# Canadian Wildland Fire & Smoke Newsletter

**Spring 2018**

"Connecting diverse wildland fire, emissions, air quality and modelling communities."

Welcome to the Spring Issue of the Canadian Wildland Fire and Smoke Newsletter. The first order of business this issue is to recognize and pay tribute to the founder of the Canadian Smoke Newsletter which morphed into the newsletter you are reading today.

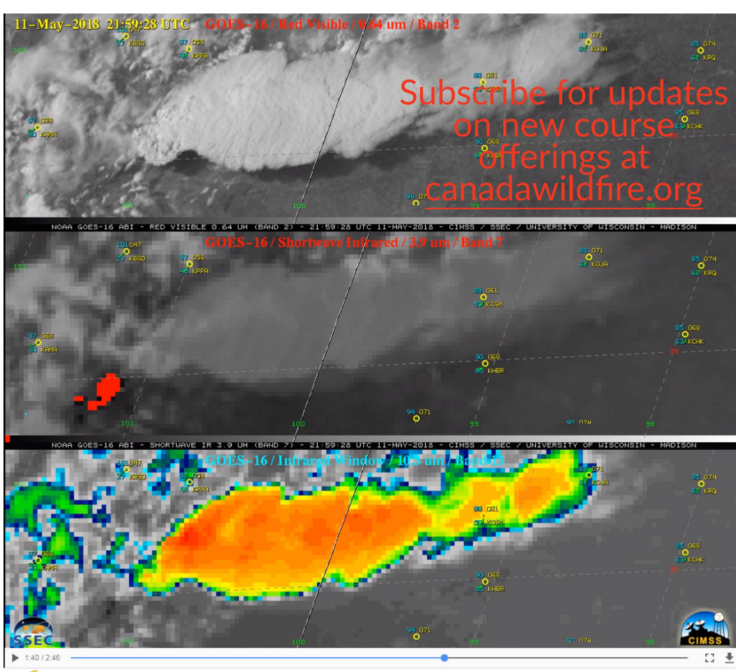
After nearly 30 years of service, Al Pankratz retired from the Meteorological Service of Canada (MSC) in November 2017. Al began his career with MSC in the early 1980s. He graduated from the then MSC Weather Observer and Briefer Training programs at the Transport Canada Training Institute in Cornwall, and as a weather observer and briefer had the opportunity to travel to many interesting places and form friendships with many people. Night shifts at weather offices in Edson, Fort Reliance (NWT), Edmonton Municipal, Calgary International, Lethbridge and the Alberta Weather Centre left an indelible impression. Al took educational leave to obtain a special certificate in meteorology at the University of Alberta in Edmonton and then followed that up with forecaster training in Downsview, Ontario. Al did two stints as a meteorologist at the Arctic Weather Centre, worked as the base met instructor at CFB Moose Jaw for two years and forecasted for the Canadian military at CFFC Edmonton (Namao). He quit MSC in 1998 and then rejoined MSC in 2004 in the Edmonton air quality section. Most of his time since then was spent working on air quality data and on smoke issues and smoke prediction. As a result, his circle of friends and acquaintances grew to include scientists from the Canadian Forest Service, Europe, the US, University of British Columbia, the University of Alberta and various provincial governments.

Al was the editor and the force behind the Canadian Smoke Newsletter beginning in Spring 2008 until recently when it became this Newsletter. Past issues of the Canadian Smoke Newsletter are available at https://www.canadawildfire.org/older-issues.

We wish Al the best in his retirement.

## NEW COURSE NOTICE:

## Remote Sensing in Wildland Fire

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## What's on tap for the 2018 wildfire season?

*by Mike Flannigan, Director, Canadian Partnership for Wildland Fire Science, Edmonton, Alberta, flanniga@ualberta.ca*

As winter finally relaxes its icy grip on Canada we start thinking about the upcoming wildfire season. Will we have another record breaking fire season in BC? Will there be another Fort McMurray fire this year? Will it be a quiet year given all the snow this winter and the cold and wet spring thus far? Good questions all. I am not sure what the 2018 fire season will bring as it depends on the day-to-day weather (read hot, dry and windy) during the fire season. Though, I can tell you that a cold and wet winter and/or spring has virtually no impact on the fire season. Recall last year, flooding in BC in the spring followed by a summer of fire and smoke. You only need a few hot, dry and windy days to generate a raging inferno regardless of how cold and wet it was prior to those hot, dry and windy days. Will a community be impacted by wildfire this year – likely, at least to some extent.

**Photo by mike Flannigan. Elephant Hill wildfire near Ashcroft, BC, 2017.**

How can we manage wildfire to reduce the risk of significant impacts on society? Canadian fire management agencies are among the best in the world but wildfires are increasing as well as their associated impacts as the climate changes and as more development occurs in our forests and wildlands. One area where Canada is failing miserably is research funding, development and innovation. Most notably, the federal effort is lacking and the worst offender is the National Science and Engineering Research Council (NSERC). Other countries such as the USA, Australia, Sweden and Portugal have responded to catastrophic wildfire seasons with dedicated or targeted funding programs for wildfire research as the more we know about wildfire the better prepared we can be for the next catastrophic fire season. There are many avenues of research and innovation that can help fire management agencies. For example, machine learning (Artificial Intelligence) is already showing promise in forecasting extreme fire weather events in the development of an early warning system. Additionally, Canada has one of the best wildfire decision supports systems in the world but parts of the system are over 40 years old and require updating.

