



Wildfire Operations Research Fall Advisory Committee Knowledge Transfer Session Minutes

Networking Session and Business Meeting
November 28, 2018

Location

Sawridge Inn and Conference Center, 4235 Gateway Blvd, Edmonton, Alberta

Attendees

FPInnovations: Chad Gardeski, Denis Cormier, Rex Hsieh, Steve Hvenegaard, Razim Refai and Greg Baxter (on-line)

Collaborative funding partners

Government of Alberta: Quentin Spila, Dave Schroeder, Cordy Tymstra, Wendell Pozniak, Partick Loewen, Jill Moorley and Kyle Fitzpatrick

Government of the Northwest Territories: Westly Steed

Government of Saskatchewan: Chris Dallyn

Conair Aerial Firefighting: Revie Lieskovsky

Affiliates

Canadian Forest Service: Dan Thompson, Ginny Marshall

Canadian Interagency Forest Fire Centre (CIFFC): Maria Sharpe

Canadian Partnership for Wildland Fire Science: Renee Beauac

University of Alberta: Andre McDonald, Eder Alain Villa Coronel

British Columbia Wildfire Service: Mike McCulley

Alberta Office of the Fire Commissioner: Steve Otway

Other guests and Vendors

MYAC Consulting Inc.: March Ackerman

Wild Rose Fire Behaviour: Marty Alexander

Hummingbird Drones: Robert Atwood

Wildfire Innovations Inc.: Don Hallet

G5 Biosolutions: Bill Schuster

Direct Fire Supression Inc.: Rick Solomon

FTS Forest Technology Systems: Chris Lindsay

Welcome (Chad Gardeski and Denis Cormier)

- Acknowledged funding partners: Government of Alberta, Government of Northwest Territories, Government of Yukon, Government of Saskatchewan, Conair, Coulson Group, Genics Inc. Also acknowledged many affiliates working with us on regular basis
- Without your support our program would not be possible; thank you very much for being here today to help us shape a program of the future

Program overview and presentations

What follows are the collected comments and questions that arose during certain presentations during the session. Q. denotes a question and A. the corresponding answer(s), while C. indicates a general comment. Presentation links are provided for each project. Detailed information regarding each project can be found at our website that can be accessed at:

<http://wildfire.fpinnovations.ca/index.aspx>

Community Protection and Fire Behaviour

1. Alberta Agriculture and Forestry collaboration with research partners and research projects overview
 - [Pelican Mountain FireSmart Fuel Management Research Site](#) (Dave Schroeder)
 - Q. Don Hallett : Can you explain the moisture absorption/loss rate between sphagnum and feathermoss
 - Q. Cordy Tymstra: Were there different burn patterns in the different moss species
 - A. Relative to feather moss, sphagnum moss retains moisture to a greater extent and is less flammable; this was apparent to us in burn patterns that we saw at the Red Earth Creek experimental fire.
2. Overview of the 2018 Pelican Mountain projects
 - [Retardant effectiveness on mulch fuel](#) (Rex Hsieh)
 - [Mulch treatment intensity and fire behaviour: Pelican Mountain](#) (Steven Hvenegaard)
 - Q. Marty Alexander: Was compaction in the high intensity treatment an influence on fire behaviour
 - A. Yes. Several mulcher passes with mixing of upper duff layer resulted in a somewhat denser fuel bed and reduced fire behaviour.
 - [Cluster retention fuel treatment at Pelican Mountain](#) (Steven Hvenegaard)
 - [Black spruce fuel amendment treatment](#) (Steven Hvenegaard)
 - Q. Steve Otway: Would burning occur in fall with approaching downturn in weather?
 - A. That would be a good opportunity. This project is very much in the conceptual stage and we need to determine best practices.
3. Overview of the 2018 Canadian Boreal Community FireSmart Project
 - [Underburning Trials: CBCFS Northwest Territories](#) (Greg Baxter)
 - [Black spruce fuel amendment at the community scale](#)(Chad Gardeski)

C. Westly Steed: There has been strong community support - Communities are very involved in FireSmart and excited to move ahead. Communities will directly benefit from research work in their WUI as opposed to projects at other research areas.

