From the Other Side of the Ledger: The Industrial Benefits of Wildland Fire Management in Canada

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Introduction

Although typically thought of in terms of its costs, fire management in Canada is also a source of economic activity and industrial benefits. In Canada, direct costs for wildfire suppression typically range from $400 million to $800 million per year. Costs depend largely on the severity of the fire season, as well as the threat posed to property or other assets. For example, in the 2003 fire season, fires in British Columbia affected extensive areas of forest and several communities in southern BC, resulting in some of the highest firefighting expenditures ever required in the province (BCMFR 2006). At first glance, it would appear that the industrial benefits of fire management could be determined by examining total public expenditures, and the industrial sectors in which those funds are spent. However, the benefits of fire management are widespread and multifaceted, extending beyond those incurred directly during a fire. Economic activity occurs and industrial benefits are created through all four stages of fire management: preparedness, mitigation, response, and recovery. The expenditures resulting from fire management, including those for employment and equipment purchases, support a number of sectors of the Canadian economy and can provide direct benefits to forest-dependent communities. In addition to economic activity, fire protection also helps to support the sustainability of Canada's forest industry. At the same time, benefits flow from the presence of fire on the landscape.

This paper briefly examines a variety of industrial benefits that can be attributed directly and indirectly to fire management in Canada. It is divided into four main sections: fire-fighting equipment and infrastructure, fire-fighting employment, benefits and costs of fuel reduction and risk abatement, and other benefits from fire and fire management. For the purposes of this discussion, fire management is defined as managing fire on a given landscape, specifically, carrying out prescribed fires, thinning forests, and deciding which fires to fight and which to let burn. Benefits from some of these activities clearly depend on one's perspective. While government spending on fire management can benefit the sectors in which money is spent, these activities may be financed through taxes that are a cost to other sectors or the overall economy. Considering the wide range of economic, social and ecological benefits that Canada's forest endowment helps to generate, fire management can also be thought of as a cost associated with the overall business of managing forests for multiple benefits. However, estimating the total industrial benefit or the net benefits of fire management is beyond the scope of this paper. Instead, the principal objective is to offer a different perspective on an aspect of the forest industry that is traditionally understood simply in terms of costs.

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Fire-Fighting Equipment and Infrastructure

A substantial network of infrastructure and equipment exists to support Canada's wildfire management programs. The total dollar value of equipment, supply caches, repeater networks, air tanker bases, and other infrastructure is likely in the hundreds of millions of dollars (P. Fuglem, BC Ministry of Forests and Range, electronic mail, 29 April 2005). Canada has a fleet of more than 50 CL-215 and CL-415 water bombers, as well as several land-based air tankers (CIFFC 2005). Bombardier Inc. (formerly Canadair) of Montréal, Quebec, manufactures the CL-215/CL-415. The CL-215 was produced from 1969 to 1989, and 125 aircraft were sold for use in Canada and abroad. Production of the CL-415 began in the 1990s, and as of 2001, 17 aircraft were in use in Canada and 36 abroad (Bombardier Inc. 2005). In 1998, the province of Ontario purchased 9 CL-415s at a total cost of $225 million (including training and maintenance). This expense was offset through an agreement whereby Bombardier would buy back the existing CL-215 fleet and conduct the final CL-415 assembly in Ontario, creating approximately 50 local jobs (MNR 1998). Table 1 shows the total number of CL-215 and CL-415s in use as of 2001.

Canadian companies are involved in the manufacture of other aircraft used in fire management, such as the Convair CV580, which is modified for use as a water bomber by Kelowna Flightcraft and Conair Group Inc. in British Columbia. Although much of the water bomber fleet is owned and operated by provincial fire agencies, some private companies (particularly in the west) make water bombers and spotter planes available on a contract basis e.g., Flying Tankers Inc. and Conair Group Inc. in British Columbia; Air Spray Ltd. in Alberta; and Forest Protection Ltd. in New Brunswick. Helicopters are also used extensively for patrols; for transporting crews; for delivering water, retardant, or other supplies; and for igniting controlled burns.

