The Canadian Wildland Fire Strategy: A Vision for an Innovative and Integrated Approach to Managing the Risks

A report to the Canadian Council of Forest Ministers, prepared by the Core Group of the Canadian Wildland Fire Strategy Assistant Deputy Ministers Task Group:

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Abstract

This report summarizes the conception and development of proposed new approaches and methodologies for the future management of wildland fires in Canada. Recognizing that emerging challenges dictate that future fire issues cannot be adequately addressed using past and present methods, the provincial, territorial and federal governments in Canada have worked together over the past two years to develop a new Canadian Wildland Fire Strategy (CWFS). While past fire management policies have been relatively successful, there is a growing consensus that the vulnerability of people, property, and natural resources to wildfire has reached an unprecedented level and is projected to continue to rise rapidly. Climate change is expected to result in more frequent and severe fires, often through interaction with growing areas of flammable forests resulting from spreading insect infestations. Expansion of wildland-urban interface areas in Canada is proceeding unabated, with a growing number of homes, cottages and businesses now located in or near flammable forests. At the same time, Canada's current fire suppression capacity is eroding as aircraft, equipment, and equipment are aging, and experienced fire management staff retire.

With the signing of the CWFS Declaration in late 2005, provincial, territorial and federal ministers committed to a shared vision, and agreed to approach their respective governments to invest approximately $2 billion over the next 10 years to implement the CWFS. This proposed joint cost-shared program would target the following four main objectives:

- a public awareness campaign about the role of wildland fire and the associated risks;
- a Canadian FireSmart initiative with activities that empower individuals and communities to directly reduce the risk from wildfire;
- an improved preparedness and response capability through, for example, replacement of aging aircraft and equipment, plus a stepped-up recruitment and training program; and
- the development and application of new science and technology in support of early warning systems, better predictive models, and the increased use of prescribed fire.

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Introduction

Fire is a natural and essential ecological process in most of Canada's forests; however, as was vividly illustrated during the 2003 fire season in western Canada, it can also have undesirable social and economic impacts. Balancing the potential benefits and detriments of wildland fire is a complex and at times daunting task for land, natural resource, and fire managers, but one that is vital to public safety and the sustainable management of forests and wildlands. Therefore, under the direction of the Canadian Council of Forest ministers and in accordance with current jurisdictional mandates, the federal, provincial, and territorial governments within Canada have been co-operating on the establishment of the Canadian Wildland Fire Strategy (CWFS). The CWFS will seek to balance the social, ecological, and economic aspects of wildland fire to deal with both the root causes and the symptoms of current and potential fire management issues. It is designed to facilitate the development and implementation of an innovative approach to wildland fire management in Canada that will:

- foster resilient communities and an empowered public,
- develop healthy and productive forest ecosystems, and
- incorporate modern business practices

This report describes the current state of wildland fire and its management in Canada, a vision for a desired future state, and recommendations on how to initiate the necessary changes over the next 10 years.

Wildland Fire Management in Canada

The Role of Fire in Canadian Forests

More than 93% of Canada's 402 million hectares of forests and other wooded land is in the public domain. The vast majority is owned and managed by provincial and territorial governments, with a small proportion (e.g., national parks and First Nations lands) under federal responsibility. The remaining 7% is privately owned.

Although governments continue to search for a balance among preservation of environmental quality, enhancement of economic wealth, and development of social benefits for the well-being of all Canadians, the economic importance of Canadian forests is beyond question. Canada's $82 billion forest industry directly employs more than 376 000 people and contributes $33 billion to Canada's gross domestic product. In addition, more than 300 communities depend on the bounty of the forest for their livelihoods. The economic and recreational importance of forests and the need to protect life and property are the primary reasons that Canada has developed some of the world's most sophisticated forest fire management programs, and why forest fire management activities conducted by the provinces, territories, and Parks Canada constitute the most expensive element of forest management in Canada. In an extreme fire season, fire suppression expenditures can reach $1 billion, with hundreds of millions of dollars of damage to public and private resources.

