



Review of Alberta Agriculture and Forestry's Wildfire Management Program and the 2015 Fire Season

Volume 2: Detailed Report

Prepared By: MNP LLP
Suite 1600, MNP Tower
10235 – 101 Street NW
Edmonton, AB T5J 3G1

Prepared For: Forestry Division, Alberta Agriculture and Forestry
10th Floor Petroleum Plaza South Tower
9915 - 108 Street
Edmonton, AB T5K 2G8

Date: December 2016

TABLE OF CONTENTS

Introduction	1
1. Overview of the 2015 Fire Season in Western Canada	4
1.1 Climate Change and Its Impact on Future Fire Seasons	4
1.2 Early Fire Season Weather Summary in Western Canada	6
1.3 Number of Wildfires and Area Burned Across Western Canada in 2015	8
2. The 2015 Fire Season in Alberta	11
2.1 Fire Weather Index Indicators	11
2.2 Wildfire Statistics.....	13
2.3 Public and Industrial Impacts	16
2.4 Summary of the 2015 Fire Season in Alberta.....	19
2.5 Conclusions	20
3. Wildfire Prevention, Wildfire Science and FireSmart	21
3.1 Overview of the Wildfire Prevention Section.....	21
3.2 Analysis and Findings	26
3.3 Conclusions	29
3.4 Recommendations and Opportunities for Improvement.....	29
4. Wildfire Detection, Presuppression Preparedness and Suppression – Program Overview	32
5. Wildfire Detection	36
5.1 Overview of Wildfire Detection	36
5.2 Analysis and Findings	43
5.3 Conclusions	45
5.4 Recommendations and Opportunities for Improvement.....	46
6. Presuppression Preparedness.....	47
6.1 Overview of Alberta’s Presuppression Preparedness.....	47
6.2 Analysis and Findings	52
6.3 Conclusions	55
6.4 Recommendations and Opportunities for Improvement.....	56

7.	Suppression	57
7.1	Overview of Wildfire Suppression in Alberta.....	57
7.2	Analysis and Findings.....	59
7.3	Conclusions.....	63
8.	Policy and Planning	64
8.1	Overview of Wildfire Management Policy and Planning.....	65
8.2	Analysis and Findings.....	66
8.3	Recommendations and Opportunities for Improvement.....	67
9.	Resource Sharing and Mutual Aid	69
9.1	Overview of Resource Sharing Arrangements for Alberta.....	69
9.2	Analysis and Findings.....	71
9.3	Recommendations and Opportunities for Improvement.....	74
10.	Flat Top Review	75
10.1	Evaluation of Fulfillment of the Flat Top Review Recommendations.....	75
11.	Alternative Revenue and Insurance Opportunities	80
11.1	Alternative Revenue.....	80
11.2	Wildfire Program Insurance.....	81
11.3	Recommendations and Opportunities for Improvement.....	87
12.	Wildfire Costs and Financial Management Opportunities	88
12.1	Recommendations and Opportunities for Improvement.....	90
	Appendix 1: Changes to Wildland Urban Interface	92
	Appendix 2: Individual Wildfire Reviews	96
	Appendix 3: Flat Top Review	114
	Appendix 4: What We Heard	138

INTRODUCTION

Over time, Alberta has developed an extensive wildfire management program that supports a relatively high degree of settlement, public use and resource development activity in the east slopes and northern boreal areas of the province. The program is managed by the Department of Agriculture and Forestry (Agriculture and Forestry). The wildfire management program is designed and developed to provide for human safety and to mitigate the risks and impacts of wildfire on communities and a range of values all of which are important to the well-being of the province. Generally, the wildfire management program has been well regarded by Albertans and other jurisdictions. It has undergone a variety of reviews, evaluations and continuous improvement initiatives to help ensure that it remains effective in meeting goals and expectations. Examples of past reviews include:

- Annual reviews carried out subsequent to each fire season.
- The 1998 Wildfire Management Program Review.
- The 2001 Chisholm Wildfire Review.
- The 2011 Flat Top Complex Wildfire Review.

The 2015 fire season in Alberta was severe and highly active in terms of the number and intensity of wildfires and the area burned. Agriculture and Forestry commissioned a review of the program, including an evaluation of the Department's performance during the season, in order to consider what could be learned from the events that transpired and to position the program for long term challenges. In implementing the review, the following activities were carried out:

- A review of the legislation, policy and structure of the wildfire program, as described in various forms of documentation.
- An historical review of wildfire conditions in Alberta, western Canada and North America, including weather patterns, wildfire indices and related trends.
- A review of the wildfire conditions, behaviour, events and occurrences experienced during the 2015 fire season.
- A review of the various functional areas of the wildfire management program, based on data collection, interviews with staff and stakeholders and an evaluation of performance relative to objectives.
- A review of the progress being made towards the recommendations put forward by the Flat Top Complex Wildfire Review Committee.
- A review of financing alternatives, including revenue generation alternatives and insurance opportunities.

The review was carried out by a multi-disciplinary team of forestry and wildfire specialists as part of the MNP national forestry practice. The Review Team included:

- | | |
|-------------------------|---------------------------------------|
| • Rod Simpson, RPF | • Gary Mandrusiak, RPFT |
| • Todd Nash, RPF | • Hugh Boyd, RPFT |
| • Dennis Quintilio, RPF | • Allen Beaver |
| • Sherra Muldoon, RPF | • Peter Fuglem, RPF
(BC – Retired) |
| • Bruce MacGregor, RPFT | |

The report is presented in chapters corresponding to the functional areas and topics reviewed. Chapters include an overview, analysis, findings, conclusions, recommendations and opportunities for improvement. Recommendations are made where findings suggest that some form of action needs to take place to address an issue or area of concern. Opportunities for improvement are made where ideas and suggestions have been recorded or developed that would allow for some degree of enhancement in the program, in keeping with the Department's objective of continuous improvement. The recommendations and opportunities for improvement focus on wildfire prevention (particularly FireSmart, planning and communications), wildfire operations, financial functions and performance measures.

Recommendations

1. *Revisit the province's strategy respecting FireSmart with an increased emphasis on a long term vision for FireSmart within the province, community responsibility, multi-agency collaboration and an outcomes based approach to implementing FireSmart projects.*
2. *Develop robust communication plans and protocols for both pre-fire season prevention awareness, as well as facts and advisories associated with wildfire events.*
3. *Develop and implement a formal wildfire risk management framework.*
4. *Establish an analyst role within the Forestry Division that can provide assistance in the area of cost analysis, cost control and efficiency. The individual or group must have capabilities in financial management and operational wildfire program delivery, and must remain at arm's length from the operations organization.*

Opportunities for Improvement

1. Improve the means of measuring wildfire prevention effectiveness by obtaining more specific data on the results of key activities or more specific feedback on targeted communities and demographic groups.
2. Expand the provincial wildfire prevention strategic plan to include a provincial work plan for implementation by the Wildfire Management Areas.
3. Enhance efforts respecting vegetation management research and science to offer a rationale for established and new FireSmart applications.
4. Improve the linkage of FireSmart outputs with wildfire suppression decision making by ensuring that Duty Officers and Incident Management Teams have ready and immediate access to information regarding FireSmart activities in surrounding communities.
5. Promote increased public engagement and communication regarding the importance of FireSmart and the need for FireSmart to be community-driven.
6. Investigate the potential for the establishment of a standing FireSmart council representing various communities and organizations for review, engagement, education and increasing the profile and commitment to FireSmart in Alberta.
7. Investigate the potential for increased effort and funding to six of the seven disciplines of FireSmart (not including fuel modification), to ensure a well-rounded and all-inclusive provincial FireSmart program is delivered.

8. Move towards a coordinated, dedicated, sustainable and predictable flow of funds to the provincial FireSmart funding program to provide a longer term ability to support FireSmart project funding requests.
9. Investigate the development and adoption of improved wildfire detection performance indicators.
10. Continue to investigate new wildfire detection technology.
11. Review the terms and conditions, and the recruitment approach and standards for contracted firefighting crews with an aim to increase recruitment and the number of firefighting crews available.
12. Continue to review and implement improvements to firefighting equipment contracting practices and guidelines.
13. Prepare communications and briefing materials to increase the level of awareness of all government representatives about wildfire and wildfire management.
14. Expand efforts within the departments of Agriculture and Forestry and Environment and Parks to link wildfire management with planning under the Land Use Framework, Forest Management Agreements and other relevant planning initiatives.
15. Incorporate wildfire management policies and objectives into public education and awareness communications, as part of the Department's communications initiative.
16. Continue to work with other jurisdictions, through the development and implementation of the Canadian Wildland Fire Strategy and through other opportunities, to enhance resource sharing, particularly with respect to aircraft and the availability of qualified and trained firefighters.
17. Continue investigating opportunities to apply an insurance approach to Agriculture and Forestry's wildfire management program.
18. Look again at the organization structure in respect to the management responsibility for the wildfire management program's regional business services (such as finance and administration functions) and ensure that there are no impediments that complicate decision making and wildfire management program delivery.

The 2015 wildfire season was extreme throughout western Canada and particularly in Alberta. A hot, dry spring with high wildfire hazards created a situation where a high number of wildfires were experienced and many of those wildfires grew aggressively. The Review Team concluded from their review of the season and Agriculture and Forestry's response that the Department's wildfire management program functioned well during the extreme fire season. The approach to wildfire management is sound, the systems are well developed, personnel are well prepared and resourcing is adequate—all are correctly oriented toward early containment of wildfires.

While resources were stretched to the limit in 2015, and resource sharing agreements were used to their full capacity, wildfires were contained or managed in a way that reduced risk to human life and property and mitigated damages to other values at risk. The program and the organization that delivered it was successful.

The current climate and wildfire science suggests that extreme seasons and wildfire situations similar to 2015 are more likely to occur in the future. Additional contributing factors that did not exacerbate the situation in 2015, such as wind events, could factor into future extreme fire seasons and wildfire events with a much more serious impact. To address these risks it is important to continually make improvements where possible and to address weaknesses or opportunities for improvement.

1. OVERVIEW OF THE 2015 FIRE SEASON IN WESTERN CANADA

Fire season length is on the increase in North America, and as a result, additional area burned on an annual basis is impacting resource availability, wildfire management budgets and community safety. In addition, climate change forecasts indicate a continued and perhaps enhanced trend in the persistence of weather conditions that are associated with catastrophic wildfire events. A similar forecast for increased public and industrial developments adjacent to flammable forest fuels implies that wildfire management agencies are facing an emerging issue in regards to setting suppression priorities and ensuring community protection. The 2015 fire season may represent a significant increase in future wildfire management challenges as illustrated by average number of wildfires and area burned in Canada over 25 years compared to the averages for 2015 in Exhibit 1.

Exhibit 1: 2015 Fire Season Comparison of Average Number of Wildfires and Area Burned in Canada

25-Year Average	Number of Wildfires 4,174	Area Burned in Hectares 1,448,331
2015 Fire Season	Number of Wildfires 6,765 (162%)	Area Burned in Hectares 3,969,504 (274%)

The fire season of 2015 impacted western Canada from May to September as concurrent wildfire events west of Manitoba eventually required importing significant national firefighting resources, as well as international resources from the United States, Mexico, New Zealand, Australia and South Africa. As a consequence of the 2015 fire season, British Columbia, Alberta and Saskatchewan commissioned reviews intended to provide recommendations for wildfire management program improvements to meet current and future challenges.

1.1 CLIMATE CHANGE AND ITS IMPACT ON FUTURE FIRE SEASONS

Climate change forecasts imply a significant increase in fire season length, area burned and possibly wildfire severity in the next few decades. The increase in length of the fire season in Canada has been forecast as early as 1993¹. In addition, a 2013² reference to changes in the length of the fire season and subsequent increase of lightning caused wildfires in Ontario and Alberta is consistent with the earlier

¹ Wotton, B.M. and Flannigan, M.D. 1993. Length of the fire season in a changing climate. *For. Chron.* 69:187-192.

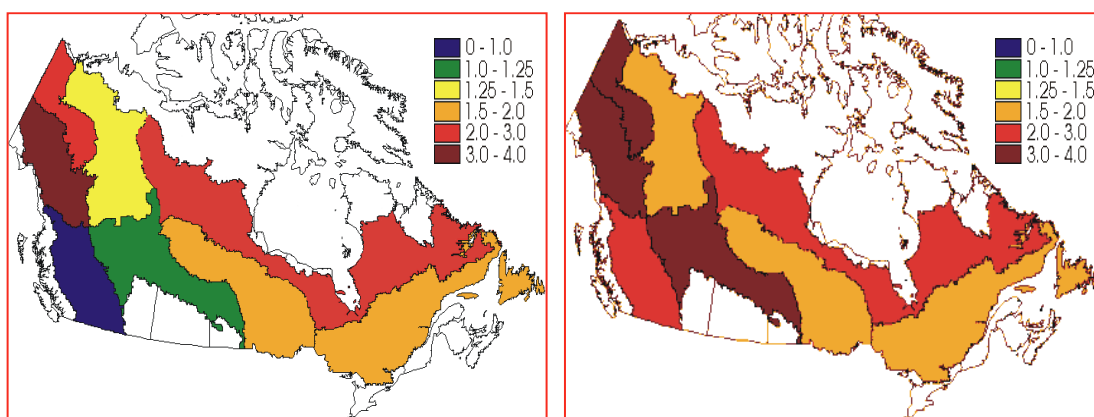
² Albert-Green et al. 2013. A methodology for investigating trends in changes in the timing of the fire season with applications to lightning caused forest fires in Alberta and Ontario, Canada. *Canadian Journal of Forestry Research*.

reference. Flannigan (2013)³ also suggests that fire seasons will increase by 20 days and be three times as severe in North America by the end of the century. Following the disastrous spring wildfires of 2011 in the Slave Lake area, Agriculture and Forestry started the fire season on March 1 rather than April 1. This strategy allowed earlier response to the significant wildfire events in May of 2015.

Area burned forecasts are also discussed here using outputs from General Climate Models (GCM) assuming both 2xCO₂ and 3xCO₂ scenarios through to the end of the century. Podur and Wotton (2010)⁴ used GCM outputs along with wildfire growth and suppression simulation models to project a doubling of area burned by 2020 and an eight-fold increase by 2100. These changes are driven by increases in wildfires escaping initial attack, with escaped wildfire frequency increasing by 34 percent by 2040 and 92 percent by the end of the 21st century. Flannigan et al (2005) used both a Canadian and a United Kingdom GCM to produce area burned estimates for 3xCO₂ across Canada. The UK model forecasts at least a tripling of the area burned while the more conservative Canadian model forecasts a more modest increase resulting in an average doubling of the area burned. The models are presented in Exhibit 2.

A recent report from California cites a climate change study that forecasts extreme wildfire risk to increase from 10 days to 60 days per fire season by the 21st century. The impact across the United States would be a 50% increase in the national firefighting budget. In summary, climate change forecasts seem consistent with recent wildfire trends in Alberta (which are magnified by the 2015 fire season) and this observation is significant to evaluating the program and developing recommendations.

Exhibit 2: Canadian (left) and United Kingdom (right) General Climate Model Forecasts for 2xCO₂ and 3xCO₂ respectively in Canadian Ecozones



³ Flannigan, M.M., Cantin, A.S., de Goot, W.D., Newberry, A., Gowman, L.M. 2013. Global wildland severity in the 21st century. *Forest Ecology and Management* 294:54-61

⁴ Podur, J. And Wotton, M. 2010. Will climate change overwhelm fire management capacity? *Ecological Modelling* 221: 1301--- 1309. doi:10.1016/j.ecolmodel.2010.01.013

1.2 EARLY FIRE SEASON WEATHER SUMMARY IN WESTERN CANADA

Environment Canada provides annual maps for both average temperature and precipitation based on 30 years of national records. Exhibit 3 and Exhibit 4 illustrate the broad area in western Canada with below normal precipitation and above normal temperature from December of 2014 to May of 2015. The combined effect of these two anomalies contributed to the significant increase of the number of wildfires and area burned in western Canada during the 2015 fire season.

Exhibit 3: National Temperature Averages for Winter (left) and Spring (right) of 2014 to 2015

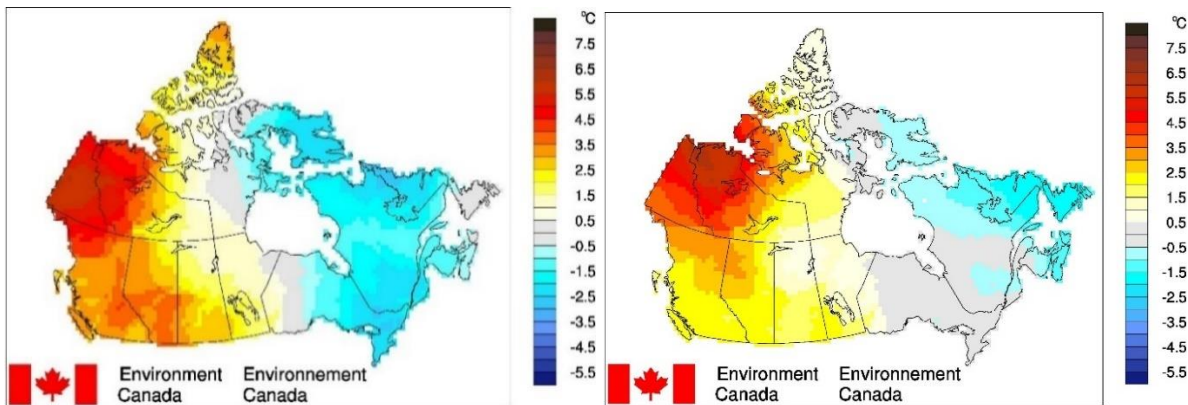
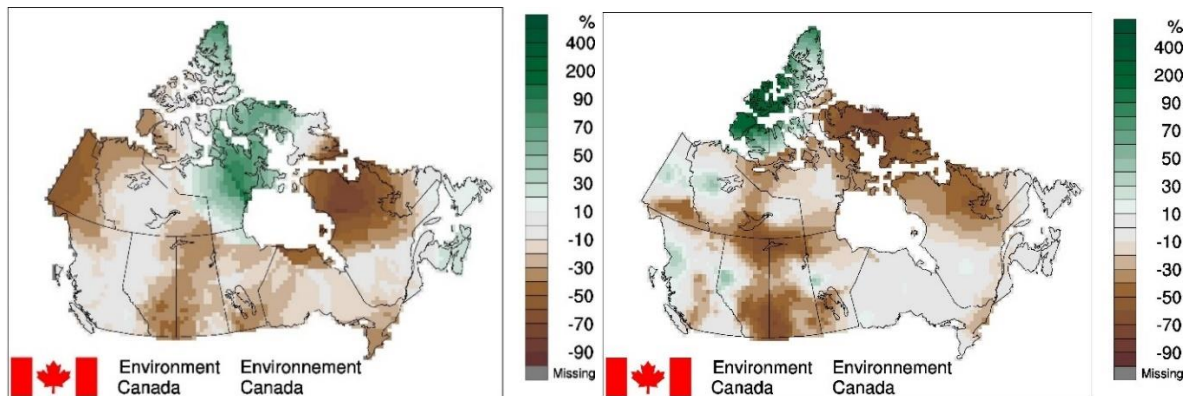


Exhibit 4: National Precipitation Averages for Winter (left) and Spring (right) of 2015



Data for the Northwestern Forests Region, which includes Alberta, was used to calculate historic departures from baseline averages for both temperature and precipitation. Exhibit 5 and Exhibit 6 present trend lines for temperature and precipitation anomalies for winter and spring of 2015 for the Northwestern Forests Region. Although average temperature varies below and above the baseline, the trend is above average since 2003. Average precipitation, on the other hand, has trended above the baseline with the exception of 2013 and 2015.

**Temperature Departure from Baseline Average
1961-1990 Northwestern Forests
Spring (March to May) 2015**
(Source: Environment Canada)

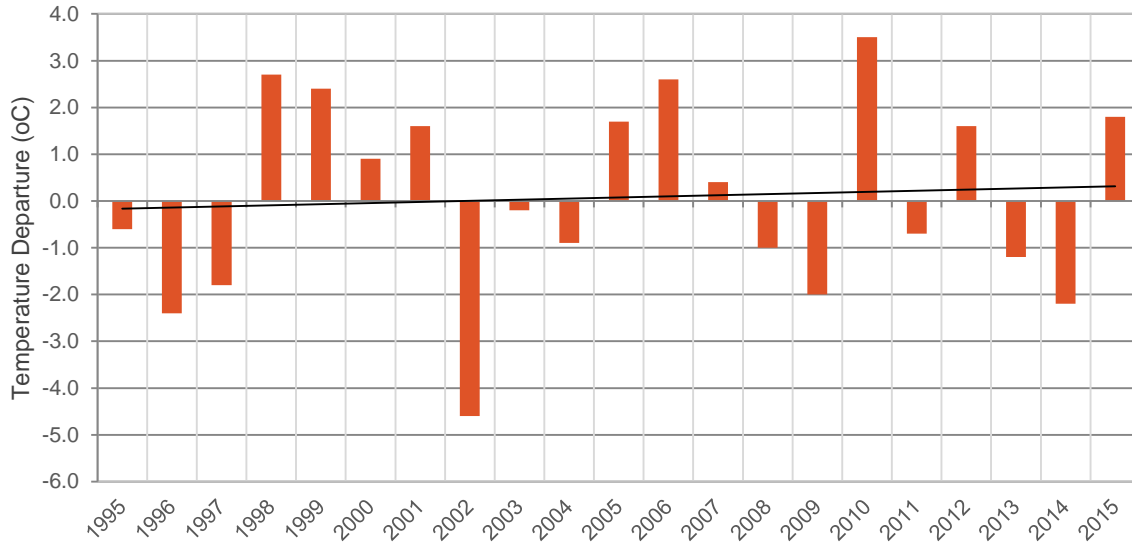
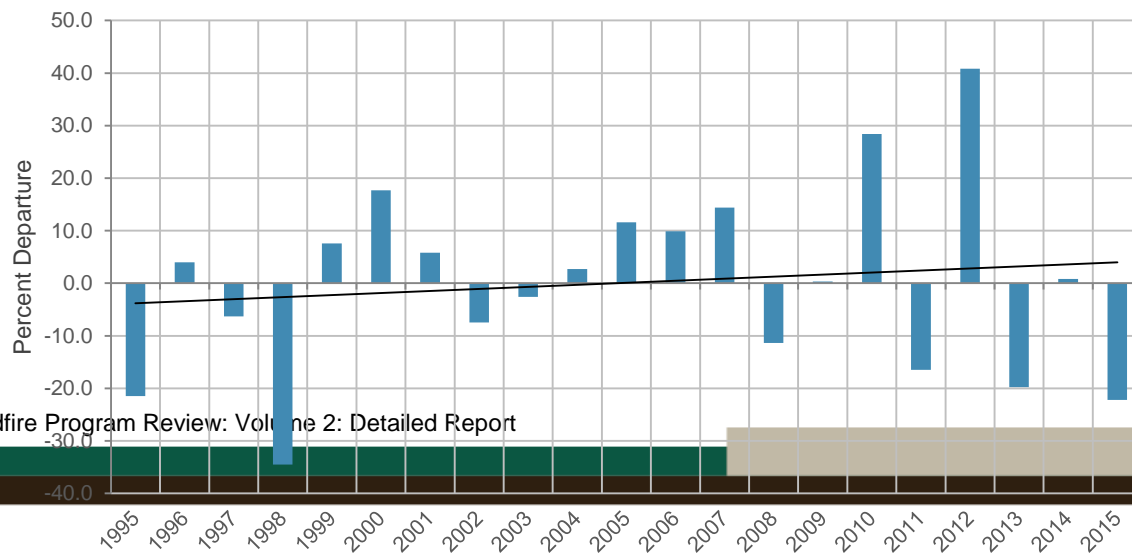


Exhibit 5: Temperature Departure from Baseline Average

Exhibit 6: Precipitation Departure from Baseline Average

**Precipitation Departure from Baseline
Average 1961-1990 Northwestern Forests
Spring (March to May) 2015**
(Source: Environment Canada)

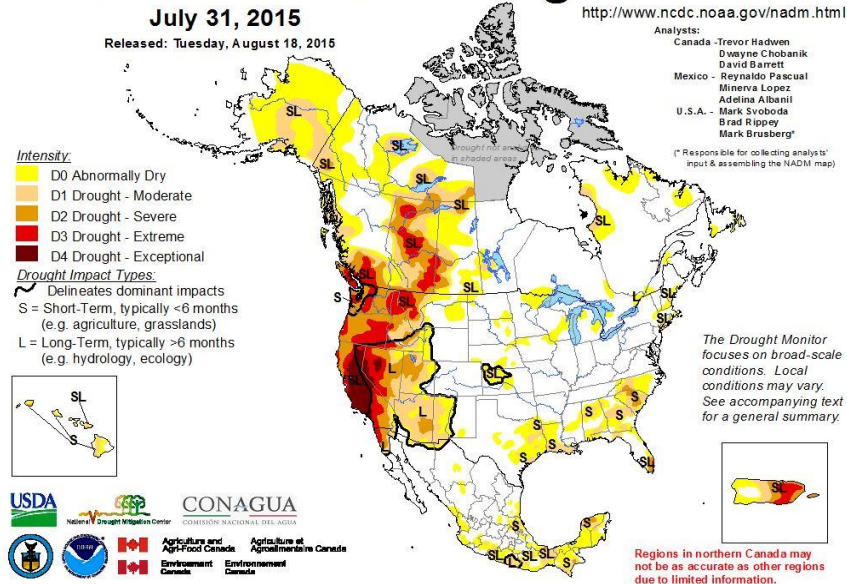


2015 Wildfire Program Review: Volume 2: Detailed Report

Furthermore, in 2015 western North America was experiencing a significant drought pattern that contributed to the concurrent demand for firefighting resources that year. As illustrated in Exhibit 7, the drought level up to August 1 in Alberta was consistent with the pattern in the western United States and southern British Columbia.

Exhibit 7: North American Drought Monitor Focused on Broad-Scale Conditions as Provided by NOAA

North American Drought Monitor



1.3 NUMBER OF WILDFIRES AND AREA BURNED ACROSS WESTERN CANADA IN 2015

The 2015 fire season across Canada was dominated by wildfire events in western Canada, and by October 31, 2015 6,765 wildfires had burned 3,969,504 hectares compared to the five-year average of 2,742 wildfires burning 934,333 hectares.

The fire season began early in western Canada. Both the number of wildfires and hectares burned significantly exceeded the 2014 totals in British Columbia, Alberta and Saskatchewan in the month of May. The early fire season challenges were a forerunner to the cumulative impacts of priority wildfire events that extended into September across western Canada. Three neighboring provinces simultaneously requesting additional resources through the Canadian Interagency Forest Fire Centre was unprecedented in Canada. Although wildfire occurrence across Canada tends to be variable and episodic, it is unusual for either all of western or eastern Canada to experience a significant increase in number of wildfires in the same season. Exhibit 8 summarizes the number of wildfires in western Canada compared to averages for the past 5, 10 and 15 years.

Area burned in 2015 also exceeded long term averages in western Canada led by Saskatchewan as shown in Exhibit 9. The significant increase in area burned may be related to the increase in wildfire severity which produces persistent smoldering along wildfire perimeters, and subsequent decrease of suppression effectiveness during extended periods of warm, dry weather.

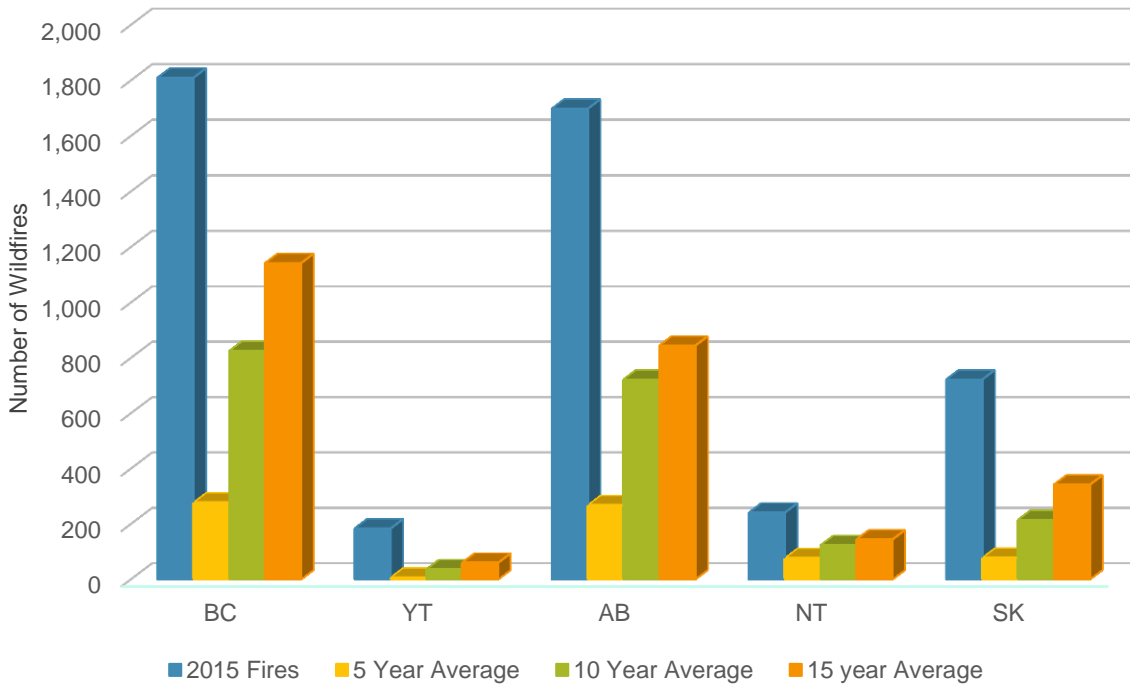
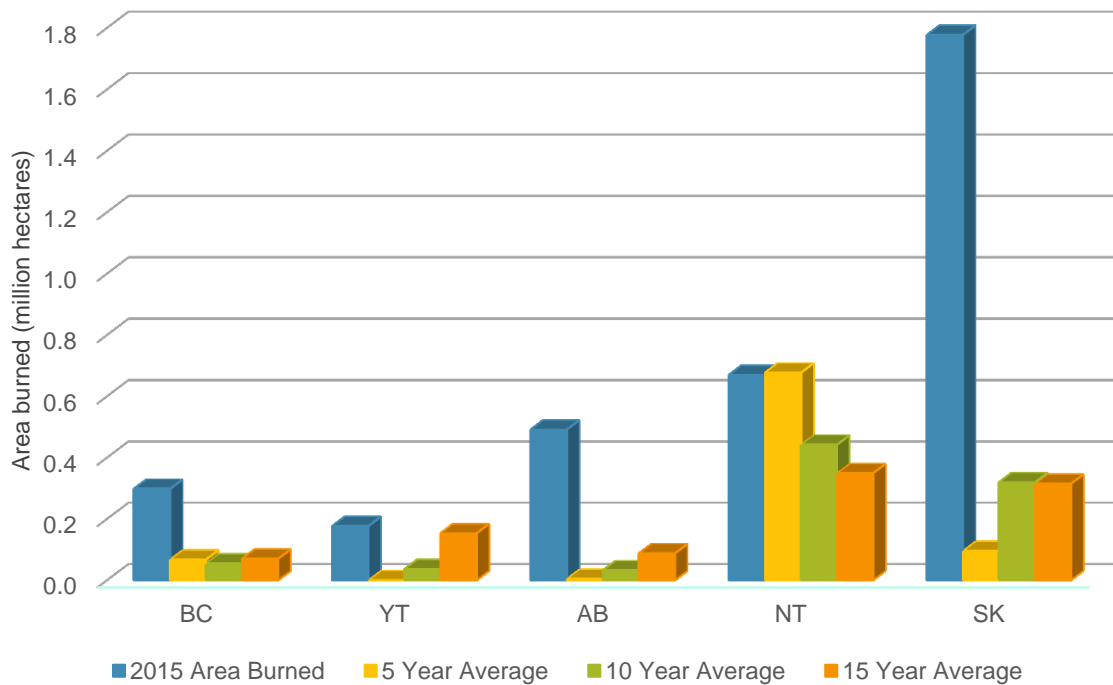


Exhibit 8: 2015 Wildfires Across Western Canada Compared to the 5, 10, and 15 Year Average

Exhibit 9: 2015 Area Burned Across Western Canada Compared to the 5, 10, and 15 Year Average (Ha)



2. THE 2015 FIRE SEASON IN ALBERTA

In Alberta the month of May is generally characterized by cured vegetation, low relative humidity and strong sustained winds under a blocking high pressure system that persists for several days or weeks. Under these conditions wildfires ignite readily, spread quickly and since most are human caused, they often threaten nearby community values at risk.

Notable spring fire seasons in Alberta include 1968, 1972, 1980, 1995, 1998, 2001, 2002, 2011 and 2015. In 2015, the addition of very high Build-Up Indices (BUIs) contributed to lower initial attack success and difficulty of control during sustained wildfire suppression operations in the month of May.

2.1 FIRE WEATHER INDEX INDICATORS

Wildfire environment conditions were extreme across western Canada early in the year, and in Alberta, wildfire behaviour became challenging. One indicator of extreme wildfire behaviour is the seasonal severity rating (SSR) that averages the daily severity rating (DSR)⁵. Exhibit 10 illustrates the 2015 average relative to historic years. This graph is a composite of five weather stations in the area of the major wildfire complexes in 2015. It illustrates a general upward trend that is occurring across the province. The composite rating of weather and environmental readings quantify the potential for extreme wildfire behaviour, and illustrates 115 days above average severity. If the DSR is cumulated through the fire season, a trend can be plotted against historic trends and this produces daily comparisons to long term data. As shown, the DSR exceeds the five-year average for May, June, July and August.

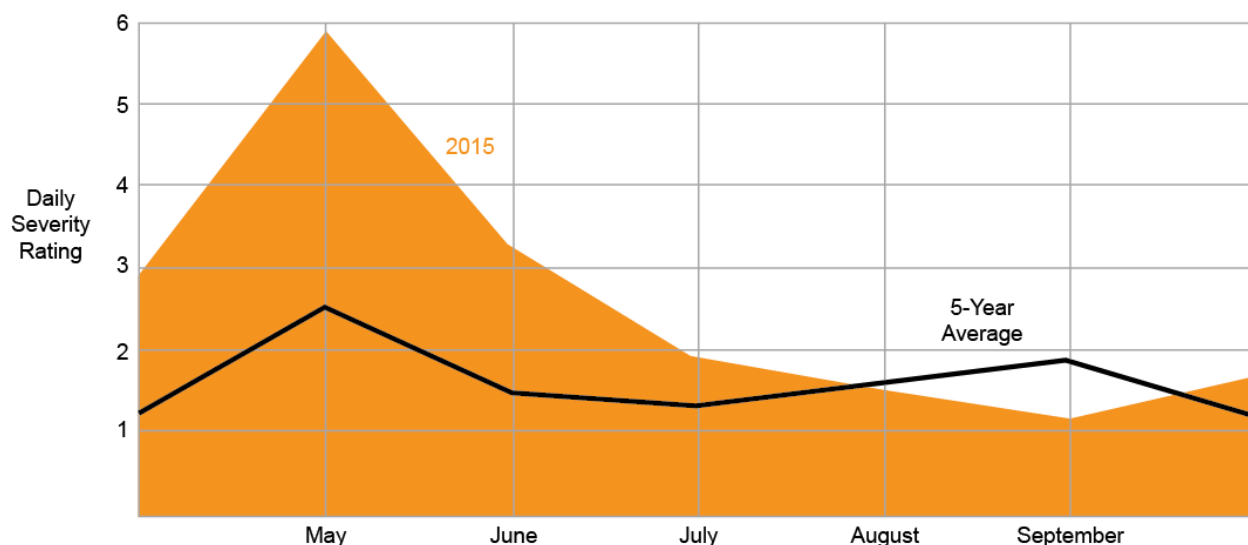


Exhibit 10: 2015 Daily Severity Rating

⁵ DSR is a Component of the Canadian Fire Weather Index System

Exhibit 11 illustrates the average SSR from the five weather stations over the previous 25-year period highlighting the early and continuing potential of the 2015 fire season relative to the historic average. Exhibit 12 shows that the cumulative daily severity rating for 2015 from the same five weather stations exceeds the historic 90th percentile for the entire fire season; 10th percentile meaning a wet year and 90th percentile indicating a dry year.

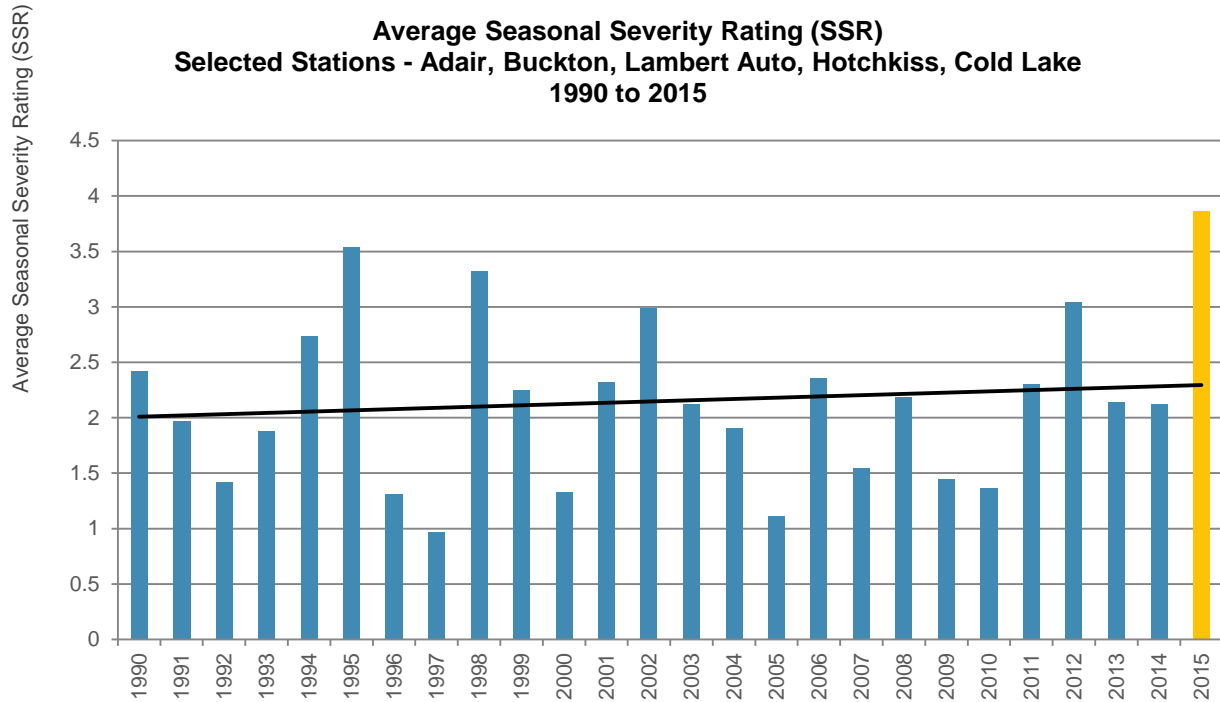
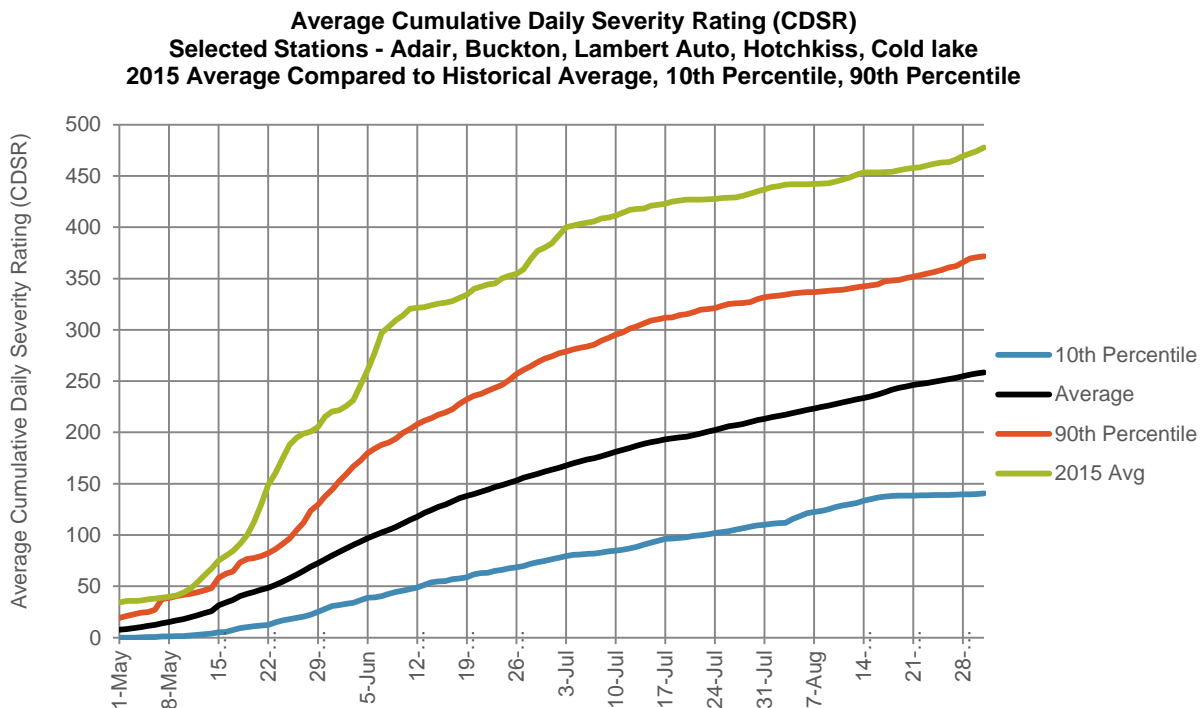


Exhibit 11: Seasonal Severity Rating Since 1990

Exhibit 12: Cumulative Daily Severity Rating in the Area of Alberta’s Major Wildfire Complexes

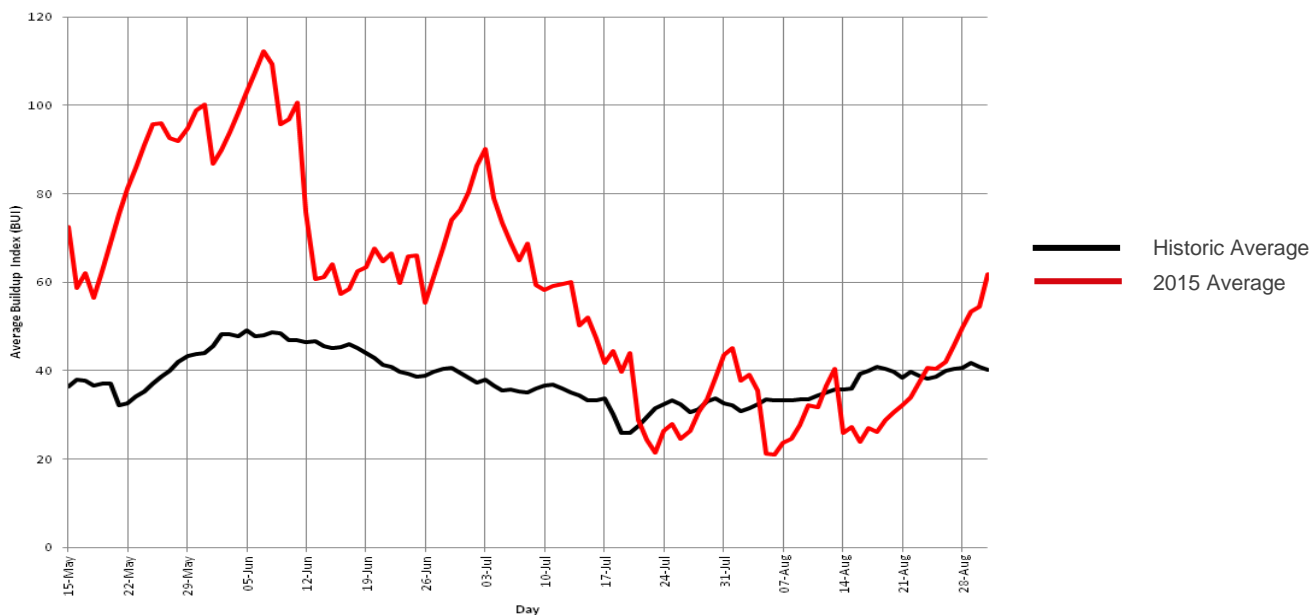
Another indicator of wildfire behaviour challenges is the Build-Up Index (BUI)⁶. Again, using the same five



selected weather stations, the 2015 BUI tracks much above the historic average and indicates the potential for high wildfire intensity and persistent smoldering associated with wildfire perimeters across most of the northern portion of Alberta. The average BUI for selected stations is shown in Exhibit 13.

