

Wildfire:

Nature, Government, Choice



By Ian Urquhart

Slave Lake, Kelowna, Barriere, La Loche, now Fort McMurray. The wildfires that devastated lives in these communities testify to the likelihood, if not certainty, that we've crossed a threshold. The world of wildfire in twenty-first century Canada promises to be a very different and more challenging world than it was a generation ago. Here's a look at the presence of wildfire on the Canadian/Albertan landscapes, explanations for this pattern, how government is addressing wildfire, and the hard choices we need to debate.

Wildfire on the Landscape: More Now Than We Have Ever Seen Before

Wildfires burn, on average, much more of Canada's forests today than they did 40 to 60 years ago. In 2012 the 10-year running

average of land burned by wildfires stood at just over two million hectares. As the University of Alberta's Dr. Mike Flannigan told the CBC program *Sunday Edition* in 2013, this was twice the average amount of territory wildfires consumed in the early 1970s. Flannigan's observation affirmed and extended the conclusion from research from the mid-1990s indicating that wildfire in the boreal forest in the 1980s and early 1990s burned significantly more of the land than was the case in the 1950s, 1960s, and early 1970s.

Chart 1 illustrates this moving average is again on the upswing. Now at 2.65 million hectares this moving average has increased since 2012 due to the very active fire years we experienced in 2013, 2014, and 2015. In 2013, 1.87 million hectares of forests burned in Québec; in 2014, wildfire spread over 3.4 million hectares of the Northwest

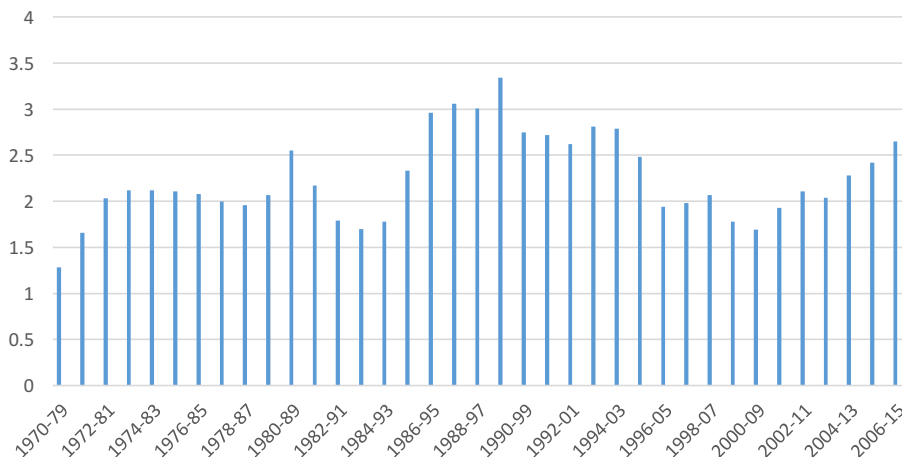
Territories; in 2015, 1.78 million hectares of Saskatchewan's boreal forest went up in flames.

Wildfire in Alberta is an important contributor to this story. The May 2016 Horse River/Fort McMurray Wildfire and very high to extreme fire danger forecasts across most of Alberta's boreal forest in early to mid-May suggest that Alberta could lead Canada into its fourth active fire year in a row. "To have four in a row," as Professor Flannigan told me, "there is no historical analogue that we have."

