

Canadian wildfire communication strategies

By Amy Christianson, Tara McGee and Cindy Jardine of the University of Alberta.

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.

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 mitigate² 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 involve 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 the effectiveness of current programs that aim to communicate wildfire mitigation to residents.

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.

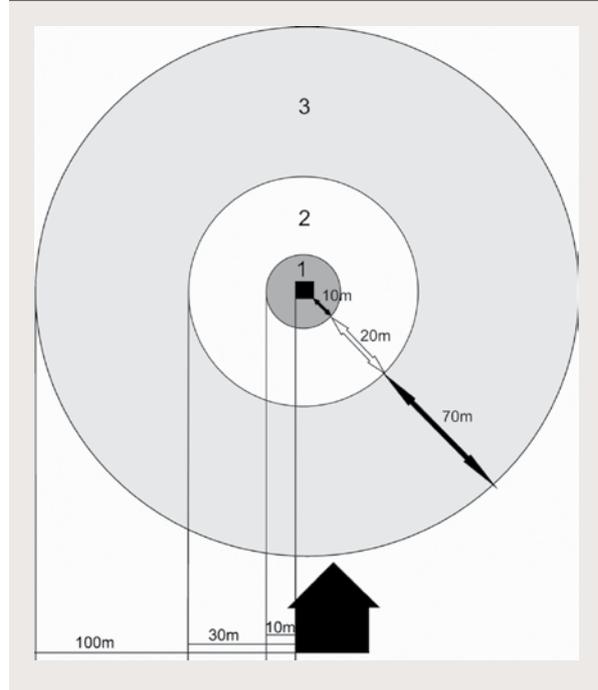
Alberta wildfire mitigation programs

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, 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,

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

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 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.

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



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 Plan³ and a FireSmart Community Zone Plan⁴ (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 principles⁵ (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

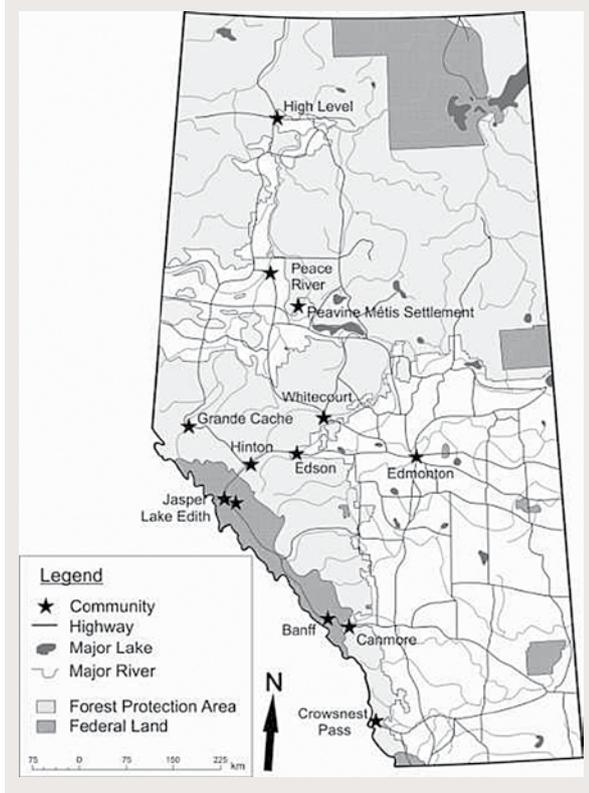
A commonly used communication approach by many government departments for causing social change is social marketing (Faulkner and Ball, 2007; Evans, 2006; Hastings and McDermott, 2006; Smith, 2006; McKenzie-Mohr, 2000; McKenzie-Mohr and Smith, 1999; Bloom and Novelli, 1981; Kotler and Zaltman, 1971). Social marketing is defined as "the design, implementation, and control of programs calculated to influence the acceptability of social ideas and involving considerations

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).

