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Human dimensions of fire management at the wildland-urban interface in Alberta: A summary report

By Tara K. McGee, Bonita L. McFarlane, Lauren Harris and Hilary Faulkner

December 2009

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Authors

Tara K. McGee,
Department of Earth and Atmospheric Sciences, University of Alberta

Bonita L. McFarlane,
Natural Resources Canada, Canadian Forest Service

Lauren Harris,
Department of Earth and Atmospheric Sciences, University of Alberta

Hilary Faulkner,
Department of Earth and Atmospheric Sciences, University of Alberta

A report submitted to the Institute for Catastrophic Loss Reduction

December 2009

ICLR research paper series – number 46

Published by
The Institute for Catastrophic Loss Reduction, December 2009

ISBN: 978-0-9784841-2-5

Table of Contents

Abstract

This report presents the results of two studies that were undertaken to examine wildfire risk mitigation at the wildland-urban interface in Alberta, Canada. One study examined homeowner adoption of mitigation measures and factors that influence adoption in six communities. A mail survey was used to collect data from 1265 homeowners. Results showed that respondents had completed many of the recommended mitigation activities. Respondents perceived the risk to their properties as moderate, they viewed recommended mitigation measures an effective way to reduce the risk, and most respondents perceived homeowners themselves as being responsible for mitigating wildfire risk on their properties. The most common constraints to completing recommended mitigation measures included the cost of mitigation, not having enough information to complete recommended activities, a belief that family and neighbors would not like the result, not having the necessary skills, and not being able to complete some activities for physical reasons. The second study examined adoption of wildfire risk management programs by 18 municipal governments in Alberta. Data were collected using two methods: A survey with mayors or reeves, fire chiefs (or their deputy), planners, chief administrative officers, councilors and directors of emergency and disaster services; and interviews with municipal government contacts and other stakeholders involved in wildfire risk management. Results showed that activities carried out by local governments included: Emergency preparedness planning; infrastructure measures; providing information; wildfire hazard assessments on public and private land; vegetation management; land use planning; and structural mitigation measures on local government buildings. A six stage process was identified for the implementation of municipal wildfire management initiatives. Factors influencing the process included communication with internal and external stakeholders, adequate financial and human resources and community characteristics such as terrain, size of the municipality, isolation and population growth. Implications for policies and programs are discussed.

Acknowledgements

This project was funded through the Canadian Forest Service–Social Sciences and Humanities Research Council (SSHRC)-Forest Research Partnership Program. We thank the funding partners Alberta Sustainable Resource Development, ATCO Electric, Canadian Forest Service, Canadian Interagency Forest Fire Centre, Institute for Catastrophic Loss Reduction, and SSHRC. We express our sincere gratitude to Adam Gossell, Anastasia Drummond, and Robert Harris of Alberta Sustainable Resource Development for their assistance and to the homeowners and municipal government staff who participated in the surveys and interviews.

1.0 Introduction

The forested landscape in Canada is changing as human communities expand further into the forest and more crown land is designated for industrial forest management and other resource development. The wildland-urban interface (WUI) is the area where structures such as homes and other human developments meet or are intermingled with forest and other vegetative fuel types (Chisholm Fire Review Committee 2001). In recent years, the frequency and severity of impacts of forest wildfires have increased, putting many human communities at risk. Climate change scenarios and increasing populations in WUI areas suggest this trend is likely to continue (Flannigan et al., 2005; Peter et al., 2006).

Fire management agencies have begun using pro-active management strategies directed at the WUI to reduce the threat to private property and human life. The success of pro-active management at the WUI depends, largely, on the willingness of municipal governments and homeowners to support and engage in fire mitigation[1] and preparedness[2] measures. Public education programs have been initiated in several provinces with a goal of improving homeowner participation in wildfire threat mitigation and preparedness. It is unclear, however, how homeowners in or near the WUI in Canada perceive the threat of wildfire, their preferences for mitigation and preparedness measures, or their willingness to use such measures on their own properties. There is also little understanding of the individual and social-cultural factors that influence wildfire mitigation and preparedness decision-making and actions by individual Canadians. In addition, little is known about wildfire mitigation programs, policies and activities of municipal governments in Canada. Understanding the processes involved, and the factors that influence municipal level mitigation will provide insights into developing effective community wildfire mitigation.

The two main goals of this research were to (1) examine homeowner adoption of recommended wildfire mitigation measures in WUI communities in Alberta, and (2) examine adoption of wildfire risk management programs by municipal governments in Alberta.

[1] Mitigation refers to proactive and sustained risk reduction adjustments.
[2] Preparedness refers to planning for a hazard incident.

The homeowner component of this research aimed to:

- Examine WUI homeowners' risk perceptions, wildfire experiences, constraints to mitigation, attribution of responsibility, and adoption of recommended wildfire mitigation activities;
- Identify factors that influence adoption of mitigation activities; and
- Examine homeowners' preferences for mitigation policy, and community fuel management.

The municipal government component of this research aimed to:

- Identify wildfire management measures completed by municipal governments in Alberta;
- Examine factors that influence the willingness and ability of municipal governments to implement wildfire management measures.

This report provides a summary of findings from two master theses. Detailed study results can be found in Harris (2008) and Flanagan (2008).

2.0 Methods

2.1 Study 1: Homeowners

A mail survey was used to examine homeowner adoption of mitigation measures and identify factors that influence adoption. The survey asked about respondents' risk perceptions, wildfire experiences, knowledge of wildfire, awareness of mitigation, constraints to completing mitigation measures, adoption of mitigation measures, and demographic factors and social/psychological characteristics.

