Canadian wildfire communication strategies

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ABSTRACT

In order to try to mitigate wildfire risks in Alberta, Canada, a taskforce of government, industry, and business stakeholders in the province created the FireSmart manual, which provides recommendations to residents and municipalities about how to reduce wildfire risks. The provincial government and local governments have established FireSmart related programs. These FireSmart programs include both social marketing and risk communication approaches. This paper reviews existing studies completed in Alberta to assess the effectiveness of these two approaches. Strengths and weaknesses of the two approaches are identified and discussed. R

Introduction

Half of the province of Alberta in western Canada (Figure 1) is covered by forests prone to wildfire, and every few years wildfires threaten communities. Four factors are increasing the risk of wildland-urban interface (WUI)[1] fires in Alberta: (1) population growth is leading to increasing development in the WUI (Partners in Protection, 2007; McGee et al., 2005b), (2) fire suppression in the province has created an unnatural build-up of fuels that contribute to extreme fire behaviour (Partners in Protection, 2007; Pyne, 2007; Peter et al., 2006; Filmon, 2004), (3) climate change is resulting in an increase in weather conditions that are conducive to fire (Partners in Protection, 2007; Flannigan et al., 2005), and (4) the presence of mountain pine beetle in the province is resulting in increased fuels (Partners in Protection, 2007; Canadian Forest Service, 2005).

However, the risk of wildfire in Alberta has been found to rank low to moderate in the eyes of the public (Faulkner et al., 2009). Shindler (2007) found that in the United States (U.S.), low risk perceptions result from decades of fire suppression, which creates a feeling that all wildfires can be controlled through fire-fighting efforts. In Canada and the U.S., there is generally enough warning for evacuation in order to avoid fatalities, which Shindler (2007) found may reduce risk perceptions. Living in the WUI is often a choice made by residents, so the risks are voluntary, which are generally perceived to be more acceptable than risks imposed involuntarily (Daniel, 2007b). There are numerous other factors that influence wildfire risk perceptions, such as geography, demographics, knowledge, values, emotions, context, trust, and personal experience (for examples, see: McFarlane et al., 2008; Daniel, 2007b; McCaffrey, 2007; Shindler, 2007; Bushnell et al., 2006; Collins, 2005; McGee et al., 2005b; Nelson et al., 2005; Monroe and Nelson, 2004; Nelson et al., 2004; McGee and Russell, 2003; Monroe et al., 2003; Beringer, 2000; Fried et al., 1999; Gardner et al., 1987).

Various programs have been developed internationally to encourage residents to mitigate[2] risk from wildfires, including those under the FireSmart banner in Alberta. Communication strategies for wildfire mitigation programs often focus on conveying that wildfire risk is high, that the resident is vulnerable to these fires, and that there are steps that one can take to reduce the risk. These communications generally involves the use of the media (newspaper, magazines, or television) or educational materials such as brochures and manuals (McCaffrey, 2004). This one-way communication approach reflects a belief amongst risk managers that lack of awareness, knowledge, and incentives are barriers to mitigation by residents (Arvai et al., 2007; Cohn et al., 2007; Shindler, 2007; Monroe and Nelson, 2004). However, there is considerable evidence that increased knowledge of wildfire risk does not automatically cause homeowners to take action to mitigate the risk (Flanagan, 2008; Daniel, 2007b; Martin et al., 2007; Steelman, 2007; Brenket-Smith et al., 2006; McGee et al., 2005a; Monroe and Nelson, 2004). Therefore, there is a need to examine

1. The wildland-urban interface (WUI) refers to "an area where various structures (most notably private homes) and other human developments meet or are intermingled with forest and other vegetative fuel types" (Chisholm Fire Review Committee, 2001).

2. Mitigation is defined as any action–collective or individual, private or public–taken to reduce the potential harm posed by an environmental hazard (Bogard, 1988)

Figure 1. Location of Alberta, Canada.

This paper will examine wildfire mitigation communication strategies in Alberta. Specifically, this paper will review the results of studies already completed in Alberta as evidence of whether or not wildfire mitigation communication strategies are increasing residents' awareness of wildfire mitigation programs and the adoption of mitigation measures.

