Proceedings for the 5th International Fire Behavior and Fuels Conference
April 11-15, 2016, Portland, Oregon, USA
Published by the International Association of Wildland Fire, Missoula, Montana, USA

Lessons Learned from an Unexpected Spread Event on a Large Fire in a Remote Mountain Park

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Introduction

History of Large Mountain Fires in Alberta

Alberta has two primary fire regime zones, the Boreal - Foothills and the Rocky Mountain Montane Cordilleran area. During the period from 1961 to 2002, 92% of fires occurred in the combined Boreal – Foothills natural region of Alberta while only 6% of fires occurred in the Montane – Cordillera natural region. The remaining 2% of fires occured in Alberta's Prairie - Parkland and Canadian Shield natural regions (Tymstra *et al*. 2005). The Montane-Cordillera natural region featured in this discussion displays considerable variation in fire regime components, due primarily to topographical influences. Mountain ranges both break up fuel continuity and define moisture and wind regimes by virtue of their orientation, while elevation retards the onset of fire season. Further to this, subalpine areas in Alberta are regarded as lightning shadow areas with significantly fewer strikes (Rogeau 2009 2010). These fire regime inputs combine to create both a significantly different fire environment than the boreal forest landscape of Alberta, especially in the Subalpine natural sub region common here. As discussed by Baker and others, the subalpine natural sub region does demonstrate a long return interval – high intensity fire regime (Baker 2009). The subject fire of this paper occurred in such a sub-alpine environment. Other sub-alpine

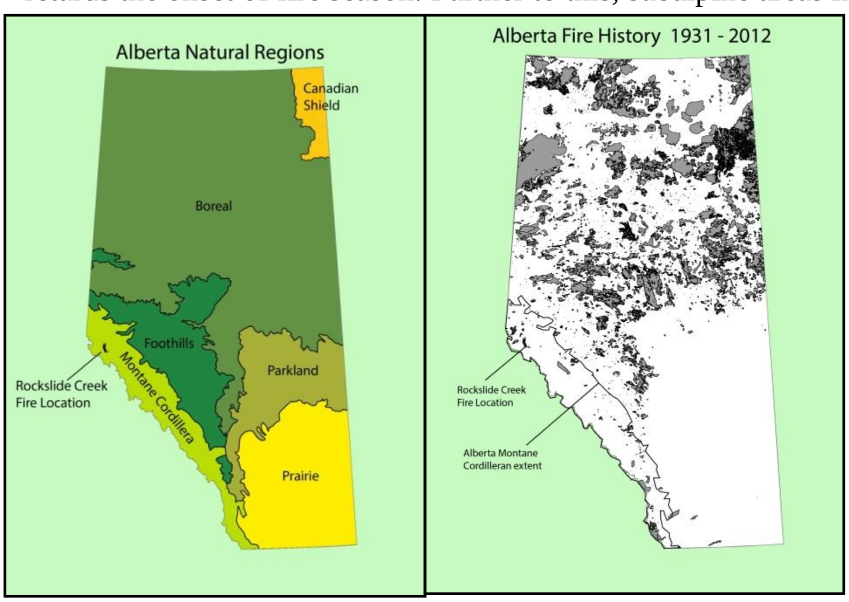

Figure 1 Alberta Canada Natural Regions and 1931-2012 aggregate fire perimeter map

fires in recent years generally follow this trend as well, although the Rockslide Creek fire ignited and burned relatively early in the year. A histogram plot of fires by year seems to show a noticeable trend emerging in the Montane-Cordilleran natural region of Alberta. While the focus of this paper is not on fire occurrence trends, one cannot help but notice a surge in fire numbers in the Montane Cordilleran area of Alberta in the last 10-15 years. Certainly there have been dry years in past with corresponding spikes in fire numbers, but the number and spacing of fire occurrence years seens to be noticeably increasing. Several fires from the Author's experience are brought forward to show the seasonality change from the Rockslide Creek fire. In the author's experience, Montane-Cordilleran fires are usually summer to late fall events, often the result of wind events like Foehn winds (locally known as Chinooks). That late season occurrence window even extends into winter in some noteworthy Alberta fires, occurring as late as December and January, following very dry autumns with very little snowfall and, invariably, driven by, again, the Foehn wind events common to the area. The Rockslide Creek fire, occurring in early June, was anomalous in both its start date, the rapid growth it exhibited, and the large size that it attained.