The survey was sent to a random sample of 3452 single-family residential property owners in six WUI communities in Alberta: Edson, Grande Cache, High Level, Hinton, Peace River and Whitecourt. The sample was drawn from a list of single-family residential property owners

provided by Alberta Land Titles. All six communities were considered to be at high wildfire risk by Alberta Sustainable Resource Development at the time of the study.

Prior to distribution, the survey was pilot tested using a small convenience sample of 26 homeowners in Edmonton, Edson, and Peace River. Once the pilot test was completed and questionnaire revised, the surveys were distributed using a modified Dillman (2007) method. An initial questionnaire, cover letter, thank you pen and business reply envelope, were mailed to the sample in May 2007. One week later, a reminder postcard was sent. One month after the initial mail-out, a second questionnaire, letter and business reply envelope were mailed to those who had not responded. A 34% response rate (n = 1265) was achieved.

2.2 Study 2: Municipal governments

A telephone survey was used to explore adoption of wildfire risk management measures by 18 municipal governments in Alberta. The survey asked about wildfire risk management measures being completed by the municipality, how they were being implemented, and factors influencing implementation. Within each municipal government, the mayor/reeve, fire chief and planner were invited to participate. Within the 18 participating municipalities, a total of 38 people participated in telephone interviews, including mayors/reeves, fire chiefs (or their deputy), planners, as well as chief administrative officers, councilors and directors of emergency/disaster services.

As a follow-up to the telephone surveys, in-person interviews were completed in order to focus on two municipal governments – one where extensive risk management measures had been completed, and the second where the municipality had faced opposition from local citizens during implementation of wildfire risk management. These two case studies allowed us to obtain additional insights into the implementation process and factors that influence the process. Interviews were completed with 16 participants, including municipal government and provincial government staff, residents, environmental groups, businesses and industry.

3.0 Study 1: Homeowner Results

3.1 Homeowners' mitigation activities

We were interested in whether homeowners had adopted or were intending to adopt 13 mitigation activities recommended by Partners in Protection (2003). The activities included those often completed as part of general property maintenance (such as mowing and watering lawns), vegetation management activities (such as thinning and removing trees), and using structural materials on their house (such as a fire resistant roof). We found that overall, respondents had completed several wildfire mitigation measures on their property (Table 1). The majority of respondents had completed several of the property maintenance and vegetation management activities. The most popular measures were keeping grass short and watered; removing shrubs, trees or fallen branches close to the house; removing needles, leaves and overhanging branches from the roof and gutter; removing debris from under balconies and porches; and pruning large trees. For measures that involve the house structure (Table 2), over half of respondents had installed fire resistant roofing materials and double or thermal pane or tempered glass in windows and exterior glass doors.

Table 1: Percentage of homeowners who had adopted or intended to adopt maintenance and vegetation management measures

Landscape mitigation activities	Done	Plan to do next year	Plan to do in 5 years	Do not plan to do	Not applicable
Keep grass short and watered frequently	88.9	2.2	0.4	4.7	3.8
Remove shrubs, trees or fallen branches close to your house	64.3	5.1	1.1	12.6	16.9
Thin shrubs or trees so that nearby shrubs and trees do not touch	43.7	7.2	1.9	18.3	28.9
Store firewood well away from your house	48.1	4.0	0.7	9.1	38.1
Remove needles, leaves and overhanging branches from the roof and gutter	62.0	13.9	1.7	2.0	20.4
Landscape with fire resistant materials and vegetation	35.2	6.5	4.8	32.6	20.9
Remove debris or needle build-up under balconies and porches	55.3	7.3	0.8	3.4	33.3
Prune large trees by removing all branches that are close to the ground	55.6	7.9	2.1	7.9	26.5
Screen house vents, gutters and the underside of eaves with metal mesh	34.9	10.1	6.2	36.4	12.4
Screen or enclose the underside of decks and porches	34.2	10.7	3.8	26.0	25.3

Table 2: Percentage of homeowners who had adopted or intended to adopt structural mitigation measures

Structural mitigation measures	Done	Plan to do in 5 years	Plan to do when it needs replacing	Do not plan to do	Not applicable
Install fire resistant roofing materials	59.5	4.4	9.8	23.0	3.4
Install double/thermal pane or tempered glass in windows and exterior glass doors	58.0	9.3	11.7	18.3	2.7
Install fire resistant exterior siding	38.6	5.4	10.1	42.1	3.8

3.2 Perceived risk

The majority of respondents rated the wildfire risk to their properties as low to moderate. On average, participants rated the risk to their property in the next 5 years as 3.7 on a scale from 1 (no risk) to 7 (great risk) (Fig. 1). Respondents also rated the perceived controllability of wildfire impacts on their property on a 7 point scale from 1 (not at all controllable) to 7 (very controllable) and the acceptability of potential impacts (1= not at all acceptable; 7 = completely acceptable). Wildfire impacts to property were generally perceived to be controllable and unacceptable.