Alberta wildfire mitigation programs

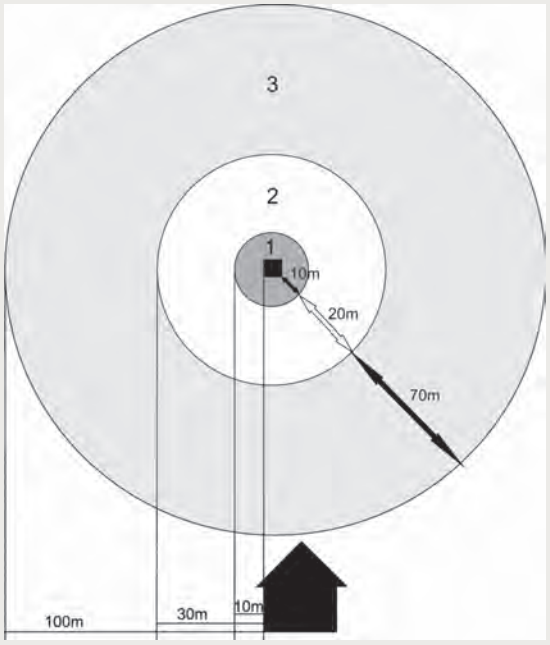
In Alberta, there are various strategies in place to try to reduce WUI fire risk. These include: (1) the FireSmart manual and brochure, developed by Partners in Protection, and (2) Alberta Sustainable Resource Development (SRD) and Municipal FireSmart programs.

The FireSmart manual and brochure

Partners in Protection was formed in Alberta in 1990 when a taskforce representing various provincial and municipal governments and associations came together to address concerns regarding wildfires in the WUI (Partners in Protection, 2007). A major achievement of this organisation was the release of the manual "FireSmart–Protecting Your Community from Wildfire" in 1999, and a later homeowner brochure "FireSmart Homeowner's Manual" (Partners in Protection, 2003a). Recommendations given to homeowners to reduce wildfire risk are based on fire science research that has shown that implementing various measures on one's property can reduce wildfire risks (Cohen and Stratton, 2003; Cohen, 2001; Cohen, 2000). More than 22,000 FireSmart brochures and multi-media CD-ROMs have been distributed nationally (Partners in Protection, 2007).

The FireSmart Homeowner's Manual (herein referred to as the FireSmart brochure) (Partners in Protection,

Figure 2. FireSmart Priority Zones (adapted from Partners in Protection, 2003a).



2003b) presents recommendations that residents can undertake to reduce wildfire risk to their property. This brochure first introduces the problem of wildfires in rural settings, and then presents the three priority zones for wildfire mitigation activities (Figure 2). In Priority Zone 1, residents are advised to remove flammable vegetation (such as pine, spruce, and juniper), deadfall, or woodpiles from this area and to keep the grass mowed and watered. In Priority Zone 2, residents are advised to remove highly flammable trees and debris that would support a crowning fire and make sure that remaining trees do not touch. In Priority Zone 3, residents are advised to thin or remove shrubs and trees and retain fire-resistant trees. The brochure also recommends the use of fire resistant building materials, such as roofing material, exterior walls, soffits, eaves, doors, and windows. The brochure also describes how a resident can assess the wildfire risk of their home and property. Further information can be found in the FireSmart manual "FireSmart–Protecting Your Community from Wildfire" (Partners in Protection, 2003a). Although the central focus of the FireSmart brochure is mitigation activities for homeowners, the FireSmart manual also incorporates recommendations for communities, with a focus on vegetation management including fire breaks.

Although the FireSmart manual and brochure are created and designed in Alberta, they are being used by provincial and municipal governments across Canada (for examples, see: City of Kelowna, 2009; Department of Community Services, 2009; Department

3. A FireSmart WUI Plan incorporates all the area in a community within the WUI (Alberta Sustainable Resource Development, 2005) and focuses on wildfire mitigation measures such as fuel management, education, legislation, development and planning (Flanagan, 2008).

4. A FireSmart Community Zone Plan incorporates wildfire mitigation measures in a variable 10 kilometer radius around the WUI zone (Flanagan, 2008; Alberta Sustainable Resource Development, 2005).