4. [Comparing the seasonal changes in live fuel flammability of larix sp. and black spruce](#) (Chad Gardeski)
5. [Light Thinning: Hummingbird prescribed fire](#) (Greg Baxter)
6. [Harvest debris and initial attack effectiveness](#) (Greg Baxter)
7. [State-of-practice: sprinklers \(FRIAA\)](#) (Chad Gardeski and Razim Refai)
 - Q. Cordy Tymstra: Are you looking at supply lines with consideration to turnover of lines?
 - A. Good learning at Canmore sprinkler exercise; wetting of supply lines is a common practice but further exploration in protecting lines is important.
8. [FireSmart vegetation management decision support research](#) (Steven Hvenegaard)
9. [Siding ignition \(FireSmart Canada\) – U of A collaboration](#) (Andre McDonald and Eder Coronel)
 - Q. Why was 27 kW/m² chosen as the heat flux for the study? How are you going to increase this value? Is there a limitation of the radiant panel?
 - A. 27kW/m² was chosen to validate the methodology and because this heat flux was used in previous studies. We would increase the value by changing the stand-off distance between the radiant heater panel and the siding test structure. Alternatively, we can increase the electrical load on the panel to increase the heat output from it and thus, increase the incident heat flux. The limitation of the radiant panel was 57 kW/m² of constant heat flux.
Update. Chad Gardeski: The results presented during the advisory meeting were preliminary and the methodology was still being refined. A low and high heat flux of 20 kW/m² and 50 kW/m² were selected for the project.
 - Q. Dan Thompson: Are there real world examples or scenarios that can be used to illustrate the heat flux values?
 - A. This was not looked at during this study, however the final heat flux conditions were selected to be representative of the heat fluxes in both wildland fires and fires involving structure to structure ignition.
 - Q. Don Hallett: Did you measure relative humidity?
 - A. No, that was outside the scope of the project.
 - A. Andre McDonald: This study is meant to provide information on minimum heat flux for igniting or deforming siding. Next step will be to assess real world scenarios. All heat fluxes are incident on the materials.

Aviation and Wildfire Chemicals

10. [Evaluating performance of fire chemicals](#) (Razim Refai)
 - Wildfire chemical roadmap
 - Chemical use survey
 - LIFT testing
 - Thermal canister testing

- Crib tests
- Drop volume recovery rates

11. [Alternative ignition device for prescribed burns and wildfire operation](#) (Mark Ackerman)

Equipment and Technology

12. [Remotely piloted aerial systems \(RPAS\) for unfired imaging: An evaluation of operational platforms](#) (Steven Hvenegaard)
13. [FireSmart Robot](#) (Greg Baxter)

Detection

14. [Effectives of Distributed decision \(crowdsourcing\) wildfire detection: Hummingbird network evaluation](#) (Rex Hsieh)

Firefighter and community safety

15. [Implementation of real-time lapse rate data](#) (Greg Baxter)
16. [Windrow burning – High Level](#) (Greg Baxter)

Knowledge exchange and transfer

17. [Knowledge exchange and transfer](#) (Chad Gardeski)

[Overview of 2017 and 2018 fire seasons in BC; lessons learned and research priorities](#)

Mike McCulley shared experiences from the extreme fire seasons experienced in British Columbia in 2017 and 2018 with perspectives on fire behaviour, community protection, firefighter safety and equipment testing. Mike worked on several BC fires in these years and is now leading and developing the British Columbia Wildfire Service Fire Science research program.