In 2004, fixed-wing water bombers logged approximately 6 000 hours of flying time in Canada, and rotary-wing water bombers (helicopters) logged over 18 000 hours of flying time (calculated from tabular data obtained from D. Bokovay, Canadian Interagency Forest Fire Centre, electronic mail, 11 April 2005). It is worth noting that the latter statistic does not include time for transporting crews to and from fires, time for daily patrols, or time when helicopters are on standby, which can accumulate to a significant amount of time and cost.

Canada's current inventory of other forest fire equipment is summarized in Table 2. Many of the items mentioned there are manufactured in Canada. For example, fire-line hose, relay tanks and power pumps are manufactured by Wildfire Equipment Inc. (formerly Wajax) in Lachine, Quebec. Fire suppression involves other equipment such as Caterpillars and backhoes for constructing fireguards and pickup trucks for transporting crews and equipment. Fuel for vehicles and equipment is also required, as is food and other basic supplies for crews. Workers require appropriate personal gear, including clothing, gloves, hard hats, and boots.

Fire fighting also involves the use of technologically sophisticated equipment such as two-way radios, global positioning systems (GPS), digital cameras, and personal computers. Various types of computer software, such as geographic information systems (GIS) are used to record spatial fire data, and specialized computer models have been developed in Canada to provide decision support to fire managers.

Table 1. Bombardier Inc. amphibious aircraft in service in November 2001

Location	CL-215	CL-215T	CL-415	Total
Alberta	6	0	0	6
Manitoba	7	0	0	7
Newfoundland	6	0	0	6
Northwest Territories	4	0	0	4
Ontario	0	0	9	9
Quebec	4	2	8	14
Saskatchewan	6	0	0	6
Canada (total)	33	2	17	52
United States	3	0	0	3
France	0	0	11	11
Greece	14	0	8	22
Italy	2	0	14	16
Spain	7	15	0	22
Croatia	2	0	3	5
Thailand	1	0	0	1
Total	62	17	53	132

Source: Bombardier Inc. (2005).

Table 2. Fire-fighting equipment used in Canada

Equipment type	Total quantity
Power pumps	10 737
Fire line hose (30 metre lengths)	221 242
Burn-out devices (e.g., drip torches and heli-torches)	2 724
Portable weather kits	134
Relay tanks	3 222
Sprinklers	8 873
Aircraft fuelling kits	56
Infrared units	86
Hand tools (e.g., Pulaski axes, chainsaws, backpack pumps)	84 634
Communication equipment (e.g., radios, repeaters)	7 009
Tents	7 738
Mess kits	4 292
Mobile camp trailers	125
Portable helipads	10

Source: CIFFC (2004).

Fire-Fighting Employment

Wildland fire fighting employs thousands of people in Canada. The work is typically seasonal, in accordance with the wildfire season. One estimate of the number of people directly employed in fighting forest fires in 2004 in each province is shown in Figure 1.

Other specialists and support staff are employed to manage fire operations, maintain equipment, and provide administrative support. It is estimated that fire management in British Columbia directly employs approximately 1 260 people (1 035 of which are seasonal), as well as providing contract work for several thousand additional firefighters and emergency crews (P. Fuglem, BC Ministry of Forests and Range, electronic mail, 29 April 2005). Also in British Columbia, approximately 360 aboriginal people obtain seasonal employment in BC's Native Unit Crew program, and there are 12 full-time positions for aboriginals in the Native Fire Prevention Technician program (MOFR 2005).

Many firefighters are hired in small, forest-dependent communities where well-paid jobs are scarce. For example, Fort Chipewyan, Alberta has a sub-office of Alberta Forest Protection with two full-time staff. During the fire season (May-September) the office typically hires ten or more employees from the local community (an eight person crew along with several support staff), and during severe fire seasons additional emergency firefighters and support staff are hired (Bauer, K. Alberta Forest Protection, telephone conversation on 22 February 2006). These jobs make an important contribution to the incomes of local residents in this isolated area. Wages for firefighters are also well above the minimum wage. An entry-level firefighter hired by the province of Ontario earns approximately $17 per hour (MNR 2003), and pay for experienced firefighters can be higher.