Fire has played a dominant role in the evolution of Canada's forests since the last Ice Age, about 10 000 years ago. Fire is particularly significant in the vast boreal region, where species such as pine, spruce, birch, and aspen not only have adapted to fire but also rely on high-intensity crown fires for regeneration. Periodic lower-

intensity fires have historically maintained surface fire regimes in most other forest regions of Canada. Expansion of the forest industry over the past century, in many cases achieved by capitalizing on increased timber supply due to reduced fire activity, has resulted in the forest sector becoming one of the largest contributors to Canada's economy. Reconciling the role of fire in maintaining the ecosystem with the need to protect life, property, and other values at risk is a complex challenge.

Evolution of Canadian Wildland Fire Management in the 20th Century

Before European settlement of the country, the character of Canada's forests was shaped primarily by natural forces such as fire, insects, disease, wind, and natural regeneration. Early settlers used fire extensively to convert forested areas into farmland, but numerous disastrous wildfires, the adopted European approach to fire exclusion, and an expanding forest industry led to the development of fire control agencies across the country in the early 1900s.

Increased access to and use of Canada's forests for industrial and recreational purposes spawned a rise in both forest fire incidence and fire suppression capabilities. The primary objective of fire agencies was to control all wildfires through early detection and initial attack when the fires were small — the "hit-them-hard, hit-them-fast" approach. During the late 1970s and early 1980s, it became apparent in Canada that total fire exclusion was neither economically feasible nor ecologically desirable. There was also an expanded awareness of the important role of natural disturbances in maintaining ecosystem health, productivity, and biodiversity. This awareness fostered a new fire management strategy in which consideration is given to the ecological role of fire, the economics of suppression, and the priority of values at risk. Currently, the wildland–urban interface (WUI) (where structures are adjacent to or intermixed with flammable vegetation) and high-value forest industry and recreational sites receive intense protection, whereas fire is often allowed to behave more naturally in non-commercial areas such as wilderness parks or remote forest areas of limited economic value.

Although Canada shares many characteristics with other countries in the Arctic and north temperate zones, it is unique from the perspective of wildland fire, because of the following characteristics:

- low population density, except for southern Canada
- range of low- to high-value resource areas
- well-developed technological infrastructure
- vast areas, coupled with limited human and financial resources
- long, often roadless, distances to be patrolled and accessed for fire control
- numerous lakes and rivers in the east, fewer lakes and rivers and rugged terrain in the west
- numerous human and natural ignition sources
- boreal forests with a tendency to experience stand-replacing crown fires

- occasional periods of extreme fire weather

In Canada, responsibility for forest and fire management rests with each of the 13 autonomous provinces and territories. The federal government is responsible for fire management in the national parks, where a greater emphasis is placed on the use of prescribed fire. Annual fire suppression costs are rising constantly in Canada and currently average about $500 million, not including public and industrial losses. Four provinces with large fire management organizations — British Columbia, Alberta, Ontario, and Quebec — generally account for about 80% of total expenditures in Canada.

In 1983, the Canadian Committee of Resource and Environment Ministers created the Canadian Interagency Forest Fire Centre (CIFFC). Located in Winnipeg, this not-for-profit organization is a co-operative of federal, provincial, and territorial member agencies. CIFFC contributions to fire management include coordinating information and resource exchanges, setting national standards for equipment and training, formulating working groups to address common interagency issues, and serving as a contact point for international requests and co-operation. CIFFC's role is vital to helping agencies to efficiently respond to extreme fire events that are beyond their respective internal capacities.

Canadian Wildland Fire Research in the 20th Century

Fire scientists and operational fire managers in Canada have always worked closely together to develop innovative fire management tools, systems, and techniques. The federal government program, initiated in 1925 and now the mandate of Natural Resources Canada's Canadian Forest Service, represents the country's largest and most continuous commitment to wildland fire research. It is complemented by fire research programs within some provincial and territorial fire management agencies, universities, and other organizations.

