time. The two important factors for determining fire regimes are vegetation type and weather patterns. Fire regimes may also reflect variables such as ignition source, including Indigenous fire stewardship,* terrain, or seasonality.

Fire regimes are useful for comparing the relative role of fire among ecosystems, for describing the degree of departure from historical conditions, and for projecting the potential effects of management or changing climatic conditions on fire behavior and effects.

* Copes-Gerbitz, K., Daniels, L.D., Hagerman, S.M. 2022. The contribution of Indigenous stewardship to an historical mixed-severity fire regime in British Columbia, Canada. Ecological Applications. DOI: 10.1002/eap.2736.

> *According to BC's Provincial Climate Risk Assessment, projected changes in precipitation and temperature may increase the chance of annual wildfire occurrence from 10% to 50%.*

[4] "Warm days" are those days where the daily maximum temperature is warmer than the 90th percentile temperature.
[5] "Climate Norms" are the standard 30-year period (1981-2010) norms used by Environment Canada/World Meteorological Organization.

CONSEQUENCES OF CATASTROPHIC WILDFIRE

The consequences of high fuel loads and a homogenous landscape coupled with the increasing likelihood of ignitions due to climate change are broad and include economic, health, climatic, and ecological impacts.

HUMAN HEALTH

Wildfires and the smoke they generate can impact our physical and mental health. The physical health effects of smoke from wildfires can range from eye and respiratory tract irritation to more serious disorders, including reduced lung function, bronchitis, exacerbation of asthma and heart failure, to premature death. Exposure to wildfire smoke results in more visits to hospitals and medical clinics.

Understanding the health effects of different types of fires and combustion phases is an area of current research, including, for example, comparing the public health impacts of smoke from prescribed burning and smoke from wildfire.[xviii] A recent report from the Rocky Mountain Research Station [6] states that, in general, western forest wildfires produce more pollutants in much higher volumes than prescribed fires that consume quite different and much smaller fuels.[xix] Not only are prescribed fires lit with the goal of minimizing smoke and fuel consumption, but also of reducing a larger amount of smoke produced over a longer duration from a future wildfire.

ECONOMIC

Between 2008 and 2020, an average of 1560 wildfires started each year in BC, burning, on average, close to 314 000 hectares annually.[xx] The average annual area burned has doubled since the 1970s, and the direct fire suppression costs have steadily increased over time, averaging $1 billion per year. The indirect costs from wildfire, such as loss of timber that supplies mills and supports jobs, damage to watersheds and drinking water, and negative impacts on the tourism industry, are 2 to 30 times higher than the direct costs to suppress wildfire.[xxi] The 2021 wildfire season, for example, had direct suppression costs of $800 million, and based on that multiplier, the indirect costs could have been up to $24 billion.

WHAT IS IMPACTED BY CATASTROPHIC WILDFIRE?

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[6] The Rocky Mountain Research Station is an integral component of the US Department of Agriculture Forest Service Research and Development.

CLIMATIC

BC has set a 2030 emissions reduction target of 40 percent below 2007 levels, reaching net zero by 2050.[xxii] Forests are considered to be one of the best ways to sequester carbon and are part of the land use sector contributions considered essential to meet greenhouse gas targets.

While fire and forest management approaches contributed to a significant fuel buildup over the last century, BC's forests also absorbed and stored large amounts of carbon. More recently, BC's forests have released more carbon than they store due to the emissions associated with mountain pine beetles and severe wildfire seasons. In 2017, 2018, and 2021, annual direct BC wildfire emissions averaged three times the annual emissions from all other sectors in BC combined. [xxiii]

PRESCRIBED BURNING

The deliberate, planned, and knowledgeable application of fire by authorized personnel, and in accordance with policy and guidelines to a specific land area to accomplish pre-determined forest management or other land use objectives.

Cultural burning, broadcast burning, and pile burning are all types of prescribed burning.