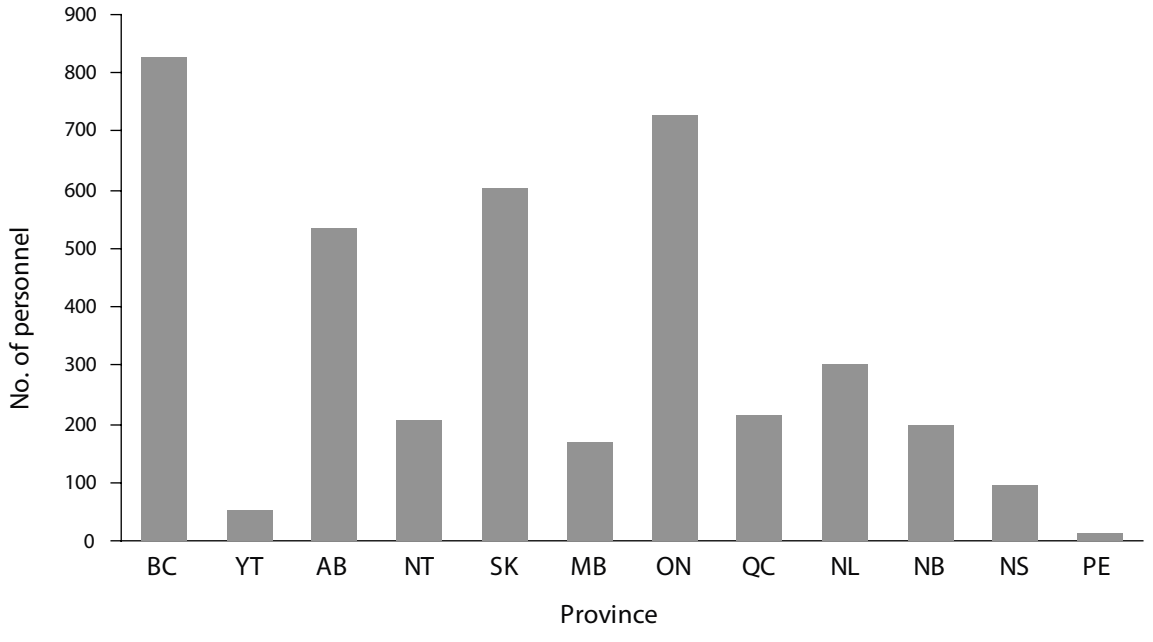

Figure 1. Fire-fighting employment in Canada. Note: Estimates do not include Parks Canada employees. Nunavut is not included due to the absence of a wildland fire management agency in the territory. Source: CIFFC (2004).

Benefits and Costs Associated with Fuel Reduction and Risk Abatement

Risk abatement activities, such as fuel modification, prescribed burning, and fireguard construction, may also provide periodic employment and economic benefits. As for other areas of fire management, the benefits and costs of these activities can be complex. A project such as stand-level fuel modification would have costs associated with planning, management, labour, and equipment needed to carry out the treatment. The costs might also include other impacts, such as disruptions to commercial recreation activity or short-term effects on water or air quality (e.g., because of smoke). Direct benefits could include revenue from merchantable trees harvested during the treatment, as well as any other resource improvements, such as improvements in grazing potential. The benefits of successful treatments might also include reduced suppression costs in the event of a fire, reduced potential for fire occurrence, or reduced likelihood of a highly catastrophic fire threatening property or human safety. If the stand is part of a commercial forest, fuel treatments may result in a greater probability of a profitable timber harvest in the future.

Nonmarket benefits could include aesthetic improvements and a return to more ecologically appropriate forest conditions. The skills and training obtained by workers may also represent a significant benefit. For example, Human Resources and Skills Development Canada and BC's Regional District of Central Okanagan are providing funding for fuel modification treatments in the Okanagan. The project has provided employment and training for 15 previously unemployed people (Seymour 2004).

