

WORKSHOP PROCEEDINGS 2002-1

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Values at Risk
Proposal Development Workshop
October 3-5, 2001
Lily Lake Village Resort, AB

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SUSTAINABLE FOREST MANAGEMENT NETWORK-RÉSEAU DE GESTION DURABLE DES FORÊTS

**Values at Risk Workshop
October 3-5, 2001
Lily Lake Village Resort**

BACKGROUND

The Sustainable Forest Management Network's Strategic Research Plan¹ identifies the development of disturbance management strategies for "values at risk" as a new research thrust in Natural Disturbance Management Research Area. The nine research areas identified by the SFM Network² will provide the basis for the Network's 2002-2003 Call for Proposals.

The values at risk identified in the KPMG review of the 1998 fire season in Alberta³ include:

- 1) Human lives and the health and safety of people potentially affected by wildfire.
- 2) Communities and homes of people living in or near the forest.
- 3) Private property such as buildings and cottages and others.
- 4) Public property and infrastructure such as power lines, communications sites, roads and others.
- 5) Industrial facilities such as gas plants, mine sites and forest sector infrastructure.
- 6) Timber—both standing timber and growing stock contributing to annual allowable cuts.
- 7) Non-timber resources such as recreation opportunities, wildlife, aesthetics, trapping areas, biodiversity/ecosystem integrity and others.

A similar list of assets at risk of wildfire damage was prepared for the California Fire Plan⁴:

- 1) citizen and firefighter safety,
- 2) watersheds and water,
- 3) timber,
- 4) wildlife and habitat (including rare and endangered species),
- 5) unique areas (scenic, cultural, and historic),

¹ <http://sfm-1.biology.ualberta.ca/english/research/PDF/ministratplan.pdf>

² <http://sfm-1.biology.ualberta.ca/english/research/PDF/researchareas.pdf>

³ http://envweb.env.gov.ab.ca/env/forests/fpd/external/mfp/e_kpmg.html

⁴ <http://www.fire.ca.gov/FireEmergencyResponse/FirePlan/FirePlan.asp>

- 6) recreation,
- 7) range,
- 8) structures, and
- 9) air quality.

The purpose of this workshop is to bring together researchers who may be interested in developing proposals intended to address the SFM Network Values at Risk research thrust, and may be interested in forming a Values at Risk research group to facilitate collaboration. The people invited to the workshop cover three broad areas of expertise: fire behaviour (the risk side), fire management (the control side), and resources (the value side). This mix of expertise gives us a good opportunity to develop an integrated suite of proposals that simultaneously address resource values, risk of fire, and management and control opportunities.

Please contact Glen Armstrong if you have questions regarding the workshop agenda.

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ATTENDEES

Kelvin Hirsch, Canadian Forest Service
Bonnie McFarlane, Canadian Forest Service
David Watson, Canadian Forest Service
Vic Adamowicz, University of Alberta
Glen Armstrong, University of Alberta
Peter Boxall, University of Alberta
Fiona Schmiegelow, University of Alberta
Uldis Silins, University of Alberta
Marian Webber, University of Alberta
Dave Martell, University of Toronto
John Branderhorst, Alberta Sustainable Resource Development
Cordy Tymstra, Alberta Sustainable Resource Development
Steve Cumming, Boreal Ecosystems Research Ltd.
William Bereska, Wildfire Consulting
Len Hunt, Ontario Ministry of Natural Resources

PRELIMINARY WORKSHOP AGENDA

October 3, 2001

Participants arrive at Lily Lake Resort. A cash bar will be open in "Harry's Den".