If the provincial government is going to achieve its emissions reduction goals, it needs to restore landscape resilience. If the provincial government wants to make BC's ecosystems resilient through fire, it needs to remove fuels, and that carbon, that has built up over the previous decades. Removal of fuels has a "cooling" effect on the landscape which can be achieved by various means, such as harvesting merchantable timber or other woody biomass to produce long-lived wood products or biofuels that replace the use of fossil fuels, and prescribed burning to reduce fine fuels. Although the removal of fuels contributes to the short-term release of carbon that is currently stored on the landscape, this strategy is necessary to mitigate the risk of future catastrophic wildfires, which will release much larger amounts of carbon dioxide and other greenhouse gases into the atmosphere and impact many other values. Designing forests for landscape resilience will enable planning for which parts of the forests need to be managed to low fuel conditions (and less dense forests) and identifying those which may be managed with the objective of maximizing carbon sequestration and storage.

ECOLOGICAL

The historical fire disturbance regimes of BC's ecosystems are based on fuel levels and ecological conditions that could "absorb and recover" after a fire, reducing future fire severity and size. However, with current high fuel loads and changing climatic conditions, catastrophic wildfires will likely push some ecosystems beyond recovery thresholds, leading to long-lasting changes.

Managing resilient ecosystems aims to reduce the vulnerability of an ecosystem to disturbance and limit the potential for irreversible change. The *Provincial Climate Preparedness and Adaptation Strategy: Actions for 2022-2025* reports that investing in climate resilience makes economic sense and can have high rates of return through avoided ecological, social, and economic damages. Increasing ecosystem resilience requires new approaches to land management that maintain or enhance the ability of ecosystems to cope with change and uncertainty, facilitating gradual ecosystem transitions under climate change.

CURRENT RISK REDUCTION AND RESTORATION EFFORTS

The Ministry of Forests is responsible for coordinating the provincial government's response to wildfire in BC. [7] The BCWS, a branch of the Ministry of Forests, has the primary responsibility for delivering this service. The BCWS relies on a system referred to as the Resource Sharing Wildfire Allocation Protocol (RSWAP) for prioritizing its response to wildfires when valuable assets are at risk. The RSWAP prioritizes values, starting with human welfare and safety; property protection; areas with high environmental and cultural values, such as community watersheds; and resource values, such as protected areas, habitat for species at risk, and timber.[xxiv] In a year with significant WUI fire, BCWS resources are necessarily directed towards the first two priorities and, as found in recent fire seasons, there may be limited resources to manage fires that threaten environmental or resource values.

The BCWS budget has increased, which will help it to deliver year-round on the key strategies outlined in the 2023-2026 Ministry of Forests Service Plan.[xxv] One objective of the Service Plan is to improve community resiliency and reduce wildfire risk through proactive natural hazard management. The key strategies continue to direct risk reduction and wildfire management activities primarily to the WUI. This narrow focus on the WUI leaves the broader landscape in an incredibly vulnerable state. Another objective of the service plan speaks to strengthening climate change mitigation and adaptation activities, yet the key strategies include planting trees, increasing densities, and expanding fertilization, all of which add more forest fuels to the landscape and, in some areas, could be contradictory to restoring landscape resilience.

[7] Schedule 1 of the *Emergency Program Management Regulation* sets out which ministers are responsible for specific Hazard Groups. Section 9 of the *Wildfire Act* authorizes the government to carry out fire control on *any lands* in BC, if a fire threatens life or threatens forest land or grassland.

TREATMENTS

Wildfire risk reduction, restoration, and climate change adaptation treatments can reduce the risk of catastrophic wildfires. Treatments may involve manual or mechanical removal of woody debris (fuel) from previously burned or harvested areas, prescribed burning after harvesting, forest thinning and prescribed burning, and managed wildfires. Prescribed burning or managed wildfires are proven to mitigate the impacts of extreme wildfire events and influence the ecological impacts of wildfire.[xxvi] Over the last twenty years, the use of prescribed burning has declined in BC. Forest licensees continue to use pile burning to achieve fire hazard abatement requirements, but very little broadcast burning has been used (see Figure 3).