Early Canadian fire researchers studied the relationship between weather and forest flammability. These fire danger studies resulted in a national system of fire hazard rating that has evolved over the years and is now part of the Canadian Forest Fire Danger Rating System (CFFDRS). Wildland fire management agencies use the CFFDRS in planning and in operational fire suppression activities, predicting the number and location of fires, organizing detection patrols, and pre-positioning resources in anticipation of fire activity. The CFFDRS is used in Canada (where a federal review determined that at least $750 million in benefits could be attributed to its use from 1971 to 1982), New Zealand, Portugal, the United Kingdom, Southeast Asia, and parts of the United States, with many other countries assessing its applicability.

Fire suppression research also contributed to the development of fire retardant chemicals and standards for testing the specifications and performance of portable fire pumps and accessories. In the 1960s, federal regional laboratories were set up across Canada to provide continuous contact with provincial forest management agencies and to augment fire research programs at two national institutes (which have since closed). Substantial fire research activities have continued at these centres in the areas of fire danger rating, prediction of fire occurrence and behaviour, fire growth modelling, fire ecology, fire suppression technology, and computerized fire management systems.

The federal fire research program continues to evolve and is part of collaborative, cross-disciplinary initiatives addressing emerging issues such as climate change impacts, carbon budgets, socio-economic impacts of fire, and application of advanced technologies. Universities have taken an increasingly active role in fire research, especially related to forest ecology and biodiversity, while provinces, territories, and operational research organizations are addressing relevant fire suppression questions.

Extent and Impact of Wildland Fires in Canada

On average since 1980, 8 600 wildfires have burned 2.5 million hectares each year (fig. 1). The area burned by wildland fires fluctuates greatly, from under 0.3 million hectares to more than 7.5 million hectares in extreme years, and there have been increases in reported area burned over the past three decades. Lightning is responsible for an average of 35% of Canadian fires, yet these fires account for 85% of the total area burned, since they often occur in large numbers over wide areas, a situation that presents access problems not usually associated with human-caused fires. Although these statistics apply to Canada as a whole, in some regions of the country almost all fires are caused by people. Canada's wildland fire suppression systems are largely successful, and the vast majority of fires (about 97%) are contained at less than 200 hectares. However, the approximately 3% of fires exceeding 200 hectares account for 95% to 98% of the total area burned (fig. 2). Canada's initial-attack success is similar to that in the United States and Australia, which also have sophisticated fire suppression programs. Fires in excess of 100 000 hectares are not uncommon in Canada, and fires exceeding 1 million hectares have been recorded, most of them occurring in the remote "modified suppression" zones, primarily in the northern regions of western and central Canada.

In the past decade, as development has expanded into flammable landscapes, wildland fires have had a growing impact on communities and homeowners. Wildland fires consistently threaten Canadians, with an average of more than 20 communities and about 70 000 people affected annually. In addition to the direct threat to people and property, exposure to wildfire smoke often causes health concerns. The threat of wildfire in the WUI was graphically illustrated in the summer of 2003 when widespread extreme fire danger conditions and multiple ignitions in western Canada overwhelmed initial attack capabilities. In British Columbia alone, 334 homes and 10 businesses were destroyed, more than 45 000 people were evacuated, and the total economic impact on the province was measured in the hundreds of millions of dollars. This was one of several fire events that attracted significant public, media, and political attention in 2003 and that served as a major catalyst to develop a new vision for wildland fire management for Canada.

The Changing Context

Since the 1980s, the complexity of wildland fire management has increased rapidly as a result of many social, economic, political, and ecological factors. First, there was a shift in resource management philosophy toward sustainable development, which introduced an integrated web of multiple and at times conflicting social, economic, and ecological demands that wildland fire management policies and activities have had to attempt to reconcile. In particular, this new philosophy

