FPInnovations
Wildfire Operations

Post-fire examinations

Indigenous Public Safety Conference

Kelsey Winter

FPInnovations

Oct 2024

Agenda

Introduction

FPInnovations

Wildfire Operations Group

Four themes

Wildfire community impact research

History of the research

Why it's important

Conducting the research

Structural investigation

Fuel treatment efficacy

Development considerations

Discussion/Questions

Next steps

Contact information


Tim Hortons
Tim Hortons
timbits

FPINNOVATIONS

FPInnovations is a not-for-profit private organization that specializes in the creation of solutions in support of the Canadian forest sector's global competitiveness

FPI is a Research and Technology Organization (RTO)

MISSION

Increase the competitiveness of the forest industry

Transform and diversify the forest sector

SECTORS

Forest operations
Pulp and Paper
Wood products
Bio-sourced products

FPINNOVATIONS IS A RTO

RESEARCH AND TECHNOLOGY ORGANISATION

FUNDAMETAL RESEARCH

TO DEVELOP KNOWLEDGE AND TRAIN THE NEXT GENERATION

TRANSLATE FUNDAMENTAL KNOWLEDGE

INTO APPLIED SOLUTIONS

TO RESPOND TO INDUSTRY CHALLENGES AND CREATE ECONOMIC VALUE

MODERNISATION

VS.

TRANSFORMATION

Wildfire Operations

VISION

To deliver practical solutions for living well with wildfire

MISSION

Providing evidenced-based empirical research to enhance prevention and mitigation efforts that reduce the risks and negative impacts of wildfire on communities and forests

Kelsey Winter
Manager

Strategic planning, team building, project management, communications and engagement.

Greg Baxter
Senior Researcher

Firefighter safety, fire behaviour analysis and community protection.

Rex Hsieh
Senior Researcher

Wildfire detection, equipment and service evaluation, project management, information systems and databases.

Steve Hvenegaard
Senior Researcher

Fuel treatment efficacy, fire behavior analysis and community protection.

Razim Refai
Senior Researcher

Aviation in wildfire operations, wildland fire chemicals, thermography, equipment testing and evaluation.

Brandon MacKinnon
Researcher

Fuel load, fire behavior, technology evaluations for wildfire operations, and utilizing RPAS for research and operations.

Andrew Stack
Researcher

Operational firefighting, wildfire case studies specialist, operational fire behavior analysis and wildfire fuel treatment research.

Greg Griffiths
Researcher

Fuel treatment efficacy, operational fire fighting, data management, community protection and forest practices.

Robin Tremblay
Researcher

Wildfire suppression and responses, risk management and operations, fire road planning, legal documentation and wildfire crew leader experience.

Wildfire Operations Group

- Founded in 2001
- Experience with case applications, technology evaluation and methods development
- National resource mobility and surge capacity
- Full integration with forest sector and fibre supply workforce
- Advisory group governance

Collaborative Partners

- Canadian Interagency Forest Fire Centre, Research and Innovation Integration Committee
- **First Nations' Emergency Services Society**
- FireSmart Canada
- Canadian Forest Service, Wildland Fire Research
- Natural Hazards Research Australia
- Firetech Connect, Australia
- Wildfire Resilient Landscapes Network, Circular Bioeconomy Alliance, Europe
- **Conair**
- **Coulson**
- **Genics**
- California Department of Forestry and Fire Protection
- Colorado Centre of Excellence for Advanced Technology Aerial Firefighting
- National Institute of Standards & Technology

Research Themes

- **Mitigation and prevention:** reduction of probability and severity of unwanted wildfires
  - Fuel treatment efficacy studies
  - In-stand microclimate comparative analysis
  - Evaluating mulching in fuel treatments
  - Large scale experimental burns
- **Wildfire response:** improving suppression success, pre-suppression tactics, firefighter safety, and maximizing efficiencies
  - Equipment evaluation
  - Detection systems and
- **Post-fire response and recovery:** post-fire recovery and rebuilding to increase forest health and resilience
  - Evaluation of changes to built environment
  - Structure-ignition research
  - Post-fire examination studies
- **National wildfire data collection:** strategy and implementation