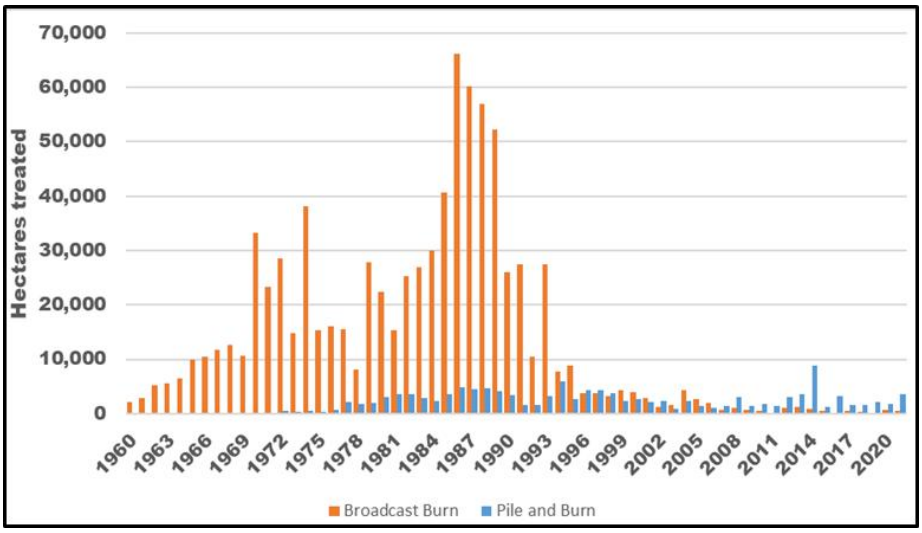

Figure 3. RESULTS activity treatment for broadcast burning and pile burning in BC: 1960-2021.

Since 2004, provincial programs [8] have invested in treatments to reduce wildfire risk. Treatments range from variations of manual fuel removal to mechanical treatments that include some harvest of merchantable timber. This investment has been directed almost exclusively to public and private lands within the WUI. Provincial records indicate that since 2018, approximately 26 000 hectares, or just over one percent of the WUI, have been treated to reduce wildfire risk at an estimated cost of $72 million. [9] Although these efforts are well-intended, they do not come close to achieving the scale required to restore landscape resilience.

SUMMARY

Across the entire landscape, despite significant effort, only a fraction of the land base has been treated for wildfire risk reduction. While fuels continue to build up and the climate changes, catastrophic wildfire seasons will continue to occur. These wildfires will release massive amounts of greenhouse gases into the atmosphere and cause widespread health and economic impacts. The consequences of catastrophic wildfires are huge. Taking a proactive approach to risk mitigation across the broader landscape will be expensive but will be offset by a reduction in the unacceptable consequences to human health, economic, climatic, and ecological costs. Scaling up various risk reduction, restoration, and adaptation treatments can tip landscape dynamics in favour of more benign wildfire behaviour and effects.[xxvii] If the people of BC want to co-exist with fire in a resilient landscape, there is an urgent need to act now to reduce the wildfire risk. It is not a matter of if our forests will burn; it's a matter of when, where, how large, and how severe fires will be. These are the factors that can be affected through LFM.

Prescribed burning or managed wildfires are proven to mitigate the impacts of extreme wildfire events and influence the ecological impacts of wildfire.

[8] Strategic Wildfire Prevention Initiative 2004 – 2017, Community Resiliency Investment Program 2018 – present, which includes FireSmart and Crown Land Wildfire Risk Reduction, Forest Enhancement Society 2016 – present.
[9] BCWS and FESBC provided all figures related to treatment area and costs; total expenditure is based on the reported average treatment cost.

LANDSCAPE FIRE MANAGEMENT: A SOLUTION

BC needs to restore landscape resilience to co-exist with fire on the landscape. Recent amendments to *Forest and Range Practices Act* create a shift to forest landscape planning and incorporate a new objective for the BC's chief forester to consider preventing, mitigating and adapting to impacts caused by significant disturbances to forests and forest health, including wildfire. LFM is a way forward by developing the land management strategies needed to reduce the negative impacts of catastrophic wildfire, restore landscape resilience, and transition landscapes in response to climate change.