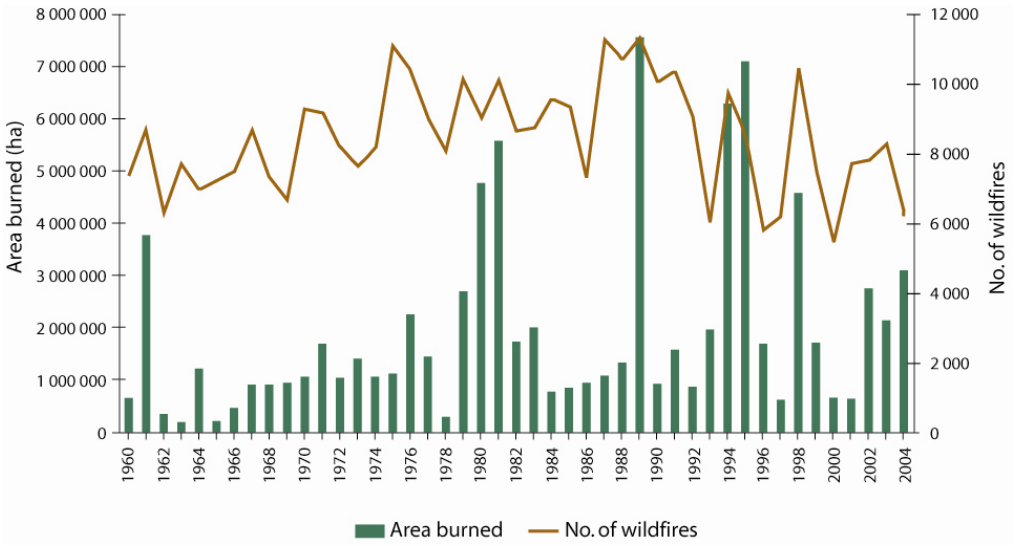

Figure 1—Area burned and wildfire occurrence statistics for Canada.

acknowledges the dynamic nature of forest ecosystems and the need to manage for the good of both present and future generations.

Second, the globalization of the forest industry is affecting Canada's market share, moving the industry toward greater consolidation as it tries to remain competitive. The pressure for a secure wood supply is perpetuating the demand for fire exclusion, even where it is not physically or economically possible, let alone ecologically desirable. Third, more people are living in the WUI. Throughout the country, especially in Ontario and Quebec, the sale of recreational properties is booming, and in parts of western Canada there is rapid growth in the number of permanent and seasonal residences being built in or near the forest. In addition, Aboriginal communities, 80% of which are forest-based, are growing rapidly. Unfortunately, most newcomers to forest living have little or no awareness of the role of wildland fire and its potential dangers. The situation is akin to living next to the ocean and being unaware of the tides.

A fourth factor is the information explosion. The Internet and 24-hour news channels tend to feature the sensational, negative side of wildland fires, with little recognition of their ecological benefits. The access to and desire for information places new demands on politicians and practitioners, who may have limited experience in media and public relations; however, it also provides a significant opportunity to bring complex issues to the public's attention.

Emerging Issues, Challenges, and Risks

Public values and attitudes concerning the forest and its management are constantly changing. Current approaches to solving forest-related issues need to be adapted and upgraded to meet the needs of tomorrow. Any strategy for the wise use of the forests must solve current challenges while providing a living legacy for generations yet to come.