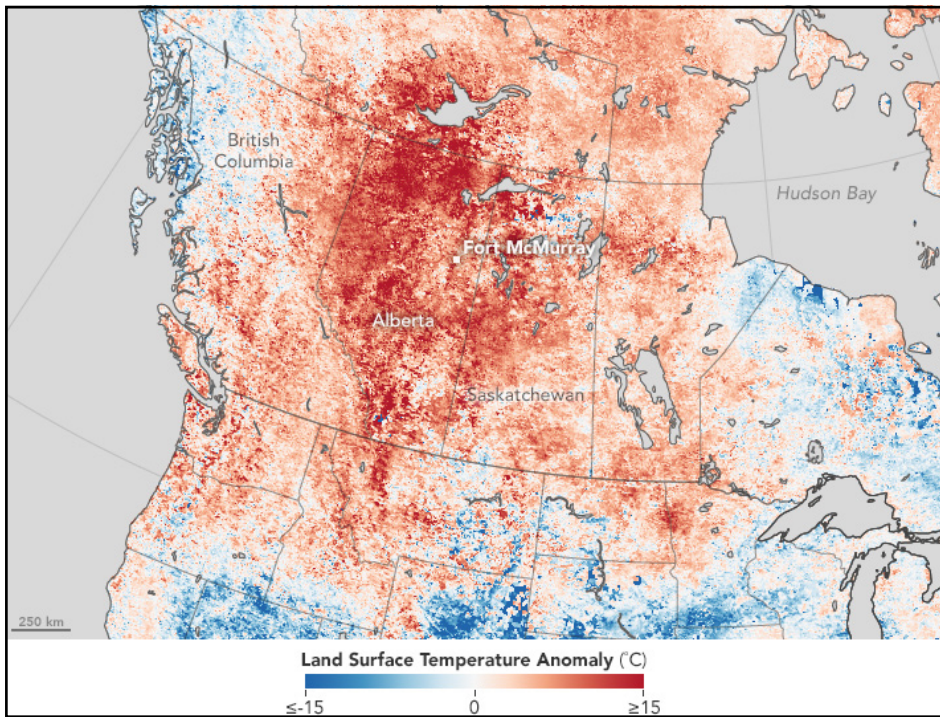
The recent history of forest land burned in Alberta generally mimics the Canadian pattern. A 1999 study prepared for Daishowa-Marubeni observed that, in northwest Alberta, large fires already occurred more frequently and burned more territory there in the 1980-1995 period than they did in the 1960s and 1970s. Chart 2 presents a provincial overview of the average territorial scope of wildfires over time. On average, three times as much of the land was burned by wildfire in the first decade of this century than was burned in the 1970s; in the first six years of the current decade the annual average of area burned stands at 301,331 hectares – nearly seven times the decadal average for the 1970s.

What the decadal averages hide is the fact that annual area burned totals over the medium to long term generally resemble a roller coaster ride. There may be tremendous variation in area burned from year to year. Reviewing the past 45 years of Alberta's fire history you will find years when hundreds of thousands of hectares burned; you will find other years which saw little wildfire on

Chart 1: Canada, Total Forest Land Burned, in Millions of Hectares, 10-year averages from 1970-79 to 2006-15



Source: Averages calculated from Canada, Natural Resources Canada, *National Forestry Database*