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

Figure 4. Location of Wildfire mitigation case study communities.



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 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).

6. Research with Peavine Métis Settlement is currently ongoing.

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 risk⁷. 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 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

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	Communication with Residents	Social Marketing	Risk Comm.	
Provincial (SRD)	Canmore	(McFarlane et al., 2008; McFarlane et al., 2007a)	<ul style="list-style-type: none"> • Canmore / Bow Corridor Community Zone Plan • Bow Corridor WUI Plan • Residential FireSmart 	<ul style="list-style-type: none"> • FireSmart brochures • Door-to door visits 	Yes	No
	Crowsnest Pass	(McGee et al., in press; Kulig et al., 2007; McGee et al., 2005a; McGee et al., 2005b)	<ul style="list-style-type: none"> • Emergency planning • Cross training • Residential FireSmart 	<ul style="list-style-type: none"> • FireSmart brochures distributed via mail, tradeshows, public events, and open houses • Home risk assessments 	Yes	No
	Edmonton	(McGee, 2005)	<ul style="list-style-type: none"> • Residential FireSmart 	<ul style="list-style-type: none"> • FireSmart brochures 	Yes	No
	Edson	(Flanagan, 2008)	<ul style="list-style-type: none"> • Town of Edson- WUI Plan 	<ul style="list-style-type: none"> • FireSmart brochures provided at community events and information sessions • Information Sessions about community wildfire management plans 	Yes	No
	Grande Cache	(Flanagan, 2008)	<ul style="list-style-type: none"> • Town of Grande Cache FireSmart Community Protection Plan • Town of Grande Cache-WUI Plan • Residential FireSmart 	<ul style="list-style-type: none"> • FireSmart brochures provided at community events and information sessions • Information Sessions about community wildfire management plans 	Yes	No
	High Level	(Flanagan, 2008)	<ul style="list-style-type: none"> • Residential FireSmart • High Level WUI Plan in development 	<ul style="list-style-type: none"> • FireSmart brochures 	Yes	No
	Hinton	(Flanagan, 2008; McFarlane et al., 2007b)	<ul style="list-style-type: none"> • Yellowhead Corridor and Hinton South Boundary FireSmart Community Protection Plan • Town of Hinton-Yellowhead County-WUI Plan • Residential FireSmart 	<ul style="list-style-type: none"> • FireSmart brochures provided at community events and information sessions • Information Sessions about community wildfire management plans • FireSmart Home and Site Hazard Assessments 	Yes	No
	Peace River	(Flanagan, 2008; McGee and McFarlane, 2007a)	<ul style="list-style-type: none"> • Residential FireSmart 	<ul style="list-style-type: none"> • FireSmart brochures 	Yes	No
	Peavine Métis Settlement	Current research	<ul style="list-style-type: none"> • Peavine Iskotew Plan 	<ul style="list-style-type: none"> • Door-to-door visits 	No	Yes
	Whitecourt	(Flanagan, 2008; McGee and McFarlane, 2007b)	<ul style="list-style-type: none"> • Town of Whitecourt Community Plan • Residential FireSmart 	<ul style="list-style-type: none"> • FireSmart brochures 	Yes	No

	Community	Related Studies	Community Wildfire Management and Residential Mitigation Programs	Communication with Residents	Social Marketing	Risk Comm.
Federal (Parks Canada)	Banff	(McFarlane et al., 2008; McFarlane et al., 2007a)	<ul style="list-style-type: none"> • Bow Corridor WUI Plan • Numerous prescribed burning and vegetation management projects • Residential FireSmart 	<ul style="list-style-type: none"> • FireSmart brochures • Door-to-door visits by fire department to explain thinning in community 	Yes	No
	Jasper	(McFarlane et al., 2007b)	<ul style="list-style-type: none"> • FireSmart-ForestWise (FsFw) Community Protection and Forest Restoration Project 	<ul style="list-style-type: none"> • FireSmart brochures 	Yes	No
	Lake Edith	(McFarlane et al., 2007b)	<ul style="list-style-type: none"> • FireSmart-ForestWise (FsFw) Community Protection and Forest Restoration Project 	<ul style="list-style-type: none"> • 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 	No	Yes

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 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 bee⁷, 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.