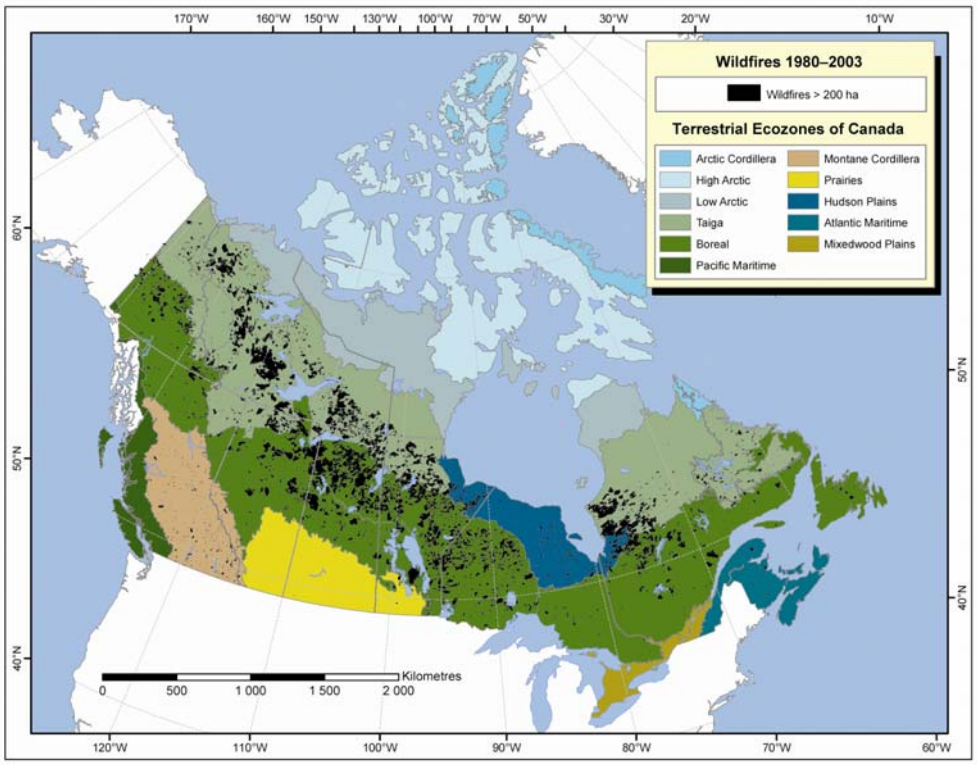

Figure 2—Wildfires with area greater than 200 hectares in Canada.

Managing Public Risk and Expectations in the Wildland–Urban Interface

Many homeowners and local governments have inadequate knowledge of the risks of wildland fire and associated management strategies. For example, few new communities have building codes requiring that homes be resistant to wildland fire or requirements for management of forest fuel. Hazard-mitigation programs are being initiated on a limited scale by a number of provincial, territorial, and municipal agencies, but in the absence of pan-Canadian technical standards. Also, forest-based communities in Canada require protection not only from the direct threat of fire but also from the indirect impacts that threaten the resource that sustains these communities (fig. 3).

Forests under Stress

The attempted exclusion of fire in some regions of Canada has led to a shift to older forests. This shift could lead to significant changes in wildfire potential, with fires of higher intensity resulting from changes in fuel structure and quantity. Changing forest conditions can also encourage infestations of insects, such as the mountain pine beetle and spruce budworm, which could lead to large fires fuelled by excessive dead woody material.