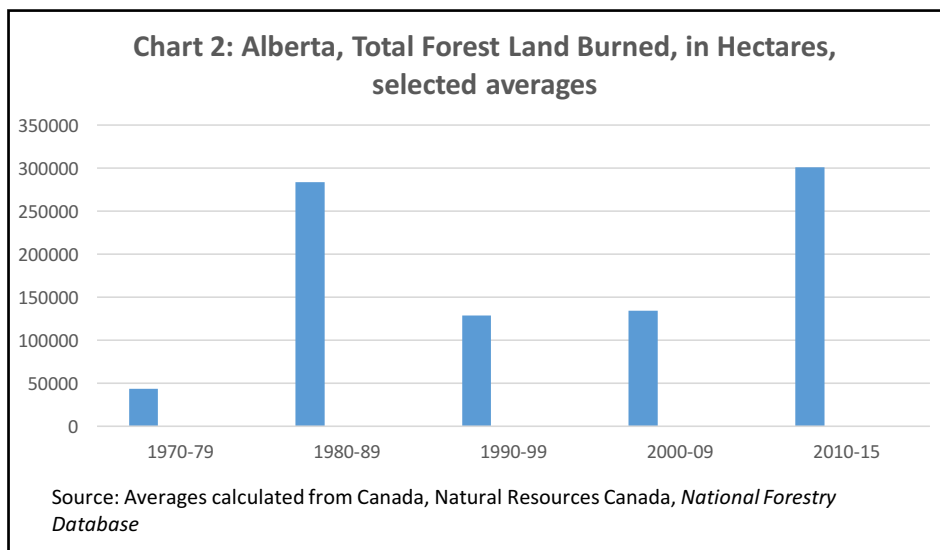


The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite recorded these temperature anomalies for the week of April 26 to May 3, 2016. Red areas were hotter than the 2000-2010 averages for this same one-week period. CREDIT: National Aeronautics and Space Administration (NASA)

the landscape. In 1995 Alberta experienced an active fire year when more than 336,000 hectares of the province burned; but in 1996 wildfire consumed less than 2,000 hectares. In 1981 two fires, over a period of just eight days, set ablaze nearly one million hectares of the boreal forest. They were the major contributors to making 1981 the worst year for area burned in Alberta (1.37 million hectares). One analysis of the 1980 and 1981 fire seasons called August 27, 1981 “Black Thursday” – in less than seven hours on that day roughly 376,000

hectares, more than one-quarter of the total territory burned in Alberta in 1981, went up in smoke.

These variations continue to mark Alberta's annual wildfire pattern in this decade. However, this decade already can be distinguished from its predecessors by the frequency of years where very large amounts of territory burn. Three of the first six years of this decade recorded annual area burned totals of more than 300,000 hectares. This year will make it four years of the first seven since, as of the Victoria Day weekend,



the Horse River/Fort McMurray wildfire was estimated to be more than 500,000 hectares in size. By the time you read this it will be larger than that. No previous decade has seen wildfire burn as much of the province as the decade we are in now.

Ironically, past successes in putting out fires makes today's challenges for wildfire managers more daunting; they've increased the risks of catastrophic wildfires. The Flat Top Complex Wildfire Review Committee (2012), struck after the May 2011 Slave Lake fire, made this point. Successful fire suppression turns a forest inventory's age structure on its head over time. This is emphatically the case for Alberta's boreal forest. In 2011, mature and overmature trees in the boreal constituted more than 60 percent of the forest inventory. In the late 1950s and early 1970s they constituted less than 10 percent of that inventory. Wildfire suppression in the boreal, the Committee concluded, was “beginning to increase the risk of large and potentially costly catastrophic wildfires.”

The recent fire record is a humbling one. Canada is a global leader on the wildfire fighting front. Moreover, our fire suppression capabilities have become more impressive over time. When ignitions are detected initial attack crews are sent, usually by helicopter, to extinguish or control the blaze before it starts to grow. Fire managers now have a variety of sophisticated predictive models and indices they can use to try to anticipate where wildfires may start. This allows them to place initial attack crews, helicopters, water bombers, and heavy machinery in close proximity to areas where they believe the chances of wildfire ignition and spread are greatest. This is especially important when, as was the case in mid-May, firefighters had less than 15 minutes to prevent a wildfire in the northeastern boreal from growing to two hectares in size after ignition. But, wildfire trends don't suggest that our impressive capabilities are reducing wildfire's impact on the landscape. Fire suppression may be successful in reducing the amount of our forests that taste wildfires but that doesn't necessari-

ly mean we will see reductions in the total areas burned over time. If you want to view fighting wildfires as a war, wildfire is a powerful adversary that is in no danger of surrendering.

Wildfire on the Landscape: Likely Even More in the Future

In Alberta our future is very likely one where the risks of wildfires starting are greater than recently. Also, the potential for wildfires to grow quickly and dramatically likely is greater as well. For Mike Flannigan our escalating needs and desires to work, live, and play in the forests well away from large urban centres is important to understanding increased wildfire risks.