Wildfire is a serious problem in Canada. Social and economic impacts are huge and growing. The trauma of losing your home to wildfire can be significant and long lasting. Severe wildfire outbreaks have caused drops in our National GDP in 2011 and 2016 due to shutdowns in the natural resource sector. And then there is the Fort McMurray fire, the costliest natural disaster in Canadian history with insurable losses near $4 billion. How many more bad fire seasons do we have to have before we actually address the pressing research needs but instead funding agencies like NSERC fiddles while Canada burns.

Regardless of what the future brings in terms of climate change or wildfire research and development, we will have to learn to live with wildfire. Wildfire has three ingredients, fuels, ignitions and the hot, dry and windy weather and I see all three at work in the future. Bottom line, we can expect wildfire and society to continue to intersect with disastrous results. However, there are things we can do to make our communities more fire resilient and reduce the likelihood of a catastrophic fire. Fire management needs to allow fire mangers the flexibility to decide where to limit or allow area burned according to the specifics of each fire. Ontario has adopted this approach known as 'Appropriate Response'. This Appropriate Response will allow fire back on the landscape as a patchwork of recently burned areas that are less likely to burn and reduce the likelihood of those large catastrophic fires. To meet the needs of the future we need to conduct research, develop and enhance fire management tools and systems to minimize the impact of unwanted fires.

*Modified from opinion piece published in the Calgary Herald May 5, 2018*


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## Pelican Mountain FireSmart Fuel Management Research Site

*by Dave Schroeder, Prescribed Fire Program Coordinator, Wildfire Fire Management Branch, Alberta Agriculture and Forestry, Alberta, dave.schroeder@gov.ab.ca*

### Background

In 2011, two of the three wildfires in the Flattop wildfire complex burned into communities in the Lesser Slave Lake area of Alberta, including the Town of Slave Lake, resulting in a large evacuation and destruction of homes and other buildings. The Ministry of Agriculture and Forestry (known then as Environment and Sustainable Resource Development) commissioned an external review of the wildfires and the department's response. The review provided 21 recommendations, which included recommendations to improve and expand fuel management treatments (Flat Top Complex Wildfire Review Committee, 2012). The Ministry has responded to all of the recommendations of the report (http://wildfire.alberta.ca/resources/reviews/2011-flat-top-complex.aspx). One of the initiatives is to gain a better understanding of the effectiveness and potential for vegetation management as a means to mitigate impact of future wildfires.

In Canada, the FireSmart program incorporates seven disciplines to mitigate wildfire impacts including vegetation management (Partners in Protection, 2003). Typically, the objective of vegetation management is to modify vegetation so that wildfire suppression can be more effective and first responders have a safe area to work in (defendable space). Except for complete vegetation removal, most vegetation management treatments aim to limit wildfire intensity, rate of spread, and production of flying embers, but are not expected to stop a wildfire without suppression. There are multiple vegetation management tactics available to wildfire managers including removal, displacement, conversion, and isolation (Agee and Skinner, 2005). The use of a particular treatment may depend on available funding, community benefits/desires such as training and employment, type of vegetation, terrain and access. The FireSmart program also advocates different levels of vegetation management based on proximity to buildings (Partners in Protection, 2003). The Flat Top Complex Wildfire review specifically indicated that more research was needed to better understand FireSmart fuel treatment effectiveness.

### Establishing the site

The Wildfire Management Branch of Agriculture and Forestry, along with its research partners and the Bigstone Cree First Nation, are undertaking a number of projects aimed at assessing how vegetation is changed following the treatment of black spruce and to understand the resources required to conduct those treatments. Ongoing projects include a vegetative fuel inventory sampling program and a series of equipment productivity tests (http://wildfire.fpinnovations.ca/Research/ProjectPage.aspx?ProjectNo=155). A research prescribed fire was done in 2015 where a crown fire was ignited upwind of two vegetation management treatments (Red Earth Fuels Engineering Evaluation Project, Hvenegaard et al, 2016). Results indicated strip mulching had a negligible effect on reducing crown fire potential, and individual stem retention following mulching was inconclusive in reducing the crown fire potential due to interaction with the strip mulch treatment. In response to the results, Wildfire Management Branch staff determined that a broader FireSmart fuel management research program was needed. The Wildfire Management Branch established the Pelican Mountain FireSmart Fuel Management Research Site in 2015 with the following goal:

To confirm if fuel management treatments in black spruce stands can meet the following criteria when subjected to extreme wildfire behaviour conditions:

1. Decrease Head Fire Intensity to allow for successful suppression by air and ground crews or pre-established suppressants (sprinkler, ground based retardant);
2. Limit the potential for crown fire development resulting from ignition within a treated area;
3. Test new techniques so that the criteria 1 and/or 2 can be met.

The site offers potential to do fuel management and baseline wildfire research. In addition to the focus on black spruce stands, projects including boreal mixedwood wildfire behaviour and aspen logging debris wildfire behaviour have been established.

The Pelican Mountain site is located near the community of Sandy Lake in central Alberta (Figure 1). The predominant tree cover within the site is black spruce, with the exception of the northeast corner which contains several aspen and mixedwood stands. An all-weather forestry road lies adjacent to the south perimeter of the site, providing good year round access.