LANDSCAPE FIRE MANAGEMENT

LFM is a holistic approach to addressing forest fuel build-up and improving landscape resilience. LFM recognizes the role of fire in BC ecosystems and is consistent with historical and expected future fire regimes [10] and the diversity of fire frequency, size, and severity. The goals of LFM include wildfire risk reduction to protect important values and, through time, restore resilience to the landscape on all public lands. The time remaining to restore this resilience is rapidly shrinking.

LFM embraces ecologically appropriate fuel management tools, including managed wildfire, prescribed burning, creation of fuel breaks, and stand-level fuel treatments. LFM involves using these tools to create conditions that impede or direct the flow of wildfire, ultimately restoring a mosaic of forested and non-forested conditions across a landscape (see Figure 4). Rebuilding a mosaic of forest and non-forest ecosystems requires the development of landscape objectives and strategies to achieve them. LFM is not about returning landscapes to historical conditions but involves understanding how historical development patterns of forest and non-forest conditions supported wildfire processes of varying size and intensity, which can guide the setting of objectives for large landscapes. A combination of landscape and stand-level changes is needed to reduce the size and frequency of the largest and most catastrophic fires, and then managers will see more diversity in fire frequency, size, and severity once again. The patterns of forest successional stages[11] and fuel conditions we create are what will drive the patterns of future fire behaviour and severity.

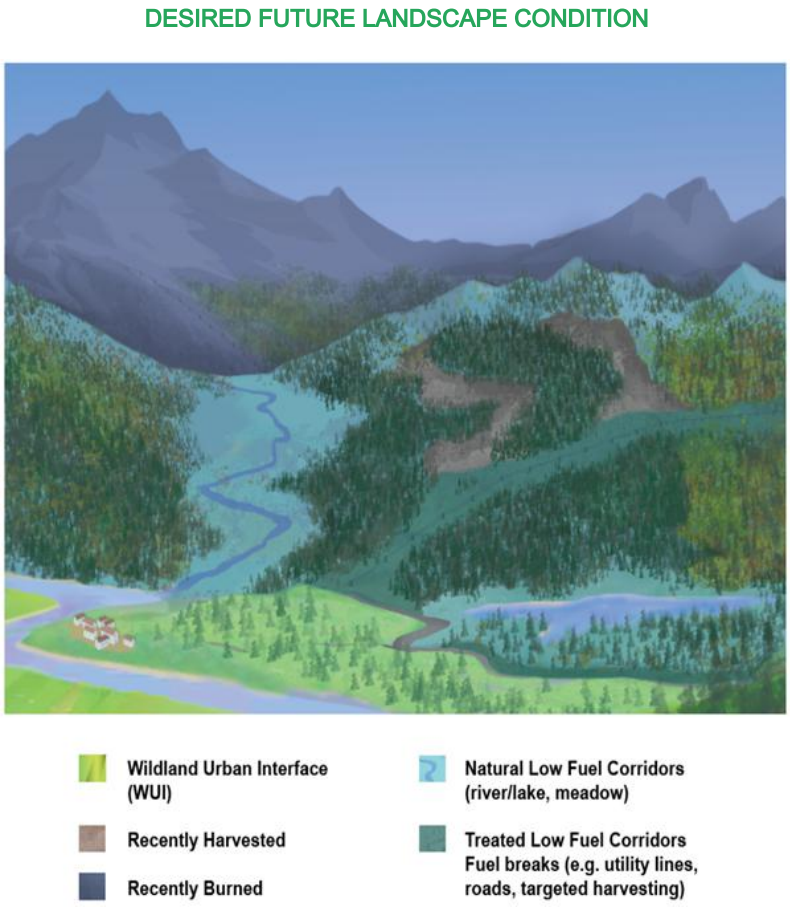

Figure 4. Illustrating the desired future landscape condition where LFM is being practiced.