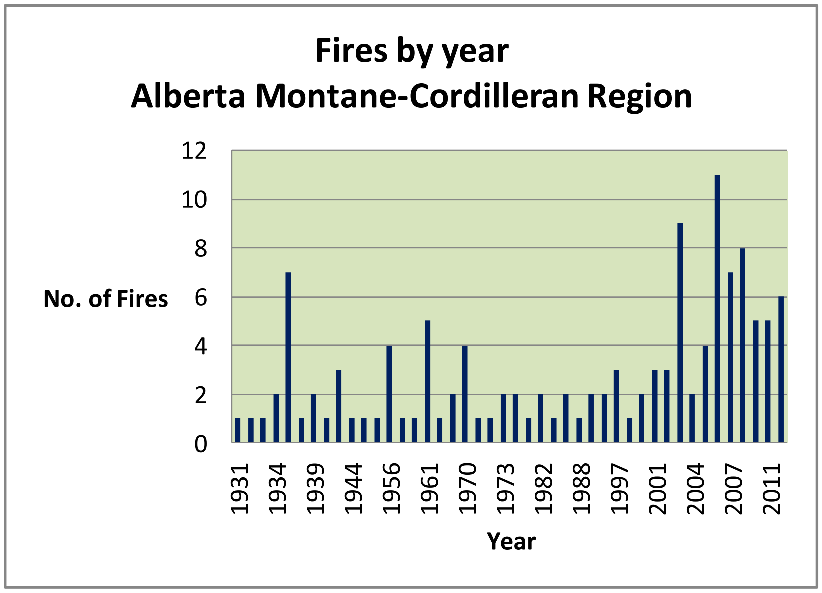

Figure 2. Fire numbers by year in the Alberta Montane-Cordilleran region

Background:

While multiple large fires burned elsewhere in dry 2015 spring conditions in the boreal forest across the province of Alberta, a rare lightning strike ignited a fire in the Wilmore Wilderness, a remote mountain park in west-central Alberta. Given the infrequency of large fires in this region and the mild, only recently thawed conditions, fire managers did not expect the fire to erupt and take a 7.5 mile (12 kilometer) run in under four hours. In three days, the fire burned over 30,000 acres (12,000 hectares) of decadent, upper foothills and subalpine forest and challenged traditional suppression tactics with intense fire behaviour and steep, inaccessible terrain. Even though Alberta's fire suppression agency followed traditional detection and response rules, fire managers of all experience levels and different jurisdictions were surprised at the spread and intensity of this fire at high elevation outside of the 'traditional' fire danger season for this area. This paper explores some of the decision traps and human dimensions of managing fire in an infrequent fire regime while providing some solutions to alleviate the potential for a future 'surprises'.

Chronology of Events on the Rockslide Creek Fire

Fire danger ratings were into the Very High and Extreme categories for much of the province of Alberta following a month of above average temperatures and below average rainfalls related to El Niño. Fire lookout personnel detected the Rockslide Creek Fire in Alberta's Wilmore Wilderness Park on 8th June 2015 a few days following the passage of convective thunderstorms.