Figure 3. 310-FIRE campaign logo from SRD (Alberta Sustainable Resource Development, 2008b).

of Environment, 2009; Department of Natural Resources, 2009; Forest Service British Columbia, 2009; Ministry of Natural Resources, 2009; Town of Swan Hills, 2007). This widespread use of the manual and brochure indicates that wildfire managers across Canada find this communication material to be useful.

FireSmart programs

The Alberta provincial department of Sustainable Resource Development (SRD) is responsible for the health, protection, management, and development of Alberta's forests, wildlife, and public lands. SRD has a Provincial FireSmart Unit that is located in Edmonton, Alberta. As well, in each SRD region of the province, there are forest prevention officers who are in charge of wildfire mitigation for their region. SRD has several wildfire mitigation strategies that deal with homeowner and community wildfire mitigation, although all involve FireSmart activities. SRD's public education program includes the distribution of FireSmart brochures to municipalities and residents in Alberta. In terms of community mitigation, SRD encourages each municipality at risk of wildfire to complete a Community FireSmart Plan consisting of a FireSmart WUI Plan[3] and a FireSmart Community Zone Plan[4] (Flanagan, 2008; Alberta Sustainable Resource Development, 2005). SRD also offers the FireSmart Grant Program which provides grants for municipalities, municipal districts and counties, Métis Settlements, and registered non-profit societies to develop their own wildfire mitigation strategies and money, guidance, and technical support to complete these activities (Gossell, 2008). The goals of this grant program (Alberta Sustainable Resource Development, 2009) are:

- to support community involvement and ownership of the WUI issues within municipal jurisdictions; and
- to provide financial support to those communities that wish to reduce the wildfire risk.

These funds have led to the development of 26 FireSmart WUI Projects and 11 FireSmart Community Zone Plans in Alberta (Alberta Sustainable Resource Development, 2008c). The main activity funded is vegetation management.

SRD also organises a FireSmart Community Series, which is an annual conference that brings together SRD staff, wildfire experts, municipal officials, with the aim of encouraging municipal governments to adopt FireSmart principles[5] (Alberta Sustainable Resource Development, 2007). Roundtables are used at the conference so that participants can engage in dialogue with wildfire experts, SRD staff and other municipal government representatives.

Many local governments in Alberta and elsewhere in Canada use communication materials developed by the provincial government in their communities. For example, Harris (2008) found that many municipalities in Alberta distribute the FireSmart brochure to homeowners. However some municipalities are developing their own communications programs and materials.

Communication

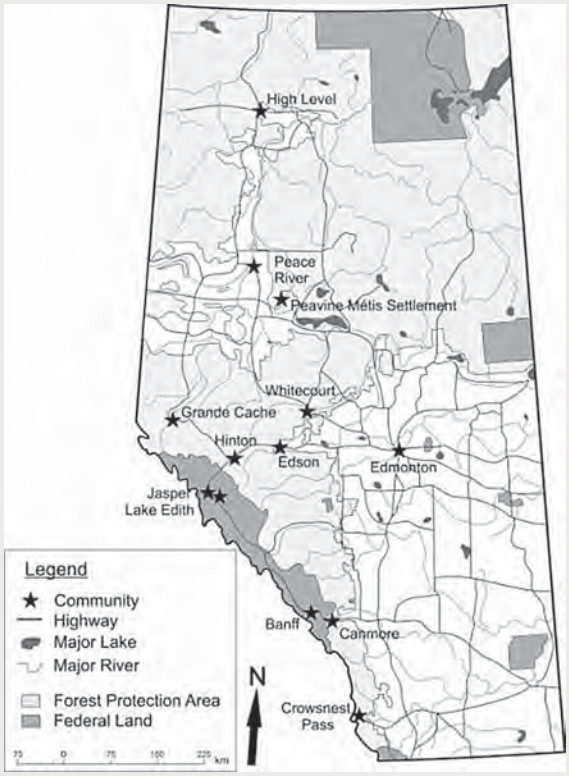
The following section discusses two risk communication approaches, social marketing and risk communication, which are used to encourage homeowners to implement recommended mitigation measures.

Social marketing

A commonly used communication approach by many government departments for causing social change is social marketing (Faulkner and Ball, 2007;

5. This conference was cancelled for 2010 due to budgetary constraints.

Figure 4. Location of Wildfire mitigation case study communities.