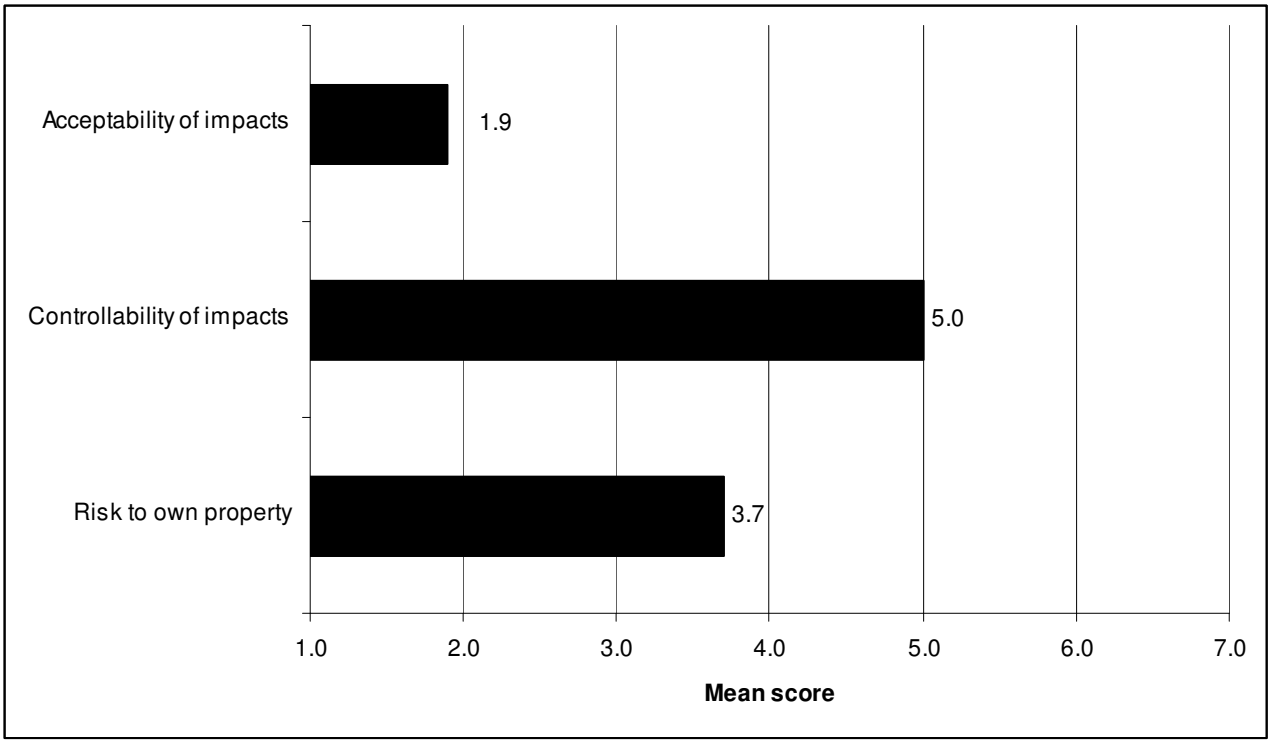

Figure 1. Perception of wildfire risk to respondents' property

3.3 Wildfire experiences

Most participants had indirect experience with wildfires through media coverage (Fig. 2). However, many also had first hand experiences such as having a wildfire come close to their community, feeling fear or anxiety due to a wildfire, seeing smoke near their house, and experiencing discomfort or health problems from smoke. About 20% of respondents reported being placed on an evacuation alert but only 3% had been evacuated and even fewer (< 1%) reported losing their house or other structures to wildfire. Some (19%) had experience in fire management or firefighting. A similar proportion reported having no experience with wildfire.