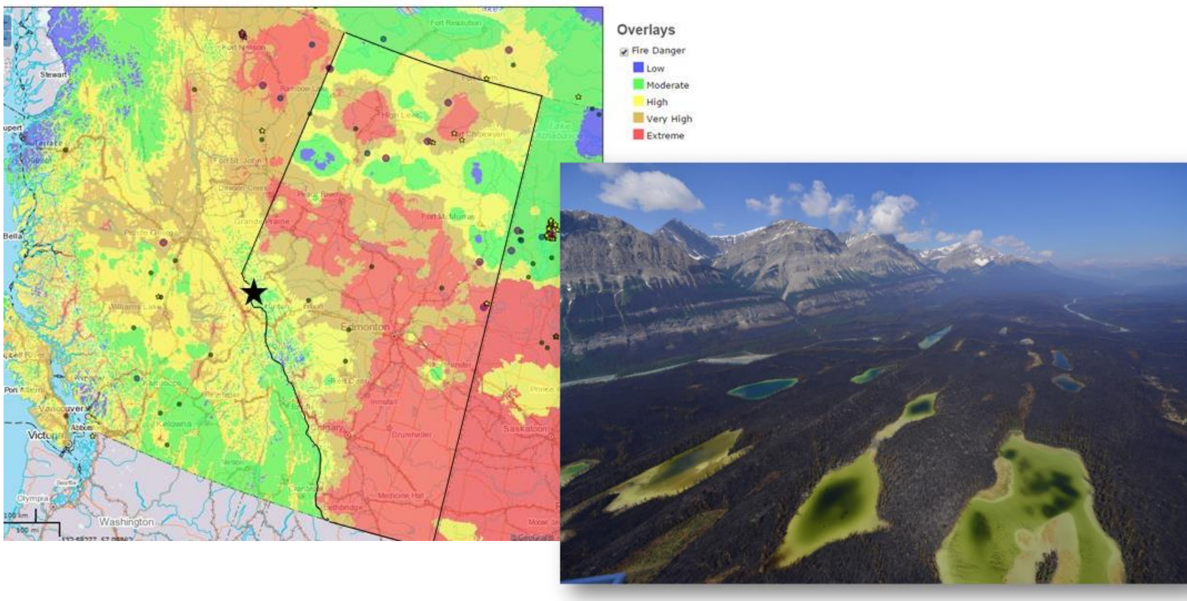

Figure 3. LEFT: Map showing location of the Rockslide Creek fire in relation to the rest of Alberta (indicated by the star). Colors indicate fire danger categories. Circles show locations of other large fires (> 2,000 acres or 1,000 hectares). RIGHT: Image of the Rockslide Creek Fire in the Smoky River drainage of Willmore Wilderness Park (Photo credit: K. Luhtasaari).

The fire started in decadent black spruce (*Picea mariana)* and lodgepole pine (*Pinus contorta* subsp. *latifolia*) forest that had only recently become snow-free. Some of the tree buds showed indication of flush, suggesting the onset of the 'spring-dip' (Jolly *et al* 2015) and sub-surface fuels were still frozen. The fire was at high elevation (5,000 feet or 1600 meters), mid slope in a wide north-south aligned river valley with remote and difficult access both by air and by foot. The fire area had been under a suspected 'dry slot' (Schoeffler 2013) synoptic pattern that brought dry subsiding air and gusty winds. Ignitions in Wilmore Wilderness Park are rare with an average of seven lightning strikes per year across its entire area. The fire return interval is long for most of the park area (>250 years) with the last large fire in the area likely to have been around 1936 (Rogeau 2015).

A helitack crew was dispatched to the fire at 1626 hrs and assessed it at 1700 hrs as a crown fire moving at 45 Chains/hr (15 meters/minute) driven by a westerly wind at 12 mph or (20 km/h) in mild conditions 64°F (18°C), and a relative humidity of 33%. The fire was approximately 24 acres (10 hectares) in size at time of assessment. Nearby values at risk included a few remote park cabins and preferred habitat of the endangered mountain caribou (*Rangifer tarandus)*. The nearest community was Grande Cache located nearly 30 miles (50 kilometers) to the north.

Given the mild weather, time of year and only recently snow-free conditions, the fire was expected to run to the top of the ridgeline before it would diminish with the diurnal drop in winds and temperature. Instead, the fire organized itself into a run spanning the breadth of the Smoky River valley (about three miles/ five kilometers) wide and filled in another 2050 acres (830 hectares) before the night was through.

The following day the fire sat with minimal spread and only a few small uphill runs. Conditions continued to be dry and warm and aerial ignition operations burnt out fuel between a nearby creek and the active fire perimeter to curb any additional spread to the south. On 10 June, crossover conditions and moderate southerly winds drove the fire another four miles (six kilometers) further north. So far, the observed fire behavior matched fire manager's expectations and experience given the fire danger and weather conditions.

On June 11th, wind speed increased to over 40 mph (60 km/h) in the Smoky Valley- an event that falls in the 100th percentile of over 20 years of weather data collected in the area. This pushed the fire another six miles to the north (10 kilometers) and added on another 14,000 acres (5500 hectares) all within three hours. Field reports of observed wind speeds surprised local fire managers and fire behaviour analysts who then tried to adjust tactics and spread projections to fit the anticipated change in fire behaviour.