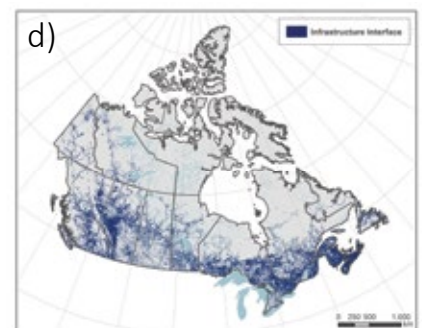
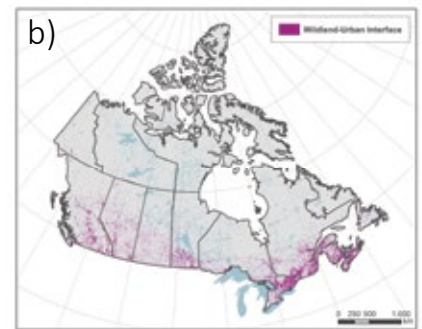
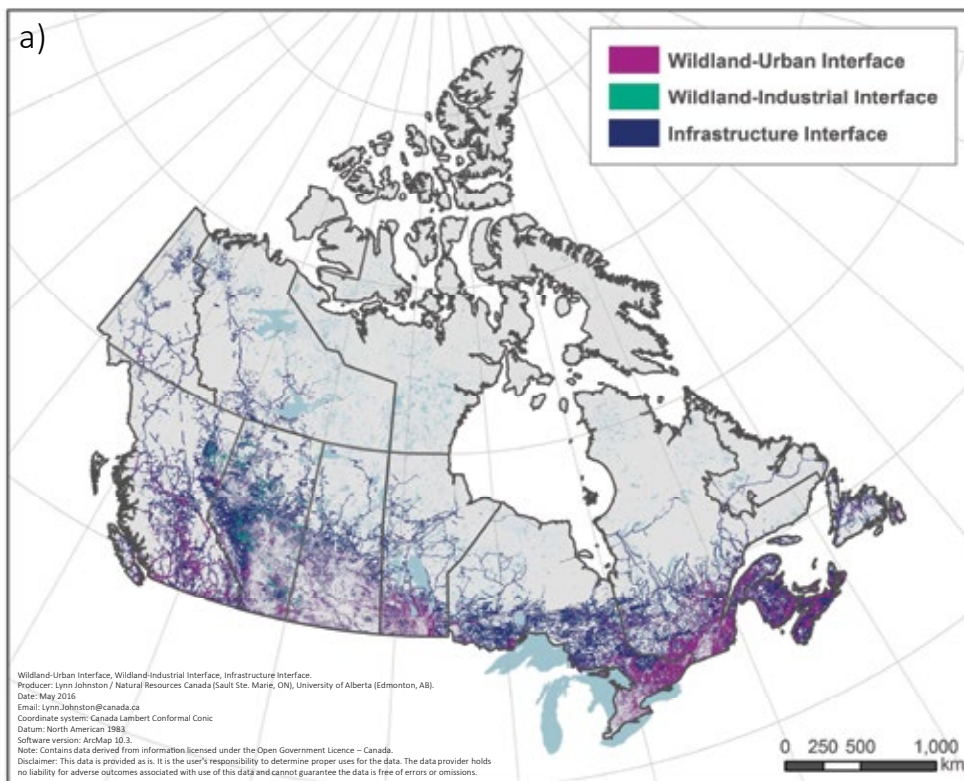
“You look at Alberta,” he says, “and...other than National Parks, there’s a lot of activity on the landscape and where you have people you have fire.” Lynn Johnston, one of Flannigan’s graduate students, studies wildlands/human interfaces. Her interface maps for wildfire may be used to support Flannigan’s observation and make important distinctions between types of interfaces and their prevalence. People who want to live in the forests, some of whom live in communities such as Bragg Creek or Nordegg, are part of the wildland-urban interface detailed in map b. Alberta stands out as a western Canadian province characterized by many wildlands/industrial and wildlands/infrastructure interfaces. Johnston wouldn’t suggest that such exten-

sive interfaces automatically translate into greater risks but I think it’s fair to suggest they may increase the potential for greater human-caused wildfire risks.

