Project Plan
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FPInnovations
Wildfire Operations Research
1176 Switzer Drive
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Developing an instrument to measure wildfire intensity

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Introduction

Currently, wildfire intensity is calculated using Byram's Fire Intensity Equation, which was published in 1959. The variables in this equation include fuel consumption and rate of spread. Collecting the data to calculate these variables is time and labour intensive. A modification of Byram's equation that uses only flame length as its variable is much simpler, but much less accurate. In 2005 students in the Mechanical Engineering Department at the University of Alberta developed an instrument called the thermal cube, which FPInnovations has been using to measure fire intensity on its research projects. This instrument measures fire intensity in kW/m^2, but most operational wildland firefighting training resources refer to fire intensity in kW/m and there is no easy conversion between the two.

This project will explore the development a robust, easily deployable sensor that will measure wildfire intensity in the field and will provide a measurement relevant to wildfire operations.

Methods

A sensor will be designed and constructed by a PHD student in the Mechanical Engineering Department at the University of Alberta and will meet the general design criteria identified by researchers with FPInnovations.

Researchers and students will field test the sensor in the Northwest Territories during experimental fires of different size, intensity, and duration. We will test the sensor's performance and durability, and collect baseline intensity data.

We will also use a radiant panel (Figure 1) to burn single trees, which will help calibrate the sensor. A Schmidt-Boelter water-cooled heat-flux gauge will be used to collect baseline intensity data, which we will compare to the data recorded by the new sensor.

The PHD student will explore the possibility of converting heat flux (direct heat per unit area) to intensity (energy released per metre).

Figure 1. The radiant panel we plan to use for sensor calibration.

Safety

All individuals involved in the field data collection in support of this project will at a minimum will successfully complete a wildfire orientation course. Personal protective equipment and safety protocols will be strictly adhered to. Non-FPInnovations staff involved in fieldwork will be monitored by a safety officer and will attend all safety briefings including tailgate briefings.

Deliverables

Progress reports and test results.

Timeline

Begin work with the Mechanical Engineering PHD student	May 2012
Experimental fires at the Canadian Boreal Community FireSmart Project site in NWT	June 2012
Progress reports and test results	December 2013

Participating Members/Collaborators

University of Alberta Mechanical Engineering Department

Government of the Northwest Territories - Environment and Natural Resources

Alberta Environment and Sustainable Resource Development