Many of these costs and benefits can be extremely difficult to quantify, and even the direct cost of treatments can vary widely. Some of the factors that influence the net cost of fuel treatments include revenue from the sale of timber, the quantity of unmerchantable stems that must be treated, terrain conditions, transportation requirements, and the availability of skilled labour. Anderson (2004) documented costs for a variety of fuel treatments in the East Kootenays in British Columbia. Total costs for planning and treatments on 2 728 hectares averaged $214 per hectare, although the costs ranged from as little as $53 per hectare in some areas to over $400 per hectare in others. Prescribed burning in Canada's national parks costs an average of $80 per hectare though costs can range from as little as $10 per hectare to over $1 000 per hectare (Parks Canada 2004). In the United States, over 5 million hectares of forest has undergone fuel reduction and restoration treatments since 2000 (HFI 2005), and the USDA Forest Service (2004b) reported that fuel treatment programs had an average cost of US$420 per hectare in 2004. The USDA Forest Service (2005) also estimated that gross costs of fuel treatments under the US National Fire Plan could vary from approximately US$85 to US$2 500 per hectare.

Other Benefits from Wildland Fire and Fire Management

In addition to the obvious benefits from ensuring human safety and protecting property, wildland fire management helps to maintain the sustainability of Canada's forest industry. By controlling fires that threaten valuable timber or plantations, fire management aims to prevent catastrophic fires from compromising future harvesting opportunities and helps to ensure the continued existence of local forest industries and employment.

Managing wildfires in Canada also promotes investment in research and development. In fact, Canada is a leader in forest fire research. Research and investment involves various fields of study, including weather forecasting, GIS mapping, operational research, technology for suppression equipment, and fire behaviour. Some of the expertise and technology developed in Canada has been exported abroad or has attracted overseas funding. The Canadian Forest Service's Canadian Forest Fire Danger Rating System and Spatial Fire Management System have been adapted for use in several other countries, including Mexico, Indonesia, Malaysia, and New Zealand (CFS 2003). BC's Real-time Emergency Management via Satellite (REMSAT) project, funded by the European Space Agency, uses satellite-based communication, GPS, and imaging to provide advanced decision support to BC fire managers. Fire crews from abroad train in Canada, and Canadian fire management experts are regularly invited to speak at international conferences and to provide tours to visiting fire managers.

Wildfire leads to economic impacts in other areas. Although the impact may be negative in terms of damage to timber inventories and property, other industrial activities may occur after fires have been extinguished, and some positive benefits can occur from the impact of fire itself. Restoration activities may be undertaken after wildfires, including salvage logging, tree planting, and rehabilitation of disturbed soil. Wood that has been burned by a low-intensity fire has multiple uses, particularly for the pulp and paper industry (Watson and Potter 2004). In some areas wildlife habitat may be improved, including habitat for species that commercial tourism operators and guide outfitters rely on (Loomis et al. 2002). Growing conditions for wild mushrooms may also be enhanced by fire, providing opportunities for commercial mushroom harvesters. Canada's morel mushroom harvest comes mainly from western Canada (particularly the Yukon); harvesters seek out recently burned areas, where growing conditions are favourable for morels (Wurtz et al. 2005). Wills and Lipsey (1999) estimated that the combined BC and Yukon harvest can range from as little as 10 000 kilograms of mushrooms in a poor year to as much as 225 000 kilograms in a good year. Pickers receive an average of $3 per pound ($6.61per kilogram), and exporters sell morels overseas for $18 to $22 per pound ($39.67 to $48.48 per kilogram) (Wills and Lipsey 1999). These figures suggest that the morel industry in western Canada could be worth between $400 000 and $10 million in any given year.

Conclusions

In this paper, we have detailed various industrial benefits and economic activity resulting from wildfire and fire management. Understanding these benefits is important for stakeholders and policymakers who are helping to shape the future of fire management in Canada. While some of these benefits may not provide a basis in themselves for spending additional public funds on fire management, the benefits to industries, workers and local economies are an important impact from program expenditures. Benefits from the presence of fire in our forests must also be considered if money is to be spent influencing fire occurrence. Although the protection of lives and property will remain essential, there are benefits from ensuring that fire continues to play its natural role in forest ecosystems.

We have examined employment, equipment used, supplies purchased, and infrastructure necessary for fire management; however, more research is required to quantify the value of these items and how often they are purchased. This descriptive analysis provides evidence of the industrial benefits associated with fire management in Canada, but a more comprehensive analysis is needed for a complete understanding of these benefits.

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