CANADIAN WILDLAND FIRE & SMOKE

# NEWSLETTER

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Image: Experimental Burn (Ellen Whitman)

# Climate change adaptation for wildland fire and ecosystem management: Conversations and strategies

By Ellen Whitman, PhD
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It seems like we experience major wildfire events that provoke global concern and discussion every few years. This year the big news story has been the unprecedented area burned in Australia, which caused multiple fatalities, destroyed homes, and damaged critical habitat for many wildlife, and plant species. Earlier in the winter, there was extensive media coverage of uncontrolled burning in the Amazon rainforest, and in March of this year, 30 wildland firefighters were killed on the job in China. Canadians have made it through recent fire seasons without major losses of life and with only limited media coverage of ecological impacts of extensive fire seasons. Increasingly though, we have seen provinces and territories facing critical choices to evacuate communities when wildfire suppression has failed in the face of unmanageable fire conditions, such as Fort McMurray, Alberta in 2016, and under overwhelming fire loads, as in British Columbia in 2017 and 2018, and the Northwest Territories in 2014 and 2015. Climate change has been a major driver of increasing extremes in wildfire activity, explaining substantially more of increasing area burned than can be attributed exclusively to land management (i.e., buildup of ladder fuels and increasing tree density creating more flammable forests where historically frequent fire has been suppressed). Even if drastic mitigation occurs, and we are able to slow emissions of greenhouse gases, we can expect the climate to continue to warm into the 2050s, with serious implications for our ability to suppress and manage wildfire, as well as for the fuels and forests that recover afterward.

Image 1: Fire scars on the trunk of a Jack Pine in the Northwest Territories (Image: Ellen Whitman).

In this context of almost certain warming for much of Canada, wildfire and forest managers are actively engaging in discussions about climate change adaptation: how will we continue to manage fire and fire-affected ecosystems in a warmer climate? I have had the privilege to participate in two recent workshops about climate change adaptation in boreal forest ecosystems, led by land- and fire-management agencies. The workshops followed Parks Canada's Adaptation Framework Approach (Nelson et al. 2020), and the Canadian Council of Forest Ministers sustainable forest management Climate Change Vulnerability and Adaptation Assessment Framework and Guidebook (Williamson et al. 2012; Edwards et al. 2015). Managers structured the workshops around discussions of climate change scenarios and the outcomes that these scenarios could have for wildland fire and forest management. We concluded by identifying adaptation options that might help managers proactively anticipate climate change risks to firefighting and forests, and respond effectively when faced with new challenges. The adaptation strategies that we discussed were diverse and imaginative; facing a wicked problem, like climate change, requires thinking beyond existing paradigms and practices. Not all strategies will be appropriate in all places, and some, while effective are not socially acceptable or economically feasible. The strategies below represent an extensive but not exhaustive list of ideas, rather than proposed changes to policy. With the agencies' permission, I am sharing a review of these groups' conversations and ideas around fire management adaptation and forest fuels, for other people and managers to consider.

**Climate change scenarios relating to wildland fire and forest fuels**

To define the scope of the problem we identified what we thought were likely direct effects of climate change on wildfire activity and forest ecosystems (Scenarios, Table 1). We then related these to specific outcomes that would affect wildfire and ecosystem management (Outcomes, Table 1). In these workshops, we often had trouble conceptualizing what climate change outcomes might look like for ecosystems due to complex interactions and uncertainty, but we had no difficulty in anticipating challenges for future management of fire. Managers have all had some direct experience with these outcomes. Climate-mediated changes to fire are happening now, and are already affecting fire and ecosystem managers' work.

Table 1. Climate change scenarios and outcomes for wildland fire

| **Climate change scenarios** | **Outcomes for wildfire and ecosystem management** |
|---|---|
| Increasingly severe fire weather, due to increased evaporative demand creating drier fuels | • Increasing area burned on the landscape<br>• Increasing occurrence of unmanageable wildfires, due to extreme fire behaviour causing limited suppression effectiveness and unsafe conditions for firefighters<br>• Increasing occurrence of high severity burning, leading to biomass loss, erosion, risks to water supply, and post-fire vegetation state changes |
| Lengthening fire seasons due to warm springs and falls | • Increasing area burned on the landscape<br>• Fire occurrence in times when staff levels may be low<br>• Risks to wildlife from fire at sensitive life stages (e.g., mortality of young ungulates in the spring) |
| Increasing occurrence of drought, and overwintered droughts in spring | • Increasing area burned on the landscape<br>• Interaction with increasing lightning activity to enable multiple simultaneous fire starts<br>• Enhanced need for 'mop up' and overwintering of fires, leading to spring fire starts<br>• Increasing occurrence of high severity burning, leading to biomass loss, erosion, risks to water supply, and post-fire vegetation state changes<br>• Risks to wildlife from fire at sensitive life stages (e.g., mortality of young ungulates in the spring)<br>• Loss of runoff from spring snowmelt, leading to low landscape moisture availability |
| Increasing lightning flashes and ignitions | • Increasing area burned on the landscape<br>• Increased occurrence of multiple simultaneous fire starts |
| Warmer nights, causing lower relative humidity and lack of or limited overnight recovery of fuel moisture | • Increasing area burned on the landscape<br>• Drier fuels, more intense fires at night, with challenges of nighttime firefighting |
| Warmer and drier general climate | • Increasing area burned on the landscape<br>• Increased likelihood of post-fire vegetation transitions or state changes as disturbances open the landscape to climate-driven change, leading to altered fuels and habitat |