Smith, 1999; Bloom and Novelli, 1981; Kotler and Zaltman, 1971). Social marketing is defined as "the design, implementation, and control of programs calculated to influence the acceptability of social ideas and involving considerations of product planning, pricing, communication, distribution, and marketing research" (Kotler and Zaltman, 1971, p.5). Generally, social marketing encourages a change away from a behaviour that may be harmful to the person or society and/or the adoption of a new behaviour that will reduce risk (O'Neill, 2004). An example of a social marketing program is the "Smokey the Bear" campaign conducted by the Advertising Council of America (Kotler and Zaltman, 1971), which communicates messages about wildfire prevention and suppression using imagery of the devastation caused by wildfires. This social marketing program has led to the almost worldwide recognition of the slogan 'Only you can prevent forest fires' and the Smokey the Bear 'brand' which has led to successful wildfire suppression programs in the USA for the last 60 years (Donovan and Brown, 2007).

However, social marketing has been criticised as being manipulative (Grier and Bryant, 2005; Morgan et al., 1992; Kotler and Zaltman, 1971) and using techniques of persuasion rather than informed decision-making (Evans, 2006; McKenzie-Mohr and Smith, 1999; Morgan et al., 1992). Smith (2006) also notes that unsuccessful programs of social marketing are as well documented as the successful programs. Grier and Bryant (2005) argue that evaluation of social marketing programs tend to be poor or not conducted at all. Nonetheless, social marketing is still identified as an appropriate communication tool to promote behaviour change (Gordon et al., 2006). Social marketing can be an effective way to obtain name recognition for the programs in which they are used. However it is unclear whether social marketing is an effective communication tool for promoting behaviour change when the activity needs to be repeated or where the behaviour change required is extremely complex (Bloom and Novelli, 1981), such as in wildfire mitigation.

Risk communication

It is widely recognised that everyone views risk differently because they process risk information based on their existing beliefs and values (Slovic et al., 2004; Slovic, 1999; Fischhoff, 1995; Morgan et al., 1992; Slovic, 1987). Therefore, there arose a need to tailor communication strategies accordingly. This led to the development of risk communication. Risk communication is defined as *"an interactive process of exchange of information among individuals, groups, and institution...(that) raises the level of understanding of relevant issues or actions for those involved and satisfies them that they are adequately informed within the limits of available knowledge"* (U.S. National Research Council, 1989, p.21 & 26). Risk communication involves shared decision making and interactive discussions about risk-management strategies (Maibach and Holtgrave, 1995). This is considered to be most effective as a two-way dialogue between regulatory stakeholders/ scientific experts and the public, with the primary purpose of informing the public so they can make good decisions about risk (Jardine, 2008b; Morgan and Lave, 1990). Increasing dialogue between stakeholders by increasing stakeholder involvement in the entire risk analysis process has been receiving increasing attention in the risk communication field. One goal of risk communication is to move away from one- and two-way *communication* to two-way *dialogue*, where all the stakeholders involved make decisions together about how to deal with the risk (Jardine, 2008c; Petts, 2004). Two-way dialogue would allow the public to be present at every stage of the wildfire risk analysis process, from risk identification to implementation to evaluation, and to engage in a more participatory process where their views can be incorporated into risk management strategies (Jardine, 2008c; Petts, 2004; McComas, 2003; Beierle, 2002; Chess et al., 1995). This has been found to increase the acceptability and adoption of the mutually agreed-upon risk management options (Jardine, 2008a).

Many factors need to be taken into account for effective risk communication to occur, including good science, economic, social, cultural, ethical, political, and legal considerations (Omenn et al., 1997). Risk communicators use literature from behavioral decision-making to understand risk perception and how people make choices about risk (Maibach and Holtgrave, 1995). However, risk communication is a complex process that is issue dependent, and limited progress has been made in producing more effective risk communication programs that meet the needs of both the risk communicator and the recipient (Faulkner and Ball, 2007).

Table 1. 310-FIRE statistics from 1996 to 2008 (Drummond, 2009; Alberta Sustainable Resource Development, 2008a).