Exhibit 13: BUI Values for 2015 Compared to the Historic Average

**Average Buildup Index (BUI) for Selected Stations -
Adair, Buckton, Lambert Auto, Hotchkiss, Cold Lake
2015 Average Compared to Historical Average 1990 to 2014**



2.2 WILDFIRE STATISTICS

The number of wildfires in Alberta during the 2015 fire season totaled 1,786⁷, a number has only been exceeded twice since 1990. The ratio between human caused and lightning caused wildfires was notable as preventable wildfires were eleven percent below the five-year average as shown in Exhibit 14.

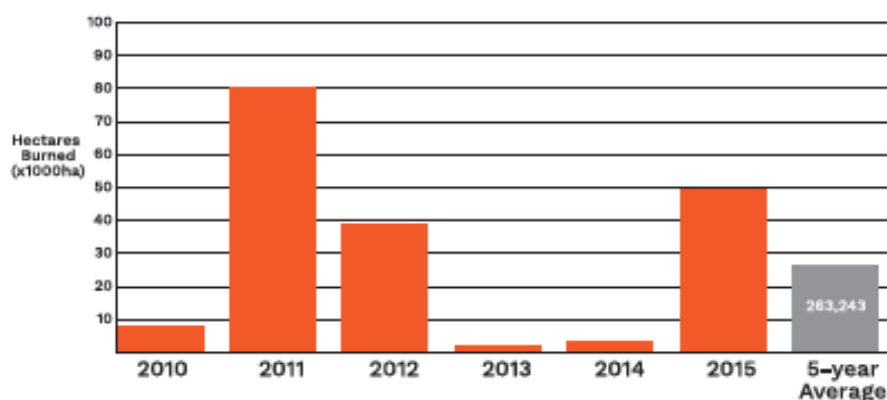
⁷ In order to allow comparisons with historical data, statistics in this section on wildfire occurrence include a number of small fires (typically recreational campfires) that have minimal cost or impact. In 2015 there were approximately 170 such events reported in Agriculture and Forestry records. Later in this report we reduce the number of fires in the analysis to include only those that required some suppression action as indicated by an expenditure of resources.

Exhibit 14: Illustration of the Total Wildfires (from April to October) Including Human Caused and Lightning Caused

	Total Wildfires	Human Caused	Lightning Caused
2015 Season	1,786	1,016 (57%)	770 (43%)
5 – Year Average	1,422	974 (68%)	448 (32%)

The area burned during the 2015 fire season totaled 492,400 hectares, most of which burned in May and June. From April 1, 2015 to July 16, 2015, Alberta recorded 1,440 wildfires that burned over 490,000 hectares; whereas the five-year average during the same period was 911 wildfires and approximately 260,323 hectares burned as shown in Exhibit 15.

Exhibit 15: Illustration of Total Hectares Burned



Sixty-four of 2015 wildfires were greater than 200 hectares in size; exceeding the five-year average of nineteen and the 25-year average of fourteen. This further demonstrates the challenges related to the severity of the 2015 fire season as illustrated in Exhibit 16.

Exhibit 16: Illustration of Class E Wildfires Greater than 200 Hectares

Exhibit 17 and Exhibit 18 illustrate both the total area burned and the number of wildfires in Alberta from 1990 to 2015. The graphs indicate a strong episodic pattern of area burned and a lesser pattern of variation in annual wildfire occurrence.

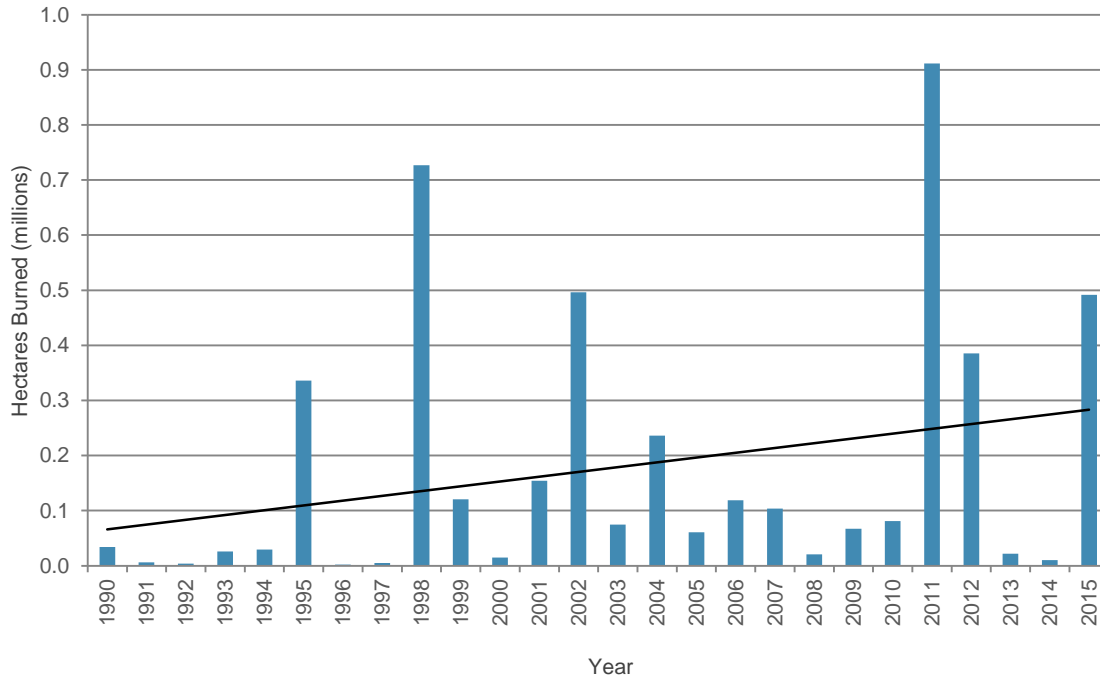
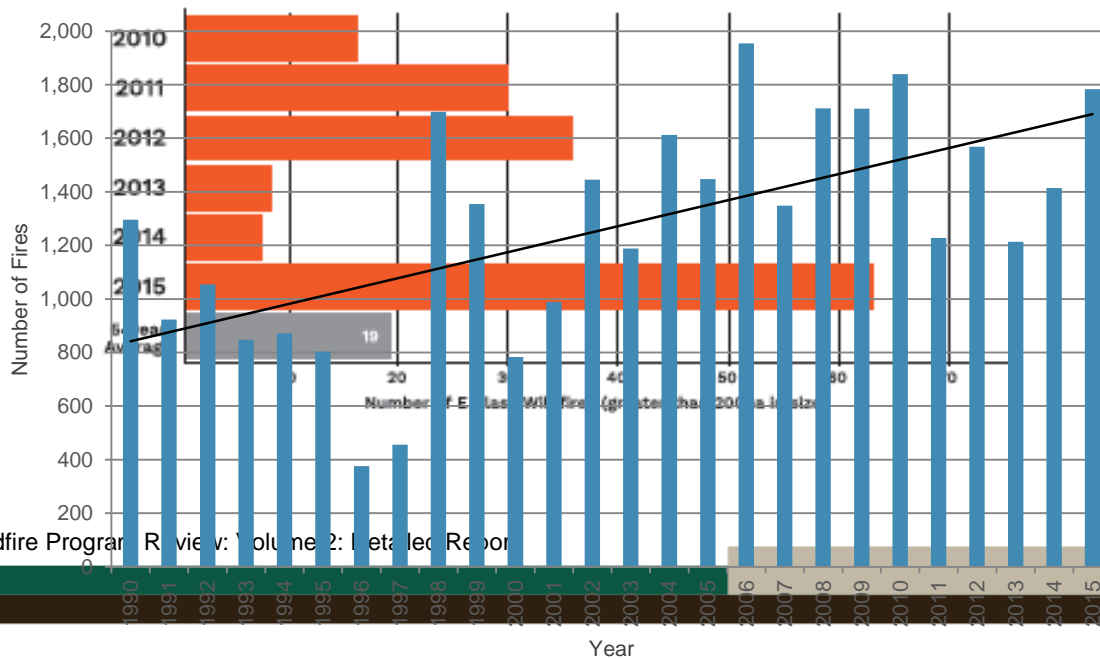


Exhibit 17: Area Burned by Year in Alberta from 1990 to 2015

Exhibit 18: Total Wildfires in Alberta from 1990 to 2015



2.3 PUBLIC AND INDUSTRIAL IMPACTS

In 2015, wildfires threatened human lives, communities, natural resources, industrial camps, and other infrastructure. The hamlet of Wabasca, the Municipal District of Lesser Slave River and North Tallcree First Nation each declared a state of local emergency as a result of three separate wildfire events. Wildfires also resulted in wildfire advisories, wildfire restrictions, weather advisories, air quality advisories, health advisories, provincial fire bans, evacuations, and road closures.

Evacuations

In emergency situations, the first response to an event is the responsibility of local authorities including municipalities and municipal districts. This includes notifying community members of evacuations and evacuation readiness. When an emergency event exceeds the capabilities of local authorities the Alberta Emergency Response Agency (AEMA) supports municipalities and coordinates the Government's response.

There were four evacuation events in Alberta over the course of the 2015 fire season. Two events warned residents to prepare for possible evacuation and the remaining two resulted in the immediate evacuation of community members. The following provides a summary of the events as of August 6, 2015:

March 31: MD of Foothills

A grassland wildfire burned north east of Blackie and moved quickly in a north easterly direction. Winds in the area gusted at high speed and shifted in direction. People were asked to avoid the area and prepare for a possible evacuation.

April 17: MD of Foothills

A wildfire burned near the border with the MD of Foothills and Kananaskis Improvement District Number 5. People were asked to prepare for possible evacuation and to avoid the area.

May 24 – May 27: Bigstone Cree First Nation

A wildfire affected the communities of Wabasca and Bigstone Cree Nation. Smoke severely reduced visibility and created hazardous road conditions. Evacuation of the residents of the impacted area was undertaken. Meander River was on evacuation watch but never evacuated.

July 2 – July 7: Tallcree First Nation

North Tallcree First Nation was evacuated due to a wildfire that was in close proximity to the community. South Tallcree First Nation was placed on evacuation watch but was never evacuated.

Oil and Gas Impacts

Oilsands, conventional oil, and gas operations and production were negatively impacted due to area and road closures and evacuations.

From the Cenovus Energy website:

“On May 23, we undertook the precautionary evacuation of our Foster Creek oil sands and Athabasca natural gas projects located on the Cold Lake Air Weapons Range (CLAWR) in northeastern Alberta due to a forest fire encroaching on the only access road to the site. Operations were shut down in a safe and orderly manner. Approximately 1,800 workers were evacuated by road and air.”

Normal operations resumed June 11.

Media reported that CNRL evacuated their facilities on May 22. CNRL released this statement on June 1:

“Due to the hardworking efforts of all the teams involved, Alberta Environment and Sustainable Resource Development has made progress in their management of the forest fire in the CLAWR. As such, the Department of National Defence granted access today to emergency crews where power lines were assessed and electrical distribution networks repaired as necessary to ensure the safe re-entry of workers to the CLAWR. This afternoon, the range was deemed safe and a Canadian Natural team of operational staff were permitted access to implement a step-by-step recovery plan, including the inspection of facilities and equipment, and the completion of repairs, if required. Following this assessment, pre-start activities towards resuming full operations will begin. The assessment of our facilities will determine the timing of when Canadian Natural will return to full operations at Primrose. Operations at Kirby South are contingent on the inspection and resumption of third-party pipeline operations through the CLAWR.”

Forest Industry Impacts

Impacts were experienced by the forest industry as wildfires burned through some of the Forest Management Agreement areas in the northwest. The area most impacted was in the High Level area as productive stands of timber were destroyed, previously harvested areas that were reforested were damaged or destroyed and forestry operations were disrupted.

While standing timber was destroyed in the course of the wildfire, adjustments to inventory have not been made yet and no reductions in the Annual Allowable Cut (AAC) have been implemented at this time. This may change as more detailed information on damage to the growing stock is gathered and analyzed.

In terms of productive areas that were previously harvested and subsequently reforested, an area of 9,844 hectares has been identified as being damaged or destroyed by 2015 wildfires. This represents a cost of \$19,828,670 in remedial reforestation and reclamation work funded by the province.

Wildfires in 2015 caused disruption to forestry field operations, particularly planting operations in the High Level area of the province. Planting operations were taking place at or near areas that were impacted by wildfires, requiring crew evacuations and causing disruptions to seedling deliveries and time sensitive planting operations.

Road Closures

There were seven road closures over the course of the 2015 fire season with the first beginning in May and the final road closure taking place in early July.

May 24 – May 27: Highway 579

Highway 579 was closed as crews worked on a wildfire in the area. Smoke reduced visibility and created hazardous driving conditions.

June 27: Highway 58

Highway 58 was closed 50 km west of High Level: road closed due to a wildfire that reduced visibility.

June 28: Highway 35

Highway 35 was closed from 85 km north of High Level to 190 km north of High Level due to wildfires.

July 2 – 3: Highway 88

Highway 88 between Red Earth Creek and South Tallcree (approximately 80 km South of Fort Vermilion) was closed in both directions due to multiple wildfires.

July 3 – 15: Highway 754

Highway 754 north of Slave Lake was closed due to a wildfire and poor visibility. No detour was available. Over this period the highway was opened and closed numerous times.

July 9 – July 22: Highway 1006 (National Park)

Hwy 16 to Maligne Canyon road was closed, with delays of over 6 hours. Maligne Road was closed due to wildfire.

July 10: Highway 734

Highway 734 south of Highway 11 (south of Nordegg) was closed due to wildfire in the area.

Other Impacts

From May 23 until June 4 the Canadian Air Force Base Cold Lake Air Weapons Range (CLAWR) was closed to all access due to a large wildfire burning in the area.

2.4 SUMMARY OF THE 2015 FIRE SEASON IN ALBERTA

The 2015 fire season was unprecedented in terms of the geographic extent of the extreme wildfire weather and hazard conditions. The wildfire events of 2015 in Alberta occurred in the context of a severe season across western Canada and the United States that required resources much beyond normal years.

The drought levels in the western United States, well known for its impacts in California and Oregon, extended north through the state of Washington and into British Columbia and Alberta. These jurisdictions experienced record fire seasons. Fire season reviews have been commissioned in British Columbia, Alberta and Saskatchewan following the 2015 fire season.

The total area burned and the number of wildfires experienced in 2015 exceeded the fifteen year averages in all of western Canada. The extent of the wildfire occurrence characterizes a situation never experienced in the past and largely represents weather patterns and climate conditions that are leading to more extreme wildfire conditions.

In Alberta specifically, previous winter and spring precipitation levels were below normal and temperature averages were above normal. During the fire season, the DSR across Alberta was above average for 115 days of the wildfire season. Build-Up Index values (BUIs) in central and northern Alberta were above average early in the season. The cumulative daily severity rating was above the 90th percentile for central and northern Alberta throughout the early season.

Against the backdrop of extreme wildfire conditions, it is noted that there was an absence of strong, persistent wind patterns usually associated with severe fire seasons. This was a critical factor in determining wildfire behaviour and was likely the one characteristic of the fire season that worked in the province's favour – a lack of severe wind events helped shape wildfire behaviour in a way that allowed suppression activities to be more effective.

There were extraordinary demands for firefighting resources in Alberta that required imports from around the world. This was true for neighbouring jurisdictions. The high demand for resources simultaneously by multiple jurisdictions tested the responsiveness and strength of resource sharing arrangements, and the ability to safely and effectively use resources trained and experienced in other parts of the country and world.

The impact of the fire season on communities and industry developments were significant but potential catastrophic impacts did not occur. While evacuations were used, there were no losses directly associated with communities – neither infrastructure nor private property. Resource values were impacted, such as merchantable timber, regenerated cut blocks and oil/gas production. These were significant though no specific quantification of losses was made.

The safety record was good given the severity of the fire season in Alberta and the actions that were taken. Tragically, a pilot was fatally injured when the airtanker he was flying for wildfire suppression operations crashed.

2.5 CONCLUSIONS

Observations of the 2015 fire season are consistent with current scientific knowledge and studies regarding climate change and weather patterns in relation to wildfire. Fire seasons are observed to be earlier, longer and more intense across North America and this is linked to changes in climate. The impacts of these changes in the fire season are reflected in disruptions and threats to communities and industry located in or near forested areas. These changes also affect the overall availability of resources necessary to address these disruptions and threats.

As a consequence of these observed changes and the expectation that the trend continues, wildfire management programs and policies are becoming more critical throughout North America. Programs and policies need to adapt to the changing conditions. This is particularly important in Alberta's Boreal Forest and the Rocky Mountain Foothills given the population distribution and the extent of the value of communities and natural resource development and use. An earlier, longer and more intense fire season in Alberta must be matched with a confirmation or update of priorities, updated policies, and a strong wildfire management program capable of delivering the level of protection needed within a changing wildfire context.

3. WILDFIRE PREVENTION, WILDFIRE SCIENCE AND FIRESMART

Agriculture and Forestry's Wildfire Prevention Section consists of the following four business units:

- **Wildfire Science and Technology**—supporting wildfire science expertise that guides and conducts operational research in relation to wildfire, information technology expertise that develops applications and tools used to predict wildfire occurrences and wildfire behaviour.
- **Wildfire Applications**—involving the maintenance and upgrade of wildfire information systems, as well as administration and auditing of province-wide wildfire prevention data in the FIRES program.
- **FireSmart**—focusing on activities related to educating and raising awareness of FireSmart principles within communities. This program area also provides oversight of prescribed burning activities implemented in the Wildfire Management Areas.
- **Compliance, Investigations and Communications**—involving the investigation of the causes of wildfire and efforts to lay charges or recover costs where appropriate. This includes administration of the *Forest and Prairie Protection Act*, fire control agreements with external stakeholders and clients, and internal auditing of the Wildfire Management Branch for continuous improvement.

The objectives of the program areas delivered under the Wildfire Prevention Section are to:

- Reduce the number and severity of human caused wildfires.
- Mitigate the effects of wildfires on communities.
- Determine the causes of human caused wildfires to inform programs and support the identification of individuals responsible.
- File charges and seek fines as a deterrent to human caused wildfires or cost recovery where evidence indicates that individuals or companies may be responsible.
- Provide internal and external communications services for the wildfire management program.

3.1 OVERVIEW OF THE WILDFIRE PREVENTION SECTION

The prevention of wildfires and the mitigation of the impacts of wildfires on communities and values at risk can be a highly effective aspect of the wildfire management program. Success in this program area reduces activity and cost in all other areas of the program, particularly presuppression and suppression. Furthermore, activities that reduce the number of wildfires reduce the negative impacts to human lives and losses associated with private property damage, community infrastructure damage and social disruption. An overview of the functions within the business unit is provided in the following sections.

Wildfire Prevention

The three components of wildfire prevention are education, engineering (e.g. fuel management) and enforcement. Budgets and human resources are assigned according to annual work plans developed for provincial and local prevention activities. Wildfire prevention practices and achievements are shared through the Canadian Interagency Forest Fire Centre (CIFFC) in an effort to ensure that practices and standards are up-to-date.

Public education and awareness, as the primary delivery mechanism for wildfire prevention, uses television, community-based social marketing, information pamphlets, newspapers, public forums, government websites, social media and the biennial FireSmart Community Series to pass on its message. Wildfire Prevention Officers, Information Officers and Wildfire Technologists have important roles in wildfire prevention. These individuals, whether stationed in provincial headquarters or field offices, support the provision of proper, accurate and current information for stakeholders and the public. This information is particularly critical during times of high wildfire risk when there is a fire ban, area closure and when wildfire suppression activities are occurring.

Exhibit 19 outlines the cost per year for wildfire prevention activities in Alberta. Most noticeable is the increase in spending in 2014 and 2015. This reflect two initiatives: added emphasis and the associated expenditures on information, education, outreach and science-related initiatives and on FireSmart – both intentional on the part of the Department and consistent with the recommendations of the Flat Top Complex Wildfire Review Committee. Otherwise, expenditures have been consistent.

Exhibit 19: Wildfire Prevention Costs

Year ⁸	Information, Education, Outreach, Science-Related Initiatives (\$)	FireSmart ⁹ (\$)	Prescribed Burning (\$)	Investigations (\$)	Total Wildfire Prevention (\$)
2012	1,729,701	1,552,807	2,229,121	1,035,504	6,547,133
2013	2,017,227	1,896,562	2,567,730	386,305	6,867,824
2014	5,909,941	5,581,605	1,559,139	797,390	13,848,075
2015	6,732,024	5,252,923	1,683,553	1,334,441	15,002,941

Agriculture and Forestry measures effectiveness of wildfire prevention by the number of preventable wildfires occurring over time. An effective program would reduce the number of human caused wildfires that would occur in the absence of a prevention program. Exhibit 20 outlines the number and proportion of human caused wildfires over the past five years. The data shows a high degree of variability in the proportion of wildfires that are human caused with the proportion being significantly lower in the past two years. Although the trend shows that the program may be effective, we expect that this measure of

⁸ The source of these numbers is government's Integrated Management Information System or IMAGIS. Only four years of data are readily available (earlier years are archived).

⁹ 2013 through 2014 includes expenditures and projects managed by the Forest Resource Improvement Association of Alberta (FRIAA).

performance is too coarse to prove a specific causal relationship. Better measures need to be more granular – i.e. targeted at specific communities or groups or forest users that may be associated with activities more commonly seen to have a wildfire risk.

Exhibit 20: Human Caused Wildfires

Year	Total Number of Wildfires ¹⁰	Human Caused Wildfires ¹¹	
		Number	%
2011	810	601	74
2012	1,241	815	66
2013	923	643	70
2014	1,105	548	50
2015	1,613	855	53

Currently, the Wildfire Prevention Section produces an annual strategic plan to guide prevention activities across the province. It is updated annually and renewed every three years. This strategic plan forms a baseline for the Wildfire Management Area annual plans. Prevention involves identifying key messages, communicating these key messages in various ways and implementing activities that reduce the occurrence of wildfire.

FireSmart

FireSmart is a specialized initiative within the wildfire prevention program. It is a proactive measure aimed at reducing the impacts of wildfire on values at risk. The FireSmart program has a set of principles and guidelines aimed at home owners, communities and industrial sites. The principles are aimed at reducing the negative impacts of wildfire through seven established disciplines (fuel management, legislation, education, development, training, inter-agency cooperation and planning).

FireSmart was originally developed in Alberta based on programs and experiences in the United States. The program has been adopted in other jurisdictions (national and provincial). Agriculture and Forestry provides funding for FireSmart activities (direct delivered, FireSmart Community Grants, Forest Resource Improvement Association of Alberta (FRIAA) FireSmart program). Spending on FireSmart activities is shown in Exhibit 19 – with the totals increasing following the Slave Lake and area wildfire in 2011. As noted earlier, this increased funding is consistent with the Flat Top Complex Wildfire Review Committee recommendations.

The Department's FireSmart Community Grant program has allocated between \$500,000 and \$1,000,000 annually to selected communities within the Forest Protection Area. An additional \$500,000 to \$1,000,000 is identified in the Department's base budget for direct-delivered FireSmart projects. FRIAA has received

¹⁰ In these sections, the number of wildfires refers to wildfires that were material to the program in that they resulted in some suppression action and expenditure.

¹¹ From the Agriculture and Forestry FIRES database – all wildfire not identified as lightning caused.

grants totalling \$23.6 million (from February 2014) and allocates these funds to communities and community organizations both within and outside of the Forest Protection Area and in First Nations lands. To March 31, 2016, FRIAA has allocated \$11.2 million to communities and has allocated another \$4.2 million subsequent to April 1 for a total of \$15.4 million. The Department has also recently entered into an agreement with Indigenous and Northern Affairs Canada for FireSmart funding on Indian Reserves. This is set at an annual maximum reimbursement to the province of \$1.5 million.

FireSmart is aimed at mitigating risk and losses to homes, community infrastructure and industrial infrastructure associated with wildfire. This is difficult to measure in a systematic and objective manner. Questions regarding the effectiveness of FireSmart have been raised in Alberta and other jurisdictions where losses of private property and community infrastructure have been experienced. While no definitive set of measures and conclusions have been developed, the question is being addressed through anecdotal evidence. Exhibit 21 outlines some of the FireSmart work carried out in the last two years.

Exhibit 21: FireSmart Activities over the Past Five Years (as of March 31, 2016)

Activity	Spent and Committed Funds (\$)	Completed Project Details ¹²
FireSmart Planning	1,498,873	245 Plans
Public Education	608,397	66 Events
Vegetation Management	7,922,586	611 Hectares
Legislation and Planning	100,000	1 Project
Other ¹³	7,208,477	Undocumented
Activity Totals	17,338,333	

FireSmart and similar programs are becoming a greater part of wildfire management programs across North America. This is driven by an increasing number of emergency wildfire situations that have impacted populated areas over the past decade. These situations have threatened human safety and communities directly, resulting in injury, death and significant financial losses. As a consequence, FireSmart activities are directly related to the highest priorities and most significant protection objectives of any wildfire management program.

The need for effective FireSmart activities is also directly related to the growth of communities and industrial expansion in the forested area of Alberta and the increases in the wildland-urban interface (WUI). Appendix 1 provides examples of the growth in the WUI for two selected communities – Canmore (east slopes example) and Slave Lake (northern boreal example). The photos illustrate the growth and increasing vulnerability of these communities over the past 15 years as the area of the communities has grown by 26 percent and 44 percent respectively since 2000. The corresponding perimeter of the

¹² Completed project deliverables for projects completed as of March 31, 2016.

¹³ Agriculture and Forestry direct delivery and grant spending. This will be in the categories shown but specific data on the use of the funds is not readily available.

communities has grown by 30 percent and 18 percent respectively. Both indicate a greater exposure to wildfire threats.

Prescribed Fire

Prescribed burning is an activity undertaken by wildfire managers (national parks as well as provincial agencies) to meet landscape objectives and help prevent the potential spread of wildfire through hazard reduction in areas surrounding communities. This reduces the severity and intensity of wildfire occurrence and aids in forest insect and disease control. Prescribed burning can reduce the probability of ignition and spread of wildfire in areas susceptible to wildfire starts by reducing the volume of fine fuels. An alternative use of prescribed burning is to reduce overall fuel loading in order to decrease the intensity of wildfire once ignited. Both objectives relate to taking proactive steps to protect values at risk.

Exhibit 19 also summarizes spending on prescribed burning carried out by Agriculture and Forestry. In addition, Indigenous and Northern Affairs Canada pays for approximately \$350,000 annually of prescribed burning activity on First Nations lands.

Prescribed fire as a part of the wildfire management program is at a steady state. The effectiveness of prescribed fire in reducing the number of wildfire starts and the spread of wildfires is difficult to measure, and currently, only activity measures are recorded. Anecdotal information suggest that prescribed fire is very effective in and near communities where grass and other fine fuels are prevalent. In terms of achieving other landscape management objectives, Agriculture and Forestry is working towards increasing the understanding and acceptance of prescribed fire by land and resource managers as a management tool. As with FireSmart, the extent of the expenditures and resulting effectiveness in fuel management are small relative to the potential need. The plan to increase the size and reach of the program is important.

Investigations and Cost Recovery

Activity related to investigations and cost recovery is largely dependent on the occurrences of human caused wildfires, the extent of losses due to human caused wildfires, and the degree of difficulty in determining cause. This area of program activity takes place as required. Exhibit 19 summarizes the cost of the investigations and cost recovery activities.

There are two issues in respect to investigations and cost recovery that warrant attention. The first is the ability of Agriculture and Forestry to effectively investigate human caused wildfires. In this regard, the work is carried out by trained and qualified investigators and the results of investigations are used to support potential legal action and cost recovery. The second area is the effectiveness of cost recovery. This is a legal process which depends largely on the evidence that the investigators acquire. There is no evidence to indicate concerns in this area of the program.

Communications

Communications is an integral component of Agriculture and Forestry's wildfire prevention program. It is achieved through public education, information and outreach. For example, much of the success of FireSmart initiatives depends on public awareness, public acceptance and ownership of aspects of FireSmart by individuals and communities.

Communications during an emergency or crisis situation are essential for wildfire suppression operations. During wildfire events, such as that experienced in Alberta in June of 2015, the public becomes aware of wildfire situations through television, radio, social media, word-of-mouth and occasionally the presence of smoke. Communications from the Department that share relevant facts and updates with the public and with residents near active wildfires is an important obligation and responsibility.

To fulfil the communications role, Agriculture and Forestry has Information Officers at provincial headquarters and area offices. Generally, provincial Information Officers are tasked with developing communications strategies, key messages and operational communications to the public, and area staff are tasked with informing the local public and stakeholders about wildfire situations of a more local relevance.

3.2 ANALYSIS AND FINDINGS

In reviewing and evaluating the effectiveness of activities carried out within Agriculture and Forestry's Wildfire Prevention Section, the three following functional areas were addressed:

- Wildfire prevention effectiveness, including provincial planning and coordination.
- FireSmart activities, including the degree to which communities are involved in FireSmart and the roles of Agriculture and Forestry and Municipal Affairs.
- Public communication, education and outreach activities.

Overall, the functions and activities delivered under the Wildfire Prevention Section represent a strength of the wildfire management program. These functions and activities are largely planned and delivered independently of the severity of any given fire season and level of activity of wildfire operations. These activities provide value in terms of reduced human caused wildfires, improved mitigation of wildfire related impacts and support for other aspects of the wildfire management program. While representing a strength, there are some opportunities for improvement.

Performance Monitoring

The proportion of human caused wildfires in Alberta has varied over the years. The growing population and increasing level of wildland-urban interface suggests that in the absence of any wildfire prevention program, the number of human caused wildfires would increase over time. The actual effectiveness of wildfire prevention is difficult to determine with the measures currently in place. Performance indicators could be improved and could help provide better focus on high value activities. It is clear that any success in preventing wildfires will translate to a reduction in the effort and cost of initial attack and wildfire suppression. Furthermore, a reduction in the number of human caused wildfires reduces human safety risks and the possibility of loss, particularly losses to private property and community values, as a high number of human caused wildfires are located close to populated areas.

Communications Planning

Feedback from interviews and workshops suggests that there is a high level of awareness of the importance of wildfire prevention among Agriculture and Forestry staff. As noted, it is less certain that this is generally understood among those who can prevent the wildfires and/or are at risk. This is the role of

communications programs, but these need to be effectively designed and assessed. This speaks to the value of a more comprehensive and focused communications plan.

It is also clear that the nature of wildfire prevention programming depends on the characteristics of the communities and public members found in different geographic regions. For example, wildfire prevention activities in the southern and central foothills, with a high number of urban recreational user needs to be different than wildfire prevention activities in the northern boreal forests where community members live and work in the forest. A stronger and comprehensive provincial level work plan for wildfire prevention is needed. Area wildfire prevention work plans, consistent with the provincial strategy and work plan, need to be consistently developed and implemented. While a provincial strategy and work plan is currently in place, and area plans are prepared at varying levels of detail, interview and workshop feedback suggests that this is an area where improvement could be made.

FireSmart

FireSmart is recognized and promoted throughout Canada and the United States as a tool for reducing potential impacts of wildfire on individuals, communities and private/public property. Research, policy analysis and experience collectively from various jurisdictions combine to identify activities and practices that help reduce losses. In terms of measuring effectiveness, performance measures currently relate to spending and activity levels and not to outcomes. This makes it difficult to evaluate the value for dollars invested into FireSmart by the province. Three specific issues have been identified for the FireSmart program.

- **Diversity of Funding Sources**—there are four sources of FireSmart funding, all aimed at providing money for communities and community organizations to implement various FireSmart activities. While each funding source has certain specific targets or objectives, all are intended to support FireSmart activities. Each of the four separate programs requires administrative structures, including project solicitation, review, approval, funding and reporting. The Flat Top Complex Wildfire Review Committee recommended the FireSmart program be delivered under one provincial framework including a streamlined and enhanced funding model.
- **Reliance on Agriculture and Forestry**—the Forestry Division has extensive knowledge and expertise related to FireSmart, largely based on the work carried out within the division to develop and implement the program. As they understand FireSmart and its importance, it makes sense for the Department to lead in its implementation. This leadership is critical to success. That said, many activities under FireSmart are the responsibility of home owners, communities and industry, addressing items such as flammable vegetation at and near homes, building materials, home owners' practices, sub-development design, facility design and emergency planning. To be effective, it is clear that communities and homeowners need to own and drive FireSmart as well. Municipal Affairs, through the Office of the Fire Commissioner, has a clear role in reinforcing this responsibility.

- **Strategic Provincial Level Initiatives**—while spending by communities on FireSmart has increased in recent years, the activities have been project-specific and not strategically coordinated on a regional and provincial scale. FireSmart projects and activities would be most effective at a community level if it is part an overall master plan for that community and for a region as a whole. A number of provincial level initiatives have been discussed, but not yet implemented, that could help accomplish this. These initiatives include a provincial level inventory of FireSmart plans and projects, a spatial database of community zones (the ten kilometre radius around a community considered key for FireSmart activities) showing FireSmart projects and related factors, public education and awareness, and more direct training and support for local Fire Chiefs (and through them for municipal planners and development officers) in regard to FireSmart.

While progress has been made in terms of significantly increasing the number of FireSmart projects since the Slave Lake and area (Flat Top) wildfires, there still is a need to clarify with the public what FireSmart is, what it is not and who has responsibilities for FireSmart. All three issues point to a lack of a clearly articulated and well understood long term vision for FireSmart in Alberta. This vision needs to involve more than just Agriculture and Forestry—other departments, municipalities and municipal organizations need to participate in creating the vision and need to help achieve it. It is important to promptly address this strategic gap in order to maintain the momentum in building FireSmart as a provincial approach to risk mitigation for vulnerable communities. Support for the program in terms of a sustained and predictable flow of funding is key to sustaining the effectiveness of the program.

Communications

Communications has become increasingly complex. Both social media and conventional media have evolved quickly in recent years and the public appears to have an increased demand for immediate access to information as events occur. This was evident in the 2015 fire season when wildfire conditions were extreme, large wildfires were visible on the landscape, and some communities were evacuated. Increased public expectations for new information through social media created an opportunity for unreliable sources to gain a foothold on these platforms. Some Albertans felt that more frequent posting from Government could have helped prevent the propagation of this misinformation.

The review identified strengths respecting the Department's communications in the 2015 fire season. The Department regularly provided information to the public regarding wildfire status and the fire season overall through news releases, television and radio interviews, social media and others. The Department's social media sites, in particular, received positive feedback for the information it provides and the accessibility of that information.

The Department's ability to more directly communicate with the public and industry at a local level on matters that are closely associated with their specific interests was identified as an area for improvement. In 2015, the communications approach related to wildfire management shifted towards greater central coordination. A lack of understanding about the changed process created frustration for staff at all levels. A more comprehensive communications strategy and plan applicable to wildfire operations would help address these issues and improve public service.

3.3 CONCLUSIONS

Programs in Agriculture and Forestry's Wildfire Prevention Section are an essential part of wildfire management in Alberta. Wildfire prevention activities are a very important first line of action in reducing the impacts of wildfire as more than half of wildfires in any given year are human caused. Wildfire prevention is closely linked to overall government communications initiatives and follow provincial priorities and guidelines—this linkage can serve as a strength. Strategic and operational planning for prevention activities, including the development and use of performance indicators, are key to a successful prevention program. There are opportunities for improvement in the area of planning that could help in this regard.

This review identified a strong commitment of the Department to providing essential wildfire-related communications to the public and stakeholders. This was demonstrated by the information provided to the public through various media and the number and quality of Information Officers working in the field and at headquarters. During the most active periods of the 2015 fire season, however, it was noted that timely and comprehensive communication of wildfire situations and events at the local level was challenging. This issue was compounded by inaccurate or misleading information provided by the public regarding wildfire status and potential dangers.

FireSmart has grown in importance in Alberta and other provinces. Funding allocated to FireSmart activities has significantly increased over the past five years, largely based on funding provided directly or indirectly through the Department. FireSmart involves a number of activities, many of which are implemented by communities, homeowners, industry and other government departments or agencies. While the progress made in providing FireSmart funding to communities and community organizations has been a very positive development, it is clear that continued progress in this program area is needed, including a more strategic approach to FireSmart. This must involve homeowners, communities, industry and other government agencies.

3.4 RECOMMENDATIONS AND OPPORTUNITIES FOR IMPROVEMENT

Recommendations

- 1. Revisit the province's strategy respecting FireSmart with an increased emphasis on a long term vision for FireSmart within the province, community responsibility, multi-agency collaboration and an outcomes based approach to implementing FireSmart projects.**

In the years following the Slave Lake area wildfires of 2011, progress has been made in making funds available to communities to plan and implement FireSmart projects. While this is an important step forward, a broad vision for FireSmart within the province is lacking and a more collaborative and coordinated approach to FireSmart is needed. This requires an increased level of community responsibility in planning, implementing and maintaining FireSmart. It also requires an increased role for other Government of Alberta ministries and external agencies in supporting communities with the implementation.