## Adaptation strategies

In response to the outcomes described above, we proposed adaptation strategies that fell into the categories of: community adaptation strategies (Table 2. Adaptation led and/or applied at the community level); fire management adaptation strategies (Table 3. Adaptation for fire management practices, systems and programs); and ecosystem management adaptation strategies (Table 4. Adaptation to manage fire effects and ecosystem health at the landscape level). Many of these strategies are ongoing (e.g., funding for FireSmart community plans, fire prevention programs), or broadly accepted by fire management agencies (e.g., increasing application of prescribed fire) but may require sustained support, or research to justify their implementation. Other strategies listed below are more novel and would require changes to policy and plans. Overall, the feasibility and acceptability of these adaptation strategies will depend on local conditions, concerns, and climate. These climate change scenarios and adaptation strategies were developed in a west-central boreal forest context, and may not directly apply across Canada; however, they are likely transferrable to some extent.

In nearly all cases, a major challenge for implementing these adaptation strategies is the expense (although the expense is often the cost of increasing staffing levels and short-term contracts, which represent job opportunities). A perceived low level of risk from fire can be at odds with the relative expense of firefighting, affecting the availability of funds for wildfire management. We concluded that climate change is likely to compound this expense. It may be both an important challenge and an opportunity in the future to highlight how catastrophic events related to climate change are hugely expensive, justifying both working to mitigate climate change and up-front spending to implement adaptation strategies that will offset this cost.

Table 2. Adaptation led and/or applied at the community level

| Community adaptation strategies | Justification and opportunities | Challenges |
|---|---|---|
| Pre-fire evacuation and emergency planning, conducted at the community level | Encourage and enable communities to develop their own community-specific and appropriate emergency management plans with defined roles and detailed information. This should include preparing for evacuations and increasing local awareness of emergency plans. | • This is happening now in many places, however, uptake and capacity to perform these actions is variable.<br>• Emergency management plans, evacuation strategies and systems are applied at the community level, where agencies may have little to no control over enforcing or encouraging their development.<br>• Plans stagnate and become irrelevant over time, requiring upkeep to be useful. |
| Support and enact FireSmart community programs, promoting owner-level fuel management and building standards | Encourage the awareness and practice of FireSmart building guidelines, community planning policies, and homeowner-level vegetation management. New construction of community infrastructure and buildings should inherently consider fire risk in landscape design and placement. | • Variable perception of fire risk and ability to control or reduce fire risk at the individual level.<br>• Perceived cost-benefit of implementing FireSmart practices by individuals.<br>• Agencies have little to no control over the enforcement or uptake of FireSmart on private lands.<br>• Expense of maintaining and supporting community programs and grants, although savings are likely to offset costs when wildfires occur. |
| Construct or retrofit and identify safe breathing spaces for vulnerable people | Ensure that communities have well-known community buildings with high-quality air filtration systems, where vulnerable people can remain in the community when smoke presents a risk to their health, but does not require complete evacuation. This would allow people to remain in communities longer when breathing conditions are poor. | • Expense of retrofitting or building new infrastructure.<br>• Agencies may have little to no control over infrastructure development within communities. |
| Relocate critical infrastructure | If critical infrastructure is in a high-fire risk area or if the infrastructure itself promotes fire occurrence (e.g., aboveground power lines in windy areas) relocate the infrastructure. | • Expense.<br>• Agencies may have little to no control over infrastructure development within communities.<br>• Uncertainty of long-term fire risk<br>• Loss of community or historic context for buildings. |
| Land conversion to agricultural uses | Where appropriate, areas of highly flammable fuels close to communities can be converted to small (community garden) or larger scale agriculture. This practice could have a dual benefit of both reducing fire risk and improving community resilience when wildfires occur. | • Expense of removing trees, which may be offset by timber sales.<br>• Land ownership in some regions is complex, and nearby lands may not be under the control or ownership of the community.<br>• Maintenance, community support and continued use of these lands is necessary in order to keep fuel loads low and to benefit communities through food production. |

Table 3. Adaptation for fire management practices, systems and programs

| **Fire management adaptation strategies** | **Justification and opportunities** | **Challenges** |
|---|---|---|
| Higher budgets and more assets and resources provided for firefighting | Annual costs of firefighting in Canada continue to increase, especially in years with overwhelming fire events. In order to respond to increasing fire loads (number of fires) and fire sizes (fires escaping initial attack) increase firefighting budgets for equipment and crews. Having more staff and equipment would likely allow agencies to respond more quickly when multiple fires occur. | • Expense, although savings may offset costs when wildfires occur.<br>• Low public perception of risk and high variability in annual fire season severity may reinforce a trend of maintaining a baseline level of funding for wildfire management and injecting emergency funds, rather than raising overall budgets. |
| Earlier man-up dates, in response to early fire season starts | As fire seasons begin increasingly early, some seasonal staff can be hired on earlier and maintained longer through the fall. | • Expense of salary, although savings may offset costs when wildfires occur.<br>• Seasonal staff often work multiple seasonal jobs or attend university, and may be unavailable when hiring windows are changed. |
| Improving fire detection capacity | Fire management agencies are often responsible for large areas of land with low population densities and limited fire detection capabilities. By increasing tower networks, use of remote cameras, smoke flights, or developing new technologies to detect wildfire starts, agencies will be able to respond to fires more rapidly, at a smaller initial fire size.<br>In the near future, the WildfireSat mission will offer some additional detection capacity in Canada. | • Expense of building and/or staffing detection networks, although savings may offset costs when wildfires occur.<br>• Technologies are in development but may be expensive to build and operate, untested, or slow to become operational. |
| Developing flexible appropriate fire response plans and systems | With increasing regularity, firefighting agencies face events where many fires ignite in a short amount of time, causing an overwhelming load of fires requiring simultaneous response. In order to respond to such instances agencies can implement response plans where fires are considered individually (e.g., “Appropriate Response” in Ontario) rather than with static control zones. Alternatively, agencies can develop alternative operational standards and strategies that recognize that such events may occur, and plan ahead to switch to appropriate response from full suppression, when a certain threshold is reached. | • Expense of changing policies and implementing new systems. Savings may offset costs when fires occur.<br>• Public buy-in and possible misperception that appropriate response is a ‘let it burn’ policy that may increase community risk from fire. |