Affiliate presentation and updates

18. CIFFC Update (Maria Sharpe)
19. [Canadian Partnership for Wildland Fire Science Update](#) (Renee Beaulac)
20. Thermal imaging technology to determine rate of spread (Dan Thompson)

Vendor presentations

21. [Innovative sprinkler design and elevated solutions](#) (Don Hallett)
22. [Innovations in water enhancement systems](#) (Bill Schuster)
- Q. What is happening with ground applications?
- A. Bill Schuster: BlazeTamer doesn't adhere to vertical surfaces; need to justify the cost of ground based applications
23. [Hummingbird crowdsourcing detection platform; next steps](#) (Robert Atwood)

Project Proposals

Four project proposals were presented and the audience was asked to vote on which ones they felt were the most relevant. The results will be used by the advisory committee to help determine the priorities and relevance of the projects. [Weblink to presentation for project proposals](#)

The following project proposals were ranked in order of priority based on the audience votes:

1. Equipment evaluation program
2. Rapid response team to document fuel treatment encounters and database management
3. Firefighter tracking and biometric monitoring
4. Structure receptivity to spotting

Fishbowl Questions

- **Question:** How big does a safety zone have to be?
Context: Firefighter safety
Submitted: Jill Moorley for Scott Elliott from HTC
 - a. FPIInnovations has completed over 20 experimental burns for our Survival Zone project in grass, standing timber and on slope. Survival zones differ from Safety zones in that survival zones are a much smaller opening for firefighters to use as a last resort and will be subjected to the radiation, superheated air and possibly flame. But if positioned correctly and lying prone on ground they physically should be able to survive. Theoretically, a safety zone is an area large enough for personnel to stand in and be safe from these. For more information on Survival Zones visit:
<http://wildfire.fpinnovations.ca/Research/ProjectPage.aspx?ProjectNo=1>
 - b. FPIInnovations has not investigated the size of safety zones, but a good reference on this is listed below.
https://www.fs.fed.us/rm/pubs_other/rmrs_2014_butler_b001.pdf

For more information please contact Greg.Baxter@fpinnovations.ca

- **Question:** Is there a configuration that is most effective for fire suppression, cost effective, fire fighter safety
Context: Crew configuration with equipment and mode of transport
Submitted: Jill Moorley
 - a. These questions were the focus of a directed research project that FPIInnovations conducted for British Columbia Wildfire Services. This project report can be obtained from BCWS. Please contact Les.Husband@gov.bc.ca (project sponsor for BC); he or Mike McCulley may be good contacts to access this research.
- **Question:** Can we quantify how much more effective it is to nozzle with 1 ½" hose vs. 5/8"? How many 5/8" nozzles have to be running to be equivalent to 1 ½".
Context: Firefighter effectiveness and efficiency.
Submitted: Scott Elliott via Jill Moorley

- a. Based on the Freeman Formula, a 1 ½” nozzle will give you higher flow rate (and thus higher volume). However, for our practical applications, things like casting distance will also have to be considered. A larger nozzle will also result in lower fluid velocity (continuity equation) if operated at a pressure below the sprinkler optimum pressure, thereby potentially reducing casting distance despite delivering more volume of water.

For more information please contact Razim.Refai@fpinnovations.ca

- **Topic:** Thermal imagery using aircraft to evaluate effectiveness of suppressants that are aerially delivered to wildfires.
Context: Ontario CFS has been working on a project in 2017 and plan to continue in 2019. They could likely use support in their efforts.
Submitted: Bill Schuster (Blazetamer)
 - a. FPInnovations has been involved with the drop tests in Ontario where thermal imaging is being used by the CFS to help evaluate the effectiveness of air tanker drop, compared to the cup-grid method. This research is being led by Josh Johnston with the CFS.
 - b. Thermal imagery can be used to map drop characteristics. Drop shape and coverage intensity, wind drift, drop velocity, plume dynamics, drying rates, as well as information on fire behaviour responses can likely be measured. Thermal imagery may be able to help provide an understanding of how a drop interacts with a stand (this is a major challenge in lab tests – replicating 3D stand characteristics) or to help determine the rate of evaporative loss. The use of thermal imagery may also reduce the time and cost associated with the cup-grid method, however FPInnovations has not completed a cost-benefit analysis