References

- Alberta Sustainable Resource Development, 2009**, *FireSmart Community Grant Program: Protecting Your Community From Wildfire*, Available at http://www.srd.gov.ab.ca/wildfires/firesmart/pdf/FireSmart_Grant_Program.pdf, Accessed on March 30, 2009.
- Alberta Sustainable Resource Development, 2008a, 10** *Years Statistical Summary*, Available at <http://www.srd.alberta.ca/wildfires/information/10yearstatsummary.aspx>, Accessed on November 28, 2008.
- Alberta Sustainable Resource Development, 2008b, 310-** *FIRE*, Available at <http://www.srd.alberta.ca/wildfires/310fire.aspx>, Accessed on.
- Alberta Sustainable Resource Development, 2008c**, *Wildland Urban Interface Plans and Projects*, Available at <http://www.srd.gov.ab.ca/wildfires/firesmart/plansprojects.aspx>, Accessed on November 20, 2008.
- Alberta Sustainable Resource Development, 2007**, *FireSmart Keeps Communities Safe*, Available at http://www.srd.gov.ab.ca/whatsnew/firesmart_web_story.aspx, Accessed on February 18, 2008.
- Alberta Sustainable Resource Development, 2005**, *FireSmart Zones*, Available at <http://srd.alberta.ca/wildfires/firesmart/zones.aspx>, Accessed on December 1, 2008.
- Alberta Sustainable Resource Development, 2001**, *FireSmart Video*, Available at <http://www.srd.gov.ab.ca/wildfires/videos/smart.aspx>, Accessed on.
- Arvai, J., et al., 2007**, *Improving Management Decisions*. IN MARTIN, W. E., RAISH, C. & KENT, B. (Eds.) *Wildfire Risk: Human Perceptions and Management Implications. Resources for the Future*, Washington, DC.
- Beierle, T. C., 2002**, *The Quality of Stakeholder-Based Decisions*, *Risk Analysis*, Vol. 22, No.4, pp.739-749.
- Beringer, J., 2000**, *Community fire safety at the urban/rural interface: The bushfire risk*, *Fire Safety Journal*, Vol. 35, No.1, pp.1-23.
- Bloom, P. N. & Novelli, W. D., 1981**, *Problems and Challenges in Social Marketing*, *Journal of Marketing*, Vol. 45 (Spring 1981), pp.79-88.
- Bogard, W. C., 1988**, *Bringing Social Theory to Hazards Research: Conditions and Consequences of the Mitigation of Environmental Hazards*, *Sociological Perspectives*, Vol. 31, No.2, pp.147-168.
- Brenket-Smith, H., et al., 2006**, *Insights into Wildfire Mitigation Decisions Among Wildland-Urban Interface Residents*, *Society and Natural Resources*, Vol. 19, pp.759-768.
- Bushnell, S., et al., 2006**, *Understanding Communities Living with Bushfire: The Thuringowa Bushfire Case Study*, *Fire Note*, Vol. November 2006, No.9, pp.1-4.

Canadian Forest Service, 2005, *Mountain Pine Beetle Initiative: Interim Report*, Canada.

Chess, C., et al., 1995, *Improving Risk Communication in Government: Research Priorities*, *Risk Analysis*, Vol. 15, No.2, pp.127-135.

Chisholm Fire Review Committee, 2001, *Chisholm Fire Review Committee final report*. Submitted to the Minister of Sustainable Resource Development., Edmonton, AB.

City of Kelowna, 2009, *FireSmart - Protecting Your Community From Wildfire*, Available at <http://www.city.kelowna.bc.ca/CM/Page384.aspx>, Accessed on May 5, 2009.