The key objective is that the multiple agencies coordinate their efforts to manage FireSmart initiatives within a 10 kilometre radius of each community at risk of wildfire. This next step in

advancing the FireSmart Program needs to include the development of a strategy focused on outcomes, the development of a vision and goals respecting the desired FireSmart status of each of the affected communities in Alberta, an inventory and analysis of FireSmart plans and projects completed to date, and the development or enhancement of longer term plans and investments for each community or group of communities.

2. Develop robust communication plans and protocols for pre-fire season wildfire prevention awareness, as well as facts and advisories associated with wildfire events.

The magnitude of the 2015 fire season in Alberta highlighted the need for a strong communications function within the Department. Well developed communication plans and protocols are required to enhance opportunities to educate and inform the public and stakeholders of potential risks associated with wildfires. In addition, the plans and protocols should support the ability of the Wildfire Management Areas to provide specific and relevant information to local community members and stakeholders on a timely basis.

Opportunities for Improvement

Wildfire Prevention

1. Improve the means of measuring wildfire prevention effectiveness by obtaining more specific data on the results of key activities or more specific feedback on targeted communities and demographic groups.

While tracking the number of human caused wildfires is aimed at the broad goal of the prevention program, information addressing more targeted questions regarding specific activities, communities and demographic groups will provide greater insight into the effectiveness of prevention efforts and may help produce better results.

2. Expand the provincial wildfire prevention strategic plan to include a provincial work plan for implementation by the Wildfire Management Areas.

Currently, Agriculture and Forestry produces an annual provincial prevention plan called a Wildfire Prevention Strategic Plan. It is updated annually, renewed every three years and forms a baseline for the Wildfire Management Area annual strategic plans. There are concerns that the timing and relevance of the provincial plan may not meet all the needs and timing requirements for Wildfire Management Area field implementation. This plan should be expanded to include a provincial level work plan for wildfire prevention activities to guide the Wildfire Management Areas in implementing their local wildfire prevention activities. This would help provide greater consistency across the province while allowing unique local needs to be met. In addition, the Wildfire Prevention Strategic Plan should tie into an enhanced provincial level communications plan or framework to increase public awareness of the importance of wildfire prevention.

FireSmart

While progress has been made in terms of expanding the funding available for FireSmart in the province, there are some specific opportunities identified to help make FireSmart more effective. These include the following items:

3. Enhance efforts respecting vegetation management research and science to offer a rationale for established and new FireSmart applications.
4. Improve the linkage of FireSmart outputs with wildfire suppression decision making by ensuring that Duty Officers and Incident Management Teams have ready and immediate access to information regarding FireSmart activities in surrounding communities.

Completed FireSmart Community Plans, including Wildfire Preparedness Guides and Wildfire Mitigation Strategy documents, should be readily available in a digital database for use by Duty Officers and suppression teams. The information contained within these plans, such as fuel hazard modification and fire breaks, is critical for prevention, presuppression and suppression requirements. Furthermore, the same up-to-date information regarding all land disturbances within the same geographical area is required. This includes cut blocks, powerlines, well sites and past wildfire sites. Linking the information within a dedicated FireSmart spatial database to the existing spatial fire management system (SFMS) and other decision support tools would allow for improved wildfire suppression strategies and operational decision making.

5. Promote increased public engagement and communication regarding the importance of FireSmart and the need for FireSmart to be community-driven.

A communication plan that defines the immediate and future benefits of FireSmart including the limitations of various FireSmart activities is needed. A clear description of what FireSmart is and what it is not should be included in FireSmart communications.

6. Investigate the potential for the establishment of a standing FireSmart council representing various communities and organizations for review, engagement, education and increasing the profile and commitment to FireSmart in Alberta.

Possible entities to be represented in the standing council would include the Alberta Urban Municipalities Association, Alberta Association of Municipal Districts & Counties, Alberta Emergency Management Agency, the Office of the Fire Commissioner, and an Aboriginal community leader.

7. Investigate the potential for increased effort and funding to six of the seven disciplines of FireSmart (not including fuel modification) to ensure that a well-rounded and all-inclusive provincial FireSmart program is delivered.

The extensive effort, dedication, energy and funding that have been allocated to the fuel modification discipline of FireSmart principles in Alberta is commendable; however, other disciplines are also important and require attention.

8. Move towards a coordinated, dedicated, sustainable and predictable flow of funds to the provincial FireSmart funding program to provide a longer term ability to support FireSmart project funding requests.

4. WILDFIRE DETECTION, PRESUPPRESSION PREPAREDNESS AND SUPPRESSION – PROGRAM OVERVIEW

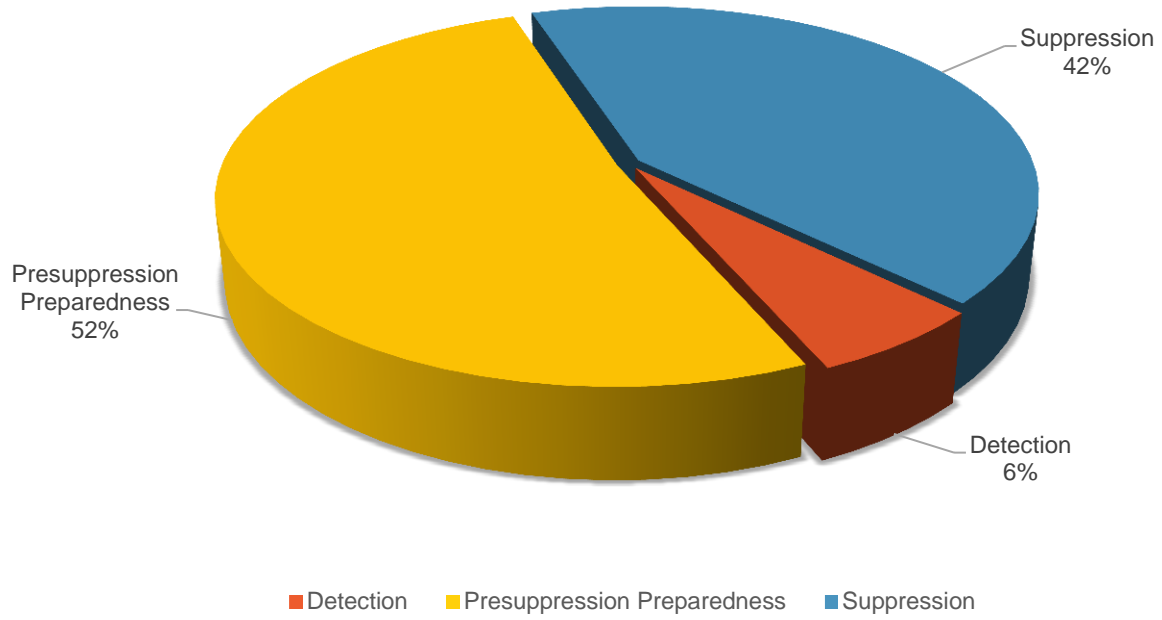
Agriculture and Forestry's wildfire management program is designed to:

- Detect wildfires early on, when they are small.
- Respond quickly – by having the appropriate equipment and manpower standing by in locations where conditions are most severe and values at risk are most significant.
- Hit wildfires hard – with resources adequate to contain the wildfire in the first burning period or as soon as possible thereafter.

The next three chapters look at each of these subcomponents - wildfire detection, presuppression preparedness, and suppression in some detail. In this chapter, we provide an overview of the program costs in terms of each subcomponent and then in terms of the major services and resources deployed – aircraft, manpower, and equipment and services.

Exhibit 22 shows the proportionate expenditure on wildfire detection, presuppression preparedness, and suppression based on the five-year average costs. Detection shows up as a critical, though comparatively minor component of the expenditures. In this discussion detection costs include expenditures on lookouts, fixed wing and loaded patrols (the latter is most significant). Of the remaining costs presuppression preparedness is the largest.

Exhibit 22: 2011 - 2015 Proportionate Expenditure on Detection, Presuppression Preparedness, and



Suppression

Exhibit 23 shows the same data by year. In general, presuppression preparedness costs are more consistent year to year. This makes sense as it is the (notionally) fixed cost of having the equipment on standby. The cost in 2015 increased mainly due to the severity of the year – the number of days under extreme conditions. To a smaller extent, presuppression preparedness costs have also shifted over time:

- Increasing to accommodate some of the changes to the program following the disastrous Slave Lake area wildfires in 2011; and the more costly, short term emergency acquisition of aircraft, manpower and equipment.
- Decreasing as contract resources (aircraft, manpower) are released early.

Exhibit 23: 2011 to 2015 Detection, Presuppression Preparedness, and Suppression Costs

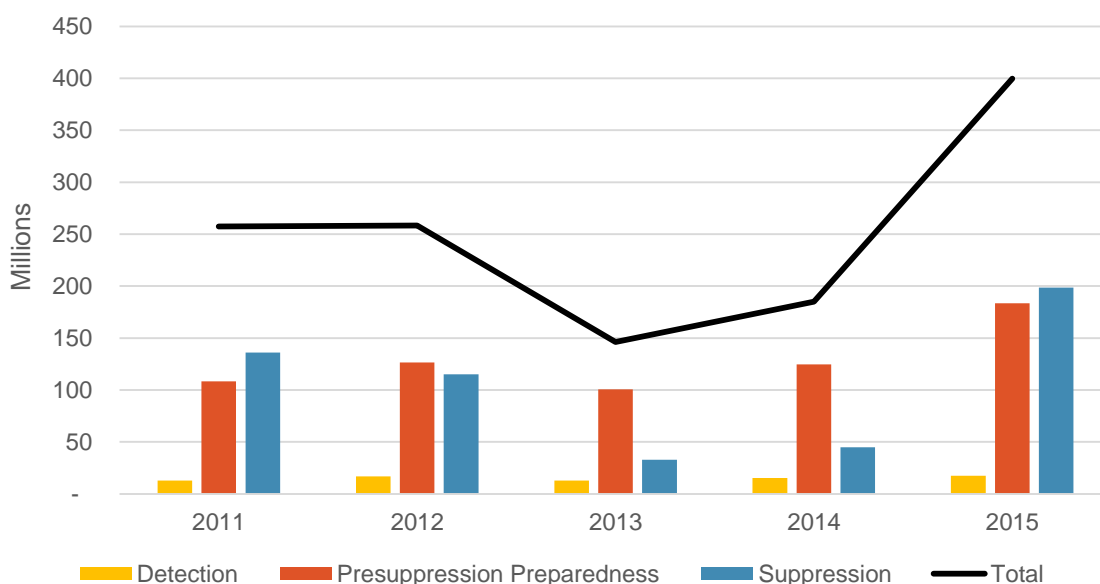


Exhibit 24 shows the more detailed data. In general, program expenditures follow expected patterns with suppression costs low in less active years (e.g. 2013, 2014); suppression costs more consistent but reflecting a higher state of readiness (e.g. 2012, 2015); and detection costs that are smaller and somewhat steady – changing mainly with the higher use of loaded patrols in extreme and smoky conditions.

Exhibit 24: Wildfire Management Program Costs (\$)

Year	Detection (\$)	Presuppression Preparedness (\$)	Suppression (\$)	Total (\$)
2011	12,827,367	108,328,623	136,096,551	257,252,541
2012	16,843,973	126,450,824	114,968,457	258,263,254
2013	12,790,109	100,551,071	32,791,371	146,132,551
2014	15,412,486	124,704,840	44,896,535	185,013,861
2015	18,953,676	183,431,103	198,561,059	400,945,838

5. WILDFIRE DETECTION

The wildfire detection aspect of Agriculture and Forestry's wildfire management program is a core part of wildfire operations and the critical first step triggering all subsequent activities in the wildfire management process. The effectiveness of detection has a direct bearing on the success of initial attack and on the effectiveness of the overall program. Detection is the crucial link between presuppression preparedness, where resources are placed on standby and strategically positioned, and suppression activities where the resources are deployed on new wildfires. Information collected during the detection process supports decision making regarding initial attack strategies and tactics aimed at containing wildfires while they are small.

Detection in Alberta involves a wide range of tools and activities, including lookouts, aerial detection, ground patrols, public reporting and lightning monitoring. Alberta is unique among provinces in its commitment to a network of staffed lookouts, therefore much of the review focuses on the costs, effectiveness and alternatives to lookouts.

The objective of the wildfire detection function is to detect and report wildfires in a timely manner to enable rapid and effective initial attack on wildfires while they are small and while the opportunity for early containment is best. This is an initial and key step in meeting the wildfire suppression objectives. The Department's performance indicator for this function is reporting wildfire discoveries within five minutes of detection.

5.1 OVERVIEW OF WILDFIRE DETECTION

The detection program is structured around five key programs:

- Lookouts.
- Aerial Patrols.
- Ground Patrols.
- Public Reporting.
- Lightning Detection and Monitoring.

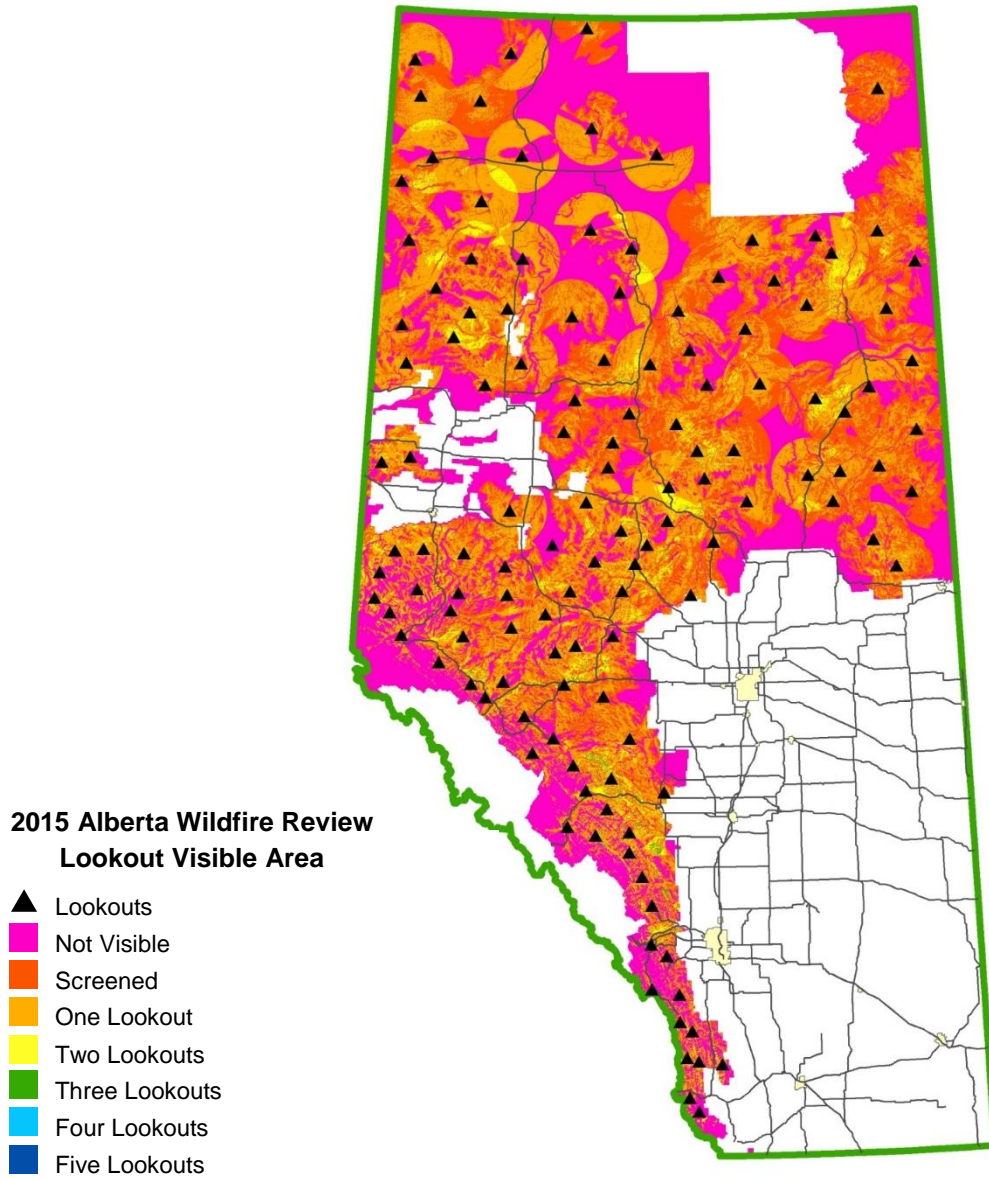
Lookouts

The main feature of Agriculture and Forestry's wildfire detection system is a network of lookouts. The majority of lookouts are staffed throughout the core fire season with the remainder staffed only during high hazard and risk. Agriculture and Forestry currently uses and maintains 127 lookouts throughout the province as illustrated in Exhibit 25.

Lookouts provide ongoing monitoring of visible areas for wildfire and also provide sites for weather monitoring, communications and crew staging. This approach offers the ability to monitor weather and wildfire hazard at a more precise level geographically, and to position resources throughout the province at various locations strategically on a day to day basis.

Exhibit 25 also shows the areas that are visible and screened or not visible to lookouts.

Exhibit 25: Alberta's Network of Lookouts



Aerial Patrols

In addition to lookouts, Agriculture and Forestry conducts aerial patrols aimed at providing detection capability in strategic areas and at strategic times. Areas typically targeted for aerial patrols are the “Screened” and “Not Visible” zones where lookouts have limited or no visibility as illustrated in Exhibit 25. Areas with high values at risk and only one lookout with visibility may also be targeted for aerial patrols. Aerial patrols are usually carried out during peak burning periods when hazards are high. Helicopter patrols with initial attack crews on board (loaded patrols) are the most common form of aerial patrol. Fixed wing patrols are used on a casual basis. Often, either loaded patrols or fixed wing patrols will follow specified routes based on known thunder storm tracks and lightning occurrence and designed to complement lookout coverage.

Ground Patrols and Public Reporting

Detection by ground patrols and responding to public reporting is highly focused on areas frequented by the public. This form of detection is largely responsive to public contact proactive in terms of sending staff to areas where the chance of human caused wildfires is high (i.e. recreation areas, known ATV trails etc.). Public reporting has always been an integral part of detection systems. This involves education and public awareness, along with readily available methods for public reporting such as the 310-FIRE public reporting phone line, website based reporting tools and the ability for civil aircraft to report wildfires when detected.

Lightning Monitoring

Lightning monitoring occurs using a province-wide electronic lightning detection system to track where and when lightning strikes. The detection system (partnership with the Government of the Northwest Territories and the electrical utilities – Fortis, TransAlta, ATCO, AltaLink) comprises a central analyzer and twelve sensors positioned across the province and uses captured data to create real-time maps of the area where lightning strikes are occurring. Ground patrols are then sent to these areas to ensure early detection of potential wildfires. In general, the partners assist with the capital expenditures and Agriculture and Forestry’s operating costs.

New Technology

Recent changes to the detection system include cameras installed on an operational trial basis to offer continuous monitoring of blind areas. Cameras have been tested in other provinces; however, conclusions on performance are not yet available. Currently, Agriculture and Forestry has twenty-five fixed cameras and five pan/tilt/zoom cameras in key locations.

2015 Detection Costs

Exhibit 26 shows the breakdown of detection costs from 2011 – 2015:

- Manpower costs for the past five years are summarized in Exhibit 26. Costs are relatively consistent from 2012 through 2014 ranging from \$3.8 to \$4.8 million annually. The amount each year depends on the fire season and the need to open lookouts early or maintain lookout operations later in the year. The 2015 costs are higher mainly due to contract wage increases (approximately \$0.7 million).
- Lookout service costs include the cost of operating and maintaining the lookout network, such as supplies, maintenance and repairs. Capital costs are in addition to these amounts. Agriculture and Forestry budgets approximately \$2 million per year – this is enough to replace tower steel for about 10 lookouts. Other capital expenditures occur less regularly (e.g. for cabins or access) and these would be in addition to the \$2 million.
- Fixed wing patrol and other costs are also steady. There is a greater use of fixed wing and rotary wing detection patrols in years where smoke is dense and restricts visibility.
- The largest variation is in the cost of loaded patrols. In some years these may have been sunk costs in that they would reflect a reassignment of contract minimums and crew costs from the presuppression amounts.

Exhibit 26: Detection Costs 2011 - 2015

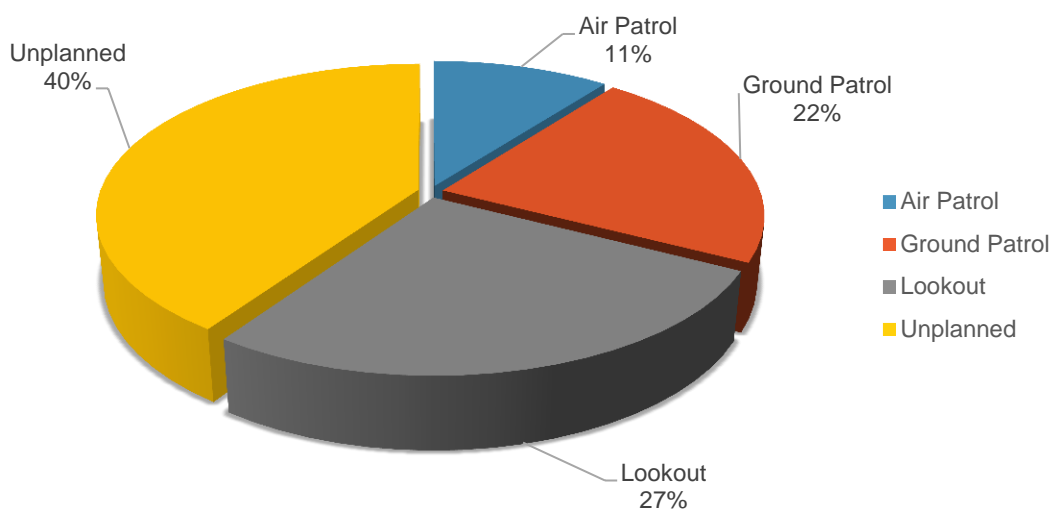
	2011 (\$)	2012 (\$)	2013 (\$)	2014 (\$)	2015* (\$)
Lookout Manpower	3,766,400	4,314,704	4,104,826	4,153,903	4,806,697
Aircraft					
Lookout Service	1,567,361	1,600,478	1,119,185	1,540,838	1,667,643
Fixed Wing Patrols	710,466	1,349,978	873,085	749,696	920,806
Loaded Rotary Wing Patrols	6,669,688	9,450,901	5,979,278	8,456,778	9,630,209
Other	113,451	127,703	713,736	511,271	545,266
Total	12,827,367	16,843,973	12,790,109	15,412,486	17,570,639

**Note: In 2015, fixed wing and loaded rotary wing patrol costs were in one cost code and as a result, the fixed wing patrol costs are estimated as the "average" of the previous 4 years.*

Detection Program Results

Exhibit 27 summarizes the results of the various methods of wildfire detection over a recent 10 year period. Between 2005 and 2014, 40 percent of all wildfires detected were unplanned – that is through public reporting. Wildfires detected by lookout towers were 27 percent, by ground patrol 22 percent and by aerial patrol 11 percent. This indicates that the detection program is varied and that all forms of detection are both employed and required. Proactive, intentional detection efforts by Agriculture and Forestry are responsible for 60 percent of reported wildfires. It is clear that public reporting is a valid and useful form of detection as Agriculture and Forestry encourages public reporting of wildfires through public awareness campaigns and systems that are in place to receive calls and investigate reports. Under an objective of early detection and rapid initial attack, having all forms of detection available presents an advantage.

Exhibit 27: Percentage of Wildfire Discoveries by detection Type (2005 to 2014)



A useful indicator of performance is the size of wildfire on assessment as summarized in Exhibit 28. This incorporates factors such as how much time passes and how quickly a wildfire grows, relative to wildfire conditions, from ignition and detection to assessment. The indicator combines detection and initial action efficiency - both are key to the program success.

Exhibit 28 also indicates the average size of the wildfires at the time of assessment¹⁴, representing the effectiveness of detection efforts towards the end goal of limiting wildfire size and impacts on values at risk. Of particular note, there is a substantial difference between the “average size when extinguished”, between wildfires being assessed at one hectare, two hectares and three hectares. This emphasizes the importance of early detection, presuppression and rapid initial attack.

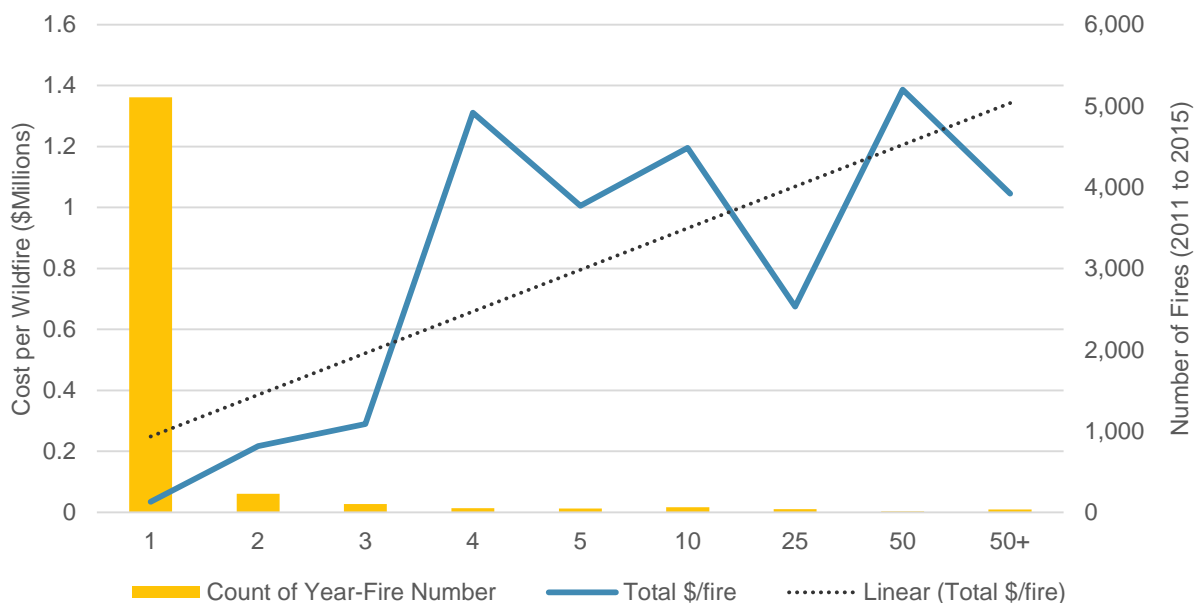
¹⁴ Time of assessment is the technical Agriculture and Forestry term. In practical terms, this is the point where the action commences on suppressing the wildfire.

Exhibit 28: 2011 – 2015 Wildfire Size on Assessment and Size when Extinguished and Suppression Costs

Wildfire Size On Assessment (ha)	Number Of Wildfires	Average Size When Extinguished (ha)	Average Suppression Cost (\$)
0.0 to 1.0	5,107	53	34,879
1.1 to 2.0	230	358	217,236
2.1 to 3.0	103	1,652	289,269
3.1 to 4.0	52	14,024	1,310,806
4.1 to 5.0	47	2,659	1,005,263
5.1 to 10.0	62	1,952	1,195,922
10.0 to 25.0	39	1,058	674,897
25.1 to 50.0	13	495	1,386,319
50+	34	4,575	1,044,988

The ability to detect and action wildfires quickly translates into lower overall costs per wildfire. This is directly related to fewer days spent carrying out wildfire suppression activities. In addition, prompt detection and early action reduces the losses caused by wildfire. Exhibit 29 presents the number of wildfires over the past five years in terms of size at assessment and graphs the relationship between size at assessment and cost per wildfire.

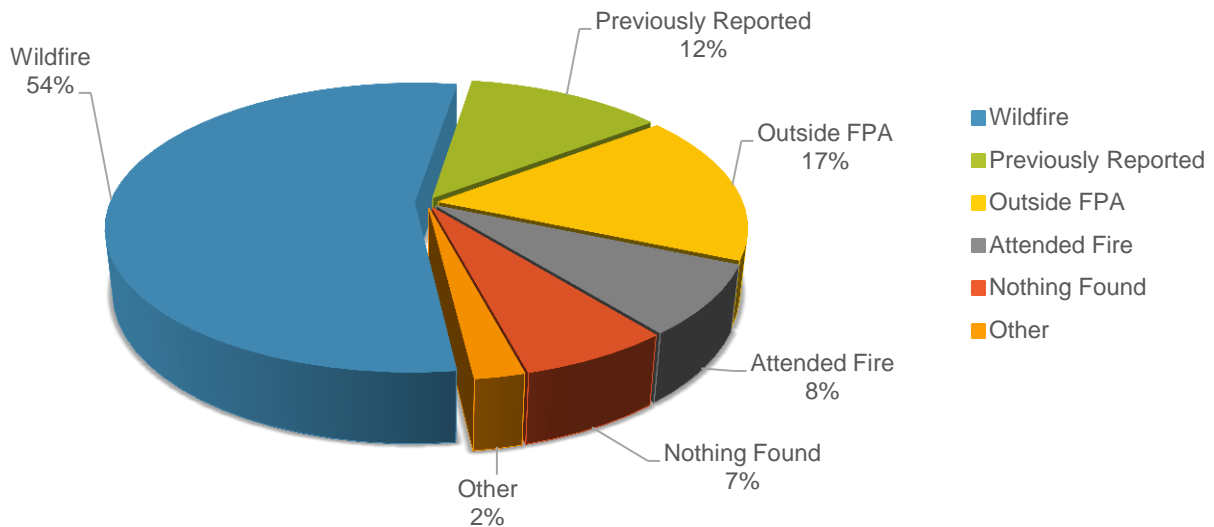
Exhibit 29: Costs per Wildfire Increase Quickly as the Size on Assessment Starts to Exceed 3 Hectares



Information on the results of detection reports by lookouts is available, indicating another aspect of the lookout system’s performance. Exhibit 30 outlines the results and indicates that of all reports:

- 54 percent represent new wildfires within the Forest Protection Area (FPA).
- 17 percent are new wildfires outside of the FPA.
- 20 percent of wildfires were either previously reported or attended wildfires (i.e. agricultural burning) and simply represent a situation where a wildfire (wildfire or permitted burn) is detected by more than one means.
- In 7 percent of the situations, no wildfire was discovered – likely cases where the wildfire was extinguished on its own (i.e. lightning starts accompanied by rain) or human error (i.e. fog mistaken as smoke).

Exhibit 30: Lookout Detection Results (2015)



It is important to note that Alberta’s detection system is intentionally designed to use multiple approaches to achieve objectives of early detection, early assessment and containment of new starts within the first burning period. Exhibit 31 clearly shows that the detection system makes use of all approaches, with the primary means being lookouts.

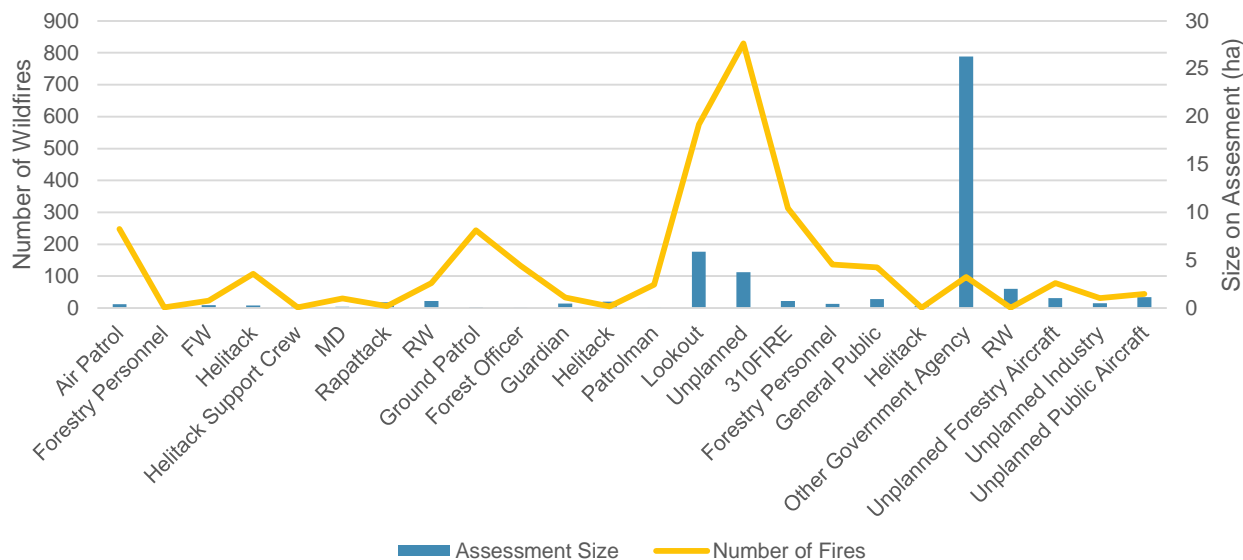


Exhibit 31: Detection Approaches - 2015

5.2 ANALYSIS AND FINDINGS

In reviewing and evaluating Agriculture and Forestry's detection system, three main issues were identified for review and study:

- Performance indicators available to measure the effectiveness of Agriculture and Forestry's detection system.
- The rationale, effectiveness and efficiency of Agriculture and Forestry's system of lookouts as the focus of its detection system.
- Opportunities to apply new technology to the detection program to improve cost efficiency.

Performance Indicators

The current performance indicator for the detection program is the time between detection and reporting. Compiling this data indicates that over 50 percent of all new wildfires were reported within one minute of discovery, and 98 percent of all wildfires were reported within five minutes of discovery. What is missing from this performance indicator is the relative importance of these few minutes in the overall sequence of events from wildfire ignition, detection, reporting, decision making, dispatch of resources, initial assessment and initial attack. This indicator may be a useful measure for the lookout person's responsibility, however it is not a useful indicator for detection effectiveness.

Ideally, a useful indicator of performance would be the elapsed time between wildfire ignition and reporting by any means. To do this, an estimate of the ignition time would have to be made. In the case of lightning, an estimate could be made using thunder storm records and lightning detection data. In the case of human caused wildfires, more judgement and estimation would be required. While the data would not be perfect, it would provide one source of additional data, not currently available, to help with insights into the effectiveness of the detection program.

Lookout System

Agriculture and Forestry's extensive use of lookouts needs to be evaluated in the context of two specific factors unique to Alberta. First, the Department is not fully dependent on lookouts for detection, rather it has adopted a multi-pronged approach to detection. Like other jurisdictions, Agriculture and Forestry uses aerial patrols, ground patrols and a range of public reporting to detect new wildfires. The Department's lookout infrastructure and usage adds another layer of detection capability for the majority of the province.

The second factor relates to Alberta's history of settlement throughout the forested area. Similar to other provinces and jurisdictions, settlement in and near forested areas meant an increased focus on wildfire management, which starts with detection. Most settled areas in and near forests featured a lookout that was manned during the fire season on days of higher hazard to help protect communities. While lookouts are occasionally found in other jurisdictions, Alberta has experienced a much higher level of settlement in and near the forested areas. This has resulted in a large number of lookouts established and maintained throughout the province.

Some gaps exist in the fixed detection visible area, owing to geography and distances. In addition, no single approach to detection could possibly provide full coverage in terms of time and space. For this reason, developing and employing multiple approaches and tools is important. Agriculture and Forestry's efforts to fully develop and support aerial detection and ground patrol procedures to supplement monitoring by lookouts is justified. The recognition of public reporting as a detection tool is also important as there are a large number of people actively living and working in remote parts of the province at any given time. It is recognized that members of the public sometimes detect wildfires before lookouts. The systems put into place by the Department to support awareness and immediate reporting of wildfires at any time significantly contributes to the goal of rapid detection, assessment and action.

In terms of cost efficiency, the ongoing cost of approximately \$6 million to operate the network of lookouts plus ongoing capital reinvestment needs to be compared to the overall costs of the wildfire management program, which averages over \$200 million annually. Given that detection is the first step in the overall wildfire suppression chain of events, given the importance of rapid initial attack to contain new wildfires in the forest burning period, and considering the very high costs of suppression that results when wildfires escape initial attack and grow to larger class status, Alberta's commitment to lookouts and the associated expenditures to operate a network of lookouts are warranted.

New Detection Technology

There is ongoing research in North America related to the use of camera and satellite technologies for automated wildfire detection. Saskatchewan recently placed cameras on 40 aging lookouts, essentially replacing manned lookouts with automated technology. Initial reports indicate that some viewing difficulties remain (poor visibility conditions) and dedicated monitoring and interpretation by staff is still required; however, cameras may be a useful adjunct tool in certain situations.

The use of satellite technologies in wildfire detection has also been tested in nearby jurisdictions. Recent results from four other programs indicate some success in the Yukon and Alaska, where 32 percent and 40 percent of all wildfires respectively were discovered by satellite. In northern British Columbia and the Northwest Territories, 15 percent and 11 percent of all wildfires respectively were discovered by satellite. Alaska and British Columbia estimate that 5 percent of their detection budget goes towards monitoring and interpreting satellite detections. Though satellite detection is continuously improving, the main issues remain the frequency of acquisition of imagery and the relatively large wildfire sizes at the time of

discovery. It would appear that at the present time, satellite detection is more suited to areas of low values at risk where early containment of wildfires is not a critical target.

Much work still needs to be done to further develop and operationalize camera and satellite detection technology but the two can add flexibility to the detection program including an extension to the detection season.

5.3 CONCLUSIONS

Agriculture and Forestry's wildfire detection system is highly developed and makes use of multiple tools to achieve objectives of early detection. The use of multiple tools, particularly the use of lookouts as a foundation of the detection program, is a strength. Given Alberta's extensive history of resource development and settlement in the forested regions of the province, this is important for public safety as well as protection of values at risk.

Early detection and reporting is the first step in the overall process of taking action on new wildfires quickly and containing them early and at small sizes. Significant cost savings and reductions in loss can be realized by achieving this overall objective, which can only be accomplished if wildfires are detected early. For this reason, detection is a priority. Given the modest cost of operating lookouts relative to the overall cost of the wildfire management program, continued use of lookouts as a foundation of the program is warranted.

5.4 RECOMMENDATIONS AND OPPORTUNITIES FOR IMPROVEMENT

Agriculture and Forestry is committed to maintaining a system of lookouts and recognizes that this decision leads to a requirement for continual maintenance and staff training/management. This commitment to a lookout system for detection is justified. Early detection is the necessary first step in rapid and aggressive initial attack, therefore the investment on this aspect of detection, coupled with other forms of detection makes sense. Given the importance of the lookout system, the Department is encouraged to continue providing base budget resources and capital funding for these cost items.

Opportunities for Improvement

9. Investigate the development and adoption of improved wildfire detection performance indicators.

An opportunity for improvement exists with respect to continual improvement of the detection system as a whole, including the integration of all forms of detection approaches to maximize effectiveness. This effort would include ongoing review and development of performance indicators to support the role of detection in the overall effort to assess and action wildfires when small. Such performance indicators should focus as much as possible on wildfire size at the time of detection in order to better support performance measures related to presuppression preparedness and suppression systems.

10. Continue to investigate new wildfire detection technology.

Continuing to investigate and evaluate new technology and approaches for detection, such as remote camera technology and satellite imagery, would support the opportunity for improvement related to the integration and optimization of the full array of detection approaches available to support overall wildfire management objectives.

6. PRESUPPRESSION PREPAREDNESS

Presuppression preparedness encompasses the broadest range of activities in Agriculture and Forestry's wildfire management program and represents a highly strategic area of decision making and policy implementation. It involves the following activity areas:

- Wildfire weather and wildfire hazard forecasting.
- Engaging resources in anticipation of their need for wildfire suppression, including initial attack crews (i.e. Helitack (HAC) and Rapattack (rappel or RAP) crews), sustained action crews (Unit crews, Firetack crews), airtankers, rotary wing aircraft and other resources.
- Training wildfire management staff, wildfire suppression crews and aircraft related crews.
- Prepositioning resources in relation to hazard and risk.

Presuppression preparedness works hand in hand with detection to enable the Department to apply suppression resources to new wildfires at the earliest possible time. In very high and extreme conditions, the ability to anticipate wildfires and to be in a state of readiness allows initial attack resources to deal with the accelerated growth of a wildfire before it reaches a point where wildfire suppression becomes ineffective. Anticipating and preparing for wildfires begins with effective monitoring and forecasting of fire weather and hazard indices.

The objective of presuppression preparedness is to establish an appropriate level of readiness in terms of resourcing and positioning of resources, to enable the rapid and effective initial attack of newly discovered wildfires. This aspect of the program, combined with early detection, represents a commitment to achieving objectives of early containment of wildfires. Applying the principles of presuppression preparedness and pursuing the objectives is strongly correlated to effective wildfire weather and wildfire hazard monitoring and forecasting.

6.1 OVERVIEW OF ALBERTA'S PRESUPPRESSION PREPAREDNESS

Presuppression preparedness can be analyzed in more detail by breaking out the resource types being managed and used. There are six areas that are identified for description and evaluation:

- Wildfire weather and wildfire hazard monitoring and forecasting system.
- Hiring HAC and RAP crews and contracting Firetack crews.
- Contracting and basing airtankers and rotary wing aircraft.
- Contracting and hiring other resources.
- Implementing the Presuppression Preparedness System (PPS).
- Training.