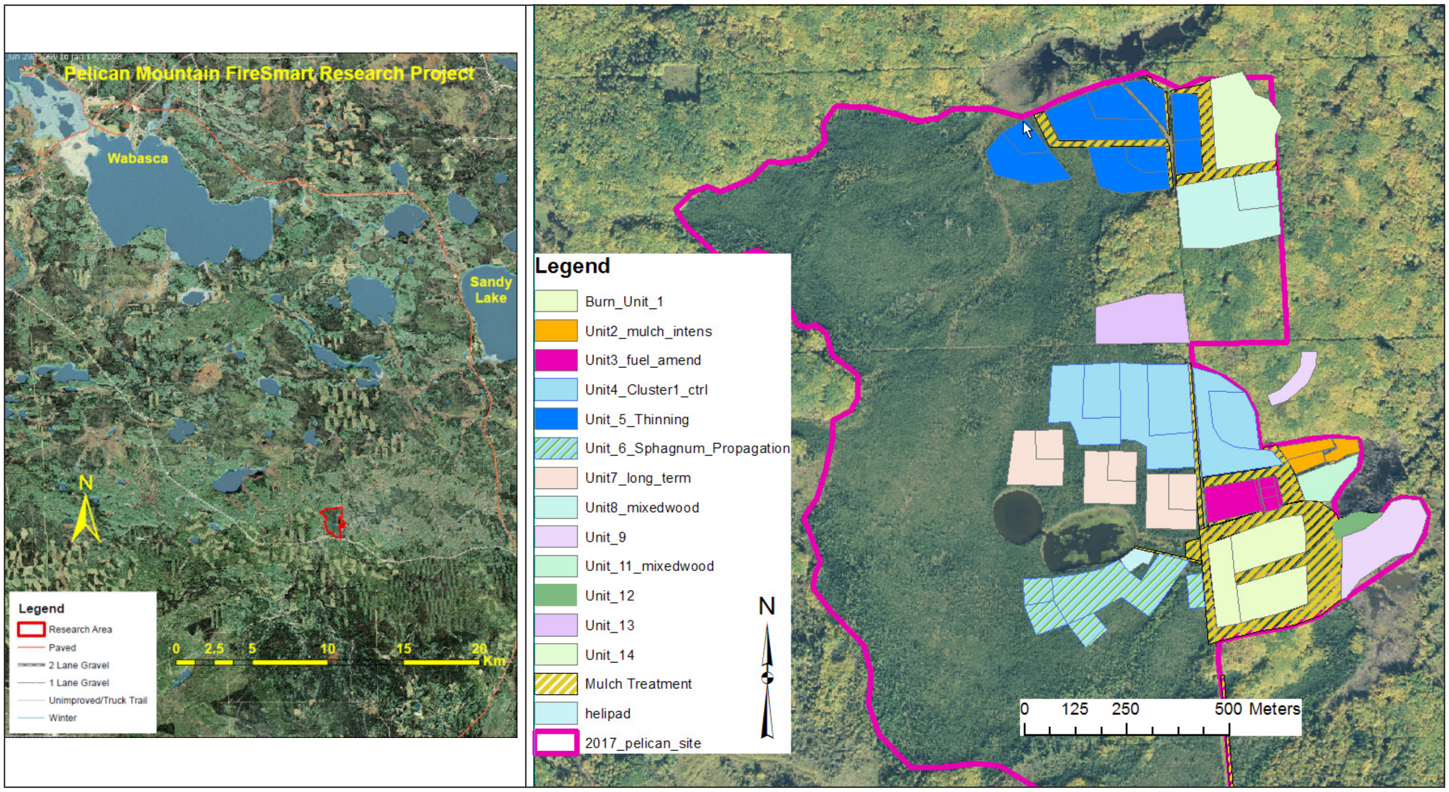


**Figure 1. Pelican Mountain research site location. The close up image shows the Unit 1 burn in the southeast corner of the site. Other research units are being prepared or are in the planning phase.**

## Research at the site can be grouped into several themes:

- Current fuel treatments (wildfire behaviour, vegetation dynamics)
- New fuel management techniques (less-flammable species propagation, black spruce fuel amendment)
- Economics (productivity, human factors such as aesthetics)
- Baseline wildfire behaviour (mulch fuel, boreal mixedwood fuel type, logging debris following the 2017 Debris Management Standards for Timber Harvest Operations)

## Current fuel treatments

The approach for the research prescribed fires is to ignite a crown fire upwind of the treated area(s) and allow the fire to burn into the treated stands without any suppression effort. These prescribed fires will be ignited during fire weather conditions conducive to generating a vigorous crown fire in black spruce stands.

The fuel management treatments being evaluated initially are those most commonly used to date and advocated by FireSmart Canada. The common tactic is to reduce canopy and surface fuel biomass by removal or displacement , thereby reducing the likelihood of crown fire. Fuel removal is generally done by manually cutting stems, pruning residual stems, and then piling and burning the biomass on-site. Displacement is done by masticating or mulching standing stems and coarse woody material. Mulching is effective at reducing canopy biomass, but does result in increased flammable vegetation on the forest floor. This is more cost effective than manual removal, and wildfire managers deal with potentially intense surface wildfire as a trade off to having crown fire.

Two research units are ready for prescribed fires in 2018. Unit 1 has two treatments (Figure 2). A single prescribed fire will be ignited in a natural stand approximately 50 metres upwind of the treatments. A 30 metre clearing between the treatments will be covered with long term wildfire retardant to limit potential for wildfire interaction between the treatments. Unit 5 has one manual thin/prune/pile burn treatment and will be used as an alternate for Unit 1 depending on wind direction.

The longevity of the effectiveness of vegetation management treatments and the timing of maintenance work is a common question of practitioners.

**Figure 2. Unit 1 treatment comparison. Mulch/prune/thin on the left and manual thin/prune/pile/burn on the right. Note: several piles on the right have subsequently been burned.**

Three research units will undergo treatments at staggered intervals, and then all three units will be burned in approximately 15 years.