Cohen, J. & Stratton, R., 2003, *Home Destruction Within the Hayman Fire Perimeter*, pp.263-292.

Cohen, J. D., 2001, *Examination of the Home Destruction in Los Alamos Associated with the Cerro Grande Fire July 10, 2000*, Rocky Mountain Research Station, Missoula Montana.

Cohen, J. D., 2000, *What is the Wildland Fire Threat to Homes? Presented as the Thompson Memorial Lecture, April 10, 2000*, School of Forestry, Northern Arizona University, Flagstaff, AZ.

Cohn, P. J., et al., 2007, *Wildland-Urban Interface Residents Views on Risk and Attribution*. IN MARTIN, W. E., RAISH, C. & KENT, B. (Eds.) *Wildfire Risk: Human Perceptions and Management Implications. Resources for the Future*, Washington, DC.

Collins, T. W., 2005, *Households, forests, and fire hazard vulnerability in the American West: A case study of a California community*, *Environmental Hazards*, Vol. 6, No.1, pp.23-37.

Daniel, T. C., 2007a, *Managing Individual Response: Lessons from Public Health Risk Behavioral Research*. IN MARTIN, W. E., RAISH, C. & KENT, B. (Eds.) *Wildfire Risk: Human Perceptions and Management Implications. Resources for the Future*, Washington, DC.

Daniel, T. C., 2007b, *Perceptions of Wildfire Risk*. IN DANIEL, T. C., CARROLL, M. S. & MOSELEY, C. (Eds.) *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. Oregon State University Press.

Department of Community Services, 2009, *FireSmart*, Available at <http://www.community.gov.yk.ca/firesmart/index.html>, Accessed on May 5, 2009.

Department of Environment, 2009, *Wildfire Management: FireSmart - Education and Prevention*, Available at <http://www.environment.gov.sk.ca/Default.aspx?DN=d9aa5f39-956e-48d1-949e-27c78c0f2482>, Accessed on.

Department of Natural Resources, 2009, *Is your Home FireSmart?*, Available at <http://www.gov.ns.ca/natr/forestprotection/wildfire/firecentre/fire-smart.asp>, Accessed on May 9, 2009.

Donovan, G. H. & Brown, T. C., 2007, *Be careful what you wish for: the legacy of Smokey Bear*, *Frontiers in Ecology and the Environment*. 5(2): 73-79, Vol. 5, No.2, pp.73-79.

Driscoll, G., 2010, *Wildfire Information Officer*, Government of Alberta, Sustainable Resource Development.

Drummond, A., 2009, *Wildfire Information Officer*, Government of Alberta, Sustainable Resource Development.

Evans, W. D., 2006, *How social marketing works in healthcare*, *BMJ*, Vol. 332, No.May, pp.1207-1210.

Faulkner, H. & Ball, D., 2007, *Environmental Hazards and Risk Communication*, *Environmental Hazards*, Vol. 7, pp.71-78.

Faulkner, H., et al., 2009, *Comparison of homeowner response to wildfire risk among towns with and without wildfire management*, *Environmental Hazards: Human and Policy Dimensions*, Vol. 8, pp.38-51.

Filmon, G., 2004, *Firestorm 2003: Provincial Review*, Victoria.

Fischhoff, B., 1995, *Risk Perception and Communication Unplugged: Twenty Years of Process*, *Risk Analysis*, Vol. 15, No.2, pp.137-145.

Flanagan, H., 2008, *Residential Wildfire Mitigation and Adoption in Alberta*, Unpublished MA Thesis. Department of Earth and Atmospheric Sciences. University of Alberta. Edmonton, Alberta.

Flannigan, M. D., et al., 2005, *Forest Fires and Climate Change in the 21st Century, Mitigation and Adaptation Strategies for Global Change*, Vol. 11, pp.847-859.

Forest Service British Columbia, 2009, *Introduction to FireSmart*, Available at <http://bcwildfire.ca/Prevention/Property/firesmart.htm>, Accessed on May 5, 2009.