Wildfire Weather and Wildfire Hazard Monitoring and Forecasting

Wildfire weather and wildfire hazard monitoring represents a foundation of the presuppression preparedness system. Forecasts of weather conditions, particularly temperature, humidity and winds, are combined with cumulative weather and fuel data to describe and forecast the wildfire hazard for locations/regions within the Province. Layered over the current and forecast wildfire hazard information are additional assessments of risk – risk of wildfire starts by people, lightning and other causes.

Agriculture and Forestry implements the system using a network of weather recording stations. This data is combined with weather data collected by Environment Canada and others to provide a complete picture of the conditions found in many different regions and locations. Agriculture and Forestry uses the Canadian Forest Fire Weather Index System to calculate a range of indices that describe fuel characteristics, weather and potential wildfire behaviour. These same indices are forecast one and two days in advance to assist with presuppression preparedness and wildfire suppression planning.

Presuppression Preparedness System

The PPS is a management system that compiles wildfire hazard information and indicates target coverage levels on a geographic basis for initial attack resources. It is based on expected performance of initial attack crews and airtankers, projected wildfire behaviour and wildfire containment objectives.

The PPS used in Alberta is highly evolved and incorporates current science and experience in setting guidelines for the level and location of resources in advance of wildfire starts. The system is developed and targeted to meet the objectives of containing all wildfires in the first burning period. The system provides direction to support aggressive and effective initial attack, in relation to priorities and values at risk. It represents the implementation of the policy of containing wildfires within the first burning period.

The PPS includes a range of standard operating procedures, tools and guidelines for engaging and positioning resources according to the system. These are implemented by the Wildfire Management Areas with oversight from the program's Provincial Headquarters. The primary constraint on the system in implementing the prescribed level of initial attack coverage for readiness is resource availability. While each Wildfire Management Area will have a target level of coverage that involves airtankers, rotary wing aircraft, initial attack crews and Firetack crews, resource availability for each area is determined by Provincial Headquarters based on provincial level resource availability, priorities and other factors. Wildfire managers indicate that in most seasons, at times there are not enough resources available to completely meet the guidelines set out in the PPS for each region at Head Fire Intensity (HFI) 5 and 6 levels; therefore, judgement is required to further assess conditions and risks and preposition resources. As a result, the training, experience and judgement of wildfire managers with respect to wildfire behaviour and initial attack strategies becomes invaluable.

A brief description of the PPS, based on excerpts from Agriculture and Forestry's 2015 Policy, Standard Operating Procedures and Business Rules is presented below:

- Presuppression preparedness planning is directed in relation to levels of coverage. Coverage refers to the ability of HAC crews, RAP crews or airtankers to arrive at a wildfire before it reaches two hectares in size. Cost per fire (and potential damages) grow quickly when action is delayed beyond this point.

- Levels of coverage are defined for different hazard levels, expressed as HFI levels. At an HFI of 1, no coverage is defined. At HFI levels of 2 to 4, 80 percent coverage is required. At HFI levels of 5 and 6, coverage greater than 80 percent is required, with modifications to increase coverage beyond 80 percent where conditions exceed certain levels and values at risk are high.
- Coverage and resource availability is defined daily and field plans regarding the amount and location of resources are reviewed at Provincial Headquarters. At times, resource availability is a constraint in meeting defined coverage levels at high HFI levels, especially when high hazards occur across a broad area of the province.

Training

Training is an ongoing core aspect of the presuppression preparedness and is important to preparing permanent and seasonal staff for each fire season. Most training is carried out at the Department's Hinton Training Centre, with some training delivered at area offices and a small amount of training delivered out of province.

Firefighting Crews

It's easiest to describe wildfire program expenditures and activities in groups that relate to wildfire crew, aircraft and other resources.

Firefighting crews are hired and contracted at the beginning of each year to provide a base level of resources to allow for initial attack and a basic level of firefighting. Should weather and wildfire conditions lead to a situation where capacity exceeds requirements, these resources may be made available to other provinces and states (when requested) under resource sharing agreements. In the case of initial attack resources, qualified individuals are hired as HAC and RAP leaders and crew members, and are provided training and support for the season. Firetack crews are contracted, fully functioning crews with appropriate training, safety protocols and basic equipment. Unit crews are highly trained and specialized sustained action crews that were established following the recommendations of the 2011 Flat Top Complex Review. Exhibit 32 summarizes costs associated with firefighting crews engaged as presuppression preparedness resources.

Three significant trends are noted in the data. In 2012, spending on contracted manpower and seasonal manpower increased by more than \$6.8 million. This mainly reflects the increase in manpower resourcing committed to presuppression preparedness in response to the 2011 Flat Top Complex Review Committee recommendations. In 2014, presuppression preparedness spending further increased by \$10 million over 2012 levels. This was reflected primarily in increases to seasonal manpower with some increase in contracted manpower. In 2015, contracted and seasonal manpower remained the same for presuppression preparedness while emergency firefighter and imported resources increased substantially. This reflects a situation where the capacity in Alberta for contracted and seasonal resources has been reached and the only additional resources available for presuppression preparedness are emergency firefighters (assembled on an "as needed" basis) or firefighters obtained through resource sharing agreements (uncertain availability and unfamiliar with Alberta conditions).

Exhibit 32: 2011 – 2015 Presuppression Preparedness Manpower Costs in Dollars

Year	Contracted Manpower (\$)	Emergency Firefighter (EFF) Manpower (\$)	MARS /NWFC ¹⁵ Manpower (\$)	Seasonal Manpower (\$)	Total (\$)
2011	6,330,629	832,037	682,375	13,369,549	21,214,589
2012	8,427,614	1,157,831	341,913	17,501,795	27,429,153
2013	6,840,968	490,311	15,500	19,035,834	26,382,613
2014	9,566,132	855,053	57,650	27,925,756	38,404,592
2015	9,683,695	1,300,046	3,323,250	25,858,081	40,165,072

Aircraft

Each year, airtankers, rotary wing and (to a lesser extent) fixed wing aircraft are engaged to provide a base level capacity to respond to wildfires. Base level costs for aircraft considered as presuppression resources are presented in Exhibit 33.

Exhibit 33: 2011 – 2015 Presuppression Preparedness Aircraft Costs in Dollars

Year	Airtanker Groups (\$)	Contract Rotary Wing Aircraft (\$)	Casual Rotary Wing and Other Aircraft Costs (\$)	Total (\$)
2011	29,642,175	14,937,597	15,749,147	60,328,920
2012	28,223,432	17,650,197	21,033,107	66,906,736
2013	27,589,977	13,942,934	9,153,179	50,686,090
2014	26,943,142	17,409,816	15,512,638	59,865,596
2015	34,790,591	8,847,127	43,561,362	87,199,081

Note: Contract rotary wing aircraft mainly includes the longer term contract equipment used with the HAC, RAP and Firetack crews. Casual rotary wing and other aircraft includes primarily short term contract (casual or day-to-day) rotary wing costs though it may also include some fuel and manpower costs.

Airtanker contracts represent a longer term commitment as the nature of the resource is that it is highly specialized with a narrow range of uses and high capital costs. These require longer term contracts and certain assurances of usage. The costs outlined in Exhibit 33 show an increase in 2015 for airtankers, reflecting the increased engagement of airtankers groups and rotary wing aircraft through short term hiring and imports from other jurisdictions. The lower rotary wing costs are the result of coding variations

¹⁵ MARS and NWFC refer respectively to resources shared under the Canadian Interagency Mutual Aid Resources Sharing (MARS) Agreement or the Northwest Compact under the Northwest Wildland Fire Protection Agreement (NWFC).

and to a lesser degree, greater use of the contract rotary wing and crews on loaded patrols (these are reported as detection costs).

Airtanker bases and wildfire bases for initial attack and sustained action crews have been established throughout the province to enable resources to be strategically positioned in anticipation of initial attack requirements. In the case of airtanker bases, there are standards and criteria for runways, tarmacs and associated infrastructure, and equipment that must be maintained. In the case of wildfire bases, access for rotary wing aircraft is maintained at or near the site, along with camp style accommodations.

Rotary wing aircraft are required to transport firefighting crews and to deliver water with buckets on wildfires in an initial attack and wildfire suppression capacity. Rotary wing aircraft contracted in advance of the season are relatively flexible in their use, and play a critical overall role in wildfire management as well as other forestry operations. Rotary wing aircraft are in high demand in other industries and other jurisdictions, which makes careful planning for the combination of season long contracts and casual hires highly important.

Other Resources

Other resources engaged as part of the presuppression preparedness system include contracts for services such as base camp operations, heavy equipment on standby, fire hose services, and others. Costs associated with other resources are summarized in Exhibit 34.

Exhibit 34: 2011 – 2015 Presuppression Preparedness Service and Equipment Costs in Dollars

Year	Equipment (\$)	Contract Supply Services (\$)	Total (\$)
2011	10,513,065	16,272,049	26,785,114
2012	15,872,655	16,242,280	32,114,935
2013	8,602,419	14,879,948	23,482,368
2014	12,605,874	13,828,779	26,434,653
2015	24,308,666	31,758,284	56,066,950

Once again, spending on contracted resources for presuppression preparedness increased noticeably in 2015, owing to the severity of the wildfire conditions and level of resources expected to be committed to wildfire operations. Most of these resources are hired or contracted according to pre-established rates such as those defined in the Forest Protection Payment Regulation and the Alberta Roadbuilders and Heavy Construction Association Equipment Rental Rates Guide. Other practices include safety and performance requirements that are appropriate for the equipment being hired or contracted and a means of ensuring fairness in hiring local and regional resources.

6.2 ANALYSIS AND FINDINGS

In evaluating the effectiveness of presuppression preparedness, the following aspects of the program were reviewed:

- The state of the wildfire weather monitoring and forecasting system.
- The state of the PPS, in terms of its use and usefulness.
- The practice of hiring/contracting, training and retaining HAC, RAP, Unit and Firetack crews in advance of the fire season.
- The management of the provincial airtanker fleet through contracting.
- The management of aircraft contracts in terms of the types, number and terms of rotary wing aircraft contracts.
- Other resource contracting practices.
- Training.

Wildfire Weather Monitoring and Forecasting

The wildfire weather and forecasting system used in Alberta is consistent with the system used in other provinces and in United States jurisdictions. Unique to Alberta is the access to weather and associated data from a large number of monitoring stations located at lookouts as well as selected other locations. This provides a very high level of detail in presenting current weather and wildfire hazard conditions as well as providing forecasts based on robust data for the next one to two days.

The Presuppression Preparedness System

The performance measure most appropriate for the PPS is the number of new wildfires contained in the first burning period. The measure is presented in Exhibit 35. The 2015 fire season represented a stress on the system as performance was decreased in terms of wildfire containment in the first and second burning periods.

Exhibit 35: Success Rate

Year	Wildfires Contained in First Burning Period (%)	Wildfires Contained in Second Burning Period (%)
2011	96.1	97.7
2012	97.9	98.4
2013	98.3	99.7
2014	99.2	99.4
2015	92.7	95.6

The degree of success in containing wildfires in the first burning depends as much on the conditions as the response. As additional input to the analysis, selected high wildfire hazard periods for 2015 were identified for further evaluation.

Exhibit 36 outlines the results experienced in 2015 for selected high wildfire hazard days in terms of percentage of wildfires contained in the first and second burning periods. These days were selected as they represented the most active periods in 2015 that tested the system and its effectiveness.

Exhibit 36: Selected Results of Peak Wildfire Hazards

Wildfire Management Area	Selected Days	Containment - First Burning Period	Containment - Second Burning Period
Fort McMurray	May 25, June 24, June 25	72%	88%
High Level	May 25, June 24, June 25, June 26	76%	99%
Peace River	May 25, June 25, June 30,	86%	93%
Slave Lake	May 25, June 30, July 1	61%	88%
Lac La Biche	June 25, June 26	87%	87%

The results indicate that in 2015, on the most severe days and in the most active areas of the province, the percentage of wildfires contained in the first burning period ranges from 61 percent to 87 percent. The goal is to contain all wildfires within the first burning period. Extended to two burning periods, the results are improved to a range of 87 percent to 99 percent, which reflects a high rate of success relative to a broader strategy aimed at early containment of wildfires. It should be noted that the first burning period extends to 10:00 AM the next day—some wildfires contained within two burning periods may have been contained the next day, but after 10:00 AM. It's clear from this data, that during the days with the highest hazard, some wildfires will not be contained early, requiring full and extended suppression efforts.

Detailed data is presented in Exhibit 37. This table details wildfire presuppression preparedness activities for some of the highest hazard days and regions of the province. The data shows the relationship between the prescribed coverage levels (80 percent or greater for all situations), the actual coverage levels reflecting resource availability and values at risk, the resourcing associated with the actual coverage level in terms of rotary wing and firefighter crews on standby and the results. An explanation of each column heading follows.

- **HFI:** Head Fire Intensity, which represents the wildfire hazard in terms of a wildfire's behaviour and degree of initial growth.
- **% Cov (Percent Coverage):** The actual percentage of a geographical area where resources have the ability to arrive at a wildfire before it is two hectares in size.
- **R/W (Rotary Wing Aircraft) and Crews:** The number of aircraft and firefighter crews actually engaged on man-up (stand-by) and pre-positioned in accordance with Standard Operating Procedures (SOPs).
- **Fires (Number of Wildfires):** The number of new wildfires occurring on that day in that Wildfire Management Area.

- **# BH 1 BP/% and # BH 2 BP/% (Being Held Status in the First and Second Burning Periods):** The number of new wildfires and the percentage of new wildfires contained or having a “Being Held” status within the first or second burning period.

Exhibit 37: Coverage Levels and Results for Selected and Areas

Fort McMurray							
Date	HFI	% Cov	R/W	Crews	Fires	#BH 1BP/%	#BH 2BP/%
25-May	6	42	10	10	6	5/83	1/100
24-Jun	5	89	8	8	21	17/81	2/90
25-Jun	5	79	9	9	20	12/60	5/85
High Level							
25-May	5	65	9	9	17	12/70	13/76
24-Jun	3	96	6	8	25	23/92	-
25-Jun	4	76	6	6	11	7/64	1/73
26-Jun	5	66	6	6	25	17/68	4/84
Peace River							
25-May	5	73	8	8	22	19/86	-
25-Jun	4	86	3	3	10	10/100	-
30-Jun	4	84	7	7	10	7/70	3/100
Slave Lake							
25-May	6	66	12	13	11	8/73	10/91
30-Jun	5	85	6	6	30	17/56	10/90
01-Jul	4	94	4	4	8	5/62	1/75
Lac La Biche							
25-Jun	4	96	5	5	11	10/91	-
26-Jun	5	76	5	5	4	3/75	-

The PPS, and the indication of its effectiveness in times of peak hazard as illustrated in Exhibit 36 and Exhibit 37, represents the core of the wildfire management program. This system ties together the stated wildfire management objectives with all of the operations management, wildfire science and wildfire experience available to establish necessary resourcing levels and repositioning strategies to achieve success.

The system performs well in terms of striving to meet stated objectives—it is recognized that it is not reasonable or expected that all wildfires can be contained in the first or second burning period when hazards are very high or extreme. Coverage levels less than the targeted 80 percent at the highest HFIs simply reflect one of two things: either resources are scarce and not available to the extent needed to achieve full coverage, or the objectives in certain areas are adjusted to reflect lower values at risk or some other decision factor.

Discussion about changes to the system to reduce the need for resources requires careful consideration of objectives and risk tolerance, as reductions in coverage levels would likely lead to fewer wildfires being contained within the first burning period and more wildfires growing out of control to large sizes.

Hiring and Contracting Other Resources

In addition to contracting airtankers, rotary wing aircraft and firefighter crews, other resources need to be contracted in order to be prepared for new wildfire starts under high hazards. These resources include water trucks, dozers, camp supplies and others. The data in Exhibit 32 suggests that increased hiring and contracting can be expected when fire seasons are severe and wildfire situations are active. This requires effective procurement practices to accomplish three objectives—allowing area staff the ability to quickly engage the resources required, ensuring cost effectiveness both through reasonable rates and accurate accounting of time and fairness.

The use of a rate guide is helpful in ensuring reasonable rates. Applying simple tracking tools to the engagement of resources assists in ensuring accurate accounting of time. Fairness has been identified as an issue in some instances as a system of rotating contracts among local equipment providers has resulted in some equipment providers being contracted for one or two day periods while others have been contracted for weeks at a time. Agriculture and Forestry plans to implement guidelines to ensure that each contractor is provided with a minimum contract or hiring period when its rotation is current.

6.3 CONCLUSIONS

Presuppression preparedness represents the foundation of the wildfire management program. The manner in which Agriculture and Forestry prepares for each upcoming fire season and the level of presuppression preparedness that the Department establishes on each day (based on current and projected weather and fire indices) is directly linked to protection objectives established in legislation and policy. Presuppression preparedness connects provincial policies and objectives with standard operating procedures and the various means of accessing resources.

Data presented in the Detection, Presuppression Preparedness and Suppression chapters all emphasize the strong relation between early action on wildfires and the level of success in containing wildfires. Early detection and rapid initial attack using airtankers, initial attack crews and other resources allows the Department to contain wildfires when they are small, resulting in better protection of Albertans and their communities, lower costs per wildfire, and reduced losses.

Agriculture and Forestry's commitment to a strong presuppression preparedness approach is necessary given the objectives set in policy and the level of settlement and development in Alberta's forested area. The Department's current presuppression preparedness program is fully warranted and necessary. Any changes contemplated to the level of resourcing to the presuppression preparedness program must be made as a consequence of a policy decision where objectives for containment are changed or redefined.

6.4 RECOMMENDATIONS AND OPPORTUNITIES FOR IMPROVEMENT

Presuppression preparedness represents the foundation of Agriculture and Forestry's wildfire management program. No significant changes are proposed to the approach and practices associated with this area of the program. Two opportunities for improvement have been identified to help with the Department's goal of continual improvement.

Opportunities for Improvement

11. Review the terms and conditions, and the recruitment approach and standards for contracted firefighting crews with an aim to increase recruitment and the number of firefighting crews available.

Advice from wildfire managers and specialists indicates that the number of contracted firefighting crews available in the province has been maximized given the current terms and conditions of the agreements with contracted crews. This perspective is supported by the data available. These terms and conditions include firefighter wages, benefits, hours, length of employment, fitness standards and other criteria.

Compounding this, the move to Canada wide fitness and training standards for firefighters has eliminated some of the more experienced and capable firefighters from the program. There is value in reengaging with these people as a source of expertise, as elders and mentors on the fireline, and as a compliment to community and individual pride in the firefighter program.

Finally, the downturn in the Alberta economy has also affected the employment options for Aboriginal peoples therefore it may be an opportune time to investigate expanding the wildfire crew program in the Aboriginal communities.

Given the importance of Alberta contracted crews to presuppression preparedness in the province and given the opportunity to expand the level of participation of Aboriginal community members in the wildfire management program, improvements in the terms and conditions for contracted crews could provide multiple benefits.

12. Continue to review and implement improvements to firefighting equipment contracting practices and guidelines.

The Department has been reviewing the practice of rotating equipment contracts through a list of local contractors to provide for a greater degree of fairness and equal opportunity. The Department is encouraged to continue with the review and implementation of this and other equipment contracting practices and guidelines to improve effectiveness, efficiency and fairness.

7. SUPPRESSION

Wildfire suppression represents the operational aspects of the wildfire management program and the most visible set of activities to the public. Suppression involves mobilizing varied resources to protect values within Alberta's forests (within and outside the Forest Protection Area) and includes all activities involved in controlling and extinguishing wildfire. Wildfire suppression involves both initial attack as well as sustained action. In terms of initial attack, wildfire suppression is closely tied in with presuppression preparedness in that once resources are needed and mobilized to address new wildfire starts, all activity and costing becomes a part of wildfire suppression.

The core objective of wildfire suppression is to action and manage wildfires to minimize or mitigate the impacts of wildfires on values-at-risk. In 2000, Cabinet approved the following priorities when allocating firefighting resources (listed in descending order of priority).

- Human Life
- Communities
- Watersheds and Sensitive Soils
- Natural Resources
- Infrastructure

The objectives of wildfire suppression are reflected by two main performance measures used by Agriculture and Forestry in the suppression program, each focusing on initial attack.

- To contain wildfire spread within the first burning period (by 10:00 am of the day following the initial assessment of the wildfire).
- To initiate suppression before the wildfire exceeds two hectares (5.9 acres) in size.

7.1 OVERVIEW OF WILDFIRE SUPPRESSION IN ALBERTA

Wildfire suppression emphasizes early detection and rapid initial attack of new wildfire starts. Successful initial attack depends on prompt and effective detection and the ability of the initial attack resource (aerial resources and firefighting crews) to respond to wildfires in a quick, efficient and safe manner. Once dispatched, the first responder assesses the wildfire, determines the best strategy and set of tactics and initiates action. Based on their assessment of the probability of success, additional resources may be needed.

Effective detection and presuppression preparedness processes and activities influence the success of initial attack and the subsequent need for sustained wildfire action. Exhibit 38 outlines the primary suppression resources costs in each year. 2015 was a particularly high cost year as most cost categories were higher in 2015 than any of the previous five years.

Exhibit 38: 2011 – 2015 Suppression Costs in Dollars

Year	All Aircraft (Including Retardant & Fuel)	All Manpower (Contract, EFF, MARS/NWFC, Seasonal)	All Equipment and Services	Total
2011	64,838,348	29,356,688	41,901,515	136,096,551
2012	67,470,561	19,513,035	27,984,861	114,968,457
2013	22,013,605	4,736,712	6,041,054	32,791,371
2014	29,581,640	6,957,497	8,357,397	44,896,535
2015	126,058,350	28,871,381	43,631,328	198,561,059

Based on conditions and resource availability, it is not always possible to action a wildfire before it reaches two hectares in size, nor is it always possible to contain the wildfire within the first burning period. Examples would be extreme burning conditions, multiple wildfire starts and remote locations. In such cases, sustained action beyond initial attack may be required and involve the use of airtankers, rotary wing aircraft, Unit and Firetack crews, heavy equipment and other resources.

Where sustained action is required, an Incident Command System (ICS) will be employed to support effective decision making and resource management. The ICS was adopted in Canada in 2002 to standardize emergency management and response to wildfire incidents. ICS is a standardized organizational structure that links facilities, equipment, personnel, processes and communications and can be used across jurisdictions to import and export resources as required.

Incident Management Teams (IMTs) are components of the ICS and are used to manage large-scale wildfire incidents. Type 1 IMTs, or IMT1s, comprise specialized individuals who are trained and certified to manage large and complex wildfire incidents. IMT1s have the most training and are put in charge of wildfires involving the most complexity. Type 2 IMTs, or IMT2s, have less training and experience than IMT1s and as such, are generally used on smaller-scale or less complex wildfire incidents.

Wildfire strategies and tactics represent the outcome of complex and time constrained decisions that are informed by policy, priorities, standard operating procedures, information on conditions and wildfire behaviour, resource availability, and values at risk. In addition to these inputs, decision makers considering strategies and tactics may choose a limited action strategy for ecological reasons. This decision, however, is uncommon due to conflicting objectives of protecting values at risk. Agriculture and Forestry uses Wildfire Analysis and Strategy (WAS) reports and processes when wildfires are not contained at the initial attack stage to support and document decisions.

Agriculture and Forestry's Provincial Forest Fire Centre (PFFC) and Wildfire Management Areas (WMAs) have started to adopt a risk management approach to assessing and suppressing wildfires. PFFC is in the process of developing a Risk Management System and the ten WMAs are working to complete regional risk management assessments and accompanying plans. This evolution of the program is intended to provide better direction to wildfire managers when faced with critical decisions on wildfires in real time.

7.2 ANALYSIS AND FINDINGS

An analysis of the wildfire suppression activities is described in two sections. An analysis of data concerning the performance and costs associated with wildfire management is presented in this section. Second, Appendix 2 consists of two case studies for complex wildfire situations that demonstrate how the overall wildfire suppression systems worked in 2015. Both are used to help identify areas of strength and areas where improvements could be pursued.

Wildfire Suppression Performance and Costs

Suppression costs and activities can be described in three specific areas: aircraft, manpower and supplies/services.

Aircraft leasing, ownership and operations account for the highest proportion of the program, contributing to presuppression preparedness, initial attack and support for sustained action on wildfires. Exhibit 39 outlines the suppression costs associated with aircraft between 2011 and 2015.

Exhibit 39: 2011 - 2015 Suppression Aircraft Cost in Dollars¹⁶

Year	Airtanker Groups (Including Retardant and Fuel) (\$)	Contract Rotary Wing Aircraft (\$)	Casual Rotary Wing and Other Aircraft Costs (\$)	Total (\$)
2011	11,191,701	11,352,161	42,294,486	64,838,348
2012	11,621,417	17,909,330	37,939,814	67,470,561
2013	7,515,285	7,007,485	7,490,835	22,013,605
2014	7,883,131	9,991,107	11,707,402	29,581,640
2015	20,884,961	4,493,342	100,680,047	126,058,350

The expenditures directly relate to the severity of the fire season. Along with presuppression preparedness they explain much of the annual variation in expenditures observed. Once again, variations in coding explain some of the variation in “rotary wing” and “other” aircraft costs.

Manpower costs are associated with all aspects of the wildfire management program and are outlined in Exhibit 40 (following page). The large wildfires and significant values at risk in 2011 and 2015 explain the increased expense evident in the contracting of local firefighting crews and emergency firefighters, imports crews and seasonal employment.

¹⁶ Retardant and fuel costs have been allocated to individual wildfires proportionate to the airtanker costs. Contract rotary wing aircraft mainly includes the longer term contract equipment used with the HAC, RAP, Unit and Firetack crews. Casual rotary wing and other aircraft includes short term contract (casual or day-to-day) rotary wing and airtanker costs though it may also include some fuel and manpower costs.

Exhibit 40: 2011 – 2015 Suppression Manpower Costs in Dollars

Year	Contracted Manpower (\$)	EFF Manpower (\$)	MARS/NWFC Manpower (\$)	Seasonal Manpower (\$)	Total (\$)
2011	7,749,988	2,739,455	15,966,450	2,900,795	29,356,688
2012	11,286,237	3,202,370	947,600	4,076,828	19,513,035
2013	2,770,746	381,541	-	1,584,425	4,736,712
2014	3,072,360	207,353	1,052,275	2,625,509	6,957,497
2015	14,237,444	1,306,080	6,742,125	6,585,732	28,871,381

Supplies and services are also used for all aspects of the wildfire management program. These resources include heavy equipment, specialized equipment other than aircraft and services other than firefighting, such as equipment maintenance and support. Usage and costs of other contracted supplies and services are shown in Exhibit 41. The patterns of use are consistent.

Exhibit 41: 2011 - 2015 Suppression Contract Supply and Service, and Equipment Costs in Dollars

Year	Equipment	Contract Supply and Services	Total
2011	28,563,501	13,338,015	41,901,515
2012	20,938,578	7,046,283	27,984,861
2013	3,980,498	2,060,556	6,041,054
2014	5,221,899	3,135,498	8,357,397
2015	31,950,936	11,680,392	43,631,328

Exhibit 42 outlines the results of the suppression program in terms of costs by wildfire size when extinguished. This data shows concentration of costs in the small size category and large size category, indicating the investment in initial attack. It also shows the unavoidable high costs incurred when wildfires escape and reach very large sizes.

Exhibit 42: 2011 - 2015 Wildfire Suppression Results

Size When Extinguished (ha)	Number of Wildfires	Average Size at Assessment	Average Cost/ Wildfire (\$)	Total Cost (\$)
<=1	4751	0.1	10,896	51,767,244
1.1 to 2	210	1.1	35,456	7,445,804
2.1 to 5	212	2.0	59,307	12,573,066
5.1 to 10	123	3.1	82,728	10,175,573
10.1 to 20	87	5.1	145,198	12,632,207
20.1 to 50	84	7.4	219,884	18,470,238
50.1 to 100	46	7.3	401,810	18,483,283
100.1 to 200	29	44.2	513,666	14,896,325
200.1 to 500	38	24.3	983,936	37,389,570
500.1 to 1,000	21	105.7	1,380,323	28,986,774
1000.1 to 2,000	17	77.9	1,417,511	24,097,683
2000.1 to 5,000	26	458.8	2,483,793	64,578,606
5000.1 to 10,000	12	6.3	3,242,105	38,905,255
10,000.1 to 20,000	17	246.5	3,239,102	55,064,728
20,000.1 to 50,000	12	583.1	5,933,746	71,204,948
50,000.1 to 100,000	1	4.0	19,692,826	19,692,826
500,000.1 to 1,000,000	1	4.0	40,949,842	40,949,842

Exhibit 43 outlines the costs of wildfire suppression in 2015 by cause. One wildfire coded as related to the oil and gas industry was located within the Cold Lake Air Weapons Range and suppression was not directly related to the industry. Setting this and the lightning caused fires aside, the data shows that the highest cost wildfires are those related to arson and those are still under investigation (also likely human caused). This underscores the importance of prevention programs.

Exhibit 43: 2011 – 2015 Wildfire Numbers and Suppression Costs by Cause¹⁷

Wildfire Cause	Number of Wildfires	Total Cost (\$)	Average Cost per Wildfire (\$)
Agriculture Industry	157	7,017,043	44,695
Forest Industry	70	9,132,705	130,467
Incendiary (Arson)	590	22,385,962	37,942
Lightning	2,230	294,087,539	131,878
Oil & Gas Industry	92	22,989,929	249,891
Other Industry	69	1,247,960	18,086
Power Line Industry	327	51,613,984	157,841
Prescribed Fire	5	53,057	10,611
Railroad	12	332,139	27,678
Recreation	972	8,696,299	8,947
Resident	699	6,968,779	9,970
Restart	23	374,527	16,284
Under Investigation	30	15,273,096	509,103
Undetermined	171	67,413,822	394,233
Total	5,447	507,586,842	93,186

Individual Wildfire Reviews

Two wildfire complexes were selected for a detailed review to assess the challenges on individual wildfires during a severe fire season. As part of these individual wildfire reviews, the views of Incident Management Teams were discussed and documented.

The first review involved the Brintnell Complex in the Slave Lake Wildfire Management Area where timber values were threatened and a highway closure occurred. The second review involved the operations of the Birch Complex in the High Level Wildfire Management Area where community evacuations occurred.

The data and information listed within these individual wildfire reviews were derived by interviewing a variety of sources directly involved with the wildfire complexes. The interviews were conducted after some

¹⁷ Some wildfires in the dataset had no cause assigned – these are excluded and as a result totals may be different from others included in the document.

basic information was collected and studied, including resource availability and utilization, communications, strategies and tactics, and Area Command structure (in the case of High Level). Each of these topics were further stratified into specific items of discussion to ensure coverage of the wildfire incident was as complete as possible.

During the interviews, the focus was on identifying what worked, what didn't work, what made the 2015 season unique, and what recommendations can be provided.

The findings of the wildfire reviews are presented in Appendix 2 along with detailed potential actions in the following categories.

- Resource availability and utilization.
- Communication.
- Incident Management Team issues.
- Tactics.
- Safety.

7.3 CONCLUSIONS

Overall, the standard operating procedures, processes and policies in place to guide wildfire suppression activities are well defined and well implemented. The wildfire suppression activities carried out in 2015 appeared to have been well executed and successful. The experience in 2015 included limited wind events, which likely led to more manageable fire behaviour and a reduced probability of extreme losses.

Recommendations and opportunities for improvement have been identified and relate to communications and wildfire policy. These recommendations and opportunities are defined in the Wildfire Prevention Section and the Policy and Planning Section.

8. POLICY AND PLANNING

The policy and planning aspect of Agriculture and Forestry's wildfire management program represents the province's overall direction with respect to wildfire management in Alberta and provides the high level means with which the direction is implemented. Wildfire management policy involves high level decisions that link the government's overall goals and strategies to the wildfire management program. Planning systems and initiatives are the enabling policy tools and strategies that help implementation of wildfire management. It should be noted that most jurisdictions across Canada have both modified and full response strategies that guide the decisions regarding financial commitments to individual wildfire events. In contrast, Alberta has a full response strategy for initial attack on all wildfires within the Forest Protection Area. This reflects the extensive values at risk and priorities in the province. This strategy requires sufficient base budget to secure adequate hired and contracted resources.

In a program delivery sense, policy and planning is carried out by setting overarching goals and associated policies, setting and updating standard operating procedures, establishing performance measures and preparing wildfire risk management plans. In addition, linkages to other provincial landscape management and emergency services plans and policies are established at this level. There are three main program areas to consider:

- Establishing an overall direction and set of expectations for the program.
- Establishing policies and standard operating procedures that define the structure of the program.
- Carrying out planning activities, at various levels, that enable the Department to achieve the program's objectives.

The objectives of policy and planning in relation to wildfire management in Alberta can be described in three main parts:

- Providing direction to Agriculture and Forestry, with respect to wildfire management, that reflects the province's approach to public safety, risk management of values and risk tolerance.
 - The objective of setting high level policy and direction is to provide a foundation for the program that subsequently informs the structure of the program and the capacity and capability for delivering the program.
- Providing structure for the program in terms of stated priorities, interdepartmental roles, intradepartmental roles, and standard processes and procedures that tie strategic direction, science and experience of wildfire management in Alberta.
- Providing linkages with other land and resource management policies and plans to enhance effective decision making, particularly with respect to wildfire prioritization and resource allocation during active wildfire situations.

8.1 OVERVIEW OF WILDFIRE MANAGEMENT POLICY AND PLANNING

Long standing structures and processes are in place to support the development of policies and plans for wildfire management. The current policy regarding wildfire management is described in terms of the provincial wildfire management priorities that guide decision making. They were approved by Cabinet in 2000 and remain in effect today. These protection priorities (human life, communities, watersheds and sensitive soils, natural resources, infrastructure) are subject to a certain amount of interpretation and their application is reviewed and documented each year in an internal annual review of each fire season.

In addition to the policy that describes wildfire management, risk management priorities and standard operating procedures are established to guide the application of the policies in an operational sense. Standard operating procedures represent the primary link between risk management goals and policies and the operational aspect of the wildfire management program. These outline processes, procedures, systems and decision supporting criteria to be applied to operations at all levels of the program. Standard operating procedures are reviewed each year to assess the degree to which they were adhered to and to identify any modifications or improvements that could be made based on experiences of the past fire season.

Wildfire management planning takes place in three primary ways. First, a certain degree of wildfire management planning is expected to take place in the course of the Land Use Framework planning initiative. While planning at the Land Use Framework level is broadly focused on a range of land use, resource use and development challenges, there are opportunities to identify values and vulnerability, regional and local priorities and specific risk features.

Second, wildfire management is expected to be addressed in detailed forest management plans (DFMP) developed by Forest Management Agreement (FMA) holders. The DFMP includes a one rotation (80 to 120 year) perspective of the growth and development of a FMA area. The wildfire management component of the DFMP is intended to include a recognition of the role that wildfire plays in the forest ecosystem and strategies for addressing wildfire are expected to be integrated into the forest management plan. FMA holders are required to develop a wildfire management plan and they enter into agreements with the province to supplement wildfire suppression capabilities through training and resourcing.

A third level of policy and planning exists through recent efforts at the Wildfire Management Area level, where risk, values at risk and risk mitigation strategies are identified at the Wildfire Management Area level. This area of planning is at an early stage of implementation and progress varies among Wildfire Management Areas. Although labelled as “risk management plans”, these are actually focusing on risk assessments.

In summary, the current policy and planning framework for Agriculture and Forestry’s wildfire management program consists of:

- A provincial policy, approved by Cabinet, which identifies five broad priorities of protection.
- A set of standard operating procedures that outline processes, procedures, decision support criteria and other operational instructions and guidelines.

- A set of linkages, currently under development, of wildfire management with other provincial landscape and resource management planning systems that identifies specific objectives, values at risk and a refinement of priorities from a provincial perspective.
- Regional risk management plans, also currently under development, that further assess risks and values at risk at a regional level.
- Detailed forest management plans, prepared either by FMA holders or Agriculture and Forestry that incorporates wildfire management with resource management strategies.

8.2 ANALYSIS AND FINDINGS

Four primary findings in relation to policy and planning are noted.

- There needs to be a stronger linkage between the wildfire management policy and a risk management framework. The wildfire management program, as it is currently constructed, appears to exist independently of any provincial level direction regarding risk tolerance and context. While this did not cause issues in the 2015 fire season, it has the potential to be problematic given projections and trends towards lengthier and more severe seasons, the possibility of severe wildfire and the possibility of trade-off decisions with significant consequences. Without the explicit support from government of a risk management framework, the potential exists that time sensitive decisions are being made with critical protection and safety consequences that are not supported by government.
- There is wide acceptance among community members, industry representatives and other stakeholders of the stated five protection priorities. Stakeholders understand that there is significant latitude for interpretation of the priorities and there exists a very high degree of trust in the ability of wildfire managers to apply judgment and make decisions.
- Notwithstanding stakeholder support for wildfire management decision makers and their ability to apply priorities, decision support tools are lacking for senior management within the program. This is not an issue in normal fire seasons, however during severe wildfire situations, reliance on standard operating procedures and experience is not sufficient. More effective decision support tools that incorporate wildfire behaviour models and values at risk data are needed to enable the most effective real time decisions.
- The linkage between wildfire risk management plans and other plans under the Land Use Framework, and FMAs and is in its infancy. Currently, Land Use Framework and forest management plans provide information on values at risk that can feed into wildfire management plans and policies.

8.3 RECOMMENDATIONS AND OPPORTUNITIES FOR IMPROVEMENT

Recommendations

3. Develop and implement a formal wildfire risk management framework.

While the program currently operates under a risk management approach, there is not an overall framework to guide future development of the program and application of the program in extreme wildfire conditions. The framework should outline the province's understanding and direction regarding risk, consequences, risk tolerance, priorities and decision authority with respect to wildfire events at the provincial and Wildfire Management Area level.

Based on a draft risk management framework, Alberta's elected representatives should be engaged to discuss aspects of a wildfire risk management framework and should be asked to confirm a wildfire management policy, including wildfire management priorities and decision authorities.

The risk management system currently being developed by Agriculture and Forestry's Wildfire Management Branch (the Extended Operations Model) needs refining in order to reflect the direction provided by the risk management framework. The organization's objective of adopting a risk management approach to wildland fire management is evident and provides an effective basis for this next step.

The Review Team suggests that the organization adopt a recognized risk management process, framework and system such as the International Organization for Standardization, ISO 31000:2009. The implementation of Risk Management Principles and Guidelines that include a risk assessment and profile structure that detail the risk sources and drivers, control effectiveness and costs plus risk, and control owners is required. This should be applied organization-wide for a holistic application of Wildland Fire Management – Risk Management. This will include social, economic and environmental values in the context of wildfire as both a potentially destructive force and as an 'interacting natural system' as defined in Alberta's Environmental Protection and Enhancement Act, 2014 and the Canadian Environmental Assessment Act 2012.

Accelerating the completion of all ten risk management assessments (regional risk management plans) should be a priority action item for the program. This effort is a key step in completing the implementation of a risk management approach to extended wildfire operations. Review of the value at risk labels should be included to assess both vulnerability and exposure of individual values that would either downgrade or enhance the priority status.

Opportunities for Improvement

A number of opportunities present themselves to strengthen the policy and planning framework guiding the wildfire management program. These are opportunities to better reflect what the public wants and needs in terms of wildfire management and what is required in order to deliver the program designed with this in mind.

- 13.** Prepare communications and briefing materials to increase the level of awareness of government representatives about wildfire and wildfire management.

Confirming or redefining government's position on risk tolerance, potential consequences and protection priorities is an opportunity to articulate a foundation for a risk management framework for the program. This can be done through the following:

- Preparing briefing materials for caucus on the nature of wildfire on forested landscapes generally and on Alberta's landscape specifically.*
 - Preparing a presentation and discussion to caucus that outlines Alberta's forestry context, wildfire management as a discipline of forestry and the current policy regarding protection priorities.*
 - Asking for Cabinet support for a wildfire management policy and a set of wildfire protection priorities for Alberta, either in its current form or in a modified form.*
- 14.** Expand efforts within the departments of Agriculture and Forestry and Environment and Parks to link wildfire management with planning under the Land Use Framework, Forest Management Agreements and other relevant planning initiatives.
 - 15.** Incorporate wildfire management policies and objectives into public education and awareness communications, as part of the Department's communications initiative.

9. RESOURCE SHARING AND MUTUAL AID

Resource sharing is an integral component of wildfire management locally, nationally and internationally. It supports the provision of adequate resources to assist when emergency events or severe wildfire situations take place. The severe fire season and the corresponding weather patterns in 2015 required the use of existing resource sharing agreements to their full capacity. This put more attention on the nature of resource sharing agreements, how effective they are and how they might be of greater use in the future.

