A Strategic Plan for the Renewal of Canada's Forest Fire Program

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Abstract

When Canada's forest fire managers met at their annual gathering in early 2000, discussions included an examination of the problems facing their agencies. Many of the problems were similar from coast to coast.

The baby boomer generation was beginning to retire in significant numbers, causing the loss of many years of accumulated fire experience. Aircraft used in forest fire operations were beginning to show their age (along with the boomer generation) with many of them having been put into service in the 1960's, 70's, and 80s. Many of these aircraft used old technology (e.g. piston driven engines) that made them vulnerable to breakdowns while in the air. Training for Aircraft Maintenance Engineers was no longer even offered by educational institutions. The trend in borrowing equipment from neighbouring jurisdictions had also increased indicating perhaps that the level of equipment needed re-examination. In short, the capacity within the system was beginning to show cracks.

There was also recognition that a number of trends were continuing to place pressure on wildfire programs across the country. The fastest growing portion of Canadian society is its aboriginal group, whose pace of growth far exceeds the rest of mainstream society. From a wildfire perspective over 80% of these communities are located in the boreal forest and are at risk from fire. As boomers retire, they too often choose to live in forested settings that are at risk from wildfire. From an economic perspective Canada's forests are a significant driver in the well being of Canada's economy. Close to a million jobs and over $44 billion in exports of forest products depend on the forest. The potential for eco-tourism is also just beginning to be realized. Canada's forests will also be impacted by the long-term impacts of climate change – in the west seasons are expected to last longer and have more extreme weather events. Even terrorist groups had begun to recognize the potential that wild fires could cause.

Lastly, Canadian fire agencies were beginning to come to grips with the fact that nearly a century of fire exclusion had created a forest that was growing in its vulnerability to fire. South of the border in the United States, the 2000 fire season had just concluded. This was one of the most difficult seasons ever and economic losses were estimated at $10 billion. While fire weather was unusually severe in 2000, a significant portion of the blame was placed on the build up of fuels that had resulted from years of effective fire suppression.

The realization hit hard that a complete renewal of Canada's forest fire system was needed. Even more challenging for fire agencies was the need to raise awareness and support for a plan to renew the entire system.

The presentation will focus on an examination of the trends expected to impact forest fire management in Canada, an overview of the strategic plan, the process used to develop the plan by Canada's forest fire agencies and lastly the current status of the Plan.

THE STRATEGIC PLAN FOR THE RENEWAL OF THE CANADIAN FOREST FIRE PROGRAM

In the spring of 2000, the Directors of Canada's forest fire agencies at the federal, provincial and territorial level gathered to discuss the state of Canada's forest fire management program. These discussions ultimately led to agreement that Canada's forest fire management program was in need of a strategic overhaul to ensure that Canadians would continue to receive world class management of forest fires.

Over the next 18 months, through the leadership of Directors; participation of working members from all agencies; and guided by the efforts of a small strategic planning secretariat, a strategic plan was developed. This work was guided by two main driving influences:

1) recognition that a strategic approach must be developed to fight wildland fire. The approach must embrace the natural role fire plays in the forest ecosystem, yet allow for effective protection from the harmful impacts on fire where its presence poses a threat to communities and other significant values within the forest (e.g. commercial timber, power lines, mining sites); and

2) recognition that the capacity of the wildland fire suppression system must be able to address the demands of difficult fire seasons predicted for Canada's boreal forest.

THE NEED FOR A STRATEGIC PLAN TO RENEW CANADA'S FOREST FIRE SYSTEM

The Historical Situation

Although fire has always been part of Canada's forests, fire activity is highly variable among years. Over the past four decades an average of two million hectares burned annually (Stocks et al. 2001). The statistics suggest that fire burned a smaller annual area during the earlier part of the 20th century, but we believe that these statistics under-represent fire because many remote fires were not detected and extensive fire monitoring did not begin until the 1950s. One of the most important developments for forest fire management in Canada has been the development of the Fire Weather Index (FWI) and the Fire Behavior Prediction (FBP) system, which are key components of the Canadian Forest Fire Danger Rating System (Alexander et al. 1996). This system incorporates decades of research into an easily usable product that allows fire managers to estimate fire risk and fire behavior for operational purposes.