Fire Year	Number of Calls	Number of Calls resulting in the reporting of a wildfire	Number of Wildfires	Area Burned (Hectares)	
1996	52	9			
1997	**90**	**16**			
1998	318	64	1698	726,968.07	
1999	**414**	**81**	**1354**	**120,504.77**	
2000	298	51	783	14,735.90	
2001	**578**	**102**	**989**	**154,124.01**	
2002	278	85	1447	496,514.88	
2003	**351**	**121**	**1188**	**74,874.27**	← Social Marketing campaign begins
2004	473	150	1612	236,089.77	
2005	**485**	**129**	**1448**	**60,763.09**	
2006	1138	261	1954	118,785.90	
2007	**743**	**180**	**1349**	**103,668.55**	
2008	917	218			

Wildfire mitigation communication in Alberta

This section discusses the communication strategies surrounding the wildfire mitigation programs in Alberta.

Social marketing

When providing information about wildfire mitigation to municipalities and residents, SRD uses a community-based (C-B) social marketing program (Partners in Protection, 2008). C-B social marketing focuses on: (1) identifying barriers and benefits to behaviour change, (2) identifying behaviour change tools, (3) conducting a pilot study, and (4) evaluating the program after it has been implemented and making changes if necessary (McKenzie-Mohr and Smith, 1999). C-B social marketing is different from social marketing because of the steps listed above, but also because it uses psychological knowledge regarding barriers to behaviour change to design a strategy for communication. C-B social marketing is increasingly being used in Canada, as compared to information-intensive campaigns (McKenzie-Mohr, 2000). C-B social marketing requires the breakdown of the information recipients into segments, with communication tailored for each segment (Evans, 2006; Smith, 2006; McKenzie-Mohr and Smith, 1999; Bloom and Novelli, 1981). The FireSmart brochures prepared by SRD do not tailor recommendations to segments of the intended audiences. However, C-B social marketing also requires evaluation of the project after implementation (McKenzie-Mohr, 2000; McKenzie-Mohr and Smith, 1999; Bloom and Novelli, 1981). SRD is currently initiating a community-based social marketing pilot project in the Foothills region with the goal of tailoring wildfire mitigation programs to target audiences. They will be evaluating this project using brief surveys (Driscoll, 2010). There are also plans for surveys and focus groups in other regions to determine whether or not behaviour change is occurring as a result of SRD's social marketing program (Driscoll, 2010). SRD currently tracks the number of pamphlets they distribute, however they acknowledge this is not indicative of the success of the program (Driscoll, 2010).

One social marketing technique being used by SRD is dramatic imagery. A video about FireSmart (Alberta Sustainable Resource Development, 2001) used to promote the FireSmart manual and brochure contains imagery showing the destruction caused by wildfire and the fear of residents being evacuated by a wildfire. The narrator of the video refers to wildfire as 'wild, unpredictable, and dangerous' (Alberta Sustainable Resource Development, 2001). While this type of fear-inducing communication can increase the perception of the magnitude of the risk and knowledge of wildfires, it may backfire because people may think the risk is so great they cannot do anything to mitigate it (Martin et al., 2007). Generally, fear-inducing communication increases enthusiasm in the initial stages of communication, but is likely to sabotage the success of the program in the long term (Daniel, 2007a). Also, the public may become more hostile to all types of fire (Shindler, 2007; O'Neill, 2004), including prescribed burning, which can reduce wildfire risk to

6. Research with Peavine Métis Settlement is currently ongoing.

communities. On the other hand, portraying fire as a natural and beneficial force may cause people to view wildfire as a low risk that they do not need to prepare for (Daniel, 2007b).

Another common social marketing technique, the use of branding to increase recognition, is being used for FireSmart. In Alberta, FireSmart can be found on merchandise including water bottles, magnets, and pens. The preference of using social marketing for the communication of FireSmart is not surprising due to the continued effectiveness of another social marketing campaign in place by Alberta Sustainable Resource Development, the 310-FIRE campaign, which began in May 2003. This goal of this campaign is to increase recognition of the phone number 310-FIRE, which is the emergency wildfire reporting line in Alberta. The communication around 310-FIRE campaign has been one-way, involving poster campaigns, newspaper ads, radio ads, the placement of the number on the back of most Sustainable Resource Development vehicles, and merchandise such as pens, fishing hooks, and shirts (Figure 3). Numbers of wildfires called in on this line have been increasing each year since the program was implemented (Table 1).