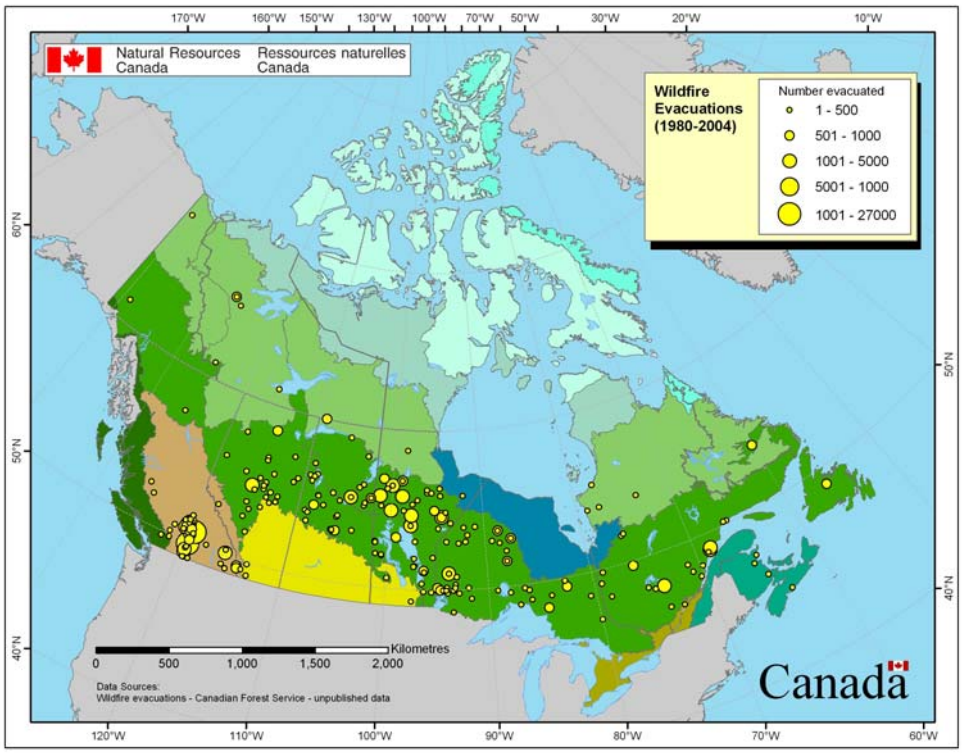

Figure 3—Wildfire evacuations for public safety in Canada.

Competition for the Forest Land Base

In many regions of Canada, most of the economically accessible, merchantable forest area has been designated for commercial harvest, for other competing land uses (such as other natural resources and non-timber forest products), or for protection (e.g., parks or wilderness). There is also significant pressure for more forest areas to be set aside for such uses as recreational activities and conservation of biodiversity. In addition, Aboriginal groups are seeking expanded access to forest lands for traditional pursuits. All of these factors have eliminated the buffer stocks that have historically been available to forest and land managers to off set major losses to wildland fire.

Public Expectations in Resource Management

The public and various stakeholders are becoming increasingly involved in resource management decisions, but they typically consider the protection of their values a government responsibility. Wildland fire management has become an issue for local, provincial, territorial, and federal governments, which must together effectively engage all constituents and stakeholders to share and manage risks.

Climate Change

Climate change research indicates that the incidence and severity of wildfires will greatly increase over the next century (by one estimate, the area burned annually in Canada could double by 2040), which will make sustainable forest management as it is currently practised particularly difficult. There will be extreme pressure on

Canadian wildland fire management agencies, because today's fire suppression practices will not be as successful and current performance objectives may not be attainable under a warmer and drier climate. Such pressure will have a direct effect on wood supply and the competitiveness of the forest industry and will in turn affect forest-dependent communities. Warmer, drier conditions could mean more frequent fires, a shift toward younger forests, and a decrease in carbon storage. Increased carbon emissions through more severe forest fires and increased vulnerability of carbon-rich peatlands to future burning under drier conditions may affect Canada's commitment to carbon sequestration and emissions reductions under the Kyoto Protocol.

Infrastructure of Forest Fire Management

The ability to manage wildland fire in Canada becomes more limited with increases in fire incidence and values needing protection. The effectiveness of suppression as practised today is near its physical limit; therefore, future gains achieved with current approaches will be smaller and costlier than in the past. Current suppression capacity is eroding as aircraft, facilities, and equipment age, while fire management costs are on the rise and fire management agencies frequently experience government constraints on their fixed budgets. Equally challenging are the current demographic characteristics of fire management personnel in Canada, with well-trained and experienced staff retiring and a limited ability to recruit adequate replacements in a competitive marketplace.

Desired Future State

The CWFS is intended as a catalyst to help all Canadians understand and manage the presence of fire on the landscape. It will facilitate the setting and implementation of policies that are integrated and accounted for within comprehensive forest and land management plans seeking to balance the social, ecological, and economic aspects of sustainable forest management (fig. 4).

Resilient Communities and an Empowered Public

Canadians will become knowledgeable about the role of wildland fire on the forest landscape, its characteristics, the capabilities of fire suppression, and the potential impact of fire on ecosystems, communities, and individual homes. Responsibility for the development of resilient communities and for empowerment of the public is shared among individuals, communities, industries, and governments through a comprehensive set of actions in accordance with a risk management framework (i.e., mitigation, preparedness, response, and recovery).