Fire suppression has been a key part of fire management during most of the 20th century. The strategy has focused on early detection and initial attack to contain fires when they are small. Priorities were set to protect specific values such as communities (life and property), industrial facilities and merchantable timber resources. In some jurisdictions, specific protection zones have been identified to focus resources, whereas in others, the entire province has been protected with priorities shifted for maximum protection of values. An important concept is that most of the area burned (greater than 95 percent) is by a small number of fires (less than 5 percent of all fires). This means that a few fires that escape initial suppression during severe fire weather have the potential to burn large areas.

Current Realities

Today, it is generally recognized that total fire exclusion is both economically impossible and ecologically undesirable. Hence, a balanced approach is used to fire management, with fire recognized as a desired process in some ecosystems, whereas rigorous suppression is used in many other locations. The direct cost of fire suppression averages about $500 million annually. Despite this large expenditure, structure and property losses are estimated to still average $2.2 million annually, and the loss in timber resources is much larger. The area

burned in Canada has been substantial in recent years, with 1989 (7.5 million hectares burned), 1995 (7.3 million hectares burned), and 1994 (6.1 million hectares burned) being the three top years in the past 40 years (Stocks et al. 2001). About 80 percent of the area burned is started by lightning fires, and a few large fires dominate the total area burned. One of the main reasons for this substantial fire activity is largely related to fire weather (Flannigan and Harrington 1988). However, it is acknowledged that landscapes and the human interaction with the forest are changing. We are fortunate that Canadian agencies share suppression resources under the Mutual Aid Resource Sharing (MARS) agreement, coordinated through the Canadian Interagency Forest Fire Centre (CIFFC). Yet it is clear that severe fire years demand resources far in excess of those available.

The 2000 fire season in the United States was one of the most severe on record, with about 2.8 million hectares burned and economic losses of the order of US$10 billion ("Burning Money", U.S. News Online, September 11, 2000). Although fire weather is the critical factor, there is a belief that the build-up of fuel over many years of effective fire suppression contributed to the severe fire season. Fuel management has been an important focus of recent work in the US, although this is mostly an issue in certain fuel-types of the western states.

In Canada, it is unclear if previous effective suppression is contributing to present difficulties in fire management. However, it is recognized that recently burned areas provide some break in fuel continuity, or alternatively, that effective suppression enhances fuel continuity creating the potential for a large fire during severe weather conditions. The issue of fuel management is central to Canadian initiatives such as "Partners in Protection", a multi-agency effort that focuses on "fire-smart" landscapes, especially around communities (Partners in Protection 1999). Current progress in protecting communities through fuel management is hoped to alleviate the most severe risks to life and property, and minimize suppression costs.

Internationally, forest fires have become a major issue related to carbon emissions. The Kyoto Protocol calls for a 6 percent reduction in Canadian carbon dioxide emissions between the 1990 base period and the 2008-2012 commitment period. Negotiations on implementation and items to be included are still in progress, but carbon stocks in forests are being discussed as an important part of Canada's ability to meet the requirements.

Strategies for the Future

The Plan will position fire management in Canada to address future needs through a strategic investments. The goal is to use our present knowledge base to derive "smart" systems for fire management and to improve our knowledge base through research and technology transfer. It is recognized that the future of fire management is to minimize economic losses, reduce risks to our social infrastructure, allow development of timber resources and northern communities, and protect ecological integrity while minimizing costs. A holistic approach to living with fire is critical since the reality is that on some days, adverse fuel and weather conditions will conspire with an ignition source to produce conflagrations that are impossible to contain until such time as conditions ameliorate.