Table 3 con't. Adaptation for fire management practices, systems and programs

| **Fire management adaptation strategies** | **Justification and opportunities** | **Challenges** |
|---|---|---|
| Strategic fuel treatments | Use prescribed fire, harvesting, and thinning to create firebreaks and reduce fuel loads near communities, on lands that are managed by the agency. Firebreaks can act as barriers to fire spread, and spotting in most conditions, whereas reduced fuel loads and removal of high-risk fuels will slow the spread of fire and reduce fire intensity, allowing fire managers to intervene successfully and causing fires to burn with lower severity fire effects. | • Expense of contracts for forestry operations (can be somewhat offset by wood sales).<br>• Expense of mounting prescribed fire operations.<br>• Increasingly severe fire weather may make appropriate prescription windows rare.<br>• Risk to communities, public, and nearby lands from escaped prescribed fire.<br>• Community buy-in for aesthetic changes and loss of nearby forests.<br>• False perception that treated landscapes cannot be breached by fire.<br>• Need for maintenance, as fuel builds up again over time. |
| Enhanced and pre-positioned communication strategies, plans, systems and messaging | Develop clear lines of communication where communities can go for information in the event of wildfire or evacuation. Prepare systems and define roles for communication in advance of disruptive fire events, and prepare and distribute messaging and education materials to inform the public, build trust, and gain social licence for other non-emergency wildfire initiatives (e.g., FireSmart fuel treatments or prescribed fire). | • Agencies generally already have communications staff, but may require additional support.<br>• Lack of free time or support to make this a priority, forcing people to react when events occur, rather than spend time developing proactive plans. |
| Fire prevention programs | Promote fire prevention, and educate communities and land users about unintentional accidental fire ignitions, with the aim of reducing occurrences of human-caused fires. Accidental human-caused ignitions are entirely preventable, and represent one of the few fire regime drivers that can be altered. | • Expense of maintaining programs and paying staff salaries, although savings from reduced fire load may offset costs. |

Table 4. Adaptation to manage fire effects and ecosystem health at the landscape level

| **Ecosystem management adaptation strategies** | **Justification and opportunities** | **Challenges** |
|---|---|---|
| Applying low-intensity prescribed fire to promote resilient, low-flammability forest structures | Where existing forest ecosystems are at risk from severe wildfire, or fire frequencies or severity increasing beyond historical ranges, managers can use low-intensity prescribed fires to thin forests and remove understory ladder fuels, creating a forest structure that will be less susceptible to high-intensity and high-severity fire that would lead to stand-replacing events in the future. | • Expense of mounting prescribed fire operations.<br>• Risk to communities, public, and nearby lands from escaped prescribed fire.<br>• Increasingly severe fire weather may make appropriate prescription windows rare.<br>• Need for maintenance, as fuel builds up again over time. |
| Applying high-intensity and/or frequent prescribed fire to convert vegetation communities or fuels | Where existing forest ecosystems are not desired values, due to fuel buildup and forest encroachment, or community risk from high-flammability fuels, managers can use high-intensity prescribed fires to open up forests to altered post-fire climates, promoting long-term vegetation change. Frequent application of fire may reinforce shifts to grass and broadleaf fuels, creating lower flammability fuel types. | • Expense of mounting prescribed fire operations.<br>• Risk to communities, public, and nearby lands from escaped prescribed fire.<br>• Community perception and desirability of converting vegetation or habitat to altered states.<br>• Increasingly severe fire weather may make appropriate prescription windows rare. |
| Dynamic wildfire zones, or appropriate ecological response | Fires in areas or seasons that may have been acceptable in the past (e.g., remote or wilderness areas with no historical wildfire suppression) may no longer be appropriate. For example, severe early spring fires may kill or displace vulnerable young animals, which would escape a fire later in the season, or severe wildfire may remove an endangered tree species that is not likely to recruit under the current climate. Ecosystem and fire managers can create seasonally dynamic suppression zones to incorporate seasonal variability in vulnerability of valued ecosystem components, or enact appropriate response in a manner that considers the potential ecological impacts of fires due to landscape context or current fire weather conditions (likelihood of severe burning), in addition to safety. | • Expense of changing policies and implementing new systems. Savings may offset costs when fires occur.<br>• Expense of firefighting in what are often remote, inaccessible areas with limited detection capability. |
| Defining and delineating critical habitat for fire suppression | For some species or forests, any fire may be unacceptable for social or ecological reasons. Agencies can create full-suppression zones in areas of critical habitat, if they are known and well-defined in advance of a fire event. | • Expense of firefighting in what are often remote, inaccessible areas with limited detection capability.<br>• Increasingly overwhelming fire weather conditions may make this approach inappropriate over time. |