Healthy and Productive Forest Ecosystems

Fire exclusion policies, heavily influenced by the European views of the past, will give way to an era of well-conceived wildland fire management in which policies reflect an understanding and acceptance of fire as maintaining Canada's healthy and diverse ecosystems. Adaptive management will maintain or enhance the ecological integrity and productivity of forest ecosystems while protecting the

material values of society. When large, uncontrollable wildfires occur, more emphasis will be placed on the protection of point values (such as homes, key watersheds, and critical stands of timber) and less on high-cost, low-probability fire control techniques. The effectiveness of fire suppression will increase when it is used in combination with proactive mitigation strategies such as fuels management.

Modern Business Practices

Wildland fire management agencies will be adaptable, continually upgrading their policies and practices to ensure public safety and security while facilitating the process of fire as a regenerator of healthy forests. All stakeholders will share expertise and resources in a culture of continuous improvement founded on the principles of risk analysis, risk management, and science and technology. Such sharing will be facilitated through effective partnerships and innovative institutional arrangements and will lead to an economically efficient process for continuous improvement, development of innovative policies, and maintenance of Canada's state-of-the-art wildland fire preparedness and response capability (in terms of both people and equipment).

Moving Forward

A new approach to wildland fire management in Canada will require changes in the attitudes and actions of individuals, stakeholder groups, the private sector, and governments. The underlying tenet is that managing the risks from wildland fire is a shared responsibility needing integrated and co-operative actions. Two specific elements have been identified as prerequisites for moving wildland fire management from its current state to the desired future state, namely, a common set of principles that provincial, territorial, and federal governments will strive to achieve and a comprehensive set of strategic objectives that organizations will commit to

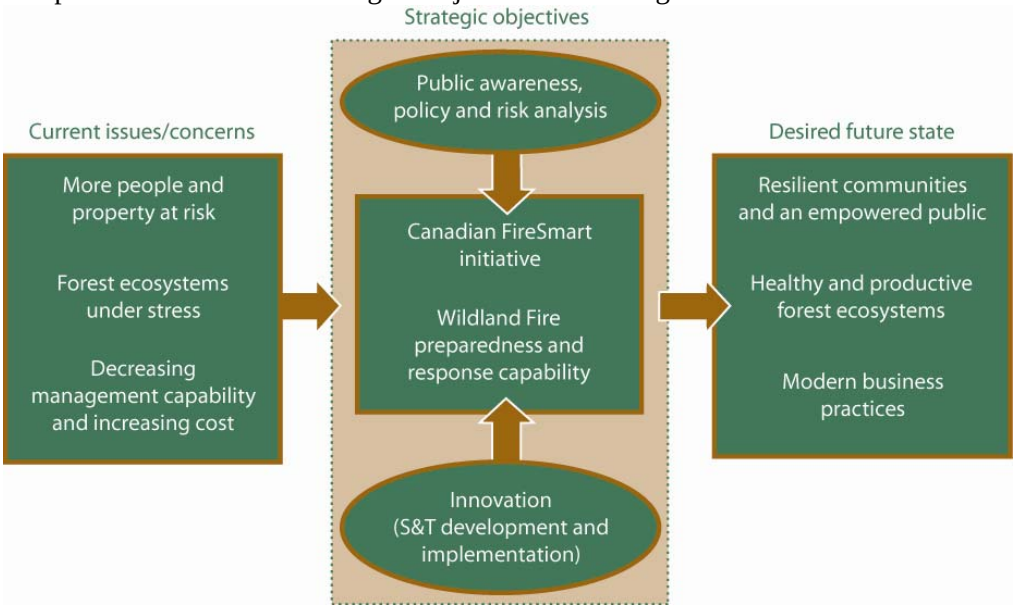

Figure 4—Strategic objectives to facilitate the transition from the current state to the desired future state. S&T = science and technology.

implementing through independent, collective, and/or bilateral activities. The latter element will require significant financial resources (likely in excess of $1 billion over the next 10 years), but these investments will accelerate the ability to enhance wildland fire management polices and practices.