History and importance

Australia – the beginning

Natural Hazards Research Australia (formerly Bushfire CRC)

- Beaumaris bushfire, January 1944: 66 homes ignited, 52 did not, 17 ignited homes were surveyed

Experimental Building Station of the Commonwealth Department of Housing and Construction

- Hobart Bushfires 1967, Blue Mountains Bushfire 1968: Surveyed 73 ignited homes, 89 not ignite

Report by the Commonwealth House of Representatives Standing Committee on Environment and Conservation

- Ash Wednesday February 16, 1983 (180 bushfires, 76 fatalities, 2,676 non-fatal injuries, 2,463 homes destroyed)
  - Ramsay, G.C., 1985. How bushfires set houses alight: lessons from Ash Wednesday. Ecos no. 43 (Autumn 1985).
  - CSIRO Division of Building Research. One day after the disaster, a detailed study was launched
  - Survey of ~1,153 homes (destroyed and survived); 720 damaged or destroyed, 433 not significantly impacted
  - 85 data elements, Challenge was to stay ahead of the bulldozers

Initial results – Embers ignite homes

- Decrease ember traps – simple plan and roof design
- Fire-retardant aluminum foil under roof tiles
- Seal ember entry e.g., eaves, gutters, vents
- Use brick cladding, particularly at ground level
- Protect windows (metal shutters or metal fly-wore screens
- Minimize wood steps, decking and pergolas
- Elevated construction – non-combustible supports, enclose the under floor space
- Locate outbuildings and gas bottles away from the house

Australia keeps going

- **Sydney Bushfires January 1994**
  - 800 bushfires (New South Wales)
  - 225 homes destroyed

- **Black Sunday February 7, 2009**
  - 400 bushfires, 173 fatalities, 414 non-fatal injuries
  - 80 communities impacted, Marysville destroyed (400 structures), 2,000 properties, 61 businesses