As noted, mulching rearranges fuel, but does not remove it. A completely mulched area cannot support a crown fire but may still pose suppression challenges. Research prescribed fires in mulch will provide baseline rate of spread and head fire intensity data that can be related to suppression capability. The research will also attempt to evaluate how wildfire behaviour is affected by variability within mulched fuel.

How does the amount or intensity of mulching affect wildfire behaviour? Is there a benefit to having the material shred into fine pieces, or mixed in with duff, and could this benefit offset the cost of doing more intensive mulching? When treating research Unit 2, one block was mulched using the standard level of mulching; a second block was mulched with minimal mulching (enough to knock down trees and vertical branches); and in the third block, the mulcher operator made several extra passes. Simultaneous line ignitions will be used to compare relative spread rate and wildfire intensity, factored against the time needed by the mulcher to complete the treatment.

A second project is studying the decomposition rate of mulched vegetation. It is expected that mulch flammability will change through time due to decomposition. Older, more decomposed mulch should result in lower rates of spread and head fire intensity relative to recently created mulch.

## New fuel management techniques

*Promoting less flammable species.*

The 2015 research prescribed fire (Hvenegaard et al, 2016) led to questions about additional tactics that could enhance current vegetation management practices. It was observed that parts of the natural and treated stands contained fairly abundant amounts of Sphagnum moss that remained unburned after experiencing a crown fire. The Sphagnum moss was most abundant where there was sufficient sunlight as this species is shade intolerant. An outcome of many vegetation management practices is that the amount of sunlight reaching the forest floor is increased. Peatland researchers from McMaster University who participated in the 2015 research prescribed fire suggested that Sphagnum moss could be propagated through a variety of techniques, which will be tested, in part, at the Pelican Mountain site.

A second project will study the potential for growing Tamarack in upland black spruce stands. Tamarack is a deciduous conifer with higher needle moisture content similar to leaves on deciduous trees like aspen versus low needle moisture content such as Black Spruce. Tamarack is shade intolerant but otherwise capable of growing on a variety of sites, mulch being an unknown. This project will have two components. First, it will seek to define where and how Tamarack can best be propagated as a replacement for black spruce. The second will assess the flammability of Tamarack and compare it with that of Black Spruce.

*Irregular mulch patterns*

Irregular treatment patterns may be more aesthetically appealing compared to thinning, or linear or grid mulch patterns. Some biologists advocate limited lines of sight to benefit wildlife (minimize hunting and predation opportunities). Research Unit 4 is an irregular patterned mulch treatment that is a combination of corridors and larger openings. Approximately 50% of the treated area has been mulched (Figure 3), emphasizing existing natural openings and areas of lower tree density. Research Unit 4 is ready for a 2018 prescribed fire using the same approach as for Units 1 and 5.

*Fuel amendment*

Removing black spruce fuel hazard may be desirable at a landscape scale. In these cases a different approach from wildland urban interface treatments may be appropriate. For example, aesthetics may be less important than treatment cost. The most effective way to remove black spruce fuel is to use prescribed fire; however, containment likelihood is low under conditions favourable for crown fires, so this is not an acceptable method in many situations. Alternatively, increasing the flammability of the fuel by changing its structure, can allow prescribed fires when wildfire danger is low. Alberta's Wildfire Management Branch refers to this approach as 'fuel amendment', where vegetation is made to be more volatile so it can be burned at lower wildfire danger, ensuring containment. In the case of black spruce, the objective is to consume as much fine canopy fuel (needles and lichen) during conditions when wildfire would otherwise spread very slowly in black spruce and the crowns not affected the wildfire. Mechanical and manual tactics to amend vegetation will be evaluated.

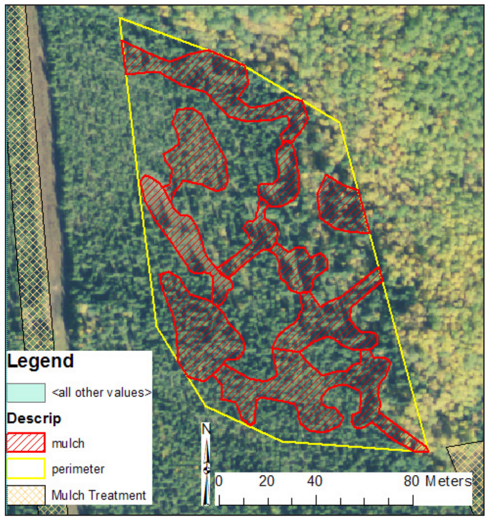


**Figure 3. Irregular mulch pattern treatment for Unit 4.**

## Economics

Vegetation management treatments can be very costly and may range from $5,000 to $10,000 per hectare depending on the techniques used, site conditions, treatment prescription and other factors. To date, there is limited data on crew and equipment productivity to do treatments so it makes sense to collect this data during the preparation of each research project being done at the site. Data collected to document wildfire behaviour, such as tree density and canopy fuel weight will also benefit productivity studies.

## Baseline wildfire behaviour

The Canadian Forest Fire Danger Rating System uses 16 fixed fuel types for its Fire Behavior Prediction System (FBP; Forestry Canada Fire Danger Group, 1992). The FBP models are limited to natural stands and in some cases supported by limited data points. The Pelican Mountain site offers opportunities to generate baseline wildfire behaviour data for existing and new fuel types. Plans are in place to conduct research prescribed fires in mixedwood, mulch, and aspen debris fuel types.