Principles of Wildland Fire Management in Canada

To move forward, federal, provincial, and territorial governments must agree on the following principles:

- Public safety — including the safety of firefighters — is paramount.
- Fire is an essential ecological process that contributes to the productivity, health, and biodiversity of the forests.
- Unwanted wildland fires can have a negative impact on public safety (including threats to security, health, and life), property, resources (including timber), services (including recreation and tourism), and non-market values.
- The responsibility for reducing risk from wildland fire is shared among individuals, communities, the private sector, and governments, according to jurisdiction and mandate.
- Wildland fire management, including the use of fire as a land management tool, is an integral component of land and resource management.
- Comprehensive risk management approaches, including an appropriate mix of mitigation, preparedness, response, and recovery, are required to manage wildland fire.
- Interagency and intergovernmental co-operation and common technical standards, shared across Canada, improve the efficiency and effectiveness of wildland fire management.
- Innovation and evaluation are essential to ensuring the continuous improvement of wildland fire management policies and practices across Canada.
- Governments and the private sector have responsibility for forest fire management on their respective lands, which the CWFS will respect.
- The Strategy will also respect, through collective and/or bilateral agreements, governments' jurisdictions and their policies, laws, regulations, and implementation needs.

Strategic Objectives

To achieve the desired future state, four strategic objectives have been identified as essential. Two of these are fundamental enablers of change: public awareness, policy, and risk analysis; and innovation. The other two, a Canadian FireSmart initiative and an enhanced wildland fire preparedness and response capability, will foster immediate action on the most urgent issues and concerns. For each objective, a suite of activities will contribute to the mission of developing resilient communities

and an empowered public, healthy and productive forest ecosystems, and modern business practices.

Specifically, the CWFS implementation plan will include an adapted set of actions, initiatives, or programs developed through collective and/or bilateral agreements among governments. The following actions or initiatives are examples that could contribute to this mission.

Resilient communities and an empowered public

- Inform and engage the public through wildland fire awareness and information initiatives and communicate the appropriate response concept to professionals, politicians, and the public.
- Share responsibility through development of integrated government policies clearly defining the risks, roles, and responsibilities of all constituencies (individuals, communities, industries, and governments).
- Minimize the risk to public safety and property by developing and implementing a Canadian FireSmart initiative with distinct components addressing mitigation, preparedness, response, and recovery.
- Initiate a directed and integrated program of physical and social science research and technology transfer on WUI issues.

Healthy and productive forest ecosystems

- Integrate land, forest, and fire management policies and practices such that fire management policies and actions are derived from explicit land and forest management objectives. In addition, ensure that land and forest management policies consider the biological, ecological, and physical characteristics of wildland fire.
- Reintroduce and/or maintain fire on parts of the landscape by appropriate means, including prescribed fire, with the goal of maximizing biodiversity, ecological integrity, and productivity in fire-dependent ecosystems.

Modern business practices

- Maintain an economically efficient and world-class wildland fire preparedness and response capability through long-term replacement of deteriorating equipment and infrastructure, implement Canadian training standards, and recruit and train personnel at universities and community colleges.
- Build effective partnerships and innovative institutional arrangements for reducing interannual variability of wildland fire management expenditures through the development and use of a Canadian interagency operational preparedness system, and foster effective communication and adaptive management through Canada-wide workshops and information-sharing sessions.

- Develop innovative risk- and cost-sharing approaches consistent with insurance principles.
- Adopt a culture of continuous improvement in policy and practice by establishing a collaborative analysis group to carry out policy assessments and analyses of level of protection, and initiate a directed program of fire science and innovation coupled with a comprehensive program of technology transfer.

Conclusions

The presence of wildland fire on the Canadian landscape will continue and, in all likelihood, increase. Attempting to eliminate wildland fire to reduce its impact is no longer a reasonable solution. As citizens within a knowledgeable society, Canadians must seek to discover how to coexist with this natural process. Some adaptations will happen quickly and others will take time, but with the right mix of principles and actions over a 10-year period, institutional and individual inertia will be overcome and Canada will be headed down this new path. Both the root causes and the symptoms of the issues must be addressed in an integrated manner. There is no single solution, because this is a complex challenge occurring within a dynamic and highly variable environment; however, by working together, Canadians can effectively manage the risks associated with wildland fire by implementing the innovative and integrated elements of the CWFS.