**Conclusions**

A major challenge that arose in these climate change adaptation workshops was the clear definition of goals and values that agencies wanted to steward, or maintain in the future. In some cases this is very easy to define (e.g., continue to keep people safe from uncontrolled wildfire, in increasingly challenging conditions), whereas ecological targets were often more fuzzy. Do agencies want to protect existing forest ecosystems, resisting climate-driven change wherever possible, or should they promote and direct some change to maintain healthy functioning ecosystems that require less human intervention but do not resemble current forests? Should managers allow forests to change to less flammable fuels, despite the loss of characteristic species? Without knowing what values we were striving to maintain or promote, it was difficult to determine the appropriateness or feasibility of different adaptation strategies. Land managers also described challenges from conflicting ecological responses (e.g., simultaneous aspen encroachment in grasslands and aspen decline in forests), or valued species with different needs that are directly at odds on the same landscape (e.g., more fire and less conifer forest in the future may be good for bison, but bad for caribou). Shifting baselines for ecosystem management is another challenge overlying all of these conversations, as fire regimes continue to change in the background.

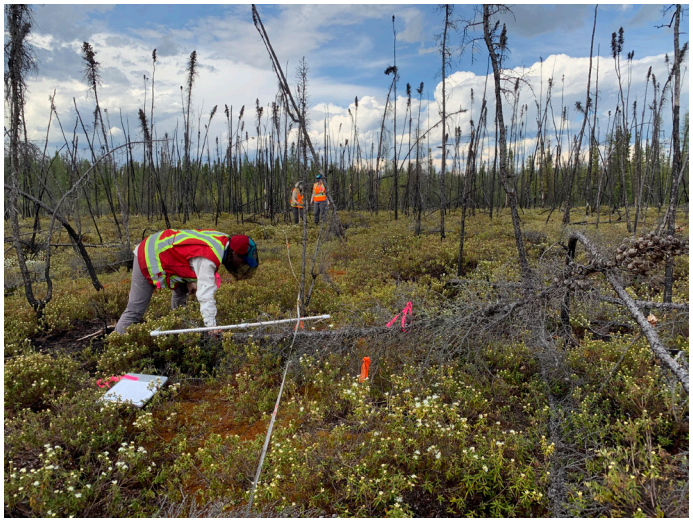

Image 2. Postburn field work (Image: Natural Resources Canada).

The adaptation strategies identified above also highlight a need for trust, collaboration, and communication across agency, departmental, and community boundaries. There are measures that may be essential to creating resilient communities that agencies have no power to enact due to a lack of jurisdiction, and the responsibility will fall to other emergency managers, communities, and landowners. Agencies can apply fuel management and prescribed fire to landscapes, but only if the public allows and trusts them to do, and understands why this is necessary. Finally, fire and ecosystem managing agencies may face demands from other governmental bodies that are responsible for wildlife, endangered species, or ecosystem health (e.g., water resources) that are at risk from fire and climate change. Those responsible for firefighting cannot meet expectations to manage for these resources if they do not receive guidance and clear targets from their counterparts, who in turn need to understand the capabilities and limitations fire managers have, when asking for their support.

The impressive multilevel community and government response to the serious risks associated with the COVID-19 pandemic offers a real example, showing that fundamental changes to governance, social acceptability of practices, and funding support are possible in order to keep people safe and healthy. I am hopeful that we can respond in a similarly innovative and progressive way to the long-term challenges and direct risks to life associated with changing climate and fire regimes, unfolding on a slower timescale. Going forward with a collaborative spirit and a willingness to respond will mean that adaptation is possible. Some change is certain, but we have the tools, optimism, and the opportunity to work hard for a sustainable and safe future.

**References**

Edwards, JE, Pearce, C, Ogden, AE, Williamson, TB (2015) Climate change and sustainable forest management in Canada: a guidebook for assessing vulnerability and mainstreaming adaptation into decision making. Canadian Council of Forest Ministers Climate Change Task Force. https://www.ccfm.org/pdf/Vulnerability%20Guidebook_June2_EN.pdf

Nelson, E; Mathieu, E; Thomas, J; Harrop Archibald, H; Ta, H; Scarlett, D; Miller, L; MacInnis, B; Sheehan, V; Pompura, K; Hassanzadeh, D; Brook, L; Grant, J; Carr, D; Graham, L; Harms, J; Sales, R; Harley, K; Cameron, R; Eckert, C; Elliot, J; Boyd, D; Tambalo, D (2020) Parks Canada's adaptation framework and workshop approach: Lessons learned from across a diverse series of adaptation workshops. Parks Stewardship Forum 36(1) 77 – 83. doi: 10.5070/P536146399.