However, the 310-FIRE campaign differs from the wildfire mitigation programs, as the 310-FIRE campaign only involves memorising a number, whereas the wildfire mitigation programs, such as FireSmart, call for a behaviour change that involves implementing numerous measures to reduce wildfire risk. Social marketing is also found to be limited in programs where the recommended behaviors need to be repeated (Bloom and Novelli, 1981). Many of the wildfire mitigation activities must be repeated, such as mowing lawns, removing deadfall near the home, thinning vegetation, removing needs, leaves, and overhanging branches from the roof and gutters, and removing debris under balcony and porches.

The FireSmart manual (Partners in Protection, 2003a) includes recommendations for the effective communication of FireSmart principles. The manual describes the main elements of a communication plan, such as identifying the target audience, purpose statement, desired outcomes, strategy, message, timing, and evaluation, which are all consistent with a social marketing strategy. The FireSmart manual provides recommended messages for various audiences such as wildland fire personnel, residents, elected officials, businesses, insurance industry, and land-use planners. This section of the FireSmart manual does not include any recommendations for involving homeowners in the development and implementation of a wildfire risk reduction plan.

SRD uses various strategies to try to encourage municipalities to implement FireSmart. Recent initiatives introduced to improve two-way dialogue between SRD and municipal governments have included the FireSmart Community Grant Program and the FireSmart Community Series. Once a municipality has decided to try to reduce wildfire risk, various techniques are used by municipal governments in Alberta to communicate FireSmart principles to the public. Information provision strategies have included brochures, newsletters, newspaper advertisements, radio announcements, website notices, television advertisements, and displays (Harris, 2008). More consultative communication strategies have been identified as open houses, exhibits, municipal activities, door-to-door visits, workshops, school presentations, and practice exercises (Harris, 2008).

Risk communication

Some wildfire mitigation programs in Alberta use a risk communication approach. These programs are usually initiated by municipalities and involve residents in each step of the wildfire risk analysis process, instead of following a generic FireSmart program. An example of this is the wildfire risk reduction program at Peavine Métis Settlement. This program incorporates residential values into the programs, along with ideas from the FireSmart manual and brochure. The Council and employees of Peavine Métis Settlement initiate these programs, such as the Elder yard beautification program, where Métis Settlement employees assist Elders in cleaning up their yards and surrounding forest around their homes, reducing wildfire risk[6]. Another example of using risk communication to reduce wildfire risk is at Lake Edith in Jasper National Park (McFarlane et al., 2007b), summarised in the following section.

Case studies

This section summarises the results of ten studies on wildfire risk reduction that have been completed in thirteen communities in Alberta (Figure 4). The residential mitigation programs, the community level wildfire management program, and communication strategies used, are described for each study (Table 2).

In eight of the study locations, the FireSmart brochure was being distributed to residents either door-to-door or at community events and information sessions. Home risk assessments were conducted in six of the cases. In two cases (Lake Edith and Peavine Métis Settlement) residents were involved in developing the community wildfire management plans therefore they incorporated elements of risk communication.

In most of the communities, residents were found to be knowledgeable about wildfire and fire behavior (Faulkner et al., 2009; Flanagan, 2008; McFarlane et al., 2008; McGee and McFarlane, 2007b; McGee and McFarlane, 2007a). In six of these communities, Flanagan (2008) found that between 48% and 80% of participants had heard of FireSmart. She found FireSmart awareness was not significantly related with intentions to adopt or the adoption of mitigation activities, which may mean that respondents indicated they had heard of FireSmart but did not know what the program

7. A work bee is when a group of people come together and volunteer their time to achieve a common goal. In terms of wildfire risk reduction, activities at a work bee usually consist of vegetation thinning and fuel modification.

Table 2. Summary of case study communities, wildlife mitigation programs, and communication strategies.