October 4, 2001

0700h-0800h

Breakfast

0800h-0815h

Introductions

Everyone

0815h-1000h

Needs Identification

Representatives from fire management agencies, and their clients

1000h-1015h

Refreshment Break

1015h-1200h

State of the Art – Fire models

e.g. Tymstra, Cumming, Anderson, others

1200h-1300h

Lunch

1300h-1500h

State of the Art – Fire effects on values

e.g. Boxall, Schmeigelow, Armstrong, Adamowicz, Silins, Malcolm, others

1500h-1515h

Refreshment Break

1515h-1700h

State of the Art – Fire management strategies and decision tools

e.g. McAlpine, Martell, Hirsch, others

1700h-1830h

Supper

1830h

Informal Discussions in "Harry's Den"

October 5, 2001

0700h-0800h

Breakfast

0800h-1000h

Project Identification

Everyone

1000h-1015h

Refreshment Break

1015h-1130h

Project Identification

Everyone

1130h-1200h

Wrap-up

1200h-1300h

Lunch

Values at Risk Map Integration Team (VARMINT) Group Overview

Glen W. Armstrong

Submitted 3 December 2001 in response to 2002-2003 SFM Network Call for Proposals

Background

Forest fire puts many of the values provided by a forest at risk of destruction or, at least, negative change. Fire management agencies spend a considerable amount of money fighting wildfires and managing the landscape to minimize the negative effects of fire. These agencies face increasing pressure to justify expenditures using a *return on investment (ROI)* framework.

The 1998 fire season in Alberta was extreme: almost 1,700 fires burned more than 726,000 ha of forest. The provincial government spent \$242 million fighting forest fires that season. In response to the severity of the fire season, and the large amount of money expended, the Alberta Forest Protection Advisory Committee commissioned KPMG to review the circumstances of that fire season and to make recommendations to improve the efficiency of forest protection in Alberta.

KPMG made several recommendations, including “consideration of the level of protection appropriate for Alberta must be founded on an assessment of values-at-risk and the priorities placed on those values”⁵. The values-at-risk identified by KPMG include:

- 1) Human lives and the health and safety of people potentially affected by wildfire,
- 2) Communities and homes of people living in or near the forest,
- 3) Private property such as buildings and cottages and others,
- 4) Public property and infrastructure such as power lines, communications sites, roads and others,
- 5) Industrial facilities such as gas plants, mine sites and forest sector infrastructure,
- 6) Timber -- both standing timber and growing stock contributing to annual allowable cuts, and
- 7) Non-timber resources such as recreation opportunities, wildlife, aesthetics, trapping areas, biodiversity/ecosystem integrity and others.

This topic is of considerable interest to many of the Sustainable Forest Management Network's partners, notably the Government of Alberta. The network sponsored two workshops (in June 2000 and October 2001) which brought together forest fire managers, government research scientists, and university-based academics to discuss the values at risk concept and to develop research questions that are of both academic and practical interest.

⁵ Nash T., McAuley G., Goodman J., Nelson L., and Mak K. 1999. Alberta Fire Review '98: Final Report. Project Report 37108TN, KPMG, Edmonton, AB.

Research Program

Partially in response to the KPMG report, the Government of Alberta has developed a GIS-based *values-at-risk map (VARM)* for Alberta which uses an arbitrary and subjective scheme for rating the value of human life, communities, timber, wildlife habitat and other assests which may be at risk of damage by fire. This VARM will provide the platform for the practical implementation of much of the research to be initiated by this team. A primary goal for VARMINT research will be to provide objective measures of values that can be linked to the map.

The VARMINT research program consists of a number of inter-related research projects tied together by a common goal of improving on-the-ground fire management decisions and linkage to a spatially explicit VARM. The six projects being submitted by VARMINT this year are:

- 1) **Adamowicz WL, Tymstra C, Boxall PC, and Watson D.** *Economic Analysis of the Effects of Wildfire and Wildfire Management on Air Quality.* This project will investigate the relationship between forest fire management and the economic benefits of air quality improvements. The project has two components. The first component will develop an information base and set of tools that can be used to construct measures of the *return on investment (ROI)* of fire management activities as they pertain to changes in human health risks and air quality. The second component of the project is to include air quality and human health considerations in a VARM. This will involve linkages between models of fire behavior, air emissions, human health and economics.
- 2) **Armstrong GW and Frederick KW.** *Approximating Values at Risk from Wildfire Using Shadow Prices.* The management plans for many forest management areas are developed with the aid of linear programming (LP) based forest activity scheduling models. A standard output of these models is the marginal contribution of each hectare of each forest type to the management objective specified for the forest. These marginal contributions are known as *shadow prices*. This project will develop a method of using these shadow prices to approximate the costs of fire in the context of the management plan developed for the forest. A major element of this research project will involve the linkage of cost estimates developed to a GIS-based VARM. This VARM will provide information to a fire management agency which will help guide fire fighting and land management decisions.
- 3) **Boxall PC, McFarlane B, Adamowicz WL, Hauer GK, Parisien M, and Tymstra C.** *A Static and Dynamic Analysis of Forest Recreation Values at Risk.* This project will investigate the relationship between forest fire management and forest-based recreation in Alberta. The main goal of the project is to provide information to improve the forest fire management policies and practices. The major objectives are: a) to enhance and expand the inclusion of recreation values in a provincial VARM; b) to incorporate in such schemes the dynamic intertemporal relationships between forest fires and recreation participation; and c) to incorporate recreation values into return on investment analysis of selected fire management activities.

- 4) **Martell DL, Hirsch KG, McAlpine R, and Tymstra C.** *Decision Support Systems for Flammable Wildland Urban Interface Landscapes.* Our objectives are to work with fire management agencies in Alberta and Ontario and a diverse group of ecologists, economists, sociologists and psychologists to
 - a. develop a spatially explicit fire occurrence prediction model and couple it with a mechanistic fire spread model to predict how fires will ignite and spread on a hypothetical wildland urban interface landscape that contains forest stands, fuel breaks, lakes, rivers, roads, communities, remote cabins and other features,
 - b. embed that flammable wildland urban interface model in a larger comprehensive simulation modelling framework that can be used to specify integrated fire management strategies to predict the probability or risk that designated areas or structures will be burned during designated time intervals,
 - c. develop methods for assessing the impact of fire on public safety and property and link our decision support systems with the socioeconomic models so fire managers can use the aggregate system to carry out comprehensive analyses of strategies for dealing with fire in wildland urban interface areas, and
 - d. work with representatives of fire management agencies in Alberta and Ontario to elicit from them, their understanding of wildland urban interface fire behaviour, its social, ecological, and economic impacts, and to field test our decision support system.
- 5) **McFarlane B, Boxall P, Mottus B, Tymstra C, and Davidson D.** *Public Attitudes, Knowledge, and Preferences in Relation to Fire and Fire Suppression.* Recently, large-scale wildfires have strained financial and human resources associated with fire suppression causing governments and the forest industry to reconsider their management policies and practices. Most wildfires occur on public lands using public resources. Thus it is important to understand the values that are at risk, the public's perception of fire and acceptance of fire policy and management activities, their willingness to accept the risk associated with living in or near a flammable forest, and the trade-offs the public is willing to make between reducing the social and economic risk from wildfire and the ecological effects of little or no fire. This project will examine these issues among the public of Alberta. The project has two components. The first component will survey the general public of Alberta regarding their attitudes, knowledge, preferences, risk perception and priorities for values at risk (e.g., recreation, timber, parks, private dwellings). The second component will survey residents of communities in the wildland-urban interface and will include an examination of their attitudes and preferences towards private and public measures to reduce the risk from wildfire to their communities and homes. This project will assist fire managers in determining if and how current fire management policies and strategies could be adjusted to achieve sustainable forest management. It will also provide an indication of where communication efforts may be needed and what messages should be communicated to the public in terms of fire, fire management, and making "firesmart" communities.
- 6) **Schmiegelow FKA, and Spence JR.** *Ecological Assessment of the Effects of Wildfire Management on Wildlife Habitat.* Concerns about the long-term sustainability of forested ecosystems managed for timber production have resulted in a demand for management plans that incorporate maintenance of non-timber values. One approach to this is to maintain the processes inherent in forest systems by emulating natural patterns