Mutual aid agreements are a form of resource sharing agreement and exist on a more localized level. They are essentially regional approaches to emergency management. Agriculture and Forestry encourages Alberta municipalities to develop regional mutual aid agreements and plans so that they would have resources or services available to them in the event of wildfire in their area of responsibility.

The objective of resource sharing is to improve resource availability and efficiency of resource utilization by moving resources from jurisdictions where resources are not required (given low hazards and/or low levels of wildfire activity) to jurisdictions where additional resources are needed to meet hazard and/or wildfire activity. The objective of mutual aid agreements is to contribute to community safety in cost-effective ways by allowing access to operational capacity during emergency events.

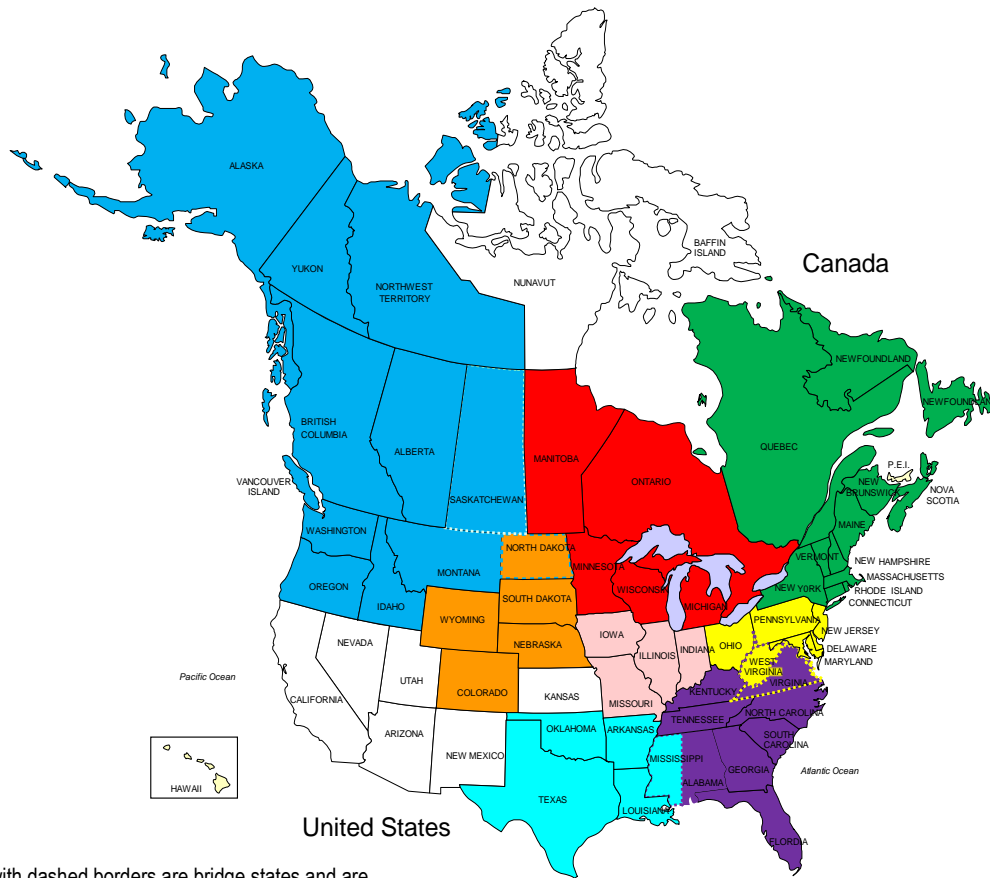
9.1 OVERVIEW OF RESOURCE SHARING ARRANGEMENTS FOR ALBERTA

The 2015 fire season in Alberta started on March 1 and wildfire activity began early in May. The fire seasons in both Saskatchewan and British Columbia followed the same pattern. In Alberta, local resources were quickly committed and all three provinces began requesting additional resources through the Canadian Interagency Forest Fire Centre (CIFFC) and the Northwest Compact which includes western Canadian wildfire management agencies and agencies in the States of Washington, Montana, Idaho, Oregon and Alaska. Exhibit 44 illustrates the various resource sharing agreements or compacts in effect today.

CIFFC provides operational wildland fire resource sharing services, as well as management and information services to its Member Agencies. In addition to coordinating services for all of the provinces, territories and the federal fire management agencies, CIFFC often coordinates the sharing of resources with the United States and other countries.

The Northwest Compact (under the Northwest Wildland Fire Protection Agreement) facilitates assistance in prevention, preparedness, prescribed fire use, training, presuppression, suppression, and control of wildland fires between the member agencies. Both organizations provide personnel trained to national standards under the Incident Command System. As the season progressed Alberta had an unprecedented level of imported overhead and firefighters on the fireline, primarily in central and northern areas of the province. Wildfire season expenditures were also unprecedented as wildfire severity impacted both initial attack success and sustained wildfire suppression operations due to persistent burning and smoldering along wildfire perimeters.

Exhibit 44: Wildfire Compacts



The context for resource sharing starts with the level of resources required in any given year. Exhibit 45 outlines the total amount of resources used by Agriculture and Forestry in the 2015 wildfire season.

Exhibit 45: Total Number of Suppression Resources Committed for the Fire Season

Personnel	495 Seasonal Wildland Firefighters
	2,904 Emergency and Contract Firefighters
Equipment	34,203 Lengths of Hose
	982 Pumps
	2,200+ Pulaskis (axes)
	933 Chainsaws
	2,000+ Shovels
	1,600+ Radios
Helicopters	48,747 Hours Flown
	190 Hired on at one time (at peak)
	321 Total Number Deployed
Fixed Wing Aircraft	5,235 Hours Flown
	11,234,998 L Retardant Dropped
	35 Hired on at one time (at peak)
	35 Total Number Deployed
Ground	1,200+ Pieces of Heavy Equipment Used (bulldozer, water trucks, excavators, etc.)
	220 Equipment Groups

When wildfire conditions are extraordinary and wildfire suppression resources are limited (such as what was experienced in 2015), the Department imports highly trained and experienced firefighters from other jurisdictions to support its wildfire suppression efforts. Importing such resources on a short-term basis enables provincial firefighters to take the required time off and ensures the province is prepared to respond appropriately to the increased number of new wildfires. The Department also exports firefighting resources when requested by other jurisdictions, and wildfire activity, resources and hazard levels in Alberta are appropriate.

9.2 ANALYSIS AND FINDINGS

Agriculture and Forestry's wildfire management program has historically been an active user of resource sharing agreements, with an aim of committing resources early when hazards increase and accessing resources from other provinces as needed. Wildfire incidence was high in central and northern Alberta early in the 2015 fire season and public and industrial values at risk were threatened. As the 2015 fire season progressed, in-house resource capacity was exceeded and additional resources were imported through CIFFC from other jurisdictions, including people and resources from around the world.

Imported resources included:

- Personnel/Crews.
- Fireline Equipment.
- Rotary Wing and Fixed Wing Aircraft.
- Heavy Equipment.

Exhibit 46 lists the number of firefighters imported and exported from various jurisdictions in 2015 through national and international mutual aid resource sharing agreements. The value of these agreements in severe wildfire seasons is high as they ensure that national standards are met and that experienced supervisors are monitoring fireline operations.

Exhibit 46: Alberta Imported and Exported Firefighter Resources for 2015

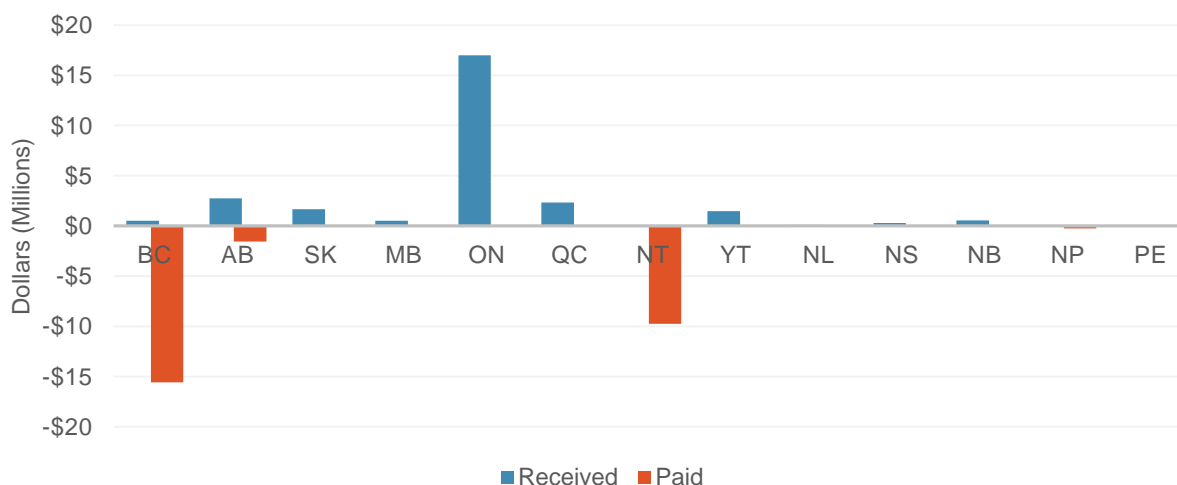
Province / Country	Imports	Exports
British Columbia	204	18
Saskatchewan	-	1
Ontario	441	-
Quebec	45	-
Yukon	-	21
Northwest Territories	-	55
Newfoundland	1	-
Nova Scotia	36	-
New Brunswick	28	-
Prince Edward Island	7	-
Parks Canada	6	5
CIFFC	3	1
Australia	47	-
New Zealand	17	-
South Africa	49	-
United States	182	135
Mexico	62	-
2015 Total	1,128	236
5 Year Average	485	210

When the fire season resource requirements in Alberta decreased late in the summer, neighboring agencies were requesting assistance. Exhibit 46 also lists the exports in response to late season requests across Canada and the western United States.

The result of many jurisdictions using the resource sharing system during the same period of time was a national shortage of resources. The level of available resources nationwide that meet agreed upon standards continues to be a compounding factor contributing to resource shortage. In spite of agreements on comprehensive standards, particularly for firefighting crews and overhead teams, some other jurisdictions cannot demonstrate that the crews and individuals meet standards and therefore their use is problematic.

Exhibit 47 depicts the expenditures and receipts for imported and exported resources respectively across Canada for 2014.

Exhibit 47: Total Canadian 2014 Wildfire Resource Exchange Costs (From CIFFC – Total is \$27 Million)



Two primary issues have been identified with respect to resource sharing and mutual aid.

- It's almost a certainty that the demand for shared resources will be higher in the coming years. This follows from the expectation that wildfire seasons will lengthen and that severe conditions such as those exhibited in 2015 will be more frequent, and from the increasing value of resources and infrastructure on the landscape. This has resulted in CIFFC developing resource sharing agreements with other jurisdictions that can meet Canadian standards. An example of this is Agriculture and Forestry's use of firefighting crews from as far away as South Africa, Australia and New Zealand in 2015. Agreements with other countries will also be needed and this in turn will require additional effort to develop common standards, common training and common specifications.
- The availability of key resources at a western Canadian level is also an issue. This includes airtankers, rotary wing aircraft and trained firefighting crews that meet agreed upon standards. The current resourcing model is designed around each jurisdiction taking primary responsibility for developing, owning or engaging resources that each feels it needs to meet projected demands in the context of its wildfire management objectives. Under this model, mutual aid and resource sharing becomes more difficult when circumstances call for resources that exceed provincial and available national capacities. This is limiting at best and at worst, it creates a competitive environment for resources that can undermine the intent of the agreements. It calls for a greater focus on collaborative approaches to capacity building, including renewing or increasing the supply of key resources. Strategies such as jointly owned or engaged resources, including airtankers and other critical assets, should be given strong consideration. This should involve all

jurisdictions, CIFFC, Natural Resources Canada and the Wildland Fire Management Working Group.

9.3 RECOMMENDATIONS AND OPPORTUNITIES FOR IMPROVEMENT

Opportunities for Improvement

16. Continue to work with other jurisdictions, through the development and implementation of the Canadian Wildland Fire Strategy and through other opportunities, to enhance resource sharing, particularly with respect to aircraft and the availability of qualified and trained firefighters.

The 2015 fire season created a situation where all western provinces were highly reliant on resource sharing. Over the year 1,128 firefighters were imported to assist with extended wildfire suppression operations in Alberta alone. As a result of the wildfire activity throughout western Canada, 357 firefighters were provided from outside of Canada, which increased costs and challenged logistics. In addition, in order to equip initial attack and suppression actions, Alberta was hiring airtankers and rotary wing aircraft on short term contracts at the same time that other western provinces were importing aircraft. This is becoming more common as climate change affects fire season length and severity. National and international agreements on resource standardization and sharing will become more important as single jurisdictions find themselves unable to secure the specialized resources needed for periods of peak demand. The Canadian Wildland Fire Strategy is one way that this issue is being addressed. Where other opportunities exist to further develop cooperative approaches and resource sharing mechanisms, these should also be pursued.

10. FLAT TOP REVIEW

In May 2011 two wildfires burned into communities in the Slave Lake Wildfire Management Area destroying 484 single-family dwellings, seven multi-family residences, 19 non-residential buildings, burning nearly 22,000 hectares, and causing the evacuation of close to 15,000 residents. These two wildfires, in addition to one other wildfire in the Slave Lake area, became known as the Flat Top Complex. In response to the severity of this event, the Government of Alberta established the Flat Top Complex Wildfire Review Committee in June 2011.

The Committee organized the review findings into seven themes and issued 21 recommendations. As a component of the current evaluation, the Review Team was asked to review and report on progress made on these recommendations. A detailed description of the recommendations and our evaluation findings can be found in Appendix 3; a summary of our findings are found below.

10.1 EVALUATION OF FULFILLMENT OF THE FLAT TOP REVIEW RECOMMENDATIONS

The status of recommendations falls into one of three, colour-coded categories:

1. **Met Expectations**—Agriculture and Forestry has met the intent of the recommendation.
2. **Partially Met Expectations**—intent of the recommendation is partially met but with outstanding components needing resolution either by Agriculture and Forestry or others.
3. **Ongoing**—solution to the recommendation is still being developed.

Overall, our findings indicate that the implementation of the Flat Top Recommendations to be reasonable and ongoing implementation is required. Furthermore, the progress achieved to-date needs to be maintained amidst increasingly severe wildfires and fire seasons. Of the 21 recommendations made by the Flat Top Wildfire Review Committee, 15 have Met Expectations, four have Partially Met Expectations and two fall into the Ongoing category. Exhibit 48 details our evaluation findings.

Exhibit 48: 2011 Flat Top Review Themes, Recommendations and Status of Implementation

<p><i>Theme - Wildfire Prevention</i> RECOMMENDATION 1: Enhancements to Wildfire Prevention Implement significant enhancements to wildfire prevention measures, including widespread fire bans, forest area closures, fire permit management, and elevated fines during extreme weather and/or wildfire behaviour conditions. Special consideration should be given to prevention activities early in the fire season. In addition, Sustainable Resource Development should enhance communications of these initiatives to stakeholders and the public to gain their support and acceptance.</p>	<p>Status <i>Met Expectations</i></p>	<p>Other comments <i>Ongoing funding required to continue implementation.</i></p>
<p><i>Theme – Wildfire Prevention</i> RECOMMENDATION 2: Human caused Wildfires/Limited Liability Fire Control Agreement Enhance wildfire prevention measures to aggressively address the increase</p>	<p>Status <i>Met Expectations</i></p>	<p>Other comments <i>Ongoing effectiveness evaluation required.</i></p>

<p>in human caused wildfires. Evaluate the effectiveness and future use of limited liability (as currently expressed in industry fire control agreements) to facilitate effective wildfire prevention by industries operating within the Forest Protection Area.</p>		
<p><i>Theme – Wildfire Prevention</i> RECOMMENDATION 3: Revised Delivery Model/Enhanced Funding for FireSmart Establish a revised delivery model for a FireSmart program under one provincial framework, including a streamlined and enhanced funding model.</p>	<p>Status <i>Met Expectations</i></p>	<p>Other comments <i>Ongoing funding required as per 20 year implementation plan for the recommendation.</i></p>
<p><i>Theme - Wildfire Prevention</i> RECOMMENDATION 4: Accelerate Fuel Management Treatments Accelerate fuel management treatments near communities in forested areas that are at risk from wildfires. Priority should be given to thinning or conversion of coniferous stands, particularly black spruce, which threaten community developments (as identified through strategic analysis of wildfire thread potential).</p>	<p>Status <i>Met Expectations</i></p>	<p>Other comments <i>Ongoing funding required as per 20 year implementation plan as well as ongoing evaluation.</i></p>
<p><i>Theme – Preparedness and Capacity</i> RECOMMENDATION 5: Advance Resource Start Times/Fill Vacancies/Expand Work Terms Advance start times for resources, including crews, equipment and aircraft contracts, to be fully ready for potential early fire seasons. Ensure staff vacancies are filled as soon as possible. Expand work terms to year round for a portion of firefighting crews to support retention and provide capacity for FireSmart initiatives.</p>	<p>Status <i>Met Expectations</i></p>	<p>Other comments <i>Ongoing funding required to sustain capacity.</i></p>
<p><i>Theme – Preparedness and Capacity</i> RECOMMENDATION 6: In-house Expanded Attack (Unit) Crews Develop in-house expanded attack firefighting crews to provide sustained action capability and other wildfire management functions (modeled after the United States Hot Shot crews and/or British Columbia Unit Crews). These crews will enhance response capability on complicated and difficult wildfires. When not fighting wildfires, these crews can be made available for fuel management and landscape FireSmart activities.</p>	<p>Status <i>Met Expectations</i></p>	<p>Other comments <i>Ongoing funding required and ongoing evaluation needed to assess need to expand unit crew capacity.</i></p>
<p><i>Theme - Preparedness and Capacity</i> RECOMMENDATION 7: Fire Behaviour Specialists/Wildfire Occurrence Prediction Ensure sufficient fire behaviour specialist capabilities at Sustainable Resource Development's Provincial Forest Fire Centre as part of wildfire weather forecasting, and implement wildfire occurrence predictions to support the Presuppression Preparedness System.</p>	<p>Status <i>Met Expectations</i></p>	<p>Other comments <i>Ongoing funding required to sustain capacity.</i></p>
<p><i>Theme - Preparedness and Capacity</i> RECOMMENDATION 8: Resource Requests Initiate resource requests in advance of potential demand, especially in anticipation of extreme wildfire risk conditions. Efforts should be made to reduce delays inherent in the resource request and sharing system internally and with other agencies.</p>	<p>Status <i>Partially Met Expectations</i></p>	<p>Other comments <i>The Department is a major contributor to the National Wildfire Response Plan, and is developing and implementing an internal risk based process.</i></p>

<p><i>Theme - Preparedness and Capacity</i></p> <p>RECOMMENDATION 9: Structural Protection Work with other agencies (e.g., Alberta Municipal Affairs) to develop a structure protection program in which Sustainable Resource Development's role in structural protection is reduced. This will allow Sustainable Resource Development to focus its resources and actions on wildfire containment. The intended result is an increased role for municipal fire services to provide sprinkler protection for homes. Key components will be the provision of standardized equipment and training for fire departments and focus on proactive deployment under the mutual aid network.</p>	<p>Status <i>Ongoing</i></p>	<p>Other comments <i>The Department is working with Alberta Emergency Management Agency and the Office of the Fire Commissioner to clarify mandates and roles.</i></p>
<p><i>Theme – Communications</i></p> <p>RECOMMENDATION 10: Standards/Training for Staff who provide Wildfire Information Enhance standards and training for employees involved in liaison and wildfire management information communications that support operations before, during and after a wildfire event.</p>	<p>Status <i>Met Expectations</i></p>	<p>Other comments <i>Ongoing training, program support, and funding required to sustain capacity.</i></p>
<p><i>Theme – Communications</i></p> <p>RECOMMENDATION 11: Fire Weather Advisories Issue Fire Weather Advisories that include wildfire behaviour potential to ensure understanding of the wildfire danger. Fire Weather Advisories should be more comprehensive in terms of distribution to staff, stakeholders and the public, and more interpretive in terms of implications (i.e., what does the information mean and what actions need to be taken). Fire Weather Advisories are a relatively rare event, which makes it even more important that their meaning is easily understood. Stakeholders and the public need to understand that wildfires can start more easily in certain conditions and, if they do start, can spread very quickly.</p>	<p>Status <i>Met Expectations</i></p>	<p>Other comments <i>Implementation funded within existing budget.</i></p>
<p><i>Theme – Communications</i></p> <p>RECOMMENDATION 12: Dispatch and Resource Tracking Systems Undertake a review of Sustainable Resource Development's dispatch and resource tracking systems. The Committee believes economies of scale and efficiencies in dispatch and tracking aircraft can be achieved through investment in improved dispatch approaches and technology. Sustainable Resource Development should determine whether other provincially-based emergency and wildfire dispatch methodologies and standards (including training) would be beneficial to its operations.</p>	<p>Status <i>Met Expectations</i></p>	<p>Other comments <i>Funding required for implementation.</i></p>
<p><i>Theme – Communications</i></p> <p>RECOMMENDATION 13: Alternative Communication Technologies Enhance communication by fully supporting alternative communication technologies (texting, social networking).</p>	<p>Status <i>Met Expectations</i></p>	<p>Other comments <i>Ongoing updates required as technology and applications evolve.</i></p>
<p><i>Theme - Organization and Incident Management</i></p> <p>RECOMMENDATION 14: Reporting Relationship Realign Area wildfire operations to a direct line reporting relationship within Sustainable Resource Development's Forestry Division to provide clearer responsibilities and authorities.</p>	<p>Status <i>Partially Met Expectations</i></p>	<p>Other comments <i>Business support services are housed in a different ministry.</i></p>

		<i>Environment and Parks provides business support services to Agriculture and Forestry wildfire management area operations via a service level agreement.</i>
<p><i>Theme - Organization and Incident Management</i></p> <p>RECOMMENDATION 15: Wildfire Management Internal Assessments/Benchmarking</p> <p>Restore regular internal assessments of Provincial and Area implementation of wildfire management strategies, priorities and procedures. Undertake regular reviews and benchmarking of Sustainable Resource Development's wildfire management strategies and firefighting priorities.</p>	<p>Status</p> <p><i>Met Expectations</i></p>	<p>Other comments</p> <p><i>National benchmarking being developed through the Canadian Interagency Forest Fire Centre.</i></p>
<p><i>Theme – Organization and Incident Management</i></p> <p>RECOMMENDATION 16: Incident Command System</p> <p>Work with the Alberta Emergency Management Agency to align implementation of the Incident Command System and the use of Incident Management Teams under a consistent provincial model.</p> <p>This should include development of appropriate training and emergency simulation exercises that are practiced regularly (from tabletop to full simulation exercises related to wildfires).</p>	<p>Status</p> <p><i>Met Expectations</i></p>	<p>Other comments</p> <p><i>Requires ongoing implementation, training and exercises.</i></p>
<p><i>Theme - Post-wildfire Business Resumption</i></p> <p>RECOMMENDATION 17: Business Continuity Plans</p> <p>Review Sustainable Resource Development's business continuity plans in the context of overall Government of Alberta plans, with particular attention to loss of department infrastructure and support to staff.</p>	<p>Status</p> <p><i>Ongoing</i></p>	<p>Other comments</p> <p><i>Part of the Government of Alberta's responsibility.</i></p>
<p><i>Theme - Policy, Procedures and Legislation</i></p> <p>RECOMMENDATION 18: Wildfire Policies and Procedures</p> <p>Undertake a comprehensive review of Sustainable Resource Development's wildfire policies and associated procedures, especially with regard to priorities, structural firefighting, initial attack, and night-time firefighting, with consideration of staff training and understanding, to ensure consistent interpretation of policies and procedures.</p>	<p>Status</p> <p><i>Partially Met Expectations</i></p>	<p>Other comments</p> <p><i>Awaiting resolution of the comments noted for Recommendation 9 to complete this recommendation.</i></p>
<p><i>Theme – Policy, Procedures and Legislation</i></p> <p>RECOMMENDATION 19: Forest and Prairie Protection Act and Regulations</p> <p>Work with legal counsel to review and update the ministry's Forest and Prairie Protection Act and associated regulations, in context with other applicable legislation, with particular attention to key areas including, but not limited to agency roles and responsibilities (such as Forest and Prairie Protection Act Section 7), evacuation authorities, wildfire investigation, fire control authorizations, administrative penalties, as well as updating definitions.</p>	<p>Status</p> <p><i>Partially Met Expectations</i></p>	<p>Other comments</p> <p><i>Consultation and review process is underway.</i></p>
<p><i>Theme - Research and Development</i></p> <p>RECOMMENDATION 20: Research, Development and Monitoring</p> <p>Collaborate with research agencies to support research, development and monitoring in key areas highlighted by the Flat Top Complex including, but not limited to the following:</p>	<p>Status</p> <p><i>Met Expectations</i></p>	<p>Other comments</p> <p><i>Ongoing funding required to address current and future program needs.</i></p>

<ul style="list-style-type: none"> • Factors contributing to wildfire threat and structure losses, including wildland and other fuels, social elements, and the contribution of black spruce as a source of extreme wildfire behaviour and spotting; • Community planning and development, including codes and standards that impact building materials and fuels in the community; • Effectiveness and efficiency of FireSmart treatments and decision support tools for FireSmart investments; • Public awareness regarding the potential risk from wildfires and best practices to mitigate this risk, and factors affecting community and resident decisions to implement wildfire risk mitigation activities; • Enhanced fuel characterization to provide improved fire behaviour forecasting; and • Prediction of wind events, including approaches for worst case probability modeling, in collaboration with Environment Canada; apply lessons learned to forecasting. 		
<p><i>Theme - Research and Development</i></p> <p>RECOMMENDATION 21: Presuppression Preparedness System/Wildfire Occurrence Prediction</p> <p>Enhance the Presuppression Preparedness System to account for new information from 2011 related to initial and expanded attack requirements, with consideration of the potential use of wildfire occurrence prediction.</p>	<p>Status</p> <p><i>Met Expectations</i></p>	<p>Other comments</p> <p><i>Aligned with Canadian Wildfire Preparedness and Response Plan initiative as well as support and partnership with the Western Partnership for Wildland Fire Science.</i></p>

11. ALTERNATIVE REVENUE AND INSURANCE OPPORTUNITIES

11.1 ALTERNATIVE REVENUE

As part of the program review, we've been asked to consider whether or not there's a role for some form of alternative revenue and/or wildfire insurance arrangement in Agriculture and Forestry's wildfire management program.

In terms of alternative revenue opportunities, three possibilities were considered:

- Increasing holding and protection charges levied on the forest industry either through Forest Management Agreements or legislation applicable to timber quotas and permits;
- Charging energy companies holding Crown dispositions a protection charge over and above the current charges applicable to dispositions held under their names; and
- Charging all other companies and individuals holding Crown dispositions a protection charge over and above the current charges applicable to dispositions held under their names.

Interviews and feedback from stakeholders communicated clearly that this type of initiative would be met with resistance for a variety of reasons including the two listed below.

- The forest industry is the only sector that currently pays a holding and protection charge and they are also required to participate in forest protection through wildfire agreements with the government. Additionally, they regularly assist with forest protection by supporting wildfire training for staff and allowing staff to work for government in certain roles during wildfire emergencies.
- The primary objective of wildfire management is to ensure human safety and protect communities. The cost of this service is not one that should be borne through additional fees. Rather, it is a core service that government should pay for from general revenues. While a methodology and formula would not be difficult to develop in order to apply a fee or surcharge on dispositions, this would be premature.

Most of the larger commercial users of public resources pay royalties or stumpage for that right. This makes them somewhat unique from a policy perspective. Notwithstanding the valid concerns noted above – at some point government may need to look at the balance in the distribution of both the costs and benefits of wildfire and the wildfire management program. However, this cannot be an isolated discussion and should only occur in the context of the overall royalty or stumpage paid by the industry, and the value of any of the management or protection costs that they incur as part of their resource or land disposition.

11.2 WILDFIRE PROGRAM INSURANCE

In terms of wildfire insurance opportunities, information on past wildfire insurance arrangements was studied, current arrangements in other jurisdictions were considered and other insurance strategies were reviewed.

In the past wildfire insurance may have been viewed as a means of leveling out annual provincial expenditures. This practice is misleading as the intent of insurance is to provide protection against a financial loss – a hedge against a specific risk or uncertainty. With insurance, funds (premiums) are pooled from insured parties and used to pay for losses that are incurred by a few. The insured parties are protected from the risk of loss for a fee that in turn depends on the probability and magnitude of the collective loss.

Alberta's Experience

Alberta first entered into a wildfire reinsurance program in 2002. The purpose was to put a financial structure in place that would help manage spikes in wildfire presuppression and suppression costs. Under the policy the Department paid a premium of \$12.5 million for a policy where:

- Alberta paid the first \$175 million in costs (eligible base, prevention, detection, presuppression and suppression costs).
- The insurer covered the lesser of:
 - 90 percent of the next \$80 million in costs (\$72 million).
 - An amount calculated by multiplying the area burned by a dollar value per hectare that decreased as the total area increased.
- The insurance payment only occurred after all of the four triggers were reached – costs greater than \$175 million, more than 1,350 eligible wildfires, more than 150,000 hectares burned and 25 percent of the days with total HFI days at levels 4, 5, or 6.
- The insurer was not responsible for any payment beyond the above amounts.

By most measures 2002 was a severe fire season. All the triggers and conditions were met and approximately \$50 million in insurance payout was collected providing a net gain of \$38.5 million.

Alberta did not enter into another insurance agreement until 2006. In this program:

- The insurance dealt solely with suppression costs (as opposed to presuppression).
- Suppression costs were not as incurred. Rather they were a calculated amount – \$300/hectare times the number of hectares burned (defined in the closing summary as the Ultimate Net Loss).
- There was a \$100 million deductible on the Ultimate Net Loss – so 333,333 hectares (\$100 million deductible divided by \$300/hectare) would need to have burned before the insurance coverage was engaged.
- The maximum limit on the insurance was also \$100 million of Ultimate Net Loss (so if 666,666 hectares burned the payout would reach its maximum).
- The premium was \$15 million for the coverage of \$100 million of Ultimate Net Loss.

Alberta's decision was to not engage the full coverage. They chose to pay 13.3 percent of the premium (\$2 million) for 13.3 percent of the coverage—that is they insured 13.3 percent of the \$100 million ultimate Net Loss (13.3 cents on the dollar). The fire season was such that the Department did not collect on the 2006 policy. The policy was not renewed.

Oregon's Forest Land Protection Fund

In North America, the State of Oregon is the only other jurisdiction having experience with insurance policies that cover some part of wildfire program expenses. As with many US states, Oregon has significant private timber holdings. Exhibit 49 describes the current ownership of forest land¹⁸ in the State – of the non-federal forest land, approximately 85 percent is privately owned. This fact underlies the State's approach to funding wildfire programs.

Exhibit 49: Oregon Forest Land Ownership

Ownership	Area (ha)
Federal Forest Land	7,383,501
Private Forest Land	4,290,079
Large	2,401,004
Small	1,889,075
State Forest Land	407,519
Tribal Forest Land	187,370
County / Municipal Forest Land	63,131
Total	12,331,600

Agencies like the United States Forest Service and the Bureau of Land Management (BLM) look after and fund wildfire detection, prevention and suppression on federal land.

Private timberland owners also have a mandated responsibility to provide and/or pay for protection. They are organized into 12 forest protection districts that provide wildfire prevention, presuppression and suppression services. Costs are (in part) covered by a land owner assessment with certain costs matched by the State.

Timberland owners in Oregon also pay into the Oregon Forest Land Protection Fund (the Fund). These dollars are available to support wildfire program activities. Subject to certain deductibles, wildfire districts can draw on the Fund to cover their expenditures; however, before the Fund can be called on for reimbursement, the district must have spent:

¹⁸ Oregon Forest Resources Institute. <http://oregonforests.org/content/forest-landowners>

- A minimum of US\$25,000 beyond initial attack expenditures (one time, any given wildfire).
- 10¢ per acre (typically about US\$100,000) on the seasonal costs.

Where negligence played a role in starting the wildfire, the Fund manager is rigorous in regard to cost collection. Collections serve to reduce the draw on the Fund.

By design, the maximum draw on the Fund in a year is US\$15 million. Once costs exceed US\$15 million, emergency State funds are available to cover costs. The State is backed by a US\$25 million insurance policy that has been renewed annually since 1973¹⁹. In years past the deductible for the policy was in the range of US\$25 million – i.e. the insurance would cover up to US\$25 million in suppression costs once the Fund had paid out its US\$15 million and the State its US\$10 million.

The State has had a claim of US\$25 million or close to it in each of the last three years. As a result deductibles and premiums have been changing – at the time of our research it was around US\$3.51 million for up to US\$25 million in coverage of net Fund and State expenditures²⁰ in excess of US\$50 million (with the State filling in the gap).

As the fire seasons become more intense and suppression costs increase, the State is being challenged to find sources of funds for wildfire suppression – particularly given the strong principle of timberland owners paying for the service.

Other Jurisdictions

To the best of our knowledge Alberta and Oregon are unique in regard to their experience with wildfire insurance programs. A different approach has been taken elsewhere by timber owners and underwriters – they've insured against a loss in the value of the standing timber.

While there is more history with this type of insurance it is still not common. In the US less than three percent of private forests and no public forests are insured against wildfire or storm related loss in value²¹. In Canada it's anticipated that there is little or no standing timber insurance.

Regardless of the type of insurance, the existence of a market is dependent both on demand and supply. Demand in North America and particularly Canada is low (to say the least). In Canada, governments own more than 90 percent of the commercial forest land base and associated forest resource, and they have chosen to essentially self-insure covering losses through their own diversification (across regions and risks) and through political and public budgeting processes. With consolidation in the timber industry, many public timber rights holders are also diversified within and across provincial boundaries and internationally. The most exposed might be individual communities and small scale rights holders. A possible example of this exposure would be the 2001 Chisholm wildfire that consumed much of the timber in the Vanderwell Contractors (1971) Ltd. FMA. The FMA losses were devastating but even so the company carried on with other sources of timber that were untouched at the time.

¹⁹ Though coverage has been continuous, the size and terms of the policy have varied.

²⁰ Net of recoveries from negligent parties or from other emergency funding sources such as FEMA.

²¹ Zhang and Stenger New Zealand Journal of Forestry Science 2014, 44(Suppl 1):S9
<http://www.nzjforestryscience.com/content/44/S1/S9>

On the supply side, the lack of demand means that insurers are unable to reduce their risk across a diverse, large number of policy holders. In addition, forests are more complex to insure than many assets as they grow and change in value over time. The risks for wildfire or loss to other agents is a complex mix of prevention and suppression policies, and environmental conditions. Also, in comparison to agricultural crops, forests have a very long rotation and can cover large geographical areas. All of this makes it more difficult to assess risk and means that transaction costs and policy premiums may be higher. This in turn may deter forest resource holders from purchasing insurance.

As a result of the market and resource realities, the business case for insurance is weak.

That said, in countries like New Zealand, Australia, China and in much of Europe it's more likely that timberland owners would consider holding insurance against losses in the value of their standing timber. For example, coverage is under 10 percent in France and Japan, 35 percent or 40 percent in Norway and Finland, and 95 percent in Sweden. In some cases, the coverage is incited by government and / or organized through timber or landowners' associations.

This insurance market focuses on private timber holdings – either in commercial plantations, timber trusts or smaller woodlots:

- In addition to wildfire losses, coverage can include damages from wind, hail, flood or other environmental events.
- The insured value may be agreed at the time coverage is placed – this would include loss limits or caps to coverage.
- Losses may be also “net of salvage” as opposed to the full value or an agreed on partial value. Alternatively, insurance may simply cover the reforestation costs.
- Plantations may have to meet certain requirements for management and wildfire breaks (e.g. FireSmart).
- Premiums might range from less than 1 percent to more than 3 percent of the value insured – of course with the actual amount dependent on the associated risks; these values may not be at all representative of the risks in Alberta's boreal forests.

The Environmental Protection and Enhancement Fund

As in all Canadian jurisdictions, Alberta effectively self-insures against many types of loss including wildfire costs. While the Environmental Protection and Enhancement Fund helps administer the funds allocated for wildfire programs it is not an insurance policy, rather it is a means for allocating or directing certain revenues to cover the cost of emergencies, and to budget for and administer expenditures. In this regard, it appears reasonably effective.

The fund is not relevant to wildfire program operations or to the financial risk that the province faces from high program expenditures or the loss of assets. Its purpose is to enable payment of expenses from approved emergency response programs that are due to environmental emergencies – including among other events, forest fires. The Environmental Protection and Enhancement Act outlines the sources of funds – for example, the General Revenue Fund, recoveries and, with the approval of the Treasury Board, royalties, dues, penalties or other sums received by the government. Eligible expenditures are outlined in Department policies.

The 2015 fiscal year started with the fund at \$150 million. Emergency expenditures exceeded this amount and the province allocated supplemental funding adequate to cover any overage and replace the original \$150 million.

We mention it here because it may be incorrectly viewed as a means of pooling risk.

Options for Alberta

In this section we are addressing the potential for financial markets (insurers) to provide a hedge for a portion of the risk. We've discussed the options for wildfire insurance with others including the Agricultural Financial Services Corporation (AFSC) and representatives of Willis Re, Willis Re is one of the world's leading reinsurance advisors and is the lead in the Oregon wildfire insurance program. AFSC is a Crown corporation with expertise in insurance and was involved in the development of both the 2002 and 2006 policies.

In order to be insurable the risk must meet certain characteristics. In this circumstance we see seven:

- There must be an ability to pool risk (wildfires in Alberta, earthquakes in California, floods in Louisiana, etc.).
- The circumstances that trigger the loss must be clear.
- The trigger must not be in the control of the insured (here the Department).
- The premium must be affordable – if the probability is too high or the loss too great then the premium may be too high relative to the value of the protection.
- The loss must be calculable.
- The insured losses cannot be so large so as to bankrupt the insurer (the pool).
- While the policy may be renewed annually, there should be a strong intent to work on this over a longer term.

With this in mind, through discussions with Willis Re and AFSC, three different approaches to wildfire insurance were identified. The original intent was to have the insurers look at the insurance options and, if they made sense, provide an initial or draft term sheet for discussion purposes. In practice this level of discussion only occurred with Willis Re and then not through AFSC. Willis Re expressed general interest in other approaches to forming an insurance program but their work focused on a program similar in general structure to the 2002 and 2006 policies. They modeled a policy that featured:

- Multiple triggers for a payout (in this case, extreme wildfire size and high number of wildfires).
- A limit to the claim or recovery (for example, \$100 million) and a fixed amount of risk retained by the province (retention).
- Two options for quantifying the amount of recovery (based on the number of wildfires or hectares over the threshold and an average or negotiated cost per hectare or per wildfire).
- Estimated premiums that were 40% to 100% more than the average annual recovery.
- A multi-year agreement (two to three years).

This approach is reasonable and has some appeal to the insurance industry. It's discussed below in the context of the three general alternatives identified:

Insuring Against Expenditures– A premium paid in return for coverage of a portion of wildfire suppression expenditures beyond a deductible limit and up to a maximum.

While this appears to be a viable insurance structure, the Department has felt that the premium is too high for the structure. In our view, the triggers used in the past and those proposed for the future still need refinement. In extreme years, the expenditures are a function of the (i) wildfire hazard and presuppression policies that drive the build-up of airtankers, helicopters, heavy equipment and manpower, resource procurement, and (ii) risk of wildfire spread (fuels and HFI) and values-at-risk that drive the suppression priority and expenditures. To the extent that the triggers reflect the true source of the risk the insurance will be increasingly effective. In general, the wildfire environment is operationally complex and it will be challenging to find insurance parameters that make it fair in all circumstances. It's worth considering though the insurance program would seem to be more likely to meet its objectives if it is simply structured and transparent.

Insure Against the Loss of One or More Values-at-Risk – This is a different concept in that there would be insurance that offsets the potential risk of loss of an asset. In recognition of the potential for multiple, conflicting priorities in firefighting, this might cover losses to forests, infrastructure or other, lower priority values.

As noted, in the case of timber, this type of insurance is becoming more common. In this context, Alberta (or perhaps an Alberta tenure rights holder) might pay a premium to insure against the value of a loss in AAC, as opposed to standing timber, due to an escaped wildfire (the sustainable benefit available to the company / Province). There would be a deductible that would be covered by the insured. There would also need to be transparency in respect to the circumstances (provincial wildfire expenditures and standard operating procedures, and the conflicting priorities) giving rise to the escaped wildfire(s) and any damages that resulted.

We understand that insurers may be less interested in this option. It is complex and although there is some private timber insurance in existence, we believe that this is still a long way from becoming reality for timber on Canadian public land. Where the loss is structural or municipal (e.g. Slave Lake), conventional insurance already has a role and governments take on disaster relief.

Where communities are at risk, the public is best served if individuals, companies and communities all take action to reduce the risk of loss through (for example) FireSmart actions. Timber is no different and rights holders should be incented to “FireSmart” the FMA timber or other assets. Once risks are managed, the emergency funding may itself be more insurable by a third party.