## Support for wildfire growth models and decision support tools

Research prescribed fires are risky, time consuming and expensive. One way to extend their value is to use wildfire behaviour simulation models that allow the treatment to be re-burned under a wide range of weather and fuel moisture conditions. The members of the Canadian Partnership for Wildland Fire Science are working with Los Alamos National Laboratory to use the FIRETEC model to do this type of work (Darwent, R., Ed., 2016). The project team is using the 2015 research wildfire to begin this modelling process, and results from wildfires at Pelican Mountain will contribute to the project. Use of the model can also help wildfire managers understand how a variety of irregular mulch patterns or vegetation dynamics following treatments could affect wildfire behaviour.

How does the knowledge generated get into the hands of practitioners? As the research fires, model runs and other experiments are completed, reports and presentations will be done by the Ministry of Agriculture and Forestry and research partners. As well, the Ministry and research partners (FPInnovations and the Canadian Partnership for Wildland Fire Science) are in the initial phase of building a stand level vegetation hazard reduction decision support system. This system will be designed to use existing data and incorporate new data as research wildfires are completed.

## Partnerships

Development of the site and the research is a partnership amongst many groups. At present, Agriculture and Forestry is partnering with:




- Alberta Pacific Forest Industries
- Bigstone Cree First Nation
- Canadian Partnership for Wildland Fire Science (Alberta Ministry of Agriculture and Forestry, University of Alberta, Canadian Forest Service)
- FireSmart Canada
- FPInnovations
- Los Alamos National Laboratory
- McMaster University
- University of Toronto

### Contact

The Pelican Mountain site is anticipated to be in use for at least 15 years and can provide opportunities for other research. For additional information about the projects contact Dave Schroeder at the Ministry of Agriculture and Forestry (dave.schroeder@gov.ab.ca) in Alberta.

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# Current research on Canada's interface areas

*by Lynn M. Johnston, Forest Fire Research Specialist, Canadian Forest Services, Great Lakes Forestry Centre, Sault Ste. Marie, Ontario, lynn.johnston@canada.ca*

## Background

Canadian wildfire disasters in recent history such as Slave Lake (2011) and Fort McMurray (2016) are examples of the destructive power of wildfires to values. Fires that have the potential to cause this kind of destruction are referred to as "interface" fires (Figure 1). The wildland-urban interface (WUI), is where homes or other human-built structures meet with or intermingle amongst burnable wildland fuels (Figure 2). Fire management agencies actively mitigate and suppress fire in these interface areas in order to protect human life and structural values. For effective fire management in the interface, we need information such as what areas are at risk.

**Figure 1: 2017 Wildland fire near a community airport. Photo credit: Government of the Northwest Territories.**

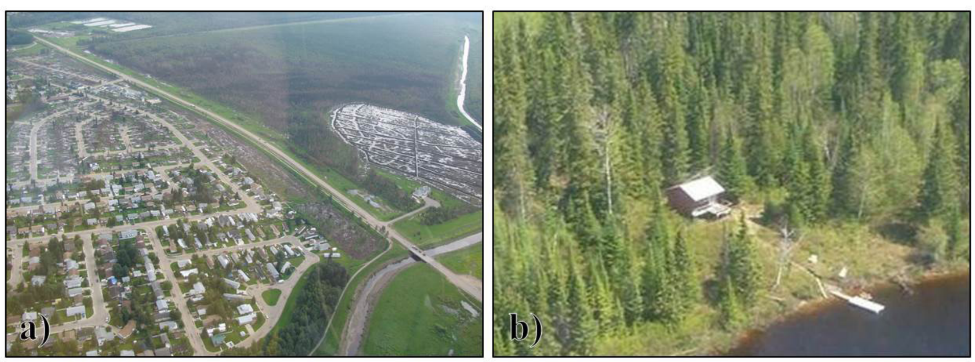


**Figure 2: Photos showing typical wildland-urban interface areas, with a) showing a community bordering a forested area, and b) showing an isolated cabin amongst a forested area. Photo credit: Mike Flannigan / University of Alberta (a), Jeremy Johnston / Ontario Ministry of Natural Resources and Forestry (b).**

In Canada, a national examination of risk is not currently available and represents a large gap in wildfire research. The WUI has been mapped and studied in other areas of the world, with many studies also quantifying interface fire risk (e.g. Radeloff et al. 2005; Theobald and Romme 2007; Vadrevu et al. 2010; Haas et al. 2013; Chuvieco et al. 2014; Thomas and Butry 2014; Fox et al. 2015; Radeloff et al. 2018). However, in Canada there is very limited information on this topic.

## Current Research

The objective of this project is to map the interface areas of Canada that are at risk to wildland fires. There are two main components to this project: 1) mapping interface areas and 2) quantitatively assessing the amount of fire risk in those interface areas.

Part one of this project is complete (Johnston and Flannigan 2018); it resulted in the production of the first national map of the interface in Canada (Figure 3a). This map includes the more traditional interface of wildland fuels with homes, commercial buildings, and public structures, forming the wildland-urban interface (WUI; Figure 3b). The interface concept was also extended to industrial (e.g. oil and gas or mining structures; Figure 3c) and infrastructure (e.g. roads, railways, powerlines; Figure 3d) areas to provide a more comprehensive view of potential impacts to human-built structures and essential infrastructure. Nationally, these maps show that Canada has 32.3 million ha of WUI (3.8% of total national land area), 10.5 million ha of wildland-industrial interface (1.2%), and 109.8 million ha of