	Community	Related Studies	Community Wildfire Management and Residential Mitigation Programs
Provincial (SRD)	Canmore	(McFarlane et al., 2008; McFarlane et al., 2007a)	• Canmore / Bow Corridor Community Zone Plan • Bow Corridor WUI Plan • Residential FireSmart
	Crowsnest Pass	**(McGee et al., in press; Kulig et al., 2007; McGee et al., 2005a; McGee et al., 2005b)**	• **Emergency planning** • **Cross training** • **Residential FireSmart**
	Edmonton	(McGee, 2005)	• Residential FireSmart
	Edson	**(Flanagan, 2008)**	• **Town of Edson- WUI Plan**
	Grande Cache	(Flanagan, 2008)	• Town of Grande Cache FireSmart Community Protection Plan • Town of Grande Cache-WUI Plan • Residential FireSmart
	High Level	**(Flanagan, 2008)**	• **Residential FireSmart** • **High Level WUI Plan in development**
	Hinton	(Flanagan, 2008; McFarlane et al., 2007b)	• Yellowhead Corridor and Hinton South Boundary FireSmart Community Protection Plan • Town of Hinton-Yellowhead County-WUI Plan • Residential FireSmart
	Peace River	**(Flanagan, 2008; McGee and McFarlane, 2007a)**	• **Residential FireSmart**
	Peavine Métis Settlement	Current research	• Peavine Iskotew Plan
	Whitecourt	**(Flanagan, 2008; McGee and McFarlane, 2007b)**	• **Town of Whitecourt Community Plan** • **Residential FireSmart**
Federal (Parks Canada)	Banff	(McFarlane et al., 2008; McFarlane et al., 2007a)	• Bow Corridor WUI Plan • Numerous prescribed burning and vegetation management projects • Residential FireSmart
	Jasper	**(McFarlane et al., 2007b)**	• **FireSmart-ForestWise (FsFw) Community Protection and Forest Restoration Project**
	Lake Edith	(McFarlane et al., 2007b)	• FireSmart-ForestWise (FsFw) Community Protection and Forest Restoration Project

entailed. Other studies also found that the majority of participants said they had heard of FireSmart, but felt they were ill-informed about the program (McFarlane et al., 2007b; McGee and McFarlane, 2007b; McGee and McFarlane, 2007a). Therefore, while the social marketing communication strategy for FireSmart appears to be working in increasing name recognition, it is not clear if the FireSmart materials are contributing to residents' knowledge about wildfire, fire behaviour, and mitigation activities.

These studies indicate that some FireSmart mitigation activities are popular among most participants, such as removing dead branches and underbrush, mowing lawns, and keeping lawns clean. It was concluded in six of the studies that participants are completing these activities not to reduce wildfire risk, but as normal property maintenance (McGee et al., in press; Faulkner et al., 2009; McFarlane et al., 2007a; McGee and McFarlane, 2007b; McGee and McFarlane, 2007a; McGee, 2005). There are also unpopular FireSmart mitigation activities. Flanagan (2008) found that landscaping with fire resistant materials and vegetation was unpopular amongst participants in her study. Some participants were also unwilling to make structural changes to their house, such as replacing

	Communication with Residents	Social Marketing	Risk Comm.
	• FireSmart brochures • Door-to door visits	☑	☐
	• **FireSmart brochures distributed via mail, tradeshows, public events, and open houses** • **Home risk assessments**	☑	☐
	• FireSmart brochures	☑	☐
	• **FireSmart brochures provided at community events and information sessions** • **Information Sessions about community wildfire management plans**	☑	☐
	• FireSmart brochures provided at community events and information sessions • Information Sessions about community wildfire management plans	☑	☐
	• **FireSmart brochures**	☑	☐
	• FireSmart brochures provided at community events and information sessions • Information Sessions about community wildfire management plans • FireSmart Home and Site Hazard Assessments	☑	☐
	• **FireSmart brochures**	☑	☐
	• Door-to-door visits	☐	☑
	• **FireSmart brochures**	☑	☐
	• FireSmart brochures • Door-to-door visits by fire department to explain thinning in community	☑	☐
	• **FireSmart brochures**	☑	☐
	• Door-to-Door FireSmart brochure distribution • Presentations at annual meetings • Work bees • Home hazard assessments and removal of problem trees • Project updates at community meetings	☐	☑

the siding or roofing, for financial reasons (Flanagan, 2008; McFarlane et al., 2007a; McGee et al., 2005a). Removing shrubs, small trees, and deadfall within 10 m of house, and landscaping with fire-resistant materials and vegetation, was also unpopular for aesthetic or lifestyle reasons (McGee et al., in press; Flanagan, 2008; McFarlane et al., 2008; McFarlane et al., 2007b; McFarlane et al., 2007a; McGee, 2005; McGee et al., 2005b; McGee et al., 2005c).