through harvest - a natural disturbance model (NDM). Two assumptions inherent to application of the NDM in the western boreal are: 1) that harvesting is largely compensatory to fire; a corollary of which is that burn rates must be reduced in harvested landscapes, and 2) that in the absence of fire, harvesting acts as a surrogate in maintaining biotic processes and patterns. Violation of either of these assumptions results in *Values at Risk*. While there is evidence that investment in fire suppression has resulted in a reduction in burn rates over time, years in which conditions for burns are favourable still result in large fire events. There is therefore a need to prioritise areas for allocation of effort. Mapping of values at risk due to wildfire provides a framework for such an assessment. Similarly, there is a need to determine how to maintain wildfire as part of a landscape approach to forest management, given knowledge that a number of species closely associated with early-successional, post-burn stands are not found in logged stands. This project will contribute to an ecological assessment of return on investment of wildfire management and mapping of wildfire risk through two case studies. The first will focus on the risk posed by fire to habitat of the threatened woodland caribou (*Rangifer tarandus caribou*). The second will focus on the habitat needs of several groups of post-burn specialists.

Next year, we hope to add a few new projects to this suite, including one by Uldis Silins which will examine the effects of fire on water resources, and one related to values held by First Nations people.

Knowledge Exchange and Technology Exploitation

The Values at Risk initiative was initiated by the partners (specifically the Government of Alberta). The research problem from the partner's perspective was clarified at a Values at Risk workshop held in October 2001. The "outputs" required by the partners, including return on investment information and information on fire risk zoning (Values at Risk Map) have been clearly presented and this project is a direct response to these requirements.

The primary output of the projects in this research group will be the development and enhancement of a Values at Risk Map. The Values at Risk Map is a fire management-zoning map that identifies areas of high risk and provides a mechanism for targeting fire management resources. Bill Bereska developed an initial map for Alberta Sustainable Resource Development. The challenge to the researchers is to add components to this map where they are missing, and to enhance the measurement of values at risk so that they can be more comprehensively incorporated into the map and into wildfire management. An alternative worth evaluating is to develop economic assessments of risk that will then be commensurable across categories of risk. This clear link between the problem raised by the partner and the research program provides for an effective knowledge exchange program. Indeed, the knowledge exchange program has been occurring for more than 1 year as the researchers and partners have participated in two workshops and the proposals are a result of the partners' and the researchers' definition of the problem and potential solutions.

A second specific product from this research group will be the assessment of returns on investment from fire management. This product also arises directly from the partner's request for such information. For this specific project the returns on investment relating to air quality and human health will be evaluated. Using a common approach to modeling fire behaviour and a common set of cases, the returns on investment related to timber, human health, recreation and other components will be investigated by this research group. The common modeling approach and common set of cases ensures that all categories of values at risk are evaluated in a common, systematic and comprehensive fashion.

In addition to traditional communications approaches (journal articles, reports, etc.) this project will involve direct communications between the partners and the researchers. The Values at Risk Map and the further development for fire behaviour / fire management models will facilitate this interaction. Monthly meetings of the local researchers and partner groups will be used to assess progress. Meetings with the national research group and partners will be held to further integrate the research program.

In this research group the distinction between the researchers and the partners is unclear as the partners (Alberta Sustainable Resource Development and Ontario Ministry of Natural Resources) are also researchers involved in the development and enhancement of values at risk models. Thus the knowledge exchange and technology exploitation components are relatively seamless.

Summary

The VARMINT research team is cross-disciplinary involving people from a wide variety of academic disciplines including forest management, fire behaviour, economics, operations research, ecology, conservation biology, sociology, and social psychology. The research program summarized in this document is a result of close collaboration between fire management professionals from Alberta Sustainable Resource Development and Ontario Ministry of Natural Resources, researchers from the Canadian Forest Service, and academics from the University of Toronto, and the University of Alberta. This collaboration resulted in project proposal that address problems of academic interest, that will also have direct practical applicability to the Sustainable Forest Management Network's partners. The inclusion of the partners as co-investigators on the projects will help ensure that the practicality of the research will remain a high priority.

The research projects summarized here will help improve the allocation of resources to fire management activities.