Fried, J. S., et al., 1999, *Assessing the Benefits of Reducing Fire Risk in the Wildland-Urban Interface: A Contingent Valuation Approach*, *International Journal of Wildland Fire*, Vol. 9, No.1, pp.9-20.

Gardner, P. D., et al., 1987, *The risk perceptions and policy response toward wildland fire hazards by urban home-owners*, *Landscape and Urban Planning*, Vol. 14, pp.163-172.

Gordon, R., et al., 2006, *The effectiveness of social marketing interventions for health improvement: What's the evidence?*, W B Saunders Co Ltd.

Gossell, A., 2008, *FireSmart Community Planning Specialist*, Government of Alberta, Sustainable Resource Development.

Grier, S. & Bryant, C. A., 2005, *Social marketing in public health*, *Annual Review of Public Health*, Vol. 26, pp.319-339.

Harris, L., 2008, *Wildfire Risk Management by Municipal Governments in Alberta, Canada*, Unpublished MA Thesis. Department of Earth and Atmospheric Sciences. University of Alberta. Edmonton, Alberta.

Hastings, G. & McDermott, L., 2006, *Putting social marketing into practice*, *BMJ*, Vol. 332, No.May, pp.1210-1211.

Jardine, C. G., 2008a, *Considerations in Planning for Successful Risk Communication*. IN EVERITT, B. & MELNICK, E. (Eds.) *Encyclopedia of Quantitative Risk Analysis and Assessment*. John Wiley & Sons, Ltd., London.

Jardine, C. G., 2008b, *The Role of Risk Communication in a Comprehensive Risk-Management Approach*. IN EVERITT, B. & MELNICK, E. (Eds.) *Encyclopedia of Quantitative Risk Analysis and Assessment*. John Wiley & Sons, Ltd., London.

Jardine, C. G., 2008c, *Stakeholder Participation in Risk-Management Decision Making*. IN EVERITT, B. & MELNICK, E. (Eds.) *Encyclopedia of Quantitative Risk Analysis and Assessment*. John Wiley & Sons, Ltd., London.

Kotler, P. & Zaltman, G., 1971, *Social marketing: an approach to planned social change.*, *Journal of Marketing*, Vol. July 35, No.3, pp.3-12.

Maibach, E. & Holtgrave, D. R., 1995, *Advances In Public-Health Communication*, *Annual Review of Public Health*, Vol. 16, pp.219-238.

Martin, I. M., et al., 2007, *Making the Decision to Mitigate Risk*. IN MARTIN, W. E., RAISH, C. & KENT, B. (Eds.) *Wildfire Risk: Human Perceptions and Management Implications*. Resources for the Future Press, Washington, D.C.

McCaffrey, S., 2007, *Understanding Public Perspectives of Wildfire Risk*. IN MARTIN, W. E., RAISH, C. & KENT, B. (Eds.) *Wildfire Risk: Human Perceptions and Management Implications*. Resources for the Future, Washington, DC.

McCaffrey, S., 2004, *Fighting Fire with Education: What is the Best Way to Reach Out to Homeowners?*, *Journal of Forestry*, Vol. July/August 2004, pp.12-19.

McCaffrey, S. & Kumagai, Y., 2007, *No Need to Reinvent the Wheel: Applying Existing Social Science Theories to Wildfire*. IN DANIEL, T. C., CARROLL, M. S. & MOSELEY, C. (Eds.) *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. Oregon State University Press.

McComas, K. A., 2003, *Public Meetings and Risk Amplification: A Longitudinal Study*, *Risk Analysis*, Vol. 23, No.6, pp.1257-1270.

McFarlane, B., et al., 2007a, *Public Perceptions of Wildland Fire Management in Banff National Park of Canada: A Summary of Findings*, Available at http://research.eas.ualberta.ca/hdhresearch/Publications/FtMF_PPFM.pdf, Accessed on December 1, 2008.