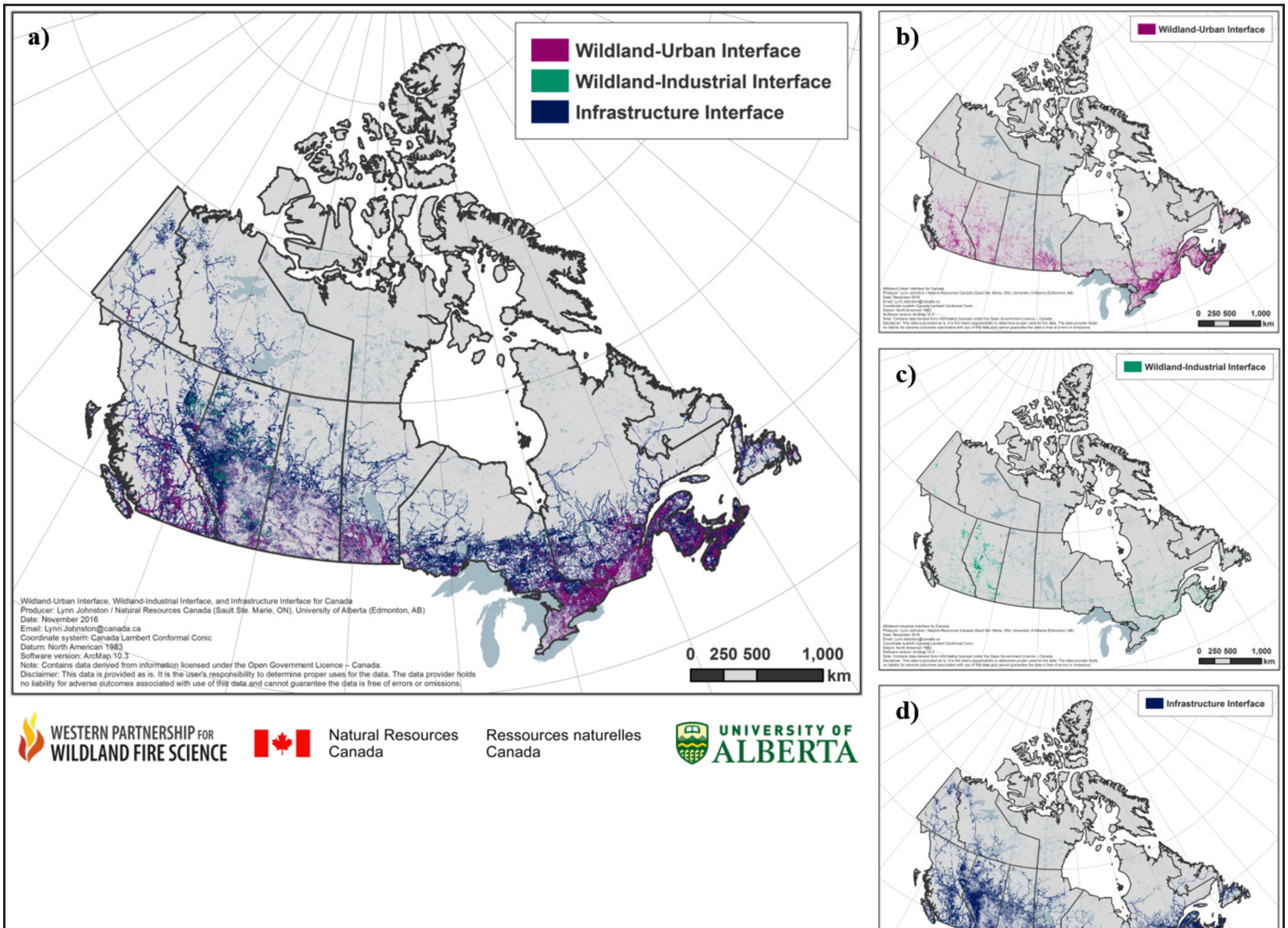


**Figure 3: Canadian national interface maps, with a) showing all three interface "types" together, b) showing the wildland-urban interface (WUI), c) showing the wildland-industrial interface, and d) showing the infrastructure interface.**

infrastructure interface (13.0%). This is a widespread issue affecting large areas of Canada. Overall, 60% of all cities, towns, settlements, and reservations across Canada were found to have a significant amount of WUI (defined as those with more than 500 ha of WUI within a 5 km radius; shown in purple in Figure 4). There have been many recent fires near or within the interface areas; 40% of recent fires would be considered an "interface fire". Further research is planned for a detailed analysis of fire activity within these interface areas to characterize things such as the fire intensity, seasonality, and ignition sources within interface areas. Upcoming research using these maps will investigate recent growth patterns in the interface and will also look at future prediction of interface areas. For more information on the production and initial analysis of these maps, see Johnston and Flannigan (2018).

With the baseline map of current interface areas complete, the second main component of this project will aim to assess the fire risk within interface areas. Maps of the interface may imply that there is a fire risk, but a map of the interface alone is not a proxy for risk. Mapping the interface is the first step in assessing interface fire risk and provides the locations of where fire risk to interface areas may be possible (i.e. where wildland fuels and human-built structures intermix or meet). A multitude of additional factors need to be considered to fully quantify risk. Fire risk is inconsistently defined in wildfire literature, but the traditional natural hazards risk definition assesses fire risk as the conditional probability