Insure Against Adverse Weather / Climate Events – Severe weather and climate events drive wildfire costs even when there are no active wildfires. This affects Agriculture and Forestry's presuppression preparedness expenditures as well as suppression costs. In this option, a premium would be paid to cover the implications of an adverse weather or seasonal climate event (perhaps defined in terms of the number of consecutive days in an extreme wildfire weather and wildfire risk scenario). The trigger would be the weather event and the insured amount paid regardless of the level of expenditure (the extreme will trigger extensive preparation and expense in any case).

We understand that insurers may be interested in this approach. It is less complex and avoids the moral hazards that exist when trying to insure against program expenditures that are, to some degree, government controlled. There is also a good weather record and a recognized standard for reporting on adverse weather and fuel hazards.

11.3 RECOMMENDATIONS AND OPPORTUNITIES FOR IMPROVEMENT

Opportunity for Improvement

17. Continue investigating opportunities to apply an insurance approach to Agriculture and Forestry's wildfire management program.

Insurance proposals appear viable and worth greater consideration. It is also reasonable to continue looking at the other options in an effort to identify a model where the premiums reflect evidence of some degree of risk sharing that works for both the province and the insurer. Three or four insurance options could be developed for discussion and testing with reinsurers.

The decision whether to proceed or not then would be a function of the premium and government's assessment of the risk. It would be important to understand the basis for the contemplated payout and its value to current and future budgets.

Insurance has a role to play in the overall approach to risk management and, as noted, to the FireSmart actions taken by individuals, companies and municipalities. This is relevant to the wildfire management program and more broadly to emergencies stemming from other environmental events (flooding, drought, etc.).

12. WILDFIRE COSTS AND FINANCIAL MANAGEMENT OPPORTUNITIES

The costs for Agriculture and Forestry's wildfire management program are broken down into base budget spending and extended (emergency) spending. Base budget spending is intended to represent all the costs associated with preventing and preparing for fire season operations (i.e. the cost of the program prior to actually suppressing wildfires). Examples of base budget costs include:

- Wildfire training and Hinton Training Centre.
- Prevention (FireSmart, prescribed fire, etc.).
- Detection.
- Wildfire Base Operations.
- Airtanker Base Operations.
- Wildfire Base Airtanker Groups.
- Presuppression preparedness.

Extended costs include the expense associated with responding to wildfires in a given fire season. Most costs are those commonly associated with suppression:

- Unit crews.
- Firetack.
- RAP.
- HAC.
- Heavy fire equipment.
- Aerial detection.
- Extended Airtanker Base and Group costs.
- Aircraft cost over and above presuppression preparedness costs.

A summary of the costs of Agriculture and Forestry's wildfire management program over the past five years is given in Exhibit 50. Costs used for this review were derived from the department's FIRES database rather than public accounts to allow for more detailed review of costs by activity and program area. Costs derived from the FIRES database do not easily reconcile to figures presented in public accounts - this is outside the scope of the review.

Exhibit 50: Wildfire Management Program Costs

Alberta Wildfire Management Costs (\$ million)					
Year	2011	2012	2013	2014	2015
Total Costs	257	258	146	185	401

Active years, such as 2011, 2012 and 2015, have resulted in expenditures between \$250 and \$400 million. Comparing this to other jurisdictions, the costs are consistent with British Columbia and Ontario in severe years (when this report was prepared, the 2015 costs for other provinces were not available).

It is important to note that direct comparisons of wildfire suppression costs in different jurisdictions can be challenging or potentially misleading due to multiple differences between the jurisdictions. Key differences include:

- Geography.
- Natural disturbance regime (ecosystem type and climate).
- Wildfire management strategies, priorities and policies.
- Financial/budget allocation processes and cost definitions / classifications.
- Number and location of high value developments, communities, infrastructure and resources.
- Land ownership.
- Year to year variability in wildfire hazard and risk.

Notwithstanding these difficulties Exhibit 51 outlines the costs for the wildfire management program in four Canadian jurisdictions. These have not been normalized in any detail and as a result, only a very high level, general comparison of the relative scope of the programs is possible.

Exhibit 51: Comparative Costs for Wildfire Management in Several Comparable Canadian Jurisdictions

Province	Program	Actual Expenditures (\$ million)				
		2011	2012	2013	2014	2015
Alberta	Wildfire Management	257	258	146	185	401
British Columbia	Direct Fire	53	134	122	298	372
Ontario	Public Protection Program— Emergency Firefighting	209	179	92	78	95
Saskatchewan	Wildfire Management/ Fire Management and Forest Protection	68	59	58	50	131

In addition to this overall comparison of costs, the costs per wildfire can be compared among the four jurisdictions. Total program costs per wildfire (detection, presuppression preparedness, and suppression, excluding prevention) for Alberta over the years varied from \$158,000 to \$317,000, with 2015 at \$248,000 per wildfire. The range for B.C. was \$74,000 to \$214,000 per wildfire. Ontario's range was \$129,000 per wildfire to \$264,000 per wildfire.

Alberta experiences relatively high costs for providing wildfire management services. This is driven by two main factors—a higher number of wildfires experienced per year and high relative values at risk as Alberta's demographics and industrial development in the north precludes most limited action strategies.

While higher expenditures may be justified, it remains important to consider cost controls at all points in the program without jeopardizing the effectiveness of the program.

While there are opportunities for cost savings in any business or program, identifying and acting on these opportunities requires accurate cost data that can be matched with processes, outputs and outcomes. In the current financial administration structure supporting the wildfire management program, financial data is difficult to compile and analyze. While a review of financial administration processes and structures is outside the scope of this review, it should be recognized that this functional area has an impact on the program's ability to manage costs and gain efficiencies.

12.1 RECOMMENDATIONS AND OPPORTUNITIES FOR IMPROVEMENT

Recommendations

4. ***Establish an analyst role within the Forestry Division that can provide assistance in the area of cost analysis, cost control and efficiency. The individual or group must have capabilities in financial management and operational wildfire program delivery, and must remain at arm's length from the operations.***

Costs of delivering a wildfire management program in Alberta are high relative to wildfire management costs experienced in other jurisdictions and relative to other resource management programs delivered by the government of Alberta. While there is a need for a robust wildfire management program in Alberta that serves the entire forested area of the province, and this drives higher costs, there are likely opportunities to control costs and achieve efficiencies in a range of program areas. This opportunity becomes more important as climate change continues to be a factor and longer, more severe fire seasons put higher demands on the province's wildfire management program. It may be difficult for wildfire managers to prioritize cost optimization and efficiency gains when their mandate focuses on meeting higher expectations related to human safety, protecting communities and mitigating wildfire impacts. Opportunities for cost optimization and efficiency may be best pursued by a small group of individuals that understand finance and operations, and that are arm's length from the operations management and staff.

Opportunity for Improvement:

18. Look again at the organization structure in respect to the management responsibility for the wildfire management program's regional business services (such as finance and administration functions) and ensure that there are no impediments that complicate decision making and wildfire management program delivery.

Feedback from staff in both Agriculture and Forestry and Environment and Parks indicates that the provision of critical finance and administration functions by staff in other departments is an area of concern.

In general, functions that are core to an organization's success are best delivered in-house where production and performance can be managed, and where accountability can be assured. Even if the function isn't "front line", external service delivery only works where the delivery structure / contract results in seamless, unimpeded service. The importance of these principles is heightened

where the organization's function is of a critical or vital nature. Accountabilities and priorities must be clear.

Our bias is that the critical nature of wildfire management activities requires that all program functions, including finance and administration, reside under the direct control of wildfire operations at a regional or provincial level. This is consistent with the findings of the Flat Top Complex Wildfire Review Committee and of prior operational program reviews. Having said that, other delivery structures can work and much can be accomplished by committed workers. If the Department's decision is to keep the finance and administration function separate, then as a minimum the structure must not impede or complicate wildfire program delivery. Based on the feedback and our observations, it appears that this is not yet being achieved.

APPENDIX 1: CHANGES TO WILDLAND URBAN INTERFACE

Alberta experiences population growth in a number of communities that are adjacent to or within forested areas. In Alberta, population growth generally means growth in the number of homes and an expansion of the interface between wildland and homes. This level of growth drives the need for an increased level of wildfire prevention and community protection.

This significant growth of communities has substantially and dramatically altered the wildland urban interface (WUI) in recent years presenting additional demand for wildfire prevention initiatives such as FireSmart. While no formal studies have been carried out, the following exhibits demonstrates the expansion of the wildland urban interface in two representative communities.

Slave Lake, Alberta—Changing Wildland Urban Interface (WUI), 2000-2015

Exhibit 52 below illustrates the Town of Slave Lake and surrounding area as it existed in 2000 and its growth up until 2015.

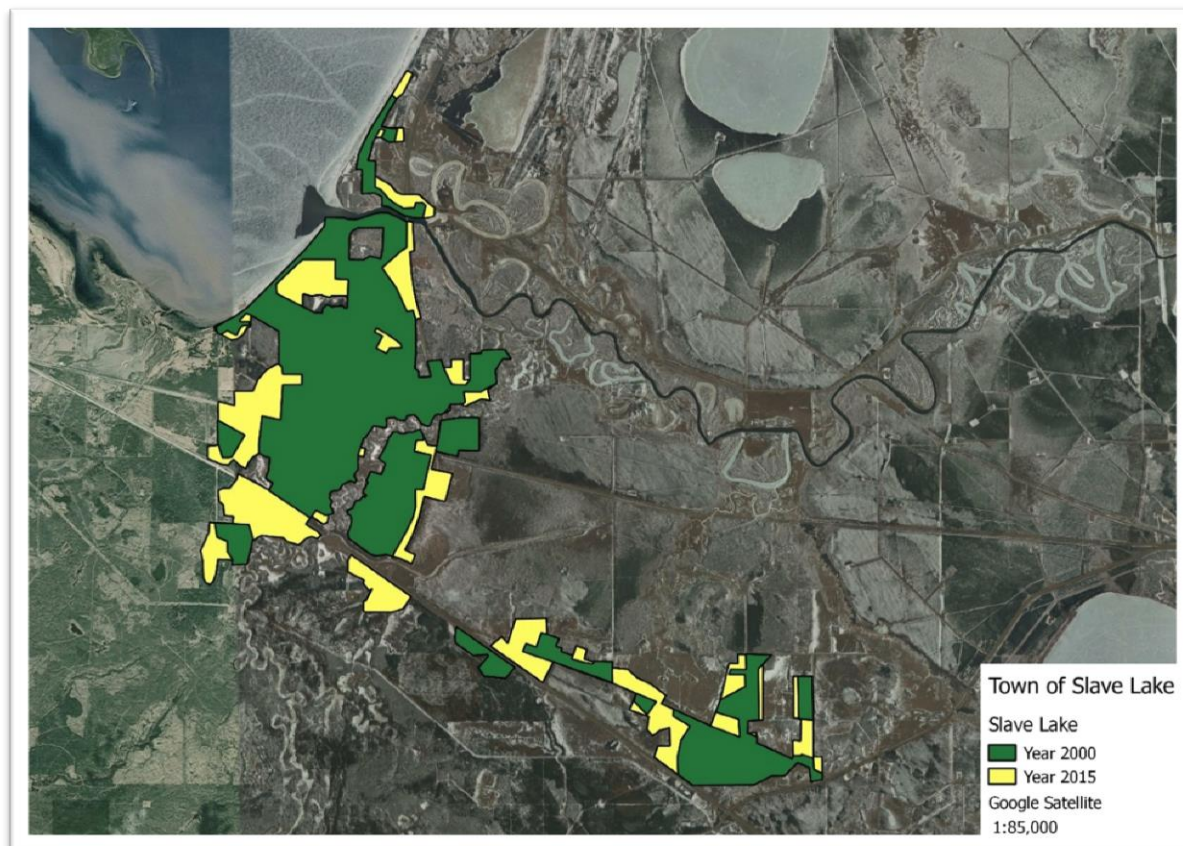


Exhibit 52: Area of the Town of Slave Lake in the Years 2000 and 2015

From 2000 until 2015 the Town of Slave Lake grew 362 hectares and its perimeter expanded by 8.4 kilometres (Exhibit 53).

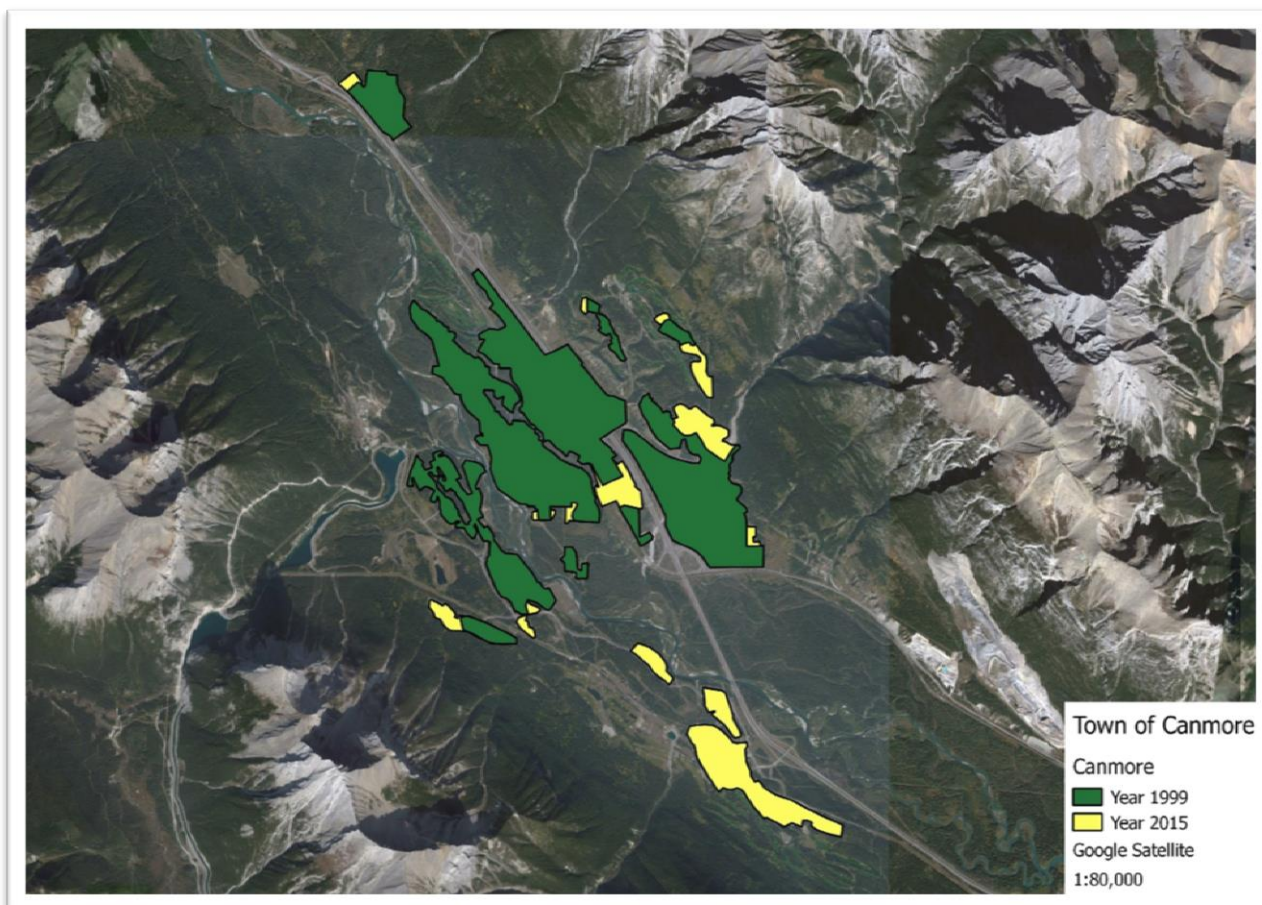
Exhibit 53: Slave Lake WUI, 200-2015

Slave Lake Wildland Urban Interface—15 Year Growth Statistics		
Year	Area (ha)	Perimeter (km)
2000	822.7	47.6
2015	1,185.1	56.0
Difference	362.4	8.4

Canmore, Alberta—Changing Wildland Urban Interface, 1999-2015

Exhibit 54 illustrates the Town Canmore and surrounding area as it existed in 1999 and its growth up until 2015.

Exhibit 54: Area of the Town of Canmore in the Years of 1999 and 2015



From 1999 until 2015 the Town of Canmore added completely new subdivisions expanding its area by only 165 hectares but increasing its perimeter by 14 kilometres. This perimeter increase elevates the risk from wildfire to lives and property in the WUI (Exhibit 55).

Exhibit 55: Canmore WUI, 1999-2015

Canmore Wildland Urban Interface—16 Year Growth Statistics		
Year	Area (ha)	Perimeter (km)
1999	626.9	46.6
2015	792.0	60.7
Difference	165.1	14.1

APPENDIX 2: INDIVIDUAL WILDFIRE CASE STUDIES

Introduction

Of the 1,786 wildfires in the Alberta 2015 fire season, 93% were contained by 10:00 am the following day. The remaining 119 wildfires were prioritized, actioned and eventually contained (based on priority ranking and resource availability). The Review Team examined both initial attack operations and follow-up sustained attack in the overall suppression program over the 2015 fire season. Initial attack includes all 1,786 wildfires and sustained attack includes the 119 escaped wildfires. Of the 119 escaped wildfires, 64 were Class E wildfires (>200 hectares) and the locations are illustrated in Figure 1 by month. Agriculture and Forestry sometimes groups the sustained attack wildfires into complexes. Each complex is managed by a highly trained Incident Management Team (IMT). This increases the efficiency and effectiveness of the resources.

Two wildfire complexes were selected for detailed case studies to assess the challenges on individual wildfires during a severe fire season and to document the opinions of IMTs.

Case study #1 assesses the operations of the Brintnell Complex in the Slave Lake Wildfire Management Area where timber values were threatened and a highway closure occurred. Case Study #2 assesses the operations of the Birch Complex in the High Level Wildfire Management Area where community evacuations occurred.

The data and information listed within these Case Studies was derived from interviewing a variety of sources directly involved with the wildfire complexes. These Case Study interviews were conducted with a baseline information outline request as follows:

- Generic topics of discussion included resource availability and utilization, communications, strategies and tactics, Area Command (High Level). Each of these generic topics were further stratified into specific items of discussion to ensure coverage of the wildfire incident was as complete as possible.

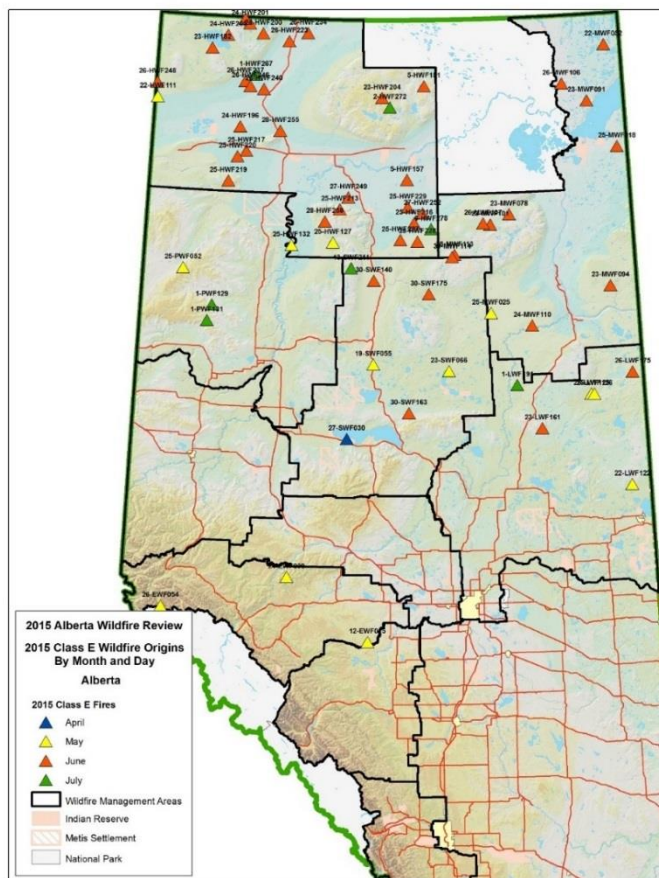


Figure 1: 2015 Class E Fire Locations in Alberta by Month

- What worked, what didn't work, what was different about the 2015 season compared to others, and what recommendations can be provided.

CASE STUDY # 1 BRINTNELL COMPLEX – SLAVE LAKE WMA

Slave Lake Wildfire Management Area Situation Overview

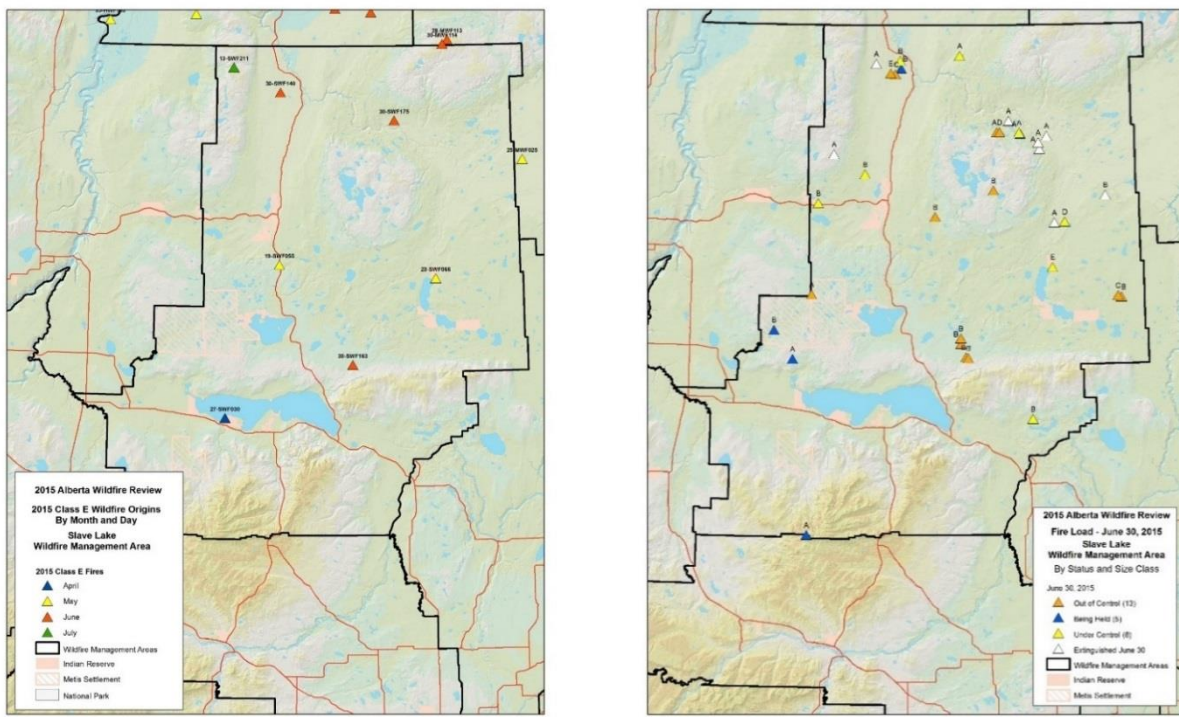
The Slave Lake Wildfire Management Area (WMA) historically has a very heavy wildfire load for the fire season (March to October). For the 2015 fire season they incurred a total of 262 wildfires, of which 220 occurred prior to July 15.

Between June 21 and June 29 the Slave Lake WMA incurred 32 wildfire starts. On June 30 alone (the date the Brintnell Complex and specifically wildfire #163 started) the Slave Lake WMA incurred 33 wildfires within a single day. At the end of June 30 the WMA had seven extinguished, five being held, eight under control, and 13 out of control; no small feat in terms of determined and successful action.

Specifically, for the Brintnell Complex of wildfires, the values at risk were limited to Marten Hills Forest Management Agreement (FMA) timber resource, the main highway leading between Slave Lake to Wabasca, Northern Lakes College facility south of Highway 754, log decks to the southwest, oil and gas facilities, and year round trapper cabins. Brintnell Complex was low priority and was actioned as a Type 2 complex until Provincial priorities changed on July 13 when it became a Type 1 incident. Twenty-six wildfires were actively burning on June 30, 2015 and twenty-four active wildfires were burning on July 1, 2015. Refer to Figure 2.

Figure 2: 2015 Class E Wildfires in Alberta by Month for the Slave Lake Wildfire Management Area (left) and Wildfire Load on June 30, 2015 (right)

Due to no immediate threat to life or community and the heavy wildfire load across the province, the Brintnell Complex was identified as provincial priority #3 or #4. Located northeast of the Town of Slave Lake, the Marten Hills topography has a substantially high ground elevation, interspersed with hilly terrain



with steep and numerous ravines amongst level bench areas, various stages of timber harvest and regeneration, with oil and gas exploration and development throughout. Other complexes of note in the WMA were the Loon Complex with one Class E wildfire and the #90 and #94 complexes.

Brintnell Complex Overview

Wildfires SWF-163, SWF-164, SWF-165 and SWF-166 ignited in the Slave Lake Wildfire Management Area and were reported on June 30, 2015 (Table 1). Wildfire #163 overran the other three wildfires which eventually formed the Brintnell Complex (Figure 3).

The values at risk on July 1 were identified as:

- Trappers cabins with year round residency.
- Northern Lakes College facility south of Highway 754.
- Highway 754 access to Wabasca.
- Log decks to the southwest.
- Marten Hills FMA.
- Oil & Gas facilities.

Table 1: Report Date and Initial Size Assessment of the Brintnell Complex Wildfires

Wildfire Number	Reporting Date	Start for Wildfire Date	Assessment Date	Size Assessed (ha)
SWF163	2015-06-30 18:48	2015-06-30 18:52	2015-06-30 19:56	10
SWF164	2015-06-30 19:21	2015-06-30 19:23	2015-06-30 20:15	3.5
SWF165	2015-06-30 18:48	2015-07-01 10:44	2015-06-30 20:15	0.3
SWF166	2015-06-30 18:48	2015-07-01 10:44	2015-06-30 20:22	1.2

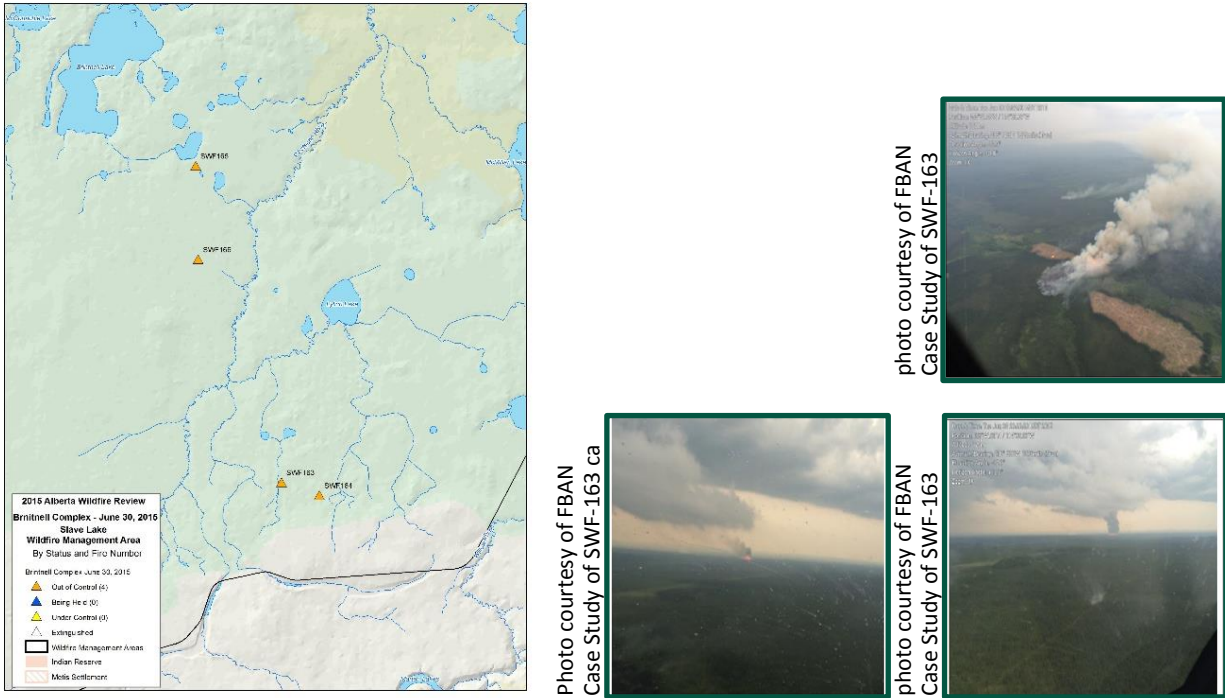


Figure 3: 2015 Brintnell Complex Wildfire Locations and Status June 30, 2015 (left) and July 1, 2015 (right)

A Wildfire Analysis and Strategy (WAS) report was prepared on July 1, 2015 as per standard operating procedure (submit when wildfire is NOT anticipated to be BH by 10:00 following initial action). The WAS report was later revised on July 5 for SWF-163.

Initial Observations on July 1

- Current weather 14°C, RH 95%, Wind 10 km/hr.
- Observed perimeter wildfire behaviour = no crowning, 10% candling, 50% surface, 40% smoldering and 20% obscured by smoke.
- Water availability limited.
- SWF-163 (40 hectares):
 - Currently burning in C2 and cutblocks S1.
 - Terrain is flat.
 - Fuels ahead of the wildfire are C2 and cutblocks and Highway 754.
- SWF-164 (3.5 hectares):
 - Currently burning in C2.
 - Terrain is flat and fuels surrounding the wildfire are C2.
- SWF-165 (0.3 hectares):
 - Currently burning in C2.
 - Terrain is flat and fuels surrounding the wildfire are C2.

- SWF-166 (1.2 hectares):
 - Currently burning in C2.
 - Terrain is flat and fuels surrounding the wildfire are C2.

Type 2 Incident Management

Type 2 Incident Management Team (IMT)

- Wildfire started on Tuesday (June 30, 2015) and was initially managed as a Level 3 incident while it stayed around 30 hectares until excursions ran out on July 2 and a Type 2 short team was put in place.
- The Type 2 short IMT was then put in place with a Type 1 mentor until July 13 when the complex was upgraded to a Type 1 incident integrating the Type 2 Team into the organization.
- Received initial resource orders but resources were limited for Crews, Dozer Bosses and Aerial Ignition Specialists.
- Lesser Slave Lake Regional Fire Service FireSmart Team initiated sprinkler protection on values at risk.

Objectives and Strategies on July 1, 2015

Table 2: Objectives and Strategies Identified in the Original WAS July 1, 2015

Objectives		
<ul style="list-style-type: none"> • SWF-163 – 40% containment of wildfire with dozer guard • SWF-164 – Determine access into wildfire. Develop helipads • SWF-165 – Being held end of the burning period • SWF-166 – Being held end of the burning period 		
Strategies		
Option 1	Option 2	Approved Option
<ul style="list-style-type: none"> • SWF-163 – Access the wildfire and construct dozer guard around the wildfire. Establish crews on wildfire to support dozer guard. Bucket ships to support dozer construction • SWF-164 – Construct helipads and establish anchor points for crews to work from • SWF-165 – Monitor • SWF-166 – Overrun by #163 	No Action	Option 1 was approved by the WMA, however was NOT approved by PFFC and indicated the following comments: <ul style="list-style-type: none"> • Provide map showing growth projections and values at risk. • Develop and submit strategy to contain Wildfire SWF-163 to minimize risk to gas plant and highway.

Observations on July 5, 2015

A revised WAS completed on July 5 for SWF-163 at 22:30:

- SWF-163 wildfire size of 1,880 hectares.
- Current weather 24°C, RH 39%, Wind 10 km/hr.
- Observed perimeter wildfire behaviour = no crowning, 10% candling, 30% surface, 60% smoldering and 60% obscured by smoke.

Observations recorded for SWF-163 on July 5, 2015 included the following:

- Wildfire burning in C2, M2 (20% coniferous) and cutblocks S1 (new and several years old).
- Terrain flat.
- Fuels at head (east) of wildfire are C2 in pockets, deciduous stands and deciduous cutblocks.
- The wildfire had burned up to highway in several spots and spotted across the highway for a 7.54-hectare excursion.
- Excursion has been fully guarded by dozers and the wildfire has 80% dozer guard completed.

Values at and within the vicinity of the wildfire included the following:

- Although no communities in the path, Highway 754 is the main access point from Wabasca to Slave Lake. The community member's access to medical area and shopping needs will be affected.
- The wildfire is currently burning in West Fraser and TOLKO industries cutblocks which will affect their timber supply.
- There is a gas plant to the west of the wildfire which is currently not affected by the wildfire, but if winds switch, this installation will be affected.
- Highway 754 has been closed due to the wildfire burning up to the highway in spots, also spotted over the highway in one area.



Figure 4: Wildfire within Britnell Complex

Objectives and Strategies on July 5, 2015

Table 3: Objectives and Strategies identified in the Revised WAS July 5, 2015 at 22:30

Objectives			
<ul style="list-style-type: none"> • The highway 754 is threatened and spotted across highway and caused a 7.54 hectare excursion. • Dozer guards have been put in place around excursion and 80% completed on the main wildfire. • 100% containment using crews, R/W and equipment in 5 days. 			
Strategies			
Option 1	Option 2	Option 3	Approved Option
100% containment with dozer guard, 100% extinguishment with crews, pumps, hose and Nodwells.	100% containment with dozer guard, 100 feet perimeter and let wildfires extinguish naturally.	No action taken.	Option 1 was approved due to proximity of Highway 754, industrial facilities, timber values and potential to burn towards Slave Lake.

Table 4: Wildfire Status Summary for the Brintnell Complex Wildfires

Wildfire Number	BH Date	UC Date	EX Date	Size BH	Size UC	Size E	Size Class
SWF163	2015-07-02 11:06	2015-08-03 18:13	2015 – 11 -16 16:20	33.2	9,895	-	E
SWF164	2015-07-02 11:30	2015-07-02 14:00	2015-07-02 15:03	3.5	3.5	3.5	B
SWF165	2015-07-01 11:31	2015-07-02 14:00	2015-07-03 16:00	2.5	2.5	2.5	B
SWF166	2015-07-01 11:10	2015-07-01 12:10	2015-07-01 17:20	1.7	1.7	1.7	B



July 9



July 10



July 10

Figure 5: Brintnell Complex Wildfires July 9 and 10 (photos courtesy FBAN Case Study)

Type 1 Incident Management Team Transitioning

A Type 1 Incident Management Team was deployed to the Brintnell Complex on July 13 for a total of 12 days on the Brintnell Complex. The “Letter of Direction” was issued from the Slave Lake Wildfire Management Area to the Type 1 Incident Management Team illustrating values and priorities for the incident.

- Good transition – met with the Wildfire Operations Officer in Slave Lake and got a lot of information.
- Wildfire was about 9,000 hectares at this time and had taken a few runs up to that point.

Wildfire #163 ranked priority three or four provincially at that time.

CASE STUDY # 2 BIRCH COMPLEX – HIGH LEVEL WMA

High Level Wildfire Management Area Situation Overview

The High Level Wildfire Management Area (WMA) historically has a very heavy wildfire load throughout the fire season (March to October). For the 2015 season, the Area incurred a total of 333 wildfires, of which 33 were Class E in size (> 200ha).

Between June 25 and July 6 the High Level WMA incurred 66 new wildfire starts; 25 of those new wildfires occurred in a single day (June 26). Within the same time frame of June 25 to July 6, there were 13 wildfire starts (9 E class in size) within the Birch Complex alone; 8 out of control, 3 being held, and 2 extinguished (Figure 6). The High Level WMA was under a tremendous wildfire load with sustained pressure throughout their area of responsibility.

The High Level Airtanker Base (ATB) program for 2015 went very well (1.2 million litres of retardant processed at the High Level ATB).

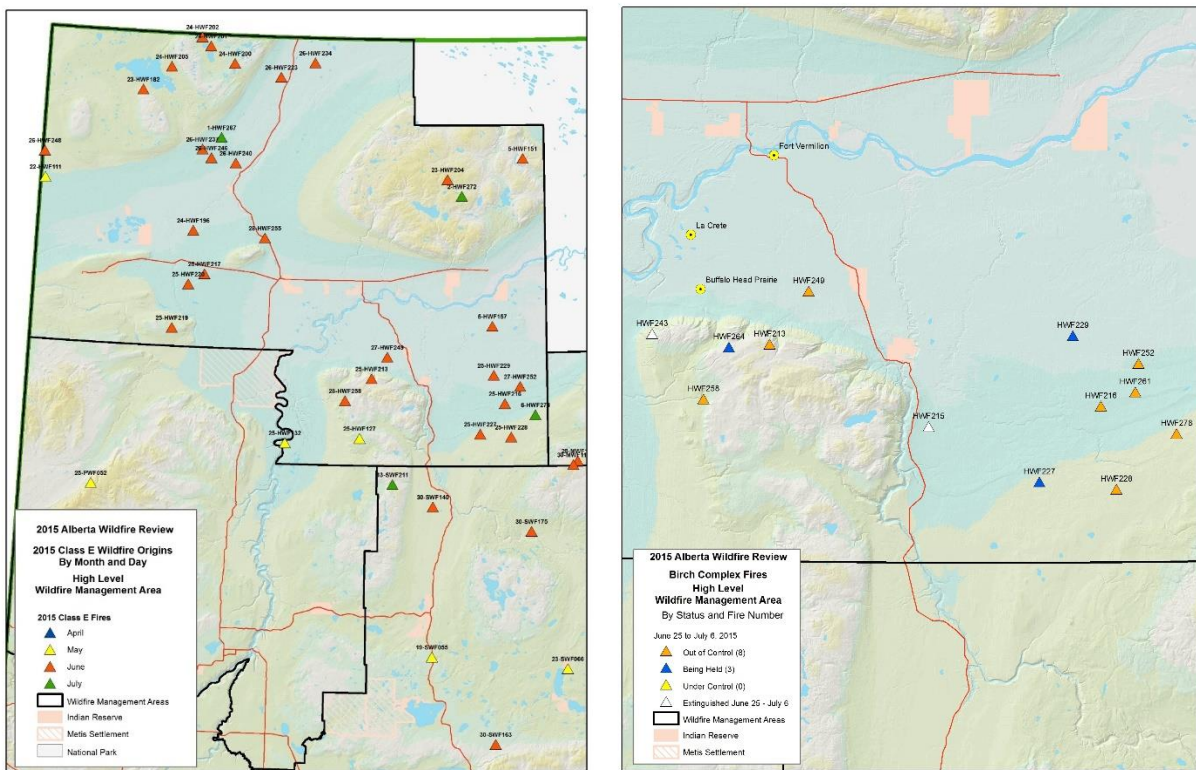


Figure 6: 2015 Class E Wildfires in the High Level Wildfire Management Area (left) and Birch Complex wildfires and Status June 25-July 6 (right)

Birch Complex Overview

Specifically, for the Birch Complex of wildfires, the values at risk were extremely high including human life, the communities of North and South Tallcree, a critical infrastructure route along Highway 88, critical infrastructure such as cell towers and powerlines, and various timber allocation areas scattered throughout. The Letter of Direction to the Type 2 Incident Management Team (IMT) was suppression on all wildfires occurring west of Highway 88 and those wildfires east of Highway 88 were evaluated daily, monitored, and managed.

The Birch Complex was first actioned on June 27 by a Type 2 IMT. Transition to a Type 1 IMT occurred on July 2 with the Type 1 IMT assuming command on the evening of July 3.

Table 5: Report Date and Initial Size Assessment for the Birch Complex Wildfires

Wildfire Number	Reported Date	Start For Wildfire Date	Assessment Date	Size Assessed (ha)
HWF213	2015-06-25 14:19	2015-06-25 14:43	2015-06-25 14:38	0.5
HWF215	2015-06-24 18:04	2015-06-25 15:05	2015-06-25 15:21	0.1
HWF216	2015-06-25 15:20	2015-06-25 15:40	2015-06-25 16:16	2
HWF227	2015-06-25 17:26	2015-06-26 12:17	2015-06-26 12:32	14
HWF228	2015-06-25 17:10	2015-06-26 11:06	2015-06-26 12:43	0.1
HWF229	2015-06-26 12:50	2015-06-26 13:05	2015-06-26 13:23	1
HWF243	2015-06-25 19:25	2015-06-26 18:10	2015-06-26 17:55	0.01
HWF249	2015-06-27 17:10	2015-06-27 17:10	2015-06-27 17:12	0.2
HWF252	2015-06-27 16:46	2015-06-27 17:00	2015-06-27 18:45	60
HWF258	2015-06-28 15:57	2015-06-28 16:10	2015-06-28 16:45	100
HWF261	2015-06-29 18:00	2015-06-29 18:00	2015-06-29 18:05	132
HWF264	2015-07-01 15:00	2015-07-02 15:31	2015-07-01 15:08	0.2
HWF278	2015-07-06 20:00	2015-07-06 20:00	2015-07-06 20:15	2056

Initial Observations

Initial priority of the Birch Complex was at a provincial ranking of 6 or 7 due to locations of the wildfires and other wildfires in the province with higher values at risk threatened. Initially the Type 2 Team was given wildfire #213 in the Buffalo Hills as priority #1 for the complex and wildfire #249 was given priority #2. Extremely dry ground conditions resulted in good access for heavy equipment. Dozer runs into willow stands were completely dry within two days. Ground water was virtually all gone and historic wet areas no longer existed. On wildfire #249 the bucket runs for rotary wing were up to 5 miles to access dip sites.