Therefore, a balanced approach is being embraced by fire management agencies whereby fire is recognized as an integral part of the forest, and we must work with fire to ensure sustainability. This approach must stress a long-term view of landscape management where fuel management is an important focus. This involves fuel reduction, fuel conversion and fuel isolation working together to optimize suppression effectiveness. It also involves the use of tools such as prescribed fire in cases where ecological benefit can be derived. It is

recognized that fuel treatment cannot be applied to the whole Canadian forest over a short period because of the vastness of the forested area (Amiro et al. 2001). However, the landscape should be prioritized to treat the most critical parts first. Urban expansion into the forest will put increased pressure on the urban/wildland interface, and fuel management is seen as a pro-active method of reducing risk (Partners in Protection 1999). In addition, incorporating fuel management in timber harvesting areas by creating "fire-smart" landscapes is being explored to reduce the incidence of large fires (Hirsch et al. 2001). This is especially important in parts of the country where the timber industry is expanding, calling for the need of additional resources for forest protection. The modification of the landscape to reduce risk of catastrophic fire will take many decades. In the interim, fire suppression is needed to protect values and to help establish the landscape patterns that are needed for the future. Prescribed fire programs for ecological integrity, preservation of bio-diversity and restoration of habitats still require an effective suppression program to control fire as a tool. Landscape management and effective fire suppression must work together to as tools for the future.

Projections of the future fire regime must also be considered. A changing climate caused by fossil fuel emissions is expected to alter our fire weather, creating the potential for more fire in the west (Wotton et al. 1998) and less fire in the east (Flannigan et al. 1998). The fire season is also expected to increase in length (Wotton and Flannigan 1993) and lightning may increase (Price and Rind 1994). Vegetation is also expected to respond to this changing climate (IPCC 1998), although the net affect of weather and vegetation still needs to be estimated. For Canada as a whole, it is likely that we will enter a period of increased fire activity, clearly a situation that calls for increased suppression resources on the current landscape.

The future calls for the renewal of Canada's forest fire program. CIFFC's plan addresses these needs in a comprehensive way – ensuring future needs are met by making investments today and addressing today's shortcomings through a cooperative approach involving all levels of government.

PROPOSAL SUMMARY

The plan has eight components that taken together create a comprehensive initiative.

Fire science and technology

Current realities and issues in fire management plus trends which will impact fire management operations in the future, suggest that there is an urgency to enhance the collective fire research capacity and capability in Canada. Increasing global demands for wood, society's concern about environmental issues (air quality, biodiversity, greenhouse gases), increasing and competing land uses, climate change and related fire impacts, escalating fire suppression costs, concerns about increasing fire behavior potential and commitments to national and international agreements, could all potentially drive future fire policy.

An integrated national program to strengthen the fire science capacity and capability in Canada is proposed. This will support and benefit all forest fire management agencies and will position Canada as a world leader in providing the essential knowledge and tools to efficiently and effectively manage fire on the landscape based on sound fire science.

Ongoing costs are estimated at almost $17 million annually with $11 million in one time transitional or capital costs.

Information Systems

Forest fire management is an information-intensive business. Accurate and timely information concerning observed and forecast weather, fuels, fire occurrence and the location and availability of suppression resources is critical to effective fire management programs, and therefore critical to ensuring public safety, community stability and reducing economic losses.

CIFFC proposes the development of the Canadian Forest Fire Information System (CFFIS). CFFIS will build on existing data and information systems to provide broader standardization, sharing and availability of critical fire, weather and resource information among fire management agencies and the public across Canada. Ongoing costs are estimated at $1.2 million annually with $3.6 million in one time transitional or capital costs.

Fire Meteorology / Climatology Program

Access to comprehensive meteorological and climatological information is essential to fire management planning strategies. Fire management agencies require access to comprehensive, standardized, digital weather information in real-time, tailored to their operations, to allow the development and implementation of decision support systems that will increase the effectiveness of firefighting decisions and resource allocation. Done effectively, this can reduce firefighting costs, economic losses and the threat to public safety, while providing more accessible and timely information to stakeholders and the public

CIFFC is proposing the enhancement of fire agencies' weather observation networks by integration with the network operated by Meteorological Services of Canada (MSC). This will strengthen both the MSC and fire agencies' networks, allowing for better information.

Ongoing costs estimates are not yet developed due to the need to undertake a needs analysis. One time costs are estimated at $15.5 million.