Climate change, in addition to fire weather (precipitation, relative humidity, temperature, and wind direction/speed), also increases the probabilities of wildfire ignition, growth, and speed of growth. For a quarter-century now Mike Flannigan has been studying what effects climate change are likely to have on wildfire. His research and that of his collaborators has long argued that climate change will increase both the severity of wildfires and the amount of area burned. In a 2004 paper Flannigan and his three co-authors explicitly demonstrated that *human* emissions of green-

Interface Maps for Wildfire in Canada

- a) Composite of maps b, c, and d
- b) Wildland-urban interface
- c) Wildland-industrial interface
- d) Infrastructure interface



CREDIT: Johnston, Lynn M. (in preparation). Mapping and analysis of Canadian wildland fire interface areas (Master’s thesis). University of Alberta, Department of Renewable Resources.

house gases and sulfate contributed to the warming in wildfire-prone areas of Canada; moreover, they demonstrated that the human contribution to climate change had a significant impact on the area burned in Canada. Three years later another of Flannigan's co-authored contributions to understanding wildfire looked ahead, instead of to the recent past. That research suggested that doubling carbon dioxide levels in the atmosphere from pre-industrial levels (roughly from 280 parts per million to 560 ppm) would increase the amount of Alberta's boreal forest burned by wildfire by 12.9 percent (the carbon dioxide concentration recorded at the Mauna Loa Observatory on May 19, 2016 was 407.82 ppm). Triple the carbon dioxide concentration and that paper predicted that wildfires will burn an additional 29.4 percent of Alberta's boreal. As greenhouse gas emissions and temperatures rise we can expect to see more wildfires and larger hectares-burned totals on those areas of the boreal that do not receive significant increases in precipitation due to climate change.

Positive feedbacks are one of the most haunting or unnerving possibilities associated with climate change. These feedbacks occur when the consequences of a warming global climate amplify, in turn, the processes that generate warming. The catastrophic fires that ravaged Indonesia last year generated such feedback. The vast majority of those fires were set deliberately, often as part of deforestation plans designed to replace rainforest with palm oil plantations. These fires released tremendous amounts of carbon into the atmosphere. The World Resources Institute reported that on many days last fall the greenhouse gas emissions from these fires were greater than the average daily emissions of the total US economy. By last December the cumulative emissions from just the Indonesian fires were greater than the annual emissions of the United Kingdom, or Canada, or Germany, or Japan. Not only do these fires release carbon into the atmosphere but, by destroying the rainforest, they also destroy carbon sinks. Forests that absorbed atmospheric carbon

dioxide were obliterated.

This year's Horse River/Fort McMurray fire, although minuscule when compared to what regularly takes place in Indonesia, has journalists asking fire and climate change experts about the global warming contributions of fires in the boreal. While the experts don't agree yet on how much carbon this Alberta fire has sent into the atmosphere no one disputes that it's millions and millions of tons; it's a significant percentage of Canada's "normal" annual GHG emissions. And, as in Indonesia, every hectare of forest burned in northern Alberta is one less hectare of forest able to sequester carbon.

Another similarity between the Indonesian fires and boreal forest fires such as the Horse River/Fort McMurray fire warrants mention and consideration. Both areas are rich in peat, partially decomposed plant matter. So when Indonesian forests are set ablaze this organic, very rich in carbon, material burns as well. The amount of peat in our northern forests, as Mike Flannigan points out, "dwarfs" the amount of peat found in tropical forests. Preventing peat fires, fires that are very hard to distinguish and may burn or smolder for months, then becomes a more pressing policy concern in a warmer future.

Does Ottawa Care Enough?