Figure 7: Wildfire #213 and #243



Figure 8: Incident Command Post June 30, 2015. Wildfire #249 on June 28, 2015 and aerial view of TallCree

Initial Objectives and Strategies

- Airtankers were not readily available for the Type 2 IMT until July 1.
- Limited water for skimmer aircraft, majority of drops were long term retardant.
- Rotary wing availability was adequate. Crews and heavy equipment were adequate to action priority wildfire #231.
- Wildfire #249 was 0.2 hectares upon initial assessment and was assessed again in the evening.
- It was approximately 1 hectare the next day burning in willow and green aspen.

- No threat and no action at the time.
- Wildfire #249 was assessed on June 28 at 1.0 hectares and deemed to be a potential quick win.
- Burning in willow, aspen, and D2 it was decided to action with a wildfire crew and medium rotary wing and bucket on June 28. Prior to any drops the rotary wing went unserviceable so another medium rotary wing was dispatched.
- This second rotary wing had a bucket malfunction prior to any drops being made.
- Concurrently the wildfire blew-up and began exhibiting behaviour as if the fuel type was C2.
- Wildfire #249 eventually grew in intensity and size which resulted in the evacuation of the community of Tallcree.
- Wildfire #249 took off midafternoon on June 28, no airtanker support was available and would have been ineffective regardless.

All wildfires had limited anchor points to work the wildfire perimeter. Lack of water, hazard indices, severe visibility limitations due to smoke, and lack of any substantial water source dictated indirect attack and heavy utilization of aerial torch (primary tool for the first few days).

Wildfire behaviour necessitated very stringent safety considerations for all fireline personnel. Recommended sprinklers for Tallcree July 1 and recommended evacuation July 2 by Type 2 IMT. Sprinkler protection was joint effort between Agriculture and Forestry and municipality staff. Structural protection was a success story with the Regional Fire Services specialized crew arriving from Slave Lake.

Table 6: Wildfire status summary for the Birch Complex Wildfires

Wildfire Number	BH Date	UC Date	EX Date	Size BH	Size UC	Size E	Size Class
HWF213	2015-07-14 8:00	2015-08-24 14:40	2015-11-24 15:44	12831.73	12822.5	-	E
HWF215	2015-06-25 20:05	2015-06-29 15:43	2015-06-29 15:44	0.1	0.1	0.1	A
HWF216	2015-07-08 9:00	2015-07-14 19:30	2015-07-25 17:00	482	482	457.6	E
HWF227	2015-06-26 17:15	2015-08-14 10:27	2015-11-24 13:06	57.8	2131.69	-	E
HWF228	2015-07-08 9:00	2015-07-14 19:30	2015-08-02 8:40	363.91	363.91	309.5	E
HWF229	2015-06-26 21:05	2015-08-25 16:00	2016-08-02 10:19	60	42737.35	-	E
HWF243	2015-06-26 21:50	2015-06-26 21:50	2015-06-29 13:20	0.1	0.1	0.1	A
HWF249	2015-07-08 18:40	2015-07-22 17:30	2015-11-24 14:05	4964.2	4964.2	-	E
HWF252	2015-07-07 19:58	2015-07-07 19:59	2015-07-07 20:00	645.28	625.28	625.28	E
HWF258	2015-07-13 8:00	2015-08-14 10:27	2015-11-24 14:01	15725.36	16028.9		E

Wildfire Number	BH Date	UC Date	EX Date	Size BH	Size UC	Size E	Size Class
HWF261	2015-07-07 19:58	2015-07-07 19:59	2015-07-07 20:00	132	132	132	D
HWF264	2015-07-01 22:04	2015-07-03 9:27	2015-07-03 9:28	4	19.5	16.21	C
HWF278	2015-07-25 10:00	2015-08-25 16:00	2015-11-24 12:49	2804.34	2524.6	-	E

Type 1 Team Transitioning

Part of the Type 1 Incident Management Team (IMT) was briefed on July 3 and integrated the Type 2 IMT into the organization. The rest of the IMT arrived over the next few days as many were on other assignments or had to time out. The Air Operations Branch Director (AOBD) never did arrive so filled in with Ontario personnel. Transfer of authority and team transition went smoothly.

Priority 1: Wildfire #249 VAR – Tallcree Community, Highway 88, cell towers and power lines

- Community of North Tallcree evacuated.
- Structural Protection being implemented.
- Area normally wet muskeg but now in drought conditions.
- Wildfire behaviour in grass and shrubs burning like C2.
- Agriculture pump used by Ontario crews for elaborate hose lay.

Priority 2: Wildfire #213 VAR – Buffalo Tower, timber resource and settlement area to the north

- #213 and #264 grew together on top of Buffalo Head Hills where Buffalo Tower was evacuated.
- Actioned wildfire prior to end of deployment to stop it from moving off the hills into the settlement area to the north.
- #258 to the south west burned within a few hundred metres of #213 and #264.

Priority 3: Wildfires #216, #227, #229, #252 and #261 VAR – Little Red Band Timber resource

- Wildfires east of Highway 88 were not threatening community or infrastructure therefore were classified as low priority based on limited resources, distance and ground conditions for heavy equipment, difficulty getting crews out daily because of smoke visibility and limited flying and limited opportunities for aerial ignition due to high BUI and drought codes.
- Wildfires were continually assessed and mapped.

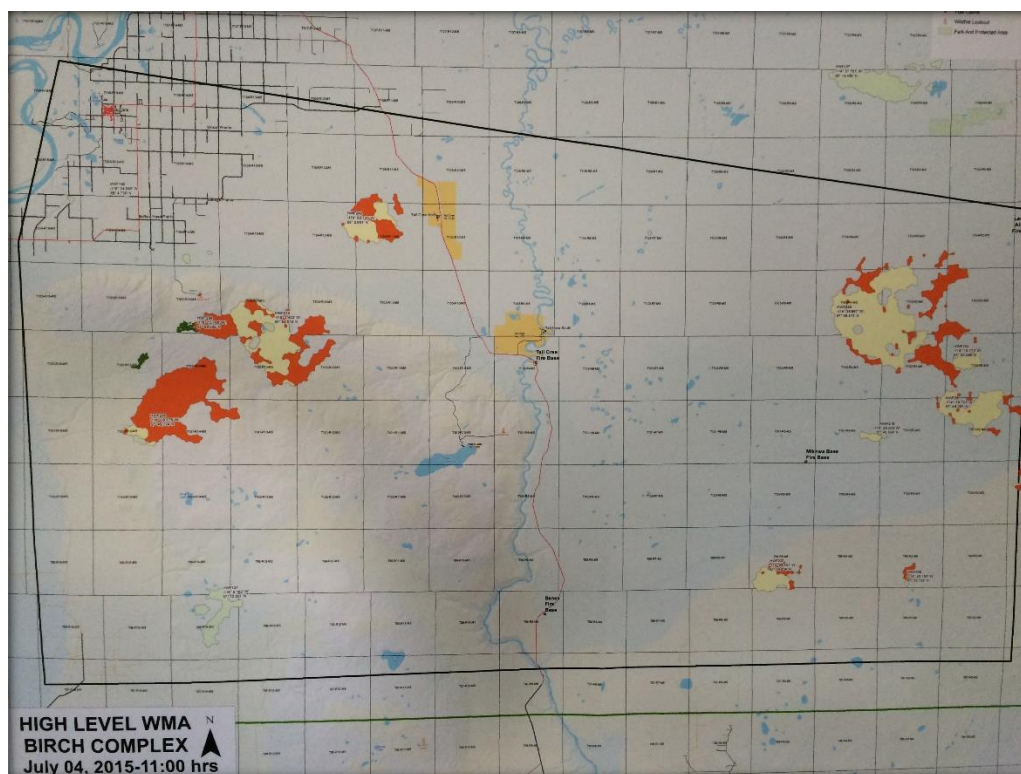


Figure 9: Birch Complex Map (July 4, 2015)

The Incident Command Post was set up at a gravel pit by South Tallcree (South Tallcree is on east side of the highway close to the river and North Tallcree is 10 kilometres to the north on the west side of Highway 88). The wildfire came to within 1.5 kilometres of the community and stopped at the river.

Strategies and Tactics

- Strategies and tactics were built on the priorities, weather and the resources available.
- Establish dozer guard supported by firefighting crews, helicopters with buckets and aerial ignition.
- Manpower and equipment was placed on #249, #213 and #264, while for the wildfires to the east three grew together and the others remained smaller.
- Area Command for High Level WMA was looking after 3 complexes (inclusive of Birch, Larne, and Chin Complex) and in place for just over two weeks in July.

Incident Management Team and Wildfire Manager Summaries

Over a period of time in January 2016, interviews were conducted with various Incident Management Team members from both the Birch and Brintnell Complexes as well as the Wildfire Managers from the associated Wildfire Management Areas. The interviewees were as follows:

- Wildfire Manager from High Level WMA.
- Incident Commander from Type 1 IMT on Birch Complex.
- Operations Chief from Type 2 IMT on Birch Complex.

- Wildfire Manager from Slave Lake WMA.
- Incident Commander from the Type 1 IMT on Brintnell Complex.
- Incident Commander from the Type 2 IMT on Brintnell Complex.
- Mentor on Type 2 IMT on Brintnell Complex.

Besides the issues that were captured from the interviews, there were mainly positive comments worth noting:

- The Wildfire Managers were very satisfied with the overall outcomes and objectives achieved by the Incident Management Teams and firefighters.
- There was an understanding that provincial resources were limited but still the effort and outcomes of the suppression efforts were excellent. In many cases it was deemed to be a compliment that Area staff were able to manage wildfire with what they had. One specific WMA measure of note relating to a successful operation was the minimal number of hectares consumed by wildfire, relative to the total number of wildfires.
- Overall very little complaints were received about wildfire operations by both field and office staff.
- Internal prioritization for the WMA went well while still working within any constraints as a result of provincial priority setting and allocation of resources due to heavy wildfire load.
- Incident Commanders were satisfied with objectives stated and achieved in Letter of Direction, as well as results accomplished based upon resources allocated and wildfire intensity/severity.
- Use of foam on the fireline was achieved but not without constant reinforcement and reiteration; some frustration with having to constantly message its use and effectiveness.
- Given severe conditions and limited resources, overall the staff were pleased with efforts and results relating to specialty problems addressed during suppression operations. For example, the positive outcomes relating to evacuations, structure protection, highway closure, minimal impacts on timber allocations, communication and liaison with external stakeholders, and import and utilization of imported national /international crews and overhead.
- Overall safety considerations and application was kept to a very high level of priority with associated success and positive outcomes. Only one serious incident occurred which involved a downed rotary wing aircraft due to transmission/drive shaft failure, pilot only on board. Response to the incident was timely and effective.
- Feedback and results achieved [strategy, tactics, evacuation, etc.] by Type 2 Incident Management Teams deployed was very positive and impressive especially in light of limited resources, wildfire intensity, and values at risk encountered.

The structure and topics of discussion were constant for all interviews, as outlined below. Within the context of this report, for every comment or issue encountered, an associated action item is proposed by the Review Team to assist in resolution.

Resource Availability and Utilization Issues

Potential Actions

<p>Limited resource availability inclusive of Safety Officers, Dozer Bosses, Aerial Ignition Specialists, Fire Behaviour Analysts, Type 1 & 2 Planning Section Chiefs, Unit Crews, Wildland Structural Protection Crew (i.e. Slave Lake model), Dispatchers (not radio operators) and Finance Administration</p>	<ul style="list-style-type: none"> • Increase capacity through certification and experience of these critical positions. Consider accessing qualified industry safety specialists for fireline safety officer positions. • Increase unit crew capacity by adding two additional unit crews as identified in the Flat Top Report
<p>Shortage of airtanker group (loss of 2015 contract) and lack of high level scanning capability</p>	<ul style="list-style-type: none"> • Establish airtanker and high level scanning contract • Establish a process to set the priority and approval of high level scanning of wildfires
<p>Lack of complete briefing information for international firefighting crews</p>	<ul style="list-style-type: none"> • Provide briefing packages prior to activation (level of training, history, strengths and expectations)
<p>Lack of certified staff for HELCO positions</p>	<ul style="list-style-type: none"> • Increase certified staff or utilize or have an adaptive certification process
<p>Non GOA agencies inability to achieve IA certification</p>	<ul style="list-style-type: none"> • Allow non GOA agencies access to HTC training
<p>Need to have a sustainable FIN Admin structure and support process for fires. For example contracts and charter rates were not settled until May.</p>	<ul style="list-style-type: none"> • Restructure to have direct report FIN Admin staffing for the branch
<p>IA resource availability to assist sustained action fires and extra rotary wing assistance for IA was very limited</p>	<ul style="list-style-type: none"> • Initial attack priority and support were dictated by provincial fire load and limited provincial resource availability

Communication Issues

Potential Actions

Lack of cell coverage in isolated areas	<ul style="list-style-type: none"> • Prepare a plan and acquire the infrastructure for temporary wildfire operations
Wildfire Branch representation on EOC	<ul style="list-style-type: none"> • Ensure that WMB staff are represented on EOCs as per SOP
Area Information Officers are limited by inability to input to social media (Facebook and Twitter)	<ul style="list-style-type: none"> • Require local IO ability to enter and format real time fire information • Increase IO training to deal with media
Not all external stakeholders are aware or unclear of WMB policies, SOPs and operation standards	<ul style="list-style-type: none"> • WMB needs to be more proactive in engaging and educating external stakeholders through formal, informal and direct face to face contact

Incident Management Team/Priority Issues

Potential Actions

(For example, mentoring, Type 2, Fire Behavior Analyst (FBAN))

Type 2 IMT are not being utilized to their full potential and abilities	<ul style="list-style-type: none"> • Increase support, mentoring, application, and sustained use of Type 2 IMT. This creates an opportunity to extend Type 2 IMT without going to the Type 1 IMT.
Lack of clarity with roles and responsibilities of Area Command and the interaction with IMT and the WMA.	<ul style="list-style-type: none"> • Define the roles, responsibilities and structure of the Area Command. Currently a task group is working toward a solution.
Roles and responsibilities of Wildland Structural Protection Team	<ul style="list-style-type: none"> • Redefine and clarify roles and responsibilities in the IMT organizational structure
There are not enough resources, capability and budget to suppress all wildfires with the anticipated increase in fire severity, intensity and fire load	<ul style="list-style-type: none"> • An approved risk management approach must be implemented to ensure priority setting of wildfires, linkage to sub-regional plans, and effective WAS production is achieved in minimizing the negative impact of wildfire.

Tactics Issues

Potential Actions

<p>In some instances airtanker status is not being met to ensure early and late coverage for IA and supporting wildfires</p>	<ul style="list-style-type: none"> • Evaluate and implement a review of airtanker status for early and late coverage
<p>Lack of data to support priorities and values at risk</p>	<ul style="list-style-type: none"> • Require forest industry critical age class information to update the fuel grid.
<p>Drought conditions are creating low water tables resulting in reduced water sources for suppression and limiting fireline anchor points. As well the fire behaviour within the fuel types are behaving in a non-traditional and volatile manner not seen in recent decades.</p>	<ul style="list-style-type: none"> • Training for extreme drought conditions must be implemented, pre-identification of water sources is critical, and fuel types must be re-evaluated to predict anticipated new fire behaviour. • Listing and availability of high pressure agriculture pumps should be formally documented for WMA use. • Reinforce application of foam use and training.
<p>Due to extreme fire behaviour there were missed opportunities to capitalize in securing indirect dozer guard by utilizing ground ignition.</p>	<ul style="list-style-type: none"> • Increase the utilization of hand ignition whenever possible and safe to do so
<p>Limited resources and heavy fire load necessitated fires being prioritized by values at risk.</p>	<ul style="list-style-type: none"> • In lieu of direct suppression, efforts were then concentrated on assessment and mapping for determining impacts on the landscape.

Safety Issues

Potential Actions

<p>Heavy and widely dispersed smoke created visibility problems for aircraft. Also created delays in getting crews to the fireline.</p>	<ul style="list-style-type: none"> • Utilize control towers at municipal airports for safe and controlled flight following. At the incident, ensure proper aircraft management systems are in place including flight following by radio operators and incident management plan procedures.
---	---

APPENDIX 3: FLAT TOP REVIEW

Agriculture and Forestry

Forestry Division, Wildfire Management Branch

Flat Top Complex Wildfire Review Committee Recommendations

Summary of the Department's Actions and Responses to the Recommendations as of February 2016

Agriculture and Forestry is implementing numerous initiatives in response to the recommendations the Flat Top Complex Wildfire Review Committee provided in 2012. Some of the recommendations required a one-time response; most of the recommendations require ongoing commitments and reflect continuous improvement. Implementation of the recommendations is allowing Alberta to protect human lives, communities, natural resources and other values from the increasing risk and severity of wildfires.

Legend

Status of Initiative	Description
Ongoing Response	Department is continuing to work to respond to the recommendation.
Ongoing Implementation	Department has responded to the recommendation. Initiative has become part of Department's regular business, or outcome of the initiative is being implemented.
Completed	Department has completed its response to the recommendation.

<p>Theme - Wildfire Prevention</p> <p>RECOMMENDATION 1: Enhancements to Wildfire Prevention</p> <p>Implement significant enhancements to wildfire prevention measures, including widespread fire bans, forest area closures, fire permit management, and elevated fines during extreme weather and/or wildfire behaviour conditions. Special consideration should be given to prevention activities early in the fire season. In addition, Sustainable Resource Development should enhance communications of these initiatives to stakeholders and the public to gain their support and acceptance.</p>		<p>Status</p>
	<p>Response Initiative</p>	
<p>1.1</p>	<p>Reviewing the <i>Forest and Prairie Protection Act</i> and associated regulations (considering increased fines for contravention and further elevated fines for contravention during fire control orders). The Department is seeking approval to initiate a stakeholder survey in 2016 regarding proposed amendments to the <i>Forest and Prairie Protection Act</i> and Regulations, Parts I and II.</p> <p><u><i>Forest and Prairie Protection Act</i></u></p> <p>Operational and administrative amendments are proposed within the Act, including:</p> <ul style="list-style-type: none"> Starting the wildfire season one month early to improve wildfire suppression readiness, and to ensure Albertans take extra care to prevent wildfires at that time. Administrative wording amendments or clarifications regarding fire guardians, forest closures, and forest pests to be aligned with current operational practices. <p><u>Forest and Prairie Protection Regulation, Part I</u></p> <ul style="list-style-type: none"> The proposed amendments are focussed on updating fines, specifically, increasing fines for burning an outdoor fire without due care and attention up to a maximum of \$1 million for corporations. These amendments are necessary to improve public safety and protect Crown lands from human caused wildfires. Proposed amendments to fines will update the regulations to correspond with existing fines for similar legislation, such as the <i>Environmental Protection and Enhancement Act</i>, <i>Water Act</i>, <i>Fisheries Act</i>, and <i>Public Lands Act</i>. Updating these fines would bring Alberta into alignment with the fines in other provinces, such as British Columbia and Saskatchewan. <p><u>Forest and Prairie Protection Regulation, Part II and other associated regulations</u></p> <ul style="list-style-type: none"> The proposed amendments address updating measures for debris disposal to reduce wildfire hazard and align with current operational practices. The other change under consideration is removing the Forest Protection Payment Regulation from regulation status to expedite the process when there are changes required for minimum wage or inflation adjustments. 	<p>Ongoing Response</p>
<p>1.2</p>	<p>Since 2012, starting the fire season one month early (March 1) to pre-position firefighters/ aircraft/equipment in the Forest Protection Area.</p> <p>Key drivers and benefits of starting the fire season one month earlier include the following:</p> <ul style="list-style-type: none"> Facilitates the earlier recruitment, retention, training and mobilization of firefighting resources. 	<p>Ongoing Implementation</p>

	<ul style="list-style-type: none"> • Facilitates the availability of required contractors for key services such as aircraft, fire retardant, manpower and other firefighting services. • Improves wildfire prevention by requiring stakeholders to obtain a fire permit one month earlier in order for the Department to proactively and cooperatively address winter burning projects before the spring wildfire hazard begins. • Trends show that wildfires are starting earlier; with wind events and warming trends, snow loads can disappear quickly and wildfires can occur in March. Consequently, preparation needs to begin earlier in the season. 	
1.3	<p>Continuing to support the Western Partnership for Wildland Fire Science</p> <p>Wildfire Management Branch is supporting the following research studies at the Western Partnership for Wildland Fire Science:</p> <p>Enhanced prediction of wind events This research study is investigating the enhanced capacity and capability to forecast critical wind events and regional variations in wind speed and direction. Simulations were run using the Weather Research and Forecasting (WRF) model to investigate the efficacy of numerical weather prediction for fire weather forecasting in North Alberta. The accuracy of 10m wind speed 72 hour forecasts for May 12-15 2011 corresponding to the time period of the 2011 Slave Lake area wildfires when larger than normal wind speeds were recorded, was assessed. The optimal WRF configuration for wind speed forecasting was also determined. The forecasts were validated against Environment Canada stations within the domain. Work is on-going to include higher resolution forecasts and adjustments to the roughness factor used in the wind speed calculation to address a significant positive bias for low wind speeds and a negative bias for high wind speeds.</p> <p>Enhanced prediction of precipitation and fuel moisture between weather stations This research project aims to increase the accuracy for predicting the spatial distribution of precipitation. Fuel moisture is a critical component of wildfire occurrence prediction and determining initial and expanded attack requirements. One of the largest challenges with fire weather mapping is determining the weather conditions between weather stations and in particular the location and amount of precipitation. Different approaches are being evaluated to determine the best technique to estimate regional precipitation, fuel moisture and fire danger.</p> <p>Development of thresholds and triggers to provide enhanced support for wildfire preparedness This research is investigating various metrics that can be used to enhance wildfire preparedness. The approach used is similar to that applied in syndromic biosurveillance systems (situational awareness and early event detection). Real-time (or near real-time) FIRES data will be analyzed and interpreted using various indicator algorithms and graphical techniques to detect trends and possible wildfire outbreaks that may not be apparent to individual wildfire management staff (i.e. DOs).</p> <p>Alberta fire risk analysis using the HIGRAD/FIRETEC model HIGRAD/FIRETEC is a coupled atmosphere wildfire model designed to represent the two-way interaction between a wildfire and its surrounding atmosphere over a wide range of scales, from metres to kilometres. This model was developed to study and understand fire behaviour at the stand level. The HIGRAD/FIRETEC model will be used to simulate crown and surface fire spread with varying fuel treatment types and intensity. This research project supports existing community protection programs, and builds</p>	<p>Ongoing Implementation</p>

	<p>stronger scientific basis fuel treatments. This project also provides an opportunity to assess the optimal balance between cost and effectiveness for different scenarios.</p> <p>Determining the spring wildfire window in Alberta using satellite-derived vegetation indices</p> <p>This project is investigating the relationship between MODIS-derived vegetation indices and the duration of the spring burning window. The results will inform the existing development of a predictive model incorporating spatial and temporal data to forecast the close of the window. This project compliments the “Forest Vegetation green-up and fire occurrence prediction in support of wildland fire management in Alberta”, project led by Dr. Mike Flannigan at the University of Alberta.</p> <p>Wildfire occurrence prediction</p> <p>There is a need to apply new statistical based models to provide scalar spatial and temporal estimates of fire arrivals. The research project will develop and validate spatially-explicit indexes of human and lightning caused fire occurrence that may be operationally applicable in Alberta. It will form the foundation of spatially explicit daily fire occurrence prediction capability in Alberta on a relatively fine-spatio-temporal scale.</p>	
1.4	<p>Hired additional seasonal and permanent Wildfire Information Officers.</p> <ul style="list-style-type: none"> • In 2011, there were a total of seven permanent Information Officer positions and two seasonal information officer positions. • In 2015 there were 12 permanent Information Officer positions and four seasonal information officer positions. 	Ongoing Implementation
1.5	<p>Including additional information in Information Officer updates to stakeholders to clearly explain the wildfire hazard and current status and trigger the desired response.</p>	Ongoing Implementation
1.6	<p>Implementing community-based social marketing (CBSM) for communities.</p> <p>Wildfire Prevention CBSM Overview</p> <p>In 2007, the wildfire prevention business planning group identified CBSM as a new strategic priority for all wildfire prevention communications. A CBSM strategy was then drafted in response to this direction set by the group. The CBSM strategy document identified the low effectiveness of information based campaigns aimed at promoting meaningful or long-term behavioural change. CBSM was offered as an alternative to the traditional distribution of printed materials and media advertising; focusing instead on identifying barriers to behavioural change and then developing pragmatic strategies to overcome these barriers.</p> <p>CBSM is based on the use of five behaviour change tactics:</p> <ul style="list-style-type: none"> • Commitment (small commitments lead to larger commitments) • Prompts (reminder of dates, required actions, etc.) • Social norms (group mentality is a strong driver of behavioural change) • Communication (branding, getting peoples’ attention) • Incentives (motivators such as award programs) <p>These behaviour change tactics are currently heavily relied upon by the FireSmart Unit and Info Unit when delivering and promoting FireSmart programs at a homeowner and</p>	Ongoing Implementation

community level.

Demonstration of Commitment to a CBSM Approach

Through FireSmart Canada and Agriculture and Forestry's FireSmart Program there are a number of awards, workshops and events that communities in Alberta are encouraged to take advantage of. With help from Agriculture and Forestry staff and programs, communities across the province have been able to obtain FireSmart Canada accolades such as the FireSmart Community Recognition Award and the FireSmart Community Protection Achievement Award. Many communities have also been able to host events such as the FireSmart Community Series, Local FireSmart Representative Workshops and FireSmart Community Champion Workshops. This is on top of many annual local area FireSmart events, and community participation in National Wildfire Community Preparedness Day.

FireSmart Canada Community Recognition Program

The Community Recognition Program is driven by homeowner participation in local FireSmart initiatives and requires members of the community to take responsibility for reducing their risk. This program utilizes the commitment, social norms and incentive CBSM tactics to drive behavioural change.

To date, awards have been granted to Lake Edith (2014), Summer Village of Waiparous (2015), Marten Beach (2015), and Midway Estates (2015). The Lower Kananaskis Lake Cottage Association will be recognized in 2016.

FireSmart Canada Community Protection Achievement Award

The FireSmart Community Protection Achievement Award is available to communities who have completed FireSmart projects which are unique, innovative and of a high standard. Communities may be nominated for specific projects or their overall community FireSmart programs.

To receive this award, communities must have engaged stakeholders and homeowners in FireSmart planning, addressed community FireSmart education efforts and have promoted FireSmart events such as work bees, open houses at fire halls and debris clean up days. This requires addressing all five CBSM behaviour change tactics.

Awards have been granted to Kananaskis Improvement District (2014), Strathcona County (2015), Town of Edson (2015) and the Town of Whitecourt (2015). Upcoming awards are being granted to the MD of Lesser Slave River (2016), Sawridge First Nation (2016), Town of Slave Lake (2016), Regional Municipality of Wood Buffalo (2016), County of Grande Prairie (2016) and Gift Lake Metis Settlement (2016).

Local FireSmart Representative (LFR) Workshops

The LFR Workshop is designed to assist community leaders and fire professionals with implementing the Community Recognition Program in their area. The workshop aims to educate attendees on the WUI, how homes are at risk from wildfires and how to reduce that risk. As well, participants learn how to better engage and educate other community members about the benefits of FireSmart through the recruitment and training of FireSmart Community Champions.

LFR workshops utilize the CBSM behaviour tactics of commitment (education about home assessments, improving structure survivability), social norms (building the foundation for a group of people in a community to push FireSmart) and through incentive (pave the road for community recognition). Workshops have been hosted in

	Slave Lake (2013), Strathcona County (2014), Canmore (2014), Lac La Biche (2015) and Grande Prairie (2015). Planned upcoming workshops include Airdrie (2016), Slave Lake (2016) and Edmonton (2016).	
1.7	<p>Continuing to enhance the use of social media platforms.</p> <p>2015 marked a record-breaking year for social media.</p> <ul style="list-style-type: none"> In 2015, two posts reached more than one million users on Facebook. Many other posts reached between 200,000 and 800,000 people. In 2013, Alberta Wildfire had approximately 30,000 followers. In 2015, the page has just over 69,000 followers. In 2013, Alberta Wildfire had approximately 3,000 twitter followers. In 2015, the page has more than 6,200 followers. Engagement in peak periods of the 2015 fire season required an additional Information Officer to be on call to respond around the clock on top of the dedicated provincial Information Officer. A new blog series called 'Alberta Wildland Firefighter Adventures' highlighted the 2015 season of three firefighters in their own words. The weekly blogs reached an average of 1,000 readers which is much higher than most government blogs. Instagram kicked off late in 2015 and is helping bridge the gap in the 16-24 year age group. Instagram is photo driven and so far Alberta Wildfire helped put a face to the organization through the #FacesofFirefighting campaign. 	Ongoing Implementation
1.8	Reviewed fire permit issuance guidelines. New guidelines were drafted in 2015 which provide clarification of permit length and other considerations for specific periods during the fire season.	Ongoing Implementation
1.9	<p>Renewed Indigenous and Northern Affairs Canada wildfire management agreement on First Nations lands within the Forest Protection Area. New agreement provides enhanced funding for wildfire prevention initiatives annually (\$1M for FireSmart, including prescribed fire and other fuel management treatments).</p> <ul style="list-style-type: none"> Canada and Alberta agreed to a one-year agreement for April 1, 2015 to March 31, 2016. A ten year agreement is being negotiated. 	Ongoing Implementation
1.10	Included significant public communications component in the Slave Lake FireSmart initiative and other wildfire management initiatives across the province.	Ongoing Implementation
1.11	Refined processes for implementing fire restrictions and bans to facilitate their implementation in a timely manner (fire ban matrix).	Ongoing Implementation
1.12	Enhanced fire control order decision support tools (i.e. fire ban matrix) to include a wider range of issues.	Completed

	<ul style="list-style-type: none"> • fire advisory • fire restriction • fire bans • forest area closures 	
1.13	Rolled out wildfire app for Apple mobile devices in 2013 and android devices in 2014.	Completed
1.14	<p>Developed FireSmart guidebooks</p> <ul style="list-style-type: none"> • FireSmart Guidebook for Community Protection (February 2013) • Emergency Preparedness Guide for Hazards Associated with Wildfires (New CAPP product) – the Department worked with CAPP to develop (March 2015). • FireSmart HomeOwners Manual (March 2015). 	Completed
1.15	Held the Wildland Fire Canada Conference in 2012 to support the transfer of technical information, knowledge and best practices for wildfire management.	Completed
<p>Theme - Wildfire Prevention</p> <p>RECOMMENDATION 2: Human caused Wildfires/Limited Liability Fire Control Agreement Enhance wildfire prevention measures to aggressively address the increase in human caused wildfires. Evaluate the effectiveness and future use of limited liability (as currently expressed in industry fire control agreements) to facilitate effective wildfire prevention by industries operating within the Forest Protection Area.</p>		Status
	Response Initiative	
2.1	<p>Reviewing the <i>Forest and Prairie Protection Act</i> and associated regulations to consider increased fines for contravention. The Department is seeking approval to initiate a stakeholder survey in 2016 regarding proposed amendments to the <i>Forest and Prairie Protection Act</i> and Regulations, Parts I and II.</p> <p>Refer to 1.1 for additional information.</p>	Ongoing Response
2.2	Reviewing all terrain vehicle-caused wildfires, with consideration for legislation to manage their use in areas with extreme wildfire hazard conditions.	Ongoing Response
2.3	<p>Updating the Rural Electrification Association fire control agreement template.</p> <ul style="list-style-type: none"> • Department is negotiating new fire control agreement with Rural Electrification Association. • The template is based on the one the large utility companies signed off. 	Ongoing Response
2.4	Communicating with firefighting agencies that border the Forest Protection Area to improve the awareness of cross jurisdictional wildfire incidents.	Ongoing Implementation

2.5	<p>Continuing with enhanced Crime Stoppers and Global TV partnership.</p> <ul style="list-style-type: none"> • Department continues to develop Public Service Announcements (PSAs) with the partners, and pay for PSA television spots. • The relationship has been effective and positive. 	Ongoing Implementation
2.6	<p>Enhanced relationship with RCMP to address human caused wildfire issues (suspicious wildfires).</p> <ul style="list-style-type: none"> • There is a considerable wildfire arson problem in Alberta's Forest Protection Area. Arson is the fourth leading trend for human caused wildfires. • Department staff are continuing to engage and solicit support from the RCMP on wildfire arson cases. • The RCMP provided substantial manpower to assist WMB during the winter of 2014/2015 and into the spring of 2015, including surveillance, and hundreds of hours of additional manpower commitment. 	Ongoing Implementation
2.7	<p>Refined the Department's cost recovery program to improve cost recovery efforts and process efficiencies.</p> <ul style="list-style-type: none"> • The cost recovery process was approved by Treasury Board, and is now being reviewed by other agencies in Canada as a template for their organization. • Of the over \$196 million spent on human caused wildfires (2009 to 2015), about \$44 million had an identified responsible party; of that amount about \$36 million has been recovered. 	Ongoing Implementation
2.8	<p>Implementing refinements to the wildfire investigation program, including certification, an enhanced wildfire investigation matrix, and improved training and standards.</p> <ul style="list-style-type: none"> • The wildfire investigation program has developed since 2011, with the staffing levels growing from one seasoned and two new investigators provincially, to four dedicated full-time staff, two long-term wage staff and five seasonal investigators in 2015. • The arson-related wildfires have been a major consideration and undertaking for this group, as well as other human caused wildfires. 	Ongoing Implementation
2.9	<p>Revised and renew timber industry fire control agreements in 2014:</p> <ul style="list-style-type: none"> • increased liability amounts. • clarification of roles and responsibilities. <p>Most of the timber companies signed the new template in 2014. Since that time, three additional companies have requested a FCA. These agreements have not yet been finalized.</p> <p>The limited liability amounts in the 2014 template increased to \$300,000, \$150,000 and \$75,000 dollars, depending on the circumstances. The previous agreement included amounts of \$200,000, \$150,000 and \$50,000, depending on the circumstances.</p>	Ongoing Implementation
2.10	<p>Revised and renewed utility line industry fire control agreements in 2015. The new</p>	Ongoing

	<p>agreements have increased liability amounts and clarify roles and responsibilities</p> <ul style="list-style-type: none"> In 2015, the three major utility companies signed an updated Fire Control Agreement. The limited liability amounts in the 2015 template increased to \$200,000 and \$100,000, depending on the circumstances. The previous agreement included amounts of \$100,000 and \$50,000, depending on the circumstances. 	Implementation
2.11	<p>Reviewing wildfire statistics and the emerging trends in arson-caused wildfires to adjust wildfire prevention strategies.</p>	Ongoing Implementation
2.12	<p>Renewed Indigenous and Northern Affairs Canada wildfire management agreement on First Nations lands within the Forest Protection Area. New agreement provides enhanced funding for wildfire prevention initiatives annually (\$1M for FireSmart, including prescribed fire and other fuel management treatments).</p> <ul style="list-style-type: none"> Canada and Alberta agreed to a one-year agreement for April 1, 2015 to March 31, 2016. A ten year agreement is being negotiated. 	Ongoing Implementation
<p>Theme - Wildfire Prevention RECOMMENDATION 3: Revised Delivery Model/Enhanced Funding for FireSmart Establish a revised delivery model for a FireSmart program under one provincial framework, including a streamlined and enhanced funding model.</p>		Status
	Response Initiative	
3.1	<p>Entered into an arrangement with the Forest Resource Improvement Association of Alberta (FRIAA) to administer some of the FireSmart work.</p> <ul style="list-style-type: none"> 2015: committed \$3.5 million 2014: committed \$11.0 million 2013: committed \$7.6 million 	Ongoing Implementation
3.2	<p>Participated on the FireSmart Regional Activity Team - approximately \$20 million was allocated for recovery activities designed to build the Town of Slave Lake as a FireSmart community.</p>	Completed
<p>Theme - Wildfire Prevention RECOMMENDATION 4: Accelerate Fuel Management Treatments Accelerate fuel management treatments near communities in forested areas that are at risk from wildfires. Priority should be given to thinning or conversion of coniferous stands, particularly black spruce, which threaten community developments (as identified through strategic analysis of wildfire thread potential).</p>		Status
	Response Initiative	

4.1	<p>Re-evaluated wildfire threat assessment for communities.</p> <p>Community Wildfire Threat Assessment Overview</p> <p>As recommended in the <i>Flat Top Complex Wildfire Review Final Report (2012)</i>, the enhancement of hazardous fuels reduction (vegetation management) near communities was identified as a key element of reducing wildfire threat. A strategic analysis of communities located in the Forest Protection Area (FPA) was undertaken in 2013. This analysis identified community boundaries and hazardous fuels adjacent to and within the boundaries of the communities.</p> <p>The focus was to enhance the data for FireSmart planning and hazardous fuels management.</p> <p>Wildfire Mitigation Strategic Development</p> <p>Provincially, 270 communities have been identified as requiring a Wildfire Mitigation Strategy—the detailed planning document which addresses all of the disciplines of FireSmart including hazardous fuel management. The majority of the 270 communities have a developed Wildfire Mitigation Strategy and have identified hazardous fuels reduction locations—specifically C-2 (Boreal Spruce) within two kilometres of community developments.</p> <p>Hazardous Fuels Management</p> <p>Of the 270 communities, the following figures are associated with area and cost estimates (\$7000/hectare) of treating the C-2 within two kilometres:</p> <ul style="list-style-type: none"> • Municipal lands 4658.63 hectares. Cost to treat \$32.6 million • Provincial lands 82919.79 hectares. Cost to treat \$580.4 million • Federal lands 30.74 hectares. Cost to treat \$215,180 • Private lands 25,051 hectares. Cost to treat \$175.3 million <p>Further analysis was completed using Forest Management Agreement (FMA) area and expanding the two kilometre buffer of C-2 management out from the community boundary to five kilometres and 10 kilometres. This analysis focused on communities that had adjacent FMAs -- hence, the two kilometre area is lower than the figure above. Costs are not provided as there is the potential to partner with FMA holders to manage hazardous fuels through traditional forest management practices. The areas are summarized as follows:</p> <ul style="list-style-type: none"> • Two kilometre sphere - 29,495 hectares • Five kilometre sphere - 175,916 hectares • Ten kilometre sphere - 713,467 hectares <p>Hazardous Fuels Management and FireSmart Program Enhancements</p> <p>The post Flat Top review of wildfire threat assessment for communities has led to the following enhancements to the FireSmart Program:</p> <ul style="list-style-type: none"> • Greater emphasis on partnerships with different stakeholders to encourage and assist with hazardous fuels management. 	Ongoing Implementation
-----	---	------------------------