Fire Suppression Equipment and Infrastructure
An essential component of fire management and effective suppression is adequate fire-line equipment. While aerial support plays a key role, putting out fires is, ultimately, a tough, on-the-ground job. Reestablishment of adequate levels of equipment is being recommended. CIFFC is also recommending the renewal of essential forest fire related infrastructure such as runways and tower detection systems. One time costs are estimated at $102.25 million.

Fire Equipment Test Facility
At present there is no Canadian test facility for forest fire equipment. Fire agencies need to have equipment that is tested and certified for Canadian operating conditions. A Canadian test facility is also required for Canada to retain its global leading edge in the manufacturing and development of safe and effective wildland fire equipment.

Current estimates require $1.5 million to meet initial capital requirements and an annual operating budget of $1.55 million.

Aerial Protection and Support
To ensure the future dependability of Canada's aerial fleets engaged in fire suppression activities, there is a need to establish a modernization plan. The plan must address all aircraft needs (amphibious, land-based, support aircraft and helicopters) in order to accurately reflect various agency and/or regional requirements.

Eligible components of the plan shall include, but is not limited to:
- purchase of new aircraft;
- conversion of piston powered air tankers to turbine engines;
- tank technology improvements;
- infrastructure to support turbine operations; and
- targeted research and development requirements (Forward Looking Infra-Red (FLIR) etc.).

Preliminary cost estimate is approximately $986 million.

Aboriginal Capacity Building
The creation of critical surge capacity to meet fire program needs is proposed by training firefighter crews, fire management technical and advanced specialists, and businesses from Aboriginal communities located in Canada's forest belt.

Ongoing costs are estimated at almost $ 40.6 million annually with $71.2 million in one time transitional or capital costs.

Aboriginal Community Protection Initiative
There are around 800 Aboriginal communities in the forested areas of Canada. These communities need the means, equipment and infrastructure to adequately protect their communities from wildfire. There are tens of millions of dollars invested in infrastructure including housing, schools, businesses, recreational complexes, etc., that need adequate protection by the people themselves who live and raise families in these communities.

The proposal would place trained personnel in Aboriginal communities provided with the technical expertise, equipment, facilities, operating and maintenance funds, to complete major forest fuels reduction and fuels maintenance around and adjacent to communities. In

the process this will provide the opportunity for education programs, employment, training, and skills development.

Ongoing costs are estimated at almost $39.5 million annually with $ 21.7 million in one time transitional or capital costs.

FINANCIAL SUMMARY

	Annual Operating	One-time (Developmental, Transitional or Capital)
	Millions of Dollars	
Fire Science and Technology	$16.785	$11.00
Information Systems	$1.91	$3.600
Forest and Fire Meteorology/ Climatology	To be determined	$15.50
Equipment and Infrastructure		$102.253
Fire Equipment Testing Facility	$1.550	$1.500
Aerial Protection and Support		$ 986.000
Aboriginal Capacity Building	$40.644	$71.200
Aboriginal Community Protection	$39.465	$21.720
Total	**$100.354**	**1,213.773**

IMPLEMENTATION FRAMEWORK

An implementation framework was developed which outlined the positions of the various provincial and territorial fire agencies with respect to timing, operational or funding issues associated with each of the Plan's components.

The priority of the different components of the plan differ by agency due to factors such as fiscal capacity, regional approaches, and previous or ongoing expenditures in key areas that are identified within certain components of the Plan.

Two recurring themes were found from agency to agency: limited fiscal capacity to undertake investments, and concern that implementation time-lines are somewhat optimistic. Although there may be a few initial, lower cost components of the Plan that could proceed early on, given tight budget environments and general economic conditions across the country, full implementation of The Strategic Plan will take longer than initially anticipated.

BENEFITS FROM IMPLEMENTING THE PLAN

An outside consulting firm was retained to provide a report on the benefits of proceeding with implementing the plan. This work was split into three areas:

1. an examination of the trends expected to have an impact on forest fire management programs in Canada;
2. an analysis of the economic benefits of the proposed investments; and

3. a discussion at the macro level of the performance improvement that could be expected as a result of making the investments.