[10] Consistent with historic fire regimes means, to the degree possible, LFM strategies should aim to achieve similar fuel loads, tree densities, and species composition to meet resilience targets and goals.
[11] A successional stage refers to a specific period in the growth of a forest. For instance, an early pioneer stage happens right after a disturbance like a fire or logging, where plants like fireweed might temporarily grow before trees start to appear. On the other hand, a climax stage occurs over time in undisturbed areas, where the types of trees remain relatively stable without events like fire or logging.

It will be important for all land managers to share a common goal of promoting ecosystems that are resilient through fire. Land management strategies can have both a positive and negative effect on landscape resilience. For example, road and cutblock design has the potential to isolate or reduce hazardous fuels, but alternatively, high post-harvest fine fuel loads promote fire spread and growth through harvested blocks. Another example is that aspen stands burn at a lower intensity than conifer stands, but reforestation obligations currently prioritize establishing conifer stands. Alternatively, silviculture strategies can establish and influence forest stand densities and species composition that are more resilient to future wildfire conditions.

LFM enables landscape-level planners to assess and understand the current condition of a landscape and values, and the threats that it will face in the near and longer term. Implementing LFM is a land manager's way to reduce the risk of impacting scarce or valuable resources on a landscape such as timber inventories planned for harvesting in the short term, areas of scarce old-growth forest, or watersheds that currently provide drinking water to communities. Where decisions are needed to address risks and balance the management of competing values, strategies can be designed to reduce those risks. LFM must happen immediately and will inform future processes, including forest landscape planning.

Forest landscape plans (FLPs) are a tool to help implement the outputs of LFM, but the forest industry is not the only operator on the land – other industries and public values influence forest and fire management practices such as air quality and health, tourism, private property and infrastructure. LFM requires a multi-sector commitment to actions that restore a landscape to a more resilient condition.

LFM requires a transgenerational commitment to create and maintain resilient conditions. There is no short-term fix to the current "fire-deficit" condition of our landscapes in BC. LFM is ongoing, from generation to generation, with treatments that require maintenance over time, the use of a broad toolkit, and a sustained commitment. A dedication to monitoring and adaptive management will inform the design and timing of initial and ongoing treatments.

As a companion document to this report, the Board will soon publish a technical bulletin to help practitioners begin practicing LFM. Starting with simple strategies and integrating them into forest practices is a good foundation that can be scaled up as capacity grows.

> *There is no short-term fix to the current "fire-deficit" condition of our landscape in BC.*

THE PATH FORWARD

The provincial government must take the lead and develop a vision and action plan that aligns and directs government players, policies, programs and spending needed to restore landscape resilience and the ability to co-exist with fire. This meshes with the Province's current priority to develop an ecosystem health and biodiversity framework. The path forward relies on an immediate response from the provincial government involving acceptance, alignment, and action from multiple government ministries. Government mandates must align and promote actions toward a common goal of landscape resilience.

Now is the time to be bold—not for relying on incremental adjustments.

A VISION AND ACTION PLAN FOR LANDSCAPE RESILIENCE

Restoring landscape resilience and co-existing with fire will require a province-wide vision and action plan. This over-arching mandate must be co-developed with Indigenous People with explicit recognition of Indigenous perspectives to steward fire on the landscape. The vision and action plan should set clear goals and integrate actions to be taken across all levels of government [12] and organizational silos.

This paradigm shift requires an immediate and sustained (multi-generational) commitment to action that exceeds the pace and scale of climate change and wildfires. This shift will require a massive investment and progress over time to transition land and fire management from a reactive to a proactive forward-looking stance. It will require sustained monitoring of the implementation and effectiveness of investments and treatments, and a commitment to adapt and adjust as knowledge about wildfires, climate change, landscape resilience, and LFM is gained. To improve the credibility of the product, an expert panel, independent of government, should support the development process.