- **Royal Commission (transformational event)**

United States starts too

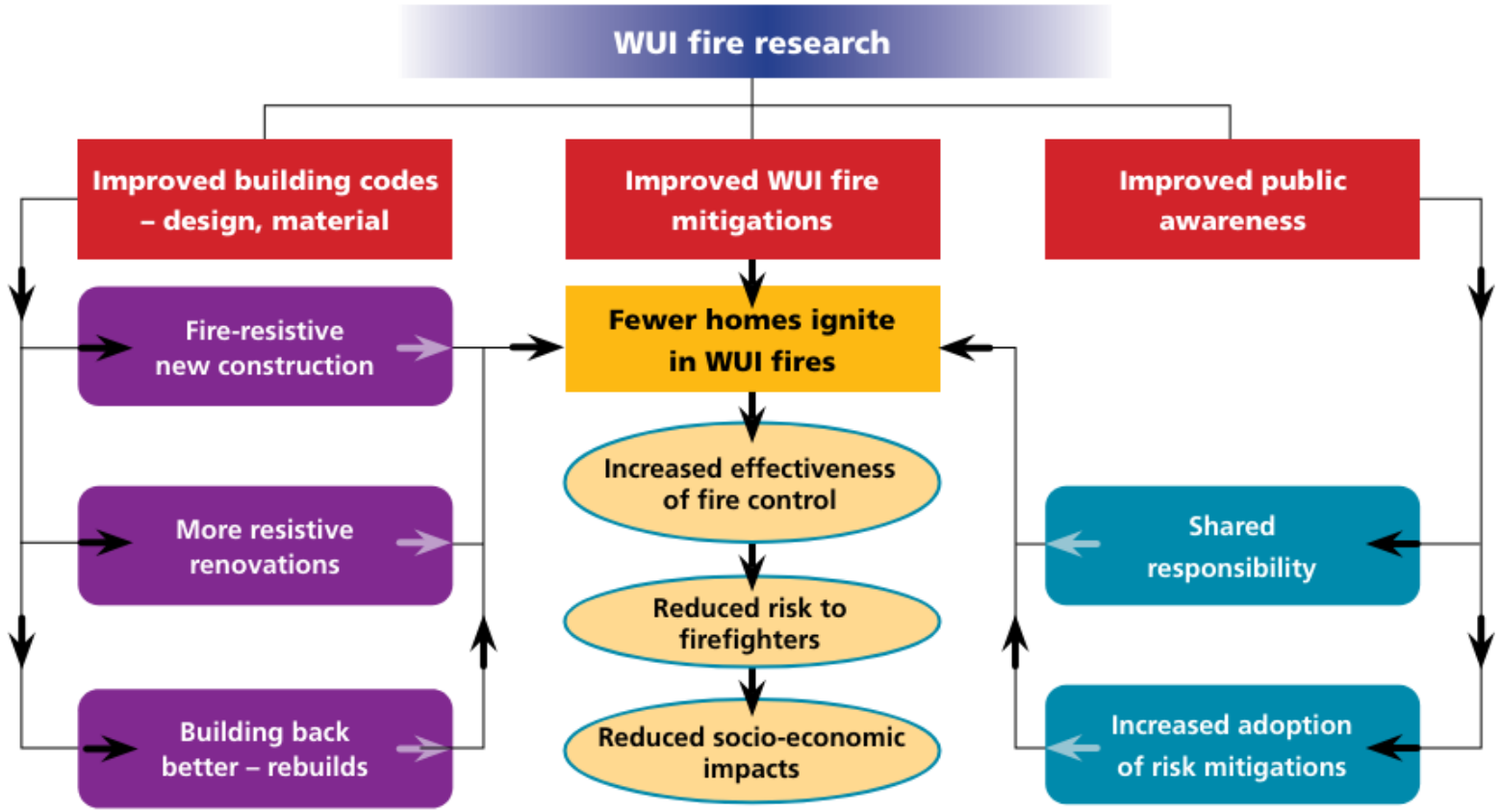
- **2008: California Wildfire Season**
  - 6,255 wildfires, 1.5 million acres
- **June 28, 2013, Arizona: Yarnell Hill Wildfire**
- **October 2017: Tubbs Fire**
  - 22 fatalities
- **November 8, 2018: Camp Fire**
  - $10 billion losses, 85 fatalities, Town of Paradise destroyed
- **August 8, 2023, Hawaii: Lahaina Wildfire**
  - 101 fatalities
  - 2,207 buildings damaged or destroyed
- **February, 2024, Texas: Smokehouse Creek Wildfire**
  - 1.1 million acres

Canada jumps in

- 2015: Slave Lake Wildfire, Alberta: 433 structures destroyed, 89 structures damaged
- 2017: Fort McMurray, Alberta: 1,595 structures destroyed, ICLR report
- 2017: Thompson Nicola Regional District/Williams Lake Area, 322 structures destroyed
- 2022: Village of Lytton and Lytton First Nation, BC: BC FireSmart Committee, 2 fatalities, over 100 properties destroyed (90% of the town)
- 2023: Enterprise, Northwest Territories (90% of the town): GNWT, FPInnovations
- 2023: Nova Scotia, Tantallon and Barrington: 102 homes and 68 homes damaged
- 2024: West Kelowna, BC, Skwlāx te Secwepemcúlecw BC FireSmart Committee, FPInnovations: 200+ structures lost
- 2024: Jasper, AB (results currently being analyzed): FPInnovations

Why this research is important

- Ensures important evidence within the wildland, interface and urban zones are not lost or compromised
- Furthers our knowledge and understanding of how wildfires enter communities, and why some homes burn, and others do not, can help improve wildfire suppression effectiveness.
- Generates homegrown research and analysis to make sure policies and practices are directly applicable to the conditions in Canada
- Leads to developing predictive models for use in determining the most cost-effective actions that individuals and governments can take to minimize structure ignition from wildfires
- Critical to our ability to prevent further disasters and recover quicker and more effectively when they do occur.
- Ultimately saves lives



Westhaver A. 2020. Developing a method for conducting wildland/urban interface fire case

Conducting the research

Wildfire Community Impact Research

Objectives

1. Identify how fire moved into a community.
2. Determine how the fire spread through the community once it had entered.
3. Compare damaged and undamaged structures.
4. Determine the impact that structure protection efforts had within the community and on individual structures.
5. Identify if fuel treatments modified fire behaviour.
6. Potentially – identify the impact that the land use planning, urban layout, critical infrastructure positioning etc. had on the resulting damage within the community.