Governments face a range of hard choices when it comes to the subject of wildfire. These choices will require resources, both financial and human, and the federal and Alberta governments' actions on this front in recent years don't inspire a great deal of confidence that they are taking the challenges of wildfire seriously enough. In the 2013 *Sunday Edition* program mentioned above Brian Stocks, a retired research scientist from the Canadian Forest Service who continues to specialize in wildfire behaviour today from the University of Toronto, noted that governments weren't doing enough to try to understand wildfire and mitigate the risks it poses to Canadians. The federal government, although a signatory to the *Canadian Wildland Fire*

“The federal government would rather spend millions of dollars on evacuating communities and recovery after the fire than spending a few dollars up front to reduce the risk and help mitigate the results of a disaster.”

Kelly O'Shea,

Executive Director, FireSmart Canada (2013)

Strategy (2005), essentially hadn't put any money into the strategy. This comment confirmed what an update on the strategy for 2008/2009 suggested: the actual federal commitment for 2005-2008 was \$4.8 million, a light year away from the \$328.9 million federal proposed funding requirement for those years.

FireSmart Canada, in the aftermath of the Flat Top Complex/Slave Lake fire, requested one million dollars from Public Safety Canada to help the non-profit organization develop a national standard for wildfire prevention planning for municipalities and rural homeowners. The federal government rejected the request. The organization then lobbied Conservative MPs and asked Minister Toews to reconsider shutting the door on this preventative proposal. Ottawa still refused. You can taste the frustration in FireSmart Canada's Kelly O'Shea's words from several years ago about federal government priorities. “The federal government would rather spend millions of dollars on evacuating communities and recovery after the fire than spending a few dollars up front to reduce the risk and help mitigate the results of a disaster.” Tom Burton, Secretary of Partners in Protection (the creator of the FireSmart brand) and a member of the Flat Top Complex Wildfire

The Western Partnership for Wildland Fire Science: Understanding and Improving Wildfire Management

Canada's fire management agencies long have been among the world's leaders when it comes to managing wildfire. But, as Professor Mike Flannigan, the Director of the Western Partnership for Wildland Fire Science, told me recently: "it's a challenging job and it's becoming more challenging in Alberta." In other words, there's an ongoing need to understand wildfire better and to improve our efforts to manage wildfire appropriately. This need is at the core of the mandate of the Western Partnership for Wildland Fire Science.

Centred at the University of Alberta, the Partnership established a collaborative network in 2009 between three institutions: the university's Department of Renewable Resources, Alberta's Department of Agriculture and Forestry, and the Canadian Forest Service. Dedicated to research and education it's not surprising to hear Professor Flannigan point to more than 20 graduate students who have developed an expertise in wildfire through the training they've received through faculty involved in the Partnership. The university registration system suggests that Renewable Resources plans to offer one undergraduate and three graduate courses explicitly focused on wildfire in the 2016-17 year. The Partnership is making an important contribution to training the next generation

of scientists and practitioners who will wrestle with the challenges of managing wildfire in Canada and abroad.

The original science plan for the Partnership established three research priorities: fire resilient landscapes, fire danger rating systems, and fire weather and climate change. Here Flannigan sees research such as that on rating systems and fire weather as work building on an already impressive Canadian pedigree. The Canadian Fire Weather Index, for example, is the de facto global standard when it comes to estimating the effects fuel moisture and wind will have on the behaviour of fire. The new modeling that researchers are developing, and students/future forestry managers are learning about, refines and improves on the insights of past generations. The prize here is greater predictability, less uncertainty. But make no mistake when it comes to prediction and uncertainty - there's no hubris in the orientation of Flannigan and his research colleagues. Uncertainty will always be a part of wildfire management. The goal of the Partnership's research and education program is to reduce that uncertainty and better prepare the current and future generations of wildfire managers to face the challenges a warming world presents.

Review Committee, noted in an interview that, before the Horse River/Fort McMurray fire, the federal government had increased the importance of wildfire in its rankings of disasters. His initial sense of Public Safety Canada Minister Ralph Goodale's position, in the aftermath of the tragic Fort McMurray fire, was that Ottawa now may take a more serious view of the need for the federal government to increase its commitment to managing wildfire.