VISION AND ACTION PLAN

ACTION PLAN EXAMPLES

Similar wildfire risk and management conditions to BC exist in the western U.S., in the states of Washington, Oregon, California and Colorado. Most of these states have invested in comprehensive reviews and program creation following major wildfire seasons in a manner like BC. However, California stands out, as their Forest Management Task Force recently developed a *Wildfire and Forest Resilience Action Plan*, to address California's wildfire challenges. The plan calls for bold action to address the key drivers of catastrophic wildfires, to significantly increase the pace and scale of forest management, and to improve the resilience of threatened communities. The action plan serves as a roadmap, integrating key findings and recommendations from various plans, studies, and assessments into a single coordinated and comprehensive strategy that applies across federal, state, and privately-owned lands to the responsible Agencies.

The action plan sets out four broad goals:

1. Increase the Pace and Scale of Forest Health Projects
2. Strengthen Protection of Communities
3. Manage Forests to Achieve the State's Economic and Environmental Goals
4. Drive Innovation and Measure Progress

The Board views California's action plan as a shining example that could guide BC in developing a similar plan.

A "made-in-BC" example of the type of process needed to address wildfire and ecosystem resilience in BC is the CleanBC Roadmap to 2030. In developing the roadmap, the Climate Solutions Council provided expert advice, and the Premier signed the final product. The Climate Solutions Council continues to provide strategic advice to government on clean economic growth and climate action.

[12] Meaning Indigenous, federal, provincial, and local governments.

TO ACHIEVE LANDSCAPE RESILIENCE, LFM MUST BE PRIORITIZED

The Board engaged over thirty experts in forest and fire ecology, land managers, and provincial and government staff. The message we heard was consistent: Without government leadership and an integrated approach, shifting to management for landscape resilience will not come close to achieving the pace and scale necessary to enable us to co-exist with fire on the landscape. To achieve the vision of landscape resilience, the following outcomes will need to be realized.

1. FOSTER PUBLIC SUPPORT

Public support is needed to successfully shift to managing for landscape resilience. Currently, many people fear that using fire as a tool[13] will result in smoke harmful to human health or that a fire will escape and cause a wildfire. Some view wildfire risk reduction or restoration treatments as another excuse for licensees to harvest timber. Public trust must be earned through inclusive processes that build public and stakeholder understanding and support.

Public trust must be sustained through the demonstration of competence. Enhanced monitoring of outcomes will be necessary to foster public support, so they can accept and value the costs and risks of treatments, as well as the serious consequences and tradeoffs of not managing for landscape resilience. For example, a recent research project headed by the U.S. Environmental Protection Agency found that smoke produced from a prescribed fire with a goal of minimizing smoke impacts can reduce health impacts by at least 40 percent compared to a wildfire. [xxviii]

2. ALIGN LEGISLATION AND POLICIES

It is crucial that all levels of government commit to sharing the responsibility to address catastrophic wildfires [xxix] in BC and work toward a common vision. Alignment of provincial legislation and policies should promote coordination and consistency across jurisdictional boundaries and ministry mandates. For example, how we manage for carbon and tree planting needs to concurrently address how we manage for landscape resilience. When coordinated, forest practices can help to reduce the impacts of catastrophic wildfires and help to harness the benefits of wildfire.

Current forest management legislation is results-based, meaning that the provincial government establishes objectives that set out the desired outcomes for forest and rangeland management. Currently, there are no objectives for managing forest fuels, landscape conditions, carbon sinks and storage, greenhouse gas or smoke emissions. Strategic land use plans do not address landscape-scale wildfire and climate adaptation. If legislation and policies align and enable it, the forest industry has a significant opportunity to manage for these desired future outcomes. Managing for landscape resilience at the desired pace and scale will require managers to apply LFM in operational decision-making and on-the-ground practices in a policy environment that supports LFM. Policy barriers take time to navigate, cost money to manage, and thus reduce the ability and likelihood of treatments occurring. This is a critical need for change so that restoring and managing for landscape resilience can happen at a meaningful scale.