TRENDS IMPACTING FOREST FIRE MANAGEMENT PROGRAMS

Fire Frequency – the impacts of continued warming caused by greenhouse gases is likely to lead to longer, drier fire seasons, particularly in the west. Fire starts are expected to increase as a result.

Area Burned by Fires – with increased fire frequency and potentially more vulnerable forests, the area burned by fire is projected to increase. Work by the Canadian Forest Service predicts the more "monster fires" in the future.

Forest Fire Suppression Costs – costs will increase substantially as the area burned increases as a result of more intense fires which tend to consume a significant (40 – 70 percent) of direct suppression costs.

Wildland Urban Interface – as more baby boomers become of retirement age and more real estate developments are set in a forest setting, growing pressure will be put on fire agencies to be capable of responding to fire starts in these areas.

Climate change impacts – the jury is still out on the impact of forest fires and the role it may play in follow-up agreements to the Kyoto protocol. From a policy perspective, fire suppression could wind up forming part of Canada's response to future commitments.

Forest Industry Growth – Due to industry development in the prairies and product diversification in traditional regions forest industry growth continues. This might be lessened in the short term if the softwood lumber dispute continues to place Canadian industry in jeopardy.

Other Uses of the Forest - Increased visitation to national and provincial parks can be seen as a proxy for wilderness use. This is expected to increase as the boomer generation retires. This creates the need for increased capacity to be able to manage fire on the landscape.

Growing Aboriginal Population – Canada's Aboriginal population continues to grow at a rate that is eclipsing the rest of Canada's population. These people are primarily located on reserve lands most of which is in embedded in Canada's boreal forest. There is also a significant rate of unemployment in this group, 42 percent of which are under the age of 19.

Contribution to the Canadian Economy Contingent on Forests – Canada's forests and the activity that they sustain are one of the key economic drivers in the Canadian economy. In 1999 total gross output reaches almost $70 billion, employing 339,000 people. It is the largest contributor to Canada's balance of trade. In some provinces, particularly Quebec, British Columbia,
New Brunswick and Alberta, it is a main driver of economic growth and employment.

ECONOMIC IMPACTS OF PLAN EXPENDITURES

The impact of the one-time expenditures is estimated at close to $2.0 billion creating over 13,000 person years of work. Household income is estimated at close to $600 million. The impact of ongoing expenditures arising from the plan is estimated at $181 million creating over 1300 person years of work and $45 million in household income.

PERFORMANCE IMPROVEMENT

The impact of these investments in Canada's forest fire management system is expected to have a synergistic effect, such that the sum of the investments will equal more than the individual investments if viewed separately. Based on analysis from a fire modeling program three major performance improvements might be anticipated:

1. A decrease in the variable costs by all agencies across Canada - a 5-10 percent decline in the variable cost is achievable within a 5-10 year period (upon the full implementation of the Plan). This amounts to $12.5-25 million of annual saving.
2. A decrease in the percentage of escape fires-currently, the rate of escaped fires average 3 percent and it is suggested that the rate can drop to 2 percent. The projected drop will lead to a decline in variable costs by as much as $83 million per year.
3. A decrease in the total area burned-implementation of The Strategic Plan will lead to a reduction in the area burned annually. A 10 percent reduction in the average total area burned is achievable.

CONCLUSION

Sustainability of our forests as a national asset may be threatened if action is not taken now. Current approaches without long-term vision and leadership in the creation of the fire management programs of tomorrow, will eventually lead to catastrophic fire seasons where even the best equipped agencies will be unable to cope with circumstances.

The best forest fire minds in Canada have collaborated on the creation of a blueprint for the future of Canada's forest fire management system. The Plan recognizes that new approaches must be developed that contribute to our ecosystem's health, while at the same time, protecting one of the most significant economic drivers in the economy. The plan takes into account a number of trends and developments that will increase pressure on fire agencies to be better able to manage fire on the landscape.