	<ul style="list-style-type: none"> • Re-examination of timber harvest debris standards. • Increased funding for hazardous fuel management programs. • The creation of a hazardous fuels management prescription that was tested in the Slave Lake Forest Area in 2013/2014 and implemented provincially in 2015. The prescription provides a strategic approach to fuels management—providing a greater level of detail as treatment recommendation and identification of site factors and areas of concern. 																						
4.2	<p>In 2015, the Department committed:</p> <ul style="list-style-type: none"> • \$500,000 for FireSmart Community Grant Program. • \$3.5 million for FRIAA FireSmart projects. • \$1.6 million for Department direct delivered FireSmart/fuel management projects. • \$818,000 committed through the Indigenous and Northern Affairs Canada agreement. <p>A summary of the last five years of the number of FireSmart Community Grant recipients and the totals disbursed are as follows. During this time period there were 54 unique towns, municipal districts, counties, non-profit organizations and Metis settlements awarded grants.</p> <table border="1"> <thead> <tr> <th>Year</th> <th>Grants Awarded</th> <th>Total Funding</th> </tr> </thead> <tbody> <tr> <td>2011-12</td> <td>23</td> <td>\$836,815</td> </tr> <tr> <td>2012-13</td> <td>23</td> <td>\$785,500</td> </tr> <tr> <td>2013-14</td> <td>19</td> <td>\$880,000</td> </tr> <tr> <td>2014-15</td> <td>13</td> <td>\$832,867</td> </tr> <tr> <td>2015-16</td> <td>15</td> <td>\$785,540</td> </tr> <tr> <td>Total</td> <td>93</td> <td>\$4,120,721</td> </tr> </tbody> </table>	Year	Grants Awarded	Total Funding	2011-12	23	\$836,815	2012-13	23	\$785,500	2013-14	19	\$880,000	2014-15	13	\$832,867	2015-16	15	\$785,540	Total	93	\$4,120,721	Ongoing Implementation
Year	Grants Awarded	Total Funding																					
2011-12	23	\$836,815																					
2012-13	23	\$785,500																					
2013-14	19	\$880,000																					
2014-15	13	\$832,867																					
2015-16	15	\$785,540																					
Total	93	\$4,120,721																					
4.3	<p>In 2014, the Department committed:</p> <ul style="list-style-type: none"> • \$832,867 for FireSmart Community Grant Program. • \$11.0 million for FRIAA FireSmart Grant. • \$1.9 million for Department direct delivery FireSmart/fuel management projects. 	Completed																					
4.4	<p>In 2013, the Department committed:</p> <ul style="list-style-type: none"> • \$880,000 for FireSmart Community Grant Program. • \$7.6 million for FRIAA FireSmart projects. • \$1.6 million for Department direct delivered FireSmart/fuel management 	Completed																					

	projects.	
4.5	<p>In 2012, the Department committed:</p> <ul style="list-style-type: none"> • \$785,500 for FireSmart Community Grant Program. • \$1.3 million for Department FireSmart projects and plans. 	Completed
<p>Theme - Preparedness and Capacity RECOMMENDATION 5: Advance Resource Start Times/Fill Vacancies/Expand Work Terms Advance start times for resources, including crews, equipment and aircraft contracts, to be fully ready for potential early fire seasons. Ensure staff vacancies are filled as soon as possible. Expand work terms to year round for a portion of firefighting crews to support retention and provide capacity for FireSmart initiatives.</p>		Status
	Response Initiatives	
5.1	Since 2012, contracts (equipment, manpower, aircraft) are in place earlier. Objective is to have contracts in place prior to start of fire season if possible.	Ongoing Implementation
5.2	Since 2012, firefighting resources have been hired earlier for the fire season. Some of the resources are brought on 1 month early in order to be better prepared for wildfire activity.	Ongoing Implementation
5.3	<p>Providing additional courses at Hinton Training Centre for firefighters. Starting crew member training earlier.</p> <ul style="list-style-type: none"> • Hold 4 firefighter member courses instead of 2. • Start the first courses one month early. 	Ongoing Implementation
5.4	Retaining a minimum of 4 firefighters per Area over the winter months for FireSmart projects and pre-season preparation.	Ongoing Implementation
5.5	<p>Reviewing current and future training priorities, direction and methods.</p> <ul style="list-style-type: none"> • The Department's wildfire training group regularly assesses training needs. • CIFFC involvement in training standards. 	Ongoing Implementation
5.6	Minimum recruitment standards have been reviewed with the objective of improving recruitment of appropriate individuals and retention of high potential seasonal employees. Job descriptions will be updated by March 2016. Once the job descriptions are finalized, adjustments may be made to the minimum recruitment standards.	Ongoing Implementation

5.7	Continuing to support the Western Partnership for Wildland Fire Science (see response initiative 1.3).	Ongoing Implementation
5.8	Completed pilot project in 2012 to resource a wildland engine from March 1 to October 31 with a specialized crew (crew provides resources for mutual aid, and supports FireSmart and other wildfire management activities in the shoulder season). <ul style="list-style-type: none"> The Department had 2 engines in 2011. In 2016, the Department has 6. 	Ongoing Implementation
5.9	Increase seasonal firefighting workforce, including an additional 3 Firetack crews, and increased the duration of their employment from 62 days guaranteed to 93 days guaranteed contracts.	Ongoing Implementation
5.10	The fourth government-owned retrofitted CL-215T (skimmer airtanker – converted from piston to turbine) was brought on-line in 2014. The planes are configured in 1 group of 4 planes or other configurations, dependent on need.	Ongoing Implementation
5.11	Reviewed and revised the curriculum for the Type 1 Fire Management Course (multi-jurisdictional operations, unified command, information/media flow and leadership). Revised curriculum for 2016.	Ongoing Implementation
5.12	Developing options to promote additional long term employment opportunities in wildfire management. This need was identified in the Department's new wildfire strategic plan.	Ongoing Implementation
5.13	Certification manual protocol and process is available to retired staff. Retired staff may be employed on fee for service contract/contract manpower/wages. This is consistent with the Canadian Wildfire Response Plan.	Ongoing Implementation
5.14	Participated on a national committee looking at the impact of demographics on wildfire management (CIFFC Graham report, Canadian Wildfire Response Strategy).	Ongoing Implementation
<p>Theme - Preparedness and Capacity</p> <p>RECOMMENDATION 6: In-house Expanded Attack (Unit) Crews</p> <p>Develop in-house expanded attack firefighting crews to provide sustained action capability and other wildfire management functions (modeled after the United States Hot Shot crews and/or British Columbia Unit Crews). These crews will enhance response capability on complicated and difficult wildfires. When not fighting wildfires, these crews can be made available for fuel management and landscape FireSmart activities.</p>		Status
	Response Initiative	
6.1	Internal sustained action task force provided recommendations regarding the implementation of unit crews.	Ongoing Implementation

	<ul style="list-style-type: none"> • Piloted one 20-person unit crew in 2012 • Hired 4 in 2013 • Hired 6 crews in 2014 • Hired 8 crews in 2015 	
6.2	Added 10 wildfire ranger positions to manage the unit crews and support other enhanced wildfire operations. However, the Department lost 10 wildfire ranger positions in 2015 due to Department restructuring. The plan is the Department will receive an addition 5 Flat Top related positions in 2016/17.	Ongoing Implementation
6.3	Reviewed firefighter crew configuration/size and modified training requirements.	Ongoing Implementation
Theme - Preparedness and Capacity RECOMMENDATION 7: Fire Behaviour Specialists/Wildfire Occurrence Prediction Ensure sufficient fire behaviour specialist capabilities at Sustainable Resource Development's Provincial Forest Fire Centre as part of wildfire weather forecasting, and implement wildfire occurrence predictions to support the Presuppression Preparedness System.		Status
	Response/Action	
7.1	Continuing to work with the science community to support development and use of wildfire occurrence predictions. Assessing the Canadian Forest Service program called Canadian Fire Resource Demand System.	Ongoing Implementation
7.2	Increasing the role and number of fire behaviour specialists (one per Area). Fire Behaviour specialist assigned to support provincial wildfire management operations at moderate to extreme wildfire intensity levels.	Ongoing Implementation
7.3	Providing a five-day fire behaviour forecast at wildfire hazard Level 3 or higher. Exploring additional methods and technology to improve fire weather forecasting. Considering seasonal wildfire behaviour forecasts.	Ongoing Implementation
Theme - Preparedness and Capacity RECOMMENDATION 8: Resource Requests Initiate resource requests in advance of potential demand, especially in anticipation of extreme wildfire risk conditions. Efforts should be made to reduce delays inherent in the resource request and sharing system internally and with other agencies.		Status

	Response Initiative	
8.1	Renewing the Memorandum of Understanding between the State of Jalisco, Mexico and Agriculture and Forestry. The agreement has been sent to Mexico for final review. The agreement will continue to allow for continued cooperation between the two agencies in wildland firefighter training and development.	Ongoing Implementation
8.2	Participating in multi-jurisdictional discussions (CIFFC, NW Compact) regarding a resource sharing strategy (easier mobility of resources, consistent training standards, terminology). Hold annual cross jurisdictional meetings with bordering jurisdictions as well as Canadian Interagency Forest Fire Centre partners (Canadian Wildfire Response Plan) and Northwest Wildland Fire Protection Agreement (Northwest Compact) partners.	Ongoing Implementation
8.3	Developed and implementing guidelines to facilitate effective response to existing and anticipated escalating wildfire situations. The process will improve documentation and repeatability of decision making.	Ongoing Implementation
8.4	Assessed the potential use of the Canadian Fire Resource Demand System. <ul style="list-style-type: none"> • System is not appropriate • Looking at other options that will fit with data integration project. 	Ongoing Implementation
8.5	Imported firefighters from Jalisco, Mexico in 2012 and 2015 under a Memorandum of Understanding between the State of Jalisco and Agriculture and Forestry.	Ongoing Implementation
<p><i>Theme - Preparedness and Capacity</i></p> <p>RECOMMENDATION 9: Structural Protection</p> <p>Work with other agencies (e.g., Alberta Municipal Affairs) to develop a structure protection program in which Sustainable Resource Development's role in structural protection is reduced. This will allow Sustainable Resource Development to focus its resources and actions on wildfire containment.</p> <p>The intended result is an increased role for municipal fire services to provide sprinkler protection for homes. Key components will be the provision of standardized equipment and training for fire Departments and focus on proactive deployment under the mutual aid network.</p>		Status
	Response Initiatives	

9.1	Exploring opportunity for municipalities to provide the structural protection service - currently the involvement of Agriculture and Forestry and municipalities in structural protection varies between municipalities. Working with Alberta Office of the Fire Commissioner to enhance the program. A memorandum of understanding has been drafted.	Ongoing Response
9.2	Working with municipalities to implement/update mutual aid agreements and plans.	Ongoing Implementation
Theme – Communications RECOMMENDATION 10: Standards/Training for Staff who provide Wildfire Information Enhance standards and training for employees involved in liaison and wildfire management information communications that support operations before, during and after a wildfire event.		Status
	Response/Action	
10.1	Developing Information Officer qualification requirements for specific roles.	Ongoing Response
10.2	Revised protocol to ensure applicable stakeholders are notified of various wildfire situations.	Ongoing Implementation
10.3	Delivering training for the Alberta Emergency Management Agency - Emergency Operations Centre. Assign Wildfire Management Branch staff to the Centre as Consequence Management Officers.	Ongoing Implementation
10.4	Developed an Internal Stakeholder Communications Plan.	Ongoing Implementation
10.5	Reviewed minimum recruitment standards and permanent vs. wage tenure for information officer positions.	Ongoing Implementation
10.6	Enhanced training regarding the use of social media tools.	Ongoing Implementation
10.7	Reviewed and enhanced Wildfire Information Officer course to include all risk scenarios (e.g. floods, train derailments, tornados).	Ongoing Implementation
Theme – Communications RECOMMENDATION 11: Fire Weather Advisories Issue Fire Weather Advisories that include wildfire behaviour potential to ensure understanding		Status

<p>of the wildfire danger.</p> <p>Fire Weather Advisories should be more comprehensive in terms of distribution to staff, stakeholders and the public, and more interpretive in terms of implications (i.e., what does the information mean and what actions need to be taken). Fire Weather Advisories are a relatively rare event, which makes it even more important that their meaning is easily understood. Stakeholders and the public need to understand that wildfires can start more easily in certain conditions and, if they do start, can spread very quickly.</p>		
	Response Initiative	
11.1	Lead the Canadian Interagency Forest Fire Centre (CIFFC) Forest and Fire Meteorology Community of Practice working group to work towards a National Fire Warning/Alert concept using common terminology and procedures.	Ongoing Response
11.2	<p>Reviewed and improved wildfire information products and Fire Weather Advisories based on input from Fire Behaviour Specialists.</p> <p>Enhanced products delivered through the Information Officers to staff, stakeholders and the public.</p>	Ongoing Implementation
11.3	Revised wildfire safety briefing to include enhanced information from the Fire Weather Advisories and other products.	Ongoing Implementation
11.4	Provided information on social media, wildfire app, and industry mail outs.	Ongoing Implementation
<p>Theme – Communications</p> <p>RECOMMENDATION 12: Dispatch and Resource Tracking Systems</p> <p>Undertake a review of Sustainable Resource Development’s dispatch and resource tracking systems.</p> <p>The Committee believes economies of scale and efficiencies in dispatch and tracking aircraft can be achieved through investment in improved dispatch approaches and technology. Sustainable Resource Development should determine whether other provincially-based emergency and wildfire dispatch methodologies and standards (including training) would be beneficial to its operations.</p>		Status
	Response Initiative	
12.1	Modernizing the wildfire data management system (FIRES). Work is ongoing and will be completed by 2018.	Ongoing Response

12.2	Upgrading the FireNet system to be compatible with First Responders Radio System (10-year project) and evergreening equipment.	Ongoing Response
12.3	Internal dispatch supervisor task group review the dispatch room operations and tracking technology. Now using elogging.	Ongoing Implementation
Theme – Communications RECOMMENDATION 13: Alternative Communication Technologies Enhance communication by fully supporting alternative communication technologies (texting, social networking).		Status
	Response Initiative	
13.1	Working on Alberta Wildfire System enhancement (AWS is a web-based spatial information and document management system that provides information to staff and stakeholders on fire ban and FireSmart program activities).	Ongoing Response
13.2	Training staff in the use of social media.	Ongoing Implementation
13.3	Piloted the use of smart phones by initial attack firefighting crews in 2012 and 2013 – full use in 2014.	Ongoing Implementation
13.4	Using smart phones and iPads for specific wildfire management positions on the fireline since 2014.	Ongoing Implementation
13.5	Providing texting capability to staff since 2011.	Ongoing Implementation
13.6	Enhancing the use of social media to provide timely and effective wildfire information and communications.	Ongoing Implementation
13.7	Developed and launched a web based application for wildfire locations.	Ongoing Implementation
13.8	Enhanced social media plan – Facebook and Twitter (started in 2011). Also using other tools such as YouTube, Vimeo, and Instagram.	Ongoing Implementation
Theme - Organization and Incident Management RECOMMENDATION 14: Reporting Relationship Realign Area wildfire operations to a direct line reporting relationship within Sustainable Resource Development's Forestry Division to provide clearer responsibilities and authorities.		Status

	Response Initiative	
14.1	Realigned area wildfire operations in 2013 to a direct line reporting relationship with Edmonton in order to improve clarity, consistency and efficiency. Business Support Services for wildfire management area operations, however, still do not have a direct line reporting relationship with Area wildfire management staff. These business support services are provided from staff in another Department.	Ongoing Response
Theme - Organization and Incident Management RECOMMENDATION 15: Wildfire Management Internal Assessments/Benchmarking Restore regular internal assessments of Provincial and Area implementation of wildfire management strategies, priorities and procedures. Undertake regular reviews and benchmarking of Sustainable Resource Development's wildfire management strategies and firefighting priorities.		Status
	Response Initiative	
15.1	Conducted a review/benchmarking of Agriculture and Forestry's Wildfire Management Strategic Plan to ensure it is current. New strategic plan will be finalized in 2016.	Ongoing Response
15.2	Developed protocol for auditing wildfire prevention programs in 2012.	Ongoing Implementation
15.3	Developed a standard operating procedure for operational wildfire management reviews and continuous improvement.	Ongoing Implementation
15.4	Re-established internal reviews of performance with respect to wildfire management standard operating procedures.	Ongoing Implementation
15.5	Compared existing wildfire management programs with other Provinces and Territories - leadership provided to Canadian Interagency Forest Fire Centre Wildfire Prevention Community of Practice. Participation and information sharing across Canada through British Columbia, Nova Scotia and National benchmarking exercises. Linkage to Canadian Council of Forest Ministers (CCFM) and Canadian Interagency Forest Fire Centre (CIFFC) strategic plans.	Ongoing Implementation
Theme - Organization and Incident Management RECOMMENDATION 16: Incident Command System Work with the Alberta Emergency Management Agency to align implementation of the Incident Command System and the use of Incident Management Teams under a consistent provincial model.		Status

This should include development of appropriate training and emergency simulation exercises that are practiced regularly (from tabletop to full simulation exercises related to wildfires).		
	Response Initiative	
16.1	<p>Regular communications between the Alberta Emergency Management Agency (AEMA) Provincial Operations Centre duty officer and Provincial Forest Fire Centre duty officer to ensure awareness of roles.</p> <ul style="list-style-type: none"> AEMA Duty Officer shadows Wildfire Management Duty Officer each May for 1 to 2 days. 	Ongoing Implementation
16.2	Participating in various multiagency mock disaster exercises to increase awareness and expertise (e.g., Hinton, K-Country).	Ongoing Implementation
16.3	Continuing to work with Alberta Emergency Management Agency to provide designated staff with Emergency Operations Centre training (Consequence Management Officers).	Ongoing Implementation
16.4	Providing Incident Command System training at Hinton Training Centre for Agriculture and Forestry staff and representatives from other agencies.	Ongoing Implementation
16.5	Participated in a Pan Canadian Incident Command System review (all risk) through Canadian Interagency Forest Fire Centre.	Ongoing Implementation
16.6	Purchased a simulator (sand table) for practicing multiagency responses to wildfires in 2012.	Ongoing Implementation
16.7	Developed an aerial firefighting simulator that connects with AirSpray and Conair.	Ongoing Implementation
<p>Theme - Post-wildfire Business Resumption RECOMMENDATION 17: Business Continuity Plans Review Sustainable Resource Development's business continuity plans in the context of overall Government of Alberta plans, with particular attention to loss of department infrastructure and support to staff.</p>		Status
	Response Initiative	
17.1	Planned enhancement to Hinton Training Centre supports business continuity.	Ongoing Response
17.2	Continuing to work with other departments to consider options to improve business continuity and business resumption.	Ongoing Implementation

Theme - Policy, Procedures and Legislation RECOMMENDATION 18: Wildfire Policies and Procedures Undertake a comprehensive review of Sustainable Resource Development's wildfire policies and associated procedures, especially with regard to priorities, structural firefighting, initial attack, and night-time firefighting, with consideration of staff training and understanding, to ensure consistent interpretation of policies and procedures.		Status
	Response Initiative	
18.1	Revising wildfire management strategy and planning tools.	Ongoing Response
18.2	Updating Wildfire Management Strategic Plan in 2016 to identify changes to Department policies and procedures.	Ongoing Response
18.3	Updating training needs and requirements (development of training plan to ensure staff knowledge and skills).	Ongoing Response
18.4	Annual review of internal standard operating procedures for wildfire management.	Ongoing Implementation
18.5	Tracking tactical/strategic wildfire management initiatives.	Ongoing Implementation
18.6	Developed a standard operating procedure identifying timeframes for yearly reviews.	Ongoing Implementation
Theme - Policy, Procedures and Legislation RECOMMENDATION 19: Forest and Prairie Protection Act and Regulations Work with legal counsel to review and update the ministry's Forest and Prairie Protection Act and associated regulations, in context with other applicable legislation, with particular attention to key areas including, but not limited to agency roles and responsibilities (such as Forest and Prairie Protection Act Section 7), evacuation authorities, wildfire investigation, fire control authorizations, administrative penalties, as well as updating definitions.		Status
	Response Initiative	
19.1	Developing amendments to <i>Forest and Prairie Protection Act</i> and associated regulations – e.g., considering increasing fines for contravention of the legislation and various administrative changes (refer to 1.1).	Ongoing Response
19.2	Provided input into the review of the Municipal Government Act and other legislation that has potential wildfire management implications (e.g., Public Lands Administration	Ongoing Implementation

	Regulation, Crowsnest Pass Regulation).	
19.3	Updated the Fire Control Zone Regulation, Forest Protection Area Regulation and Forest Protection Payment Regulation.	Completed
<p>Theme - Research and Development</p> <p>RECOMMENDATION 20: Research, Development and Monitoring</p> <p>Collaborate with research agencies to support research, development and monitoring in key areas highlighted by the Flat Top Complex including, but not limited to the following:</p> <ul style="list-style-type: none"> • Factors contributing to wildfire threat and structure losses, including wildland and other fuels, social elements, and the contribution of black spruce as a source of extreme wildfire behaviour and spotting; • Community planning and development, including codes and standards that impact building materials and fuels in the community; • Effectiveness and efficiency of FireSmart treatments and decision support tools for FireSmart investments; • Public awareness regarding the potential risk from wildfires and best practices to mitigate this risk, and factors affecting community and resident decisions to implement wildfire risk mitigation activities; • Enhanced fuel characterization to provide improved fire behaviour forecasting; and • Prediction of wind events, including approaches for worst case probability modeling, in collaboration with Environment Canada; apply lessons learned to forecasting. 		Status
	Response Initiative	
20.1	<p>Working with Environment Canada on predictability of wind events.</p> <p>Wildfire Management Branch is implementing ensemble modelling with assistance from Environment Canada. The Global Deterministic Prediction System (GDPS) is currently being used until the ensemble data will be readily available. GDPS information, which extends out as far as 14 days into the future, is being utilized to create Fire Weather Index forecast maps for a forecasted 5-day period. These maps include forecasts of wind speed and direction.</p> <p>A diurnal head fire intensity product is also being produced for specific fuel types over a three-day period. This is currently achieved using weather from RedApp which uses the deterministic weather.</p>	Ongoing Response
20.2	Continuing to support the Western Partnership for Wildland Fire Science (see response initiative 1.3).	Ongoing Implementation
20.3	Implementing wildfire management science plan (includes environmental scan, research literature review, workshop, 3-year science plan). Identified the components of recommendation 20 that Environment and Sustainable Resource Development will lead, and which ones will be supported by the Department.	Ongoing Implementation

20.4	Exploring new technology to support wildfire management programs (e.g., detection cameras, gel trial etc.). Worked with FPInnovations to test the effectiveness of fire retardant gels delivered by helicopters. Collaborating with other agencies on various research and development initiatives.	Ongoing Implementation
20.5	Held a Fire Science Workshop to inform stakeholders about the preparation of a Wildfire Science Plan (based on a 3-year environmental scan, scoping session, and literature review).	Completed
20.6	Identified research priorities for wildfire management – Key Result Areas have been developed.	Completed
20.7	Developed Fire Science and Research Business Model to facilitate more focused and directed research.	Completed
Theme - Research and Development RECOMMENDATION 21: Presuppression Preparedness System/Wildfire Occurrence Prediction Enhance the Presuppression Preparedness System to account for new information from 2011 related to initial and expanded attack requirements, with consideration of the potential use of wildfire occurrence prediction.		Status
	Response Initiatives	
21.1	Working on wildfire management systems modernization.	Ongoing Response
21.2	Working with the science community to support the development and use of wildfire occurrence prediction. Assessing the feasibility of using the Canadian Forest Service Canadian Fire Resource Demand System.	Ongoing Response
21.3	Continuing to support the Western Partnership for Wildland Fire Science (see response initiative 1.3).	Ongoing Implementation

Overview of Assessment of Implementation of Flat Top Recommendations

Agriculture and Forestry has had approximately three and a half years to implement its response to the recommendations the Flat Top Complex Wildfire Review Committee provided in May, 2012. Overall, the Department has made reasonable efforts to meet all of Committee’s recommendations, although several rely on efforts by other Departments and agencies as well as support from the Government of Alberta, financially and otherwise. Although not specifically evaluated, it generally appears that sufficient financial resources have been made available. With regard to efforts by other Departments, it would appear that progress has been made but further alignment of priorities and urgency will be needed. In closing, the

threat of wildfires is projected to escalate - Alberta and other western Provinces and Territories should anticipate events similar to Slave Lake. The public will expect preparation, mitigation and response based on the important learnings from such events.

Peter Fuglem, Member of Flat Top Complex Wildfire Committee and member of the 2015 Review Team

The lessons learned and applied from the Flat Top Complex Review have been aggressively addressed by the Wildfire Management Branch with a concerted and substantial effort in resources and funding. What has been accomplished must be maintained and monitored for continued effectiveness. For those few recommendations that still require components for finalization or a concluding solution; committed effort by means of program support and/or associated funding by the Wildfire Management Branch and where required, by associated Departments within the Government of Alberta is needed to ensure success. Understanding and managing the wildfire environment with the huge impact it has upon the people of Alberta cannot be overstated. The severity and intensity of the wildfire season is increasing the threat and risk to human life and other values; thus increasing the pressure for setting priorities on a landscape with a heavy wildfire load. The action taken with the responses to the 21 Flat Top Review recommendations aligns perfectly with a key Alberta Wildfire Management Policy; "Maintain a culture of continuous improvement through constant review of operations and processes, then apply lessons learned."

Hugh Boyd, member of the 2015 Review Team

APPENDIX 4: WHAT WE HEARD

This section summarizes the key points heard by the Review Team when they met with Agriculture and Forestry staff and stakeholders. The points are the opinions of the staff and stakeholders and do not necessarily reflect the opinion of the Review Team. The information in this section was considered by the Review team in developing its recommendations and opportunities for improvement.

1. Wildfire Prevention, FireSmart and Public Education & Awareness

There is a high degree of support for the wildfire prevention program among staff and stakeholders, primarily based on the understanding that in any given year, 50 percent or more wildfires are human caused. Public education and awareness involves communication and outreach at a local level as well as at a provincial level. The local Wildfire Information Officers in the Wildfire Management Areas are highly regarded by the organization and by stakeholders but were constrained at times in responding to local misinformation and rumour found on social media. This was a consequence of close central control of all wildfire related communications. At a provincial level, communication and awareness is well regarded, but lacking in major urban centres, where the public is less connected with the forest on a day to day basis. A summary of what we heard follows:

- The most valuable aspect of wildfire prevention is public education and awareness, such as messaging in schools and creating a greater awareness among field employees of natural resource based companies. This was seen to be highly regarded at the local level. Given the high concentration of population in urban centres, many of whom use public forests recreationally, more could be done in the major cities.
- It is difficult to measure the effectiveness of wildfire prevention activities, but the sense is that education and awareness is effective and the returns on the investment are highly positive. Team members are interested in some enhanced way of measuring results.
- Currently, the prevention program is seen by some team members and stakeholders to fluctuate between enforcement and education in a somewhat reactive manner. A clearer strategic direction to emphasize education and awareness would be welcome by many of the individuals that provided input.
- Greater delegation of responsibility and authority in regards to local communication is needed. Such a delegation of responsibility would recognize the importance and critical need for wildfire information and communications to be timely, accurate and rich in content. In the absence of such abilities social media dictates that incorrect or unfiltered information regarding wildfire is spread by members of the public.
- There is a strong perspective that local Wildfire Information Officers are very capable and helpful. There is support for a distinct Wildfire Information Group within the Branch. This could include Wildfire Information Officers in the field with direct access and input to social media as well as funding and classification support to the program for more effective recruitment and retention.

Prescribed Fire

Within the Wildfire Management Branch there is continued support for a robust and strong prescribed fire program.

- There are challenges with occasional negative public perceptions of prescribed fire owing to visibility and air quality issues, but continued support from government, combined with an active and engaging public stakeholder program by the Branch, will ensure program effectiveness.
- The benefits towards local community protection and landscape management objectives associated with a provincial prescribed fire program is largely recognized by staff and stakeholders.

Investigations

There is general support for continuing to invest in investigations and cost recovery activities where evidence suggests preventable human caused wildfires have resulted in costs to the program and/or losses.

- There is a general recognition that investigations are a time consuming but are a value-added process that contributes significantly to the wildfire prevention program.

FireSmart

FireSmart as a set of guidelines and independent program has a very high degree of support among forest division team members, representatives of local governments and with community members. There is consensus that FireSmart activities are beneficial in reducing community wildfire threat and that the investments made provide valuable returns.

- Support for FireSmart activities is particularly strong with First Nations communities in the forested areas of Alberta, as they are generally more vulnerable to wildfire.
- There is strong support for a single provincial level funding source for FireSmart projects. Engaging FRIAA to implement FireSmart projects is generally regarded as having significantly enhanced the support and adoption of FireSmart by communities.
- Educational tools to support improved public awareness and buy-in is seen to be lagging. Updated or more modern graphics and visuals of fuel hazard reduction projects would be helpful for educational and planning purposes.
- It is generally recognized that FireSmart should be driven and owned at the local level by communities (city, town, county or Municipal District); however, expertise and supporting tools are lacking to promote this. The current situation is that FireSmart is primarily driven by Agriculture and Forestry.
- The linkage between fuel modification work and presuppression planning and suppression operations can be strengthened. Duty officers often don't have the most up-to-date information on the status of fuel modification surrounding communities or remote facilities and camps.

2. Detection

Staff and stakeholders engaged recognize that Alberta's detection system is extensive and supports aggressive and rapid initial attack. All interviewed agree that Alberta's detection system is the most developed in the country and believe it serves key advantages in achieving initial attack and containment objectives. A summary of comments and feedback follows:

- Modernization is ongoing within the program, particularly with the lookout tower system. This involves lookout maintenance and upgrades (i.e. new steel, cabins, sites etc.) and the addition of some technology respecting weather monitoring.
- The province continues to use new technology to support the detection program. The commitment to provide Internet access to all lookouts should be a priority.
- Lookout staff are all very experienced and while there are some issues related to recruitment, retention and performance, the issues are reasonable and being properly managed given the nature and scope of the program.
- Manned lookouts have made a very positive contribution but detection cameras have been identified as an effective supplemental support.
- Safety is a priority working around lookouts given the nature of the job and remoteness. There have been few safety issues overall.
- Lookout observations and effectiveness are greatly affected by smoke (especially in 2015). There is continued need to have other forms of detection supplementing the lookout system.
- There is need to engage some more camera technologies to supplement manned lookout operations. The Province is working with FP Innovations on this matter.
- The ability to spatially come up with probabilities to refine detection would be beneficial (the new wildfire risk management plan doesn't do that quite yet but could be adapted to do so).
- The use of aerial patrols is more sporadic now, as towers, loaded patrols and public use of 310-FIRE meets most of the detection requirements.

3. Presuppression Preparedness

In interviews, it became clear that more and more, Wildfire Management Area (WMA) Managers are using wildfire risk management planning to help make more informed and deliberate decisions in advance of wildfire occurrence. To the extent possible, local, regional and provincial planning (i.e. LUF planning, provincial policy and planning) is being integrated into these plans. A summary of comments and feedback follows:

- A risk-based approach clearly forms the basis of today's system, though it is not formalized and needs to be better linked to the WMA. There is an opportunity to use a risk-based approach intentionally and more formally.
- As risks and values change over time continual attention and updating would be required to a risk management framework. A risk based approach to presuppression preparedness will require:

- Assessing the spatial and temporal likelihood of wildfire occurrence and frequency of exceptional wildfire behaviour occurrences.
 - Assessing the severity of those occurrences in terms of the associated wildfire behaviour and spread potential (area of exposure).
 - Identifying the landscape values and their vulnerability to the assessed likelihood and severity.
 - Making these risks management plans easily accessible to wildfire managers and operations staff.
- Wildfire Management staff should apply and utilize weather and hazard information effectively and knowledgably—the information exists, but is not utilized as much as it could be.
 - More effective decision support tools are needed to allow managers the ability to quickly compile and analyze information to make decisions.
 - There is a need to continually look at resource requirements for upcoming three day periods (whether to acquire resources or release them). Weather and hazard forecasts are critical to making these decisions.
 - Depth of experience, in terms of a person’s ability to interpret all data and indices, is vital—technical specialists such as meteorologists, wildfire behaviour and risk analysts will become increasingly important.
 - Currently, there are excellent forecasts and guidance for a three to five day outlook, which wildfire managers depend on greatly. There is little in the way of forecast and predictions beyond that, which would be very helpful (but clearly difficult). Finally, including wildfire behaviour modelling with weather forecasts is very helpful and expanding this practice and service would be a significant step forward.
 - The Spatial Fire Management System (SFMS) has been used since 1999 and needs a major update to bring it into real time accuracy.
 - Fuel grid limitation for modeling and SFMS represents a concern. Updating fuel types is very important to make SFMS more useful. In particular, non-vegetated areas are not representative as areas such as cutblocks, other clearings and previous burns may revegetate rather quickly.

4. Suppression

Activities involved in suppression operations vary widely. Feedback received throughout the stakeholder engagement portion of the review followed a number of themes:

Training

- Wildfire management training in Alberta is highly regarded throughout the province and by other jurisdictions. Stakeholders indicated concerns about the end to Type 1 initial attack training for non-government staff at the Hinton Training Centre; it is believed that this will have a significant, negative effect upon Municipal Districts and Counties.

- Stakeholders also reported the occurrence of fall training fatigue, particularly in evidence after a long fire season. Managers we spoke with recognize the issue and agree it's important to balance staff fatigue with the need for training. One option could be to increase the use of on-line training.

Operations

- Operations with respect to initial attack and sustained action represent a wide range of activities. Priority setting during active wildfire situations is not well-documented and when a high number of wildfires occur in one day there are added challenges.
- Rather than filling out numerous wildfire analysis and strategy (WAS) documents perhaps a point ranking system could be used. This would also help alleviate issues associated with one person shouldering the responsibility of prioritizing values-at-risk.
- It was suggested that priority setting for initial attack and sustained action be separated.
- There are opportunities to improve decision-making. Currently, costs don't affect decisions by duty officers, however it should be incorporated into the decision process somehow particularly into decisions regarding double dispatching.
- Better intelligence from other wildfires in other WMAs can inform decision-making.
- Resource shortages in the 2015 season included:
 - A shortage of Incident Management Teams.
 - Lack of resources to action wildfires adversely affecting wildfire containment.
 - The use of initial attack resources on sustained action.
- Things that worked well included:
 - E-logging events and activities in duty rooms, suggesting a strong system in place.
 - A number of people were pleased with new tools becoming available and being utilized such as risk management approaches, prescribed burning, wildfire management plan templates and others.
- Concerns include:
 - The need for Helicopter Coordinator (HELCO) certification to manage heavy rotary wing aircraft. There should be an update to standard operating procedures to reduce this restriction.
 - There is a need to double the number of ignition specialists to achieve objectives of increasing the use of indirect attack with torches.

Commuting and Camps

- The move away from line camps and towards base camps has become well established in Alberta and has significantly changed how sustained action on wildfires is implemented. The use of base camps and commuting to wildfires is highly inefficient in terms of the productive time on a wildfire and the extensive use of medium helicopters. Notwithstanding

the health and safety requirements, line camps are much more efficient and the use of outsourced camp providers may be a viable option in certain cases.

Occupational Health and Safety

- Safety related procedures were written up 10 years ago or more; there is a need for these to be modernized for project work (i.e. chainsaw operations, loading equipment, use of side-by-sides vs quads, climbing towers).
- Fireline hazard assessments are not being completed and submitted regularly. Improvement in this area is required—this issue is being reviewed provincially.
- Daily hazard assessments, as is increasingly being done for other industries, is not feasible for wildfire operations.
- In the past, most Occupational Health and Safety (OHS) auditors had forestry backgrounds, making the process more efficient. Two years ago a change was made and now auditors have backgrounds in construction (Alberta Association of Construction) and have less of an understanding of the business which impedes efficiency.
- Hours of work and managing cumulative fatigue is recognized as a priority. Much of this aspect of health and safety is based on effective management of people and employee-employer relationships. There may not be a support system in place to properly deal with this.
- We are relying more on pilots to keep track of duty day, however interpretation of the requirements isn't consistent and is difficult to follow up on.
- OHS requirements are discouraging overnight operations. Improved training may need to be considered to help ensure that dozer operations at night can be implemented.
- There are still areas with poor cell, radio and satellite phone coverage that crew leaders need to be aware of.

Operational Communication

- Social media has become an increasing issue. The centralization of public communications means that government is delayed and out-paced in providing factual information to the public on current wildfire situations compared to other sources of information on social media that may not be correct.

Performance Targets

- The performance measure of containing a wildfire within the first burning period (10:00 rule) works well and is as up-to-date as possible for a measure. This is a current best practice. Trends indicate improvement at containing a higher proportion of wildfires at less than four hectares in accordance with the initial attack objective, but adding campfires to wildfire occurrence statistics may skew the data somewhat.

Aircraft

- Aircraft, both airtankers and rotary wing, represent the single largest expense within the wildfire management program.
- Double dispatch effectiveness depends on dispatcher experience. The fallback position seems to be to overuse double dispatch, resulting in inefficiencies.
- Rotary Wing Utilization is limited by availability when other provinces and states are active in wildfire suppression. Alberta tends to hire (tie up) rotary wing aircraft early in the wildfire season or during higher hazards; however other jurisdictions are starting to follow suit.
- There is newer technology for buckets that can improve effectiveness that Alberta should pursue more actively (i.e. variable flow and shallow fill buckets).
- Litres per hour are a better measure for airtanker productivity than retardant drop cycles. Cycles can be a useful planning tool for determining litres per hour.

Finance and Administration Support

- Concerns were noted regarding the lack of finance and administrative support during busier times, especially during suppression operations.
- Concerns were identified that there are no finance and administration direct reports to the Wildfire Manager, therefore the manager had limited ability to address the problem.
- Dollars are not considered to be the issue; rather staff availability is considered to be the issue. An example shared was that in the past there were three data entry input staff during suppression operations and now there is only 1 admin person available to do administration duties and data input.

5. Resource Sharing

- Resource sharing works well until demands are high in multiple jurisdictions – then everyone focuses on their own needs and priorities. This poses a significant challenge and it is expected to continue through into the future. An additional challenge is concerning the different qualifications in imported crews. For example, the IC 3 level used in Ontario is very different than the standards used in Alberta. Finally, upon the arrival of IMTs from out-of-province an Alberta liaison would be helpful to speed up their integration.
- CIFFC has been very effective with respect to supporting resource sharing agreements in place and in 2015 they were able to put an agreement with Australia and South Africa in place under significant time constraints.
- Most municipalities have mutual aid agreements in place, but not all. A key concern is that many municipalities don't agree that they are the wildfire management agency outside of the FPA. A contradiction between the *Forest Prairie Protection Act (FPPA)* and the *Municipal Government Act (MGA)* ensures further confusion on this point. Clarification and enforcement of roles and responsibilities is needed.

- Forest and Utilities companies have been generally cooperative and constructive in entering into wildfire agreements and implementing them. On the other hand oil and gas companies generally don't get involved with wildfire agreements and do not seem to be concerned about wildfire planning other than FireSmart mitigation for camps and production infrastructure.
- An excellent example of cooperation and resource sharing at local and regional level are the sprinkler trailers that are a joint effort with Forestry.

6. Policy and Planning

- Much of the success related to prioritization and decision making is based on experience of the operational leadership within the program. This level of experience, coupled with highly effective working relationships among operational leaders in the program, allows for consistent choices and decisions to be made in the absence of a clear decision process and clearer priorities. There is a highly effective culture within the Wildfire Management Branch that enables successful decision making and action in emergency situations; however, this is difficult to document and control at a government level.
- There is a significant level of overlap in the priorities. Ambiguity exists and difficulties are experienced in terms of differentiating priorities such as human life, communities and infrastructure, since there can be a significant level of overlap. For example, protection of communities once evacuations are completed may not be as high a priority as it would be prior to evacuation. In a practical sense, there is little difference in priorities between protecting communities and protecting infrastructure that supports communities.
- Many believe that priorities for the program inside the Forest Protection Area (FPA) should be higher than outside the FPA, however this is not how the program is actually delivered. Resources are often used outside of the FPA.
- It is difficult to determine the relative priorities for sensitive soils, watersheds and natural resources where information on values is lacking. It is quite possible that prioritization among these values doesn't occur in actual practice.
- Priorities for the timber resource need to be refined in terms of standing timber, Annual Allowable Cut (AAC), critical age classes and areas scheduled for harvest in the next five years. Some industry members suggest that areas defined as the next 5 years of harvest is a priority since investments in operational planning are made. Others consider critical age classes to be the priority as losses of these stands are likely to affect annual allowable cuts.
- Setting priorities between communities when more than one is threatened and resources are limited is a critical decision—policies and direction aren't clear enough in this type of situation.
- The Act covers the question of not needing to suppress every wildfire on the landscape; however, the prevailing practice is to suppress all wildfires regardless of location and conditions. Many individuals believe there should be a policy and risk management approach that puts this into practice.
- Double dispatch of airtankers at high hazards, if followed too literally, may cause resourcing difficulties if there are subsequent unforeseen requests for airtankers on new starts.

- The pilot duty day is likely the SOP that is most problematic and the one that could be most improved. The 14 hour time period might represent the biggest discrepancy as each Duty Officer might have different interpretation of what the duty day is.
- A more comprehensive Wildfire Management Policy, including a more robust description of the risk management objectives, is needed to guide decisions about resource allocation and trade-offs when wildfire danger and occurrence is high. This is particularly important in an environment of an increasingly severe wildfire events and national limitations of suppression resources.
- Expanded decision protocols and standard operating procedures are needed to support a more comprehensive policy regarding priorities. These are particularly required to address trade-off decisions involving threats to communities.



ABOUT MNP

MNP is one of the largest chartered accountancy and business consulting firms in Canada, with offices in urban and rural centres across the country positioned to serve you better. Working with local team members, you have access to our national network of professionals as well as strategic local insight to help you meet the challenges you face every day and realize what's possible.

Visit us at MNP.ca

Aon.

BESTEMPLOYER

PLATINUM | CANADA

Wherever business
takes you.



Praxity
MEMBER
GLOBAL ALLIANCE OF
INDEPENDENT FIRMS

Praxity, AISBL, is a global alliance of independent firms. Organised as an international not-for-profit entity under Belgium law, Praxity has its administrative office in London. As an alliance, Praxity does not practice the profession of public accountancy or provide audit, tax, consulting or other professional services of any type to third parties. The alliance does not constitute a joint venture, partnership or network between participating firms. Because the alliance firms are independent, Praxity does not guarantee the services or the quality of services provided by participating firms.