McFarlane, B., et al., 2007b, *Public Perceptions of Wildland Fire Management in the Foothills Model Forest: A Summary of Findings*, Available at http://research.eas.ualberta.ca/hdhresearch/Publications/FtMF_PPFM.pdf, Accessed on December 1, 2008.

McFarlane, B., et al., 2008, *Vegetation Management in Banff National Park: A Survey of Local Residents*, Available at http://research.eas.ualberta.ca/hdhresearch/Publications/vegetation_management_Banff.pdf, Accessed on January 26, 2009.

McGee, T., 2005, *Completion of recommended WUI fire mitigation measures within urban households in Edmonton, Canada*, *Environmental Hazards*, Vol. 6, pp.147-157.

McGee, T., et al., 2005a, *March 2005 Final Report: Exploration of Wildfire Risk Reduction in Communities Directly Affected by Wildfires in 2003, Ottawa, Ontario*.

McGee, T. & McFarlane, B., 2007a, *Peace River Case Study*, Available at http://research.eas.ualberta.ca/hdhresearch/Publications/peace_river.html, Accessed on February 19, 2008.

McGee, T. & McFarlane, B., 2007b, *Whitecourt Case Study*, Available at <http://research.eas.ualberta.ca/hdhresearch/Publications/whitecourt.html>, Accessed on February 19, 2008.

McGee, T., et al., in press, *An examination of the influence of hazard experience on wildfire risk perception and adoption of mitigation measures*, *Society and Natural Resources*, Vol.

McGee, T., et al., 2005b, *March 2005 Final Report: Exploration of Wildfire Risk Reduction in Communities Directly Affected by Wildfires in 2003, Ottawa, Ontario*.

McGee, T., et al., 2005c *Wildfire Risk Reduction in the Communities Affected by the 2003 Lost Creek Fire*. Edmonton, Alberta, Foothills Model Forest.

McGee, T. & Russell, S., 2003, "It's just a natural way of life..." an investigation of wildfire preparedness in rural Australia, *Environmental Hazards*, Vol. 5, pp.1-12.

McKenzie-Mohr, D., 2000, *Fostering Sustainable Behavior Through Community-Based Social Marketing*, *American Psychologist*, Vol. May 2000, pp.531-537.

McKenzie-Mohr, D. & Smith, W., 1999, *Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing*, New Society Publishers, Gabriola Island, B.C.

Ministry of Natural Resources, 2009, *Be FireSmart*, Available at http://www.mnr.gov.on.ca/en/Business/AFFM/2ColumnSubPage/STEL02_165412.html, Accessed on May 5, 2009.

Monroe, M. & Nelson, K., 2004, *The Value of Assessing Public Perceptions: Wildland Fire and Defensible Space*, *Applied Environmental Education and Communication*, Vol. 3, pp.109-117.

Monroe, M. C., et al., 2003, *Wildland Fire in the Southeast: Negotiating Guidelines for Defensible Space*, *Journal of Forestry*, Vol. April/May 2003, pp.14-19.

Morgan, M. G., et al., 1992, *Communicating Risk to the Public*, *Eviron. Sci. Technol.*, Vol. 26, No.11, pp.2048-2056.

Morgan, M. G. & Lave, L., 1990, *Ethical Considerations in Risk Communication Practice and Research*, *Risk Analysis*, Vol. 10, No.3, pp.355-358.

Nelson, K. C., et al., 2005, *The Look of the Land: Homeowner Landscape Management and Wildfire Preparedness in Minnesota and Florida*, *Society & Natural Resources*, Vol. 18, No.4, pp.321-336.

Nelson, K. C., et al., 2004, *Living with fire: homeowner assessment of landscape values and defensible space in Minnesota and Florida*, *International Journal of Wildland Fire*, Vol. 13, No.4, pp.413-425.

