AN URGENT NEED FOR A NEW FOREST FIRE RESEARCH VISION:
Forest Fire Danger Rating at the Millennium[1]

Context

Thirty three years ago CFS fire researchers met in Ottawa and agreed on a common goal – to develop a national fire danger rating system. This vision brought together researchers with diverse skills, experiences and personalities to develop the knowledge to create the present day Canadian Forest Fire Danger Rating System (CFFDRS). The CFFDRS turned out to be a unique accomplishment. It is the only truly national fire danger rating system in the world. It is used as the principal source of fire intelligence by all Canadian fire management agencies and has been adopted and adapted by several other countries and an increasing number of U.S. states. As computing and communications technology advanced, CFS fire researchers have built sophisticated fire management systems to manipulate data and display the CFFDRS outputs, which are widely used and have been transferred internationally.

While the CFFDRS and its ancillary products are worthy achievements (Van Wagner 1990), the job is far from done. Resource management agencies spend some $500 MM a year on fire management -- about half the forestry expenditures in Canada. The number of fire starts is and will continue to increase with population, without accounting for a changing climate. Government budgets are frozen or shrinking, and there is even greater need for efficient allocation of fire management resources. Every year, communities across Canada are threatened with evacuation in the face of forest fires, and increasingly homes are lost such as occurred on the Chisholm Fire in Alberta in 2001 and in southern British Columbia during the 2003 fire season. During the 2001 fire season, four wildland firefighters were killed in Washington state, only 10 kilometres from the Canadian border, bringing the wildland firefighter fatality toll in the U.S. to nearly 140 in the past 10 years. Canada has been very fortunate to have suffered so few wildland firefighter fatalities, but there have been many near misses and entrapments – for example, on the 2001 Chisholm Fire (Beck et al. 2001) and so we shouldn't believe it couldn't happen here. While greater understanding and ability to predict fire behavior won't avert all such incidents, it is a crucial to reducing the risk. Furthermore, over half of Canada's forests have little or no commercial timber value. Providing an appropriate fire management response in these areas frees up resources for protecting timber, communities and other values-at-risk from wildfire. Paradoxically, we need greater knowledge of fire behavior and risk assessment to intelligently to do no or less suppression in areas of low timber value than to dispatch an air tanker.

Today, fire and resource managers are faced with several complex questions such as:

- Can we protect communities and investments in managed forests more effectively through fuel treatments than fire suppression and how should they be done?
- How can we allow fire to play a more natural role in the vast areas of Canada that are not managed without endangering communities or other high value resources?

- Are Canadian firefighters at risk because our fire behavior prediction system does not apply to substantial areas of the Canadian forest and wildlands?

Strategic Objectives

Do these questions address strategic objectives? We think they do in part, but if not, do we have our priorities right? Developing knowledge to help fire managers across Canada protect life and property and help ecosystem managers use fire to maintain critical habitats and threatened species are surely important goals for sustainable forest management as protecting natural, commercial forests and plantation values.

Status

Addressing new questions such as those listed above are beyond our present knowledge and the theoretical and empirical basis of the CFFDRS. For example, there is no objective evidence to show that thinning could protect a community or a forest plantation from forest fire or how it should be done. Our present attempts to provide answers are stretching the system beyond credibility. Recent research carried out during the International Crown Fire Modelling Experiment in the Northwest Territories (Alexander and Lanoville 2004) has provided new insights but much remains to be done.

Opportunities and Constraints

We believe that we need to develop a new integrated fire prediction system that can be used to address the kinds of questions posed above. In keeping with past successes, we propose a modular system involving a suite of models encompassing the various transitions in fire behavior (i.e., probability of ignition, surface fire spread, crown fire initiation, crown fire spread, large fire/atmospheric interactions, long range spotting) as well as the immediately evident impacts of fire (e.g., depth of burn, crown scorch) for the full range of Canadian forest types. A start has been made in some areas (e.g., Lawson and Dalrymple 1996; Taylor and Armitage 1996; Lawson et al. 1997; Cruz et al. 2003, 2004) but again much remains to be accomplished.

We believe the next generation system can be done using a semi-empirical approach that parameterizes fuel types. The most logical approach would be to build on the wealth of existing empirical data while realizing the need to include new knowledge from targeted field experiments that address key knowledge gaps, such as the effect of stand density on fire spread. It is critical that we continue to carry out the kind of outdoor field research that the CFS has come to be recognized internationally for. In this way, new knowledge and understanding is developed in order to advance fire management and in turn sustainable forest management. It also paramount that we must continue to be involved in transferring the information and technology to users through our involvement in the development and delivery of national training courses to ensure that the knowledge generated is applied and used. In this sense we acknowledge the need to be socially responsible (Alexander 2003).

It's time for a new vision for fire danger research. One that will bring our diverse skills and experiences across the country together again to address common goals. This can't be done in

isolation for a number of reasons, including the fact that resources for fire danger rating research have declined significantly since the 1970s and 80s.   A national fire research working group like the former highly successful CFS Fire Danger Group that operated from 1968 to 1995 is need to take on this important work. Such a group will need to work with their colleagues and partners in other organizations, both nationally and internationally (Weber 1995), to incorporate their skills and knowledge, and to integrate new data sources such as the national forest inventory if this vision is to be realized.

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