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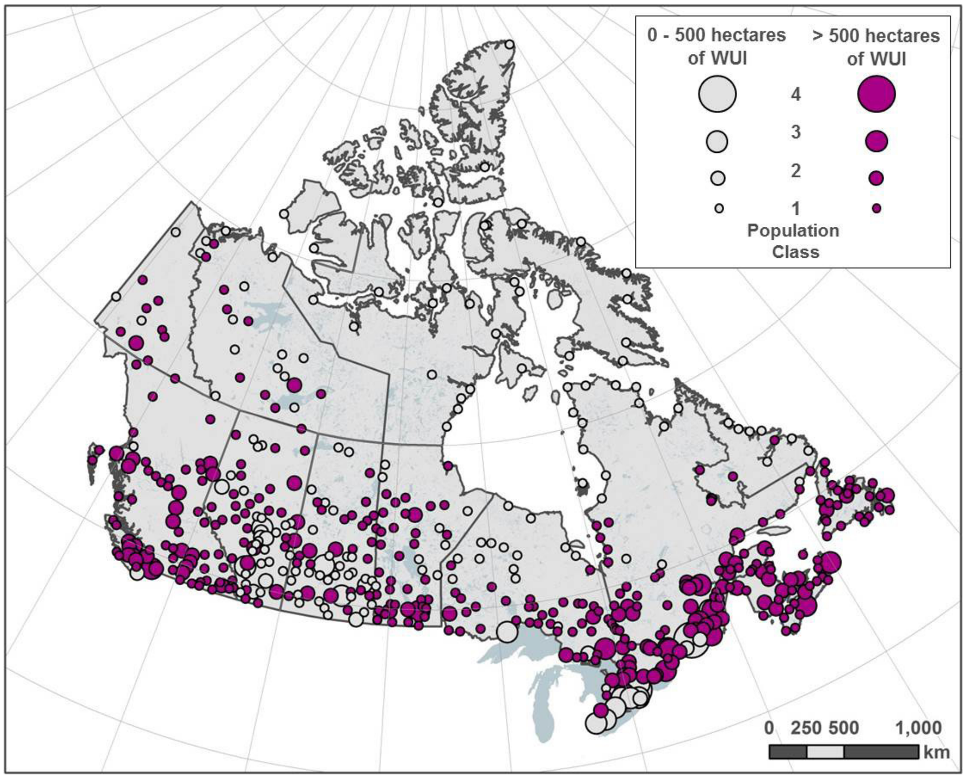


**Figure 4. Map of "Populated Places" by relative population size ("Population Class" 4 = population of over 1 000 000, 3 = 100 000 – 999 999, 2 = 10 000 – 99 999, 1 = 1– 9 999) in Canada; points shown in purple indicate a substantial amount of wildland-urban interface (WUI; > 500 hectares) and points in grey indicate very little (possibly zero) WUI (0 – 500 hectares).**

of an event occurring multiplied by the expected consequence when the event occurs (Finney 2005; Hardy 2005; Thompson et al. 2011; Haas et al. 2013; Miller and Ager 2013; Chuvieco et al. 2014). We can further refine the definition of fire risk to the function of likelihood, intensity, and effects (e.g. Thompson and Calkin 2011; Miller and Ager 2013). Assessment of these three risk components can use variety of potential approaches and quickly develops into a complex paradigm with many elements, as visualized in the word cloud in Figure 5.

## Conclusion

The results of this project will be useful for further research related to fire risk and begins to addresses a large gap in our knowledge base. There are also many potential practical applications of this study, including fire insurance, municipal planning, fire suppression, values protection, fuel management, and forestry.


**Figure 5. Word cloud of terms related to fire risk.**

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## Windrow burning in aspen - can we shift burning to the fire season?

*By Greg Baxter, Researcher, FPInnovations, Edmonton, Alberta, greg.baxter@fpinnovations.ca*

Northwestern Alberta has been a focal point for agricultural expansion for many years. More recently, accelerated lands sales have led to the clearing of large tracks of land and significant burning projects, aimed at preparing the land for agricultural use. Given the requirement for land owners to have burning permits during "Fire Season" (March 1st – October 31st) and the risks involved in large scale burning during fire season, sites are often differed to time frames outside the established fire season. Although windrow burning outside of fire season often poses less risk to fire escape, other issues can result in public safety concerns e.g. smoke, which can increase the potential for health issues and traffic accidents. Given these concerns local forestry and municipal authorities have engaged in discussions aimed at identifying potential burning options. The scale of the burning is large, thousands of hectares have been cleared and windrows of one kilometer in length are common.

Alberta Agriculture and Forestry (AAF) has engaged FPInnovations to conduct a windrow burning project aimed at identifying potential scenarios under which windrow burning could be conducted safely during fire season. To accomplish this, three factors need to be considered:

- Moisture content of the windrowed debris.
- Surrounding fuels and fire hazard.
- Smoke dispersal.

Working closely with AAF and local land owners a study area was located where we could begin work with freshly cut and windrowed debris.

**Windrows burning near High Level, Alberta.**

To effectively burn a windrow quickly with as little smoke as possible, the debris needs to have low fuel moisture content. We are monitoring moisture content from snow melt to freeze up with consideration for windrow orientation. Two seasons of data has been collected from freshly cut aspen. A third season is soon to begin and two windrows will be in their second season of drying.

The windrows are located in cleared out areas and have forests surrounding them. Spotting into these stands during burning would be a concern during the fire season. The cleared areas surrounding the windrows change quickly from a cutblock appearance to a ploughed field to crops within two years.

The main issue with the burning of many windrows following the fire season are the poor atmospheric ventilation conditions that tend to occur during the winter months. Satellite images show many fires burning starting on November 1st and local weather forecasts mention smoke in surrounding areas and High Level. Due to inversions, smoke from the burning windrows sits near the surface creating poor visibility for driving as well as breathing issues. Smoke simulations using historic weather data to compare winter burning to burning in mid-June when ventilation is usually better have been completed.

To burn the windrows in a safe manner, the debris needs to be dry enough for a high intensity and quick burn, the area surrounding the windrows needs to have low ignition probability and venting needs to be effective in transporting the smoke up and away from the local roads. To date, two years of moisture content data has been collected, smoke simulations have been completed and two windrows have been burned.

