Living with Wildland fire: What we learned from the 2016 Horse River (Fort McMurray) Wildfire

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Outline

- Fire in Canada and Alberta
- Fire Management
- Fort McMurray fire
- Lessons learned and options to prevent disastrous fires
Canadian Fire Statistics

- Currently - average of 7,000 fires a year burn 3 million ha (doubled since the 1970s)
- Primarily crown fires
- Fire size
  - 3% of fires are >200 ha
  - represent 97% of area burned
Alberta is Different

- Spring fires – 51% of the annual area burned is from May fire starts
- 82% of the fires in May are human-caused
- 10 year average of 1,500 fires burning 200,000 ha
- 2015 1,700 fires burned almost 500,000 ha
Fire Issues

- An average of $800 million spent by fire management agencies in Canada a year on direct fire fighting costs
- Health and safety of Canadians – evacuations, impacts on economic activity
- Smoke impacts – health, transportation – air & ground
- Impacts on water quantity and quality

Cost to fight fire in Canada 1970-2013

Photo credit – Northwest Territories
Fire Impacts

- Location, location location
- Slave Lake May 2011; Fort McMurray 2016
- 2017 New Zealand, Chile, Portugal, Spain, South Africa, USA (CA) and Canada (BC, AB, NT, SK and MB).
Forest Fires – 3 Ingredients

- Fuel – type, loading, moisture, structure, chemical composition etc.
- Ignition - human and lightning
- Weather - temperature, precipitation atmospheric moisture and wind; upper atmospheric conditions (blocking ridges), sunshine
Map of evacuations, and evacuations with structure loss due to fire 1980-2007
National map of the “human-wildland interface”
Fire Management

• Canadian fire management agencies among best in the world
• Canadian Forest Fire Danger Rating System
• Initial attack but if fire escapes…
• Traditional approach has been zonation and full response in the intensive zone – some agencies are moving toward using appropriate response
Fort McMurray Fire… by the Numbers

- Ignition – May 1\textsuperscript{st} at ~1600
- Hot, dry and windy
- 90,000 people evacuated
- Over 2,800 structures burned
- ~590,000 ha
- Insurable losses $3.77 billion; costliest natural disaster in Canadian history
- Negative impact on National GDP

Photo credit: Globe and Mail
Smoke discovered and reported by rotary-wing patrol Sunday, May 1, 2016 at 1603h, burning in grass under high power transmission line; confirmed as a wildfire at 1606h; MWF spread into trees at 1610h; reached 2.0 ha in size at 1633h.
May 1, 2016 1739h
Crossed Horse River at 1726h
May 1, 2016 1841h
60 ha in size by 1805 h; doubled in size over the next hour
Burned overnight
May 2, 2016 1100h
500 ha in size at 0903h; 1,285 ha at 1700h
May 2, 2016 2014h
2,656 ha at 2000h
Reached Athabasca River at 2010h; spotted across the river during evening
May 3, 2016 2000h (mandatory evacuation at 1820 h)
Spots again across the Athabasca River (Golf Course)
Three separate runs into Fort McMurray
May 5, 2016 1600h Average ROS 2.86 km/h
June 13, 2016 Contained (589,188 ha)
Wildfire MWF-009-16
Location and distance of spot fires ignited from lightning strikes generated by the pyrocumulus cloud created by the fire.
Topography and fuel
Fire Weather

- Antecedent conditions – El Nino – warm and dry
- Surface weather
- Canadian FWI System Indices
- Upper atmosphere maps
- Vertical structure – low level jet
- Synoptic features
- Pyrocumulonimbus
Hot, dry and windy…..

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Low Level Jet

Fort Smith May 3 12 z

Wind Speed (km/hr) vs. Height above sea level (m)
Surface Weather Map - 4 May 1500 MDT
Pyrocumulonimbus

- Extreme and erratic fire behaviour including rapid fire spread
- Lightning
- New lightning fire starts due to the pyrocumulus
This series of images are all 375-m VIIRS I-band 4 (3.74 μm), and each has been scaled so that warmer = brighter and the hot spots show up as the bright white pixels.
Same as the last image, but zoomed in over Fort McMurray. The next few slides will be over this same domain. The fire was first detectable via GOES-15 at 2230 UTC on 1 May (a few hours after this image)
Development

- Canadians live, work and play in the forest
- Development increasing in parts of the country
- More people = more fire

In the last 10 years, 60% of new homes in the U.S. have been built on lands adjacent to fire-prone public lands.

Op-Ed: Why do we keep putting people in the way of wildfire? The wrong carrots and sticks.
Options

- From the wildland fire perspective - 3 ingredients
  - But can only manage the fuel and human-caused fires

- From the community perspective
  - 7 Disciplines of Fire Smart – education, vegetation management, legislation and planning, development considerations, cross-training, emergency management

- Overall – The Canadian Wildland Fire Strategy encompasses both perspectives
“Build Back Better” – Resilient Communities
Summary

- Forest fires are a fact of life in our Canadian forests and will probably increase in the future.

- People live, work and play in the forest and human activities will continue to increase in the future.

- Fire and people will occasionally intersect with disastrous results for society. Fort McMurray was a medium risk community.

- We have options to reduce the risk and minimize the impacts BUT we have to learn to live with fire.
Recommendation 1 Response:
Legislation passed in Dec. 2016 to designate March 1\textsuperscript{st} as the start of the fire season

Recommendation 2 Response:
Weather forecast has been extended from 3-days to 5-days

Recommendation 4 Response:
An appropriate Incident Commander and associated support resources will be assigned to complex wildfires near communities that require a response from both urban and wildland fire fighters.

http://wildfire.alberta.ca/resources/reviews/2016-wildfire-review.aspx
Lessons learned from the Horse River Wildfire

Recommendation 6 Response: The provincial wildfire suppression priorities (human life, communities, watersheds and sensitive soils, natural resources, infrastructure) are being reviewed.

Recommendation 7 Response: ICS will consistently be used by Alberta Agriculture and Forestry, and Alberta Emergency Management Agency when dealing with Wildland Urban Interface wildfires.

Recommendation 8 Response: A long-term vision for the provincial FireSmart program will be developed.
Recommendation 9 Response:
A joint wildfire planning task team (municipal and wildland management staff, and industry stakeholders will be established.
- establish processes for communications
- help GOA utilize industrial equipment
- help industry understand wildfire hazards

Recommendation 10 Response:
A landscape wildfire management plan for Alberta’s northeast region will be finalized and implemented.

Lessons learned from the Horse River Wildfire
…other lessons learned from the Horse River Wildfire

- The period between snowmelt and greenup is a critical period

- Influence of atmospheric stability and mixing height on surface winds are important information the FBAN should consider

- Time between inversion breakdown and blowup can be very short

- Extreme fire behavior and fire spread can occur during the evening (are we getting more nighttime burning?)

- Important to foster and support the 4 Cs of partnering before the disaster occurs