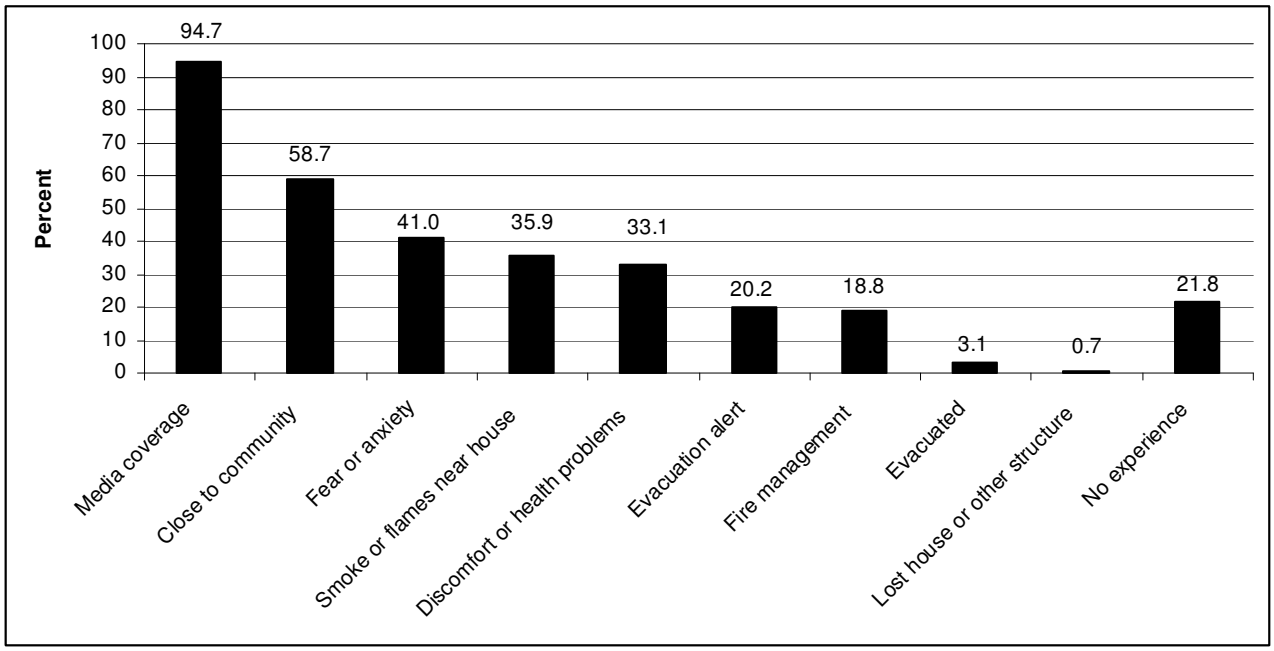

Figure 2. Experiences with wildfire

3.4 Attribution of responsibility

Respondents were asked who they thought should be responsible for wildfire risk reduction on their property: themselves and their household, the local fire department, the municipal government, provincial government, and federal government. A large majority of respondents perceived all as having some responsibility for mitigating wildfire impacts (Fig. 3). The municipality and the homeowner were considered by the largest majority (86%) to have responsibility for reducing the risk from wildfires to respondents' properties, followed by provincial government and the local fire department. The lowest proportion (71%) viewed homeowner mitigation as a federal government responsibility.

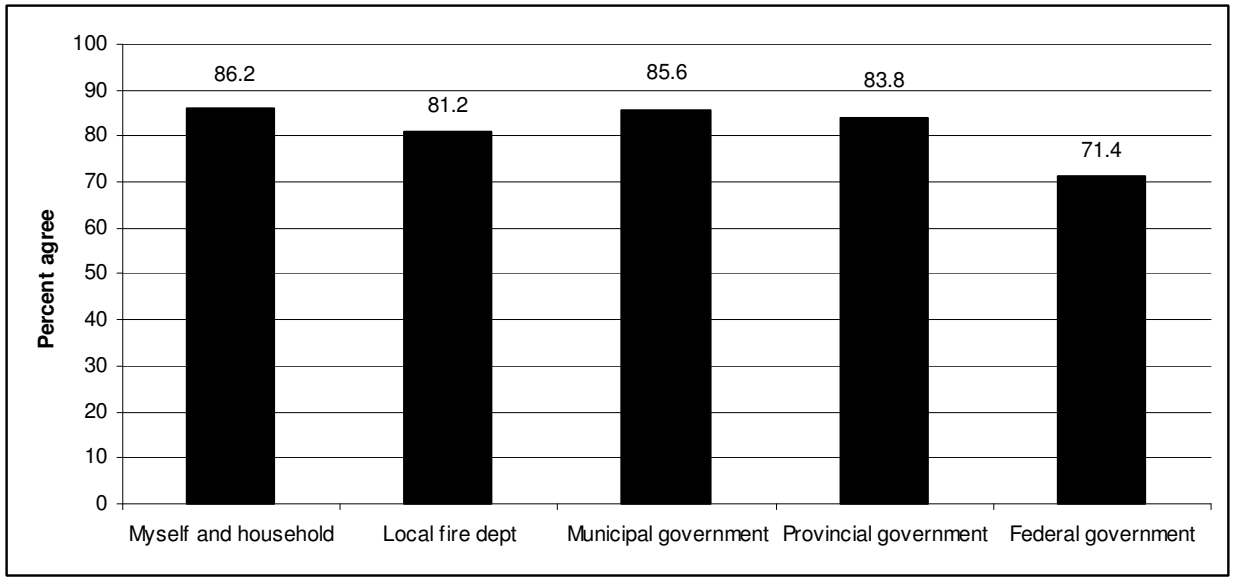

Figure 3. Attribution of responsibility for homeowner wildfire mitigation

3.5 Outcome expectancy

There was a high level of outcome expectancy (a belief that personal action would reduce the impact of wildfire to respondents' property) amongst participants. Respondents generally agreed that 'preparing for wildfires will significantly reduce damage to my house should a wildfire occur' (Fig. 4). There was also considerable disagreement with the statement 'wildfires are too destructive to bother preparing for'.

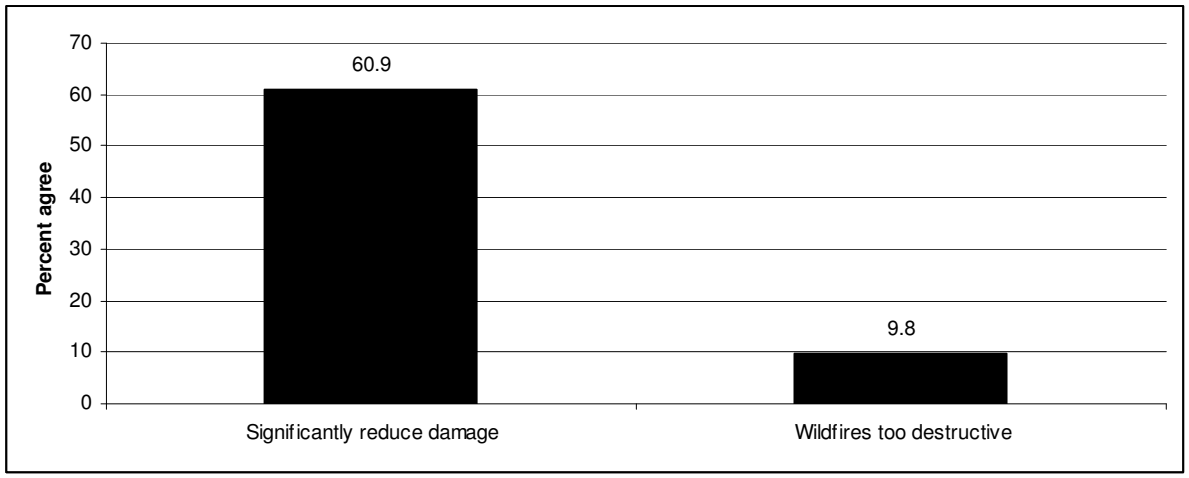

Figure 4. Outcome expectancy of wildfire mitigation

3.6 Awareness

About 20% of respondents indicated they had searched for information about wildfires and their impacts, and how to reduce the wildfire risk to their property. These respondents sought information from a variety of sources, the most common of which was the provincial department that is responsible for forestry (Alberta Sustainable Resource Development) (Fig. 5). Other sources of information that were used by a smaller proportion of respondents included the internet, local fire department, friends and relatives, and neighbors.