Williamson, TB, Campagna, MA, Ogden, AE (2012) Adapting sustainable forest management to climate change: a framework for assessing vulnerability and mainstreaming adaptation into decision making. Canadian Council of Forest Ministers Climate Change Task Force. https://www.ccfm.org/pdf/WilliamsonVulnerability_Eng_Final.pdf

# Canadian Smoke Forum

By Jeff Eyamie
Theme Lead – Smoke Forum, Health Canada, jeff.eyamie@canada.ca

The third Canadian Smoke Forum was held in conjunction with the Wildland Fire Canada conference in November, and was the largest one yet.

We highlighted the latest in health research, forecast modelling, and new areas of research, like the development of filtration guidelines for health care facilities, the mental health impacts of a smoke event, and the assessment of wildfire smoke's impact on the Canadian economy, among many others.

After three Canadian Smoke Forums and a stand-alone Canadian Symposium on Wildfire Smoke Communication held in April of 2019, the national community of practice advancing the science of wildfire smoke in Canada continues to grow.

Emerging from the forum was a shared desire to formalize the community into some type of organization, to better position researchers and agencies working in this field to connect with the broader wildland fire research community in more meaningful ways.

A special thanks go out to the members of organizing committee for the third Canadian Smoke Forum: Ginny Marshall (CFS), Dr. Sarah Henderson (BC CDC), Didier Davignon (ECCC), and Brian Simpson (CFS). Extra special thanks to our session chairs as well!

# Wildland Fire Canada Conference 2019

By Mike Wotton
Co-chair, 2019 Wildland Fire Canada Conference

The 5th conference in the Wildland Fire Canada series was successfully held November 18-21, 2019 in Ottawa. The three day conference was attended by 375 registrants and was cohosted by the Ontario Ministry of Natural Resources and Forestry, and the Canadian Forest Service. There were over 140 presentations over the course of the main program, on themes that ranged from the processes that govern fire, to living and working with fire and to collaborative strategies and shared learning from recent fire seasons. This year the Smoke Forum, which has been a day-long event after previous Wildland Fire Canada conferences, was integrated throughout the main program as a separate theme. The overall theme of the conference was "New Paths, New Partnerships" and the location, in the Canada's capital, allowed the fire community to build new relationships with different groups outside the core of traditional operational fire management community.

The conference series began in 2010 in Kitchener, Ontario and subsequent events have been held in Alberta, Nova Scotia, and British Columbia. The next conference will be in Edmonton in fall 2021, and will be delivered in partnership with the International Association for Wildland Fire.

Wildland Fire Canada 2019

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# Supporting worker health and wellness through research:
# Ongoing initiatives in British Columbia involving wildland firefighting

By Natasha Broznitsky
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In 2019, the BC Wildfire Service (BCWS) joined Canada Wildfire as an Executive Member. At the time, the BCWS Research & Innovation (R&I) business area had only recently been created, and one of its first priorities was to determine how the BCWS should focus its research effort and funding. With input from other areas of the BCWS and relevant external groups, the R&I business area determined that there are four general areas of importance to the BCWS when it comes to research and innovation activities:

- wildland fire science
- wildfire management personnel health and wellness
- human factors in wildland fire
- innovative products, services and technologies

While there are initiatives underway in all four areas, and approximately half of BCWS R&I staff are devoted completely to the 'innovation' stream of this business area, wildland firefighter health and wellness has emerged as a top priority for the BCWS R&I business area. As such, much of the research that the BCWS is engaged in through Canada Wildfire focuses on health and wellness. Three projects are currently underway:

Image 1. Firefighters are fitted for N95 masks and dual cartridge respirators the night before data collection takes place. For this phase of the study, individuals with facial hair were excluded but efforts are being made to include them in the next phase of research, as they make up a large proportion of wildland firefighters (Image: BC Wildfire Service, Exposures in wildland fire study).

## Exploring the health impacts of occupational exposure to wildland fires for wildland firefighters and related personnel: a scoping review

*Dr. Chelsea Pelletier and Mike Eadie, University of Northern British Columbia*

The research landscape of wildland firefighter health has changed rapidly in recent years. In considering how to plan for effective worker health research, the BCWS saw an opportunity to both establish itself as a leader in wildland firefighter health research and to ensure future worker health research was prioritized effectively by partnering with the University of Northern British Columbia to conduct a scoping review.

This research consists of the following:

- looking holistically at the existing body of research and knowledge on wildfire management personnel health and wellness (including its physical, mental and emotional dimensions) by conducting a global literature scan
- conducting a survey of BCWS staff and key members of other groups and organizations to identify stakeholder research priorities

The outcome of this project will be the recommendation of a five-year research plan for the BCWS that takes the holistic occupational health of all BCWS staff into account. This project is expected to be completed in the fall of 2020.

The BCWS will share the results of this project, and of all other research, and hopes it will be valuable to other wildland fire agencies.

## Exposures in wildland fire

*Dr. Nicola Cherry, University of Alberta*

This project originated in Alberta as a partnership between the University of Alberta and the province of Alberta. The BCWS was excited for the opportunity to collaborate in this research by providing funding and access to a larger pool of participants.

This research aims to examine:

- whether wildland firefighters have more chronic lung disease than other people of the same age, gender and geographic location
- the nature and concentration of polycyclic aromatic hydrocarbons on the skin and in the breathing zone of wildland firefighters
- the acceptability and practicality of respiratory protective equipment and enhanced hygiene in limiting the exposure of polycyclic aromatic hydrocarbons

Some kinds of polycyclic aromatic hydrocarbons are known to be harmful to human health, but little research has occurred in a wildland fire-specific environment.