Protection of communities and the other values contained in our forests is a key outcome of the Plan. Numerous northern communities are linked to the health of our forests and are considered dependent on protected forests. Aboriginal interests in this initiative are strong – jobs for young aboriginals along with protection of their communities are key outcomes. Environmental protection, conservation of natural spaces and natural resources management are rapidly becoming public priorities as the value of our natural resources increase and international agreements regarding carbon emissions materialize. Canada's pre-eminence in fire science and research could eventually be restored, as universities and fire agencies collaborate to improve forest fire management practices.

Although it is envisioned that full implementation of The Strategic Plan will take several years to complete, it is crucial that commitments be established now to ensure agencies are capable of providing the protection where needed and are also capable of managing fire on the landscape in the years ahead.

By the end of the decade, Canada should have in place a forest fire management system that can deal with expected pressures and demands for the succeeding generation of Canadians.

In relative terms the plan is expensive, but the justification for taking these steps are well thought out and supported. The benefits will accrue to all Canadians whether they work

directly in the forest industry, or in one of our many parks, or enjoy being able to live in a forest setting or as a visitor to Canada's wilderness.

Bumps along the way caused by economic downturns must not deter Canada's governments from doing the right thing for fire management. Commitment and leadership at federal, provincial and territorial levels is required.

CIFFC believes this Strategic Plan can be looked upon as the blueprint to a future where our forests are healthy, where fire is recognized as an essential part of the ecosystem and where values that require protection receive the protection they need.

CURRENT STATUS

The Strategic Plan made visits in 2001 and 2002 to Canada's Council of Forest Ministers (CCFM). This Council is comprised on Ministers from all provinces, territories and the federal government responsible for Canada's forests. While the plan received unanimous support from the Ministers, adjustments and modifications were needed. In particular, additional research was required into the potential benefits of the Plan and examination of the priority placed on moving the Plan forward by the various levels of government.

Another challenge in moving the plan forward to implementation, is that while both levels of government share responsibility for forest management, delivery of forest fire programming is the jurisdiction of provinces and territories. Getting federal support for the plan then, requires connecting the Plan's benefits to federal priorities. This includes highlighting linkages to federal priorities in such areas as: leadership of national level initiatives; improving the conditions of Aboriginal peoples; management of the Canadian economy including the creation of employment; health and safety of communities; support to Canada's manufacturers of forest fire equipment; investing in Canada's scientific research community; and protection of federal lands from fire (e.g. national parks and Defence lands).

As the plan's initiatives connect to the mandate of several federal Ministries, finding a champion at the federal level to successfully lead this initiative through the federal process of determining priorities and allocating funding has been difficult. In June, representatives fire agencies met with the federal Minister responsible for forests. Minister Dahliwahl committed to working with agencies to see how the Canadian Forest Service (CFS) could adjust its programming and align itself with the Plan. The Minister also committed to appointing a point person within his Ministry that could help facilitate meetings between CIFFC member agencies and various Ministries that would have an interest in the Plan's initiatives (e.g. Meteorological Services of Canada; Indian and Native Affairs; Industry Canada).

Lastly, finding funding for such a large initiative will be difficult when placed amongst all of the priorities and interests of the federal government. Health care, SARS, the spread of Mad Cow disease, security from terrorist groups to name several of the more prominent issues have all impacted the ability of other initiatives to make headway.

Still, fire agencies will not be easily deterred. A third visit to CCFM is planned for the fall of 2003. At that time provincial agencies expect to have met with the point person in CFS and began to schedule meetings with the other federal Ministries that have an interest in the Plan. There is a possibility that some of the "low hanging fruit" in the plan can be "picked" and brought forward. Longer term initiatives are also underway with several agencies actively exploring approaches to replace aerial fleets; aboriginal initiatives are under way in several

provinces; and fire science investments are being made. Canadian manufacturers are also helping to move the plan forward by working with Federal Ministers and showing their support for the Plan.

As it is with any large initiative, timing, patience and perseverance will be the key to finding success. Fortunately in their daily lives, fire organizations are blessed with many individuals who have these qualities in abundance, and who now are prepared to put the same effort they put into fighting a large escaped fire into seeing the Strategic Plan come to life.