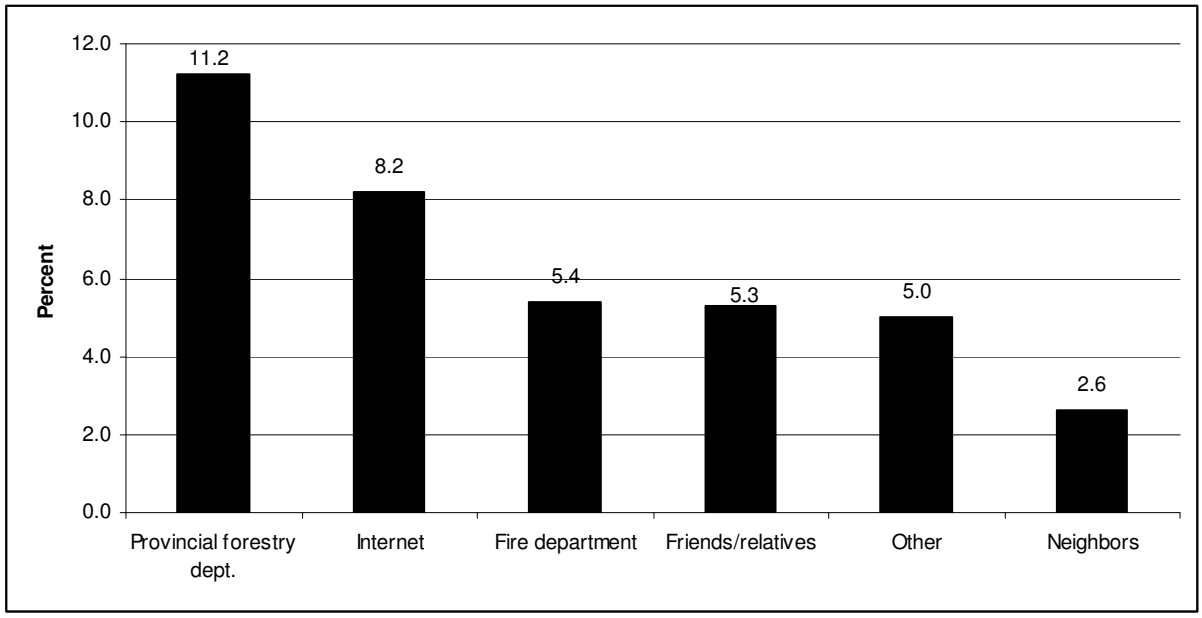

Figure 5. Wildfire information sources

Partners in Protection developed the Firesmart manual in 1999 to provide information to governments and homeowners about wildfire risks and measures that can be used to reduce the risks. The Firesmart name is also being used by Alberta Sustainable Resource Development in their educational materials and signage related to wildfire risk reduction activities on public land. Nearly, 2/3 of respondents indicated they had heard the term “FireSmart”. Among these respondents, the most common sources of the term were brochures, television, newspapers, and radio (Fig. 6).

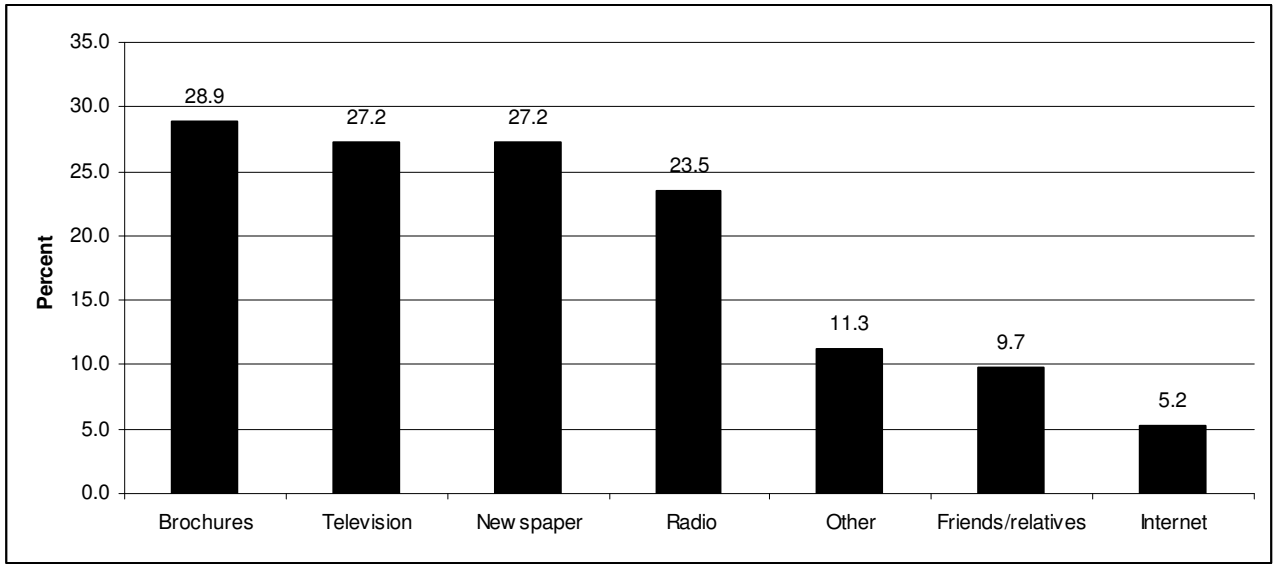

Figure 6. Sources of FireSmart information.