In the summer of 2019, the R&I business area facilitated sampling trips for members of Dr. Cherry's research team to collect data from wildland firefighters working on wildfires. The research team took skin wipes and urine samples before, immediately after, and the morning after firefighters had worked on a fire. Some firefighters wore an N-95 mask or a dual cartridge respirator and some carried a small vacuum pump to monitor the ambient air conditions. Half of the participating firefighters were asked to shower and change into clean clothes as soon as possible after the end of their shift. Results from this portion of the study are expected to be released in the spring of 2020.

This research also includes a data linkage component, which is currently underway. A questionnaire is being sent to all 2019 BCWS firefighters. If they choose to take part, they will answer a series of questions and agree to have their answers linked to a subset of their BCWS fire line records and to a subset of their public health records. By linking these pieces of information together, Dr. Cherry hopes to gain insight into the chronic disease rates of wildland firefighters.

The BCWS will continue to participate in the next phase of the study, the particulars of which are being discussed with the province of Alberta and Dr. Cherry. The next phase of the study will include further investigation into interventions that can limit firefighters' exposure.

Image 2: Chris Morgan (University of Alberta) takes skin wipe samples from a BCWS Columbia Unit Crew firefighter after finishing a day on the fireline. Post-shift skin wipe samples are compared to pre-shift skin wipe samples to determine if any of the polycyclic aromatic hydrocarbons that are being considered in this research have collected on the skin throughout the day. Skin wipes were taken from various locations, including the hands, back of neck, and chest. The research team also began to take skin wipes from the legs of some participants after being alerted by firefighters that this can be one of the most exposed areas due to airborne ash and dust (Image: BC Wildfire Service, Exposures in wildland fire study).

## Psychological health and safety in wildland firefighting

*Dr. Sandra Dorman and Dr. Caleb Leduc, Laurentian University's Centre for Research in Occupational Safety and Health (CROSH)*

Laurentian University' CROSH and the Ontario Aviation, Forest Fire and Emergency Services Branch (AFFES) have partnered on many health research initiatives and taken lead roles in contributing to the body of knowledge on wildland firefighter health knowledge. One of the products from their partnership has been the development of a psychosocial health program for the Ontario AFFES. This program was shown to be effective at educating staff on issues pertaining to psychological health and safety in the workplace, lowering most psychosocial risk scores and positively influencing the workplace culture around mental health.

The BCWS is contributing to the existing work completed by Ontario AFFES and Laurentian University' CROSH by providing funding for Laurentian University's CROSH to determine how to best implement a psychosocial health program for the BCWS that builds on the success of the program in Ontario.

This project intends to do the following:

- leverage the collective knowledge and expertise pertaining to both psychological health and safety and the process of wildland fire intervention program development to mobilize exiting knowledge and best practices from neighbouring jurisdictions and associated industries
- audit the psychosocial climate, including assessment of employee experiences and availability and evaluation of existing resources, supports and structures
- work with BCWS Organizational Development, Safety and Wellbeing, and Research and Innovation staff to determine how to best implement the findings of this project in the BCWS

This project is expected to be complete in the summer of 2020.

The BC Wildfire Service would like to thank those universities and wildland fire agencies that have collaborated with the BC Wildfire Service so far. They have been instrumental in supporting the BC Wildfire Service's strong start with Canada Wildfire. The BC Wildfire Service is interested in participating in research that has a nationally collaborative lens and is excited to partner with more universities and wildland fire agencies in the future.

Image 3: BCWS Unit Crew firefighter Tim Hildebrand pauses to take a radio call while hiking chainsaw gear up a long, steep hill. An important part of this research is to gain insight into what types of masks or respirators may be acceptable for use in wildland firefighting. While dual cartridge respirators such the one Tim is wearing protect against many types of contaminants, they are also more difficult to breath in, particularly when a worker is hiking in difficult terrain and are weighed down with as much gear as wildland firefighters often are (Image: BC Wildfire Service, Exposures in wildland fire study).

# Congratulations Brian!

Brian Wiens is joing the Canada Wildfire team as the Managing Director! Brian comes to Canada Wildfire after five years with the Canadian Forest Service(CFS) as the Director for Wildland Fire Science in the Northern Forestry Centre in Edmonton. His time in fire was first kindled during undergraduate summers at the Edmonton Depot of the Alberta Forest Service as a weather technician.

Brian Weins,
Managing Director, Canada Wildfire

After graduation from the University of Alberta he joined the Canadian Atmospheric Environment Service as an operational meteorologist and worked across Canada from Nova Scotia to the Yukon, and back to Edmonton. In 1995 he completed an MSc and spent a few more years in operational meteorology before moving to air quality science. This included work on smoke (both wildfire and agricultural burning), regional development and implementation of the Air Quality Health Index forecasting system, field sampling during the 2003 Fairholme range burn, and as co-PI on PrAIRie2005, an Edmonton based field campaign on air quality.

Over time, Brian oversaw the air quality science unit and then worked as the Chief of Prairie and Northern Science Division. As the manager for the Water Survey of Canada - Alberta office which included hydrometric monitoring during the 2013 flood, follow up repairs, and flood data analysis. His last stint at the Meteorological Service of Canada was as Associate Director/ Chief Meteorologist overseeing forecast operations for the four western provinces and all three territories.