O'Neill, P., 2004, *Developing a Risk Communication Model to Encourage Community Safety from Natural Hazards*.

Omenn, G. S., et al., 1997, *Framework for Environmental Health Risk Management*, Washington, D.C., pp.64.

Partners in Protection, 2008, 12th Annual General Meeting of Partners in Protection, Available at <http://www.partnersinprotection.ab.ca/agm.php>, Accessed on December 3, 2008.

Partners in Protection, 2007, *Partners in Protection Business Plan: Into the Future October 2007*, Edmonton, AB.

Partners in Protection, 2003a, *FireSmart: Protecting Your Community from Wildfire. Second Edition*, Edmonton, Alberta.

Partners in Protection, 2003b, *The Home Owners FireSmart Manual: Protect your home from wildfire. Second Edition*, Edmonton, Alberta.

Peter, B., et al., 2006, *Fire Risk and Population Trends in Canada's Wildland-Urban Interface*. IN HIRSCH, K. G. & FUGLEM, P. (Eds.) *Canadian Wildland Fire Strategy: Background Syntheses, Analyses, and Perspectives*. Canadian Council of Forest Ministers.

Petts, J., 2004, *Barriers to participation and deliberation in risk decisions: evidence from waste management*, *Journal of Risk Research*, Vol. 7, No.2, pp.115-133.

Pyne, S. J. (Ed.), 2007 *Awful Splendour: A Fire History of Canada*, UBC Press, Vancouver, B.C.

Shindler, B., 2007, *Public Acceptance of Wildland Fire Conditions and Fuel Reduction Practices: Challenges for Federal Forest Managers*. IN DANIEL, T. C., CARROLL, M. S. & MOSELEY, C. (Eds.) *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. Oregon State University Press.

Slovic, P., 1999, *Trust, Emotion, Sex, Politics, and Science: Surveying the Risk-Assessment Battlefield*, *Risk Analysis*, Vol. 19, No.4, pp.689-701.

Slovic, P., 1987, *Perception of Risk*, *Science*, Vol. 236, pp.280-285.

Slovic, P., et al., 2004, *Risk as Analysis and Risk as Feelings: Some Thoughts about Affect, Reason, Risk and Rationality*, *Risk Analysis*, Vol. 24, No.2, pp.311-322.

Smith, W. A., 2006, *Social marketing: an overview of approach and effects*, *Injury Prevention*, Vol. 12, No. Supplement 1, pp.i38-i43.

Steelman, T. A., 2007, *Addressing the Mitigation Paradox at the Community Level*. IN MARTIN, W. E., RAISH, C. & KENT, B. (Eds.) *Wildfire Risk: Human Perceptions and Management Implications. Resources for the Future*, Washington, DC.

Town of Swan Hills, 2007, *FireSmart Program*, Available at http://www.townofswanhills.com/index.php?option=com_content&task=view&id=44&Itemid=1, Accessed on May 5, 2009.

U.S. National Research Council, 1989, *Improving Risk Communication*, PRESS, N. A., Washington, D.C.

Winter, P. L. & Cvetkovich, G. T., 2007, *Diversity in Southwestern's Views of Forest Service Fire Management*. IN MARTIN, W. E., RAISH, C. & KENT, B. (Eds.) *Wildfire Risk: Human Perceptions and Management Implications. Resources for the Future*, Washington, DC.

About the authors

Amy Christianson is a PhD candidate at the University of Alberta. She is currently working with an Aboriginal community in Northern Alberta on the influence of community history, values, and traditions on wildfire risk perception and mitigation.

Tara McGee is an Associate Professor in Human Geography within the Department of Earth and Atmospheric Sciences at the University of Alberta in Edmonton, Alberta.

Cindy Jardine is an Associate Professor with the School of Public Health at the University of Alberta. Her research interests are in risk communication and exploring means for developing informed public dialogue on contentious risk policy issues.

Amy Christianson is the corresponding author for this paper and may be contacted at anc@ualberta.ca

R