As part of the FireSmart-ForestWise program at Lake Edith in Jasper National Park, cottage owners were invited by Parks Canada to have a wildfire hazard assessment completed of their cabin and were provided with a list of recommended mitigation measures in and around their cabin, similar to those recommended in the FireSmart homeowner brochure. Cottage owners were also invited to participate in work bees as part of vegetation thinning around their cabins. All participants had participated in at least one work bee[7], and had also carried out fuel modification on their properties (McFarlane et al., 2007b). Participation in work bees was popular because it provided an opportunity for cottage owners to assist Parks Canada to reduce the wildfire risk to their cottage, aesthetic benefits, and an opportunity to reconnect with neighbours (McFarlane et al., 2007b).

Discussion

The majority of FireSmart communication appears to be following a one-way information transmission model where social marketing techniques are used to encourage residents to implement mitigation measures recommended by governments. The benefits of such a communication strategy in Alberta are unclear. The complex activities and behaviour changes needed for wildfire mitigation do not appear to be occurring on the majority of study participants' properties. Studies completed in Alberta, and reviewed here, have found that participants are knowledgeable about wildfire risk and fire behaviour. However it is not clear if this knowledge has been gained via the FireSmart communication programs. In the U.S., lack of personal contact has been found to explain low level of behaviour change despite an overwhelming amount of brochures and manuals that have been produced by various agencies on wildfire risk reduction (McCaffrey, 2004). McCaffrey (2004) argues that in order for these types of one-way communication techniques to be effective, the material must be given to directly to residents through personal contact with a government or agency representative, and not through mailing, display tables, or newsstands.

On the other hand, two-way communication, either between residents or between residents and a trusted risk manager, has been shown to be key to creating a localised incentive to adopt mitigation measures (McCaffrey and Kumagai, 2007; McGee et al., 2005b; McCaffrey, 2004; Monroe and Nelson, 2004). Shindler (2007) found that many successful wildfire mitigation programs could be traced to one individual with strong communication skills who is respected in the community.

When the FireSmart manual and brochure were first developed, Partners in Protection was comprised of members from municipal, provincial, and federal government departments, as well as associations, training providers, research organisations, business, and industry (Partners in Protection, 2007). There were no representatives of the general public (Partners in Protection, 2007). It appears that Partners in Protection drew together scientific experts to develop broad risk reduction principles, and public involvement was deemed to be most appropriate in applying these principles to communities. However, this goes against the principles of risk communication, where all stakeholders are involved in every stage of the risk management process. Certain recommendations, such as removing fire-prone trees and replacing them with more fire-resistant species, continue to be included in the FireSmart manual and brochure, although most residents have indicated they are unlikely to implement them (Flanagan, 2008). Involving resident stakeholders in the entire risk management process would allow recommendations that conflict with residents' values to be identified early in the process. Therefore, a recommended mitigation measure may be reworded or redeveloped to increase the likelihood of implementation.

Wildfire communication programs must pay greater attention to the risk perspectives of those at risk, as commitment to wildfire mitigation programs can be expected to be limited if fire risk is a relatively low concern (Daniel, 2007b). The success of any program has been found to depend on whether it is physically possible, economically viable, and culturally acceptable for those being asked to make changes to actually do so (Shindler, 2007). Each community has unique cultural, social, economic, political, geographic, meteorological, and vegetative conditions that suggest that specific communication approaches and risk mitigation strategies will be needed in different locations (Steelman, 2007; McGee, 2005; McGee and Russell, 2003). When homeowners' values are incorporated in mitigation and education strategies, wildfire risk reduction programs are more likely to be adopted (McCaffrey, 2007; McFarlane et al., 2007b; Shindler, 2007; Winter and Cvetkovich, 2007; McGee et al., 2005b; Monroe and Nelson, 2004; Nelson et al., 2004; Fried et al., 1999). As seen from the Alberta case studies, wildfire mitigation programs that centered on risk communication, as opposed to social marketing, were more likely to be accepted by residents and lead to great community participation in wildfire mitigation.

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