Discussion

A rare, early season mountain fire in the Albertan Rocky Mountain provides an opportunity to explore a number of lessons learned. Analyses of fire behavior and After Action Reviews are common approaches to fire review but they often fail to tease out the human dimensions of decision-making.

Lessons Learned

Decision traps

When experienced fire managers flew over the Rockslide Creek Fire they were a bit amazed at the fire's intensity and rapid spread because 'it just does not happen up there at this time of year.' Our personal experience drives the way we react to events- we experience a feeling of security based on our comfort with our actions during similar past event, often while unaware of some potential danger. Predetermined ideas like: 'it's spring time', 'the snow has only just recently melted', 'we usually get rain in June', 'it's too cold in the mountains for fire' or 'we don't get fire in Wilmore (wilderness area) in June' can distract us from noticing key fire weather triggers or fuel conditions that are outside of normal. This overconfidence in our judgment leads to failure to collect key factual information because we are so sure of our assumptions and opinions. Most decision makers commit some kind of error along the way and authors (Russo and Schoemaker 1989) describe these as 'decision-traps'.

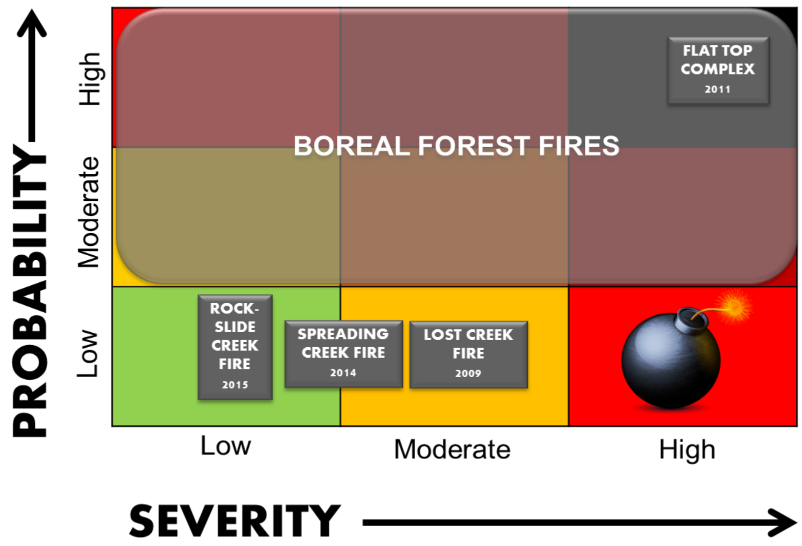

Figure 4. Probability/Severity matrix

In order to make good decisions, we must revisit these errors to identify the pitfalls in our personal decision-making process. We depend on rules of thumb in a place like Wilmore because we do not have our own boots on the ground out there- we are fully dependent on experience and remote weather monitoring stations. These 'anchors' implicitly drive our expectations, so we must become explicitly aware of them. What factors are influencing your decisions? To avoid the decision trap, we should be asking for feedback to calibrate our embedded thoughts (How much overwinter precipitation was there? How are conditions now? How does the current weather compare to the historic weather? We must also always strive know what we do not know and seek to find ways to compensate for the uncertainty. We have to be aware of the "Tyranny of the Urgent[1]" situations that divert our focus. Situational awareness is another discipline that is designed to overcome this tunnel vision.

Conclusions

The 2015 Rockslide Creek fire occurred in a quiet, out of the way corner of Alberta, during a period when mountain fires were normally at a minimum, and the standing boreal forest fire load was very high. Due to those circumstances, the fire was largely un-anticipated, and while the Alberta fire response/suppression framework was robust enough to deal with the fire in a prompt fashion, the fire did surprise people whose jobs it was not to be surprised. For high-reliability organizations, these outlier events do not offer any rebate in their consequences. The agency has to forego the luxury-of-trends to highlight where attention is required, and deliberately focus on all corners of the landscape in a deliberate, systematic fashion, similar to the commercial pilot keeping an eye on dozens, if not hundreds of gauges and indicators monitoring the overall health of his or her aircraft. Likewise, the fire management agency needs to establish systems that over-ride human shortcomings and monitor conditions and elicit a response when (infrequent) conditions are met. The cumulative set of smoke detectors in all homes in a town that together provide fire warning to the fire department is a suitable analogy.

[1] Hummel, Charles E., Pamphlet on time management, 1994, InterVarsity Press

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