3.7 Perceived constraints

Respondents rated seven potential constraints that might prevent them from completing mitigation activities on their property on a 5-point scale ranging from strongly disagree to strongly agree. Having money to complete activities (cost) was perceived as a constraint by about half of our respondents (Fig. 7). Not having enough information to complete recommended activities, and a belief that family and neighbors would not like the result of some of the mitigation activities were also identified as significant constraints. Personal limitations of not having the necessary skills and not being able to complete some activities for physical reasons were also cited as constraints by nearly 1/3 of respondents. Only about 6% of respondents felt that implementation of recommended mitigation activities would interfere with the feeling of connectedness to nature. About ¼ of respondents simply did not consider mitigation a priority.

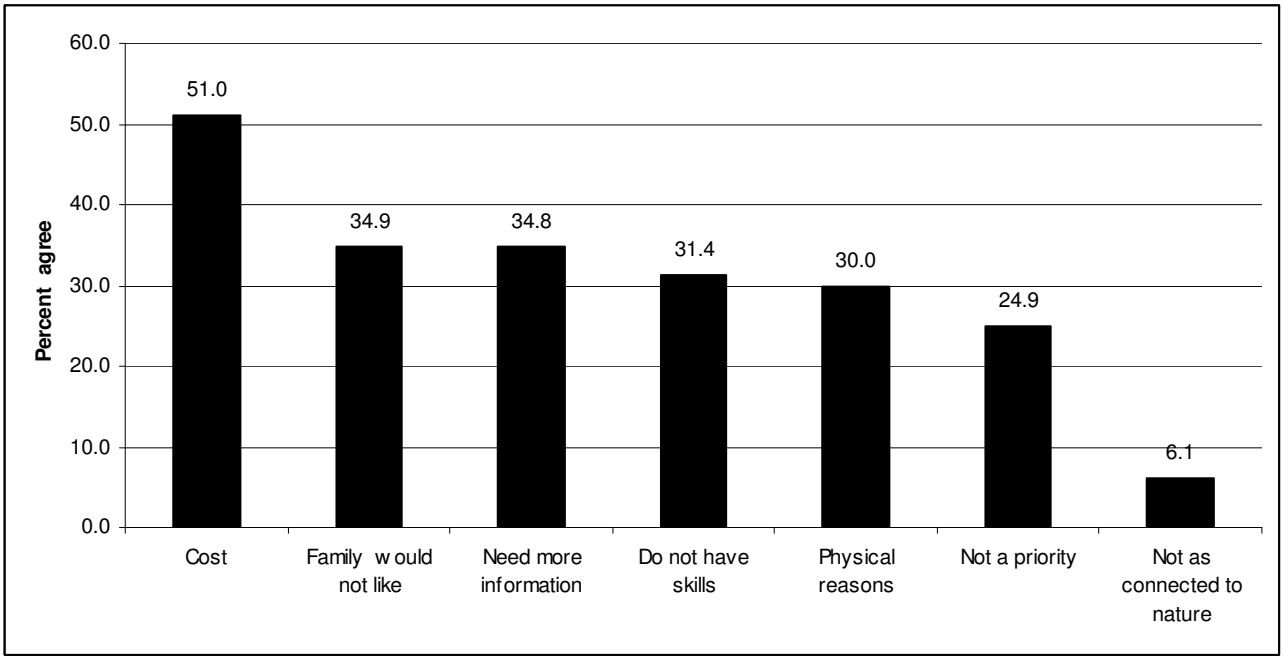

Figure 7. Constraints to wildfire mitigation

3.8 Policy and community fuel management preferences

Respondents were asked to indicate their support (on a scale from 1 'strongly oppose' to 5 'strongly favour') for seven risk management policy options: Educating homeowners; bylaws requiring homeowners to remove shrubs, trees and dead branches close to homes; reduced insurance premiums if recommended activities are completed; neighborhood work bees; free wildfire hazard assessments; bylaws requiring new houses to use fire resistant building materials; and restricting houses from being built in high risk areas. All measures were supported (Fig 8). The measures that received the highest level of support were educating homeowners on ways to reduce the wildfire risk on their properties, reduced insurance premiums if recommended activities are completed and free wildfire hazard assessments for residential properties. There was less support for restricting houses from being built in high risk areas and bylaws requiring new houses to use fire resistant building materials. The least popular measures were neighborhood work bees to help people prepare homes and properties

for wildfires, and bylaws requiring homeowners to remove shrubs, trees and dead branches close to their house.