Fire Behaviour

Includes:

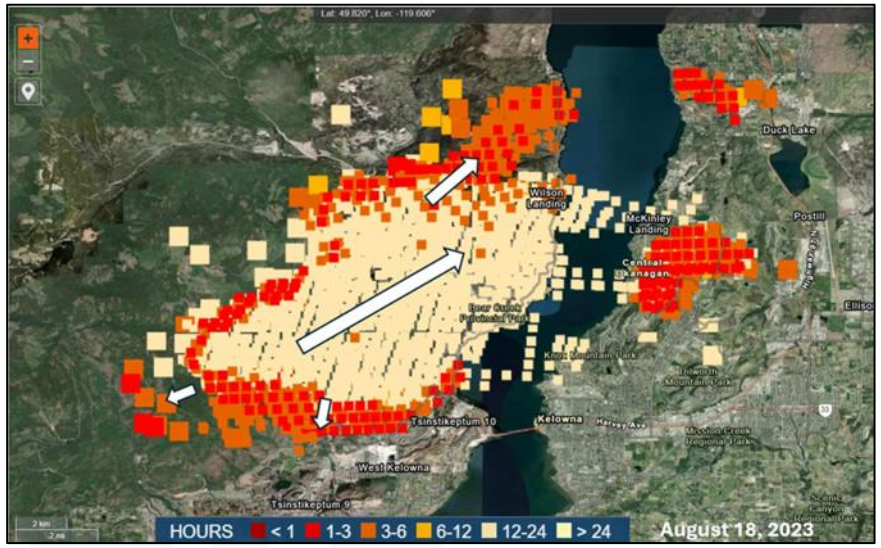
Fuels
Topography
Weather

- Photos and videos from staff (agencies and fire departments) and public
- Recorded observations and notes from staff
- Interviews
- Remote sensing imagery including drone imagery
- Fire growth simulation modelling
- Weather data, and
- Physical Field evidence (type, amount, and location) for fire movement

Example of findings

Fire Behaviour

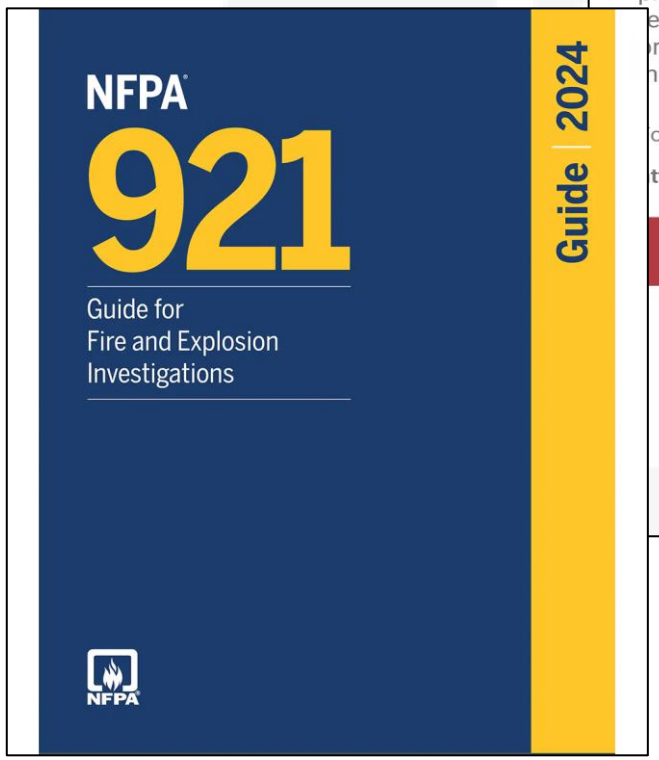
1. Fire Spread – extreme fire behvaiour due to long term drought and a cold-front
2. Homes ignited by embers storms originating long distances away
3. Once burning – structures acted like ember sources and continued to spread the fire