At CFS, Brian managed the operation of the Canadian Wildland Information System and the research program at the Northern Forestry Centre. He was a member of the management and executive committees for the Canadian Interagency Forest Fire Centre and part of update of the strategic plan. As a member of the leadership team, Brian developed the proposals for investment in wildland fire science and operations delivered in Budget 2019 as part of Public Safety's Emergency Management Strategy. In this past year he led the rollout of that investment that adds 18 CFS staff for wildland fire science and programs, including the resources routed through NSERC to support a Strategic Network.

Brian is no stranger to Canada Wildfire as he has been one of the CFS representatives on the management committee over the past five years. And, the Canadian Smoke Newsletter (now the Canadian Wildland Fire and Smoke Newsletter) was launched and run by one of his colleagues during his time Environment and Climate Change Canada.

Brian lives in Edmonton in a home built with and for his family a dozen years ago and still loves to work on new building projects, small and large. He and his wife Kelly have three adult children and three small grandchildren. He is an active board member for the Kokopelli Choir Association and sings as a baritone in the Vacilando Choir.

## NEW PARTNERS AT CANADA WILDFIRE

Canada Wildfire is pleased to announce that Parks Canada and the Saskatchewan Public Safety Agency have joined the Partnership. We look forward to having both agencies on our Mangement Team, and supporting our mission.

Saskatchewan PUBLIC SAFETY AGENCY

Canada Wildfire

Canada

# Barriers to FireSmart Development: Social science project kicks off with province-wide surveys to municipalities

By Elise Gatti, PhD
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Recent wildfire-related disasters in Canada, Australia, and the U.S. have intensified interest in finding ways to bolster the resilience of communities at the Wildland-Urban Interface (WUI). The Human Dimensions of Hazards Research Group (HDHRG) at the University of Alberta is contributing to this effort by exploring the role of land use planning in fire-adapted communities in the Barriers to FireSmart Development Project. The 2-year research initiative, funded by an Alberta Agriculture and Forestry - Wildfire Management Science & Technology grant (2018) and with technical support from FireSmart Alberta, aims to shed light on how municipal governments are addressing wildfire hazards and risk through land use planning and related landscape measures. The research will also identify challenges to a land use approach to wildfire mitigation, and explore possible solutions to overcoming current barriers.

**Barriers to FireSmart Development**
**Human Dimensions of Hazards Research Group | University of Alberta**

**What is "FireSmart Development"?**

Wildland fires are a natural and necessary landscape process. Since 1991, FireSmart Canada has encouraged communities located at the WUI to become fire-adapted ("FireSmart") by proactively taking steps to address wildfire hazards and risk. FireSmart is based on a shared-responsibility model in which resilience can only be increased if governments, businesses, residents, and civic groups concurrently work together and take action in their relative domains of influence. In order to be "FireSmart", a community will engage in the seven FireSmart disciplines: Education, Emergency Planning, Interagency Cooperation, Cross-Training, Vegetation Management, Planning, and Development (FireSmart, 2020). When it comes to the concept of "FireSmart development", FireSmart recognizes that wildland fuels combine with built fuels (e.g., homes and other structures) to create a WUI fuel complex. The ignition of built structures is substantially determined by their location, design, and materials, all of which can be influenced through land use planning and development standards.

In Canada, municipal land use planning is the responsibility of local governments. Municipalities can use land use bylaws, statutory plans, and development standards to specify where and how development occurs, including where specific human activities are allowed. Communities can use these planning tools to "build in resilience" by, for example, excluding certain uses from high-risk areas; requiring setbacks between structures and wildland fuels; regulating density; and requiring that road network design facilitate emergency evacuation and fire-fighting access. Because building codes are provincially regulated, municipalities cannot set architectural standards for private buildings. They can, however, lead by example by adopting a policy to use fire-resistant design and materials for all municipal buildings.

**A Need for Research on the Canadian Context**

While a land use planning approach to wildfire mitigation has been shown to be effective at limiting impacts, as well as being cost-effective (Berke et al., 2015; Browne & Minnery, 2015; MMC, 2018), the extent to which WUI municipalities in Canada are integrating wildfire mitigation into their planning policies—and whether or not they are facing barriers— is unknown. Research

on municipal government wildfire mitigation programs, policies, and activities in Canada is lacking (McGee et al., 2009), as is general research on barriers to a land use approach to wildfire mitigation (Gatti et al., 2019). However, limited available evidence suggests that planning and development tools are underused by municipalities in Western Canada, as well as in other countries with similar planning regimes (deScally et al., 2018; Harris et al., 2011; Mockrin et al., 2018; Muller & Schulte, 2011). The research being conducted at the University of Alberta addresses these research gaps.

**Barriers to FireSmart Development Project**

The purpose of the Barriers to FireSmart Development Project is two-fold: 1) To provide baseline data about the use of municipal planning tools for wildfire mitigation in Alberta; and 2) to identify and explore constraints that prevent municipalities from using these tools. To this effect, researchers recently distributed an online questionnaire to municipal planners working in municipalities across Alberta. The survey will be used to assess how municipalities are addressing potential wildfire hazards and risk through land use planning, as well as to identify barriers. The survey will also collect planners' perceptions and experiences about wildfire risk and planning. A second online questionnaire will be distributed this summer to fire chiefs across Alberta. The survey will collect data about vegetation management on municipal property, as well as fire chiefs' experiences with the Forest Resource Improvement Association of Alberta (FRIAA) FireSmart program.