With respect to wildfire research, the story Stocks told to the CBC about the history of federal cuts to basic science in Natural Resources Canada painted the federal government with the brush of neglect. Stocks

claimed that, when he started his fire research work with the federal government roughly forty years ago, the federal research capacity in terms of personnel was at its peak. About 50 staff, with adequate budgets, were engaged in basic scientific research on fire. This research capacity suffered debilitating cuts over the subsequent forty years. By 2013, the federal fire research capabilities were less than half of what they had been. He asserted that fewer than 24 people, with "a hugely inadequate budget," were engaged in fire research in 2013. He went on to say that so many of the wildfire challenges we face require basic scientific research to underpin policy

and this research suffered from cuts to government laboratories. The path we've been on for forty years, one where we've moved away from government-based basic scientific research, seriously hinders our chances of adapting to a world with more wildfires on most landscapes.

And What About Alberta?

The provincial government owns the vast majority of Alberta's natural resources and arguably has the primary responsibility for responding to wildfire. What does Alberta's recent wildfire management record look like? One place to begin is with the annual base amounts budgeted for managing wild-

fire. As a base budget, this total generally will be less and sometimes far less than what the province actually spends on fighting wildfires. Supplementary estimates will be relied on in active or bad fire years to ensure the province fights all dangerous fires.

For example, Alberta Sustainable Resource Development's 2011/2012 budget dedicated \$107.4 million "to cover wildfire prevention and detection and to retain (on-call) the necessary manpower, equipment and aircraft for immediate mobilization." The Flat Top Complex/Slave Lake and Richardson Backcountry wildfires were largely responsible for Alberta spending an additional \$250 million in wildfire emergency funding during that fiscal year. The lower figure, \$107.4 million, is a better estimate of the permanent resources Alberta devoted that year to managing wildfire.

From the 2004/2005 fiscal year to the 2014/2015 fiscal year there was very slim growth in this measure of Alberta's commitment to managing wildfire. Two percent annually, that's how little the base or pre-season Alberta wildfire management budget grew in constant, inflation-adjusted dollars. The Flat Top Complex Wildfire Review Committee noted that the increasing costs of a wide range of firefighting resources was a "key pressure" on the government's ability to prepare for wildfires. I'm skeptical that such a slim real increase in the base budget has been able to keep pace with the current costs and needs of wildfire management.

In November 2015, at the end of an active fire year where wildfires burned nearly 500,000 hectares of Alberta, Agriculture and Forestry Minister Oneil Carlier told members of a legislative committee that a review had started of the personnel and equipment his department would need to be prepared well for the 2016 fire season. Apparently that review didn't convince the provincial government to increase markedly Alberta's base wildfire management budget. In April 2016 Deputy Minister Bev Yee told the Standing Committee on Alberta's Economic Future that the wildfire base budget was slightly less than the

previous year. Still, she suggested, her department was ready for the 2016 season. Premier Notley defended her government's approach to wildfire by saying that, if the fire season warranted it, Alberta would "add if necessary" to the base budget. This philosophy is no different from that taken by the Progressive Conservative governments she succeeded.

Performance Measures and Priorities: Do They Need to Change?

Do climatological and weather circumstances justify this continuation in wildfire management policy? If Alberta truly wants to take the "proactive approach to controlling wildfires" that Minister Carlier subscribed to in his November 2015 committee testimony then perhaps Alberta should be investing in more wildfire research, knowledge, equipment, and personnel.

This suspicion arises from the belief that the challenges and risks associated with wildfire today are more serious than they were one or two generations ago. One of the first things these challenges demand is a serious reconsideration of how government measures and reports wildfire management success. Containment and suppression is a longstanding measure of how well Alberta is performing its wildfire management role; what percentage of wildfires are contained by 10am of the day following their discovery? Alberta's performance is stellar according to this measure. In 2011, the government could report that 96.1 percent of all wildfires were contained within this timeframe. But...this was the year Slave Lake burned; this also was the year of the Richardson backcountry fire – a mammoth 600,000 hectares fire that burned for months. And, to return to an observation from the Flat Top Complex Review Committee report, successful suppression actually is beginning to increase the risks of catastrophic wildfires.