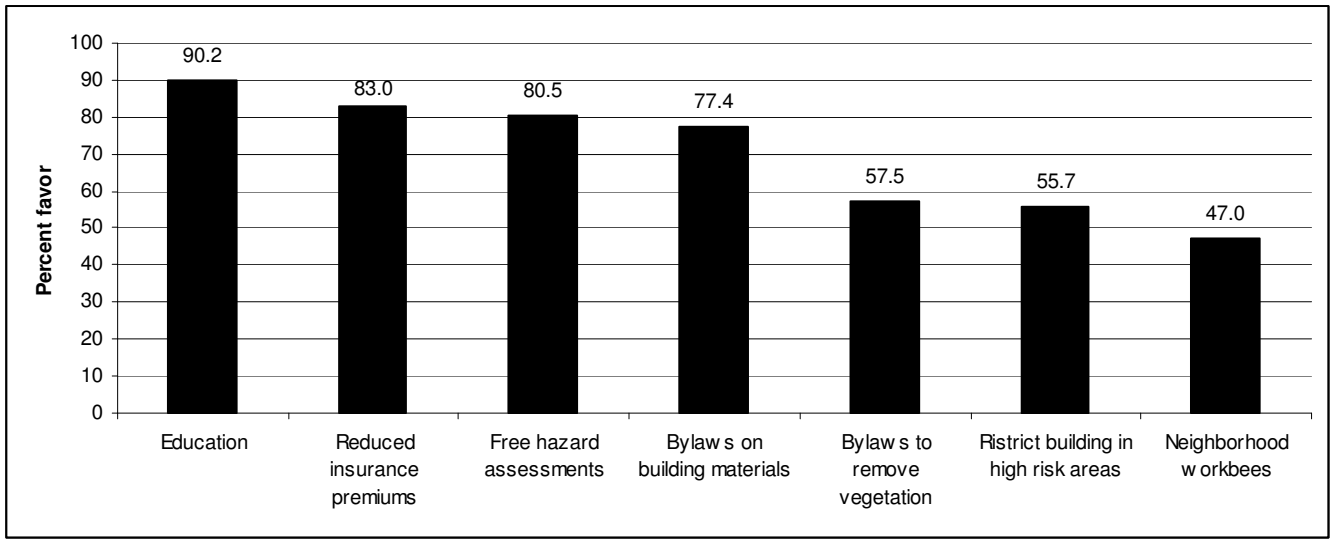

Figure 8. Support for policies to enhance homeowner wildfire risk mitigation

We also sought information about respondents' support for fuel management options (fireguards, vegetation thinning, and prescribed burning) in or around their communities. All three options were supported and were perceived as effective in protecting communities from wildfire (Fig. 9). Fireguards received the highest level of support and were perceived to be the most effective.

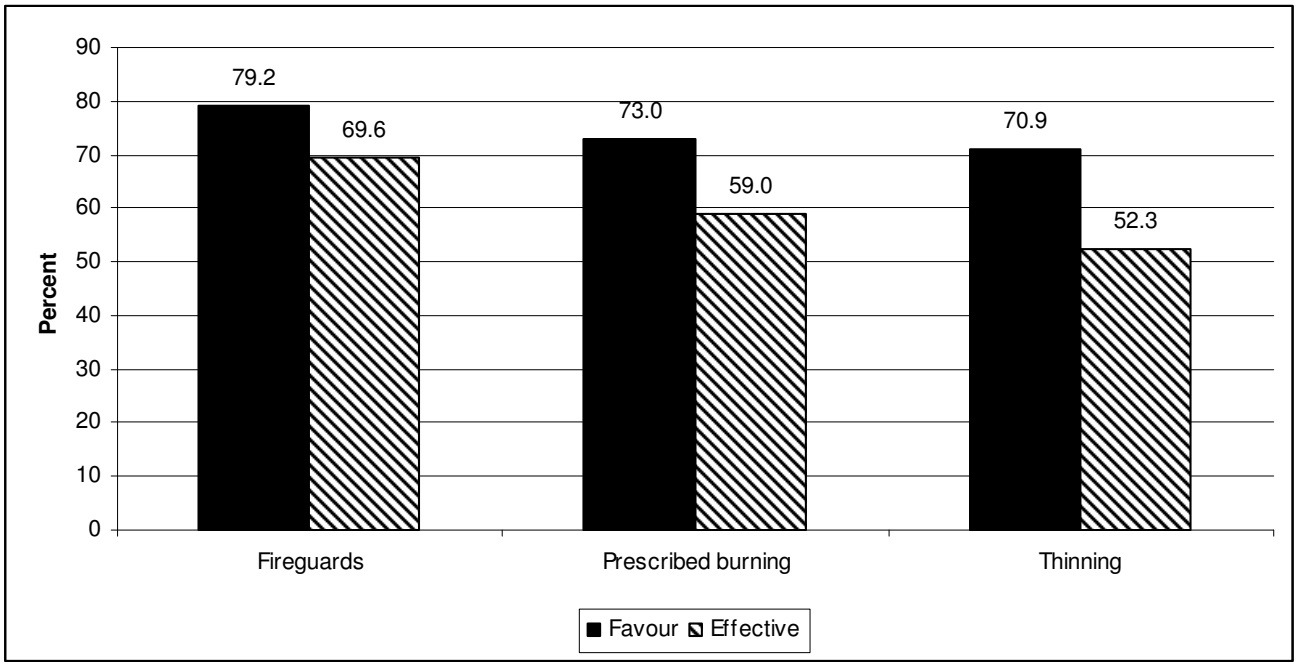

Figure 9. Support and effectiveness of fuel management options for communities

4.0 Study 2: Municipal Government Results

We were interested in the types of wildfire management activities that are being carried out by local governments. Activities being carried out by participating local governments included: Emergency preparedness plans; infrastructure measures; providing information to local government officials and the public; wildfire hazard assessments on public and private land; vegetation management; land use planning; and using structural mitigation measures on local government buildings. Emergency preparedness plans were implemented by all local governments because they are required by law. Infrastructure measures such as ensuring adequate water supply and road widths, and providing information to local government officials and the public, were also completed by most participating local governments. Many participating local governments were completing wildfire hazard assessments on public land (municipal or provincial government) and on homeowners' properties, and vegetation management on municipal lands. Only a few municipalities, however, were using land use

planning measures to reduce wildfire risks or implementing measures to make government buildings more fire resistant.