The results of these studies will inform the design of the next phase of research, which will focus on barriers to a land use approach to wildfire mitigation in Alberta. Researchers will use semi-structured interviews with key informants from municipalities across Alberta, as well as government and industry. The project runs until March 2021.

To learn more about the Barriers to FireSmart Development Project, visit www.eas.ualberta.ca/wildfire. To learn more about FireSmart Canada, visit www.firesmartcanada.ca.

**References**

Berke, P., Newman, G., Lee, J., Combs, T., Combs, T., Kolosna, C., & Salvesen, D. (2015). Evaluation of networks of plans and vulnerability to hazards and climate change: A resilience scorecard. Journal of the American Planning Association, 81(4), 287-302. doi:10.1080/01944363.2015.1093954

Browne, E., & Minnery, J. (2015). Bushfires and land use planning in peri-urban South East Queensland. Australian Planner, 52(3), 219-228. doi:10.1080/07293682.2015.1040425

de Scally, D. G., de Scally, F. A., & Senese, D. M. (2018). Reduction of wildland-urban-interface fire risk in Kelowna, Canada. Western Geography, 12, 12-35.

FireSmart Canada. (2020). Seven FireSmart disciplines. Retrieved from https://firesmartcanada.ca/what-is-firesmart/understanding-firesmart/seven-firesmart-disciplines/

Gatti, E., McGee, T., & Yusefi, S. (2019, November 18–21). Barriers to the adoption of land use planning and development wildfire mitigation measures. Wildland Fire Canada 2019, Ottawa, Canada.

Harris, L. M., McGee, T. K., & McFarlane, B. L. (2011). Implementation of wildfire risk management by local governments in Alberta, Canada. Journal of Environmental Planning and Management, 54(4), 457-475. doi:10.1080/09640568.2010.515881

Mockrin, M. H., Fishler, H. K., & Stewart, S. I. (2018). Does wildfire open a policy window? Local government and community adaptation after fire in the United States. Environmental Management, 62(2), 210-228. doi:10.1007/s00267-018-1030-9

Multihazard Mitigation Council. (2018). Natural hazard mitigation saves: 2018 interim report. Washington, DC: National Institute of Building Sciences. Retrieved from www.nibs.org

Muller, B., & Schulte, S. (2011). Governing wildfire risks: what shapes county hazard mitigation programs? Journal of Planning Education & Research, 31(1), 60-73. doi:10.1177/0739456X10395895

Canada Wildfire

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EDITORS: Mike Flannigan and Renée Beaulac
VISIT CANADAWILDFIRE.ORG FOR MORE INFO

# A NEW VISION FOR THE CIFFC FIRE SCIENCE COMMITTEE

By Maria Sharpe, MSc RPF
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The Canadian Interagency Forest Fire Centre (CIFFC) is currently exploring the potential for expanding its mandate towards a common understanding and need for an integrated wildfire management system in Canada*. The CIFFC Fire Science Committee is following suit through a collective desire to strengthen our role in the Canadian wildland fire research community. The core committee consists of representatives from CIFFC members (provincial and territorial fire management agencies, Parks Canada and the Canadian Forest Service) in addition to our highly valued non-core membership representing academia, Canada Wildfire and most recently FPInnovations and the Alaska Fire Science Consortium. We bridge the perceived gap between wildland fire research and operations with many of our members filling operational fire management roles within their agency in addition to contributing and, in some cases, leading their agency science and technology programs. We are driven to uncover, expand and access research as it relates to wildland fire management. Our committee gathered in conjunction with Wildland Fire Canada 2019 for a rebranding exercise where we created our new Vision and Mission Statement:


With our vision and mission complete, the focus for the next couple of months will shift towards the creation of our committee goals and actions. Here are some of the committee's initial thoughts:


Be sure to check out the next Canada Wildland Fire and Smoke Newsletter for a window into the ACTIONS we plan to take to achieve our MISSION. For further details about CIFFC, check out our new website www.ciffc.ca.
*see the Fall 2019 Canadian Wildland Fire and Smoke newsletter for details on the CIFFC Strategic Plan.

# A New Reality: Fire Management and the COVID-19 Pandemic

By Mike Flannigan and Renée Beaulac
Editors, Canadian Wildland Fire and Smoke Newsletter

Our fire season has started across Canada and things are very different this year. The world has changed dramatically in the last few months with the COVID-19 pandemic, almost everything has changed and that includes wildland fire. The implications for wildland fire are numerous, from training, to preparedness, to response (crews, fire camps etc.) and evacuations. A few examples include remote delivery of some training (due to social/ physical distancing), hiring more staff to compensate for potential COVID-19 interruptions and even how crews eat their meals has changed from group meals to service that is more like a take-out service.

One silver lining in a dark pandemic cloud is that with people staying at home during the spring fire season, which is typically driven by human-caused fires, it may be quieter than normal. Thus far it has been a quiet start to the fire season except for parts of Eastern Canada that has had some hot and dry conditions.

There is a lot of uncertainty right now and no one knows for sure what the future holds. However, we are confident that if your community is threatened by wildland fire your fire agencies will be there to help.

Image 1. Fire crews in Swan Hills social distancing during lunch (Image: Alberta Wildfire).