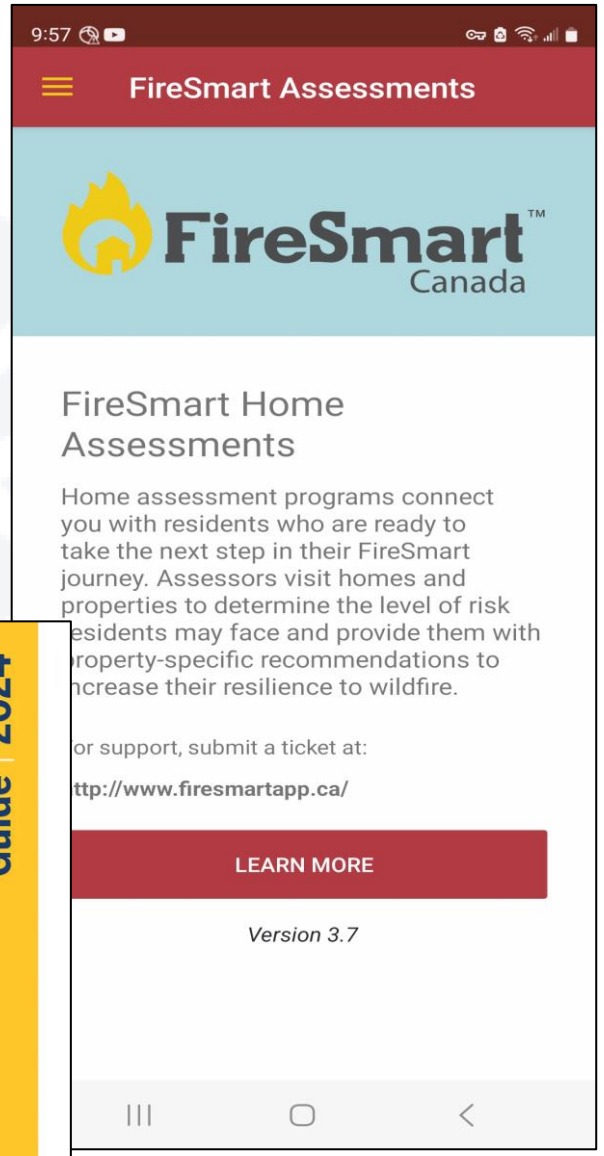


Structural Ignition Analysis

Methods

- Random selection of damaged structures – then closest undamaged (if exists and not too far)
- Canadian Home Assessment App
- Structural Fire Investigation





Example of findings

Structures – Damaged

Main Factors Contributing to Ignition:

Flammable Material within 1.5 m of structure

- Cedars and Soffits
- Vehicles, ATV's, wood piles

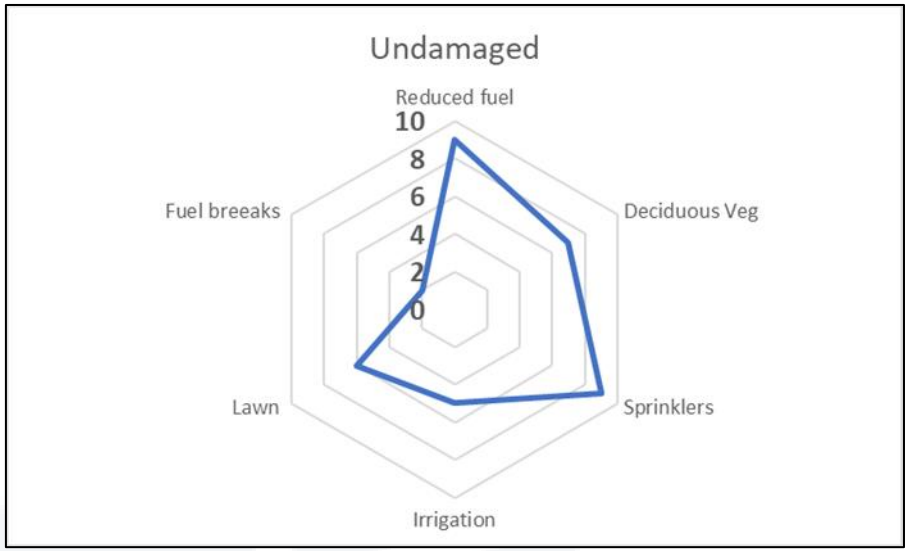
Decks – position on slope, material, condition and items