3. MANAGE FOR SHIFTING DYNAMICS

The approach taken by the provincial government to manage for non-timber values has primarily resulted in setting aside large, forested areas as static reserves to protect habitat for species at risk, preserve old growth, and for overall biodiversity conservation. These unmanaged reserves are especially vulnerable to burning because of the amount of forest fuels that have accumulated over time. There is a significant risk to these static reserves because, in many parts of the province suitable alternatives are challenging to find or absent, given past wildfires, insects and diseases, and harvest histories. In some ecosystems, the absence of frequent disturbance at low or moderate intensity puts the integrity of these areas at risk, even without future wildfires. In these ecosystems, the characteristics that make conservation areas valuable were created under a frequent-fire disturbance regime. Legal objectives for reserves typically restrict proactive management interventions designed to restore or maintain resilience.

Members of the public want conservation of certain values, such as old growth; at the same time, these same values are at risk due to climate change and wildfire threat. Land managers cannot protect the values that the public want conserved by simply plotting them on a map. Conservation of values must involve managing for shifting dynamics on the landscape, which means actively managing the values today and planning to create or recruit more (e.g., attributes important to old-growth forest, caribou habitat, or ungulate winter range) in the future somewhere else on the landscape.

[13] Managed wildfires can help do the work on a landscape to create low fuel conditions. Prescribed and cultural burning are also tools for reducing fuel loads and improving the resilience of a landscape.

4. DEVELOP FUNDING MODELS

Wildfire risk reduction or restoration treatments can be costly, and there is currently little funding to support landscape treatment outside the WUI. The appraisal system does not recognize the cost of treatments on public lands in BC, meaning that the forest licensee will have to bear the cost of treating an area. The cost of treatments is a significant barrier. Without large and sustained financial support, markets for the residual fibre, or imposing legal requirements, risk reduction or restoration treatments will not occur. For example, the U.S. Department of Agriculture recently announced $10 billion USD to increase the pace and scale of landscape restoration and resilience investments, supporting its 10-Year Wildfire Crisis Strategy for treating large landscapes and confronting the wildfire crisis. [xxx]

Opportunity exists from the development of a bio-economy that makes use of the large volumes of available low-grade biomass, including innovative engineered wood products (mass timber and cross-laminated timber products) with long carbon retention times and high substitution benefits. Removing merchantable fibre and non-merchantable biomass in support of a bio-economy can help stabilize carbon in long-lived forest products, create substitution values by replacing the use of concrete and metal in some construction, and reduce smoke emissions from wildfires and any associated prescribed burning after harvests.

Government funding for alternative energy systems can benefit communities and create incentives for the removal of low-value biomass (or fuels) from the landscape. For example, the community of Esk'etemc in Alkali Lake burns wood biomass to generate heat for the school, the health building, administration offices, and some homes. The community of Clearwater has taken the same approach, now burning wood waste to heat its municipal office and the sports arena. In both examples, the communities hold area-based tenures close to town, and both have prioritized wildfire risk reduction and adaptation treatments, which has generated biomass. This type of approach directly benefits communities concurrent with reducing wildfire risk.

5. ACHIEVE SCALE

Wildfire risk reduction or restoration treatments can be costly, Proactive fuels management is needed to achieve the risk reduction and landscape restoration scale required in BC. As stated previously, treatments may involve manual or mechanical removal of fuel from previously burned or harvested areas, prescribed burning after harvesting, forest thinning and prescribed burning, and managed wildfires. Treatments at scale require supporting policy, a sustainable funding model (that is not vulnerable to election cycles), and public acceptance. The forest industry will have a large role to play in achieving the necessary scale of treatments through targeted harvesting techniques and hazard abatement strategies, including prescribed burning. To achieve scale, we must use all the tools in the toolbox.

Prescribed Burning

Proactive use of prescribed fire allows the land manager to reduce or mitigate the negative human health, soil, and ecological impacts of a wildfire, and generate the positive ecological, social, and habitat benefits of a more benign fire. Prescribed burning is an effective tool for reducing fine fuels on a stand or landscape scale. Prescribed burns can be applied after harvesting or as an understory burn for fuel reduction within a standing forest. Prescribed fires consume the fine, kindling type fuels, but generally not the larger type fuels. When prescribed burned, the energy source, or fuel, necessary for combustion is removed, making it difficult for wildfire ignition, spread, and crown fire initiation to occur.