A six stage process appeared to be occurring in order for wildfire management measures to be implemented. The process started with recognition of a wildfire risk and development of a risk management proposal. Next, support within municipal government was required. Once this was obtained, the proposal was revised, resources were secured and stakeholder input sought. Stakeholders include local residents, businesses and industry, as well as other government agencies. At the fourth stage, the municipal government accepted the wildfire risk management proposal, then it became a plan. This plan was then implemented, and finally the plan was reviewed on an ongoing basis. Importantly, this process did not necessarily flow from one step to the next, and some steps repeated. For example, seeking support within municipal government and from external stakeholders occurred at several stages in the process.

We found that several factors influenced local governments' implementation of wildfire management measures. The six stage process was initiated by an individual who perceived a significant wildfire risk in the municipality, and also had personal experience with wildfires. Communication with internal and stakeholders was crucial to their ability to implement wildfire management measures successfully. Inadequate communication with local residents resulted in setbacks due to lack of public support for planned wildfire management activities. Inadequate communication within the local government itself may result in a low level of support for wildfire management and therefore difficulty in obtaining necessary resources. Financial and human resources were also required by local governments in order to implement wildfire management measures. In some cases, funding was obtained internally, but in others outside (provincial) funding was obtained. Lastly, community characteristics including terrain, size of the municipality, isolation and population growth also provided challenges to implementation of municipal wildfire mitigation.

5.0 Implications

Our homeowner findings suggest that many homeowners perceive a moderate risk to their properties and they have completed many of the recommended mitigation activities. Although low-cost, low effort mitigation options were the most popular, a large proportion of respondents also reported completing many of the potentially contentious options such as removing and thinning vegetation. Completing a few mitigation activities, however, does not necessarily translate into a substantively reduced risk. Importantly, our results suggest that homeowners are willing to make changes to their properties to reduce the wildfire risk, and they also view mitigation as an effective way to reduce the potential damage caused by a wildfire. Additionally, most survey respondents perceived homeowners themselves as being responsible for mitigating wildfire risk on their properties, but also consider governments (primarily municipal and provincial) as sharing that responsibility. These findings have implications for public education initiatives and other programs and initiatives that aim to encourage homeowners to implement recommended mitigation measures. There are several implications for public education programs. Although our results suggest that homeowners perceive a risk to their property, they also suggest that homeowners are underestimating the potential risk. Respondents perceived the risk to their properties as moderate, whereas Alberta Sustainable Resource Development rated the communities in our study as high risk. In addition, lack of information was cited as a factor preventing respondents from conducting mitigation activities on their property. Informing the public of the potential risk and how to respond to that risk is a necessary first step in mitigation. However, educating the public is necessary but probably not sufficient to initiate substantial homeowner mitigation.

Our findings that homeowners are willing to implement many mitigation measures, believe that mitigation will effectively reduce wildfire risks, and accept responsibility for mitigation on their property indicates that homeowners may be receptive to implementing recommended mitigation measures if the constraints can be overcome. Mandating wildfire mitigation via the use of legislation appears to be acceptable if applied to new developments. Our study shows less support for the use of legislation to enforce homeowners to complete mitigation activities on existing houses and properties. Providing financial incentives for mitigation appears to be a

fundamental factor for homeowner mitigation. A lack of funds, which was cited as a constraint to mitigation by many respondents, and support for free site hazard assessments and reduced insurance premiums suggest that initiatives to reduce the financial burden on the homeowner would help facilitate mitigation. For example, programs aimed at providing financial and technical assistant to communities, such as the Community FireSmart Program in Alberta, have proven to be very successful. Some communities have cited this assistance as fundamental to their community wildfire mitigation plans. In addition to financial incentives, homeowner programs that provide skilled labor (e.g., for removing trees) and assistance for people who do not have the physical ability to perform labor intensive mitigation activities will probably offset some of the obstacles to mitigation.

In addition to programs and policies directed at the homeowner, the findings of the municipal government component of our study suggest that involving stakeholders early in the planning process is critical to successful implementation of community wildfire mitigation plans. Municipal governments should make better use of land use planning options to mitigate the wildfire risk during development. Our results from the homeowner study suggest that most residents would support planning options such as restricting development in high risk areas or bylaws requiring the use of fire resistant materials. Municipal governments should also consider implementing measures to make their own buildings more fire resistant. This would allow residents to see that implementing structural measures on their homes would not detrimentally affect the aesthetic values of their home. It would also show residents that their municipal government is also taking actions to reduce the wildfire risk to buildings, which may encourage homeowners to do the same on their own property.

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Institute for Catastrophic Loss Reduction
Institut de Prévention des Sinistres Catastrophiques

Toronto office
20 Richmond Street East
Suite 210
Toronto, Ontario, Canada
M5C 2R9

☎ 416-364-8677
🖷 416-364-5889

London office
1491 Richmond Street
London, Ontario, Canada
N6G 2M1

☎ 519 661-3234
🖷 519-661-4273

@ info@iclr.org
⊕ www.iclr.org