Example of findings

Structures – Undamaged

Main features of undamaged structures:

- Fuel management
    1. Green or low grass
    2. Reduced fuels
    3. Sprinklers



Fuel Treatment Efficacy

Methods

- Put in plots using standard fuel inventory data collection methods.
- Document fire behaviour in treated and untreated plots.
- Review plots on slope which influenced fire behaviour.
- Compare results to standards – i.e. treatment designed to meet 90th percentile conditions for fire weather at a specific location.

Example of findings

Fuel Treatment Efficacy

- Although in this case study fire behaviour was affected (fire intensity estimated at 17 160 kW/m), it still produced a fire that exceeded suppression capability.

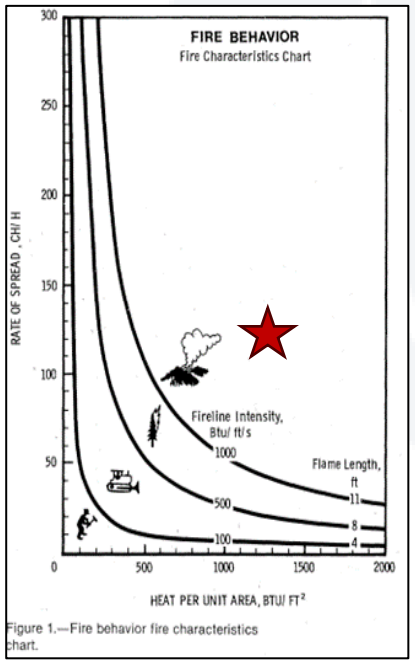


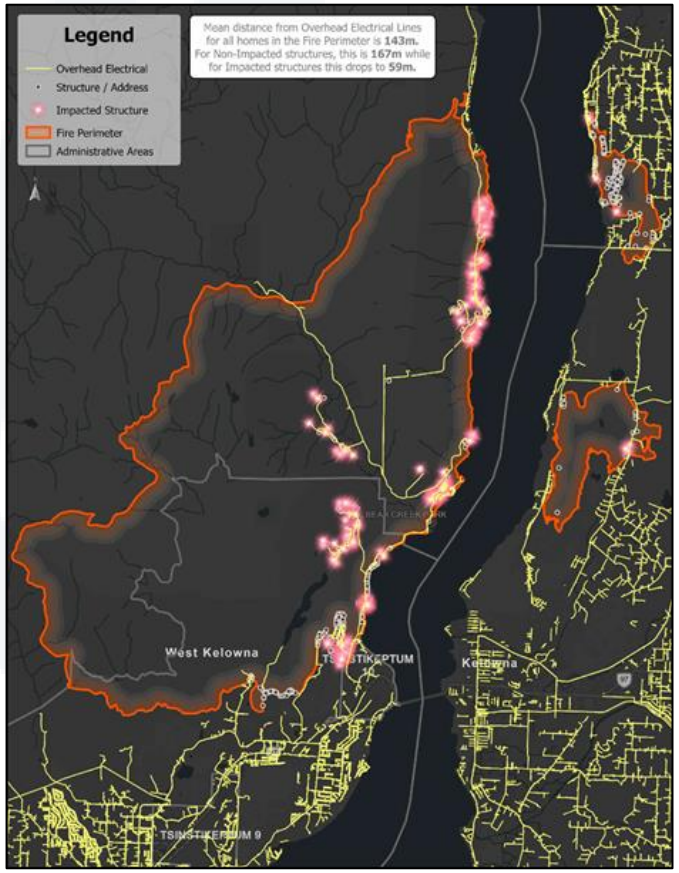
Figure 1.—Fire behavior fire characteristics chart.