Several complexities are involved with planning and implementing prescribed burns, including permitting processes, weather windows, a lack of a qualified and skilled workforce, liability, smoke production, and public opinion. While existing policies may provide clear direction and safeguard accountability, they have unintended consequences, creating disincentives or barriers to widespread practice.

If industrial forest harvesting and wildfire risk reduction, restoration, and adaptation treatments are utilized together with prescribed burning, significant community benefits in fire awareness, training, and capacity building could align, while increasing landscape resilience.

Cultural Burning

The Province of BC has committed to: "Integrate traditional practices and cultural uses of fire into wildfire prevention and forest management practices and support the reintroduction of strategized burning." [xxxi] This is a good start. Respecting the practice of Indigenous fire stewardship will help to change our relationship with fire and bring controlled fire back to the landscape.

Future management must recognize the contribution of Indigenous peoples to historical fire regimes and include ecocultural strategies such as cultural burning and a return of Indigenous land stewardship if we are to minimize the negative impacts from high-severity wildfires. To change our relationship with fire, policy and practices should reflect Indigenous Peoples' relationship with and knowledge of fire, and integrate Indigenous fire stewardship into LFM.

6. BUILD CAPACITY AND EXPERTISE

Restoring landscape resilience is going to take a lot of work. To get this work done, there must be a workforce to draw from. This means qualified professionals with the necessary tools and training to carry out planning and prescriptions. It also means people who are willing and able to carry out the treatments on the ground. There is a shortage of skilled, willing and able people to carry out this work in BC. It is difficult for a professional to access fire management training or professional development opportunities unless they are an employee of the BCWS. The labour market is competitive, and finding people to carry out the on-the-ground work to the scale necessary is a significant challenge.

The Forest Professionals BC and the BCWS have created a community of practice for fire management, which will hopefully yield positive outcomes related to guidelines, standards and development opportunities.

The demand for expertise in LFM and the on-the-ground application of treatments already exists and will continue to grow. Increasing access to formal education, training, and professional development is critical to achieving the scale of LFM required to improve landscape resilience.

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CONCLUSIONS

Historically, fire played an important role in ecosystem functions in much of BC and was a key factor in maintaining landscape resilience. The twentieth century's fire and forest management policies aimed to protect and conserve forests by emphasizing fire prevention and suppression and excluding Indigenous fire stewardship. These policies have resulted in an increase in densely forested areas on BC's landscapes and an increase in the amount and distribution of forest fuels. Provincial government data indicates that 45 percent (39 million hectares) of public land in BC is at high or extreme threat of wildfire.

The current approach to managing the risks of catastrophic wildfires is to focus on risk reduction and management activities near communities, leaving the broader landscape in a severely vulnerable state. Landscape fire management reduces this vulnerability through land management strategies that decrease the risk of catastrophic wildfire, restore landscape resilience, and transition landscapes in response to climate change.

Bold and immediate action is required by the provincial government to align its actions and policies with a vision of landscape resilience and human co-existence with fire. Unless BC is prepared to accept a future of increasingly frequent catastrophic wildfires and the associated costs and consequences, it is time for a paradigm shift in land management.

Achieving this paradigm shift will require a province-wide vision and action plan that aligns the policies and programs across all levels of government, and integrates LFM into the land management framework in BC. It requires collaboration and coordination to enable timely action at the scale necessary to affect meaningful progress toward restoring landscape resilience. This paradigm shift must be a provincial priority that spans ministry mandates and election cycles. This shift must be lasting and enable actions that exceed the pace of climate change and wildfires. Getting there will require leadership from the provincial government supported by research, monitoring, and qualified professionals.

RECOMMENDATION

The provincial government leads the development and implementation of a vision and action plan for landscape resilience that will align policies and programs across all levels of government to enable landscape fire management.

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