Plans for 2018 include burning a windrow during the fire season when all environmental conditions are met.

# Ember Award for Excellence in Wildland Fire Science
# 2017 Recipient: Brian Stocks

*The IAWF Ember Award for Excellence in Wildland Fire Science has been given since 2006. It was established to recognize sustained excellence in research contributions to wildland fire science, innovative solutions to important wildland fire challenges, and effective and appropriate communication of wildland fire science and research results. The name "Ember" reflects the fact that research and science often move slowly, and their benefits or impacts may not be apparent for years.*


**Brian Stocks (left) holding his Ember Award along side Tom Zimmerman (right). Brian received the 2017 IAWF's Ember Award at a ceremony in Boise ID 27 October 2017.**

Brian Stocks has had a long and highly productive career dedicated to the advancement of wildland fire science and management. He produced an outstanding record of scientifically original and important papers, while at the same time spending a considerable part of his career ensuring that new science was delivered as usable products to fire management agencies. In addition to this scientific achievement, Brian's modest, approachable style has allowed him to quietly be the nucleus of research teams that have exposed researchers from multiple disciplines to wildland fire and advanced our global understanding of the importance of wildland fire on the biosphere.

Brian began his career with the Canadian Forest Service (CFS) in 1967, as the leader of the newly formed fire research unit at the Great Lakes Forestry Centre in Sault Ste Marie. He finished his career in the public service at the top level of the Canadian government's Research Scientist category, a level reached by only a handful of researchers government-wide and a level almost never attained by one without a PhD. After his retirement from the CFS in 2003, he remained very active, helping shape the future of fire management in Canada through his central role in developing the Canadian Wildland Fire Strategy. He also worked with the CFS to define its fire research direction and carried out numerous projects for the Canadian Interagency Forest Fire Centre and the Canadian Council of Forest Ministers' Wildland Fire Management Working Group. Thirteen years into retirement, he is still very active in the global fire research community and is regularly invited as a co-investigator on major research proposals from large funding organizations such as NASA and the Joint Fire Science Program. He has been a member of the official review team for last two major WUI events (Slave Lake in 2011 and the Ft McMurray review in 2016), providing critical assessment and recommendations on changes to wildfire policy.

He is the author or co-author of more than 190 scientific papers including 20 book chapters. Some of these papers have appeared in top journals like Nature while others, published in mainstream forest science journals, describe the numerous experimental fire campaigns that form the foundation of the globally-recognized Canadian Forest Fire Danger Rating System (CFFDRS). He has co-edited two books and served as a guest-editor of special issues of scientific journals. His early vision of the enormous impact that climate change could have on wildland fire management both in Canada and throughout the globe led to a significant research effort in Canada and numerous publications and international presentations. Brian has served as an adjunct professor at the University of Toronto for over two decades, and is still an active advisor and mentor to many of the fire researchers working in Canada and abroad, which is a demonstration of his easy-going, selfless approach and his depth of professional experience.

Through the 1980s, Brian led the CFS's Fire Danger Rating Working Group and oversaw the ongoing development of the world-renowned CFFDRS. This was a pivotal period of expansion of the CFFDRS to include fuel types and quantitative fire behaviour prediction. His strong national leadership of the CFS fire research program during this time culminated in the publication of the Canadian Forest Fire Behavior (FBP) System in 1992 and the delivery of a comprehensive national technology transfer program to the Canadian fire management community. In addition to his decades-long leadership of fire research in Canada, Brian is also extremely well-known and respected in the international community as one of the world's foremost experts in large-scale, field-based experimental burning. He coordinated Canadian participation in NASA's recent ARCTAS experiment during the International Polar Year. Brian led Canadian scientific delegations on experimental burning programs in Alaska, Siberia, South Africa, and Kenya. He also conceived and coordinated international, multi-disciplinary fire experiments in Canada such as the Ontario Mass Fire Experiment (1987-1990), which raised global awareness of biomass burning and its impact on global atmospheric chemistry, and the Northwest Territories' International Crown Fire Modelling Experiment (1997-2000), which allowed rigorous study of extremely high-intensity fire behaviour and its impacts. These campaigns, and the numerous associated publications that Brian authored in international journals, raised awareness of globally important wildland fire issues.

Throughout his long career Brian Stocks has been well-known for his ability to build highly successful and productive teams. This ranges from working on the ground with fire managers during experimental burning projects, to bringing internationally renowned scientists from disparate fields together to find a common purpose and build multi-disciplinary synergies. This truly unique ability is reflected in the wide array of highly productive scientific collaborations from diverse disciplines that is revealed in his publication record.

Brian Stocks received the 2017 IAWF's Ember Award at a ceremony in Boise ID 27 October 2017.

*This write up is an edited version of the Ember Award nomination package for Brian Stocks submitted by Mike Wotton, Mike Flannigan and Bill de Groot .*

## Global Fire EWS

A Global Early Warning System for Wildland Fire

The Global Fire Early Warning System (EWS) provides 1-10 day forecasted FWI System data based on the Canadian Meteorological Centre's (CMC) Global Deterministic Forecast System (GDPS). Global Fire EWS' 0.24 x 0.24 degree resolution provides a means of comparing fire danger between countries, continents and biomes. To enhance the weather-based FWI system, multiple basemaps and active fire hotspots are available within the system to present additional perspectives on terrain, vegetation, proximity to populations, and visible smoke and cloud. The Global Fire EWS is processed and presented on Canada Wildfire's network at the University of Alberta in collaboration with Natural Resources Canada and multiple international partners.

Contact Alan Cantin for more information alan.cantin@canada.ca