Development Considerations

Urban Planning – Design Analysis

- Proximity to overhead electrical
- Proximity to water hydrants
- Proximity to arterial/collector roads
- Number of neighbors
- Lot size

Interesting but inconclusive results – more work required.



2023/24 Key Recommendations

Fire Behaviour

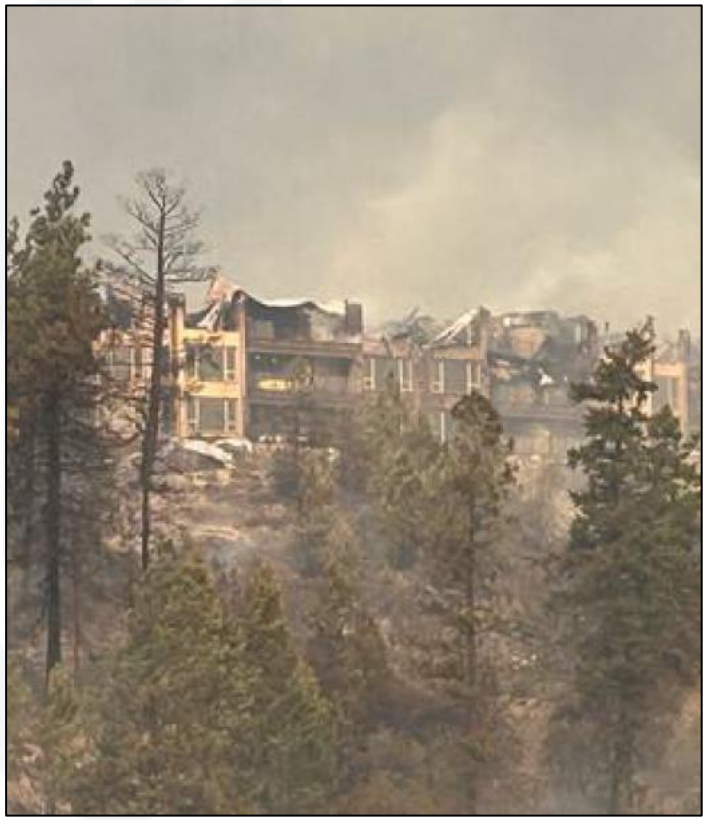
- Cold front – develop a cold-front categorization system

Structure ignition analysis

- NO combustible fuels within 1.5 m of structure
- Vegetation Management from 1.5 – 10 m from structure
- Slope – fuel management below
- Deck and combustible yard item management

Fuel treatment efficacy

- FBP Fuel types – a review of FBP fuel typing and sub-fuel types to categorize for BC