Hypothetically, would we be comfortable in arguing at the end of the current fire year that it was a success because we met a containment target of 97.8 percent? I wouldn't

think so. Slave Lake in 2011 and Fort McMurray in 2016 should make it clear that this measure for protecting the public and environment is flawed. The government needs to reconsider how it measures wildfire management performance.

"Alberta Agriculture and Forestry," according to the department, "responds to every wildfire reported in the Forest Protection Area (approximately 60% of the province's landbase)." The province's five priorities in deciding how to allocate wildfire fighting resources are: human life, communities, watershed and sensitive soils, natural resources, and infrastructure. With respect to these priorities, should the province devote resources to protect commercial timber values at the same time as it tries to subdue a fire on the doorstep of a community?

In the aftermath of the Horse Lake/Fort McMurray fire this is a hard question our political leaders should be asked to wrestle with. On April 30, 2016, one day before the Horse Lake/Fort McMurray fire was discovered, a wildfire erupted approximately 45 kilometres northwest of Red Earth on a landscape marked by clearcuts, well sites, and merchantable timber. Communities were not threatened by this rapidly growing, out of control wildfire. But the Otter Lakes wildfire did threaten timber values. So, helicopters, airtankers, and dozens of firefighters attacked the wildfire. Thanks to the hard work of the firefighters and the use of aircraft and heavy equipment they were able to slow the growth of this fire in an unpopulated area. By Saturday May 7th the fire had grown to nearly 2,000 hectares but it was 50 percent contained. The next day the province announced that the fire was held – it was not expected to grow any larger.

With no communities at risk should the province have hit the Otter Lakes wildfire as hard as it did? Might not some of the aircraft and firefighters used there to defend timber values, perhaps even all of those resources, have been better deployed on the next day or on May 2nd 200 kilometres to the east fighting the fire that engulfed the

southern section of Fort McMurray? Surely the province must convene a review of how the Horse River/Fort McMurray fire was tackled. I hope such a committee will take a hard look at what sort of balance is being struck between priorities when it comes to allocating wildfire management and fighting resources.

It All Comes Down to Hard Choices

Challenges, risks, hard choices between values, and shared responsibilities are among the constants I see when it comes to efforts to manage wildfire. Since I started to consider the subject of wildfire last year I've come to appreciate the range of hard choices that lie ahead of us. Governments need to decide if, given our need to adapt on a landscape being shaped by climate change and a history of wildfire suppression, they

have treated wildfire seriously enough.

If they decide they haven't then what should they do? Some options strike me as easier than others. An easy option, in my mind, would be to invest much more in understanding, preventing, and fighting catastrophic wildfire.

More difficult, more controversial, options revolve around the importance we give to different values. They are suggested above in thinking about the balance between community protection and commercial interests when it comes to fighting wildfire. Here you could add forest health to the mix of values. The boreal is a disturbance forest and wildfire is vital to its renewal. Should fires in the boreal that threaten forestry tenures or petroleum well sites but don't threaten communities be allowed to burn in order to restore health and ecological balance to the boreal? If you want to say

yes to this question – what about the contributions that wildfires in the boreal and its peatlands may make to climate change?

And, finally, what responsibilities do we have as individuals? I've heard one respected voice suggest that perhaps governments should limit the ability of individuals to live as they please in those lovely, forested locales far from the city many people dream about. If we choose to live with others in nature then do we have a duty to sacrifice some of our aesthetic wants for the safety of others. When I return to the legacy my parents left me on Kootenay Lake later this year should I be thinking of defensible space as I sit under the pines, of what I should do to make our structures, as well as my neighbours', more resilient to wildfire. Hard choices, but ones we need to debate and make. 🌲