Please contact joshua.johnston@canada.ca or Chad.Gardeski@fpinnovations.ca

- **Question:** Can we safely and effectively burn black spruce by walking a dozer over a stand – in the winter – letting fuel complex cure over the spring/summer – and then burn in the fall under moderate burning conditions?
Context: Community protection and fuel management
Submitted: Marty Alexander
 - a. FPInnovations will be evaluating the treatment of black spruce stands using a shearblading technique at pelican Mountain as well as a manual hand falling technique at the CBCFS site. The goal is to perform the treatments, let the fuel cure then try to generate a crown fire during moderate conditions using the accumulated fuels. The results of these trials could guide further trials using different techniques.

For more information please contact Greg.Baxter@fpinnovation.ca

- **Topic:** What makes an effective safety culture? Do the SOPs and rules we have keep us safe? Can we be better; are we doing things that prevent us from getting better?
Context: Firefighter safety
- **Submitted:** Jill Moorley
 - a. Wildfire Today and IAWF Wildfire magazines have several years of accumulated content on safety, leadership and firefighter culture; are these worth reviewing?
 - i. As a start have a look at Wildfire August 2018 article titled 'United to Reduce Line of Duty Deaths and Injuries of Wildland Firefighters'.
 - b. This is a huge human factors topic. Is this something that we can tackle? Maybe a good first step would be having this put forward as a proposal?

For more information please contact Steven.Hvenegaard@fpinnovations.ca

Parking lot questions

1. Windrow burning – Could the wood be chipped and used for heating?
 - a. AAF has contacted forest industry to see if they would use material, but distance and private property legalities has reduced interest in utilizing the wood. The amount of dirt in debris would not be an issue if a picker was used to load into a chipper or onto trucks for moving.

For more information please contact Greg.Baxter@fpinnovations.ca

2. UAV- What about low cost commercially available UAV equipment? (Dan Thompson)
 - a. Most UAV that are operated by thermal imaging service providers or other resource management imaging missions are commercial off the shelf (COTS) models. 'Low cost' is a relative term; FPInnovations has conducted a Technology Watch that summarizes UAV capabilities and cost.

For more information please contact Steven.Hvenegaard@fpinnovations.ca

3. Mulch – Anyone doing any vertical structure measurements? (Mark Ackerman)
 - a. In past, our destructive sampling methods have been straightforward in homogeneous mulch fuel beds commonly produced in linear corridors or in fuel treatments. Destructive sampling yields accurate mulch coverage (kg/m²) and measuring mulch depth has provided reliable estimates of bulk density. However, within a low intensity mulch treatment that we have been investigating at Pelican Mountain, there is greater variability in the surface fuel components (mulch, moss, branches, stems and needles). The variability makes it difficult to apply conventional sampling methods (destructive sampling and mulch depth measurements) to estimate an average coverage and bulk density. In several of our mulch research projects, we have conducted intensive moisture content measurements of mulch at different depths within the mulch fuel bed.

For more information please contact Steven.Hvenegaard@fpinnovations.ca

4. RPAS – Could this have application to LACES (lookouts)?

- a. Yes. RPAS have been used on fireline operations at a tactical level to develop situational awareness in inaccessible areas (terrain, blowdown, or other obstacles) and identify no-go zones, areas with potential hazards (fire activity, dangerous trees, etc.) and to inform decision making (resource requirements and tactics).
- b. Some agencies have developed protocols for flying drones during daytime in areas of mixed airspace. Several agency personnel (crew leaders) have certification to fly drones. Literature is available that outlines the development of these programs and the protocols that are implemented to ensure safety in shared airspace.
- c. Some of the key concerns beyond shared airspace in operating RPAS on the fireline include maintaining visual line of sight (VLOS), maintaining a command and control link (C2), and having trained, dedicated resources with fireline experience that can be integrated into the wildfire ICS structure.

For more information please contact Steven.Hvenegaard@fpinnovations.ca