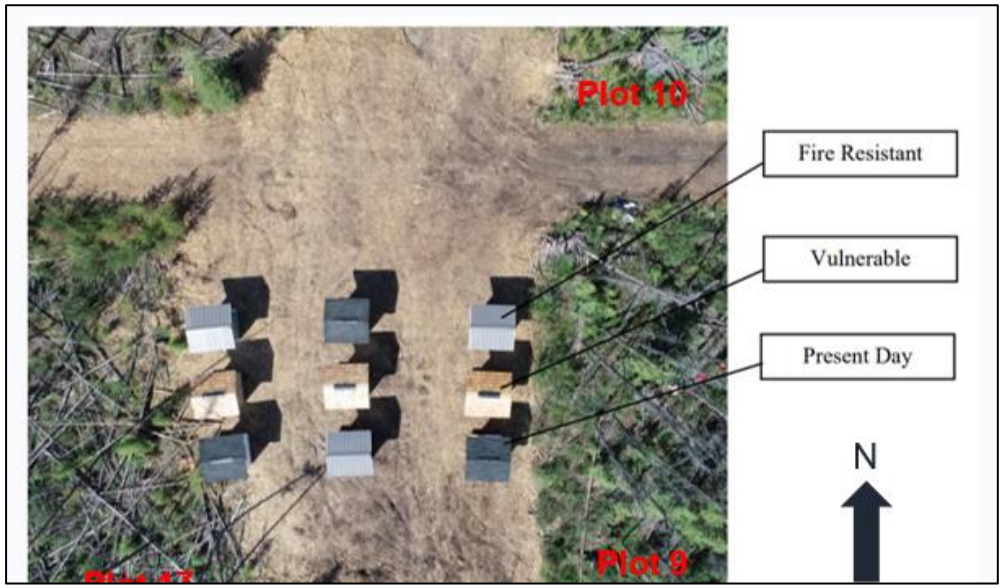


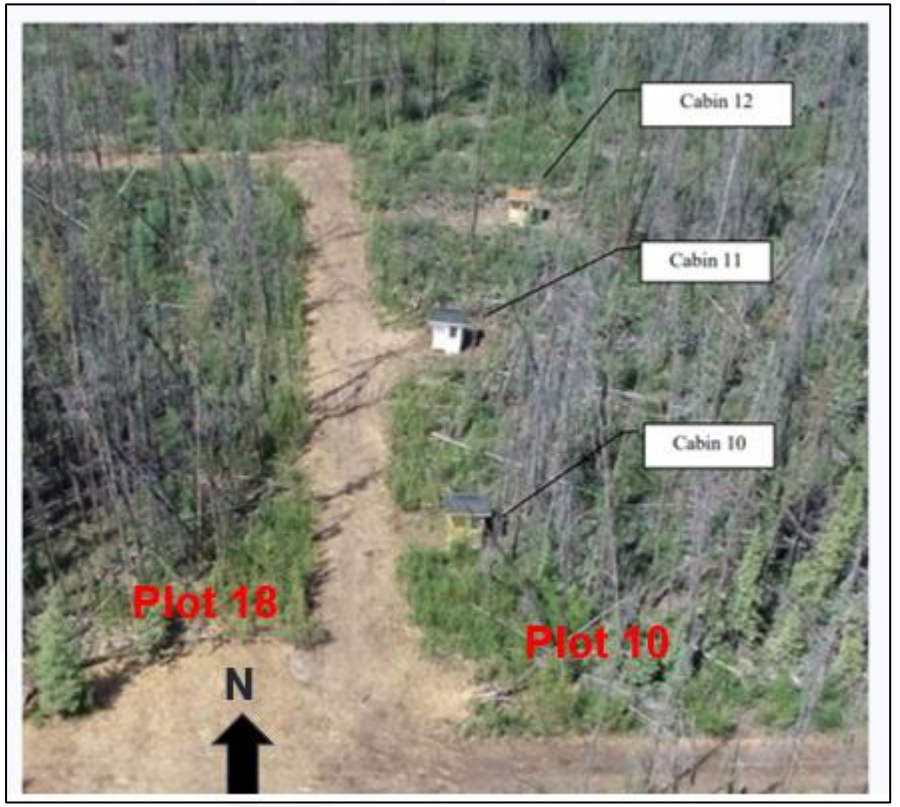
Next Steps

- Ongoing work towards national standardized approach to Wildfire Community Impact Research (Workshop NB next week)
- Work with partners to create research package in preparation for impacted communities in 2025, refine based on this year’s learnings
- Continue to develop methodologies for each aspect of the research
- Further knowledge transfer and community meetings
- Work with FireSmart in living labs

Fort Providence FireSmart and Sprinkler research

- FireSmart Village
- 9 scaled structures: fire resistant, vulnerable and present day (e.g. most common from FireSmart BC assessment results)





- Sprinkler research
- Testing traditional vs low volume sprinklers with different degrees of spray (e.g. 180 vs 360)

FPInnovations
Wildfire Operations

FPInnovations

THANK YOU

Kelsey Winter
Kelsey.Winter@fpinnovations.ca
604.999.4279

wildfire.fpinnovations.ca

web.fpinnovations.ca